ManualsPlus.com

Errata

Title & Document Type: 8566B/8568B Spectrum Analyzer Troubleshooting and Repair Manual

Manual Part Number: 08566-90042

Revision Date: December 1984

HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, semiconductor products and chemical analysis businesses are now part of Agilent Technologies. We have made no changes to this manual copy. The HP XXXX referred to in this document is now the Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A.

About this Manual

We've added this manual to the Agilent website in an effort to help you support your product. This manual provides the best information we could find. It may be incomplete or contain dated information, and the scan quality may not be ideal. If we find a better copy in the future, we will add it to the Agilent website.

Support for Your Product

Agilent no longer sells or supports this product. You will find any other available product information on the Agilent Test & Measurement website:

www.tm.agilent.com

Search for the model number of this product, and the resulting product page will guide you to any available information. Our service centers may be able to perform calibration if no repair parts are needed, but no other support from Agilent is available.

Agilent Technologies

ManualsPlus.com

HEWLETT PACKARD

TROUBLESHOOTING AND REPAIR MANUAL
VOLUME 1

8566B SPECTRUM ANALYZER RF SECTION

SERIAL NUMBERS

This manual applies directly to RF sections with serial numbers prefixed 2410A.

COPYRIGHT © HEWLETT-PACKARD COMPANY, 1984
1212 VALLEY HOUSE DRIVE, ROHNERT PARK, CALIFORNIA, 94928, U.S.A.

MANUAL PART NUMBER: 08566-90042
Microfiche Part Number: 08566-90048

Printed: December 1984

ManualsPlus.com

SAFETY SYMBOLS

The following safety symbols are used throughout this manual and in the instrument. Familiarize yourself with each of the symbols and its meaning before operating this instrument.

Instruction manual symbol. The instrument will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the instrument against damage. Location of pertinent information within the manual is indicated by use of this symbol in the table of contents.

Indicates dangerous voltages are present. Be extremely careful.

CAUTION

The CAUTION sign denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in damage to or destruction of the instrument. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

WARNING

The WARNING sign denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

GENERAL SAFETY CONSIDERATIONS

WARNING

BEFORE THIS INSTRUMENT IS SWITCHED ON, make sure it has been properly grounded through the protective conductor of the ac power cable to a socket outlet provided with protective earth contact. Any interruption of the protective (grounding) conductor, inside or outside the instrument, or disconnection of the protective earth terminal can result in personal injury.

WARNING

There are voltages at many points in the instrument which can, if contacted, cause personal injury. Be extremely careful. Any adjustments or service procedures that require operation of the instrument with protective covers removed should be performed only by trained service personnel.

CAUTION

BEFORE THIS INSTRUMENT IS SWITCHED ON, make sure its primary power circuitry has been adapted to the voltage of the ac power source. Failure to set the ac power input to the correct voltage could cause damage to the instrument when the ac power cable is plugged in.

ManualsPlus.com

HP 8566B SPECTRUM ANALYZER
DOCUMENTATION OUTLINE

Included with the HP Model 8566B Spectrum Analyzer are three manuals: the Operator's Handbook, the Operating and Programming Manual, and the Tests and Adjustments Manual. Not included with the instrument, but available at no charge upon return of the enclosed order card, is the two-volume Troubleshooting and Repair Manual.

OPERATOR'S HANDBOOK
(HP Part Number 08566-90045)

Contents:

General Information, Installation, Quick Reference, Specifications, and Operation Verification. Available as separate publications are Specifications (HP Part Number 08566-90046), Operation Verification (HP Part Number 08566-60008), and a pocket-sized version of the Quick Reference Guide.

OPERATING AND PROGRAMMING MANUAL
(HP Part Number 08566-90040)

Contents:

Manual and remote operation, including complete syntax and command description. Accompanying this manual is the separate, pocket-sized Quick Reference Guide (HP Part Number 5955-8970).

TESTS AND ADJUSTMENTS MANUAL
(HP Part Number 08566-90051)

Contents:

Electrical performance testing and adjustment procedures.

TROUBLESHOOTING AND REPAIR MANUAL
(HP Part Number 08566-90042)

Contents:

IF-Display Section and RF Section service information.

ManualsPlus.com

CONTENTS

Volume 1	Contents
RF Section General Information	General information on the contents of the manual, including storage, shipment, and packaging.
Signature Analysis Description	An explanation of the use of Signature Analysis diagrams for digital troubleshooting.
Spectrum Analyzer Overall Troubleshooting	Troubleshooting index, special messages, diagnostic functions, error correction routine, sweep system block diagram and troubleshooting, mnemonics listing, and Spectrum Analyzer Overall Block Diagram.
RF Section Analog Troubleshooting	Phase lock loop operation, start frequency tuning equations, and phase lock troubleshooting.
RF Section Digital Troubleshooting	Instrument preset checks, digital storage verification, and RF Digital Troubleshooting Block Diagram.
A5 Front Panel through A23 Motherboard	Service sheets containing circuit descriptions, troubleshooting information (if applicable), replacement procedures (if applicable), replaceable parts lists, parts identification (if applicable), signature analysis troubleshooting diagrams (if applicable), block diagrams, component locations, and schematic diagrams.
General Parts Listing	Replaceable parts information, reference designations and abbreviations, Manufacturer's Code List, RF Miscellaneous Parts List, RF Assemblies Parts List, and instrument parts identification.
Major Assembly and Component Locations	RF Section major assembly and component locations.

Volume 2	
IF-Display Section General Information	General information on manual contents, instrument storage and shipment.
Signature Analysis Description	An explanation of the use of Signature Analysis diagrams for digital troubleshooting.
IF Overall Block Diagram	Mnemonic Table, Instrument Bus Pin Connection Table, and Overall IF Block Diagram.
A1 Display Section Block Diagram	A1 Display Section Troubleshooting information, Block Diagram, and A1A1 through A1A10 service sheets.

ManualsPlus.com

A3 Digital Storage Troubleshooting ..... A3 Digital Storage Troubleshooting information, Block Diagram, and A3A1 through A3A10 service sheets.

A4 IF Section Troubleshooting ..... A4 Section Block Diagram, and A4A1 through A4A10 service sheets.

General Parts Listing ..... Replaceable parts information, and parts identification figures.

Major Assembly and Component Locations ..... Major assembly identification figure.

ManualsPlus.com

ManualsPlus.com

RF SECTION GENERAL INFORMATION SERVICE

INTRODUCTION

This volume of the Troubleshooting and Repair Manual contains information for the troubleshooting and repair of the RF Section of the instrument. This information is combined in service sheets and indexed with tabs for quick reference. Also contained in this volume are overall troubleshooting information and illustrations of the instrument useful in isolating failures to the RF or IF-Display Section.

SERVICE SHEETS

The service sheets in this manual are organized in alphanumeric order and are indexed with tabs to make it easy to locate a specific service sheet. Each of the service sheets contain the following information:

Circuit Description (where practical)
Replacement Procedure (where practical)
Troubleshooting Hints (where practical)
Replaceable Parts List
Component Location Illustration
Parts Identification (where practical)
Block Diagram (where practical)
Schematic Diagram

Also included, where applicable, are Signature Analysis Diagrams for troubleshooting digital circuits.

REPLACEMENT PROCEDURES

Replacement procedures are included for use in removing and replacing assemblies for repair. They are located in the following sections:

A5 Front Panel
- Front Panel Removal and Repair

A6 RF Module
- A6 RF Module Replacement
- A6A1 Coaxial Switch and A6A17 300 MHz BPF Replacement
- A6A2 RF Attenuator Replacement
- A6A4 Second Converter Replacement
- A6A6 First Converter Replacement
- A6A15 3.6 GHz BPF, A6A16 1.5 GHz LPF, and A6A18 LPF Replacement

A6A3 Last Converter
- A6A3 Last Converter Replacement

A6A7 YTX Current Driver/A6A5 ACLU/ A6A8 YTX
- A6A5 Amplifier/Coupler/Load Unit (ACLU) Replacement
- A6A7 YTX Current Driver Replacement
- A6A8 YTX Replacement

A7M/N-Reference/A22 10 MHz Frequency Standard
- A7 M/N-Reference Replacement
- A22 10 MHz Standard Replacement

A8 Rectifier/A9 Power Line Module
- RF Section Internal Fuse Replacement
- Transformer Replacement
- Power Transistor Replacement

A11 YTO Loop
- A11 YTO Loop and A11A3 YTO (2.0 – 6.2 GHz Oscillator) Replacement

A17 Positive Regulator
- RF Section Internal Fuse Replacement

A18 Negative Regulator
- RF Section Internal Fuse Replacement

MAJOR ASSEMBLY AND COMPONENT LOCATIONS

Major assembly and component location illustrations for the RF Section are located at the rear of both volumes.

TROUBLESHOOTING

Troubleshooting information for the RF Section is divided into three levels as follows:

Instrument Level
- Signature Analysis Description
- Spectrum Analyzer Overall Troubleshooting

ManualsPlus.com

Section Level

RF Section Analog Troubleshooting
RF Section Digital Troubleshooting
A6 RF Module
A7 M/N-Reference/A22 10 MHz Frequency Standard
A10 20/30 Synthesizer
A11 YTO Loop

Assembly Level

Most assemblies have troubleshooting hints immediately following circuit descriptions. Troubleshooting information is also located on assembly level block diagrams, notes, and schematics.

All assemblies are indexed by tab except for the ones listed below. The index tab they can be found under is also listed.

PRINTED CIRCUIT BOARD EDGE CONNECTOR CONTACT CLEANING

MATERIALS:

- Lint-free cloth or equivalent (HP Part Number 9310-0039, Check Digit 3).
- Solution of 80% electronics-grade isopropyl alcohol and 20% water.
- Static-free work station.

PROCEDURE:

1. Dampen the cloth with the alcohol and water solution and scrub the edge connector contacts vigorously, using a circular motion. Polish one side of the board at a time until the contacts shine, keeping the cloth damp to dissolve contaminants and reduce static electricity.

2. Using a clean cloth, dry the contacts by wiping from their inside to outside edge. This prevents particles from building up on the contact edges.

CAUTION

Do not use erasers to clean the edge connectors. They cause microscopic damage to the contact surface, removing the thin gold plating and exposing the nickel under-plating, which eventually corrodes. Erasers also leave a film on the contact and generate static electricity.

Do not use paper of any kind to clean the edge connector contacts. Paper or lint particles left on the edge contact surface can cause intermittent electrical connections.

Do not touch contact or trace surfaces with bare hands. Always handle the board by its edges.

SIGNATURE ANALYSIS

This instrument has been designed to incorporate signature analysis. Signature analysis diagrams are included in the appropriate sections. For explanation on the use of these diagrams, refer to the Signature Analysis Description Tab.

HP-IB ADDRESS SELECTION

The HP-IB address for the HP 8566B is preset at the factory by means of a five-segment binary switch located on the A15 Processor Assembly. This switch is set to the binary number 11111 which corresponds to a decimal equivalent of 31. The number 31 is a special instruction code that commands the instrument to use the last input address stored in memory. This stored HP-IB address is ASCII 2R (decimal 18) and determines the address to be used on "power up."

TABLE 1. ASSEMBLY LOCATIONS

Assembly	Location
A29	A15 Controller
A24	General Parts Listing
A10A9	General Parts Listing
T1	A8 Rectifier/A9 Power Line Module

ManualsPlus.com

The HP-IB address may be changed to any of the addresses listed in Table 2 by resetting the HP-IB address switch to correspond to the binary equivalent of the desired ASCII character or decimal value as indicated in the table. The five-segment switch is illustrated in Figure 1 and is shown in its preset position (decimal 31).

TABLE 2. CROSS-REFERENCE BETWEEN ASCII, DECIMAL, AND BINARY ADDRESS CODES

ASCII CHARACTER		DECIMAL VALUE	5-BIT BINARY EQUIVALENT
@	SP	00	00000
A	!	01	00001
B	"	02	00010
C	#	03	00011
D	$	04	00100
E	%	05	00101
F	&	06	00110
G	'	07	00111
H	(	08	01000
I	)	09	01001
J	*	10	01010
K	+	11	01011
L	,	12	01100
M	–	13	01101
N	.	14	01110
O	/	15	01111
P	Ø	16	10000
Q	1	17	10001
R	2	18	10010
S	3	19	10011
T	4	20	10100
U	5	21	10101
V	6	22	10110
W	7	23	10111
X	8	24	11000
Y	9	25	11001
Z	:	26	11010
[	;	27	11011
\	<	28	11100
]	=	29	11101
⁀	>	30	11110

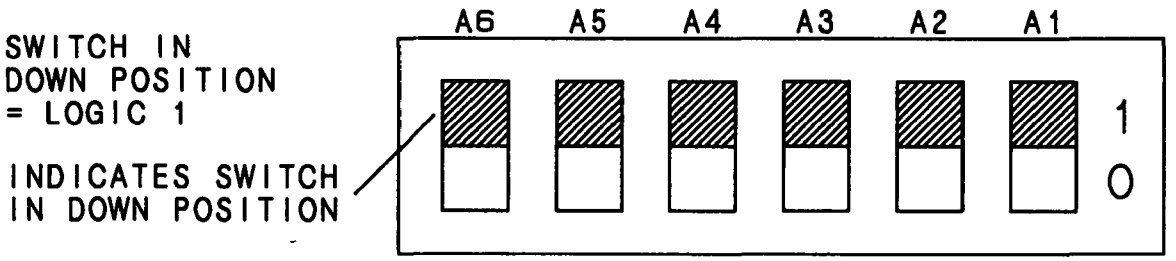


FIGURE 1. HP-IB ADDRESS SWITCH (SHOWN IN FACTORY PRESET POSITION)

ManualsPlus.com

The HP-IB address may also be changed from the front panel or programmed via a controller using a special shift key function (KSP). This address remains in effect as long as the instrument memory has power from either the ac line or the internal battery. However, if this stored address is lost, the default address is the factory preset decimal 18 (ASCII 2R). For additional information on the HP-IB address, refer to the Operating and Programming Manual.

STORAGE AND SHIPMENT

Environment

The instrument may be stored or shipped in environments within the following limits:

Temperature	−40°C to +75°C
Humidity	5% to 90% at 0° to 40°C
Altitude	Up to 15,240 meters (50,000 feet)

The instrument should be protected from temperature extremes which might cause condensation within the instrument.

Original Packaging

It is recommended that the original factory packaging materials be retained for use when shipping the instrument. If original packaging material cannot be retained, packaging materials identical to those used in factory packaging are available through the Hewlett-Packard offices. Part numbers and descriptions of the packaging materials are listed in Figure 2.

The combined weight of the two instrument sections is approximately 50 kg (112 lbs). Because of the weight involved, do not package the instrument sections fastened together as one unit. The instrument sections must be separated and packaged in separate containers. The quantity of packaging materials in Figure 2 is for only one instrument section.

If the instrument is being returned to Hewlett-Packard for servicing, attach a tag to each carton indicating the type of service required, return address, model number, and full serial number. For your convenience, a supply of tags is included at the end of this section. Also, mark each container FRAGILE to assure careful handling. In any correspondence, refer to the instrument by model number and full serial number.

Other Packaging

If it is necessary to use packaging materials other than the type used in original factory packaging, the following general instructions should be followed.

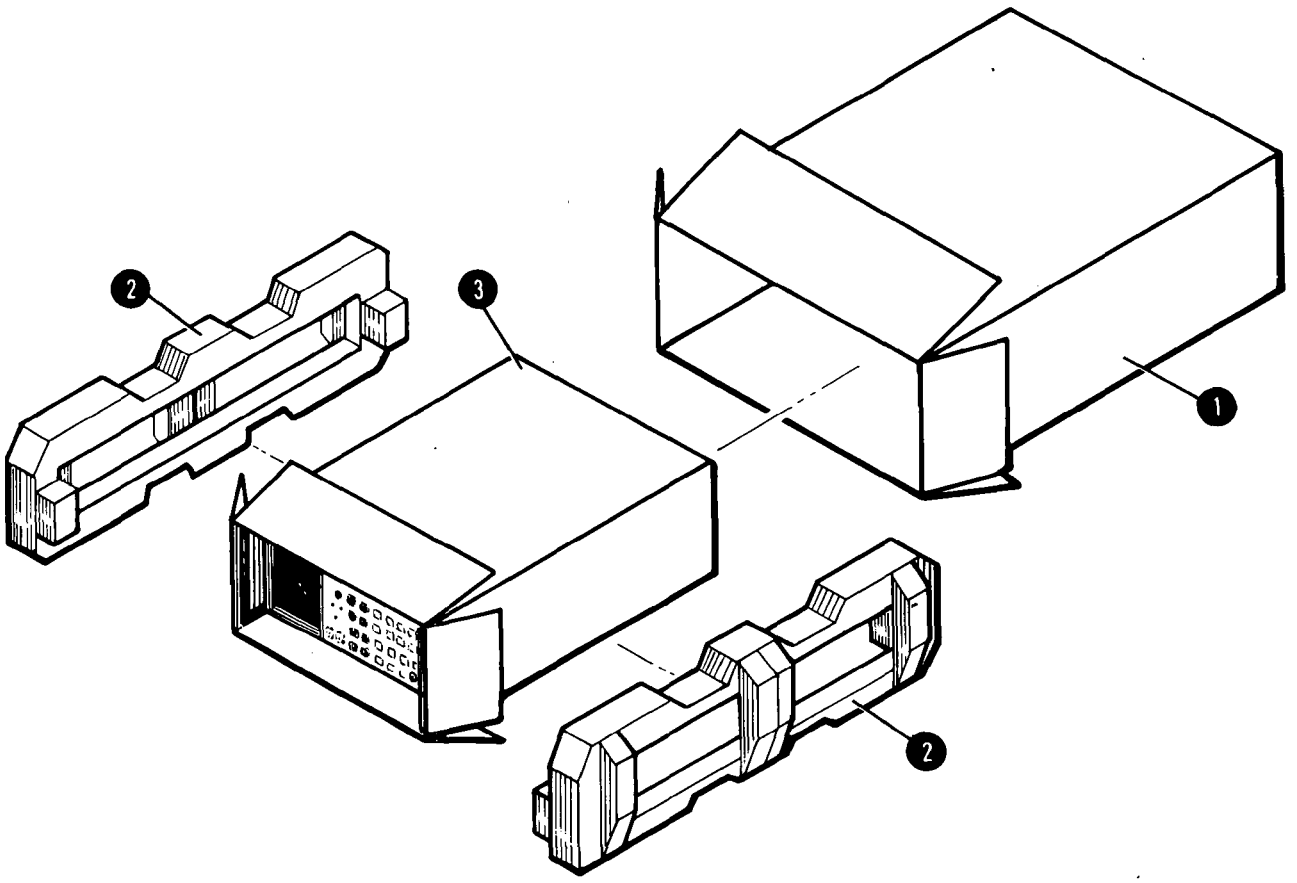
a. Separate the two instrument sections and wrap each in heavy paper or plastic.

b. Place the instrument sections in separate containers with 8 to 10 cm (3 to 4 inches) of shock-absorbing material around all sides to provide firm cushioning and prevent movement inside the container. Protect front panels with cardboard. Double-wall corrugated cartons of 125 kg (275 lb) bursting strength are sufficient for shipping containers.

c. Seal each container securely and, if shipping to a Hewlett-Packard office or service center, attach a tag to each container indicating the type of service required, return address, model number and full serial number. For your convenience, a supply of tags is included at the end of this section.

d. Mark each container FRAGILE to assure careful handling.

ManualsPlus.com



NOTE

FRONT HANDLES MUST BE MOUNTED FOR SHIPMENT.

Item	HP Part Number	C D	Qty	Description	Manufacturer Code	Mfr. Part Number
1	9211-4487	3	1	Outer Box	28480	9211-4487
2	5180-2319	5	2	Inner Foam Pad	28480	5180-2319
3	5180-2320	8	1	Inner Box	28480	5180-2320

FIGURE 2. PACKAGING FOR SHIPMENT USING FACTORY PACKAGING MATERIALS

ManualsPlus.com

TABLE 3. RECOMMENDED TEST EQUIPMENT (1 OF 3)

Instrument	Critical Specifications for Equipment Substitution	Recommended Model
SIGNAL SOURCES		
Synthesized Sweeper	Frequency: 10 MHz to 21 GHz Output Power: +10 dBm maximum (leveled <13.5 GHz) +3 dBm maximum (leveled) Aging Rate: $<1 \times 10^{-9}$/day Spurious Signals: < – 35 dBc (<7 GHz) < – 25 dBc (<20 GHz) Amplitude Modulation: dc to 100 kHz Leveling: Internal, External Power Meter	HP 8340A
Signal Generator	Frequency: 20 – 800 MHz SSB Phase Noise: >130 dB below carrier at 20 kHz away Stability: <10 ppm/10 min. (HP 8340A may be substituted)	HP 8640B, Opt. 002
ANALYZERS		
Spectrum Analyzer	Frequency: 0.1 to 100 MHz Resolution Bandwidth: 10 Hz Frequency Span: 20 Hz	HP 8553B/8552B 141T
Spectrum Analyzer	Frequency: .04 to 325 MHz	HP 8557A/853A
Spectrum Analyzer	Frequency: 100 to 1500 MHz	HP 8558B/853A
Signature Analyzer	No known substitute. Provides preferred method for troubleshooting digital circuitry.	HP 5005A/B
COUNTERS		
Microwave Frequency Counter	Frequency: 10 Hz to 21 GHz Sensitivity: – 33 dBm (<12 GHz) – 23 dBm (<21 GHz)	HP 5343A
Frequency Counter	Frequency: .02 to 20 GHz Sensitivity: – 30 dBm (HP 5343A may be substituted)	HP 5340A
OSCILLOSCOPE		
Oscilloscope	Frequency: 100 MHz Sensitivity: .005 V/Div Dual Channel: Third Channel Trigger View Display Storage	HP 1741A
Probe (2 required)	10:1 Divider, compatible with oscilloscope	HP 1004D

ManualsPlus.com

TABLE 3. RECOMMENDED TEST EQUIPMENT (2 OF 3)

Instrument	Critical Specifications for Equipment Substitution	Recommended Model
METERS		
Digital Voltmeter	Resolution: ±0.1 mV Range: 0 to 100 Vdc Input Impedance 100V Range: 10 MΩ	HP 3456A
High Voltage Probe	1000:1 Divider Impedance: 10 MΩ	HP 34111A
Power Meter	Range: −20 to +10 dBm Accuracy: ±0.02 dB HP-IB Compatible	HP 436A
Power Sensor	Frequency: .01 to 18 GHz Compatible with HP 436A Power Meter	HP 8481A
Power Sensor	Frequency: 50 MHz to 26.5 GHz with APC (m) Connector Compatible with HP 436A Power Meter	HP 8485A
Power Meter	Range: −20 to +10 dBm Accuracy: ±0.02 dB	HP 432A
Thermistor Mount	Frequency: 18 to 22 GHz Compatible with HP 432A Power Meter	HP K486A
Thermistor Mount	Frequency: 10 MHz to 18 GHz Compatible with HP 432A Power Meter	HP 8478B
ATTENUATORS		
10 dB Step Attenuator	Steps: 10 dB from 0 to 90 dB Frequency: 5 to 100 MHz Calibrated to uncertainty error of ±(0.02 dB + 0.01 dB/10 dB step) at 20 MHz from 0 dB to 90 dB	HP 355D-H89
1 dB Step Attenuator	Steps: 1 dB from 0 to 10 dB Frequency: 20 to 100 MHz Calibrated to uncertainty error of ±(0.02 dB + 0.01 dB/10 dB step) at 20 MHz from 0 dB to 10 dB	HP 355C-H25
SPECIAL DEVICES		
Display Adjustment PC Board	Required for preliminary display adjustments	HP 85662-60088
CABLES		
Cable Assembly	Frequency Range: 200 Hz to 22 GHz SMA Male Connectors Length: 61 cm (24 inches) SWR: <1.4 at 22 GHz	HP 5061-1086

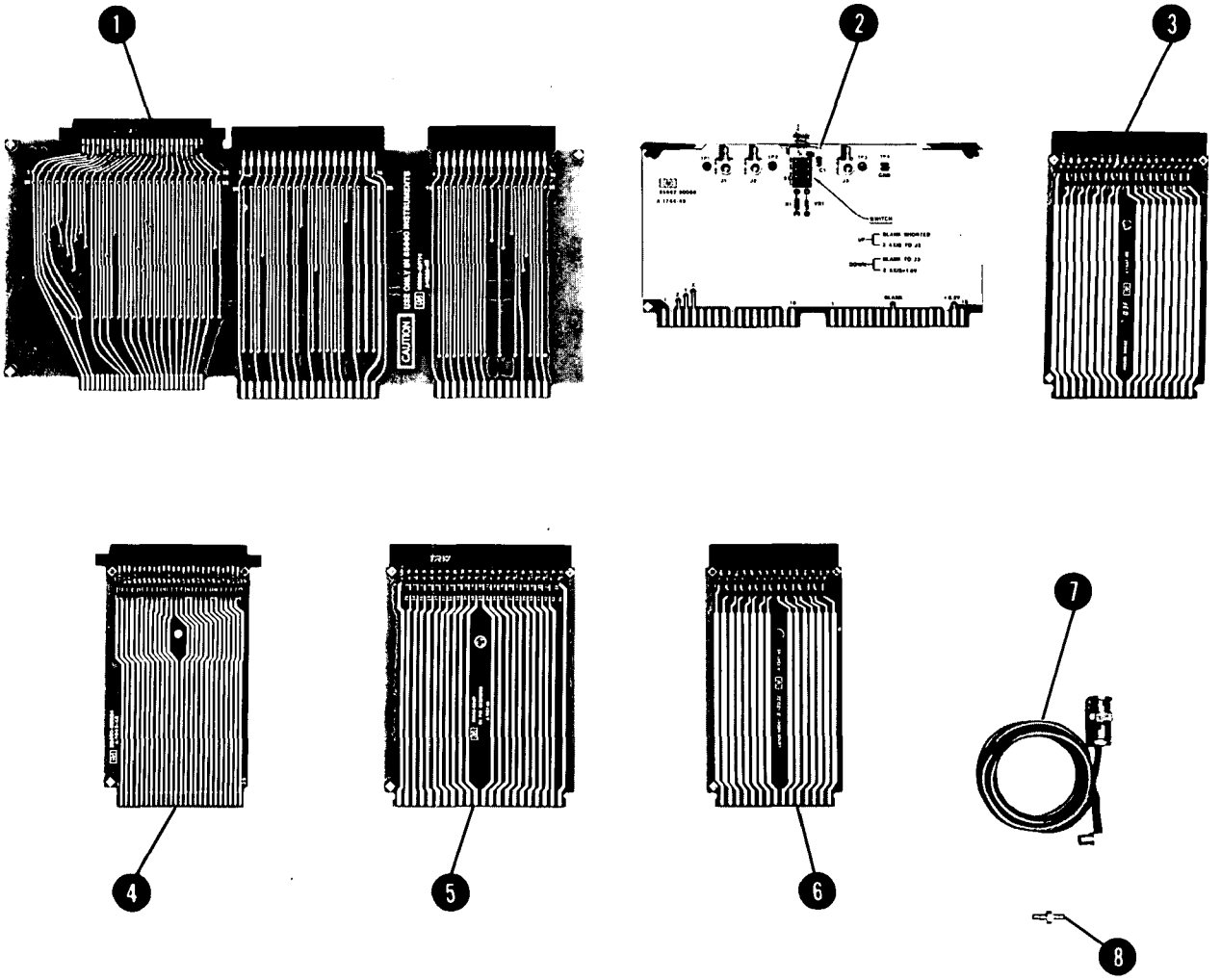
ManualsPlus.com

TABLE 3. RECOMMENDED TEST EQUIPMENT (3 OF 3)

Instrument	Critical Specifications for Equipment Substitution	Recommended Model
CABLES (Cont'd)		
Test Cable (2 required)	BNC (m) to SMB Snap-On (f)	HP 85680-60093
Test Cable	SMB Snap-On (f) to SMB Snap-On (f)	HP 85662-60042
ADAPTERS		
Adapter	Type N (f) to BNC (m)	HP 1250-0077
Adapter	SMB Snap-On (m) to SMB Snap-On (m)	HP 1250-0669
BOARD EXTENDERS		
Extender* (2 required)	PC Board: 36 contacts; 2 rows of 18	HP 08505-60042
Extender*	PC Board: 30 contacts; 2 rows of 15	HP 08505-60041
Extender	PC Board: 20 contacts; 2 rows of 10	HP 85680-60028
Extender	PC Board: 12 contacts; 2 rows of 6	HP 08505-60109
Extender*	A12 RF Section Interface Extender (for Signature Analysis)	HP 85660-60114
Extender* (2 required)	PC Board: 50 contacts; 2 rows of 25	HP 85680-60034
Extender* (2 required)	PC Board: 44 contacts; 2 rows of 22	HP 08565-60107
PC Board Extractor	PC Board extracting tool	HP 03950-4001

* Part of Service Accessories

ManualsPlus.com



Item	Qty	Description	Mfr. Part Number	C D
1	1	Extender Board: A12 RF Section Interface	85660-60114	5
2	1	PC Board: Display Adjustment Test	85662-60088	4
3	2	Extender Board: 36 contacts; 2 rows of 18	08505-60042	8
4	2	Extender Board: 50 contacts; 2 rows of 25	85680-60034	2
5	2	Extender Board: 44 contacts; 2 rows of 22	08565-60107	8
6	1	Extender Board: 30 contacts; 2 rows of 15	08505-60041	7
7	2	Cable: 4-foot long; BNC to SMB snap-on	85680-60093	3
8	1	Adapter: SMB snap-on male to SMB snap-on male	1250-0669	9

FIGURE 3. SERVICE ACCESSORIES, HP PART NUMBER 08566-60001

ManualsPlus.com

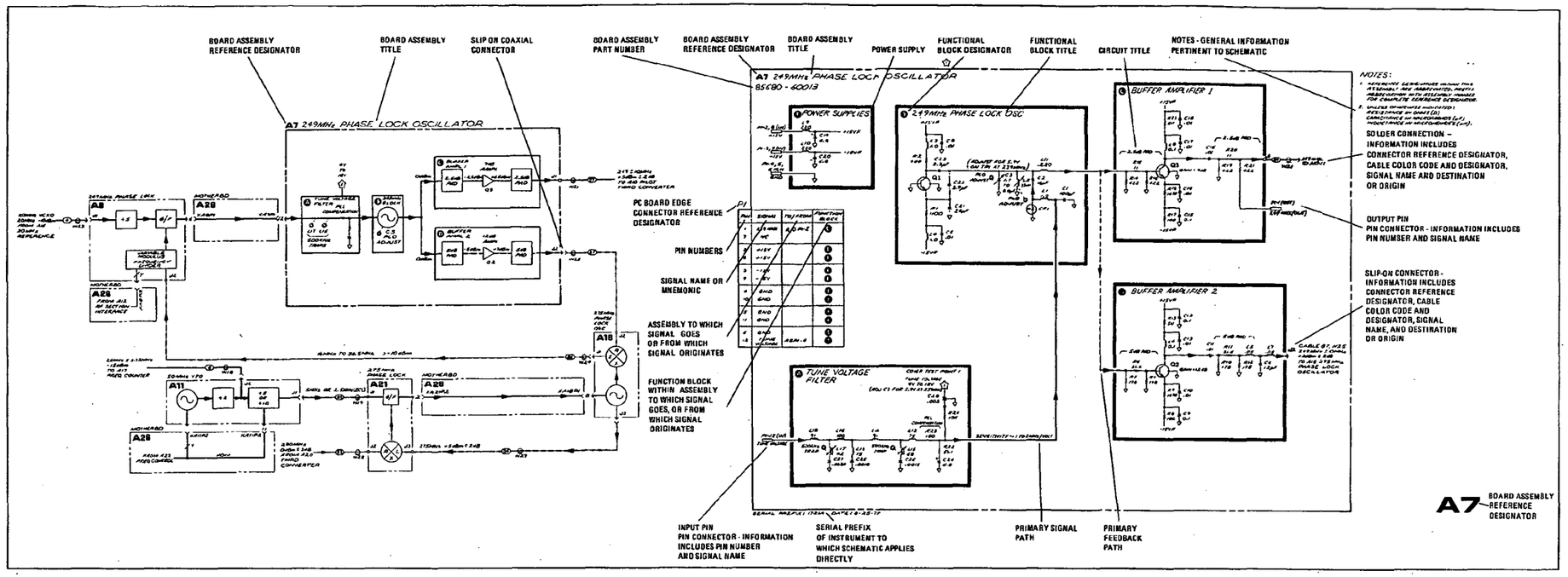


FIGURE 4. SCHEMATIC AND BLOCK DIAGRAM FORMAT

ManualsPlus.com

GRAPHIC SYMBOLS USED ON SCHEMATIC AND BLOCK DIAGRAMS

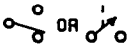
BASIC COMPONENT SYMBOLS

VARIBLE RESISTOR: CW INDICATES CLOCKWISE ROTATION OF SHAFT. MOVES WIPER TOWARDS LOCATION OF CW.

THERMISTOR

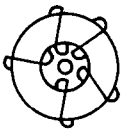
ELECTROLYTIC CAPACITOR

VARIABLE CAPACITOR

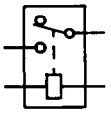


SLIDE, TOGGLE, OR ROCKER SWITCH

FEEDTHROUGH CAPACITOR



TOROIDAL TRANSFORMER



RELAY

SURFACE ACOUSTIC WAVE (SAW)

FERRITE BEAD

PUSHBUTTON SWITCH

CRYSTAL

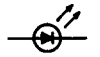
SPEAKER

GENERAL PURPOSE DIODE

BREAKDOWN DIODE: ZENER

SCHOTTKY DIODE

VARACTOR DIODE (VARICAP)



LIGHT-EMITTING DIODE

PIN DIODE

TRIAC

STEP RECOVERY DIODE

TEMPERATURE-COMPENSATED VOLTAGE-REFERENCE DIODE

SCR (SILICON CONTROLLED RECTIFIER)

TRANSISTOR, PNP

TRANSISTOR, NPN

JUNCTION-FET, N-CHANNEL

JUNCTION-FET, P-CHANNEL

MOS-FET, N-CHANNEL

MOS-FET, P-CHANNEL

* INDICATES A FACTORY SELECTED COMPONENT

INDICATES SHIELDING CONDUCTOR FOR CABLES

INDICATES A PLUG-IN CONNECTION

INDICATES A SOLDERED OR MECHNICAL CONNECTION

INDICATES A SINGLE PIN OF A PC BOARD EDGE CONNECTOR

CONNECTION SYMBOL INDICATING A JACK (EXCEPT FOR PC BOARD EDGE CONNECTORS)

CONNECTION SYMBOL INDICATING A PLUG (EXCEPT FOR PC BOARD EDGE CONNECTORS)

FIGURE 5. GRAPHIC SYMBOLS (1 OF 2)

ManualsPlus.com

GRAPHIC SYMBOLS USED ON SCHEMATIC AND BLOCK DIAGRAMS

BASIC COMPONENT SYMBOLS (CONT'D)

TEST POINT: TERMINAL PROVIDED FOR TEST PROBE CONNECTION

MEASUREMENT POINT: USED TO INDICATE A CONVENIENT POINT FOR MEASUREMENT. NO TERMINAL PROVIDED FOR TEST PROBE.

INDICATES WIRE OR CABLE COLOR CODE. COLOR CODE SAME AS RESISTOR COLOR CODE. FIRST NUMBER INDICATES BASE COLOR, SECOND AND THIRD NUMBERS INDICATE COLORED STRIPES.

JUMPER WIRE

EARTH GROUND SYMBOL

INSTRUMENT CHASSIS GROUND. MAY BE ACCOMPANIED BY A NUMBER OR LETTER TO SPECIFY A PARTICULAR GROUND.

SCREWDRIVER ADJUSTMENT

PANEL CONTROL

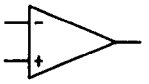
COMMONLY USED ASSEMBLY AND CIRCUIT SYMBOLS

OSCILLATOR, RPG (ROTARY PULSE GENERATOR)

FAN MOTOR

MIXER

TRANSMISSION LINE



OP AMP

INVERTER, BUFFER

FIGURE 5. GRAPHIC SYMBOLS (2 OF 2)

ManualsPlus.com

SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS

The following is a guide to the symbols used for digital or logic ICs in this manual. The symbology is based upon American National Standard ANSI Y32.14, *Graphic Symbols for Logic Diagrams (Two-State Devices)*, but does not strictly follow the standard. This figure should be consulted for the explanation of digital IC symbols used in Sections VIII and IX.

DEFINITIONS

Logic Element: The part or parts of a logic device symbol having a well-defined logic function (OR, AND, FLIP-FLOP, etc.) and one or more outputs. The inputs of a logic element may be data or control inputs; the outputs are data outputs.

Control Block: The part of a logic device symbol to which all logic lines common to a group of logic elements are connected. Lines connected to a control block are control lines.

Function Label: The notation within a logic device symbol that denotes its overall logic function (counter, shift register, multiplexer, etc.).

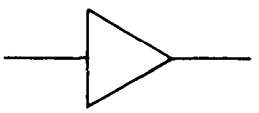
Line Label: The symbol or abbreviation associated with an output or input line that defines the action of the line.

Indicator Symbol: A symbol associated with an input or output line which defines the active state or special characteristics of the line.

BASIC LOGIC SYMBOLS

Distinctive-Shape Symbols

Amplifier/Buffer



AND Gate

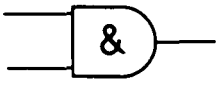
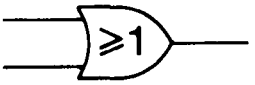


FIGURE 6. SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (1 OF 8)

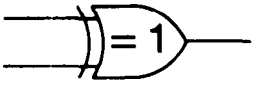
ManualsPlus.com

SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (Cont'd)

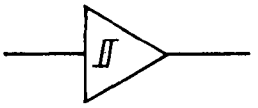
OR Gate



EXCLUSIVE OR Gate

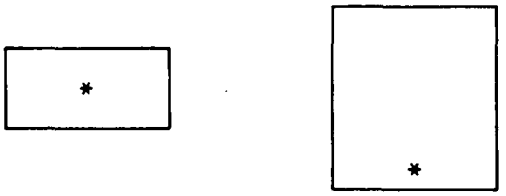


Schmitt Trigger



Rectangular Symbols

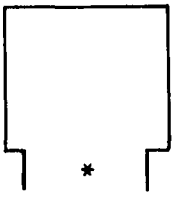
General Logic Element



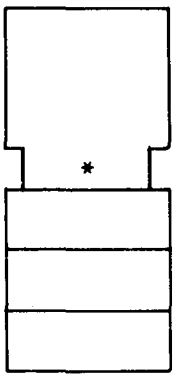
NOTE

The asterisk indicates where the function label is placed

Control Block



Logic Elements with Common Control Block



NOTE

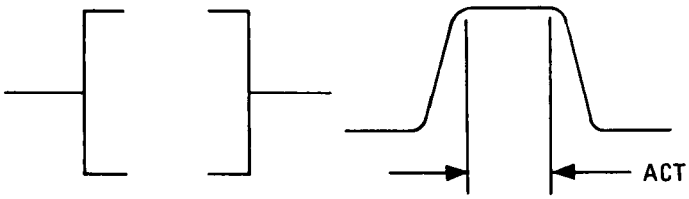
If elements sharing control lines are widely separated, each element will have a control block.

FIGURE 6. SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (2 OF 8)

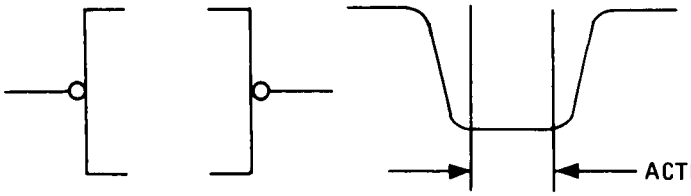
ManualsPlus.com

SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (Cont'd)

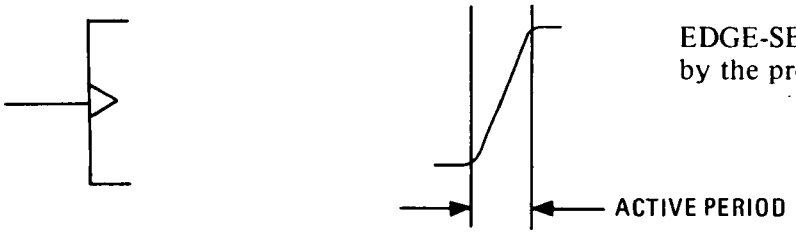
INDICATOR SYMBOLS (positive logic assumed)



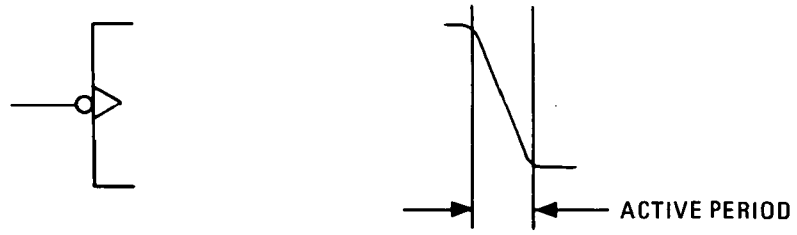
ACTIVE-HIGH inputs and outputs are indicated by the absence of the negation symbol, ○.

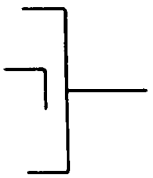


ACTIVE-LOW inputs and outputs are indicated by the presence of the negation symbol, ○.

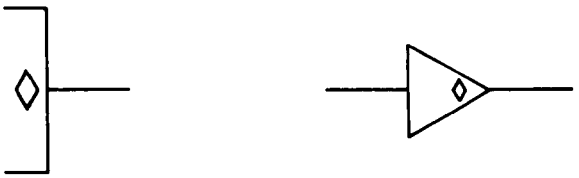


EDGE-SENSITIVE (Dynamic) inputs are indicated by the presence of the dynamic input symbol,





TRAILING-EDGE ACTIVATED outputs are indicated by the output delay symbol, ⌉. These outputs become active when the signal that initiates the change returns to its original state (example: the outputs of a J-K master-slave flip-flop).



OPEN-COLLECTOR outputs are indicated by the presence of the open-collector symbol, ◊

FIGURE 6. SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (3 OF 8)

ManualsPlus.com

SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (Cont'd)

NOTE

The logic negation symbol (○) alone gives no information about the actual voltage levels used in a digital circuit. For this reason the type of logic system (positive or negative) must be specified. In this manual, unless otherwise noted on the schematic, the logic system is positive; that is, the more positive voltage level is the HIGH or 1-state and the less positive level is the LOW or 0-state.

FUNCTION LABELS

Σ	ADDER
▷	AMPLIFIER/BUFFER
1 ⎍	MONOSTABLE MULTIVIBRATOR (ONE-SHOT)
&	AND GATE
≥1	OR GATE
=1	EXCLUSIVE OR GATE
X→Y	ENCODER, DECODER
XMAX→Y	PRIORITY ENCODER
⎍	SCHMITT TRIGGER
ALU	ARITHMETIC AND LOGIC UNIT
CTR	COUNTER
DEMUX	DEMULTIPLEXER
FF	FLIP-FLOP
MUX	MULTIPLEXER
RAM	RANDOM-ACCESS MEMORY
REG	REGISTER
ROM	READ-ONLY MEMORY
SAR	SUCCESSIVE APPROXIMATION REGISTER
SR	SHIFT REGISTER

FIGURE 6. SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (4 OF 8)

ManualsPlus.com

SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (Cont'd)

LINE LABELS

←	SHIFT LEFT (OR UP)
→	SHIFT RIGHT (OR DOWN)
+1	COUNT UP
−1	COUNT DOWN
=0,−1	BORROW OUTPUT
=9,+1	CARRY OUTPUT (DECIMAL COUNTER)
=15,+1	CARRY OUTPUT (BINARY COUNTER)
An	nTH ADDRESS BIT (ROM, RAM)
C	CLOCK INPUT
D	DATA OR DELAY INPUT (FLIP-FLOP)
Dn	nth DATA BIT INPUT
EN	ENABLE
F	3-STATE ENABLE INPUT (SEE "DEPENDENCY")
G	GATING INPUT (SEE "DEPENDENCY")
J	J-K FLIP-FLOP J INPUT
K	J-K FLIP-FLOP K INPUT
LD	LOAD ENABLE INPUT (SYNCHRONOUS)
PS	PRESET INPUT (ASYNCHRONOUS)
R	RESET OR CLEAR INPUT
RD	READ ENABLE INPUT (RAM, ROM)
S	SET INPUT
SEL	LINE OR FUNCTION SELECT INPUT
SER	SERIAL DATA INPUT (SHIFT REGISTER)
T	TRIGGER INPUT (MONOSTABLE)
WR	WRITE ENABLE INPUT (RAM)
Yn	nth DATA BIT OUTPUT OR I/O
3-ST (placed by function label)	3-STATE

FIGURE 6. SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (5 OF 8)

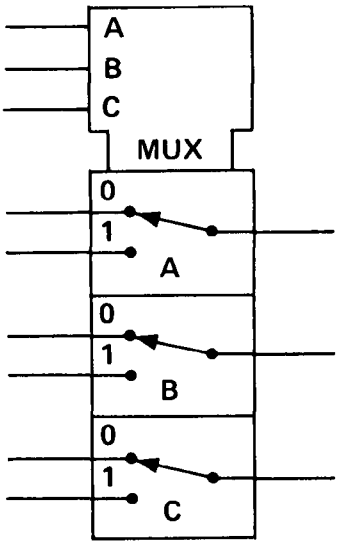
ManualsPlus.com

SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (Cont'd)

NOTES

1. The suffix or subscript 0 denotes the least significant bit (LSB) of a data or address word.

2. Letters may be used to identify a line or logic element without indicating a specific logic function. For example:

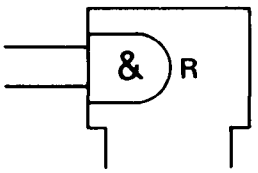


Triple 2-Channel Multiplexer

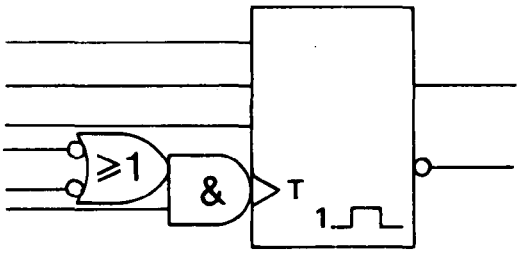
Letters are used to relate control inputs to logic elements. The numerals 0 and 1 indicate 0-state and 1-state, respectively, and relate the position of a "switch" to the logic state of the corresponding control line.

DEPENDENCY (G and F)

The dependency of inputs or outputs on an input is indicated with gate symbols or the G line label. Gate symbols are often used when the dependency exists between inputs. Two examples are:



Two inputs ANDed to produce a reset



Three inputs gated to produce a trigger

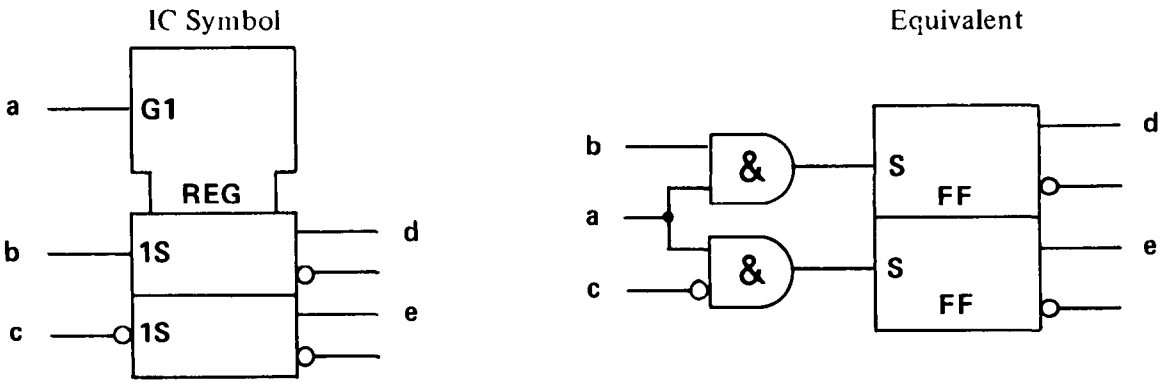
FIGURE 6. SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (6 OF 8)

ManualsPlus.com

SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (Cont'd)

When the G label is used, the gating input is labelled with a G followed by a numeral or letter. The line labels of the gated inputs or outputs are prefixed with the same numeral or letter. Two examples are:

2-Bit Register



2-to-4-Line Decoder

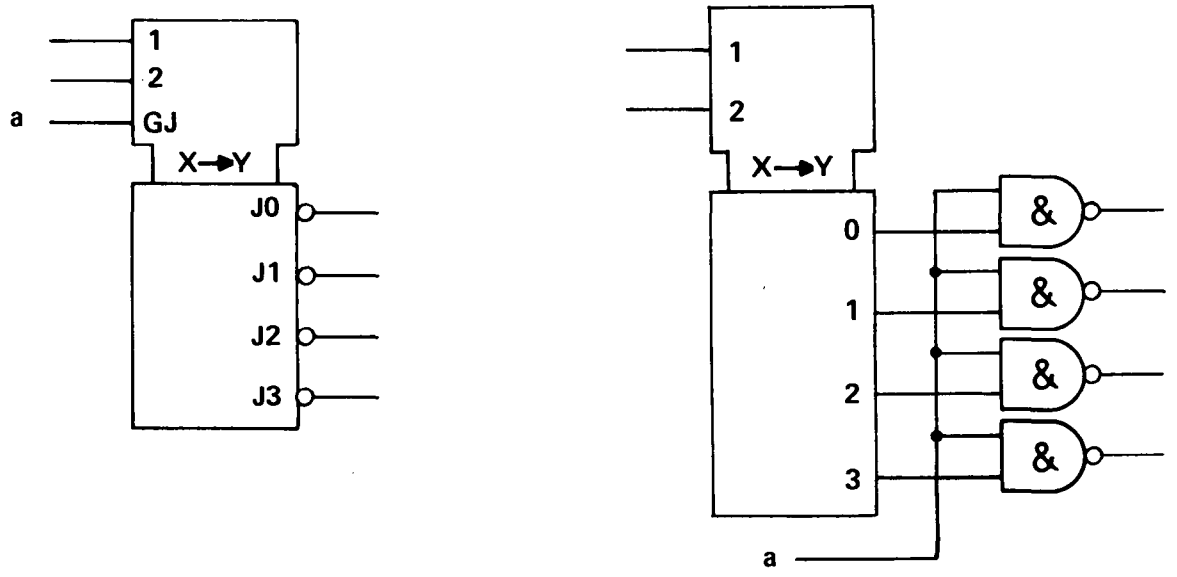


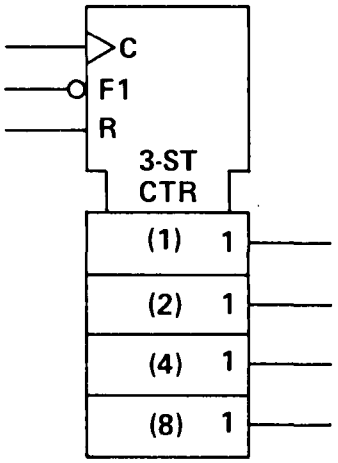
FIGURE 6. SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (7 OF 8)

ManualsPlus.com

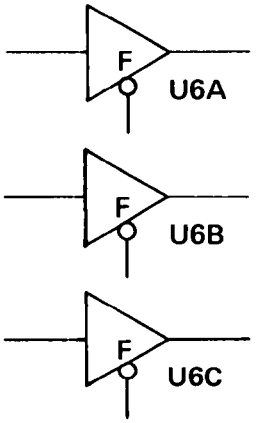
SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (Cont'd)

The F line label is used to indicate 3-state logic. The 3-state enable input is labelled with an F and numerals or letters are used as with the G label:

Counter with
3-State Outputs



3-State Buffers



WEIGHTING OF INPUT AND OUTPUT LINES

The coding of multiplexers, demultiplexers, encoders, and decoders is shown by decimal weighting. An example is the 2-to-4-line decoder shown on the previous page.

WEIGHTING OF FLIP-FLOPS

When the position of a flip-flop in an array is significant (as in counters and shift registers), the flip-flop is labelled with its decimal weight. An example is the "Counter with 3-State Outputs" shown above.

FIGURE 6. SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (8 OF 8)

ManualsPlus.com

Signature Analysis Description

ManualsPlus.com

SIGNATURE ANALYSIS DESCRIPTION

GENERAL DESCRIPTION

This instrument has been designed to incorporate signature analysis. Troubleshooting the instrument using signature analysis requires the use of an HP Model 5005A, 5005B, or 5006B Signature Analyzer. The signature analyzer is a service tool that receives signals via a probe from the circuit under test, compresses them, and displays the result in the form of a digital signature that corresponds to specific data nodes in the circuit under test. For a complete description of signature analyzer operation, refer to the HP 5005A, 5005B, or 5006B Signature Analyzer Operating and Service Manual.

Signature Analysis Troubleshooting Diagrams are included with the service sheets for the A12 Front-Panel Interface and A15 Controller assemblies. Refer to the following Signature Analysis Troubleshooting Instructions as a guide for the use of the Signature Analysis Troubleshooting Diagram.

ManualsPlus.com

SIGNATURE ANALYSIS TROUBLESHOOTING

1. Connect signature analyzer and set controls according to diagram instructions.

2. Set up test configuration as indicated in the diagram, such as jumpering test points or removing test jumpers.

3. Verify the +5Vdc signature for the test being performed as indicated in green lettering on the main verification path (GREEN LINE). This signature can be verified by probing the +5Vdc supply. If +5Vdc signature is incorrect, check equipment settings and connections. Then check for activity at CLOCK, START, and STOP connections using signature analyzer probe. If there is no activity, refer to assembly schematic for troubleshooting.

4. Begin probing the printed circuit board at the beginning of the green line on the diagram. (Point A in the sample.)

5. Probe every point indicated by the green line.

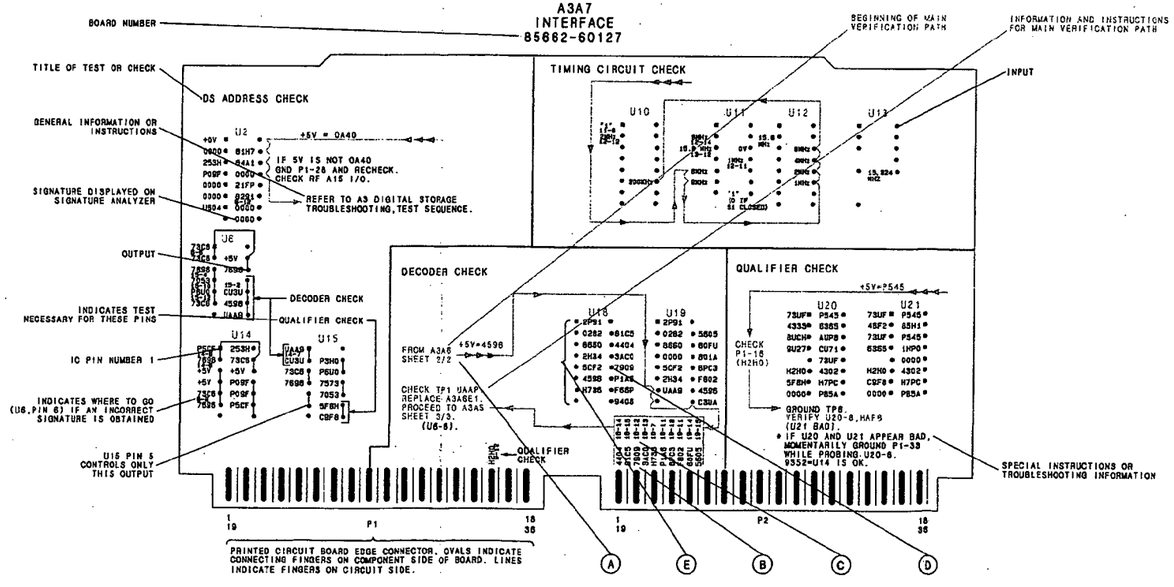
6. If a bad signature is located (Point B in sample), the location is suspected bad. Information printed in red on the troubleshooting diagram (Point C) can help to trace the problem by indicating the source of the signal. For example, "18-12" indicates that the signature originates at U18 pin 12.

7. Check signature at its origin (D). If signature is still bad, go to input pin(s) related to that output (E). A red line connecting the input to the output indicates that the output is affected by only that input. A black line indicates an electrical connection between IC pins. If any input signature is bad, refer to assembly schematic to determine the origin of the input pin (F in sample).

8. Verify signatures to inputs/outputs connected to a suspected bad location. If signatures are good, the printed circuit board, connectors, and solder joints should be checked for faults. After locating the faulty source, proceed with conventional troubleshooting.

9. Before replacing any suspected defective component, follow instructions printed in red and referenced by an asterisk(*) on the signature analysis troubleshooting diagram.

ManualsPlus.com



SIGNATURE ANALYSIS TROUBLESHOOTING DIAGRAMS

THE SIGNATURE ANALYSIS TROUBLESHOOTING DIAGRAMS ARE PRINTED IN THREE COLORS WITH EACH COLOR HAVING A PARTICULAR SIGNIFICANCE. IN GENERAL, BLACK IS USED FOR GENERAL INFORMATION SUCH AS TEST TITLES AND EQUIPMENT CONNECTIONS, GREEN IS USED TO SHOW THE MAIN VERIFICATION PATH, AND RED IS USED FOR INSTRUCTIONS AND PATHS TO FOLLOW WHEN A BAD SIGNATURE HAS BEEN LOCATED ON THE MAIN VERIFICATION PATH. A MORE DETAILED DESCRIPTION FOLLOWS:

BLACK

PAD	IC OUTPUT PIN
DIAMOND	IC OPEN COLLECTOR (3-STATE) OUTPUT PIN
LINE	INDICATES PHYSICAL CONNECTION BETWEEN IC PINS; ALSO, INDICATES BORDER BETWEEN TESTS
LETTERING	GENERAL INFORMATION AND INSTRUCTIONS FOR THE TEST
ASTERISK	UNSTABLE OR UNRELIBLE SIGNATURE

GREEN

LINE	MAIN VERIFICATION PATH
LETTERING	INFORMATION AND INSTRUCTIONS FOR MAIN VERIFICATION PATH

RED

PAD	IC INPUT PIN
LINE	USED BETWEEN INPUT AND OUTPUT OF IC TO INDICATE THAT INPUT EFFECTS ONLY THE OUTPUT TO WHICH THE RED LINE IS CONNECTED; USED BETWEEN ICS TO INDICATE PATH TO FOLLOW WHEN A BAD SIGNATURE HAS BEEN LOCATED
LETTERING	TROUBLESHOOTING INFORMATION AND INSTRUCTIONS TO FOLLOW WHEN BAD SIGNATURE HAS BEEN LOCATED

FIGURE 1. SIGNATURE ANALYSIS TROUBLESHOOTING DIAGRAM FORMAT

ManualsPlus.com

ManualsPlus.com

TABLE 1. TROUBLESHOOTING INDEX (1 OF 2)

Troubleshooting Information	Tab Title and/or Location	Vol.
Start Frequency Tuning Equations and Phase Lock	RF Section Analog Troubleshooting Block Diagram	1
Diagnostic Functions	Spectrum Analyzer Overall Troubleshooting	1
Digital Storage	A3 Digital Storage Block Diagram	2
Display System	Spectrum Analyzer Overall Troubleshooting A1 Display Section Block Diagram	1 2
Error Correction Routine	Spectrum Analyzer Overall Troubleshooting	1
RF Section Digital (includes INSTR CHECK LEDs)	A3 Digital Storage Block Diagram RF Section Digital Troubleshooting Block Diagram A15 Controller	2 1 1
Special Messages	Spectrum Analyzer Overall Troubleshooting	1
Sweep System	Spectrum Analyzer Overall Troubleshooting	1
A1A1 Keyboard	A12 Front-Panel Interface	1
A3 Digital Storage	Spectrum Analyzer Overall Troubleshooting A3 Digital Storage Block Diagram	1 2
A3A1 Trigger*	Spectrum Analyzer Overall Troubleshooting (Sweep System) A3 Digital Storage Block Diagram	1 2
A3A2 Intensity Control*	A1 Display Section Block Diagram A3 Digital Storage Block Diagram	2 2
A3A3 Line Generator*	A1 Display Section Block Diagram A3 Digital Storage Block Diagram	2 2
A3A4 Memory	A1 Display Section Block Diagram A3 Digital Storage Block Diagram	2 2
A3A5 Data Manipulator A3A6 Main Control A3A7 Interface	A3 Digital Storage Block Diagram	2
A3A8 Analog-Digital Converter*	Spectrum Analyzer Overall Troubleshooting (Sweep System) A1 Display Section Block Diagram A3 Digital Storage Block Diagram	1 2 2
A3A9 Track and Hold*	Spectrum Analyzer Overall Troubleshooting (Diagnostic Functions) A1 Display Section Block Diagram A3 Digital Storage Block Diagram	1 2 2

ManualsPlus.com

TABLE 1. TROUBLESHOOTING INDEX (2 OF 2)

Troubleshooting Information	Tab Title and/or Location	Vol.
A4A1 Video Processor* A4A2 Log Amplifier-Detector* A4A3 Log Amplifier-Filter* A4A4 Bandwidth Filter A4A5 Step Gain* A4A6 Down/Up Converter* A4A7 3 MHz Bandwidth Filter A4A8 Attenuator-Bandwidth Filter* A4A9 IF Control*	Spectrum Analyzer Overall Troubleshooting (Error Correction Routine)	1
A5 Front Panel	A12 Front-Panel Interface A15 Controller	1 1
A6 RF Module A7 M/N Loop A10 20/30 Synthesizer A11 YTO Loop	Spectrum Analyzer Overall Troubleshooting (Diagnostic Functions)	1
A12 Front-Panel Interface*	Spectrum Analyzer Overall Troubleshooting (Sweep System) A15 Controller	1 1
A15 Controller*	Spectrum Analyzer Overalll Troubleshooting (Sweep System)	1
A16 Scan Generator*	Spectrum Analyzer Overall Troubleshooting (Sweep System)	1

*Troubleshooting information is also located behind the tab having the same title as that listed in this table.

ManualsPlus.com

SPECTRUM ANALYZER OVERALL TROUBLESHOOTING

SPECIAL MESSAGES

As a convenience to the operator and as an aid in servicing, eleven messages can appear in the upper right corner of the CRT display. (Ten of these messages are shown in Figure 1.) Five of the messages inform the operator of possible erroneous data from improper instrument operation. The other six provide warnings of instrument malfunctions that must be repaired for proper instrument operation.

A brief description of each message follows. The troubleshooting information listed is not meant to be exhaustive. Refer to the appropriate Troubleshooting Block Diagram and Troubleshooting Hints for more detailed information.

EXT REF

Indication to operator that the external frequency reference is selected.

MEAS UNCAL

A warning to the operator that the amplitude/frequency data on the CRT is invalid because the analyzer's sweep speed is too fast for the selected bandwidth.

*

A warning to the operator that the analyzer settings displayed on the CRT have been changed but the trace data has not been updated. This would occur, for example, when Trace A view is selected and then Center Frequency is changed.

OVEN COLD

Indication that the frequency reference oven temperature is too low. There will be an oven cold indication normally for about 10 minutes after the line power is initially applied to the instrument. (The oven is powered and should stay warm as long as the instrument is in STANDBY.) The time base HOVC (High = Oven Cold) signal is routed to the A12 Front-Panel Interface for generation of this message.

BATTERY

A warning to the operator that the CMOS memory on the A15 Controller has probably lost the stored instrument states. The warning can only appear at instrument turn on. If it appears, the instrument automatically reinitializes all the instrument states to the instrument preset condition. The battery warning can be caused by too low a voltage from the A10A9 Battery Pack or a problem with the A15 CMOS memory power supply circuit. Performing the "long POP" instrument check (see RF Section Digital Troubleshooting) erases the stored instrument states and causes a battery warning to appear at instrument turn on. The HP-IB address is also lost. The battery warning can be removed by pressing [2–22 GHz] and the HP-IB address restored by keying in [SHIFT] [ZOOM] (desired address) [Hz μV μSEC].

PL1

The PLL1 Phase Lock Loop is unlocked. Items to check are:

- A10A1 – Check signal out at A10A1J3.
- A10A2 – Check signal in at A10A2J2.

ManualsPlus.com

- A10A3 – Check signal out at A10A3J3.
- A10A4 – Check signal out at A10A4J2 and in at A10A4J4.

PL2

The PLL2 Phase Lock Loop is unlocked. Items to check are:

- A10A5 – Check signal out at A10A5J3.
- A10A6 – Check ϕ Det Out voltage at A10A6TP7.
- A10A7 – Check 500 kHz Reference at A10A7TP5 and divided output at A10A7TP1.
- A10A8 – Check VCO Tune output current at A10A8J2.

REF UNLOCK

The 10 MHz Reference Loop is unlocked. Items to check are:

- OVEN COLD indicator on – this is normal operation.
- Cable W15 connected to rear-panel FREQ REFERENCE IN and OUT connectors.
- Rear-Panel FREQ REFERENCE EXT/INT switch in proper position.
- A7A1 and A7A2 – Check 10 MHz out at A7A1J4.

YTO UNLOCK

The YTO Phase Lock Loop is unlocked. Items to check are:

- A19 D/A Converter
- A20 Main Coil Driver
- A21 FM Coil Driver
- A11 YTO Loop
- A16 Scan Generator

M/N UNLOCK

The M/N Phase Lock Loop is unlocked. Items to check are:

- A7A3 – Check output at A7A3J1.
- A7A4 – Check output at A7A4J1.

HET UNLOCK

The RF Module Phase lock Loop is unlocked. Items to check are:

- CAL OUTPUT

ManualsPlus.com

- A6A9 – Check voltage at A6A9J4.
- A6A4 – Check 3.3 GHz output of A6A4.

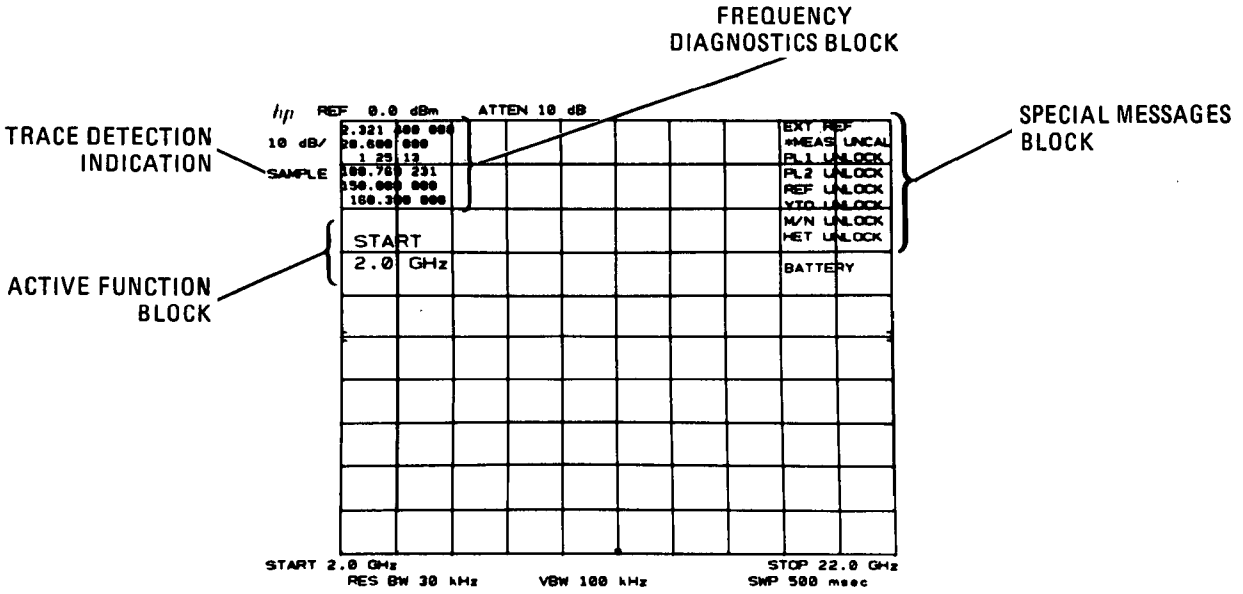


FIGURE 1. CRT LOCATIONS OF SPECIAL MESSAGES AND DIAGNOSTIC FUNCTION INDICATORS

ManualsPlus.com

DIAGNOSTIC FUNCTIONS

The Diagnostic Functions are accessible through the blue [SHIFT] key on the front panel. Through their use it is possible to trace many instrument malfunctions back to the functional block without removing any assemblies. They are also used in Performance Tests and Adjustments as an aid in performing necessary adjustments. A summary of the Diagnostic Functions follows. More information on their use can be found in the troubleshooting procedures.

Frequency Diagnostics [SHIFT] [R MKR→ REF LVL] (KSR)

This function displays many of the internal frequency control parameters in the upper left corner of the CRT display. (See Figure 1.) These parameters are the programmed values determined by the A15 Controller. For example, following an [2 – 22 GHz], a [SHIFT] [R MKR→ REF LVL] (KSR) might display the following values:

(1) 2.321 400 000

(2) 30.000 000

(3) 1 17 11

(4) 184.545 455

(5) 150.000 000

(6) 160.300 000

Line 1 is the setting of the YTO Frequency for the selected START frequency.

Line 2 is the setting of the 20/30 SYNTHESIZER for the selected START frequency.

Line 3 contains three different numbers. The first is the Band code number. The setting varies from 0 for center frequencies below 2.5 GHz to 4 for center frequencies above 18.6 GHz. The second number is the M number of the M/N loop. The third number is the N number of the M/N Loop.

Line 4 indicates the frequency output of the M/N loop.

Line 5 indicates the frequency to which the PLL2 VCO has been tuned.

Line 6 shows the frequency to which the Controller has programmed the PLL3 VCO.

Lock Indicator Disable A12TP2 Jumpered to A12TP3

This function permits the analyzer to sweep at normal sweep rates ignoring any phase lock flag indications. For example, if a YTO UNLOCK problem exists, the analyzer will sweep slower since it spends most of its time trying to lock the YTO at center frequency during retrace. By performing the phase lock inhibit, the analyzer does not waste time trying to lock the YTO, so the front panel keys and display can be used as in normal operation. Note, of course, that the displayed frequencies will probably not be accurate.

ManualsPlus.com

Trace Detection

Three different sampling modes are used by the analyzer in converting the video signal; these are positive peak, negative peak, and sample. Normally the analyzer selects the proper mode for each measurement, but these can be manually selected to verify proper operation. The mode selected is indicated on the upper left side of the CRT display when under manual control.(See Figure 1.) For example, a signal could be expanded to 2 dB/div to eliminate the noise floor, and then by comparing a positive peak trace measurement, it can be determined if the gains and offsets of the three modes are properly aligned. All three should appear the same on a stable, noise-free signal. When in the noise, the positive peak should display the highest noise peaks, negative peak mode should display the lowest noise levels, and sample mode should display values between the positive and negative peaks.

[SHIFT] Trace A [b MAX HOLD] (KSb) displays positive peaks.

[SHIFT] Trace A [d VIEW] (KSd) displays negative peaks.

[SHIFT] Trace A [e BLANK] (KSe) displays sampled data.

[SHIFT] Trace A [a CLEAR-WRITE] (KSa) returns to the normal automatic detection modes and removes the CRT indication.

ManualsPlus.com

ERROR CORRECTION ROUTINE

The internal Error Correction Routine available by pressing [SHIFT] [FREQUENCY SPAN] (KSW) is also useful as a diagnostic aid. If a malfunction causes the routine to stop, restart it and note the control settings (RES BW, ATTEN, REF LEVEL, LOG/LIN, etc.) when the failure occurred. If the routine runs, the correction factors can be displayed by pressing [SHIFT] [LINE] (KSw). Figure 2 displays the data for a typical instrument. Table 2 gives the parametric information, specifications and a place to start the troubleshooting procedure.

Caution must be exercised in interpreting the correction factor data. Wrong conclusions can be reached by not understanding how the internal program runs. The program assumes that the input signal level is −10.0 dBm. Any error in this level translates to the correction factors; therefore, the Amplitude Accuracy test [RECALL] 8 should be performed first. The internal program runs in the LIN mode while [RECALL] 8 is in 1 dB/LOG mode. Large offsets in LOG/LIN offset (lines 1 and 14) will cause errors in the data.

```
hp   REF -7.0 dBm     ATTEN 10 dB
                0.32 dB
1 dB/          -0.20 dB
               -0.15 dB
               -0.12 dB
               -0.09 dB
                0.05 dB   -320.000 kHz
                0.00 dB    -80.000 kHz
               -0.06 dB     4.000 kHz
               -0.48 dB    12.000 kHz
                0.87 dB  -5.100 kHz
                0.68 dB   -600  Hz
                0.74 dB    100  Hz
                0.66 dB   -20  Hz
                0.67 dB   -26  Hz
                0.69 dB   -11  Hz
                0.70 dB   -7  Hz
                1.06 dB   -1  Hz
               -0.35 dB
               -0.23 dB
                0.00 dB
                0.12 dB
                0.11 dB
CORR'D          0.11 dB
                0.21 dB
                0.24 dB
               -0.02 dB
               -0.02 dB
               -0.02 dB
               -0.02 dB
               -0.02 dB
               -0.02 dB
START 100.000 000 MHz                          STOP 100.000 000 MHz
      RES BW 30  Hz       VBW 100  Hz              SWP 10.0  sec
```

FIGURE 2. ERROR CORRECTION ROUTINE DATA

ManualsPlus.com

TABLE 2. ERROR CORRECTION ROUTINE PARAMETERS

Line	Parameter	Specification	Troubleshooting Information
1	LOG and LIN scale, BW <100 kHz	±1 dB typical	A4A3/A4A2
2	LOG 10 dB/	±(0.5 dB–1 dB reading)	A4A1
3	LOG 5 dB/		
4	LOG 2 dB/		
5	LOG 1 dB/	±0.5 dB	
6	RES BW = 3 MHz	±1 dB*	A4A8/A4A4/A4A6
7	1 MHz	*	
8	300 kHz		
9	100 kHz		
10	30 kHz		
11	10 kHz		
12	3 kHz	±0.5 dB*	
13	1 kHz		
14	300 Hz		
15	100 Hz		A4A7/A4A6/A4A5
16	30 Hz		
17	10 Hz	±1 dB*	
18	LOG and LIN scale, BW ≥100 kHz	±1 dB typical	A4A3/A4A2
19	Step Gains = A20	±0.6 dB	A4A8
20	A10		
21	SG20-2	±1.0 dB	A4A5
22	SG20-1		
23	SG10		
24	LG20	±1.0 dB typical	A4A3
25	LG10		
26	RF ATTENUATOR = 20 dB	±0.2 dB typical	A6A10 A12U8
27	30 dB		
28	40 dB		
29	50 dB		
30	60 dB		
31	70 dB		

*Specifications for all Resolution Bandwidths are referenced to the 1 MHz Resolution Bandwidth. The frequency error terms are for error correction only.

ManualsPlus.com

SWEEP SYSTEM BLOCK DIAGRAM DESCRIPTION

The 8566B Spectrum Analyzer sweep system consists of the following modes:

Continuous Sweep; Free Run Trigger

Several different assemblies are involved in the 8566B sweep system. The A16 Scan Generator generates the 0 to 10V sweep ramp. The ramp converter on the A3A8 Analog-Digital Converter and the Digital Storage Processor Section digitize this ramp into a 10-bit sweep address. When the sweep address reaches the marker address, the Digital Storage Processor Section outputs a RSHS (Low = Reset High Sweep) pulse. This signal resets the High Sweep flip-flop on the A3A1 Trigger assembly. HSWP (High Sweep) goes low and the current source charging the sweep capacitor on A16 is shunted to ground, stopping the sweep ramp at its present value. The negative transition on the HSWP line generates a Service Request on A12 Front-Panel Interface forcing LSRQ low which sets LSTP (Low Stop) high. This "wakes up" the A15 Controller. The Controller then reads the sweep address from the Digital Storage Processor Section. If it corresponds to the end of the sweep, the A15 Controller outputs a sweep reset command to the A16 Scan Generator, resetting the sweep ramp to 0V. After all Service Requests have been handled (LSRQ is high), the A15 Controller starts the sweep by issuing a set HSWP command to the A3A1 Trigger. The A15 Controller then issues a stop command to the A12 Front-Panel Interface assembly that forces LSTP low, stopping the Controller. After a 500 μsec delay on A3A1 Trigger, HSWP goes high, the sweep ramp starts, the Digital Storage Processor Section starts digitizing the ramp, and the front panel SWEEP LED lights indicating a sweep is in progress.

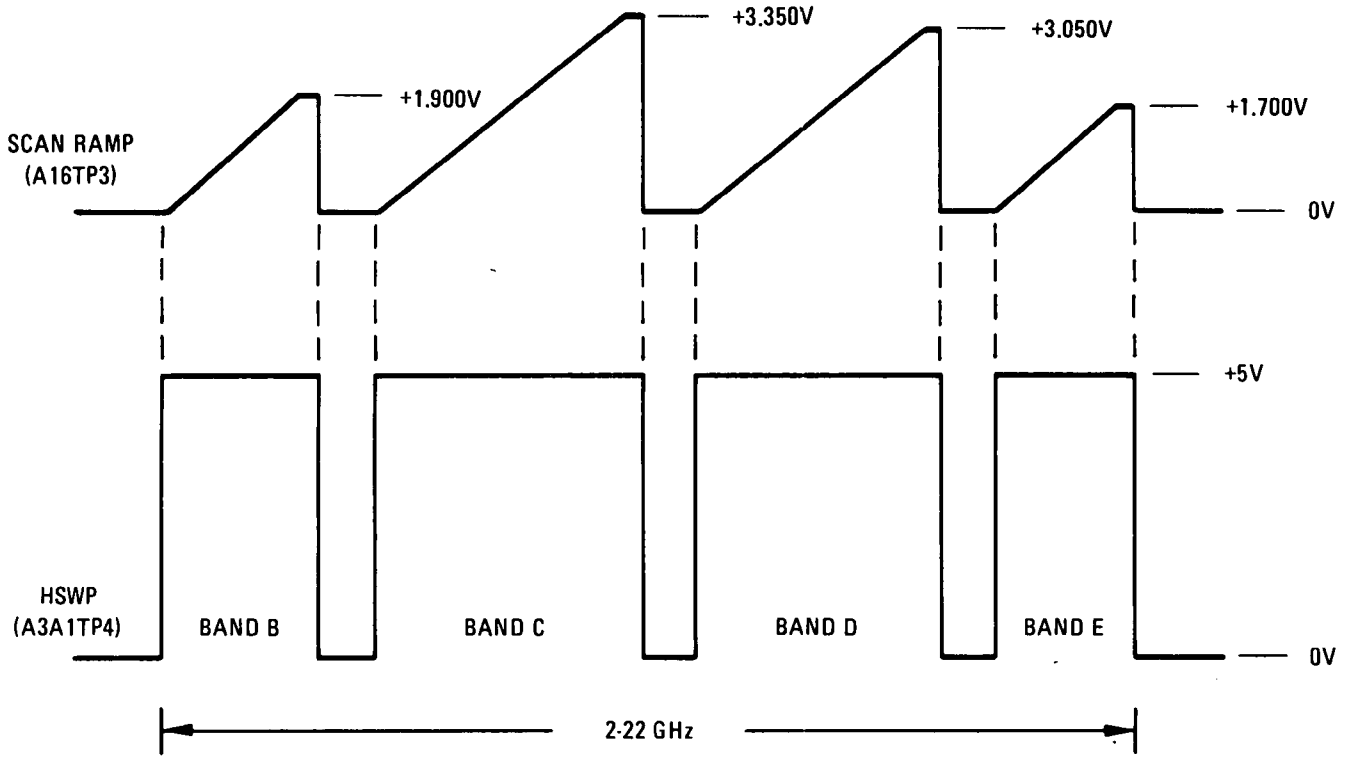


FIGURE 3. SWEEP SYSTEM TIMING EXAMPLE

Triggered Sweep

The triggered sweep modes are very similar to free run operation except that instead of the A15 Controller outputting a set HSWP command to the A3A1 Trigger assembly, it outputs a trigger enable command. The output of the trigger select circuit (line, external, or video) then clocks the HSWP line high.

ManualsPlus.com

Single Sweep

The single sweep mode is useful in troubleshooting the sweep system because it does not rely on feedback from Digital Storage before resetting the sweep generator. Whenever the SWEEP [SINGLE] key is pressed, the A15 Controller resets the sweep generator and then sets HSWP high through the A3A1 Trigger assembly. Digital Storage then stops the sweep when it has reached the end and the ramp resets to 0V.

Fast Sweep

Fast sweep is enabled only for 0 Hz frequency spans and sweep times less than 20 msec. HSWP is forced low, and the A16 Sweep Generator is not used. See A3A1 Trigger for a description of the fast sweep operation.

Service Requests

Any of the Service Requests on the A12 Front-Panel Interface will force LSRQ low which forces HSWP low. For example, when a front-panel key is depressed, a keyboard Service Request is generated. LSRQ goes low, LSTP goes high, and HSWP goes low stopping the sweep. Depending on which key was pressed, the A15 Controller will either continue the sweep or reset it and start a new sweep. Note that the analyzer cannot sweep if any Service Requests are present.

ManualsPlus.com

SWEEP SYSTEM TROUBLESHOOTING

The following procedure is an aid to rapidly isolate sweep system malfunctions. When the malfunction has been traced to a single assembly, check the Service Sheets for that assembly for a more thorough troubleshooting procedure.

Isolate the Scan Sweep

Disconnect the ramp from A3A8J1 and jumper A3A8TP1 to A3A8TP2. This forces the ramp comparator output high. The Digital Storage Processor Section should continue to process data and increment the sweep address. The HSWP light should be flashing and HSWP should have an approximately 16 msec pulse width. (Note that the instrument preset state may appear to be functioning properly but will become distorted as the sweep time is slowed down.) If this works, the Digital Storage Processor Section and A15 Controller, A12 Front-Panel Interface, and A3A1 Trigger assemblies are operating properly. Suspect the ramp generator or A16 Scan Generator or ramp converter on the A3A8 Analog-Digital Converter. To further isolate the scan generator, reconnect the sweep ramp to A3A8J1 and remove the jumper. Set the sweep time to 1 second and press the SWEEP [SINGLE] key. The ramp waveform will start at greater than 10V, go to 0V when the SWEEP [SINGLE] key is pressed, and ramp back up to greater than 10V. If the ramp waveform is correct, check the A3A8 ramp converter. Otherwise check the ramp generator on A16.

Isolate Digital Storage Processor Section If HSWP Stays High (SWEEP LED ON)

With the sweep ramp disconnected from A3A8J1 and A3A8TP1 jumpered to A3A8TP2, check RSHS output for the presence of 60 nsec low pulses. (The logic probe of the HP 5005A Signature Analyzer can be used to detect them.) If present, check A3A1 Trigger. If not, check the Digital Storage Processor Section.

Isolate A12 Front-Panel Interface If HSWP Stays Low (SWEEP LED OFF)

Troubleshoot A12 Front-Panel Interface using the Signature Analysis Troubleshooting Diagrams.

See A3A1 Trigger Troubleshooting Procedure

Note that the A3A1 Trigger assembly also generates and controls the fast sweep timing (sweeps less than 10 msec).

ManualsPlus.com

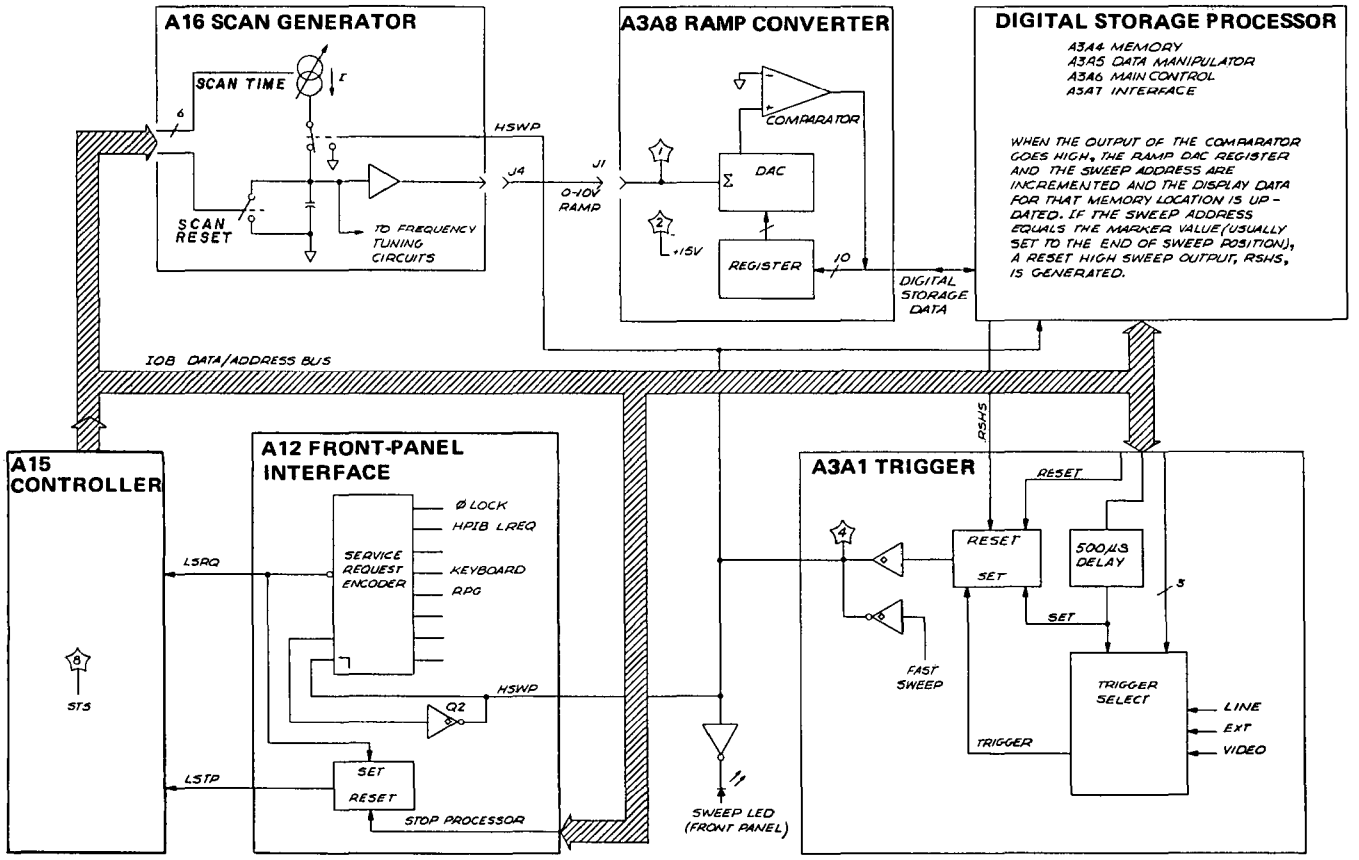


FIGURE 4. SWEEP SYSTEM BLOCK DIAGRAM

ManualsPlus.com

TABLE 3. MNEMONICS LISTING FOR RF SECTION

Mnemonic	Active State	Description	Mnemonic	Active State	Description
ADRØ – 4		Address Bits Ø through 4	LDAS	LOW	DAC Strobe
ATN*	LOW	Attention True	LDSR	LOW	Digital Storage Ready
BATT		Battery	LHBZ	LOW	HP-IB Input Buffer from Main Processor Full
BFC ON		Filter Capacitor IN			
DAV*	LOW	Data Valid	LIDAØ – 15	LOW	Instruction, Data and Address Bus Bits
DIO1 – 8	LOW	HP-IB Data Input/Output Bits			
DSØ – 3	HIGH	μProcessor Inputs/Output Device Select Bits	LIPS	LOW	Instrument Preset
			LLED	LOW	LED Strobe
EOI*	LOW	End or Identify	LMNE	LOW	M/N Output Enable
HLE2	HIGH	Phase Lock Loop 2 Lock Enable	LREQ	LOW	Word Ready from HP-IB Processor
HLEY	HIGH	YTO Lock Enable			
HOVH	HIGH	Oven Cold	LRMT	LOW	Remove (High = Local)
HPON	HIGH	Power ON to IF-Display Section	LROM1 – 3	LOW	Enable ROM 3-State Outputs
HPUP	HIGH	Power Up	LRTL	LOW	Local Button Pushed
HS1, 2		Handshake 1, 2	LSAS	LOW	Scan Attenuator Strobe
HSTD	HIGH	10 MHz Standard ON	LSBY	HIGH	Standby
HSTM	HIGH	START Memory	LSOB	LOW	Stay Off Bus
HSWP	HIGH	Sweeping	LSRQ	LOW	Service Request
HUL1	HIGH	Phase Lock Loop 1 or 3 Unlocked	LSTP	LOW	Stop A15 Controller
			LSTS	LOW	Scan Time Strobe
HUL2	HIGH	Phase Lock Loop 2 Unlocked	LTGR	LOW	Tracking Generator Request
HULH	HIGH	Heterodyne Oscillator Unlocked	LTIO	LOW	IF-Display Section I/O Strobe
			LWRT	LOW	Write Memory
HULM	HIGH	M/N Unlocked	LYSP	LOW	YTO Span
HULR	HIGH	REF Unlocked	M1 – 5		M/N Loop-M Inputs
HULY	HIGH	YTO Unlocked	MARØ – 1Ø		Memory Address Bits
HXRF	HIGH	External Reference	N1 – 6		M/N Loop-N Inputs
HYGH	HIGH	YTO Loop Gain High	N DAC*	HIGH	Data Accepted
IFC*	LOW	Interface Clear	N RFD*	HIGH	Ready for Data
IOBØ – 15	HIGH	Instrument Bus Data Bits	PDBØ – 7	HIGH	μProcessor Data Bits
KCØ – 7		Key Columns Ø through 7	REN*	LOW	Remote Enable
KRØ – 11		Key Rows Ø through 11	RPG1		Rotary Pulse
LADR	LOW	Address LED ON	RPG2		Generator Lines
LANR	LOW	Analog Reset	SAT1		Scan Integer
LAOS	LOW	Aux Out Strobe	SAT2		Attenuator
LBIO	LOW	RF Section I/O Strobe	SRQ*	LOW	Service Request
LCK1 – 5	LOW	Strobes for PLL1, 2, 3	SW1		Switch 1
LCS1 – 8	LOW	Chip Select for ROMs	SW2		Switch 2

* HP-IB Mnemonics

ManualsPlus.com

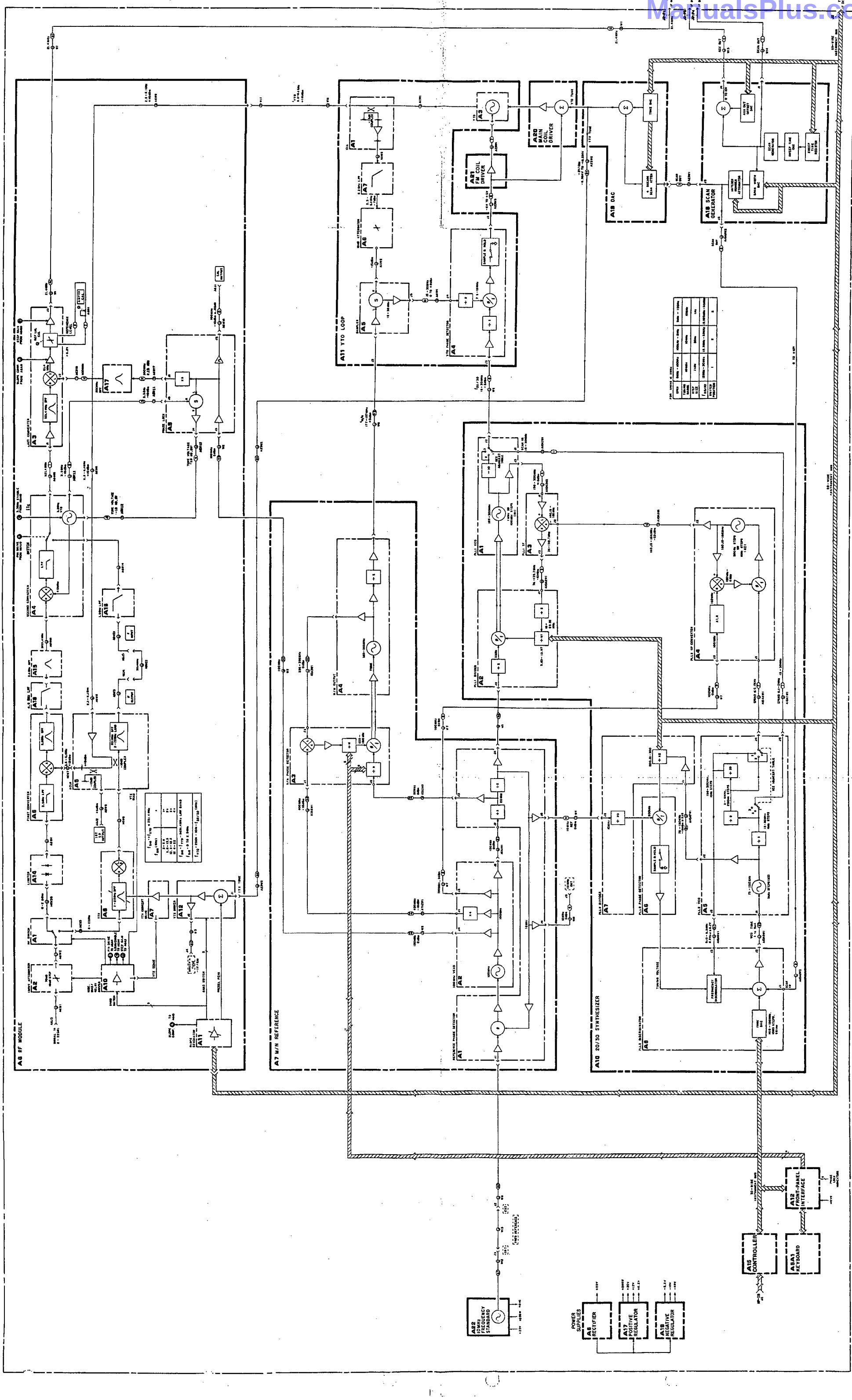


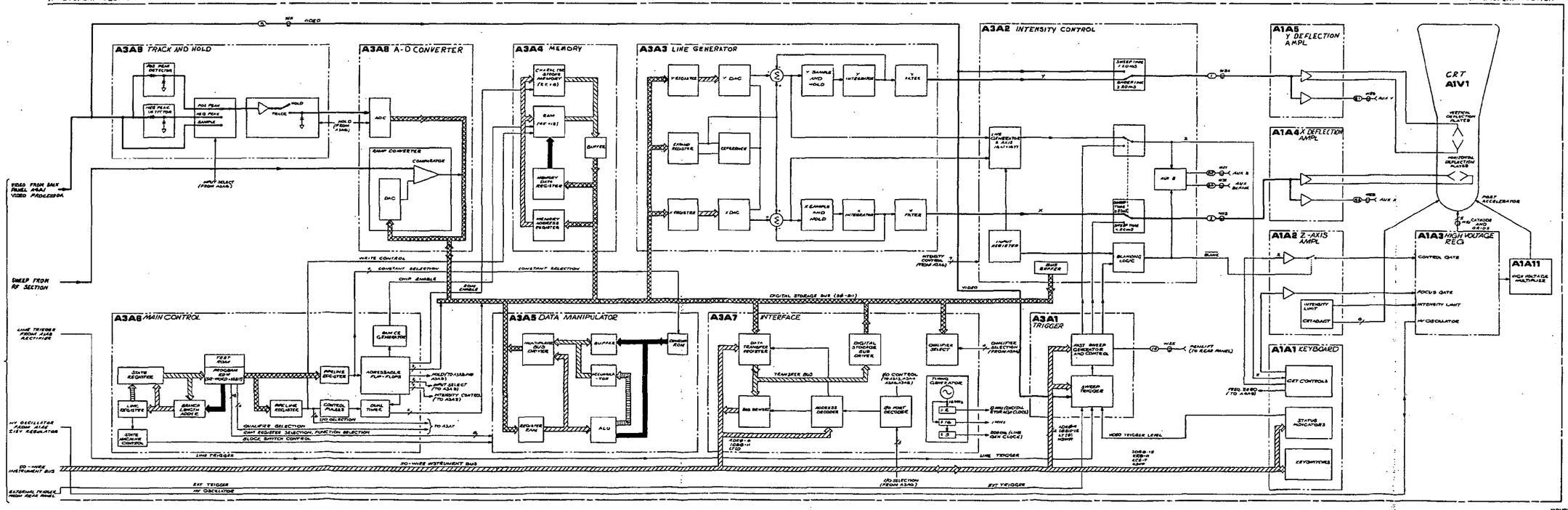
FIGURE 5. SPECTRUM ANALYZER OVERALL BLOCK DIAGRAM (1 OF 3)

ManualsPlus.com

RF SECTION

IF DISPLAY SECTION

IF DISPLAY SECTION



NOTE

UNLESS OTHERWISE INDICATED, POWER LEVELS ARE MEASURED UNDER THE FOLLOWING CONDITIONS USING SPECTRUM ANALYZER:

INSTRUMENT RECEIVER

CENTER FREQUENCY	50 MHz
FREQUENCY SPAN	0 Hz
ATTENUATION	0 dB
RESOLUTION BANDWIDTH	3 kHz

FIGURE 5. SPECTRUM ANALYZER OVERALL BLOCK DIAGRAM (2 OF 3)

ManualsPlus.com

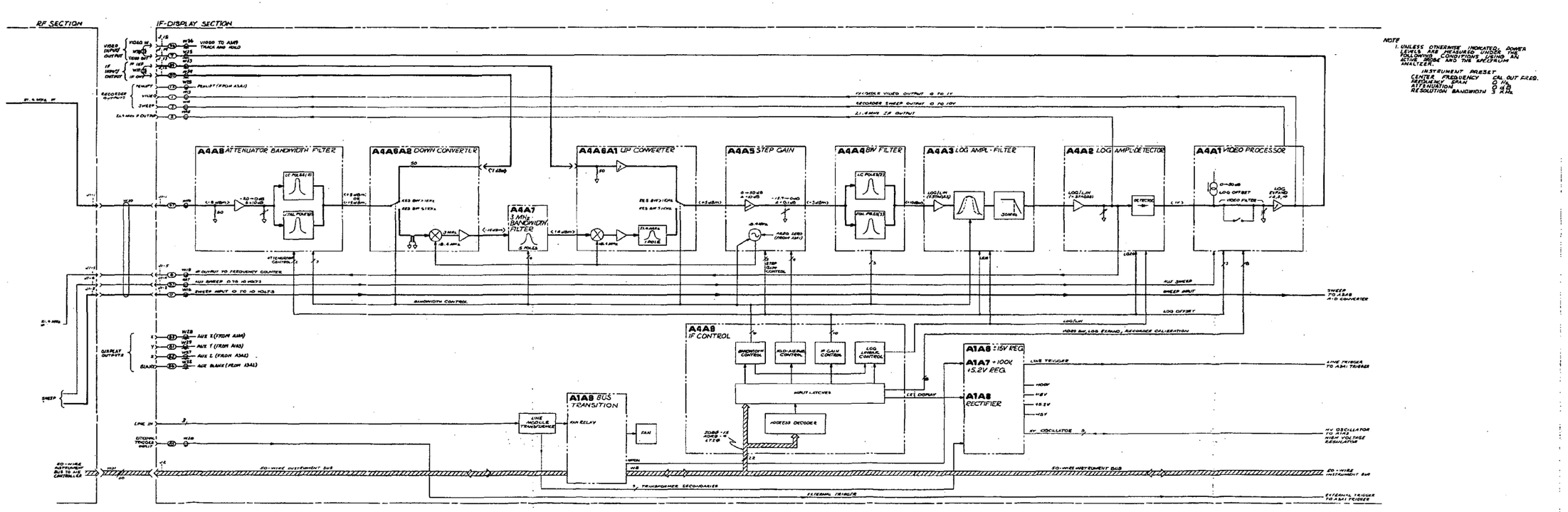


FIGURE 5. SPECTRUM ANALYZER OVERALL BLOCK DIAGRAM (3 OF 3)

ManualsPlus.com

ManualsPlus.com

RF SECTION ANALOG TROUBLESHOOTING

PHASE LOCK LOOPS
PRINCIPLES OF OPERATION

General Description

The fundamental RF signal input to the A6 RF Module (2-6.2 GHz) is generated by the A11A3 YTO (YIG-Tuned Oscillator). This signal is phase-locked, through other phase-lock loops, to the A22 10 MHz Standard (internal crystal oscillator). The YTO Loop pretunes and locks the YTO signal to the output of the M/N Loop (part of A7) and the A10 20/30 Loop. The M/N and 20/30 Loops serve two basic functions. First, they phase-lock the YTO Loop to the 10 MHz Standard through the Reference Loop (part of A7). They also provide the stepped tuning of the YTO output signal. The M/N Loop provides the larger steps (2000 to 6199 MHz in 10 MHz steps) while the 20/30 Loop provides the smaller (1 MHz to 1 Hz) steps.

All phase lock loops are referenced, either directly or indirectly, to the A22 10 MHz Standard. Figure 1 shows the relationship between the various loops as well as defining the assemblies associated with the loops.

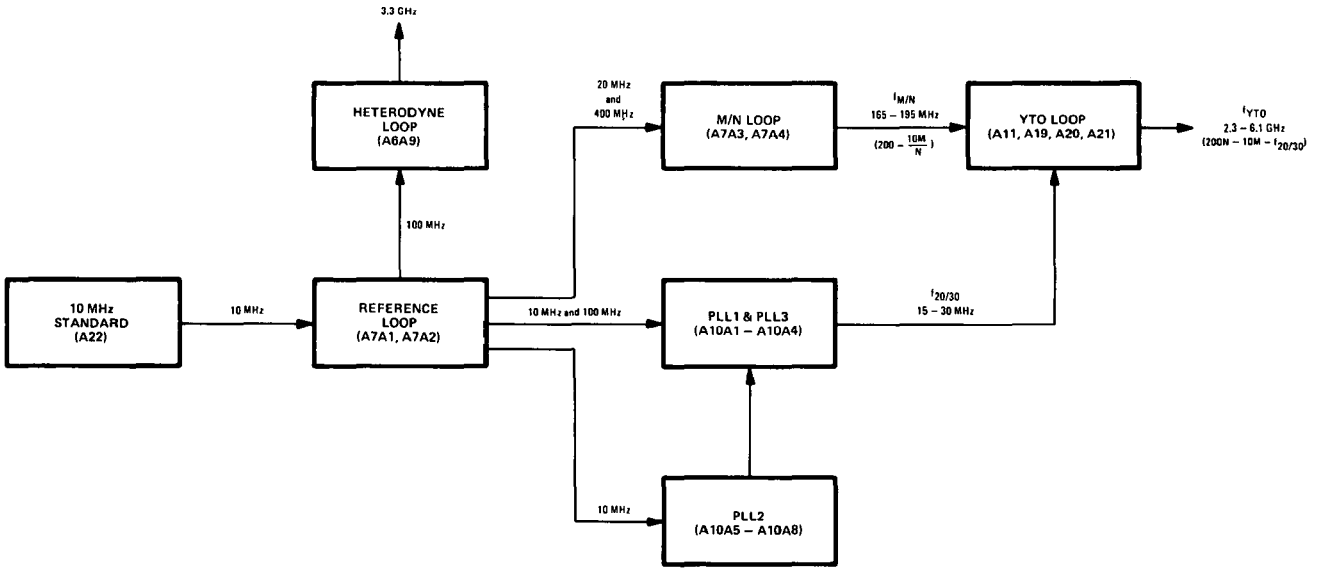


FIGURE 1. PHASE LOCK LOOPS (SYNTHESIZER), BLOCK DIAGRAM

Reference Loop (Part of A7)

The Reference Loop is phase-locked to the A22 10 MHz Standard and its phase-locked outputs (10, 20, 100, and 400 MHz) are used as references for the 20/30 Loop, the M/N Loop, and the Heterodyne Loop (part of A6). The 10 MHz signal is also used as an auxiliary rear-panel output.

The A7A2 100 MHz VCXO (Voltage-Controlled Crystal Oscillator) is the heart of this loop. The 100 MHz output signal is 1) routed to the A6A9 Phase Lock assembly to be used as a reference for the Heterodyne Loop and as the front-panel CAL OUTPUT signal, 2) routed to the A10A3 PLL3 Up Converter to be used as a reference for that phase-lock loop, 3) multiplied by four to produce the reference signal for the M/N Loop (A7A3 M/N Phase Detector), and 4) divided by five to produce a 20 MHz reference signal also used by the M/N Loop. The 20 MHz signal is divided by two to produce a 10 MHz signal which is used as a reference for the PLL1 and PLL2 phase-lock loops in the 20/30 Loop and also as the rear-panel auxiliary output. The 10 MHz signal is also phase compared to the output of the A22 10 MHz Standard. The resulting error signal is used to tune the 100 MHz VCXO to phase-lock the Reference Loop.

ManualsPlus.com

M/N Loop (Part of A7)

The frequency output of the M/N Loop is dependent on the front-panel Start Frequency/Center Frequency and in part, controls the YTO output frequency. This signal is disabled during sweeps when the frequency span is greater than 5 MHz (fundamental mixing). An encoded equivalent of the front-panel frequency's most significant digits are input to the M/N Loop as M and N numbers. The ratio of the M and N numbers determines the M/N OUT ($f_{M/N}$) frequency and are chosen such that the Nth harmonic (same as the divider number) of $f_{M/N}$ tunes in exactly 10 MHz increments as M is changed. There is one 10 MHz step for each valid $f_{M/N}$ frequency (M/N ratio) and Nth harmonic (N number). Refer to Table 2 for a complete list of M and N numbers and resulting $f_{M/N}$ frequencies. This 10 MHz step complements the 20/30 Loop whose tuning range is 10 MHz and step size is 1 Hz. Together, the M/N loop, YTO pretuning, and 20/30 Loop are able to tune the A11A3 YTO from 2000.000 000 to 6199.999 999 MHz in 1 Hz steps.

YTO Loop (A11)

Whenever a change is made to the Start Frequency/Center Frequency (from the front panel or remote controller), the YTO is pretuned near the desired new frequency. This is done by encoded information being sent from the A12 Front-Panel Interface to the A19 DAC (Digital-to-Analog Converter) which generates and routes an analog voltage to the A20 Main Coil Driver. The Main Coil Driver, in turn, generates a tuning current to tune the YTO. This places the YTO frequency 20 to 30 MHz below the Nth harmonic of the M/N Loop output ($f_{M/N}$). For frequency spans greater than 5 MHz, the YTO frequency is locked at the start of each sweep with the M/N loop and the 20/30 loop to a 1 Hz resolution. The YTO signal (f_{YTO}) and the M/N Loop output signal ($f_{M/N}$) are mixed in the A11A5 Sampler (harmonic mixer) to produce the YTO IF (f_{YTOIF}) signal. This 20 to 30 MHz signal is phase compared to the 20/30 Loop output signal ($f_{20/30}$) in the A11A4 YTO Phase Detector producing a dc error voltage. It should be noted that f_{YTOIF} and $f_{20/30}$ are equal when the YTO Loop is phase-locked. This error voltage is stored in a capacitor, the loop (YTO) opened, and a sweep taken. The loop is relocked at the start of each sweep. If the frequency span is less than 5 MHz, the YTO Loop is always locked and is forced to sweep by following the swept oscillator reference ($f_{20/30}$) from PLL2 in the 20/30 Loop which is either applied directly to the YTO or divided down and summed into PLL2 and PLL1 and then applied to the YTO.

When the frequency span is less than 25 kHz, the loop gain of the YTO Loop is increased by approximately 10 dB to provide better performance. This is performed by control signal HYGH (High = YTO Loop Gain High) being placed in a High state.

20/30 Loop (A10)

The 20/30 Loop translates tuning data for the seven least significant digits of the YTO frequency (2 to 6.2 GHz) into frequencies from 30 to 20.000 001 MHz. This translation is quite straightforward and the resulting output frequency can be calculated by the following equation:

$$f_{20/30} = 30 - \text{x.xxx xxx MHz}$$

where x.xxx xxx is the seven least significant digits of the YTO frequency.

This process of frequency translation is used to tune the YTO over a 10 MHz range in 1 Hz steps (1 Hz steps in zero frequency span) and uses three complete phase-lock loops (PLL1, PLL2, and PLL3) to achieve this.

Phase Lock Loop 2 (PLL2) provides a low-frequency (20 to 30 MHz) reference ($f_{20/30}$) to the YTO Loop for frequency spans between approximately 100 kHz and 5 KHz. This loop is locked at the start of each sweep, the error voltage stored in a capacitor, the loop unlocked, and a sweep taken. For frequency spans of less than approximately 100 kHz and greater than 5 kHz, the 20 to 30 MHz output is divided by 5 and applied as an input to Phase Lock Loop 3 (PLL3) and Phase Lock Loop 1 (PLL1). The output of PLL1/PLL3 then serves as the reference input ($f_{20/30}$) to the YTO Loop. If the frequency span is 5 kHz or smaller, the output of PLL2 is divided by 100 and applied to PLL3.

ManualsPlus.com

Heterodyne Loop (Part of A6)

The Heterodyne Loop (A6A9) consists of a 3.3 GHz oscillator located in the A6A4 Second Converter that is locked to the 100 MHz VCXO in the A7A2 assembly. The 100 MHz signal drives the Sampler in the A6A9 Phase Lock assembly which produces a dc output proportional to the phase difference between the 33rd harmonic of 100 MHz and the 3.3 GHz oscillator output signal being sampled. This dc output is amplified and used to drive the 3.3 GHz oscillator to achieve phase lock. If the loop is unlocked, a search oscillator (in the A6A9) turns on and sweeps the 3.3 GHz VCO until phase-lock is again achieved. The Heterodyne loop is used only for start frequencies of less than 2 GHz.

ManualsPlus.com

TROUBLESHOOTING INFORMATION

Troubleshooting Table

Table 1 correlates CRT phase-lock error messages with the probable faulty phase-lock loop and associated assemblies. This is especially helpful in determining the faulty loop when more than one phase-lock error message is displayed.

TABLE 1. TROUBLESHOOTING USING CRT UNLOCK MESSAGES

Message(s) (UNLOCK)	Probable Faulty Loop	Associated Assemblies
PL1	Phase Lock Loop 1	A10A1 – A10A4
PL2	Phase Lock Loop 2	A10A5 – A10A8
REF	Reference Loop	A7A1, A7A2, A22
YTO	YTO Loop	A19, A20, A21, A11
M/N	M/N Loop	A7A3, A7A4
HET	Heterodyne Loop	A6A9, A6A4
PL1, PL2	Phase Lock Loop 2	A10A5 – A10A8
PL1, YTO	Phase Lock Loop 1	A10A1 – A10A4
PL1, PL2, YTO	Phase Lock Loop 2	A10A5 – A10A8
REF, PL1, PL2	Reference Loop	A7A1, A7A2, A22
REF, M/N, YTO	Reference Loop	A7A1, A7A2, A22
M/N, YTO	M/N Loop	A7A3, A7A4
HET, REF	Reference Loop	A7A1, A7A2, A22

ManualsPlus.com

START FREQUENCY TUNING EQUATIONS AND PHASE LOCK TROUBLESHOOTING

General

Phase-lock loop troubleshooting is much easier if it is understood how the start frequency is derived. The Diagnostic Functions of the spectrum analyzer can also be used to simplify troubleshooting of the phase-lock loop.

Figure 2 shows a simplified block diagram of the assemblies involved in setting the start frequency. The 8566B has two tuning modes. For frequency spans greater than 5MHz, a method called lock and roll is used. This basically involves phase locking the analyzer start frequency during the retrace period prior to the beginning of a new scan. For frequency spans of 5 MHz and less, the analyzer is phase-locked during all of a sweep.

The equation for start frequency is:

$f_{SF} = (B \cdot (N \cdot f_{M/N} - f_{20/30})) + f_{IF}$

where

f_{SF} = Start Frequency

B = band number. KSR displays the value of B which varies from 0 to 4. When the displayed value is 0 (low band), use 1 as a multiplier.

N = N number for M/N Loop. KSR displays the value of N which varies from 11 to 32.

$f_{M/N}$ = M/N loop frequency in MHz. KSR displays the value which ranges from 177 to 197 MHz.

$f_{20/30}$ = Synthesizer frequency in MHz. KSR displays the value which ranges from 20 to 30 MHz.

f_{IF} = Signal IF frequency. The value is 3621.4 MHz for band 0, −321.4 MHz for band 1, and + 321.4 MHz for bands 2, 3, and 4.

NOTE

For a detailed explanation of the Frequency Diagnostic Function (KSR), see Diagnostic Functions in the Spectrum Analyzer Overall Troubleshooting Section of this manual.

As an example, these values are used following an INSTR PRESET ([2-22 GHz] pressed) to determine the start frequency.

B = 1 N = 13

$f_{M/N}$ = 180.769231 MHz

$f_{20/30}$ = 28.600000

f_{IF} = − 321.4 MHz

Substitute these values into the equation.

$f_{SF} = (1 \cdot (13 \cdot 180 \cdot 769231\ \text{MHz}) - 28.600000\ \text{MHz}) - 321.4\ \text{MHz} = 2000.0\ \text{MHz}$

ManualsPlus.com

M/N Loop Tuning

The frequency output of the M/N Loop is dependent on the ratio of M and N numbers. These numbers are input in the form of digital tuning information to the M/N Loop Phase Detector. The following equation shows the relationship between the output frequency and the M and N numbers.

$f_{M/N} = (200 - 10\,(M/N))$ MHz

where

$f_{M/N}$ = M/N output frequency

M = M number which varies from 8 – 27. KSR displays the value of M.

N = N number which varies from 11 – 32. KSR displays the value of N.

The M and N numbers are selected such that the M/N Loop output pretunes the YTO frequency in 10 MHz steps. For a listing of the M and N numbers, M/N output frequencies ($f_{M/N}$), and the YTO frequencies, refer to Table 2, M and N Numbers and Resulting Frequencies.

20/30 Synthesizer Tuning

When a start frequency change occurs, the YTO is pretuned near the new desired frequency by the A19 Digital-Analog Converter and A20 Main Coil Driver. This places the YTO frequency 20 to 30 MHz below the Nth harmonic of the M/N Loop output. (The Nth harmonic is the same as the M/N Loop's N number.) The YTO frequency and the M/N Loop harmonic are mixed in the A11A5 Sampler. The YTO IF (20 – 30 MHz) is phase compared with the 20/30 Synthesizer output. The A11A4 Phase Detector's error voltage is then used to tune the YTO through the A21 FM Coil Driver and the A20 Main Coil Driver to achieve phase-lock.

The 20/30 Synthesizer is used to pretune the YTO in 1 Hz steps (in zero frequency span) through a 10 MHz range. The following formula expresses the relationship between the frequencies found in the YTO Loop.

$f_{20/30} = (N \cdot f_{M/N}) - f_o = f_{YTOIF}$

where

$f_{20/30}$ = 20/30 Synthesizer frequency. (Displayed with KSR.)

N = N number, varies from 11 – 32. (KSR displays value of N.)

$f_{M/N}$ = M/N Loop frequency

f_o = YTO frequency

f_{YTOIF} = YTO IF frequency

The 20/30 Synthesizer frequency can also be determined by using the YTO frequency set. This frequency is available by using KSR. In this case,

$f_{20/30} = (30.000000 - D_7 . D_6 D_5 D_4 D_3 D_2 D_1)$

where

D_1 to D_7 is the YTO frequency displayed with D_1 being the least significant digit (1 Hz).

ManualsPlus.com

Marker Mode

When the MARKER [NORMAL] mode is selected, the analyzer does the following. First, the center frequency is determined. Because the [NORMAL] marker is a display marker, after the center frequency is calculated, the position of the marker on the display is determined. By knowing that the display consists of 1000 points and the programmed frequency span, the processor calculates the offset between the center frequency and the marker. The frequency span accuracy is the major cause of error in the readout accuracy of the MARKER [NORMAL] mode.

Phase Lock Loop Troubleshooting

If one of the phase-lock error messages appears, a loop has failed. Start the troubleshooting procedure by determining if the malfunction is dependent on Center Frequency, Frequency Span, etc. Next, break the suspected loop and measure the power levels as indicated on the RF Section Analog Block Diagram. Even with the oscillators at the extremes of their ranges, the power levels must be within the limits indicated. The loop frequencies can be counted and compared with the programmed frequencies listed by KSR by inserting a tee connector into the loop.

The Lock Indicator Disable jumper (A12TP2 to A12TP3) may be necessary if the keyboard is locked out. Use the information from the Diagnostic Function and the Start Frequency Tuning Equations to narrow the fault to a single assembly.

ManualsPlus.com

TABLE 2. M AND N NUMBERS AND RESULTING FREQUENCIES (1 OF 5)

YTO START FREQ. MHz	M	N	M/N MHz	YTO START FREQ. MHz	M	N	M/N MHz
2000	17	11	184.545455	2540	23	14	183.571429
2010	16	11	185.454545	2550	22	14	184.285714
2020	15	11	186.363636	2560	21	14	185.000000
2030	14	11	187.272727	2570	20	14	185.714286
2040	13	11	188.181818	2580	19	14	186.428571
2050	12	11	189.090909	2590	18	14	187.142857
2060	11	11	190.000000	2600	17	14	187.857143
2070	10	11	190.909091	2610	16	14	188.571429
2080	9	11	191.818182	2620	15	14	189.285714
2090	8	11	192.727273	2630	14	14	190.000000
2100	27	12	177.500000	2640	13	14	190.714286
2110	26	12	178.333333	2650	12	14	191.428571
2120	25	12	179.166667	2660	11	14	192.142857
2130	24	12	180.000000	2670	10	14	192.857143
2140	23	12	180.833333	2680	9	14	193.571429
2150	22	12	181.666667	2690	8	14	194.285714
2160	21	12	182.500000	2700	27	15	182.000000
2170	20	12	183.333333	2710	26	15	182.666667
2180	19	12	184.166667	2720	25	15	183.333333
2190	18	12	185.000000	2730	24	15	184.000000
2200	17	12	185.833333	2740	23	15	184.666667
2210	16	12	186.666667	2750	22	15	185.333333
2220	15	12	187.500000	2760	21	15	186.000000
2230	14	12	188.333333	2770	20	15	186.666667
2240	13	12	189.166667	2780	19	15	187.333333
2250	12	12	190.000000	2790	18	15	188.000000
2260	11	12	190.833333	2800	17	15	188.666667
2270	10	12	191.666667	2810	16	15	189.333333
2280	9	12	192.500000	2820	15	15	190.000000
2290	8	12	193.333333	2830	14	15	190.666667
2300	27	13	179.230769	2840	13	15	191.333333
2310	26	13	180.000000	2850	12	15	192.000000
2320	25	13	180.769231	2860	11	15	192.666667
2330	24	13	181.538462	2870	10	15	193.333333
2340	23	13	182.307692	2880	9	15	194.000000
2350	22	13	183.076923	2890	8	15	194.666667
2360	21	13	183.846154	2900	27	16	183.125000
2370	20	13	184.615385	2910	26	16	183.750000
2380	19	13	185.384615	2920	25	16	184.375000
2390	18	13	186.153846	2930	24	16	185.000000
2400	17	13	186.923077	2940	23	16	185.625000
2410	16	13	187.692308	2950	22	16	186.250000
2420	15	13	188.461538	2960	21	16	186.875000
2430	14	13	189.230769	2970	20	16	187.500000
2440	13	13	190.000000	2980	19	16	188.125000
2450	12	13	190.769231	2990	18	16	188.750000
2460	11	13	191.538462	3000	17	16	189.375000
2470	10	13	192.307692	3010	16	16	190.000000
2480	9	13	193.076923	3020	15	16	190.625000
2490	8	13	193.846154	3030	14	16	191.250000
2500	27	14	180.714286	3040	13	16	191.875000
2510	26	14	181.428571	3050	12	16	192.500000
2520	25	14	182.142857	3060	11	16	193.125000
2530	24	14	182.857143	3070	10	16	193.750000

ManualsPlus.com

TABLE 2. M AND N NUMBERS AND RESULTING FREQUENCIES (2 OF 5)

YTO START FREQ. MHz	M	N	M/N MHz	YTO START FREQ. MHz	M	N	M/N MHz
3080	9	16	194.375000	3620	15	19	192.105263
3090	8	16	195.000000	3630	14	19	192.631579
3100	27	17	184.117647	3640	13	19	193.157895
3110	26	17	184.705882	3650	12	19	193.684211
3120	25	17	185.294118	3660	11	19	194.210526
3130	24	17	185.882353	3670	10	19	194.736842
3140	23	17	186.470588	3680	9	19	195.263158
3150	22	17	187.058824	3690	8	19	195.789474
3160	21	17	187.647059	3700	27	20	186.500000
3170	20	17	188.235294	3710	26	20	187.000000
3180	19	17	188.823529	3720	25	20	187.500000
3190	18	17	189.411765	3730	24	20	188.000000
3200	17	17	190.000000	3740	23	20	188.500000
3210	16	17	190.588235	3750	22	20	189.000000
3220	15	17	191.176471	3760	21	20	189.500000
3230	14	17	191.764706	3770	20	20	190.000000
3240	13	17	192.352941	3780	19	20	190.500000
3250	12	17	192.941176	3790	18	20	191.000000
3260	11	17	193.529412	3800	17	20	191.500000
3270	10	17	194.117647	3810	16	20	192.000000
3280	9	17	194.705882	3820	15	20	192.500000
3290	8	17	195.294118	3830	14	20	193.000000
3300	27	18	185.000000	3840	13	20	193.500000
3310	26	18	185.555556	3850	12	20	194.000000
3320	25	18	186.111111	3860	11	20	194.500000
3330	24	18	186.666667	3870	10	20	195.000000
3340	23	18	187.222222	3880	9	20	195.500000
3350	22	18	187.777778	3890	8	20	196.000000
3360	21	18	188.333333	3900	27	21	187.142857
3370	20	18	188.888889	3910	26	21	187.619048
3380	19	18	189.444444	3920	25	21	188.095238
3390	18	18	190.000000	3930	24	21	188.571429
3400	17	18	190.555556	3940	23	21	189.047619
3410	16	18	191.111111	3950	22	21	189.523810
3420	15	18	191.666667	3960	21	21	190.000000
3430	14	18	192.222222	3970	20	21	190.476190
3440	13	18	192.777778	3980	19	21	190.952381
3450	12	18	193.333333	3990	18	21	191.428571
3460	11	18	193.888889	4000	17	21	191.904762
3470	10	18	194.444444	4010	16	21	192.380952
3480	9	18	195.000000	4020	15	21	192.857143
3490	8	18	195.555556	4030	14	21	193.333333
3500	27	19	185.789474	4040	13	21	193.809524
3510	26	19	186.315789	4050	12	21	194.285714
3520	25	19	186.842105	4060	11	21	194.761905
3530	24	19	187.368421	4070	10	21	195.238095
3540	23	19	187.894737	4080	9	21	195.714286
3550	22	19	188.421053	4090	8	21	196.190476
3560	21	19	188.947368	4100	27	22	187.727273
3570	20	19	189.473684	4110	26	22	188.181818
3580	19	19	190.000000	4120	25	22	188.636364
3590	18	19	190.526316	4130	24	22	189.090909
3600	17	19	191.052632	4140	23	22	189.545455
3610	16	19	191.578947	4150	22	22	190.000000

ManualsPlus.com

TABLE 2. M AND N NUMBERS AND RESULTING FREQUENCIES (3 OF 5)

YTO START FREQ. MHz	M	N	M/N MHz		YTO START FREQ. MHz	M	N	M/N MHz
4160	21	22	190.454545		4700	27	25	189.200000
4170	20	22	190.909091		4710	26	25	189.600000
4180	19	22	191.363636		4720	25	25	190.000000
4190	18	22	191.818182		4730	24	25	190.400000
4200	17	22	192.272727		4740	23	25	190.800000
4210	16	22	192.727273		4750	22	25	191.200000
4220	15	22	193.181818		4760	21	25	191.600000
4230	14	22	193.636364		4770	20	25	192.000000
4240	13	22	194.090909		4780	19	25	192.400000
4250	12	22	194.545455		4790	18	25	192.800000
4260	11	22	195.000000		4800	17	25	193.200000
4270	10	22	195.454545		4810	16	25	193.600000
4280	9	22	195.909091		4820	15	25	194.000000
4290	8	22	196.363636		4830	14	25	194.400000
4300	27	23	188.260870		4840	13	25	194.800000
4310	26	23	188.695652		4850	12	25	195.200000
4320	25	23	189.130435		4860	11	25	195.600000
4330	24	23	189.565217		4870	10	25	196.000000
4340	23	23	190.000000		4880	9	25	196.400000
4350	22	23	190.434783		4890	8	25	196.800000
4360	21	23	190.869565		4900	27	26	189.615385
4370	20	23	191.304348		4910	26	26	190.000000
4380	19	23	191.739130		4920	25	26	190.384615
4390	18	23	192.173913		4930	24	26	190.769231
4400	17	23	192.608696		4940	23	26	191.153846
4410	16	23	193.043478		4950	22	26	191.538462
4420	15	23	193.478261		4960	21	26	191.923077
4430	14	23	193.913043		4970	20	26	192.307692
4440	13	23	194.347826		4980	19	26	192.692308
4450	12	23	194.782609		4990	18	26	193.076923
4460	11	23	195.217391		5000	17	26	193.461538
4470	10	23	195.652174		5010	16	26	193.846154
4480	9	23	196.086957		5020	15	26	194.230769
4490	8	23	196.521739		5030	14	26	194.615385
4500	27	24	188.750000		5040	13	26	195.000000
4510	26	24	189.166667		5050	12	26	195.384615
4520	25	24	189.583333		5060	11	26	195.769231
4530	24	24	190.000000		5070	10	26	196.153846
4540	23	24	190.416667		5080	9	26	196.538462
4550	22	24	190.833333		5090	8	26	196.923077
4560	21	24	191.250000		5100	27	27	190.000000
4570	20	24	191.666667		5110	26	27	190.370370
4580	19	24	192.083333		5120	25	27	190.740741
4590	18	24	192.500000		5130	24	27	191.111111
4600	17	24	192.916667		5140	23	27	191.481481
4610	16	24	193.333333		5150	22	27	191.851852
4620	15	24	193.750000		5160	21	27	192.222222
4630	14	24	194.166667		5170	20	27	192.592593
4640	13	24	194.583333		5180	19	27	192.962963
4650	12	24	195.000000		5190	18	27	193.333333
4660	11	24	195.416667		5200	17	27	193.703704
4670	10	24	195.833333		5210	16	27	194.074074
4680	9	24	196.250000		5220	15	27	194.444444
4690	8	24	196.666667		5230	14	27	194.814815

ManualsPlus.com

TABLE 2. M AND N NUMBERS AND RESULTING FREQUENCIES (4 OF 5)

YTO START FREQ. MHz	M	N	M/N MHz	YTO START FREQ. MHz	M	N	M/N MHz
5240	13	27	195.185185	5720	25	30	191.666667
5250	12	27	195.555556	5730	24	30	192.000000
5260	11	27	195.925926	5740	23	30	192.333333
5270	10	27	196.296296	5750	22	30	192.666667
5280	9	27	196.666667	5760	21	30	193.000000
5290	8	27	197.037037	5770	20	30	193.333333
5300	27	28	190.357143	5780	19	30	193.666667
5310	26	28	190.714286	5790	18	30	194.000000
5320	25	28	191.071429	5800	17	30	194.333333
5330	24	28	191.428571	5810	16	30	194.666667
5340	23	28	191.785714	5820	15	30	195.000000
5350	22	28	192.142857	5830	14	30	195.333333
5360	21	28	192.500000	5840	13	30	195.666667
5370	20	28	192.857143	5850	12	30	196.000000
5380	19	28	193.214286	5860	11	30	196.333333
5390	18	28	193.571429	5870	10	30	196.666667
5400	17	28	193.928571	5880	9	30	197.000000
5410	16	28	194.285714	5890	8	30	197.333333
5420	15	28	194.642857	5900	27	31	191.290323
5430	14	28	195.000000	5910	26	31	191.612903
5440	13	28	195.357143	5920	25	31	191.935484
5450	12	28	195.714286	5930	24	31	192.258065
5460	11	28	196.071429	5940	23	31	192.580645
5470	10	28	196.428571	5950	22	31	192.903226
5480	9	28	196.785714	5960	21	31	193.225806
5490	8	28	197.142857	5970	20	31	193.548387
5500	27	29	190.689655	5980	19	31	193.870968
5510	26	29	191.034483	5990	18	31	194.193548
5520	25	29	191.379310	6000	17	31	194.516129
5530	24	29	191.724138	6010	16	31	194.838710
5540	23	29	192.068966	6020	15	31	195.161290
5550	22	29	192.413793	6030	14	31	195.483871
5560	21	29	192.758621	6040	13	31	195.806452
5570	20	29	193.103448	6050	12	31	196.129032
5580	19	29	193.448276	6060	11	31	196.451613
5590	18	29	193.793103	6070	10	31	196.774194
5600	17	29	194.137931	6080	9	31	197.096774
5610	16	29	194.482759	6090	8	31	197.419355
5620	15	29	194.827586	6100	27	32	191.562500
5630	14	29	195.172414	6110	26	32	191.875000
5640	13	29	195.517241	6120	25	32	192.187500
5650	12	29	195.862069	6130	24	32	192.500000
5660	11	29	196.206897	6140	23	32	192.812500
5670	10	29	196.551724	6150	22	32	193.125000
5680	9	29	196.896552	6160	21	32	193.437500
5690	8	29	197.241379	6170	20	32	193.750000
5700	27	30	191.000000	6180	19	32	194.062500
5710	26	30	191.333333	6190	18	32	194.375000

ManualsPlus.com

TABLE 2. M AND N NUMBERS AND RESULTING FREQUENCIES (5 OF 5)

YTO START FREQ. MHz	M	N	M/N MHz
6000	17	31	194.516129
6010	16	31	194.838710
6020	15	31	195.161290
6030	14	31	195.483871
6040	13	31	195.806452
6050	12	31	196.129032
6060	11	31	196.451613
6070	10	31	196.774194
6080	9	31	197.096774
6090	8	31	197.419355
6100	27	32	191.562500
6110	26	32	191.875000
6120	25	32	192.187500
6130	24	32	192.500000
6140	23	32	192.812500
6150	22	32	193.125000
6160	21	32	193.437500
6170	20	32	193.750000
6180	19	32	194.062500
6190	18	32	194.375000

ManualsPlus.com

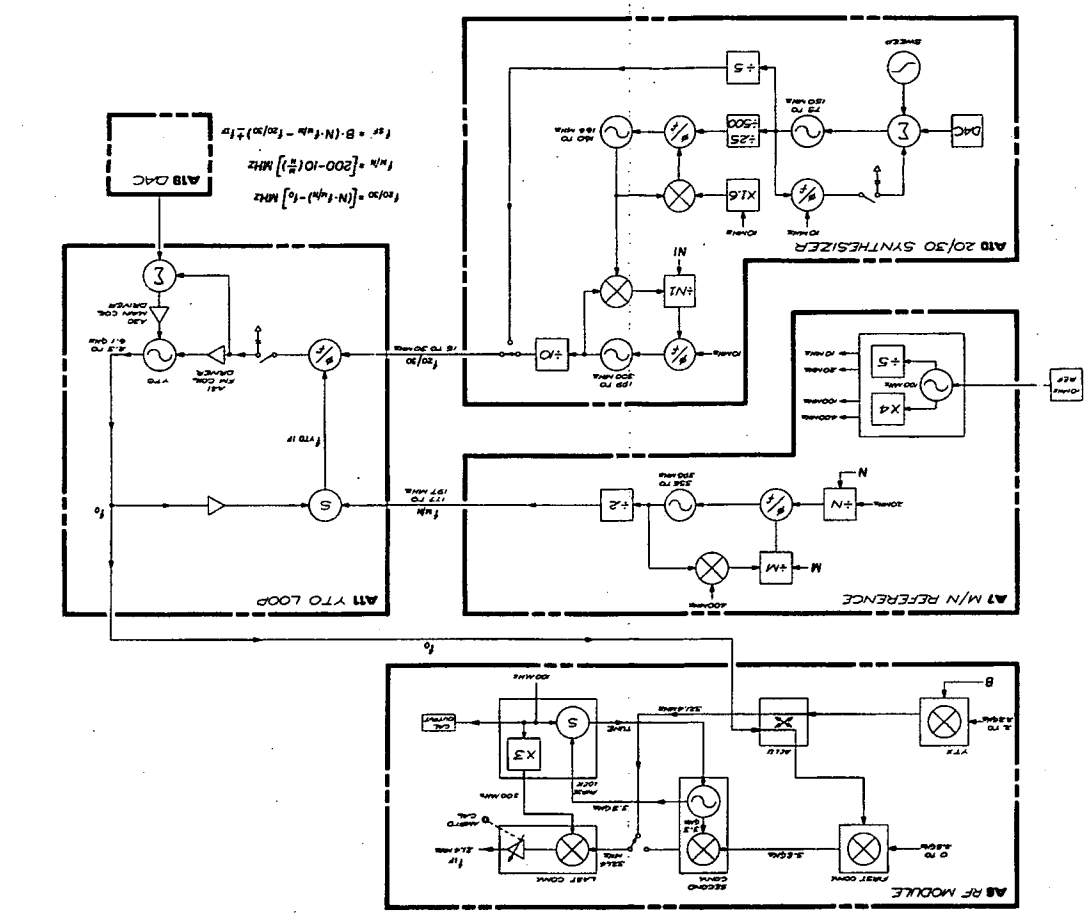


FIGURE 2. SIMPLIFIED RF BLOCK DIAGRAM

ManualsPlus.com

ManualsPlus.com

RF SECTION DIGITAL TROUBLESHOOTING

PRELIMINARY CHECKS

Instrument Preset Check

The two red INSTR CHECK LEDs light whenever the instrument is turned on or when [2-22 GHz] is pushed. The main processor then performs a check of itself, a checksum verification of all ROMs on the A15 Controller, a partial check of the Instrument Bus (50-wire bus), and a read-write check of the RAMs and A3A4 Memory in the IF-Display Section.

If all the checks pass, both INSTR CHECK LEDs turn off.

If any check fails, one or both INSTR CHECK LEDs remain on.

a. **Both INSTR CHECK LEDs on** indicates a problem with the A15 Controller. First, remove the Controller and make sure that the 50-wire ribbon cable and HP-IB ribbon cable are pressed all the way onto A15J1 and A15J2 connectors. Reinstall the A15 Controller. If both front panel INSTR CHECK LEDs still remain on when the instrument is turned on, follow procedure under A15 Controller Self Test.

b. **Left LED (INSTR CHECK I) on** indicates a failure occurred when checking the Digital Storage Memory (A3A4). First, check to ensure that a LINE power cord is connected to the IF-Display Section. Also check to see that the rear-panel Analyzer Bus Interconnect Cable, W31, is properly connected. If INSTR CHECK I still remains on when the instrument is turned on, troubleshoot the A3 Digital Storage in the IF-Display Section.

c. **Right LED (INSTR CHECK II) on** indicates a failure occurred during the partial check of the Instrument Bus.

NOTE

The partial interface check reads the key column lines (KC0 through KC7) from the A1 and A5 front panels. If any front panel key is shorted or stuck closed, INSTR CHECK II LED should remain on after the Self Test is completed. This part of the Self Test can easily be verified by pushing any key, except [LCL], and holding the key in while pushing [2-22 GHz]. If the I/O interface check routine is working, INSTR CHECK II LED will stay on.

d. **Suspected digital failure but no INSTR CHECK LEDs on** may indicate a RAM or I/O bus failure which is not checked in the normal Self Check or "POP" (Power-On Preset). If the two front panel INSTR CHECK LEDs turn on when the LINE switch is set to ON, and turn off again within a few seconds (indicating no digital problems), but symptoms persist (such as improper CRT display or improper response to particular commands) indicating that the problem is in the digital area, a "LONG POP"can be performed.

"LONG POP" Instrument Preset Check (Jumper A15TP4[STS] to A15TP1-7[T3])

This check is very similar to the normal Instrument Preset Check: an additional processor check is performed, all of the RAM locations in Digital Storage (A3A4 Memory) are checked, and the RAM memory on the A15 Controller is verified.

Since these more extensive checks require altering information that has been stored in RAM, LONG POP requires an internal jumper from A15TP4 (STS) to A15TP1-7 (T3). To perform a LONG POP, set LINE switch

ManualsPlus.com

to STANDBY and jumper A15TP4 to A15TP1-7. (Refer to A15 component locations diagram for location of test points). When LINE switch is set to ON, the two red INSTR CHECK LEDs are forced on and the main processor steps through the Self Test routine, expanding the normal POP with the additional tests mentioned above. The expected results for a LONG POP are exactly the same as for the normal POP of Instrument Preset as described above in the Instrument Preset Check (paragraphs a, b, and c).

Because LONG POP is a "destructive test" (it alters any information that has been stored in RAM), it should be performed only as a last resort effort in troubleshooting what appears to be a memory or processor related problem.

Digital Storage Verification

The Instrument Preset Check does a fairly complete verification of the Digital Storage controller and memory. An additional check can be done, independent of the RF section, by jumpering A3A6TP3 to A3A6TP6 and pushing A3A7S1 momentarily. A test pattern should appear on the display. Refer to the A3 Digital Storage Troubleshooting Section in Volume 2 of this manual for a more detailed description of this procedure. Note that when the jumper is connected, the left check LED always stays on following an INSTR PRESET, since in the test pattern mode, Digital Storage ignores all instructions from the A15 Controller.

ManualsPlus.com

RF SECTION

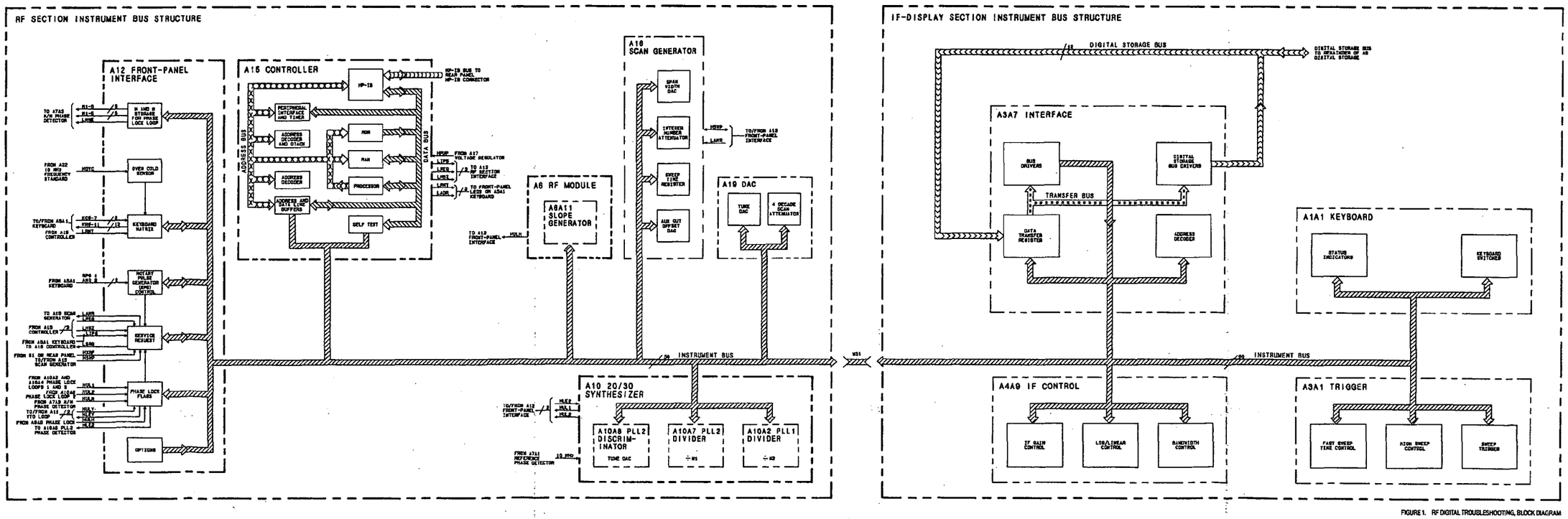


FIGURE 1. RF DIGITAL TROUBLESHOOTING, BLOCK DIAGRAM

ManualsPlus.com

A5 Front Panel

ManualsPlus.com

A5 FRONT PANEL, CIRCUIT DESCRIPTION

A5 Front Panel comprises the A5A1 Keyboard, A5A2 Rotary Pulse Generator (RPG), Instrument Check indicators, and LINE power switch.

A5A1 Keyboard

A5A1 Keyboard includes all the front-panel pushbutton key-switches and their indicator LEDs. (Refer to A12 Front-Panel Interface for a description of the key-switch circuitry.) The LEDs, which are driven by A12, indicate the status of pushbuttons, except for INSTR CHECK indicators I (DS2) and II (DS3).

Instrument Check Indicators

The INSTR CHECK indicators are used with a self-test routine that is run whenever the LINE switch is turned on or the [2-22 GHz] key is pressed. The self-test routine checks the digital circuitry in A15 Controller, portions of A12 Front-Panel Interface, and A3 Digital Storage in the IF-Display Section. Both LEDs are lit until the self-test routine is completed. If both LEDs remain on, the problem is probably on the A15 Controller. INSTR CHECK II indicates a problem on the A12 Front-Panel Interface assembly or the Instrument Bus, and INSTR CHECK I indicates a problem in the A3 Digital Storage area of the IF-Display Section (A3A4 Memory.)

A5A2 Rotary Pulse Generator

A5A2 Rotary Pulse Generator (RPG) is operated by the DATA knob on the front panel. The rate and direction of rotation of the knob are transmitted to A12 Front-Panel Interface on the RPG 1 and RPG 2 lines.

LINE Power Switch

When the LINE switch is in STANDBY, a circuit is completed to light STANDBY indicator LED DS1. The LED is lit when the instrument is in STANDBY.

Connectors and AMPTD CAL Adjustment

The RF INPUT, CAL OUTPUT, and 1ST LO OUTPUT connectors and the AMPTD CAL adjustment are physically part of the A6 RF Module and explanations of these components are located with the A6 information.

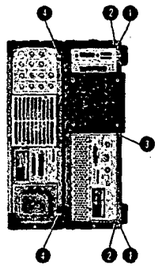
ManualsPlus.com

RF SECTION.

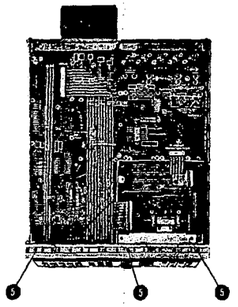
FRONT PANEL REMOVAL AND REPAIR

With ac line cords removed, proceed as follows.

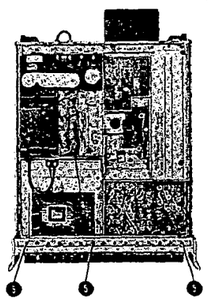
1. Remove interconnecting cables between instruments.
2. Position instrument on right side as shown in View A.
3. Remove feet (1) from rear of RF Section by removing screws (2) shown in View A.
4. Loosen bottom cover screw (3) and remove cover.
5. Loosen thumbscrews (4) and separate instruments by holding IF-Display Section in place while pushing the RF Section at the front panel.
6. After separating instruments, slide RF Section away from IF-Display Section far enough to remove screws (5) holding front panel to frame. (Refer to View B.)
7. Remove screws (5) from other side of instrument. (Refer to View C.)
8. Pull front-panel out of frame as shown in View D.
9. Disconnect cable (6) from connector (7) . Disconnect cable (8) from connector (9) . (Refer to View D.)
10. To replace INSTR CHECK and STANDBY LEDs proceed as follows:
    a. Unsolder the wires from the LED leads and push on the leads with a soldering aid to force the LED out of the socket and through the front panel.
    b. Insert a new LED and resolder as shown in View E.
    c. Trim excess lead length.



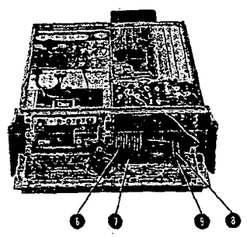
VIEW A



VIEW B

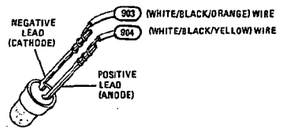


VIEW C



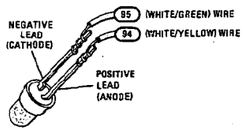
VIEW D

STANDBY

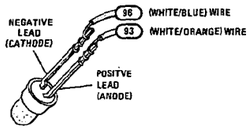


INSTR CHECK

I



II

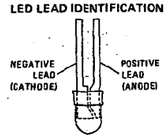


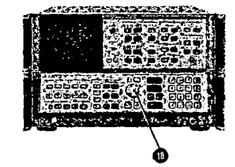
VIEW E

FRONT PANEL REMOVAL AND REPAIR (Cont'd)

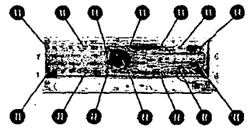
11. To replace SIGNAL INPUT LEDs, SWITCHES, or KEYS, proceed as follows:
    a. Loosen set screw in DATA control knob (RPG) (10) using a No. 4 allen wrench (HP Part No. 8710-0857) and remove knob. (Refer to View F.)
    b. Remove nut from DATA control using a 7/16-inch wrench.
    c. Remove fourteen (14) screws (11) and lift printed circuit board away from front panel. (Refer to View G.)
    d. Pull defective LED out of socket with fingers (it may be necessary to pry slightly with a pointed instrument such as a soldering aid), trim both leads on new LED to 3/8-inch (1 cm) and insert new LED in socket with negative (cathode) lead to square pad on printed circuit board. (Refer to LED lead identification below.)
    e. To remove defective switch, remove key from switch, melt plastic pins holding switch to printed circuit board using a soldering iron, and remove switch from printed circuit board.
    f. To replace switch, insert plastic pins of new switch through printed circuit board and melt the pins with a soldering iron on the rear side of the printed circuit board enough to secure switch. Replace key.
    g. Reassemble printed circuit board to front panel and connect cables.
12. Reconnect connectors removed in Step 9.
13. Secure front panel to RF section by tightening six screws (5) . (Refer to views B and C.)
14. Secure IF-Display Section to RF Section, replace bottom cover, and reconnect ac line cords.

LED LEAD IDENTIFICATION





VIEW F



VIEW G

FIGURE 1. FRONT PANEL REMOVAL AND REPAIR

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A5	85660-60005	3	1	FRONT PANEL ASSEMBLY (INCLUDES A5A1 AND A5A2)	28480	85660-60005
A5DS1	1990-0487	7	10	LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A5DS2	1990-0486	6	2	LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4684
A5DS3	1990-0486	6		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4684
A5S1	3101-2193	5	1	SWITCH-TGL SUBMIN SPDT 2A 250VAC	28480	3101-2193
A5A1	85660-60210	2	1	BOARD ASSEMBLY, KEYBOARD	28480	85660-60210
A5A1C1	0160-2055	9	1	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A5A1C2	0160-4832	4	1	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A5A1DS1	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A5A1DS2	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A5A1DS3	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A5A1DS4	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A5A1DS5	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A5A1DS6	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A5A1DS7	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A5A1DS8	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A5A1DS9	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A5A1E1	1251-0600	0	11	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5A1E2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5A1E3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5A1E4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5A1E5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5A1E6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5A1E7	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5A1E8	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5A1E9	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5A1E10	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5A1E11	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A5A1J1	1200-0507	9	1	SOCKET-IC 16-CONT DIP-SLDR	28480	1200-0507
A5A1P1	1251-5549	6	1	CONNECTOR 50-PIN M POST TYPE	28480	1251-5549
A5A1Q1	1854-0477	7	1	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A5A1R1	0757-0438	3	1	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A5A1R2	0698-3152	8	1	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A5A1R3	0698-3150	6	1	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A5A1R4	0698-7242	5	1	RESISTOR 1.78K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1781-F
A5A1S1-A5A1S49	5060-9436	7	49	PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A5A1U1	1810-0229	5	2	NETWORK-RES 8-SIP330.0 OHM X 7	01121	208A331
A5A1U2	1820-1196	8	2	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A5A1U3	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A5A1U4	1810-0229	5		NETWORK-RES 8-SIP330.0 OHM X 7	01121	208A331
A5A1W1*	8159-0005	0	3	RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005
A5A1W2*	8159-0005	0		RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005
A5A1W3*	8159-0005	0		RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005
				MISCELLANEOUS PARTS		
	0380-1233	9	9	SPACER-SPECIALTY .450 IN LG; .175 IN OD	00000	ORDER BY DESCRIPTION
A5A2	0960-0684	2	1	ROTARY PULSE GENERATOR	28480	0960-0684

*Indicates Factory Selected Value

ManualsPlus.com

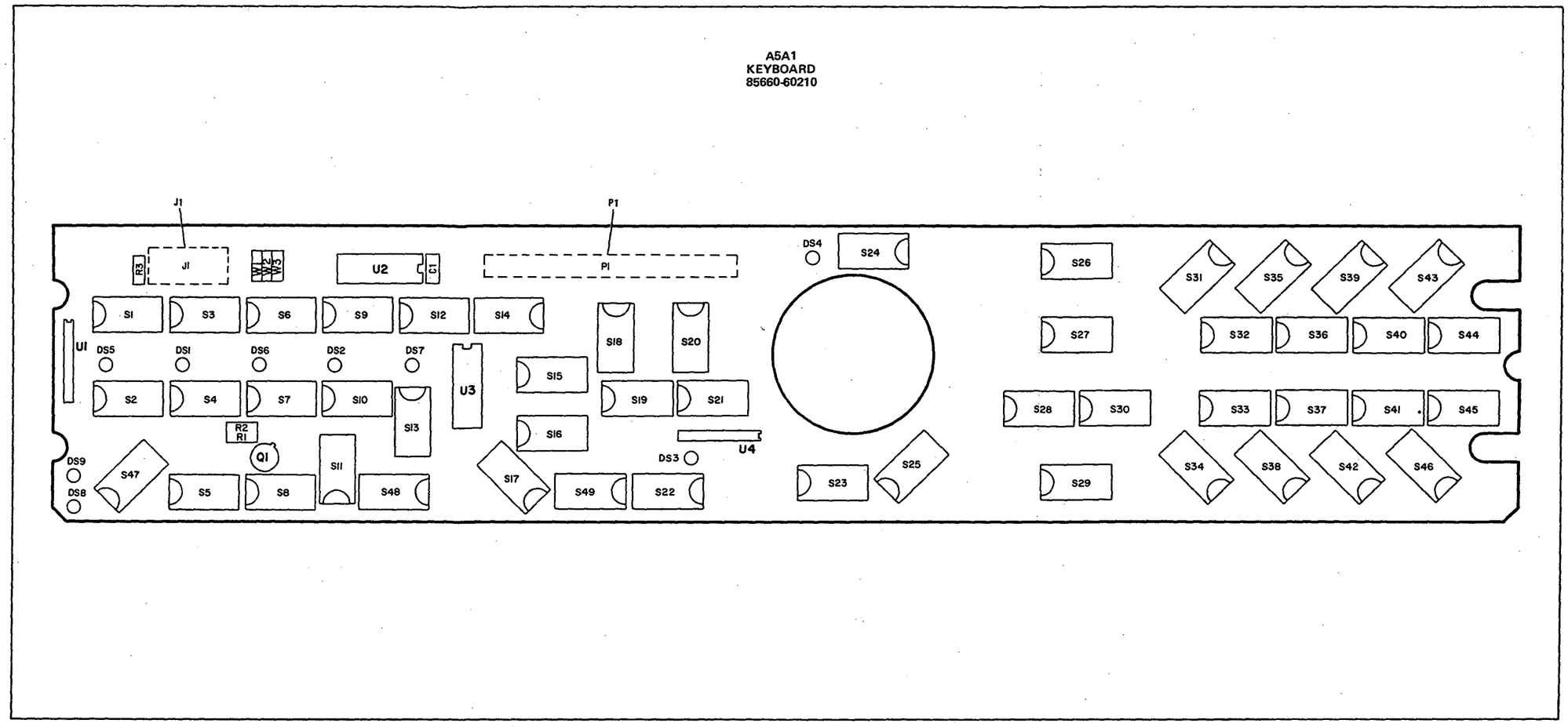


FIGURE 2. A5A1 KEYBOARD, COMPONENT LOCATIONS

ManualsPlus.com

RF SECTION

A5 FRONT PANEL
85660-60005

A5A1 KEYBOARD 85660-60210

A5A2 ROTARY PULSE GENERATOR

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (μF) INDUCTANCE IS IN MICROHENRIES (μH)

SERIAL PREFIX: 2410A

A5

FIGURE 3. A5 FRONT PANEL, SCHEMATIC DIAGRAM

ManualsPlus.com

ManualsPlus.com

A6 RF MODULE

A6 RF MODULE REPLACEMENT

NOTE

For location of hardware and cables referred to in this procedure, see Figure 1.

Removal

1. Remove ac line cords, separate instrument sections, and remove top, bottom, and right side covers from RF Section.
2. Remove RF front panel. (See A5 Front Panel Removal procedure in A5 Front Panel section.)
3. Remove two clips **(1)** by removing four screws **(2)**.
4. Remove five cables **(3)** from A6 PC boards.
5. Remove A6 RF Module PC cover plate by removing six screws **(4)**.
6. Disconnect coaxial cable **(5)** at point shown.
7. Disconnect two ribbon cables **(6)** from motherboard.
8. Remove five screws **(7)**.
9. Slide RF Module out from mainframe.

Installation

10. Slide RF Module into the mainframe; push coaxial cable **(5)** in slightly so that it does not get caught on mainframe.
11. Replace five screws **(7)**.
12. Reconnect two ribbon cables **(6)** to motherboard.
13. Reconnect coaxial cable **(5)**.
14. Replace A6 RF Module PC cover plate by replacing six screws **(4)**.
15. Reconnect five cables **(3)** to A6 PC boards.
16. Replace two clips **(1)** by replacing four screws **(2)**.
17. Replace front panel.
18. Replace top, bottom, and side covers, reconnect IF and RF Sections, and reconnect ac line cords.

ManualsPlus.com

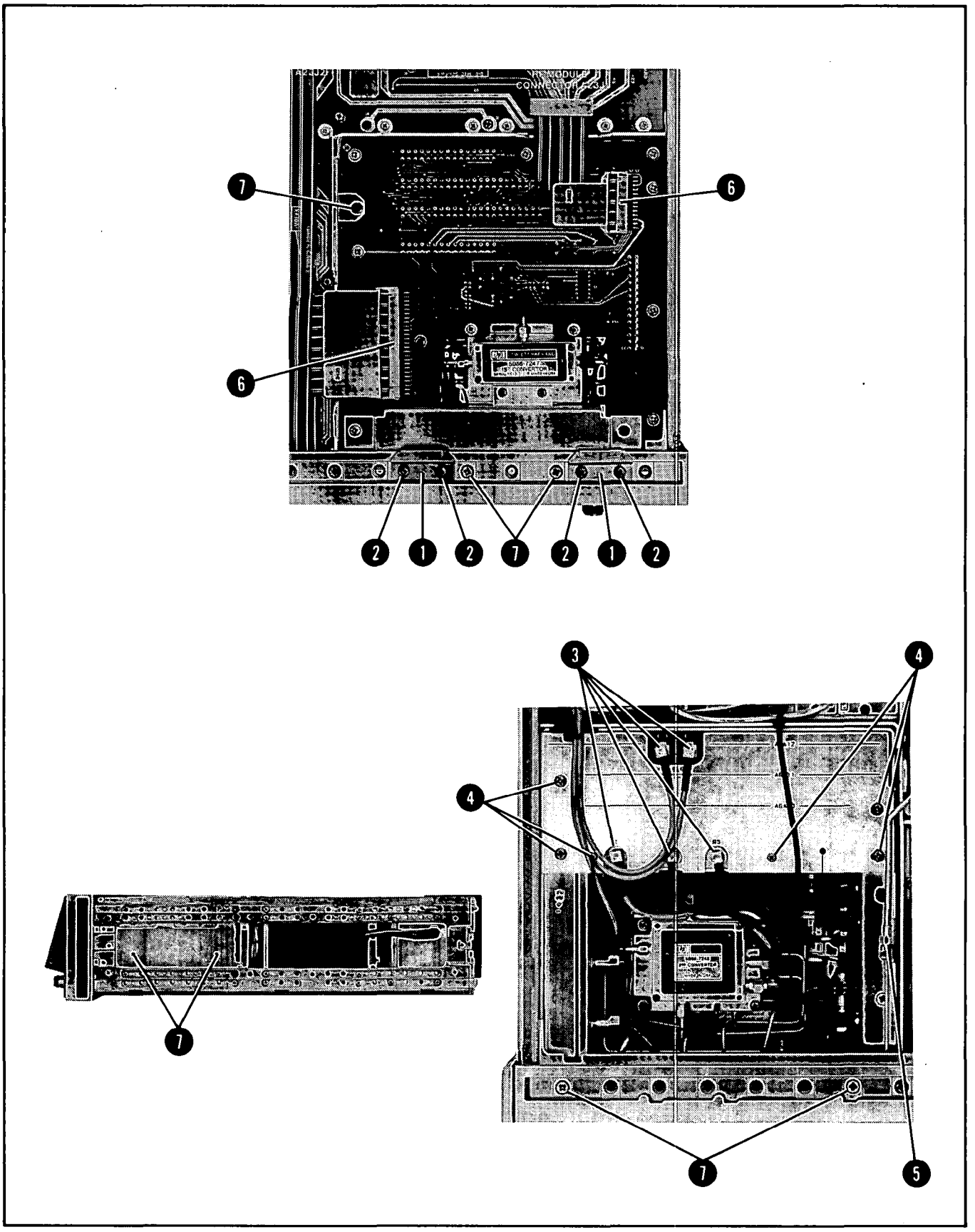


FIGURE 1. A6 RF MODULE REPLACEMENT

ManualsPlus.com

A6A1 COAXIAL SWITCH AND A6A17 300 MHz BPF REPLACEMENT

NOTE

For location of hardware and cables referred to in this procedure, see Figure 2.

1. Remove front panel from RF Section. (See A5 Front Panel Section for front panel removal procedure.)
2. A6A1 Replacement:
   a. Disconnect connectors **(1)**, **(2)**, and **(3)**.
   b. Unsolder wires from the Coaxial Switch:

      1 (brown) wire from input (1)
      3 (orange) wire from input (c+)
      2 (red) wire from input (2)

   c. Release Coaxial Switch **(5)** by removing two screws **(4)**.
   d. Fasten new Coaxial Switch to RF Module with two screws **(4)**.
   e. Resolder wires and reconnect connectors.
3. A6A17 Replacement:
   a. Disconnect connectors **(6)** and **(7)** and remove A6A17 BPF from mounting clips.
   b. Install new A6A17 BPF in mounting clips and reconnect connectors.
4. Replace front panel. (See A5 Front Panel Section for front panel replacement procedure.)

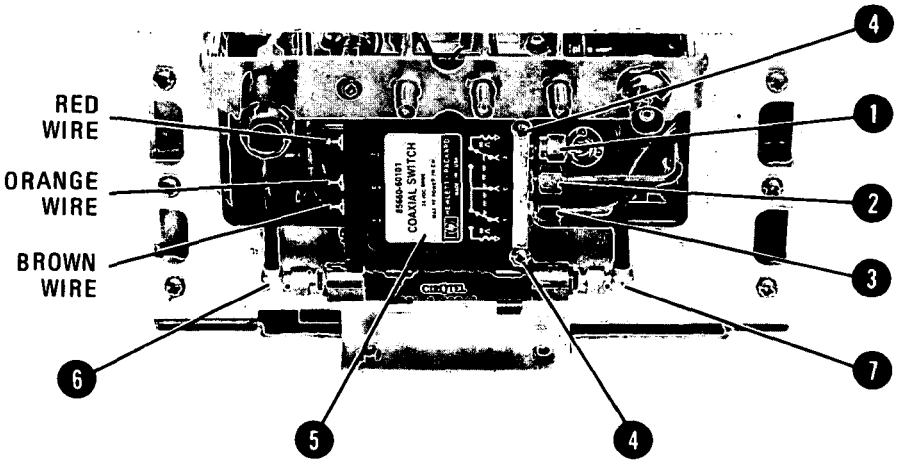


FIGURE 2. A6A1 COAXIAL SWITCH AND A6A17 300 MHz BPF REPLACEMENT

ManualsPlus.com

A6A2 RF ATTENUATOR REPLACEMENT

NOTE

For location of hardware and cables referred to in this procedure, see Figure 3.

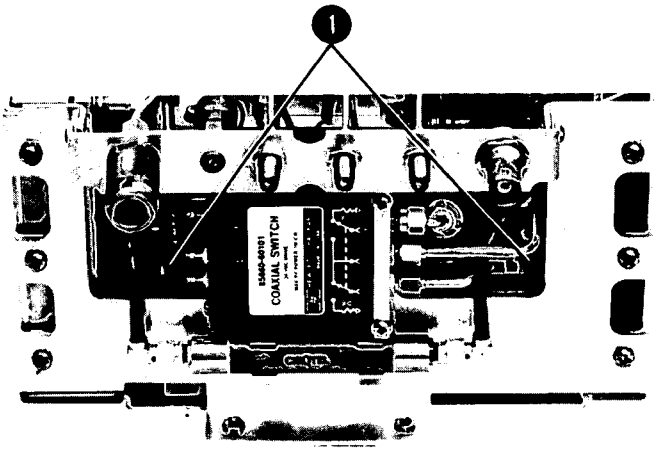
Removal

1. Remove front panel from RF Section. (See A5 Front Panel Section for front panel removal procedure.)
2. Remove top and bottom covers from RF Section.
3. Disconnect attenuator cables **(1)**.
4. Remove two screws **(2)** used to attach attenuator bracket to motherboard.
5. Remove two screws **(3)** used to attach attenuator bracket to "totem pole" assembly.
6. Remove RF Module PC board cover by removing six screws **(4)** and five cables **(5)** (three from A6A9 and two from A6A12).
7. Remove A6A9 leaving remaining cables attached.
8. Disconnect attenuator ribbon cable connector **(6)** from motherboard.
9. Attenuator (attached to bracket) is now free. Remove from RF Module.
10. Remove attenuator bracket from attenuator by removing two screws **(7)**.

Installation

11. Attach attenuator bracket to attenuator by replacing two screws **(7)**.
12. Place attenuator (attached to bracket) in RF Module.
13. Connect attenuator ribbon cable connector **(6)** to motherboard connector.
14. Align attenuator connectors **(1)** with cable connectors and tighten cable connectors.
15. Replace two screws **(3)** used to attach attenuator bracket to "totem pole" assembly.
16. Replace two screws **(2)** used to attach attenuator bracket to motherboard.
17. Replace A6A9 Phase Lock assembly.
18. Install PC board cover and replace six screws **(4)**.
19. Reconnect five cables **(5)** (three to A6A9 and two to A6A12). Cables are color-coded and color codes are marked on PC board cover.
20. Replace top and bottom covers on RF Section.
21. Replace front panel. (See A5 Front Panel Section for front panel replacement procedure.)

ManualsPlus.com



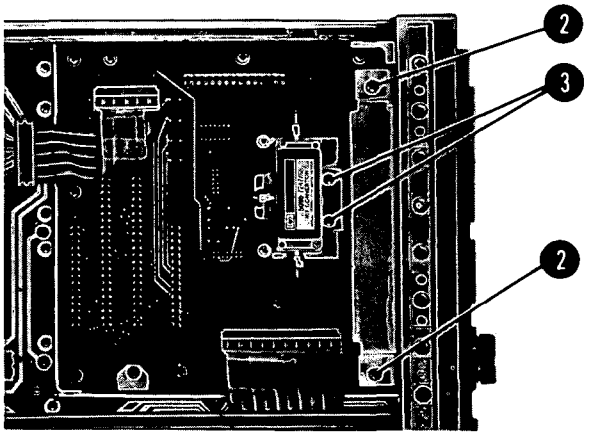
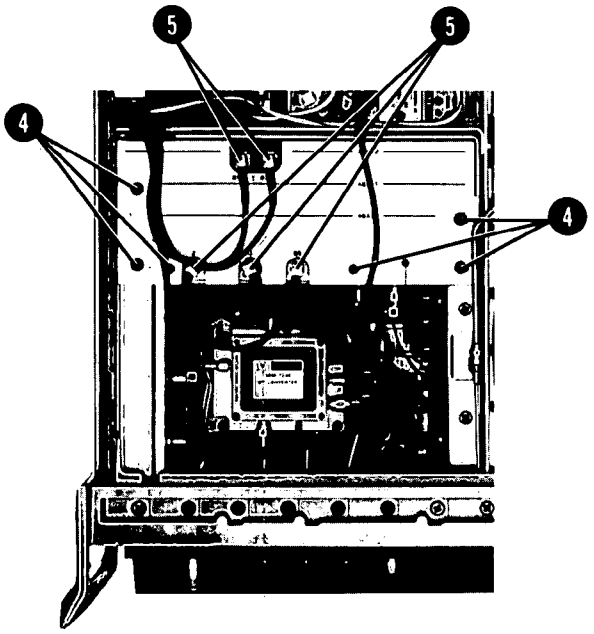
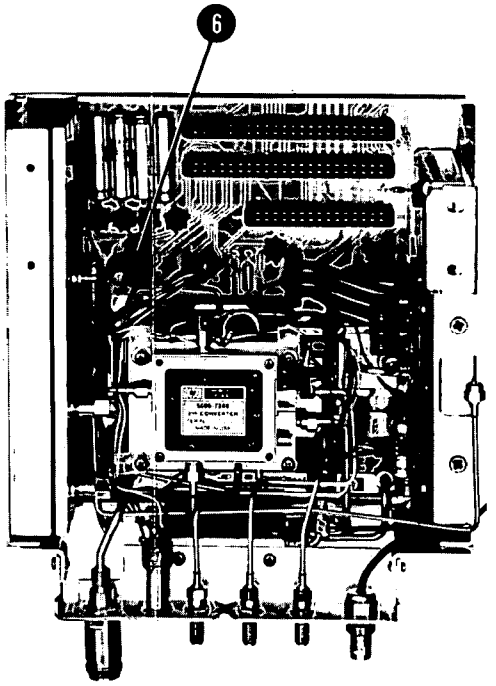


FIGURE 3. REPLACEMENT OF A6A2 RF ATTENUATOR (1 OF 2)

ManualsPlus.com





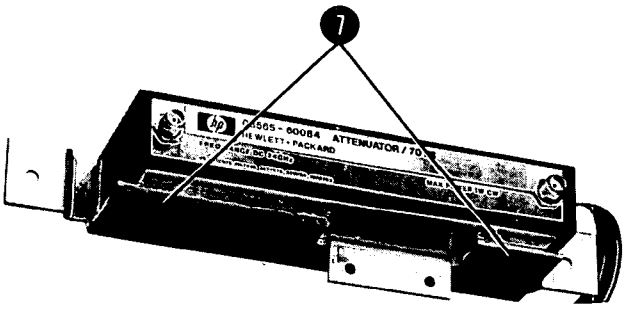


FIGURE 3. REPLACEMENT OF A6A2 RF ATTENUATOR (2 OF 2)

ManualsPlus.com

A6A4 SECOND CONVERTER REPLACEMENT

NOTE

For location of hardware and cables referred to in this procedure, see Figure 4.

Removal

1. Remove ac line cords and RF Section bottom cover.
2. Disconnect connectors **(4)** and **(8)**, single-pin connector **(2)**, and double-pin connector **(3)** from Second Converter.
3. Disconnect the remaining cables from Second Converter:

   1 (brown) cable from .321 OUT **(7)**
   4 (yellow) cable from TUNE **(9)**

4. Remove two screws **(6)** to remove Second Converter from A6 RF Module.

Installation

5. Position new Second Converter on mounting bracket. Secure with two screws.
6. Reconnect connector **(1)**, 5 (green) cable, connector **(4)**, single-pin connector **(2)**, and double-pin connector **(3)** to Second Converter.
7. Reconnect the following cables to Second Converter.

   1 (brown) cable to .321 OUT **(7)**
   1 (brown) cable to .321 IN **(8)**
   4 (yellow) cable to TUNE **(9)**

8. Replace bottom cover and ac line cords.

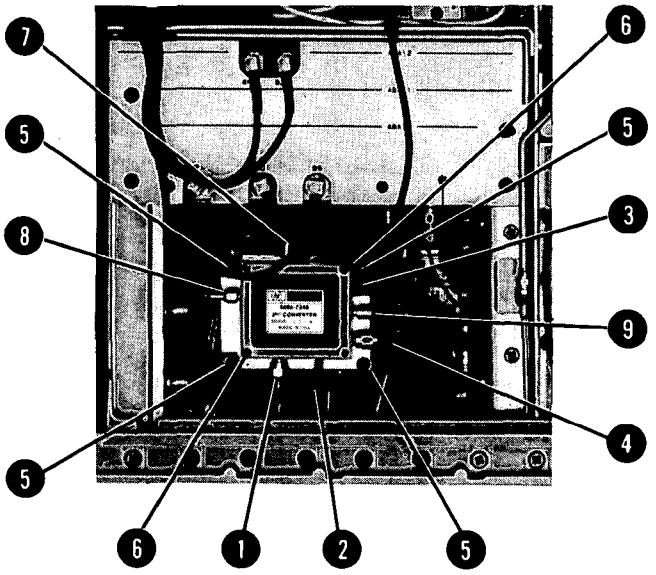


FIGURE 4. A6A4 SECOND CONVERTER REPLACEMENT

ManualsPlus.com

A6A6 FIRST CONVERTER REPLACEMENT

NOTE

For location of hardware and cables referred to in this procedure, see Figure 5.

Removal

1. Remove ac line cords, IF-Display Section, and RF Section top cover.
2. Remove two screws **(2)** to release A6A6 First Converter from A6 RF Module. Disconnect connectors **(1)** from A6A6 First Converter.

Installation

3. Position new A6A6 First Converter in RF Module and reconnect connectors **(1)**. Reinstall two screws **(2)**.
4. Replace RF Section top cover. Attach IF-Display Section to RF Section. Reconnect ac line cords.

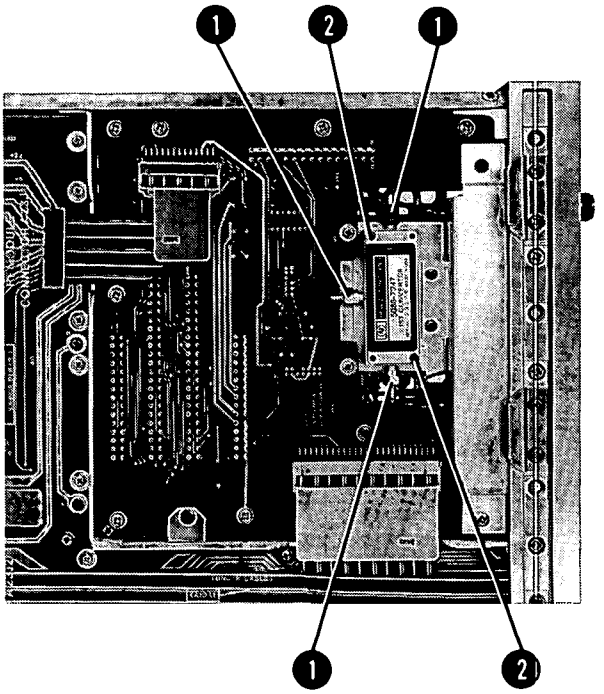


FIGURE 5. A6A6 FIRST CONVERTER REPLACEMENT

ManualsPlus.com

A6A15 3.6 GHz BPF, A6A16 1.5 GHz LPF, AND A6A18 LPF REPLACEMENT

NOTE

For location of hardware and cables referred to in this procedure, see Figure 6.

Removal

1. Remove ac line cords, separate instrument sections, and remove top and bottom covers from RF Section.
2. Remove five cables **(1)** from A6 PC boards; three from A6A9 and two from A6A12.
3. Remove RF Module PC board cover by removing six screws **(2)**.
4. Remove A6A9 assembly and A6A10, A6A11, and A6A12 PC boards.
5. Disconnect 4 (yellow) cable and 5 (green) cable from 2nd Converter to release A6A9 assembly.
6. Disconnect coaxial cable **(3)** between A11 YTO Loop and A6A5 ACLU at the ACLU.
7. Disconnect cable between A6A8 YTX and A6A5 ACLU at the YTX.
8. Disconnect cable between front-panel 1ST LO OUTPUT connector and A6A5 ACLU at the ACLU.
9. Disconnect 1 (brown) cable from A6A4 2nd Converter .321 OUT.
10. Disconnect cable between A6A14 Limiter and A6A1 RF Switch at the RF Switch.
11. Remove three screws **(4)** used to attach ACLU cover plate one at a time removing cable clamp and reinstalling the screws.
12. Disconnect wire harness connectors from ACLU and 2nd Converter to release wire harness from "totem pole" assembly.
13. Disconnect cable between front-panel IF OUTPUT connector and A6A5 ACLU at the ACLU.
14. Disconnect cable between front-panel IF INPUT connector and A6A16 1.5 GHz LPF at the 1.5 GHz LPF.
15. Disconnect wire harness plug from motherboard and position wire harness such that "totem pole" assembly can be removed.
16. Remove two screws **(5)** attaching "totem pole" assembly to motherboard and two screws **(6)** attaching "totem pole" assembly to attenuator bracket.
17. Remove "totem pole" assembly from RF Module.
18. A6A15, A6A16, or A6A18 can now be replaced by disconnecting attached cables.

Installation

19. Replace A6A15, A6A16, or A6A18 in "totem pole" assembly and reconnect cables.
20. Place "totem pole" assembly in RF Module.

ManualsPlus.com

21. Replace two screws **(5)** to attach "totem pole" assembly to motherboard and two screws **(6)** to attach "totem pole" assembly to attenuator bracket.

CAUTION

The YIG-Tuned Mixer (YTX) contains an extremely small and sensitive diode. A reverse voltage in excess of 3 volts may damage it. It is connected directly to the center conductor of the LO/IF connector, and is especially susceptible to blowout from electrostatic discharge. Before connecting any cable to this connector, first discharge the cable by connecting the center conductor to ground. It is recommended that the other end of the cable be connected first. Once the cable is properly installed (from the YTX to the ACLU), the BIAS pin of the ACLU is connected to the YTX diode and must also be treated with caution. A general rule is to connect all devices to ground before connecting them to the BIAS pin on the ACLU.

22. Reconnect cable to A6A8 YTX.

23. Reconnect cable to A6A1 RF Switch.

24. Reconnect cable from front-panel 1ST LO OUTPUT to A6A5 ACLU.

25. Reconnect cable from front-panel IF OUTPUT to A6A5 ACLU.

26. Reconnect cable from front-panel IF INPUT to A6A16 1.5 GHz LPF.

27. Reconnect cable **(3)** between A11 YTO Loop and A6A5 ACLU.

28. Reconnect 1 (brown) cable to 2nd Converter .321 OUT.

29. Remove three screws **(4)** from A6A5 ACLU cover plate one at a time replacing cable clamps then replacing screws.

30. Reconnect all wire harness connectors to A6A5 ACLU and A6A4 2nd Converter as follows:

A6A4 2nd Converter
- Green (5) wire to I_E
- White/Brown (91) wire to V_c
- White/Black (90) wire to SW

A6A5 ACLU
- Gray (8) wire to BIAS
- White/Red (92) wires to +5VDC (three pins)

31. Reconnect wire harness to motherboard.

32. Replace A6A9 assembly and A6A10, A6A11, and A6A12 PC boards.

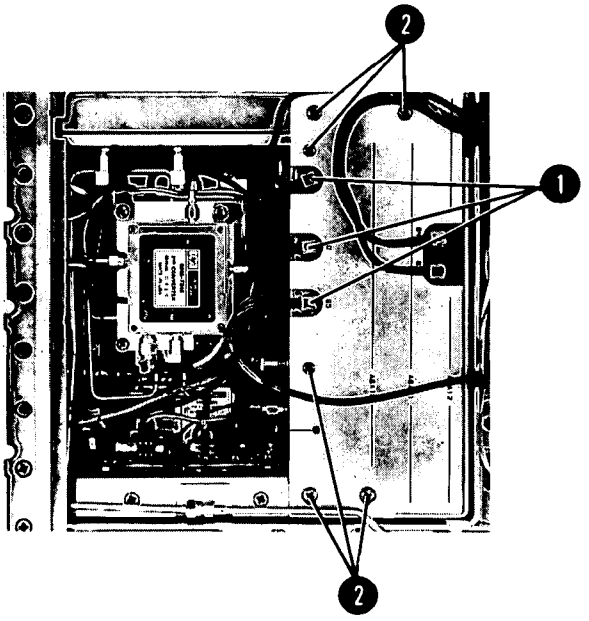
33. Replace PC board cover and install six screws **(2)**.

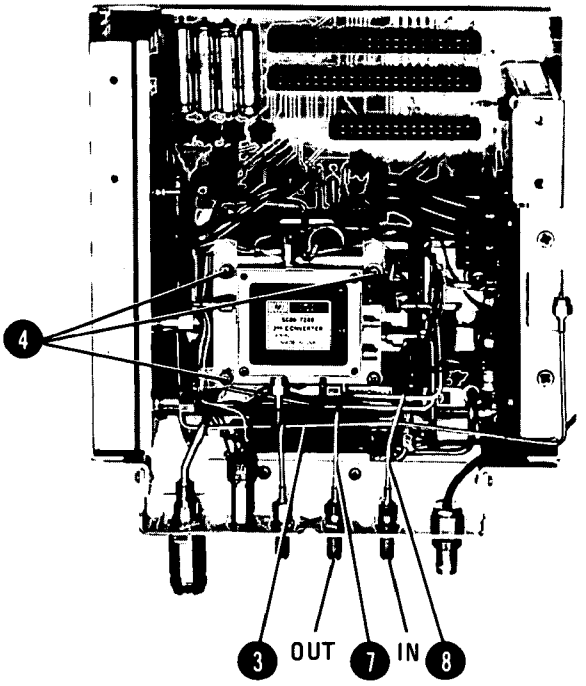
34. Reconnect 4 (yellow) cable and 5 (green) cable to 2nd Converter.

35. Reconnect five cables **(1)** to A6 PC boards; three to A6A9 and two to A6A12.

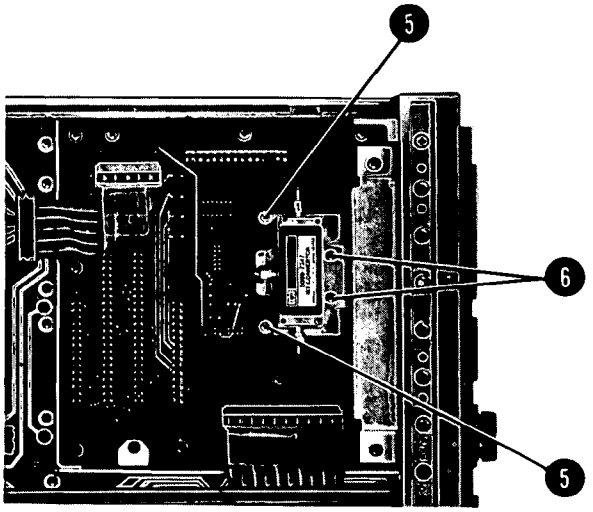
36. Replace top and bottom covers on RF Section, recombine instrument sections, and reconnect ac line cords.

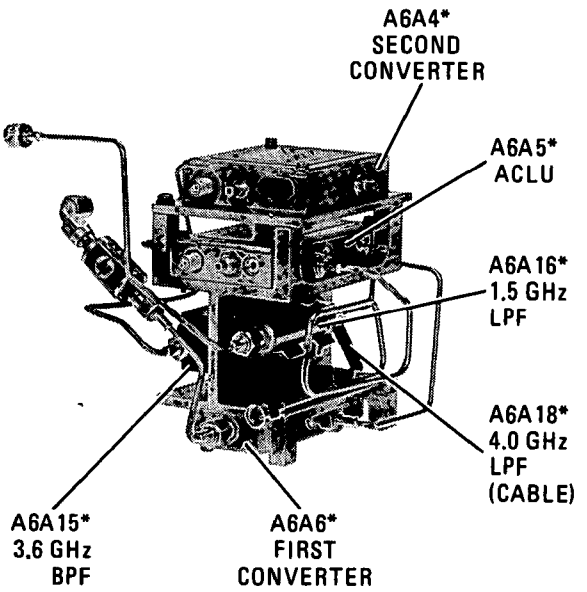
ManualsPlus.com





"TOTEM POLE" ASSEMBLY





*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

FIGURE 6. A6A15 BPF, A6A16 LPF, AND A6A18 LPF REPLACEMENT

ManualsPlus.com

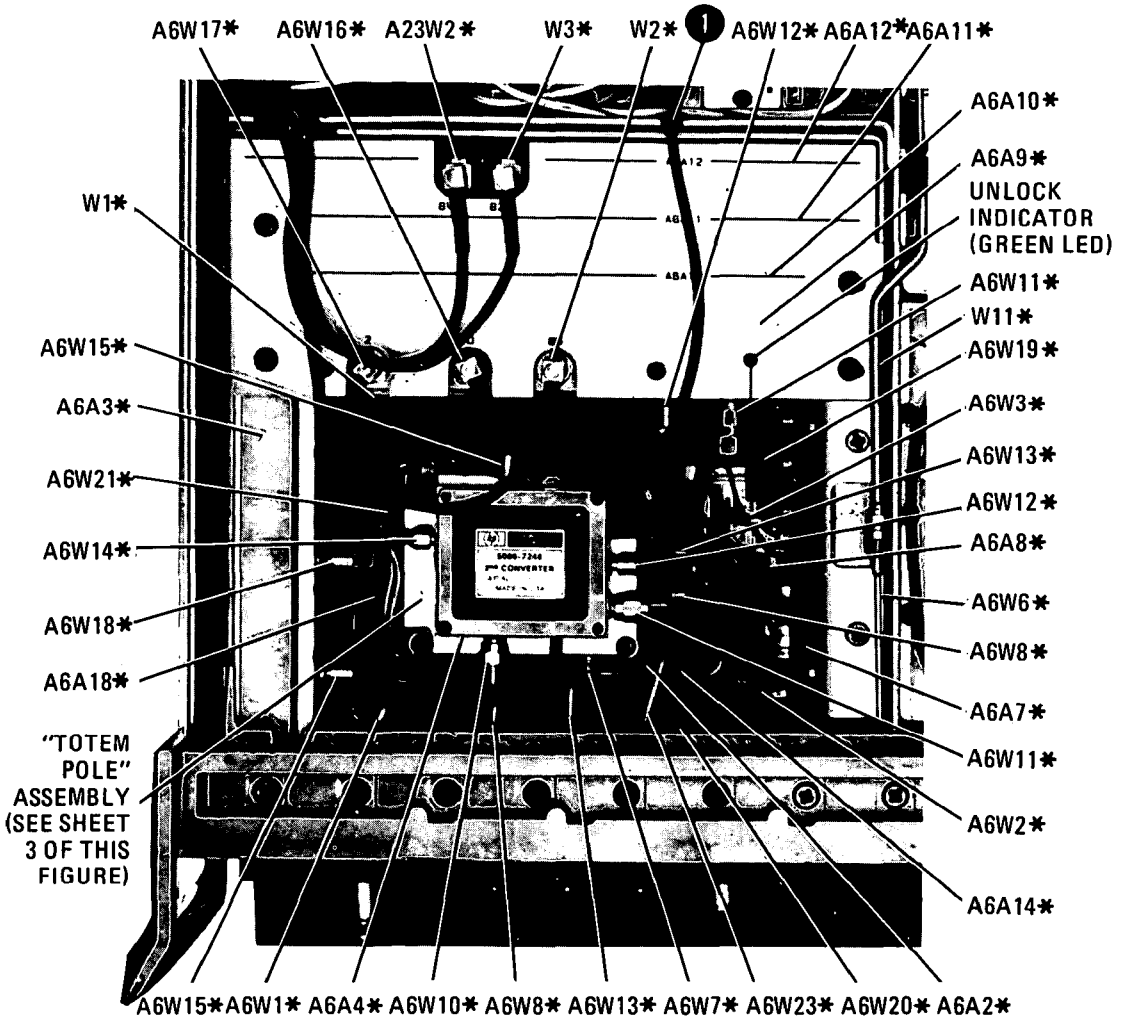
TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6				RF MODULE		
A6A1	85660-60101	0	1	RF SWITCH	28480	85660-60101
A6A2	85660-60121	4	1	RF ATTENUATOR/ERROR CORRECTION ROM (INCLUDES A12U8)	28480	85660-60121
A6A3	85660-60003	1	1	LAST CONVERTER ASSEMBLY	28480	85660-60003
A6A4	5086-7248	9	1	SECOND CONVERTER	28480	5086-7248
A6A5	5086-7133	1	1	AMPLIFIER/COUPLER/LOAD UNIT (ACLU)	28480	5086-7133
A6A6	5086-7247	8	1	FIRST CONVERTER	28480	5086-7247
A6A7	85660-60128	1	1	BOARD ASSEMBLY, YIG-TUNED MIXER CURRENT DRIVER	28480	85660-60128
A6A8	5086-7226	3	1	YIG-TUNED MIXER (YTX) (NEW)	28480	5086-7226
A6A8	5086-6226	1	1	YIG-TUNED MIXER (YTX) (RE-STORED 5086-7226)	28480	5086-6226
A6A9	85660-60226	0	1	PHASE LOCK ASSEMBLY	28480	85660-60226
A6A10	85660-60180	5	1	BOARD ASSEMBLY, MISCELLANEOUS BIAS/RELAY DRIVER	28480	85660-60180
A6A11	85660-60126	9	1	BOARD ASSEMBLY, SLOPE GENERATOR	28480	85660-60126
A6A12	85660-60013	3	3	BOARD ASSEMBLY, YTX DRIVER	28480	85660-60013
A6A13	85660-60014	4	1	BOARD ASSEMBLY, RF MODULE MOTHERBOARD	28480	85660-60014
A6A14	5086-7261	6	1	LIMITER, 0-2.5 GHZ	28480	5086-7261
A6A15	9135-0067	5	1	BANDPASS FILTER, 3.6 GHZ, SMA CONNECTORS	28480	9135-0067
A6A16	5086-7299	0	1	LOW PASS FILTER, 1.5 GHZ	28480	5086-7299
A6A17	0955-0117	5	1	BANDPASS FILTER, 300 MHZ	28480	0955-0117
A6A18	9135-0108	5	1	FILTER, LOW PASS, 26 GHZ	28480	9135-0108
A6J1				PART OF A6W16 (CAL OUTPUT)		
A6J2	1250-1251	7	1	ADAPTER-COAX STR F-SMA F-SMA	28480	1250-1251
A6J3	86290-60005	7	1	CONNECTOR, TYPE N (RF INPUT) (SEE FIGURE 3 IN GENERAL PARTS LISTING SECTION FOR PARTS BREAKDOWN)	28480	86290-60005
A6R1	2100-1717	4	1	RESISTOR-VAR CONTROL CCP 50K 20% LIN	28480	2100-1717
A6W1	85660-20073	1	1	CABLE ASSEMBLY, J1 (RF INPUT) TO A6A2 (RF ATTENUATOR)	28480	85660-20073
A6W2	85660-20074	2	1	CABLE ASSEMBLY, A6A2 (RF ATTENUATOR) TO A6A1 (RF SWITCH)	28480	85660-20074
A6W3	85660-20075	3	1	CABLE ASSEMBLY, A6A1 (RF SWITCH) TO A6A8 (YTX)	28480	85660-20075
A6W4	85660-20079	7	1	CABLE ASSEMBLY, A6A14 (LIMITER) TO A6A6 (FIRST CONVERTER)	28480	85660-20079
A6W5	85660-20076	4	1	CABLE ASSEMBLY, A6A8 (YTX) TO A6A5(ACLU)	28480	85660-20076
A6W6	85660-20077	5	1	CABLE ASSEMBLY, A6A5 (ACLU LO IN) TO W11 CABLE ASSEMBLY FROM A11A1	28480	85660-20077
A6W7	85660-20082	2	1	CABLE ASSEMBLY, A6A5 (ACLU) TO A6A6 (FIRST CONVERTER)	28480	85660-20082
A6W8	85660-20104	9	1	CABLE ASSEMBLY, 1ST LO OUTPUT	28480	85660-20104
A6W9				NOT ASSIGNED		
A6W10	85660-20081	1	1	CABLE ASSEMBLY, A6A15 (306 GHZ BPF) TO A6A4 (SECOND CONVERTER)	28480	85660-20081
A6W11	85660-60055	3	1	CABLE ASSEMBLY, GREEN, A6A9 (PHASE LOCK) TO A6A4 (SECOND CONVERTER) VTO	28480	85660-60055
A6W12	85660-60097	3	1	CABLE ASSEMBLY, YELLOW,A6A4(SECOND CONV-ERTER) TO A6A9U1 (SAMPLER)	28480	85660-60097
A6W13	85660-20113	0	1	CABLE ASSEMBLY, A6A5 (ACLU) TO A6A16 (1.5 GHZ LPF)	28480	85660-20113
A6W14	85660-20112	9	1	CABLE ASSEMBLY, A6A16 (1.5 GHZ LPF) TO A6A4 (SECOND CONVERTER)	28480	85660-20112
A6W15	85660-60057	5	1	CABLE ASSEMBLY, BROWN, A6A4 (SECOND CONVERTER) TO A6A3 (LAST CONVERTER)	28480	85660-60057
A6W16	85660-60058	6	1	CABLE ASSEMBLY, BLACK, CAL OUTPUT	28480	85660-60058
A6W17	85660-60056	4	1	CABLE ASSEMBLY, RED, A6A9 (PHASE LOCK) TO A6A17 (300 MHZ BPF)	28480	85660-60056
A6W18	85660-60054	2	1	CABLE ASSEMBLY, RED, A6A17 (300 MHZ BPF) TO A6A3 (LAST CONVERTER)	28480	85660-60054
A6W19	8120-2847	1	1	CABLE ASSEMBLY, RIBBON, A6A12 (YTX DRIVER) TO A6A7(YTX CURRENT DRIVER)	28480	8120-2847
A6W20	1250-1397	2	1	ADAPTER-COAX RTANG M-SMA M-SMA (RF SWITCH) TO A6A14 (LIMITER)	28480	1250-1397
A6W21	85660-60060	0	1	CABLE ASSEMBLY, WIRE HARNESS (A6R1,A6A1,A6A4 AND A6A5 TO A6A13J4)	28480	85660-60060

*Indicates Factory Selected Value

ManualsPlus.com

A6
RF MODULE

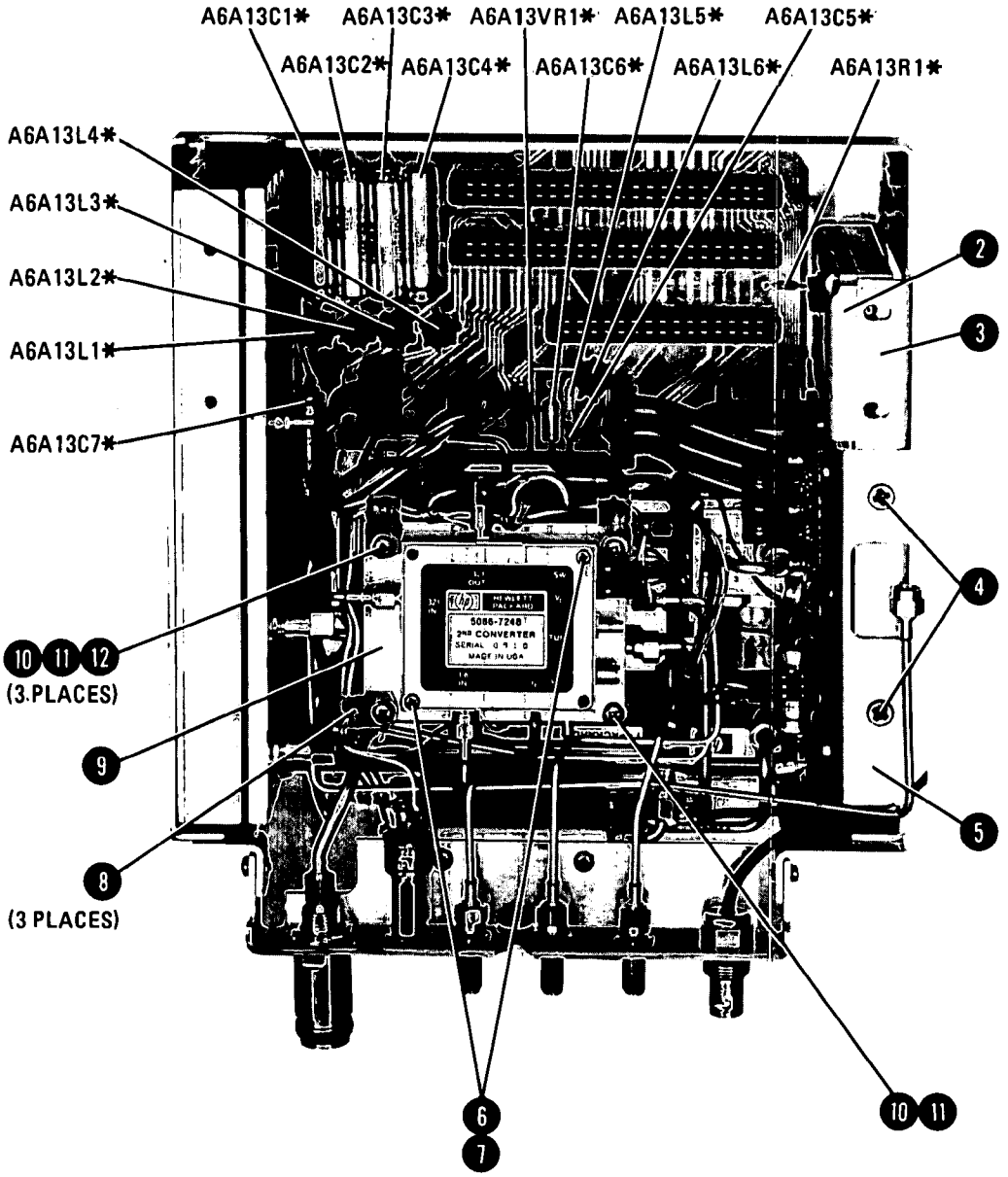


*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

FIGURE 7. A6 RF MODULE, PARTS IDENTIFICATION (1 OF 7)

ManualsPlus.com

A6
RF MODULE

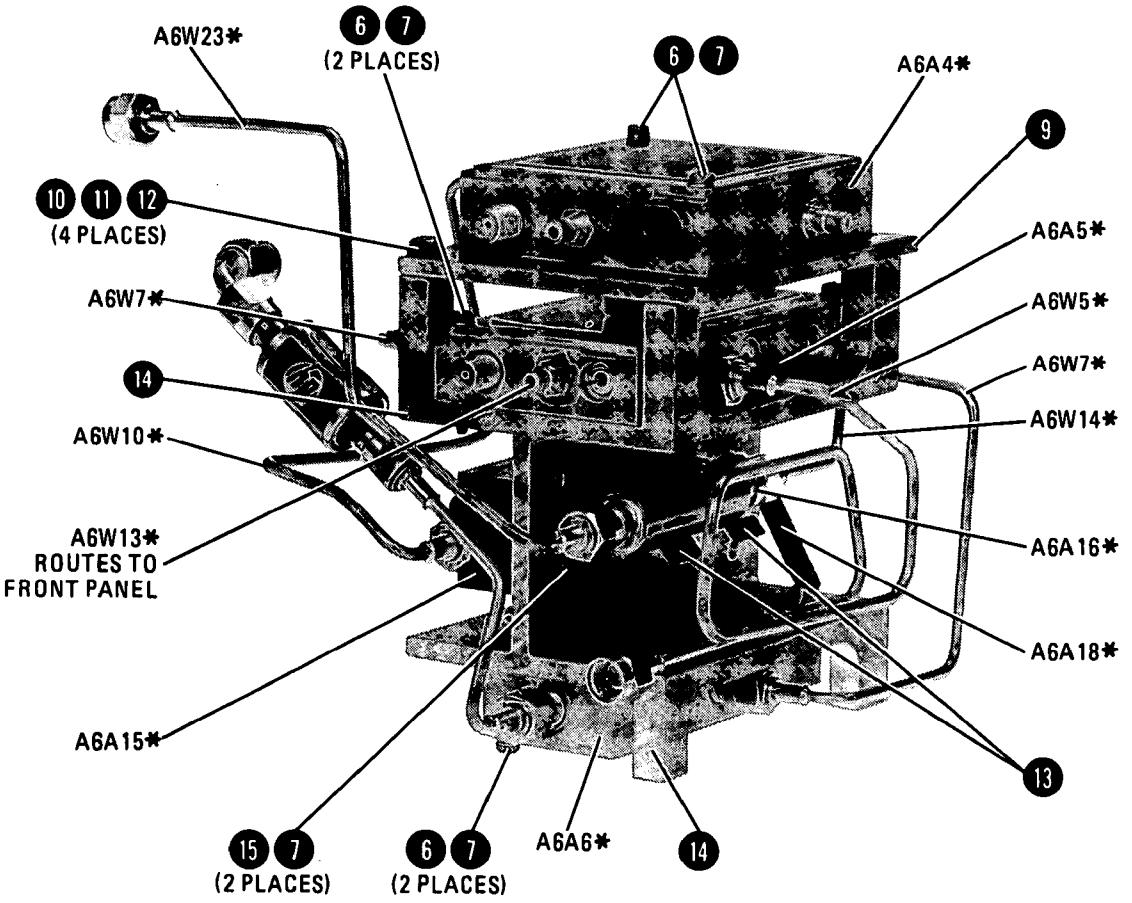


*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

FIGURE 7. A6 RF MODULE, PARTS IDENTIFICATION (2 OF 7)

ManualsPlus.com

A6
RF MODULE

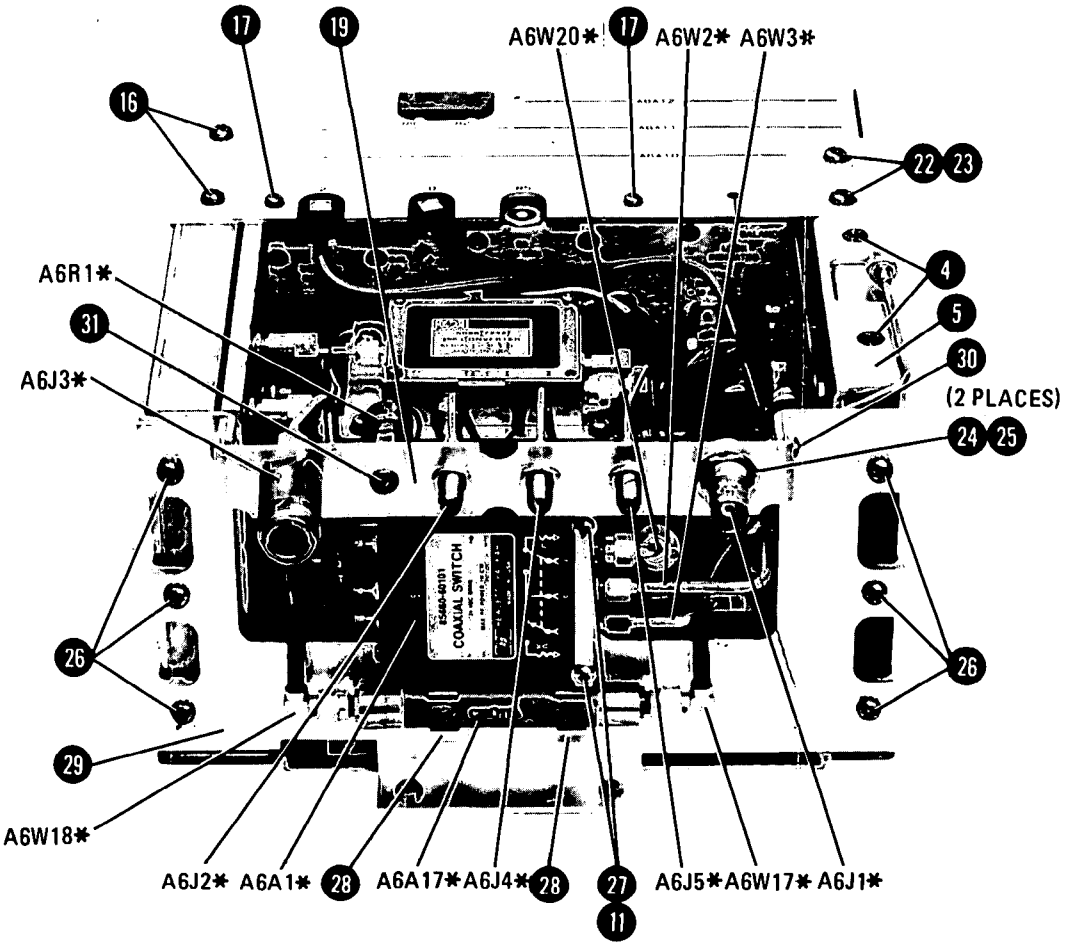


*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

FIGURE 7. A6 RF MODULE, PARTS IDENTIFICATION (3 OF 7)

ManualsPlus.com

A6
RF MODULE

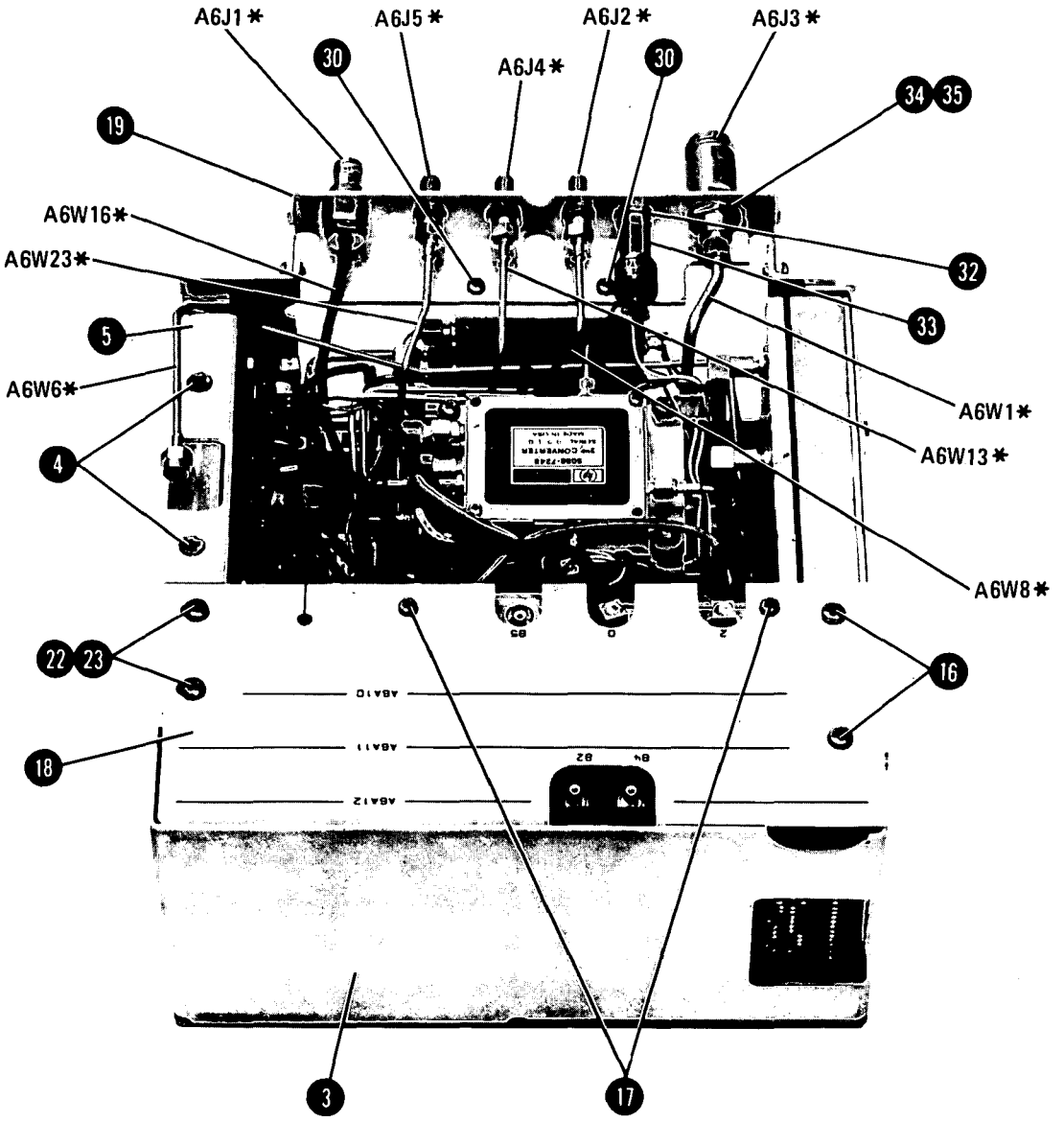


*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

FIGURE 7. A6 RF MODULE, PARTS IDENTIFICATION (4 OF 7)

ManualsPlus.com

A6
RF MODULE

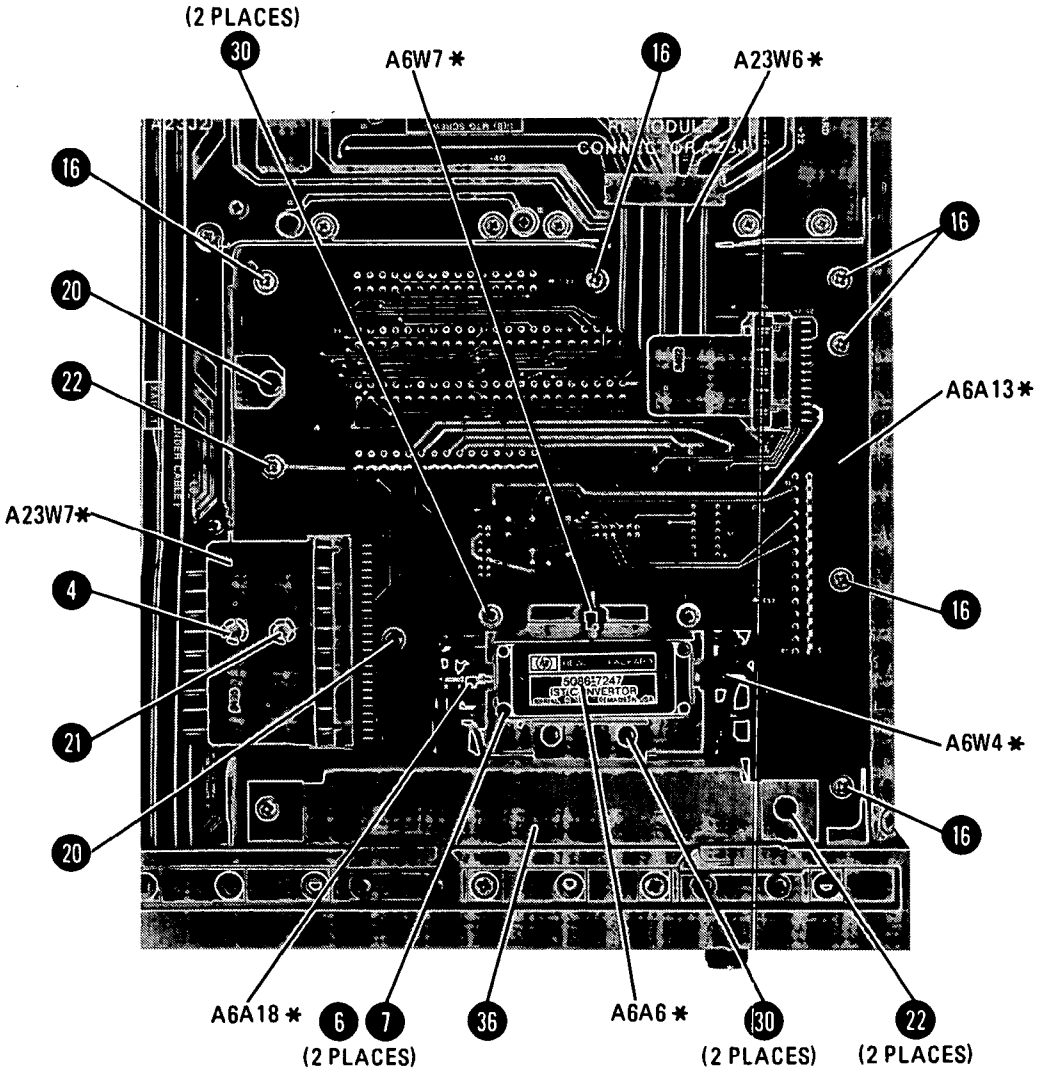


*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

FIGURE 7. A6 RF MODULE, PARTS IDENTIFICATION (5 OF 7)

ManualsPlus.com

A6
RF MODULE



*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

FIGURE 7. A6 RF MODULE, PARTS IDENTIFICATION (6 OF 7)

ManualsPlus.com

Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
1	0400-0009	9	Grommet, Rubber (For W2)	28480	0400-0009
2	85660-00020	6	Air Duct, RF Module	28480	85660-00020
3	85660-00015	9	Bracket, Main, RF Module	28480	85660-00015
4	2360-0116	5	Screw, Mach, 6-32, .312-IN LG, FLAT HD	28480	2360-0116
5	85660-00023	9	Heat Sink, YTX Current Driver	28480	85660-00023
6	0520-0137	8	Screw, Mach, 2-56, .75-IN LG, PAN HD	28480	0520-0137
7	2190-0890	1	Washer, Split, 2-56 (For screws (**6**) & (**15**))	28480	2190-0890
8	1400-0053	4	Cable Clamp (For Screw (**10**))	28480	1400-0053
9	85660-00021	7	Mounting Plate, 2nd Converter	28480	85660-00021
10	2200-0145	2	Screw, Mach, 4-40, .438-IN LG, PAN HD	28480	2200-0145
11	2190-0003	8	Washer, Split, 4-40 (For screws (**10**) & (**27**))	28480	2190-0003
12	3050-0105	6	Washer, Flat, 4-40 (For screw (**10**))	28480	3050-0105
13	1400-0942	0	Component Clip (For A6A16)	28480	1400-0942
14	85660-20072	0	Mount, Microcircuit, "Totem Pole"	28480	85660-20072
15	0520-0130	1	Screw, Mach, 2-56, .375-IN LG, PAN HD	28480	0520-0130
16	2360-0115	4	Screw, Mach, 6-32, .312-IN LG, PAN HD	28480	2360-0115
17	2200-0105	4	Screw, Mach, 4-40, .312-IN LG, PAN HD	28480	2200-0105
18	85660-00073	0	Cover, RF Module PC Board	28480	85660-00073
19	85660-00055	1	Bracket, Connector, RF Module	28480	85660-00055
20	2360-0119	8	Screw, Mach, 6-32, .438-IN LG, PAN HD	28480	2360-0119
21	2360-0122	3	Screw, Mach, 6-32, .5-IN LG, FLAT HD	28480	2360-0122
22	2360-0117	6	Screw, Mach, 6-32, .375-IN LG, PAN HD	28480	2360-0117
23	3050-0010	2	Washer, Flat, 6-32 (For screw (**22**))	28480	3050-0010
24	2950-0154	2	Nut, Hex, ½ IN (For A6J1)	28480	2950-0154
25	2190-0054	9	Washer, Lock, ½ IN (For A6J1)	28480	2190-0054
26	2360-0113	2	Screw, Mach, 6-32, .25-IN LG, PAN HD	28480	2360-0113
27	2200-0151	0	Screw, Mach, 4-40, .75-IN LG, PAN HD	28480	2200-0151
28	1400-0937	3	Component Clip (For A6A17)	28480	1400-0937
29	85660-00014	8	Bracket, Front, RF Module	28480	85660-00014
30	2200-0103	2	Screw, Mach, 4-40, .25-IN LG, PAN HD	28480	2200-0103
31	1490-0968	9	Panel Bushing (For A6R1)	28480	1490-0968
32	2190-0027	6	Washer, Lock, .256 ID (For A6R1)	28480	2190-0027
33	0590-0061	4	Nut, Hex, 1/4 IN (For A6R1)	28480	0590-0061
34	2950-0132	6	Nut, Hex, 7/16 IN (For A6J3)	28480	2950-0132
35	2190-0104	0	Washer, Lock, 7/16 IN (For A6J3)	28480	2190-0104
36	85660-00019	3	Bracket, Attenuator, RF Module	28480	85660-00019

FIGURE 7. A6 RF MODULE, PARTS IDENTIFICATION (7 OF 7)

ManualsPlus.com

RF SECTION

A6A3 LAST CONVERTER

A6A12 YTX DRIVER

A6A7 YTX CURRENT DRIVER

A6A9 PHASE LOCK

A6A11 SLOPE GENERATOR

A6A10 MISC BIAS / RELAY DRIVER

SIGNAL IN 0 TO 22 GHZ

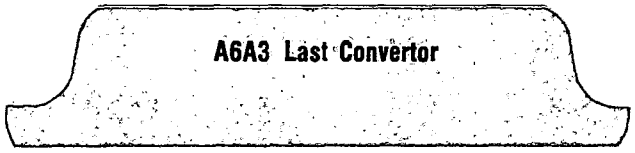
YTX TUNE -5V/GHz -6.964V TO -18.364V FROM A19 DAC

100MHz FROM A7A2 100MHz VCXO

21.4 MHz TO IF-DISPLAY SECTION

50-WIRE INSTRUMENT BUS

ManualsPlus.com



ManualsPlus.com

A6A3 LAST CONVERTER, CIRCUIT DESCRIPTION

The Last Converter has two main purposes: 1) to convert the 321.4 MHz IF signal from the A6 RF Module down to 21.4 MHz for processing by the IF-Display Section, and 2) to provide the means for correcting for variations in conversion loss versus frequency in the input circuitry.

The Last Converter consists of 11 basic elements. They are a 321.4 MHz amplifier, a 321.4 MHz bandpass filter, a 321.4 to 21.4 MHz converter, a 21.4 MHz preamp, two pin diode attenuators, two pin diode controlled variable gain amplifiers, an output stage, a temperature compensation circuit, and power supply filtering.

Power Supplies (K)

The power supply filtering consists of series inductors and shunt capacitors (L21 – 24 and C49 – 53). In addition to this, R38 and VR1 provide a 6.2V source used for biasing transistors.

321.4 MHz Amplifier (A)

The 321.4 MHz amplifier consists of Q8 and its associated circuitry. Q7 provides bias for Q8 by setting the base current.

321.4 MHz Bandpass Filter (B)

The 321.4 MHz amplifier drives the 321.4 MHz bandpass filter which consists of L4 – L8 and C8 – C12. This filter is made up of five LC tank circuits coupled magnetically and capacitively. Capacitive coupling occurs through PC board traces on the circuit side of the PC board. Coupling into and out of the filter is done with tapped inductors L4 and L8. The filter is tuned by means of C8 – C12.

321.4 – 21.4 MHz Converter (C)

The 321.4 MHz filter drives the 321.4 – 21.4 MHz converter. This converter consists of a packaged double balanced mixer, U1. The 300 MHz LO for this converter comes from the A6A9 Phase Lock.

21.4 MHz Preamplifier (D)

The 321.4 – 21.4 MHz converter drives the 21.4 MHz preamp which consists of Q6 and its associated components. Q5 provides bias for Q6 by setting the base current. L10, C22, and C23 form a series resonant circuit producing a notch in the frequency response of this amplifier at 10.7 MHz. This is to prevent the second harmonic of 10.7 MHz from causing a spurious response.

Slope Attenuator (E)

The 8566 is a harmonic mixing spectrum analyzer, and as such has five bands of frequencies to cover the range 0 – 22 GHz. When changing from band to band, the conversion loss of the input mixer changes. Also within each band there are variations of conversion loss with frequency.

The variations of conversion loss within each band are compensated by pin diodes CR1 – CR4 and associated circuitry. Pin diodes have a property of changing RF impedance as their dc current is varied. Thus CR1/CR2 and CR3/CR4 form the two elements of a voltage divider. The current through CR1/CR2 is fixed by R10 and R11. The current through CR3/CR4 is determined by circuitry on the A6A11 Slope Generator. This forms a current controlled variable attenuator. Pin diodes CR1/CR2 are used in place of a fixed resistor to provide temperature tracking with CR3/CR4.

ManualsPlus.com

Step Gain Amplifier #1 (F) and Step Gain Amplifier #2 (H)

The variations of conversion loss from band to band are compensated for by two identical variable gain amplifiers made up of Q3 and Q10 and associated circuitry (Q4 and Q9 are emitter follower buffers). A simplified circuit of one of these stages is shown in Figure 1. The gain of this amplifier is determined approximately by

$$\text{Gain} \approx \frac{\text{Impedance (CR8, CR9, and CR10)}}{\text{Impedance (CR5, CR6, and CR7)}}$$

The impedance of CR8, CR9, and CR10 is determined by R23 and temperature compensation circuitry (Q1).

Impedance of CR5, CR6, and CR7 is determined by current from the step gain circuit on the A6A10 Relay Driver.

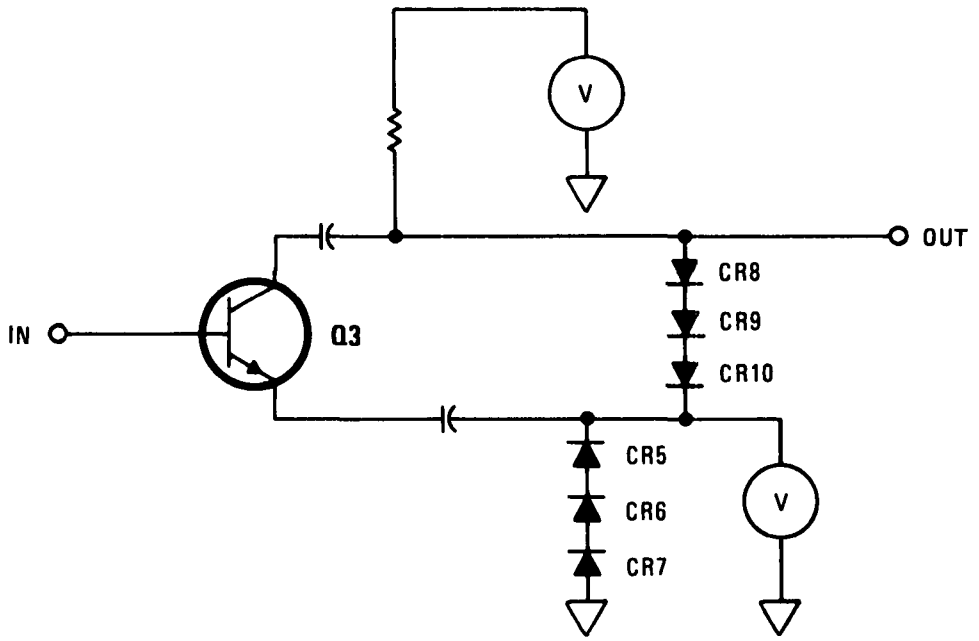


FIGURE 1. STEP GAIN AMPLIFIER, SIMPLIFIED SCHEMATIC

Amplitude Calibration Attenuator (G)

Q2 is an emitter follower buffer driving a second pin attenuator, CR11 – CR14. The current through CR11 and CR12 is determined by the front-panel control A6R1, AMPTD CAL. The current through CR13 and CR14 is fixed by R27. This circuit provides for amplitude calibration of the instrument.

21.4 MHz Output (J)

Q11 and Q12 form the output stage for the Last Converter. Q11 is an emitter follower driving common emitter amplifier Q12.

ManualsPlus.com

Temperature Compensation Voltage Source (I)

Q1 provides a voltage to set the current in CR8 – CR10 and CR15 – CR17. This voltage varies with temperature, changing the gain of the two step gain amplifiers to compensate for gain changes with temperature elsewhere in the Last Converter.

ManualsPlus.com

A6A3 LAST CONVERTER REPLACEMENT

NOTE

For location of hardware and cables referred to in this procedure, see Figure 2.

Removal

1. Remove ac line cords and RF Section bottom and right side covers.
2. Disconnect cables **(1)**: three from top of A6A9 Phase Lock assembly and two from A6A12 YTX Driver board.
3. Remove A6 RF Module PC cover plate by removing six screws **(2)**.
4. Remove A6A9 assembly and A6A10, A6A11, and A6A12 PC boards from the A6 RF Module. It is not necessary to disconnect the two cables (green and yellow) from the front side of the A6A9 Phase Lock assembly.
5. Disconnect the following cables from the A6A3 Last Converter:

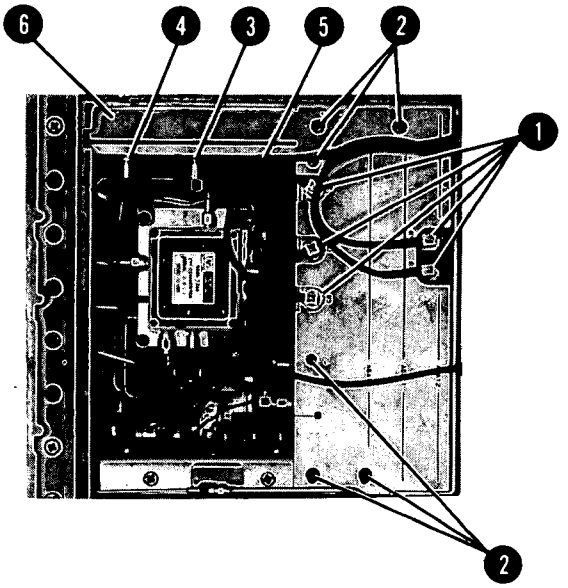
   2 (red) cable **(3)**
   1 (brown) cable **(4)**
   81 (gray/brown) cable **(5)**

6. Remove two screws **(7)** and remove A6A3 Last Converter **(6)** from RF Module.

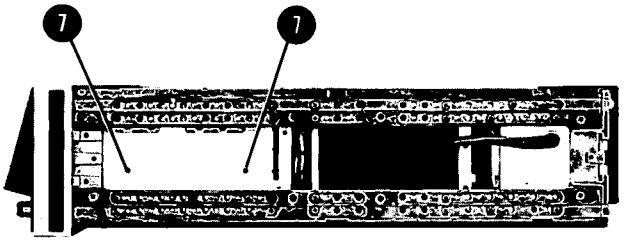
Installation

7. When installing the A6A3 Last Converter, push Last Converter board into A6A13 Motherboard PC connector, replace two screws **(7)** and reconnect cables disconnected in step 5.
8. Replace PC boards removed in step 4. Reconnect 5 (green) and 4 (yellow) cables to A6A9 Phase Lock if they were removed during removal of A6A3.
9. Replace and secure A6 RF Module PC board cover with six screws **(2)**.
10. Reconnect cables **(1)** to A6A9 Phase Lock and A6A12 YTX Driver. Cables are color-coded and color codes are marked on PC board cover.
11. Replace bottom and right side covers on RF Section. Reconnect ac line cords.

ManualsPlus.com



VIEW A



VIEW B

FIGURE 2. A6A3 LAST CONVERTER REPLACEMENT

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A3	85660-60003	1	1	LAST CONVERTER ASSEMBLY	28480	85660-60003
A6A3L1	9135-0002	8	5	FILTER-LOW PASS SOLDER-TERMS	33095	51-744-018
A6A3L2	9135-0002	8		FILTER-LOW PASS SOLDER-TERMS	33095	51-744-018
A6A3L3	9135-0002	8		FILTER-LOW PASS SOLDER-TERMS	33095	51-744-018
A6A3L4	9135-0002	8		FILTER-LOW PASS SOLDER-TERMS	33095	51-744-018
A6A3L5	9135-0002	8		FILTER-LOW PASS SOLDER-TERMS	33095	51-744-018
				MISCELLANEOUS PARTS		
	2190-0557	7	3	WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0557
	2200-0140	7	34	SCREW-MACH 4-40 .25-IN-LG 100 DEG	28480	2200-0140
	2200-0144	1	34	SCREW-MACH 4-40 .375-IN-LG 100 DEG	28480	2200-0144
	2950-0078	9	3	NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
	85660-00009	1	1	COVER TOP	28480	85660-00009
	85660-20065	1	1	COVER BOTTOM	28480	85660-20065
	85660-20066	2	1	HOUSING	28480	85660-20066
A6A3A1	85660-60002	0	1	BOARD ASSEMBLY, LAST CONVERTER	28480	85660-60002
A6A3A1C1	0160-3877	5	2	CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A6A3A1C2	0160-3878	6	8	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A3A1C3	0160-3877	5		CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A6A3A1C4	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A3A1C5	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A3A1C6	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A3A1C7	0160-2246	0	1	CAPACITOR-FXD 3.6PF +-.25PF 500VDC CER	28480	0160-2246
A6A3A1C8	0121-0452	4	5	CAPACITOR-V TRMR-AIR 1.3-5.4PF 175V	74970	187-0103-028
A6A3A1C9	0121-0452	4		CAPACITOR-V TRMR-AIR 1.3-5.4PF 175V	74970	187-0103-028
A6A3A1C10	0121-0452	4		CAPACITOR-V TRMR-AIR 1.3-5.4PF 175V	74970	187-0103-028
A6A3A1C11	0121-0452	4		CAPACITOR-V TRMR-AIR 1.3-5.4PF 175V	74970	187-0103-028
A6A3A1C12	0121-0452	4		CAPACITOR-V TRMR-AIR 1.3-5.4PF 175V	74970	187-0103-028
A6A3A1C13	0160-0572	1	1	CAPACITOR-FXD 2200PF +-20% 100VDC CER	28480	0160-0572
A6A3A1C14	0160-3879	7	31	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C15	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C16	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C17	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A3A1C18	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C19	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C20	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C21	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C22	0160-3653	5	1	CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	28480	0160-3653
A6A3A1C23	0121-0046	2	1	CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304322 9/35PF N650
A6A3A1C24	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C25	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C26	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C27	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C28	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C29	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C30	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A3A1C31	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A3A1C32	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C33	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C34	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C35	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C36	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C37	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C38	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C39	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C40	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C41	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C42	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C43	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A3A1C44	0160-3456	6	1	CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A6A3A1C45	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C46	0160-4892	6	2	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A6A3A1C47	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C48	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C49	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C50	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A6A3A1C51	0160-4084	8	1	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A6A3A1C52	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C53	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A3A1C54	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879

*Indicates Factory Selected Value

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A3A1CR1- A6A3A1CR20	1901-1070	9	20	DIODE-PIN 110V	28480	1901-1070
A6A3A1E1	0360-0124	3	10	CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
A6A3A1E2	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
A6A3A1E3	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
A6A3A1E4	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
A6A3A1E5	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
A6A3A1E6	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
A6A3A1E7	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
A6A3A1E8	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
A6A3A1E9	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
A6A3A1E10	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
A6A3A1E11	9170-0029	3	6	CORE-SHIELDING BEAD	28480	9170-0029
A6A3A1E12	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A6A3A1E13	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A6A3A1E14	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A6A3A1E15	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A6A3A1E16	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A6A3A1J1	1250-1611	3	3	CONNECTOR-RF SMB M PC 50-OHM	28480	1250-1611
A6A3A1J2	1250-1611	3		CONNECTOR-RF SMB M PC 50-OHM	28480	1250-1611
A6A3A1J3	1250-1611	3		CONNECTOR-RF SMB M PC 50-OHM	28480	1250-1611
A6A3A1L1	9100-2255	4	2	INDUCTOR RF-CH-MLD 470NH 10% .105DX.26LG	28480	9100-2255
A6A3A1L2	9100-2891	4	1	INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A6A3A1L3	9100-2255	4		INDUCTOR RF-CH-MLD 470NH 10% .105DX.26LG	28480	9100-2255
A6A3A1L4	85660-80002	2	2	COIL TAPPED	28480	85660-80002
A6A3A1L5	85660-80001	1	3	COIL FILTER	28480	85660-80001
A6A3A1L6	85660-80001	1		COIL FILTER	28480	85660-80001
A6A3A1L7	85660-80001	1		COIL FILTER	28480	85660-80001
A6A3A1L8	85660-80002	2		COIL TAPPED	28480	85660-80002
A6A3A1L9	9100-2247	4	1	INDUCTOR RF-CH-MLD 100NH 10% .105DX.26LG	28480	9100-2247
A6A3A1L10	9140-0144	0	1	INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A6A3A1L11				NOT ASSIGNED		
A6A3A1L12	9100-1623	8	8	INDUCTOR RF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A6A3A1L13	9100-1623	8		INDUCTOR RF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A6A3A1L14	9100-1623	8		INDUCTOR RF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A6A3A1L15	9100-1623	8		INDUCTOR RF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A6A3A1L16				NOT ASSIGNED		
A6A3A1L17				NOT ASSIGNED		
A6A3A1L18	9100-1623	8		INDUCTOR RF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A6A3A1L19	9100-1623	8		INDUCTOR RF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A6A3A1L20				NOT ASSIGNED		
A6A3A1L21	9100-1623	8		INDUCTOR RF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A6A3A1L22	9100-1623	8		INDUCTOR RF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A6A3A1L23	9100-1623	8		INDUCTOR RF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A6A3A1L24	9100-1623	8		INDUCTOR RF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A6A3A1Q1	1854-0477	7	1	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A3A1Q2	1854-0345	8	6	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A6A3A1Q3	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A6A3A1Q4	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A6A3A1Q5	1853-0281	9	2	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A6A3A1Q6	1854-0247	9	2	TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
A6A3A1Q7	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A6A3A1Q8	1854-0686	0	1	TRANSISTOR NPN SI TO-72 PD=200MW FT=4GHZ	28480	1854-0686
A6A3A1Q9	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A6A3A1Q10	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A6A3A1Q11	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A6A3A1Q12	1854-0247	9		TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
A6A3A1R1	0757-0438	3	6	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A3A1R2	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A3A1R3	0757-0418	9	3	RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A6A3A1R4	0698-3154	0	1	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A6A3A1R5	0698-8818	3	1	RESISTOR 3.16 1% .125W F TC=0+-100	28480	0698-8818
A6A3A1R6	0698-0085	0	1	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A6A3A1R7	0757-0440	7	1	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A6A3A1R8	0698-3431	6	1	RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-23R7-F
A6A3A1R9	0757-0198	2	1	RESISTOR 100 1% .5W F TC=0+-100	28480	0757-0198
A6A3A1R10	0757-0419	0	1	RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-681R-F
A6A3A1R11	0757-0428	1	1	RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A6A3A1R12	0757-0278	9	2	RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A6A3A1R13	0757-0280	3	3	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A3A1R14	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A3A1R15	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A3A1R16	0757-0200	7	1	RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A6A3A1R17	0757-0447	4	1	RESISTOR 16.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1622-F
A6A3A1R18	0757-0418	9		RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A6A3A1R19	0698-3441	8	1	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A6A3A1R20	0698-3132	4	2	RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F

*Indicates Factory Selected Value

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

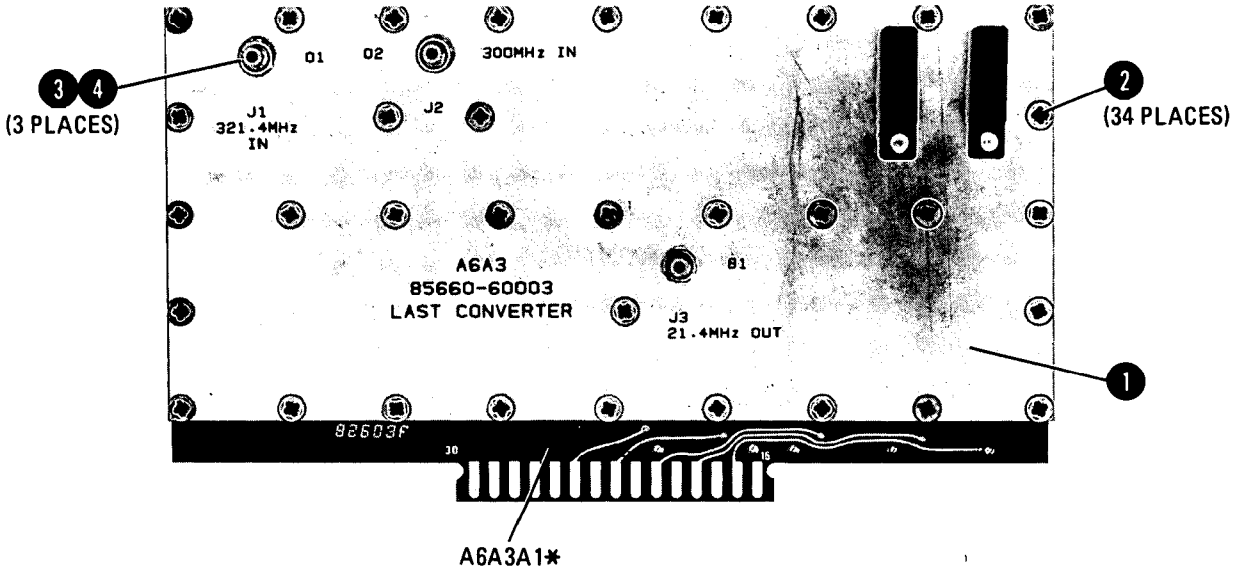
Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A3A1R21	0698-3155	1	2	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A6A3A1R22	0698-3446	3	1	RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A6A3A1R23	0698-3162	0	2	RESISTOR 46.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4642-F
A6A3A1R24	0757-0416	7	2	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A3A1R25	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A3A1R26	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A3A1R27	0698-3449	6	1	RESISTOR 28.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2872-F
A6A3A1R28	0757-0278	9		RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A6A3A1R29	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A3A1R30	0698-3132	4		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A6A3A1R31	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A6A3A1R32	0757-0418	9		RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A6A3A1R33	0698-3162	0		RESISTOR 46.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4642-F
A6A3A1R34	0757-0417	8	1	RESISTOR 562 1% .125W F TC=0+-100	24546	C4-1/8-T0-562R-F
A6A3A1R35	0698-0083	8	1	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A6A3A1R36	0698-3439	4	1	RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A6A3A1R37	0757-0394	0	2	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A6A3A1R38	0757-0814	9	1	RESISTOR 511 1% .5W F TC=0+-100	28480	0757-0814
A6A3A1R39	0757-0442	9	3	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A3A1R40	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A3A1R41	0757-0798	8	1	RESISTOR 110 1% .5W F TC=0+-100	28480	0757-0798
A6A3A1R42	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A3A1R43	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A3A1R44	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A3A1R45	0698-4037	0	1	RESISTOR 46.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-46R4-F
A6A3A1R46	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A6A3A1U1	0955-0084	5	1	MIXER DBL BAL S BARR DIODE; P=200MW MAX	28480	0955-0084
A6A3A1VR1	1902-0625	0	1	DIODE-ZNR 1N829 6.2V 5% DO-7 PD=.25W	04713	1N829
				MISCELLANEOUS PARTS		
	1205-0226	9	2	HEAT SINK SGL TO-5/TO-39-CS	28480	1205-0226

*Indicates Factory Selected Value

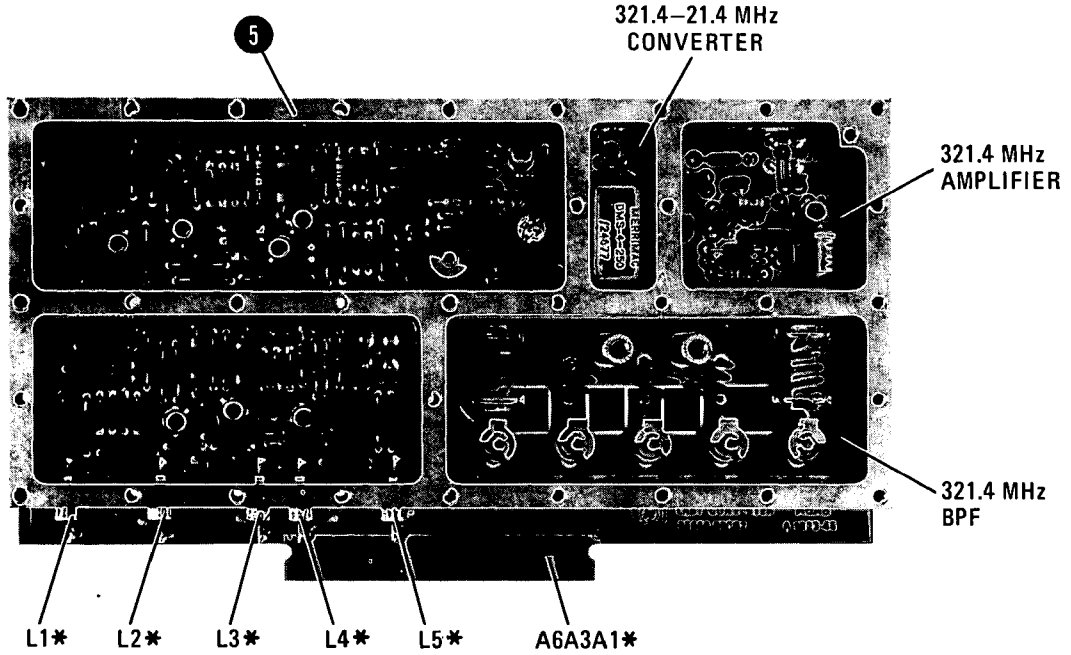
ManualsPlus.com

A6A3
LAST CONVERTER
ASSEMBLY

FRONT



INTERNAL



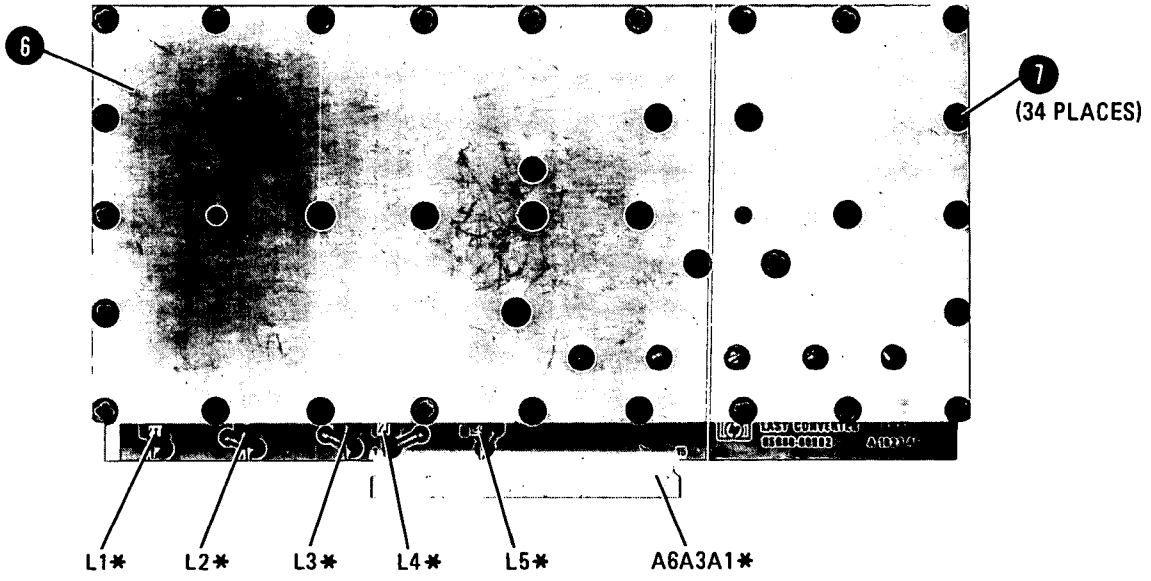
*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

FIGURE 3. A6A3 LAST CONVERTER ASSEMBLY, PARTS IDENTIFICATION (1 OF 2)

ManualsPlus.com

A6A3
LAST CONVERTER ASSEMBLY

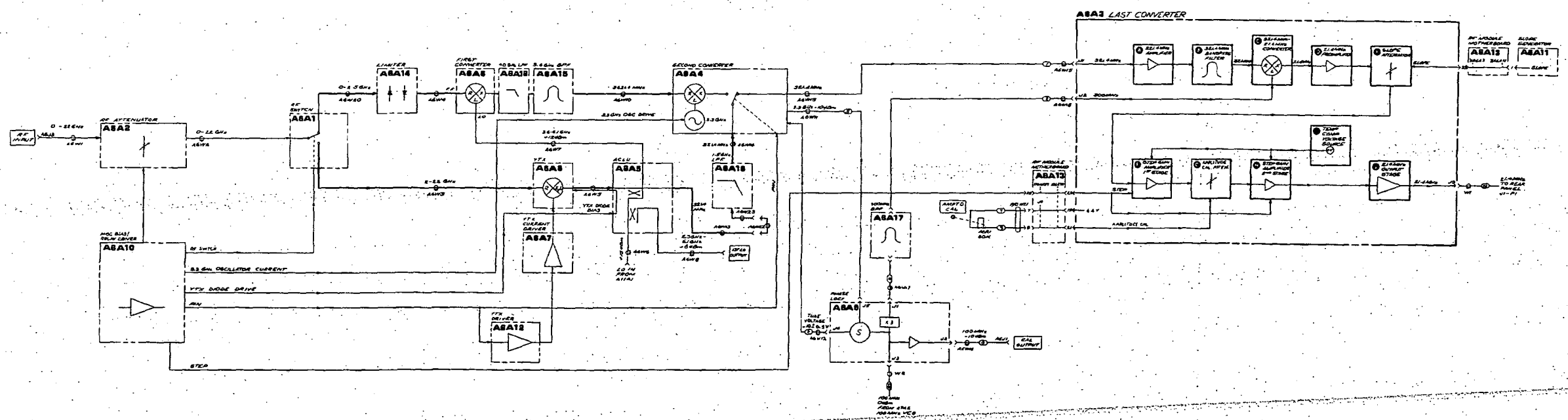
REAR



*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
1	85660-20065	1	Cover, Bottom, Last Converter	28480	85660-20065
2	2200-0144	1	Screw, Mach, 4-40, .375-IN LG, FLAT HD	28480	2200-0144
3	2950-0078	9	Nut, Hex, 10-32 (For J1, J2, and J3)	28480	2950-0078
4	2190-0124	4	Washer, Lock, 10-32 (For J1, J2, and J3)	28480	2190-0124
5	85660-20066	2	Housing, Last Converter	28480	85660-20066
6	85660-00009	1	Cover, Top, Last Converter	28480	85660-00009
7	2200-0138	3	Screw, Mach, 4-40, .188-IN LG, FLAT HD	28480	2200-0138

FIGURE 3. A6A3 LAST CONVERTER ASSEMBLY, PARTS IDENTIFICATION (2 OF 2)



A6A3

FIGURE 4. A6A3 LAST CONVERTER, BLOCK DIAGRAM

ManualsPlus.com

ManualsPlus.com

A6A3A1
LAST CONVERTER
85660-60002

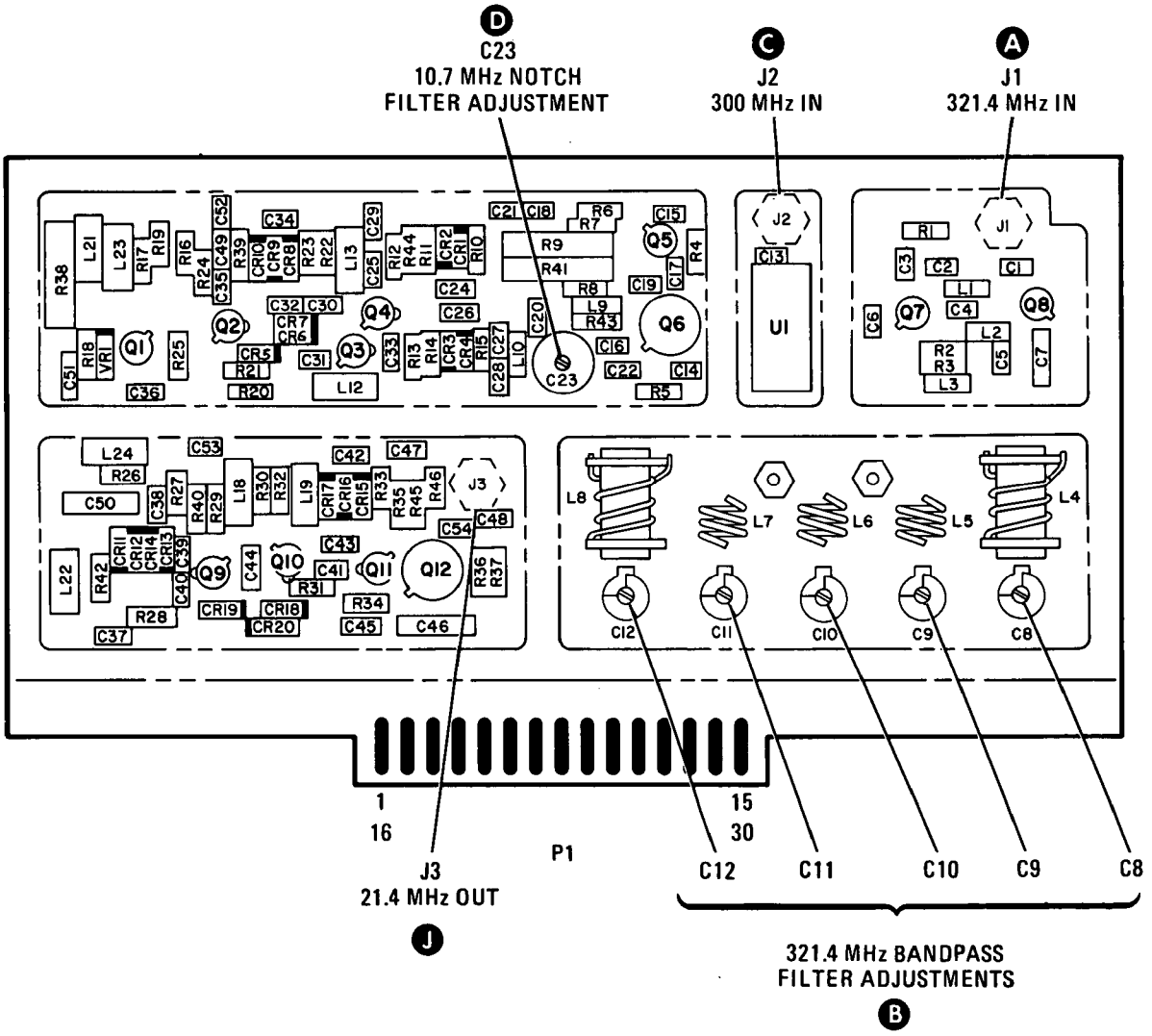
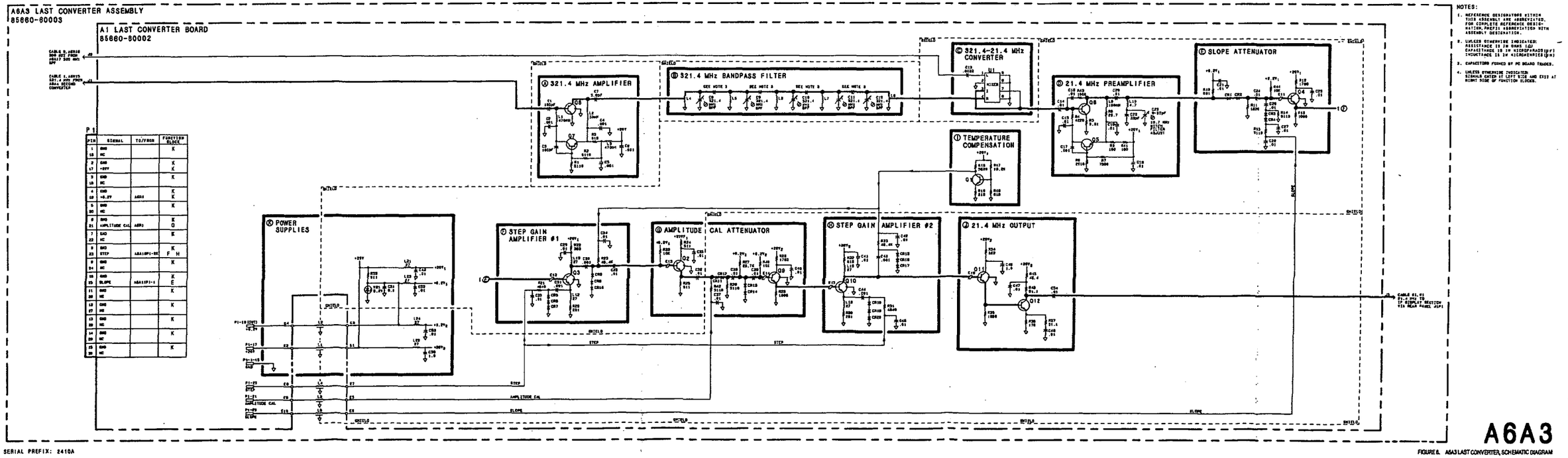


FIGURE 5. A6A3A1 LAST CONVERTER BOARD, COMPONENT LOCATIONS

ManualsPlus.com



PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	GND		K
18	NC		
2	GND		K
17	+20V		K
3	GND		K
19	NC		
4	GND		K
16	+8.2V	A6A3	K
5	GND		K
20	NC		
6	GND		K
21	AMPLITUDE CAL	A6A3	G
7	GND		K
22	NC		
8	GND		K
23	STEP	A6A1P1-26	F H
9	GND		K
24	NC		
10	GND		K
25	SLOPE	A6A1P1-1	E
11	GND		K
26	NC		
12	GND		K
27	NC		
13	GND		K
28	NC		
14	GND		K
29	NC		
15	GND		K
30	NC		

SERIAL PREFIX: 2410A

A6A3

FIGURE 6. A6A3 LAST CONVERTER, SCHEMATIC DIAGRAM

A6A7 YTX Current Driver
A6A5 ACLU A6A8 YTX

ManualsPlus.com

ManualsPlus.com

A6A7 YIG-TUNED MIXER (YTX) CURRENT DRIVER, CIRCUIT DESCRIPTION

The YTX Current Driver has three functions: 1) to provide the output stage for the A6A8 YTX coil, 2) to provide filter circuitry for the YTX, and 3) to provide control circuitry for the YTX heater.

YTX Drive Output (B)

The YTX drive output consists of Q5, Q6, R14 – R17, VR4, and CR3. Q5 and Q6 form a darlington transistor driven by the A6A12 YTX Driver. R14 – R17 are four 100-ohm ten-watt resistors connected in parallel to form a 25-ohm resistor which is used to sense the current in the YTX coil. This sense signal is fed back to the YTX Driver. Four resistors are used for power handling capability and temperature stability. VR4 and CR3 limit the flyback voltage produced across the YTX coil during scan reset and prevent breakdown of Q5 and Q6.

Filter Capacitor Drive (A)

When the spectrum analyzer is set to narrow spans and narrow resolution bandwidths, hum and noise in the YTX drive circuitry which FMs the YTX can introduce phase noise and line frequency sidebands onto a displayed signal. To prevent this occurrence, a large filter capacitor, A6A7C1, is connected across the YTX coil by switch Q8 whenever the resolution bandwidth is 100 Hz or less.

Q8 is controlled from A6A11 Slope Generator through Q2, Q3, and Q4. When the resolution bandwidth is 100 Hz or less, the filter capacitor is connected before the start of a scan and disconnected at the end of a scan so that the scan reset and hysteresis correction can be performed.

YTX Heater Control (C)

The YTX heater control is a feedback circuit designed to maintain the center support of the YTX at a constant 75°C, as the ambient temperature ranges from 0° to 55°C. The green LED, DS1, indicates that current is flowing properly in the heater. Red LED, DS2, indicates the circuit is saturated, putting maximum power into the heater.

The heater ring of the YTX has a 450-ohm thin-film heater resistor, and a thermal sensor with a positive temperature coefficient. The resistance versus temperature characteristics of the thermal sensor are shown in Figure 1.

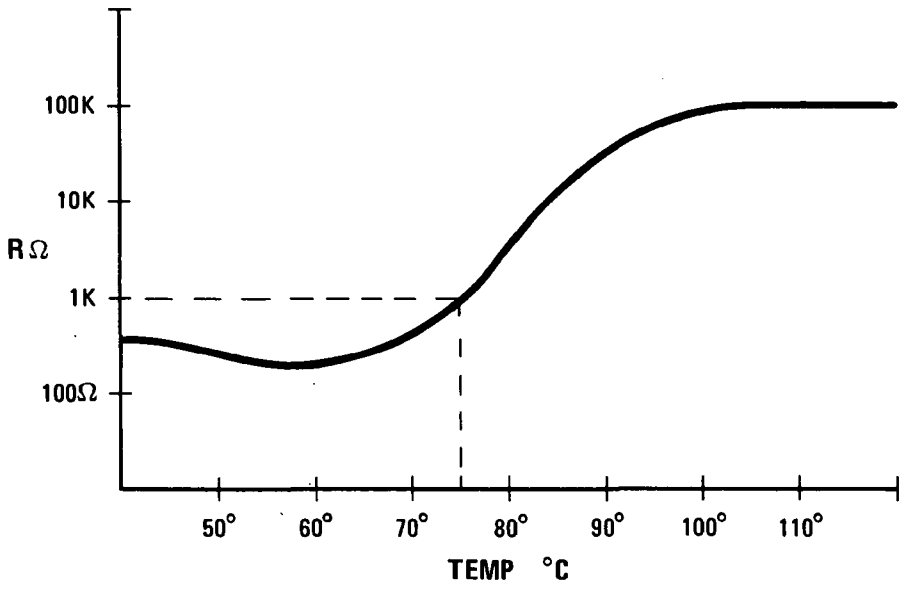


FIGURE 1. YTX THERMAL SENSOR RESISTANCE VS. TEMPERATURE CHARACTERISTICS

ManualsPlus.com

Op-amp U1, with R2, R3, R4, Q1, and Q7 becomes an amplifier with a gain of about 127. In addition, R2 and R3 set a reference voltage at the negative input of the amplifier. Darlington Q1 and Q7 is able to provide the large currents required to heat the heater resistor to 75°C. VR2 and R5 offset the op-amp output voltage to be within range of the output stage (0 to −40 volts). CR1 protects the op-amp input.

The circuit operates as follows: If the heater ring is cool (as at turn-on, etc.), the divider formed by R1 and the sensor (described above) outputs a voltage that is less than the reference at the minus input to the amplifier. This causes the amplifier output to swing negative, thus drawing more current through the heater resistor, heating up the sensor, causing it to increase its resistance. This raises the voltage at the R1/sensor divider output until it exactly equals that of the reference divider R2/R3. In general, small temperature errors are manifested as a small voltage between pins 2 and 3 of the op-amp (its input). This error is amplified and applied to the heater resistor with the appropriate sign to eliminate the error.

ManualsPlus.com

A6A8 YIG-TUNED MIXER (YTX), A6A5 AMPLIFIER/COUPLER/LOAD UNIT (ACLU), CIRCUIT DESCRIPTION

The YTX consists of a three-pole tunable bandpass filter and a single diode microwave harmonic mixer. The 2 to 6 GHz local oscillator (LO) signal enters the ACLU, and is amplified and coupled into the YTX to turn its diode on and off at the LO rate. The diode conduction angle is adjusted with DC diode bias to be optimum for the harmonic of the LO being used. The incoming microwave signal passes through the bandpass filter, through the mixer diode, as it switches on and off, and into the precision 50Ω load of the ACLU. The IF signal at 321.4 MHz travels down the same line as the LO, but at 321.4 MHz the parallel LC below the 50Ω resistor resonates to transform the YTX diode's IF impedance down to match the 50Ω load presented to the ACLU output.

The purpose of the three-pole filter is twofold: to reject the image response of the mixer 642.8 MHz away from the desired signal; and to reject the LO signal that would otherwise come out the mixer's microwave input port, and thus out the instrument front panel.

HANDLING THE YIG-TUNED MIXER

CAUTION

The YIG Tuned Mixer (YTX) contains an extremely small and sensitive diode. A reverse voltage in excess of 3 volts may damage it. It is connected directly to the center conductor of the LO/IF connector, and is especially susceptible to blowout from electrostatic discharge. Before connecting any coaxial cable to the YTX, connect the YTX BIAS pin to ground, discharge the coaxial cable by connecting the center conductor to ground (YTX body), then simultaneously touch both to chassis ground and/or the YTX package. It is recommended that the other end of the cable be connected first before going through this procedure.

Once the cable from the YTX to the ACLU is properly installed, the BIAS pin of the ACLU is directly connected to the YTX diode. Therefore, treat the BIAS pin with extreme caution, especially avoiding electrostatic discharge. As a general rule, connect all devices to the chassis before connecting to or touching the BIAS pin on the ACLU.

ManualsPlus.com

A6A5 AMPLIFIER/COUPLER/LOAD UNIT (ACLU) REPLACEMENT

NOTE

For location of hardware and cables referred to in this procedure, see Figure 2.

Removal

1. Remove ac line cords and RF Section bottom cover.
2. Disconnect connectors **(4)** and **(8)**, single-pin connector **(2)**, and double-pin connector **(3)** from Second Converter.
3. Disconnect the remaining cables from Second Converter:

   1 (brown) cable from .321 OUT **(7)**
   4 (yellow) cable from TUNE **(9)**

4. Remove ACLU cover-plate by removing four screws **(5)** as shown in View A.
5. Disconnect five connectors **(10)**, three 92 (white/red) single-pin connectors **(11)**, and one 8 (gray) single-pin connector **(12)**. (Refer to View B.)
6. Release ACLU by removing two screws **(13)** shown in View B.

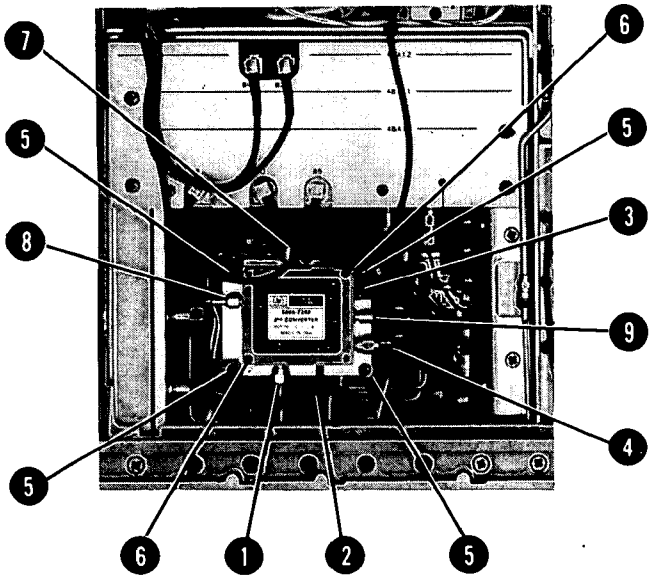
Installation

7. Secure new ACLU on mounting bracket with two screws **(13)**, and reconnect the cables and wires removed in step 5.
8. Replace ACLU cover-plate with four screws **(5)** shown in View A.
9. Reconnect connector **(1)**, 5 (green) cable, connector **(4)**, single-pin connector **(2)**, and double-pin connector **(3)** to Second Converter.
10. Reconnect the following cables to Second Converter: (Refer to View A.)

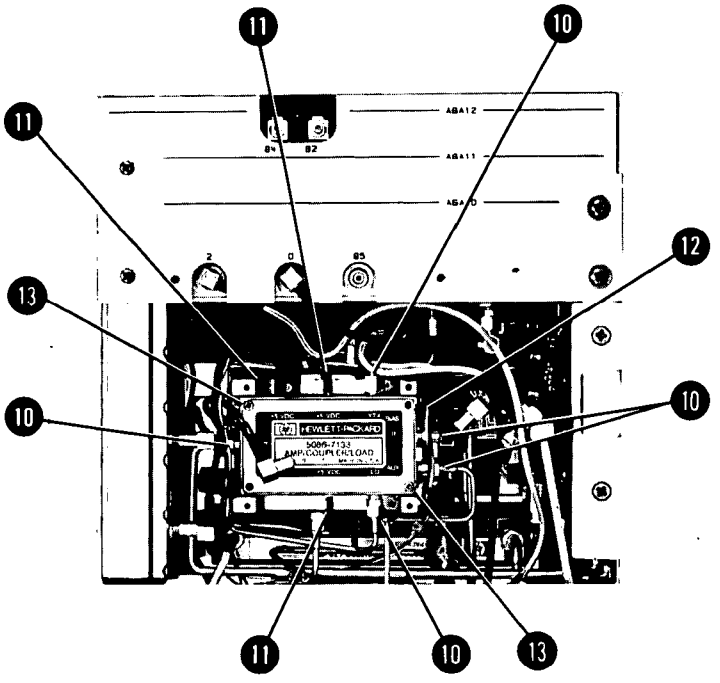
    1 (brown) cable to .321 OUT **(7)**
    1 (brown) cable to .321 IN **(8)**
    4 (yellow) cable to TUNE **(9)**

11. Replace bottom cover and ac line cords.

ManualsPlus.com



VIEW A



VIEW B

FIGURE 2. A6A5 ACLU REPLACEMENT

ManualsPlus.com

A6A7 YTX CURRENT DRIVER REPLACEMENT

NOTE

For location of hardware and cables referred to in this procedure, see Figure 3.

Removal

1. Remove ac line cords and RF Section bottom cover.
2. Disconnect cable **(1)** between A11 YTO Loop and RF Module.
3. Disconnect 5-pin connector **(2)** and ribbon cable **(3)** from A6A7.
4. Remove two screws **(4)** and remove A6A7 from RF Module.

Installation

5. Place A6A7 in RF Module and replace two screws **(4)**.
6. Reconnect 5-pin connector **(2)** and ribbon cable **(3)** to A6A7.
7. Reconnect cable **(1)** between A11 YTO Loop and A6 RF Module.
8. Replace bottom cover on RF Section and reconnect ac line cords.

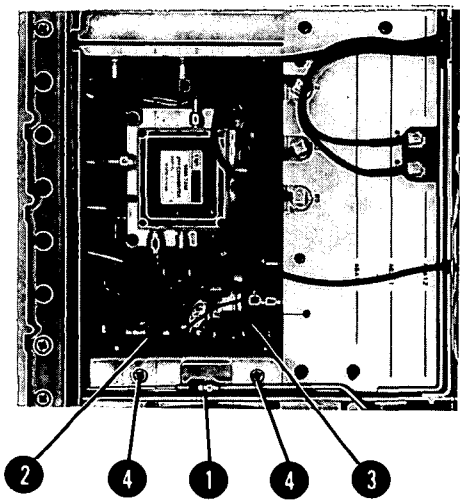


FIGURE 3. A6A7 YTX CURRENT DRIVER REPLACEMENT

ManualsPlus.com

A6A8 YTX REPLACEMENT

NOTE

For location of hardware and cables referred to in this procedure, see Figure 4.

Removal

1. Remove ac line cords, separate instrument sections, and remove top and bottom covers from RF Section.
2. Disconnect cable **(1)** between A11 YTO Loop and RF Module.
3. Remove five cables from RF Module PC boards; three from A6A9 Phase Lock and two from A6A12 YTX Driver.
4. Remove RF Module PC board cover by removing six screws **(2)**.
5. Remove A6A9 assembly and A6A10, A6A11, and A6A12 PC boards.
6. Disconnect 4 (yellow) cable and 5 (green) cable from 2nd Converter to release A6A9 assembly.
7. Remove ribbon cable **(3)** between A6A7 YTX Current Driver and motherboard.
8. Disconnect 5-pin connector **(4)** from A6A7 and remove A6A7 by removing two screws **(5)**.

CAUTION

The A6A8 YTX contains an extremely sensitive diode located inside the LO/IF connector. This diode is highly susceptible to blow-out from static discharge. Be very careful when handling the YTX to avoid damaging this diode.

9. Disconnect all cables from A6A8 YTX.
10. Disconnect bus cable **(6)** from motherboard.
11. Remove two screws **(7)** holding YTX to motherboard.
12. Remove YTX from RF Module.

Installation

13. Place YTX in RF Module. Be sure insulator is properly installed between YTX and motherboard.
14. Replace two screws **(7)** to attach YTX to motherboard.
15. Reconnect bus cable **(6)** to motherboard.

ManualsPlus.com

CAUTION

The A6A8 YTX contains an extremely sensitive diode located inside the LO/IF connector. This diode is highly susceptible to blow-out from static discharge. Be very careful when connecting cables to the YTX to avoid damaging this diode. Ground (discharge) all cables before connecting them to the YTX.

16. Reconnect coaxial cables to YTX.
17. Place A6A7 YTX Current Driver in RF Module and secure with two screws **(5)**.
18. Reconnect 5-pin connector **(4)** to A6A7.
19. Replace ribbon cable **(5)** between A6A7 and motherboard.
20. Replace A6A9 assembly and A6A10, A6A11, and A6A12 PC boards.
21. Reconnect 4 (yellow) cable and 5 (green) cable to 2nd Converter.
22. Replace RF Module PC board cover and secure with six screws **(2)**.
23. Reconnect five cables to RF Module PC boards; three to A6A9 Phase Lock and two to A6A12 YTX Driver. Cables are color-coded and color codes are labeled on PC board cover.
24. Reconnect cable **(1)** between A11 YTO Loop and RF Module.
25. Replace top and bottom covers on RF Section, recombine instrument sections, and reconnect ac line cords.

ManualsPlus.com

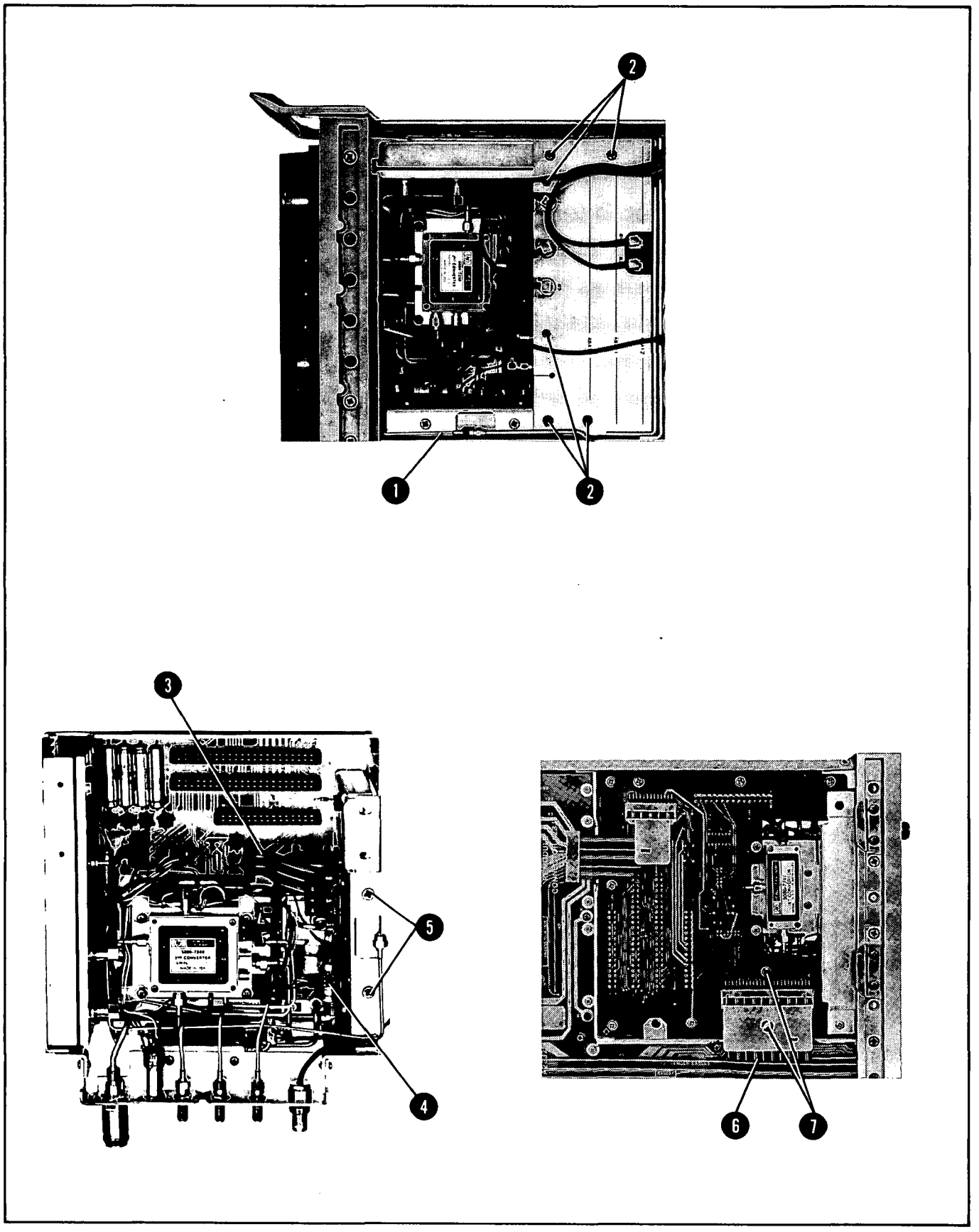


FIGURE 4. A6A8 YTX REPLACEMENT

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A7	85660-60128	1	1	BOARD ASSEMBLY, YIG-TUNED MIXER (YTX) CURRENT DRIVER)	28480	85660-60128
A6A7C1	0180-0094	4	1	CAPACITOR-FXD 100UF+75-10% 25VDC AL	56289	30D107G025DD2
A6A7CR1	1901-1067	4	3	DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A7CR2	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A7CR3	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A7DS1	1990-0485	5	1	LED-LAMP LUM-INT=800UCD IF=30MA-MAX	28480	5082-4984
A6A7DS2	1990-0486	6	1	LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4684
A6A7J1	1251-5146	9	1	CONNECTOR 6-PIN M POST TYPE	28480	1251-5146
A6A7J2	1251-5144	7	1	CONNECTOR 14-PIN M POST TYPE	28480	1251-5144
A6A7Q1	1853-0281	9	2	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A6A7Q2	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A6A7Q3	1854-0477	7	1	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A7Q4	1853-0038	4	2	TRANSISTOR PNP SI TO-39 PD=1W FT=100MHZ	28480	1853-0038
A6A7Q5	1853-0038	4		TRANSISTOR PNP SI TO-39 PD=1W FT=100MHZ	28480	1853-0038
A6A7Q6	1853-0391	2	1	TRANSISTOR PNP 2N6051 SI DARL TO-3	04713	2N6051
A6A7Q7	1853-0413	9	1	TRANSISTOR PNP 2N6049 SI TO-66 PD=75W	28480	1853-0413
A6A7Q8	1884-0282	5	1	THYRISTOR-TRIAC 2N6073	04713	2N6073
A6A7R1	0698-3157	3	2	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A6A7R2	0757-0447	4	1	RESISTOR 16.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1622-F
A6A7R3	0757-0421	4	1	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A6A7R4	0757-0465	6	1	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A7R5	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A6A7R6	0698-3438	3	1	RESISTOR 147 1% .125W F TC=0+-100	24546	C4-1/8-T0-147R-F
A6A7R7	0757-0416	7	2	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A7R8	0757-0458	7	2	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A6A7R9	0757-0442	9	2	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A7R10	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A6A7R11	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A7R12	0698-3635	2	1	RESISTOR 680 5% 2W MO TC=0+-200	28480	0698-3635
A6A7R13	0757-0438	3	1	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A7R14	0811-0653	0	4	RESISTOR 100 1% 12W PW TC=0+-5	28480	0811-0653
A6A7R15	0811-0653	0		RESISTOR 100 1% 12W PW TC=0+-5	28480	0811-0653
A6A7R16	0811-0653	0		RESISTOR 100 1% 12W PW TC=0+-5	28480	0811-0653
A6A7R17	0811-0653	0		RESISTOR 100 1% 12W PW TC=0+-5	28480	0811-0653
A6A7R18	0757-0401	0	1	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A6A7R19	0698-0082	7	1	RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A6A7R20	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A7R21	0698-3395	1	1	RESISTOR 34.0 1% .5W F TC=0+-100	28480	0698-3395
A6A7U1	1826-1058	3	1	IC OP AMP GP 8-TO-99 PKG	28480	1826-1058
A6A7VR1				NOT ASSIGNED		
A6A7VR2	1902-3279	6	1	DIODE-ZNR 28.7V 5% DO-35 PD=.4W	28480	1902-3279
A6A7VR3				NOT ASSIGNED		
A6A7VR4	1902-0644	3	1	DIODE-ZNR 1N5363B 30V 5% PD=5W TC=+29MV	28480	1902-0644
				MISCELLANEOUS PARTS		
	0340-0162	7	1	INSULATOR-XSTR ALUMINUM	28480	0340-0162
	2190-0014	1	8	WASHER-LK INTL T NO. 2 .089-IN-ID	28480	2190-0014
	0340-1064	0	4	INSULATOR-FLG-BSHG NYLON	28480	0340-1064
	2200-0107	8	4	SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	0380-1602	6	4	STANDOFF-RVT-ON .1-IN-LG 4-40-THD	28480	0380-1602
	85660-00023	9	1	HEAT SINK CR DR	28480	85660-00023
	0520-0128	7	8	SCREW-MACH 2-56 .25-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	0610-0001	6	8	NUT-HEX-DBL-CHAM 2-56-THD .062-IN-THK	00000	ORDER BY DESCRIPTION
	1200-0043	8	1	INSULATOR-XSTR ALUMINUM	28480	1200-0043
	1200-0081	4	2	INSULATOR-FLG-BSHG NYLON	28480	1200-0081

*Indicates Factory Selected Value

ManualsPlus.com

A6A7
YTX CURRENT DRIVER

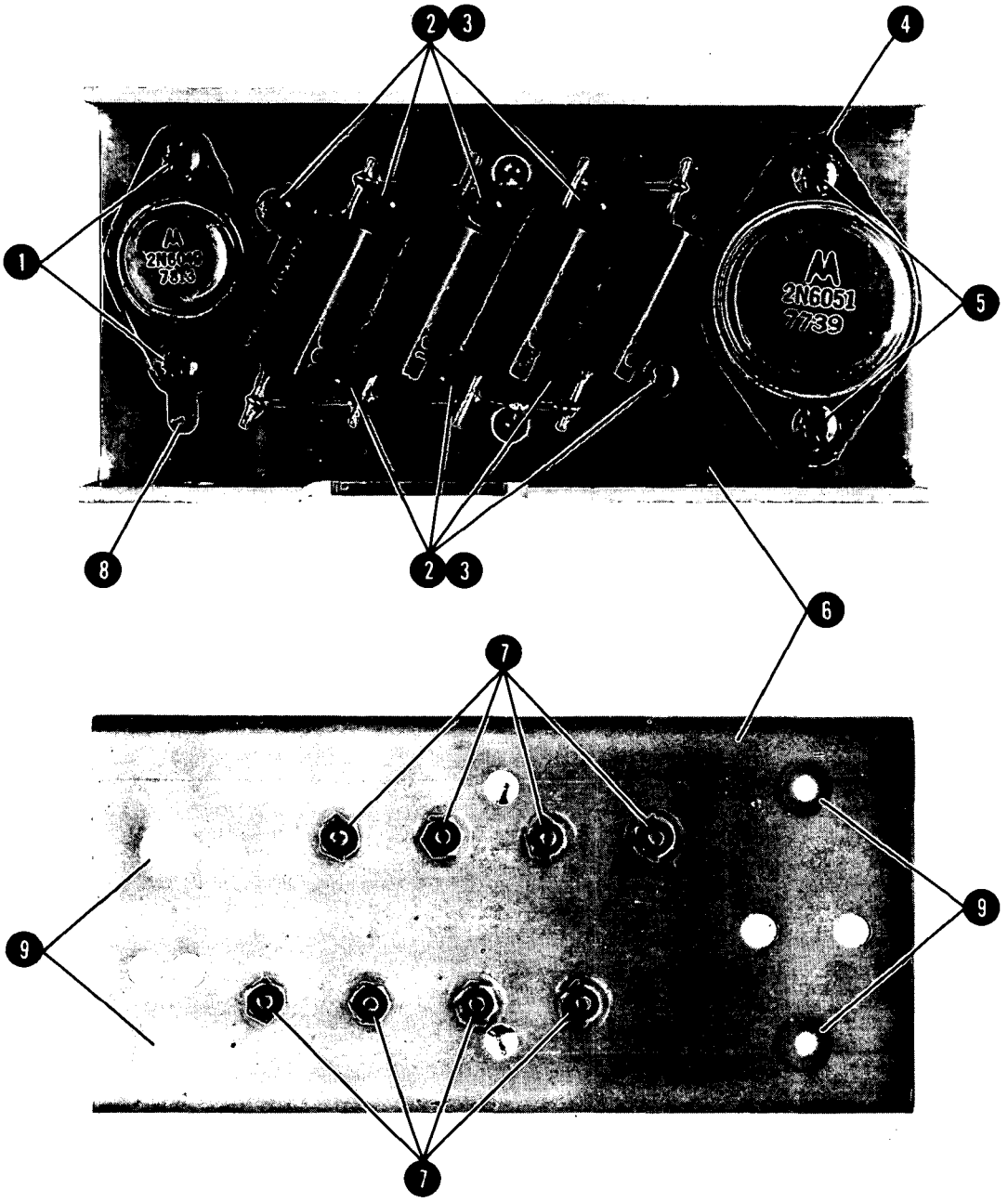


FIGURE 5. A6A7 YTX CURRENT DRIVER, PARTS IDENTIFICATION (1 OF 2)

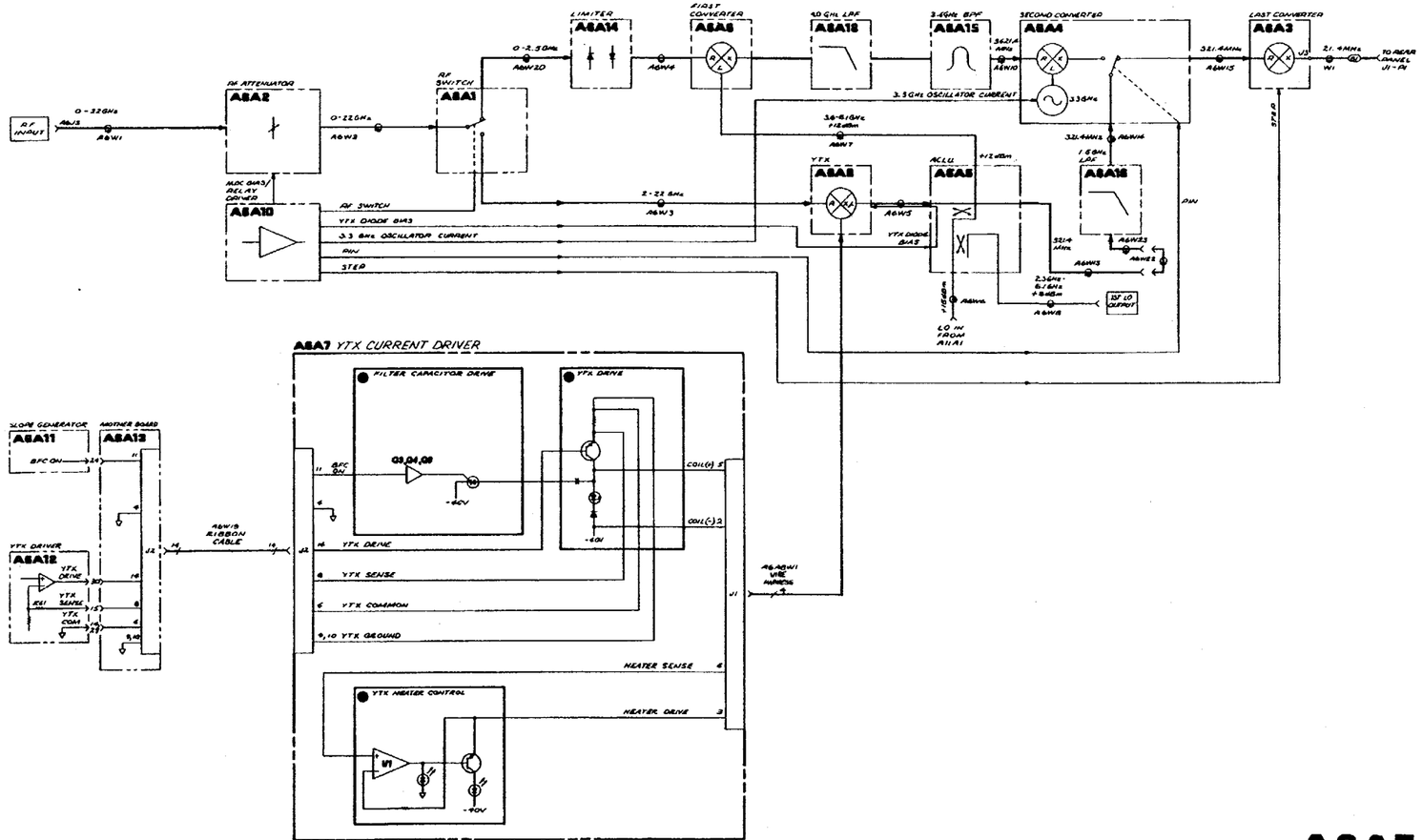
ManualsPlus.com

Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
1	2200-0107	6	Screw, Mach, 4-40, .375-IN LG, PAN HD	28480	2200-0107
2	0520-0128	7	Screw, Mach, 2-56, .25-IN LG, PAN HD	28480	0520-0128
3	2190-0014	1	Washer, Lock, 2-56, (For screw (2))	28480	2190-0014
4	1200-0043	8	Insulator, Transistor (For Q6)	28480	1200-0043
5	2200-0109	8	Screw, Mach, 4-40, .438-IN LG, PAN HD	28480	2200-0109
6	85660-00023	9	Heat Sink, YTX Current Driver	28480	85660-00023
7	0610-0001	6	Nut, Hex, 2-56 (For screw (2))	28480	0610-0001
8	0340-0162	7	Insulator, Transistor (For Q7)	28480	0340-0162
9	0340-1064	0	Insulator, Bushing (For Q6 & Q7)	28480	0340-1064

FIGURE 5. A6A7 YTX CURRENT DRIVER, PARTS IDENTIFICATION (2 OF 2)

ManualsPlus.com

RF SECTION



A6A7

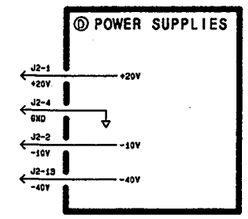
FIGURE 6. A6A7 YTX CURRENT DRIVER, BLOCK DIAGRAM

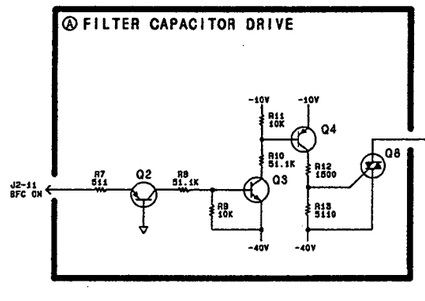
ManualsPlus.com

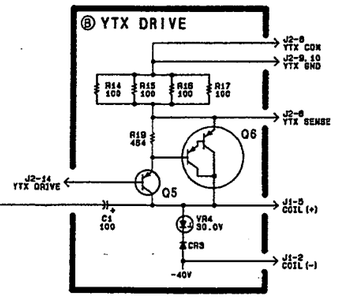
A6A7 YIG-TUNED MIXER (YTX) CURRENT DRIVER
85660-60128

J1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	NC		
2	COIL (-)	A6A8P1-1	B
3	HEATER DRIVE	A6A8P1-4	C
4	HEATER SENSE	A6A8P1-3	C
5	COIL (+)	A6A8P1-5	B
6	NC		

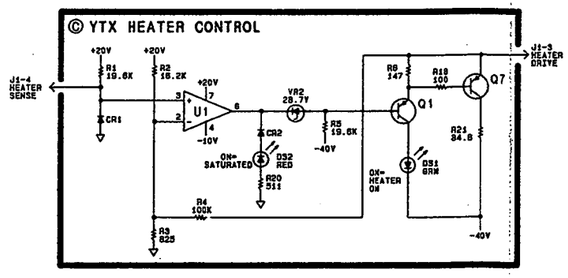






J2

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	+20V		D
2	-10V		D
3	NC		
4	GND		D
5	NC		
6	YTX CON	A6A12P1-14, 29	B
7	NC		
8	YTX SENSE	A6A10P1-21	B
9	YTX GND	A6A13	B
10	YTX GND	A6A13	B
11	BFC ON	A6A11P1-24	A
12	NC		
13	-40V		D
14	YTX DRIVE	A6A12P1-30	B



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (μF) INDUCTANCE IS IN MICROHENRIES (μH)
3. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.
4. MNEMONICS TABLE:

MNEMONIC	DESCRIPTION
BFC ON	FILTER CAPACITOR ENABLE

SERIAL PREFIX: 2410A

A6A7

FIGURE 8. A6A7 YIG-TUNED MIXER (YTX) CURRENT DRIVER, SCHEMATIC DIAGRAM

ManualsPlus.com

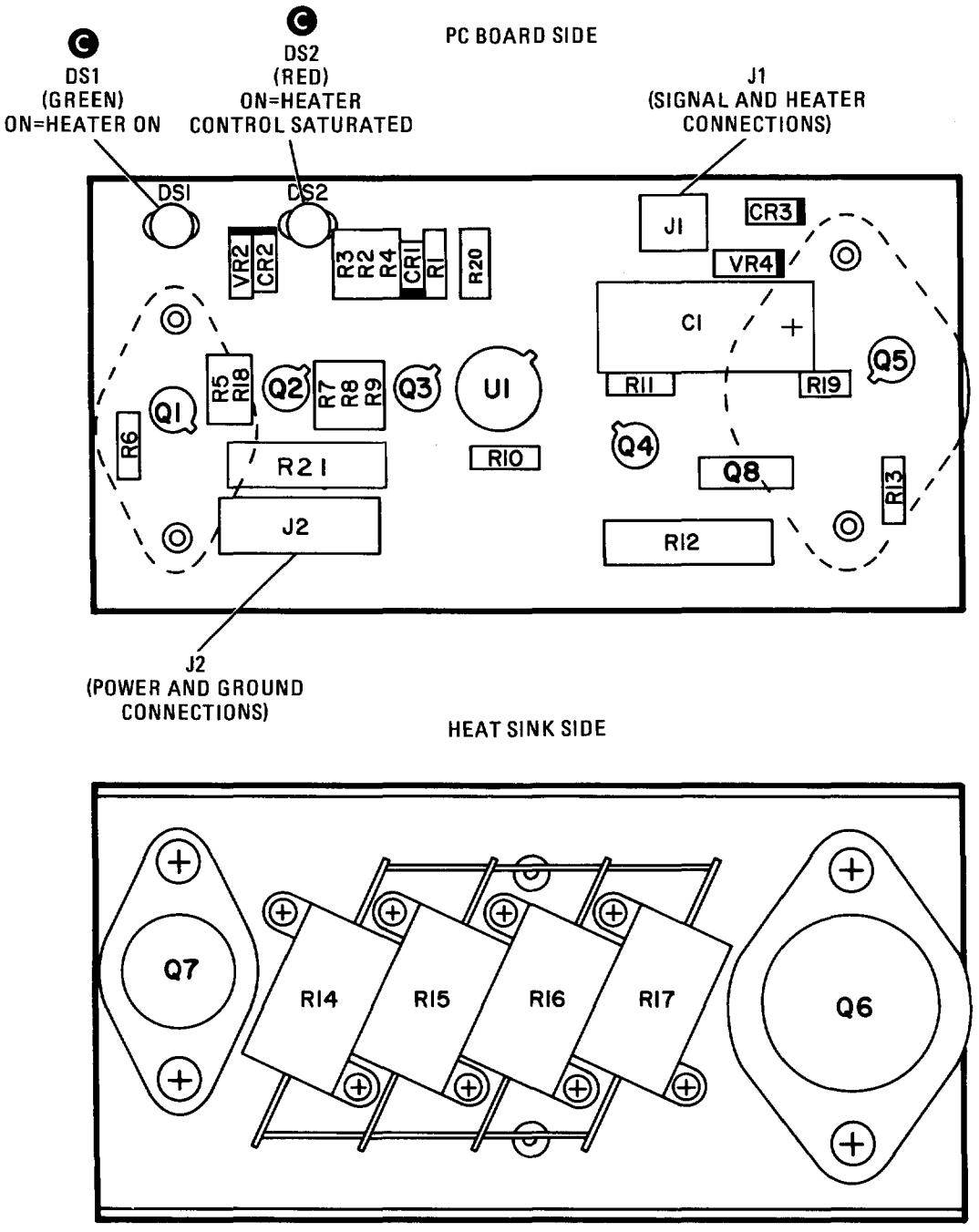
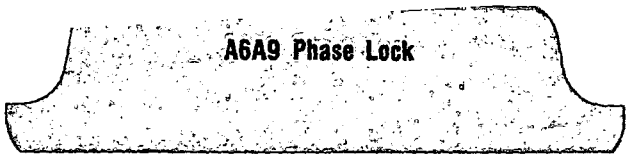


FIGURE 7. A6A7 YTX CURRENT DRIVER, COMPONENT LOCATIONS



ManualsPlus.com

ManualsPlus.com

A6A9 PHASE LOCK, CIRCUIT DESCRIPTION

The A6A9 Phase Lock has three major functions: 1) to provide the 100 MHz calibrator signal to the instrument front panel, 2) to provide a 300 MHz local oscillator to the Last Converter, and 3) to phase-lock the second converter local oscillator to the 100 MHz internal reference.

100 MHz Buffer Amplifier (A)

The 100 MHz buffer amplifier Q1 amplifies the frequency reference from the A7A2 VCXO assembly. Low-pass matching network, L1 and C4, provides a 50-ohm input impedance. Transformer T1 acts as a power divider, supplying the 100 MHz signal to both the Driver circuit and the Phase Lock circuit.

Driver (C)

Transistor Q2 amplifies the 100 MHz from the Buffer Amplifier. Power divider T2 drives both the 100 MHz Calibrator and the 300 MHz LO circuit.

100 MHz Calibrator (D)

The Calibrator circuit consists of a differential amplier, Q3A and Q3B, followed by a low-pass filter. Low-pass filter C19, L8, C20, L9, and C22, eliminates higher order harmonics on the front panel calibrator output. Potentiometer R11 sets the gain of Q3.

Tripler (G)

With the 100 MHz input from the Driver circuit, the Tripler produces a 300 MHz output. Inductor L10 and C24 are used for impedance matching. The output tank circuit, formed by L11 and the output capacitance of transistor Q4, resonates at 300 MHz. Capacitor C29 adjusts the loading of the stage and couples the output to the Power Amplifier.

300 MHz Power Amplifier (H)

The output of the 300 MHz Power Amplifier, approximately +20 dBm, is the local oscillator for the A6A3 Last Converter. Capacitor C30 reduces the sub-harmonic content of the output. The output filter C52, L21, and C53, reduces higher order harmonics while maintaining a 50-ohm output impedance.

Sampler Driver (B)

Amplifier U2 drives the sampler step recovery diode in function block E with the 100 MHz frequency reference. Capacitors C8, C9, and L4 match the forward biased impedance of the diode to U2. Resistor R5 loads the output of U2 during the diode's reverse biased condition.

Sampler (E) and Loop Integrator (F)

The output of the sampler is a dc voltage proportional to the phase difference between the 33rd harmonic of the 100 MHz reference and the 3.3 GHz output of the second converter local oscillator (A6A4). Integrator U3 supplies a tune voltage to the second converter local oscillator. This phase locks the oscillator to the 100 MHz frequency reference. Potentiometer R38 adjusts the output balance of the sampler. Capacitor C46 is the integrator capacitor for U3.

ManualsPlus.com

Aided Acquisition and Unlock Detector (I)

The output tune voltage from the Loop Integrator (function block F) becomes −25V when the second converter local oscillator is unlocked (A6A4). The Aided Acquisition circuitry detects this condition and retunes the oscillator within the capture range of the phase-lock loop. The Aided Acquisition circuitry also controls the Lock Indicator (function block J).

Negative Rail Detector and One Shot: The Negative Rail Detector U4A is an inverting comparator. The threshold voltage at pin 5 is set at −23.5V. During unlock,the input of U4A becomes more negative than the threshold voltage and the comparator output becomes positive. Resistor R21 provides positive feedback, stabilizing the circuit. Resistors R25 and R26 form a voltage divider reducing the input to U4B below the value of the power supplies. The positive output of U4A triggers One Shot multivibrator U4B. The negative output of U4B forward biases diodes CR1 and CR2. The diodes become a constant current source for integrator capacitor C46 (function block F), causing a positive direction search ramp of voltage at the output of U3. This search ramp tunes the second converter local oscillator through the capture range of the phase-lock loop.

If the loop does not phase-lock on the search ramp, the tune voltage will remain positive until the One Shot recovers, reverse biasing CR1 and CR2. The output of U3 then becomes negative (unlock condition), causing the Aided Acquisition circuitry to repeat the search cycle until phase-lock occurs. This results in a sawtooth tune waveform with a period of approximately 4 msec.

The One Shot on time, controlled by R24 and C38, is approximately 1 msec. This is the time it takes for the voltage on pin 7 to decay to −25V to less than −20V. During this time, the input to U4C has become −20V due to the positive tune voltage ramp. In high band, the PIN signal goes negative, which disables the search ramp and unlock detector through CR3.

Switch and Unlock Detector: When unlock occurs, the output of U4B becomes low, causing U4C to have a low output. The output of U4D becomes positive, turning off Q5. If no lock occurs on the search ramp, capacitor C37 keeps Q5 off until the next search cycle begins.

Lock Indicator (J)

In the locked condition, Q5 is forward biased, grounding the HULH line and turning on DS1. During an unlock condition, the output of U4D is +5V, which turns off Q5. This turns off Lock Indicator DS1 and raises HULH, indicating to the processor that an HET unlock has occurred.

ManualsPlus.com

For B 85660-60286
Cover 85660-00073

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A9	85660-60226	0	1	PHASE LOCK ASSEMBLY	28480	85660-60226
A6A9DS1	1990-0485	5	1	LED-LAMP LUM-INT=800UCD IF=30MA-MAX	28480	5082-4984
A6A9J1	1250-0544	9	3	CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544
A6A9J2	1250-0544	9		CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544
A6A9J3	1250-0544	9		CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544
A6A9L1-A6A9L13				NOT ASSIGNED NOT ASSIGNED		
A6A9L14	9135-0002	8	5	FILTER-LOW PASS SOLDER-TERMS	33095	51-744-018
A6A9L15	9135-0002	8		FILTER-LOW PASS SOLDER-TERMS	33095	51-744-018
A6A9L16	9135-0002	8		FILTER-LOW PASS SOLDER-TERMS	33095	51-744-018
A6A9L17	9135-0002	8		FILTER-LOW PASS SOLDER-TERMS	33095	51-744-018
A6A9L18	9135-0002	8		FILTER-LOW PASS SOLDER-TERMS	33095	51-744-018
A6A9U1	1813-0213	3	2	IC WIDEBAND AMPL TO-39 PKG	04713	MWA130
A6A9U2	1813-0213	3		IC WIDEBAND AMPL TO-39 PKG	04713	MWA130
A6A9TB1	85660-60008	6	1	BOARD ASSEMBLY, SAMPLER	28480	85660-60008
A6A9TB1U1	5086-7097	6	1	SAMPLER 2-6.5 GHZ (PREFERRED)	28480	5086-7097
A6A9TB1U1	5086-7292	3	1	SAMPLER 2-6.0 GHZ (ALTERNATE FOR 5086-7097)	28480	5086-7292
				A6A9 MISCELLANEOUS PARTS		
	85660-00070	6	1	COVER, PHASE LOCK ASSEMBLY	28480	85660-00070
	85660-20205	1	1	COVER, BOTTOM, PHASE LOCK ASSEMBLY	28480	85660-20205
	85660-20204	0	1	HOUSING, PHASE LOCK ASSEMBLY	28480	85660-20204
	85660-80061	3	1	INSULATOR MYLAR CLEAR	28480	85660-80061
	86701-00054	8	1	SPACER, SAMPLER	28480	86701-00054
	2200-0148	5	20	SCREW-MACH 4-40 .5-IN-LG 100 DEG	28480	2200-0148
	2200-0140	7	20	SCREW-MACH 4-40 .25-IN-LG 100 DEG	28480	2200-0140
	2200-0107	8	2	SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2190-0559	7	1	WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0557
	2950-0078	9	1	NUT-HEX DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
	2190-0067	4	1	WASHER-LK INTL T 1/4 IN .256-IN-ID	28480	2190-0067
	2950-0177	9	1	NUT-HEX-DBL-CHAM 1/4-36-THD .05-IN-THK	28480	2950-0177
A6A9A1	85660-60202	2	1	BOARD ASSEMBLY, PHASE LOCK	28480	85660-60202
A6A9A1C1	0160-4835	7	2	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A6A9A1C2	0160-4574	1	5	CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A6A9A1C3	0160-4574	1		CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A6A9A1C4	0160-3874	2	1	CAPACITOR-FXD 10PF +-.5PF 200 VDC CER	28480	0160-3874
A6A9A1C5	0160-3878	6	16	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C6	0160-4084	8	7	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A6A9A1C7	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C8	0160-4494	4	2	CAPACITOR-FXD 39PF +-5% 200VDC CER 0+-30	28480	0160-4494
A6A9A1C9	0160-4494	4		CAPACITOR-FXD 39PF +-5% 200VDC CER 0+-30	28480	0160-4494
A6A9A1C10	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C11	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100 VDC CER	28480	0160-3878
A6A9A1C12	0160-4385	2	1	CAPACITOR-FXD 15PF +-5% 200VDC CER 0+-30	28480	0160-4835
A6A9A1C13	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C14	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C15	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A6A9A1C16	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C17	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C18	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C19	0160-4387	4	2	CAPACITOR-FXD 47PF +-5% 200VDC CER 0+-30	28480	0160-4387
A6A9A1C20	0160-4350	1	1	CAPACITOR-FXD 68PF +-5% 200VDC CER 0+-30	28480	0160-4350
A6A9A1C21	0180-0500	7	2	CAPACITOR-FXD 47UF+-20% 20VDC TA	28480	0180-0500
A6A9A1C22	0160-4387	4		CAPACITOR-FXD 47PF +-5% 200VDC CER 0+-30	28480	0160-4387
A6A9A1C23	0160-4574	1		CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A6A9A1C24	0160-3875	3	1	CAPACITOR-FXD 22PF +-5% 200VDC CER 0+-30	28480	0160-3875
A6A9A1C25	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A6A9A1C26	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C27	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C28				NOT ASSIGNED		
A6A9A1C29	0121-0452	4	1	CAPACITOR-V TRMR-AIR 1.3-5.4PF 175V	74970	187-0103-028
A6A9A1C30	0160-4492	2	3	CAPACITOR-FXD 18PF +-5% 200VDC CER 0+-30	28480	0160-4492
A6A9A1C31	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A6A9A1C32	0160-4389	6	1	CAPACITOR-FXD 100PF +-5PF 200VDC CER	28480	0160-4389
A6A9A1C33	0160-4383	0	1	CAPACITOR-FXD 6.8PF +-.5PF 200VDC CER	20932	502E0200RD689D
A6A9A1C34	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C35	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C36	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C37	0160-4441	1	1	CAPACITOR-FXD .47UF +-10% 50VDC CER	28480	0160-4441
A6A9A1C38	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A6A9A1C39	0180-2139	2	1	CAPACITOR-FXD 10UF+-20% 60VDC TA	06001	69F177G7
A6A9A1C40	0180-0500	7		CAPACITOR-FXD 47UF+-20% 20VDC TA	28480	0180-0500

*Indicates Factory Selected Value

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A9A1C41	0180-0197	8	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A6A9A1C42	0160-4574	1		CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A6A9A1C43	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A6A9A1C44	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A6A9A1C45	0160-4574	1		CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A6A9A1C46	0160-0158	9	1	CAPACITOR-FXD 5600PF +-10% 200VDC POLYE	28480	0160-0158
A6A9A1C47				NOT ASSIGNED		
A6A9A1C48	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A6A9A1C49	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1C50	0160-4801	7	2	CAPACITOR-FXD 100PF +-5% 100VDC CER	28480	0160-4801
A6A9A1C51	0160-4801	7		CAPACITOR-FXD 100PF +-5% 100VDC CER	28480	0160-4801
A6A9A1C52	0160-4492	2		CAPACITOR-FXD 18PF +-5% 200VDC CER 0+-30	28480	0160-4492
A6A9A1C53	0160-4492	2		CAPACITOR-FXD 18PF +-5% 200VDC CER 0+-30	28480	0160-4492
A6A9A1C54	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A6A9A1CR1	1901-0954	6	1	DIODE-CUR RGLTR 1N5285 270UA DO-7	28480	1901-0954
A6A9A1CR2	1901-0050	3	2	DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A6A9A1CR3	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A6A9A1CR4	1901-0518	8	1	DIODE-SM SIG SCHOTTKY	28480	1901-0518
A6A9A1DS1				SEE A6A9DS1		
A6A9A1E1				NOT ASSIGNED		
A6A9A1E2				NOT ASSIGNED		
A6A9A1E3	1251-0600	0	4	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A9A1E4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A9A1E5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A9A1E6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A9A1J1-A6A9A1J3				NOT ASSIGNED		
A6A9A1J4	1250-1538	3	1	CONNECTOR-RF SMB M PC 50-OHM	28480	1250-1538
A6A9A1L1	9135-0073	3	2	INDUCTOR RF-CH-MLD 51NH 6% .102DX.26LG	28480	9135-0073
A6A9A1L2	9140-0158	6	3	INDUCTOR RF-CH-MLD 1UH 10% .106DX.26LG	28480	9140-0158
A6A9A1L3	9140-0158	6		INDUCTOR RF-CH-MLD 1UH 10% .106DX.26LG	28480	9140-0158
A6A9A1L4	9135-0073	3		INDUCTOR RF-CH-MLD 51NH 6% .102DX.26LG	28480	9135-0073
A6A9A1L5	9100-2248	5	1	INDUCTOR RF-CH-MLD 120NH 10% .105DX.26LG	28480	9100-2248
A6A9A1L6	9140-0158	6		INDUCTOR RF-CH-MLD 1UH 10% .105DX.26LG	28480	9140-0158
A6A9A1L7				NOT ASSIGNED		
A6A9A1L8	9100-2247	4	2	INDUCTOR RF-CH-MLD 100NH 10% .105DX.26LG	28480	9100-2247
A6A9A1L9	9100-2247	4		INDUCTOR RF-CH-MLD 100NH 10% .105DX.26LG	28480	9100-2247
A6A9A1L10	9100-2251	0	1	INDUCTOR RF-CH-MLD 220NH 10% .105DX.26LG	28480	9100-2251
A6A9A1L11	85660-80012	4	1	COIL 24NH	28480	85660-80012
A6A9A1L12	9135-0068	6	2	INDUCTOR RF-CH-MLD 33NH 6% .102DX.26LG	28480	9135-0068
A6A9A1L13	9100-2250	9	1	INDUCTOR RF-CH-MLD 180NH 10% .105DX.26LG	28480	9100-2250
A6A9A1L14				NOT ASSIGNED		
A6A9A1L15				NOT ASSIGNED		
A6A9A1L16				NOT ASSIGNED		
A6A9A1L17				NOT ASSIGNED		
A6A9A1L18				NOT ASSIGNED		
A6A9A1L19	9140-0142	8	2	INDUCTOR RF-CH-MLD 2.2UH 10% .105DX.26LG	28480	9140-0142
A6A9A1L20	9140-0142	8		INDUCTOR RF-CH-MLD 2.2UH 10% .105DX.26LG	28480	9140-0142
A6A9A1L21	9135-0068	6		INDUCTOR RF-CH-MLD 33NH 6% .102DX.26LG	28480	9135-0068
A6A9A1Q1	1854-0696	2	1	TRANSISTOR NPN SI TO-72 PD=200MW	28480	1854-0696
A6A9A1Q2	1854-0247	9	1	TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
A6A9A1Q3	1854-0295	7	1	TRANSISTOR-DUAL NPN PD=400MW	28480	1854-0295
A6A9A1Q4	1854-0632	6	1	TRANSISTOR NPN SI PD=180MW FT=4GHZ	25403	BFR-91
A6A9A1Q5	1853-0007	7	2	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A6A9A1Q6	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A6A9A1R1	0698-3447	4	1	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A6A9A1R2	0698-3437	2	1	RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A6A9A1R3	0698-3431	6	2	RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-23R7-F
A6A9A1R4	0757-0394	0	3	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A6A9A1R5*	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A6A9A1R6	0757-0421	4	1	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A6A9A1R7	0757-0402	1	2	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A6A9A1R8	0698-3431	6		RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-23R7-F
A6A9A1R9	0757-0401	0	2	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A6A9A1R10*	0757-0280	3	1	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A9A1R11	2100-2574	3	1	RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	30983	ET50X501
A6A9A1R12	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A6A9A1R13	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A6A9A1R14	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A6A9A1R15	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F

*Indicates Factory Selected Value

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

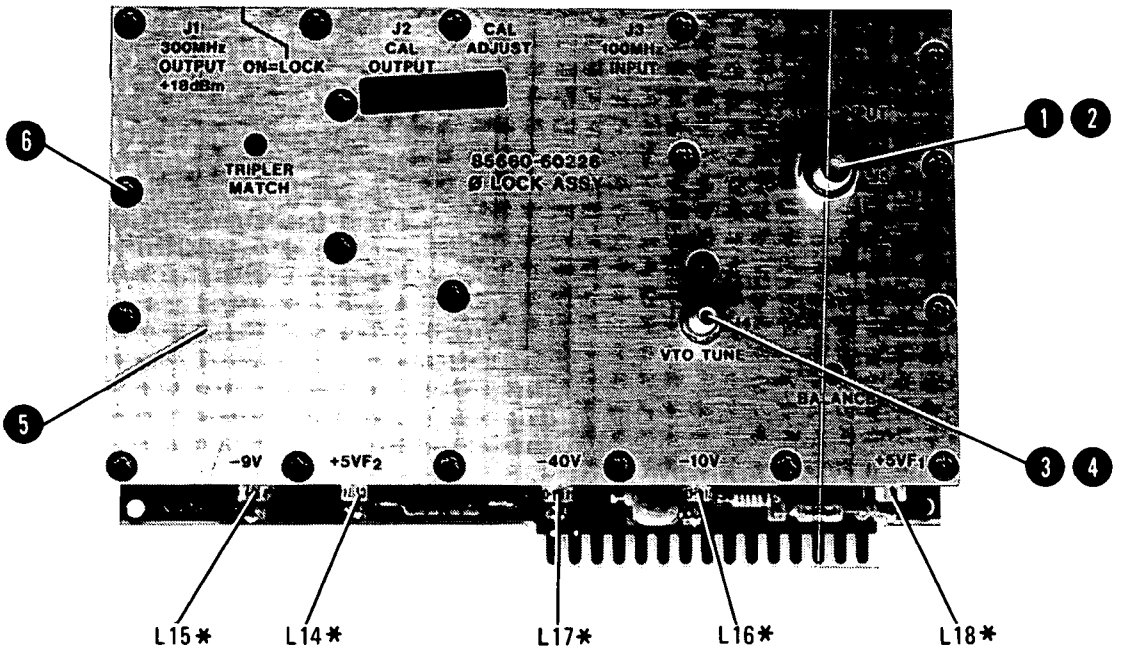
Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A9A1R16	0698-3136	8	2	RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A6A9A1R17	0698-3136	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A6A9A1R18	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A9A1R19	0757-0417	8	1	RESISTOR 562 1% .125W F TC=0+-100	24546	C4-1/8-T0-562R-F
A6A9A1R20	0757-0438	3	2	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A9A1R21	0698-3452	1	1	RESISTOR 147K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1473-F
A6A9A1R22	0757-0442	9	5	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A9A1R23	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A9A1R24	0698-3162	0	1	RESISTOR 46.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-46R4-F
A6A9A1R25	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A9A1R26	0698-7421	2	1	RESISTOR 40K .25% .125W F TC=0+-100	19701	MF4C1-8-T0-4002-C
A6A9A1R27	0757-0459	8	1	RESISTOR 56.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5622-F
A6A9A1R28	0698-3459	8	1	RESISTOR 383K 1% .125W F TC=0+-100	28480	0698-3459
A6A9A1R29	0757-0465	6	1	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A9A1R30	0757-0463	4	1	RESISTOR 82.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8252-F
A6A9A1R31	0757-0418	9	1	RESISTOR 619K 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A6A9A1R32	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A9A1R33	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A9A1R34	0757-0278	9	2	RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A6A9A1R35	0757-0278	9		RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A6A9A1R36	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A9A1R37	0757-0816	1	1	RESISTOR 681 1% .5W F TC=0+-100	28480	0757-0816
A6A9A1R38	2100-1738	9	1	RESISTOR-TRMR 10K 10% C TOP-ADJ 1-TRN	73138	82PR10K
A6A9A1R39	0757-0470	3	1	RESISTOR 162K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1623-F
A6A9A1R40	0757-0419	0	2	RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-681R-F
A6A9A1R41	0757-0419	0		RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-681R-F
A6A9A1T1	08552-6044	1	2	TRANSFORMER, RF 5-PIN	28480	08552-6044
A6A9A1T2	08552-6044	1		TRANSFORMER, RF 5-PIN	28480	08552-6044
A6A9A1U1				SEE A6A9U1		
A6A9A1U2				SEE A6A9U2		
A6A9A1U3	1826-0987	5	1	IC OP AMP PRCN 8-DIP-C PKG	28480	1826-0987
A6A9A1U4	1826-0306	2	1	IC COMPARATOR GP QUAD 14-DIP-C PKG	27014	LM339AJ
A6A9A1VR1	1902-0041	4	1	DIODE-ZNR 5.11V 5% DO-35 PD=.4W	28480	1902-0041
A6A9A1W1	1460-1489	8	1	WIREFORM BE CU AG	28480	1460-1489

*Indicates Factory Selected Value

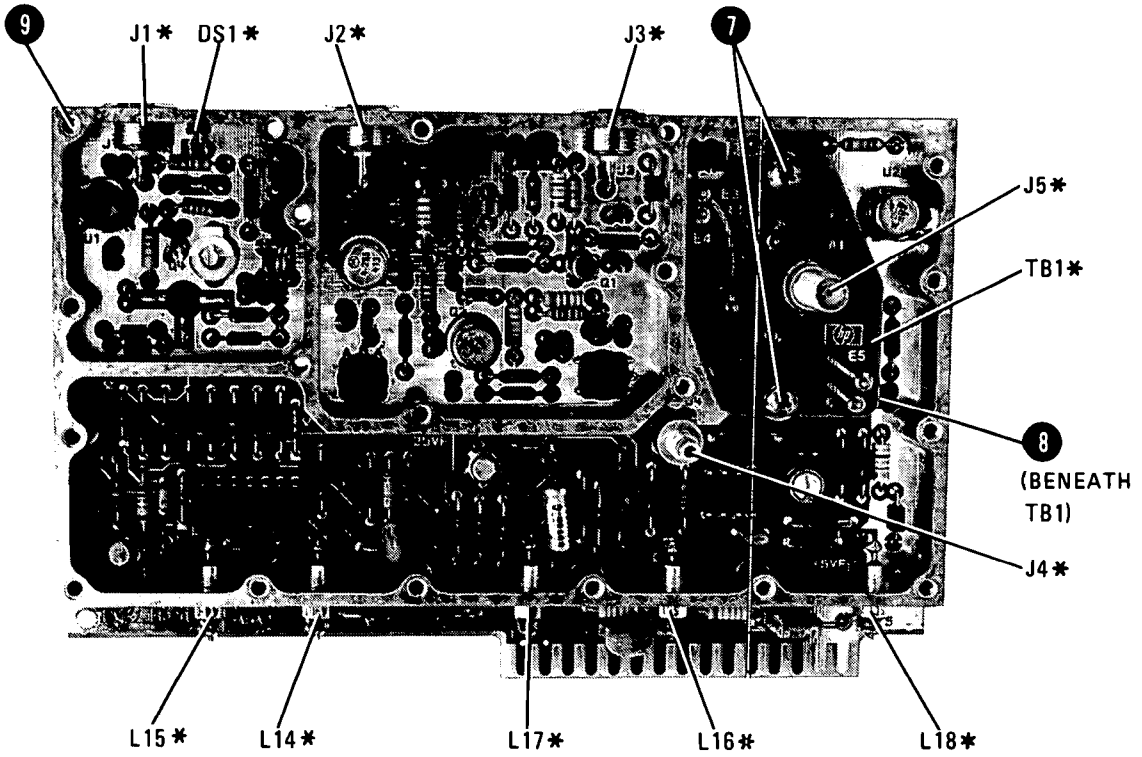
ManualsPlus.com

A6A9
PHASE LOCK ASSEMBLY

FRONT



INTERNAL

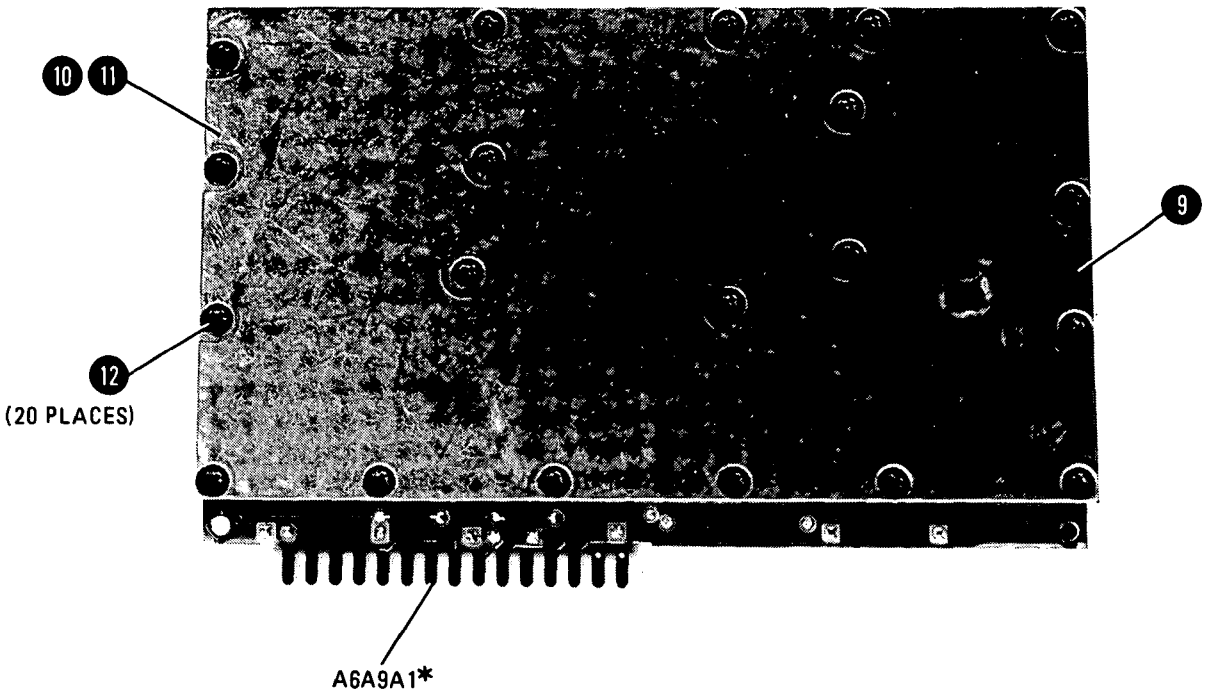


*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

FIGURE 1. A6A9 PHASE LOCK ASSEMBLY, PARTS IDENTIFICATION (1 OF 2)

ManualsPlus.com

A6A9
PHASE LOCK ASSEMBLY
REAR

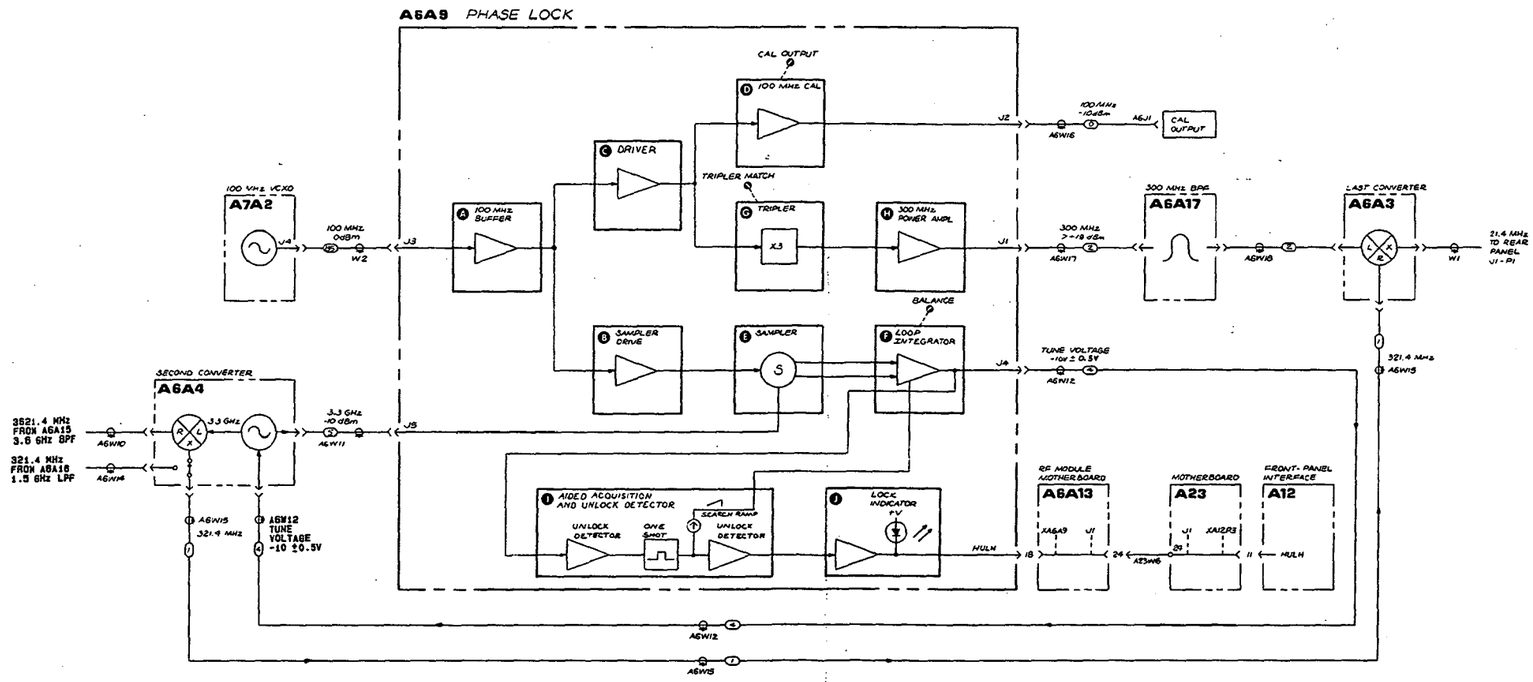


*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
1	2950-0177	9	Nut, Hex, RF Connector (For J5)	28480	2950-0177
2	2190-0067	4	Washer, Lock, RF Connector (For J5)	28480	2190-0067
3	2950-0078	9	Nut, Hex, 10-32 (For J4)	28480	2950-0078
4	2190-0557	7	Washer, Lock, .195-IN ID (For J4)	28480	2190-0557
5	85660-00070	6	Cover, Front, Phase Lock Assembly	28480	85660-00070
6	2200-0140	7	Screw, Mach, 4-40, .250-IN LG, FL HD	28480	2200-0140
7	2200-0109	8	Screw, Mach, 4-40, .438-IN LG, PAN HD	28480	2200-0109
8	86701-00054	8	Spacer-Sampler (Between TB1 and U1)	28480	86701-00054
9	85660-20204	0	Housing, Phase Lock Assembly	28480	85660-20204
10	85660-20205	1	Cover, Rear, Phase Lock Assembly	28480	85660-20205
11	85660-80061	3	Insulating Shield, Plastic	28480	85660-80061
12	2200-0148	5	Screw, Mach, 4-40, .500-IN LG, FL HD	28480	2200-0148

FIGURE 1. A6A9 PHASE LOCK ASSEMBLY, PARTS IDENTIFICATION (2 OF 2)

ManualsPlus.com



A6A9

FIGURE 2. A6A9 PHASE LOCK, BLOCK DIAGRAM

ManualsPlus.com

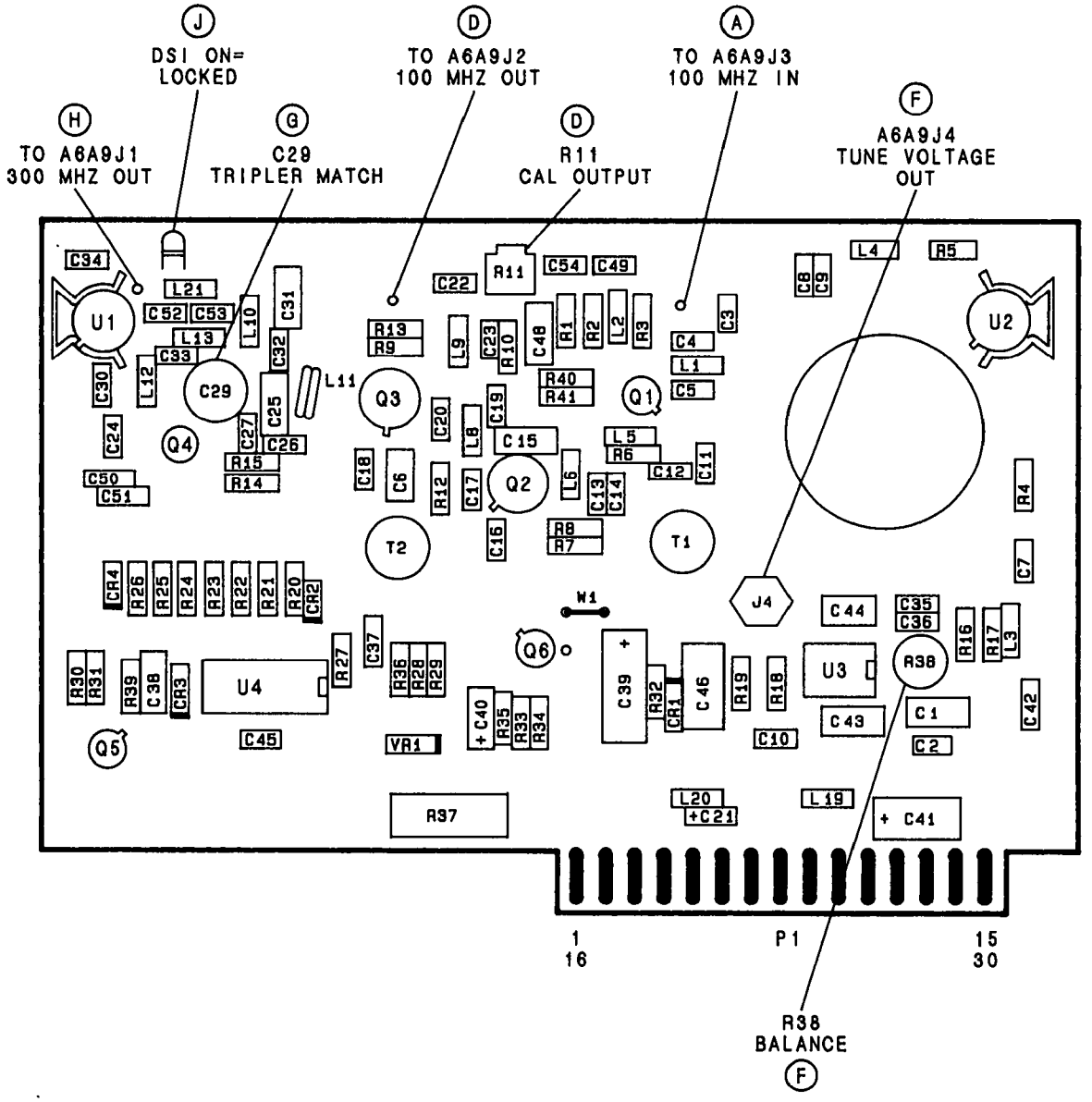


FIGURE 3. A6A9A1 PHASE LOCK BOARD, COMPONENT LOCATIONS

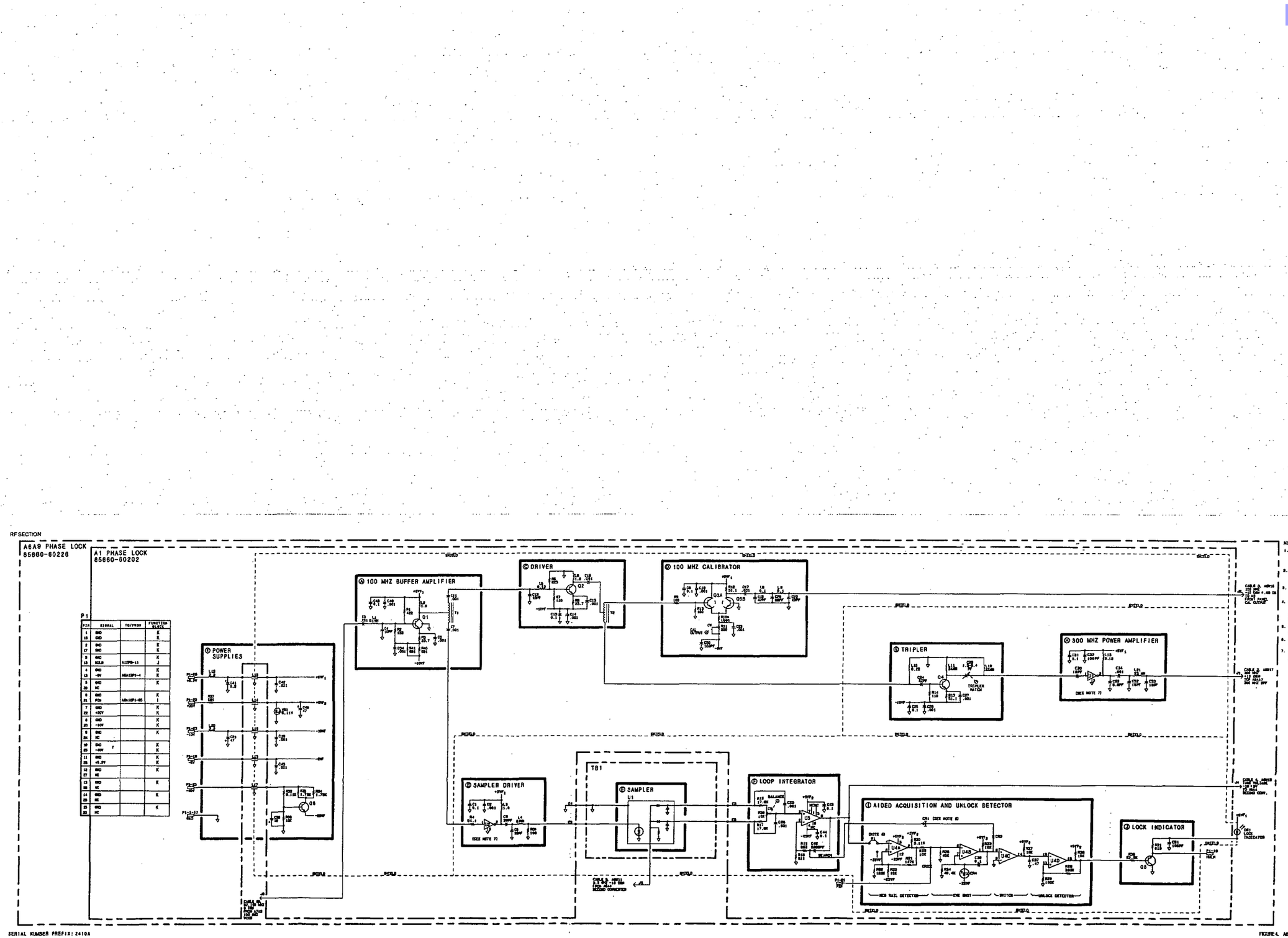
ManualsPlus.com

A6A9 PHASE LOCK
85660-60228

A1 PHASE LOCK
85660-60202

P1

PIN	SIGNAL	TO/FROM	FUNCTION SHEET
1	GND		K
2	GND		K
17	GND		K
3	GND		K
18	VLO	A1P9-11	J
4	GND		K
19	-9V	A9A13P3-4	K
5	GND		K
20	NC		K
6	GND		K
21	PIN	A9A10P1-65	I
7	GND		K
22	+20V		K
8	GND		K
23	-10V		K
9	GND		K
24	NC		K
10	GND	7	K
25	-20V		K
11	GND		K
26	+5.2V		K
12	GND		K
27	NC		K
13	GND		K
28	NC		K
14	GND		K
29	NC		K
15	GND		K
30	NC		K



NOTES:

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE PREFIXED WITH THE NUMBER 9 FOR IDENTIFICATION WITH SCHEMATIC DIAGRAMS.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS, CAPACITANCE IN MICROFARADS (μF), INDUCTANCE IN MICROHENRIES (μH).
3. DASHED LINES IN SHIELDS ENCLOSE ASSEMBLIES AND INDICATE SIGNAL PATH. SOLID LINES ENCLOSE SECTIONS OF FUNCTIONAL BLOCKS.
4. MNEMONIC TABLE:

MNEMONIC	DESCRIPTION
MLB	MICROWAVE LOCK BOARD (ALSO KNOWN AS MCB)

5. CR1 IS A CURRENT REGULATOR DIODE. IT FUNCTIONS AS A CONSTANT CURRENT SOURCE.
6. R1 IN USED TO JUMPER PIN 4 OF U44 TO -20VP FOR TROUBLESHOOTING.
7. R1 AND C2 ARE NOT INSTALLED WHEN A 5C8 SYNTHESIZER IS USED IN THE 8340. THEY MUST BE INSTALLED WHEN A 5C7 IS USED.

A6A9

FIGURE 4. A6A9 PHASE LOCK, SCHEMATIC DIAGRAM

SERIAL NUMBER PREFIX: 2410A

ManualsPlus.com

A6A10 Miscellaneous Biss/Relay Driver

ManualsPlus.com

A6A10 MISCELLANEOUS BIAS/RELAY DRIVER, CIRCUIT DESCRIPTION

This assembly is a collection of circuits necessary for proper operation of other assemblies in the A6 RF Module. It contains nine circuits: 1) YTX Diode Bias; 2) YTX Linearity Correction, 3) 3.3 GHz Oscillator Driver, 4) PIN Switch Driver, 5) Band Step Gains, 6) RF Switch Driver, 7) RF Attenuator Driver, 8) +22V Delay, and 9) Power Down.

YTX Diode Bias (G)

To maintain the precise diode bias across the mixer diode, the effects of series resistance between the bias circuit and the diode must be eliminated. To do this, a negative impedance voltage source U2 is used.

Voltage bias to the YTX diode is adjusted from band to band via R9, R12, R15, and R18. This voltage is applied to U2 via FET switches Q6, Q7, Q8, and Q10. U2 has both positive and negative feedback. The positive feedback is controlled by R43, R46, and R47, while the negative feedback is via R45. The fact that the positive feedback and the negative feedback are picked off across R44 causes a negative impedance at pin P1-7 proportional to the amplifier gain and R44.

YTX Linearity Correction (D)

Due to nonlinearities in the YTX magnet structure, some linearity correction must be made. This is accomplished by placing resistors in parallel with the current sense resistor in the YTX coil driver circuit. These parallel resistors increase the coil current slightly. For current compensation, both the point of compensation and the magnitude of compensation must be varied.

This is accomplished in the following manner using U7D as a typical circuit: U7D is an ideal zener circuit, that is, as long as the YTX linearity voltage is less negative than the voltage on U7 pin 12 (the positive op amp input) diode CR5 is reverse biased. In this state, the YTX linearity line sees a high impedance and no compensation occurs. When the YTX linearity voltage goes more negative than the bias on U7 pin 12, diode CR5 is forward biased and U7D becomes a voltage follower maintaining the voltage at the cathode of CR5 at the same voltage as on U7 pin 12. In this situation, R32 and R31 are effectively in parallel with the current sense resistor of the coil driver circuit. R31 is used to adjust the magnitude of compensation, while R40 is used to adjust the frequency at which the compensation occurs. In a similar manner, U7A, B, C are used to correct for higher frequency nonlinearity.

PIN Switch Driver (F)

The PIN switch driver converts the TTL logic level LO-Band signal to the +20V/-10V signal required by the Second Converter. The TTL level at P1-34 is input to the base of Q21. A high at the base of Q21 turns Q21 on, turning on Q4, which pulls the collector of Q4 to approximately +20V. This turns on Q3, providing the +20V signal to the PIN drive output, P1-35. A low input on the LO-Band TTL input turns Q21 off, which turns Q4 off. The collector of Q4 then goes low, turning on Q2, and pulling the PIN drive line to -10V.

3.3 GHz Oscillator Driver (H)

The PIN drive signal is also used to turn the 3.3 GHz oscillator on in LO-Band, off in the HI-Band mode. When the PIN drive goes high, Q1 is turned on which pulls its collector to -10V. The -10V is the negative bias for the 3.3 GHz oscillator. When the PIN drive goes low, Q1 is turned off, dropping the oscillator bias current to zero, which turns off the 3.3 GHz oscillator. In the on state, resistor R1 is used to adjust the oscillator bias current.

RF Switch Driver (E)

The YTX LO-Band RF switch is driven by darlington amplifiers U5E, and U5F. A high input on the LO-Band line drives the outputs of U5F low, and U5E high. A low output at U5F drives the LO-HI Band relay to the LO-

ManualsPlus.com

Band position. The reverse occurs with a low input which drives U5E's output low which forces the RF relay to the HI-Band position.

Band Step Gains (I)

To correct for different conversion efficiencies and gains in the individual frequency bands, the IF gain is changed. This is done in the A6A3 Last Converter by varying the current through PIN attenuator diodes in the 21.4 MHz amplifier. This current is controlled by Q12, Q14 – Q17, and Q19. In LO-Band, the high output on the PIN drive line breaks down zener VR1 and turns on Q12. This applies –40V to the potentiometer R21. Adjusting R21 varies the current in the step gain in LO-Band.

The gain of A6A3 Last Converter is adjusted in each band as each transistor, Q12, Q14 – Q17, and Q19, is turned on for each individual band.

RF Attenuator Driver (C)

The RF attenuator driver is similar to the LO-HI Band relay driver. The major difference is the logic decoding to the inputs of the darlington switch drivers. The input to the logic circuit is the standard 10, 20, 40 dB attenuation logic levels. The logic circuit U1 decodes this to the 10, 20, 20, 20, dB attenuation logic levels required to drive the RF attenuator. The output drivers consist of darlington amplifiers driven by the outputs of U1 or the inverted outputs of U1, via U3. A low output of a darlington turns that line on. That is, a low at U5D pin 13, coupled with high at U4F pin 11, enables the 10 dB attenuation position, and so forth.

Power Down (A)

The power down circuit switches the RF attenuator into a 40 dB attenuation position to prevent accidental damage to A6A8 YTX or A6A4 Second Converter from an input signal when the instrument is off. When the power up signal goes low, U3 pin 10 is driven high which turns on Q9 and Q13, forcing U1 pins 5, 6, and 9, U4 pin 7, and U3 pin 5 high. This forces at least the last two 20 dB attenuation stages in the attenuator on.

+22V Delay (B)

On power up, the instrument goes through a self-check program. To prevent the RF relays and the attenuator from chattering during this time, the +22 volt bias to the attenuator and RF switch is delayed for about 2.5 seconds after the power up signal goes high. This delay is caused by R59 and C10. When power up goes high, it takes approximately 2.5 seconds for the voltage across C10 to charge up enough to turn on U3E. U3E output is inverted twice by the darlington amplifiers U4B and U4A so that when U3E output drops, U4A output also drops turning on Q11 which applies the +22V to the relay circuits.

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A10	85660-60180	5	1	BOARD ASSEMBLY, MISCELLANEOUS BIAS/RELAY DRIVER	28480	85660-60180
A6A10C1	0160-2055	9	2	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A6A10C2	0180-2206	4	1	CAPACITOR-FXD 60UF+-10% 6VDC TA	56289	150D606X9006B2
A6A10C3	0180-2208	6	1	CAPACITOR-FXD 220UF+-10% 10VDC TA	56289	150D227X9010S2
A6A10C4	0180-0116	1	2	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A6A10C5	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A6A10C6	0160-4441	1	2	CAPACITOR-FXD .47UF +-10% 50VDC CER	28480	0160-4441
A6A10C7	0160-3879	7	2	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A10C8	0180-0097	7	1	CAPACITOR-FXD 47UF+-10% 35VDC TA	56289	150D476X9035S2
A6A10C9	0160-4441	1		CAPACITOR-FXD .47UF +-10% 50VDC CER	28480	0160-4441
A6A10C10	0180-0228	6	3	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A6A10C11	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A6A10C12	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A10C13	0180-0228	6		CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A6A10C14				NOT ASSIGNED		
A6A10C15	0180-0228	6		CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A6A10CR1	1901-1067	4	20	DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR2	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR3	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR4	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR5	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR6	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR7	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR8	1901-0535	9	8	DIODE-SM SIG SCHOTTKY	28480	1901-0535
A6A10CR9	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A6A10CR10	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR11	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A6A10CR12	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A6A10CR13	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A6A10CR14	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A6A10CR15	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR16	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A6A10CR17	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A6A10CR18	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR19	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR20	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR21	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR22	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR23	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR24	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR25	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR26	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR27	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10CR28	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A10Q1	1854-0477	7	12	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A10Q2	1853-0281	9	3	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A6A10Q3	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A10Q4	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A6A10Q5	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A10Q6	1855-0420	2	4	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A6A10Q7	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A6A10Q8	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A6A10Q9	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A10Q10	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A6A10Q11	1853-0213	7	1	TRANSISTOR PNP 2N4236 SI TO-5 PD=1W	04713	2N4236
A6A10Q12	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A10Q13	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A6A10Q14	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A10Q15	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A10Q16	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A10Q17	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A10Q18	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A10Q19	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A10Q20	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A10Q21	1854-0472	2	1	TRANSISTOR NPN SI DARL PD=500MW	04713	MPS-A14
A6A10R1	2100-2574	3	1	RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	30983	ET50X501
A6A10R2	0698-7260	7	17	RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R3	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R4	0698-7277	6	5	RESISTOR 51.1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5112-F
A6A10R5	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F

*Indicates Factory Selected Value

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A10R6	0757-0346	2	5	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A6A10R7	0698-7243	6	5	RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-F
A6A10R8	0698-7266	3	1	RESISTOR 17.8K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1782-F
A6A10R9	2100-0545	4	4	RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	32997	3292X-1-102
A6A10R10	0698-7281	2	4	RESISTOR 75K 2% .05W F TC=0+-100	24546	C3-1/8-T0-7502-G
A6A10R11	0699-0127	3	4	RESISTOR 464K 1% .05W F TC=0+-100	28480	0699-0127
A6A10R12	2100-0545	4		RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	32997	3292X-1-102
A6A10R13	0698-7281	2		RESISTOR 75K 2% .05W F TC=0+-100	24546	C3-1/8-T0-7502-G
A6A10R14	0699-0127	3		RESISTOR 464K 1% .05W F TC=0+-100	28480	0699-0127
A6A10R15	2100-0545	4		RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	32997	3292X-1-102
A6A10R16	0698-7281	2		RESISTOR 75K 2% .05W F TC=0+-100	24546	C3-1/8-T0-7502-G
A6A10R17	0699-0127	3		RESISTOR 464K 1% .05W F TC=0+-100	28480	0699-0127
A6A10R18	2100-0545	4		RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	32997	3292X-1-102
A6A10R19	0698-7281	2		RESISTOR 75K 2% .05W F TC=0+-100	24546	C3-1/8-T0-7502-G
A6A10R20	0699-0127	3		RESISTOR 464K 1% .05W F TC=0+-100	28480	0699-0127
A6A10R21	2100-3611	1	6	RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	32997	3292X-1-503
A6A10R22	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R23	2100-3611	1		RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	32997	3292X-1-503
A6A10R24	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R25	2100-3611	1		RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	32997	3292X-1-503
A6A10R26	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R27	2100-3611	1		RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	32997	3292X-1-503
A6A10R28	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R29	2100-3611	1		RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	32997	3292X-1-503
A6A10R30	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R31	2100-1661	7	8	RESISTOR-TRMR 20K 5% WW SIDE-ADJ 22-TRN	32997	3057P-1-203
A6A10R32	0757-0416	7	5	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A10R33	0698-3260	9	4	RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A6A10R34	2100-1661	7		RESISTOR-TRMR 20K 5% WW SIDE-ADJ 22-TRN	32997	3057P-1-203
A6A10R35	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A10R36	0698-3260	9		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A6A10R37	2100-1661	7		RESISTOR-TRMR 20K 5% WW SIDE-ADJ 22-TRN	32997	3057P-1-203
A6A10R38	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A10R39	0698-3260	9		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A6A10R40	2100-1661	7		RESISTOR-TRMR 20K 5% WW SIDE-ADJ 22-TRN	32997	3057P-1-203
A6A10R41	2100-1661	7		RESISTOR-TRMR 20K 5% WW SIDE-ADJ 22-TRN	32997	3057P-1-203
A6A10R42	2100-1661	7		RESISTOR-TRMR 20K 5% WW SIDE-ADJ 22-TRN	32997	3057P-1-203
A6A10R43	0698-7277	6		RESISTOR 51.1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5112-F
A6A10R44	0757-0316	6	1	RESISTOR 42.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-42R2-F
A6A10R45	0698-7243	6		RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-F
A6A10R46	0698-7277	6		RESISTOR 51.1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5112-F
A6A10R47	0698-7258	3	1	RESISTOR 8.25K 1% .05W F TC=0+-100	24546	C3-1/8-T0-8251-F
A6A10R48	0698-7243	6		RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-F
A6A10R49	0698-7242	5	1	RESISTOR 1.78K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1781-F
A6A10R50	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R51	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R52	0757-1078	9	1	RESISTOR 1.47K 1% .5W F TC=0+-100	28480	0757-1078
A6A10R53	0698-7212	9	3	RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-F
A6A10R54	0757-0442	9	1	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A10R55				NOT ASSIGNED		
A6A10R56	0698-7246	9	1	RESISTOR 2.61K 1% .05W F TC=0+-100	24546	C3-1/8-T0-2611-F
A6A10R57	0698-7238	9	2	RESISTOR 1.21K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1211-F
A6A10R58	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R59	0698-3454	3	1	RESISTOR 215K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2153-F
A6A10R60	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A10R61	0698-7243	6		RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-F
A6A10R62	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A6A10R63	0698-7212	9		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-F
A6A10R64	0698-7243	6		RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-F
A6A10R65	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A6A10R66	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A6A10R67	0757-0398	4	1	RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A6A10R68	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A6A10R69	0698-7212	9		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-F
A6A10R70	2100-1661	7		RESISTOR-TRMR 20K 5% WW SIDE-ADJ 22-TRN	32997	3057P-1-203
A6A10R71	0698-3260	9		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A6A10R72	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A10R73	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R74	0698-7230	9		RESISTOR 1.21K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1211-F
A6A10R75	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R76	2100-1661	7		RESISTOR-TRMR 20K 5% WW SIDE-ADJ 22-TRN	32997	3057P-1-203
A6A10R77	0698-7277	6		RESISTOR 51.1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5112-F
A6A10R78	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R79	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R80	0698-7277	6		RESISTOR 51.1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5112-F

*Indicates Factory Selected Value

ManualsPlus.com

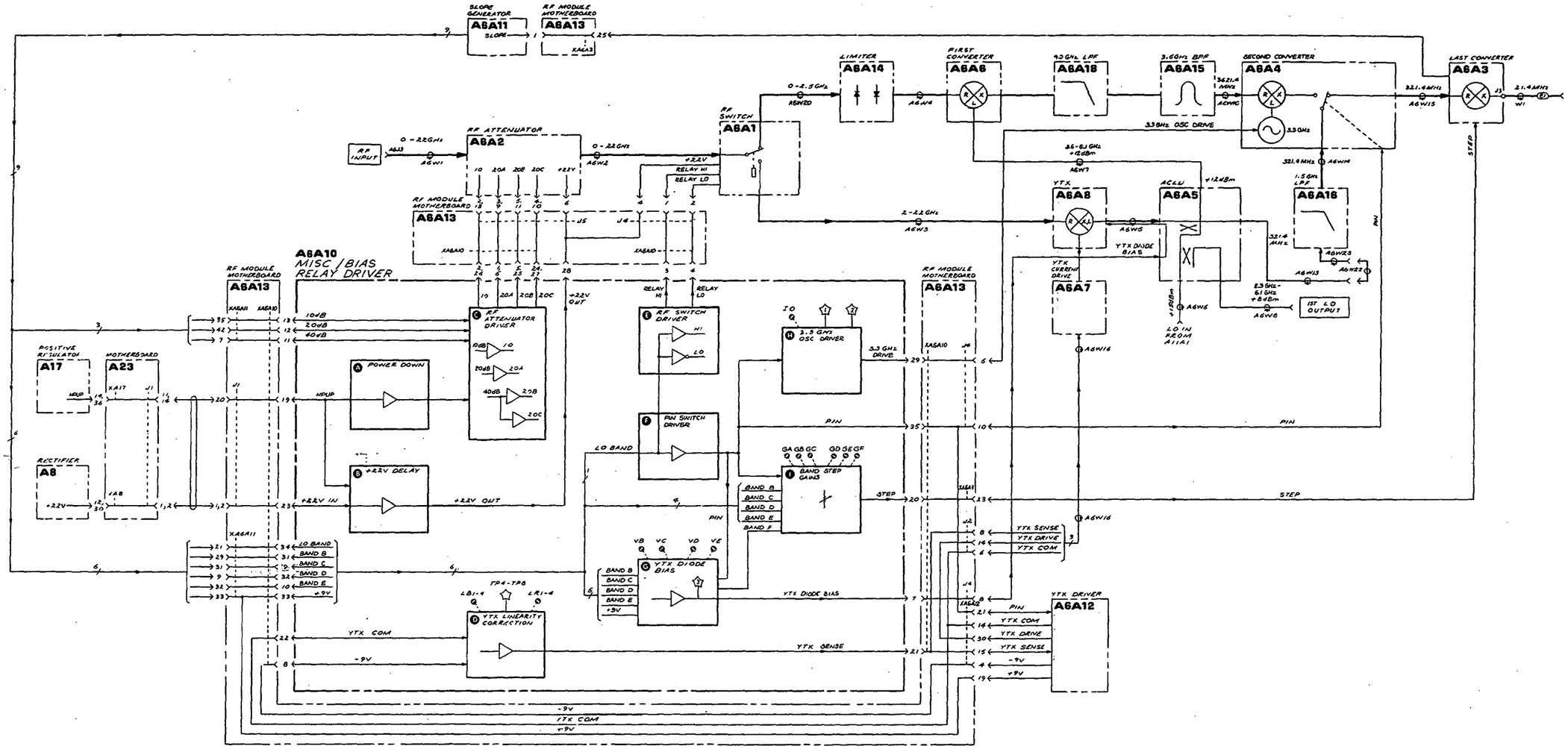
TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A10R81	2100-3611	1		RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	32997	3292X-1-503
A6A10R82	0698-3153	9	1	RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A6A10R83	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10R84	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A6A10TP1	1251-0600	0	8	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A10TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A10TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A10TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A10TP5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A10TP6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A10TP7	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A10TP8	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A10U1	1820-1538	2	1	IC GATE CMOS NAND QUAD 2-INP	3L585	CD4011AF
A6A10U2	1826-1058	3	1	IC OP AMP GP 8-TO-99 PKG	28480	1826-1058
A6A10U3	1820-1542	8	1	IC BFR CMOS INV HEX 1-INP	3L585	CD4049AF
A6A10U4	1858-0047	5	2	TRANSISTOR ARRAY 16-PIN PLSTC DIP	13606	ULN-2003A
A6A10U5	1858-0047	5		TRANSISTOR ARRAY 16-PIN PLSTC DIP	13606	ULN-2003A
A6A10U6	1810-0206	8	1	NETWORK-RES 8-SIP10.0K OHM X 7	01121	208A103
A6A10U7	1826-0161	7	1	IC OP AMP GP QUAD 14-DIP-P PKG	04713	MLM324P
A6A10VR1	1902-3323	1	1	DIODE-ZNR 42.2V 5% DO-35 PD=.4W TC=+.08%	28480	1902-3323
A6A10VR2	1902-3301	5	4	DIODE-ZNR 34.8V 5% DO-35 PD=.4W	28480	1902-3301
A6A10VR3	1902-3301	5		DIODE-ZNR 34.8V 5% DO-35 PD=.4W	28480	1902-3301
A6A10VR4	1902-3301	5		DIODE-ZNR 34.8V 5% DO-35 PD=.4W	28480	1902-3301
A6A10VR5	1902-3301	5		DIODE-ZNR 34.8V 5% DO-35 PD=.4W	28480	1902-3301
A6A10VR6	1902-3203	6	1	DIODE-ZNR 14.7V 5% DO-35 PD=.4W	28480	1902-3203
A6A10VR7	1902-3345	7	1	DIODE-ZNR 51.1V 5% DO-35 PD=.4W	28480	1902-3345
A6A10VR8	1902-0025	4	1	DIODE-ZNR 10V 5% DO-35 PD=.4W TC=+.06%	28480	1902-0025
A6A10VR9	1902-3234	3	1	DIODE-ZNR 19.6V 5% DO-35 PD=.4W	28480	1902-3234
				MISCELLANEOUS PARTS		
	4040-0748	3	1	EXTR PC BD BLK	28480	4040-0748
	4040-0749	4	1	EXTR PC BD BRN	28480	4040-0749

*Indicates Factory Selected Value

ManualsPlus.com

RF SECTION



A6A10

FIGURE 1. A6A10 MISCELLANEOUS BIAS/RELAY DRIVER, BLOCK DIAGRAM

ManualsPlus.com

A6A10
MISCELLANEOUS BIAS/RELAY DRIVER
85660-60180

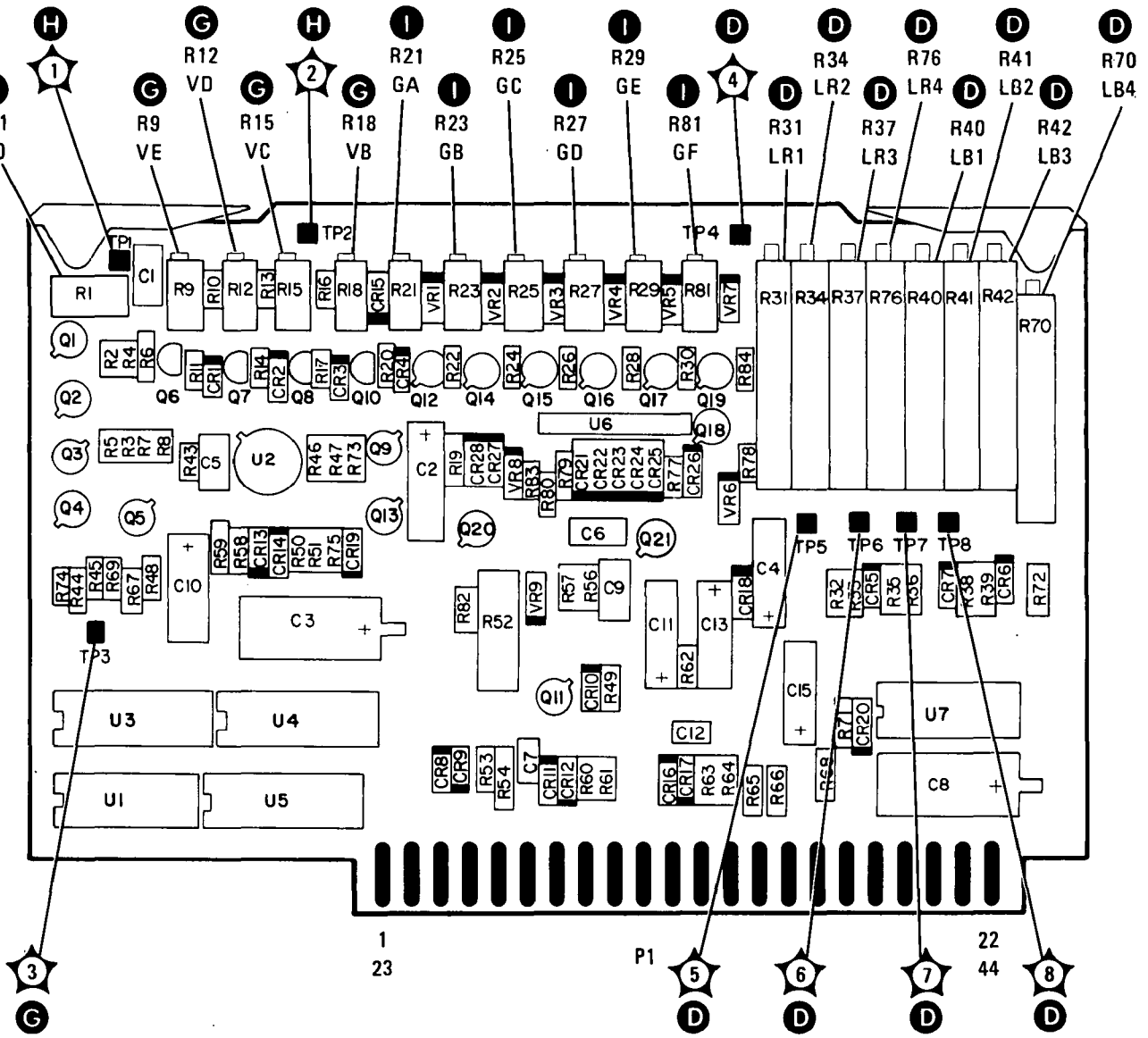


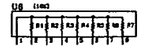
FIGURE 2. A6A10 MISCELLANEOUS BIAS/RELAY DRIVER, COMPONENT LOCATIONS

ManualsPlus.com

A6A10 MISCELLANEOUS BIAS/RELAY DRIVER
85660-60180

P1

P1#	SIGNAL	TO/FROM	FUNCTION BLOCK
1	+5A+S	A6A2	C
21	+22V IN	A6P1-12,36	B
2	10-S	A6A2	C
24	BCC-S	A6A2	C
3	RELAY K3	A6A1	E
23	7MA-1	A6A2	C
4	RELAY LO	A6A3	E
26	10-S	A6A2	C
5	ESB-S	A6A2	C
27	ESC-1	A6A2	C
6	2EA-1	A6A2	C
28	+22V OUT	A6A2	B
7	YTX BIAS	A6A9	G
29	3.3 GHZ DRIVE	A6A4	H
8	-9V	A6A13P1-4	D
30	NC		
9	BAND C	A6A11P1-21	G
31	BAND B	A6A11P1-28	G
10	BAND E	A6A11P1-32	G
32	BAND D	A6A11P1-8	G
11	+8 DB	A6A11P1-7	C
33	+8V	A6A11P1-18	G
12	20 DB	A6A11P1-43	C
34	LO BAND	A6A11P1-21	F
13	10 DB	A6A11P1-25	C
35	PIN	A6A4 A6A11P1-10 A6A12P1-13	F
14	+20V		J
36	+20V		J
15	-10V		J
37	-10V		J
16	GND		J
38	GND		J
17	-42V		J
39	-42V		J
18	+5.2V		J
40	+5.2V		J
19	MPUP	A6A13J1-25	A
41	NC		
20	STEP	A6A3A1P1-20	I
42	NC		
21	YTX SENSE	A6A7J2-6	D
43	NC		
22	YTX CODE	A6A12P1-14	D
44	NC		

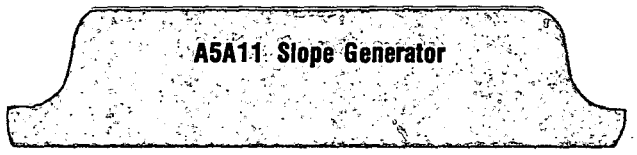
NOTES:
1. REFERENCE DESIGNATORS WITHIN ASSEMBLIES ARE UNIQUE. FOR EXAMPLE, A2R1 IDENTIFIES R1 WITHIN A2. ASSEMBLY PREFIX ABBREVIATION WITH HASHMARK ("#") OMITTED.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS, 1/4W, 5%. CAPACITANCE IN UF. INDUCTANCE IN MICROHENRYS (UH).
3. UNLESS OTHERWISE INDICATED: DIGITAL SIGNALS AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCK.
4. NEGATIVE TRUE LOGIC ON OUTPUTS.
5. U8 PIN CONFIGURATION:

6. USE IS NOT USED. PIN E IS CONNECTED TO GROUND. PIN 15 IS NOT CONNECTED.
7. MNEMONICS TABLE:

MNEMONIC	DESCRIPTION
MPUP	A13—POWER UP

A6A10

FIGURE 3. A6A10 MISCELLANEOUS BIAS/RELAY DRIVER, SCHEMATIC DIAGRAM

ManualsPlus.com



ManualsPlus.com

A6A11 SLOPE GENERATOR, CIRCUIT DESCRIPTION

The slope generator takes a voltage which is proportional to YTX frequency and produces a current to control the slope attenuator in the A6A3 Last Converter, which corrects for conversion loss variations of the input mixer within each band. The slope generator also has circuitry which decodes bandswitch and attenuator settings, produces pulses for the sample and hold, and hysteresis circuits in the A6A12 YTX Driver, produces the YTX peaking signal for the YTX Driver, and a signal to switch in the filter capacitor on the A6A7 YTX Current Driver.

Bandswitch and Attenuator Decode (A)

U9 is a hex latch which receives six lines from the 50-wire Instrument Bus and a strobe, LCK2, which goes low when the six lines have valid RF Module information. Three of the latch outputs have attenuator setting information and go to the A6A10 Miscellaneous Bias/Relay Driver. The other three lines have bandswitch information which is decoded by U3A and U3B.

U3B decodes the low band (Band A, 0 – 2.5 GHz) and the external mixer band (BAND F). When pin 2 of U9 is high and pin 12 is low, the LO BAND is selected. The output of U3B is high, turning Q22 on, bringing the collector of Q22 low. This turns Q19 off, bringing the collector of Q19 (LO BAND) high. This information goes to the A6A10 Miscellaneous Bias/Relay Driver to control the RF input switch. Q20 inverts the signal and drives amplifier U4A, producing a signal which is approximately +17V when Band A is valid and approximately -8V otherwise. This signal is used throughout the A6A11 Slope Generator. When pins 2 and 12 of U9 are both high, BAND F is active. The output of U3B is low, turning Q22 off, and bringing the collector of Q22 (and BAND F line) high. At the same time, Q19 turns on, bringing the LO BAND line low.

U3A decoder is enabled when pin 2 of U9 is low. Pins 5 and 12 of U9 have coded information giving harmonic numbers as shown in Table 1.

TABLE 1. BANDSWITCH DECODING

BAND	B2 (PIN 12)	B1 (PIN 5)	N
B	0	1	1
C	1	0	2
D	1	1	3
E	0	0	4

This information is decoded by U3A and amplified by U5. The outputs of U5 are approximately +3V when a band is valid and approximately -22V otherwise. These signals are used to drive FET switches on the A6A11 Slope Generator and the A6A12 YTX Driver.

Preselector Peak (B)

A second latch, U10, receives the same six lines as U9, but receives a different strobe, LCK5. This strobe is valid when the six lines have preselector peaking information. The outputs of this latch drive six bits of a DAC which produces 0 to 10V at the output of U4B. This voltage goes to the A6A12 YTX Driver. This circuit is used to adjust the tracking of the YTX in an automatic routine.

Hysteresis, Sample-Hold Control, and Filter Capacitor (D)

U8 is a Quad D-Latch which is used to decode information relating to Hysteresis, Sample and Hold, and Filter Capacitor information. Four lines from the 50-wire Instrument Bus go to the inputs of the latch. The latch is

ManualsPlus.com

strobed when these lines have valid RF Module information. The instrument controller is able to connect the filter capacitor across the YTX, and control the Hysteresis and Sample and Hold circuits on the YTX Driver.

Slope Offset (C)

U7 receives the −.525V/GHz signal from the A6A12 YTX Driver, amplifies and offsets it such that a ramp centered about 6V is produced at TP8. Q11 – Q15 and associated circuitry produce the offset for each band.

Slope Breakpoint Generator (E)

The signal at TP8 has a maximum range on Band C (5.8 – 12.5 GHz, second harmonic) of approximately 0 – 12V. This signal is applied to two voltage dividers R36/R37 and R38/R39 which drive the positive inputs to U6A and U6B respectively. The voltage at the inputs to these op amps is clamped by CR5 and CR6 such that U6A sees only the first half of the full band ramp and U6B sees only the second half. In this manner, each full band is divided into two segments with one breakpoint in the center.

Upper Segment Generator (F) and Lower Segment Generator (G)

The outputs of U6 drive variable gain amplifiers as shown in Figure 1:

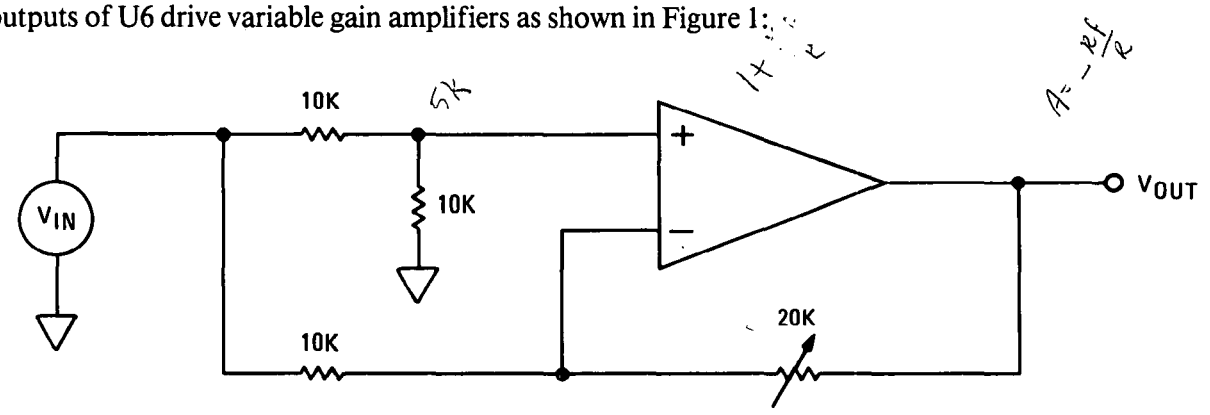


FIGURE 1. VARIABLE GAIN AMPLIFIER, SIMPLIFIED SCHEMATIC

When the 20K potentiometer is set to zero, the amplifier has a gain of +1/2; when set to 20K, the gain is −1/2; and when set to 10K, the gain is zero. FETs Q1 – Q10 switch in different 20K potentiometers for the five bands. The outputs for the two segments at U2 are summed together in U1. A waveform similar to Figure 2 is present at the output of U2B if a full band is swept (e.g. 5.8 – 12.5 GHz), and the oscilloscope horizontal input is connected to the sweep output of the analyzer. Similarly, the output of U2A will appear as shown in Figure 3.

Slope Output (H)

Both waveforms (Figures 2 and 3) are summed together at U1 to form a current source with Q16 to drive the slope attenuator in the A6A3 Last Converter. The average output current is set by slope gain adjustment R84.

The slope attenuator in the A6A3 Last Converter varies the gain of the 21.4 MHz IF with the collector current of Q16 providing gain correction that varies with frequency. Within each band, there is independent control over two halves of the band, and IF gain that increases or decreases with increasing frequency.

When Band F (external mixer) is selected, Q18 and Q21 provide additional gain to make up for the conversion loss of the external mixer.

ManualsPlus.com

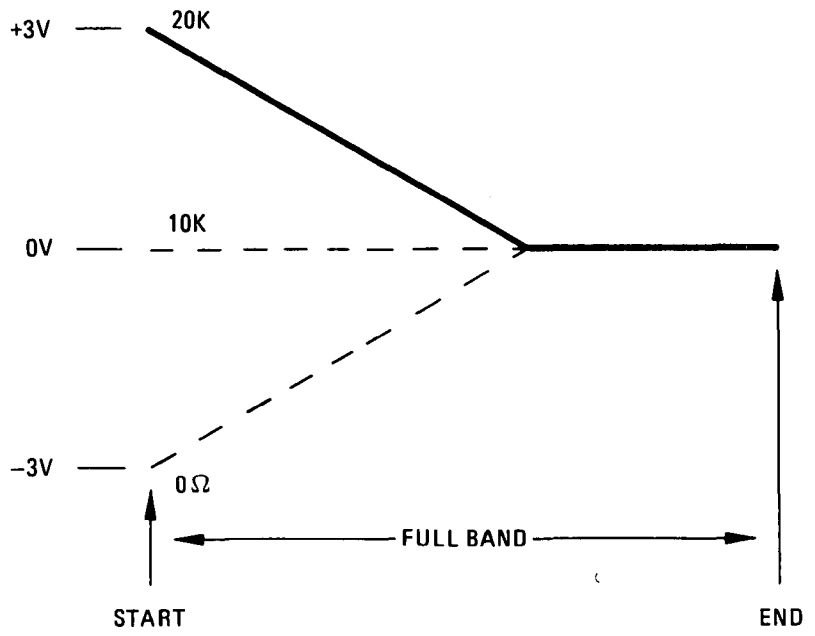


FIGURE 2. U2B OUTPUT WAVEFORM

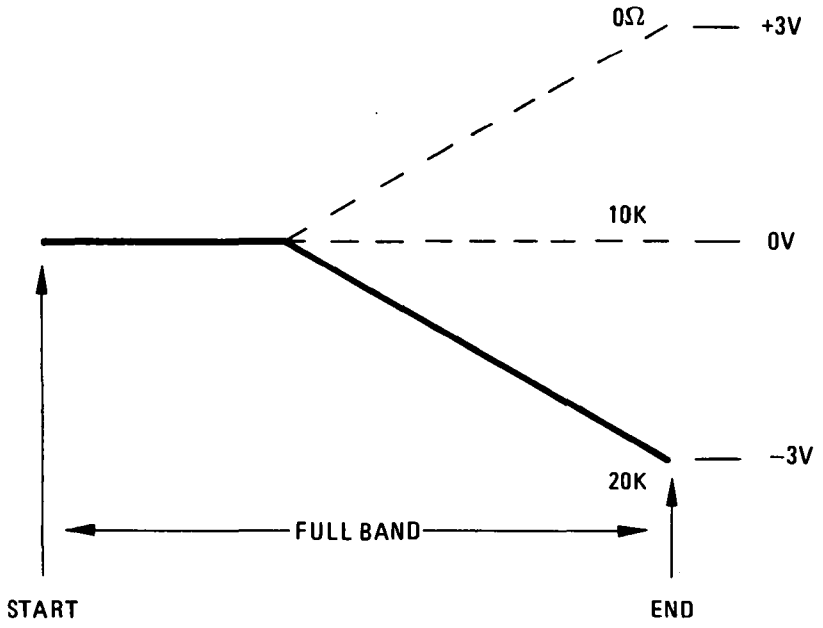


FIGURE 3. U2A OUTPUT WAVEFORM

ManualsPlus.com

TABLE 2. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A11	05660-60126	9	1	BOARD ASSEMBLY, SLOPE GENERATOR	28480	05660-60126
A6A11C1	0180-0291	3	1	CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A6A11C2	0160-3877	5	1	CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A6A11C3	0180-0229	7	1	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A6A11C4	0180-0116	1	2	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A6A11C5	0180-1746	5	1	CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A6A11C6	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A6A11CR1	1901-1067	4	16	DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR2	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR3	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR4	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR5	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR6	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR7	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR8	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR9	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR10	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR11	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR12	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR13	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR14	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR15	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR16	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A11CR17	1901-0518	8	1	DIODE-SM SIG SCHOTTKY	28480	1901-0518
A6A11Q1	1855-0414	4	10	TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A11Q2	1855-0414	4		TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A11Q3	1855-0414	4		TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A11Q4	1855-0414	4		TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A11Q5	1855-0414	4		TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A11Q6	1855-0414	4		TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A11Q7	1855-0414	4		TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A11Q8	1855-0414	4		TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A11Q9	1855-0414	4		TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A11Q10	1855-0414	4		TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A11Q11	1854-0477	7	9	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A11Q12	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A11Q13	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A11Q14	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A11Q15	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A11Q16	1854-0637	1	1	TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A6A11Q17	1853-0281	9	4	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A6A11Q18	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A6A11Q19	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A11Q20	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A11Q21	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A11Q22	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A11Q23	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A6A11Q24	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A6A11R1	0757-0440	7	1	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A6A11R2*	0698-3453	2	1	RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A6A11R3	0757-0465	6	23	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R4	0698-3260	9	2	RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A6A11R5	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R6	0757-0199	3	1	RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A6A11R7	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R8	0757-0290	5	2	RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A6A11R9	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R10	0698-3150	6	1	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A6A11R11	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R12	0757-0442	9	20	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R13	0757-0123	3	1	RESISTOR 34.8K 1% .125W F TC=0+-100	28480	0757-0123
A6A11R14	0698-0084	9	1	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A6A11R15	0757-0280	3	8	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A11R16	0757-1094	9	1	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A6A11R17	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A11R18	0757-0416	7	4	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A11R19	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A11R20	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A11R21	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R22	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R23	0698-3260	9		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A6A11R24-A6A11R35				NOT ASSIGNED		

*Indicates Factory Selected Value

ManualsPlus.com

TABLE 2. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A11R36	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R37	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R38	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R39	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R40	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R41	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R42	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R43	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R44	0698-0085	0	1	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A6A11R45	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R46	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R47	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R48	2100-3353	8	10	RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A6A11R49	0683-3955	8	10	RESISTOR 3.9M 5% .25W FC TC=-900/+1100	01121	CB3955
A6A11R50	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R51	2100-3353	8		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A6A11R52	0683-3955	8		RESISTOR 3.9M 5% .25W FC TC=-900/+1100	01121	CB3955
A6A11R53	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R54	2100-3353	8		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A6A11R55	0683-3955	8		RESISTOR 3.9M 5% .25W FC TC=-900/+1100	01121	CB3955
A6A11R56	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R57	2100-3353	8		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A6A11R58	0683-3955	8		RESISTOR 3.9M 5% .25W FC TC=-900/+1100	01121	CB3955
A6A11R59	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R60	2100-3353	8		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A6A11R61	0683-3955	8		RESISTOR 3.9M 5% .25W FC TC=-900/+1100	01121	CB3955
A6A11R62	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R63	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R64	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R65	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R66	2100-3353	8		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A6A11R67	0683-3955	8		RESISTOR 3.9M 5% .25W FC TC=-900/+1100	01121	CB3955
A6A11R68	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R69	2100-3353	8		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A6A11R70	0683-3955	8		RESISTOR 3.9M 5% .25W FC TC=-900/+1100	01121	CB3955
A6A11R71	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R72	2100-3353	8		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A6A11R73	0683-3955	8		RESISTOR 3.9M 5% .25W FC TC=-900/+1100	01121	CB3955
A6A11R74	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R75	2100-3353	8		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A6A11R76	0683-3955	8		RESISTOR 3.9M 5% .25W FC TC=-900/+1100	01121	CB3955
A6A11R77	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R78	2100-3353	8		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A6A11R79	0683-3955	8		RESISTOR 3.9M 5% .25W FC TC=-900/+1100	01121	CB3955
A6A11R80	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R81	0698-3136	8	2	RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A6A11R82	0698-3136	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A6A11R83	0698-3159	5	1	RESISTOR 26.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2612-F
A6A11R84	2100-3273	1	1	RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	28480	2100-3273
A6A11R85	0698-3156	2	2	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A6A11R86	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A11R87				NOT ASSIGNED		
A6A11R88	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A6A11R89	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R90	0757-0430	3	3	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A11R91	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A11R92	0757-0290	5		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A6A11R93	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A11R94	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A11R95	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A11R96	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A11R97	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R98	0698-3157	3	4	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A6A11R99	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A6A11R100	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A6A11R101	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A6A11R102	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R103	0757-0463	4	1	RESISTOR 82.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8252-F
A6A11R104	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A11R105	0757-0430	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A11R106	0757-0200	7	1	RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A6A11R107	0757-0346	2	4	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A6A11R108	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A6A11R109	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A6A11R110	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F

*Indicates Factory Selected Value

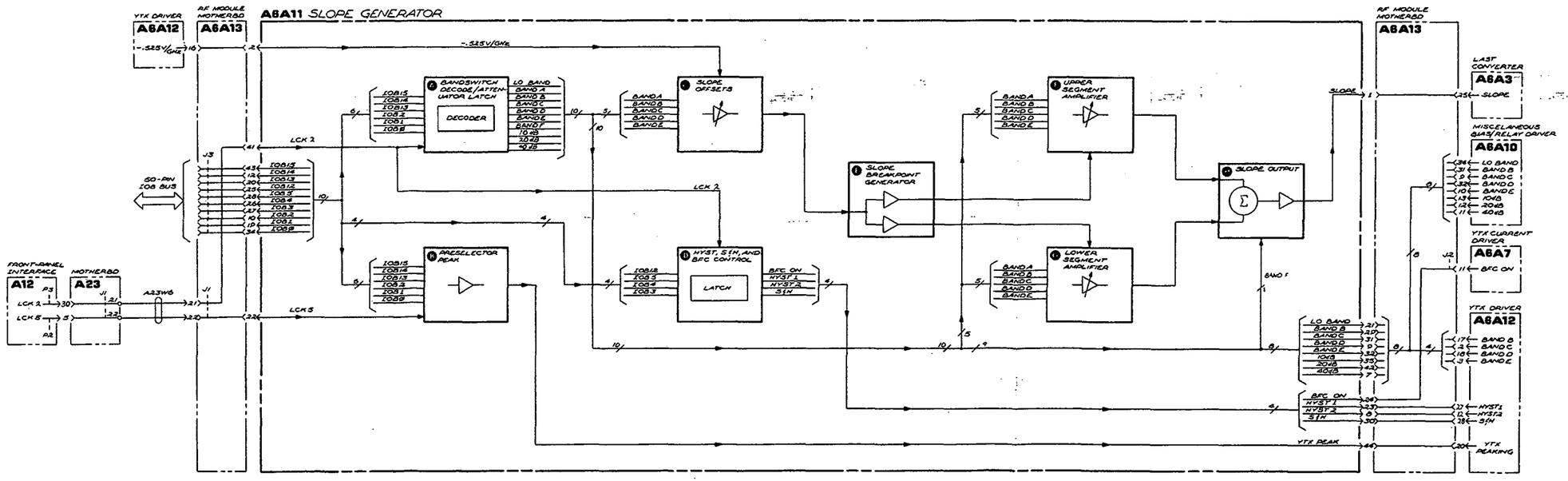
ManualsPlus.com

TABLE 2. REPLACEABLE PARTS

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A6A11R111	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A11R112				NOT ASSIGNED		
A6A11R113	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A11R114	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R115	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R116	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R117	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R118	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R119	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11R120	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A11TP1	1251-0600	0	8	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A11TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A11TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A11TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A11TP5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A11TP6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A11TP7	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A11TP8	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A11U1	1826-1058	3	2	IC OP AMP GP 8-TO-99 PKG	28480	1826-1058
A6A11U2	5081-8117	3	3	SCREEN 1826-0092	28480	5081-8117
A6A11U3	1820-1281	2	1	IC DCDR TTL LS 2-TO-4-LINE DUAL 2-INP	01295	SN74LS139N
A6A11U4	5081-8117	3		SCREEN 1826-0092	28480	5081-8117
A6A11U5	1826-0161	7	1	IC OP AMP GP QUAD 14-DIP-P PKG	04713	MLM324P
A6A11U6	5081-8117	3		SCREEN 1826-0092	28480	5081-8117
A6A11U7	1826-1058	3		IC OP AMP GP 8-TO-99 PKG	28480	1826-1058
A6A11U8	1820-1195	7	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS175N
A6A11U9	1820-1196	8	2	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A6A11U10	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A6A11U11	1826-0188	8	1	IC CONV 8-B-D/A 16-DIP-C PKG	04713	MC1408L-8
A6A11VR1	1902-0625	0	1	DIODE-ZNR 1N829 6.2V 5% DO-7 PD=.25W	04713	1N829
A6A11VR2	1902-0041	4	1	DIODE-ZNR 5.11V 5% DO-35 PD=.4W	28480	1902-0041
A6A11VR3	1902-3203	6	1	DIODE-ZNR 14.7V 5% DO-35 PD=.4W	28480	1902-3203
A6A11VR4	1902-0025	4	1	DIODE-ZNR 10V 5% DO-35 PD=.4W TC=+.06%	28480	1902-0025
				MISCELLANEOUS PARTS		
	4040-0749	4	2	EXTR PC 3D BRN	28480	4040-0749

*Indicates Factory Selected Value

ManualsPlus.com



A6A11

FIGURE 4. A6A11 SLOPE GENERATOR, BLOCK DIAGRAM

ManualsPlus.com

A6A11
SLOPE GENERATOR
85660-60126

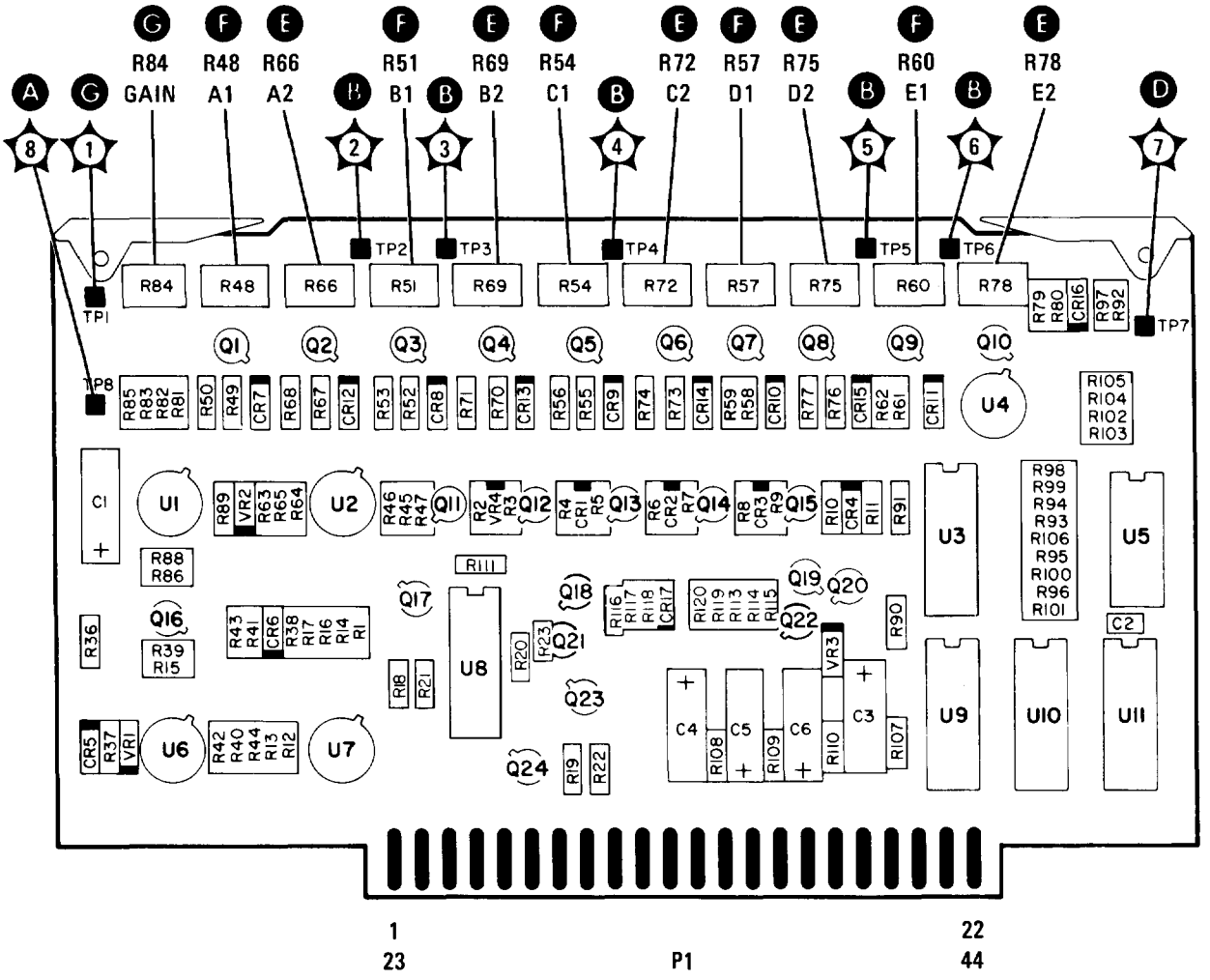


FIGURE 5. A6A11 SLOPE GENERATOR, COMPONENT LOCATIONS

A6A11 SLOPE GENERATOR
85680-60126

P1

P1#	SIGNAL	TO/FROM	FUNCTION BLOCK
1	SLOPE	A8A3P1-25	H
25	HYST1	A8A1P1-17	D
2	+.5257/DAC	A8A1P1-18	C
24	SPE DB	A8A7J2-11	D
3	NC		
25	IDB18	IDC BUS	D
4	NC		
26	IDB4	IDC BUS	D
5	NC		
27	IDB3	IDC BUS	D
6	NC		
28	IDB2	IDC BUS	D
7	45 DB	A8A1P1-11	A
29	BAND B	A8A1P1-37	
		A8A1P1-31	
8	HYST2	A8A1P1-12	D
30	5 AND 10	A8A1P1-30	
9	BAND G	A8A1P1-16	A
31	BAND C	A8A1P1-32	
		A8A1P1-2	
10	IDB2	A8A1P1-9	
32	BAND E	A8A1P1-15	
11	-8V	A8A1P1-4	I
33	+8V	A8A1P1-10	
12	IDB14	IDC BUS	A
34	IDB5	IDC BUS	
13	NC		
35	15 DB	A8A3P1-13	A
14	+20V		I
36	+20V		
15	-20V		I
37	-20V		
16	GND		I
38	GND		
17	-40V		I
39	-40V		
18	+8.8V		I
40	+8.8V		
19	IDB1	IDC BUS	A
41	LCK3	A12P2-20	
20	IDB13	IDC BUS	A
42	20 DB	A8A10P1-12	
21	LO BAND	A8A10P1-54	A
43	IDB12	IDC BUS	
22	LCK5	A12P2-6	B
44	YTO PEAKING	A8A1EP1-20	

① POWER SUPPLIES

② PRESELECTOR PEAK

③ HYST, S AND H, AND BFC CONTROL

④ BAND SWITCH DECODE/ATTENUATOR LATCH

⑤ SLOPE OFFSETS

⑥ SLOPE BREAKPOINT GENERATOR

⑦ UPPER SEGMENT AMPLIFIER

⑧ LOWER SEGMENT AMPLIFIER

⑨ SLOPE OUTPUT

NOTES:

1. REFERENCE DESIGNATIONS WITHIN [ ] ARE ASSEMBLY IDENTIFICATION NUMBERS. REFERENCE DESIGNATIONS WITHOUT BRACKETS ARE ASSEMBLY SERIAL NUMBERS.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS, K=1000, M=1000000 CAPACITANCE IN MICROFARADS (UF)
3. UNLESS OTHERWISE INDICATED: BINARY ENTRY AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.
4. MNEMONIC TABLE:

MNEMONIC	DESCRIPTION
MFC 6N 1000-10	FILTER CAPACITOR ENABLE INSTRUMENT RUN DATA BITS 3 THRU 10
LCK2	LOW-CLOCK2
LCK5	LOW-CLOCK5
L1D4-10	INSTRUCTION, DATA AND ADDRESS BUS BIT 10

A6A11

FIGURE 6. A6A11 SLOPE GENERATOR, SCHEMATIC DIAGRAM

A6A11 11/12

SERIAL NUMBER PREFIX: 2410A

ManualsPlus.com

ManualsPlus.com

A6A12 YTX Driver

ManualsPlus.com

A6A12 YIG-TUNED MIXER (YTX) DRIVER, CIRCUIT DESCRIPTION

The YTX Driver receives a voltage proportional to the instrument LO frequency and produces a signal to control current in the YTX coil.

Input Differential Amplifier (A)

This input signal to the YTX Driver comes from the A19 DAC and is −3V/GHz. For example, as the LO sweeps from 2 – 6 GHz, this input signal sweeps from −6 to −18V. It is buffered by differential amplifier U1A, and appears at TP1.

Bandswitch (C)

The frequency that the YTX is tuned to must be made to follow the first, second, third, or fourth harmonic of the LO frequency, depending on the frequency band in which the instrument is operating. This is done by attenuating the buffered input signal with a voltage divider as shown in Figure 1.

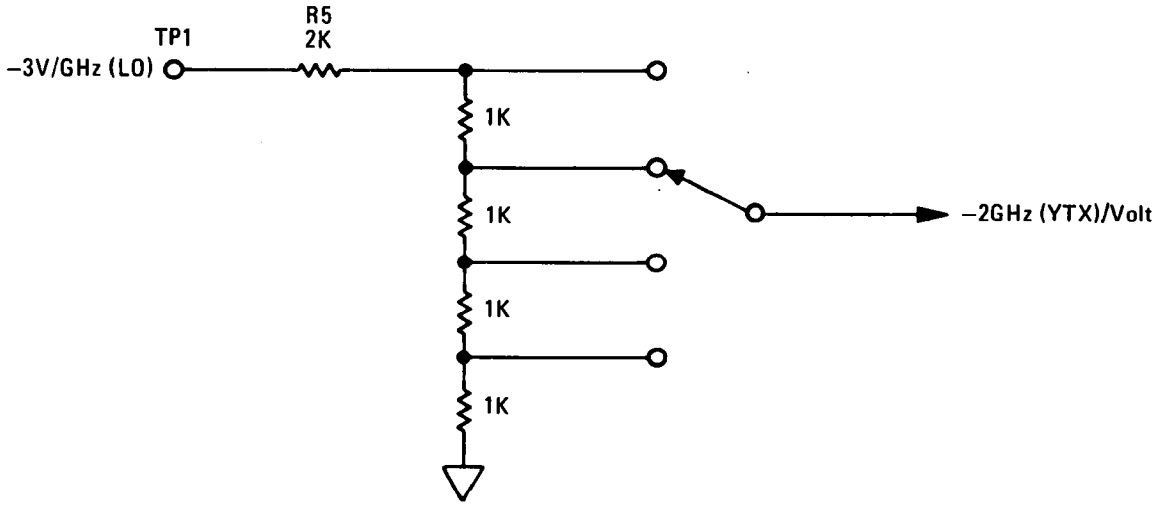


FIGURE 1. VOLTAGE DIVIDER

The position on the attenuator is determined by the harmonic number in use. The bandswitching is done with FET Q1, Q2, Q3, and Q12. The bandswitch information used to turn on the FETs comes from A6A11 Slope Generator. R6 and R11 – R14 form a second voltage divider used as a gate return through R15 – R18. This prevents current through bandswitch diodes and resistors (e.g. R19 and CR1) when the associated FET is switched off from affecting the bandswitch voltage divider R5 and R7 – R10.

Sample and Hold (E)

The output of the bandswitch drives preamp U5. U5 and U1B together form an op amp with U5 a low-noise, low-temperature drift preamplifier. U5, U1B, and U6 are used in a sample and hold circuit as shown in Figure 2.

Q15, a JFET, is used as the switch for the sample and hold. The switch is opened (i.e., the FET is turned off) whenever a bandcrossing occurs. When a bandcrossing occurs, the input voltage at J1 changes as the LO resets its frequency to start a new band, and the YTX bandswitch changes bands. At this time, the voltage at the input of U5 varies. The sample and hold circuit is used to prevent these variations from reaching the YTX. The sample and hold switch is controlled through Q14 by a signal from the A6A11 Slope Generator. R44, R45, CR10, and CR11 keep the output of U1B from saturating when the feedback loop is opened by Q15 being off. This prevents a "glitch" at the output of U6 when the loop closes if U1B suddenly had to recover from a saturated condition.

ManualsPlus.com

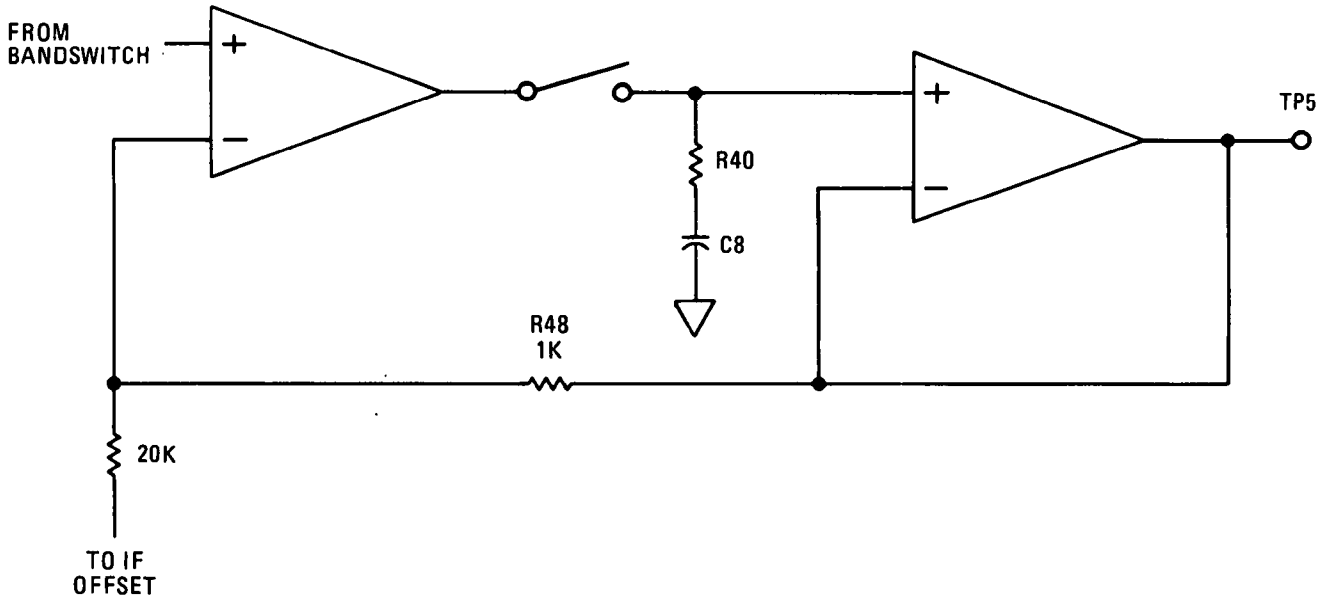


FIGURE 2. SAMPLE AND HOLD, SIMPLIFIED SCHEMATIC

IF Offsets (F)

In addition to tracking a harmonic of the LO, the YTX must be offset from this LO harmonic by the first IF (321.4 MHz). This is done by U7A and its associated components. Q7 – Q10 switch in different IF offset adjustments for each band. The YTX peaking signal from A6A11 Slope Generator is also summed into U7A through R77.

Sweep + Tune (H)

Since the U5, U1B, and U6 combination have a gain of 1.05 set by R48 and R75, the voltage at TP5 has a sensitivity of −0.525V/GHz (YTX). This signal goes to the A6A11 Slope Generator, to voltage divider R54 and R55, and to U8. U8 is set to give −1V/GHz (YTX) at its output which goes to J2. This signal is cabled to the rear panel of the instrument to provide an analog voltage proportional to input frequency. U2A and its associated circuitry provide an offset voltage for U8 to correct for the LO offset in the 0 – 2.5 GHz band. R98 is adjusted for 0V at J2 with the analyzer tuned to 0 Hz.

YTX Drive Output (G)

Voltage divider R54 and R55 drive the output stage shown in Figure 3.

R_s and the output transistor are on A6A7 YTX Current Driver. The YTX has a nominal coil sensitivity of 75 MHz/mA. R63 and R66 provide the means for compensating for variations among YTXs. When the YTX center frequency is tuned to 5.8 GHz, the voltage at pin 3 of U3 is +1.52V. There is no voltage across R66 so it has no effect. R63 is adjusted for tracking at 5.8 GHz and R66 is adjusted at 2 GHz. U4A and voltage divider R68 and R69 provide the +1.52V source.

The YTX magnet exhibits hysteresis which must be corrected for. This is done by signals from the A6A11 Slope Generator which is controlled by the instrument controller. Q18 is turned on for a short period of time to correct for hysteresis in narrow spans (<1 GHz); Q18 and Q19 are both turned on for a short period of time in large spans and when making large downward steps in frequency. The length of time that the transistors are on and the length of time after they are off before the sweep starts is controlled by the instrument controller and varies with start frequency, span, previous stop frequency, etc.

ManualsPlus.com

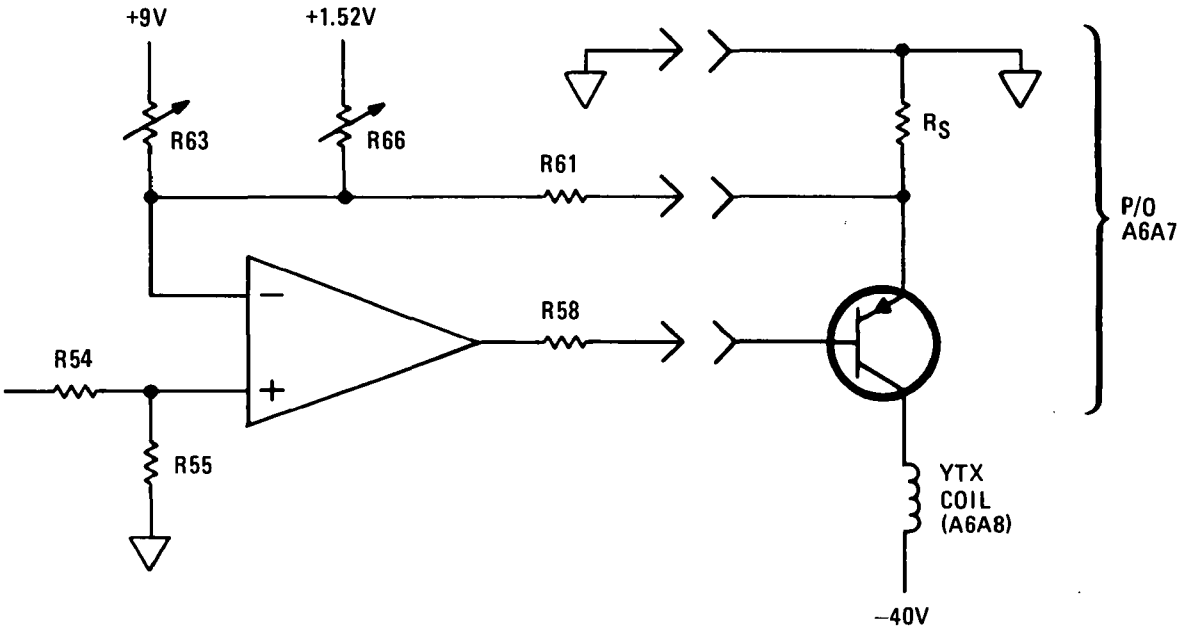


FIGURE 3. OUTPUT AMPLIFIER, SIMPLIFIED SCHEMATIC

Delay Compensation (B)

The YTX and YTO (LO) are electromagnetically tuned devices. As such, they both exhibit a delay in their response to changes in magnet current. When a change in coil current occurs, there is a delay before the corresponding change in frequency occurs. When a ramp of current is applied to a YTX or YTO magnet coil, there is a time delay between the ramp current and the corresponding frequency. Since the YTX and YTO have different magnet structures, they exhibit different amounts of delay. This causes tracking problems. These problems are compounded by harmonic mixing.

On the fourth harmonic, the YTO is sweeping 1/4 as much in frequency as the YTX. Thus the YTO exhibits its least delay with respect to the YTX. R24, R25, C1, C2, C11, and C23 are used to "speed up" the YTX to track the YTO on fourth harmonic. On lower harmonics, the YTO exhibits more delay compared to the YTX since it must now sweep further. The YTX is then delayed to match the YTO under these conditions by R26 and C3.

Since these RC combinations have long time constants, they cannot readily respond to the transients produced at band crossings and scan resets. Therefore, whenever the sample and hold circuit is holding, R24 – R26 are shorted by Q4 – Q6 respectively.

+9V and –9V Reference Supplies (D)

U2B and U7B and their associated circuitry form –9V and +9V reference supplies used in the YTX Driver, and elsewhere in the A6 RF Module.

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A12	85660-60013	3	1	BOARD ASSEMBLY, YIG-TUNED MIXER (YTX) DRIVER	28480	85660-60013
A6A12C1*	0180-2205	3	1	CAPACITOR-FXD .33UF+-10% 35VDC TA	56289	150D334X9035A2
A6A12C2*	0180-0218	4	1	CAPACITOR-FXD .15UF+-10% 35VDC TA	56289	150D154X9035A2
A6A12C3*	0180-0373	2	1	CAPACITOR-FXD .68UF+-10% 35VDC TA	56289	150D684X9035A2
A6A12C4	0160-0571	0	4	CAPACITOR-FXD 470PF +-20% 100VDC CER	28480	0160-0571
A6A12C5	0160-0571	0		CAPACITOR-FXD 470PF +-20% 100VDC CER	28480	0160-0571
A6A12C6	0180-0197	8	3	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A6A12C7	0160-3097	1	4	CAPACITOR-FXD .47UF +80-20% 50VDC CER	28932	5033ES50RD474Z
A6A12C8	0160-3879	7	1	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A12C9	0160-3097	1		CAPACITOR-FXD .47UF +80-20% 50VDC CER	28932	5033ES50RD474Z
A6A12C10	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A6A12C11*	0180-1735	2	1	CAPACITOR-FXD .22UF+-10% 35VDC TA	56289	150D224X9035A2
A6A12C12	0160-0571	0		CAPACITOR-FXD 470PF +-20% 100VDC CER	28480	0160-0571
A6A12C13	0160-0571	0		CAPACITOR-FXD 470PF +-20% 100VDC CER	28480	0160-0571
A6A12C14	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A6A12C15	0160-3097	1		CAPACITOR-FXD .47UF +80-20% 50VDC CER	28932	5033ES50RD474Z
A6A12C16	0160-4084	8	1	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A6A12C17	0160-3097	1		CAPACITOR-FXD .47UF +80-20% 50VDC CER	28932	5033ES50RD474Z
A6A12C18	0180-0229	7	2	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A6A12C19	0180-0116	1	2	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A6A12C20	0180-1746	5	1	CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A6A12C21	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A6A12C22	0180-0229	7		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A6A12C23*	0180-0376	5	1	CAPACITOR-FXD .47UF+-10% 35VDC TA	56289	150D474X9035A2
A6A12CR1	1901-1067	4	17	DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR2	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR3	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR4	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR5	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR6	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR7	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR8	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR9	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR10	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR11	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR12	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR13				NOT ASSIGNED		
A6A12CR14	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR15	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR16	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR17	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12CR18	1901-1067	4		DIODE-SWITCHING 125V 175MA 60NS DO-35	07263	FDH444
A6A12J1	1250-0543	8	2	CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A6A12J2	1250-0543	8		CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A6A12Q1	1855-0414	4	8	TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A12Q2	1855-0414	4		TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A12Q3	1855-0414	4		TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A12Q4	1855-0420	2	4	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A6A12Q5	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A6A12Q6	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A6A12Q7	1855-0414	4		TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A12Q8	1855-0414	4		TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A12Q9	1855-0414	4		TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A12Q10	1855-0414	4		TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A12Q11	1853-0281	9	1	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A6A12Q12	1855-0414	4		TRANSISTOR J-FET 2N4393 N-CHAN D-MODE	04713	2N4393
A6A12Q13	1854-0557	4	2	TRANSISTOR NPN 2N2432A SI TO-18 PD=300MW	01295	2N2432A
A6A12Q14	1854-0557	4		TRANSISTOR NPN 2N2432A SI TO-18 PD=300MW	01295	2N2432A
A6A12Q15	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A6A12Q16	1854-0637	1	1	TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A6A12Q17	1853-0322	9	1	TRANSISTOR PNP 2N2946A SI TO-46 PD=400MW	01295	2N2946A
A6A12Q18	1854-0477	7	2	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A12Q19	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A6A12R1	0698-8067	4	6	RESISTOR 5K .01% .15W F TC=0+-1	28480	0698-8067
A6A12R2	0698-8067	4		RESISTOR 5K .01% .15W F TC=0+-1	28480	0698-8067
A6A12R3	0698-8067	4		RESISTOR 5K .01% .15W F TC=0+-1	28480	0698-8067
A6A12R4	0698-8067	4		RESISTOR 5K .01% .15W F TC=0+-1	28480	0698-8067
A6A12R5	0699-0153	5	1	RESISTOR 2K .1% .225W F TC=0+-1	28480	0699-0153
A6A12R6	0698-3153	9	1	RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A6A12R7	0698-8625	0	7	RESISTOR 1K .1% .1W F TC=0+-5	28480	0698-8625
A6A12R8	0698-8625	0		RESISTOR 1K .1% .1W F TC=0+-5	28480	0698-8625
A6A12R9	0698-8625	0		RESISTOR 1K .1% .1W F TC=0+-5	28480	0698-8625
A6A12R10	0698-8625	0		RESISTOR 1K .1% .1W F TC=0+-5	28480	0698-8625

*Indicates Factory Selected Value

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A6A12R11	0698-0083	8	6	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A6A12R12	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A6A12R13	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A6A12R14	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A6A12R15	0698-3453	2	11	RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A6A12R16	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A6A12R17	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A6A12R18	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A6A12R19	0757-0280	3	12	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A12R20	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A12R21	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A12R22	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A12R23	0757-0442	9	13	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12R24	2100-3353	8	2	RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A6A12R25	2100-3353	8		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A6A12R26	2100-3357	2	1	RESISTOR-TRMR 500K 10% C SIDE-ADJ 1-TRN	28480	2100-3357
A6A12R27	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A6A12R28	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A6A12R29	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A6A12R30	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A12R31	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A12R32	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A12R33	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12R34	0757-0465	6	5	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A12R35	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12R36	0698-3157	3	4	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A6A12R37	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A6A12R38	0698-4037	0	6	RESISTOR 46.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-46R4-F
A6A12R39	0698-4037	0		RESISTOR 46.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-46R4-F
A6A12R40	0757-0401	0	5	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A6A12R41	0698-4037	0		RESISTOR 46.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-46R4-F
A6A12R42	0698-4037	0		RESISTOR 46.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-46R4-F
A6A12R43	0698-8027	4	2	RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8027
A6A12R44	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A6A12R45	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A6A12R46	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A12R47	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12R48	0698-8625	0		RESISTOR 1K .1% .1W F TC=0+-5	28480	0698-8625
A6A12R49	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12R50	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A12R51	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A12R52	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12R53				NOT ASSIGNED		
A6A12R54	0698-7479	0	4	RESISTOR 10K .1% .225W F TC=0+-1	28480	0698-7479
A6A12R55	0698-7479	0		RESISTOR 10K .1% .225W F TC=0+-1	28480	0698-7479
A6A12R56	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A6A12R57	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A6A12R58	0698-0082	7	1	RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A6A12R59	0698-4037	0		RESISTOR 46.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-46R4-F
A6A12R60	0698-4037	0		RESISTOR 46.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-46R4-F
A6A12R61	0698-8625	0		RESISTOR 1K .1% .1W F TC=0+-5	28480	0698-8625
A6A12R62	0698-8027	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8027
A6A12R63	2100-4052	6	3	RESISTOR-TRMR 20K 5% MF SIDE-ADJ 25-TRN	28480	2100-4052
A6A12R64	0698-7479	0		RESISTOR 10K .1% .225W F TC=0+-1	28480	0698-7479
A6A12R65	0698-8485	0	3	RESISTOR 6.69K .1% .1W F TC=0+4	28480	0698-8485
A6A12R66	2100-4052	6		RESISTOR-TRMR 20K 5% MF SIDE-ADJ 25-TRN	28480	2100-4052
A6A12R67	0698-8625	0		RESISTOR 1K .1% .1W F TC=0+-5	28480	0698-8625
A6A12R68	0698-8485	0		RESISTOR 6.69K .1% .1W F TC=0+4	28480	0698-8485
A6A12R69	0698-6407	2	1	RESISTOR 32.8K .1% .1W F TC=0+4	28480	0698-6407
A6A12R70	0698-3150	4	1	RESISTOR 23.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2372-F
A6A12R71	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12R72	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12R73	0698-3151	7	1	RESISTOR 2.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2871-F
A6A12R74	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12R75	0698-8161	9	1	RESISTOR 20K 1% .1W F TC=0+-5	28480	0698-8161
A6A12R76	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12R77	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A12R78	0698-3161	9	4	RESISTOR 38.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3832-F
A6A12R79	0698-3161	9		RESISTOR 38.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3832-F
A6A12R80	0698-3161	9		RESISTOR 38.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3832-F
A6A12R81	0698-3161	9		RESISTOR 38.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3832-F
A6A12R82	2100-1661	7	4	RESISTOR-TRMR 20K 5% WW SIDE-ADJ 22-TRN	32997	3057P-1-203
A6A12R83	2100-1661	7		RESISTOR-TRMR 20K 5% WW SIDE-ADJ 22-TRN	32997	3057P-1-203
A6A12R84	2100-1661	7		RESISTOR-TRMR 20K 5% WW SIDE-ADJ 22-TRN	32997	3057P-1-203
A6A12R85	2100-1661	7		RESISTOR-TRMR 20K 5% WW SIDE-ADJ 22-TRN	32997	3057P-1-203

*Indicates Factory Selected Value

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A12R86	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A6A12R87	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A6A12R88	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A6A12R89	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A6A12R90	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A12R91	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A12R92	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A12R93	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A6A12R94	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A6A12R95	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A6A12R96	0698-3156	2	1	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A6A12R97	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A6A12R98	2100-3390	3	1	RESISTOR-TRMR 1K 10% MF SIDE-ADJ 25-TRN	18612	1202-Y-1K
A6A12R99	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12R100	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12R101	0757-0458	7	1	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A6A12R102	0757-0289	2	1	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A6A12R103	0757-0346	2	4	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A6A12R104	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A6A12R105	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A6A12R106	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A6A12R107	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A6A12R108	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A6A12R109	0698-7479	0		RESISTOR 10K .1% .225W F TC=0+-1	28480	0698-7479
A6A12R110	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A6A12R111	0757-0438	3	2	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A12R112	0698-8485	0		RESISTOR 6.69K .1% .1W F TC=0+4	28480	0698-8485
A6A12R113	2100-4052	6		RESISTOR-TRMR 20K 5% MF SIDE-ADJ 25-TRN	28480	2100-4052
A6A12R114	0698-8067	4		RESISTOR 5K .01% .15W F TC=0+-1	28480	0698-8067
A6A12R115	0698-8067	4		RESISTOR 5K .01% .15W F TC=0+-1	28480	0698-8067
A6A12R116	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A6A12R117	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A6A12R118	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A6A12TP1	1251-0600	0	6	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A12TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A12TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A12TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A12TP5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A12TP6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A6A12U1	5081-8117	3	4	SCREEN 1826-0092	28480	5081-8117
A6A12U2	5081-8117	3		SCREEN 1826-0092	28480	5081-8117
A6A12U3	1826-0162	8	2	IC PREAMPLIFIER TO-99 PKG	27014	LM321H
A6A12U4	5081-8117	3		SCREEN 1826-0092	28480	5081-8117
A6A12U5	1826-0162	8		IC PREAMPLIFIER TO-99 PKG	27014	LM321H
A6A12U6	1826-0371	1	1	IC OP AMP LOW-BIAS-H-IMPD TO-99 PKG	27014	LF256H
A6A12U7	5081-8117	3		SCREEN 1826-0092	28480	5081-8117
A6A12U8	1826-1058	3	1	IC OP AMP GP 8-TO-99 PKG	28480	1826-1058
A6A12VR1	1902-3203	6	2	DIODE-ZNR 14.7V 5% DO-35 PD=.4W	28480	1902-3203
A6A12VR2				NOT ASSIGNED		
A6A12VR3	1902-0025	4	1	DIODE-ZNR 10V 5% DO-35 PD=.4W TC=+.06%	28480	1902-0025
A6A12VR4	1902-3203	6		DIODE-ZNR 14.7V 5% DO-35 PD=.4W	28480	1902-3203
A6A12VR5	1902-0625	0	1	DIODE-ZNR 1N829 6.2V 5% DO-7 PD=.25W	04713	1N829
				MISCELLANEOUS PARTS		
	4040-0749	4	1	EXTR PC BD BRN	28480	4040-0749
	4040-0750	7	1	EXTR PC BD RED	28480	4040-0750

*Indicates Factory Selected Value

ManualsPlus.com

A6A12
YTX DRIVER
85660-60013

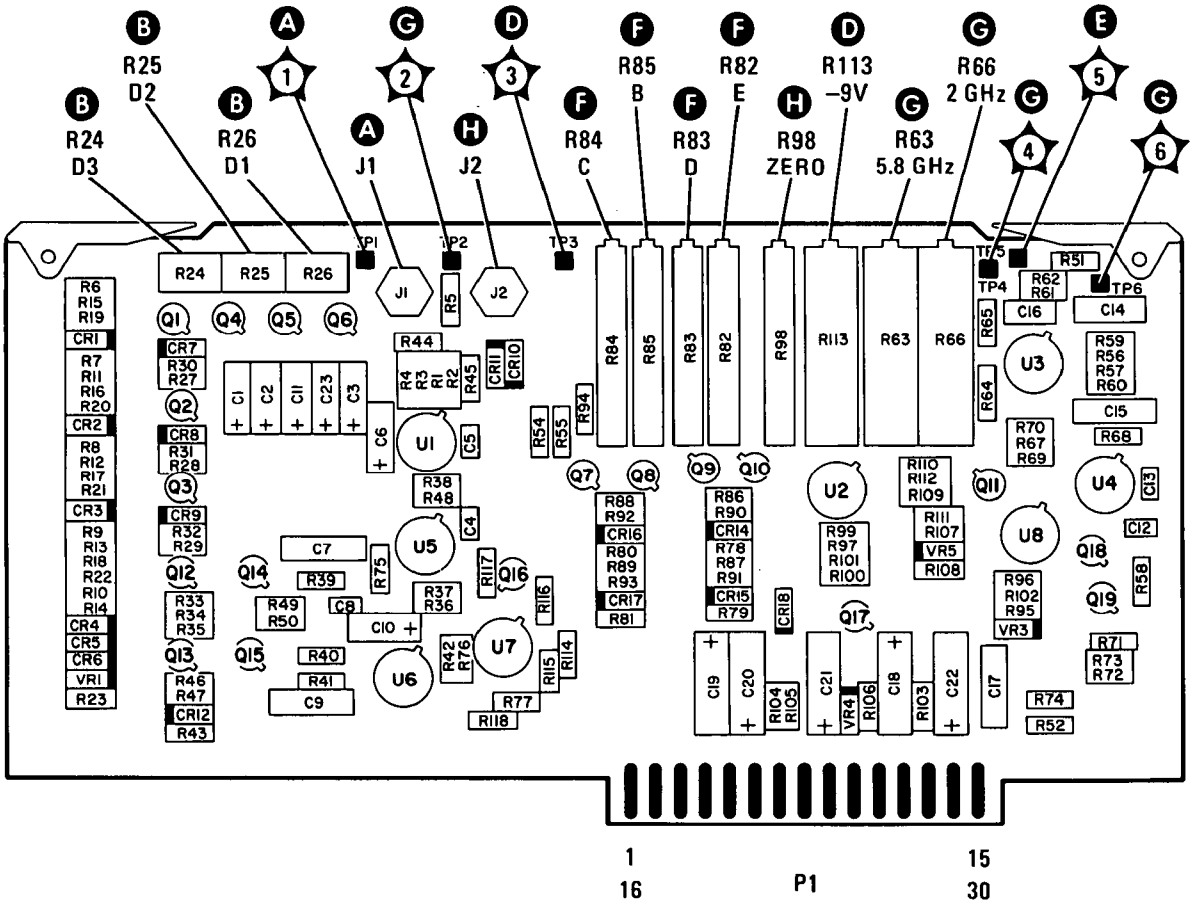
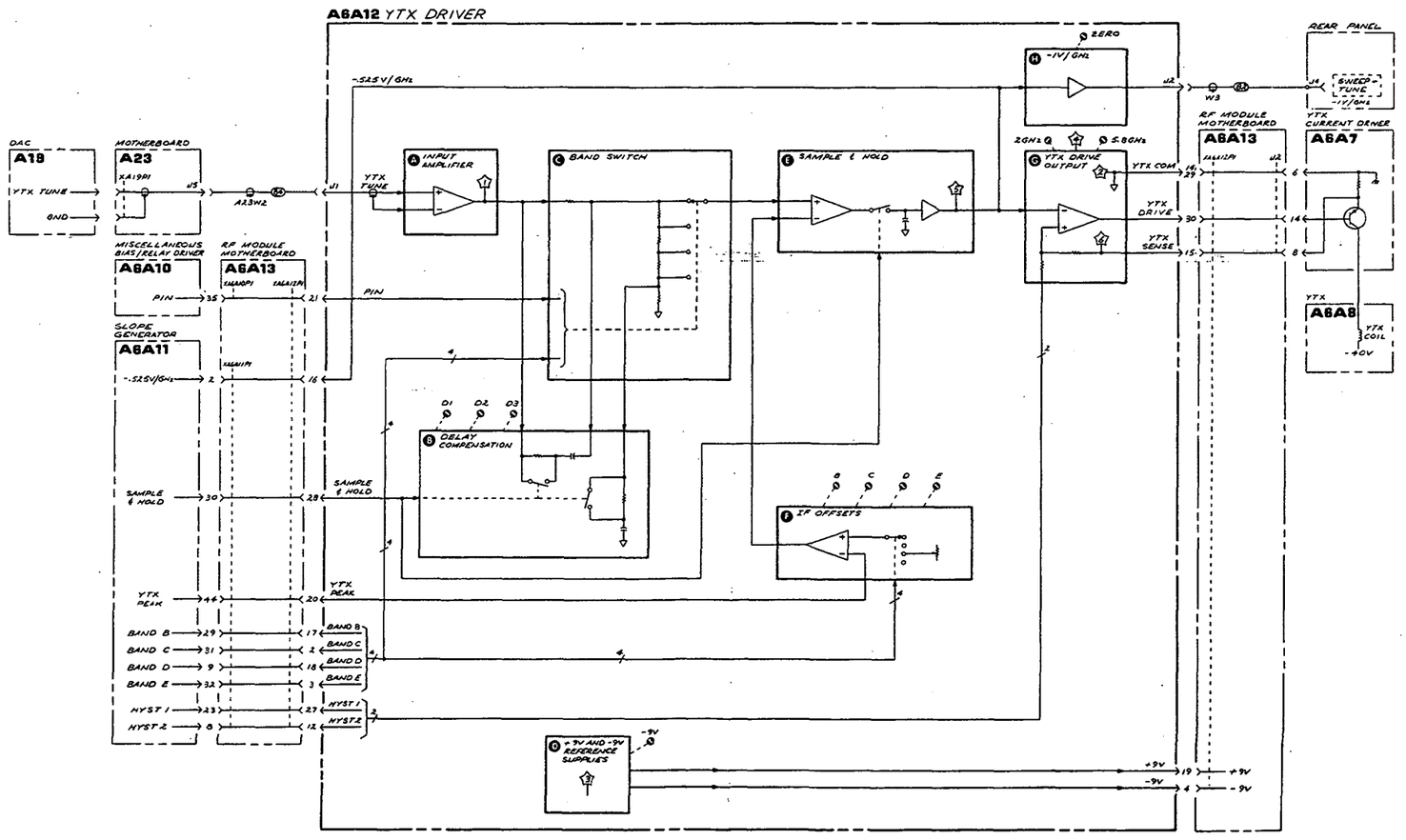


FIGURE 5. A6A12 YTX DRIVER, COMPONENT LOCATIONS

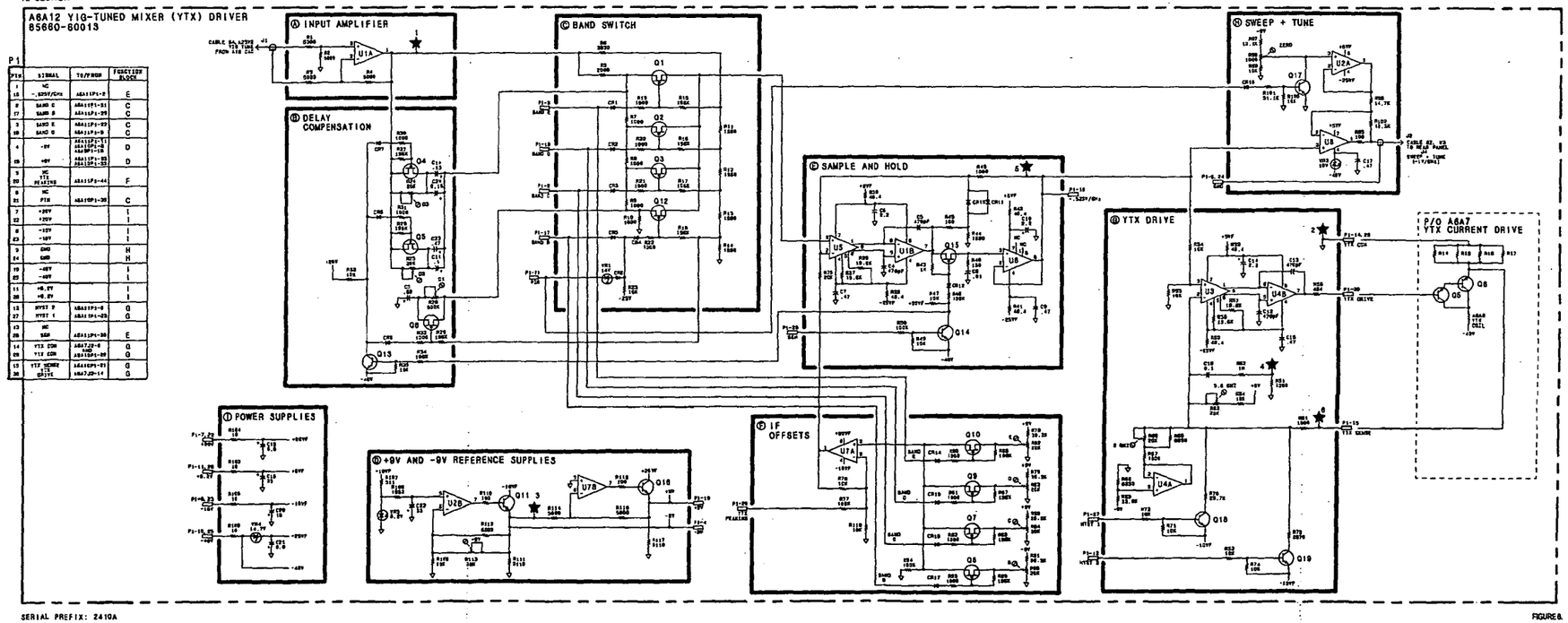
ManualsPlus.com



A6A12

FIGURE 4. A6A12 YTX DRIVER, BLOCK DIAGRAM

ManualsPlus.com



P1	SIGNAL	TO/FROM	FUNCTION BLOCK
1	NC		
18	-.525V/GHz	A6A11P1-5	E
2	BAND C	A6A11P1-31	C
17	BAND B	A6A11P1-29	C
3	BAND E	A6A11P1-27	C
20	BAND D	A6A11P1-9	C
4	-9V	A6A11P2-11 A6A11P1-8 A6A9P1-18	D
19	+9V	A6A11P1-33 A6A11P1-32	D
5	NC		
20	YTX DRIVING	A6A11P2-44	F
6	NC		
21	PIN	A6A10P1-38	C
7	+20V		I
22	+20V		I
8	-12V		I
23	-12V		I
9	GND		H
24	GND		H
10	-40V		I
25	-40V		I
11	+8.7V		I
26	+8.2V		I
12	HYST 2	A6A11P1-6	G
27	HYST 1	A6A11P1-28	G
13	NC		
28	GND	A6A11P1-30	E
14	YTX DRN	A6A7J2-6	G
29	YTX GDN	A6A10P1-29	G
15	YTX SCHRE DRIVE	A6A10P1-21	G
30		A6A7J2-14	G

SERIAL PREFIX: 2410A

FIGURE 8. A6A12 YTX DRIVER, SCHEMATIC DIAGRAM

A6A12

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6A13	85660-60014	4	1	BOARD ASSEMBLY, RF MODULE MOTHERBOARD	28480	85660-60014
A6A13C1	0180-2216	6	1	CAPACITOR-FXD 350UF+75-10% 16VDC AL	56289	30D357G016DH2
A6A13C2	0180-1997	8	1	CAPACITOR-FXD 20UF+50-10% 150VDC AL	28480	0180-1997
A6A13C3	0180-2144	9	1	CAPACITOR-FXD 200UF+75-10% 25VDC AL	56289	30D207G025DH9
A6A13C4	0180-1819	3	1	CAPACITOR-FXD 100UF+75-10% 50VDC AL	56289	30D107G050DH2
A6A13C5	0160-3879	7	1	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A6A13C6	0180-0229	7	1	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A6A13C7	0180-0141	2	1	CAPACITOR-FXD 50UF+75-10% 50VDC AL	56289	30D506G050DD2
A6A13J1	1251-5550	9	1	CONNECTOR 26-PIN M POST TYPE	28480	1251-5550
A6A13J2	1251-5144	7	1	CONNECTOR 14-PIN M POST TYPE	28480	1251-5144
A6A13J3	1251-5549	6	1	CONNECTOR 50-PIN M POST TYPE	28480	1251-5549
A6A13J4	1251-5145	8	1	CONNECTOR 12-PIN M POST TYPE	28480	1251-5145
A6A13J5	1200-0508	0	1	SOCKET-IC 14-CONT DIP-SLDR	28480	1200-0508
A6A13L1	08558-80011	6	5	FILTER COIL BLUE	28480	08558-80011
A6A13L2	08558-80011	6		FILTER COIL BLUE	28480	08558-80011
A6A13L3	08558-80011	6		FILTER COIL BLUE	28480	08558-80011
A6A13L4	08558-80011	6		FILTER COIL BLUE	28480	08558-80011
A6A13L5	9140-0144	0	1	INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A6A13L6	08558-80011	6		FILTER COIL BLUE	28480	08558-80011
A6A13R1	0757-0401	0	1	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A6A13VR1	1902-0049	2	1	DIODE-ZNR 6.19V 5% DO-35 PD=.4W	28480	1902-0049
A6A13XA1				NOT ASSIGNED		
A6A13XA2				NOT ASSIGNED		
A6A13XA3	1251-2035	9	3	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A6A13XA4 thru A6A13XA8				NOT ASSIGNED		
A6A13XA9	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A6A13XA10	1251-1365	6	2	CONNECTOR-PC EDGE 22-CONT/ROW 2-ROWS	28480	1251-1365
A6A13XA11	1251-1365	6		CONNECTOR-PC EDGE 22-CONT/ROW 2-ROWS	28480	1251-1365
A6A13XA12	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035

*Indicates Factory Selected Value

ManualsPlus.com

A6A13
RF MODULE MOTHERBOARD
85660-60014

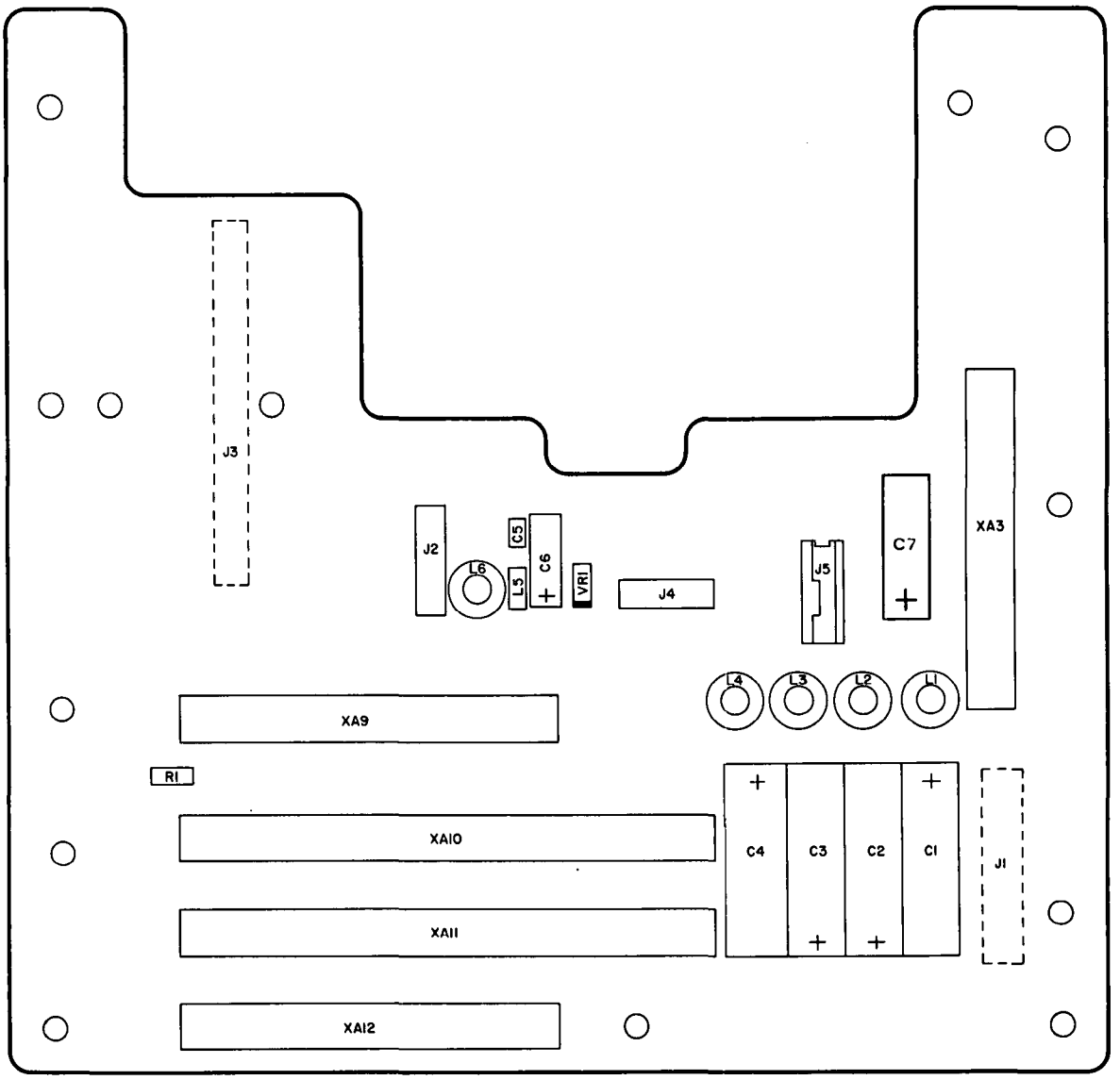


FIGURE 1. A6A13 RF MODULE MOTHERBOARD, COMPONENT LOCATIONS

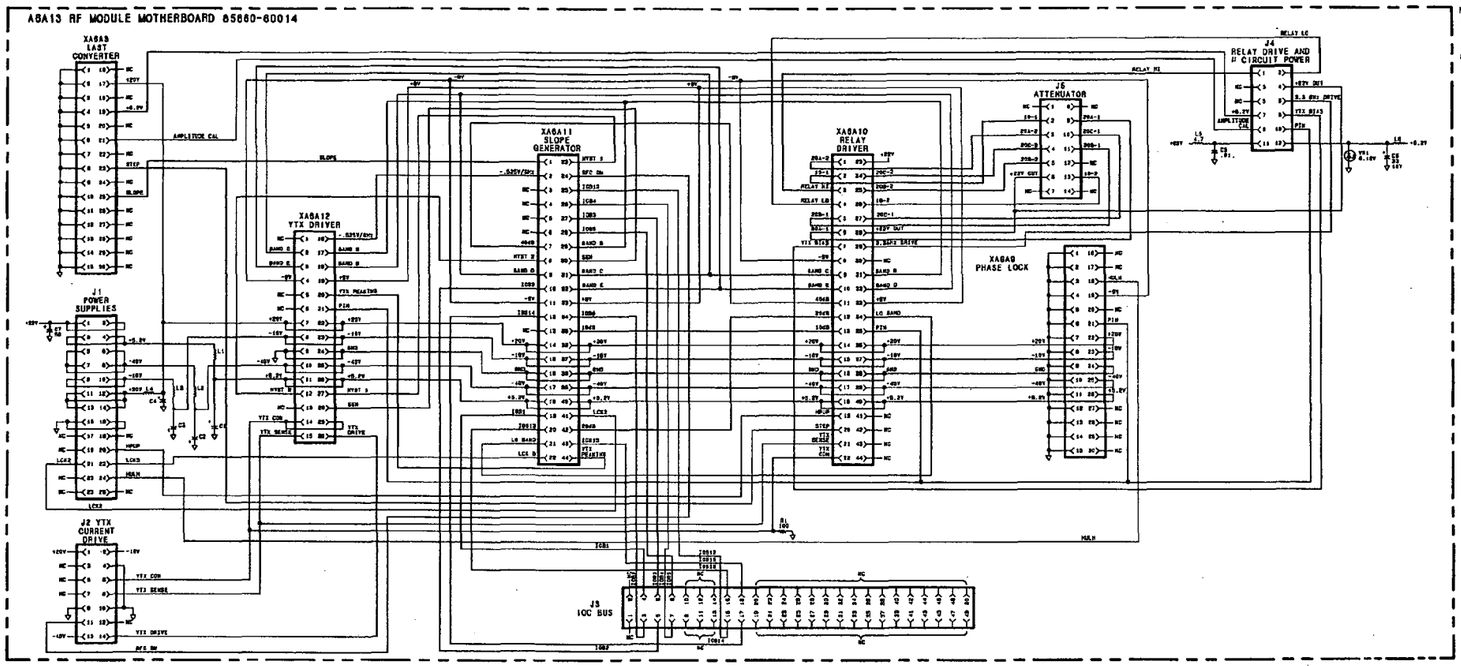
ManualsPlus.com

A6A13 RF Module Motherboard

ManualsPlus.com

RF SECTION

A6A13 RF MODULE MOTHERBOARD 85680-60014



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE PREFIXED WITH THE ASSEMBLY DESIGNATION (A6A13) TO PROVIDE UNIQUE REFERENCE DESIGNATIONS WITH RESPECT TO THE OVERALL INSTRUMENT.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN Ω, 1/8W, 10% CAPACITANCE IN μF, 5% MICA/PAPER, pF. INDUCTANCE IN μH MICROHENRIES, μH.

SERIAL NUMBER PREFIX: 2410A

A6A13

FIGURE 2. A6A13 RF MODULE MOTHERBOARD, INTERCONNECT DIAGRAM

ManualsPlus.com

A7 M/N-Reference
A22 10 MHz Frequency Standard

ManualsPlus.com

A7 M/N REFERENCE, TROUBLESHOOTING

Reference

All phase lock loops in the 8566B are referenced to the A22 10 MHz Frequency Standard. The 10 MHz Frequency Standard is used to directly phase-lock the A7A2 100 MHz VCXO only. All other phase lock loops receive their reference from either the A7A1 or A7A2 (10 and 20 MHz from the A7A1 and 100 and 400 MHz from the A7A2).

A malfunction of the 100 MHz VCXO is indicated by all phase lock error messages (PL1 UNLOCK, PL2 UNLOCK, REF UNLOCK, YTO UNLOCK, M/N UNLOCK, and HET UNLOCK) being displayed on the 8566B CRT. Table 1 lists the phase lock error messages, related reference, location for measurement, and signal level.

TABLE 1. PHASE LOCK ERROR MESSAGES

Phase Lock Error Message	Reference Frequency	Output Connector	Level (dBm)
PL1 UNLOCK	100 MHz	A7A2J3	0 dBm
PL1 UNLOCK	10 MHz	A7A1J4	0 dBm
PL2 UNLOCK	10 MHz	A7A1J5	0 dBm
YTO UNLOCK and M/N UNLOCK	400 MHz	A7A2J1*	–10 dBm
YTO UNLOCK and M/N UNLOCK	20 MHz	A7A1J3	0 dBm
HET UNLOCK	100 MHz	A7A2J4	0 dBm
All Flags	100 MHz	A7A2J2	0 dBm

*Measure output at end of A7A2W1 96 cable.

M/N Loop

The M/N Loop consists of a 355 to 395 MHz VCO, part of A7A4, and a phase detector, part of A7A3. The output of the VCO is divided by two and is used to drive the A11A5 Sampler assembly. This divided signal is disabled by means of control line LMNE during sweeps when the frequency span is greater than 5 MHz (fundamental mixing). The two divider numbers, M and N, are selected by the A15 Controller such that the Nth harmonic (same as the N divide number) of the divided VCO output changes in exactly 10 MHz increments as M is changed. For example:

If M = 26,
N = 20,
and VCO Frequency = 187.0 MHz,
then M/N output frequency = N(VCO) = 20 x 187.0 = 3,740 MHz.

If M is changed to 25,
then the VCO frequency changes to 187.5 MHz,
and the M/N output frequency changes to 3,750 MHz (20 x 187.5).

Result = 10 MHz change for M divider change of 1.

ManualsPlus.com

An incorrect M or N number, due to the main controller or a bad latch on A7A3, can be easily detected. The frequency diagnostic [SHIFT] [MKR→ REF LVL] gives the M and N numbers and the M/N output frequency (VCO divided by two) for the start frequency selected. A frequency counter attached to A7A4J2 indicates the actual frequency output. Table 2, M and N Numbers and Resulting Frequencies, of the RF Section Analog Troubleshooting tab, lists all possible M/N output frequencies. By locating the M/N frequency measured by the counter, the M and N numbers required to produce this frequency are obtained. The M and N numbers can then be compared to those shown in the frequency diagnostic. The latch and divider for the number in error can then be located using the troubleshooting procedure outlined for A7A3.

ManualsPlus.com

A7 M/N-REFERENCE REPLACEMENT

NOTE

For location of hardware and cables referred to in this procedure, see Figure 1.

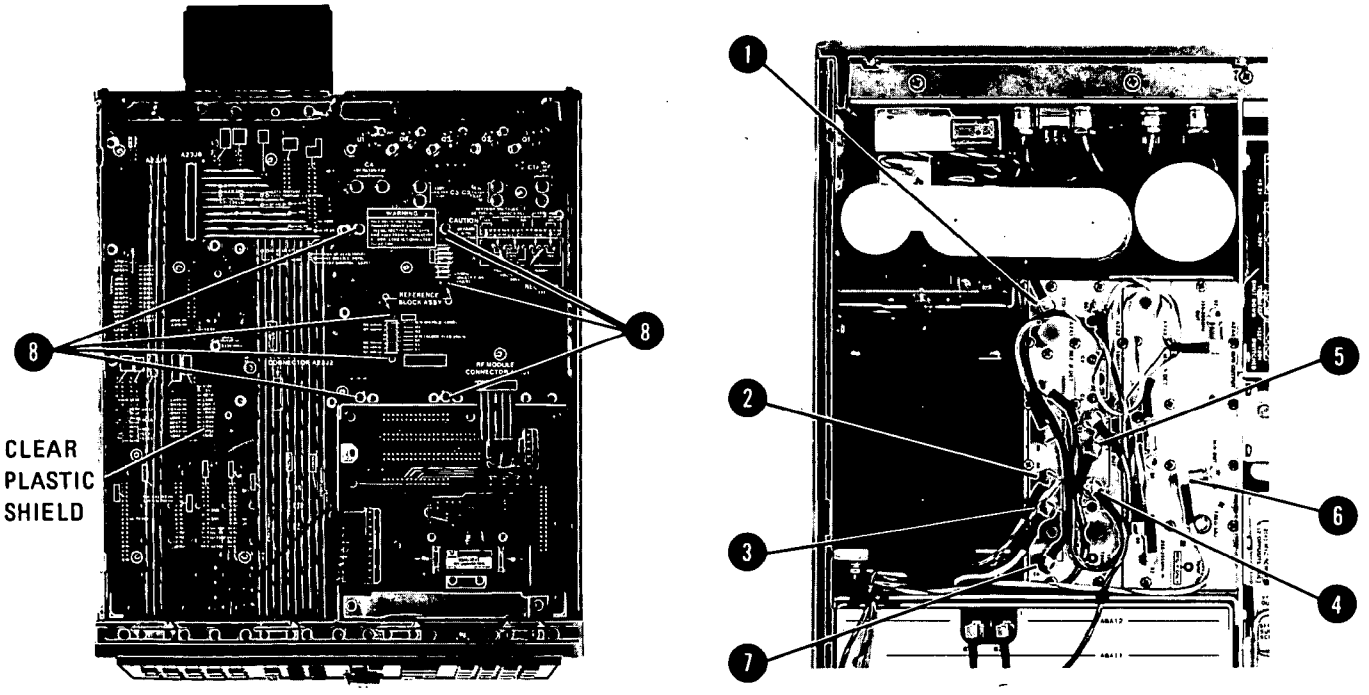
Removal

1. Remove ac line cords, IF-Display Section, and RF Section top and bottom covers.

2. Remove the following cables from A7 M/N Reference:

   80 (gray/black) cable (A7A1J1, STD IN) **(1)**
   86 (gray/blue) cable (A7A1J4, 10 MHz OUT) **(2)**
   9 (white) cable (A7A1J5, 10 MHz OUT) **(3)**
   85 (gray/green) cable (A7A2J4, 100 MHz OUT) **(4)**
   8 (gray) cable (A7A2J3, 100 MHz OUT) **(5)**
   93 (white/orange) cable (A7A4J2, M/N OUT) **(6)**
   6 (blue) cable (A7A1J6, 10 MHz OUT) **(7)**

3. Remove clear plastic shield from motherboard (Figure 1, VIEW A) by removing all nylon screws. Remove eight screws **(8)** from the motherboard (refer to View A). Note: Screws are marked on motherboard with the letter "B" for easy identification.



VIEW A VIEW B

FIGURE 1. A7 M/N REFERENCE REMOVAL AND INSTALLATION

ManualsPlus.com

Installation

4. Position A7 section in RF Section and secure with eight screws **(8)**. Replace clear plastic shield over motherboard. Reconnect cables removed in step 2.

5. Replace RF Section top and bottom covers. Reassemble IF-Display Section to RF Section. Reconnect ac line cords.

ManualsPlus.com

A22 10 MHz STANDARD REPLACEMENT

NOTE

For location of hardware and cables referred to in this procedure, see Figure 2.

Removal

1. Remove ac line cords and RF Section bottom cover.
2. Remove A11 YTO Loop by removing three screws as indicated by instructions on top of YTO Loop assembly. Disconnect cable connector **(2)**.
3. Release A22 10 MHz Standard by removing two screws **(1)**.
4. When removing 10 MHz Standard, disconnect 87 (gray/violet) cable and 6-pin connector from behind.

Installation

5. When installing new 10 MHz Standard, check that rear studs are supported by both rear rubber mounts and reconnect 87 (gray/violet) cable and 6-pin connector (red wire to rear pin). Fasten 10 MHz Standard to RF Section with two screws **(1)**.
6. Replace A11 YTO Loop. Replace three screws removed in step 2 and reconnect cable connector **(2)**.
7. Replace RF Section bottom cover and reconnect ac line cords.

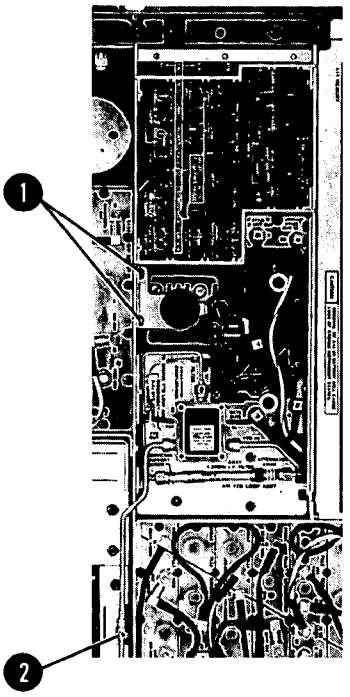


FIGURE 2. A22 10 MHz STANDARD REPLACEMENT

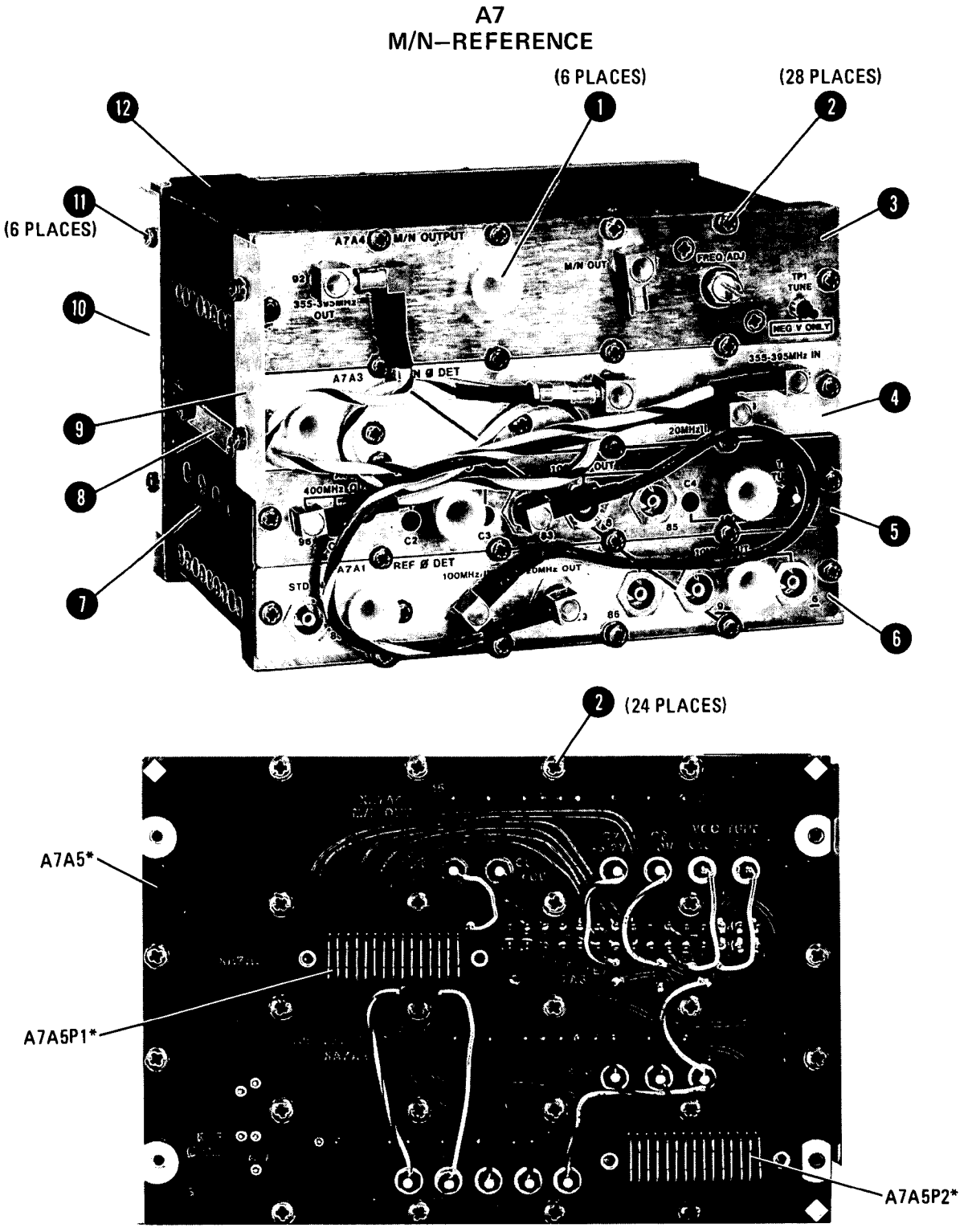
ManualsPlus.com

TABLE 2. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7				M/N-REFERENCE		
A7A1	85660-60015	5	1	BOARD ASSEMBLY, REFERENCE PHASE DETECTOR	28480	85660-60015
A7A2	85660-60135	0	1	BOARD ASSEMBLY, 100 MHZ VCXO	28480	85660-60135
A7A3	85660-60136	1	1	BOARD ASSEMBLY, M/N PHASE DETECTOR	28480	85660-60136
A7A4	85660-60113	4	1	BOARD ASSEMBLY, M/N OUTPUT	28480	85660-60113
A7A5	85660-60020	2	1	BOARD ASSEMBLY, M/N-REFERENCE MOTHERBOARD	28480	85660-60020

*Indicates Factory Selected Value

ManualsPlus.com



*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

FIGURE 3. A7 M/N REFERENCE, PARTS IDENTIFICATION (1 OF 2)

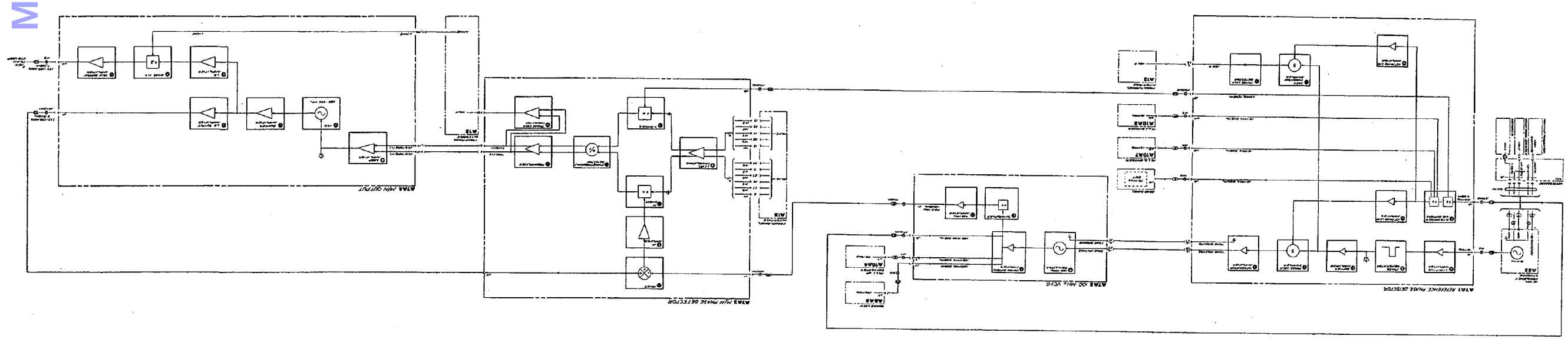
ManualsPlus.com

Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
1	86701-40001	9	Extractor, PC Board	28480	86701-40001
2	2200-0105	4	Screw, Mach, 4-40, .312-IN LG, PAN HD	28480	2200-0105
3	85660-20049	1	Cover, PC Board (A7A4 M/N Output)	28480	85660-20049
4	85660-20047	9	Cover, PC Board (A7A3 M/N ϕ DET)	28480	85660-20047
5	85660-20046	8	Cover, PC Board (A7A2 100 MHz VCXO)	28480	85660-20046
6	85660-20045	7	Cover, PC Board (A7A1 REF ϕ DET)	28480	85660-20045
7	5021-3208	7	Housing, M/N-Reference Block	28480	5021-3208
8	86701-00024	2	Air Scoop	28480	86701-00024
9	86701-00029	7	Air Baffle, Top	28480	86701-00029
10	86701-00030	0	Air Baffle, Bottom	28480	86701-00030
11	2200-0103	2	Screw, Mach, 4-40, .25-IN LG, PAN HD	28480	2200-0103
12	0460-0778	5	Tape, Adhesive, Foam Cushion (4-IN)	28480	0460-0778

FIGURE 3. A7 M/N REFERENCE, PARTS IDENTIFICATION (2 OF 2)

ManualsPlus.com

FIGURE 4. A7 MAIN REFERENCE, BLOCK DIAGRAM
A7/A23 8/10



ManualsPlus.com

ManualsPlus.com

A7A1 REFERENCE PHASE DETECTOR, CIRCUIT DESCRIPTION

The A7A1 Reference Phase Detector contains the frequency divider, phase detector, and integrating amplifier for the 100 MHz Reference phase-lock loop. Basically, 100 MHz from the A7A2 VCXO is divided by 10 and compared to the 10 MHz frequency standard by the phase detector. The error voltage from this comparison is fed back to the VCXO to keep its frequency locked to 10 times that of the frequency standard. The bandwidth of the reference phase-lock loop is 100 Hz; the 10 MHz derived from the 100 MHz VCXO must be within 100 Hz of the 10 MHz frequency standard for the loop to lock reliably.

Limiting Amplifier (A)

U1 amplifies and limits the amplitude of the 10 MHz from the frequency standard. U1A and U1B form a limiting differential pair, while the emitter follower U1 provides a low impedance output.

Pulse Generator (B)

U2D is biased with feedback resistor R10 to further limit the 10 MHz to a well-shaped square wave and set the proper logic levels for digital buffer U2C. U2A and U2B generate narrow pulses, the width being the gate delay of U2A plus the delay from R11 and C5. When the output of U2C goes low, the output of U2B goes high after one gate delay (of U2B). After a delay due to R11, C5 and U2A gate delay, the output of U2A goes high which causes U2B output to return low again, thus generating a narrow pulse.

Phase Lock Sampler (D)

The phase lock sampler performs the function of phase detector. The 10 MHz pulses from the buffer amplifier are applied to the primary of T1 which causes CR3 and CR4 to turn on for the duration of the pulses. This samples the divided by 10 VCXO frequency and stores this voltage on C26. When the loop is locked, the feedback due to the complete phase-lock loop forces this voltage to be nearly zero. When the loop is unlocked, this voltage may be zero or varying, depending on the reason for unlock.

Integrating Amplifier (E)

Q4 is a differential input pair which together with Q5 and Q6 forms a high gain amplifier. Feedback is added with C32 and R49 to make an integrating amplifier. C32 provides ac feedback only, so for the amplifier to remain linear, dc feedback is accomplished by virtue of the entire phase-lock loop.

VCXO Divider and Buffers (F)

100 MHz from the A7A2 VXCO is applied to the counter U3 which divides by 5, then by 2. Its outputs are 10 MHz and 20 MHz which are buffered by U4 to be used as reference frequencies by other assemblies in the instrument. The other 10 MHz output is used to drive the Phase Lock Sampler **(D)** and Lock Indicator Sampler **(I)**.

45° Phase Lead and Buffer Amplifier (G) and 45° Phase Lag and Buffer Amplifier (H)

The 45° phase shift buffers are used to provide two 10 MHz signals which are 90° apart in phase, the purpose of which is explained in Lock Indicator Sampler description. 45° phase shift in **(G)** is accomplished with C35 and R53, while in **(H)** it is done by R59 and C38.

ManualsPlus.com

Lock Indicator Sampler (I)

The lock indicator sampler functions the same as the phase lock sampler **(D)**. The only difference is that the 10 MHz is 90° shifted in phase. This causes the output of the lock indicator sampler to be a maximum negative voltage when the loop is locked, since in this state the output of the phase-lock sampler is 0V.

Phase Lock Detector (J)

The output of the lock indicator sampler is compared to −0.5V by U5. When the output voltage becomes closer to 0 than to −0.5V, U5 switches its output to TTL high to indicate to the A15 Processor that the loop is unlocked.

ManualsPlus.com

A7A1 REFERENCE PHASE DETECTOR, TROUBLESHOOTING

The A7A1 Reference Phase Detector compares the output of the 10 MHz Frequency Standard to the output of the A7A2 100 MHz VCXO and provides the tuning drive voltage for the VCXO. A phase lock detector in A7A1 indicates to the main processor (A15) the state of the Reference Phase Lock Loop.

Samplers (D), (I)

The Phase Lock and Lock Indicator Samplers are identical. The diodes are biased to approximately the same level in each. The dc bias on the diodes is as shown in Table 1.

TABLE 1. SAMPLER DIODE BIAS VOLTAGE LEVELS

Diode	dc Bias
CR3 Anode	+1.87
CR4 Cathode	−1.92
CR5 Cathode	−1.92
CR6 Anode	+1.82

The Phase Lock Sampler output (junction of R32 and R34) is 0V when locked or with no 10 MHz reference, and approximately +0.1V with no 100 MHz input. The Lock Indicator output (junction of R25 and R23) is −1.5V when locked, 0V with no 10 MHz reference, and approximately +0.2V with no 100 MHz input.

45° Phase Lead Amplifier (G) and 45° Phase Lag Amplifier (H)

The Phase Amplifiers shift the 100 MHz VCXO signal, which has been divided by 10 by U3, +45° and −45° respectively. Figure 1 is typical of the waveforms at the collectors of Q1 and Q2. The dc voltages for Q1 and Q2 are as shown in Table 2.

Oscilloscope Settings:
Vertical: 0.05V/Div AC
Horizontal: 0.05usec/Div
Probe: 10:1

Analyzer Settings:
INSTR PRESET

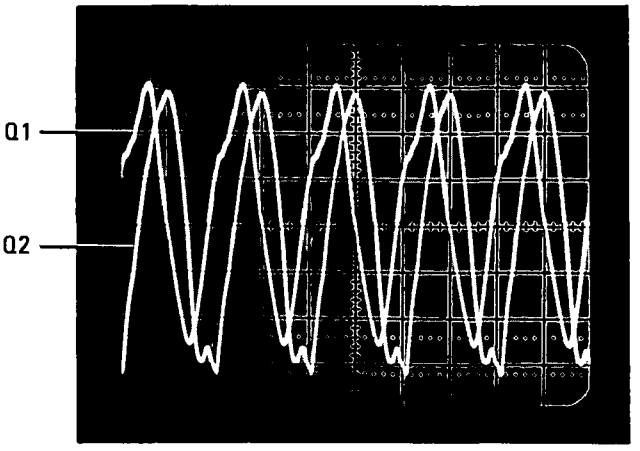


FIGURE 1. OUTPUTS OF 45° PHASE AMPLIFIERS

ManualsPlus.com

TABLE 2. PHASE AMPLIFIER VOLTAGE LEVELS

	Voltage Levels	
	Q1	Q2
Emitter	–8.0	–8.0
Base	–7.4	–7.4
Collector	–3.6	–3.6

Limiting Amplifier (A)

The Limiting Amplifier shapes and amplifies the 10 MHz reference from the Frequency Standard (A22). Typical voltage levels for U1 are shown in Table 3.

TABLE 3. LIMITING AMPLIFIER VOLTAGE LEVELS

U1 Pin No.	dc Voltage Level
1	+5.0
2	0
3	+0.5
4	0
5	+2.3
6	+2.3
7	+1.6
8	+5.0

Pulse Generator (B)

Typical input/output waveforms for the Pulse Generator are shown in Figures 2 and 3.

Oscilloscope Settings:
Vertical: 0.1V/Div
Horizontal: 0.2usec/Div
X10 Magnifier
Probes: 10:1
Channel A: U2B Pin 5
Channel B: U2A Pin 2

Analyzer Settings:
INSTR PRESET

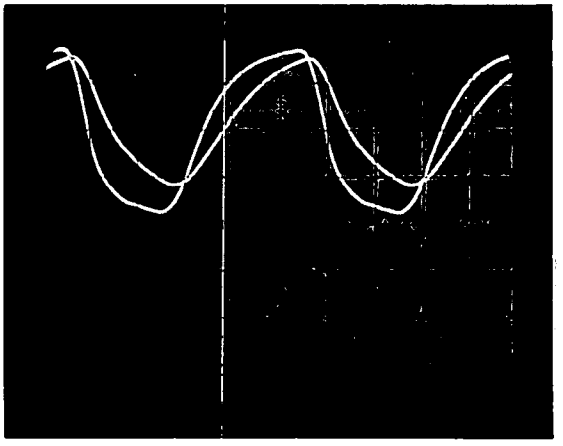


FIGURE 2. PULSE GENERATOR INPUT WAVEFORMS

ManualsPlus.com

Oscilloscope Settings:
Vertical: 0.1V/Div
Horizontal: 0.05usec/Div
Probe: 10:1
Channel A: U2B Pin 4(TP1)

Analyzer Settings:
INSTR PRESET

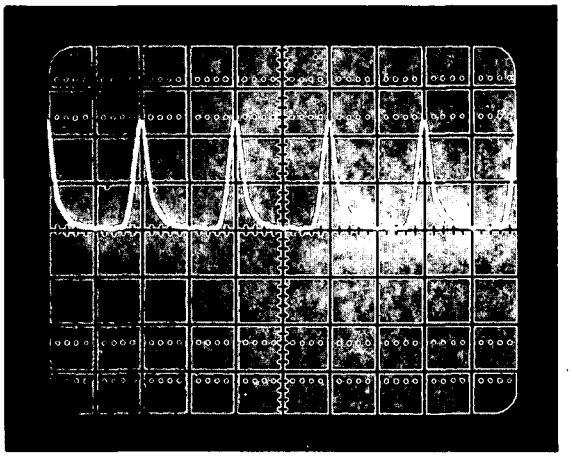


FIGURE 3. PULSE GENERATOR OUTPUT PULSES

Buffer Amplifier (C)

Typical voltage levels for the Buffer Amplifier are shown in Table 4.

TABLE 4. BUFFER AMPLIFIER VOLTAGE LEVELS

	Voltage Levels	
	Q2	Q7
Emitter	–4.6	–4.6
Base	–4.5	–4.5
Collector	–0.3	–9.4

Integrating Amplifier (E)

Typical voltage levels for the Integrating Amplifier are shown in Table 5.

Integrating Amplifier tune voltage output (junction of R75 and R51):

– 8.6V (locked)
– 23.6V (unlocked with no 10 MHz)
– 1.4V (unlocked with no 100 MHz)

NOTE

The tune voltage can be measured at A7A2TP1. However, the voltage levels will be slightly lower.

ManualsPlus.com

TABLE 5. INTEGRATING AMPLIFIER VOLTAGE LEVELS

Transistor	dc Voltage Levels
Q4A	
Pin 1	+0.9
Pin 2	+9.8
Pin 3	0.0 (locked) 0.0 (no 10 MHz) +0.1 (no 100 MHz)
Q4B	
Pin 4	+0.9
Pin 5	+9.8
Pin 6	0.0
Q5	
Emitter	+10.3
Base	+9.8
Collector	Gnd
Q6	
Emitter	+10.3
Base	+9.8
Collector	−2.2

Phase Lock Detector (J)

The output of the Lock Indicator Sampler is compared to a reference of −0.4V by comparator U5. The output of U5 is high for any unlocked condition. VR1 limits the output voltage (HULR) to approximately 4.64V.

This can be checked by disconnecting the 10 MHz input at A7A1J1 (gray/white cable) and measuring the output of U5. With the loop unlocked (10 MHz removed), this output should be approximately 4.64V.

ManualsPlus.com

TABLE 6. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A1	05660-60015	5	1	BOARD ASSEMBLY, REFERENCE PHASE DETECTOR	28480	05660-60015
A7A1C1	0180-0197	8	5	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A7A1C2	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A7A1C3	0180-1746	5	4	CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A7A1C4	0160-3879	7	6	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A7A1C5	0140-0190	7	1	CAPACITOR-FXD 39PF +-5% 300VDC MICA	72136	DM15E390J0300WV1CR
A7A1C6	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A7A1C7	0160-2055	9	24	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7A1C8	0180-3073	5	1	CAPACITOR-FXD 2.2UF+-20% 35VDC TA	28480	0180-3073
A7A1C9	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A7A1C10	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7A1C11	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A7A1C12	0160-2199	2	1	CAPACITOR-FXD 30PF +-5% 300VDC MICA	28480	0160-2199
A7A1C13	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A7A1C14	0160-2204	0	3	CAPACITOR-FXD 100PF +-5% 300VDC MICA	28480	0160-2204
A7A1C15	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A7A1C16	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7A1C17	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7A1C18	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7A1C19	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7A1C20	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7A1C21	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7A1C22	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7A1C23	0180-0553	0	2	CAPACITOR-FXD 22UF+-20% 25VDC TA	28480	0180-0553
A7A1C24	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7A1C25	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7A1C26	0160-2204	0		CAPACITOR-FXD 100PF +-5% 300VDC MICA	28480	0160-2204
A7A1C27	0140-0193	0	4	CAPACITOR-FXD 82PF +-5% 300VDC MICA	72136	DM15E820J0300WV1CR
A7A1C28	0180-0553	0		CAPACITOR-FXD 22UF+-20% 25VDC TA	28480	0180-0553
A7A1C29	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7A1C30	0140-0193	0		CAPACITOR-FXD 82PF +-5% 300VDC MICA	72136	DM15E820J0300WV1CR
A7A1C31	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A7A1C32	0170-0066	9	1	CAPACITOR-FXD .027UF +-10% 200VDC POLYE	28480	0170-0066
A7A1C33	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7A1C34	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7A1C35	0140-0193	0		CAPACITOR-FXD 82PF +-5% 300VDC MICA	72136	DM15E820J0300WV1CR
A7A1C36	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7A1C37	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7A1C38	0140-0193	0		CAPACITOR-FXD 82PF +-5% 300VDC MICA	72136	DM15E820J0300WV1CR
A7A1C39	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A7A1C40	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A7A1C41	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7A1C42	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7A1C43	0160-2206	2	1	CAPACITOR-FXD 160PF +-5% 300VDC MICA	28480	0160-2206
A7A1C44	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7A1C45	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7A1C46	0140-0210	2	3	CAPACITOR-FXD 270PF +-5% 300VDC MICA	72136	DM15F271J0300WV1CR
A7A1C47	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7A1C48	0140-0210	2		CAPACITOR-FXD 270PF +-5% 300VDC MICA	72136	DM15F271J0300WV1CR
A7A1C49	0160-2201	7	1	CAPACITOR-FXD 51PF +-5% 300VDC MICA	28480	0160-2201
A7A1C50	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7A1C51	0140-0210	2		CAPACITOR-FXD 270PF +-5% 300VDC MICA	72136	DM15F271J0300WV1CR
A7A1C52	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7A1C53	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7A1C54	0180-0183	2	1	CAPACITOR-FXD 10UF+75-10% 50VDC AL	56289	30D106G050CB2
A7A1C55	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A7A1C56	0180-0229	7	1	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A7A1C57	0160-2204	0		CAPACITOR-FXD 100PF +-5% 300VDC MICA	28480	0160-2204
A7A1C58	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A7A1C59	0160-3878	6	2	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A1C60	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A7A1C61	0160-3454	4	1	CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A1C62	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A1CR1	1901-0518	8	6	DIODE-SM SIG SCHOTTKY	28480	1901-0518
A7A1CR2	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A7A1CR3	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A7A1CR4	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A7A1CR5	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A7A1CR6	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A7A1J1	1250-0544	9	5	CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544
A7A1J2				P/O A7A1W1		
A7A1J3	1250-0544	9		CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544
A7A1J4	1250-0544	9		CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544
A7A1J5	1250-0544	9		CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544

*Indicates Factory Selected Value

ManualsPlus.com

TABLE 6. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A1J6	1250-0544	9		CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544
A7A1L1	9140-0238	3	2	INDUCTOR RF-CH-MLD 82UH 5% .166DX.385LG	28480	9140-0238
A7A1L2	9140-0238	3		INDUCTOR RF-CH-MLD 82UH 5% .166DX.385LG	28480	9140-0238
A7A1L3	9140-0143	9	2	INDUCTOR RF-CH-MLD 3.3UH 10% .105DX.26LG	28480	9140-0143
A7A1L4	9140-0143	9		INDUCTOR RF-CH-MLD 3.3UH 10% .105DX.26LG	28480	9140-0143
A7A1L5	9100-2261	2	1	INDUCTOR RF-CH-MLD 2.7UH 10% .105DX.26LG	28480	9100-2261
A7A1L6	9140-0114	4	1	INDUCTOR RF-CH-MLD 10UH 10% .166DX.385LG	28480	9140-0114
A7A1L7	9100-2255	4	4	INDUCTOR RF-CH-MLD 470NH 10% .105DX.26LG	28480	9100-2255
A7A1L8	9100-0368	6	1	INDUCTOR RF-CH-MLD 330NH 10% .105DX.26LG	28480	9100-0368
A7A1L9	9100-2257	6	3	INDUCTOR RF-CH-MLD 820NH 10% .105DX.26LG	28480	9100-2257
A7A1L10	9100-2255	4		INDUCTOR RF-CH-MLD 470NH 10% .105DX.26LG	28480	9100-2255
A7A1L11	9100-2257	6		INDUCTOR RF-CH-MLD 820NH 10% .105DX.26LG	28480	9100-2257
A7A1L12	9100-2255	4		INDUCTOR RF-CH-MLD 470NH 10% .105DX.26LG	28480	9100-2255
A7A1L13	9100-2257	6		INDUCTOR RF-CH-MLD 820NH 10% .105DX.26LG	28480	9100-2257
A7A1L14	9100-2255	4		INDUCTOR RF-CH-MLD 470NH 10% .105DX.26LG	28480	9100-2255
A7A1L15	9100-2256	5	1	INDUCTOR RF-CH-MLD 560NH 10% .105DX.26LG	28480	9100-2256
A7A1L16	9100-2891	4	1	INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A7A1Q1	1854-0019	3	3	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A7A1Q2	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A7A1Q3	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A7A1Q4	1855-0049	1	1	TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	28480	1855-0049
A7A1Q5	1853-0451	5	2	TRANSISTOR PNP 2N3799 SI TO-18 PD=360MW	01295	2N3799
A7A1Q6	1853-0451	5		TRANSISTOR PNP 2N3799 SI TO-18 PD=360MW	01295	2N3799
A7A1Q7	1853-0034	0	1	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A7A1R1	0757-0399	5	2	RESISTOR 82.5 1% .125W F TC=0+-100	24546	C4-1/8-T0-82R5-F
A7A1R2	0757-0417	8	1	RESISTOR 562 1% .125W F TC=0+-100	24546	C4-1/8-T0-562R-F
A7A1R3	0757-0416	7	4	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A1R4	0757-0401	0	3	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7A1R5	0698-3156	2	1	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A7A1R6	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7A1R7	0757-0420	3	1	RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A7A1R8	0757-0438	3	1	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A7A1R9	0757-0399	5		RESISTOR 82.5 1% .125W F TC=0+-100	24546	C4-1/8-T0-82R5-F
A7A1R10	0698-7222	1	1	RESISTOR 261 1% .05W F TC=0+-100	24546	C3-1/8-T0-261R-F
A7A1R11	0698-7219	6	1	RESISTOR 196 1% .05W F TC=0+-100	24546	C3-1/8-T0-196R-F
A7A1R12	0757-0442	9	5	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A7A1R13	0698-3453	2	3	RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A7A1R14	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A7A1R15	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A7A1R16	0757-0441	8	2	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A7A1R17	0698-3438	3	2	RESISTOR 147 1% .125W F TC=0+-100	24546	C4-1/8-T0-147R-F
A7A1R18	0757-0346	2	6	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A7A1R19	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A7A1R20	0757-0441	8		RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A7A1R21	0698-3438	3		RESISTOR 147 1% .125W F TC=0+-100	24546	C4-1/8-T0-147R-F
A7A1R22	0698-3136	8	1	RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A7A1R23	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A7A1R24	0698-3154	0	5	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A7A1R25	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A7A1R26	0757-0280	3	5	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A7A1R27	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A7A1R28	0698-3450	9	1	RESISTOR 42.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4222-F
A7A1R29	0698-3449	6	1	RESISTOR 28.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2872-F
A7A1R30	0757-0444	1	2	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A7A1R31	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A7A1R32	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A7A1R33	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A7A1R34	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A7A1R35	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A7A1R36	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A7A1R37	0757-0200	7	1	RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A7A1R38	0757-0421	4	2	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A7A1R39	0757-0440	7	1	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A7A1R40	0757-0394	0	2	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A7A1R41	0698-3446	3	2	RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A7A1R42	0698-0085	0	3	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A7A1R43	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A7A1R44	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A7A1R45	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A7A1R46	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A7A1R47	0698-3453	2		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A7A1R48	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A7A1R49	0698-7285	6	1	RESISTOR 110K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1103-F
A7A1R50	0698-3157	3	2	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F

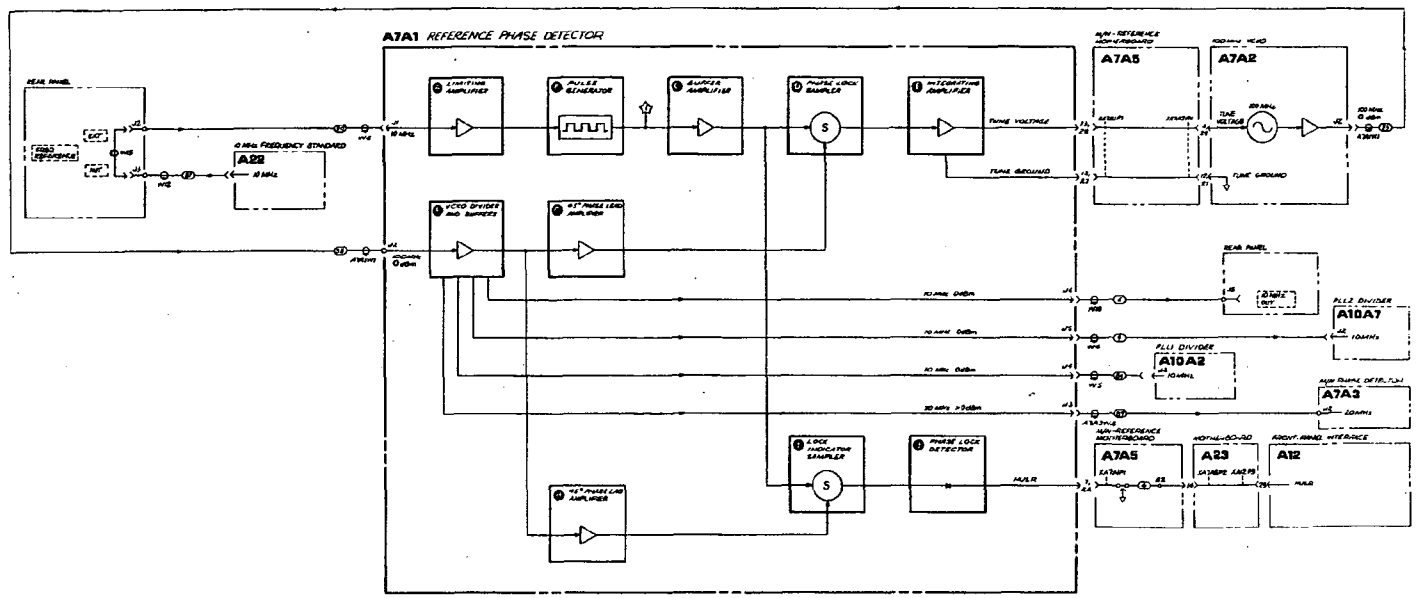
*Indicates Factory Selected Value

ManualsPlus.com

TABLE 6. REPLACEABLE PARTS

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A7A1R51	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A7A1R52	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7A1R53	0698-3440	7	2	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A7A1R54	0698-7234	5	1	RESISTOR 825 1% .05W F TC=0+-100	24546	C3-1/8-T0-825R-F
A7A1R55	0698-7257	2	1	RESISTOR 7.5K 1% .05W F TC=0+-100	24546	C3-1/8-T0-7501-F
A7A1R56	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A7A1R57	0698-3446	3		RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A7A1R58	0698-7246	9	1	RESISTOR 2.61K 1% .05W F TC=0+-100	24546	C3-1/8-T0-2611-F
A7A1R59	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A7A1R61	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A7A1R62	0757-0278	9	1	RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A7A1R63	0698-0085	0		RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A7A1R64	0698-3132	4	2	RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A7A1R65	0698-0085	0		RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A7A1R66	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A7A1R67	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A7A1R68	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A1R69	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A1R70	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A1R71	0757-0274	5	1	RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1211-F
A7A1R72	0698-3132	4		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A7A1R73	0757-0317	7	1	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A7A1R74	0757-0289	2	1	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A7A1R75	0698-7236	7	1	RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A7A1T1	08552-6044	1	2	TRANSF RF 5 PIN	28480	08552-6044
A7A1T2	08552-6044	1		TRANSF RF 5 PIN	28480	08552-6044
A7A1TP1	1251-0600	0	1	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A1U1	1858-0032	0	1	TRANSISTOR ARRAY 14-PIN PLSTC DIP	3L585	CA3146E
A7A1U2	1820-0328	6	1	IC GATE TTL NOR QUAD 2-INP	01295	SN7402N
A7A1U3	1820-1383	5	1	IC CNTR ECL BCD POS-EDGE-TRIG	04713	MC10130L
A7A1U4	1820-0002	1	1	IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A7A1U5	1820-0223	0	1	IC OP AMP GP TO-99 PKG	3L585	CA301AT
A7A1U6	1820-0429	8	1	IC V RGLTR TO-39	18324	LM309H
A7A1VR1	1902-3082	9	1	DIODE-ZNR 4.64V 5% DO-35 PD=.4W	28480	1902-3082
A7A1VR2	1902-3256	9	1	DIODE-ZNR 23.7V 5% DO-35 PD=.4W	28480	1902-3256
A7A1W1	05660-60084	8	1	CBL AY GRA/OR	28480	05660-60004
				MISCELLANEOUS PARTS		
	2190-0124	4	1	WASHER-LK INTL T NO. 10 .175-IN-ID	28480	2190-0124
	2200-0101	0	2	SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2200-0103	2	1	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
	2950-0078	9	1	NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
	85660-20045	7	1	CVR PC REF PHDET	28480	85660-20045
	06701-40001	9	2	EXTRACTOR PC	28480	06701-40001

*Indicates Factory Selected Value



A7A1

FIGURE 4. A7A1 REFERENCE PHASE DETECTOR, BLOCK DIAGRAM

ManualsPlus.com

ManualsPlus.com

A7A1
REFERENCE PHASE DETECTOR
85660-60015

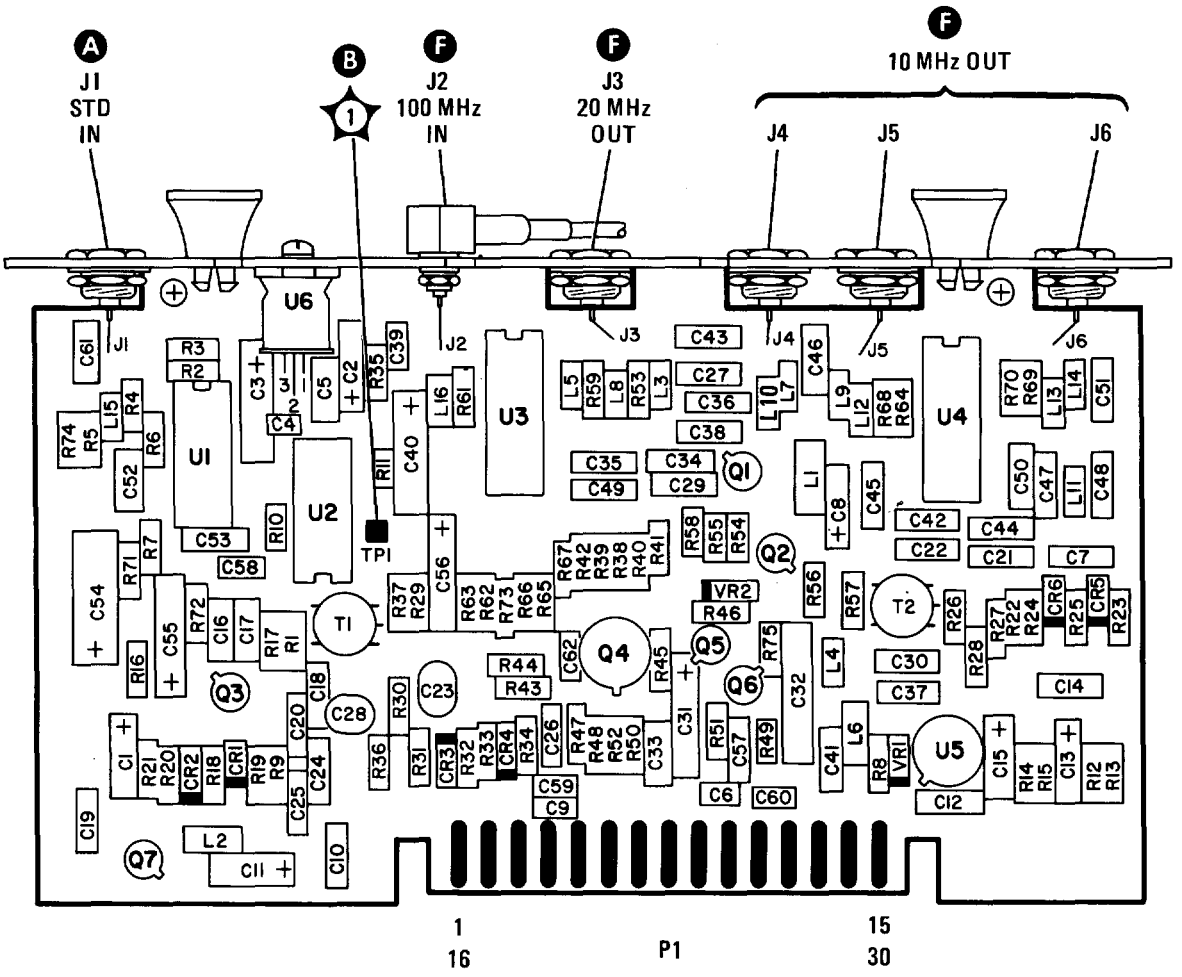
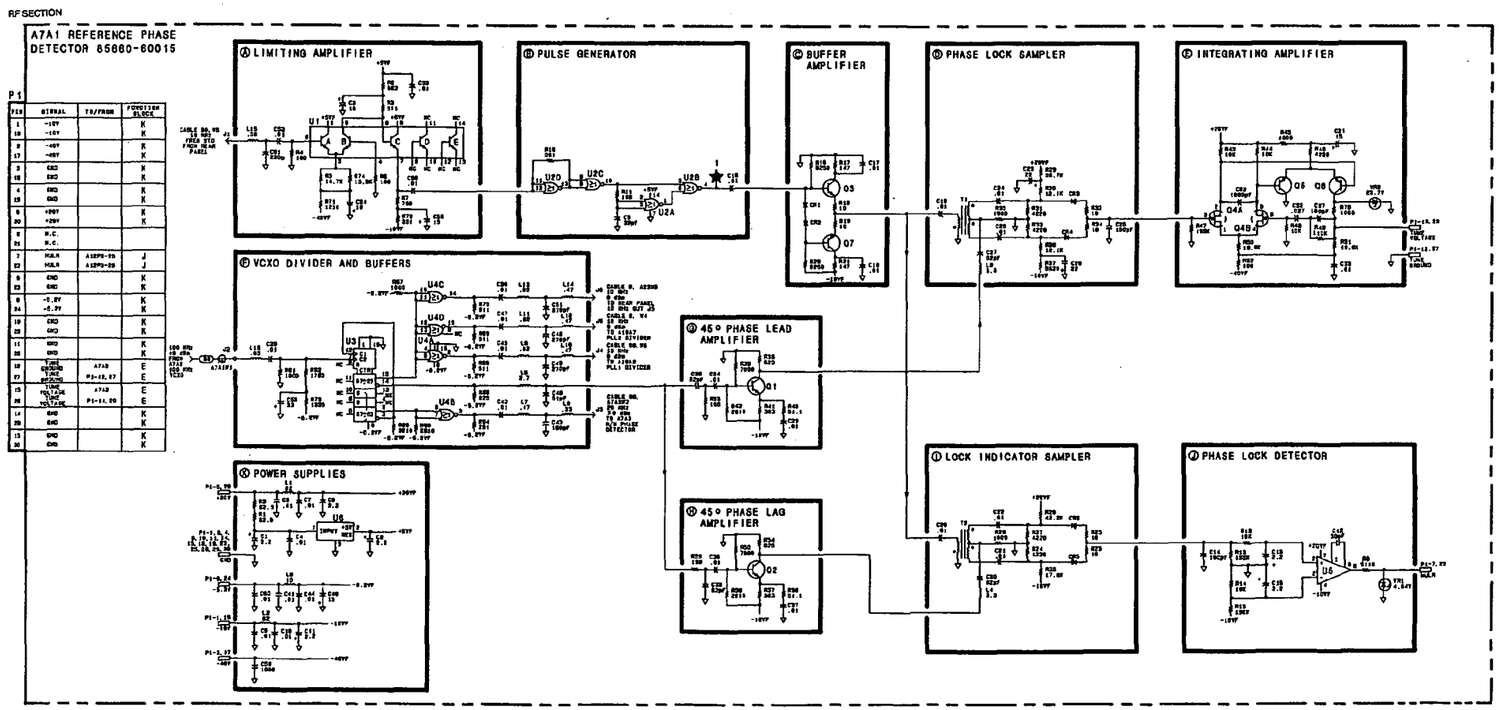


FIGURE 5. A7A1 REFERENCE PHASE DETECTOR, COMPONENT LOCATIONS

ManualsPlus.com



PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	-10V		K
16	-10V		K
2	-40V		K
17	-40V		K
3	GND		K
18	GND		K
4	GND		K
19	GND		K
5	+20V		K
20	+20V		K
6	N.C.		
21	N.C.		
7	MUX	A12P2-20	J
22	MUX	A12P2-20	J
8	GND		K
23	GND		K
9	-5.2V		K
24	-5.2V		K
10	GND		K
25	GND		K
11	GND		K
26	GND		K
12	TUNE CLOCK SIGNAL	A7A2 P3-19,57	E
27	TUNE VOLTAGE LOW VOLTAGE	A7A2 P3-11,59	E
13	GND		K
28	GND		K
14	GND		K
29	GND		K
15	GND		K
30	GND		K

SERIAL PREFIX: 2410A

FIGURE 6. A7A1 REFERENCE PHASE DETECTOR, SCHEMATIC DIAGRAM

A7A1

ManualsPlus.com

A7A2 100 MHz VCXO

ManualsPlus.com

A7A2 100 MHz VOLTAGE-CONTROLLED CRYSTAL OSCILLATOR (VCXO), CIRCUIT DESCRIPTION

A7A2 consists of a 100 MHz voltage-controlled crystal oscillator, buffer amplifiers, and a frequency quadrupler. In conjunction with A7A1 Reference Phase Detector, it forms the reference phase-lock loop. Outputs of 100 MHz and 400 MHz are used as frequency references by other assemblies in the instrument.

100 MHz Oscillator (A)

Q5 functions as a common-base amplifier with feedback to form an oscillator. The feedback includes the 100 MHz crystal Y1 and varactor CR1 which are the principal frequency-determining components. CR1 is tuned by the output of A7A1 and can vary the frequency by approximately ±1 kHz. The amplitude of the oscillations is limited by CR3 and CR4. TP1 is accessible from the top cover; the voltage should be near −8V dc for proper operation. The voltage is adjusted by tuning the oscillator with C4.

100 MHz Buffer Amplifier (B)

Q6, Q7, Q8, Q9, and Q11 form a series of 100 MHz amplifiers. They buffer the 100 MHz outputs from each other as well as from the oscillator.

Quadrupler (C)

100 MHz from Q7 in **(B)** is applied to T3. The secondary of T3 is connected to Q3 and Q4 to form a full-wave rectifier. Positive half cycles of 100 MHz to T3 turn on Q3 while negative half cycles turn on Q4. The collectors are connected together to sum the currents and produce even harmonics of 100 MHz. The output is tuned to 400 MHz by C3 and L10 to select 400 MHz.

400 MHz Amplifier (D)

Q1 and Q2 are two common-emitter tuned amplifier stages which amplify 400 MHz and filter undesired harmonics of 100 MHz. R67, R68, and R69 form a pad which is selected to give −9 dBm ±2 dB output at 400 MHz.

ManualsPlus.com

A7A2 100 MHz VCXO, TROUBLESHOOTING

The 100 MHz VCXO supplies all of the fixed reference frequencies for the 8566B. Separate 100 MHz outputs are routed to the A6A9, A10A4, and A7A1 assemblies. A 400 MHz signal is applied to the A7A3 assembly. The A7A1 assembly divides the 100 MHz input to provide 10 MHz and 20 MHz references.

100 MHz Oscillator (A)

The tune voltage at A7A2TP1 is nominally −8V. If an unlocked condition exists, this voltage is either −23V or −1.3V. If the level is −23V, check the 10 MHz reference to A7A1. If the level is −1.3V, check the outputs of the 100 MHz Buffer/Amplifier.

Typical voltage levels for the oscillator transistor Q5 are:

Emitter ..... −12.8V
Base ..... −11.9V
Collector 0.0V

100 MHz Buffer/Amplifier (B)

All 100 MHz output levels should be approximately 0 dBm. Typical voltage levels for each transistor are as shown in Table 1.

TABLE 1. 100 MHz BUFFER/AMPLIFIER VOLTAGE LEVELS

	Q6	Q7	Q11	Q8	Q9
Emitter	3.8	3.8	3.8	4.3	5.0
Base	4.5	4.5	4.5	5.0	5.5
Collector	9.2	9.1	9.3	10.0	11.0

Quadrupler (C) and 400 MHz Amplifier (D)

Typical voltage levels for the Quadrupler and 400 MHz Amplifier are as shown in Table 2.

The 400 MHz Amplifier output at A7A2J1 (white/blue cable) is approximately −10 dBm.

TABLE 2. QUADRUPLER AND 400 MHz AMPLIFIER VOLTAGE LEVELS

	Q3	Q4	Q1	Q2
Emitter	−4.6	−5.1	−6.6	−6.6
Base	−5.9	−5.9	−5.9	−5.9
Collector	0.0	0.0	0.0	0.0

ManualsPlus.com

TABLE 3. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A2	05660-60135	0	1	BOARD ASSEMBLY, 100MHZ VOLTAGE-CONTROL-LED CRYSTAL OSCILLATOR (VCXO)	28480	05660-60135
A7A2C1	0121-0495	5	3	CAPACITOR-V TRMR-AIR 1.9-15.7PF 175V	74970	187-0309-125
A7A2C2	0121-0495	5		CAPACITOR-V TRMR-AIR 1.9-15.7PF 175V	74970	187-0309-125
A7A2C3	0121-0495	5		CAPACITOR-V TRMR-AIR 1.9-15.7PF 175V	74970	187-0309-125
A7A2C4	0121-0493	3	1	CAPACITOR-V TRMR-AIR 1.7-11PF 175V	74970	187-0306-125
A7A2C5	0180-0049	9	1	CAPACITOR-FXD 20UF+75-10% 50VDC AL	56289	30D206G050CC2
A7A2C6	0160-3456	6	5	CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A7A2C7	0160-3454	4	19	CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C8*	0160-2251	7	1	CAPACITOR-FXD 5.6PF +-.25PF 500VDC CER	28480	0160-2251
A7A2C9	0160-4084	8	1	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A7A2C10	0140-0191	8	1	CAPACITOR-FXD 56PF +-5% 300VDC MICA	72136	DM15E560J0300WV1CR
A7A2C11	0160-2204	0	1	CAPACITOR-FXD 100PF +-5% 300VDC MICA	28480	0160-2204
A7A2C12	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C13	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C14	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C15	0160-2261	9	8	CAPACITOR-FXD 15PF +-5% 500VDC CER 0+-30	28480	0160-2261
A7A2C16	0160-2261	9		CAPACITOR-FXD 15PF +-5% 500VDC CER 0+-30	28480	0160-2261
A7A2C17	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C18	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C19	0160-2261	9		CAPACITOR-FXD 15PF +-5% 500VDC CER 0+-30	28480	0160-2261
A7A2C20	0160-2261	9		CAPACITOR-FXD 15PF +-5% 500VDC CER 0+-30	28480	0160-2261
A7A2C21	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C22	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C23	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C24	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C25	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C26	0160-2261	9		CAPACITOR-FXD 15PF +-5% 500VDC CER 0+-30	28480	0160-2261
A7A2C27	0160-2261	9		CAPACITOR-FXD 15PF +-5% 500VDC CER 0+-30	28480	0160-2261
A7A2C28	0160-3872	0	2	CAPACITOR-FXD 2.2PF +-.25PF 200VDC CER	28480	0160-3872
A7A2C29	0160-3872	0		CAPACITOR-FXD 2.2PF +-.25PF 200VDC CER	28480	0160-3872
A7A2C30	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C31	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C32	0160-2261	9		CAPACITOR-FXD 15PF +-5% 500VDC CER 0+-30	28480	0160-2261
A7A2C33	0160-2261	9		CAPACITOR-FXD 15PF +-5% 500VDC CER 0+-30	28480	0160-2261
A7A2C34	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C35	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C36	0160-3878	6	5	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A2C37	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A2C38	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A2C39	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C40	0160-2238	0	1	CAPACITOR-FXD 1.5PF +-.25PF 500VDC CER	28480	0160-2238
A7A2C41				NOT ASSIGNED		
A7A2C42	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A2C43	0180-0116	1	2	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A7A2C44	0160-2253	9	1	CAPACITOR-FXD 6.8PF +-.25PF 500VDC CER	28480	0160-2253
A7A2C45				NOT ASSIGNED		
A7A2C46	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A2C47	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C48	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A7A2C49	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A7A2C50	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A7A2C51	0160-4299	7	1	CAPACITOR-FXD 2200PF +-20% 250VDC CER	56289	C067F251F222MS22-CDH
A7A2C52	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A7A2C53	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A7A2C54	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C55	0160-3454	4		CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A7A2C56	0160-2437	1	1	CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7A2CR1	0122-0245	5	1	DIODE-VVC 1N5139 6.8PF 10%	01281	1N5139
A7A2CR2				NOT ASSIGNED		
A7A2CR3	1901-0539	3	2	DIODE-SM SIG SCHOTTKY	28480	1901-0539
A7A2CR4	1901-0539	3		DIODE-SM SIG SCHOTTKY	28480	1901-0539
A7A2E1	9170-0029	3	1	CORE-SHIELDING BEAD	28480	9170-0029
A7A2J1				P/O A7A2W1		
A7A2J2	1250-0544	9	3	CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544
A7A2J3	1250-0544	9		CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544
A7A2J4	1250-0544	9		CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544
A7A2L1				NOT ASSIGNED		
A7A2L2	9100-2250	7	1	INDUCTOR RF-CH-MLD 180NH 10% .105DX.26LG	28480	9100-2250
A7A2L3	9140-0158	6	3	INDUCTOR RF-CH-MLD 1UH 10% .105DX.26LG	28480	9140-0158
A7A2L4*	9100-0368	6	1	INDUCTOR RF-CH-MLD 330NH 10% .105DX.26LG	28480	9100-0368
A7A2L5	9100-2538	6	1	INDUCTOR RF-CH-MLD 1UH 10% .161DX.385LG	28480	9100-2538

*Indicates Factory Selected Value

ManualsPlus.com

TABLE 3. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A2L6	9100-2251	0	4	INDUCTOR RF-CH-MLD 220NH 10% .105DX.26LG	28480	9100-2251
A7A2L7	9100-2251	0		INDUCTOR RF-CH-MLD 220NH 10% .105DX.26LG	28480	9100-2251
A7A2L8	9100-2251	0		INDUCTOR RF-CH-MLD 220NH 10% .105DX.26LG	28480	9100-2251
A7A2L9	9100-2251	0		INDUCTOR RF-CH-MLD 220NH 10% .105DX.26LG	28480	9100-2251
A7A2L10-A7A2L13				NOT ASSIGNED		
A7A2L14	9100-2247	4	2	INDUCTOR RF-CH-MLD 100NH 10% .105DX.26LG	28480	9100-2247
A7A2L15	9100-2248	5		INDUCTOR RF-CH-MLD 120NH 10% .105DX.26LG	28480	9100-2248
A7A2L16	9140-0158	6		INDUCTOR RF-CH-MLD 1UH 10% .105DX.26LG	28480	9140-0158
A7A2L17	9140-0158	6		INDUCTOR RF-CH-MLD 1UH 10% .105DX.26LG	28480	9140-0158
A7A2L18	9140-0144	0	2	INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A7A2L19	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A7A2Q1	1854-0345	8	9	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A2Q2	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A2Q3	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A2Q4	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A2Q5	1854-0247	9	1	TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
A7A2Q6	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A2Q7	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A2Q8	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A2Q9	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A2Q10	1854-0404	0	1	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A7A2Q11	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A2R1	0757-0279	0	3	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A7A2R2	0757-0419	0	1	RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-681R-F
A7A2R3	0698-3440	7	1	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A7A2R4	0757-0422	5	6	RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A7A2R5	0698-3155	1	2	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A7A2R6	0698-7224	3	1	RESISTOR 316 1% .05W F TC=0+-100	24546	C3-1/8-T0-316R-F
A7A2R7	0757-0346	2	2	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A7A2R8	0757-0422	5		RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A7A2R9	0757-0442	9	1	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A7A2R10	0757-0401	0	7	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7A2R11	0757-0394	0	5	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A7A2R12	0757-0416	7	6	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A2R13	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A7A2R14	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A2R15	0757-0422	5		RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A7A2R16	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7A2R17	0698-3150	6	8	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A7A2R18	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A7A2R19	0698-7198	0	2	RESISTOR 26.1 1% .05W F TC=0+-100	24546	C3-1/8-T0-26R1-F
A7A2R20	0698-3443	0	5	RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A7A2R21	0698-3429	2	3	RESISTOR 19.6 1% .125W F TC=0+-100	03888	PME55-1/8-T0-19R6-F
A7A2R22	0698-3443	0		RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A7A2R23	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A7A2R24	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7A2R25	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A7A2R26	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A2R27	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A7A2R28	0757-0422	5		RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A7A2R29	0698-7190	0		RESISTOR 26.1 1% .05W F TC=0+-100	24546	C3-1/8-T0-26R1-F
A7A2R30	0698-3443	0		RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A7A2R31	0698-3429	2		RESISTOR 19.6 1% .125W F TC=0+-100	03888	PME55-1/8-T0-19R6-F
A7A2R32	0698-3443	0		RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A7A2R33	0698-3443	0		RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A7A2R34	0698-3429	2		RESISTOR 19.6 1% .125W F TC=0+-100	03888	PME55-1/8-T0-19R6-F
A7A2R35	0698-7223	2	1	RESISTOR 287 1% .05W F TC=0+-100	24546	C3-1/8-T0-287R-F
A7A2R36	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A7A2R37	0757-0422	5		RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A7A2R38	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7A2R39	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A7A2R40	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A2R41	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A7A2R42	0698-0084	9	3	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A7A2R43	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A7A2R44	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A7A2R45	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A7A2R46	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A7A2R47	0757-0439	4	2	RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A7A2R48	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A2R49	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A7A2R50	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F

*Indicates Factory Selected Value

ManualsPlus.com

TABLE 3. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A2R51	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A2R52	0757-0280	3	2	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A7A2R53	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A7A2R54	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A7A2R55	0757-0422	5		RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A7A2R56	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A7A2R57	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7A2R58	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7A2R59	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A7A2R60	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A7A2R61	0757-0397	3	1	RESISTOR 68.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-68R1-F
A7A2R62	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7A2R63-A7A2R66				NOT ASSIGNED		
A7A2R67*	0698-3437	2	2	RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A7A2R68*	0698-4037	0	1	RESISTOR 46.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-46R4-F
A7A2R69*	0698-3437	2		RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A7A2T1	08553-6012	5	3	TRNSFRMR RF BLUE	28480	08553-6012
A7A2T2	08553-6012	5		TRNSFRMR RF BLUE	28480	08553-6012
A7A2T3	08553-6012	5		TRNSFRMR RF BLUE	28480	08553-6012
A7A2TP1				NOT ASSIGNED		
A7A2TP2	1251-0600	0	3	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A2TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A2TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A2W1	85660-60082	6	1	CBL AY WHT/BLU	28480	85660-60082
A7A2Y1	0410-1086	5	1	CRYSTAL-QUARTZ 100.00 MHZ HC-35/U-HLDR	28480	0410-1086
				MISCELLANEOUS PARTS		
	85660-20046	8	1	COVER V	28480	85660-20046
	86701-40001	9	2	EXTRACTOR PC	28480	86701-40001

*Indicates Factory Selected Value

ManualsPlus.com

A7A2
100 MHz VCXO
85660-60135

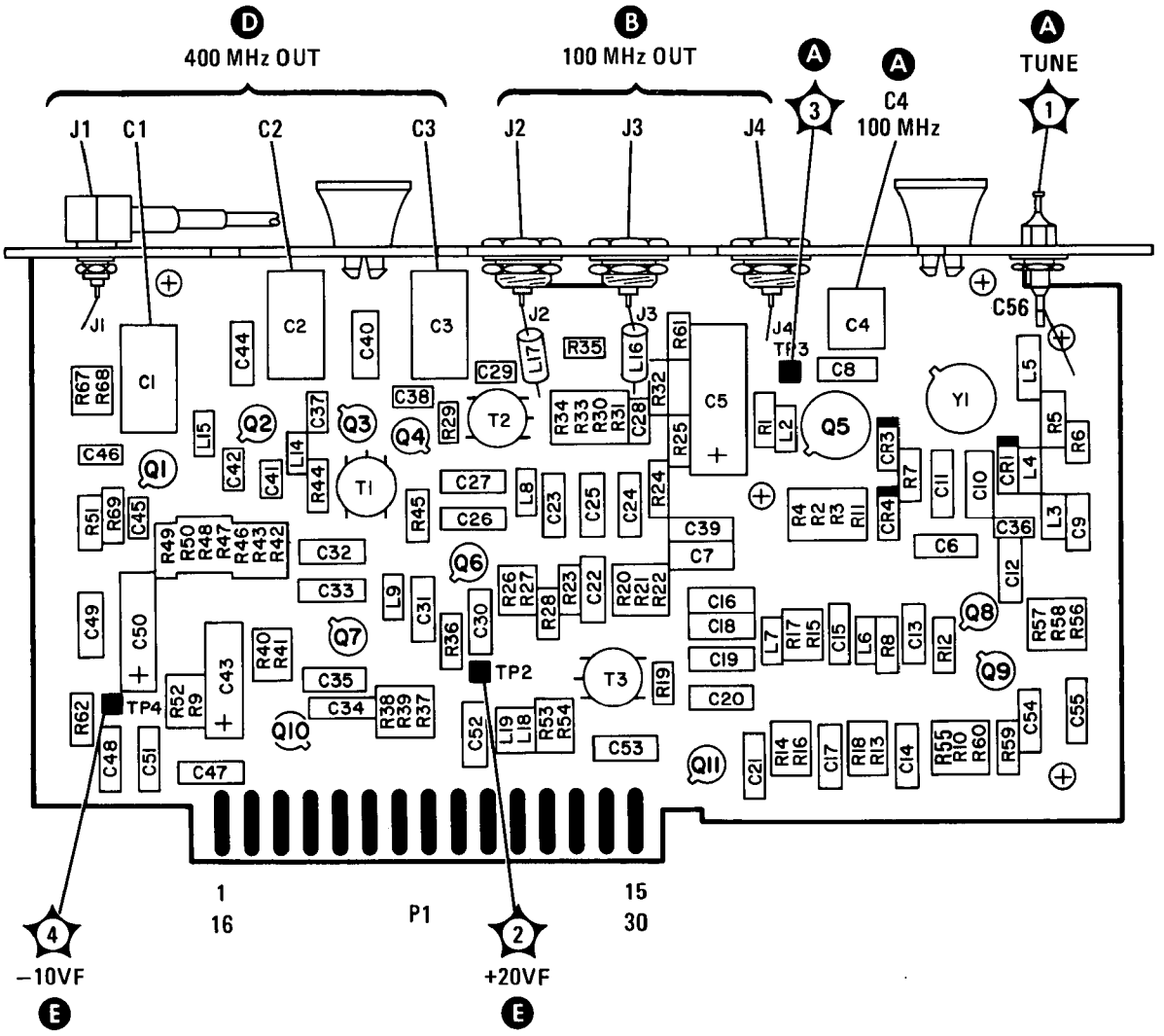
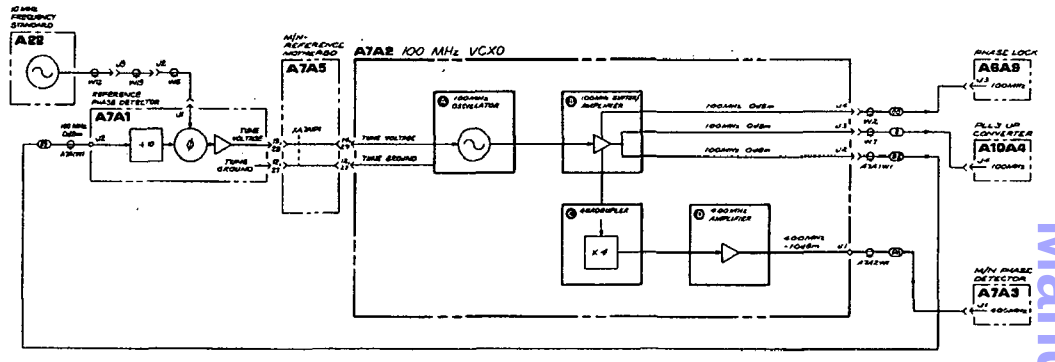


FIGURE 2. A7A2 100 MHz VCXO, COMPONENT LOCATIONS

RF SECTION



A7A2

ManualsPlus.com

A7A2 100 MHz VOLTAGE-CONTROLLED CRYSTAL OSCILLATOR (VCXO)
65660-60135

P1

P1#	SIGNAL	TO/FROM	FUNCTION BLOCK
1	+10V		E
19	-15V		E
2	NC		
17	NC		
3	-42V		A
18	-42V		A
4	NC		
16	NC		
5	+20V		E
15	+20V		E
6	GND		E
14	GND		E
7	GND		E
13	GND		E
8	GND		E
12	GND		E
9	GND		E
11	GND		E
10	GND		E
21	10MHz REFERENCE TUNE VOLTAGE	A7A1 P1-18,87	A
37			A
35	NC		
20	NC		
34	TUNE VOLTAGE CONTROL VOLTAGE	A7A4 P1-19,89	A
88			A
33	GND		E
36	GND		E

A 100 MHz OSCILLATOR

B 100 MHz BUFFER/AMPLIFIER

C POWER SUPPLIES

D 400 MHz AMPLIFIER

E QUADRUPLER

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATIONS, PREFIX ABBREVIATIONS WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (μF) INDUCTANCE IS IN MICROHENRIES (μH)
3. L10, L11, AND, L12 ARE PART OF PRINTED CIRCUIT BOARD
4. ASTERISK (*) INDICATES FACTORY SELECTED COMPONENT. TYPICAL VALUE IS SHOWN.
5. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.

A7A2

SERIAL PREFIX: 2410A

FIGURE 3. A7A2 100 MHz VCXO, SCHEMATIC DIAGRAM

ManualsPlus.com

ManualsPlus.com

A7A3 M/N Phase Detector

ManualsPlus.com

A7A3 M/N PHASE DETECTOR, CIRCUIT DESCRIPTION

The M/N phase detector has two programmable frequency dividers: an M divider and an N divider. M and N are integer numbers which give the ratio of divider input frequency to divider output frequency (i.e. the divide number). The input to the N divider is 20 MHz; the M divider input is the difference frequency between the M/N VCO (355 – 395 MHz) and 400 MHz. The two divider outputs are compared in a phase/frequency detector. The detector output is amplified and applied to A7A4 M/N Output where it is used to tune the M/N VCO.

In general, the M/N output frequency (from A7A4) is (200 – 10 M/N) MHz. The M/N VCO frequency is twice the M/N output frequency. The spectrum analyzer frequency diagnostics (displayed by [SHIFT] R) show the M number, N number, and M/N frequency. The fifth line of diagnostics contains three integers; the second integer is the M number, and the third integer is the N number. The next (sixth) diagnostic line gives the M/N output frequency in MHz (177.5 MHz to 197.5 MHz).

TTL→ECL Level Translators (A)

The numbers to program the frequency dividers come from A12 Front-Panel Interface in binary at TTL levels. U3, U13, and U17 shift these to ECL levels which are approximately −0.9V logic high and −1.7V logic low. N1 and M1 designate the least significant bits.

N Divider (B) and M Divider (C)

The M and N dividers are virtually identical. Basically, the four most significant bits of N (three bits for M), N3, N4, N5, N6 load a counter U6. It counts down to two and is reloaded on the next clock pulse. The 2 least significant bits, N1 and N2, control pulse swallowing logic which causes the counter to count down to 1 instead of 2 before reloading. The logic determines the proper number of extra pulses to be swallowed to effect the proper divide number.

For troubleshooting, it is expedient to set the M and N numbers equal in a 1 MHz span using the frequency diagnostics explained above. Waveforms at corresponding points in the two dividers can then be compared to pinpoint the problem.

MIXER (D)

Q3 is an amplifier which drives the LO port of the mixer U24. It supplies about +5 dBm over the 355 to 395 MHz range. The output of the mixer is the difference between 400 MHz and the M/N VCO frequency which gives an IF frequency between 5 and 45 MHz. The IF level is about −17 dBm.

IF AMPLIFIER (E)

The 60 MHz low-pass filter rejects unwanted mixing products from the mixer. Q4 and U18B amplify and limit the IF signal and give it the proper levels to run the following ECL circuitry.

Phase/Frequency Detector (F)

The outputs of M and N dividers are compared in U1. When they are in phase, the outputs of U1 are narrow, coincident pulses. For unlock conditions, the output pulses are of varying widths.

Preamplifier (G)

Q1 and Q2 are a low-noise differential pair preamplifier. Their outputs are combined in the integrating amplifier of A7A4.

ManualsPlus.com

Phase Lock Indicator (H)

U2A and U2B are voltage comparators which compare each tune line to the average plus a small offset provided by R29. If the loop unlocks, one of the preamplifier outputs is higher than the comparison voltage, and the phase lock indicator goes high, indicating the unlock condition.

ManualsPlus.com

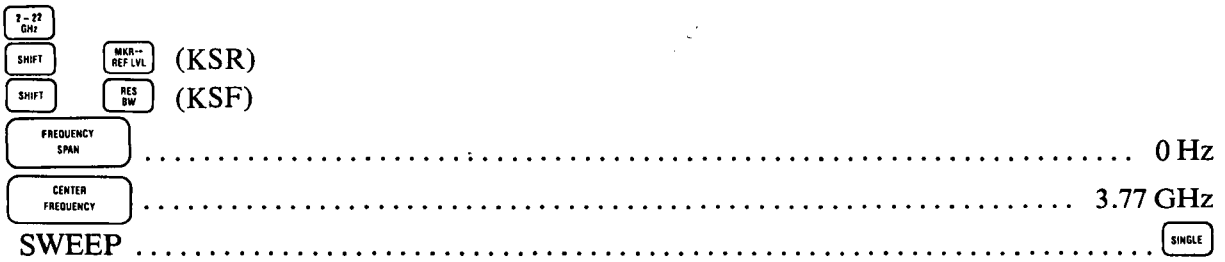
A7A3 M/N PHASE DETECTOR, TROUBLESHOOTING

The A7A3 M/N Phase Detector mixes the A7A4 M/N VCO output (355 to 395 MHz) with 400 MHz from the A7A2 100 MHz VCXO. The product of this mixing and the 20 MHz reference from the A7A1 are then divded by the M and N dividers respectively, and their resultant outputs are compared by a phase/frequency detector. The phase error is used to tune the A7A4 VCO.

The two dividers (M and N) are identical in operation and their waveforms can be compared for troubleshooting purposes. The M and N numbers can be set to the same value and various test points within each divider compared to reveal a malfunction, providing one of the dividers is known to be operating properly.

M Divider (C) and N Divider (B)

To display the M and N divide numbers on the 8566B CRT, key in the following settings:



The third line of the diagnostic (KSR) should read as follows:

1 20 20

The second and third numbers are the M and N divide numbers respectively. The waveform at test points 3 and 7, 5 and 6, and 1 and 2 should be as shown in Figures 1, 2, and 3 respectively. The Center Frequencies for Figures 1a, 1b, 1c, and 1d are 3.77 GHz, 3.96 GHz, 4.15 GHz, and 4.34 GHz respectively. The M and N numbers are 20, 21, 22, and 23 respectively.

Oscilloscope control settings for Figures 1 through 3 are:

Vertical: 0.1 V/Div
Horizontal: 0.2 μsec/Div
Probe: 10:1

NOTE

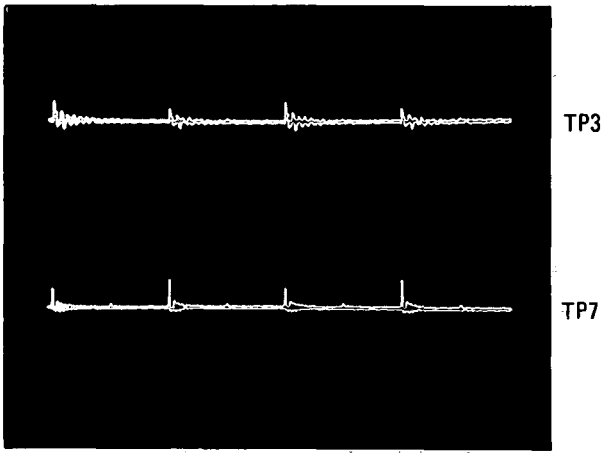
All waveform voltage levels are emitter coupled logic (ECL) levels: −0.9V = high, −1.7V = low.

Mixer (D) and IF Amplifier (E)

The Mixer inputs are 400 MHz from A7A2 100 MHz VCXO and 355 to 395 MHz from A7A4 M/N Output. When the M and N numbers are the same, the M/N output frequency is 380 MHz.

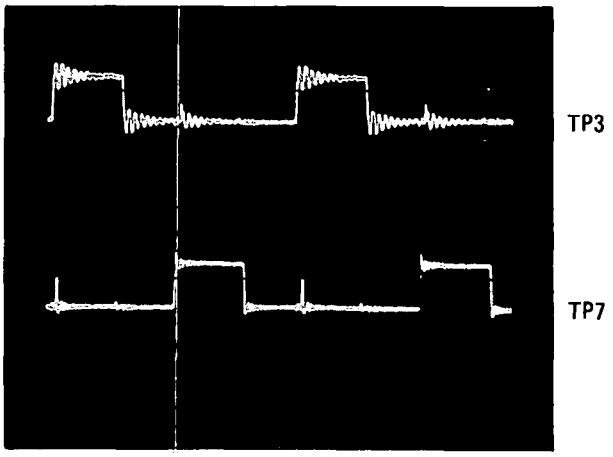
ManualsPlus.com

LEVELS = ECL LOW = −1.7V



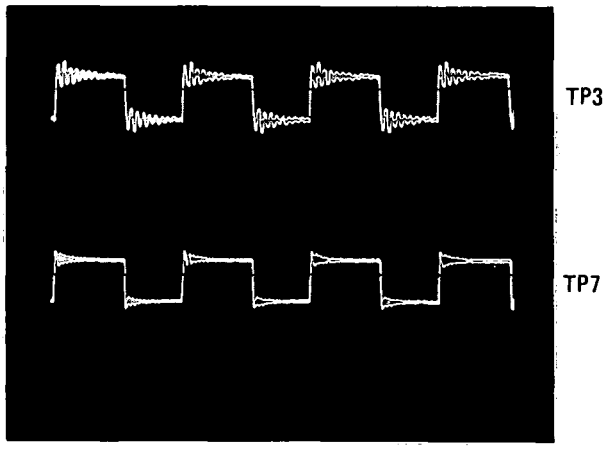
a. M or N Numbers 8, 12, 16, 20, 24, 28, or 32

DUTY CYCLE < 1/3



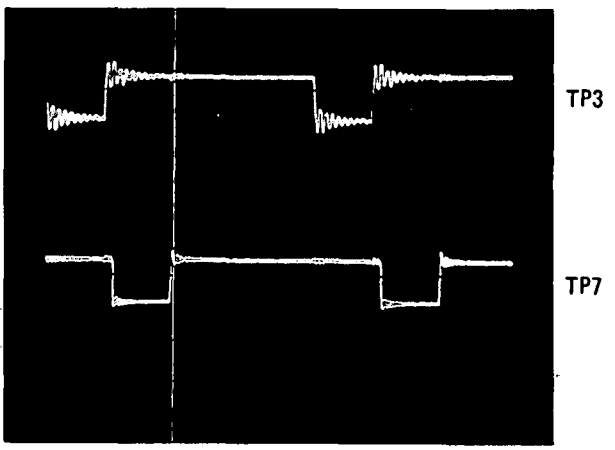
b. M or N Numbers 9, 13, 17, 21, 25, or 29

DUTY CYCLE ≈ 1/2



c. M or N Numbers 10, 14, 18, 22, 26, or 30

DUTY CYCLE > 2/3



d. M or N Numbers 11, 15, 19, 23, 27, or 31

FIGURE 1. M AND N DIVIDER WAVEFORMS FOR TEST POINTS 3 AND 7

ManualsPlus.com

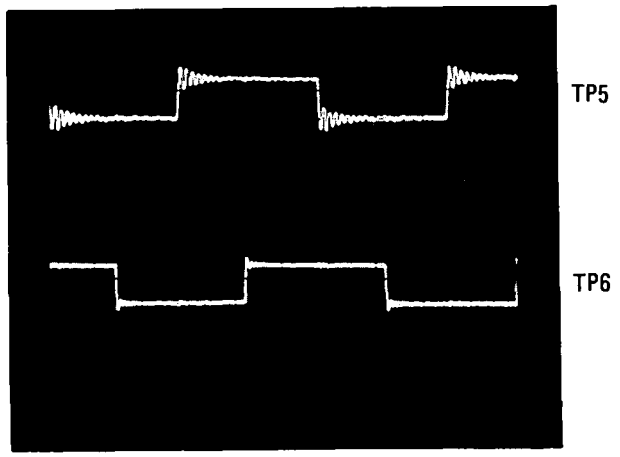


FIGURE 2. M AND N DIVIDER WAVEFORMS FOR TEST POINTS 5 AND 6

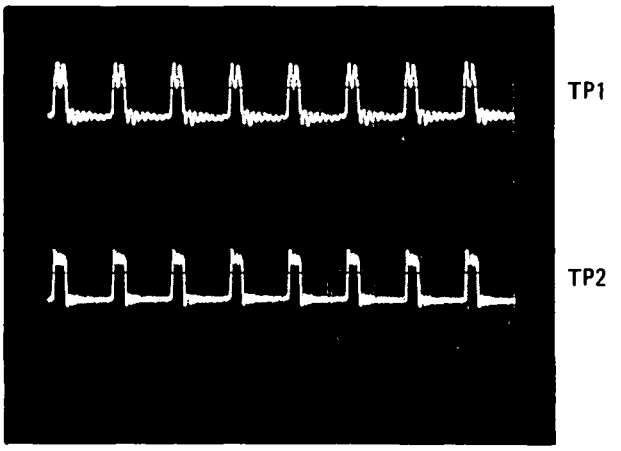


FIGURE 3. M AND N DIVIDER WAVEFORMS FOR TEST POINTS 1 AND 2

ManualsPlus.com

The output of the IF Amplifier at U18 Pin 3 is at ECL logic levels: −0.9V = high, −1.7V = low. Typical voltage levels for Q3 and Q4 are shown in Table 1.

TABLE 1. IF AMPLIFIER VOLTAGE LEVELS

	Voltage Levels	
	Q3	Q4
Emitter	−5.6	−7.4
Base	−4.8	−6.6
Collector	0	−1.9

Phase Frequency Detector (F) and Preamplifier (G)

The Phase/Frequency Detector outputs pulses whose width is proportional to the phase difference of the two input signals. These pulses are filtered by the combination of R24/C5 and R25/C6. The Preamplifier amplifies these pulses which are representative of the phase difference of the two input signals. Typical voltage levels for the Preamplifier are shown in Table 2.

TABLE 2. TYPICAL PREAMPLIFIER VOLTAGE LEVELS

	Voltage Levels			
	Phase Locked		No Input At	
		J1	J2	J3
Q1				
Emitter	−1.0	−1.0	−1.0	−1.0
Base	−1.7	−0.8	−1.7	−0.8
Collector	−4.8	−7.9	−1.8	−7.9
Q2				
Emitter	−1.0	−1.0	−1.0	−1.0
Base	−1.7	−1.7	−0.8	−1.7
Collector	−4.8	−1.8	−7.9	−1.8

Phase Lock Indicator (H)

The outputs of the Preamplifier are compared to a reference voltage of −4V by U2A and U2B. The output (HULM) is high (active state) when the loop is unlocked.

This can be checked by disconnecting the 400 MHz input at A7A3J1 (white/blue cable) and measuring the output of U2 (P1-26). With the loop unlocked (400 MHz removed), this voltage should be approximately 4.64V.

ManualsPlus.com

TABLE 3. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A3	85660-60136	1	1	BOARD ASSEMBLY, M/N PHASE DETECTOR	28480	85660-60136
A7A3C1	0160-4299	7	4	CAPACITOR-FXD 2200PF +-20% 250VDC CER	56289	C067F251F222MS22-CDH
A7A3C2	0160-0574	3	6	CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A7A3C3	0160-4299	7		CAPACITOR-FXD 2200PF +-20% 250VDC CER	56289	C067F251F222MS22-CDH
A7A3C4	0180-0100	3	1	CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A7A3C5	0160-0572	1	2	CAPACITOR-FXD 2200PF +-20% 100VDC CER	28480	0160-0572
A7A3C6	0160-0572	1		CAPACITOR-FXD 2200PF +-20% 100VDC CER	28480	0160-0572
A7A3C7	0160-3876	4	2	CAPACITOR-FXD 47PF +-20% 200VDC CER	28480	0160-3876
A7A3C8	0160-3877	5	1	CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A7A3C9	0160-3876	4		CAPACITOR-FXD 47PF +-20% 200VDC CER	28480	0160-3876
A7A3C10	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A7A3C11	0160-3873	1	1	CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A7A3C12	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A7A3C13	0160-3878	6	3	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A3C14	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A7A3C15	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A3C16	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A3C17	0180-0197	8	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A7A3C18	0160-4299	7		CAPACITOR-FXD 2200PF +-20% 250VDC CER	56289	C067F251F222MS22-CDH
A7A3C19	0180-0291	3	1	CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A7A3C20	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A7A3C21	0160-4299	7		CAPACITOR-FXD 2200PF +-20% 250VDC CER	56289	C067F251F222MS22-CDH
A7A3C22	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A7A3J1	1250-0690	6	1	CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
A7A3L1	9100-1641	0	2	INDUCTOR RF-CH-MLD 240UH 5% .166DX.385LG	28480	9100-1641
A7A3L2	9100-2259	8	1	INDUCTOR RF-CH-MLD 1.5UH 10% .105DX.26LG	28480	9100-2259
A7A3L3	9100-1641	0		INDUCTOR RF-CH-MLD 240UH 5% .166DX.385LG	28480	9100-1641
A7A3L4	9100-2891	4	2	INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A7A3L5	9100-2891	4		INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A7A3L6	9100-2248	5	3	INDUCTOR RF-CH-MLD 120NH 10% .105DX.26LG	28480	9100-2248
A7A3L7	9100-2248	5		INDUCTOR RF-CH-MLD 120NH 10% .105DX.26LG	28480	9100-2248
A7A3L8	9100-2248	5		INDUCTOR RF-CH-MLD 120NH 10% .105DX.26LG	28480	9100-2248
A7A3Q1	1853-0451	5	2	TRANSISTOR PNP 2N3799 SI TO-18 PD=360MW	01295	2N3799
A7A3Q2	1853-0451	5		TRANSISTOR PNP 2N3799 SI TO-18 PD=360MW	01295	2N3799
A7A3Q3	1854-0345	8	2	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A3Q4	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A3R1	0698-3154	0	5	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A7A3R2	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A7A3R3	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A7A3R4	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A7A3R5	0698-7267	4	1	RESISTOR 19.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1962-F
A7A3R6	0757-0401	0	1	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7A3R7	0698-0083	8	2	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A7A3R8	0698-7192	4	2	RESISTOR 14.7 1% .05W F TC=0+-100	24546	C3-1/8-T0-14R7-F
A7A3R9	0757-0280	3	2	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A7A3R10	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A7A3R11	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A7A3R12	0698-7212	9	1	RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-F
A7A3R13	0698-3157	3	2	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A7A3R14	0757-0416	7	4	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A3R15	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A3R16	0698-7248	1	3	RESISTOR 3.16K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3161-F
A7A3R17	0698-7248	1		RESISTOR 3.16K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3161-F
A7A3R18	0698-7223	2	1	RESISTOR 287 1% .05W F TC=0+-100	24546	C3-1/8-T0-287R-F
A7A3R19	0698-7256	1	1	RESISTOR 6.81K 1% .05W F TC=0+-100	24546	C3-1/8-T0-6811-F
A7A3R20	0698-7248	1		RESISTOR 3.16K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3161-F
A7A3R21	0698-7220	9	2	RESISTOR 215 1% .05W F TC=0+-100	24546	C3-1/8-T0-215R-F
A7A3R22	0698-7220	9		RESISTOR 215 1% .05W F TC=0+-100	24546	C3-1/8-T0-215R-F
A7A3R23	0698-7192	4		RESISTOR 14.7 1% .05W F TC=0+-100	24546	C3-1/8-T0-14R7-F
A7A3R24	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A3R25	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7A3R26	0757-0441	8	2	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A7A3R27	0757-0441	8		RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A7A3R28	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A7A3R29	0698-3162	0	1	RESISTOR 46.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4642-F
A7A3R30	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A7A3TP1	1251-0600	0	7	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A3TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A3TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A3TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A3TP5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600

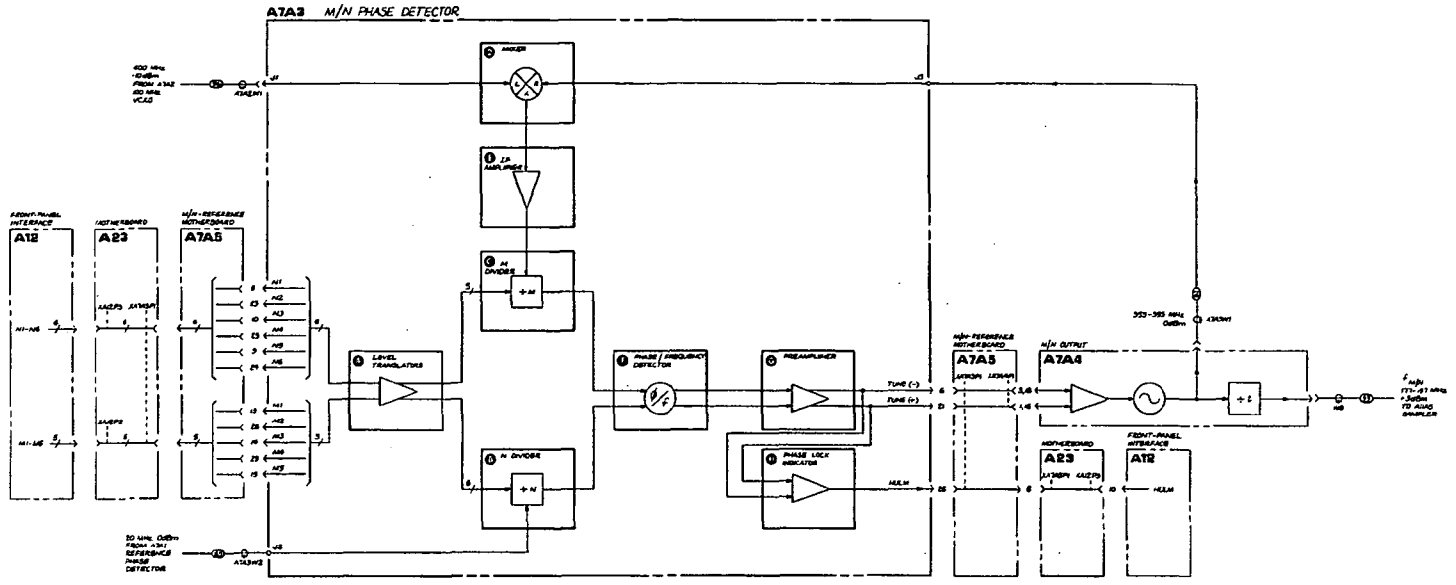
*Indicates Factory Selected Value

ManualsPlus.com

TABLE 3. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A3TP6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A3TP7	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A3U1	1820-1344	8	1	IC PL LOOP 14-DIP-C PKG	04713	MC12040L
A7A3U2	5081-8117	3	1	SCREEN 1826-0092	28480	5081-8117
A7A3U3	1810-0251	3	3	NETWORK-RES 10-SIP MULTI-VALUE	28480	1810-0251
A7A3U4	1820-1225	4	2	IC FF ECL D-M/S DUAL	04713	MC10231P
A7A3U5	1810-0204	6	6	NETWORK-RES 8-SIP1.0K OHM X 7	01121	208A102
A7A3U6	1820-0821	4	2	IC CNTR ECL BIN UP/DOWN SYNCHRO	04713	MC10136L
A7A3U7	1820-0802	1	4	IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A7A3U8	1810-0204	6		NETWORK-RES 8-SIP1.0K OHM X 7	01121	208A102
A7A3U9	1820-0806	5	2	IC GATE ECL OR-NOR DUAL 4-5-INP	04713	MC10109P
A7A3U10	1820-0820	3	2	IC FF ECL J-BAR K-BAR COM CLOCK DUAL	04713	MC10135L
A7A3U11	1810-0204	6		NETWORK-RES 8-SIP1.0K OHM X 7	01121	208A102
A7A3U12	1820-0802	1		IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A7A3U13	1810-0251	3		NETWORK-RES 10-SIP MULTI-VALUE	28480	1810-0251
A7A3U14	1820-1225	4		IC FF ECL D-M/S DUAL	04713	MC10231P
A7A3U15	1810-0204	6		NETWORK-RES 8-SIP1.0K OHM X 7	01121	208A102
A7A3U16	1820-0821	4		IC CNTR ECL BIN UP/DOWN SYNCHRO	04713	MC10136L
A7A3U17	1810-0251	3		NETWORK-RES 10-SIP MULTI-VALUE	28480	1810-0251
A7A3U18	1820-0802	1		IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A7A3U19	1810-0204	6		NETWORK-RES 8-SIP1.0K OHM X 7	01121	208A102
A7A3U20	1820-0806	5		IC GATE ECL OR-NOR DUAL 4-5-INP	04713	MC10109P
A7A3U21	1820-0820	3		IC FF ECL J-BAR K-BAR COM CLOCK DUAL	04713	MC10135L
A7A3U22	1810-0204	6		NETWORK-RES 8-SIP1.0K OHM X 7	01121	208A102
A7A3U23	1820-0802	1		IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A7A3U24	0955-0063	0	1	MIXER-DOUBLE BALANCE PWR INP=200MW; PK	28480	0955-0063
A7A3VR1	1902-3082	9	1	DIODE-ZNR 4.64V 5% DO-35 PD=.4W	28480	1902-3082
A7A3W1	85660-60083	7	1	CBL AY WHT/RED	28480	85660-60083
A7A3W2	85660-60085	9	1	CBL AY GRA/WHT	28480	85660-60085
				MISCELLANEOUS PARTS		
	2190-0070	1	10	WASHER-LK HLCL NO. 2 .088-IN-ID	28480	2190-0890
	2200-0101	0	2	SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2200-0103	2	2	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
	2950-0078	9	3	NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
	85660-20047	9	1	COVER PC M/N DET	28480	85660-20047
	86701-40001	9	1	EXTRACTOR PC	28480	86701-40001
	1205-0285	0	5	HEAT SINK SGL DIP	28480	1205-0285
	2190-0014	1	3	WASHER-LK INTL T NO. 2 .089-IN-ID	28480	2190-0014
	2190-0124	4	5	WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0124
	2190-0124	4		WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0124

*Indicates Factory Selected Value



A7A3

FIGURE 4. A7A3 M/N PHASE DETECTOR, BLOCK DIAGRAM

ManualsPlus.com

ManualsPlus.com

A7A3
M/N PHASE DETECTOR
85660-60136

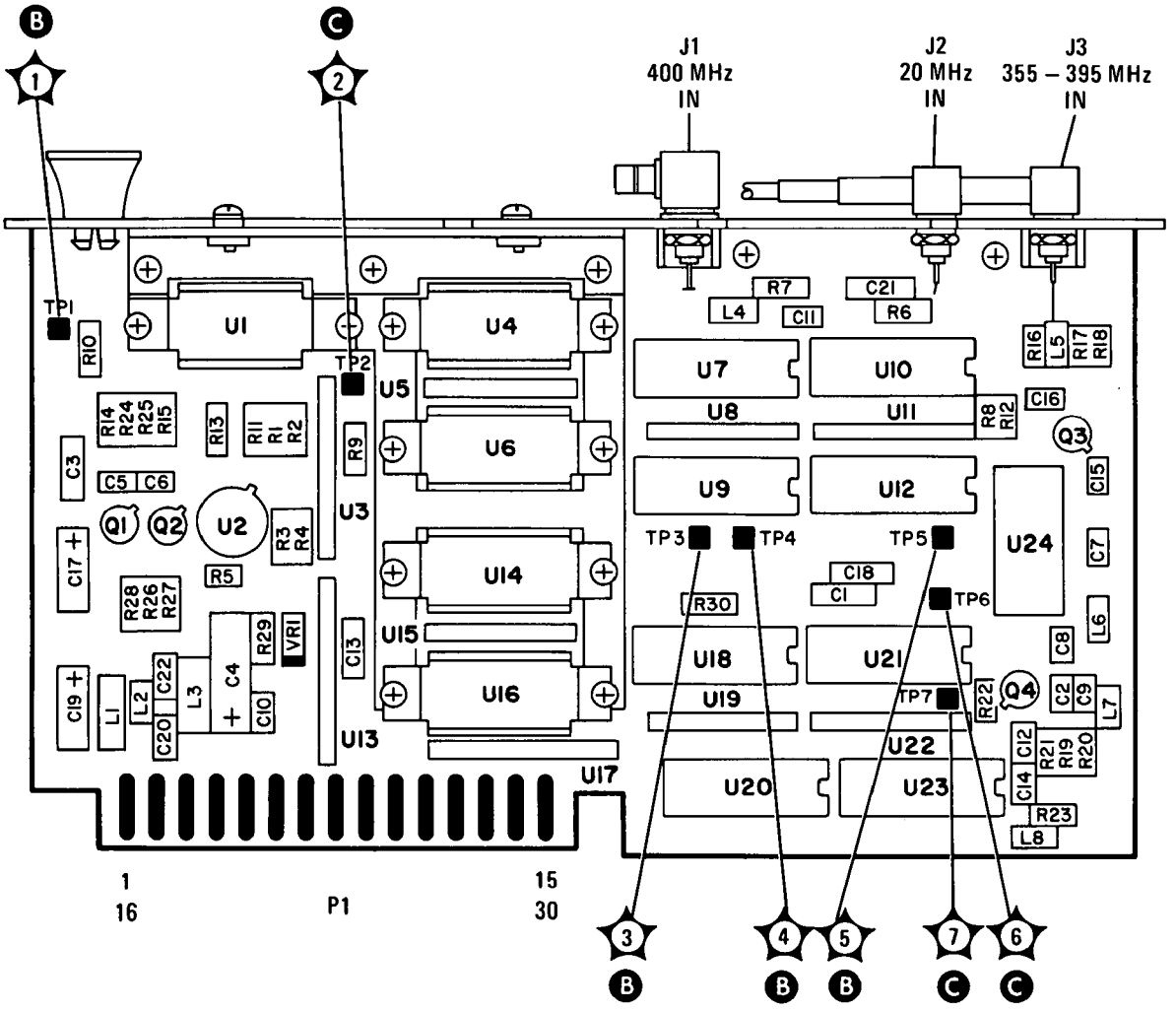


FIGURE 5. A7A3 M/N PHASE DETECTOR, COMPONENT LOCATIONS

ManualsPlus.com

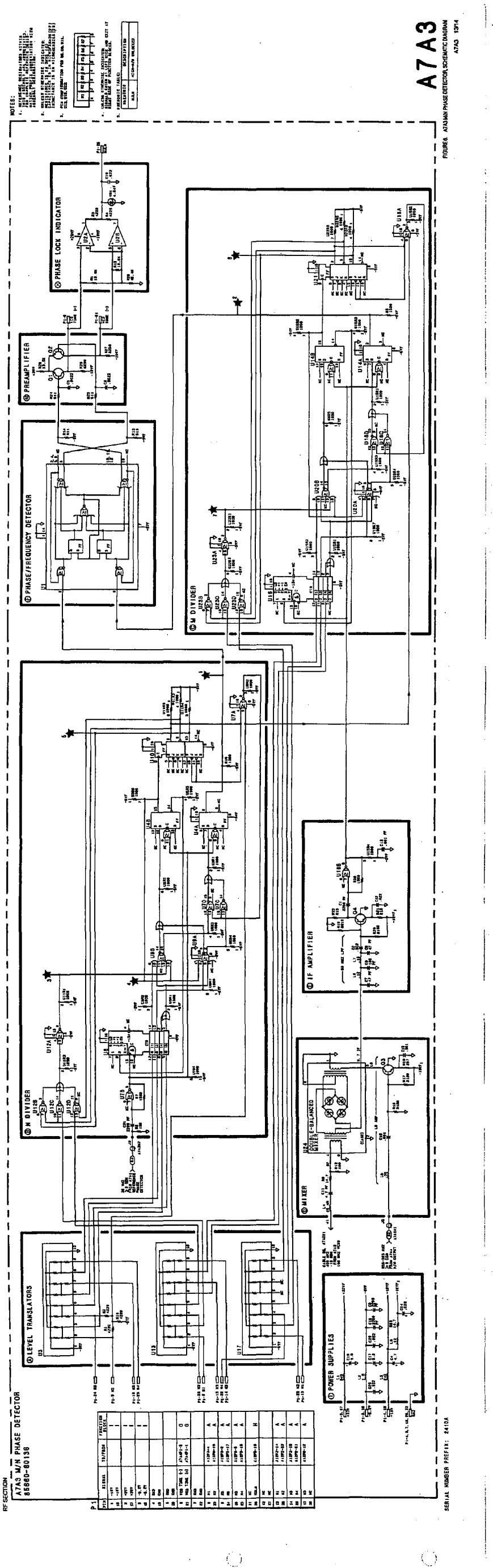


FIGURE 6. A7A3 MAIN PHASE DETECTOR, SCHEMATIC DIAGRAM

ManualsPlus.com

A7A4 M/N Output

ManualsPlus.com

A7A4 M/N OUTPUT, CIRCUIT DESCRIPTION

A7A4 amplifies the output of the A7A4A1 M/N VCO in two different paths. One path is amplification and buffering to drive the mixer in the M/N phase-lock loop. The other path drives a divide by two which, after further amplification, goes to the A11A5 Sampler.

The integrating loop amplifier which generates the tuning voltage for the M/N VCO is also included on A7A4.

LO Output Amplifier (D)

Q5 is a common-emitter amplifier followed by a resistive pad to increase reverse isolation. Q2 is a common-base amplifier which is broadly tuned by L2, L10, and associated capacitances. Q1 is another common-emitter amplifier which is followed by a 400 MHz low-pas filter.

Divide By 2 (F)

U2 is an EECL (HP ECL) divide by 2. This generates the M/N output frequency which is one-half that of the M/N VCO. For frequency spans of greater than 5 MHz, the M/N control line goes TTL high during the sweep which turns U2 off. At the end of the sweep, U2 is turned back on and the M/N VCO is phase-locked to give the correct start frequency. During multi-band sweeps, U2 will be turned on at the beginning of each band, but will be turned off during the actual sweep.

Loop Amplifier (A)

U1 is connected as an integrating amplifier and generates -5V to -35V for tuning the M/N VCO. C13 is the integrating capcitor; C12 and C15 are for compensation of U1 to guarantee stability, and R34, C14, and R15 compensate the entire phase-lock loop. The 200 kHz low-pass filter rejects the sampling frequency (20 MHz divided by N) and its harmonics which are generated in the phase detector.

Voltage-Controlled Oscillator (B)

The M/N voltage-controlled oscillator (VCO) consists of a resonator A7A4A1A1 and Q2 with its associated circuitry. The oscillation frequency is determined by the bias on the varactors CR1 and CR2 which tunes the cavity resonator. Coarse tuning is provided by C1, while C5 is used to vary the output coupling to the cavity thereby varying the output power. The impedance looking into the emitter of Q2 has a negative real part which provides the conditions necessary for oscillation to occur.

Buffer Amplifier (C)

Q1 is a common-emitter buffer amplifier which provides at least 0 dBm output over the 355 to 395 MHz range of the VCO.

LO Amplifier (E)

Q6 and Q7 form a buffer amplifier to assure that there is roughly 0 dBm to drive the divide-by-2 (U2 in block (F)). R24 and R25 set the proper dc level to drive U2.

M/N Output Amplifier (G)

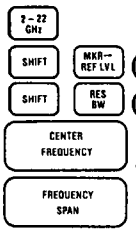
Q3 and Q4 provide buffering between the divider U2 and the output.

ManualsPlus.com

A7A4 M/N OUTPUT, TROUBLESHOOTING

The VCO tune voltage from the A7A3 M/N Phase Detector is amplified and applied to the Voltage-Controlled Oscillator (VCO) by the loop amplifier. The VCO output is amplified, divided by two, and applied to the A11A5 Sampler for phase locking the A11A3 YIG-Tuned Oscillator (YTO) in 10 MHz increments. A portion of the VCO output provides feedback to the A7A3 Phase Detector for phase locking of the M/N Loop.

Spectrum analyzer control settings for A7A4 troubleshooting:



Loop Amplifier (A)

The tune voltage from the Loop Amplifier can be measured at TP1, located on the cover of the A7A4. The dc voltage at TP1, with the front panel settings indicated above, should be −13.5V. If an unlocked condition exists, the voltage is approximately −0.5V or −37.5V. If the level is −0.5V, the probable cause is no VCO output to the A7A3 Phase Detector. A level of −37.5V indicates that the 20 MHz reference to the A7A3 Phase Detector is not present.

Voltage-Controlled Oscillator (VCO) (B) and Buffer Amplifier (C)

The VCO output frequency with the tuning voltage set to −13.5V should be 380 MHz. Typical voltage levels for the VCO are as shown in Table 1.

TABLE 1. TYPICAL VCO VOLTAGE LEVELS

A7A4A1A2 Voltage Levels		
	Q2	Q1
Emitter	−10.8	−8.3
Base	−10.2	−7.6
Collector	0	0

LO Output Amplifier (D)

TABLE 2. TYPICAL LO OUTPUT AMPLIFIER VOLTAGE LEVELS

A7A4A2 Voltage Levels			
	Q5	Q2	Q1
Emitter	−6.7	−6.7	−6.7
Base	−6.2	−6.2	−6.2
Collector	−0.5	0	0

ManualsPlus.com

LO Amplifier (E) and M/N Output Amplifier (G)

TABLE 3. TYPICAL LO AND M/N OUTPUT AMPLIFIER VOLTAGE LEVELS

A7A4A2 Voltage Levels				
	Q6	Q7	Q3	Q4
Emitter	–6.7	–3.1	–4.5	–5.2
Base	–6.2	–2.4	–3.8	–4.5
Collector	–2.4	0	0	0

ManualsPlus.com

TABLE 4. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A4	85660-60113	4	1	BOARD ASSEMBLY, M/N OUTPUT (INCLUDES A7A4A1 M/N VCO ASSY AND A7A4A2 M/N VCO BOARD ASSY)	28480	85660-60113
A7A4J1				SEE A7A4A2J1		
A7A4J2				SEE A7A4A2J2		
A7A4J3				SEE A7A4A2J3		
A7A4TP1				SEE A7A4A2C23		
A7A4A1	85660-60096	2	1	M/N VCO ASSEMBLY, (INCLUDES A7A4A1A1 OSCILLATOR ASSEMBLY AND A7A4A1A2 BOARD ASSEMBLY)	28480	85660-60096
A7A4A1A1				OSCILLATOR ASSEMBLY, M/N VCO (P/O A7A4A1-NOT SEPARATELY REPLACEABLE)		
A7A4A1A1C1	86701-20049	3	1	SCREW TUNING FREQUENCY ADJ.	28480	86701-20049
A7A4A1A1C2	0160-4301	2	2	CAPACITOR-FXD 3.9PF +-.1PF 500VDC PORC	29990	ATC100-B-3R9-B-C-500
A7A4A1A1C3	0160-4301	2		CAPACITOR-FXD 3.9PF +-.1PF 500VDC PORC	29990	ATC100-B-3R9-B-C-500
A7A4A1A1C4				CAPACITANCE FORMED BY RESONATOR		
A7A4A1A1C5	86701-20046	0	1	POWER PROBE	28480	86701-20046
A7A4A1A1CR1	0122-0084	0	2	DIODE-VVC 5.25PF 5% C4/C45-MIN=2.4	28480	0122-0084
A7A4A1A1CR2	0122-0084	0		DIODE-VVC 5.25PF 5% C4/C45-MIN=2.4	28480	0122-0084
A7A4A1A1L1	9140-0158	6	3	INDUCTOR RF-CH-MLD 1UH 10% .105DX.26LG	28480	9140-0158
A7A4A1A1L2	9140-0158	6		INDUCTOR RF-CH-MLD 1UH 10% .105DX.26LG	28480	9140-0158
A7A4A1A2				BOARD ASSEMBLY, M/N VCO (P/O A7A4A1-NOT SEPARATELY REPLACEABLE)		
A7A4A1A2C1	0160-3878	6	20	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A1A2C2	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A1A2C3	0160-3879	7	2	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A7A4A1A2C4	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A1A2C5	0180-1731	8	1	CAPACITOR-FXD 4.7UF+-10% 50VDC TA	56289	150D475X9050B2
A7A4A1A2C6	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A1A2C7	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A1A2C8	0160-3873	1	3	CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A7A4A1A2C9	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A1A2C10	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A7A4A1A2C11	0180-2161	0	1	CAPACITOR-FXD .75UF+-10% 50VDC TA	56289	150D754X9050A2
A7A4A1A2J1				P/O A7A4A1A2W1		
A7A4A1A2J2	1251-0600	0	3	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A4A1A2J3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A4A1A2J4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A7A4A1A2L1	9135-0073	3	1	INDUCTOR RF-CH-MLD 51NH 6% .102DX.26LG	28480	9135-0073
A7A4A1A2L2	9100-0346	0	1	INDUCTOR RF-CH-MLD 50NH 20% .105DX.26LG	28480	9100-0346
A7A4A1A2L3	86701-20051	7	1	INDUCTOR	28480	86701-20051
A7A4A1A2L4	9140-0158	6		INDUCTOR RF-CH-MLD 1UH 10% .105DX.26LG	28480	9140-0158
A7A4A1A2Q1	1854-0686	0	2	TRANSISTOR NPN SI TO-72 PD=200MW FT=4GHZ	28480	1854-0686
A7A4A1A2Q2	1854-0610	0	1	TRANSISTOR NPN SI TO-46 FT=800MHZ	28480	1854-0610
A7A4A1A2R1	0757-0317	7	1	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A7A4A1A2R2	0698-7219	6	2	RESISTOR 196 1% .05W F TC=0+-100	24546	C3-1/8-T0-196R-F
A7A4A1A2R3	0698-7193	5	1	RESISTOR 16.2 1% .05W F TC=0+-100	24546	C3-1/8-T0-16R2-F
A7A4A1A2R4	0698-3154	0	1	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A7A4A1A2R5	0757-0420	1	2	RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A7A4A1A2R6	0698-7262	9	1	RESISTOR 12.1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1212-F
A7A4A1A2R7	0757-0420	1		RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A7A4A1A2R8	0698-7248	1	5	RESISTOR 3.16K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3161-F
A7A4A1A2R9	0698-7205	0	2	RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T0-51R1-F
A7A4A1A2R10	0698-7265	2	1	RESISTOR 16.2K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1622-F
A7A4A1A2R11	0698-7250	5	1	RESISTOR 3.83K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3831-F
A7A4A1A2R12	0757-0401	0	1	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7A4A1A2R13	0757-0400	9	1	RESISTOR 90.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-90R9-F
A7A4A1A2W1	85660-60118	9	1	CBL AY WHT	28480	85660-60118
A7A4A1A2W2	86701-20050	6	1	CABLE JUMPER	28480	86701-20050
A7A4A2				BOARD ASSEMBLY, M/N OUTPUT (PART OF A7A4-NOT SEPARATELY REPLACEABLE		
A7A4A2C1	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2C2	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2C3	0160-3874	2	4	CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A7A4A2C4	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2C5	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878

*Indicates Factory Selected Value

ManualsPlus.com

TABLE 4. REPLACEABLE PARTS

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A7A4A2C6	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A7A4A2C7	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2C8	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A7A4A2C9	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A7A4A2C10	0160-3872	0	1	CAPACITOR-FXD 2.2PF +-.25PF 200VDC CER	28480	0160-3872
A7A4A2C11	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A7A4A2C12	0160-2261	9	1	CAPACITOR-FXD 15PF +-5% 500VDC CER 0+-30	28480	0160-2261
A7A4A2C13	0160-2290	4	2	CAPACITOR-FXD .15UF +-10% 80VDC POLYE	28480	0160-2290
A7A4A2C14	0160-2290	4		CAPACITOR-FXD .15UF +-10% 80VDC POLYE	28480	0160-2290
A7A4A2C15	0140-0196	3	1	CAPACITOR-FXD 150PF +-5% 300VDC MICA	72136	DM15F151J0300WV1CR
A7A4A2C16	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2C17	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2C18	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A7A4A2C19	0160-3876	4	1	CAPACITOR-FXD 47PF +-20% 200VDC CER	28480	0160-3876
A7A4A2C20	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2C21	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2C22	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2C23	0160-4351	2	1	CAPACITOR-FDTHRU 1000PF 20% 200V CER	28480	0160-4351
A7A4A2C24	0160-0161	4	2	CAPACITOR-FXD .01UF +-10% 200VDC POLYE	28480	0160-0161
A7A4A2C25	0160-0153	4	1	CAPACITOR-FXD 1000PF +-10% 200VDC POLYE	28480	0160-0153
A7A4A2C26	0160-0161	4		CAPACITOR-FXD .01UF +-10% 200VDC POLYE	28480	0160-0161
A7A4A2C27	0160-3534	1	1	CAPACITOR-FXD 510PF +-5% 100VDC MICA	28480	0160-3534
A7A4A2C28	0160-0298	8	1	CAPACITOR-FXD 1500PF +-10% 200VDC POLYE	28480	0160-0298
A7A4A2C29	0180-0197	8	2	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A7A4A2C30	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2C31	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A7A4A2C32				NOT ASSIGNED		
A7A4A2C33	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2C34	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2C35	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A7A4A2CR1				NOT ASSIGNED		
A7A4A2CR2				NOT ASSIGNED		
A7A4A2CR3	1901-0040	1	2	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A7A4A2CR4	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A7A4A2J1	1250-0657	5	2	CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0657
A7A4A2J2	1250-0657	5		CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0657
A7A4A2J3	1250-0257	1	1	CONNECTOR-RF SMB M PC 50-OHM	28480	1250-0257
A7A4A2L1	9100-2891	4	9	INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A7A4A2L2	9100-2891	4		INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A7A4A2L3	9100-2891	4		INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A7A4A2L4	9100-2891	4		INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A7A4A2L5	9100-2891	4		INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A7A4A2L6	9100-1634	1	1	INDUCTOR RF-CH-MLD 75UH 5% .166DX.385LG	28480	9100-1634
A7A4A2L7	9100-1635	2	1	INDUCTOR RF-CH-MLD 91UH 5% .166DX.385LG	28480	9100-1635
A7A4A2L8	9100-1620	5	1	INDUCTOR RF-CH-MLD 15UH 10% .166DX.385LG	28480	9100-1620
A7A4A2L9	9140-0210	1	1	INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A7A4A2L10	9100-2891	4		INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A7A4A2L11	9100-2891	4		INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A7A4A2L12	9100-2891	4		INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A7A4A2L13	9100-2891	4		INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A7A4A2L14	9140-0144	0	1	INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A7A4A2Q1	1854-0546	1	2	TRANSISTOR NPN SI TO-72 PD=200MW	28480	1854-0546
A7A4A2Q2	1854-0345	8	4	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A4A2Q3	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A4A2Q4	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A4A2Q5	1854-0546	1		TRANSISTOR NPN SI TO-72 PD=200MW	28480	1854-0546
A7A4A2Q6	1854-0686	0		TRANSISTOR NPN SI TO-72 PD=200MW FT=4GHZ	28480	1854-0686
A7A4A2Q7	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A7A4A2R1	0698-7212	9	3	RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-TO-100R-F
A7A4A2R2	0698-7248	1		RESISTOR 3.16K 1% .05W F TC=0+-100	24546	C3-1/8-TO-3161-F
A7A4A2R3	0698-7243	6	4	RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-TO-1961-F
A7A4A2R4	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-TO-51R1-F
A7A4A2R5	0698-7223	2	3	RESISTOR 287 1% .05W F TC=0+-100	24546	C3-1/8-TO-287R-F
A7A4A2R6	0698-7248	1		RESISTOR 3.16K 1% .05W F TC=0+-100	24546	C3-1/8-TO-3161-F
A7A4A2R7	0698-7243	6		RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-TO-1961-F
A7A4A2R8	0757-0316	6	1	RESISTOR 42.2 1% .125W F TC=0+-100	24546	C4-1/8-TO-42R2-F
A7A4A2R9	0698-7218	5	1	RESISTOR 178 1% .05W F TC=0+-100	24546	C3-1/8-TO-178R-F
A7A4A2R10	0698-7188	8	3	RESISTOR 10 1% .05W F TC=0+-100	24546	C3-1/8-TO-10R-F
A7A4A2R11	0698-7212	9		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-TO-100R-F
A7A4A2R12	0757-0394	0	1	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-TO-51R1-F
A7A4A2R13	0698-7212	9		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-TO-100R-F
A7A4A2R14	0757-1094	9	4	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1471-F
A7A4A2R15	0757-1094	9		RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1471-F

*Indicates Factory Selected Value

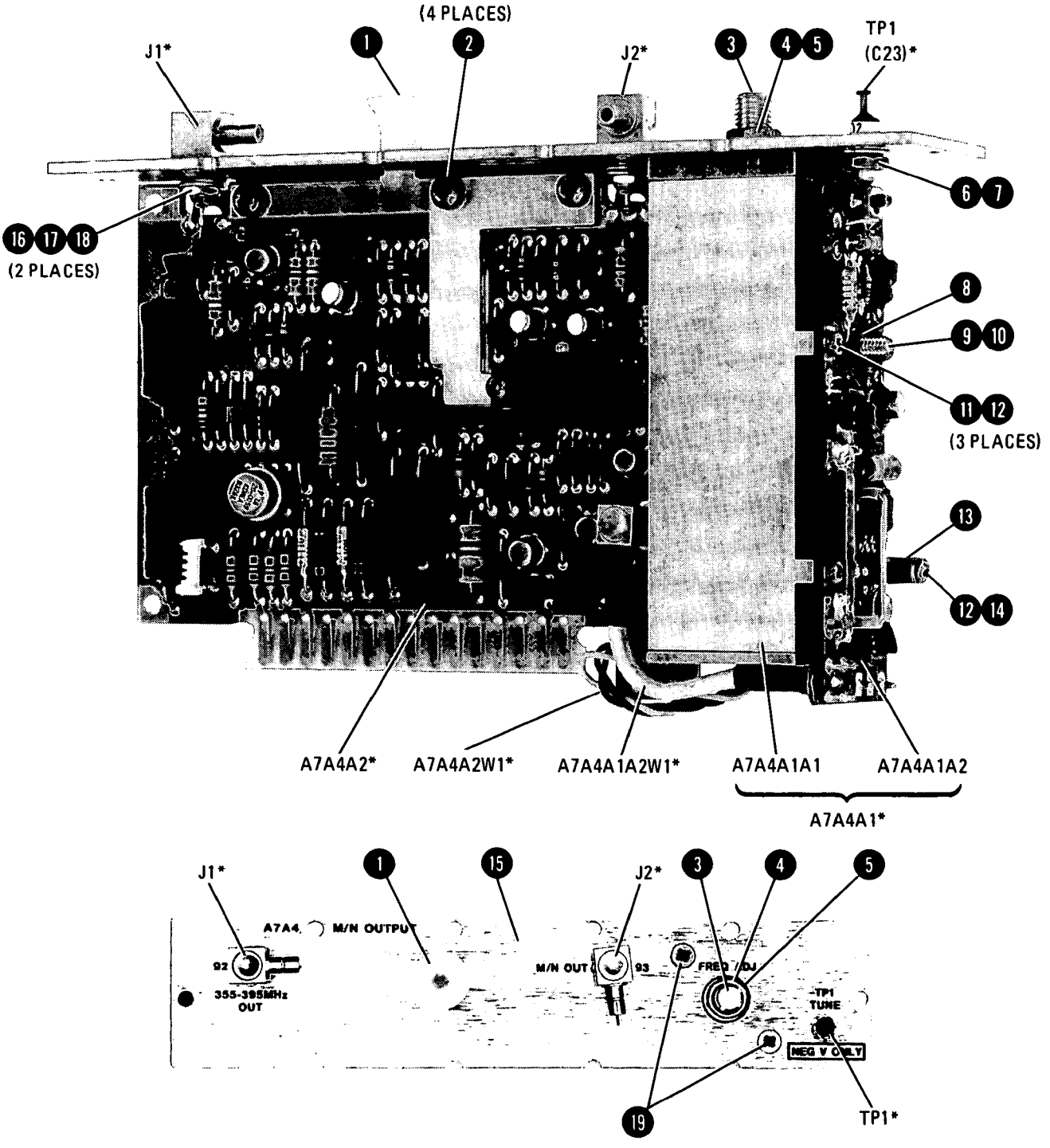
ManualsPlus.com

TABLE 4. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A4A2R16	0757-1094	7		RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A7A4A2R17	0757-1094	9		RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A7A4A2R18	0698-7260	7	2	RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A7A4A2R19	0698-7248	1		RESISTOR 3.16K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3161-F
A7A4A2R20	0698-7222	1	1	RESISTOR 261 1% .05W F TC=0+-100	24546	C3-1/8-T0-261R-F
A7A4A2R21	0698-7223	2		RESISTOR 287 1% .05W F TC=0+-100	24546	C3-1/8-T0-287R-F
A7A4A2R22	0698-7188	8		RESISTOR 10 1% .05W F TC=0+-100	24546	C3-1/8-T0-10R-F
A7A4A2R23	0698-7229	8	3	RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-F
A7A4A2R24	0698-7219	6		RESISTOR 196 1% .05W F TC=0+-100	24546	C3-1/8-T0-196R-F
A7A4A2R25	0698-7239	0	1	RESISTOR 1.33K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1331-F
A7A4A2R26	0698-7243	6		RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-F
A7A4A2R27	0698-7248	1		RESISTOR 3.16K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3161-F
A7A4A2R28	0698-7229	8		RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-F
A7A4A2R29	0698-7243	6		RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-F
A7A4A2R30	0698-7200	5	1	RESISTOR 31.6 1% .05W F TC=0+-100	24546	C3-1/8-T0-31R6-F
A7A4A2R31	0698-7224	3	1	RESISTOR 316 1% .05W F TC=0+-100	24546	C3-1/8-T0-316R-F
A7A4A2R32	0698-7188	8		RESISTOR 10 1% .05W F TC=0+-100	24546	C3-1/8-T0-10R-F
A7A4A2R33	0757-0280	3	1	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A7A4A2R34	0757-0279	0	1	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A7A4A2R35	0698-7223	2		RESISTOR 287 1% .05W F TC=0+-100	24546	C3-1/8-T0-287R-F
A7A4A2R36	0698-7210	7	1	RESISTOR 82.5 1% .05W F TC=0+-100	24546	C3-1/8-T0-82R5-F
A7A4A2R37	0698-7257	2	1	RESISTOR 7.5K 1% .05W F TC=0+-100	24546	C3-1/8-T0-7501-F
A7A4A2R38	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A7A4A2R39	0698-7229	8		RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-F
A7A4A2U1	1826-0059	2	1	IC OP AMP GP TO-99 PKG	01295	LM201AL
A7A4A2U2	1820-2106	2	1	IC FF ECL D-M/S POS-EDGE-TRIG	07263	F11C06DC
A7A4A2VR1	1902-3070	5	2	DIODE-ZNR 4.22V 5% DO-35 PD=.4W	28480	1902-3070
A7A4A2VR2	1902-3070	5		DIODE-ZNR 4.22V 5% DO-35 PD=.4W	28480	1902-3070
A7A4A2W1	85660-60103	2	1	JUMPER WIRE AY	28480	85660-60103
				MISCELLANEOUS PARTS		
	1205-0285	0	1	HEAT SINK SGL DIP	28480	1205-0285
	2190-0009	4	1	WASHER-LK INTL T NO. 8 .160-IN-ID	28480	2190-0009
	2190-0124	4	4	WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0124
	86701-40001	9	1	EXTRACTOR PC	28480	86701-40001
	2190-0890	1	2	WASHER-LK HLCL NO. 2 .088-IN-ID	28480	2190-0890
	2200-0101	0	2	SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2200-0103	2	2	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
	2580-0002	4	1	NUT-HEX-DBL-CHAM 8-32-THD .085-IN-THK	28480	2580-0002
	2950-0078	9	2	NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
	3050-0082	8	1	WASHER-FL NM NO. 4 .116-IN-ID .188-IN-OD	28480	3050-0082
	85660-00065	9	1	HEAT SINK I.C.	28480	85660-00065
	85660-20049	1	1	COVER PC M/N OUT	28480	85660-20049

*Indicates Factory Selected Value

ManualsPlus.com



*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

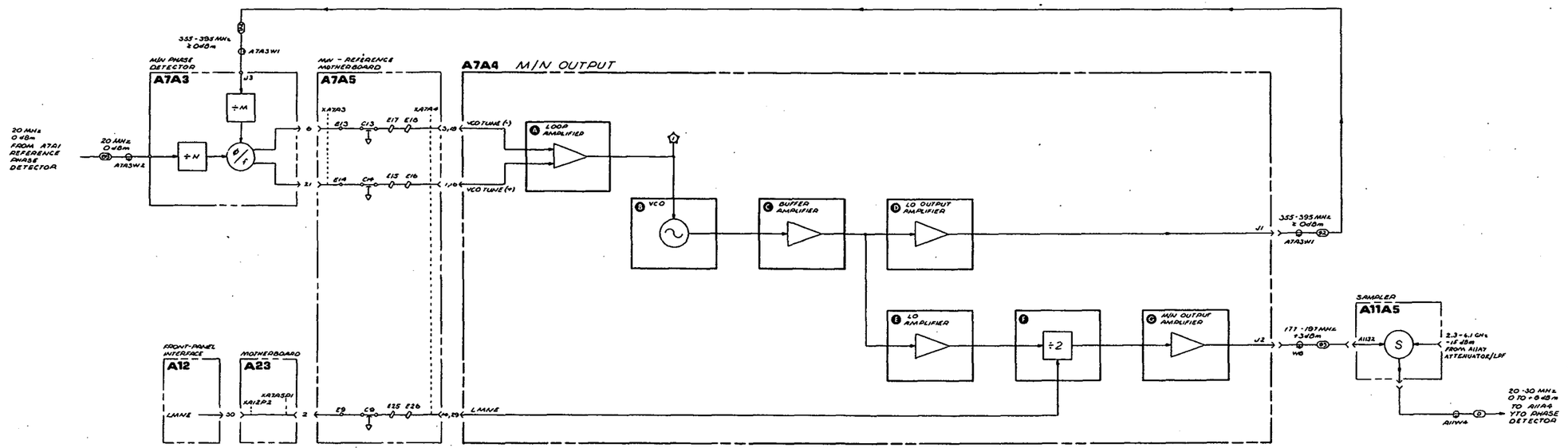
FIGURE 1. A7A4 M/N OUTPUT ASSEMBLY, PARTS IDENTIFICATION (1 OF 2)

ManualsPlus.com

Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
1	86701-40001	9	Extractor, PC Board	28480	86701-40001
2	2200-0101	0	Screw, Mach, 4-40, .188-IN LG, PAN HD	28480	2200-0101
3	86701-20049	3	Screw, Tuning, Freq Adjust	28480	86701-20049
4	2950-0078	9	Nut, Hex, 10-32 (For Freq Adjust (3))	28480	2950-0078
5	3050-0082	8	Washer, FL NM, .116-IN ID (For (3))	28480	3050-0082
6	2580-0002	4	Nut, Hex, 8-32 (For C23)	28480	2580-0002
7	2190-0009	4	Washer, Lock, .168-IN ID (For C23)	28480	2190-0009
8	2260-0002	6	Nut, Hex, 4-40 (For Pwr Adjust)	28480	2260-0002
9	86701-20046	0	Probe, 4-40 Thread (Pwr Adjust)	28480	86701-20046
10	86701-20047	1	Support-Resonator (For Probe (9))	28480	86701-20047
11	0520-0128	7	Screw, Mach, 2-56, .250-IN LG, PAN HD	28480	0520-0128
12	2190-0045	8	Washer, Lock, .088-IN ID (For screw (11))	28480	2190-0045
13	0380-0020	0	Spacer, .250-IN LG, .128-IN ID (For (14))	28480	0380-0020
14	0520-0133	4	Screw, Mach, 2-56, .500-IN LG, PAN HD	28480	0520-0133
15	85660-20049	1	Cover, PC Board, (A7A4 M/N Output)	28480	85660-20049
16	2950-0078	9	Nut, Hex, 10-32 (For J1 and J2)	28480	2950-0078
17	2190-0124	4	Washer, Lock, .195-IN ID (For J1 and J2)	28480	2190-0124
18	85660-20068	4	Ground Lug (For J1 and J2)	28480	85660-20068
19	2200-0167	8	Screw, Mach, 4-40, .375-IN LG, FLAT HD	28480	2200-0167

FIGURE 1. A7A4 M/N OUTPUT ASSEMBLY, PARTS IDENTIFICATION (2 OF 2)

ManualsPlus.com



A7A4

FIGURE 2. A7A4 M/N OUTPUT, BLOCK DIAGRAM

ManualsPlus.com

A7A4A1A2
M/N VCO
85660-60096

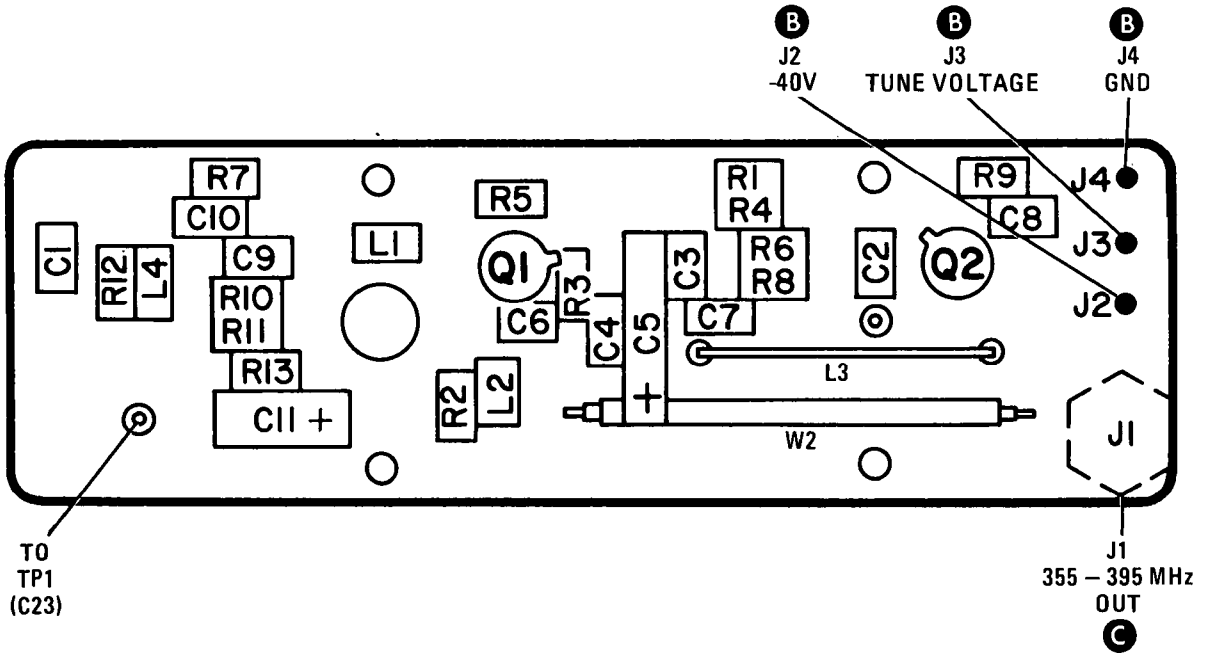


FIGURE 3. A7A4A1A2 M/N VCO BOARD, COMPONENT LOCATIONS

ManualsPlus.com

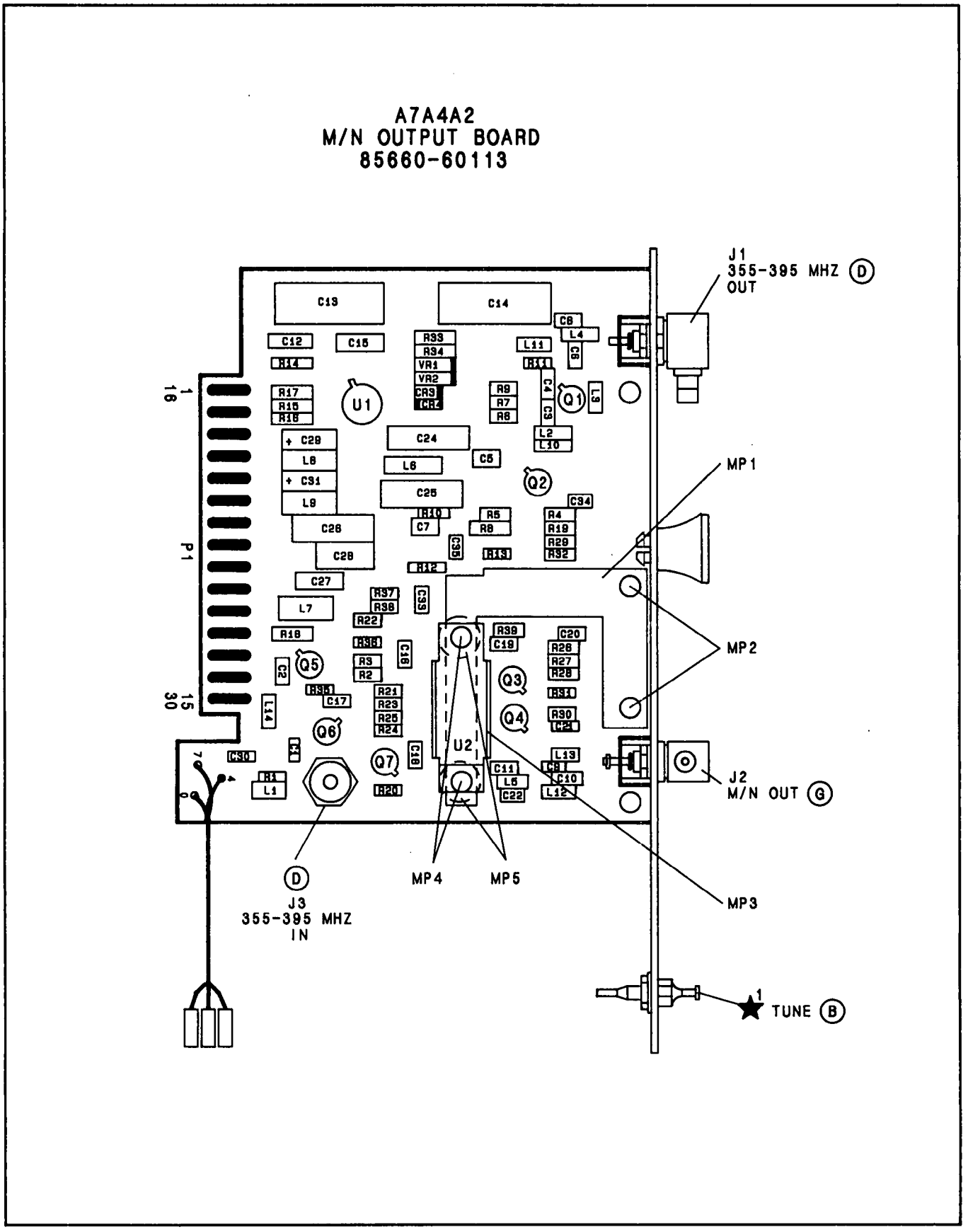


FIGURE 4. A7A4A2 M/N OUTPUT BOARD, COMPONENT LOCATIONS

ManualsPlus.com

RF SECTION

A7A4 M/N OUTPUT ASSEMBLY
85660-60192

A7A4A2 M/N OUTPUT BOARD

Ⓐ LOOP AMPLIFIER

A7A4A1 M/N VOLTAGE CONTROLLED OSCILLATOR (VCO) ASSEMBLY
85660-60098

A7A4A1A2 M/N VCO BOARD

Ⓑ VOLTAGE-CONTROLLED OSCILLATOR

A7A4A1A1 M/N VCO

Ⓒ BUFFER AMPLIFIER

Ⓓ LO OUTPUT AMPLIFIER

Ⓔ LO AMPLIFIER

Ⓕ DIVIDE BY 2

Ⓖ M/N OUTPUT AMPLIFIER

Ⓗ POWER SUPPLIES

P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	VCO TUNE (+)	A7A3P1-21	A
46	VCO TUNE (+)	A7A3P1-21	A
2	GND		H
47	GND		H
3	VCO TUNE (-)	A7A3P1-6	A
48	VCO TUNE (-)	A7A3P1-9	A
4	GND		H
45	GND		H
5	+16V		
26	+16V		
6	GND		
21	GND		
7	+5.2V		
20	+5.2V		
8	GND		
23	GND		
9	GND		
24	GND		
10	GND		
25	GND		
11	GND		
22	GND		
12	+42V		
27	+42V		
13	GND		
28	GND		
14	LANE	A12P2-30	F
29	LANE	A12P2-30	F
15	GND		H
30	GND		H

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATIONS, PREFIX ABBREVIATIONS WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN Ω OHMS (Ω) CAPACITANCE IN F MICROFARADS(UF) INDUCTANCE IN H MICROHENRIES(UH)
3. A7A4A1A1C4 IS AN AIR CYCLEACTAC CAPACITOR FORMED BY RESONATOR HOUSING AND RESONATOR CERMIC COMBINATION.
4. PWR ADJUSTMENT. TYPE IS AN ADJUSTABLE PROBE MOUNTED THROUGH A HOLE IN THE SIDE EXTENSION INTO RESONATOR HOUSING.
5. ADJUSTMENT SCREW LOCATED ON COVER OF A7A4 M/N OUTPUT.
6. UNLESS OTHERWISE INDICATED - SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.
7. REFERENCE TABLE

REFERENCE	DESCRIPTION
LANE	LOW-M/N OUTPUT ENABLE

A7A4

SERIAL NUMBER PREFIX: 2410A

FIGURE 5. A7A4 M/N OUTPUT, SCHEMATIC DIAGRAM

ManualsPlus.com

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A5	85660-60020	2	1	BOARD ASSEMBLY, M/N REFERENCE MOTHERBOARD	28480	85660-60020
A7A5C1	0160-2437	1	12	CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7A5C2	0160-2437	1		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7A5C3	0160-2437	1		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7A5C4	0160-2437	1		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7A5C5	0160-2437	1		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7A5C6	0160-2437	1		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7A5C7	0160-2437	1		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7A5C8	0160-2437	1		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7A5C9	0160-2437	1		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7A5C10	0160-2437	1		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7A5C11	0160-2437	1		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7A5C12	0160-2437	1		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A7A5C13	0160-4083	7	2	CAPACITOR-FDTHRU 10PF 10% 200V CER	28480	0160-4083
A7A5C14	0160-4083	7		CAPACITOR-FDTHRU 10PF 10% 200V CER	28480	0160-4083
A7A5E1				PART OF PC BOARD		
A7A5E2				PART OF PC BOARD		
A7A5E3				PART OF PC BOARD		
A7A5E4				PART OF PC BOARD		
A7A5E5				PART OF PC BOARD		
A7A5E6				PART OF PC BOARD		
A7A5E7				PART OF PC BOARD		
A7A5E8				PART OF PC BOARD		
A7A5E9				PART OF PC BOARD		
A7A5E10-A7A5E12				NOT ASSIGNED		
A7A5E13				PART OF PC BOARD		
A7A5E14				PART OF PC BOARD		
A7A5E15	9170-0029	3	12	CORE-SHIELDING BEAD	28480	9170-0029
A7A5E16	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A7A5E17	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A7A5E18	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A7A5E19	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A7A5E20	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A7A5E21	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A7A5E22	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A7A5E23	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A7A5E24	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A7A5E25	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A7A5E26	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A7A5XA7A1	1251-4423	3	1	CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	28480	1251-4423
A7A5XA7A2	1251-4174	1	1	CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	28480	1251-4174
A7A5XA7A3	1251-2035	9	1	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A7A5XA7A4	1251-5020	8	1	CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	28480	1251-5020
A7A5XA7A5P1	5060-0112	8	2	CONNECTOR:15 CONTACTS	28480	5060-0112
A7A5XA7A5P2	5060-0112	8		CONNECTOR:15 CONTACTS	28480	5060-0112
				MISCELLANEOUS PARTS		
	2190-0007	2	2	WASHER-LK INTL T NO. 6 .141-IN-ID	28480	2190-0007
	2190-0843	4	12	WASHER-LK INTL T NO. 8 .165-IN-ID	28480	2190-0843
	2420-0003	7	2	NUT-HEX-DBL-CHAM 6-32-THD .094-IN-THK	28480	2420-0003
	2580-0002	4	12	NUT-HEX-DBL-CHAM 8-32-THD .005-IN-THK	28480	2580-0002

*Indicates Factory Selected Value

ManualsPlus.com

A7A5
M/N – REFERENCE MOTHERBOARD
(Top View)
85660-60020

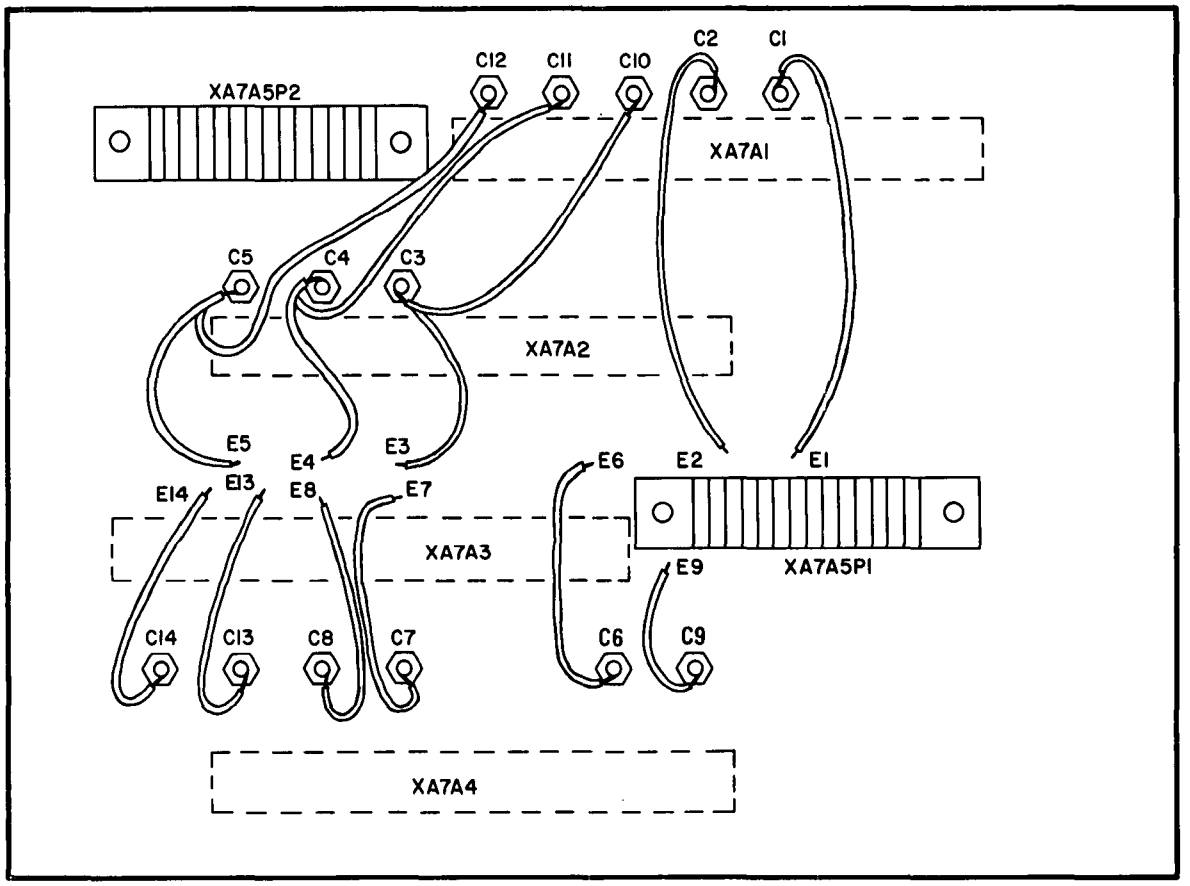


FIGURE 1. A7A5 M/N-REFERENCE MOTHERBOARD, COMPONENT LOCATIONS (TOP VIEW)

ManualsPlus.com

A7A5
M/N – REFERENCE MOTHERBOARD
(Bottom View)
85660-60020

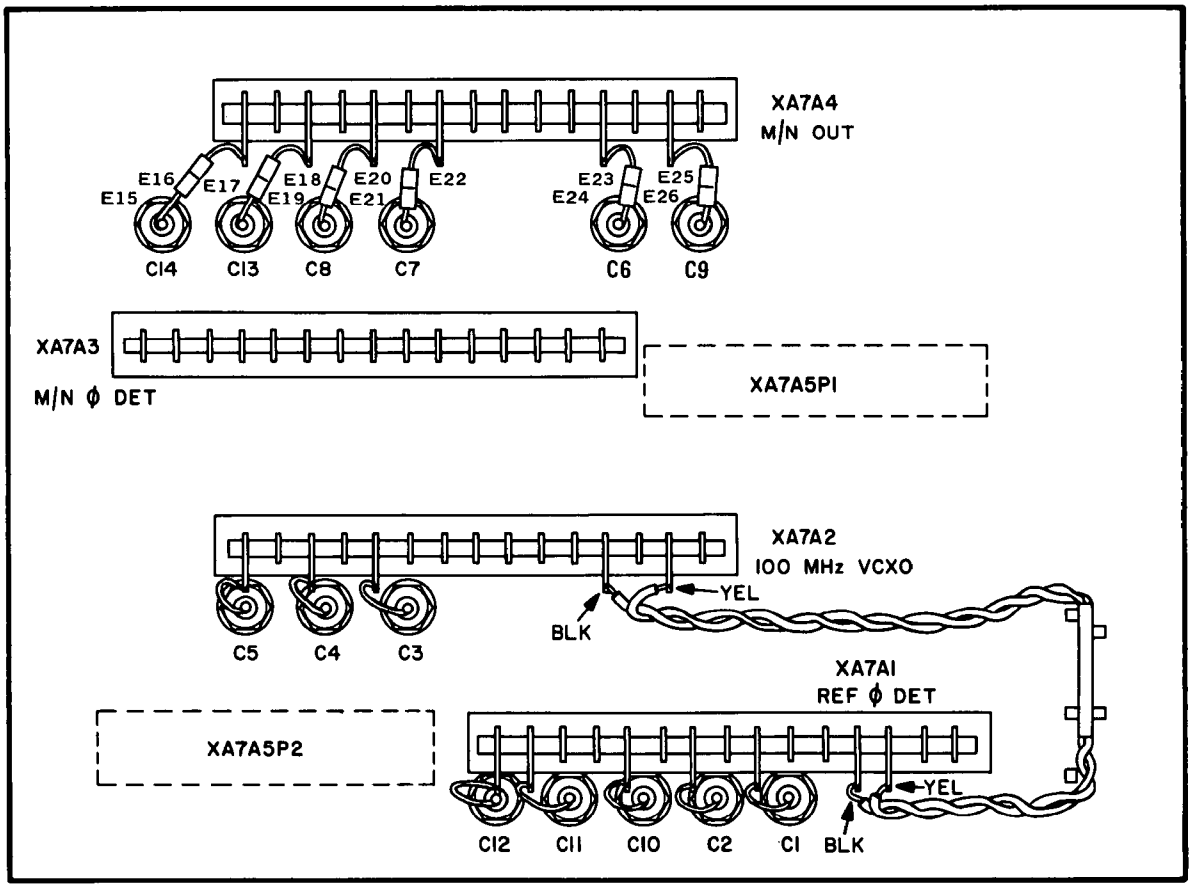


FIGURE 2. A7A5 M/N-REFERENCE MOTHERBOARD, COMPONENT LOCATIONS (BOTTOM VIEW)

ManualsPlus.com

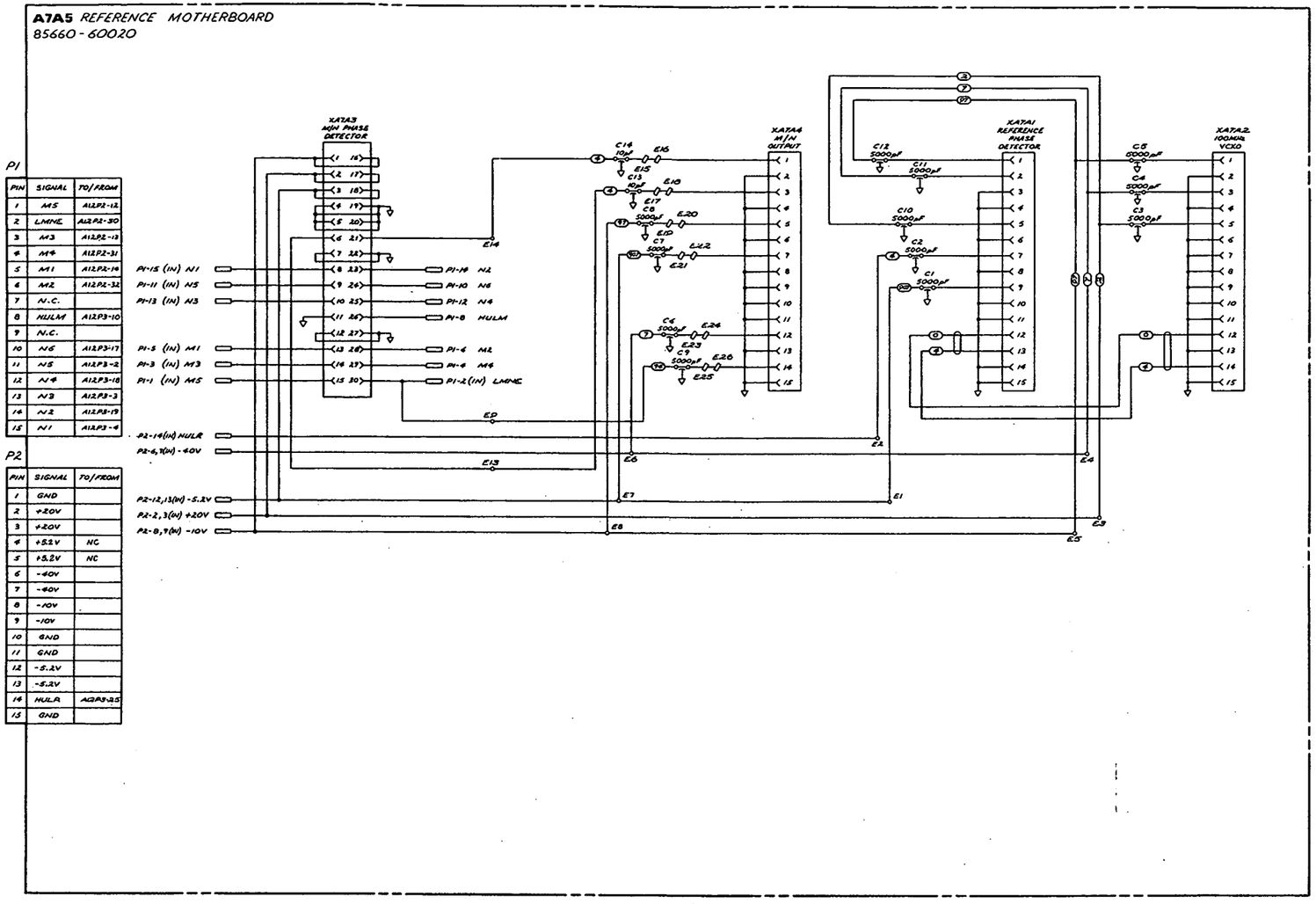
A7A5 *REFERENCE MOTHERBOARD*
85660-60020

P1

PIN	SIGNAL	TO/FROM
1	M5	A12P2-12
2	LMINE	A12P2-30
3	M3	A12P2-13
4	M4	A12P2-31
5	M1	A12P2-14
6	M2	A12P2-32
7	N.C.	
8	NULM	A12P3-10
9	N.C.	
10	N6	A12P3-17
11	N5	A12P3-2
12	N4	A12P3-18
13	N3	A12P3-3
14	N2	A12P3-19
15	N1	A12P3-4

P2

PIN	SIGNAL	TO/FROM
1	GND	
2	+20V	
3	+20V	
4	+5.2V	NC
5	+5.2V	NC
6	-40V	
7	-40V	
8	-10V	
9	-10V	
10	GND	
11	GND	
12	-5.2V	
13	-5.2V	
14	NULR	A6P3-35
15	GND	



NOTES:
1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. PREFIX ABBREVIATION WITH ASSEMBLY NUMBER FOR COMPLETE REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS (Ω) CAPACITANCE IN MICROFARADS (μF) INDUCTANCE IN MICROHENRIES (μH).

A7A5

FIGURE 3. A7A5 M/N-REFERENCE MOTHERBOARD, INTERCONNECT DIAGRAM

ManualsPlus.com

A8 Rectifier
A9 Power Line Module

ManualsPlus.com

A8 RECTIFIER, CIRCUIT DESCRIPTION

Power is supplied to the instrument through the A9 Power Line Module, which contains the line voltage selector, to the primary of transformer T1. Three bridge rectifiers and one center-tapped secondary provide the rectified outputs.

Diodes CR1 through CR4 form a bridge rectifier that provides approximately 55V for the −40V supply, part of the A18 Negative Regulator. CR5 through CR8 form a bridge rectifier that provides about 20V for the −10V supply and the −5.2V supply, also part of the A18 Negative Regulator.

Diodes CR9 through CR12 form a bridge rectifier that provides approximately 30V for the +22V supply, part of the A8 Rectifier, and also the +20V and +12V supplies, part of the A17 Positive Regulator. Diodes CR13 and CR14 form a full-wave rectifier that provides about 12V for the +5.2V supply, part of the A17 Positive Regulator.

The +22V supply is an 18V three-terminal regulator U1 which has its common terminal biased at +4V by R1, DS1, and R2. DS1 is a LED indicator that indicates the presence of +22V. VR1 and CR16 form a crowbar circuit for overvoltage protection. Fuse F1 provides overcurrent protection. The regulator U1 is also internally protected against short circuits on its output. The +22V supply is always on as long as the instrument is connected to an ac line outlet.

The instrument is also protected against line overvoltages by an input crowbar circuit consisting of VR2 and CR18. This crowbar causes the line fuse to blow if an overvoltage condition occurs on the line.

All power supply filter capacitors and bleeder resistors are located on the A23 Motherboard. The location of fuses in the RF Section is shown in Figure 1.

ManualsPlus.com

RF SECTION INTERNAL FUSE REPLACEMENT

NOTE

For location of hardware and cables referred to in this procedure, see Figure 1.

WARNING

Remove ac line cord from both instruments before proceeding with this procedure.

1. Position instrument upside-down as shown in View A.
2. Remove feet **(1)** from rear of RF Section by removing screws **(2)** shown in View A.
3. Remove bottom cover by loosening screw **(3)** and pulling cover toward rear of instrument.
4. Location of fuses is shown in View B.

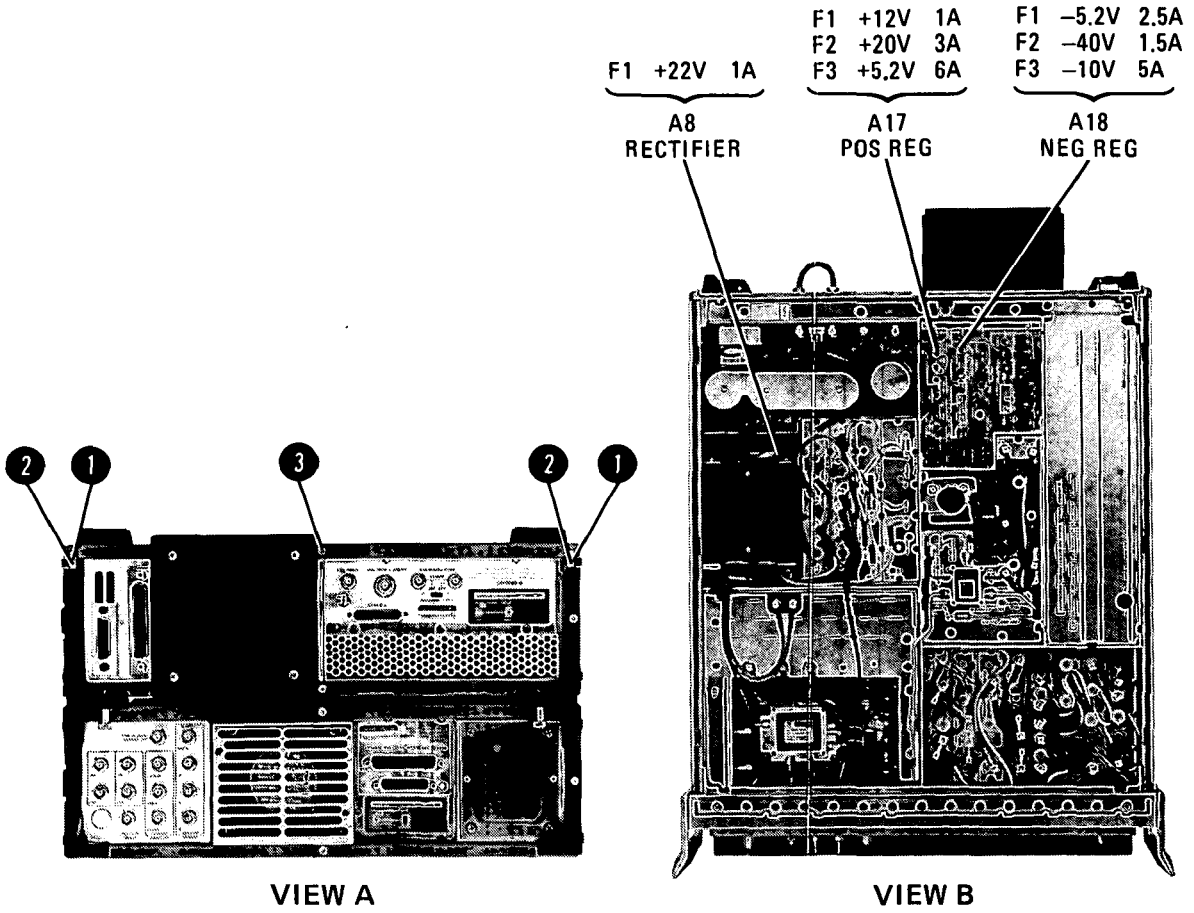


FIGURE 1. INTERNAL FUSE REPLACEMENT

ManualsPlus.com

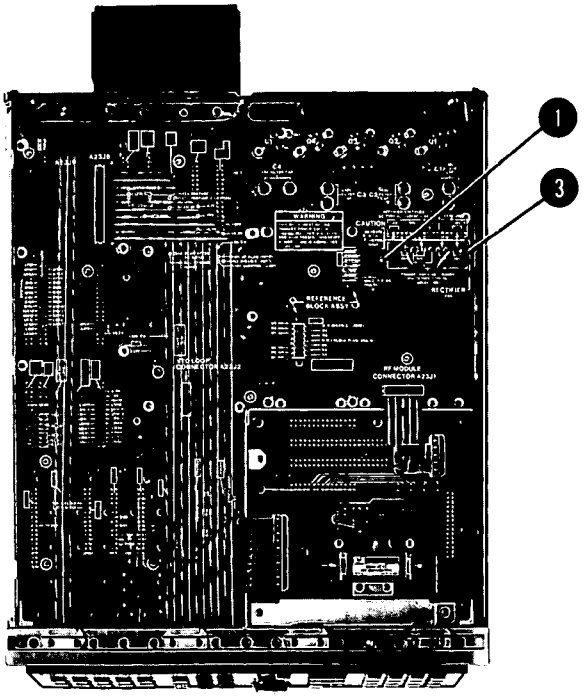
TRANSFORMER REPLACEMENT

NOTE

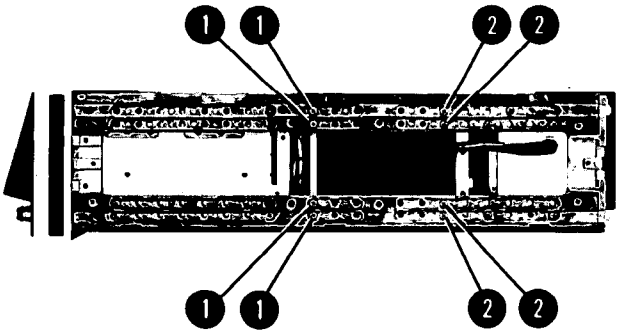
For location of hardware and cables referred to in this procedure, see Figure 2.

1. Remove ac line cords, IF-Display Section, and RF Section bottom cover, top cover, and right side cover.
2. Remove front panel. (See A5 Front Panel section for A5 Front Panel Removal procedure.)
3. Remove A6 RF Module. (See A6 section for A6 RF Module removal procedure.)
4. Remove seven screws **(1)**.
5. To avoid losing washers and nuts from screws **(2)** (View B) into the interior of the RF Section, it is recommended to do the following:
   a. Set RF Section on right side with transformer on bottom.
   b. Set the RF Section partially off the table so that a screwdriver can reach the remaining four mounting screws.
   c. For each screw **(2)**, hold nut with needlenose pliers while removing screw. Note: Mounting screws on motherboard side can be accessed through small opening **(3)** (View A) on motherboard.
   d. When installing new transformer, set RF Section on side as described in steps 5a and 5b. For each mounting screw, align nut and washers with hole, and while holding nut with needlenose pliers, tighten screw.
   e. Tighten remaining seven screws **(1)** to secure Transformer to RF Section.
6. Replace RF Module.
7. Replace front panel.
8. Replace covers, attach IF-Display section to RF Section, and replace ac line cords.

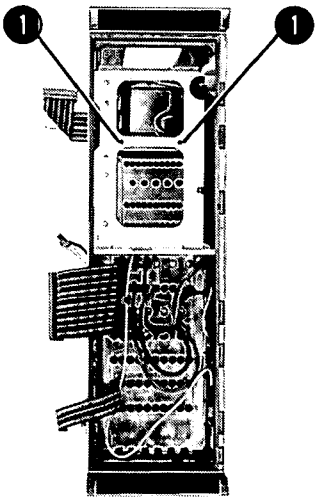
ManualsPlus.com



VIEW A



VIEW B



VIEW C

FIGURE 2. TRANSFORMER REPLACEMENT

ManualsPlus.com

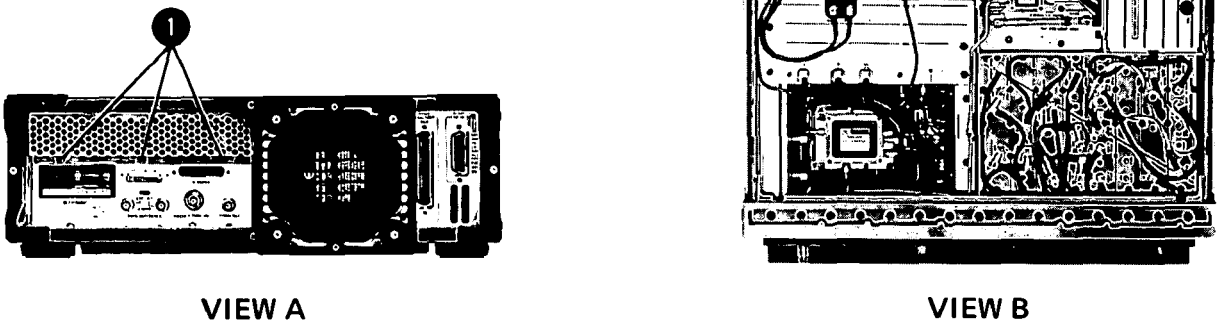
POWER TRANSISTOR REPLACEMENT (REAR RF COVER REMOVAL)

NOTE

For location of hardware and cables referred to in this procedure, see Figure 3.

With ac line cords and RF Section bottom cover removed, proceed as follows:

1. Loosen rear cover by removing five screws **(1)** shown in Views A and B.
2. Power Transistors can now be easily replaced.



VIEW A VIEW B

FIGURE 3. POWER TRANSISTOR REPLACEMENT

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A8	85660-60196	3	1	BOARD ASSEMBLY, RECTIFIER	28480	85660-60196
A8C1	0160-2055	9	3	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A8C2	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A8C3	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A8C4	0160-4084	8	1	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A8C5	0180-0230	0	2	CAPACITOR-FXD 1UF+-20% 50VDC TA	56289	150D105X0050A2
A8C6	0180-0230	0		CAPACITOR-FXD 1UF+-20% 50VDC TA	56289	150D105X0050A2
A8C7	0180-0197	8	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A8C8	0160-4005	3	4	CAPACITOR-FXD 1UF +-20% 100VDC CER	28480	0160-4005
A8C9	0160-4005	3		CAPACITOR-FXD 1UF +-20% 100VDC CER	28480	0160-4005
A8C10	0160-4005	3		CAPACITOR-FXD 1UF +-20% 100VDC CER	28480	0160-4005
A8C11	0160-4005	3		CAPACITOR-FXD 1UF +-20% 100VDC CER	28480	0160-4005
A8C12	0160-3638	6	1	CAPACITOR-FXD .22UF +80-20% 200VDC CER	28480	0160-3638
A8C13	0180-1731	8	1	CAPACITOR-FXD 4.7UF+-10% 50VDC TA	56289	150D475X9050D2
A8CR1	1901-0662	3	13	DIODE-PWR RECT 100V 6A	04713	MR751
A8CR2	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A8CR3	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A8CR4	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A8CR5	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A8CR6	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A8CR7	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A8CR8	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A8CR9	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A8CR10	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A8CR11	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A8CR12	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A8CR13	1901-0765	7	2	DIODE-PWR RECT 1N5812 50V 20A 35NS DO-4	12969	1N5812
A8CR14	1901-0765	7		DIODE-PWR RECT 1N5812 50V 20A 35NS DO-4	12969	1N5812
A8CR16	1884-0018	5	2	THYRISTOR-SCR 2N4186 VRRM=200	04713	2N4186
A8CR17	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A8CR18	1884-0018	5		THYRISTOR-SCR 2N4186 VRRM=200	04713	2N4186
A8CR19	1901-0743	1	2	DIODE-PWR RECT 1N4004 400V 1A DO-41	01295	1N4004
A8CR20	1901-0743	1		DIODE-PWR RECT 1N4004 400V 1A DO-41	01295	1N4004
A8DS1	1990-0487	7	1	LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A8F1	2110-0001	8	1	FUSE 1A 250V NTD 1.25X.25 UL	75915	312001
A8R1	0698-0083	8	1	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A8R2	2100-3052	4	1	RESISTOR-TRMR 50 10% C SIDE-ADJ 17-TRN	02111	43P500
A8R3	0757-0346	2	1	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A8R4	0698-3444	1	1	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A8R5	0698-3447	4	1	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A8R6*	0698-3442	9	1	RESISTOR 237 1% .125W F TC=0+-100	24546	C4-1/8-T0-237R-F
A8R7	0698-3558	8	1	RESISTOR 4.02K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4021-F
A8U1	1826-0423	4	1	IC V RGLTR TO-3	27014	LM317K
A8VR1	1902-3263	8	1	DIODE-ZNR 24.9V 2% DO-35 PD=.4W	28480	1902-3263
A8VR2	1902-0197	1	1	DIODE-ZNR 82.5V 5% DO-7 PD=.1W TC=+.082%	28480	1902-0197
				MISCELLANEOUS PARTS		
	0340-1077	5	1	INSULATOR FPPR	28480	0340-1077
	1200-0081	4	2	INSULATOR-FLG-BSHG NYLON	28480	1200-0081
	2110-0269	0	2	FUSEHOLDER-CLIP TYPE.25D-FUSE	28480	2110-0269
	2190-0124	4	2	WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0124
	2200-0107	6	2	SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2740-0001	3	2	NUT-HEX-DBL-CHAM 10-32-THD .109-IN-THK	00000	ORDER BY DESCRIPTION
	3050-0876	8	2	WASHER-FL NM NO. 10 .194-IN-ID	28480	3050-0876
	5040-6843	2	1	EXTRACTOR	28480	5040-6843
	86701-00018	4	1	HEATSINK RECT	28480	86701-00018
A9	0960-0443	1	1	LINE MODULE-FILTERED	28480	0960-0443
A9C1	0160-4065	5	1	CAPACITOR-FXD .1UF +-20% 250VAC(RMS)	28480	0160-4065

*Indicates Factory Selected Value

ManualsPlus.com

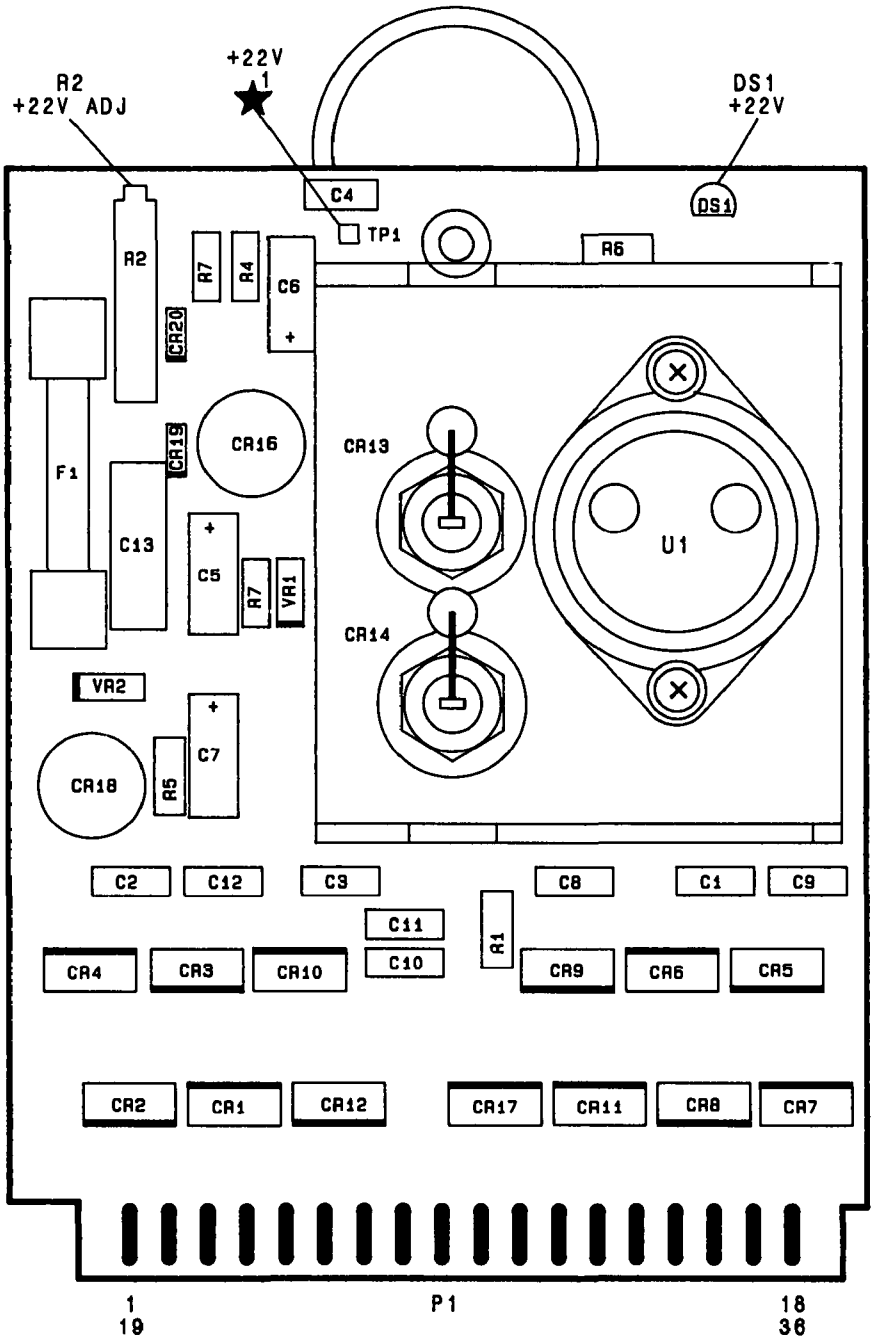
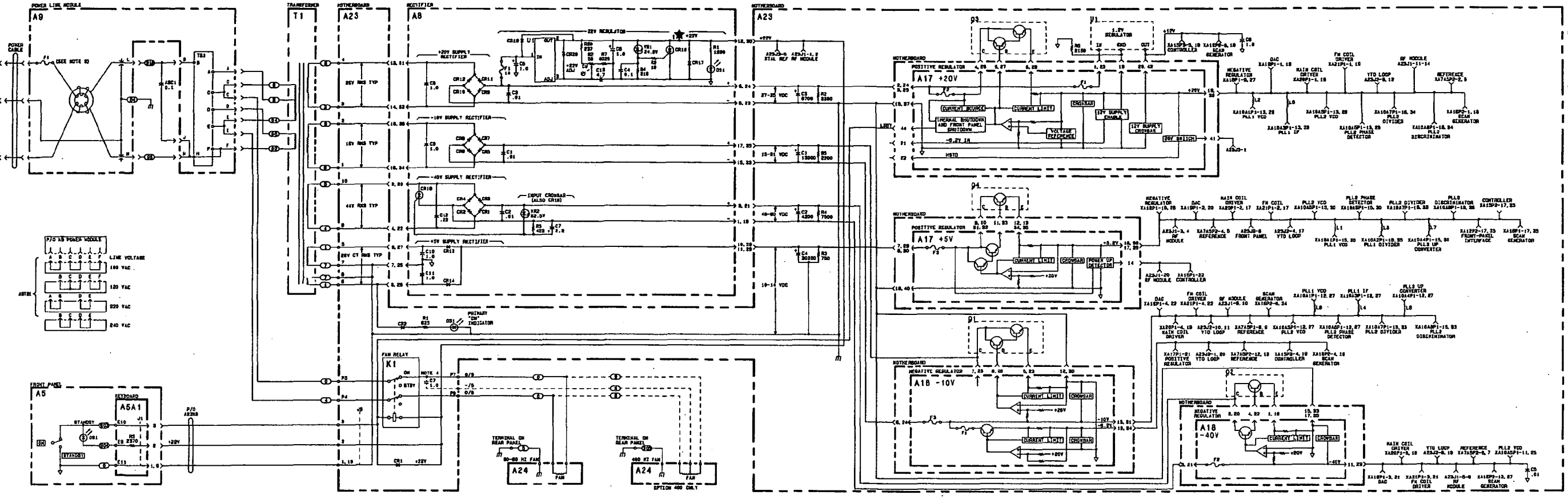


FIGURE 4. A8 RECTIFIER, COMPONENT LOCATIONS

RF SECTION



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE IDENTIFIED FOR COMPLETE REFERENCE DESIGNATION, PREFIX WITH A1 IN CONJUNCTION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (μF) INDUCTANCE IS IN MICROHENRIES (μH)
3. A9P1 IS ALSO LISTED IN REPLACEABLE PARTS LIST AS P1 FOR ORDERING CONVENIENCE.
4. C7 LOADED FOR OPTION 400 ONLY.
5. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE AND EXIT RIGHT SIDE OF FUNCTION BLOCKS.

A8

FIGURE 5. A8 RECTIFIER, SCHEMATIC DIAGRAM AND A23 MOTHERBOARD POWER DISTRIBUTION DIAGRAM

ManualsPlus.com

ManualsPlus.com

A10 20/30 Synthesizer

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10				20/30 SYNTHESIZER		
A10A1	85660-60131	6	1	BOARD ASSEMBLY, PLL1 VCO	28480	85660-60131
A10A2	85660-60023	5	1	BOARD ASSEMBLY, PLL1 DIVIDER	28480	85660-60023
A10A3	85660-60024	6	1	BOARD ASSEMBLY, PLL1 IF	28480	85660-60024
A10A4	85660-60025	7	1	BOARD ASSEMBLY, PLL3 UP CONVERTER	28480	85660-60025
A10A5	85660-60168	9	1	BOARD ASSEMBLY, PLL2 VCO	28480	85660-60168
A10A6	85660-60130	5	1	BOARD ASSEMBLY, PLL2 PHASE DETECTOR	28480	85660-60130
A10A7	85660-60028	0	1	BOARD ASSEMBLY, PLL2 DIVIDER	28480	85660-60028
A10A8	85660-60176	9	1	BOARD ASSEMBLY, PLL2 DISCRIMINATOR	28480	85660-60176
A10A9	85660-60080	4	1	BATTERY PACK ASSEMBLY (INCLUDES A10A9A1 AND A10A9MP1)	28480	85660-60080
A10A9A1	08672-60092	0	1	BATTERY	28480	08672-60092
A10A9MP1	85660-20138	9	1	BATTERY HOLDER-MLD PLASTIC	28480	85660-20138
A10A9MP2	85660-60054	2	1	BATTERY CLAMP	28480	85660-60054

*Indicates Factory Selected Value

ManualsPlus.com

A10
20/30 SYNTHESIZER

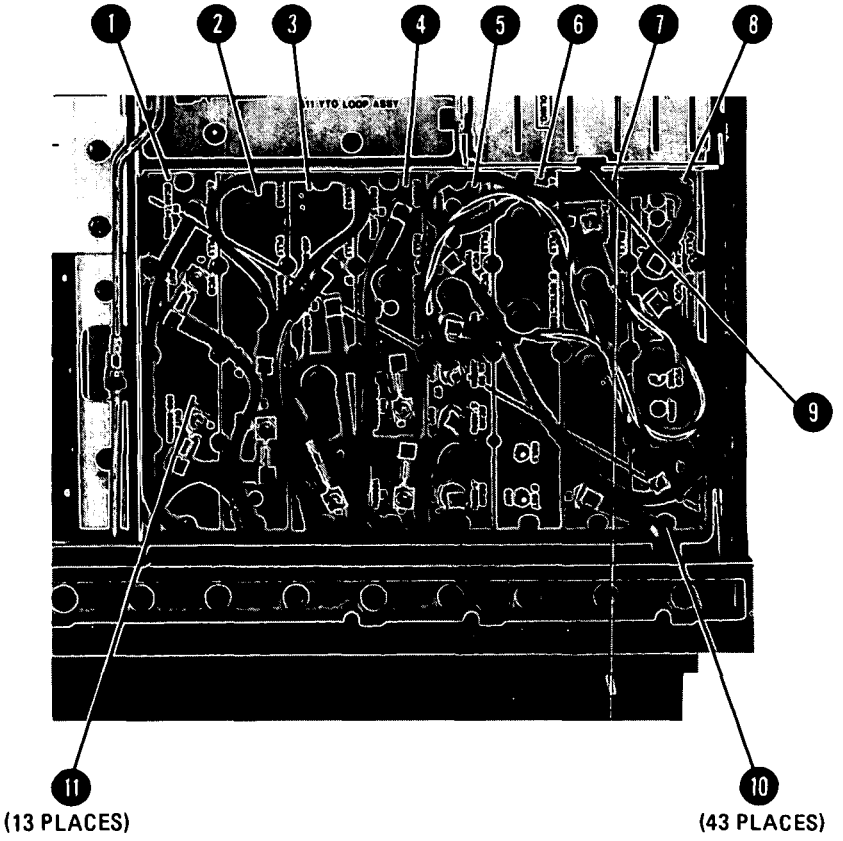
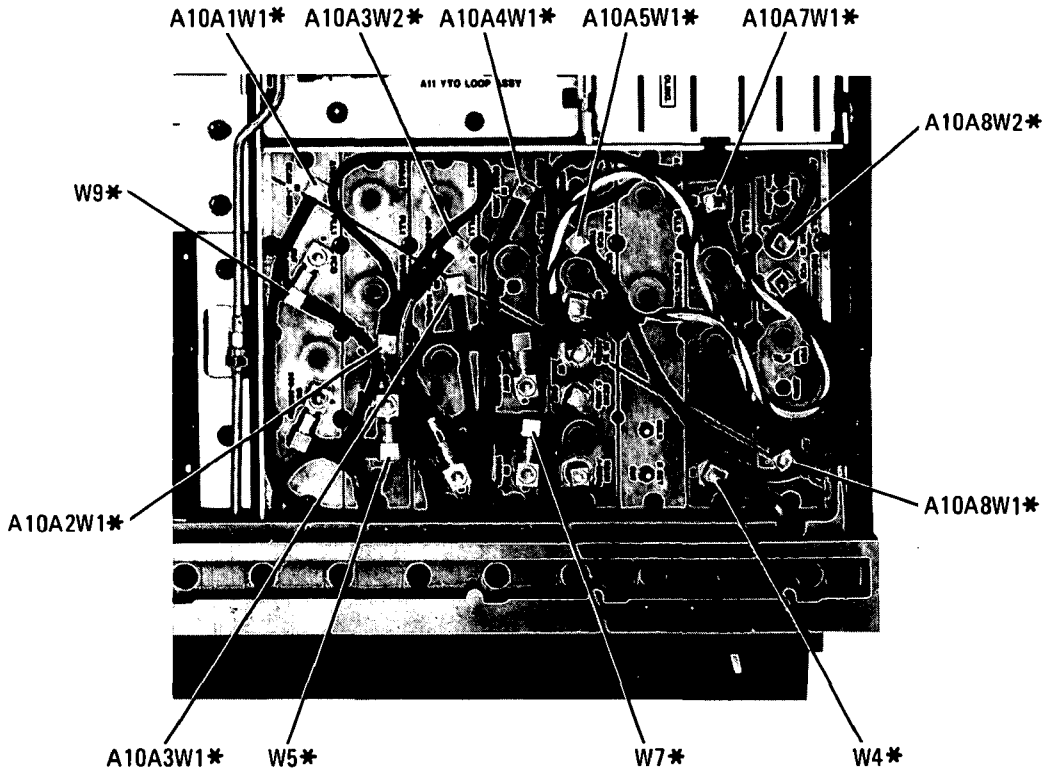


FIGURE 1. A10 20/30 SYNTHESIZER, PARTS IDENTIFICATION (1 OF 4)

ManualsPlus.com

A10
20/30 SYNTHESIZER

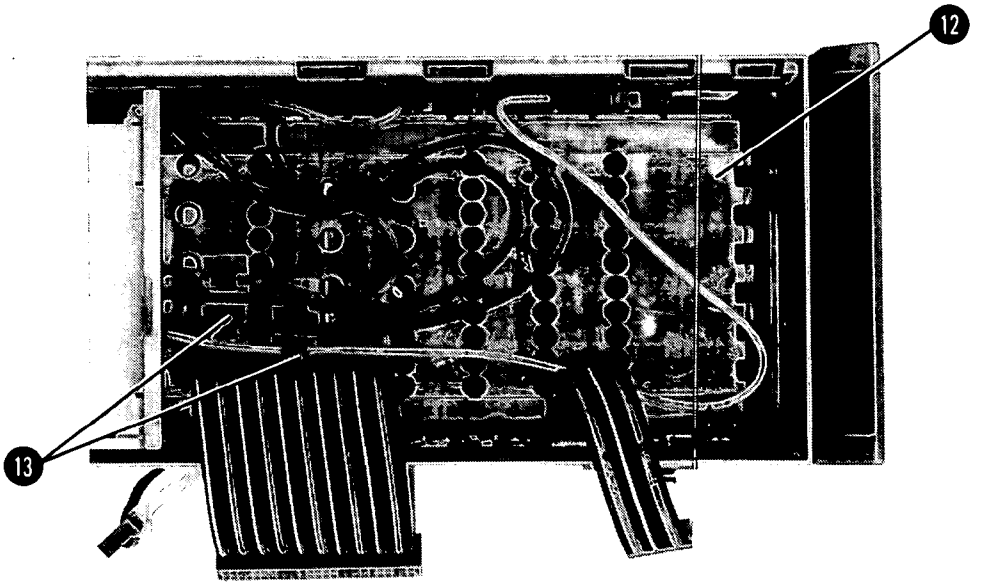


*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

FIGURE 1. A10 20/30 SYNTHESIZER, PARTS IDENTIFICATION (2 OF 4)

ManualsPlus.com

A10
20/30 SYNTHESIZER



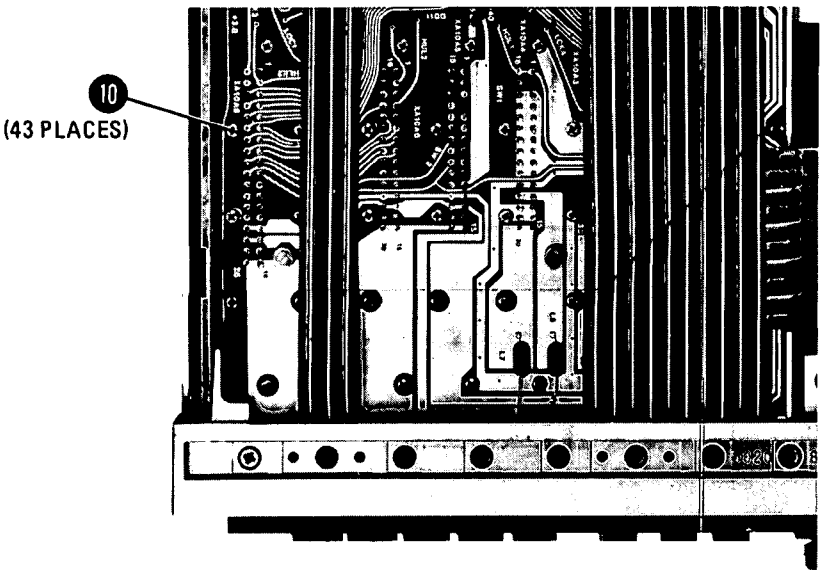


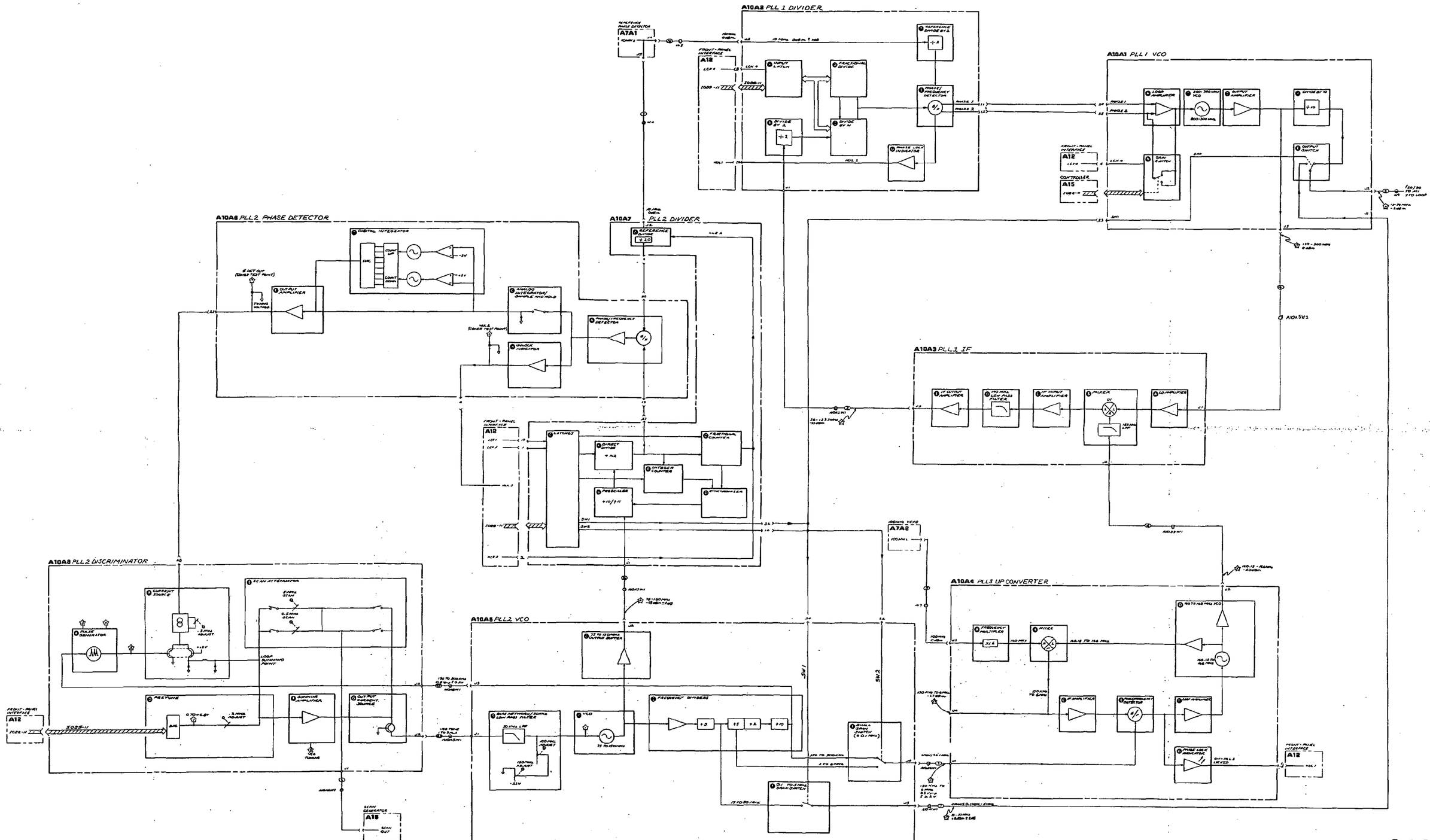
FIGURE 1. A10 20/30 SYNTHESIZER, PARTS IDENTIFICATION (3 OF 4)

ManualsPlus.com

Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
1	85660-20052	6	Cover, PC Board (A10A1 PLL1 VCO)	28480	85660-20052
2	85660-20053	7	Cover, PC Board (A10A2 PLL1 Divider)	28480	85660-20053
3	85660-20054	8	Cover, PC Board (A10A3 PLL1 IF)	28480	85660-20054
4	85660-20055	9	Cover, PC Board (A10A4 PLL3 Up Converter)	28480	85660-20055
5	85660-20056	0	Cover, PC Board (A10A5 PLL2 VCO)	28480	85660-20056
6	85660-20057	1	Cover, PC Board (A10A6 PLL2 ϕ DET)	28480	85660-20057
7	85660-20058	2	Cover, PC Board (A10A7 PLL2 Divider)	28480	85660-20058
8	85660-20059	3	Cover, PC Board (A10A8 PLL2 Discriminator)	28480	85660-20059
9	0400-0009	9	Grommet, Rubber (For A10A8W2)	28480	0400-0009
10	2200-0105	4	Screw, Mach, 4-40, .312-IN LG, PAN HD	28480	2200-0105
11	86701-40001	9	Extractor, PC Board	28480	86701-40001
12	85660-20190	3	Housing, 20/30 Synthesizer	28480	85660-20190
13	1400-0510	8	Clamp, Cable	28480	1400-0510

FIGURE 1. A10 20/30 SYNTHESIZER, PARTS IDENTIFICATION (4 OF 4)

ManualsPlus.com



A10

FIGURE 2. A10 2030 SYNTHESIZER, TROUBLESHOOTING BLOCK DIAGRAM

ManualsPlus.com

A10A1 PLL1 VCO

ManualsPlus.com

A10A1 PHASE LOCK LOOP 1 (PLL1) VOLTAGE-CONTROLLED OSCILLATOR (VCO), CIRCUIT DESCRIPTION

A10A1 contains the loop amplifier and voltage-controlled oscillator for the PLL1 phase lock loop. The oscillator tunes from 200 to 300 MHz for a range of about 4V to 16V tuning of the varactor. The oscillator drives a counter which divides the frequency by 10. The counter output goes through a switch and a filter to the 20/30 output. The oscillator is turned off in spans greater than 100 kHz but less than or equal to 5 MHz to prevent spurious responses.

Loop Amplifier (A)

The loop amplifier consists of a low-noise differential pair input stage, Q9 and Q10, and an operational amplifier U6A. Feedback (ac) is provided by C34 and R29. The output of the amplifier goes through a programmable ac voltage divider consisting of R31, R32, R33, R34, R35 with R36 and C36. The signal then is filtered by a 40 kHz low-pass filter which has two notches tuned to reject 50 kHz.

U6B compares the dc varactor tune voltage to about +17.5V. If the tune voltage goes higher than this, U6B switches and pulls it down to about +5V. Hysteresis in the switching point of U6B provided by R24 keeps U6B from switching back to the original state until the tune voltage reaches about +5V.

Q2 keeps the tune voltage from going below about +3V. This is to ensure that the VCO always oscillates and the varactors do not become forward biased in spans where PLL1 is active.

Gain Switch (B)

U5 latches the four most significant bits of the programming of PLL1 divider. These are level translated by U4 which drives four FET switches. By changing the voltage divider in **(A)** in this manner, a constant loop bandwidth of 5 kHz is achieved.

200 – 300 MHz VCO (C) and Output Amplifier (D)

The VCO consists of Q11 which operates in the grounded-base mode. The resonator is principally CR3, CR4, and L4. Feedback is accomplished with L5, R16, and C17. In spans greater than 100 kHz but less than or equal to 5 MHz, the VCO is turned off by forward biasing the varactors. Q5 is a common-base buffer amplifier. The output of the VCO is applied to Q4 where it is amplified and applied to A10A3 PLL1 IF and the Divide by 10 **(F)**.

Output Switch (E)

The output switch is U2 which is a quad ECL NOR gate. For frequency spans greater than 100 kHz, but less than or equal to 5 MHz, the switch input to R3 is TTL low. U2B and U2C are on while U2D is off. For all other spans, the opposite states exist. This has the effect of connecting the 20/30 output, J2, to either the output of U3 divider or to J1.

Divide by 10 (F)

Q3 is a common-emitter amplifier which drives U3 through a high-pass filter. U3 is an ECL divide by 10 counter which generates the necessary 20 to 30 MHz from the VCO output.

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A1	05660-60131	6	1	BOARD ASSEMBLY, PHASE LOCK LOOP 1 (PLL1) VOLTAGE CONTROL-LED OSCILLATOR (VCO)	28480	05660-60131
A10A1C1	0160-0574	3	8	CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A1C2	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A1C3	0160-3875	3	3	CAPACITOR-FXD 22PF +-5% 200VDC CER 0+-30	28480	0160-3875
A10A1C4	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A1C5	0160-3877	5	1	CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A10A1C6	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A1C7	0160-3875	3		CAPACITOR-FXD 22PF +-5% 200VDC CER 0+-30	28480	0160-3875
A10A1C8	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A1C9	0160-3878	6	3	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A10A1C10	0160-3874	2	5	CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A10A1C11	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A10A1C12	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A10A1C13	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A10A1C14	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A10A1C15	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A10A1C16	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A10A1C17	0160-3875	3		CAPACITOR-FXD 22PF +-5% 200VDC CER 0+-30	28480	0160-3875
A10A1C18	0160-4084	8	1	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A1C19	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A1C20	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A1C21	0160-4953	0	4	CAPACITOR-FXD .027UF +-5% 50VDC CER	28480	0160-4953
A10A1C22	0160-4953	0		CAPACITOR-FXD .027UF +-5% 50VDC CER	28480	0160-4953
A10A1C23	0160-4953	0		CAPACITOR-FXD .027UF +-5% 50VDC CER	28480	0160-4953
A10A1C24	0160-4951	8	3	CAPACITOR-FXD .033UF +-5% 50VDC CER	28480	0160-4951
A10A1C25	0160-4952	9	1	CAPACITOR-FXD .039UF +-5% 50VDC CER	28480	0160-4952
A10A1C26	0160-0158	9	1	CAPACITOR-FXD 5600PF +-10% 200VDC POLYE	28480	0160-0158
A10A1C27	0180-0116	1	2	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A10A1C28	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035D2
A10A1C29	0180-0291	3	1	CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A10A1C30	0180-0197	8	2	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A10A1C31	0160-4953	0		CAPACITOR-FXD .027UF +-5% 50VDC CER	28480	0160-4953
A10A1C32	0160-4298	6	1	CAPACITOR-FXD 4700PF +-20% 250VDC CER	56289	C067F251H472MS22-CDH
A10A1C33	0160-4951	8		CAPACITOR-FXD .033UF +-5% 50VDC CER	28480	0160-4951
A10A1C34	0160-4951	8		CAPACITOR-FXD .033UF +-5% 50VDC CER	28480	0160-4951
A10A1C35	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A1C36	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A10A1CR1	1901-0040	1	5	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A10A1CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A10A1CR3	0122-0085	1	2	DIODE-VVC 2.2PF 7% C3/C25-MIN=4.5	00039	1S2208(B)
A10A1CR4	0122-0085	1		DIODE-VVC 2.2PF 7% C3/C25-MIN=4.5	00039	1S2208(B)
A10A1CR5	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A10A1CR6	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A10A1CR7	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A10A1J1				P/O A10A1W1		
A10A1J2	1250-0690	6	2	CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
A10A1J3	1250-0690	6		CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
A10A1L1	9100-2257	6	2	INDUCTOR RF-CH-MLD 820NH 10% .105DX.26LG	28480	9100-2257
A10A1L2	9100-2091	4	1	INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2091
A10A1L3	9100-2257	6		INDUCTOR RF-CH-MLD 820NH 10% .105DX.26LG	28480	9100-2257
A10A1L4	85660-80004	4	2	INDUCTOR 30NH	28480	85660-80004
A10A1L5	85660-80005	5		INDUCTOR 4NH	28480	85660-80005
A10A1L6	9100-2258	7	2	INDUCTOR RF-CH-MLD 1.2UH 10% .105DX.26LG	28480	9100-2258
A10A1L7	85660-80008	8	2	INDUCT-ADJ .4MH	28480	85660-80008
A10A1L8	85660-80008	8		INDUCT-ADJ .4MH	28480	85660-80008
A10A1L9	9100-1647	6	1	INDUCTOR RF-CH-MLD 470UH 5% .2DX.45LG	28480	9100-1647
A10A1L10	9100-1788	6	3	CHOKE-WIDE BAND ZMAX=680 OHM@ 100 MHZ	02114	VK200 20/4B
A10A1L11	9100-1788	6		CHOKE-WIDE BAND ZMAX=680 OHM@ 100 MHZ	02114	VK200 20/4B
A10A1L12	9100-1788	6		CHOKE-WIDE BAND ZMAX=680 OHM@ 100 MHZ	02114	VK200 20/4B
A10A1L13	9100-2258	7		INDUCTOR RF-CH-MLD 1.2UH 10% .105DX.26LG	28480	9100-2258
A10A1L14	9100-2254	3	2	INDUCTOR RF-CH-MLD 390NH 10% .105DX.26LG	28480	9100-2254
A10A1L15	9100-2254	3		INDUCTOR RF-CH-MLD 390NH 10% .105DX.26LG	28480	9100-2254
A10A1L16	9100-2247	4	1	INDUCTOR RF-CH-MLD 100NH 10% .105DX.26LG	28480	9100-2247
A10A1Q1	1855-0420	2	4	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A10A1Q2	1854-0023	9	3	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A10A1Q3	1854-0345	8	4	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A10A1Q4	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A10A1Q5	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179

*Indicates Factory Selected Value

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A1Q6	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A10A1Q7	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A10A1Q8	1855-0420	2		TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A10A1Q9	1854-0023	9		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A10A1Q10	1854-0023	9		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A10A1Q11	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A10A1R1	0757-0395	1	2	RESISTOR 56.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-56R2-F
A10A1R2	0757-0280	3	11	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A1R3	0757-0317	7	1	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A10A1R4	0757-0441	8	2	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A10A1R5	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A1R6	0757-0123	3	4	RESISTOR 34.8K 1% .125W F TC=0+-100	28480	0757-0123
A10A1R7	0757-0441	8		RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A10A1R8	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A1R9	0698-3444	1	1	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A10A1R10	0757-0460	1	1	RESISTOR 61.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6192-F
A10A1R11	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A1R12	0698-0082	7	1	RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A10A1R13	0757-0428	1	2	RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A10A1R14	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A1R15	0757-0402	1	2	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A10A1R16	0698-7195	7	1	RESISTOR 19.6 1% .05W F TC=0+-100	24546	C3-1/8-T0-19R6-F
A10A1R17	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A1R18	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A10A1R19	0757-0428	1		RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A10A1R20	0757-0395	1		RESISTOR 56.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-56R2-F
A10A1R21	0698-3438	3	2	RESISTOR 147 1% .125W F TC=0+-100	24546	C4-1/8-T0-147R-F
A10A1R22	0698-3438	3		RESISTOR 147 1% .125W F TC=0+-100	24546	C4-1/8-T0-147R-F
A10A1R23	0757-0458	7	2	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A10A1R24	0757-0289	2	3	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A10A1R25	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A10A1R26	0757-0416	7	4	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A10A1R27	0757-0123	3		RESISTOR 34.8K 1% .125W F TC=0+-100	28480	0757-0123
A10A1R28	0757-0123	3		RESISTOR 34.8K 1% .125W F TC=0+-100	28480	0757-0123
A10A1R29	0757-0440	7	2	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A10A1R30	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A10A1R31	0757-0465	6	1	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A10A1R32	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A10A1R33	0698-3159	5	1	RESISTOR 26.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2612-F
A10A1R34	0757-0290	5	1	RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A10A1R35	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A10A1R36	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A10A1R37	0757-0442	9	1	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10A1R38	0757-0123	3		RESISTOR 34.8K 1% .125W F TC=0+-100	28480	0757-0123
A10A1R39	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A10A1R40	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A10A1R41	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A10A1R42	0698-7180	8	1	RESISTOR 10 1% .05W F TC=0+-100	24546	C3-1/8-T0-10R-F
A10A1R43	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A1R44	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A1R45	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A1R46	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A1R47	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A1R48	0757-0462	3	4	RESISTOR 75K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7502-F
A10A1R49	0757-0462	3		RESISTOR 75K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7502-F
A10A1R50	0757-0462	3		RESISTOR 75K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7502-F
A10A1R51	0757-0462	3		RESISTOR 75K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7502-F
A10A1TP1	0360-0124	3	4	CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
A10A1TP2	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
A10A1TP3	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
A10A1TP4	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
A10A1U1	1810-0204	6	1	NETWORK-RES 8-SIP1.0K OHM X 7	01121	208A102
A10A1U2	1820-0802	1	1	IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A10A1U3	1820-1088	5	1	IC PRESCR ECL	04713	MC12013L
A10A1U4	1826-0161	7	1	IC OP AMP GP QUAD 14-DIP-P PKG	04713	MLM324P
A10A1U5	1820-1195	7	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS175N
A10A1U6	5081-8117	3	1	SCREEN 1826-0092	28480	5081-8117
A10A1VR1	1902-3048	7	1	DIODE-ZNR 3.48V 5% DO-35 PD=.4W	28480	1902-3048
A10A1W1	85660-60009	3	1	CBL AY BRN	28480	85660-60009

*Indicates Factory Selected Value

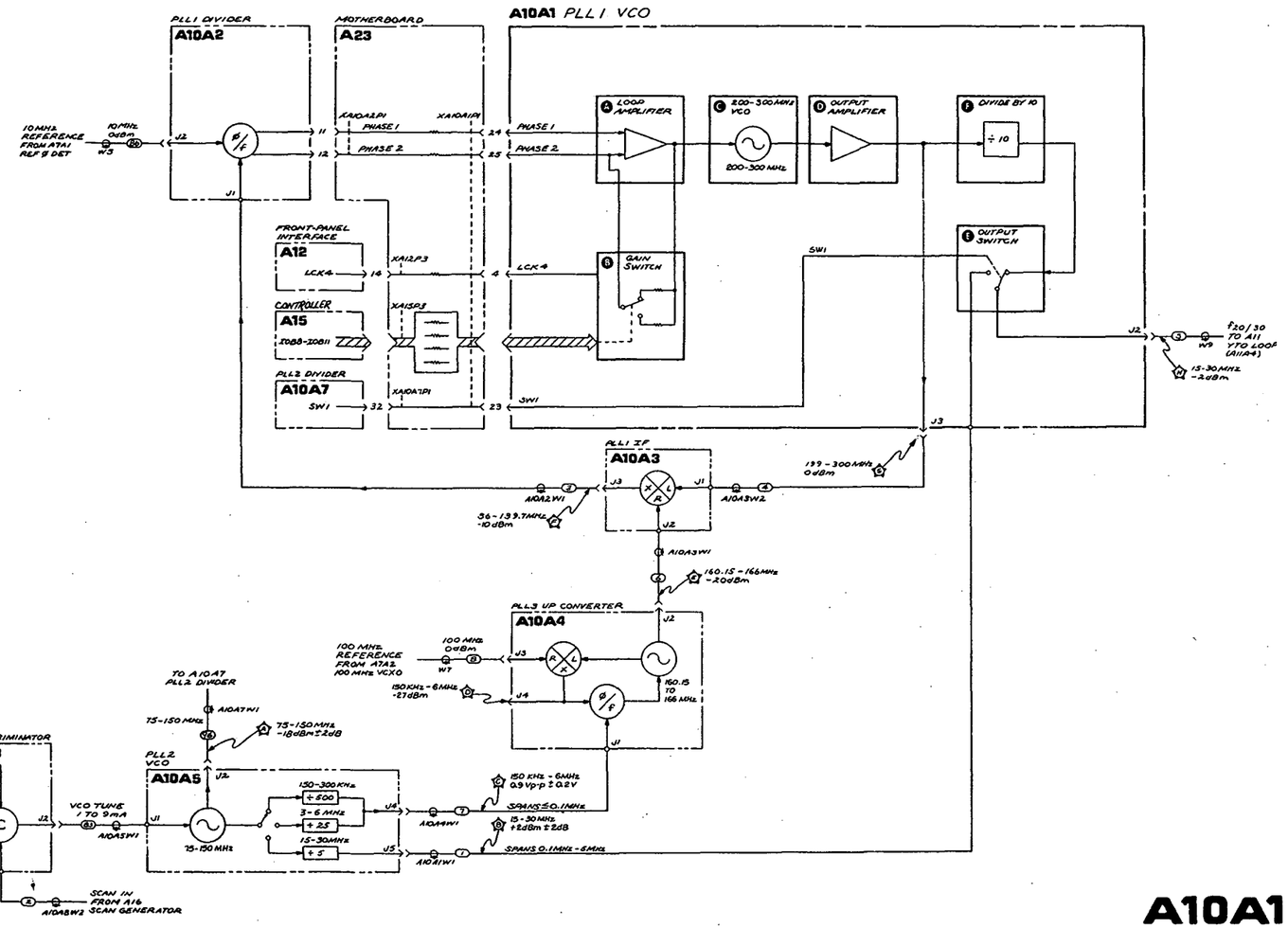
ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				MISCELLANEOUS PARTS		
	2190-0124	4	3	WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0124
	2200-0101	0	2	SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2950-0078	9	3	NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
	85660-20052	6	1	CVR PC PLLI VCO	28480	85660-20052
	85660-20068	4	3	GROUND LUG	28480	85660-20068
	86701-40001	9	1	EXTRACTOR PC	28480	86701-40001
	85660-00038	6	1	SHIELDING CAN	28480	85660-00038

*Indicates Factory Selected Value

ManualsPlus.com



A10A1

FIGURE 1. A10A1 PLL1 VCO, BLOCK DIAGRAM

ManualsPlus.com

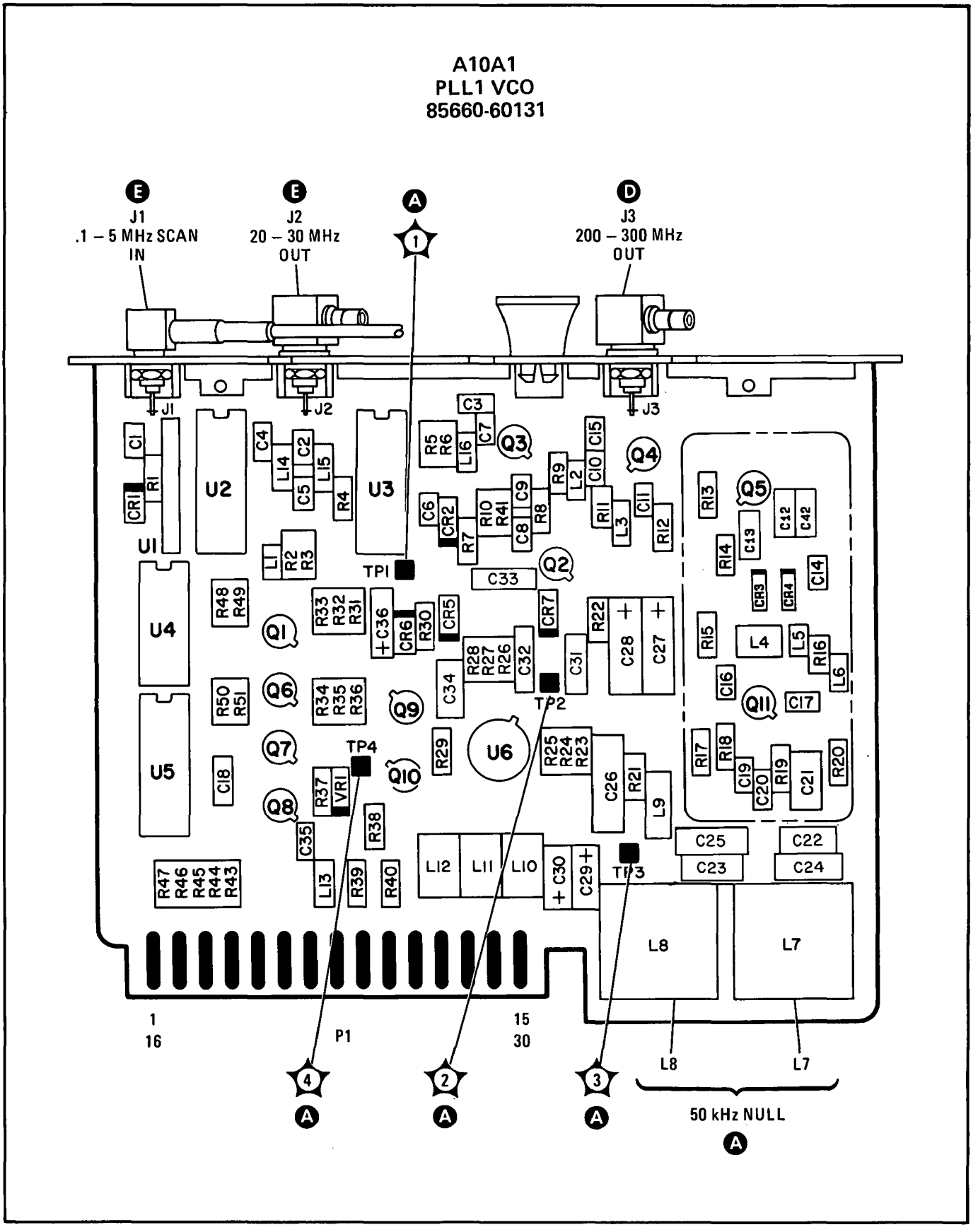


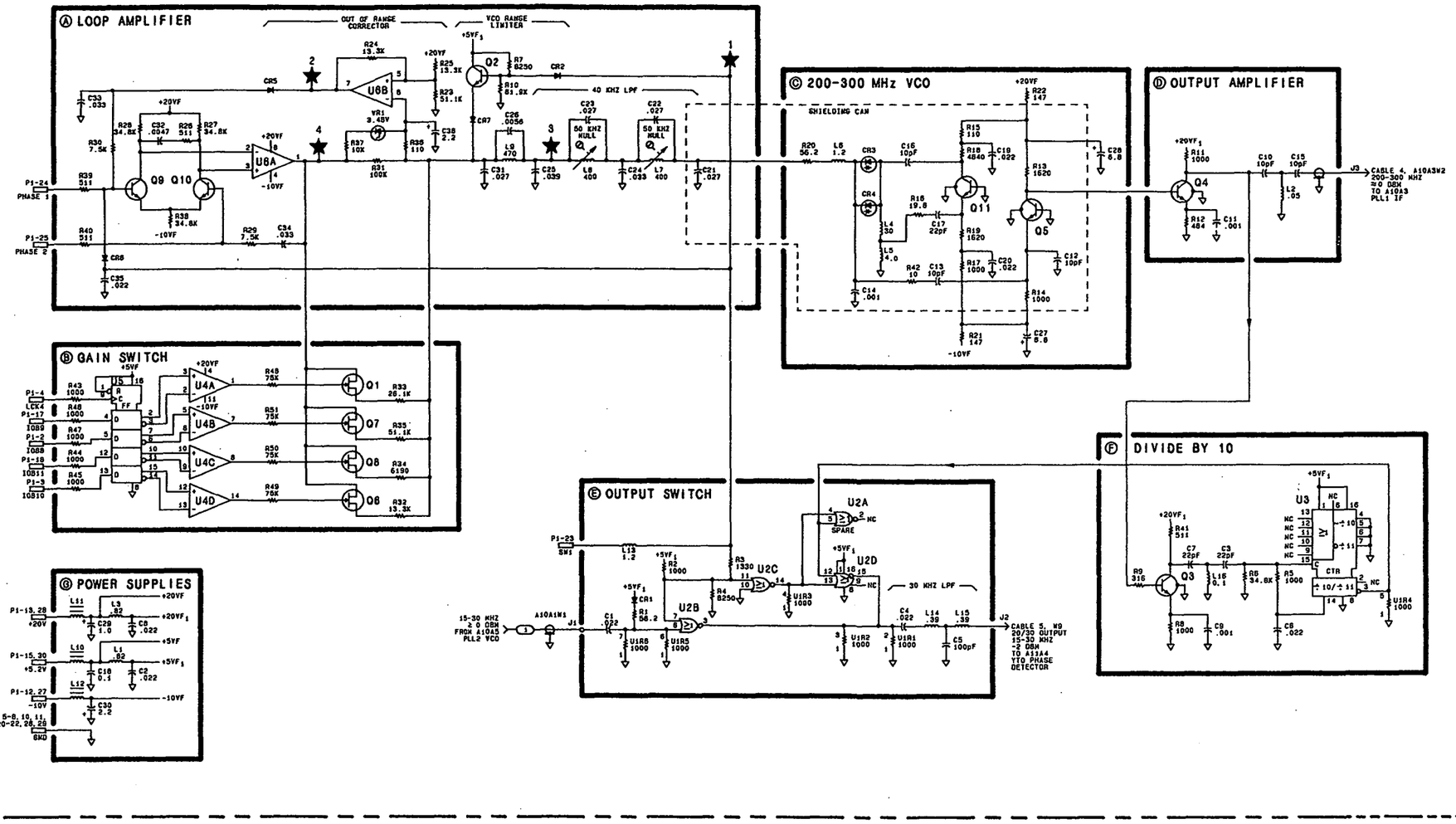
FIGURE 2. A10A1 PLL1 VCO, COMPONENT LOCATIONS

ManualsPlus.com

A10A1 PHASE LOCK LOOP 1 (PLL1) VOLTAGE-CONTROLLED OSCILLATOR (VCO) 85660-60131

P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1 16	GND GND		G G
2 17	IOB8 IOB9	A15P2-9 A15P2-27	B B
3 18	IOB10 IOB11	A15P2-10 A15P2-28	B B
4 19	LCK4 GND	A12P3-14	B NC
5 20	GND GND		G G
6 21	GND GND		G G
7 22	GND GND		G G
8 23	GND SW1	A10A7P1-32	NC E
9 24	NC PHASE 1	A10A2P1-11	A
10 25	GND PHASE 2	A10A2P1-12	NC A
11 26	GND GND		G G
12 27	-10V -10V		G G
13 28	+20V +20V		G G
14 29	GND GND		G G
15 30	+5.2V +5.2V		G G



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (μF) INDUCTANCE IS IN MICROHENRIES (μH)
3. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.
4. MNEMONICS TABLE:

MNEMONIC	DESCRIPTION
IOB8-11	INSTRUMENT BUS DATA BITS 8 THRU 11
LCK4	LOW-CLOCK4
SW1	SWITCH 1

A10A1

SERIAL NUMBER PREFIX: 2410A

FIGURE 3. A10A1 PLL1 VCO, SCHEMATIC DIAGRAM

ManualsPlus.com

A10A2 PLL1 Divider

ManualsPlus.com

A10A2 PHASE LOCK LOOP 1 (PLL1) DIVIDER, CIRCUIT DESCRIPTION

A10A2 functions as a programmable frequency divider and a phase/frequency detector. The divider is programmed by the A15 Controller to divide the input frequency down to 5 MHz. This is then compared with a 5 MHz reference in the phase/frequency detector. The detector output, after amplification, controls the frequency of the PLL1 voltage-controlled oscillator.

The divide number is always between 3.60 and 13.97. The integer part is coded in binary while the fractional part is coded in BCD.

Divide by 2 (A)

U5 constitutes a 3-stage limiting amplifier. U5 is an ECL triple line receiver which changes the input to the proper amplitude and dc level (approximately +3V low and +4V high) for driving the subsequent divider. U4A is a D-type flip-flop which divides the limiting amplifier output by 2.

Input Latch (B)

U9 and U10 are latches which store the divider programming number. The number is clocked into the latches with LCK4.

Divide by N (C)

U12 is a 4-bit binary counter which is programmed with the integer part (3 to 13) of the divide number. In operation it is clocked by the output of U4A and counts down to 1. On the next clock pulse, the programming number is loaded into the counter, and the cycle repeats. Loading time is sensed by U14B when the count is at 2. The next clock pulse causes U14B to change states which enables the loading of U12 on the subsequent clock pulse.

Fractional Divide (D)

The fractional divide works on the pulse-swallowing principle. Consider a divider that divides by N for P − A output pulses and by N + 1 for A output pulses. Note that the total output pulses is P. The number of input pulses to get P output pulses is N (P − A) + (N + 1)A = NP + A. Therefore, the divide ratio is the number of input pulses divided by the number of output pulses which is equal to N + A/P. In this case P is 100, so N represents the integer portion of the divide number while A represents the fractional part times 100. Therefore, if the divide number is 8.57, N = 8 and A = 57. The integer divider normally divides by N; to divide by N + 1, the counter is kept in a "hold" state for one pulse. Thus the counter effectively "swallows" a pulse and never reacts to it. The fractional divide number is programmed into U1 and U2 which are TTL decade rate multipliers connected in cascade. The input comes from the integer divide counter U12 via U4B and the ECL to TTL translator consisting of U3B and Q1. For every 100 clock pulses into U1 and U2, there is output from U3A equal to 100 times the fractional part of the divide number. For example, if N = 8.57, then 57 pulses occur at U3A output for every 100 pulses into U1/U2. U3A translates the TTL outputs of U1 and U2 to ECL, which then are latched by U15B, synchronized by U14A, and fed back to U12. This causes U12 to go into a "hold" state for one input pulse. This effects the pulse swallowing and the fractional divide numbers.

Phase/Frequency Detector (E)

The phase/frequency detector compares the divider output with a 5 MHz reference frequency. When the two inputs are in phase, the outputs are ECL high, approximately +4V, with very narrow pulses at a 5 MHz rate. When the inputs are the same frequency but different in phase, one output line is a pulse with a width corresponding to the phase difference; the other output is high with very narrow pulses. For a difference in input frequencies, the outputs are pulses of varying widths, but with different average dc voltage levels. The sign of this dc voltage is set by which frequency is higher and the magnitude is determined by the amount of frequency difference.

ManualsPlus.com

Reference Divide by 2 (F)

U7C is an input buffer amplifier which generates the proper level for ECL (approximately +3V low and +4V high). U15A divides the 10 MHz input by 2 and applies this 5 MHz to the phase/frequency detector.

Phase Lock Indicator (G)

The input to the phase lock indicator is the wired OR Q outputs of the phase/frequency detector. This input is ECL low (approximately 3V) when the loop is locked; in this condition, the dc voltage at the base of Q3 is lower than that at the base of Q2 so Q3 is on and Q2 is off. If the loop unlocks, the input to the phase lock indicator consists of varying width pulses, the average dc value of which is about half way between a logic low and high. The voltage divider consisting of R35 and R15 causes the voltage at Q2 base to be lower than that at Q3 base, so Q2 turns on indicating an unlock condition.

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A2	85660-60023	5	1	BOARD ASSEMBLY, PHASE LOCK LOOP 1 (PLL1) DIVIDER	28480	85660-60023
A10A2C1	0160-0574	3	8	CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A2C2	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A2C3	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A2C4	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A2C5	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A2C6	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A2C7	0160-0570	9	2	CAPACITOR-FXD 220PF +-20% 100VDC CER	20932	5024EM100RD221M
A10A2C8	0160-0570	9		CAPACITOR-FXD 220PF +-20% 100VDC CER	20932	5024EM100RD221M
A10A2C9	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A2C10	0160-4084	8	1	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A2C11	0160-3875	3	1	CAPACITOR-FXD 22PF +-5% 200VDC CER 0+-30	28480	0160-3875
A10A2C12	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A2C13	0180-2207	5	1	CAPACITOR-FXD 100UF+-10% 10VDC TA	56289	150D107X9010R2
A10A2CR1	1901-0040	1	2	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A10A2CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A10A2DS1	1990-0485	5	1	LED-LAMP LUM-INT=800UCD IF=30MA-MAX	28480	5082-4984
A10A2J1				NOT ASSIGNED		
A10A2J2	1250-0690	6	1	CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
A10A2L1	9100-2255	4	1	INDUCTOR RF-CH-MLD 470NH 10% .105DX.26LG	28480	9100-2255
A10A2L2	9100-1788	6	1	CHOKE-WIDE BAND ZMAX=680 OHM@ 180 MHZ	02114	VK200 20/4B
A10A2Q1	1853-0405	9	1	TRANSISTOR PNP SI PD=300MW FT=850MHZ	04713	2N4209
A10A2Q2	1853-0451	5	2	TRANSISTOR PNP 2N3799 SI TO-18 PD=360MW	01295	2N3799
A10A2Q3	1853-0451	5		TRANSISTOR PNP 2N3799 SI TO-18 PD=360MW	01295	2N3799
A10A2R1	0757-0280	3	19	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R2	0698-3431	6	1	RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-23R7-F
A10A2R3	0757-0403	2	2	RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-T0-121R-F
A10A2R4	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R5	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R6	0757-0394	0	1	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R7	0757-0416	7	5	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A10A2R8	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A10A2R9	0698-0083	8	1	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A10A2R10	0698-3440	7	4	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A10A2R11	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R12	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A10A2R13	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A10A2R14	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A10A2R15	0757-0442	9	1	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10A2R16	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R17	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A10A2R18	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R19	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R20	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R21	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R22	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R23	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R24	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R25	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R26	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R27	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R28	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R29	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R30	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A10A2R31	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A10A2R32	0757-0403	2		RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-T0-121R-F
A10A2R33	0757-0419	0	1	RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-681R-F
A10A2R34	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R35	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2TP1	1251-0600	0	14	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2TP5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2TP6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2TP7	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2TP8	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2TP9	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2TP10	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600

*Indicates Factory Selected Value

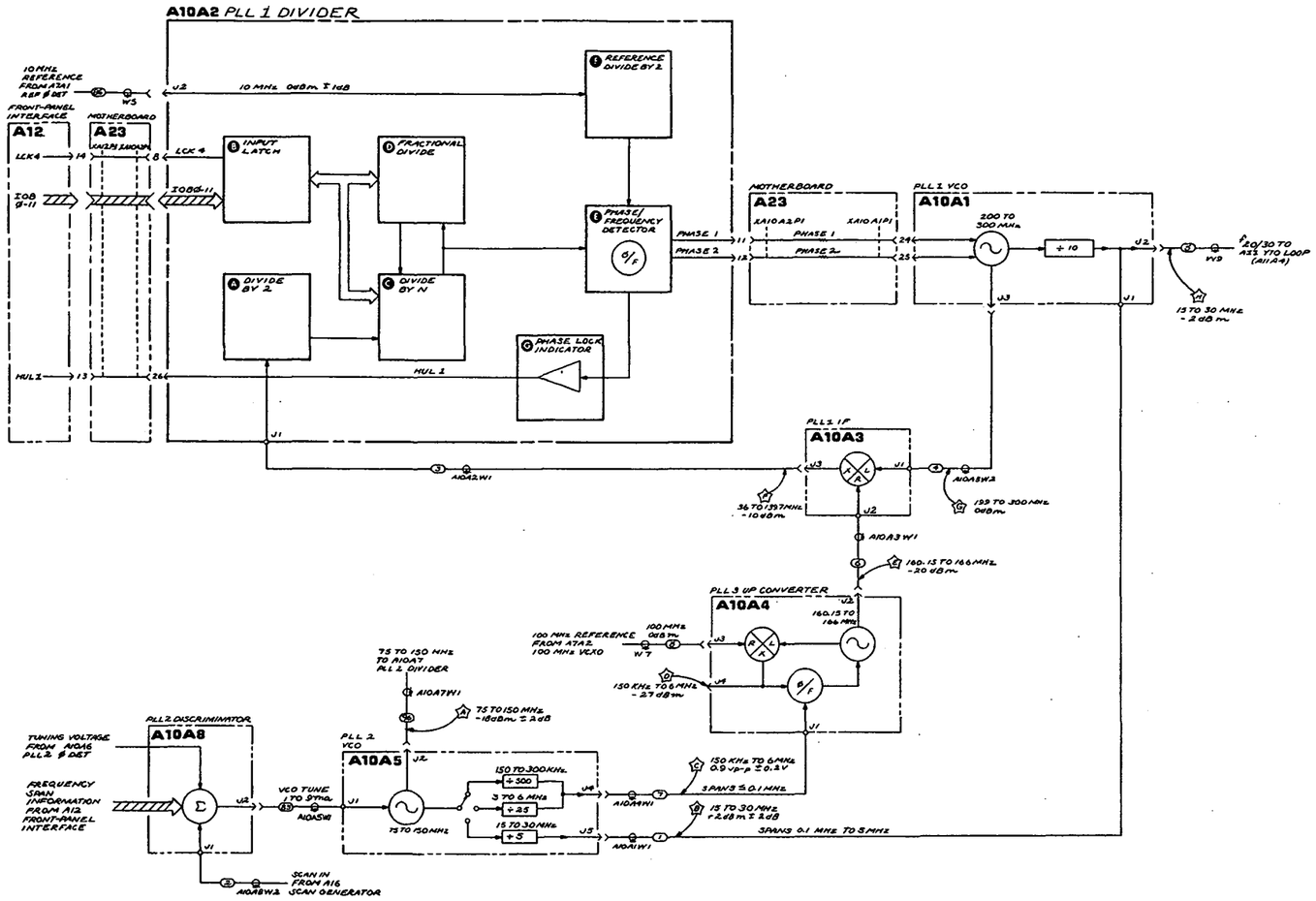
ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A2TP11	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2TP12	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2TP13	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2TP14	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2U1	1820-0909	9	2	IC MULTR TTL	01295	SN74167N
A10A2U2	1820-0909	9		IC MULTR TTL	01295	SN74167N
A10A2U3	1820-0808	7	1	IC GATE ECL NOR DUAL 3-INP	04713	MC10111P
A10A2U4	1820-1225	4	1	IC FF ECL D-M/S DUAL	04713	MC10231P
A10A2U5	1820-1320	0	1	IC RCVR ECL LINE RCVR TPL 2-INP	04713	MC10216L
A10A2U6	1810-0204	6	4	NETWORK-RES 8-SIP1.0K OHM X 7	01121	208A102
A10A2U7	1820-0802	1	1	IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A10A2U8	1810-0204	6		NETWORK-RES 8-SIP1.0K OHM X 7	01121	208A102
A10A2U9	1820-1196	8	2	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A10A2U10	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A10A2U11	1810-0204	6		NETWORK-RES 8-SIP1.0K OHM X 7	01121	208A102
A10A2U12	1820-0821	4	1	IC CNTR ECL BIN UP/DOWN SYNCHRO	04713	MC10136L
A10A2U13	1810-0204	6		NETWORK-RES 8-SIP1.0K OHM X 7	01121	208A102
A10A2U14	1820-0817	8	3	IC FF ECL D-M/S DUAL	04713	MC10131P
A10A2U15	1820-0817	8		IC FF ECL D-M/S DUAL	04713	MC10131P
A10A2U16	1820-0817	8		IC FF ECL D-M/S DUAL	04713	MC10131P
A10A2VR1	1902-3059	0	1	DIODE-ZNR 3.83V 5% DO-35 PD=.4W	28480	1902-3059
A10A2W1	85660-60090	6	1	CBL AY ORG	28480	85660-60090
				MISCELLANEOUS PARTS		
	0520-0128	7	2	SCREW-MACH 2-56 .25-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2190-0124	4	2	WASHER-LK INTL T NO. 10 .175-IN-ID	28480	2190-0124
	1205-0205	0	1	HEAT SINK SGL DIP	28480	1205-0205
	2190-0890	1	2	WASHER-LK HLCL NO. 2 .088-IN-ID	28480	2190-0890
	2200-0101	0	2	SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2950-0078	9	2	NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
	85660-00012	6	1	HEAT SINK BOTTOM	28480	85660-00012
	85660-20053	7	1	CVR PC PLL1 DIVD	28480	85660-20053
	86701-40001	9	2	EXTRACTOR PC	28480	86701-40001

*Indicates Factory Selected Value

ManualsPlus.com



A10A2

FIGURE 1. A10A2 PLL1 DIVIDER, BLOCK DIAGRAM

ManualsPlus.com

A10A2
PLL1 DIVIDER
85660-60023

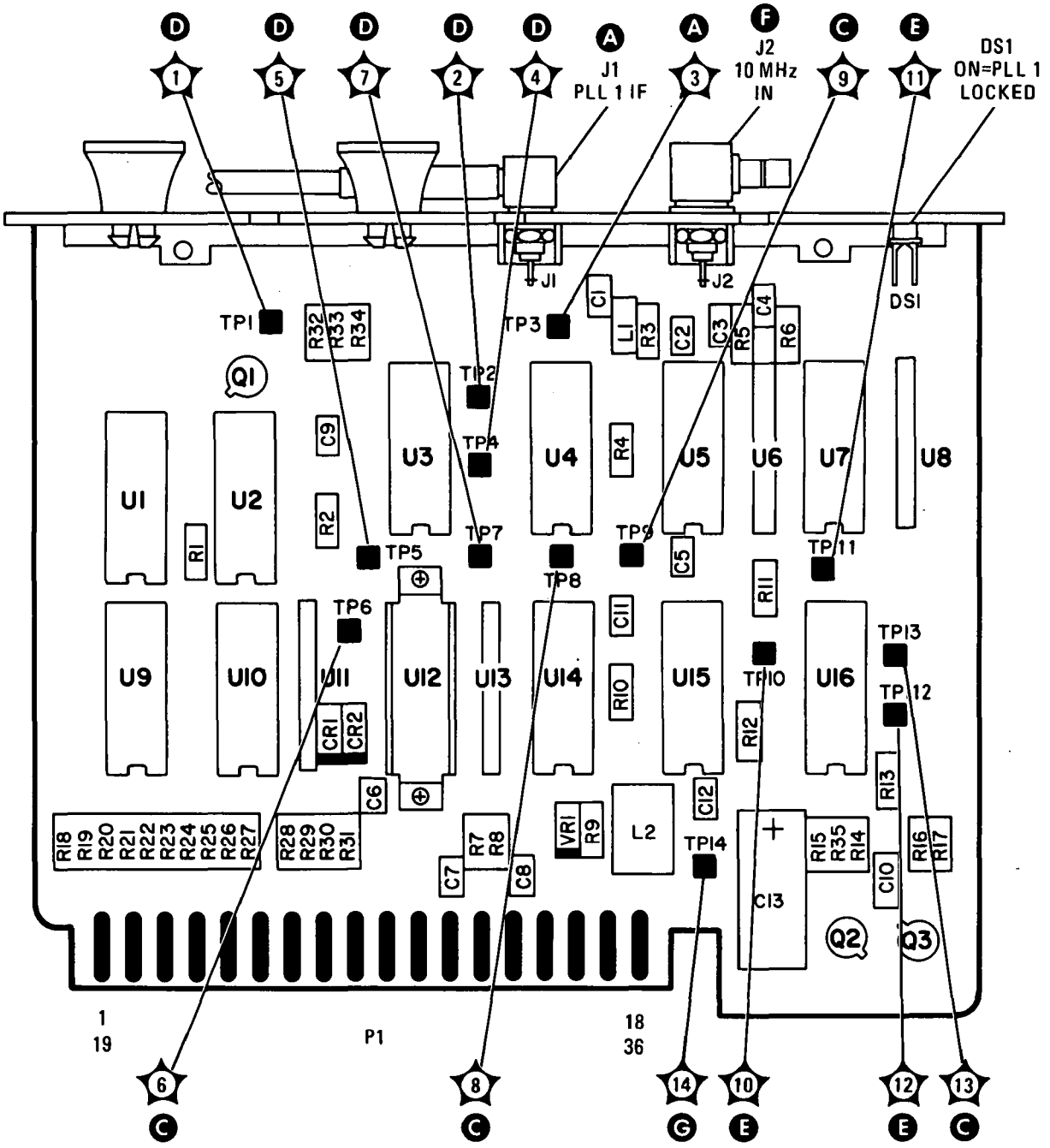
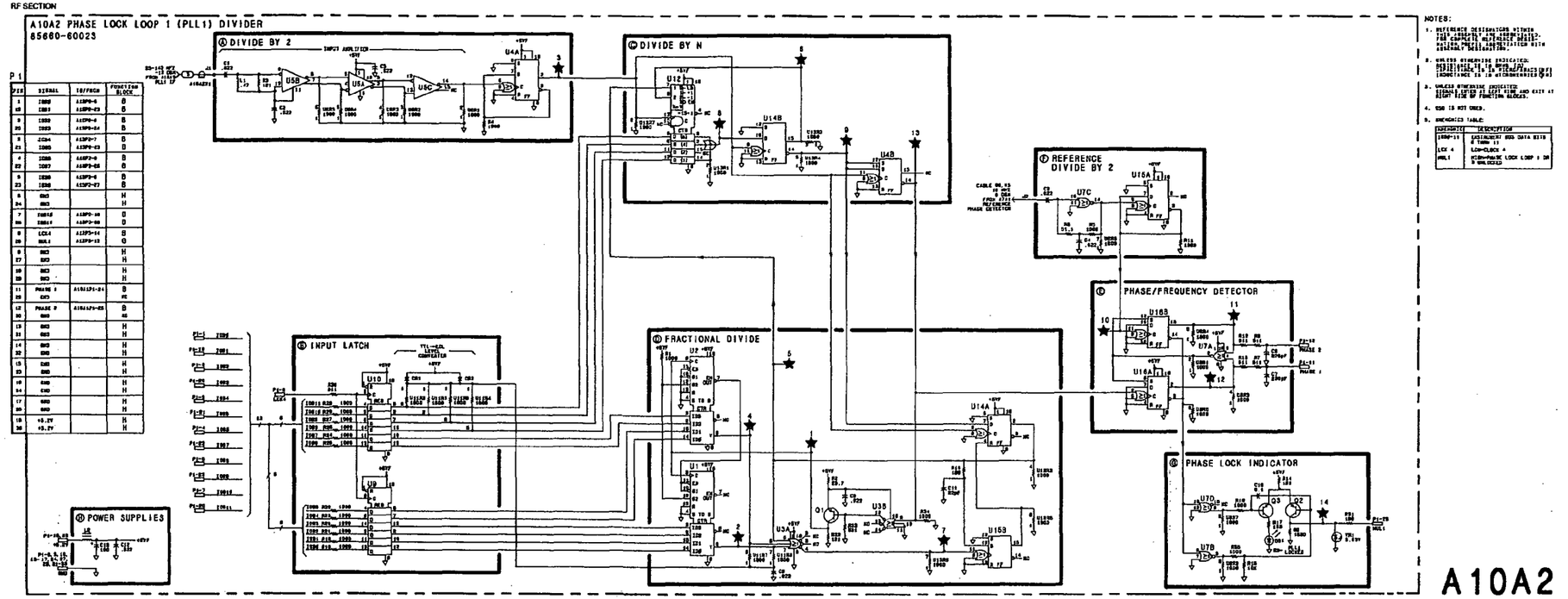


FIGURE 2. A10A2 PLL1 DIVIDER, COMPONENT LOCATIONS

ManualsPlus.com

RF SECTION



A10A2

SERIAL NUMBER PREFIX: 2410A

FIGURE 3. A10A2 PLL1 DIVIDER, SCHEMATIC DIAGRAM

ManualsPlus.com

A10A3 PLL IF

ManualsPlus.com

A10A3 PHASE LOCK LOOP 1 (PLL1) IF, CIRCUIT DESCRIPTION

The function of A10A3 is basically to mix the output of A10A4 (160.15 to 166 MHz) with the LO output from A10A1 (200 to 300 MHz). The output of this assembly is the difference frequency suitably filtered and amplified to about −10 dBm.

LO Amplifier (A)

The LO amplifier consists of common-emitter amplifiers Q1 and Q2. CR1 and CR2 provide limiting to prevent overdriving Q2 near 200 MHz where Q1 has more gain.

Mixer (B)

The double-balanced mixer U1 operates with about +7 dBm LO drive and with −30 dBm RF signal input. The IF output is about −36 dBm and covers 30 MHz to 140 MHz. The 185 MHz Low-Pass Filter attenuates the harmonics of the RF signal input. The 10 dB pad reduces the RF signal input from −20 dBm to −30 dBm.

IF Input Amplifier (C)

The IF input amplifier has an input filter to partially filter the RF and LO signals from the mixer. The amplifier Q3 has emitter degeneration R17 to reduce distortion.

140 MHz Low-Pass Filter (D)

The 140 MHz Low-Pass Filter is a modified elliptic filter which must pass 140 MHz while rejecting 160 to 166 MHz by at least 60 dB. The three adjustable coils optimize the stopband by providing nulls at the frequencies shown on the schematic. This filter also filters the LO frequencies (200 – 300 MHz).

IF Output Amplifier (E)

The IF output amplifier consists of two common-emitter stages and an output low-pass filter. The two stages are coupled by C14 and L17 which provide high frequency peaking.

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A3	85660-60024	6	1	BOARD ASSEMBLY, PHASE LOCK LOOP 1 (PLL1) IF	28480	85660-60024
A10A3C1	0160-3878	6	5	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A10A3C2	0160-0574	3	12	CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A3C3	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A10A3C4	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A10A3C5	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A3C6	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A10A3C7	0160-3875	3	4	CAPACITOR-FXD 22PF +-5% 200VDC CER 0+-30	28480	0160-3875
A10A3C8	0160-3875	3		CAPACITOR-FXD 22PF +-5% 200VDC CER 0+-30	28480	0160-3875
A10A3C9	0160-3875	3		CAPACITOR-FXD 22PF +-5% 200VDC CER 0+-30	28480	0160-3875
A10A3C10	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A3C11	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A3C12	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A3C13	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A3C14	0160-3876	4	1	CAPACITOR-FXD 47PF +-20% 200VDC CER	28480	0160-3876
A10A3C15	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A3C16	0160-3653	5	1	CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	28480	0160-3653
A10A3C17	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A10A3C18	0160-3874	2	4	CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A10A3C19	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A3C20	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A3C21	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A3C22	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A3C23	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A10A3C24	0160-3875	3		CAPACITOR-FXD 22PF +-5% 200VDC CER 0+-30	28480	0160-3875
A10A3C25	0160-3565	8	3	CAPACITOR-FXD 6.8PF +-.5PF 100VDC CER	28480	0160-3565
A10A3C26	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A10A3C27	0160-3565	8		CAPACITOR-FXD 6.8PF +-.5PF 100VDC CER	28480	0160-3565
A10A3C28	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A3C29	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A10A3C30	0160-3565	8		CAPACITOR-FXD 6.8PF +-.5PF 100VDC CER	28480	0160-3565
A10A3C31	0160-3873	1	1	CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A10A3C32	0160-4289	5	1	CAPACITOR-FXD 15PF +-5% 100VDC CER 0+-30	51642	150100C0G150J
A10A3CR1	1901-0535	9	2	DIODE-SM SIG SCHOTTKY	28480	1901-0535
A10A3CR2	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A10A3J1				P/O A10A3W1		
A10A3J2				P/O A10A3W2		
A10A3J3	1250-0670	6	1	CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0670
A10A3L1	9100-2256	5	3	INDUCTOR RF-CH-MLD 560NH 10% .105DX.26LG	28480	9100-2256
A10A3L2	9100-2247	4	5	INDUCTOR RF-CH-MLD 100NH 10% .105DX.26LG	28480	9100-2247
A10A3L3	9100-2248	5	3	INDUCTOR RF-CH-MLD 120NH 10% .105DX.26LG	28480	9100-2248
A10A3L4	9100-2248	5		INDUCTOR RF-CH-MLD 120NH 10% .105DX.26LG	28480	9100-2248
A10A3L5	9100-2891	4	3	INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A10A3L6	9100-2247	4		INDUCTOR RF-CH-MLD 100NH 10% .105DX.26LG	28480	9100-2247
A10A3L7	9100-2247	4		INDUCTOR RF-CH-MLD 100NH 10% .105DX.26LG	28480	9100-2247
A10A3L8	9100-1788	6	2	CHOKE-WIDE BAND ZMAX=680 OHM@ 100 MHZ	02114	VK200 20/4B
A10A3L9	9100-1788	6		CHOKE-WIDE BAND ZMAX=680 OHM@ 100 MHZ	02114	VK200 20/4B
A10A3L10	9100-0368	6	1	INDUCTOR RF-CH-MLD 330NH 10% .105DX.26LG	28480	9100-0368
A10A3L11	85660-80006	6	2	INDUCTOR 120NH	28480	85660-80006
A10A3L12	85660-80009	9	1	INDUCTOR 100NH	28480	85660-80009
A10A3L13	85660-80006	6		INDUCTOR 120NH	28480	85660-80006
A10A3L14	9100-2251	0	1	INDUCTOR RF-CH-MLD 220NH 10% .105DX.26LG	28480	9100-2251
A10A3L15	9100-2247	4		INDUCTOR RF-CH-MLD 100NH 10% .105DX.26LG	28480	9100-2247
A10A3L16	9100-2247	4		INDUCTOR RF-CH-MLD 100NH 10% .105DX.26LG	28480	9100-2247
A10A3L17	9100-2248	5		INDUCTOR RF-CH-MLD 120NH 10% .105DX.26LG	28480	9100-2248
A10A3L18	9100-2256	5		INDUCTOR RF-CH-MLD 560NH 10% .105DX.26LG	28480	9100-2256
A10A3L19	9100-2256	5		INDUCTOR RF-CH-MLD 560NH 10% .105DX.26LG	28480	9100-2256
A10A3L20	9100-2891	4		INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A10A3L21	9100-2891	4		INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A10A3Q1	1854-0345	8	4	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A10A3Q2	1854-0370	7	1	TRANSISTOR NPN 2N5109 SI TO-39 PD=800MW	3L585	2N5109
A10A3Q3	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A10A3Q4	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A10A3Q5	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A10A3R1	0757-0394	0	3	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A3R2	0698-3152	8	2	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A10A3R3	0757-0421	4	1	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A10A3R4	0757-0401	0	3	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A10A3R5	0698-3429	2	3	RESISTOR 19.6 1% .125W F TC=0+-100	03888	PME55-1/8-T0-19R6-F

*Indicates Factory Selected Value

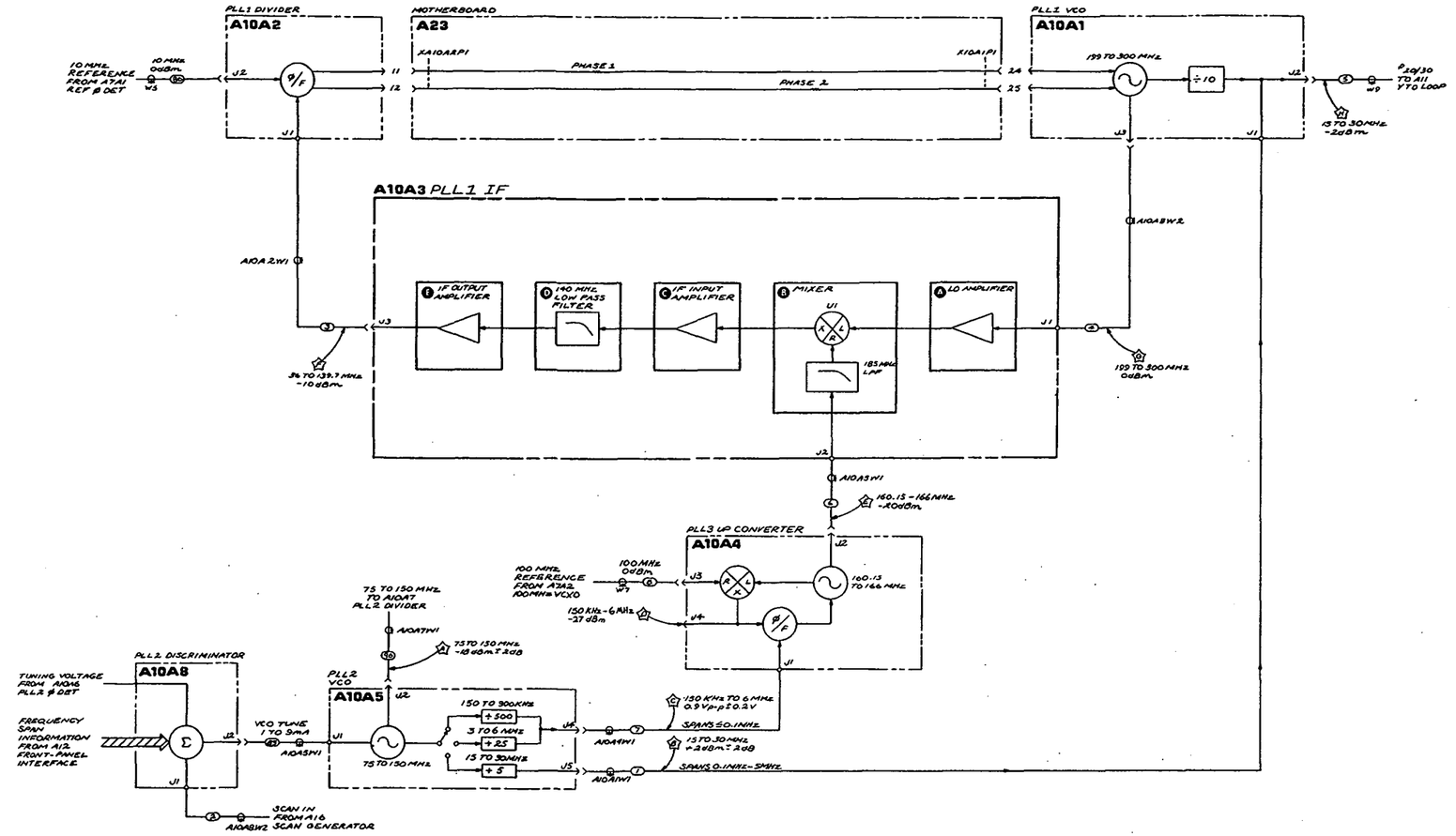
ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A3R6	0698-3438	3	1	RESISTOR 147 1% .125W F TC=0+-100	24546	C4-1/8-T0-147R-F
A10A3R7	0698-3446	3	1	RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A10A3R8	0698-3440	7	2	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A10A3R9	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A3R10	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A10A3R11	0757-0397	3	1	RESISTOR 68.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-68R1-F
A10A3R12	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A10A3R13	0757-0428	1	1	RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A10A3R14	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A10A3R15	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A10A3R16	0698-3444	1	2	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A10A3R17	0757-0346	2	1	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A3R18	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A10A3R19	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A3R20	0698-3429	2		RESISTOR 19.6 1% .125W F TC=0+-100	03888	PME55-1/8-T0-19R6-F
A10A3R21	0757-0280	3	5	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A3R22	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A3R23	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A3R24	0698-3429	2		RESISTOR 19.6 1% .125W F TC=0+-100	03888	PME55-1/8-T0-19R6-F
A10A3R25	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A3R26	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A3R27	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A10A3U1	0955-0063	0	1	MIXER-DOUBLE BALANCE PWR INP=200MW; PK	28480	0955-0063
A10A3W1	85660-60091	7	1	CBL AY YEL	28480	85660-60091
A10A3W2	85660-60092	8	1	CBL AY BLUE	28480	85660-60092
				MISCELLANEOUS PARTS		
	2190-0124	4	3	WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0124
	2200-0101	0	2	SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2950-0078	9	3	NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
	85660-20054	8	1	CVR PC PLL1 IF	28480	85660-20054
	85660-20068	4	3	GROUND LUG	28480	85660-20068
	86701-40001	9	2	EXTRACTOR PC	28480	86701-40001
	85660-00038	6	2	SHIELDING CAN	28480	85660-00038
	85660-00040	0	1	SHIELDING CAN	28480	85660-00040

*Indicates Factory Selected Value

ManualsPlus.com



A10A3

FIGURE 1. A10A3 PLL1 IF, BLOCK DIAGRAM

ManualsPlus.com

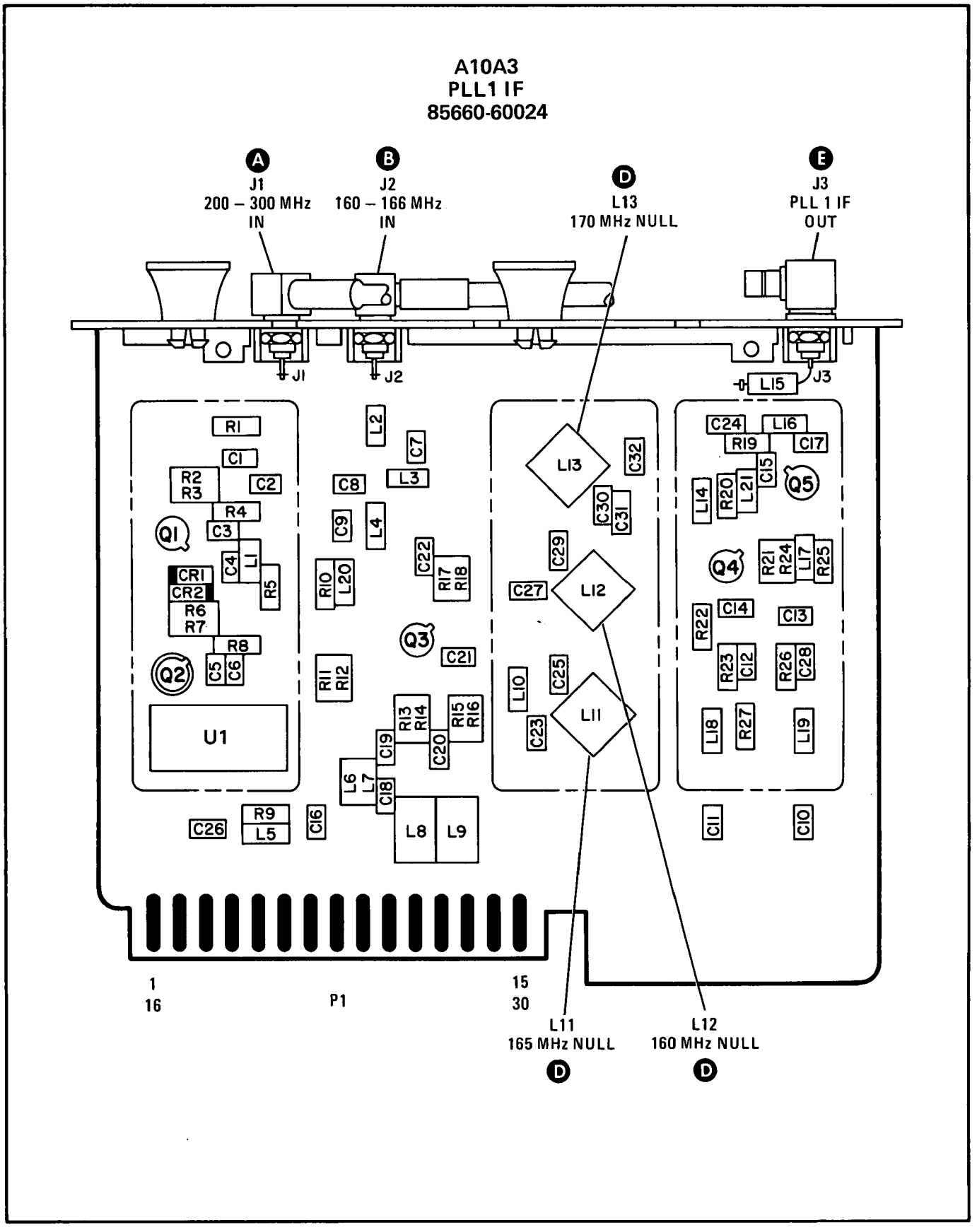


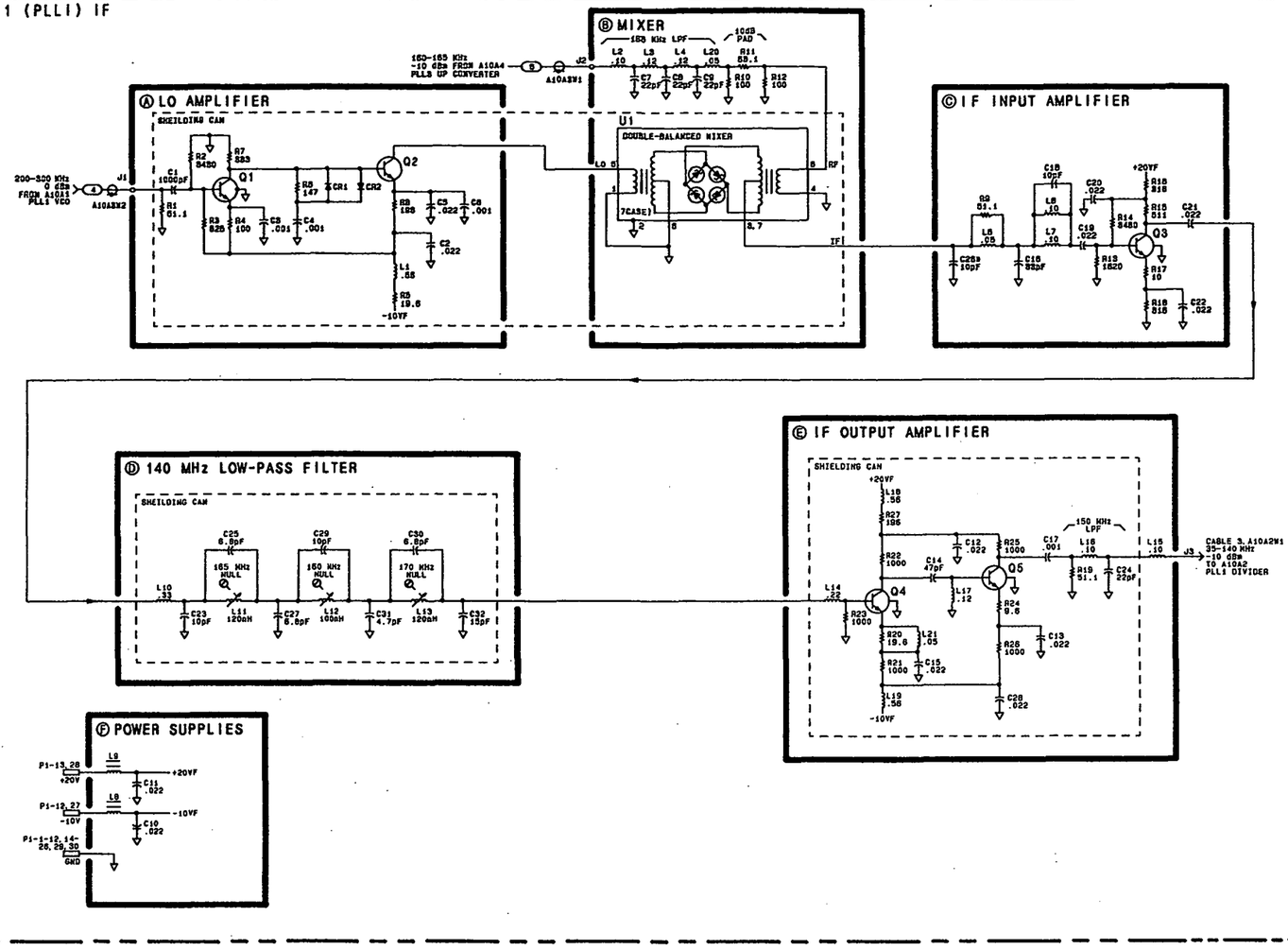
FIGURE 2. A10A3 PLL1 IF, COMPONENT LOCATIONS

ManualsPlus.com

A10A3 PHASE LOCK LOOP 1 (PLLI) IF
85660-60024

P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	GND		F
16	GND		F
2	GND		F
17	GND		F
3	GND		F
18	GND		F
4	GND		F
19	GND		F
5	GND		F
20	GND		F
6	GND		F
21	GND		F
7	GND		F
22	GND		F
8	GND		F
23	GND		F
9	GND		F
24	GND		F
10	GND		F
25	GND		F
11	GND		F
26	GND		F
12	-10V		F
27	-10V		F
13	+20V		F
28	+20V		F
14	GND		F
29	GND		F
15	GND		F
30	GND		F



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (UF) INDUCTANCE IS IN MICROHENRIES (UH)
3. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.

SERIAL PREFIX: 2410A

A10A3

FIGURE 3. A10A3 PLL1 IF, SCHEMATIC DIAGRAM

ManualsPlus.com

A10A4 PLL3 Up Converter

ManualsPlus.com

A10A4 PHASE LOCK LOOP 3 (PLL3) UP CONVERTER, CIRCUIT DESCRIPTION

The function of A10A4 is to mix 160 MHz with the output of A10A5 (.15 to 6 MHz) and output the sum of the two frequencies. This is done using a phase lock loop which has a closed loop bandwidth of approximately 10 kHz.

Frequency Multiplier x 1.6 (A)

The frequency multiplier generates 160 MHz from the 100 MHz at the input. U3 divides the input by 5 and produces harmonics of 20 MHz. The 160 MHz bandpass filter selects 160 MHz which is then amplified by Q5 and buffered with a pad to −20 dBm. All three adjustments are set by peaking the 160 MHz signal.

160 to 166 MHz VCO (D)

The 160 to 166 MHz VCO uses Q1 in a Colpitts configuration. L11 centers the frequency range of the VCO while CR3 is the varactor which tunes the oscillator. Q2 and Q4 are buffer amplifiers.

Mixer (B)

U7 is a double-balanced mixer which operates with about +7 dBm of LO power and −20 dBm of RF signal power at 160 MHz. The desired output is the difference frequency and lies between 150 kHz and 6 MHz.

IF Amplifier (C)

The output of the mixer U7 is filtered by an 8-section elliptic filter which must reject 14 to 20 MHz, and other higher frequencies. The filter output is amplified by Q3.

Loop Amplifier (F)

The phase detector outputs are connected to the differential inputs of U2. C9 and R16 provide ac feedback around U2 while dc feedback is provided by the entire phase lock loop. CR4 and CR5 lessen the charging time of C7 when the input frequency is changed abruptly. R14, R15, and C7 form an ac voltage divider which sets the loop bandwidth to about 10 kHz. The output of the divider goes to the varactor in the oscillator and tunes the VCO. U1B prevents this tune voltage from latching at a positive value by sensing when the voltage goes above 0V. When this occurs, the output of U1B pulls the tune voltage down to the proper lock range. R13 provides hysteresis to allow time for the loop to lock.

Phase/Frequency Detector (E)

U6B and U6C are ECL buffer amplifiers which have the proper output amplitude and dc level (approximately +3V low and +4V high) to drive the phase/frequency detector. When the phase detector inputs have the same phase, the outputs are ECL high narrow negative coincident pulses. If there is a phase offset, the pulse widens on one of the outputs depending on which signal is leading in phase. When the input frequencies are different, the outputs consist of varying width pulses; the dc or average value of the outputs are different depending on which frequency is higher and by how much.

Phase Lock Indicator (G)

The phase lock indicator senses the outputs of the phase detector which are ECL logic high when the loop is locked. When the loop is not locked, the average phase detector output level drops to half way between a logic low and logic high. U1A switches when this occurs and causes DS1 to go out and the phase lock output to go to TTL high.

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A4	85660-60025	7	1	BOARD ASSEMBLY, PHASE LOCK LOOP 3 (PLL3) UP CONVERTER	28480	85660-60025
A10A4C1	0160-0574	3	16	CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A4C2	0160-0572	1	2	CAPACITOR-FXD 2200PF +-20% 100VDC CER	28480	0160-0572
A10A4C3	0160-0572	1		CAPACITOR-FXD 2200PF +-20% 100VDC CER	28480	0160-0572
A10A4C4	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A4C5	0160-4084	8	3	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A4C6	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A4C7	0180-0291	3	2	CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A10A4C8	0160-0161	4	2	CAPACITOR-FXD .01UF +-10% 200VDC POLYE	28480	0160-0161
A10A4C9	0160-0161	4		CAPACITOR-FXD .01UF +-10% 200VDC POLYE	28480	0160-0161
A10A4C10	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A4C11	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A4C12	0180-0228	6	3	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A10A4C13	0180-0291	3		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A10A4C14	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A4C15	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A4C16	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A4C17	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A4C18	0160-3749	0	2	CAPACITOR-FXD 330PF +-10% 50VDC CER	28480	0160-3749
A10A4C19	0160-3877	5	3	CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A10A4C20	0160-3749	0		CAPACITOR-FXD 330PF +-10% 50VDC CER	28480	0160-3749
A10A4C21	0180-0228	6		CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A10A4C22	0160-3876	4	1	CAPACITOR-FXD 47PF +-20% 200VDC CER	28480	0160-3876
A10A4C23	0180-0228	6		CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A10A4C24	0160-3877	5		CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A10A4C25	0160-0571	0	2	CAPACITOR-FXD 470PF +-20% 100VDC CER	28480	0160-0571
A10A4C26	0160-3877	5		CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A10A4C27	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A4C28	0160-0571	0		CAPACITOR-FXD 470PF +-20% 100VDC CER	28480	0160-0571
A10A4C29	0160-3878	6	1	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A10A4C30	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A4C31	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A4C32	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A4C33	0160-3875	3	3	CAPACITOR-FXD 22PF +-5% 200VDC CER 0+-30	28480	0160-3875
A10A4C34	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A4C35	0160-3872	0	2	CAPACITOR-FXD 2.2PF +-.25PF 200VDC CER	28480	0160-3872
A10A4C36	0160-3872	0		CAPACITOR-FXD 2.2PF +-.25PF 200VDC CER	28480	0160-3872
A10A4C37	0160-3565	8	1	CAPACITOR-FXD 6.8PF +-.5PF 100VDC CER	28480	0160-3565
A10A4C38	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A4C39	0160-3874	2	3	CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A10A4C40	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A4C41	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A4C42	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A4C43	0160-3873	1	2	CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A10A4C44	0160-3875	3		CAPACITOR-FXD 22PF +-5% 200VDC CER 0+-30	28480	0160-3875
A10A4C45	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A10A4C46	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A10A4C47	0160-3873	1		CAPACITOR-FXD 4.7PF +-.5PF 200VDC CER	28480	0160-3873
A10A4C48	0160-3875	3		CAPACITOR-FXD 22PF +-5% 200VDC CER 0+-30	28480	0160-3875
A10A4C49*	0160-4385	2	1	CAPACITOR-FXD 15PF +-5% 200VDC CER 0+-30	28480	0160-4385
A10A4C50	0121-0452	4	1	CAPACITOR-V TRMR-AIR 1.3-5.4PF 175V	74970	187-0103-028
A10A4CR1	1901-0050	3	4	DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A10A4CR2	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A10A4CR3	0122-0085	1	1	DIODE-VVC 2.2PF 7% C3/C25-MIN=4.5	00039	1S2208(B)
A10A4CR4	0122-0085	1		DIODE -VVC 2.2PF 7% C3/C25-MIN=4.5	00039	1S2208(B)
A10A4CR5	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A10A4DS1	1990-0485	5	1	LED-LAMP LUM-INT=800UCD IF=30MA-MAX	28480	5082-4984
A10A4J1				P/O A10A4W1		
A10A4J2	1250-0690	6	2	CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
A10A4J3	1250-0690	6		CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
A10A4J4	1250-0257	1	1	CONNECTOR-RF SMB M PC 50-OHM	28480	1250-0257
A10A4L1	9140-0179	1	2	INDUCTOR RF-CH-MLD 22UH 10% .166DX.385LG	28480	9140-0179
A10A4L2	9140-0179	1		INDUCTOR RF-CH-MLD 22UH 10% .166DX.385LG	28480	9140-0179
A10A4L3	9100-1788	6	2	CHOKE-WIDE BAND ZMAX=680 OHM@ 180 MHZ	02114	VK200 20/48
A10A4L4	9100-1788	6		CHOKE-WIDE BAND ZMAX=680 OHM@ 180 MHZ	02114	VK200 20/48
A10A4L5	9100-2258	7	7	INDUCTOR RF-CH-MLD 1.2UH 10% .105DX.26LG	28480	9100-2258
A10A4L6	9100-2258	7		INDUCTOR RF-CH-MLD 1.2UH 10% .105DX.26LG	28480	9100-2258
A10A4L7	9100-2258	7		INDUCTOR RF-CH-MLD 1.2UH 10% .105DX.26LG	28480	9100-2258
A10A4L8	9100-2257	6	1	INDUCTOR RF-CH-MLD 820NH 10% .105DX.26LG	28480	9100-2257
A10A4L9	9100-2254	3	1	INDUCTOR RF-CH-MLD 390NH 10% .105DX.26LG	28480	9100-2254
A10A4L10	9100-2258	7		INDUCTOR RF-CH-MLD 1.2UH 10% .105DX.26LG	28480	9100-2258

*Indicates Factory Selected Value

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A4L11	85660-80006	6	3	INDUCTOR 120NH	28480	85660-80006
A10A4L12	9100-2255	4	1	INDUCTOR RF-CH-MLD 470NH 10% .105DX.26LG	28480	9100-2255
A10A4L13	9100-2258	7		INDUCTOR RF-CH-MLD 1.2UH 10% .105DX.26LG	28480	9100-2258
A10A4L14	9100-2258	7		INDUCTOR RF-CH-MLD 1.2UH 10% .105DX.26LG	28480	9100-2258
A10A4L15	9100-2891	4	1	INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A10A4L16	85660-80006	6		INDUCTOR 120NH	28480	85660-80006
A10A4L17	85660-80006	6		INDUCTOR 120NH	28480	85660-80006
A10A4L18	9135-0073	3	1	INDUCTOR RF-CH-MLD 51NH 6% .102DX.26LG	28480	9135-0073
A10A4L19	9100-2258	7		INDUCTOR RF-CH-MLD 1.2UH 10% .105DX.26LG	28480	9100-2258
A10A4L20	9100-2251	0	1	INDUCTOR RF-CH-MLD 220NH 10% .105DX.26LG	28480	9100-2251
A10A4L21	9140-0158	6	1	INDUCTOR RF-CH-MLD 1UH 10% .105DX.26LG	28480	9140-0158
A10A4L22	9140-0144	0	1	INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A10A4Q1	1854-0345	8	4	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A10A4Q2	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A10A4Q3	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A10A4Q4	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A10A4Q5	1855-0327	8	1	TRANSISTOR J-FET 2N4416 N-CHAN D-MODE	01295	2N4416
A10A4R1	0698-3440	7	3	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A10A4R2	0757-0394	0	2	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A4R3	0698-0083	8	3	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A10A4R4	0757-0418	9	1	RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A10A4R5	0757-0280	3	5	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A4R6	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A4R7	0698-3159	5	2	RESISTOR 26.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2612-F
A10A4R8	0698-3159	5		RESISTOR 26.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2612-F
A10A4R9	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A4R10	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A4R11	0757-0438	3	3	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A4R12	0757-0441	8	3	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A10A4R13	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A4R14	0698-3160	8	1	RESISTOR 31.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3162-F
A10A4R15	0698-3447	4	1	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A10A4R16	0757-0441	8		RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A10A4R17	0757-0441	8		RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A10A4R18	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A4R19	0757-0346	2	4	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A4R20	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A4R21	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A4R22	0757-0421	4	1	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A10A4R23	0757-0466	7	1	RESISTOR 110K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1103-F
A10A4R24	0698-3156	2	2	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A10A4R25	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A10A4R26	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A10A4R27	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A10A4R28	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A4R29	0757-0397	3	2	RESISTOR 68.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-68R1-F
A10A4R30	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A4R31	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A10A4R32	0698-7219	6	1	RESISTOR 176 1% .05W F TC=0+-100	24546	C3-1/8-T0-196R-F
A10A4R33	0757-0397	3		RESISTOR 68.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-68R1-F
A10A4R34	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A10A4R35	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A4R36	0757-0279	0	1	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A10A4R37	0757-1094	9	1	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A10A4R38	0698-7192	4	1	RESISTOR 14.7 1% .05W F TC=0+-100	24546	C3-1/8-T0-14R7-F
A10A4R39	0698-7230	1	2	RESISTOR 562 1% .05W F TC=0+-100	24546	C3-1/8-T0-562R-F
A10A4R40	0698-7188	8	1	RESISTOR 10 1% .05W F TC=0+-100	24546	C3-1/8-T0-10R-F
A10A4R41	0698-7200	5	2	RESISTOR 31.6 1% .05W F TC=0+-100	24546	C3-1/8-T0-31R6-F
A10A4R42	0698-7236	7	2	RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A10A4R43	0698-7248	1	1	RESISTOR 3.16K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3161-F
A10A4R44	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A10A4R45	0698-7230	1		RESISTOR 562 1% .05W F TC=0+-100	24546	C3-1/8-T0-562R-F
A10A4R46	0698-7218	5	2	RESISTOR 178 1% .05W F TC=0+-100	24546	C3-1/8-T0-178R-F
A10A4R47	0698-7200	5		RESISTOR 31.6 1% .05W F TC=0+-100	24546	C3-1/8-T0-31R6-F
A10A4R48	0698-7218	5		RESISTOR 178 1% .05W F TC=0+-100	24546	C3-1/8-T0-178R-F
A10A4R49	0698-7207	2	1	RESISTOR 61.9 1% .05W F TC=0+-100	24546	C3-1/8-T0-61R9-F
A10A4TP1	1251-0600	0	3	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A4TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A4TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A4U1	5081-8117	3	1	SCREEN 1826-0092	28480	5081-8117
A10A4U2	1826-1058	3	1	IC OP AMP GP 8-TO-99 PKG	28480	1826-1058
A10A4U3	1820-1303	5	1	IC CNTR ECL BCD POS-EDGE-TRIG	04713	MC10138L
A10A4U4	1810-0205	7	1	NETWORK-RES 8-SIP4.7K OHM X 7	01121	208A472
A10A4U5	1820-0817	8	1	IC FF ECL D-M/S DUAL	04713	MC10131P

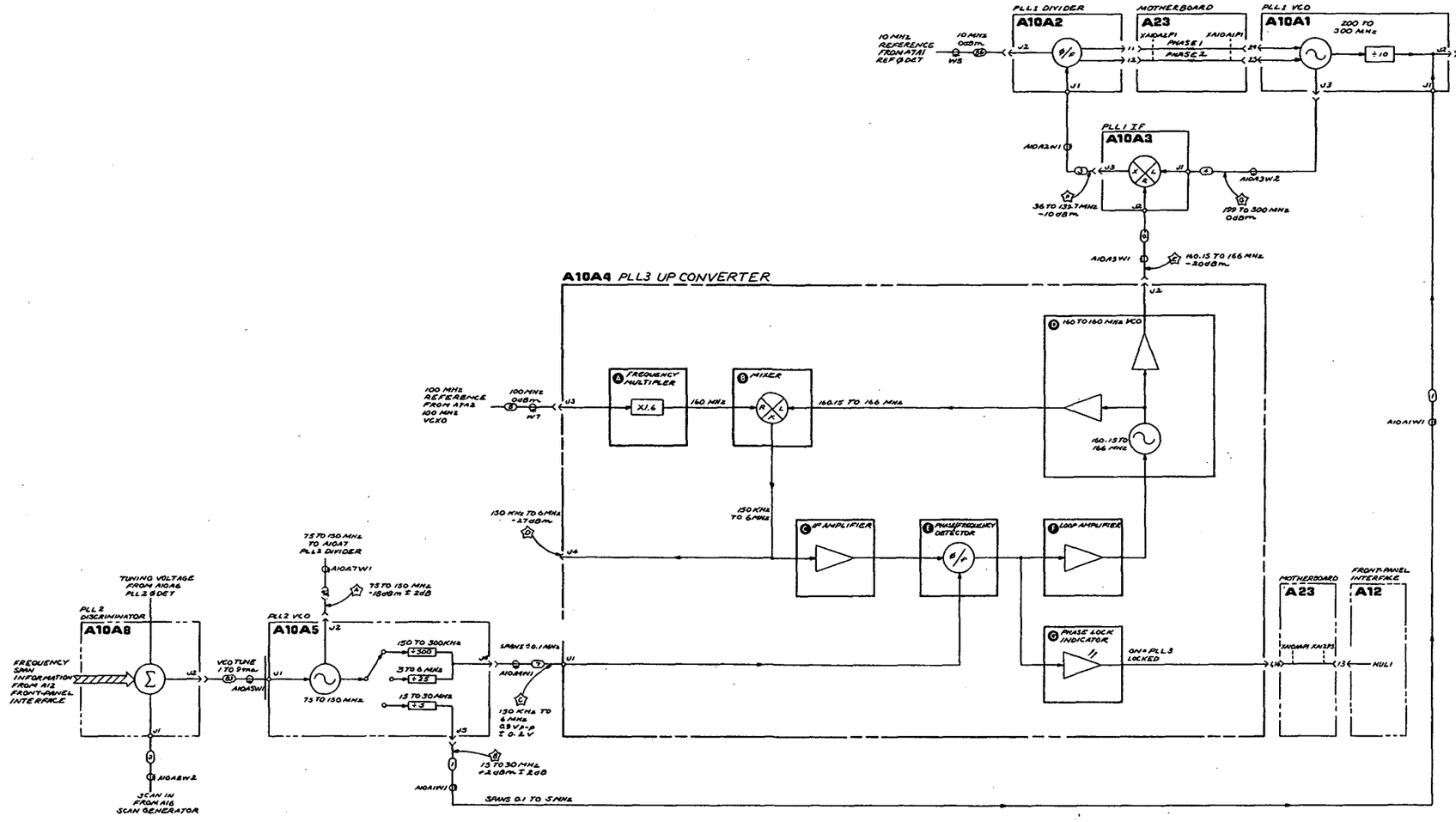
*Indicates Factory Selected Value

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A4U6	1820-0802	1	1	IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A10A4U7	0955-0063	0	1	MIXER-DOUBLE BALANCE PWR INP=200MW; PK	28480	0955-0063
A10A4W1	85660-60093	9	1	CBL AY VIO	28480	85660-60093
				MISCELLANEOUS PARTS		
	2190-0124	4	3	WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0124
	2200-0101	0	2	SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2950-0078	9	3	NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
	3050-0082	8	1	WASHER-FL NM NO. 4 .116-IN-ID .188-IN-OD	28480	3050-0082
	85660-20055	9	1	CVR PC PLL1 UPCN	28480	85660-20055
	85660-20068	4	3	GROUND LUG	28480	85660-20068
	86701-40001	9	1	EXTRACTOR PC	28480	86701-40001
	85660-00042	2	1	SHIELDING CAN	28480	85660-00042

*Indicates Factory Selected Value



A10A4

FIGURE 1. A10A4 PLL3 UP CONVERTER, BLOCK DIAGRAM

ManualsPlus.com

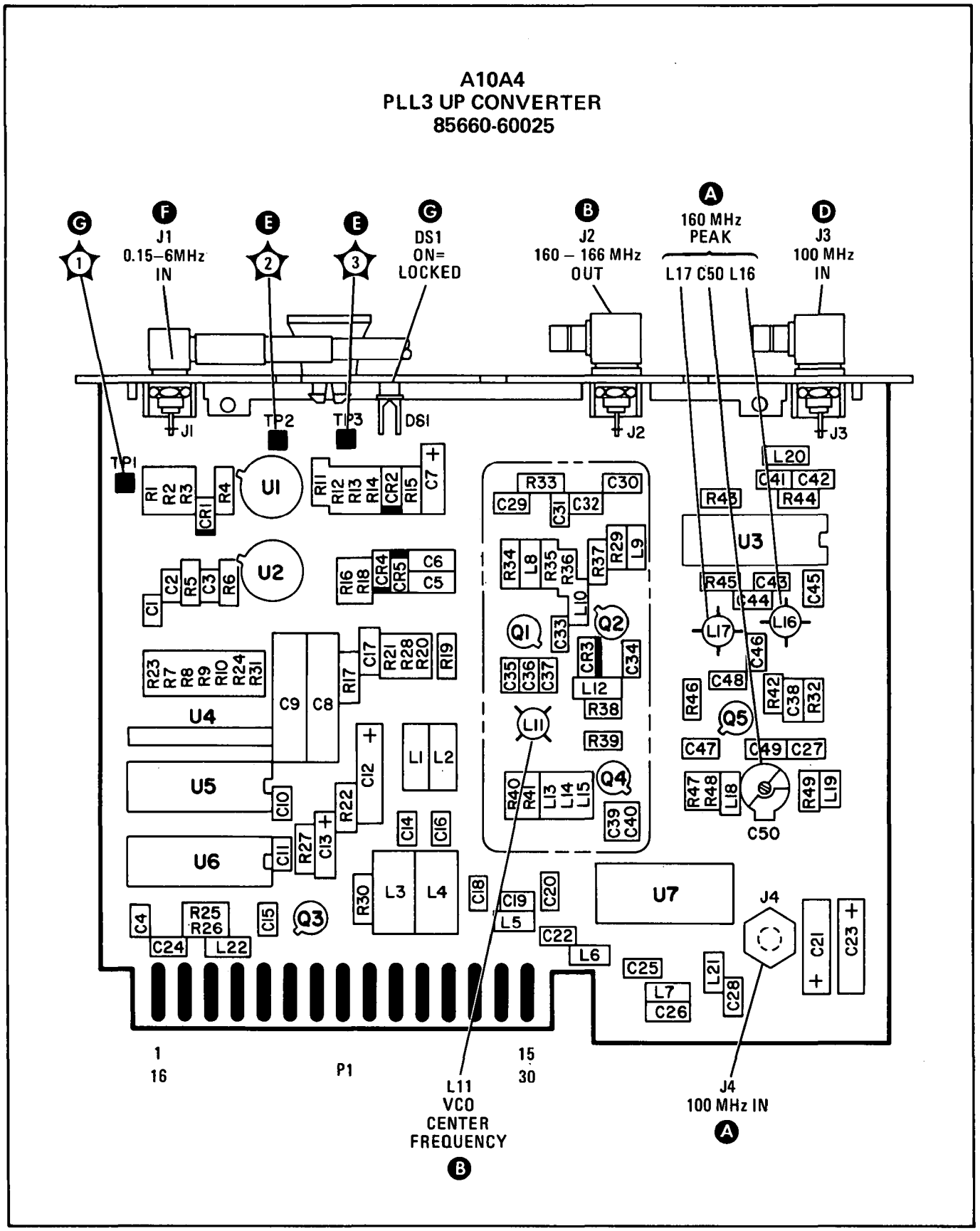


FIGURE 2. A10A4 PLL3 UP CONVERTER, COMPONENT LOCATIONS

ManualsPlus.com

A10A5 PLL2 VCO

ManualsPlus.com

A10A5 PHASE LOCK LOOP 2 (PLL2) VOLTAGE CONTROLLED OSCILLATOR (VCO),CIRCUIT DESCRIPTION

VCO (B)

The VCO is a varactor tuned oscillator which tunes 75 to 150 MHz. Varactors CR1, CR2, CR3, and CR4 form a series tuned resonant circuit with L4 and L5. This series circuit connects the emitters of Q1 and Q2. Q2 is a common-base amplifier whose load impedance is made up primarily of L9, R14, and R15. The voltage across the load is coupled to the base of emitter-follower Q1, which drives the series resonant circuit.

Bias Network/50 kHz Low-Pass Filter (A)

Transistors Q5 and Q6 and associated components form a filtered −32V source to bias the varactor tuning diodes. In the absence of tuning current, the varactor bias is set by R2 to approximately −17V. Tuning current from the A10A8 PLL2 Discriminator passes through the 50 kHz low-pass filter and acts to pull this bias voltage in a positive direction. Tuning sensitivity is set by R4, to −10 MHz/mA.

75 – 150 MHz Output Buffer (C)

Q4 is a grounded-base amplifier to isolate the VCO from the load circuits. The output of Q4 is filtered, attenuated, and used to drive the A10A7 PLL2 Divider.

Frequency Dividers (D)

Q3 isolates the VCO from the dividers and develops the required drive voltage. Note that all of the dividers and gates are ECL with V_{CC} hooked to +5V and V_{EE} grounded. U3 divides the VCO frequency by 5; to 15 – 30 MHz. U6C provides isolation. U2 divides by 5; to 3 – 6 MHz. U2 then further divides by 2 and U1 divides by 10, so the output of U1 is 0.15 – 0.30 MHz. The output of U1 is fed to the A10A8 PLL2 Discriminator.

Small Span Switch (E)

U5 functions as a single-pole double-throw switch, controlled by SW2. For frequency spans less than 0.1 MHz but greater than 5 kHz, SW2 is TTL high, routing the 3 – 6 MHz signal from U2 through U5C, U5B, and U5D to the A10A4 PLL3 Up Converter. When the frequency span is 5 kHz or less, SW2 is low, routing the 0.15 – 0.30 MHz signal from U1 through U5A and U5D to the PLL3 Up Converter. R33 and R34 shift the TTL levels to ECL levels.

0.1 – 5 MHz Span Switch (F)

For frequency spans of 0.1 – 5 MHz, SW1 is TTL low, routing the 15 – 30 MHz signal from U3 through U6D, U7D, and T1 to the A10A1 PLL1 VCO. When SW1 is high, the circuit provides 90 dB of isolation. R35 and R36 shift the TTL levels to ECL levels.

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A5	85660-60168	7	1	BOARD ASSEMBLY, PHASE LOCK LOOP 2 (PLL2) VOLTAGE CONTROLLED OSCILLATOR	28480	85660-60168
A10A5C1	0160-0300	3	1	CAPACITOR-FXD 2700PF +-10% 200VDC POLYE	28480	0160-0300
A10A5C2	0160-0155	6	1	CAPACITOR-FXD 3300PF +-10% 200VDC POLYE	28480	0160-0155
A10A5C3	0160-0154	5	1	CAPACITOR-FXD 2200PF +-10% 200VDC POLYE	28480	0160-0154
A10A5C4	0160-3879	7	4	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A10A5C5	0160-4084	8	14	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A5C6	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A10A5C7	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A10A5C8	0160-3878	6	6	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A10A5C9	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A5C10	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A10A5C11	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A10A5C12	0160-4525	2	1	CAPACITOR-FXD 29PF +-5% 200VDC CER 0+-30	28480	0160-4525
A10A5C13	0160-4524	1	1	CAPACITOR-FXD 24PF +-5% 200VDC CER 0+-30	51642	200-200-NP0-240J
A10A5C14	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A10A5C15	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A10A5C16	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A10A5C17	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A10A5C18	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A5C19	0160-4892	6	1	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A10A5C20	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A5C21	0160-0571	0	1	CAPACITOR-FXD 470PF +-20% 100VDC CER	28480	0160-0571
A10A5C22	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A5C23	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A5C24	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A5C25	0160-3877	5	1	CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A10A5C26	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A5C27	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A5C28	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A5C29	0180-2141	6	2	CAPACITOR-FXD 3.3UF+-10% 50VDC TA	56289	150D335X9050B2
A10A5C30	0180-2141	6		CAPACITOR-FXD 3.3UF+-10% 50VDC TA	56289	150D335X9050B2
A10A5C31	0180-1715	8	1	CAPACITOR-FXD 150UF+-10% 6VDC TA	56289	150D157X9006R2
A10A5C32	0180-1746	5	2	CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A10A5C33	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A5C34	0180-0229	7	1	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A10A5C35	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A5C36	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A10A5C37	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A5C38	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A5CR1	0122-0085	1	4	DIODE-VVC 2.2PF 7% C3/C25-MIN=4.5	00039	1S2208(B)
A10A5CR2	0122-0085	1		DIODE-VVC 2.2PF 7% C3/C25-MIN=4.5	00039	1S2208(B)
A10A5CR3	0122-0085	1		DIODE-VVC 2.2PF 7% C3/C25-MIN=4.5	00039	1S2208(B)
A10A5CR4	0122-0085	1		DIODE-VVC 2.2PF 7% C3/C25-MIN=4.5	00039	1S2208(B)
A10A5J1				NOT ASSIGNED		
A10A5J2	1250-0544	9	4	CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544
A10A5J3	1250-0544	9		CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544
A10A5J4	1250-0544	9		CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544
A10A5J5	1250-0544	9		CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544
A10A5L1	85660-80031	7	2	INDUCTOR	28480	85660-80031
A10A5L2	85660-80031	7		INDUCTOR	28480	85660-80031
A10A5L3	9140-0144	0	1	INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A10A5L4	9100-3358	0	2	INDUCTOR RF-CH-MLD 162NH 5% .2DX.385LG	28480	9100-3358
A10A5L5	9100-3358	0		INDUCTOR RF-CH-MLD 162NH 5% .2DX.385LG	28480	9100-3358
A10A5L6	9100-2251	0	1	INDUCTOR RF-CH-MLD 220NH 10% .105DX.26LG	28480	9100-2251
A10A5L7	9140-0158	6	2	INDUCTOR RF-CH-MLD 1UH 10% .105DX.26LG	28480	9140-0158
A10A5L8	9100-2247	4	8	INDUCTOR RF-CH-MLD 100NH 10% .105DX.26LG	28480	9100-2247
A10A5L9	9100-2891	4	2	INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A10A5L10	9100-2891	4		INDUCTOR RF-CH-MLD 50NH 10% .105DX.26LG	28480	9100-2891
A10A5L11	9140-0158	6		INDUCTOR RF-CH-MLD 1UH 10% .105DX.26LG	28480	9140-0158
A10A5L12	9100-2247	4		INDUCTOR RF-CH-MLD 100NH 10% .105DX.26LG	28480	9100-2247
A10A5L13	9100-2258	7	1	INDUCTOR RF-CH-MLD 1.2UH 10% .105DX.26LG	28480	9100-2258
A10A5L14	9100-2250	9	1	INDUCTOR RF-CH-MLD 180NH 10% .105DX.26LG	28480	9100-2250
A10A5L15	9100-2247	4		INDUCTOR RF-CH-MLD 100NH 10% .105DX.26LG	28480	9100-2247
A10A5L16	9100-2247	4		INDUCTOR RF-CH-MLD 100NH 10% .105DX.26LG	28480	9100-2247
A10A5L17	9100-2247	4		INDUCTOR RF-CH-MLD 100NH 10% .105DX.26LG	28480	9100-2247
A10A5L18	9100-2247	4		INDUCTOR RF-CH-MLD 100NH 10% .105DX.26LG	28480	9100-2247
A10A5L19	9100-2247	4		INDUCTOR RF-CH-MLD 100NH 10% .105DX.26LG	28480	9100-2247
A10A5L20	9100-2247	4		INDUCTOR RF-CH-MLD 100NH 10% .105DX.26LG	28480	9100-2247
A10A5L21	9100-1618	1	3	INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A10A5L22	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A10A5L23	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618

*Indicates Factory Selected Value

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A5MP1-A10A5MP7				NOT ASSIGNED		
A10A5MP8	86701-40001	9	2	EXTRACTOR PC	28480	86701-40001
A10A5Q1	1854-0610	0	2	TRANSISTOR NPN SI TO-46 FT=800MHZ	28480	1854-0610
A10A5Q2	1854-0610	0		TRANSISTOR NPN SI TO-46 FT=800MHZ	28480	1854-0610
A10A5Q3	1854-0345	8	2	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A10A5Q4	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A10A5Q5	1853-0281	9	2	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A10A5Q6	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A10A5R1	0698-0085	0	1	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A10A5R2	2100-3273	1	2	RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	28480	2100-3273
A10A5R3	0757-0428	1	1	RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A10A5R4	2100-3273	1		RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	28480	2100-3273
A10A5R5	0757-0447	4	1	RESISTOR 16.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1622-F
A10A5R6	0757-0401	0	3	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A10A5R7	0698-7205	0	2	RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T0-51R1-F
A10A5R8	0698-7205	0		RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T0-51R1-F
A10A5R9	0757-0346	2	4	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A5R10	0698-7228	7	2	RESISTOR 464 1% .05W F TC=0+-100	24546	C3-1/8-T0-464R-F
A10A5R11	0698-7228	7		RESISTOR 464 1% .05W F TC=0+-100	24546	C3-1/8-T0-464R-F
A10A5R12	0698-7188	8	1	RESISTOR 10 1% .05W F TC=0+-100	24546	C3-1/8-T0-10R-F
A10A5R13	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A5R14	0757-0398	4	4	RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A10A5R15	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A10A5R16	0757-0418	9	1	RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A10A5R17	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A5R18	0757-0419	0	3	RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-681R-F
A10A5R19	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A5R20	0757-0400	9	1	RESISTOR 90.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-90R9-F
A10A5R21	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A10A5R22	0757-0398	4		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A10A5R23	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A10A5R24	0698-4037	0	1	RESISTOR 46.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-46R4-F
A10A5R25	0698-0083	8	1	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A10A5R26	0757-0280	3	5	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A5R27	0698-3440	7	1	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A10A5R28	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A5R29	0757-0316	6	1	RESISTOR 42.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-42R2-F
A10A5R30	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A5R31	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A5R32	0698-3446	3	1	RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A10A5R33	0698-3444	1	2	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A10A5R34	0757-0419	0		RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-681R-F
A10A5R35	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A10A5R36	0757-0419	0		RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-681R-F
A10A5R37	0757-0442	9	2	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10A5R38	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10A5R39	0757-0465	6	1	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A10A5R40	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A5R41	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A10A5R42	0757-0397	3	1	RESISTOR 68.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-68R1-F
A10A5R43	0698-3132	4	1	RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A10A5R44	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A10A5T1	08553-6012	5	1	TRNSFR,R RF BLUE	28480	08553-6012
A10A5TP1	1251-0600	0	1	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A5U1	1820-1383	5	2	IC CNTR ECL BCD POS-EDGE-TRIG	04713	MC10138L
A10A5U2	1820-1383	5		IC CNTR ECL BCD POS-EDGE-TRIG	04713	MC10138L
A10A5U3	1820-2047	0	1	IC DIVR ECL QUINARY	52648	SP8622BDG
A10A5U4	1810-0205	7	1	NETWORK-RES 8-SIP4.7K OHM X 7	01121	238A472
A10A5U5	1820-0802	1	3	IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A10A5U6	1820-0802	1		IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A10A5U7	1820-0802	1		IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A10A5W1	85660-60088	2	1	CBL AY GRA/ORG	28480	85660-60088
				MISCELLANEOUS PARTS		
	2190-0124	4	1	WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0124
	2200-0101	0	2	SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2950-0078	9	1	NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
	85660-20056	0	1	CVR PC PLL2 VCO	28480	85660-20056

*Indicates Factory Selected Value

ManualsPlus.com

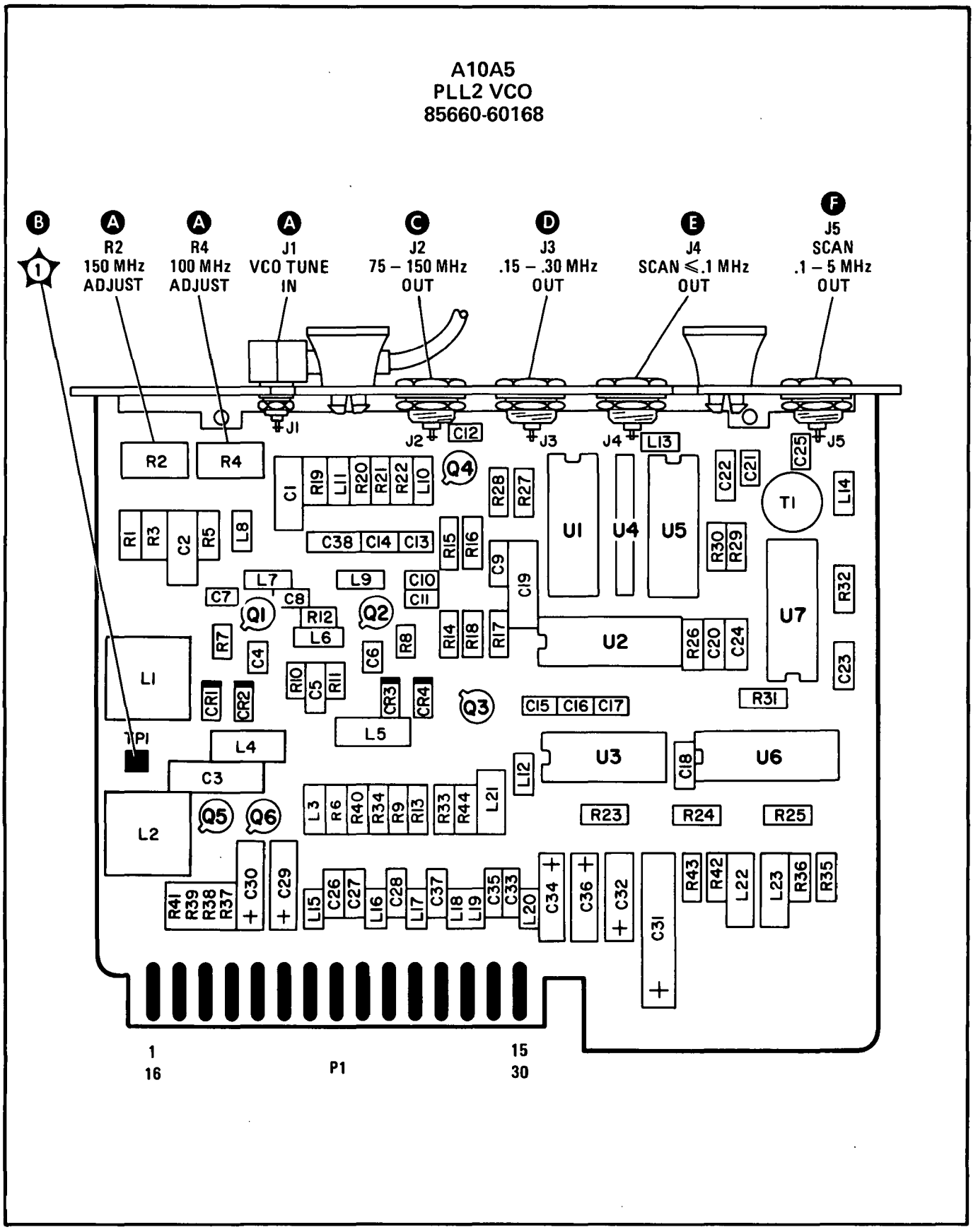


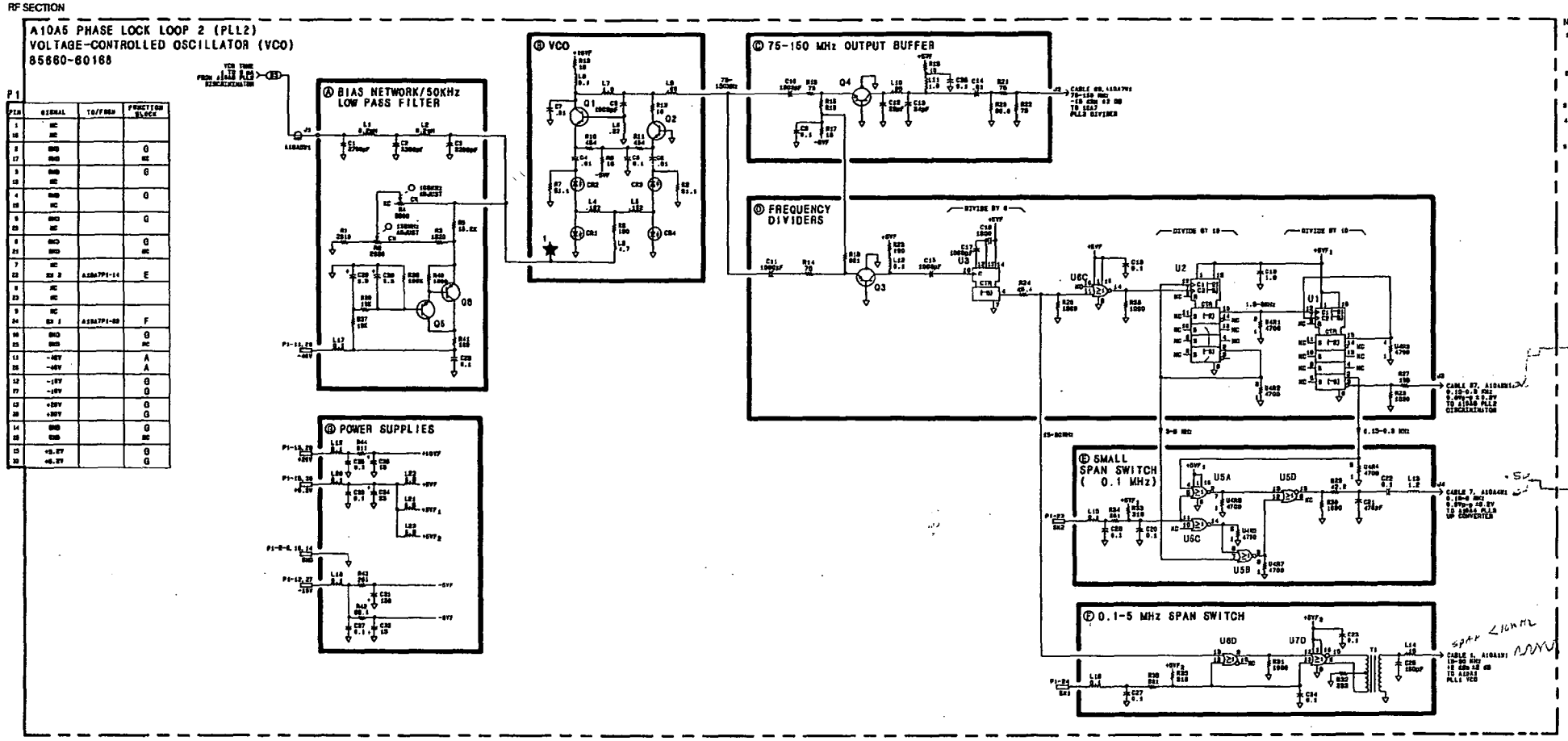
FIGURE 2. A10A5 PLL2 VCO, COMPONENT LOCATIONS

RF SECTION

A10A5 PHASE LOCK LOOP 2 (PLL2)
VOLTAGE-CONTROLLED OSCILLATOR (VCO)
85680-60168

P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	NC		
16	NC		
7	GND		G
17	GND		GC
8	GND		G
18	NC		
4	GND		G
20	NC		
5	GND		G
21	GND		GC
6	GND		G
22	NC		
7	SW 2	A10A7P1-14	E
23	NC		
8	NC		
24	SW 1	A10A7P1-09	F
25	GND		G
10	GND		GC
11	+8V		A
26	+8V		A
12	+5V		G
27	+5V		G
13	+5V		G
28	+5V		G
14	GND		G
29	GND		GC
15	+8.5V		G
30	+8.5V		G



NOTES:

1. REFERENCE DESIGNATIONS WITHIN [illegible] ARE ASSIGNED FOR ASSEMBLY IDENTIFICATION ONLY. WHEN ORDERING REPLACEMENT ASSEMBLIES, USE REFERENCE DESIGNATION WITH ASSEMBLY PART NUMBER.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS, 1/4W, ±5%. CAPACITANCE IS IN PICOFARADS (pF) INDUCTANCE IS IN MICROHENRIES (µH)
3. C86,C88,C71,C78 AND C79 ARE NOT USED.
4. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT BOTTOM AND EXIT AT TOP OF FUNCTION BLOCKS.
5. MNEMONICS TABLE:

MNEMONIC	DESCRIPTION
SW1	SWITCH 1
SW2	SWITCH 2

A10A5

FIGURE 3. A10A5 PLL2 VCO, SCHEMATIC DIAGRAM

SERIAL NUMBER PREFIX: 2410A

ManualsPlus.com

ManualsPlus.com

A10A6 PLL2 Phase Detector

ManualsPlus.com

A10A6 PHASE LOCK LOOP 2 (PLL2) PHASE DETECTOR, CIRCUIT DESCRIPTION

The purpose of the A10A6 PLL2 Phase Detector is to compare the output of the A10A5 PLL2 VCO (after division by the A10A7 PLL2 Divider) to the 500 kHz Reference from the A7A1 Reference Phase Detector. The phase difference is converted to an error voltage used to correct the PLL2 VCO frequency.

Phase-Frequency Detector (A)

The phase-frequency detector responds to the phase difference between the 500 kHz reference input and the divided input from the A10A7 PLL2 Divider. Assuming both flip-flops U6A and U6B have been cleared, Q9 is on and Q10 is off. Q9 supplies about 3 mA current which is sunk by current source Q8 resulting in approximately zero current flow through the 50 kHz low-pass filter to U3.

A pulse from the PLL2 Divider on P1-19 clocks the Q output of U6A high, turning Q9 off. A subsequent reference pulse on P1-20 clocks the Q output of U6B high, which will immediately reset both flip-flops through U7A. Thus the effect of a pulse at P1-19 leading one at P1-20 is to momentarily reduce the output current. Therefore, if the divided output leads the reference in phase, the current decreases. Similarly, if the reference phase leads, the current increases because Q10 is connected to the Q output of U6B.

If the two inputs have different frequencies, the pulse relationships become complicated, but the net effect is positive output current if the reference frequency is high.

U3 serves as an amplifier to provide the high currents necessary to rapidly charge the integrating capacitor C7 in the following stage. VR2 and VR3 serve as clamps, limiting the output swing to ± 5.8V.

Unlock Indicator (B)

When the phase lock loop is in a steady state condition, the voltage at TP1 is zero. If unlocked, the voltage will be non-zero except for transients passing through zero. When the voltage at TP1 exceeds ± 0.7V, either Q1 or Q2 is turned on, discharging C15 or C14 respectively and tripping comparator U1. When TP1 voltage settles to less than ± 0.7V, C14 and C15 must recharge before the comparator is reset. This takes 5 msec. The comparator output is TTL high for an unlock condition and remains there for 5 msec after a lock condition is established.

Analog Integrator-Sample and Hold (C)

U2 and C7 form an integrator which integrates current flowing from U3 through R8. The output of the integrator is summed with other signals in U4 and ultimately controls the VCO frequency. In steady state conditions, TP3 will settle to a constant voltage which tunes the VCO to the correct frequency. If the voltage at TP3 is constant, the input current must be zero, so opening FET switch Q3 will not change the voltage at TP3. When PLL2 is being used in its swept mode, the loop is locked to a start frequency set by A10A7 PLL2 Divider, then Q3 is opened. This breaks the lock loop, permitting a sweep to be executed.

Q3 is closed with zero gate voltage, and open with -7V gate voltage. The gate drive comes from Q6 and Q7, which translate the TTL level lock-sweep signal on P1-2 to the $0/-7$V levels. P1-2 is also connected to U6A and Q8, which results in zero voltage at TP1 during a sweep. A negative voltage may turn on Q3, changing the charge stored on C7.

Digital Integrator (D)

The analog integrator does not have sufficient control range to correct initial warm-up drift and long term aging. If TP3 goes below -4.7V, Q5 is turned on and its collector voltage is pulled down to -1.4V. At this point, CR4 and CR3 become forward biased, clamping U2 and preventing further negative movement of TP3.

ManualsPlus.com

Simultaneously, the input of U7B will have been pulled low, which turns on a 2 kHz oscillator made up of U7C, R20, and C11. This clocks the count up input of counters U8 and U9, which drives DAC U10. U10 sources negative current to the summing junction of U4 and this current increases in magnitude as U8 and U9 count up. When the current reaches a value which tunes the VCO to the proper frequency, TP3 moves positive, shutting off the oscillator and returning control to the analog integrator. An analogous sequence occurs when TP3 tries to rise above +5.7V.

Output Amplifier (E)

U4 serves to sum signals from the analog integrator, DAC, and R11. R11 is a high frequency signal path shunting the integrators. C8, C9, and R12 form a 3 kHz active low-pass filter network.

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A6	85660-60130	5	1	BOARD ASSEMBLY, PHASE LOCK LOOP 2 (PLL2) PHASE DETECTOR	28480	85660-60130
A10A6C1	0180-0197	8	4	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A10A6C2	0160-0574	3	1	CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A10A6C3	0160-3879	7	1	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A10A6C4	0160-4892	6	2	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A10A6C5	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A10A6C6	0160-2199	2	2	CAPACITOR-FXD 30PF +-5% 300VDC MICA	28480	0160-2199
A10A6C7	0160-5609	5	1	CAPACITOR-FXD 10UF +-10% 50VDC MET-POLYC	28480	0160-5609
A10A6C8	0160-4084	8	4	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A6C9	0160-0573	2	1	CAPACITOR-FXD 4700PF +-20% 100VDC CER	28480	0160-0573
A10A6C10	0160-2199	2		CAPACITOR-FXD 30PF +-5% 300VDC MICA	28480	0160-2199
A10A6C11	0180-0291	3	3	CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A10A6C12	0180-0291	3		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A10A6C13	0160-4441	1	3	CAPACITOR-FXD .47UF +-10% 50VDC CER	28480	0160-4441
A10A6C14	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A10A6C15	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A10A6C16	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A6C17	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A10A6C18	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A6C19	0180-0291	3		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A10A6C20	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A6C21	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A10A6C22	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A10A6C23	0160-2437	1	2	CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A10A6C24	0160-2437	1		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A10A6CR1	1901-0033	2	2	DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0033
A10A6CR2	1901-0376	6	2	DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A10A6CR3	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A10A6CR4	1901-0033	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0033
A10A6L1	9100-1651	2	1	INDUCTOR RF-CH-MLD 750UH 5% .2DX.45LG	28480	9100-1651
A10A6L2	9140-0144	0	3	INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A10A6L3	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A10A6L4	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A10A6Q1	1853-0281	9	2	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A10A6Q2	1854-0477	7	1	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A10A6Q3	1855-0386	9	1	TRANSISTOR J-FET 2N4392 N-CHAN D-MODE	04713	2N4392
A10A6Q4	1853-0322	9	1	TRANSISTOR PNP 2N2946A SI TO-46 PD=400MW	01295	2N2946A
A10A6Q5	1854-0557	4	1	TRANSISTOR NPN 2N2432A SI TO-18 PD=300MW	01295	2N2432A
A10A6Q6	1854-0404	0	2	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A10A6Q7	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A10A6Q8	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A10A6Q9	1853-0007	7	2	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A10A6Q10	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A10A6R1	0757-0280	3	5	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A6R2	0757-0317	7	2	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A10A6R3	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A6R4	0757-0317	7		RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A10A6R5	0698-0083	8	1	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A10A6R6	0698-3440	7	1	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A10A6R7	0757-0123	3	1	RESISTOR 34.8K 1% .125W F TC=0+-100	28480	0757-0123
A10A6R8	0698-0082	7	1	RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A10A6R9	0757-0442	9	2	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10A6R10	0698-3260	9	1	RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A10A6R11	0757-0290	5	1	RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A10A6R12	0757-0420	3	1	RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A10A6R13	0698-0084	9	3	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A10A6R14	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A6R15	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10A6R16	0757-0439	4	1	RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A10A6R17	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A10A6R18	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A10A6R19	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A6R20	0698-3445	2	3	RESISTOR 348 1% .125W F TC=0+-100	24546	C4-1/8-T0-348R-F
A10A6R21	0698-3445	2		RESISTOR 348 1% .125W F TC=0+-100	24546	C4-1/8-T0-348R-F
A10A6R22	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A6R23	0757-0279	0	1	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A10A6R24	0698-3450	9	1	RESISTOR 42.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4222-F
A10A6R25	0757-0462	3	1	RESISTOR 75K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7502-F
A10A6R26	0757-0467	8	1	RESISTOR 121K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1213-F
A10A6R27	0698-3266	5	1	RESISTOR 237K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2373-F
A10A6R28	0698-3460	1	1	RESISTOR 422K 1% .125W F TC=0+-100	28480	0698-3460
A10A6R29	0757-0438	3	2	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A6R30	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F

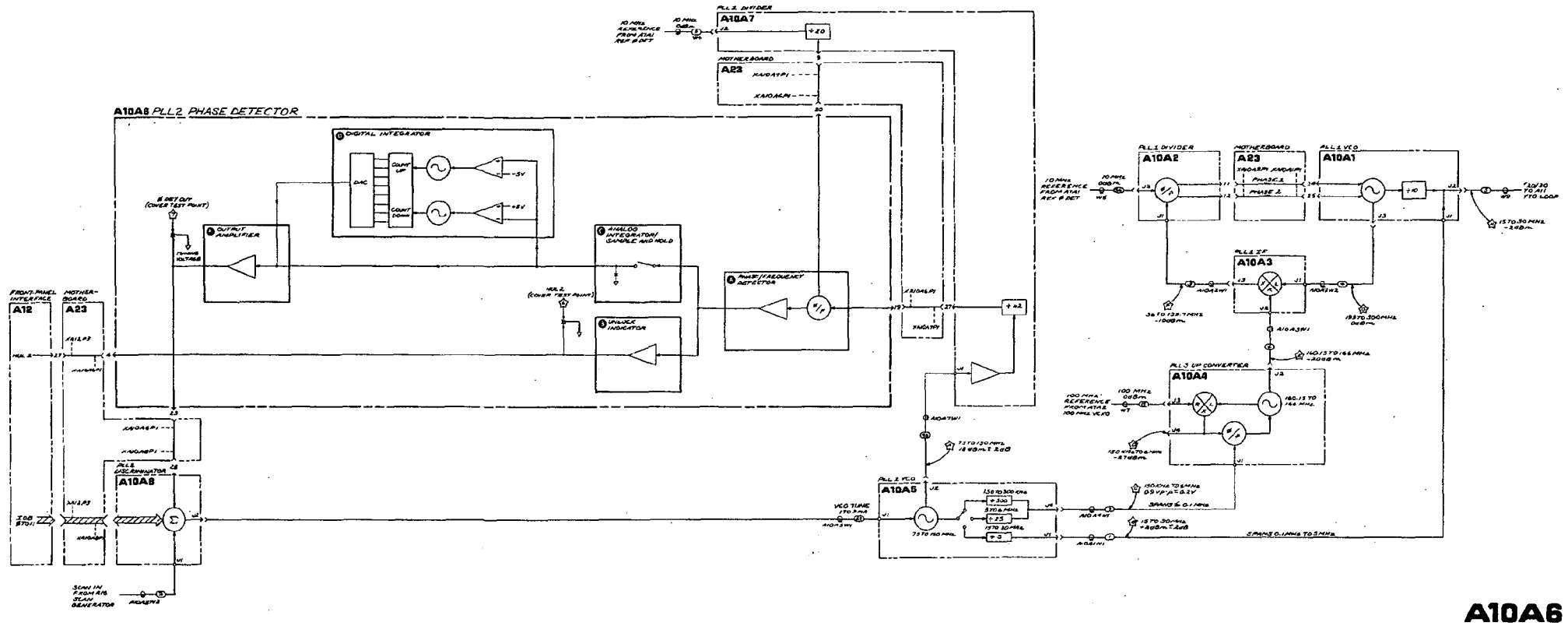
*Indicates Factory Selected Value

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A6R31	0698-3154	0	1	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A10A6R32	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A6R33	0698-0085	0	1	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A10A6R34	0698-3445	2		RESISTOR 348 1% .125W F TC=0+-100	24546	C4-1/8-T0-348R-F
A10A6R35	0757-0346	2	1	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A6R36	0757-0440	7	1	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A10A6TP1	1251-0600	0	5	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A6TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A6TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A6TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A6TP5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A6U1	1826-0026	3	1	IC COMPARATOR PRCN TO-99 PKG	01295	LM311L
A10A6U2	1826-0459	6	1	IC OP AMP 14-DIP-C PKG	27014	LH0042CD
A10A6U3	1826-0059	2	2	IC OP AMP GP TO-99 PKG	01295	LM201AL
A10A6U4	1826-0059	2		IC OP AMP GP TO-99 PKG	01295	LM201AL
A10A6U5	1820-0429	8	1	IC V RGLTR TO-39	18324	LM309H
A10A6U6	1820-1212	9	1	IC FF TTL LS J-K NEG-EDGE-TRIG	01295	SN74LS112AN
A10A6U7	1820-1425	6	1	IC SCHMITT-TRIG TTL LS NAND QUAD 2-INP	01295	SN74LS132N
A10A6U8	1820-1194	6	2	IC CNTR TTL LS BIN UP/DOWN SYNCHRO	01295	SN74LS193N
A10A6U9	1820-1194	6		IC CNTR TTL LS BIN UP/DOWN SYNCHRO	01295	SN74LS193N
A10A6U10	1826-0448	3	1	IC CONV 10-B-D/A 16-DIP-P PKG	24355	AD7520LN(SEL)
A10A6VR1				NOT ASSIGNED		
A10A6VR2	1902-0041	4	2	DIODE-ZNR 5.11V 5% DO-35 PD=.4W	28480	1902-0041
A10A6VR3	1902-0041	4		DIODE-ZNR 5.11V 5% DO-35 PD=.4W	28480	1902-0041
A10A6VR4	1902-3002	3	1	DIODE-ZNR 2.37V 5% DO-7 PD=.4W TC=-.074%	28480	1902-3002
				MISCELLANEOUS PARTS		
	2190-0009	4	2	WASHER-LK INTL T NO. 8 .168-IN-ID	28480	2190-0009
	2200-0101	0	2	SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2580-0002	4	2	NUT-HEX-DBL-CHAM 8-32-THD .095-IN-THK	28480	2580-0002
	85660-20057	1	1	CVR PC 2 PHSDETC	28480	85660-20057
	86701-40001	9	2	EXTRACTOR PC	28480	86701-40001

*Indicates Factory Selected Value



A10A6

FIGURE 1. A10A6 PLL2 PHASE DETECTOR, BLOCK DIAGRAM

ManualsPlus.com

ManualsPlus.com

A10A6
PLL2 PHASE DETECTOR
85660-60130

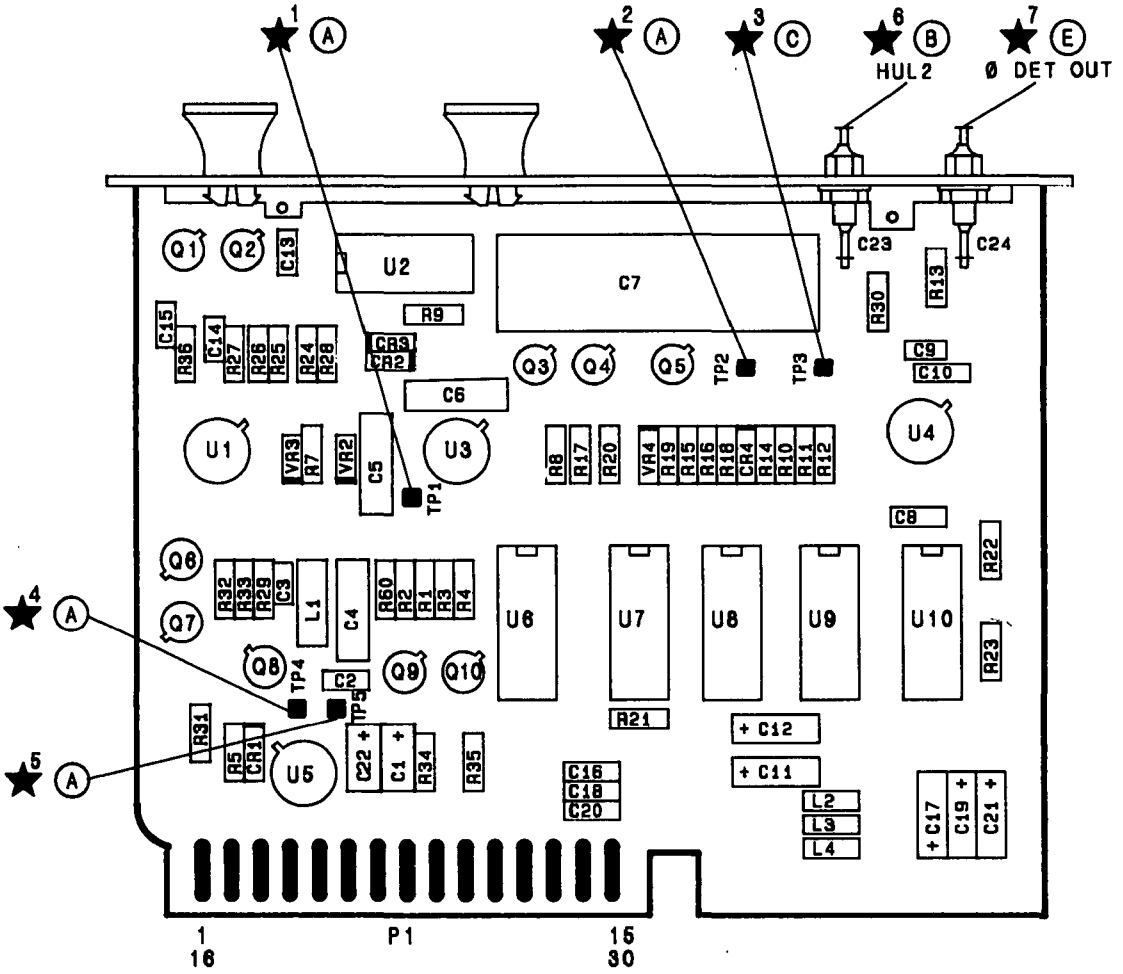


FIGURE 2. A10A6 PLL2 PHASE DETECTOR, COMPONENT LOCATIONS

ManualsPlus.com

A10A6 PHASE LOCK LOOP 2
(PLL2) PHASE DETECTOR
85660-60130

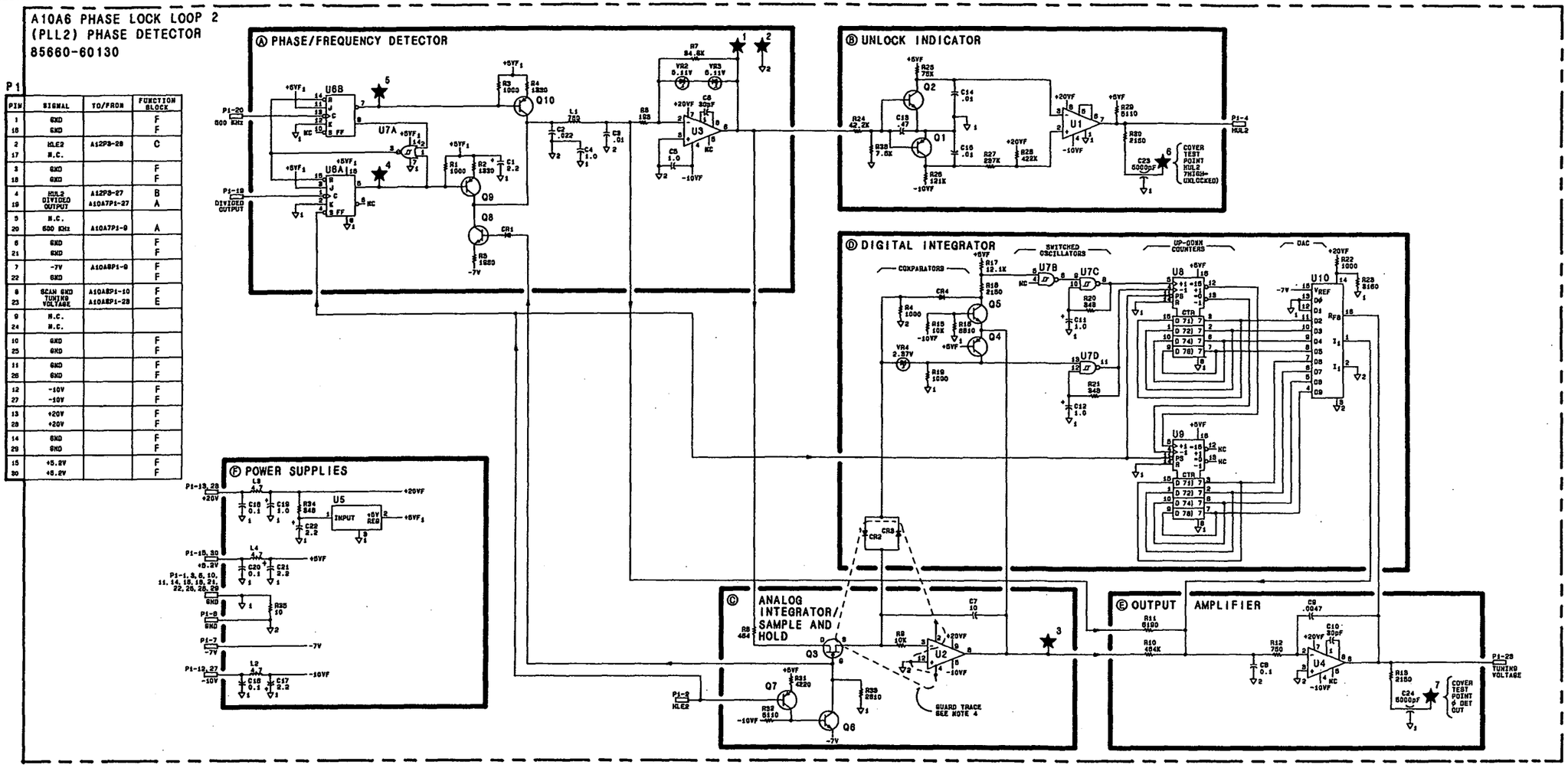
P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	GND		F
16	GND		F
2	HLE2	A12P3-28	C
17	N.C.		
3	GND		F
18	GND		F
4	HUL2 DIVIDED OUTPUT	A12P3-27	B
19		A10A7P1-27	A
5	N.C.		
20	500 KHz	A10A7P1-9	A
6	GND		F
21	GND		F
7	-7V	A10A8P1-9	F
22	GND		F
8	SCAN GND TUNING VOLTAGE	A10A8P1-10	F
23		A10A8P1-28	E
9	N.C.		
24	N.C.		
10	GND		F
25	GND		F
11	GND		F
26	GND		F
12	-10V		F
27	-10V		F
13	+20V		F
28	+20V		F
14	GND		F
29	GND		F
15	+5.2V		F
30	+5.2V		F

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (μF) INDUCTANCE IS IN MICROHENRIES (μH)
3. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS
4. PINS 2 AND 4 OF OP AMP U2 HAVE NO ELECTRICAL CONNECTION TO THE OP AMP.
5. MNEMONICS TABLE:

MNEMONIC	DESCRIPTION
HLE2	HIGH-PHASE LOCK LOOP 2 LOCK ENABLE
HUL2	HIGH-PHASE LOCK LOOP 2 UNLOCKED



SERIAL NUMBER PREFIX: 2410A

FIGURE 3. A10A6 PLL2 PHASE DETECTOR, SCHEMATIC DIAGRAM

A10A6

ManualsPlus.com

A10A7 PLL2 Divider

ManualsPlus.com

A10A7 PHASE LOCK LOOP 2 (PLL2) DIVIDER, CIRCUIT DESCRIPTION

Reference Divider (A)

A 10 MHz signal derived from the quartz crystal reference is amplified by Q2 and used to drive divider U4. The divide by 10 output of U4 drives U16, whose divide by 2 output goes to the A10A6 PLL2 Phase Detector. This 500 kHz signal is used as a reference to which the programmable divide output of the PLL2 Divider is compared. The TTL input on P1-2 disables the reference divider during sweeps.

Prescaler (B)

The −18 dBm, 75 – 150 MHz input from A10A5 PLL2 VCO, is amplified by Q1 and used to drive prescaler U1A which is a variable module divider. It divides by 10 if pin 9, "PSW," is high; it divides by 11 if pin 9 is low. U1B is an ECL circuit which contains an ECL to TTL translator. Pin 7 is the TTL output, which drives gate U9C. U9C is used as a buffer to drive the multiple of loads on its output; the "CLK" line.

The prescaler should be thought of as a ÷10 with the ability to "swallow" input pulses. If the PSW line is low, in effect one input pulse is lost (swallowed) for each output (CLK) pulse produced.

Latches (C)

U12, U13, and U14 are latches which store the divider programming number. The number is clocked into the latches with LCK1 and LCK2. U14 also latches in SW1 and SW2, which are sent to A10A5 PLL2 VCO and A10A1 PLL1 VCO.

Direct Divide (F)

U8 and U15 are cascaded dividers whose state outputs are sensed by U9B. The CLK line from the prescaler clocks U8. When the count reaches 25, the output of U9B goes high. This initiates a divide sequence by J-K flip-flops U10A and U10B, which are clocked by CLK. The Q output of U10A goes high on a count of 27 and low on 29. This signal is output to the A10A6 PLL2 Phase Detector. The $\overline{Q}$ output of U10A goes low on a count of 27, resetting U8 and U15. When it returns high on 29, the sequence resumes.

U15 is preset to a count of zero and U8 to a count of 0 to 9 depending on input data. Thus, if U8 is preset to 0, the circuit divides by 29. If preset to 9, the circuit divides by 20.

Since the prescaler has already divided by 10, the 75-150 MHz input is divided by numbers 200, 210, ... 290 according to the BCD digit programming U8. Since the output is locked to 500 kHz by the phase lock loop, the VCO is programmed from 100 to 145 MHz in 5 MHz steps.

Synchronizer (D)

Other divide numbers are provided through the pulse swallowing technique. The output frequency is held by the lock loop to 500 kHz. If N input pulses per second are swallowed, the input frequency must rise by N Hz to keep the output constant. If N input pulses are swallowed for each output pulse, input frequency must rise by N x 500 kHz.

The pulse swallow synchronizer accepts pulses from the fractional counter and integer counter, and at the proper time, as determined by the CLK line, drops the PSW line to swallow input pulses.

Integer Counter (E)

U7 is a presettable counter which is preset to an externally programmable count by the RST line. RST pulses come from the direct divide output, and occur at a 500 kHz rate. After each RST pulse, U7 counts CLK pulses

ManualsPlus.com

until a count of 9 is reached. A count of 9 causes the output of U9A to go high. The pulse swallow synchronizer drops the PSW line one CLK pulse after the RST pulse, and raises it two CLK pulses after U9A goes high. PSW therefore is low one CLK pulse longer than the count time. If U7 is preset to N, (9-N) + 1 input pulses will be swallowed for each CLK pulse, forcing the input frequency to rise by (10-N) x 500 kHz.

Fractional Counter (G)

U5 and U6 are rate multipliers. They provide the function $F_{OUT} = F_{IN} \times N/100$ where N is a two digit BCD number (8 bits). The least significant digit goes to U5, the other to U6. The output comes from U5 and triggers a 1.6 μsec pulse from one-shot multivibrator U11.

The input frequency to the rate multipliers is 500 kHz, so $F_{OUT} = N \times 5$ kHz.

The output from U11 goes to U2A. A high input at U2A causes the synchronizer to swallow one less pulse per RST pulse than it would have otherwise. The fractional counter therefore causes the input frequency to drop by N x 5 kHz, where N ranges from 0 to 99.

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A7	05660-60020	0	1	BOARD ASSEMBLY, PHASE LOCK LOOP 2 (PLL2) DIVIDER	28480	05660-60028
A10A7C1	0160-3877	5	2	CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A10A7C2	0160-3879	7	2	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A10A7C3	0160-4084	8	12	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A7C4	0160-3877	5		CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A10A7C5	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A7C6	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A7C7	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A7C8	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A10A7C9	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A7C10	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A7C11	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A7C12	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A7C13	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A7C14	0160-0570	9	1	CAPACITOR-FXD 220PF +-20% 100VDC CER	20932	5024EM100RD221M
A10A7C15	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A7C16	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A7C17	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A7C18	0180-1746	5	2	CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A10A7C19	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A10A7CR1	1901-0743	1	2	DIODE-PWR RECT 1N4004 400V 1A DO-41	01295	1N4004
A10A7CR2	1901-0743	1		DIODE-PWR RECT 1N4004 400V 1A DO-41	01295	1N4004
A10A7J1				P/O A10A7W1		
A10A7J2	1250-0544	9	1	CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544
A10A7L1	9100-2250	9	1	INDUCTOR RF-CH-MLD 180NH 10% .105DX.26LG	28480	9100-2250
A10A7L2	9100-1788	6	1	CHOKE-WIDE BAND ZMAX=680 OHM@ 180 MHZ	02114	VK200 20/4B
A10A7L3	9100-1618	1	2	INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A10A7L4	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A10A7Q1	1854-0546	1	1	TRANSISTOR NPN SI TO-72 PD=200MW	28480	1854-0546
A10A7Q2	1854-0019	3	1	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A10A7R1	0757-0276	7	1	RESISTOR 61.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-6192-F
A10A7R2	0757-0279	0	1	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A10A7R3	0757-0280	3	7	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A7R4	0757-0395	1	1	RESISTOR 56.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-56R2-F
A10A7R5	0757-0401	0	1	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A10A7R6	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A7R7	0698-3444	1	1	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A10A7R8	0698-3157	3	1	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A10A7R9	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A7R10	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A7R11	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A7R12	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A7R13	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A7R14	0757-0442	9	1	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10A7TP1	1251-0600	0	5	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A7TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A7TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A7TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A7TP5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A7U1	1820-1888	5	1	IC PRESCR ECL	04713	MC12013L
A10A7U2	1820-0681	4	1	IC GATE TTL S NAND QUAD 2-INP	01295	SN74S00N
A10A7U3	1820-0629	0	2	IC FF TTL S J-K NEG-EDGE-TRIG	01295	SN74S112N
A10A7U4	1820-1251	6	5	IC CNTR TTL LS DECD ASYNCHRO	01295	SN74LS196N
A10A7U5	1820-0909	9	2	IC MULTR TTL	01295	SN74167N
A10A7U6	1820-0909	9		IC MULTR TTL	01295	SN74167N
A10A7U7	1820-1251	6		IC CNTR TTL LS DECD ASYNCHRO	01295	SN74LS196N
A10A7U8	1820-1251	6		IC CNTR TTL LS DECD ASYNCHRO	01295	SN74LS196N
A10A7U9	1820-0686	9	1	IC GATE TTL S AND TPL 3-INP	01295	SN74S11N
A10A7U10	1820-0629	0		IC FF TTL S J-K NEG-EDGE-TRIG	01295	SN74S112N
A10A7U11	1820-0261	6	1	IC MV TTL MONOSTBL	01295	SN74121N
A10A7U12	1820-1196	8	3	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A10A7U13	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A10A7U14	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A10A7U15	1820-1251	6		IC CNTR TTL LS DECD ASYNCHRO	01295	SN74LS196N
A10A7U16	1820-1251	6		IC CNTR TTL LS DECD ASYNCHRO	01295	SN74LS196N
A10A7W1	05660-60087	1	1	CBL AY WHT/BLU	28480	05660-60087

*Indicates Factory Selected Value

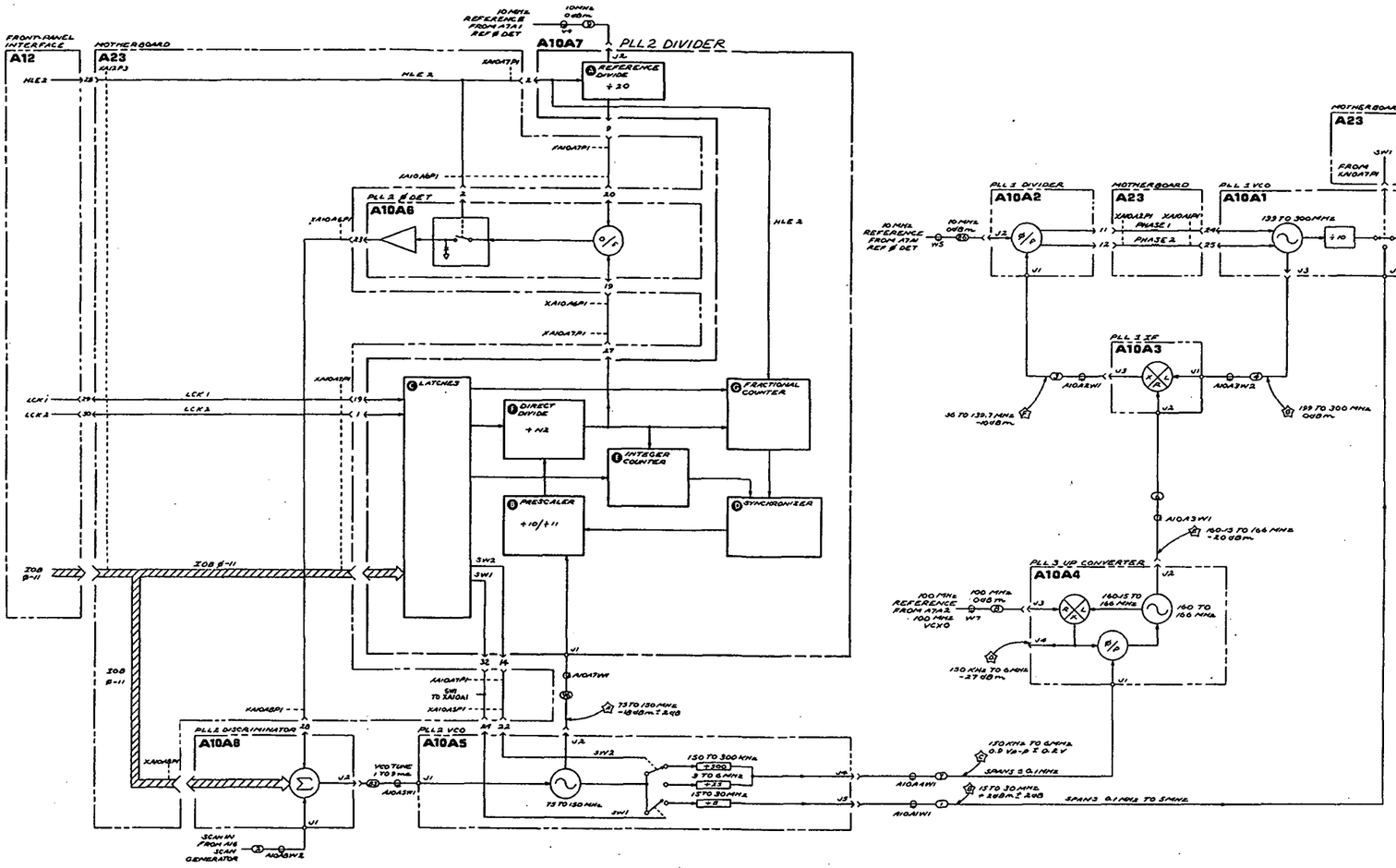
ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				MISCELLANEOUS PARTS		
	2190-0124	4	1	WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0124
	2200-0101	0	2	SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2950-0078	9	1	NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
	85660-20058	2	1	CVR PC PLL2 DIVR	28480	85660-20058
	86701-40001	9	2	EXTRACTOR PC	28480	86701-40001

*Indicates Factory Selected Value

ManualsPlus.com



A10A7

FIGURE 1. A10A7 PLL2 DIVIDER, BLOCK DIAGRAM

ManualsPlus.com

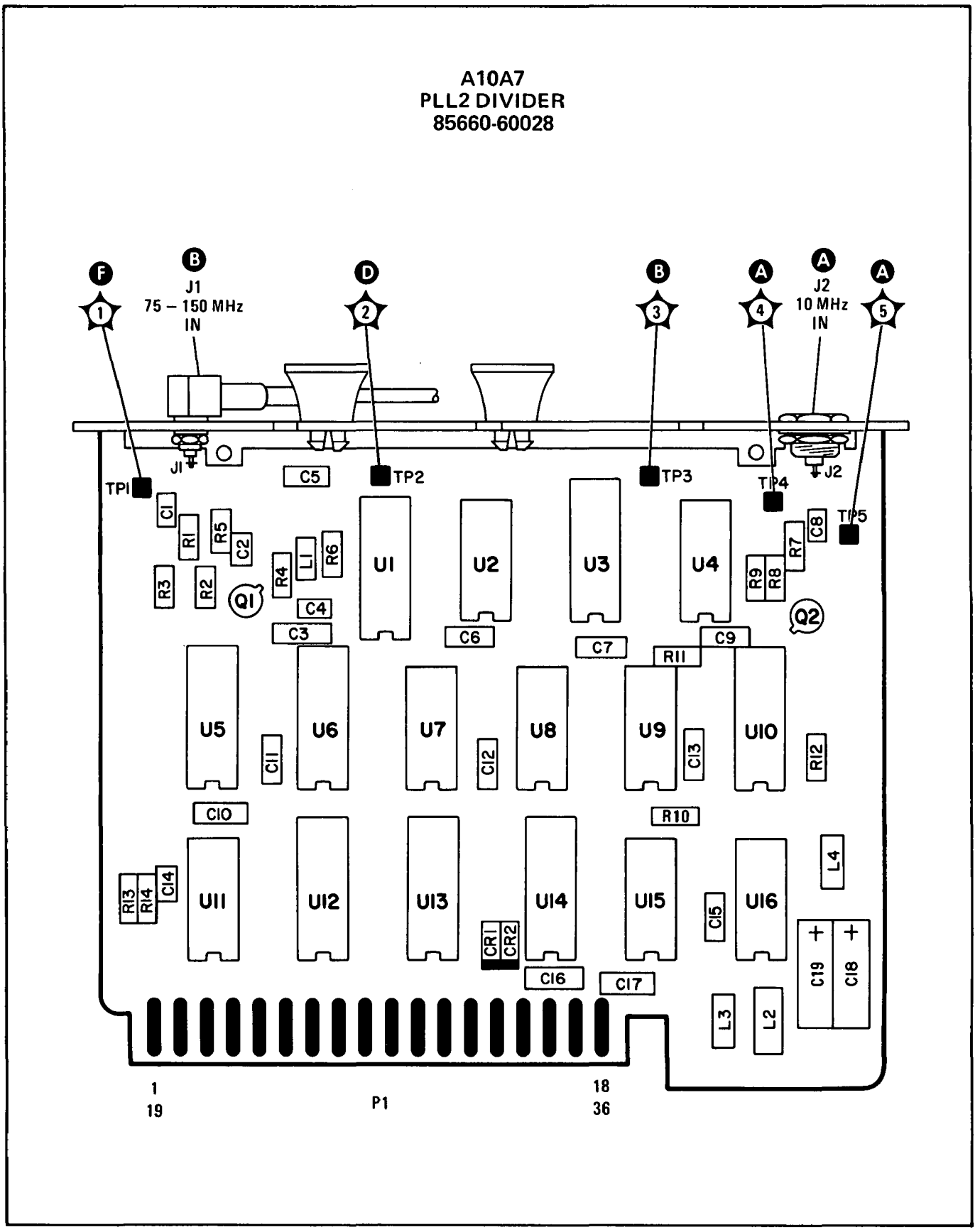
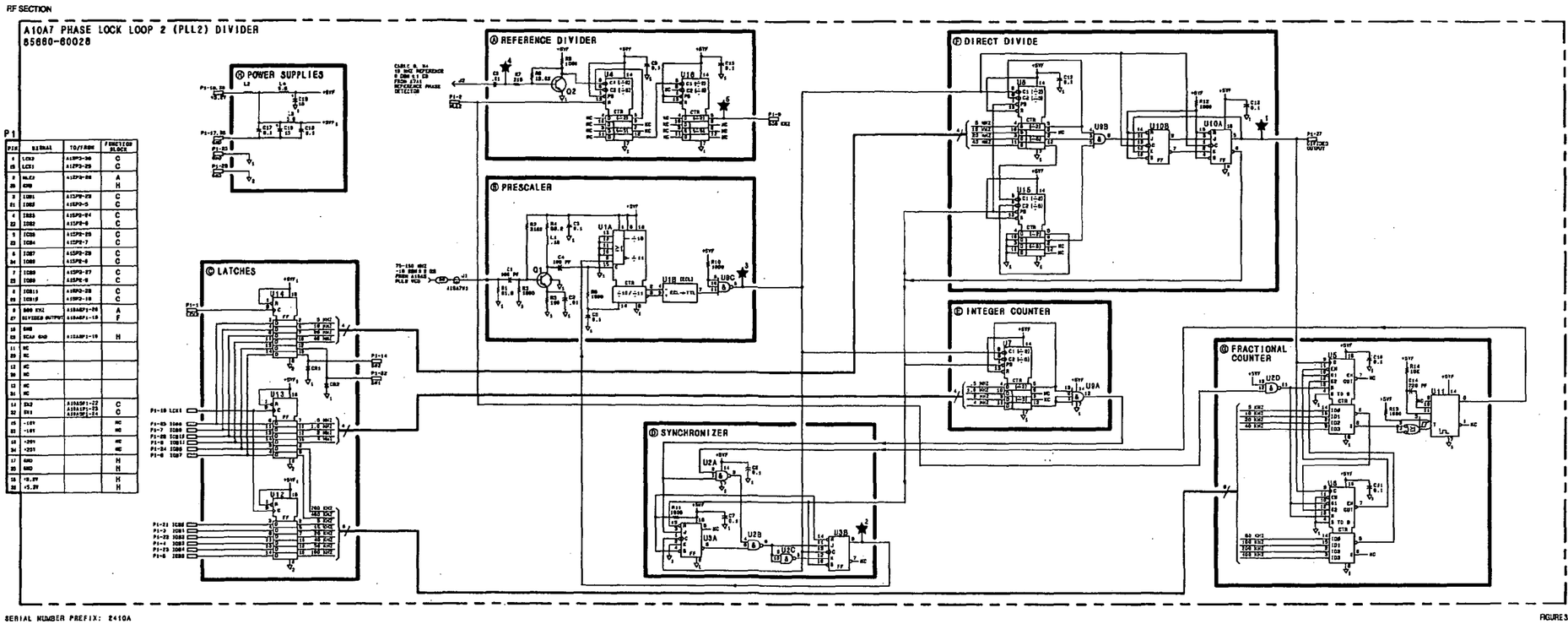


FIGURE 2. A10A7 PLL2 DIVIDER, COMPONENT LOCATIONS

ManualsPlus.com



P1	SIGNAL	TO/FROM	FUNCTION BLOCK
1	LCK2	A1MP3-36	G
45	LCK1	A1MP3-29	C
2	MLK2	A1MP4-26	A
46	GND		H
3	ICM1	A1MP8-29	C
21	ICM2	A1MP2-5	C
4	ICM3	A1MP2-24	C
22	ICM2	A1MP2-6	C
5	ICM4	A1MP2-25	C
23	ICM4	A1MP2-7	C
6	ICM7	A1MP2-29	C
24	ICM8	A1MP2-8	C
7	ICM8	A1MP2-27	C
25	ICM9	A1MP2-9	C
8	ICM10	A1MP2-28	C
26	ICM1P	A1MP2-10	C
9	500 KHZ	A10AP1-26	A
27	REVISED OUTPUT	A10AP1-18	F
10	GND		
28	SCAN GND	A10AP1-19	H
11	NC		
29	NC		
12	NC		
30	NC		
13	NC		
31	NC		
14	EN2	A10AP1-22, A10A1P1-23, A10A3P1-24	C
32	EN1		C
15	-10V		H
33	-10V		H
16	+20V		H
34	+20V		H
17	GND		H
35	GND		H
18	-8.2V		H
36	+5.2V		H

SERIAL NUMBER PREFIX: 2410A

FIGURE 3. A10A7 PLL2 DIVIDER, SCHEMATIC DIAGRAM

ManualsPlus.com

A10A8 PLL2 Discriminator

ManualsPlus.com

A10A8 PHASE LOCK LOOP 2 (PLL2) DISCRIMINATOR, CIRCUIT DESCRIPTION

The A10A8 PLL2 Discriminator combines the error voltage information from the A10A6 PLL2 Phase Detector, the attenuated scan information (SCAN DAC IN) from the A16 Scan Generator, and the tuning information from the A12 Front-Panel Interface (via the Instrument Bus) to produce a tuning current to tune the oscillator in the A10A5 PLL2 VCO.

Pulse Generator (A)

A10A5 PLL2 VCO provides an ECL level .15 to .30 MHz input which is amplified by Q6 and Q7. At the beginning of a cycle, both inputs of gate U7D are low. When Q7 collector goes high, U7D output goes low, saturating Q11 and causing resonator L4, C15, C16 to ring at 5.2 MHz. This damped oscillation appears at Q9 collector, is clipped by Q10, and used to drive counter U6. U6 is preset to a count of 6. When the count reaches 8, the (8) output of U6 goes high. This is fed back to the other input of U7D, holding its output low after the input from Q7 goes low. After 1.6 μsec, the count reaches 16, (8) goes low again, U7D output goes high, Q11 is turned off, resulting in the resonance being damped by R17. At the count of 16, U7C and U7B reset the counter to 5. Before the oscillation is fully damped, the counter gets clocked to 6. U7A prevents a latch-up condition by clearing the counter in the event that the output of U7D remains low for a long period of time.

−7V Reference Supply (C)

U13 biases reference diode VR1 at 7.5 mA, and provides a low impedance source at −7.0V ±1%.

Current Source (B)

The −7V source, via R6 and Q3A, provides current which develops a stable 7V drop across R7 and Q3B. This acts as the reference for a 3.2 mA current source comprised of U4 and Q4. This current flows to ground through Q5A when the (8) output of U6 is low. If an input pulse has triggered the pulse generator, the current is switched through Q5B for 1.6 μsec. Q5B's collector current goes through a low-pass filter to the summing point of the discriminator loop. The average value of this current is directly proportional to the input frequency, being 1.5 mA at 300 kHz. The current to frequency ratio is adjustable ±1% by the phase lock input on P1-28.

Summing Amplifier (F)

U3 is a noninverting integrator which responds to the voltage at the loop summing point, the junction of C22 and R43. The output of U3 is connected through R45 to the output summing network, whose output tunes the A10A5 PLL2 VCO. Non-zero voltages at the loop summing point will therefore cause the VCO frequency to change, until the current from the discriminator reaches a level which cancels the other input, returning the summing point voltage to zero. In this way, the VCO frequency is forced to be exactly proportional to the net current fed to the summing point.

Pretune (D)

The pre-tune circuit tunes the discriminator loop approximately to the desired frequency. The phase lock loop then applies small corrections to get the frequency exact. A 10-bit binary word representing the pretune frequency is latched by U9 and U12. The data programs DAC U11, whose output goes to U10. If the input is all zeros, the output of U10 is zero. The pretune current is then that which flows through R40: −1.5 mA. This tunes the input frequency to 300 kHz. A binary word representing decimal 1000 will result in +6.84V at U10's output, adding +0.5 mA to the summing point. The resulting −1.0 mA tunes the loop to 200 kHz.

ManualsPlus.com

Scan Attenuator (E)

The attenuated scan ramp is fed to the loop summing point via the range resistors selected by analog switches U1A and U1D. If U1D is closed, a +10V ramp causes a .5 MHz span (referred to the 15–30 MHz VCO output). U1A closed results in a 5 MHz span. U1B is closed when U1A is, feeding a current to the summing point which compensates for drift and nonlinearity in U1A.

U2A and U2B direct the scan ramp directly to the VCO. This "forward feed" helps compensate for the rather slow response of the discriminator loop.

U2C and U2D perform a logic function: U2-10 HI, U2-15 LO for wide scans; U2-10 LO, U2-15 HI for narrow scans, and both HI for scan disabled.

Output Current Source (G)

Q1 and Q2 form a low-noise current summing point for error signals from U3 and forward feed from the scan and phase lock inputs. The output current goes to the A10A5 PLL2 VCO.

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A8	85660-60176	9	1	BOARD ASSEMBLY, PHASE LOCK LOOP 2 (PLL2) DISCRIMINATOR	28480	85660-60176
A10A8C1	0160-4084	8	10	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A8C2	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A8C3	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A8C4	0180-0291	3	1	CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A10A8C5	0180-0197	8	2	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A10A8C6	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A10A8C7	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A8C8				NOT ASSIGNED		
A10A8C9	0160-3879	7	3	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A10A8C10	0160-2199	2	2	CAPACITOR-FXD 30PF +-5% 300VDC MICA	28480	0160-2199
A10A8C11	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A8C12	0160-0571	0	1	CAPACITOR-FXD 470PF +-20% 100VDC CER	28480	0160-0571
A10A8C13	0160-4892	6	2	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A10A8C14	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A8C15	0160-4605	9	1	CAPACITOR-FXD 36PF +-2% 500VDC CER 0+-30	28480	0160-4605
A10A8C16	0160-2252	8	1	CAPACITOR-FXD 6.2PF +-.25PF 500VDC CER	28480	0160-2252
A10A8C17	0160-3877	5	2	CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A10A8C18	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A8C19	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A8C20	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A10A8C21	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A8C22	0160-3079	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A10A8C23	0160-0161	4	1	CAPACITOR-FXD .01UF +-10% 200VDC POLYE	28480	0160-0161
A10A8C24	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A8C25	0160-3456	6	1	CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A8C26	0160-2199	2		CAPACITOR-FXD 30PF +-5% 300VDC MICA	28480	0160-2199
A10A8C27	0160-3877	5		CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A10A8C28	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A10A8C29	0160-2437	1	1	CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A10A8CR1	1901-0539	3	2	DIODE-SM SIG SCHOTTKY	28480	1901-0539
A10A8CR2	1901-0539	3		DIODE-SM SIG SCHOTTKY	28480	1901-0539
A10A8J1				P/O A10A8W2		
A10A8J2	1250-0544	9	1	CONNECTOR-RF SM-SNP M SGL-HOLE-FR 50-OHM	28480	1250-0544
A10A8J3				P/O A10A8W1		
A10A8L1	9140-0144	0	4	INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A10A8L2	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A10A8L3	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A10A8L4	9140-0392	0	1	INDUCTOR RF-CH-MLD 22UH 3% .166DX.385LG	28480	9140-0392
A10A8L5	9100-1629	4	1	INDUCTOR RF-CH-MLD 47UH 5% .166DX.385LG	28480	9100-1629
A10A8L6	9100-1666	9	1	INDUCTOR RF-CH-MLD 3.6MH 5% .23DX.57LG	28480	9100-1666
A10A8L7	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A10A8L8	0180-0229	7	1	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010D2
A10A8Q1	1854-0404	0	1	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A10A8Q2	1853-0281	9	2	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A10A8Q3	1854-0475	5	1	TRANSISTOR-DUAL NPN PD=750MW	28480	1854-0475
A10A8Q4	1855-0413	3	1	TRANSISTOR J-FET P-CHAN D-MODE TO-18 SI	27014	2N5116
A10A8Q5	1853-0269	3	1	TRANSISTOR-DUAL PNP 2N3009 PD=600MW	01295	2N3009
A10A8Q6	1853-0007	7	1	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A10A8Q7	1854-0019	3	1	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A10A8Q8	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A10A8Q9	1854-0247	9	1	TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
A10A8Q10	1853-0308	7	1	TRANSISTOR-DUAL PNP PD=600MW	28480	1853-0308
A10A8Q11	1853-0034	0	1	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A10A8R1	0757-0346	2	1	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A8R2	0757-0199	3	1	RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A10A8R3	0757-0123	3	1	RESISTOR 34.8K 1% .125W F TC=0+-100	28480	0757-0123
A10A8R4	0757-0442	9	1	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10A8R5	0698-3132	4	1	RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A10A8R6	0699-0078	3	3	RESISTOR 2.1K .1% .1W F TC=0+-10	28480	0699-0078
A10A8R7	0699-0078	3		RESISTOR 2.1K .1% .1W F TC=0+-10	28480	0699-0078
A10A8R8	0699-0078	3		RESISTOR 2.1K .1% .1W F TC=0+-10	28480	0699-0078
A10A8R9	2100-1739	0	1	RESISTOR-TRMR 5K 10% WW SIDE-ADJ 20-TRN	02660	3810P-502
A10A8R10	0699-0082	9	1	RESISTOR 215 .1% .1W F TC=0+-10	28480	0699-0082
A10A8R11	0757-0280	3	9	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A8R12	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A8R13	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A8R14	0698-3153	9	2	RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A10A8R15	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F

*Indicates Factory Selected Value

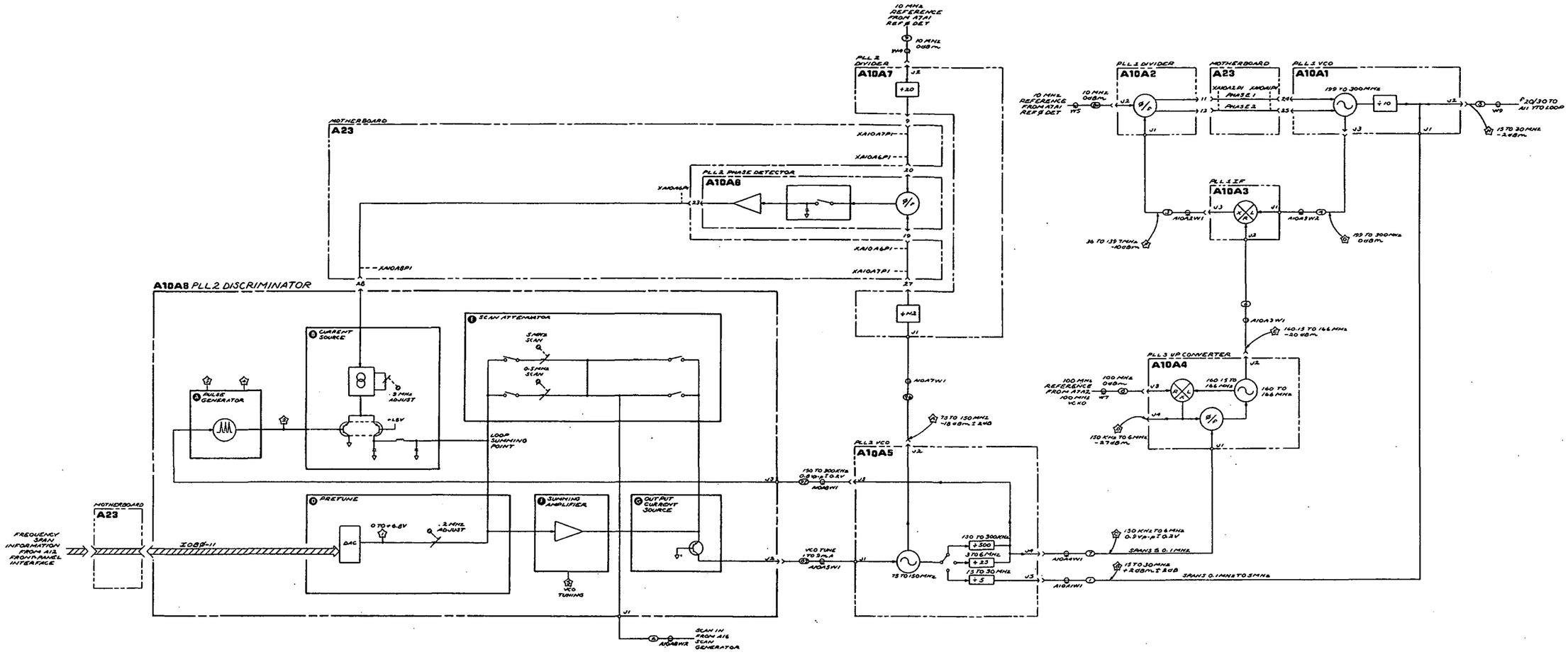
ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A8R16	0698-3151	7	1	RESISTOR 2.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2871-F
A10A8R17	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A8R18	0698-3445	2	1	RESISTOR 348 1% .125W F TC=0+-100	24546	C4-1/8-T0-348R-F
A10A8R19	0698-3447	4	1	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A10A8R20	0757-1094	9	2	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A10A8R21	0698-3444	1	1	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A10A8R22	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A8R23	0698-3152	8	1	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A10A8R24	0757-1094	9		RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A10A8R25	2100-1972	3	1	RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	02660	3810P-203
A10A8R26	0699-0081	8	1	RESISTOR 390K .1% .125W F TC=0+-10	28480	0699-0081
A10A8R27	2100-2851	9	1	RESISTOR-TRMR 2K 10% WW SIDE-ADJ 20-TRN	02660	3810P-202
A10A8R28	0699-0080	7	1	RESISTOR 39K .1% .125W F TC=0+-10	28480	0699-0080
A10A8R29	0698-3499	6	3	RESISTOR 40.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4022-F
A10A8R30	0698-3499	6		RESISTOR 40.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4022-F
A10A8R31	0698-3499	6		RESISTOR 40.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4022-F
A10A8R32	0698-3153	9		RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A10A8R33	0699-0084	1	1	RESISTOR 6.15K .1% .1W F TC=0+-10	28480	0699-0084
A10A8R34	0699-0083	0	1	RESISTOR 681 .1% .1W F TC=0+-25	28480	0699-0083
A10A8R35	0757-0400	9	1	RESISTOR 90.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-90R9-F
A10A8R36	0698-0003	8	1	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A10A8R37	0698-0084	9	1	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A10A8R38	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A8R39	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A8R40	0699-0079	4	1	RESISTOR 4.667K .1% .1W F TC=0+-10	28480	0699-0079
A10A8R41	2100-1799	2	1	RESISTOR-TRMR 500 10% WW SIDE-ADJ 20-TRN	02660	3810P-501
A10A8R42	0698-8831	0	1	RESISTOR 13.4K .1% .125W F TC=0+-10	28480	0698-8831
A10A8R43	0757-0274	5	1	RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1211-F
A10A8R44	0698-0085	0	1	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A10A8R45	0698-3150	6	1	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A10A8R46	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A8R47	0757-0430	3	1	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A8R48	0757-0394	0	1	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A8R49	0757-0401	0	2	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A10A8R50	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A10A8TP1	1251-0600	0	6	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A8TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A8TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A8TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A8TP5				NOT ASSIGNED		
A10A8TP6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A8TP7	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A8U1	1826-0582	6	2	IC SWITCH ANLG QUAD 16-DIP-C PKG	27014	LF13201D
A10A8U2	1826-0582	6		IC SWITCH ANLG QUAD 16-DIP-C PKG	27014	LF13201D
A10A8U3	5180-2315	1	1	IC 05C M1 OP AMP	28480	5180-2315
	5180-2314	0		NOTE: USE AS ALTERNATE FOR U3	28480	5180-2314
A10A8U4	1820-0223	0	2	IC OP AMP GP TO-99 PKG	3L585	CA301AT
A10A8U5	1820-0429	8	1	IC V RGLTR TO-39	18324	LM339H
A10A8U6	1820-1194	6	1	IC CNTR TTL LS BIN UP/DOWN SYNCHRO	01295	SN74LS193N
A10A8U7	1820-1144	6	1	IC GATE TTL LS NOR QUAD 2-INP	01295	SN74LS02N
A10A8U8	1826-0353	9	1	IC 7806L15 V RGLTR TO-39	07263	UA78L15ACH
A10A8U9	1820-1196	8	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A10A8U10	1826-0059	2	1	IC OP AMP GP TO-99 PKG	01295	LM201AL
A10A8U11	1826-0448	3	1	IC CONV 10-B-D/A 16-DIP-P PKG	24355	AD7520LN(SEL)
A10A8U12				NOT ASSIGNED		
A10A8U13	1820-0223	0		IC OP AMP GP TO-99 PKG	3L585	CA301AT
A10A8VR1	1902-0692	1	1	DIODE-ZNR 6.3V 1% DO-7 PD=.4W TC=+.001%	28480	1902-0692
A10A8W1	85660-60086	0	1	CBL AY WHT/VIO	28480	85660-60086
A10A8W2	85660-60071	3	1	CBL AY RED	28480	85660-60071
				MISCELLANEOUS PARTS		
	2190-0009	4	1	WASHER-LK INTL T NO. 8 .168-IN-ID	28480	2190-0009
	2190-0124	4	1	WASHER-LK INTL T NO. 10 .195-IN-ID	28480	2190-0124
	2200-0101	0	2	SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2200-0164	5	1	SCREW-MACH 4-40 .188-IN-LG UNCT 82 DEG	00000	ORDER BY DESCRIPTION
	2580-0002	4	1	NUT-HEX-DBL-CHAM 8-32-THD .065-IN-THK	28480	2580-0002
	2950-0078	9	1	NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
	3050-0021	5	1	WASHER-FL NM NO. 8 .188-IN-ID .375-IN-OD	28480	3050-0021
	3050-0032	8	1	WASHER-FL MTLC NO. 8 .189-IN-ID	28480	3050-0032
	3050-0907	6	1	WASHER-SHLDR NO. 10 .194-IN-ID	28480	3050-0907
	85660-20059	3	1	CVR PC 2 DISCRIM	28480	85660-20059
	86701-40001	9	1	EXTRACTOR PC	28480	86701-40001

*Indicates Factory Selected Value

ManualsPlus.com



A10A8

FIGURE 1. A10A8 PLL2 DISCRIMINATOR, BLOCK DIAGRAM

ManualsPlus.com

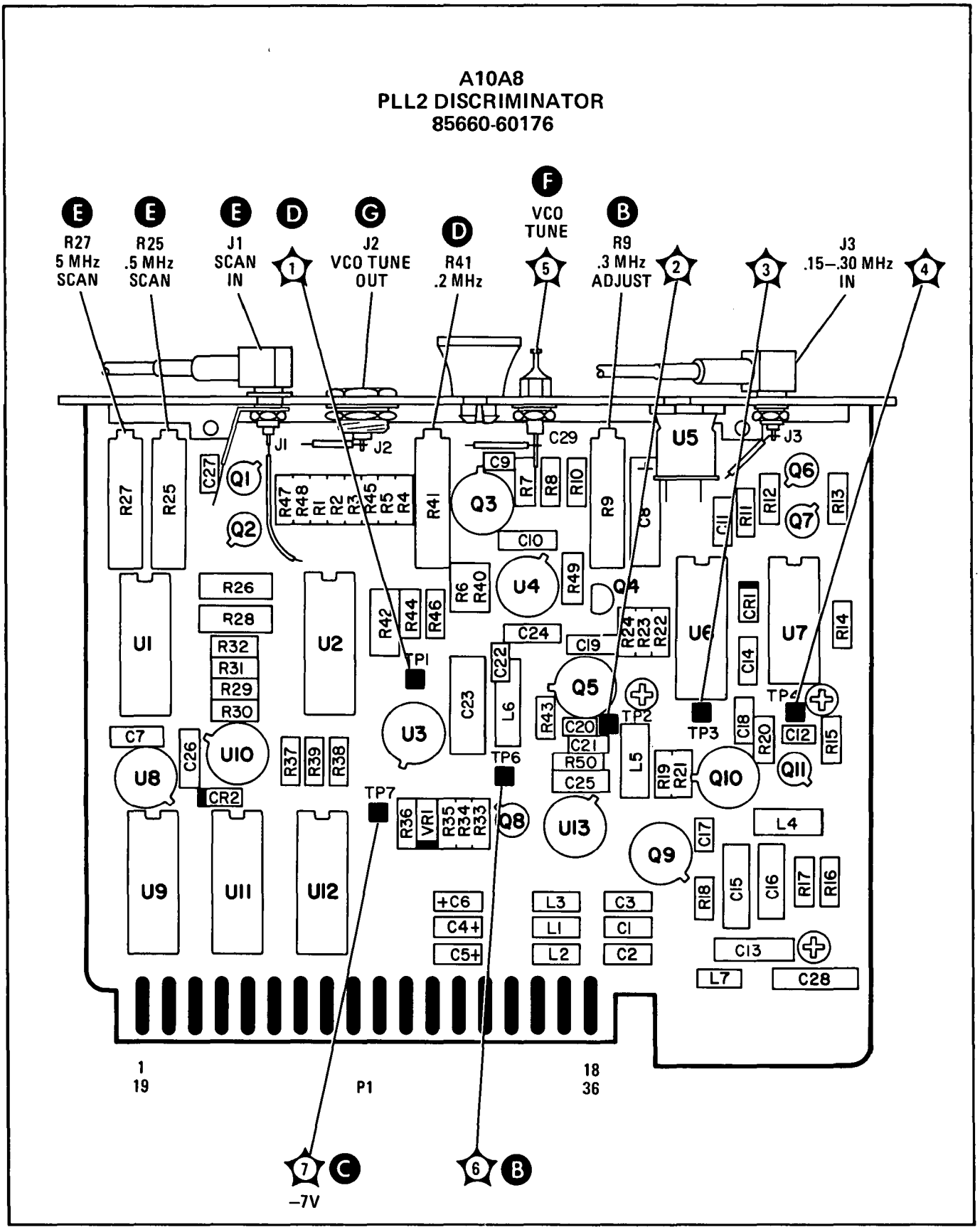


FIGURE 2. A10A8 PLL2 DISCRIMINATOR, COMPONENT LOCATIONS

ManualsPlus.com

RF SECTION

A10A8 PHASE LOCK LOOP 2 (PLL2) DISCRIMINATOR
85660-60178

P1

P1/J1	SIGNAL	TO/FROM	FUNCTION BLOCK
1	NC		
19	LOCK	A13P3-12	D
2	+8.5		NC
20	GND		NC
3	D001	A13P3-13	D
21	D002	A13P3-2	D
4	D003	A13P3-24	D
22	D004	A13P3-4	D
5	D005	A13P3-23	D
23	D006	A13P3-7	D
6	D007	A13P3-22	D
24	D008	A13P3-9	D
7	D009	A13P3-21	D
25	D010	A13P3-8	D
8	D011	A13P3-20	D
26	D012	A13P3-10	D
9	-7V	A10A8P1-7	C
27	GND		NC
10	SCAN GND	A10A8P1-9	C
28	TUNING VOLTAGE	A10A8P1-25	B
11	GND	A10A8P1-23	H
29	NC		
12	GND		H
30	NC		
13	GND		H
31	NC		
14	GND		H
32	NC		
33	-15V		H
15	+15V		H
16	+25V		H
34	+25V		H
17	GND		H
35	GND		H
18	+5.2V		H
36	+5.2V		H

NOTES:

1. REFERENCE DESIGNATORS WITHIN [illegible] ARE UNIQUE TO THIS ASSEMBLY. FOR CROSS-REFERENCE TO OTHER ASSEMBLIES, REFERENCE DESIGNATIONS WITH ASSEMBLY IDENTIFICATION ARE USED.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN Ω, ±5% (J OR K); CAPACITANCE IN PF, ±10% (K); INDUCTANCE IN UH ±10%; VOLTAGE IN DC MEASUREMENTS ±2%.
3. UNLESS OTHERWISE INDICATED: TRIANGLE ENTER IN LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCK.
4. ASSEMBLIES TABLE:

ASSEMBLY	DESCRIPTION
1368-11	INSTRUMENT RED BUS BITS 8255 B THRU 31
LCK3	1=HI=CLOCK3
HLK3	HIGH=PHASE LOCK LOOP 2 LOCK ENABLE

Ⓐ PULSE GENERATOR

Ⓑ CURRENT SOURCE

Ⓒ SCAN ATTENUATOR

Ⓓ -7V SUPPLY

Ⓔ POWER SUPPLIES

Ⓕ PRETUNE

Ⓖ SUMMING AMPLIFIER

Ⓗ OUTPUT CURRENT SOURCE

SERIAL NUMBER PREFIX: 2410A

A10A8

FIGURE 3. A10A8 PLL2 DISCRIMINATOR, SCHEMATIC DIAGRAM

ManualsPlus.com

A11 YTO Loop

ManualsPlus.com

A11 YTO LOOP AND A11A3 YTO REPLACEMENT

NOTE

For location of hardware and cables referred to in this procedure, see Figure 1.

With the ac line cords and RF Section bottom cover removed, proceed as follows:

1. Disconnect connector **(1)** from A11A1 (Coupler/Isolator/Amplifier) **(2)**. (Refer to View A.)

2. Remove the following cables from A11 YTO Loop: (Refer to View A.)

   8 (gray) (A11J1, ϕ DET OUT) **(5)**
   5 (green) (A11J3, 20/30 IN) **(6)**
   93 (white/orange) (A11J2, M/N IN) **(7)**
   0 (black) (A11J4, IF IN) **(9)**

3. Release YTO Loop from RF Section by removing three screws **(3)** as shown in View A. Note: Screws are marked with the letter "A" for easy identification.

4. Partially slide YTO Loop out from RF Section. Reach behind YTO Loop and disconnect cable **(10)** from motherboard connector. (Note position of cable.) (Refer to View B.)

5. Remove A11 YTO Loop from RF Section.

6. To replace A11A3 YTO (2.0 – 6.2 GHz OSCILLATOR), proceed as follows:

   a. Disconnect connector **(11)** from A11A3 YTO **(12)**. Disconnect cable **(13)** from YTO connector **(8)**. (Refer to View B.)

   b. To remove YTO, remove two screws **(4)** as shown in View A.

   c. When installing new YTO, reconnect connector **(11)** (refer to View B) before tightening screws **(4)** shown in View A.

   d. Reconnect cable **(13)** to YTO connector **(8)**. (Refer to View B.)

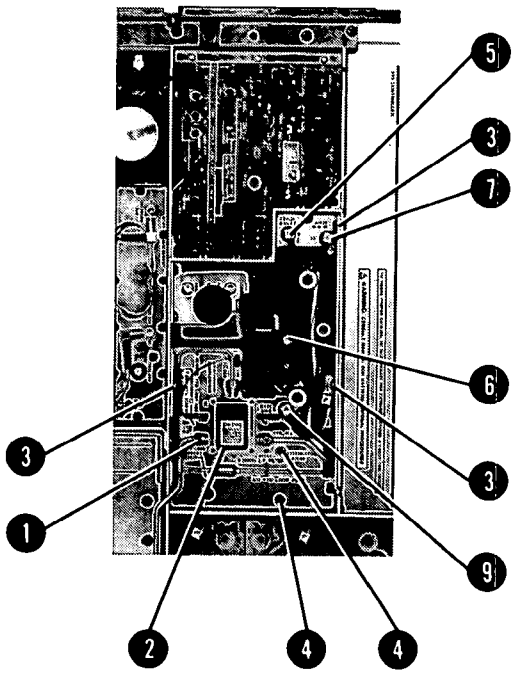
7. When installing A11 YTO Loop in RF Section, reconnect cable **(10)** to motherboard before completely sliding A11 into RF Section. (Refer to View B.)

8. Secure YTO Loop to RF Section with screws **(3)** as shown in View A.

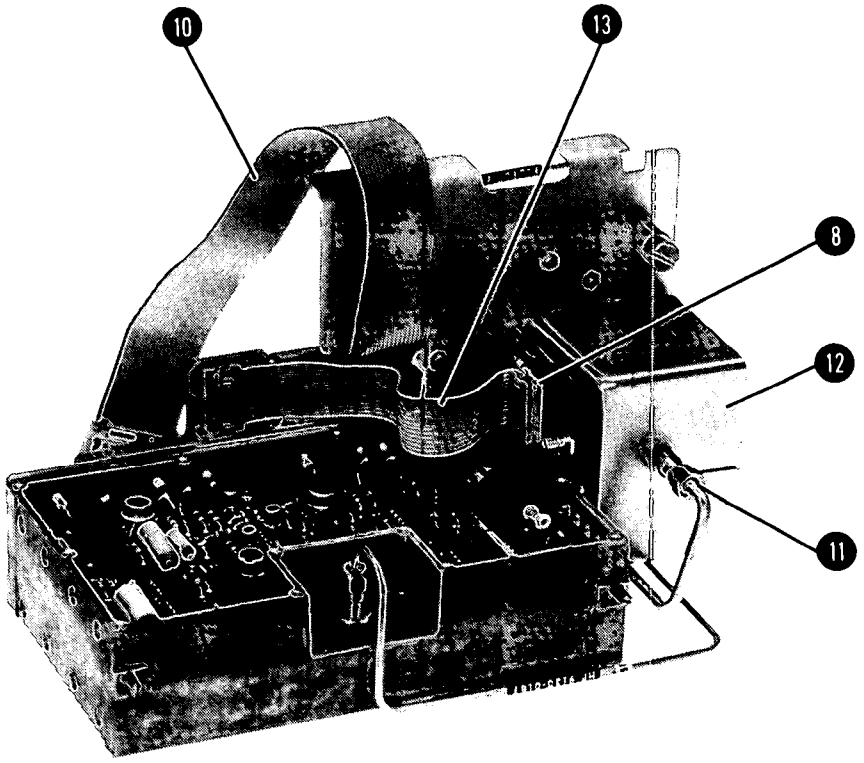
9. Reconnect cables and connectors to YTO Loop as removed in steps 1 and 2.

10. Replace bottom cover and ac line cords.

ManualsPlus.com



VIEW A



VIEW B

FIGURE 1. A11 YTO LOOP AND A11A3 YTO REPLACEMENT

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A11				YTO LOOP ASSEMBLY		
A11A1	5086-7295	6	1	COUPLER/ISOLATOR/AMPLIFIER (CIA)	28480	5086-7295
A11A2	85660-60123	6	1	BOARD ASSEMBLY, INTERCONNECT, YTO LOOP (MUST BE USED WITH A11A3 5086-7314)	28480	85660-60123
A11A3	5086-7314	0	1	YIG-TUNED OSCILLATOR (YTO) (NEW)	28480	5086-7314
A11A3	5086-6314	8	1	YIG-TUNED OSCILLATOR (YTO) (RESTORED 5086-7314)	28480	5086-6314
A11A4	85660-60175	8	1	BOARD ASSEMBLY, YIG-TUNED OSCILLATOR (YTO) DETECTOR	28480	85660-60175
A11A5	85660-60199	6	1	BOARD ASSEMBLY, SAMPLER	28480	85660-60199
A11A6	0955-0122	2	1	ATTENUATOR, COAXIAL	28480	0955-0122
A11A7	9135-0040	4	1	LOW-PASS FILTER, 6.2 GHZ	28480	9135-0040
A11C1	0160-3036	8	6	CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-3036
A11C2	0160-3036	8		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-3036
A11C3	0160-4748	1	3	CAPACITOR-FDTHRU 1000PF 20% 200V CER	28480	0160-4748
A11C4	0160-3036	8		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-3036
A11C5	0160-3036	8		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-3036
A11C6	0160-4748	1		CAPACITOR-FDTHRU 1000PF 20% 200V CER	28480	0160-4748
A11C7	0160-3036	8		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-3036
A11C8	0160-4748	1		CAPACITOR-FDTHRU 1000PF 20% 200V CER	28480	0160-4748
A11C9	0160-3036	8		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-3036
A11J1	1250-0691	7	5	CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0691
A11J2	1250-0691	7		CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0691
A11J3	1250-0691	7		CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0691
A11J4	1250-0691	7		CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0691
A11J5	1250-0691	7		CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0691
A11U1	5086-7292	3	1	SAMPLER, 2-6.0 GHZ	28480	5086-7292
A11W1	85660-20086	6	1	CABLE, A11A3 YTO TO A11A1 COUPLER	28480	85660-20086
A11W2	85660-20163	0	1	CABLE, A11A6 ATTENUATOR TO A11A5 SAMPLER	28480	85660-20163
A11W3	85660-20087	7	1	CABLE, A11A1 COUPLER TO A11A7 FILTER	28480	85660-20087
A11W4	85660-60081	5	1	CABLE ASSEMBLY, BLACK (A11A5 TO A11A4)	28480	85660-60081

*Indicates Factory Selected Value

ManualsPlus.com

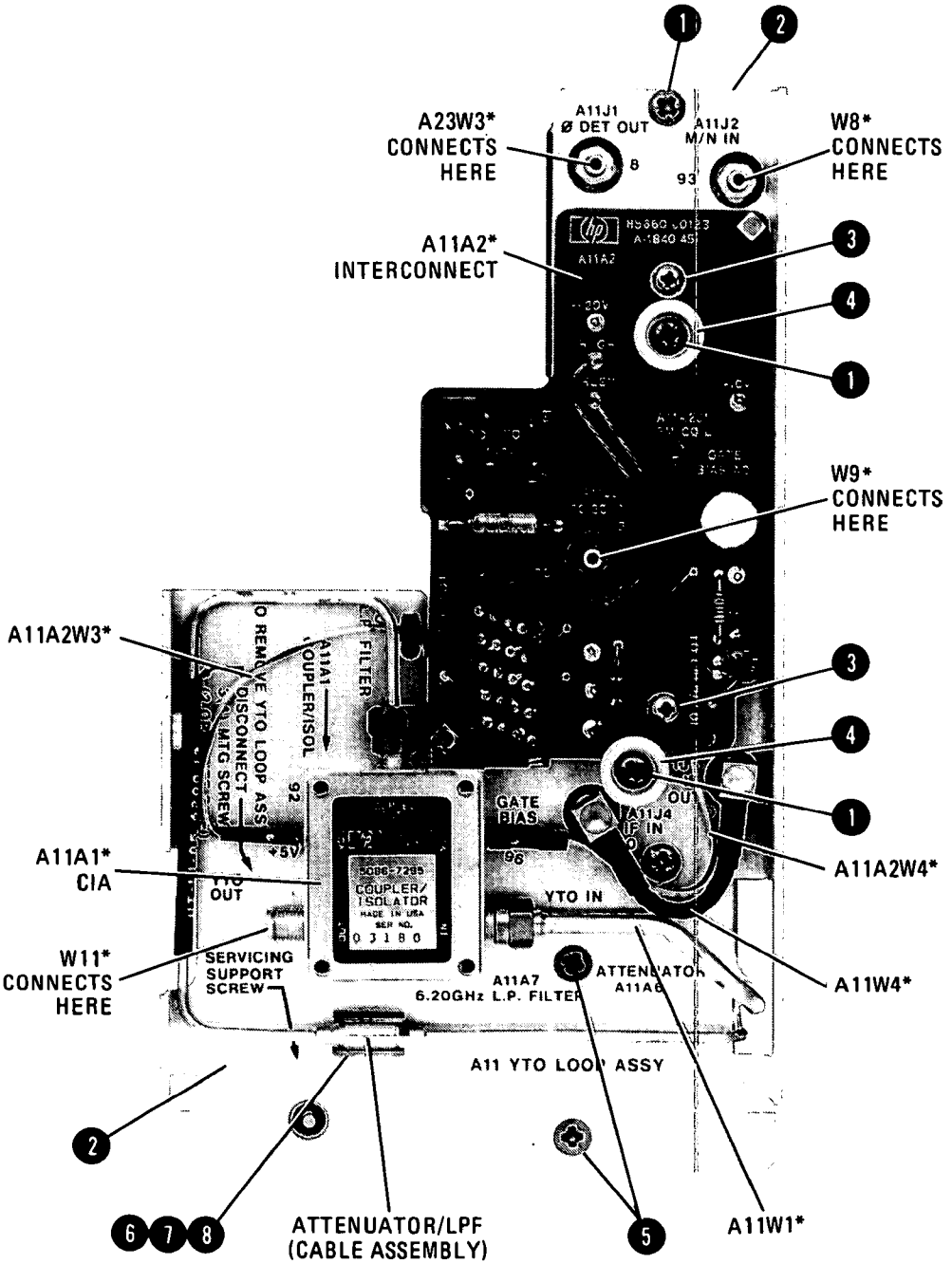
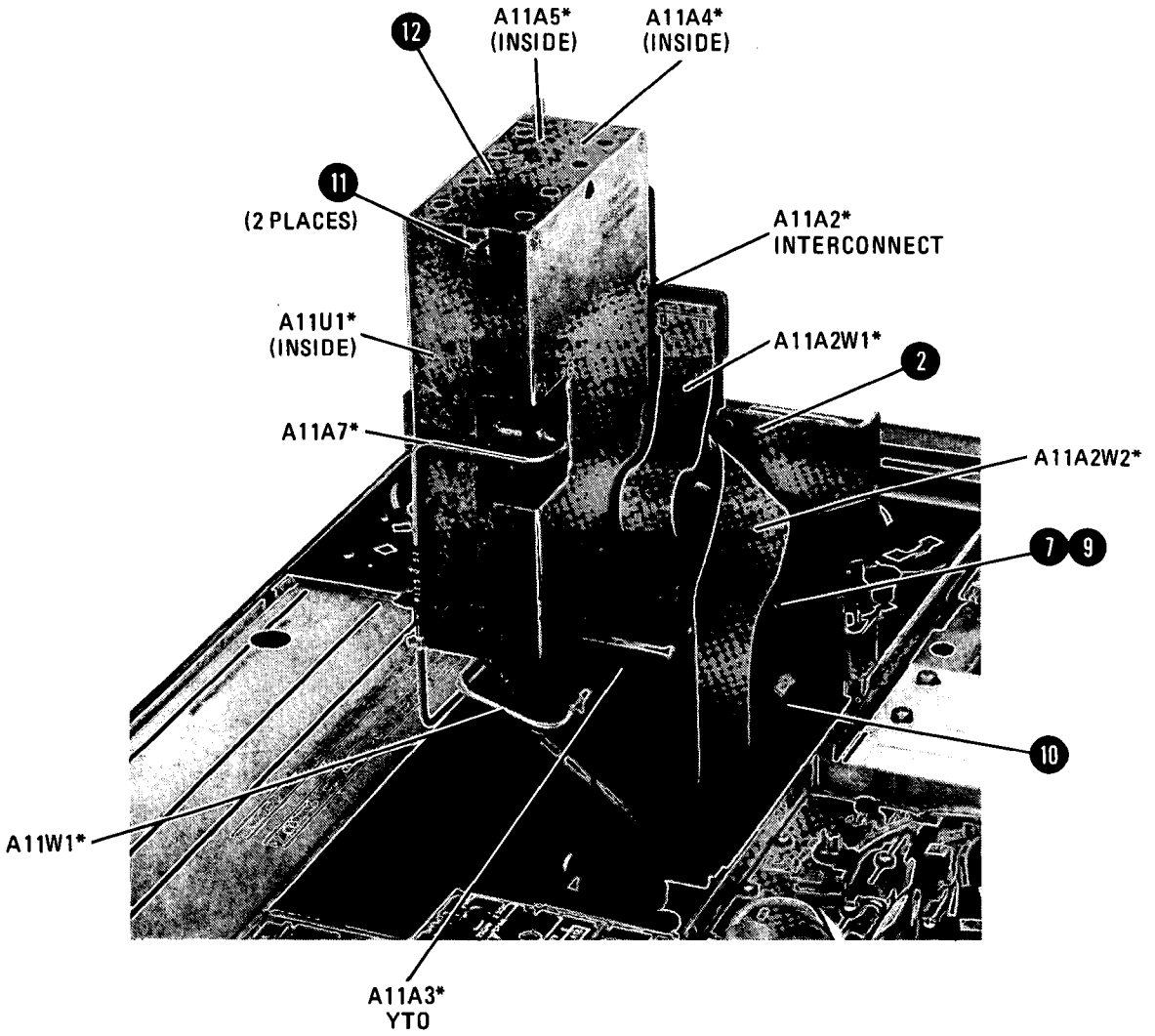


FIGURE 2. A11 YTO LOOP ASSEMBLY, PARTS IDENTIFICATION (1 OF 4)

ManualsPlus.com

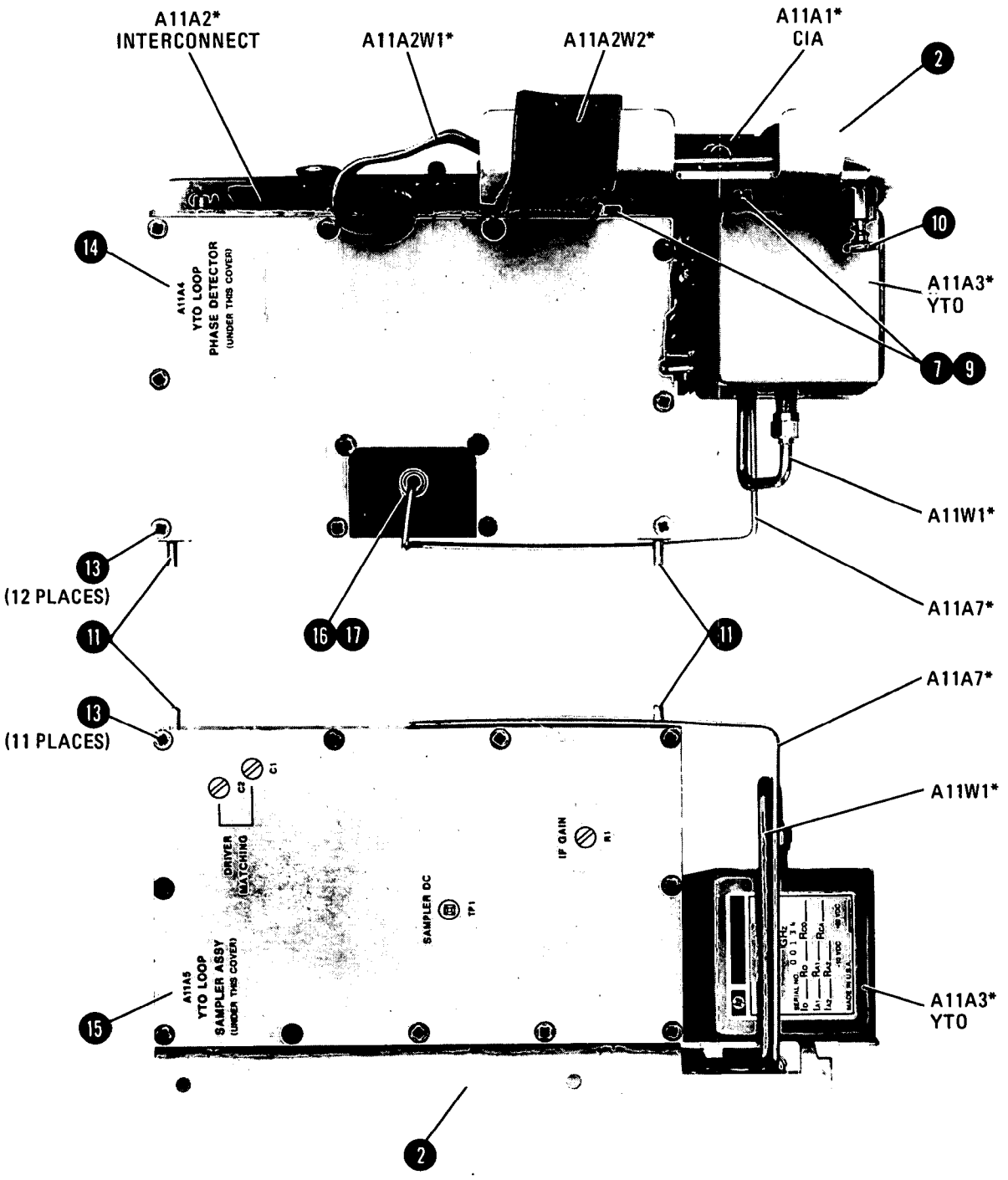
A11
YTO LOOP



*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

FIGURE 2. A11 YTO LOOP ASSEMBLY, PARTS IDENTIFICATION (2 OF 4)

ManualsPlus.com



*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

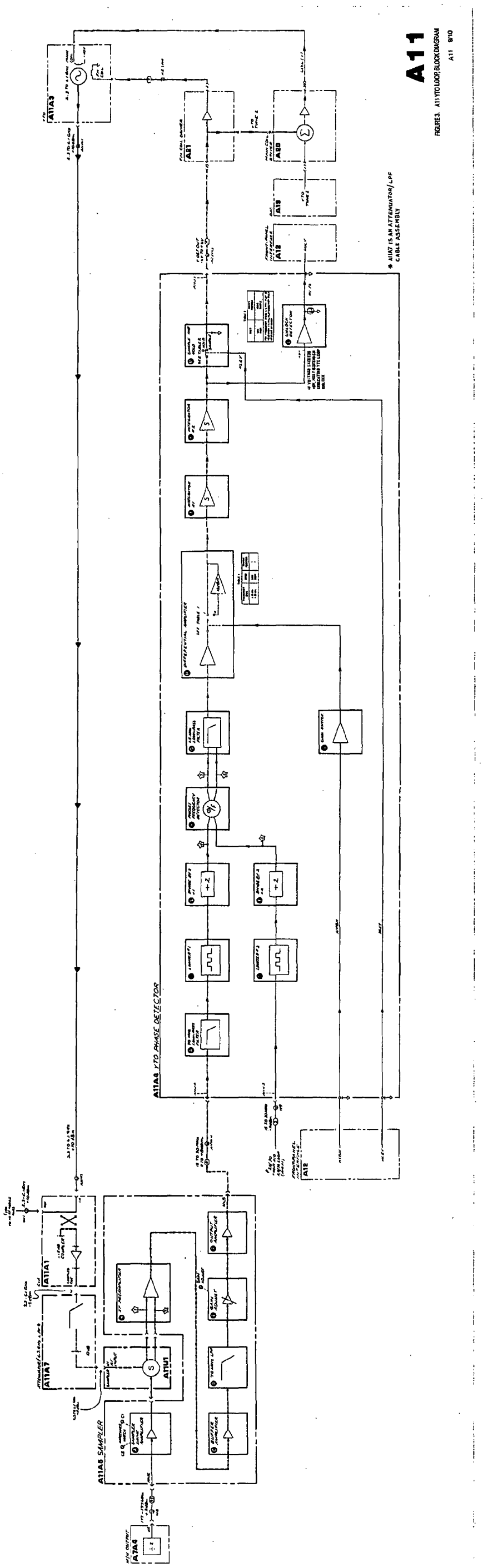
FIGURE 2. A11 YTO LOOP ASSEMBLY, PARTS IDENTIFICATION (3 OF 4)

ManualsPlus.com

Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
1	2360-0331	6	Screw, Mach, 6-32, .25-IN LG, PAN HD	28480	2360-0331
2	85660-00024	0	Deck, YTO Loop Assembly	28480	85660-00024
3	2200-0103	2	Screw, Mach, 4-40, .25-IN LG, PAN HD	28480	2200-0103
4	85660-20100	5	Extractor, YTO Loop Assembly	28480	85660-20100
5	2360-0333	8	Screw, Mach, 6-32, .25-IN LG, FLAT HD	28480	2360-0333
6	0520-0127	6	Screw, Mach, 2-56, .188-IN LG, PAN HD	28480	0520-0127
7	2190-0890	1	Washer, Lock, 2-56 (For screws (6) & (9))	28480	2190-0890
8	1400-0970	4	Clip, Component (For A11A7 LPF)	28480	1400-0970
9	0520-0129	8	Screw, Mach, 2-56, .312-IN LG, PAN HD	28480	0520-0129
10	1390-0284	0	Cap Screw Assembly	28480	1390-0284
11	85660-20088	8	Stud, YTO Loop Assembly	28480	85660-20088
12	86701-20009	5	Housing, YTO Loop Assembly	28480	86701-20009
13	2200-0165	6	Screw, Mach, 4-40, .25-IN LG, FLAT HD	28480	2200-0165
14	85660-00035	3	Cover, Housing (A11A4 YTO ϕ DET)	28480	85660-00035
15	85660-00034	2	Cover, Housing (A11A5 Sampler)	28480	85660-00034
16	1250-1143	6	Nut, Hex, RF Connector	28480	1250-1143
17	1250-1142	5	Washer, Lock, RF Connector	28480	1250-1142

FIGURE 2. A11 YTO LOOP ASSEMBLY, PARTS IDENTIFICATION (4 OF 4)

ManualsPlus.com



ManualsPlus.com

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A11A2	85660-60123	6	1	BOARD ASSEMBLY, INTERCONNECT, YTO LOOP	28480	85660-60123
A11A2C1	0180-0374	3	1	CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A11A2C2	0160-3879	7	1	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A11A2L1	9100-2262	3	1	INDUCTOR RF-CH-MLD 3.9UH 10% .105DX.26LG	28480	9100-2262
A11A2R1	0757-0280	3	1	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A11A2R2	2100-1775	4	1	RESISTOR-TRMR 5K 5% WW TOP-ADJ 1-TRN	28480	2100-1775
A11A2W1	8120-2801	7	1	FLAT RIBBON ASSY 28-AWG 14-COND	28480	8120-2801
A11A2W2	8120-2803	9	1	FLAT RIBBON ASSY 28-AWG 20-COND	28480	8120-2803
A11A2W3	85660-60108	7	1	CBL AY +5V	28480	85660-60108
A11A2W4	85660-60109	8	1	CBL AY GATE BIAS	28480	85660-60109

*Indicates Factory Selected Value

ManualsPlus.com

A11A2
YTO LOOP INTERCONNECT
85660-60123

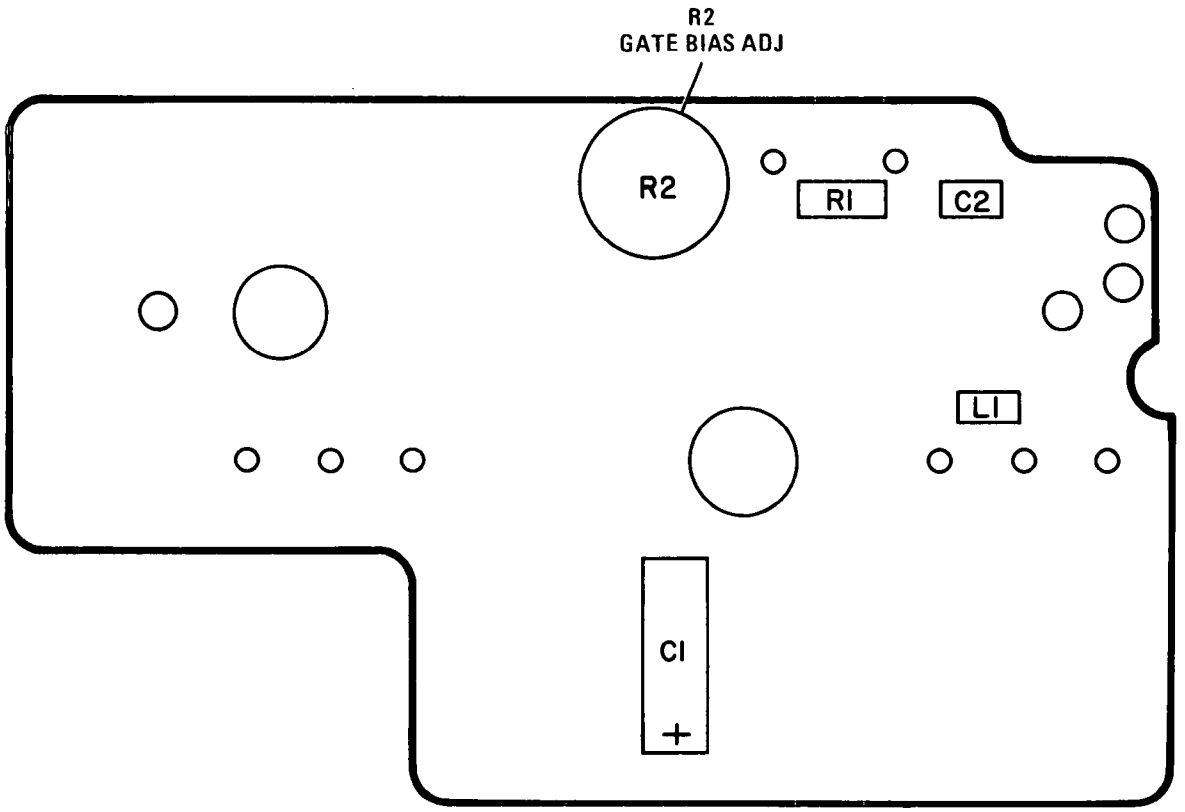
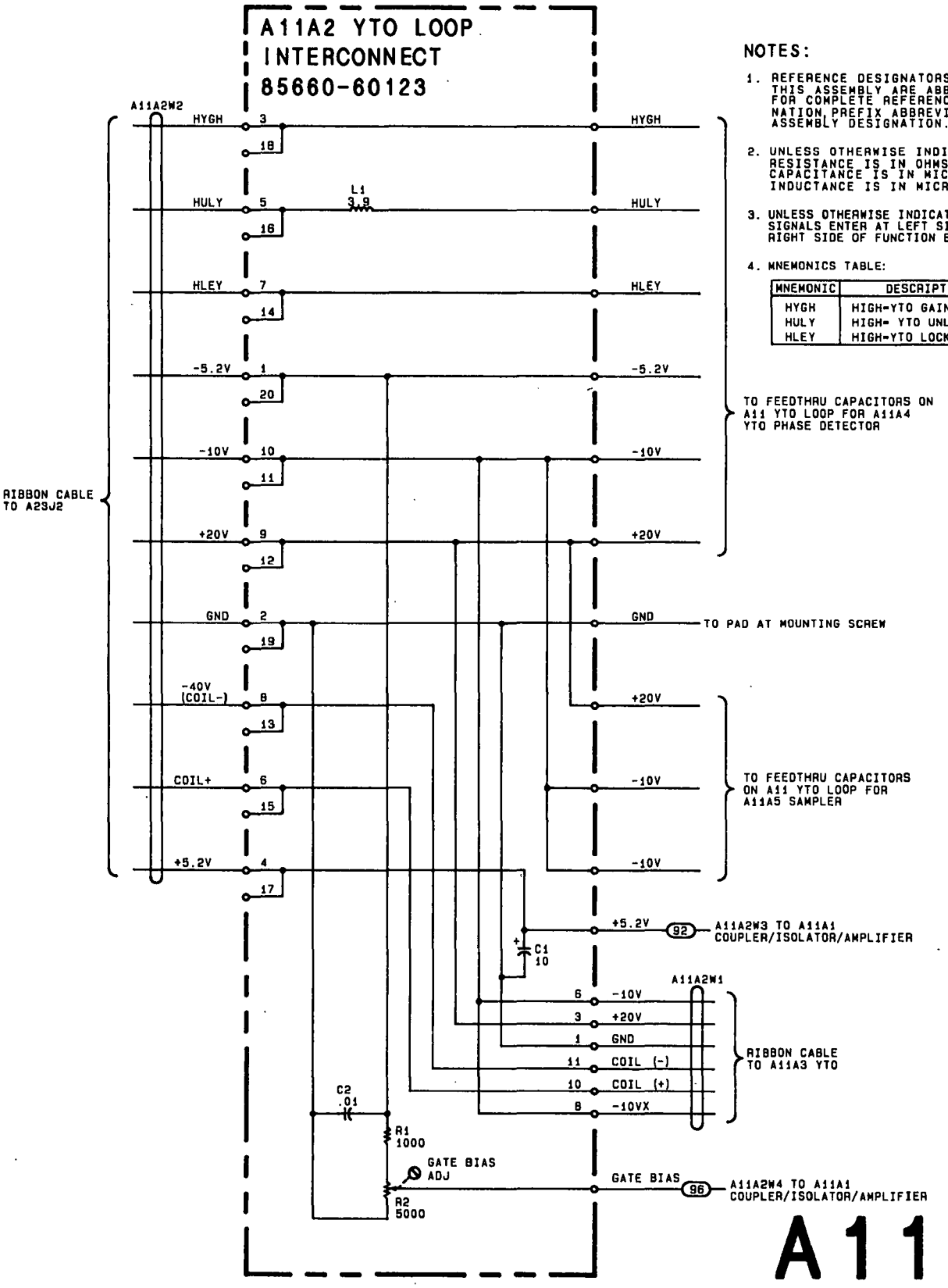


FIGURE 1. A11A2 YTO LOOP INTERCONNECT, COMPONENT LOCATIONS

ManualsPlus.com



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (μF) INDUCTANCE IS IN MICROHENRIES (μH)
3. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.
4. MNEMONICS TABLE:

MNEMONIC	DESCRIPTION
HYGH	HIGH=YTO GAIN HIGH
HULY	HIGH= YTO UNLOCKED
HLEY	HIGH=YTO LOCK ENABLE

A11A2

SERIAL NUMBER PREFIX: 2410A

FIGURE 2. A11A2 YTO LOOP INTERCONNECT, INTERCONNECT DIAGRAM

ManualsPlus.com

A11A4 YTO Phase Detector

ManualsPlus.com

A11A4 YIG-TUNED OSCILLATOR (YTO), PHASE DETECTOR, CIRCUIT DESCRIPTION

The A11A4 YTO Phase Detector compares the frequency and phase of the A11A5 Sampler IF signal to the output of the A10 20/30 Synthesizer Loop. The resultant error signal is integrated, amplified, and applied to the A21 FM Coil Driver where it is routed to either the main coil (dc path) or FM coil (ac path) of the A11A3 YTO. This tunes the YTO frequency the proper amount in the proper direction to maintain phase lock.

70 MHz LPF (A)

The output of the A11A5 Sampler (IF IN) is passed through a 70 MHz LPF to remove any unwanted frequencies which may have been introduced during the sampling process.

Limiters (B) and (C) and Divide By Twos (D) and (E)

Each of the two input signals (IF IN and 20/30 IN) are passed through a limiter to establish ECL signal levels. Each signal is then divided by two before being applied to the phase/frequency detector. This lowers the frequency at which the detector must operate.

Phase/Frequency Detector (F) and 1.5 MHz LPF (G)

The two input signals (IF IN and 20/30 IN), after being divided by two, are applied to Phase Frequency Detector U3. The function of U3 is to output a pulse which is related to the phase difference of the two input signals. The width of this pulse is directly proportional to the amount of phase difference. If the IF signal leads the 20/30 signal, a negative pulse appears at U3 pin 3 (TP3), the width of which is proportional to the amount of phase difference. If the 20/30 signal leads the IF signal, a negative pulse appears at U3 pin 12 (TP2). In each case, the other output pin remains at an ECL high level (approximately -0.6V). If the inputs are in phase, one of the detector outputs is an ECL high (approximately -0.6V) with narrow negative spikes and the other just an ECL high. The detector outputs are averaged in the 1.5 MHz LPF before being applied to the differential amplifier.

Differential Amplifier (H)

The detector outputs are applied to Differential Amplifier Q4. The output of this differential amplifier is directly related to the phase difference of the IF IN and 20/30 IN signals.

Loop Gain Switch (I)

In frequency spans less than 25 kHz (N = 1), Loop Gain Switch **(I)** is enabled. The enable signal HYGH (High = YTO Gain High) is from the A12 Front-Panel Interface and is high whenever a frequency span of less than 25 kHz is selected. This high turns on Q2 which turns on Q3 which causes Q1 to saturate. Q1 then effectively becomes a short, placing R14 between the emitters of Q4A and Q4B. This lowers the emitter resistance by a factor of four, increasing the gain by approximately 12 dB. This improves phase noise at narrow frequency spans (<25 kHz).

Integrator #1 (J)

Integrator #1 produces a ramp output proportional to the amplitude and period of the input. This integrating action is performed by R16, R21, and C12. Diodes CR2 and CR3 limit the upper and lower ramp voltages to one diode drop (approximately 0.6V). This ramp may be in either a positive or negative direction depending on the input. When the loop is locked and the instrument is in zero frequency span, the output is a dc level.

ManualsPlus.com

Integrator #2 (K)

Integrator #2 also produces a ramp output but of greater amplitude due to zener diodes VR1 and CR2. The upper and lower ramp voltages are limited by VR1/CR6 and VR2/CR7 to approximately 6.8V. This corresponds to a capture range of about ±20 MHz, since YTO sensitivity is −3 MHz/V. Integrating action is performed by R24, R25, and C16. In zero frequency span, when the loop is locked, the output is a dc level.

Sample and Hold (M)

The purpose of the sample and hold (U1 and associated circuitry) is to sample the ramp voltage output of the integrators to tune the YTO frequency, then hold this dc value to prevent the YTO loop from affecting the YTO Sweep.

For frequency spans less than 5 MHz (including ZERO), U1 is held in the sample mode. This means that the YTO is phase locked during the entire sweep for frequency spans less than 5 MHz.

For frequency spans greater than 5 MHz (fundamental mixing only), phase lock is performed only at the start of each sweep as follows. Just prior to a sweep, U1 is placed in the sample mode, the sampled output is applied to YTO to correct its frequency and phase lock occurs. Then U1 is placed in the hold mode, which stores the sampled output voltage across C1. This voltage keeps the YTO tuned to the correct frequency. The sweep occurs and the sequence is repeated.

The mode of operation of U1 is determined by control signal HLEY (High = YTO Lock Enable) from the A12 Front-Panel Interface. The duration of the sample mode is determined by HLEY which varies with frequency span selected.

Unlock Detector (L)

Phase lock is obtained by use of the YTO (FM coil for ac corrections and main coil dc corrections) which has a frequency tuning range of approximately ±20 MHz at 3 MHz/V sensitivity.

Unlock Detector U2 and associated circuitry is used to determine when the error voltage is too large for the YTO Loop to respond. This detection is performed for both positive and negative error voltages by U2A and U2B respectively.

If the error voltage (ramp output of Integrator #2) exceeds ±6.1V, control signal HULY (High = YTO Unlocked) is generated and routed to the A12 Front-Panel Interface where it causes a service request to be generated. Coded information corresponding to this request is placed on the Instrument Bus and is detected by the A15 Controller which turns on the "YTO UNLOCK" annotation on the CRT.

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A11A4	85660-60175	8	1	BOARD ASSEMBLY, YIG-TUNED OSCILLATOR (YTO) DETECTOR	28480	85660-60175
A11A4C1	0160-3787	6	1	CAPACITOR-FXD 1UF +-10% 50VDC MET-POLYC	28480	0160-3787
A11A4C2	0180-0116	1	1	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A11A4C3	0180-0197	8	2	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A11A4C4	0160-2307	4	2	CAPACITOR-FXD 47PF +-5% 300VDC MICA	28480	0160-2307
A11A4C5	0160-2307	4		CAPACITOR-FXD 47PF +-5% 300VDC MICA	28480	0160-2307
A11A4C6	0160-2200	6	1	CAPACITOR-FXD 43PF +-5% 300VDC MICA	28480	0160-2200
A11A4C7	0160-2264	2	1	CAPACITOR-FXD 20PF +-5% 500VDC CER 0+-30	28480	0160-2264
A11A4C8	0160-0574	3	4	CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A11A4C9	0160-3879	7	2	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A11A4C10				NOT ASSIGNED		
A11A4C11	0160-3538	5	2	CAPACITOR-FXD 750PF +-5% 100VDC MICA	28480	0160-3538
A11A4C12	0160-0165	8	1	CAPACITOR-FXD .056UF +-10% 200VDC POLYE	28480	0160-0165
A11A4C13				NOT ASSIGNED		
A11A4C14				NOT ASSIGNED		
A11A4C15	0160-4835	7	2	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A11A4C16	0160-2453	1	1	CAPACITOR-FXD .22UF +-10% 80VDC POLYE	28480	0160-2453
A11A4C17	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A11A4C18				NOT ASSIGNED		
A11A4C19	0160-4787	8	1	CAPACITOR-FXD 22PF +-5% 100VDC CER 0+-30	28480	0160-4787
A11A4C20	0160-3661	5	1	CAPACITOR-FXD .1UF +-5% 50VDC MET-POLYC	28480	0160-3661
A11A4C21	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A11A4C22				NOT ASSIGNED		
A11A4C23	0160-3538	5		CAPACITOR-FXD 750PF +-5% 100VDC MICA	28480	0160-3538
A11A4C24				NOT ASSIGNED		
A11A4C25	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A11A4C26	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A11A4C27	0160-0574	3		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A11A4C28	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A11A4CR1	1901-0040	1	5	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11A4CR2	1901-0518	8	2	DIODE-SM SIG SCHOTTKY	28480	1901-0518
A11A4CR3	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A11A4CR4	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11A4CR5	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11A4CR6	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11A4CR7	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11A4L1	9100-1620	5	3	INDUCTOR RF-CH-MLD 15UH 10% .166DX.385LG	28480	9100-1620
A11A4L2	9100-1641	0	2	INDUCTOR RF-CH-MLD 240UH 5% .166DX.385LG	28480	9100-1641
A11A4L3	9100-1641	0		INDUCTOR RF-CH-MLD 240UH 5% .166DX.385LG	28480	9100-1641
A11A4L4	9100-0368	6	2	INDUCTOR RF-CH-MLD 330NH 10% .105DX.26LG	28480	9100-0368
A11A4L5	9100-2254	3	2	INDUCTOR RF-CH-MLD 390NH 10% .105DX.26LG	28480	9100-2254
A11A4L6	9100-2254	3		INDUCTOR RF-CH-MLD 390NH 10% .105DX.26LG	28480	9100-2254
A11A4L7	9100-0368	6		INDUCTOR RF-CH-MLD 330NH 10% .105DX.26LG	28480	9100-0368
A11A4L8	9100-1620	5		INDUCTOR RF-CH-MLD 15UH 10% .166DX.385LG	28480	9100-1620
A11A4L9	9100-1620	5		INDUCTOR RF-CH-MLD 15UH 10% .166DX.385LG	28480	9100-1620
A11A4Q1	1855-0395	0	1	TRANSISTOR J-FET N-CHAN D-MODE TO-52 SI	17856	FN2645
A11A4Q2	1854-0404	0	1	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A11A4Q3	1853-0451	5	1	TRANSISTOR PNP 2N3799 SI TO-18 PD=360MW	01295	2N3799
A11A4Q4	1854-0475	5	1	TRANSISTOR-DUAL NPN PD=750MW	28480	1854-0475
A11A4R1	0698-7212	9	3	RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-TO-100R-F
A11A4R2	0698-7212	9		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-TO-100R-F
A11A4R3	0698-7219	6	2	RESISTOR 196 1% .05W F TC=0+-100	24546	C3-1/8-TO-196R-F
A11A4R4	0698-7219	6		RESISTOR 196 1% .05W F TC=0+-100	24546	C3-1/8-TO-196R-F
A11A4R5	0698-7212	9		RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-TO-100R-F
A11A4R6	0698-3132	4	2	RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A11A4R7	0698-3440	7	2	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A11A4R8	0757-0280	3	2	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A11A4R9	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A11A4R10	0757-0442	9	7	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A11A4R11	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A11A4R12	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A11A4R13	0698-7208	9	1	RESISTOR 147K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1473-F
A11A4R14	0757-0418	9	1	RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A11A4R15	0757-0438	3	2	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A11A4R16	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A11A4R17	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A11A4R18	0698-3132	4		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A11A4R19	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A11A4R20	0698-3154	0	1	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F

*Indicates Factory Selected Value

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A11A4R21	0757-1094	9	1	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A11A4R22	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A11A4R23				NOT ASSIGNED		
A11A4R24*	0698-0082	7	1	RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A11A4R25	0698-3152	8	1	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A11A4R26				NOT ASSIGNED		
A11A4R27	0757-0440	7	1	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A11A4R28	0757-0458	7	1	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A11A4R29	0698-3157	3	1	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A11A4R30	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A11A4R31	0757-0416	7	2	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A11A4R32	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A11A4R33	0698-4020	1	1	RESISTOR 9.53K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9531-F
A11A4R34	0698-0085	0	1	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A11A4R35	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A11A4R36	0698-3136	8	1	RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A11A4R37	0757-0279	0	1	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A11A4R38-A11A4R42				NOT ASSIGNED		
A11A4R43	0757-0421	4	1	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A11A4R44-A11A4R52				NOT ASSIGNED		
A11A4R53	0757-0394	0	1	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A11A4R54	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A11A4TP1	1251-0600	0	4	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A11A4TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A11A4TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A11A4TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A11A4U1	1826-0422	3	1	IC SMPL/HOLD TO-99 PKG	27014	LF298H
A11A4U2	5081-8117	3	1	SCREEN 1826-0092	28480	5081-8117
A11A4U3	1820-1344	8	1	IC PL LOOP 14-DIP-C PKG	04713	MC12040L
A11A4U4	1820-0802	1	1	IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A11A4U5	1826-0783	9	2	IC OP AMP LOW-NOISE 8-DIP-C PKG	52063	XR5534ACN
A11A4U6	1820-0817	8	2	IC FF ECL D-M/S DUAL	04713	MC10131P
A11A4U7	1810-0204	6	1	NETWORK-RES 8-SIP1.0K OHM X 7	31121	208A102
A11A4U8	1820-0817	8		IC FF ECL D-M/S DUAL	04713	MC10131P
A11A4U9	1826-0783	9		IC OP AMP LOW-NOISE 8-DIP-C PKG	52063	XR5534ACN
A11A4VR1	1902-1260	1	2	DIODE-ZNR 1N5525C 6.2V 2% DO-7 PD=.4W	04713	1N5525C
A11A4VR2	1902-1260	1		DIODE-ZNR 1N5525C 6.2V 2% DO-7 PD=.4W	04713	1N5525C
A11A4VR3				NOT ASSIGNED		
A11A4VR4	1902-3082	9	1	DIODE-ZNR 4.64V 5% DO-35 PD=.4W	28480	1902-3082

*Indicates Factory Selected Value

ManualsPlus.com

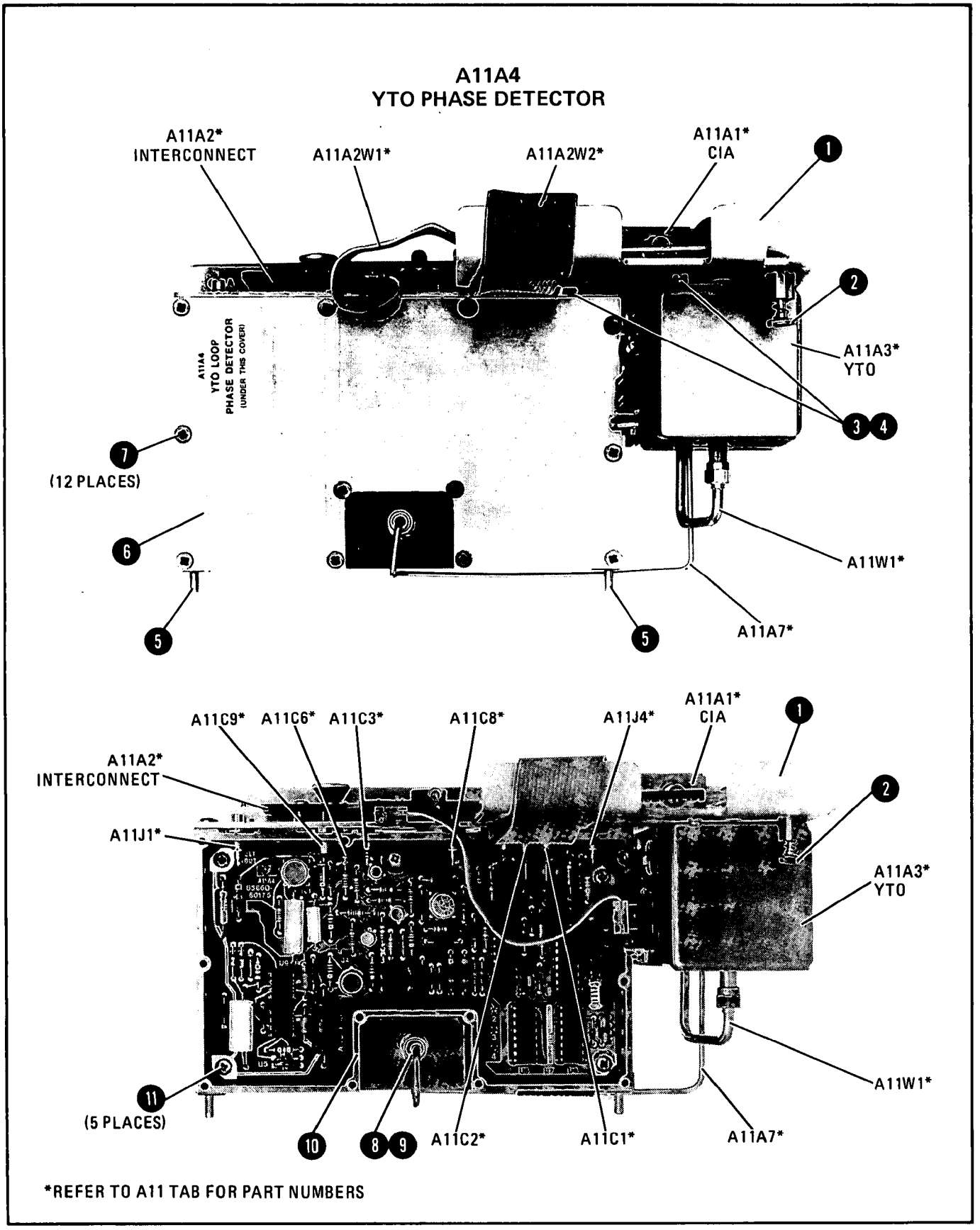
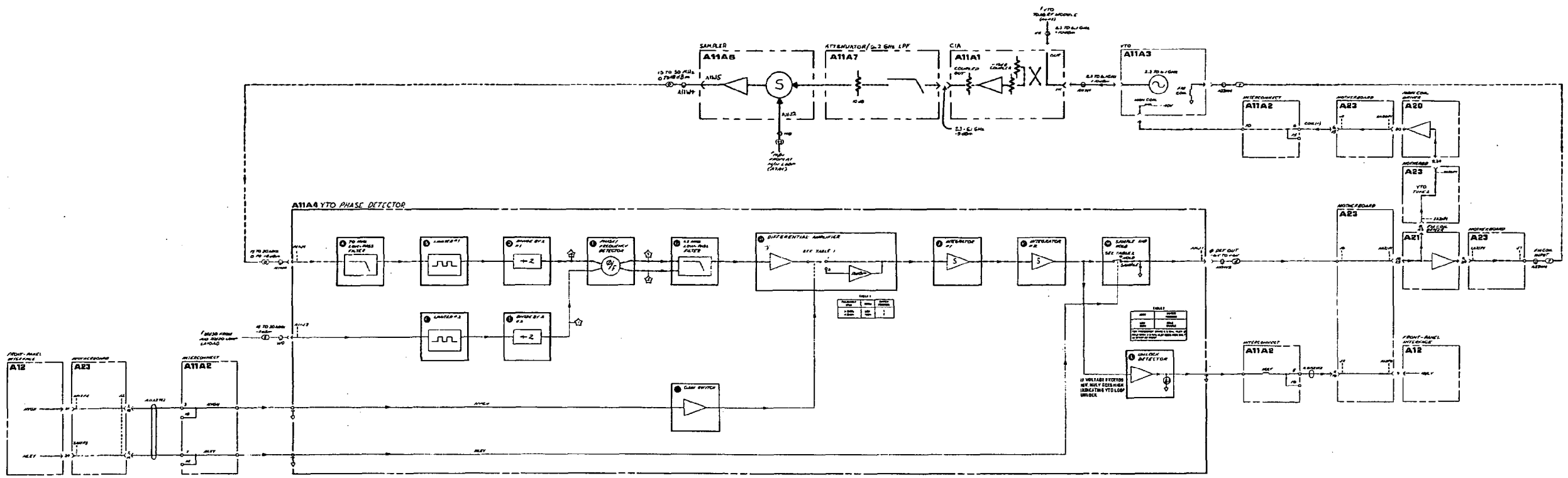


FIGURE 1. A11A4 YTO PHASE DETECTOR, PARTS IDENTIFICATION (1 OF 2)

ManualsPlus.com

Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
1	85660-00024	0	Deck, YTO Loop Assembly	28480	85660-00024
2	1390-0284	0	Cap Screw Assembly	28480	1390-0284
3	0520-0129	8	Screw, Mach, 2-56, .312-IN LG, PAN HD	28480	0520-0129
4	2190-0890	1	Washer, Lock, 2-56 (For screw (3))	28480	2190-0890
5	85660-20088	8	Stud, YTO Loop Assembly	28480	85660-20088
6	85660-00035	3	Cover, Housing (A11A4 YTO ϕ DET)	28480	85660-00035
7	2200-0165	6	Screw, Mach, 4-40, .25-IN LG, FLAT HD	28480	2200-0165
8	1250-1143	6	Nut, Hex, RF Connector	28480	1250-1143
9	1250-1142	5	Washer, Lock, RF Connector	28480	1250-1142
10	86701-20009	5	Housing, YTO Loop Assembly	28480	86701-20009
11	2200-0103	2	Screw, Mach, 4-40, .25-IN LG, PAN HD	28480	2200-0103

FIGURE 1. A11A4 YTO PHASE DETECTOR, PARTS IDENTIFICATION (2 OF 2)



A11A4

FIGURE 2. A11A4 YTO PHASE DETECTOR, BLOCK DIAGRAM

ManualsPlus.com

ManualsPlus.com

A11A4
YTO PHASE DETECTOR
85660-60175

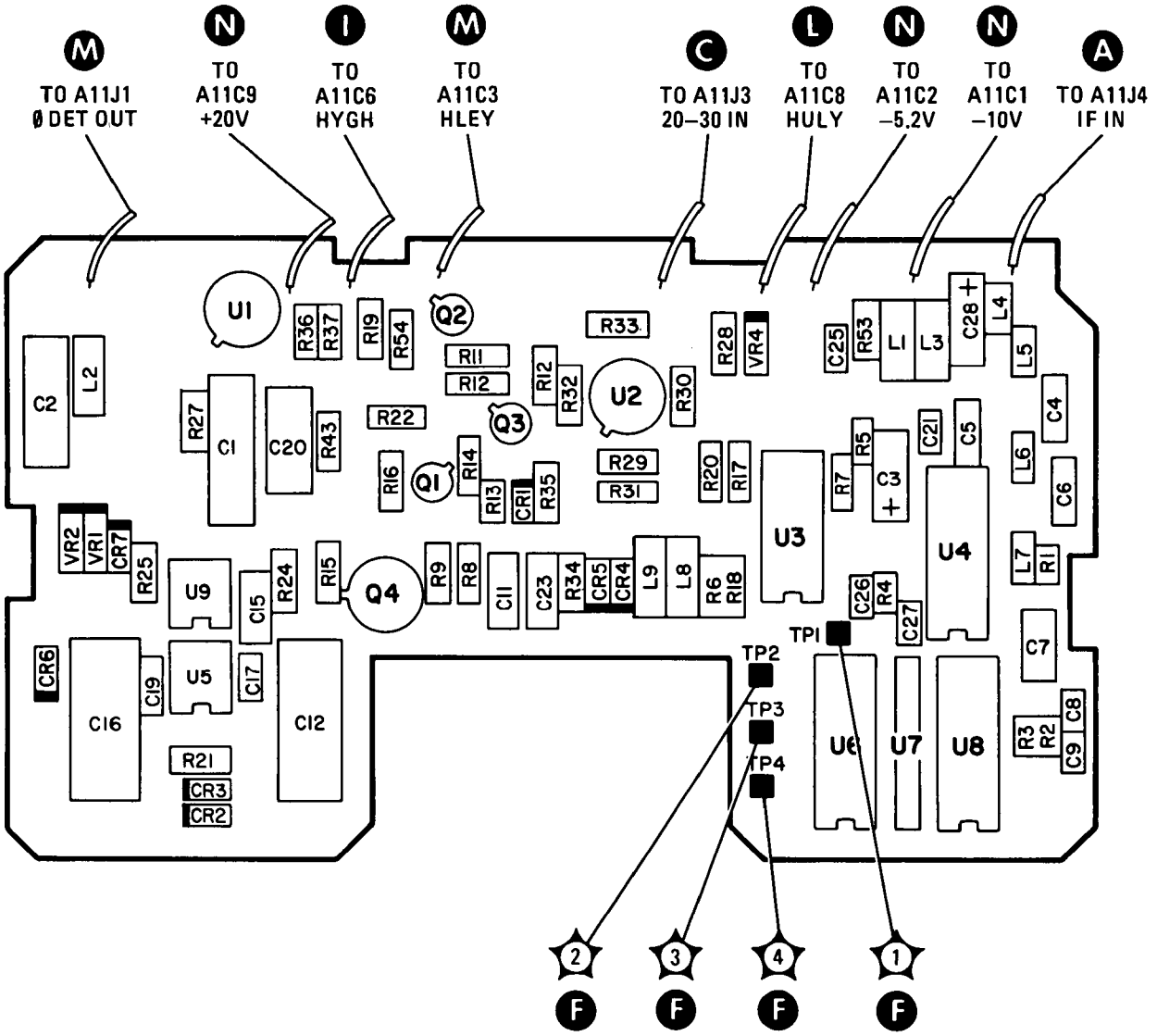
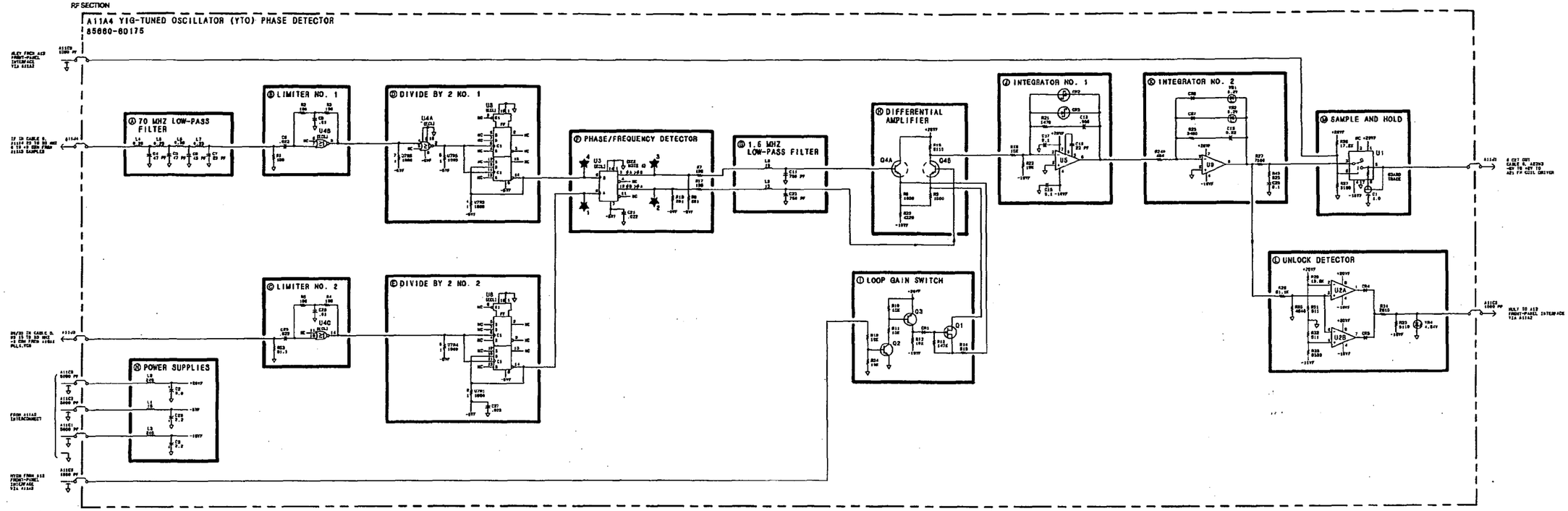


FIGURE 3. A11A4 YTO PHASE DETECTOR, COMPONENT LOCATIONS

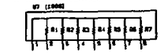
ManualsPlus.com

RF SECTION

A11A4 YIG-TUNED OSCILLATOR (YTO) PHASE DETECTOR
85660-60175



NOTES:

1. REFERENCE DESIGNATIONS WITHIN [illegible] ARE FOR REFERENCE PURPOSES ONLY. REFERENCE DESIGNATION WITH ASSEMBLY PREFIX ADDED.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS, 1/4W, ±5%. CAPACITANCE IN MICROFARADS (µF) OR PICOFARADS (pF).
3. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.
4. U7 PIN CONFIGURATION:

5. MNEMONIC TABLE:

MNEMONIC	DESCRIPTION
ALCV	HIGH=TTL LOCK ENABLE
HIGH	HIGH=TTL GAIN HIGH
HOLD	HIGH=TTL UNLOCKED

6. "A1A3J6" SYNCHRONIZES PHASE A LEADS PHASE B. SEE CIRCUIT DESCRIPTIONS

SERIAL NUMBER PREFIX: 2410A

A11A4

FIGURE 4. A11A4 YTO PHASE DETECTOR, SCHEMATIC DIAGRAM

ManualsPlus.com

A11A5 Sampler

ManualsPlus.com

A11A5 SAMPLER, CIRCUIT DESCRIPTION

The A11A5 Sampler mixes the output of the A11A3 YTO (RF INPUT) with the Nth harmonic of the output of the A7 M/N-Reference Loop (M/N IN). The 20 to 30 MHz difference signal (IF OUT) is output to the A11A4 YTO Phase Detector to be compared with the 20 to 30 MHz (20/30 IN) from the A10 20/30 Synthesizer for the purpose of phase locking.

Sampler Drive Amplifier (A)

The output of the A7 M/N-Reference Loop (M/N IN) is applied to common-base amplifier Q3. The output of Q3 is ac-coupled to common-emitter amplifier Q8. The output of Q8 is passed through an impedance matching network which provides maximum drive power to A11U1 Sampler. Adjustments C1 and C2 optimize this impedance match.

Sampler A11U1

A11U1 Sampler contains a step recovery diode (SRD) circuit to create harmonics of the M/N IN signal which are mixed with the low-level (−15 dBm) RF INPUT signal from the A11A3 YTO (via the A11A1 Coupler/Isolator/Amplifier and A11A7 Attenuator/6.2 GHz LPF).

When the YTO Loop is phase locked, the mixing product of the Nth harmonic of the M/N IN signal and the RF INPUT signal is precisely equal to the 20/30 IN signal from the A10 20/30 Synthesizer. This allows the YTO Loop to become phase locked to that harmonic.

IF Preamplifier (B)

The IF Preamplifier consists of common-source amplifier Q4, common-emitter amplifier Q2, and feedback divider R20/R16. Overall gain provided is approximately 14 dB.

Buffer Amplifier (C) and 70 MHz LPF (D)

The A11U1 Sampler output, after being amplified, is buffered by emitter-follower Q7 and applied to a 70 MHz low-pass filter. This filtering is done to remove any unwanted signals produced by the mixing action of the sampler.

Gain Adjust (E)

After being filtered, the IF signal is applied to common-emitter amplifier Q6 which has adjustable gain. IF Gain adjustment R1 can be adjusted to provide from 5 dB to 20 dB of gain. This is used to adjust the level of the IF signal to the proper level for comparison to the 20/30 signal in the A11A4 YTO Phase Detector.

Output Amplifier (F)

The IF signal is further amplified by output amplifier Q5 and Q1. Gain is approximately 21 dB. This provides the proper level signal to drive the A11A4 YTO Phase Detector.

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A11A5	85660-60199	6	1	BOARD ASSEMBLY, SAMPLER	28480	85660-60199
A11A5C1	0121-0046	2	2	CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304322 9/35PF N650
A11A5C2	0121-0046	2		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304322 9/35PF N650
A11A5C3	0180-0197	8	2	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A11A5C4	0180-0116	1	1	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A11A5C5	0160-2055	9	3	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A11A5C6	0160-2150	5	1	CAPACITOR-FXD 33PF +-5% 300VDC MICA	28480	0160-2150
A11A5C7	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A11A5C8	0160-3878	6	2	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A11A5C9	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A11A5C10	0160-2264	2	1	CAPACITOR-FXD 20PF +-5% 500VDC CER 0+-30	28480	0160-2264
A11A5C11	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A11A5C12	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A11A5C13	0180-0228	6	1	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015D2
A11A5C14	0160-4832	4	13	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11A5C15	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11A5C16				NOT ASSIGNED		
A11A5C17	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11A5C18	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11A5C19	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11A5C20	0160-0939	4	1	CAPACITOR-FXD 430PF +-5% 300VDC MICA	28480	0160-0939
A11A5C21	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11A5C22*	0140-0196	3	1	CAPACITOR-FXD 150PF +-5% 300VDC MICA	72136	DM15F151J0300WV1CR
A11A5C23	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11A5C24	0140-0193	0	2	CAPACITOR-FXD 82PF +-5% 300VDC MICA	72136	DM15E820J0300WV1CR
A11A5C25	0140-0193	0		CAPACITOR-FXD 82PF +-5% 300VDC MICA	72136	DM15E820J0300WV1CR
A11A5C26	0160-2308	5	1	CAPACITOR-FXD 36PF +-5% 300VDC MICA	28480	0160-2308
A11A5C27	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11A5C28	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11A5C29	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11A5C30	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11A5C31	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11A5C32	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A11A5L1				NOT ASSIGNED		
A11A5L2	9140-0144	0	1	INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A11A5L3	9100-1623	8	1	INDUCTOR RF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A11A5L4	9100-2251	0	1	INDUCTOR RF-CH-MLD 220NH 10% .105DX.26LG	28480	9100-2251
A11A5L5	9100-2258	7	2	INDUCTOR RF-CH-MLD 1.2UH 10% .105DX.26LG	28480	9100-2258
A11A5L6	9100-2258	7		INDUCTOR RF-CH-MLD 1.2UH 10% .105DX.26LG	28480	9100-2258
A11A5L7	9100-0346	0	1	INDUCTOR RF-CH-MLD 50NH 20% .105DX.26LG	28480	9100-0346
A11A5L8				NOT ASSIGNED		
A11A5L9				NOT ASSIGNED		
A11A5L10*	9100-2261	2	1	INDUCTOR RF-CH-MLD 2.7UH 10% .105DX.26LG	28480	9100-2261
A11A5L11*	9100-0368	6	1	INDUCTOR RF-CH-MLD 330NH 10% .105DX.26LG	28480	9100-0368
A11A5L12	9100-2249	6	2	INDUCTOR RF-CH-MLD 150NH 10% .105DX.26LG	28480	9100-2249
A11A5L13	9100-2250	9	1	INDUCTOR RF-CH-MLD 180NH 10% .105DX.26LG	28480	9100-2250
A11A5L14	9100-2249	6		INDUCTOR RF-CH-MLD 150NH 10% .105DX.26LG	28480	9100-2249
A11A5Q1	1854-0247	9	3	TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
A11A5Q2	1854-0345	8	3	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A11A5Q3	1854-0247	9		TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
A11A5Q4	1855-0235	7	1	TRANSISTOR J-FET N-CHAN D-MODE TO-52 SI	28480	1855-0235
A11A5Q5	1853-0015	7	1	TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A11A5Q6	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A11A5Q7	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A11A5Q8	1854-0247	9		TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
A11A5R1	2100-3383	4	1	RESISTOR-TRMR 50 10% C TOP-ADJ 1-TRN	28480	2100-3383
A11A5R2	0757-0394	0	5	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A11A5R3	0698-3440	7	1	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A11A5R4	0698-0085	0	1	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A11A5R5	0757-0424	7	3	RESISTOR 1.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1101-F
A11A5R6	0757-0280	3	3	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A11A5R7	0757-0278	9	1	RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A11A5R8	0757-0796	6	1	RESISTOR 82.5 1% .5W F TC=0+-100	28480	0757-0796
A11A5R9	0757-0399	5	1	RESISTOR 82.5 1% .125W F TC=0+-100	24546	C4-1/8-T0-82R5-F
A11A5R10	0698-3457	6	1	RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3457
A11A5R11	0757-0470	3	1	RESISTOR 162K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1623-F
A11A5R12				NOT ASSIGNED		
A11A5R13	0698-7216	3	1	RESISTOR 147 1% .05W F TC=0+-100	24546	C3-1/8-T0-147R-F
A11A5R14				NOT ASSIGNED		
A11A5R15	0757-0424	7		RESISTOR 1.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1101-F

*Indicates Factory Selected Value

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A11A5R16	0757-0398	4	1	RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A11A5R17	0757-0424	7		RESISTOR 1.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1101-F
A11A5R18	0757-0419	0	1	RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-681R-F
A11A5R19	0757-0421	4	1	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A11A5R20	0698-7224	3	1	RESISTOR 316 1% .05W F TC=0+-100	24546	C3-1/8-T0-316R-F
A11A5R21*	0698-7205	0	1	RESISTOR 51.1 1% .05W F TC=0+-100	24546	C3-1/8-T0-51R1-F
A11A5R22*	0698-7195	7	1	RESISTOR 19.6 1% .05W F TC=0+-100	24546	C3-1/8-T0-19R6-F
A11A5R23	0698-0083	8	1	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A11A5R24	0698-0084	9	1	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A11A5R25	0698-0082	7	2	RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A11A5R26	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A11A5R27	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A11A5R28	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A11A5R29	0698-7212	9	1	RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-F
A11A5R30	0757-0346	2	2	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A11A5R31	0757-0420	3	1	RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A11A5R32	0698-3439	4	2	RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A11A5R33	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A11A5R34	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A11A5R35	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A11A5R36	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A11A5R37	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A11A5R38	0757-0276	7	2	RESISTOR 61.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-6192-F
A11A5R39	0757-0276	7		RESISTOR 61.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-6192-F
A11A5R40	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A11A5R41	0698-7196	8	1	RESISTOR 21.5 1% .05W F TC=0+-100	24546	C3-1/8-T0-21R5-F
A11A5TP1	1251-0600	0	2	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A11A5TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
				MISCELLANEOUS PARTS		
	1200-0173	5	2	INSULATOR-XSTR DAP-GL	28480	1200-0173
	1205-0011	0	2	HEAT SINK TO-5/TO-39-CS	28480	1205-0011

*Indicates Factory Selected Value

ManualsPlus.com

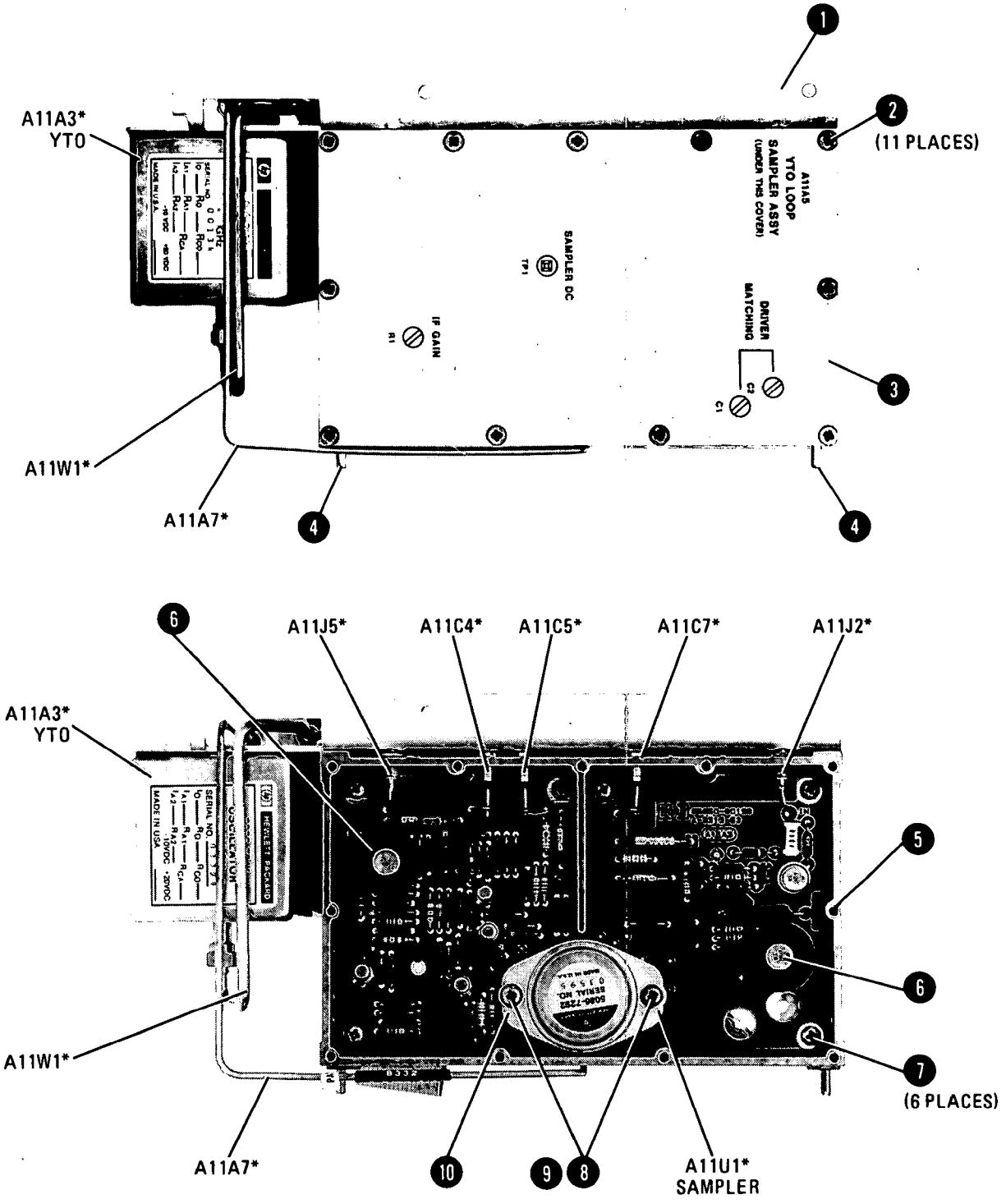


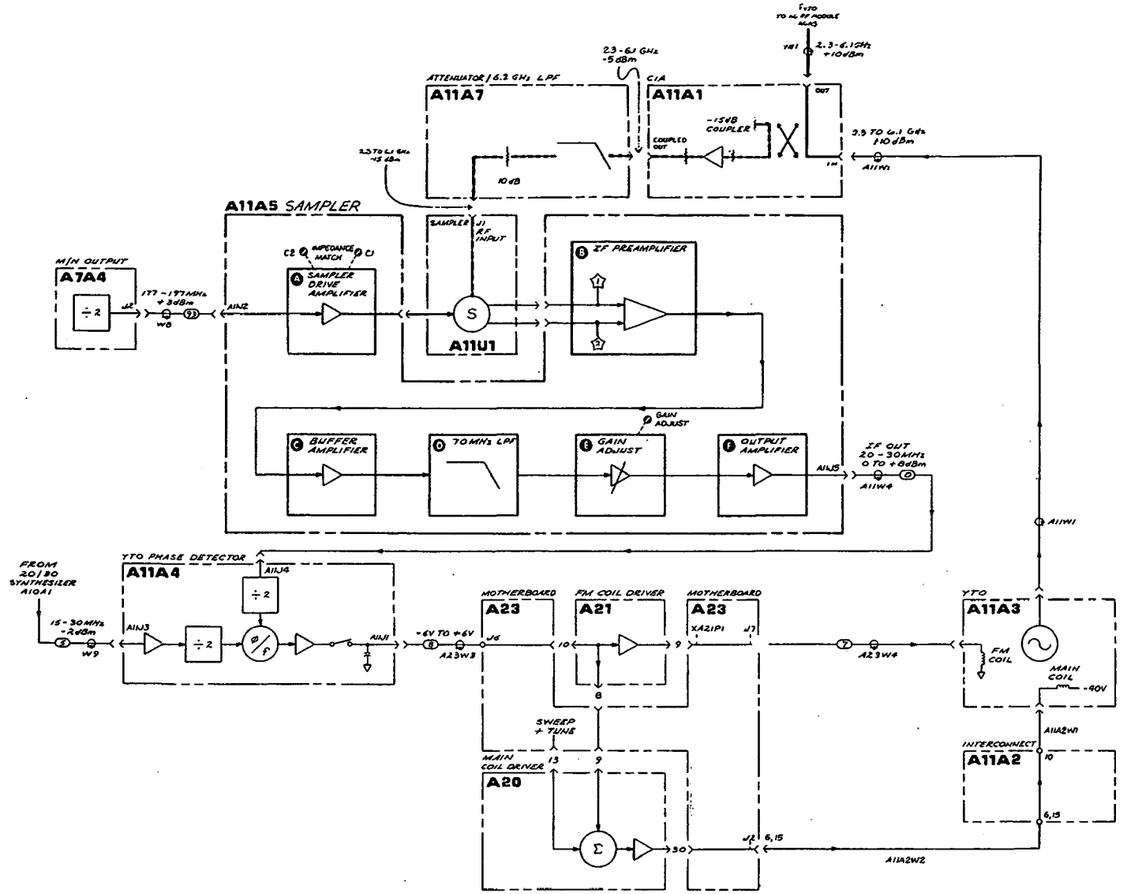
FIGURE 1. A11A5 SAMPLER, PARTS IDENTIFICATION (1 OF 2)

ManualsPlus.com

Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
1	85660-00024	0	Deck, YTO Loop Assembly	28480	85660-00024
2	2200-0165	6	Screw, Mach, 4-40, .25-IN LG, FLAT HD	28480	2200-0165
3	85660-00034	2	Cover, Housing (A11A5 Sampler)	28480	85660-00034
4	85660-20088	8	Stud, YTO Loop Assembly	28480	85660-20088
5	86701-20009	5	Housing, YTO Loop Assemby	28480	86701-20009
6	1205-0011	0	Heat Sink, To-5/To-39-CS	28480	1205-0011
7	2200-0103	2	Screw, Mach, 4-40, .25-IN LG, PAN HD	28480	2200-0103
8	2200-0111	2	Screw, Mach, 4-40, .5-IN LG, PAN HD	28480	2200-0111
9	3050-0105	6	Washer, Flat, .125-IN ID (For screw (8))	28480	3050-0105
10	86701-00054	8	Spacer, Sampler	28480	86701-00054

FIGURE 1. A11A5 SAMPLER, PARTS IDENTIFICATION (2 OF 2)

ManualsPlus.com



A11A5

FIGURE 2. A11A5 SAMPLER, BLOCK DIAGRAM

ManualsPlus.com

A11A5
SAMPLER
85660-60199

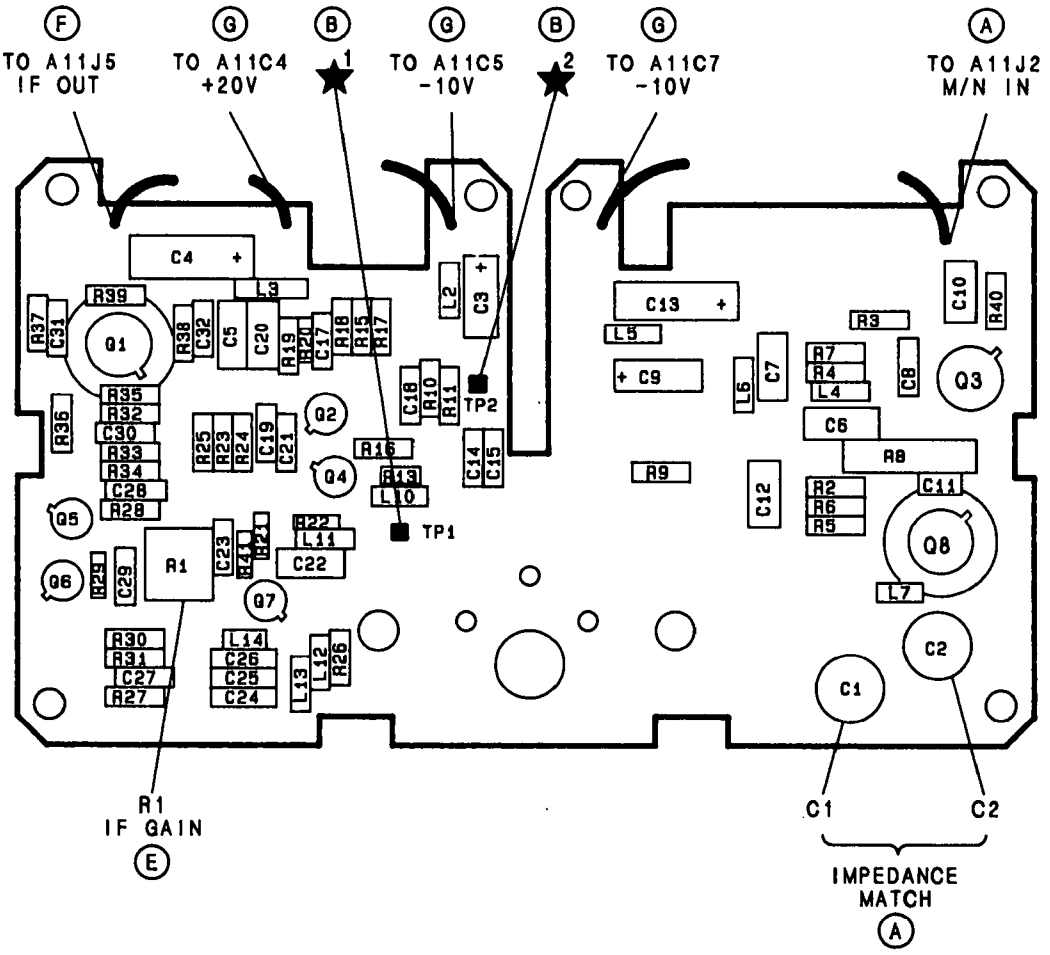
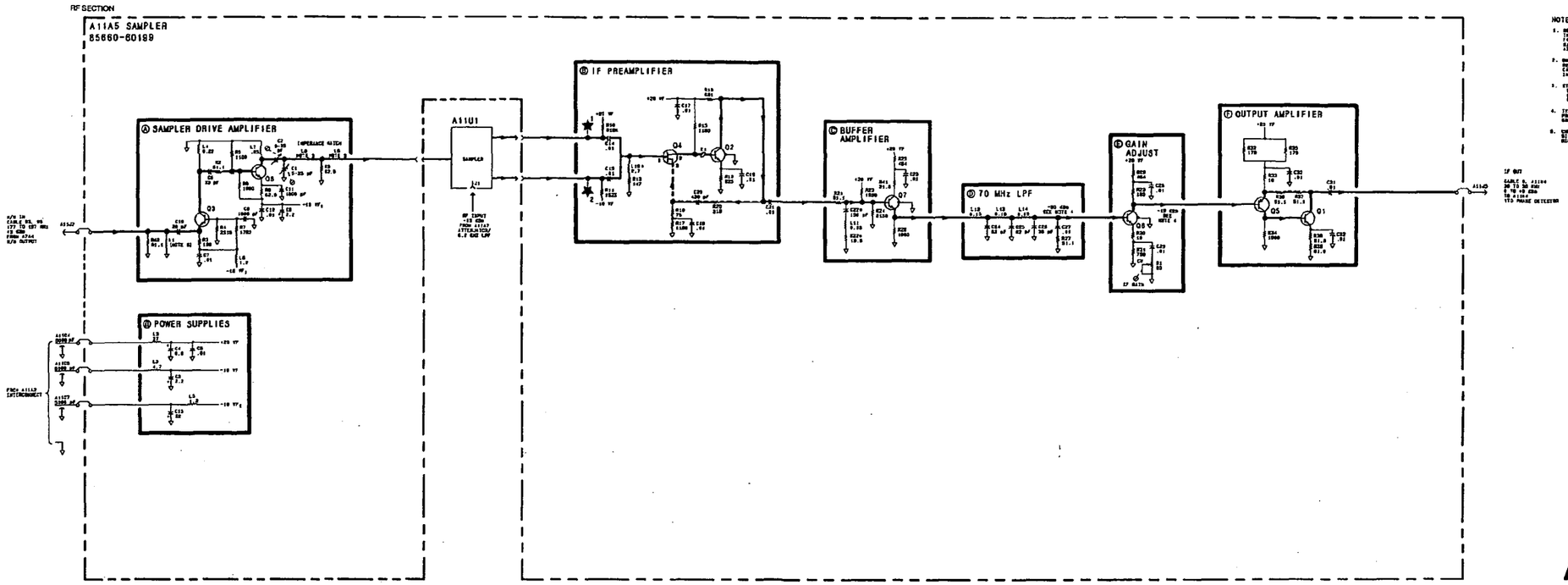


FIGURE 3. A11A5 SAMPLER, COMPONENT LOCATIONS

ManualsPlus.com



SERIAL NUMBER PREFIX: 2410A

A11A5

FIGURE 4. A11A5 SAMPLER, SCHEMATIC DIAGRAM

ManualsPlus.com

A12 Front-Panel Interface

ManualsPlus.com

A12 FRONT-PANEL INTERFACE, CIRCUIT DESCRIPTION

A12 Front-Panel Interface contains the miscellaneous digital functions for interfacing with A15 Controller.

Keyboard Matrix (A)

The keyboard is organized as a matrix (rows and columns) of normally open SPST switches. The rows are driven by U2 and U3. U6 functions as a key-down detector. Q2 and associated circuitry debounce the key switches, and U14B latches the key-down condition. U1 and U4 gate the key columns onto the Data Bus. By selectively enabling the key rows, A15 Controller can poll the keyboard.

Oven Cold Sensor (B)

When U22 senses the oven line is less than +17V, it tells the Controller that oven is no longer cold.

Rotary Pulse Generator (RPG) Control (C)

U11B enables the RPG, allowing the pulses to be counted. U11A detects the direction of rotation of the RPG (rotation of the DATA knob on the front panel). U18 and U19 count the number of RPG pulses since the last RPG RESET. U28 provides a holdoff of about 200 msec, until service is requested, giving the instrument time to respond to the last request and to continue to sweep before the next request occurs; that is, to give the operator visual feedback.

Service Request (D)

This circuit encodes the various requests for service for A15 Controller.

U24 encodes the service request. U27 is a change detector (HXRF or LRMT), and U25 latches these changes. U14A detects and latches the falling edge of HSWP.

U16B asserts LSTP, which stops A15 Controller (puts it in idle) when set by a pulse from U13. U13 also provides the reset pulses for clearing the request latches U14A, U14B, U16A, U25A, and U25B. U16B is cleared by any pending request (that is, it restarts A15 Controller) by U24.

Q3 pulls HSWP low whenever a request is pending.

U12 gates the encoded request and also places HXRF or LHBZ on the Data Bus.

M/N Storage (E)

U26 and U29 store the numbers for the M/N Phase-Lock Loop.

Phase-Lock Flags (F)

Each flag can be enabled (interrogated) or all flags can be enabled. U30 and U32 provide the logic, and U20 stores the state of the enabled flags.

Address Decoder (G)

U7, U10 and U33 decode the address lines, enabling the appropriate ICs to gate or store data for the Data Bus.

Attenuator Correction Rom (H)

U8 is a PROM (programmable read-only memory) that contains the attenuation errors (calibration data) of the RF Attenuator.

ManualsPlus.com

Control Lines (I)

U9 controls certain mainframe functions, such as turning off the internal reference oscillator (HSTD).

Options (J)

U21 gates the Options jumpers onto the data bus.

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A12	85660-60211	3	1	BOARD ASSEMBLY, FRONT PANEL INTERFACE	28480	85660-60211
A12C1	0180-0197	8	3	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A12C2	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A12C3	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A12C4	0160-4835	7	1	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A12C5	0160-4892	6	1	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A12C6	0180-0373	2	1	CAPACITOR-FXD .68UF+-10% 35VDC TA	56289	150D684X9035A2
A12C7	0160-4832	4	1	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A12C8	0160-4574	1	3	CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A12C9	0160-4574	1		CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A12C10	0160-0571	0	1	CAPACITOR-FXD 470PF +-20% 100VDC CER	28480	0160-0571
A12C11	0160-4574	1		CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A12CR1	1901-0040	1	3	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A12CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A12CR3	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A12CR4	1901-0518	8	2	DIODE-SM SIG SCHOTTKY	28480	1901-0518
A12CR5	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A12L1	08558-80011	6	1	FILTER COIL BLUE	28480	08558-80011
A12Q1	1854-0404	0	3	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A12Q2	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A12Q3	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A12R1	0698-7281	2	1	RESISTOR 75K 2% .05W F TC=0+-100	24546	C3-1/8-T0-7502-G
A12R2	0698-7268	5	2	RESISTOR 21.5K 1% .05W F TC=0+-100	24546	C3-1/8-T0-2152-F
A12R3	0698-7251	6	1	RESISTOR 4.22K 1% .05W F TC=0+-100	24546	C3-1/8-T0-4221-F
A12R4	0698-7272	1	1	RESISTOR 31.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3162-F
A12R5	0698-7260	7	5	RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A12R6	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A12R7	0698-7268	5		RESISTOR 21.5K 1% .05W F TC=0+-100	24546	C3-1/8-T0-2152-F
A12R8	0757-0442	9	9	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A12R9	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A12R10	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A12R11	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A12R12	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A12R13	0698-7243	6	7	RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-F
A12R14	0698-7243	6		RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-F
A12R15	0698-7243	6		RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-F
A12R16	0698-7243	6		RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-F
A12R17	0698-7236	7	2	RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A12R18	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A12R19	0698-7243	6		RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-F
A12R20	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A12R21	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A12R22	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A12R23	0698-7243	6		RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-F
A12R24	0698-7260	7		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-F
A12R25	0698-7243	6	1	RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-F
A12R26	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A12R27	0698-0083	8	2	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A12R28	0698-3454	3	1	RESISTOR 215K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2153-F
A12R29	0698-7243	6		RESISTOR 1.96K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1961-F
A12R30	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A12R31	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A12R32	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A12R33	0698-7217	4	1	RESISTOR 162 1% .05W F TC=0+-100	24546	C3-1/8-T0-162R-F
A12TP1	1251-5177	6	3	CONNECTOR-SGL CONT PIN .031-IN-BSC-SZ	28480	1251-5177
A12TP2	1251-5177	6		CONNECTOR-SGL CONT PIN .031-IN-BSC-SZ	28480	1251-5177
A12TP3	1251-5177	6		CONNECTOR-SGL CONT PIN .031-IN-BSC-SZ	28480	1251-5177
A12U1	1820-1491	6	3	IC BFR TTL LS NON-INV HEX 1-INP	01295	SN74LS367AN
A12U2	1820-1196	8	6	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A12U3	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A12U4	1820-1491	6		IC BFR TTL LS NON-INV HEX 1-INP	01295	SN74LS367AN
A12U5	1810-0206	8	2	NETWORK-RES 8-SIP10.0K OHM X 7	01121	208A103
A12U6	1820-1207	2	1	IC GATE TTL LS NAND 8-INP	01295	SN74LS30N
A12U7	1820-1202	7	1	IC GATE TTL LS NAND TPL 3-INP	01295	SN74LS10N
A12U8				P/O A6A2 NOT SEPARATELY REPLACEABLE		
A12U9	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A12U10	1820-1216	3	3	IC DCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N
A12U11	1820-1112	8	3	IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A12U12	1820-1492	7	1	IC BFR TTL LS INV HEX 1-INP	01295	SN74LS368AN
A12U13	1820-1216	3		IC DCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N
A12U14	1820-1112	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A12U15	1820-1199	1	2	IC INV TTL LS HEX 1-INP	01295	SN74LS04N

*Indicates Factory Selected Value

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A12U16	1820-1112	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A12U17	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A12U18	1820-2270	1	2	IC CNTR TTL LS BIN UP/DOWN SYNCHRO	34335	AM25LS2569DC
A12U19	1820-2270	1		IC CNTR TTL LS BIN UP/DOWN SYNCHRO	34335	AM25LS2569DC
A12U20	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A12U21	1820-1491	6		IC BFR TTL LS NON-INV HEX 1-INP	01295	SN74LS367AN
A12U22	1826-0161	7	1	IC OP AMP GP QUAD 14-DIP-P PKG	04713	MLM324P
A12U23	1820-1425	6	1	IC SCHMITT-TRIG TTL LS NAND QUAD 2-INP	01295	SN74LS132N
A12U24	1820-0907	3	1	IC ENCDR TTL L 8-INP	07263	93L18PC
A12U25	1820-1440	5	1	IC LCH TTL LS QUAD	01295	SN74LS279N
A12U26	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A12U27	1820-1211	8	1	IC GATE TTL LS EXCL-OR QUAD 2-INP	01295	SN74LS86N
A12U28	1826-0180	0	1	IC TIMER TTL MONO/ASTBL	01295	NE555P
A12U29	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A12U30	1820-1210	7	2	IC GATE TTL LS AND-OR-INV DUAL 2-INP	01295	SN74LS51N
A12U31	1810-0206	8		NETWORK-RES 8-SIP10.0K OHM X 7	01121	208A103
A12U32	1820-1210	7		IC GATE TTL LS AND-OR-INV DUAL 2-INP	01295	SN74LS51N
A12U33	1820-1216	3		IC DCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N
A12W1				NOT ASSIGNED		
A12W2*	0757-0346	2	1	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
				MISCELLANEOUS PARTS		
	1200-0812	9	1	SOCKET-IC 16-CONT DIP DIP-SLDR	28480	1200-0812
	4040-0749	4	1	EXTR PC BD BRN	28480	4040-0749
	4040-0750	7	1	EXTR PC BD RED	28480	4040-0750

*Indicates Factory Selected Value

ManualsPlus.com

NOTE

- FOR INSTRUCTIONS ON THE USE OF SIGNATURE ANALYSIS DIAGRAMS READ THE SIGNATURE ANALYSIS DESCRIPTION SECTION OF THIS MANUAL.

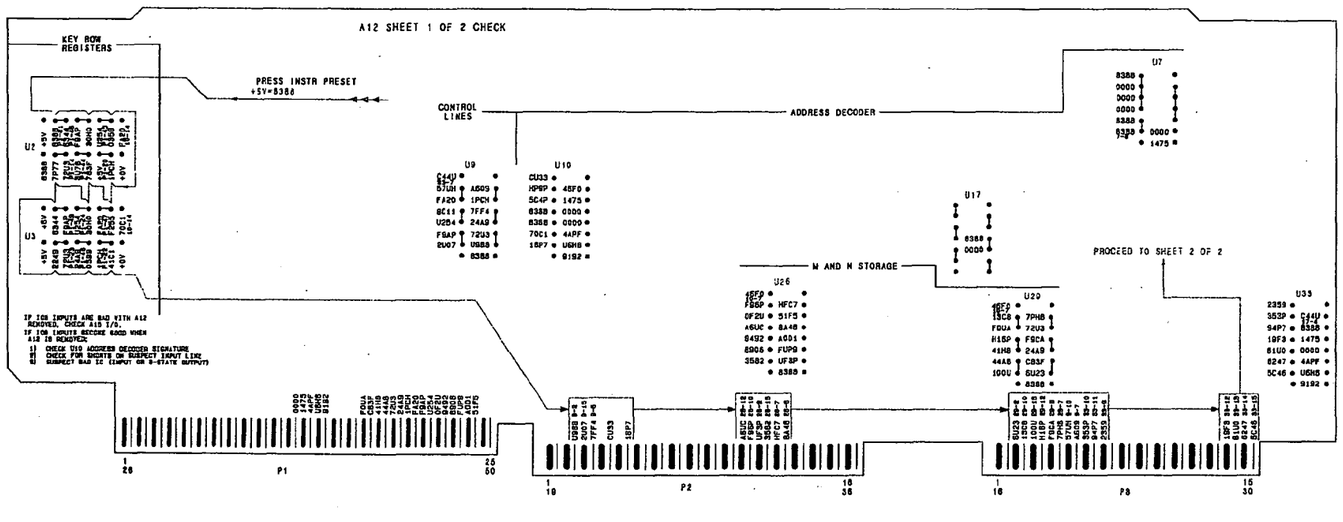
A12 SHEET 1 OF 2 CHECK

SPECTRUM ANALYZER CONNECTIONS:
INSTALL A12 BOARD ON A12 FRONT-PANEL INTERFACE EXTENDER BOARD, HP PART NUMBER 85680-60114
JUMPER A15TP1-4 (18) TO A15TP3 (ST6)

SIGNATURE ANALYZER CONNECTIONS:
CLOCK ⌐¯ TO A15TP1-1 (8)
START ⌐¯ TO A15TP1-4 (14)
STOP ⌐¯ TO A15TP1-3 (11)
POD GND TO A15TP3 (GND)

- REFER TO FIGURE 1, SIGNATURE ANALYSIS TROUBLESHOOTING DIAGRAM FORMAT, IN THE SIGNATURE ANALYSIS DESCRIPTION SECTION FOR EXPLANATION AND INSTRUCTIONS OF SIGNATURE ANALYSIS TROUBLESHOOTING DIAGRAMS.
- REFER TO RF SECTION DIGITAL TROUBLESHOOTING FOR ADDITIONAL TROUBLESHOOTING INFORMATION.

A12
FRONT-PANEL INTERFACE
85680-60211
SHEET 1 OF 2



A12

FIGURE 1. A12 FRONT-PANEL INTERFACE, SIGNATURE ANALYSIS TROUBLESHOOTING DIAGRAM (1 OF 2)

ManualsPlus.com

A12
FRONT-PANEL INTERFACE
85660-60211
SHEET 2 OF 2

NOTE

- FOR INSTRUCTIONS ON THE USE OF SIGNATURE ANALYSIS DIAGRAMS READ THE SIGNATURE ANALYSIS DESCRIPTION SECTION OF THIS MANUAL.

SRQ RPG PHASE-LOCK CHECK

SPECTRUM ANALYZER CONNECTIONS:
INSTALL A12 BOARD ON A12 FRONT-PANEL INTERFACE EXTENDER BOARD, HP PART NUMBER 85680-60114.
JUMPER A1(P)1-4 (TP) TO A1STP2 (STP)

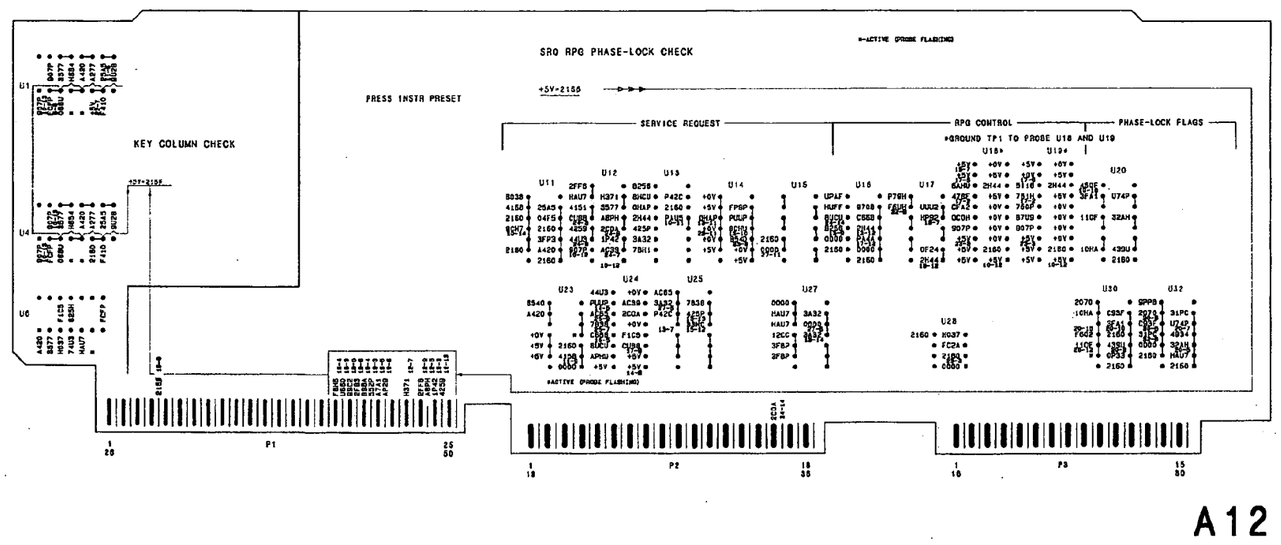
SIGNATURE ANALYZER CONNECTIONS:
CLOCK ⌐¬ TO A1STP1-1 (S)
START ⌐¬ TO A1STP1-6 (T2)
STOP ⌐¬ TO A1STP1-4 (T3)
POD GND TO A1STP3 (GND)
PROBE GND TO A1STP6

KEY COLUMN CHECK

SPECTRUM ANALYZER CONNECTIONS:
INSTALL A12 BOARD ON A12 FRONT-PANEL INTERFACE EXTENDER BOARD, HP PART NUMBER 85680-60114.
JUMPER A1(P)1-4 (TP) TO A1STP2 (STP)

SIGNATURE ANALYZER CONNECTIONS:
CLOCK ⌐¬ TO A1STP1-1 (S)
START ⌐¬ TO A1STP1-6 (T1)
STOP ⌐¬ TO A1STP1-4 (T2)
POD GND TO A1STP3 (GND)
PROBE GND TO A1STP6

*REFER TO FIGURE 1, SIGNATURE ANALYSIS TROUBLESHOOTING DIAGRAM FORMAT, IN THE SIGNATURE ANALYSIS DESCRIPTION SECTION FOR EXPLANATION AND INSTRUCTIONS OF SIGNATURE ANALYSIS TROUBLESHOOTING DIAGRAMS.
*REFER TO RF SECTION DIGITAL TROUBLESHOOTING FOR ADDITIONAL TROUBLESHOOTING INFORMATION.



A12

FIGURE 1. A12 FRONT-PANEL INTERFACE, SIGNATURE ANALYSIS TROUBLESHOOTING DIAGRAM (2 OF 2)

ManualsPlus.com

KEYBOARD MATRIX

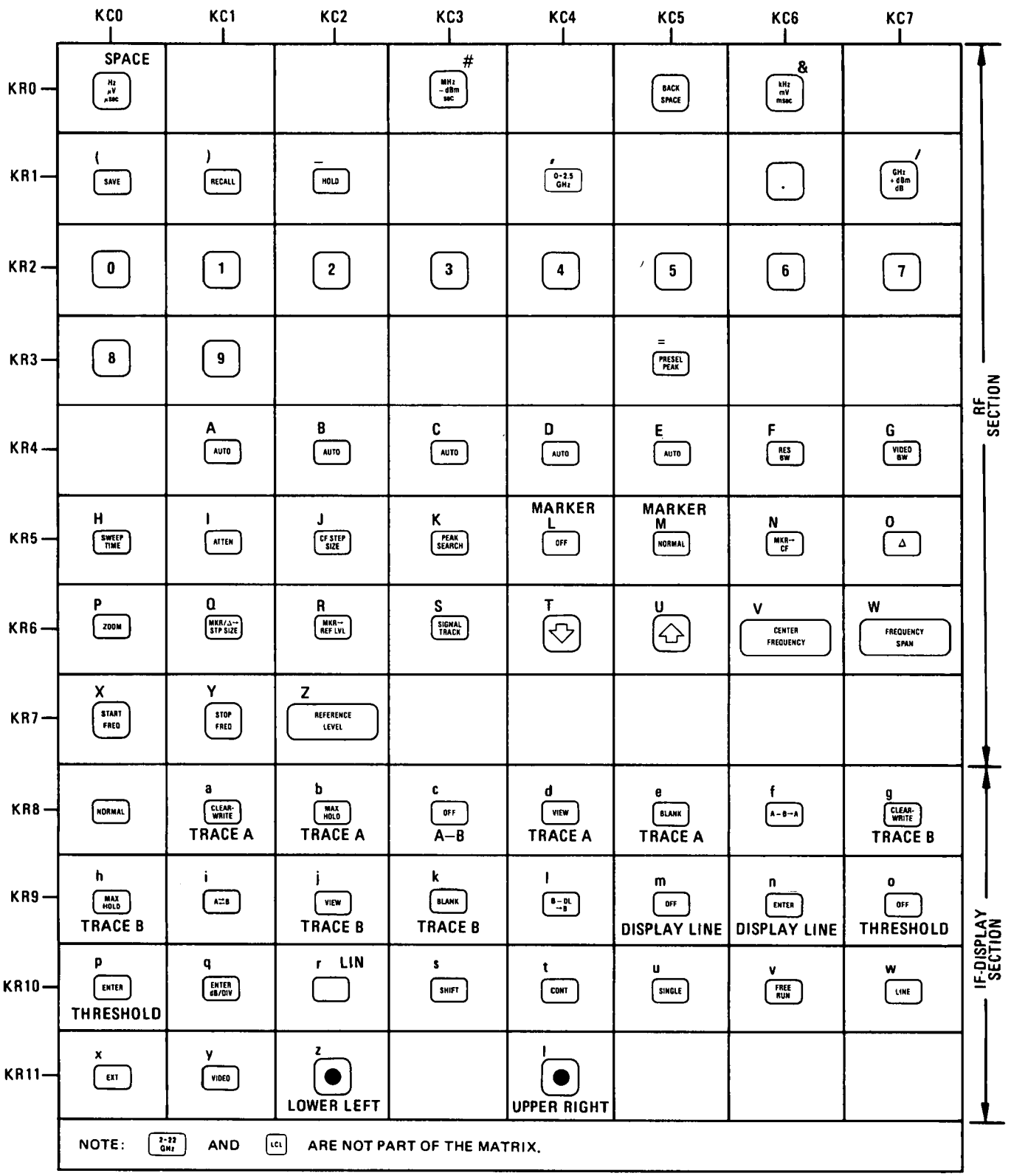
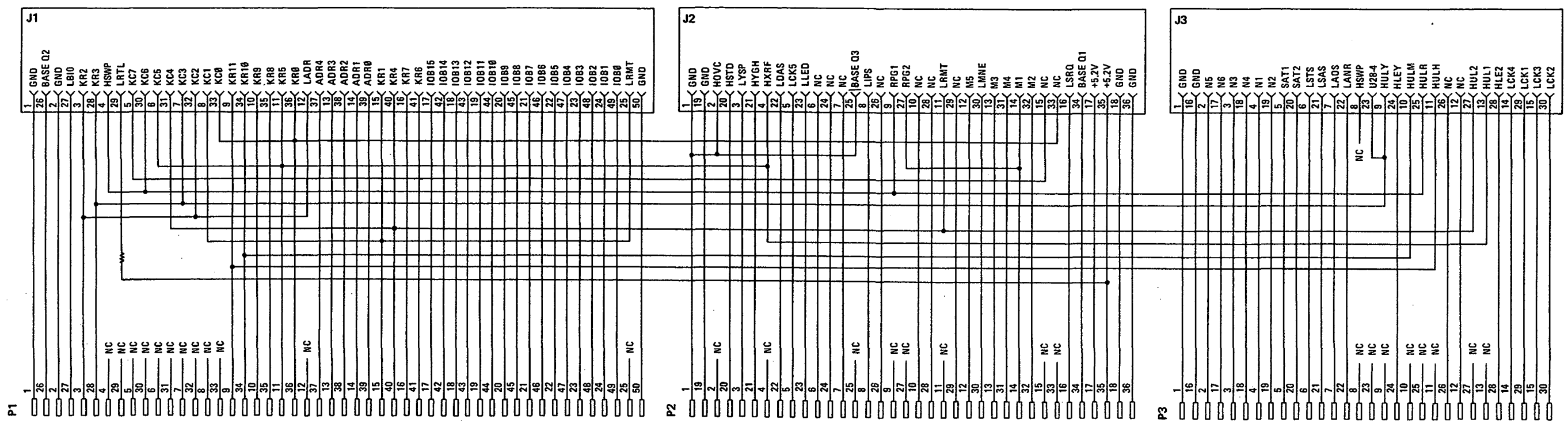


FIGURE 2. 8566 KEYBOARD MATRIX

ManualsPlus.com



A12

FIGURE 3. A12 FRONT-PANEL INTERFACE EXTENDER BOARD, SCHEMATIC DIAGRAM

ManualsPlus.com

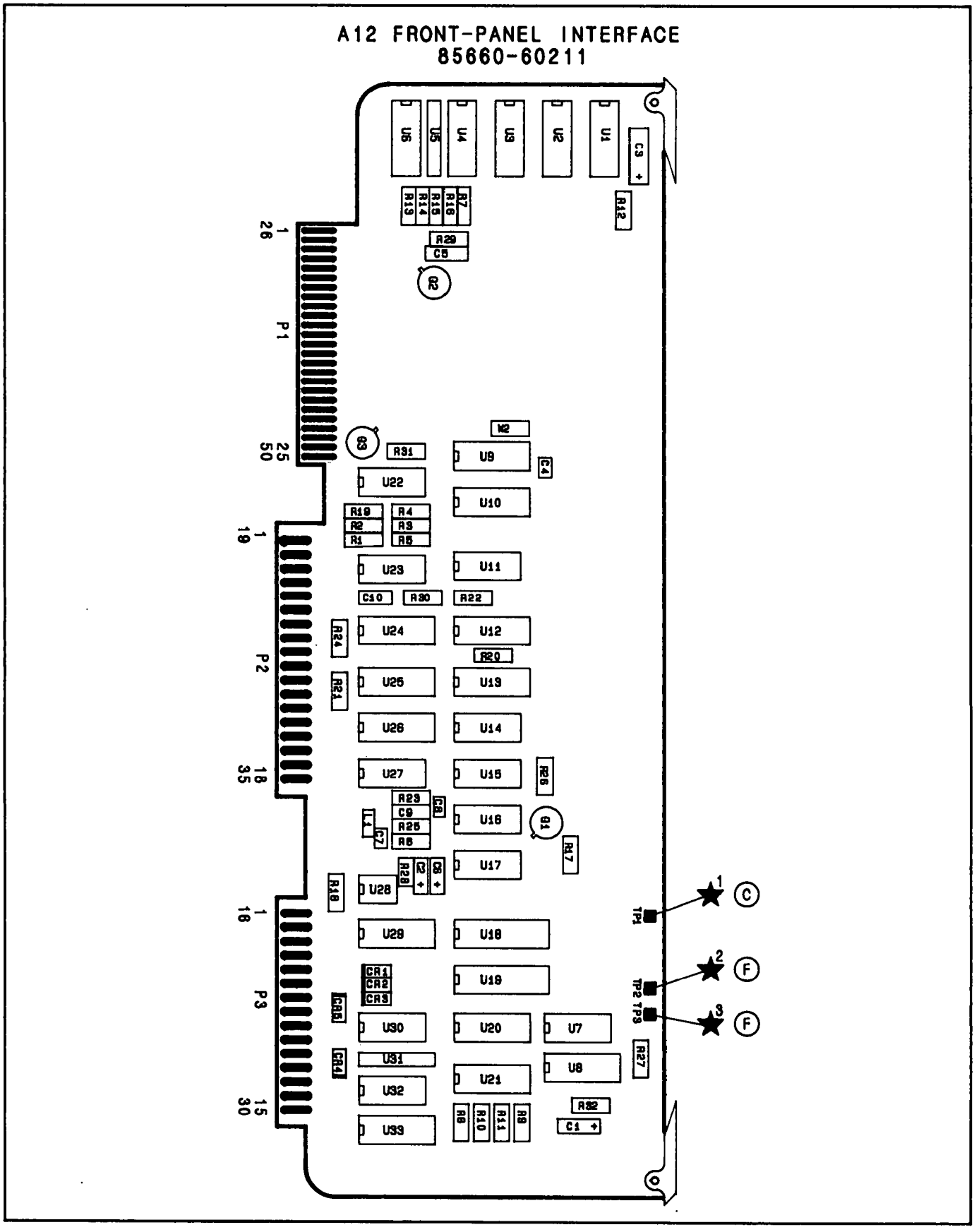


FIGURE 4. A12 FRONT-PANEL INTERFACE, COMPONENT LOCATIONS

ManualsPlus.com

TABLE 2. MNEMONICS LISTING FOR RF SECTION

Mnemonic	Active State	Description	Mnemonic	Active State	Description
ADRØ – 4		Address Bits Ø through 4	LDAS	LOW	DAC Strobe
ATN*	LOW	Attention True	LDSR	LOW	Digital Storage Ready
BATT		Battery	LHBZ	LOW	HP-IB Input Buffer from Main Processor Full
BFC ON		Filter Capacitor IN			
DAV*	LOW	Data Valid	LIDAØ – 15	LOW	Instruction, Data and Address Bus Bits
DIO1 – 8	LOW	HP-IB Data Input/Output Bits			
DSØ – 3	HIGH	μProcessor Inputs/Output Device Select Bits	LIPS	LOW	Instrument Preset
			LLED	LOW	LED Strobe
EOI*	LOW	End or Identify	LMNE	LOW	M/N Output Enable
HLE2	HIGH	Phase Lock Loop 2 Lock Enable	LREQ	LOW	Word Ready from HP-IB Processor
HLEY	HIGH	YTO Lock Enable			
HOVH	HIGH	Oven Cold	LRMT	LOW	Remove (High = Local)
HPON	HIGH	Power ON to IF-Display Section	LROM1 – 3	LOW	Enable ROM 3-State Outputs
HPUP	HIGH	Power Up	LRTL	LOW	Local Button Pushed
HS1, 2		Handshake 1, 2	LSAS	LOW	Scan Attenuator Strobe
HSTD	HIGH	10 MHz Standard ON	LSBY	HIGH	Standby
HSTM	HIGH	START Memory	LSOB	LOW	Stay Off Bus
HSWP	HIGH	Sweeping	LSRQ	LOW	Service Request
HUL1	HIGH	Phase Lock Loop 1 or 3 Unlocked	LSTP	LOW	Stop A15 Controller
			LSTS	LOW	Scan Time Strobe
HUL2	HIGH	Phase Lock Loop 2 Unlocked	LTGR	LOW	Tracking Generator Request
HULH	HIGH	Heterodyne Oscillator Unlocked	LTIO	LOW	IF-Display Section I/O Strobe
			LWRT	LOW	Write Memory
HULM	HIGH	M/N Unlocked	LYSP	LOW	YTO Span
HULR	HIGH	REF Unlocked	M1 – 5		M/N Loop-M Inputs
HULY	HIGH	YTO Unlocked	MARØ – 1Ø		Memory Address Bits
HXRF	HIGH	External Reference	N1 – 6		M/N Loop-N Inputs
HYGH	HIGH	YTO Loop Gain High	N DAC*	HIGH	Data Accepted
IFC*	LOW	Interface Clear	N RFD*	HIGH	Ready for Data
IOBØ – 15	HIGH	Instrument Bus Data Bits	PDBØ – 7	HIGH	μProcessor Data Bits
KCØ – 7		Key Columns Ø through 7	REN*	LOW	Remote Enable
KRØ – 11		Key Rows Ø through 11	RPG1		Rotary Pulse
LADR	LOW	Address LED ON	RPG2		Generator Lines
LANR	LOW	Analog Reset	SAT1		Scan Integer
LAOS	LOW	Aux Out Strobe	SAT2		Attenuator
LBIO	LOW	RF Section I/O Strobe	SRQ*	LOW	Service Request
LCK1 – 5	LOW	Strobes for PLL1, 2, 3	SW1		Switch 1
LCS1 – 8	LOW	Chip Select for ROMs	SW2		Switch 2

* HP-IB Mnemonics

ManualsPlus.com

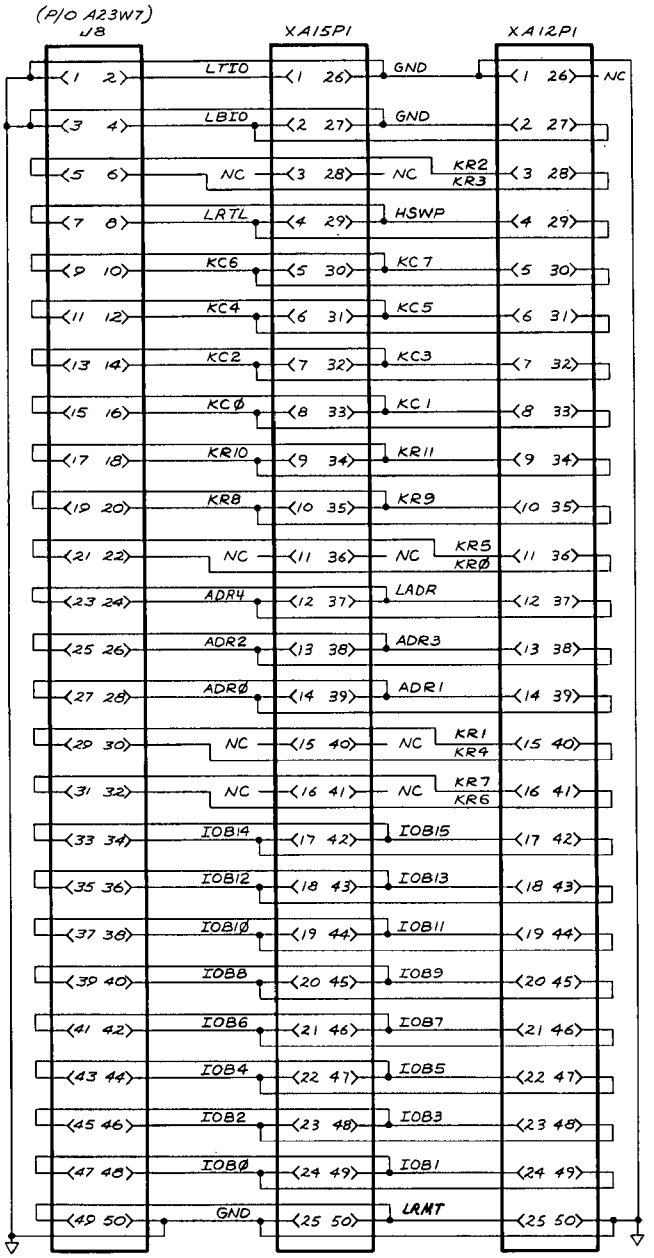


FIGURE 5. A23 MOTHERBOARD INSTRUMENT BUS, INTERCONNECT DIAGRAM

ManualsPlus.com

RF SECTION

A12 FRONT-PANEL INTERFACE (SHEET 1 OF 2)
85680-60211

P1

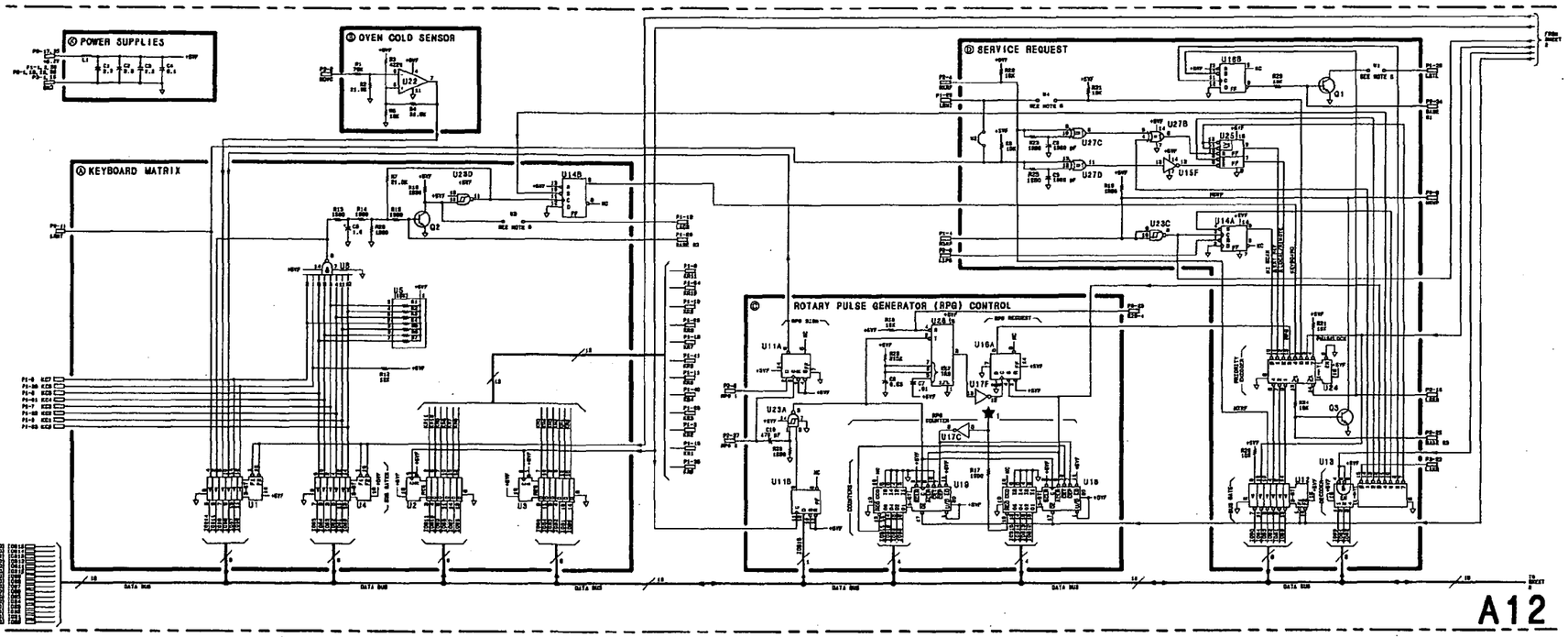
PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	GND		K
2	GND		K
3	GND		K
4	GND		K
5	+5V		K
6	+5V		K
7	+5V		K
8	+5V		K
9	+5V		K
10	+5V		K
11	+5V		K
12	+5V		K
13	+5V		K
14	+5V		K
15	+5V		K
16	+5V		K
17	+5V		K
18	+5V		K
19	+5V		K
20	+5V		K
21	+5V		K
22	+5V		K
23	+5V		K
24	+5V		K
25	+5V		K

P2

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	GND		K
2	GND		K
3	+5V		K
4	+5V		K
5	+5V		K
6	+5V		K
7	+5V		K
8	+5V		K
9	+5V		K
10	+5V		K
11	+5V		K
12	+5V		K
13	+5V		K
14	+5V		K
15	+5V		K
16	+5V		K
17	+5V		K
18	+5V		K
19	+5V		K
20	+5V		K
21	+5V		K
22	+5V		K
23	+5V		K
24	+5V		K
25	+5V		K

P3

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	GND		K
2	GND		K
3	+5V		K
4	+5V		K
5	+5V		K
6	+5V		K
7	+5V		K
8	+5V		K
9	+5V		K
10	+5V		K
11	+5V		K
12	+5V		K
13	+5V		K
14	+5V		K
15	+5V		K
16	+5V		K
17	+5V		K
18	+5V		K
19	+5V		K
20	+5V		K
21	+5V		K
22	+5V		K
23	+5V		K
24	+5V		K
25	+5V		K



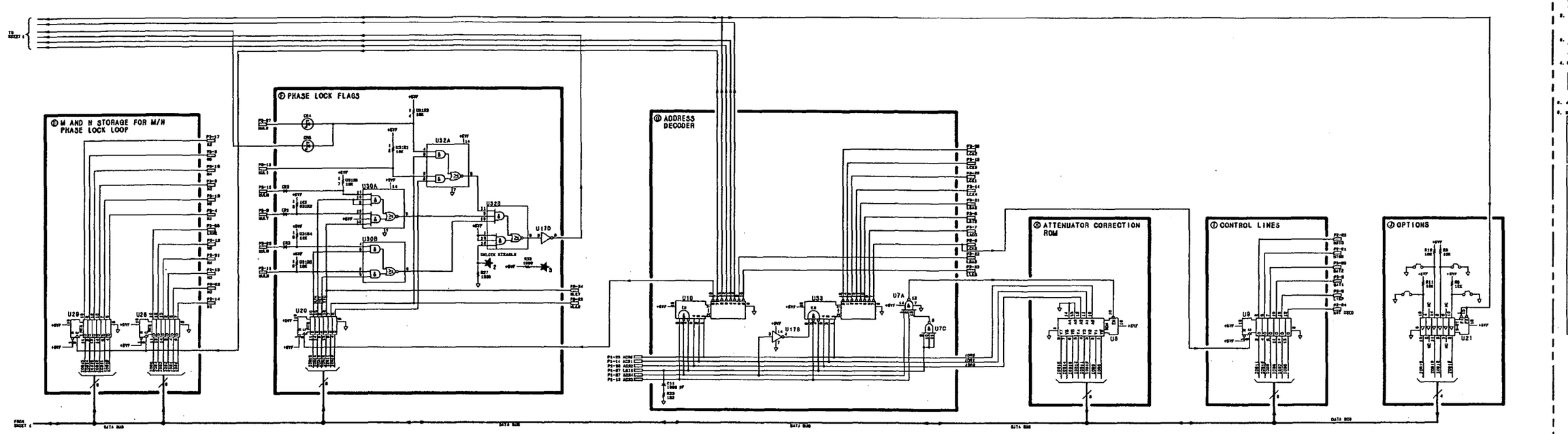
SERIAL NUMBER PREFIX: 2410A

FIGURE 6. A12 FRONT-PANEL INTERFACE, SCHEMATIC DIAGRAM (1 OF 2)

ManualsPlus.com

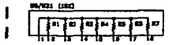
RF SECTION

A12 FRONT-PANEL INTERFACE (SHEET 2 OF 2)
85680-60211



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATIONS, PREFIX ABBREVIATIONS WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (μF) INDUCTANCE IS IN MICROHENRIES (μH)
3. UNLESS OTHERWISE INDICATED: LOGIC LEVELS ARE TTL: 2.4V TO +5.0V = LOGIC "1" = HIGH 0V TO +0.4V = LOGIC "0" = LOW
4. MSI TTL PIN CONFIGURATIONS:



5. JUMPERS W1, W2, AND W4 ARE NOT LOADED.
6. MNEMONIC TABLE:

MNEMONIC	DESCRIPTION
A000-A004	ADDRESS BITS 0 THRU 4
ALC2	HIGH=PHASE LOCK LOOP 2 LOCK CHECK
ALKY	HIGH=KEYBOARD ENABLE
ANYS	HIGH=ANY KEY DOWN
FSTE	HIGH=10 MHz STANDARD ON
HSUP	HIGH=SWEEPING
HOL1	HIGH=PHASE LOCK LOOP 1 IS UNLOCKED
HOL2	HIGH=PHASE LOCK LOOP 2 UNLOCKED
HSLS	HIGH=METERTIME SEQ. IN PROG.
HSLK	HIGH=SWEEP UNLOCKED
HSLS	HIGH=SWEEP SELECTED
LA0-7	HIGH=BITS ON/ADDR
RSWP	HIGH=EXTERNAL REF.
STBH	HIGH=BITS LOCK RAIN HIGH
TOMO-TOM15	INSTRUMENT BUS DATA BITS 0 THRU 15
KC0-KC7	KEY COLUMNS 0 THRU 7
KR0-KR11	KEY ROWS 0 THRU 11
LADR	LOW=ADDRESS LED ON
LARE	LOW=ANALOG RESET
LA2K	LOW=HEX OUT DAC STROBE
LA1K	LOW=HP BUS STROBE
LA1-LA2	LOW=STROBE FOR PLL 0, 1 OR 2
LA4K	LOW=INSTRUMENT PRESET
LA7D	LOW=LED STROBE
LA6K	LOW=LED STROBE
LA8E	LOW=A/D OUTPUT ENABLE
LBRT	LOW=BRIGHT
LBTL	LOW=LOCAL BUTTON PUSHED
LBAB	LOW=REAR ATTENUATOR STROBE
LBRS	LOW=SERVICE REQUEST
LBTP	LOW=STOP PROCESSOR
LCLK	LOW=SCAN TIME STROBE
LTRN	LOW=TRIGGER GENERATOR RESET
LTSP	LOW=STB SPAN
RI0-KB	A/D LOOP-6 INPUTS
RI-KB	A/D LOOP-9 INPUTS
SPG1	ROTARY PULSE
WR02	MICROVALUE KINKS
BAT1-BAT4	SCAN INTERNAL ATTEN.

SERIAL NUMBER PREFIX: 2410A

FIGURE 8. A12 FRONT-PANEL INTERFACE, SCHEMATIC DIAGRAM (2 OF 2)

ManualsPlus.com

ManualsPlus.com

HP 8566B Option 002

Supplement Description

What This Supplement Is For

This supplement provides troubleshooting and repair information unique to the HP 8566B Option 002. The combination of this supplement and your instrument's standard documentation, including the Option 915 service documentation, will provide a complete and accurate set of documentation for an HP 8566B Option 002.

How to Use This Supplement

This supplement is to be used in conjunction with the 8566B Troubleshooting and Repair Manual, HP part number 85660-90210 or 08566-90042. Insert the following pages after the A15 tab in either of these manuals.

What is Option 002

This option provides faster processing of data, thus increasing the speed of measurement. This decreases the measurement time by as much as half that of a standard HP 8566B when performing some of the common spectrum analyzer measurements.

A standard HP 8566B can be retrofitted to an Option 002 by installing a Turbo retrofit kit (HP 8566B Option R02).

An HP 8566A can be retrofitted to an 8566B Option 002 by installing the 8566AB Option 002, A to B retrofit kit.

ManualsPlus.com

HP Part Number 85660-60382

A15 Controller (Option 002 only)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A15	85660-60382	9	1	BOARD ASSEMBLY, CONTROLLER (Option 002 only)	28480	85660-60382
A15BT1	1420-0331	3	1	BATTERY 3.68V 1.75A-HR LITHIUM THIONYL		15-51-04-410-000
A15C1	0160-4554	7	1	CAPACITOR-FXD 0.01uF 50 VDC +-20% CER	04222	SA105C103MAAH
A15C2	0160-4554	7	1	CAPACITOR-FXD 0.01uF 50 VDC +-20% CER	04222	SA105C103MAAH
A15C3	0160-4554	7	1	CAPACITOR-FXD 0.01uF 50 VDC +-20% CER	04222	SA105C103MAAH
A15C4	0160-4554	7	1	CAPACITOR-FXD 0.01uF 50 VDC +-20% CER	04222	SA105C103MAAH
A15C5	0160-4554	7	1	CAPACITOR-FXD 0.01uF 50 VDC +-20% CER	04222	SA105C103MAAH
A15C6	0160-4554	7	1	CAPACITOR-FXD 0.01uF 50 VDC +-20% CER	04222	SA105C103MAAH
A15C7	0160-4554	7	1	CAPACITOR-FXD 0.01uF 50 VDC +-20% CER	04222	SA105C103MAAH
A15C8	0160-4554	7	1	CAPACITOR-FXD 0.01uF 50 VDC +-20% CER	04222	SA105C103MAAH
A15C10	0160-4554	7	1	CAPACITOR-FXD 0.01uF 50 VDC +-20% CER	04222	SA105C103MAAH
A15C11	0160-4554	7	1	CAPACITOR-FXD 0.01uF 50 VDC +-20% CER	04222	SA105C103MAAH
A15C12	0160-4554	7	1	CAPACITOR-FXD 0.01uF 50 VDC +-20% CER	04222	SA105C103MAAH
A15C13	0160-4554	7	1	CAPACITOR-FXD 0.01uF 50 VDC +-20% CER	04222	SA105C103MAAH
A15C15	0160-4554	7	1	CAPACITOR-FXD 0.01uF 50 VDC +-20% CER	04222	SA105C103MAAH
A15C17	0160-4554	7	1	CAPACITOR-FXD 0.01uF 50 VDC +-20% CER	04222	SA105C103MAAH
A15C18	0160-4554	7	1	CAPACITOR-FXD 0.01uF 50 VDC +-20% CER	04222	SA105C103MAAH
A15C19	0160-4554	7	1	CAPACITOR-FXD 0.01uF 50 VDC +-20% CER	04222	SA105C103MAAH
A15C20	0160-4554	7	1	CAPACITOR-FXD 0.01uF 50 VDC +-20% CER	04222	SA105C103MAAH
A15C22	0160-4554	7	1	CAPACITOR-FXD 0.01uF 50 VDC +-20% CER	04222	SA105C103MAAH
A15C23	0160-4554	7	1	CAPACITOR-FXD 0.01uF 50 VDC +-20% CER	04222	SA105C103MAAH
A15C24	0160-4574	1	1	CAPACITOR-FXD 1000PF +-10% 100VDC CER	04222	SA101C102KAAH
A15C25	0160-4535	4	1	CAPACITOR-FXD 1UF +-10% 50VDC CER	04222	SR305C105KAAH
A15C29	0160-4801	7	1	CAPACITOR-FXD 100PF +-5% 100VDC CER 0+-3	04222	SA102A101JAAH
A15C30	0160-4832	4	1	CAPACITOR-FXD .01UF +-10% 100VDC CER	04222	SA101C103KAAH
A15C31	0160-4808	4	1	CAPACITOR-FXD 470PF +-5% 100VDC CER 0+-3	04222	SA101A471JAAH
A15C32	0180-2207	5	1	CAPACITOR-FXD 100UF+-10% 10VDC TA	56289	150D107X9010R2-DYS
A15C34	0160-4801	7	1	CAPACITOR-FXD 100PF +-5% 100VDC CER 0+-3	04222	SA102A101JAAH
A15CR3	1901-0518	8	1	DIODE-SCHOTTKY SM SIG	28480	1901-0518
A15DS1	1990-0958	7	1	LED-LAMP IF=7MA-MAX BVR=5V	28480	HLMP-1700
A15DS2	1990-0958	7	1	LED-LAMP IF=7MA-MAX BVR=5V	28480	HLMP-1700
A15DS3	1990-0958	7	1	LED-LAMP IF=7MA-MAX BVR=5V	28480	HLMP-1700
A15DS4	1990-0958	7	1	LED-LAMP IF=7MA-MAX BVR=5V	28480	HLMP-1700
A15DS5	1990-0958	7	1	LED-LAMP IF=7MA-MAX BVR=5V	28480	HLMP-1700
A15DS6	1990-0958	7	1	LED-LAMP IF=7MA-MAX BVR=5V	28480	HLMP-1700
A15DS7	1990-0958	7	1	LED-LAMP IF=7MA-MAX BVR=5V	28480	HLMP-1700
A15DS8	1990-0958	7	1	LED-LAMP IF=7MA-MAX BVR=5V	28480	HLMP-1700
A15DS9	1990-0958	7	1	LED-LAMP IF=7MA-MAX BVR=5V	28480	HLMP-1700
A15DS10	1990-0958	7	1	LED-LAMP IF=7MA-MAX BVR=5V	28480	HLMP-1700
A15DS11	1990-0958	7	1	LED-LAMP IF=7MA-MAX BVR=5V	28480	HLMP-1700
A15DS12	1990-0958	7	1	LED-LAMP IF=7MA-MAX BVR=5V	28480	HLMP-1700
A15DS13	1990-0958	7	1	LED-LAMP IF=7MA-MAX BVR=5V	28480	HLMP-1700
A15DS14	1990-0958	7	1	LED-LAMP IF=7MA-MAX BVR=5V	28480	HLMP-1700
A15E1	1251-4787	2	1	SHUNT-DIP 8 POSITION DUAL INLINE PKG	00779	435704-8
A15J1	1251-5926	3	1	CONN-POST TYPE .100-PIN-SPCG 50-CONT	18873	67997-650
A15J2	1251-5905	8	1	CONN-POST TYPE .100-PIN-SPCG 24-CONT	18873	67997-624

Indicates factory-selected value

ManualsPlus.com

HP Part Number 85660-60382
A15 Controller (Option 002 only)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A15J3	1200-0607	0	1	16-PIN IC SOCKET	00779	641600-1/TUBED 2-641600
A15J5	1251-5619	1	1	CONN-POST TYPE .100-PIN-SPCG 4-CONT	18873	68000-604
A15L1	9140-0875	4	1	INDUCTOR 80uH 10%	28480	9140-0875
A15MP1	1400-1267	4	1	HOLDER-BAT .531-.656-DIA FOR AA CELLS	91833	91
A15MP3	1480-0073	6	2	PIN-ROLL .062-IN-DIA .25-IN-LG BE-CU	72962	99-012-062-0250
A15MP4	4040-0749	4	1	EXTR-PC BD BRN POLYC .062-IN-BD-THKNS 1-	28480	4040-0749
A15MP5	4040-0753	0	1	EXTR-PC BD GRN POLYC .062-IN-BD-THKNS 1-	28480	4040-0753
A15MP6	0361-0026	6	1	RIVET-SEMITUB OVH .089DIA .125LG	12014	R-4008-1/8
A15MP11	1200-0567	1	1	SOCKET-IC 28-CONT DIP DIP-SLDR	00779	2-641605-1
A15Q1	1854-0477	7	1	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A15Q2	1853-0213	7	1	TRANSISTOR PNP 2N4236 SI TO-5 PD=1W	04713	2N4236
A15R2	0757-0442	9	1	RESISTOR 10K +-1% .125W TF TC=0+-100	2M627	CRB14 OR CRB25
A15R3	0698-3157	3	1	RESISTOR 19.6K 1% .125W TF TC=0+-100	2M627	CRB14 OR CRB25
A15R4	0698-3260	9	1	RESISTOR 464K 1% .125W TF TC=0+-100	2M627	CRB14 OR CRB25
A15R5	0757-0280	3	1	RESISTOR 1K +-1% .125W TF TC=0+-100	2M627	CRB14 OR CRB25
A15R6	0757-0442	9	1	RESISTOR 10K +-1% .125W TF TC=0+-100	2M627	CRB14 OR CRB25
A15R7	0757-0442	9	1	RESISTOR 10K +-1% .125W TF TC=0+-100	2M627	CRB14 OR CRB25
A15R8	0757-0442	9	1	RESISTOR 10K +-1% .125W TF TC=0+-100	2M627	CRB14 OR CRB25
A15R9	0698-3260	9	1	RESISTOR 464K 1% .125W TF TC=0+-100	2M627	CRB14 OR CRB25
A15R10	0757-0280	3	1	RESISTOR 1K +-1% .125W TF TC=0+-100	2M627	CRB14 OR CRB25
A15R11	0757-0280	3	1	RESISTOR 1K +-1% .125W TF TC=0+-100	2M627	CRB14 OR CRB25
A15R12	0757-0401	0	1	RESISTOR 100 +-1% .125W TF TC=0+-100	2M627	CRB14 OR CRB25
A15R13	0698-3440	7	1	RESISTOR 196 1% .125W TF TC=0+-100	2M627	CRB14 OR CRB25
A15R14	0757-0401	0	1	RESISTOR 100 +-1% .125W TF TC=0+-100	2M627	CRB14 OR CRB25
A15R18	0757-0280	3	1	RESISTOR 1K +-1% .125W TF TC=0+-100	2M627	CRB14 OR CRB25
A15R19	0698-3155	1	1	RESISTOR 4.64K 1% .125W TF TC=0+-100	2M627	CRB14 OR CRB25
A15R21	0698-7212	9	1	RESISTOR 100 +-1% .05W TF TC=0+-100	19701	5063J
A15SW1	3101-2197	9	1	SWITCH-DIP RKR 6-1A 0.05A 30VDC	81073	76YY2346S
A15TP1	1252-0569	2	1	CONN-POST TYPE .150-PIN-SPCG 9-CONT	00779	87221-8
A15TP2	1251-8427	5	1	CONN-POST TYPE .150-PIN-SPCG 5-CONT	00779	87221-4
A15U1	1810-0446	8	1	NETWORK-RES 8-SIP 1.5K OHM X 7	11236	750-81
A15U2	1810-0446	8	1	NETWORK-RES 8-SIP 1.5K OHM X 7	11236	750-81
A15U3	1810-0446	8	1	NETWORK-RES 8-SIP 1.5K OHM X 7	11236	750-81
A15U4	1820-1197	9	1	IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A15U5	1820-3401	2	1	IC BFR TTL ALS OR QUAD 2-INP	01295	SN74ALS1032AN
A15U6	1820-2548	6	1	IC-GENERAL PURPOSE INTERFACE BUS ADAPTER	01295	TMS9914ANL
A15U7	1820-1199	1	1	IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A15U8	1820-1216	3	1	IC DCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N
A15U9	1820-3449	8	1	IC-PARALLEL INTERFACE/TIMER/8MHZ/MC68000	04713	MC68230L8
A15U10	1820-2102	8	1	IC LCH TTL LS D-TYPE OCTL	01295	SN74LS373N
A15U11	1820-1997	7	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG PRL-IN	01295	SN74LS374N
A15U12	1820-3590	0	1	IC GATE TTL LS OR QUAD 2-INP	28480	1820-3590
A15U13	1820-1203	8	1	IC GATE TTL LS AND TPL 3-INP	01295	SN74LS11N
A15U14	1818-3335	6	1	IC CMOS 65536 (64K) STAT RAM 100-NS 3-S	28480	1818-3335
A15U15	1818-3335	6	1	IC CMOS 65536 (64K) STAT RAM 100-NS 3-S	28480	1818-3335
A15U17	1818-3335	6	1	IC CMOS 65536 (64K) STAT RAM 100-NS 3-S	28480	1818-3335
A15U18	1818-3335	6	1	IC CMOS 65536 (64K) STAT RAM 100-NS 3-S	28480	1818-3335

**Indicates factory-selected value*

ManualsPlus.com

HP Part Number 85660-60382

A15 Controller (Option 002 only)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A15U20	85660-80221	7	1	IC 16R4 PAL PRGMD	28480	85660-80221
A15U21	1810-0205	7	1	NETWORK-RES 8-SIP 4.7K OHM X 7	11236	750-81
A15U22	1820-2024	3	1	IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS244N
A15U23	1810-0394	5	1	NETWORK-RES 8-SIP 6.8K OHM X 7	11236	750-81
A15U24	1820-1851	2	1	IC ENCDR TTL LS	01295	SN74LS148N
A15U25	1810-0205	7	1	NETWORK-RES 8-SIP 4.7K OHM X 7	11236	750-81
A15U26	1820-6516	6	1	IC-16 BIT MICROPROCESSOR /16 MHZ	28480	1820-6516
A15U27	1820-2772	8	1	IC FF CMOS/74HC J-K NEG-EDGE-TRIG PRESET	28480	1820-2772
A15U28	1820-1281	2	1	IC DCDR TTL LS 2-TO-4-LINE DUAL	01295	SN74LS139AN
A15U29	1810-0205	7	1	NETWORK-RES 8-SIP 4.7K OHM X 7	11236	750-81
A15U30	1820-3513	7	1	IC-INTERFACE XCVR BCD UP/DOWN INSTRUMENT	27014	DS75161AN
A15U31	1820-3431	8	1	IC-INTERFACE XCVR BCD UP/DOWN INSTRUMENT	27014	DS75160AN
A15U32	1820-2675	0	1	IC TRANSCEIVER TTL LS BUS OCTL	01295	SN74LS646NT
A15U33	1810-0279	5	1	NETWORK-RES 10-SIP 4.7K OHM X 9	11236	750-101
A15U34	1820-1997	7	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG PRL-IN	01295	SN74LS374N
A15U35	1820-1112	8	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG PRESET	01295	SN74LS74AN
A15U36	1820-2675	0	1	IC TRANSCEIVER TTL LS BUS OCTL	01295	SN74LS646NT
A15U37	85660-80217	1	1	EPROM PRGMD	28480	85660-80217
A15U38	85660-80219	3	1	EPROM PRGMD	28480	85660-80219
A15U39	85660-80218	2	1	EPROM PRGMD	28480	85660-80218
A15U40	85660-80220	6	1	EPROM PRGMD	28480	85660-80220
A15U41	1810-0344	5	1	NETWORK-RES 10-SIP 6.8K OHM X 9	11236	750-101
A15U42	85660-80070	4	1	IC1618 PAL PRGMD	28480	85660-80070
A15U43	1826-0759	9	1	IC COMPARATOR GP QUAD 14-DIP-C PKG	04713	LM339J
A15U44	1810-0205	7	1	NETWORK-RES 8-SIP 4.7K OHM X 7	11236	750-81
A15U45	1820-3562	6	1	IC BFR TTL ALS INV HEX	01295	SN74ALS1005N
A15U46	1810-0205	7	1	NETWORK-RES 8-SIP 4.7K OHM X 7	11236	750-81
A15U47	1820-3590	0	1	IC GATE TTL LS OR QUAD 2-INP	28480	1820-3590
A15Y1	1813-0196	1	1	CLOCK-OSCILLATOR-CRYSTAL 14.7456-MHZ	28480	1813-0196
A15Y1	1813-0129	0	0	CLOCK-OSCILLATOR-XTAL 14.7456-MHZ 0.01% (ALTERNATE PART FOR 1813-0196)	00815	HS-100(14.7456MHZ)

**Indicates factory-selected value*

ManualsPlus.com

A15 CONTROLLER
85660-60382
(SHEET 1 OF 3)
(OPTION 002 ONLY)

P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	LTIO	A12P1-28	F
25	GND		R
2	LBIO	A12P1-27	F
27	GND		R
3	NC		
28	NC		
4	LRTL	A3A1P1-43	I
29	HSWP	A12P1-4	S
5	KC6	A12P1-30	S
30	KC7	A12P1-5	S
6	KC4	A12P1-31	S
31	KC5	A12P1-6	S
7	KC2	A12P1-32	S
32	KC3	A12P1-7	S
8	KCØ	A12P1-33	S
33	KC1	A12P1-8	S
9	KR1Ø	A12P1-34	S
34	KR11	A12P1-9	S
10	KR8	A12P1-35	S
35	KR9	A12P1-10	S
11	NC		
36	NC		
12	ADR4	A12P1-37	H
37	LADR	A3A1P1-28	I
13	ADR2	A12P1-38	H
38	ADR3	A12P1-13	H
14	ADRØ	A12P1-39	H
39	ADR1	A12P1-14	H
15	NC		
40	NC		
16	NC		
41	NC		
17	IOB14	A12P1-42	H
42	IOB15	A12P1-17	H
18	IOB12	A12P1-43	H
43	IOB13	A12P1-18	H
19	IOB1Ø	A12P1-44	H
44	IOB11	A12P1-19	H
20	IOB8	A12P1-45	H
45	IOB9	A12P1-20	H
21	IOB6	A12P1-46	H
45	IOB7	A12P1-21	H
22	IOB4	A12P1-47	H
47	IOB5	A12P1-22	H
23	IOB2	A12P1-48	H
45	IOB3	A12P1-23	H
24	IOBØ	A12P1-49	H
49	IOB1	A12P1-24	H
25	GND		R
50	LRMT	A12P1-25	I

P2

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	GND		R
19	LBIO		F
2	ADRØ		H
20	ADR1		H
3	ADR2		H
21	ADR3		H
4	ADR4		H
22	NC		H
5	IOBØ		H
23	IOB1		H
6	IOB2		H
24	IOB3		H
7	IOB4		H
25	IOB5		H
8	IOB6		H
26	IOB7		H
9	IOB8		H
27	IOB9		H
10	IOB1Ø		H
28	IOB11		H
11	IOB12		H
29	IOB13		H
12	IOB14		H
30	IOB15		H
13	NC		
31	NC		
14	GND		R
32	MPUP	A17P1-43	B
15	NC		
33	LIPS	A12P2-8	I
16	NC		
34	LSRQ	A12P2-16	J
17	+5.2V		R
35	+5.2V		R
18	GND		R
36	GND		R

INSTRUMENT BUS

P3

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	NC		
18	NC		
2	GND		R
17	GND		R
3	+12V		R
18	+12V		R
4	-5.2		NC
19	-5.2		NC
5	NC		
20	NC		
6	NC		
21	NC		
7	NC		
22	NC		
8	NC		
23	NC		
9	NC		
24	NC		
10	NC		
25	NC		
11	NC		
26	NC		
12	NC		
27	NC		
13	NC		
28	NC		
14	NC		
29	NC		
15	GND		R
30	GND		R

J1

P.N	SIGNAL	TO FROM	FUNCTION BLOCK
1	NC		
2	IOB1	A4A10J1-4	H
3	IOB3	A4A10J1-6	H
4	IOB5	A4A10J1-8	H
5	IOB7	A4A10J1-10	H
6	IOB9	A4A10J1-12	H
7	IOB11	A4A10J1-14	H
8	IOB13	A4A10J1-16	H
9	IOB15	A4A10J1-18	H
10	LADR	NC	I
11	MPON	A1A9J1-22	R
12	ADR1	A4A10J1-24	H
13	ADR3	A4A10J1-26	H
14	NC		
15	NC		
16	KR9	A1A1J1-33	S
17	KR11	A1A1J1-31	S
18	KC1	A1A1J1-41	S
19	KC3	A1A1J1-39	S
20	KC5	A1A1J1-37	S
21	KC7	A1A1J1-35	S
22	HSWP	A3A1P1-21	S
23	LDSR	A3A10J1-46	J
24	GND		R
25	GND		R
26	GND		R
27	IOBØ	A4A10J1-3	H
28	IOB2	A4A10J1-5	H
29	IOB4	A4A10J1-7	H
30	IOB6	A4A10J1-9	H
31	IOB8	A4A10J1-11	H
32	IOB1Ø	A4A10J1-13	H
33	IOB12	A4A10J1-15	H
34	IOB14	A4A10J1-17	H
35	NC		
36	NC		
37	ADRØ	A4A10J1-23	H
38	ADR2	A4A10J1-25	H
39	ADR4	A4A10J1-27	H
40	NC		
41	KR8	A1A1J1-34	S
42	KR1Ø	A1A1J1-32	S
43	KCØ	A1A1J1-42	S
44	KC2	A1A1J1-40	S
45	KC4	A1A1J1-38	S
46	KC6	A1A1J1-36	S
47	NC		
48	LSRQ	A1A9J1-45	J
49	LBIO	A1A9J1-47	F
50	LTIO	A3A10J2-49	F

J2

PIN	SIGNAL	TO FROM	FUNCTION BLOCK
1	DIØ1	J5-1	J
2	DIØ2	J5-2	J
3	DIØ3	J5-3	J
4	DIØ4	J5-4	J
5	EOI	J5-5	J
6	DAV	J5-6	J
7	NRFD	J5-7	J
8	NDAC	J5-8	J
9	IFC	J5-9	J
10	SRQ	J5-10	J
11	ATN	J5-11	J
12	NC	SEE NOTE 5	
13	DIØ5	J5-13	J
14	DIØ6	J5-14	J
15	DIØ7	J5-15	J
16	DIØ8	J5-15	J
17	REN	J5-17	J
18	NC	SEE NOTE 5	
19	NC	SEE NOTE 5	
20	NC	SEE NOTE 5	
21	NC	SEE NOTE 5	
22	NC	SEE NOTE 5	
23	NC	SEE NOTE 5	
24	NC	SEE NOTE 5	

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.

2. UNLESS OTHERWISE INDICATED:
   RESISTANCE IS IN OHMS (Ω).
   CAPACITANCE IS IN MICROFARADS (μF).
   INDUCTANCE IS IN MICROHENRIES (μH).

3. UNLESS OTHERWISE INDICATED:
   SIGNALS ENTER AT LEFT SIDE OR TOP, AND EXIT RIGHT SIDE OR BOTTOM OF FUNCTION BLOCKS.

4. PINS 12, 18-24 ARE CHASSIS GROUNDED THRU A20.

5. ON EARLIER VERSIONS OF 85660-60245, R21 IS NOT INSTALLED. REFER TO FUNCTION BLOCK F.

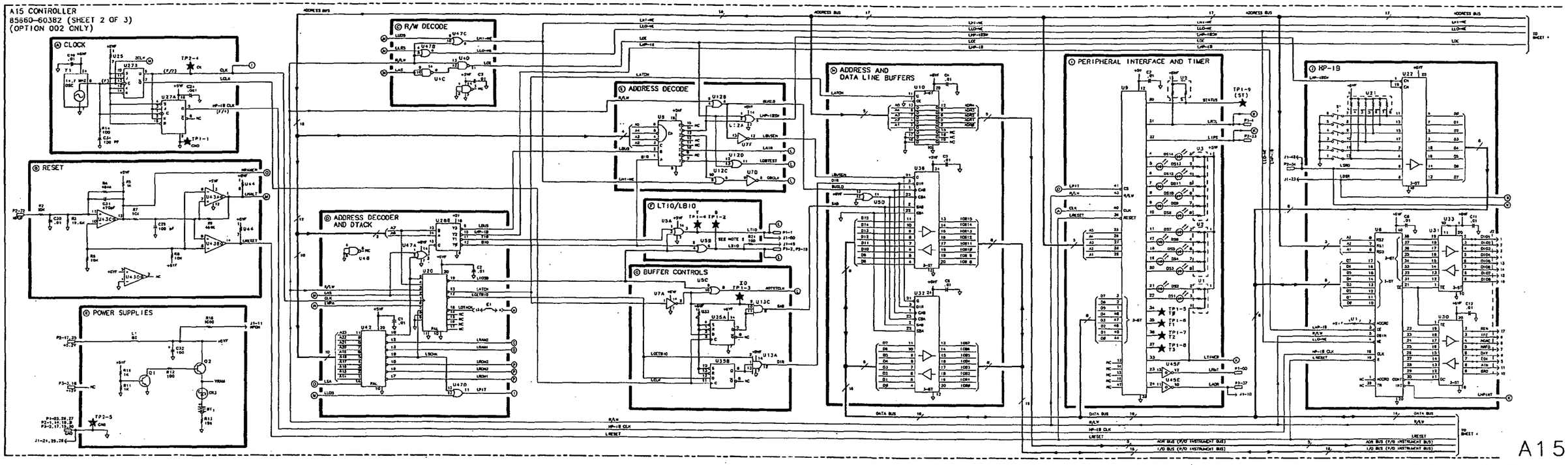
6. MNEMONIC TABLE:

MNEMONIC	DESCRIPTION
ADRØ	INSTRUMENT BUS ADDRESS BIT Ø
ADR1	INSTRUMENT BUS ADDRESS BIT 1
ADR2	INSTRUMENT BUS ADDRESS BIT 2
ADR3	INSTRUMENT BUS ADDRESS BIT 3
ADR4	INSTRUMENT BUS ADDRESS BIT 4
ATN	LOW=ATTENTION
DAV	LOW=DATA VALID
DIØ1	MP-IB DATA INPUT/OUTPUT
DIØ2	MP-IB DATA INPUT/OUTPUT
DIØ3	MP-IB DATA INPUT/OUTPUT
DIØ4	MP-IB DATA INPUT/OUTPUT
DIØ5	MP-IB DATA INPUT/OUTPUT
DIØ6	MP-IB DATA INPUT/OUTPUT
DIØ7	MP-IB DATA INPUT/OUTPUT
DIØ8	MP-IB DATA INPUT/OUTPUT
EOI	LOW=END OR IDENTIFY
MPON	HIGH=IF-DISPLAY SECTION POWER ON
MPUP	HIGH=POWER UP
HRAMEN	HIGH=RAM-ENABLE
IFC	LOW=INTERFACE CLEAR
IOBØ	INSTRUMENT BUS DATA BIT Ø
IOB1	INSTRUMENT BUS DATA BIT 1
IOB2	INSTRUMENT BUS DATA BIT 2
IOB3	INSTRUMENT BUS DATA BIT 3
IOB4	INSTRUMENT BUS DATA BIT 4
IOB5	INSTRUMENT BUS DATA BIT 5
IOB6	INSTRUMENT BUS DATA BIT 6
IOB7	INSTRUMENT BUS DATA BIT 7
IOB8	INSTRUMENT BUS DATA BIT 8
IOB9	INSTRUMENT BUS DATA BIT 9
IOB1Ø	INSTRUMENT BUS DATA BIT 1Ø
IOB11	INSTRUMENT BUS DATA BIT 11
IOB12	INSTRUMENT BUS DATA BIT 12
IOB13	INSTRUMENT BUS DATA BIT 13
IOB14	INSTRUMENT BUS DATA BIT 14
IOB15	INSTRUMENT BUS DATA BIT 15
LADR	LOW=ADDRESS LED ON
LBIO	LOW=BOTTOM BOX INPUT/OUTPUT
LDSR	LOW=DIGITAL STORAGE READY
LIPS	LOW=INSTRUMENT PRESET
LRMT	LOW=REMOTE;HIGH=LOCAL
LRTL	LOW=RETURN TO LOCAL
LSRQ	LOW=SERVICE REQUEST
LTIO	LOW=TOP BOX INPUT/OUTPUT
NDAC	HIGH=DATA ACCEPTED
NRFD	HIGH=READY FOR DATA
REN	LOW=REMOTE ENABLE
SRQ	LOW=SERVICE REQUEST

UA15_1L

ManualsPlus.com

A15 CONTROLLER
85660-60382 (SHEET 2 OF 3)
(OPTION 002 ONLY)



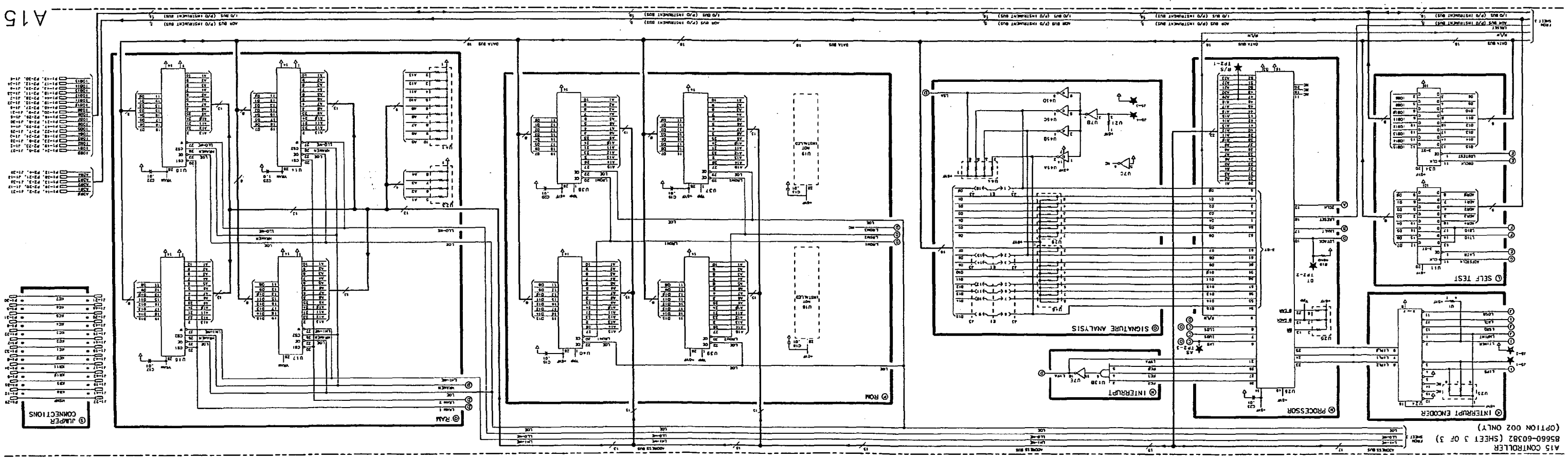
A15

A15 CONTROLLER, SCHEMATIC DIAGRAM (2 OF 3)

ManualsPlus.com

A15

A15 CONTROLLER
85560-60382 (SHEET 3 OF 3)
(OPTION 002 ONLY)



ManualsPlus.com

A15 CONTROLLER, CIRCUIT DESCRIPTION

The A15 Controller performs the main control functions of the spectrum analyzer. The board includes a 16-bit microprocessor (the instrument's main processor), read-only memory (ROMs), random-access memory (RAMs), and HP-IB circuitry.

The schematic shows how the main processor, memory, HP-IB, and other circuits on the A15 Controller are interconnected via the microprocessor's 23-bit address bus and the 16-bit data bus. To control signal flow on these buses, various signals must be derived from the address bus signals and the microprocessor's remaining output signals. These control signals are generated by two programmable-array-logic integrated circuits (PALs) and other discrete logic (R/W DECODE, ADDRESS DECODER AND DTACK, ADDRESS DECODE, and LTIO/LBIO blocks). The signals are used by the microprocessor to control data flow and address decoding on the A15 Controller and to control signal flow over the Instrument Bus.

The 16-bit, 8 MHz MC68000 microprocessor receives input through the front panel keyboard or from HP-IB, performs the necessary decoding and calculations, and outputs the proper control signals to execute a specific spectrum analyzer operation. Typical main processor tasks include phase-locking the YTO, selecting the correct sweep time and frequency span, setting the IF-Display Section resolution bandwidth and sensitivity, and displaying the current control settings on the CRT through the A3 Digital Storage Section. Instructions that tell the microprocessor how to accomplish these tasks, the firmware, are stored in ROMs located on the A15 Controller. In addition, custom commands and programming can be downloaded into RAM, permitting specialized operation without requiring a dedicated controller.

The microprocessor performs a brief power-on pretest (POP) at instrument turn-on, verifying operation of critical circuits and lighting front-panel check LEDs I and II. In addition, LEDs located on the top edge of the A15 Controller provide information to help identify particular faulty circuit components in case a failure occurs.

The instrument's main memory consists of read-only memory (ROM) and random-access memory (RAM) which are located on the A15 Controller. Each 16-bit word in memory is composed of two 8-bit bytes. The ROM, used to provide permanent storage of the firmware, is composed of four 32K-byte erasable programmable read-only memorys (EPROMs). This provides a total of 64K-words of ROM. The RAM, used for erasable storage of custom instructions and programs, is composed of four 8K-byte static CMOS memory integrated circuits for a total of 16K-words of RAM. A lithium battery located on the A15 Controller provides battery backup power to the CMOS RAM to preserve the contents of memory when power is removed from the instrument. The typical in-circuit life expectancy of the non-rechargeable battery is at least 3 years.

The HP-IB allows the spectrum analyzer to communicate with external devices. It is implemented using four ICs: a data latch, an HP-IB processor, and two bus transceivers.

The A15 Controller clock circuit generates an 8-MHz clock signal for the 16-bit microprocessor and a synchronous 4-MHz clock signal for the HP-IB processor. The appropriate clock frequency is derived from division of the output signal of a 14.7456 MHz hybrid crystal clock oscillator.

The A15 Controller firmware includes extensive diagnostics which are executed whenever the instrument is powered up or the INSTRUMENT PRESET key is pressed.
The microprocessor executes a self-test routine and indicates the results via LEDs. A memory failure, microprocessor failure, or Instrument Bus failure can usually be pinpoined to the failed component using these indicators.

HP-IB Address Switch

The position of the address switch on the A15 Controller (A15SW1) determines what read/write address is used by the analyzer when the line power is turned on.

ManualsPlus.com

The address switch is preset to 31 (switches A1 through A5 pressed up) at the factory. If the CMOS backup battery is not discharged, the last read/write address used by the analyzer is active with power on. If the backup battery is discharged, the analyzer will default to a read/write address of 18 with power on.

If the address switch is set to any address from 0 to 30, this address will be used as the read/write address by the analyzer with power on.

Switch A6 is also set in the "up" position (logic 1) at the factory. A6 in this position does a checksum verification of the two pairs of ROMs on the A15 Controller as part of the self-test routine with power on.

HP-IB Signal Ground (A29)

The A29 assembly provides chassis ground for the HP-IB shield. Pins 12 and 18 through 24 of the HP-IB connector J2 are immediately grounded to the chassis upon entering the instrument.

ManualsPlus.com

A15 CONTROLLER, TROUBLESHOOTING

Troubleshooting the A15 Controller is divided into three levels:

Level 1 is Self Test which uses the built-in diagnostics of the spectrum analyzer to isolate the failure. No external test equipment is required.

Level 2 is Signature Analysis which requires the use of a signature analyzer such as an HP 5005A, 5005B, or 5006A. This level of troubleshooting should be performed to further isolate the problem or when Self Test will not run.

Level 3 is Manual Tests which require the use of general troubleshooting equipment such as a digital voltmeter and oscilloscope. This level is required when neither Self Test nor Signature Analysis can isolate the failure.

Level 1 SELF TEST

The Self Test is run on power-up and after pushing the INSTRUMENT PRESET key. Two front panel LEDs, INSTR CHECK I and II, give an indication of Self Test results (without removing any covers from the instrument). There are also 15 LEDs on the A15 Controller (DS1 through DS15) that will help isolate a problem.

Front Panel INSTR CHECK I and II LEDs

The two red INSTR CHECK LEDs are forced on whenever the instrument is turned on or the INSTRUMENT PRESET key is pushed. The main processor then performs a check of itself, a checksum verification of all ROMs on the A15 Controller, a partial check of the Instrument Bus (50-wire bus), and a read/write check of the RAMs and A3A4 Memory in the IF-Display Section.

If all the checks pass, both INSTR CHECK LEDs are turned off.
If the checks fail, one or both INSTR CHECK LEDs remain on.

a. BOTH INSTR CHECK LEDs ON indicates a problem on the A15 Controller. First remove the A15 Controller and make sure that the 50-wire ribbon cable and HP-IB ribbon cable are pressed all the way onto A15J1 and A15J2 connectors. Reinstall the A15 Controller. If both front panel INSTR CHECK LEDs still remain on when the instrument is turned on, follow procedure under A15 Controller Self Test.

b. LEFT LED (INSTR CHECK I) ON indicates a failure occurred when checking Digital Storage Memory (A3A4). First check to ensure that a LINE power cord is connected to the IF-Display Section. Also check to see that the rear-panel Analyzer Bus Interconnect Cable, W31, is properly connected. If INSTR CHECK I still remains on when the instrument is turned on, troubleshoot the A3 Digital Storage in the IF-Display Section.

c. RIGHT LED (INSTR CHECK II) ON indicates a failure occurred during the partial check of the Instrument Bus.

NOTE

The partial interface check reads the key column lines (KC0 through KC7) from the A1 and A5 front panels. If any front panel key is shorted or stuck closed, INSTR CHECK II LED should remain on after the Self Test is completed. This part of the Self Test can easily be verified by pushing any key, except LCL, and holding the key in while pushing the INSTRUMENT PRESET key. If the I/O interface check routine is working, INSTR CHECK II LED will stay on.

ManualsPlus.com

d. SUSPECTED DIGITAL FAILURE BUT NO INSTR CHECK LEDS ON may indicate a RAM or I/O bus failure which is not checked in the normal Self Test or "POP" (Power On Preset). If the two front panel INSTR CHECK LEDs turn on when the LINE switch is set to ON, and within a few seconds turn off (indicating no digital problems), but symptoms (such as improper CRT display or improper response to particular commands) indicate that the problem is in the digital area, a "LONG POP" can be performed. LONG POP is very similar to the normal POP except an additional processor check is performed, all of the RAM locations in Digital Storage (A3A4 Memory) are checked, and the memory (RAM) on the A15 Controller is verified.

Since these more extensive checks require altering information that has been stored in RAM, LONG POP requires an internal jumper from A15TP4 (STS) to A15TP1-7 (T3). To perform a LONG POP, set LINE switch to STANDBY and jumper A15TP4 to A15TP1-7. (Refer to A15 Controller Component Locations for location of test points). When LINE switch is then set to ON, the two red INSTR CHECK LEDs are forced on and the main processor steps through the Self Test routine, expanding the normal POP by the additional tests mentioned. The expected results for a LONG POP are exactly the same as for the normal POP of INSTR PRESET as described in paragraphs a, b, and c under "Front Panel INSTR CHECK I and II LEDs".

Because LONG POP is a "destructive test" (it alters any information that has been stored in RAM), it should be performed only as a last resort effort in troubleshooting what appears to be a memory or processor related problem.

A15 Controller Self Test

The A15 Controller Self Test is run on power-up and after pushing the INSTRUMENT PRESET key. Fourteen LEDs (A15DS1 through A15DS14) on the A15 Controller give an indication of the Self Test results. All fourteen LEDs are forced on whenever the instrument is turned on or the INSTRUMENT PRESET key is pushed. The main processor (A15U26) then performs a check of itself, a check of the Peripheral Interface and Timer chip, a checksum verification of all the ROMs on the A15 Controller, a read/write check of the RAMs on the A15 Controller, and an Instrument Bus check that checks the I/O Bus, Address Bus, and Data Bus for stuck lines.

If all the checks pass, the fourteen LEDs are turned off serially as each check is completed. If the checks fail, one or more LEDs remain on. Refer to Table 1, A15 Controller Self Test Fail Indicators, at the end of this troubleshooting section.

Other failure modes to look for are:

a. If the fourteen LEDs do not turn on when the spectrum analyzer is turned on or the INSTRUMENT PRESET key is pushed, use Signature Analysis (troubleshooting Level 2) to determine the probable failure.

Hint: Check U39 and U40 ROM signatures and U42 PAL signatures before taking the green path.

b. If the fourteen LEDs turn on but are all turned off at the same time (instead of sequentially), the Peripheral Interface and Timer chip has most likely failed.

c. When an I/O failure is indicated (DS3, DS4, or a combination of these LEDs remain on), it may become necessary to use an oscilloscope to locate a stuck line if the faulty component cannot be located using Signature Analysis.

Hint: Try replacing U20 and U42 PALs first, then try replacing U39 and U40 ROMs. If I/O failure still occurs, probe I/O lines with oscilloscope.

ManualsPlus.com

Level 2 SIGNATURE ANALYSIS

Signature Analysis has been designed into the A15 Controller to permit troubleshooting to the component level without totally understanding the detailed circuitry of the A15 Controller. Most of the A15 Controller failures (80 to 90%) can be isolated to a component or small group of components using Signature Analysis. Data Bus, Address Bus, and I/O Bus problems will usually require the use of an oscilloscope as a troubleshooting aid. Refer to MANUAL TESTS (Level 3).

To proceed with Signature Analysis, follow the procedures on the Signature Analysis Diagram.

Level 3 MANUAL TESTS

If neither the Self Test nor Signature Analysis leads to a failed component, it will be necessary to use a DVM and/or an oscilloscope. The following procedure may help locate the failed component:

a. Check all power supply voltages that supply power to the A15 Controller.

b. Check processor clock by connecting oscilloscope to A15TP2-4 (CK). The clock frequency should be approximately 7.36 MHz. The amplitude should be approximately +5V (HIGH) and OV (LOW). Also check for LOLK at pin 76 of A15U27B.

c. Check HP-IB clock at pin 5 of A15U27A. The HP-IB clock frequency should be approxmately 3.68 MHz. The amplitude should be approximately +5V (HIGH) and OV (LOW).

d. Some intermittent failures may require the use of heat (hair dryer) or cold (freeze mist) to isolate the failure.

CAUTION

Care should be exercised to avoid getting components too hot. Excessive heat may cause permanent damage of good components. Also, avoid spraying freeze mist directly on PC boards. Failures due to high-resistance paths between traces on PC boards have been caused by spraying the boards with freeze mist.

ManualsPlus.com

TABLE 1. A15 CONTROLLER SELT TEST FAIL INDICATORS

A15 LED On	Affected Circuitry	Probable Failure
DS1	Processor	A15U26
DS2	Top Box Address!	Use Signature Analysis or oscilloscope to isolate failure.
DS3	Bottom Box Address	Use Signature Analysis or oscilloscope to isolate failure.
DS4	I/O, Data Bus	Use Signature Analysis or oscilloscope to isolate failure.
DS5	RAM	A15U18
DS6	RAM	A15U15
DS7	RAM	A15U17
DS8	RAM	A15U14
*DS9	ROM	A15U19
*DS10	ROM	A15U16
DS11	ROM	A15U39
DS12	ROM	A15U37
DS13	ROM	A15U40
DS14	ROM	A15U38
**DS15	RAM	Power Supply (VRAM)

* A15U16 and A15U19 are loaded when 128K ROMs (set of 6) are installed. A15U16 and A15U19 are not loaded when 256K ROMs (set of 4) are used.

** DS15 should normally stay on. If DS15 is not on, suspect the power supply that supplies VRAM.

ManualsPlus.com

TABLE 2. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A15	85660-60209	9	1	BOARD ASSEMBLY, CONTROLLER	28480	85660-60209
A15TB1	1420-0331	3	1	BATTERY 3.4V 1.75A-HR LITHIUM THIONYL	28480	1420-0331
A15C1	0160-4554	7	19	CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A15C2	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A15C3	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A15C4	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A15C5	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A15C6	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A15C7	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A15C8	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A15C9				NOT ASSIGNED		
A15C10	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A15C11	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A15C12	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A15C13	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A15C14				NOT ASSIGNED		
A15C15	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A15C16				NOT ASSIGNED		
A15C17	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A15C18	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A15C19	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A15C20	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A15C21				NOT ASSIGNED		
A15C22	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A15C23	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A15C24	0160-4574	1		CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A15C25	0160-4535	4		CAPACITOR-FXD 1UF +-10% 50VDC CER	28480	0160-4535
A15C26-A15C28			1	NOT ASSIGNED		
A15C29	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A15C30	0180-0500	7	1	CAPACITOR-FXD 47UF +-20% 20VDC TA	28480	0180-0500
A15C31	0180-0197	8	2	CAPACITOR-FXD 2.2UF +-10% 20VDC TA	56289	150D225X9020A2
A15C32	0180-0552	9	1	CAPACITOR-FXD 220UF +-20% 10VDC TA	28480	0180-0552
A15C33	0180-0197	8		CAPACITOR-FXD 2.2UF +-10% 20VDC TA	56289	150D225X9020A2
A15C34	0160-4801	7	1	CAPACITOR-FXD 100PF +-5% 100VDC CER	28480	0160-4801
A15C35	0160-4833	5	1	CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A15CR1	1901-0620	3	2	DIODE-SWITCHING 60V 400MA DO-35	9N171	NDP250
A15CR2	1901-0050	3	1	DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A15CR3	1901-0518	8	1	DIODE-SM SIG SCHOTTKY	28480	1901-0518
A15CR4	1901-0620	3		DIODE-SWITCHING 60V 400MA DO-35	9N171	NDP250
A15DS1	1990-0958	7	14	LED-LAMP IF=7MA-MAX BVR=5V	28480	1990-0958
A15DS2	1990-0958	7		LED-LAMP IF=7MA-MAX BVR=5V	28480	1990-0958
A15DS3	1990-0958	7		LED-LAMP IF=7MA-MAX BVR=5V	28480	1990-0958
A15DS4	1990-0958	7		LED-LAMP IF=7MA-MAX BVR=5V	28480	1990-0958
A15DS5	1990-0958	7		LED-LAMP IF=7MA-MAX BVR=5V	28480	1990-0958
A15DS6	1990-0958	7		LED-LAMP IF=7MA-MAX BVR=5V	28480	1990-0958
A15DS7	1990-0958	7		LED-LAMP IF=7MA-MAX BVR=5V	28480	1990-0958
A15DS8	1990-0958	7		LED-LAMP IF=7MA-MAX BVR=5V	28480	1990-0958
A15DS9	1990-0958	7		LED-LAMP IF=7MA-MAX BVR=5V	28480	1990-0958
A15DS10	1990-0958	7		LED-LAMP IF=7MA-MAX BVR=5V	28480	1990-0958
A15DS11	1990-0958	7		LED-LAMP IF=7MA-MAX BVR=5V	28480	1990-0958
A15DS12	1990-0958	7		LED-LAMP IF=7MA-MAX BVR=5V	28480	1990-0958
A15DS13	1990-0958	7		LED-LAMP IF=7MA-MAX BVR=5V	28480	1990-0958
A15DS14	1990-0958	7		LED-LAMP IF=7MA-MAX BVR=5V	28480	1990-0958
A15DS15	1990-0957	6	1	LED-LAMP LUM-INT=1MCD IF=7MA-MAX BVR=5V	28480	1990-0957
A15E1	1251-4787	2	1	SHUNT-DIP 8-POSITION	28480	1251-4787
A15J1	1251-5926	3	1	CONNECTOR 50-PIN M POST TYPE	28480	1251-5926
A15J2	1251-5905	8	1	CONNECTOR 24-PIN M POST TYPE	28480	1251-5905
A15J3				NOT ASSIGNED		
A15J4				NOT ASSIGNED		
A15J5	1251-5619	1	1	CONNECTOR 4-PIN M POST TYPE	28480	1251-5619
A15L1	9140-0864	1	1	COIL 120UH 20%	28480	9140-0864
A15L2	9100-1788	6	1	CHOKE-WIDE BAND ZMAX=680 OHM @ 180 MHZ	02114	VK 200 20/48
A15MP1	1251-8616	4	1	CONN-POST TYPE .150-PIN-SPCG 4-CONT	28480	1251-8616
A15MP2				NOT ASSIGNED		
A15MP3	1480-0073	6	2	PIN-ROLL .062-IN-DIA .25-IN-LG BE-CU	28480	1480-0073
A15MP4	4040-0749	4	1	EXTR-PC BD BRN POLYC .062-BD-THKNS	28480	4040-0749
A15MP5	4040-0753	0	1	EXTR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0753

*Indicates Factory Selected Value

ManualsPlus.com

TABLE 2. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A15MP6				NOT ASSIGNED		
A15MP7	2200-0139	4	1	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0139
A15MP8	3050-0105	6	1	WASHER-FL MTLC NO. 4 .125-IN-ID	28480	3050-0105
A15MP9	2190-0003	8	1	WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0003
A15MP10	2260-0001	5	1	NUT-HEX-DBL-CHAM 4-40-THD .094-IN-THK	28480	2260-0001
A15Q1	1853-0281	9	1	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A15R1				NOT ASSIGNED		
A15R2	0698-7272	1	1	RESISTOR 31.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3162-F
A15R3				NOT ASSIGNED		
A15R4	0698-3157	3	1	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A15R5	0698-3152	8	2	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A15R6	0698-3260	9	3	RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A15R7	0757-0280	3	2	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A15R8	0757-0465	6	1	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A15R9	0757-0442	9	2	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A15R10	0698-3260	9		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A15R11	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A15R12	0698-3260	9		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A15R13	0698-3440	7	1	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A15R14	0757-0401	0	1	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A15R15	0757-0421	4	1	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A15R16	0698-3151	7	1	RESISTOR 2.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2871-F
A15R17	0757-0428	1	1	RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A15R18	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A15R19	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A15R20	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A15SW1	3101-2197	9	1	SWITCH-RKR DIP-RKR-ASSY 6-1A .05A 30VDC	28480	3101-2197
A15TP1	1251-8096	4	1	HEADER ASSY 7PIN	28480	1251-8096
A15TP2				NOT ASSIGNED		
A15TP3	0360-1682	0	2	TERMINAL-STUD SGL-TUR PRESS-MTG	28480	0360-1682
A15TP4	0360-1682	0		TERMINAL-STUD SGL-TUR PRESS-MTG	28480	0360-1682
A15TP5	1251-5177	6	2	CONNECTOR-SGL CONT PIN .031-IN-BSC-SZ	28480	1251-5177
A15TP6	1251-5177	6		CONNECTOR-SGL CONT PIN .031-IN-BSC-SZ	28480	1251-5177
A15U1	1810-0446	8	3	NETWORK-RES 8-SIP1.5K OHM X 7	11236	750-81-1.5K
A15U2	1810-0446	8		NETWORK-RES 8-SIP1.5K OHM X 7	11236	750-81-1.5K
A15U3	1810-0446	8		NETWORK-RES 8-SIP1.5K OHM X 7	11236	750-81-1.5K
A15U4	1820-1197	9	1	IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A15U5	1820-3401	2	1	IC BFR TTL ALS OR QUAD 2-INP	28480	1820-3401
A15U6	1820-2551	1	1	IC-GENERAL PURPOSE INTERFACE BUS ADAPTER	28480	1820-2551
A15U7	1820-1199	1	1	IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A15U8	1820-1216	3	1	IC DCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N
A15U9	1820-3449	8	1	IC-PARALLEL INTERFACE/TIMER/8MHZ/MC68000	28480	1820-3449
A15U10	1820-2102	8	1	IC LCH TTL LS D-TYPE OCTL	01295	SN74LS373N
A15U11	1820-1997	7	2	IC FF TTL LS D-TYPE POS-EDGE-TRIG PRL-IN	01295	SN74LS374N
A15U12	1820-1208	3	2	IC GATE TTL LS OR QUAD 2-INP	01295	SN74LS32N
A15U13	1820-1203	8	1	IC GATE TTL LS AND TPL 3-INP	01295	SN74LS11N
A15U14	1818-3183	2	4	IC CMOS 65536 (64K) STAT RAM 150-NS 3-S	28480	1818-3183
A15U14	1818-3305	0	4	IC CMOS 65536 (64K) STAT RAM 150-NS 3-S	28480	1818-3305
A15U15	1818-3183	2		IC CMOS 65536 (64K) STAT RAM 150-NS 3-S	28480	1818-3183
A15U15	1818-3305	0		IC CMOS 65536 (64K) STAT RAM 150-NS 3-S	28480	1818-3305
A15U16				NOT ASSIGNED		
A15U17	1818-3183	2		IC CMOS 65536 (64K) STAT RAM 150-NS 3-S	28480	1818-3183
A15U17	1818-3305	0		IC CMOS 65536 (64K) STAT RAM 150-NS 3-S	28480	1818-3305
A15U18	1818-3183	2		IC CMOS 65536 (64K) STAT RAM 150-NS 3-S	28480	1818-3183
A15U18	1818-3305	0		IC CMOS 65536 (64K) STAT RAM 150-NS 3-S	28480	1818-3305
A15U19				NOT ASSIGNED		
A15U20	5180-2330	0	1	IC16R4 PAL PRGMD	28480	5180-2330
A15U21	1810-0205	7	5	NETWORK-RES 8-SIP4.7K OHM X 7	01121	208A472
A15U22	1820-2024	3	1	IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS244N
A15U23	1810-0394	5	1	NETWORK-RES 8-SIP6.8K OHM X 7	01121	208A682
A15U24	1820-1851	2	1	IC ENCDR TTL LS	01295	SN74LS148N
A15U25	1810-0205	7		NETWORK-RES 8-SIP4.7K OHM X 7	01121	208A472
A15U26	1820-2505	5	1	IC-MPU; CLK FREQ=8MHZ. INSTRUCTION	28480	1820-2505
A15U27	1820-3173	5	1	IC FF CMOS/74HC J-K NEG-EDGE-TRIG	28480	1820-3173
A15U28	1820-1281	2	1	IC DCDR TTL LS 2-TO-4-LINE DUAL 2-INP	01295	SN74LS139N
A15U29	1810-0205	7		NETWORK-RES 8-SIP4.7K OHM X 7	01121	208A472
A15U30	1820-2483	8	1	IC RCVR TTL LS BUS OCTL	01295	SN75161N
A15U31	1820-3431	8	1	IC TRANSCEIVER TTL S INSTR-BUS IEEE-488	28480	1820-3431
A15U32	1820-2675	0	2	IC RCVR TTL LS BUS OCTL	01295	SN74LS646N
A15U33	1810-0279	5	1	NETWORK-RES 10-SIP4.7K OHM X 9	01121	210A472
A15U34	1820-1997	7		IC FF TTL LS D-TYPE POS-EDGE-TRIG PRL-IN	01295	SN74LS374N
A15U35	1820-1112	8	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A15U36	1820-2675	0		IC RCVR TTL LS BUS OCTL	01295	SN74LS646N

*Indicates Factory Selected Value

ManualsPlus.com

TABLE 2. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A15U37	85660-80053	3	1	EPROM PRGMD U37	28480	85660-80053
A15U38	85660-80055	5	1	EPROM PRGMD U38	28480	85660-80055
A15U39	85660-80054	4	1	EPROM PROG U39	28480	85660-80054
A15U40	85660-80056	6	1	EPROM PRGMD U40	28480	85660-80056
A15U41	1810-0344	5	1	NETWORK-RES 10-SIP6.8K OHM X 9	01121	210A682
A15U42	85660-80070	4	1	IC1618 PAL PRGMD	28480	85660-80070
A15U43	1826-0759	9	1	IC COMPARATOR GP QUAD 14-DIP-C PKG	04713	LM339J
A15U44	1810-0205	7		NETWORK-RES 8-SIP4.7K OHM X 7	01121	208A472
A15U45	1820-3562	6	1	IC BFR TTL ALS INV HEX	28480	1820-3562
A15U46	1810-0205	7		NETWORK-RES 8-SIP4.7K OHM X 7	01121	208A472
A15U47	1820-1208	3		IC GATE TTL L8 OR QUAD 2-INP	01295	SN74LS32N
A15U48	1826-0393	7	1	IC V RGLTR-ADJ-POS 1.2/37V TO-220 PKG	27014	LM317T
A15W2*	8159-0005	0	1	RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005
A15Y1	1813-0196	1	1	XTAL-CLOCK-OSCILLATOR 14.7456-MHZ	28480	1813-0196
A15U37 38 39 40	85660-60270					

*Indicates Factory Selected Value

ManualsPlus.com

NOTE

- FOR INSTRUCTIONS ON THE USE OF SIGNATURE ANALYSIS DIAGRAMS, READ THE SIGNATURE ANALYSIS DESCRIPTION SECTION OF THIS MANUAL.

FREE RUN CHECK

SPECTRUM ANALYZER CONNECTIONS:

GROUND A15J5 PIN 4 TO A15J5 PIN 3
REMOVE JUMPER A15E1
GROUND A15TP1-3 (T) TO A15TP3 (GND)

SIGNATURE ANALYZER CONNECTIONS:

CLOCK ⌐¯ TO A15TP2-3 (AS)
START ⌐¯ TO A15TP2-1 (R/S)
STOP ¯⌐ TO A15TP2-1 (R/S)
POD GND TO A15TP3 (GND)
PROBE GND TO A15TP3 (GND)

- REFER TO SIGNATURE ANALYSIS DESCRIPTION SECTION FOR EXPLANATION OF SIGNATURE ANALYSIS TROUBLESHOOTING DIAGRAMS.
- REFER TO RF SECTION DIGITAL BLOCK DIAGRAM FOR ADDITIONAL TROUBLESHOOTING INFORMATION.

A15
CONTROLLER
08566-60209

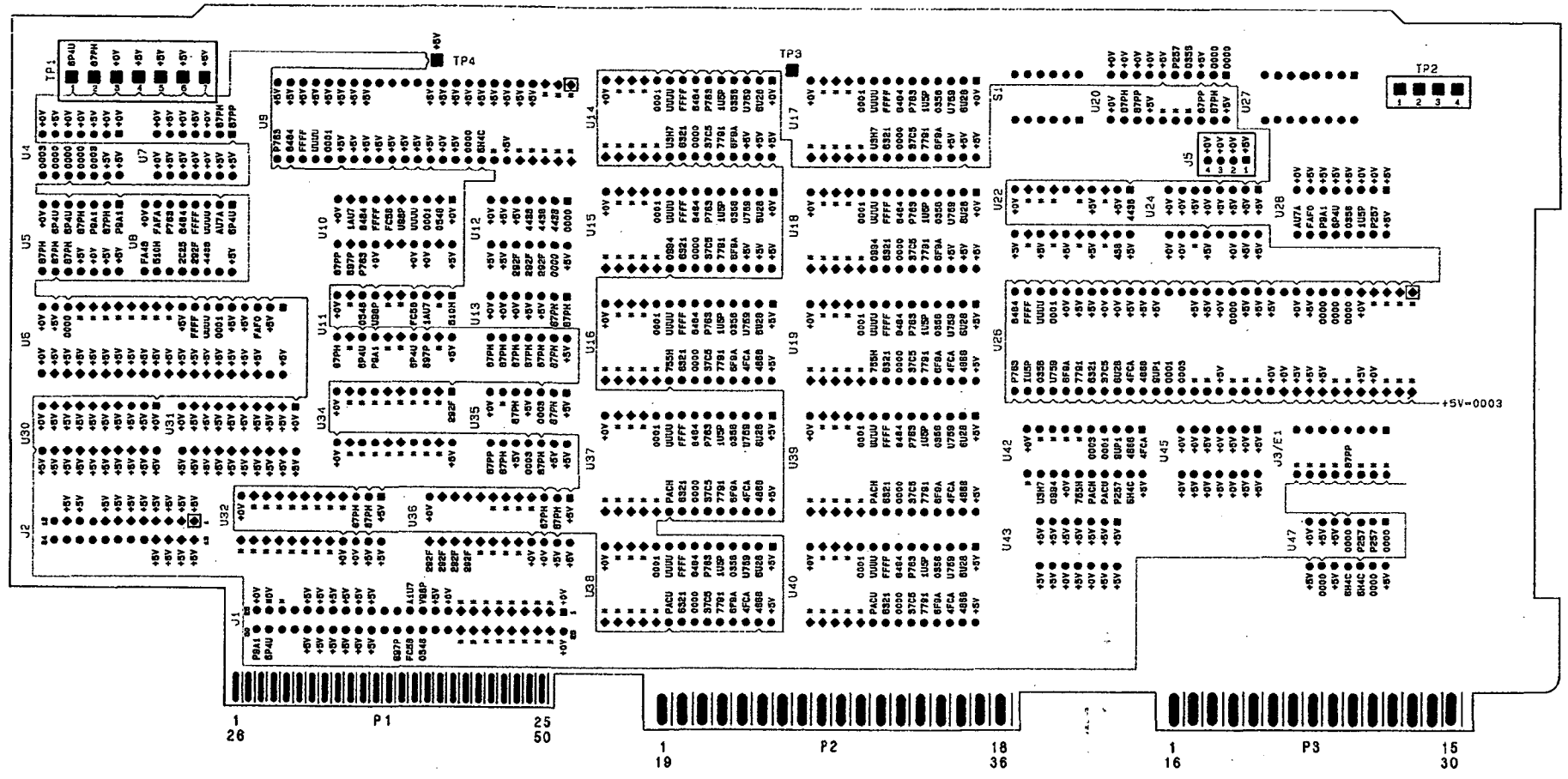
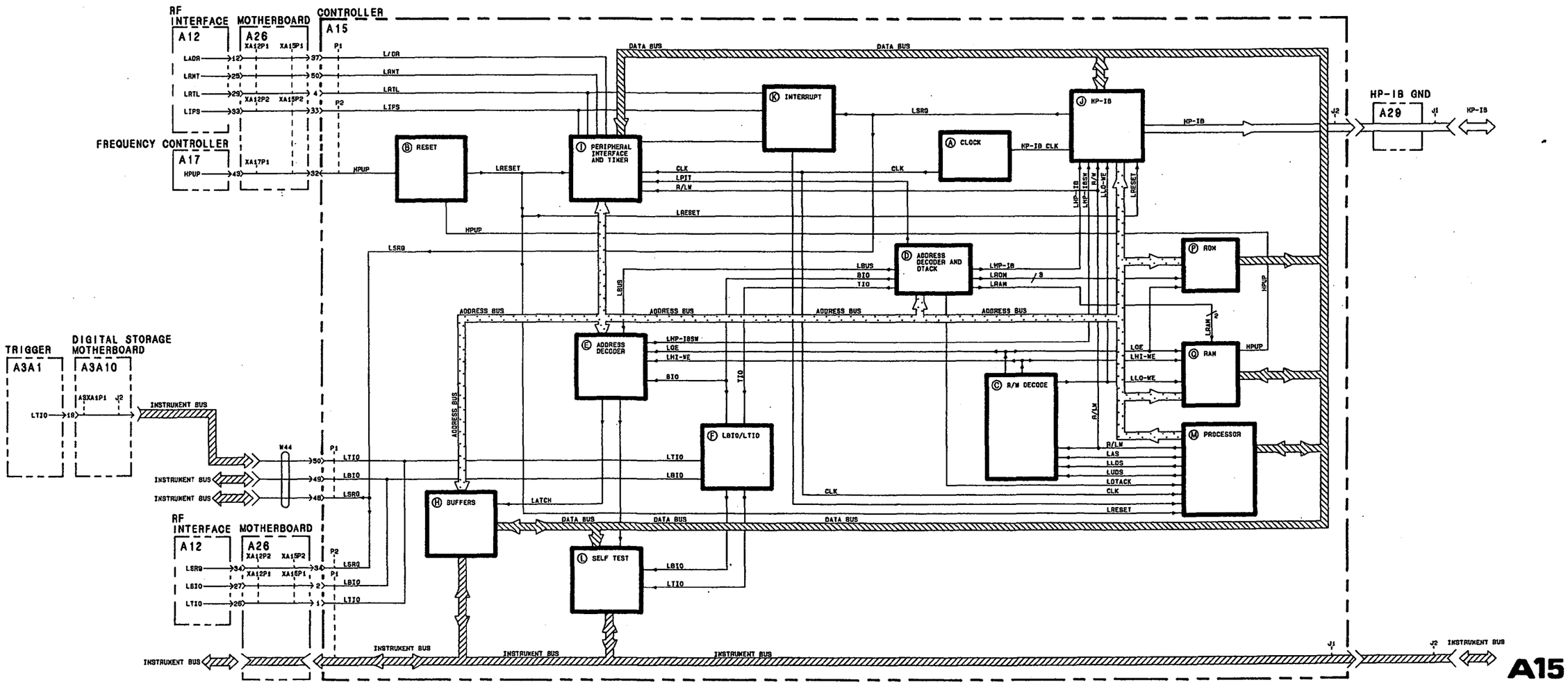


FIGURE 1. A15 CONTROLLER, SIGNATURE ANALYSIS TROUBLESHOOTING DIAGRAM

ManualsPlus.com

RF SECTION

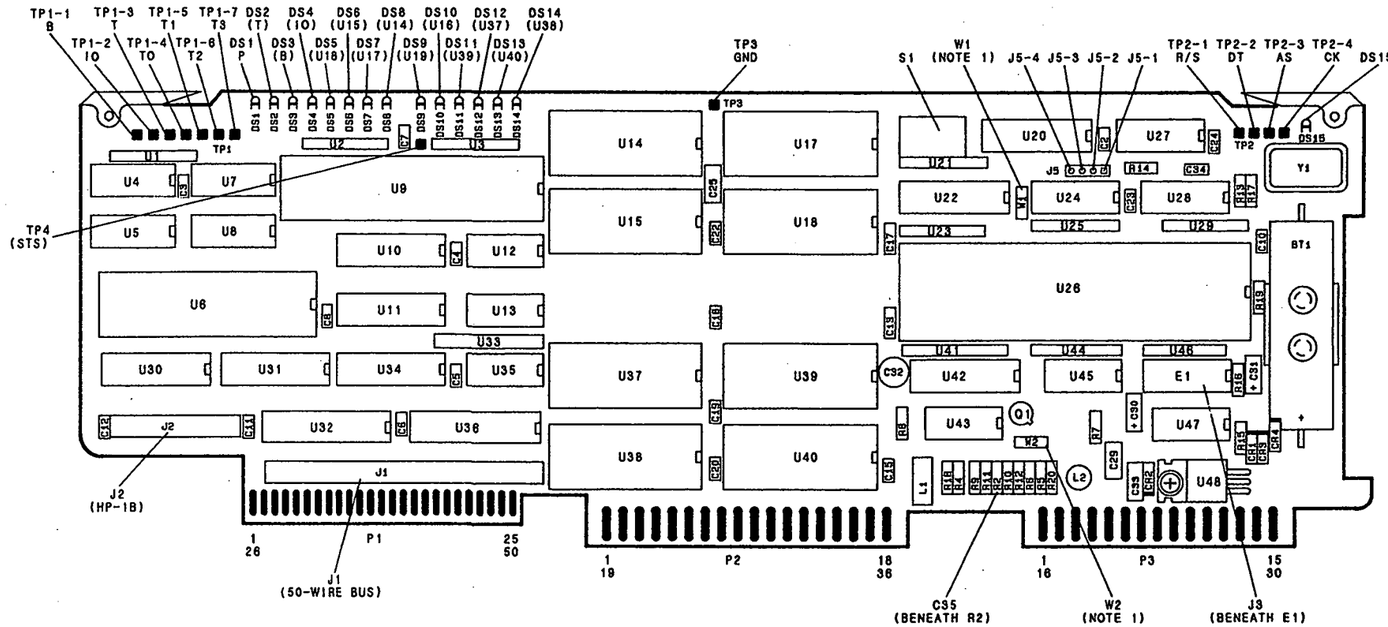


A15

FIGURE 2. A15 CONTROLLER, BLOCK DIAGRAM

ManualsPlus.com

A15
CONTROLLER
85660-60209



NOTES:
1. JUMPER W1 IS LOADED WHEN 128K ROMS (SET OF SIX) ARE INSTALLED; W2 IS LOADED WHEN 256K ROMS (SET OF FOUR) ARE INSTALLED.

FIGURE 3. A15 CONTROLLER, COMPONENT LOCATIONS

ManualsPlus.com

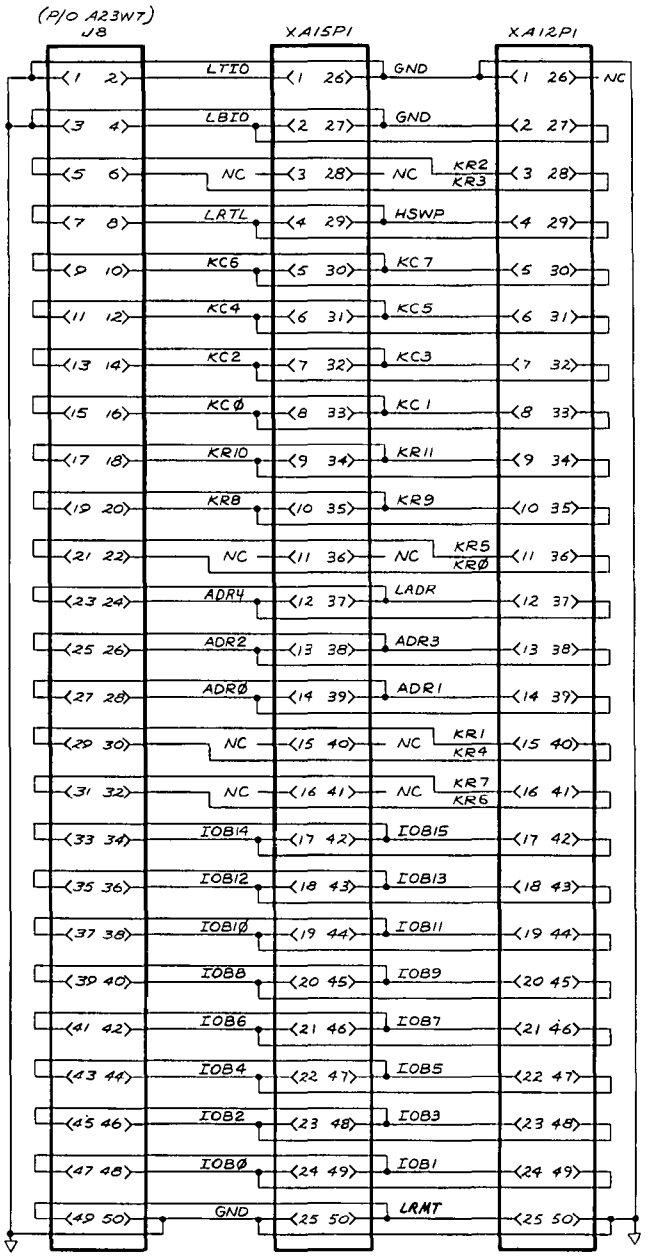


FIGURE 4. A23 MOTHERBOARD INSTRUMENT BUS, INTERCONNECT DIAGRAM

ManualsPlus.com

A15 CONTROLLER
85660-60209
(SHEET 1 OF 3)

P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	LTIO	A12P1-26	F
26	GND		R
2	LBIO	A12P1-27	F
27	GND		R
3	NC		
28	NC		
4	LRTL	A5A1P1-43	I
29	HSWP	A12P1-4	S
5	KC6	A12P1-30	S
30	KC7	A12P1-6	S
6	KC4	A12P1-31	S
31	KC5	A12P1-8	S
7	KC2	A12P1-32	S
32	KC3	A12P1-7	S
8	KC0	A12P1-33	S
33	KC1	A12P1-8	S
9	KR10	A12P1-34	S
34	KR11	A12P1-9	S
10	KR8	A12P1-35	S
35	KR9	A12P1-10	S
11	NC		
36	NC		
12	ADR4	A12P1-37	H
37	LADR	A5A1P1-28	
13	ADR2	A12P1-38	H
38	ADR3	A12P1-13	H
14	ADR0	A12P1-39	H
39	ADR1	A12P1-14	H
15	NC		
40	NC		
16	NC		
41	NC		
17	IOB14	A12P1-42	H
42	IOB15	A12P1-17	H
18	IOB12	A12P1-43	H
43	IOB13	A12P1-18	H
19	IOB10	A12P1-44	H
44	IOB11	A12P1-19	H
20	IOB8	A12P1-45	H
45	IOB9	A12P1-20	H
21	IOB6	A12P1-46	H
46	IOB7	A12P1-21	H
22	IOB4	A12P1-47	H
47	IOB5	A12P1-22	H
23	IOB2	A12P1-48	H
48	IOB3	A12P1-23	H
24	IOB0	A12P1-49	H
49	IOB1	A12P1-24	H
25	GND		R
50	LRWT	A12P1-25	I

P2

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	GND		R
19	LBI0		F
2	ADR0		H
20	ADR1		H
3	ADR2		H
21	ADR3		H
4	ADR4		H
22	NC		H
5	IOB0		H
23	IOB1		H
6	IOB2		H
24	IOB3		H
7	IOB4		H
25	IOB5		H
8	IOB6		H
26	IOB7		H
9	IOB8		H
27	IOB9		H
10	IOB10		H
28	IOB11		H
11	IOB12		H
29	IOB13		H
12	IOB14		H
30	IOB15		H
13	NC		
31	NC		
14	GND		R
32	HPUP	A17P1-43	B
15	NC		
33	LIPS	A12P2-8	I
16	NC		
34	LSRQ	A12P2-16	J
17	+5.2V		R
35	+5.2V		R
18	GND		R
36	GND		R

INSTRUMENT BUS

P3

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	NC		
18	NC		
2	GND		R
17	GND		R
3	+12V		R
16	+12V		R
4	NC		
19	NC		
5	NC		
20	NC		
6	NC		
21	NC		
7	NC		
22	NC		
8	NC		
23	NC		
9	NC		
24	NC		
10	NC		
25	NC		
11	NC		
26	NC		
12	NC		
27	NC		
13	NC		
28	NC		
14	NC		
29	NC		
15	GND		R
30	GND		R

J1

PIN	SIGNAL	TO FROM	FUNCTION BLOCK
1	NC		
2	IO31	A4A10J1-4	H
3	IO33	A4A10J1-6	H
4	IO35	A4A10J1-8	H
5	IO37	A4A10J1-10	H
6	BIO9	A4A10J1-12	H
7	IO311	A4A10J1-14	H
8	IO313	A4A10J1-16	H
9	IO315	A4A10J1-18	H
10	LADR	NC	I
11	HPON	A1A9J1-22	R
12	ADR1	A4A10J1-24	H
13	ADR3	A4A10J1-26	H
14	NC		
15	NC		
16	KR9	A1A1J1-33	S
17	KR11	A1A1J1-31	S
18	KC1	A1A1J1-41	S
19	KC3	A1A1J1-39	S
20	KC5	A1A1J1-37	S
21	KC7	A1A1J1-35	S
22	HSWP	A3A1P1-21	S
23	LDSR	A3A10J1-46	J
24	GND		R
25	GND		R
26	GND		R
27	IO30	A4A10J1-3	H
28	IO32	A4A10J1-5	H
29	IO34	A4A10J1-7	H
30	IO36	A4A10J1-9	H
31	IO38	A4A10J1-11	H
32	IO310	A4A10J1-13	H
33	IO312	A4A10J1-15	H
34	IO314	A4A10J1-17	H
35	NC		
36	NC		
37	ADR0	A4A10J1-23	H
38	ADR2	A4A10J1-25	H
39	ADR4	A4A10J1-27	H
40	NC		
41	KR8	A1A1J1-34	S
42	KR10	A1A1J1-32	S
43	KC0	A1A1J1-42	S
44	KC2	A1A1J1-40	S
45	KC4	A1A1J1-38	S
46	KC6	A1A1J1-36	S
47	NC		
48	LSRQ	A1A9J1-45	J
49	LBIO	A1A9J1-47	F
50	LTIO	A5A10J2-49	F

J2

PIN	SIGNAL	TO FROM	FUNCTION BLOCK
1	DIO1	J5-1	J
2	DIO2	J5-2	J
3	DIO3	J5-3	J
4	DIO4	J5-4	J
5	EOI	J5-5	J
6	DAV	J5-6	J
7	NRFD	J5-7	J
8	NDAC	J5-8	J
9	IFC	J5-9	J
10	SRQ	J5-10	J
11	ATN	J5-11	J
12	NC	SEE NOTE 5	
13	DIO5	J5-13	J
14	DIO6	J5-14	J
15	DIO7	J5-15	J
16	DIO8	J5-16	J
17	REN	J5-17	J
18	NC	SEE NOTE 5	
19	NC	SEE NOTE 5	
20	NC	SEE NOTE 5	
21	NC	SEE NOTE 5	
22	NC	SEE NOTE 5	
23	NC	SEE NOTE 5	
24	NC	SEE NOTE 5	

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω); CAPACITANCE IS IN MICROFARADS (μF) INDUCTANCE IS IN MICROHENRIES (μH)
3. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE OR TOP, AND EXIT RIGHT SIDE OR BOTTOM OF FUNCTION BLOCKS.
4. JUMPER W1 IS LOADED WHEN 128K ROMS (SET OF SIX) ARE INSTALLED; W2 IS LOADED WHEN 256K ROMS (SET OF FOUR) ARE INSTALLED.
5. PINS 12, 18-24 ARE CHASSIS GROUNDED THRU A29.

6. MNEMONIC TABLE:

MNEMONIC	DESCRIPTION
ADR0	INSTRUMENT BUS ADDRESS BIT 0
ADR1	INSTRUMENT BUS ADDRESS BIT 1
ADR2	INSTRUMENT BUS ADDRESS BIT 2
ADR3	INSTRUMENT BUS ADDRESS BIT 3
ADR4	INSTRUMENT BUS ADDRESS BIT 4
ATN	LOW=ATTENTION
DAV	LOW=DATA VALID
DIO1	HP-IB DATA INPUT/OUTPUT
DIO2	HP-IB DATA INPUT/OUTPUT
DIO3	HP-IB DATA INPUT/OUTPUT
DIO4	HP-IB DATA INPUT/OUTPUT
DIO5	HP-IB DATA INPUT/OUTPUT
DIO6	HP-IB DATA INPUT/OUTPUT
DIO7	HP-IB DATA INPUT/OUTPUT
DIO8	HP-IB DATA INPUT/OUTPUT
EOI	LOW=END OR IDENTIFY
HPON	HIGH=IF-DISPLAY SECTION POWER ON
HPUP	HIGH=POWER UP
IFC	LOW=INTERFACE CLEAR
IOB0	INSTRUMENT BUS DATA BIT 0
IOB1	INSTRUMENT BUS DATA BIT 1
IOB2	INSTRUMENT BUS DATA BIT 2
IOB3	INSTRUMENT BUS DATA BIT 3
IOB4	INSTRUMENT BUS DATA BIT 4
IOB5	INSTRUMENT BUS DATA BIT 5
IOB6	INSTRUMENT BUS DATA BIT 6
IOB7	INSTRUMENT BUS DATA BIT 7
IOB8	INSTRUMENT BUS DATA BIT 8
IOB9	INSTRUMENT BUS DATA BIT 9
IOB10	INSTRUMENT BUS DATA BIT 10
IOB11	INSTRUMENT BUS DATA BIT 11
IOB12	INSTRUMENT BUS DATA BIT 12
IOB13	INSTRUMENT BUS DATA BIT 13
IOB14	INSTRUMENT BUS DATA BIT 14
IOB15	INSTRUMENT BUS DATA BIT 15
LADR	LOW=ADDRESS LED ON
LBIO	LOW=BOTTOM BOX INPUT/OUTPUT
LDSR	LOW=DIGITAL STORAGE READY
LIPS	LOW=INSTRUMENT PRESET
LRWT	LOW=REMOTE: HIGH=LOCAL
LRTL	LOW=RETURN TO LOCAL
LSRQ	LOW=SERVICE REQUEST
LTIO	LOW=TOP BOX INPUT/OUTPUT
NDAC	HIGH=DATA ACCEPTED
NRFD	HIGH=READY FOR DATA
REN	LOW=REMOTE ENABLE
SRQ	LOW=SERVICE REQUEST

A15

SERIAL NUMBER PREFIX: 2410A

FIGURE 5. A15 CONTROLLER, SCHEMATIC DIAGRAM (1 OF 3)

ManualsPlus.com

RF SECTION

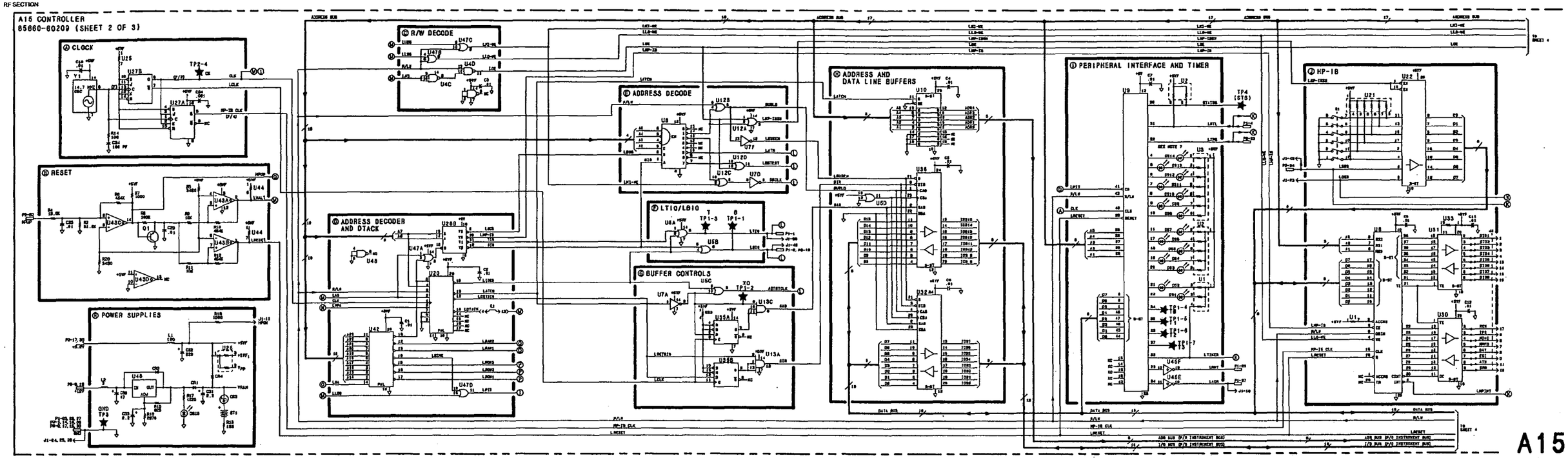


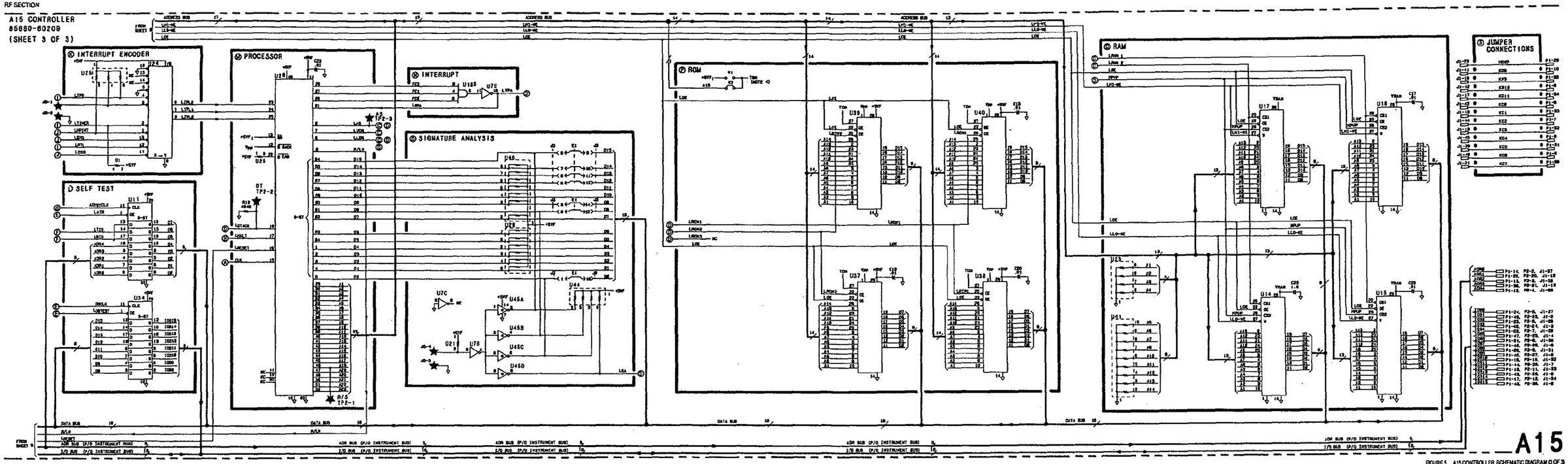
FIGURE 5. A15 CONTROLLER, SCHEMATIC DIAGRAM (2 OF 3)

SERIAL NUMBER PREFIX: 2410A

ManualsPlus.com

RF SECTION

A15 CONTROLLER
85680-60208
(SHEET 3 OF 3)



A15

SERIAL NUMBER PREFIX: 2410A

FIGURE 5. A15 CONTROLLER, SCHEMATIC DIAGRAM (3 OF 3)

ManualsPlus.com

A16 Scan Generator

ManualsPlus.com

A16 SCAN GENERATOR, CIRCUIT DESCRIPTION

The A16 Scan Generator provides tuning voltage ramps to the IF-Display Section (SCAN OUT and AUX OUT) and scaled ramps to the A10A8 PLL2 Discriminator and A19 DAC.

The SCAN OUT ramp to the IF-Display Section is used for the horizontal sweep signal for the CRT display update and the AUX OUT ramp is used by the A4A1 Video Processor to maintain video information in proper correlation with the horizontal sweep and frequency tuning.

The scaled ramp to the A10A8 PLL2 Discriminator is used to scale the tuning current ramp (VCO TUNE) used to tune the VCO on the A10A5 PLL2 VCO.

Scan Time Register (B) and Sweep Time DAC (D)

Scan time information is placed in the scan time registers U26, U27, and U29. This information comes from the front panel via the Instrument Bus. Processing of this information is done on the A12 Front-Panel Interface and A15 Controller. The information is clocked into the Scan Time Register by control signal LSTS (Low = Scan Time Strobe). This control signal becomes active (low) whenever the selected scan time is changed. A positive dc voltage is developed by U8 corresponding to the programmed sweep time information applied to the DAC U28. This voltage is between +0.7V and +7.0V.

Ramp Generator (E)

The dc voltage level provided by U8 causes a constant current to flow through the proper scaling resistor, through Virtual Ground Q5, to the Ramp Capacitor C1. The scaling resistor is selected by the programmed sweep information from the front panel the same as is the sweep time. This information turns on one of the switch drivers U20A through U20D which turns on one and only one of the scaling resistor switches Q1, Q2, Q3, or Q4, to place the proper scaling resistors in the charging current path for C1. If the selected sweep time is slower than 200 seconds, none of the scaling resistors are switched in. For 0–2.5 GHz frequency span, the waveform on Ramp Capacitor C1 is a positive going ramp from −5.0 Vdc to −2.0 Vdc with a 3 msec reset time. Ramp Buffer U3 amplifies and shifts the level of the ramp so that the SCAN OUT is a 0 to +10.0 Vdc ramp.

Ramp Control Logic (C), Switch Driver (N), Ramp Reset Switch (M), and Ramp Reset Amplifier (J)

The sweep ramp is formed by alternately charging and discharging C1, according to the following cycle.

Control line HSWP resets the sweep (High = Sweeping). When HSWP goes low (determined by IF-Display Section), LHOLD (U5C pin 8) goes low, turning on CR1. When CR1 is on, charging current bypasses ramping capacitor C1, and instead passes to ground via CR1. Ramping capacitor C1 stops charging.

Ramping capacitor C1 holds its charge until LANR, from Front-Panel Interface Assembly A12, goes low (Low = Analog Reset). When LANR goes low, LHOLD goes high, turning CR1 off, removing the current bypass for ramping capacitor C1. RESET/GO (U5D pin 11) goes high, turning Q9 off. Q7 and Q6 then turn on, providing a discharge path for C1 through Ramp Reset Amplifier U2. Test point 3 remains at ground potential until HSWP again goes high, starting the cycle again.

Frequency Span Register (I) and Span Width DAC (L)

The Span Width DACs U17 and U10 provide a negative scan ramp to be scaled by the Integer Number Attenuator. The output ramp is negative going 0 to −10 Vdc. Frequency span information arrives on the Instrument Bus and is stored in registers U16 and U18. This information is clocked into Frequency Span Registers U16 and U18 whenever control line LSAS (Low = Scan Attenuator Strobe) goes low.

ManualsPlus.com

Integer Number Attenuator (O), Band Decoder (P), Switch Drivers (Q)

The Integer Number Attenuator scales the 0 to −10V ramp at TP5 to the harmonic band being swept. This division is by 1/2 for Band C, 1/3 for Band D, and 1/4 for Band E. In Band B, the ramp is not scaled so remains at 0 to −10V.

The division is performed by R48 through R50. If in Band B, only R80 is in the circuit. In Band C, R48 is added. In Band D, R49 is added. In Band E, R50 is added. These resistors are switched in by transistors Q15, Q13, and Q14, which are driven by drivers U19A, U19B, and U19C respectively. The information necessary to determine when and which resistors to switch in comes from the A12 Front-Panel Interface (SAT 1 and SAT 2), and is decoded by Band Decoder P.

Aux Out Register (F), Aux Out Offset DAC (G), and Aux Out Amplifier (H)

The AUX OUT signal is a positive-going ramp voltage from the scan generator which is amplified by U9B. This output is always 0 to +10V regardless of the selected frequency span.

If more than one harmonic band is swept, there is a small ramp output from the ramp generator E (TP3) for each band with each ramp resetting to 0V. To combine these ramps, Aux Out Offset DAC U22 and U9A provide a voltage to hold the Aux Out Amplifier input at a dc level at the end of each ramp. The output therefore is a continuous ramp voltage from 0 to +10V. This voltage is programmed into the DAC U22 by the span information from the Instrument Bus. This information is stored in Aux Out Register U23 and U21, being clocked in by control line LAOS (Low = Aux Out Strobe). This control line is from the A12 Front-Panel Interface and is enabled (pulled low) whenever front-panel key selections indicate that more than one harmonic board is being swept.

Voltage Reference (A)

Voltage Reference U7 and associated circuitry provide a stable −7 Vdc reference voltage for both the Sweep Time and Aux Out Offset DACs.

Scan Test Circuit (K)

The control signal HSWP (High = Sweeping) is normally pulled low indicating the end of a sweep by the A3A1 Trigger in the IF-Display Section. This signal can also be pulled low by the Scan Test Circuit for the purpose of testing the scan circuitry.

If the scan ramp should exceed +11V, this overvoltage is detected by U11D which triggers one-shot multivibrator U6. U6 generates a 50 msec pulse on the HSWP line. When this pulse goes low, the A15 Controller "thinks" that the sweep has ended and performs its update functions. When the pulse goes high again (after 50 msec), the A15 Controller "thinks" a new sweep has begun. This enables the sweep circuitry to function without the IF-Display Section, or when a circuit malfunction exists, thus aiding troubleshooting.

Scan Reset Amplifier (S)

Scan Reset Amplifier supplies negative feedback that holds SCAN OUT (Q12 emitter) at ground potential during retrace.

Fixed-gain amplifier U13 amplifies any potential at its noninverting input, pin 3. During retrace, LSAMPLE is low, and sample-and-hold device U14 tracks the U13 output, charging C20 at TP9. This error voltage at TP9 is divided by R64, R65, and R66, and summed with the Span Width DAC output at U12 pin 2. The amplified and inverted output of U12 cancels the potential at SCAN OUT that produced the error voltage at TP9.

When the sweep commences, HSWP and LSAMPLE are high. The input to U14 is held on C20 for the duration of the sweep.

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A16	85660-60190	5	1	BOARD ASSEMBLY, SCAN GENERATOR	28480	85660-60198
A16C1	0160-5609	5	1	CAPACITOR-FXD 10UF +-10% 50VDC MET-POLYC	28480	0160-5609
A16C2	0160-2208	4	1	CAPACITOR-FXD 330PF +-5% 300VDC MICA	28480	0160-2208
A16C3	0160-4892	6	27	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C4	0180-0116	1	1	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A16C5	0180-0228	6	1	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A16C6	0180-0229	7	1	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A16C7	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C8	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C9	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C10	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C11	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C12	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C13	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C14	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C15	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C16	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C17	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C18	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C19	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C20	0160-3787	6	1	CAPACITOR-FXD 1UF +-10% 50VDC MET-POLYC	28480	0160-3787
A16C21	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C22	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C23	0160-3447	5	1	CAPACITOR-FXD 470PF +-10% 1KVDC CER	28480	0160-3447
A16C24				NOT ASSIGNED		
A16C25	0160-4092	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C26	0180-0291	3	1	CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A16C27	0160-3448	6	2	CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3448
A16C28	0160-3448	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3448
A16C29	0160-4092	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C30	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C31	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C32	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C33	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C34	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C35	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C36	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C37	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C38	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A16C39	0160-4835	7	1	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A16C40	0160-4832	4	1	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A16CR1	1901-0539	3	4	DIODE-SM SIG SCHOTTKY	28480	1901-0539
A16CR2	1901-0539	3		DIODE-SM SIG SCHOTTKY	28480	1901-0539
A16CR3	1901-0539	3		DIODE-SM SIG SCHOTTKY	28480	1901-0539
A16CR4	1901-0539	3		DIODE-SM SIG SCHOTTKY	28480	1901-0539
A16CR5	1901-0376	6	1	DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A16CR6	1901-0040	1	1	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A16J1	1250-0543	8	4	CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A16J2	1250-0543	8		CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A16J3	1250-0543	8		CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A16J4	1250-0543	8		CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A16Q1	1855-0020	8	4	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A16Q2	1855-0020	8		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A16Q3	1855-0020	8		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A16Q4	1855-0020	8		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A16Q5	1855-0082	2	3	TRANSISTOR J-FET P-CHAN D-MODE SI	28480	1855-0082
A16Q6	1855-0082	2		TRANSISTOR J-FET P-CHAN D-MODE SI	28480	1855-0082
A16Q7	1855-0082	2		TRANSISTOR J-FET P-CHAN D-MODE SI	28480	1855-0082
A16Q8	1854-0404	0	1	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A16Q9	1853-0281	9	1	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A16Q10	1854-0557	4	2	TRANSISTOR NPN 2N2432A SI TO-18 PD=300MW	01295	2N2432A
A16Q11	1854-0557	4		TRANSISTOR NPN 2N2432A SI TO-18 PD=300MW	01295	2N2432A
A16Q12	1854-0637	1	1	TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A16Q13	1853-0322	9	3	TRANSISTOR PNP 2N2946A SI TO-46 PD=400MW	01295	2N2946A
A16Q14	1853-0322	9		TRANSISTOR PNP 2N2946A SI TO-46 PD=400MW	01295	2N2946A
A16Q15	1853-0322	9		TRANSISTOR PNP 2N2946A SI TO-46 PD=400MW	01295	2N2946A
A16R1	0757-0464	5	1	RESISTOR 90.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9092-F
A16R2	0683-2265	1	1	RESISTOR 22M 5% .25W FC TC=-900/+1200	01121	CB2265
A16R3				NOT ASSIGNED		
A16R4	0757-0465	6	1	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A16R5	0757-0470	3	1	RESISTOR 162K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1623-F

*Indicates Factory Selected Value

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A16R6	0698-8827	4	2	RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A16R7	0698-3450	9	1	RESISTOR 42.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4222-F
A16R8	0698-3459	8	1	RESISTOR 383K 1% .125W F TC=0+-100	28480	0698-3459
A16R9	0698-3153	9	3	RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A16R10	0698-3161	9	2	RESISTOR 38.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3832-F
A16R11	0698-3446	3	1	RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A16R12	0698-3153	9		RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A16R13	0757-0416	7	2	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A16R14-A16R17				NOT ASSIGNED		
A16R18	0757-0442	9	11	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A16R19	0757-0438	3	1	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A16R20	0757-0280	3	4	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A16R21	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A16R22	0757-0199	3	3	RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A16R23	0757-0459	8	2	RESISTOR 56.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5622-F
A16R24	0698-3136	8	4	RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A16R25	0757-0289	2	2	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A16R26				NOT ASSIGNED		
A16R27	0698-0084	9	2	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A16R28	0698-3161	9		RESISTOR 38.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3832-F
A16R29				NOT ASSIGNED		
A16R30	0698-3160	8	1	RESISTOR 31.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3162-F
A16R31	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A16R32	0757-1094	9	1	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A16R33	0757-0439	4	1	RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A16R34	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A16R35	0698-3154	0	1	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A16R36				NOT ASSIGNED		
A16R37				NOT ASSIGNED		
A16R38	0698-3157	3	1	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A16R39	0698-3158	4	2	RESISTOR 23.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2372-F
A16R40	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A16R41	0698-3153	9		RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A16R42				NOT ASSIGNED		
A16R43				NOT ASSIGNED		
A16R44	0699-0307	1	1	RESISTOR 36.75K .1% .1W F TC=0+-10	28480	0699-0307
A16R45	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A16R46	0699-0311	7	1	RESISTOR 74.25K .1% .1W F TC=0+-10 NOTE: THIS IS THE ONLY ACCEPTABLE ALTERNATE FOR *R46.	28480	0699-0311
A16R46	0699-0380	0	1	RESISTOR 73.8741K .025% .1W F TC=0+-5	28480	0699-0380
A16R47				NOT ASSIGNED		
A16R48	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A16R49	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A16R50	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A16R51				NOT ASSIGNED		
A16R52				NOT ASSIGNED		
A16R53	0698-3136	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A16R54	0757-0440	7	4	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A16R55	0757-0459	0		RESISTOR 56.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5622-F
A16R56	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A16R57	0698-3443	0	1	RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A16R58	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A16R59	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A16R60	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A16R61	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A16R62	2100-1760	7	2	RESISTOR-TRMR 5K 5% WW SIDE-ADJ 1-TRN	28480	2100-1760
A16R63	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A16R64	0757-0199	3		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A16R65	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A16R66	0698-8827	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-8827
A16R67	2100-1760	7		RESISTOR-TRMR 5K 5% WW SIDE-ADJ 1-TRN	28480	2100-1760
A16R68	2100-1759	4	3	RESISTOR-TRMR 2K 5% WW SIDE-ADJ 1-TRN	28480	2100-1759
A16R69				NOT ASSIGNED		
A16R70	0698-3158	4		RESISTOR 23.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2372-F
A16R71	2100-1759	4		RESISTOR-TRMR 2K 5% WW SIDE-ADJ 1-TRN	28480	2100-1759
A16R72	2100-1759	4		RESISTOR-TRMR 2K 5% WW SIDE-ADJ 1-TRN	28480	2100-1759
A16R73	0698-3136	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A16R74-A16R79				NOT ASSIGNED		
A16R80	0699-0308	2	4	RESISTOR 24.97K .025% .1W F TC=0+-5	28480	0699-0308
A16R81	0699-0308	2		RESISTOR 24.97K .025% .1W F TC=0+-5	28480	0699-0308
A16R82	0699-0308	2		RESISTOR 24.97K .025% .1W F TC=0+-5	28480	0699-0308
A16R83	0699-0308	2		RESISTOR 24.97K .025% .1W F TC=0+-5	28480	0699-0308
A16R84	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A16R85				NOT ASSIGNED		

*Indicates Factory Selected Value

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A16R86	0757-0346	2	1	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A16R87-A16R89				NOT ASSIGNED		
A16R90	0698-3136	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A16R91	0757-0199	3		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A16R92	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A16R93	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A16R94	0698-3162	0	1	RESISTOR 46.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4642-F
A16R95	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A16R96	0757-0424	7	1	RESISTOR 1.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1101-F
A16R97	0757-0405	4	1	RESISTOR 162 1% .125W F TC=0+-100	24546	C4-1/8-T0-162R-F
A16R98	0757-0278	9	1	RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A16TP1	1251-0600	0	9	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A16TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A16TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A16TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A16TP5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A16TP6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A16TP7	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A16TP8	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A16TP9	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A16U1	1826-0601	0	2	IC OP AMP PRCN TO-99 PKG	06665	OP-16FJ
A16U2	1826-0471	2	2	IC OP AMP LOW-DRIFT TO-99 PKG	28480	1826-0471
A16U3	1826-0601	0		IC OP AMP PRCN TO-99 PKG	06665	OP-16FJ
A16U4	1826-0306	2	2	IC COMPARATOR GP QUAD 14-DIP-C PKG	27014	LM339AJ
A16U5	1820-1425	6	1	IC SCHMITT-TRIG TTL LS NAND QUAD 2-INP	01295	SN74LS132N
A16U6	1826-0180	0	1	IC TIMER TTL MONO/ASTBL	01295	NE555P
A16U7	1826-1058	3	2	IC OP AMP GP 8-TO-99 PKG	28480	1826-1058
A16U8	1826-1058	3		IC OP AMP GP 8-TO-99 PKG	28480	1826-1058
A16U9	1826-0092	3	1	IC OP AMP GP DUAL TO-99 PKG	28480	1826-0092
A16U10	1826-0229	8	2	IC OP AMP LOW-DRIFT TO-99 PKG	06665	OP-05CJ
A16U11	1826-0161	7	2	IC OP AMP GP QUAD 14-DIP-P PKG	04713	MLM324P
A16U12	1826-0229	8		IC OP AMP LOW-DRIFT TO-99 PKG	06665	OP-05CJ
A16U13	1826-0471	2		IC OP AMP LOW-DRIFT TO-99 PKG	28480	1826-0471
A16U14	1826-0840	9	1	IC SMPL/HOLD 14-DIP-C PKG	24355	AD583
A16U15	1810-0206	8	1	NETWORK-RES 8-SIP10.0K OHM X 7	91121	208A103
A16U16	1820-1196	8	6	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A16U17	1826-0684	9	1	IC CONV 12-B-D/A 18-DIP-C PKG	28480	1826-0684
A16U18	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A16U19	1826-0161	7		IC OP AMP GP QUAD 14-DIP-P PKG	04713	MLM324P
A16U20	1826-0306	2		IC COMPARATOR GP QUAD 14-DIP-C PKG	27014	LM339AJ
A16U21	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A16U22	1826-0541	7	2	IC CONV 10-B-D/A 16-DIP-P PKG NOTE: THE 1826-0448 IS AN ALTERNATE FOR U22 AND U28.	28480	1826-0541
A16U23	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A16U24	1820-1197	9	2	IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A16U25	1820-1197	9		IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A16U26	1820-1195	7	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS175N
A16U27	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A16U28	1826-0541	7		IC CONV 10-B-D/A 16-DIP-P PKG NOTE: THE 1826-0448 IS AN ALTERNATE FOR U22 AND U28.	28480	1826-0541
A16U29	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A16VR1	1902-3203	6	2	DIODE-ZNR 14.7V 5% DO-35 PD=.4W	28480	1902-3203
A16VR2	1902-3203	6		DIODE-ZNR 14.7V 5% DO-35 PD=.4W	28480	1902-3203
A16VR3	1902-0625	0	1	DIODE-ZNR 1N829 6.2V 5% DO-7 PD=.25W	04713	1N829
A16W1	1460-1489	8	1	WIREFORM BE CU AG	28480	1460-1489
				MISCELLANEOUS PARTS		
	4040-0749	4	1	EXTR PC BD BRN	28480	4040-0749
	4040-0754	1	1	EXTR PC BD BLU	28480	4040-0754
	0380-1194	1	2	STANDOFF-RND .594-IN-LG 4-40THD	00000	ORDER BY DESCRIPTION

*Indicates Factory Selected Value

ManualsPlus.com

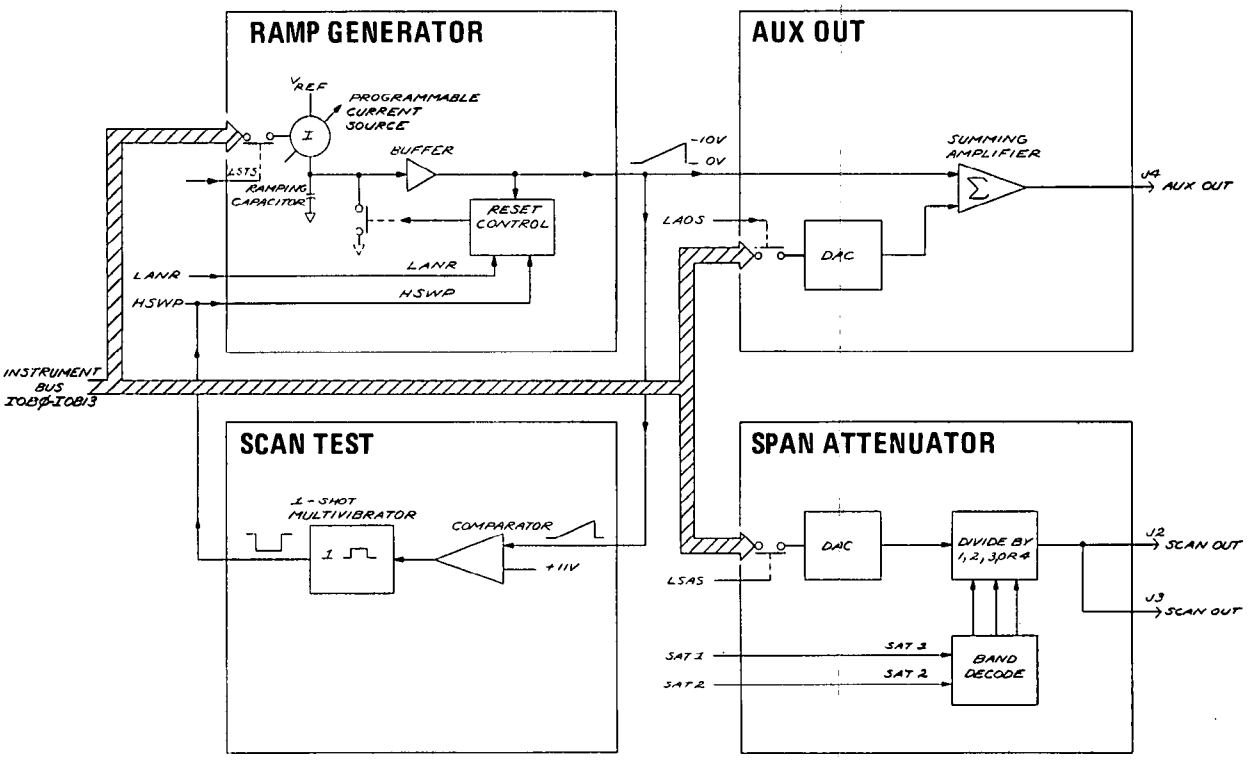


FIGURE 1. A16 SCAN GENERATOR, SIMPLIFIED BLOCK DIAGRAM

ManualsPlus.com

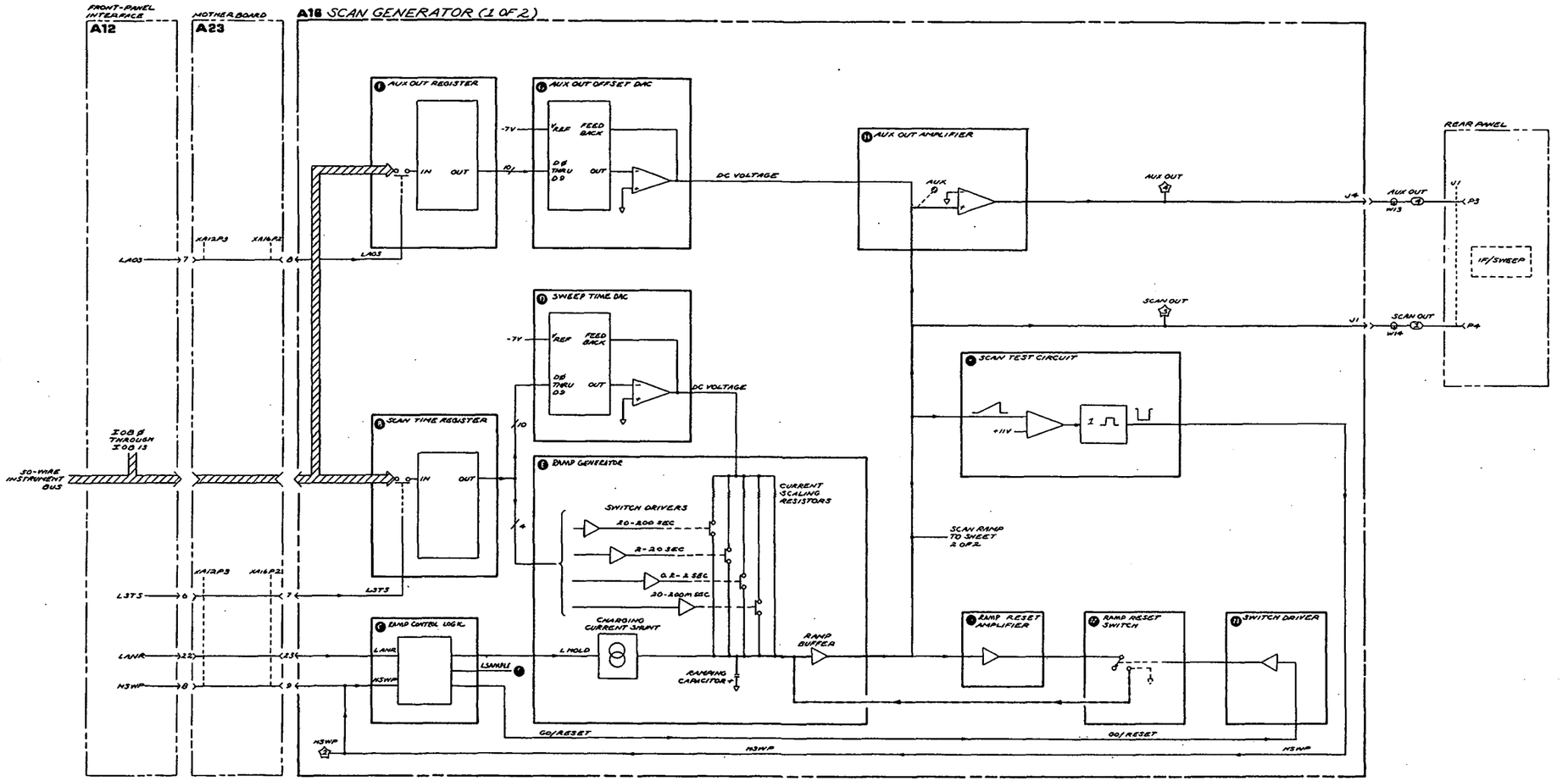
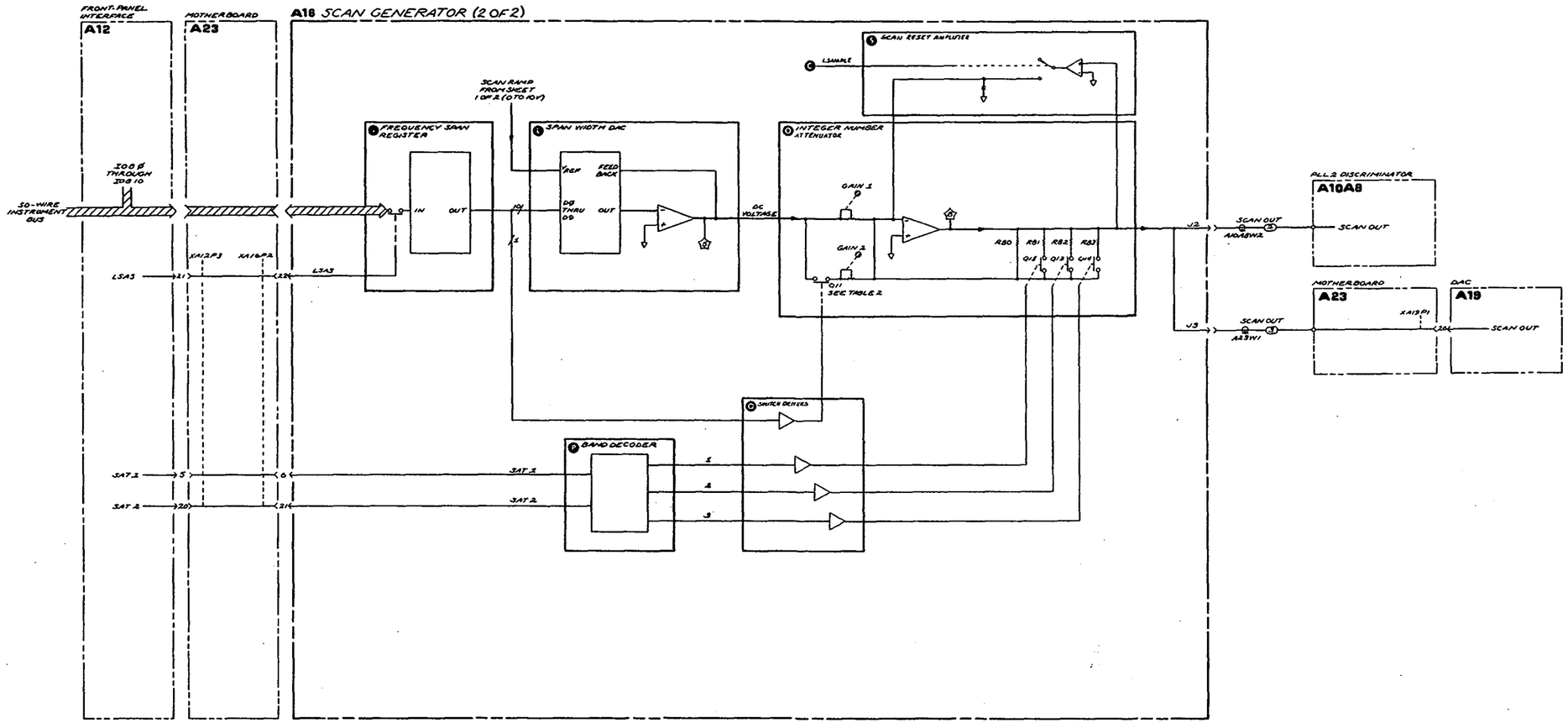


FIGURE 2. A16 SCAN GENERATOR, BLOCK DIAGRAM (1 OF 2)

ManualsPlus.com



A16

FIGURE 2. A16 SCAN GENERATOR, BLOCK DIAGRAM (2 OF 2)

ManualsPlus.com

A16
SCAN GENERATOR
85660-60198

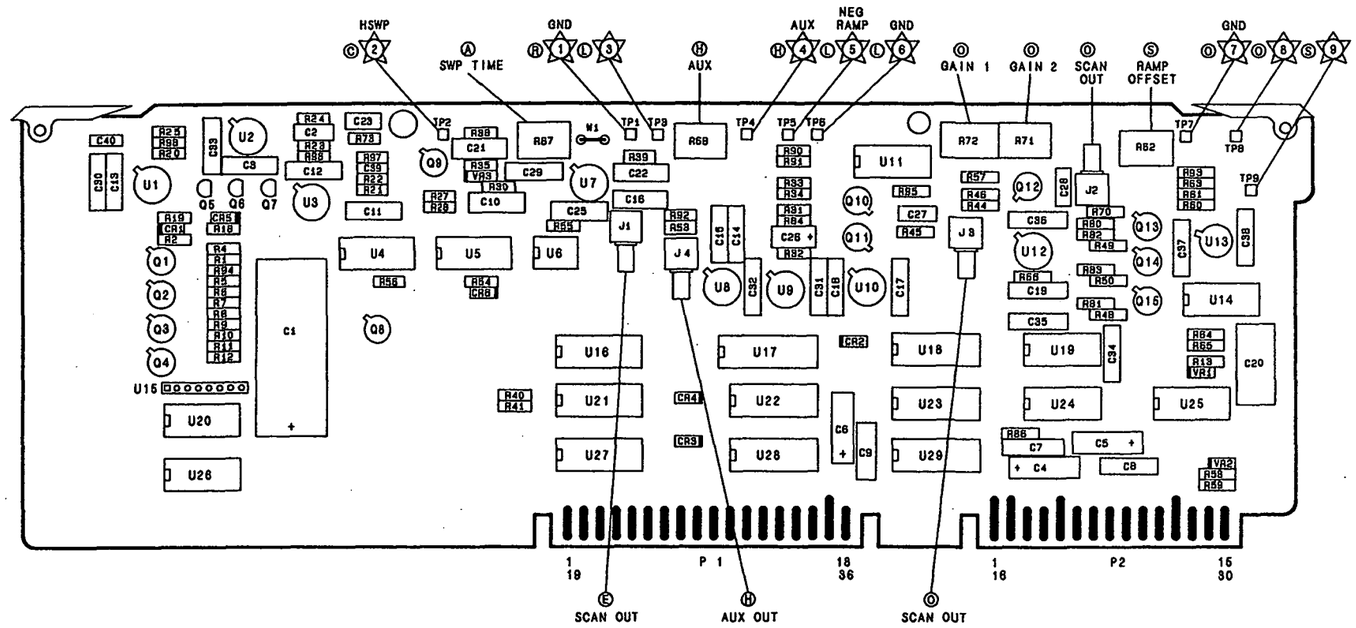


FIGURE 3. A16 SCAN GENERATOR, COMPONENT LOCATIONS

ManualsPlus.com

A16 SCAN GENERATOR
85660-60198 (1 OF 2)

P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	GND	A15P2-1	
19	LBIO	A15P2-19	
2	ADRØ	A15P2-2	
20	ADR1	A15P2-20	
3	ADR2	A15P2-3	
21	ADR3	A15P2-21	
4	ADR4	A15P2-4	
22	NC		
5	IOBØ	A15P2-5	B
23	IOB1	A15P2-23	B
6	IOB2	A15P2-6	B
24	IOB3	A15P2-24	B
7	IOB4	A15P2-7	B
25	IOB5	A15P2-25	B
8	IOB6	A15P2-8	B
26	IOB7	A15P2-26	B
9	IOB8	A15P2-9	B
27	IOB9	A15P2-27	B
10	IOB1Ø	A15P2-10	B
28	IOB11	A15P2-28	B
11	IOB12	A15P2-11	B
29	IOB13	A15P2-29	B
12	NC		
30	NC		
13	NC		
31	NC		
14	NC		
32	NC		
15	NC		
33	NC		
16	NC		
34	NC		
17	+5.2V	A15P2-17	R
35	+5.2V	A15P2-35	R
18	GND	A15P2-18	
36	GND	A15P2-36	

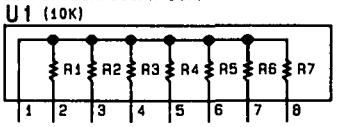
P2

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	+20V		R
16	+20V		R
2	GND		R
17	GND		R
3	+12V		
18	+12V		
4	-5.2V		
19	-5.2V		
5	-10V		R
20	-10V		R
6	SAT1	A12P3-5	P
21	SAT2	A12P3-20	P
7	LSTS	A12P3-6	B
22	LSAS	A12P3-21	I
8	LAOS	A12P3-7	F
23	LANR	A12P3-22	C
9	HSWP	A12P3-8	C
24	NC		
10	NC		
25	NC		
11	NC		
26	NC		
12	-40V		R
27	-40V		R
13	NC		
28	NC		
14	NC		
29	NC		
15	GND		
30	GND		

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (µF) INDUCTANCE IS IN MICROHENRIES (µH)
3. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE OR TOP AND EXIT AT RIGHT SIDE OR BOTTOM OF FUNCTION BLOCKS.
4. U1 PIN CONFIGURATION:

U1 (10K)



5. MNEMONIC TABLE:

MNEMONIC	DESCRIPTION
LSAS	LOW=SCAN ATTENUATOR STROBE
LSTS	LOW=SCAN TIME STROBE
LAOS	LOW=AUX OUT STROBE
HSWP	HIGH=SWEEPING
SAT1	SCAN INTEGER ATTENUATOR LSB
SAT2	SCAN INTEGER ATTENUATOR MSB
LANR	LOW=ANALOG RESET

6. ACCEPTABLE VALUES FOR R46* ARE:

VALUE	PART NUMBER
74.25K	0699-0311 (CD=7)
73.874K	0699-0380 (CD=0)

A16

SERIAL PREFIX: 2410A

FIGURE 4. A16 SCAN GENERATOR, SCHEMATIC DIAGRAM (1 OF 2)

ManualsPlus.com

A16 SCAN GENERATOR
85660-60188 (2 OF 2)

Ⓐ VOLTAGE REFERENCE

Ⓑ SCAN TIME REGISTER

Ⓒ SWEEP TIME DAC

Ⓓ AUX OUT REGISTER

Ⓔ AUX OUT OFFSET DAC

Ⓕ AUX OUT AMPLIFIER

Ⓖ SCAN TEST CIRCUIT

Ⓗ SCAN RESET AMPLIFIER

Ⓘ POWER SUPPLIES

Ⓙ RAMP GENERATOR

Ⓚ FREQUENCY SPAN REGISTER

Ⓛ SPAN WIDTH DAC

Ⓜ INTEGER NUMBER ATTENUATOR

Ⓝ RAMP CONTROL LOGIC

Ⓟ SWITCH DRIVERS

Ⓠ BAND DECODER

Ⓡ RAMP RESET AMPLIFIER

Ⓢ RAMP RESET SWITCH

Ⓣ SWITCH DRIVER

A16

SERIAL PREFIX: 2410A

FIGURE 4. A16 SCAN GENERATOR, SCHEMATIC DIAGRAM (2 OF 2)

ManualsPlus.com

A17 Positive Regulator

ManualsPlus.com

A17 POSITIVE REGULATOR, CIRCUIT DESCRIPTION

A17 Positive Regulator provides +20V, +12V, and +5.2V regulated voltages to the instrument. It also provides for thermal shutdown at temperatures above 85°C or, if the fan fails, controls power to the oscillator in the A22 10 MHz Frequency Standard, and ensures power-up and power-down operation that will not invalidate data in A15 Controller. The relationship of A17 to A8 Rectifier, A23 Motherboard, and A18 Negative Regulator is shown on the A8 schematic.

Front-Panel Shutdown (F)

When the front-panel LINE switch is in STANDBY, the LSBY line is grounded, fan relay K1 on the A23 Motherboard is energized turning the fan off, and the STANDBY LED is turned on.

Pin 9 of U3C is also at ground when LSBY is grounded so the output of U3C is at +10V, turning on Q11 through R41. Q11 sinks all of the current supplied by the compound current source Q1 and Q2, which turns off the +20V supply series-pass transistor A23Q3, located on the A23 Motherboard. All other supplies are referenced to the output of the +20V Regulator, so they are also disabled. (The +22V supply is an exception. It is always on as long as the instrument has ac power from the line.)

When the front-panel LINE switch is in the ON position, the LSBY line is no longer grounded, the fan relay K1 is no longer energized and the fan turns on. LSBY rises to about +22V due to the fan relay coil. This causes the output of U3C to go low, turning off Q11. The current source of Q1 and Q2 can now supply current to A23Q3 on the A23 Motherboard and the +20V supply will turn on.

Thermal Shutdown (I)

U3D senses the voltage across thermistor RT1. The resistance of RT1 is nominally 1000 ohms at 25°C and drops to 107 ohms at 85°C. When the resistance drops, the output of U3D rises, turning on the thermal shutdown LED DS3 and also Q12 which disables the current source in the +20V supply, shutting the supply off. CR5 and R52 provide hysteresis so the instrument will not turn on again until the temperature drops to 55°C.

+20V Regulator (A)

The +20V supply has as its reference a 6.2V zener diode VR2 biased from the output of the +20V supply (**(E)** on the schematic). The +20V output is divided down by R9, R50, and R10 to 6.2V. This voltage is compared with the +6.2V reference voltage by amplifier U1. This amplifier sinks current from the current source Q1, so that the voltage at the base of the series-pass transistor A23Q3 (on A23 Motherboard) is such that the output of the supply is at +20V.

A simple form of foldback current limiting is provided by the current sensing resistor R3, R4, R5, CR4, and Q3. Overvoltage protection is provided by the +20V crowbar **(G)** consisting of VR3 and CR1. DS2 is a LED which indicates the presence of an output voltage. Fuse F2 provides further protection for the supply.

+20V Switched Supply (J)

The +20V switched supply is provided to drive the output amplifier of the A22 10 MHz Frequency Standard. If the Reference Disable line HSTD is low, Q10 is off, and Q9 is off so no power is supplied to the standard. When HSTD goes high, both Q9 and Q10 turn on and +20V is supplied to the standard.

+12V Regulator (B)

The +12V supply is a 12V floating regulator with its reference terminal biased at 11V by R24 and VR8. This supply is enabled by the presence of the −5.2V supply, which causes Q8 to turn off, allowing the zener diode VR8 to be biased by the current flowing from the output of the supply through R24. LED DS4 provides a

ManualsPlus.com

visible indication of an output voltage. Overvoltage protection is provided by the +12V crowbar **(D)**. The regulator itself is internally protected, but further protection is provided by CR3 and F1.

+5.2V Regulator (C)

The operation of this supply is similar to that of the +20V supply. Its reference is from the voltage divider R36 and R49 from the +20V supply. This voltage is compared with the divided down output voltage by U2, which drives the Darlington-connected transistors Q6 and Q4 and the series-pass transistor A23Q4 on the A23 Motherboard. Foldback current limit is provided by R27-29, R31, R32, and Q5. The output crowbar **(H)** provides overvoltage protection. Further protection is provided by F3.

Power Up/Down Detector (K)

A power-up indication HPUP is provided to allow the instrument to turn on and off in an orderly manner. The HPUP line goes high when all of the following conditions are met:

1) The rectified dc voltage of the +5.2V supply is above 8.6V. (Provides an indication that the Line Voltage is present.)

2) The +5.2V output is higher than +4.9V.

3) The front-panel shutdown and thermal shutdown circuits allow the instrument to be turned on.

If both the front-panel shutdown and thermal shutdown transistors Q11 and Q12 are off, CR11 is reverse biased. If the output of the +5.2V supply is greater than +4.9V, the output of U3A is high and CR12 is reverse biased. If the dc input voltage to the +5.2V supply is greater than +8.6V, then the voltage at pin 5 of U3B is greater than +6.2V and the output of U3B is high. This turns on transistors Q13 and Q7, pulling the collector of Q7 to about +5V. This provides the HPUP signal.

If any of the above conditions are not met, HPUP remains low. R59 and C14 provide an additional time delay at turn-on to allow the supplies to settle down.

ManualsPlus.com

RF SECTION INTERNAL FUSE REPLACEMENT

NOTE

For location of hardware and cables referred to in this procedure, see Figure 1.

WARNING

Remove ac line cord from both instruments before proceeding with this procedure.

1. Position instrument upside-down as shown in View A.
2. Remove feet **(1)** from rear of RF Section by removing screws **(2)** shown in View A.
3. Remove bottom cover by loosening screw **(3)** and pulling cover toward rear of instrument.
4. Location of fuses is shown in View B.

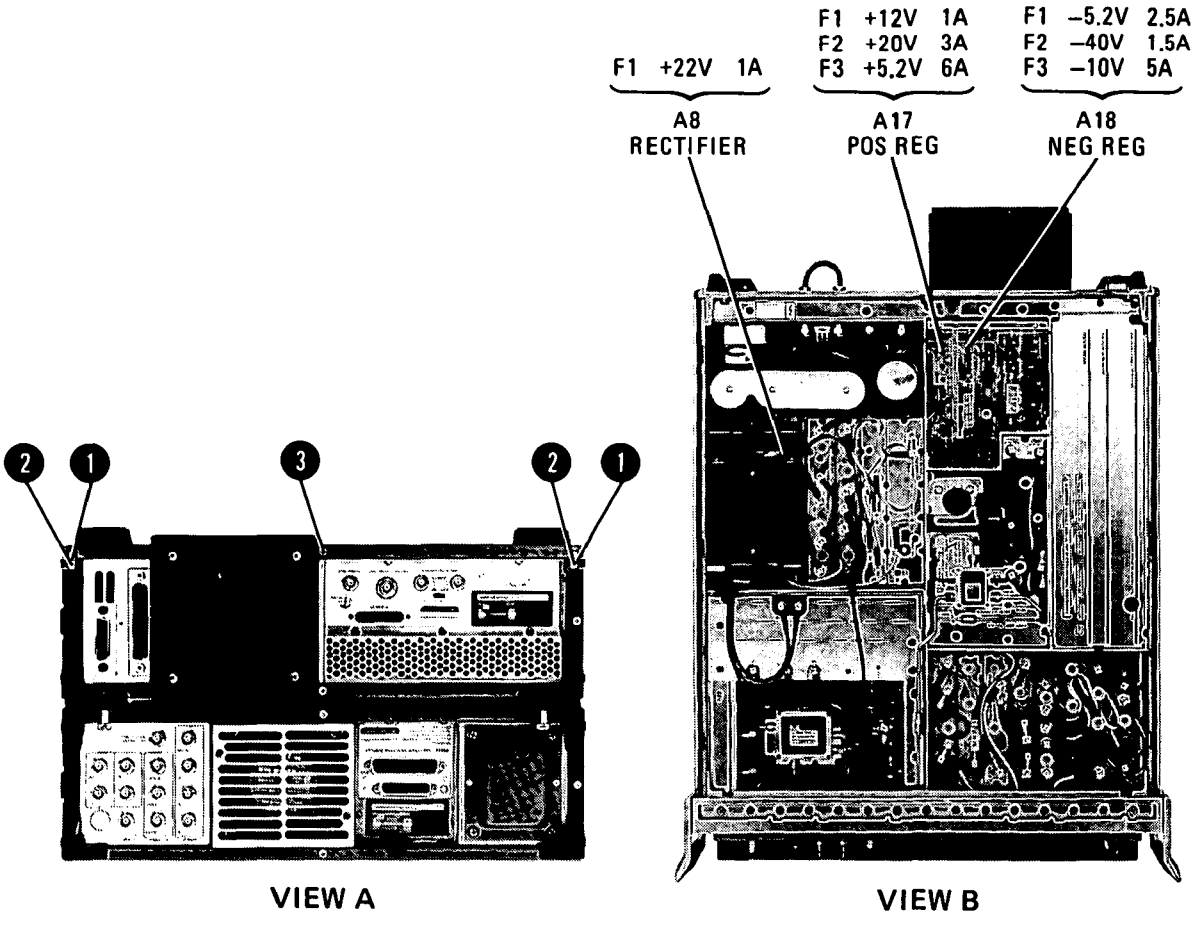


FIGURE 1. INTERNAL FUSE REPLACEMENT

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A17	85660-60174	7	1	BOARD ASSEMBLY, POSITIVE REGULATOR	28480	85660-60174
A17C1	0180-2205	3	1	CAPACITOR-FXD .33UF+-10% 35VDC TA	56289	150D334X9035A2
A17C2	0180-0116	1	2	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A17C3	0180-1746	5	1	CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A17C4	0160-2199	2	2	CAPACITOR-FXD 30PF +-5% 300VDC MICA	28480	0160-2199
A17C5	0180-0228	6	2	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A17C6	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A17C7	0160-0573	2	1	CAPACITOR-FXD 4700PF +-20% 100VDC CER	28480	0160-0573
A17C8	0160-4256	6	2	CAPACITOR-FXD .047UF +-20% 200VDC CER	16546	CW30 B 473M
A17C9	0160-4256	6		CAPACITOR-FXD .047UF +-20% 200VDC CER	16546	CW30 B 473M
A17C10	0160-2199	2		CAPACITOR-FXD 30PF +-5% 300VDC MICA	28480	0160-2199
A17C11	0180-0197	8	3	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A17C12	0180-0228	6		CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A17C13	0160-4892	6	1	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A17C14	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A17C15	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A17C16	0160-4832	4	1	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A17CR1	1884-0018	5	2	THYRISTOR-SCR 2N4186 VRRM=200	04713	2N4186
A17CR2	1884-0046	9	1	THYRISTOR-SCR VRRM=50	03508	C230F
A17CR3	1901-0743	1	1	DIODE-PWR RECT 1N4004 400V 1A DO-41	01295	1N4004
A17CR4	1901-0033	2	5	DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A17CR5	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A17CR6	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A17CR7	1884-0018	5		THYRISTOR-SCR 2N4186 VRRM=200	04713	2N4186
A17CR8-A17CR10				NOT ASSIGNED		
A17CR11	1901-0033	2		DIODE-GEN PRP 180V 200MA DO 7	28480	1901-0033
A17CR12	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A17DS1	1990-0487	7	3	LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A17DS2	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A17DS3	1990-0404	8	1	LED-LAMP LUM-INT=300UCD IF=50MA-MAX	28480	5082-4480
A17DS4	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A17F1	2110-0001	8	1	FUSE 1A 250V NTD 1.25X.25 UL	75915	312001
A17F2	2110-0003	0	1	FUSE 3A 250V NTD 1.25X.25 UL	75915	312003
A17F3	2110-0056	3	1	FUSE 6A 250V NTD 1.25X.25 UL IEC	75915	312006
A17Q1	1853-0012	4	1	TRANSISTOR PNP 2N2904A SI TO-39 PD=600MW	01295	2N2904A
A17Q2	1853-0451	5	1	TRANSISTOR PNP 2N3799 SI TO-18 PD=360MW	01295	2N3799
A17Q3	1854-0404	0	7	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A17Q4	1854-0441	5	1	TRANSISTOR NPN SI PD=5.6W FT=800KHZ	28480	1854-0441
A17Q5	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A17Q6	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A17Q7	1853-0281	9	2	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A17Q8	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A17Q9	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A17Q10	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A17Q11	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A17Q12	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A17Q13	1854-0477	7	1	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A17R1	0757-0443	0	3	RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A17R2	0757-0401	0	4	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A17R3	0811-1659	8	1	RESISTOR .27 5% 2W PW TC=0+-300	75042	BWH2-27/100-J
A17R4	0757-0418	9	2	RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A17R5	0757-0443	0		RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A17R6	0757-0394	0	1	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A17R7	0698-3150	6	4	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A17R8	0698-3442	9	1	RESISTOR 237 1% .125W F TC=0+-100	24546	C4-1/8-T0-237R-F
A17R9	0698-8465	6	1	RESISTOR 7.15K .5% .125W F TC=0+-50	28480	0698-8465
A17R10	0698-6035	0	3	RESISTOR 3.16K .5% .125W F TC=0+-50	24546	NC55-1/8-T2-3161-D
A17R11	0757-0280	3	7	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A17R12	0757-0278	9	2	RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A17R13	0683-0275	9	2	RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A17R14	0698-3444	1	4	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A17R15	0757-0346	2	3	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A17R16	0757-0278	9		RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A17R17	0698-3162	0	1	RESISTOR 46.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4642-F
A17R18	0757-0442	9	2	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A17R19	0757-0438	3	5	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A17R20	0698-0083	8	1	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A17R21	0757-0465	6	1	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A17R22	0757-0443	0		RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A17R23	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A17R24	0757-0399	5	1	RESISTOR 82.5 1% .125W F TC=0+-100	24546	C4-1/8-T0-82R5-F
A17R25	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F

*Indicates Factory Selected Value

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A17R26	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A17R27	0811-1661	2	3	RESISTOR .39 5% 2W PW TC=0+-800	75042	BWH2-39/100-J
A17R28	0811-1661	2		RESISTOR .39 5% 2W PW TC=0+-800	75042	BWH2-39/100-J
A17R29	0811-1661	2		RESISTOR .39 5% 2W PW TC=0+-800	75042	BWH2-39/100-J
A17R30	0757-0419	0	1	RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-681R-F
A17R31	0757-0420	3	1	RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A17R32	0698-3154	0	1	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A17R33	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A17R34	0698-8466	7	1	RESISTOR 942 .5% .125W F TC=0+-50	28480	0698-8466
A17R35	0698-6835	0		RESISTOR 3.16K .5% .125W F TC=0+-50	24546	NC55-1/8-T2-3161-D
A17R36	0698-6835	0		RESISTOR 3.16K .5% .125W F TC=0+-50	24546	NC55-1/8-T2-3161-D
A17R37	0683-0275	9		RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A17R38	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A17R39	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A17R40	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A17R41	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A17R42	0757-0410	9		RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A17R43	0698-3156	2	1	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A17R44	0757-0459	8	3	RESISTOR 56.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5622-F
A17R45	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A17R46	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A17R47	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A17R48	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A17R49	0698-8464	5	1	RESISTOR 12.6K .5% .125W F TC=0+-50	28480	0698-8464
A17R50	2100-3095	5	1	RESISTOR-TRMR 200 10% C SIDE-ADJ 17-TRN	02111	43P201
A17R51	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A17R52	0698-0084	9	1	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A17R53	0698-4405	6	1	RESISTOR 107 1% .125W F TC=0+-100	24546	C4-1/8-T0-107R-F
A17R54	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A17R55	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A17R56	0698-3157	3	1	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A17R57	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A17R58	0698-3634	1	1	RESISTOR 470 5% 2W MO TC=0+-200	28480	0698-3634
A17R59	0757-0459	8		RESISTOR 56.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5622-F
A17R60	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A17R61				NOT ASSIGNED		
A17R62	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A17R63	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A17R64	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A17R65	0757-0459	8		RESISTOR 56.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5622-F
A17R66	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A17R67	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A17R68	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A17R69	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A17RT1	0837-0126	6	1	THERMISTOR DISC 1K-OHM TC=-4.4%/C-DEG	28480	0837-0126
A17TP1	1251-0600	0	8	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A17TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A17TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A17TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A17TP5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A17TP6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A17TP7	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A17TP8	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A17U1	1820-0223	0	2	IC OP AMP GP TO-99 PKG	3L585	CA301AT
A17U2	1820-0223	0		IC OP AMP GP TO-99 PKG	3L585	CA301AT
A17U3	1826-0161	7	1	IC OP AMP GP QUAD 14-DIP-P PKG	04713	MLM324P
A17VR1	1902-3171	7	1	DIODE-ZNR 11V 5% DO-35 PD=.4W TC=+.062%	28480	1902-3171
A17VR2	1902-0686	3	2	DIODE-ZNR 6.2V 2% DO-7 PD=.4W TC=+.002%	04713	1N825
A17VR3	1902-3252	5	1	DIODE-ZNR 22.6V 2% DO-35 PD=.4W	28480	1902-3252
A17VR4	1902-0049	2	3	DIODE-ZNR 6.19V 5% DO-35 PD=.4W	28480	1902-0049
A17VR5	1902-0686	3		DIODE-ZNR 6.2V 2% DO-7 PD=.4W TC=+.002%	04713	1N825
A17VR6	1902-0049	2		DIODE-ZNR 6.19V 5% DO-35 PD=.4W	28480	1902-0049
A17VR7	1902-3203	6	1	DIODE-ZNR 14.7V 5% DO-35 PD=.4W	28480	1902-3203
A17VR8	1902-3172	8	1	DIODE-ZNR 11V 2% DO-35 PD=.4W TC=+.062%	28480	1902-3172
A17VR9	1902-0049	2		DIODE-ZNR 6.19V 5% DO-35 PD=.4W	28480	1902-0049
				MISCELLANEOUS PARTS		
	2110-0269	0	6	FUSEHOLDER-CLIP TYPE.25D-FUSE	28480	2110-0269
	2190-0014	1	2	WASHER-LK INTL T NO. 2 .089-IN-ID	28480	2190-0014
	2190-0027	6	1	WASHER-LK INTL T 1/4 IN .256-IN-ID	28480	2190-0027
	2950-0051	8	1	NUT-HEX-DBL-CHAM 1/4-28-THD .094-IN-THK	00000	ORDER BY DESCRIPTION
	5040-6043	2	1	EXTRACTOR	28480	5040-6043

*Indicates Factory Selected Value

ManualsPlus.com

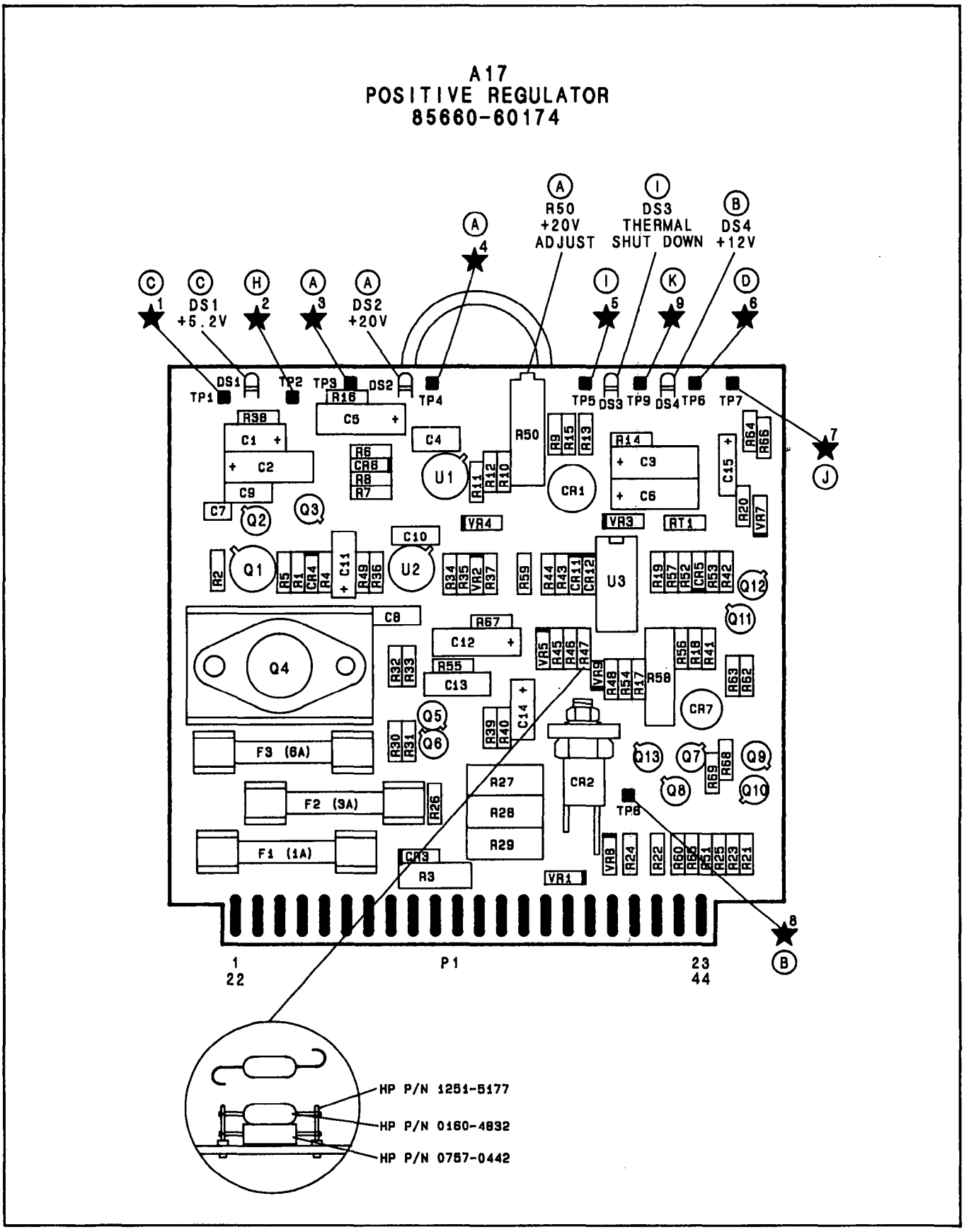


FIGURE 2. A17 POSITIVE REGULATOR, COMPONENT LOCATIONS

RF SECTION

A17 POSITIVE REGULATOR
85680-60174

P/O A23 MOTHERBOARD

P1	SIGNAL	TO/FROM	FUNCTION BLOCK
1	+12V UNREG	A23J3-1	A
2	+20V TYP	A8P1-8,24	A
3	+22V TYP	A8P1-8,24	A
4	+20V UNREG	A23J3	A
5	+20V BASE DRIVE	A23J3	A
6	+20V EMITTER	A23J3	A
7	+15V TYP	A8P1-15,29	C
8	+15V TYP	A8P1-15,29	C
9	+9.2V UNREG	A23J4	C
10	+9.2V UNREG	A23J4	C
11	+9V BASE DRIVE	A23J4	C
12	+9V EMITTER	A23J4	C
13	+9V EMITTER	A23J4	C
14	+20V	SEE A8	A
15	GND		A
16	+5.2V	SEE A8	C
17	+5.2V	SEE A8	C
18	GND		A
19	+11.8V	A23J1-3	B
41	+20V SWITCHED	A12 P10 1	J
20	+12V OUT	A23J1-2	B
21	-5.2V	A19P1-15,24	B
43	HPIB	A15P2-32	K
22	10MHz	A12P10-29	J
44	LSBY	A5J41-3	F

SERIAL NUMBER PREFIX: 2410A

NOTES:

1. REFERENCE DESIGNATIONS WITHIN [illegible] ARE ASSEMBLY NUMBERS.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN Ω, ±5%, 1/4W; CAPACITANCE IN µF, ±10%, 50VDC; INDUCTANCE IN µH ±10%.
3. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.
4. ABBREVIATIONS TABLE:

ABBREVIATION	DEFINITION
HPIB	HIGH-SPEED GP
10MHz	10MHz VCXO OR STANDARD OR
LSBY	LOW-STANDBY

A17

FIGURE 3. A17 POSITIVE REGULATOR, SCHEMATIC DIAGRAM

ManualsPlus.com

ManualsPlus.com

A18 Negative Regulator

ManualsPlus.com

A18 NEGATIVE REGULATOR, CIRCUIT DESCRIPTION

A18 Negative Regulator provides −5.2V, −10V, and −40V regulated voltages to the instrument. All three supplies derive their reference from the +20V supply on the A17 Positive Regulator. The relationship of A18 to A8 Rectifier, A17 Positive Regulator, and A23 Motherboard is shown on the A8 schematic.

−10V Regulator (A)

The −10V supply is referenced to the +20V supply by a resistor divider consisting of R5, R6, and R7 connected between the two supplies. The voltage at the junction of R5 and R6 is nominally 0V. Any error is amplified by U2 to drive the series-pass transistor A23Q1. The entire unregulated portion of the supply including the rectifier diodes and filter capacitor is floating, thus the collector of A23Q1 is typically +15V. Current sensing resistors R1 and R23 are connected between the emitter of A23Q1 and ground. These resistors, along with R2, R3, CR1, and Q1, form a current foldback protection network.

Overvoltage protection is provided by the −10V crowbar **(B)** consisting of VR2 and CR26. Further protection is provided by fuse F3. A LED DS2 indicates the presence of an output voltage.

−5.2V Regulator (C)

The −5.2V supply is also referenced to the +20V supply by a resistor divider consisting of R37, R33, and R39 connected between the two supplies. This supply is a double regulated supply, as its input is the regulated output from the −10V supply. Error amplifier U1 drives the pass transistor Q2 via Q3. R32 and R33 are dropping resistors so the power dissipation in Q2 is not excessive. R34, R12, R36, and Q4 provide current foldback protection. Further protection is provided by F1. Overvoltage protection is provided by the −5.2V crowbar **(D)** consisting of VR4 and CR27. A LED DS3 indicates the presence of an output voltage.

−40V Regulator

The −40V supply is referenced to the +20V supply by the voltage divider consisting of R24, R25, and R26, designed so that the input to the error amplifier U3 is at 0V. The output of the error amplifier drives the Darlington connection of Q5 and the series-pass transistor A23Q2. The input to the supply is floating, so the collector of A23Q2 is typically at +10V. Foldback current protection is provided by R17, R18, R19, and Q6. Further current protection is provided by the −40V crowbar **(F)** consisting of VR3 and CR25. The presence of an output voltage is indicated by a LED DS1.

ManualsPlus.com

RF SECTION INTERNAL FUSE REPLACEMENT

NOTE

For location of hardware and cables referred to in this procedure, see Figure 1.

WARNING

Remove ac line cord from both instruments before proceeding with this procedure.

1. Position instrument upside-down as shown in View A.
2. Remove feet **(1)** from rear of RF Section by removing screws **(2)** shown in View A.
3. Remove bottom cover by loosening screw **(3)** and pulling cover toward rear of instrument.
4. Location of fuses is shown in View B.

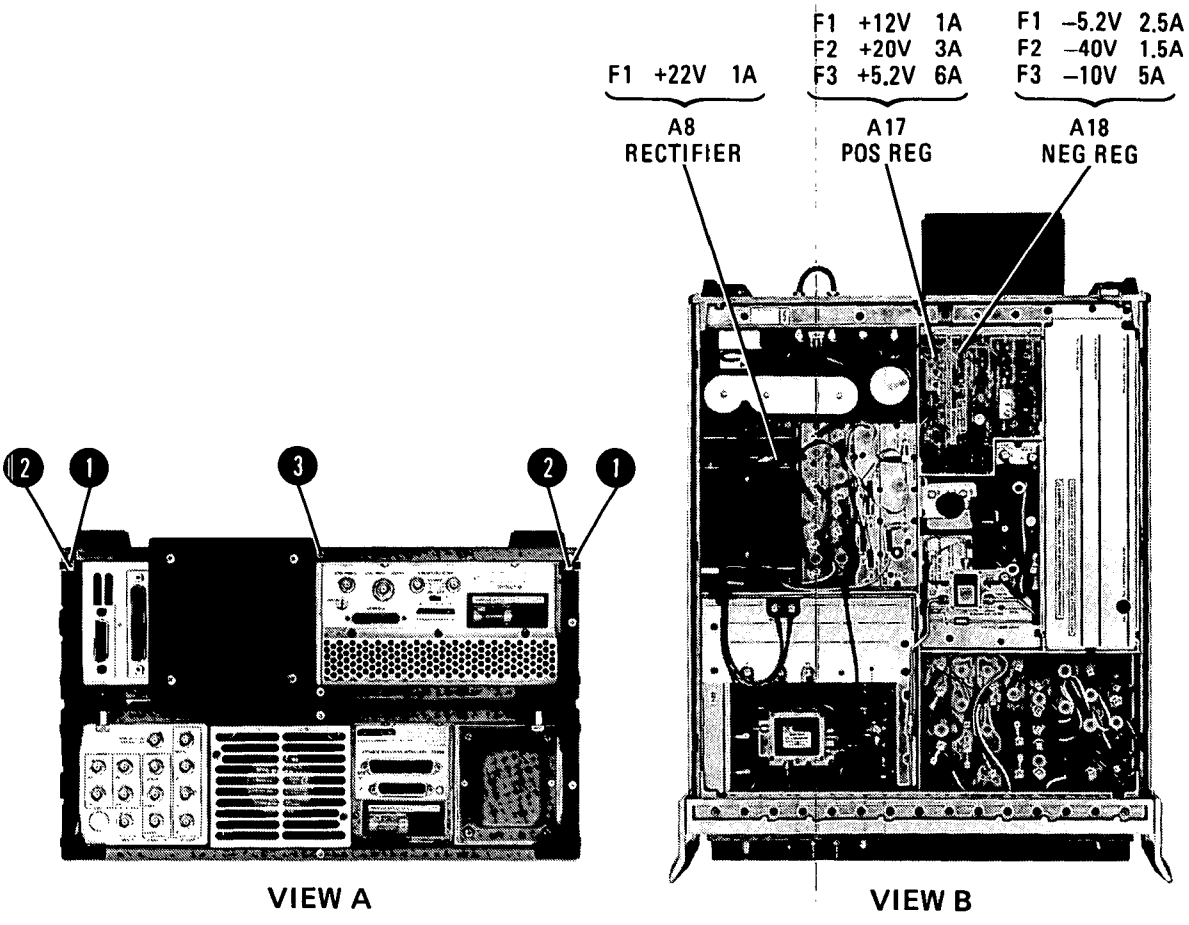


FIGURE 1. INTERNAL FUSE REPLACEMENT

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A18	85660-60137	2	1	BOARD ASSEMBLY, NEGATIVE REGULATOR	28480	85660-60137
A18C1	0160-2199	2	3	CAPACITOR-FXD 30PF +-5% 300VDC MICA	28480	0160-2199
A18C2	0180-0228	6	3	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A18C3	0180-1746	5	2	CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020D2
A18C4	0160-2199	2		CAPACITOR-FXD 30PF +-5% 300VDC MICA	28480	0160-2199
A18C5	0180-0228	6		CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015D2
A18C6	0160-2199	2		CAPACITOR-FXD 30PF +-5% 300VDC MICA	28480	0160-2199
A18C7	0180-0228	6		CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A18C8	0180-1731	8	1	CAPACITOR-FXD 4.7UF+-10% 50VDC TA	56289	150D475X9050D2
A18C9	0160-4256	6	3	CAPACITOR-FXD .047UF +-20% 200VDC CER	16546	CW30 B 473M
A18C10	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A18C11	0160-4892	6	3	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A18C12	0160-4256	6		CAPACITOR-FXD .047UF +-20% 200VDC CER	16546	CW30 B 473M
A18C13	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A18C14	0160-4892	6		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-4892
A18C15	0160-4256	6		CAPACITOR-FXD .047UF +-20% 200VDC CER	16546	CW30 B 473M
A18C16	0180-0100	3	1	CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035D2
A18CR1	1901-0033	2	7	DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A18CR2	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A18CR3	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A18CR4	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A18CR5	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A18CR6	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A18CR7	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A18CR8	1901-0662	3	3	DIODE-PWR RECT 100V 6A	04713	MR751
A18CR9	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A18CR10				NOT ASSIGNED		
A18CR11				NOT ASSIGNED		
A18CR12	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A18CR13				NOT ASSIGNED		
A18CR14				NOT ASSIGNED		
A18CR15	1901-0743	1	1	DIODE-PWR RECT 1N4004 400V 1A DO-41	01295	1N4004
A18CR16-A18CR24				NOT ASSIGNED		
A18CR25	1884-0018	5	3	THYRISTOR-SCR 2N4186 VRRM=200	04713	2N4186
A18CR26	1884-0018	5		THYRISTOR-SCR 2N4186 VRRM=200	04713	2N4186
A18CR27	1884-0018	5		THYRISTOR-SCR 2N4186 VRRM=200	04713	2N4186
A18DS1	1990-0487	7	3	LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A18DS2	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A18DS3	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A18F1	2110-0083	6	1	FUSE 2.5A 250V NTD 1.25X.25 UL	28480	2110-0083
A18F2	2110-0043	8	1	FUSE 1.5A 250V NTD 1.25X.25 UL	28480	2110-0043
A18F3	2110-0010	9	1	FUSE 5A 250V NTD 1.25X.25 UL	75915	312005
A18Q1	1854-0404	0	2	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A18Q2	1854-0441	5	1	TRANSISTOR NPN SI PD=5.8W FT=800KHZ	28480	1854-0441
A18Q3	1853-0001	1	1	TRANSISTOR PNP SI TO-39 PD=600MW	28480	1853-0001
A18Q4	1853-0007	7	1	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A18Q5	1854-0271	9	1	TRANSISTOR NPN SI TO-39 PD=1W FT=150MHZ	28480	1854-0271
A18Q6	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A18R1	0811-1552	0	2	RESISTOR .56 5% 2W PW TC=0+-800	75042	BWH2-9/16-J
A18R2	0757-0421	4	1	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A18R3	0757-0438	3	1	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A18R4	0757-0280	3	6	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A18R5	0698-6035	0	6	RESISTOR 3.16K .5% .125W F TC=0+-50	24546	NC55-1/8-T2-3161-D
A18R6	0698-6035	0		RESISTOR 3.16K .5% .125W F TC=0+-50	24546	NC55-1/8-T2-3161-D
A18R7	0698-6035	0		RESISTOR 3.16K .5% .125W F TC=0+-50	24546	NC55-1/8-T2-3161-D
A18R8	0683-0275	9	3	RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A18R9	0698-3444	1	4	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A18R10	0757-0346	2	3	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A18R11	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A18R12	0757-0428	1	1	RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A18R13	0698-3447	4	1	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A18R14	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A18R15	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A18R16	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A18R17	0811-1665	6	1	RESISTOR .82 5% 2W PW TC=0+-800	75042	BWH2-82/100-J
A18R18	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A18R19	0698-3449	6	1	RESISTOR 28.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2872-F
A18R20	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F

*Indicates Factory Selected Value

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A18R21	0757-0442	9	2	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A18R22	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A18R23	0811-1552	0		RESISTOR .56 5% 2W PW TC=0+-800	75042	BWH2-9/16-J
A18R24	0698-8464	5	1	RESISTOR 12.6K .5% .125W F TC=0+-50	28480	0698-8464
A18R25	0698-6835	0		RESISTOR 3.16K .5% .125W F TC=0+-50	24546	NC55-1/8-T2-3161-D
A18R26	0698-6835	0		RESISTOR 3.16K .5% .125W F TC=0+-50	24546	NC55-1/8-T2-3161-D
A18R27	0683-0275	9		RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A18R28	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A18R29	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A18R30	0698-3150	6	2	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A18R31	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A18R32	0812-0066	1	3	RESISTOR .33 5% 2W PW TC=0+-800	75042	BWH2-33/100-J
A18R33	0812-0066	1		RESISTOR .33 5% 2W PW TC=0+-800	75042	BWH2-33/100-J
A18R34	0812-0066	1		RESISTOR .33 5% 2W PW TC=0+-800	75042	BWH2-33/100-J
A18R35	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A18R36	0757-0441	8	1	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A18R37	0698-6835	0		RESISTOR 3.16K .5% .125W F TC=0+-50	24546	NC55-1/8-T2-3161-D
A18R38	0698-7050	3	1	RESISTOR 4.48K .5% .125W F TC=0+-50	28480	0698-7050
A18R39	0698-6853	2	1	RESISTOR 7.68K .5% .125W F TC=0+-50	24546	NC55-1/8-T2-7681-D
A18R40	0683-0275	9		RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A18R41				NOT ASSIGNED		
A18R42				NOT ASSIGNED		
A18R43	0757-0401	0	3	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A18R44	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A18R45	0698-3435	0	1	RESISTOR 38.3 1% .125W F TC=0+-100	24546	C4-1/8-T0-38R3-F
A18R46	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A18R47	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A18TP1	1251-0600	0	5	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A18TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A18TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A18TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A18TP5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A18U1	1820-0223	0	3	IC OP AMP GP TO-99 PKG	3L585	CA301AT
A18U2	1820-0223	0		IC OP AMP GP TO-99 PKG	3L585	CA301AT
A18U3	1820-0223	0		IC OP AMP GP TO-99 PKG	3L585	CA301AT
A18VR1	1902-0025	4	1	DIODE-ZNR 10V 5% DO-35 PD=.4W TC=+.06%	28480	1902-0025
A18VR2	1902-3171	7	1	DIODE-ZNR 11V 5% DO-35 PD=.4W TC=+.062%	28480	1902-3171
A18VR3	1902-3330	0	1	DIODE-ZNR 44.2V 2% DO-35 PD=.4W	28480	1902-3330
A18VR4	1902-0049	2	1	DIODE-ZNR 6.19V 5% DO-35 PD=.4W	28480	1902-0049
				MISCELLANEOUS PARTS		
	2110-0269	0	6	FUSEHOLDER-CLIP TYPE.25D-FUSE	28480	2110-0269
	5000-9043	6	1	PIN	28480	5000-9043
	5040-6843	2	1	EXTRACTOR	28480	5040-6843

*Indicates Factory Selected Value

ManualsPlus.com

A18
NEGATIVE REGULATOR
85660-60137

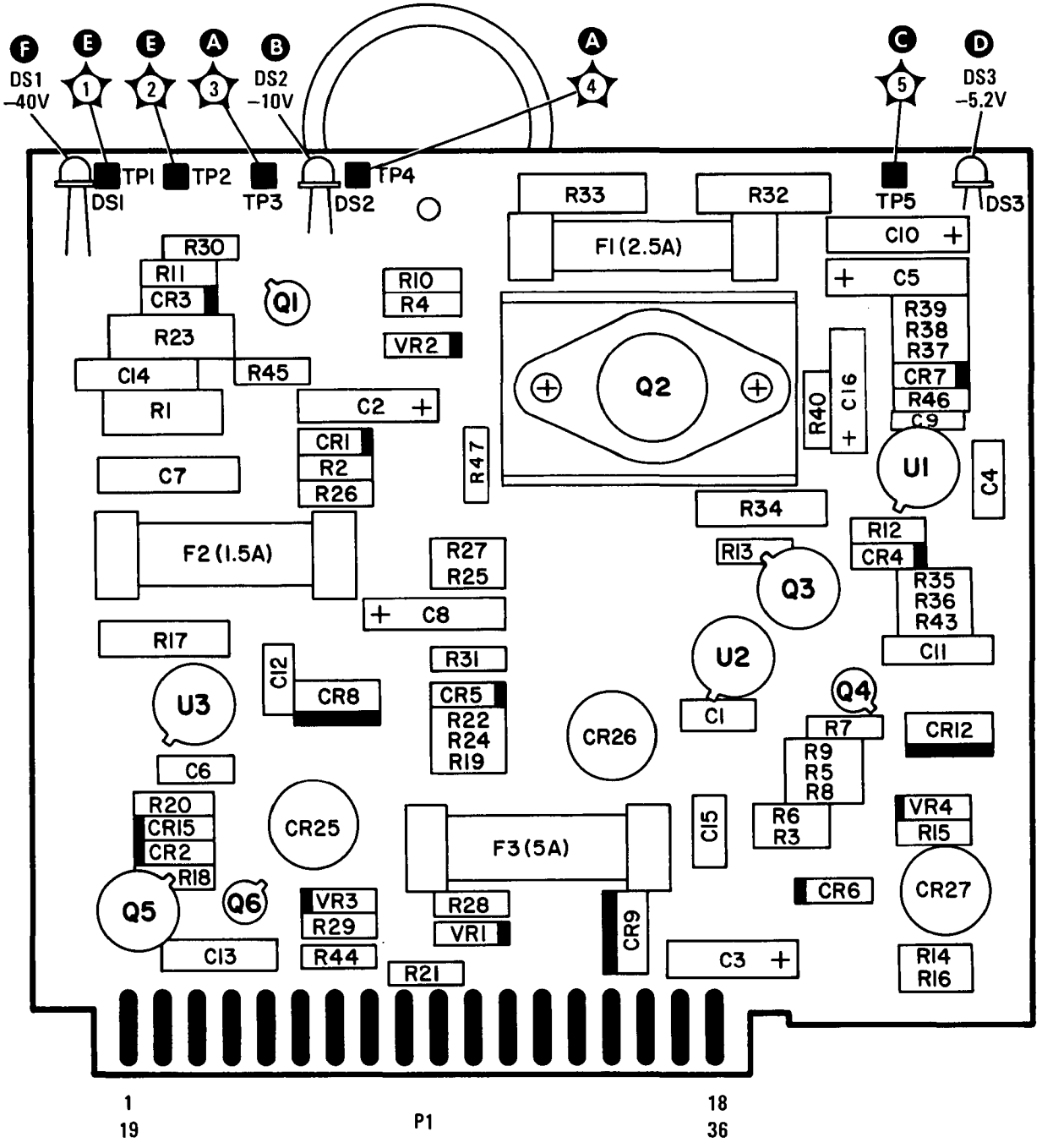


FIGURE 2. A18 NEGATIVE REGULATOR, COMPONENT LOCATIONS

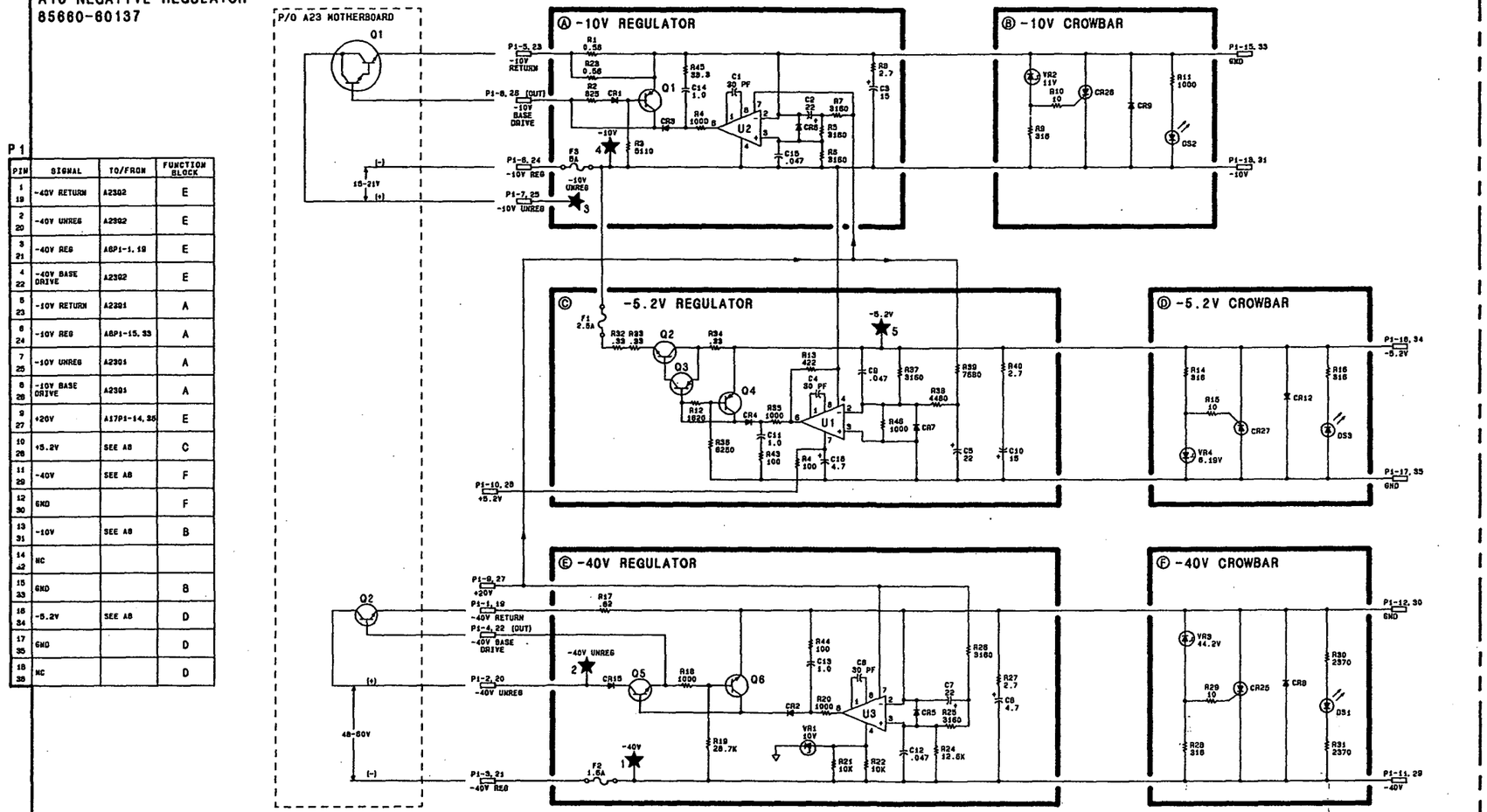
ManualsPlus.com

RF SECTION

A18 NEGATIVE REGULATOR
85660-60137

P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1 19	-40V RETURN	A23J2	E
2 20	-40V UNREG	A23J2	E
3 21	-40V REG	A8P1-1, 19	E
4 22	-40V BASE DRIVE	A23J2	E
5 23	-10V RETURN	A23J1	A
6 24	-10V REG	A8P1-15, 33	A
7 25	-10V UNREG	A23J1	A
8 26	-10V BASE DRIVE	A23J1	A
9 27	+20V	A17P1-14, 35	E
10 28	+5.2V	SEE A8	C
11 29	-40V	SEE A8	F
12 30	GND		F
13 31	-10V	SEE A8	B
14 32	NC		
15 33	GND		B
16 34	-5.2V	SEE A8	D
17 35	GND		D
18 36	NC		D



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (μF) INDUCTANCE IS IN MICROHENRIES (μH)
3. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.

SERIAL NUMBER PREFIX: 2410A

FIGURE 3. A18 NEGATIVE REGULATOR, SCHEMATIC DIAGRAM

ManualsPlus.com

ManualsPlus.com

A19 DIGITAL-TO-ANALOG CONVERTER (DAC), CIRCUIT DESCRIPTION

The A19 DAC provides the tuning voltage to the A20 YTO Main Coil Driver used to coarse tune the YTO Start Frequency and set the proper amount of sweep. This occurs at the beginning of each sweep and at the beginning of each harmonic band within a sweep.

YTO Pretune Register (A) and Pretune DAC (C)

Frequency information is loaded into pretune registers U5 and U6 from the Instrument Bus. This is coded information from the Instrument Bus. This information is clocked into the registers by LDAS (Low = DAC Strobe). The Pretune DAC, in conjunction with U2, provides an output of 0 to +12.6 Vdc in approximately 3 mV increments. The exact voltage is dependent on the coded information input. This voltage is applied to Summing Amplifier U4 through R3.

Frequency Span Register and Switch Driver (B) and Span Scaling (E)

Coded span information from the A12 Front-Panel Interface is loaded into register U7 from the Instrument Bus and clocked out to switch drivers U8 and U9 by LSAS (Low = Scan Attenuator Strobe). These switch drivers turn on (close) switches Q2 through Q6 according to the coded information input. The SCAN DAC IN signal (attenuated sweep ramp) from the A16 Scan Generator is then applied to the proper scaling resistors R26 through R30, R38, and R58, to provide the sweep for the YTO. This output current is applied to Summing Amplifier U4.

Summing Amplifier (F)

The fixed dc current from the Pretune DAC, corresponding to the desired YTO Start Frequency, and the ramp current from the Scaling Resistors, corresponding to the desired Frequency Span, are summed at the input of U4. U4 amplifies this combined signal and applies it to both the YTO and YTX at a sensitivity of −3V/GHz to coarse tune the analyzer to the selected Start Frequency and Frequency Span.

Negative Voltage Reference (D) and Positive Voltage Reference (H)

U3 and associated circuitry **(D)** provide a nominal −12.6V reference for U3, the pretune DAC in function block **(C)**. U10 and associated circuitry **(H)** provide a nominal +10V reference for summing amplifier U4 in function block **(F)**.

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A19	85660-60212	4	1	BOARD ASSEMBLY, DIGITAL-TO ANALOG CONVERTER	28480	85660-60212
A19C1	0160-4005	3	6	CAPACITOR-FXD 1UF +-20% 100VDC CER	28480	0160-4005
A19C2	0180-0630	4	3	CAPACITOR-FXD 4.7UF+-20% 50VDC TA	28480	0180-0630
A19C3				NOT ASSIGNED		
A19C4	0160-2055	9	6	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A19C5	0160-4005	3		CAPACITOR-FXD 1UF +-20% 100VDC CER	28480	0160-4005
A19C6	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A19C7	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A19C8				NOT ASSIGNED		
A19C9				NOT ASSIGNED		
A19C10	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A19C11	0180-0116	1	1	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A19C12	0160-4005	3		CAPACITOR-FXD 1UF +-20% 100VDC CER	28480	0160-4005
A19C13	0180-0229	7	1	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A19C14	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A19C15	0180-0183	2	1	CAPACITOR-FXD 10UF+75-10% 50VDC AL	56289	30D106G050CB2
A19C16	0160-4005	3		CAPACITOR-FXD 1UF +-20% 100VDC CER	28480	0160-4005
A19C17	0180-0228	6	1	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A19C18	0160-4745	8	2	CAPACITOR-FXD .33UF +-10% 100VDC POLYP	28480	0160-4745
A19C19	0160-4005	3		CAPACITOR-FXD 1UF +-20% 100VDC CER	28480	0160-4005
A19C20	0180-0630	4		CAPACITOR-FXD 4.7UF+-20% 50VDC TA	28480	0180-0630
A19C21	0180-0630	4		CAPACITOR-FXD 4.7UF+-20% 50VDC TA	28480	0180-0630
A19C22	0160-4745	8		CAPACITOR-FXD .33UF +-10% 100VDC POLYP	28480	0160-4745
A19C23	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A19C24	0160-4005	3		CAPACITOR-FXD 1UF +-20% 100VDC CER	28480	0160-4005
A19CR1	1901-0179	7	1	DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A19CR2	1901-0539	3	1	DIODE-SM SIC SCHOTTKY	28480	1901-0539
A19CR3	1901-0050	3	1	DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A19E1	0340-0060	4	1	TERMINAL-STUD SPCL-FDTHRU PRESS-MTG	98291	011-6809 000 209
A19Q1	1853-0281	9	1	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A19Q2	1853-0322	9	7	TRANSISTOR PNP 2N2946A SI TO-46 PD=400MW	01295	2N2946A
A19Q3	1853-0322	9		TRANSISTOR PNP 2N2946A SI TO-46 PD=400MW	01295	2N2946A
A19Q4	1853-0322	9		TRANSISTOR PNP 2N2946A SI TO-46 PD=400MW	01295	2N2946A
A19Q5	1853-0322	9		TRANSISTOR PNP 2N2946A SI TO-46 PD=400MW	01295	2N2946A
A19Q6	1853-0322	9		TRANSISTOR PNP 2N2946A SI TO-46 PD=400MW	01295	2N2946A
A19Q7	1853-0322	9		TRANSISTOR PNP 2N2946A SI TO-46 PD=400MW	01295	2N2946A
A19Q8	1853-0322	9		TRANSISTOR PNP 2N2946A SI TO-46 PD=400MW	01295	2N2946A
A19R1	0698-8590	8	1	RESISTOR 853 1% .125W F TC=0+-100	28480	0698-8590
A19R2	0757-0280	3	1	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A19R3	0699-0306	0	3	RESISTOR 6K .025% .1W F TC=0+-5	28480	0699-0306
A19R4	0698-0024	7	1	RESISTOR 2.61K 1% .5W F TC=0+-100	28480	0698-0024
A19R5	0699-0306	0		RESISTOR 6K .025% .1W F TC=0+-5	28480	0699-0306
A19R6	0699-0642	7	2	RESISTOR 10K .1% .1W F TC=0+-5	28480	0699-0642
A19R7	0699-0306	0		RESISTOR 6K .025% .1W F TC=0+-5	28480	0699-0306
A19R8	0757-0346	2	10	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A19R9	2100-4020	8	2	RESISTOR-TRMR 2K 10% MF SIDE-ADJ 26-TRN	28480	2100-4020
A19R10	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A19R11	0698-6348	0	2	RESISTOR 3K .1% .125W F TC=0+-25	28480	0698-6348
A19R12	0757-0439	4	1	RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A19R13	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A19R14	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A19R15	0699-0156	8	2	RESISTOR 6.19K .1% .1W F TC=0+-5	28480	0699-0156
A19R16	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A19R17	0757-0400	9	1	RESISTOR 90.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-90R9-F
A19R18	0757-0422	5	1	RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A19R19	2100-1762	9	1	RESISTOR-TRMR 20K 5% WW SIDE-ADJ 1-TRN	28480	2100-1762
A19R20	0757-0159	5	1	RESISTOR 1K 1% .5W F TC=0+-100	28480	0757-0159
A19R21	0757-0442	9	11	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A19R22	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A19R23	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A19R24	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A19R25	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A19R26	0699-0302	6	1	RESISTOR 800 .025% .1W F TC=0+-5	28480	0699-0302
A19R27	0699-0304	8	1	RESISTOR 8K .025% .1W F TC=0+-5	28480	0699-0304
A19R28	0699-0309	3	1	RESISTOR 80K .025% .1W F TC=0+-5	28480	0699-0309
A19R29	0699-0643	8	2	RESISTOR 400K .02% .125W F TC=0+-5	28480	0699-0643
A19R30	0683-4755	8	1	RESISTOR 4.7M 5% .25W FC TC=-900/+1100	01121	CB4755
A19R31	0699-0643	8		RESISTOR 400K .02% .125W F TC=0+-5	28480	0699-0643
A19R32	2100-3061	5	2	RESISTOR-TRMR 500K 10% C SIDE-ADJ 17-TRN	02111	43P504
A19R33	0757-0443	0		RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A19R34	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A19R35	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F

*Indicates Factory Selected Value

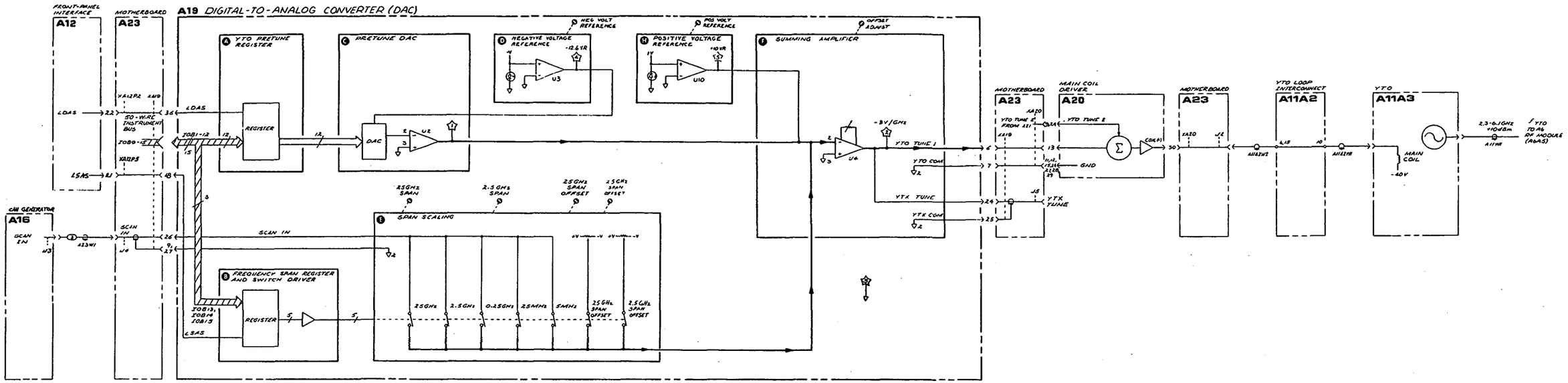
ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A19R36	0757-0440	7	1	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A19R37	0757-0443	0	1	RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A19R38	0757-0465	6	2	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A19R39	0757-0438	3	4	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A19R40	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A19R41	2100-3154	7	2	RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	02111	43P102
A19R42	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A19R43	2100-3061	5		RESISTOR-TRMR 500K 10% C SIDE-ADJ 17-TRN	02111	43P504
A19R44	0698-8826	3	1	RESISTOR 825K 1% .125W F TC=0+-100	28480	0698-8826
A19R45	0757-0276	7	1	RESISTOR 61.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-6192-F
A19R46	0698-8572	6	1	RESISTOR 508.7 .1% .125W F TC=0+-25	28480	0698-8572
A19R47	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A19R48	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A19R49	0699-0642	7		RESISTOR 10K .1% .1W F TC=0+-5	28480	0699-0642
A19R50	2100-4020	8		RESISTOR-TRMR 2K 10% MF SIDE-ADJ 26-TRN	28480	2100-4020
A19R51	0698-6348	0		RESISTOR 3K .1% .125W F TC=0+-25	28480	0698-6348
A19R52	0699-0156	8		RESISTOR 6.19K .1% .1W F TC=0+-5	28480	0699-0156
A19R53	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A19R54	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A19R55	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A19R56	2100-3154	7		RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	02111	43P102
A19R57	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A19R58	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A19R59	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A19R60	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A19R61	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A19R62	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A19TP1	1251-0600	0	5	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A19TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A19TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A19TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A19TP5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A19U1	1826-1190	4	1	D/A 12-BIT 18-CERDIP CMOS	28480	1826-1190
A19U2	1826-0471	2	1	IC OP AMP LOW-DRIFT TO-99 PKG	28480	1826-0471
A19U3	5180-2315	1	3	IC 05C M10PAMP	28480	5180-2315
A19U3	5180-2314	0	3	NOTE: USE AS ALTERNATE FOR 5180-2315	28480	5180-2314
A19U4	5180-2315	1		IC 05C M10PAMP	28480	5180-2315
A19U4	5180-2314	0		NOTE: USE AS ALTERNATE FOR 5180-2315	28480	5180-2314
A19U5	1820-1196	8	3	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A19U6	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A19U7	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A19U8	1826-0161	7	2	IC OP AMP GP QUAD 14-DIP-P PKG	04713	MLM324P
A19U9	1826-0161	7		IC OP AMP GP QUAD 14-DIP-P PKG	04713	MLM324P
A19U10	5180-2315	1		IC 05C M10PAMP	28480	5180-2315
A19U10	5180-2314	0		NOTE: USE AS ALTERNATE FOR 5180-2315	28480	5180-2314
A19VR1	1902-0625	0	2	DIODE-ZNR 1N829 6.2V 5% DO-7 PD=.25W	04713	1N829
A19VR2	1902-0625	0		DIODE-ZNR 1N829 6.2V 5% DO-7 PD=.25W	04713	1N829
A19VR3	1902-3203	6	1	DIODE-ZNR 14.7V 5% DO-35 PD=.4W	28480	1902-3203
				MISCELLANEOUS PARTS		
	5000-9043	6	1	PIN	28480	5000-9043
	5040-6843	2	1	EXTRACTOR	28480	5040-6843

*Indicates Factory Selected Value

ManualsPlus.com



A19

FIGURE 1. A19 DIGITAL-TO-ANALOG CONVERTER, BLOCK DIAGRAM

ManualsPlus.com

A19
DIGITAL-TO-ANALOG CONVERTER
85660-60212

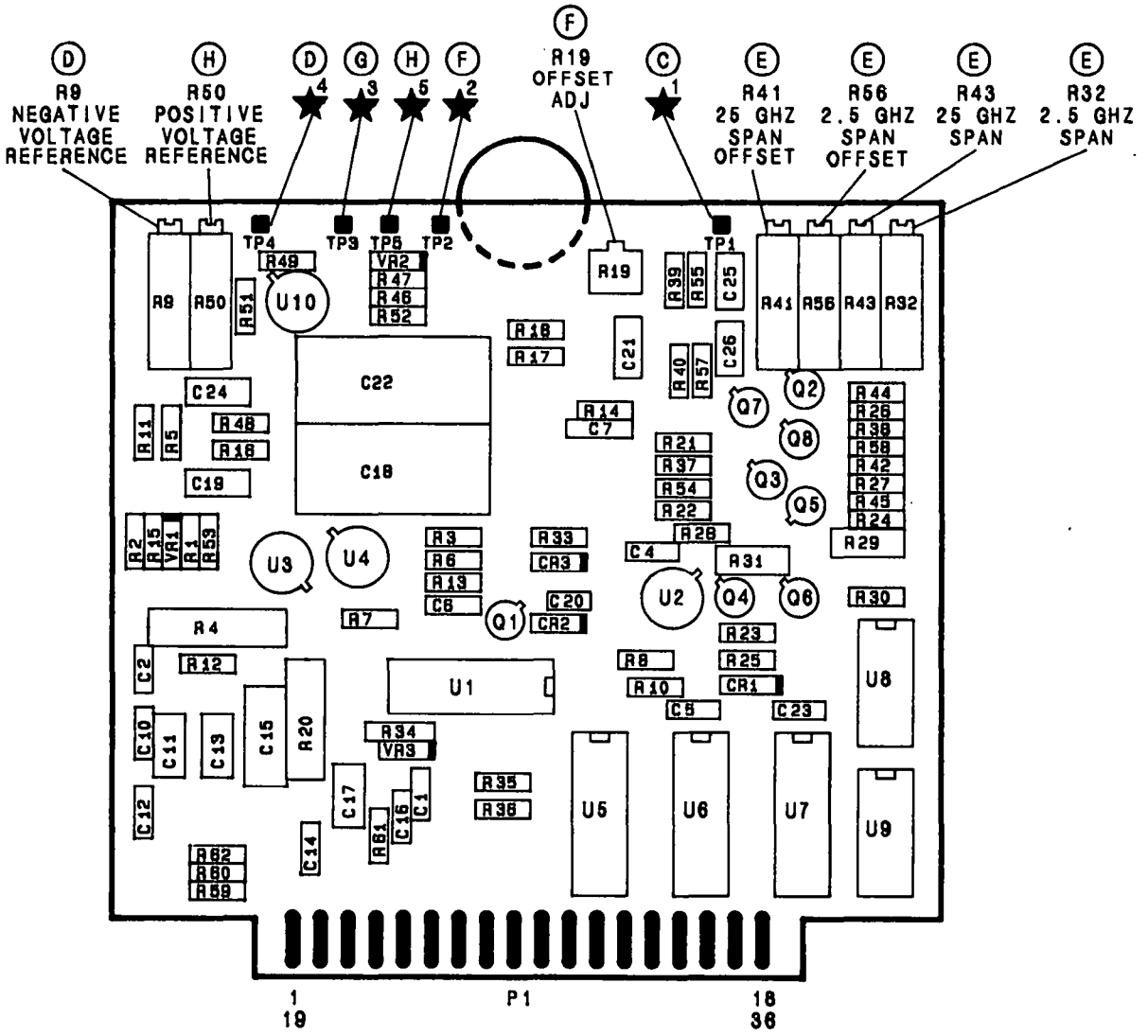


FIGURE 2. A19 DIGITAL-TO-ANALOG CONVERTER, COMPONENT LOCATIONS

ManualsPlus.com

RF SECTION

A19 DIGITAL-TO-ANALOG CONVERTER (DAC)
85680-60212

P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	+20V		G
49	+20V		G
2	+5.2V		G
50	+5.2V		G
3	-42V		G
51	-42V		G
4	-15V	P-J	G
52	-15V		G
5	GND		G
53	GND		G
6	YTO TUNE 1	A2CP1-13	F
54	YTO TUNE	A8A13J3	F
7	YTO CMA		F
55	YTO CMA		F
8	DAC		G
56	DCAL DAC IN	A19J3	E
9	DAC		E
57	DAC		E
10	DB3		A
58	DB8		AC
11	DB2		A
59	DB2		A
12	DB5		A
60	DB4		A
13	DB7		A
61	DB6		A
14	DB9		A
62	DB8		A
15	DB11		A
63	DB10		A
16	DB13		B
64	DB12		A
17	DB15		B
65	DB14		B
18	LBAB	A12P3-21	B
66	LBAB	A12P3-22	A

INSTRUMENT BUS DATA LINES

Ⓐ YTO PRETUNE REGISTER

Ⓑ PRETUNE DAC

Ⓒ NEGATIVE VOLTAGE REFERENCE

Ⓓ POSITIVE VOLTAGE REFERENCE

Ⓔ SUMMING AMPLIFIER

Ⓕ POWER SUPPLIES

Ⓖ FREQUENCY SPAN REGISTER AND SWITCH DRIVER

Ⓗ SPAN SCALING

NOTES:

1. REFERENCE DESIGNATIONS WITH A PREFIX OF (19) ARE ASSEMBLY A19. REFERENCE DESIGNATIONS WITH NO PREFIX ARE PART OF ASSEMBLY A19.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS (Ω), CAPACITANCE IN MICROFARADS (μF) INDUCTANCE IN MICROHENRIES (μH).
3. UNLESS OTHERWISE INDICATED: SIGNALS EXITED AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.
4. MNEMONIC TABLE:

MNEMONIC	DESCRIPTION
LBAB	LOW-BAND STROBE
LBAS	LOW-SCAN ATTENUATOR STROBE
DB00-DB15	INSTRUMENT BUS DATA BITS 0 THRU 15

SERIAL NUMBER PREFIX: 2410A

A19

FIGURE 3. A19 DIGITAL-TO-ANALOG CONVERTER, SCHEMATIC DIAGRAM

ManualsPlus.com

A20 Main Coil Driver

ManualsPlus.com

A20 MAIN COIL DRIVER, CIRCUIT DESCRIPTION

The A20 Main Coil Driver produces a tuning current proportional to the tuning voltage input from the A19 DAC and applies it to the A11A3 YTO. This provides coarse tuning of the YTO frequency and sweep. Fine tuning is performed by summing a current proportional to the low-frequency error voltage from the A11A4 YTO Phase Detector (via the A21 FM Coil Driver) with the tuning current from the A19 DAC. Additional fine tuning is done by the A21 FM Coil Driver using the current proportional to the high-frequency error voltage component.

Input Amplifier (A)

Transistors Q6 through Q12 form a discrete noninverting operational amplifier whose output is proportional to the tuning voltage input (YTO TUNE 1). This output is applied to Coil Driver Q1, Q4, and Q5 which supply the YTO Main Coil current. For frequency spans greater than 5 MHz, LYSP (Low = YTO Span) turns on (closes) switch Q2 allowing a current flow through R19. This is done to improve sweep linearity for wide spans (>5 MHz).

Phase Lock Amplifier (E)

Phase Lock Amplifier U1B provides a current proportional to the low-frequency error voltage input (YTO TUNE 2). This error voltage input is from the A11A4 YTO Phase Detector and is indicative of the YTO frequency error. The current output of the Phase Lock Amplifier is summed with the currnt output controlled by the Input Amplifier in the Coil Driver.

Coil Driver (C)

Transistors Q1, Q4, and Q5 provide drive current to the main coil of the A11A3 YTO to set the frequency and amount of sweep of the YTO. YTO main coil sensitivity is approximately 25 mA/GHz. The Coil Driver output is between approximately 50 and 150 mA.

Shaping Network (B)

Compensation network U2 provides linearity shaping of the current output of the Coil Driver. The components of the network are factory selected to match the YTO. Resistors R24, R16, and R25 sense the current output of the Coil Driver. R25 is used to fine tune the YTO to 6.15 GHz.

Offset Reference (D)

The Offset Reference composed of U1A and associated circuitry provides a fixed voltage to Phase Lock Amplifier U1B. This voltage provides the current necessary to fine tune the YTO to 2.3 GHz.

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A20	85660-60206	6	1	BOARD ASSEMBLY, MAIN COIL DRIVER	28480	85660-60206
A20C1	0160-4832	4	7	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A20C2	0180-1731	8	1	CAPACITOR-FXD 4.7UF+-10% 50VDC TA	56289	150D475X9050B2
A20C3	0180-0116	1	2	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A20C4	0160-0574	3	1	CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A20C5	0180-0116	1		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A20C6	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A20C7	0180-2139	2	1	CAPACITOR-FXD 10UF+-20% 60VDC TA	06001	69F177G7
A20C8	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A20C9	0180-0291	3	1	CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A20C10	0180-0229	7	1	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A20C11	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A20C12	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A20C13	0180-0197	8	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A20C14	0180-0228	6	1	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A20C15	0180-1746	5	1	CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A20C16	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A20C17	0160-4442	2	1	CAPACITOR-FXD .15UF +-20% 100VDC CER	20932	5030-EM-100-RD-154M
A20C18	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A20C19	0160-3877	5	1	CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A20C20	0160-3878	6	1	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A20CR1	1901-0033	2	4	DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0033
A20CR2	1901-0040	1	2	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A20CR3	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A20CR4				NOT ASSIGNED		
A20CR5	1901-0033	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0033
A20CR6	1901-0033	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0033
A20CR7	1901-0033	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0033
A20Q1	1854-0237	7	1	TRANSISTOR NPN SI TO-66 PD=20W FT=10MHZ	28480	1854-0237
A20Q2	1855-0413	3	1	TRANSISTOR J-FET P-CHAN D-MODE TO-18 SI	27014	2N5116
A20Q3				NOT ASSIGNED		
A20Q4	1854-0232	2	1	TRANSISTOR NPN SI TO-39 PD=1W FT=15MHZ	28480	1854-0232
A20Q5	1853-0038	4	1	TRANSISTOR PNP SI TO-39 PD=1W FT=100MHZ	28480	1853-0038
A20Q6	1854-0404	0	1	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A20Q7	1853-0007	7	2	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A20Q8	1854-0022	8	1	TRANSISTOR NPN SI TO-39 PD=700MW	07263	S17843
A20Q9	1854-0475	5	1	TRANSISTOR-DUAL NPN PD=750MW	28480	1854-0475
A20Q10	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A20Q11	1853-0451	5	2	TRANSISTOR PNP 2N3799 SI TO-18 PD=360MW	01295	2N3799
A20Q12	1853-0012	4	1	TRANSISTOR PNP 2N2904A SI TO-39 PD=600MW	01295	2N2904A
A20Q13	1853-0451	5		TRANSISTOR PNP 2N3799 SI TO-18 PD=360MW	01295	2N3799
A20R1-A20R4				NOT ASSIGNED		
A20R5	0757-0440	7	2	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A20R6	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A20R7	0698-0083	8	1	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A20R8	0698-3440	7	3	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A20R9	0757-0346	2	4	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A20R10	0757-0465	6	2	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A20R11	0698-3157	3	1	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A20R12	0757-0442	9	1	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A20R13	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A20R14	0757-0401	0	2	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A20R15	0757-0421	4	1	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A20R16	0811-3440	9	1	RESISTOR 125 1% 25W PW TC=0+-2	28480	0811-3440
A20R17	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A20R18	0757-0458	7	3	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A20R19	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A20R20				NOT ASSIGNED		
A20R21				NOT ASSIGNED		
A20R22	0757-0290	5	1	RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A20R23	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A20R24	0811-2936	6	1	RESISTOR 15 .1% .5W PWW TC=0+-5	14140	1251-1/4-C-15R-B
A20R25	2100-4020	0	2	RESISTOR-TRMR 2K 10% MF SIDE-ADJ 26-TRN	28480	2100-4020
A20R26	0757-0438	3	2	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A20R27	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A20R28	0757-0467	8	1	RESISTOR 121K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1213-F
A20R29	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A20R30	0698-8025	4	1	RESISTOR 1.91K .25% .125W F TC=0+-50	19701	MF4C1/8-T2-1911-C
A20R31	0757-0402	1	1	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A20R32	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F

*Indicates Factory Selected Value

ManualsPlus.com

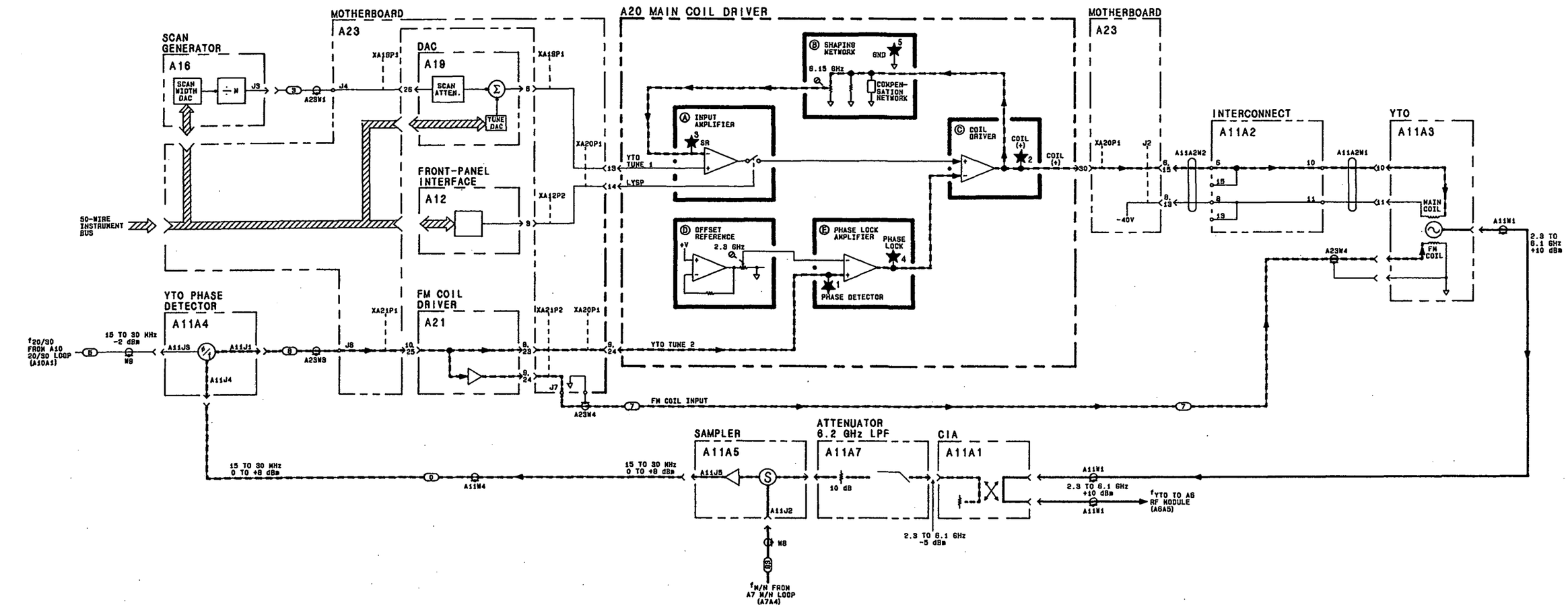
TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A20R33	0757-0428	1	1	RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A20R34	2100-4020	8		RESISTOR-TRMR 2K 10% MF SIDE-ADJ 26-TRN	28480	2100-4020
A20R35	0698-3153	9	1	RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A20R36	0698-3447	4	1	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A20R37	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A20R38	0698-5673	2	1	RESISTOR 3.9K 1% .125W F TC=0+-25	28480	0698-5673
A20R39	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A20R40	0698-8420	3	1	RESISTOR 4.22K 1% .125W F TC=0+-25	19701	MF4C1/8-T9-4221-F
A20R41	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A20R42	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A20TP1	1251-0600	0	6	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A20TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A20TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A20TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A20TP5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A20TP6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A20U1	5081-8117	3	1	SCREEN 1826-0092	28480	5081-8117
A20VR1	1902-0680	7	1	DIODE-ZNR 1N827 6.2V 5% DO-7 PD=.4W	24046	1N827
A20VR2	1902-3404	9	1	DIODE-ZNR 82.5V 5% DO-7 PD=.4W TC=+.082%	28480	1902-3404
				MISCELLANEOUS PARTS		
	1205-0085	8	1	HEAT SINK TO-66-CS	28480	1205-0085
	5000-9043	6	1	PIN	28480	5000-9043
	5040-6843	2	1	EXTRACTOR	28480	5040-6843
	2190-0003	8	2	WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0003
	2190-0018	5	2	WASHER-LK HLCL NO. 6 .141-IN-ID	28480	2190-0018
	2200-0107	6	2	SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2260-0001	5	2	NUT-HEX-DBL-CHAM 4-40-THD .094-IN-THK	28480	2260-0001
	2360-0119	8	2	SCREW-MACH 6-32 .438-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2420-0003	7	2	NUT-HEX-DBL-CHAM 6-32-THD .094-IN-THK	28480	2420-0003
	3050-0010	2	2	WASHER-FL MTLC NO. 6 .147-IN-ID	28480	3050-0010

*Indicates Factory Selected Value

ManualsPlus.com

RF SECTION



A20

FIGURE 1. A20 MAIN COIL DRIVER, BLOCK DIAGRAM

ManualsPlus.com

A20
MAIN COIL DRIVER
85660-60206

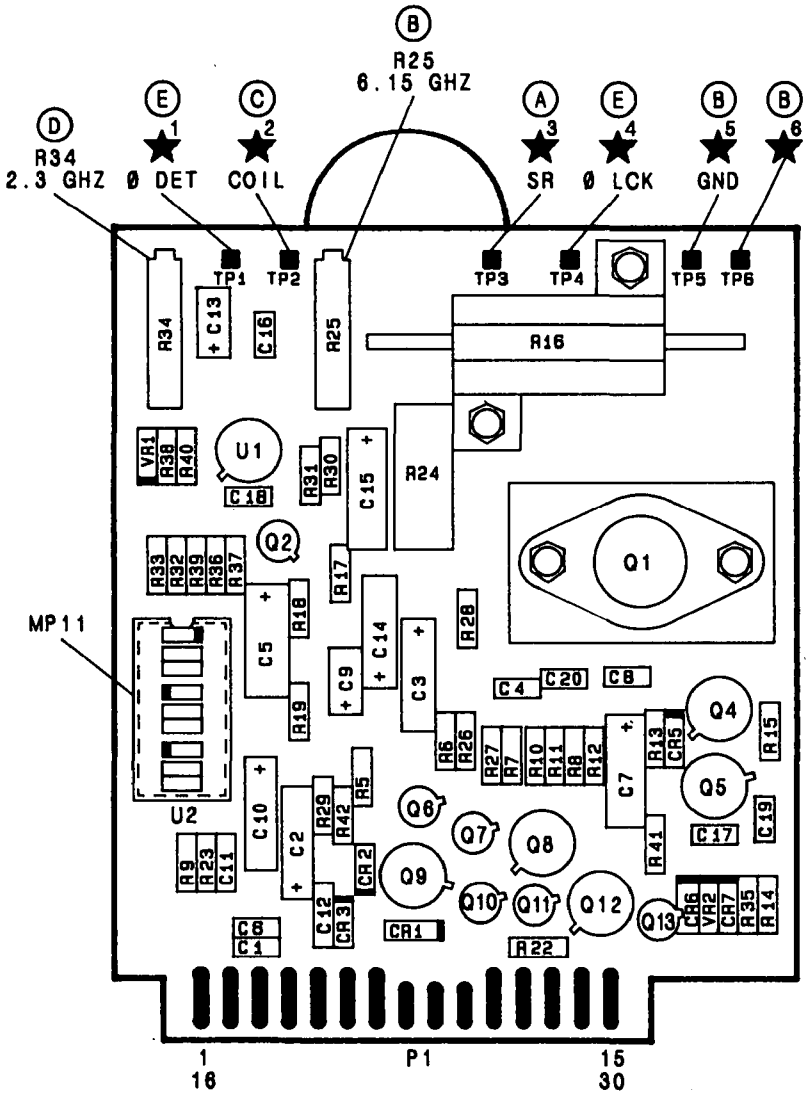


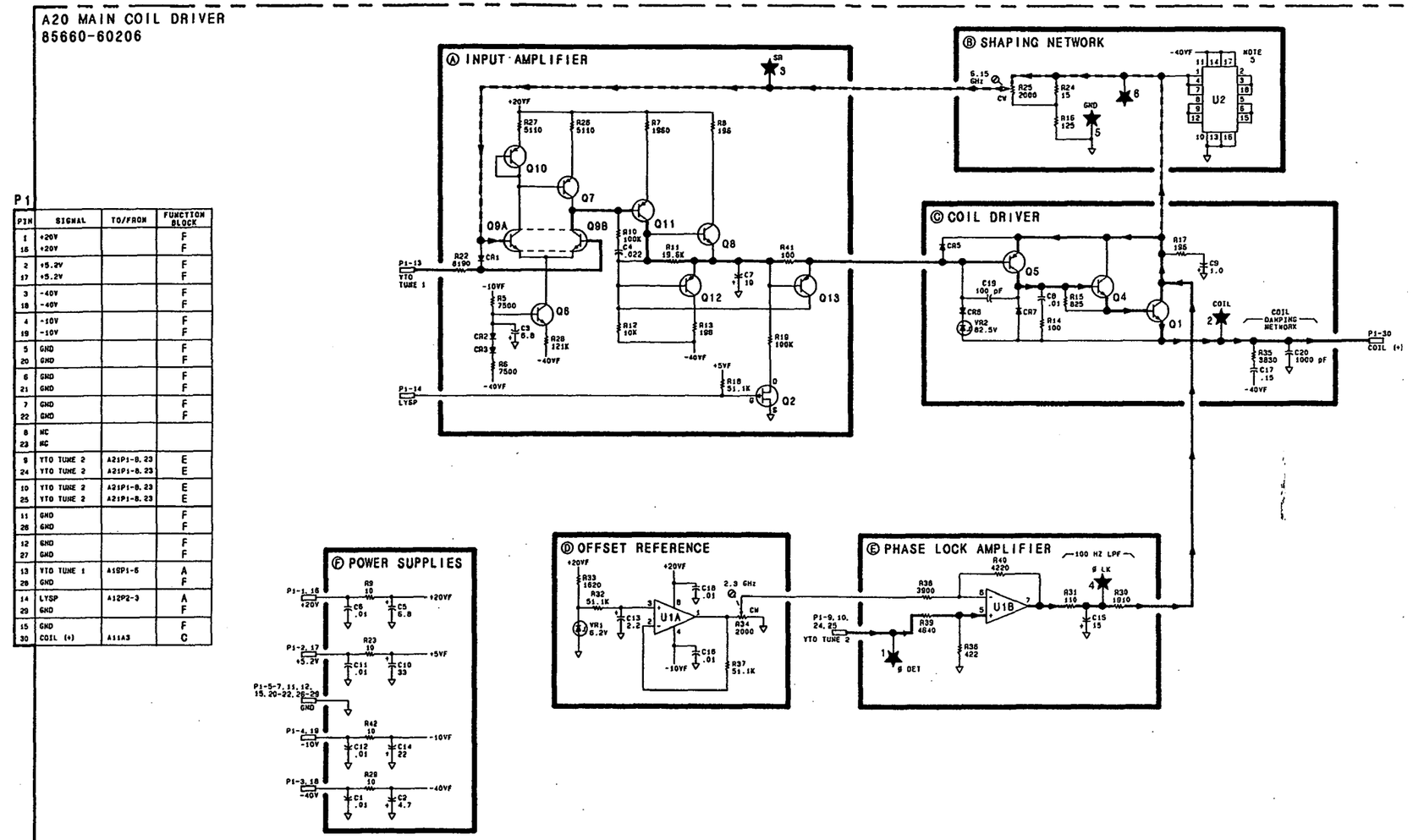
FIGURE 2. A20 MAIN COIL DRIVER, COMPONENT LOCATIONS

ManualsPlus.com

A20 MAIN COIL DRIVER
85660-60206

P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	+20V		F
16	+20V		F
2	+5.2V		F
17	+5.2V		F
3	-40V		F
18	-40V		F
4	-10V		F
19	-10V		F
5	GND		F
20	GND		F
6	GND		F
21	GND		F
7	GND		F
22	GND		F
8	NC		
23	NC		
9	YTO TUNE 2	A2:P1-8, 23	E
24	YTO TUNE 2	A2:P1-8, 23	E
10	YTO TUNE 2	A2:P1-8, 23	E
25	YTO TUNE 2	A2:P1-8, 23	E
11	GND		F
26	GND		F
12	GND		F
27	GND		F
13	YTO TUNE 1	A1:P1-5	A
28	GND		F
14	LYSP	A12P2-3	A
29	GND		F
15	GND		F
30	COIL (+)	A11A3	C

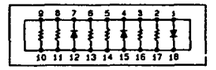


NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (UF) INDUCTANCE IS IN MICROHENRIES (UH)
3. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.
4. MNEMONIC TABLE:

MNEMONIC	DESCRIPTION
LYSP	LOW-YTO SPAN

5. U2 IS A COMPENSATION NETWORK FOR THE YTO WITH FACTORY SELECTABLE COMPONENTS. THE TYPICAL CONFIGURATION IS:



DIRECTION OF DIODES MAY BE DIFFERENT FROM DIAGRAM. ALSO, THERE MAY BE NO COMPONENTS BETWEEN PINS 7 AND 12, 8 AND 11, OR 9 AND 10.

SERIAL NUMBER PREFIX: 2410A

FIGURE 3. A20 MAIN COIL DRIVER, SCHEMATIC DIAGRAM

ManualsPlus.com

A21 FM Coil Driver

ManualsPlus.com

A21 FM COIL DRIVER, CIRCUIT DESCRIPTION

The A21 FM Coil Driver performs two functions: 1) it separates the low-frequency component from the error voltage input (ϕ DET IN) and directs it to the A20 Main Coil Driver, and 2) it provides drive current to the FM Coil of the YTO proportional to the high-frequency component of the error voltage input (ϕ DET IN).

Phase Detector Buffer (A)

This buffer drives both the low-frequency (<100 Hz) portion of the error voltage input (ϕ DET IN) to be applied to the A20 Main Coil Driver and the high-frequency portion to be applied to the FM Coil of the YTO.

100 Hz High-Pass Filter/Amplifier (B)

This filter/amplifier separates the low-frequency (<100 Hz) signals from the input to be applied to the main coil of the YTO and amplifies the high-frequency signals to be applied to the FM Coil of the YTO.

Bias Stabilization (D)

This circuit adjusts the dc current in Buffer **(C)** to ensure there is no quiescent current applied to the YTO FM Coil.

Output Amplifier (E)

Q1 and Q4 form a push-pull amplifier to provide drive current to the YTO FM Coil proportional to the high-frequency error voltage input (ϕ DET IN). This is done to tune the YTO frequency to a corrected output determined by the YTO Phase Lock Loop.

Matching Network (F)

Provides impedance matching between the Output Amplifier and the YTO FM Coil to assure accurate tuning of the YTO frequency.

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A21	85660-60040	6	1	BOARD ASSEMBLY, FM COIL DRIVER	28480	85660-60040
A21C1	0160-3879	7	10	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A21C2	0180-0234	4	1	CAPACITOR-FXD 33UF+-20% 75VDC TA	06001	69F286G7
A21C3	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A21C4	0180-1719	2	2	CAPACITOR-FXD 22UF+-10% 25VDC TA	06001	69F146G8
A21C5	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A21C6	0180-0116	1	1	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A21C7	0160-4441	1	1	CAPACITOR-FXD .47UF +-10% 50VDC CER	28480	0160-4441
A21C8	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A21C9	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A21C10	0180-0491	5	1	CAPACITOR-FXD 10UF+-20% 25VDC TA	28480	0180-0491
A21C11	0180-0197	8	2	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A21C12	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A21C13	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A21C14	0160-4084	8	4	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A21C15	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A21C16	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A21C17	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A21C18	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A21C19	0180-1719	2		CAPACITOR-FXD 22UF+-10% 25VDC TA	06001	69F146G8
A21C20	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A21C21	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A21C22	0140-0194	1	1	CAPACITOR-FXD 110PF +-5% 300VDC MICA	72136	DM15F111J0300WV1CR
A21C23	0160-2206	2	1	CAPACITOR-FXD 160PF +-5% 300VDC MICA	28480	0160-2206
A21C24	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A21CR1	1901-0040	1	2	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A21CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A21L1	9100-2259	8	1	INDUCTOR RF-CH-MLD 1.5UH 10% .105DX.26LG	28480	9100-2259
A21Q1	1854-0013	7	1	TRANSISTOR NPN 2N2218A SI TO-5 PD=800MW	04713	2N2218A
A21Q2	1854-0404	0	1	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q3	1854-0477	7	2	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A21Q4	1853-0012	4	1	TRANSISTOR PNP 2N2904A SI TO-39 PD=600MW	01295	2N2904A
A21Q5	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A21Q6	1854-0023	9	1	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A21Q7	1854-0247	9	1	TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
A21Q8	1853-0451	5	1	TRANSISTOR PNP 2N3799 SI TO-18 PD=360MW	01295	2N3799
A21R1	0757-0346	2	7	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A21R2	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A21R3	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A21R4	0757-0401	0	1	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A21R5	0757-0458	7	1	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A21R6	0757-0441	8	3	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A21R7	0698-0083	8	4	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A21R8	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A21R9	0698-3155	1	3	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A21R10	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A21R11	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A21R12	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A21R13	0698-3150	6	1	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A21R14	0757-0442	9	1	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A21R15	0757-0439	4	1	RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A21R16	0757-0441	8		RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A21R17	0757-0447	4	1	RESISTOR 16.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1622-F
A21R18	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A21R19	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A21R20	0757-0441	8		RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A21R21	0698-3438	3	1	RESISTOR 147 1% .125W F TC=0+-100	24546	C4-1/8-T0-147R-F
A21R22	0757-0394	0	1	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A21R23	0698-3447	4	1	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A21R24	0698-3429	2	1	RESISTOR 19.6 1% .125W F TC=0+-100	03888	PME55-1/8-T0-19R6-F
A21R25	0757-0420	3	3	RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A21R26	0686-1825	3	1	RESISTOR 1.8K 5% .5W CC TC=0+647	01121	EB1825
A21R27	0757-0420	3		RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A21R28	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A21R29	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A21R30	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A21R31	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A21R32	0757-0802	5	2	RESISTOR 162 1% .5W F TC=0+-100	28480	0757-0802
A21R33	0757-0802	5		RESISTOR 162 1% .5W F TC=0+-100	28480	0757-0802
A21R34	0698-3442	9	1	RESISTOR 237 1% .125W F TC=0+-100	24546	C4-1/8-T0-237R-F
A21R35	0757-0420	3		RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F

*Indicates Factory Selected Value

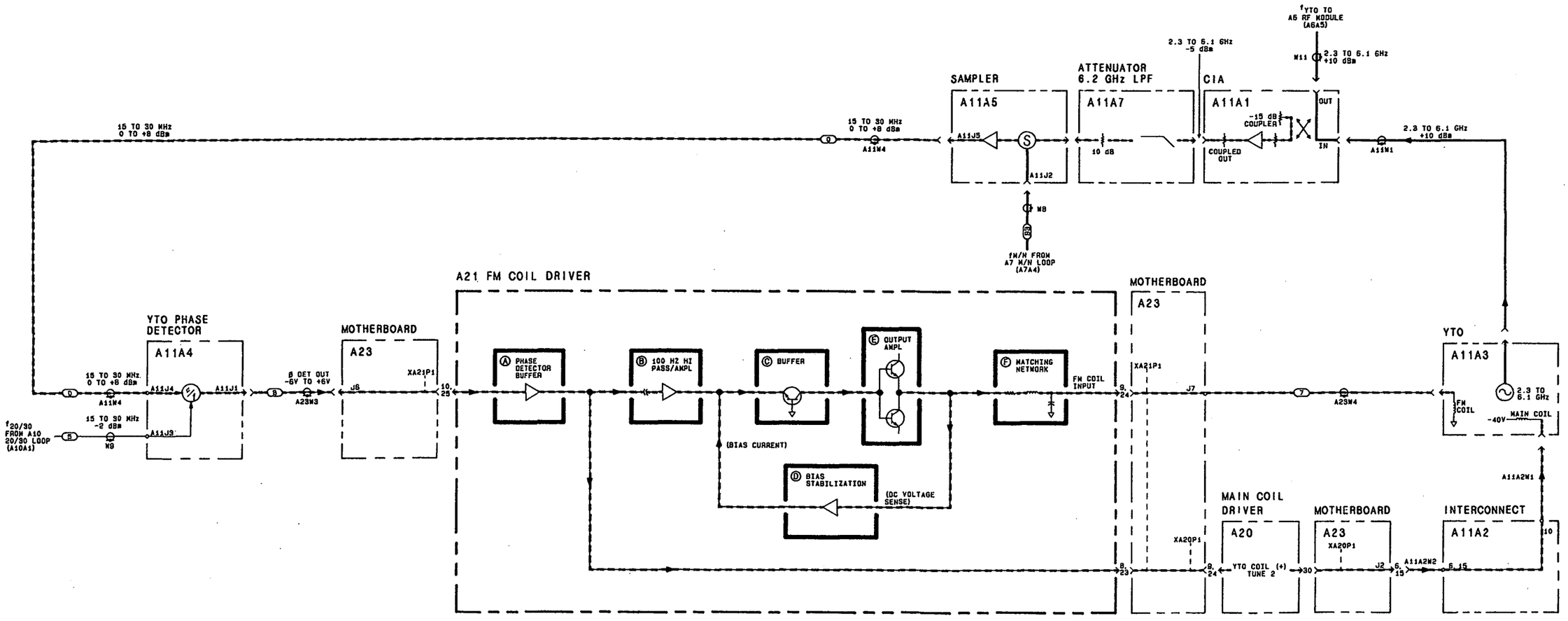
ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A21TP1	1251-0600	0	2	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A21TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A21U1	1826-1058	3	1	IC OP AMP GP 8-TO-99 PKG	28480	1826-1058
				MISCELLANEOUS PARTS		
	1200-0173	5	1	INSULATOR-XSTR DAP-GL	28480	1200-0173
	1205-0011	0	2	HEAT SINK TO-5/TO-39-CS (FOR Q1, Q4)	28480	1205-0011
	1205-0037	0	1	HEAT SINK TO-18-CS (FOR Q3)	28480	1205-0037
	5000-9043	6	1	PIN	28480	5000-9043
	5000-6843	8	1	EXTRACTOR	28480	5000-6843

*Indicates Factory Selected Value

ManualsPlus.com



A21

FIGURE 1. A21 FM COIL DRIVER, BLOCK DIAGRAM

ManualsPlus.com

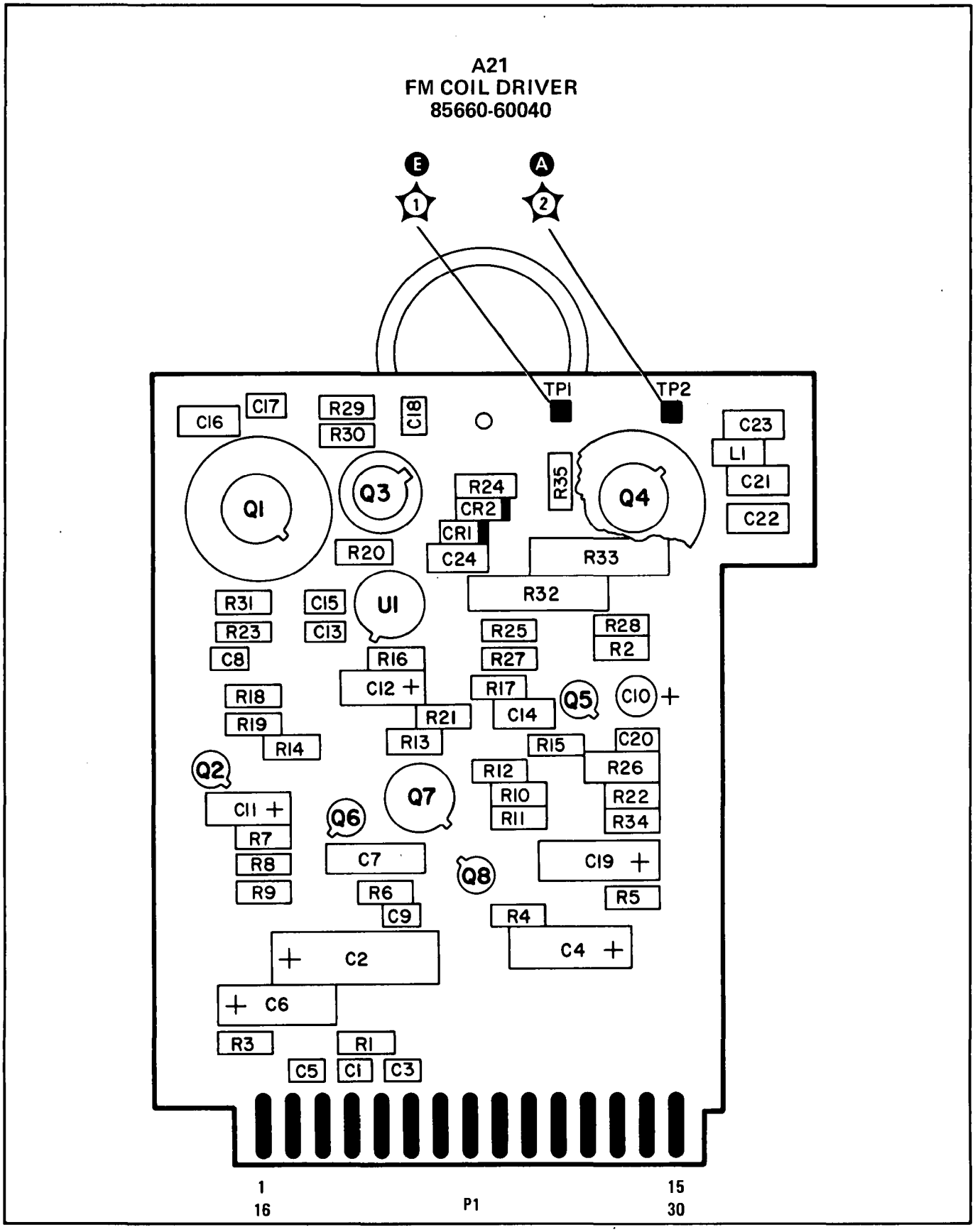


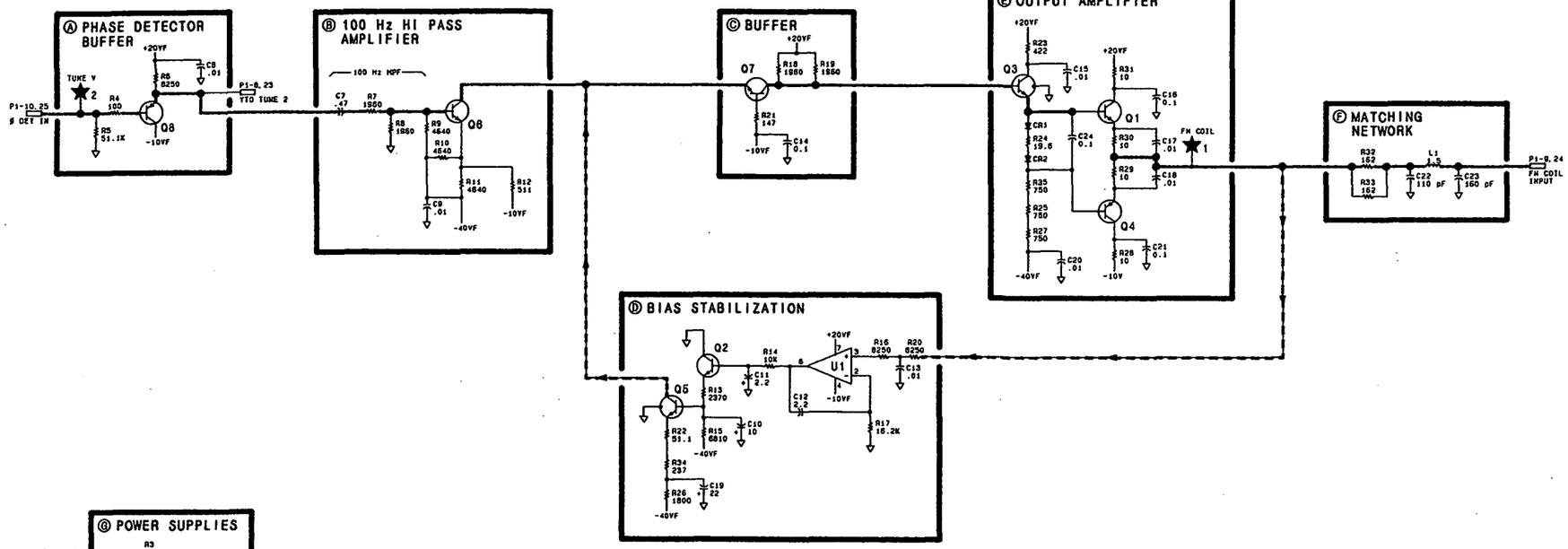
FIGURE 2. A21 FM COIL DRIVER, COMPONENT LOCATIONS

ManualsPlus.com

A21 FM COIL DRIVER
85660-60040

P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1 16	+20V		G
2 17	+5.2V		NC
3 18	-40V		G
4 19	-10V		G
5 20	GND		G
6 21	GND		G
7 22	NC		
8 23	YTO TUNE 2	A20P1-9, 24	A
9 24	FM COIL INPUT	A1A3	F
10 25	Ø DET IN	A1J1	A
11 26	GND		G
12 27	NC		
13 28	NC		
14 29	NC		
15 30	NC		



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω). CAPACITANCE IS IN MICROFARADS (μF) INDUCTANCE IS IN NICROHENARIES (μH)
3. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.

A21

SERIAL NUMBER PREFIX: 2410A

FIGURE 3. A21 FM COIL DRIVER, SCHEMATIC DIAGRAM

ManualsPlus.com

A23 Motherboard

ManualsPlus.com

TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A23	85660-60243	1	1	BOARD ASSEMBLY, MOTHERBOARD	28480	85660-60243
A23C1-A23C4				NOT ASSIGNED		
A23C5	0160-3879	7	1	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A23C6	0160-0127	2	1	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A23C7 (OPTION 400)	0170-0073	8	1	CAPACITOR-FXD 1UF +-10% 600VDC POLYE (OPTION 400)	28480	0170-0073
A23CR1	1901-0743	1	1	DIODE-PWR RECT 1N4004 400V 1A DO-41	01295	1N4004
A23CR2	1901-0050	3	1	DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A23DS1	1990-0517	4	1	LED-LAMP LUM-INT=3MCD IF=20MA-MAX BVR=5V	28480	5082-4655
A23J2	1251-5799	8	1	CONNECTOR 20-PIN M POST TYPE	28480	1251-5799
A23K1	0490-0618	5	1	RELAY 2C 24VDC-COIL 5A 115VAC	28480	0490-0618
A23L1	85660-80007	7	8	INDUCT P/S FLTR	28480	85660-80007
A23L2	85660-80007	7		INDUCT P/S FLTR	28480	85660-80007
A23L3	85660-80007	7		INDUCT P/S FLTR	28480	85660-80007
A23L4	85660-80007	7		INDUCT P/S FLTR	28480	85660-80007
A23L5	85660-80007	7		INDUCT P/S FLTR	28480	85660-80007
A23L6	85660-80007	7		INDUCT P/S FLTR	28480	85660-80007
A23L7	85660-80007	7		INDUCT P/S FLTR	28480	85660-80007
A23L8	85660-80007	7		INDUCT P/S FLTR	28480	85660-80007
A23P1	1251-0600	0	6	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A23P2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A23P3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A23P4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A23P5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A23P6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A23P7	0360-1788	7	2	CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A23P8	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A23R1	0757-0421	4	1	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A23R2	0687-3321	0	1	RESISTOR 3.3K 10% .5W CC TC=0+647	01121	EB3321
A23R3	0683-7515	4	1	RESISTOR 750 5% .25W FC TC=-400/+600	01121	CB7515
A23R4	0686-7525	2	1	RESISTOR 7.5K 5% .5W CC TC=0+647	01121	EB7525
A23R5	0683-2225	3	1	RESISTOR 2.2K 5% .25W FC TC=-400/+700	01121	CB2225
A23R6	0698-0004	9	1	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A23R7	0698-7229	8	7	RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-F
A23R8	0698-7229	8		RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-F
A23R9	0698-7229	8		RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-F
A23R10	0698-7229	8		RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-F
A23R11	0698-7229	8		RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-F
A23R12	0698-7229	8		RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-F
A23R13	0698-7229	8		RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-F
A23XA8	1251-2026	0	12	CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026
A23XA10A1	1251-2035	9	12	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A23XA10A2	1251-2026	8		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026
A23XA10A3	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A23XA10A4	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A23XA10A5	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A23XA10A6	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A23XA10A7	1251-2026	8		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026
A23XA10A8	1251-2026	8		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026
A23XA12P1	1251-7452	4	2	CONNECTOR-PC EDGE 25-CONT/ROW 2-ROWS	28480	1251-7452
A23XA12P2	1251-2026	8		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026
A23XA12P3	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A23XA15P1	1251-7452	4		CONNECTOR-PC EDGE 25-CONT/ROW 2-ROWS	28480	1251-7452
A23XA15P2	1251-2026	8		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026
A23XA15P3	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A23XA16P1	1251-2026	8		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026
A23XA16P2	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A23XA17	1251-1365	6	1	CONNECTOR-PC EDGE 22-CONT/ROW 2-ROWS	28480	1251-1365
A23XA18	1251-2026	8		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026
A23XA19	1251-2026	8		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026
A23XA20	1251-2035	9		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A23XA21	1251-2035	9	1	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035

*Indicates Factory Selected Value

ManualsPlus.com

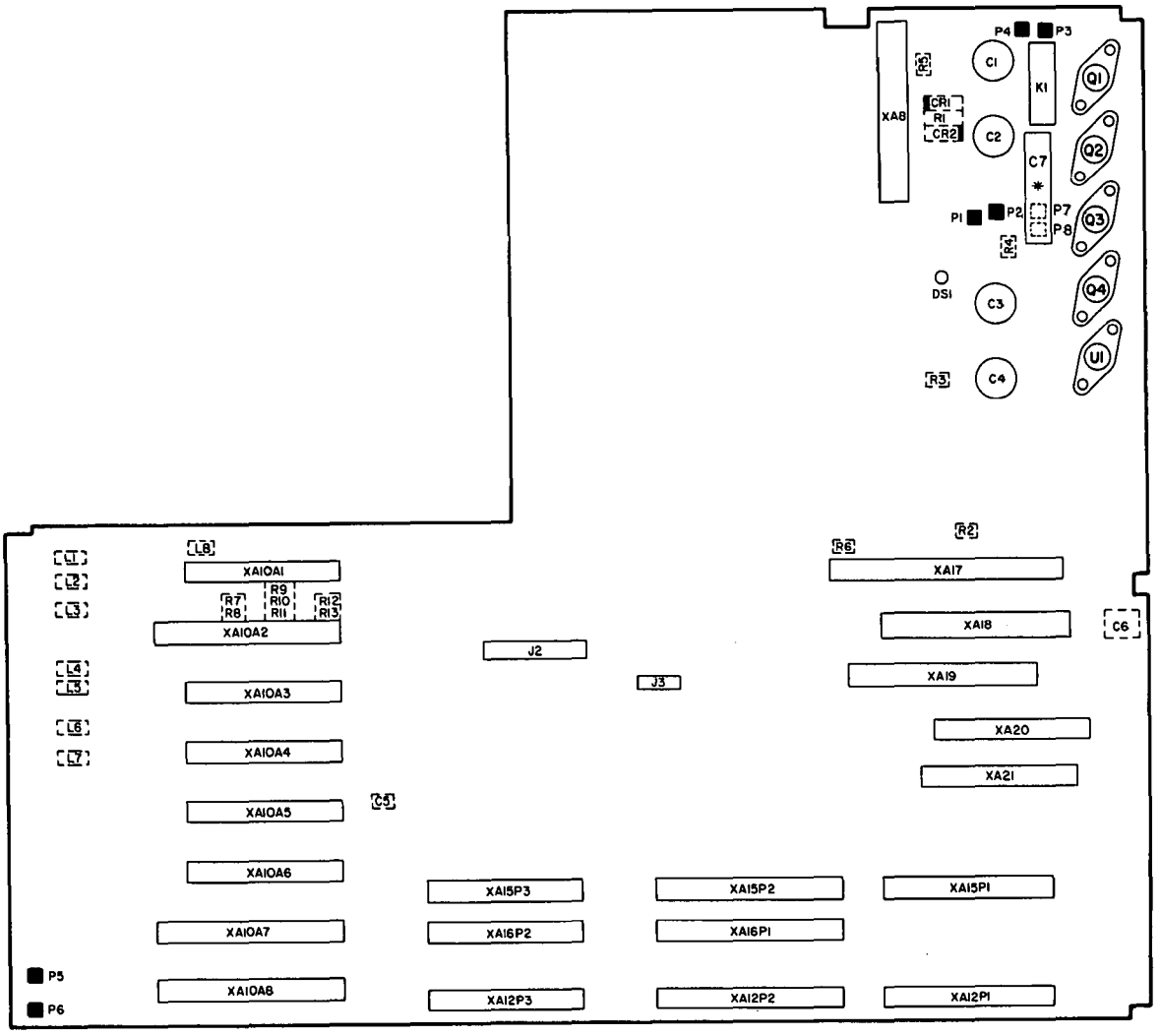
TABLE 1. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				A23 MISCELLANEOUS PARTS		
	1251-2313	6	10	CONNECTOR-SGL CONT SKT .04-IN-BSC-SZ RND	28480	1251-2313
A24	85660-60049	5	1	FAN ASSEMBLY	28480	85660-60049
				A24 MISCELLANEOUS PARTS		
	3160-0308	4	1	FAN-TBAX 120-CFM 115V 50/60-HZ (STANDARD)	28480	3160-0308
	3160-0087	6	1	FAN-TBAX 95-CFM 95-120V 47-440-HZ (OPTION 400 ONLY)	28480	3160-0087
	85660-00048	8	1	HOUSING GRILL	28480	85660-00048
	85660-00049	9	1	FILTER, AIR, FAN	28480	85660-00049
	85660-00044	4	1	HOUSING, BOTTOM	28480	85660-00044
	85660-00045	5	1	HOUSING, TOP	28480	85660-00045
	85660-00046	6	1	BASE PLATE	28480	85660-00046
	85660-00047	7	1	SUPPORT PLATE	28480	85660-00047
	1520-0205	2	4	SHOCK MOUNT .47-EFF-HGT	28480	1520-0205
	85660-20092	4	4	SNUBBER (RETAINS ISOLATION MOUNT)	28480	85660-20092
	2360-0196	1	4	SCREW-MACH 6-32 .375-IN-LG 100 DEG (SECURES SNUBBER)	00000	ORDER BY DESCRIPTION
	0360-0268	6	2	TERMINAL-SLDR LUG LK-MTG FOR-#6-SCR	28480	0360-0268
	0890-0983	5	1	TUBING-HS .123-D/.062-RCVD .02-WALL (OPTION 400 ONLY)	28480	0890-0983
	1400-0249	0	2	CABLE TIE .062-.625-DIA .091-WD NYL	06383	PLT1M-8
	2200-0105	4	8	SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2200-0770	9	10	SCREW-MACH 4-40 .188-IN-LG 100 DEG	00000	ORDER BY DESCRIPTION
	2260-0003	7	4	NUT-HEX-PLSTC LKG 4-40-THD .141-IN-THK	00000	ORDER BY DESCRIPTION
	86701-00017	3	3	DISK, FAN, EMI SHIELD	28480	86701-00017

*Indicates Factory Selected Value

ManualsPlus.com

A23
MOTHERBOARD
85660-60243



✳ LOADED FOR OPTION 400 ONLY

[ ] INDICATES COMPONENT ON REVERSE SIDE

FIGURE 1. A23 MOTHERBOARD, COMPONENT LOCATIONS

A23 *MOTHERBOARD*
B5660-60243

NOTES:

A. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. PREFIX ABBREVIATION WITH ASSEMBLY NUMBER FOR COMPLETE REFERENCE DESIGNATION. EXCEPT FOR CONNECTORS, WHICH ARE COMPLETE AS SHOWN.

B. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS (Ω), CAPACITANCE IN MICROFARADS (μF), INDUCTANCE IN MICROHENRIES (μH).

C. C1 LOADED ONLY FOR OPTION 400.

D. FIRST COLOR IS FOR STANDARD INSTRUMENT, SECOND COLOR IS FOR OPTION 400.

E. A11J21, J22, AND J23 ARE SHOWN W/ A22 AND A19 SCHEMATIC SECTIONS.

ManualsPlus.com

ManualsPlus.com

General Parts Listing

ManualsPlus.com

GENERAL PARTS LISTING

INTRODUCTION

The replaceable parts list breakdown for each major assembly is located following the circuit description for the assembly. This section contains information for ordering the replacement parts not listed in the major assembly tabs. Table 1, Reference Designation and Abbreviations, includes a list of reference designations and a list of abbreviations used in the parts list. Table 2, Manufacturers Code List, lists names and addresses that correspond to the manufacturer code numbers in the parts list.

REPLACEABLE PARTS LIST

Replaceable Parts tables can be found in each assembly section and list the following information for each part in that assembly.

1. The Hewlett-Packard part number.
2. The part number check digit (CD).
3. The total quantity (Qty) in the instrument. This quantity is given only once, at the first appearance of the part in the list.
4. The description of the part.
5. A five-digit code indicating a typical manufacturer of the part.
6. The manufacturer's part number.

MISCELLANEOUS PARTS

Table 4, Miscellaneous Parts, lists parts of the instrument that are not directly related to any major assembly.

ORDERING INFORMATION

To order a part listed in the replaceable parts table, quote the Hewlett-Packard part number (with check digit), indicate the quantity required, and address the order to the nearest Hewlett-Packard office. The check digit will ensure accurate and timely processing of your order.

To order a part that is not listed in the replaceable parts table, include the instrument model number, instrument serial number, the description and function of the part, and the number of parts required. Address the order to the nearest Hewlett-Packard office.

ManualsPlus.com

TABLE 1. REFERENCE DESIGNATIONS AND ABBREVIATIONS (1 OF 3)

REFERENCE DESIGNATIONS

A ..... Assembly
AT ..... Attenuator, Isolator, Limiter, Termination
B ..... Fan, Motor
BT ..... Battery
C ..... Capacitor
CP ..... Coupler
CR ..... Diode, Diode Thyristor, Step Recovery Diode, Varactor
DC ..... Directional Coupler
DL ..... Delay Line
DS ..... Annunciator, Lamp, Light Emitting Diode (LED), Signaling Device (Visible)
E ..... Miscellaneous Electrical Part
F ..... Fuse
FL ..... Filter
HY ..... Circulator
J ..... Electrical Connector (Stationary Portion), Jack
K ..... Relay
L ..... Coil, Inductor
M ..... Meter
MP ..... Miscellaneous Mechanical Part
P ..... Electrical Connector (Movable Portion), Plug
Q ..... Silicon Controlled Rectifier (SCR), Transistor, Triode Thyristor
R ..... Resistor
RT ..... Thermistor
S ..... Switch
T ..... Transformer
TB ..... Terminal Board
TC ..... Thermocouple
TP ..... Test Point
U ..... Integrated Circuit, Microcircuit
V ..... Electron Tube
VR ..... Breakdown Diode (Zener), Voltage Regulator
W ..... Cable, Wire, Jumper
X ..... Socket
Y ..... Crystal Unit (Piezoelectric, Quartz)
Z ..... Tuned Cavity, Tuned Circuit

ABBREVIATIONS

A

A ..... Across Flats, Acrylic, Air (Dry Method), Ampere
ADJ ..... Adjust, Adjustment
ANSI ..... American National Standards Institute (formerly USASI-ASA)
ASSY ..... Assembly
AWG ..... American Wire Gage

B

BCD ..... Binary Coded Decimal
BD ..... Board, Bundle
BE-CU ..... Beryllium Copper
BNC ..... Type of Connector
BRG ..... Bearing, Boring
BRS ..... Brass
BSC ..... Basic
BTN ..... Button

C

C ..... Capacitance, Capacitor, Center Tapped, Cermet, Cold, Compression
CCP ..... Carbon Composition Plastic
CD ..... Cadmium, Card, Cord
CER ..... Ceramic
CHAM ..... Chamfer
CHAR ..... Character, Characteristic, Charcoal
CMOS ..... Complementary Metal Oxide Semiconductor
CNDCT ..... Conducting, Conductive, Conductivity, Conductor
CONT ..... Contact, Continuous, Control, Controller
CONV ..... Converter
CPRSN ..... Compression
CUP-PT ..... Cup Point
CW ..... Clockwise, Continuous Wave

D

D ..... Deep, Depletion, Depth, Diameter, Direct Current
DA ..... Darlington
DAP-GL ..... Diallyl Phthalate Glass
DBL ..... Double
DCDR ..... Decoder
DEG ..... Degree
D-HOLE ..... D-Shaped Hole
DIA ..... Diameter
DIP ..... Dual In-Line Package
DIP-SLDR ..... Dip Solder
D-MODE ..... Depletion Mode
DO ..... Package Type Designation
DP ..... Deep, Depth, Diametric Pitch, Dip
DP3T ..... Double Pole Three Throw
DPDT ..... Double Pole Double Throw
DWL ..... Dowel

E

E-R ..... E-Ring
EXT ..... Extended, Extension, External, Extinguish

F

F ..... Fahrenheit, Farad, Female, Film (Resistor), Fixed, Flange, Frequency
FC ..... Carbon Film/Composition, Edge of Cutoff Frequency, Face
FDTHRU ..... Feed Through
FEM ..... Female
FIL-HD ..... Fillister Head
FL ..... Flash, Flat, Fluid
FLAT-PT ..... Flat Point
FR ..... Front
FREQ ..... Frequency
FT ..... Current Gain Bandwidth Product (Transition Frequency), Feet, Foot
FXD ..... Fixed

G

GEN ..... General, Generator
GND ..... Ground
GP ..... General Purpose, Group

H

H ..... Henry, High
HDW ..... Hardware
HEX ..... Hexadecimal, Hexagon, Hexagonal
HLCL ..... Helical
HP ..... Hewlett-Packard Company, High Pass

I

IC ..... Collector Current, Integrated Circuit
ID ..... Identification, Inside Diameter
IF ..... Forward Current, Intermediate Frequency
IN ..... Inch
INCL ..... Including
INT ..... Integral, Intensity, Internal

ManualsPlus.com

TABLE 1. REFERENCE DESIGNATIONS AND ABBREVIATIONS (2 OF 3)

J

J-FET ..... Junction Field Effect Transistor
JFET ..... Junction Field Effect Transistor

K

K ..... Kelvin, Key, Kilo, Potassium
KNRLD ..... Knurled
KVDC ..... Kilovolts Direct Current

L

LED ..... Light Emitting Diode
LG ..... Length, Long
LIN ..... Linear, Linearity
LK ..... Link, Lock
LKG ..... Leakage, Locking
LUM ..... Luminous

M

M ..... Male, Maximum, Mega, Mil, Milli, Mode
MA ..... Milliampere
MACH ..... Machined
MAX ..... Maximum
MC ..... Molded Carbon Composition
MET ..... Metal, Metallized
MHZ ..... Megahertz
MINTR ..... Miniature
MIT ..... Miter
MLD ..... Mold, Molded
MM ..... Magnetized Material, Millimeter
MOM ..... Momentary
MTG ..... Mounting
MTLC ..... Metallic
MW ..... Milliwatt

N

N ..... Nano, None
N-CHAN ..... N-Channel
NH ..... Nanohenry
NM ..... Nanometer, Nonmetallic
NO ..... Normally Open, Number
NOM ..... Nominal
NPN ..... Negative Positive Negative (Transistor)
NS ..... Nanosecond, Non-Shorting, Nose
NUM ..... Numeric
NYL ..... Nylon (Polyamide)

O

OA ..... Over-All
OD ..... Outside Diameter
OP AMP ..... Operational Amplifier
OPT ..... Optical, Option, Optional

P

PA ..... Picoampere, Power Amplifier
PAN-HD ..... Pan Head
PAR ..... Parallel, Parity
PB ..... Lead (Metal), Pushbutton
PC ..... Printed Circuit
PCB ..... Printed Circuit Board
P-CHAN ..... P-Channel
PD ..... Pad, Power Dissipation
PF ..... Picofarad, Power Factor
PKG ..... Package
PLSTC ..... Plastic
PNL ..... Panel
PNP ..... Positive Negative Positive (Transistor)
POLYC ..... Polycarbonate
POLYE ..... Polyester
POT ..... Potentiometer
POZI ..... Pozidriv Recess
PREC ..... Precision
PRP ..... Purple, Purpose
PSTN ..... Piston
PT ..... Part, Point, Pulse Time
PW ..... Pulse Width

Q

Q ..... Figure of Merit

R

R ..... Range, Red, Resistance, Resistor, Right, Ring
REF ..... Reference
RES ..... Resistance, Resistor
RF ..... Radio Frequency
RGD ..... Rigid
RND ..... Round
RR ..... Rear
RVT ..... Rivet, Riveted

S

SAWR ..... Surface Acoustic Wave Resonator
SEG ..... Segment
SGL ..... Single
SI ..... Silicon, Square Inch
SL ..... Slide, Slow
SLT ..... Slot, Slotted
SMA ..... Subminiature, A Type (Threaded Connector)
SMB ..... Subminiature, B Type (Slip-On Connector
SMC ..... Subminiature, C Type (Threaded Connector)
SPCG ..... Spacing
SPDT ..... Single Pole Double Throw
SPST ..... Single Pole Single Throw
SQ ..... Square
SST ..... Stainless Steel
STL ..... Steel
SUBMIN ..... Subminiature
SZ ..... Size

T

T ..... Teeth, Temperature, Thickness, Time, Timed, Tooth, Typical
TA ..... Ambient Temperature, Tantalum
TC ..... Temperature Coefficient
THD ..... Thread, Threaded
THK ..... Thick
TO ..... Package Type Designation
TPG ..... Tapping
TR-HD ..... Truss Head
TRMR ..... Trimmer
TRN ..... Turn, Turns
TRSN ..... Torsion

U

UCD ..... Microcandela
UF ..... Microfarad
UH ..... Microhenry
UL ..... Microliter, Underwriters' Laboratories, Inc.
UNHDND ..... Unhardened

V

V ..... Variable, Violet, Volt, Voltage
VAC ..... Vacuum, Volts, Alternating Current
VAR ..... Variable
VDC ..... Volts, Direct Current

W

W ..... Watt, Wattage, White, Wide, Width
W/SW ..... With Switch
WW ..... Wire Wound

X

X ..... By (Used With Dimensions), Reactance

Y

YIG ..... Yttrium-Iron-Garnet

Z

ZNR ..... Zener

ManualsPlus.com

TABLE 1. REFERENCE DESIGNATIONS AND ABBREVIATIONS (3 OF 3)

MULTIPLIERS					
Abbreviation	**Prefix**	**Multiple**	**Abbreviation**	**Prefix**	**Multiple**
T	tera	10^{12}	m	milli	10^{-3}
G	giga	10^{9}	μ	micro	10^{-6}
M	mega	10^{6}	n	nano	10^{-9}
k	kilo	10^{3}	p	pico	10^{-12}
da	deka	10	f	femto	10^{-15}
d	deci	10^{-1}	a	atto	10^{-18}
c	centi	10^{-2}			

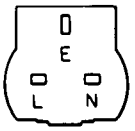
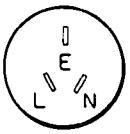
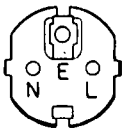
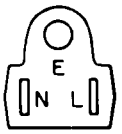
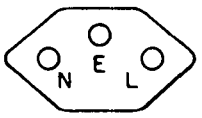
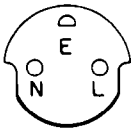
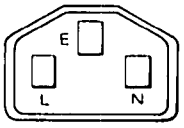
ManualsPlus.com

TABLE 2. MANUFACTURERS CODE LIST

Mfr. No.	Manufacturer Name	Address	Zip Code
00000	ANY SATISFACTORY SUPPLIER		
00039	NIPPON ELECTRIC CO	TOKYO, JP	
01121	ALLEN-BRADLEY CO	MILWAUKEE, WI	53204
01281	TRW INC SEMICONDUCTOR DIV	LAWNDALE, CA	90260
01295	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS, TX	75222
02111	SPECTROL ELECTRONICS CORP	CITY OF IND, CA	91745
02114	FERROXCUBE CORP	SAUGERTIES, NY	12477
02660	BUNKER RAMO CORP AMPHENOL CONN DIV	BROADVILLE, IL	60153
03508	GE CO SEMICONDUCTOR PROD DEPT	AUBURN, NY	13201
03888	K D I PYROFILM CORP	WHIPPANY, NJ	07981
04713	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX, AZ	85008
06001	MEPCO ELECTRA CORP	COLUMBIA, SC	29063
06383	PANDUIT CORP	TINLEY PARK, IL	60477
06665	PRECISION MONOLITHICS INC	SANTA CLARA, CA	95050
07263	FAIRCHILD SEMICONDUCTOR DIV	MOUNTAIN VIEW, CA	94042
12969	UNITRODE CORP	WATERTOWN, MA	02172
13606	SPRAGUE ELECT CO SEMICONDUCTOR DIV	CONCORD, NH	03301
14140	EDISON ELEK DIV MCGRAW-EDISON	MANCHESTER, NH	03130
16546	U S CAPACITOR CORP	BURBANK, CA	91504
17856	SILICONIX INC	SANTA CLARA, CA	95054
18324	SIGNETICS CORP	SUNNYVALE, CA	94086
18612	VISHAY RES PROD VISHAY INTERTECH	MALVERN, PA	19355
19701	MEPCO/ELECTRA CORP	MINERAL WELLS, TX	76067
20932	EMCON DIV ITW	SAN DIEGO, CA	92129
24046	TRANSITRON ELECTRONIC CORP	WAKEFIELD, MA	01880
24355	ANALOG DEVICES INC	NORWOOD, MA	02062
24546	CORNING GLASS WORKS	BRADFORD, PA	16701
27014	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA, CA	95051
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO, CA	94304
29990	AMERICAN TECH CER DIV PHASE IND	HUNTINGTON STA, NY	11746
3L585	RCA CORP SOLID STATE DIV	SOMERVILLE, NJ	
30983	MEPCO/ELECTRA CORP	SAN DIEGO, CA	92121
32997	BOURNS INC TRIMPOT PROD DIV	RIVERSIDE, CA	92507
33095	SPECTRUM CONTROL INC	FAIRVIEW, PA	16415
34335	ADVANCED MICRO DEVICES INC	SUNNYVALE, CA	94086
51642	CENTRE ENGINEERING INC	STATE COLLEGE, PA	16801
52063	EXAR INTEGRATED SYSTEMS INC	SUNNYVALE, CA	94086
52648	PLESSEY SEMICONDUCTORS	SANTA ANA, CA	92705
52763	STETTNER ELECTRONICS INC	CHATTANOOGA, TN	13035
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS, MA	01247
72136	ELECTRO MOTIVE CORP	FLORENCE, SC	06226
74970	JOHNSON E F CO	WASECA, MN	56093
75042	TRW INC PHILADELPHIA DIV	PHILADELPHIA, PA	19108
75915	LITTELFUSE INC	DES PLAINES, IL	60016
98291	SEALECTRO CORP	MAMARONECK, NY	10544

ManualsPlus.com

TABLE 3. AC POWER CABLES AVAILABLE

Plug Type**	Cable HP Part Number	Plug Description	Cable Length cm (inches)	Cable Color	For Use In Country
250V 	8120-1351 8120-1703	Straight*BS1363A 90°	229 (90) 229 (90)	Mint Gray Mint Gray	Great Britain, Cyprus, Nigeria, Rhodesia, Singapore, So. Africa, India
250V 	8120-1369 8120-0696	Straight*NZSS198/ASC112 90°	201 (79) 221 (87)	Gray Gray	Australia, New Zealand
250V 	8120-1689 8120-1692	Straight*CEE7-Y11 90°	201 (79) 201 (79)	Mint Gray Mint Gray	East and West Europe, Saudi Arabia, United Arab Republic (unpolarized in many nations)
125V 	8120-1348 8120-1398 8120-1754	Straight*NEMA5-15P 90° Straight*NEMA5-15P	203 (80) 203 (80) 91 (36)	Black Black Black	United States Canada, Japan (100 or 200V), Mexico, Phillipines, Taiwan
	8120-1378 8120-1521 8120-1676	Straight*NEMA5-15P 90° Straight*NEMA5-15P	203 (80) 203 (80) 91 (36)	Jade Gray Jade Gray Jade Gray	
250V 	8120-2104	Straight*SEV1011 1959-24507 Type 12	201 (79)	Gray	Switzerland
220V 	8120-0698	Straight*NEMA6-15P			
250V 	8120-1860	Straight*CEEE22-VI			

* Part number shown for plug is industry identifier for plug only. Number shown for cable is HP Part Number for complete cable, including plug.

** E = Earth Ground; L = Line; N = Neutral.

ManualsPlus.com

TABLE 4. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				RF SECTION MISCELLANEOUS PARTS		
AT1	1810-0118	1	1	TERMINATION-COAX SMA (TERMINATES 1ST LO OUTPUT)	28480	1810-0118
B1				FAN (SEE A24)		
C1				FILTER CAPACITOR (SEE A23C1)		
C2				FILTER CAPACITOR (SEE A23C2)		
C3				FILTER CAPACITOR (SEE A23C3)		
C4				FILTER CAPACTIOR (SEE A23C4)		
F1	2110-0055	2	1	FUSE 4A 250V FAST-BLO 1.25X.25 UL IEC (FOR 100/120 VOLT OPERATION)	75915	312004
F1	2110-0006	3	1	FUSE 2A 250V SLO-BLO 1.25X.25 UL (FOR 220/240 VOLT OPERATION)	71400	MDX-2
FL1				LINE MODULE (SEE A9)		
J1	1251-3418	4	1	CONNECTOR 5-PIN F D SERIES (IF/SWEEP)	28480	1251-3418
J2				PART OF W6		
J3				PART OF W12		
J4				PART OF W3		
J5				PART OF W16		
K1				FAN RELAY (SEE A23K1)		
S1	3101-0070	3	1	SWITCH-SL DPDT-NS MINTR .5A 125VAC/DC (FREQ REFERENCE INT-EXT)	28480	3101-0070
T1	85660-60048	4	1	TRANSFORMER, POWER, AC LINE	28480	85660-60048
W1	85660-60066	6	1	CABLE ASSEMBLY, COAX 81, A6A3 LAST CONV TO REAR PANEL J1P1	28480	85660-60066
W2	85660-60073	5	1	CABLE ASSEMBLY, COAX 85, A7A2 100 MHZ VCXO TO A6A9 PHASE LOCK	28480	85660-60073
W3	85660-60063	3	1	CABLE ASSEMBLY, COAX 82, A6A12 YTX DRIVER TO REAR PANEL J4 (SWEEP + TUNE)	28480	85660-60063
W4	85660-60076	8	1	CABLE ASSEMBLY, COAX 9, A7A1 REF. 0-DET TO A10A7 PLL2-DIVIDER	28480	85660-60076
W5	85660-60077	9	1	CABLE ASSEMBLY, COAX 86, A7A1 REF. 0-DET TO A10A2 PLL1-DIVIDER	28480	85660-60077
W6	85660-60078	0	1	CABLE ASSEMBLY, COAX 80, REAR PANEL J2 (FREQ REFERENCE EXT)TO A7A1 REF. 0-DET	28480	85660-60078
W7	85660-60075	7	1	CABLE ASSEMBLY, COAX 8, A7A2 100MHZ VCXO TO A10A4 PLL3-UP-CONV	28480	85660-60075
W8	85660-60072	4	1	CABLE ASSEMBLY, COAX 93, A7A4 MIN OUTPUT TO A11A5 SAMPLER	28480	85660-60072
W9	85660-60074	6	1	CABLE ASSEMBLY, COAX 5, A10A1 PLL1-VCO TO A11A4 PHASE DET.	28480	85660-60074
W10				NOT ASSIGNED		
W11	85660-20067	3	1	CABLE ASSEMBLY, A11A1 DIR. CPLR TO A6W6	28480	85660-20067
W12	85660-60062	2	1	CABLE ASSEMBLY, COAX 87, A22 10 MHZ STD TO REAR PANEL J3 (FREQ REFERENCE INT)	28480	85660-60062
W13	85660-60065	5	1	CABLE ASSEMBLY, COAX 4, A14 SCAN GEN TO REAR PANEL J1P3	28480	85660-60065
W14	85660-60064	4	1	CABLE ASSEMBLY, COAX 1, A14 SCAN GEN TO REAR PANEL J1P4	28480	85660-60064
W15	85660-60117	8	1	CABLE ASSEMBLY, REAR PANEL J2 (FREQ REFERENCE INT) TO REAR PANEL J3 (FREQ REFERENCE EXT)	28480	85660-60117
W16	85660-60067	7	1	CABLE ASSEMBLY, COAX 6, A7A1 REF. 0-DET TO REAR PANEL J5 (10MHZ OUT)	28480	85660-60067
	85660-90016	9	1	INFORMATION CARD, ENGLISH (MANUAL OPERATION)	28480	85660-90016
	85660-90017	0	1	INFORMATION CARD, ENGLISH (REMOTE OPERATION)	28480	85660-90017
	5061-2033	8	1	TRAY ASSEMBLY, INFORMATION PULL-OUT CARD	28480	5061-2033
	6010-0350	2		PAINT, ENAMEL, JADE GREY	28480	6010-0350

*Indicates Factory Selected Value

ManualsPlus.com

TABLE 5. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				RF SECTION ASSEMBLIES		
A5	85660-60005	3	1	FRONT PANEL ASSEMBLY (INCLUDES A5A1 AND A5A2)	28480	85660-60005
A5A1	85660-60210	2	1	BOARD ASSEMBLY, KEYBOARD	28480	85660-60210
A5A2	0960-0684	2	1	ROTARY PULSE GENERATOR	28480	0960-0684
A6A1	85660-60101	0	1	RF SWITCH	28480	85660-60101
A6A2	85660-60121	4	1	RF ATTENUATOR/ERROR CORRECTION ROM (INCLUDES A12U8)	28480	85660-60121
A6A3	85660-60003	1	1	LAST CONVERTER ASSEMBLY	28480	85660-60003
A6A3A1	85660-60002	0	1	BOARD ASSEMBLY, LAST CONVERTER	28480	85660-60002
A6A4	5086-7248	9	1	SECOND CONVERTER	28480	5086-7248
A6A5	5086-7133	1	1	AMPLIFIER/COUPLER/LOAD UNIT (ACLU)	28480	5086-7133
A6A6	5086-7247	8	1	FIRST CONVERTER	28480	5086-7247
A6A7	85660-60128	1	1	BOARD ASSEMBLY, YIG-TUNED MIXER CURRENT DRIVER	28480	85660-60128
A6A8	5086-7226	3	1	YIG-TUNED MIXER (YTX) (NEW)	28480	5086-7226
A6A8	5086-6226	1	1	YIG-TUNED MIXER (YTX) (RESTORED 5086-7226)	28480	5086-6226
A6A9	85660-60226	0	1	PHASE LOCK ASSEMBLY	28480	85660-60226
A6A9A1	85660-60202	2	1	BOARD ASSEMBLY, PHASE LOCK	28480	85660-60202
A6A10	85660-60180	5	1	BOARD ASSEMBLY, MISCELLANEOUS BIAS/RELAY DRIVER	28480	85660-60180
A6A11	85660-60126	9	1	BOARD ASSEMBLY, SLOPE GENERATOR	28480	85660-60126
A6A12	85660-60013	3	1	BOARD ASSEMBLY, YIG-TUNED MIXER (YTX) DRIVER	28480	85660-60013
A6A13	85660-60014	4	1	BOARD ASSEMBLY, RF MODULE MOTHERBOARD	28480	85660-60014
A6A14	5086-7261	6	1	LIMITER, 0-2.5 GHZ	28480	5086-7261
A6A15	9135-0067	5	1	BANDPASS FILTER, 3.6 GHZ, SMA CONNECTORS	28480	9135-0067
A6A16	5086-7299	0	1	LOW PASS FILTER, 1.5 GHZ	28480	5086-7299
A6A17	0955-0117	5	1	BANDPASS FILTER, 300 MHZ	28480	0955-0117
A6A18	9135-0108	5	1	FILTER, LOW PASS, 26 GHZ	28480	9135-0108
A7A1	85660-60015	5	1	BOARD ASSEMBLY, REFERENCE PHASE DETECTOR	28480	85660-60015
A7A2	85660-60135	0	1	BOARD ASSEMBLY, 100MHZ VOLTAGE-CONTROLLED CRYSTAL OSCILLATOR (VCXO)	28480	85660-60135
A7A3	85660-60136	1	1	BOARD ASSEMBLY, M/N PHASE DETECTOR	28480	85660-60136
A7A4	85660-60113	4	1	BOARD ASSEMBLY, M/N OUTPUT (INCLUDES A7A4A1 M/N VCO ASSY AND A7A4A2 M/N VCO BOARD ASSY)	28480	85660-60113
A7A4A1	85660-60096	2	1	M/N VCO ASSEMBLY (INCLUDES A7A4A1A1 OSCILLATOR ASSEMBLY AND A7A4A1A2 BOARD ASSEMBLY)	28480	85660-60096
A7A5	85660-60020	2	1	BOARD ASSEMBLY, M/N REFERENCE MOTHERBOARD	28480	85660-60020
A8	85660-60196	3	1	BOARD ASSEMBLY, RECTIFIER	28480	85660-60196
A9	0960-0443	1	1	LINE MODULE-FILTERED	28480	0960-0443
A10A1	85660-60131	6	1	BOARD ASSEMBLY, PHASE LOCK LOOP 1 (PLL1) VOLTAGE-CONTROLLED OSCILLATOR (VCO)	28480	85660-60131
A10A2	85660-60023	5	1	BOARD ASSEMBLY, PHASE LOCK LOOP 1 (PLL1) DIVIDER	28480	85660-60023
A10A3	85660-60024	6	1	BOARD ASSEMBLY, PHASE LOCK LOOP 1 (PLL1) IF	28480	85660-60024
A10A4	85660-60025	7	1	BOARD ASSEMBLY, PHASE LOCK LOOP 3 (PLL3) UP CONVERTER	28480	85660-60025
A10A5	85660-60168	9	1	BOARD ASSEMBLY, PHASE LOCK LOOP 2 (PLL2) VOLTAGE-CONTROLLED OSCILLATOR (VCO)	28480	85660-60168
A10A6	85660-60130	5	1	BOARD ASSEMBLY, PHASE LOCK LOOP 2 (PLL2) PHASE DETECTOR	28480	85660-60130
A10A7	85660-60028	0	1	BOARD ASSEMBLY, PHASE LOCK LOOP 2 (PLL2) DIVIDER	28480	85660-60028
A10A8	85660-60176	9	1	BOARD ASSEMBLY, PHASE LOCK LOOP 2 (PLL2) DISCRIMINATOR	28480	85660-60176
A10A9	85660-60080	4	1	BATTERY PACK ASSEMBLY (INCLUDES A10A9A1 AND A10A9MP1)	28480	85660-60080
A10A9A1	08672-60092	0	1	BATTERY	28480	08672-60092
A11A1	5086-7295	6	1	COUPLER/ISOLATOR/AMPLIFIER (CIA)	28480	5086-7295
A11A2	85660-60123	6	1	BOARD ASSEMBLY, INTERCONNECT, YTO LOOP (MUST BE USED WITH A11A3 5086-7314)	28480	85660-60123
A11A3	5086-7314	0	1	YIG-TUNED OSCILLATOR (YTO) (NEW)	28480	5086-7314
A11A3	5086-6314	8	1	YIG-TUNED OSCILLATOR (YTO) (RESTORED 5086-7314)	28480	5086-6314

*Indicates Factory Selected Value

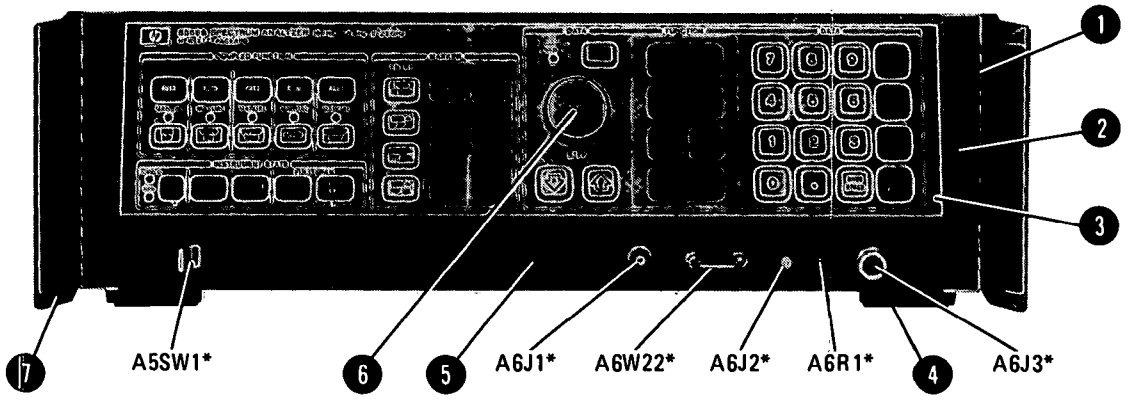
ManualsPlus.com

TABLE 5. REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A11A4	85660-60175	8	1	BOARD ASSEMBLY, YIG-TUNED OSCILLATOR (YTO) DETECTOR	28480	85660-60175
A11A5	85660-60199	6	1	BOARD ASSEMBLY, SAMPLER	28480	85660-60199
A11A6	0955-0122	2	1	ATTENUATOR, COAXIAL	28480	0955-0122
A11A7	9135-0040	4	1	LOW-PASS FILTER, 6.2 GHZ	28480	9135-0040
A12	85660-60211	3	1	BOARD ASSEMBLY, FRONT PANEL INTERFACE	28480	85660-60211
A15	85660-60209	9	1	BOARD ASSEMBLY, CONTROLLER	28480	85660-60209
A16	85660-60198	5	1	BOARD ASSEMBLY, SCAN GENERATOR	28480	85660-60198
A17	85660-60174	7	1	BOARD ASSEMBLY, POSITIVE REGULATOR	28480	85660-60174
A18	85660-60137	2	1	BOARD ASSEMBLY, NEGATIVE REGULATOR	28480	85660-60137
A19	85660-60212	4	1	BOARD ASSEMBLY, DIGITAL-TO-ANALOG CONVERTER	28480	85660-60212
A20	85660-60206	6	1	BOARD ASSEMBLY, MAIN COIL DRIVER	28480	85660-60206
A21	85660-60040	6	1	BOARD ASSEMBLY, FM COIL DRIVER	28480	85660-60040
A23	85660-60243	1	1	BOARD ASSEMBLY, MOTHERBOARD	28480	85660-60243
A24	85660-60049	5	1	FAN ASSEMBLY	28480	85660-60049
A22	5063-0257	7		OSC. OVEN ASS		
A24	85660-60358			FAN KIT 50-60 Hz		85660-60358
				FAN KIT 400 Hz		85660-60359

*Indicates Factory Selected Value

ManualsPlus.com

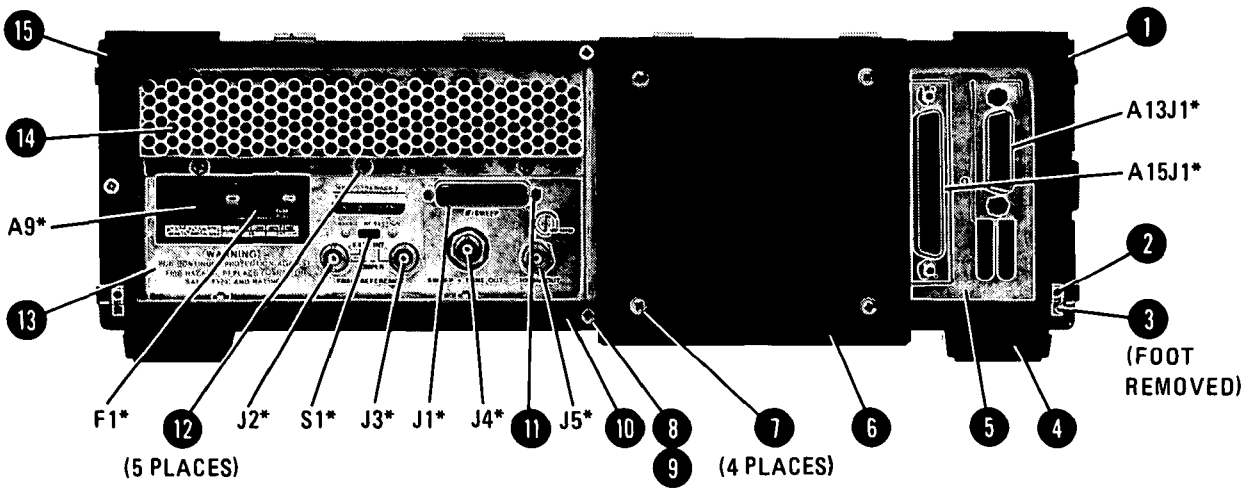


*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
1	85660-20084	4	Frame, Front, RF Section	28480	85660-20084
2	85680-20125	8	Bezel, Front	28480	85680-20125
3	85660-00032	0	Panel, Dress, Upper Front, RF Section	28480	85660-00032
	6010-0350	2	Paint, Enamel, Jade Grey	28480	6010-0350
4	5040-7201	8	Foot, Bottom	28480	5040-7201
5	85660-00058	0	Panel, Front Dress, Lower, RF Section	28480	85660-00058
6	0370-2992	8	Knob, Round, RPG, Data Control	28480	0370-2992
7	5061-0089	0	Handles, Front, Pair	28480	5061-0089

FIGURE 1. INSTRUMENT PARTS IDENTIFICATION, FRONT VIEW

ManualsPlus.com

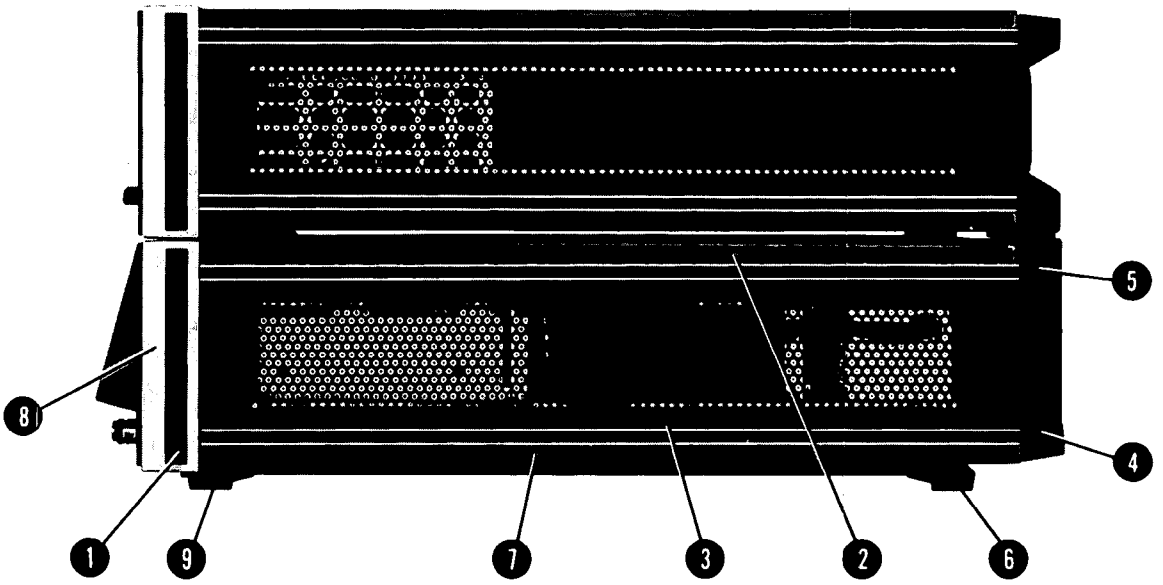


*REFER TO INDIVIDUAL TABS AND/OR MISCELLANEOUS PARTS LIST FOR PART NUMBERS.

Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
1	5020-8940	2	Lock Foot, Lower Right	28480	5020-8940
2	2360-0332	7	Screw, 6-32, .312-IN LG, PAN HD	28480	2360-0332
3	5040-7221	2	Foot, Rear	28480	5040-7221
4	5040-7201	8	Foot, Bottom	28480	5040-7201
5	85660-20207	8	Support, PC Board, Rear	28480	85660-20207
6	85660-00048	8	Housing Grill, Fan	28480	85660-00048
7	2360-0196	1	Screw, Mach, 6-32, .375-IN LG, 100 DEG	28480	2360-0196
8	0570-1171	7	Screw, Cover Mounting, 6-32, .460-IN LG	28480	0570-1171
9	0510-0043	4	Retainer Ring for screw (8)	28480	0510-0043
10	5060-9847	4	Cover, 18-IN (For bottom with feet)	28480	5060-9847
11	1251-2942	7	Screw, 4-40 (Includes nut and washer)	28480	1251-2942
12	2360-0115	4	Screw, Mach, 6-32, .312-IN LG, PAN HD	28480	2360-0115
13	85660-00011	5	Panel, Rear, RF Section	28480	85660-00011
14	85660-20061	7	Heat Sink, Transistor	28480	85660-20061
15	5020-8938	8	Lock Foot, Lower Left	28480	5020-8938

FIGURE 2. RF SECTION PARTS IDENTIFICATION

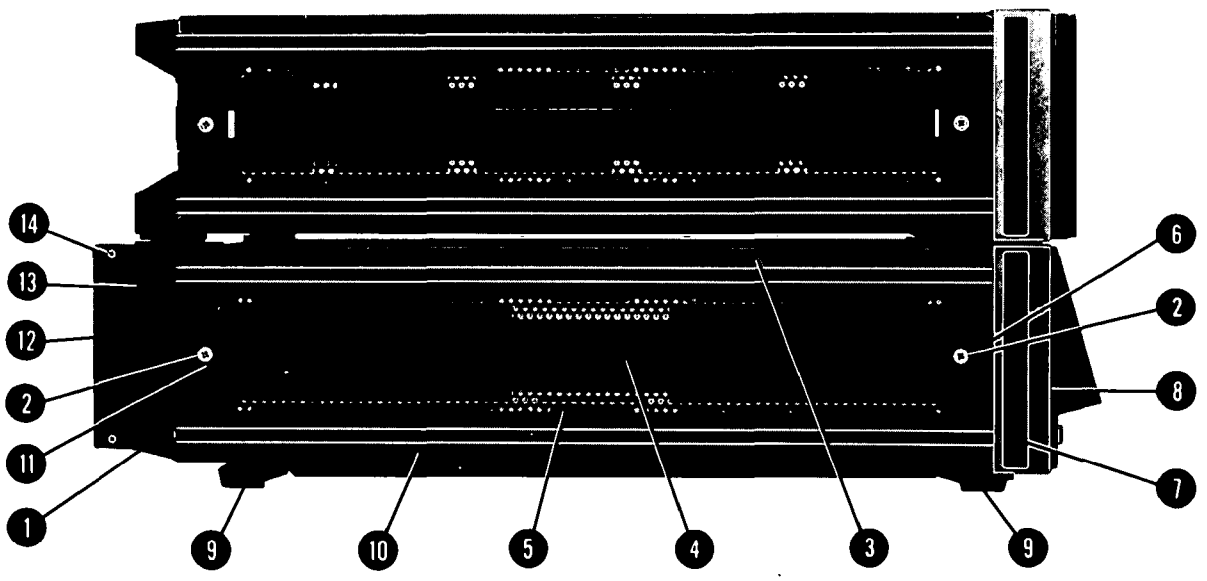
ManualsPlus.com



Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
1	5001-0439	8	Trim Strip, Front Frame, Side	28480	5001-0439
2	5060-9835	0	Cover, 18-IN (For top and bottom w/o feet)	28480	5060-9835
3	5060-9912	4	Cover, 18-IN, Side, Perforated	28480	5060-9912
4	5040-7221	2	Foot, Rear	28480	5040-7221
5	5020-8938	8	Lock Foot, Lower Left	28480	5020-8938
6	5040-7201	8	Foot, Bottom	28480	5040-7201
7	5060-9847	4	Cover, 18-IN (For bottom with feet)	28480	5060-9847
8	85660-20084	4	Frame, Front, RF Section	28480	85660-20084

FIGURE 3. RF SECTION PARTS IDENTIFICATION, RIGHT SIDE VIEW

ManualsPlus.com

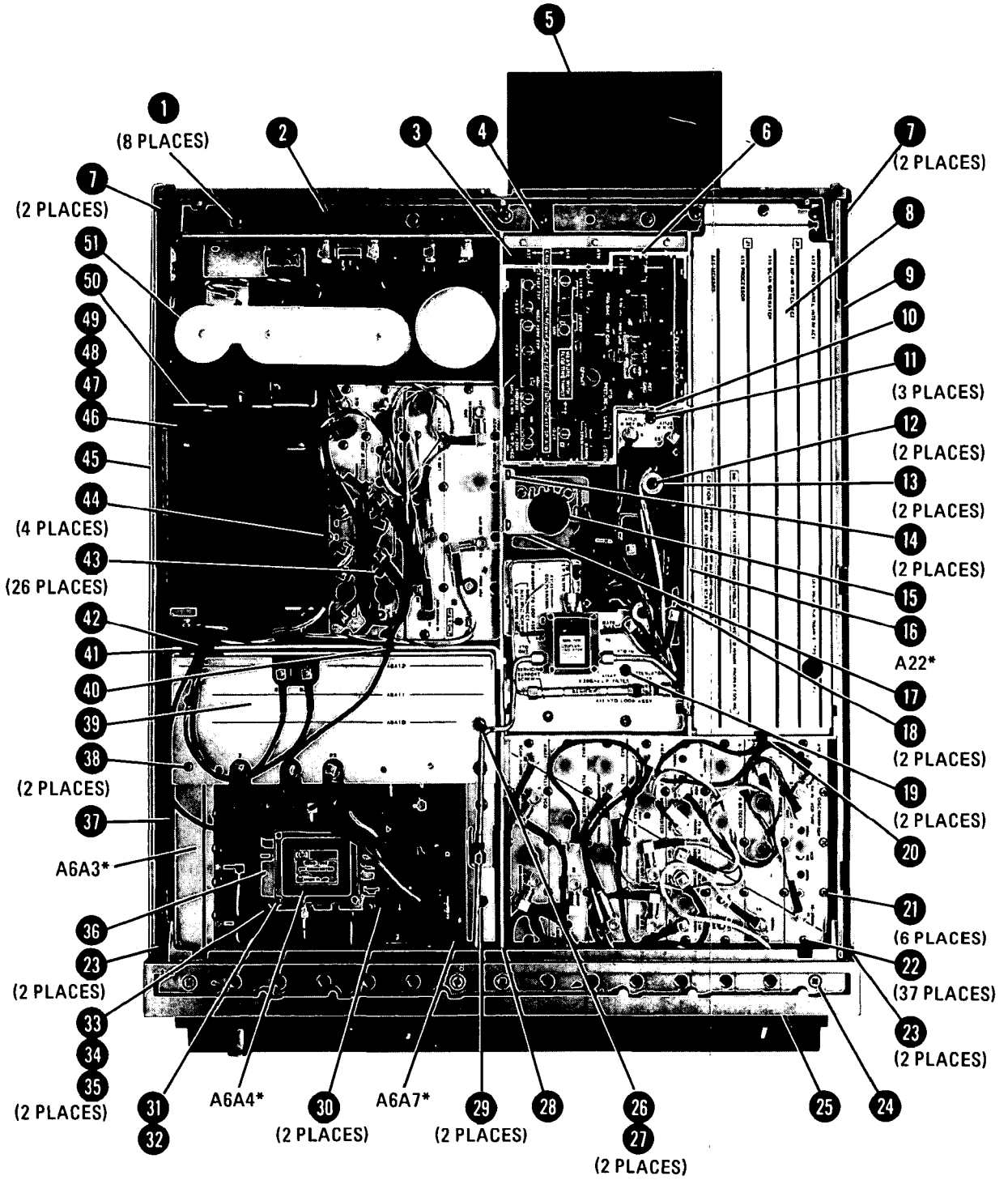


Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
1	5040-7221	2	Foot, Rear	28480	5040-7221
2	2680-0172	1	Screw, 10-32, .375 IN LG, FH	28480	2680-0172
3	5060-9835	0	Cover, 18-IN (For top and bottom w/o feet)	28480	5060-9835
4	5060-9804	3	Strap Handle Assembly, 18-IN	28480	5060-9804
5	5060-9937	3	Cover, 18-IN, Side, Perforated	28480	5060-9937
6	5040-7219	8	Cover, Strap Handle, Front	28480	5040-7219
7	5001-0439	8	Trim Strip, Front Frame, Side	28480	5001-0439
8	85660-20084	4	Frame, Front, RF Section	28480	85660-20084
9	5040-7201	8	Foot, Bottom	28480	5040-7201
10	5060-9847	4	Cover, 18-IN (For bottom with feet)	28480	5060-9847
11	5040-7220	1	Cover, Strap Handle, Rear	28480	5040-7220
12	85660-00048	8	Housing Grill, Side, Fan	28480	85660-00048
13	5020-8940	2	Lock Foot, Lower Right	28480	5020-8940
14	2200-0770	9	Screw, Mach, 4-40, .188-IN LG, 100 DEG FH	28480	2200-0770

85660-00049 FAN Foam Filter

FIGURE 4. RF SECTION PARTS IDENTIFICATION, LEFT SIDE VIEW

ManualsPlus.com



*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

FIGURE 5. RF SECTION PARTS IDENTIFICATION, BOTTOM VIEW (1 OF 2)

ManualsPlus.com

Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
1	2360-0115	4	Screw, Mach, 6-32, .312-IN LG, PAN HD	28480	2360-0115
2	85660-20085	5	Frame, Rear, RF Section	28480	85660-20085
3	85660-00075	1	Cover, Plastic, Regulator	28480	85660-00075
4	86701-00028	6	Spring, Flat (For cover (3))	28480	86701-00028
5	85660-00044	4	Housing, Fan, Bottom	28480	85660-00044
6	86701-20005	1	Guide, PC Board, Regulator	28480	86701-20005
7	2510-0195	9	Screw, 8-32, .375-IN LG, 100 DEG FH	28480	2510-0195
8	85660-00074	0	Cover, Controller	28480	85660-00074
9	85660-20099	1	Strut, Corner, 18-IN	28480	85660-20099
10	86701-20006	2	Guide, PC Board, Regulator	28480	86701-20006
11	2360-0331	6	Screw, Mach, 6-32, .25-IN LG, PAN HD	28480	2360-0331
12	2200-0103	2	Screw, Mach, 4-40, .35-IN LG, PAN HD	28480	2200-0103
13	85660-20100	5	Extractor, PC Board	28480	85660-20100
14	2360-0111	0	Screw, Mach, 6-32, .188-IN LG, PAN HD	28480	2360-0111
15	1520-0205	2	Mount, Isolation (For A22)	28480	1520-0205
16	85660-00002	4	Divider, Processor	28480	85660-00002
17	85660-00026	2	Shock Mount, Bottom (For A22)	28480	85660-00026
18	2200-0103	2	Screw, Mach, 4-40, .25-IN LG, PAN HD	28480	2200-0103
19	2360-0333	8	Screw, Mach, 6-32, .25-IN LG, 100 DEG FH	28480	2360-0333
20	0400-0009	9	Grommet, Round, .125-IN ID, .25-IN OD	28480	0400-0009
21	85660-60100	9	Screw, Mach, 4-40, .312-IN LG, PAN HD (Includes washer)	28480	85660-60100
22	2200-0105	4	Screw, Mach, 4-40, .312-IN LG, 82 DEG FH	28480	2200-0105
23	2510-0192	6	Screw, 8-32, .25-IN LG, 100 DEG FH	28480	2510-0192
24	2360-0116	5	Screw, Mach, 6-32, .312-IN LG, 82 DEG FH	28480	2360-0116
25	85660-20084	4	Frame, Front, RF Section	28480	85660-20084
26	2360-0117	6	Screw, Mach, 6-32, .375-IN LG, PAN HD	28480	2360-0117
27	3050-0227	3	Washer, Flat, No. 6, .149-IN (For screw (26))	28480	3050-0227
28	85660-00001	3	Divider, Center	28480	85660-00001
29	2360-0116	5	Screw, Mach, 6-32, .312-IN LG, 82 DEG FH	28480	2360-0116
30	1400-0053	4	Clamp, Cable, Nylon, .172-IN DIA, .375-IN WIDE	28480	1400-0053
31	0520-0137	3	Screw, Mach, 2-56, .75-IN LG, PAN HD	28480	0520-0137
32	2190-0890	1	Washer, Lock, HLCL, No. 2 (For screw (31))	28480	2190-0890
33	2200-0145	2	Screw, Mach, 4-40, .438-IN LG, PAN HD	28480	2200-0145
34	2190-0003	8	Washer, Lock, HLCL, No. 4 (For screw (33))	28480	2190-0003
35	3050-0105	6	Washer, Flat, No. 4 (For screw (33))	28480	3050-0105
36	85660-00021	7	Cover, Microcircuit Mount	28480	85660-00021
37	85660-00015	9	Main Bracket, RF Module	28480	85660-00015
38	2360-0115	4	Screw, Mach, 6-32, .312-IN LG, PAN HD	28480	2360-0115
39	85660-00022	8	Cover, PC Board, RF Module	28480	85660-00022
40	0400-0009	9	Grommet, Round, .125-IN ID, .25-IN OD	28480	0400-0009
41	85660-00007	9	Chassis, RF Module	28480	85660-00007
42	0400-0219	3	Grommet, Round, .5-IN ID, .093-IN Wide	28480	0400-0219
43	2200-0105	4	Screw, Mach, 4-40, .312-IN LG, PAN HD	28480	2200-0105
44	85660-60100	9	Screw, Mach, 4-40, .312-IN LG, PAN HD (Includes washer)	28480	85660-60100
45	5020-8837	6	Strut, Corner, 18-IN	28480	5020-8837
46	2360-0197	2	Screw, Mach, 6-32, .375-IN LG, PAN HD	28480	2360-0197
47	2190-0006	1	Washer, Lock, HLCL, No. 6 (For screw (46))	28480	2190-0006
48	3050-0227	3	Washer, Flat, No. 6 (For screw (46))	28480	3050-0227
49	2420-0002	6	Nut, Hex, 6-32 Thread (For screw (46))	28480	2420-0002
50	85660-00013	7	Support, PC Board, Rectifier	28480	85660-00013
51	86701-00016	2	Support, Capacitor	28480	86701-00016

FIGURE 5. RF SECTION PARTS IDENTIFICATION, BOTTOM VIEW (2 OF 2)

ManualsPlus.com

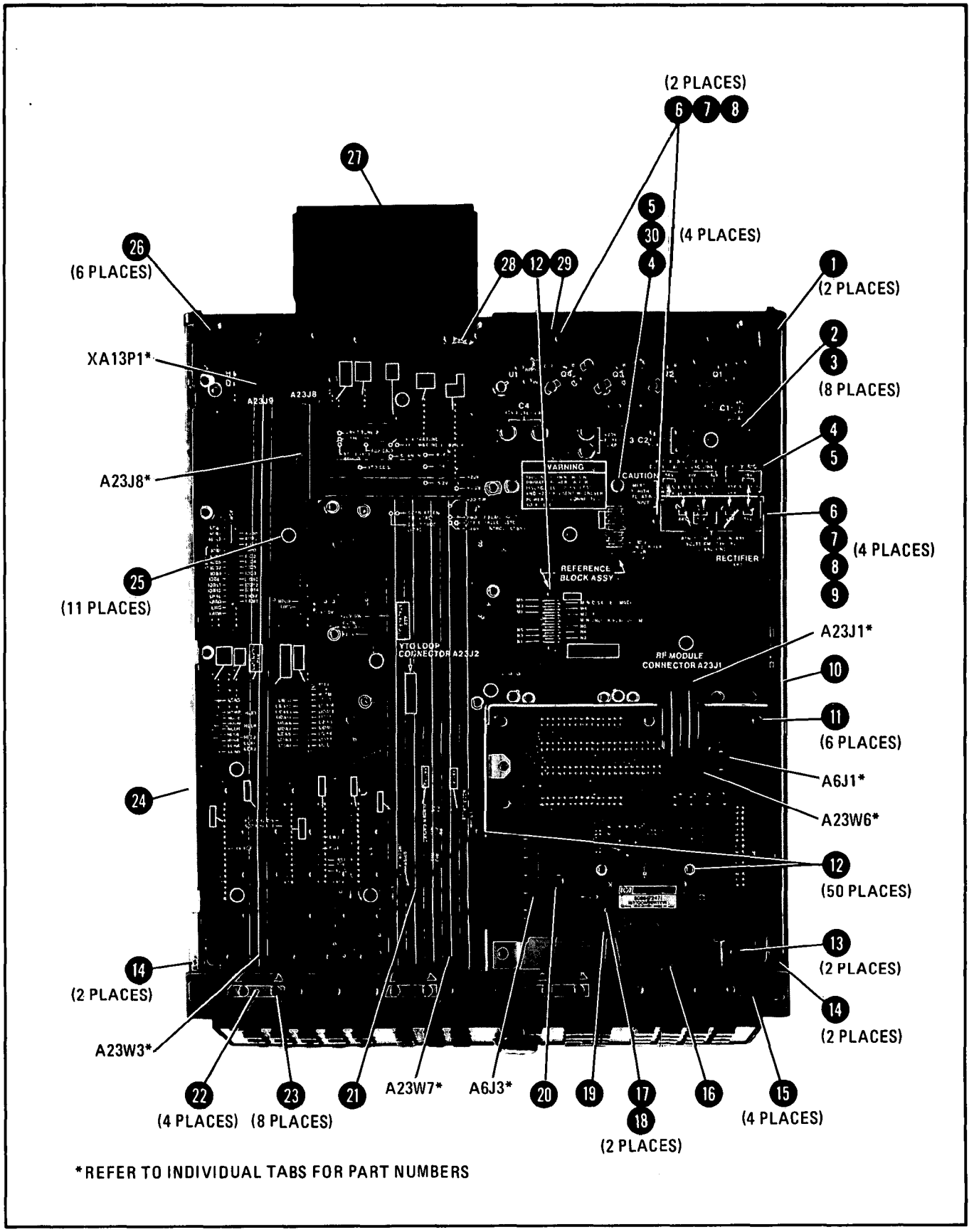


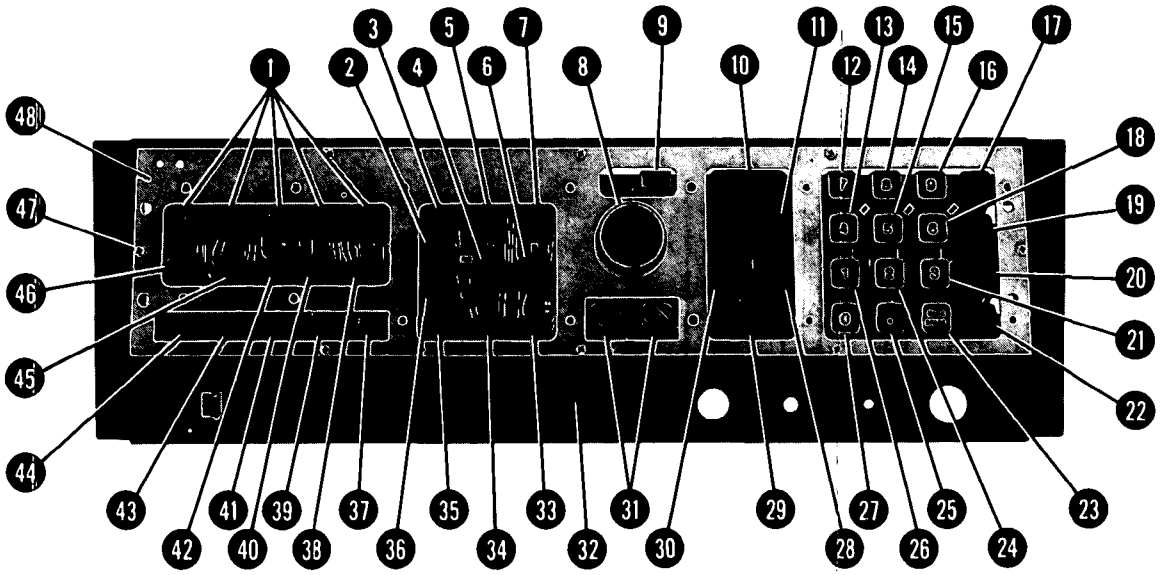
FIGURE 6. RF SECTION PARTS IDENTIFICATION, TOP VIEW (1 OF 2)

ManualsPlus.com

Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
1	2510-0195	9	Screw, 8-32, .375-IN LG, 100 DEG FH	28480	2510-0195
2	2680-0129	8	Screw, Mach, 10-21, .312-IN LG, PAN HD	28480	2680-0129
3	2190-0011	8	Washer, Lock, Internal Tooth (For screw (2))	28480	2190-0011
4	2200-0153	2	Screw, Mach, 4-40, .875-IN LG, PAN HD	28480	2200-0153
5	3050-0105	6	Washer, Flat, No. 4 (For screw (4))	28480	3050-0105
6	2360-0197	2	Screw, Mach, 6-32, .375-IN LG, PAN HD	28480	2360-0197
7	2190-0006	1	Washer, Lock, HLCL, No. 6 (For screw (6))	28480	2190-0006
8	3050-0227	3	Washer, Flat, No. 6 (For screw (6)	28480	3050-0227
9	2420-0002	6	Nut, Hex, 6-32 Thread (For screw (6))	28480	2420-0002
10	85660-20098	0	Strut, Corner, 18-IN	28480	85660-20098
11	2360-0113	2	Screw, Mach, 6-32, .25-IN LG, PAN HD	28480	2360-0113
12	2200-0105	4	Screw, Mach, 4-40, .312-IN LG, PAN HD	28480	2200-0105
13	2360-0017	5	Screw, Mach, 6-32, .375-IN LG, PAN HD	28480	2360-00017
14	2510-0192	6	Screw, 8-32, .25-IN LG, 100 DEG FH	28480	2510-0192
15	2360-0116	5	Screw, Mach, 6-32, .312-IN LG, 82 DEG FH	28480	2360-0116
16	85660-00019	3	Mount, Attenuator	28480	85660-00019
17	5020-0137	3	Screw, Mach, 2-56, .75-IN LG, PAN HD	28480	5020-0137
18	2190-0680	7	Washer, Lock, HLCL, No. 2 (For screw (17))	28480	2190-0680
19	85660-20072	0	Mount, Microcircuit	28480	85660-20072
20	2360-0119	8	Screw, Mach, 6-32, .438-IN LG, PAN HD	28480	2360-0119
21	85660-00033	1	Insulator, PC Board, Plastic	28480	85660-00033
22	1600-0367	7	Metal Lock Link, Stainless Steel	28480	1600-0367
23	2360-0330	5	Screw, Mach, 6-32, .188-IN LG, PAN HD	28480	2360-0330
24	5020-8837	6	Strut, Corner, 18-IN	28480	5020-8837
25	0570-0034	9	Screw, Mach, 4-40, .25-IN LG, RND HD, Plastic	28480	0570-0034
26	2360-0115	4	Screw, Mach, 6-32, .312-IN LG, PAN HD	28480	2360-0115
27	85660-00045	5	Housing, Fan, Top	28480	85660-00045
28	2360-0268	8	Lug, Terminal, Ground	28480	2360-0268
29	1400-0907	7	Clamp, Wire	05683	3/16-HFR
30	2190-0003	8	Washer, Lock, HLCL, No. 4 (For screw (4))	28480	2190-0003

FIGURE 6. RF SECTION PARTS IDENTIFICATION, TOP VIEW (2 OF 2)

ManualsPlus.com



Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
1	5041-0706	6	Key, AUTO	28480	5041-0706
2	5041-0712	4	Key, MKR→CF	28480	5041-0712
3	5041-0938	6	Key, PEAK SEARCH	28480	5041-0938
4	5041-0716	8	Key, Δ	28480	5041-0716
5	5041-0692	9	Key, OFF	28480	5041-0692
6	5041-0717	9	Key, ZOOM	28480	5041-0717
7	5041-0698	5	Key, NORMAL	28480	5041-0698
8	0370-2992	8	Knob, Round, RPG, Data Control	28480	0370-2992
9	5041-0725	9	Key, HOLD	28480	5041-0725
10	5041-0673	6	Key, CENTER FREQUENCY	28480	5041-0673
11	5041-0674	7	Key, FREQUENCY SPAN	28480	5041-0674
12	5041-0751	1	Key, 7	28480	5041-0751
13	5041-0748	6	Key, 4	28480	5041-0748
14	5041-0752	2	Key, 8	28480	5041-0752

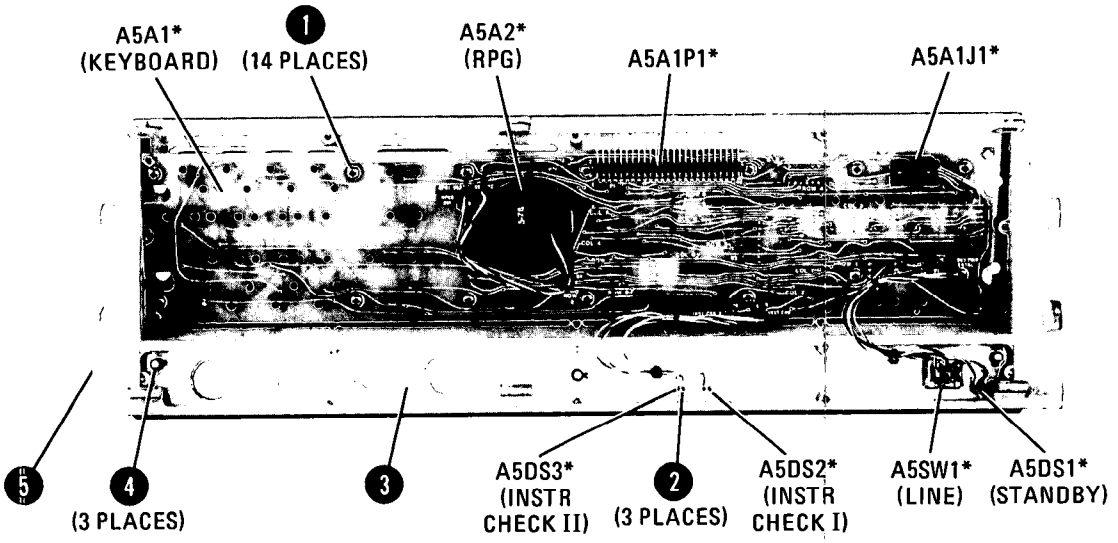
FIGURE 7. RF SECTION PARTS IDENTIFICATION, FRONT PANEL (1 OF 3)

ManualsPlus.com

Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
15	5041-0749	7	Key, 5	28480	5041-0749
16	5041-0753	3	Key, 9	28480	5041-0753
17	5041-0727	1	Key, GHz	28480	5041-0727
18	5041-0750	0	Key, 6	28480	5041-0750
19	5041-0728	2	Key, MHz	28480	5041-0728
20	5041-0729	3	Key, kHz	28480	5041-0729
21	5041-0828	3	Key, 3	28480	5041-0828
22	5041-0730	6	Key, Hz	28480	5041-0730
23	5041-0757	7	Key, BACK SPACE	28480	5041-0757
24	5041-0827	2	Key, 2	28480	5041-0827
25	5041-0755	5	Key, .	28480	5041-0755
26	5041-0826	1	Key, 1	28480	5041-0826
27	5041-0754	4	Key, 0	28480	5041-0754
28	5041-0669	0	Key, STOP FREQ	28480	5041-0669
29	5041-0675	8	Key, REFERENCE LEVEL	28480	5041-0675
30	5041-0668	9	Key, START FREQ	28480	5041-0668
31	5041-0756	6	Key,	28480	5041-0756
32	85660-00058	0	Panel, Dress, Lower Front	28480	85660-00058
33	5041-0937	5	Key, SIGNAL TRACK	28480	5041-0937
34	5041-0917	1	Key, PRESEL PEAK	28480	5041-0917
35	5041-0715	7	Key, MKR→ REF LVL	28480	5041-0715
36	5041-0714	6	Key, MKR/Δ→ STP SIZE	28480	5041-0714
37	5041-0724	8	Key, 2 – 22 GHz	28480	5041-0724
38	5041-0711	3	Key, CF STEP SIZE	28480	5041-0711
39	5041-0723	7	Key, 0 – 2.5 GHz	28480	5041-0723
40	5041-0710	2	Key, ATTEN	28480	5041-0710
41	5041-0775	9	Key, RECALL	28480	5041-0775
42	5041-0709	9	Key, SWEEP TIME	28480	5041-0709
43	5041-0095	6	Key, SAVE	28480	5041-0095
44	5041-0726	0	Key, LCL	28480	5041-0726
45	5041-0708	8	Key, VIDEO BW	28480	5041-0708
46	5041-0707	7	Key, RES BW	28480	5041-0707
47	85660-00032	0	Panel, Dress, Upper Front, RF Section	28480	85660-00032

FIGURE 7. RF SECTION PARTS IDENTIFICATION, FRONT PANEL (2 OF 3)

ManualsPlus.com



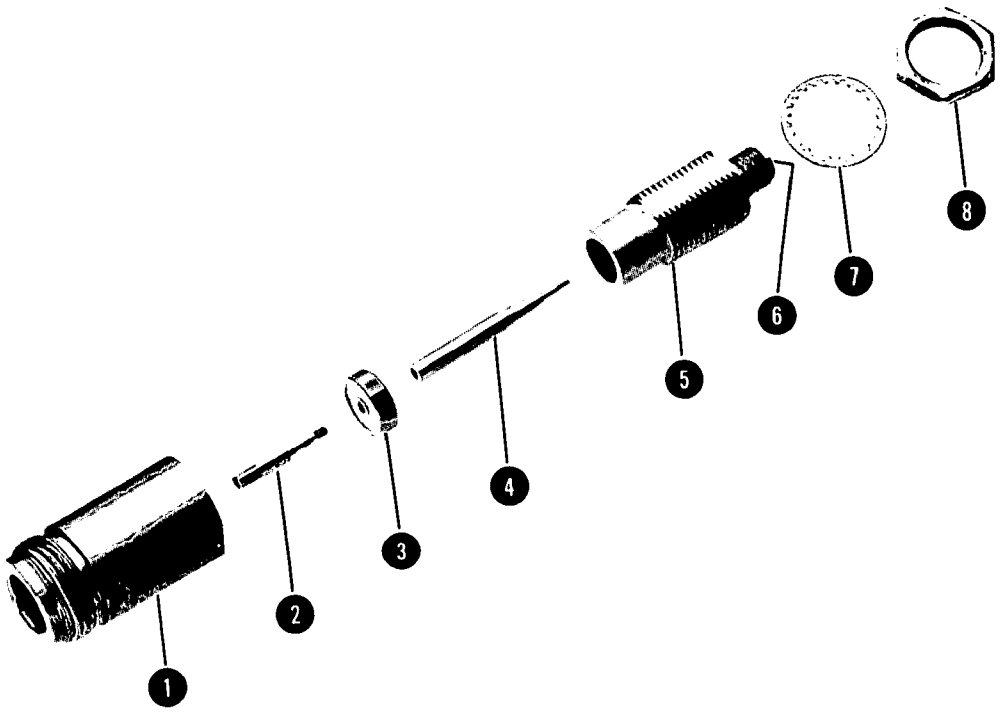
*REFER TO INDIVIDUAL TABS FOR PART NUMBERS.

Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
1	2200-0103	2	Screw, Mach, 4-40, .24-IN LG, PAN HD	28480	2200-0103
2	85680-40004	4	Mount, LED (For INSTR CHECK LEDs)	28480	85680-40004
3	85660-00056	8	Panel, Sub, Lower Front	28480	85660-00056
4	0510-1148	2	Retainer, Push-On (To attach dress panels)	28480	0510-1148
5	85680-20125	8	Bezel, Front, RF Section	28480	85680-20125

FIGURE 7. RF SECTION PARTS IDENTIFICATION, FRONT PANEL (3 OF 3)

ManualsPlus.com

A6J3
RF INPUT

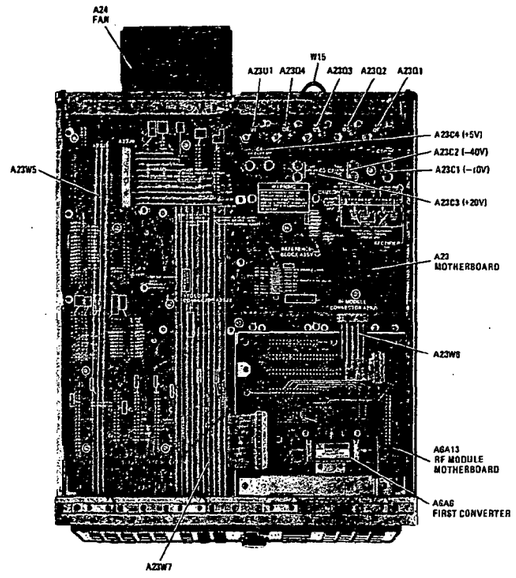


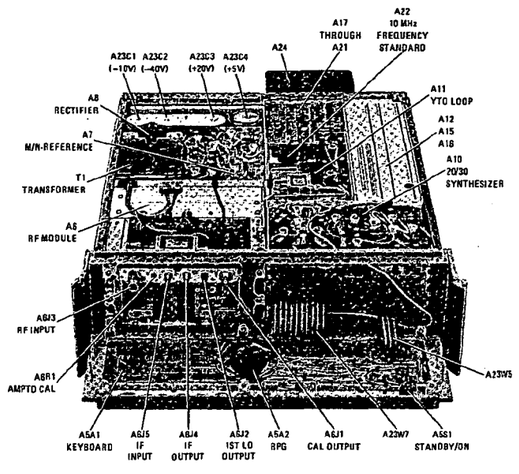
Item	HP Part Number	C D	Description	Mfr. Code	Manufacturer's Part Number
A6J3	86290-60005	7	Connector Assembly (Type N)	28480	86290-60005
1	1250-1577	0	Body: RF Connector (Type N)	02660	131-150
2	1250-0915	8	Contact: RF Connector (Type N)	02660	131-149
3	5040-0306	0	Insulator	28480	5040-0306
4	08555-20093	5	Center Conductor	28480	08555-20093
5	08555-20094	6	Body: Bulkhead	28480	08555-20094
6	08761-2027	4	Insulator	28480	08761-2027
7	2190-0104	0	Washer: Lock 0.439-IN ID	28480	2190-0104
8	2950-0132	6	Nut: Hex 7/16-28	28480	2950-0132

FIGURE 8. RF INPUT CONNECTOR, PARTS IDENTIFICATION

ManualsPlus.com

ACLU A6A5
Controller A15
Coupler/Isolator/Amplifier A11A1
Digital-Analog Converter A19
FM Coil Driver A21
Fan A24
First Converter A6A6
Front Panel A5
Front Panel Interface A12
Interconnect A11A2
Keyboard A5A1
Last Converter A6A3
Line Module A9
M/N Output A7A4
M/N Phase Detector A7A3
M/N Reference A7
M/N Reference Motherboard A7A5
Main Coil Driver A20
Miscellaneous Bias/Relay Driver A6A10
Motherboard A23
Negative Regulator A18
Phase Lock A6A9
Phase-Lock Loop 1 Divider A10A2
Phase-Lock Loop 1 IF A10A3
Phase-Lock Loop 1 VCO A10A1
Phase-Lock Loop 2 Discriminator A10A8
Phase-Lock Loop 2 Divider A10A7
Phase-Lock Loop 2 Phase Detector A10A6
Phase-Lock Loop 2 VCO A10A5
Phase-Lock Loop 3 Up Converter A10A4
Positive Regulator A17
RF Module A6
RF Module Motherboard A6A13
RPG A5A2
Rectifier A8
Reference Phase Detector A7A1
Sampler A11A5
Scan Generator A16
Second Converter A6A4
Slope Generator A6A11
STANDBY/ON Switch A5S1
YTO Loop A11
YTO Phase Detector A11A4
YTX A6A8
YTX Current Driver A6A7
YTX Driver A6A12
6.2 GHz Low-Pass Filter A11A7
10 MHz Frequency Standard A22
20/30 Synthesizer A10
100 MHz VCXO A7A2





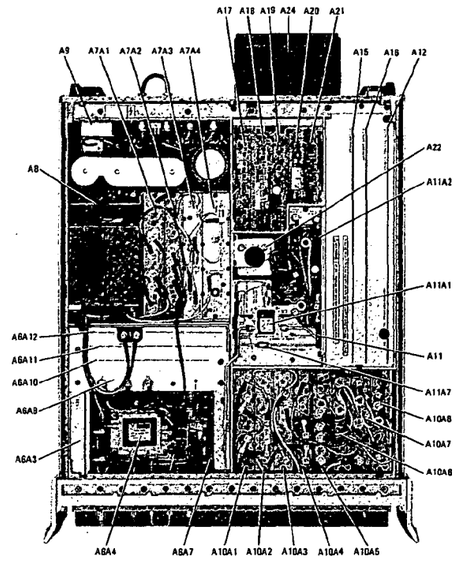


FIGURE 1. MAJOR ASSEMBLY AND COMPONENT LOCATIONS (RF SECTION)

ManualsPlus.com

HEWLETT PACKARD

TROUBLESHOOTING AND REPAIR MANUAL
VOLUME 2

8566B/8568B SPECTRUM ANALYZER IF-DISPLAY SECTION

SERIAL NUMBERS

This manual applies directly to IF-Display sections with serial numbers prefixed 2403A.

COPYRIGHT © HEWLETT-PACKARD COMPANY, 1984
1212 VALLEY HOUSE DRIVE, ROHNERT PARK, CALIFORNIA, 94928, U.S.A.

MANUAL PART NUMBER
HP 8566B: 08566-90042
HP 8568B: 08568-90043

MICROFICHE PART NUMBER
HP 8566B: 08566-90048
HP 8568B: 08568-90048

Printed: December 1984

ManualsPlus.com

SAFETY SYMBOLS

The following safety symbols are used throughout this manual and in the instrument. Familiarize yourself with each of the symbols and its meaning before operating this instrument.

Instruction manual symbol. The instrument will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the instrument against damage. Location of pertinent information within the manual is indicated by use of this symbol in the table of contents.

Indicates dangerous voltages are present. Be extremely careful.

CAUTION

The CAUTION sign denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in damage to or destruction of the instrument. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

WARNING

The WARNING sign denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

GENERAL SAFETY CONSIDERATIONS

WARNING

BEFORE THIS INSTRUMENT IS SWITCHED ON, make sure it has been properly grounded through the protective conductor of the ac power cable to a socket outlet provided with protective earth contact. Any interruption of the protective (grounding) conductor, inside or outside the instrument, or disconnection of the protective earth terminal can result in personal injury.

WARNING

There are voltages at many points in the instrument which can, if contacted, cause personal injury. Be extremely careful. Any adjustments or service procedures that require operation of the instrument with protective covers removed should be performed only by trained service personnel.

CAUTION

BEFORE THIS INSTRUMENT IS SWITCHED ON, make sure its primary power circuitry has been adapted to the voltage of the ac power source. Failure to set the ac power input to the correct voltage could cause damage to the instrument when the ac power cable is plugged in.

ManualsPlus.com

VOLUME 2

CONTENTS

MAJOR TAB	CONTENTS
IF-Display Section General Information	General information on manual contents, instrument storage and shipment.
Signature Analysis Description	An explanation of the use of Signature Analysis diagrams for digital troubleshooting.
IF Overall Block Diagram	Mnemonic Table, Instrument Bus Pin Connection Table, and Overall IF Block Diagram.
A1 Display Section Block Diagram	A1 Display Section Troubleshooting information, Block Diagram, and A1A1 through A1A10 service sheets.
A3 Digital Storage Troubleshooting	A3 Digital Storage Troubleshooting information, Block Diagram, and A3A1 through A3A10 service sheets.
A4 IF Section Troubleshooting	A4 Section Block Diagram, and A4A1 through A4A10 service sheets.
General Parts Listing	Replaceable parts information and parts identification figures.
Major Assembly and Component Locations	Major assembly identification figure.

ManualsPlus.com

IF SECTION SERVICE

INTRODUCTION

This volume of the Troubleshooting and Repair Manual contains information for the troubleshooting and repair of the IF-Display Section of the instrument. This information is combined in service sheets and indexed with tabs for quick reference. General or overall service information for the instrument is contained in Volume 1 of this manual.

SERVICE SHEETS

The service sheets in each volume of this manual are organized in alpha-numeric order and are indexed with tabs to make it easy to locate a specific service sheet. Each of the service sheets contain the following information:

- Circuit Description (where practical)
- Troubleshooting Hints (where practical)
- Replaceable Parts List
- Block Diagram (where practical)
- Component Location Illustration
- Schematic Diagram

Also included, where applicable, are Signature Analysis Diagrams for troubleshooting digital circuits.

REPAIR PROCEDURES

Repair procedures are included for use in removing and replacing assemblies for repair. They are located in the following sections:

Front-Panel LED Replacement
Tab: A1A1 Keyboard, A1A2 Z Axis Amplifier

Front Panel Removal and Repair
Tab: A1A1 Keyboard, A1A2 Z Axis Amplifier

CRT Replacement
Tab: A1A3 High Voltage Regulator

IF-Display Section Internal Fuse Replacement
Tab: A1A6 ±15V Regulator

MAJOR ASSEMBLY AND COMPONENT LOCATIONS

Major assembly and component location illustrations for the IF Section are located at the rear of this volume.

TROUBLESHOOTING

Troubleshooting information for the IF Section is divided into three levels as follows:

Instrument Level
Signature Analysis Description

Section Level
IF Overall Block Diagram
A1 Display Section Block Diagram
A3 Digital Storage Troubleshooting
A4 IF Section Troubleshooting

Assembly Level
Most assemblies have troubleshooting hints immediately following their circuit descriptions. Troubleshooting information is also located on assembly-level block diagrams, notes, and schematics.

All assemblies are indexed by tab except for the ones listed in Table 1 at the end of this section. Table 1 lists the index tabs where these assemblies can be found.

SIGNATURE ANALYSIS

This instrument has been designed to incorporate signature analysis. In the appropriate sections, signature analysis diagrams are included. For an explanation of the use of these diagrams, refer to the Signature Analysis Description Tab.

ManualsPlus.com

STORAGE AND SHIPMENT

Environment

The instrument may be stored or shipped in environments within the following limits:

Temperature ..... −40°C to +75°C
Humidity ..... 5% to 90% at 0° to 40°C
Altitude ..... Up to 15,240 meters (50,000 feet)

The instrument should be protected from temperature extremes which might cause condensation within the instrument.

Original Packaging

It is recommended that the original factory packaging materials be retained for use when shipping the instrument. If original packaging material cannot be retained, packaging materials identical to those used in factory packaging are available through Hewlett-Packard offices. Part numbers and descriptions of the packaging materials are listed in Figure 1.

The combined weight of the two instrument sections is approximately 50 kg (112 lbs). Because of the weight involved, do not package the instrument sections fastened together as one unit. The instrument sections must be separated and packaged in separate containers. The quantity of packaging materials in Figure 1 is for only one instrument section.

If the instrument is being returned to Hewlett-Packard for servicing, attach a tag to each carton indicating the type of service required, return address, model number, and full serial number. For your convenience, a supply of tags is included at the end of this section. Also, mark each container FRAGILE to assure careful handling. In any correspondence, refer to the instrument by model number and full serial number.

Other Packaging

If it is necessary to use packaging materials other than the type used in original factory packaging, the following general instructions should be followed.

a. Separate the two instrument sections and wrap each in heavy paper or plastic.

b. Place the instrument sections in separate containers with 8 to 10 cm (3 to 4 inches) of shock-absorbing material around all sides to provide firm cushioning and prevent movement inside the container. Protect front panels with cardboard. Double-wall corrugated cartons of 125 kg (275 lb) bursting strength are sufficient for shipping containers.

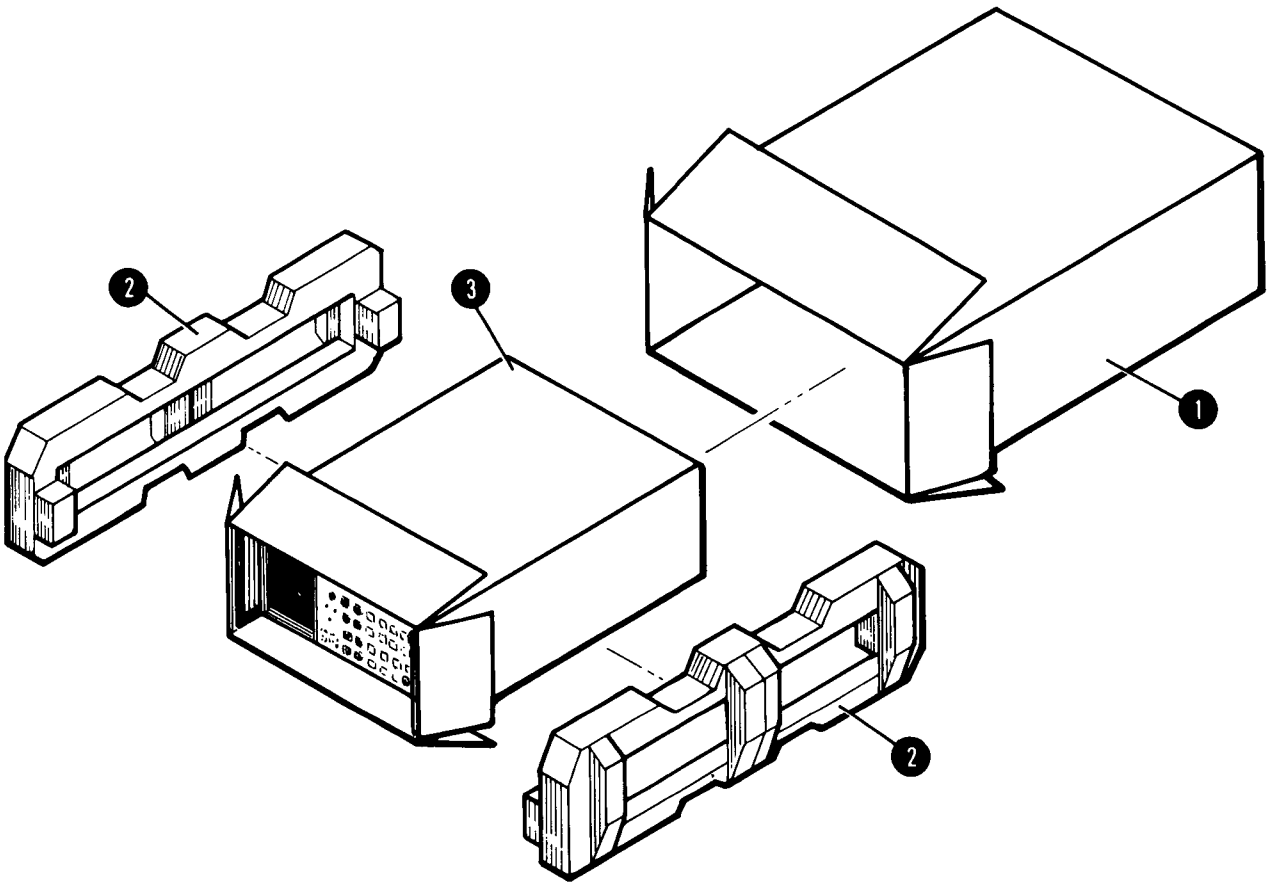
c. Seal each container securely and, if shipping to a Hewlett-Packard office or service center, attach a tag to each container indicating the type of service required, return address, model number, and full serial number. For your convenience, a supply of tags is included at the end of this section.

d. Mark each container FRAGILE to assure careful handling.

TABLE 1. ASSEMBLY LOCATIONS

Assembly	Tab Location
A1T1	A1A8 Rectifier, Block Diagram and General Parts Listing, Table 4
A1V1	A1A3 High Voltage Regulator, Block Diagram and General Parts Listing, Table 4
A1A11	A1A3 High VoltageRegulator, Block Diagram and General Parts Listing, Table 4
A2	Not Assigned

ManualsPlus.com



NOTE

FRONT HANDLES MUST BE MOUNTED FOR SHIPMENT.

Item	HP Part Number	C D	Qty	Description	Manufacturer Code	Mfr. Part Number
1	9211-4487	3	1	Outer Box	28480	9211-4487
2	5180-2319	5	2	Inner Foam Pad	28480	5180-2319
3	5180-2320	8	1	Inner Box	28480	5180-2320

FIGURE 1. PACKAGING FOR SHIPMENT USING FACTORY PACKAGING MATERIALS

ManualsPlus.com

Signature Analysis Investigation

ManualsPlus.com

SIGNATURE ANALYSIS GENERAL DESCRIPTION

This instrument has been designed to incorporate signature analysis. Troubleshooting the instrument using signature analysis requires the use of an HP Model 5005A, 5005B, or 5006B Signature Analyzer. The signature analyzer is a service tool that receives signals via a probe from the circuit under test and displays the result in the form of a digital signature that corresponds to specific data nodes in the circuit under test. For a complete description of signature analyzer operation, refer to the HP 5005A, 5005B, or 5006B Signature Analyzer Operating and Service Manual.

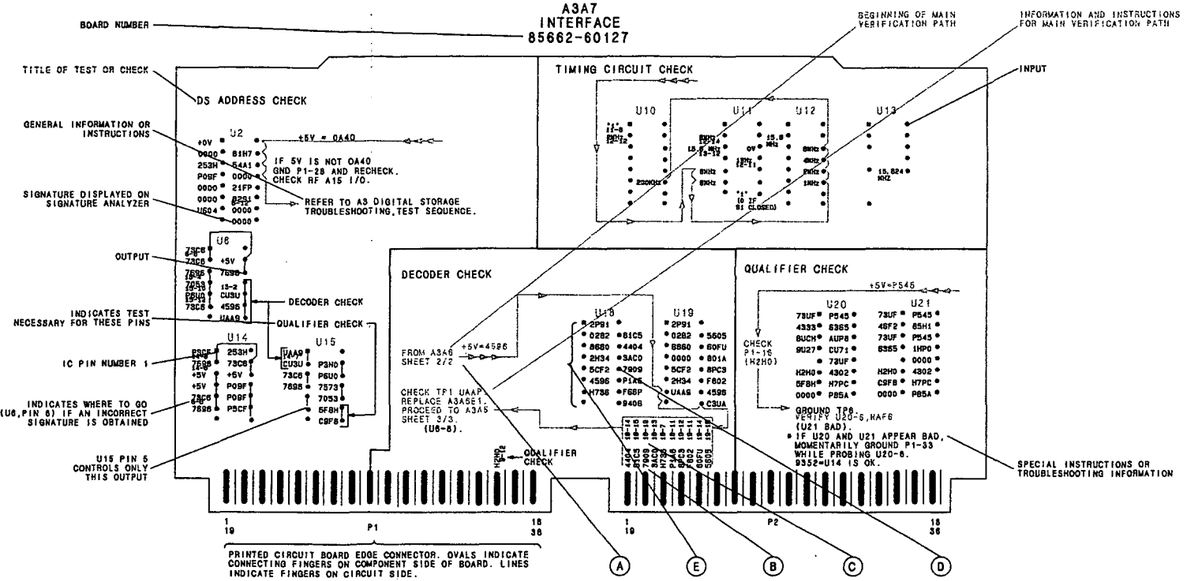
When it is possible to troubleshoot a circuit using signature analysis, a diagram of correct signatures is included with the service sheets for that assembly. The following diagram is included as a guide for the use of signature analysis diagrams.

The A3 Digital Storage section makes extensive use of signature analysis. Since the assemblies are very interactive, troubleshooting should be done on this section as a whole. Special test programs that exercise the circuits under test are used by the A3 section Signature Analysis. An explanation of these test programs is included in the "A3 Digital Storage Troubleshooting" tab uner the title "Digital Storage Signature Analysis/CRT Display Test Programs." Refer to the orange A3 Digital Storage tab for an explanation of the signature analysis troubleshooting strategy.

ManualsPlus.com

SIGNATURE ANALYSIS TROUBLESHOOTING

1. Connect signature analyzer and set controls according to diagram instructions.
2. Set up test configuration as indicated in the diagram, such as jumpering test points or removing test jumpers.
3. Verify the +5Vdc signature for the test being performed as indicated in green lettering on the main verification path (GREEN LINE). This signature can be verified by probing the +5Vdc supply. If +5Vdc signature is incorrect, check equipment settings and connections. Then check for activity at CLOCK, START, and STOP connections using signature analyzer probe. If there is no activity, refer to assembly schematic for troubleshooting.
4. Begin probing the printed circuit board at the beginning of the green line on the diagram. (Point A in the sample.)
5. Probe every point indicated by the green line.
6. If a bad signature is located (Point B in sample), the location is suspected bad. Information printed in red on the troubleshooting diagram (Point C) can help to trace the problem by indicating the source of the signal. For example, "18-12" indicates that the signature originates at U18 pin 12.
7. Check signature at its origin (D). If signature is still bad, go to input pin(s) related to that output (E). A red line connecting the input to the output indicates that the output is affected by only that input. A black line indicates an electrical connection between IC pins. If any input signature is bad, refer to assembly schematic to determine the origin of the input pin .
8. Verify signatures to inputs/outputs connected to a suspected bad location. If signatures are good, the printed circuit board, connectors, and solder joints should be checked for faults. After locating the faulty source, proceed with conventional troubleshooting.
9. Before replacing any suspected defective component, follow instructions printed in red and referenced by an asterisk(*) on the signature analysis troubleshooting diagram.



SIGNATURE ANALYSIS TROUBLESHOOTING DIAGRAMS

THE SIGNATURE ANALYSIS TROUBLESHOOTING DIAGRAMS ARE PRINTED IN THREE COLORS WITH EACH COLOR HAVING A PARTICULAR SIGNIFICANCE. IN GENERAL, BLACK IS USED FOR GENERAL INFORMATION SUCH AS TEST TITLES AND EQUIPMENT CONNECTIONS. GREEN IS USED TO SHOW THE MAIN VERIFICATION PATH, AND RED IS USED FOR INSTRUCTIONS AND PATHS TO FOLLOW WHEN A BAD SIGNATURE HAS BEEN LOCATED ON THE MAIN VERIFICATION PATH. A MORE DETAILED DESCRIPTION FOLLOWS:

BLACK

PAD	IC OUTPUT PIN
DIAMOND	IC OPEN COLLECTOR (3-STATE) OUTPUT PIN
LINE	INDICATES PHYSICAL CONNECTION BETWEEN IC PINS; ALSO INDICATES BORDER BETWEEN TESTS
LETTERING	GENERAL INFORMATION AND INSTRUCTIONS FOR THE TEST
ASTERISK	UNSTABLE OR UNRELIBLE SIGNATURE

GREEN

LINE	MAIN VERIFICATION PATH
LETTERING	INFORMATION AND INSTRUCTIONS FOR MAIN VERIFICATION PATH

RED

PAD	IC INPUT PIN
LINE	USED BETWEEN INPUT AND OUTPUT OF IC TO INDICATE THAT INPUT EFFECTS ONLY THE OUTPUT TO WHICH THE RED LINE IS CONNECTED; USED BETWEEN ICS TO INDICATE PATH TO FOLLOW WHEN A BAD SIGNATURE HAS BEEN LOCATED
LETTERING	TROUBLESHOOTING INFORMATION AND INSTRUCTIONS TO FOLLOW WHEN BAD SIGNATURE HAS BEEN LOCATED

FIGURE 1. SIGNATURE ANALYSIS TROUBLESHOOTING DIAGRAM FORMAT

ManualsPlus.com

IP Overall Block Diagram

ManualsPlus.com

TABLE 1. A3 DIGITAL STORAGE MNEMONIC TABLE

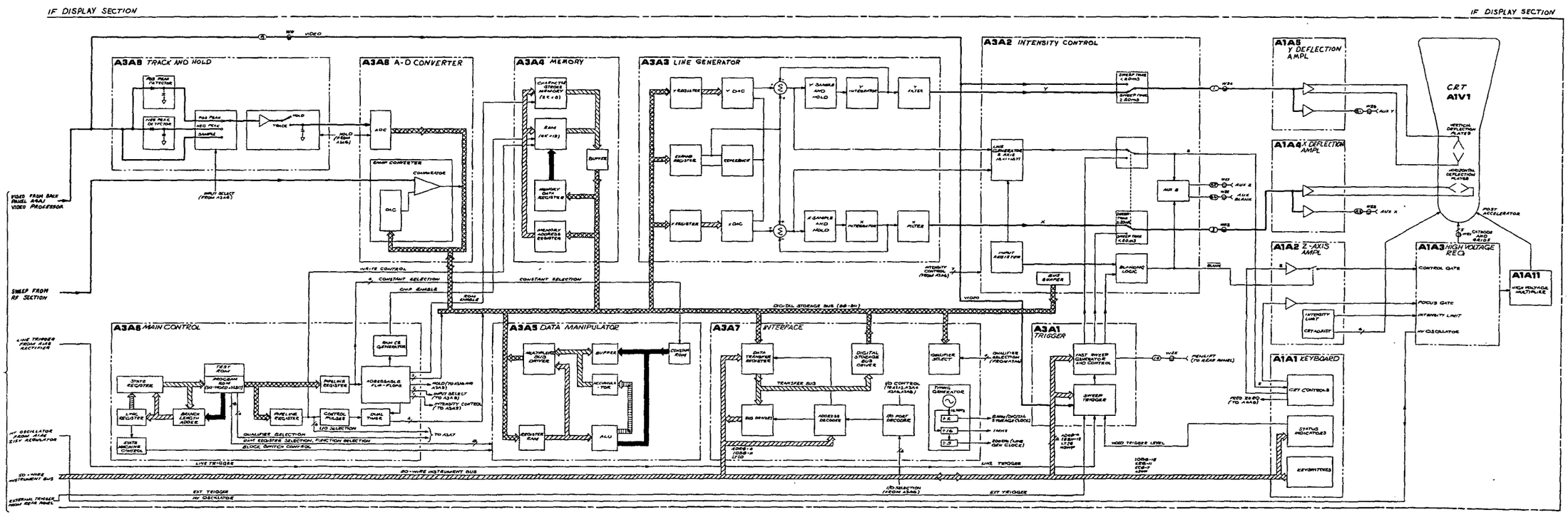
Mnemonic	Description	Mnemonic	Description
18.4MHZ LO	18.4 MHz Local Oscillator Signal	LDRMP	Load Ramp Register
1MHZ	1 MHz ADC Clock	LDSR	LOW = Digital Storage Ready
21.4MHZ	21.4 MHz IF Signal	LDX	Load X Position Register
3MHZ	3 MHz IF Signal	LDY	Load Y Position Register
A LOG	Log Expand Control	LFSEN	LOW = Fast Sweep Enable
AØ – A11	Accumulator Bus Bits Ø through 11	LG1Ø	Linear Gain Controls
A1ØdB	Attenuation Controls	LG2Ø	
A2ØdB		LGCLK	200 kHz Line Generator Clock
A2dB		LGX	Line Generator Horizontal Signal
A4dB		LGY	Line Generator Vertical Signal
A8dB		LINCRSA	Increment Stroke Address
ADRØ	Instrument Bus Address Bits Ø through 3	LINTG	LOW = Integrator Control
ADR3		LL	Long Line
AUX BLANK	Auxiliary Blanking Output	LLGBLANK	LOW = Line Generator Blanking Control
AUX Z	Auxiliary Z Axis Output	LLL	LOW = Long Line
AVdB	Attenuation Control	LMEMEN	LOW = Enable Memory Output
B LOG	Log Expand Control	LOG/LIN	Log/Linear Control
BØ – B11	Digital Storage Bus Data Bits Ø through 11	LQ	LOW = Selected Qualifier
BLØ – BL6	Branch Length Bus Bits Ø through 6	LROMEN	LOW = ROM Enable
BLINK	Blink CRT Display Control	LRSTO	LOW = Reset Trigger Occurred
BRIGHT	Bright CRT Display Control	LRTN	LOW = Enable Interrupt Return
BS	Block Switch Control	LRTRC	LOW = Retrace Signal
BW5	Bandwidth Controls	LTIO	LOW = IF-Display Section I/O Strobe
BW63		LTON	LOW = Turn On
BW68		LTSTA	LOW = Input Test A Data
BW7		LTSTB	LOW = Input Test B Data
CE	Memory Chip Enable	LWRITE	Memory Write Control
CHAR	Character Mode Display Control	LZERO	Output of Zero Check on ALU Result
CLK	8 MHz System Clock	MAØ – MA11	Memory Address Bus Bits Ø through 11
CRT DSBL	CRT Disable Control	NSØ – NS7	Next State Bus Bits Ø through 7
ΔX	Delta X Position	OS1Ø	Offset Gain Controls
ΔY	Delta Y Position	OS2Ø-1	
DIM	Dim CRT Display Control	OS2Ø-2	
DOTEN	Dot Enable	PENLIFT	Recorder PENLIFT Control
FØ – F11	Function Bus Bits Ø through 11	POS	Sign of ALU Results
FCØ – FC3	Data Manipulator Function Control Bits Ø thru 3	PSØ – PS3	I/O Port Selection Bits Ø through 3
FREQ ZERO	Frequency Zero Control	QSØ – QS3	Qualifier Selection Bits Ø through 3
FS	Fast Sweep Mode	RØ – R11	Ram Bus Bits Ø through 11
FSOUT	Fast Sweep Output	RBWA	Resolution Bandwidth Controls
FSZ	Fast Sweep Z Axis	RBWB	
HLDX	Hold X Position (Sample and Hold Control)	RBWC	
HLDY	Hold Y Position (Sample and Hold Control)	RBWD	
HOLD	Track and Hold Control	REC CAL	Recorder Calibrate
HSWP	HIGH = Sweeping	REC ZERO	Recorder Zero
ICLK	Indicator Clock (Front-Panel LEDs)	RMØ – RM2	Ram Register Select Bits Ø through 2
INSELA	Input Selection Bit A	RSEN	Reset Peak Detectors Enable
INSELB	Input Selection Bit B	RSHS	Reset High Sweep
INTG	Integrator Control	SØ – S11	Source Bus Bits Ø through 11
INTR	Interrupt	SØ – S7	State Bus Bits Ø through 7
IOBØ	Instrument Bus Data Bits Ø through 15	SG1Ø	Step Gain Controls
IOB15		SG2Ø-1	
IOC	I/O Port Input/Output Control	SG2Ø-2	
KSØ – KS3	Constant Selection Bits Ø through 3	SMPL	Sample
LØ – L7	Link State Bus Bits Ø through 7	STROK8	Stroke 8 of Current Character
LADC	LOW = Enable ADC Output	SWITCH	Up/Down Converter Control
LBLANK	LOW = Blanking Control	VBWA	Video Bandwidth Controls
LCLK	Inverted CLK	VBWB	
LCLRSA	LOW = Clear Stroke Address	VBWC	
LDCHAR	Load Character Register	VBWD	
LDEXP	Load Expand Register	VIDEO	Video Signal
LDM EN	Data Manipulator Output Enable	X	Horizontal Signal to CRT
LDMAR	Load Memory Address Register	Y	Vertical Signal to CRT
LDMDR	Load Memory Data Register	Z	Intensity Signal to CRT

ManualsPlus.com

TABLE 2. 50-WIRE INSTRUMENT BUS PIN CONNECTION TABLE FOR IF-DISPLAY SECTION

Pin	Signal	Description
1	GND	Ground
2	NC	No Connection
3	IOBØ	Instrument Bus Data Bits Ø – 15
4	IOB1	
5	IOB2	
6	IOB3	
7	IOB4	
8	IOB5	
9	IOB6	
10	IOB7	
11	IOB8	
12	IOB9	
13	IOB10	
14	IOB11	
15	IOB12	
16	IOB13	
17	IOB14	
18	IOB15	
19	NC	No Connection
20	NC	No Connection
21	NC	No Connection
22	HPON	HIGH = IF-Display Section Power ON
23	ADRØ	Instrument Bus Address Bits Ø – 4
24	ADR1	
25	ADR2	
26	ADR3	
27	ADR4	
28	ADR5	Address Bit 5 not used
29	NC	No Connection
30	NC	No Connection
31	KR8	Key Rows 8 – 11
32	KR9	
33	KR10	
34	KR11	
35	KCØ	Key Columns Ø – 7
36	KC1	
37	KC2	
38	KC3	
39	KC4	
40	KC5	
41	KC6	
42	KC7	
43	LSTP	LOW = Stop Processor
44	HSWP	HIGH = Sweeping
45	LSRQ	LOW = Service Request
46	LDSR	LOW = Digital Storage Ready
47	LBIO	LOW = RF Section I/O Strobe
48	GND	Ground
49	LTIO	LOW = IF-Display Section I/O Strobe
50	GND	Ground

ManualsPlus.com



NOTE

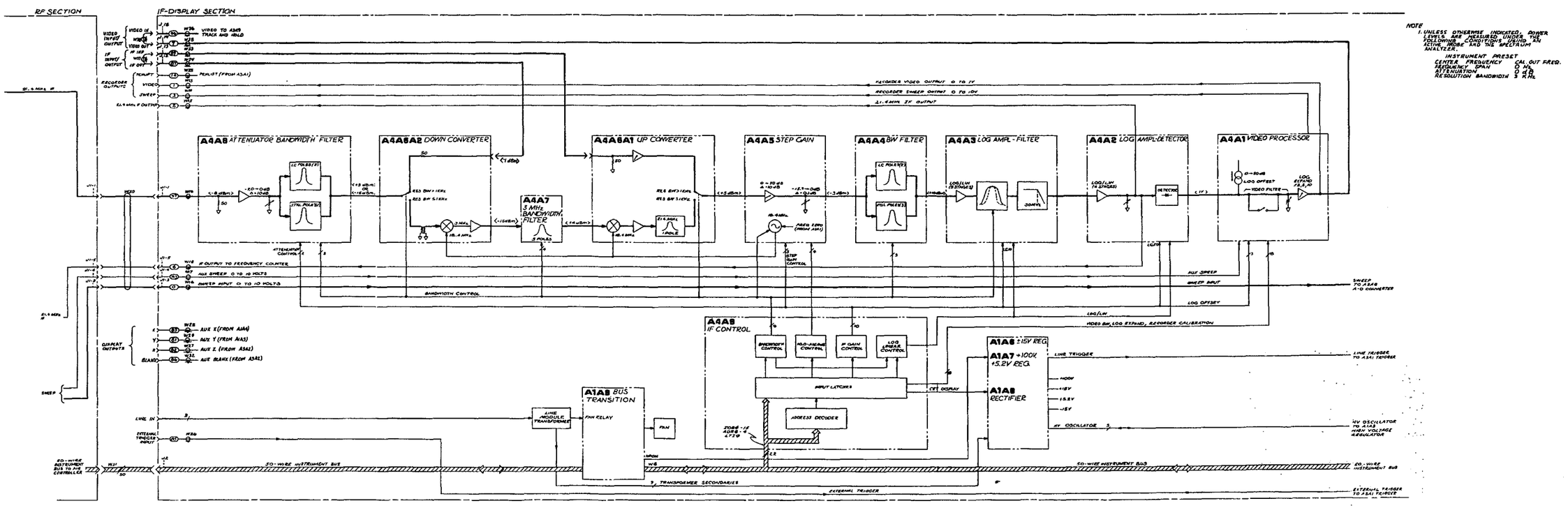
UNLESS OTHERWISE INDICATED, PROBE LEVELS ARE MEASURED UNDER THE FOLLOWING CONDITIONS, USING AN ACTIVE PROBE AND THE SPECTRUM ANALYZER:

INSTRUMENT PRESET

CENTER FREQUENCY 50 MHz
FREQUENCY SPAN 0 Hz
ATTENUATION 0 dB
RESOLUTION BANDWIDTH 3 kHz

FIGURE 1. IF-DISPLAY OVERALL BLOCK DIAGRAM (2 OF 2)
IF Overall Block Diagram -/6

ManualsPlus.com



NOTE
1. UNLESS OTHERWISE INDICATED, POWER LEVELS ARE MEASURED UNDER THE FOLLOWING CONDITIONS FROM AN INSTRUMENT PRESET AND THE SPECTRUM ANALYZER.

INSTRUMENT PRESET	
CENTER FREQUENCY	CAL OUT FREQ.
FREQUENCY SPAN	0 Hz
ATTENUATION	0 dB
RESOLUTION BANDWIDTH	3 MHz

FIGURE 1. IF-DISPLAY OVERALL BLOCK DIAGRAM (1 OF 2)
IF Overall Block Diagram 3/4

ManualsPlus.com

ManualsPlus.com

DISPLAY TROUBLESHOOTING

The Display system consists of four sections:

- Input section: A3A8 Analog-Digital Converter and A3A9 Track and Hold.
- Processor section: A3A4 Memory, A3A5 Data Manipulator, A3A6 Main Control, and A3A7 Interface.
- CRT Driver section: A3A1 Trigger, A3A2 Intensity Control, and A3A3 Line Generator.
- CRT Amplifier section: A1A2 Z Axis Amplifier, A1A4/A5 X/Y Deflection Amplifier, and A1A3 HV Regulator.

Isolation of a malfunction to one of the above sections is done with the use of rear-panel display outputs and the internal test programs.

If the left INSTR CHECK LED is on, a failure has probably occurred in Digital Storage. Refer to the A3 Digital Storage Troubleshooting notes for the correct troubleshooting procedure.

The following paragraphs briefly describe the failure modes and appropriate places to begin the troubleshooting.

Characters Only

If only the characters on the CRT display are affected, the problem most likely exists on the A3A4 Memory. Perform the character ROM check on the SA Diagram.

Graticule and Characters Only

If the graticule and characters are incorrect, but the video information appears to be correct, suspect the System ROMs on A3A6 first. Also the "long POP" test of the RF Section memory should be performed. Refer to the Digital Storage Troubleshooting notes for more information.

Video (Signal) Only

If only the video information is incorrect, suspect A4 IF Section, A3A8, or A3A9. To eliminate the IF, connect the rear-panel SWEEP and VIDEO RECORDER OUTPUTS to an oscilloscope. If the video is correct, then either A3A8 or A3A9 is defective.

Remove cable 0 from A3A9J1. Then jumper A3A8TP1 to A3A9TP3 and push Instrument Preset. This substitutes the sweep ramp for the video input. The CRT display is similar to Figure 7 in the A3A8 tab. If the ramp is incorrect, remove A3A9, jumper A3A8TP1 to A3A8TP6 and push Instrument Preset. The CRT display is the same as Figure 7 in the A3A8 tab. If the display is correct, the problem is in the A3A9 assembly. Refer to A3A9 Troubleshooting procedure. If ramp is incorrect, suspect ADC on A3A8. See the A3A8 Troubleshooting notes to verify this.

Don't rule out the sweep system, especially the ramp converter on A3A8, when troubleshooting video failures. Some ramp converter failures produce CRT displays that are similar to those caused by ADC failures.

ManualsPlus.com

All CRT Information Blank or Distorted

Check X, Y, and Z DISPLAY OUTPUTS on rear panel. If these are correct, the fault is most likely with the X/Y Deflection Amplifiers or Z Axis Amplifier. The following program, which places a dot at the center of the display, is helpful when troubleshooting the Deflection Amplifiers. It balances the voltages in both halves of the circuitry. Press Instrument Preset and key in the following:

```
Blank Trace A
[SHIFT] Recorder Lower Left ..... DSPL ADRS
0 Hz
[SHIFT] Recorder Upper Right ..... WRITE:
1090 Hz ..... Vector Command
512 Hz  }
512 Hz  } ..... X, Y coordinates for center screen
1092 Hz ..... End of display
```

If the X, Y, and Z DISPLAY OUTPUTS produce either distorted or no output, Digital Storage must be tested. Connect a jumper from A3A6TP3 to A3A6TP6 and push A3A7S1. The Digital Storage Test Pattern (Figure 1 of the A3 Digital Storage Troubleshooting tab) results. Refer to the Digital Storage Troubleshooting procedures. If the test pattern is correct, start with the system ROMs check.

If the test pattern is incorrect, verify operation of A3A3 Line Generator and A3A2 Intensity Control. Refer to the troubleshooting information included with the schematics. If A3A3 and A3A2 are working properly, then all of Digital Storage will have to be checked, starting with A3A6.

Whenever the display is blank, and the left INSTR CHECK LED is off, check the A1A6 ±15V Regulator and A1A7 +100V, +5.2V Regulator. The power supply LEDs indicate the presence of voltage but not regulation. Verify operation of A3A2 Intensity Control and A1A2 Z Axis Amplifier. If these are all working properly, carefully examine the A1A3 High Voltage Regulator assembly.

ManualsPlus.com

ManualsPlus.com

A1A1 KEYBOARD, CIRCUIT DESCRIPTION

A1A1 Keyboard consists of three functional blocks: CRT Controls, Keyboard Switches, and Status Indicators.

CRT Controls (A)

The CRT Controls include the following front-panel potentiometers:

- INTENSITY control R1. Sets the level of the input to A1A2 Z Axis Amplifier.
- ALIGN screwdriver adjustment R8. Sets the CRT trace to horizontal.
- FOCUS screwdriver adjustment R2. Focuses the CRT trace.
- FREQ ZERO screwdriver adjustment R3. For resolution bandwidths of 1 kHz or less, adjusts the frequency of the 18.4 MHz oscillator (A4A5 Step Gain) to precisely align the IF passband to 21.400 MHz.

The front-panel STANDBY indicator, LED DS16, which is driven by the PWR DWN signal from A1A6 ±15V Regulator, is activated when line power is applied while the power supply regulators are off.

Keyboard Switches (B)

The Keyboard Switches are a matrix of rows and columns connected to the RF Section keyboard by the 50-wire Instrument Bus W8. When a keyboard switch is activated, A15 Controller recognizes the switch and performs the indicated operation.

Status Indicators (C)

The Status Indicators, LEDs DS1 through DS17, show the states of the various keyboard functions. A15 Controller loads the latches U1 and U2 via the Instrument Bus W8. The latch address is decoded in A3A1 Trigger, which generates the ICLK strobe signal.

ManualsPlus.com

A1A2 Z AXIS AMPLIFIER, CIRCUIT DESCRIPTION

A1A2 Z Axis Amplifier receives from A3A2 Intensity Control two signals for control of the CRT: a 0V – 2V Z signal proportional to the CRT writing rate, and a blanking signal LBLANK.

Amplifier (A)

The Z signal, after attenuation by the front-panel INTENSITY potentiometer A1R1, drives the input stage Q9, Q10. This amplifier supplies a differential current output to the Focus Gate Amplifier and, through a Blanking Switch, to the Control Gate Amplifier.

Blanking Switch (B)
Control Gate Amplifier (C)

The input to the Control Gate Amplifier is a virtual-ground, current-summing junction. Its output voltage is given by:

$$V \approx I_{Q7} R25$$

where I_{Q7} is the current in Q7, which is determined by the Z-axis input when LBLANK is high. When LBLANK is low, Q7 is off, and the output of the Control Gate Amplifier drops to a few volts, blanking the CRT.

Focus Gate Amplifier (D)

The Focus Gate Amplifier supplies a correction voltage to the FOCUS grid of the CRT to compensate for defocusing effects with varying intensity levels. The magnitude of this correction voltage is set by FOCUS GAIN potentiometer R30 and the front-panel FOCUS screwdriver adjustment A1R2. The output stage is identical to that of the Control Gate Amplifier except for the pulse response adjustments (HF GAIN potentiometer R22 and HF TRIM capacitor C10 in the Control Gate Amplifier). These components are fixed in the Focus Gate Amplifier.

CRT Adjustments (E)

The CRT Adjustments set the bias voltage for the various CRT functions. Each adjustment name is indicated on the schematic.

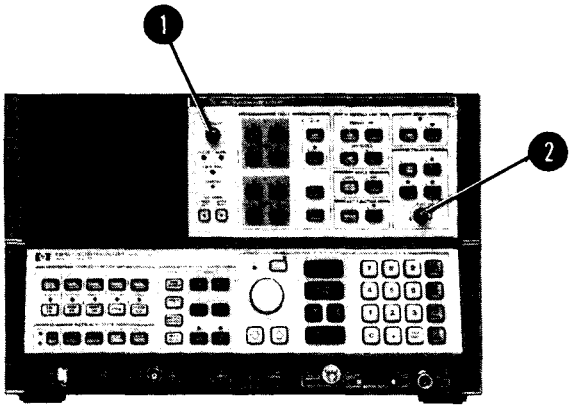
ManualsPlus.com

FRONT-PANEL LED REPLACEMENT

1. Set instrument LINE switch to STANDBY.

2. Loosen set screws in INTENSITY control and Video Trigger LEVEL control knobs ❶ and ❷ using a No. 2 allen wrench (HP Part Number 8710-0892) and remove knobs.

FRONT PANEL VIEW



3. Remove nut from INTENSITY control and from Video Trigger LEVEL control using a 5/16-inch wrench.

4. Front panel is now loose. It may be necessary to pry front panel out slightly using a sharp instrument such as a knife blade along the edge of the panel.

5. Front-panel LEDs are now accessible for replacement. Unsolder leads from rear of printed circuit board. Pull out LED and LED standoff with fingers. Insert new LED in standoff, then mount on board with negative (cathode) lead to square pad on printed circuit board. Refer to illustration on next page for idenification of LED leads.

FIGURE 1. FRONT-PANEL LED REPLACEMENT (1 OF 2)

ManualsPlus.com

FRONT-PANEL LED REPLACEMENT (Cont'd)

6. The RECORDER pushbutton LEDs (3), LOWER LEFT and UPPER RIGHT cannot be replaced as described in Step 5. To replace these LEDs, it is necessary to remove the pushbutton keys and the A1A1 Keyboard:

   a. Remove key housing the defective LED by prying the key outward using a pointed instrument such as a soldering aid.

   b. Remove sub-panel and A1A1 Keyboard by removing the screws (4) from the perimeter and prying forward if necessary with a pointed instrument.

   c. Unsolder the defective LED from the rear of the A1A1 Keyboard.

   d. Loosen the leads from the printed circuit board using a soldering aid and push on the leads to force LED out of switch through the front of the panel.

   e. Insert new LED through the switch from the front of the panel so that leads extend through the printed circuit board at the rear of the Keyboard. Negative (cathode) lead goes to square pad on printed circuit board.

   f. Pull leads of LED with fingers or needle-nose pliers to ensure that LED is far enough inside of the switch to allow the key to be reinstalled.

   g. Solder LED leads to printed circuit board, trim excess lead length, and reassemble front panel.

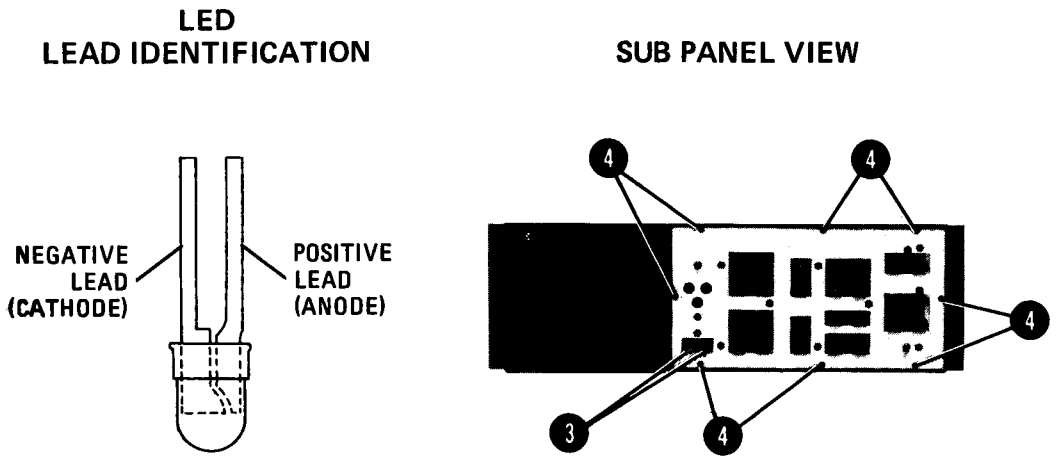
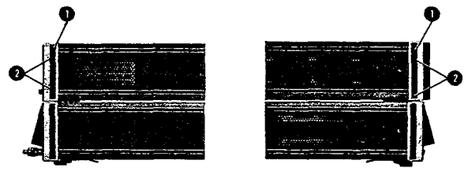


FIGURE 1. FRONT-PANEL LED REPLACEMENT (2 OF 2)

ManualsPlus.com

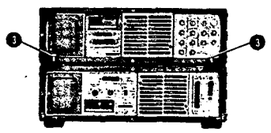
FRONT PANEL REMOVAL AND REPAIR

1. Remove adhesive trim strip (1) from both sides of instrument.
2. Remove two screws (2) located under trim strip (1) as shown in View A.



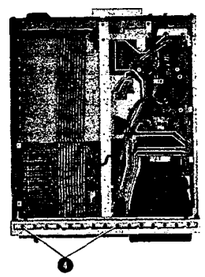
VIEW A

3. Loosen thumbscrews (3) shown in View B used to fasten instrument sections together.
4. Separate instrument sections by holding RF Section in place while pulling forward toward front panel on IF-Display Section.

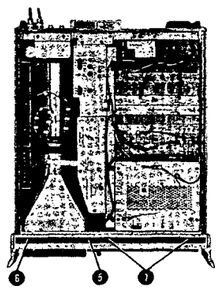


VIEW B

5. After instruments have been separated, lift IF-Display Section off of RF Section and place on left side as shown in View C.
6. Remove two screws (4) from bottom of instrument used to secure front panel to frame.
7. Remove trim strip (5) shown in View D by inserting blade of small flat blade screwdriver into slot (6) and lifting upwards.
8. Remove two screws (7) located under trim strip (5) as shown in View D.

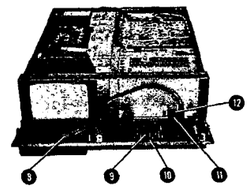


VIEW C



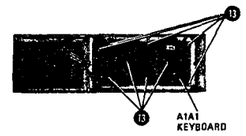
VIEW D

9. Place instrument in position shown in View E and pull front panel forward to position shown.
10. Disconnect cable (8) from A1A10 Motherboard as shown in View E. Disconnect cable (9) at connector (10) and cable (11) at connector (12) on A3A10 Motherboard.



VIEW E

11. Front panel is now loose from instrument as shown in View F.
12. To remove A1A1 Keyboard, remove nine screws (13) used to fasten Keyboard to frame.



VIEW F

FIGURE 2. FRONT PANEL REMOVAL AND REPAIR

ManualsPlus.com

TABLE 1. A1A1, REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1A1	85662-60001	1	1	KEYBOARD ASSEMBLY (INCLUDES W1 AND W9)	28480	85662-60001
	85662-60129	4	1	RESTORED 85662-60001	28480	85662-60129
A1A1C1	0160-4084	8	1	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A1DS1	1990-0485	5	1	LED-LAMP LUM-INT=800UCD IF=30MA-MAX	28480	5082-4984
A1A1DS2	1990-0487	7	17	LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A1A1DS3	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A1A1DS4	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A1A1DS5	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A1A1DS6	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A1A1DS7	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A1A1DS8	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A1A1DS9	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A1A1DS10	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A1A1DS11	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A1A1DS12	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A1A1DS13	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A1A1DS14	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A1A1DS15	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A1A1DS16	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A1A1DS17	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A1A1DS18	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A1A1J1	1251-5269	7	1	CONNECTOR 50-PIN M POST TYPE	28480	1251-5269
A1A1Q1	1854-0404	0	2	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A1Q2	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A1R1	2100-3587	0	1	RESISTOR-VAR CONTROL CP 2K 10% 10CW	28480	2100-3587
A1A1R2	2100-2452	6	3	RESISTOR-TRMR 25K 20% CCP TOP-ADJ 1-TRN	01121	FR253M
A1A1R3	2100-2452	6		RESISTOR-TRMR 25K 20% CCP TOP-ADJ 1-TRN	01121	FR253M
A1A1R4	0698-3157	3	1	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A1A1R5	0757-0420	3	1	RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751 -F
A1A1R6	0757-0442	9	2	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A1R7	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A1R8	2100-2452	6		RESISTOR-TRMR 25K 20% CCP TOP-ADJ 1-TRN	01121	FR253M
A1A1R9	0698-3444	1	3	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A1A1R10	0698-3161	9	2	RESISTOR 38.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3832-F
A1A1R11	0698-3161	9		RESISTOR 38.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3832-F
A1A1R12	2100-3647	3	1	RESISTOR-VAR CONTROL CP 5K 10% LIN	28480	2100-3647
A1A1R13	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A1A1R14	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A1A1R15	0757-0401	0	1	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101 -F
A1A1S1-A1A1S28	5060-9436	7	28	PUSHBUTTON SWITCH P.C. MOUNT	28480	5060-9436
A1A1U1	1820-1730	6	2	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS273N
A1A1U2	1820-1730	6		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS273N
A1A1U3	1810-0203	5	2	NETWORK-RES 8-SIP470.0 OHM X 7	01121	208A471
A1A1U4	1810-0203	5		NETWORK-RES 8-SIP470.0 OHM X 7	01121	208A471
				MISCELLANEOUS PARTS		
	0380-1233	9	16	SPACER-SPECIALTY .450 IN LG; .175 IN OD	00000	ORDER BY DESCRIPTION

ManualsPlus.com

TABLE 2. A1A2, REPLACEABLE PARTS (1 OF 2)

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A1A2	85662-60100	1	1	BOARD ASSEMBLY, Z-AXIS AMPLIFIER	28480	85662-60100
A1A2C1	0180-0374	3	2	CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A1A2C2	0180-0374	3		CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A1A2C3	0160-3670	6	10	CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A2C4	0160-4084	8	5	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A2C5	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A2C6	0160-2204	0	2	CAPACITOR-FXD 100PF +-5% 300VDC MICA	28480	0160-2204
A1A2C7	0160-2308	5	1	CAPACITOR-FXD 36PF +-5% 300VDC MICA	28480	0160-2308
A1A2C8	0160-3670	6		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A2C9	0160-3670	6		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A2C10	0121-0474	0	1	CAPACITOR-V TRMR-PSTN .3-1.5PF 600V	28480	0121-0474
A1A2C11	0160-3670	6		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A2C12	0160-3670	6		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A2C13	0160-3670	6		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A2C14	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A2C15	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A2C16	0180-0269	5	1	CAPACITOR-FXD 1UF+50-10% 150VDC AL	56289	30D105G150BA2
A1A2C17	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A2C18	0160-2204	0		CAPACITOR-FXD 100PF +-5% 300VDC MICA	28480	0160-2204
A1A2C19	0160-3670	6		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A2C20	0160-2238	0	1	CAPACITOR-FXD 1.5PF +-.25PF 500VDC CER	28480	0160-2238
A1A2C21	0160-3670	6		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A2C22	0160-3670	6		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A2C23	0160-3670	6		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A2CR1	1901-0535	9	1	DIODE-SM SIG SCHOTTKY	28480	1901-0535
A1A2CR2	1901-0096	7	2	DIODE-SWITCHING 120V 50MA 100NS	28480	1901-0096
A1A2CR3	1901-0028	5	4	DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A1A2CR4	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A1A2CR5	1901-0096	7		DIODE-SWITCHING 120V 50MA 100NS	28480	1901-0096
A1A2CR6	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A1A2CR7	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A1A2L1	9140-0210	1	3	INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A1A2L2	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A1A2L3	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A1A2Q1	1853-0232	0	2	TRANSISTOR PNP SI TO-39 PD=1W FT=200MHZ	28480	1853-0232
A1A2Q2	1854-0419	7	2	TRANSISTOR NPN SI TO-39 PD=1W FT=200MHZ	28480	1854-0419
A1A2Q3	1853-0232	0		TRANSISTOR PNP SI TO-39 PD=1W FT=200MHZ	28480	1853-0232
A1A2Q4	1853-0007	7	4	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A1A2Q5	1854-0404	0	8	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A2Q6	1854-0419	7		TRANSISTOR NPN SI TO-39 PD=1W FT=200MHZ	28480	1854-0419
A1A2Q7	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A2Q8	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A2Q9	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A1A2Q10	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A1A2Q11	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A1A2Q12	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A2Q13	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A2Q14	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A2Q15	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A2Q16	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A2R1	0757-0394	0	8	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1A2R2	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1A2R3	0757-0442	9	2	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A2R4	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1A2R5	2100-3351	6	2	RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A1A2R6	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1A2R7	0757-0200	7	3	RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A1A2R8	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A1A2R9	0757-0200	7		RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A1A2R10	0757-0441	8	1	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A1A2R11	0698-0085	0	1	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A1A2R12	0757-0443	0	2	RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A1A2R13	0757-0280	3	5	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A2R14	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A2R15	0757-0346	2	1	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A1A2R16	0698-0084	9	3	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A1A2R17	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A2R18	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A1A2R19	0757-0421	4	2	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A1A2R20	0757-0428	1	1	RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F

ManualsPlus.com

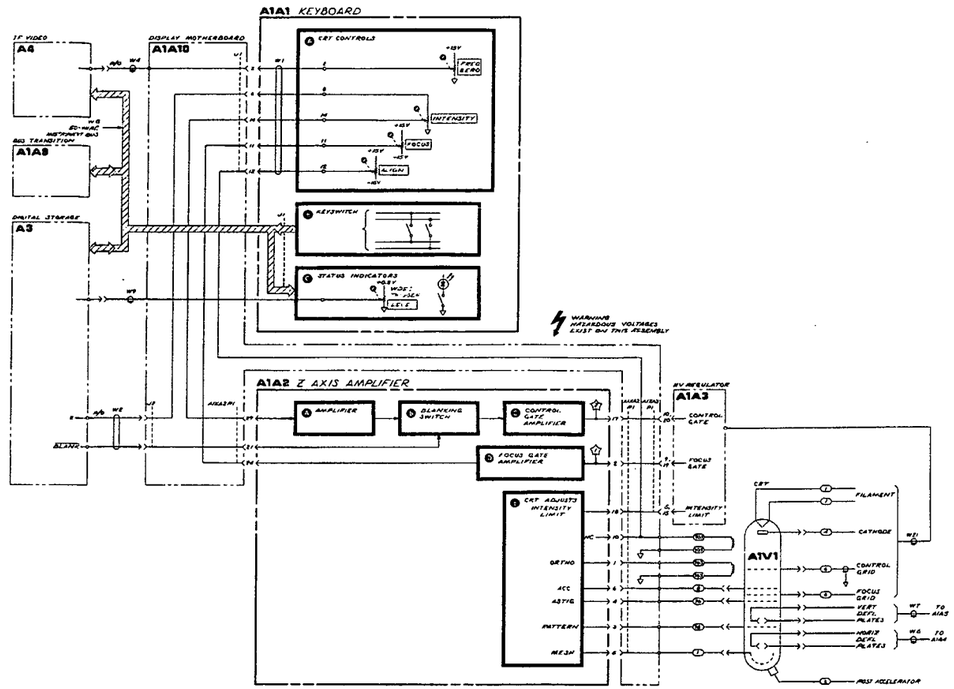
TABLE 2. A1A2, REPLACEABLE PARTS (2 OF 2)

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A1A2R21	0757-0443	0		RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A1A2R22	2100-3207	1	1	RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	28480	2100-3207
A1A2R23	0698-3152	8	2	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A1A2R24	0698-3416	7	2	RESISTOR 21.5K 1% .5W F TC=0+-100	28480	0698-3416
A1A2R25	0757-0841	2	2	RESISTOR 12.1K 1% .5W F TC=0+-100	28480	0757-0841
A1A2R26	0698-3151	7	2	RESISTOR 2.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2871-F
A1A2R27	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1A2R28	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1A2R29	0757-0819	4	2	RESISTOR 909 1% .5W F TC=0+-100	28480	0757-0819
A1A2R30	2100-3351	6		RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A1A2R31	2100-3353	8	1	RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A1A2R32	2100-3355	0	1	RESISTOR-TRMR 100K 10% C SIDE-ADJ 1-TRN	28480	2100-3355
A1A2R33	0698-3158	4	1	RESISTOR 23.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2372-F
A1A2R34	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A2R35	2100-3354	9	2	RESISTOR-TRMR 50K 10% C SIDE-ADJ 1-TRN	28480	2100-3354
A1A2R36	2100-3354	9		RESISTOR-TRMR 50K 10% C SIDE-ADJ 1-TRN	28480	2100-3354
A1A2R37	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A1A2R38	0698-3440	7	2	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A1A2R39	0757-0274	5	1	RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1211-F
A1A2R40	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A1A2R41	0757-0200	7		RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A1A2R42	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A1A2R43	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A2R44	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A2R45	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A1A2R46	0698-3416	7		RESISTOR 21.5K 1% .5W F TC=0+-100	28480	0698-3416
A1A2R47	0757-0841	2		RESISTOR 12.1K 1% .5W F TC=0+-100	28480	0757-0841
A1A2R48	0698-3151	7		RESISTOR 2.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2871-F
A1A2R49	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1A2R50	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1A2R51	0757-0819	4		RESISTOR 909 1% .5W F TC=0+-100	28480	0757-0819
A1A2TP1	0360-0535	0	3	TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A1A2TP2	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A1A2TP3	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A1A2VR1	1902-3333	3	1	DIODE-ZNR 46.4V 5% DO-7 PD=.4W	28480	1902-3333
A1A2VR2	1902-3357	1	1	DIODE-ZNR 56.2V 5% DO-7 PD=.4W TC=+.081%	28480	1902-3357
A1A2VR3	1902-0049	2	1	DIODE-ZNR 6.19V 5% DO-35 PD=.4W	28480	1902-0049
				MISCELLANEOUS PARTS		
	5000-9043	6	1	PIN: PC, BOARD EXTRACTOR	28480	5000-9043
	5040-6843	2	1	EXTRACTOR, PC BOARD	28480	5040-6843

ManualsPlus.com

FIGURE 1. A7 DISPLAY SECTION BLOCK DIAGRAM

ManualsPlus.com



A1A1
A1A2

FIGURE 3. A1A1 KEYBOARD AND A1A2 Z AXIS AMPLIFIER, BLOCK DIAGRAM

ManualsPlus.com

A1
FRONT PANEL

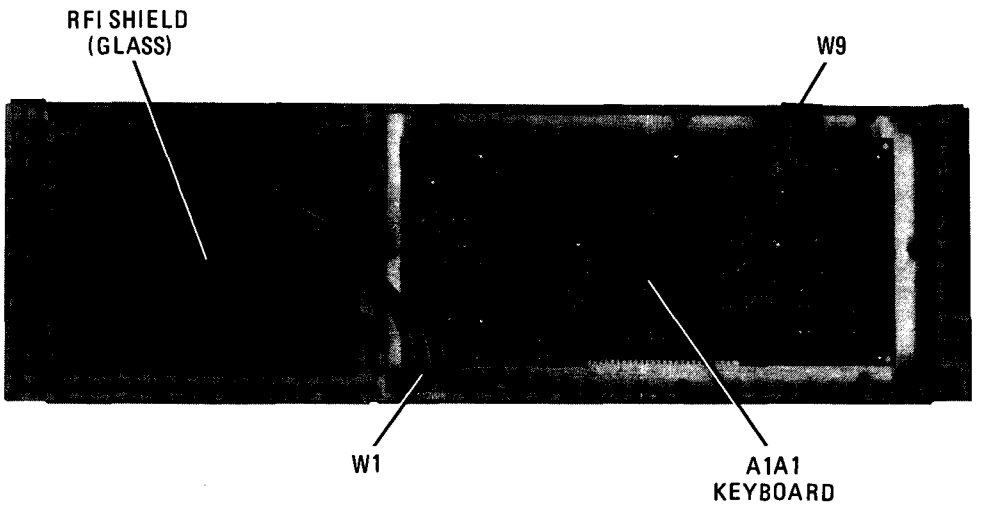


FIGURE 4. A1 FRONT PANEL, ASSEMBLY AND COMPONENT LOCATIONS

ManualsPlus.com

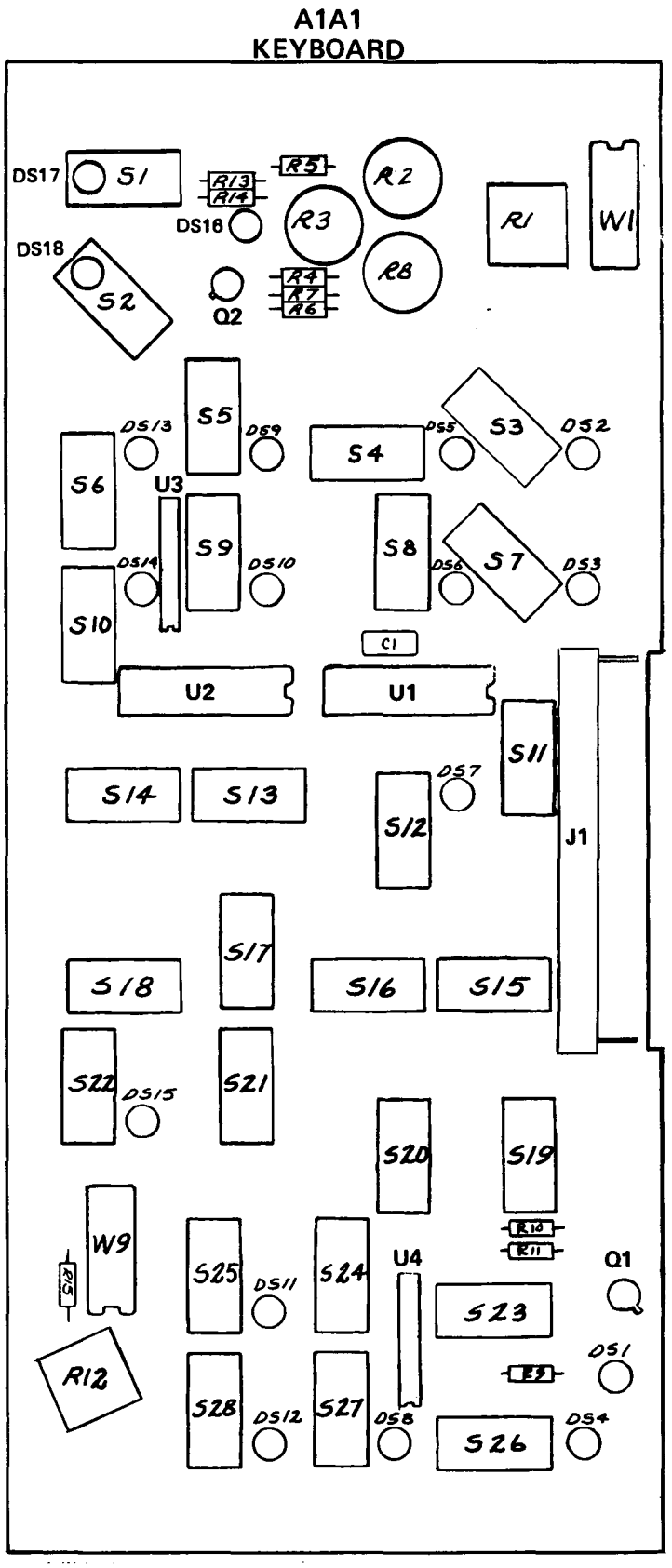


FIGURE 5. A1A1 KEYBOARD, COMPONENT LOCATIONS

ManualsPlus.com

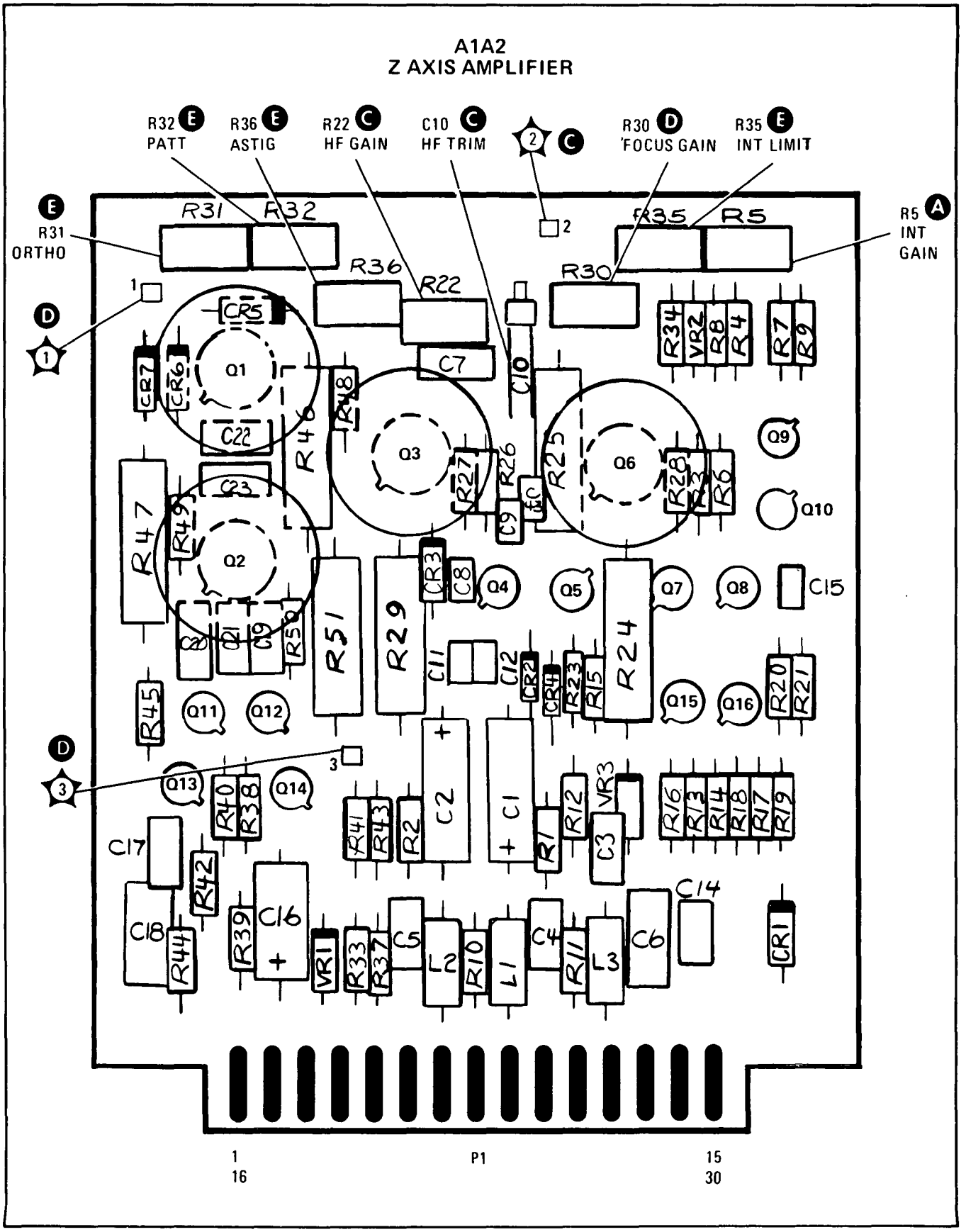


FIGURE 6. A1A2 Z AXIS AMPLIFIER, COMPONENT LOCATIONS

ManualsPlus.com

IF-DISPLAY SECTION

A1A1 KEYBOARD
85662-60001

Ⓐ CRT CONTROLS

Ⓑ KEYBOARD SWITCHES

Ⓒ STATUS INDICATORS

A1A2 Z AXIS AMPLIFIER
85662-60100

P1 Pin	SIGNAL	TO/FROM	FUNCTION BLOCK
1	ORTHO	A1V1	E
10	GND		F
9	FOCUS GATE	A1A2	D
17	CONTROL GATE	A1A2	C
3	PATTERN INTENSITY LIMIT	A1V1	E
18		A1A2	E
15	GND		F
6	WEHN	A1V1	E
20	GND		F
8	ACC	A1V1	E
21	LBLANK	A1A2	B
7	-15V		F
22	NC		
5	GND		F
23	GND		F
9	+15V		F
24	FOCUS	A1A1	D
12	TRACE ALIGN	NC	
25	NC		
11	GND		F
26	GND		F
13	+100V		F
27	GND		F
14	GND		F
28	Z-AXIS	A1A1	A
16	GND		F
30	GND		F

Ⓑ BLANKING SWITCH

Ⓐ AMPLIFIER

Ⓒ CONTROL GATE AMPLIFIER

Ⓓ FOCUS GATE AMPLIFIER

Ⓔ POWER SUPPLIES

Ⓔ CRT ADJUSTMENTS

WARNING
HAZARDOUS VOLTAGES EXIST ON THIS ASSEMBLY

A1A1
A1A2

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (UF) INDUCTANCE IS IN MICROHENRIES (UH)
3. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE OR TOP AND EXIT AT RIGHT SIDE OR BOTTOM OF FUNCTION BLOCKS.
4. MNEMONIC TABLE:

MNEMONIC	DESCRIPTION
ERTHO	ORTHOGONAL
ACC	ACCELERATION
ASTIG	ASTIGMATISM
2	AUXILLARY 2 OUTPUT
LBLANK	BLKN. CRT BEAM BLANK(ING)
Z-AXIS	INTENSITY SIGNAL
SCLK	INDICATOR CLOCK (FRONT PANEL LEDS)

5. TEST POINT WAVEFORM ASSUME INSTRUMENT PRESET CONDITION. ACTUAL AMPLITUDE OF SIGNALS IS DETERMINED BY SETTING OF ASSOC INTENSITY CONTROL.
6. 50-PINS INSTRUMENT BUS, MNEMONIC/PIN NUMBER INDEX.

PIN	SIGNAL	DESCRIPTION
1	GND	GROUND
2	NC	NO CONNECTION
3	DIO1	INSTRUMENT BUS DATA BITS 0-15
4	DIO2	
5	DIO3	
6	DIO4	
7	DIO5	
8	DIO6	
9	DIO7	
10	DIO8	
11	DIO9	
12	DIO10	
13	DIO11	
14	DIO12	
15	DIO13	
16	DIO14	
17	DIO15	
18	DIO16	
19	NC	NO CONNECTION
20	NC	NO CONNECTION
21	IMPCM	NO CONNECTION (SEE COMPLETE SECTION FOR CM)
22	ADD0	INSTRUMENT BUS ADDRESS BITS 0-4
23	ADD1	
24	ADD2	
25	ADD3	
26	ADD4	
27	NC	NO CONNECTION
28	NC	NO CONNECTION
29	LKEY	KEY ROWS 0-13
30	KC0	KEY COLUMNS 0-7
31	KC1	
32	KC2	
33	KC3	
34	KC4	
35	KC5	
36	KC6	
37	KC7	
38	LSTP	LOW-STOP PROCESSOR
39	LSDI	LOW-DATA/PINS
40	LSRQ	LOW-SERVICE REQUEST
41	LSRD	LOW-PERIPHERAL STROBE READY
42	LSWR	LOW-WRITE STROBE
43	LSTB	LOW-DISPLAY SECTION I/O STROBE
44	LSTD	STROBE
45	LSTC	DISPLAY SECTION I/O
46	GND	GROUND

7. ▲ INDICATES FACTORY SELECTED COMPONENT. REFER TO SECTION VI FOR RANGE OF VALUES

FIGURE 7. A1A1 KEYBOARD AND A1A2 Z AXIS AMPLIFIER, SCHEMATIC DIAGRAM

ManualsPlus.com

A1A3 HIGH VOLTAGE REGULATOR, CIRCUIT DESCRIPTION

WARNING

The CRT filament potential is connected to the −4000 Vdc cathode potential, which is dangerous to life.

The post-accelerator potential of approximately +18 kV is supplied by High Voltage Multiplier A1A11 (refer to block diagram).

High-Voltage Transformer (A)
High-Voltage Rectifier and Filter (B)

The cathode of CRT A1V1 operates at −4000 Vdc. This voltage is generated by rectifying an ac signal (approximately 30 kHz) on the secondary of High-Voltage Transformer T1. The primary side of T1 is an oscillator circuit located in A1A6 ±15V Regulator. The rectifier circuit consists of CR1 and filter components C1, R3, and C3. The CRT filament voltage of 4.45 Vrms is generated by another secondary winding of T1 and is held at −4000 Vdc by R1.

The cathode voltage is stabilized by a feedback control circuit consisting of R4, C4, and the amplifier circuit in A1A6 ±15V Regulator in conjunction with a primary feedback winding on T1. (Refer to the circuit description of A1A6.) The cathode voltage is set by HV ADJ potentiometer A1A6R32 in the Oscillator Level Control circuit of A1A6.

Control Grid Level Shift (C)

The control grid voltage is provided by generating a bias voltage with respect to the cathode voltage. This bias voltage is generated by a capacitively coupled, clipped sine-wave signal at the junction of C2 and C5. The sine wave is derived from the T1 secondary through R2. The upper clipping level is set by INTENSITY LIMIT adjustment A1A2R35 in A1A2 Z Axis Amplifier. The lower clipping level is set by the output of the Control Gate Amplifier in A1A2. The clipped sine-wave signal is coupled to the control grid circuit through C5, where it is rectified by CR3 and CR4 to generate a dc bias voltage across R7. C6, R10, and C7 are a filter to remove ripple from the bias voltage. C7 also allows fast pulse signals to be coupled directly to the control grid, to maintain response times of 30 nsec or less.

Focus Grid Charge Level Shift (D)

The focus voltage is set by a resistive divider string from the cathode, with an intensity-focus correction bias developed in a manner similar to that of the control grid bias voltage described above. FOCUS LIMIT potentiometer R14 sets the focus grid to approximately −2500 Vdc, and the focus bias is generated by a clipped sine wave at the junction of C9 and C10. This upper clipping level is set by VR2 (+82.5V), and the lower clipping level is set by the FOCUS GATE voltage from A1A2.

ManualsPlus.com

TABLE 1. A1A3, REPLACEABLE PARTS

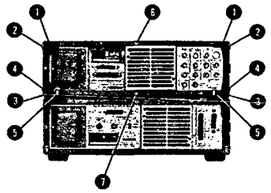
Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1A3	85662-60059	9	1	BOARD ASSEMBLY, HIGH VOLTAGE REGULATOR	28480	85662-60059
A1A3C1	0160-4148	5	2	CAPACITOR-FXD .033UF +-20% 6KVDC	56289	430P333060
A1A3C2	0160-2264	2	2	CAPACITOR-FXD 20PF +-5% 500VDC CER 0+-30	28480	0160-2264
A1A3C3	0160-4148	5		CAPACITOR-FXD .033UF +-20% 6KVDC	56289	430P333060
A1A3C4	0160-3960	7	2	CAPACITOR-FXD 1000PF +-20% 8KVDC	28480	0160-3960
A1A3C5	0160-3960	7		CAPACITOR-FXD 1000PF +-20% 8KVDC	28480	0160-3960
A1A3C6	0160-0678	8	2	CAPACITOR-FXD .01UF +-20% 6KVDC	28480	0160-0678
A1A3C7	0160-0678	8		CAPACITOR-FXD .01UF +-20% 6KVDC	28480	0160-0678
A1A3C8	0160-0543	6	4	CAPACITOR-FXD 4700PF +-20% 4KVDC	28480	0160-0543
A1A3C9	0160-2264	2		CAPACITOR-FXD 20PF +-5% 500VDC CER 0+-30	28480	0160-2264
A1A3C10	0160-0543	6		CAPACITOR-FXD 4700PF +-20% 4KVDC	28480	0160-0543
A1A3C11	0160-0543	6		CAPACITOR-FXD 4700PF +-20% 4KVDC	28480	0160-0543
A1A3C12	0160-3456	6	1	CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A1A3C13	0160-0543	6		CAPACITOR-FXD 4700PF +-20% 4KVDC	28480	0160-0543
A1A3C14	0180-0269	5	1	CAPACITOR-FXD 1UF+50-10% 150VDC AL	56289	30D105G150BA2
A1A3CR1	1901-0683	8	1	DIODE-HV RECT 10KV 5MA 250NS	28480	1901-0683
A1A3CR2	1901-0028	5	8	DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A1A3CR3	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A1A3CR4	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A1A3CR5	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A1A3CR6	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A1A3CR7	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A1A3CR8	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A1A3CR9	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A1A3R1	0698-8737	5	1	RESISTOR 100K 5% .25W CC TC=-400/+800	28480	0698-8737
A1A3R2	0687-3941	0	2	RESISTOR 390K 10% .5W CC TC=0+882	01121	EB3941
A1A3R3	0687-4721	6	1	RESISTOR 4.7K 10% .5W CC TC=0+647	01121	EB4721
A1A3R4	0698-8018	5	1	RESISTOR 30M 1% 3W C TC=0+-100	03888	PVC175-3-T0-3004-F
A1A3R5	0698-8777	3	6	RESISTOR 1K 5% .25W CC TC=-400/+900	28480	0698-8777
A1A3R6	0698-8777	3		RESISTOR 1K 5% .25W CC TC=-400/+900	28480	0698-8777
A1A3R7	0686-1065	3	2	RESISTOR 10M 5% .5W CC TC=0+1059	01121	EB1065
A1A3R8	0698-8777	3		RESISTOR 1K 5% .25W CC TC=-400/+900	28480	0698-8777
A1A3R9	0698-8777	3		RESISTOR 1K 5% .25W CC TC=-400/+900	28480	0698-8777
A1A3R10	0699-1064	9	2	RESISTOR 1M 5% .25W CC TC=-600/+900	28480	0699-1064
A1A3R11	0687-2221	7	1	RESISTOR 2.2K 10% .5W CC TC=0+647	01121	EB2221
A1A3R12	0687-1001	9	1	RESISTOR 10 10% .5W CC TC=0+412	01121	EB1001
A1A3R13	0698-8992	4	1	RESISTOR 8M 2% 1W C TC=0+-250	28480	0698-8992
A1A3R14	2100-3626	8	1	RESISTOR-TRMR 2M 20% C SIDE-ADJ 1-TRN	73138	72XR2M
A1A3R15	0698-8993	5	1	RESISTOR 14M 2% 1W C TC=0+-250	28480	0698-8993
A1A3R16	0698-8768	2	1	RESISTOR 100 5% .25W CC TC=-400/+500	28480	0698-8768
A1A3R17	0687-3941	0		RESISTOR 390K 10% .5W CC TC=0+882	01121	EB3941
A1A3R18	0699-1065	0	1	RESISTOR 10K 5% .25W CC TC=-400/+700	28480	0699-1065
A1A3R19	0686-1065	3		RESISTOR 10M 5% .5W CC TC=0+1059	01121	EB1065
A1A3R20	0698-8777	3		RESISTOR 1K 5% .25W CC TC=-400/+900	28480	0698-8777
A1A3R21	0698-8777	3		RESISTOR 1K 5% .25W CC TC=-400/+900	28480	0698-8777
A1A3R22	0699-1064	9		RESISTOR 1M 5% .25W CC TC=-600/+900	28480	0699-1064
A1A3R23	0687-2231	9	1	RESISTOR 22K 10% .5W CC TC=0+765	01121	EB2231
A1A3R24	0687-6801	7	1	RESISTOR 68 10% .5W CC TC=0+412	01121	EB6801
A1A3T1	01332-61106	4	1	XFMR AY-HV	28480	01332-61106
A1A3TP1-A1A3TP3				NOT ASSIGNED		
A1A3TP4	0360-0535	0	2	TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A1A3TP5	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A1A3V1	2140-0018	0	2	LAMP-GLOW A9A-CT 90VDC 700UA T-2-BULB	00471	A9A-CT
A1A3V2	2140-0018	0		LAMP-GLOW A9A-CT 90VDC 700UA T-2-BULB	00471	A9A-CT
A1A3VR1	1902-0182	4	1	DIODE-ZNR 20.5V 5% DO-35 PD=.4W	28480	1902-0182
A1A3VR2	1902-0197	1	1	DIODE-ZNR 82V 5% PD=1W IR=5UA	28480	1902-0197
				MISCELLANEOUS PARTS		
	85662-00068	4	1	SUPPORT BRACKET	28480	85662-00068

ManualsPlus.com

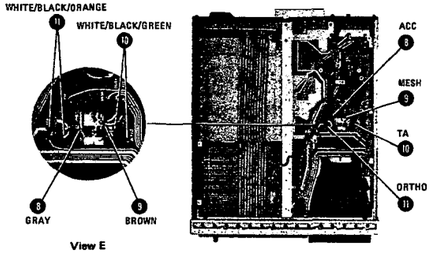
CRT REPLACEMENT

REMOVAL

1. Remove feet (1) from rear of instrument by removing screws (2) shown in View A. Remove feet (3) by removing screws (4) and loosening thumbscrews (5).
2. Separate instruments by holding RF Section in place and pulling forward toward front panel on IF-Display Section.
3. When instruments have been seaparated, remove top cover form IF-Diaplay Section by loosening screw (6) and remove bottom cover by loosening screw (7).
4. Turn instrument upside down as shown in View B. Disconnect wire (8) ACC and wire (9) MESH from neck of CRT. Disconnect wires (10) TA and wires (11) ORTHO from A1A10 Motherboard.
5. Turn instrument over as shown in View C. Unplug high voltage cable at connector (12). Remove wires (13) from neck of CRT, noting location of connections for reconnection to new CRT.
6. Loosen two screws (14) in CRT clamp. (It is not necessary to remove these screws; CRT can be removed if they have been loosened.) It may be necessary to remove cover (15) by removing screws (16) to gain access to clamp screw (14) next to cover.
7. CRT is now loose and can be removed. It is necessary to remove the front panel to remove the CRT from the instrument. Refer to Figure 2 of the A1A1/A1A2 assemblies tab for the procedure to remove the front panel.
8. When front panel has been removed, pull CRT out through front of instrument far enough to allow room at rear of CRT to disconnect plug (17) from socket at rear of CRT.
9. When cable has been disconnected from rear of CRT, tube can be removed from instrument by pulling it out through front of instrument.
10. Remove CRT shield from tube by first removing foam spacer at rear of shield between tube socket and shield, then pull tube out of shield.

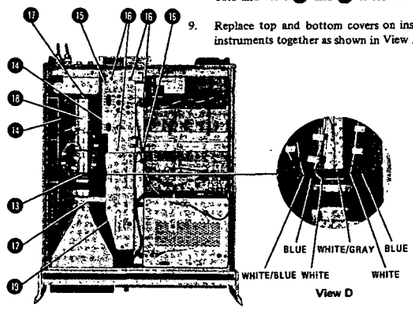


View A



View E

View B



View C

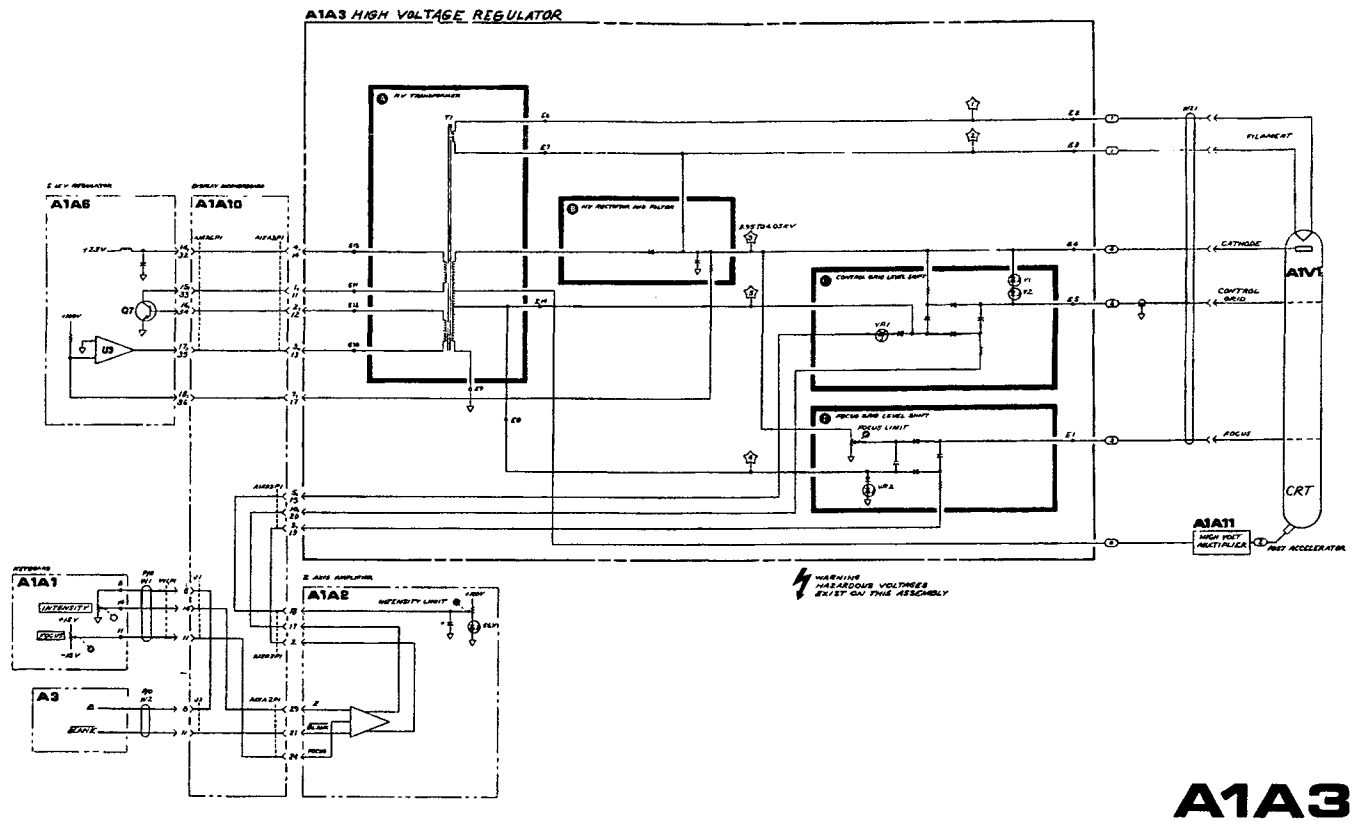
View D

CRT REPLACEMENT

INSTALLATION

1. Install CRT shield on new CRT and insert foam spacer at rear of shield.
2. Insert new CRT into instrument through front panel frame so that rear of tube passes through clamp (18). Make sure grounding strap (19) makes contact with conductive strip on side of CRT. (Refer to View C.)
3. Reconnect plug (17) to socket at rear of new CRT. (Refer to View C.)
4. Replace front panel. Refer to Figure 2 of the A1A1/A1A2 assemblies tab, if necessary.
5. Pull forward towards front panel on rear of CRT to ensure that CRT is properly mated with front panel and then tighten screws (14) in clamp (18). (Refer to View C.)
6. Replace cover (15) and install screws (16) if they were removed during removal of CRT.
7. Connect wires (13) to neck of CRT and connect high voltage cable to CRT at connector (12). (Refer to Views C and D.)
8. Turn instrument over as shown in View B and connect wires (8) and (9) to neck of CRT and wires (10) and (11) to A1A10 Motherboard. (Refer to View E.)
9. Replace top and bottom covers on instrument, install feet (1) and (2), and join instruments together as shown in View A by tightening thumbscrews (5).

FIGURE 1. CATHODE RAY TUBE (CRT) REPLACEMENT



A1A3

FIGURE 2. A1A3 HIGH VOLTAGE REGULATOR, BLOCK DIAGRAM

ManualsPlus.com

ManualsPlus.com

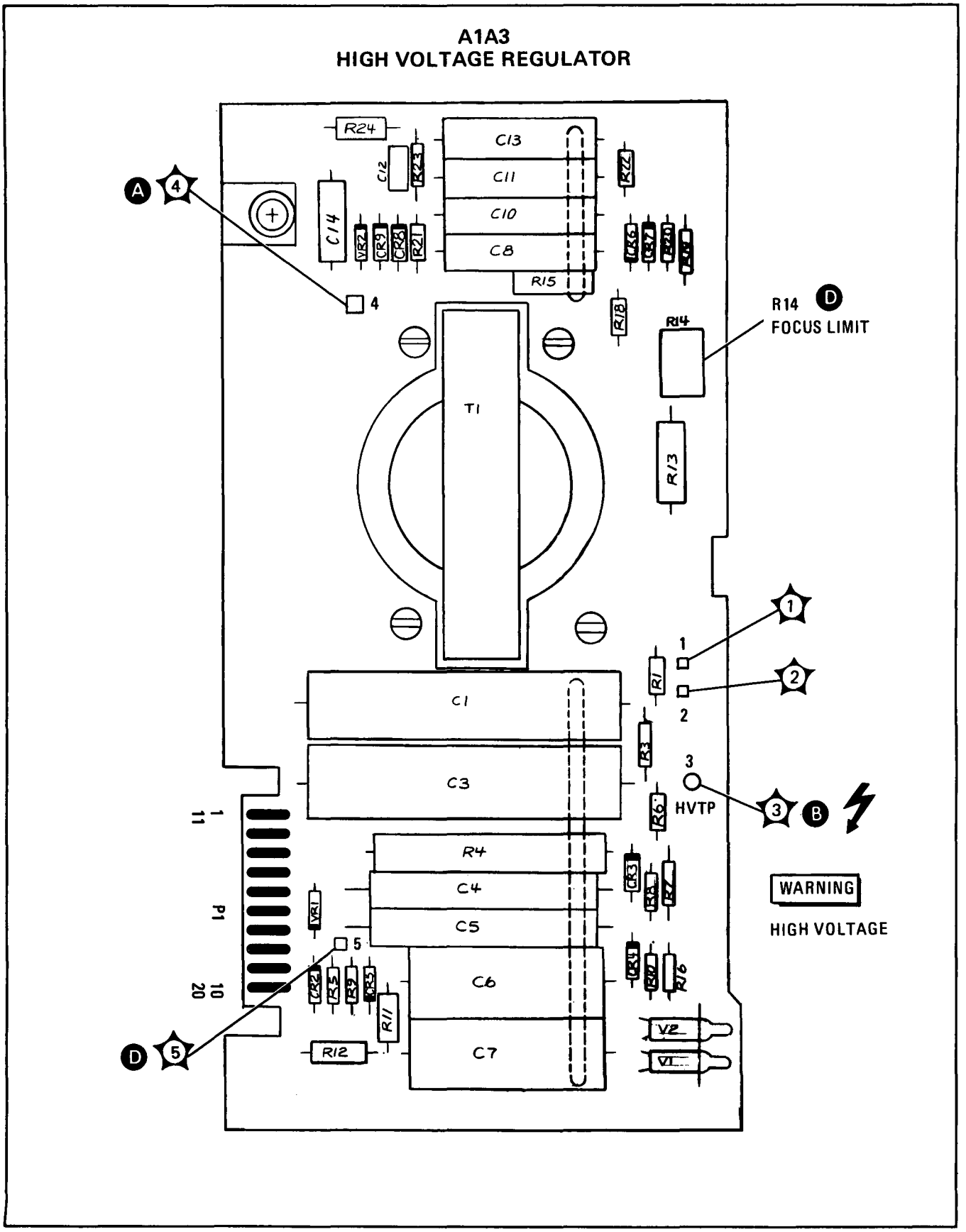
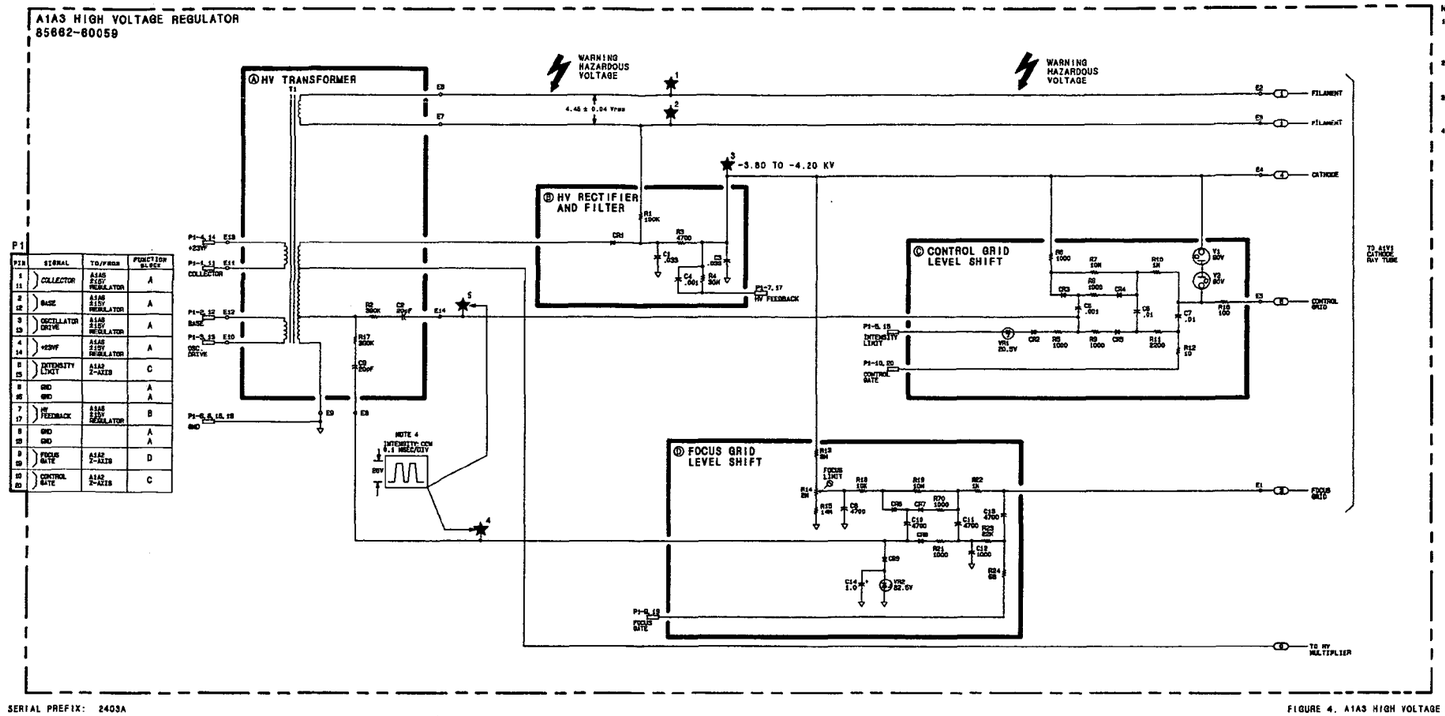


FIGURE 3. A1A3 HIGH VOLTAGE REGULATOR, COMPONENT LOCATIONS

ManualsPlus.com



NOTES:
1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (μF) INDUCTANCE IS IN MICROHENRIES (μH)
3. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE OR TOP AND EXIT AT RIGHT SIDE OR BOTTOM OF FUNCTION BLOCKS.
4. BECAUSE TP4 AND TP5 ARE DIFFICULT TO REACH, USE CAUTION WHEN MAKING MEASUREMENTS AT THESE POINTS.

SERIAL PREFIX: 2403A

FIGURE 4. A1A3 HIGH VOLTAGE REGULATOR, SCHEMATIC DIAGRAM
A1A3 9/10

ManualsPlus.com

A1A4
A1A5 X AND Y DEFLECTION AMPLIFIERS, CIRCUIT DESCRIPTION

A1A4 X Deflection Amplifier and A1A5 Y Deflection Amplifier each consists of a differential input state (Q10, Q15) with current source Q11, two current gain stages (Q9, Q14 and Q8, Q13), and two output differential current-to-voltage amplifiers. A display output amplifier provides rear-panel X and Y DISPLAY OUTPUTS.

Current Amplifier (B)

The Current Amplifier transforms an input voltage change to a differential current change at the collectors of Q10 and Q15. This change is amplified in the following current gain stages Q9 and Q14. POSN adjust R7 sets the CRT trace position, and GAIN adjust R27 sets the CRT trace deflection limits.

The collectors of Q8 and Q13 are virtual-ground, current-summing junctions of the output amplifiers. When a signal is applied so as to increase the current in Q8 (decrease in Q13) Q5 conducts more, turning off Q2 and causing the output (collector of Q2) to rise. Current feedback through R29 supplies the increase in current required by Q8. The analogous operation, with inverted polarity, occurs in the other output amplifier.

Current to Voltage Amplifiers (C) (D)

Emitter followers Q7 and Q12 are feedforward amplifiers, coupling the drive signal directly to the bases of Q1 and Q4, thus improving the frequency response. Trimmer capacitors C10 and C11, along with HF GAIN potentiometer R28, adjust the amplifier frequency response for minimum overshoot and equal risetimes (≈70 nsec).

An input signal of 0 to 2V peak will cause a beam deflection equal to the length of the graticule lines.

Display Output (A)

Display output amplifier U1 provides a 1V maximum rear-panel signal to the X and Y DISPLAY OUTPUTS.

ManualsPlus.com

TABLE 1. A1A4, REPLACEABLE PARTS (1 OF 2)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1A4	85662-60057	7	1	BOARD ASSEMBLY, X-DEFLECTION AMPLIFIER	28480	85662-60057
A1A4C1	0180-0374	3	2	CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A1A4C2	0180-0374	3		CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A1A4C3	0160-4084	8	6	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A4C4	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A4C5	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A4C6	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A4C7	0160-3670	6	3	CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A4C8	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A4C9	0160-3533	0	1	CAPACITOR-FXD 470PF +-5% 300VDC MICA	28480	0160-3533
A1A4C10	0121-0474	0	2	CAPACITOR-V TRMR-PSTN .3-1.5PF 600V	28480	0121-0474
A1A4C11	0121-0474	0		CAPACITOR-V TRMR-PSTN .3-1.5PF 600V	28480	0121-0474
A1A4C12	0160-4182	7	4	CAPACITOR-FXD .01UF +-20% 200VDC CER	72982	8121-M200-X7R-103M
A1A4C13	0160-4182	7		CAPACITOR-FXD .01UF +-20% 200VDC CER	72982	8121-M200-X7R-103M
A1A4C14	0160-4182	7		CAPACITOR-FXD .01UF +-20% 200VDC CER	72982	8121-M200-X7R-103M
A1A4C15	0160-4182	7		CAPACITOR-FXD .01UF +-20% 200VDC CER	72982	8121-M200-X7R-103M
A1A4C16	0160-3670	6		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A4C17	0160-3670	6		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A4C18	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A4CR1	1901-0040	1	2	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A1A4CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A1A4L1	9140-0210	1	3	INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A1A4L2	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A1A4L3	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A1A4Q1	1853-0232	0	2	TRANSISTOR PNP SI TO-39 PD=1W FT=200MHZ	28480	1853-0232
A1A4Q2	1854-0523	4	2	TRANSISTOR NPN SI TO-39 PD=1W FT=150MHZ	28480	1854-0523
A1A4Q3	1854-0523	4		TRANSISTOR NPN SI TO-39 PD=1W FT=150MHZ	28480	1854-0523
A1A4Q4	1853-0232	0		TRANSISTOR PNP SI TO-39 PD=1W FT=200MHZ	28480	1853-0232
A1A4Q5	1853-0007	7	7	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A1A4Q6	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A1A4Q7	1854-0404	0	4	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A4Q8	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A4Q9	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A1A4Q10	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A1A4Q11	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A1A4Q12	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A4Q13	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A4Q14	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A1A4Q15	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A1A4R1	0757-0438	3	3	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A1A4R2	0757-0394	0	3	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1A4R3	0698-3150	6	2	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A1A4R4	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A1A4R5	0698-3155	1	2	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A1A4R6	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1A4R7	2100-3353	8	1	RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A1A4R8	0757-0401	0	4	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1A4R9	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1A4R10	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1A4R11	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1A4R12	0757-0428	1	2	RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A1A4R13	0757-0428	1		RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A1A4R14	0757-0440	7	1	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A1A4R15	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A1A4R16	0698-0084	9	4	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A1A4R17	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A1A4R18	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A1A4R19	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A1A4R20	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A1A4R21	0757-1094	9	1	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A1A4R22	0757-0460	1	2	RESISTOR 61.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6192-F
A1A4R23	0757-0460	1		RESISTOR 61.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6192-F
A1A4R24	0698-3153	9	3	RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A1A4R25	0698-3153	9		RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A1A4R26	0757-0421	4	1	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A1A4R27	2100-3273	1	2	RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	28480	2100-3273
A1A4R28	2100-3273	1		RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	28480	2100-3273
A1A4R29	0698-3415	6	2	RESISTOR 19.6K 1% .5W F TC=0+-100	28480	0698-3415
A1A4R30	0698-3415	6		RESISTOR 19.6K 1% .5W F TC=0+-100	28480	0698-3415
A1A4R31	0757-0439	4	2	RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A1A4R32	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A1A4R33	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A1A4R34	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A1A4R35	0757-0851	4	2	RESISTOR 43.2K 1% .5W F TC=0+-100	28480	0757-0851

ManualsPlus.com

TABLE 1. A1A4, REPLACEABLE PARTS (2 OF 2)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1A4R36	0757-0851	4		RESISTOR 43.2K 1% .5W F TC=0+-100	28480	0757-0851
A1A4R37	0757-0346	2	4	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A1A4R38	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A1A4R39	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A1A4R40	0757-0346	2		RESISTOR 10 1% .125W F TC=0+ 100	24546	C4-1/8-T0-10R0-F
A1A4R41	0757-0873	0	2	RESISTOR 1.62K 1% .5W F TC=0+-100	28480	0757-0873
A1A4R42	0757-0873	0		RESISTOR 1.62K 1% .5W F TC=0+-100	28480	0757-0873
A1A4R43	0698 3153	9		RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A1A4R44	0757 0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1A4TP1	0360-0535	0	3	TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A1A4TP2	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A1A4TP3	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A1A4U1	1826-0821	8	1	IC OP AMP GP TO-99 PKG	27014	LM310H
				MISCELLANEOUS PARTS		
	5040-6843	2	1	EXTRACTOR	28480	5040-6843
	1205-0095	0	4	HEAT SINK	30161	32259

ManualsPlus.com

TABLE 2. A1A5, REPLACEABLE PARTS (1 OF 2)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1A5	05662-60057	7	1	BOARD ASSEMBLY, Y-DEFLECTION AMPLIFIER	28480	05662-60057
A1A5C1	0180-0374	3	2	CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A1A5C2	0180-0374	3		CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A1A5C3	0160-4804	6	6	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4804
A1A5C4	0160-4804	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4804
A1A5C5	0160-4804	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4804
A1A5C6	0160-4804	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4804
A1A5C7	0160-3678	6	3	CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3678
A1A5C8	0160-4804	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4804
A1A5C9	0160-3533	0	1	CAPACITOR-FXD 470PF +-5% 300VDC MICA	28480	0160-3533
A1A5C10	0121-0474	8	2	CAPACITOR-V TRMR-PSTN .3-1.5PF 600V	28480	0121-0474
A1A5C11	0121-0474	8		CAPACITOR-V TRMR-PSTN .3-1.5PF 600V	28480	0121-0474
A1A5C12	0160-4102	7	4	CAPACITOR-FXD .01UF +-20% 200VDC CER	72982	8121-M200-X7R-103M
A1A5C13	0160-4102	7		CAPACITOR-FXD .01UF +-20% 200VDC CER	72982	8121-M200-X7R-103M
A1A5C14	0160-4102	7		CAPACITOR-FXD .01UF +-20% 200VDC CER	72982	8121-M200-X7R-103M
A1A5C15	0160-4102	7		CAPACITOR-FXD .01UF +-20% 200VDC CER	72982	8121-M200-X7R-103M
A1A5C16	0160-3678	6		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3678
A1A5C17	0160-3678	6		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3678
A1A5C18	0160-4804	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4804
A1A5CR1	1901-0040	1	2	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A1A5CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A1A5L1	9140-0210	1	3	INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A1A5L2	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A1A5L3	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A1A5Q1	1853-0232	8	2	TRANSISTOR PNP SI TO-39 PD=1W FT=200MHZ	28480	1853-0232
A1A5Q2	1854-0523	4	2	TRANSISTOR NPN SI TO-39 PD=1W FT=150MHZ	28480	1854-0523
A1A5Q3	1854-0523	4		TRANSISTOR NPN SI TO-39 PD=1W FT=150MHZ	28480	1854-0523
A1A5Q4	1853-0232	8		TRANSISTOR PNP SI TO-39 PD=1W FT=200MHZ	28480	1853-0232
A1A5Q5	1853-0007	7	7	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A1A5Q6	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A1A5Q7	1854-0404	8	4	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A5Q8	1854-0404	8		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A5Q9	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A1A5Q10	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A1A5Q11	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A1A5Q12	1854-0404	8		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A5Q13	1854-0404	8		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A5Q14	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A1A5Q15	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A1A5R1	0757-0438	3	3	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A1A5R2	0757-0394	8	3	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1A5R3	0698-3150	6	2	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A1A5R4	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A1A5R5	0698-3135	1	2	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A1A5R6	0757-0394	8		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1A5R7	2100-3353	8	1	RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	28480	2100-3353
A1A5R8	0757-0401	8	4	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1A5R9	0757-0401	8		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1A5R10	0757-0401	8		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1A5R11	0757-0401	8		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1A5R12	0757-0428	1	2	RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A1A5R13	0757-0428	1		RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A1A5R14	0757-0449	7	1	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A1A5R15	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A1A5R16	0698-0084	9	4	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A1A5R17	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A1A5R18	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A1A5R19	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A1A5R20	0698-3135	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A1A5R21	0757-1094	9	1	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A1A5R22	0757-0460	1	2	RESISTOR 61.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6192-F
A1A5R23	0757-0460	1		RESISTOR 61.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6192-F
A1A5R24	0698-3153	9	3	RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A1A5R25	0698-3153	9		RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A1A5R26	0757-0421	4	1	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A1A5R27	2100-3273	1	2	RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	28480	2100-3273
A1A5R28	2100-3273	1		RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	28480	2100-3273
A1A5R29	0698-3415	6	2	RESISTOR 19.6K 1% .5W F TC=0+-100	28480	0698-3415
A1A5R30	0698-3415	6		RESISTOR 19.6K 1% .5W F TC=0+-100	28480	0698-3415
A1A5R31	0757-0439	4	2	RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A1A5R32	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A1A5R33	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A1A5R34	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A1A5R35	0757-0851	4	2	RESISTOR 43.2K 1% .5W F TC=0+-100	28480	0757-0851

ManualsPlus.com

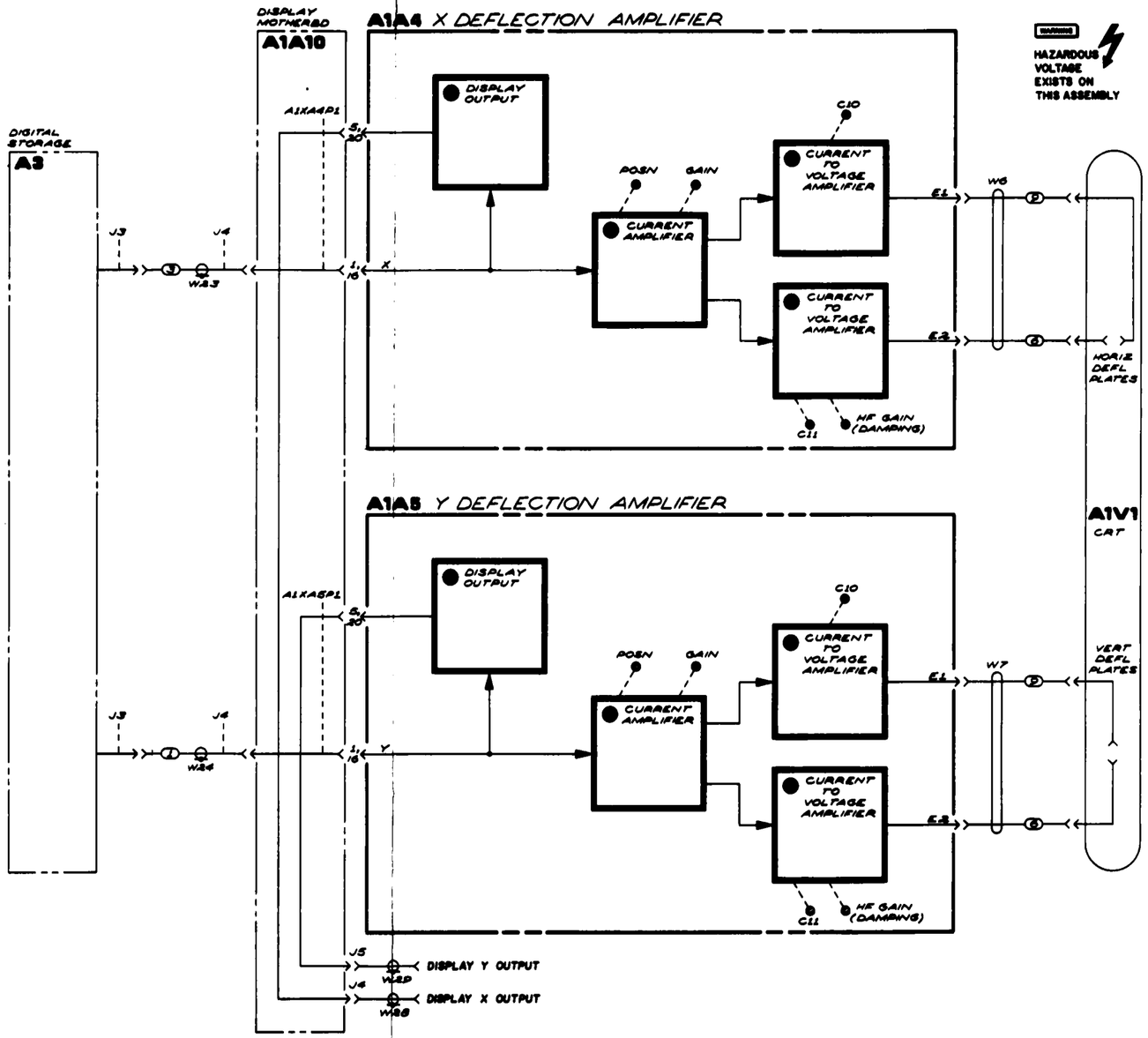
TABLE 2. A1A5, REPLACEABLE PARTS (2 OF 2)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1A5R36	0757-0851	4		RESISTOR 43.2K 1% .5W F TC=0+-100	28480	0757-0851
A1A5R37	0757-0346	2	4	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A1A5R38	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A1A5R39	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A1A5R40	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A1A5R41	0757-0873	0	2	RESISTOR 1.62K 1% .5W F TC=0+-100	28480	0757-0873
A1A5R42	0757-0873	0		RESISTOR 1.62K 1% .5W F TC=0+-100	28480	0757-0873
A1A5R43	0698-3153	9		RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A1A5R44	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1A5TP1	0360-0535	0	3	TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A1A5TP2	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A1A5TP3	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A1A5U1	1826-0021	8	1	IC OP AMP GP TO-99 PKG	27014	LM310H
				MISCELLANEOUS PARTS		
	5040-6843	2	1	EXTRACTOR	28480	5040-6843
	1205-0095	0	4	HEAT SINK	30161	3225B

FIGURE 1. A1A4 X DEFLECTION AMPLIFIER AND A1A5 Y DEFLECTION AMPLIFIER, BLOCK DIAGRAM

ManualsPlus.com

ManualsPlus.com



A1A4

FIGURE 1. A1A4 X DEFLECTION AMPLIFIER AND A1A5 Y DEFLECTION AMPLIFIER, BLOCK DIAGRAM

ManualsPlus.com

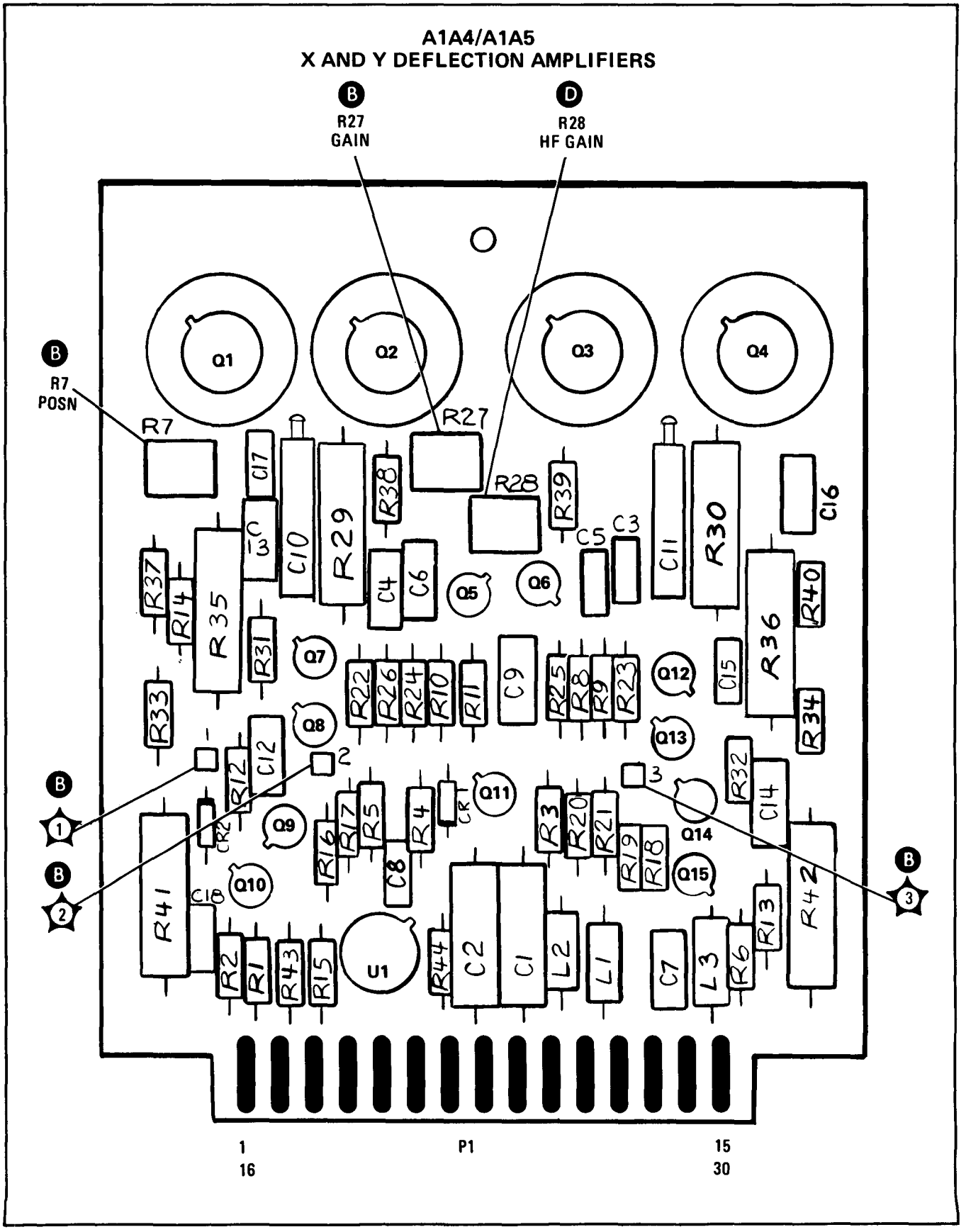


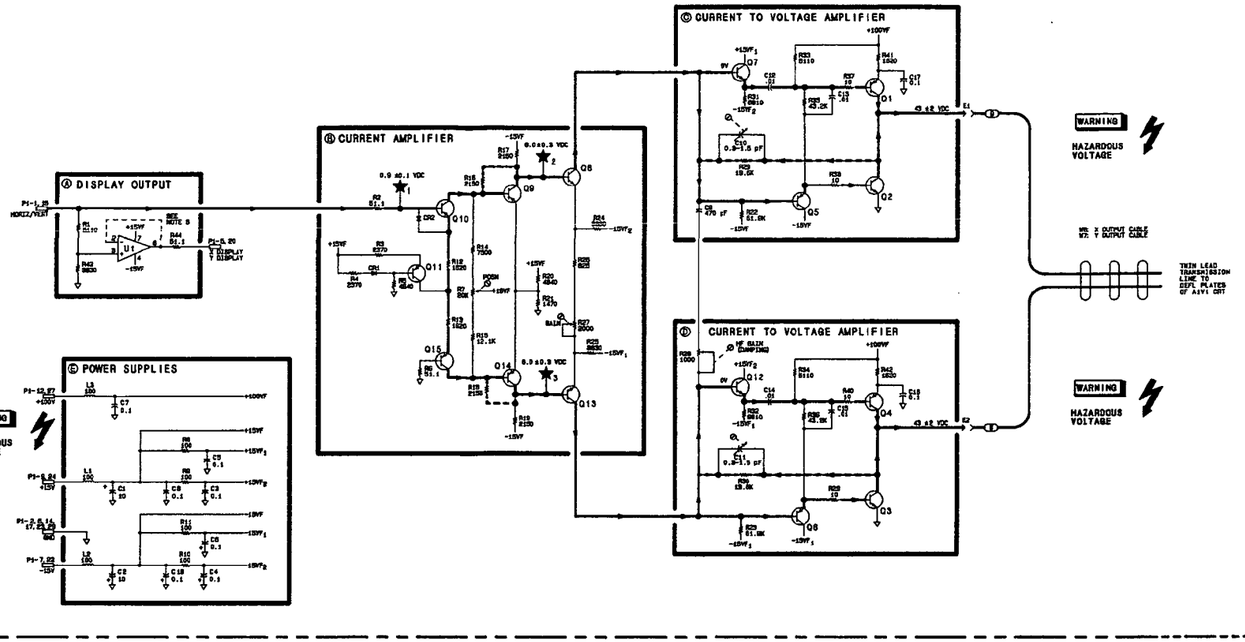
FIGURE 2. A1A4 X DEFLECTION AMPLIFIER AND A1A5 Y DEFLECTION AMPLIFIER, COMPONENT LOCATIONS

ManualsPlus.com

A1A4 X DEFLECTION AMPLIFIER
A1A5 Y DEFLECTION AMPLIFIER
85662-60057

P

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1 35	HORIZ/VERT INPUT	A3A2	A
2 17	GND GND		E
3 18	NC NC		
4 19	NC NC		
5 20	DISPLAY OUT	REAR PANEL	A
6 21	NC NC		
7 22	-15V -15V		E
8 23	GND GND		E
9 24	+15V +15V		E
10 25	NC NC		
11 26	NC NC		
12 27	+100V +100V		E
13 28	NC NC		
14 29	GND GND		E
15 30	NC NC		



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (μF) INDUCTANCE IS IN MICROHENRIES (μH)
3. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE OR TOP AND EXIT AT RIGHT SIDE OR BOTTOM OF FUNCTION BLOCKS.
4. DC TEST VOLTAGES ARE VALID WHEN THE FOLLOWING PROGRAM IS KEYED IN: INSTRUMENT PRESET
   BLANK TRACE 1
   SHIFT LOWER LEFT 0 HZ
   SHIFT UPPER RIGHT
   0 HZ
   512 HZ
   615 HZ
   1562 HZ
5. INVERTING INPUT (PIN 2) IS INTERNALLY CONNECTED TO OUTPUT (PIN 6).

A1A4
A1A5

SERIAL PREFIX: 2403A

FIGURE 3. A1A4 X Deflection Amplifier and A1A5 Y Deflection Amplifier, Schematic Diagram

ManualsPlus.com

A1A6 ±15V REGULATOR, CIRCUIT DESCRIPTION

WARNING

Unregulated voltages as high as +150V are present in the IF-Display Section whenever the power cord is connected to a power source. This condition is annunciated by LED indicator A1A8DS1. Remove the power cord when setting up service procedures.

The IF-Display section is activated by the logic signal HPON (power on), which is connected to the RF Section via wire number 22 of the Instrument Bus. A logic "0" (<+0.8V) holds the instrument in a standby condition with all unregulated supplies active and the regulated supplies turned off. A logic "1" (>+2.0V) turns on the regulators and activates the instrument.

A1A6 ±15V Regulator contains the +15V Regulator, to which all other supplies are referenced, the −15V Regulator, a thermal shutdown circuit, and active components necessary for A1A3 High Voltage Regulator to activate the CRT.

NOTE

Reference is made in the following paragraphs to components in other assemblies: A1A3 High Voltage Regulator and A1A7 +100V, +5.2V Regulator. These components are identified by complete reference designations; for example, A1A6Q7.

+15V Regulator (A)

Q1 and Q2 form a current source from the unregulated (+23V typical) supply. Under active conditions, this current drives Darlington regulator Q5 on until amplifier U1 senses an equal-voltage condition between voltage reference VR1 (U1 pin 3) and the sense input (U1 pin 2). U1 then holds that regulated condition by shunting the drive current through R4.

Foldback current limiting is provided by Q4 and the voltage divider string on its base. This circuit senses an overcurrent condition (higher voltage across R11, R18) and limits the current to a value proportional to the supply voltage.

Overvoltage crowbar circuit CR4 and associated circuitry shorts the output when an overvoltage condition of approximately +18.5V is reached. Zener diode CR3 conducts, turning on CR4, which conducts and blows fuse F1.

The regulator circuit can be shut down by turning on Q3, which shunts the source current to ground.

−15V Regulator (B)

The −15V Regulator is a tracking supply, holding the −15V supply to the same magnitude (inverted polarity) as the +15V supply, through divider resistors R19 and R20. Overvoltage and current limiting circuits are identical to those of the +15V supply.

ManualsPlus.com

Thermal Shutdown (C)

Thermistor R46 (negative temperature coefficient) is mounted to the heat sink of Q5 and Q9. As the heat sink temperature increases to approximately 80°C, the resistance decreases to less than 107Ω, and the voltage across the bridge circuit in which the thermistor is located changes polarity, causing U4 to go high. This turns on transistors Q3 and A1A7Q2, to shut down all power supplies, and transistor A1A1Q2, to light the front-panel STANDBY indicator. Current feedback through CR6 holds the bridge circuit in an unbalanced condition until the temperature drops to about 55°C, when the increased thermistor resistance again switches the bridge polarity. Q10 turns off the supplies by unbalancing the bridge when its input (HPON) is less than about +2.0V.

High-Voltage Oscillator (D)

The collector of A1A6Q7 is connected to the primary winding of transformer A1A3T1, and a feedback winding is connected to the base of Q7. Positive feedback from the feedback winding causes the circuit to oscillate at a frequency (approximately 25 to 30 kHz) determined primarily by the inductance and capacitance of T1. Q7 operates as a Class C amplifier, supplying a large current (approximately 2A peak) over a conduction period of less than one-half cycle.

Oscillator Level Control (E)

Amplifier U3 regulates the dc level of the high-voltage CRT cathode voltage by controlling the base drive to Q7 through the feedback winding. The cathode voltage is sampled via current through A1A3R4, which is compared with a reference current through A1A6R31, R32, and R50 (referenced to the +100V supply) at the input to U3. The output of U3 then holds the base drive at the level necessary to maintain about −4000 Vdc at the cathode of A1V1. Amplifier open loop gain is set by R35, with R34, R36, and C14 limiting the control loop bandwidth to approximately 7 Hz.

C15 supplies surge current for Q7, and L2 controls the conduction time of Q7. CR15 and CR16 allow U3 to generate self-bias sufficient to maintain level control if the −15V supply should fail.

Q8 disables the CRT by removing the +100V reference for the regulator circuit. Q8 is controlled from A4A9 IF Control, which may be addressed via the Instrument Bus.

ManualsPlus.com

A1A7 +100V, +5.2V REGULATOR, CIRCUIT DESCRIPTION

A1A7 +100V, +5.2V Regulator receives +118V unregulated and +9V unregulated inputs from A1A8 Rectifier to provide regulated outputs of +100V and +5.2V.

+100V Regulator (A)

Q7 and associated circuitry form a current source of approximately 3 mA from the unregulated +118V supply. Under active conditions, this current drives Q8 on until amplifier U2 senses an equal voltage condition between the voltage reference (divider resistors R8 and R9 from the +15V supply) and the sense input (U2 pin 2). U2 then holds the regulated condition by shunting current through Q4.

The +100V regulator circuit is shut down by PWR DWN going high, turning on Q2, which shunts the source current to ground.

+5.2V Regulator (B)

The +5.2V Regulator is similar to the −15V Regulator in A1A6 ±15V Regulator. It is referenced to the +15V supply and has overvoltage and current limiting circuits similar to those in the −15V Regulator.

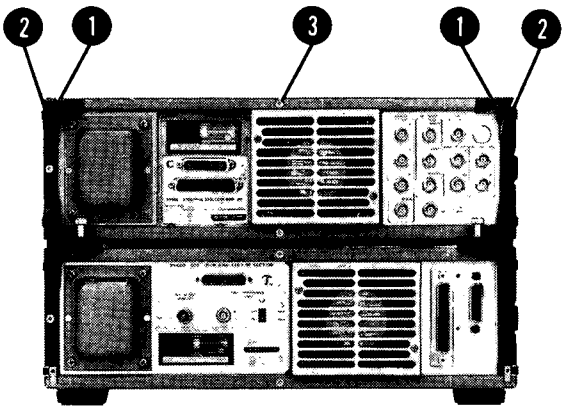
ManualsPlus.com

IF-DISPLAY SECTION INTERNAL FUSE REPLACEMENT

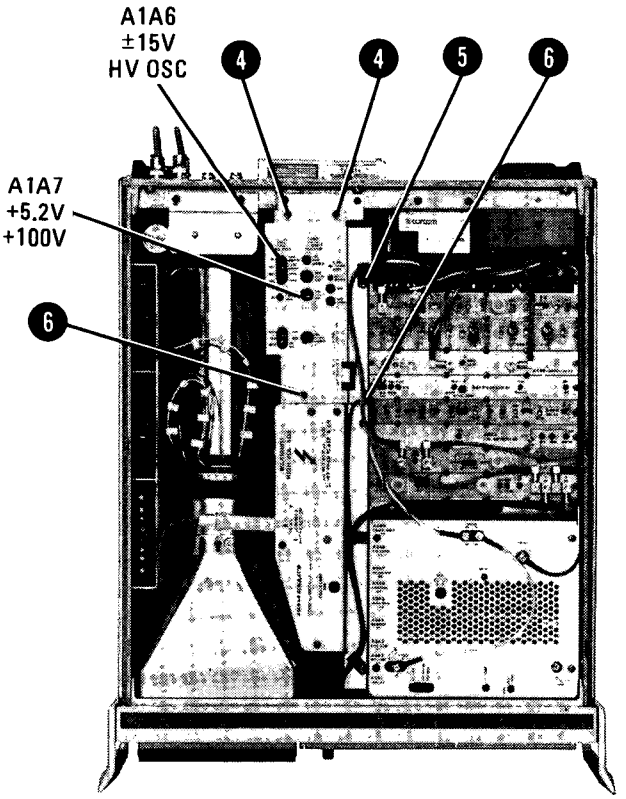
WARNING

Remove AC Line cord from both instruments before proceeding with this procedure.

1. Remove feet (1) from rear of instrument by removing screws (2) shown in View A.
2. Remove top cover from IF-Display Section by loosening screw (3) shown in View A.
3. Remove metal cover from Low Voltage Power Supply section by removing rear screws (4), cable clamp and screw (5), and front screws (6) shown in View B.
4. The fuses for the +15 Vdc, -15 Vdc, and HV oscillator are located on the A1A6 ±15V Regulator and the fuses for the +5.2 Vdc and +100 Vdc supplies are located on the A1A7 +5.2V, +100V Regulator. Locations are shown in View B.



VIEW A



VIEW B

FIGURE 1. IF-DISPLAY SECTION INTERNAL FUSE REPLACEMENT

ManualsPlus.com

TABLE 1. A1A6, REPLACEABLE PARTS (1 OF 2)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1A6	85662-60101	2	1	BOARD ASSEMBLY, +/-15V REGULATOR	28480	85662-60101
A1A6C1	0180-2205	3	1	CAPACITOR-FXD .33UF+-10% 35VDC TA	56289	150D334X9035A2
A1A6C2	0180-0116	1	1	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A1A6C3	0160-2199	2	2	CAPACITOR-FXD 30PF +-5% 300VDC MICA	28480	0160-2199
A1A6C4	0180-1746	5	3	CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A1A6C5	0180-0228	6	1	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A1A6C6	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A1A6C7	0180-0197	8	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A1A6C8	0160-3456	6	1	CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A1A6C9	0160-2199	2		CAPACITOR-FXD 30PF +-5% 300VDC MICA	28480	0160-2199
A1A6C10	0180-0291	3	1	CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A1A6C11	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A1A6C12	0180-0141	2	1	CAPACITOR-FXD 50UF+75-10% 50VDC AL	56289	30D506G050DD2
A1A6C13	0160-0164	7	1	CAPACITOR-FXD .039UF +-10% 200VDC POLYE	28480	0160-0164
A1A6C14	0160-4084	8	3	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A6C15	0160-0166	9	1	CAPACITOR-FXD .068UF +-10% 200VDC POLYE	28480	0160-0166
A1A6C16	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A6C17	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A6CR1				NOT ASSIGNED		
A1A6CR2	1901-0033	2	5	DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A1A6CR3	1902-3224	1	2	DIODE-ZNR 17.8V 5% DO-35 PD=.4W	28480	1902-3224
A1A6CR4	1884-0018	5	2	THYRISTOR-SCR 2N4186 VRRM=200	04713	2N4186
A1A6CR5				NOT ASSIGNED		
A1A6CR6	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A1A6CR7	1902-3224	1		DIODE-ZNR 17.8V 5% DO-35 PD=.4W	28480	1902-3224
A1A6CR8	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A1A6CR9	1884-0018	5		THYRISTOR-SCR 2N4186 VRRM=200	04713	2N4186
A1A6CR10	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A1A6CR11	1901-0200	5	1	DIODE-PWR RECT 100V 1.5A	28480	1901-0200
A1A6CR12				NOT ASSIGNED		
A1A6CR13	1901-0028	5	2	DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A1A6CR14	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A1A6CR15	1901-0040	1	2	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A1A6CR16	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A1A6CR17	1902-0556	6	1	DIODE-ZNR 20V 5% PD=1W IR=5UA	28480	1902-0556
A1A6CR18	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A1A6DS1	1990-0487	7	2	LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A1A6DS2	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A1A6F1	2110-0083	6	1	FUSE 2.5A 250V NTD 1.25X.25 UL	28480	2110-0083
A1A6F2	2110-0002	9	1	FUSE 2A 250V NTD 1.25X.25 UL	75915	312002
A1A6F3	2110-0007	4	1	FUSE 1A 250V TD 1.25X.25 UL	75915	313001
A1A6L1	9140-0171	3	1	INDUCTOR RF-CH-MLD 40UH 10% .296DX.968LG	28480	9140-0171
A1A6L2	9100-1641	0	1	INDUCTOR RF-CH-MLD 240UH 5% .166DX.385LG	28480	9100-1641
A1A6Q1	1853-0281	9	3	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A1A6Q2	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A1A6Q3	1854-0477	7	2	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A1A6Q4	1854-0019	3	2	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A1A6Q5	1854-0611	1	2	TRANSISTOR NPN 2N6055 SI DARL TO-3	04713	2N6055
A1A6Q6	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A1A6Q7	1854-0518	7	1	TRANSISTOR NPN 2N5877 SI TO-3 PD=150W	04713	2N5877
A1A6Q8	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A1A6Q9	1854-0611	1		TRANSISTOR NPN 2N6055 SI DARL TO-3	04713	2N6055
A1A6Q10	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A1A6R1	0757-0442	9	7	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A6R2	0757-0403	2	2	RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-T0-121R-F
A1A6R3	0757-0394	0	1	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A1A6R4	0698-3150	6	1	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A1A6R5	0698-3442	9	1	RESISTOR 237 1% .125W F TC=0+-100	24546	C4-1/8-T0-237R-F
A1A6R6	0757-1094	9	2	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A1A6R7	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A6R8	0698-3247	2	1	RESISTOR 4.53K .25% .125W F TC=0+-50	28480	0698-3247
A1A6R9	2100-3095	5	1	RESISTOR-TRMR 200 10% C SIDE-ADJ 17-TRN	02111	43P201
A1A6R10	0698-6835	0	1	RESISTOR 3.16K .5% .125W F TC=0+-50	24546	NC55-1/8-T2-3161-D
A1A6R11	0811-1669	0	2	RESISTOR 1.8 5% 2W PW TC=0+-400	75042	BWH2-1R8-J
A1A6R12	0757-0280	3	2	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A6R13	0757-0424	7	1	RESISTOR 1.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1101-F
A1A6R14	0683-0275	9	2	RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A1A6R15	0698-3444	1	2	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A1A6R16	0757-0346	2	2	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A1A6R17	0757-0317	7	2	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A1A6R18	0811-1669	0		RESISTOR 1.8 5% 2W PW TC=0+-400	75042	BWH2-1R8-J
A1A6R19	0698-7794	2	2	RESISTOR 10K .25% .125W F TC=0+-100	19701	MF4C1/8-T0-1002-C
A1A6R20	0698-7794	2		RESISTOR 10K .25% .125W F TC=0+-100	19701	MF4C1/8-T0-1002-C

ManualsPlus.com

TABLE 1. A1A6, REPLACEABLE PARTS (2 OF 2)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1A6R21	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A1A6R22	0757-0418	9	2	RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A1A6R23	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A1A6R24	0757-0276	7	1	RESISTOR 61.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-6192-F
A1A6R25	0757-0418	9		RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A1A6R26	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A6R27	0757-0317	7		RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A1A6R28	0811-1661	2	1	RESISTOR .39 5% 2W PW TC=0+-800	75042	BWH2-39/100-J
A1A6R29	0683-0275	9		RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A1A6R30	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A6R31	0698-3243	8	1	RESISTOR 178K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1783-F
A1A6R32	2100-3054	6	1	RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	02111	43P503
A1A6R33	0757-0465	6	2	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A1A6R34	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A1A6R35	0683-2265	1	1	RESISTOR 22M 5% .25W FC TC=-900/+1200	01121	CB2265
A1A6R36	0698-3459	8	1	RESISTOR 383K 1% .125W F TC=0+-100	28480	0698-3459
A1A6R37	0757-0403	2		RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-T0-121R-F
A1A6R38	0698-3446	3	2	RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A1A6R39	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A6R40	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A6R41	0698-3446	3		RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A1A6R42	0757-0290	5	2	RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A1A6R43	0698-4405	6	1	RESISTOR 107 1% .125W F TC=0+-100	24546	C4-1/8-T0-107R-F
A1A6R44	0757-1094	9		RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A1A6R45	0757-0290	5		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A1A6R46	0837-0126	6	1	THERMISTOR DISC 1K-OHM TC=-4.4%/C-DEG	28480	0837-0126
A1A6R47				NOT ASSIGNED		
A1A6R48	0698-3154	0	1	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A1A6R49	0757-0816	1	1	RESISTOR 681 1% .5W F TC=0+-100	28480	0757-0816
A1A6R50	0757-0462	3	1	RESISTOR 75K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7502-F
A1A6R51	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A6R52	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A6TP1	1251-0600	0	7	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A1A6TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A1A6TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A1A6TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A1A6TP5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A1A6TP6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A1A6TP7	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A1A6U1	1820-0223	0	2	IC OP AMP GP TO-99 PKG	3L585	CA301AT
A1A6U2	1820-0223	0		IC OP AMP GP TO-99 PKG	3L585	CA301AT
A1A6U3	1826-0167	3	1	IC OP AMP PRGMBL TO-99 PKG	3L585	CA3094AT
A1A6U4	1826-0026	3	1	IC COMPARATOR PRCN TO-99 PKG	01295	LM311L
A1A6VR1	1902-0686	3	1	DIODE-ZNR 6.2V 2% DO-7 PD=.4W TC=+.002%	04713	1N825
A1A6VR2	1902-0554	4	1	DIODE-ZNR 10V 5% PD=1W IR=10UA	28480	1902-0554
A1A6VR3	1902-3263	8	1	DIODE-ZNR 24.9V 2% DO-35 PD=.4W	28480	1902-3263
				MISCELLANEOUS PARTS		
	4040-0754	1	1	EXTR PC BD BLU	28480	4040-0754

ManualsPlus.com

TABLE 2. A1A7, REPLACEABLE PARTS

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A1A7	85662-60052	2	1	BOARD ASSEMBLY, +100V +5.2V REGULATOR	28480	85662-60052
A1A7C1	0180-0197	8	2	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A1A7C2	0160-3670	6	1	CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A7C3	0160-2199	2	2	CAPACITOR-FXD 30PF +-5% 300VDC MICA	28480	0160-2199
A1A7C4	0180-0228	6	2	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A1A7C5	0160-2199	2		CAPACITOR-FXD 30PF +-5% 300VDC MICA	28480	0160-2199
A1A7C6	0180-0291	3	1	CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A1A7C7	0180-0228	6		CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A1A7C8	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A1A7C9	0160-3449	7	1	CAPACITOR-FXD 2000PF +-10% 250VDC CER	28480	0160-3449
A1A7C10	0160-4084	8	1	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A7CR1	1901-0050	3	2	DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A1A7CR2	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A1A7CR3	1901-0033	2	2	DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A1A7CR4	1902-0513	5	1	DIODE-ZNR 82.5V 2% DO-15 PD=1W TC=+.082%	28480	1902-0513
A1A7CR5	1902-3256	9	1	DIODE-ZNR 23.7V 5% DO-35 PD=.4W	28480	1902-3256
A1A7CR6	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A1A7CR7	1902-0049	2	1	DIODE-ZNR 6.19V 5% DO-35 PD=.4W	28480	1902-0049
A1A7CR8	1884-0018	5	1	THYRISTOR-SCR 2N4186 VRRM=200	04713	2N4186
A1A7CR9	1901-0200	5	1	DIODE-PWR RECT 100V 1.5A	28480	1901-0200
A1A7DS1	1990-0487	7	2	LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A1A7DS2	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A1A7F1	2110-0010	9	1	FUSE 5A 250V NTD 1.25X.25 UL	75915	312005
A1A7F2	2110-0004	1	1	FUSE .25A 250V NTD 1.25X.25 UL	28480	2110-0004
A1A7L1	9100-1641	0	1	INDUCTOR RF-CH-MLD 240UH 5% .166DX.385LG	28480	9100-1641
A1A7MP1	0340-0416	4	2	INSULATOR-XSTR THERMA-FILM	28480	0340-0416
A1A7MP2	0380-0886	6	3	STANDOFF-RVT-ON .1-IN-LG 4-40THD	00000	ORDER BY DESCRIPTION
A1A7MP3-A1A7MP10				NOT ASSIGNED		
A1A7MP11	0570-0034	9	1	SCREW-MACH 4-40 .25-IN-LG RD-HD-SLT	00000	ORDER BY DESCRIPTION
A1A7Q1	1854-0404	0	2	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A7Q2	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A7Q3	1854-0019	3	2	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A1A7Q4	1854-0523	4	1	TRANSISTOR NPN SI TO-39 PD=1W FT=150MHZ	28480	1854-0523
A1A7Q5	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A1A7Q6	1854-0618	8	1	TRANSISTOR NPN SI DARL TO-3 PD=150W	04713	MJ3000
A1A7Q7	1853-0414	0	1	TRANSISTOR PNP 2N6423 SI TO-66 PD=35W	04713	2N6423
A1A7Q8	1854-0311	8	1	TRANSISTOR NPN 2N4240 SI TO-66 PD=35W	3L585	2N4240
A1A7R1	0757-0466	7	1	RESISTOR 110K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1103-F
A1A7R2	0757-0442	9	5	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A7R3	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A7R4	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A7R5	0698-3440	7	2	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A1A7R6	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A1A7R7	0757-0317	7	2	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A1A7R8	0757-0438	3	2	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A1A7R9	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A7R10	0698-7794	2	1	RESISTOR 10K .25% .125W F TC=0+-100	19701	MF4C1/8-T0-1002-C
A1A7R11	0698-8417	8	1	RESISTOR 5.3K .25% .125W F TC=0+-50	19701	MF4C1/8-T2-5301-C
A1A7R12	0757-0418	9	2	RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A1A7R13	0757-0276	7	1	RESISTOR 61.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-6192-F
A1A7R14	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A1A7R15	0757-0274	5	1	RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1211-F
A1A7R16	0698-3427	0	2	RESISTOR 13.3 1% .125W F TC=0+-100	03888	PME55-1/8-T0-13R3-F
A1A7R17	0757-0401	0	1	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A1A7R18	0812-0066	1	2	RESISTOR .33 5% 2W PW TC=0+-800	75042	BWH2-33/100-J
A1A7R19	0698-3444	1	1	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A1A7R20	0683-0275	9	1	RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A1A7R21	0698-0085	0	1	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A1A7R22	0698-3453	2	1	RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A1A7R23	0757-0464	5	1	RESISTOR 90.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9092-F
A1A7R24	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A7R25	0698-3427	0		RESISTOR 13.3 1% .125W F TC=0+-100	03888	PME55-1/8-T0-13R3-F
A1A7R26	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A1A7R27	0757-0418	9		RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A1A7R28	0757-0317	7		RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A1A7R29	0812-0066	1		RESISTOR .33 5% 2W PW TC=0+-800	75042	BWH2-33/100-J
A1A7U1	1820-0223	0	2	IC OP AMP GP TO-99 PKG	3L585	CA301AT
A1A7U2	1820-0223	0		IC OP AMP GP TO-99 PKG	3L585	CA301AT
				MISCELLANEOUS PARTS		
	4040-0755	2	1	EXTR-PC BD VIO POLYC .062-BD-THKNS	28480	4040-0755

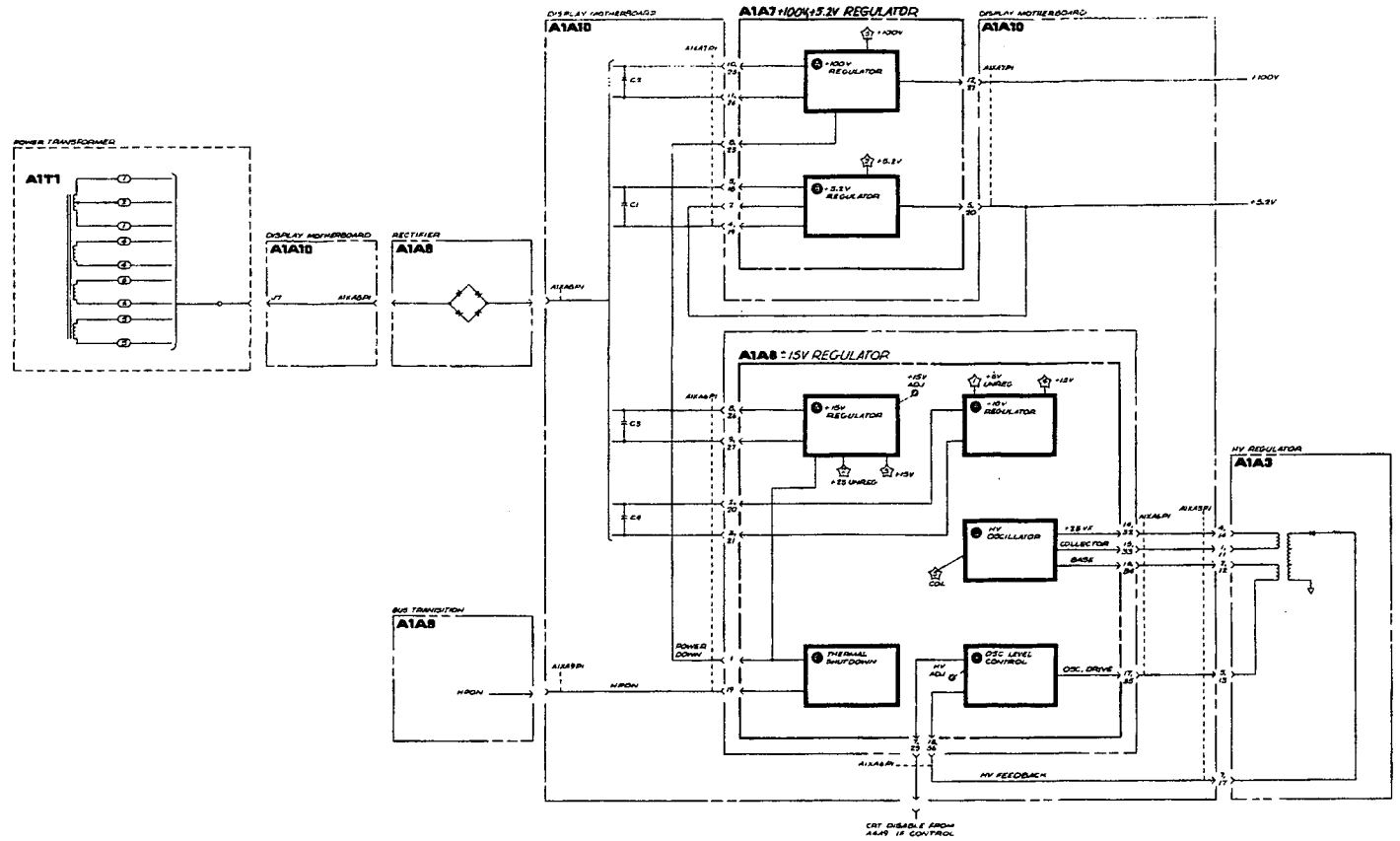


FIGURE 2. A1A8 ±15V REGULATOR AND A1A7 +100V, +5.2V REGULATOR, BLOCK DIAGRAM

ManualsPlus.com

ManualsPlus.com

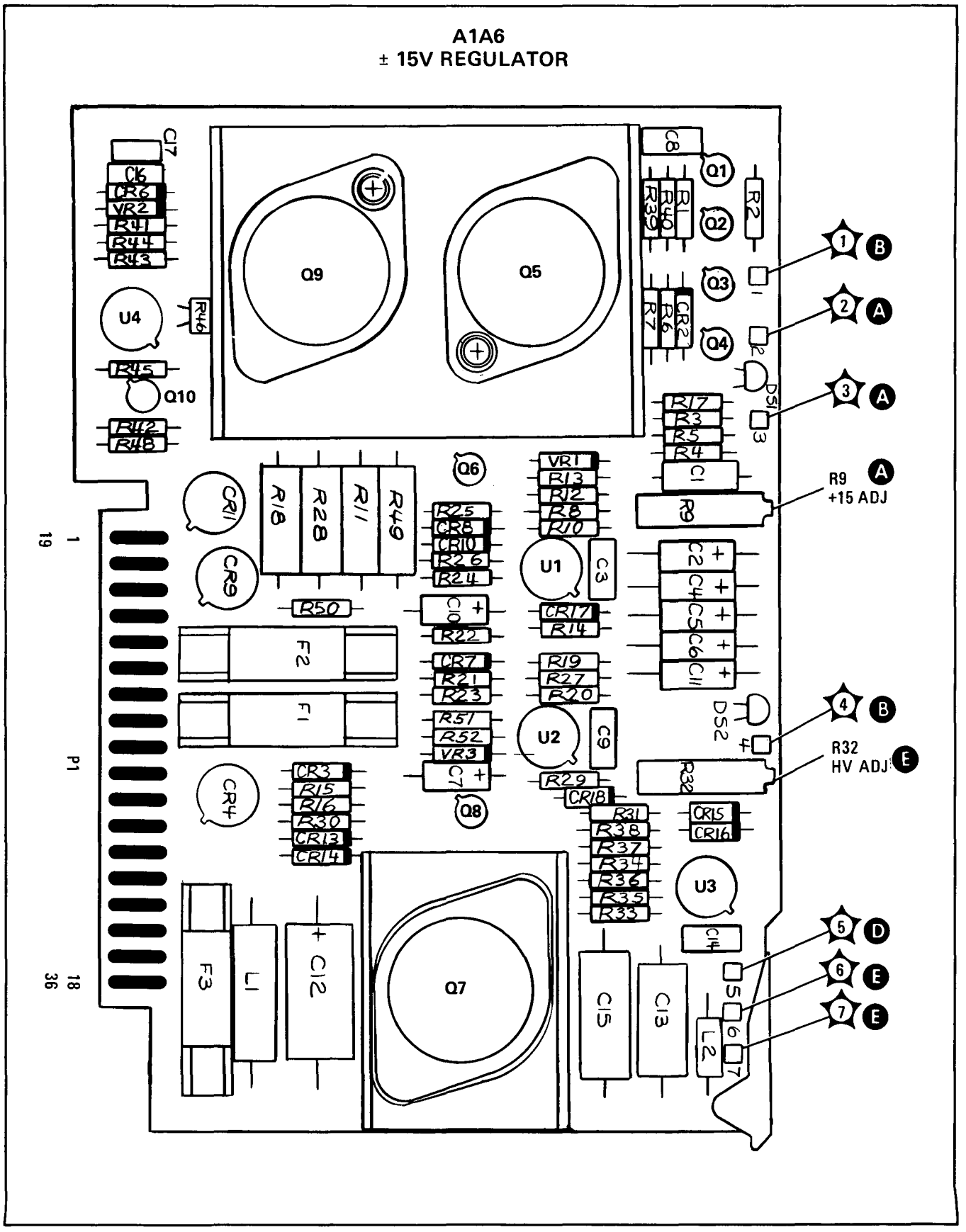


FIGURE 3. A1A6 ± 15V REGULATOR, COMPONENT LOCATIONS

ManualsPlus.com

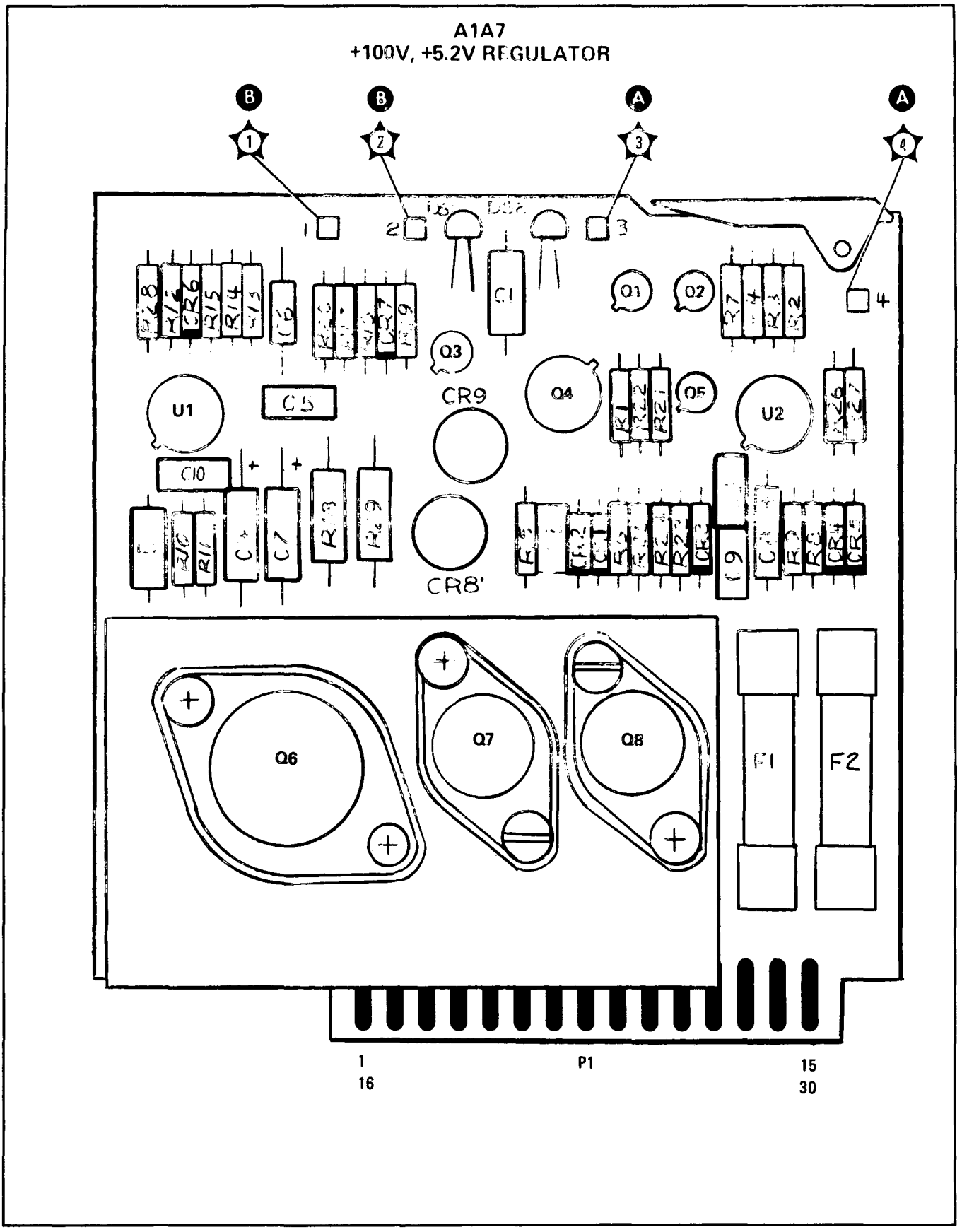


FIGURE 4. A1A7 + 100V, + 5.2V REGULATOR, COMPONENT LOCATIONS

ManualsPlus.com

IF-DISPLAY SECTION

A1A6 +15V REGULATOR
85662-80101

P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	PWR DWN	A1A7	C
18	RPWR	A1A7	C
2	+8V UNREG	A1A10	B
20	+8V UNREG	A1A10	B
3	-15V SENSE	A1A10	B
21	-15V SENSE	A1A10	B
4	+100V		B
22	+100V		B
5	+15V		A
23	+15V		A
6	ENC		B
24	ENC		B
7	DRY CONN.	A4A8	E
25	DRY CONN.	A4A8	E
9	+23V UNREG	A1A10	A
29	+23V UNREG	A1A10	A
9	+15V ENC	A1A10	A
27	+15V ENC	A1A10	A
10	+15V GND		C
28	+15V GND		C
11	+15V ENC		E
26	+15V ENC		E
17	+23V UNREG	A1A10	A
33	+23V UNREG	A1A10	A
43	+15V GND		E
31	+15V GND		E
14	+23VF	A1A3	D
30	+23VF	A1A3	D
13	COLLECTOR	A1A3	D
29	COLLECTOR	A1A3	D
16	BASE	A1A3	D
34	BASE	A1A3	D
37	OSC DRIVE	A1A3	E
36	OSC DRIVE	A1A3	E
12	HV FEEDBACK	A1A3	E
32	HV FEEDBACK	A1A3	E

Ⓐ +15V REGULATOR

Ⓑ -15V REGULATOR

Ⓒ THERMAL SHUTDOWN

Ⓓ HV OSCILLATOR

Ⓔ OSCILLATOR LEVEL CONTROL

WARNING
HAZARDOUS VOLTAGE

SERIAL PREFIX: 2403A

A1A7 +100V, +5.2V REGULATOR
85662-80052

WARNING
HAZARDOUS VOLTAGE

P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	+8V UNREG	NC	
68	+5.2V GND	NC	
2	+8.2V SENSE	P1-3, 23	B
17	+8V UNREG	NC	
3	+8V UNREG	A1A10	B
19	+8V UNREG	A1A10	B
4	+8.2V GND	A1A10	B
18	+8.2V GND	A1A10	B
5	+8.2V	P1-3	B
20	+8.2V	P1-2	B
6	+100V GND	NC	
21	+100V GND	NC	
7	+100V UNREG	NC	
22	+100V UNREG	NC	
8	PWR CNV	A1A8	A
23	PWR CNV	A1A8	A
9	EPROM	NC	
24	EPROM	NC	
10	+18V UNREG	A1A10	A
25	+18V UNREG	A1A10	A
11	+100V GND	A1A10	A
26	+100V GND	A1A10	A
12	+100V		A
27	+100V		A
13	+15V		C
28	+15V		C
14	NC		
29	NC		
15	NC		
30	NC		

Ⓐ +100V REGULATOR

Ⓑ +5.2V REGULATOR

Ⓒ POWER SUPPLIES

WARNING
HAZARDOUS VOLTAGE

SERIAL PREFIX: 2403A

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (μF) INDUCTANCE IS IN MICROHENRIES (μH)
3. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.

WARNING

4. HAZARDOUS VOLTAGE EXISTS ON THIS BOARD.
5. THE TIME CONSTANT OF THE +18V UNREGULATED CIRCUIT IS 20 SECONDS. ALLOW ADEQUATE TIME AFTER THE POWER CORD IS REMOVED FOR THE FILTER CAPACITORS TO DISCHARGE BEFORE SERVICING.

A1A6
A1A7

FIGURE 5. A1A6 +15V REGULATOR AND A1A7 +100V, +5.2V REGULATOR, SCHEMATIC DIAGRAM

ManualsPlus.com

A1A8 RECTIFIER, CIRCUIT DESCRIPTION

WARNING

Because of the high voltage present in this assembly, servicing should be performed only by qualified personnel.

A1A8 Rectifier contains three bridge rectifiers and one full-wave rectifier to provide unregulated power for the IF-Display Section. External power is supplied to the instrument through Line Module FL1 and Power Transformer A1T1.

+9V UNREG

Full-wave rectifier CR7 and CR8 provides an unregulated +9V to A1A7 +100V, +5.2V Regulator. LED DS1 is lit whenever there is power to the transformer.

Test points TP1 and TP2, when jumpered together, cause HPON to go high, turning on the IF-Display Section in the absence of a signal from the RF Section when power is required for troubleshooting.

The LINE TRIGGER voltage is selected as required by A3A1 Trigger.

+118V UNREG

Bridge rectifier U1 provides an unregulated +118V to A1A7.

WARNING

The time constant of the filter capacitor circuit is about 25 seconds. Before servicing, allow adequate time for discharge after line power cable is removed.

+23V UNREG

The +23V unregulated supply, bridge rectifier CR9 through CR12, includes an overvoltage protection circuit. If line power from a 220V/240V source is applied when the Line Voltage Selector is set to 100V/120V, the overvoltage causes CR6 to conduct, turning on CR5 to blow the fuse in the Line Module.

+5V UNREG

Bridge rectifier CR1 through CR4 provides unregulated +5V and −15V to A1A6 ±15V Regulator.

ManualsPlus.com

A1A9 BUS TRANSITION, CIRCUIT DESCRIPTION

A1A9 Bus Transition provides jack J2 (inside front panel) for the 50-wire Instrument Bus, which is routed through the IF-Display Section through a flat ribbon cable W8.

HPON, the IF-Display Section power-on control line (W8 wire 22) is sensed by amplifier Q1 and Q2 to activate fan relay K1, which supplies line power to the cooling fan B1.

The +5.2V supply is connected to the LSTP line (W8 wire 43) through CR1 to halt operation of A15 Controller if there is a supply failure.

ManualsPlus.com

TABLE 1. A1A8, REPLACEABLE PARTS

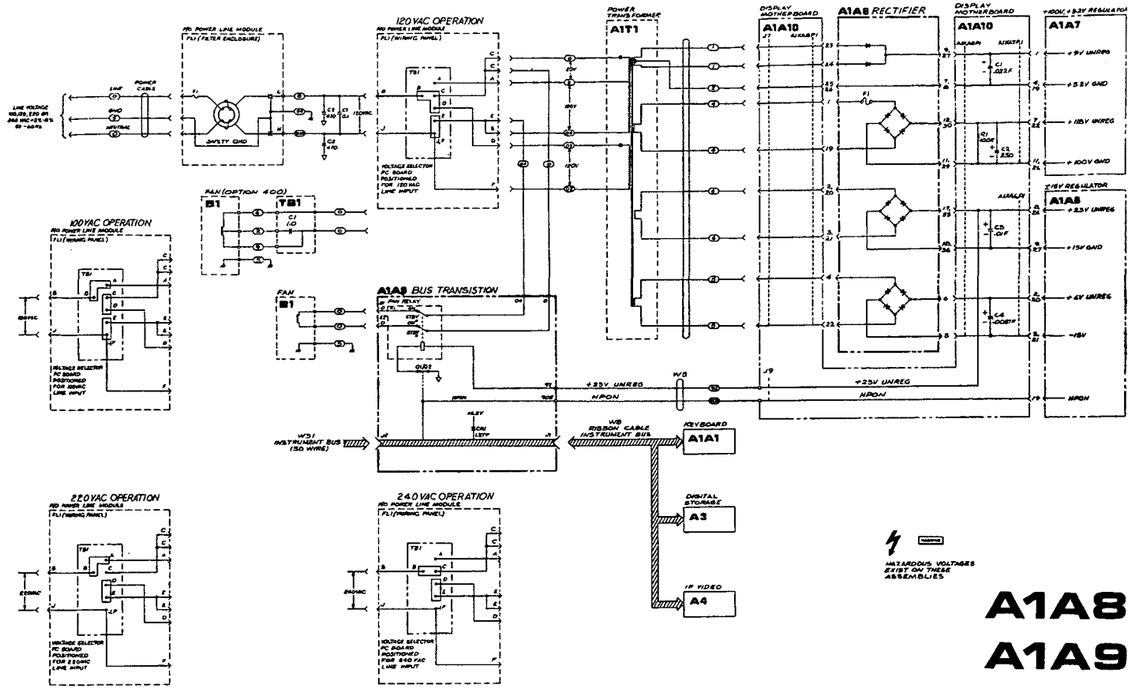
Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1A8	85662-60133	0	1	BOARD ASSEMBLY, RECTIFIER	28480	85662-60133
A1A8C1	0160-4832	4	2	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A1A8C2	0160-4298	6	1	CAPACITOR-FXD 4700PF +-20% 250VDC CER	56289	C067F251H472MS22-CDH
A1A8C3	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A1A8C4	0160-0168	1	2	CAPACITOR-FXD .1UF +-10% 200VDC POLYE	28480	0160-0168
A1A8C5	0160-0168	1		CAPACITOR-FXD .1UF +-10% 200VDC POLYE	28480	0160-0168
A1A8C6	0160-0970	3	1	CAPACITOR-FXD .47UF +-10% 80VDC POLYE	28480	0160-0970
A1A8C7	0180-0197	8	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A1A8CR1	1901-0662	3	10	DIODE-PWR RECT 100V 6A	04713	MR751
A1A8CR2	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A1A8CR3	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A1A8CR4	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A1A8CR5	1884-0018	5	1	THYRISTOR-SCR 2N4186 VRRM=200	04713	2N4186
A1A8CR6	1902-0656	7	1	DIODE-ZNR 39V 5% PD=1W IR=5UA	28480	1902-0656
A1A8CR7	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A1A8CR8	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A1A8CR9	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A1A8CR10	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A1A8CR11	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A1A8CR12	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A1A8DS1	1990-0486	6	1	LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4684
A1A8F1	2110-0007	4	1	FUSE 1A 250V TD 1.25X.25 UL	75915	313001
A1A8R1	0757-0420	3	1	RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A1A8R2	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A1A8R3	0698-0085	0	1	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A1A8R4	0698-3152	8	1	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A1A8R5	0757-0280	3	1	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A8R6	0757-0367	7	1	RESISTOR 100K 1% .5W F TC=0+-100	28480	0757-0367
A1A8R7	0698-3407	6	1	RESISTOR 1.96K 1% .5W F TC=0+-100	28480	0698-3407
A1A8R8	0698-3447	4	1	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A1A8TP1	0360-1788	7	2	CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A1A8TP2	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A1A8U1	1901-0367	5	1	DIODE-FW BRDG 600V 1A	28480	1901-0367
				MISCELLANEOUS PARTS		
	4040-0747	2	1	EXTR-PC BD GRA POLYC .062-BD-THKNS	28480	4040-0747

ManualsPlus.com

TABLE 2. A1A9, REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1A9	85662-60056	6	1	BOARD ASSEMBLY, BUS TRANSITION (INCLUDES W5)	28480	85662-60056
A1A9CR1	1901-0033	2	2	DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A1A9CR2	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A1A9E1	1251-0600	0	2	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A1A9E2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A1A9J1	1251-5269	7	1	CONNECTOR 50-PIN M POST TYPE	28480	1251-5269
A1A9J2	1251-4432	4	1	CONNECTOR 50-PIN F D SUBMIN	28480	1251-4432
A1A9K1	0490-0618	5	1	RELAY 2C 24VDC-COIL 5A 115VAC	28480	0490-0618
A1A9Q1	1854-0477	7	2	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A1A9Q2	1854-0477	7		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A1A9R1	0698-3157	3	1	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A1A9R2	0757-0442	9	2	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1A9R3	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F

ManualsPlus.com



A1A8
A1A9

FIGURE 1. A1A8 RECTIFIER AND A1A9 BUS TRANSITION, BLOCK DIAGRAM

ManualsPlus.com

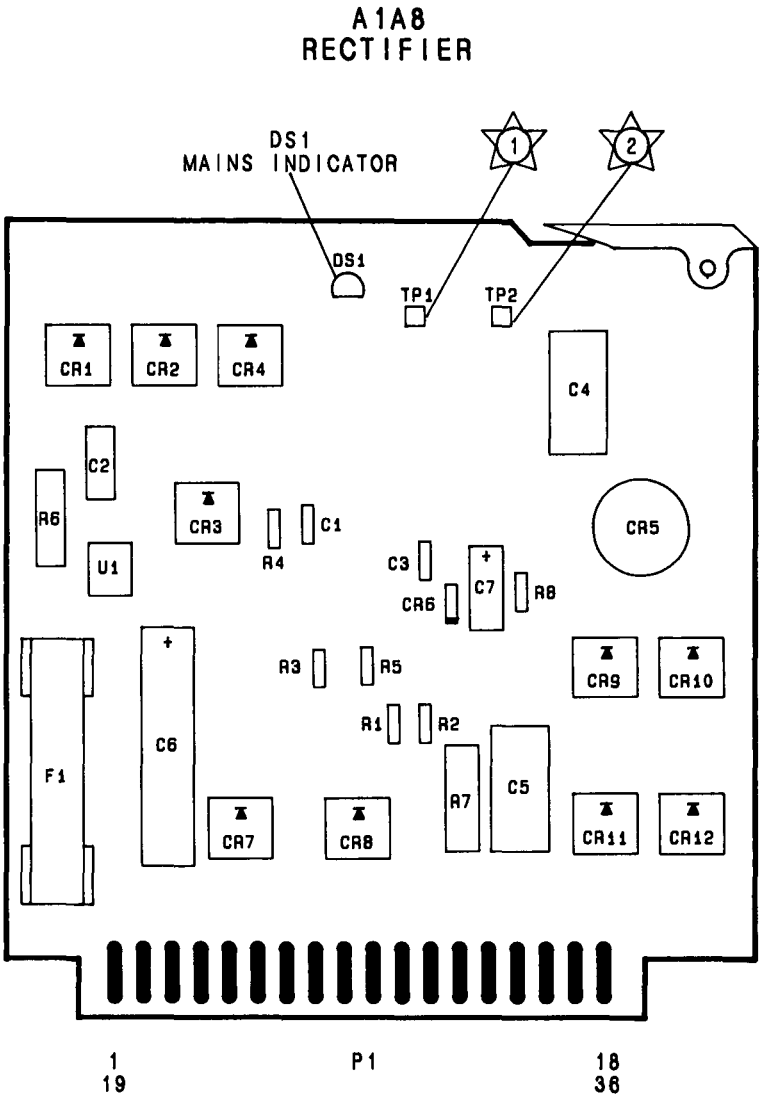


FIGURE 2. A1A8 RECTIFIER, COMPONENT LOCATIONS

ManualsPlus.com

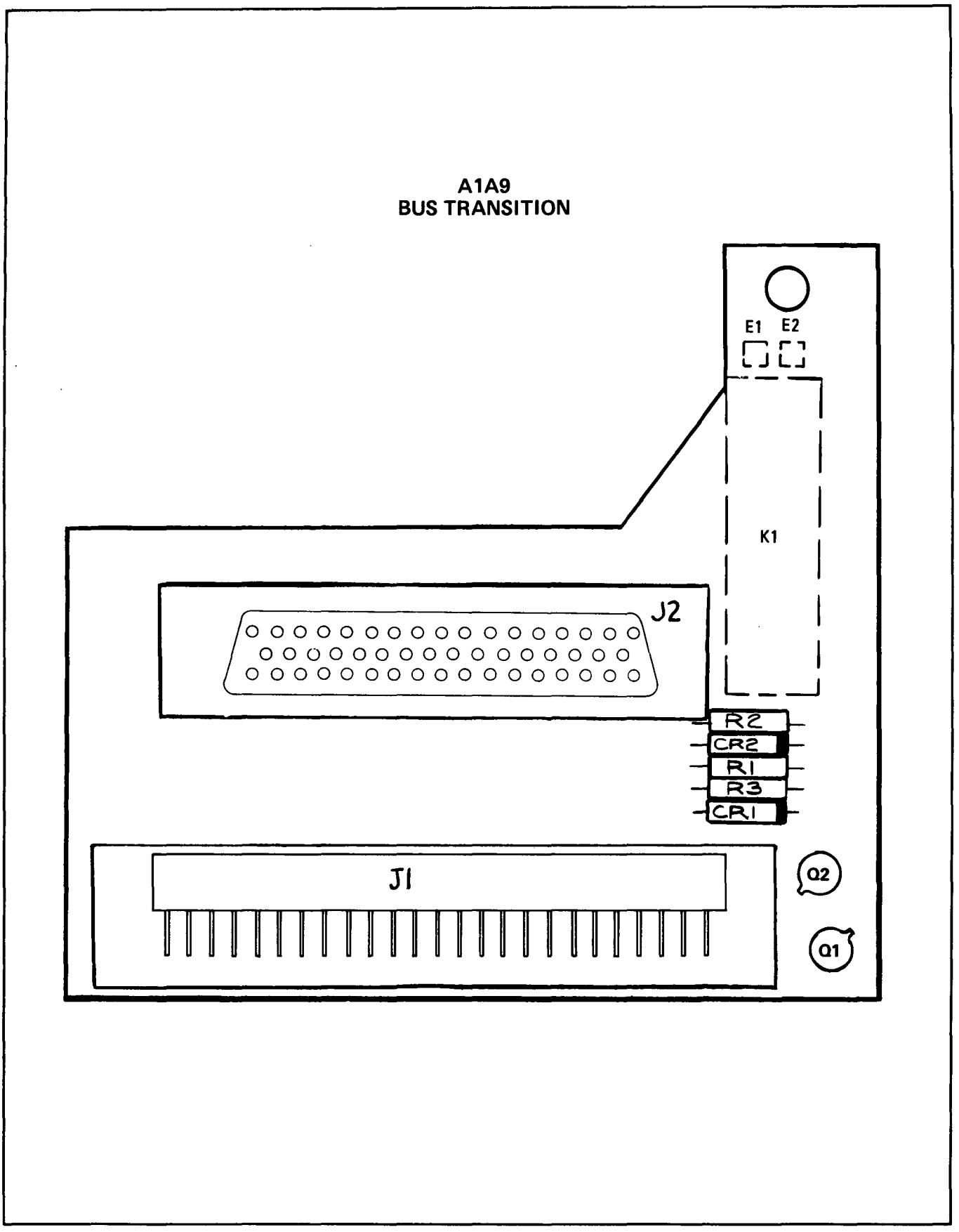


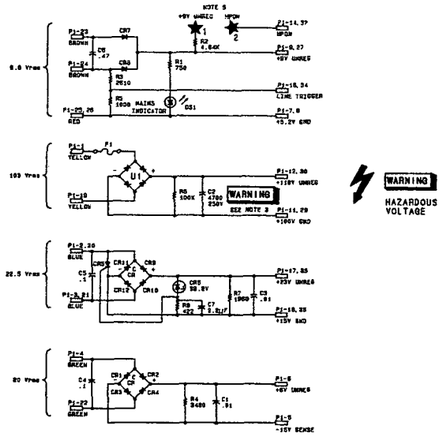
FIGURE 3. A1A9 BUS TRANSITION, COMPONENT LOCATIONS

ManualsPlus.com

A1A8 RECTIFIER
85662-60133

P1

PIN	SIGNAL	TO/FROM
1 19	YELLOW YELLOW	A1T1
2 20	BLUE BLUE	A1T2
3 21	BLUE BLUE	A1T1
4 22	GREEN GREEN	A1T1
5 23	+15V SENSE BROWN	A1A8 A1T1
6 24	+8V UNREG BROWN	A1A8 A1T1
7 25	+5.2V GND RED	A1A7 A1T1
8 26	+5.2V GND RED	A1A7 A1T1
9 27	+8V UNREG +8V UNREG	A1A7
10 28	NC NC	
11 29	+190V GND +190V GND	A1A7
12 30	+118V UNREG +118V UNREG	A1A7
13 31	NC NC	
14 32	HPON HPON	A1A7
15 33	NC NC	
16 34	LINE TRIGGER LINE TRIGGER	A3
17 35	+23V UNREG +23V UNREG	A1A6
18 36	+15V GND +15V GND	A1A6



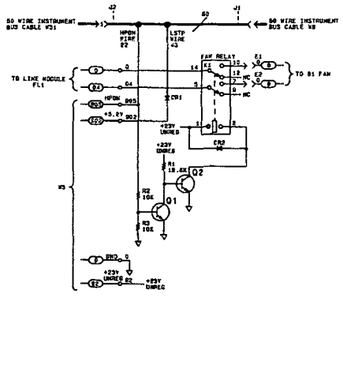
WARNING
HAZARDOUS VOLTAGE

SERIAL PREFIX: 2403A

A1A9 BUS TRANSITION
85662-60056

J1 50-WIRE INSTRUMENT BUS

PIN	SIGNAL
1	GND
2	NC
3	IDB8
4	IDB1
5	IDB3
6	IDB3
7	IDB4
8	IDB5
9	IDB6
10	IDB7
11	IDB8
12	IDB9
13	IDB10
14	IDB11
15	IDB12
16	IDB13
17	IDB14
18	IDB15
19	AC
20	NC
21	AC
22	HPON
23	ADA0
24	ADA1
25	ADA2
26	ADA3
27	ADA4
28	ADA5 (NOT USED)
29	NC
30	NC
31	KA8
32	KA9
33	KA10
34	KA11
35	KC0
36	KC1
37	KC2
38	KC3
39	KC4
40	KC5
41	KC6
42	KC7
43	LSTP
44	HSVP
45	LSR0
46	LSR9
47	LSI2
48	GND
49	LT10
50	GND



SERIAL PREFIX: 2403A

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (µF) INDUCTANCE IS IN MICROHENRIES (µH)

WARNING

3. THE TIME CONSTANT OF THE 100V FILTER CAPACITOR CIRCUIT IS 25 SECONDS. ALLOW ADEQUATE TIME AFTER POWER CORD IS REMOVED FOR FILTER CAPACITORS TO DISCHARGE BEFORE SERVICING.
4. MNEMONIC TABLE:

MNEMONIC	DESCRIPTION
HPON	HIGH-DISPLAY POWER ON
LSTP	LOW-STOP PROCESSOR
LSWP	LOW-SWEEPING
LSRQ	LOW-SERVICE REQUEST
LDSR	LOW-DIGITAL STORAGE READY
LSIO	LOW-A2 SECTION I/O STROBE
LTIO	LOW-DISPLAY SECTION I/O STROBE
ADA0-ADA5	ADDRESS BITS 0-5
IDB0-IDB15	DATA BITS 0-15
KA8-KA11	KEY ROWS 8-11
KC0-KC7	SET COLUMNS 0-7

5. SHORTING TP1 TO TP2 ALLOWS SERVICING OF THE IF DISPLAY SECTION WITHOUT THE RF SECTION BEING CONNECTED.
6. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE OR TOP AND EXIT AT RIGHT SIDE OR BOTTOM OF FUNCTION BLOCKS.

A1A8
A1A9

Figure 4. A1A8 Rectifier and A1A9 Bus Transition, Schematic Diagram

ManualsPlus.com

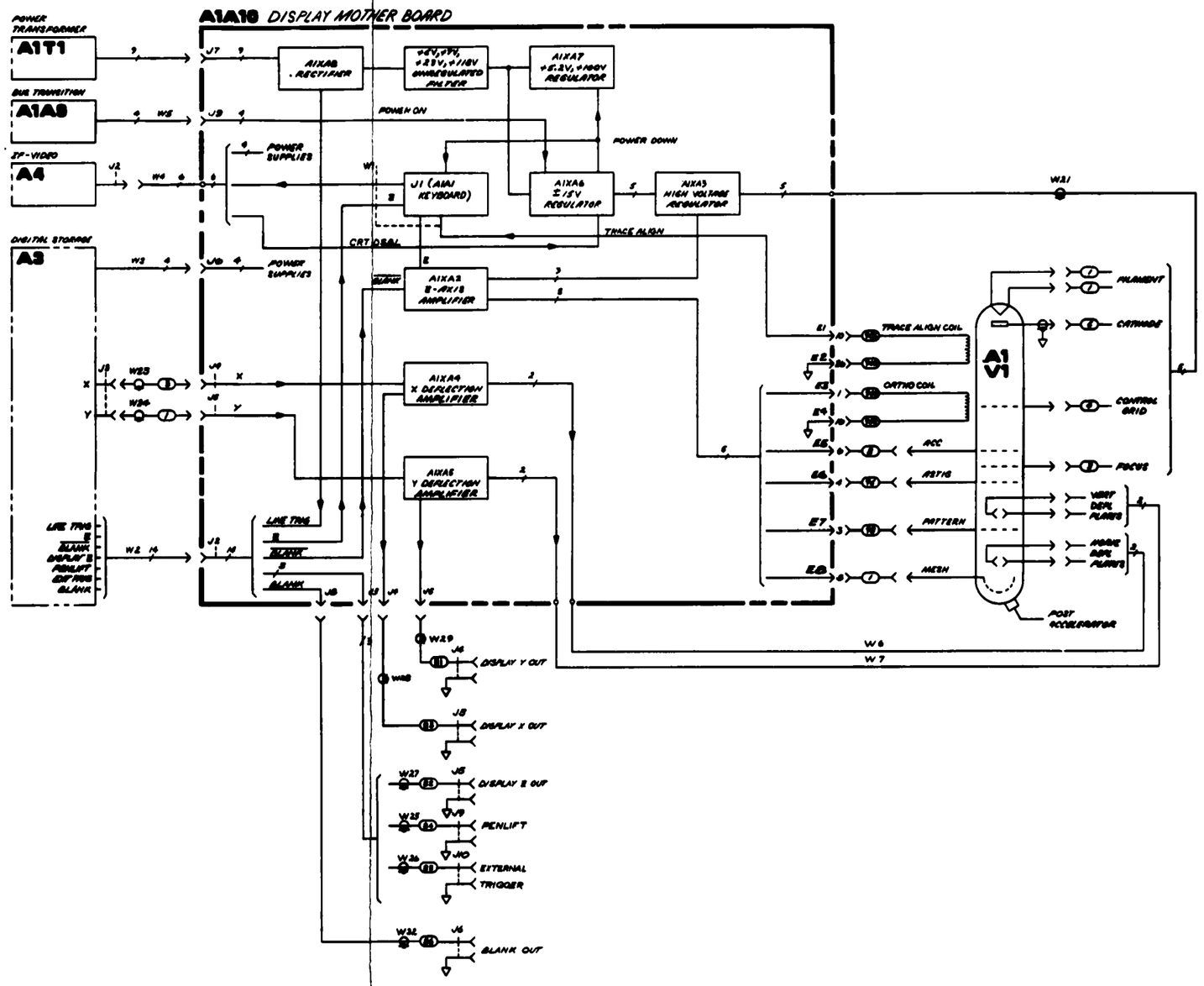
TABLE 1. A1A10, REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1A10	85662-60050	0	1	BOARD ASSEMBLY, DISPLAY MOTHERBOARD (INCLUDES W3)	28480	85662-60050
A1A10C1	0180-2808	2	1	CAPACITOR-FXD .022F+-20% 20VDC AL	28480	0180-2808
A1A10C2	0180-2642	2	1	CAPACITOR-FXD 250UF+50-10% 250VDC AL	28480	0180-2642
A1A10C3	0180-2641	1	1	CAPACITOR-FXD .018F+75-10% 40VDC AL	00853	500183U040EC2A
A1A10C4	0180-0453	9	1	CAPACITOR-FXD 8700UF+75-10% 40VDC AL	28480	0180-0453
A1A10E1	0360-1788	7	8	CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A1A10E2	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A1A10E3	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A1A10E4	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A1A10E5	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A1A10E6	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A1A10E7	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A1A10E8	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A1A10J1	1200-0508	0	2	SOCKET-IC 14-CONT DIP-SLDR	28480	1200-0508
A1A10J2	1200-0508	0		SOCKET-IC 14-CONT DIP-SLDR	28480	1200-0508
A1A10J3	1251-5815	9	1	CONNECTOR 6-PIN M POST TYPE	28480	1251-5815
A1A10J4	1251-5816	0	3	CONNECTOR 4-PIN M POST TYPE	28480	1251-5816
A1A10J5	1251-5816	0		CONNECTOR 4-PIN M POST TYPE	28480	1251-5816
A1A10J6	1251-3195	4	1	CONNECTOR 4-PIN M POST TYPE	28480	1251-3195
A1A10J7	1251-4281	1	1	CONNECTOR 9-PIN M POST TYPE	28480	1251-4281
A1A10J8	1251-5817	1	1	CONNECTOR 2-PIN M POST TYPE	28480	1251-5817
A1A10J9	1251-5816	0		CONNECTOR 4-PIN M POST TYPE	28480	1251-5816
A1A10R1	0757-0367	7	1	RESISTOR 100K 1% .5W F TC=0+-100	28480	0757-0367
A1A10W1	8150-2829	2	1	WIRE 18AWG BK 300V PVC 19X30 105C	28480	8150-2829
A1A10W2	8150-3246	9	1	WIRE 18AWG W/R 300V PVC 19X30 105C	28480	8150-3246
A1A10A1XA1				NOT ASSIGNED		
A1A10A1XA2	1251-2035	9	1	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-2035
A1A10A1XA3	1251-2034	8	1	CONNECTOR-PC EDGE 10-CONT/ROW 2-ROWS	28480	1251-2034
A1A10A1XA4						
A1A10A1XA7				NOT ASSIGNED		
A1A10A1XA8	1251-2026	8	2	CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026

ManualsPlus.com

IF-DISPLAY SECTION

ManualsPlus.com



A1A10

FIGURE 1. A1A10 DISPLAY MOTHERBOARD, BLOCK DIAGRAM

ManualsPlus.com

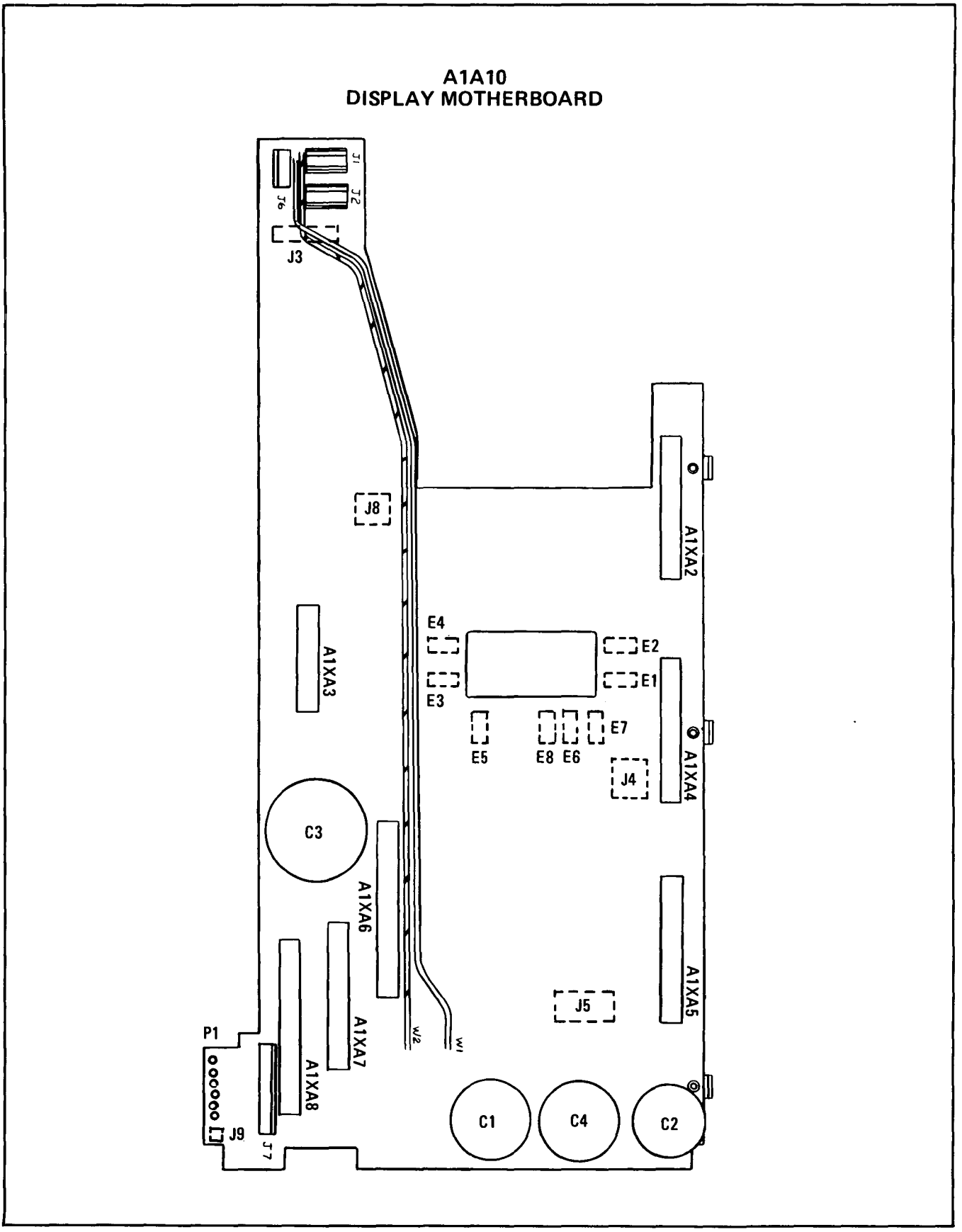
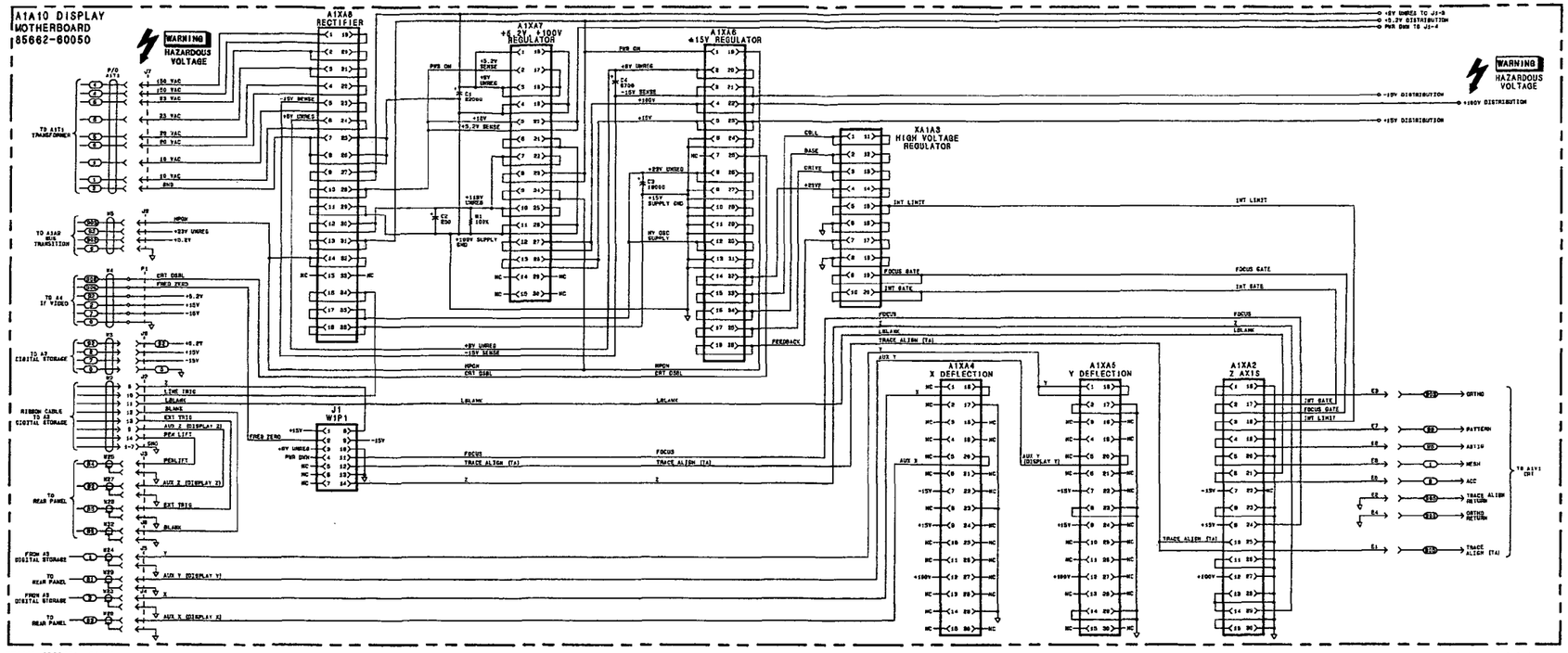


FIGURE 2. A1A10 DISPLAY MOTHERBOARD, COMPONENT LOCATIONS

ManualsPlus.com



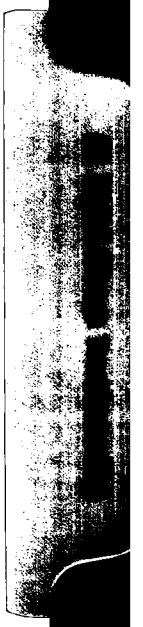
NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (μF) INDUCTANCE IS IN MICROHENRIES (μH)

SERIAL PREFIX: 2403A

FIGURE 3. A1A10 DISPLAY MOTHERBOARD, SCHEMATIC DIAGRAM

ManualsPlus.com



ManualsPlus.com

A3 DIGITAL STORAGE, CIRCUIT DESCRIPTION

A3 Digital Storage consists of three sections:

- **Input Section:** A3A8 Analog-Digital Converter and A3A9 Track and Hold. This section receives the video and sweep signals, converts them to digital, and transfers the data to the Processor Section.
- **Processor Section:** A3A4 Memory, A3A5 Data Manipulator, A3A6 Main Control, and A3A7 Interface. This section handles all data transfers, data functions, and control for the data storage. The digital storage algorithm is contained in read-only memory (ROM) in A3A6 Main Control.
- **CRT Driver Section:** A3A1 Trigger, A3A2 Intensity Control, and A3A3 Line Generator. This section, under control of the Processor Section, generates beam control signals (X, Y, and Z) to display the memory data.

A3 DIGITAL STORAGE, TROUBLESHOOTING

The troubleshooting information in this section is organized in the following manner.

Digital Storage Failure Tests
Description of two tests that can be performed to isolate failures in the Digital Storage section.

Failure Analysis and Testing Sequence
Analysis of the results of the two Digital Storage Failure Tests, and a recommended testing sequence of Digital Storage Assemblies.

Digital Storage Signature Analysis/CRT Display Test Programs
In-depth description of test programs used to troubleshoot the Digital Storage Section. (This material is supplementary. It is not needed for most troubleshooting.)

A3 Digital Storage Block Diagram
Overall block diagram for Digital Storage Section, including mnemonics.

DIGITAL STORAGE FAILURE TESTS

1. INSTRUMENT CHECK LED: The left INSTR CHECK LED (CHECK LED I) remaining on after Instrument Preset is pushed indicates that a bad bit was detected when the analyzer performed its self check routine. This check routine writes and reads to the read-write memory (RAM) in Digital Storage. To activate this test, press Instrument Preset.

2. DIGITAL STORAGE TEST PATTERN: The test pattern shown in Figure 1 can be used to verify the existence of a failure. This pattern can be generated independently of the main processor in the RF Section (A15 Controller). To enable the test pattern:

   a. Jumper A3A6TP3 and A3A6TP6. (Turns on the test ROMs.)

   b. Push A3A7S1 to initialize.

   If troubleshooting without the RF Section or with the Analyzer Bus Interconnect cable W31 disconnected, A1A8TP1 and A1A8TP2 must be jumpered to turn on the power supplies.

   If the CRT remains blank, A1A6TP6 and A1A6TP7 may have to be jumpered to inhibit the CRT disable line controlled by the A15 Controller.

ManualsPlus.com

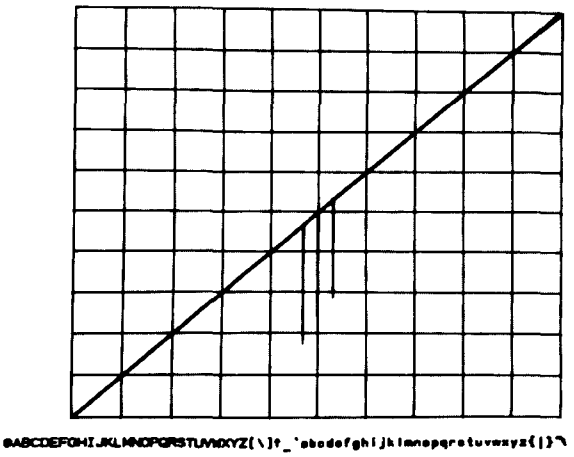


FIGURE 1. DIGITAL STORAGE TEST PATTERN

FAILURE ANALYSIS AND TESTING SEQUENCE

INSTR CHECK LED I and the Digital Storage test pattern can be used together to determine in what area of the Digital Storage Section a failure exists. See "Digital Storage Failure Tests." Failure symptoms (and trouble-shooting information for each) are as follows:

TABLE 1. DIGITAL STORAGE FAILURE ANALYSIS

	Correct Test Pattern	Incorrect/No Test Pattern
CHECK LED I ON	See (2)	See (1)
CHECK LED I OFF	See (4)	See (3)

1. If INSTR CHECK LED I remains on and no test pattern can be obtained, the Digital Storage processor must be checked, starting with the A3A6 Main Control assembly. Perform the following sequence of signature analysis tests.

NOTE

For all of the following tests, except the System ROMs Check, A3A6TP3 and A3A6TP6 must be jumpered to turn on the test ROMs and disable the normal system ROMs.

ManualsPlus.com

Control Board Outputs and Test ROMs Check	A3A6 SHEET 1/2
System ROMs Check	A3A6 SHEET 2/2
Decoder Check	A3A7 SHEET 1/2
A3A5 (Data Manipulator) Verification	A3A5 SHEET
IOB Interface Check	A3A7 SHEET 2/2
Memory Check	A3A4
Test B Check	A3A2
Test B Check and Test A Check	A3A6 SHEET 2/2
Test A Check and ADC Check	A3A8
Line Generator	A3A3
Intensity Control	A3A2
CRT Deflection Circuitry	A1A2, A1A4, A1A5
DS Address Check	A3A7 SHEET 1/2
A15 Controller I/O	A15

2. If INSTR CHECK LED I remains on but the test pattern is correct, first check the following:

IOB Interface	A3A7SHEET 2/2
Memory	A3A4
DS Address	A3A7 SHEET 1/2
System ROM	A3A6 SHEET 2/2
A15 Controller I/O	A15

3. If INSTR CHECK LED I is off but the test pattern is incorrect, first check the A3A3 Line Generator and A3A2 Intensity Control before checking the entire Digital Storage Processor.

4. If INSTR CHECK LED I is off and the test pattern is correct, but the CRT and characters come up incorrectly after a normal Instrument Preset, check the System ROMs first. A "long POP" check of the A15 Controller in the RF Section should also be performed.

DIGITAL STORAGE SIGNATURE ANALYSIS/CRT DISPLAY TEST PROGRAMS

NOTE

For all tests, unless otherwise specified: Test Point A3A6TP3 must be jumpered to A3A6TP6. This turns on the Test ROMs. After all jumpers for a test are connected, momentarily push switch A3A7S1 to initialize.

THE LEFT INSTRUMENT CHECK LED SHOULD REMAIN ON WHEN THE TEST ROMS ARE ENABLED AND INSTRUMENT PRESET IS PUSHED.

Test Pattern:

Generates a test pattern with graticule, a diagonal line, characters, and three vertical lines representing the ADC converter outputs of the negative peak, sample, and positive peak detectors.

The IOB Interface circuitry and the System ROM are not used in generating the Test Pattern.

ManualsPlus.com

Free Run Check:

A3A6E1 removed: disables feedback from the program ROM to the Branch Length Adder.
A3A6TP8 grounded: disables qualifier feedback.
A3A6TP5 grounded: disables interrupt and return inputs to the State Machine Controller. The BS (Block Switch) line is forced to toggle at a 4 MHz rate.

The program addresses decrements in a binary sequence through all possible addresses with the BS line toggling at 4 MHz, SØ at 2 MHz, S1 at 1 MHz, etc. This checks the A3A6 Main Control assembly, its ROM, Pipeline Registers, flip-flops and control pulses outputs, and the A3A7 I/O Port Decoder. To check the System ROMs, the same test setup is used but the A3A6TP3 to A3A6TP6 jumper is removed to re-enable the System ROMs outputs.

This test requires that the 8 MHz clocks, CLK and LCLK, and the initialize signal, LTON from A3A7, be working.

This test also requires that a basic "kernel" be running. This includes part of the State Machine Control **(F)** and the loop consisting of the Link Register, State Register, and Branch Length Adder on A3A6. See A3A6 Main Control Troubleshooting to troubleshoot this circuitry.

Test Program 1:

A3A6TP8 grounded: disables qualifier feedback.
A3A6TP7 grounded: forces state machine interrupt high.
A3A5TP2 grounded: disables the Register RAM outputs.

This program generates the pattern to test the A3A5 Data Manipulator, its Accumulator, Control Decode logic, Pipeline Registers, and parts of its ALU, Constant ROM, and Multiplexer Bus Drivers. This is the test that exercises the Digital Storage Bus with all feedback from it disabled.

Test Program 2:

A3A6TP8 grounded: disables qualifier feedback.
A3A6TP7 grounded: forces state machine interrupt high.

This program is the same as Test Program 1 except that the Register RAM outputs are enabled on the A3A5 Data Manipulator assembly. Since there is now feedback from the Accumulator through the Register RAM, a bad bit will make all higher order bits appear bad; so when probing the bus lines, the low order bits should be verified first and then higher order ones. The program generates various patterns that are written into and read from register RAM location Ø; it also selects all the qualifier inputs on A3A7 in both a low and a high state; and it exercises all the bits in the branch length word on the A3A6 Main Control assembly.

This program is used to verify the Branch Length Adder on A3A6 Main Control assembly when A3A6E1 jumper is replaced. On A3A5 it tests the Register RAM, ALU A inputs, and the multiplexer inputs from the RAMs. And finally, it checks the qualifier select circuitry on A3A7, so that the qualifier feedback can be used in generating the following test programs.

Test Program 3:

A3A7TP6 grounded: test qualifier bit read by program.
A3A2R12 LL FULL CW: the long line threshold on A3A2 is adjusted fully clockwise so that the normal interrupt, INTR, is always a 20 μsec period, independent of the line generator.

ManualsPlus.com

This program uses the Register RAM location Ø and the qualifier verified in Test Program 2 to generate a complete pattern test of all the Register RAM locations and Constant ROM words on A3A5. A pattern is also output to the X and Y line generator registers on A3A3. The program does not read any input ports; Multiplexer Bus Drivers on A3A5 are the only talkers on the Digital Storage data bus. However, a hard failure on the bus will be fed back into the A3A5 Data Manipulator and appear to make all signatures incorrect. In this case, Test Program 1 must be used.

Test Program 4:

A3A7TP6 jumpered to A3A7TP3: test qualifier bit
A3A2R12 LL FULL CW

This is the overall check program used to test all the Digital Storage input ports. The program generates the signals to check the memory, IOB data, IOB address, LTSTA, LTSTB, and ADC inputs on the bus. For each input, a clock is selected corresponding to each input putting data on the bus. This is done by positioning the jumper plug at the proper position in the IC socket A3A7J1. For example, to check Memory, the jumper is put at pin 3, connecting pin 3 to pin 12. The clock then appearing on A3A7TP1 is used by the Signature analyzer to check the data coming only from the A3A4 Memory Assembly, and is independent of data from the other input ports.

This program requires that the A3A5 Data Manipulator assembly be working and the Digital Storage bus be good. As in Test Program 3, a hard failure on the Digital Storage bus on the A3A4 Memory assembly, for example, would make all signatures appear incorrect and require using Test Program 1 to check the bus.

Test Program 5:

A3A7TP6 jumpered to A3A7TP4: test qualifier bit
A3A2R12 LL FULL CW
A3A1 removed

This program is used to generate a simple ramp waveform for the X and Y Line Generators and also to generate simple repetitive control signals to the A3A9 Track and Hold assembly. It is also used to check the Buffer on the A3A5 Data Manipulator assembly. The X and Y ramp waveforms are 20 msec long when A3A2R12 is fully CW (long line) and 5 msec long when A3A2R12 is fully CCW (short line). See A3A9 Troubleshooting for a diagram of the A3A9 control signals. A3A1 is removed to let the HSWP line go high, for A3A9 troubleshooting.

Test Program 6:

A3A7TP6 jumpered to A3A6TP2: test qualifier bit
A3A2R12 LL FULL CW
A3A1 removed

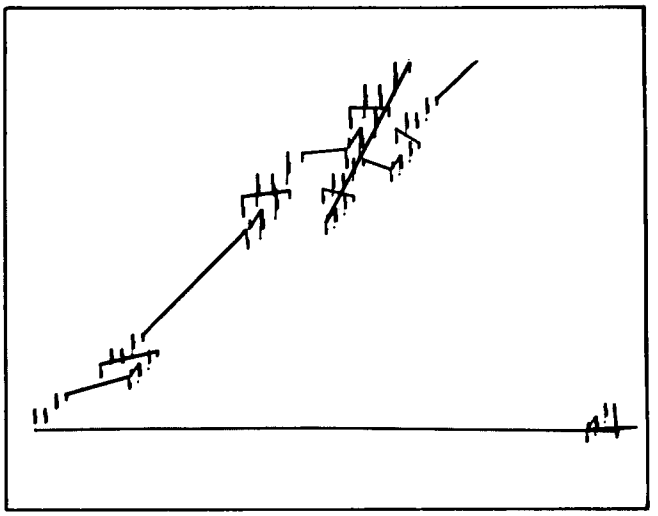
This program is almost identical to Test Program 5, except that the HOLD line to A3A9 is normally high, going low to reset the hold capacitor and peak detectors only every 80 msec. This can be used to check hold times. In addition, the CRT trace will be in the blink mode, blinking once a second.

Figure 2 shows the CRT displays for the various Test Programs. They are not meant to verify that each test is running correctly, but rather to assure you that the test program is cycling. With caution, they can also be used to do some short-cutting in the overall Digital Storage troubleshooting procedure.

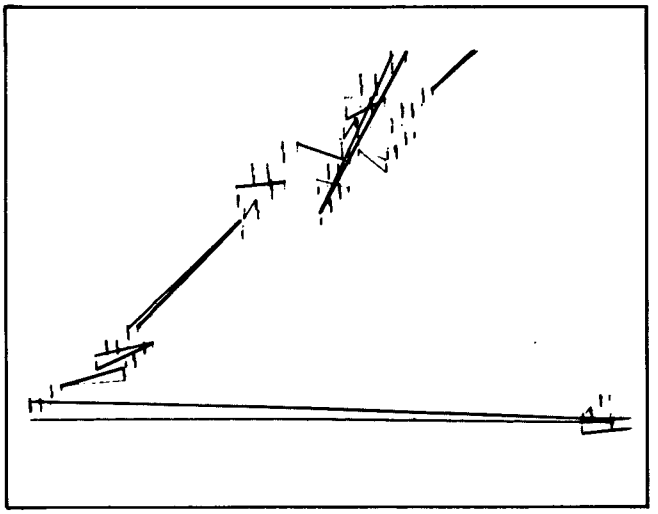
For example, the memory check, the IOB interface checks, the ADC check, Test A and Test B checks should not be done if the Test Program 4 trace is not on the CRT. On the other hand, if the traces for Test Programs 3, 4, and 5 appear correct, then the Main Control and Data Manipulator checks could be temporarily bypassed and the memory or IOB interface checks performed. (However, if these checks have bad inputs or the fault cannot be found, then the A3A6 Main Control and A3A5 Data Manipulator assemblies must be verified as shown in the complete Digital Storage troubleshooting procedure.)

ManualsPlus.com

TEST PROGRAM 3



TEST PROGRAM 4



TEST PROGRAMS 5 & 6

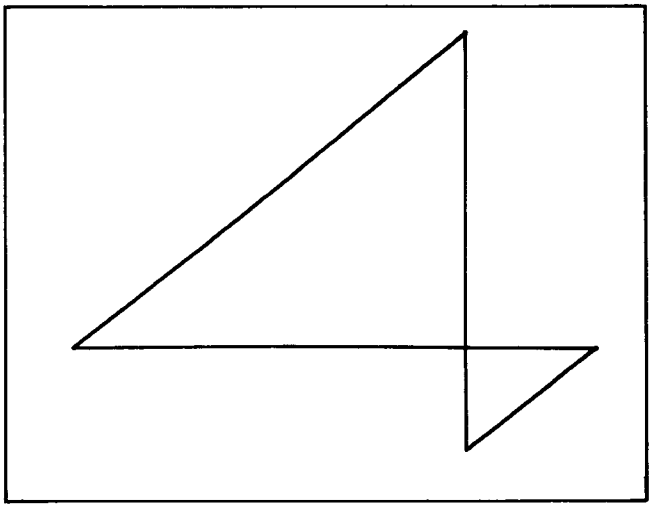


FIGURE 2. DIGITAL STORAGE TEST PROGRAM CRT DISPLAYS

ManualsPlus.com

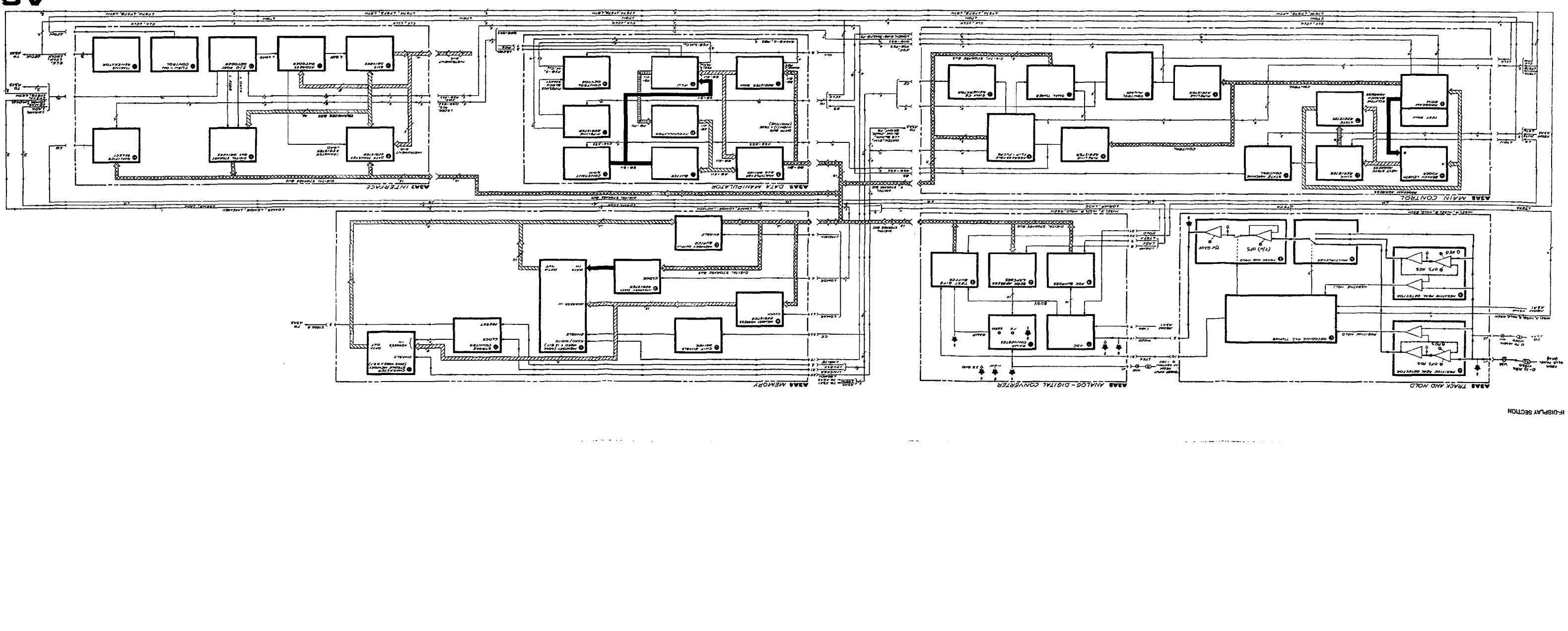
TABLE 2. A3 DIGITAL STORAGE MNEMONIC TABLE

Mnemonic	Description	Mnemonic	Description
18.4MHZ LO	18.4 MHz Local Oscillator Signal	LDRMP	Load Ramp Register
1MHZ	1 MHz ADC Clock	LDSR	LOW = Digital Storage Ready
21.4MHZ	21.4 MHz IF Signal	LDX	Load X Position Register
3MHZ	3 MHz IF Signal	LDY	Load Y Position Register
A LOG	Log Expand Control	LFSEN	LOW = Fast Sweep Enable
AØ – A11	Accumulator Bus Bits Ø through 11	LG1Ø	Linear Gain Controls
A1ØdB	Attenuation Controls	LG2Ø	
A2ØdB		LGCLK	200 kHz Line Generator Clock
A2dB		LGX	Line Generator Horizontal Signal
A4dB		LGY	Line Generator Vertical Signal
A8dB		LINCRSA	Increment Stroke Address
ADRØ	Instrument Bus Address Bits Ø through 3	LINTG	LOW = Integrator Control
ADR3		LL	Long Line
AUX BLANK	Auxiliary Blanking Output	LLGBLANK	LOW = Line Generator Blanking Control
AUX Z	Auxiliary Z Axis Output	LLL	LOW = Long Line
AVdB	Attenuation Control	LMEMEN	LOW = Enable Memory Output
B LOG	Log Expand Control	LOG/LIN	Log/Linear Control
BØ – B11	Digital Storage Bus Data Bits Ø through 11	LQ	LOW = Selected Qualifier
BLØ – BL6	Branch Length Bus Bits Ø through 6	LROMEN	LOW = ROM Enable
BLINK	Blink CRT Display Control	LRSTO	LOW = Reset Trigger Occurred
BRIGHT	Bright CRT Display Control	LRTN	LOW = Enable Interrupt Return
BS	Block Switch Control	LRTRC	LOW = Retrace Signal
BW5	Bandwidth Controls	LTIO	LOW = IF-Display Section I/O Strobe
BW63		LTON	LOW = Turn On
BW68		LTSTA	LOW = Input Test A Data
BW7		LTSTB	LOW = Input Test B Data
CE	Memory Chip Enable	LWRITE	Memory Write Control
CHAR	Character Mode Display Control	LZERO	Output of Zero Check on ALU Result
CLK	8 MHz System Clock	MAØ – MA11	Memory Address Bus Bits Ø through 11
CRT DSBL	CRT Disable Control	NSØ – NS7	Next State Bus Bits Ø through 7
ΔX	Delta X Position	OS1Ø	Offset Gain Controls
ΔY	Delta Y Position	OS2Ø-1	
DIM	Dim CRT Display Control	OS2Ø-2	
DOTEN	Dot Enable	PENLIFT	Recorder PENLIFT Control
FØ – F11	Function Bus Bits Ø through 11	POS	Sign of ALU Results
FCØ – FC3	Data Manipulator Function Control Bits Ø thru 3	PSØ – PS3	I/O Port Selection Bits Ø through 3
FREQ ZERO	Frequency Zero Control	QSØ – QS3	Qualifier Selection Bits Ø through 3
FS	Fast Sweep Mode	RØ – R11	Ram Bus Bits Ø through 11
FSOUT	Fast Sweep Output	RBWA	Resolution Bandwidth Controls
FSZ	Fast Sweep Z Axis	RBWB	
HLDX	Hold X Position (Sample and Hold Control)	RBWC	
HLDY	Hold Y Position (Sample and Hold Control)	RBWD	
HOLD	Track and Hold Control	REC CAL	Recorder Calibrate
HSWP	HIGH = Sweeping	REC ZERO	Recorder Zero
ICLK	Indicator Clock (Front-Panel LEDs)	RMØ – RM2	Ram Register Select Bits Ø through 2
INSELA	Input Selection Bit A	RSEN	Reset Peak Detectors Enable
INSELB	Input Selection Bit B	RSHS	Reset High Sweep
INTG	Integrator Control	SØ – S11	Source Bus Bits Ø through 11
INTR	Interrupt	SØ – S7	State Bus Bits Ø through 7
IOBØ	Instrument Bus Data Bits Ø through 15	SG1Ø	Step Gain Controls
IOB15		SG2Ø-1	
IOC	I/O Port Input/Output Control	SG2Ø-2	
KSØ – KS3	Constant Selection Bits Ø through 3	SMPL	Sample
LØ – L7	Link State Bus Bits Ø through 7	STROK8	Stroke 8 of Current Character
LADC	LOW = Enable ADC Output	SWITCH	Up/Down Converter Control
LBLANK	LOW = Blanking Control	VBWA	Video Bandwidth Controls
LCLK	Inverted CLK	VBWB	
LCLRSA	LOW = Clear Stroke Address	VBWC	
LDCHAR	Load Character Register	VBWD	
LDEXP	Load Expand Register	VIDEO	Video Signal
LDM EN	Data Manipulator Output Enable	X	Horizontal Signal to CRT
LDMAR	Load Memory Address Register	Y	Vertical Signal to CRT
LDMDR	Load Memory Data Register	Z	Intensity Signal to CRT

ManualsPlus.com

FIGURE 3. A3 DIGITAL STORAGE, BLOCK DIAGRAM

A3 8/10



ManualsPlus.com

A3A1 TRIGGER, CIRCUIT DESCRIPTION

A3A1 Trigger contains circuits which generate the HSWP signal used by other assemblies in the A3 Digital Storage section and in the spectrum analyzer RF section. Instrument Bus commands set the HSWP line high or low, or program HSWP to go high when a sweep trigger occurs. Trigger sources that may be selected are: the line, the video signal, or an external trigger input from the instrument rear panel. A3A1 Trigger contains circuits that select and process trigger signals. It also contains the Fast Sweep Generator, which produces a linear ramp voltage (0V to approximately +2.2V) used as a horizontal sweep for the CRT display. This sweep ramp is used only with FREQUENCY SPAN = 0 Hz. (It is not used to sweep the RF Section frequency.)

The fast sweep ramp is applied to A1A4 X Deflection Amplifier when selected by an analog multiplexer in A3A2 Intensity Control. The fast sweep time may be varied in a 1, 2, 5 sequence from 10 msec (1 msec/div) to 1 μsec (100 nsec/div). Trigger circuitry used for the triggering of RF Section sweeps (by HSWP) is used to trigger fast sweeps.

A3A1 also contains the Recorder Penlift Driver circuit, which is part of the High Sweep Control.

High Sweep Control (B)

The High Sweep Control circuit generates HSWP, which is a TTL open-collector signal that is used by A3 Digital Storage to control signal tracking and conversion. HSWP is also used in the instrument RF Section to control the Sweep Generator circuitry. The sweep ramp is in progress when HSWP is high and is stopped (at any point during the sweep) when HSWP is low. The RF Section can also pull HSWP low to stop the sweep under certain conditions. For example, when a front-panel key is pressed, the main processor in the RF Section pulls HSWP low (on A12 Interface) to immediately stop the sweep, then programs HSWP low (on A3A1 Trigger) with an Instrument Bus command before servicing the front-panel request. HSWP must be set high again (on A3A1 Trigger) for the sweep in the RF Section to resume.

HSWP is used directly to light the green front-panel SWEEP LED on the IF-Display Section. This LED provides a very quick method of checking for activity on the HSWP line.

HSWP Generation. For HSWP to be high, flip-flop U12A pin 6 must be low. Inverter U7A buffers U12A and provides the open collector drive for the HSWP line. U12A is set and cleared by the Instrument Bus and can be cleared by the RSHS signal from A3A6 Main Control. To set HSWP, Instrument Bus bits 14 and 15 are set high, Address 50 is selected, and address decoder U18 is enabled by LTIO (the IF-Display Section address strobe). U18, pin 13 goes low, which clocks the U4A and U4B Q outputs high. The positive-going transition at the U4B output triggers a pulse of approximately 500 μsec at U9A pin 4. At the end of this pulse, U9B generates a narrow (50-nsec) pulse that clocks U12A and U12B. This causes U12A pin 6 to go low and HSWP to go high. (Note that HSWP is set high approximately 500 μsec after occurrence of the Instrument Bus SET command. This time delay allows A15 Controller to perform certain functions before the sweep starts.

To clear HSWP, Instrument Bus 13 is set high, Address 50 is selected, and (when the IF-Display Section address strobe occurs) U12A, U12B, U4A, and U4B are cleared. HSWP may also be cleared by other assemblies in the A3 Digital Storage when the RSHS line goes low.

In Fast Sweep mode (sweep time setting ≤10 msec), HSWP is no longer used to control the RF Section sweep ramp, since the spectrum analyzer is not sweeping the RF Section frequency. It is normal to see the green front-panel sweep LED turn off for these settings, even though the CRT trace is sweeping.

Free Run Mode (for Sweep Time ≥20 mSec). When the RF Section is in Free Run mode with sweep time settings ≥20 msec, the sweep is started when the Instrument Bus sets HSWP. The sweep is stopped by the RSHS line from A3A6 Main Control or by a CLEAR command from the Instrument Bus. A15 Controller controls the time from the end of one sweep to the beginning of the next sweep (sweep dead time).

ManualsPlus.com

Line, Video, and External Triggers (for Sweep Time ≥20 mSec). The RF Section can direct A3A1 to set HSWP high when a line, video, or external trigger occurs. If Instrument Bus line 14 is high and U18 is strobed with Address 50, U18 pin 13 will go low, setting U4A pin 9 high, which triggers U9A. At the end of the pulse generated by U9B, U12B pin 9 will be clocked high, placing a high at the data input (pin 2) of U12A. The output (pin 6) of trigger multiplexer U16 in the Trigger generator will then cause U12A to be clocked on a negative-going transition of the selected trigger input. (Refer to the Trigger Generator circuit description.)

Recorder Pen Lift Driver. In sweep time settings ≥20 msec, the Recorder Pen Lift Driver supplies the PEN LIFT signal to the rear-panel PENLIFT connector. PENLIFT may also be used to control blanking of an external CRT display.

PENLIFT is a 0V to 15V signal that lowers the recorder pen when an RF Section sweep is in progress (HSWP is high, PENLIFT is 0V) and lifts the pen when a sweep is not in progress (HSWP is low, PENLIFT is 15V). Decoder U3A is a noninverting buffer that drives Q15 from the HSWP line.

Sweep Trigger (F)

The Sweep Trigger circuit produces triggers for all sweep times. It contains the video, external, and line trigger circuits, the fast sweep Free Run Oscillator, the trigger multiplexer, and the fast-sweep Auto Trigger circuit. A valid trigger for the Fast Sweep Generator or the High Sweep Control circuit is produced by a negative-going transition at the selected input of trigger multiplexer U16. This trigger signal will start a sweep only if the Fast Sweep Control and High Sweep Control circuits are in the proper states.

Video Trigger. Video Trigger Comparator U13 generates a negative-going transition when the VIDEO signal rises above the voltage at U13 pin 2, which depends on the position of the front-panel TRIGGER LEVEL control. R49, R50, and R51 divide the TRIG LEVEL voltage (0V to +5.1V) to approximately −0.1V to +2.1V at U13 pin 2. The LOW FAST SWEEP signal, connected to the strobe inputs (pins 5 and 6) of U13, disables the output of U13 in Fast Sweep mode when the fast sweep ramp is being generated. R52 provides hysteresis for U13, and CR1 protects U13 from excessive input voltage on the VIDEO line. The +10V and −10V supply voltages for U13 are derived through VR4 and VR5.

External and Line Triggers. The EXT TRIG input from the IF-Display Section rear panel is applied to buffer/inverter Q14 through divider R61 and R62. When EXT TRIG rises above approximately +1.4V, Q14 saturates and U15C pin 9 goes low, causing U16 pin 3 to go low, producing a trigger.

A voltage, resistively divided from a winding of the IF-Display Section line transformer, is buffered by Schmitt trigger inverter U15A, the output of which is applied to U16 pin 2, the line trigger input of the trigger multiplexer. Negative-going transitions at U16 pin 2 are valid line triggers.

Free Run Mode (Sweep Time ≤10 mSec). In Fast Sweep mode, during the fast sweep dead time, U11C pin 8 is high. This causes U15B to oscillate at a rate (determined by R59 and C11) of approximately 500 kHz. Negative-going transitions at U15B pin 6 produce triggers in the Fast Sweep, Free Run mode. U15B is gated off during the fast sweep ramp. Note that the Free Run Oscillator is not used to trigger sweeps in sweep times ≥20 msec. (See High Sweep Control circuit description.)

Fast Sweep Auto Trigger. When the EXT or VIDEO key is pressed and the sweep time is 10 msec or less (Fast Sweep mode), a fast sweep ramp will be started automatically about 25 msec after the start of the last fast sweep if no video or external trigger occurs first. If SHIFT EXT or SHIFT VIDEO keys are pressed, fast sweep triggering will be in Normal mode. In Normal mode, no fast sweep will be started until a trigger occurs. The CRT graticule and characters will not be refreshed until a fast sweep has occurred.

Fast Sweep Auto Trigger Circuitry. In Auto Trigger mode, the Instrument Bus sets U5 pin 12 High. U1A pin 1 goes high when the fast sweep ramp begins, triggering a 25-msec (low) pulse at U1A pin 4. If another fast sweep ramp is started within 25 msec of the beginning of the previous fast sweep ramp, U1A will be re-

ManualsPlus.com

triggered, and U1A pin 4 will not go high for at least another 25 msec. If triggers cease to occur, U11D pin 11 will go high 25 msec after the last fast sweep. This causes trigger multiplexer U16 to select the output of the Free Run Oscillator in either Video or External mode, triggering a sweep. Auto triggering will not occur in sweep times ≥20 msec, because in this case the Auto Trigger circuitry is disabled by the FAST SWEEP ENABLE line to U11B pin 5.

If SHIFT EXT or SHIFT VIDEO keys are pressed, U5 pin 12 will be low, preventing automatic triggering in the absence of a video or external trigger.

Fast Sweep Time Control (A)

Data on Instrument Bus lines 11 through 14 specify the fast sweep generator sweep time. This data is latched into hex D flip-flop U6 when Address 51 is strobed. (Refer to the table, Note 6 on the schematic, for coding of the sweep time control lines.) Data on Instrument Bus line 15 is latched into U6 with the four sweep time bits (IOB11 – IOB14) and enables fast sweep generator operation.

Switchable Current Source. Current for the generation of the fast sweep ramp is supplied by Q13. Op amp U8 regulates (through R6 and R7) the emitter voltage of Q13 to keep it equal to the reference voltage at U8 pin 3.

Q6 controls the reference voltage by switching R2 in or out of the voltage divider circuit, which is made up of R1, R2, and R3. The voltage difference between Q13 emitter and +15 VF1 is set at 2V when Q6 is off and 4V when Q6 is on. The voltage difference is held across a switchable resistance between Q13 emitter and +15VF1. FET switches Q7, Q8, and Q9 connect resistors in parallel with R14 to change the current supplied by the current source. When Q7, Q8, and Q9 are off, R14 sets Q13 collector current. In certain sweep times, Q9 is turned on by U2C. (Refer to the table on the schematic, Note 6.) This places R11 in parallel with R14, increasing the current by a factor of 5. Similarly, R12 or R13 may be switched in to increase current by factors of 10 and 50 respectively. Q7, Q8, and Q9 are controlled by open-collector drivers U2B, U2A, and U2C. The FET switches are on when the FET gate voltage is high (+15V) and off when the FET gate voltage is low (approximately +0.2V). U3B decodes the sweep rate control lines from U6 and controls U2A, U2B, and U2C.

Fast Sweep Generator (C)

To produce the fast sweep ramp for sweep times ≤100 μsec, current from Q13 charges timing capacitor C4. For sweep times of 200 μsec to 10 msec, Q11 is turned on, placing timing capacitor C5 in parallel with C4, increasing the sweep time by a factor of 100. C4 and C5 (if it is in the circuit) are discharged by Q10 and Q12 at the end of the sweep.

Discharge Switch. When no sweep is in progress, the output of open-collector inverter U7D is high (+5V), and current through R30 and R31 flow into Q10 and through CR6 into Q12. In addition, current flows from Q13 into Q12. At the start of a fast sweep ramp, U7D pin 8 goes low, and the voltage at the anode of CR6 and the emitter of Q10 is pulled slightly negative by R32. CR6 becomes reverse biased, and Q10 turns off, turning Q12 off. Current from the collector of Q13 now flows into timing capacitors C4 and C5, and the sweep ramp begins. When the end of the sweep ramp (+2.2V) is detected by the Fast Sweep Control circuit, U7D pin 8 goes high (about +5V), turning Q10 on. This turns Q12 on, and it begins to discharge C4 and C5. Q12 continues to discharge the timing capacitors until CR6 becomes forward biased. At that time, the circuit reaches equilibrium, holding the sweep ramp at near 0V, with the offset adjusted by R34.

Fast Sweep Buffer Amplifier. Op amp U14 is connected as a unity gain buffer amplifier, which provides the low impedance fast sweep ramp output (FS OUT). FS OUT is applied to the X-axis scan multiplexer in A3A2 Intensity Control.

ManualsPlus.com

Fast Sweep Control (D)

The Fast Sweep Control contains circuitry for end of sweep detection and controls fast sweep dead time, and fast sweep triggering.

End of Sweep Detection. When the sweep ramp reaches about +2.2V, Q5 conducts and turns Q4 on. When the collector of Q4 goes low, U1B pin 5 produces a pulse whose length is the dead time. U10A and U10B are cleared when U10B pin 5 goes low, and timing capacitors C4 and C5 are discharged by the Discharge Switch in the Fast Sweep Generator. Voltage divider R19 and R20 set the level at which Q5 senses the end of the sweep ramp. (Note that the fast sweep ramp ends beyond the right-hand edge of the CRT.) The LRTRC line from U10B pin 5, which is high during the sweep, supplies the retrace blanking signal to A3A2 Intensity Control.

Fast Sweep Dead Time. Multivibrator U1B controls the sweep dead time. U1B is triggered at the end of the fast sweep ramp and holds U10A and U10B cleared for a time that is determined by C7, R24, and R25. This prevents the triggering of further ramps for the length of the pulse from U1B pin 5. The length of the dead time is about 15 μsec for sweep times from 1 μsec through 100 msec and about 120 μsec for sweep times from 200 μsec through 10 msec. The ST 1ØØ line (from U6 pin 12 in the Fast Sweep Time Control circuit) controls the length of the sweep dead time by switching the U1B timing resistors with transistor switch Q3. In sweep times of 10 msec through 200 μsec, Q3 is off and the dead time, set by C7 and R24, is 120 μsec. In sweep times of 100 μsec through 1 μsec, Q3 is on, placing R25 in parallel with R24 to decrease the dead time to 15 μsec. C6 and R23 supply additional base drive to Q4 at the end of the sweep to insure triggering of U1B.

Fast Sweep Triggering. Flip-flops U10A and U10B control the state of the fast sweep generator. U10A controls the Discharge Switch through inverter/buffer U7D. At the end of a fast sweep, both U10A and U10B are held cleared by the dead time circuit (U1B and U7F). Following the dead time, a trigger from U16 pin 5 causes U10B pin 7 to go low. This causes U10A pin 5 to go high, which turns off the Discharge Switch and starts a sweep ramp. This can occur only if FS EN is high. If FS EN is low, the J and K inputs of U10B are held low and a trigger will not set U10B.

Fast Sweep Multiplexing. In Fast Sweep mode, the X output of A3A3 Line Generator and the fast sweep ramp must be multiplexed to A1A4 X Deflection Amplifier to produce a display consisting of the graticule and characters with the fast sweep ramp and the analog video signal. The video signal from A4A1 Video Processor is multiplexed to A1A5 Y Deflection Amplifier when the fast sweep ramp is multiplexed to A1A4. The X and Y multiplexers are located in A3A2 Intensity Control.

In Fast Sweep mode, the output from A3A3 is applied to the CRT deflection amplifiers following the completion of at least one fast sweep ramp.

Fast Sweep Intensity Control (E)

To provide uniform intensity between the fast sweep trace and the other information displayed on the CRT, the Fast Sweep Intensity Control circuit generates a voltage to control the CRT beam intensity (Z-axis) when the fast sweep ramp is multiplexed in.

The FSZ voltage is dependent on the duty cycle of the fast sweep ramp; that is, the ratio of time during which the ramp is in progress to the sum of dead time and sweep time. FSZ varies from about 150 mV (low beam intensity) for high duty cycle operation to about 2V (high beam intensity) for very low duty cycle operation.

The LRTRC line, high during the fast sweep ramp, provides a digital waveform which is averaged and inverted by Q2, C15, and associated circuitry, providing an output voltage to Q1 that is dependent on the average value of the LRTRC signal. Q1 is an emitter follower which provides drive when the FSZ signal is above ≈150 mV for low duty cycle sweep operation (less than 20 percent). When the voltage at the collector of Q2 is below +0.7V (high duty cycle operation), the base-emitter junction of Q1 is off, and the FSZ voltage is held at about 150 mV by voltage divider R71 and R72.

ManualsPlus.com

A3A1 TRIGGER, TROUBLESHOOTING

Much of the circuitry on the A3A1 Trigger can be tested without removing the assembly from the instrument. First key in Instrument Preset, [FREQUENCY SPAN] 0 Hz and [SWEEP TIME] 10 msec. Noise should be displayed at approximately 2.5 divisions up from the bottom graticule. If the display is blanked, try [LINE] and then [VIDEO] triggering.

The waveforms shown on the service sheet for TP2 and TP5 are valid only in the [FREE RUN] and Normal mode ([SHIFT] [VIDEO] , [SHIFT] [EXT]). The Fast Sweep time should be equal to the time it takes the ramp at TP5 to sweep from 0V to +2V. The oversweep above 2V is determined by the Sweep Comparator and is not critical for instrument operation. The dead time when the ramp and LRTRC are low is approximately 15 μsec for sweep times less than 200 μsec, and 120 μsec for sweep times from 200 μsec to 10 ms. During the dead time the Free Run Oscillator is on. See Figure 1 for the relationships between the waveforms.

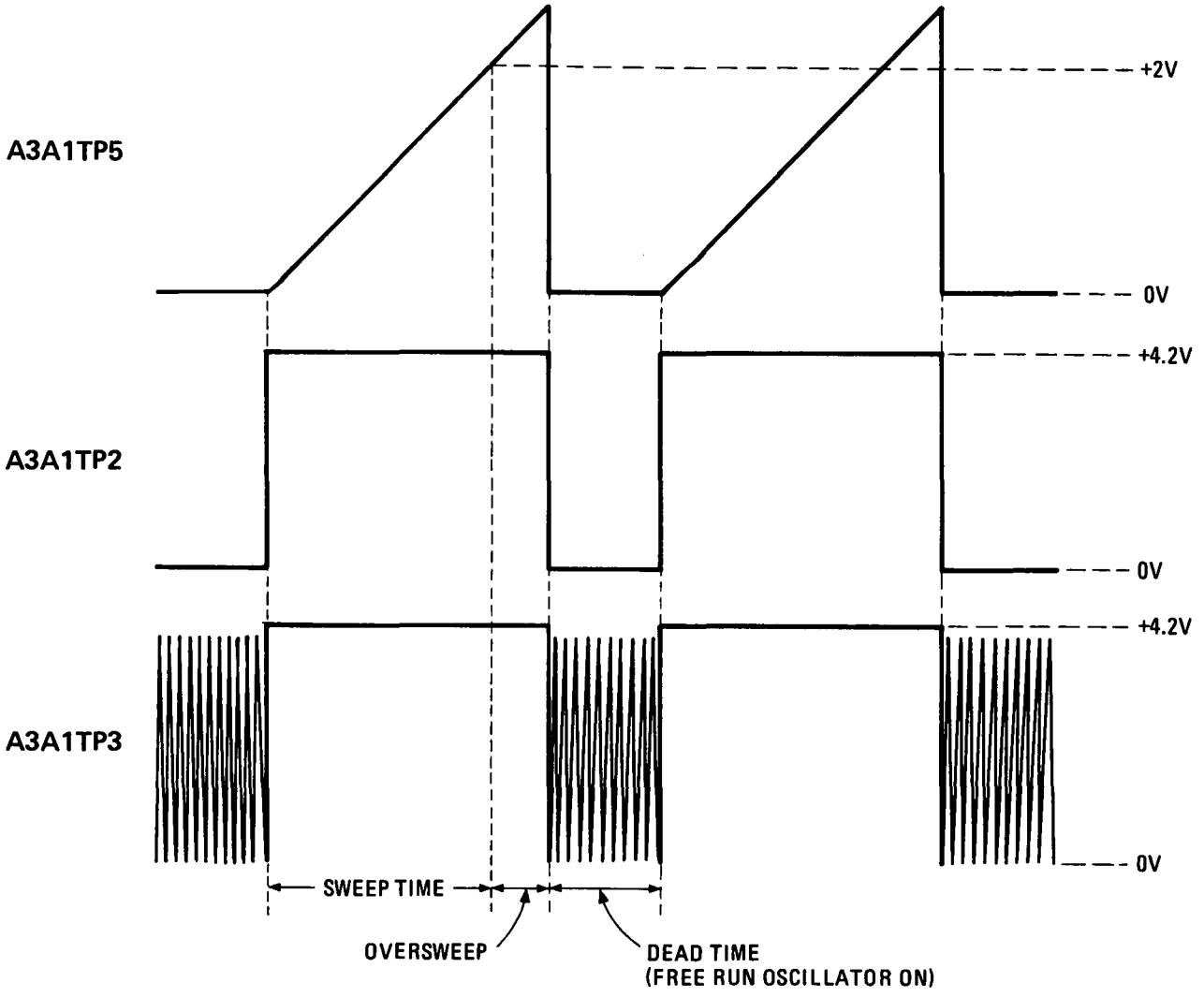


FIGURE 1. FAST SWEEP TIME WAVEFORMS

ManualsPlus.com

When using [LINE] TRIGGER, the waveforms are similar except for the dead time. Following the minimum dead time period, whenever a negative-going transition occurs at TP3, a ramp is started. When the sweep ends, TP2 goes low and stays low until a negative-going transition occurs at TP3. See Figure 2 for the relationships between the [LINE] TRIGGER waveforms.

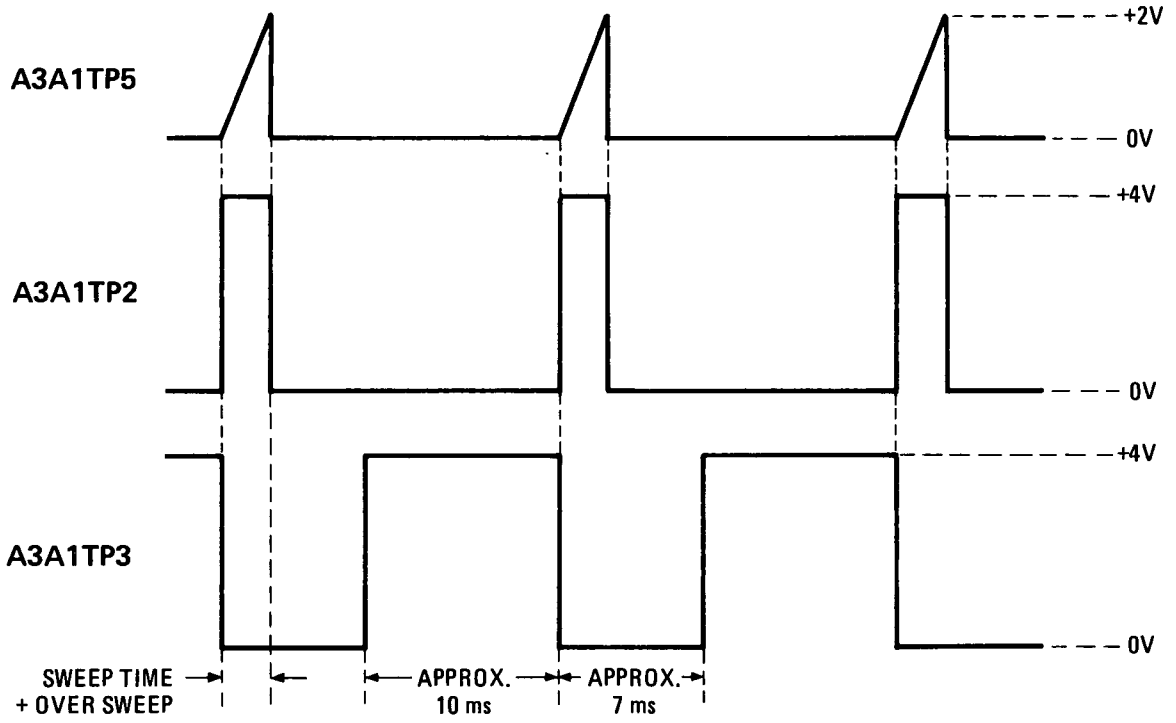


FIGURE 2. FAST SWEEP LINE TRIGGER WAVEFORMS

If noise is used as a video trigger and the TRIGGER LEVEL control is properly set, the [VIDEO] trigger waveforms at TP5 and TP2 will be the same as those in Figure 1. During the minimum dead time period, the noise signal trigger will be present. If a video trigger does not occur (TRIGGER LEVEL control set fully CW or CCW), then the Auto Trigger circuitry will generate a trigger approximately every 25 msec. TP2 and TP5 will have the relationship shown in Figure 2. If the voltage at U13 pin 3 is much less than U13 pin 2, then TP3 will be approximately +4V. If the opposite is true, the waveforms at TP3 and TP2 will be the same.

If no fast sweep is occurring, check TP5 first. If the voltage is greater than +2.6V, the most likely failure would be in the Fast Sweep Control circuitry. Refer to the circuit description for operation of this functional block. An open Discharge Switch would also cause TP5 to remain greater than +2.6V for all fast sweep times.

If TP5 is 0 ±200 mVdc and no fast sweeps occur, the Fast Sweep Control circuitry should be examined. Other defective components that would cause the same indications are Q13 and U7D. The Sweep Trigger circuit may also be defective.

ManualsPlus.com

The Sweep Trigger circuitry can be tested by tracing the trigger signals through U16 to pin 13 of U10. Try Triggering first, as this is the simplest source. A TTL signal at the power line frequency should be present at TP3. U7 pin 12 and the FAST SWP ENABLE line should both be high. Also check for proper trigger signals at TP3.

Incorrect sweep times on the fast sweep time mode are difficult to observe from the display. One quick troubleshooting method is to disconnect the VIDEO signal (cable 96, coming from the rear-panel VIDEO INP jack) from A3A9J1 and connect A3A9J1 to A3A2J2. This sends a 200 kHz test waveform to the Deflection Amplifiers. Press [VIDEO] TRIGGER and set the [SWEEP TIME] to 10 μsec. Adjust the LEVEL Control to produce a display. It should appear as in Figure 3. By using fast sweep times from 10 μsec to 200 μsec, all of the Fast Sweep Time Control circuitry will be exercised. If one or more of the sweep times is incorrect, Note 6 will be helpful in determining if one of the control lines is faulty. The Switchable Current Source circuitry may also be defective.

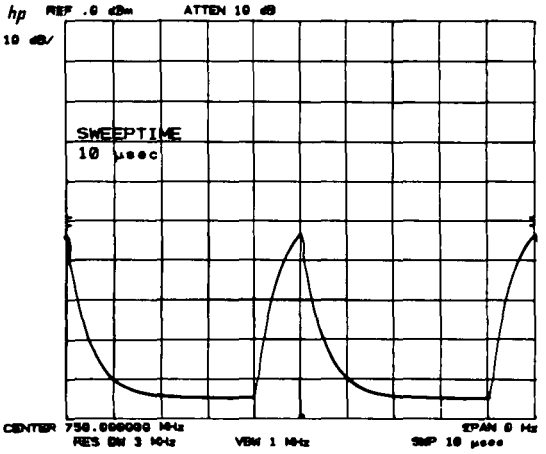


FIGURE 3. 200 kHz TEST SIGNAL WAVEFORM

ManualsPlus.com

TABLE 1. A3A1, REPLACEABLE PARTS (1 OF 3)

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A3A1	85662-60014	6	1	BOARD ASSEMBLY, TRIGGER	28480	85662-60014
A3A1C1	0160-0174	9	3	CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A3A1C2	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A3A1C3	0160-2252	8	1	CAPACITOR-FXD 6.2PF +-.25PF 500VDC CER	28480	0160-2252
A3A1C4	0140-0233	9	1	CAPACITOR-FXD 480PF +-1% 300VDC MICA	72136	DM15F481F0300WV1C
A3A1C5	0160-4314	7	1	CAPACITOR-FXD .05UF +-1% 200VDC	28480	0160-4314
A3A1C6	0160-2307	4	1	CAPACITOR-FXD 47PF +-5% 300VDC MICA	28480	0160-2307
A3A1C7	0160-0155	6	1	CAPACITOR-FXD 3300PF +-10% 200VDC POLYE	28480	0160-0155
A3A1C8	0160-4084	8	2	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A1C9	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A1C11	0160-3456	6	1	CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A3A1C12	0180-0197	8	7	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A3A1C13				NOT ASSIGNED		
A3A1C14	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A3A1C15	0180-0374	3	1	CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A3A1C16	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A3A1C17	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A3A1C18	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A3A1C19	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A3A1C20	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A3A1C21				NOT ASSIGNED		
A3A1C22				NOT ASSIGNED		
A3A1C23	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A3A1C24-A3A1C26				NOT ASSIGNED		
A3A1C27	0160-2055	9	3	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A1C28	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A1C29	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A1CR1	1901-0535	9	4	DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A1CR2	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A1CR3	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A1CR4	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A1CR5	1901-0040	1	1	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A1CR6	1901-0179	7	1	DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A3A1L1	9140-0114	4	3	INDUCTOR RF-CH-MLD 10UH 10% .166DX.385LG	28480	9140-0114
A3A1L2	9140-0114	4		INDUCTOR RF-CH-MLD 10UH 10% .166DX.385LG	28480	9140-0114
A3A1L3	9140-0114	4		INDUCTOR RF-CH-MLD 10UH 10% .166DX.385LG	28480	9140-0114
A3A1Q1	1854-0882	8	2	TRANSISTOR NPN PD=300MW FT=200MHZ	28480	1854-0882
A3A1Q2	1854-0882	8		TRANSISTOR NPN PD=300MW FT=200MHZ	28480	1854-0882
A3A1Q3	1853-0281	9	2	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A3A1Q4	1854-0404	0	4	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A3A1Q5	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A3A1Q6	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A3A1Q7	1855-0020	8	3	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A3A1Q8	1855-0020	8		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A3A1Q9	1855-0020	8		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A3A1Q10	1853-0034	0	1	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A3A1Q11	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A3A1Q12	1854-0546	1	1	TRANSISTOR NPN SI TO-72 PD=200MW	28480	1854-0546
A3A1Q13	1853-0451	5	1	TRANSISTOR PNP 2N3799 SI TO-18 PD=360MW	01295	2N3799
A3A1Q14	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A3A1Q15	1854-0039	7	1	TRANSISTOR NPN 2N3053S SI TO-39 PD=1W	3L585	2N3053S
A3A1R1	0698-6863	4	1	RESISTOR 1.537K .25% .125W F TC=0+-50	28480	0698-6863
A3A1R2	0698-6867	8	1	RESISTOR 7.35K .25% .125W F TC=0+-50	28480	0698-6867
A3A1R3	0698-7794	2	1	RESISTOR 10K .25% .125W F TC=0+-100	19701	MF4C1/8-T0-1002-C
A3A1R4	0757-0279	0	10	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A3A1R5	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A3A1R6	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A3A1R7	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A3A1R8	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A3A1R9	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A3A1R10	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A3A1R11	0698-5573	1	1	RESISTOR 50K .5% .125W F TC=0+-100	24546	C4-1/8-T0-5002-D
A3A1R12	0698-8014	1	1	RESISTOR 22.3K .5% .125W F TC=0+-50	19701	MF4C1/8-T2-2232-D
A3A1R13	0698-6840	7	1	RESISTOR 4.07K .5% .125W F TC=0+-50	24546	NC55-1/8-T2-4071-D
A3A1R14	0698-6217	2	1	RESISTOR 200K .5% .125W F TC=0+-100	28480	0698-6217
A3A1R15	0757-0416	7	4	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A3A1R16	0757-0280	3	11	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3A1R17	0698-0083	8	2	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A3A1R18	0698-3440	7	2	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A3A1R19	0757-0443	0	1	RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A3A1R20	0757-1094	9	2	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F

ManualsPlus.com

TABLE 1. A3A1, REPLACEABLE PARTS (2 OF 3)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3A1R21	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3A1R22	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3A1R23	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3A1R24	0757-0465	6	1	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A3A1R25	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A3A1R26	0698-3156	2	4	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A3A1R27	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A3A1R28	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A3A1R29	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3A1R30	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3A1R31	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A3A1R32	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A3A1R33	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A3A1R34	2100-1972	3	1	RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	02660	3810P-203
A3A1R35	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A3A1R36	0698-3441	8	1	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A3A1R37	0698-3445	2	1	RESISTOR 348 1% .125W F TC=0+-100	24546	C4-1/8-T0-348R-F
A3A1R38				NOT ASSIGNED		
A3A1R39				NOT ASSIGNED		
A3A1R40	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A3A1R41	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A3A1R42	0757-0438	3	1	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A3A1R43	0757-1094	9		RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A3A1R44				NOT ASSIGNED		
A3A1R45	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3A1R46	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A3A1R47	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A3A1R48	0757-0442	9	3	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3A1R49	0757-0289	2	1	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A3A1R50	0683-1555	0	1	RESISTOR 1.5M 5% .25W FC TC=-900/+1100	01121	CB1555
A3A1R51	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3A1R52	0698-3260	9	1	RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A3A1R53	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A3A1R54	0757-0346	2	3	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A3A1R55	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A3A1R56	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A3A1R57				NOT ASSIGNED		
A3A1R58	0698-3450	9	1	RESISTOR 42.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4222-F
A3A1R59	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3A1R60	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3A1R61	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3A1R62	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3A1R63				NOT ASSIGNED		
A3A1R64				NOT ASSIGNED		
A3A1R65	0698-0085	0	1	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A3A1R66	0698-3154	0	1	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A3A1R67	0757-0290	5	1	RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A3A1R68	0698-3160	8	1	RESISTOR 31.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3162-F
A3A1R69	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3A1R70				NOT ASSIGNED		
A3A1R71	0698-3447	4	1	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A3A1R72*	0698-3449	6	1	RESISTOR 28.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2872-F
A3A1TP1	1251-0600	0	5	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3A1TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3A1TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3A1TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3A1TP5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A3A1U1	1820-1423	4	2	IC MV TTL LS MONOSTBL RETRIG DUAL	01295	SN74LS123N
A3A1U2	1820-1417	6	1	IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS26N
A3A1U3	1820-1281	2	1	IC DCDR TTL LS 2-TO-4-LINE DUAL 2-INP	01295	SN74LS139N
A3A1U4	1820-1112	8	2	IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A3A1U5	1820-1196	8	2	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A3A1U6	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A3A1U7	1820-0471	0	1	IC INV TTL HEX 1-INP	01295	SN7406N
A3A1U8	1826-0319	7	2	IC OP AMP LOW-BIAS-H-IMPD TO-99 PKG	04713	LF356G
A3A1U9	1820-1423	4		IC MV TTL LS MONOSTBL RETRIG DUAL	01295	SN74LS123N
A3A1U10	1820-1212	9	1	IC FF TTL LS J-K NEG-EDGE-TRIG	01295	SN74LS112AN
A3A1U11	1820-1201	6	1	IC GATE TTL LS AND QUAD 2-INP	01295	SN74LS08N
A3A1U12	1820-1112	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A3A1U13	1820-0475	4	1	IC COMPARATOR HS TO-99 PKG	27014	LM306H
A3A1U14	1826-0319	7		IC OP AMP LOW-BIAS-H-IMPD TO-99 PKG	04713	LF356G
A3A1U15	1820-1425	6	1	IC SCHMITT-TRIG TTL LS NAND QUAD 2-INP	01295	SN74LS132N
A3A1U16	1820-1298	1	1	IC MUXR/DATA-SEL TTL LS 8-TO-1-LINE	01295	SN74LS251N
A3A1U17	1820-1197	9	1	IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A3A1U18	1820-1216	3	1	IC DCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N

*Indicates factory selected value

ManualsPlus.com

TABLE 1. A3A1, REPLACEABLE PARTS (3 OF 3)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3A1VR1	1902-3224	1	2	DIODE-ZNR 17.8V 5% DO-35 PD=.4W	28480	1902-3224
A3A1VR2	1902-3224	1		DIODE-ZNR 17.8V 5% DO-35 PD=.4W	28480	1902-3224
A3A1VR3	1902-3182	0	1	DIODE-ZNR 12.1V 5% DO-35 PD=.4W	28480	1902-3182
A3A1VR4	1902-0041	4	2	DIODE-ZNR 5.11V 5% DO-35 PD=.4W	28480	1902-0041
A3A1VR5	1902-0041	4		DIODE-ZNR 5.11V 5% DO-35 PD=.4W	28480	1902-0041
				MISCELLANEOUS PARTS		
	4040-0749	4	2	EXTR-PC BD BRN POLYC .062-BD-THKNS	28480	4040-0749

ManualsPlus.com

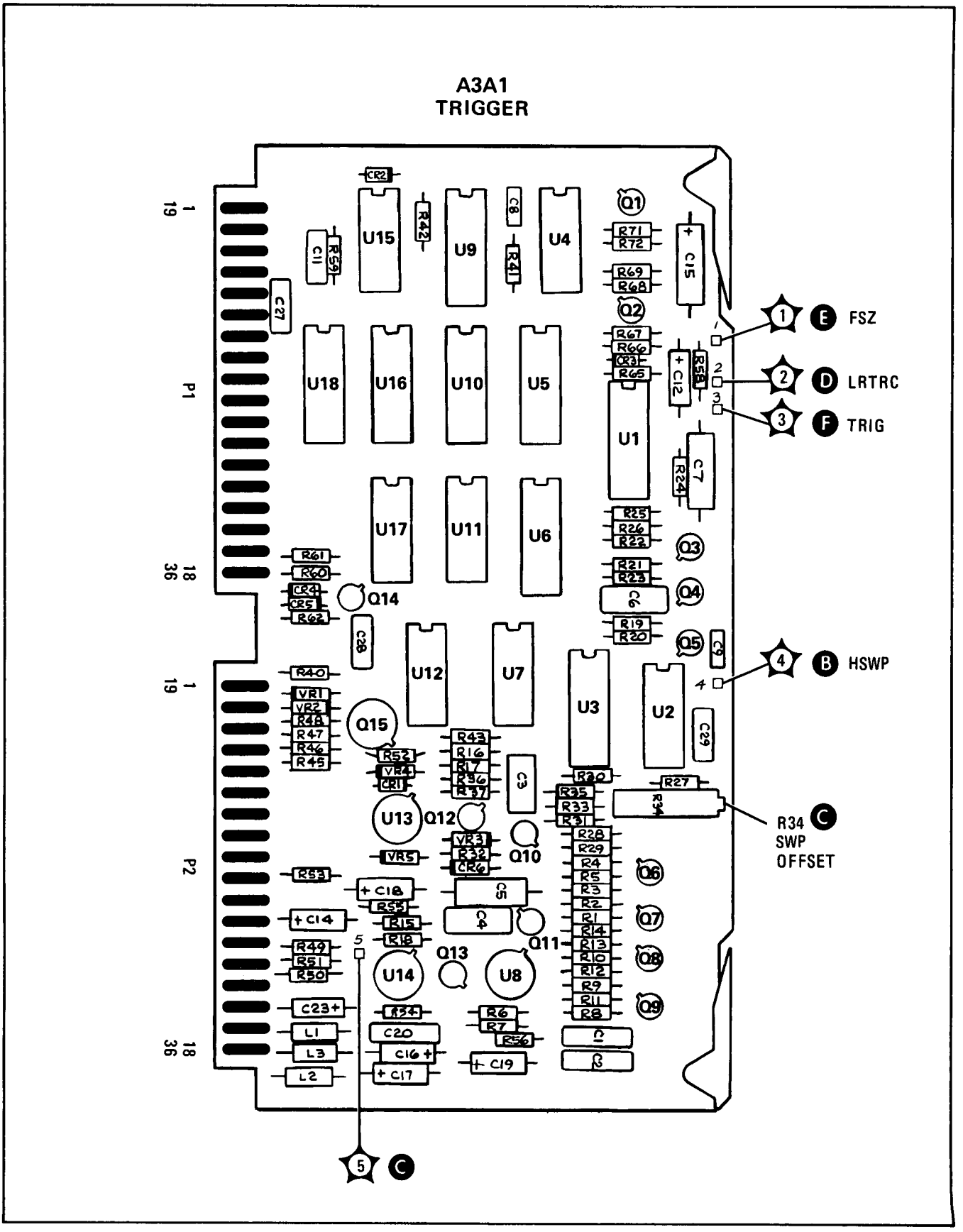


FIGURE 5. A3A1 TRIGGER, COMPONENT LOCATIONS

ManualsPlus.com

IF-DISPLAY SECTION

A3A1 TRIGGER
05682-60014

P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	FST	A3A2P1-1	E
19	LTIO	A3A10J2-46	B
2	NC		
20	HSHS	A3A8P1-15	B
3	NC		
21	HSYP	A3A10J1-7	
4	NC		
22	NC		
5	LINE TRIG	A3A10A2-16	F
23	NC		
6	NC		
24	NC		
7	NC		
25	NC		
8	NC		
26	ADR4	A3A10J1-27	B
9	ADR3	A3A10J1-28	B
27	ADR2	A3A10J2-23	B
10	NC	A3A10J2-24	B
28	VIDEO	A3A2P1-12	F
11	NC	A3A2P1-13	G
29	VBND		
12	NC	A3A10J2-17	C
30	FB OUT	A3A2P1-15	
13	NC	NOTE A	
31	NC	NOTE E	
14	NC		
32	NC		
15	NC		
33	NC		
16	NC		
34	NC		
17	NC		
35	NC		
18	PEN LIFT	A3A10H2-14	B
36	LFSEN	A3A2P2-7	D

P2

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	ICLK	A3A10J1-8	B
19	NC		
2	EXT TRIG	A3A10K2-13	F
20	NC		
3	NC		
21	NC		
4	NC		
22	NC		
5	TRIG LEVEL	A3A10J1-14	F
23	NC		
6	NC		
24	NC		
7	NC		
25	NC		
8	NC		
26	LSTRC	A3A2P2-17	
9	NC		
27	VBND	A3A2P1-11	G
10	NC		
28	VIDEO	A3A2P1-12	F
11	NC	A3A2P1-13	G
29	VBND		
12	NC		
30	FB OUT	A3A2P1-15	C
13	NC	NOTE A	
31	NC	NOTE E	
14	NC		
32	NC		
15	NC		
33	NC		
16	DGND		G
34	DGND		G
17	+5V		G
35	ABND		G
18	+15V		G
36	-15V		G

Ⓐ FAST SWEEP TIME CONTROL

Ⓒ FAST SWEEP GENERATOR

Ⓓ FAST SWEEP CONTROL

Ⓔ FAST SWEEP INTENSITY CONTROL

Ⓕ SWEEP TRIGGER

Ⓖ POWER SUPPLIES

Ⓗ HIGH SWEEP CONTROL

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (μF) INDUCTANCE IS IN MICROHENRIES (μH)
3. MNEMONIC TABLE:

MNEMONIC	DESCRIPTION
ADR0-4	INSTRUMENT BUS ADDRESS BITS 0-4 (HIGH=TRUE)
EXT TRIG	EXTERNAL TRIGGER
LFSEN	FAST SWEEP ENABLE
FB OUT	FAST SWEEP OUT
FBZ	FAST SWEEP Z-AXIS (INTENSITY)
HSWP	HIGH SWEEP
IDB11-15	INSTRUMENT BUS DATA BITS 11-15 (HIGH=TRUE)
ICLK	INDICATOR CLOCK (FRONT PANEL LEDS)
LINE TRIG	LINE TRIGGER
LTIO	LOW-TOP BOX I/O STROBE
PEN LIFT	CHART RECORDER PEN LIFT (1=DOWN)
LSTRC	FAST SWEEP RETRACE (LOW=RETRACE)
RBHS	RESET HIGH SWEEP
TRIG LEVEL	TRIGGER LEVEL (FROM FRONT PANEL CONTROL)
VIDEO	VIDEO SIGNAL, 0-2V

4. TRIGGER SOURCE ADDRESS:

A10 P1 PIN 19	A10 P1 PIN 21	TRIGGER SOURCE
0	0	FREE RUN
0	1	LINE
1	0	EXT
1	1	VIDEO

5. AUTO TRIGGERING TRUTH TABLE:

A10 P1 PIN 12	FAST SWEEP TRIGGERING
0	AUTO TRIGGER (NORMAL MODE (SHIFT TIMER, EXT)

6. FAST SWEEP TIME TRUTH TABLE:

FAST SWEEP TIME	A10 P1 PIN 18	A9 P1 PIN 20	A9 P1 PIN 22	A9 P1 PIN 24
100NS	0	0	0	0
200	0	0	0	1
500	0	0	1	0
1US	0	0	1	1
2US	0	1	0	0
5US	0	1	0	1
10US	0	1	1	0
20US	0	1	1	1
50US	1	0	0	0
100	1	0	0	1
200	1	0	1	0
500	1	0	1	1
1MS	1	1	0	0
2MS	1	1	0	1
5MS	1	1	1	0
10MS	1	1	1	1

7. UNLESS OTHERWISE INDICATED LOGIC LEVELS ARE TTL. +2.8V TO +5.0VVOLTS, "1", =HIGH 0V TO +0.8VVOLTS, "0", =LOW
8. P2-20,30 USED FOR SIGNAL FEEDBACKUSING 10:1 PASSIVE PROBE ASSEMBLY.
9. SEE TROUBLESHOOTING HINTS FOR THIS BOARD.
10. FOR SWEEP TIMES SLOWER THAN 1MS/DIV, FOR A 100% SIGNAL TEST WAVEFORM IS OBTAINED BY SHORTENED SWEEPS TO 1MS/DIV AND THEN PUSHING INSTRUMENT PRESET.
11. UNLESS OTHERWISE INDICATED SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.

A3A1

SERIAL PREFIX: 2403A

FIGURE 6. A3A1 TRIGGER, SCHEMATIC DIAGRAM

ManualsPlus.com

A3A2 INTENSITY CONTROL, CIRCUIT DESCRIPTION

A3A2 Intensity Control provides the following functions:

- It receives ΔX and ΔY signals from A3A3 Line Generator, approximates the line length, and controls the Z-axis level to the display.
- It sets and controls the duration of the Line Generator drawing period, which is either 4 μsec or 19 μsec, depending on the approximate line length.
- It provides drive signals to Line Generator switches.
- It controls all display blanking.
- It multiplexes digital storage (Line Generator) X, Y, Z, and blanking with direct display of fast sweep, video, fast sweep Z, and retrace blanking.

Intensity level is modulated as a function of ΔX and ΔY. The Line Generator Z-Axis circuit receives ΔX and ΔY from A3A3 Line Generator. The magnitudes of ΔX and ΔY are summed together to approximate line length. The output of the Line Generator Z-Axis circuit goes to the Bright circuit, which sets the Z-axis signal to maximum when bright lines are drawn. The signal from the Bright circuit is multiplexed with the FSZ signal from A3A1 Trigger and becomes the Z signal to the display. The Z signal also goes to the AUX Z circuit, where Z and AUX BLANK are combined to form the AUX Z signal.

The line length approximation from the Line Generator Z-Axis circuit goes to the Long Line Comparator, which decides whether the line should be drawn as a long line (19 μsec drawing time) or a short line (4 μsec drawing time). This decision is stored at the Input Register and sent to the A3A3 Line Generator as the LLL signal. It goes with LGCLK to the Long Line/Short Line Timing circuit, which generates the timing signals necessary to control the Line Generator setup and drawing periods. The signal INTR is used by A3A6 Main Control to determine when to send new X and Y values to the Line Generator. The timing signals also go to the Integrator Switch Driver and to the Sample and Hold Driver, which form the drive signals needed for the Line Generator.

Control of display blanking begins at the Input Register. Blank and blink information is held in the register during the line drawing period. The Blanking Logic circuit controls all display blanking. It unblanks, blanks, or blinks lines as required by the Input Register. It multiplexes digital storage blanking with fast-sweep retrace blanking.

Fast Scan Trigger Detect and Bus Buffer circuits are used to provide information to A3A6 Main Control to create the digital storage display.

Line Generator Z-Axis (J)

ΔX and ΔY are received from A3A3 Line Generator. U17 and associated circuitry is a magnitude detector. For positive ΔX, CR1 is forward biased, U17 output goes negative, and CR2 cathode is at 0V. For negative ΔX, CR1 is reverse biased, U17 output goes positive, and CR2 cathode is $-\Delta X$ volts (or $|\Delta X|$). Since R15 = 2R7 = R1, the signal at CR5 anode due to ΔX alone is $-|\Delta X|$. When added to the output of the ΔY magnitude detector, the signal at CR5 anode is $(-|\Delta X| - |\Delta Y|)$, which is a rough approximation of line length. The signal at CR7 anode is equal to the signal at CR5 anode except when CR5 anode is more positive than −0.1V. R16 and R17 prevent CR7 anode from rising above −0.1V.

The line length signal $(-|\Delta X| - |\Delta Y|)$ is sampled by U5 during the setup period of A3A3 Line Generator. Switches Q2 and Q4 are closed during sampling. The signal is held on C3 during the drawing period. Switches Q1 and Q3 are closed during the hold mode.

ManualsPlus.com

For dim lines, the DIM signal is high, and switch A of analog switch U1A is closed to lower the gain of the Sample and Hold circuit.

U1A switch D is closed during long lines (19 μsec drawing period).

Bright (K)

For bright lines (BRIGHT signal high), switch C of U1B is closed to set the signal LGZ to +2V.

Digital Storage/Fast Scan Mux (M)

This circuit provides multiplexing between the digital storage display (Line Generator) and the fast scan display (video and fast sweep). For the digital storage display, LGX, LGY, and LGZ are connected to X, Y, and Z by U15 and U14. For the fast scan display, FS OUT (fast sweep output), VIDEO, and FSZ (fast sweep Z axis) are selected.

Long Line Comparator (L)

The Long Line Comparator receives the line length approximation from CR7 cathode and compares it with the long-line threshold (LL THRESHOLD adjustment R12). U4 pin 7 goes high when the approximation has greater magnitude than the threshold.

Input Register (C)

The signal from the Long Line Comparator and line intensity information are stored in the Input Register when a positive edge occurs on the INTR line. The Input Register is updated for each line drawn on the display. Signal FS is used to select the fast scan display (fast sweep and video).

Blink (D)

The output of U12 is a 1-Hz signal with a 90 percent duty cycle. When enabled by the BLINK command stored in the Input Register, this signal causes display blinking.

Long Line/Short Line Timing (B)

This circuit receives signal LGCLK from A3A7 Interface and signal LL from the Input Register. It generates signal INTR, which is a string of 1 μsec pulses. When LL is low the pulses are spaced 5 μsec apart; when LL is high the pulses are 20 μsec apart. This provides the timing signals for the 4 and 19 μsec Line Generator drawing periods and 1 μsec setup period.

Integrator Switch Driver (E)

This circuit provides the drive signals for the Integrator switches in A3A3 Line Generator. Q13 and Q14 form a complementary driver. When the input is low, Q13 is on and Q14 is off, setting INTG to −5V and LINTG to 4.7V nominal. When the input is high, Q13 is off and 14 is on, setting INTG to +7.3V nominal and LINTG to −5V.

Sample and Hold Switch Driver (G)

This circuit provides the drive signals for the Sample and Hold circuits of the Line Generator X, Y, and Z axes. Q10 and Q12 form a complementary driver. A −9.6V reference is provided by Q11 and associated circuitry. Q9 is a level translator. When U11 pin 11 goes low, Q9 collector goes to −10.3V, turning Q10 off and Q12 on. Signals HLDX and HLDY go to 0V, and signal SMPL goes to −7.6V nominal. When U11 pin 11 goes high, Q9 collector goes to −8.9V, turning Q10 on and Q12 off. SMPL goes to 0V and Q10 collector goes to −8.4V nominal. Potentiometers R50 (X S&H BAL) and R51 (Y S&H BAL) are used to adjust the HLDX and HLDY

ManualsPlus.com

drive levels to A3A3 Line Generator. C18 and Q5 speed the rise time of the HLDX and HLDY signals. As U11 pin 11 goes from high to low, the base of Q5 goes low, causing Q5 to turn on and the HLDX and HLDY signals to rise almost instantaneously.

Blanking Logic (F)

This circuit provides all display blanking. It multiplexes the retrace blanking of the fast scan display (direct video and fast sweep) with the digital storage blanking. For the digital storage display it provides blanking or unblanking as specified by signals LLGBLANK, BLINK, DOTEN, and INTR. R30, R27, C16, R28, R32, and C15 are delay circuits which match the delay of the LBLANK signal to the delay of the Line Generator. R31, R29, and C14 match the retrace blanking delay to the fast sweep delay.

AUX Z (N)

The AUX Z circuit receives the LBLANK signal from the Blanking Logic and the Z signal from the Digital Storage/Fast Scan Mux. It generates the AUX BLANK and AUX Z signals. R65 and R62 convert the 0 – 2V range of Z to the 0 – 1V range necessary for variation of AUX Z intensity. U8 is a voltage follower with Q6 providing a high current output.

Blanking causes the AUX Z signal to drop to – 1V or less. When AUX BLANK goes high, Q7 turns off and Q8 turns on, causing AUX Z to go negative. When AUX BLANK IS LOW, Q7 is on and Q8 is off.

Fast Scan Trigger Detect (H)

This circuit is used to detect the occurrence of a fast scan trigger. When LRTRC, the retrace signal, goes high, a fast scan has been triggered. Flip-flop U18B is set by the positive edge of LRTRC. U18B is reset by LRSTO.

Bus Buffer (I)

This circuit buffers status signals onto the Digital Storage Bus.

ManualsPlus.com

A3A2 INTENSITY CONTROL, TROUBLESHOOTING

The A3A2 Intensity Control Assembly modulates the Z-Axis intensity, controls the A3A3 Line Generator drawing period, controls the display blanking, and multiplexes Digital Storage with the fast sweep video for sweep times less than 20 ms.

Digital Storage Test Program 4 is used to troubleshoot this assembly. Table 1 lists the voltages that are present at various nodes in the Line Generator Z-Axis **(J)**. Depending on the persistence of the oscilloscope the waveforms will appear either as dots or vertical line segments. If any of the sample and hold FETs A3A2 Q1 – Q4 are defective, it is easier to replace all four than to isolate the defective component.

TABLE 1. LINE GENERATOR Z-AXIS VOLTAGES

A3A2R12	P1-36	U17 pin 6	P1-34	U16 pin 6	U9 pin 6	U5 pin 6
LL (CW)	+2V to −6V	−0.5V to +6V	+2V to −9V	−0.5V to +9V	0 to +9V	0 to +6V
SL (CCW)	+5V to −6V	−0.5V to +6V	+2V to −9V	−0.5V to +9V	0 to +9V	0 to +14V

Disabling the blanking signal can be helpful when troubleshooting labels that are shifted from their proper positions. This is done by grounding one input to U7D. This can be accomplished without removing the board by running a jumper from ground to A3A2R32, the resistor nearest to the LG/FS CAL connector, A3A2J2.

The following program draws either a horizontal or a vertical line on the CRT. It is useful for troubleshooting problems associated with dynamic operation of the Z-Axis Line Generator. A better understanding of the operation of the Z-Axis Line Generator will be gained by keying in this program and observing the waveforms while reading the circuit description.

Key in the following:

Instrument Preset	Comments
[BLANK] TRACE A	
[BLANK] TRACE B	
[SHIFT] Recorder Upper Right	WRITE:
1056 Hz	(Skip Page)
[SHIFT] Recorder Lower Left	DSPL ADRS
0 Hz	
[SHIFT] Recorder Upper Right	WRITE:
1026 Hz	Vector Command
0 Hz 0 Hz	X, Y PAIR 1
1023 Hz 0 Hz	X, Y PAIR 2
0 Hz 0 Hz	X, Y PAIR 3
1056 Hz	(Skip Page)
[SHIFT] Recorder Lower Left	DSPL ADRS
2048 Hz	
[SHIFT] Recorder Upper Right	WRITE:
1056 Hz	(Skip Page)

ManualsPlus.com

To switch to a vertical line, key in:

SHIFT Recorder Lower Left
3 Hz
SHIFT Recorder Upper Right
0 Hz
1023 Hz

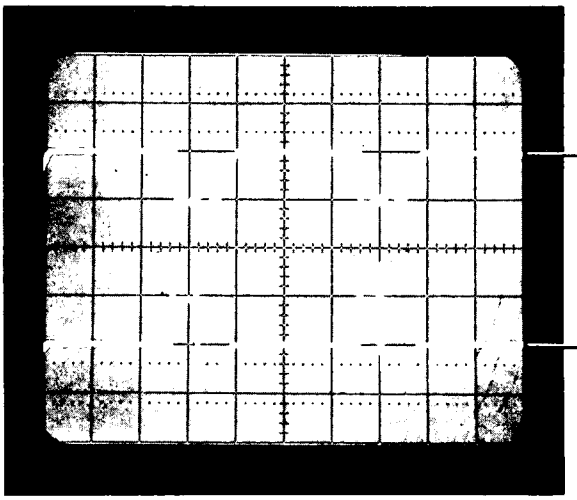
The waveforms in Figure 1 show the voltages for the ΔX and X components. For a vertical line, the waveforms are identical at the corresponding nodes in the ΔY and Y channels.

ManualsPlus.com

Oscilloscope settings:
Vertical: 5V/div
Sweeptime: 10μs/div
Ext trigger: A3A2 P2-23
Analyzer Settings:
A3A2R12: Fully CCW

U9 pin 6

P1-36

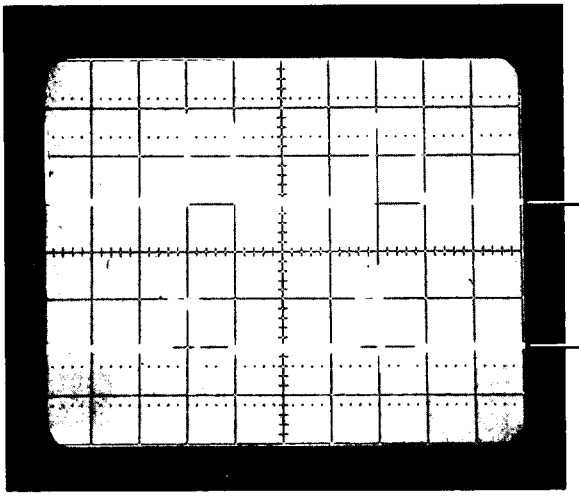


a. Magnitude Detector Output

Oscilloscope Settings:
Vertical: 5V/div
Sweeptime: 10μs/div
Ext trigger: A3A2 P2-23
Analyzer Settings:
A3A2R12: Fully CCW

U5 pin 6

P1-36

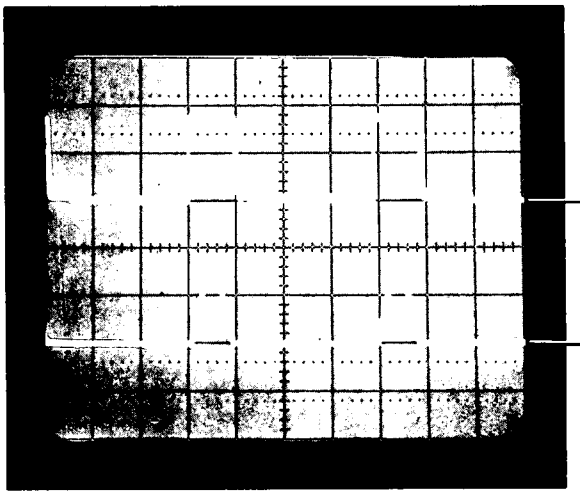


b. Sample and Hold Output

Oscilloscope Settings:
Vertical: 1V/div
Sweeptime: 10μs/div
Ext trigger: A3A2 P2-23
Analyzer Settings:
A3A2R12: Fully CCW

TP4

TP6



c. Z and X Outputs

FIGURE 1. INTENSITY CONTROL WAVEFORMS

ManualsPlus.com

TABLE 2. A3A2, REPLACEABLE PARTS (1 OF 3)

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A3A2	85662-60025	9	1	BOARD ASSEMBLY, INTENSITY CONTROL	28480	85662-60025
A3A2C1	0160-2249	3	1	CAPACITOR-FXD 4.7PF +-.25PF 500VDC CER	28480	0160-2249
A3A2C2	0160-2264	2	2	CAPACITOR-FXD 20PF +-5% 500VDC CER 0+-30	28480	0160-2264
A3A2C3	0160-3067	5	1	CAPACITOR-FXD 200PF +-5% 300VDC MICA	28480	0160-3067
A3A2C4	0160-2202	8	1	CAPACITOR-FXD 75PF +-5% 300VDC MICA	28480	0160-2202
A3A2C5	0160-4084	8	17	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C6	0180-0228	6	1	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A3A2C7	0180-0374	3	3	CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A3A2C8	0180-0374	3		CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A3A2C9	0180-0374	3		CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A3A2C10	0160-2055	9	3	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A2C11	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A2C12				NOT ASSIGNED		
A3A2C13	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C14	0160-2257	3	1	CAPACITOR-FXD 10PF +-5% 500VDC CER 0+-60	28480	0160-2257
A3A2C15	0160-2264	2		CAPACITOR-FXD 20PF +-5% 500VDC CER 0+-30	28480	0160-2264
A3A2C16	0140-0192	9	1	CAPACITOR-FXD 68PF +-5% 300VDC MICA	72136	DM15E680J0300WV1CR
A3A2C17	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C18	0160-2204	0	1	CAPACITOR-FXD 100PF +-5% 300VDC MICA	28480	0160-2204
A3A2C19	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C20	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C21	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C22	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C23	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C24	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C25	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C26	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C27	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C28	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C29	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C30	0140-0205	5	1	CAPACITOR-FXD 62PF +-5% 300VDC MICA	72136	DM15E620J0300WV1CR
A3A2C31	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C32	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C33	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C34	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A2CR1	1901-0040	1	12	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A2CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A2CR3	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A2CR4	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A2CR5	1901-0518	8	5	DIODE-SM SIG SCHOTTKY	28480	1901-0518
A3A2CR6	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A3A2CR7	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A3A2CR8	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A2CR9	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A2CR10	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A2CR11	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A2CR12	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A2CR13	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A2CR14	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A2CR15	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A3A2CR16	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A3A2CR17	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A2J1	1250-0543	8	2	CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A3A2J2	1250-0543	8		CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A3A2L1	9140-0210	1	2	INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3A2L2	08558-80011	6	1	FILTER COIL BLUE	28480	08558-80011
A3A2L3	9140-0237	2	1	INDUCTOR RF-CH-MLD 200UH 5% .166DX.385LG	28480	9140-0237
A3A2L4				NOT ASSIGNED		
A3A2L5	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3A2Q1	1855-0081	1	4	TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0081
A3A2Q2	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0081
A3A2Q3	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0081
A3A2Q4	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0081
A3A2Q5	1853-0007	7	6	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A3A2Q6	1854-0404	0	3	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A3A2Q7	1853-0034	0	1	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A3A2Q8	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A3A2Q9	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A3A2Q10	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A3A2Q11	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A3A2Q12	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A3A2Q13	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A3A2Q14	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251

ManualsPlus.com

TABLE 2. A3A2, REPLACEABLE PARTS (2 OF 3)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3A2R1	0757-0449	6	7	RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A3A2R2	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A3A2R3	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A3A2R4	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A3A2R5	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A3A2R6	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A3A2R7	0757-0442	9	8	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3A2R8	0698-3153	9	2	RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A3A2R9	0698-3156	2	1	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A3A2R10	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3A2R11	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3A2R12	2100-3354	9	1	RESISTOR-TRMR 50K 10% C SIDE-ADJ 1-TRN	28480	2100-3354
A3A2R13	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3A2R14	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3A2R15	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A3A2R16	0757-0438	3	5	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A3A2R17*	0757-0470	3	1	RESISTOR 162K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1623-F
A3A2R18	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A3A2R19	0757-0280	3	2	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3A2R20	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3A2R21*	0757-0447	4	1	RESISTOR 16.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1622-F
A3A2R22	0757-0443	0	1	RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A3A2R23	0757-0421	4	1	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A3A2R24	0698-3157	3	3	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A3A2R25	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3A2R26	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3A2R27	0757-0422	5	3	RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A3A2R28	0757-0317	7	3	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A3A2R29	0757-0422	5		RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A3A2R30	0757-0317	7		RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A3A2R31	0757-0317	7		RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A3A2R32	0757-0422	5		RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A3A2R33				NOT ASSIGNED		
A3A2R34	0698-0084	9	1	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A3A2R35	0757-1094	9	1	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A3A2R36	0698-3435	0	1	RESISTOR 38.3 1% .125W F TC=0+-100	24546	C4-1/8-T0-38R3-F
A3A2R37	0698-3151	7	1	RESISTOR 2.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2871-F
A3A2R38	0757-0398	4	1	RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A3A2R39	0757-0401	0	2	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A3A2R40	0698-3446	3	2	RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A3A2R41	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A3A2R42	0757-0394	0	2	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A3A2R43	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A3A2R44	0757-0460	1	1	RESISTOR 61.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6192-F
A3A2R45	0757-0288	1	1	RESISTOR 9.09K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-9091-F
A3A2R46	0757-0419	0	2	RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-681R-F
A3A2R47	0757-0278	9	1	RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A3A2R48	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A3A2R49	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A3A2R50	2100-3351	6	2	RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A3A2R51	2100-3351	6		RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A3A2R52	0698-3443	0	1	RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A3A2R53	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A3A2R54	0698-0082	7	1	RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A3A2R55	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A3A2R56	0698-3150	6	1	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A3A2R57	0757-0428	1	1	RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A3A2R58	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A3A2R59	0698-3442	9	1	RESISTOR 237 1% .125W F TC=0+-100	24546	C4-1/8-T0-237R-F
A3A2R60	0698-3446	3		RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A3A2R61	0757-0419	0		RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-681R-F
A3A2R62	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A3A2R63	0698-3153	9		RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A3A2R64	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3A2R65	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A3A2R66	0757-0405	4	1	RESISTOR 162 1% .125W F TC=0+-100	24546	C4-1/8-T0-162R-F
A3A2TP1	0360-0535	0	13	TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A2TP2	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A2TP3	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A2TP4	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A2TP5	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A2TP6	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A2TP7	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A2TP8	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A2TP9	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A2TP10	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION

*Indicates factory selected value

ManualsPlus.com

TABLE 2. A3A2, REPLACEABLE PARTS (3 OF 3)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3A2TP11	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A2TP12	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A2TP13	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A2U1	1820-1548	4	1	IC SWITCH ANLG QUAD 14-DIP-C PKG	3L585	CD4066AY
A3A2U2	1820-1196	8	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A3A2U3	1820-1197	9	1	IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A3A2U4	1826-0026	3	1	IC COMPARATOR PRCN TO-99 PKG	01295	LM311L
A3A2U5	1826-0081	0	5	IC OP AMP WB TO-99 PKG	27014	LM318H
A3A2U6	1820-1415	4	1	IC SCHMITT-TRIG TTL LS NAND DUAL 4-INP	01295	SN74LS13N
A3A2U7	1820-1425	6	1	IC SCHMITT-TRIG TTL LS NAND QUAD 2-INP	01295	SN74LS132N
A3A2U8	1826-0081	0		IC OP AMP WB TO-99 PKG	27014	LM318H
A3A2U9	1826-0081	0		IC OP AMP WB TO-99 PKG	27014	LM318H
A3A2U10	1820-1199	1	1	IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A3A2U11	1820-0054	5	1	IC GATE TTL NAND QUAD 2-INP	01295	SN7400N
A3A2U12	1826-0180	0	1	IC TIMER TTL MONO/ASTBL	01295	NE555P
A3A2U13	1820-1432	5	1	IC CNTR TTL LS BIN SYNCHRO POS-EDGE-TRIG	01295	SN74LS163AN
A3A2U14	1826-0417	6	2	IC SWITCH ANLG QUAD 16-DIP-C PKG	27014	LF13333D
A3A2U15	1826-0417	6		IC SWITCH ANLG QUAD 16-DIP-C PKG	27014	LF13333D
A3A2U16	1826-0081	0		IC OP AMP WB TO-99 PKG	27014	LM318H
A3A2U17	1826-0081	0		IC OP AMP WB TO-99 PKG	27014	LM318H
A3A2U18	1820-1112	8	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A3A2U19	1820-1491	6	1	IC BFR TTL LS NON-INV HEX 1-INP	01295	SN74LS367AN
A3A2VR1	1902-0554	4	1	DIODE-ZNR 10V 5% PD=1W IR=10UA	28480	1902-0554
A3A2VR2	1902-0025	4	1	DIODE-ZNR 10V 5% DO-35 PD=.4W TC=+.06%	28480	1902-0025
A3A2VR3	1902-3092	1	1	DIODE-ZNR 4.99V 2% DO-35 PD=.4W	28480	1902-3092
A3A2VR4	1902-3139	7	1	DIODE-ZNR 6.25V 5% DO-35 PD=.4W	28480	1902-3139
				MISCELLANEOUS PARTS		
	4040-0750	7	2	EXTR-PC BD RED POLYC .062-BD-THKNS	28480	4040-0750

ManualsPlus.com

NOTE

- FOR INSTRUCTIONS ON THE USE OF SIGNATURE ANALYSIS DIAGRAMS READ THE SIGNATURE ANALYSIS DESCRIPTION SECTION OF THIS MANUAL.

INTENSITY CONTROL CHECK

SPECTRUM ANALYZER CONNECTIONS:
REMOVE A3A1
JUMPER A3A2R12 LL THRESH FULLY CW
JUMPER A3A7TP3 TO A3A7TP6
JUMPER A3A6TP3 TO A3A6TP6

SIGNATURE ANALYZER CONNECTIONS:
CLOCK ⌐¬ TO A3A2TP2
START ⌐¬ TO A3A6TP2
STOP ⌐¬ TO A3A6TP2
POD GND A3A6TP1
PROBE GND A3A2TP3

PRESS:
A3A7S1 AFTER COMPLETING CONNECTIONS FOR EACH TEST OR CHECK

INTERRUPT CHECK

SPECTRUM ANALYZER CONNECTIONS:
REINSTALL A3A1
JUMPER A3A7TP3 TO A3A7TP6
JUMPER A3A6TP3 TO A3A6TP6
ADJUST A3A2R12 LL THRESH FULLY CCW

SIGNATURE ANALYZER CONNECTIONS:
CLOCK ⌐¬ A3A2TP2
START ⌐¬ A3A6TP2
STOP ⌐¬ A3A6TP2
POD GND A3A6TP1
PROBE GND A3A2TP3

PRESS:
A3A7S1 AFTER COMPLETING CONNECTIONS FOR EACH TEST OR CHECK

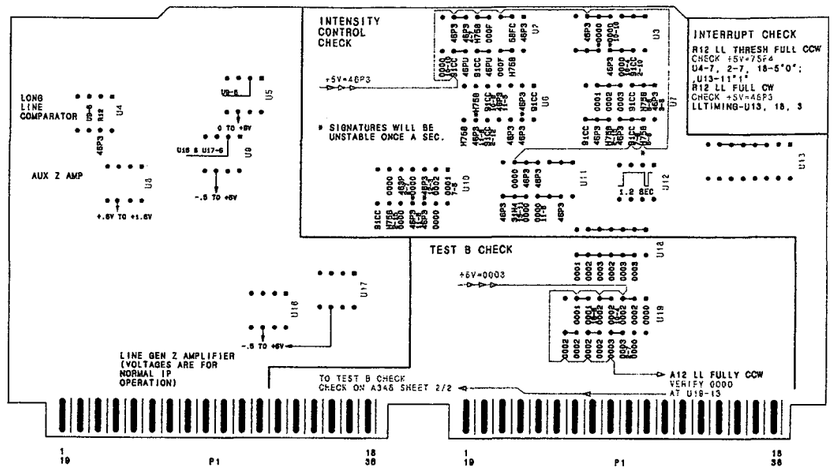
TEST B CHECK

SPECTRUM ANALYZER CONNECTIONS:
REMOVE A3A1
ADJUST A3A2R12LL FULLY CW
JUMPER A3A2P2-28 TO P2-27, P2-27, P2-14, AND P2-7
CONNECT A3A7J1 JUMPER TO PINS 4 AND 11
JUMPER A3A7TP3 TO A3A7TP6
JUMPER A3A6TP3 TO A3A6TP6
DISCONNECT REAR-PANEL CABLES (TO KEEP POWER ON, JUMPER A1A8TP1 TO A1A6TP2

SIGNATURE ANALYZER CONNECTIONS:
CLOCK ⌐¬ TO A3A7TP1
START ⌐¬ TO A3A6TP2
STOP ⌐¬ TO A3A6TP2
POD GND A3A2TP3
PROBE GND TO A3A2TP3

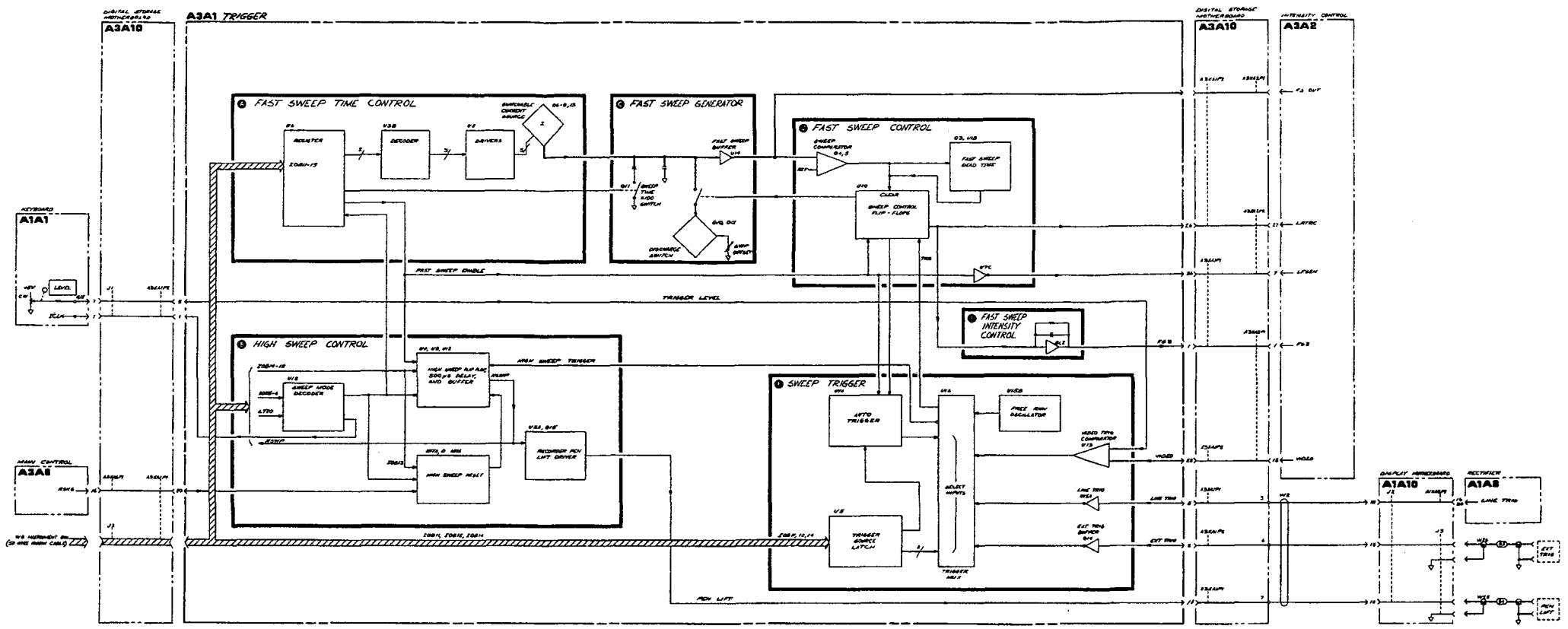
PRESS:
A3A7S1 AFTER COMPLETING CONNECTIONS FOR EACH TEST OR CHECK

A3A2
INTENSITY CONTROL
85662-60025



A3A2

FIGURE 2. A3A2 INTENSITY CONTROL, SIGNATURE ANALYSIS TROUBLESHOOTING DIAGRAM



A3A1

FIGURE 4. A3A1 TRIGGER, BLOCK DIAGRAM

ManualsPlus.com

ManualsPlus.com

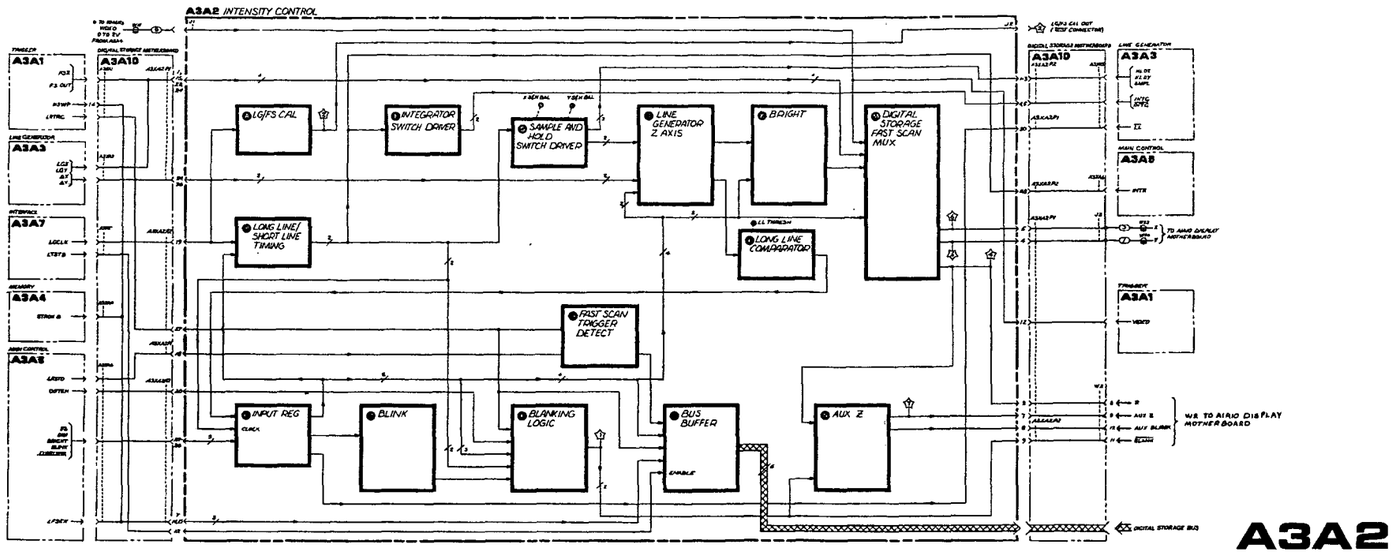


FIGURE 3. A3A2 INTENSITY CONTROL, BLOCK DIAGRAM

ManualsPlus.com

IF-DISPLAY SECTION

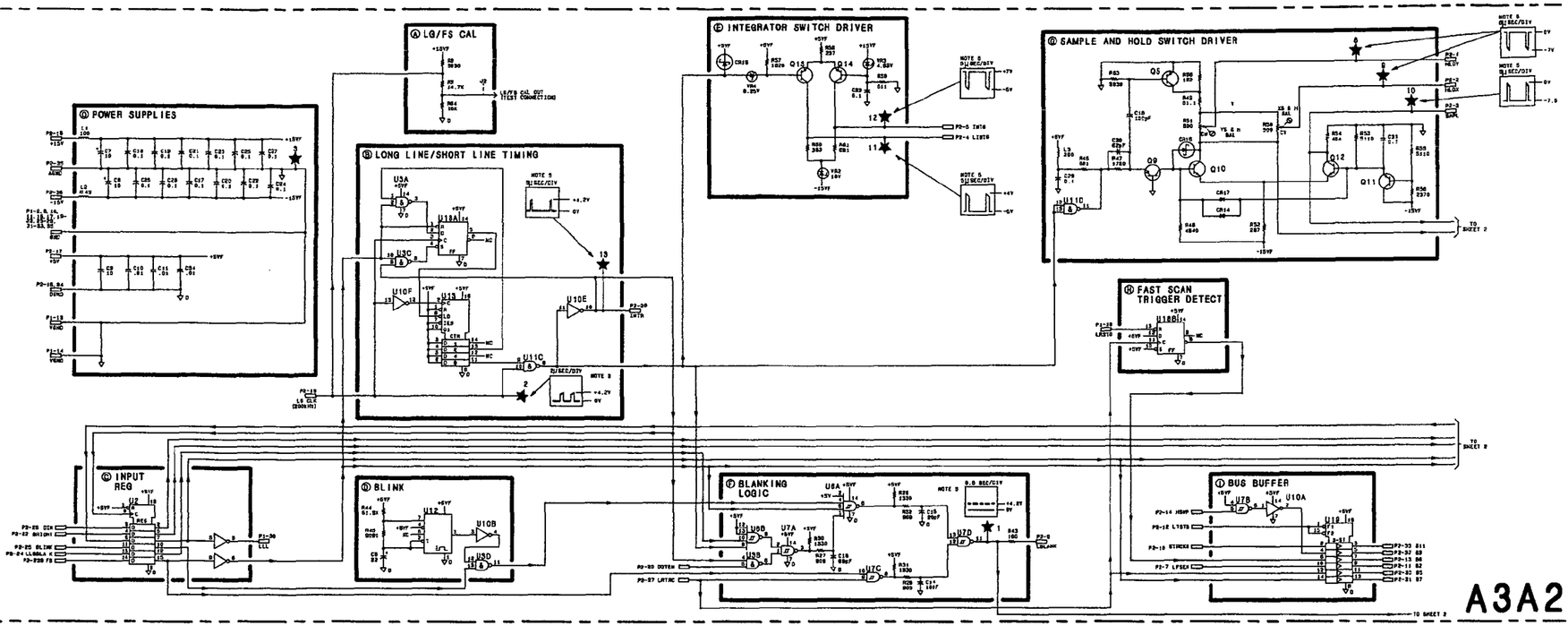
A3A2 INTENSITY CONTROL
85662-80025 (SHEET 1 OF 2)

P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK	
1	FSZ	A3A1P1-7	M	O
26	GND			B
6	GND		O	
20	GND			O
3	Z	A3A10K2-8	M	O
21	GND			O
4	Y	A3A10J3-Y	M	O
22	GND			C
5	X	A3A10J3-X	M	E
23	GND			N
6	GND		O	
24	LBY	A3A3P1-5	M	
7	AUXI	A3A10K3-8	N	O
25	GND			
8	NC		O	
26	GND			
9	NC		O	
27	GND			
10	GND		O	
28	GND			
11	GND		O	
29	GND			
12	VIDEO	A3A1P2-26	M	I
30	LLL	A3A3P1-20		C
13	VGND		O	
31	GND			
14	VGND		O	
32	GND			
15	F.B. OUT	A3A1P2-30	M	I
33	GND			
16	GND		O	
34	AY	A3A3P1-16		J
17	GND		O	
35	GND			
18	LRETC	A3A3P1-18		H
36	AX	A3A3P1-19		J

P2

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK	
1	HLDY	A3A3P1-32	G	O
45	LDCLK	A3A7P2-6		B
2	HLDX	A3A3P1-33	G	G
89	DOTEN	A3A6P1-24		FG
3	SWP.	A3A3P1-34	G	
91	NC			
4	LINTG	A3A3P1-35	E	E
22	BRIGHT	A3A6P1-1		C
5	INTG	A3A3P1-36	E	E
23	FS	A3A6P1-19		C
6	NC			
24	LLGBLANK	A3A6P1-2		C
7	LFSCN	A3A1P2-31	I	I
25	SLINE	A3A6P1-20		C
8	AUX BLANK	A2A10K2-13	M	M
26	DIM	A3A3P1-3		C
9	LBLANK	A3A10K2-11	F	F
27	LNTRC	A3A2P1-26		F
10	NC			
28	INTN	A3A6P1-24	B	
11	BZ			I
29	NC			
12	LTSTB	A3A7P1-4		I
30	HS			
13	B6	A3A7P1-13		I
31	B7			
14	XSWP	A3A1P1-21		I
92	B8			
15	STRCKB	A3A4P1-9		I
32	B11			
16	DGND		O	
94	DGND			O
17	+5V		O	
93	ANGD			O
18	+15V		O	
96	-15V			O

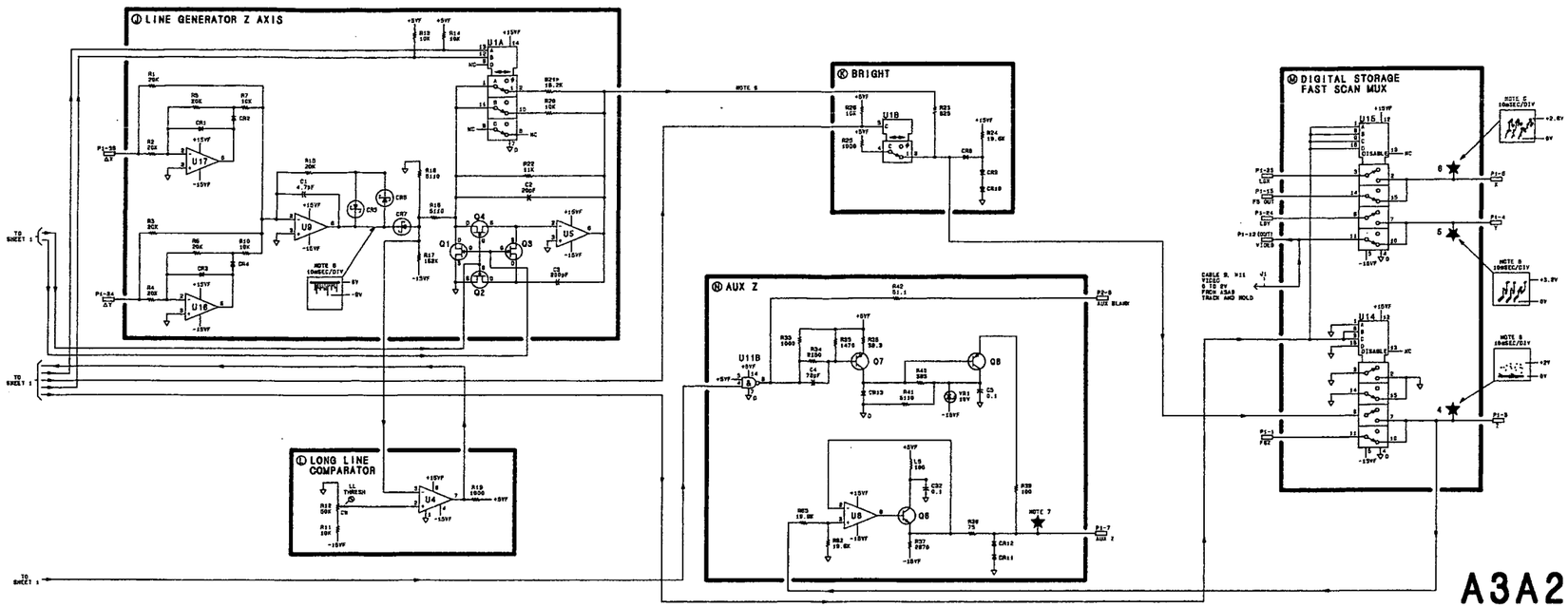


SERIAL PREFIX: 2403A

FIGURE 5. A3A2 INTENSITY CONTROL, SCHEMATIC DIAGRAM (1 OF 2)

ManualsPlus.com

A3A2 INTENSITY CONTROL
85662-80025 (SHEET 2 OF 2)



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (μF) INDUCTANCE IS IN MICROHENRIES (μH)
3. UNLESS OTHERWISE INDICATED: LOGIC LEVELS ARE TTL: +2.0V TO +5.0V=LOGIC "1" HIGH 0V TO +0.8V=LOGIC "0" LOW
4. MNEMONIC TABLE:

MNEMONIC	DESCRIPTION
FSS	FAST SWEEP Z
LGX	LINE GENERATOR X
LGY	LINE GENERATOR Y
LLL	LONG LINE LINE
HLGY	HOLD Y
LGCLK	LINE GENERATOR CLOCK
HLGX	HOLD X
DOTEN	DOT ENABLE
LSMPL	SAMPLE
LINTS	NOT INTEGRATE
INTG	INTEGRATE
FS	FAST SCAN
LLGBLANK	LOW=LINE GENERATOR BLANK
LFSEN	LOW=FAST SCAN ENABLE
INTR	INTERRUPT
HSWP	HIGH=SWEEP
LRSTG	LOW=RESET TRIGGER OCCURRED
STROKE	EIGHT CHARACTER STROKE
BRIGHT	BRIGHT LINE
DIM	DIM LINE
LL	LONG LINE
LRTRC	LOW=RETRACE
BLINK	BLINK LINE
ΔX	DELTA X
ΔY	DELTA Y
LBLANK	LOW=BLANK
LTSTB	LOW=TEST B
XS & HBAL	X SAMPLE AND HOLD BALANCE
YS & HBAL	Y SAMPLE AND HOLD BALANCE
LLTHRESH	LONG LINE THRESHOLD

5. TEST CONDITIONS FOR WAVEFORMS ARE: ROTATE A3A2 R12 TO FULL CW POSITION SHORT A3A6TP5 TO A3A3TP6 SHORT A3A7TP5 TO A3A7TP6 PRESS A3A7S1
6. USE TEST CONDITIONS FROM NOTE 5 AND EXTERNAL TRIGGER FROM P2-P3.
7. USING TEST CONDITIONS FROM NOTE 5 AND EXTERNAL TRIGGER FROM P2-P3, A WAVEFORM APPEARS AT TP4. MAXIMUM POSITIVE AMPLITUDE IS +4.3V. A +3.3V BLANKING SIGNAL IS ALSO PRESENT.
8. USING TEST CONDITIONS FROM NOTE 5 AND EXTERNAL TRIGGER FROM P2-P3, WAVEFORM APPEARS AT TP4. POLE MEASURE. MAXIMUM POSITIVE AMPLITUDE IS +8V.
9. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE OR TOP AND EXIT AT RIGHT SIDE OR BOTTOM OF FUNCTION BLOCKS.

SERIAL PREFIX: 2403A

FIGURE 5. A3A2 INTENSITY CONTROL, SCHEMATIC DIAGRAM (2 OF 2)

ManualsPlus.com

A3A3 LINE GENERATOR, CIRCUIT DESCRIPTION

A3A3 Line Generator receives a series of digital X and Y display positions, converts them to analog values, and connects them with straight lines. This process, called line generation, is similar to that of dot-to-dot drawing on paper (see Figure 1). Two independent line generators are required: one for the X series of values and one for the Y series. For each line there is a setup period followed by a drawing period. During the setup period the display is blanked by A3A2 Intensity Control.

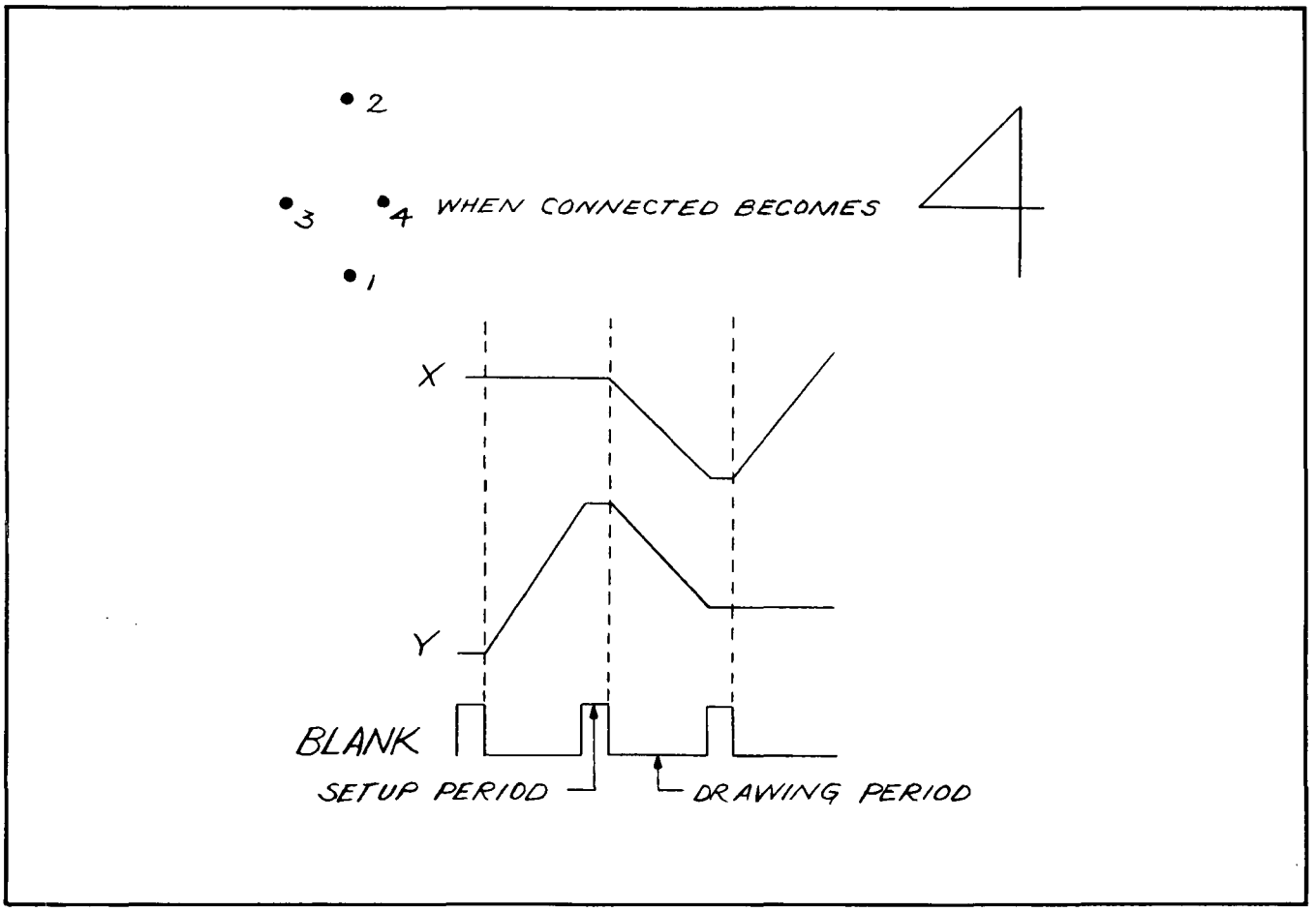


FIGURE 1. LINE GENERATION PROCESS

Each of the line generators consists of a register, a digital-to-analog converter (DAC), a summing amplifier, a sample and hold circuit, an integrator, and a filter. The X or Y register receives the next display point from the Digital Storage Bus. The DAC converts this number to a current. The summing amplifier then computes a position change ΔX equal to "next X" minus "present X." During the setup time for the next line, ΔX and ΔY are sampled by the Sample and Hold circuit. At the end of the setup time and during the drawing time, ΔX and ΔY are held for constant input to the Integrator. During the drawing time, the Integrator output changes linearly from X to $X + \Delta X$ and from Y to $Y + \Delta Y$. This is done by integrating ΔX and ΔY at a constant rate such that the output becomes $X + \Delta X$ and $Y + \Delta Y$; that is, "new X" and "new Y."

ManualsPlus.com

X Register (A)

U5 and U6 form a 10-bit X Position Register. When a new X position is present on lines BØ-B9 of the Digital Storage Bus, the CHAR line is held low and a positive-going edge on LDX causes U5 and U6 to be loaded with the value of BØ-B9. These 10 bits then become the X position input to the X DAC. Characters are drawn by changing only bits 1, 2, and 3 of the X Position Register and bits 1 – 4 of the Y Position Register. Strokes of a character are described by a series of X and Y values sent to the Line Generator on the Digital Storage Bus. B4-B6 of the Digital Storage Bus carry the series of X values. When the next X value is present on B4-B6, the CHAR line is held high and a positive-going edge on LDCHAR causes U5 to be loaded with the new values for bits 1 – 3 of the X position.

X DAC (D)

The output of U5 and U6 are the X position input to U4, the X DAC. U4 is a 10-bit multiplying DAC whose output current depends on the digital input code and the voltage at VREF (pin 15). This output current is the analog X position sent to the X Summing Amplifier. The inputs of U4 are clamped to a maximum of +3.6V by diodes CR1 through CR10.

X Summing Amplifier (G)

The X Summing Amplifier receives the next X position from the X DAC, the present X position from the X Integrator, and an X position shift from the Expand Register. The three signals are summed to give ΔX = "next X" + "X shift" – "present X." "X shift " is a binary signal of 0V or +5V, and the amount of shift is adjusted by X EXP potentiometer R1 (X and Y shift are used to move the display origin from the graticule lower left to the screen lower left). X GAIN potentiometer R4, the X line generator gain adjustment, varies the magnitude of the X line generator output. R4 also has an effect on the accuracy of line positions. XLL potentiometer R6, the X long line adjust, is used to adjust line position accuracy (see Integrator description).

X Sample and Hold (J)

The ΔX value from the Summing Amplifier is held for constant input to the Integrator by the X Sample and Hold circuit. Sampling occurs during the setup period, which lasts 1 μsec. Holding occurs during the drawing period, which lasts 4 μsec or 19 μsec. Q2 and Q3 are on during the sample mode and are driven by the SMPL line. Q1 and Q4 are on during the hold mode and are driven by the HLDX line (see Figure 2). Q6 is a dual FET used to provide a high-impedance input to U2. Capacitor C23 is the holding capacitor.

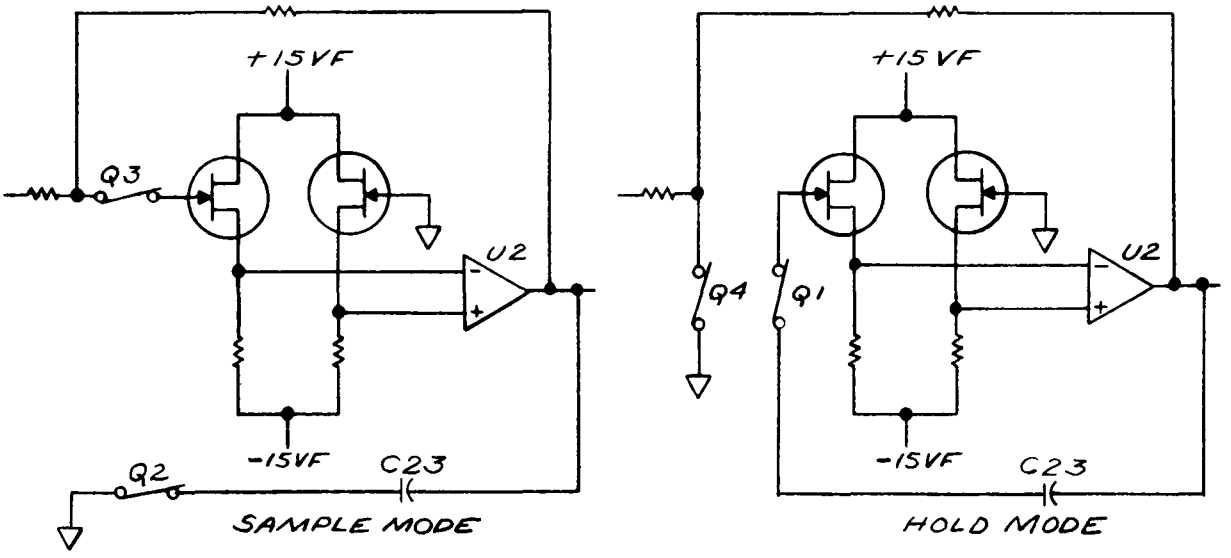


FIGURE 2. SAMPLE AND HOLD MODES, SIMPLIFIED SCHEMATIC

ManualsPlus.com

X Integrator (L)

U1, C26, and Q5 form an "integrate and hold" circuit whose output is the X display position. During the setup period, Q5 is open, leaving only U1 and C26 holding the present value of X. During the drawing period, Q5 is closed and the constant ΔX value from the Sample and Hold circuit causes a constant current (proportional to ΔX) to flow through C26. This constant current through C26 causes the output of U1 to change linearly from the value (X_i) at the last setup period toward a new value $X_{i+1} = X_i + \Delta X$. When the drawing period ends, Q5 opens and the circuit returns to the hold mode, this time with output at the new X position, X_i. The process of current flow through C26 is equivalent to integrating ΔX over the drawing period.

The drawing period may last for 4 μsec (short line) or 19 μsec (long line). The hold period lasts for 1 μsec. When the Line Generator is drawing a long line (19 μsec), switch Q8 is open and the current through C26 is determined by R15. When the Line Generator is drawing a short line (4 μsec), switch Q8 is closed and the current through C26 is determined by R15 in parallel with R7, R18. In either case, the current must be precisely set so that the X position will become $X_{i+1} = X_i + \Delta X$ at the end of the drawing period. In the long line mode, XLL potentiometer R6 of the Summing Amplifier is adjusted to get accurate line positioning. For accuracy in the short line mode, XSL potentiometer R18 must be properly adjusted.

Diodes CR22 and CR23 keep the source of Q5 within 0.7V of ground during the hold mode. Capacitors C43 and C27 and signal LINTG compensate for gate feedthrough on Q5. R16, C29, and C28 provide frequency compensation for U1.

X Filter (O)

The X Filter is a 2.5-MHz low-pass filter which smooths out transients from the X Integrator.

Y Register (C)

U9 and U10 form a 10-bit Y Register. When a new Y position is present on BØ-B9 of the Digital Storage Bus, the CHAR line is held low and a positive-going edge on LDY causes U9 and U10 to be loaded with the value of BØ-B9. These 10 bits then become the Y position input to the Y DAC. When characters are being drawn, bits 1 – 4 of the Y Register are changed. BØ-B3 of the Digital Storage Bus carry the series of Y values representing the Y components of the character strokes. When the next Y value is present on BØ-B3, the CHAR line is held high and a positive-going edge on LDCHAR causes U9 to be loaded with the new values for bits 1 through 4 of the Y position.

Y DAC, Y Summing Amplifier, Y Sample and Hold, Y Integrator, and Y Filter (F) (I) (K) (N) (P)

The Y DAC, Y Summing Amplifier, Y Sample and Hold, Y Integrator, and Y Filter operate in a manner identical to that of the corresponding X Line Generator circuits.

Expand Register (B)

U14 is a 2-bit Expand Register which provides scale and origin-shift information to the X and Y Line Generators. When a new expand value is present on B6 and B8 of the Digital Storage Bus, a positive-going edge on LDEXP causes U14 to be loaded with the value of B6 and B8. A high on B6 will cause a scale increase of 13 percent over normal (the graticule is drawn at normal scale) and an origin shift of 13.6 percent of normal scale. A high on B8 will cause a scale increase of 55 percent over normal with no origin shift. A high on both B6 and B8 will cause a scale increase of 68 percent over normal and an origin shift of 13.6 percent of normal scale. Q16 and Q17 provide buffering from the TTL signals to the analog circuits.

ManualsPlus.com

Reference (E)

U13 provides the reference voltage to the X and Y DACs. The magnitude of the reference voltage is proportional to the scale of the Line Generator output. For normal scale the reference voltage is nominally −5.12V. For the three expanded scales, the reference may be −5.8V, −7.9V, or −8.6V.

Y Offset (H)

The Y Offset circuit supplies a signal to the Y Summing Amplifier such that the output of the Y Line Generator will be 0V when the Y Register contains all zeroes and no origin shift is present. YOS potentiometer R43 is used to make the adjustment.

Long Line Switch Driver (M)

The long Line Switch Driver provides level translation from the TTL signal LLL to the gate signals for Q7 and Q8. A high on LLL turns on Q7 and Q8.

Line Generator Timing

Figure 3 shows the timing relationship between the X and Y Line Generator outputs and the drive signals. Changes in the X Register, Y Register, and Expand Register occur only during the drawing period; that is, when the Sample and Hold circuit is holding. Changes in the LLL signal occur only during the setup period; that is, when the Integrator is holding. The length of the drawing period (either 4 or 19 μsec) is determined by A3A2 Intensity Control.

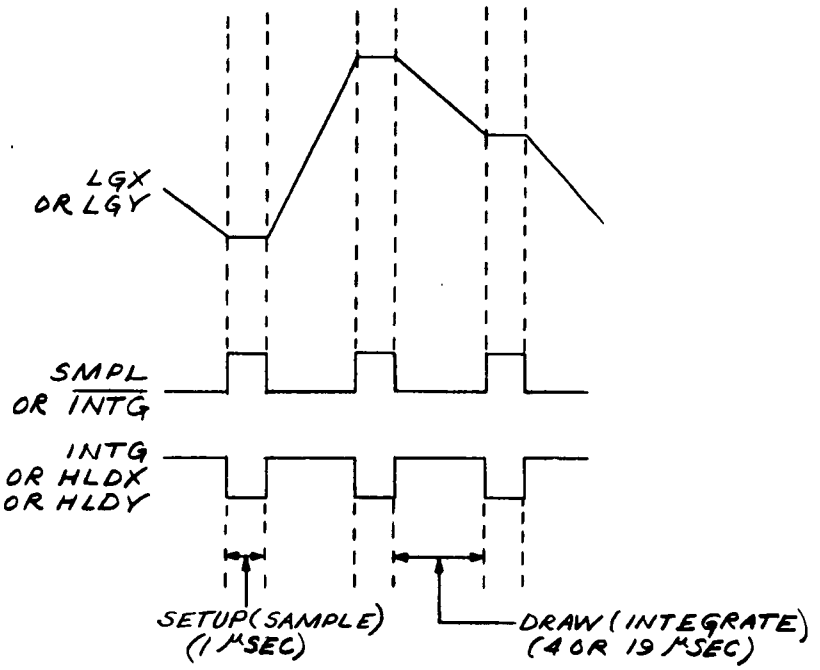


FIGURE 3. LINE GENERATOR TIMING

ManualsPlus.com

A3A3 LINE GENERATOR, TROUBLESHOOTING

The A3A3 Line Generator Assembly converts the digital X and Y display positions from the Digital Storage processor to analog values and draws lines between them. It positions the characters with respect to the graticule and sets the size of the display and graticule.

A distorted CRT display involving both the horizontal and the vertical components is often caused by malfunctions on this assembly. If only the video information is distorted, suspect the A3A8 Analog Digital Converter. Drawing of the characters is controlled by the Character Stroke Memory on the A3A4 Memory Assembly.

If both the X and Y channels are distorted, suspect the Expand Register **(B)**, Reference **(E)**, Long Line Switch Driver **(M)** and/or the INTG or SMPL control signals, as these are common to both channels.

If the positive amplitude at A3A3TP11 is only +2V, the gate of either Q5 or Q10 has been damaged.

The Long Line switches Q7 and Q8 can be tested as follows. Set A3A2R12 in the LL position (full CW). A3A3TP6 is then a TTL low and the gates of Q7 and Q8 are approximately −15V. With A3A2R12 in the fully CCW position, A3A3TP6 is a TTL high and the gates of Q7 and Q8 are approximately −1V.

If it is determined that any of the Sample and Hold FETs Q1−Q4 or Q12−Q15 are defective, the best procedure is to replace all four since it is not easy to determine which FET is defective.

The Digital Storage Test Programs can be used to troubleshoot the analog functions on A3A3. When using these programs, the LL/SL pot A3A2R12 should be set to the full CW position (LL). The SL (full CCW) position should also be examined as it exercises the circuitry at the highest speeds.

Digital Storage Test Program 5 and the CRT display are used to verify the input Registers and the DACs. It is not necessary to remove A3A1 when testing A3A3. The display in Figure 4 is the result of a Y DAC or Y Register malfunction. Notice that the malfunction causes vertical jumps in the test waveform. A defective component in the X channel would cause horizontal jumps. The Signature Analyzer is necessary to determine the defective component.

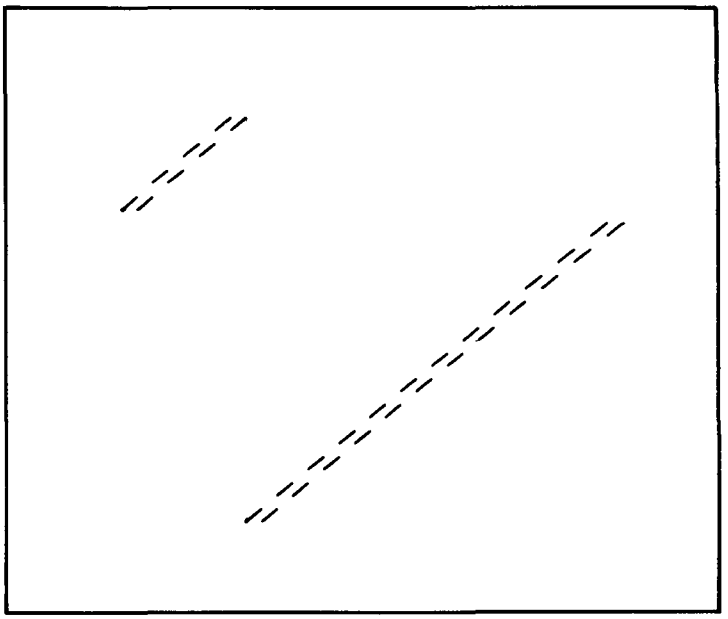


FIGURE 4. DIGITAL STORAGE TEST PROGRAM #5 DISPLAY WITH DEFECTIVE Y CHANNEL

ManualsPlus.com

The Expand Register **(B)** and Reference **(E)** set the V_{REF} levels for the X and Y DACs. This provides both magnification and origin shift for the display. As shown in Table 1, four voltage levels are generated. These levels are present when Digital Storage Test Program 3 is used (again it is not necessary to remove A3A1). The reference voltage is measured at A3A3TP8. With A3A2R12 in the LL position and the oscilloscope sweep time set to 2 msec/div, the waveform shown in Figure 5 will result. In the SL position the waveform is identical for a sweep time of 1 msec/div.

TABLE 1. REFERENCE VOLTAGE TRUTH TABLE

	Reference Voltage			
	−5.1V	−5.8V	−7.9V	−8.6V
U14 pin 3 U14 pin 11	H H	L H	H L	L L

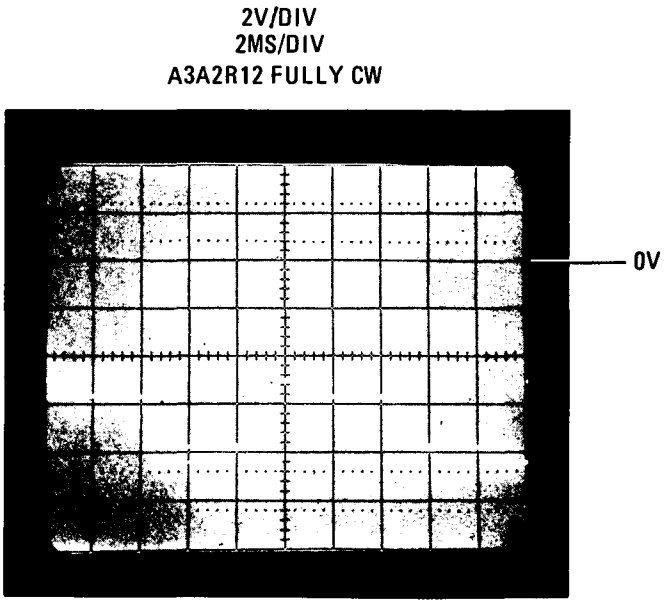


FIGURE 5. REFERENCE VOLTAGES

The following program is useful in troubleshooting problems related to the dynamic operation of the Summing Amplifiers, Sample and Hold, and Integrators. It draws a line from the lower left corner of the display to the upper right corner and then back to the lower left.

ManualsPlus.com

Key in the following:

Instrument Preset	Comments
[BLANK] TRACE A	
[BLANK] TRACE B	
[SHIFT] Recorder Upper Right	WRITE:
1056 Hz	Skip Page
[SHIFT] Recorder Lower Left	DSPL ADRS
0 Hz	
[SHIFT] Recorder Upper Right	WRITE:
1026 Hz	Vector Command
0 Hz 0 Hz	X, Y pair 1
1023 Hz 1023 Hz	X, Y pair 2
0 Hz 0 Hz	X, Y pair 3
1056 Hz	Skip Page
[SHIFT] Recorder Lower Left	DSPL ADRS
2048 Hz	
[SHIFT] Recorder Upper Right	WRITE
1056 Hz	Skip Page

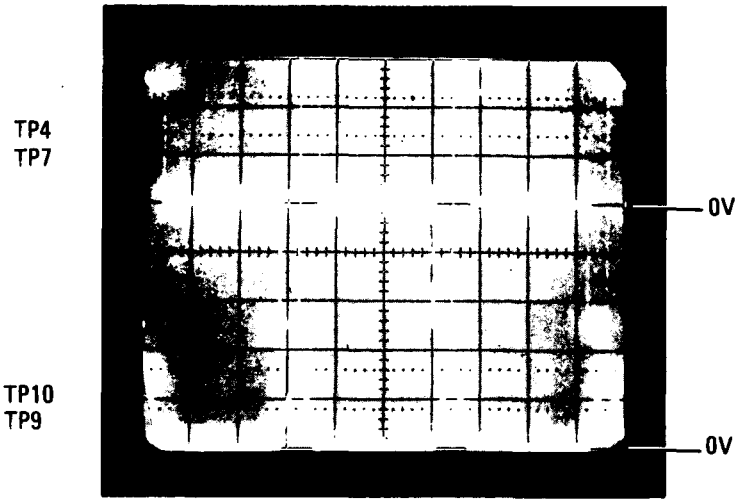
The waveforms in Figure 6 show the X and Y channel outputs for this program.

The +5V pulse at A3A3TP12 is the "next X" data from the X DAC. In this program the "X shift" value from the Expand Register is 0V. The "present X" value is the waveform of A3A3TP10. The output at A3A3TP12 is ΔX = "next X" + "X shift" − "present X." The small spikes every 5 μsec indicate the beginning and end of the 1 μsec sampling period. A3A3TP4 shows the output of the Sample and Hold circuitry. Note that the output is inverted relative to the output of the summing amplifier.

A3A3TP10 shows the result of integrating ΔX over the drawing period. See the A3A3 Line Generator Circuit Description for a more complete description of the operation of the Integrator circuit.

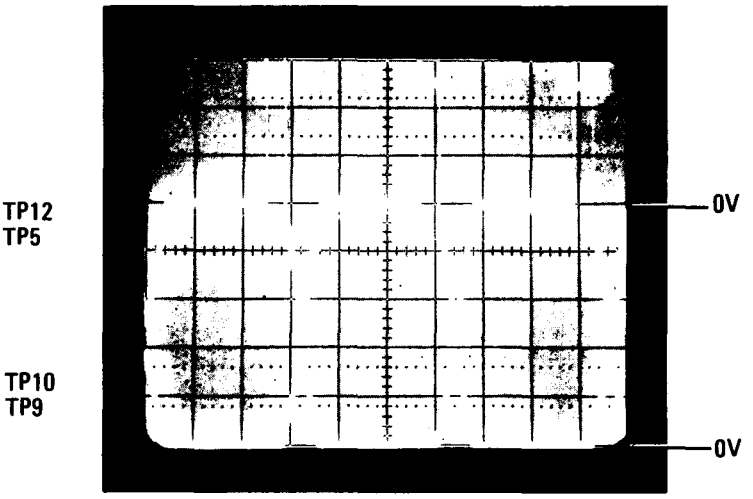
ManualsPlus.com

Oscilloscope Settings:
Sweeptime: 10 μs/div
Ext. trigger: TP10
Vertical:
Upper trace: 2V/div
Lower trace: 1V/div
Analyzer Settings:
A3A2R12: Fully CCW



a. Sample and Hold Output

Oscilloscope Settings:
Sweeptime: 10μs/div
Ext. trigger: TP10
Vertical:
Upper trace: 2V/div
Lower trace: 1V/div
Analyzer Settings:
A3A2R12: Fully CCW



b. Summing Amplifier Output

FIGURE 6. LINE GENERATOR X AND Y CHANNEL OUTPUTS

ManualsPlus.com

TABLE 2. A3A3, REPLACEABLE PARTS (1 OF 3)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3A3	85662-60128	3	1	BOARD ASSEMBLY, LINE GENERATOR	28480	85662-60128
A3A3C1	0180-0374	3	3	CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A3A3C2	0180-0374	3		CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A3A3C3	0180-0374	3		CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A3A3C4	0160-2257	3	2	CAPACITOR-FXD 10PF +-5% 500VDC CER 0+-60	28480	0160-2257
A3A3C5	0160-2257	3		CAPACITOR-FXD 10PF +-5% 500VDC CER 0+-60	28480	0160-2257
A3A3C6	0160-4084	8	17	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A3C7	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A3C8	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A3C9	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A3C10	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A3C11	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A3C12	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A3C13	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A3C14	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A3C15	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A3C16	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A3C17	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A3C18	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A3C19	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A3C20	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A3C21	0160-2250	6	5	CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A3A3C22	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A3A3C23	0160-3067	5	2	CAPACITOR-FXD 200PF +-5% 300VDC MICA	28480	0160-3067
A3A3C24	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A3A3C25	0160-3067	5		CAPACITOR-FXD 200PF +-5% 300VDC MICA	28480	0160-3067
A3A3C26	0160-2675	9	2	CAPACITOR-FXD 3900PF +-1% 300VDC MICA	28480	0160-2675
A3A3C27				NOT ASSIGNED		
A3A3C28	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A3A3C29	0160-3995	8	2	CAPACITOR-FXD 3900PF +-10% 250VDC CER	28480	0160-3995
A3A3C30	0160-3995	8		CAPACITOR-FXD 3900PF +-10% 250VDC CER	28480	0160-3995
A3A3C31	0160-2675	9		CAPACITOR-FXD 3900PF +-1% 300VDC MICA	28480	0160-2675
A3A3C32				NOT ASSIGNED		
A3A3C33	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A3A3C34	0140-0191	8	2	CAPACITOR-FXD 56PF +-5% 300VDC MICA	72136	DM15E560J0300WV1CR
A3A3C35	0140-0199	6	2	CAPACITOR-FXD 240PF +-5% 300VDC MICA	72136	DM15F241J0300WV1CR
A3A3C36	0160-3536	3	2	CAPACITOR-FXD 620PF +-5% 100VDC MICA	28480	0160-3536
A3A3C37	0140-0191	8		CAPACITOR-FXD 56PF +-5% 300VDC MICA	72136	DM15E560J0300WV1CR
A3A3C38	0140-0199	6		CAPACITOR-FXD 240PF +-5% 300VDC MICA	72136	DM15F241J0300WV1CR
A3A3C39	0160-3536	3		CAPACITOR-FXD 620PF +-5% 100VDC MICA	28480	0160-3536
A3A3C40	0160-2055	9	3	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A3C41	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A3C42	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A3C43	0160-2241	5	2	CAPACITOR-FXD 2.2PF +-.25PF 500VDC CER	28480	0160-2241
A3A3C44	0160-2241	5		CAPACITOR-FXD 2.2PF +-.25PF 500VDC CER	28480	0160-2241
A3A3C45				NOT ASSIGNED		
A3A3C46	0160-2264	2	2	CAPACITOR-FXD 20PF +-5% 500VDC CER 0+-30	28480	0160-2264
A3A3C47	0160-2264	2		CAPACITOR-FXD 20PF +-5% 500VDC CER 0+-30	28480	0160-2264
A3A3C48	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A3C49	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A3CR1	1901-0535	9	23	DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A3CR2	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A3CR3	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A3CR4	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A3CR5	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A3CR6	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A3CR7	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A3CR8	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A3CR9	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A3CR10	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A3CR11	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A3CR12	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A3CR13	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A3CR14	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A3CR15	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A3CR16	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A3CR17	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A3CR18	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A3CR19	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A3CR20	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A3CR21	1901-0040	1	5	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A3CR22	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A3CR23	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A3CR24	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A3CR25	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535

ManualsPlus.com

TABLE 2. A3A3, REPLACEABLE PARTS (2 OF 3)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3A3CR26	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A3CR27	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A3CR28	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A3L1	9140-0210	1	2	INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3A3L2	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3A3L3	9100-1618	1	2	INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A3A3L4	9100-1620	5	2	INDUCTOR RF-CH-MLD 15UH 10% .166DX.385LG	28480	9100-1620
A3A3L5	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A3A3L6	9100-1620	5		INDUCTOR RF-CH-MLD 15UH 10% .166DX.385LG	28480	9100-1620
A3A3Q1	1855-0081	1	8	TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0081
A3A3Q2	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0081
A3A3Q3	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0081
A3A3Q4	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0081
A3A3Q5	1855-0241	5	2	TRANSISTOR MOSFET N-CHAN E-MODE TO-72 SI	18324	SD215
A3A3Q6	1855-0050	4	2	TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	28480	1855-0050
A3A3Q7	1855-0020	8	2	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A3A3Q8	1855-0020	8		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A3A3Q9	1853-0034	0	3	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A3A3Q10	1855-0241	5		TRANSISTOR MOSFET N-CHAN E-MODE TO-72 SI	18324	SD215
A3A3Q11	1855-0050	4		TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	28480	1855-0050
A3A3Q12	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0081
A3A3Q13	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0081
A3A3Q14	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0081
A3A3Q15	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0081
A3A3Q16	1853-0034	0		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A3A3Q17	1853-0034	0		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A3A3R1	2100-3356	1	1	RESISTOR-TRMR 200K 10% C SIDE-ADJ 1-TRN	28480	2100-3356
A3A3R2	2100-3357	2	1	RESISTOR-TRMR 500K 10% C SIDE-ADJ 1-TRN	28480	2100-3357
A3A3R3	0698-3440	7	3	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A3A3R4	2100-3207	1	2	RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	28480	2100-3207
A3A3R5	2100-3207	1		RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	28480	2100-3207
A3A3R6	2100-3274	2	2	RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A3A3R7	2100-3351	6	2	RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A3A3R8	2100-3351	6		RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A3A3R9	2100-3274	2		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	28480	2100-3274
A3A3R10	0698-5350	2	8	RESISTOR 2.613K .1% .125W F TC=0+-25	28480	0698-5350
A3A3R11	0698-5350	2		RESISTOR 2.613K .1% .125W F TC=0+-25	28480	0698-5350
A3A3R12	0698-3157	3	6	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A3A3R13	0698-5350	2		RESISTOR 2.613K .1% .125W F TC=0+-25	28480	0698-5350
A3A3R14	0698-5350	2		RESISTOR 2.613K .1% .125W F TC=0+-25	28480	0698-5350
A3A3R15	0698-7095	6	2	RESISTOR 11K .25% .125W F TC=0+-50	28480	0698-7095
A3A3R16	0698-3428	1	2	RESISTOR 14.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-14R7-F
A3A3R17	0698-0085	0	2	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A3A3R18	0698-5350	2		RESISTOR 2.613K .1% .125W F TC=0+-25	28480	0698-5350
A3A3R19	0757-0442	9	4	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3A3R20	0757-0438	3	3	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A3A3R21	0757-0462	3	1	RESISTOR 75K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7502-F
A3A3R22	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A3A3R23	0698-0084	9	3	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A3A3R24	0757-0424	7	2	RESISTOR 1.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1101-F
A3A3R25	0698-3161	9	1	RESISTOR 38.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3832-F
A3A3R26	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A3A3R27	0698-5350	2		RESISTOR 2.613K .1% .125W F TC=0+-25	28480	0698-5350
A3A3R28	0698-5350	2		RESISTOR 2.613K .1% .125W F TC=0+-25	28480	0698-5350
A3A3R29	0698-5350	2		RESISTOR 2.613K .1% .125W F TC=0+-25	28480	0698-5350
A3A3R30	0698-7095	6		RESISTOR 11K .25% .125W F TC=0+-50	28480	0698-7095
A3A3R31	0698-3428	1		RESISTOR 14.7 1% .125W F TC=0+-100	03688	PME55-1/8-T0-14R7-F
A3A3R32	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3A3R33	0698-0085	0		RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A3A3R34	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3A3R35	0698-3136	8	1	RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A3A3R36	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A3A3R37	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A3A3R38	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A3A3R39	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A3A3R40	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A3A3R41	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A3A3R42	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A3A3R43	2100-3354	9	1	RESISTOR-TRMR 50K 10% C SIDE-ADJ 1-TRN	28480	2100-3354
A3A3R44	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A3A3R45	0698-3441	8	1	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8-T0-215R-F
A3A3R46	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3A3R47	0698-6963	5	2	RESISTOR 5.55K .1% .125W F TC=0+-25	28480	0698-6963
A3A3R48	0698-6963	5		RESISTOR 5.55K .1% .125W F TC=0+-25	28480	0698-6963
A3A3R49	0698-3150	6	1	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A3A3R50	0757-0424	7		RESISTOR 1.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1101-F

ManualsPlus.com

TABLE 2. A3A3, REPLACEABLE PARTS (3 OF 3)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3A3R51	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A3A3R52	0757-0421	4	1	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A3A3R53	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A3A3R54	0757-0465	6	1	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A3A3R55	0757-0814	9	1	RESISTOR 511 1% .5W F TC=0+-100	28480	0757-0814
A3A3TP1	0360-0535	0	12	TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A3TP2	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A3TP3	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A3TP4	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A3TP5	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A3TP6	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A3TP7	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A3TP8	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A3TP9	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A3TP10	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A3TP11	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A3TP12	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A3U1	1826-0079	6	4	IC OP AMP WB TO-99 PKG	29832	1321
A3A3U2	1826-0089	8	2	IC OP AMP WB TO-99 PKG	29832	1322
A3A3U3	1826-0079	6		IC OP AMP WB TO-99 PKG	29832	1321
A3A3U4	1826-0684	9	2	IC CONV 12-B-D/A 18-DIP-C PKG	28480	1826-0684
A3A3U5	1820-1444	9	2	IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD	01295	SN74LS298N
A3A3U6	1820-1196	8	2	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A3A3U7	1826-0079	6		IC OP AMP WB TO-99 PKG	29832	1321
A3A3U8	1826-0684	9		IC CONV 12-B-D/A 18-DIP-C PKG	28480	1826-0684
A3A3U9	1820-1444	9		IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD	01295	SN74LS298N
A3A3U10	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A3A3U11	1826-0079	6		IC OP AMP WB TO-99 PKG	29832	1321
A3A3U12	1826-0089	8		IC OP AMP WB TO-99 PKG	29832	1322
A3A3U13	1826-0081	0	1	IC OP AMP WB TO-99 PKG	27014	LM318H
A3A3U14	1820-1195	7	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS175N
A3A3U15	1820-1197	9	1	IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A3A3VR1	1902-3036	3	1	DIODE-ZNR 3.16V 5% DO-7 PD=.4W TC=-.064%	28480	1902-3036
A3A3VR2	1902-0686	3	1	DIODE-ZNR 6.2V 2% DO-7 PD=.4W TC=+.002%	04713	1N825
A3A3VR3	1902-3094	3	1	DIODE-ZNR 5.11V 2% DO-35 PD=.4W	28480	1902-3094
				MISCELLANEOUS PARTS		
	4040-0751	8	2	EXTR PC BD ORN	28480	4040-0751

NOTE

- FOR INSTRUCTIONS ON THE USE OF SIGNATURE ANALYSIS DIAGRAMS READ THE SIGNATURE ANALYSIS DESCRIPTION SECTION OF THIS MANUAL.

WAVEFORM CHECK

SPECTRUM ANALYZER CONNECTIONS:
DISCONNECT REAR-PANEL 50-WIRE CABLE
JUMPER A3A7TP6 TO A3A7TP4
JUMPER A3A8TP3 TO A3A8TP6
ADJUST A3A2R12 LL THRESH FULLY CW
JUMPER A1A8TP1 TO A1A8TP2

SIGNATURE ANALYZER CONNECTIONS:
NONE REQUIRED

PRESS:
A3A7S1 AFTER COMPLETING CONNECTIONS FOR EACH TEST OR CHECK

A3A3 CHECK

SPECTRUM ANALYZER CONNECTIONS:
ADJUST A3A2R12 LL THRESH FULLY CW
GROUND A3A8TP6 TO A3A7TP5
JUMPER A3A8TP3 TO A3A8TP6

SIGNATURE ANALYZER CONNECTIONS:
CLOCK ⌐¯ TO A3A8TP4 (LCLK)
START ⌐¯ TO A3A8TP2
STOP ⌐¯ TO A3A8TP2
POD GND TO A3A8TP1
PROBE GND TO A3A8TP1

PRESS:
A3A7S1 AFTER COMPLETING CONNECTIONS FOR EACH TEST OR CHECK

A3A3
LINE GENERATOR
85662-60128

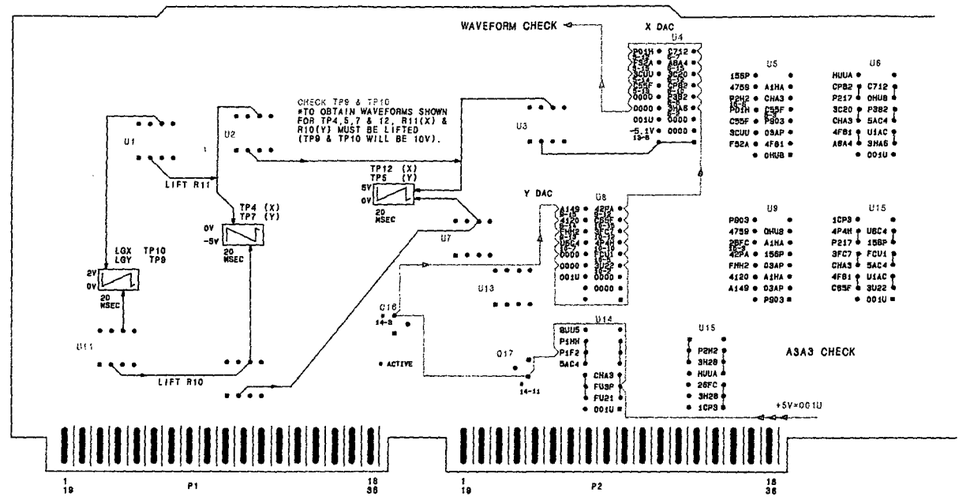


FIGURE 7. A3A3 LINE GENERATOR, SIGNATURE ANALYSIS TROUBLESHOOTING DIAGR

ManualsPlus.com

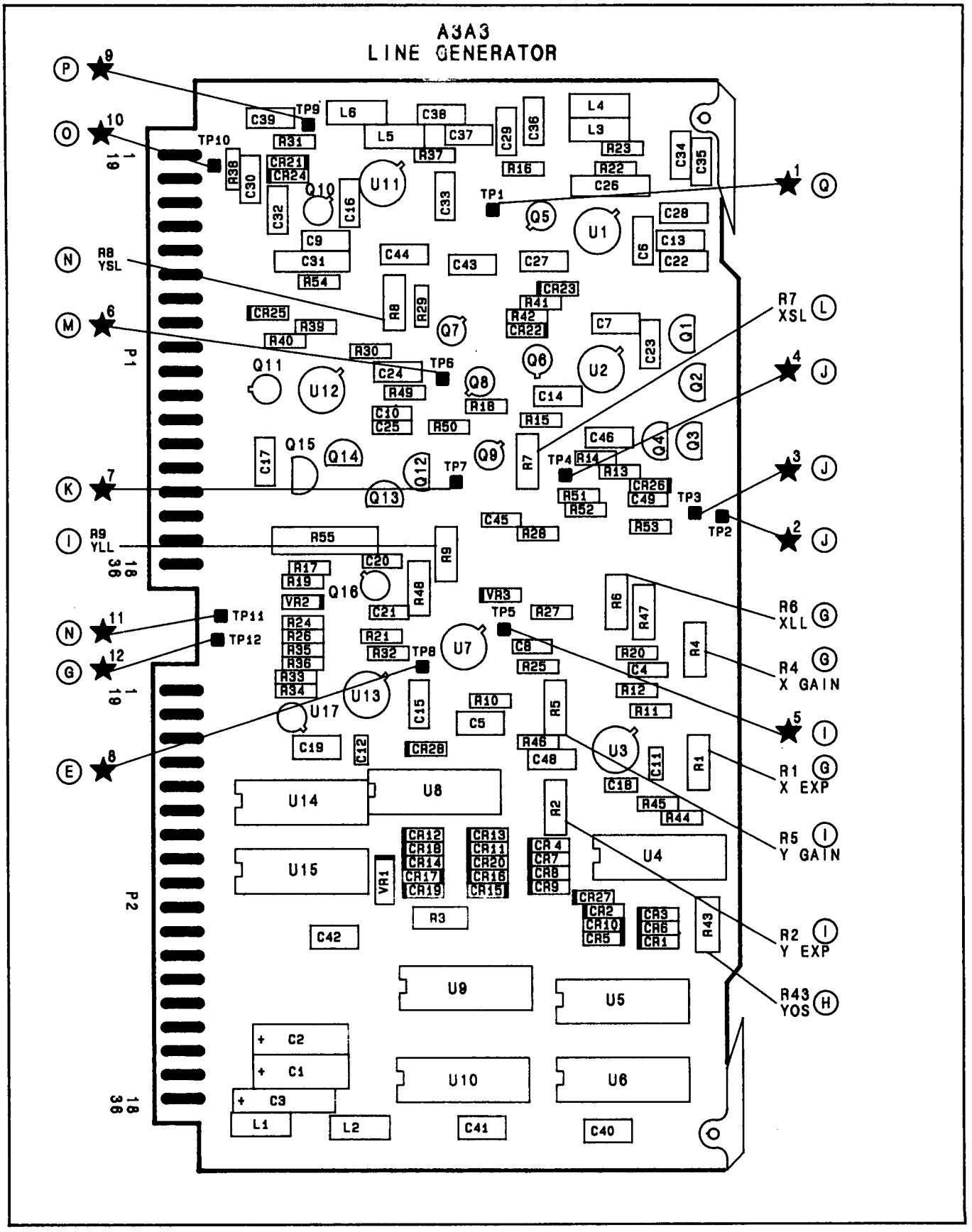


FIGURE 9. A3A3 LINE GENERATOR, COMPONENT LOCATIONS

ManualsPlus.com

A3A3 LINE GENERATOR
85662-60128 (1 OF 2)

P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	GND		Q
19	GND		Q
2	GND		Q
20	GND		Q
3	GND		Q
21	GND		Q
4	GND		Q
22	GND		Q
5	LGX	A3A2P1-23	O
23	GND		Q
6	LGY	A3A2P1-24	Q
24	GND		Q
7	GND		Q
25	GND		Q
8	GND		Q
26	GND		Q
9	GND		Q
27	GND		Q
10	GND		Q
28	GND		Q
11	GND		Q
29	GND		Q
12	GND		Q
30	LLL	A3A2P1-30	Q
13	GND		Q
31	GND		Q
14	GND		Q
32	HLDY	A3A2P2-1	K
15	GND		Q
33	HLDX	A3A2P2-2	J
16	Δ Y	A3A2P1-34	I
34	SMPL	A3A2P2-3	J
17	GND		Q
35	LINTG	A3A2P2-3	L N
18	Δ X	A3A2P1-36	G
36	INTG	A3A2P2-5	L N

P2

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	CHAR	A3A6P1-21	A
19	LDEXP	A3A7P2-19	B
2	NC		
20	LD CHAR	A3A7P2-19	A C
3	NC		
21	LDY	A3A7P2-1	
4	NC		
22	LDX	A3A7P2-1	A
5	NC		
23	NC		
6	NC		
24	NC		
7	NC		
25	NC		
8	NC		
26	NC		
9	NC		
27	NC		
10	BØ	DIGITAL STORAGE BUS	A
28	B1		A
11	B2		A
29	B3		A
12	B4		A
30	B5		A
13	B6		A
31	B7		A
14	B8		A
32	B9		A
15	NC		
33	NC		
16	DGND		Q
34	DGND		Q
17	+5V		Q
35	AGND		Q
18	+15V		Q
36	-15V		Q

SERIAL PREFIX: 2403A

FIGURE 10. A3A3 LINE GENERATOR, SCHEMATIC DIAGRAM (1 OF 2)

ManualsPlus.com

A3A3 LINE GENERATOR
85662-60128 (2 OF 2)
(SERIAL PREFIX: 2403A)

Ⓐ X REGISTER

Ⓑ EXPAND REGISTER

Ⓒ Y REGISTER

Ⓓ POWER SUPPLIES

Ⓔ REFERENCE

Ⓐ X DAC

Ⓕ Y DAC

Ⓖ X SUMMING AMPLIFIER

Ⓗ Y OFFSET

Ⓘ Y SUMMING AMPLIFIER

Ⓙ X SAMPLE AND HOLD

Ⓚ Y SAMPLE AND HOLD

Ⓛ LONG LINE SWITCH DRIVER

Ⓜ X INTEGRATOR

Ⓝ Y INTEGRATOR

Ⓞ X FILTER

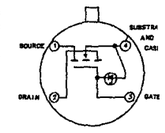
Ⓟ Y FILTER

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION W11 ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (INDUCTANCE IS IN MICROHENRIES).
3. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE AND EXI RIGHT SIDE OF FUNCTION BLOCKS.
4. MNEMONIC TABLE:

MNEMONIC	DESCRIPTION
XSL	X SHORT LINE
XLL	X LONG LINE
INTG	INTEGRATE
LINTG	LONG-INTEGRATE
YSL	Y SHORT LINE
LYLL	Y LONG LINE
LLL	LONG-LONG LINE
HLDY	HOLD Y
LDY	LINE GEN Y POSITIO
LDX	LINE GEN X POSITION
HLDX	HOLD X
SMPL	SAMPLE
ΔX	DELTA X
ΔY	DELTA Y
LDX	LOAD X REGISTER
LDY	LOAD Y REGISTER
LDEXP	LOAD EXPAND REGISTE
CHAR	CHARACTER MODE
LDCHAR	LOAD CHARACTER REGISTER
B0-B9	DIGITAL STORAGE BUS BITS B-9

6. Q5 AND Q10 ARE N-CHANNEL ENHANCEMENT MODE FETS WITH THE FOLLOWING PIN CONFIGURATION (TOP VIEW).



6. UNLESS OTHERWISE INDICATED, LOGIC LEVELS ARE TTL:
   +2.0V TO 5.0V=LOGIC '1' = HIGH
   0V TO +0.8V=LOGIC '0' = LOW
7. C27* AND C33* ARE FACTORY-SELECTED COMPONENTS. THESE COMPONENTS MAY NOT BE INSTALLED. IF THESE COMPONENTS ARE INSTALLED, ACCEPTABLE VALUES RANGE FROM 1 pF TO 10 pF.
8. TEST CONDITIONS TO OBTAIN THESE WAVEFORMS ARE AS FOLLOWS:
   1. ROTATE A3A2R13 TO FULL CW POSITION.
   2. SHORT A3A7P3 TO A3A7P5
   3. SHORT A3A7P4 TO A3A7P6
   4. PUSH A3A7P1
9. LIFT R11 AND USE TEST CONDITIONS FROM NOTE 8.
10. LIFT R10 AND USE TEST CONDITIONS FROM NOTE 9.
11. R47* AND R48* ARE FACTORY-SELECTED COMPONENTS. ACCEPTABLE VALUES RANGE FROM 5KΩ TO 10KΩ.

A3A3

A3A3 LINE GENERATOR, SCHEMATIC DIAGRAM (2 OF 2)

ManualsPlus.com

A3A4 MEMORY, CIRCUIT DESCRIPTION

Memory Assembly A3A4 contains 4096 12-bit words of static random-access memory (RAM) and 2048 8-bit words of read-only memory (ROM), plus the necessary latches, buffers, and control logic for input and output operations. Data for display annotation (center frequency, reference level, etc.), graticules, characters, and TRACE A and TRACE B is stored in memory.

Display Memory (E)

Display memory contains two 2k x 12 blocks. The lower block, made up of U4 and U5, corresponds to addresses 0000 through 2047 and is enabled by LCE1 from Control Logic. The upper block, U3 and U6, corresponds to addresses 2048 through 4095 and is enabled by LCE2. Four of the eight input/output lines of U5 and U6 are not used since only 12-bit data words are required. LOE enables the RAM outputs for read operations only. LWE writes data to the RAM.

The RAM address latches, U7 and U8, store the memory address during read and write operations. These latches are required because the memory address register is occasionally changed before a read operation is completed. When not enabled, these latches are transparent.

Memory Address Register (A)

Registers U15 and U16 store the memory address for display memory and character stroke memory.

Memory Data Input Register (C)

Registers U9 and U11 store input data to be written to the display memory for write operations only.

Buffers U10 and U12 pass data from Memory Data Input Register to display memory for write operations only.

Memory Data Output Buffer (B)

Buffers U13 and U14 enable the output data from either display memory or character stroke memory to the Digital Storage Bus for read operations only.

Control Logic (D)

Control Logic generates control signals for display memory and buffers in Memory Data Input Register. When control line CE (chip enable) is true, RAM address 11 (RA11) from U7 generates low chip enable 1 and 2 (LCE1, LCE2). This enables the lower or upper block of display memory during read and write operations.

During read operations, LOE (low output enable) is generated in U17D when CE is true and LWRITE (low write) is false. During write operations, U17C produces LWE (low write enable) when CE and LWRITE are true.

Inverters U18E and U18D produce LDINEN (low data input enable) when LWE is true. The two inverters delay the rising edge of LDINEN to hold the data lines after LWE goes false, at the end of a write operation.

Character Stroke Memory (G)

ROM U2 is a 2048 word by 8-bit read-only memory that contains the relative X and Y axis coordinate information that forms displayed characters. Each 8-bit word contains three bits of X-axis information, four bits of Y-axis information, and one bit for blanking. The ROM is addressed from the memory address register and the stroke counter. The ROM outputs are enabled by LROMEN (low ROM enable).

ManualsPlus.com

Stroke Counter (F)

The stroke counter drives the lower three address bits of character stroke memory. Since most characters contain less than eight line segments, the character information is stored in consecutive 8-word blocks in the ROM. The memory address register contains the address of the 8-word block while the stroke counter contains the address of the individual strokes. To read the information for all the line segments of a character, the memory address register is held constant while the stroke counter addresses up to eight strokes.

The STROK8 output goes high to signal the processor that the eighth stroke has been reached. LCLRSA clears the counter at the beginning of each character and INCRSA is used to increment the counter after each stroke.

ManualsPlus.com

A3A4 MEMORY, TROUBLESHOOTING

Signature Analysis Test Program 4 is used to write and read various patterns from the Display Memory **(E)** and to read the Character Stroke Memory **(G)**. An explanation of Test Program 4 is located in the "A3 Digital Storage Troubleshooting" tab. This test requires that the Digital Storage input bus be good (i.e., there are no shorted Digital Storage data lines). This would show up either as an incorrect 5 Vdc signature or as incorrect inputs to the memory address registers U15 and U16. To isolate a hard bus bit failure, Test Program 1 on the A3A5 Data Manipulator SA Diagram 1 must be used.

ManualsPlus.com

TABLE 1. A3A4, REPLACEABLE PARTS

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A3A4	85662-60125	0	1	BOARD ASSEMBLY, MEMORY	28480	85662-60125
A3A4C1	0160-4835	7	18	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A4C2	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A4C3	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A4C4	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A4C5	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A4C6	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A4C7	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A4C8	0180-1746	5	2	CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3A4C9	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A4C10	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A4C11	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A4C12	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A4C13	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A4C14	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A4C15	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A4C16	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A4C17				NOT ASSIGNED		
A3A4C18	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A4C19	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A4C20				NOT ASSIGNED		
A3A4C21	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A4C22	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3A4U1	1820-1278	7	1	IC CNTR TTL LS BIN UP/DOWN SYNCHRO	01295	SN74LS191N
A3A4U2	1818-0293	9	1	IC NMOS 16384 (16K) ROM 450-NS	55576	SYD2316B MASKED
A3A4U3	1818-1611	7	4	IC CMOS 16384 (16K) STAT RAM 150-NS 3-S	34013	HM6116P-3
A3A4U4	1818-1611	7		IC CMOS 16384 (16K) STAT RAM 150-NS 3-S	34013	HM6116P-3
A3A4U5	1818-1611	7		IC CMOS 16384 (16K) STAT RAM 150-NS 3-S	34013	HM6116P-3
A3A4U6	1818-1611	7		IC CMOS 16384 (16K) STAT RAM 150-NS 3-S	34013	HM6116P-3
A3A4U7	1820-2102	8	2	IC LCH TTL LS D-TYPE OCTL	01295	SN74LS373N
A3A4U8	1820-2102	8		IC LCH TTL LS D-TYPE OCTL	01295	SN74LS373N
A3A4U9	1820-1196	8	4	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A3A4U10	1820-1492	7	4	IC BFR TTL LS INV HEX 1-INP	01295	SN74LS368AN
A3A4U11	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A3A4U12	1820-1492	7		IC BFR TTL LS INV HEX 1-INP	01295	SN74LS368AN
A3A4U13	1820-1492	7		IC BFR TTL LS INV HEX 1-INP	01295	SN74LS368AN
A3A4U14	1820-1492	7		IC BFR TTL LS INV HEX 1-INP	01295	SN74LS368AN
A3A4U15	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A3A4U16	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A3A4U17	1820-1197	9	1	IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A3A4U18	1820-1199	1	1	IC INV TTL LS HEX 1-INP	01295	SN74LS04N
				MISCELLANEOUS PARTS		
	4040-0752	9	2	EXTR-PC BD YEL POLYC .062-BD-THKNS	28480	4040-0752

ManualsPlus.com

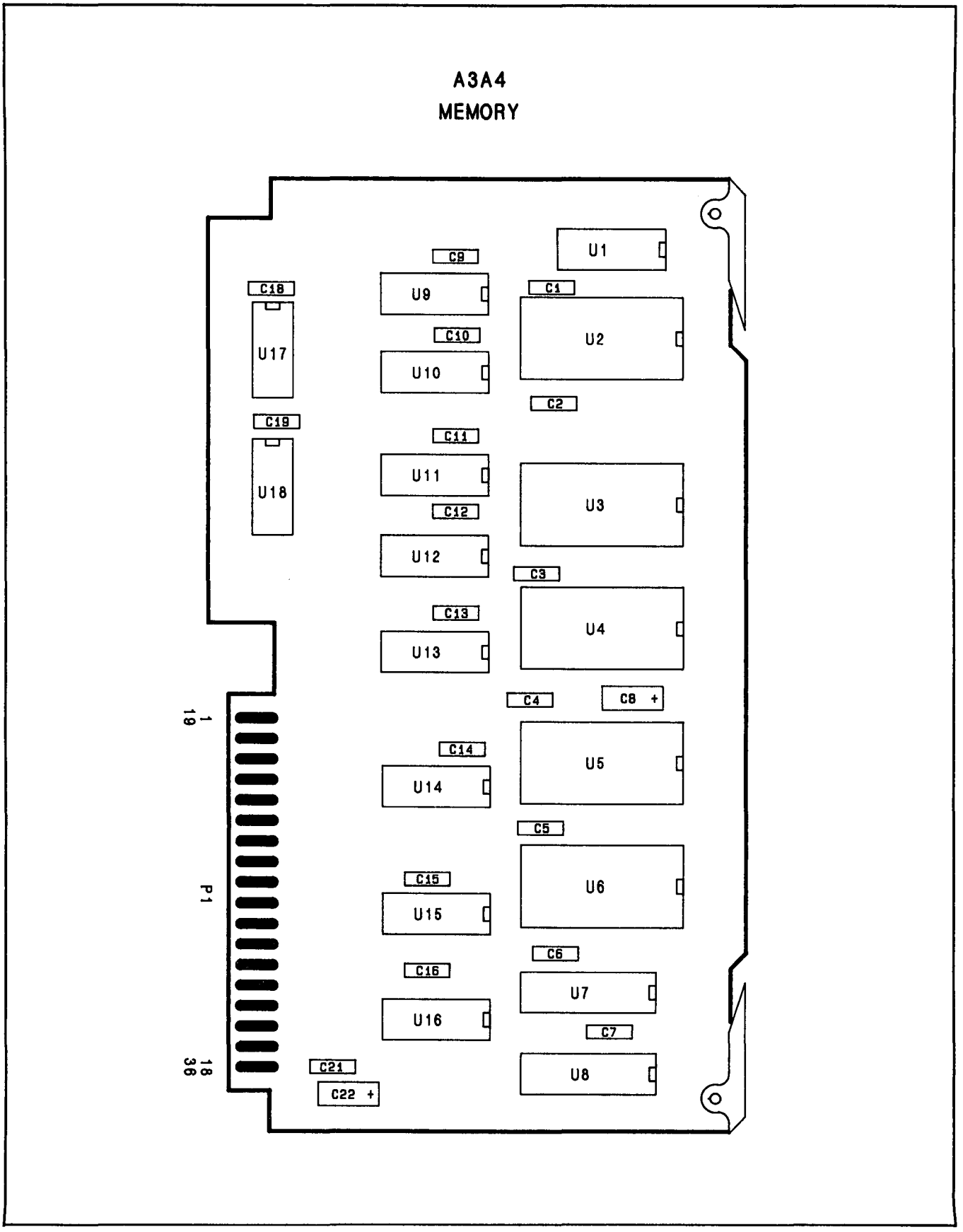


FIGURE 3. A3A4 MEMORY, COMPONENT LOCATIONS

ManualsPlus.com

A3A5 DATA MANIPULATOR, CIRCUIT DESCRIPTION

A3A5 Data Manipulator contains 16 random-access memory (RAM) registers and 32 read-only memory (ROM) registers, an accumulator, and an arithmetic logic unit (ALU). This assembly provides all data functions and transfers for digital storage.

Register RAM (B)

U13, U15, and U17 form the 16 12-bit RAM registers used for data storage during data manipulation.

Constant ROM (F)

U1 and U18 form the 16 12-bit ROM registers used as constants for data storage during data manipulation.

Accumulator (D)

U7 and U9 form the 12-bit Accumulator, which receives and holds all results of ALU operations.

Buffer (C)

U5 and U11 are three-state data buffers that allow the Accumulator data to be transferred to the Source Bus.

Arithmetic Logic Unit (ALU) (E)

U2, U3, and U4 are the main Arithmetic Logic Unit (ALU). U16 provides high-speed carry look-ahead. U14 decodes ALU outputs to determine whether a zero-value result has been generated.

Pipeline Register (G)

U12 and U24 form an instruction Pipeline Register for data manipulation instructions.

Control Decoder (H)

U19 through U23 decode data manipulation instructions into the necessary control lines.

Multiplexer/Bus Driver (A)

U6, U8, and U10 form a 12-bit Bus Driver with two data inputs. Data from the RAM Bus or from the Accumulator Bus may be transferred to the main Digital Storage Bus through these drivers.

ManualsPlus.com

A3A5 DATA MANIPULATOR, TROUBLESHOOTING

SA Diagram 3 is used to verify proper operation of A3A5 Data Manipulator. The first check uses Test Program 2, with the qualifier feedback disabled, to verify the qualifier select circuitry on A3A7. The next check uses Test Program 3 to check the Data Manipulator Bus output at the connector and the LZERO output at U14 pin 9. (Since Test Program 3 is the first program to use the qualifier and the normal interrupt, the INTR line from A3A2 to A3A6U16 pin 10 and the buffered qualifier A3A6U27 might have to be checked, if the proper 5 Vdc signature is not obtained. The INTR line should be a 50-kHz signal.) If any signatures are incorrect in these two checks on SA Diagram 3, then SA Diagrams 1 and 2 must be checked first. If tests on diagrams 1 and 2 check correctly, then the fault can be properly traced back using Diagram 3. The last check on this diagram verifies the U5 and U11 buffers. On all previous checks, they have not been enabled, so that the Source bus was always the Constant ROM output. Test Program 5, though, enables U5 and U11 so they can be checked. This also checks that the Constant ROM outputs can be disabled.

SA Diagram 1 uses Test Program 1 to check the Accumulator, Control Decode logic, Pipeline Registers, and parts of the ALU, Constant ROM, and the Multiplexer Bus Driver. The Register RAM outputs are disabled by A3A5TP2 being grounded; thus, they should be high. This eliminates the feedback from the data bus back into the A3A5 Data Manipulator.

Troubleshooting the Digital Storage Bus

If a Multiplexer Bus Driver on A3A5 has an incorrect output but all its inputs are good, the multiplexer may be defective or there may be another bad driver/load on that data bit. To help isolate this problem, A3A2, A3A4, and A3A8 can be removed and the test program on Diagram 1 run. If neither removing the boards nor replacing the multiplexer solves the problem, additional probing with a scope, current tracer, or ohmmeter may be required to further isolate the bad node.

SA Diagram 2 uses Test Program 2, which is the same as Test Program 1 except that the Register RAMs are enabled. This feedback path means that a low-order bit failure can make higher-order bits appear bad. Therefore, it is best to probe beginning with bit Ø and then working up. This is the purpose of the red arrows on U2, U3, and U4. If a register RAM output appears incorrect, it may be due to either the RAM being defective, or the ALU input being faulty. To check this, the table on the diagram should be used. Grounding A3A5TP2 disables the RAM outputs, and the ALU input is verified by manually grounding the RAM output. The signature at U9 pin 10 should change to the one shown in the table. If it does, the ALU is probably all right; the fault is in the Register RAM.

ManualsPlus.com

TABLE 1. A3A5, REPLACEABLE PARTS (1 OF 2)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3A5	85662-60145	4	1	BOARD ASSEMBLY, DATA MANIPULATOR	28480	85662-60145
A3A5C1	0160-4835	7	25	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A5C2	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A5C3	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A5C4	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A5C5	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A5C6	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A5C7	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A5C8	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A5C9	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A5C10	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A5C11	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A5C12	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A5C13	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A5C14	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A5C15	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A5C16	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A5C17	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A5C18	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A5C19	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A5C20	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A5C21	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A5C22	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A5C23	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A5C24	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A5C25	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A5C26	0180-0228	6	2	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A3A5C27	0180-0228	6		CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A3A5C28	0160-4832	4	3	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A3A5C29	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A3A5C30	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A3A5L1	08558-80011	6	1	FILTER COIL BLUE	28480	08558-80011
A3A5R1	0698-3155	1	15	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A3A5R2	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A3A5R3	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A3A5R4	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A3A5R5	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A3A5R6	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A3A5R7	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A3A5R8	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A3A5R9	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A3A5R10	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A3A5R11	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A3A5R12	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A3A5R13	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A3A5R14	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A3A5R15	0698-3132	4	2	RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A3A5R16	0698-3132	4		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A3A5R17	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A3A5TP1	0360-0535	0	4	TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A5TP2	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A5TP3	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A5TP4	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A5U1	85662-80015	9	1	IC ROM 512X8 U1	28480	85662-80015
A3A5U2	1820-1974	0	3	IC ARITH-LGC-UN TTL S	01295	SN74S181J
A3A5U3	1820-1974	0		IC ARITH-LGC-UN TTL S	01295	SN74S181J
A3A5U4	1820-1974	0		IC ARITH-LGC-UN TTL S	01295	SN74S181J
A3A5U5	1820-1491	6	2	IC BFR TTL LS NON-INV HEX 1-INP	01295	SN74LS367AN
A3A5U6	1820-1439	2	3	IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE	01295	SN74LS258AN
A3A5U7	1820-1196	8	2	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A3A5U8	1820-1439	2		IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE	01295	SN74LS258AN
A3A5U9	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A3A5U10	1820-1439	2		IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE	01295	SN74LS258AN
A3A5U11	1820-1491	6		IC BFR TTL LS NON-INV HEX 1-INP	01295	SN74LS367AN
A3A5U12	1820-1076	3	1	IC FF TTL S D-TYPE POS-EDGE-TRIG CLEAR	01295	SN74S174N
A3A5U13	1816-0724	7	3	IC TTL S 64-BIT STAT RAM 35-NS 3-S	01295	SN74S189N
A3A5U14	1820-1130	0	1	IC GATE TTL S NAND 13-INP	01295	SN74S133N
A3A5U15	1816-0724	7		IC TTL S 64-BIT STAT RAM 35-NS 3-S	01295	SN74S189N
A3A5U16	1820-1305	1	1	IC GEN TTL S LOOK-AHD-CRY	01295	SN74S182N
A3A5U17	1816-0724	7		IC TTL S 64-BIT STAT RAM 35-NS 3-S	01295	SN74S189N
A3A5U18	85662-80016	0	1	IC ROM 512X8 U18	28480	85662-80016
A3A5U19	1820-0681	4	1	IC GATE TTL S NAND QUAD 2-INP	01295	SN74S00N
A3A5U20	1820-0685	8	1	IC GATE TTL S NAND TPL 3-INP	01295	SN74S10N

ManualsPlus.com

TABLE 1. A3A5, REPLACEABLE PARTS (2 OF 2)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3A5U21	1820-1202	7	1	IC GATE TTL LS NAND TPL 3-INP	01295	SN74LS10N
A3A5U22	1820-1197	9	1	IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A3A5U23	1820-1287	8	1	IC BFR TTL LS NAND QUAD 2-INP	01295	SN74LS37N
A3A5U24	1820-1195	7	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS175N
				MISCELLANEOUS PARTS		
	4040-0753	0	2	EXTR PC BD GRN	28480	4040-0753

ManualsPlus.com

NOTE

- FOR INSTRUCTIONS ON THE USE OF SIGNATURE ANALYSIS DIAGRAMS READ THE SIGNATURE ANALYSIS DESCRIPTION SECTION OF THIS MANUAL.

DATA MANIPULATOR CHECK 1

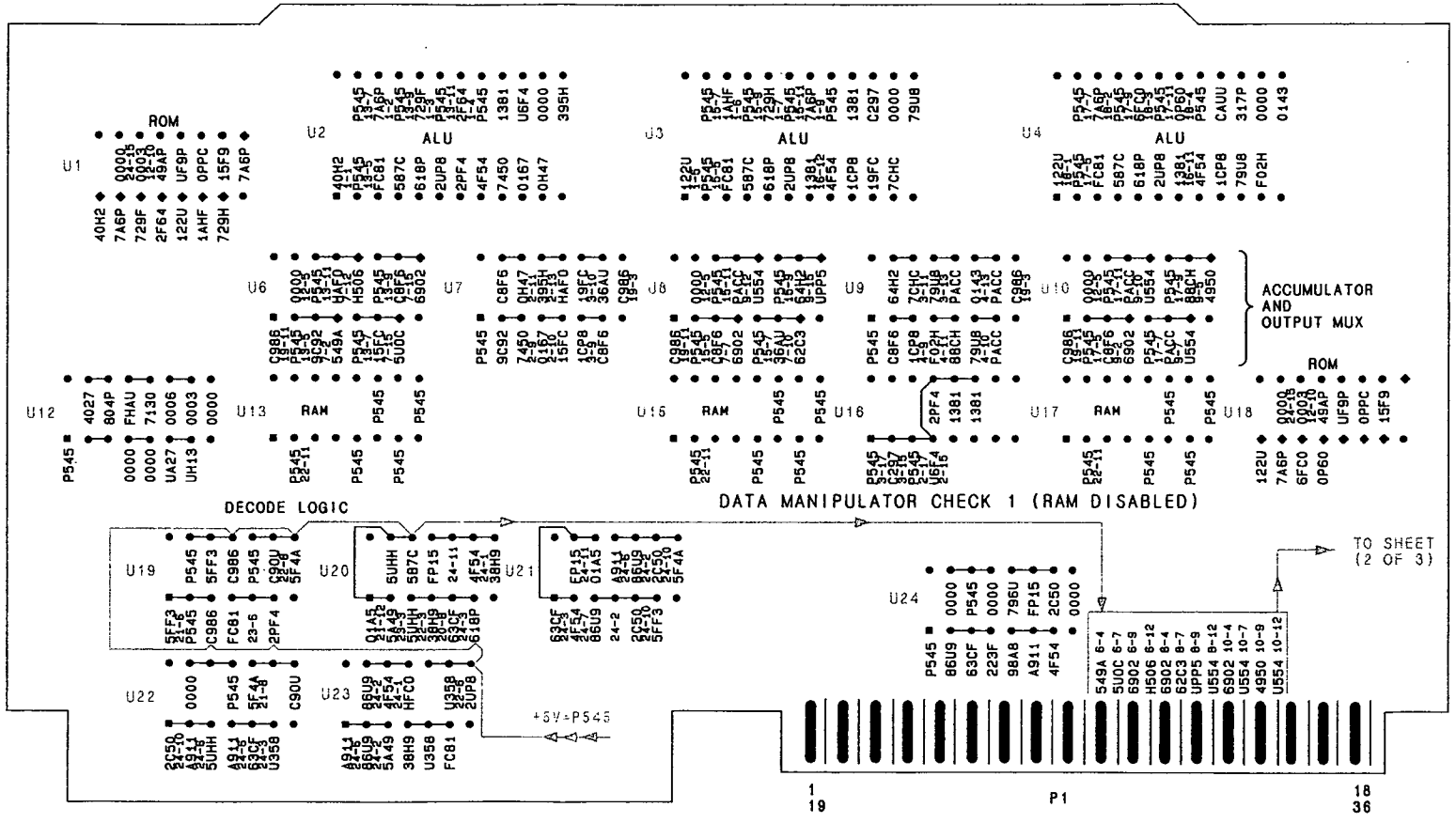
SPECTRUM ANALYZER CONNECTIONS:
GROUND A3A5TP2 TO A3A5TP1. GROUND A3A6TP7 AND A3A6TP8 TO A3A6TP1.
ADJUST INTENSITY FULLY CCW.

SIGNATURE ANALYZER CONNECTIONS:
CLOCK TO A3A7TP7 (LCLK)
START TO A3A6TP2
STOP TO A3A6TP2
POD GND TO A3A6TP1
PROBE GND TO A3A5TP1

PRESS:
PRESS A3A7S1 AFTER COMPLETING CONNECTIONS FOR EACH TEST OR CHECK.

ManualsPlus.com

A3A5
DATA MANIPULATOR
85662-60145



A3A5

FIGURE 1. A3A5 DATA MANIPULATOR, SIGNATURE ANALYSIS TROUBLESHOOTING DIAGRAM (1 OF 3)

ManualsPlus.com

NOTE

- FOR INSTRUCTIONS ON THE USE OF SIGNATURE ANALYSIS DIAGRAMS READ THE SIGNATURE ANALYSIS DESCRIPTION SECTION OF THIS MANUAL

DATA MANIPULATOR CHECK 2

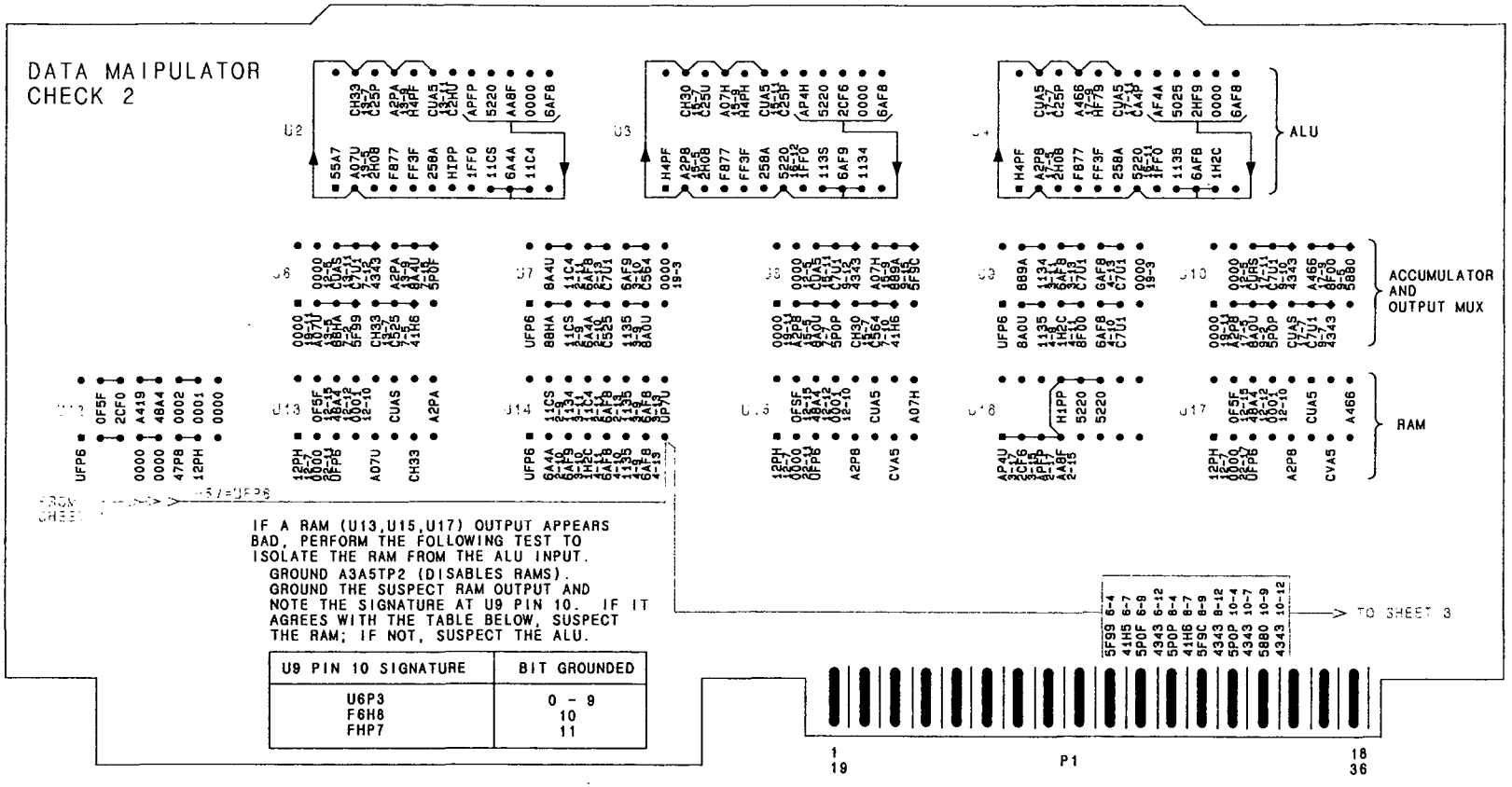
SPECTRUM ANALYZER CONNECTIONS:
GROUND A3A6TP7 AND A3A6TP8 TO A3A6TP1
JUMPER A3A6TP3 TO A3A6TP6

SIGNATURE ANALYZER CONNECTIONS:
CLOCK ⌐ TO A3A5TP4
START ⌐ TO A3A6TP2
STOP ⌐ TO A3A6TP2
POD GND TO A3A6TP1
PROBE GND TO A3A5TP1

PRESS:
A3A7S1 AFTER COMPLETING CONNECTIONS FOR EACH TEST OR CHECK

ManualsPlus.com

A3A5
DATA MANIPULATOR
85662-60145



A3A5

FIGURE 1. A3A5 DATA MANIPULATOR, SIGNATURE ANALYSIS TROUBLESHOOTING DIAGRAM (2 OF 3)

ManualsPlus.com

NOTE

- FOR INSTRUCTIONS ON THE USE OF SIGNATURE ANALYSIS DIAGRAMS READ THE SIGNATURE ANALYSIS DESCRIPTION SECTION OF THIS MANUAL.

DATA MANIPULATOR CHECK 3

SPECTRUM ANALYZER CONNECTIONS:
- JUMPER A3A6TP3 TO A3A6TP6
- GROUND A3A6TP7 AND A3A6TP8 TO A3A6TP1
- ADJUST INTENSITY FULLY CCW

SIGNATURE ANALYZER CONNECTIONS:
- CLOCK ⎍ TO A3A7TP7 (LCLK)
- START ⎍ TO AEA6TP2
- STOP ⎍ TO A3A6TP2
- POD GND TO A3A6TP1
- PROBE GND TO A3A5TP1

PRESS:
- A3A7S1 AFTER COMPLETING CONNECTIONS FOR EACH TEST OR CHECK

DATA MANIPULATOR CHECK 4

SPECTRUM ANALYZER CONNECTIONS:
- ADJUST A3A2R12LL THRESH FULLY CW
- GROUND A3A7TP6 TO A3A7TP5
- JUMPER A3A6TP3 TO A3A6TP6

SIGNATURE ANALYZER CONNECTIONS:
- CLOCK ⎍ TO A3A7TP7 (LCLK)
- START ⎍ TO A3A6TP2
- STOP ⎍ TO A3A6TP2
- POD GND TO A3A6TP1
- PROBE GND TO A3A5TP1

PRESS:
- A3A7S1 AFTER COMPLETING CONNECTIONS FOR EACH TEST OR CHECK

DATA MANIPULATOR CHECK 5

SPECTRUM ANALYZER CONNECTIONS:
- GROUND A3A7TP6 TO A3A7TP5
- JUMPER A3A6TP3 TO A3A6TP6

SIGNATURE ANALYZER CONNECTIONS:
- CLOCK ⎍ TO A3A5TP4 (LOAD)
- START ⎍ TO A3A6TP2
- STOP ⎍ TO A3A6TP2
- POD GND TO A3A5TP1
- PROBE GND A3A5TP1

PRESS:
- A3A7S1 AFTER COMPLETING CONNECTIONS FOR EACH TEST OR CHECK

DATA MANIPULATOR CHECK 4

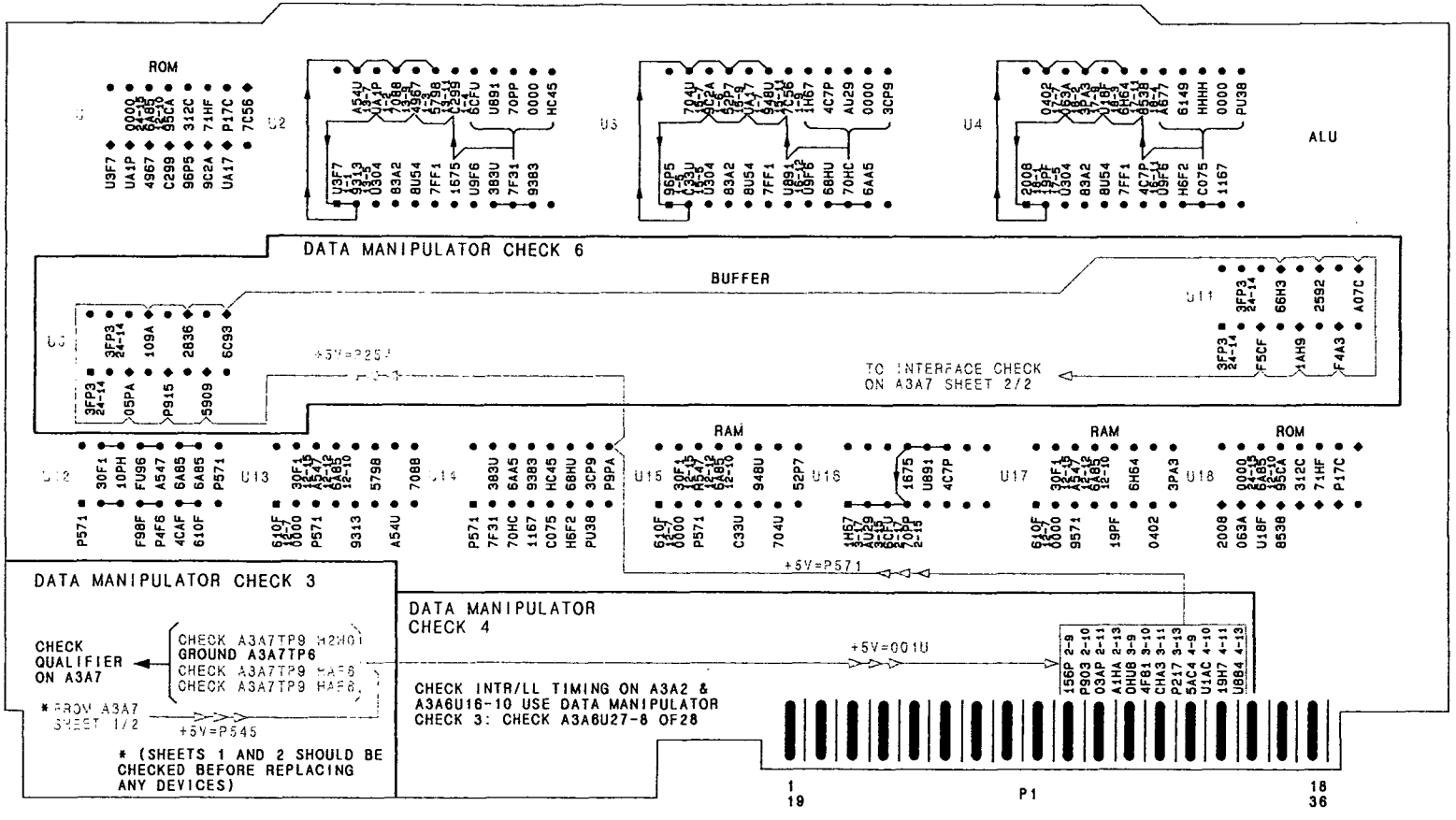
SPECTRUM ANALYZER CONNECTIONS:
- ADJUST A3A2R12LL THRESH FULLY CW
- GROUND A3A7TP4 TO A3A7TP6
- JUMPER A3A6TP3 TO A3A6TP6

SIGNATURE ANALYZER CONNECTIONS:
- CLOCK ⎍ TO A3A5TP4 (LOAD)
- START ⎍ TO A3A6TP2
- STOP ⎍ TO A3A6TP2
- POD GND TO A3A6TP1
- PROBE GND TO A3A5TP1

PRESS:
- A3A7S1 AFTER COMPLETING CONNECTIONS FOR EACH TEST OR CHECK

ManualsPlus.com

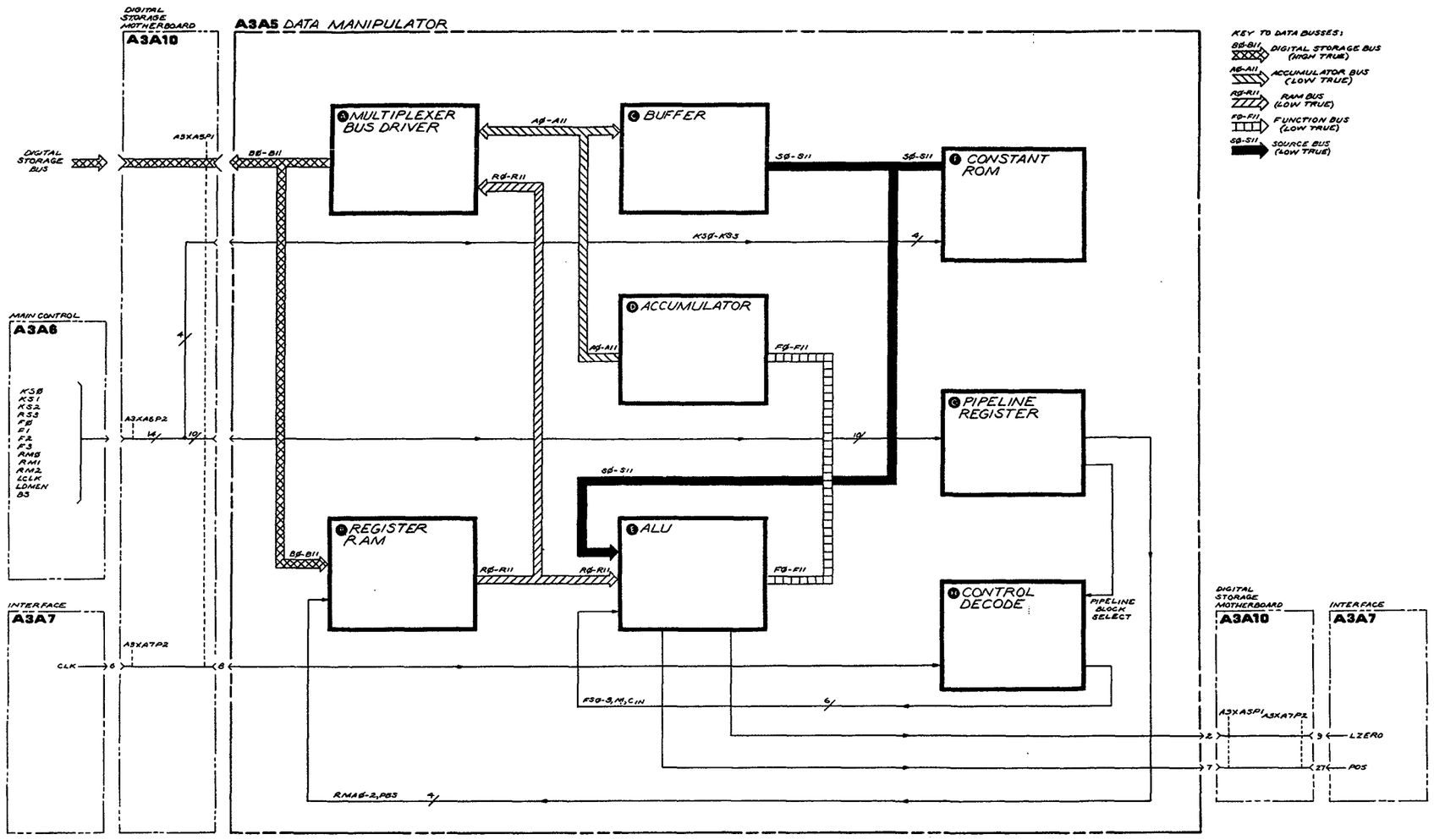
A3A5
DATA MANIPULATOR
85662-60145



A3A5

FIGURE 1. A3A5 DATA MANIPULATOR, SIGNATURE ANALYSIS TROUBLESHOOTING DIAGRAM (3 OF 3)

ManualsPlus.com



A3A5

FIGURE 2. A3A5 DATA MANIPULATOR, BLOCK DIAGRAM

ManualsPlus.com

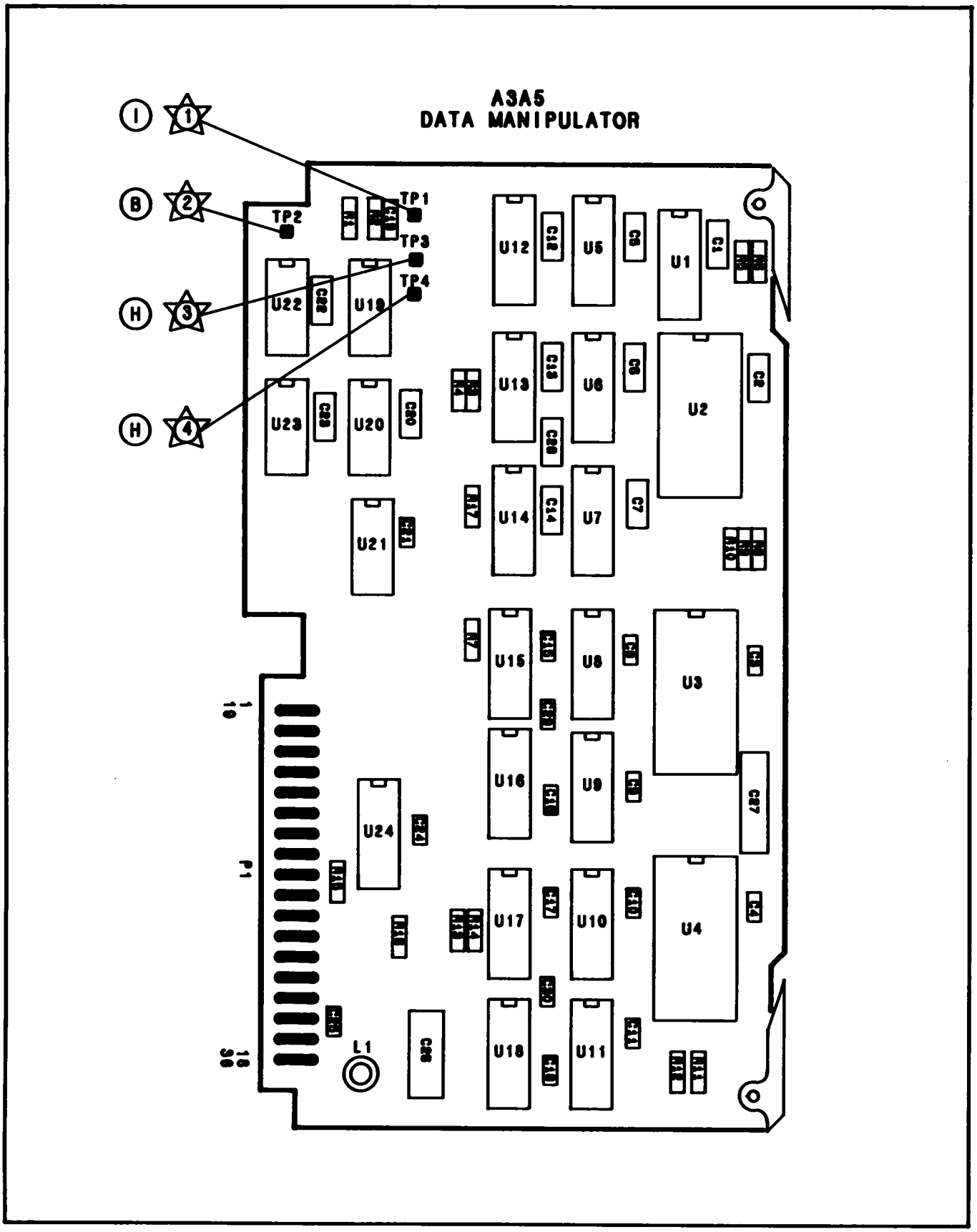


FIGURE 3. A3A5 DATA MANIPULATOR, COMPONENT LOCATIONS

IF-DISPLAY SECTION

A3A5 DATA MANIPULATOR
85682-60145

Ⓐ MULTIPLEXER BUS DRIVER

Ⓑ REGISTER RAM

Ⓒ BUFFER

Ⓓ ACCUMULATOR

Ⓔ ALU

Ⓕ CONSTANT ROM

Ⓖ PIPELINE REGISTER

CONTROL DECODE

Ⓘ POWER SUPPLIES

P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	XS0	A3A5P2-7	F
18	XS1	A3A5P2-1	F
2	XS2	A3A5P2-4	F
20	XS3	A3A5P2-3	F
5	S0	A3A5P2-21	G
21	S1	A3A5P2-5	G
4	SM1	A3A5P2-23	G
22	LCLK	A3A5P2-20	G
6	FM2	A3A5P2-26	G
23	F3	A3A5P2-8	G
8	F2	A3A5P2-27	G
24	F1	A3A5P2-7	G
7	M20	A3A7P2-27	E
25	F0	A3A5P2-9	G
9	CLK	A3A5P2-19	G
26	LZERO	A3A7P2-9	E
9	NC		
27	LCH 12A	A3A5P2-6	G
10	B7		A
28	B1		A
11	B3		A
29	B2		A
12	B4		A
30	B5		A
13	B6	DIGITAL STORAGE BUS	A
31	B7		A
14	B8		A
32	B9		A
15	B10		A
33	B11		A
19	GND1		I
34	GND		I
17	+5V		I
35	GND		I
16	+5V		I
36	NC		

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS 1/2W CAPACITANCE IS IN MICROFARADS(UF) INDUCTANCE IS IN MICROHENRIES(UH)
3. MNEMONIC TABLE:

MNEMONIC	DESCRIPTION
A3P-XS0	CONSTANT SELECTION BITS 0-3
BE	BLOCK SWITCH CONTROL
RAM-RW2	RAM REGISTER SELECT 0 THROUGH 2
LCLK	INVERTED CLOCK
F0-F3	FUNCTION BITS 0 THROUGH 3
M20	SIGN OF ALU RESULTS
LZERO	OUTPUT OF ZERO CHECK IN ALU RESULTS (LOW=TRUE)
LOWEN	DATA MANIPULATOR OUTPUT ENABLE (LOW=TRUE)
CLK	5MHZ SYSTEM CLOCK
B0-B11	DIGITAL STORAGE BUS DATA BITS 0 THROUGH 11

4. CONTROL DECODE

INPUTS												OUTPUTS							
FUNCTION	F CODE	M	FUNCTION SELECT				CIN	L WRITE RAM	LOAD ACC	LOAD OUT
	F3F2F1F0		F3S3F2S2F1S1F0S0							
A+B→ACC	0 0 0 0	L	L L L L L L L L				H	H	H	L
A+B→ACC	0 0 0 1	L	L L L L L L L H				H	H	H	L
A-B→ACC	0 0 1 0	L	L L L L L H L L				H	H	H	L
A/B→ACC	0 0 1 1	L	L L L L L H L H				H	H	H	L
A→ACC	0 1 0 0	L	L L L L H L L L				H	H	H	L
B→ACC	0 1 0 1	L	L L L L H L L H				H	H	H	L
B→A	0 1 1 0	L	L L L L H L H L				H	H	L	L
ACC→ACC	0 1 1 1	L	L L L L H L H H				H	H	H	L
A+B→A	1 0 0 0	L	L L L L L L L L				H	H	L	L
A+B→A	1 0 0 1	L	L L L L L L L H				H	H	L	L
A-B→A	1 0 1 0	L	L L L L L H L L				H	H	L	L
A/B→A	1 0 1 1	L	L L L L L H L H				H	H	L	L
A→A	1 1 0 0	L	L L L L H L L L				H	H	L	L
B→A	1 1 0 1	L	L L L L H L L H				H	H	L	L
ACC→A	1 1 1 0	L	L L L L H L H L				H	H	L	L
A→A	1 1 1 1	L	L L L L H L H H				H	H	L	L

5. UNLESS OTHERWISE INDICATED: LOGIC LEVELS ARE TTL. VF 0V TO 10.87V=LOGIC "1"=HIGH VF 7V TO +5.25V=LOGIC "0"=LOW
6. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT: LC23 SLOT OR TOP LAND SIGNALS EXIT: RIGHT SIDE OR BOTTOM OF FUNCTION BLOCKS.

A3A5

SERIAL PREFIX: 2403A

FIGURE 4. A3A5 DATA MANIPULATOR, SCHEMATIC DIAGRAM
A3A5 17/18

ManualsPlus.com

ManualsPlus.com

A3A6 MAIN CONTROL, CIRCUIT DESCRIPTION

The Digital Storage Processor is controlled by an algorithmic state machine, which uses relative-state addressing and interrupt linkage in performing the control algorithm. The Digital Storage Processor includes A3A4 Memory, A3A5 Data Manipulator, A3A6 Main Control, and A3A7 Interface.

State Register (D)

The State Register, U13 and U14, contains the present state of the algorithm. The present state data is supplied to the Program ROM (Read-Only Memory), where it is decoded into control functions.

Branch Length Adder (A)

The Branch Length Adder, U1 and U2, receives branch length data from the Program ROM and adds it to the present state data to generate the next state.

Link Register (C)

The Link Register, U12 and U15, holds the suspended state of the main program during interrupts and holds the next interrupt state during the main program.

In effect the Link Register acts as a "bookmark" for both the main program and the interrupt program, so that either program can resume at the correct state.

State Machine Control (F)

The State Machine Control, U16, U17, U18, U27C, and U27D, manages switching between the main and interrupt programs. In addition, it generates a signal to increment the Branch Length Adder for conditional branching.

Program ROM (B)

The Program ROM, U4, U6, U8, and U10, contains both the main program and the interrupt program. U5, U7, U9, and U11 are test firmware used in Signature Analysis.

Pipeline Registers (E) (K)

The Pipeline Registers, U24 and U28, hold instructions from the Program ROM for 125 nsec during execution.

Addressable Flip-Flops (L)

U21 and U23 contain 16 flip-flops that may be individually set and cleared. These flip-flops control signals for the Input Section and CRT Driver Section of A3 Digital Storage. The Input Section includes A3A8 Analog-Digital Converter and A3A9 Track and Hold. The CRT Driver Section includes A3A1 Trigger, A3A2 Intensity Control, and A3A3 Line Generator. The flip-flops also control flags and memory control lines for the Processor Section, which includes A3A4 Memory, A3A5 Data Manipulator, A3A6 Main Control, and A3A7 Interface. U19, U27A, and U27B decode instructions from Pipeline Register U28 to control the 16 flip flops. U29 contains buffers to output flag and timer signals onto the Digital Storage Bus.

Control Pulses (G)

U26 decodes eight control pulses based on the instruction in the Pipeline Register U24. U25A is a flip-flop that is set and cleared by the signals decoded by U26. U26 controls the reset of peak detectors in the Input Section of A3 Digital Storage.

ManualsPlus.com

Dual Timer (H)

U20 provides two timing pulses. One, about 20 msec, controls the CRT refresh rate. The other, about 20 μsec, is used in the digital peak detection algorithm.

RAM Chip Enable Generator (J)

U22 generates chip enable timing for A3A4 Memory. It delays execution of program instructions 1½ states (182.5 nsec) to allow addresses to settle.

ManualsPlus.com

A3A6 MAIN CONTROL, TROUBLESHOOTING

On SA Diagram 1, the Free Run check is used to test the outputs of the Test ROM flip-flops, pipeline registers and control pulses decoder. The INTR and LQ inputs do not have stable signatures, so a few pins – such as U16 pin 10 – are checked simply for activity. The SA probe light should flash, indicating high and low activity.

The Free Run check is done with A3A6TP8 grounded. This forces U27 pin 11 high and U18 pin 6 low. To verify these components and the U1 adder input, this ground is removed. As soon as a high qualifier comes in, the state register should quit sequencing since the branch length is 0 (– 1 due to all highs from J1, plus 1 due to the qualifier input). This in turn stops the gate light on the Signature Analyzer.

To verify that the branch length adder works, the E1 jumper is replaced, Test Program 2 is set up, and the 5 Vdc signature is checked to see if the program is sequencing properly.

On SA Diagram 2, the Free Run check setup is used to verify the System ROM. The setup is the same as on Diagram 1 except that the Test ROMs are not enabled by the A3A6TP3 to A3A6TP6 jumper.

After A3A5 and A3A7 have been checked, the LTSTA and LTSTB lines are verified by using Test Program 4.

5 Vdc Signature of 4596 is Not Obtained

Verify 8 MHz clocks at P2-19 and P2-20.
Verify a high (low when A3A7S1 is pressed) at LTON P1-13 and U15-5.
Verify a 4 MHz waveform on BS A3A6TP9.

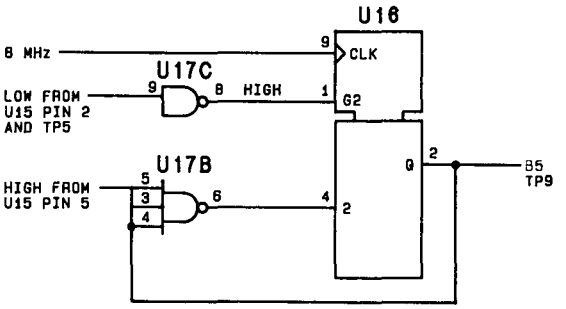


FIGURE 1. EQUIVALENT CIRCUIT OF STATE MACHINE CONTROL

Verify the turn-on states of the register and adder outputs.
When A3A7S1 is pressed:
- LTON P1-13 goes low.
- U12, U15 outputs go low.
- U13, U14 outputs go low.
- U1, U2 outputs go high.

ManualsPlus.com

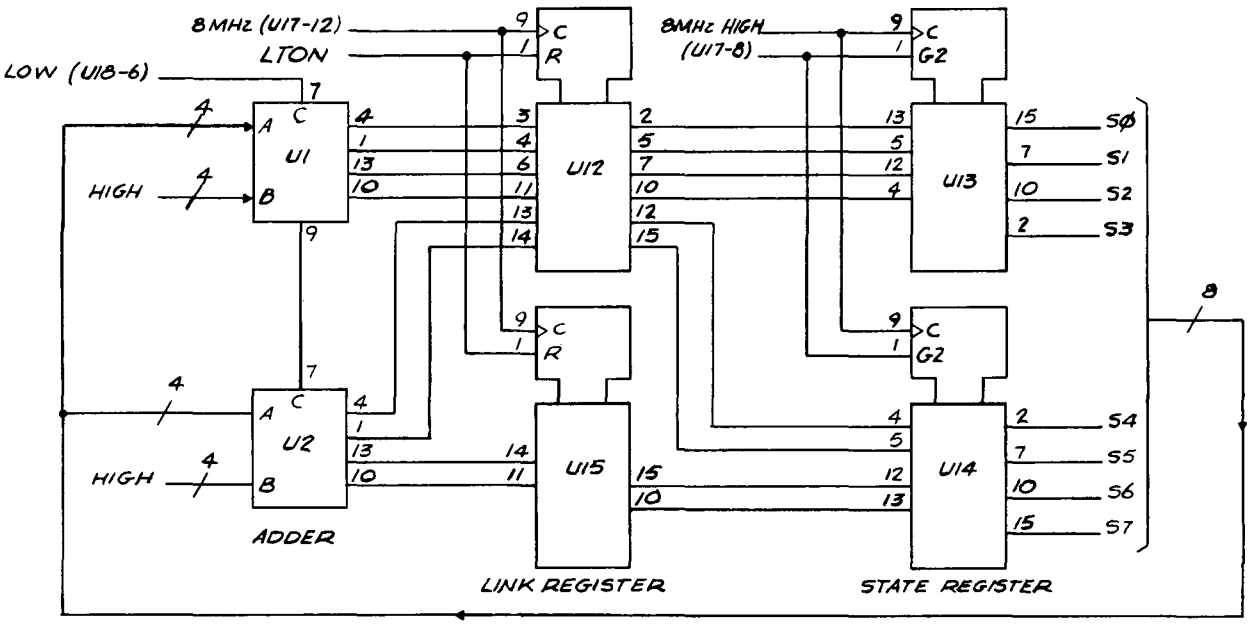


FIGURE 2. EQUIVALENT CIRCUIT OF STATE REGISTER, ADDER, AND LINK REGISTER

Verify binary count sequence, starting at the least significant bit SØ (500 nsec square wave) to S7 (64 μsec square wave). (A signature of 3951 when the Start and Stop are changed to S3 (A3A6TP10) indicates that U1, U13, and U12 pins 2, 5, 7, and 10 are good.)

5 Vdc Signature of P545 Not Obtained

Verify that U18 pin 3 is always high. (A3A6TP7 grounded.)

The reason that the test is not cycling properly is probably due to either the B inputs to the Branch Length Adders U1 and U2 or to the NS (Next State) inputs to the State Register U13 and U14 or U16. To isolate, remove E1 from the IC socket again and ground A3A6TP5 and A6TP8, as at the beginning of the check. (5 Vdc 4596.)

Momentarily ground U17 pin 8 while noting the 5 Vdc signature.

If a 5 Vdc signature of CC34 is not obtained, U13 or U14 is defective. Change the Start and Stop to S3 (A3A6TP10). The 5 Vdc signature should be 3951. Momentarily ground U17 pin 8 again while noting the 5 Vdc signature. A signature of UP73 indicates that U13 is good.

If a 5 Vdc signature of CC34 was obtained, check the adder B inputs U1, U2, pins 2, 6, 15, 11 by individually grounding the inputs. Pressing A3A7S1, and observing on an oscilloscope that the period of S7 (A3A6TP11) decreases. If it does not, then the faulty adder has been located.

ManualsPlus.com

TABLE 1. A3A6, REPLACEABLE PARTS (1 OF 2)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3A6	85662-60146	5	1	BOARD ASSEMBLY, MAIN CONTROL	28480	85662-60146
A3A6C1	0160-4835	7	28	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C2	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C3	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C4	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C5	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C6	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C7	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C8	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C9	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C10	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C11	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C12	0160-4832	4	1	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A3A6C13	0180-0197	8	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A3A6C14	0180-0228	6	1	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A3A6C15	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C16	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C17	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C18	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C19	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C20	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C21	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C22	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C23	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C24	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C25	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C26	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C27	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C28	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C29	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C30	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6C31	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A6E1	1251-4787	2	1	SHUNT-DIP 8-POSITION	28480	1251-4787
A3A6J1	1200-0507	9	1	SOCKET-IC 16-CONT DIP-SLDR	28480	1200-0507
A3A6L1	08558-80011	6	1	FILTER COIL BLUE	28480	08558-80011
A3A6R1	0698-3155	1	3	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A3A6R2	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A3A6R3	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A3A6R4	0698-3157	3	1	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A3A6R5	0698-6320	8	1	RESISTOR 5K .1% .125W F TC=0+-25	03888	PME55-1/8-T9-5001-B
A3A6R6	0757-0401	0	1	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A3A6TP1	0360-0535	0	11	TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A6TP2	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A6TP3	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A6TP4	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A6TP5	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A6TP6	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A6TP7	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A6TP8	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A6TP9	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A6TP10	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A6TP11	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A6U1	1820-1871	6	2	IC ADDR TTL S BIN FULL ADDR 4-BIT	01295	SN74S283N
A3A6U2	1820-1871	6		IC ADDR TTL S BIN FULL ADDR 4-BIT	01295	SN74S283N
A3A6U3	1810-0205	7	1	NETWORK-RES 8-SIP4.7K OHM X 7	01121	208A472
A3A6U4	85662-80019	3	1	IC ROM B 512X8	28480	85662-80019
A3A6U5	85662-80009	1	1	IC ROM B 512X8	28480	85662-80009
A3A6U6	85662-80020	6	1	IC ROM B 512X8	28480	85662-80020
A3A6U7	85662-80007	9	1	IC ROM B 512X8	28480	85662-80007
A3A6U8	85662-80010	4	1	IC ROM B 512X8	28480	85662-80010
A3A6U9	85662-80017	1	1	IC ROM B 512X8	28480	85662-80017
A3A6U10	85662-80008	0	1	IC ROM B 512X8	28480	85662-80008
A3A6U11	85662-80018	2	1	IC ROM B 512X8	28480	85662-80018
A3A6U12	1820-1076	3	2	IC FF TTL S D-TYPE POS-EDGE-TRIG CLEAR	01295	SN74S174N
A3A6U13	1820-1981	9	2	IC RGTR TTL S QUAD 2-INP	34335	AM25S09PC
A3A6U14	1820-1981	9		IC RGTR TTL S QUAD 2-INP	34335	AM25S09PC
A3A6U15	1820-1076	3		IC FF TTL S D-TYPE POS-EDGE-TRIG CLEAR	01295	SN74S174N

ManualsPlus.com

TABLE 1. A3A6, REPLACEABLE PARTS (2 OF 2)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3A6U16				NOT ASSIGNED		
A3A6U17	1820-0685	8	2	IC GATE TTL S NAND TPL 3-INP	01295	SN74S10N
A3A6U18	1820-0681	4	2	IC GATE TTL S NAND QUAD 2-INP	01295	SN74S00N
A3A6U19	1820-0685	8		IC GATE TTL S NAND TPL 3-INP	01295	SN74S10N
A3A6U20	1820-1423	4	1	IC MV TTL LS MONOSTBL RETRIG DUAL	01295	SN74LS123N
A3A6U21	1820-1729	3	2	IC LCH TTL LS COM CLEAR 8-BIT	01295	SN74LS259N
A3A6U22	1820-0693	8	1	IC FF TTL S D-TYPE POS-EDGE-TRIG	01295	SN74S74N
A3A6U23	1820-1729	3		IC LCH TTL LS COM CLEAR 8-BIT	01295	SN74LS259N
A3A6U24	1820-1196	8	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A3A6U25	1820-1112	8	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A3A6U26	1820-1216	3	1	IC DCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N
A3A6U27	1820-0681	4		IC GATE TTL S NAND QUAD 2-INP	01295	SN74S00N
A3A6U29	1820-1491	6	1	IC BFR TTL LS NON-INV HEX 1-INP	01295	SN74LS367AN
				MISCELLANEOUS PARTS		
	4040-0754	1	2	EXTR PC BD BLU	28480	4040-0754

ManualsPlus.com

NOTE

- FOR INSTRUCTIONS ON THE USE OF SIGNATURE ANALYSIS DIAGRAMS READ THE SIGNATURE ANALYSIS DESCRIPTION SECTION OF THIS MANUAL.

CONTROL BOARD OUTPUTS AND TEST ROMS CHECK

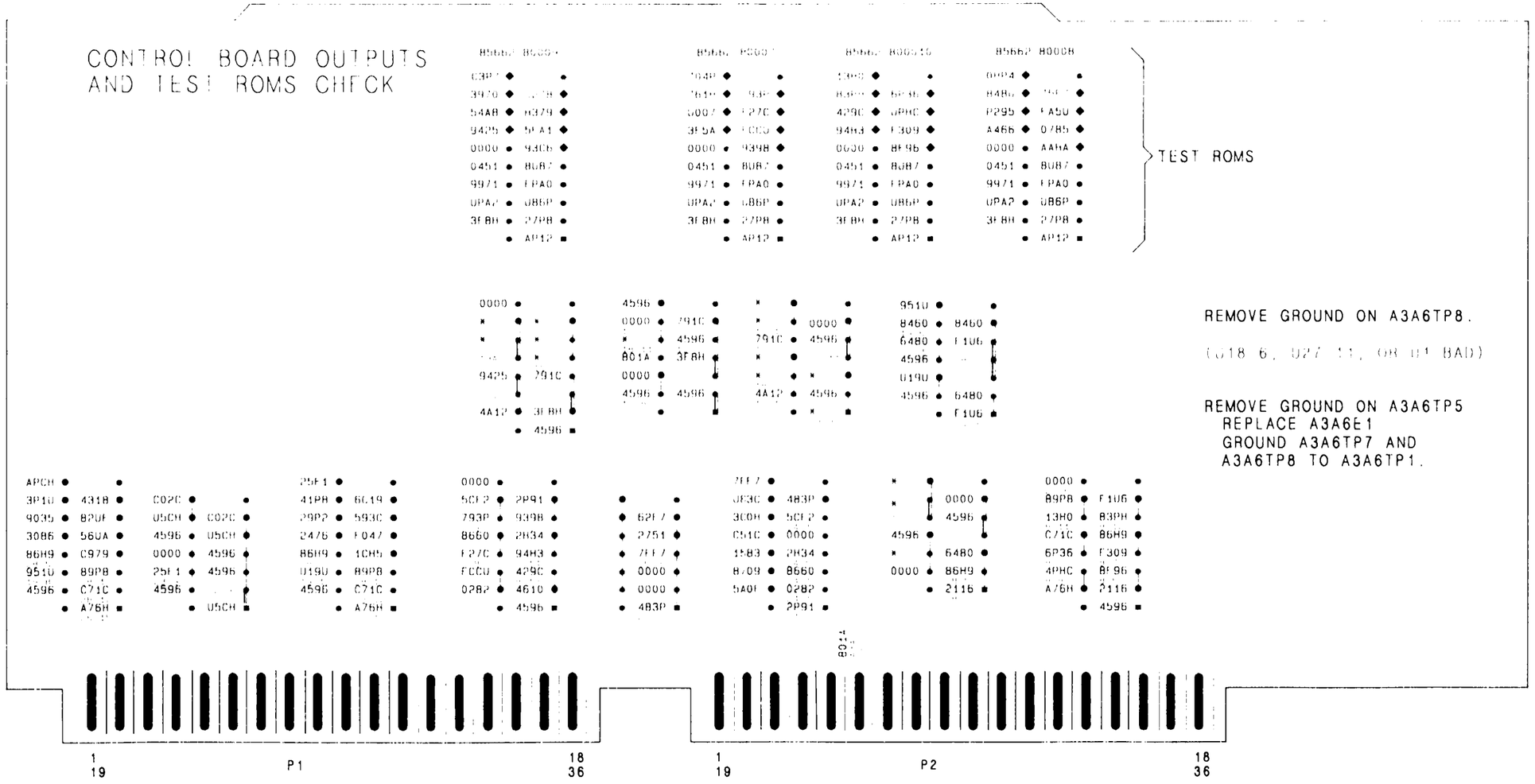
SPECTRUM ANALYZER CONNECTIONS:
GROUND A3A6TP5 AND A3A6TP8 TO A3A6TP1
JUMPER A3A6TP3 TO A3A6TP6
REMOVE A3A6E1 FROM A3A6J1 SOCKET
ADJUST INTENSITY FULLY CCW

SIGNATURE ANALYZER CONNECTIONS:
CLOCK ⎍ TO A3A6TP4 (LCLK)
START ⎍ TO A3A6TP11
STOP ⎍ TO A3A6TP11
POD GND TO A3A6TP1
PROBE GND TO A3A6TP1

PRESS:
A3A7S1 AFTER COMPLETING ALL CONNECTIONS

ManualsPlus.com

A3A6
MAIN CONTROL
85662-60146



A3A6

FIGURE 3. A3A6 MAIN CONTROL, SIGNATURE ANALYSIS TROUBLESHOOTING DIAGRAM (1 OF 2)

ManualsPlus.com

NOTE

- FOR INSTRUCTIONS ON THE USE OF SIGNATURE ANALYSIS DIAGRAMS READ THE SIGNATURE ANALYSIS DESCRIPTION SECTION OF THIS MANUAL.

SYSTEM ROMS CHECK

SPECTRUM ANALYZER CONNECTIONS:
REMOVE A3A6E1 FROM A3A6J1 SOCKET
GROUND A3A6TP5 AND A3A6TP8 TO A3A6TP1
REMOVE JUMPER FROM A3A6TP3 AND A3A6TP6

SIGNATURE ANALYZER CONNECTIONS:
CLOCK ⎍ TO A3A6TP4 (LCLK)
START ⎍ TO A3A6TP11
STOP ⎍ TO A3A6TP11
POD GND TO A3A6TP1
PROBE GND TO A3A6TP1

PRESS:
A3A7S1 AFTER COMPLETING CONNECTIONS FOR EACH TEST OR CHECK

TEST A CHECK

SPECTRUM ANALYZER CONNECTIONS:
CONNECT A3A7J1 JUMPER TO PINS 5 AND 10
JUMPER A3A7TP3 TO A3A7TP6
ADJUST A3A2R12LL THRESH FULLY CW
JUMPER A3A6TP3 TO A3A6TP6

SIGNATURE ANALYZER CONNECTIONS:
CLOCK ⎍ TO A3A7TP1 (SA CLK)
START ⎍ TO A3A6TP2
STOP ⎍ TO A3A6TP2
POD GND TO A3A6TP1
PROBE GND TO A3A6TP1

PRESS:
A3A7S1 AFTER COMPLETING CONNECTIONS FOR EACH TEST OR CHECK

TEST B CHECK

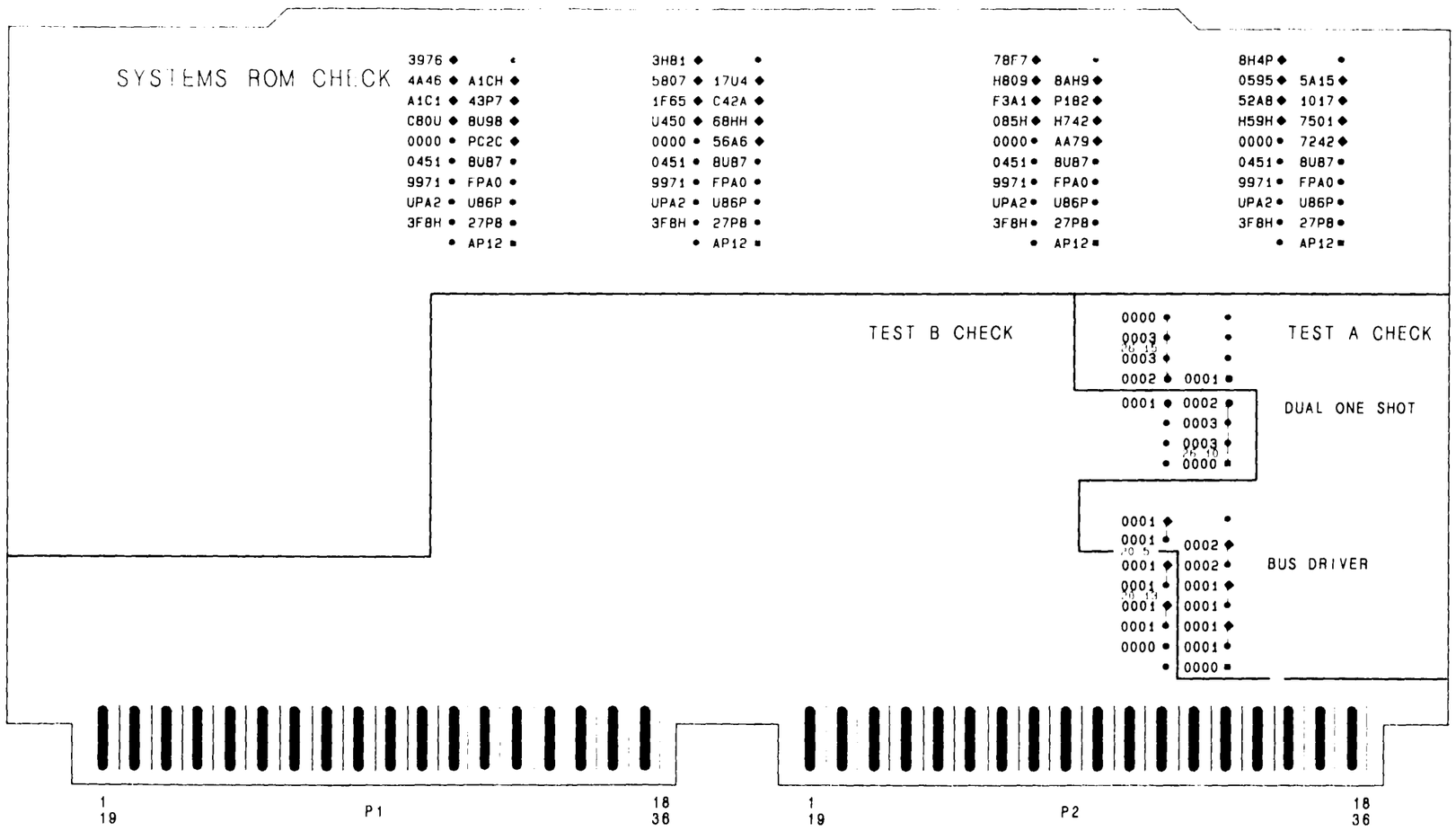
SPECTRUM ANALYZER CONNECTIONS:
CONNECT A3A7J1 JUMPER TO PINS 5 AND 11
JUMPER A3A7TP3 TO A3A7TP6
ADJUST A3A2R12LL THRESH FULLY CW
JUMPER A3A6TP3 TO A3A6TP6

SIGNATURE ANALYZER CONNECTIONS:
CLOCK ⎍ TO A3A7TP1 (SA CLK)
START ⎍ TO A3A6TP2
STOP ⎍ TO A3A6TP2
POD GND TO A3A6TP1
PROBE GND TO A3A6TP1

PRESS:
A3A7S1 AFTER COMPLETING CONNECTIONS FOR EACH TEST OR CHECK

ManualsPlus.com

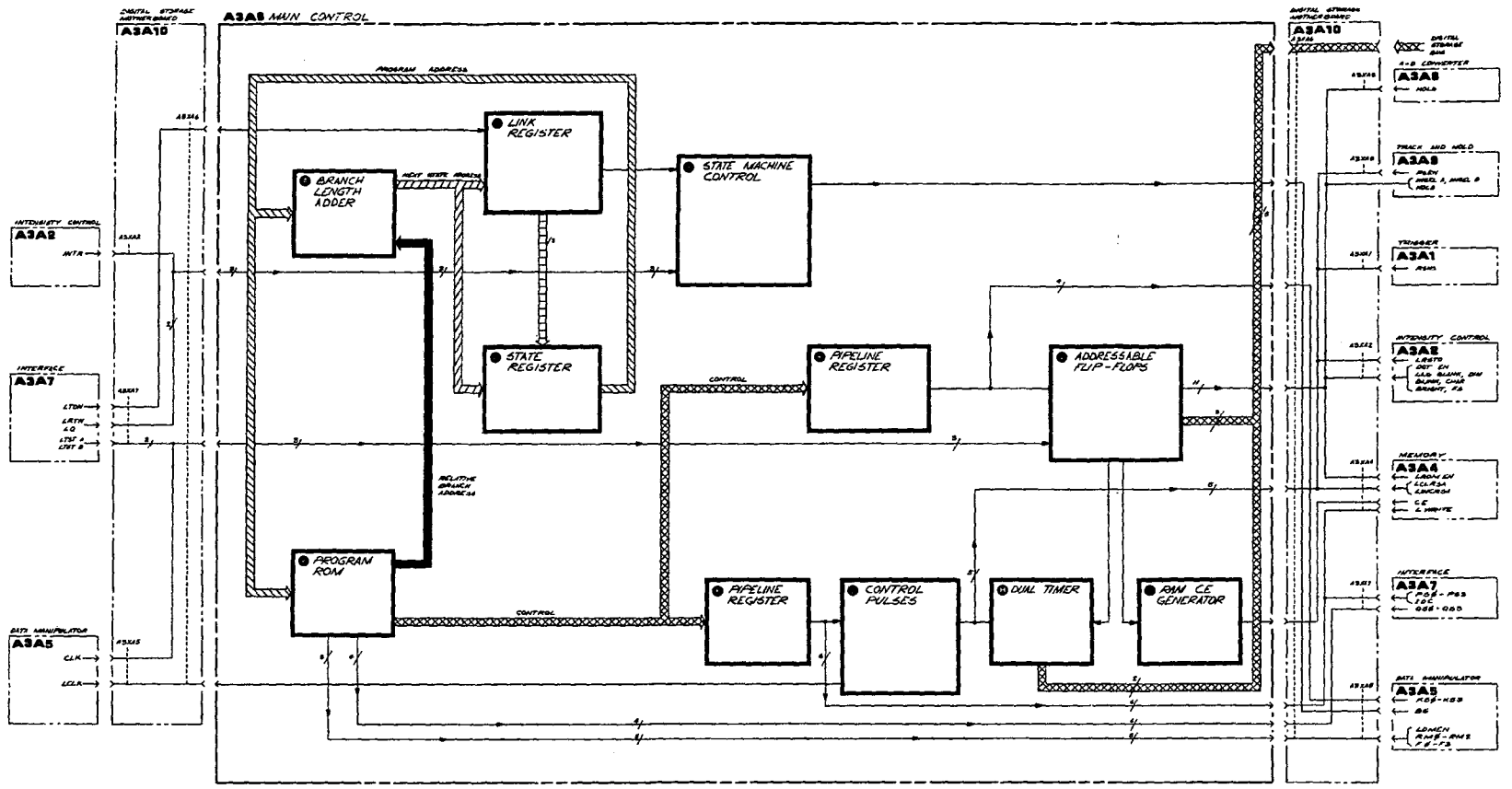
A3A6
MAIN CONTROL
85662-60146



A3A6

FIGURE 3. A3A6 MAIN CONTROL, SIGNATURE ANALYSIS TROUBLESHOOTING DIAGRAM (2 OF 2)

IF-DISPLAY SECTION



A3A6

FIGURE 4. A3A6 MAIN CONTROL, BLOCK DIAGRAM

ManualsPlus.com

ManualsPlus.com

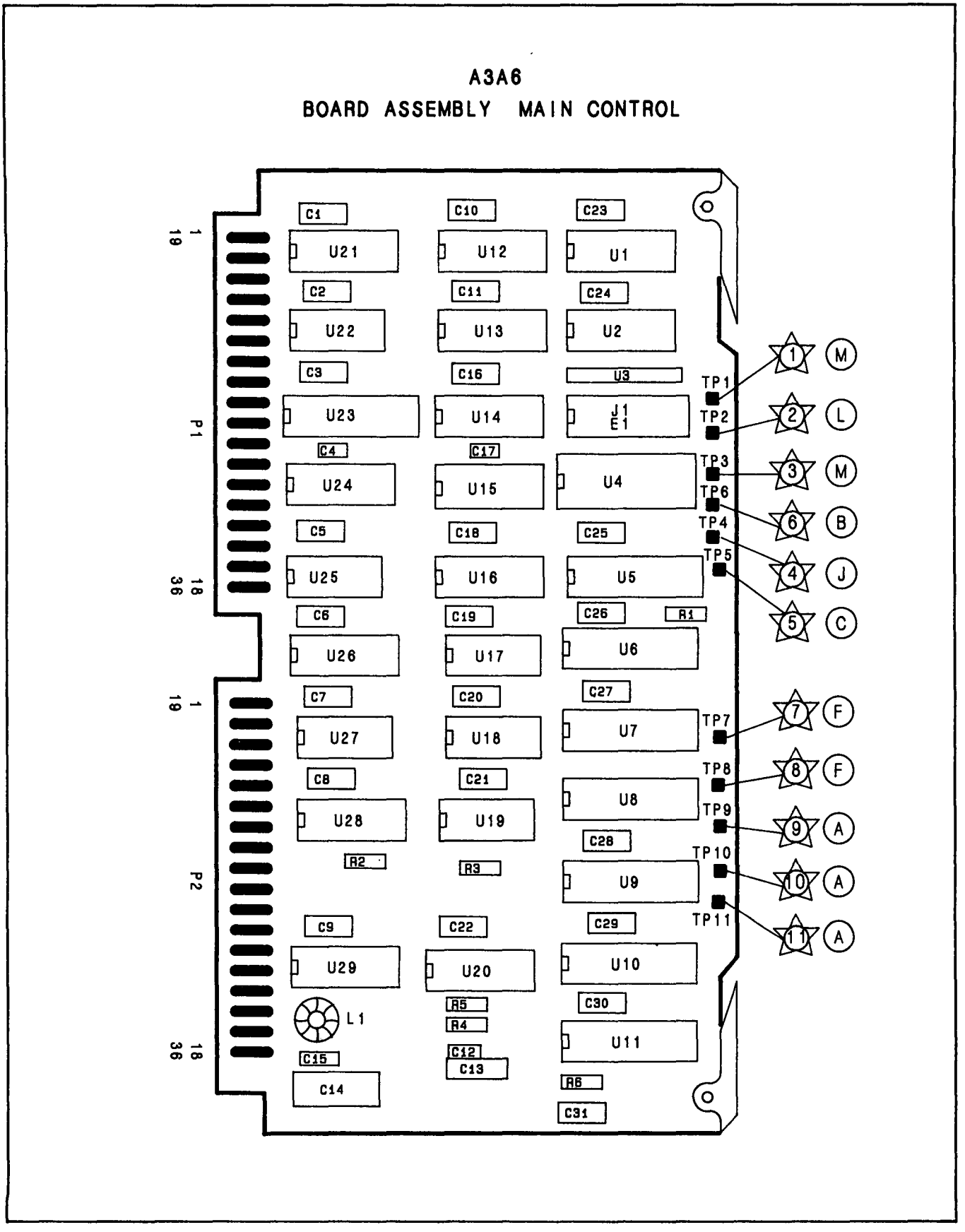
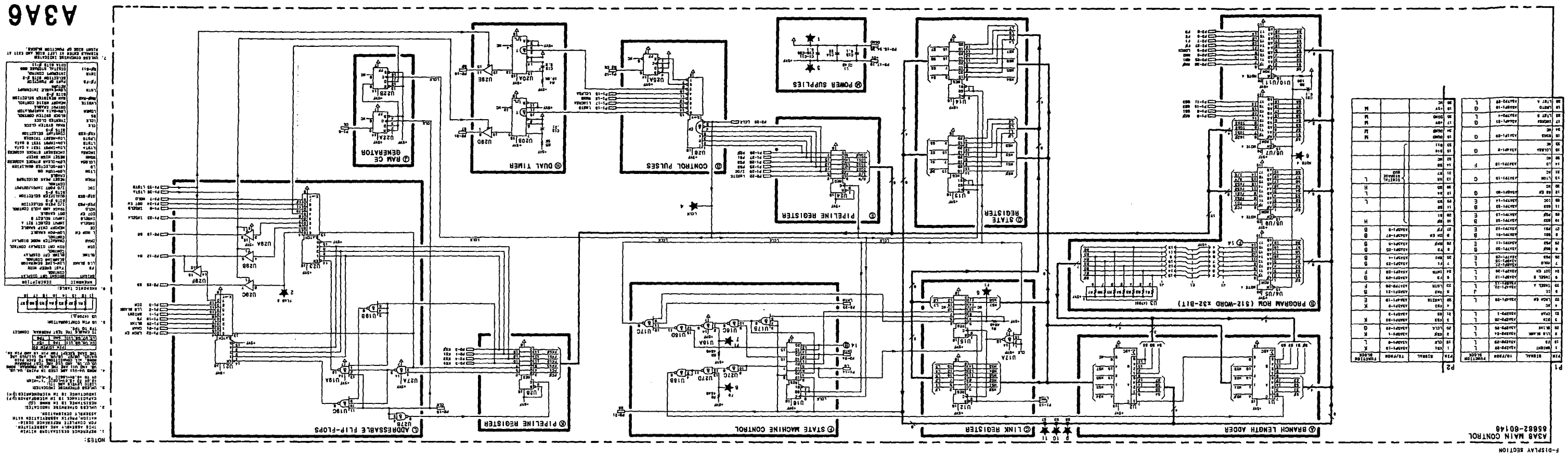


FIGURE 5. A3A6 MAIN CONTROL, COMPONENT LOCATIONS

ManualsPlus.com

FIGURE 6. A3A6 MAIN CONTROL, SCHEMATIC DIAGRAM

A3A6



ManualsPlus.com

ManualsPlus.com

A3A7 INTERFACE, CIRCUIT DESCRIPTION

A3A7 Interface provides data transfer between A15 Controller and A3 Digital Storage. This assembly also includes qualifier selection for conditional branching, input/output (I/O) port decoding, and the main clock circuits.

Data Transfer Register (A)

U2, U7, U8, and U9 form a 16-bit Data Transfer Register which can be loaded or output onto either the Instrument Bus (through U16 and U17, the Instrument Bus Drivers) or the Digital Storage Bus (through U3, U4, and U5, the Digital Storage Bus Drivers).

Instrument Address Decoder (C)

U6, U14, and U15 control the loading and output of data between the Data Transfer Register and the Instrument Bus.

Qualifier Select (H)

U20 and U21 select one of 16 qualifiers to be used for conditional branching. Selection is controlled by A3A6 Main Control firmware.

I/O Port Decoder (D)

U18 and U19 decode I/O port control signals from the Pipeline Registers in A3A6 Main Control.

Timing Generator (G)

U10, U11, U12, and U13 generate 8-MHz, 1-MHz, and 200-kHz timing signals used by A3 Digital Storage.

ManualsPlus.com

A3A7 INTERFACE, TROUBLESHOOTING

The A3A7 Interface assembly contains several different circuits. Testing the Timing Generator and Turn-on Control is probably best done with an oscilloscope to monitor the 8-MHz, 1-MHz, and 200-kHz outputs. The I/O Port Decoder, on SA Diagram 1, is tested using the Free Run check. The Qualifier Select circuit is checked, along with the A3A5 Data Manipulator assembly, using Test Program 2. The Digital Storage address check uses the self-check routine from the A15 Controller in the RF Section.

The IOB interface circuitry is checked on SA Diagram 2 using the overall Test Program 4. The 50-wire Analyzer Bus Interconnect cable W31 is removed so that the U16 and U17 Bus Drivers **(B)** can continually drive the IOB lines when A3A7TP8 is grounded. The address section of the interface is done first, with the jumper pin put in pin 6 of A3A7J1 to generate the proper clock for the Signature Analyzer. To check the data portion of the interface, the jumper is moved to pin 7. If a fault is found in verifying the data at the P2 connector, the jumper E1 is opened before probing U3 to U9. This opens the feedback from the Data Transfer Registers **(A)** through the Bus Driver **(B)** and back to the register **(A)**. If all the Bus Driver **(B)** outputs and the Digital Storage Bus Driver **(E)** outputs are good when the jumper is opened, then the fault is in the register corresponding to the bad bit detected at the connector; i.e., its IOB input is defective.

If the fault appears to be a bus fight problem (i.e., the A15 Controller cannot properly drive the IOB data lines until A3A7 is removed), then the problem might be that the Bus Driver **(B)** will not go into its high impedance output state. This can be determined by checking with an oscilloscope the IOB0-11 lines with the Analyzer Bus Interconnect cable disconnected and with A3A7TP8 not grounded. The lines should be "floating," usually between 1.4V and 2V. With the Analyzer Bus Interconnect cable disconnected, A1A8TP1 and A1A8TP2 must be jumpered to turn on the power supplies.

ManualsPlus.com

TABLE 1. A3A7, REPLACEABLE PARTS (1 OF 2)

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A3A7	85662-60127	2	1	BOARD ASSEMBLY, INTERFACE	28480	85662-60127
A3A7C1	0160-4835	7	23	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A7C2	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A7C3	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A7C4	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A7C5	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A7C6	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A7C7	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A7C8	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A7C9	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A7C10	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A7C11	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A7C12	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A7C13	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A7C14	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A7C15	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A7C16	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A7C17	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A7C18	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A7C19	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A7C20	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A7C21	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A7C22	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A7C23	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A7C24	0180-0228	6	1	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A3A7CR1	1901-0535	9	1	DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A7E1	1460-1489	8	1	WIREFORM BE CU AG	28480	1460-1489
A3A7E2	1258-0124	7	1	PIN-PROGRAMING DUMPER .30 CONTACT	91506	8136-475G1
A3A7J1	1200-0508	0	1	SOCKET-IC 14-CONT DIP-SLDR	28480	1200-0508
A3A7L1	08558-80011	6	1	FILTER COIL BLUE	28480	08558-80011
A3A7L2	9100-1618	1	1	INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A3A7Q1	1854-0404	0	1	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A3A7R1	0757-0278	9	4	RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A3A7R2	0757-0278	9		RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A3A7R3	0757-0278	9		RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A3A7R4	0757-0278	9		RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A3A7S1	3101-2170	8	1	SWITCH-PB SPDT MOM	28480	3101-2170
A3A7TP1	0360-0535	0	10	TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A7TP2	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A7TP3	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A7TP4	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A7TP5	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A7TP6	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A7TP7	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A7TP8	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A7TP9	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A7TP10	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A7U1	1810-0206	8	1	NETWORK-RES 8-SIP10.0K OHM X 7	01121	208A103
A3A7U2	1820-1444	9	4	IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD	01295	SN74LS298N
A3A7U3	1820-1491	6	5	IC BFR TTL LS NON-INV HEX 1-INP	01295	SN74LS367AN
A3A7U4	1820-1491	6		IC BFR TTL LS NON-INV HEX 1-INP	01295	SN74LS367AN
A3A7U5	1820-1491	6		IC BFR TTL LS NON-INV HEX 1-INP	01295	SN74LS367AN
A3A7U6	1820-1202	7	2	IC GATE TTL LS NAND TPL 3-INP	01295	SN74LS10N
A3A7U7	1820-1444	9		IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD	01295	SN74LS298N
A3A7U8	1820-1444	9		IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD	01295	SN74LS298N
A3A7U9	1820-1444	9		IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD	01295	SN74LS298N
A3A7U10	1820-1431	4	1	IC CNTR TTL LS DECD SYNCHRO	01295	SN74LS162AN
A3A7U11	1820-0693	8	1	IC FF TTL S D-TYPE POS-EDGE-TRIG	01295	SN74S74N
A3A7U12	1820-1432	5	1	IC CNTR TTL LS BIN SYNCHRO POS-EDGE-TRIG	01295	SN74LS163AN
A3A7U13	1820-2592	0	1	IC OSC TTL LS	01295	SN74LS320N
A3A7U14	1820-1202	7		IC GATE TTL LS NAND TPL 3-INP	01295	SN74LS10N
A3A7U15	1820-1416	5	1	IC SCHMITT-TRIG TTL LS INV HEX 1-INP	01295	SN74LS14N
A3A7U16	1820-1491	6		IC BFR TTL LS NON-INV HEX 1-INP	01295	SN74LS367AN
A3A7U17	1820-1491	6		IC BFR TTL LS NON-INV HEX 1-INP	01295	SN74LS367AN
A3A7U18	1820-1240	3	2	IC DCDR TTL S 3-TO-8-LINE 3-INP	01295	SN74S138N
A3A7U19	1820-1240	3		IC DCDR TTL S 3-TO-8-LINE 3-INP	01295	SN74S138N
A3A7U20	1820-1302	8	2	IC MUXR/DATA-SEL TTL S 8-TO-1-LINE 8-INP	01295	SN74S251N

ManualsPlus.com

TABLE 1. A3A7, REPLACEABLE PARTS (2 OF 2)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3A7U21	1820-1302	8		IC MUXR/DATA-SEL TTL S 8-TO-1-LINE 8-INP	01295	SN74S251N
A3A7VR1	1902-3036	3	1	DIODE-ZNR 3.16V 5% DO-7 PD=.4W TC=-.064%	28480	1902-3036
A3A7Y1	0410-0758	6	1	CRYSTAL-QUARTZ 15.824 MHZ HC-18/U-HLDR	28480	0410-0758
				MISCELLANEOUS PARTS		
	4040-0755	2	2	EXTR PC BD VIO	28480	4040-0755

ManualsPlus.com

NOTE

- FOR INSTRUCTIONS ON THE USE OF SIGNATURE ANALYSIS DIAGRAMS READ THE SIGNATURE ANALYSIS DESCRIPTION SECTION OF THIS MANUAL.

DECODER CHECK

SIGNATURE ANALYZER CONNECTIONS:
CLOCK ⌐¯ TO A3A7TP7 (LCLK)
START ⌐¯ TO A3A6TP11
STOP ⌐¯ TO A3A6TP11
POD GND TO A3A7TP5
PROBE GND TO A3A7TP5

SPECTRUM ANALYZER CONNECTIONS:
REMOVE A3A6E1 FROM A3A6J1 SOCKET
CONNECT A3A7J1 JUMPER TO PINS 7 AND 8
GROUND A3A6TP5 AND A3A6TP8 TO A3A6TP1
JUMPER A3A6TP3 TO A3A6TP6
ADJUST INTENSITY FULLY CCW

PRESS:
A3A7S1 AFTER COMPLETING CONNECTIONS FOR EACH TEST OR CHECK.

QUALIFIER CHECK

SIGNATURE ANALYZER CONNECTIONS:
CLOCK ⌐¯ TO A3A7TP7
START ⌐¯ TO A3A6TP2
STOP ⌐¯ TO A3A6TP2
POD GND TK A3A7TP5
PROBE GND TO A3A7TP5

SPECTRUM ANALYZER CONNECTIONS:
(REPLACE A3A6E1)
ADJUST INTENSITY FULLY CCW
GROUND A3A6TP7 AND A3A6TP8 TO A3A6TP1
JUMPER A3A6TP3 TO A3A6TP2

DS ADDRESS CHECK

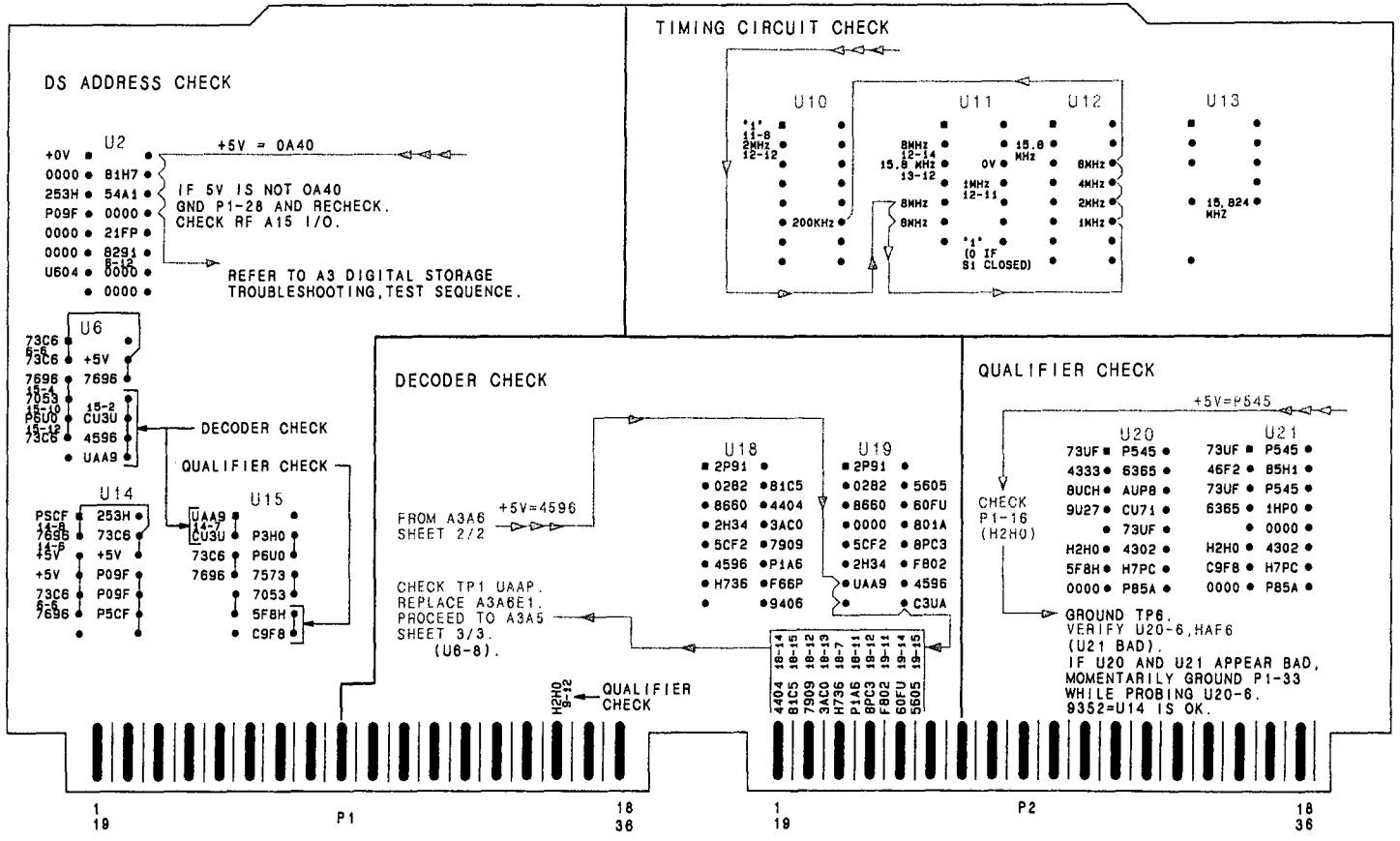
SIGNATURE ANALYZER CONNECTIONS:
CLOCK ⌐¯ TO A15TP1-2 (I/O)
START ⌐¯ TO A15TP1-6 (T2)
STOP ⌐¯ TO A15TP1-7 (T3)
POD GND TO A15TP9 (GND)

SPECTRUM ANALYZER CONNECTIONS:
GROUND A15TP2 (STS) TO A15TP3 (GND)
GROUND A3A7TP2 TO A3A7TP5
REMOVE A3A6

PRESS:
A3A7S1 AFTER COMPLETING CONNECTIONS FOR EACH TEST OR CHECK.

ManualsPlus.com

A3A7
INTERFACE
85662-60127



A3A7

FIGURE 1. A3A7 INTERFACE, SIGNATURE ANALYSIS DIAGRAM (1 OF 2)

ManualsPlus.com

NOTE

- FOR INSTRUCTIONS ON THE USE OF SIGNATURE ANALYSIS DIAGRAMS READ THE SIGNATURE ANALYSIS DESCRIPTION SECTION OF THIS MANUAL

IOB INTERFACE CHECK (ADDRESS)

SIGNATURE ANALYZER CONNECTIONS:
CLOCK ⎍⎍ TO A3A7TP1 (SA CLK)
START ⎍⎍ TO A3A6TP2
STOP ⎍⎍ TO A3A6TP2
POD GND TO A3A7TP5
PROBE GND TO A3A7TP5

SPECTRUM ANALYZER CONNECTIONS:
CONNECT A3A7J1 JUMPER TO PINS 6 AND 9
JUMPER A3A7TP3 TO A3A7TP2 AND A3A7TP6
GROUND A3A7TP3 TO A3A7TP5
ADJUST A3A2R12 LL THRESH FULLY CW
JUMPER A3A6TP3 TO A3A6TP6
DISCONNECT REAR PANEL 50-WIRE CABLES
JUMPER A1A8TP1 TO A1A8TP2

PRESS:
A3A7S1 AFTER COMPLETING CONNECTIONS FOR EACH TEST OR CHECK.

IOB INTERFACE CHECK (DATA)

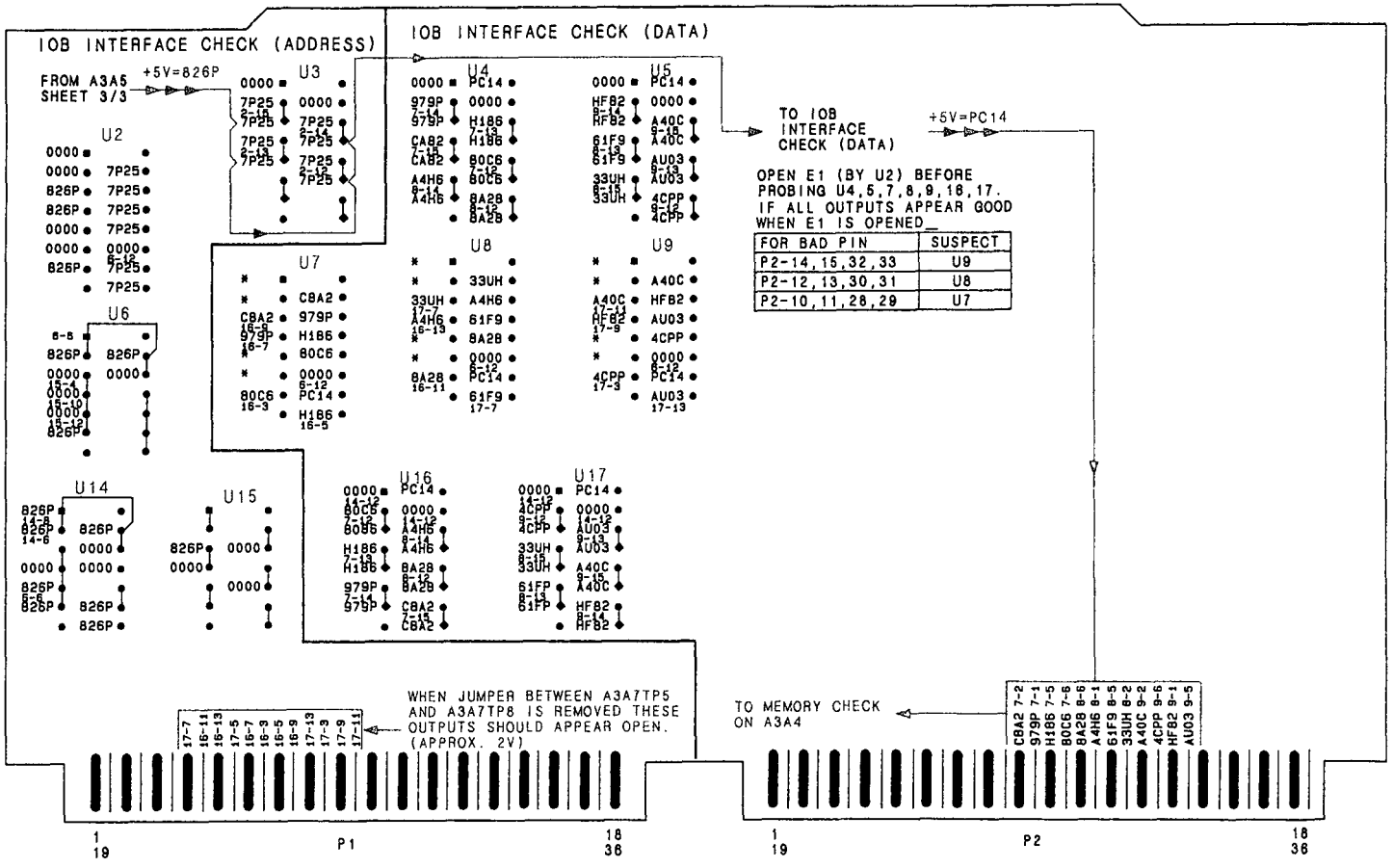
SIGNATURE ANALYZER CONNECTIONS:
CLOCK ⎍⎍ TO A3A7TP1 (SA CLK)
START ⎍⎍ TO A3A6TP2
STOP ⎍⎍ TO A3A6TP2
POD GND TO A3A7TP5
PROBE GND TO A3A7TP5

SPECTRUM ANALYZER CONNECTIONS:
CONNECT A3A7J1 JUMPER PINS 7 AND 8
JUMPER A3A7TP3 TO A3A7TP2 AND A3A7TP6
GROUND A3A7TP8 TO A3A7TP5
ADJUST A3A2R12 LL THRESH FULLY CW
JUMPER A3A6TP3 TO A3A6TP6
DISCONNECT REAR-PANEL 50-WIRE CABLE
JUMPER A1A8TP1 TO A1A8TP2

PRESS:
A3A7S1 AFTER COMPLETING CONNECTIONS FOR EACH TEST OR CHECK.

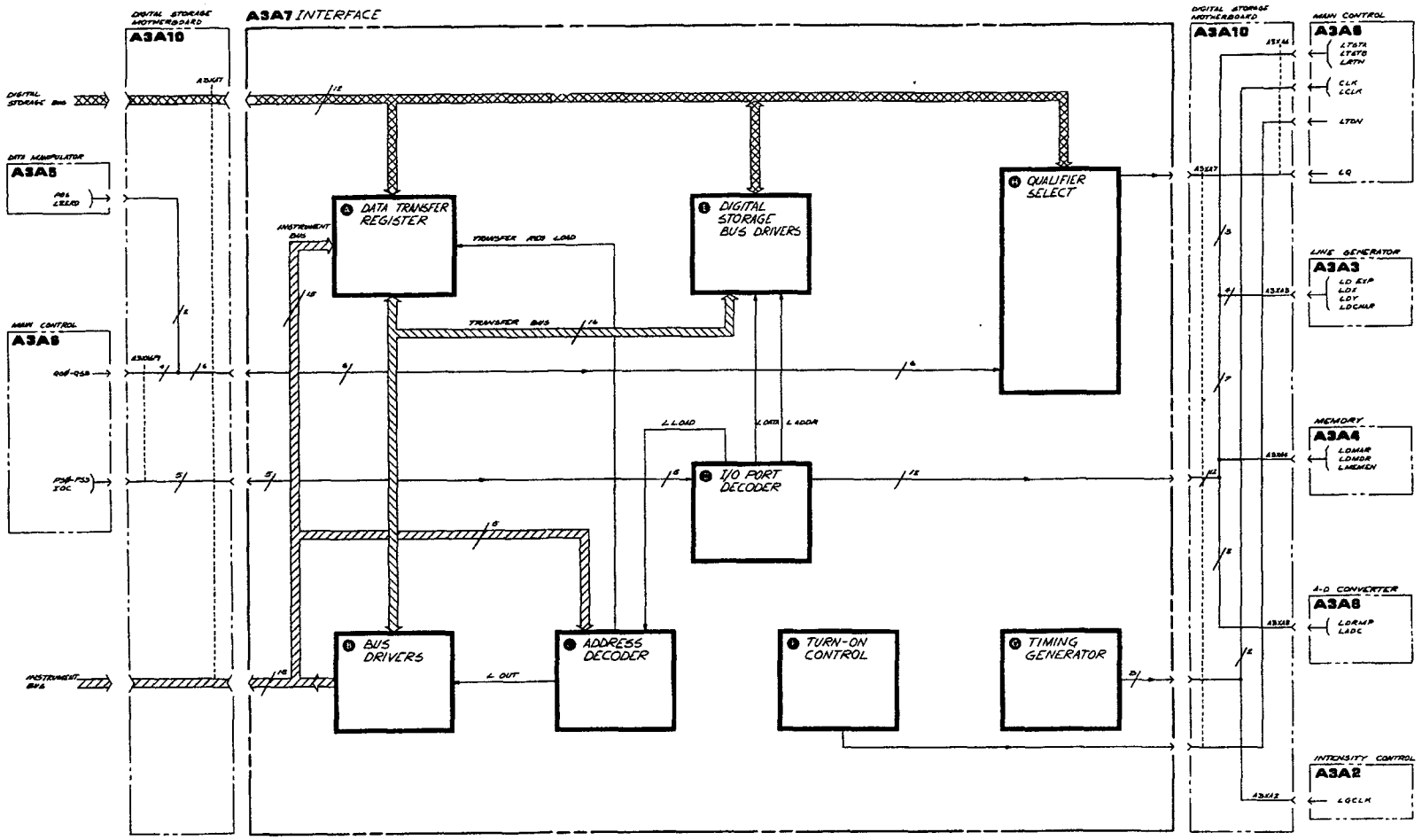
ManualsPlus.com

A3A7
INTERFACE
85662-60127



A3A7

FIGURE 1. A3A7 INTERFACE, SIGNATURE ANALYSIS DIAGRAM (2 OF 2)



A3A7

FIGURE 2. A3A7 INTERFACE, BLOCK DIAGRAM

ManualsPlus.com

ManualsPlus.com

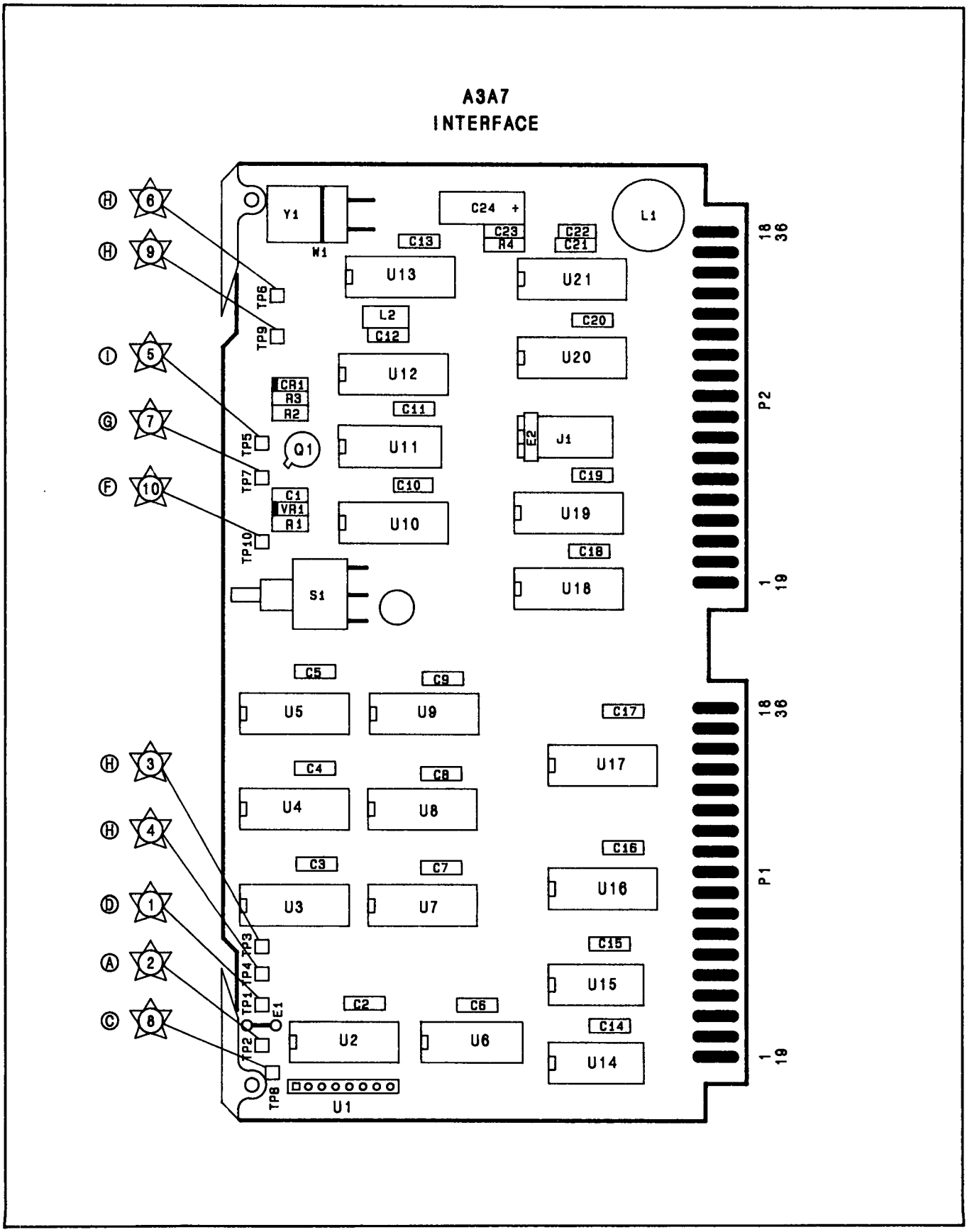


FIGURE 3. A3A7 INTERFACE, COMPONENT LOCATIONS

IF-DISPLAY SECTION

A3A7 INTERFACE
85662-60127

P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK	
1	ADRF			A
19	ADR2			4
2	ADR4			
20	LT10			
3	ADR3			
21	ADR1			
4	DB6B			
22	DB4			
5	DB5	INSTRU-MENT BUS		
23	DB7			
6	DB1			
24	DB3			
7	DB2			
25	DB0F			
8	DB11			
26	DB9			
9	DB10			
27	DB8			
10	MC			
28	LSER	A3A10J2P-46		A
11	P82	A3A8P1-28		D
29	P83	A3A8P1-29		D
12	P81	A3A8P1-27		D
30	P8F	A3A8P1-8		H
13	P8F	A3A8P1-28		D
31	G81	A3A8P1-9		H
14	IOC	A3A8P1-29		D
32	G82	A3A7P1-10		H
15	LTOW	A3A8P1-13		F
33	G89	A3A8 P1-11		H
16	LG	A3A8P1-14		H
34	MC			
17	MC			
35	MC			
18	MC			
36	LD EXP	A3A8P1-10		D

P2

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK	
1	LDX	A3A8P2-26		D
19	LDCHAR	A3A8P2-25		D
2	LD HOR	A3A8P1-6		D
20	LDY	A3A8P1-31		D
3	LD RAD	A3A8P1-29		D
21	LD RAP	A3A8P1-8		D
4	LTST B	A3A8P1-35		D
22	LTST A	A3A8P1-36		D
5	LMEM EN	A3A8P1-4		D
23	LADC	A3A8P1-6		D
6	CLK	A3A8P2-10		G
24	LCLK	A3A8P2-25		G
7	MC			
25	INTG	A3A8P1-7		G
8	LD CLK	A3A2P2-18		G
26	LRTN	A3A8P2-23		G
9	LSER2	A3A5P1-20		H
27	P83	A8A8P1-7		H
10	EF			A
28	X1			4
11	B2			
29	B3			
12	B4		INSTRU-MENT BUS	
30	B5			
13	B6			
31	B7			
14	B8			
32	B9			
15	B10			F
33	B11			A
16	GND			I
34	GND1			I
17	+5V			
35	MC			
18	+5V			I
36	MC			

Ⓐ DATA TRANSFER REGISTER

Ⓑ BUS DRIVER

Ⓒ ADDRESS DECODER

Ⓓ I/O PORT DECODER

Ⓔ DIGITAL STORAGE BUS DRIVERS

Ⓕ TURN-ON CONTROL

Ⓖ TIMING GENERATOR

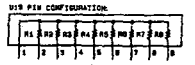
Ⓗ QUALIFIER SELECT

Ⓘ POWER SUPPLIES

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATOR, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (μF) INDUCTANCE IS IN MICROHENRIES (μH)
3. UNLESS OTHERWISE INDICATED: LOGIC LEVELS ARE TTL: +2.2V TO +5.0V = LOGIC "1" =HIGH 0V TO +0.8V = LOGIC "0" =LOW
4. MNEMONIC TABLE:

MNEMONIC	DESCRIPTION
A3A8P2DB4	INSTRUMENT BUS ADDRESS BITS B-4
DB6B-DB11	INSTRUMENT BUS DATA BITS B-11
P8F-P83	I/O PORT SELECTION BITS
A8F-A83	QUALIFIER SELECTION BITS
DOTEN	DOT ENABLE
LDSB	LOAD DIGITAL STORAGE BUS
IOC	I/O PORT INPUT/OUTPUT CONTROL
LTOW	TURN ON CONTROL SLOW TIMES
LG	QUALIFIER SELECTION SLOW TRACE
LD EXP	LOAD EXPAND REGISTER
LD X	LOAD X POSITION REGISTER
LD Y	LOAD Y POSITION REGISTER
LD CHAR	LOAD CHARACTER REGISTER
LD HOR	LOAD MEMORY DATA REGISTER
LD RAM	LOAD MEMORY ADDRESS REGISTER
LD RAP	LOAD RAMP REGISTER
LTST A	LOW=INPUT TEST A DATA
LTST B	LOW=INPUT TEST B DATA
LMEM EN	LOW=ENABLE MEMORY OUTPUT
LADC	LOW=ENABLE ADC OUTPUT
LRTN	LOW=ENABLE INTERRUPT RETURN
LERR2	LOW=ERROR OR ULP RESET OUTPUT (LOW TRUE)
P2S	SIGN OF ALU RESULTS (MSB=+, LSB=-)
CLK	8MHz SYSTEM CLOCK
LCLK	INTENTED CLOCK
LD CLK	200KHz LINE GENERATOR CLOCK
LT10	10MSEC DISPLAY SECTION STROBE

5. W1B PIN CONFIGURATION:

A3A7

SERIAL PREFIX: 2403A

FIGURE 4. A3A7 INTERFACE, SCHEMATIC DIAGRAM

ManualsPlus.com

ManualsPlus.com

ManualsPlus.com

A3A8 ANALOG-DIGITAL CONVERTER, CIRCUIT DESCRIPTION

A3A8 Analog-Digital Converter converts the analog VIDEO signal from A3A9 Track and Hold into storable digital data for A3 Digital Storage. The important data and control lines are: all Digital Storage Bus bits, B0 – B11, which are used for data inputs and outputs, ADC, which loads final ADC data onto the Digital Storage Bus; HOLD, which resets the ADC and initiates a conversion; LD RMP, which updates the Ramp DAC with a new scan address; and LTSTA, which enables test bits (B0, B1, and B2), RAMP, LTRK, and BUSY onto the Digital Storage Bus.

ADC (A)

The ADC (analog-to-digital) circuit converts analog (sampled video) data from A3A9 Track and Hold into 10 bits of binary code using the technique of successive approximation. A simplified schematic of the ADC circuit is shown in Figure 1.

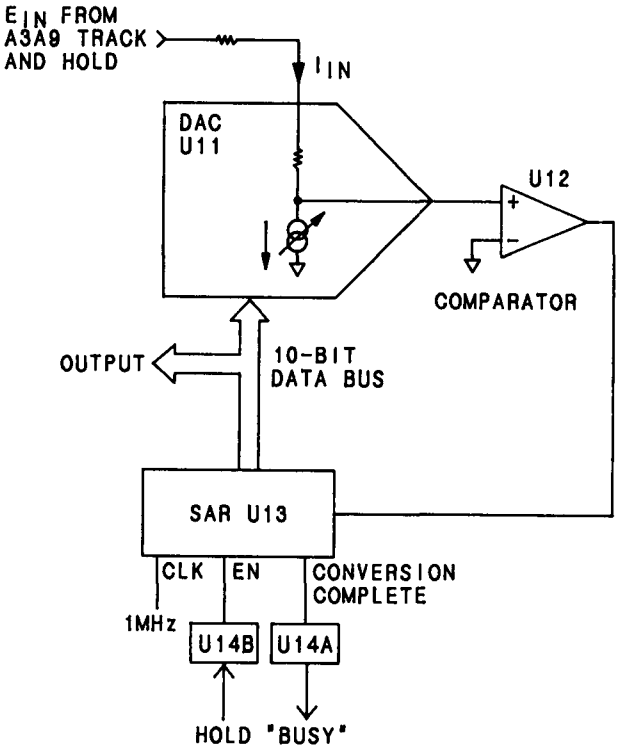


FIGURE 1. A3A8 ANALOG-DIGITAL CONVERTER, SIMPLIFIED SCHEMATIC

The ADC circuit consists of digital-to-analog converter (DAC) U11, comparator U12, and successive approximation register U13. A 1-MHz clock fixes conversion time at 11 μsec. To begin a conversion, the ADC is first reset to ones by a low HOLD. When HOLD goes high, each bit is individually tried in a "trial" conversion, starting with the most significant bit. A decision is made to retain or drop the bit based on the comparator output. Once the decision has been made for each of the 10 bits, a "conversion-complete" signal sets the flip-flop U14A. This signal, called BUSY, can be transferred onto the Digital Storage Bus by the BUS Buffers U15.

ManualsPlus.com

Ramp Converter (C)

The Ramp Converter makes a comparison between the analog sweep signal and the scan address (X Axis). Comparator U4 makes this comparison and produces a signal called RAMP. RAMP high indicates that the scan address needs to be updated. When RAMP is low, no update is needed. When an update occurs, a new address is latched into the Scan Address latches U9 and U10. This results in an updated comparison between the output of DAC U5 and the Sweep input as shown in the simplified schematic (Figure 2). A reference voltage is created for the DAC by VR1 and U3. This voltage is adjustable by R5 to set the full-scale (+10.000V) sweep ramp point at the 1000th data "bucket"; the rightmost edge of the CRT trace. Amplifier U2 sums the currents from the DAC U5, the sweep input, and the ZERO stick, and drives the comparator input. OFFS is adjustable by R6.

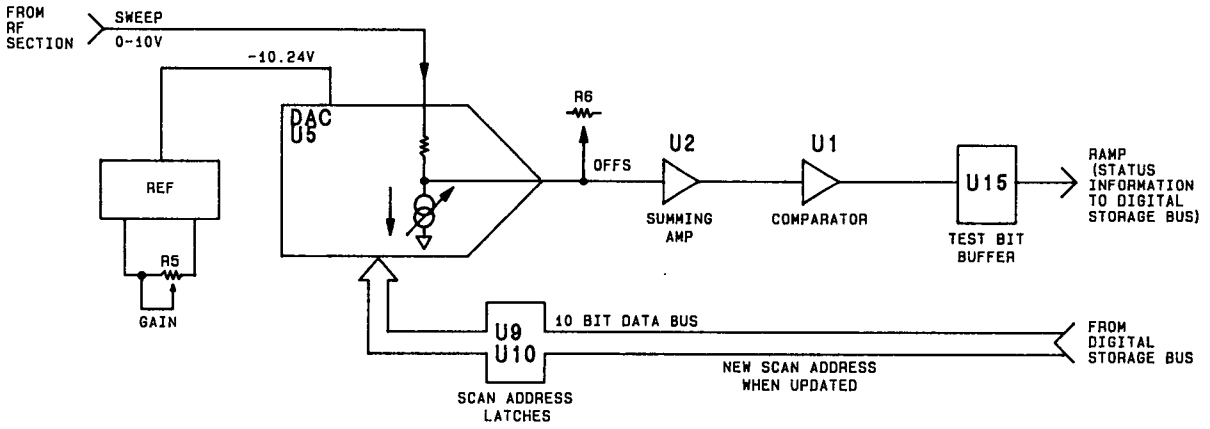


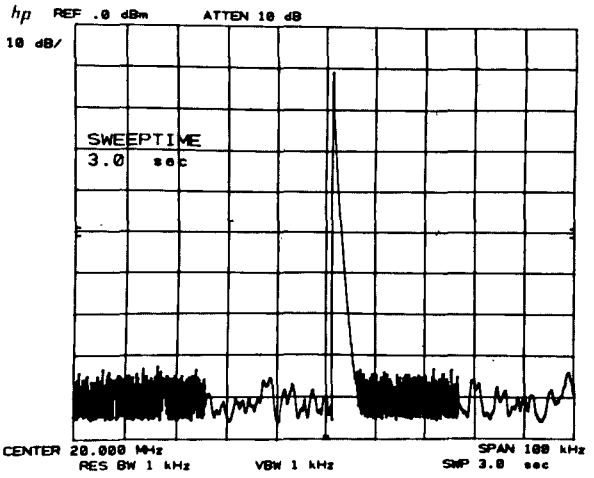
FIGURE 2. RAMP CONVERTER, SIMPLIFIED SCHEMATIC

ManualsPlus.com

A3A8 ANALOG-DIGITAL CONVERTER, TROUBLESHOOTING

The A3A8 Analog Digital Converter converts the analog video and sweep voltages to digital data. Consequently, a failure on this assembly will affect the display of Trace A and Trace B data. Character and graticule generation are not affected by A3A8.

Stuck bits in the Ramp Converter will distort the displayed signal. this is most easily observed with slow sweep times. When a bit fails, the Ramp Converter will default to a 20 msec sweep rate during the display period when that bit would normally be working. Figure 3 is an example of the CAL OUTPUT signal with a 3 sec sweep time when U5 pin 5 is stuck low.



NOTE: Center Frequency Readout will be 100.000 000 MHz for an HP 8566B.

FIGURE 3. RAMP CONVERTER BIT FAILURE

By looking at noise with a 3-second sweep time (push Instrument Preset first), it is possible to determine which of the data bits are stuck by counting the discrete states displayed. For example, Figure 4 shows the result of an MSB failure (D9). $2^{10-9} = 2$ states are displayed. The ADC Check on the SA Diagram is then performed to isolate the failure to a single component. To detect low order bit (D0-D4) failures, tune to the CAL OUTPUT signal and set frequency span to 100 kHz, sweep time to 3 sec. A failure will then result in slight "stair-stepping" of the displayed signal. The noise display will be missing states, but this will be difficult to see.

Digital Storage Test Program 4 is used to verify the inputs to the DAC, U5.

Failures in the video analog to digital process are characterized by "stair-stepped" signals and noise that is displayed as discrete vertical lines. Low order bit failures will cause many small steps while a high order bit failure will cause a single step that will eliminate the peak of the display. Note that only the signal will be affected and that the graticules and characters will not be affected. Front panel displays of the CAL OUTPUT signal for several bit failures are shown in Figures 5 and 6.

ManualsPlus.com

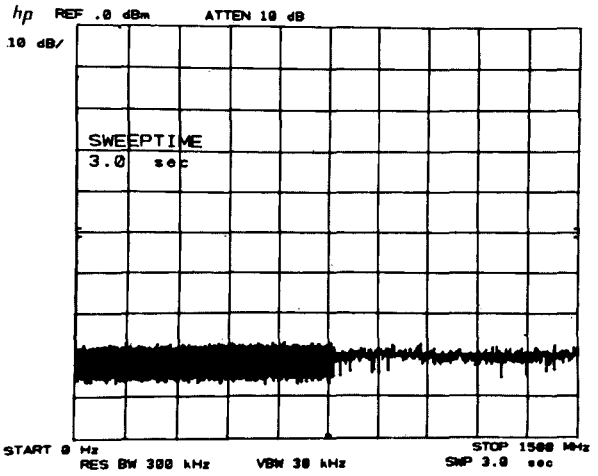
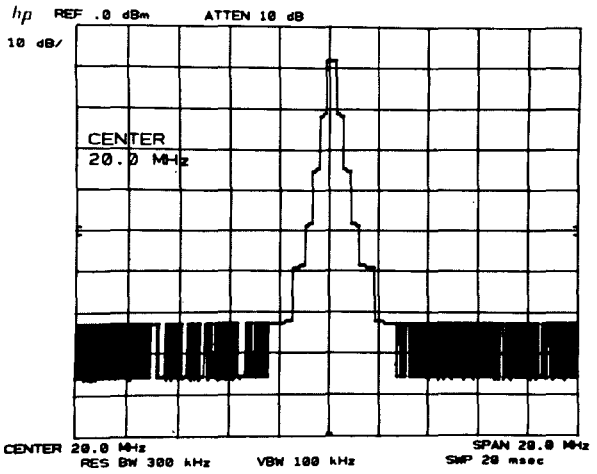


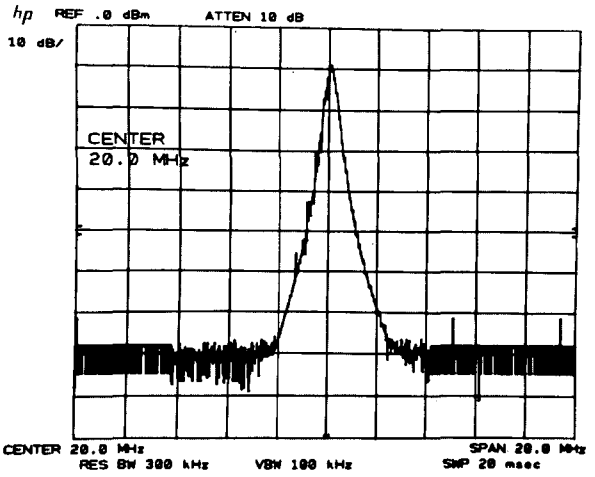
FIGURE 4. RAMP CONVERTER MSB FAILURE



NOTE: Center Frequency Readout will be 100.000 000 MHz for an HP 8566B.

FIGURE 5. VIDEO ADC BIT 5 FAILURE

ManualsPlus.com



NOTE: Center Frequency Readout will be 100.000 000 MHz for an HP 8566B.

FIGURE 6. VIDEO ADC BIT 2 FAILURE

If the RAMP, HOLD or BUSY lines become stuck, the display will show a sweep related problem. If the analyzer is not sweeping, the Sweep System Troubleshooting notes should be consulted to help isolate the failure to a particular assembly.

Table 1 contains the display symptoms that result from failures of the RAMP, HOLD or BUSY lines.

TABLE 1. A3A8 SWEEP RELATED FAILURE SYMPTOMS

Line	Failure	
	Stuck High	Stuck Low
BUSY	Sweep LED on Line at bottom of display CK LED I on after Instrument Preset	Displayed signals noisy and similar to Figure 5
RAMP	Display jitter along x axis Frequency readout incorrect	Sweep LED on Line at bottom of display
HOLD	Line at top of display	Sweep LED on Line at bottom of display CK LED I on after Instrument Preset

Test Circuit

The test circuit on A3A8 is designed to aid in troubleshooting lower-order bit failures and linearity problems in both the Ramp Converter circuit and the ADC circuit. The test circuit is normally transparent to A3A8 operation, and is activated by grounding A3A8TP8 NOISE TEST or A3A8TP10 RAMP TEST to A3A8TP9 to switch multiplexers U16, U17, and U18.

ManualsPlus.com

Noise Test

The Noise Test, activated by grounding A3A8TP8 NOISE TEST to A3A8TP9, "expands" the vertical scale of the Digital Storage Section for closer examination of digital data from the the ADC circuit. This is accomplished by shifting the 4 least significant bits (LSBs) of the digitized video data by 6 bits, effectively multiplying it by 64. When the noise test is activated, the 6 most significant bits (MSBs) are not used, and the 6 LSBs are forced to logic 0. In addition, the "new" MSB is inverted to center the CRT trace (assuming the VIDEO input signal was at top-screen). The resulting CRT trace appears to be amplified to 64 times the normal resolution, allowing variations in the LSBs to be easily viewed.

With the noise test activated, a constant VIDEO signal present at the input to A3A9 Track and Hold will ideally produce a flat CRT trace. The CRT trace should exhibit no more than 2 bits peak-to-peak of digital noise.

Stuck ADC bits and transistor noise on A3A8 can be easily checked in the noise test mode by removing A3A9 Track and Hold from the instrument and jumpering A3A8TP2 SWP/100 to A3A8TP6 VIDEO. This substitutes a scaled-down sweep ramp signal for the VIDEO input signal to the ADC. A series of approximately 10 stair-steps should be displayed on the CRT, each with sharp, well-defined corners.

The noise test mode can be used to adjust the peak detector offsets (OFS POS and OFS NEG) on A3A9 Track and Hold by grounding A3A9TP3 to A3A9TP1, with the VIDEO cable (96) disconnected from A3A9J1. The CRT trace will fall on the bottom graticule line when both offsets on A3A9 are properly adjusted.

Ramp Test

The Ramp Test is very similar to the Noise Test, and is activated by grounding A3A8TP10 RAMP TEST to A3A8TP9. In addition, the VIDEO cable (96) is disconnected from A3A9J1, and A3A8TP1 SWP is jumpered to A3A9TP3 to substitute the sweep ramp signal as the VIDEO input to A3A9 Track and Hold. In the ramp test mode, the test circuit again "expands" the vertical CRT scale by a factor of 64. The 4 LSBs of digital scan data are subtracted from the 4 LSBs of digitized video data, and the results are displayed on the CRT. Since both sets of digital data correspond to the sweep ramp voltage, the subtraction ideally yields a constant value (011100000 = 448). If the Track and Hold, ADC, and Ramp Converter circuits are linear and functioning properly, a horizontal line will appear approximately ½-division below the center CRT graticule line. This line might exhibit numerous noise-like spikes in peak-detector mode, which is normal.

Linearity and noise in the Ramp Converter, ADC, and Track and Hold circuits can also be checked without using the ramp test. As before, disconnect the VIDEO cable (96) from A3A9J1 and jumper A3A8TP1 SWP to A3A9TP3. This substitutes the sweep ramp signal as the VIDEO input to A3A9 Track and Hold. A straight diagonal line should be displayed on the CRT, indicating linear digitizing of the analog sweep ramp signal by both the ADC and the Ramp Converter circuits.

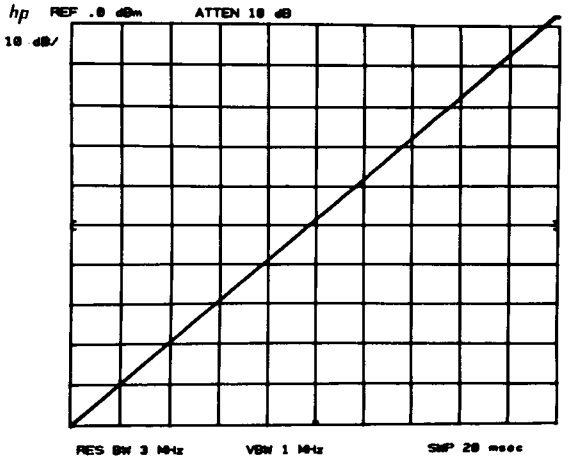


FIGURE 7. A3A8 DAC LINEARITY

ManualsPlus.com

TABLE 2. A3A8, REPLACEABLE PARTS (1 OF 2)

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A3A8	85662-60130	7	1	BOARD ASSEMBLY, ANALOG-DIGITAL CONVERTER	28480	85662-60130
A3A8C1	0160-4814	2	1	CAPACITOR-FXD 150PF +-5% 100VDC CER	28480	0160-4814
A3A8C2	0160-4835	7	26	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8C3	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8C4	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8C5	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8C6	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8C7	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8C8	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8C9	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8C10	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8C11	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8C12	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8C13	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8C14	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8C15	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8C16	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8C17	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8C18	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8C19	0180-0229	7	1	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A3A8C20	0180-1746	5	2	CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3A8C21	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3A8C22	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8C23	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8C24	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8C25	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8C26	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8C27	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8C28	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8C29	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8C30	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A8CR1	1901-0535	9	6	DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A8CR2	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A8CR3	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A8CR4	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A8CR5	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A8CR6	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A8E1	1460-1489	8	1	WIREFORM BE CU AG	28480	1460-1489
A3A8J1	1250-0543	8	1	CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A3A8L1	08558-80011	6	1	FILTER COIL BLUE	28480	08558-80011
A3A8L2	9140-0114	4	2	INDUCTOR RF-CH-MLD 10UH 10% .166DX.385LG	28480	9140-0114
A3A8L3	9140-0114	4		INDUCTOR RF-CH-MLD 10UH 10% .166DX.385LG	28480	9140-0114
A3A8MP1				NOT ASSIGNED		
A3A8MP2	1480-0073	6	2	PIN-ROLL .062-IN-DIA .25-IN-LG BE-CU	28480	1400-0073
A3A8R1	0757-0280	3	2	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3A8R2	0757-0438	3	4	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A3A8R3	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A3A8R4	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3A8R5	2100-3123	0	1	RESISTOR-TRMR 500 10% C SIDE-ADJ 17-TRN	02111	43P501
A3A8R6	2100-3054	6	1	RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	02111	43P503
A3A8R7	0698-6630	3	3	RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A3A8R8	0757-0180	2	2	RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A3A8R9	0698-6630	3		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A3A8R10	0698-6630	3		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A3A8R11	0698-6320	8	5	RESISTOR 5K .1% .125W F TC=0+-25	03888	PME55-1/8-T9-5001-B
A3A8R12	0698-6320	8		RESISTOR 5K .1% .125W F TC=0+-25	03888	PME55-1/8-T9-5001-B
A3A8R13	0698-6320	8		RESISTOR 5K .1% .125W F TC=0+-25	03888	PME55-1/8-T9-5001-B
A3A8R14	0698-6320	8		RESISTOR 5K .1% .125W F TC=0+-25	03888	PME55-1/8-T9-5001-B
A3A8R15	0698-6361	7	1	RESISTOR 8K .1% .125W F TC=0+-25	28480	0698-6361
A3A8R16	0698-6320	8		RESISTOR 5K .1% .125W F TC=0+-25	03888	PME55-1/8-T9-5001-B
A3A8R17	0698-3152	8	1	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A3A8R18	0757-0424	7	1	RESISTOR 1.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1101-F
A3A8R19	0698-6360	6	1	RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A3A8R20	0698-6323	1	1	RESISTOR 100 .1% .125W F TC=0+-25	28480	0698-6323
A3A8R21	0757-0428	1	1	RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
A3A8R22	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A3A8R23	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A3A8R24	0757-0180	2		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180

ManualsPlus.com

TABLE 2. A3A8, REPLACEABLE PARTS (2 OF 2)

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A3A8TP1	0360-0535	0	11	TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A8TP2	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A8TP3	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A8TP4	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A8TP5	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A8TP6	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A8TP7	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A8TP8	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A8TP9	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A8TP10	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A8TP11	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A8U1	1826-0116	2	2	IC COMPARATOR GP TO-99 PKG	06665	CMP-01-CJ
A3A8U2	1826-0471	2	3	IC OP AMP LOW-DRIFT TO-99 PKG	28480	1826-0471
A3A8U3	1826-0471	2		IC OP AMP LOW-DRIFT TO-99 PKG	28480	1826-0471
A3A8U4	1826-0471	2		IC OP AMP LOW-DRIFT TO-99 PKG	28480	1826-0471
A3A8U5	1826-0684	9	1	IC CONV 12-B-D/A 18-DIP-C PKG	28480	1826-0684
A3A8U6	1820-1441	6	1	IC ADDR TTL LS BIN FULL ADDR 4-BIT	01295	SN74LS283N
A3A8U7	1820-1144	6	1	IC GATE TTL LS NOR QUAD 2-INP	01295	SN74LS02N
A3A8U8	1820-1199	1	1	IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A3A8U9	1820-1196	8	2	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A3A8U10	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A3A8U11	1820-1984	2	1	IC CONV 10-B-D/A 16-DIP-C PKG	24355	AD561KD
A3A8U12	1826-0116	2		IC COMPARATOR GP TO-99 PKG	06665	CMP-01-CJ
A3A8U13	1820-1720	4	1	IC RGTR TTL 12-BIT	27014	DM2504CN
A3A8U13	1820-1978	4	1	IC RGTR TTL L 12-BIT NOTE: ALTERNATE FOR 1820-1720	34335	AM25L04PC
A3A8U14	1820-1282	3	1	IC FF TTL LS J-K BAR POS-EDGE-TRIG	01295	SN74LS109AN
A3A8U15	1820-1438	1	4	IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD	01295	SN74LS257AN
A3A8U16	1820-1438	1		IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD	01295	SN74LS257AN
A3A8U17	1820-1438	1		IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD	01295	SN74LS257AN
A3A8U18	1820-1438	1		IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD	01295	SN74LS257AN
A3A8VR1	1902-0686	3	1	DIODE-ZNR 6.2V 2% DO-7 PD=.4W TC=+.002%	04713	1N825
				MISCELLANEOUS PARTS		
	4040-0747	2	2	EXTR PC BD GRA	28480	4040-0747

ManualsPlus.com

NOTE

- FOR INSTRUCTIONS ON THE USE OF SIGNATURE ANALYSIS DIAGRAMS READ THE SIGNATURE ANALYSIS DESCRIPTION SECTION OF THIS MANUAL.

ADC AND TEST CIRCUIT CHECK

SPECTRUM ANALYZER CONNECTIONS:
- REMOVE A3A9
- ADJUST A3A2R12 LL THRESH FULLY CW
- JUMPER A3A7TP3 TO A3A7TP6
- JUMPER A3A6TP3 TO A3A7TP6
- JUMPER A3A8TP6 (VIDEO) TO A3A8P1-18 (+15VDC)

SIGNATURE ANALYZER CONNECTIONS:
- CLOCK ⎍ TO A3A8P1-7 (1 MHZ)
- START ⎍ TO A3A6TP2
- STOP ⎍ TO A3A6TP2
- POD GND TO A3A6TP1
- PROBE GND TO A3A6TP9

PRESS:
- A3A7S1 AFTER COMPLETING CONNECTIONS FOR EACH TEST OR CHECK

RAMP CONVERTER CHECK

SPECTRUM ANALYZER CONNECTIONS:
- JUMPER A3A7TP3 TO A3A7TP6
- JUMPER A3A6TP3 TO A3A6TP6
- REMOVE W16 (SWEEP INPUT) FROM A3A8J1
- GROUND A3A8TP5 (SWEEP) TO A3A8TP4 (SHIELD)

SIGNATURE ANALYZER CONNECTIONS:
- CLOCK ⎍ TO A3A8P1-7 (1 MHZ)
- START ⎍ TO A3A6TP2
- STOP ⎍ TO A3A6TP2
- POD GND TO A3A6TP1
- PROBE GND TO A3A6TP9

PRESS:
- A3A7S1 AFTER COMPLETING CONNECTIONS FOR EACH TEST OR CHECK

ADC CHECK

SPECTRUM ANALYZER CONNECTIONS:
- CONNECT A3A7J1 JUMPER TO PINS 2 AND 13
- JUMPER A3A6TP3 TO A3A7TP6
- JUMPER A3A6TP3 TO A3A6TP6
- ADJUST A3A2R12 LL THRESH FULLY CW
- JUMPER A3A8TP6 (VIDEO) TO A3A8P1-18 (+15V)
- REMOVE A3A9

SIGNATURE ANALYZER CONNECTIONS:
- CLOCK ⎍ TO A3A8P1-7 (1 MHZ)
- START ⎍ TO A3A6TP2
- STOP ⎍ TO A3A6TP2
- POD GND TO A3A6TP1
- PROBE GND TO A3A6TP9

PRESS:
- A3A7S1 AFTER COMPLETING CONNECTIONS FOR EACH TEST OR CHECK

TEST A CHECK

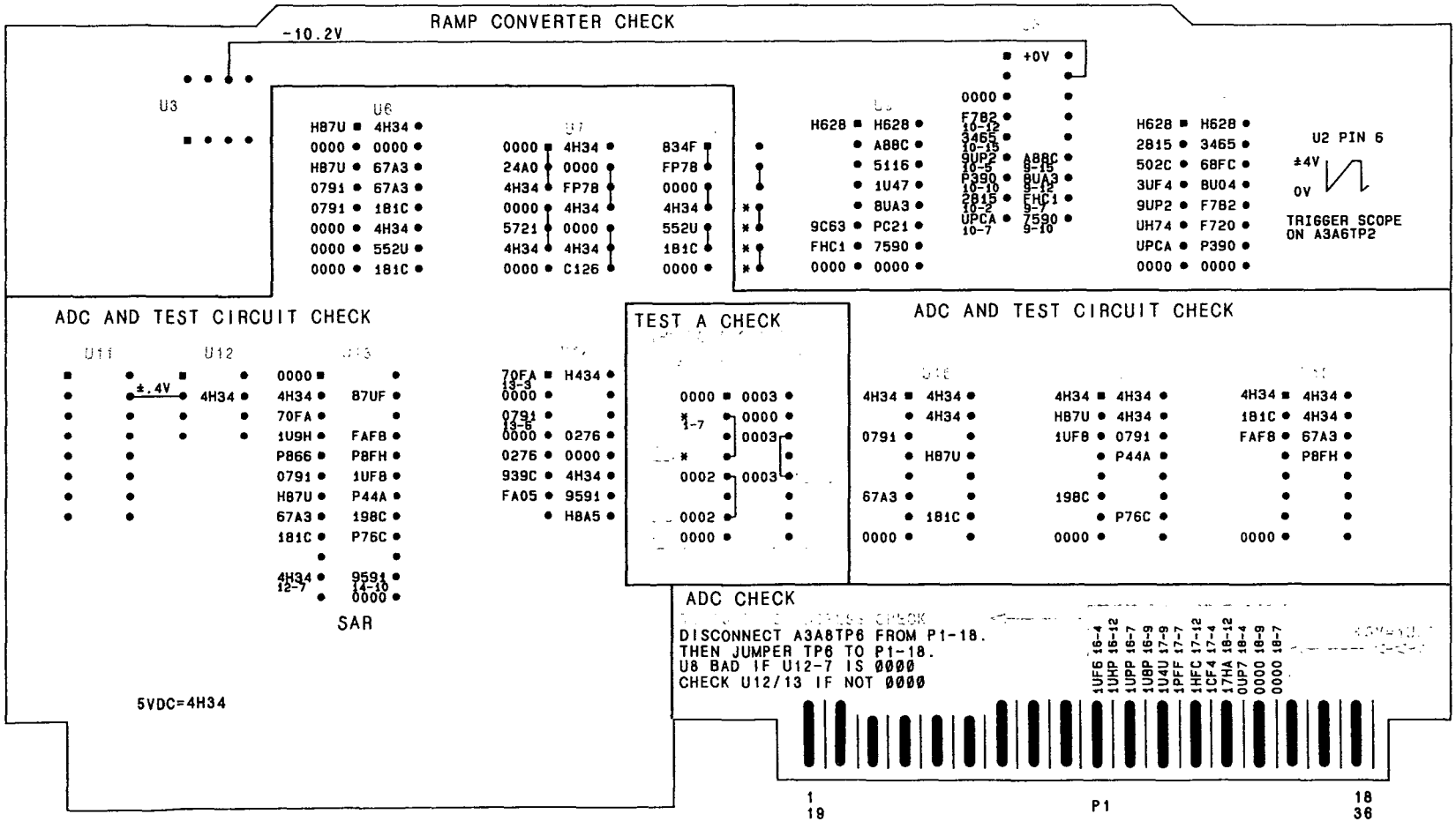
SPECTRUM ANALYZER CONNECTIONS:
- CONNECT A3A7J1 JUMPER TO PINS 5 AND 10
- REMOVE W16 (SWEEP INPUT) FROM A3A8J1
- JUMPER A3A7TP3 TO A3A7TP6
- JUMPER A3A6TP3 TO A3A6TP6
- JUMPER A3A8TP5 (SWEEP) TO A3A8TP4 (SHIELD)
- REMOVE A3A9

SIGNATURE ANALYZER CONNECTIONS:
- CLOCK ⎍ TO A3A7P1
- START ⎍ TO A3A6TP2
- STOP ⎍ TO A3A6TP2
- POD GND TO A3A6TP1
- PROBE GND TO A3A6TP9

PRESS:
- A3A7S1 AFTER COMPLETING CONNECTIONS FOR EACH TEST OR CHECK

ManualsPlus.com

A3A8
ANALOG-DIGITAL CONVERTER
85662-60130



A3A8

FIGURE 8. A3A8 ANALOG-DIGITAL CONVERTER, SIGNATURE ANALYSIS TROUBLESHOOTING DIAGRAM

ManualsPlus.com

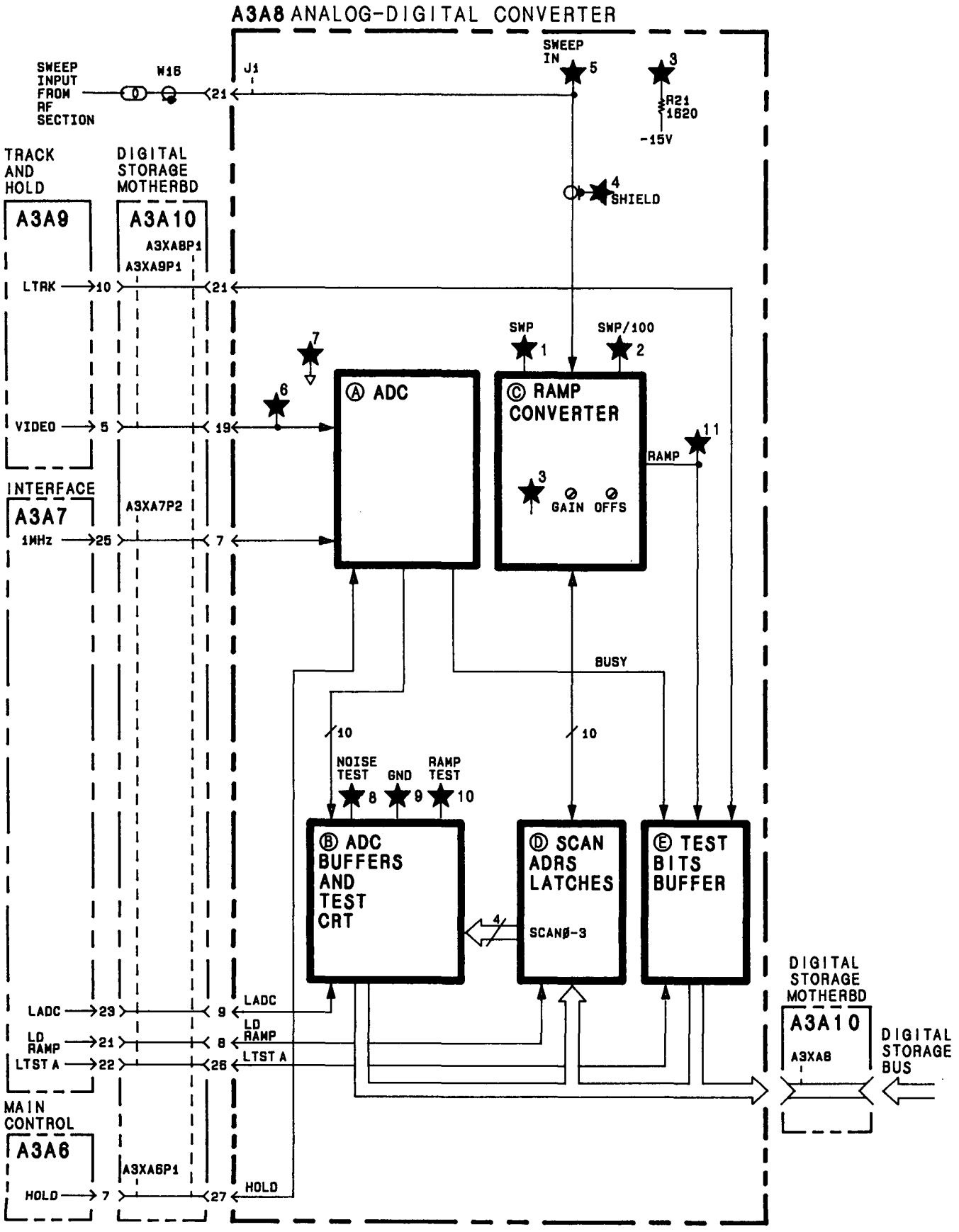


FIGURE 9. A3A8 ANALOG-DIGITAL CONVERTER, BLOCK DIAGRAM

ManualsPlus.com

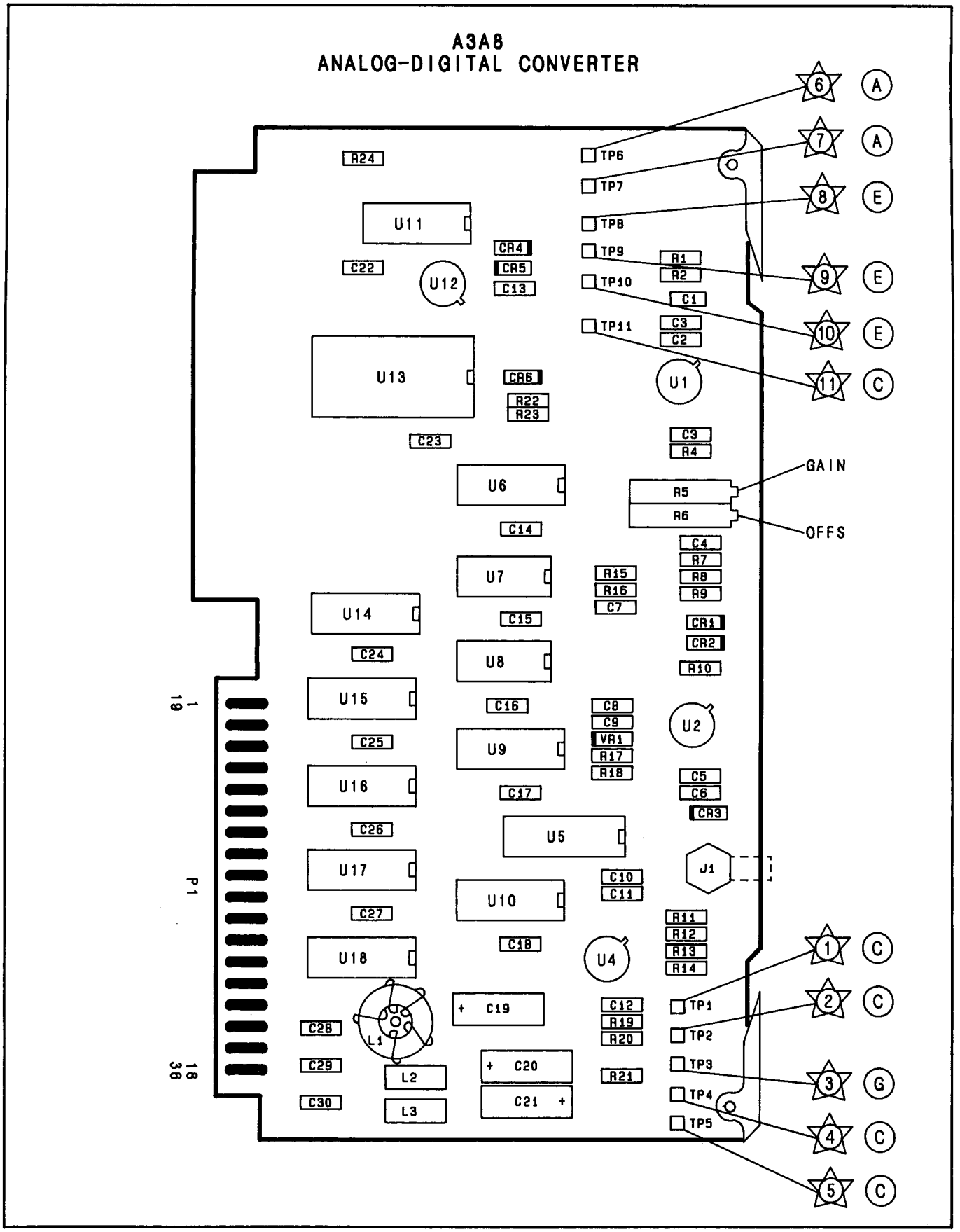


FIGURE 10. A3A8 ANALOG-DIGITAL CONVERTER, COMPONENT LOCATIONS

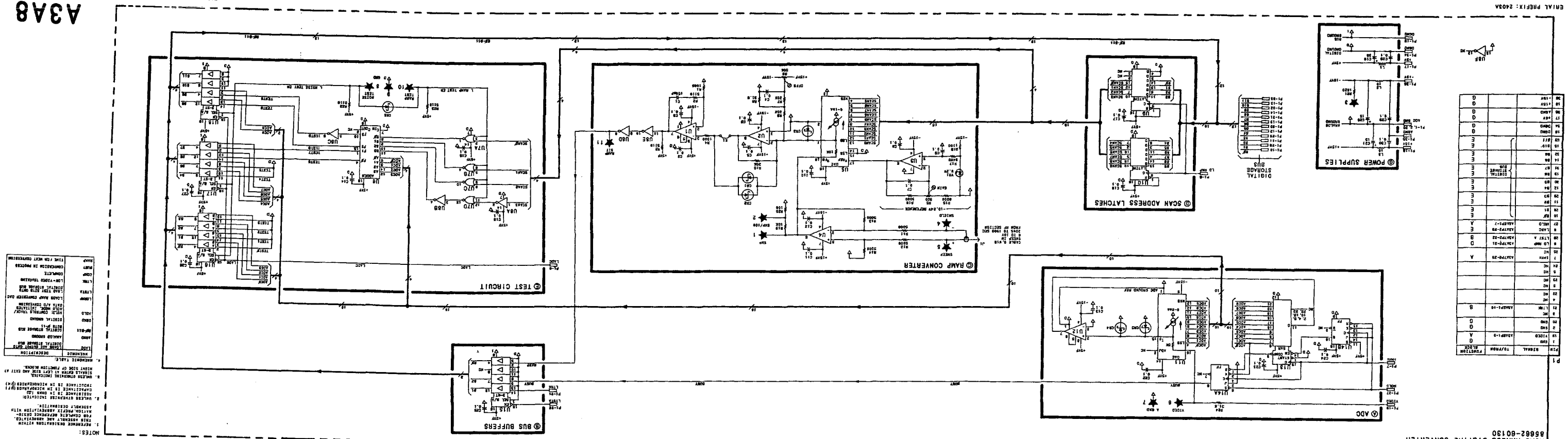
ManualsPlus.com

A3A8

FIGURE 11. A3A8 ANALOG-DIGITAL CONVERTER, SCHEMATIC DIAGRAM

A3A8 13T4

SERIAL PREFIX: 2403A



MNEMONIC	DESCRIPTION
A3A8	ANALOG-DIGITAL CONVERTER
A3U10	8BIT D/A CONVERTER
ADC	ANALOG CONVERTER
ADDR	DIGITAL ADDRESS
ADLD	DATA A/D CONVERTER
ALE	ADDRESS LATCH ENABLE
ANLG GND	ANALOG GROUND
BUS	DIGITAL STORAGE BUS
CLK	CLOCK
COMP	COMPARATOR
DAC	DIGITAL TO ANALOG CONVERTER
DGND	DIGITAL GROUND
DIG GND	DIGITAL GROUND
DLAT	DATA LATCH
DRAM	DYNAMIC RANDOM ACCESS MEMORY
EOC	END OF CONVERSION
FET	FIELD EFFECT TRANSISTOR
GND	GROUND
HOLD	HOLD
INT	INTERRUPT
LATCH	LATCH
LOW-VIDEO THRESHOLD	LOW-VIDEO THRESHOLD
MUX	MULTIPLEXER
PWR	POWER
RAMP	RAMP CONVERTER
RAMP CONVERTER DAC	RAMP CONVERTER DAC
RAMP TEST CIRCUIT	RAMP TEST CIRCUIT
SCAN	SCAN ADDRESS
SCAN ADDR	SCAN ADDRESS
SHIFT	SHIFT
SHIFT CLOCK	SHIFT CLOCK
SMPL	SAMPLE
SMPL/HOLD	SAMPLE/HOLD
SMPL/HOLD AMP	SAMPLE/HOLD AMPLIFIER
SMPL/HOLD CONTROL	SAMPLE/HOLD CONTROL
SMPL/HOLD OFFSET	SAMPLE/HOLD OFFSET
SMPL/HOLD OFFSET ADJ	SAMPLE/HOLD OFFSET ADJUST
SMPL/HOLD OUT	SAMPLE/HOLD OUTPUT
SMPL/HOLD OUTPUT	SAMPLE/HOLD OUTPUT
SMPL/HOLD OUTPUT ADJ	SAMPLE/HOLD OUTPUT ADJUST
SMPL/HOLD OUTPUT CNTRL	SAMPLE/HOLD OUTPUT CONTROL
SMPL/HOLD OUTPUT CONTROL	SAMPLE/HOLD OUTPUT CONTROL
SMPL/HOLD OUTPUT CONTROL ADJ	SAMPLE/HOLD OUTPUT CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST	SAMPLE/HOLD OUTPUT CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CNTRL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJ	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CNTRL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJ	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CNTRL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJ	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CNTRL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJ	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CNTRL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJ	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CNTRL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJ	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CNTRL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJ	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CNTRL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJ	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CNTRL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJ	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CNTRL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJ	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CNTRL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJ	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CNTRL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJ	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CNTRL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJ	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CNTRL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJ	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CNTRL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJ	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CNTRL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJ	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST
SMPL/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CNTRL	SAMPLE/HOLD OUTPUT CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST CONTROL ADJUST C

ManualsPlus.com

ManualsPlus.com

A3A9 TRACK AND HOLD, CIRCUIT DESCRIPTION

A3A9 Track and Hold provides circuitry to insure that the true peak of the RF signal and a true representation of noise are displayed on the CRT. This is accomplished by positive and negative peak detection.

Positive Peak Detector (A)

The Positive Peak Detector acquires the most positive voltage to appear at its input and holds that voltage on holding capacitor C26 until the circuit is reset by a reset pulse from the decoding and timing circuits. FET Q6 is periodically turned on by the reset pulse, discharging C26 through R12 and Q6 to ground. Figure 1 shows a simplified schematic of the Positive Peak Detector.

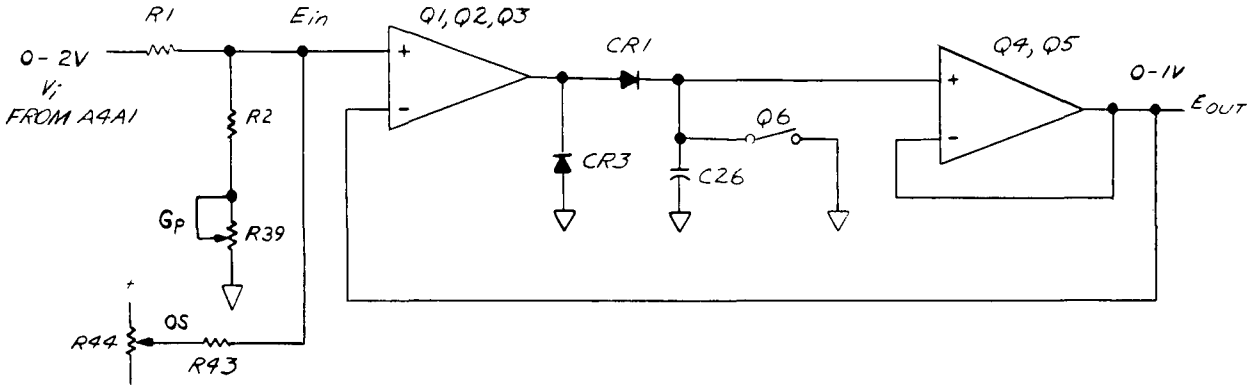


FIGURE 1. POSITIVE PEAK DETECTOR, SIMPLIFIED SCHEMATIC

The circuit consists of amplifier Q3, Q2, Q1, diode CR1, holding capacitor C26, and buffer Q4, Q5. When E_{in} is less than the feedback voltage E_{out}, CR1 is off and C26 will hold the voltage it has acquired. CR3 limits the reverse voltage across CR1 to minimize leakage current. CR1 turns on when E_{in} is greater than E_{out}, and C26 charges to equalize E_{in} and E_{out}.

A pair of matched FETs, Q4A and Q4B, and emitter follower Q5 are used in the buffer circuit. Q4A is used as a source follower and Q4B as a current source. The Q4A bias current is equal to the algebraic sum of the current from Q4B, the base current to Q3B, and the bias current through R13. This sum of currents insures a very small gate-to-source voltage and prevents gate-to-source forward biasing.

Q1, Q2, and Q3 are all dual transistors. Q3 and Q2 form the input stage, with Q3 connected as emitter followers and Q2 forming a differential pair. Gain for the differential stage is set by collector resistor R7. Additional gain is provided by Q1B. Q1B is connected as a transistor inverter with R9 in the emitter and R8 in the collector. Q1A is connected as a diode. Gain and offset adjustments for the Positive Peak Detector are performed in the resistor divider that includes R1 and R2. GPOS potentiometer R39 adjusts the attenuation so that a 2V full-scale input produces a 1V full-scale output. OFS POS potentiometer R44 zeroes the output with 0V input. U5 compares the input and output of the Peak Detector. A TTL high level is produced when the output is greater than the input. (R40, R41, and R16 provide a small amount of hysteresis for noise immunity.)

ManualsPlus.com

Negative Peak Detector (B)

The Negative Peak Detector acquires the most negative voltage to appear at its input and holds that voltage on holding capacitor C38 until reset by a pulse from the decoding and timing circuits. Circuit operation is the same as that of the Positive Peak Detector except that supply polarities are reversed and PNP instead of NPN transistors are used. Figure 2 shows a simplified schematic of the Negative Peak Detector.

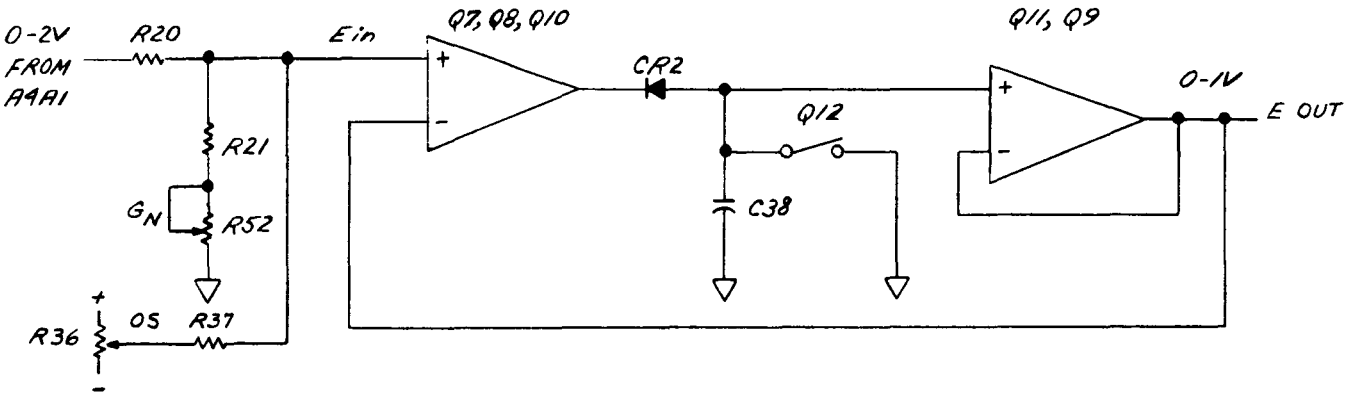


FIGURE 2. NEGATIVE PEAK DETECTOR, SIMPLIFIED SCHEMATIC

The circuit consists of amplifier Q7/Q8/Q10, diode CR2, holding capacitor C38, buffer Q11/Q9, and reset transistor Q12. R71 creates an offset between the output and the emitter of Q9. This insures that the voltage across C38 is always negative for positive outputs from 0V to +1V. GNEG potentiometer R52 sets the gain (input attenuation) so that a 2V full-scale input produces a 1V full-scale output. OFS NEG potentiometer R36 zeroes the offset. U4 compares the input to the output.

Decoding and Timing (C)

The Decoding and Timing circuit provides reset pulses to the Peak Detectors and control lines for Multiplexer selection, and it performs other logic functions.

U9 decodes control lines SEL A and SEL B to produce three lines for Multiplexer selection. After inversion by U8A, U8B, and U8C, the voltage levels are shifted to −0.5V and +9V. Multivibrators U12A and U12B produce pulses (when triggered by HOLD) which reset the Peak Detectors. Latches U13A and U13B are used to provide the Peak Detector status signal LTRK.

Multiplexer (D)

The outputs of the Peak Detectors are multiplexed through U1 before sampling by the Track and Hold circuit. Control lines to the Multiplexer are provided by the Decoding and Timing circuit.

Track and Hold (E)

The Track and Hold circuit samples the signal appearing at the output of multiplexer U1 and holds the voltage on capacitor C15. The output of the Track and Hold circuit is used in A3A8 Analog-Digital Converter, where it is converted into Y-axis graph data. A simplified schematic of the Track and Hold circuit is shown in Figure 3.

ManualsPlus.com

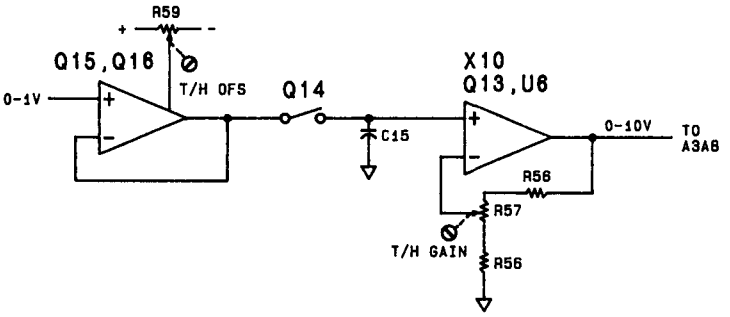


FIGURE 3. TRACK AND HOLD CIRCUIT, SIMPLIFIED SCHEMATIC

Q16 and Q15 form a buffer amplifier. Q14 switches on and off to open or close a path between the amplifier and holding capacitor C15. A FET input amplifier (Q13, U6) amplifies the capacitor voltage by a factor of 10. The gain is set by T/H GAIN potentiometer R57. Offset is adjusted by controlling the current flow through R67 with (T/H) OFS potentiometer R59.

ManualsPlus.com

A3A9 TRACK AND HOLD, TROUBLESHOOTING

Display problems which involve only the video are often caused by malfunctions on either A3A8 Analog-Digital Converter or the A3A9 Track and Hold. The blue [SHIFT] key functions and the Digital Storage Test Patterns can be used to isolate the failure.

Figure 4 shows the Digital Storage Test Pattern. Refer to the A3 Digital Storage Troubleshooting section to generate the test pattern. The three vertical lines represent the detector outputs on A3A9. The left one is the negative peak detector, the center one is the sampling mode and the right one is the positive peak detector. These should move up and down when a VIDEO signal is present at A3A9J1, indicating normal operation. If one is stuck, the blue [SHIFT] key can be used to verify this.

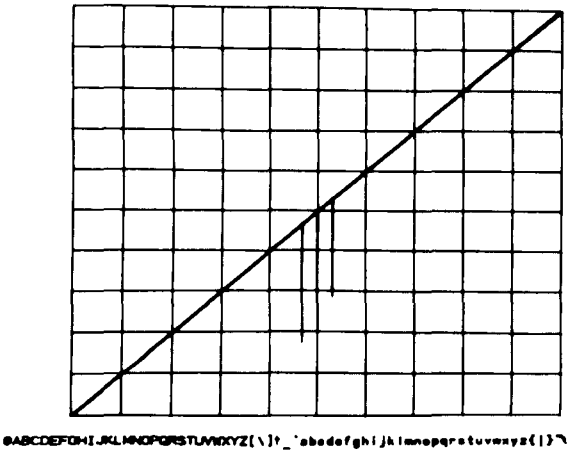


FIGURE 4. DIGITAL STORAGE TEST PATTERN

Slight stair-stepping of the diagonal line could be caused by a low order bit failure on A3A8 or a noisy component on A3A9. To isolate the assemblies remove A3A9, jumper A3A8TP1 to A3A8TP6 and push Instrument Preset. The Display is a diagonal line. If the diagonal line is not stair-stepped or noisy, the problem is on A3A9.

Noise on the peaks of the displayed signals is most often caused by leakage in Q6 or Q14. This is very noticeable in 0 Hz frequency spans. To determine whether Q6 or Q14 is defective, sampling detection is used. [SHIFT] TRACE A [BLANK] (KSe) puts the instrument in the sampling mode. A noisy signal when using the sampling mode generally indicates a defective Q14. A defective Q6 produces noise in the normal detection mode and in the positive peak detection mode, [SHIFT] TRACE A [MAX HOLD] (KSb).

ManualsPlus.com

Proper operation of the detectors can be tested with the following sequence.

CLEAR-WRITE TRACE B
Instrument Preset
RECALL 8
SHIFT TRACE A MAX HOLD ..... Positive Peak Detection
VIEW TRACE B

SHIFT TRACE A VIEW ..... Negative Peak Detection
(both traces coincide)

SHIFT TRACE A BLANK ..... Sampling Mode
(both traces coincide)

If the traces do not coincide in the above test, refer to the Track and Hold adjustments in the Performance Tests and Adjustments manual.

If the voltage on A3A9TP8 is correct and that of A3A9TP9 is incorrect when performing the BIAS Check of Note 10 on the schematic, check to see if the drain and source voltages on Q14 are approximately +1V. If not, Q14 is most likely open.

The LTRK signal is verified using an oscilloscope. Following an Instrument Preset, set the spectrum analyzer sweeptime to 75 msec. Figure 5 shows the resultant waveform.

Oscilloscope settings:
Sweeptime: 50 ms/div
Analyzer Sweeptime: 75 ms

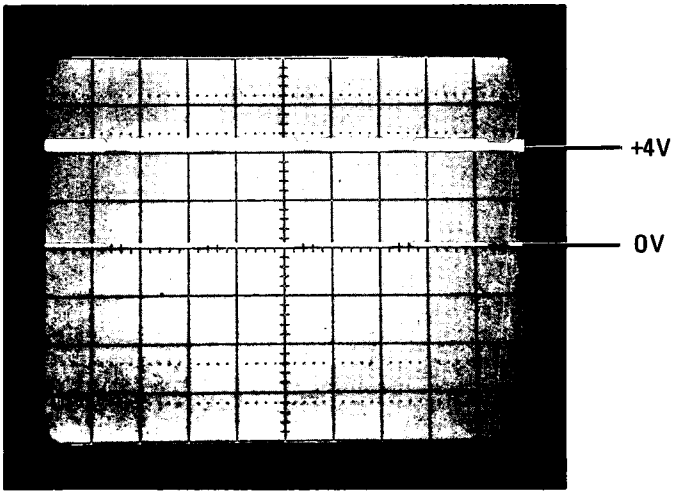
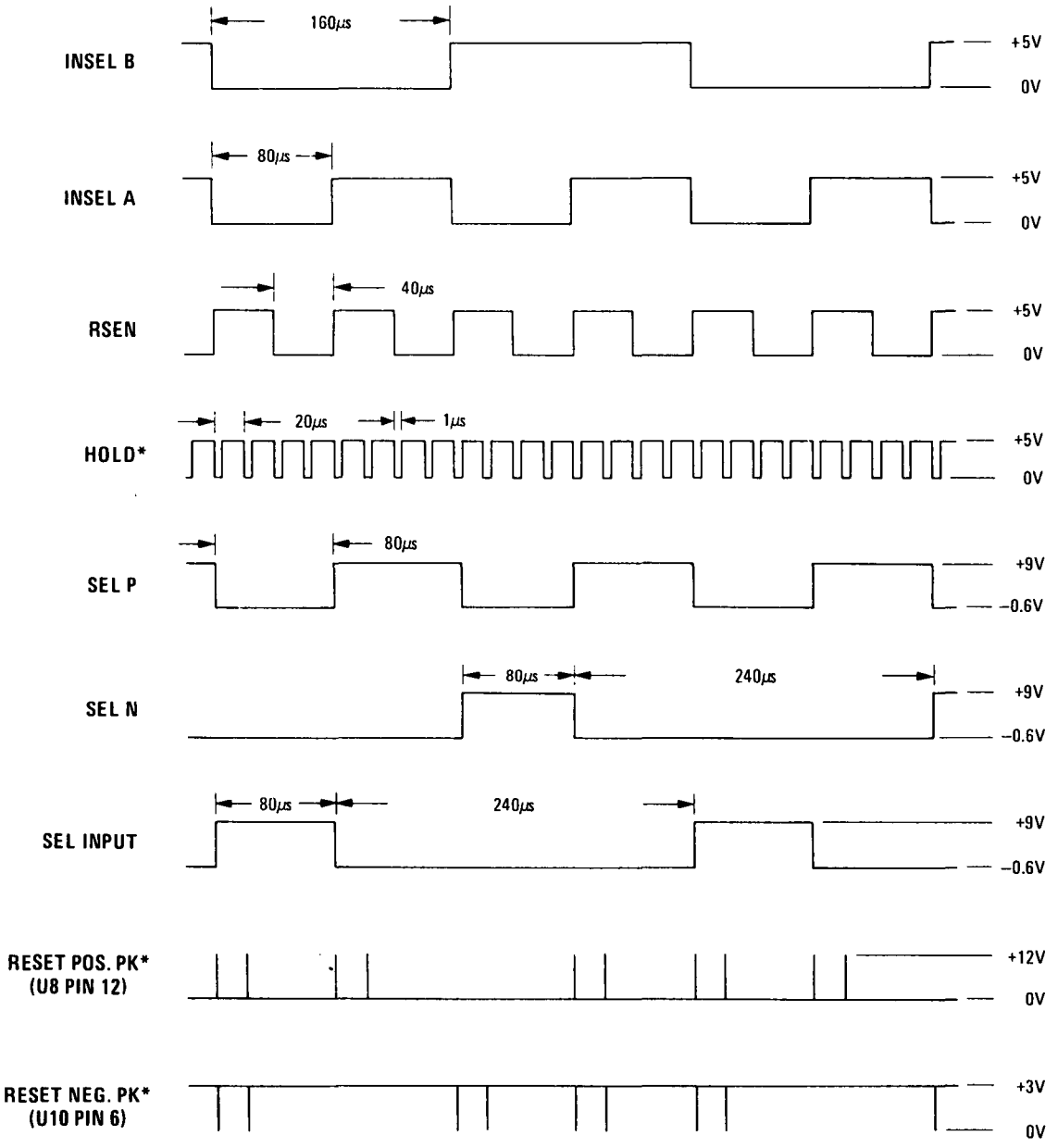


FIGURE 5. LTRK TIMING WAVEFORM

The Decoding and Timing **(C)** is checked using an oscilloscope. Figure 6 shows the timing waveforms when using Digital Storage Test Program 5. When Digital Storage Test Program 6 is used, HOLD is normally high. It goes low every 80 msec. The two reset lines are then active only every 80 msec. Figure 5 shows the LTRK line for a sweeptime of 75 msec following an Instrument Preset.

ManualsPlus.com



* For Test Program 6, HOLD is normally high, going low only every 80 msec which resets the peak detectors (RESET POS, PK and RESET NEG. PK). All other waveforms remain the same as for Test Program 5.

FIGURE 6. A3A9 TIMING WAVEFORMS USING DIGITAL STORAGE TEST PROGRAM 5

ManualsPlus.com

TABLE 1. A3A9, REPLACEABLE PARTS (1 OF 3)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3A9	85662-60151	2	1	BOARD ASSEMBLY TRACK/HOLD	28480	85662-60151
A3A9C1	0160-4835	7	33	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C2	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C3	0180-1746	5	4	CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3A9C4	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3A9C5				NOT ASSIGNED		
A3A9C6				NOT ASSIGNED		
A3A9C7	0180-0229	7	1	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A3A9C8	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C9	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C10	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C11	0180-0197	8	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A3A9C12	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C13	0160-4832	4	4	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A3A9C14	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C15	0160-3536	3	1	CAPACITOR-FXD 620PF +-5% 100VDC MICA	28480	0160-3536
A3A9C16	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C17	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C18	0160-4801	7	3	CAPACITOR-FXD 100PF +-5% 100VDC CER	28480	0160-4801
A3A9C19	0160-4801	7		CAPACITOR-FXD 100PF +-5% 100VDC CER	28480	0160-4801
A3A9C20	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C21	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C22	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C23	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A3A9C24	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C25	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C26	0160-0945	2	2	CAPACITOR-FXD 910PF +-5% 100VDC MICA	28480	0160-0945
A3A9C27	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C28				NOT ASSIGNED		
A3A9C29				NOT ASSIGNED		
A3A9C30	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C31	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C32	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C33	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C34	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C35	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C36	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C37	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C38	0160-0945	2		CAPACITOR-FXD 910PF +-5% 100VDC MICA	28480	0160-0945
A3A9C39	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A3A9C40	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C41	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C42	0160-4812	0	1	CAPACITOR-FXD 220PF +-5% 100VDC CER	28480	0160-4812
A3A9C43	0160-4808	4	1	CAPACITOR-FXD 470PF +-5% 100VDC CER	28480	0160-4808
A3A9C44	0160-4801	7		CAPACITOR-FXD 100PF +-5% 100VDC CER	28480	0160-4801
A3A9C45	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A3A9C46	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C47	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C48	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3A9C49	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3A9C50	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C51	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C52	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C53	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C54	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9C55	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A3A9CR1	1901-0376	6	2	DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A3A9CR2	1901-0376	6		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A3A9CR3	1901-0535	9	2	DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A9CR4	1901-0033	2	1	DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A3A9CR5	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A3A9J1	1250-0543	8	2	CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A3A9J2	1250-0543	8		CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A3A9L1	9140-0096	1	1	INDUCTOR RF-CH-MLD 1UH 10% .166DX.385LG	28480	9140-0096
A3A9L2	9100-1629	4	4	INDUCTOR RF-CH-MLD 47UH 5% .166DX.385LG	28480	9100-1629
A3A9L3	9100-1629	4		INDUCTOR RF-CH-MLD 47UH 5% .166DX.385LG	28480	9100-1629
A3A9L4	9140-0210	1	1	INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3A9L5	9100-1629	4		INDUCTOR RF-CH-MLD 47UH 5% .166DX.385LG	28480	9100-1629
A3A9L6	9100-1629	4		INDUCTOR RF-CH-MLD 47UH 5% .166DX.385LG	28480	9100-1629
A3A9Q1	1853-0075	9	2	TRANSISTOR-DUAL PNP PD=400MW	28480	1853-0075
A3A9Q2	1854-0712	3	2	TRANSISTOR-DUAL NPN PD=1.8W	28480	1854-0712
A3A9Q3	1854-0712	3		TRANSISTOR-DUAL NPN PD=1.8W	28480	1854-0712
A3A9Q4	1855-0050	4	3	TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	28480	1855-0050
A3A9Q5	1854-0019	3	1	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019

ManualsPlus.com

TABLE 1. A3A9, REPLACEABLE PARTS (2 OF 3)

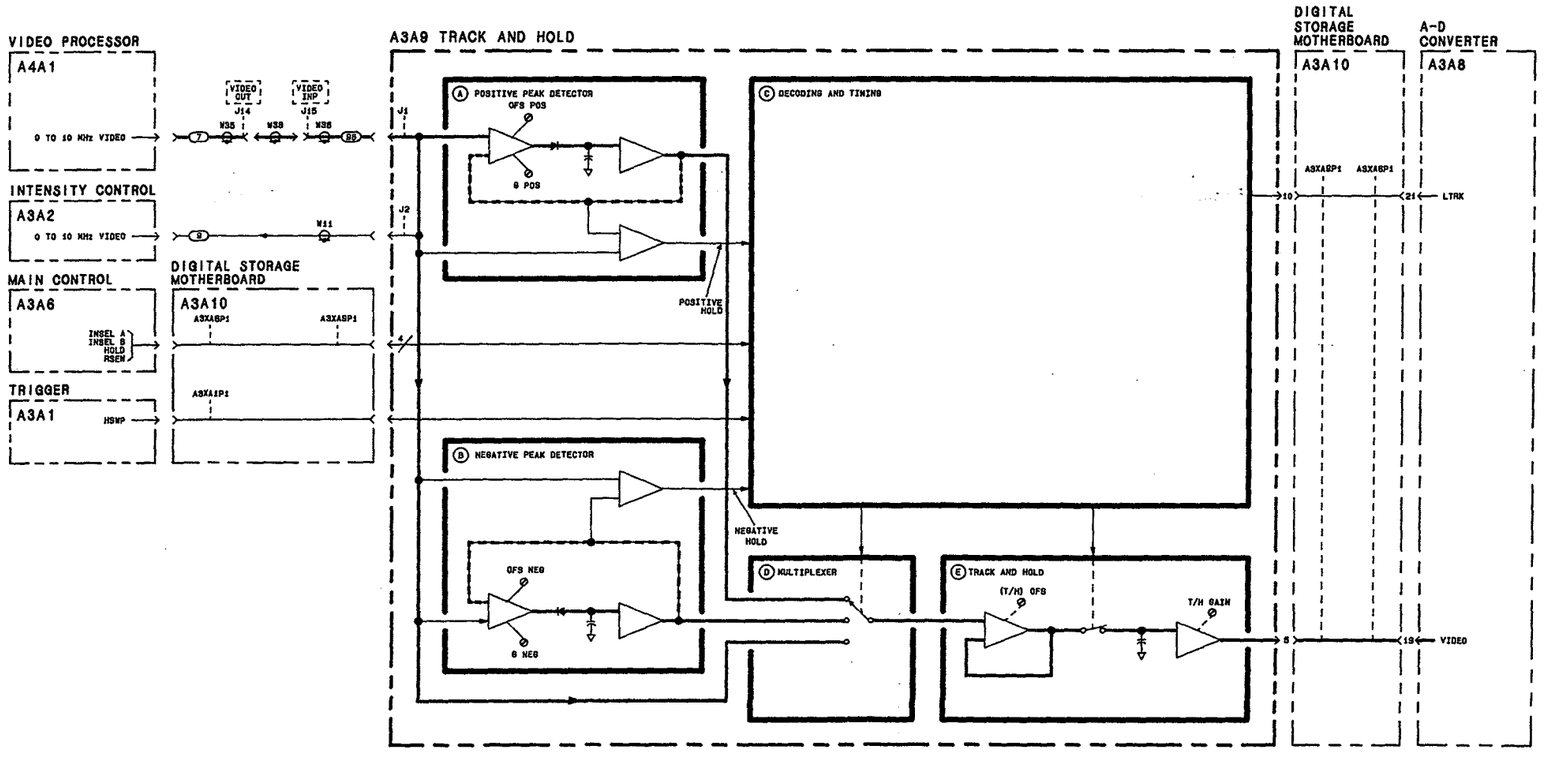
Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3A9Q6	1855-0241	5	2	TRANSISTOR MOSFET N-CHAN E-MODE TO-72 SI	10324	SD215
A3A9Q7	1853-0316	1	1	TRANSISTOR-DUAL PNP PD=500MW	28480	1853-0316
A3A9Q8	1853-0075	9		TRANSISTOR-DUAL PNP PD=400MW	28480	1853-0075
A3A9Q9	1853-0034	0	1	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A3A9Q10	1854-0475	5	2	TRANSISTOR-DUAL NPN PD=750MW	28480	1854-0475
A3A9Q11	1855-0050	4		TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	28480	1855-0050
A3A9Q12	1853-0322	9	1	TRANSISTOR PNP 2N2946A SI TO-46 PD=400MW	01295	2N2946A
A3A9Q13	1855-0050	4		TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	28480	1855-0050
A3A9Q14	1855-0241	5		TRANSISTOR MOSFET N-CHAN E-MODE TO-72 SI	10324	SD215
A3A9Q15	1854-0404	0	1	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A3A9Q16	1854-0475	5		TRANSISTOR-DUAL NPN PD=750MW	28480	1854-0475
A3A9R1	0698-6377	5	6	RESISTOR 200 .1% .125W F TC=0+-25	28480	0698-6377
A3A9R2	0698-6377	5		RESISTOR 200 .1% .125W F TC=0+-25	28480	0698-6377
A3A9R3	0757-0442	9	8	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3A9R4	0757-0438	3	4	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A3A9R5	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3A9R6	0757-0280	3	11	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3A9R7	0757-0274	5	2	RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1211-F
A3A9R8	0698-0083	8	1	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A3A9R9	0698-3440	7	1	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A3A9R10	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3A9R11	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3A9R12	0757-0346	2	3	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A3A9R13	0757-0465	6	1	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A3A9R14	0757-0279	0	4	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A3A9R15	0698-3157	3	7	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A3A9R16	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A3A9R17	0698-6377	5		RESISTOR 200 .1% .125W F TC=0+-25	28480	0698-6377
A3A9R18	0698-6377	5		RESISTOR 200 .1% .125W F TC=0+-25	28480	0698-6377
A3A9R19				NOT ASSIGNED		
A3A9R20	0698-6377	5		RESISTOR 200 .1% .125W F TC=0+-25	28480	0698-6377
A3A9R21	0698-6377	5		RESISTOR 200 .1% .125W F TC=0+-25	28480	0698-6377
A3A9R22	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3A9R23	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A3A9R24	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3A9R25	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3A9R26	0757-0274	5		RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1211-F
A3A9R27	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A3A9R28	0757-0416	7	2	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A3A9R29	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A3A9R30	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A3A9R31	0757-0401	0	3	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A3A9R32	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A3A9R33	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A3A9R34	0698-0084	9	1	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A3A9R35	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A3A9R36	2100-3161	6	2	RESISTOR-TRMR 20K 10% C SIDE-ADJ 17-TRN	02111	43P203
A3A9R37	0757-0462	3	2	RESISTOR 75K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7502-F
A3A9R38	0698-6323	1	3	RESISTOR 100 .1% .125W F TC=0+-25	28480	0698-6323
A3A9R39	2100-3164	9	2	RESISTOR-TRMR 10 20% C SIDE-ADJ 17-TRN	02111	43P100
A3A9R40	0698-3136	8	2	RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A3A9R41	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A3A9R42	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A3A9R43	0757-0462	3		RESISTOR 75K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7502-F
A3A9R44	2100-3161	6		RESISTOR-TRMR 20K 10% C SIDE-ADJ 17-TRN	02111	43P203
A3A9R45	0698-6323	1		RESISTOR 100 .1% .125W F TC=0+-25	28480	0698-6323
A3A9R46	0698-3136	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A3A9R47	0698-6320	8	1	RESISTOR 5K .1% .125W F TC=0+-25	03888	PME55-1/8-T9-5001-B
A3A9R48	0757-0289	2	1	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A3A9R49	0757-0440	7	1	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A3A9R50	0757-1094	9	1	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A3A9R51	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3A9R52	2100-3164	9		RESISTOR-TRMR 10 20% C SIDE-ADJ 17-TRN	02111	43P100
A3A9R53	0698-0085	0	1	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A3A9R54	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A3A9R55	0698-3157	3		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A3A9R56	0698-8298	3	1	RESISTOR 1.071K .25% .125W F TC=0+-25	19701	MF4C1/8-T9-1071R-C
A3A9R57	2100-3757	6	1	RESISTOR-TRMR 100 10% C SIDE-ADJ 17-TRN	28480	2100-3757
A3A9R58	0698-3451	0	1	RESISTOR 133K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1333-F
A3A9R59	2100-3750	9	1	RESISTOR-TRMR 20K 10% C SIDE-ADJ 17-TRN	28480	2100-3750
A3A9R60	0699-1024	1	1	RESISTOR 10K .01% .125W F TC=0+-10	28480	0699-1024
A3A9R61	0757-0441	8	1	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A3A9R62	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A3A9R63	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A3A9R64	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A3A9R65	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F

ManualsPlus.com

TABLE 1. A3A9, REPLACEABLE PARTS (3 OF 3)

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A3A9R66				NOT ASSIGNED		
A3A9R67	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A3A9R68	0698-8872	9	1	RESISTOR 532 .25% .125W F TC=0+-100	28480	0698-8872
A3A9R69	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3A9R70	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3A9R71				NOT ASSIGNED		
A3A9R72	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A3A9R73	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3A9R74	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A3A9R75	0698-6323	1		RESISTOR 100 .1% .125W F TC=0+-25	28480	0698-6323
A3A9R76	0698-3156	2	5	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A3A9R77	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3A9R78	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A3A9R79	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3A9R80	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A3A9R81	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3A9R82	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A3A9R83	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3A9R84	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A3A9R85	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3A9R86	0698-3150	6	5	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A3A9R87	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A3A9R88	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A3A9R89	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A3A9R90	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A3A9TP1	0360-0535	0	4	TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A9TP2	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A9TP3	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A9TP4-A3A9TP8				NOT ASSIGNED		
A3A9TP9	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A3A9U1	1826-0415	4	1	IC SWITCH ANLG QUAD 16-DIP-P PKG	18324	SD5000B
A3A9U2				NOT ASSIGNED		
A3A9U3				NOT ASSIGNED		
A3A9U4	1826-0026	3	2	IC COMPARATOR PRCN TO-99 PKG	01295	LM311L
A3A9U5	1826-0026	3		IC COMPARATOR PRCN TO-99 PKG	01295	LM311L
A3A9U6	1826-0089	8	1	IC OP AMP WB TO-99 PKG	29832	1322
A3A9U7				NOT ASSIGNED		
A3A9U8	1820-0471	0	1	IC INV TTL HEX 1-INP	01295	SN7406N
A3A9U9	1820-1281	2	1	IC DCDR TTL LS 2-TO-4-LINE DUAL 2-INP	01295	SN74LS139N
A3A9U10	1820-1202	7	1	IC GATE TTL LS NAND TPL 3-INP	01295	SN74LS10N
A3A9U11	1820-1197	9	1	IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A3A9U12	1820-1423	4	1	IC MV TTL LS MONOSTBL RETRIG DUAL	01295	SN74LS123N
A3A9U13	1820-1112	8	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A3A9U14	1826-0601	0	2	IC OP AMP PRCN TO-99 PKG	06665	OP-16FJ
A3A9U15	1826-0601	0		IC OP AMP PRCN TO-99 PKG	06665	OP-16FJ
				MISCELLANEOUS PARTS		
	4040-0756	3	2	EXTR PC BD WHT	28480	4040-0756

ManualsPlus.com



A3A9

FIGURE 7. A3A9 TRACK AND HOLD, BLOCK DIAGRAM

ManualsPlus.com

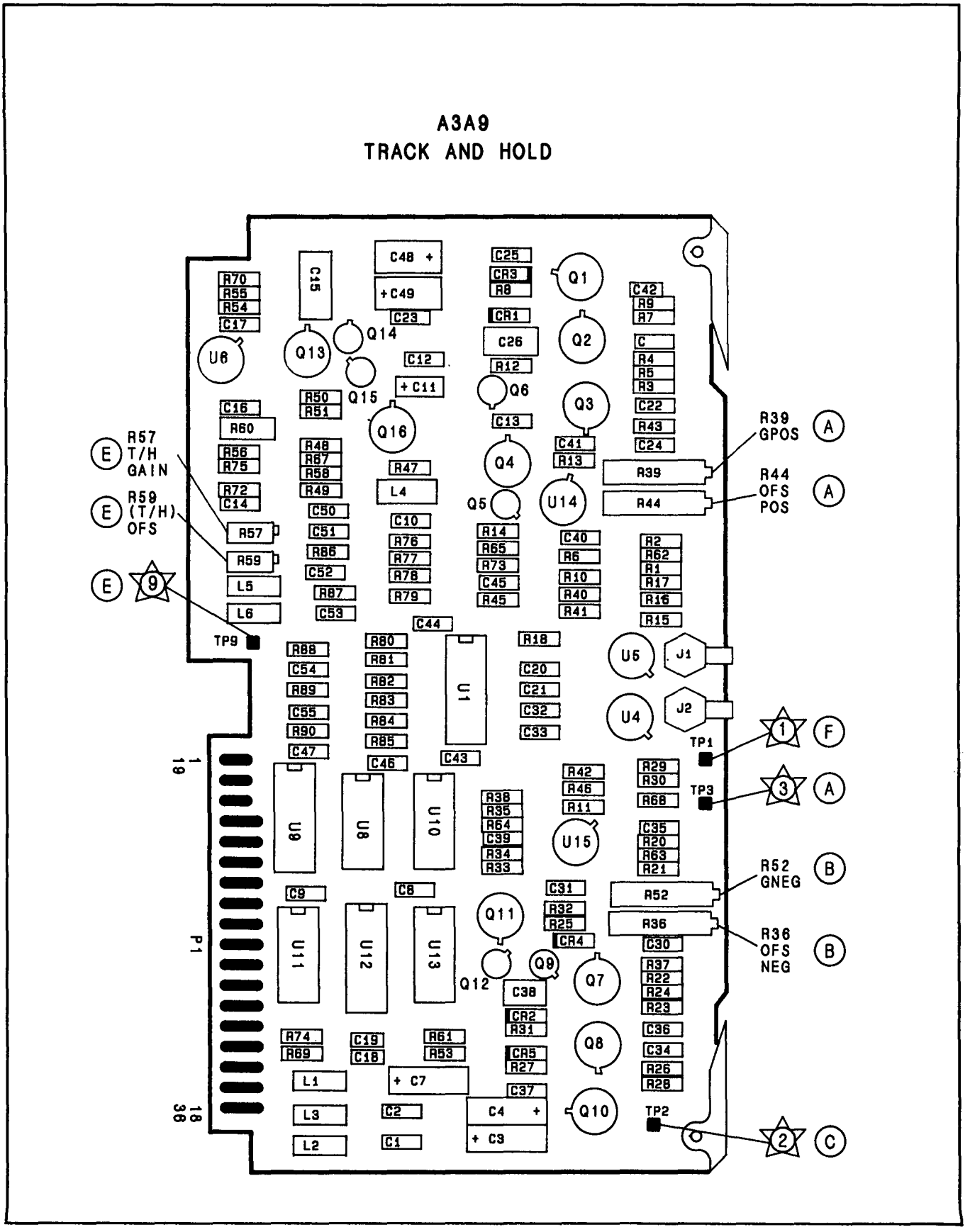
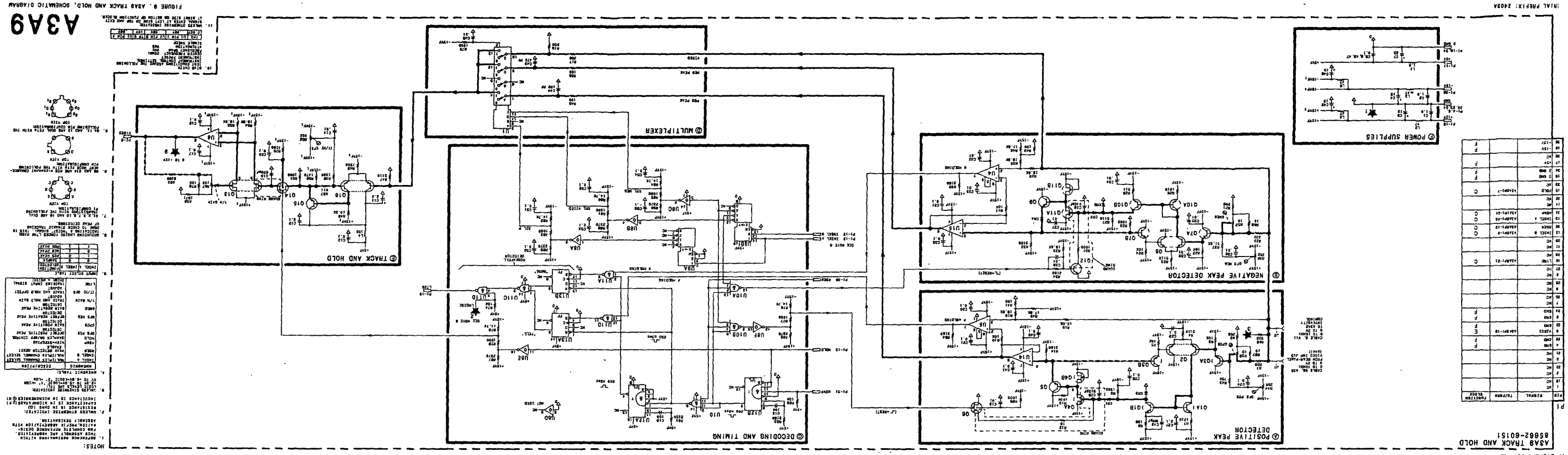


FIGURE 8. A3A9 TRACK AND HOLD, COMPONENT LOCATIONS

ManualsPlus.com

A3A9

FIGURE 9. A3A9 TRACK AND HOLD, SCHEMATIC DIAGRAM



ManualsPlus.com

ManualsPlus.com

TABLE 1. A3A10, REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3A10	85662-60015	7	1	BOARD ASSEMBLY, DIGITAL STORAGE MOTHERBOARD (INCLUDES W2 AND W3)	28480	85662-60015
A3A10J1	1200-0508	0	1	SOCKET-IC 14-CONT DIP-SLDR	28480	1200-0508
A3A10J2	1251-5926	3	1	CONNECTOR 50-PIN M POST TYPE	28480	1251-5926
A3A10J3	1251-5816	0	1	CONNECTOR 4-PIN M POST TYPE	28480	1251-5816
A3XA1P1	1251-2026	8	14	CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026
A3XA1P2	1251-2026	8		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026
A3XA2P1	1251-2026	8		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026
A3XA2P2	1251-2026	8		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026
A3XA3P1	1251-2026	8		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026
A3XA3P2	1251-2026	8		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026
A3XA4P1	1251-2026	8		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026
A3XA5P1	1251-2026	8		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026
A3XA6P1	1251-2026	8		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026
A3XA6P2	1251-2026	8		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026
A3XA7P1	1251-2026	8		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026
A3XA7P2	1251-2026	8		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026
A3XA8P1	1251-2026	8		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026
A3XA9P1	1251-2026	8		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026

ManualsPlus.com

A3A10
DIGITAL STORAGE MOTHERBOARD

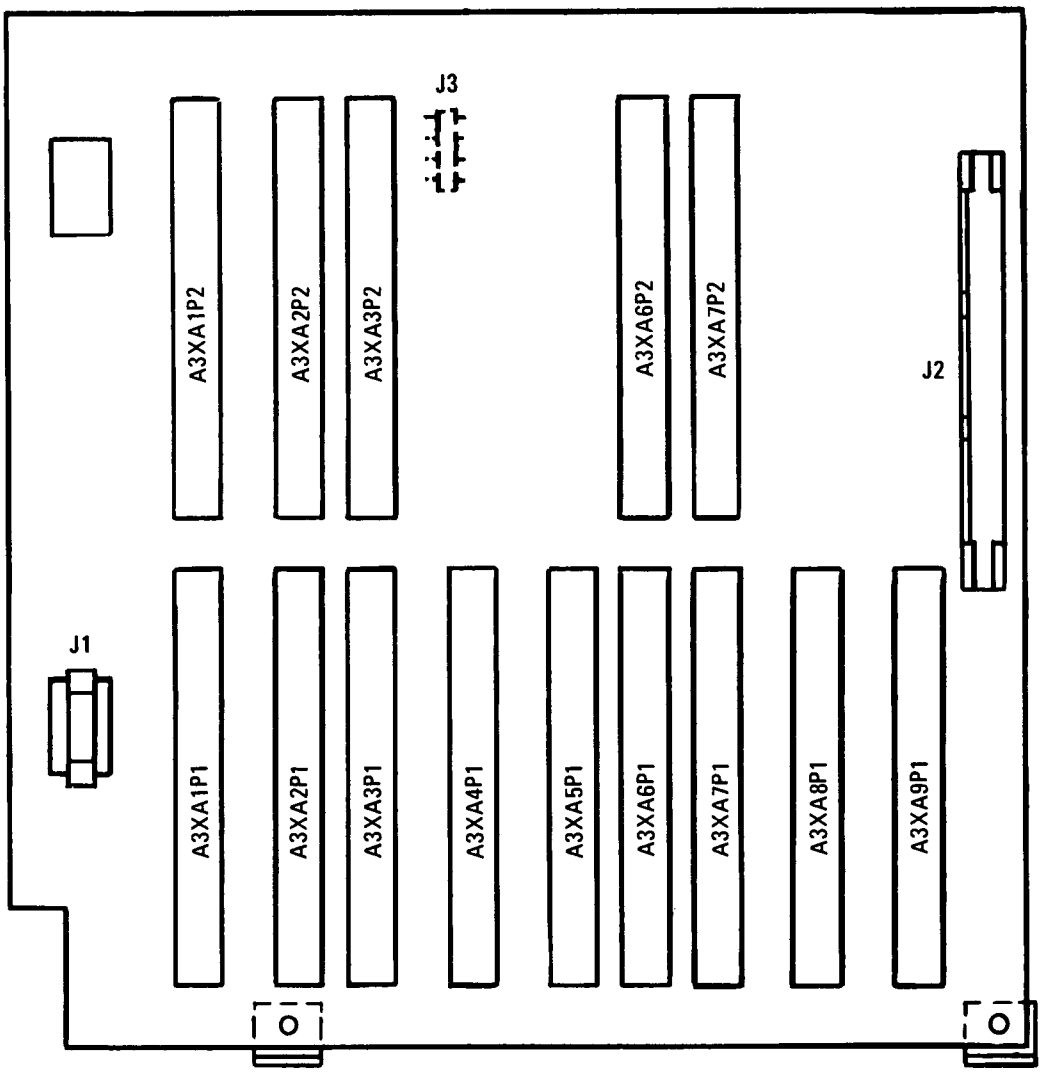


FIGURE 1. A3A10 DIGITAL STORAGE MOTHERBOARD, COMPONENT LOCATIONS

1F-DISPLAY SECTION

A3A10 DIGITAL STORAGE MOTHERBOARD
85662-80015

A3A10J2
50-WIRE INSTRUMENT BUS

PIN	SIGNAL
1	GND (HC)
2	LTIN
3	IOB9
4	IOB1
5	IOB2
6	IOB3
7	IOB4
8	IOB5
9	IOB6
10	IOB7
11	IOB8
12	IOB9
13	IOB10
14	IOB11
15	IOB12
16	IOB13
17	IOB14
18	IOB15
19	NC
20	NC
21	NC
22	HPOR (HC)
23	ADR0
24	ADR1
25	ADR2
26	ADR3
27	ADR4
28	SYS_RST (HC)
29	NC
30	NC
31	XWR (HC)
32	XRD (HC)
33	XRIO (HC)
34	XRII (HC)
35	XCB (HC)
36	XC1 (HC)
37	XC2 (HC)
38	XC3 (HC)
39	XC4 (HC)
40	XC5 (HC)
41	XC6 (HC)
42	XC7 (HC)
43	LSTP (HC)
44	HSYP
45	LSYD (HC)
46	LTSR
47	LDIG (HC)
48	GND
49	LTIP
50	DGND

INSTRUMENT BUS
CONTROL FLIP-FLOP BUS
I/O MUX BUS

A3A10J3
D.T OUTPUTS

A3A10J2
INSTRUMENT BUS

A3A10J1
TRACE AND HOLD

A3A10J1
ANALOG-DIGITAL CONVERTER

A3A7P2
INTERFACE

A3A7P1
INTERFACE

A3A8P2
MAIN CONTROL

A3A8P1
MAIN CONTROL

A3A9P1
DATA MANIPULATOR

A3A4P2
MEMORY

A3A2P2
LINE GENERATOR

A3A2P1
LINE GENERATOR

A3A3P2
INTENSITY CONTROL

A3A3P1
INTENSITY CONTROL

A3A1P2
TRIGGER

A3A1P1
TRIGGER

A3A10P2

A3A10P3

A3A10P4

A3

SERIAL NUMBER PREFIX: 2403A

FIGURE 2. A3A10 DIGITAL STORAGE MOTHERBOARD, INTERCONNECT DIAGRAM
A3A10 3/4

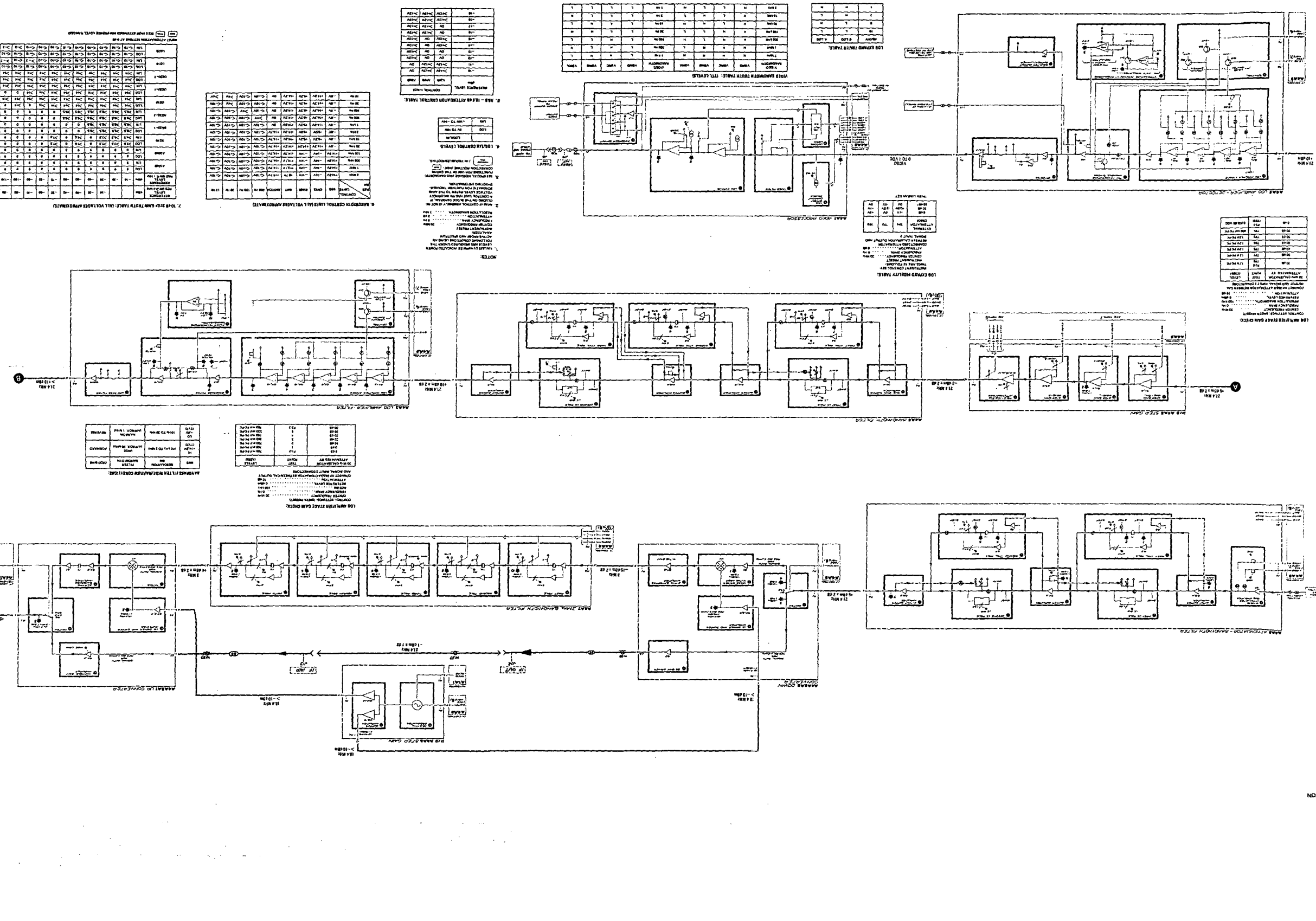
ManualsPlus.com

ManualsPlus.com

A4

FIGURE 5. A4 IF SECTION, BLOCK DIAGRAM

A4 1/2


A4A5 LOG AMPLIFIER / DETECTOR
A4A6 VIDEO PROCESSOR
A4A7 ANALOG INTERFACE
A4A8 LOG AMPLIFIER
A4A9 ATTENUATOR - AMPLIFIER
A4A10 3-POLE FILTER
A4A11 LO CONVERTER
A4A12 LO AMPLIFIER
A4A13 LO DRIVER
A4A14 LO MULTIPLIER
A4A15 LO SOURCE
A4A16 YTO
A4A17 YTO DRIVER
A4A18 SAMPLER
A4A19 SAMPLE LOOP
A4A20 REFERENCE
A4A21 REFERENCE OSCILLATOR
A4A22 REFERENCE DIVIDER
A4A23 REFERENCE AMPLIFIER
A4A24 REFERENCE MULTIPLIER
A4A25 REFERENCE DRIVER
A4A26 REFERENCE PHASE DETECTOR
A4A27 REFERENCE LOOP FILTER
A4A28 REFERENCE VCO
A4A29 REFERENCE VCO DRIVER
A4A30 REFERENCE VCO SAMPLER
A4A31 REFERENCE VCO SAMPLE LOOP
A4A32 REFERENCE VCO REFERENCE
A4A33 REFERENCE VCO REFERENCE DIVIDER
A4A34 REFERENCE VCO REFERENCE AMPLIFIER
A4A35 REFERENCE VCO REFERENCE MULTIPLIER
A4A36 REFERENCE VCO REFERENCE PHASE DETECTOR
A4A37 REFERENCE VCO REFERENCE LOOP FILTER
A4A38 REFERENCE VCO REFERENCE VCO
A4A39 REFERENCE VCO REFERENCE VCO DRIVER
A4A40 REFERENCE VCO REFERENCE VCO SAMPLER
A4A41 REFERENCE VCO REFERENCE VCO SAMPLE LOOP
A4A42 REFERENCE VCO REFERENCE VCO REFERENCE
A4A43 REFERENCE VCO REFERENCE VCO REFERENCE DIVIDER
A4A44 REFERENCE VCO REFERENCE VCO REFERENCE AMPLIFIER
A4A45 REFERENCE VCO REFERENCE VCO REFERENCE MULTIPLIER
A4A46 REFERENCE VCO REFERENCE VCO REFERENCE PHASE DETECTOR
A4A47 REFERENCE VCO REFERENCE VCO REFERENCE LOOP FILTER
A4A48 REFERENCE VCO REFERENCE VCO REFERENCE VCO
A4A49 REFERENCE VCO REFERENCE VCO REFERENCE VCO DRIVER
A4A50 REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLER
A4A51 REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLE LOOP
A4A52 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE
A4A53 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE DIVIDER
A4A54 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE AMPLIFIER
A4A55 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE MULTIPLIER
A4A56 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE PHASE DETECTOR
A4A57 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE LOOP FILTER
A4A58 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO
A4A59 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO DRIVER
A4A60 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLER
A4A61 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLE LOOP
A4A62 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE
A4A63 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE DIVIDER
A4A64 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE AMPLIFIER
A4A65 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE MULTIPLIER
A4A66 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE PHASE DETECTOR
A4A67 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE LOOP FILTER
A4A68 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO
A4A69 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO DRIVER
A4A70 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLER
A4A71 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLE LOOP
A4A72 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE
A4A73 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE DIVIDER
A4A74 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE AMPLIFIER
A4A75 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE MULTIPLIER
A4A76 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE PHASE DETECTOR
A4A77 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE LOOP FILTER
A4A78 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO
A4A79 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO DRIVER
A4A80 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLER
A4A81 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLE LOOP
A4A82 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE
A4A83 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE DIVIDER
A4A84 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE AMPLIFIER
A4A85 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE MULTIPLIER
A4A86 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE PHASE DETECTOR
A4A87 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE LOOP FILTER
A4A88 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO
A4A89 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO DRIVER
A4A90 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLER
A4A91 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLE LOOP
A4A92 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE
A4A93 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE DIVIDER
A4A94 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE AMPLIFIER
A4A95 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE MULTIPLIER
A4A96 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE PHASE DETECTOR
A4A97 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE LOOP FILTER
A4A98 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO
A4A99 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO DRIVER
A4A100 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLER
A4A101 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLE LOOP
A4A102 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE
A4A103 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE DIVIDER
A4A104 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE AMPLIFIER
A4A105 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE MULTIPLIER
A4A106 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE PHASE DETECTOR
A4A107 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE LOOP FILTER
A4A108 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO
A4A109 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO DRIVER
A4A110 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLER
A4A111 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLE LOOP
A4A112 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE
A4A113 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE DIVIDER
A4A114 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE AMPLIFIER
A4A115 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE MULTIPLIER
A4A116 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE PHASE DETECTOR
A4A117 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE LOOP FILTER
A4A118 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO
A4A119 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO DRIVER
A4A120 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLER
A4A121 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLE LOOP
A4A122 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE
A4A123 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE DIVIDER
A4A124 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE AMPLIFIER
A4A125 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE MULTIPLIER
A4A126 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE PHASE DETECTOR
A4A127 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE LOOP FILTER
A4A128 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO
A4A129 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO DRIVER
A4A130 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLER
A4A131 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLE LOOP
A4A132 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE
A4A133 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE DIVIDER
A4A134 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE AMPLIFIER
A4A135 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE MULTIPLIER
A4A136 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE PHASE DETECTOR
A4A137 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE LOOP FILTER
A4A138 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO
A4A139 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO DRIVER
A4A140 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLER
A4A141 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLE LOOP
A4A142 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE
A4A143 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE DIVIDER
A4A144 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE AMPLIFIER
A4A145 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE MULTIPLIER
A4A146 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE PHASE DETECTOR
A4A147 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE LOOP FILTER
A4A148 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO
A4A149 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO DRIVER
A4A150 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLER
A4A151 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLE LOOP
A4A152 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE
A4A153 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE DIVIDER
A4A154 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE AMPLIFIER
A4A155 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE MULTIPLIER
A4A156 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE PHASE DETECTOR
A4A157 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE LOOP FILTER
A4A158 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO
A4A159 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO DRIVER
A4A160 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLER
A4A161 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLE LOOP
A4A162 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE
A4A163 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE DIVIDER
A4A164 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE AMPLIFIER
A4A165 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE MULTIPLIER
A4A166 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE PHASE DETECTOR
A4A167 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE LOOP FILTER
A4A168 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO
A4A169 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO DRIVER
A4A170 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLER
A4A171 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLE LOOP
A4A172 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE
A4A173 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE DIVIDER
A4A174 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE AMPLIFIER
A4A175 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE MULTIPLIER
A4A176 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE PHASE DETECTOR
A4A177 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE LOOP FILTER
A4A178 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO
A4A179 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO DRIVER
A4A180 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLER
A4A181 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLE LOOP
A4A182 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE
A4A183 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE DIVIDER
A4A184 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE AMPLIFIER
A4A185 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE MULTIPLIER
A4A186 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE PHASE DETECTOR
A4A187 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE LOOP FILTER
A4A188 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO
A4A189 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO DRIVER
A4A190 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLER
A4A191 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO SAMPLE LOOP
A4A192 REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE VCO REFERENCE

ManualsPlus.com

ManualsPlus.com

A4A1 VIDEO PROCESSOR, CIRCUIT DESCRIPTION

A4A1 Video Processor filters the detected IF signal from A4A2 Log Amplifier, it sets the dB/DIV LOG SCALE and the REFERENCE LEVEL offsets below −50 dBm or −70 dBm, and it provides the IF video output and the X and Y recorder outputs.

Video Filter (C)

The Video Filter is an RC low pass filter with selectable R and C. The series resistance R is one of two values controlled by switch U7. When the switch is closed (0), R17 is short circuited and the series resistance is minimum. In this state, video bandwidths from 3 kHz to 3 MHz are attainable (The 3 MHz nominal bandwidth is attained when Q14 through Q20 are turned off). When switch U7 is open (1), the series resistance R is high, approximately equal to R17 and video bandwidths from 1 Hz to 1 kHz are attainable. Shunt capacitors C5 through C11 are selected by switching transistors Q14 through Q20. Only one of these switching transistors can be on at any one time. Each capacitor except C11 is used with the high series resistance for the lower bandwidths and the low series resistance for the higher bandwidths.

Log Expand (D)

The Log Expand circuit allows four different amplitude scales: 10, 5, 2, 1 dB/DIV. Changes in the amplitude scale are accomplished by first amplifying the video signal, then attenuating it various amounts. This is accomplished by FET input amplifier U2, which offsets the input −5V and whose gain (set by R22 and R21) is 5. The offset is set by the current through Q1. This current source is adjustable using OS potentiometer R14. Switching transistors Q4, Q5, and Q6 are turned on or off to achieve voltage divider ratios of 1/10, 1/5, 1/2, and 1. Diodes CR2 and CR3 clamp this attenuated signal at about −1.2V to prevent forward biasing any switch in the off state. A final amplifier consisting of Q7, Q8, and Q9 amplifies this attenuated signal by 4 and offsets the output +2V. A +2V output corresponds to a full scale signal. This final amplifier is a two-stage amplifier. The first stage is a FET input stage made up of dual FET Q7. The first-stage output is multiplied by the transistor inverter Q8, whose output is buffered by an emitter follower Q9. This output is fed back to the inverting input through a resistor divider stick. Gain of the amplifier is adjusted by ZERO potentiometer R32, and offset for full scale is adjusted by FS potentiometer R36. Diode CR1 clamps the output at about −1.2V.

Log Offset Current Source (A)

The Log Offset Current Source simulates log gain for instrument reference levels below −60 dBm. This is achieved by offsetting the 0V to 1V video input signal by driving current through the source resistance R16. This current is changed by supplying different currents into the emitter of Q13, the transistor current source. Currents are controlled by switching transistors Q10, Q11, and Q12. For example, when switch Q12 is turned on, the transistor saturates and a current flows through R5 into the emitter of Q13. This emitter current (set by the voltage drop across R5) is closely equal to the collector current through Q12. The voltage drop across R5 can be changed by varying LG OS potentiometer R2, since U6 pin 3 and the emitter of Q13 are at the same voltage. This is true because U6 is a voltage follower with unity gain. Once R2 is set, the accuracy of R5, R7, and R9 determines the relative accuracy of the offsets, 0.1V, 0.2V, 0.2V (10 dB, 20 dB, 20 dB).

Power Supplies (F)

Zener diode VR2 is used to provide the −8.8V supply, which is used in the Log Expand circuit with the FS adjustment R36.

ManualsPlus.com

Decode Logic (B)

The Decode Logic circuit performs additional decoding on output lines from IF Control A4A9. VBWA, VBWB, VBWC, and VBWD are decoded by U8, a 1-of-8 decoder, and inverted by U10 to drive one of the seven capacitors used in the Video Filter. U11 decodes A LOG and B LOG and drives the switches that vary the attenuator in the Log Expand circuit.

Recorder Output (E)

The Recorder Output circuit provides outputs for an X-Y plotter. Also provided are outputs for calibrating lower left (LL) and upper right (UR). Calibration outputs and signal outputs are routed through switch U4. A control line, REC CAL, from IF Control A4A9 controls the state of the U4 switches. When REC CAL is high, the video output through U3 and AUX SWEEP have closed paths through the switch to provide VIDEO and SWEEP outputs to the rear panel. When the REC CAL is low, a closed path through the switch exists between the calibration voltages and the VIDEO and SWEEP outputs. Control line REC ZERO causes the FS or ZERO voltage to appear across the R50, R55, R51 divider stick. When in LL, REC ZERO is low and the switch inputs are pulled to about 0V. When REC ZERO is high, its open collector output will be set to the voltage determined by the divider stick: +10V for X_r out, and +1V for Y_r out.

ManualsPlus.com

A4A1 VIDEO PROCESSOR, TROUBLESHOOTING

Proper operation of the Log Offsets, OS1Ø, OS2Ø-1, and OS2Ø-2 can be determined from the display.

Connect an HP 355D Step Attenuator between CAL OUTPUT and the input of the spectrum analyzer. Set this attenuator to 110 dB. Press Instrument Preset and key in the following settings:

[CENTER FREQUENCY] ..... equal to CAL OUTPUT frequency

[FREQUENCY SPAN] ..... 0 Hz

[RES BW] ..... 3 kHz

[VIDEO BW] ..... 10 Hz

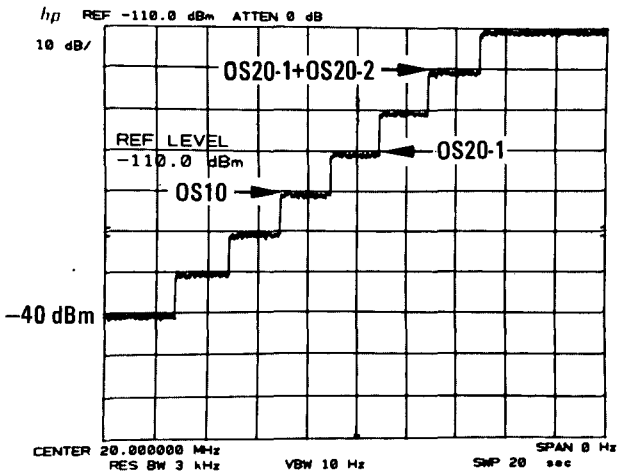
[ATTEN] ..... 0 dB

[SHIFT] [ATTEN]

[SWEEP TIME] ..... 20 sec

[REFERENCE LEVEL] ..... −40 dBm

Press the [SINGLE] sweep key. Then press the DATA STEP ⇩ key repeatedly. A display similar to Figure 1 should result. If a step is missing, one of the offsets or its control circuitry is defective. The truth table in Note 5 is an aid to determine which offset circuit is not operating properly. 0V in the table indicates that an offset is active. Accurate determination of amplitude step size is attainable using the MARKER [Δ] key and the DATA knob.



NOTE: Center Frequency readout will be 100.000 000 MHz for an HP 8566B.

FIGURE 1. LOG OFFSET GAIN STEP DISPLAY

The Video Filter circuit can be checked from the front panel. With no input signal, press Instrument Preset and set the controls as follows:

[CENTER FREQUENCY] ..... 25 MHz

[FREQUENCY SPAN] ..... 100 kHz

[SWEEP TIME] ..... 20 sec

[REFERENCE LEVEL] ..... −90 dBm

[VIDEO BW] ..... 1 Hz

ManualsPlus.com

Press [SINGLE] sweep. Then press the DATA STEP [⇧] key repeatedly. The display should appear as in Figure 2. Now key in [SHIFT] TRACE A [VIEW] . This turns only the Negative Peak Detector on. Reset [VIDEO BW] to 1 Hz. Press the [SINGLE] sweep key. Then press the DATA step [⇧] key repeatedly. The display should appear as in Figure 3.

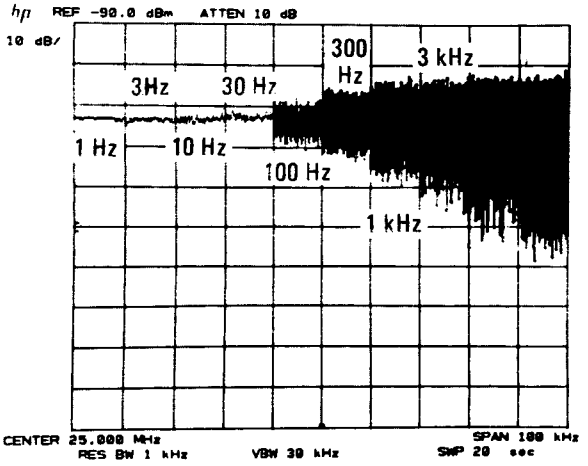


FIGURE 2. VIDEO BANDWIDTH STEP DISPLAY

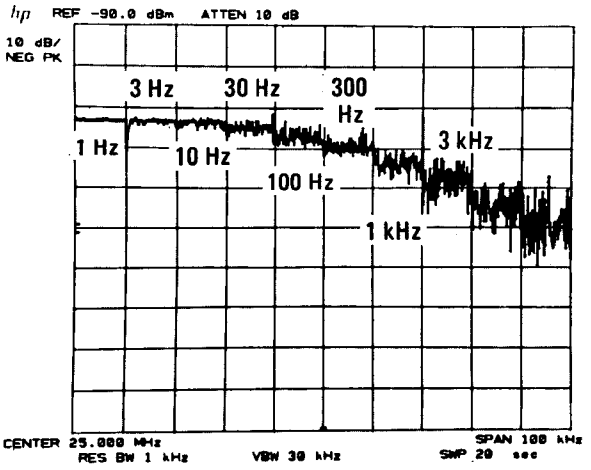


FIGURE 3. VIDEO BANDWIDTH STEP DISPLAY WITH NEGATIVE PEAK DETECTION

If the displayed noise does not change monotonically (continuously decrease level) with the step key, the indicated Video bandwidth is faulty. Refer to the service sheet to determine the defective switch, capacitor, or decoder.

The Log Expand and Decode Logic circuitry can be accurately checked by using the Error Correction Routine. Pressing [SHIFT] [FREQUENCY SPAN] (KSW) starts this routine. The error terms are displayed by pressing [SHIFT] [LINE] (KSw). The last three lines give the offset errors from the 1 dB LOG reference for the 2 dB, 5 dB, and 10 dB LOG scales, respectively. Maximum error is ±0.5 dB for proper operation.

ManualsPlus.com

TABLE 1. A4A1, REPLACEABLE PARTS (1 OF 2)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A1	85662-60122	7	1	BOARD ASSEMBLY, VIDEO PROCESSOR	28480	85662-60122
A4A1C1				NOT ASSIGNED		
A4A1C2	0160-2055	9	9	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A1C3				NOT ASSIGNED		
A4A1C4	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A1C5	0160-0945	2	1	CAPACITOR-FXD 910PF +-5% 100VDC MICA	28480	0160-0945
A4A1C6	0160-0155	6	1	CAPACITOR-FXD 3300PF +-10% 200VDC POLYE	28480	0160-0155
A4A1C7	0160-0161	4	1	CAPACITOR-FXD .01UF +-10% 200VDC POLYE	28480	0160-0161
A4A1C8	0160-0163	6	1	CAPACITOR-FXD .033UF +-10% 200VDC POLYE	28480	0160-0163
A4A1C9	0160-0168	1	1	CAPACITOR-FXD .1UF +-10% 200VDC POLYE	28480	0160-0168
A4A1C10	0180-2205	3	1	CAPACITOR-FXD .33UF+-10% 35VDC TA	56289	150D334X9035A2
A4A1C11	0180-0291	3	1	CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A4A1C12	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A1C13				NOT ASSIGNED		
A4A1C14	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A1C15	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A1C16	0180-1719	2	2	CAPACITOR-FXD 22UF+-10% 25VDC TA	06001	69F146GB
A4A1C17	0180-0229	7	1	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A4A1C18	0180-1719	2		CAPACITOR-FXD 22UF+-10% 25VDC TA	06001	69F146GB
A4A1C19	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A1C20	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A1C21	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A1C22	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A1C23	0160-4805	1	3	CAPACITOR-FXD 47PF +-5% 100VDC CER 0+-30	28480	0160-4805
A4A1C24	0160-4805	1		CAPACITOR-FXD 47PF +-5% 100VDC CER 0+-30	28480	0160-4805
A4A1C25	0160-4800	6	1	CAPACITOR-FXD 120PF +-5% 100VDC CER	28480	0160-4800
A4A1C26	0160-4791	4	1	CAPACITOR-FXD 10PF +-5% 100VDC CER 0+-30	28480	0160-4791
A4A1C27	0160-4805	1		CAPACITOR-FXD 47PF +-5% 100VDC CER 0+-30	28480	0160-4805
A4A1C28	0160-4084	8	3	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A4A1C29	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A4A1C30	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A4A1CR1	1901-0535	9	1	DIODE-SM SIG SCHOTTKY	28480	1901-0535
A4A1CR2	1901-0179	7	2	DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A4A1CR3	1901-0179	7		DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A4A1J1	1250-0690	6	4	CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
A4A1J2	1250-0690	6		CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
A4A1J3	1250-0690	6		CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
A4A1J4	1250-0690	6		CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
A4A1L1	9140-0114	4	2	INDUCTOR RF-CH-MLD 10UH 10% .166DX.385LG	28480	9140-0114
A4A1L2	9140-0114	4		INDUCTOR RF-CH-MLD 10UH 10% .166DX.385LG	28480	9140-0114
A4A1L3	9100-1618	1	3	INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A1L4	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A1L5	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A1Q1	1853-0281	9	5	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A4A1Q2	1854-0404	0	11	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A1Q3	1855-0050	4	1	TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	28480	1855-0050
A4A1Q4	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A1Q5	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A1Q6	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A1Q7	1855-0213	1	1	TRANSISTOR-JFET DUAL N-CHAN D-MODE TO-78	28480	1855-0213
A4A1Q8	1853-0388	7	1	TRANSISTOR-DUAL PNP PD=600MW	28480	1853-0388
A4A1Q9	1854-0478	7	1	TRANSISTOR NPN 2N5109 SI TO-39 PD=800MW	3L585	2N5109
A4A1Q10	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A4A1Q11	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A4A1Q12	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A4A1Q13	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A4A1Q14	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A1Q15	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A1Q16	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A1Q17	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A1Q18	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A1Q19	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A1Q20	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A1Q21	1854-0637	1	1	TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A4A1R1	0698-3443	0	1	RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A4A1R2	2100-3109	2	1	RESISTOR-TRMR 2K 10% C SIDE-ADJ 17-TRN	02111	43P202
A4A1R3	0698-3510	2	1	RESISTOR 453 1% .125W F TC=0+-100	24546	C4-1/8-T0-453R-F
A4A1R4	0757-0442	9	5	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A1R5	0698-6880	5	1	RESISTOR 16K .5% .125W F TC=0+-50	28480	0698-6880
A4A1R6	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A1R7	0698-6755	3	2	RESISTOR 8K .5% .125W F TC=0+-50	24546	NC4-1/8-T2-8001-D
A4A1R8	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A1R9	0698-6755	3		RESISTOR 8K .5% .125W F TC=0+-50	24546	NC4-1/8-T2-8001-D
A4A1R10*	0757-0422	5	1	RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F

*Indicates factory selected value

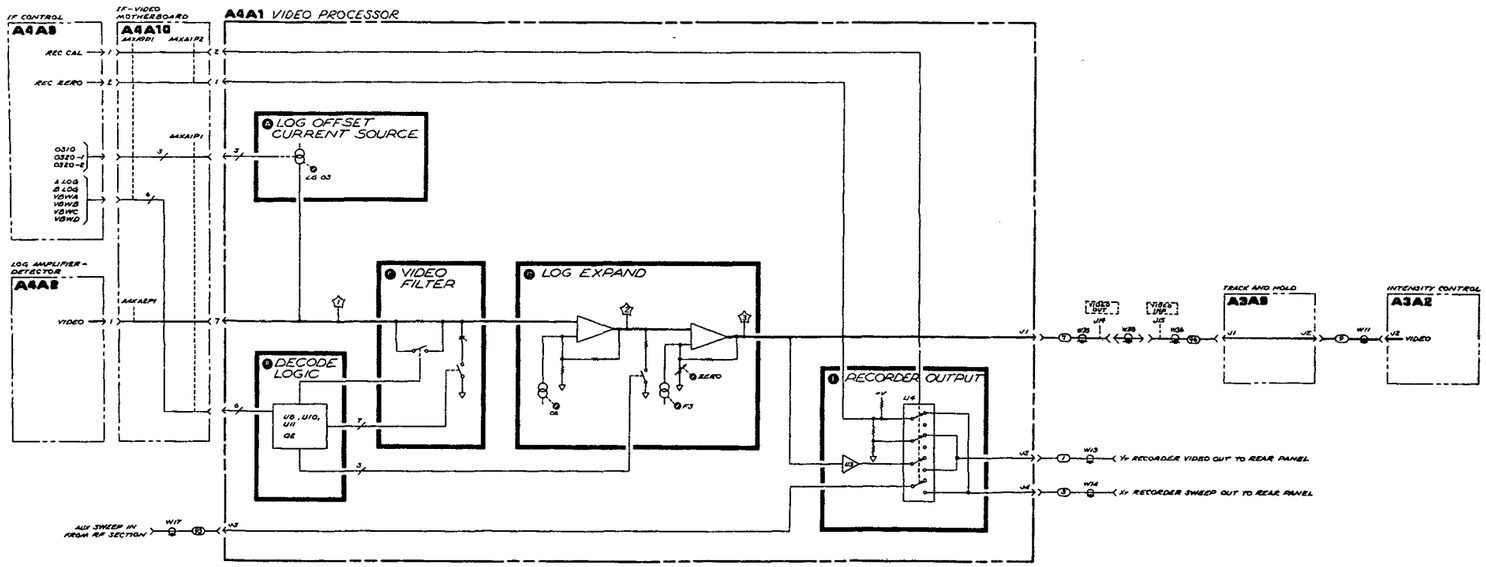
ManualsPlus.com

TABLE 1. A4A1, REPLACEABLE PARTS (2 OF 2)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A1R11	0757-0403	2	1	RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-T0-121R-F
A4A1R12	0757-0159	5	1	RESISTOR 1K 1% .5W F TC=0+-100	28480	0757-0159
A4A1R13	0698-3153	9	1	RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A4A1R14	2100-3056	8	2	RESISTOR-TRMR 5K 10% C SIDE-ADJ 17-TRN	02111	43P502
A4A1R15	0698-6330	0	1	RESISTOR 2K 1% .125W F TC=0+-25	28480	0698-6330
A4A1R16	0757-0394	0	1	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A4A1R17	0698-4211	2	1	RESISTOR 158K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1583-F
A4A1R18	0698-3155	1	7	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A4A1R19	0698-3158	4	5	RESISTOR 23.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2372-F
A4A1R20	0698-3158	4		RESISTOR 23.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2372-F
A4A1R21	0698-3240	5	2	RESISTOR 500 .25% .125W F TC=0+-50	28480	0698-3240
A4A1R22	0698-7799	7	3	RESISTOR 2K .25% .125W F TC=0+-100	19701	MF4C1/8-T0-2001-C
A4A1R23	0698-7799	7		RESISTOR 2K .25% .125W F TC=0+-100	19701	MF4C1/8-T0-2001-C
A4A1R24	0698-7839	6	1	RESISTOR 222 .5% .125W F TC=0+-50	19701	MF4C1/8-T2-222R-D
A4A1R25	0698-3240	5		RESISTOR 500 .25% .125W F TC=0+-50	28480	0698-3240
A4A1R26	0698-7799	7		RESISTOR 2K .25% .125W F TC=0+-100	19701	MF4C1/8-T0-2001-C
A4A1R27	0757-0274	5	3	RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1211-F
A4A1R28	0757-0274	5		RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1211-F
A4A1R29	0757-0200	7	1	RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A4A1R30	0757-0438	3	1	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A4A1R31	0698-3444	1	1	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A4A1R32	2100-3154	7	1	RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	02111	43P102
A4A1R33	0757-0274	5		RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1211-F
A4A1R34	0698-5552	6	1	RESISTOR 1K 1% .125W F TC=0+-25	28480	0698-5552
A4A1R35	0698-3275	6	1	RESISTOR 2.5K 1% .125W F TC=0+-25	28480	0698-3275
A4A1R36	2100-3056	8		RESISTOR-TRMR 5K 10% C SIDE-ADJ 17-TRN	02111	43P502
A4A1R37	0698-0084	9	3	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A4A1R38	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A4A1R39	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A4A1R40	0698-0085	0	3	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A4A1R41	0698-0085	0		RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A4A1R42	0757-0290	5	1	RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A4A1R43	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A4A1R44	0698-3158	4		RESISTOR 23.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2372-F
A4A1R45	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A4A1R46	0698-3158	4		RESISTOR 23.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2372-F
A4A1R47	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A4A1R48	0698-3158	4		RESISTOR 23.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2372-F
A4A1R49	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A1R50	0698-5577	5	1	RESISTOR 2.5K .5% .125W F TC=0+-100	24546	C4-1/8-T0-2501-D
A4A1R51	0757-0416	7	2	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A4A1R52	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A4A1R53	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A4A1R54	0698-3445	2	2	RESISTOR 348 1% .125W F TC=0+-100	24546	C4-1/8-T0-348R-F
A4A1R55	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A4A1R56	0698-0085	0		RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A4A1R57	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A4A1R58	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A1R59	0757-0401	0	1	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A4A1R60	0757-0437	2	2	RESISTOR 4.75K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4751-F
A4A1R61	0698-4123	5	1	RESISTOR 499 1% .125W F TC=0+-100	24546	C4-1/8-T0-499R-F
A4A1R62	0757-0280	3	1	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A4A1R63	0698-4376	0	1	RESISTOR 32.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-32R4-F
A4A1R64	0698-3445	2		RESISTOR 348 1% .125W F TC=0+-100	24546	C4-1/8-T0-348R-F
A4A1R65	0757-0437	2		RESISTOR 4.75K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4751-F
A4A1R66	0757-0289	2	1	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A4A1R67*	0757-0459	8	1	RESISTOR 56.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5622-F
A4A1TP1	1251-0600	0	3	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A1TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A1TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A1U1	5081-8117	3	1	SCREEN 1826-0092	28480	5081-8117
A4A1U2	1826-0089	8	1	IC OP AMP WB TO-99 PKG	29832	1322
A4A1U3	1826-0021	8	1	IC OP AMP GP TO-99 PKG	27014	LM310H
A4A1U4	1826-0417	6	1	IC SWITCH ANLG QUAD 16-DIP-C PKG	27014	LF13333D
A4A1U5	1810-0215	9	1	NETWORK-RES 8-SIP75.0K OHM X 7	01121	208A753
A4A1U6	1826-1058	3	1	IC OP AMP GP 8-TO-99 PKG	28480	1826-1058
A4A1U7	1826-1020	9	1	ANALOG SWITCH 2 SPST 10-METAL	28480	1826-1020
A4A1U8	1820-1216	3	1	IC DCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N
A4A1U9				NOT ASSIGNED		
A4A1U10	1820-0586	8	1	IC INV TTL L HEX 1-INP	01295	SN74L04N
A4A1U11	1820-1272	1	1	IC BFR TTL LS NOR QUAD 2-INP	01295	SN74LS33N
A4A1VR1	1902-0686	3	2	DIODE-ZNR 6.2V 2% DO-7 PD=.4W TC=+.002%	04713	1N825
A4A1VR2	1902-0686	3		DIODE-ZNR 6.2V 2% DO-7 PD=.4W TC=+.002%	04713	1N825
				MISCELLANEOUS PARTS		
	85662-20041	5	1	CVR VIDEO PROCSR	28480	85662-20041
	86701-40001	9	2	EXTRACTOR PC	28480	86701-40001

*Indicates factory selected value

ManualsPlus.com



A4A1

FIGURE 4. A4A1 VIDEO PROCESSOR, BLOCK DIAGRAM

ManualsPlus.com

A4A1
VIDEO PROCESSOR

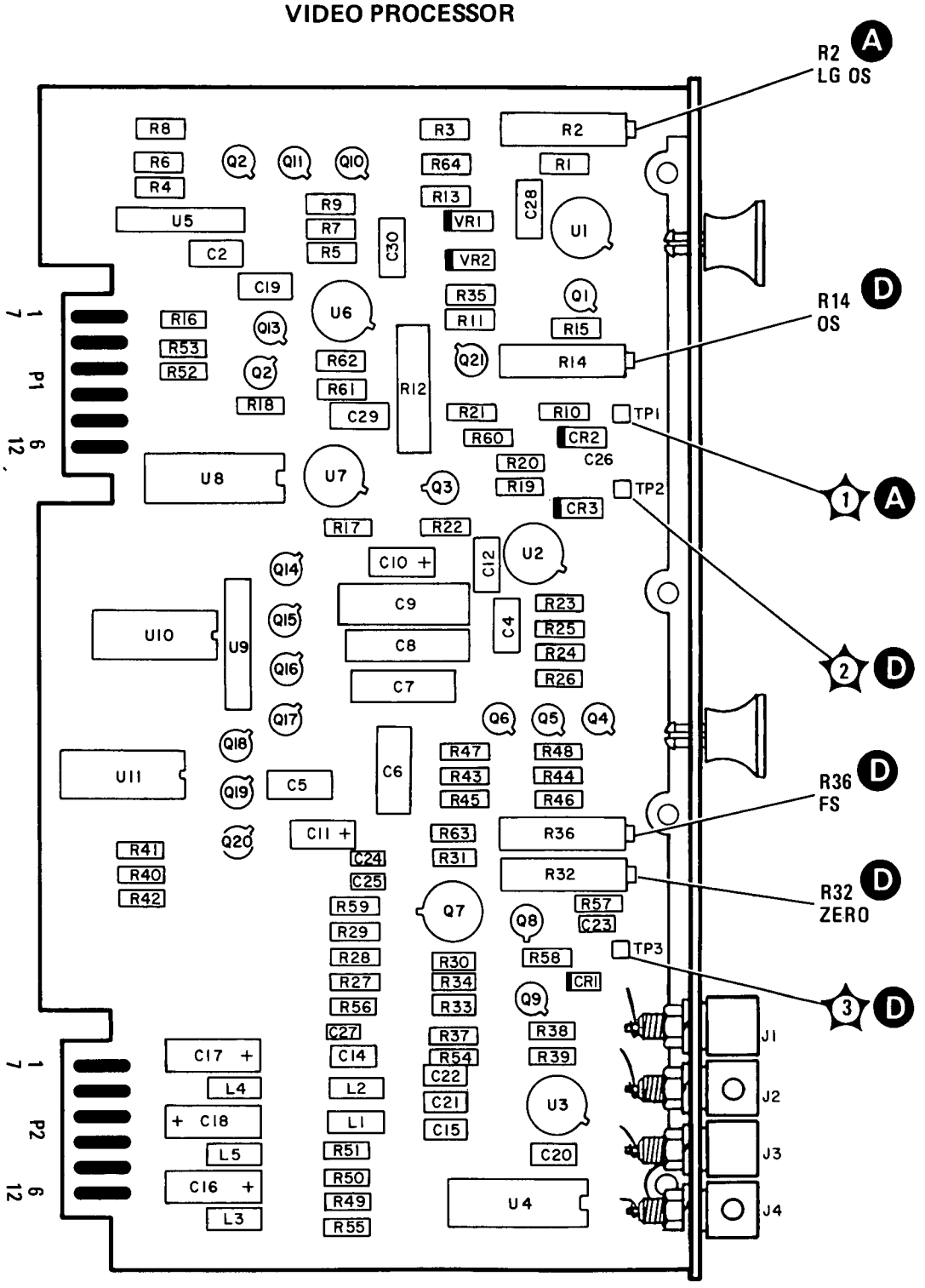


FIGURE 5. A4A1 VIDEO PROCESSOR, COMPONENT LOCATIONS

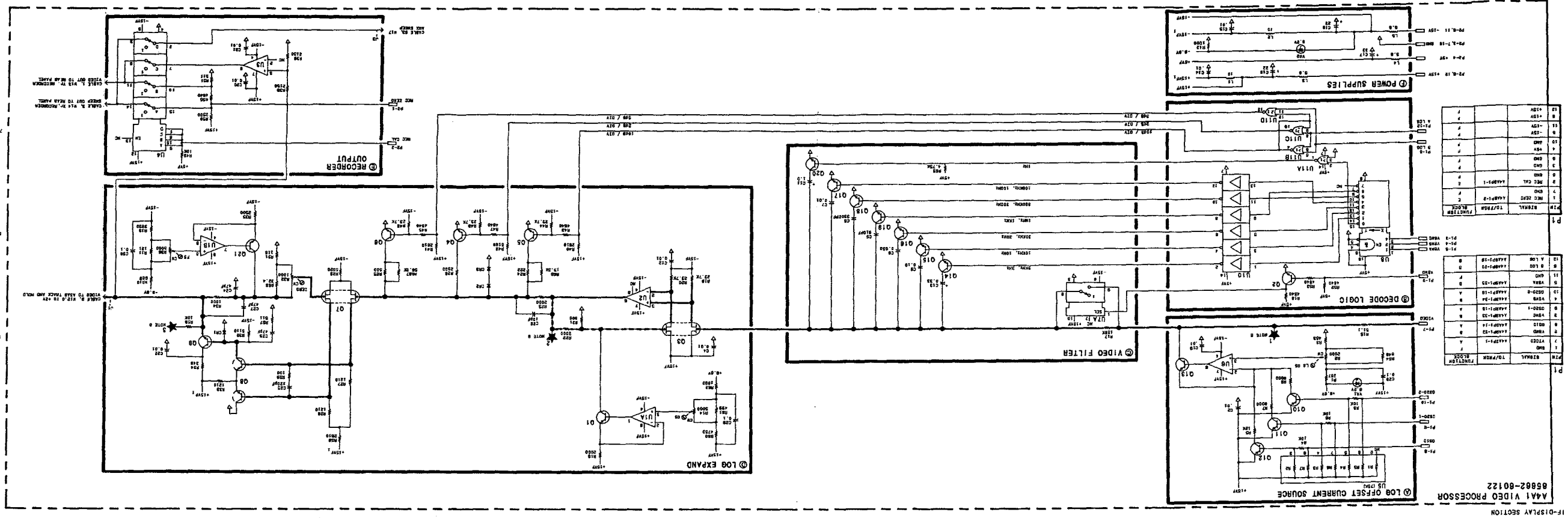
ManualsPlus.com

SERIAL PREFIX: 2403A

A4A1

FIGURE 8. A4A1 VIDEO PROCESSOR ASSEMBLY , SCHEMATIC DIAGRAM

A4A1 11/12



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION WITH ASSEMBLY PREFIX ASSIGNMENT, ADD A4.
2. UNLESS OTHERWISE INDICATED, RESISTANCE IS IN OHMS (Ω), CAPACITANCE IS IN MICROFARADS (μF), INDUCTANCE IS IN MICROHENRIES (μH).
3. REFERENCE DESIGNATORS WITHIN ASSEMBLY PREFIX ASSIGNMENT: A4
4. UNLESS OTHERWISE INDICATED, LOGIC LEVELS ARE TTL.
5. STRAIT BAJA BYPASS TRUTH TABLE.

LOG REF LEVEL	BYPASS
-10 TO -20	0
-20 TO -30	1

6. VIDEO BANDWIDTH TRUTH TABLE.

VIDEO AMPLIFIER	VBW2	VBW1	VBW0
10MHz	H	H	H
20MHz	H	H	L
30MHz	H	L	H
40MHz	H	L	L
50MHz	L	H	H
60MHz	L	H	L
70MHz	L	L	H
80MHz	L	L	L

7. LOG EXPAND TRUTH TABLE.

LOG SCALE	B LOG	A LOG
10 dB / DIV	L	L
5 dB / DIV	L	H
2 dB / DIV	H	L
1 dB / DIV	H	H

8. RECORDER OUTPUT TABLE.

	REC	REC			
	CAL	ZERO	DISPLAY	J2	DISPLAY
CAL	0V	0V	0V	0V	0V
ZERO	0V	0V	0V	0V	0V
DISPLAY	0V	0V	0V	0V	0V
J2	0V	0V	0V	0V	0V

9. LOG EXPAND FIDELITY CABLE ADJUSTMENT PROCEDURE

INTERNAL CONNECTIONS AND ADJUSTMENTS ARE AS FOLLOWS

EXTERNAL CONNECTIONS AND ADJUSTMENTS

1. CONNECT 20 MHz SINEWAVE SIGNAL TO INPUT.
2. SET AMPLITUDE TO 8 DIVISIONS.
3. SET HORIZONTAL SCALE TO 1 mSEC/DIV.
4. SET VERTICAL SCALE TO 1 VOLT/DIV.
5. ADJUST C1 FOR MINIMUM DISTORTION.
6. SET HORIZONTAL SCALE TO 10 mSEC/DIV.
7. SET VERTICAL SCALE TO 10 mV/DIV.
8. ADJUST C2 FOR MINIMUM DISTORTION.
9. REPEAT STEPS 3 THROUGH 8 AS NECESSARY.

10. LOG EXPAND ADJUSTMENTS

SET LIGHT SIDE ON BOTTOM OF PANEL

	+5V	+15V	-15V	VIDEO
RECORDER OUTPUT				
LIGHT SHIELD				
ACTIVATED				
JUMPER ACTIVATED	0V	+15V	-15V	+1V
BATTERY ACTIVATED	0V	+15V	GATED*	VIDEO
LIGHT SHIELD ACTIVATED	0V	0V	0V	0V

ManualsPlus.com

ManualsPlus.com

A4A2 LOG AMPLIFIER-DETECTOR, CIRCUIT DESCRIPTION

A4A2 Log Amplifier-Detector Assembly contains the last four of the nine log amplifier stages. (The first five stages are in A4A3 Log Amplifier-Filter.) The first two stages in this assembly (Stage 6 and Stage 7) are also used in linear mode as a switchable 20 dB gain step. Following the last log stage, the 21.4 MHz IF signal is applied to a PIN diode attenuator. In log mode, this attenuation is varied with temperature to compensate for bias variations in the log stages. After passing through the PIN attenuator, the IF signal is detected to produce the vertical (video) signal which is applied to A4A1 Video Processor. The 21.4 MHz signal is attenuated and sent to the 21.4 MHz IF OUTPUT connector on the rear panel.

The control circuit of A4A2 contains log/linear switching circuitry and 20 dB linear gain step switching circuitry. Also contained in A4A2 is a temperature-dependent power supply which biases the log stages in A4A2 and A4A3. A similar temperature-dependent bias supply controls the attenuation of the PIN Diode Attenuator.

Log Amplifier Stages (A)

A4A2 contains the last four of the nine log amplifier stages. (Refer to A4A3 Log Amplifier-Filter for a description of log amplifier stages.) The operation of each stage is essentially identical to that of the log stages in A4A3.

LOG Mode. In LOG mode, the LOG/LIN control line from A4A9 IF Control is high (about +7V). Q9 is turned on, connecting the log diode bias resistor of each stage to the −12 VTV supply through CR16 and CR18. Q8 is off and PIN diodes CR12 and CR15 are reverse biased through R50. The LG2Ø control line from A4A9 IF Control Assembly is low in LOG mode, so Q10 is off and CR6 and CR9 are reverse biased. Thus all log diodes are on, and linear gain PIN diodes are off. The logged IF signal is applied through Q14 to the PIN Diode Attenuator, the Detector, and the Counter Output Limiter.

LINEAR Mode. Each of the log stages in this assembly provides linear gain through the use of a switchable PIN diode signal path. In LINEAR mode, the LOG/LIN control line is pulled to the −12 VTV supply through R101. This turns off Q9, removing the bias current from all log diodes. As the Q9 collector is pulled high through R46, the Q8 collector saturates to the −12 VTV supply, forward biasing PIN diodes CR2 and CR15 through CR21 in Log Amplifier Stages 8 and 9. Since PIN diode resistance is not affected by signal level, Stages 8 and 9 become non-limiting amplifiers with combined gain of approximately 15 dB. R36 is factory selected to adjust the gain of Stage 9 in LINEAR mode. This gain is necessary to obtain a 1V (full screen) video output in linear mode at approximately the same input level to the IF module that causes a 1V (full screen) output in LOG mode.

20 dB Linear Gain Step. Stages 6 and 7 are used as a switchable 20 dB gain step in LINEAR mode at low reference levels. When the LG2Ø control line is high (more positive than −5V), the Q10 collector saturates to the −12 VTV supply, turning on PIN diodes CR6 and CR9 in Log Amplifier Stages 6 and 7. Stage 6 and 7 each provide approximately 10 dB of non-limiting gain when LG2Ø is high. The combined gain of stages 6 and 7 is adjusted to 20 dB by varying the resistance of CR6. R14 sets the bias current and thus the resistance of CR6.

Pin Diode Attenuator (C)

In LOG mode, attenuation of the PIN Diode Attenuator is varied with temperature to compensate for bias variations with temperature in the Log Amplifier Stages. The attenuation is removed in the LINEAR mode.

LOG Mode. In LOG mode, Q7 is turned off because Q8 is off. CR30 is forward biased by the LOG/LIN control line through R63. PIN diodes CR28 and CR29 are forward biased by U1B through R62 and R61. PIN diodes CR26 and CR27 operate with fixed bias current through R56 and R57. CR26 through CR29 form a resistive voltage divider with CR28 and CR29 operating as a variable resistance. Op amp U1, which biases CR28 and CR29, is a temperature dependent voltage source. The voltage at U1 pin 7 becomes more negative as temperature increases, causing the attenuation to increase. The attenuation of the PIN Diode Attenuator is set by R61 (refer to ATTEN and −12 VTV Adjustments).

ManualsPlus.com

LINEAR Mode. In LINEAR mode, Q9 is off and Q8 and Q7 are on. Q7 supplies additional drive for CR26 and CR27 through R58. This biases CR26 and CR27 so that their resistance is small (<50Ω total). CR28 and CR29 are reverse biased through R63, since LOG/LIN is pulled to −12 VTV in linear mode. There is no attenuation, and the signal from Q14 is coupled directly to emitter follower Q5.

Detector Driver. The signal output from the PIN Diode attenuator is applied to emitter follower Q5, which provides low-impedance drive for the Detector. Bias for Q5 is supplied by R65, which with R64 forms a voltage divider for the signal from the Q5 emitter. The signal at J1 is linearly related to the displayed vertical signal in both LINEAR and LOG modes. The signal is sent by coax cable to the 21.4 MHz IF OUTPUT connector on the rear panel.

Temperature-Dependent Regulators (D)

The −12 VTV and PIN Diode Regulators provide temperature compensation for the Log Amplifier Stages. CR37 and CR38 operate as the temperature sensing elements to control the two voltages. U1A controls Q11 to regulate the −12 VTV supply, which provides a nominal −12V to a filter network for distribution throughout the Log Amplifier assemblies. The −12 VTV voltage is adjusted to provide proper log fidelity; it becomes more negative as temperature increases to correct for variations in log diode resistance. U1B produces a nominal −7V and forms the current source for CR28 and CR29 in the PIN Diode Attenuator. The voltage of U1B pin 7 becomes more negative as temperature increases to control the attenuation of the PIN Diode Attenuator.

ATTEN (C) and −12 VTV Adjustments (D)

The PIN Diode Attenuator adjustment (ATTEN potentiometer R61) is essentially a gain adjustment that varies the slope of the log curve. The −12 VTV adjustment (−12 VTV potentiometer R91 in the Temperature-Dependent Regulators circuit) varies the offset and slope of the log curve. These two adjustments (which interact) are used to set the output versus input curve in log mode. The IF input signal level, which causes a 1V (full screen) output in LINEAR mode, is used as a reference for full-scale deflection in LOG mode. The ATTEN and −12 VTV adjustments are made to give a 1V video output in both LOG and LINEAR modes for the same IF input signal level, and a 100 mV video output change for a 10 dB IF signal change in LOG mode.

Detector (E)

Q1 through Q4 and associated circuitry form a full wave rectifier to convert the IF signal to a video signal. Q4 is the current driver for the detector and converts voltage variations at the Q5 emitter to current variations which drive Q2 and Q3. Q3 is a half wave rectifier and conducts when the signal at the Q5 emitter is positive. The Q3 collector current is applied to the low-pass filter consisting of R75, R76, L12 through L14, and C51 through C54. When the signal at the Q5 collector goes negative, current generated in the Q4 collector is pulled out of the Q2 emitter. Q1 forms a current mirror, which drives current into the low-pass filter when Q2 collector current flows. Thus current flows into the low-pass filter on both positive and negative halves of the IF signal at the Q5 emitter. CR31, CR32, CR33, and R72 keep Q2 and Q3 biased slightly below cutoff. When current flows into the low-pass filter from Q1 or Q3, a positive voltage is developed across R75 and R76. The voltage developed is proportional to the IF signal level at the Q5 emitter. The low-pass filter has a bandwidth of about 7 MHz to remove IF frequencies from the detected video output signal. The detected voltage is applied to unity gain buffer amplifier Q12 and Q13 to drive A4A1 Video Processor. The offset of differential pair Q12 is removed by ZERO adjustment R79.

Counter Output Limiter (F)

The Counter Output Limiter provides an amplitude-limited signal at the IF frequency used for frequency counting. The IF signal from detector driver Q5 is buffered by Q6. CR35 and CR36 are biased to cutoff for signal levels corresponding to greater than a one-division display. In LOG or LINEAR mode, the counter output remains at approximately −30 dBm for signal levels displayed in the top nine divisions of the display.

ManualsPlus.com

A4A2 LOG AMPLIFIER-DETECTOR, TROUBLESHOOTING

If the amplitude of the displayed signals is approximately 10 dB low (i.e., CAL OUTPUT appears to be −20 dBm) in the log mode but correct in the linear display mode, then one of the log amplifier stages in the A4A3 Log Amplifier-Filter board or the A4A2 Log Amplifier-Detector board is defective. Connect a 10 dB step attenuator between the CAL OUTPUT and Spectrum Analyzer input. Refer to the Log Amplifier Stage Gain Check note on the service sheets for the necessary front panel control settings. When forward biased in log mode, the Schottky diodes should have voltage drops of 200 to 400 mV.

The following procedure will determine if the Linear Gain Steps, LG1Ø and LG2Ø, are operating properly. The LG1Ø circuitry is located on the A4A3 Log Amplifier-Filter board while the LG2Ø circuitry is located on the A4A2 Log Amplifier-Detector board. Connect a 10 dB step attenuator set to 0 dB between the CAL OUTPUT and the Spectrum Analyzer input. Press Instrument Preset and key in the following settings:

[CENTER FREQUENCY] ..... equal to the CAL OUTPUT frequency
[FREQUENCY SPAN] ..... 10 kHz
[RES BW] ..... 3 kHz
[ATTEN] ..... 0 dB
[SHIFT] LOG SCALE [ENTER dB/DIV] (Turns off IF Step Gains)
[REFERENCE LEVEL] ..... −60 dBm
SCALE LIN

The peak of the displayed signal should be on the top graticule. Adjust the front panel AMPTD CAL control to place the peak of the signal one division below the top graticule. If the signal limits at the top of the display, one of the Linear Gain Steps is stuck in the on state.

Set the 10 dB step attenuator to 10 dB and key in [REFERENCE LEVEL] −70 dBm. The peak of the displayed signal should be one division below the top graticule. If signal limits at the top of the display, the LG2Ø circuitry is defective. A signal approximately 3 divisions high indicates the LG1Ø circuitry is defective.

Set the 10 dB step attenuator to 20 dB and key in [REFERENCE LEVEL] −80 dBm. The peak of the displayed signal should be one division below the top graticule. The LG1Ø circuitry is defective if the signal limits at the top of the display. The LG2Ø circuitry is faulty if the displayed signal is approximately 3 divisions high.

The detector circuit on the A4A2 Log Amplifier-Detector board is most easily checked with dc voltages. These are derived using 0 Hz [CENTER FREQUENCY] and attenuating the CAL OUTPUT signal. The easiest point to check the Detector output without removing boards is A4A1TP1. Connect a DVM to this test point. The voltage at A4A1TP1 should be +1V for a signal displayed on the top graticule. The output will be 0.1V less for each division down from the top in either the linear or the 10 dB/DIV log modes when the detector is operating properly.

ManualsPlus.com

TABLE 1. A4A2, REPLACEABLE PARTS (1 OF 4)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A2	85662-60096	4	1	LOG AMPLIFIER (INCLUDES A4A2 AND A4A3)	28480	85662-60096
A4A2	85662-60097	5	1	RESTORED 85662-60096	28480	85662-60097
A4A2	85662-60132	9	1	BOARD ASSEMBLY, LOG AMPLIFIER-DETECTOR	28480	85662-60132
A4A2C1				NOT ASSIGNED		
A4A2C2				NOT ASSIGNED		
A4A2C3	0160-2055	9	50	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C4	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C5	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C6	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C7	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C8	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C9	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C10	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C11	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C12	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C13	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C14	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C15	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C16	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C17	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C18	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C19	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C20	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C21	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C22	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C23	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C24	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C25	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C26	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C27	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C28	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C29	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C30	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C31				NOT ASSIGNED		
A4A2C32	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C33	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C34	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C35				NOT ASSIGNED		
A4A2C36	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C37	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C38	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C39	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C40	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C41	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C42	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C43	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C44	0160-4084	8	1	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A4A2C45				NOT ASSIGNED		
A4A2C46	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C47				NOT ASSIGNED		
A4A2C48	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C49	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C50	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C51	0160-2262	0	1	CAPACITOR-FXD 16PF +-5% 500VDC CER 0+-30	28480	0160-2262
A4A2C52	0160-2200	6	1	CAPACITOR-FXD 43PF +-5% 300VDC MICA	28480	0160-2200
A4A2C53	0160-2307	4	1	CAPACITOR-FXD 470PF +-5% 300VDC MICA	28480	0160-2307
A4A2C54	0160-2205	1	1	CAPACITOR-FXD 120PF +-5% 300VDC MICA	28480	0160-2205
A4A2C55	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C56- A4A2C59	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C60				NOT ASSIGNED		
A4A2C61				NOT ASSIGNED		
A4A2C62	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C63	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C64	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C65	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C66	0180-0228	6	1	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A4A2C67				NOT ASSIGNED		
A4A2C68	0160-4297	5	7	CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101H223ZS22-CDH
A4A2C69	0160-4297	5		CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101H223ZS22-CDH
A4A2C70	0160-4297	5		CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101H223ZS22-CDH
A4A2C71	0160-4297	5		CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101H223ZS22-CDH
A4A2C72	0160-4297	5		CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101H223ZS22-CDH

ManualsPlus.com

TABLE 1. A4A2, REPLACEABLE PARTS (2 OF 4)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A2C73	0160-4297	5		CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101H223ZS22-CDH
A4A2C74	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C75	0160-4297	5		CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101H223ZS22-CDH
A4A2CR1-A4A2CR3				NOT ASSIGNED		
A4A2CR4	1901-1085	6	8	DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A2CR5	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A2CR6	1901-1070	9	8	DIODE-PIN 110V	28480	1901-1070
A4A2CR7	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A2CR8	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A2CR9	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A4A2CR10	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A2CR11	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A2CR12	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A4A2CR13	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A2CR14	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A2CR15	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A4A2CR16	1901-0047	8	10	DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A2CR17				NOT ASSIGNED		
A4A2CR18	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A2CR19	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A2CR20	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A2CR21	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A2CR22-A4A2CR25				NOT ASSIGNED		
A4A2CR26	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A4A2CR27	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A4A2CR28	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A4A2CR29	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A4A2CR30	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A2CR31	1910-0016	0	3	DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
A4A2CR32	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
A4A2CR33	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
A4A2CR35	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A2CR36	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A2CR37	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A2CR38	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A2E1	9170-0029	3	8	CORE-SHIELDING BEAD	28480	9170-0029
A4A2E2	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A2E3	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A2E4	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A2E5	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A2E6	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A2E7	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A2E8	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A2J1	1250-0690	6	2	CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
A4A2J2	1250-0690	6		CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
A4A2L1	9100-1618	1	3	INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A2L2	9140-0105	3	2	INDUCTOR RF-CH-MLD 8.2UH 10%	28480	9140-0105
A4A2L3	9140-0114	4	3	INDUCTOR RF-CH-MLD 10UH 10% .166DX.385LG	28480	9140-0114
A4A2L4	9140-0114	4		INDUCTOR RF-CH-MLD 10UH 10% .166DX.385LG	28480	9140-0114
A4A2L5	9100-1619	2	2	INDUCTOR RF-CH-MLD 6.8UH 10%	28480	9100-1619
A4A2L6	9100-1623	8	2	INDUCTOR RF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A4A2L7	9100-1623	8		INDUCTOR RF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A4A2L8	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A2L9	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A2L10	9100-3553	7	1	INDUCTOR RF-CH-MLD 3.9UH 5% .166DX.385LG	28480	9100-3553
A4A2L11				NOT ASSIGNED		
A4A2L12	9140-0105	3		INDUCTOR RF-CH-MLD 8.2UH 10%	28480	9140-0105
A4A2L13	9140-0114	4		INDUCTOR RF-CH-MLD 10UH 10% .166DX.385LG	28480	9140-0114
A4A2L14	9140-0178	0	1	INDUCTOR RF-CH-MLD 12UH 10% .166DX.385LG	28480	9140-0178
A4A2L15-A4A2L49				NOT ASSIGNED		
A4A2L50	9100-1619	2	1	INDUCTOR RF-CH-MLD 6.8UH 10%	28480	9100-1619
A4A2MP1				NOT ASSIGNED		
A4A2MP2				NOT ASSIGNED		
A4A2MP3				NOT ASSIGNED		
A4A2Q1	1853-0075	9	1	TRANSISTOR-DUAL PNP PD=400MW	28480	1853-0075
A4A2Q2	1854-0345	8	2	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A4A2Q3	1853-0015	7	1	TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A4A2Q4	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A4A2Q5	1853-0405	9	1	TRANSISTOR PNP SI PD=300MW FT=850MHZ	04713	2N4209

ManualsPlus.com

TABLE 1. A4A2, REPLACEABLE PARTS (3 OF 4)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A2Q6	1854-0019	3	9	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A2Q7	1853-0281	9	1	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A4A2Q8	1854-0404	0	4	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A2Q9	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A2Q10	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A2Q11	1854-0637	1	1	TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A4A2Q12	1854-0475	5	1	TRANSISTOR-DUAL NPN PD=750MW	28480	1854-0475
A4A2Q13	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A2Q14	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A2Q15	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A2Q16	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A2Q17	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A2Q18	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A2Q19	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A2Q20	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A2Q21	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A2R1	0757-0346	2	9	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A4A2R2	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A4A2R3	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A4A2R4	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A4A2R5	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A4A2R6	0757-0279	0	14	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A2R7	0757-0402	1		RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A4A2R8	0698-3136	8	8	RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A4A2R9	0698-3136	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A4A2R10	0698-3444	1	5	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A4A2R11	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A4A2R12	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A2R13	0757-0280	3	6	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A4A2R14	2100-3161	6	1	RESISTOR-TRMR 20K 10% C SIDE-ADJ 17-TRN	02111	43P203
A4A2R15	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A4A2R16	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A2R17	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A4A2R18*	0757-0402	1	2	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A4A2R19	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A2R20	0698-3136	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A4A2R21	0698-3136	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A4A2R22*	0698-3153	9	3	RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A4A2R23	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A2R24*	0757-0439	4	10	RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A4A2R25	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A2R26	0698-3438	3		RESISTOR 147 1% .125W F TC=0+-100	24546	C4-1/8-T0-147R-F
A4A2R27	0698-3136	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A4A2R28	0698-3136	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A4A2R29	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A4A2R30	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A4A2R31	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A2R32	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A2R33				NOT ASSIGNED		
A4A2R34	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A4A2R35	0757-1094	9	1	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A4A2R36*	0698-3438	3	2	RESISTOR 147 1% .125W F TC=0+-100	24546	C4-1/8-T0-147R-F
A4A2R37	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A2R38	0698-3136	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A4A2R39	0698-3136	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A4A2R40	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A4A2R41	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A4A2R42	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A2R43	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A4A2R44	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A4A2R45	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A4A2R46	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A4A2R47	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A4A2R48	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A4A2R49	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A4A2R50	0757-0442	9	14	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A2R51-A4A2R55				NOT ASSIGNED		
A4A2R56	0757-0438	3	1	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A4A2R57	0757-0458	7	2	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A4A2R58	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A2R59	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A2R60	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A2R61	2100-1972	3	1	RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	02660	3810P-203
A4A2R62*	0757-0199	3	1	RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A4A2R63	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F

*Indicates factory selected value

ManualsPlus.com

TABLE 1. A4A2, REPLACEABLE PARTS (4 OF 4)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A2R64	0757-0394	0	2	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A4A2R65	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A4A2R66	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A2R67	0757-0416	7	3	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A4A2R68				NOT ASSIGNED		
A4A2R69	0698-3437	2	1	RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A4A2R70	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A4A2R71	0698-3446	3	1	RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A4A2R72	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A2R73	0757-0401	0	4	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A4A2R74	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A4A2R75	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A4A2R76	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A4A2R77	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A2R78	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A4A2R79	2100-3103	6	1	RESISTOR-TRMR 10K 10% C SIDE-ADJ 17-TRN	02111	43P103
A4A2R80	0757-0440	7	1	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A4A2R81	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A2R82	0698-3442	9	1	RESISTOR 237 1% .125W F TC=0+-100	24546	C4-1/8-T0-237R-F
A4A2R83	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A4A2R84	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A4A2R85	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A4A2R86*	0698-3154	0	2	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A4A2R87	0698-3152	8	1	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A4A2R88*	0698-3158	4	1	RESISTOR 23.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2372-F
A4A2R89*	0698-3457	6	1	RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3457
A4A2R90	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A4A2R91	2100-2852	0	1	RESISTOR-TRMR 1K 10% WW SIDE-ADJ 20-TRN	02660	3810P-102
A4A2R92	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A4A2R93	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A4A2R94	0683-0275	9	1	RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A4A2R95	0698-3153	9		RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A4A2R96*	0698-3161	9	1	RESISTOR 38.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3832-F
A4A2R97*	0698-8825	2	1	RESISTOR 681K 1% .125W F TC=0+-100	28480	0698-8825
A4A2R98	0698-3153	9		RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A4A2R99*	0757-0461	2	1	RESISTOR 68.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6812-F
A4A2R100	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A2R101	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A4A2R102	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A2R103	0757-0465	6	1	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A4A2R104	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A2R105	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A2R106	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A4A2R107	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A2R108	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A2R109	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A2R110	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A2R111	0757-0123	3	1	RESISTOR 34.8K 1% .125W F TC=0+-100	28480	0757-0123
A4A2R112	0757-0395	1	1	RESISTOR 56.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-56R2-F
A4A2R113	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A4A2R114	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A4A2R115	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A2TP1	1251-0600	0	8	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A2TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A2TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A2TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A2TP5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A2TP6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A2TP7	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A2TP8	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A2U1	5081-8117	3	1	SCREEN 1826-0092	28480	5081-8117
A4A2VR1	1902-0126	6	2	DIODE-ZNR 2.61V 5% DO-7 PD=.4W TC=-.072%	28480	1902-0126
A4A2VR2	1902-0041	4	1	DIODE-ZNR 5.11V 5% DO-35 PD=.4W	28480	1902-0041
A4A2VR3	1902-0126	6		DIODE-ZNR 2.61V 5% DO-7 PD=.4W TC=-.072%	28480	1902-0126
				MISCELLANEOUS PARTS		
	1205-0011	0	1	HEAT SINK	28480	1205-0011
	85662-20040	4	1	COVER LOG AMP DET	28480	85662-20040
	86701-40001	9	1	EXTRACTOR-PC	28480	86701-40001

*Indicates factory selected value

ManualsPlus.com

IF-DISPLAY SECTION

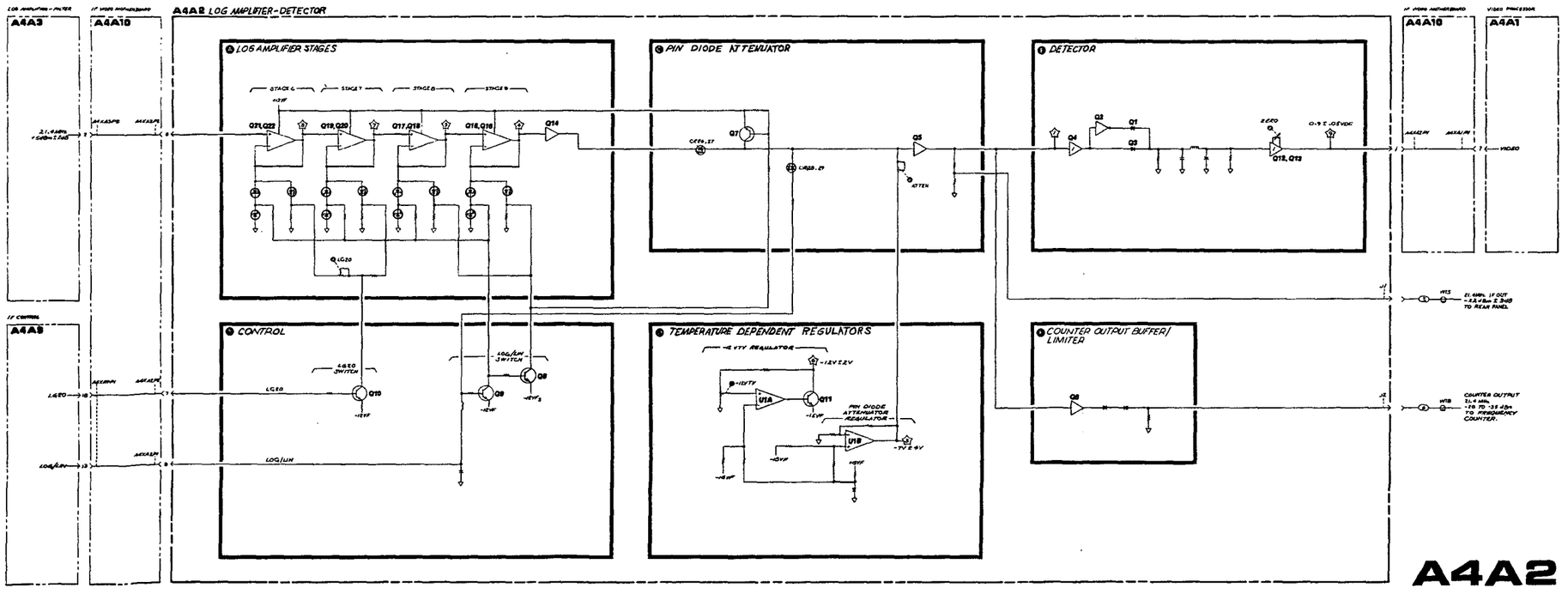


FIGURE 1. A4A2 LOG AMPLIFIER-DETECTOR, BLOCK DIAGRAM

ManualsPlus.com

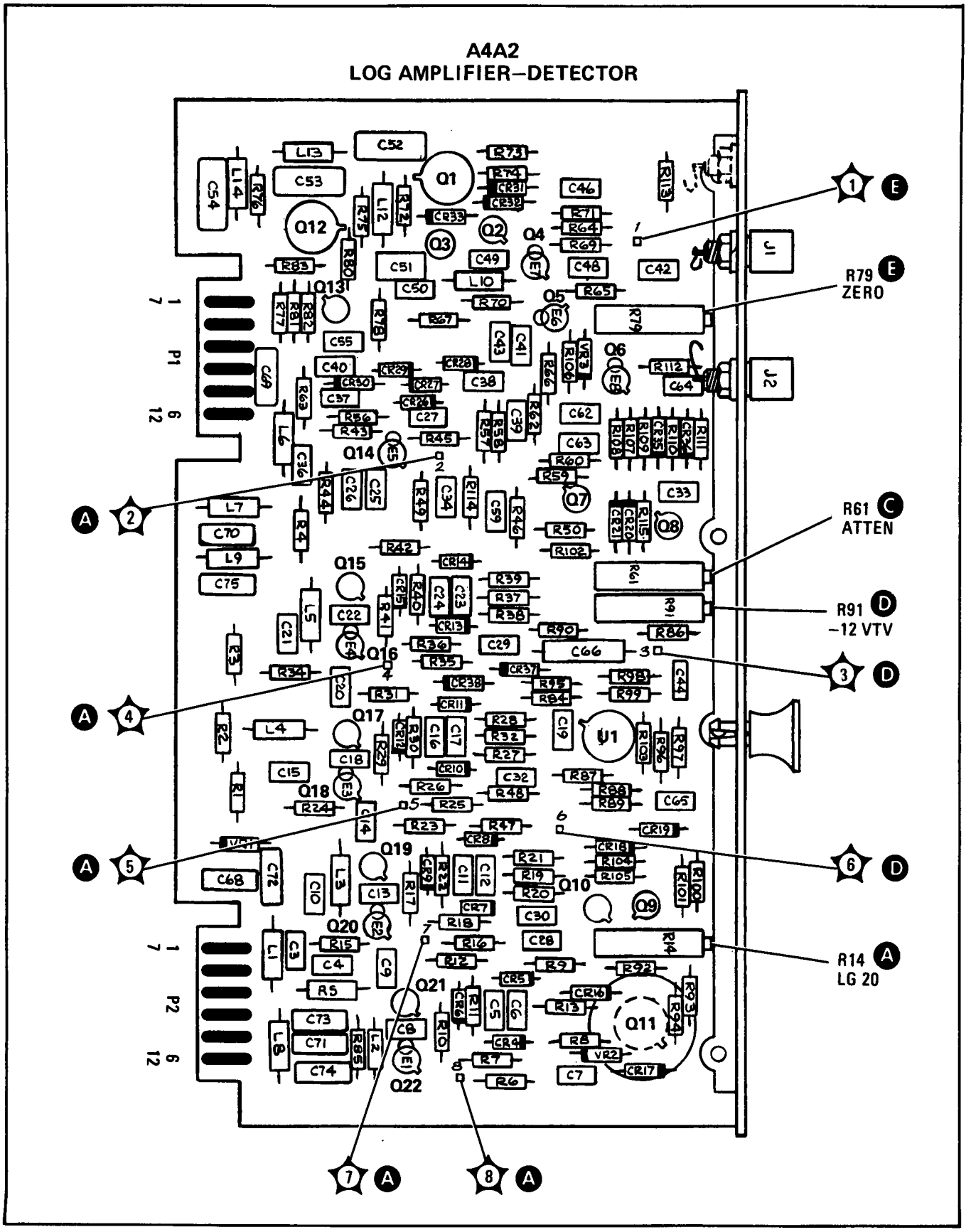


FIGURE 2. A4A2 LOG AMPLIFIER-DETECTOR, COMPONENT LOCATIONS

IF-DISPLAY SECTION

A4A2 LOG AMPLIFIER - DETECTOR
85682-60132

Ⓐ LOG AMPLIFIER STAGES

Ⓑ POWER SUPPLIES

Ⓒ CONTROL

Ⓓ PIN DIODE ATTENUATOR

Ⓔ DETECTOR

Ⓕ TEMPERATURE-DEPENDENT REGULATORS

Ⓖ COUNTER OUTPUT LIMITER

P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	VIDEO	A4A3 P1-7	E
2	GND		G
4	GND		G
3	GND		G
9	LOG/LIN	A4A3 P1-13	B
4	GND		G
10	ARC	A4A3 P1-11	B
5	GND		G
11	GND		G
6	GND		G
12	-12VTV	A4A3 P1-12	D

P2

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	GND		G
7	LO20	A4A3 P1-18	B
7	GND		G
2	21.4 MHz	A4A3 P2-2	A
3	GND		G
8	GND		G
4	GND		G
10	GND		G
5	-15V		D G
11	-12V		D G
6	+15V		G
12	+12V		G

NOTES:

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN IN OHMS (Ω) CAPACITANCE IN IN MICROFARADS (μF) INDUCTANCE IS IN MICROHENRIES (μH)
3. LO20 OPERATION
   CONTROL SETTINGS: (MAIN, PRESET)
   FREQUENCY SPAN 0 Hz
   LINEAR
   RESOLUTION BANDWIDTH 3 KHZ

ATTENUATOR LEVEL	LO20	LOG AMP OUTPUT
19.9 dV	HI (+9V TO +11V)	FORWARD
90 mV	LO (-11V TO -13V)	REVERSE

4. LOG AMPLIFIER STAGE GAIN CHECK:
   CONTROL SETTINGS: (MAIN, PRESET)
   CENTER FREQUENCY 70 MHZ
   FREQUENCY SPAN 0 Hz
   RESOLUTION BANDWIDTH 100 KHz
   REFERENCE LEVEL 0 dBm
   ATTENUATION 10 dB
   CONNECTION OF 8350 ATTENUATOR BETWEEN RF OUTPUT AND SIGNAL INPUT IS ELIMINATED.

80 MHz CALIBRATION ATTENUATED V_1	TEST POINT	LEVEL V_{p-p}
20 dB	TP6 (TP6)	6.1V P-P
30 dB	TP6	1.9V P-P
40 dB	TP6	1.2V P-P
50 dB	TP6	0.37V P-P
60 dB	TP6	0.12V P-P
70 dB	TP6	0.04 PP
80 dB	TP6 (TP6)	0.01 P-P

5. MNEMONIC TABLE:

MNEMONIC	DESCRIPTION
VIDEO	LOG AMP DETECTED OUTPUT
LOG/LIN	LOG-LINEAR CONTROL
ARC	AUTO GAIN CONTROL INPUT
LO20	LINEAR GAIN 20 dB STEP

6. ASTERISK (*) DENOTES A FACTORY SELECTED VALUE. NOMINAL VALUE IS SHOWN. REFER TO SECTION V FOR RANGE OF VALUES.
7. LOG/LINEAR CONTROL LEVELS

	LOG/LIN
LOG	-9V TO -13V
LIN	-15V TO -17V

8. 21.4 MHz IF OUTPUT LEVEL = -12 dBm ±3 dB FOR SIGNALS AT TOP OF SCREEN IF LEVEL IS PROPORTIONAL TO DISPLAYED SIGNAL LEVEL IN 10 dB LOG OR LINEAR.
9. AGC INPUT PROVIDED ONLY WITH FACTORY INSTALLED OPT. 002 APPLICATION, WHEN AGC APPLIED TO LINEAR MODE, GAIN INCREASED AS VOLTAGE INCREASES. WHEN APPLIED TO LOG MODE, GAIN RANGE APPROXIMATELY 25 dB

A4A2

SERIAL PREFIX: 2403A

FIGURE 3. A4A2 LOG AMPLIFIER-DETECTOR, SCHEMATIC DIAGRAM
A4A2 13/14

ManualsPlus.com

ManualsPlus.com

ManualsPlus.com

A4A3 LOG AMPLIFIER-FILTER, CIRCUIT DESCRIPTION

A4A3 Log Amplifier-Filter, with A4A2 Log Amplifier-Detector, provides the ability to display signals in either a linear or log mode. In log mode the calibrated display range is 90 dB. A4A3 contains the first five of nine log stages, and A4A2 contains the last four. A4A3 also contains circuitry for using one of the log stages as a switchable 10 dB gain step. This is used only in linear mode.

After being processed by the first five log amplifier stages, the 21.4 MHz IF signal is applied to the log amplifier filter, the bandwidth of which is either narrow (approximately 1 MHz) or wide (>20 MHz). The filter is in narrow mode for resolution bandwidths of ≤30 kHz to reduce noise generated in the log amplifier stages.

Control lines from A4A9 IF Control drive circuits of A4A3 which control the log amplifier filter, log/linear switching, and 10 dB linear gain step.

Log Amplifier Stages (A)

In LOG mode, the five log amplifier stages in A4A3 and the four log amplifier stages in A4A2 limit their gain in sequence with increasing signal level to provide 90 dB of log display range. In LINEAR mode, signal-level-dependent components are switched out of the signal path, and a linear display is provided.

LOG Mode. A simplified schematic of a log amplifier stage is shown in Figure 1. In LOG mode, the LOG/LIN control line is high (about +7V), Q16 is on, forward biasing log diodes CR25, CR26, and all other log diodes in this assembly. CR25 and CR26 are Schottky diodes with a forward bias voltage of approximately +0.4V. Q11 is an emitter follower used as a voltage source which drives Q12 through the resistance of CR25 and CR26. Q12 forms a common-base amplifier tuned to approximately 21.4 MHz. The gain of the amplifier is set by the ratio of R48 to the total resistance R_T between the emitters of Q11 and Q12 (primarily the resistance of CR25 and CR26). The formula for computing gain is:

$$G = 1 + \frac{316}{R_T}$$

R_T is at a minimum (approximately 150Ω) for small signals. The small-signal gain of the stage (about 10 dB) is set by the dc bias current through the log diodes. As the signal level at the Q11 emitter increases, signal current cancels bias current in the log diodes, increasing R_T. The gain of the stage for large signals is reduced to nearly unity (0 dB) because R_T becomes very large. Signal current flow through R49 keeps the stage gain slightly above unity to compensate for the input loading of the following stage.

Bias Supplies

The −12 VTV is supplied to A4A3 from A4A2. This voltage determines log diode bias current and becomes more negative as temperature increases to compensate for the increased resistance of the log diodes. The same supply is used to compensate the log diodes of the four log stages in A4A2.

LINEAR Mode. (See Figure 1) In LINEAR Mode, log diodes CR15 and CR16 are zero biased, and the limiting action is removed from the stage. R_T is large, and stage gain is nearly unity. Signal flow is through emitter follower Q11 and R48 to Q13.

ManualsPlus.com

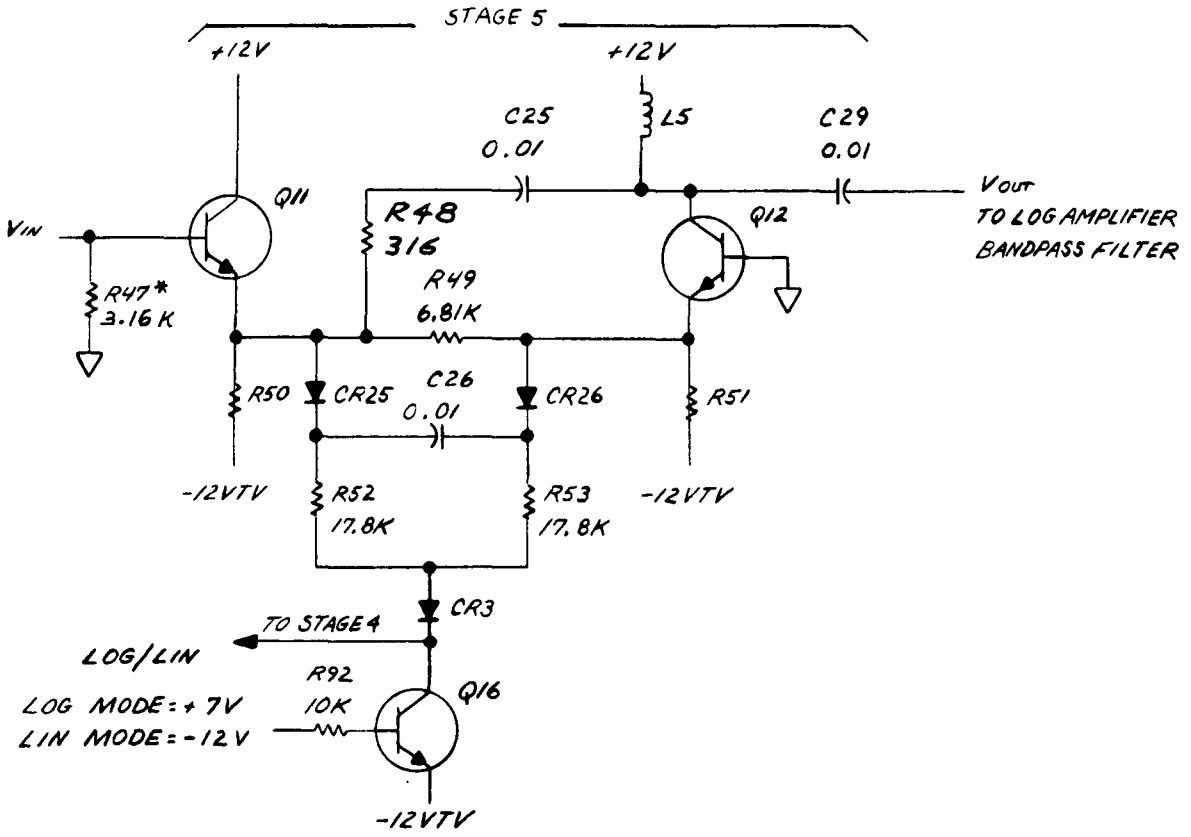


FIGURE 1. LOG AMPLIFIER STAGE, SIMPLIFIED SCHEMATIC

Log Stages. All nine of the log amplifier stages in A4A2 and A4A3 are similar in operation, although there are variations in certain stages. While all stages except the first three contain two log diodes each, the first two stages contain six diodes each, and the third contains four diodes. More diodes are used in Stages 1 through 3 because these stages have their logging action at higher signal levels than the other log stages. Log diodes of Stages 1 and 2 are biased so that the logging action occurs at signal levels of approximately 0 dBm to +10 dBm, whereas the remaining stages log at lower signal levels. To provide proper log fidelity (log amplifier output versus input), attenuation is required between the output of a higher level log stage and the input of a lower level log stage. Resistive divider R20, R29, and R30 attenuates the output of Stage 2, and a similar attenuator is used between Stages 3 and 4. Resistors in series with the log diodes of Stage 1 through 3 are factory-selected to compensate for variations in log diode resistance. Correct stage gain is required for proper log fidelity. Refer to the A4A3 schematic note for the method of checking the gain of Stages 1 through 5 in log mode.

10 dB Linear Gain Step. Stage 5 is used as a switchable 10 dB gain step in linear mode at low reference levels. When control line LG1Ø is low (−12V typical), Q17 is off and CR27 is reverse biased, preventing CR27 from being a signal path. When control line LG1Ø is high (more positive than −3V), the Q17 collector is saturated to the −12 VTV supply, and PIN diode CR27 is forward biased. LG1Ø adjustment R83 sets the bias current (and thus resistance) of PIN diode CR27. The resistance of CR27 plus R54 is set so that the gain of Stage 5 will increase by 10 dB when CR27 is turned on (refer to the foregoing gain formula). Since PIN diode resistance is unaffected by signal level, Stage 5 operates as a non-limiting amplifier. This 10 dB gain step, in conjunction with a similar 20 dB gain step in A4A2, is used for the last 30 dB of step gain (lowest 30 dB of reference level) in linear mode. See the schematic note for the reference levels at which this gain step is checked.

ManualsPlus.com

Bandpass Filters (C)

In narrow resolution bandwidths, noise generated in the log amplifiers is reduced by the Bandpass Filter following Log Amplifier Stage 5. The bandwidth of this filter is switchable between wide (>20 MHz) and narrow (about 1 MHz). In resolution bandwidths of 30 kHz or less, the filter bandwidth is narrow. This reduces the log amplifier noise contribution 90 dB down from the reference level. In resolution bandwidths of 100 kHz and greater, the bandwidth of the filter is wide enough so as not to affect the shape of the wide resolution bandwidth filters (see Figure 2).

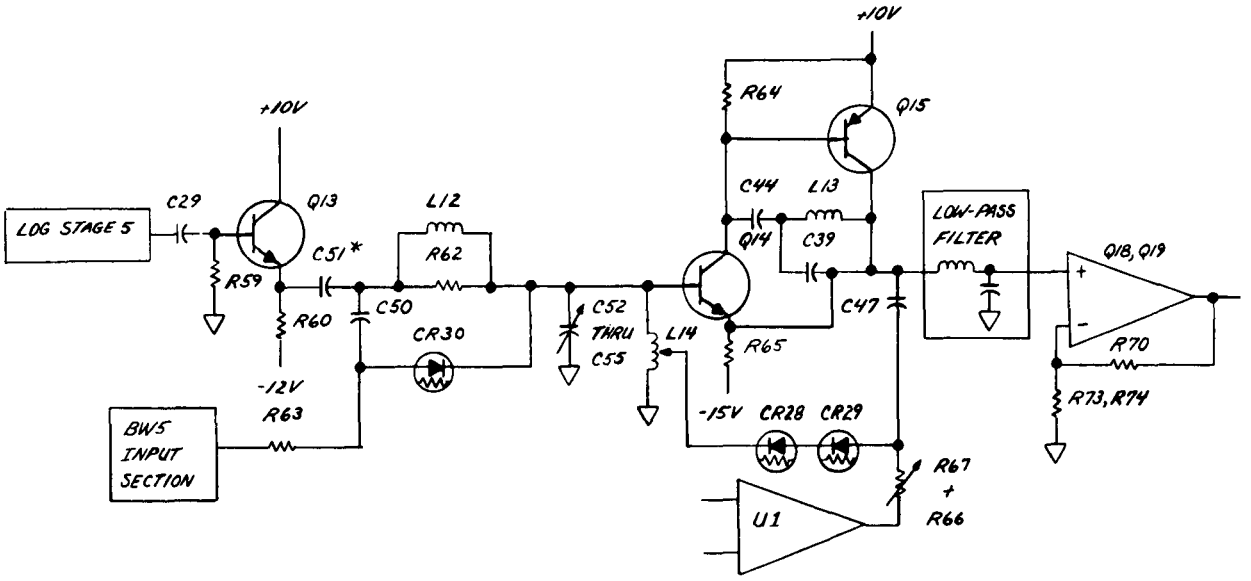


FIGURE 2. BANDPASS FILTER, SIMPLIFIED SCHEMATIC

Bandpass Filter Switching. Emitter follower Q13 buffers the output of Log Amplifier Stage 5 and drives the Bandpass Filter. The filter bandwidth is determined by the resistance through which the LC tank network (L14 and C52 through C55) is driven. In resolution bandwidths of 3 MHz to 100 kHz, bandwidth control line BW5 is high (+15V) and CR30 is forward biased through R63, resulting in a low filter drive impedance and wide bandwidth. When the analyzer resolution bandwidth is less than 100 kHz, BW5 is low (about −0.6V). CR30 is reverse biased, and the LC shunt network is driven through R62, setting the filter bandwidth at about 1 MHz. The signal is buffered by Q14 and Q15. The output of buffer amplifier Q14/Q15 provides a low impedance drive for the Low-Pass Filter. The Buffer Amplifier Q14/Q15 also drives the center tap of L14 through the resistance of PIN diodes CR28 and CR29. This feedback results in an apparent negative input resistance in parallel with L14. The negative input resistance compensates for the parallel resistance present in the tank circuit because of the Q of L14. The gain of the filter in narrow mode is set equal to that in wide mode by setting the resistance CR28 and CR29. The resistance of CR28 and CR29 is set by adjusting the diode bias current with FILTER AMPTD adjustment R67. L13 and C39 are frequency compensation for Q14 and Q15.

BW5 Input Section. TP7 and TP8 provide a means to adjust the bandpass filter for equal gain in wide and narrow modes. This can be done without changing IF bandwidth, which might in itself introduce an amplitude change. With the analyzer in narrow resolution bandwidths (30 kHz through 10 Hz), BW5 is approximately −0.6V, which reverse biases CR30. This places the Bandpass Filter in narrow mode. The center frequency of the bandpass filter can be adjusted with CTR adjustment C55. To place the Bandpass Filter in wide mode, TP7 and TP8 are shorted together with a jumper wire. This forward biases CR30 through R89 and R63. Filter amplitude can then be set with FILTER AMPTD adjustment R67 so that amplitudes are equal in wide (test points jumpered) and narrow (jumper removed) modes.

ManualsPlus.com

Filter Temperature Compensation (D)

The Filter Temperature Compensation circuit stabilizes the gain of the bandpass filter with temperature changes.

Op Amp U1 and associated circuitry provide temperature dependent bias for CR28 and CR29 to compensate for temperature-dependent changes in the Q of L14 and the resistance of CR28 and CR29. As temperature increases, diode bias current increases as the voltage at U1 pin 6 increases. CR5 and CR6 operate as temperature-sensing elements to control the voltage at U1 pin 6.

Low-Pass Filter (E)

The Low-Pass Filter consists of L15, L16, C56 through C59, R67, and R68. It has a bandwidth of about 30 MHz, which removes harmonics of the 21.4 HMz IF signal to reduce log fidelity variations between wide and narrow settings of the Bandpass Filter. The Low-Pass Filter has a loss of 6 dB, which is compensated for by buffer amplifier Q18/Q19, which has a gain of 6 dB. R74* is factory-selected to adjust the gain of Q18/Q19 for proper log fidelity.

ManualsPlus.com

A4A3 LOG AMPLIFIER-FILTER, TROUBLESHOOTING

If the amplitude of the displayed signals is approximately 10 dB low (i.e., CAL OUTPUT appears to be −20 dBm) in the log mode but correct in the linear display mode, then one of the log amplifier stages in the A4A3 Log Amplifier-Filter board or the A4A2 Log Amplifier-Detector board is defective. Connect a 10 dB step attenuator between the CAL OUTPUT and the spectrum analyzer input. Refer to the Log Amplifier Stage Gain Check note on the service sheets for the necessary front panel control settings. When forward biased in log mode, the Schottky diodes should have voltage drops of 200 – 400 mV.

The following procedure will determine if the Linear Gain Steps, LG1Ø and LG2Ø, are operating properly. The LG1Ø circuitry is located on the A4A3 Log Amplifier-Filter Board while the LG2Ø circuitry is located on the A4A2 Log Amplifier-Detector Board. Connect a 10 dB step attenuator set to 0 dB between the CAL OUTPUT and the spectrum analyzer input. Press Instrument Preset and key in the following settings:

CENTER FREQUENCY ..... equal to the CAL OUTPUT frequency
FREQUENCY SPAN ..... 10 kHz
RES BW ..... 3 kHz
ATTEN ..... 0 dB
SHIFT LOG SCALE ENTER dB/DIV (Turns off IF Step Gains)
REFERENCE LEVEL ..... −60 dBm
SCALE LIN

The peak of the displayed signal should be on the top graticule. Adjust the front panel AMPTD CAL control to place the peak of the signal one division below the top graticule. If the signal limits at the top of the display, one of the Linear Gain Steps is stuck in the on state.

Set the 10 dB step attenuator to 10 dB and key in REFERENCE LEVEL −70 dBm. The peak of the displayed signal should be one division below the top graticule. If signal limits at the top of the display, the LG2Ø circuitry is defective. A signal approximately 3 divisions high indicates that the LG1Ø circuitry is defective.

Set the 10 dB step attenuator to 20 dB and key in REFERENCE LEVEL −80 dBm. The peak of the displayed signal should be one division below the top graticule. The LG1Ø circuitry is defective if the signal limits at the top of the display. The LG2Ø circuitry is faulty if the displayed signal is approximately 3 divisions high.

The detector circuit on the A4A2 Log Amplifier-Detector board is most easily checked with dc voltages. These are derived using 0 Hz FREQUENCY SPAN and attenuating the CAL OUTPUT signal. The easiest point to check the Detector output without removing boards is A4A1TP1. Connect a DVM to this test point. The voltage at A4A1TP1 should be +1V for a signal displayed on the top graticule. The output will be 0.1V less for each division down from the top in either the linear or the 10 dB/DIV log modes when the detector is operating properly.

ManualsPlus.com

TABLE 1. A4A3, REPLACEABLE PARTS (1 OF 4)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A3	85662-60096	4	1	LOG AMPLIFIER (INCLUDES A4A2 AND A4A3)	28480	85662-60096
	85662-60097	5		RESTORED 85662-60096	28480	85662-60097
	85662-60009	9	1	BOARD ASSEMBLY, LOG AMPLIFIER	28480	85662-60009
A4A3C1	0160-2055	9	46	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C2	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C3	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C4	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C5	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C6	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C7	0160-2244	8	1	CAPACITOR-FXD 3PF +-.25PF 500VDC CER	28480	0160-2244
A4A3C8	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C9	0160-2236	8	2	CAPACITOR-FXD 1PF +-.25PF 500VDC CER	28480	0160-2236
A4A3C10	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C11	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C12	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C13	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C14	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C15	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C16	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C17	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C18	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C19	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C20	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C21				NOT ASSIGNED		
A4A3C22				NOT ASSIGNED		
A4A3C23	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C24	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C25	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C26	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C27	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C28	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C29	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C30				NOT ASSIGNED		
A4A3C31	0160-4297	5	6	CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101H223ZS22-CDH
A4A3C32	0160-4297	5		CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101H223ZS22-CDH
A4A3C33	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C34	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C35				NOT ASSIGNED		
A4A3C36				NOT ASSIGNED		
A4A3C37	0160-4297	5		CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101H223ZS22-CDH
A4A3C38	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C39	0160-2255	1	1	CAPACITOR-FXD 8.2PF +-.25PF 500VDC CER	28480	0160-2255
A4A3C40	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C41	0160-4297	5		CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101H223ZS22-CDH
A4A3C42	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C43	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C44	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C45	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C46	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C47	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C48	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C49	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C50	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C51*	0160-3536	3	1	CAPACITOR-FXD 620PF +-5% 100VDC MICA	28480	0160-3536
A4A3C52*	0160-2252	8	2	CAPACITOR-FXD 6.2PF +-.25PF 500VDC CER	28480	0160-2252
A4A3C53*	0160-0839	3	1	CAPACITOR-FXD 110PF +-1% 300VDC MICA	28480	0160-0839
A4A3C54	0160-0455	9	1	CAPACITOR-FXD 18PF +-2% 600VDC CER	28480	0160-0455
A4A3C55	0121-0493	3	1	CAPACITOR-V TRMR-AIR 1.7-11PF 175V	74970	187-0306-125
A4A3C56	0160-2251	7	1	CAPACITOR-FXD 5.6PF +-.25PF 500VDC CER	28480	0160-2251
A4A3C57	0160-2236	8		CAPACITOR-FXD 1PF +-.25PF 500VDC CER	28480	0160-2236
A4A3C58	0160-2262	0	1	CAPACITOR-FXD 16PF +-5% 500VDC CER 0+-30	28480	0160-2262
A4A3C59	0160-2252	8		CAPACITOR-FXD 6.2PF +-.25PF 500VDC CER	28480	0160-2252
A4A3C60				NOT ASSIGNED		
A4A3C61	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C62	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C63	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C64				NOT ASSIGNED		
A4A3C65	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C66	0160-4297	5		CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101H223ZS22-CDH
A4A3C67	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C68	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C69	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C70	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055

*Indicates factory selected value

ManualsPlus.com

TABLE 1. A4A3, REPLACEABLE PARTS (2 OF 4)

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A4A3C71	0160-4297	5		CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101H223ZS22-CDH
A4A3CR1	1901-0047	8	5	DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A3CR2	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A3CR3	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A3CR4	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A3CR5	85662-80026	2	2	DTC-SEL1901-0050	28480	85662-80026
A4A3CR6	85662-80026	2		DTC-SEL1901-0050	28480	85662-80026
A4A3CR7	1901-1085	6	20	DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A3CR8	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A3CR9	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A3CR10	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A3CR11	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A3CR12	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A3CR13	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A3CR14	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A3CR15	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A3CR16	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A3CR17	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A3CR18	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A3CR19	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A3CR20	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A3CR21	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A3CR22	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A3CR23	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A3CR24	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A3CR25	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A3CR26	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A4A3CR27	1901-1070	9	4	DIODE-PIN 110V	28480	1901-1070
A4A3CR28	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A4A3CR29	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A4A3CR30	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A4A3CR31	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A3L1	9100-1619	2	1	INDUCTOR RF-CH-MLD 6.8UH 10%	28480	9100-1619
A4A3L2	9140-0105	3	5	INDUCTOR RF-CH-MLD 8.2UH 10%	28480	9140-0105
A4A3L3	9140-0105	3		INDUCTOR RF-CH-MLD 8.2UH 10%	28480	9140-0105
A4A3L4	9140-0105	3		INDUCTOR RF-CH-MLD 8.2UH 10%	28480	9140-0105
A4A3L5	9140-0105	3		INDUCTOR RF-CH-MLD 8.2UH 10%	28480	9140-0105
A4A3L6	9100-1618	1	6	INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A3L7	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A3L8	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A3L9	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A3L10	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A3L11	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A3L12	9100-1623	8	1	INDUCTOR RF-CH-MLD 27UH 5% .166DX.385LG	28480	9100-1623
A4A3L13	9140-0105	3		INDUCTOR RF-CH-MLD 8.2UH 10%	28480	9140-0105
A4A3L14	9100-3854	1	1	INDUCTOR 400NH 10% .3DX1.016LG Q=150	28480	9100-3854
A4A3L15	9140-0111	1	1	INDUCTOR RF-CH-MLD 3.3UH 10%	28480	9140-0111
A4A3L16	9140-0098	3	1	INDUCTOR RF-CH-MLD 2.2UH 10%	28480	9140-0098
A4A3Q1	1854-0345	8	1	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A4A3Q2	1853-0007	7	3	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A4A3Q3	1854-0019	3	11	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A3Q4	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A3Q5	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A4A3Q6	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A3Q7	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A3Q8	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A3Q9	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A3Q10	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A3Q11	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A3Q12	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A3Q13	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A3Q14	1854-0546	1	1	TRANSISTOR NPN SI TO-72 PD=200MW	28480	1854-0546
A4A3Q15	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A4A3Q16	1854-0404	0	2	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A3Q17	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A3Q18	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A3Q19	1853-0405	9	1	TRANSISTOR PNP SI PD=300MW FT=850MHZ	04713	2N4209
A4A3R1				NOT ASSIGNED		
A4A3R2	0757-0346	2	6	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A4A3R3				NOT ASSIGNED		
A4A3R4	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A4A3R5	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F

ManualsPlus.com

TABLE 1. A4A3, REPLACEABLE PARTS (3 OF 4)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A3R6	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A4A3R7	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A4A3R8	0757-0401	0	1	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A4A3R9	0757-0439	4	7	RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A4A3R10	0698-3444	1	7	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A4A3R11	0698-3439	4	3	RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A4A3R12	0698-3429	2	2	RESISTOR 19.6 1% .125W F TC=0+-100	03888	PME55-1/8-T0-19R6-F
A4A3R13	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A3R14	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A3R15*	0757-0316	6	1	RESISTOR 42.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-42R2-F
A4A3R16	0698-0084	9	3	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A4A3R17	0698-3151	7	2	RESISTOR 2.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2871-F
A4A3R18				NOT ASSIGNED		
A4A3R19	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A4A3R20	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A4A3R21	0698-3429	2		RESISTOR 19.6 1% .125W F TC=0+-100	03888	PME55-1/8-T0-19R6-F
A4A3R22	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A4A3R23	0757-0274	5	3	RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1211-F
A4A3R24	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A3R25*	0757-0394	0	2	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A4A3R26	0698-3151	7		RESISTOR 2.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2871-F
A4A3R27	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A4A3R28				NOT ASSIGNED		
A4A3R29*	0698-3440	7	1	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A4A3R30	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A4A3R31	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A4A3R32	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A4A3R33	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A3R34	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A3R35*	0757-0180	2	1	RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A4A3R36	0757-0441	8	2	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A4A3R37	0757-0441	8		RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A4A3R38*	0698-3443	0	1	RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A4A3R39	0698-3446	3	1	RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A4A3R40	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A4A3R41	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A4A3R42	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A3R43	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A3R44	0698-3136	8	4	RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A4A3R45	0698-3136	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A4A3R46				NOT ASSIGNED		
A4A3R47*	0757-0279	0	12	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A3R48	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A4A3R49	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A4A3R50	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A3R51	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A3R52	0698-3136	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A4A3R53	0698-3136	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A4A3R54*	0757-0399	5	1	RESISTOR 82.5 1% .125W F TC=0+-100	24546	C4-1/8-T0-82R5-F
A4A3R55				NOT ASSIGNED		
A4A3R56				NOT ASSIGNED		
A4A3R57	0757-0442	9	6	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A3R58				NOT ASSIGNED		
A4A3R59	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A4A3R60	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A4A3R61	0698-0082	7	2	RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A4A3R62	0757-0274	5		RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1211-F
A4A3R63	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A4A3R64	0698-3439	4		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A4A3R65	0757-0274	5		RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1211-F
A4A3R66*	0757-0466	7	1	RESISTOR 110K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1103-F
A4A3R67	2100-3054	6	1	RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	02111	43P503
A4A3R68	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A4A3R69	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A4A3R70	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A4A3R71	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A4A3R72	0757-0280	3	3	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A4A3R73	0757-0418	9	1	RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A4A3R74*	0698-3153	9	1	RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A4A3R75				NOT ASSIGNED		
A4A3R76	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A3R77	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A3R78	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A3R79*	0757-0458	7	1	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A4A3R80*	0698-0083	8	1	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F

*Indicates factory selected value

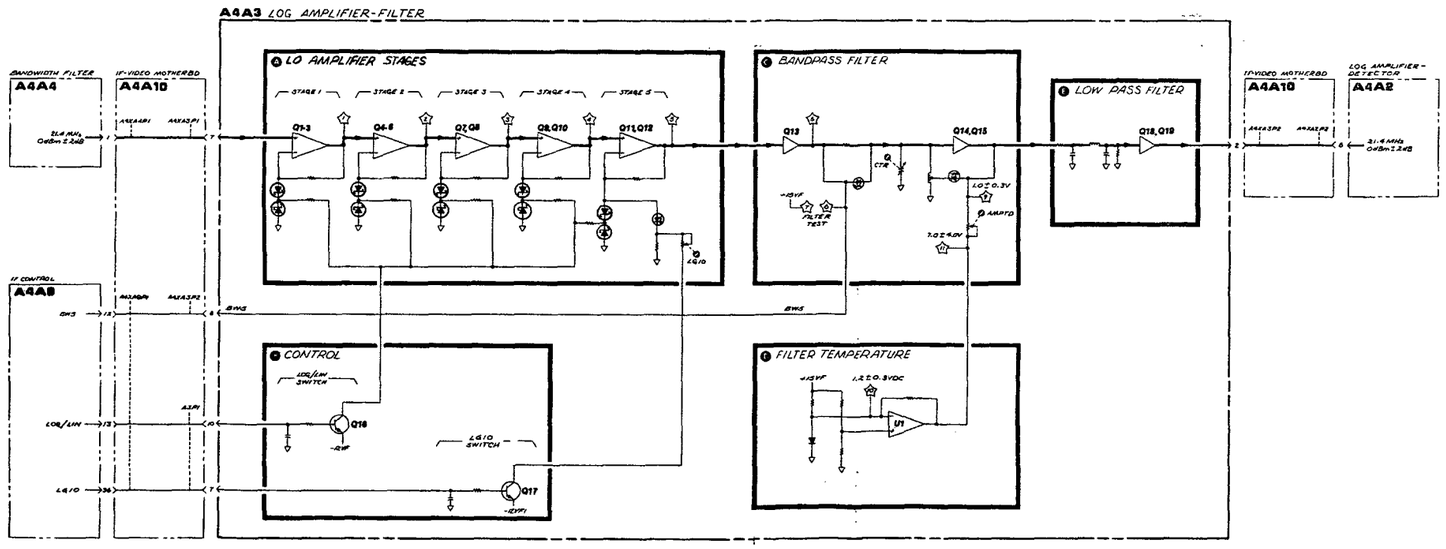
ManualsPlus.com

TABLE 1. A4A3, REPLACEABLE PARTS (4 OF 4)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A3R81*	0757-0447	4	1	RESISTOR 16.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1622-F
A4A3R82	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A3R83	2100-3161	6	1	RESISTOR-TRMR 20K 10% C SIDE-ADJ 17-TRN	02111	43P203
A4A3R84	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A3R85	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A3R86				NOT ASSIGNED		
A4A3R87	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A4A3R88	0698-3160	8	1	RESISTOR 31.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3162-F
A4A3R89	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A4A3R90	0757-0465	6	1	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A4A3R91				NOT ASSIGNED		
A4A3R92	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A3R93	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A4A3TP1	1251-0600	0	11	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A3TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A3TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A3TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A3TP5	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A3TP6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A3TP7	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A3TP8	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A3TP9	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A3TP10	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A3TP11	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A3U1	1826-1058	3	1	IC OP AMP GP 8-TO-99 PKG	28480	1826-1058
A4A3VR1	1902-0126	6	1	DIODE-ZNR 2.61V 5% DO-7 PD=.4W TC=-.072%	28480	1902-0126
A4A3VR2	1902-0579	3	1	DIODE-ZNR 5.1V 5% PD=1W IR=10UA	28480	1902-0579
A4A3VR3	1902-0041	4	1	DIODE-ZNR 5.11V 5% DO-35 PD=.4W	28480	1902-0041
				MISCELLANEOUS PARTS		
	6960-0016	0	2	PLUG-HOLE TR-HD FOR .125-D-HOLE NYL	28480	6960-0016
	6960-0069	3	3	PLUG-HOLE CNCL-HD FOR .125-D-HOLE NYL	28480	6960-0069
	85662-20037	9	1	COVER LOG AMPLIFIER	28480	85662-20037

*Indicates factory selected value

ManualsPlus.com



A4A3

FIGURE 3. A4A3 LOG AMPLIFIER-FILTER, BLOCK DIAGRAM

ManualsPlus.com

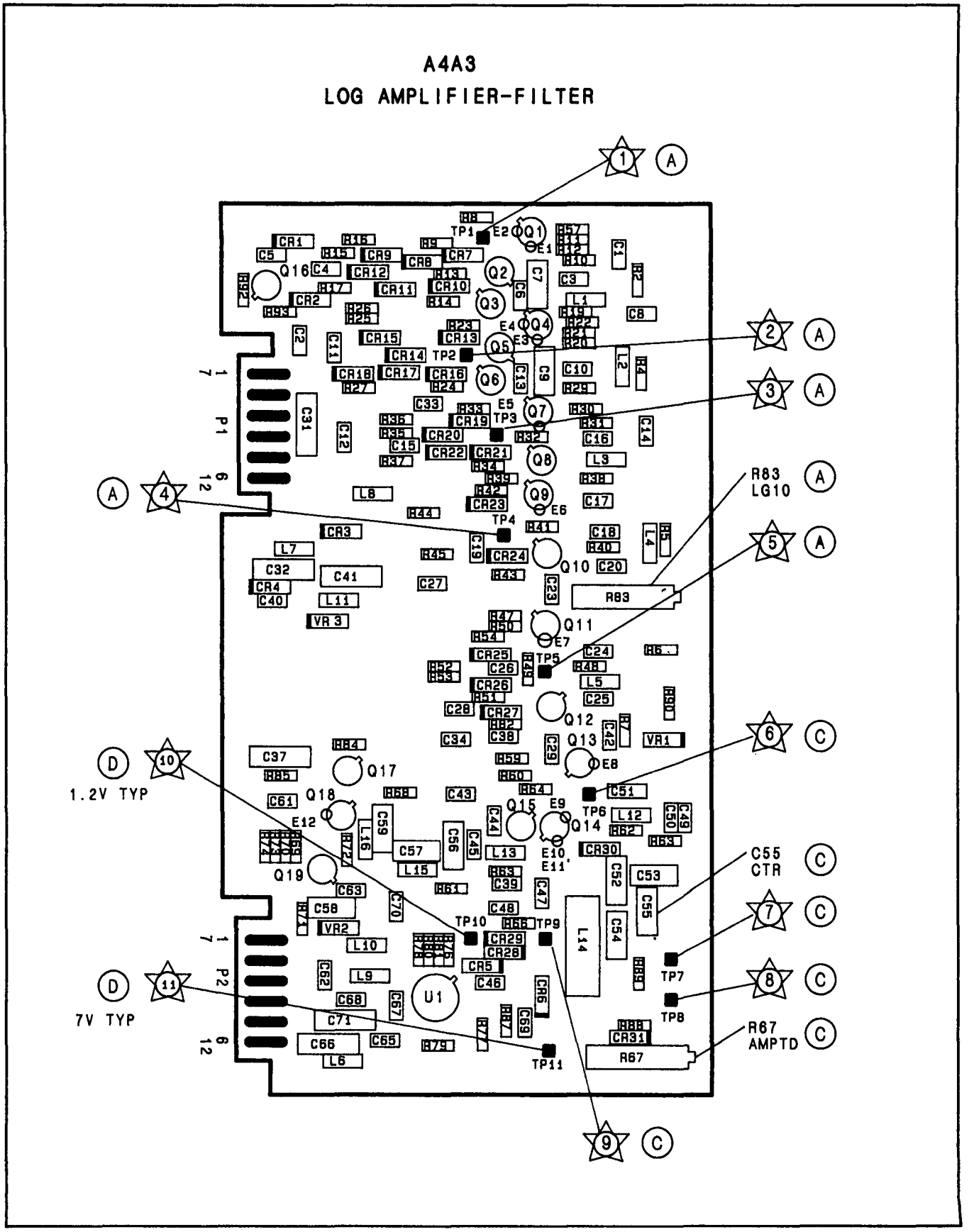


FIGURE 4. A4A3 LOG AMPLIFIER-FILTER, COMPONENT LOCATIONS

F-DISPLAY SECTION

A4A3 LOG AMPLIFIER-FILTER
85662-60009

P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	GND		F
2	P1.A4A1	A4A3P1-1	A
3	GND		F
4	GND		F
5	GND		F
6	GND		F
7	GND		F
8	GND		F
9	GND		F
10	LOG/LIN	A4A3P1-10	B
11	GND		F
12	AGC	A4A3P1-12	B
13	GND		F
14	-12VTV	A4A3P1-14	F

P2

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	GND		F
2	LOG	A4A3P1-26	B
3	P1.A4A1	A4A3P2-3	C
4	GND	A4A3P1-19	C
5	GND		F
6	GND		F
7	GND		F
8	GND		F
9	+12V		F
10	+15V		F
11	GND		F
12	+15V		F
13	-15V		F

Ⓐ LOG AMPLIFIER STAGES

Ⓑ BANDPASS FILTER

Ⓒ CONTROL

Ⓓ FILTER TEMPERATURE COMPENSATION

Ⓔ LOW-PASS FILTER

Ⓕ POWER SUPPLIES

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (μF) INDUCTANCE IS IN MICROHENRIES (μH)
3. * INDICATES FACTORY SELECTED COMPONENT. TYPICAL VALUE SHOWN.
4. BANDPASS FILTER MODE/BANDWIDTH CONDITIONS:

BW	RESOLUTION BW	FILTER SECTION
10 +27.5V (TYP) 50Ω	100KHZ TO 3MHz	BANDPASS (SHAPE FACTOR=5)
10 +5V (TYP) 1MΩ	10KHz TO 80 Hz	NARROW BANDPASS (SHAPE FACTOR=15)
	1KHz	REVERSE

5. FOR ADJUSTMENT OF BANDPASS FILTER FOR 10.7MHZ TEST POINT CHECK FORWARD BANDPASS FILTER IN "FREQ" MODE WITH 10 KHz BANDW.
6. LOG/LIN OPERATION: LOG/LIN SETTINGS: (LIMITER PRESET) LOG/LIN OPERATION BAR LOG/LIN RESOLUTION BANDWIDTH 3KHz

REFERENCE LEVEL	LOG	CRT1 B2A5
10 V 50 1W	+10 TO +19V	FORMATS
50 1W	LOG 1V/dB TO -10V	REVERSE

7. LOG AMPLIFIER RETURN GAIN CHECK: CONTROL SETTINGS: (LIMITER PRESET)
   - SOURCE CAL FREQ: ..... CAL OUT FIXED.
   - SOURCE ATTEN: 10dB
   - PER REF: ..... LOG/LIN
   - REFERENCE LEVEL: ..... +10dBm
   - ATTENUATOR: 10dB
   - CONNECTIONS: ATTENUATOR BETWEEN CAL OUTPUT AND SIGNAL INPUT.
   - CONNECTOR

TEMP. CALIBRATION ATTENUATOR BY	TEST POINT	LIMITER 1.25V
5dB	1	PC-FT 765mV Min
10dB	1	765mV Min
20dB	2	765mV Min
30dB	3	280mV Min
40dB	4	105mV Min
50dB	5	105mV Min
60dB	5	105mV Min

8. MNEMONIC TABLE:

MNEMONIC	DESCRIPTION
A3J9	STRAIN GAGE STEP SIGNAL
LOG/LIN	LOG-LINEAR CONTROL
AGC	AUTOMATIC GAIN CONTROL VOLTAGE INPUT
BWR	BANDWIDTH CONTROL LINE 9

9. C83 AND C93 IS FACTORY SELECTED IF NECESSARY TO ADJUST FILTER CENTER FREQUENCY.
10. RR1, 15 FACTORY SELECTED FOR TEMPERATURE COMPENSATION AND MAY NOT BE PRESENT.
11. LOG/LIN CONTROL LEVELS:

	LOG/LIN
LOW	3V TO 15V
HIGH	+15V TO +17V

12. REFER TO NOTE 5 ON A4A3 LOG AMPLIFIER SELECTOR SCHEMATIC.
13. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.

SERIAL PREFIX: 2403A

A4A3

FIGURE 5. A4A3 LOG AMPLIFIER-FILTER, SCHEMATIC DIAGRAM
A4A3 15/16

ManualsPlus.com

ManualsPlus.com

A4A4 Bandwidth Filter

ManualsPlus.com

A4A4 BANDWIDTH FILTER, CIRCUIT DESCRIPTION

A4A4 Bandwidth Filter determines the bandwidth of the 21.4 MHz IF in conjunction with A4A8 Attenuator-Bandwidth Filter. A4A4 is very similar to A4A8 except that it does not have a switchable gain input amplifier, and it has an extra stage of crystal filtering. Only the 10 dB Gain Input Buffer Amplifier will be described here. For descriptions of the other circuits in A4A4, refer to descriptions of the corresponding circuits in A4A8.

Input Buffer Amplifier (A)

The 10 dB Input Buffer Amplifier (Figure 1) functions as a noninverting op amp.

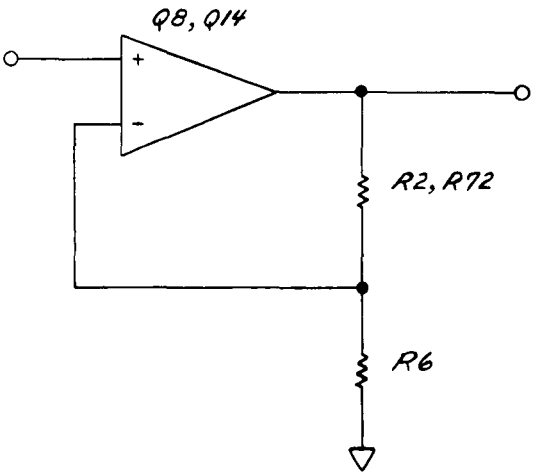


FIGURE 1. A4A4 INPUT BUFFER AMPLIFIER, EQUIVALENT CIRCUIT

In the crystal mode (30 kHz, 10 kHz, and 3 kHz bandwidths), the amplifier includes Q7. The biasing of the amplifier is independent of its RF (21.4 MHz) operation but is very critical for its proper functioning. If a malfunction occurs, the dc bias should be checked first.

The current through Q14 is determined by the difference between two current sources, one involving Q7 and the other involving Q8 (see Figure 2). The most convenient way to find the current from each source is to measure the voltage across each emitter resistor (A 1 kΩ resistor should be used in series with the voltmeter probe tip to prevent the circuit from oscillating and giving an erroneous reading). For Q7, the current through R90 must be included. If results are inconsistent, the emitter resistor should be checked also. Check to see that the BW5 line is at the voltage specified on the schematic.

In the LC mode (the four wider bandwidths), the BW5 line goes to approximately +14.8V and turns off the current source Q7. The current supplied by Q7 in the crystal mode is now supplied through CR1 and R12 from the BW5 line. In the LC mode, the current through Q14 can be found by subtracting the current through R12 from the current through R4.

ManualsPlus.com

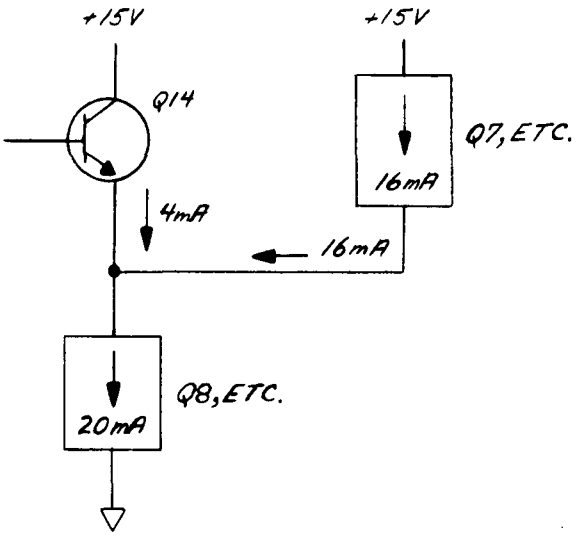


FIGURE 2. A4A4 INPUT BUFFER AMPLIFIER, CURRENT SINKS

ManualsPlus.com

TABLE 1. A4A4, REPLACEABLE PARTS (1 OF 5)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A4	85662-60184	1	1	BANDWIDTH FILTER	28480	85662-60184
A4A4C1	0160-4832	4	51	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C2	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C3	0160-5899	5	1	CAPACITOR-FXD 7.5PF +-.5PF 200VDC CER	28480	0160-5899
A4A4C4	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C5	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C6	0160-4833	5	3	CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A4C7	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C8	0160-4791	4	3	CAPACITOR-FXD 10PF +-5% 100VDC CER 0+-30	28480	0160-4791
A4A4C9	0121-0059	7	3	CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	73899	DV11PR8A
A4A4C10*	0160-4795	8	3	CAPACITOR-FXD 4.7PF +-.5PF 100VDC CER	28480	0160-4795
A4A4C11	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C13	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C14	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C15	0160-4574	1	2	CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A4A4C16	0160-0437	7	2	CAPACITOR-FXD 12PF +-5% 500VDC CER	28480	0160-0437
A4A4C17*	0160-0134	1	4	CAPACITOR-FXD 220PF +-5% 300VDC MICA	28480	0160-0134
A4A4C18	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C19	0121-0036	0	2	CAPACITOR-V TRMR-CER 5.5-18PF 350V	73899	DV11PR18A
A4A4C20	0121-0444	4	3	CAPACITOR-V TRMR-CER 3-9PF 160V PC-MTG	28480	0121-0444
A4A4C21	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C22	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C23	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C24	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C25	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C26	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C27	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C28	0140-0194	1	1	CAPACITOR-FXD 110PF +-5% 300VDC MICA	72136	DM15F111J0300WV1
A4A4C29	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C30	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C31	0160-2207	3	3	CAPACITOR-FXD 300PF +-5% 300VDC MICA	28480	0160-2207
A4A4C32	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C33	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A4C34	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C35	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C36	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C37	0160-4791	4		CAPACITOR-FXD 10PF +-5% 100VDC CER 0+-30	28480	0160-4791
A4A4C38*	0160-4795	8		CAPACITOR-FXD 4.7PF +-.5PF 100VDC CER	28480	0160-4795
A4A4C39	0121-0059	7		CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	73899	DV11PR8A
A4A4C40	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C41	0121-0452	4	2	CAPACITOR-V TRMR-AIR 1.3-5.4PF 175V	74970	187-0103-028
A4A4C43	0121-0452	4		CAPACITOR-V TRMR-AIR 1.3-5.4PF 175V	74970	187-0103-028
A4A4C46	0160-4835	7	3	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A4A4C47	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C48	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C49	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C50	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C52	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C53	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C54	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C55	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A4C56	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C57	0160-2207	3		CAPACITOR-FXD 300PF +-5% 300VDC MICA	28480	0160-2207
A4A4C58	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C59	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C60	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C61	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C62	0160-4574	1		CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A4A4C63	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C64	0160-4791	4		CAPACITOR-FXD 10PF +-5% 100VDC CER 0+-30	28480	0160-4791
A4A4C65	0121-0059	7		CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	73899	DV11PR8A

ManualsPlus.com

TABLE 1. A4A4, REPLACEABLE PARTS (2 OF 5)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A4C66*	0160-4795	8		CAPACITOR-FXD 4.7PF +-.5PF 100VDC CER	28480	0160-4795
A4A4C67	0121-0036	0		CAPACITOR-V TRMR-CER 5.5-18PF 350V	73899	DV11PR18A
A4A4C68	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C69	0160-0437	7		CAPACITOR-FXD 12PF +-5% 500VDC CER	28480	0160-0437
A4A4C70*	0160-0134	1		CAPACITOR-FXD 220PF +-5% 300VDC MICA	28480	0160-0134
A4A4C71	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C72	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C73	0121-0444	4		CAPACITOR-V TRMR-CER 3-9PF 160V PC-MTG	28480	0121-0444
A4A4C74	0121-0444	4		CAPACITOR-V TRMR-CER 3-9PF 160V PC-MTG	28480	0121-0444
A4A4C76	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C77	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C78	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C79	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C80	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C81	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C84	0160-2207	3		CAPACITOR-FXD 300PF +-5% 300VDC MICA	28480	0160-2207
A4A4C86	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C87	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A4A4C88	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A4A4C89	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C90	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C91	0160-5902	1	3	CAPACITOR-FXD 11PF +-5% 200VDC CER 0+-30	28480	0160-5902
A4A4C92	0160-0134	1		CAPACITOR-FXD 220PF +-5% 300VDC MICA	28480	0160-0134
A4A4C93	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C94	0160-5902	1		CAPACITOR-FXD 11PF +-5% 200VDC CER 0+-30	28480	0160-5902
A4A4C95	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C96	0160-5902	1		CAPACITOR-FXD 11PF +-5% 200VDC CER 0+-30	28480	0160-5902
A4A4C97	0160-0134	1		CAPACITOR-FXD 220PF +-5% 300VDC MICA	28480	0160-0134
A4A4C98	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A4C99	0160-6634	8	3	CAPACITOR-FXD 9PF +-.5PF 50VDC CER	28480	0160-6634
A4A4C100	0160-6634	8		CAPACITOR-FXD 9PF +-.5PF 50VDC CER	28480	0160-6634
A4A4C101	0160-6634	8		CAPACITOR-FXD 9PF +-.5PF 50VDC CER	28480	0160-6634
A4A4CR1	1901-0047	8	11	DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A4CR3	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A4CR4	1901-1070	9	6	DIODE-PIN 110V	28480	1901-1070
A4A4CR5	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A4A4CR6	1901-0535	9	8	DIODE-SM SIG SCHOTTKY	28480	1901-0535
A4A4CR7	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A4CR8	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A4A4CR10	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A4CR12	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A4CR13	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A4A4CR14	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A4A4CR15	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A4CR16	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A4A4CR18	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A4CR19	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A4A4CR20	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A4CR21	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A4A4CR22	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A4A4CR23	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A4CR24	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A4A4CR25	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A4A4CR27	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A4A4CR28	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A4A4CR29	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A4CR30	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A4E1	9170-0029	3	16	CORE-SHIELDING BEAD	28480	9170-0029
A4A4E2	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A4E3	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A4E4	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A4E5	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A4E6	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A4E7	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A4E8	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A4E9	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A4E10	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029

ManualsPlus.com

TABLE 1. A4A4, REPLACEABLE PARTS (3 OF 5)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A4E11	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A4E12	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A4E13	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A4E14	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A4E15	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A4E16	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A4L1	9100-1641	0	1	INDUCTOR RF-CH-MLD 240UH 5%	28480	9100-1641
A4A4L2	9100-0539	3	3	INDUCTOR (MISC ITEM)	28480	9100-0539
A4A4L3	9140-0398	6	2	INDUCTOR RF-CH-MLD 12UH 5%	28480	9140-0398
A4A4L4	85662-60188	5	2	COIL ASSY 21 MHZ	28480	85662-60188
A4A4L5	9140-0399	7	3	INDUCTOR RF-CH-MLD 2.2UH 5%	28480	9140-0399
A4A4L6	9100-3912	2	3	INDUCTOR RF-CH-MLD 15UH 5%	28480	9100-3912
A4A4L7	9140-0453	4	2	INDUCTOR RF-CH-MLD 6.8UH 5% .166DX.385LG	28480	9140-0453
A4A4L8	9140-0399	7		INDUCTOR RF-CH-MLD 2.2UH 5%	28480	9140-0399
A4A4L9	9100-3560	6	7	INDUCTOR RF-CH-MLD 5.6UH 5%	28480	9100-3560
A4A4L10	9100-3560	6		INDUCTOR RF-CH-MLD 5.6UH 5%	28480	9100-3560
A4A4L12	9100-3560	6		INDUCTOR RF-CH-MLD 5.6UH 5%	28480	9100-3560
A4A4L13	9100-3912	2		INDUCTOR RF-CH-MLD 15UH 5%	28480	9100-3912
A4A4L14	9100-3560	6		INDUCTOR RF-CH-MLD 5.6UH 5%	28480	9100-3560
A4A4L15	9100-0539	3		INDUCTOR (MISC ITEM)	28480	9100-0539
A4A4L16	9100-0539	3		INDUCTOR (MISC ITEM)	28480	9100-0539
A4A4L17	9140-0398	6		INDUCTOR RF-CH-MLD 12UH 5%	28480	9140-0398
A4A4L18	85662-60188	5		COIL ASSY 21 MHZ	28480	85662-60188
A4A4L19	9140-0399	7		INDUCTOR RF-CH-MLD 2.2UH 5%	28480	9140-0399
A4A4L20	9140-0453	4		INDUCTOR RF-CH-MLD 6.8UH 5% .166DX.385LG	28480	9140-0453
A4A4L22	9100-3912	2		INDUCTOR RF-CH-MLD 15UH 5%	28480	9100-3912
A4A4L24	9100-3560	6		INDUCTOR RF-CH-MLD 5.6UH 5%	28480	9100-3560
A4A4L25	9100-3560	6		INDUCTOR RF-CH-MLD 5.6UH 5%	28480	9100-3560
A4A4L26	9100-3560	6		INDUCTOR RF-CH-MLD 5.6UH 5%	28480	9100-3560
A4A4L27	9100-3562	8	3	INDUCTOR RF-CH-MLD 4.7UH 5%	28480	9100-3562
A4A4L28	9100-3562	8		INDUCTOR RF-CH-MLD 4.7UH 5%	28480	9100-3562
A4A4L29	9100-3562	8		INDUCTOR RF-CH-MLD 4.7UH 5%	28480	9100-3562
A4A4Q1	1855-0267	5	3	TRANSISTOR J-FET N-CHAN D-MODE TO-92 SI	28480	1855-0267
A4A4Q2	1853-0007	7	7	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A4A4Q3	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A4A4Q4	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A4A4Q5	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A4A4Q6	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A4A4Q7	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A4A4Q8	1854-0404	0	3	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A4Q9	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A4A4Q10	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A4Q11	1855-0267	5		TRANSISTOR J-FET N-CHAN D-MODE TO-92 SI	28480	1855-0267
A4A4Q12	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A4Q13	1855-0267	5		TRANSISTOR J-FET N-CHAN D-MODE TO-92 SI	28480	1855-0267
A4A4Q14	1854-0345	8	1	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A4A4R1	0757-0441	8	1	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	CT4-1/8-TO-8251-
A4A4R2	0698-3431	6	2	RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-TO-23R
A4A4R3*	0698-8819	4	1	RESISTOR 3.83 1% .125W F TC=0+-100	28480	0698-8819
A4A4R4	0757-0401	0	4	RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-TO-101-F
A4A4R5	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-TO-1002-
A4A4R6	0757-0397	3	1	RESISTOR 68.1 1% .125W F TC=0+-100	24546	CT4-1/8-TO-68R1-
A4A4R7	0698-3155	1	3	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8-TO-4641-
A4A4R8	0757-0280	3	7	RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-TO-1001-
A4A4R9	0757-0438	3	6	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-TO-5111-
A4A4R10	0698-3441	8	3	RESISTOR 215 1% .125W F TC=0+-100	24546	CT4-1/8-TO-215R-
A4A4R11	0757-0443	0	3	RESISTOR 11K 1% .125W F TC=0+-100	24546	CT4-1/8-TO-1102-
A4A4R12	0698-0082	7	4	RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-TO-4640-
A4A4R13	0698-3444	1	3	RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-TO-316R-
A4A4R14	0698-3442	9	3	RESISTOR 237 1% .125W F TC=0+-100	24546	CT4-1/8-TO-237R-
A4A4R15	0757-0279	0	3	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	CT4-1/8-TO-3161-
A4A4R16*	0757-0442	9	6	RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-TO-1002-
A4A4R17	0698-3156	2	4	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	CT4-1/8-TO-1472-
A4A4R18	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	CT4-1/8-TO-1472-
A4A4R19	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-TO-1001-
A4A4R20*	0698-3154	0	6	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	CT4-1/8-TO-4221-F

ManualsPlus.com

TABLE 1. A4A4, REPLACEABLE PARTS (4 OF 5)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A4R21	0757-0290	5	6	RESISTOR 6.19K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-619
A4A4R22	0757-0290	5		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-619
A4A4R24	0698-3431	6		RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-23R
A4A4R25	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A4A4R26	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-
A4A4R27	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4641-
A4A4R28	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-
A4A4R29	0757-0443	0		RESISTOR 11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1102-
A4A4R30	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-
A4A4R31	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	CT4-1/8-T0-215R-
A4A4R32	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-
A4A4R33	0698-3442	9		RESISTOR 237 1% .125W F TC=0+-100	24546	CT4-1/8-T0-237R-
A4A4R34	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3161-
A4A4R35*	0757-0418	9	1	RESISTOR 619 1% .125W F TC=0+-100	24546	CT4-1/8-T0-619R-
A4A4R37	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-
A4A4R39	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-
A4A4R40*	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4221-
A4A4R41	0757-0290	5		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-619
A4A4R43	2100-3163	8	1	RESISTOR-TRMR 1M 20% C SIDE-ADJ 17-TRN	73138	89PR1M
A4A4R45*	0757-0346	2	1	RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A4A4R46	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-
A4A4R48	0757-0290	5		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-619
A4A4R49	2100-3052	4	1	RESISTOR-TRMR 50 10% C SIDE-ADJ 17-TRN	73138	89PR50
A4A4R50	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A4A4R51	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-
A4A4R52	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4641-
A4A4R53	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-
A4A4R54	0757-0443	0		RESISTOR 11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1102-
A4A4R55	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-
A4A4R56	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	CT4-1/8-T0-215R-
A4A4R57	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-
A4A4R58	0698-3442	9		RESISTOR 237 1% .125W F TC=0+-100	24546	CT4-1/8-T0-237R-
A4A4R59	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3161-
A4A4R60*	0757-0288	1	1	RESISTOR 9.09K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-909
A4A4R61	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1472-
A4A4R62	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1472-
A4A4R63	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-
A4A4R64*	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4221-
A4A4R65*	0698-0083	8	1	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1961-
A4A4R66	0757-0290	5		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-619
A4A4R67	0757-0290	5		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-619
A4A4R68	0757-0417	8	1	RESISTOR 562 1% .125W F TC=0+-100	24546	CT4-1/8-T0-562R-
A4A4R70	0698-3440	7	1	RESISTOR 196 1% .125W F TC=0+-100	24546	CT4-1/8-T0-196R-
A4A4R72	0698-3438	3	1	RESISTOR 147 1% .125W F TC=0+-100	24546	CT4-1/8-T0-147R-
A4A4R73	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-
A4A4R74	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-
A4A4R75	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-
A4A4R76	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-
A4A4R82	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A4A4R83	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-
A4A4R84	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-
A4A4R85	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-
A4A4R88	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4221-
A4A4R89	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4221-
A4A4R90	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4221-
A4A4R91	0757-0180	2	3	RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A4A4R92	0757-0180	2		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A4A4R93	0757-0180	2		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A4A4R94*	0757-0465	6	2	RESISTOR 100K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1003-
A4A4R95	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1003-
A4A4R96	0757-0420	3	1	RESISTOR 750 1% .125W F TC=0+-100	24546	CT4-1/8-T0-751-F
A4A4TP1	0360-1788	7	6	CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A4TP2	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A4TP3	1251-0600	0	2	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A4TP4	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A4TP5	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788

ManualsPlus.com

TABLE 1. A4A4, REPLACEABLE PARTS (5 OF 5)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A4TP6	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A4TP7	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A4TP8	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A4VR1	1902-0048	1	1	DIODE-ZNR 6.81V 5% DO-35 PD=.4W	28480	1902-0048
				A4A4 MISCELLANEOUS PARTS		
	0470-0440	9	1	COATING DOW CORNING 3140 SIL-RBR-RTV 1P	28480	0470-0440
	2190-0401	0	4	WASHER-FL NM NO. 4 .12-IN-ID .312-IN-OD	28480	2190-0401
	6960-0016	0	2	PLUG-HOLE TR-HD FOR .125-D-HOLE NYL	28480	6960-0016
	85662-20153	0	1	CR BW FILTER	28480	85662-20153

ManualsPlus.com

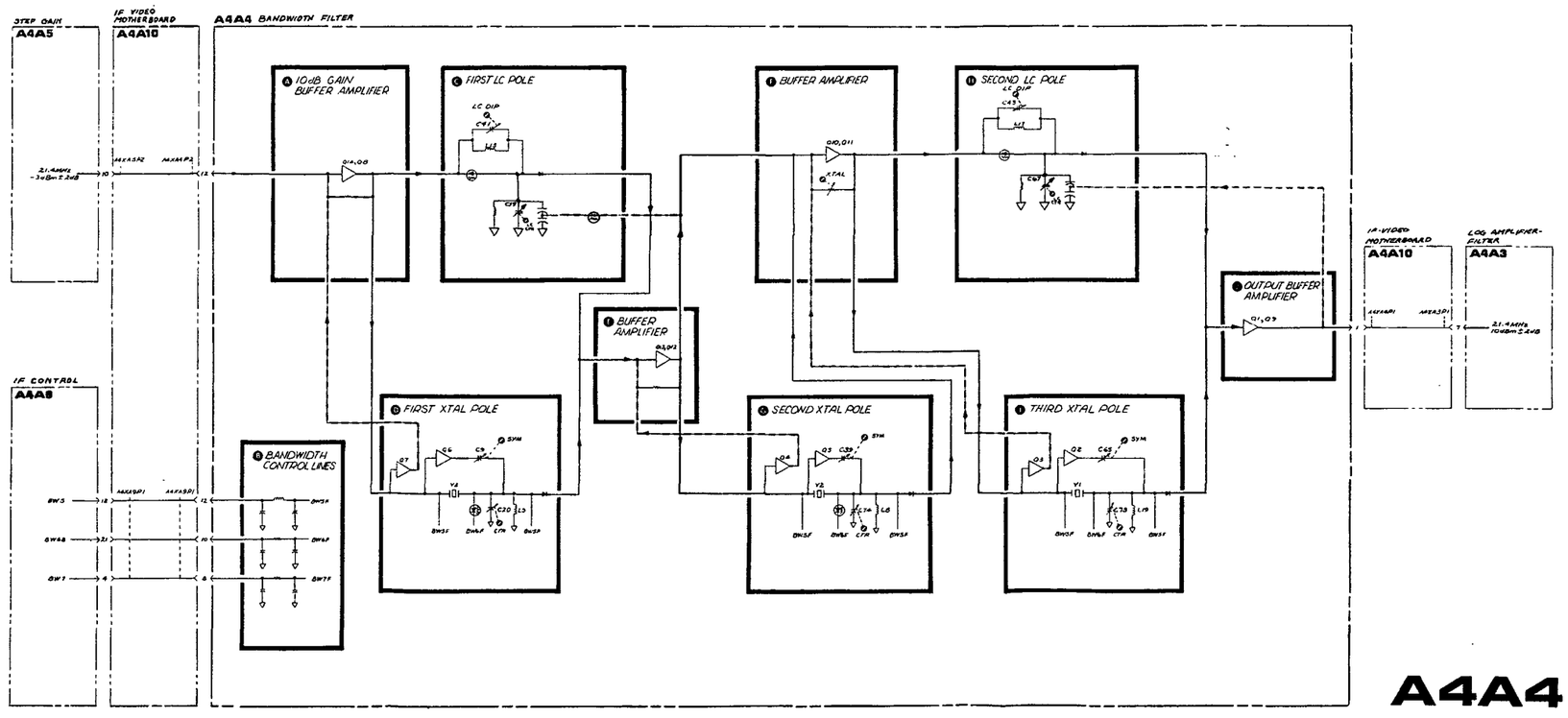


FIGURE 3. A4A4 BANDWIDTH FILTER, BLOCK DIAGRAM

ManualsPlus.com

A4A4
BANDWIDTH FILTER

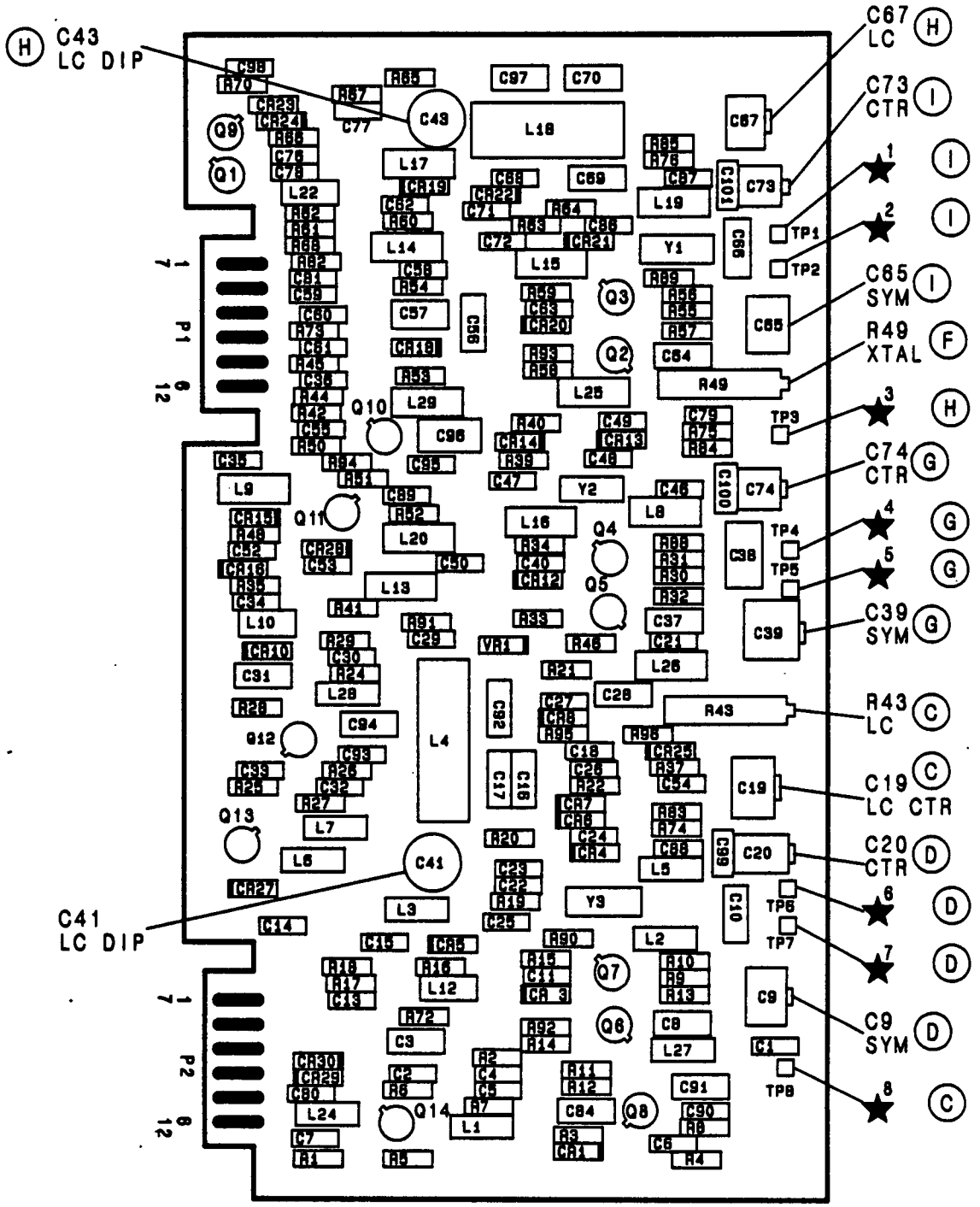


FIGURE 4. A4A4 BANDWIDTH FILTER, COMPONENT LOCATIONS

ManualsPlus.com

IF-DISPLAY SECTION

A4A4 BANDWIDTH FILTER
85662-60184

P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	21.4 MHz	A4A5, P1-7	J
2	GND		K
3	GND		K
4	+12V	A4A5, P1-4	B
5	GND		K
6	GND		K
7	GND		K
8	GND	A4A5, P1-21	B
9	GND		K
10	+120V	A4A5, P2-9	K
11	GND		K
12	GND	A4A5, P1-12	B

P2

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	GND		K
2	GND		K
3	GND		K
4	GND		K
5	GND		K
6	GND		K
7	+12V		K
8	GND		K
9	+15V		K
10	+15V		K
11	GND		K
12	21.4 MHz	A4A5, P2-10	A

Ⓐ 10 dB GAIN BUFFER AMPLIFIER

Ⓑ FIRST LC POLE

Ⓒ BUFFER AMPLIFIER

Ⓓ BUFFER AMPLIFIER

Ⓔ SECOND LC POLE

Ⓕ OUTPUT BUFFER AMPLIFIER

Ⓖ BANDWIDTH CONTROL LINES

Ⓗ POWER SUPPLIES

Ⓘ FIRST XTAL POLE

Ⓙ SECOND XTAL POLE

Ⓚ THIRD XTAL POLE

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (μF) INDUCTANCE IS IN MICROHENRIES (μH)
3. ARTWORK DO SCRIBES A FACTORY SELECTED COMPONENT; TYPICAL VALUE IS SHOWN. REFER TO SECTION V FOR RANGE OF VALUES.
4. MNEMONIC TABLE:

MNEMONIC	DESCRIPTION
BW8	BANDWIDTH 8
BW7	BANDWIDTH 7 CLC WORD
BW0	BANDWIDTH 0 CTAL WORD

5. UNLESS OTHERWISE NOTED, INSTRUMENT SETTINGS ARE AS FOLLOWS:

INSTRUMENT	SETTING
INSTRUMENT PRESET	
CENTER FREQUENCY	CAL. OUT FREQ
FREQUENCY SPAN	0 Hz
ATTENUATION	0 dB
RESOLUTION BANDWIDTH	3 kHz

6. TABLE OF RESOLUTION BANDWIDTH CONTROL LINE VOLTAGES

RESOLUTION BANDWIDTH	TYPICAL VALUES		
	BW8	BW0	BW7
3 MHz	+24.0	-24.0	+ 5.7
1 MHz	+24.0	-24.0	+24.0
300 kHz	+24.0	-24.0	+24.0
100 kHz	+24.0	-24.0	+24.0
30 kHz	+ 5	+19.3	+24.0
10 kHz	+ 5	+19.3	+24.0
3 kHz	+ 5	+19.3	+24.0
1 kHz	+ 5	+19.3	+24.0
300 Hz AND NARROWER	+ 5	+24.0	+24.0

7. UNLESS OTHERWISE INDICATED, SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.

A4A4

FIGURE 5. A4A4 BANDWIDTH FILTER, SCHEMATIC DIAGRAM, OPTION 462

ManualsPlus.com

ManualsPlus.com

A4A5 STEP GAIN, CIRCUIT DESCRIPTION

A4A5 Step Gain has three functions. It provides 65.9 dB of gain in discrete 0.1 dB steps (from −15.9 dB to +50 dB); it develops a nominal +10V bias supply; and it provides the 18.4 MHz LO frequency to A4A6A1 Up Converter and A4A6A2 Down Converter.

Step Gain 10 dB + Calibration (C)

This circuit is configured as a non-inverting operational amplifier. It provides a minimum of about 2 dB gain (adjustable by CAL potentiometer R33) and a maximum of about 12 dB (adjustable by 10 dB potentiometer R32). (See Figure 1.) The PIN diode CR5 functions as a variable resistor that has about 1K resistance at minimum and 70Ω of resistance at maximum gain. When the SG10 line is not sinking current (SG10 is off), the PIN resistance is controlled only by R33. When the SG10 line is grounded (SG10 is on), the gain is controlled primarily by R32. If the CAL potentiometer is adjusted, R32 must be adjusted also.

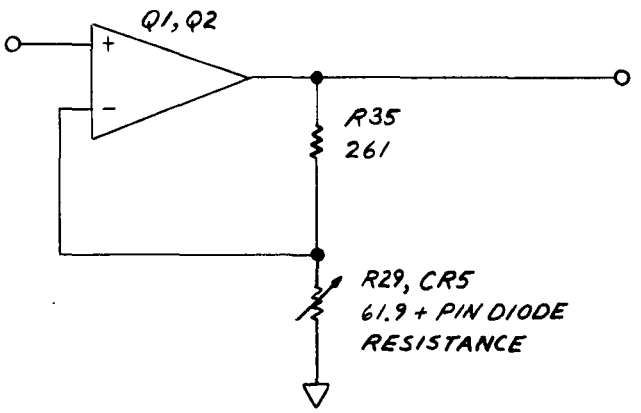


FIGURE 1. STEP GAIN 10 dB + CALIBRATION, EQUIVALENT CIRCUIT

Step Gain 20 dB-1 (D)
Step Gain 20 dB-2 (E)

This circuit is similar to the Step Gain 10 dB + Calibration circuit, except that the gain range is from 0 dB to 20 dB. PIN diode CR6 functions as both a switch and as a variable resistor. When the SG20-1 line is low, CR6 is turned on by current adjustable by 20 dB-1 potentiometer R44. More current through the PIN causes the PIN to have a lower resistance and the amplifier to have more gain. The Step Gain 20 dB-2 circuit is identical in operation to the Step Gain 20 dB-1 circuit.

A0.0 – A15.9 dB Attenuators (F)

These attenuators normally operate over the range of 0.0 dB to 9.9 dB except in the Error Correction function [SHIFT] [FREQUENCY SPAN], when they operate over the whole range of 0.0 dB to 15.9 dB. The first three attenuation stages, A8dB, A4dB, and A2dB, are emitter followers with a resistor divider on the output of each one. The dividers are switched in and out with diodes CR8, CR9, and CR10 to yield discrete steps of attenuation. The last attenuator is variable. Its range is adjusted by VR potentiometer R51. R51 sets the emitter voltage of Q16, which in turn determines how much current is sunk through PIN diode CR11 when resistors are switched in A4A9 IF Control. (See Figure 2.)

ManualsPlus.com

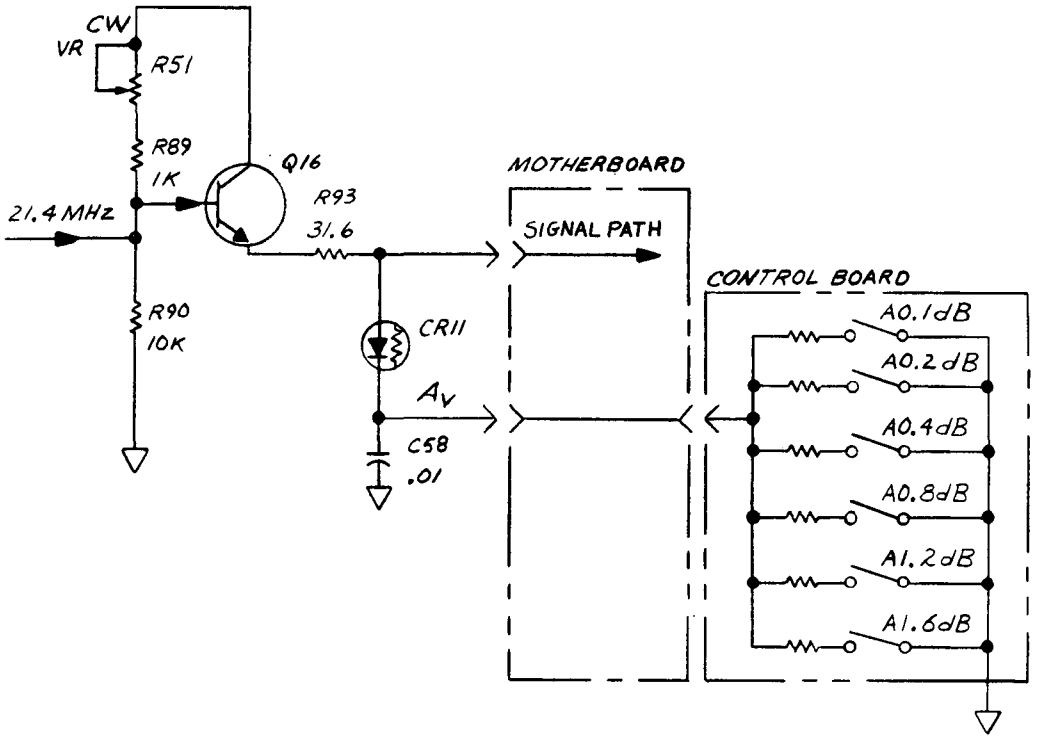


FIGURE 2. A0.0 – A15.9 dB ATTENUATORS, SIMPLIFIED SCHEMATIC

+ 10V Temperature Compensating Power Supply (G)

This supply (see Figure 3) compensates for the effect of temperature on PIN diodes used on the A4A5, A4A4, and A4A8 assemblies. Its nominal voltage is + 10V and its nominal temperature coefficient is + 35 mV/°C. The output voltage is derived from the following equation:

$$
\begin{aligned}
V_o &= V_{R4} + V_{fb} \\
&= (I_{R4})(R_4) + V_{fb} \\
&= \left(\frac{V_{R5}}{R_5}\right)(R_4) + V_{fb} \\
&\approx \left[\frac{(V_{fb} - V_{CR2})}{R_5}\right](R_4) + V_{fb}
\end{aligned}
$$

where: $V_{fb} \approx 3V$ (the voltage applied across CR2, CR3, CR4, and R5 at U1 pin 2) and is equal to the input voltage.

ManualsPlus.com

Using circuit values:

$$\approx \left[\frac{(3V - 1.8V)}{9.09K} \right] (51.1K) + 3V$$

$$\approx 9.75V$$

As temperature changes, the voltage drop across CR2, CR3, and CR4 changes. This results in a change in the current through the feedback resistor R4. Since $V_{out} = V_{fb} + V_{R4}$, the voltage developed across R4 changes the output of the supply. The change in V_{out} is directly proportional to the change in current through R4.

$$\Delta V_{out} = (\Delta I_{R4})(R_4)$$

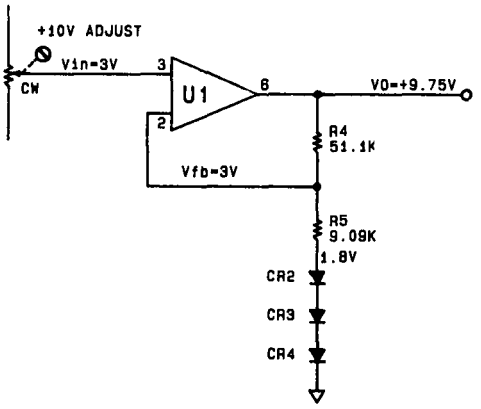


FIGURE 3. + 10V TEMPERATURE-COMPENSATING POWER SUPPLY, SIMPLIFIED SCHEMATIC

18.4 MHz Oscillator (A)

The 18.4 MHz Oscillator is basically a Colpitts oscillator with a crystal Y1 in the feedback path. A simplified schematic is shown in Figure 4.

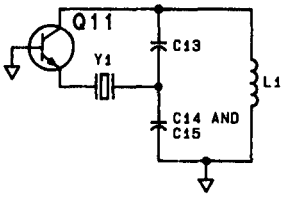


FIGURE 4. 18.4 MHz OSCILLATOR, EQUIVALENT CIRCUIT

If the crystal were replaced with a large capacitor, the circuit would oscillate at the resonant frequency of the parallel resonant circuit made up of L1, C13, C14, and C15. When the crystal is inserted, the feedback path is broken except at the series resonance of the crystal (18.4 MHz). The parallel combination of varactor CR1, temperature-compensating capacitor C7, and FREQ ZERO COARSE air-variable capacitor C10 are in series with the crystal and can pull it several kHz either side of 18.4 MHz.

ManualsPlus.com

The voltage output is determined by the current through R10* times the collector load. If the output is too low, R10* can be decreased in size.

The collector voltage is divided by C13, C14, and C15 and goes to the Buffer Amplifiers. The division ratio is:

$$\frac{\frac{1}{C_{15}}}{\frac{1}{C_{13}} + \frac{1}{C_{14}} + \frac{1}{C_{15}}} \approx 0.13$$

Buffer Amplifiers (B)

The Buffer Amplifiers are two almost identical amplifier circuits. The top amplifier on the schematic (Q10, Q8) provides the 18.4 MHz LO signal to A4A6A1 Up Converter, while the bottom amplifier (Q12, Q13) provides the signal to A4A6A2 Down Converter.

ManualsPlus.com

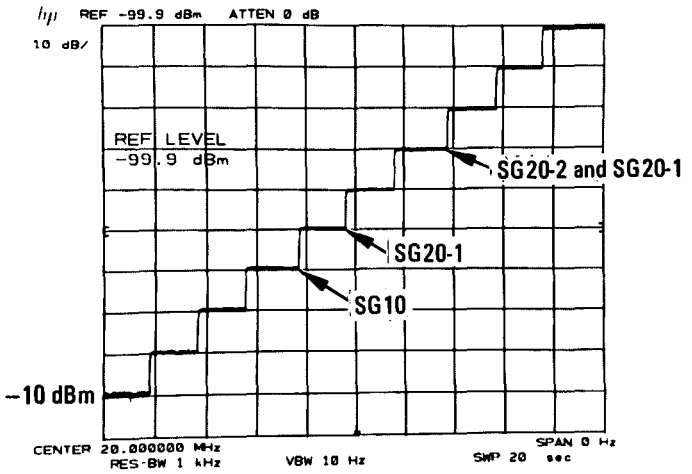
A4A5 STEP GAIN, TROUBLESHOOTING

Operation of the Step Gains and A0.0 to A15.9 Attenuator can be determined from the display by several easy tests.

The Step Gains are checked in the following way. Connect a 10 dB step attenuator between CAL OUTPUT and the input to the analyzer. Set this attenuator to 90 dB, press Instrument Preset, and key in the following:

[CENTER FREQUENCY] ..... equal to the CAL OUTPUT frequency
[FREQUENCY SPAN] ..... 0 Hz
[RES BW] ..... 1 kHz
[ATTEN] ..... 0 dB
[VIDEO BW] ..... 10 Hz
[SWEEP TIME] ..... 20 sec
[REFERENCE LEVEL] ..... −10 dBm

Press the [SINGLE] sweep key and then repeatedly press the DATA SWEEP ⇩ key. Figure 5 should be displayed. If one or more of the steps is missing, refer to Note 8 for the Step Gain truth table to determine which stage is faulty. 0V in the table indicates that a control line is active.



NOTE: Center Frequency readout will be 100.000 000 MHz for an HP 8566B.

FIGURE 5. 10 dB STEP GAIN TEST

If a component has been replaced, a simple calibration/diagnostic program exists. The calibration routine is started by connecting a cable from CAL OUTPUT to the input of the analyzer and then pressing [SHIFT] [FREQUENCY SPAN]. When this program has finished, press [SHIFT] [LINE] TRIGGER which will list the calibration data. (Refer to Figure 6.) Lines 19 through 26 give the step gain errors. Acceptable error is ±1 dB. Locations of the correction data are given in Table 1.

ManualsPlus.com

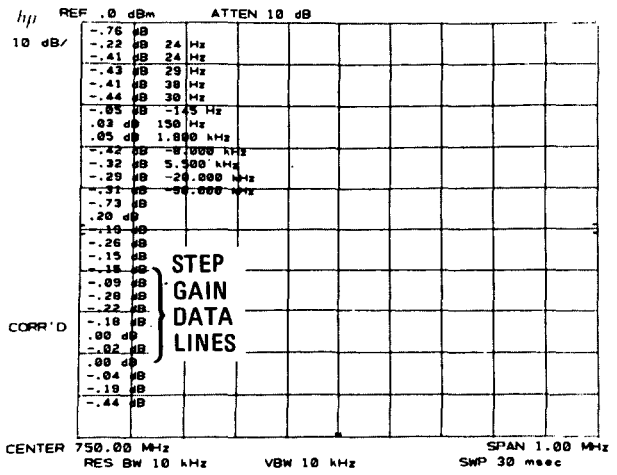


FIGURE 6. ERROR CORRECTION ROUTINE DATA

TABLE 1. LOCATIONS OF STEP GAIN CALIBRATION DATA

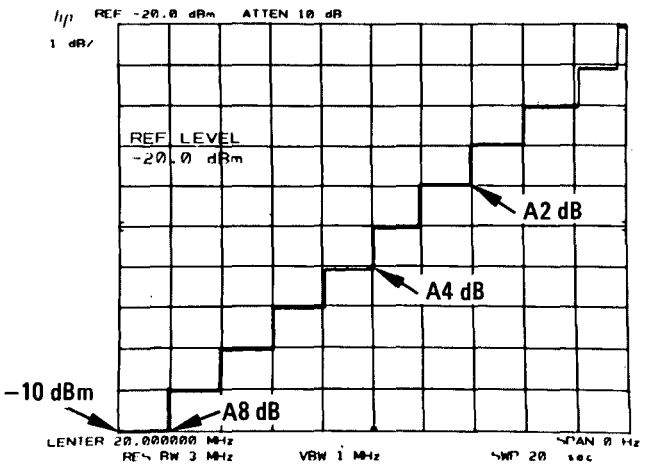
Reference Level (dBm)	−10	−20	−30	−40	−50	−60	−70	≤−80
Step Gain Control Line	A20 dB (A4A8 assembly)	A10 dB (A4A8 assembly)		SG10	SG20-1	SG10 SG20-1	SG20-1 SG20-2	SG10 SG20-1 SG20-2
Calibration Line	26	25	24	23	22	21	20	19

The A2dB, A4dB, and A8dB circuitry of the A0.0 to A15.9 Attenuator is activated by the following routine. First, connect a 1 dB step attenuator between CAL OUTPUT and the input to the analyzer. Set this attenuator to 10 dB, press Instrument Preset, and key in the following:

CENTER FREQUENCY ..... equal to the CAL OUTPUT frequency
FREQUENCY SPAN ..... 0 Hz
LOG SCALE (ENTER dB/DIV) ..... 1 dB
SWEEP TIME ..... 20 sec
REFERENCE LEVEL ..... −10 dBm

Press (SINGLE) sweep and repeatedly press the DATA STEP (⇩) key. The display should appear as in Figure 7. If every other step is missing, the AVdB control line is faulty. Check the A1dB circuitry on the A4A9 IF Control board to find the defective component. If only a few steps are missing, refer to the truth table in Note 9 to determine which function is not operating properly. 0V in the table indicates that a line is active.

ManualsPlus.com



NOTE: Center Frequency readout will be 100.000 000 MHz for an HP 8566B.

FIGURE 7. 1 dB STEP GAIN TEST

Often several steps will appear to be slightly in error. Analysis of the truth table in Note 9 will indicate that no single stage could be faulty. This is caused by log fidelity error in the log amplifier circuitry. If accurate determination of the step size is necessary, IF substitution using a calibrated 1 dB step attenuator will be required.

Operation of the AVdB control line and the 0.1 – 1.9 dB section of the A0.0 – A15dB Attenuator on A4A9 IF Control can be tested with the following method. Press Instrument Preset and key in the following:

[CENTER FREQUENCY] ..... equal to the CAL OUTPUT frequency

[FREQUENCY SPAN] ..... 0 Hz

LIN SCALE

[Δ]

[SHIFT] [AUTO] (KSA)

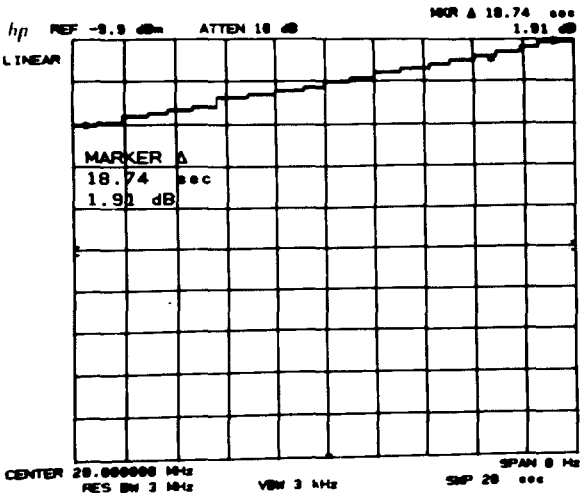
[SWEEP TIME] ..... 20 sec

[VIDEO BW] ..... 3 kHz

[REFERENCE LEVEL] ..... – 8 dBm

Press the [SINGLE] sweep key and rotate the DATA control knob in a counterclockwise direction. A stepped display similar to Figure 8 should result. If the steps are not monotonic, the circuitry is faulty. The AVdB control line voltage for a – 10 dBm Reference Level will vary widely among instruments, although the ratio between the voltage for – 11.9 dBm and – 10 dBm will remain constant. During the above test, the voltage should vary approximately 8.5% from – 10 dBm to – 11.9 dBm.

ManualsPlus.com



NOTE: Center Frequency readout will be 100.000 000 MHz for an HP 8566B.

FIGURE 8. 0.1 dB STEP GAIN TEST

The absolute step amplitudes can be determined with the MARKER Δ function. The reference steps are 0.00 dB, 0.90 dB, and 1.90 dB. In the Linear mode, the error should be less than ±0.12 dB. If these steps are not correct, or the display is not monotonic, refer to A4A9 IF Control Service Sheet for more troubleshooting information.

ManualsPlus.com

TABLE 2. A4A5, REPLACEABLE PARTS (1 OF 3)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A5	85662-60139	6	1	BOARD ASSEMBLY, STEP GAIN	28480	85662-60139
A4A5C1	0160-4833	5	3	CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A5C2				NOT ASSIGNED		
A4A5C3	0160-4832	4	41	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C4	0180-0197	8	2	CAPACITOR-FXD .2.2UF +-10% 20VDC TA	28480	0180-0197
A4A5C5	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C6				NOT ASSIGNED		
A4A5C7				NOT ASSIGNED		
A4A5C8	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C9	0160-2251	7	1	CAPACITOR-FXD 5.6PF +-.25PF 500VDC CER	28480	0160-2251
A4A5C10	0121-0493	3	1	CAPACITOR-V TRMR-AIR 1.7-11PF 175V	28480	0121-0493
A4A5C11	0160-0127	2	1	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A4A5C12				NOT ASSIGNED		
A4A5C13	0160-0334	3	1	CAPACITOR-FXD 47PF +-.5PF 300VDC MICA	28480	0160-0334
A4A5C14	0160-2209	5	1	CAPACITOR-FXD 360PF +-5% 300VDC MICA	28480	0160-2209
A4A5C15	0160-3538	5	1	CAPACITOR-FXD 750PF +-5% 100VDC MICA	28480	0160-3538
A4A5C16				NOT ASSIGNED		
A4A5C17	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C18	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C19	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C20	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C21	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C22	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C23	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C24	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A5C25	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A5C26	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C27	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C28	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C29	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C30				NOT ASSIGNED		
A4A5C31	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C32	0160-2252	8	1	CAPACITOR-FXD 6.2PF +-.25PF 500VDC CER	28480	0160-2252
A4A5C33	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C34	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C35	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C36	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C37	0160-2244	8	2	CAPACITOR-FXD 3PF +-.25PF 500VDC CER	28480	0160-2244
A4A5C38	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C39	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C40	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C41	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C42	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C43				NOT ASSIGNED		
A4A5C44	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C45	0160-2244	8		CAPACITOR-FXD 3PF +-.25PF 500VDC CER	28480	0160-2244
A4A5C46	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A4A5C47	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C48	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C49	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C50	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C51	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C52	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C53	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C54	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C55	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C56	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C57	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C58	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C59	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C60				NOT ASSIGNED		
A4A5C61	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C62	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C63	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A5C64	0180-2216	6	1	CAPACITOR-FXD 350UF+75-10% 16VDC AL	56289	30D357G016DH2
A4A5CR1	0122-0255	7	1	DIODE-VVC 1N5144 22PF 10% C4/C60-MIN=3.2	01281	1N5144
A4A5CR2	1901-0040	1	5	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A5CR3	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A5CR4	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A5CR5	1901-1070	9	4	DIODE-PIN 110V	28480	1901-1070
A4A5CR6	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A4A5CR7	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A4A5CR8	1901-1117	5	3	DIODE-SWITCHING 30V	28480	1901-1117
A4A5CR9	1901-1117	5		DIODE-SWITCHING 30V	28480	1901-1117
A4A5CR10	1901-1117	5		DIODE-SWITCHING 30V	28480	1901-1117

ManualsPlus.com

TABLE 2. A4A5, REPLACEABLE PARTS (2 OF 3)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A5CR11	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A4A5CR12	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A5CR13	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A5E1	9170-0029	3	15	CORE-SHIELDING BEAD	28480	9170-0029
A4A5E2	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A5E3	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A5E4	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A5E5	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A5E6	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A5E7	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A5E8	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A5E9				NOT ASSIGNED		
A4A5E10	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A5E11	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A5E12	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A5E13	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A5E14	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A5E15	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A5E16	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A5L1	9140-0266	7	1	INDUCTOR RF-CH-MLD 1.8UH 5% .166DX.385LG	28480	9140-0266
A4A5L2	9140-0158	6	1	INDUCTOR RF-CH-MLD 1UH 10% .105DX.26LG	28480	9140-0158
A4A5L3	9100-1618	1	3	INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A5L4	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A5L5	9100-1624	9	6	INDUCTOR RF-CH-MLD 30UH 5% .166DX.385LG	28480	9100-1624
A4A5L6	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A5L7-A4A5L9				NOT ASSIGNED		
A4A5L10	9100-1624	9		INDUCTOR RF-CH-MLD 30UH 5% .166DX.385LG	28480	9100-1624
A4A5L11	9100-1624	9		INDUCTOR RF-CH-MLD 30UH 5% .166DX.385LG	28480	9100-1624
A4A5L12	9100-1624	9		INDUCTOR RF-CH-MLD 30UH 5% .166DX.385LG	28480	9100-1624
A4A5L13	9100-1624	9		INDUCTOR RF-CH-MLD 30UH 5% .166DX.385LG	28480	9100-1624
A4A5L14	9100-1624	9		INDUCTOR RF-CH-MLD 30UH 5% .166DX.385LG	28480	9100-1624
A4A5Q1	1854-0345	8	3	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A4A5Q2	1853-0015	7	3	TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A4A5Q3	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A4A5Q4	1853-0015	7		TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A4A5Q5	1854-0345	8		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A4A5Q6	1853-0015	7		TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A4A5Q7	1854-0404	0	1	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A5Q8	1854-0019	3	6	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A5Q9	1853-0281	9	1	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A4A5Q10	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A5Q11	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A5Q12	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A5Q13	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A5Q14	1854-0994	3	3	TRANSISTOR NPN SI TO-72 PD=200MW	28480	1854-0994
A4A5Q15	1854-0994	3		TRANSISTOR NPN SI TO-72 PD=200MW	28480	1854-0994
A4A5Q16	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A5Q17	1854-0994	3		TRANSISTOR NPN SI TO-72 PD=200MW	28480	1854-0994
A4A5R1	0698-0084	9	4	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A4A5R2	2100-3103	6	1	RESISTOR-TRMR 10K 10% C SIDE-ADJ 17-TRN	02111	43P103
A4A5R3	0757-0440	7	1	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A4A5R4	0757-0458	7	1	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A4A5R5	0757-0288	1	1	RESISTOR 9.09K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-9091-F
A4A5R6	0757-0442	9	7	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A5R7	0757-0465	6	3	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A4A5R8	0757-0439	4	2	RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A4A5R9	0757-0439	4		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A4A5R10*	0698-0083	8	3	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A4A5R11	0757-0421	4	1	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A4A5R12	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A5R13	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A4A5R14	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A5R15	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A5R16	0757-0401	0	4	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A4A5R17	0757-0346	2	3	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A4A5R18	0698-3444	1	5	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A4A5R19	0698-3437	2	2	RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A4A5R20	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A4A5R21	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A4A5R22	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A4A5R23	0698-3437	2		RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A4A5R24	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A4A5R25	0757-0279	0	2	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F

*Indicates factory selected value

ManualsPlus.com

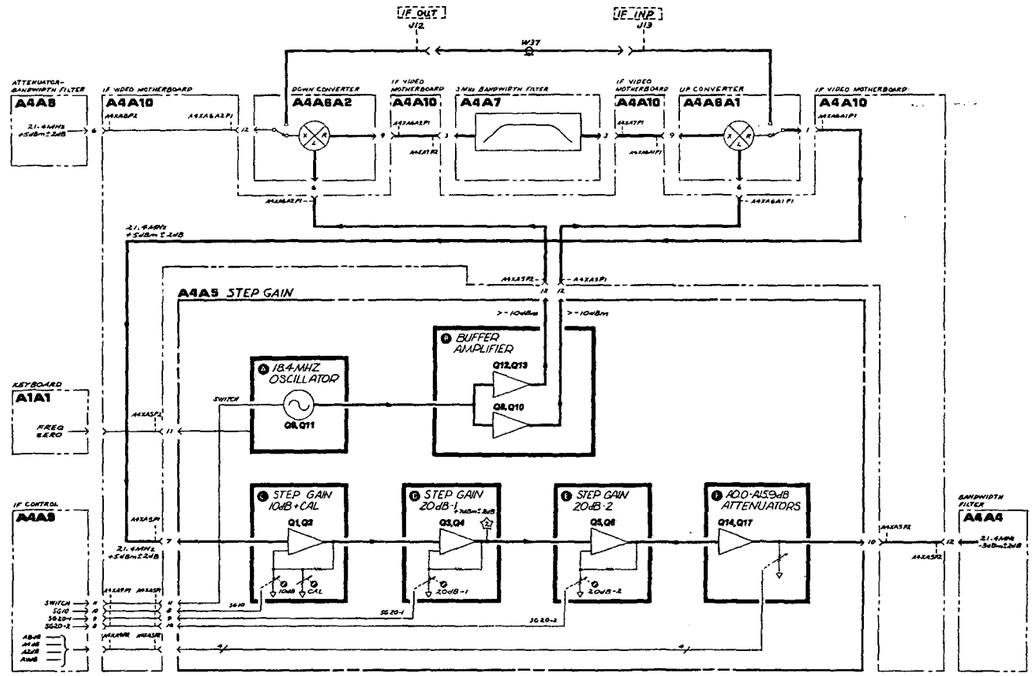
TABLE 2. A4A5, REPLACEABLE PARTS (3 OF 3)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A5R26	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A5R27	0757-0290	5	3	RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A4A5R28	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A4A5R29	0757-0276	7	3	RESISTOR 61.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-6192-F
A4A5R30	0698-3260	9	7	RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A4A5R31	0757-0280	3	10	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A4A5R32	2100-3056	8	3	RESISTOR-TRMR 5K 10% C SIDE-ADJ 17-TRN	02111	43P502
A4A5R33	2100-3163	8	1	RESISTOR-TRMR 1M 20% C SIDE-ADJ 17-TRN	02111	43P105
A4A5R34	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A4A5R35	0698-3132	4	1	RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A4A5R36	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A4A5R37	0757-0276	7		RESISTOR 61.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-6192-F
A4A5R38	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A4A5R39	0757-0290	5		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A4A5R40	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A4A5R41	0698-4037	0	2	RESISTOR 46.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-46R4-F
A4A5R42	0698-3260	9		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A4A5R43	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A4A5R44	2100-3056	8		RESISTOR-TRMR 5K 10% C SIDE-ADJ 17-TRN	02111	43P502
A4A5R45	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A4A5R46	0757-0420	3	2	RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A4A5R47	0757-0276	7		RESISTOR 61.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-6192-F
A4A5R48	0698-4037	0		RESISTOR 46.4 1% .125W F TC=0+-100	24546	C4-1/8-T0-46R4-F
A4A5R49	0757-0290	5		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A4A5R50	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A4A5R51	2100-3161	6	1	RESISTOR-TRMR 20K 10% C SIDE-ADJ 17-TRN	02111	43P203
A4A5R52	0698-3260	9		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A4A5R53	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A4A5R54	2100-3056	8		RESISTOR-TRMR 5K 10% C SIDE-ADJ 17-TRN	02111	43P502
A4A5R55	0757-0420	3		RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A4A5R56	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A4A5R57				NOT ASSIGNED		
A4A5R58				NOT ASSIGNED		
A4A5R59	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A4A5R60	0698-3260	9		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A4A5R61	0757-0403	2	1	RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-T0-121R-F
A4A5R62*	0698-3151	7	1	RESISTOR 2.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2871-F
A4A5R63	0757-0398	4	1	RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A4A5R64	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A4A5R65	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A5R66	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A5R67	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A4A5R68	0698-3260	9		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A4A5R69	0757-0395	1	1	RESISTOR 56.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-56R2-F
A4A5R70	0757-0419	0	1	RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-681R-F
A4A5R71	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A4A5R72-A4A5R79				NOT ASSIGNED		
A4A5R80	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A4A5R81				NOT ASSIGNED		
A4A5R82				NOT ASSIGNED		
A4A5R83	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A4A5R84	0698-3260	9		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A4A5R85	0698-3435	0	2	RESISTOR 38.3 1% .125W F TC=0+-100	24546	C4-1/8-T0-38R3-F
A4A5R86*	0698-3447	4	1	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A4A5R87	0698-3438	3	1	RESISTOR 147 1% .125W F TC=0+-100	24546	C4-1/8-T0-147R-F
A4A5R88	0757-0317	7	1	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A4A5R89	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A4A5R90	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A5R91	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A4A5R92	0698-3260	9		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A4A5R93	0698-3435	0		RESISTOR 38.3 1% .125W F TC=0+-100	24546	C4-1/8-T0-38R3-F
A4A5R94				NOT ASSIGNED		
A4A5R95				NOT ASSIGNED		
A4A5R96	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A4A5R97	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A4A5TP1	1251-0600	0	3	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A5TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A5TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A5U1	1826-1058	3	1	IC OP AMP GP 8-TO-99 PKG	28480	1826-1058
A4A5VR1	1902-3104	6	1	DIODE-ZNR 5.62V 5% DO-35 PD=.4W	28480	1902-3104
A4A5Y1	0410-1489	2	1	XTAL 18.4 MHZ	28480	0410-1489
				MISCELLANEOUS PARTS		
	6960-0016	0	2	PLUG-HOLE TR-HD FOR .125-D-HOLE NYL	28480	6960-0016
	05662-20148	3	1	COVER STEP GAIN	28480	05662-20148
	86701-40001	9	2	EXTRACTOR PC	28480	86701-40001

*Indicates factory selected value

ManualsPlus.com

IF-DISPLAY SECTION



A4A5

FIGURE 9. A4A5 STEP GAIN, BLOCK DIAGRAM

ManualsPlus.com

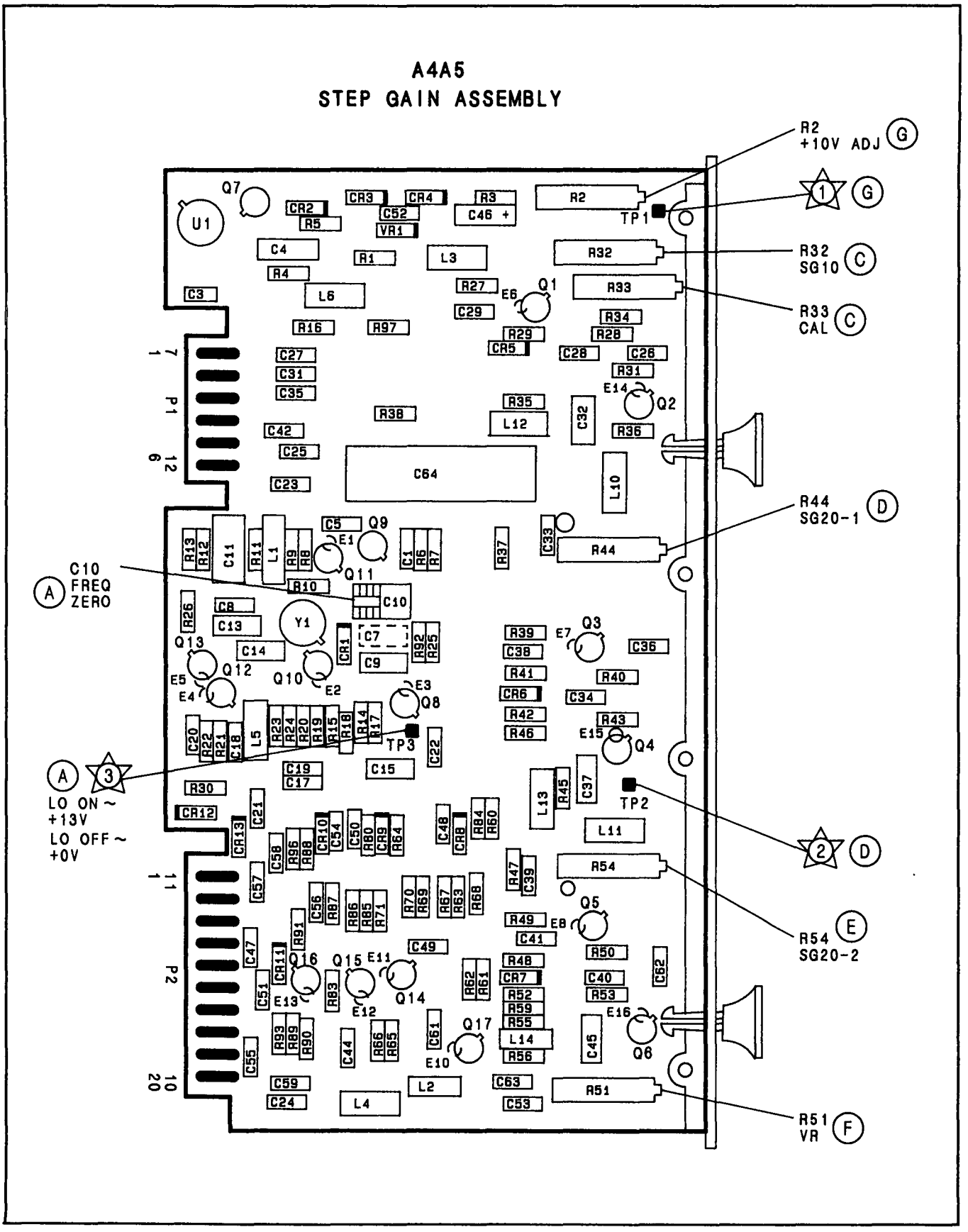


FIGURE 10. A4A5 STEP GAIN, COMPONENT LOCATIONS

F-DISPLAY SECTION

A4A5 STEP GAIN
85662-80139

P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	GND		G
7	21.4 MHz	A4A6A1P1-1	C
2	GND		G
8	5819	A4A3P1-19	C
3	GND		G
9	5820-1	A4A3P1-8	D
4	GND		G
10	5820-2	A4A3P1-5	E
5	+10V@ SWITCH	A4A3P1-11, A4A3P1-13	G A
6	GND		G
12	18.4 MHz LO	A4A5A1P1-5	B

P2

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	GND		G
11	FREQ ZERO	A1J1	A
2	GND		G
12	18.4 MHz LO	A4A6A2P1-1	B
3	GND		G
13	A1 dB	A4A3P2-7	F
4	GND		G
14	GND		G
5	GND		G
15	A8 dB	A4A3P2-6	F
6	GND		G
16	A4 dB	A4A3P2-4	F
7	GND		G
17	A2 dB	A4A3P2-22	F
8	GND		G
18	-15V		G
9	GND		G
19	+15V		G
10	21.4 MHz	A4A6P3-12	F
20	GND		G

Ⓐ 18.4 MHz OSCILLATOR

Ⓑ BUFFER AMPLIFIERS

Ⓒ STEP GAIN 10 dB +CAL

Ⓓ STEP GAIN 20 dB-1

Ⓔ STEP GAIN 20 dB-2

Ⓕ A0.0-A15.0 dB ATTENUATORS

Ⓖ POWER SUPPLIES

NOTES:

1. REFERENCE DESIGNATORS WITHIN THICK BORDERS ARE ASSEMBLIES. FOR CABLE/ETC REFERENCE DESIGNATORS, REFER TO INTERCONNECTION WITH ASSEMBLIES.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN Ω, POWER 1/4W, CAPACITANCE IN 1# PICOFARADS (pF) INDUCTANCE IN 10 MICROHENRIES (μH)
3. ANTENNA (A) DENOTES FACTORY SELECTED COMPONENT. NOMINAL VALUE SHOWN. REFER TO SECTION 8 FOR RANGE OF VALUES.
4. MNEMONIC TABLE:

MNEMONIC	DESCRIPTION
A1 dB	ATTENUATOR 1 dB
A2 dB	ATTENUATOR 2 dB
A4 dB	ATTENUATOR 4 dB
A8 dB	ATTENUATOR 8 dB
A1 dB FREQ ZERO	ATTENUATOR VARIABLE FREQUENCY ZERO FROM PANEL CONTROL
5820	STEP GAIN 10 dB
5820-1	STEP GAIN 20 dB-1
5820-2	STEP GAIN 20 dB-2
SWITCH	LOW-pi DIODE COMPOSITE (3 AMP, 12V)

5. RF PERFORMANCE OF THIS BOARD IS AS-SEMBLY AFFECTED BY NON-RF ESTIMATES. SEE TROUBLESHOOTING SECTION FOR INFORMA-TION ON REPAIR OF THIS BOARD.
6. INSTRUMENT CONTROL SETTINGS FOR ALL TESTS PERFORMED ON THIS BOARD ARE AS FOLLOWS:

	CAL. OUT FREQ.	
INSTRUMENT PRESET		
CENTER FREQUENCY	0 Hz	
FREQUENCY SPAN	0 Hz	
ATTENUATION	0 dB	

7. 300 mV PEAK (SCOPE PROBE MAY LOAD THE CIRCUIT) NEEDED FOR ACCURATE MEASUREMENT OF TEST POINT.
8. STEP GAIN TRUTH TABLE:

REF. LEVEL (MEAS BY 21 MHz)	dBm	-10	-20	-30	-40	-50	-60	-70	≤-80
5814	LOW	>7.2V	>7.5V	>7.5V	0V	>7.8V	0V	>7.5V	0V
5820-1	LOW	>8.0V	>8.5V	>8.5V	>8.5V	0V	0V	0V	0V
5820-2	LOW	>8.0V	>8.5V	>8.5V	>8.5V	>8.3V	>8.3V	0V	0V

9. A0.0 - 15.0 dB ATTENUATOR CONTROL TABLE:

REF LEVEL dBm	CONTROL LINES		
	A1 dB	A2 dB	A4 dB thru A8 dB
-10	>+13V	>+12V	0V
-11	>+13V	>+12V	0V
-12	0V	0V	>+15V
-13	0V	0V	>+13V
-14	>+13V	0V	>+15V
-15	>+13V	0V	>+13V
-16	0V	>+12V	>+15V
-17	0V	>+12V	>+12V
-18	>+12V	>+12V	>+12V
-19	>+12V	>+12V	>+12V

10. NORMALLY OPEN.
11. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.

SERIAL NUMBER PREFIX: 2403A

A4A5

FIGURE 11. A4A5 STEP GAIN, SCHEMATIC DIAGRAM
A4A5 17/18

ManualsPlus.com

ManualsPlus.com

ManualsPlus.com

A4A6A1 UP CONVERTER, CIRCUIT DESCRIPTION

For narrow (≤1 kHz) bandwidths, A4A6A1 Up Converter Assembly converts the 3 MHz IF signal from A4A7 3 MHz Filter to a 21.4 MHz IF signal and sends it to A4A5 Step Gain. For wide (≥3 kHz) bandwidths, the 21.4 MHz from A4A6A2 Down Converter is amplified and sent to A4A5.

Variable Gain Amplifier (A)

The Variable Gain Amplifier has about 6 dB of gain to compensate for the loss incurred by the 50-Ohm Driver in A4A6A2, which converts the 21.4 MHz IF signal into a 50Ω system.

21.4 MHz IF Switch (B)

For wide (≥3 kHz) bandwidths, the SWITCH line goes to +15V, which turns Q6 off. This forward biases CR3 (the current is sunk through the LO Driver and Buffer Amplifier) and reverse biases CR2, allowing the 21.4 MHz IF signal to pass through CR3 and then to A4A5.

For narrow (≤1 kHz) bandwidths, the SWITCH line goes to 1V, turning Q6 on. The collector of Q6 goes to about +15V, which turns the LO Driver on, forward biases CR2, and reverse biases CR3, breaking the path from the Variable Gain Amplifier.

LO Driver and Buffer Amplifier (C)

This circuit is only on for bandwidths ≤1 kHz. It consists of an emitter follower (Q7) driving a common base stage (Q8) which in turn drives a common emitter stage (Q9). The voltages and signal levels are indicated on the schematic.

Mixer (D)

The Mixer is double balanced and has about 6 dB conversion loss. It mixes the 3 MHz IF signal from A4A7 with the 18.4 MHz LO signal from the LO Driver and Buffer Amplifier to produce a 21.4 MHz signal through the 21.4 MHz Bandpass Amplifier to A4A5.

21.4 MHz Bandpass Amplifier (E)

This is a common emitter amplifier with about 7 dB of gain. It is preceded by a wide (BW ≈ 5 MHz) bandpass filter (R61, C32, and L2) and followed by a narrow (BW ≈ 10 kHz) bandpass (T1, Y1, L8, and R60). The wide filter attenuates harmonics of the 18.4 MHz LO, and the narrow filter attenuates the fundamental of the 18.4 MHz LO. 18.4 MHz NULL adjustment C31 compensates for the case capacitance of the crystal. The crystal Y1 and inverting transformer T1 are driven by an emitter follower Q4. The output emitter follower is turned on and off by the SWITCH line.

ManualsPlus.com

A4A6A2 DOWN CONVERTER, CIRCUIT DESCRIPTION

For resolution bandwidths ≤1 kHz, A4A6A2 Down Converter converts the 21.4 MHz IF signal from A20 Third Converter down to a 3 MHz IF signal. For resolution bandwidths ≥3 kHz, the 21.4 MHz is not converted but is sent through A4A6A1 Up Converter to A4A5 Step Gain.

Switch (C) and 50-Ohm Driver (A)

For bandwidths ≥3 kHz, the SWITCH line is +15V and Q7 is off. R38 in the LO Driver and Buffer Amplifier pulls the collector of Q7 to less than 0V. This forward biases CR3 and reverse biases CR5, passing the 21.4 MHz IF signal to the 50 Ohm Driver, where it is converted to a 50Ω system (6 dB loss) and sent to A4A6A1.

For bandwidths ≤ 1 kHz, the SWITCH line is 0V, turning Q7 on. The collector Q7 goes to almost +15V, which turns CR5 on (shorting any signal that might pass through CR3) and CR3 off. Q7 also turns the LO on.

LO Driver and Buffer Amplifier (B)

This circuit is only on for bandwidths ≤1 kHz. It consists of an emitter follower Q6 driving a common base stage Q5 which in turn drives a common emitter stage Q2. The proper bias voltages and signal levels are shown on the schematic.

Mixer and Driver (D)

Q1 is an emitter follower driving a step-down transformer. The turns ratio is about 4½ to 1, which yields a 12 dB loss and drives the Mixer from a low impedance. The Mixer has an additional 5 dB loss.

3 MHz Bandpass Amplifier (E)

This amplifier compensates for the losses of the transformer T1 and the mixer U1. The filter at the output, consisting of L5, C22, and R52, has less than 1 dB of loss at 3 MHz.

ManualsPlus.com

A4A6 DOWN/UP CONVERTER, TROUBLESHOOTING

If the resolution bandwidths less than 3 kHz are not working properly, the fault is most likely on the Down/Up Converter or the 3 MHz Bandwidth Filter boards.

If only noise is displayed, check the voltage on the SWITCH control lines. If the SWITCH line is working, the 18.4 MHz LO signal levels should be tested. The 18.4 MHz Oscillator is located on the A4A5 Step Gain board.

A4A6A2R33* may have to be changed if mixer A4A6A2U1 is replaced. Refer to the Performance Tests and Adjustments manual for the correct procedure for selecting this value.

Note that the SWITCH control line voltage is different on the A4A6A1 Up Converter board. This is due to a 100Ω resistor, R4, on the A4A10 IF Video Motherboard.

ManualsPlus.com

TABLE 1. A4A6, REPLACEABLE PARTS (1 OF 4)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A6	85662-60018	0	1	DOWN/UP CONVERTER ASSEMBLY	28480	85662-60018
A4A6J1	1250-0690	6	2	CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
A4A6J2	1250-0690	6		CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
				MISCELLANEOUS PARTS		
	86701-40001	9	1	EXTRACTOR, PC BOARD	28480	86701-40001
	85662-20039	1	1	COVER CONVERTER ASSEMBLY	28480	85662-20039
A4A6A1	85662-60006	6	1	BOARD ASSEMBLY, UP CONVERTER (P/O A4A6)	28480	85662-60006
A4A6A1C1- A4A6A1C3				NOT ASSIGNED		
A4A6A1C4	0160-4084	8	2	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A4A6A1C5	0160-2055	9	16	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C6- A4A6A1C8				NOT ASSIGNED		
A4A6A1C9	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A4A6A1C10				NOT ASSIGNED		
A4A6A1C11	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C12	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C13	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C14				NOT ASSIGNED		
A4A6A1C15				NOT ASSIGNED		
A4A6A1C16	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C17	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C18	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C19	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C20	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C21	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C22	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C23	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C24	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C25	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C26	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C27	0160-2244	8	1	CAPACITOR-FXD 3PF +-.25PF 500VDC CER	28480	0160-2244
A4A6A1C28				NOT ASSIGNED		
A4A6A1C29				NOT ASSIGNED		
A4A6A1C30	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C31	0121-0453	5	1	CAPACITOR-V TRMR-AIR 1.3-5.4PF 175V	74970	187-0303-125
A4A6A1C32	0140-0199	6	1	CAPACITOR-FXD 240PF +-5% 300VDC MICA	72136	DM15F241J0300WV1CR
A4A6A1CR1				NOT ASSIGNED		
A4A6A1CR2	1901-0047	8	3	DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A6A1CR3	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A6A1CR4	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A6A1E1	9170-0029	3	7	CORE-SHIELDING BEAD	28480	9170-0029
A4A6A1E2	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A6A1E3	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A6A1E4	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A6A1E5	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A6A1E6	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A6A1E7	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A6A1L1	9140-0112	2	2	INDUCTOR RF-CH-MLD 4.7UH 10%	28480	9140-0112
A4A6A1L2	9100-1611	4	1	INDUCTOR RF-CH-MLD 220NH 20%	28480	9100-1611
A4A6A1L3				NOT ASSIGNED		
A4A6A1L4	9100-1624	9	1	INDUCTOR RF-CH-MLD 30UH 5% .166DX.385LG	28480	9100-1624
A4A6A1L5	9100-1620	5	1	INDUCTOR RF-CH-MLD 15UH 10% .166DX.385LG	28480	9100-1620
A4A6A1L6				NOT ASSIGNED		
A4A6A1L7	9140-0112	2		INDUCTOR RF-CH-MLD 4.7UH 10%	28480	9140-0112
A4A6A1L8	9100-1618	1	1	INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A6A1Q1	1854-0019	3	5	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A6A1Q2	1853-0007	7	2	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A4A6A1Q3	1854-0345	8	1	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A4A6A1Q4	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A6A1Q5	1854-0247	9	1	TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
A4A6A1Q6	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A4A6A1Q7	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A6A1Q8	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A6A1Q9	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A6A1R1	0757-0401	0	2	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A4A6A1R2				NOT ASSIGNED		
A4A6A1R3				NOT ASSIGNED		
A4A6A1R4	0757-1094	9	1	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A4A6A1R5	0757-0465	6	2	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F

ManualsPlus.com

TABLE 1. A4A6, REPLACEABLE PARTS (2 OF 4)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A6A1R6	0757-0438	3	1	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A4A6A1R7				NOT ASSIGNED		
A4A6A1R8				NOT ASSIGNED		
A4A6A1R9	0698-3442	9	1	RESISTOR 237 1% .125W F TC=0+-100	24546	C4-1/8-T0-237R-F
A4A6A1R10	0757-0400	9	1	RESISTOR 90.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-90R9-F
A4A6A1R11				NOT ASSIGNED		
A4A6A1R12	0757-0279	0	2	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A6A1R13	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A6A1R14	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A4A6A1R15	0757-0280	3	4	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A4A6A1R16	0757-0317	7	1	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A4A6A1R17	0757-0442	9	5	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A6A1R18	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A6A1R19	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A4A6A1R20	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A4A6A1R21	0757-0180	2	2	RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A4A6A1R22	0757-0180	2		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A4A6A1R23	0757-0346	2	2	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A4A6A1R24	0757-0416	7	2	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A4A6A1R25	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A4A6A1R26	0757-0394	0	1	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A4A6A1R27	0757-0439	4	1	RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A4A6A1R28	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A6A1R29	2100-3154	7	1	RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	02111	43P102
A4A6A1R30	0698-3439	4	1	RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A4A6A1R31				NOT ASSIGNED		
A4A6A1R32	0757-0419	0	1	RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-681R-F
A4A6A1R33	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A4A6A1R34	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A6A1R35	0698-3444	1	1	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A4A6A1R50	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A6A1R51	0757-0447	4	1	RESISTOR 16.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1622-F
A4A6A1R52-A4A6A1R59				NOT ASSIGNED		
A4A6A1R60	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A4A6A1R61	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A4A6A1T1	85662-80002	4	1	COIL ASSY X-FER	28480	85662-80002
A4A6A1TP2	1251-0600	0	2	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A6A1TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A6A1U1	0955-0084	5	1	MIXER DBL BAL S BARR DIODE; P=200MW MAX	28480	0955-0084
A4A6A1Y1				CRYSTAL, 21.4 MHZ, SET OF SIX INCLUDES A4A4Y1-3, A4A6A1Y1 AND A4A8Y1-2		
				MISCELLANEOUS PARTS		
	6960-0016	0	1	PLUG-HOLE TR-HD FOR .125-D-HOLE NYL	28480	6960-0016

ManualsPlus.com

TABLE 1. A4A6, REPLACEABLE PARTS (3 OF 4)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A6A2	85662-60005	5	1	BOARD ASSEMBLY, DOWN CONVERTER(P/O A4A6)	28480	85662-60005
A4A6A2C1				NOT ASSIGNED		
A4A6A2C2	0160-2055	9	18	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C3				NOT ASSIGNED		
A4A6A2C4	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C5				NOT ASSIGNED		
A4A6A2C6				NOT ASSIGNED		
A4A6A2C7	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C8	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C9	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C10	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C11	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C12	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C13	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C14	0140-0196	3	1	CAPACITOR-FXD 150PF +-5% 300VDC MICA	72136	DM15F151J0300WV1CR
A4A6A2C15	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C16	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C17	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C18	0160-4084	8	2	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A4A6A2C19	0160-4084	8		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A4A6A2C20	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C21	0160-2207	3	1	CAPACITOR-FXD 300PF +-5% 300VDC MICA	28480	0160-2207
A4A6A2C22	0140-0193	0	1	CAPACITOR-FXD 82PF +-5% 300VDC MICA	72136	DM15E820J0300WV1CR
A4A6A2C23	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C24	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C25				NOT ASSIGNED		
A4A6A2C26				NOT ASSIGNED		
A4A6A2C27	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C28	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C29	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C30	0140-0210	2	1	CAPACITOR-FXD 270PF +-5% 300VDC MICA	72136	DM15F271J0300WV1CR
A4A6A2CR1	1901-0040	1	1	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A6A2CR2				NOT ASSIGNED		
A4A6A2CR3	1901-0047	8	2	DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A6A2CR4				NOT ASSIGNED		
A4A6A2CR5	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A6A2E1	9170-0029	3	4	CORE-SHIELDING BEAD	28480	9170-0029
A4A6A2E2	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A6A2E3	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A6A2E4	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A6A2L1	9140-0111	1	1	INDUCTOR RF-CH-MLD 3.3UH 10%	28480	9140-0111
A4A6A2L2				NOT ASSIGNED		
A4A6A2L3				NOT ASSIGNED		
A4A6A2L4	9140-0112	2	3	INDUCTOR RF-CH-MLD 4.7UH 10%	28480	9140-0112
A4A6A2L5	9100-1625	0	1	INDUCTOR RF-CH-MLD 33UH 5% .166DX.385LG	28480	9100-1625
A4A6A2L6				NOT ASSIGNED		
A4A6A2L7				NOT ASSIGNED		
A4A6A2L8	9140-0112	2		INDUCTOR RF-CH-MLD 4.7UH 10%	28480	9140-0112
A4A6A2L9	9140-0112	2		INDUCTOR RF-CH-MLD 4.7UH 10%	28480	9140-0112
A4A6A2L10	9140-0114	4	1	INDUCTOR RF-CH-MLD 10UH 10% .166DX.385LG	28480	9140-0114
A4A6A2L11	9100-1611	4	1	INDUCTOR RF-CH-MLD 220NH 20%	28480	9100-1611
A4A6A2L12	9100-2232	7	1	INDUCTOR RF-CH-MLD 560NH 10%	28480	9100-2232
A4A6A2Q1	1854-0019	3	4	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A6A2Q2	1853-0034	0	2	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A4A6A2Q3	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A6A2Q4	1854-0345	8	1	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A4A6A2Q5	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A6A2Q6	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A6A2Q7	1853-0007	7	1	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A4A6A2Q8	1853-0034	0		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A4A6A2R1				NOT ASSIGNED		
A4A6A2R2				NOT ASSIGNED		
A4A6A2R3				NOT ASSIGNED		
A4A6A2R4	0698-0083	8	1	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1961-F
A4A6A2R5-A4A6A2R10				NOT ASSIGNED		
A4A6A2R11	0757-0346	2	4	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-TO-10R0-F
A4A6A2R12	0757-0279	0	5	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-TO-3161-F
A4A6A2R13	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-TO-3161-F
A4A6A2R14	0757-0394	0	4	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-TO-51R1-F
A4A6A2R15	0757-0465	6	1	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1003-F

ManualsPlus.com

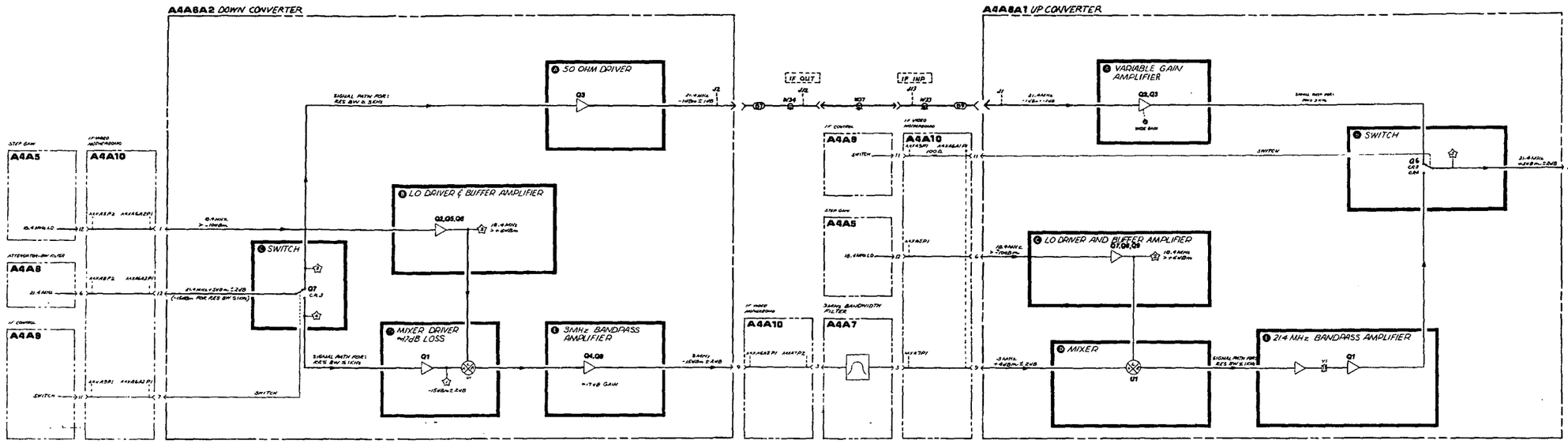
TABLE 1. A4A6, REPLACEABLE PARTS (4 OF 4)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A6A2R16	0757-0442	9	4	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A6A2R17	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A4A6A2R18	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A6A2R19	0757-0418	9	2	RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A4A6A2R20	0698-0084	9	2	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A4A6A2R21				NOT ASSIGNED		
A4A6A2R22	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A6A2R23	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A6A2R24	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A4A6A2R25	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A4A6A2R26	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A4A6A2R27	0698-0082	7	2	RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A4A6A2R28	0757-0180	2	1	RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A4A6A2R29	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A4A6A2R30	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A6A2R31	0757-0401	0	1	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A4A6A2R32	0698-3447	4	1	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A4A6A2R33*	0757-0395	1	1	RESISTOR 56.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-56R2-F
A4A6A2R34				NOT ASSIGNED		
A4A6A2R35	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A4A6A2R36				NOT ASSIGNED		
A4A6A2R37				NOT ASSIGNED		
A4A6A2R38	0757-0438	3	1	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A4A6A2R39	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A4A6A2R40	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A4A6A2R41	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A4A6A2R42	0757-0418	9		RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A4A6A2R43-A4A6A2R49				NOT ASSIGNED		
A4A6A2R50	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A4A6A2R51				NOT ASSIGNED		
A4A6A2R52	0757-0280	3	1	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A4A6A2T1	85662-80001	3	1	COIL AY XFMR	28480	85662-80001
A4A6A2TP1	1251-0600	0	4	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A6A2TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A6A2TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A6A2TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A6A2U1	0955-0084	5	1	MIXER DBL BAL S BARR DIODE; P=200MW MAX	28480	0955-0084
A4A6A2VR1	1902-0049	2	1	DIODE-ZNR 6.19V 5% DO-35 PD=.4W	28480	1902-0049
				MISCELLANEOUS PARTS		
	6960-0016	0	1	PLUG-HOLE TR-HD FOR .125-D-HOLE NYL	28480	6960-0016

*Indicates factory selected value

ManualsPlus.com

ManualsPlus.com



A4A6

FIGURE 1. A4A6A2 DOWN CONVERTER AND A4A6A1 UP CONVERTER, BLOCK DIAGRAM

ManualsPlus.com

A4A6
DOWN/UP CONVERTER

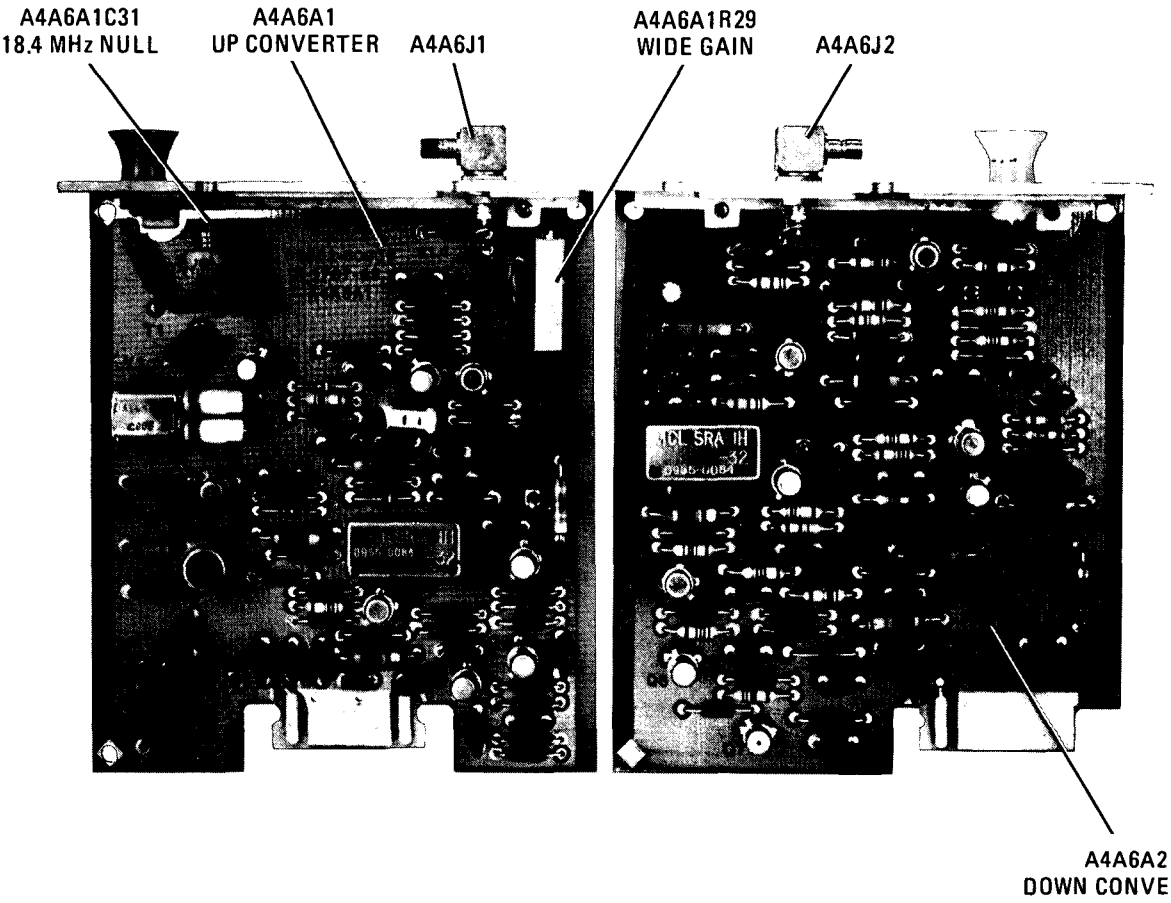


FIGURE 2. A4A6 DOWN/UP CONVERTER, ASSEMBLY AND COMPONENT LOCATIONS

ManualsPlus.com

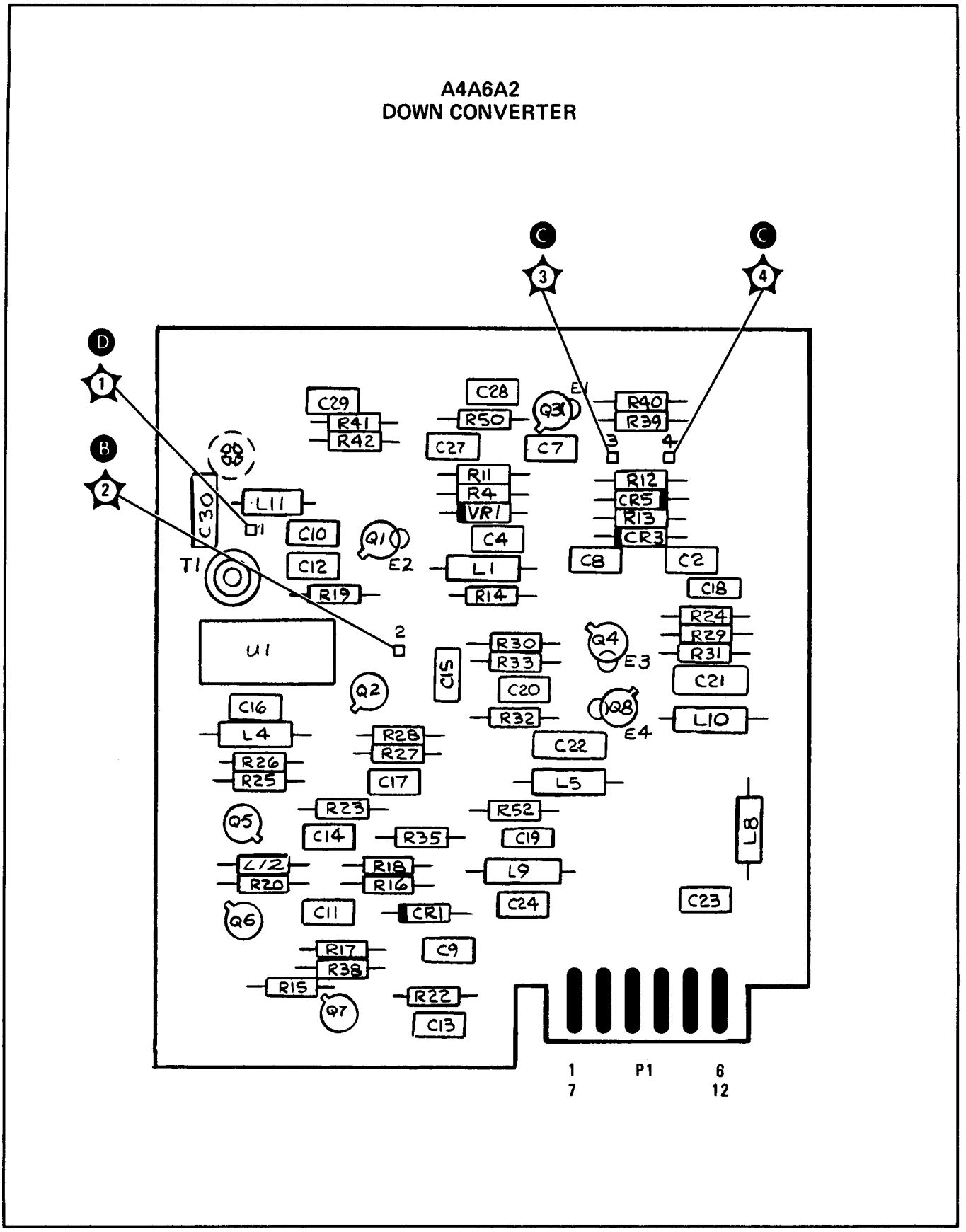


FIGURE 3. A4A6A2 DOWN CONVERTER, COMPONENT LOCATIONS

ManualsPlus.com

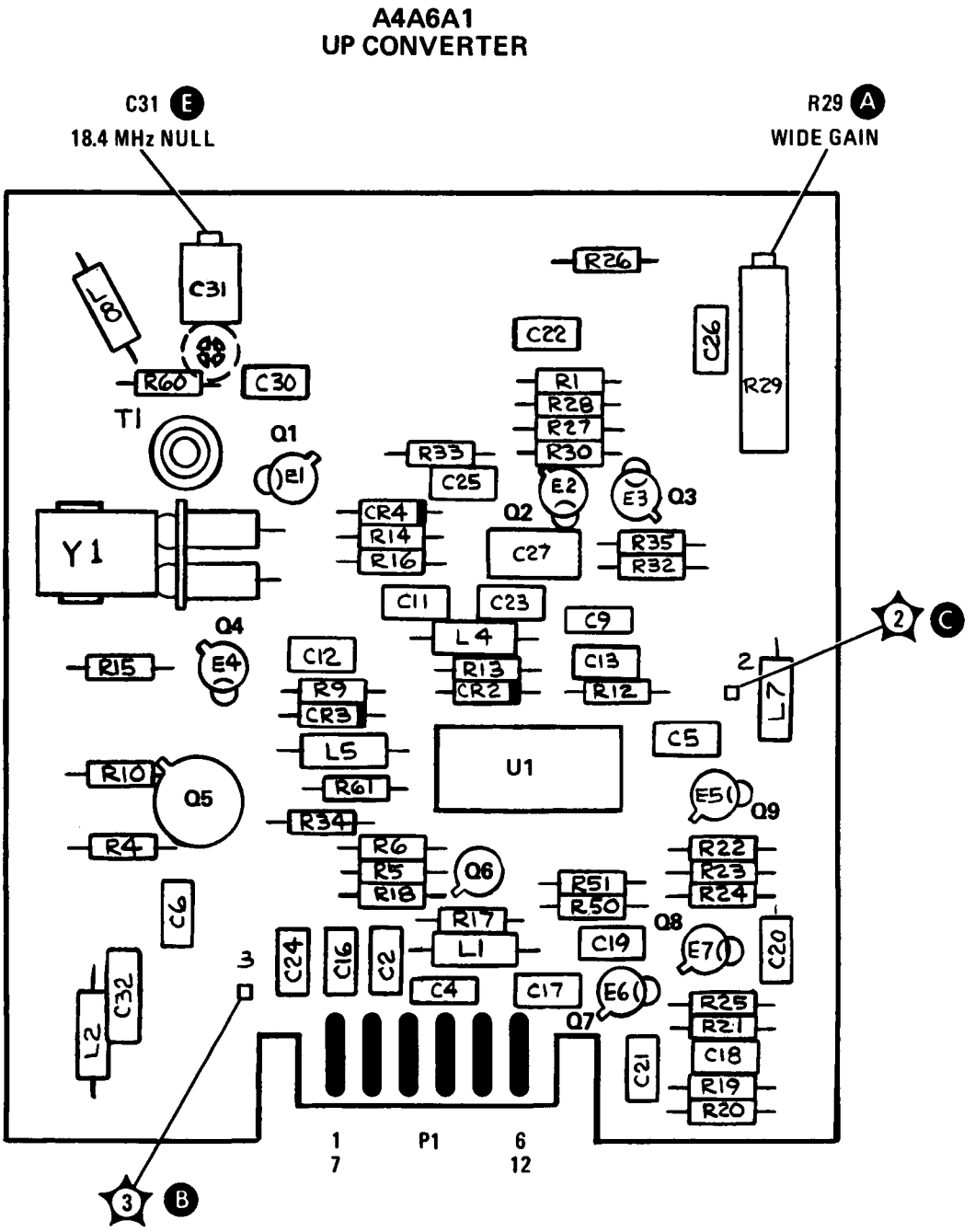
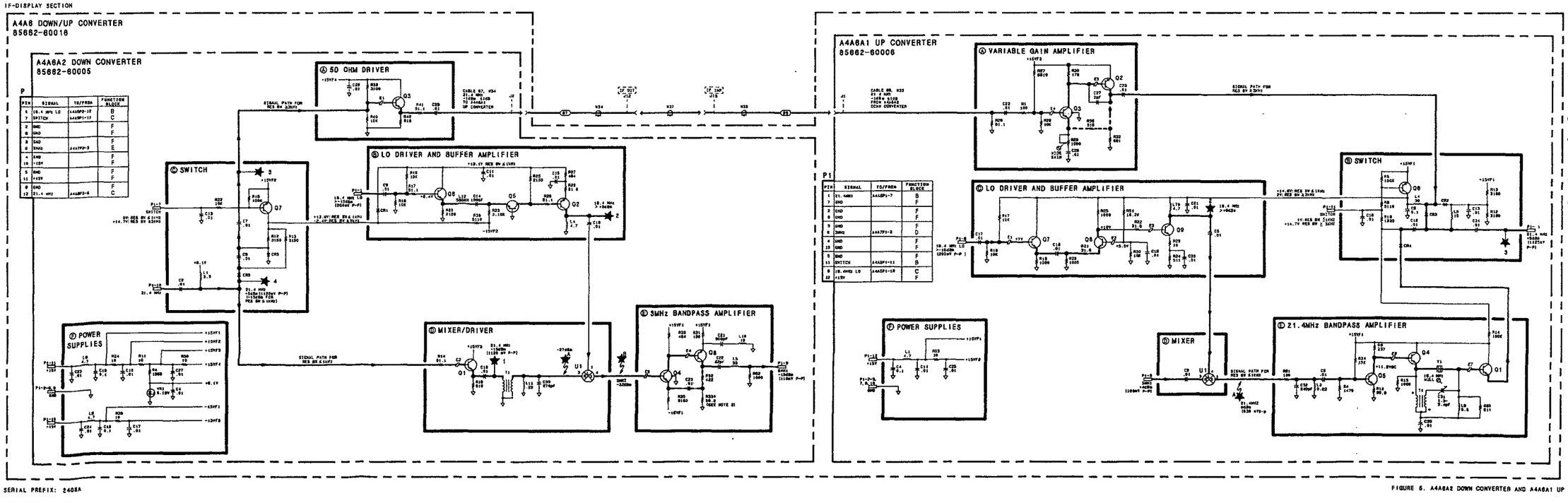


FIGURE 4. A4A6A1 UP CONVERTER, COMPONENT LOCATIONS

ManualsPlus.com

IF-DISPLAY SECTION



SERIAL PREFIX: 2408A

FIGURE 6. A4A8A2 DOWN CONVERTER AND A4A6A1 UP CONVERTER, SCHEMATIC DIAGRAM
A4A6 17/18

ManualsPlus.com

A4A7 3 MHz Bandwidth Filter

ManualsPlus.com

A4A7 3 MHz BANDWIDTH FILTER, CIRCUIT DESCRIPTION

A4A7 3 MHz Filter is a variable bandwidth filter centered at 3 MHz. The bandwidths are controlled from 10 Hz to 300 Hz in a 1, 3, 10 sequence by lines that have the same name as the bandwidth they activate. When none of the lines is activated, the filter has a 1 kHz bandwidth.

The filter has five poles which are almost identical. Only one is described in detail. Each pole has a negative output impedance to compensate for the series resistance of the crystal, but it is adjustable in only two poles.

4th Pole (D)

The basis of the buffer amplifier is a complementary feedback pair including Q9 and Q10 (see Figure 1).

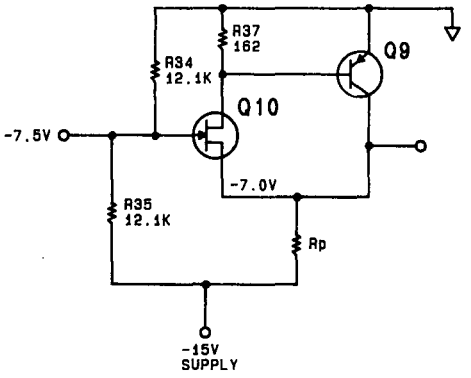


FIGURE 1. COMPLEMENTARY FEEDBACK PAIR, SIMPLIFIED SCHEMATIC

The bias current through Q10 is $0.7V/162\Omega \approx 4$ mA, and the total current through Q10 plus Q9 is set by R_P to be about 20 mA. The source voltage of Q10 should always be higher than the gate voltage.

The circuit as shown in Figure 1 has no gain. R39, R36, and C26 are added (see schematic) so this stage has a gain of:

$$G = 1 + \frac{R38}{R36} \approx 1 \text{ dB}$$

R_P is replaced by a 20 mA current sink (see Figure 2).

ManualsPlus.com

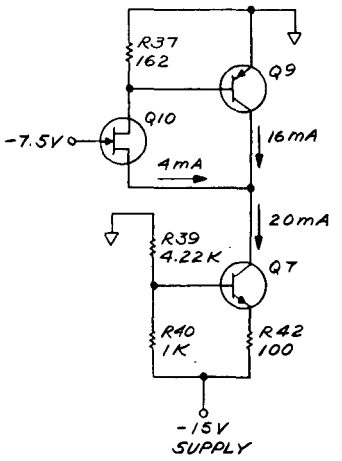


FIGURE 2. COMPLEMENTARY PAIR WITH CURRENT SINK

The description to this point is sufficient to understand how the circuit is biased. The 3 MHz operation is described in the following paragraphs.

Potentiometer R41 is added and the signal from the collector of Q9 is fed into the base of Q7 by C28 (see Figure 3).

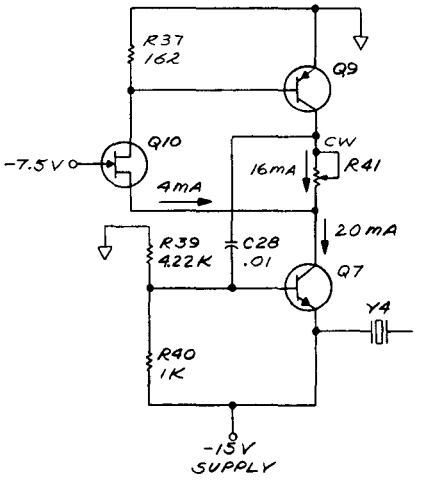


FIGURE 3. BUFFER AMPLIFIER WITH NEGATIVE OUTPUT IMPEDANCE

The circuit still operates the same because there is no load on the emitter of Q7 and hence no collector current (Remember, this is 3 MHz AC operation). If a load (Y4) is added to the emitter of Q7, collector current is developed and this current is fed back into the complementary pair Q9, Q10. The sense of this current is such that the feedback is positive. The more load, the more positive feedback is developed. The more positive feedback, the more gain the amplifier has. This implies negative output impedance. The magnitude of the negative output impedance is the resistance to which R41 is set.

Now the circuit can be completed.

ManualsPlus.com

Q8 and the SYM cap (Figure 4) are added to cancel the effect of the case (parallel) capacitance of the crystal. R94, R96 and other resistors are switched in to change bandwidths. C31 and C62 (not shown) are in series with the crystal to tune the center frequency to precisely 3 MHz. The negative output impedances of the amplifier is set to compensate for the series resistance of the crystal so that as different bandwidths are selected, the amplitude (overall gain) does not change. If the relative gain of the filter assembly is too low in the 10 Hz BW, and cannot be corrected by R41 and R30, three common problems are:

- All five crystals are not tuned close enough to the same center frequency.
- The series resistance of one or more of the crystals is too high.
- The output impedance of one or more of the buffer amplifiers is not negative enough.

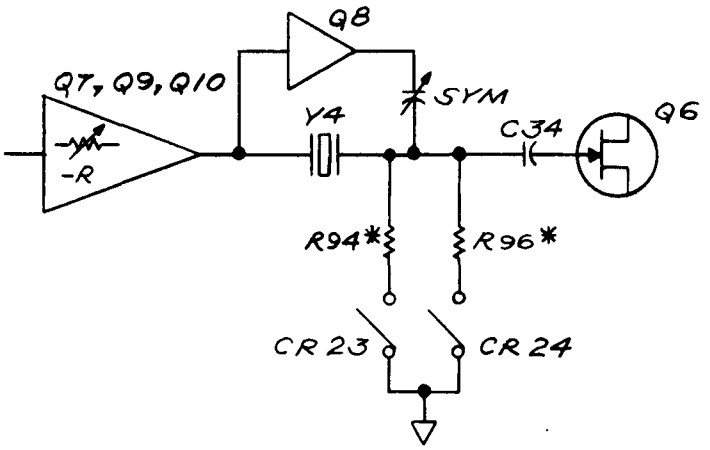


FIGURE 4. FOURTH POLE, EQUIVALENT CIRCUIT

ManualsPlus.com

TABLE 1. A4A7, REPLACEABLE PARTS (1 OF 4)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A7	85662-60004	4	1	BOARD ASSEMBLY, 3MHZ BANDWIDTH FILTER	28480	85662-60004
A4A7C1	0160-2055	9	37	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C2	0160-2266	4	1	CAPACITOR-FXD 24PF +-5% 500VDC CER 0+-30	28480	0160-2266
A4A7C3	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C4	0160-2250	6	8	CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A4A7C5*	0160-4611	7	5	CAPACITOR-FXD 68PF +-1% 300VDC MICA	28480	0160-4611
A4A7C6	0121-0446	6	5	CAPACITOR-V TRMR-CER 4.5-20PF 160V	28480	0121-0446
A4A7C7	0121-0105	4	5	CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304324 9/35PF N650
A4A7C8	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C9	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C10	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C11	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A4A7C12*	0160-4611	7		CAPACITOR-FXD 68PF +-1% 300VDC MICA	28480	0160-4611
A4A7C13	0121-0493	3	4	CAPACITOR-V TRMR-AIR 1.7-11PF 175V	74970	187-0306-125
A4A7C14	0121-0446	6		CAPACITOR-V TRMR-CER 4.5-20PF 160V	28480	0121-0446
A4A7C15	0121-0105	4		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304324 9/35PF N650
A4A7C16	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C17	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C18	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A4A7C19	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A4A7C20	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C21*	0160-4611	7		CAPACITOR-FXD 68PF +-1% 300VDC MICA	28480	0160-4611
A4A7C22	0121-0493	3		CAPACITOR-V TRMR-AIR 1.7-11PF 175V	74970	187-0306-125
A4A7C23	0121-0446	6		CAPACITOR-V TRMR-CER 4.5-20PF 160V	28480	0121-0446
A4A7C24	0121-0105	4		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304324 9/35PF N650
A4A7C25	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C26	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C27	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A4A7C28	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C29	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A4A7C30*	0160-4611	7		CAPACITOR-FXD 68PF +-1% 300VDC MICA	28480	0160-4611
A4A7C31	0121-0493	3		CAPACITOR-V TRMR-AIR 1.7-11PF 175V	74970	187-0306-125
A4A7C32	0121-0446	6		CAPACITOR-V TRMR-CER 4.5-20PF 160V	28480	0121-0446
A4A7C33	0121-0105	4		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304324 9/35PF N650
A4A7C34	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C35	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C36	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A4A7C37	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C38	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A4A7C39*	0160-4611	7		CAPACITOR-FXD 68PF +-1% 300VDC MICA	28480	0160-4611
A4A7C40	0121-0493	3		CAPACITOR-V TRMR-AIR 1.7-11PF 175V	74970	187-0306-125
A4A7C41	0121-0446	6		CAPACITOR-V TRMR-CER 4.5-20PF 160V	28480	0121-0446
A4A7C42	0121-0105	4		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304324 9/35PF N650
A4A7C43	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C44	0160-2244	8	2	CAPACITOR-FXD 3PF +-.25PF 500VDC CER	28480	0160-2244
A4A7C45	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C46	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C47	0160-2244	8		CAPACITOR-FXD 3PF +-.25PF 500VDC CER	28480	0160-2244
A4A7C48	0160-4300	1	14	CAPACITOR-FXD .047UF +80-20% 100VDC CER	56289	C023F101L473ZS22-CDH
A4A7C49	0180-0197	8	6	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A4A7C50	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A4A7C51	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A4A7C52	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A4A7C53	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A4A7C54	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A4A7C55	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C56	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C57	0160-4300	1		CAPACITOR-FXD .047UF +80-20% 100VDC CER	56289	C023F101L473ZS22-CDH
A4A7C58	0160-4297	5	5	CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101H223ZS22-CDH
A4A7C59	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C60	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C61	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C62	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C63	0160-4300	1		CAPACITOR-FXD .047UF +80-20% 100VDC CER	56289	C023F101L473ZS22-CDH
A4A7C64	0160-4297	5		CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101H223ZS22-CDH
A4A7C65	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C66	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C67	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C68	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C69	0160-4300	1		CAPACITOR-FXD .047UF +80-20% 100VDC CER	56289	C023F101L473ZS22-CDH
A4A7C70	0160-4297	5		CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101H223ZS22-CDH

*Indicates factory selected value

ManualsPlus.com

TABLE 1. A4A7, REPLACEABLE PARTS (1 OF 3)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A7	85662-60186	3	1	3MHZ BANDWIDTH FILTER	28480	85662-60186
A4A7C1	0160-2055	9	37	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C2	0160-2266	4	1	CAPACITOR-FXD 24PF +-5% 500VDC CER 0+-30	28480	0160-2266
A4A7C3	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C4	0160-2250	6	8	CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A4A7C5*	0160-4611	7	5	CAPACITOR-FXD 68PF +-1% 300VDC MICA	28480	0160-4611
A4A7C6	0121-0446	6	5	CAPACITOR-V TRMR-CER 4.5-20PF 160V	28480	0121-0446
A4A7C7	0121-0105	4	5	CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	73899	DV11PR35D
A4A7C8	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C9	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C10	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C11	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A4A7C12*	0160-4611	7		CAPACITOR-FXD 68PF +-1% 300VDC MICA	28480	0160-4611
A4A7C13	0121-0493	3	4	CAPACITOR-V TRMR-AIR 1.7-11PF 175V	74970	187-0306-125
A4A7C14	0121-0446	6		CAPACITOR-V TRMR-CER 4.5-20PF 160V	28480	0121-0446
A4A7C15	0121-0105	4		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	73899	DV11PR35D
A4A7C16	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C17	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C18	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A4A7C19	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A4A7C20	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C21*	0160-4611	7		CAPACITOR-FXD 68PF +-1% 300VDC MICA	28480	0160-4611
A4A7C22	0121-0493	3		CAPACITOR-V TRMR-AIR 1.7-11PF 175V	74970	187-0306-125
A4A7C23	0121-0446	6		CAPACITOR-V TRMR-CER 4.5-20PF 160V	28480	0121-0446
A4A7C24	0121-0105	4		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	73899	DV11PR35D
A4A7C25	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C26	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C27	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A4A7C28	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C29	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A4A7C30*	0160-4611	7		CAPACITOR-FXD 68PF +-1% 300VDC MICA	28480	0160-4611
A4A7C31	0121-0493	3		CAPACITOR-V TRMR-AIR 1.7-11PF 175V	74970	187-0306-125
A4A7C32	0121-0446	6		CAPACITOR-V TRMR-CER 4.5-20PF 160V	28480	0121-0446
A4A7C33	0121-0105	4		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	73899	DV11PR35D
A4A7C34	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C35	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C36	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A4A7C37	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C38	0160-2250	6		CAPACITOR-FXD 5.1PF +-.25PF 500VDC CER	28480	0160-2250
A4A7C39*	0160-4611	7		CAPACITOR-FXD 68PF +-1% 300VDC MICA	28480	0160-4611
A4A7C40	0121-0493	3		CAPACITOR-V TRMR-AIR 1.7-11PF 175V	74970	187-0306-125
A4A7C41	0121-0446	6		CAPACITOR-V TRMR-CER 4.5-20PF 160V	28480	0121-0446
A4A7C42	0121-0105	4		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	73899	DV11PR35D
A4A7C43	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C44	0160-2244	8	2	CAPACITOR-FXD 3PF +-.25PF 500VDC CER	28480	0160-2244
A4A7C45	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C46	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C47	0160-2244	8		CAPACITOR-FXD 3PF +-.25PF 500VDC CER	28480	0160-2244
A4A7C48	0160-4300	1	14	CAPACITOR-FXD .047UF +80-20% 100VDC CER	56289	C023F101L473ZS22
A4A7C55	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C56	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C57	0160-4300	1		CAPACITOR-FXD .047UF +80-20% 100VDC CER	56289	C023F101L473ZS22
A4A7C58	0160-4297	5	5	CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101H223ZS22
A4A7C59	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C60	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C61	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C62	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C63	0160-4300	1		CAPACITOR-FXD .047UF +80-20% 100VDC CER	56289	C023F101L473ZS22
A4A7C64	0160-4297	5		CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101H223ZS22
A4A7C65	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C66	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055

ManualsPlus.com

TABLE 1. A4A7, REPLACEABLE PARTS (2 OF 3)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A7C67	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C68	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C69	0160-4300	1		CAPACITOR-FXD .047UF +80-20% 100VDC CER	56289	C023F101L473ZS22
A4A7C70	0160-4297	5		CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101H223ZS22
A4A7C71	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C72	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C73	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C74	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C75	0160-4300	1		CAPACITOR-FXD .047UF +80-20% 100VDC CER	56289	C023F101L473ZS22
A4A7C76	0160-4297	5		CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101H223ZS22
A4A7C77	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C78	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C79	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C80	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C81	0160-4300	1		CAPACITOR-FXD .047UF +80-20% 100VDC CER	56289	C023F101L473ZS22
A4A7C82	0160-4297	5		CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101H223ZS22
A4A7C83	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C84	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C85	0160-4300	1		CAPACITOR-FXD .047UF +80-20% 100VDC CER	56289	C023F101L473ZS22
A4A7C86	0160-4300	1		CAPACITOR-FXD .047UF +80-20% 100VDC CER	56289	C023F101L473ZS22
A4A7C87	0160-4300	1		CAPACITOR-FXD .047UF +80-20% 100VDC CER	56289	C023F101L473ZS22
A4A7C88	0160-4300	1		CAPACITOR-FXD .047UF +80-20% 100VDC CER	56289	C023F101L473ZS22
A4A7C89	0160-4300	1		CAPACITOR-FXD .047UF +80-20% 100VDC CER	56289	C023F101L473ZS22
A4A7C90	0160-4300	1		CAPACITOR-FXD .047UF +80-20% 100VDC CER	56289	C023F101L473ZS22
A4A7C91	0160-4300	1		CAPACITOR-FXD .047UF +80-20% 100VDC CER	56289	C023F101L473ZS22
A4A7C92	0160-4300	1		CAPACITOR-FXD .047UF +80-20% 100VDC CER	56289	C023F101L473ZS22
A4A7C93*	0160-2252	8	1	CAPACITOR-FXD 6.2PF +-.25PF 500VDC CER	28480	0160-2252
A4A7E1	9170-0029	3	22	CORE-SHIELDING BEAD	28480	9170-0029
A4A7E2	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A7E3	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A7E4	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A7E5	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A7E6	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A7E7	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A7E8	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A7E9	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A7E10	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A7E11	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A7E12	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A7E13	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A7E14	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A7E15	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A7E16	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A7E17	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A7E18	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A7E19	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A7E20	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A7E21	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A7E22	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A7L1	9100-1643	2	6	INDUCTOR RF-CH-MLD 300UH 5%	28480	9100-1643
A4A7L2	9100-1648	7	5	INDUCTOR RF-CH-MLD 560UH 5%	28480	9100-1648
A4A7L3	9100-1629	4	2	INDUCTOR RF-CH-MLD 47UH 5%	28480	9100-1629
A4A7L4	9100-1643	2		INDUCTOR RF-CH-MLD 300UH 5%	28480	9100-1643
A4A7L5	9100-1648	7		INDUCTOR RF-CH-MLD 560UH 5%	28480	9100-1648
A4A7L7	9100-1643	2		INDUCTOR RF-CH-MLD 300UH 5%	28480	9100-1643
A4A7L8	9100-1648	7		INDUCTOR RF-CH-MLD 560UH 5%	28480	9100-1648
A4A7L10	9100-1643	2		INDUCTOR RF-CH-MLD 300UH 5%	28480	9100-1643
A4A7L11	9100-1648	7		INDUCTOR RF-CH-MLD 560UH 5%	28480	9100-1648
A4A7L13	9100-1643	2		INDUCTOR RF-CH-MLD 300UH 5%	28480	9100-1643
A4A7L14	9100-1648	7		INDUCTOR RF-CH-MLD 560UH 5%	28480	9100-1648
A4A7L15	9100-1629	4		INDUCTOR RF-CH-MLD 47UH 5%	28480	9100-1629
A4A7L16	9100-1643	2		INDUCTOR RF-CH-MLD 300UH 5%	28480	9100-1643
A4A7L17	9140-0114	4	2	INDUCTOR RF-CH-MLD 10UH 10%	28480	9140-0114
A4A7L20	9140-0114	4		INDUCTOR RF-CH-MLD 10UH 10%	28480	9140-0114

ManualsPlus.com

TABLE 1. A4A7, REPLACEABLE PARTS (3 OF 3)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A7Q1	1853-0031	7	6	TRANSISTOR PNP 2N3789 SI TO-3 PD=150W	04713	2N3789
A4A7Q2	1855-0081	1	5	TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0081
A4A7Q3	1854-0882	8	5	TRANSISTOR NPN PD=300MW FT=200MHZ	28480	1854-0882
A4A7Q4	1854-0023	9	5	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A4A7Q5	1853-0031	7		TRANSISTOR PNP 2N3789 SI TO-3 PD=150W	04713	2N3789
A4A7Q6	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0081
A4A7Q7	1854-0882	8		TRANSISTOR NPN PD=300MW FT=200MHZ	28480	1854-0882
A4A7Q8	1854-0023	9		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A4A7Q9	1853-0031	7		TRANSISTOR PNP 2N3789 SI TO-3 PD=150W	04713	2N3789
A4A7Q10	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0081
A4A7Q11	1854-0882	8		TRANSISTOR NPN PD=300MW FT=200MHZ	28480	1854-0882
A4A7Q12	1854-0023	9		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A4A7Q13	1853-0031	7		TRANSISTOR PNP 2N3789 SI TO-3 PD=150W	04713	2N3789
A4A7Q14	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0081
A4A7Q15	1854-0882	8		TRANSISTOR NPN PD=300MW FT=200MHZ	28480	1854-0882
A4A7Q16	1854-0023	9		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A4A7Q17	1853-0031	7		TRANSISTOR PNP 2N3789 SI TO-3 PD=150W	04713	2N3789
A4A7Q18	1855-0081	1		TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0081
A4A7Q19	1854-0023	9		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A4A7Q20	1854-0882	8		TRANSISTOR NPN PD=300MW FT=200MHZ	28480	1854-0882
A4A7Q21	1853-0031	7		TRANSISTOR PNP 2N3789 SI TO-3 PD=150W	04713	2N3789
A4A7Q22	1854-0345	8	1	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A4A7R30	2100-3426	6	2	RESISTOR-TRMR 20 10% C SIDE-ADJ 1-TRN	28480	2100-3426
A4A7R41	2100-3426	6		RESISTOR-TRMR 20 10% C SIDE-ADJ 1-TRN	28480	2100-3426
A4A7R58	0757-0405	4	1	RESISTOR 162 1% .125W F TC=0+-100	24546	CT4-1/8-T0-162R-
A4A7TP1	0360-1788	7	10	CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A7TP2	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A7TP3	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A7TP4	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A7TP5	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A7TP6	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A7TP7	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A7TP8	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A7TP9	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A7TP10	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
				A4A7 MISCELLANEOUS PARTS		
	0470-0440	9	1	COATING DOW CORNING 3140 SIL-RBR-RTV 1P	28480	0470-0440
	6960-0069	3	4	PLUG-HOLE CNCL-HD FOR .125-D-HOLE NYL	28480	6960-0069

ManualsPlus.com

Revised 6/19/1991 Change Note

TABLE 1. A4A7, REPLACEABLE PARTS (4 OF 4)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A7R61	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A4A7R62	0698-3435	0	1	RESISTOR 38.3 1% .125W F TC=0+-100	24546	C4-1/8-T0-38R3-F
A4A7R63	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A4A7R64	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A4A7R65	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A4A7R66*	0757-0395	1	4	RESISTOR 56.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-56R2-F
A4A7R67	0698-3443	0	5	RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A4A7R68*	0698-3437	2	5	RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A4A7R69	0698-0082	7	3	RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A4A7R70*	0757-0416	7	18	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A4A7R71	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A4A7R72*	0698-0083	8	5	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A4A7R73	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A4A7R74*	0757-0395	1		RESISTOR 56.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-56R2-F
A4A7R75	0698-3443	0		RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A4A7R76*	0698-3437	2		RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A4A7R77	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A4A7R78*	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A4A7R79	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A4A7R80*	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A4A7R81	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A4A7R82*	0757-0395	1		RESISTOR 56.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-56R2-F
A4A7R83	0698-3443	0		RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A4A7R84*	0698-3437	2		RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A4A7R85	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A4A7R86*	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A4A7R87	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A4A7R88*	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A4A7R89	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A4A7R90*	0757-0395	1		RESISTOR 56.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-56R2-F
A4A7R91	0698-3443	0		RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A4A7R92*	0698-3437	2		RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A4A7R93	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A4A7R94*	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A4A7R95	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A4A7R96*	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A4A7R97	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A4A7R98*	0757-0394	0	6	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A4A7R99	0698-3443	0		RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A4A7R100*	0698-3437	2		RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A4A7R101	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A4A7R102*	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A4A7R103	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A4A7R104*	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A4A7R105	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A4A7R106	0757-0465	6	4	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A4A7R107	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A4A7R108	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A4A7R109	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A4A7TP1	0360-1788	7	10	CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A7TP2	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A7TP3	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A7TP4	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A7TP5	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A7TP6	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A7TP7	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A7TP8	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A7TP9	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A7TP10	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A7Y1	0410-0404	9	5	CRYSTAL-QUARTZ MATCHED SET OF 5	28480	0410-0404
A4A7Y2	0410-0404	9		CRYSTAL-QUARTZ MATCHED SET OF 5	28480	0410-0404
A4A7Y3	0410-0404	9		CRYSTAL-QUARTZ MATCHED SET OF 5	28480	0410-0404
A4A7Y4	0410-0404	9		CRYSTAL-QUARTZ MATCHED SET OF 5	28480	0410-0404
A4A7Y5	0410-0404	9		CRYSTAL-QUARTZ MATCHED SET OF 5	28480	0410-0404
				MISCELLANEOUS PARTS		
	6960-0069	3	4	PLUG-HOLE CNCL-HD FOR .125-D-HOLE NYL	28480	6960-0069
	85662-20034	6	1	COVER 3MHZ BW FILTER	28480	85662-20034

*Indicates factory selected value

ManualsPlus.com

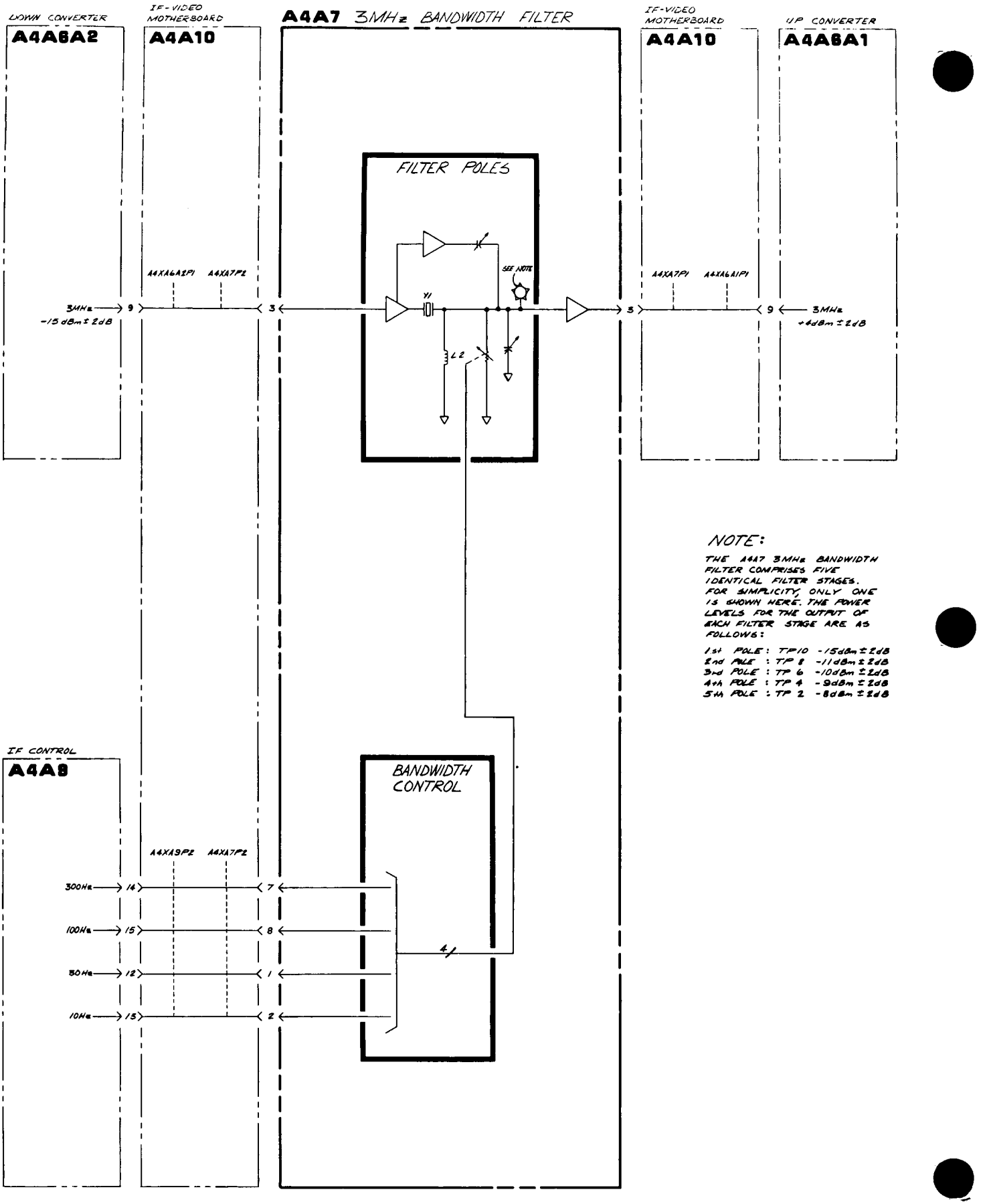


FIGURE 5. A4A7 3 MHz BANDWIDTH FILTER, BLOCK DIAGRAM

ManualsPlus.com

A4A7
3 MHz BANDWIDTH FILTER

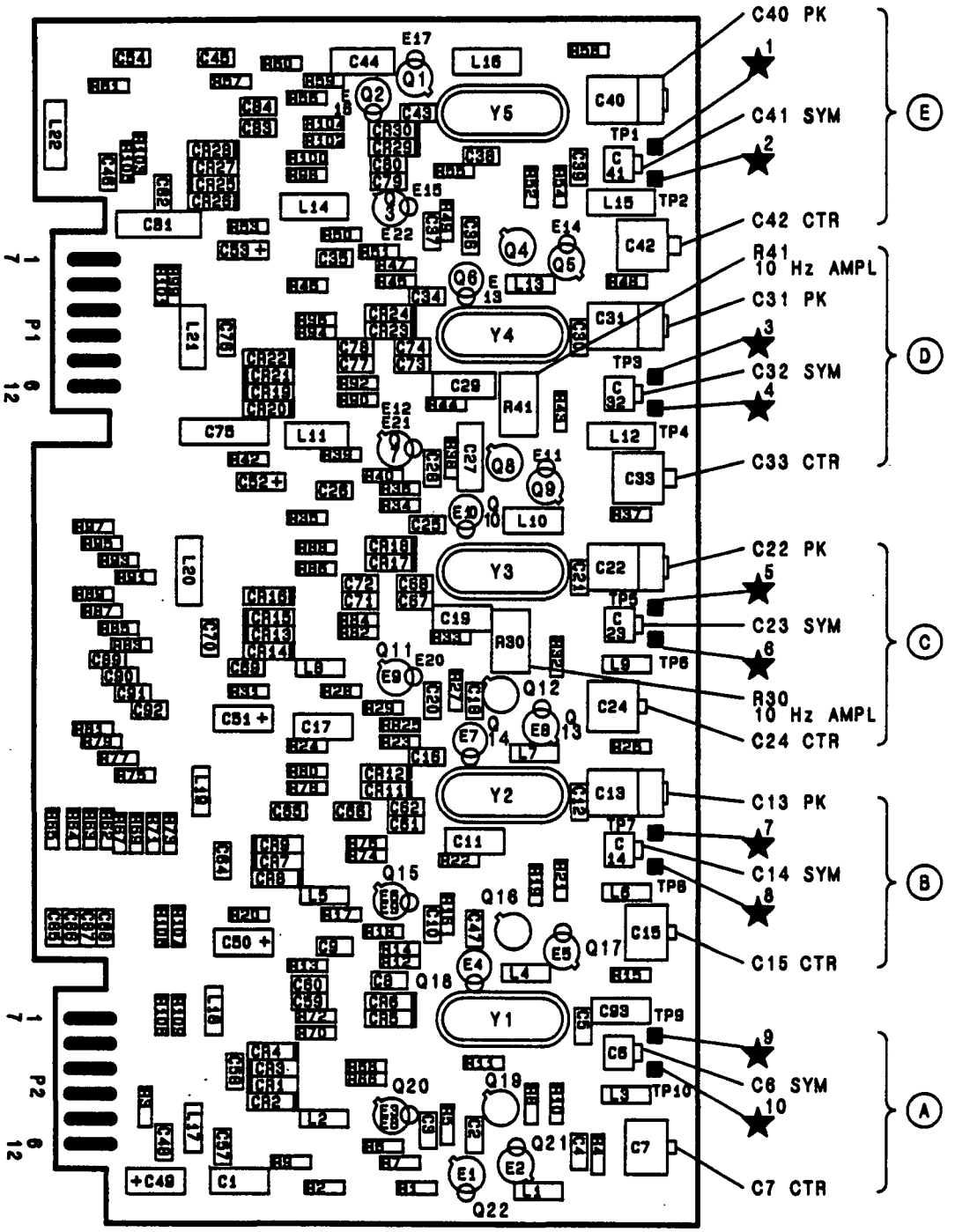


FIGURE 6. A4A7 3 MHz BANDWIDTH FILTER, COMPONENT LOCATIONS

IF-DISPLAY SECTION

A4A7 3 MHz BANDWIDTH FILTER
85662-60186

P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	[illegible]		G
2	[illegible]		G
3	[illegible]		G
4	4 MHz		E
5	[illegible]		G
6	[illegible]		G
7	[illegible]		G
8	[illegible]		G
9	[illegible]		G
10	[illegible]		G

P2

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	30 Hz	A4A6, P2-13	F
2	300 Hz	A4A6, P2-14	F
3	3 kHz	A4A6, P2-15	F
4	30 kHz	A4A6, P2-16	F
5	3 MHz	A4A6	A
6	+15V		G
7	-15V		G
8	+5V		G
9	+5V		G
10	GND		G

Ⓐ FIRST POLE

Ⓑ SECOND POLE

Ⓒ THIRD POLE

Ⓓ FOURTH POLE

Ⓔ FIFTH POLE

Ⓕ BANDWIDTH CONTROL (SEE NOTE 4)

Ⓖ POWER SUPPLIES

NOTES:

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATIONS, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS (μF) INDUCTANCE IS IN MICROHENRIES (μH)
3. ASTERISK (*) INDICATES FACTORY SELECTED COMPONENT. VALUES GIVEN ARE TYPICAL. REFER TO SCHEMATIC FOR NOMINAL VALUES.
4. TRUTH TABLE FOR BANDWIDTH CONTROL LINES:

RESOLUTION BANDWIDTH	CONTROL LINES			
	300 Hz	100 Hz	30 Hz	10 Hz
1 kHz	(-10V)	(-10V)	(-10V)	(-10V)
300 Hz	(+5V)	(-10V)	(-10V)	(-10V)
100 Hz	(-10V)	(+5V)	(-10V)	(-10V)
30 Hz	(-10V)	(-10V)	(+5V)	(-10V)
10 Hz	(-10V)	(-10V)	(+5V)	(+5V)

5. INSTRUMENT SETTINGS FOR ALL MEASUREMENTS ON THIS BOARD:

INSTRUMENT	CAL OUT FREQ
FREQUENCY COUNTER	3 MHz
ATTENUATOR	0 dB
RESOLUTION BANDWIDTH	3 MHz

6. ALL MEASUREMENTS ARE WITH BOARD IN EXTENDER. CONNECTIONS OUT THRU P3 OR P4 TO EXTENDER CAT. NO. 5080-0356.
7. SOURCE VOLTAGE SHOULD BE AT 20 dBm (MEASURED THRU 50Ω, 10dB, 2W ATTENUATOR) FOR 3 MHz SIGNAL. 3 MHz SOURCE IS INDICATED WITH A SQUARE PAD.
8. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTIONAL BLOCKS.

IAL PREFIX: 2408A

A4A7

FIGURE 7. A4A7 3 MHz BANDWIDTH FILTER, SCHEMATIC DIAGRAM 11/12

ManualsPlus.com

ManualsPlus.com

A4A8 Attenuator-Bandwidth Filter

ManualsPlus.com

A4A8 ATTENUATOR-BANDWIDTH FILTER, CIRCUIT DESCRIPTION

A4A8 Attenuator-Bandwidth Filter and A4A4 Bandwidth Filter operate at 21.4 MHz and are variable in bandwidth from 3 kHz to 3 MHz. The narrower bandwidths (3 kHz through 30 kHz) are obtained from five synchronously tuned crystal filters; the wider bandwidths (100 kHz through 3 MHz), from four synchronously tuned LC tank circuits (the bandwidths 10 Hz through 1 kHz are obtained from A4A7 3 MHz Filter). The Bandwidth Filter assemblies are on similar printed-circuit boards. A4A8 has two LC filters and two crystal filters, and A4A4 has two LC filters and three crystal filters (A4A6A1 Up Converter has a single 21.4 MHz crystal that is used only for bandwidths ≤1 kHz). These six crystals comprise a matched set and must be replaced as such. The replacement assemblies are shipped without crystals, so the crystals from the replaced boards must be used again.

10 – 20 dB Attenuator, 10 dB Amplifier (A)

The 10 dB Amplifier is a common emitter amplifier with a gain of ≈10 dB.

$$G = \frac{R63}{R3||R62} \qquad G_{dB} = 20 \log G$$

$$= \frac{287}{90.91} \qquad = 20 \log 3.16$$

$$= 3.16 \qquad \approx 10$$

For the lower gain settings of 0 dB and −10 dB (activated by A10dB and A20dB, respectively), additional collector resistance is switched in by CR3 or CR2, thereby lowering the gain.

Input Buffer Amplifier (C)

The unity gain Input Buffer Amplifier functions as a noninverting op amp (see Figure 1).

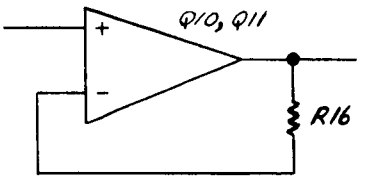


FIGURE 1. A4A8 INPUT BUFFER AMPLIFIER, EQUIVALENT CIRCUIT

In the crystal mode (3 kHz, 10 kHz, and 30 kHz bandwidths), the amplifier includes Q2. The biasing of the amplifier is independent of its ac (21.4 MHz) operation but is very critical for its proper functioning. If a malfunction occurs, the dc bias should be checked first.

The current through Q10 is determined by the difference between two current sources, one involving Q2 and the other involving Q11 (see Figure 2). The most convenient way to find the current from each source is to measure the voltage across each emitter resistor (a 1kΩ resistor should be used in series with the voltmeter probe tip to prevent the circuit from oscillating and giving an erroneous reading). For Q2, the current through R60 must be included. If results are inconsistent, the emitter resistor should be checked also. Check to see that the BW5 line is at approximately −0.5V for bandwidths ≤30 kHz.

ManualsPlus.com

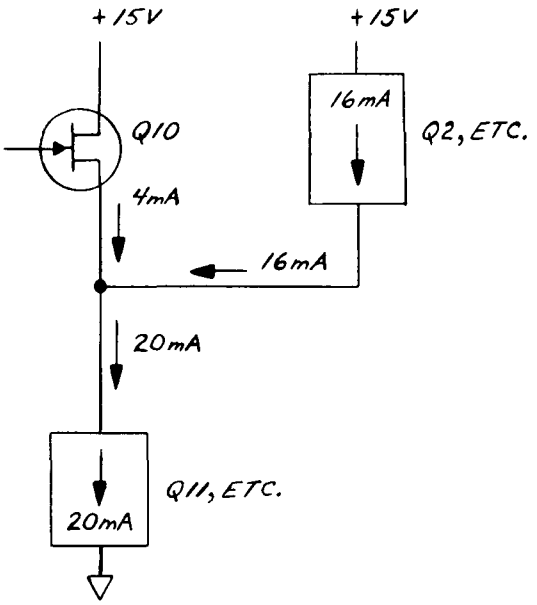


FIGURE 2. A4A8 INPUT BUFFER AMPLIFIER, CURRENT SINKS

In the LC mode (the four wider bandwidths), the BW5 line goes to approximately +14.8V and turns off the current source Q2. The current supplied by Q2 in the crystal mode is now supplied through CR5 and R15 from the BW5 line. In the LC mode, the current through Q10 can be found by subtracting the current through R5 from the current through R12. C76, L34, and C77 form a feedback tank circuit to suppress oscillations.

Buffer Amplifier (F)

The Buffer Amplifier is similar to the Input Buffer Amplifier. The input is selected by the BW5 line from CR9 in the LC mode or from CR8 in the crystal mode.

In the crystal mode, the current through Q4 is determined by the difference between the current sourced by Q6 and that sunk by Q5 (about 4 mA). A significant deviation from this current should be reflected by the gate-to-source voltage of Q4. The source should be at least 0.4V more positive than the gate, but not more than 2.0V more positive. If the difference is less than 0.4V, the FET current is too high; if the difference is greater than 2.0V, the FET current may be too low. In the either case the FET could also be defective. To determine precisely the current through Q4, the difference between the current through R47 and that through R61 should be subtracted from the current through R41. If the results are inconsistent, check the above-mentioned resistors.

In the LC mode of operation, current is supplied through R44 and CR11 from the BW5 line instead of through Q6. The difference between the current through R44 and that through R41 yields the FET current. C79, L35, and C80 form a feedback tank circuit to suppress oscillations.

Output Buffer Amplifier (I)

The Output Buffer Amplifier is a complementary pair of transistors in which Q8 acts as a source follower boosted by Q9. The current through FET Q8 is set by R58:

$$I_{FET} = \frac{V_{be}(Q9)}{196\Omega} \approx \frac{0.7V}{196\Omega} \approx 3.5mA$$

ManualsPlus.com

The total current through Q8 and Q9 is set by R59. The input is selected by the BW5 line from either CR15 in the LC mode or CR14 in the crystal mode.

Crystal Filtering Circuits (E) (H)

The bandwidths 3 kHz, 10 Hz, and 30 kHz are obtained by crystal filtering in the First Crystal Pole and Second Crystal Pole circuits. The crystals are used in series resonant mode and can be modeled as a series resonant circuit with a parallel capacitance (see Figure 3).

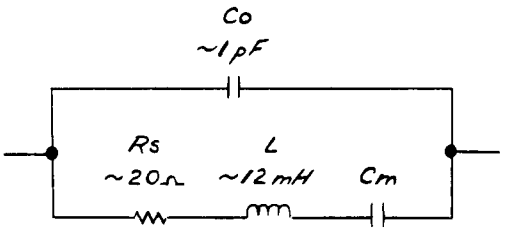


FIGURE 3. QUARTZ CRYSTAL, SIMPLIFIED SCHEMATIC

The parallel capacitance (C_o) and series resistance (R_s) are not desired and are compensated for in the circuit, as shown in the equivalent circuit of a single pole of crystal filtering (see Figure 4).

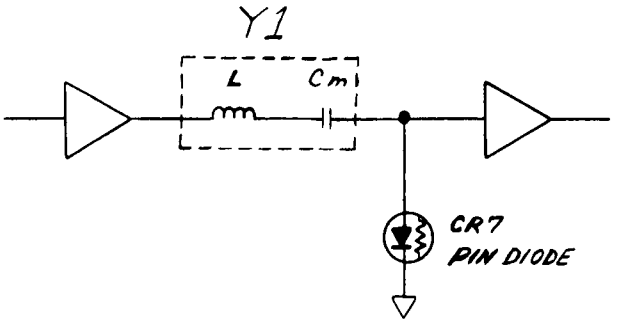


FIGURE 4. CRYSTAL FILTERING POLE, EQUIVALENT CIRCUIT

Since the two crystal filtering circuits are almost identical, the following description is for the First Crystal Pole circuit only.

The PIN diode CR7 functions as a variable resistor at 21.4 MHz. As the resistance is lowered by increasing the current in the BW63 line, the bandshape becomes narrower. The bandwidth of one pole widens to approximately 80 kHz when CR7 is turned off completely at the 30 kHz BW setting. For a five-pole filter, the bandwidth of each pole is about 2.6 times the bandwidth of all five poles taken together. The bandwidth of two poles is about 1.5 times the bandwidth of all five poles taken together.

A simplified schematic of a crystal pole, including compensation for R_s and C_o in the crystal and input capacitance of the buffer amplifier, is shown in Figure 5.

ManualsPlus.com

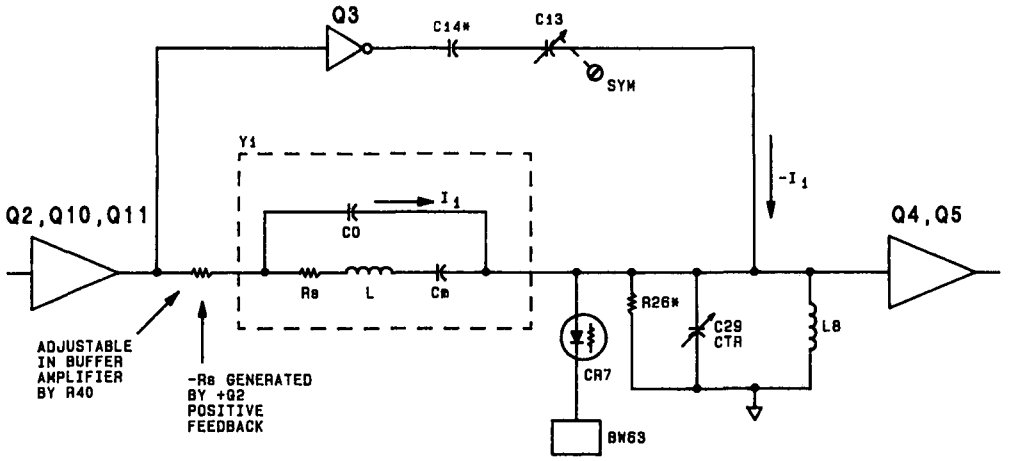


FIGURE 5. CRYSTAL POLE, SIMPLIFIED SCHEMATIC

The SYM adjustment C13 compensates for C_o by producing a current ($-I_1$) that is equal to the current (I_1) through C_o of the crystal but opposite in phase. These currents cancel, nullifying the effect of C_o. The positive feedback from the collector of Q2 generates a negative output resistance that cancels R_s of the crystal. This is approximated by resistor R16 in the Input Buffer Amplifier and XTL adjustment R40 in the Buffer Amplifier.

The input capacitance of the Buffer Amplifier, printed circuit board capacitance, PIN diode capacitance, and the centering (CTR) capacitor C29 are in parallel resonance with L8. These components have negligible effect on the band shape. As long as C29 has sufficient range to "dip" the band shape, they can be ignored in analyzing the remainder of the circuit.

The PIN diode CR7 controls bandwidths from 3 kHz to 10 kHz. For the 30 kHz bandwidth, CR7 is back biased and R26 sets that bandwidth. If the 30 kHz bandwidth is much too narrow, even with CR7 back biased, the circuit might be loaded by a bad buffer amplifier (Q4, Q5). If the bandwidth is only slightly narrow, it may be widened by selecting a new value for R26*. If the narrowest bandwidth (3 kHz) has too little gain, and it cannot be increased enough by XTL adjustment R40, then the crystals may have too high a series resistance (defective crystal), the output resistance may not be negative enough (defective Buffer Amplifier or Q3), or the crystals may have drifted too far apart in frequency.

LC Filters (D) (G)

The two LC filtering circuits are used for the wider bandwidths (100 kHz through 3 MHz). They are similar in function; the Second LC Pole circuit is described. A schematic of the simplified equivalent circuit is shown in Figure 6.

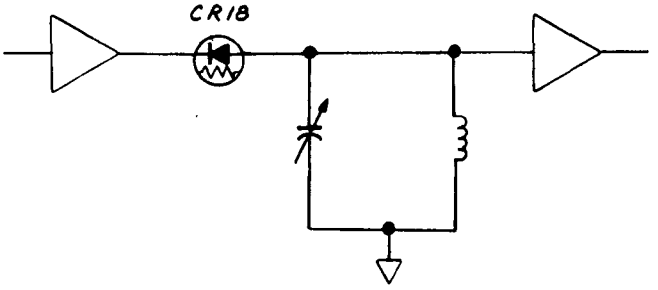


FIGURE 6. LC POLE, EQUIVALENT CIRCUIT

ManualsPlus.com

The Q (bandwidth) is set by the resistance of the PIN diode CR18. A more detailed schematic of the Second LC Pole circuit is shown in Figure 7.

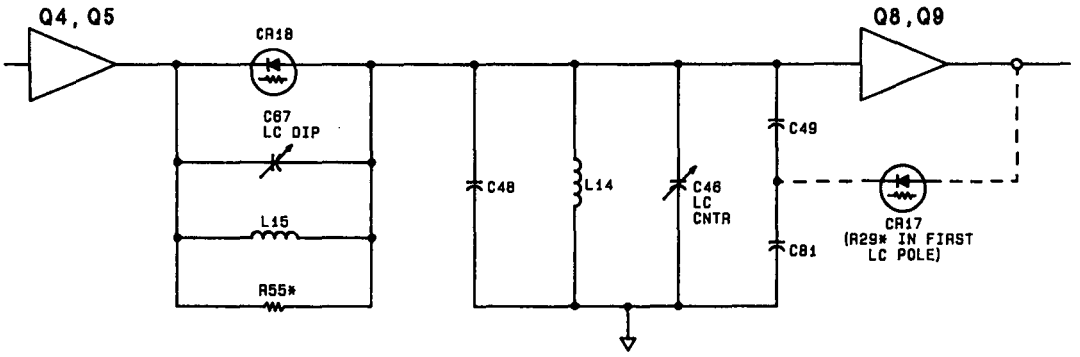


FIGURE 7. SECOND LC POLE CIRCUIT, SIMPLIFIED SCHEMATIC

The LC filter pole comprises an inductor (L14) in parallel with four capacitors: C48, C46 (LC CENTER), and the series combination of C49* and C81*. The parallel circuit is driven through PIN diode CR18, which functions as a variable resistor. The BW7 line sets the current through CR18. Higher resistance results in narrower bandwidth.

C67 and L15 tune out the case capacitance of CR18. R55* sets the 100 kHz bandwidth when CR18 is back biased (i.e., highest resistance). CR17 is controlled by the LC adjustment R35 and compensates for losses in the parallel resonant circuit. In the First LC Pole circuit, fixed resistor R29* replaces CR17.

Low gain in one of the poles in the 100 kHz bandwidth is caused by:

1. Broken or cracked metalized-glass inductor (often intermittent).
2. The pole being centered at some frequency other than 21.4 MHz.
3. Insufficient feedback from the buffer amplifier.
4. Defective buffer amplifier that is loading the circuit.

If the 10 kHz bandwidth amplitude is correct, but that of the 300 kHz bandwidth is too low, either C66 or C67 is not properly adjusted. If the 300 kHz amplitude is too high, the four LC poles are not tuned close enough to the same frequency. In either case, refer to the Performance Tests and Adjustments manual.

ManualsPlus.com

A4A8 ATTENUATOR-BANDWIDTH FILTER, TROUBLESHOOTING

As an aid in troubleshooting, critical dc voltages for proper operation are indicated at several nodes on the accompanying schematic.

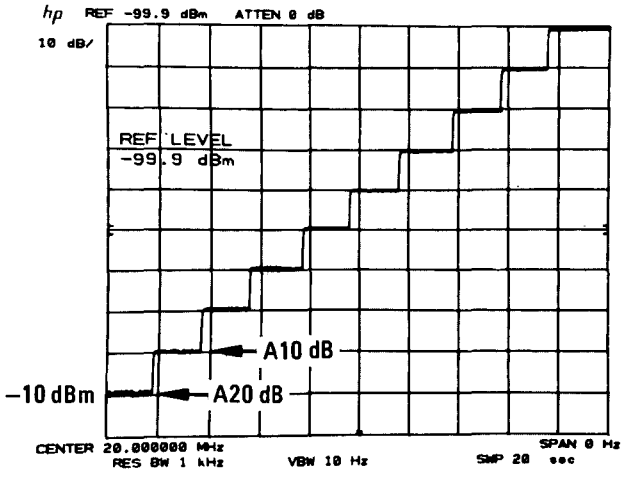
If the resolution bandwidths from 3 kHz to 3 MHz have low gain and/or incorrect bandwidth, either this board or the A4A4 Bandwidth Filter board may be defective. To determine which board is faulty, disconnect the 97 cable from A4A8J1 and connect it to A4A6J1. If the signal is then 3 to 5 dB lower than expected (i.e., CAL OUTPUT is −13 to −15 dBm) and/or the bandwidth is 30 to 60 percent wider than expected (i.e., 1 MHz [RES BW] is 1.3 to 1.5 MHz), then A4A8 is suspect.

Control line BW5 determines whether the LC filters or the crystal filters are selected. If this line does not switch, A4A9Q3 on the IF control board should be checked. BW63 controls the crystal mode resolution bandwidths from 3 kHz to 30 kHz. The LC resolution bandwidths from 100 kHz to 3 MHz are controlled by BW7. If any of the control line voltages in Note 5 are incorrect, signals from A4A9 IF Control should be checked.

Operation of the A10dB and A20dB circuitry can be determined by the following method. Connect a 355D attenuator between the CAL OUTPUT and the input of the spectrum analyzer. Set this attenuator to 90 dB, press Instrument Preset, and key in the following:

[CENTER FREQUENCY] ..... equal to the CAL OUTPUT frequency
[FREQUENCY SPAN] ..... 0 Hz
[RES BW] ..... 1 kHz
[ATTEN] ..... 0 dB
[VIDEO BW] ..... 10 Hz
[SWEEP TIME] ..... 20 sec
[REFERENCE LEVEL] ..... −10 dBm

Press the [SINGLE] sweep key and then repeatedly press the DATA STEP [⇩] key. Figure 8 shows the display of a properly working instrument. If either of the first two steps is missing, the A10dB or A20dB circuitry is faulty. Note 6 on the LC schematic diagram indicates the correct control line voltages from the A4A9 IF Control board.



NOTE: Center Frequency readout will be 100.000 000 MHz for an HP 8566B.

FIGURE 8. A10dB/A20dB STEP DISPLAY

ManualsPlus.com

TABLE 1. A4A8, REPLACEABLE PARTS (1 OF 4)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A8	85662-60131	8	1	BOARD ASSEMBLY, ATTENUATOR-BANDWITH FLT	28480	85662-60131
A4A8C1	0140-0200	0	1	CAPACITOR-FXD 390PF +-5% 300VDC MICA	72136	DM15F391J0300WV1CR
A4A8C2	0160-2055	9	47	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C3	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C4	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C5	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C6	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C7	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C8	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C9	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C10				NOT ASSIGNED		
A4A8C11	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C12	0160-2255	1	1	CAPACITOR-FXD 8.2PF +-.25PF 500VDC CER	28480	0160-2255
A4A8C13	0121-0059	7	2	CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	52763	304324 2/8PF NPO
A4A8C14*	0160-2249	3	2	CAPACITOR-FXD 4.7PF +-.25PF 500VDC CER	28480	0160-2249
A4A8C15	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C16	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C17	0160-2207	3	2	CAPACITOR-FXD 300PF +-5% 300VDC MICA	28480	0160-2207
A4A8C18	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C19	0160-4297	5	4	CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101H223ZS22-CDH
A4A8C20	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C21	0160-3456	6	2	CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A4A8C22	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C23	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C24	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C25	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C26	0160-4297	5		CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101H223ZS22-CDH
A4A8C27	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C28	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C29	0121-0446	6	2	CAPACITOR-V TRMR-CER 4.5-20PF 160V	28480	0121-0446
A4A8C30	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C31	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C32	0121-0036	0	2	CAPACITOR-V TRMR-CER 5.5-18PF 350V	52763	304324 5.5/18PF NPO
A4A8C33	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C34	0160-0437	7	2	CAPACITOR-FXD 12PF +-5% 500VDC CER	28480	0160-0437
A4A8C35*	0160-0134	1	2	CAPACITOR-FXD 220PF +-5% 300VDC MICA	28480	0160-0134
A4A8C36	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C37				NOT ASSIGNED		
A4A8C38	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C39	0160-4297	5		CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101H223ZS22-CDH
A4A8C40	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C41	0160-2254	0	1	CAPACITOR-FXD 7.5PF +-.25PF 500VDC CER	28480	0160-2254
A4A8C42	0121-0059	7		CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	52763	304324 2/8PF NPO
A4A8C43*	0160-2249	3		CAPACITOR-FXD 4.7PF +-.25PF 500VDC CER	28480	0160-2249
A4A8C44	0121-0446	6		CAPACITOR-V TRMR-CER 4.5-20PF 160V	28480	0121-0446
A4A8C45	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C46	0121-0036	0		CAPACITOR-V TRMR-CER 5.5-18PF 350V	52763	304324 5.5/18PF NPO
A4A8C47	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C48	0160-0437	7		CAPACITOR-FXD 12PF +-5% 500VDC CER	28480	0160-0437
A4A8C49*	0160-0134	1		CAPACITOR-FXD 220PF +-5% 300VDC MICA	28480	0160-0134
A4A8C50	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A4A8C51	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C52	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C53	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C54	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C55	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C56	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C57	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C58	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C59	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C60	0160-4297	5		CAPACITOR-FXD .022UF +80-20% 100VDC CER	56289	C023F101H223ZS22-CDH
A4A8C61	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C62	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C63*	0140-0194	1	1	CAPACITOR-FXD 110PF +-5% 300VDC MICA	72136	DM15F111J0300WV1CR
A4A8C64	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C65	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C66	0121-0452	4	2	CAPACITOR-V TRMR-AIR 1.3-5.4PF 175V	74970	187-0103-028
A4A8C67	0121-0452	4		CAPACITOR-V TRMR-AIR 1.3-5.4PF 175V	74970	187-0103-028
A4A8C68	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C69	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C70	0160-2207	3		CAPACITOR-FXD 300PF +-5% 300VDC MICA	28480	0160-2207

*Indicates factory selected value

ManualsPlus.com

TABLE 1. A4A8, REPLACEABLE PARTS (1 OF 4)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A8	85662-60185	2	1	ATTENUATOR-BANDWIDTH FILTER	28480	85662-60185
A4A8C1	0140-0200	0	1	CAPACITOR-FXD 390PF +-5% 300VDC MICA	72136	DM15F391J0300WV1
A4A8C2	0160-4832	4	47	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C3	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C4	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C5	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C6	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C7	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C8	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C9	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C11	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C12	0160-4792	5	1	CAPACITOR-FXD 8.2PF +-.5PF 100VDC CER	28480	0160-4792
A4A8C13	0121-0059	7	2	CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	73899	DV11PR8A
A4A8C14*	0160-4795	8	2	CAPACITOR-FXD 4.7PF +-.5PF 100VDC CER	28480	0160-4795
A4A8C15	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C16	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C17	0160-2207	3	2	CAPACITOR-FXD 300PF +-5% 300VDC MICA	28480	0160-2207
A4A8C18	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C19	0160-4833	5	4	CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A8C20	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C21	0160-4574	1	2	CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A4A8C22	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C23	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C24	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C25	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C26	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A8C27	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C28	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C29	0121-0444	4	2	CAPACITOR-V TRMR-CER 3-9PF 160V PC-MTG	28480	0121-0444
A4A8C30	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C31	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C32	0121-0036	0	2	CAPACITOR-V TRMR-CER 5.5-18PF 350V	73899	DV11PR18A
A4A8C33	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C34	0160-0437	7	2	CAPACITOR-FXD 12PF +-5% 500VDC CER	28480	0160-0437
A4A8C35*	0160-0134	1	2	CAPACITOR-FXD 220PF +-5% 300VDC MICA	28480	0160-0134
A4A8C36	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C38	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C39	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A8C40	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C41	0160-5899	5	1	CAPACITOR-FXD 7.5PF +-.5PF 200VDC CER	28480	0160-5899
A4A8C42	0121-0059	7		CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	73899	DV11PR8A
A4A8C43*	0160-4795	8		CAPACITOR-FXD 4.7PF +-.5PF 100VDC CER	28480	0160-4795
A4A8C44	0121-0444	4		CAPACITOR-V TRMR-CER 3-9PF 160V PC-MTG	28480	0121-0444
A4A8C45	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C46	0121-0036	0		CAPACITOR-V TRMR-CER 5.5-18PF 350V	73899	DV11PR18A
A4A8C47	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C48	0160-0437	7		CAPACITOR-FXD 12PF +-5% 500VDC CER	28480	0160-0437
A4A8C49*	0160-0134	1		CAPACITOR-FXD 220PF +-5% 300VDC MICA	28480	0160-0134
A4A8C50	0160-4574	1		CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A4A8C51	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C52	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C53	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C54	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C55	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C56	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C57	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C58	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C59	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C60	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A8C61	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C62	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832

ManualsPlus.com

TABLE 1. A4A8, REPLACEABLE PARTS (2 OF 4)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A8C63*	0140-0194	1	1	CAPACITOR-FXD 110PF +-5% 300VDC MICA	72136	DM15F111J0300WV1
A4A8C64	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C65	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C66	0121-0452	4	2	CAPACITOR-V TRMR-AIR 1.3-5.4PF 175V	74970	187-0103-028
A4A8C67	0121-0452	4		CAPACITOR-V TRMR-AIR 1.3-5.4PF 175V	74970	187-0103-028
A4A8C68	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C69	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C70	0160-2207	3		CAPACITOR-FXD 300PF +-5% 300VDC MICA	28480	0160-2207
A4A8C71	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C72	0160-4835	7	2	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A4A8C73	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A4A8C74	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C75	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C76	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C77	0160-5902	1	2	CAPACITOR-FXD 11PF +-5% 200VDC CER 0+-30	28480	0160-5902
A4A8C78*	0140-0198	5	2	CAPACITOR-FXD 200PF +-5% 300VDC MICA	72136	DM15F201J0300WV1
A4A8C79	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A8C80	0160-5902	1		CAPACITOR-FXD 11PF +-5% 200VDC CER 0+-30	28480	0160-5902
A4A8C81*	0140-0198	5		CAPACITOR-FXD 200PF +-5% 300VDC MICA	72136	DM15F201J0300WV1
A4A8C82	0160-6634	8	2	CAPACITOR-FXD 9PF +-.5PF 50VDC CER	28480	0160-6634
A4A8C83	0160-6634	8		CAPACITOR-FXD 9PF +-.5PF 50VDC CER	28480	0160-6634
A4A8CR2	1901-1070	9	7	DIODE-PIN 110V	28480	1901-1070
A4A8CR3	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A4A8CR4	1901-0047	8	6	DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A8CR5	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A8CR6	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A4A8CR7	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A4A8CR8	1901-0535	9	5	DIODE-SM SIG SCHOTTKY	28480	1901-0535
A4A8CR9	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A8CR10	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A4A8CR11	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A8CR12	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A8CR13	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A4A8CR14	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A4A8CR15	1901-0047	8		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A8CR16	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A4A8CR17	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A4A8CR18	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A4A8CR19	1901-0535	9		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A4A8E1	9170-0029	3	11	CORE-SHIELDING BEAD	28480	9170-0029
A4A8E3	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A8E4	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A8E5	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A8E6	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A8E9	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A8E10	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A8E11	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A8E12	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A8E13	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A8E14	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029
A4A8L1	9100-3314	8	1	INDUCTOR RF-CH-MLD 150NH 5%	28480	9100-3314
A4A8L2	9100-3313	7	2	INDUCTOR RF-CH-MLD 22UH 5%	28480	9100-3313
A4A8L3	9140-0453	4	2	INDUCTOR RF-CH-MLD 6.8UH 5% .166DX.385LG	28480	9140-0453
A4A8L4	9100-3560	6	4	INDUCTOR RF-CH-MLD 5.6UH 5%	28480	9100-3560
A4A8L5	9100-0539	3	3	INDUCTOR (MISC ITEM)	28480	9100-0539
A4A8L6	9100-0539	3		INDUCTOR (MISC ITEM)	28480	9100-0539
A4A8L7	85662-60188	5	2	COIL ASSY 21 MHZ	28480	85662-60188
A4A8L8	9140-0399	7	2	INDUCTOR RF-CH-MLD 2.2UH 5%	28480	9140-0399
A4A8L9	9100-3912	2	2	INDUCTOR RF-CH-MLD 15UH 5%	28480	9100-3912
A4A8L10	9140-0453	4		INDUCTOR RF-CH-MLD 6.8UH 5% .166DX.385LG	28480	9140-0453
A4A8L11	9100-3560	6		INDUCTOR RF-CH-MLD 5.6UH 5%	28480	9100-3560
A4A8L12	9100-3560	6		INDUCTOR RF-CH-MLD 5.6UH 5%	28480	9100-3560
A4A8L13	9100-0539	3		INDUCTOR (MISC ITEM)	28480	9100-0539
A4A8L14	85662-60188	5		COIL ASSY 21 MHZ	28480	85662-60188
A4A8L15	9140-0398	6	1	INDUCTOR RF-CH-MLD 12UH 5%	28480	9140-0398

ManualsPlus.com

TABLE 1. A4A8, REPLACEABLE PARTS (3 OF 4)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A8L16	9100-3912	2		INDUCTOR RF-CH-MLD 15UH 5%	28480	9100-3912
A4A8L17	9140-0399	7		INDUCTOR RF-CH-MLD 2.2UH 5%	28480	9140-0399
A4A8L19	9100-3560	6		INDUCTOR RF-CH-MLD 5.6UH 5%	28480	9100-3560
A4A8L20	9100-3313	7		INDUCTOR RF-CH-MLD 22UH 5%	28480	9100-3313
A4A8L33	9100-3551	5	1	INDUCTOR RF-CH-MLD 1UH 5%	28480	9100-3551
A4A8L34	9100-3562	8	2	INDUCTOR RF-CH-MLD 4.7UH 5%	28480	9100-3562
A4A8L35	9100-3562	8		INDUCTOR RF-CH-MLD 4.7UH 5%	28480	9100-3562
A4A8Q1	1854-0345	8	1	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A4A8Q2	1853-0007	7	5	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A4A8Q3	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A4A8Q4	1855-0267	5	3	TRANSISTOR J-FET N-CHAN D-MODE TO-92 SI	28480	1855-0267
A4A8Q5	1854-0404	0	2	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A8Q6	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A4A8Q7	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A4A8Q8	1855-0267	5		TRANSISTOR J-FET N-CHAN D-MODE TO-92 SI	28480	1855-0267
A4A8Q9	1853-0007	7		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A4A8Q10	1855-0267	5		TRANSISTOR J-FET N-CHAN D-MODE TO-92 SI	28480	1855-0267
A4A8Q11	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A8R1	0757-0395	1	1	RESISTOR 56.2 1% .125W F TC=0+-100	24546	CT4-1/8-T0-56R2-
A4A8R2	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1961-
A4A8R3	0757-0401	0	5	RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A4A8R4	0757-0294	9	1	RESISTOR 17.8 1% .125W F TC=0+-100	19701	5033R-1/8-T0-17R
A4A8R5	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A4A8R6	2100-3053	5	1	RESISTOR-TRMR 20 20% C SIDE-ADJ 17-TRN	73138	89PR20
A4A8R7	2100-3052	4	2	RESISTOR-TRMR 50 10% C SIDE-ADJ 17-TRN	73138	89PR50
A4A8R8	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	CT4-1/8-T0-511R-
A4A8R9	0698-3260	9		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A4A8R10	0698-3260	9		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A4A8R11	0757-0280	3	8	RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-
A4A8R12	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A4A8R13	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-
A4A8R14	0698-3155	1	2	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4641-
A4A8R15	0698-0082	7	3	RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-
A4A8R16	0698-3429	2	1	RESISTOR 19.6 1% .125W F TC=0+-100	03888	PME55-1/8-T0-19R
A4A8R17	0757-0443	0		RESISTOR 11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1102-
A4A8R18	0757-0438	3	4	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-
A4A8R19*	0698-3260	9	3	RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A4A8R20	0698-3441	8	2	RESISTOR 215 1% .125W F TC=0+-100	24546	CT4-1/8-T0-215R-
A4A8R21	0698-3444	1	2	RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-
A4A8R22	0698-3442	9	2	RESISTOR 237 1% .125W F TC=0+-100	24546	CT4-1/8-T0-237R-
A4A8R23	0757-0279	0	2	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3161-
A4A8R24*	0757-0346	2	1	RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A4A8R25	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-
A4A8R26*	0698-3154	0	4	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4221-
A4A8R27	0757-0290	5	4	RESISTOR 6.19K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-619
A4A8R28	0757-0290	5		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-619
A4A8R29*	0698-0083	8	2	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1961-
A4A8R30*	0757-0442	9	4	RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-
A4A8R31	0698-3156	2	4	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1472-
A4A8R32	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1472-
A4A8R33	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-
A4A8R35	2100-3153	6	1	R:VAR 1K/1K/250 OHM 20%/20%/20%	28480	2100-3153
A4A8R38	0757-1094	9	1	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1471-
A4A8R39	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-
A4A8R40	2100-3052	4		RESISTOR-TRMR 50 10% C SIDE-ADJ 17-TRN	73138	89PR50
A4A8R41	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A4A8R42	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-
A4A8R43	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4641-
A4A8R44	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-
A4A8R45	0757-0443	0		RESISTOR 11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1102-
A4A8R46	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-
A4A8R47	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	CT4-1/8-T0-215R-
A4A8R48	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-F

ManualsPlus.com

TABLE 1. A4A8, REPLACEABLE PARTS (4 OF 4)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A8R49	0698-3442	9		RESISTOR 237 1% .125W F TC=0+-100	24546	CT4-1/8-T0-237R-
A4A8R50	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-
A4A8R51	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3161-
A4A8R52*	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4221-
A4A8R53	0757-0290	5		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-619
A4A8R54	0757-0290	5		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-619
A4A8R55*	0757-0443	0	3	RESISTOR 11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1102-
A4A8R56	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1472-
A4A8R57	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1472-
A4A8R58	0698-3440	7	1	RESISTOR 196 1% .125W F TC=0+-100	24546	CT4-1/8-T0-196R-
A4A8R59	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-
A4A8R60	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4221-
A4A8R61	0698-3154	0		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4221-
A4A8R62	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-
A4A8R63	0698-3443	0	1	RESISTOR 287 1% .125W F TC=0+-100	24546	CT4-1/8-T0-287R-
A4A8R64	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A4A8R66	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-
A4A8R67	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-
A4A8R68	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-
A4A8R69	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-
A4A8R70	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-
A4A8R71	0757-0465	6	1	RESISTOR 100K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1003-
A4A8R72	0757-0180	2	2	RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A4A8R73	0757-0180	2		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A4A8TP1	0360-1788	7	4	CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A8TP2	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A8TP3	1251-0600	0	2	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A8TP4	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A8TP5	0360-1788	7		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A8TP6	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A8VR1	1902-3139	7	1	DIODE-ZNR 8.25V 5% DO-35 PD=.4W	28480	1902-3139
				A4A8 MISCELLANEOUS PARTS		
	0470-0440	9	1	COATING DOW CORNING 3140 SIL-RBR-RTV 1P	28480	0470-0440
	1250-0690	6	1	CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
	2190-0401	0	4	WASHER-FL NM NO. 4 .12-IN-ID .312-IN-OD	28480	2190-0401
	2190-0557	7	1	WASHER-LK INTL T NO. 10 .195-IN-ID	78189	1210-06-00-0551
	2200-0101	0	4	SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIP
	2950-0078	9	1	NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	28480	2950-0078
	6960-0069	3	1	PLUG-HOLE CNCL-HD FOR .125-D-HOLE NYL	28480	6960-0069
	8151-0014	5	1	WIRE 24AWG 1X24	28480	8151-0014
	85662-20038	0	1	CVR ATTEN BW FLT	28480	85662-20038
	86701-40001	9	1	EXTRACTOR PC	28480	86701-40001

ManualsPlus.com

IF-DISPLAY SECTION

ManualsPlus.com

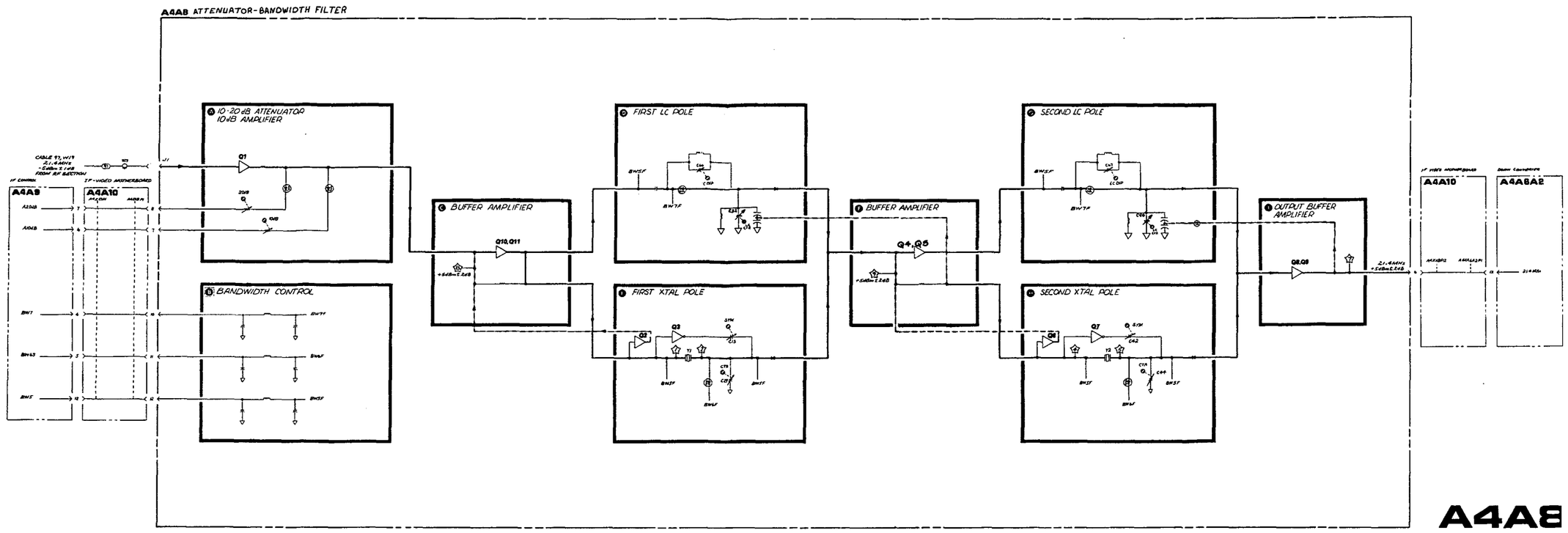


FIGURE 9. A4A8 ATTENUATOR-BANDWIDTH FILTER, BLOCK DIAGRAM

ManualsPlus.com

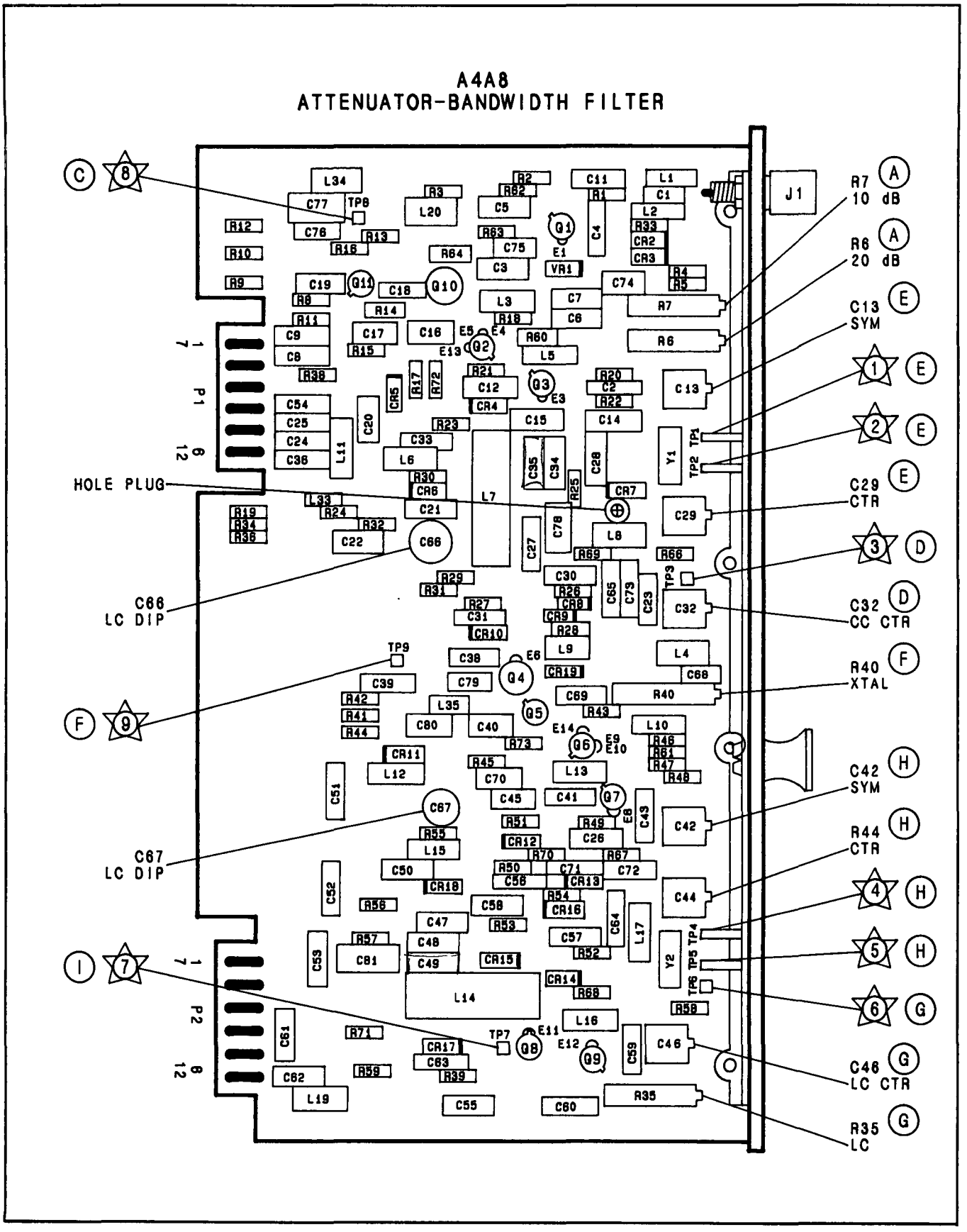


FIGURE 10. A4A8 ATTENUATOR-BANDWIDTH FILTER, COMPONENT LOCATIONS

ManualsPlus.com

IF-DISPLAY SECTION

A4A8 ATTENUATOR-BANDWIDTH FILTER
85662-60185

P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	GND		J
2	11MHz	A4AP1-9	A
3	GND		J
4	629MHz	A4AP1-7	A
5	GND		J
6	GND		J
7	GND		J
8	GND	A4AP1-4	B
9	GND		J
10	GND	A4AP1-5	B
11	+10V	A4AP1-6	J
12	GND	A4AP1-12	B

P2

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	GND		J
2	GND		J
3	GND		J
4	GND		J
5	GND		J
6	GND		J
7	-10V		J
8	+42V		J
9	+10V		J
10	22.4 MHz	A4A8A3-P1-4	J
11	GND		J

Ⓐ 10-20dB ATTENUATOR
10dB AMPLIFIER

Ⓑ INPUT BUFFER AMPLIFIER

Ⓒ BANDWIDTH CONTROL

Ⓓ POWER SUPPLY

Ⓔ FIRST LC POLE

Ⓕ FIRST XTAL POLE

Ⓖ BUFFER AMPLIFIER

Ⓗ SECOND LC POLE

Ⓘ SECOND XTAL POLE

Ⓙ OUTPUT BUFFER AMPLIFIER

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATIONS, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (Ω) CAPACITANCE IS IN MICROFARADS(μF) INDUCTANCE IS IN MICROHENRIES(μH)
3. ASTERISK (*) DENOTES A FACTORY SELECTED COMPONENT. TYPICAL VALUE IS SHOWN. REFER TO SECTION 8 FOR FULL NAME OF VALUES.
4. MNEMONIC TABLE:

MNEMONIC	DESCRIPTION
A30dB	ATTENUATION 30dB
A20dB	ATTENUATION 20dB
BW1	BANDWIDTH 1
BW7	BANDWIDTH 7 (LC MODE)
BW8	BANDWIDTH 8 (CRYSTAL MODE)

5. TABLE OF RESOLUTION BANDWIDTH CONTROL LINE VOLTAGES

RESOLUTION BANDWIDTH	TYPICAL VALUES		
	BW6	BW7	BW8
8MHz	+14.8	+0.7	+0
5MHz	+14.8	+10.1	+0
3MHz	+14.8	+10.1	+0
1.5MHz	+14.8	+10.1	+0
300kHz	+14.8	+14.8	+0
100kHz	+14.8	+14.8	+0
30kHz	+14.8	+14.8	+0
10kHz	+14.8	+14.8	+0
3kHz	-8	+14.8	+0
1kHz AND ALWAYS	-8	+14.8	+14.8

6.

REFERENCE LEVEL MIX OF 2 SHOWN	dBm			L-10
REFERENCE LEVEL MIX OF 1 SHOWN	dBm	+15	+30	+20
A30dB	L30	0V	+9V	+9V
	L10	0V	+9V	+9V
A20dB	L30	+9V	0V	+9V
	L10	+9V	0V	+9V
INPUT ATTENUATION - - -		0dB		

7. POWER LEVELS MEASURED UNDER THE FOLLOWING CONDITIONS:
CENTER FREQUENCY CAL. OUT FREQ.
FREQUENCY SPAN 0Hz
ATTENUATION 0dB
RESOLUTION BANDWIDTH 8kHz
8. SOURCE P28 ON MB 8A.A8 BUS IS INDICATE INCLUDE P48 ON P2 BOARD.
9. UNLESS OTHERWISE INDICATED: SIGNALS EXITED AT LEFT SIDE ARE EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.

A4A8

FIGURE 11. A4A8 ATTENUATOR-BANDWIDTH FILTER, SCHEMATIC DIAGRAM, OPTION 462

ManualsPlus.com

ManualsPlus.com

A4A9 IF CONTROL, CIRCUIT DESCRIPTION

Control information for A4 IF-Video assembly is transmitted over the Instrument Bus from the A15 Controller and decoded by A4A9 IF Control.

Address Decoder (B)

The Address Decoder monitors ADR 0—4 and activates the input latches for addresses 20 and 21 when LTIO goes low. Address 20 activates U6, U8, and U9. Address 21 activates U3, U10, and U12:

	ADR4 (16)	ADR3 (8)	ADR2 (4)	ADR1 (2)	ADR0 (1)
Address 20	H	L	H	L	L
Address 21	H	L	H	L	H

Input Latches (A)

The input latches hold whatever was present at their inputs when LTIO goes low. The output goes high to activate the function. For example, when U8 pin 5 is high, SG10 (step gain 10) is activated.

A0.0 to A15.9 dB Control (C)

The A0.0 to 15.9 dB Control circuitry provides attenuation control voltages for the A4A5 Step Gain. Up to 14 dB of attenuation is accomplished by switching on discrete attenuation steps on the A4A5 Step Gain via the A8dB, A4dB and A2dB control switching lines. The smaller attenuation steps (0.1 dB through 1.9 dB) are accomplished by controlling the amount of dc current through a PIN diode attenuator on A4A5. One of the outputs of U11 goes low when a particular step of attenuation is selected. The output of U19A also goes low when an odd step of attenuation is desired (0.1 dB, 0.3 dB, 1.5 dB, etc). The fixed resistors tied to edge-connector pin P2-7 determine the amount of current through (and hence the attenuation of) the PIN diode attenuator. The operation of the attenuator is described in A4A5.

IF Gain Control (D)

The IF Gain Control interfaces with A4A5 Step Gain, the Log Amplifiers in A4A2, A4A3, and A4A1 Video Processor. A table on the A4A9 schematic describes the conditions under which the steps are used.

Bandwidth Control (E)

Bandwidths from 3 MHz to 100 kHz (BW5 = +14.8V): These bandwidths are produced in the 21.4 MHz IF by four parallel tank circuits (two in A4A4 Bandwidth Filter and two in A4A8 Attenuator-Filter). The Q (which determines bandwidth) is controlled by PIN diodes used as variable resistors. The resistance of these PIN diodes is determined by the dc current through them which in turn is determined by the particular resistive control path chosen by U6. Either R60, R61 or R62 is switched in by a low U6 output. These

ManualsPlus.com

potentiometers (3 MHz, 1 MHz, or 300 kHz) determine the PIN diode current and hence the bandwidth. If none of these resistive control paths are chosen, U4A turns on and the filter poles go to their highest Q (determined by factory-selected resistors on A4A4 and A4A8) which yields the 100 kHz bandwidth. U8B is on only for bandwidths 3 MHz through 100 kHz.

Bandwidths from 30 kHz to 3 kHz (BW = −0.6V): These bandwidths are produced in the 21.4 MHz IF by five crystal filter poles (three in A4A4 and two in A4A8). The Q (which determines the bandwidth) is controlled by dc current through PIN diodes in a similar manner to the 3 MHz–100 kHz bandwidths described in the above paragraph. Potentiometers R65, R66 (10 kHz and 3 kHz) determine the PIN diode current and hence the bandwidth. If neither of these resistive control paths are chosen, U4B and U4C turn on and the filter poles go to their lowest Q (determined by factory-selected resistors on A4A4 and A4A8) which yields the 30 kHz bandwidth.

Bandwidths from 1 kHz to 10 kHz (Switch = 0V): These bandwidths are produced in 3 MHz IF (A4A7) by five crystal filter poles. The Q is controlled by factory-selected resistors which are switched in by diodes on A4A7. The diodes are controlled by U3A (10 Hz), U3B (30 Hz), U3C (100 Hz), and U3D (300 Hz). If none of these transistors are on, the filter poles go to the lowest Q which yields the 1 kHz bandwidth. U16C is on only for bandwidths 1 kHz through 10 Hz.

ManualsPlus.com

A4A9 IF CONTROL, TROUBLESHOOTING

If the BW5 control line is not switching, it is most likely defective. If U4D is found to be defective, check U8C to determine if it has failed also.

Figure 1 is reproduced from the troubleshooting for the A4A5 Step Gain. It shows the results of a quick test to determine proper operation of the 0.0 to 1.9 dB attenuator section of the A0.0 to A15.9 dB control. As Figure 1 shows, the steps are not exactly 0.1 dB. If the steps are not continuously increasing (monotonic), either a control line is not switching or a switching diode is defective. Note 10 will be useful in determining when a control line is active.

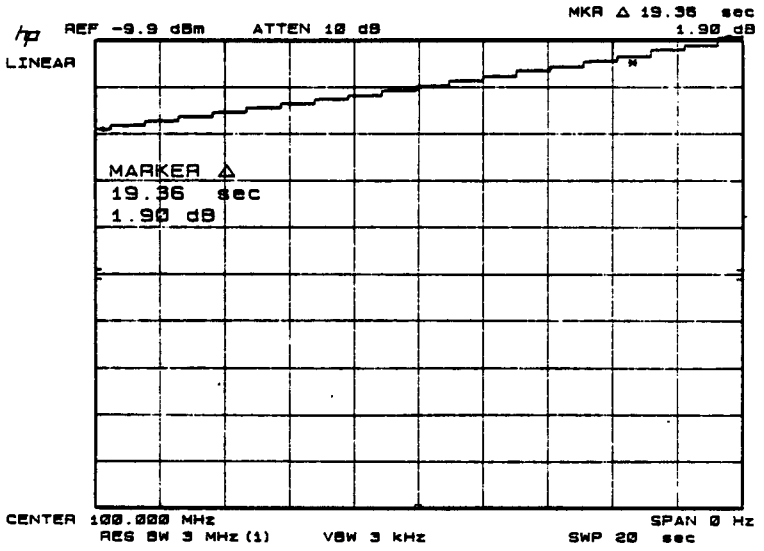


FIGURE 1. 0.1 dB STEP GAIN DISPLAY

The absolute step amplitudes can be determined with the MARKER Δ function (the reference steps are 0.0 dB and 0.9 dB). In the Linear mode the error should be less than ±0.12 dB.

The 0.1 dB through 1.8 dB steps are controlled by factory-selected resistors. If one of these steps is in error by more than ±0.12 dB in the Linear mode, refer to Section V for the procedure to determine the correct value. The other steps should be ±0.2 dB in the Linear mode.

ManualsPlus.com

TABLE 1. A4A9, REPLACEABLE PARTS (1 OF 3)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A9	85662-60187	4	1	IF CONTROL	28480	85662-60187
A4A9C1	0160-4832	4	14	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A9C2	0180-0197	8	4	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A4A9C3	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A9C4	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A9C5	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A9C6	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A9C7	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A9C8	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A9C9	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A9C10	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A9C11	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A9C12	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A9C13	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A9C14	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A9C15	0160-4822	2	4	CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
A4A9C16	0160-4822	2		CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
A4A9C17	0160-4822	2		CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
A4A9C18	0160-4822	2		CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
A4A9C19	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A9C20	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A4A9C21	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A4A9C22	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A4A9CR1	1901-0050	3	29	DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR2	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR3	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR4	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR5	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR6	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR7	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR8	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR9	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR10	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR11	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR12	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR13	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR14	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR15	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR16	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR17	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR18	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR19	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR20	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR21	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR22	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR23	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR24	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR25	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR26	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR27	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR28	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9CR29	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A4A9L1	9100-1618	1	1	INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A9R2	0757-0438	3	7	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-
A4A9R3	0757-0289	2	4	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-133
A4A9R6	0757-0463	4		RESISTOR 82.5K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-8252-
A4A9R7	0698-3456	5	1	RESISTOR 287K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2873-
A4A9R10	0757-0458	7	2	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5112-
A4A9R11	0698-3156	2	4	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1472-
A4A9R14	0757-0442	9	6	RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-
A4A9R15	0698-0082	7	1	RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-
A4A9R16	0757-0424	7	1	RESISTOR 1.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1101-
A4A9R17	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F

ManualsPlus.com

TABLE 1. A4A9, REPLACEABLE PARTS (2 OF 3)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A9R18	0757-0317	7	1	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1331-
A4A9R19	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-
A4A9R20	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-
A4A9R21	0757-0419	0	2	RESISTOR 681 1% .125W F TC=0+-100	24546	CT4-1/8-T0-681R-
A4A9R22	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-
A4A9R23	0757-0419	0		RESISTOR 681 1% .125W F TC=0+-100	24546	CT4-1/8-T0-681R-
A4A9R24	0757-0280	3	1	RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-
A4A9R25	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-
A4A9R26	0757-0428	1	1	RESISTOR 1.62K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1621-
A4A9R27	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-
A4A9R28	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-
A4A9R29	0698-0085	0	4	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2611-
A4A9R30	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5112-
A4A9R31	0757-0279	0	1	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3161-
A4A9R32	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-133
A4A9R33	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1472-
A4A9R34	0698-3437	2	3	RESISTOR 133 1% .125W F TC=0+-100	24546	CT4-1/8-T0-133R-
A4A9R35	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-133
A4A9R36	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1472-
A4A9R37	0698-3437	2		RESISTOR 133 1% .125W F TC=0+-100	24546	CT4-1/8-T0-133R-
A4A9R38	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-
A4A9R39	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-
A4A9R40	0698-0085	0		RESISTOR 2.61K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2611-
A4A9R41	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-
A4A9R42	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1212-
A4A9R43	0757-1094	9	2	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1471-
A4A9R44	0757-1094	9		RESISTOR 1.47K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1471-
A4A9R45	0698-3450	9	2	RESISTOR 42.2K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4222-
A4A9R46*	0757-0466	7	1	RESISTOR 110K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1103-
A4A9R47	0698-3457	6	1	RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3457
A4A9R48*	0698-3458	7	1	RESISTOR 348K 1% .125W F TC=0+-100	28480	0698-3458
A4A9R49	0698-3161	9	1	RESISTOR 38.3K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3832-
A4A9R50*	0757-0462	3	1	RESISTOR 75K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-7502-
A4A9R51	0757-0464	5	1	RESISTOR 90.9K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-9092-
A4A9R52*	0698-8960	6	1	RESISTOR 750K 1% .125W F TC=0+-100	28480	0698-8960
A4A9R53	0698-3449	6	1	RESISTOR 28.7K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2872-
A4A9R54	0757-0199	3	2	RESISTOR 21.5K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2152-
A4A9R55*	0757-0460	1	2	RESISTOR 61.9K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-6192-
A4A9R56	0757-0460	1		RESISTOR 61.9K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-6192-
A4A9R57*	0698-3460	1	1	RESISTOR 422K 1% .125W F TC=0+-100	28480	0698-3460
A4A9R58	0698-3450	9		RESISTOR 42.2K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4222-
A4A9R59*	0698-8824	1	1	RESISTOR 562K 1% .125W F TC=0+-100	28480	0698-8824
A4A9R60	2100-3103	6	2	RESISTOR-TRMR 10K 10% C SIDE-ADJ 17-TRN	73138	89PR10K
A4A9R61	2100-3054	6	2	RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	73138	89PR50K
A4A9R62	2100-3162	7	1	RESISTOR-TRMR 200K 10% C SIDE-ADJ 17-TRN	73138	89PR200K
A4A9R63	0698-3437	2		RESISTOR 133 1% .125W F TC=0+-100	24546	CT4-1/8-T0-133R-
A4A9R64	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	5033R-1/8-T0-133
A4A9R65	2100-3054	6		RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	73138	89PR50K
A4A9R66	2100-3103	6		RESISTOR-TRMR 10K 10% C SIDE-ADJ 17-TRN	73138	89PR10K
A4A9R67	0698-0085	0		RESISTOR 2.61K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2611-
A4A9R68	0698-0085	0		RESISTOR 2.61K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2611-
A4A9R69	0698-3260	9	1	RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A4A9R70*	0698-8826	3	1	RESISTOR 825K 1% .125W F TC=0+-100	28480	0698-8826
A4A9R71	0757-0199	3		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2152-
A4A9R72*	0757-0467	8	1	RESISTOR 121K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1213-
A4A9R74*	0757-0463	4	2	RESISTOR 82.5K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-8252-
A4A9R75	0698-3156	2		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1472-
A4A9R76	0757-0465	6	1	RESISTOR 100K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1003-
A4A9R77	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-
A4A9TP1	1251-0600	0	2	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A9TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A4A9U1	1826-0990	0	1	IC OP AMP GP DUAL 8-DIP-C PKG	28480	1826-0990
A4A9U2	1820-1418	7	1	IC DCDR TTL LS BCD-TO-DEC 4-TO-10-LINE	01295	SN74LS42N
A4A9U3	1858-0076	0	3	TRANSISTOR ARRAY 14-PIN PLSTC TO-116	04713	MPQ2907P
A4A9U4	1858-0076	0		TRANSISTOR ARRAY 14-PIN PLSTC TO-116	04713	MPQ2907P
A4A9U5	1810-0280	8	3	NETWORK-RES 10-SIP 10.0K OHM X 9	91637	CSC10A01-103G/MSP

ManualsPlus.com

TABLE 1. A4A9, REPLACEABLE PARTS (3 OF 3)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A9U6	1820-0468	5	2	IC DCDR TTL BCD-TO-DEC 4-TO-10-LINE	01295	SN7445N
A4A9U7	1820-1195	7	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS175N
A4A9U8	1858-0077	1	1	TRANSISTOR ARRAY 14-PIN PLSTC TO-116	04713	MPQ2222P
A4A9U9	1820-0471	0	3	IC INV TTL HEX 1-INP	01295	SN7406N
A4A9U10	1820-1196	8	5	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A4A9U11	1820-0468	5		IC DCDR TTL BCD-TO-DEC 4-TO-10-LINE	01295	SN7445N
A4A9U12	1810-0280	8		NETWORK-RES 10-SIP 10.0K OHM X 9	91637	CSC10A01-103G/MS
A4A9U13	1820-1216	3	1	IC DCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N
A4A9U14	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A4A9U15	1820-0471	0		IC INV TTL HEX 1-INP	01295	SN7406N
A4A9U16	1858-0076	0		TRANSISTOR ARRAY 14-PIN PLSTC TO-116	04713	MPQ2907P
A4A9U17	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A4A9U18	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A4A9U19	1820-0471	0		IC INV TTL HEX 1-INP	01295	SN7406N
A4A9U20	1820-1196	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS174N
A4A9U21	1820-2024	3	1	IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS244N
A4A9U22	1810-0280	8		NETWORK-RES 10-SIP 10.0K OHM X 9	91637	CSC10A01-103G/MS
A4A9VR1	1902-3203	6	1	DIODE-ZNR 14.7V 5% DO-35 PD=.4W	28480	1902-3203
A4A9VR2	1902-0041	4	1	DIODE-ZNR 5.11V 5% DO-35 PD=.4W	07263	1N751A
				A4A9 MISCELLANEOUS PARTS		
	85662-80043	3	1	LBL ID 662-60187	28480	85662-80043
	85662-20192	7	1	BD IF CONTROL	28480	85662-20192
	8159-0005	0	2	RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005

ManualsPlus.com

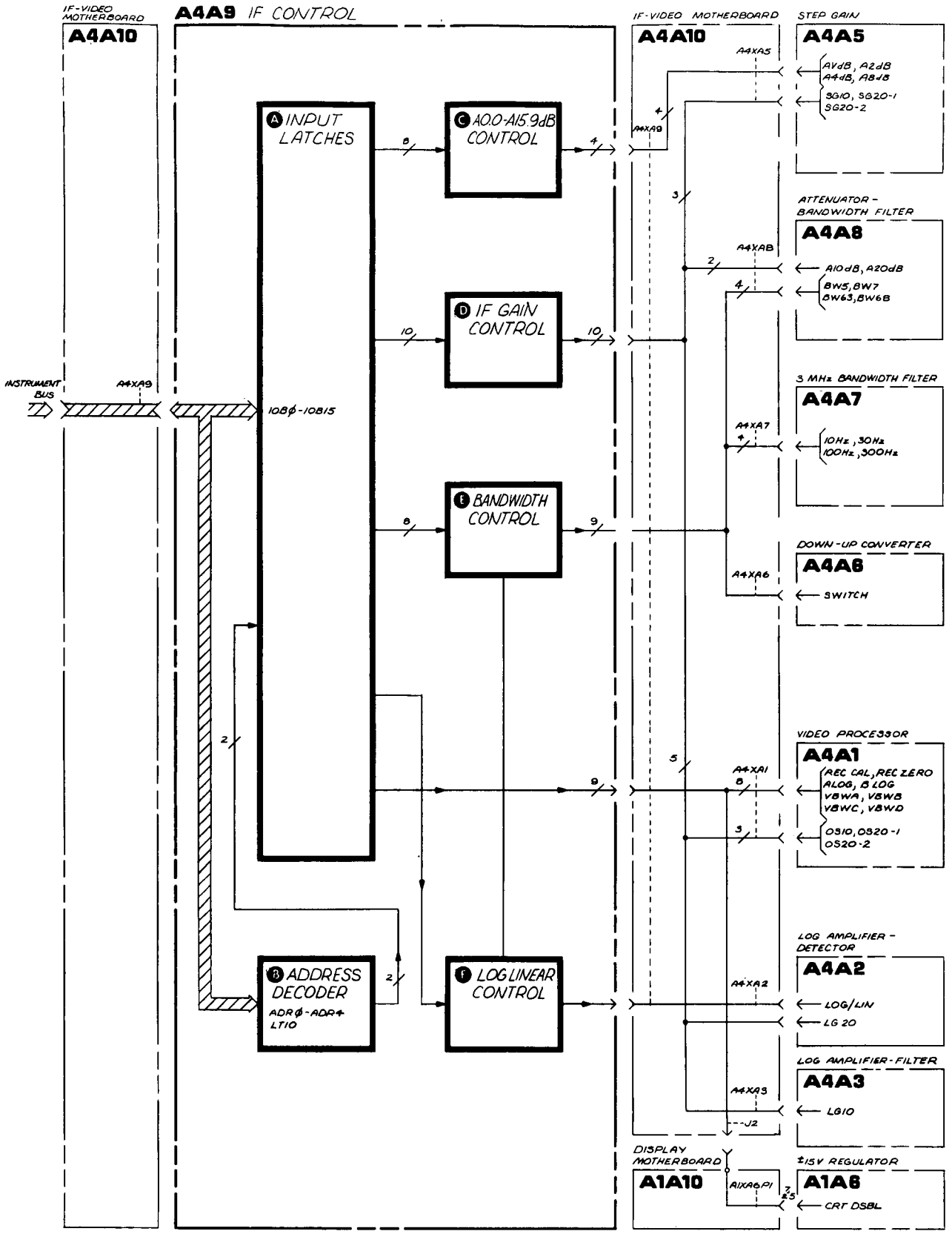


FIGURE 2. A4A9 IF CONTROL, BLOCK DIAGRAM

ManualsPlus.com

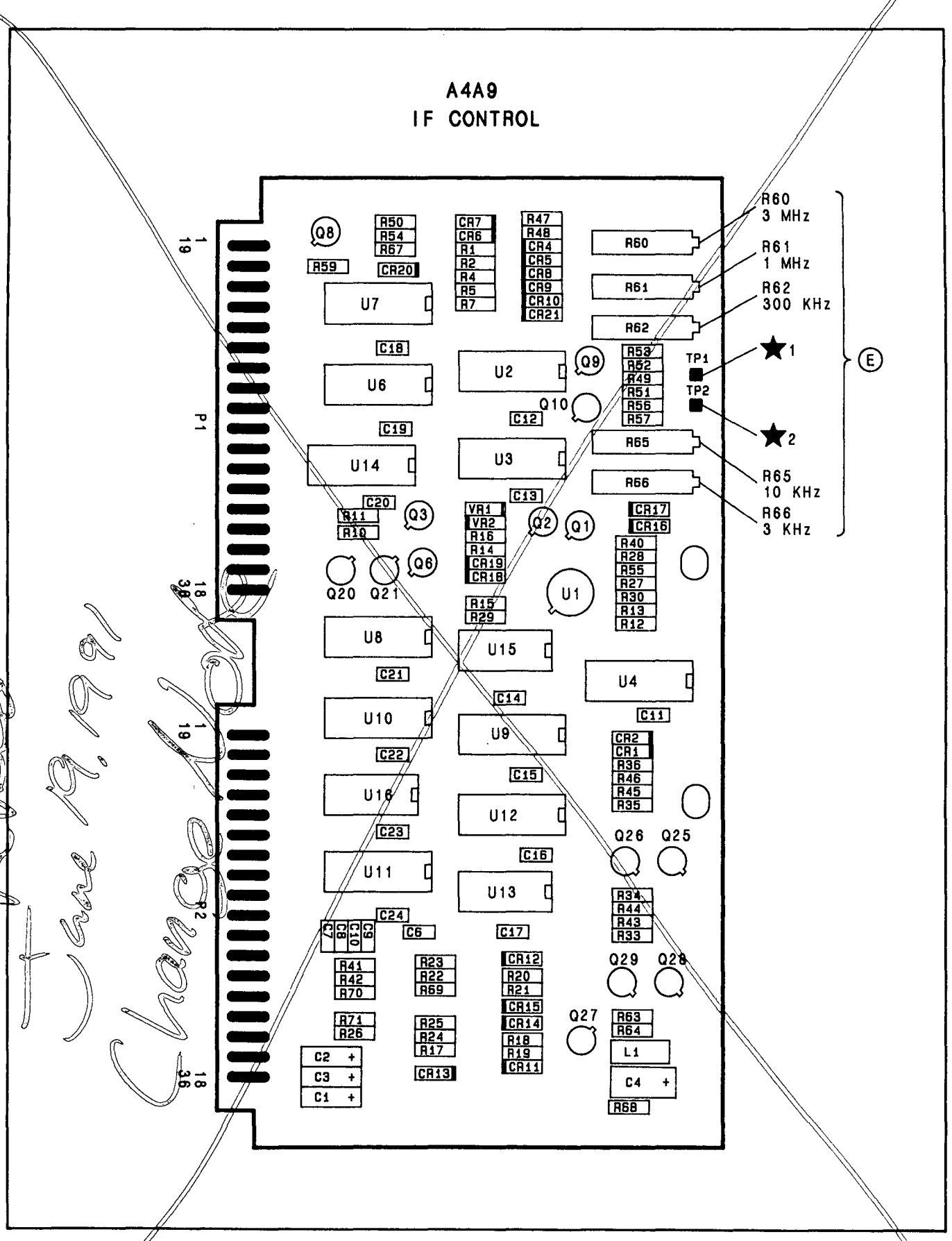


FIGURE 3. A4A9 IF CONTROL, COMPONENT LOCATIONS

ManualsPlus.com

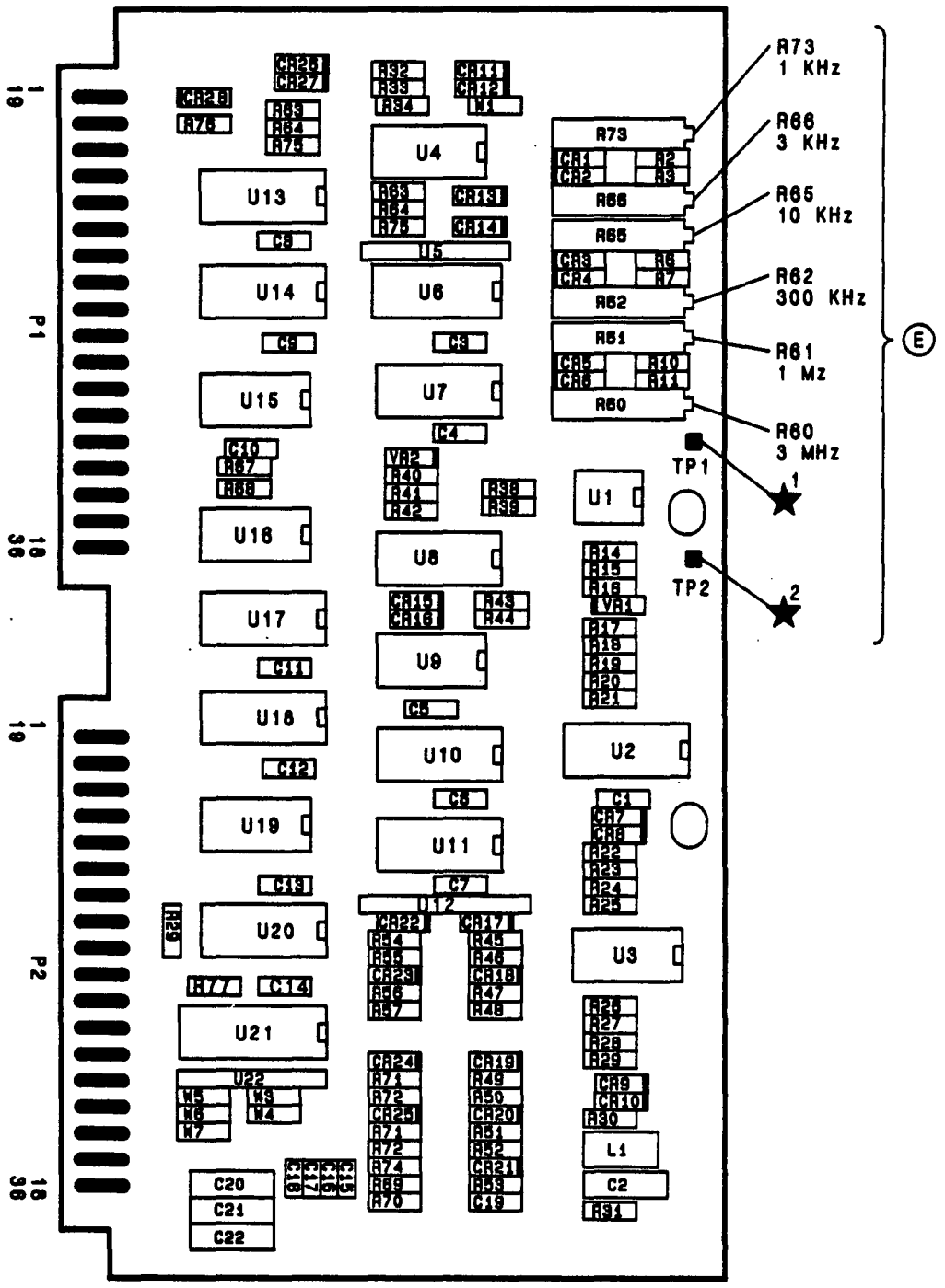
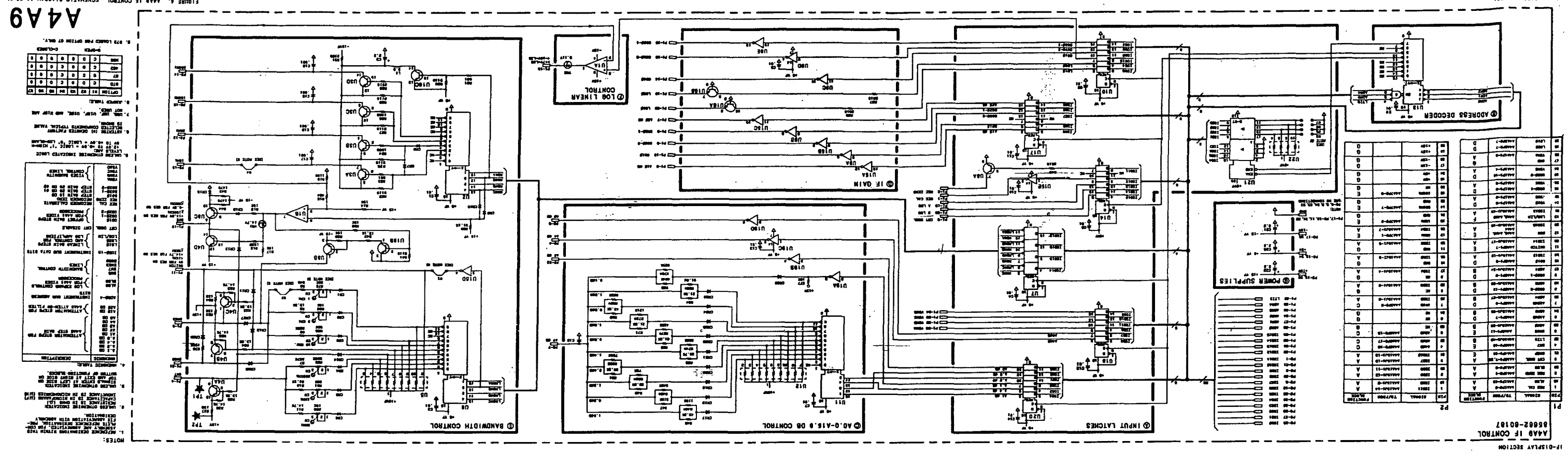


FIGURE 3. A4A9 IF CONTROL, COMPONENT LOCATIONS

ManualsPlus.com



ManualsPlus.com

NOTES:

8. 0.0-15.9 dB CONTROL TRUTH TABLE (LEVELS AT OUTPUT OF LATCHES U18 AND U20):

CONTROL LINE \ REF LEVEL (dBM)	0	-.1	-.2	-.3	-.4	-.5	-.6	-.7	-.8	-.9	-1.0	-1.1	-1.2	-1.3	-1.4	-1.5	-1.6	-1.7	-1.8	-1.9
A.1 dB	H		H		H		H		H		H		H		H		H		H	
A.2 dB			H	H			H	H					H	H			H	H		
A.4 dB			H	H	H	H							H	H	H	H				
A.8 dB	H	H									H	H								
A1 dB	H	H	H	H	H	H	H	H	H	H										

REFERENCE LEVEL (dBM)	A2dB	A4dB	A8dB
-10			H
-11			H
-12	H	H	
-13	H	H	
-14		H	
-15		H	
-16	H		
-17	H		
-18			
-19			

9. RESOLUTION BANDWIDTH TRUTH TABLE:

RESOLUTION BANDWIDTH	RBWD	RBWC	RBWB	RBWA
3 MHz	H	H	H	H
1 MHz	H	H	H	
300 KHz	H	H		H
100 KHz	H	H		
30 KHz	H		H	H
10 KHz	H		H	
3 KHz	H			H
1 KHz		H	H	
300 Hz		H		H
100 Hz		H		
30 Hz			H	H
10 Hz			H	

VIDEO BANDWIDTH TRUTH TABLE:

VIDEO BANDWIDTH	VBWD	VBWC	VBWB	VBWA
3 MHz	H	H	H	H
1 MHz	H	H	H	
300 KHz	H	H		H
100 KHz	H	H		
30 KHz	H		H	H
10 KHz	H		H	
3 KHz	H			H
1 KHz		H	H	
300 Hz		H		H
100 Hz		H		
30 Hz			H	H
10 Hz			H	
3 Hz				H
1 Hz				

10. 10 dB GAIN STEP TRUTH TABLE (LEVELS AT OUTPUT OFLATCHES U17 AND U10):

REFERENCE LEVEL RES BW ≥3 KHz	dBM			-10	-20	-30	-40	-50	-60	-70	-80	-90	-100	-110
REFERENCE LEVEL RES BW ≤1 KHz	dBM	-10	-20	-30	-40	-50	-60	-70	-80	-90	-100	-110	-120	-130
A1$ dB	LOG		H											
	LIN		H											
A2$ dB	LOG	H												
	LIN	H												
S81$	LOG				H		H		H	H	H	H	H	H
	LIN				H		H		H	H	H	H		
S82$-1	LOG					H	H	H	H	H	H	H	H	H
	LIN					H	H	H	H	H	H	H		
S82$-2	LOG							H	H	H	H	H	H	H
	LIN							H	H	H	H	H		
OS1$	LOG									H		H		H
	LIN													
OS2$-1	LOG										H	H	H	H
	LIN													
OS2$-2	LOG												H	H
	LIN													
L81$	LOG													
	LIN									H		H		
L82$	LOG													
	LIN										H	H		
INPUT ATTENUATION SETTING AT 0dB; SHIFT ATTENUATOR (FOR EXTENDED RANGES)														

11. BANDWIDTH CONTROL LINES (ALL VOLTAGES APPROXIMATE):

RES BW \ CONTROL LINES	BW6	BW5	BW4	BW7	SWITCH	300 Hz	100 Hz	30Hz	10 Hz
3 MHz	+14.8V	-14V	-14V	+11.6V	+14.7V	<-10V	<-10V	<-10V	<-10V
1 MHz	+14.8V	-14V	-14V	+13.5V	+14.7V	<-10V	<-10V	<-10V	<-10V
300 KHz	+14.8V	-14V	-14V	+14.2V	+14.7V	<-10V	<-10V	<-10V	<-10V
100 KHz	+14.8V	-14V	-14V	+14.8V	+14.7V	<-10V	<-10V	<-10V	<-10V
30 KHz	-.8V	+14.8V	+14.8V	+14.8V	+14.7V	<-10V	<-10V	<-10V	<-10V
10 KHz	-.8V	+8.3V	+8.3V	+14.8V	+14.7V	<-10V	<-10V	<-10V	<-10V
3 KHz	-.8V	+8.3V	+8.3V	+14.8V	+14.7V	<-10V	<-10V	<-10V	<-10V
1 KHz	-.8V	+14.8V	+8.2V	+14.8V	0V	<-10V	<-10V	<-10V	<-10V
300 Hz	-.8V	+14.8V	+8.2V	+14.8V	0V	>4V	<-10V	<-10V	<-10V
100 Hz	-.8V	+14.8V	+8.2V	+14.8V	0V	<-10V	>-4V	<-10V	<-10V
30 Hz	-.8V	+14.8V	+8.2V	+14.8V	0V	<-10V	<-10V	>4V	<-10V
10 Hz	-.8V	+14.8V	+8.2V	+14.8V	0V	<-10V	<-10V	>4V	>4V

12. ADDRESS LINE TRUTH TABLE:

ADR4	ADR3	ADR2	ADR1	ADR0	ADDRESS
H		H			ADDRESS 20
H		H		H	ADDRESS 21

13. LOG EXPAND TRUTH TABLE:

dB/DIV	B LOG	A LOG
10		
5		H
2	H	
1	H	H

ManualsPlus.com

ManualsPlus.com

TABLE 1. A4A10, REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A10	85662-60149	8	1	BOARD ASSEMBLY, IF-VIDEO MOTHERBOARD	28480	85662-60149
A4A10C1	0180-1746	5	2	CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A4A10C2	0180-0229	7	1	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A4A10C3	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A4A10C4	0160-4833	5	13	CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C5	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C6	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C7	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C8	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C9	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C10	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C11	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C12	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C13	0160-4832	4	3	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A10C14	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C15	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A10C16	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C17	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C18	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C19	0160-4574	1	4	CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A4A10C20	0160-4574	1		CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A4A10C21	0160-4574	1		CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A4A10C22	0160-4574	1		CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A4A10C23	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A10J1	1251-8432	2	1	CONN-POST TYPE .100-PIN-SPCG 50-CONT	28480	1251-8432
A4A10J2	1251-3276	2	1	CONNECTOR 6-PIN M POST TYPE	28480	1251-3276
A4A10L1	9100-1618	1	11	INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A10L2	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A10L3	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A10L4	08558-80011	6	3	FILTER COIL BLUE	28480	08558-80011
A4A10L5	08558-80011	6		FILTER COIL BLUE	28480	08558-80011
A4A10L6	08558-80011	6		FILTER COIL BLUE	28480	08558-80011
A4A10L7	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A10L8	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A10L9	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A10L10	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A10L11	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A10L12	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A10L13	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A10L14	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A10R1	0757-0401	0	4	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A4A10R2	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A4A10R3	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A4A10R4	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A4A10A4XA1P1	1251-0472	4	15	CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA1P2	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA2P1	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA2P2	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA3P1	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA3P2	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA4P1	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA4P2	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA5P1	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA5P2	1251-2034	8	1	CONNECTOR-PC EDGE 10-CONT/ROW 2-ROWS	28480	1251-2034
A4A10A4XA6A1P1	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA6A2P1	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA7P1	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA7P2	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA8P1	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA8P2	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA9P1	1251-2026	8	2	CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026
A4A10A4XA9P2	1251-2026	8		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026

ManualsPlus.com

A4A10
IF-VIDEO MOTHERBOARD

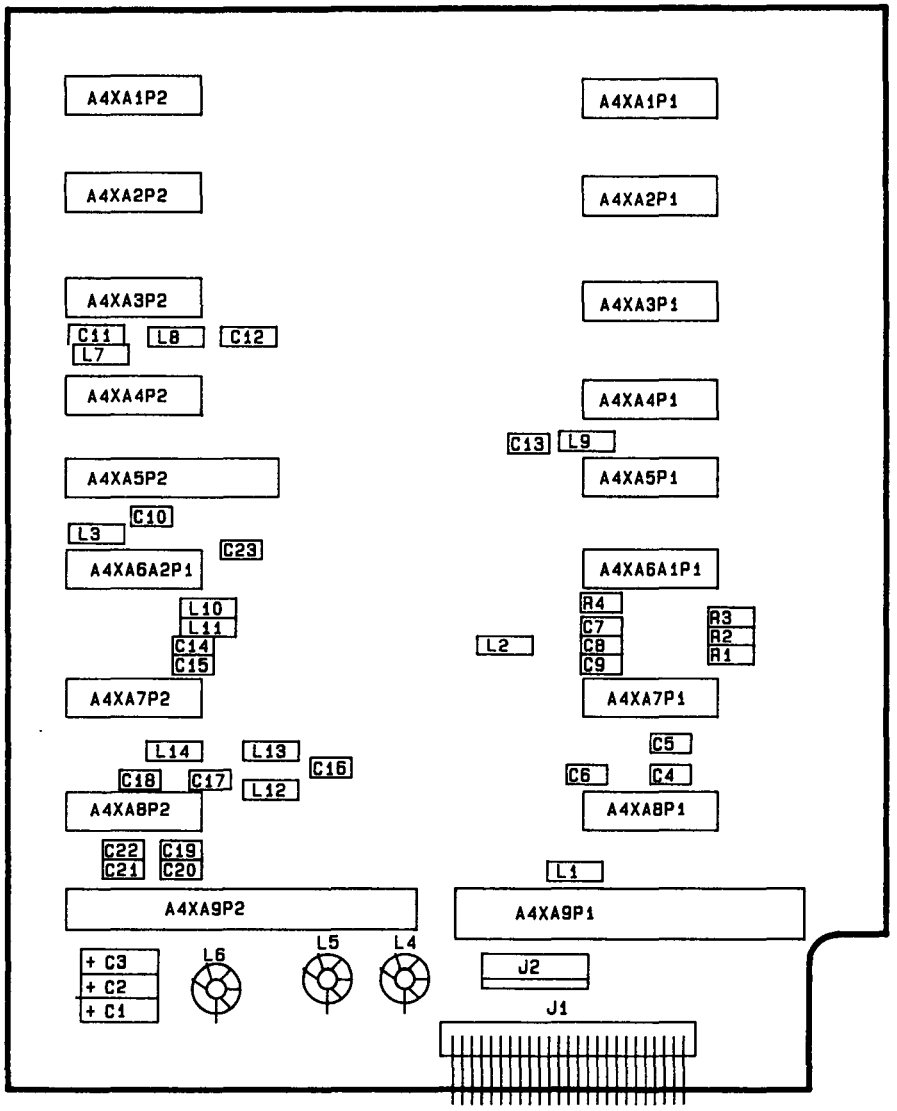


FIGURE 1. A4A10 IF-VIDEO MOTHERBOARD, COMPONENT LOCATIONS

ManualsPlus.com

TABLE 1. A4A10, REPLACEABLE PARTS

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4A10	85662-60149	8	1	BOARD ASSEMBLY, IF-VIDEO MOTHERBOARD	28480	85662-60149
A4A10C1	0180-1746	5	2	CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A4A10C2	0180-0229	7	1	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A4A10C3	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A4A10C4	0160-4833	5	13	CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C5	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C6	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C7	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C8	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C9	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C10	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C11	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C12	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C13	0160-4832	4	3	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A10C14	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C15	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A10C16	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C17	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C18	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A4A10C19	0160-4574	1	4	CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A4A10C20	0160-4574	1		CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A4A10C21	0160-4574	1		CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A4A10C22	0160-4574	1		CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4574
A4A10C23	0160-4832	4		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A4A10J1	1251-8432	2	1	CONN-POST TYPE .100-PIN-SPCG 50-CONT	28480	1251-8432
A4A10J2	1251-3276	2	1	CONNECTOR 6-PIN M POST TYPE	28480	1251-3276
A4A10L1	9100-1618	1	11	INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A10L2	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A10L3	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A10L4	08558-80011	6	3	FILTER COIL BLUE	28480	08558-80011
A4A10L5	08558-80011	6		FILTER COIL BLUE	28480	08558-80011
A4A10L6	08558-80011	6		FILTER COIL BLUE	28480	08558-80011
A4A10L7	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A10L8	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A10L9	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A10L10	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A10L11	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A10L12	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A10L13	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A10L14	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4A10R1	0757-0401	0	4	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A4A10R2	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A4A10R3	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A4A10R4	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A4A10A4XA1P1	1251-0472	4	15	CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA1P2	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA2P1	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA2P2	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA3P1	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA3P2	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA4P1	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA4P2	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA5P1	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA5P2	1251-2034	8	1	CONNECTOR-PC EDGE 10-CONT/ROW 2-ROWS	28480	1251-2034
A4A10A4XA6A1P1	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA6A2P1	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA7P1	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA7P2	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA8P1	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA8P2	1251-0472	4		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	28480	1251-0472
A4A10A4XA9P1	1251-2026	8	2	CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026
A4A10A4XA9P2	1251-2026	8		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	28480	1251-2026

ManualsPlus.com

A4A10
IF-VIDEO MOTHERBOARD

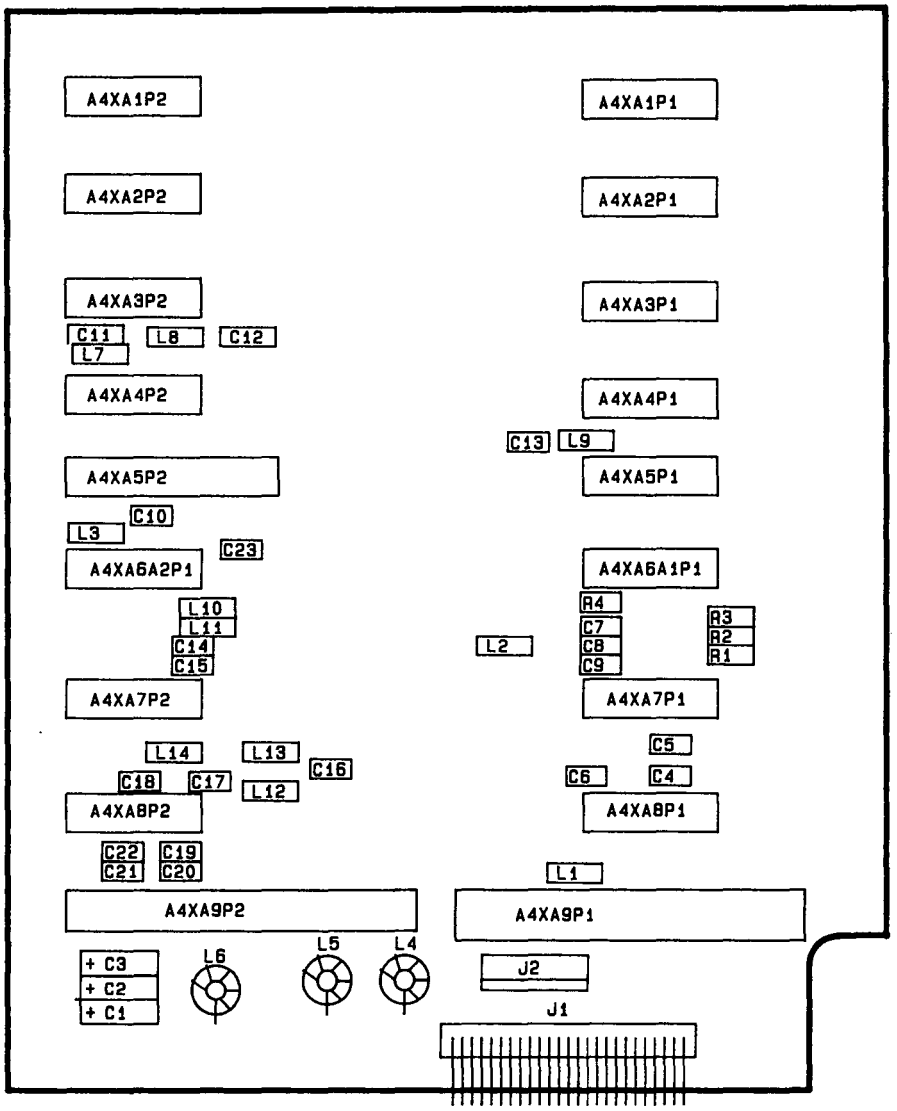


FIGURE 1. A4A10 IF-VIDEO MOTHERBOARD, COMPONENT LOCATIONS

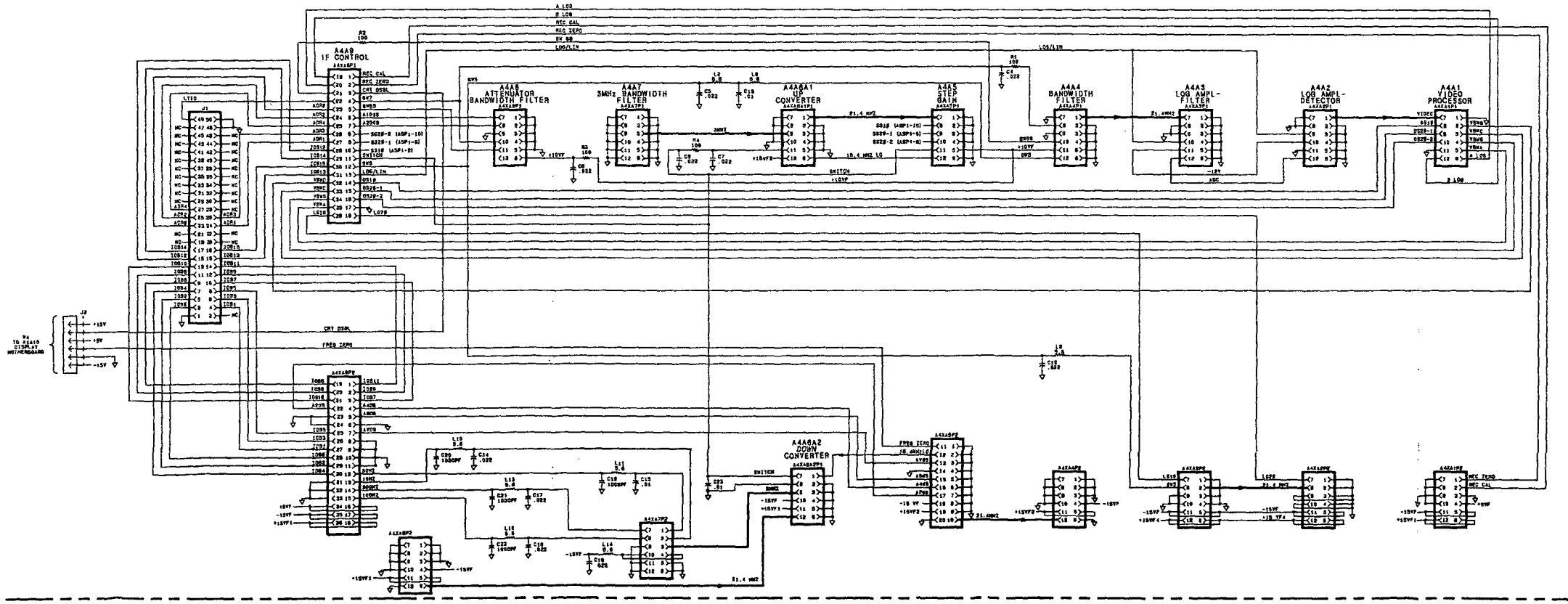
IF-DISPLAY SECTION

A4A10 IF-VIDEO MOTHERBOARD
85662-60149

J1 50-WIRE INSTRUMENT BUS

PIN	SIGNAL
1	GND
2	NC
3	IDB7
4	IDB1
5	IDB3
6	IDB5
7	IDB7
8	IDB6
9	IDB4
10	IDB2
11	IDB0
12	IDB8
13	IDB15
14	IDB11
15	IDB13
16	IDB12
17	IDB14
18	IDB10
19	NC
20	NC
21	NC
22	HPSW (NC)
23	ADR7
24	ADR1
25	ADR0
26	ADR5
27	ADR3
28	ADR4
29	ADR6 (NOT USED)
30	NC
31	NC
32	NC
33	NWR (NC)
34	NRD (NC)
35	NIOR (NC)
36	NIOW (NC)
37	NCS (NC)
38	NDS (NC)
39	NDS (NC)
40	NCS (NC)
41	NCS (NC)
42	NCS (NC)
43	LSTP (NC)
44	HSWP (NC)
45	LSRQ (NC)
46	LSRP (NC)
47	LSTB (NC)
48	GND
49	LTIB
50	GND

POWER SUPPLIES



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATION, PREFIX ABBREVIATION WITH ASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IS IN OHMS (OK) CAPACITANCE IS IN MICROFARADS (UF) INDUCTANCE IS IN MICROHENRIES (UH)
3. MNEMONIC TABLE:

MNEMONIC	DESCRIPTION
SB1B SB2B-1 SB2B-2	STEP GAIN CONTROLS
OB1B OB2B-1 OB2B-2	OFFSET GAIN CONTROLS
LA1B LA2B	LINEAR GAIN CONTROLS
VBPA VBWB VBMC VBMD	VIDEO BANDWIDTH CONTROLS
RBNA RBPB RBMC RBND	RESOLUTION BANDWIDTH CONTROLS
VIDEO SWITCH 18.4MHz LO 21.4MHz 3MHz	VIDEO SIGNAL UP/DOWN CONVERTER LOCAL OSC SIGNAL 21.4MHz IF SIGNAL 3MHz IF SIGNAL
BW3 BW7 RA83 RA89	BANDWIDTH CONTROL
FREQ ZERO CRT DSBL REC CAL REC ZERO	FREQ ZERO CONTROL CRT BLANK CONTROL RECORDER CALIBRATION RECORDER ZERO
A LOG B LOG	LOG EXPAND CONTROL
LOG/LIN	LOG/LINEAR CONTROL
A24B A12B A6B A3B A1B A24B A12B A6B A3B A1B	ATTENUATION CONTROLS
IDB8-IDB15	INSTRUMENT BUS DATA BITS 8-15
ADR6-ADR4	ENHANCEMENT BUS ADDRESS BITS
LTIB	LOW-DISPLAY SECTION I/O STROBE

4. UNLESS OTHERWISE INDICATED: SIGNALS ENTER AT LEFT SIDE AND EXIT AT RIGHT SIDE OF FUNCTION BLOCKS.

A4A10

SERIAL PREFIX: 2403A

FIGURE 2. A4A10 IF-VIDEO MOTHERBOARD, INTERCONNECT DIAGRAM
A4A10 3/4

ManualsPlus.com

ManualsPlus.com

ManualsPlus.com

GENERAL PARTS LISTING

INTRODUCTION

The replaceable parts list breakdown for each major assembly is located following the circuit description for the assembly. This section contains information for ordering the replacement parts not listed in the major assembly tabs. Table 1 includes a list of reference designations and a list of abbreviations used in the parts list. Table 2 lists names and addresses that correspond to the manufacturer code numbers in the parts list.

REPLACEABLE PARTS LIST

The following information is listed for each part:

1. The Hewlett-Packard part number.
2. The part number check digit (CD).
3. The total quantity (Qty) in the instrument. This quantity is given only once, at the first appearance of the part in the list.
4. The description of the part.
5. A five-digit code indicating a typical manufacturer of the part.
6. The manufacturer's part number.

ORDERING INFORMATION

To order a part listed in the replaceable parts table, quote the Hewlett-Packard part number (with check digit), indicate the quantity required, and address the order to the nearest Hewlett-Packard office. The check digit will ensure accurate and timely processing of your order.

To order a part that is not listed in the replaceable parts table, include the instrument model number, instrument serial number, the description and function of the part, and the number of parts required. Address the order to the nearest Hewlett-Packard office.

ManualsPlus.com

TABLE 1. REFERENCE DESIGNATIONS AND ABBREVIATIONS (1 OF 3)

REFERENCE DESIGNATIONS

A ..... Assembly
AT ..... Attenuator, Isolator, Limiter, Termination
B ..... Fan, Motor
BT ..... Battery
C ..... Capacitor
CP ..... Coupler
CR ..... Diode, Diode Thyristor, Step Recovery Diode, Varactor
DC ..... Directional Coupler
DL ..... Delay Line
DS ..... Annunciator, Lamp, Light Emitting Diode (LED), Signaling Device (Visible)
E ..... Miscellaneous Electrical Part
F ..... Fuse
FL ..... Filter
HY ..... Circulator
J ..... Electrical Connector (Stationary Portion), Jack
K ..... Relay
L ..... Coil, Inductor
M ..... Meter
MP ..... Miscellaneous Mechanical Part
P ..... Electrical Connector (Movable Portion), Plug
Q ..... Silicon Controlled Rectifier (SCR), Transistor, Triode Thyristor
R ..... Resistor
RT ..... Thermistor
S ..... Switch
T ..... Transformer
TB ..... Terminal Board
TC ..... Thermocouple
TP ..... Test Point
U ..... Integrated Circuit, Microcircuit
V ..... Electron Tube
VR ..... Breakdown Diode (Zener), Voltage Regulator
W ..... Cable, Wire, Jumper
X ..... Socket
Y ..... Crystal Unit (Piezoelectric, Quartz)
Z ..... Tuned Cavity, Tuned Circuit

ABBREVIATIONS

A

A ..... Across Flats, Acrylic, Air (Dry Method), Ampere
ADJ ..... Adjust, Adjustment
ANSI ..... American National Standards Institute (formerly USASI-ASA)
ASSY ..... Assembly
AWG ..... American Wire Gage

B

BCD ..... Binary Coded Decimal
BD ..... Board, Bundle
BE-CU ..... Beryllium Copper
BNC ..... Type of Connector
BRG ..... Bearing, Boring
BRS ..... Brass
BSC ..... Basic
BTN ..... Button

C

C ..... Capacitance, Capacitor, Center Tapped, Cermet, Cold, Compression
CCP ..... Carbon Composition Plastic
CD ..... Cadmium, Card, Cord
CER ..... Ceramic
CHAM ..... Chamfer
CHAR ..... Character, Characteristic, Charcoal
CMOS ..... Complementary Metal Oxide Semiconductor
CNDCT ..... Conducting, Conductive, Conductivity, Conductor
CONT ..... Contact, Continuous, Control, Controller
CONV ..... Converter
CPRSN ..... Compression
CUP-PT ..... Cup Point
CW ..... Clockwise, Continuous Wave

D

D ..... Deep, Depletion, Depth, Diameter, Direct Current
DA ..... Darlington
DAP-GL ..... Diallyl Phthalate Glass
DBL ..... Double
DCDR ..... Decoder
DEG ..... Degree
D-HOLE ..... D-Shaped Hole
DIA ..... Diameter
DIP ..... Dual In-Line Package
DIP-SLDR ..... Dip Solder
D-MODE ..... Depletion Mode
DO ..... Package Type Designation
DP ..... Deep, Depth, Diametric Pitch, Dip
DP3T ..... Double Pole Three Throw
DPDT ..... Double Pole Double Throw
DWL ..... Dowel

E

E-R ..... E-Ring
EXT ..... Extended, Extension, External, Extinguish

F

F ..... Fahrenheit, Farad, Female, Film (Resistor), Fixed, Flange, Frequency
FC ..... Carbon Film/Composition, Edge of Cutoff Frequency, Face
FDTHRU ..... Feed Through
FEM ..... Female
FIL-HD ..... Fillister Head
FL ..... Flash, Flat, Fluid
FLAT-PT ..... Flat Point
FR ..... Front
FREQ ..... Frequency
FT ..... Current Gain Bandwidth Product (Transition Frequency), Feet, Foot
FXD ..... Fixed

G

GEN ..... General, Generator
GND ..... Ground
GP ..... General Purpose, Group

H

H ..... Henry, High
HDW ..... Hardware
HEX ..... Hexadecimal, Hexagon, Hexagonal
HLCL ..... Helical
HP ..... Hewlett-Packard Company, High Pass

I

IC ..... Collector Current, Integrated Circuit
ID ..... Identification, Inside Diameter
IF ..... Forward Current, Intermediate Frequency
IN ..... Inch
INCL ..... Including
INT ..... Integral, Intensity, Internal

ManualsPlus.com

TABLE 1. REFERENCE DESIGNATIONS AND ABBREVIATIONS (2 OF 3)

J

J-FET ..... Junction Field Effect Transistor
JFET ..... Junction Field Effect Transistor

K

K ..... Kelvin, Key, Kilo, Potassium
KNRLD ..... Knurled
KVDC ..... Kilovolts Direct Current

L

LED ..... Light Emitting Diode
LG ..... Length, Long
LIN ..... Linear, Linearity
LK ..... Link, Lock
LKG ..... Leakage, Locking
LUM ..... Luminous

M

M ..... Male, Maximum, Mega, Mil, Milli, Mode
MA ..... Milliampere
MACH ..... Machined
MAX ..... Maximum
MC ..... Molded Carbon Composition
MET ..... Metal, Metallized
MHZ ..... Megahertz
MINTR ..... Miniature
MIT ..... Miter
MLD ..... Mold, Molded
MM ..... Magnetized Material, Millimeter
MOM ..... Momentary
MTG ..... Mounting
MTLC ..... Metallic
MW ..... Milliwatt

N

N ..... Nano, None
N-CHAN ..... N-Channel
NH ..... Nanohenry
NM ..... Nanometer, Nonmetallic
NO ..... Normally Open, Number
NOM ..... Nominal
NPN ..... Negative Positive Negative (Transistor)
NS ..... Nanosecond, Non-Shorting, Nose
NUM ..... Numeric
NYL ..... Nylon (Polyamide)

O

OA ..... Over-All
OD ..... Outside Diameter
OP AMP ..... Operational Amplifier
OPT ..... Optical, Option, Optional

P

PA ..... Picoampere, Power Amplifier
PAN-HD ..... Pan Head
PAR ..... Parallel, Parity
PB ..... Lead (Metal), Pushbutton
PC ..... Printed Circuit
PCB ..... Printed Circuit Board
P-CHAN ..... P-Channel
PD ..... Pad, Power Dissipation
PF ..... Picofarad, Power Factor
PKG ..... Package
PLSTC ..... Plastic
PNL ..... Panel
PNP ..... Positive Negative Positive (Transistor)
POLYC ..... Polycarbonate
POLYE ..... Polyester
POT ..... Potentiometer
POZI ..... Pozidriv Recess
PREC ..... Precision
PRP ..... Purple, Purpose
PSTN ..... Piston
PT ..... Part, Point, Pulse Time
PW ..... Pulse Width

Q

Q ..... Figure of Merit

R

R ..... Range, Red, Resistance, Resistor, Right, Ring
REF ..... Reference
RES ..... Resistance, Resistor
RF ..... Radio Frequency
RGD ..... Rigid
RND ..... Round
RR ..... Rear
RVT ..... Rivet, Riveted

S

SAWR ..... Surface Acoustic Wave Resonator
SEG ..... Segment
SGL ..... Single
SI ..... Silicon, Square Inch
SL ..... Slide, Slow
SLT ..... Slot, Slotted
SMA ..... Subminiature, A Type (Threaded Connector)
SMB ..... Subminiature, B Type (Slip-On Connector
SMC ..... Subminiature, C Type (Threaded Connector)
SPCG ..... Spacing
SPDT ..... Single Pole Double Throw
SPST ..... Single Pole Single Throw
SQ ..... Square
SST ..... Stainless Steel
STL ..... Steel
SUBMIN ..... Subminiature
SZ ..... Size

T

T ..... Teeth, Temperature, Thickness, Time, Timed, Tooth, Typical
TA ..... Ambient Temperature, Tantalum
TC ..... Temperature Coefficient
THD ..... Thread, Threaded
THK ..... Thick
TO ..... Package Type Designation
TPG ..... Tapping
TR-HD ..... Truss Head
TRMR ..... Trimmer
TRN ..... Turn, Turns
TRSN ..... Torsion

U

UCD ..... Microcandela
UF ..... Microfarad
UH ..... Microhenry
UL ..... Microliter, Underwriters' Laboratories, Inc.
UNHDND ..... Unhardened

V

V ..... Variable, Violet, Volt, Voltage
VAC ..... Vacuum, Volts, Alternating Current
VAR ..... Variable
VDC ..... Volts, Direct Current

W

W ..... Watt, Wattage, White, Wide, Width
W/SW ..... With Switch
WW ..... Wire Wound

X

X ..... By (Used With Dimensions), Reactance

Y

YIG ..... Yttrium-Iron-Garnet

Z

ZNR ..... Zener

ManualsPlus.com

TABLE 1. REFERENCE DESIGNATIONS AND ABBREVIATIONS (3 OF 3)

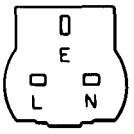
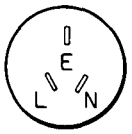
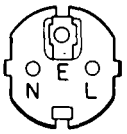
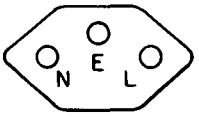
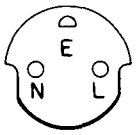
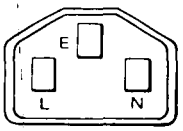
MULTIPLIERS					
Abbreviation	**Prefix**	**Multiple**	**Abbreviation**	**Prefix**	**Multiple**
T	tera	10^{12}	m	milli	10^{-3}
G	giga	10^{9}	μ	micro	10^{-6}
M	mega	10^{6}	n	nano	10^{-9}
k	kilo	10^{3}	p	pico	10^{-12}
da	deka	10	f	femto	10^{-15}
d	deci	10^{-1}	a	atto	10^{-18}
c	centi	10^{-2}			

TABLE 2. MANUFACTURERS CODE LIST

Mfr. No.	Manufacturer Name	Address	Zip Code
S4013	HITACHI	TOKYO, JP	
00000	ANY SATISFACTORY SUPPLIER		
00471	DOW-KEY CO INC	BROOMFIELD, WY	80020
00853	SANGAMO ELEC CO S CAROLINA DIV	PICKENS, SC	29671
01121	ALLEN-BRADLEY CO	MILWAUKEE, WI	53204
01281	TRW INC SEMICONDUCTOR DIV	LAWNDALE, CA	90260
01295	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS, TX	75222
02111	SPECTROL ELECTRONICS CORP	CITY OF IND, CA	91745
02660	BUNKER RAMO CORP AMPHENOL CONN DIV	BROADVILLE, IL	60153
03888	K D I PYROFILM CORP	WHIPPANY, NJ	07981
04713	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX, AZ	85008
06001	MEPCO ELECTRA CORP	COLUMBIA, SC	29063
06665	PRECISION MONOLITHICS INC	SANTA CLARA, CA	95050
18324	SIGNETICS CORP	SUNNYVALE, CA	94086
19701	MEPCO/ELECTRA CORP	MINERAL WELLS, TX	76067
24355	ANALOG DEVICES INC	NORWOOD, MA	02062
24546	CORNING GLASS WORKS	BRADFORD, PA	16701
27014	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA, CA	95051
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO, CA	94304
29832	TELEDYNE PHILBRICK NEXUS	DEDHAM, MA	02026
3L585	RCA CORP SOLID STATE DIV	SOMERVILLE, NJ	
30161	AAVID ENGINEERING INC	LACONIA, NH	03246
34335	ADVANCED MICRO DEVICES INC	SUNNYVALE, CA	94086
52763	STETTNER ELECTRONICS INC	CHATTANOOGA, TN	13035
55576	SYNERTEK	SANTA CLARA, CA	95051
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS, MA	01247
72136	ELECTRO MOTIVE CORP	FLORENCE, SC	06226
72982	ERIE TECHNOLOGICAL PRODUCTS INC	ERIE, PA	16512
73138	BECKMAN INSTRUMENTS INC HELIPOT DIV	FULLERTON, CA	92634
74970	JOHNSON E F CO	WASECA, MN	56093
75042	TRW INC PHILADELPHIA DIV	PHILADELPHIA, PA	19108
75915	LITTELFUSE INC	DES PLAINES, IL	60016
91506	AUGAT INC	ATTLEBORO, MA	02703

ManualsPlus.com

TABLE 3. AC POWER CABLES AVAILABLE

Plug Type**	Cable HP Part Number	Plug Description	Cable Length cm (inches)	Cable Color	For Use In Country
250V 	8120-1351 8120-1703	Straight*BS1363A 90°	229 (90) 229 (90)	Mint Gray Mint Gray	Great Britain, Cyprus, Nigeria, Rhodesia, Singapore, So. Africa, India
250V 	8120-1369 8120-0696	Straight*NZSS198/ASC112 90°	201 (79) 221 (87)	Gray Gray	Australia, New Zealand
250V 	8120-1689 8120-1692	Straight*CEE7-Y11 90°	201 (79) 201 (79)	Mint Gray Mint Gray	East and West Europe, Saudi Arabia, United Arab Republic (unpolarized in many nations)
125V	8120-1348 8120-1398 8120-1754	Straight*NEMA5-15P 90° Straight*NEMA5-15P	203 (80) 203 (80) 91 (36)	Black Black Black	United States Canada, Japan (100 or 200V), Mexico, Phillipines, Taiwan
	8120-1378 8120-1521 8120-1676	Straight*NEMA5-15P 90° Straight*NEMA5-15P	203 (80) 203 (80) 91 (36)	Jade Gray Jade Gray Jade Gray	
250V 	8120-2104	Straight*SEV1011 1959-24507 Type 12	201 (79)	Gray	Switzerland
220V 	8120-0698	Straight*NEMA6-15P			
250V 	8120-1860	Straight*CEEE22-VI			

* Part number shown for plug is industry identifier for plug only. Number shown for cable is HP Part Number for complete cable, including plug.

** E = Earth Ground; L = Line; N = Neutral.

ManualsPlus.com

TABLE 4. IF-DISPLAY SECTION, MISCELLANEOUS PARTS

Reference Designator	HP Part Number	C D	Qty	Description	Mfr. Code	Mfr. Part Number
A1T1	9100-4009	0	1	TRANSFORMER	28480	9100-4009
A1V1	5083-5791	7	1	CRT-P31 PHOSPER COATING	28480	5083-5791
A1V1MP1	4320-0311	0	1	SHOCK MOUNT CRT	28480	4320-0311
A1V1MP2	0905-0573	2	1	GASKET, CRT REAR	28480	0905-0573
A1V1MP3	01332-66001	8	1	TRACE ALIGN COIL	28480	01332-66001
A1V1MP4	01701-66001	5	1	ORTHO COIL	28480	01701-66001
A1V1MP5	8500-2163	7	5	THIN-FILM CLEANER FOR CLEANING EMI CRT SHIELD	28480	8500-2163
A1A1	85662-60001	1	1	KEYBOARD ASSEMBLY	28480	85662-60001
A1A1 (restored)	85662-60129	4	1	RESTORED KEYBOARD ASSEMBLY	28480	85662-60129
A1A2	85662-60100	1	1	Z-AXIS AMPLIFIER BOARD ASSY	28480	85662-60100
A1A3	85662-60059	9	1	HIGH VOLTAGE REGULATOR BOARD ASSY	28480	85662-60059
A1A4	85662-60057	7	1	X-DEFLECTION AMPLIFIER BOARD ASSY	28480	85662-60059
A1A5	85662-60057	7	1	Y-DEFLECTION AMPLIFIER BOARD ASSY	28480	85662-60057
A1A6	85662-60101	2	1	+ / – 15V REGULATOR BOARD ASSY	28480	85662-60101
A1A7	85662-60052	2	1	+ 100V + 5.2V REGULATOR BOARD ASSY	28480	85662-60052
A1A8	85662-60133	0	1	RECTIFIER BOARD ASSY	28480	85662-60133
A1A9	85662-60056	6	1	BUS TRANSITION BOARD ASSY	28480	85662-60056
A1A10	85662-60050	0	1	DISPLAY MOTHERBOARD ASSY	28480	85662-60050
A1A11	0960-0383	8	1	HV MULTIPLIER	28480	0960-0383
A3A1	85662-60014	6	1	TRIGGER BOARD ASSY	28480	85662-60014
A3A2	85662-60025	9	1	INTENSITY CONTROL BOARD ASSY	28480	85662-60025
A3A3	85662-60128	3	1	LINE GENERATOR BOARD ASSY	28480	85662-60128
A3A4	85662-60125	0	1	MEMORY BOARD ASSY	28480	85662-60125
A3A5	85662-60145	9	1	DATA MANIPULATOR BOARD ASSY	28480	85662-60145
A3A6	85662-60146	5	1	MAIN CONTROL BOARD ASSY	28480	85662-60146
A3A7	85662-60127	7	1	INTERFACE BOARD ASSY	28480	85662-60127
A3A8	85662-60130	7	1	ANALOG-DIGITAL CONVERTER BOARD ASSY	28480	85662-60130
A3A9	85662-60151	2	1	TRACK/HOLD BOARD ASSY	28480	85662-60151
A3A10	85662-60015	7	1	DIGITAL STORAGE MOTHERBOARD ASSY	28480	85662-60015
A4A1	85662-60122	7	1	VIDEO PROCESSOR BOARD ASSY	28480	85662-60122
A4A2/A4A3	85662-60096	4	1	LOG AMPLIFIER (INCLUDES A4A2 AND A4A3)	28480	85662-60096
A4A2/A4A3	85662-60097	5	1	RESTORED 85662-60097	28480	85662-60097
A4A2	85662-60132	9	1	LOG AMPLIFIER-DETECTOR BOARD ASSY	28480	85662-60132
A4A3	85662-60009	9	1	LOG AMPLIFIER BOARD ASSY	28480	85662-60009
A4A4	85662-60142	1	1	BANDWIDTH FILTER BOARD ASSY	28480	85662-60142
A4A5	85662-60139	6	1	STEP GAIN BOARD ASSY	28480	85662-60139
A4A6	85662-60018	0	1	DOWN/UP CONVERTER ASSY	28480	85662-60018
A4A6A1	85662-60006	6	1	UP CONVERTER BOARD ASSY	28480	85662-60006
A4A6A2	85662-60005	5	1	DOWN CONVERTER BOARD ASSY	28480	85662-60005
A4A7	85662-60004	4	1	3 MHZ BW FILTER BOARD ASSY	28480	85662-60004
A4A8	85662-60131	8	1	ATTENUATOR BANDWIDTH FLT BOARD ASSY	28480	85662-60131
A4A9	85662-60147	6	1	IF CONTROL BOARD ASSY	28480	85662-60147
A4A10	85662-60149	8	1	IF-VIDEO MOTHERBOARD ASSY	28480	85662-60149
B1	3160-0298	1	1	FAN-SKL 72-CFM 115V 50/60/400-HZ 1.5-THK (OPTION 400 ONLY)	28480	3160-0298
B1	3160-0296	9	1	FAN-SKL 72-CFM 115V 50/60-HZ 1.5-THK	28480	3160-0296
C1	0160-4065	5	1	CAPACITOR-FXD .1UF ± 20% 250VAC (RMS)	28480	0160-4065
C2	0160-2636	2	2	CAPACITOR-FXD 470PF ± 20% 3KVDC CER	28480	0160-2636
C3	0160-2636	2	1	CAPACITOR-FXD 470PF ± 20% 3KVDC CER	28480	0160-2636
F1	2110-0007	4	1	FUSE A1 250V SLO-BLO 1.25X.25 UL IEC	75915	313001
F1	2110-0006	3	1	FUSE 2A 250V SLO-BLO 1.25X.25 UL	71400	MDX-2
FL1	0960-0448	6	1	LINE MODULE FILTER	05245	F1927
FL1TB1			1	PART OF FL1 & NOT SEPARATELY REPLACEABLE		
J1	1251-7498	8	1	CONNECTOR 5-PIN F D SERIES	28480	1251-7498
J2				(SEE A1A9J2)		
J3				PART OF W28		
J4				PART OF W29		
J5				PART OF W27		
J6				PART OF W32		
J7				PART OF W14		
J8				PART OF W13		
J9				PART OF W25		
J10				PART OF W26		
J11				PART OF W15		
J12				PART OF W34		
J13				PART OF W33		
J14				PART OF W35		
J15				PART OF W36		
T1				SEE A1T1		
TB1	85662-60086	2	1	TERMINAL BOARD, PC 400HZ CAP (OPT 400)	28480	85662-60086
TB1	0170-0073	8	1	CAPACITOR-FXD 1UF ± 10% 600VDC POLYE	28480	0170-0073
V1			1	SEE A1V1		
W1	85662-60068	0	2	CABLE ASSEMBLY, A1A1 TO A1A10 (RIBBON CABLE, P/O A3 INTERCONNECT	28480	85662-60068
W2	85662-60068	0	1	CABLE ASSEMBY, A1A1 TO A1A10 (RIBBON CABLE, P/O A3 INTERCONNECT)	28480	85662-60068
W3	85662-60062	4	1	CABLE ASSEMBLY, A1A10 TO A3A10 (A3 POWER)	28480	85662-60062
W4	85662-60063	5	1	CABLE ASSEMBLY, A1A10 TO A4A10	28480	85662-60063
W5	85662-60073	7	1	CABLE ASSEMBLY, A1A10 TO A1A9	28480	85662-60073

ManualsPlus.com

TABLE 4. IF-DISPLAY SECTION, MISCELLANEOUS PARTS

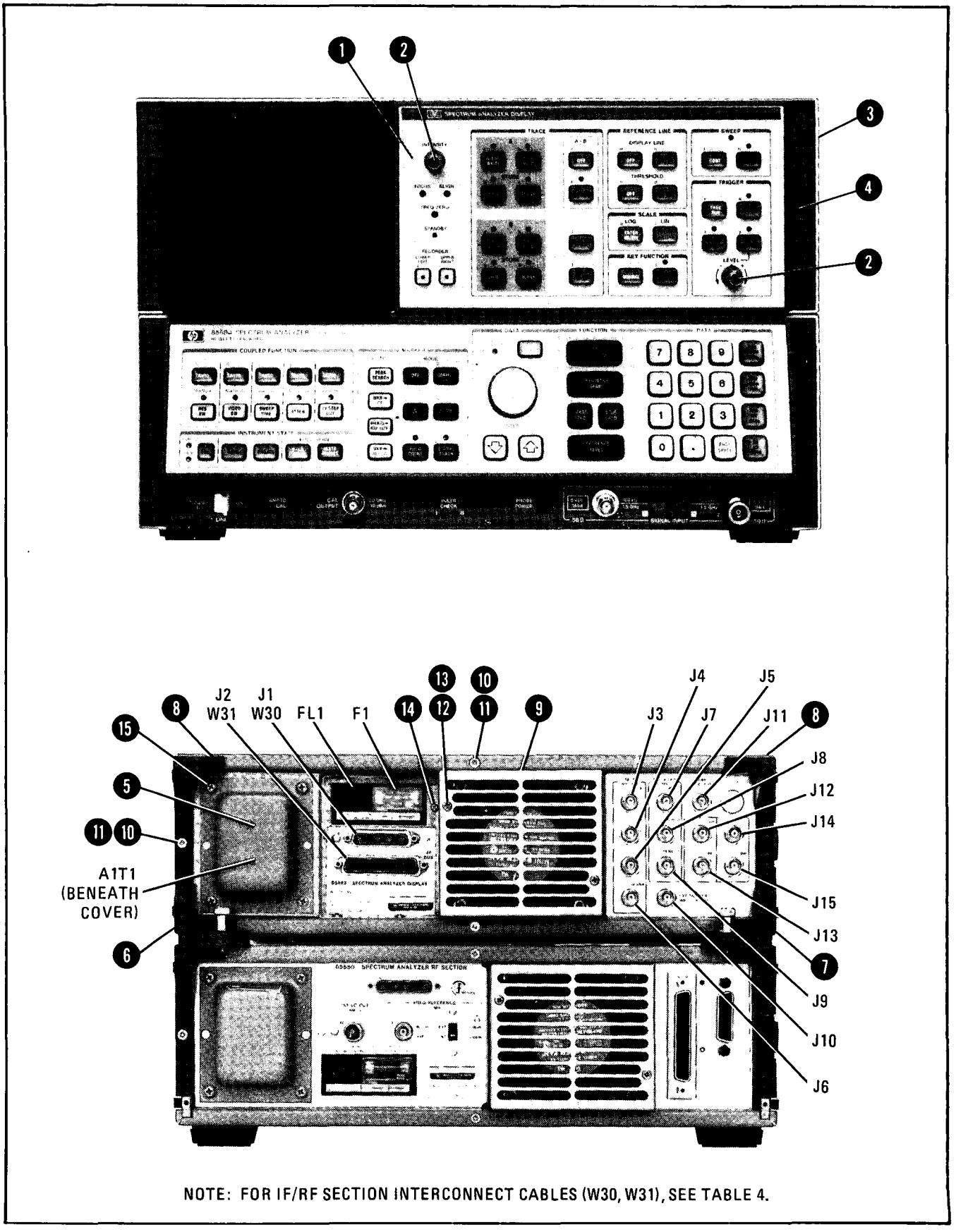
Reference Designator	HP Part Number	C D	Qty	Description	Mfr. Code	Mfr. Part Number
W6	85662-60064	6	1	CABLE ASSEMBLY, A1A4 TO A1V1 (X-DEFL)	28480	85662-60064
W7	85662-60064	6	1	CABLE ASSEMBLY, A1A5 TO A1V1 (Y-DEFL)	28480	85662-60064
W8	85662-60028	2	1	CABLE ASSEMBLY, (INST. BUS)	28480	85662-60028
W9	85662-60066	8	1	CABLE ASSEMBLY, A1A10 TO A3A10 (RIBBON CABLE)	28480	85662-60066
W10				NOT ASSIGNED		
W11	85662-60043	1	2	CABLE ASSEMBLY, COAX 9, A3A9 TO A3A2 (VIDEO)	28480	85662-60043
W12				NOT ASSIGNED		
W13	85662-60103	4	1	CABLE ASSEMBLY, COAX 1, A4A1 TO REAR PANEL J8 (RECORDER VIDEO)	28480	85662-60103
W14	85662-60102	3	1	CABLE ASSEMBLY, COAX 3, A4A1 TO REAR PANEL J7 (RECORDER SWEEP)	28480	85662-60102
W15	85662-60104	5	1	CABLE ASSEMBLY, COAX 2, A4A2 TO REAR PANEL J11 (21.4MHZ IF OUTPUT)	28480	85662-60104
W16	85662-60032	8	1	CABLE ASSEMBLY, COAX 0, REAR	28480	85662-60032
W17	85662-60033	9	1	CABLE ASSEMBLY, COAX 93, REAR PANEL J1 TO A4A1 (AUX SWEEP INPUT)	28480	85662-60033
W18	85662-60031	7	1	CABLE ASSEMBLY, COAX 6, A4A2 TO REAR PANEL J1 (COUNTER OUTPUTS)	28480	85662-60031
W19	85662-60030	6	1	CABLE ASSEMBLY, COAX 97, REAR PANEL A1 TO A4A8 (21.4MHZ IF INPUT)	28480	85662-60030
W20				NOT ASSIGNED		
W21	85662-60070	4	1	CABLE ASSEMBLY, A1A3 TO A1V1 (CRT REAR CONNECTOR)	28480	85662-60070
W22				NOT ASSIGNED		
W23	85662-60029	3	1	CABLE ASSEMBLY, COAX 1, A3A10 TO A1A10 (X-DEFLECTION)	28480	85662-60029
W24	85662-60039	5	1	CABLE ASSEMBLY, COAX 1, A3A10 TO A1A10 (Y-DEFLECTION)	28480	85662-60039
W25	85662-60037	3	1	CABLE ASSEMBLY, COAX 84, A1A10 TO REAR PANEL J9 (PENLIFT)	28480	85662-60037
W26	85662-60038	4	1	CABLE ASSEMBLY, COAX 85, A1A10 TO REAR PANEL J10 (EXTERNAL TRIGGER)	28480	85662-60038
W27	85662-60036	2	1	CABLE ASSEMBLY, COAX 82, A1A10 TO REAR PANEL J5 (DISPLAY OUTPUT Z)	28480	85662-60036
W28	85662-60034	0	1	CABLE ASSEMBLY, COAX 83, A1A10 TO REAR PANEL J3 (DISPLAY OUTPUT X)	28480	85662-60034
W29	85662-60035	1	1	CABLE ASSEMBLY, COAX 81, A1A10 TO REAR PANEL J4 (DISPLAY OUTPUT Y)	28480	85662-60035
W30	85662-60093	1	1	CABLE ASSEMBLY, IF-DISPLAY SECTION TO RF SECTION (COAX INTERCONNECT)	28480	85662-60093
W31	85662-60094	2	1	CABLE ASSEMBLY, IF-DISPLAY SECTION TO RF SECTION (INST. BUS INTERCONNECT)	28480	85662-60094
W32	85662-60044	2	1	CABLE ASSEMBLY, COAX 86, A1A10 TO REAR PANEL J6 (DISPLAY OUTPUT BLANK)	28480	85662-60044
W33	85662-60118	1	1	CABLE ASSEMBLY, COAX 89, A4A6 TO REAR PANEL J13 (IF IN)	28480	85662-60118
W34	85662-60119	2	1	CABLE ASSEMBLY, COAX 87, A4A6 TO REAR PANEL J12 (IF OUT)	28480	85662-60119
W35	85662-60120	5	1	CABLE ASSEMBLY, COAX 7, A4A1 TO REAR PANEL J14 (VIDEO OUT)	28480	85662-60120
W36	85662-60121	6	1	CABLE ASSEMBLY, COAX 96, A3A9 TO REAR PANEL J15 (VIDEO IN)	28480	85662-60121
W37	85662-60117	0	2	CABLE ASSEMBLY, COAX 8, IF OUT TO IF IN	28480	85662-60117
W38	85662-60117	0	1	CABLE ASSEMBLY, COAX 8, VIDEO OUT TO VIDEO IN	28480	85662-60117
Not part of Cable Assy order separate	9170-1392		2	Ferite Core		9170-1392
	0460-1118			CLOTH TAPE		

ManualsPlus.com

Item	HP Part Number	C D	Description	Mfr. Code	Mfr. Part Number
1	85662-00054	8	Panel, Front Dress	28480	85662-00054
2	0370-1005	2	Knob, Base Ptr.	28480	0370-1005
3	5020-8803	6	Frame, Front	28480	5020-8803
4	85662-20064	2	Bezel, Mainframe	28480	85662-20064
5	85680-00047	1	Painted Cover	28480	85680-00047
6	5020-8939	9	Lock Foot, Lower Left	28480	5020-8939
7	5020-8937	7	Lock Foot, Lower Right	28480	5020-8937
8	5040-7221	2	Foot, Upper Right/Left	28480	5040-7221
9	86701-00007	7	Guard Fan	28480	86701-00007
10	0570-1171	7	Screw, Cover MTG 6-32 .460-IN-LG	28480	0570-1171
11	0510-0043	4	Retainer Ring For Screw (10)	28480	0510-0043
12	2360-0219	9	Screw, 6-32, 1.375-IN-LG PAN HD	28480	2360-0219
13	2190-0018	5	Washer, LK	28480	2190-0018
14	2200-0103	2	Screw, 4-40, .25-IN-LG PAN HD	28480	2200-0103
15	2510-0136	8	Screw, 8-32, 2.5-IN-LG PAN HD	28480	2510-0136
A1T1			See Table 4 of this Tab		
FL1			See Table 4		
F1			See Table 4		
J1			See Table 4		
J2			See Table 4		
J3			See Table 4		
J4			See Table 4		
J5			See Table 4		
J6			See Table 4		
J7			See Table 4		
J8			See Table 4		
J9			See Table 4		
J10			See Table 4		
J11			See Table 4		
J12			See Table 4		
J13			See Table 4		
J14			See Table 4		
J15			See Table 4		
W30			See Table 4		
W31			See Table 4		

FIGURE 1. IF-DISPLAY SECTION PARTS IDENTIFICATION, FRONT/BACK VIEW (1 OF 2)

ManualsPlus.com



NOTE: FOR IF/RF SECTION INTERCONNECT CABLES (W30, W31), SEE TABLE 4.

FIGURE 1. IF-DISPLAY SECTION PARTS IDENTIFICATION, FRONT/BACK VIEW (2 OF 2)

ManualsPlus.com

Item	HP Part Number	C D	Description	Mfr. Code	Mfr. Part Number
1	5060-9912	4	Cover, Side, Perf.	28480	5060-9912
2	5060-9937	3	Cover, Side, Perf.	28480	5060-9937
3	5060-9835	0	Cover – 18"	28480	5060-9835
4	5060-9804	3	Strap Handle Assy – 18"	28480	5060-9804
5	5040-7220	1	Cover, Strap Handle, Rear	28480	5040-7220
6	5040-7219	8	Cover, Strap Handle, Front	28480	5040-7219
7	5040-7253	0	Bezel, CRT	28480	5040-7253
8	5020-8803	6	Frame, Front	28480	5020-8803
9	5020-8896	7	Trim Strip	28480	5020-8896
10	5040-7221	2	Foot, Rear	28480	5040-7221
11	5020-8939	9	Lock Foot, Left	28480	5020-8939
12	5020-8937	7	Lock Foot, Right	28480	5020-8937
13	2680-0172	1	Screw, 10-32, .375-IN-LG FL HD	28480	2680-0172
14	2510-0195	9	Screw, 8-32	28480	2510-0195

Set 5062-3999

FIGURE 2. IF-DISPLAY SECTION PARTS IDENTIFICATION, SIDE VIEW (1 OF 2)

ManualsPlus.com

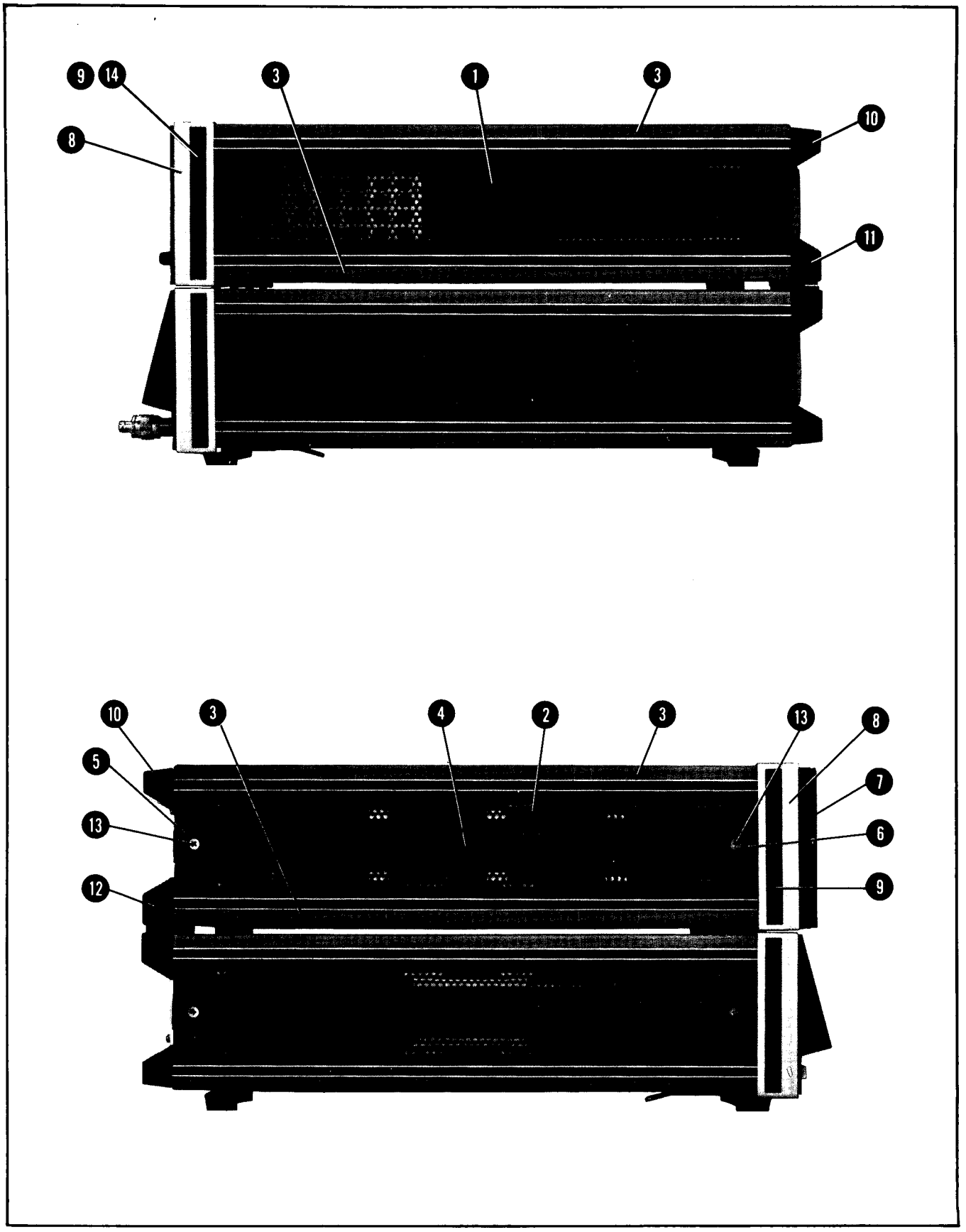


FIGURE 2. IF-DISPLAY SECTION PARTS IDENTIFICATION, SIDE VIEW (2 OF 2)

ManualsPlus.com

Item	HP Part Number	C D	Description	Mfr. Code	Mfr. Part Number
1	85662-20041	5	Cover, A4A1 Assembly	28480	85662-20041
2	85662-20040	4	Cover, A4A2 Assembly	28480	85662-20040
3	85662-20037	9	Cover, A4A3 Assembly	28480	85662-20037
4	85662-20036	8	Cover, A4A4 Assembly	28480	85662-20036
5	85662-20148	3	Cover, A4A5 Assembly	28480	85662-20148
6	85662-20039	1	Cover, A4A6 Assembly	28480	85662-20039
7	85662-20034	6	Cover, A4A7 Assembly	28480	85662-20034
8	85662-20038	0	Cover, A4A8 Assembly	28480	85662-20038
9	85662-00075	3	Cover, Digital Storage	28480	85662-00075
10	85662-00036	6	Cover, HV Supply	28480	85662-00036
11	85662-00049	1	Shroud, Airduct (Voltage Regulator Cover)	28480	85662-00049
12	85662-00052	6	Cover, Side HV	28480	85662-00052
13	85660-20030	2	Frame, Rear	28480	85660-20030
14	5020-8882	1	Strut, Corner, 18"	28480	5020-8882
15	5020-8803	6	Frame, Front	28480	5020-8803
16	85662-20064	2	Bezel, Mainframe	28480	85662-20064
17	5040-7253	0	Bezel, CRT	28480	5040-7253
18	5040-7202	9	Trim, Top	28480	5040-7202
19	01332-60602	3	Shield, CRT, Front	28480	
20	1220-0203	4	Shield, CRT, Rear	28480	1220-0203
21	08505-00121	8	Clamp, CRT Shield	28480	08505-00121
22	85662-00037	7	Shield, Amplifier	28480	85662-00037
23	85662-20092	6	IF Housing Casting	28480	85662-20092
24	85662-00046	8	Bracket, PC Board	28480	85662-00046
25	85662-60099	7	Shield Assy-Digital Storage (Beneath Cover 9)	28480	85662-60099
26	85660-00041	3	Bracket, Dual Capacitor	28480	85660-00041
26	85662-00062	8	Bracket, Tri-Capacitor (Option 400)	28480	85662-00062
27	5060-9899	6	Front Handles Set 5062-3989	28480	5060-9899
28	85662-00040	2	Bracket, Capacitor	28480	85662-00040
29	86701-00007	1	Guard, Fan	28480	86701-00007
30	2360-0197	2	Screw, 6-32, .5-IN-LG PAN-HD	28480	2360-0197
31	3050-0227	3	Washer, F1 For Screw	28480	3050-0227
32	2190-0006	1	Washer, LK For Screw	28480	2190-0006
33	1400-0017	0	Clamp-Cable, .312-DIA, .375-WIDE	28480	1400-0017
34	2510-0192	6	Screw, 8-32, .25-IN-LG 100 DEG FH	28480	2510-0192
35	2510-0195	9	Screw, 8-32, .375-IN-LG 100 DEG FH	28480	2510-0195
36	2360-0115	4	Screw, 6-32, .312-IN-LG PAN HD	28480	2360-0115
37	85662-20042	6	Guide-HV, Nylon	28480	85662-20042
38	3050-0105	6	Washer-FL MTLC No. 4 .125 IN-ID	28480	3050-0105
39	2360-0113	2	Screw, 6-32, .25-IN-LG PAN-HD	28480	2360-0113
40	2360-0221	3	Screw, 6-32, .25-IN-LG PAN-HD	28480	2360-0221
41	2200-0107	6	Screw, 4-40, .375-IN-LG	28480	2200-0107
42	2200-0103	2	Screw, 4-40, .25-IN-LG PAN-HD	28480	2200-0103
43	2360-0117	6	Screw, MACH 6-32, .375-IN-LG PAN-HD-POZI	28480	2360-0117
44	3050-0227	3	Washer-FL MTLC No. 4 .125-IN-ID	28480	3050-0227
A1T1			See Table 4 of this Tab		
FL1			See Table 4 of this Tab		
W6			See Table 4 of this Tab		
W7			See Table 4 of this Tab		

FIGURE 3. IF-DISPLAY SECTION PARTS IDENTIFICATION, TOP VIEW (1 OF 2)

ManualsPlus.com

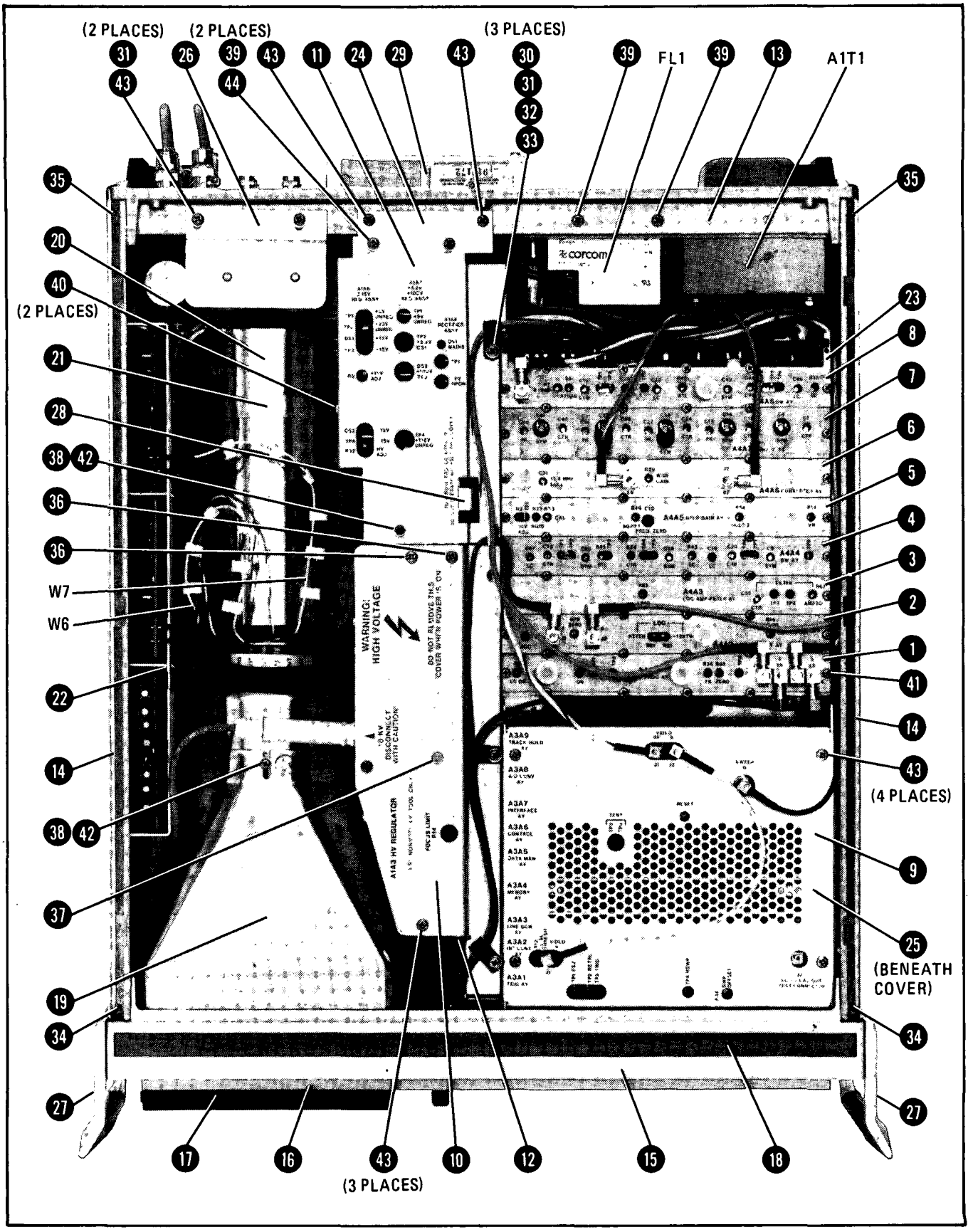


FIGURE 3. IF-DISPLAY SECTION PARTS IDENTIFICATION, TOP VIEW (2 OF 2)

ManualsPlus.com

Item	HP Part Number	C D	Description	Mfr. Code	Mfr. Part Number
1	85662-20030	2	Frame, Rear	28480	85662-20030
2	2510-0195	9	Screw, 8-32, .375-IN-LG 100 DEG FH	28480	2510-0195
3	5020-8882	1	Strut, Corner, 18"	28480	5020-8882
4	2190-0011	8	Washer-LK For Screw	02440	1022
5	2680-0099	1	Screw, 10-32, .375-IN-LG PAN-HD	28480	2680-0099
6	2360-0113	2	Screw, 6-32, .25-IN-LG PAN-HD	28480	2360-0113
7	1400-1218	5	Clamp, Cable	28480	1400-1218
8	2360-0113	2	Screw, 6-32, .25-IN-LG PAN-HD	28480	2360-0113
9	3050-0105	6	Washer-F1 For Screw	28480	3050-0105
10	2190-0003	8	Washer-LK For Screw	28480	2190-0003
11	1220-0203	4	Shield, CRT, Rear	28480	1220-0203
12	2200-0103	2	Screw, 4-40, .25-IN-LG PAN-HD	28480	2200-0103
13	2510-0192	6	Screw, 8-32, .15-IN-LG 100 DEG FH	28480	2510-0192
14	5020-8803	6	Frame, Front	28480	5020-8803
15	85662-20064	2	Bezel, Mainframe	28480	85662-20064
16	5040-7253	0	Bezel, CRT	28480	5040-7253
17	0520-0163	0	Screw, 2-56, .18-IN-LG 82 DEG FH	28480	0520-0163
18	2360-0118	7	Screw, 6-32, .375-IN-LG 82 DEG FH	28480	2360-0118
19	2200-0105	4	Screw, 4-40, .312-IN-LG PAN-HD	28480	2200-0105
20	85662-20031	3	Support, Center Member	28480	85662-20031
21	2360-0121	2	Screw, 6-32, .500-IN-LG PAN-HD	28480	2360-0121
22	85662-00053	7	Strap	28480	85662-00053
23	2360-0115	4	Screw, 6-32, .312-IN-LG PAN-HD	28480	2360-0115
24	2360-0116	5	Screw, 6-32, .312-IN-LG 82 DEG FH	28480	2360-0116
25	01332-60602	3	Shield, CRT, Front	28480	01332-60602
A1T1			See Table 4 of this Tab		
A1V1			See Table 4 of this Tab		
A3A10			Refer To Individual Assembly Parts Tables		
A4A10			Refer To Individual Assembly Parts Tables		
W8			See Table 4 of this Tab		
W23			"		
W24			"		
W25			"		
W26			"		
W27			"		
W28			"		
W29			"		

FIGURE 4. IF-DISPLAY SECTION PARTS IDENTIFICATION, BOTTOM VIEW (1 OF 2)

ManualsPlus.com

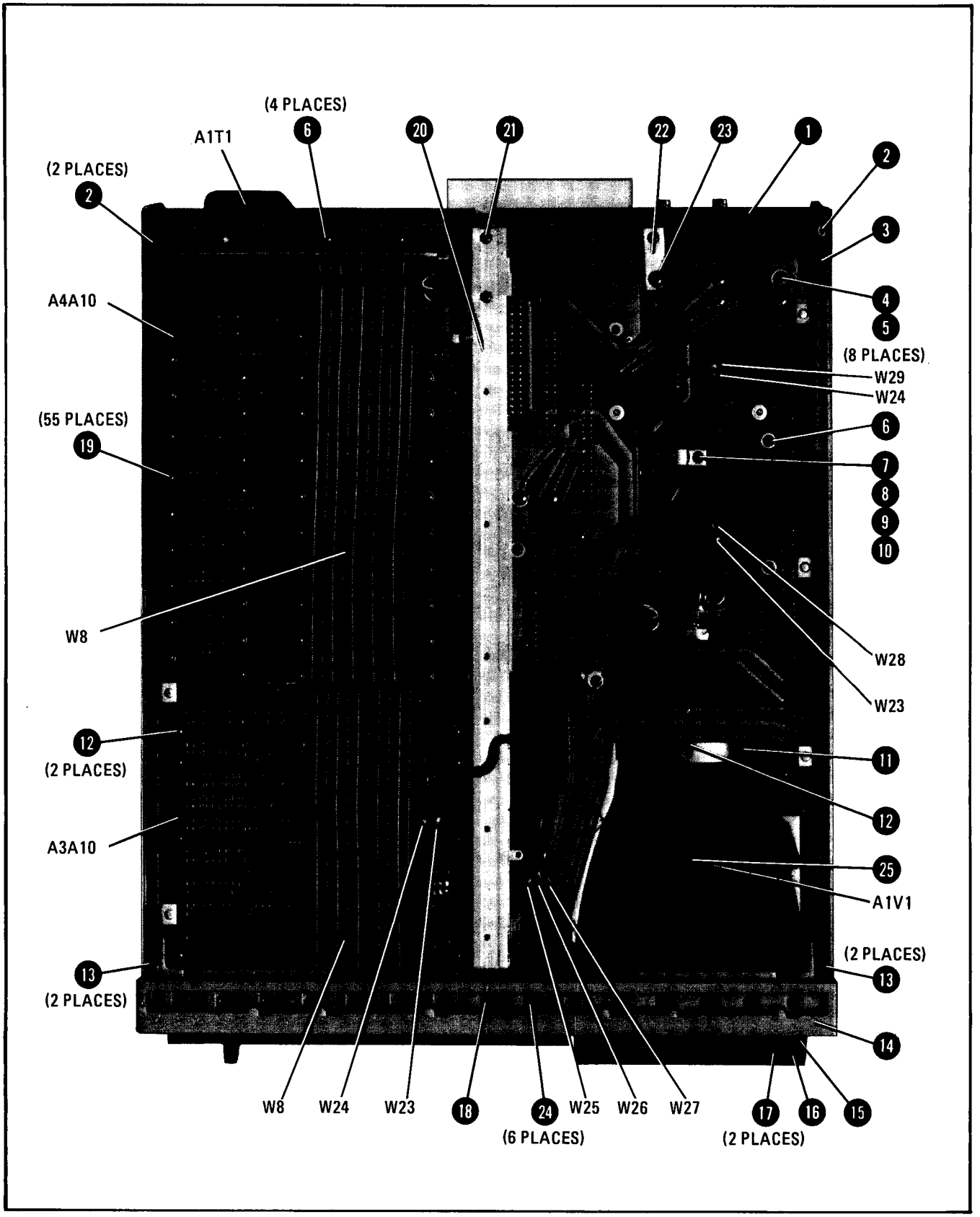


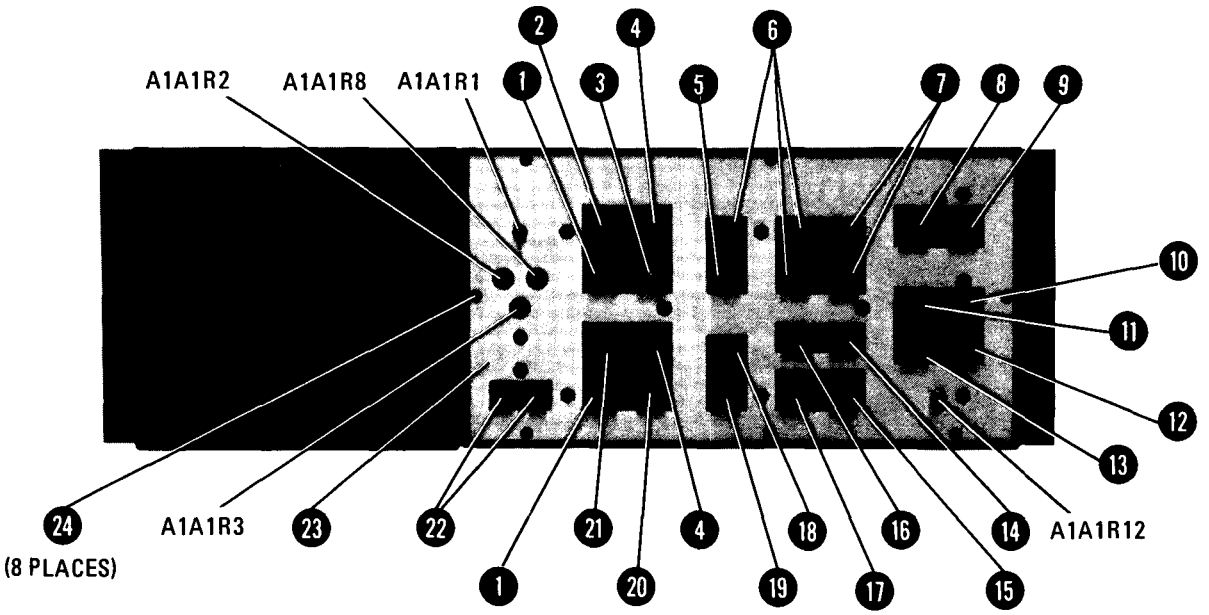
FIGURE 4. IF-DISPLAY SECTION PARTS IDENTIFICATION, BOTTOM VIEW (2 OF 2)

ManualsPlus.com

Item	HP Part Number	C D	Description	Mfr. Code	Mfr. Part Number
1	5041-0690		Key VIEW	28480	5041-0690
2	5041-0688		Key CLEAR-WRITE	28480	5041-0688
3	5041-0807		Key BLANK	28480	5041-0807
4	5041-0689		Key MAX HOLD	28480	5041-0689
5	5041-0732		Key A B→A	28480	5041-0732
6	5041-0693		Key OFF	28480	5041-0693
7	5041-0696		Key ENTER	28480	5041-0696
8	5041-0700		Key CONT	28480	5041-0700
9	5041-0701		Key SINGLE	28480	5041-0701
10	5041-0703		Key LINE	28480	5041-0703
11	5041-0702		Key FREE RUN	28480	5041-0702
12	5041-0705		Key VIDEO	28480	5041-0705
13	5041-0704		Key EXT	28480	5041-0704
14	5041-0310		Key LINEAR	28480	5041-0310
15	5041-0699		Key SHIFT	28480	5041-0699
16	5041-0733		Key ENTER dB/DIV	28480	5041-0733
17	5041-0697		Key NORMAL	28480	5041-0697
18	5041-0694		Key A=B	28480	5041-0694
19	5041-0916		Key B - DL →B	28480	5041-0916
20	5041-0691		Key BLANK	28480	5041-0691
21	5041-0806		Key CLEAR-WRITE	28480	5041-0806
22	5041-0285		Key RECORDER	28480	5041-0285
23	85662-00030		Panel, Sub Front	28480	85662-00030
24	0624-0201		Screw, 4-40, .188-IN-LG 82 DET FT HD	28480	0624-0201
25	85662-20064		Bezel, Mainframe	28480	85662-20064
26	9135-0052		RFI Shield: Glass	28480	9135-0052
27	85662-00030		Panel, Sub Front	28480	85662-00030
28	2200-0103		Screw, 4-40, .25-IN-LG PAN-HD	28480	2200-0103
A1A1			Refer To Individual Assembly Parts Tables		
A1A1R1			"		
A1A1R2			"		
A1A1R3			"		
A1A1R8			"		
A1A1R12			"		
W1			See Table 4 of this Tab		
W9			"		

FIGURE 5. IF-DISPLAY SECTION PARTS IDENTIFICATION, FRONT PANEL VIEW (1 OF 2)

ManualsPlus.com



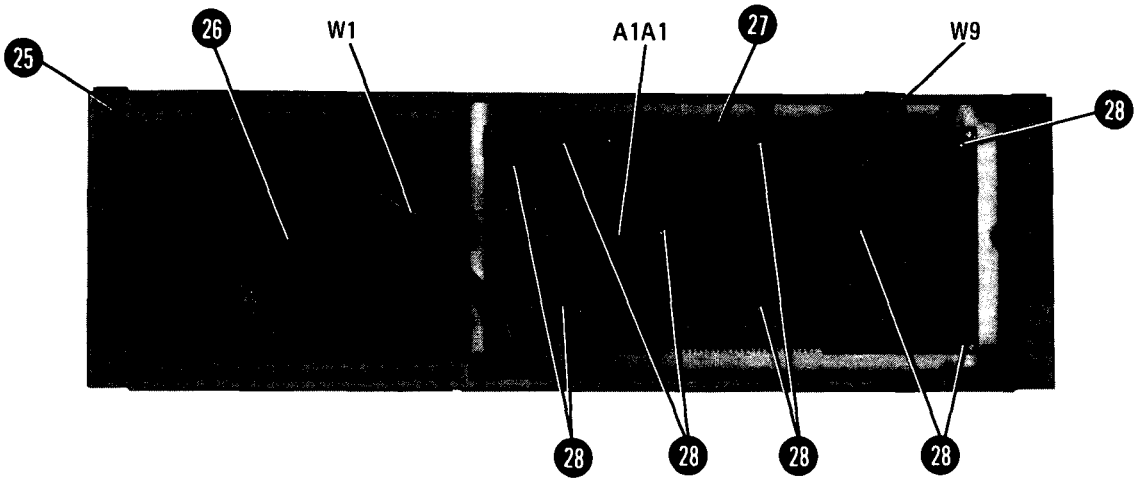
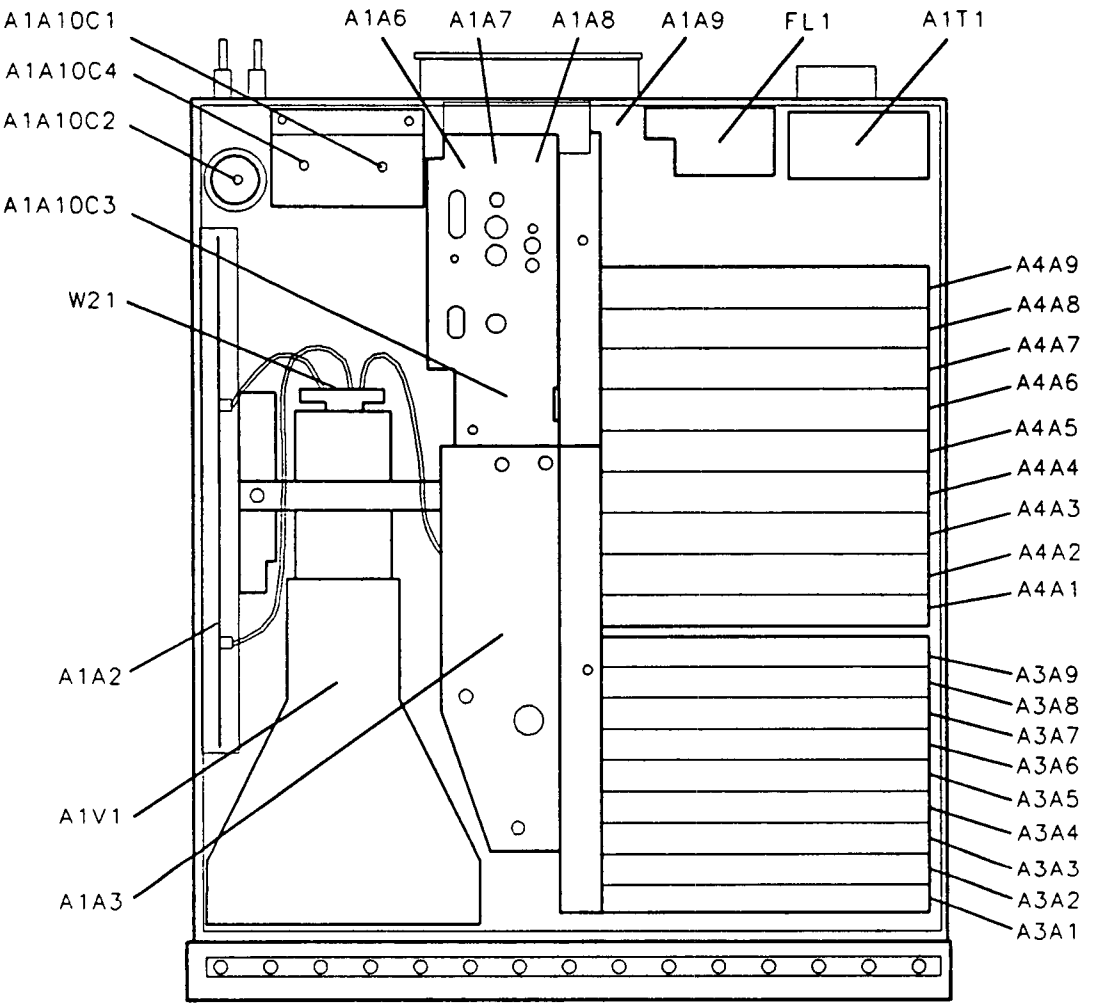


FIGURE 5. IF-DISPLAY SECTION PARTS IDENTIFICATION, FRONT-PANEL VIEW (2 OF 2)

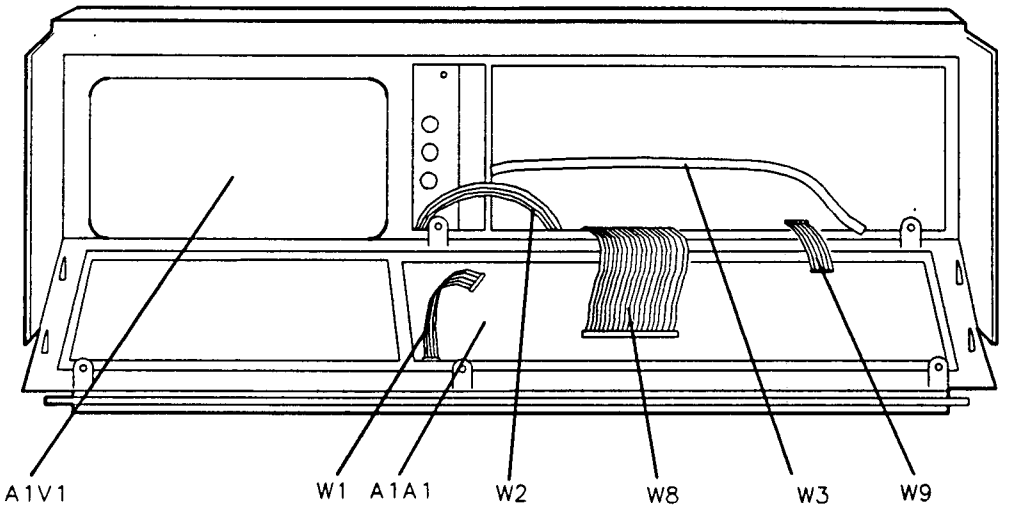
ManualsPlus.com

ManualsPlus.com



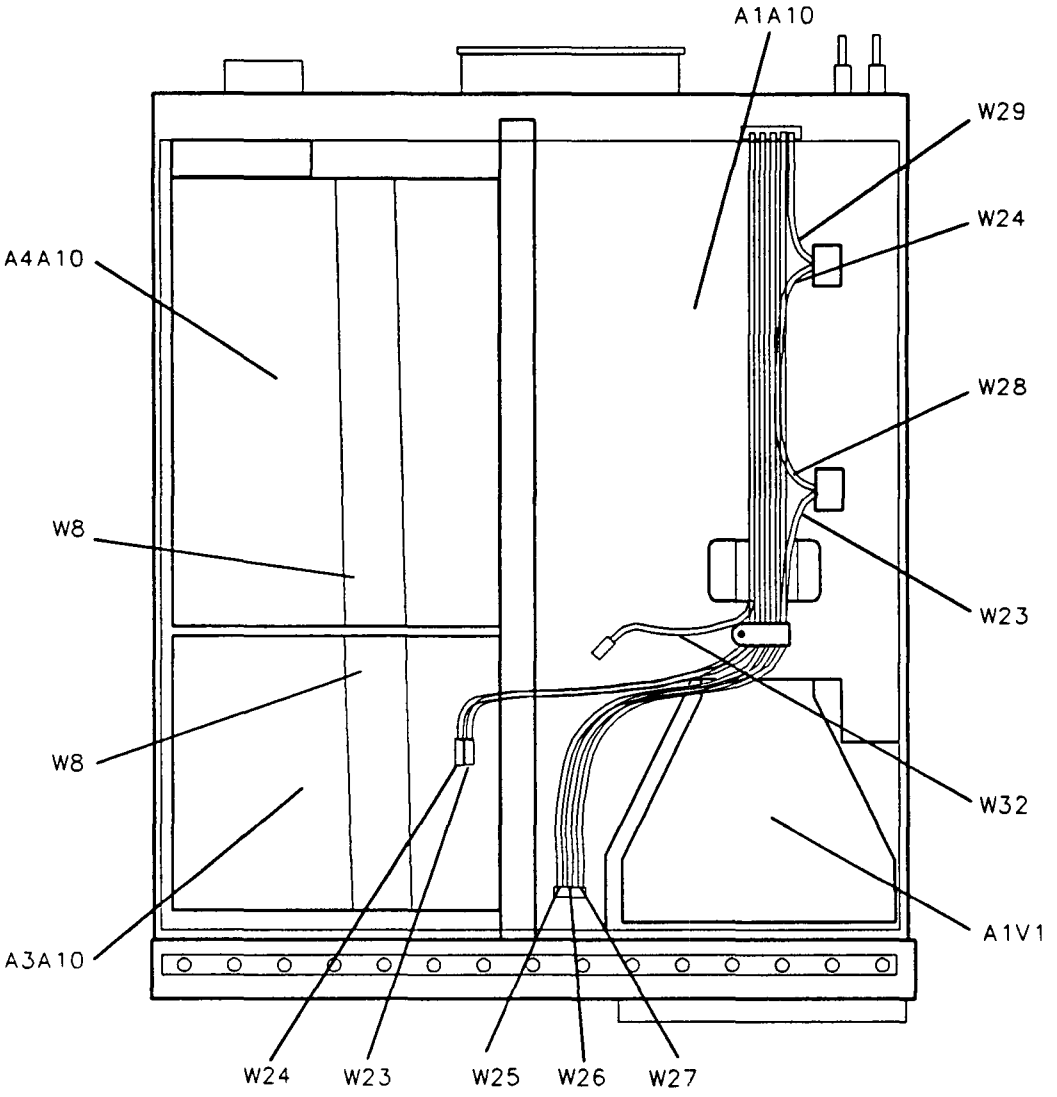
Major Assembly and Component Locations (IF Display Section Top View)

ManualsPlus.com



Major Assembly and Component Locations (IF Display Section Front View)

ManualsPlus.com

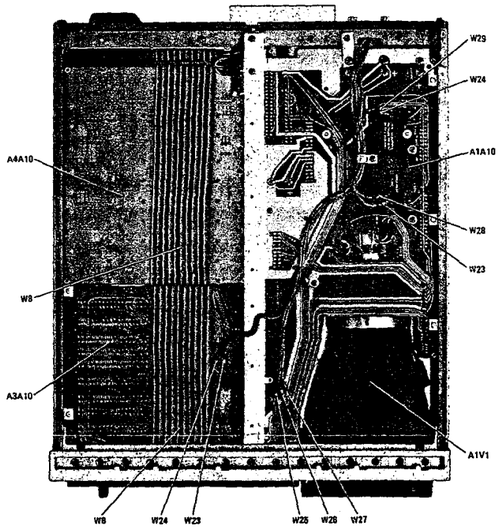


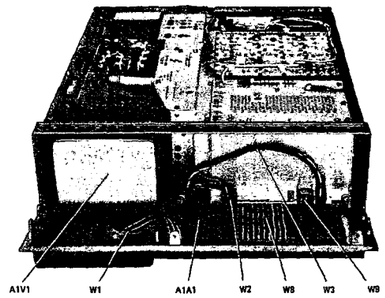
Major Assembly and Component Locations (IF Display Section Bottom View)

ManualsPlus.com

IF-DISPLAY SECTION

Analog-Digital Converter	A3A8
Attenuator-Bandwidth Filter	A4A8
Bandwidth Filter	A4A4
Bus Transition	A1A9
CRT	A1V1
Data Manipulator	A3A5
Digital Storage Motherboard	A3A10
Display Motherboard	A1A10
Down/Up Converter	A4A6
High Voltage Multiplier	A1A11
High Voltage Regulator	A1A3
IF Control	A4A9
IF-Video Motherboard	A4A10
Intensity Control	A3A2
Interface	A3A7
Keyboard	A1A1
Line Generator	A3A3
Log Amplifier-Detector	A4A2
Log Amplifier-Filter	A4A3
Main Control	A3A6
Memory	A3A4
Rectifier	A1A8
Step Gain	A4A5
Track and Hold	A3A9
Trigger	A3A1
Video Processor	A4A1
X Deflection Amplifier	A1A4
Y Deflection Amplifier	A1A5
Z Axis Amplifier	A1A2
3 MHz Bandwidth Filter	A4A7





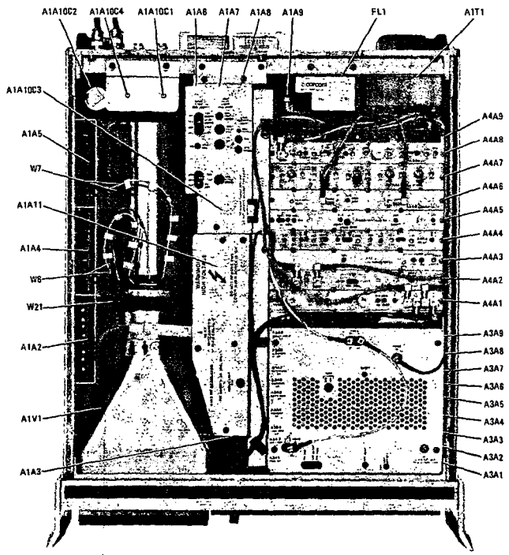


FIGURE 1. MAJOR ASSEMBLY, COMPONENT LOCATIONS

ManualsPlus.com

HEWLETT-PACKARD SALES AND SERVICE OFFICES

To obtain servicing information or to order replacement parts, contact the nearest Hewlett-Packard Sales and Service Office listed in the HP Catalog, or contact the nearest regional office listed below:

IN THE UNITED STATES

CALIFORNIA
P.O. Box 4230
1421 South Manhattan Avenue
Fullerton 92631

GEORGIA
P.O. Box 105005
2000 South Park Place
Atlanta 30339

ILLINOIS
5201 Tollview Drive
Rolling Meadows 60008

NEW JERSEY
W. 120 Century Road
Paramus 07652

IN CANADA

Hewlett-Packard (Canada) Ltd.
17500 South Service Road
Trans-Canada Highway
Kirkland, Quebec H9J 2M5

IN FRANCE

Hewlett-Packard France
F-91947 Les Ulis Cedex
Orsay

IN GERMAN FEDERAL REPUBLIC

Hewlett-Packard GmbH
Vertriebszentrale Frankfurt
Berner Strasse 117
Postfach 560 140
D-6000 Frankfurt 56

IN GREAT BRITAIN

Hewlett-Packard Ltd.
King Street Lane
Winnersh, Wokingham
Berkshire RG11 5AR

IN OTHER EUROPEAN COUNTRIES

SWITZERLAND
Hewlett-Packard (Schweiz) AG
29 Chemin Chateau Bloc
CH-1219 LeLignon-Geneva

IN ALL OTHER LOCATIONS

Hewlett-Packard Inter-Americas
3200 Hillview Avenue
Palo Alto, California 94304

ManualsPlus.com

Printed in U.S.A.

ManualsPlus.com

SERVICE NOTE

Supersedes:

None

HP MODEL 8566A/B SPECTRUM ANALYZER

Serial Prefix 2503A and Below

RACK MOUNTING WITH SLIDES (OPTION 010)
ENGLISH SYSTEM II CABINET PARTS

The following is a list of English hardware and instructions required to mount an HP 8566A/B with slides in a rack of 482.6 mm (19 in.) spacing or in non-HP racks.

Description	Qty	HP Part Number	CD
SIDE COVER	1	5060-9937	3
RACK MOUNT KIT	1	5061-0086	7
includes:			
Rack Mount Flange	2	5020-8877	4
Front Handle Assembly	2	5060-9902	2
8-32x5/8 Pan-Head Screw	8	2510-0194	8
HEAVY DUTY SLIDE KIT	1	1494-0016	6
includes:			
Modified Slides	2		
10-32x7/16 Pan-Head Screw	8	2680-0101	6
10-32x3/8 Pan-Head Screw	4	2680-0099	1
10-32 F.H.M. Screw	6	2600-0117	6
10-32 Unistrut Nut	8	0590-0698	3
SLIDE ADAPTER KIT (for non-HP racks)	1	1494-0042	8
includes:			
Adapter Bracket	2		
10-32 Bar Nuts	4		
10-32x1/2 Pan-Head Screw	12	2680-0101	6
10-32 x1/2 F.H.M. Screw	4	2680-0117	4
10-32 Nut W/Lock Washer	8	0590-0639	2

I/NS/WN

5/85-53/KGB

HEWLETT PACKARD

FOR MORE INFORMATION, CALL YOUR LOCAL HP SALES OR SERVICE OFFICE or East (201) 265-5000 • Midwest (312) 255-9800 • South (404) 955-1500 • West (213) 970-7500 or (415) 968-9200 OR WRITE, Hewlett-Packard, 1820 Embarcadero, Palo Alto, California 94303. IN EUROPE, CALL YOUR LOCAL HP SALES OR SERVICE OFFICE OR WRITE, Hewlett-Packard S.A., 7, rue du Bois-du-Lan, P.O. Box, CH-1217 Meyrin 2-Geneva, Switzerland. IN JAPAN, Yokogawa-Hewlett-Packard Ltd., 1-27-15, Yabe Sagamihara City, Kanagawa Prefecture, Japan 229.

Printed in U.S.A.

ManualsPlus.com

PROCEDURE:

RACK MOUNT KIT

1. Remove the front handles from the RF Section and IF-Display Section of the spectrum analyzer. (See Figure 1.)

2. Attach the new rack mount flanges and front handles provided in the Rack Mount Kit. (See Figure 2.) Use the eight 8-32x5/8 pan-head screws included in this kit.

3. It may be necessary to remove the information card tray on the bottom of the instrument before rack mounting. To remove the tray, tilt the instument on its side and remove the four feet. To retain the use of the information card on the instrument, do not remove feet; also, allow approximately 2 cm (3/4 in.) below the instrument to accommodate the tray when rack mounting. No filler strip is provided.

HEAVY DUTY SLIDE KIT

4. In the following description, the words "left" and "right" refer to the location of instrument assemblies as viewed from the front of the instrument. On the IF-Display Section (top box), remove the strap handle located on the left side cover. Next remove the IF-Display Section's right rear lock foot and right rear top foot. Slide the right side cover off to the rear, and replace it with the new side cover included in this kit. Replace the right rear lock foot and right rear top foot.

5. Attach one slide inner member bracket to each side of the instrument using two 10-32x3/8 pan-head screws per side (see Figure 3).

NOTE

When using non-HP System Rack Cabinets, skip steps 6 through 8 and proceed to step 9.

6. Insert two Unistrut nuts into each of the four vertical columns of the systems cabinet (four nuts in each side of the cabinet).

7. Bolt an outer slide mount to the Unistrut nuts in each side of the systems cabinet, using four 10-32x 7/16 pan-head screws per side.

8. Expand the outer slide mounts to their full length. Mount the instrument onto the system cabinet by bolting the outer slide mount to the inner member bracket on the instrument, using three 10-32 flat-head screws per side.

NOTE

If any binding is encountered in the slides after mounting, it will be necessary to support the instrument and loosen the bolts to the Unistrut nuts (adapter brackets, for non-HP racks) at each side of the cabinet. Adjust the slides slightly until they operate freely. Re-tighten the bolts.

SLIDE ADAPTER KIT (for non-HP racks)

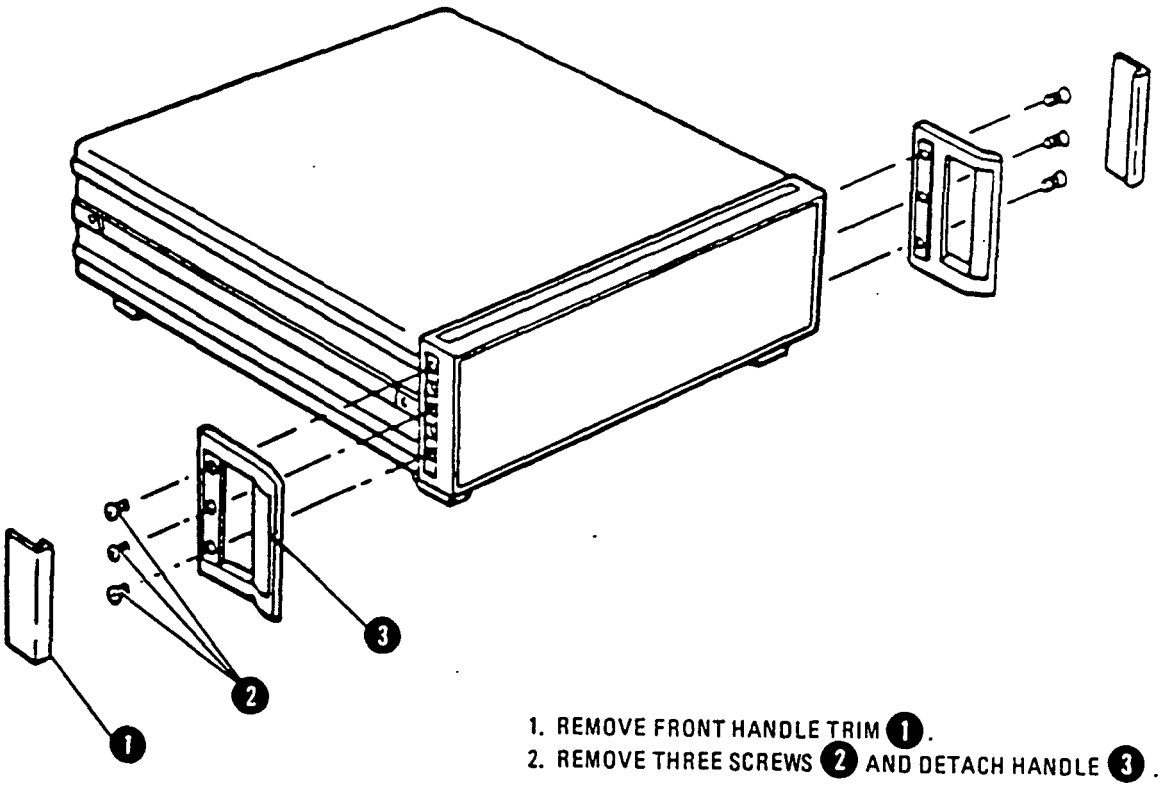
9. Using hole pattern "B" (see Figure 4), attach one adapter bracket to the front of each outer slide mount, using two 10-32x1/2 flat-head screws and nuts per bracket.

10. Using hole pattern "B", attach one adapter bracket to the rear of each outer slide mount, using two 10-32x1/2 pan-head screws and nuts per bracket.

11. Bolt an outer slide mount to each side of the system rack cabinet using 10-32x1/2 pan-head screws. Use the bar nuts provided in the kit if the rack mounting strips have through-holes.

12. Perform step 8.

ManualsPlus.com



1. REMOVE FRONT HANDLE TRIM ❶.
2. REMOVE THREE SCREWS ❷ AND DETACH HANDLE ❸.

FIGURE 1. REMOVING FRONT HANDLES

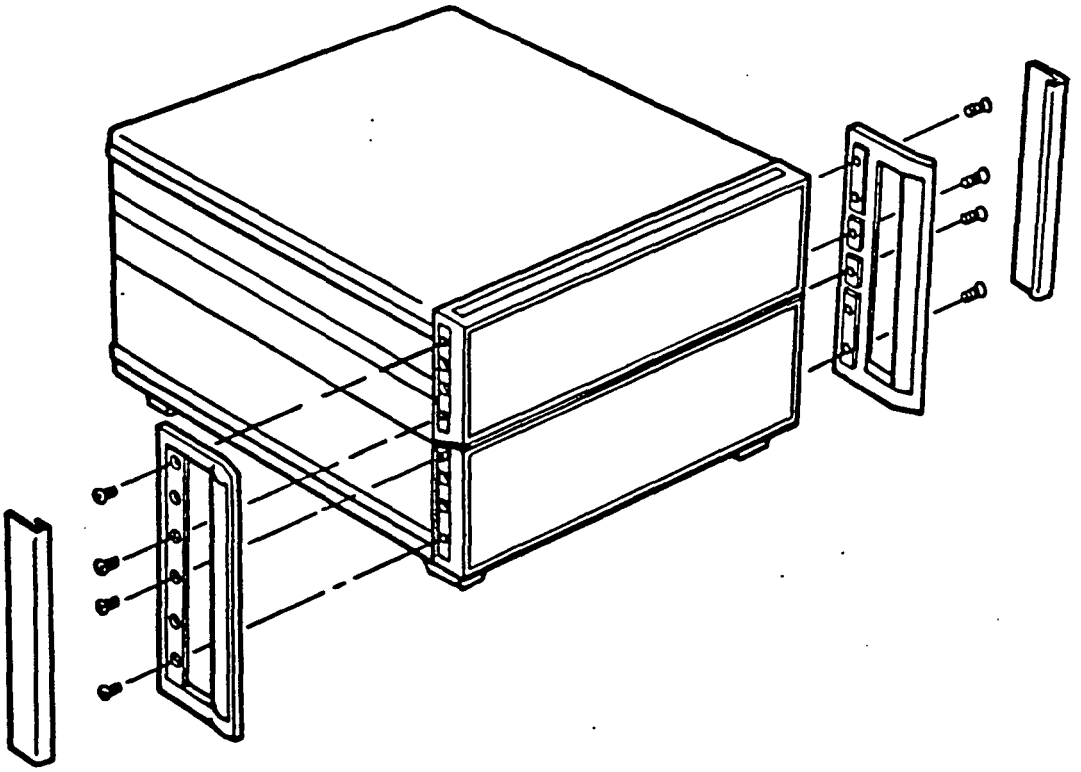


FIGURE 2. INSTALLING RACK MOUNT KIT

ManualsPlus.com

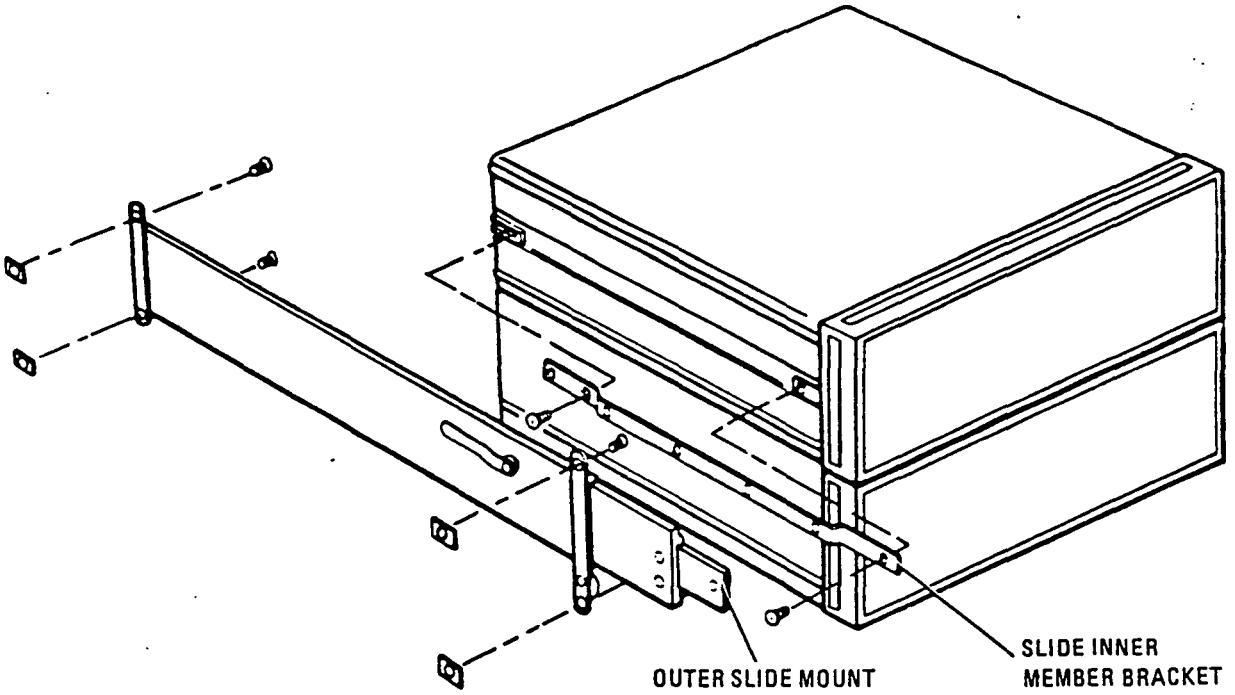


FIGURE 3. ATTACHING RACK MOUNT SLIDES

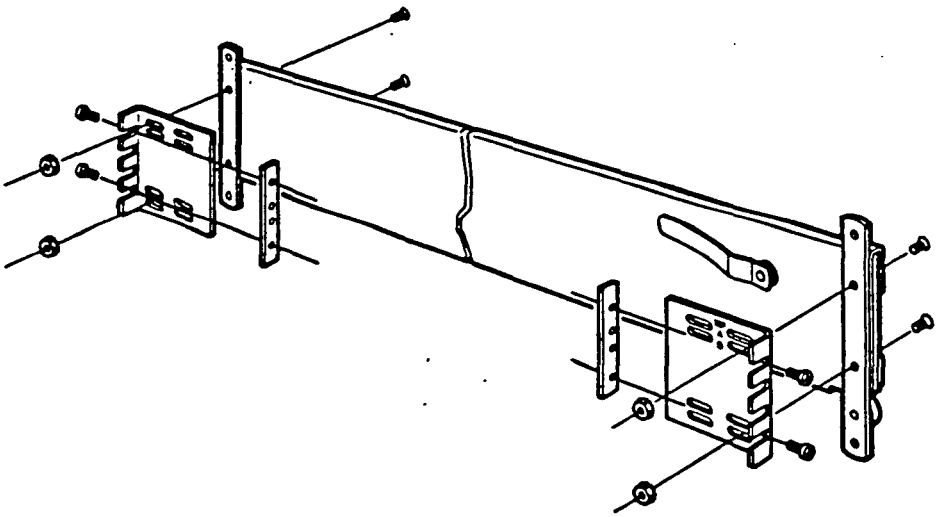


FIGURE 4. INSTALLING SLIDE ADAPTER

ManualsPlus.com

SERVICE NOTE

Supersedes:

None

HP MODEL 8566A/B SPECTRUM ANALYZER

Serial Prefix 2516A and Above

RACK MOUNTING WITH SLIDES (OPTION 010)
METRIC SYSTEM II CABINET PARTS

The following is a list of metric hardware and instructions required to mount an HP 8566A/B with slides in a rack of 482.6 mm (19 in.) spacing or in non-HP racks.

Description	Qty	HP Part Number	CD
SIDE COVER	1	5060-9937	3
RACK MOUNT KIT	1	5061-9686	1
includes:			
Rack Mount Flange	2	5020-8877	4
Front Handle Assembly	2	5061-9502	0
M4x0.7x16 Pan-Head Screw	8	0515-1106	2
HEAVY DUTY SLIDE KIT	1	1494-0058	6
includes:			
Modified Slides	2	——	
M5x0.8x12 Pan-Head Screw	8	0515-0904	6
M5x0.8x10 Pan-Head Screw	4	0515-0927	3
M5x0.8x12 F.H.M. Screw	6	0515-0956	8
M5x0.8 Unistrut Nut	8	0535-0079	8
SLIDE ADAPTER KIT (for non-HP racks)	1	1494-0064	4
includes:			
Adapter Bracket	2	——	
M5x0.8 Bar Nuts	4	——	
M5x0.8x12 Pan-Head Screw	12	0515-0904	6
M4x0.8x12 F.H.M. Screw	4	0515-0956	8
M5x0.8 Nut W/Lock Washer	8	0535-0081	2

I/NS/WN

5/85-53/KGB

HEWLETT PACKARD

FOR MORE INFORMATION, CALL YOUR LOCAL HP SALES OR SERVICE OFFICE or East (201) 265-5000 • Midwest (312) 255-9800 • South (404) 955-1500 • West (213) 970-7500 or (415) 968-9200 **OR WRITE,** Hewlett-Packard, 1820 Embarcadero, Palo Alto, California 94303. **IN EUROPE, CALL YOUR LOCAL HP SALES OR SERVICE OFFICE OR WRITE,** Hewlett-Packard S.A., 7, rue du Bois-du-Lan, P.O. Box, CH-1217 Meyrin 2-Geneva, Switzerland. **IN JAPAN,** Yokogawa-Hewlett-Packard Ltd., 1-27-15, Yabe Sagamihara City, Kanagawa Prefecture, Japan 229.

Printed in U.S.A.

ManualsPlus.com

PROCEDURE:

RACK MOUNT KIT

1. Remove the front handles from the RF Section and IF-Display Section of the spectrum analyzer. (See Figure 1.)

2. Attach the new rack mount flanges and front handles provided in the Rack Mount Kit. (See Figure 2.) Use the eight M4x0.7x16 pan-head screws included in this kit.

3. It may be necessary to remove the information card tray on the bottom of the instrument before rack mounting. To remove the tray, tilt the instument on its side and remove the four feet. To retain the use of the information card on the instrument, do not remove feet; also, allow approximately 2 cm (3/4 in.) below the instrument to accommodate the tray when rack mounting. No filler strip is provided.

HEAVY DUTY SLIDE KIT

4. In the following description, the words "left" and "right" refer to the location of instrument assemblies as viewed from the front of the instrument. On the IF-Display Section (top box), remove the strap handle located on the left side cover. Next remove the IF-Display Section's right rear lock foot and right rear top foot. Slide the right side cover off to the rear, and replace it with the new side cover included in this kit. Replace the right rear lock foot and right rear top foot.

5. Attach one slide inner member bracket to each side of the instrument using two M5x0.8x10 pan-head screws per side (see Figure 3).

NOTE

When using non-HP System Rack Cabinets, skip steps 6 through 8 and proceed to step 9.

6. Insert two Unistrut nuts into each of the four vertical columns of the systems cabinet (four nuts in each side of the cabinet).

7. Bolt an outer slide mount to the Unistrut nuts in each side of the systems cabinet, using four M5x 0.8x12 pan-head screws per side.

8. Expand the outer slide mounts to their full length. Mount the instrument onto the system cabinet by bolting the outer slide mount to the inner member bracket on the instrument, using three M5x 0.8x12 flat-head screws per side.

NOTE

If any binding is encountered in the slides after mounting, it will be necessary to support the instrument and loosen the bolts to the Unistrut nuts (adapter brackets, for non-HP racks) at each side of the cabinet. Adjust the slides slightly until they operate freely. Re-tighten the bolts.

SLIDE ADAPTER KIT (for non-HP racks)

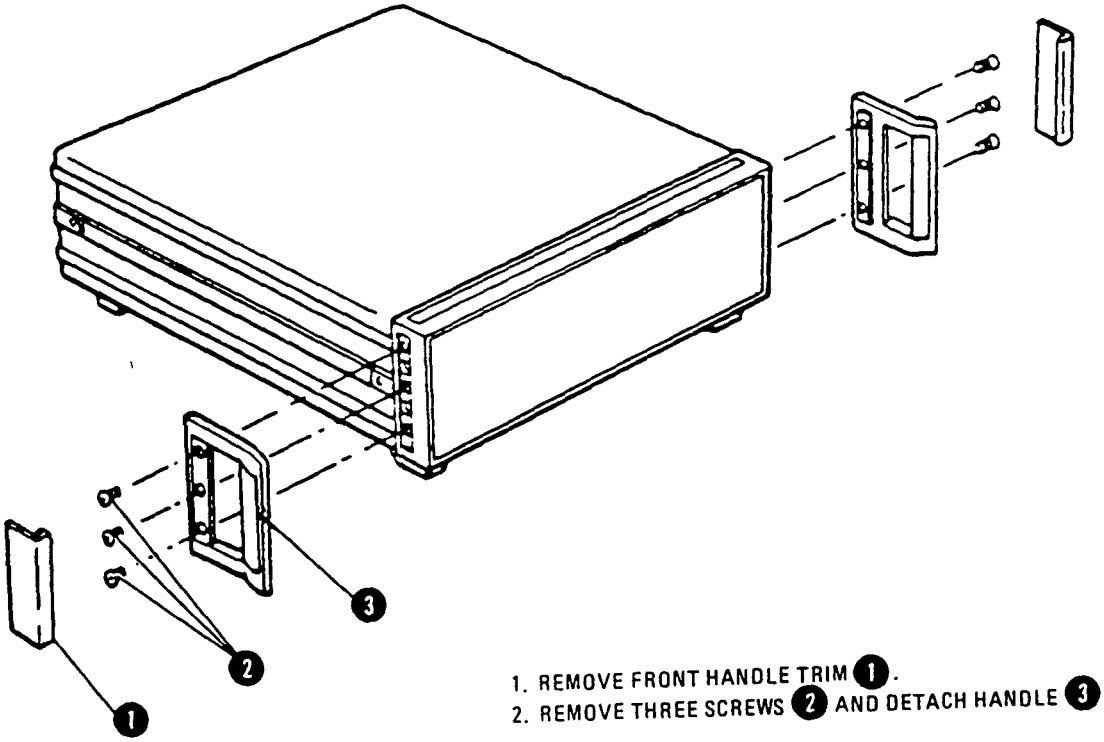
9. Using hole pattern "B" (see Figure 4), attach one adapter bracket to the front of each outer slide mount, using two M4x0.8x12 flat-head screws and nuts per bracket.

10. Using hole pattern "B", attach one adapter bracket to the rear of each outer slide mount, using two M5x0.8x12 pan-head screws and nuts per bracket.

11. Bolt an outer slide mount to each side of the system rack cabinet using M5x0.8x12 pan-head screws. Use the bar nuts provided in the kit if the rack mounting strips have through-holes.

12. Perform step 8.

ManualsPlus.com



1. REMOVE FRONT HANDLE TRIM (1).
2. REMOVE THREE SCREWS (2) AND DETACH HANDLE (3).

FIGURE 1. REMOVING FRONT HANDLES

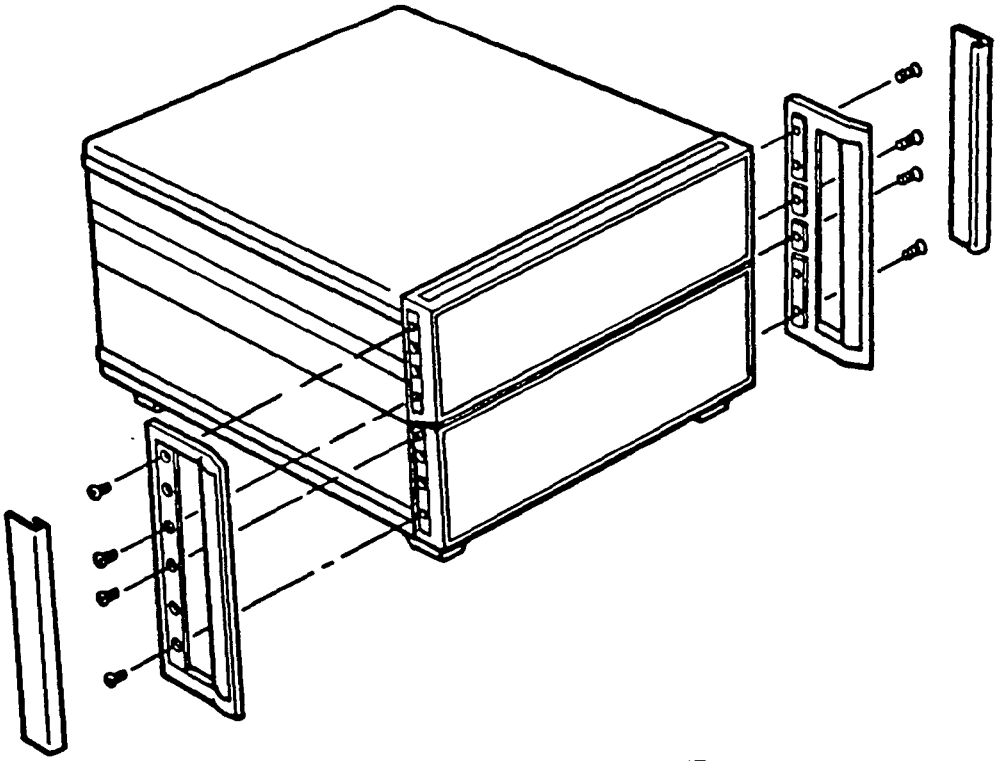


FIGURE 2. INSTALLING RACK MOUNT KIT

ManualsPlus.com

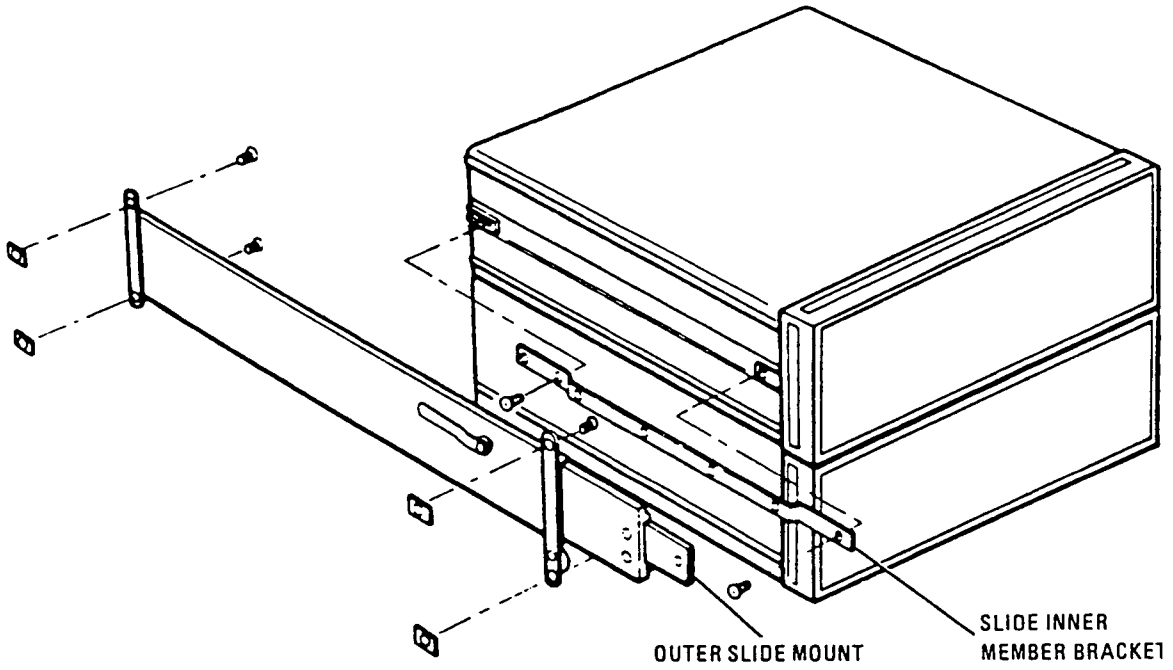


FIGURE 3. ATTACHING RACK MOUNT SLIDES

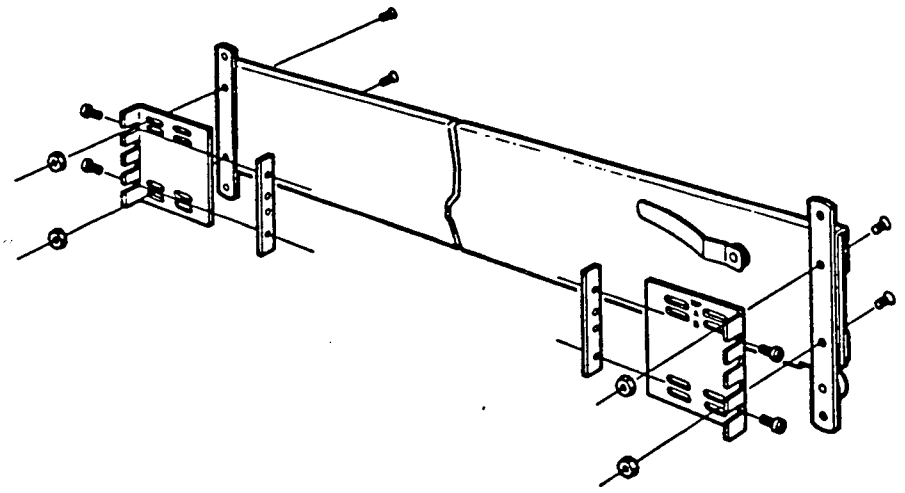


FIGURE 4. INSTALLING SLIDE ADAPTER

ManualsPlus.com

S E R V I C E N O T E

SUPERSEDES: None

HP 8566B Spectrum Analyzer HP 85660B RF Section

Serial Numbers: 85660B RF Section serial numbers 0000A00000 / 2430A01036

Exceptions: None

Repair and replacement of A5A2 Rotary Pulse Generator

To Be Performed By: HP-Qualified Personnel or Customer

Parts Required:

Part No.	Description
See text	RPG Lamp
0960-0684	A5A2 Rotary Pulse Generator
85660-60210	A5A1 Keyboard Assembly
See text	A12 Front Panel Interface

Situation / Solution:

The A5A2 Rotary Pulse generator (RPG) used in 85660B spectrum analyzer RF sections with serial number prefix 2430A and below has been obsoleted. The RPG, HP part number 5060-0329, should be repaired at component level whenever possible. Most RPG failures are easily remedied by replacing the RPG lamp, HP part number 2140-0016. The small incandescent lamp is soldered into place and is accessed by removing the RPG rear cover.

Continued

DATE: 09 December 1992

ADMINISTRATIVE INFORMATION

SERVICE NOTE CLASSIFICATION:

INFORMATION ONLY

AUTHOR:	ENTITY:	ADDITIONAL INFORMATION:
BS	5300	

© 1992 HEWLETT-PACKARD COMPANY
PRINTED IN U.S.A.

HEWLETT PACKARD

ManualsPlus.com

S E R V I C E N O T E

SUPERSEDES: 8566B-10A

HP 8566B Spectrum Analyzer
HP 85662A IF Section
HP 85660B RF Section

Serial Numbers:

85660B RF Sections 0000A00000 / 2937A06183
85662A IF Display Sections 0000A00000 / 3340A21346

Duplicate Service Notes: 8568B-10B

Option 462 6 dB resolution bandwidths

Situation:

The 8566B Option 462 has been redefined due to MIL-STD 462D. MIL-STD 462D specifies 6 dB resolution bandwidths. Early 8566B Option 462 instruments had impulse bandwidths from 3 MHz to 1kHz, and 6 dB bandwidths from 300Hz to 10 Hz.

The Option 462 Impulse Bandwidth instrument and the retrofit kit used to install impulse bandwidths in a standard instrument are no longer available. Replacement parts for the impulse bandwidth instrument will continue to be available.

Customers who already own MIL EMI receivers which contain 8566B Option 462 Impulse Bandwidth instruments, and customers who wish to retrofit 6 dB bandwidths into a standard 8566B can do so by installing a retrofit kit.

Continued

DATE: 21 December 1993

ADMINISTRATIVE INFORMATION

SERVICE NOTE CLASSIFICATION:

INFORMATION ONLY

AUTHOR:	ENTITY:	ADDITIONAL INFORMATION:
BS	5300	

© 1994 HEWLETT-PACKARD COMPANY
PRINTED IN U.S.A.

HEWLETT PACKARD

ManualsPlus.com

Solution / Action:

A standard instrument can be retrofitted to an Option 462 6dB instrument by installing the HP 8566B 6 dB Bandwidth Retrofit Kit, HP part number 08566-60016. The kit includes three bandwidth boards, an IF control board, firmware, manuals, a dress front panel and an installation note. Installation time is 2-3 hours.

An Option 462 Impulse Bandwidth instrument can be retrofitted to an Option 462 6dB Bandwidth instrument by installing the HP 8566B IBW to 6 dB Bandwidth Retrofit Kit, HP part number 08566-60017. The kit includes the A4A7 bandwidth board, firmware, a dress front panel, manuals, and an installation note. Installation time is 2 hours.

The 6 dB bandwidth adjustment procedure and performance tests are in the 8566B Performance Tests and Adjustments Manual included in the retrofit kits.

ManualsPlus.com

S E R V I C E N O T E

SUPERSEDES: 8566B-11A

HP 8566B Spectrum Analyzers
HP 8567A Spectrum Analyzers
HP 8568B Spectrum Analyzers

Serial Numbers:
0000A00000/9999A99999

Duplicate Service Notes:
8566B-11B
8567A-01A
8568B-11B

A15 CONTROLLER ASSEMBLY FIRMWARE REPLACEMENT KIT

To Be Performed By: Customer or HP-Qualified Personel

Parts Required:
Firmware Replacement Kit (See Table 1 for part numbers and contents.)
PAL HP part number 85660-80070 (See NOTE)

DATE: 13 November 1989

ADMINISTRATIVE INFORMATION

SERVICE NOTE CLASSIFICATION: **MODIFICATION AVAILABLE**	
ACTION CATEGORY: AGREEABLE TIME	■ PERFORMANCE ENHANCEMENT □ SERVICEABILITY/RELIABILITY ENHANCEMENT
LOCATION CATEGORY: ■ CUSTOMER INSTALLABLE ■ HP LOCATION □ ON-SITE	AVAILABLE UNTIL: Support Life
AUTHOR: BF ENTITY: 5300	ADDITIONAL INFORMATION: Installation Note 5958-7130

©1989 HEWLETT-PACKARD COMPANY
PRINTED IN U.S.A.

HEWLETT PACKARD

ManualsPlus.com

8566B-11B

NOTE

The PAL is needed for firmware upgrade of HP 8568B Spectrum Analyzers with serial numbers 0000A00000/2445A00971 or HP 8568A Spectrum Analyzers that have been upgraded to an HP 8568B with the HP 8568AB Retrofit Kit (formerly HP 8568A + 01K) with serial numbers 0000A00000/2426A00316.

Situation:

From time to time, firmware is changed to correct bugs or add enhancements.

Solution/Action:

Firmware Replacement Kits are available to upgrade your spectrum analyzer. The Firmware Replacement Kits contain the latest version of firmware.

Table 1. Firmware Replacement Kits

Kit Contents	HP8566B 085660-60270	HP 8567A 085670-60009	HP 8568B 085680-60197
Date Code	10.10.89	7.4.87	7.4.87
A15U37 EPROM	85660-80185	85670-80019	85680-80113
A15U38 EPROM	85660-80187	85670-80021	85680-80115
A15U39 EPROM	85660-80186	85670-80020	85680-80114
A15U40 EPROM	85660-80188	85670-80022	85680-80116

ManualsPlus.com

SERVICE NOTE

Supersedes:

8566B-12

HP MODEL 8566B SPECTRUM ANALYZER

All Serials

HP MODEL 8566AB RETROFIT KIT
(formerly 8566A+01K)

All Serials

INSTALLATION PROCEDURE FOR REBUILT A15 CONTROLLER ASSEMBLY

This service note documents the recommended procedure for installation of the Rebuilt A15 Controller Assembly, HP Part Number 85660-60260, into an HP 8566B Spectrum Analyzer.

PROCEDURE:

CAUTION

This procedure MUST be performed at an anti-static workstation to avoid possible electrostatic discharge damage to the A15 Controller Assembly

1. Turn HP 8566B over to access the bottom of HP 85660B RF Section. Remove power cord, two bottom rear feet, and bottom cover from RF Section.

2. Locate and remove controller cover from RF Section.

CAUTION

Note proper routing of ribbon cables prior to removal of A15 Controller Assembly; ribbon cables can be permanently damaged by improper installation.

CAUTION

Do not place A15 Controller Assembly directly on a metallic surface, as this might permanently discharge lithium battery A15BT1.

I/NS/WN 8/87-53/TM

HEWLETT PACKARD

FOR MORE INFORMATION, CALL YOUR LOCAL HP SERVICE OFFICE at East (201) 265-5000 ● Midwest (312) 255-9800 ● South (404) 955-1500 ● West (213) 970-7500 or (415) 968-9200 OR WRITE, Hewlett-Packard, 1820 Embarcadero, Palo Alto, California 94303. IN EUROPE, CALL YOUR LOCAL HP SALES or SERVICE OFFICE OR WRITE, Hewlett-Packard S.A., 7, rue du Bois-du-Lan Case Postale 365 CH 1217 Meyrin 1 - Geneva, Switzerland. IN JAPAN, Yokogawa-Hewlett-Packard Ltd., 27-15, Yabe, 1 Chrome, Sagamihara City, Kanagawa Prefecture, Japan 229.

Printed in U.S.A.

ManualsPlus.com

3. Remove rebuilt A15 Controller Assembly from protective anti-static packaging and place on anti-static mat. Save packaging for storage of old A15 Controller Assembly.

4. Using colored lift tabs, carefully remove old A15 Controller Assembly from RF Section and store in protective anti-static packaging.

5. Locate A15SW1 near top-center of A15 Controller. Verify that switch A1 (closest to battery) is set open (toggled down towards white dot) to select a logic "1". If A1 is closed, the HP 8566B will not pass its self test at power-up, and both front-panel CHECK LEDs will light.

   Five remaining switches, A2 through A6, determine the HP 8566B HP-IB address at power-up. Switch A2 is HP-IB address least-significant and A6 is HP-IB address most-significant bit. With all five switches open (factory setting), special HP-IB address 31 (1 + 2 + 4 + 8 + 16 = 31) is selected. In this case, A15 Controller checks memory (CMOS RAM) for the previously-selected HP-IB address setting, and selects default address 18 if none is found.

6. Install rebuilt A15 Controller in RF Section. Be careful not to pinch ribbon cables between edge connectors and PC board.

7. Reconnect power cord to RF Section. (HP 85662A IF/Display Section should still be connected to RF Section with two interconnect cables, and should have its own power cord connected).

8. Perform "Long POP" (power-on pretest) to initialize memory (CMOS RAM) on A15 Controller by jumpering test point A15TP1-8 T3 to test point A15TP1-9 ST (or, on earlier A15 Controllers, by jumperting test point A15TP1-7 T3 to test point A15TP4 STS) and turning LINE switch ON. A15 Controller LEDs A15DS1 through A15DS14 should all turn on, then turn off sequentially, indicating that A15 Controller has successfully executed self-test (if not, the four EPROMs might be improperly installed). In addition, all front-panel LEDs should turn on momentarily, indicating that HP 8566B has performed its power-on pretest.

   After successful completion of self-test, a "BATTERY" flag should appear on the instrument CRT, indicating that information previously stored in CMOS RAM on A15 Controller has been lost or erased. Normally, the "BATTERY" flag appears after several years of use to indicate that lithium battery A15BT1 requires replacement.

9. Set LINE switch to STANDBY and remove jumper from A15 Controller.

10. Turn LINE switch ON and confirm that the "BATTERY" flag is no longer displayed.

11. Set LINE switch to STANDBY and remove power cord from rear of RF Section.

12. Replace controller cover, RF Section bottom cover, and two rear feet. Instrument is now ready for use (no recalibration is required).

ManualsPlus.com

8566B-19A

S E R V I C E N O T E

SUPERSEDES: 8566B-19

HP 8566A Spectrum Analyzer
HP 85660A RF Section

HP 8566B Spectrum Analyzer
HP 85660B RF Section

Serial Numbers:

85660A RF Section 0000A00000 / 9999A99999
85660B RF Section 0000A00000 / 9999A99999

Exceptions: None

RF Attenuator with Calibration ROM Replacement

To Be Performed By: HP-Qualified Personnel

Parts Required: Attenuator Retrofit Kit, HP part number 85660-60336.

Situation:

Replacing early RF step attenuators in HP 85660A or HP 85660B spectrum analyzer RF sections requires modification of the A6A10 Miscellaneous Bias/Driver Assembly and replacement of the A6A2W1 attenuator control cable. Instruments which require these modifications are HP 85660A RF sections serial number 2722A03646 and below, and HP 85660B RF sections with serial number prefix 2729A and below.

Continued

DATE: 02 March 1993

ADMINISTRATIVE INFORMATION

SERVICE NOTE CLASSIFICATION: **MODIFICATION AVAILABLE**		
ACTION CATEGORY: AGREEABLE TIME		☐ PERFORMANCE ENHANCEMENT ■ SERVICE/RELIABILITY ENHANCEMENT
LOCATION CATEGORY:	■ CUSTOMER INSTALLABLE ☐ ON-SITE ☐ HP LOCATION	AVAILABLE UNTIL: Support Life
AUTHOR: BS	ENTITY: 5300	ADDITIONAL INFORMATION:

© 1993 HEWLETT-PACKARD COMPANY
PRINTED IN U.S.A.

HEWLETT PACKARD

ManualsPlus.com

The RF attenuator and attenuator calibration ROM are the only parts needed when replacing the RF attenuator on later instruments or instruments which have been previously modified. Although the Attenuators on these later instruments are being replaced and not retrofitted, the Attenuator Retrofit Kit is still used for the repair.

Solution/Action:

The RF Attenuator Retrofit Kit, HP part number 85660-60336 includes all parts and instructions required to install the RF attenuator (included in the kit) into any HP 85660A or 85660B spectrum analyzer RF section. Each RF attenuator is accompanied by a customized attenuator calibration PROM which provides attenuator correction data necessary to achieve the instrument's specified amplitude accuracy. Each RF attenuator is individually characterised so replacement PROMS are not separately available. The PROM (A12U8) installs into a 16-pin DIP socket on the A12 RF Interface Assembly.

ManualsPlus.com

S E R V I C E N O T E

SUPERSEDES:

HP 8566B Spectrum Analyzer
HP 8567A Spectrum Analyzer
HP 8568B Spectrum Analyzer
HP 85662A IF-Display Section

Serial Numbers:
2813A15812/2816A16023
See text for exceptions.

Duplicate Service Notes:
8566B-20 8567A-04 8568B-14

Misloaded Capacitor Exposed to 130% of Its Rating

To Be Performed By: HP-Qualified Personnel or Customer

Situation:
An assembly process variation was discovered that might have resulted in two large electrolytic power supply capacitors being installed in the wrong location in HP 85662A IF-Display Sections within the serial range listed above. When installed in the wrong location, one of the capacitors can be exposed to as much as 130% of its rating. This would probably result in a premature capacitor failure, with possible venting of the capacitor electrolyte onto the bottom of the IF-Display Section. Venting might cause damage to other components and assemblies.

DATE: 25 May 1990

ADMINISTRATIVE INFORMATION

SERVICE NOTE CLASSIFICATION: **MODIFICATION RECOMMENDED**

ACTION CATEGORY:	☐ IMMEDIATELY ☐ ON SPECIFIED FAILURE ■ AGREEABLE TIME	LABOR STANDARDS: 0.5 Hour
LOCATION CATEGORY:	■ CUSTOMER INSTALLABLE ☐ ON-SITE ■ HP LOCATION	SERVICE INVENTORY: ☐ RETURN ☐ SCRAP ■ SEE TEXT USED PARTS: ☐ RETURN ■ SCRAP ☐ SEE TEXT
AVAILABILITY: PRODUCT'S SUPPORT LIFE		RESPONSIBLE ENTITY: 5300 UNTIL: 01 July 1992
AUTHOR: TM ENTITY: 5300		ADDITIONAL INFORMATION:

©1989 HEWLETT-PACKARD COMPANY
PRINTED IN U.S.A.

HEWLETT PACKARD

ManualsPlus.com

The two capacitors affected are A1A10C1, 22000 µF (HP part number 0180-2808), and A1A10C4, 8700 µF (HP part number 0180-0453). They are located along the HP 85662A rear frame, behind the CRT. Both capactors are the same physical size.

Table of Serial Number Exceptions

2816A15860
2816A15968
2816A15971
2816A15974/2816A15976
2816A15988/2816A15990
2816A16001
2816A16006
2816A16008

Solution/Action

Any HP 85662A IF-Display Section within the above serial range should be inspected. If capacitors A1A10C1 and A1A10C4 are found to be installed in the wrong location, replace both capacitors with new ones using the following procedure.

WARNING

These capactors can store a large charge. Be careful to discharge the capacitors before removing them.

Procedure

1. Remove the power cords and interconnect cables from the rear of the spectrum analyzer.
2. Loosen the lock feet and separate the RF and the IF sections; set the RF section aside.
3. Remove the 2 rear feet near the top of the IF-Display Section.
4. Remove the top cover and check for proper position of the capacitors (A1A10C1 and A1A10C4). Se Figure 1.

   If the capacitors are in the correct location, reinstall the top cover and rear feet. Mate the IF and RF sections and reconnect cables. No further work is required.

If capacitors are *not* in the correct locations, proceed with the following steps.

ManualsPlus.com

5. Remove the 2 screws securing the bracket over the top of the capacitors and remove the bracket.

6. Remove the 2 rear feet near the bottom of the IF-Display Section.

7. Remove the bottom cover.

CAUTION

When each capacitor is installed with the correct polarity, the vent plug in the bottom of the capacitor will be visible through the hole in the A1A10 Motherboard Assembly.

---

8. Remove the 4 screws securing A1A10C1 and A1A10C4 to the motherboard.

9. Remove the existing capacitors and replace with new capacitors, making sure the A1A10C1, 22000 µF (HP part number 0180-2808), and A1A10C4, 8700 µF (HP part number 0180-0453), are in the correct locations.

10. Reinstall the bracket, top cover, bottom cover, and the 4 rear feet.

11. Mate the IF and RF sections and reconnect cables. No calibration is required.

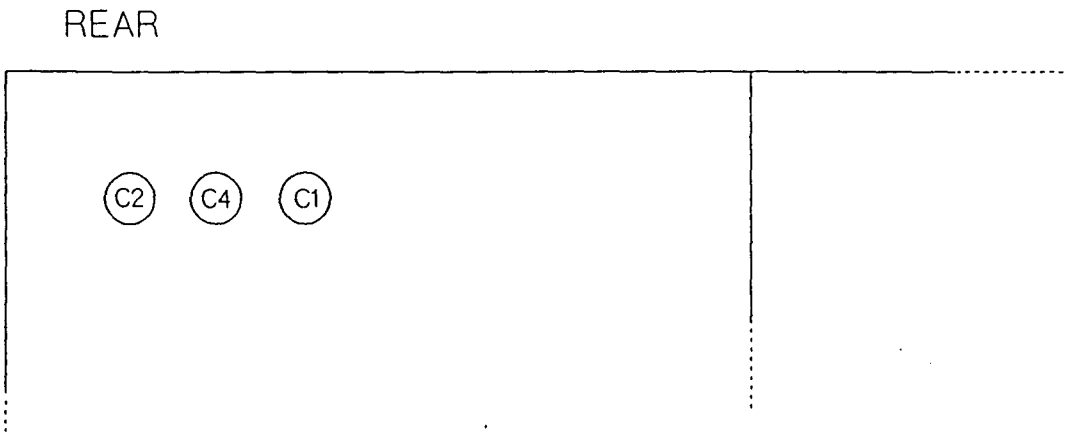


Figure 1. Location of A1A10C1 and A1A10C4

ManualsPlus.com

8566B-33

S E R V I C E N O T E

SUPERSEDES:

HP 8566B Spectrum Analyzer
HP 85660B RF Section

Serial Numbers:
2747A05521/2950A06360

Oven Oscillator Thermal Fuse Failure

Parts Required:
Thermal Fuse Kit, HP part number 10811-67001

Situation:
The thermal fuse (HP part number 2110-0801) in the Oven Oscillator (HP part number 10811-60111) of the A22 Frequency Standard (HP part number 5062-1916) will fail after 3 months to 2 years of operation.

The defective fuses are in Oven Oscillators with serial prefix 2850A. The serial number label is located under the top isolation mount on the oscillator and cannot be seen without removing the isolation mount. Therefore, use the instrument serial number to identify units with defective fuses.

DATE: 10 April 1990

ADMINISTRATIVE INFORMATION

SERVICE NOTE CLASSIFICATION: **MODIFICATION RECOMMENDED**

ACTION CATEGORY:	☐ IMMEDIATELY ☐ ON SPECIFIED FAILURE ☒ AGREEABLE TIME	LABOR STANDARDS: 1.0 Hour
LOCATION CATEGORY:	☒ CUSTOMER INSTALLABLE ☐ ON-SITE ☒ HP LOCATION	SERVICE INVENTORY: ☐ RETURN ☐ SCRAP ☒ SEE TEXT USED PARTS: ☐ RETURN ☒ SCRAP ☐ SEE TEXT
AVAILABILITY: PRODUCT'S SUPPORT LIFE		RESPONSIBLE ENTITY: 5300 UNTIL: 1 May 1992
AUTHOR: BS ENTITY: 5300		ADDITIONAL INFORMATION: Refer to Service Note 10811A/B-03

©1989 HEWLETT-PACKARD COMPANY
PRINTED IN U.S.A.

HEWLETT PACKARD

ManualsPlus.com

Symptoms of an open fuse are as follows:

- •OVEN COLD error message appears on screen
- •Frequency drift
- •Decrease in Center Frequency accuracy
- •Unable to adjust the frequency standard within specifications

Solution:
Any HP 8566B within the serial number range listed above and all Frequency Standards in Service Stock having Oven Oscillators with serial prefix 2850A should have the fuse replaced with HP part number 10811-80008. For convenience all parts required to replace the fuse are included in the Thermal Fuse Kit (HP part number 10811-67001).

This service note and Service Note 10811A/B-03 describe how to identify modified oscillators and instruments.

Repair and Recalibration Procedure

1. Remove the YTO Loop. Refer to the A11 YTO Loop and A11A3 YTO replacement information in the HP 8566B Troubleshooting and Repair manual.
2. Remove the A22 Frequency Standard by removing the two vibration mount screws, the power supply connector from the motherboard and disconnecting the coax cable (grey and violet) from the A22 Frequency Standard.
3. Service Note 10811A/B-03 describes how to replace the defective fuse once the Frequency Standard has been removed from the instrument.
4. Reinstall the Frequency Standard and the YTO Loop.

CAUTION

Be careful reinstalling the YTO Loop to ensure the coax and ribbon cables are not damaged.

5. Allow the instrument to warm up for at least 30 minutes.
6. Perform the Center Frequency Readout Accuracy Test. Use HP part number 5010-4653 Performance Test part 2 software.
7. If the Center Frequency Readout Test fails, the Time Base Adjustment should be performed.

A recommended method for further identification of instruments with replaced fuse is to use a label (HP part number 9320-5559). Type or print the service note number (8566B-33) in the space above "PSSN Installed". Attach the label to the rear panel of the instrument near the serial number label.

ManualsPlus.com

8566B-37

S E R V I C E N O T E

SUPERSEDES: None

HP 8566B Spectrum Analyzer
HP 85662A IF Display Section

Serial Numbers: 85662A IF Display Sections 0000A00000 / 3140A20342

New A4A1 Video Processor

Situation:

The latest A4A1 Video Processor, HP part number 85662-60241, has replaced the 85662-60122 Video Processor. Although this latest video processor is backward compatible, a new adjustment procedure is required.

The adjustment procedure in the latest Performance Tests and Adjustments manual, HP part number 08566-90148, can be used to adjust both vintages of video processors listed in this note. This latest manual contains many updated procedures, and is necessary for the support of the HP 8566B Spectrum Analyzer. A copy of this manual ships with each new 8566B instrument.

The early HP 8566B Performance Tests and Adjustments Manual, part number 08566-90051, must be updated before adjustments on the latest Video Processor can be performed.

Continued

DATE: 04 December 1991

ADMINISTRATIVE INFORMATION

SERVICE NOTE CLASSIFICATION:		
INFORMATION ONLY		
AUTHOR:	ENTITY:	ADDITIONAL INFORMATION:
BS	5300	

© 1992 HEWLETT-PACKARD COMPANY
PRINTED IN U.S.A.

HEWLETT PACKARD

ManualsPlus.com

Solution / Action:

When attempting to order the early video processor, HP part number 85662-60122, you will be instructed to order the Video Processor Retrofit Kit, HP part number 85662-60258. The kit contains the latest video processor assembly and an installation note which outlines the adjustment procedure. This kit is necessary since it is not apparent that the latest video processor cannot be adjusted using an earlier procedure.

Order the latest video processor, HP part number 85662-60241, if you already have a copy of the new video processor adjustment procedure. The latest adjustment procedure is in the HP 8566B Performance Tests and Adjustments manual, HP part number 08566-90148. The installation note in the Video Processor Retrofit Kit also contains the adjustment information, and this service note outlines how to update the early performance tests and adjustments manual.

NOTE:

When replacing the video processor on Option 462 instruments, the 3 MHz bandwidth adjustment potentiometer on A4A9 IF Control board may run out of adjustment range. If this occurs, change the value of factory select resistor A4A9R11 or the value of both A4A9R11 and R87. Consult the 85662A IF Display Section Troubleshooting and Repair manual, HP part number 85662-90085, for component location and factory select resistor ranges.

To update the early HP 8566B Performance Tests and Adjustments manual, HP part number 08566-90051, insert the installation note supplied in the retrofit kit into the manual or make the following corrections:

Under the Adjustments tab, Test 6, page 42, replace steps 7 through 21 with the steps listed below.

7. Set the step attenuator to 0 dB.

8. Key in REFERENCE LEVEL and adjust DATA knob for DVM indication as close to +1.00 +/- 0.001 Vdc as possible. (It may be necessary to slightly adjust the front panel AMPTD CAL control to achieve required tolerance.)

9. Connect DVM to A4A1TP2.

10. Adjust A4A1R14 OS for a DVM indication of 0.000 +/- 0.003 Vdc. See Figure 22 for the location of the adjustment.

11. Connect DVM to A4A1TP3.

12. Set the step attenuator to 120 dB.

13. Adjust A4A1R32 ZERO for a DVM indication of 0.000 Vdc +/- 0.001 Vdc.

14. Set the step attenuator to 0 dB.

15. Adjust A4A1R36 FS for DVM indication of +2.00 +/- 0.001 Vdc.

16. Repeat steps 12 through 15 until no further adjustments are required.

ManualsPlus.com

S E R V I C E N O T E

SUPERSEDES: None

HP 8566B Spectrum Analyzer (standard and Option 462)
HP 85662A IF Section (standard and Option 462)

Serial Numbers: 85662A IF Section serial numbers 3001A18529/3217A21001

Duplicate Service Notes: 8568B-33

Exceptions:

Of the 2,472 serial numbers listed above, only 250 to 500 instruments contain A4A4 assemblies with the affected date code.

Intermittent PC Edge Connectors on A4A4 Bandwidth Filter Assembly

To Be Performed By: HP-Qualified Personnel

Parts Required:

A4A4 Bandwidth Filter Assembly:
HP part number 85662-60189 for standard instruments.
HP part number 85662-60184 for Option 462 instruments.

Situation:

A4A4 Bandwidth Filter Assemblies with date code 950428 have insufficient gold plating on the printed circuit (PC) edge contacts. This thin gold plating may lead to reliability problems since the nickel layer can be exposed as the gold plating wears away with repeated board insertions. Intermittent or constant failure symptoms may include:

Continued

DATE: 20 February 1993

ADMINISTRATIVE INFORMATION

SERVICE NOTE CLASSIFICATION: **MODIFICATION RECOMMENDED**					
ACTION CATEGORY:	☐ IMMEDIATELY ☐ ON SPECIFIED FAILURE ■ AGREEABLE TIME	STANDARDS: LABOR: 1.5 Hours			
LOCATION CATEGORY:	☐ CUSTOMER INSTALLABLE ☐ ON-SITE ■ HP LOCATION	SERVICE INVENTORY:	☐ RETURN ■ SCRAP ☐ SEE TEXT	USED PARTS:	☐ RETURN ■ SCRAP ☐ SEE TEXT
AVAILABILITY:	PRODUCT'S SUPPORT LIFE	RESPONSIBLE UNTIL : 01 January 1995			
AUTHOR: BS	ENTITY: 5300	ADDITIONAL INFORMATION:			

© 1993 HEWLETT-PACKARD COMPANY
PRINTED IN U.S.A.

HEWLETT PACKARD

ManualsPlus.com

- Bandwidth switching problems where displayed filter bandshape does not change when Resolution Bandwidth is changed.
- 3dB bandwidth is incorrect.
- Loss of displayed signal.

Several PC board suppliers build this board assembly, and the problem only occurs on one supplier's product. The serial number range listed above covers all instruments produced over the period that defective board assemblies were in the factory's stock room. Therefore, each 85662A IF Display Section listed above must have the date code of the A4A4 Bandwidth Filter checked. Only A4A4 assemblies with date code 950428 are covered under this service note.

Solution:

Remove the A4A4 assembly and check the date code which is located on the foil side (back side) of the board, above the P2 connector. If the date code is 950428, replace the A4A4 Assembly.

ManualsPlus.com

SERVICE NOTE

Supersedes:

None

HP MODEL 8568A/B SPECTRUM ANALYZER

Serial Prefix 2431A and Below

RACK MOUNTING WITH SLIDES (OPTION 010)
ENGLISH SYSTEM II CABINET PARTS

The following is a list of English hardware and instructions required to mount an HP 8568A/B with slides in a rack of 482.6 mm (19 in.) spacing or in non-HP racks.

Description	Qty	HP Part Number	CD
SIDE COVER	1	5060-9937	3
RACK MOUNT KIT	1	5061-0086	7
includes:			
Rack Mount Flange	2	5020-8877	4
Front Handle Assembly	2	5060-9902	2
8-32x5/8 Pan-Head Screw	8	2510-0194	8
HEAVY DUTY SLIDE KIT	1	1494-0016	6
includes:			
Modified Slides	2	——	
10-32x7/16 Pan-Head Screw	8	2680-0101	6
10-32x3/8 Pan-Head Screw	4	2680-0099	1
10-32 F.H.M. Screw	6	2600-0117	6
10-32 Unistrut Nut	8	0590-0698	3
SLIDE ADAPTER KIT (for non-HP racks)	1	1494-0042	8
includes:			
Adapter Bracket	2	——	
10-32 Bar Nuts	4	——	
10-32x1/2 Pan-Head Screw	12	2680-0101	6
10-32 x1/2 F.H.M. Screw	4	2680-0117	4
10-32 Nut W/Lock Washer	8	0590-0639	2

I/NS/WN

5/85-53/KGB

HEWLETT PACKARD

FOR MORE INFORMATION, CALL YOUR LOCAL HP SALES OR SERVICE OFFICE or East (201) 265-5000 • Midwest (312) 255-9800 • South (404) 955-1500 • West (213) 970-7500 or (415) 968-9200 **OR WRITE,** Hewlett-Packard, 1820 Embarcadero, Palo Alto, California 94303. **IN EUROPE, CALL YOUR LOCAL HP SALES OR SERVICE OFFICE OR WRITE,** Hewlett-Packard S.A., 7, rue du Bois-du-Lan, P.O. Box, CH-1217 Meyrin 2-Geneva, Switzerland. **IN JAPAN,** Yokogawa-Hewlett-Packard Ltd., 1-27-15, Yabe Sagamihara City, Kanagawa Prefecture, Japan 229.

Printed in U.S.A.

ManualsPlus.com

PROCEDURE:

RACK MOUNT KIT

1. Remove the front handles from the RF Section and IF-Display Section of the spectrum analyzer. (See Figure 1.)

2. Attach the new rack mount flanges and front handles provided in the Rack Mount Kit. (See Figure 2.) Use the eight 8-32x5/8 pan-head screws included in this kit.

3. It may be necessary to remove the information card tray on the bottom of the instrument before rack mounting. To remove the tray, tilt the instument on its side and remove the four feet. To retain the use of the information card on the instrument, do not remove feet; also, allow approximately 2 cm (3/4 in.) below the instrument to accommodate the tray when rack mounting. No filler strip is provided.

HEAVY DUTY SLIDE KIT

4. In the following description, the words "left" and "right" refer to the location of instrument assemblies as viewed from the front of the instrument. On the IF-Display Section (top box), remove the strap handle located on the left side cover. Next remove the IF-Display Section's right rear lock foot and right rear top foot. Slide the right side cover off to the rear, and replace it with the new side cover included in this kit. Replace the right rear lock foot and right rear top foot.

5. Attach one slide inner member bracket to each side of the instrument using two 10-32x3/8 pan-head screws per side (see Figure 3).

NOTE

When using non-HP System Rack Cabinets, skip steps 6 through 8 and proceed to step 9.

6. Insert two Unistrut nuts into each of the four vertical columns of the systems cabinet (four nuts in each side of the cabinet).

7. Bolt an outer slide mount to the Unistrut nuts in each side of the systems cabinet, using four 10-32x 7/16 pan-head screws per side.

8. Expand the outer slide mounts to their full length. Mount the instrument onto the system cabinet by bolting the outer slide mount to the inner member bracket on the instrument, using three 10-32 flat-head screws per side.

NOTE

If any binding is encountered in the slides after mounting, it will be necessary to support the instrument and loosen the bolts to the Unistrut nuts (adapter brackets, for non-HP racks) at each side of the cabinet. Adjust the slides slightly until they operate freely. Re-tighten the bolts.

SLIDE ADAPTER KIT (for non-HP racks)

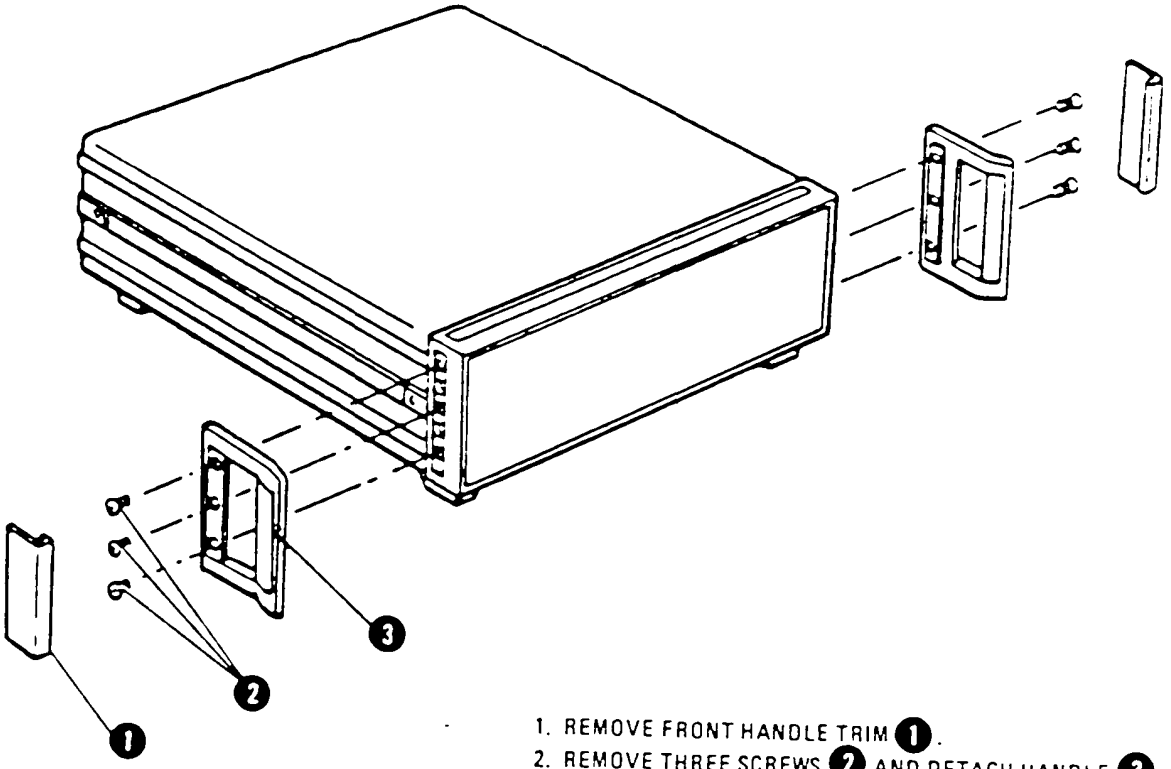
9. Using hole pattern "B" (see Figure 4), attach one adapter bracket to the front of each outer slide mount, using two 10-32x1/2 flat-head screws and nuts per bracket.

10. Using hole pattern "B", attach one adapter bracket to the rear of each outer slide mount, using two 10-32x1/2 pan-head screws and nuts per bracket.

11. Bolt an outer slide mount to each side of the system rack cabinet using 10-32x1/2 pan-head screws. Use the bar nuts provided in the kit if the rack mounting strips have through-holes.

12. Perform step 8.

ManualsPlus.com



1. REMOVE FRONT HANDLE TRIM (1).
2. REMOVE THREE SCREWS (2) AND DETACH HANDLE (3).

FIGURE 1. REMOVING FRONT HANDLES

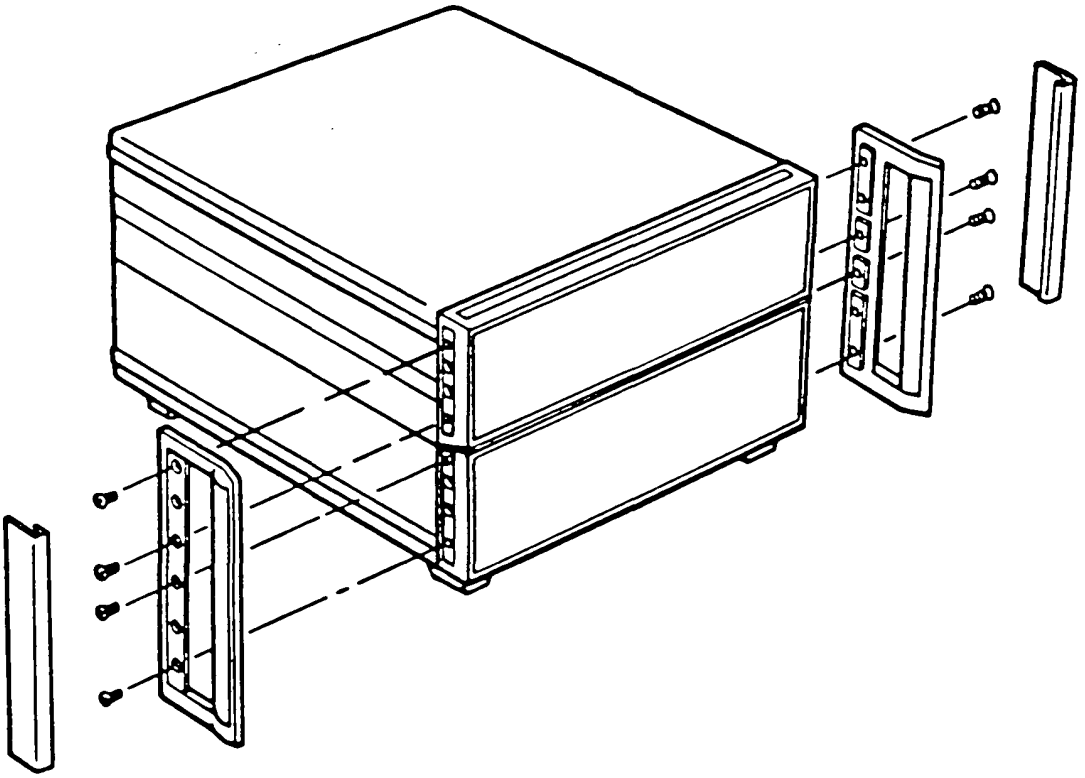


FIGURE 2. INSTALLING RACK MOUNT KIT

ManualsPlus.com

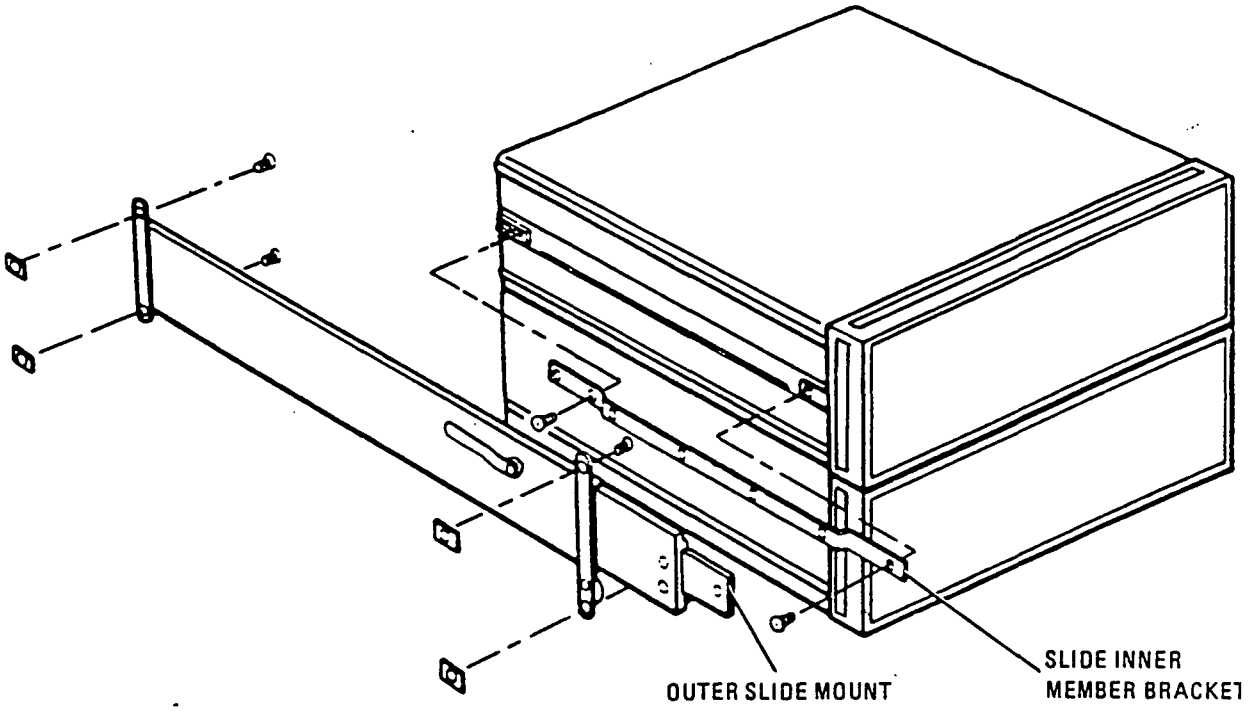


FIGURE 3. ATTACHING RACK MOUNT SLIDES

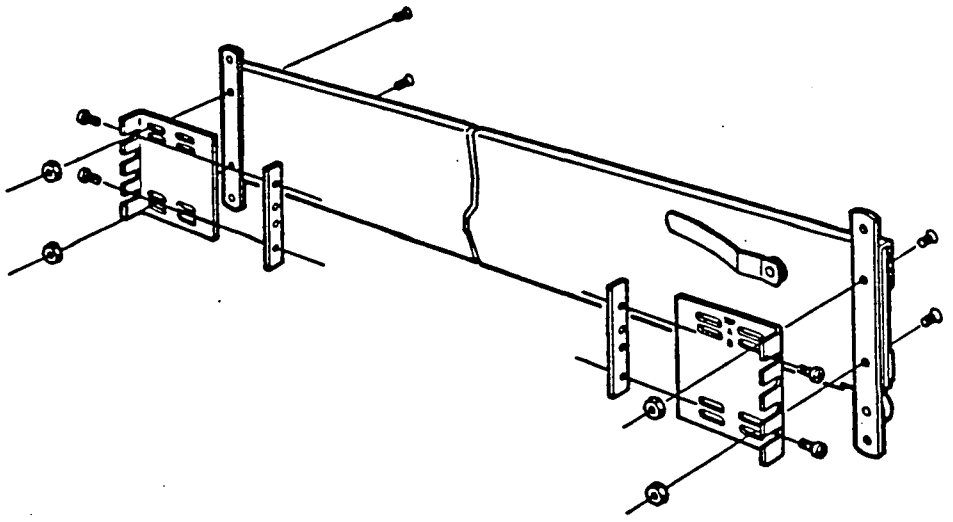


FIGURE 4. INSTALLING SLIDE ADAPTER

ManualsPlus.com

SERVICE NOTE

Supersedes:

None

HP MODEL 8568A/B SPECTRUM ANALYZER

Serial Prefix 2517A and Above

RACK MOUNTING WITH SLIDES (OPTION 010)
METRIC SYSTEM II CABINET PARTS

The following is a list of metric hardware and instructions required to mount an HP 8568A/B with slides in a rack of 482.6 mm (19 in.) spacing or in non-HP racks.

Description	Qty	HP Part Number	CD
SIDE COVER	1	5060-9937	3
RACK MOUNT KIT	1	5061-9686	1
includes:			
Rack Mount Flange	2	5020-8877	4
Front Handle Assembly	2	5061-9502	0
M4x0.7x16 Pan-Head Screw	8	0515-1106	2
HEAVY DUTY SLIDE KIT	1	1494-0058	6
includes:			
Modified Slides	2	———	
M5x0.8x12 Pan-Head Screw	8	0515-0904	6
M5x0.8x10 Pan-Head Screw	4	0515-0927	3
M5x0.8x12 F.H.M. Screw	6	0515-0956	8
M5x0.8 Unistrut Nut	8	0535-0079	8
SLIDE ADAPTER KIT (for non-HP racks)	1	1494-0064	4
includes:			
Adapter Bracket	2	———	
M5x0.8 Bar Nuts	4	———	
M5x0.8x12 Pan-Head Screw	12	0515-0904	6
M4x0.8x12 F.H.M. Screw	4	0515-0956	8
M5x0.8 Nut W/Lock Washer	8	0535-0081	2

I/NS/WN

5/85-53/KGB

HEWLETT PACKARD

FOR MORE INFORMATION, CALL YOUR LOCAL HP SALES OR SERVICE OFFICE or East (201) 265-5000 • Midwest (312) 255-9800 • South (404) 955-1500 • West (213) 970-7500 or (415) 968-9200 **OR WRITE**, Hewlett-Packard, 1820 Embarcadero, Palo Alto, California 94303. **IN EUROPE, CALL YOUR LOCAL HP SALES OR SERVICE OFFICE OR WRITE**, Hewlett-Packard S.A., 7, rue du Bois-du-Lan, P.O. Box, CH-1217 Meyrin 2-Geneva, Switzerland. **IN JAPAN**, Yokogawa-Hewlett-Packard Ltd., 1-27-15, Yabe Sagamihara City, Kanagawa Prefecture, Japan 229.

Printed in U.S.A.

ManualsPlus.com

PROCEDURE:

RACK MOUNT KIT

1. Remove the front handles from the RF Section and IF-Display Section of the spectrum analyzer. (See Figure 1.)

2. Attach the new rack mount flanges and front handles provided in the Rack Mount Kit. (See Figure 2.) Use the eight M4x0.7x16 pan-head screws included in this kit.

3. It may be necessary to remove the information card tray on the bottom of the instrument before rack mounting. To remove the tray, tilt the instument on its side and remove the four feet. To retain the use of the information card on the instrument, do not remove feet; also, allow approximately 2 cm (3/4 in.) below the instrument to accommodate the tray when rack mounting. No filler strip is provided.

HEAVY DUTY SLIDE KIT

4. In the following description, the words "left" and "right" refer to the location of instrument assemblies as viewed from the front of the instrument. On the IF-Display Section (top box), remove the strap handle located on the left side cover. Next remove the IF-Display Section's right rear lock foot and right rear top foot. Slide the right side cover off to the rear, and replace it with the new side cover included in this kit. Replace the right rear lock foot and right rear top foot.

5. Attach one slide inner member bracket to each side of the instrument using two M5x0.8x10 pan-head screws per side (see Figure 3).

NOTE

When using non-HP System Rack Cabinets, skip steps 6 through 8 and proceed to step 9.

6. Insert two Unistrut nuts into each of the four vertical columns of the systems cabinet (four nuts in each side of the cabinet).

7. Bolt an outer slide mount to the Unistrut nuts in each side of the systems cabinet, using four M5x 0.8x12 pan-head screws per side.

8. Expand the outer slide mounts to their full length. Mount the instrument onto the system cabinet by bolting the outer slide mount to the inner member bracket on the instrument, using three M5x 0.8x12 flat-head screws per side.

NOTE

If any binding is encountered in the slides after mounting, it will be necessary to support the instrument and loosen the bolts to the Unistrut nuts (adapter brackets, for non-HP racks) at each side of the cabinet. Adjust the slides slightly until they operate freely. Re-tighten the bolts.

SLIDE ADAPTER KIT (for non-HP racks)

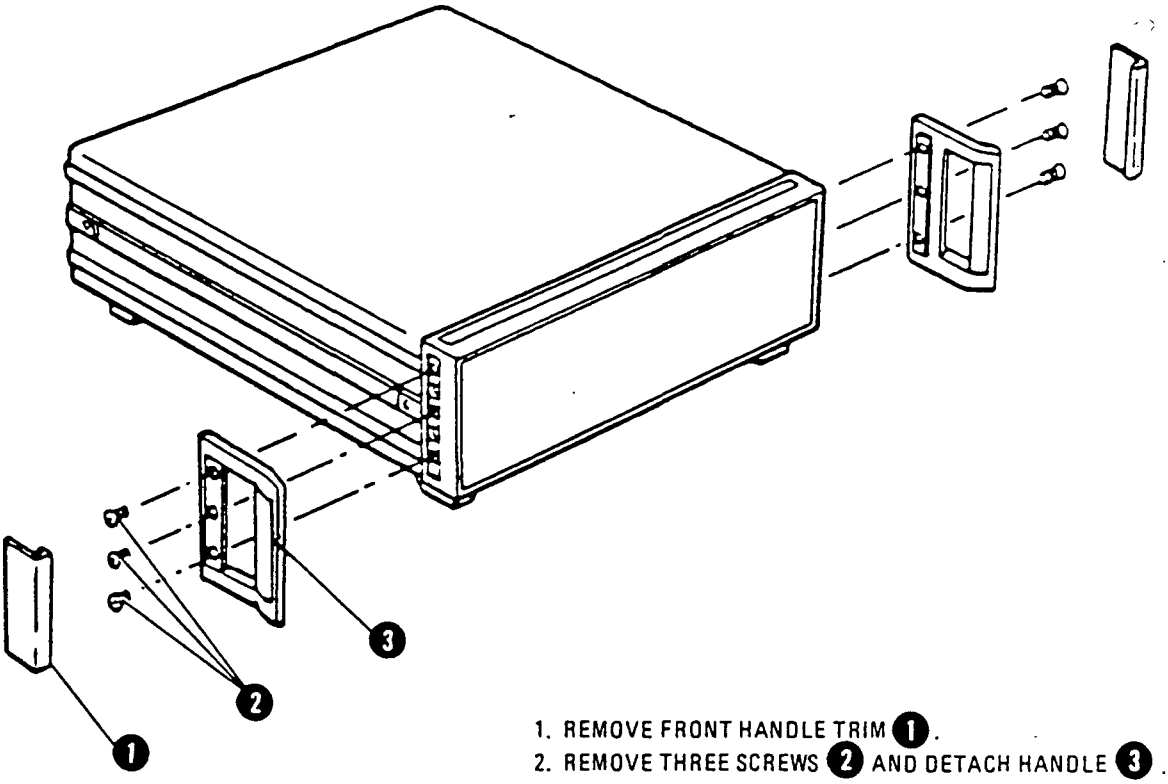
9. Using hole pattern "B" (see Figure 4), attach one adapter bracket to the front of each outer slide mount, using two M4x0.8x12 flat-head screws and nuts per bracket.

10. Using hole pattern "B", attach one adapter bracket to the rear of each outer slide mount, using two M5x0.8x12 pan-head screws and nuts per bracket.

11. Bolt an outer slide mount to each side of the system rack cabinet using M5x0.8x12 pan-head screws. Use the bar nuts provided in the kit if the rack mounting strips have through-holes.

12. Perform step 8.

ManualsPlus.com



1. REMOVE FRONT HANDLE TRIM (1).
2. REMOVE THREE SCREWS (2) AND DETACH HANDLE (3).

FIGURE 1. REMOVING FRONT HANDLES

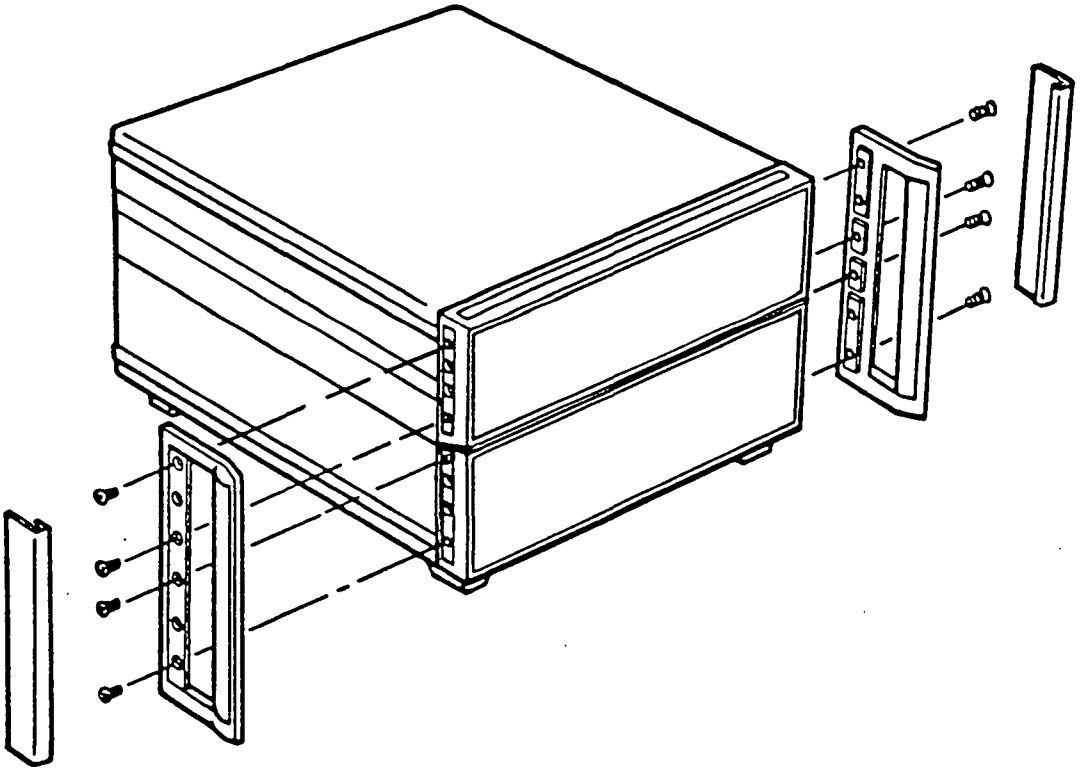


FIGURE 2. INSTALLING RACK MOUNT KIT

ManualsPlus.com

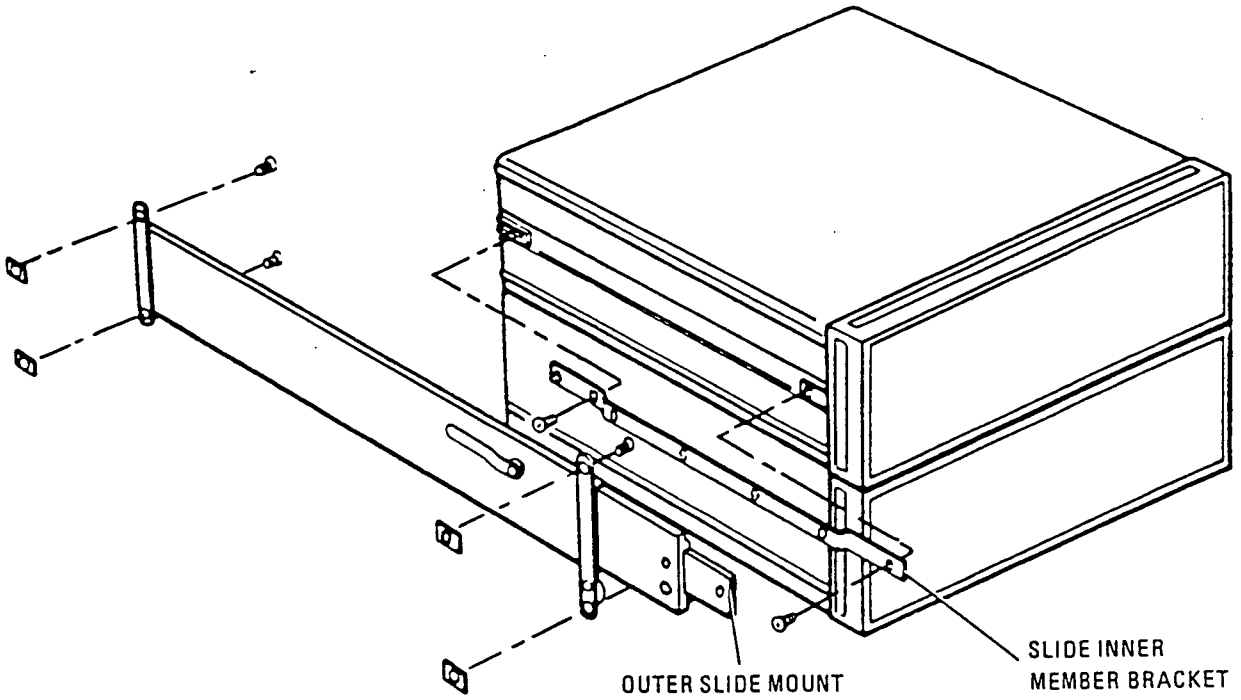


FIGURE 3. ATTACHING RACK MOUNT SLIDES

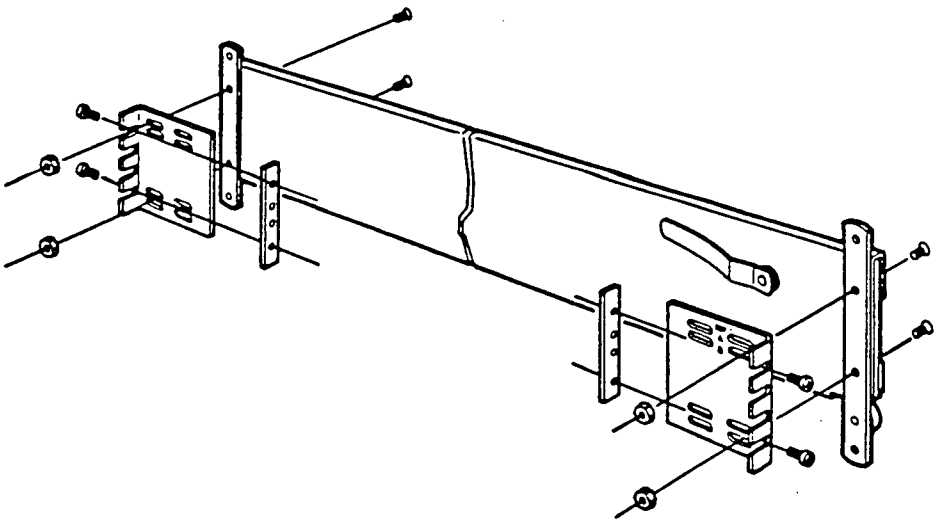


FIGURE 4. INSTALLING SLIDE ADAPTER

ManualsPlus.com

8568B-04A

S E R V I C E N O T E

SUPERSEDES: 8568B-04

HP 8567A Spectrum Analyzer
HP 8568A Spectrum Analyzer
HP 8568B Spectrum Analyzer

Serial Numbers:

0000A00000/2517A02036

See text for other applicable serial numbers.

Duplicate Service Notes

8567A-11A
8568A-46A
8568B-04A

To Be Performed By:

Customers and HP-Qualified Personnel

Frequency Spur Correction

Parts Required:

Qty	Ref. Des.	Description	HP Part Number
2	A10C13/C14	Capacitor, 10 pF 200 V Ceramic	0160-3874
1	A9MP1	Shield	7100-1304

DATE: 21 December 1989

ADMINISTRATIVE INFORMATION

SERVICE NOTE CLASSIFICATION: **MODIFICATION RECOMMENDED**

ACTION CATEGORY:
- ☐ IMMEDIATELY
- ☒ ON SPECIFIED FAILURE
- ☐ AGREEABLE TIME

LOCATION CATEGORY:
- ☒ CUSTOMER INSTALLABLE
- ☐ ON-SITE
- ☐ HP LOCATION

AVAILABILITY: PRODUCT'S SUPPORT LIFE

AUTHOR: BF ENTITY: 5300

LABOR STANDARDS: 3.0 Hours

SERVICE INVENTORY:
- ☐ RETURN
- ☐ SCRAP
- ☒ SEE TEXT

USED PARTS:
- ☐ RETURN
- ☐ SCRAP
- ☒ SEE TEXT

RESPONSIBLE ENTITY: 5300 UNTIL: Feb 1992

ADDITIONAL INFORMATION:

©1989 HEWLETT-PACKARD COMPANY
PRINTED IN U.S.A.

HEWLETT PACKARD

ManualsPlus.com

Table of Affected Serial Numbers	
8567A	0000A00000/2541A00137
8568A	0000A00000/2517A03270
8568B	0000A00000/2517A02036

Situation:

Signals from the A23 RF Converter Assembly feed through the A9 Pilot Second IF Amplifier Assembly and mix with the A10 Pilot Third Converter Assembly. This prevents the spectrum analyzer's meeting specifications for spurious responses (75 dB below -40 dBm total signal power at the input mixer).

This condition generates two families of spurs:

$(5 + 20 \times N)$ MHz, and $(12 + 20 \times N)$ MHz, where N equals the harmonic number of the 20 MHz Comb Generator

Solution/Action:

If any of these spectrum analyzers display these spurs above the specification limit, the A9 and A10 assemblies should be modified.

Modification Procedure:

1. Separate the two instrument sections and set the IF-Display section aside.
2. Remove the two rear feet and the bottom cover from the RF section.
3. Using a #1 pozidrive screwdriver, remove the 4-40 screws from around the A9 Pilot Second IF Amplifier and the A10 Pilot Third Converter Assemblies. Remove these assemblies from the instrument and place them on a static-free work surface.
4. Solder A9MP1 (HP part number 7100-1304) to the ground plane as shown in Figure 1.

NOTE

The shield is installed over the A9 lowpass filter. First remove the upright shield between this filter and A9C9 and A9L4, if present.

5. Install the two 10 pF capacitors on the A10 assembly. See Figure 2.
   a. Solder one lead of A10C13 to A10J1 and the other lead to the ground plane.
   b. Solder one lead of A10C14 to A10J2 and the other lead to the ground plane.
6. Install the A9 and A10 assemblies into the RF section.

Replace all screws, cover and feet. The spectrum analyzer is now ready for testing.

ManualsPlus.com

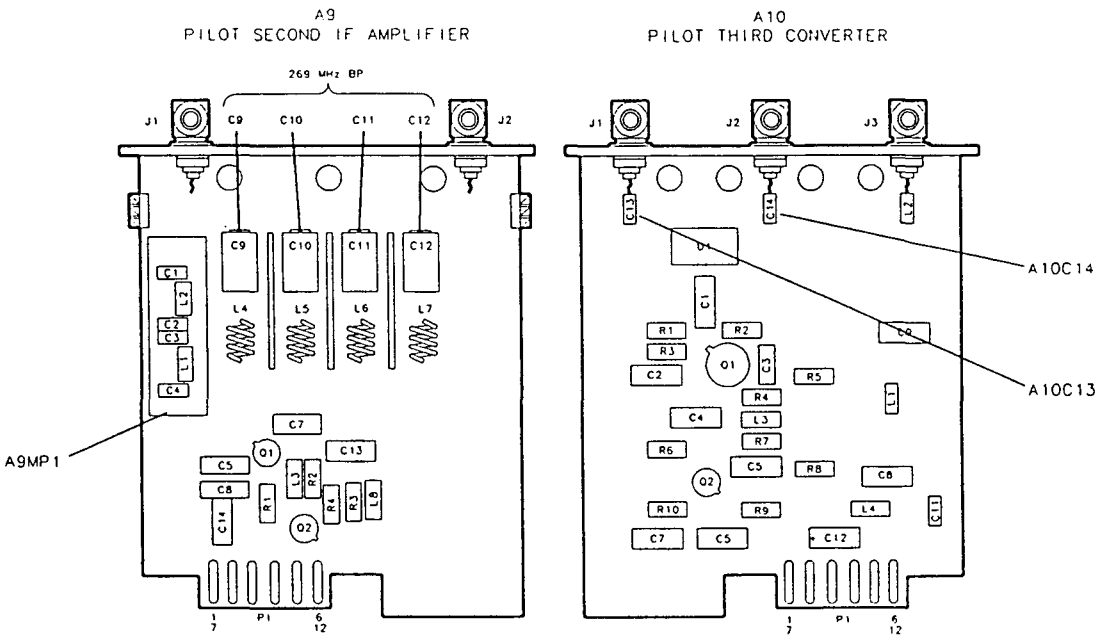


Figure 1. Component Locations

ManualsPlus.com

Subject: 8568B-8A
Creator: Sally CARSTENSEN / HP5300/M0 Dated: 02/25/93 at 1752.

8568B-8A

PRELIMINARY SERVICE NOTE

SUPERSEDES: 8568B-8

HP 8568B Spectrum Analyzer
HP 85680B RF Section

Serial Numbers:
85680B RF Section 0000A00000 / 999A99999

Exceptions: None

RF ATTENUATOR WITH CALIBRATION ROM REPLACEMENT

To Be Performed By: HP-qualified personnel

Parts Required: Attenuator Retrofit Kit, HP part number 85680-60228.

Situation:

HP 85680B spectrum analyzer RF sections serial prefix 2732A and below require changing the attenuator power cable (W42) when replacing the RF step attenuator A5AT1 and attenuator calibration PROM A12U17. The W42 attenuator power cable is include in the Attenuator Retrofit Kit.

Solution/Action

The RF Attenuator Retrofit Kit, HP part number 85680-60228 includes all parts and instructions required to install the RF attenuator (included in the kit) into an HP 85680B spectrum analyzer RF section.

Each RF attenuator is accompanied by a customized attenuator calibration PROM which provides attenuator correction data necessary to achieve the instrument's specified amplitude accuracy. Each RF attenuator is individually characterized so replacement PROMS are not separately available. The PROM (A12U7) installs into a 16-pin DIP socket on the A12 RF Interface Assembly.

Date: 22 February 1993

****
*
*
* MODIFICATION AVAILABLE *

ManualsPlus.com

```
*                    ----------------------                          *
*                                                                    *
*                                                                    *
*             REASON:          PERFORMANCE ENHANCEMENT ____          *
*                                        or                          *
*              SERVICEABILITY/RELIABILITY ENHANCEMENT __X_           *
* LOCATION CATEGORY: CUSTOMER INSTALLABLE X_ ON-SITE __              *
*                 HP LOCATION___                                     *
*    AVAILABLE UNTIL: Support Life_____________                      *
*      AUTHOR/ENTITY: Bill Scharf     5300_____________              *
*   ADDITIONAL INFO: ____________________________________            *
**********************************************************************
```

ManualsPlus.com

S E R V I C E N O T E

SUPERSEDES: 8568B-10A

HP 8568B Spectrum Analyzer
HP 85662A IF Section
HP 85680B RF Section

Serial Numbers:

85680B RF Sections 0000A00000 / 2714A03282
85662A IF Display Sections 0000A00000 / 3340A21346

Duplicate Service Notes: 8566B-10B

Option 462 6 dB resolution bandwidths

Situation:

The 8568B Option 462 has been redefined due to MIL-STD 462D. MIL-STD 462D specifies 6 dB resolution bandwidths. Early 8568B Option 462 instruments had impulse bandwidths from 3 MHz to 1kHz, and 6 dB bandwidths from 300Hz to 10 Hz.

The Option 462 Impulse Bandwidth instrument and the retrofit kit used to install impulse bandwidths in a standard instrument are no longer available. Replacement parts for the impulse bandwidth instrument will continue to be available.

Customers who already own MIL EMI receivers which contain 8568B Option 462 Impulse Bandwidth instruments, and customers who wish to retrofit 6 dB bandwidths into a standard 8568B can do so by installing a retrofit kit.

Continued

DATE: 21 December 1993

ADMINISTRATIVE INFORMATION

SERVICE NOTE CLASSIFICATION:

INFORMATION ONLY

AUTHOR:	ENTITY:	ADDITIONAL INFORMATION:
BS	5300	

© 1994 HEWLETT-PACKARD COMPANY
PRINTED IN U.S.A.

HEWLETT PACKARD

ManualsPlus.com

Solution / Action:

A standard instrument can be retrofitted to an Option 462 6dB instrument by installing the HP 8568B 6 dB Bandwidth Retrofit Kit, HP part number 08568-60126. The kit includes three bandwidth boards, an IF control board, firmware, manuals, a dress front panel and an installation note. Installation time is 2-3 hours.

An Option 462 Impulse Bandwidth instrument can be retrofitted to an Option 462 6dB Bandwidth instrument by installing the HP 8568B IBW to 6 dB Bandwidth Retrofit Kit, HP part number 08568-60127. The kit includes the A4A7 bandwidth board, firmware, a dress front panel, manuals, and an installation note. Installation time is 2 hours.

The 6 dB bandwidth adjustment procedure and performance tests are in the 8568B Performance Tests and Adjustments Manual included in the retrofit kits.

ManualsPlus.com

S E R V I C E N O T E

SUPERSEDES: 8568B-11A

HP 8566B Spectrum Analyzers
HP 8567A Spectrum Analyzers
HP 8568B Spectrum Analyzers

Serial Numbers:
0000A00000/9999A99999

Duplicate Service Notes:
8566B-11B
8567A-01A
8568B-11B

A15 CONTROLLER ASSEMBLY FIRMWARE REPLACEMENT KIT

To Be Performed By: Customer or HP-Qualified Personel

Parts Required:
Firmware Replacement Kit (See Table 1 for part numbers and contents.)
PAL HP part number 85660-80070 (See NOTE)

DATE: 13 November 1989

ADMINISTRATIVE INFORMATION

SERVICE NOTE CLASSIFICATION: **MODIFICATION AVAILABLE**	
ACTION CATEGORY: AGREEABLE TIME	■ PERFORMANCE ENHANCEMENT □ SERVICEABILITY/RELIABILITY ENHANCEMENT
LOCATION CATEGORY: ■ CUSTOMER INSTALLABLE □ ON-SITE ■ HP LOCATION	AVAILABLE UNTIL: Support Life
AUTHOR: BF ENTITY: 5300	ADDITIONAL INFORMATION: Installation Note 5958-7130

©1989 HEWLETT-PACKARD COMPANY
PRINTED IN U.S.A.

HEWLETT PACKARD

ManualsPlus.com

NOTE

The PAL is needed for firmware upgrade of HP 8568B Spectrum Analyzers with serial numbers 0000A00000/2445A00971 or HP 8568A Spectrum Analyzers that have been upgraded to an HP 8568B with the HP 8568AB Retrofit Kit (formerly HP 8568A + 01K) with serial numbers 0000A00000/2426A00316.

Situation:

From time to time, firmware is changed to correct bugs or add enhancements.

Solution/Action:

Firmware Replacement Kits are available to upgrade your spectrum analyzer. The Firmware Replacement Kits contain the latest version of firmware.

Table 1. Firmware Replacement Kits

Kit Contents	HP8566B 085660-60270	HP 8567A 085670-60009	HP 8568B 085680-60197
Date Code	10.10.89	7.4.87	7.4.87
A15U37 EPROM	85660-80185	85670-80019	85680-80113
A15U38 EPROM	85660-80187	85670-80021	85680-80115
A15U39 EPROM	85660-80186	85670-80020	85680-80114
A15U40 EPROM	85660-80188	85670-80022	85680-80116

ManualsPlus.com

Supersedes:
8568B-12

HP MODEL 8568B SPECTRUM ANALYZER

All Serials

HP MODEL 8568AB RETROFIT KIT
(formerly 8568A+01K)

All Serials

INSTALLATION PROCEDURE FOR REBUILT A15 CONTROLLER ASSEMBLY

This service note documents the recommended procedure for installation of the Rebuilt A15 Controller Assembly, HP Part Number 85680-60190, into an HP 8568B Spectrum Analyzer.

PROCEDURE:

CAUTION

This procedure MUST be performed at an anti-static workstation to avoid possible electrostatic discharge damage to the A15 Controller Assembly.

1. Turn HP 8568B over to access the bottom of HP 85680B RF Section. Remove power cord, two bottom rear feet, and bottom cover from RF Section.

2. Locate and remove controller cover from RF Section.

CAUTION

Note proper routing of ribbon cables prior to removal of A15 Controller Assembly; ribbon cables can be permanently damaged by improper installation.

CAUTION

Do not place A15 Controller Assembly directly on a metallic surface, as this might permanently discharge lithium battery A15BT1.

I/NS/WN 8/87-53/TM

HEWLETT PACKARD

FOR MORE INFORMATION, CALL YOUR LOCAL HP SERVICE OFFICE at East (201) 265-5000 ● Midwest (312) 255-9800 ● South (404) 955-1500 ● West (213) 970-7500 or (415) 968-9200 OR WRITE, Hewlett-Packard, 1820 Embarcadero, Palo Alto, California 94303. IN EUROPE, CALL YOUR LOCAL HP SALES or SERVICE OFFICE OR WRITE, Hewlett-Packard S.A., 7, rue du Bois-du-Lan Case Postale 365 CH 1217 Meyrin 1 - Geneva, Switzerland. IN JAPAN, Yokogawa-Hewlett-Packard Ltd., 27-15, Yabe, 1 Chrome, Sagamihara City, Kanagawa Prefecture, Japan 229.

Printed in U.S.A.

ManualsPlus.com

3. Remove Rebuilt A15 Controller Assembly from protective anti-static packaging and place on anti-static mat. Save packaging for storage of old A15 Controller Assembly.

4. Using colored lift tabs, carefully remove old A15 Controller Assembly from RF Section and store in protective anti-static packaging.

5. Locate A15SW1 near top-center of A15 Controller. Verify that switch A1 (closest to battery) is set open (toggled down towards white dot) to select a logic "1". If A1 is closed, the HP 8568B will not pass its self test at power-up, and both front-panel CHECK LEDs will light.

   Five remaining switches, A2 through A6, determine the HP 8568B HP-IB address at power-up. Switch A2 is HP-IB address least-significant bit, and A6 is HP-IB address most-significant bit. With all five switches open (factory setting), special HP-IB address 31 (1 + 2 + 4 + 8 + 16 = 31) is selected. In this case, A15 Controller checks memory (CMOS RAM) for the previously-selected HP-IB address setting, and selects default address 18 if none is found.

6. Install rebuilt A15 Controller in RF Section. Be careful not to pinch ribbon cables between edge connectors and PC board.

7. Reconnect power cord to RF Section. (HP 85662A IF/Display Section should still be connected to RF Section with two interconnect cables, and should have its own power cord connected).

8. Perform "Long POP" (power-on pretest) to initialize memory (CMOS RAM) on A15 Controller by jumpering test point A15TP1-8 T3 to test point A15TP1-9 ST (or, on earlier A15 Controllers, by jumpering test point A15TP1-7 T3 to test point A15TP4 STS) and turning LINE switch ON. A15 Controller LEDs A15DS1 through A15DS14 should all turn on, then turn off sequentially, indicating that A15 Controller has successfully executed self-test (if not, the four EPROMs might be improperly installed). In addition, all front-panel LEDs should turn on momentarily, indicating that HP 8568B has performed its power-on pretest.

   After successful completion of self-test, a "BATTERY" flag should appear on the instrument CRT, indicating that information previously stored in CMOS RAM on A15 Controller has been lost or erased. Normally, the "BATTERY" flag appears after several years of use to indicate that lithium battery A15BT1 requires replacement.

9. Set LINE switch to STANDBY and remove jumper from A15 Controller.

10. Turn LINE switch ON and confirm that the "BATTERY" flag is no longer displayed.

11. Set LINE switch to STANDBY and remove power cord from rear of RF Section.

12. Replace Controller Cover, RF Section bottom cover, and two rear feet. Instrument is now ready for use (no recalibration is required).

ManualsPlus.com

8568B-14

S E R V I C E N O T E

SUPERSEDES:

HP 8566B Spectrum Analyzer
HP 8567A Spectrum Analyzer
HP 8568B Spectrum Analyzer
HP 85662A IF-Display Section

Serial Numbers:
2813A15812/2816A16023
See text for exceptions.

Duplicate Service Notes:
8566B-20 8567A-04 8568B-14

Misloaded Capacitor Exposed to 130% of Its Rating

To Be Performed By: HP-Qualified Personnel or Customer

Situation:
An assembly process variation was discovered that might have resulted in two large electrolytic power supply capacitors being installed in the wrong location in HP 85662A IF-Display Sections within the serial range listed above. When installed in the wrong location, one of the capacitors can be exposed to as much as 130% of its rating. This would probably result in a premature capacitor failure, with possible venting of the capacitor electrolyte onto the bottom of the IF-Display Section. Venting might cause damage to other components and assemblies.

DATE: 25 May 1990

ADMINISTRATIVE INFORMATION

SERVICE NOTE CLASSIFICATION: **MODIFICATION RECOMMENDED**			
ACTION CATEGORY:	☐ IMMEDIATELY ☐ ON SPECIFIED FAILURE ☒ AGREEABLE TIME	LABOR STANDARDS: 0.5 Hour	
LOCATION CATEGORY:	☒ CUSTOMER INSTALLABLE ☐ ON-SITE ☒ HP LOCATION	SERVICE INVENTORY: ☐ RETURN ☐ SCRAP ☒ SEE TEXT	USED PARTS: ☐ RETURN ☒ SCRAP ☐ SEE TEXT
AVAILABILITY: PRODUCT'S SUPPORT LIFE		RESPONSIBLE ENTITY: 5300 UNTIL: 01 July 1992	
AUTHOR: TM ENTITY: 5300		ADDITIONAL INFORMATION:	

©1989 HEWLETT-PACKARD COMPANY
PRINTED IN U.S.A.

HEWLETT PACKARD

ManualsPlus.com

The two capacitors affected are A1A10C1, 22000 µF (HP part number 0180-2808), and A1A10C4, 8700 µF (HP part number 0180-0453). They are located along the HP 85662A rear frame, behind the CRT. Both capactors are the same physical size.

Table of Serial Number Exceptions

2816A15860
2816A15968
2816A15971
2816A15974/2816A15976
2816A15988/2816A15990
2816A16001
2816A16006
2816A16008

Solution/Action

Any HP 85662A IF-Display Section within the above serial range should be inspected. If capacitors A1A10C1 and A1A10C4 are found to be installed in the wrong location, replace both capacitors with new ones using the following procedure.

WARNING

These capactors can store a large charge. Be careful to discharge the capacitors before removing them.

Procedure

1. Remove the power cords and interconnect cables from the rear of the spectrum analyzer.
2. Loosen the lock feet and separate the RF and the IF sections; set the RF section aside.
3. Remove the 2 rear feet near the top of the IF-Display Section.
4. Remove the top cover and check for proper position of the capacitors (A1A10C1 and A1A10C4). See Figure 1.

   If the capacitors are in the correct location, reinstall the top cover and rear feet. Mate the IF and RF sections and reconnect cables. No further work is required.

If capacitors are *not* in the correct locations, proceed with the following steps.

ManualsPlus.com

5. Remove the 2 screws securing the bracket over the top of the capacitors and remove the bracket.

6. Remove the 2 rear feet near the bottom of the IF-Display Section.

7. Remove the bottom cover.

CAUTION

When each capacitor is installed with the correct polarity, the vent plug in the bottom of the capacitor will be visible through the hole in the A1A10 Motherboard Assembly.

---

8. Remove the 4 screws securing A1A10C1 and A1A10C4 to the motherboard.

9. Remove the existing capacitors and replace with new capacitors, making sure the A1A10C1, 22000 µF (HP part number 0180-2808), and A1A10C4, 8700 µF (HP part number 0180-0453), are in the correct locations.

10. Reinstall the bracket, top cover, bottom cover, and the 4 rear feet.

11. Mate the IF and RF sections and reconnect cables. No calibration is required.

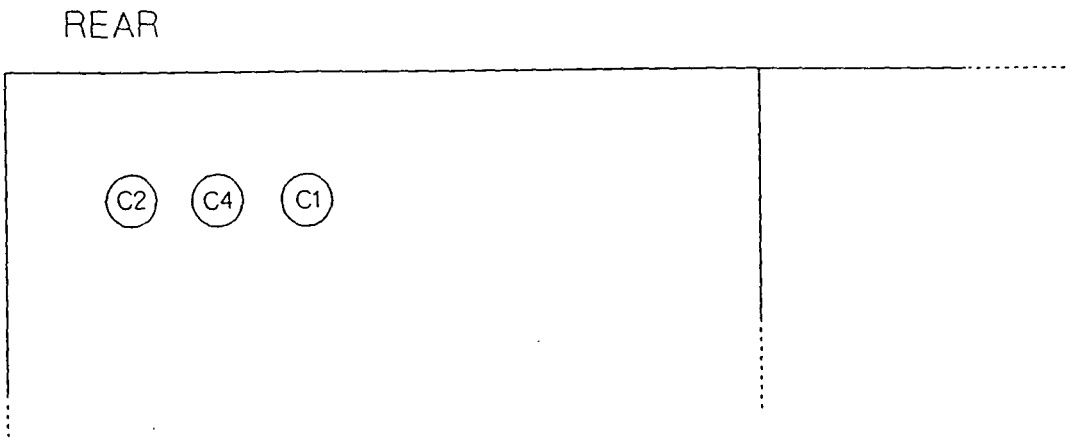


Figure 1. Location of A1A10C1 and A1A10C4

ManualsPlus.com

S E R V I C E N O T E

SUPERSEDES: NONE

HP 85670A RF Section
HP 85680A RF Section
HP 85680B RF Section

Serial Numbers:

85670A 0000A00000/2841A00615
85680A 0000A00000/2840A03306
85680B 0000A00000/2941A04612

Duplicate Service Notes:

8567A-08
8568A-54
8568B-21

LO Amplifier Replacement Kit

To Be Performed By:

Customer or HP-Qualified Personnel

DATE: 6 December 1989

ADMINISTRATIVE INFORMATION

SERVICE NOTE CLASSIFICATION: **MODIFICATION AVAILABLE**	
ACTION CATEGORY: AGREEABLE TIME	☐ PERFORMANCE ENHANCEMENT ◉ SERVICEABILITY/RELIABILITY ENHANCEMENT
LOCATION CATEGORY: ◉ CUSTOMER INSTALLABLE ☐ ON-SITE ◉ HP LOCATION	AVAILABLE UNTIL: Support Life
AUTHOR: BF ENTITY: 5300	ADDITIONAL INFORMATION: Recommended on Failure of A23A4A3 or A23A4A4

©1989 HEWLETT-PACKARD COMPANY
PRINTED IN U.S.A.

HEWLETT PACKARD

ManualsPlus.com

Parts Required:

LO Amplifier Replacement Kit, HP Part Number 85680-60247

Quantity	Description	HP Part Number
1	LO Amplifier	0955-0473
1	Cable Assembly, W7	85680-20236
1	Installation Note	85680-90130

Situation

The LO amplifier, HP part number 5086-7244, is no longer available. It is being replaced by HP part number 0955-0473. The LO Amplifier Replacement Kit includes cable assembly W7 to maintain proper phase shift and the amplifier assembly.

Solution/Action

Whenever A23A4A3, HP part number 5086-7244, needs replacement, order the replacement kit, HP part number 85680-60247. The Pilot First LO Amplifier does not need to maintain its phase shift, therefore, if A23A4A4, HP part number 5086-7244 needs replacing, order only HP part number 0955-0473.

ManualsPlus.com

8568B-25

S E R V I C E N O T E

SUPERSEDES: None

PRELIMINARY SERVICE NOTE

HP 8568B Spectrum Analyzer
HP 85680B RF Section
HP 85662A IF Display Section

Serial Numbers: 85680B RF Sections 0000A00000 / 2928A04878
85662A IF Display Sections 0000A00000 / 2848A18429

NEW COOLING FANS FOR THE 8568B SPECTRUM ANALYZER

Situation:

The R&D Bench product line has switched to a new fan supplier. The "old" fans are no longer available.

The 85680B has received a new 50-60 Hz fan and a new 400 Hz fan, both of which require a different mounting system than the fans they replaced. The latest fan assemblies are also fitted with lint filters. The fan housing on the 85680B is 50.8mm (2.0 in) longer and 12.0mm (0.5in) wider than the housing it replaces. As a result of this change, early model HSWP adapters used with the 85685A RF Preselector can no longer be connected to the instrument bus connector. A new W31 Instrument Bus Interconnect cable (HP part number 85662-60220) with an integral HSWP jack is available to replace the HSWP adapter. The W31 cable offers greater reliability than the HSWP adapter.

The 85662A also has a new 50-60 Hz fan. Although the size of the fan housing has not changed to accommodate the latest fan, the mounting system did change. The 400 Hz fan and existing 400 Hz mounting system remains unchanged.

Continued

DATE: 26 September 1991

ADMINISTRATIVE INFORMATION

SERVICE NOTE CLASSIFICATION:		
INFORMATION ONLY		
AUTHOR:	ENTITY:	ADDITIONAL INFORMATION:
BS	5300	

© 1991 HEWLETT-PACKARD COMPANY
PRINTED IN U.S.A.

HEWLETT PACKARD

ManualsPlus.com

Solution / Action:

Old style direct replacement fans will become unavailable when our stock is depleted. Fan kits have been set up for use when replacing fans in instruments with serial numbers listed above. Each fan kit includes a complete fan assembly which can be installed in minutes and does not require rear panel modification or lower level assembly. Fan Installation Note HP part number 5958-7177 is included in the kit.

The following is a list of fan replacement kits:

For HP 85680B instruments with serial numbers 2928A04878 and below:

- Order 85660-60358 for the 50-60 Hz fan kit.
- Order 85660-60359 for the 400 Hz fan kit.

For HP 85662A instruments with serial numbers 2848A18429 and below:

- Order 85662-60243 for the 50-60 Hz fan kit. If the 400 Hz fan needs replacement, order only the raw fan (HP part number 3160-0298). This is the same fan we have been using for years in the 85662A 400 Hz application.
- Instruments which require fan replacement and already contain the latest fan can be repaired by either ordering the replacement fan, or the fan kit listed above.
- The 50-60 Hz replacement fan for the 85662A is HP part number 85662-60219. Included is a wired fan with mounting inserts and heat shrink covered connection terminals installed.
- The 50-60 Hz replacement fan for the 85680B (and 85680A, 85670A, 85660A/B) is HP part number 85660-60387. Included is a wired fan with an EMI shield and heat shrink covered connection terminals installed.
- The 400 Hz replacement fan for the 85680B (and 85680A, 85670A, 85660A/B) is a raw fan. The HP part number is 3160-0087.

ManualsPlus.com

S E R V I C E N O T E

SUPERSEDES:

HP 8568B Spectrum Analyzer
HP 85680B RF Section

Serial Numbers:
2841A04340/3001A04941

Oven Oscillator Thermal Fuse Failure

Parts Required:
Thermal Fuse Kit, HP part number 10811-67001

Situation:
The thermal fuse (HP part number 2110-0801) in the Oven Oscillator (HP part number 10811-60111) of the A27 Frequency Standard (HP part number 5062-1916) will fail after the oscilltor has been in operation 3 months to 2 years.

The defective fuses are in Oven Oscillators with serial prefix 2850A. The serial number label is located under the top isolation mount on the oscillator and cannot be seen without removing the isolation mount. Therefore, use the instrument serial number to identify units with defective fuses.

DATE: 10 April 1990

ADMINISTRATIVE INFORMATION

SERVICE NOTE CLASSIFICATION: **MODIFICATION RECOMMENDED**

ACTION CATEGORY:	☐ IMMEDIATELY ☐ ON SPECIFIED FAILURE ◉ AGREEABLE TIME	LABOR STANDARDS: 1.0 Hour
LOCATION CATEGORY:	◉ CUSTOMER INSTALLABLE ☐ ON-SITE ◉ HP LOCATION	SERVICE INVENTORY: ☐ RETURN ☐ SCRAP ◉ SEE TEXT USED PARTS: ☐ RETURN ◉ SCRAP ☐ SEE TEXT
AVAILABILITY: PRODUCT'S SUPPORT LIFE		RESPONSIBLE ENTITY: 5300 UNTIL: 1 May 1992
AUTHOR: BS ENTITY: 5300		ADDITIONAL INFORMATION: Refer to Service Note 10811A/B-03

©1989 HEWLETT-PACKARD COMPANY
PRINTED IN U.S.A.

HEWLETT PACKARD

ManualsPlus.com

Symptoms of an open fuse are as follows:

- •OVEN COLD error message appears on screen
- •Frequency drift
- •Decrease in Center Frequency accuracy
- •Unable to adjust the frequency standard within specifications

Solution:
Any HP 8568B within the serial number range listed above and all Frequency Standards in Service Stock having Oven Oscillators with serial prefix 2850A should have the fuse replaced with HP part number 10811-80008. For convenience all parts required to replace the fuse are included in the Thermal Fuse Kit (HP part number 10811-67001).

This service note and Service Note 10811A/B-03 describe how to identify modified oscillators and instruments.

Repair and Recalibration Procedure

1. Turn the HP 8568B over to access the bottom of the instrument.
2. Remove the power cord, two bottom rear feet, bottom cover, carrying handle and side cover.
3. Remove the A27 Frequency Standard by removing the two top mount screws on the side rail and disconnecting the coax cable (red or grey with red band) at A16J1.
4. Service Note 10811A/B-03 describes how to replace the defective fuse once the Frequency Standard has been removed from the instrument.
5. Reinstall the Frequency Standard.
6. Replace the power cord, two bottom rear feet, bottom cover, carrying handle and side cover.
7. Allow the instrument to warm up for at least 30 minutes.
8. Perform the Center Frequency Readout Accuracy Test. Use HP part number 5010-4670 Performance Test part 2 software.
9. If the Center Frequency Readout Test fails, the Time Base Adjustment should be performed.

A recommended method for further identification of instruments with replaced fuses is to use a label (HI part number 9320-5559). Type or print the service note number (8568B-27) in the space above "PSSN Installed". Attach the label to the rear panel of the instrument near the serial number label.

ManualsPlus.com

S E R V I C E N O T E

SUPERSEDES:

HP 8568B Spectrum Analyzer
HP 85680B RF Section

Serial Numbers:
2841A04550/3001A04974
Exceptions:
3001A04971/3001A04973

Surface-Acoustic-Wave Resonator Failures

Situation

Recent manufacturing lots of the Surface-Acoustic-Wave (SAW) Resonators, A20Z1 (HP part number 1GA1-8000), used in the 280 MHz oscillator of the A20 Third Converter have a higher than normal Q. This causes excessive acoustic-wave amplitude, resulting in metal migration of the aluminum coupling transducers in the SAW device. Metal migration drastically reduces the Q of the device, and the output of the 280 MHz oscillator decreases.

Symptoms of defective SAW devices are as follows:

- 275 UNLOCK
- Low or no 280 MHz output measured at A20J3

DATE: 12 April 1990

ADMINISTRATIVE INFORMATION

SERVICE NOTE CLASSIFICATION: **MODIFICATION RECOMMENDED**

ACTION CATEGORY:	☐ IMMEDIATELY ☐ ON SPECIFIED FAILURE ☒ AGREEABLE TIME	LABOR STANDARDS: 1.0 Hour	
LOCATION CATEGORY:	☒ CUSTOMER INSTALLABLE ☐ ON-SITE ☒ HP LOCATION	SERVICE INVENTORY: ☐ RETURN ☒ SCRAP ☐ SEE TEXT	USED PARTS: ☐ RETURN ☒ SCRAP ☐ SEE TEXT
AVAILABILITY: PRODUCT'S SUPPORT LIFE		RESPONSIBLE ENTITY: 5300	UNTIL: 12 May 1991
AUTHOR: BS	ENTITY: 5300	ADDITIONAL INFORMATION:	

©1989 HEWLETT-PACKARD COMPANY
PRINTED IN U.S.A.

HEWLETT PACKARD

ManualsPlus.com

Solution:
Any HP 8568B within the serial number range listed above and all 1GA1-8000 SAW devices in service stock which have a lot number less than 81618A should be replaced with SAW devices having lot number 81618A and above.

The replacement SAW devices have copper-aluminum coupling transducers to eliminate the problem.

CAUTION

Electrostatic discharge (ESD) can damage or destroy electronic components. This procedure should be performed at a static-safe work station.

A20Z1 Replacement Procedure:

1. Turn the HP 8568B over to access the bottom of the HP 8568B RF Section. Remove the power cord, two bottom feet and bottom cover from the RF section.
2. Locate the A20 Third Converter Assembly and remove the snap-on coax cables from A20J2 and A20J3. Disconnect the 96 cable at A19J2.
3. Remove the A20 Third Converter Assembly from the instrument. Unsolder and remove the SAW device A20Z1.
4. Insert the replacement SAW, reinsert the A20 assembly, reconnect the coax cables, and power up the HP 8568B Spectrum Analyzer.
5. Allow the analyzer to warm up for at least 5 minutes.
6. Perform the "Third Converter Adjustment" in the *HP 8568B Performance Tests and Adjustments* manual.
7. Assure the front panel Amp Cal potentiometer has sufficient range to adjust the Cal signal to -10 dBm using "Recall 8."

NOTE

If the Amp Cal has insufficient range, A20R19 can be padded. Excessive padding of A20R19 can cause TOI problems, if padding seems excessive, look for a gain problem elsewhere.

8. Perform the "Spurious Response Test" in the "Performance Tests" chapter, to check TOI and SOI.

ManualsPlus.com

S E R V I C E N O T E

SUPERSEDES: None

HP 8568B Spectrum Analyzer
HP 85662A IF Display Section

Serial Numbers: 85662A IF Display Sections 0000A00000 / 3140A20342

New A4A1 Video Processor

Situation:

The latest A4A1 Video Processor, HP part number 85662-60241, has replaced the 85662-60122 Video Processor. Although this latest video processor is backward compatible, a new adjustment procedure is required.

The adjustment procedure in the latest Performance Tests and Adjustments manual, HP part number 08568-90105, can be used to adjust both vintages of video processors listed in this note. This latest manual contains many updated procedures, and is necessary for the support of the 8568B Spectrum Analyzer. A copy of this manual ships with each new 8568B instrument.

The early HP 8568B Performance Tests and Adjustments Manual, part number 08568-90051, must be updated before adjustments on the latest Video Processor can be performed.

Continued

DATE: 04 December 1991

ADMINISTRATIVE INFORMATION

SERVICE NOTE CLASSIFICATION:		
INFORMATION ONLY		
AUTHOR:	ENTITY:	ADDITIONAL INFORMATION:
BS	5300	

© 1992 HEWLETT-PACKARD COMPANY
PRINTED IN U.S.A.

HEWLETT PACKARD

ManualsPlus.com

Solution / Action:

When attempting to order the early video processor, HP part number 85662-60122, you will be instructed to order the Video Processor Retrofit Kit, HP part number 85662-60258. The kit contains the latest video processor assembly and an installation note which outlines the adjustment procedure. This kit is necessary since it is not apparent that the latest video processor cannot be adjusted using an earlier procedure.

Order the latest video processor, HP part number 85662-60241, if you already have a copy of the new video processor adjustment procedure. The latest adjustment procedure is in the HP 8568B Performance Tests and Adjustments manual, HP part number 08568-90105. The installation note in the Video Processor Retrofit Kit also contains the adjustment information, and this service note outlines how to update the early performance tests and adjustments manual.

NOTE:

When replacing the video processor on Option 462 instruments, the 3 MHz bandwidth adjustment potentiometer on A4A9 IF Control board may run out of adjustment range. If this occurs, change the value of factory select resistor A4A9R11 or the value of both A4A9R11 and R87. Consult the 85662A IF Display Section Troubleshooting and Repair manual, HP part number 85662-90085, for component location and factory select resistor ranges.

To update the early HP 8568B Performance Tests and Adjustments manual, HP part number 08568-90051, insert the installation note supplied in the retrofit kit into the manual or make the following corrections:

Under the Adjustments tab, Test 6, page 42, replace steps 7 through 21 with the steps listed below.

7. Set the step attenuator to 0 dB.
8. Key in REFERENCE LEVEL and adjust DATA knob for DVM indication as close to +1.00 +/- 0.001 Vdc as possible. (It may be necessary to slightly adjust the front panel AMPTD CAL control to achieve required tolerance.)
9. Connect DVM to A4A1TP2.
10. Adjust A4A1R14 OS for a DVM indication of 0.000 +/- 0.003 Vdc. See Figure 22 for the location of the adjustment.
11. Connect DVM to A4A1TP3.
12. Set the step attenuator to 120 dB.
13. Adjust A4A1R32 ZERO for a DVM indication of 0.000 Vdc +/- 0.001 Vdc.
14. Set the step attenuator to 0 dB.
15. Adjust A4A1R36 FS for DVM indication of +2.00 +/- 0.001 Vdc.
16. Repeat steps 12 through 15 until no further adjustments are required.

ManualsPlus.com

8568B-35

S E R V I C E N O T E

SUPERSEDES

HP 8568B Spectrum Analyzer
HP 85680B RF Section

Serial Numbers: 3001A04879 / 9999A99999 and earlier instruments which have had the Fan Assembly Replacement Kit installed. If the fan housing is dark gray, this service note applies.

RF Section Fan Motor Replacement

Duplicate Service Notes: 8566B-42
8567A-18

To Be Performed By: HP-Qualified Personnel

Parts Required:

HP P/N	Description
85660-60387	Fan Motor Replacement Kit

Continued

DATE: kJanuary 1996

ADMINISTRATIVE INFORMATION

SERVICE NOTE CLASSIFICATION:

INFORMATION ONLY

AUTHOR:	ENTITY:	ADDITIONAL INFORMATION:
BS	5320	

© 1995 HEWLETT-PACKARD COMPANY
PRINTED IN U.S.A.

HEWLETT PACKARD

ManualsPlus.com

Situation:

Fan vendors have changed on the 85660B, 85680B and 85670A RF sections. The latest 50/60 hz cooling fan must have a notch cut into the fan connector cover to accommodate the fan wires. The fan has been rotated 90 degrees in the housing (the fan mounting hardware is unchanged). The fan wire length has been shortened as a result of rotating the fan. The latest fan turns the opposite direction as the one it replaces, although the direction of the air flow through the instrument is unchanged.

Solution/Action:

Since the fan needs to be modified (a notch cut into the connector cover),mounted in a slightly different fashion and the wires shortened, a Fan Motor Replacement Kit, HP p/n 85660-60387 has been set up. The kit contains a fan which has the correct length wires attached and the EMI disk installed. The kit also includes an installation note which explains how to mount the fan in the fan housing. The raw fan, HP p/n 3160-0308 will no longer be supplied.

ManualsPlus.com

S E R V I C E N O T E

SUPERSEDES: None

HP 8566B Spectrum Analyzer
HP 85660B RF Section

Serial Numbers: 85660B RF Sections
0000A00000 / 9999A99999

Recommended replacement for A10A6U2 OP AMP

Situation:

Due to a part discontinuance, the 14-pin version of A10A6U2, HP part number 1826-0457, will no longer be loaded at the factory. All 14-pin op amps which remain in stock will be available for field service.

The replacement part is an 8-pin op amp, HP part number 1826-0250, which requires installation instructions since the PC board layout has not changed.

The latest A10A6 PLL2 Phase Detector Assembly is Hp part number 85660-60389 and has the 8-pin op amp installed. If U2 fails on this assembly, replace it with another 8-pin op amp.

Although the 1826-0457 14-pin op amp is no longer used in production, it is still a valid replacement part and will be available until the stock is depleted. Therefor early A10A6 assemblies with U2 failures can be repaired with the 14-pin part.

Continued

DATE: October 1994

ADMINISTRATIVE INFORMATION

SERVICE NOTE CLASSIFICATION:

INFORMATION ONLY

AUTHOR:	ENTITY:	ADDITIONAL INFORMATION:
BS	5300	

© 1994 HEWLETT-PACKARD COMPANY
PRINTED IN U.S.A.

HEWLETT PACKARD

ManualsPlus.com

Solution / Action:

The following procedure outlines how to install the 8-pin op amp (U2) into the 14-pin "foot-print" on the PC board.

Figure 1 shows the bottom view of the op amp. The op amp leads are pointing towards you. Remove (cut off) lead 5 and form the remaining leads as shown.

Insert insulating tubing over lead 7 to prevent lead 7 from shorting to lead 6.

Figure 2 shows U2 inserted into the PC board.

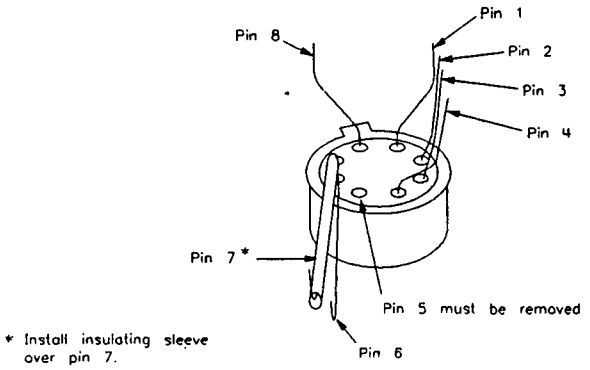


Figure 1. How to form the part (bottom view).

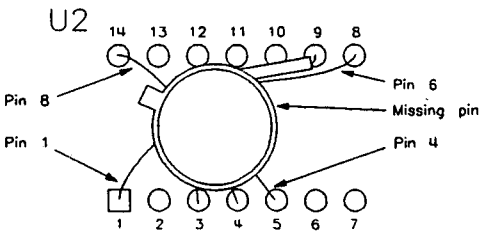


Figure 2. Top view of U2 loaded into the PC board.