

MANUAL SUPPLEMENT

NETWORK ANALYZER

8410B

SUPPLEMENT
PART NO. 08410-90048

USE THIS SUPPLEMENT WITH
MANUAL PART NO. 08410-90020
PRINTED DECEMBER 1971

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HEWLETT  PACKARD



SECTION I

NETWORK ANALYZER

INTRODUCTION

This supplement describes the differences between the Model 8410A and the Model 8410B. In addition, this supplement describes the changes necessary to the 8410A Operating and Service Manual (08410-90020) to document the 8410B.

DESCRIPTION

The 8410B incorporates an AUTO frequency range mode, which gives it the capability of automatically tracking the HP 8620A Sweep Oscillator over octave and multioctave frequency bands from 110 MHz to 18 GHz. In all other respects and functions the 8410B is the same as the 8410A.

MANUAL CHANGES FOR MODEL 8410B

Make the following manual changes to the 8410A Operating and Service Manual (08410-90020) to document the 8410B.

1-A. SAFETY CONSIDERATIONS

General

This instrument has been designed and tested according to IEC Publication 348, "Safety Requirements for Electronic Measuring Apparatus," and has been supplied in safe condition. This is a Safety Class I instrument.

Operation

BEFORE APPLYING POWER, make sure the instrument's ac input is set for the available ac line voltage, that the correct fuse is installed, and that all normal safety precautions have been taken.

Service

Although the instrument has been designed in accordance with international safety standards, the information, cautions, and warnings in this manual must be followed to ensure safe operation and to keep the instrument safe. Service and adjustments should be performed only by qualified service personnel.

Adjustment or repair of the opened instrument with the ac power connected should be avoided as much as possible and, when inevitable, should be performed only by a skilled person who knows the hazard involved.

Capacitors inside the instrument may still be charged even though the instrument has been disconnected from its source of supply.

Make sure only fuses of the required current rating and type (normal blow, time delay, etc.) are used for replacement. Do not use repaired fuses or short circuit the fuse holders.

Whenever it is likely that the protection has been impaired, make the instrument inoperative and secure it against any unintended operation.

WARNING

If this instrument is to be energized through an autotransformer (for voltage reduction), make sure the common terminal is connected to the earthed pole of the power source.

BEFORE SWITCHING ON THE INSTRUMENT, the protective earth terminals of the instrument must be connected to the protective conductor of the mains power cord. The mains plug shall only be inserted in a socket outlet provided with protective earth contact. The protection must not be negated by using an extension cord (power cable) without a protective grounding conductor.

Any interruption of the protective (grounding) conductor, inside or outside the instrument, or disconnection of the protective earth terminal is likely to make this instrument dangerous. Intentional interruption of the earth ground is prohibited.

Servicing this instrument often requires that you work with the instrument's protective covers removed and with ac power connected. Be very careful; the energy at many points in the instrument may, if contacted, cause personal injury.

With the ac power cable connected, the ac line voltage is present at the terminals of the power line module and at the LINE power switch. Be very careful. Bodily contact with this voltage can be fatal.

CAUTION

BEFORE SWITCHING ON THIS INSTRUMENT, make sure instrument's ac input is set to the voltage of the ac power source.

BEFORE SWITCHING ON THIS INSTRUMENT, make sure that all devices connected to the instrument are connected to the protective earth ground.

BEFORE SWITCHING ON THIS INSTRUMENT, make sure the line power (mains) plug is connected to a three-conductor line power outlet that has a protective (earth) ground. (Grounding one conductor of a two-conductor outlet is not sufficient.

BEFORE SWITCHING ON THIS INSTRUMENT, make sure the ac-line fuse is of the required current rating and type (normal-blow, time-delay, etc.).

Page 1-2, Table 1-1:

Substitute Table 1-1A for Table 1-1.

Table 1-1A. Models 8410B and 8411A Specifications

Frequency Range:

8410B: 0.110 to 18 GHz.

8411A: 0.110 to 12.4 GHz.

Option 018: 0.110 to 18 GHz.¹

8411A Input Impedance: 50 ohms nominal. SWR <1.5:1, 0.11 to 8.0 GHz; <2:1, 8.0 to 12.4 GHz; typically increases to a 10:1 SWR, 12.4 to 18 GHz.

Channel Isolation: >65 dB, 0.1 to 6 GHz; >60 dB, 6 to 12.4 GHz; >50 dB, 12.4 to 18 GHz.

AMPLITUDE

Amplitude Range:

Reference Channel: Any 20 dB range between -16 and -44 dBm; reference channel level meter indicates proper range. A 20 dB variation causes <1.5 dB and <4° change in amplitude and phase indications.

Test Channel: -10 to -78 dBm from 0.11 to 12.4 GHz; -10 to -68 dBm from 12.4 to 18 GHz.

Maximum RF input to either Channel: 50 mW (+17 dBm) damage level.

Maximum dc on RF Line: +3 V (damage Level).

IF Gain Control: Adjusts gain of test channel relative to reference channel. Range: 69 dB total in 10 dB and 1 dB steps; vernier provides continuous adjustment over at least 2 dB.

Accuracy: ±0.1 dB per 10-dB step, ±0.05 dB per 1-dB step. Maximum cumulative, ±0.2 dB.

Frequency Response: Reference and test channels typically track within:

±0.3 dB for any octave 0.11 to 8 GHz.

±0.4 dB, 8 to 12.4 GHz.

±1.5 dB, 12.4 to 18 GHz.

Noise: Less than -78 dBm equivalent input noise 0.11 to 12.4 GHz; -68 dBm 12.4 to 18 GHz.

PHASE

Phase Range: 0 to 360°

Control: Vernier provides continuous phase reference adjustment over at least 90°.

Frequency Response: Reference and test channels typically track within:

±1° for any octave 0.11 to 8 GHz.

±2°, 8 to 12.4 GHz.

±10°, 12.4 to 18 GHz.

GENERAL

Outputs: Two rear panel auxiliary outputs provide 278 kHz IF signals; outputs may be used for signal analysis, special applications, and convenient test points; modulation bandwidth nominally 10 kHz. Reference Channel IF: 2 volts peak-to-peak.

Test Channel IF: 10 volts peak-to-peak or less, depending on signal level and test channel gain setting.

Connectors (8411A): APC-7.

Cable Supplied: Source Control Cable HP Part No. 8120-2140 for use with the 8620A Sweep Oscillator.

Power: 100, 120, 220, or 240V ac +5% -10%, 50 to 60 Hz, 70 watts (includes 8411A).

Weight:

8410: Net, 33 lb (14,9 kg). Shipping 41 lb (18,5 kg).

8411A: Net, 7 lb (3,2 kg). Shipping 10 lb (4,5 kg).

Dimension:

8410: 7½ in. high, 16-¾ in. wide, 18-¾ in. deep (191 x 425 x 467 mm).

8411A: 2-5/8 in. high, 9 in. wide, 5-5/8 in. deep (67 x 228 x 143 mm), exclusive of connectors. 5-ft cable permanently attached for connection to 8410B.

¹ Specifications for the 8411A 018 Option below 12.4 GHz are the same as the standard instrument. Specifications above 12.4 GHz apply to the Option 018 only.

Page 1-3, Paragraph 1-15

For accessories furnished, add the following:

SOURCE CONTROL CABLE

Provides the control logic interconnections to the 8620A Sweep Oscillator necessary for automatic operation.

Page 1-5, Figure 1-2:

Change item 5 to read as follows:

5. **FREQ RANGE (GHz)**. Automatic or manual frequency range selection control. In AUTO position, automatically selects proper frequency range. Particular frequency ranges can be selected. Selected range must include the frequency (or frequencies) at which measurements are to be made. The dial is marked to indicate that an 8411A Option 18 is required for frequency ranges above 12.4 GHz.

Add to Item 7 the following:

Because the meter averages in RF power during the automatic relocking cycle and sweeper retrace, the meter level should be set at a slow sweep rate.

Page 1-6, Figure 1-3:

Substitute Figure 1-3A. Model 8410B Rear Panel Features.

Page 1-7, Paragraph 1-42:

Add the following:

NOTE: In the AUTO mode of operation, Display Blanking, from the 8620A Sweep Oscillator, must be connected to the plug-in CRT display unit (8412A or 8414A).

Page 1-9, Paragraph 1-69:

Add the following:

For AUTO mode operation, a 1V/GHz Frequency Reference voltage is supplied by the RF plug-in of the 8620A Sweep Oscillator. The requirements for this voltage are that it be positive in polarity and in direct proportion (1V/GHz) to the signal source output frequency.

Page 1-9, Paragraph 1-70:

Add the following:

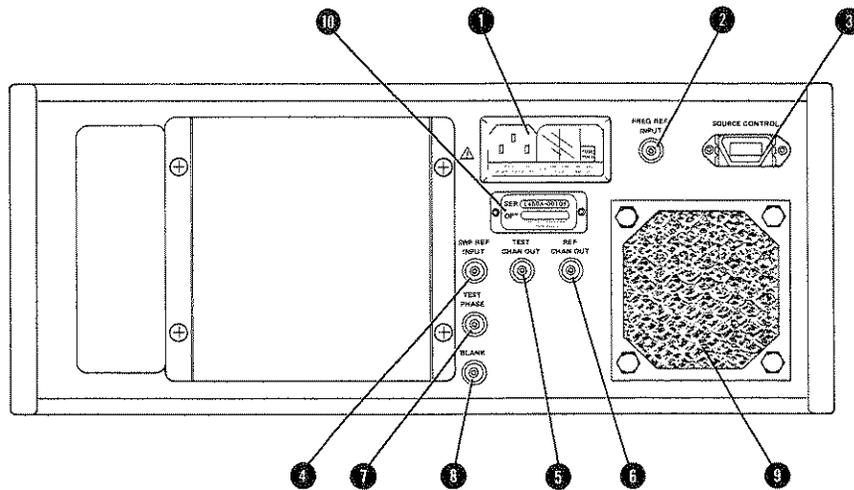
1-70A. 8620A SWEEP OSCILLATOR with RF PLUG IN

Table 1-6A gives a serial number breakdown of the 8620A Sweep Oscillator and RF plug-ins that are compatible for 8410B AUTO mode operation. Instruments with serial prefixes, or numbers, not included in Table 1-6A require a service kit and modification. For Service Note and Modification Kit part numbers, contact the local Hewlett-Packard Field Office.

NOTE

An 8620A Sweep Oscillator modified for compatibility with the 86290A RF plug-in needs an additional modification for compatibility with the Model 8410B in AUTO mode of operation. This modification provides a path for the Stop Sweep signal from the 8410B, and consists of a jumper between 8620A-J7 (A17) and 8620A-J2 (27). If the jumper is installed, then grounding 8620A-J2 (27) will stop the 8620A Sweep Oscillator from sweeping.

REAR PANEL FEATURES



1. **Power Line Module and Fuse.** Allows selection of 100, 120, 220, or 240 Vac Operation. To change power selection, power cable must be disconnected from rear of instrument. This allows plastic window covering fuse compartment to slide to one side, exposing fuse. To either change fuses or power selection, pull outward on lever in fuse compartment.
2. **FREQ REF INPUT.** Accepts a voltage proportional to reference channel input frequency (1 V/GHz). Voltage is used in AUTO mode operation. FREQ REF INPUT is supplied by the RF section of the 8620A Sweep Oscillator.
3. **SOURCE CONTROL.** For use when operated with the 8620A Sweep Oscillator. Connector is used with Source Control cable to provide interconnection of Stop Sweep and External Trigger between 8410B and 8620A Sweep Oscillator.
4. **SWP REF INPUT.** Accepts a voltage proportional to reference channel input frequency. Voltage enables auto-tuning to track fast sweeping input frequencies. Nominal 0 to +40 volts per octave¹ from 20K ohms $\pm 20\%$ source impedance required. The lower voltage must coincide with the lowest input frequency. HP 690 and 8690 Sweep Oscillators furnish suitable reference voltages². SWP REF INPUT voltage must be provided when the sweep mode selected is from high frequency to low frequency at any sweep speed. SWP REF INPUT is not used with the 8620A Sweep Oscillator.
5. **TEST CHAN OUT.** 278 KHz sine wave. Amplitude depends upon the amplitude of the test channel RF input and the settings of the front-panel TEST CHANNEL GAIN (dB) and AMPL VERNIER controls. Amplitude range is 0 to about 10 volts p-p.
6. **REF CHAN OUT.** 278 KHz sine wave with amplitude fixed at about 2 volts p-p nominal when REF CHANNEL LEVEL meter reads in the OPERATE region.
7. **TEST PHASE.** 278 KHz sine wave with amplitude fixed at about 0.22 volts p-p. Signal is in phase with test channel input.
8. **BLANK.** Provides a -2 to -4 volt blanking signal when the 8410B is not phase locked. This blanking signal may be used with an auxiliary display unit.
9. **AIR INTAKE FILTER.** Clean regularly. Do not obstruct air flow.
10. **SERIAL NUMBER PLATE.** Eight digit serial number should be included in any correspondence concerning the Model 8410B.

¹ Swept frequency measurements can be made over somewhat wider frequency ranges than indicated by the FREQ RANGE (GHz) selector provided the sweep reference voltages cover the required ranges. See Tables 1-6 and 1-7 for details.

² 690-series Oscillators need dividers for sweep reference output, and internal dividers of 8690 Oscillators should be checked. See Tables 1-6 and 1-7.

Figure 1-3A. Model 8410B Rear Panel Features

Page 1-10:
Add Table 1-6A.

Table 1-6A. AUTO Tune/Source Compatibility

| HP Model Number | Instrument Serial Prefix or Number |
|-------------------|------------------------------------|
| 8620A (Mainframe) | 1427A01876 and above. |
| 86290A | 1432A00101 and above. |
| Other Rf plug-ins | 1506A and above. |

Page 1-12, Paragraphs 1-91 thru 1-95:

Substitute the following:

1-91. POWER REQUIREMENTS

1-92. The 8410B requires a power source of 100, 120, 220, or 240 volts ac +5% --10%, 50 to 60 Hz, single phase. Power output should be capable of 85 watts when the 8413 Phase-Gain Indicator plug-in is installed, and 105 watts when a CRT display plug-in is installed (8412A rectangular display or 8414A Polar display).

1-93. LINE VOLTAGE SELECTION

1-94. Figure 1-4A provides instructions for line voltage and fuse selection. A set of fuses is supplied with the instrument.

CAUTION

To prevent damage to the instrument, make the line voltage selection before connecting line-power.

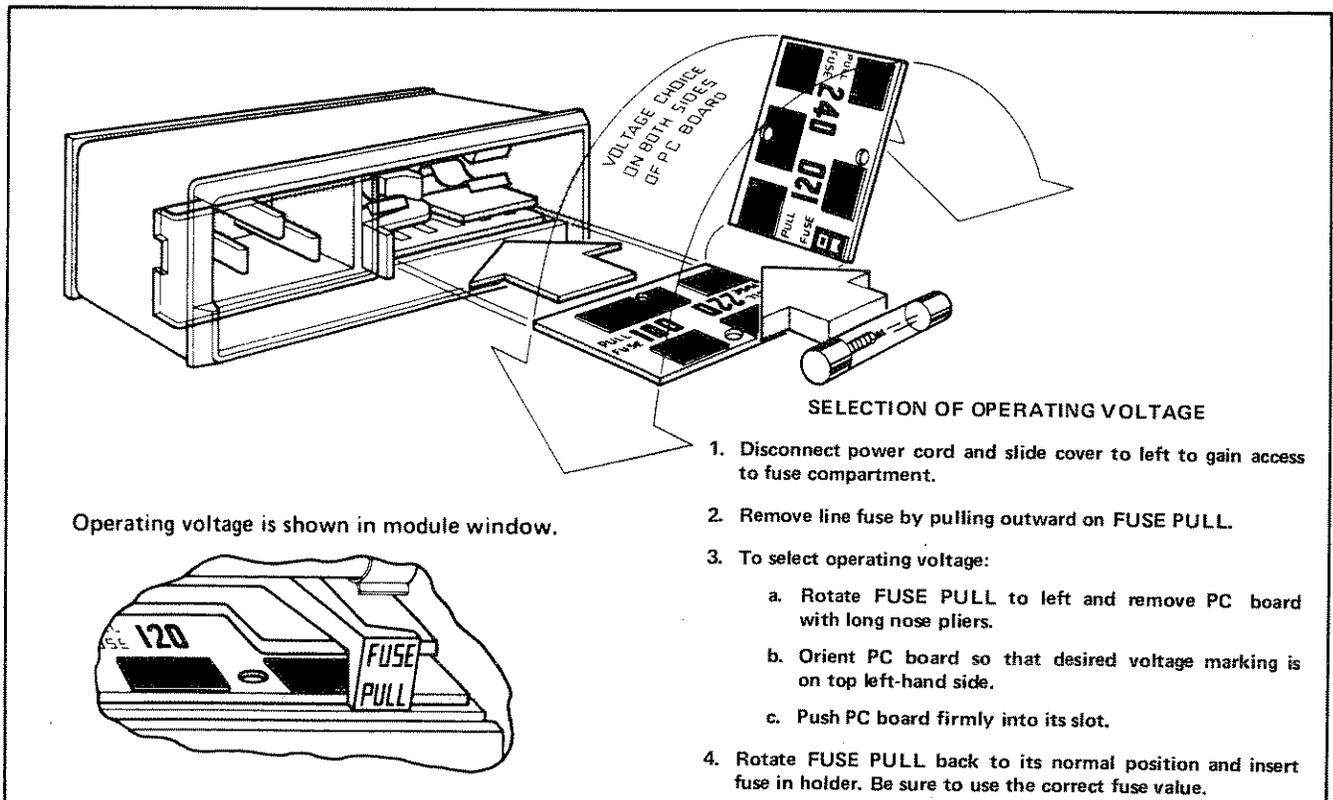


Figure 1-4A. Line Voltage Selection

Page 1-16, Paragraph 1-120:

Delete “unscrew retaining ring near the front panel.”

Page 2-1, Paragraph 2-4:

Change line voltage requirements to 100, 120, 220, or 240 volts ac +5 –10%.

Page 2-1, Table 2-1:

Change Signal Source Frequency Range to 0.11 to 18 GHz.

Add Recommended HP Model 8620A/86290A.

Page 3-1

Add the following maintenance precaution:

PRINTED CIRCUIT BOARD REMOVAL. Turn off the line voltage before removing, or replacing, printed circuit boards. Damage to integrated circuits may occur if power is applied during printed circuit board removal or replacement.

Page 3-1, Paragraph 3-4:

Change line voltage requirements to 100, 120, 220, or 240 volts ac +5% –10%.

Page 3-1, Paragraph 3-9:

Change to read as follows:

A circuit board extender (HP Part No. 08410-60109) is supplied with the 8410B and is stored behind the front panel assembly (Figure 3-19A). The extender raises boards clear of the chassis for easier access to the test points, and is designed to work with either 12 or 15 pin circuit boards.

Page 3-3, Table 3-1:

Change Signal Source Frequency Range to 0.11 to 18 GHz.

Add Recommended HP Model 8620A/86290A.

Page 3-4, Table 3-1:

Change Item 11 to: Digital Voltmeter, Recommended HP Model 3480 C/D with 3484A multifunction unit.

Page 3-6, Table 3-2:

Add the following:

P/O Table 3-2. 8410B Alignment Controls

| REFERENCE DESIGNATOR | FUNCTION AFFECTED | COMPONENT LOCATION FIGURE | ADJUSTMENT PROCEDURE Figure 3-11 |
|----------------------|---------------------------------|---------------------------|----------------------------------|
| A9R9 | VTO Trigger Threshold | 3-82 | 15 |
| A9R17 | Sweep Delay | 3-82 | 15 |
| A18R2 | Auto frequency range selection. | 3-84 | 16 |

Page 3-46, Figure 3-11:

Add the following adjustment procedures.

| TEST | DESCRIPTION AND PROCEDURE |
|------|--|
| 15 | <p>CIRCUIT 8410B AUTOMATIC CONTROL ASSEMBLY A9. (Adjust A9R9 and A9R17).</p> <p>DESCRIPTION The VTO Trigger Threshold (A9R9) is adjusted to ensure the automatic relocking cycle is triggered when the 8411A VTO reaches the upper limits of frequency range.</p> <p>The Sweep Delay is adjusted to give the 8410B enough time to stabilize after phase locking.</p> |

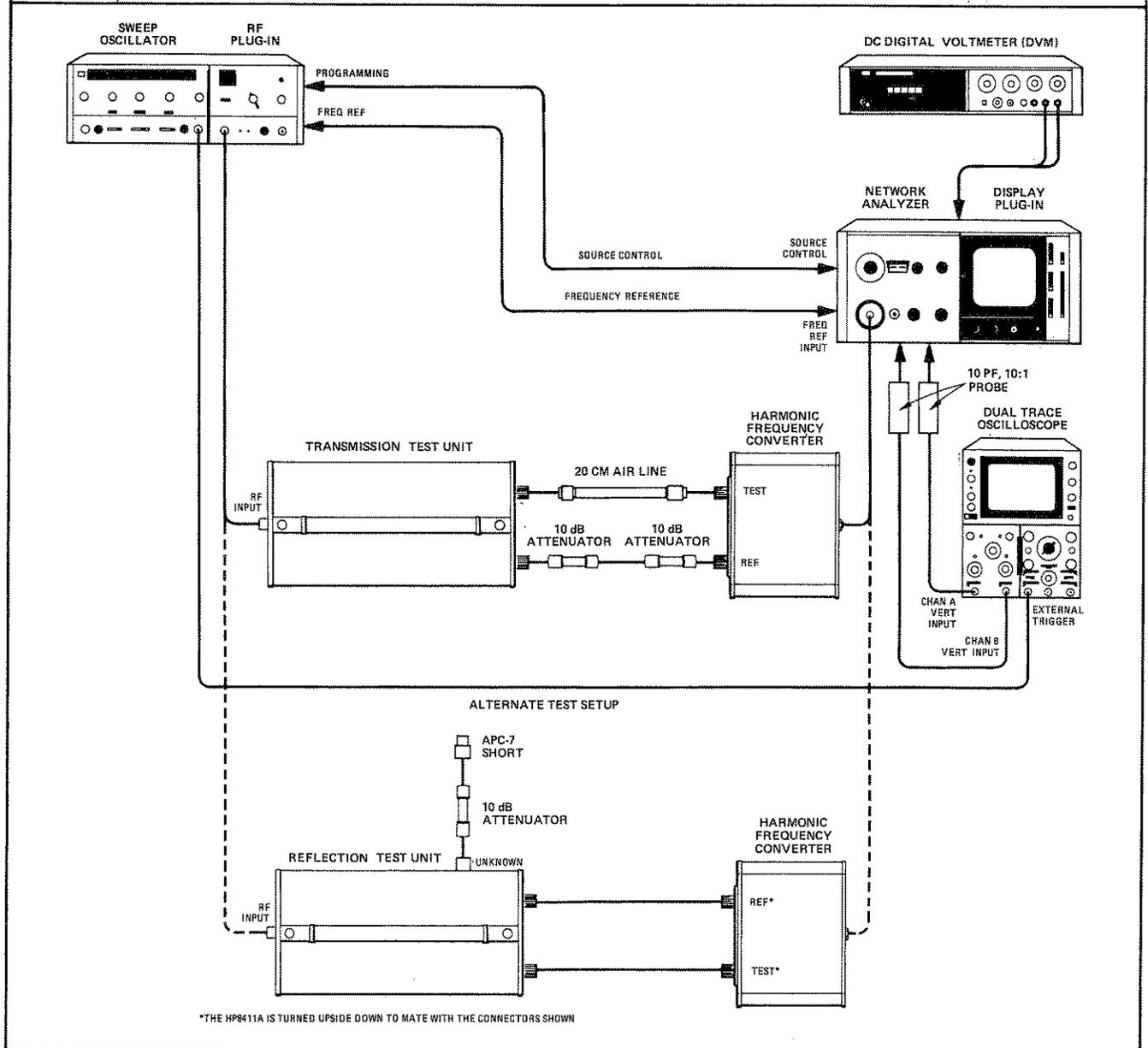


Figure 3-11. Adjustment Procedure (Sheet 25 of 27).

| TEST | DESCRIPTION AND PROCEDURE |
|------------------------|---|
| <p>15 (Cont'd)</p> | <p>PROCEDURE</p> <ol style="list-style-type: none"> a. Connect DVM between A9TP1 and chassis ground. Adjust VTO trigger threshold THR (A9R9) for 11.20 Vdc \pm0.01 Vdc. b. Phase lock 8410B as follows: <ol style="list-style-type: none"> 1. Set sweep oscillator to sweep over less than one octave band. (For example 4.5 GHz to 7.5 GHz). 2. Set FREQ RANGE (GHz) switch on 8410B to AUTO position. 3. With the sweep oscillator set to a slow sweep time, adjust RF power from the sweep oscillator for REF CHANNEL LEVEL meter indication in the middle of the OPERATE range. Reset sweep time to a faster sweep. 4. Set SWEEP STABILITY for best display on 8412A, 8413A, or 8414A. 5. Adjust 8410B PHASE VERNIER control; phase indication on 8412A, 8413A, or 8414A should change smoothly, indicating the 8410B is tracking properly. c. Connect 10:1 probes of dual trace oscilloscope to 8410B — A9TP2 and A9TP3. Set up oscilloscope to A plus B display. Adjust sweep delay DLY (A9R17) for a positive pulse of 1.6 msec duration. |
| <p>16</p> | <p>CIRCUIT 8410B A/D CONVERTER A18 (Adjust A18R2)</p> <p>DESCRIPTION The frequency range switching points in AUTO mode are affected by the A/D reference voltage set by A18R2. For this adjustment no test setup is required.</p> <p>PROCEDURE</p> <ol style="list-style-type: none"> a. Connect DVM between 8410B-A18TP8 and chassis ground. Adjust A18R2 A/D ADJ for 11.25 Vdc \pm0.01 Vdc. |

Figure 3-11. Adjustment Procedure (Sheet 26 of 27)

Page 3-52, Table 3-8:

Change A9 to HP Part No. 08410-60106 ASSY: AUTOMATIC CONTROL

NOTE: See Table 3-8A for complete parts list.

Page 3-59, Table 3-8:

Add the following:

| | | |
|-----|-----------|-----------------------------------|
| C39 | 0160-2436 | C:FXD CER 10 PF 20% 200VDCW |
| C40 | 0160-2438 | C:FXD CER 5000 PF +80-20% 200VDCW |
| C41 | 0160-2436 | C:FXD CER 10 PF 20% 200VDCW |
| C42 | 0160-2436 | C:FXD CER 10 PF 20% 200VDCW |
| C43 | 0160-2436 | C:FXD CER 10 PF 20% 200VDCW |
| C44 | 0160-2436 | C:FXD CER 10 PF 20% 200VDCW |
| C45 | 0160-2436 | C:FXD CER 10 PF 20% 200VDCW |
| C46 | 0160-0939 | C:FXD MICA 430 PF 5% 300VDGW |
| FL1 | 5060-9422 | LINE POWER MODULE |

Delete J14.

Change J17 to HP Part No. 1251-0143 CONNECTOR: 14 PIN FEMALE

Change J18 to HP Part No. 1510-0087 BINDING POST:GRAY

Page 3-60, Table 3-8:

Add L13 HP Part No. 9100-2249 COIL: FXD 1.15 μ H \pm 10%

Change S1 to HP Part No. 3100-3317.

Delete S2

Change T1 to HP Part No. 9100-3812

Add XA17 HP Part No. 1251-1190 CONNECTOR:PC EDGE 2 ROW 24 CONTACT

Add XA18 HP Part No. 1251-1190 CONNECTOR:PC EDGE 2 ROW 24 CONTACT

Add XA19 HP Part No. 1251-1190 CONNECTOR:PC EDGE 2 ROW 24 CONTACT

Delete XF1

Change COVER:MOVABLE HOUSING BOARD to HP Part No. 08410-0060

Change COVER:MOVABLE HOUSING CONNECTOR to HP Part No. 08410-00059.

Page 3-61, Table 3-8:

Change KNOB:BLACK 3/4" DIAL to HP Part No. 08410-00058

Page 3-62, Table 3-8:

Change Item 2 to HP Part No. 08410-00056.

Page 3-63, Table 3-8:

Change Item 2 to HP Part No. 7120-4476.

Change Item 4 to HP Part No. 08410-00061.

Page 3-64

Add Table 3-8A

Page 3-72

Add Figure 3-16A. 8410B Troubleshooting Procedure.

Page 3-74, Figure 3-19 (Sheet 1 of 2):

Substitute Figure 3-19A.

Page 3-75, Figure 3-21:

Substitute Figure 3-21A.

Page 3-78, Figure 3-24:

Substitute Figure 3-24A.

Page 3-79, Figure 3-26:

Change the note in the PHASE-LOCK AND SEARCH CIRCUIT block to read as follows:

NOTE

Frequency is 250 Hz in the two lowest and the highest frequency ranges.
Amplitude depends on frequency range switch setting.

Page 3-101, Figure 3-70:

Change description of 938 wire from XA5-1 to read as follows:

PHASE ERROR SIGNAL TO A19-23 FREQUENCY RANGE ASSEMBLY

Page 3-103, Figure 3-74

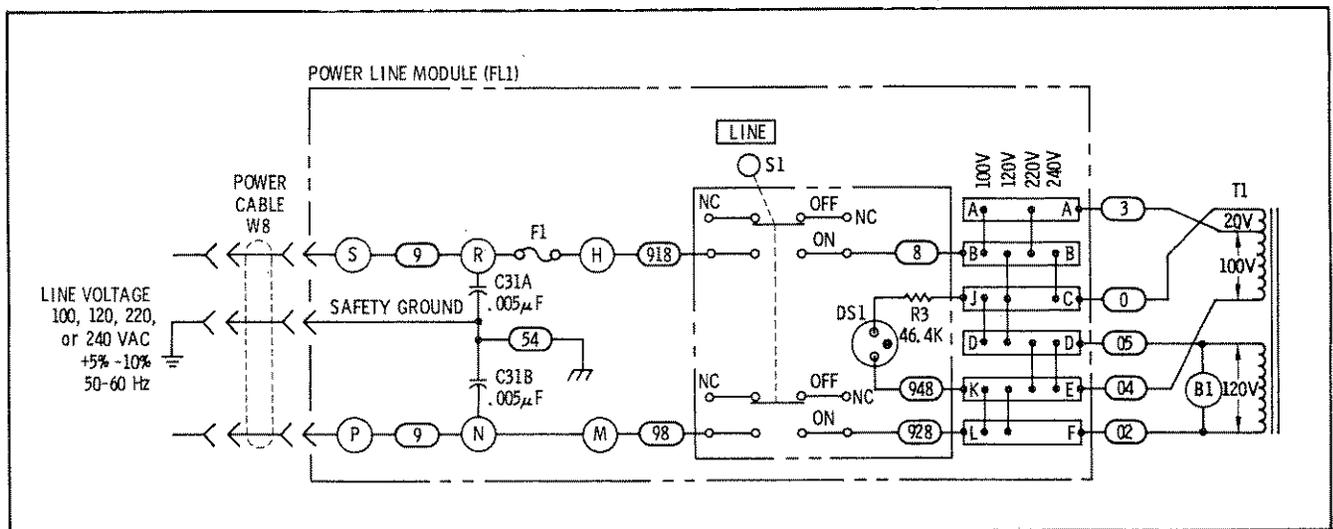
Substitute Figure 3-74A.

Page 3-106, Figure 3-77:

Change $\pm 20V$ power supply outputs as shown in partial schematic on page 1-11.

Page 3-108, Figure 3-81:

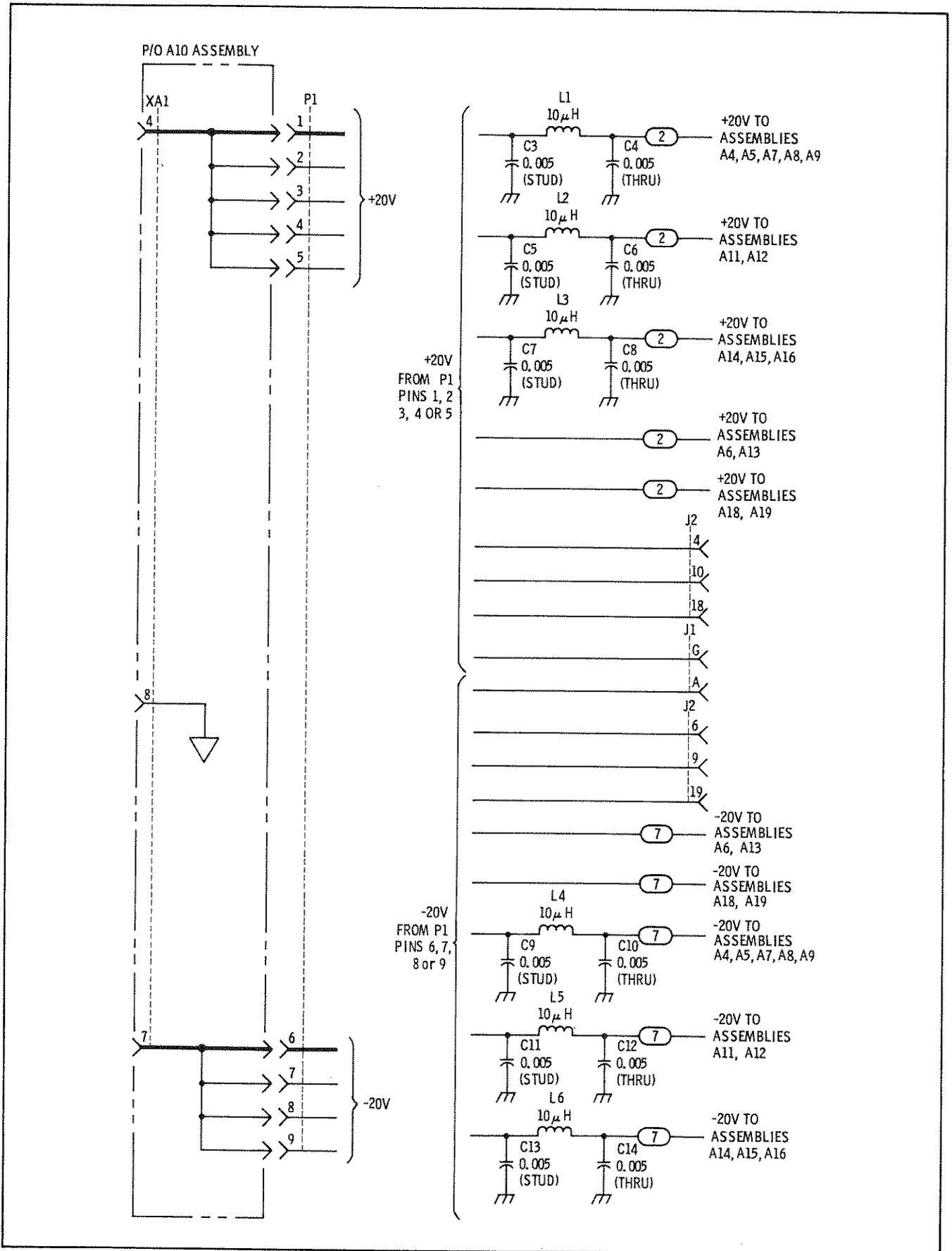
Substitute partial schematic shown below for primary power section.



P/O Figure 3-81. Power Supply Schematic Diagram

After Page 3-108:

Add Figures 3-82 thru 3-88.



P/O Figure 3-77. 8410B +20V and -20V Power Supply Schematic Diagram

Table 3-8A. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|---|----------|-------------------|
| A9 | C8410-60106 | 1 | BOARD ASSY, AUTOMATIC CONTROL | 28480 | 08410-60106 |
| A9C1 | 0160-0575 | 2 | CAPACITOR-FXD .047UF +-20% 50WVDC CER | 28480 | 0160-0575 |
| A9C2 | 0160-3877 | 1 | CAPACITOR-FXD 100PF +-20% 200WVDC CER | 28480 | 0160-3877 |
| A9C3 | 0160-0575 | 1 | CAPACITOR-FXD .047UF +-20% 50WVDC CER | 28480 | 0160-0575 |
| A9C4 | 0160-0571 | 1 | CAPACITOR-FXD 470PF +-20% 100WVDC CER | 28480 | 0160-0571 |
| A9C5 | 0180-1745 | 1 | CAPACITOR-FXD; 1.5UF+-10% 20VDC TA | 56289 | 150D155X9020A2 |
| A9C6 | 0180-1743 | 2 | CAPACITOR-FXD; .1UF+-10% 35VDC TA-SOLID | 56289 | 150D104X9035A2 |
| A9C7 | 0180-1743 | 2 | CAPACITOR-FXD; .1UF+-10% 35VDC TA-SOLID | 56289 | 150D104X9035A2 |
| A9C8 | 0160-4084 | 2 | CAPACITOR-FXD .1UF +-20% 50WVDC CER | 28480 | 0160-4084 |
| A9C9 | 0180-1746 | 3 | CAPACITOR-FXD; 15UF+-10% 20VDC TA-SOLID | 56289 | 150D156X9020B2 |
| A9C10 | 0160-4084 | 2 | CAPACITOR-FXD .1UF +-20% 50WVDC CER | 28480 | 0160-4084 |
| A9CR1 | 1901-0040 | 2 | DIODE-SWITCHING ZNS 30V 50MA | 28480 | 1901-0040 |
| A9CR2 | 1901-0040 | 2 | DIODE-SWITCHING ZNS 30V 50MA | 28480 | 1901-0040 |
| A9G1 | 1854-0071 | 10 | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| A9G2 | 1854-0071 | 1 | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| A9G3 | 1854-0071 | 1 | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| A9G4 | 1854-0071 | 1 | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| A9G5 | 1854-0071 | 1 | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| A9G6 | 1855-0020 | 3C | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A9G7 | 1854-0071 | 1 | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| A9G8 | 1854-0071 | 1 | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| A9G9 | 1854-0071 | 1 | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| A9G10 | 1854-0071 | 1 | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| A9F1 | 0757-0465 | 6 | RESISTOR 100K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-1003-F |
| A9F2 | 0757-0461 | 1 | RESISTOR 68.1K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-6812-F |
| A9F3 | 0757-0442 | 3 | RESISTOR 10K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-1002-F |
| A9F4 | 0683-1055 | 1 | RESISTOR 1M 5% .25W FC TC=-800/+900 | 01121 | CP1055 |
| A9F5 | 0757-0458 | 5 | RESISTOR 51.1K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-5112-F |
| A9F6 | 0757-0458 | 1 | RESISTOR 51.1K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-5112-F |
| A9F7 | 0757-0458 | 1 | RESISTOR 51.1K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-5112-F |
| A9F8 | 0698-3162 | 1 | RESISTOR 46.4K 1% .125W F TC=0+-100 | 16299 | C4-1/8-T0-4642-F |
| A9F9 | 2100-3109 | 1 | RESISTOR-VAR TRMR 2KOHM 10% C SIDE ADJ | 32997 | 3006P-1-202 |
| A9F10 | 0757-0290 | 1 | RESISTOR 6.19K 1% .125W F TC=0+-100 | 19701 | ME4C1/8-T0-6191-F |
| A9F11 | 0757-0428 | 3 | RESISTOR 1.62K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-1621-F |
| A9F12 | 0757-0421 | 4 | RESISTOR 825 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-825R-F |
| A9F13 | 0757-0416 | 3 | RESISTOR 511 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-511R-F |
| A9F14 | 0757-0458 | 3 | RESISTOR 51.1K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-5112-F |
| A9F15 | 0757-0442 | 1 | RESISTOR 10K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-1002-F |
| A9F16 | 0757-0420 | 2 | RESISTOR 750 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-751-F |
| A9F17 | 2100-3094 | 1 | RESISTOR-VAR TRMR 10KOHM 10% C SIDE ADJ | 32997 | 3006P-1-104 |
| A9F18 | 0757-0442 | 1 | RESISTOR 10K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-1002-F |
| A9F19 | 0698-3158 | 2 | RESISTOR 23.7K 1% .125W F TC=0+-100 | 16299 | C4-1/8-T0-2372-F |
| A9F20 | 0757-0444 | 1 | RESISTOR 12.1K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-1212-F |
| A9F21 | 0757-0123 | 1 | RESISTOR 34.8K 1% .125W F TC=0+-100 | 24546 | C5-1/4-T0-3482-F |
| A9F22 | 0698-0083 | 3 | RESISTOR 1.96K 1% .125W F TC=0+-100 | 16299 | C4-1/8-T0-1961-F |
| A9F23 | 0698-3156 | 3 | RESISTOR 14.7K 1% .125W F TC=0+-100 | 16299 | C4-1/8-T0-1472-F |
| A9F24 | 0698-0083 | 1 | RESISTOR 1.96K 1% .125W F TC=0+-100 | 16299 | C4-1/8-T0-1961-F |
| A9F25 | 0757-0280 | 2 | RESISTOR 1K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-1001-F |
| A9F26 | 0698-3155 | 1 | RESISTOR 4.64K 1% .125W F TC=0+-100 | 16299 | C4-1/8-T0-4641-F |
| A9F27 | 0698-3156 | 1 | RESISTOR 14.7K 1% .125W F TC=0+-100 | 16299 | C4-1/8-T0-1472-F |
| A9F28 | 0698-3158 | 1 | RESISTOR 23.7K 1% .125W F TC=0+-100 | 16299 | C4-1/8-T0-2372-F |
| A9F29 | 0757-0440 | 2 | RESISTOR 7.5K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-7501-F |
| A9F30 | 0698-3153 | 1 | RESISTOR 3.83K 1% .125W F TC=0+-100 | 16299 | C4-1/8-T0-3831-F |
| A9F31 | 0757-0416 | 2 | RESISTOR 511 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-511R-F |
| A9F32 | 0757-0438 | 2 | RESISTOR 5.11K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-5111-F |
| A9F33 | 0698-3446 | 2 | RESISTOR 383 1% .125W F TC=0+-100 | 16299 | C4-1/8-T0-383R-F |
| A9F34 | 0698-3443 | 3 | RESISTOR 287 1% .125W F TC=0+-100 | 16299 | C4-1/8-T0-287R-F |
| A9F35 | 0757-0428 | 1 | RESISTOR 1.62K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-1621-F |
| A9F36 | 0698-3260 | 30 | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PMF555 |
| A9U1 | 1820-1538 | 1 | IC CD4011AE | 02735 | CD4011AE |
| A9U2 | 1820-1569 | 2 | IC MC14528CP | 04713 | MC14528CP |
| A9U3 | 1820-1569 | 1 | IC MC14528CP | 04713 | MC14528CP |
| A9U4 | 1826-0026 | 2 | IC LM311H | 27014 | LM311H |
| A9VR1 | 1902-0680 | 2 | DIODE-ZNR 1N827 6.2V 5% DO-7 PD=.25W | 33877 | 1N827 |
| A9VR2 | 1902-0071 | 2 | DIODE-ZNR 9V 5% DO-14 PD=.5W TC=+.001% | 28480 | 1902-0071 |
| A9VR3 | 1902-0025 | 1 | DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06% | 04713 | SZ 10939-182 |
| A9XU1 | 1200-0508 | 7 | SOCKET; ELEC; IC 14-CONT DIP SLDR TERM | 06776 | ICN-143-S3W |
| A9XU2 | 1200-0507 | 10 | SOCKET; ELEC; IC 16-CONT DIP SLDR TERM | 06776 | ICN-163-S3W |
| A9XU3 | 1200-0507 | 1 | SOCKET; ELEC; IC 16-CONT DIP SLDR TERM | 06776 | ICN-163-S3W |
| A9XU4 | 1200-0455 | 2 | SOCKET; ELFC; IC 8-CONT DIP SLDR TERM | 91506 | 508-86-10 |

Table 3-8A. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|--|----------|---------------------|
| A17 | 08410-60109 | 1 | BOARD ASSY, EXTENDER | 28480 | 08410-60109 |
| A18 | 08410-60107 | 1 | BOARD ASSY, A/O CONVERTER | 28480 | 08410-60107 |
| A18C1 | 0180-1746 | 1 | CAPACITOR-FXD; 15UF+-10% 20VDC TA-SOLID | 56289 | 150D156X902082 |
| A18C2 | 0160-3466 | | CAPACITOR-FXD 100PF +-10% 100VDC CER | 28480 | 0160-3466 |
| A18C3 | 0180-1746 | | CAPACITOR-FXD; 15UF+-10% 20VDC TA-SOLID | 56289 | 150D156X902082 |
| A18CR1 | 1901-0470 | | DIODE-HV RECT 1KV 600MA | 04713 | SF1358-14 |
| A18MP1 | 5040-6843 | | EXTRACTOR, P.C. BOARD | 28480 | 5040-6843 |
| A18MP2 | 5000-9043 | 1 | PIN: P.C. BOARD EXTRACTOR | 28480 | 5000-9043 |
| A18Q1 | 1854-0071 | | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| A18R1 | 0698-0082 | 1 | RESISTOR 464 1% .125W F TC=0+-100 | 16299 | C4-1/8-TQ-6640-F |
| A18R2 | 2100-3154 | | RESISTOR-VAR TRMR 1KOHM 10% C SIDE ADJ | 32997 | 3006P-1-102 |
| A18R3 | 0757-0421 | | RESISTOR 825 1% .125W F TC=0+-100 | 24546 | C4-1/8-TQ-825R-F |
| A18R4 | 0757-0424 | | RESISTOR 1.1K 1% .125W F TC=0+-100 | 24546 | C4-1/8-TQ-1101-F |
| A18R5 | 0757-0421 | | RESISTOR 825 1% .125W F TC=0+-100 | 24546 | C4-1/8-TQ-825R-F |
| A18R6 | 0757-0417 | 2 | RESISTOR 562 1% .125W F TC=0+-100 | 24546 | C4-1/8-TQ-562R-F |
| A18R7 | 0698-3466 | | RESISTOR 393 1% .125W F TC=0+-100 | 16299 | C4-1/8-TQ-383R-F |
| A18R8 | 0698-3443 | | RESISTOR 287 1% .125W F TC=0+-100 | 16299 | C4-1/8-TQ-287R-F |
| A18R9 | 0698-3440 | | RESISTOR 196 1% .125W F TC=0+-100 | 16299 | C4-1/8-TQ-196R-F |
| A18R10 | 0698-3438 | | RESISTOR 147 1% .125W F TC=0+-100 | 16299 | C4-1/8-TQ-147R-F |
| A18R11 | 0757-0401 | 1 | RESISTOR 100 1% .125W F TC=0+-100 | 24546 | C4-1/8-TQ-101-F |
| A18R12 | 0757-0397 | | RESISTOR 69.1 1% .125W F TC=0+-100 | 24546 | C4-1/8-TQ-691R-F |
| A18R13 | 0757-0394 | | RESISTOR 51.1 1% .125W F TC=0+-100 | 24546 | C4-1/8-TQ-511R-F |
| A18R14 | 0698-3434 | | RESISTOR 34.8 1% .125W F TC=0+-100 | 16299 | C4-1/8-TQ-348R-F |
| A18R15 | 0698-3432 | | RESISTOR 26.1 1% .125W F TC=0+-100 | 03888 | PME55-1/4-TQ-26R1-F |
| A18R16 | 0757-0276 | 1 | RESISTOR 61.9 1% .125W F TC=0+-100 | 24546 | C4-1/8-TQ-6192-F |
| A18R17 | 0757-0416 | | RESISTOR 511 1% .125W F TC=0+-100 | 24546 | C4-1/8-TQ-5112-F |
| A18R18 | 0757-0394 | | RESISTOR 51.1 1% .125W F TC=0+-100 | 24546 | C4-1/8-TQ-511R-F |
| A18R19 | 0757-0458 | | RESISTOR 51.1K 1% .125W F TC=0+-100 | 24546 | C4-1/8-TQ-5112-F |
| A18R20 | 0757-0462 | | RESISTOR 75K 1% .125W F TC=0+-100 | 24546 | C4-1/8-TQ-7502-F |
| A18R21 | 0698-3450 | 1 | RESISTOR 42.2K 1% .125W F TC=0+-100 | 16299 | C4-1/8-TQ-4222-F |
| A18R22 | 0757-0465 | | RESISTOR 100K 1% .125W F TC=0+-100 | 24546 | C4-1/8-TQ-1003-F |
| A18R23 | 0757-0465 | | RESISTOR 100K 1% .125W F TC=0+-100 | 24546 | C4-1/8-TQ-1003-F |
| A18R24 | 0757-0465 | | RESISTOR 100K 1% .125W F TC=0+-100 | 24546 | C4-1/8-TQ-1003-F |
| A18R25 | 0757-0465 | | RESISTOR 100K 1% .125W F TC=0+-100 | 24546 | C4-1/8-TQ-1003-F |
| A18R26 | 0757-0465 | 1 | RESISTOR 100K 1% .125W F TC=0+-100 | 24546 | C4-1/8-TQ-1003-F |
| A18R27 | 0698-3159 | | RESISTOR 26.1K 1% .125W F TC=0+-100 | 16299 | C4-1/8-TQ-2612-F |
| A18U1 | 1820-1534 | 1 | IC CD4001AE | 02735 | CD4001AE |
| A18U2 | 1820-1535 | | IC CD4025AE | 02735 | CD4025AE |
| A18U3 | 1820-1570 | | IC MC14532CP | 04713 | MC14532CP |
| A18U4 | 1820-1570 | | IC MC14532CP | 04713 | MC14532CP |
| A18U5 | 1820-1540 | | IC CD4042AE | 02735 | CD4042AE |
| A18U6 | 1820-1540 | 3 | IC CD4042AE | 02735 | CD4042AE |
| A18U7 | 1826-0026 | | IC LM311H | 27014 | LM311H |
| A18U8 | 1826-0161 | | IC LM324N | 27014 | LM324N |
| A18U9 | 1820-1540 | | IC CD4042AE | 02735 | CD4042AE |
| A18U10 | 1820-1540 | | IC CD4042AE | 02735 | CD4042AE |
| A18U11 | 1826-0161 | 1 | IC LM324N | 27014 | LM324N |
| A18U12 | 1826-0161 | | IC LM324N | 27014 | LM324N |
| A18VR1 | 1902-0680 | 1 | DIODE-ZNR 1N827 6.2V 5% DO-7 PD=.25W | 03877 | 1N827 |
| A18VR2 | 1902-0071 | | DIODE-ZNR 9V 5% DO-14 PD=.5W TC=+.001% | 28480 | 1902-0071 |
| A18VR3 | 1902-3256 | | DIODE-ZNR 22.7V 5% DO-7 PD=.4W TC=+.076% | 04713 | SZ 10939-290 |
| A18VR4 | 1902-3182 | | DIODE-ZNR 12.1V 5% DO-7 PD=.4W TC=+.064% | 04713 | SZ 10939-206 |
| A18XU1 | 1200-0508 | 1 | SOCKET; ELEC; IC 14-CONT DIP SLDR TERM | 06776 | ICN-143-S3W |
| A18XU2 | 1200-0508 | | SOCKET; ELEC; IC 14-CONT DIP SLDR TERM | 06776 | ICN-143-S3W |
| A18XU3 | 1200-0507 | | SOCKET; ELEC; IC 16-CONT DIP SLDR TERM | 06776 | ICN-163-S3W |
| A18XU4 | 1200-0507 | | SOCKET; ELEC; IC 16-CONT DIP SLDR TERM | 06776 | ICN-163-S3W |
| A18XU5 | 1200-0507 | | SOCKET; ELEC; IC 16-CONT DIP SLDR TERM | 06776 | ICN-163-S3W |
| A18XU6 | 1200-0507 | 1 | SOCKET; ELEC; IC 16-CONT DIP SLDR TERM | 06776 | ICN-163-S3W |
| A18XU7 | 1200-0455 | | SOCKET; ELEC; IC 8-CONT DIP SLDR TERM | 91506 | 508-AG-10 |
| A18XU8 | 1200-0508 | | SOCKET; ELEC; IC 14-CONT DIP SLDR TERM | 06776 | ICN-143-S3W |
| A18XU9 | 1200-0507 | | SOCKET; ELEC; IC 16-CONT DIP SLDR TERM | 06776 | ICN-163-S3W |
| A18XU10 | 1200-0507 | | SOCKET; ELEC; IC 16-CONT DIP SLDR TERM | 05776 | ICN-163-S3W |
| A18XU11 | 1200-0508 | 1 | SOCKET; ELEC; IC 14-CONT DIP SLDR TERM | 06776 | ICN-143-S3W |
| A18XU12 | 1200-0508 | | SOCKET; ELEC; IC 14-CONT DIP SLDR TERM | 06776 | ICN-143-S3W |
| A19 | 08410-60108 | 1 | BOARD ASSY, FREQUENCY RANGE | 28480 | 08410-60108 |
| A19C1 | 0180-0374 | 1 | CAPACITOR-FXD; 10UF+-10% 20VDC TA-SOLID | 56289 | 150D106X902082 |
| A19MP1 | 5040-6843 | | EXTRACTOR P.C. BOARD | 28480 | 5040-6843 |
| A19MP2 | 5000-9043 | | PIN: P.C. BOARD EXTRACTOR | 28480 | 5000-9043 |
| A19Q1 | 1855-0082 | | TRANSISTOR MOSFET P-CHAN D-MODE SI | 28480 | 1855-0082 |
| A19Q2 | 1855-0082 | | TRANSISTOR MOSFET P-CHAN D-MODE SI | 28480 | 1855-0082 |
| A19Q3 | 1855-0082 | 5 | TRANSISTOR MOSFET P-CHAN D-MODE SI | 28480 | 1855-0082 |
| A19Q4 | 1855-0082 | | TRANSISTOR MOSFET P-CHAN D-MODE SI | 28480 | 1855-0082 |
| A19Q5 | 1855-0082 | | TRANSISTOR MOSFET P-CHAN D-MODE SI | 28480 | 1855-0082 |

Table 3-8A. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|---|----------|----------------------|
| A19Q6 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q7 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q8 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q9 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q10 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q11 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q12 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q13 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q14 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q15 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q16 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q17 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q18 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q19 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q20 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q21 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q22 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q23 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q24 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q25 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q26 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q27 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q28 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q29 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q30 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q31 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q32 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q33 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19Q34 | 1855-0020 | | TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI | 28480 | 1855-0020 |
| A19R1 | 0757-0462 | | RESISTOR 75K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-7502-F |
| A19R2 | 0757-0462 | | RESISTOR 75K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-7502-F |
| A19R3 | 0757-0462 | | RESISTOR 75K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-7502-F |
| A19R4 | 0757-0280 | | RESISTOR 1K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-1001-F |
| A19R5 | 0757-0462 | | RESISTOR 75K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-7502-F |
| A19R6 | 0757-0462 | | RESISTOR 75K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-7502-F |
| A19R7 | 0698-3154 | 1 | RESISTOR 4.22K 1% .125W F TC=0+-100 | 16299 | C4-1/8-T0-4221-F |
| A19R8 | 0757-0440 | | RESISTOR 7.5K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-7501-F |
| A19R9 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME555 |
| A19R10 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME555 |
| A19R11 | 0757-0199 | 1 | RESISTOR 21.5K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-2152-F |
| A19R12 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME555 |
| A19R13 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME555 |
| A19R14 | 0757-0279 | 1 | RESISTOR 3.16K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-3161-F |
| A19R15 | 0698-3429 | 1 | RESISTOR 19.6 1% .125W F TC=0+-100 | 03888 | PME555-1/3-T0-1946-F |
| A19R16 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME555 |
| A19R17 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME555 |
| A19R18 | 0757-0428 | | RESISTOR 1.62K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-1621-F |
| A19R19 | 0757-0399 | 1 | RESISTOR 82.5 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-8255-F |
| A19R20 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME555 |
| A19R21 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME555 |
| A19R22 | 0757-0420 | | RESISTOR 750 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-751-F |
| A19R23 | 0698-3444 | 2 | RESISTOR 316 1% .125W F TC=0+-100 | 16299 | C4-1/8-T0-316R-F |
| A19R24 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME555 |
| A19R25 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME555 |
| A19R26 | 0757-0417 | | RESISTOR 562 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-562R-F |
| A19R27 | 0698-3447 | 1 | RESISTOR 422 1% .125W F TC=0+-100 | 16299 | C4-1/8-T0-422R-F |
| A19R28 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME555 |
| A19R29 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME555 |
| A19R30 | 0698-3444 | | RESISTOR 316 1% .125W F TC=0+-100 | 16299 | C4-1/8-T0-316R-F |
| A19R31 | 0757-0418 | 1 | RESISTOR 619 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-619R-F |
| A19R32 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME555 |
| A19R33 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME555 |
| A19R34 | 0698-3443 | | RESISTOR 287 1% .125W F TC=0+-100 | 16299 | C4-1/8-T0-287R-F |
| A19R35 | 0757-0421 | | RESISTOR 825 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-825R-F |
| A19R36 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME555 |
| A19R37 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME555 |
| A19R38 | 0698-3440 | | RESISTOR 196 1% .125W F TC=0+-100 | 16299 | C4-1/8-T0-196R-F |
| A19R39 | 0757-1094 | 1 | RESISTOR 1.47K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-1471-F |
| A19R40 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME555 |
| A19R41 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME555 |
| A19R42 | 0698-3438 | | RESISTOR 147 1% .125W F TC=0+-100 | 16299 | C4-1/8-T0-147R-F |
| A19R43 | 0698-0083 | | RESISTOR 1.96K 1% .125W F TC=0+-100 | 16299 | C4-1/8-T0-1961-F |
| A19R44 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME555 |
| A19R45 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME555 |

Table 3-8A. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|--|----------|---------------------|
| A19R46 | 0757-0402 | 1 | RESISTOR 110 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-111-F |
| A19R47 | 0698-3152 | 1 | RESISTOR 3.48K 1% .125W F TC=0+-100 | 16299 | C4-1/8-T0-3481-F |
| A19P48 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME55S |
| A19R49 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME55S |
| A19R50 | 0757-0398 | 1 | RESISTOR 75 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-75F0-F |
| A19R51 | 0757-0200 | 1 | RESISTOR 5.62K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-5621-F |
| A19R52 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME55S |
| A19R53 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME55S |
| A19R54 | 0757-0595 | 1 | RESISTOR 56.2 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-56R2-F |
| A19R55 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME55S |
| A19R56 | 0757-0438 | | RESISTOR 5.11K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-5111-F |
| A19R57 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME55S |
| A19R58 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME55S |
| A19R59 | 0698-3435 | 1 | RESISTOR 385. 1% .125W F TC=0+-100 | 16299 | C4-1/8-T0-38R3-F |
| A19R60 | 0757-0439 | 1 | RESISTOR 6.81K 1% .125W F TC=0+-100 | 24546 | C4-1/8-T0-6811-F |
| A19R61 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME55S |
| A19R62 | 0698-3260 | | RESISTOR 464K 1% .125W F TC=0+-100 | 03888 | PME55S |
| A19R63 | 0698-3431 | 1 | RESISTOR 23.7 1% .125W F TC=0+-100 | 03888 | PME55-1/8-T0-23R7-F |
| A19R64 | 0757-0238 | 1 | RESISTOR 9.09K 1% .125W F TC=0+-100 | 19701 | MF4C1/8-T0-9091-F |
| A19R65 | 0698-3156 | | RESISTOR 14.7K 1% .125W F TC=0+-100 | 16299 | C4-1/8-T0-1472-F |
| A19S1 | 3101-1273 | 1 | SWITCH-SL DPDT-NS SUBMIN 2A 120VAC | 28480 | 3101-1273 |
| A19U1 | 1820-1526 | 2 | IC CD4028AE | 02735 | CD4028AE |
| A19U2 | 1820-1526 | | IC CD4028AE | 02735 | CD4028AE |
| A19U3 | 1820-1535 | | IC CD4025AE | 02735 | CD4025AE |
| A15VR1 | 1902-3193 | 1 | DIODE-ZNR 13.3V 5% DO-7 PD=.4W TC*+.059% | 04713 | SZ 10939-218 |
| A19XU1 | 1200-0507 | | SOCKET; ELEC; IC 16-CONT DIP SLDR TERM | 06776 | ICN-163-S3W |
| A19XU2 | 1200-0507 | | SOCKET; ELEC; IC 16-CONT DIP SLDR TERM | 06776 | ICN-163-S3W |
| A19XU3 | 1200-0508 | | SOCKET; ELEC; IC 14-CONT DIP SLDR TERM | 06776 | ICN-143-S3W |

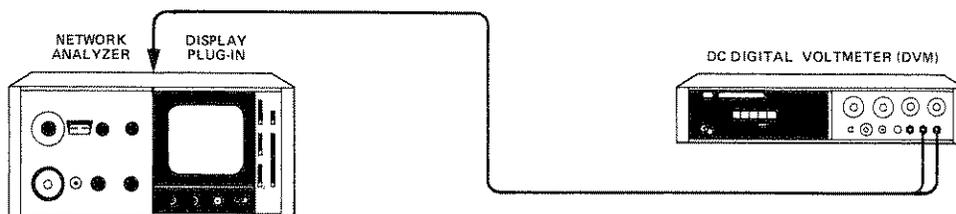
8410B TROUBLESHOOTING PROCEDURE

DESCRIPTION

If the 8410B has trouble phase locking or tracking over single octave or multioctave bands, the following troubleshooting procedure should be followed. The troubleshooting is divided into two parts. Part I tests the A19 Frequency Range Assembly and part of the A18 A/D Converter Assembly used in both AUTO mode and for selected frequency ranges. Part II tests the A9 Automatic Control Assembly and part of the A18 A/D Converter used in AUTO mode only.

PART I

TEST SETUP



NOTE: Use floating terminals on Digital Voltmeter.

TEST EQUIPMENT: Item 11, Table 3-1.

PROCEDURE

- a. Check overall frequency range selection as follows:
 1. Remove A9 Automatic Control Assembly.
 2. Position A19S1 to TEST.
 3. Stepping FREQ RANGE (GHz) control through all frequency range positions, make resistance checks designated in the table below.

NOTE

Use 10K ohms fullrange display on Digital Voltmeter. Improper range selection may result in inaccurate readings.

4. If the resistance check is good, proceed to Part II of the troubleshooting procedure. If the resistance check is incorrect, proceed to Part I, step b.
- b. Set FREQ RANGE (GHz) control to the position where an incorrect indication was found in step a. Make voltage checks at the designated test points in the table below.

Figure 3-16A. 8410B Troubleshooting Procedures (Sheet 1 of 6)

| PART I (Con't.) | | | | | | | | | | | | | | |
|-------------------|------------------|---------|--------|--------|---------|--------|------------------|---------|------|-----|---------|------|-----|------|
| RESISTANCE (OHMS) | | | | | | | | | | | | | | |
| FREQ RANGE (GHz) | A19TP5 to A19TP2 | | | | | | A19TP4 to A19TP3 | | | | | | | |
| | LOW | NOMINAL | HIGH | LOW | NOMINAL | HIGH | LOW | NOMINAL | HIGH | LOW | NOMINAL | HIGH | LOW | HIGH |
| 0.1 – 0.25 | 3.318K | 3.528K | 3.743K | 37 | 56 | 84 | | | | | | | | |
| 0.18 – 0.35 | 1.705K | 1.816K | 1.930K | 56 | 75 | 105 | | | | | | | | |
| 0.25 – 0.5 | 1.110K | 1.185K | 1.264K | 114 | 137 | 170 | | | | | | | | |
| 0.35 – 0.7 | 612 | 657 | 706 | 321 | 357 | 402 | | | | | | | | |
| 0.5 – 1.0 | 481 | 518 | 559 | 411 | 452 | 504 | | | | | | | | |
| 0.7 – 1.4 | 292 | 318 | 348 | 573 | 624 | 685 | | | | | | | | |
| 1.0 – 2.0 | 269 | 293 | 322 | 733 | 794 | 865 | | | | | | | | |
| 1.4 – 2.8 | 193 | 213 | 237 | 1.188K | 1.276K | 1.375K | | | | | | | | |
| 2.0 – 4.0 | 151 | 168 | 190 | 1.492K | 1.599K | 1.717K | | | | | | | | |
| 2.8 – 5.7 | 118 | 134 | 154 | 2.263K | 2.418K | 2.583K | | | | | | | | |
| 4.0 – 8.0 | 87 | 100 | 119 | 3.046K | 3.250K | 3.463K | | | | | | | | |
| 5.7 – 11.3 | 70 | 83 | 100 | 4.825K | 5.138K | 5.462K | | | | | | | | |
| 8.0 – 16.0 | 54 | 65 | 82 | 6.423K | 6.838K | 7.264K | | | | | | | | |
| 11.3 – 18.0 | 40 | 51 | 67 | 8.568K | 9.118K | 9.682K | | | | | | | | |

| TEST POINT | FREQ RANGE (GHZ) | | | | | | | | | | | | | |
|------------|------------------|-----------|----------|----------|---------|---------|---------|---------|---------|---------|---------|----------|----------|-----------|
| | 0.1-0.25 | 0.18-0.35 | 0.25-0.5 | 0.35-0.7 | 0.5-1.0 | 0.7-1.4 | 1.0-2.0 | 1.4-2.8 | 2.0-4.0 | 2.8-5.7 | 4.0-8.0 | 5.7-11.3 | 8.0-16.0 | 11.3-18.0 |
| A18TP2 | +12V | +12V | 0V | 0V | +12V | +12V | 0V | 0V | +12V | +12V | 0V | 0V | +12V | +12V |
| A18TP3 | +12V | +12V | +12V | +12V | +12V | +12V | +12V | +12V | 0V | 0V | 0V | 0V | 0V | 0V |
| A18TP4 | 0V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | +12V | +12V | +12V | +12V | +12V | +12V |
| A18TP5 | +12V | 0V | +12V | 0V | +12V | 0V | +12V | 0V | +12V | 0V | +12V | 0V | +12V | 0V |
| A18TP6 | +12V | +12V | +12V | +12V | 0V | 0V | 0V | 0V | +12V | +12V | +12V | +12V | 0V | 0V |

c. If Part I, step B checks good, the problem is on the A19 Frequency Range Assembly. If Part I, step B check indicates incorrect, the problem is on the A18 A/D Converter Assembly.

d. Replace A9 Automatic Control Assembly and return A18S1 to NORMAL position.

Figure 3-16A. 8410B Troubleshooting Procedures (Sheet 2 of 6)

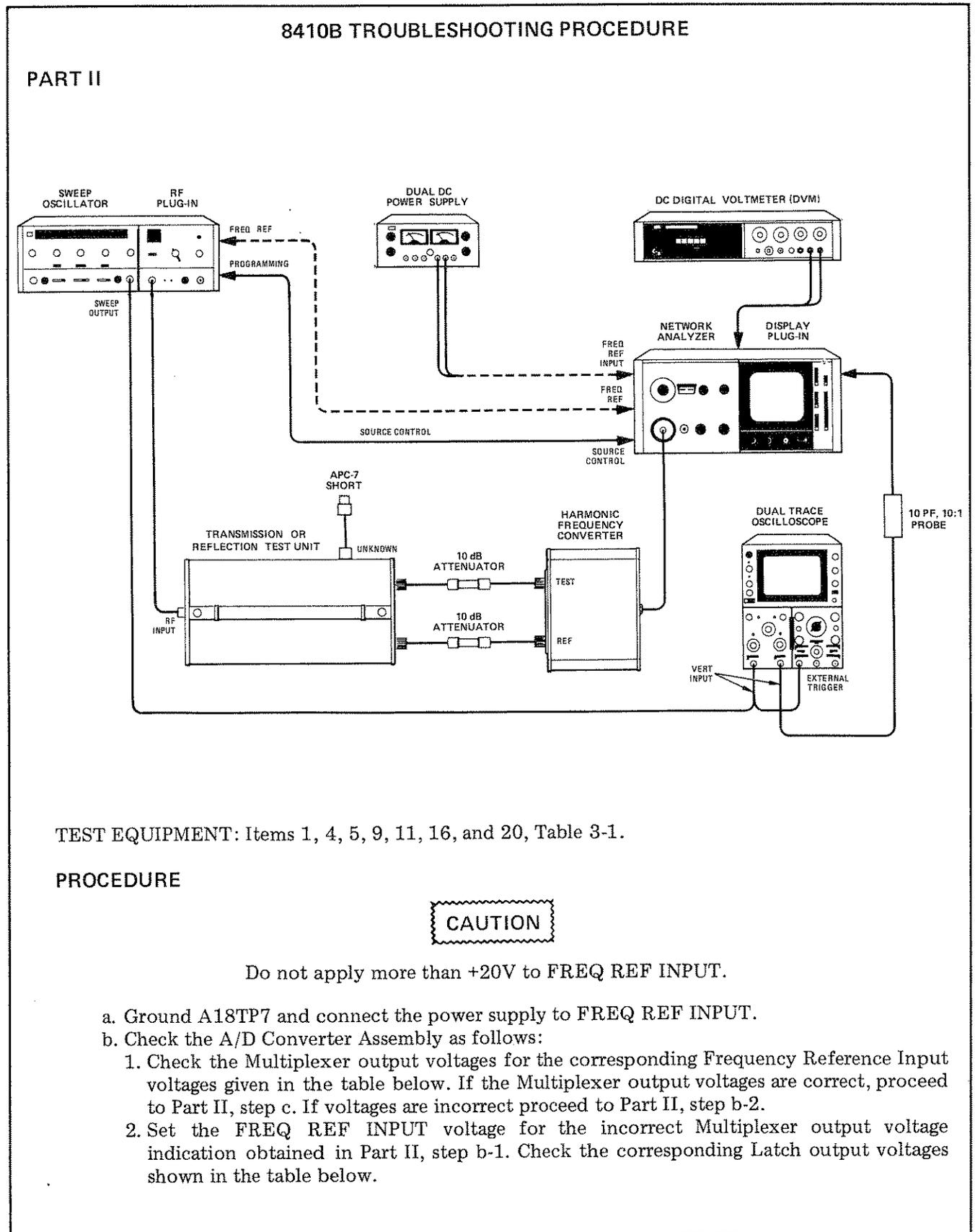


Figure 3-16A. 8410B Troubleshooting Procedures (Sheet 3 of 6)

| PART II (Cont'd) | | | | | | | | | | | | | |
|---|--------|--------|--------|--------|--------|-------|--------|--------|-------|--------|--------|--------|-------|
| 3. If the Latch output voltages are incorrect, the trouble is in the Log A/D Converter or Latch circuitry. If the Latch output voltages are correct, the trouble is in the Encoder or Multiplexer circuitry. | | | | | | | | | | | | | |
| MULTIPLEXER OUTPUTS | | | | | | | | | | | | | |
| FREQ REF INPUT | A18TP2 | A18TP3 | A18TP4 | A18TP5 | A18TP6 | | | | | | | | |
| +0.1V | +12V | +12V | 0V | +12V | +12V | | | | | | | | |
| +0.2V | +12V | +12V | 0V | 0V | +12V | | | | | | | | |
| +0.3V | 0V | +12V | 0V | +12V | +12V | | | | | | | | |
| +0.4V | 0V | +12V | 0V | 0V | +12V | | | | | | | | |
| +0.6V | +12V | +12V | 0V | +12V | 0V | | | | | | | | |
| +0.8V | +12V | +12V | 0V | 0V | 0V | | | | | | | | |
| +1.2V | 0V | +12V | 0V | +12V | 0V | | | | | | | | |
| +1.7V | 0V | +12V | 0V | 0V | 0V | | | | | | | | |
| +2.4V | +12V | 0V | +12V | +12V | +12V | | | | | | | | |
| +3.4V | +12V | 0V | +12V | 0V | +12V | | | | | | | | |
| +4.8V | 0V | 0V | +12V | +12V | +12V | | | | | | | | |
| +7.0V | 0V | 0V | +12V | 0V | +12V | | | | | | | | |
| +9.5V | +12V | 0V | +12V | +12V | 0V | | | | | | | | |
| +11.5V | +12V | 0V | +12V | 0V | 0V | | | | | | | | |
| LATCH OUTPUTS | | | | | | | | | | | | | |
| FREQ REF INPUT | A8U5 | A18U6 | | | | A18U9 | | | | A18U10 | | | |
| | Pin 1 | Pin 1 | Pin 11 | Pin 10 | Pin 2 | Pin 1 | Pin 11 | Pin 10 | Pin 2 | Pin 1 | Pin 11 | Pin 10 | Pin 2 |
| +0.1V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | 0V |
| +0.2V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | +12V |
| +0.3V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | +12V | +12V |
| +0.4V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | +12V | +12V | +12V |
| +0.6V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | +12V | +12V | +12V | +12V |
| +0.8V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | +12V | +12V | +12V | +12V | +12V |
| +1.2V | 0V | 0V | 0V | 0V | 0V | 0V | 0V | +12V | +12V | +12V | +12V | +12V | +12V |
| +1.7V | 0V | 0V | 0V | 0V | 0V | 0V | +12V | +12V | +12V | +12V | +12V | +12V | +12V |
| +2.4V | 0V | 0V | 0V | 0V | 0V | +12V | +12V | +12V | +12V | +12V | +12V | +12V | +12V |
| +3.4V | 0V | 0V | 0V | 0V | +12V | +12V | +12V | +12V | +12V | +12V | +12V | +12V | +12V |
| +4.8V | 0V | 0V | 0V | +12V | +12V | +12V | +12V | +12V | +12V | +12V | +12V | +12V | +12V |
| +7.0V | 0V | 0V | +12V | +12V | +12V | +12V | +12V | +12V | +12V | +12V | +12V | +12V | +12V |
| +9.5V | 0V | +12V | +12V | +12V | +12V | +12V | +12V | +12V | +12V | +12V | +12V | +12V | +12V |
| +11.5V | +12V | +12V | +12V | +12V | +12V | +12V | +12V | +12V | +12V | +12V | +12V | +12V | +12V |
| c. Remove ground from A18TP7 and disconnect power supply. d. Connect FREQ REF INPUT from sweep oscillator and set FREQ RANGE (GHz) control to AUTO. e. Set the sweep oscillator to sweep over more than one octave band (Example 2GHz to 6 GHz) | | | | | | | | | | | | | |

Figure 3-16A. 8410B Troubleshooting Procedures (Sheet 4 of 6)

- f. With Channel A of the oscilloscope connected to the 8620A SWEEP OUT, connect Channel B to the test points designated in the timing diagram below. Set oscilloscope for a chopped display and negative trigger slope. Check that the two triggers and the leading edges of each pulse coincide (except HOLD ALLOW, which may remain high (+10V) for more than one trigger).

NOTE

If an 86290A RF section is used, an additional external trigger will appear if the sweep oscillator is operated over a sequential break point (6.2 GHz or 12.4 GHz).

- g. If Part II step f check indicates incorrect, the problem is in the A9 Automatic Control Assembly or the control signals fed to it.

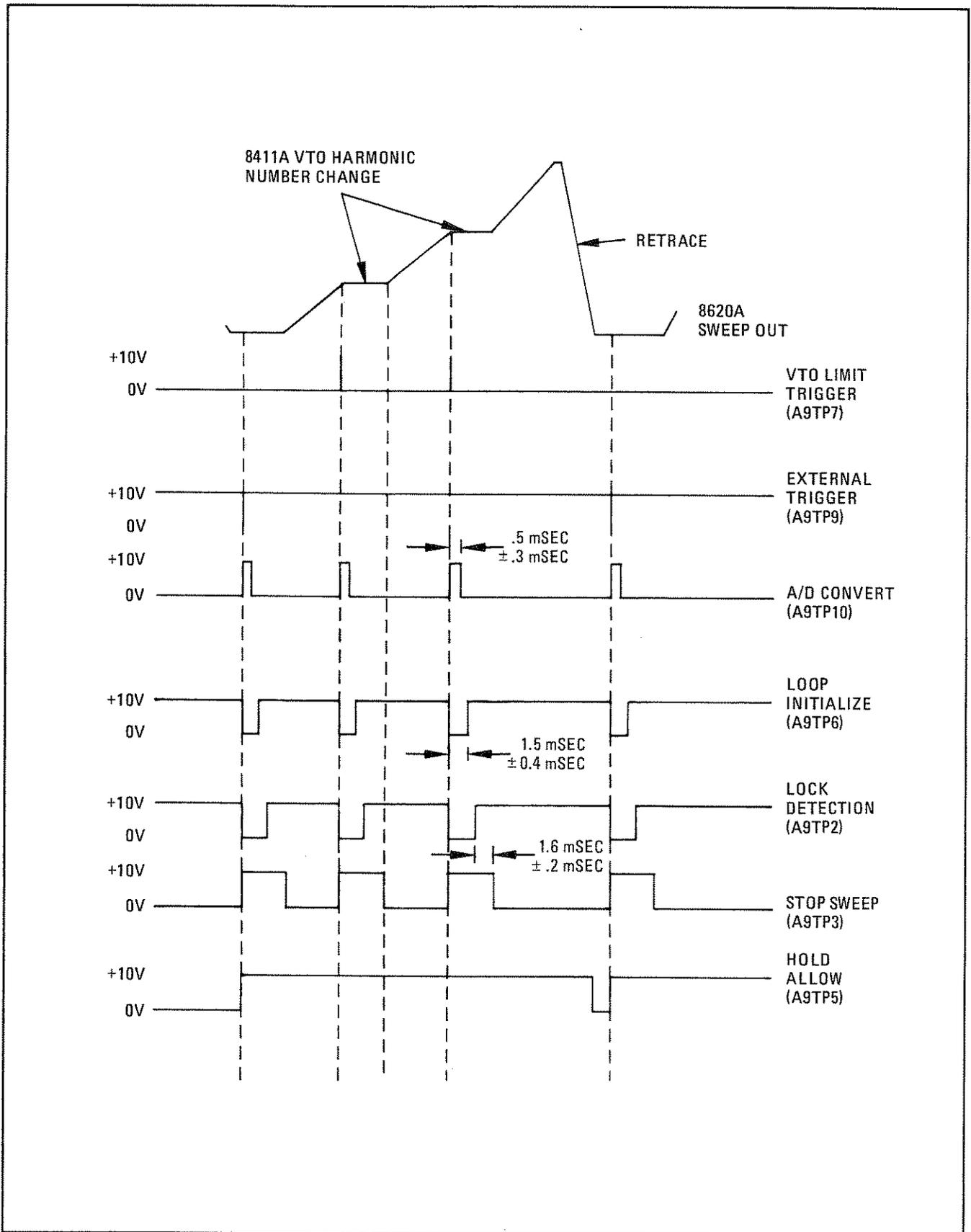


Figure 3-16A. 8410B Troubleshooting Procedures (Sheet 6 of 6)

