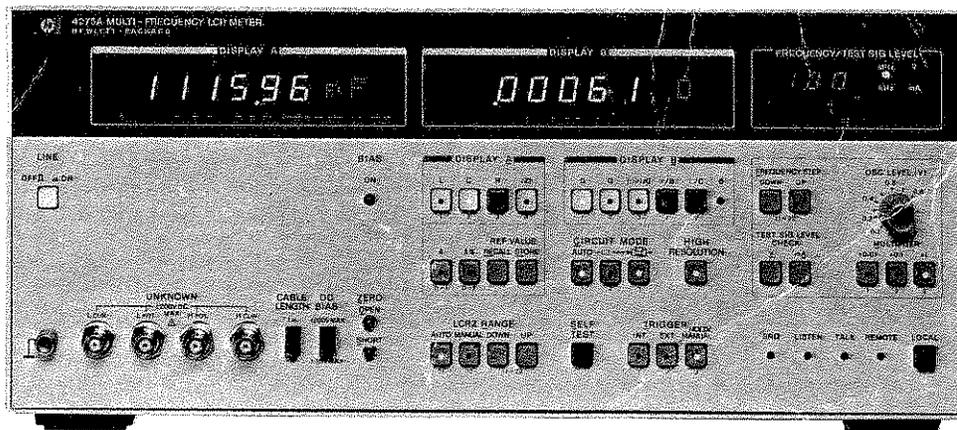


4275A MULTI-FREQUENCY LCR METER





SERVICE MANUAL

MODEL 4275A
MULTI-FREQUENCY LCR METER

(Including Options 001, 002, 003, 004 and 101)

SERIAL NUMBERS

This manual applies directly to instruments
with serial numbers prefixed 2045J and above.

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Table 4-1. Recommended Performance Test Equipment.

| Equipment | Critical Specifications | Recommended Model/Note |
|-----------------------|--|---|
| Capacitance Standards | <p>1pF $\pm 0.03\%$ 10pF $\pm 0.03\%$ 100pF $\pm 0.03\%$ 1000pF $\pm 0.03\%$ Useable frequencies: up to 10MHz</p> | <p>HP 16381A HP 16382A HP 16383A HP 16384A</p> |
| Resistance Standards | <p>0.1Ω $\pm 10\%$ 1Ω $\pm 10\%$ 10Ω $\pm 10\%$ 100Ω $\pm 0.03\%$ 1000Ω $\pm 0.03\%$ 10kΩ $\pm 0.03\%$ 100kΩ $\pm 0.03\%$ Useable frequencies: up to 10MHz</p> | <p>HP 16074A Standard Resistor Set</p> |
| Frequency Counter | <p>Maximum frequency: >10MHz Accuracy: 0.001% (1×10^{-5})</p> | <p>HP 5314A</p> |
| RF Voltmeter | <p>Voltage range: 1mV to 3V rms f.s. Bandwidth: 10kHz to 10MHz Accuracy: 1%</p> | <p>HP 3400A</p> |
| DC Voltmeter | <p>Voltage range: 10mV to 100V f.s. Sensitivity: 0.1mV min. Accuracy: 0.05% Input impedance: >10MΩ</p> | <p>HP 3465A/B</p> |
| Test Cable | <p>BNC to BNC cable</p> | <p>1 ea.</p> |
| Test Cable | <p>BNC to BNC cable (≤ 10cm) (Replaceable by Open Termination included in HP 16074A).</p> | <p>2 ea.</p> |
| Bias Controller | <p>(Needed for Option 001 or 002 Internal DC Bias Supply Test).</p> | <p>HP 16023B</p> |
| Test Fixture | <p>(Needed for Option 001 Internal DC Bias Supply Test).</p> | <p>HP 16047A</p> |
| Test Leads | <p>(Needed for Option 002 Internal DC Bias Supply Test).</p> | <p>HP 16048A</p> |
| HP-IB Controller | <p>(Needed for Option 101 HP-IB Interface Test).</p> | <p>HP 9825A/ w 98210A/ w 98213A/ w 98034A</p> |

SECTION IV PERFORMANCE TESTS

4-1. INTRODUCTION.

4-2. This section provides the check procedures to verify the 4275A specifications listed in Table 1-1. All tests can be performed without access to the interior of the instrument. A simpler operational test is presented in Section III under Self Test (paragraph 3-5). The performance test procedures in this section can also be used to do an incoming inspection of the instrument and to verify whether the instrument meets its specified performance after troubleshooting or making adjustments. If specifications are found to be out of limits, check that controls are properly set, and then proceed to adjustments or troubleshooting.

Note

Allow a 30-minute warm-up and stabilization period before conducting any performance test.

4-3. EQUIPMENT REQUIRED.

4-4. Equipment required for the performance tests is listed in Table 4-1 Recommended Performance Test Equipment. Any equipment whose characteristics equal the critical specifications given in the table may be substituted for the recommended model(s).

Accuracy checks in this section use 16380 series standard capacitors (16381A, 16382A, 16383A and 16384A) and the 16074A Standard Resistor Set. These accessory standards have the specifications which satisfy the performance requirements for the accuracy checks and are especially fit for use as 4275A accuracy test standards.

Note

All components used as standards should be calibrated by an instrument whose specifications are traceable to NBS, PTB, LNE, NRC, JEMIC, or equivalent standards group; or all components should be calibrated directly by an authorized calibration organization such as NBS. The calibration cycle should be determined by the stability specification for each component.

4-5. TEST RECORD.

4-6. Results of the performance tests may be tabulated on the Test Record at the end of these procedures. The Test Record lists all the tested specifications and their acceptable limits. Test results recorded at incoming inspection can be used for comparison in periodic maintenance and troubleshooting and after repairs or adjustments.

4-7. CALIBRATION CYCLE.

4-8. This instrument requires periodic verification of performance. Depending on the use and environmental conditions, the instrument should be checked with the following performance tests at least once every year. To maximize instrument "up time", the recommended preventive maintenance frequency for the 4275A is twice a year.

Performance Test Table

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ACCURACY TEST CONSIDERATIONS

This paragraph discusses how the 4275A accuracy is tested and verified. As the 4275A has (because of its wider measurement capabilities), to a great extent, expanded the selectable measurement parameters, frequency and range along with high accuracy (as its features), the accuracy check ranges that need to be verified include some critical measuring regions where accuracies are difficult to be directly compared to the specifications by using standards.

Measurement accuracies are tested by reading the displays when measuring standard capacitors, inductors, resistors and other devices as references whose values are calibrated and certified by transfer of values from national standards. Certain 4275A measurement range capabilities are out of the applicable ranges of the practical standards; so such standards, to satisfy the requirements for checking on all the 4275A ranges, will be unavailable. The method then, is to check accuracies on the specific ranges at which the standards are applicable. Further corroboration for the entire range (to the instrument performance limits), is done by particular tests for evaluating full range accuracy.

Theoretical Background of Accuracy Checks.

The 4275A, in accord with its measurement principles, detects the vector impedance (or its reciprocal value: admittance) of the unknown sample to be tested. The various measurement data provided, with respect to the 13 possible measurement parameters (L, C, R, D, etc.), are arithmetically derived from measured values of the right-angle vector components (resistance and reactance). For example, the capacitance value of a sample is calculated by the following equation relative to the capacitance-to-reactance values:

$$C_x = \frac{1}{2\pi f X_m}$$

Where, C_x is capacitance value of sample,
 f is measurement frequency,
 X_m is measured reactance value of sample.

As discussed above, each measurement parameter is interrelated with the impedance (or admittance) value so the accuracies on all ranges can be verified if the instrument satisfies specified accuracies for each one of its resistive and reactive measurement parameters, e.g. resistance and capacitance from the lowest through the highest test frequencies.

It is important to note that the accuracy is based on arithmetic relationships as are the parameter relationships. This theoretical background is pertinent to the corroboration of the accuracy evaluations which are done by simplified test procedures instead of time-consuming-tests on the 600 (approximately) possible combinations of the fundamental test parameters (measurement parameter, frequency, range, etc.).

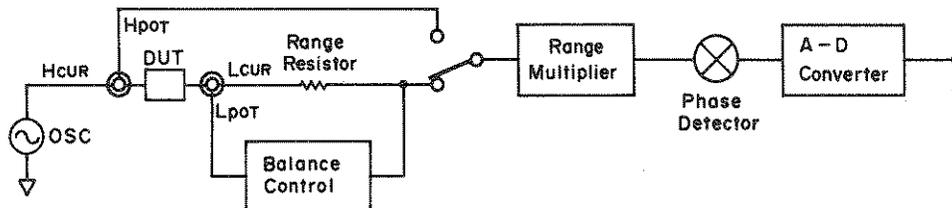
ACCURACY TEST CONSIDERATIONS

Corroboration Check Considerations

The test for measurement accuracy with respect to the vector impedance is made on specific ranges using standards, and on the other ranges by using alternate methods which are (theoretically and experimentally) proven to be practicable for verification of the ranges which otherwise would be uncertifiable because of the limitations of the standards. If the end results of these checks meet all the individual test limits, the instrument should satisfy its specified accuracies across its entire range. Then, how can these methods be explained? Let's look at the performance test articles.

Accuracy test procedures include checks for the following circuit sections:

- 1) Bridge Circuit Range Resistors.
- 2) Range Multiplier.
- 3) Bridge Balance Control.
- 4) Phase Detector.
- 5) A-D (Analog to Digital) Converter.



4275A Measurement Section

CAPACITANCE ACCURACY TEST verifies Range Resistor accuracy for the reactive impedance measurement from the lowest through the highest test frequencies. (Balance Control linearity and normal operations of the Phase Detector and A-D Converter are also verified).

RESISTANCE ACCURACY TEST does its verification in a manner similar to that for the Capacitance Accuracy Test, but for resistive impedance measurements. Thus, accuracies for both reactive and resistive components of the vector impedance are verified.

SELF OPERATING TEST verifies the multiples of the Range Multiplier which extends the measurement ranges. The A-D Converter accuracy is also checked by this combined self-test function which enables automatic check of each one of these circuits.

FREQUENCY-PHASE ACCURACY TEST verifies phase-flatness characteristics (minimum phase shift) of the overall measurement section and Phase Detector phase accuracy from the lowest through the highest test frequencies.

Note

A set of detection phases, each different by 90 degrees, is used in the Phase Detector. If their relative phase angles are exactly 90 degrees, the phase relationships of the detection phases on the vector DUT voltage (or current) detected have no influence on the resultant accuracy. The accuracy of the right-angle detection phases is verified by both this test and dissipation factor checks associated with the capacitance Accuracy Test.

ACCURACY TEST STANDARDS

1) Standard Capacitors.

The HP 16380 Series Standard Capacitors, featuring the four terminal pair configuration, are recommended for use as performance test standards. The four standard capacitors 16381A (1pF), 16382A (10pF), 16383A (100pF) and 16384A (1000pF) are calibrated at 0.01% accuracy (within 0.1% of their nominal capacitance values) at 1kHz. For values at frequencies to 10MHz, an extrapolation of the calibrated values at 1kHz is used (this is based on the careful consideration of their inherent residual parameter values and on the actual test measurement to verify the frequency dependency of the values). Capacitance values at frequencies up to 10MHz are read from the graph given on the data sheet of each standard.

Note

A high capacitance standard, useable in the high frequency region, is unavailable. Here's why:

A 10 μ F capacitor, for example, has an impedance value of 0.16 Ω at 100kHz. A capacitance standard would have, in addition, residual impedances which could not be neglected when compared to the pure impedance of 0.16 Ω . Thus, an attempt at tests which would use the standard capacitor at the higher operating frequency ranges is not practicable.

2) Standard Resistors.

The standard resistors used for accuracy checks should be practically pure resistances and should maintain an extremely low order of residual reactance at frequencies to 10MHz. The HP 16074A Standard Resistor Set, especially designed as standards useable over a broad frequency region, with four terminal pair configurations, is suitable for the accuracy checks. These thin film resistors, which ensure negligible low stray capacitance and less skin effect, provide the standard resistance values of 0.1 Ω , 1 Ω and 10 Ω at $\pm 10\%$ and 100 Ω , 1000 Ω , 10k Ω and 100k Ω at $\pm 0.01\%$ calibration accuracies to 10MHz (1MHz at 100k Ω). Open (0S) and short (0 Ω) terminations which facilitate optimum zero offset adjustment as well as two quasi-inductors for inductance accuracy checks are included in the 16074A.

Note

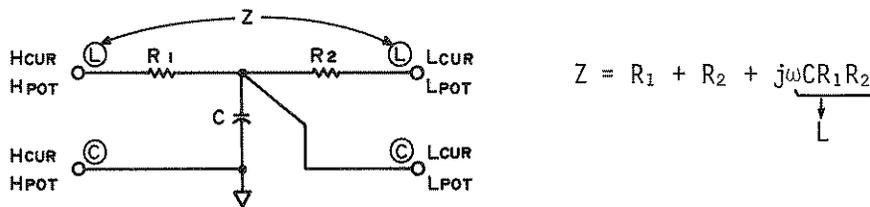
The 0.1 Ω , 1 Ω and 10 Ω resistors are used as the (pure resistance) reference samples in the Frequency-Phase Accuracy Test.

3) Standard Inductors.

The 4275A inductance accuracy is theoretically certified if the capacitance accuracy meets the specifications. Generally, inductors have unwanted parasitic impedances to some extent (that is, coil resistance and distributed capacitance). As these residuals significantly dominate the inductance values at high frequencies, inductance standards useable in RF region (higher than about 100kHz) are substantially unavailable. Inductors with higher inductance values have lower frequency limits.

ACCURACY TEST STANDARDS

If it is desired to check inductance measurement accuracy on least at one range, a quasi-inductor may be useful as a substitution test sample. The quasi-inductor offers an equivalent inductance (when connected to the 4275A) by a simple network circuit consisting of a capacitor and resistors. A quasi-inductor circuit is shown in the figure below:



The equivalent inductance value is given by the equation:

$$L = C \cdot R_1 \cdot R_2$$

The values of R and C are respectively measured to calculate the equivalent inductance value (prior to the inductance accuracy check). The HP 16074A Quasi-inductors offer the composite inductance values of 100µH and 100mH. Useable frequency ranges for these inductors are given in the table below:

| Sample | Useable frequency range | Recommended test frequency |
|--------|-------------------------|----------------------------|
| 100µH | 100kHz to 10MHz | 1MHz |
| 100mH | 10kHz to 1MHz | 100kHz |

Note

Component resistors R₁ and R₂ in the quasi circuit may be measured at dc with a high accuracy DMM. These high stability resistors need only be re-calibrated at the recommended calibration period of 6 months. The capacitors should be checked before each test.

GENERAL

The standards should be of the four terminal pair configuration design to provide compatibility with the instrument. This minimizes reduction in reliability of the values due to the effects of the residuals associated with cabling and connections.

Note

Skin effect should be considered as it affects the value of the standards in the high frequency region. The contribution of skin effect to the resistive factor of the sample increases in proportion to the square root of the frequency and is dominant at high frequencies (generally, in the megahertz region).

PERFORMANCE TESTS

4-9. TEST FREQUENCY ACCURACY TEST

4-10. This test verifies that test signal frequencies for 4275A meet the specified frequency accuracy of 0.01%.

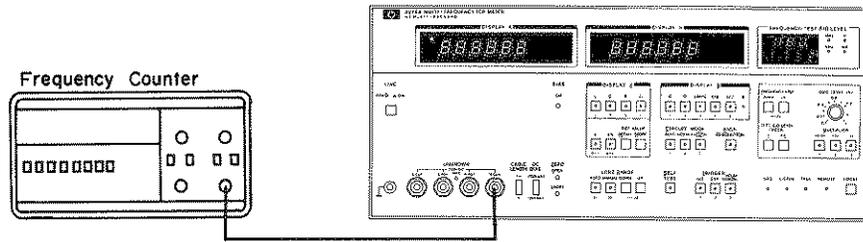


Figure 4-1. Test Frequency Accuracy Test Setup.

EQUIPMENT:

- Frequency Counter HP 5314A.
- Test cable BNC to BNC cable.

PROCEDURE:

1. Connect BNC to BNC cable to 4275A UNKNOWN H_{CUR} terminal and to frequency counter input as shown in Figure 4-1.
2. Set 4275A controls as follows:
 - MULTIPLIER x1
 - OSC LEVEL fully cw
 - Test frequency 1.00MHz
 - DC BIAS switch (rear panel) OFF
 - Other controls any setting
3. Read display output of frequency counter. Frequency readouts must be within 999.9kHz and 1000.1kHz.
4. Change test frequency setting and read frequency counter display output at each of the 10 spot test frequencies (and any optional frequency). Frequency readouts must be within the test limits given in Table 4-2.

Table 4-2. Test Frequency Accuracy Test.

| Frequency setting | Test limits |
|-------------------|--------------------|
| 10.0kHz | 9.999 - 10.001kHz |
| 20.0kHz | 19.998 - 20.002kHz |
| 40.0kHz | 39.996 - 40.004kHz |
| 100kHz | 99.99 - 100.01kHz |
| 200kHz | 199.98 - 200.02kHz |
| 400kHz | 399.96 - 400.04kHz |
| 1.00MHz | 0.9999 - 1.0001MHz |
| 2.00MHz | 1.9998 - 2.0002MHz |
| 4.00MHz | 3.9996 - 4.0004MHz |
| 10.0MHz | 9.999 - 10.001MHz |
| Opt. Freq. | ±0.01% |

Note

- 1) Test limits in above table do not account for reading error contributed by measurement errors in the test equipment.
- 2) If this test fails, the instrument requires troubleshooting.

PERFORMANCE TESTS

4-11. TEST SIGNAL LEVEL (VARIABLE RANGE TEST).

4-12. This test verifies that the variable range of the test signal level for the 4275A meets the specified range span of 1mV and 1V rms at every test frequency setting.

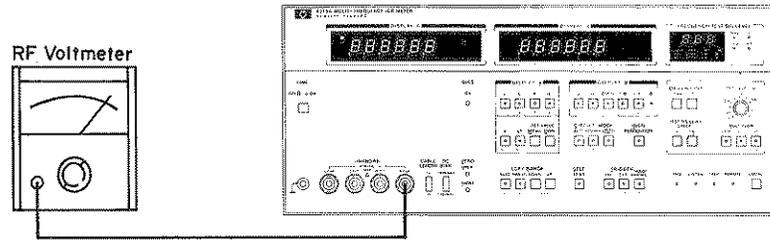


Figure 4-2. Test Signal Level Variable Range Test Setup.

EQUIPMENT:

- RF Voltmeter HP 3400A and HP 3465A/B
- Test cable BNC to BNC cable/BNC to dual banana cable

Note

Use RF Voltmeter calibrated for frequency response of 10kHz to 10MHz.

PROCEDURE:

1. Connect BNC to BNC cable to 4275A UNKNOWN H_{CUR} terminal and to RF volt-
meter input as shown in Figure 4-2.
2. Set RF voltmeter range as appropriate to measure voltage of 1V rms.
3. Set 4275A controls as follows:
 - MULTIPLIER x1
 - OSC LEVEL fully cw
 - Test frequency 10.0MHz
 - DC BIAS switch (rear panel) OFF
 - Other controls Any setting
4. RF voltmeter readout should be 1.00V rms or more (when the value is cor-
rected for the voltmeter frequency response).
5. Change test frequency setting successively to lower frequencies (from
10.0MHz) and verify that RF voltmeter readout exceeds 1.00V rms at each
test frequency setting.
6. Set 4275A controls in accord with table 4-3 and verify that all the test
limits given in the table are satisfied.

Table 4-3. Test Signal Level Variable Range Test.

| Control settings | | | Test limits |
|---|-----------|---------------|---|
| Test frequency | OSC LEVEL | MULTIPLIER | |
| Each setting from 10.0kHz to 10.0MHz | fully cw | x1 | greater than 1.00V rms |
| Any setting | fully cw | x0.1 x0.01 | greater than 100mV rms greater than 10.0mV rms |
| 10kHz | fully ccw | x0.01 | less than 1.00mV rms (Use 3465A/B) |

PERFORMANCE TESTS

4-13. SELF-OPERATING TEST

4-14. The Self-operating test checks operating conditions of the circuits (Range Multiplier for extending measurement capability to higher and lower ranges; Null Detector for bringing bridge into optimum balance; Buffer Amplifiers for accurately detecting potentials across DUT and range resistor; and Integrator for converting analog measurement quantities into digital) which are especially significant for sustaining the specified accuracies. All the tests on these individual circuits can be accomplished easily and simply with the SELF TEST function. To ascertain that these circuits satisfy the performance requirements for ensuring the specified accuracies, display readouts are compared with severe test limits. Because basic circuit operating conditions related to the accuracy are verified in this test, the instrument should be initially checked with this test for acceptability.

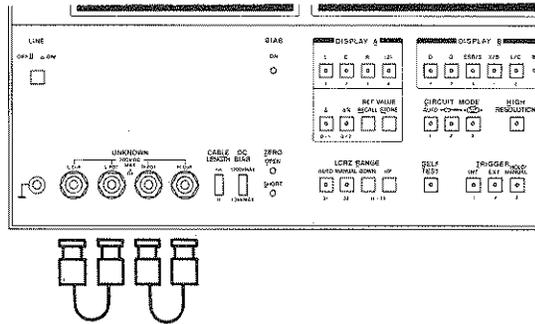


Figure 4-3. Self Operating Test Setup.

EQUIPMENT:

BNC to BNC cable 10cm long, 2 required.

Note

If open (OS) termination of the HP 16074A Standard Resistor set is available, use it instead of BNC to BNC cable.

PROCEDURE:

1. Set CABLE LENGTH switch to "0" position.
2. Connect L_{CUR} and L_{POT} terminals with a BNC to BNC cable as shown in Figure 4-3. Similarly Connect H_{CUR} and H_{POT} terminals.

CAUTION

VERIFY THAT DC BIAS INDICATOR LAMP DOES NOT LIGHT. IF ILLUMINATED, SET REAR PANEL DC BIAS SWITCH TO OFF.

3. Set test signal frequency to 100kHz.
4. Press SELF TEST button and then DISPLAY B function D button.

Note

Self test item number (in this case "1" which means the first step) is displayed in DISPLAY A unit indicator as shown below:



PERFORMANCE TESTS

5. DISPLAY A and DISPLAY B readouts should be within the following test limits:

| | |
|-----------------|----------------|
| DISPLAY A | .00±100 counts |
| DISPLAY B | .00±100 counts |
6. Press DISPLAY B function Q button. Self test item number "2" is displayed.
7. Set test signal level and frequency as follows:

| | |
|----------------------|----------|
| MULTIPLIER | x1 |
| OSC LEVEL | fully cw |
| Test frequency | 100kHz |
8. DISPLAY A readout should be within the following test limit:

| | |
|-----------------|----------------------|
| DISPLAY A | -1000.00±100 counts. |
|-----------------|----------------------|
9. Change test frequency to 1.00MHz.
10. DISPLAY B readout should be within the following test limit:

| | |
|-----------------|------------------|
| DISPLAY B | .00±1000 counts. |
|-----------------|------------------|
11. Press DISPLAY B function ESR/G button. Self test item number "3" is displayed.
12. Set test signal in accord with step 7 and repeat test steps 8, 9 and 10 above with respect to the third self-test step.
13. Press DISPLAY B function X/B button. Self test item number "4" is displayed.
14. Set test signal in accord with step 7 ~~other than setting~~ ^{Except set} MULTIPLIER to x 0.1. Repeat test steps 8, 9 and 10 above with respect to the fourth self-test step.
15. Press DISPLAY B function L/C button. Self test item number "5" is displayed.
16. Set test signal in accord with step 7 other than setting MULTIPLIER to x 0.01. Repeat test steps 8, 9 and 10 with respect to the fifth self test step.
17. Press DISPLAY A Δ% button. Self test item number "7" is displayed and MULTIPLIER is automatically set to x 0.1.
18. Set test frequency to 100kHz.
19. Display readouts should be within the following test limits:

| | |
|-----------------|-----------------|
| DISPLAY A | .00±1000 counts |
| DISPLAY B | .00±1000 counts |

Note

Self test item 6 does not exist.

PERFORMANCE TESTS

Table 4-4. Self Operating Test Summary.

| Test item | Press button | Control settings | | | Test Limits | |
|-----------|--------------|------------------|-----------|-----------|-------------------------|-----------------|
| | | MULTIPLIER | OSC LEVEL | Frequency | DISPLAY A | DISPLAY B |
| 1 | D | — | — | 100kHz | .00±100 counts | .00±100 counts |
| 2 | Q | x1 | fully cw | 100kHz | -1000.00 ±100 counts | — |
| | | x1 | fully cw | 1.00MHz | — | .00±1000 counts |
| 3 | ESR/G | x1 | fully cw | 100kHz | -1000.00 ±100 counts | — |
| | | x1 | fully cw | 1.00MHz | — | .00±1000 counts |
| 4 | X/B | x0.1 | fully cw | 100kHz | -1000.00 ±100 counts | — |
| | | x0.1 | fully cw | 1.00MHz | — | .00±1000 counts |
| 5 | L/C | x0.01 | fully cw | 100kHz | -1000.00 ±100 counts | — |
| | | x0.01 | fully cw | 1.00MHz | — | .00±1000 counts |
| 7 | Δ% | x0.1 | fully cw | 100kHz | .00±1000 counts | .00±1000 counts |

1 14
2 53
3 126
4

12

PERFORMANCE TESTS

Note

- 1) If short (0Ω) and open ($0S$) terminations of the HP 16074A Standard Resistor Set are available, use them for zero offset adjustment instead of BNC to BNC cables and BNC Tee adapters.
- 2) Use BNC to BNC cables of 10cm long or less. Using a longer cable may affect test results.

PROCEDURE:

1. Set CABLE LENGTH switch to "0" position.
2. Connect L_{CUR} and L_{POT} terminals with a BNC to BNC cable as shown in Figure 4-4 (a). Similarly connect H_{CUR} and H_{POT} terminals.
3. Set 4275A controls as follows:

DISPLAY A function C
 Deviation measurement function off
 LCRZ RANGE AUTO
 DISPLAY B function D
 CIRCUIT MODE AUTO ()
 HIGH RESOLUTION on
 SELF TEST off
 TRIGGER INT
 OSC LEVEL fully cw
 MULTIPLIER x1

*Press
Self Test
OFF*

CAUTION

VERIFY THAT DC BIAS INDICATOR LAMP DOES NOT LIGHT. IF ILLUMINATED, SET REAR PANEL DC BIAS SWITCH TO OFF.

4. Press ZERO OPEN button and wait approximately 15 seconds until "open" offset adjustment is completed ("CAL" letters in DISPLAY A disappear).
5. Connect cables and terminal adapters as shown in Figure 4-4 (b). Connect BNC tee adapters to each other.
6. Press ZERO SHORT button and wait approximately 15 seconds until "short" offset adjustment is completed.
7. Disconnect cables and connect 1pF Standard Capacitor direct to UNKNOWN terminals as shown in Figure 4-4 (c).
8. Set test frequency and test signal level MULTIPLIER in accord with Table 4-5. Capacitance and dissipation factor readouts should be within tolerances given in the table.
9. Change standard capacitor successively to 10pF, 100pF and 1000pF and verify that the instrument satisfies Table 4-5.

Note

1. Table 4-5 applies to the tests at both MULTIPLIER x1 and x 0.1 settings.
2. When 1000pF standard capacitor is measured at 4MHz or 10MHz test frequency, CIRCUIT MODE is automatically set to  mode.

PERFORMANCE TESTS

Table 4-5. Capacitance Accuracy Tests.

| Test frequency | Standard capacitance | | | |
|----------------|----------------------------|---------------|----------------|---------------|
| | 1pF | | 10pF | |
| | C test limits | D test limits | C test limits | D test limits |
| 10.0kHz | — | — | C.V. ±0.0130pF | 0±0.00090 |
| 20.0kHz | — | — | C.V. ±0.0120pF | 0±0.00075 |
| 40.0kHz | C.V. ±5.10fF (±15.0fF) | 0±0.00360 | C.V. ±0.0420pF | 0±0.00360 |
| 100kHz | C.V. ±4.50fF (±9.0fF) | 0±0.00210 | C.V. ±0.0360pF | 0±0.00210 |
| 200kHz | — | — | C.V. ±0.0120pF | 0±0.00075 |
| 400kHz | C.V. ±4.60fF (±10.0fF) | 0±0.00260 | C.V. ±0.0160pF | 0±0.00135 |
| 1.00MHz | C.V. ±4.30fF (±7.0fF) | 0±0.00170 | C.V. ±0.0130pF | 0±0.00090 |
| 2.00MHz | — | — | C.V. ±0.0330pF | 0±0.00260 |
| 4.00MHz | C.V. ±14.00fF (±32.0fF) | 0±0.00710 | C.V. ±0.1220pF | 0±0.00710 |
| 10.0MHz | C.V. ±24.00fF (±42.0fF) | 0±0.01110 | C.V. ±0.2220pF | 0±0.01110 |

C.V. = Calibrated value of standard capacitor.
C test limit values in parenthesis apply to MULTIPLIER X0.1 setting.

Table 4-5. Capacitance Accuracy Tests (continued).

| Test frequency | Standard capacitance | | | |
|----------------|----------------------|---------------|---------------|-----------------------|
| | 100pF | | 1000pF | |
| | C test limits | D test limits | C test limits | D test limits |
| 10.0kHz | C.V. ±0.130pF | 0±0.00090 | C.V. ±1.30pF | 0±0.00090 |
| 20.0kHz | C.V. ±0.120pF | 0±0.00075 | C.V. ±1.20pF | 0±0.00075 |
| 40.0kHz | C.V. ±0.160pF | 0±0.00135 | C.V. ±1.60pF | 0±0.00135 |
| 100kHz | C.V. ±0.130pF | 0±0.00090 | C.V. ±1.30pF | 0±0.00090 |
| 200kHz | C.V. ±0.120pF | 0±0.00075 | C.V. ±1.20pF | 0±0.00075 |
| 400kHz | C.V. ±0.160pF | 0±0.00135 | C.V. ±1.60pF | 0±0.00135 |
| 1.00MHz | C.V. ±0.130pF | 0±0.00090 | C.V. ±1.30pF | 0±0.00090 |
| 2.00MHz | C.V. ±0.330pF | 0±0.00260 | C.V. ±3.30pF | 0±0.00260 -0.00230 |
| 4.00MHz | C.V. ±1.202pF | 0±0.00710 | C.V. ±32.0pF | 0±0.01210 -0.01130 |
| 10.0MHz | C.V. ±2.200pF | 0±0.01110 | C.V. ±32.0pF | 0±0.01510 -0.01210 |

C.V. = Calibrated value of standard capacitor.

12

14

14

14

56

52

PERFORMANCE TESTS

HIGH RESOLUTION on
 SELF TEST off
 TRIGGER INT
 OSC LEVEL fully cw
 MULTIPLIER x1

CAUTION

VERIFY THAT DC BIAS INDICATOR LAMP DOES NOT LIGHT. IF ILLUMINATED, SET REAR PANEL DC BIAS SWITCH TO OFF.

Note

If Capacitance Accuracy Test (paragraph 4-15) has not been performed before doing this test, perform zero offset adjustment in accord with Capacitance Accuracy Test steps 2, 4, 5 and 6.

3. Connect 100Ω standard resistor direct to UNKNOWN terminals as shown in Figure 4-5.
4. Set test frequency and test signal level MULTIPLIER in accord with Table 4-6. Resistance readouts should be within tolerances given in the table.
5. Change standard resistor successively to 1000Ω, 10kΩ and 100kΩ and verify that the instrument satisfies Table 4-6.

Note

1. Table 4-6 applies to tests at both MULTIPLIER x1 and X0.1 settings.
2. Measurement CIRCUIT MODE is automatically set to  mode on 100Ω range and to  mode on other ranges.

Table 4-6. Resistance Accuracy Test.

| Test Frequency | Test Limits | | | |
|----------------|--------------|-------------|---------------|--------------|
| | 100Ω | 1000Ω | 10kΩ | 100kΩ |
| 10.0kHz | C.V. ±0.130Ω | C.V. ±4.0Ω | C.V. ±0.040kΩ | C.V. ±0.40kΩ |
| 20.0kHz | | | | |
| 40.0kHz | | | | |
| 100kHz | | | | |
| 200kHz | C.V. ±0.230Ω | C.V. ±5.0Ω | C.V. ±0.050kΩ | — |
| 400kHz | | | | |
| 1.00MHz | | | | |
| 2.00MHz | C.V. ±0.550Ω | C.V. ±12.0Ω | — | — |
| 4.00MHz | C.V. ±2.070Ω | C.V. ±33.0Ω | — | — |
| 10.0MHz | | | | |

C.V. = Calibrated value of standard resistor

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PERFORMANCE TESTS

4-19. INDUCTANCE ACCURACY TEST (Confirmation Test).

4-20. Inductance accuracy is verified if the instrument meets both capacitance and resistance accuracy test limits. If it is desired to confirm the inductance accuracy on at least at one range, perform the following test:

Note

This confirmation test does not necessarily have to be done.

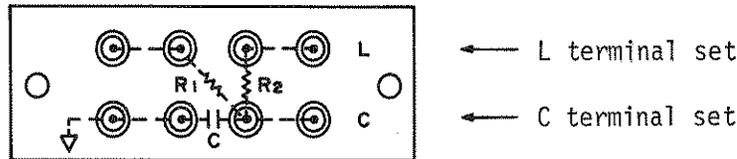


Figure 4-6. HP 16074A Quasi-inductor.

[Internal Connection Configuration]
 is shown in the figure.

EQUIPMENT:

Quasi-inductor from HP 16074A Standard Resistor Set.

PROCEDURE:

1. Set CABLE LENGTH switch to "0" position.
2. Set 4275A controls as follows:

DISPLAY A function C
 Deviation measurement function off
 LCRZ RANGE AUTO
 CIRCUIT MODE
 HIGH RESOLUTION on
 SELF TEST off
 TRIGGER INT
 OSC LEVEL fully cw
 MULTIPLIER x1

CAUTION

VERIFY THAT DC BIAS INDICATOR LAMP DOES NOT LIGHT. IF ILLUMINATED, SET REAR PANEL DC BIAS SWITCH TO OFF.

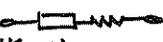
Note

If Capacitance Accuracy Test (paragraph 4-15) has not been performed before doing this test, perform a zero offset adjustment in accord with Capacitance Accuracy Test steps 2, 4, 5 and 6.

PERFORMANCE TESTS

100µH range check

3. Connect 100µH quasi-inductor "C" terminals direct to 4275A UNKNOWN terminals. See Figure 4-6.
4. Set test signal frequency to 1.00MHz.
5. Read displayed capacitance value (Cm). *1021PF*
6. Calculate composite inductance value (Lm) from the calibrated values for the component resistors (R₁ and R₂) and the capacitance value obtained in step 5 procedure. Lm is given by equation:

$$Lm = R_1 \cdot R_2 \cdot (Cm - 7.1pF) \text{ (H)}$$
R₁ = 316.4 Ω
R₂ = 100108.96
7. Disconnect quasi-inductor "C" terminals from UNKNOWN terminals. Connect its "L" terminals to 4275A UNKNOWN terminals.
8. Set DISPLAY A function to "L". *→ Circuit mode =  500µH*
9. Inductance display readout should be within ±0.50µH of the calculated Lm value.
10. Disconnect quasi-inductor sample. *102.44*

100mH range check

11. Check 100mH range using 100mH quasi-inductor and procedures similar to those described in steps 3 through 8. Set test frequency to 100kHz during this test. *C = 1625.7PF*
L = 101.99

Note

Calculate Lm value by the following equation (instead of the equation given in step 6):

$$Lm = R_1 \cdot R_2 \cdot Cm \text{ (H)}$$

R₁ = 1K Ω
R₂ = 1M Ω

12. Inductance display readout should be within ±0.30mH of the calculated Lm value.

102.06 µH
102.10 µH

Cm = 96.87 nF
Lm = 96.87 mH

109.75
C = 96.78 nF
L = 97.00 mH

2

PERFORMANCE TESTS

4-21. FREQUENCY-PHASE ACCURACY TEST

4-22. This test checks phase accuracies to ascertain accurate detection of the vector impedance components which are the source of the arithmetic measurement data. The frequency-phase accuracy test is made by connecting a resistor with extremely low reactive elements and by reading reactance display values (almost zero) to verify that the impedance of the DUT is being accurately detected with respect to the right-angle vector components.

Frequency-Phase Accuracy Check Ranges

| R range | Test frequency |
|----------------|----------------|
| 1000m Ω | 10kHz to 1MHz |
| 10 Ω | 10kHz to 10MHz |

Note

The test should be done at both test signal MULTIPLIER x1 and x0.1 settings (OSC LEVEL control is set to its fully cw position).

EQUIPMENT:

| | | |
|------------------|-------------|-----------------------------------|
| Resistor | 1 Ω | } HP 16074A Standard Resistor Set |
| | 10 Ω | |
| Terminator | 0 Ω | |
| | Open (OS) | |

Note

The resistors used as references in this test have been designed to maintain extremely low order (residual) reactance at frequencies to 10MHz. Short and open terminators are specially matched to these two resistors in order to ensure an optimum zero offset adjustment.

PROCEDURE:

1. Set CABLE LENGTH switch to "0" position.
2. Connect open (OS) terminator direct to UNKNOWN terminals as shown in Figure 4-5.
3. Set 4275A controls as follows:

| | |
|--------------------------------------|----------|
| DISPLAY A function | R |
| Deviation measurement function | off |
| LCRZ RANGE | AUTO |
| DISPLAY B function | X |
| CIRCUIT MODE | AUTO |
| HIGH RESOLUTION | on |
| SELF TEST | off |
| TRIGGER | INT |
| OSC LEVEL | fully cw |
| MULTIPLIER | x1 |

PERFORMANCE TESTS

CAUTION

VERIFY THAT DC BIAS INDICATOR LAMP DOES NOT LIGHT. IF ILLUMINATED, SET REAR PANEL DC BIAS SWITCH TO OFF.

4. Press ZERO OPEN button and wait approximately 15 seconds until "open" offset adjustment is completed ("CAL" letters in DISPLAY A disappears).
5. Disconnect open terminator and connect 0Ω terminator direct to UNKNOWN terminals.
6. Press ZERO SHORT button and wait approximately 15 seconds until "short" offset adjustment is completed.
7. Disconnect short terminator and connect 1Ω test resistor direct to UNKNOWN terminals.
8. Set test frequency and test signal level MULTIPLIER in accord with Table 4-7. Reactance display readouts should be within tolerances given in the table.
9. Connect 10Ω test resistor in place of 1Ω resistor and verify that Table 4-7 is satisfied.

Note

Table 4-7 applies to tests at both MULTIPLIER x1 and x0.1 settings.

Table 4-7. Frequency-Phase Accuracy Tests.

| Test frequency | Reactance test limits | |
|----------------|------------------------------|-----------------------|
| | 1000mΩ | 10Ω |
| 10.0kHz | $0 \pm 1.50 \text{ m}\Omega$ | $0 \pm 0.0130 \Omega$ |
| 20.0kHz | | |
| 40.0kHz | | |
| 100kHz | $0 \pm 1.69 \text{ m}\Omega$ | $0 \pm 0.0136 \Omega$ |
| 200kHz | $0 \pm 1.87 \text{ m}\Omega$ | $0 \pm 0.0142 \Omega$ |
| 400kHz | $0 \pm 2.25 \text{ m}\Omega$ | $0 \pm 0.0155 \Omega$ |
| 1.00MHz | $0 \pm 3.38 \text{ m}\Omega$ | $0 \pm 0.0193 \Omega$ |
| 2.00MHz | — | $0 \pm 0.0275 \Omega$ |
| 4.00MHz | — | $0 \pm 0.1400 \Omega$ |
| 10.0MHz | — | $0 \pm 0.1780 \Omega$ |

971.61

7

6

↓
8

3

17

PERFORMANCE TESTS

4-23. INT DC BIAS SUPPLY TEST (OPTION 001)

4-24. This test verifies that the Option 001 Internal DC BIAS Supply applies the specified bias voltages to the device under test.

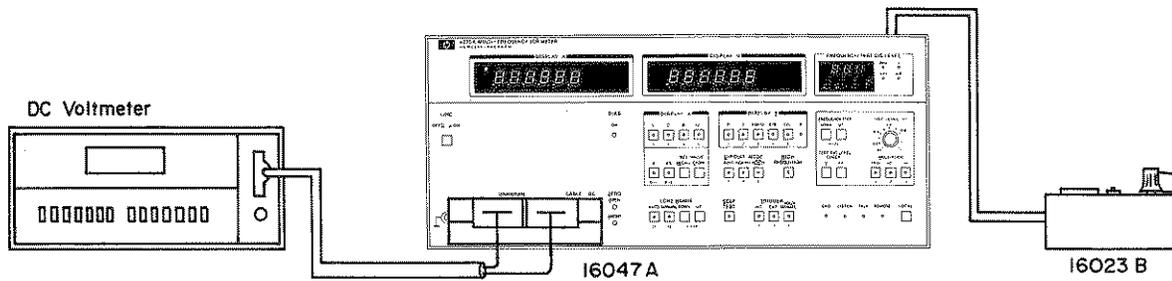


Figure 4-7. Option 001 Int DC Bias Supply Test Setup.

EQUIPMENT:

| | |
|-----------------------|------------|
| DC Voltmeter | HP 3465A/B |
| Test Fixture | HP 16047A |
| Bias Controller | HP 16023B |

PROCEDURE:

1. Set 4275A front panel DC BIAS switch to $\pm 35V$ MAX and CABLE LENGTH switch to "0" position. Attach 16047A Test Fixture to UNKNOWN terminals.
2. Connect 16023B DC Bias Controller to rear panel INT DC BIAS CONTROL connector.

CAUTION

BEFORE OPERATING DC BIAS SWITCH, VERIFY THAT DC BIAS VOLTAGE HAS BEEN SET TO ZERO VOLTS.

3. Set rear panel DC BIAS switch to INT $\pm 35V/100V$ ($\leq 1\mu F$) position.
4. Connect an appropriate pair of wire leads between dc voltmeter input and 16047A Test Fixture (see Figure 4-7).
5. Set dc bias voltage into 16023B DC Bias Controller in accord with Table 4-8. DC voltmeter readouts should be identical with the bias setting voltages within tolerances given in the table.

Note

To change bias voltage:

1. Set a new bias voltage value into the three digit thumbwheel switch of the 16023B.
2. Press 16023B ENTER button (this actuates the 4275A to read the new value).

PERFORMANCE TESTS

Table 4-8. DC Bias Voltage Test Limits.

| DC Bias Setting | Tolerance | DC Bias Setting | Tolerance |
|-----------------|-----------------|-----------------|----------------|
| .000V | -.0020 - .0020V | .100V | .0975 - .1025V |
| .001 | -.0010 - .0030 | .200 | .1970 - .2030 |
| .002 | .0000 - .0040 | .300 | .2965 - .2035 |
| .003 | .0010 - .0050 | .400 | .3960 - .4040 |
| .004 | .0020 - .0060 | .500 | .4955 - .5045 |
| .005 | .0030 - .0070 | .600 | .5950 - .6050 |
| .006 | .0040 - .0080 | .700 | .6945 - .7055 |
| .007 | .0050 - .0090 | .800 | .7940 - .8060 |
| .008 | .0060 - .0100 | .900 | .8935 - .9065 |
| .009 | .0070 - .0110 | 1.00 | .9910 - 1.009 |
| .010 | .0080 - .0120 | 2.00 | 1.986 - 2.014 |
| .020 | .0179 - .0221 | 3.00 | 2.982 - 3.018 |
| .030 | .0279 - .0321 | 4.00 | 3.977 - 4.023 |
| .040 | .0378 - .0422 | 5.00 | 4.972 - 5.028 |
| .050 | .0478 - .0522 | 6.00 | 5.967 - 6.033 |
| .060 | .0577 - .0623 | 7.00 | 6.962 - 7.038 |
| .070 | .0677 - .0723 | 8.00 | 7.958 - 8.042 |
| .080 | .0776 - .0824 | 9.00 | 8.953 - 9.047 |
| .090 | .0876 - .0924 | 10.0 | 9.930 - 10.07 |
| | | 20.0 | 19.88 - 20.12 |
| | | 30.0 | 29.82 - 30.16 |

Note

When dc bias voltage is measured at rear panel INT DC BIAS MONITOR connector, voltmeter readout will be somewhat lower than the actual (applied) voltage because of monitor output impedance (30kΩ).
Measured voltage value Em is:

$$E_m = E_{\text{bias}} \times \frac{Z_i}{30 + Z_i} \text{ (V)}$$

Where, Zi is voltmeter input impedance (in kΩ).

4-25. INT DC BIAS SUPPLY TEST (OPTION 002)

4-26. This test verifies that the Option 002 Internal DC Bias Supply applies the specified bias voltages to the device under test.

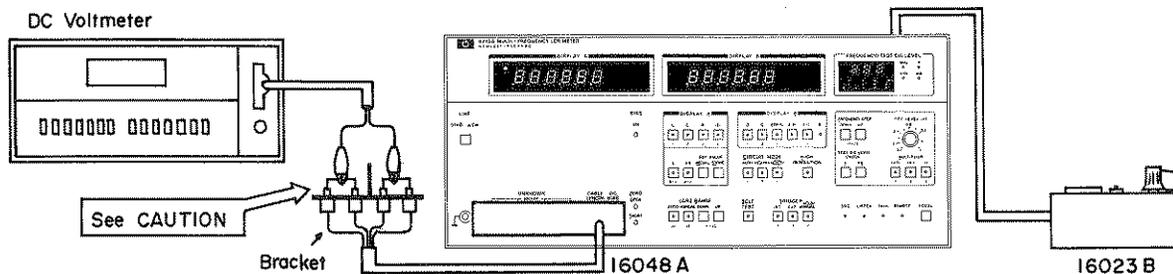


Figure 4-8. Option 002 Int DC Bias Supply Test Setup.

EQUIPMENT:

- DC Voltmeter HP 3465A/B
- Test Leads HP 16048A
- Bias Controller HP 16023B

PERFORMANCE TESTS

PROCEDURE:

1. Set 4275A front panel DC BIAS switch to $\pm 200V$ MAX and CABLE LENGTH switch to "1m" position. Connect 16048A Test Leads to UNKNOWN terminals.
2. Connect 16023B DC BIAS Controller to rear panel INT DC BIAS CONTROL connector.

CAUTION

BEFORE OPERATING DC BIAS SWITCH, VERIFY THAT DC BIAS VOLTAGE HAS BEEN SET TO ZERO VOLTS.

3. Set rear panel DC BIAS switch to INT $\pm 35V/100V$ ($\leq .1\mu F$) position.
4. Connect 16048A Test Leads to dc voltmeter input (see Figure 4-8).

CAUTION

DO NOT TOUCH BNC CONNECTOR CENTER PIN WHERE A LIVE VOLTAGE MAY EXIST.

5. Set dc bias voltage into 16023B DC Bias Controller switch in accord with Table 4-9. DC Voltmeter readouts should be identical with the bias setting voltages within tolerances given in the table.

Note

To change bias voltage:

1. Set a new bias voltage value into the three digit thumbwheel switch of the 16023B.
2. Press 16023B ENTER button (this actuates the 4275A to read the new value).

TABLE 4-9. DC Bias Voltage Test Limits.

| DC Bias Setting | Tolerance | DC Bias Setting | Tolerance |
|-----------------|-----------------|-----------------|---------------|
| 00.0V | -0.040 - 0.040V | 05.0V | 4.86 - 5.14V |
| 00.1 | 0.058 - 0.142 | 06.0 | 5.84 - 6.16 |
| 00.2 | 0.156 - 0.244 | 07.0 | 6.82 - 7.18 |
| 00.3 | 0.254 - 0.346 | 08.0 | 7.80 - 8.20 |
| 00.4 | 0.352 - 0.448 | 09.0 | 8.78 - 9.22 |
| 00.5 | 0.450 - 0.550 | 10.0 | 9.76 - 10.24 |
| 00.6 | 0.548 - 0.652 | 20.0 | 19.56 - 20.44 |
| 00.7 | 0.646 - 0.754 | 30.0 | 29.37 - 30.63 |
| 00.8 | 0.744 - 0.856 | 40.0 | 39.17 - 40.83 |
| 00.9 | 0.842 - 0.958 | | |
| 01.0 | 0.940 - 1.060 | 50.0 | 48.97 - 51.03 |
| 02.0 | 1.920 - 2.08 | 60.0 | 58.77 - 61.23 |
| 03.0 | 2.90 - 3.10 | 70.0 | 68.58 - 71.42 |
| 04.0 | 3.88 - 4.12 | 80.0 | 78.38 - 81.62 |
| | | 90.0 | 88.18 - 91.82 |

Note

When dc bias voltage is measured at rear panel INT DC BIAS MONITOR connector, voltmeter readout will be somewhat lower than the actual bias voltage. Refer to note in Paragraph 4-24.

PERFORMANCE TESTS

4-27. HP-IB INTERFACE TEST (OPTION 101 ONLY).

4-28. This test verifies that the HP-IB circuitry has the capabilities (listed in Table 3-10) to correctly communicate between external HP-IB devices and the 4275A through the interface bus cable.

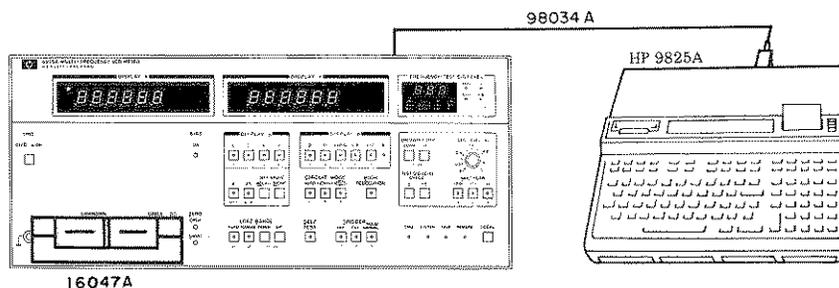


Figure 4-9. HP-IB Interface Test Setup.

EQUIPMENT:

Calculator HP 9825A
 ROM HP 98210A, 98213A
 Interface Card with cable HP 98034A

Sample capacitor (1000pF~1000nF)

PROCEDURE:

1. Turn power switches of both the 4275A and 9825A to OFF.
2. Connect 98034A Interface Card with cable between 9825A I/O slot and 4275A rear panel HP-IB connector as shown in Figure 4-9.
3. Install required ROM blocks in 9825A ROM slots.
4. Set 98034A Select Code Switch dial to select code 7 (using a screwdriver).
5. Remove 4275A top cover.
6. Set 4275A A22S1 HP-IB Control Switch to following settings:
 - bit 1~5 : 10001 (17 in binary code)
 - bit 6 : 0
 - bit 7 : 0
7. Replace top cover.
8. Connect 16047A Test Fixture to 4275A UNKNOWN terminals.
9. Turn 4275A and 9825A ON.
10. Set 4275A controls as follows:
 - OSC LEVEL 1
 - 16047A Test Fixture Open
 - Other Controls Initial control settings.
11. Load test program as shown on Pages 4-24 through 4-27 in calculator.
12. Execute the program.
13. Check that 4275A display, 9825A display, and printed data are in accord with Controller Instructions and Operator Responses for each test program.
14. Perform steps 10 thru 13 with respect to individual test programs and verify that 4275A and 9825A correctly communicates through the HP-IB interface.

PERFORMANCE TESTS

TEST PROGRAM 1**[PURPOSE]**

This test verifies that 4275A Opt. 101 has the following capabilities:

- (1) Remote/Local Capability.
- (2) Local Lockout.
- (3) Talk Address Disabled by Listen Address.
- (4) Listen Address Disabled by Talk Address.

[PROGRAMMING]

| | |
|---|--|
| <pre> 0: "REMOTE/LOCAL TEST": 1: dim AS[1] 2: 0+A 3: rds(717)+B 4: prt "REMOTE/LOCAL TEST";spc 3 5: rem 7 6: wrt 717,"T1";ent "LISTEN= 1 ,TALK= 0 ,REMOTE= 1",AS 7: if AS="n";1+A 8: cli 7;ent "LISTEN= 0 ,TALK= 0 ,REMOTE= 1",AS 9: if AS="n";1+A 10: lcl 7;ent "LISTEN= 0 ,TALK= 0 ,REMOTE= 0 ",AS 11: if AS="n";1+A 12: rem 717;ent "LISTEN= 1 ,TALK= 0 ,REMOTE= 1 ",AS 13: if AS="n";1+A 14: llo 7 15: lcl 717;ent "LISTEN= 1 ,TALK= 0 ,REMOTE= 0 ",AS 16: if AS="n";1+A 17: wrt 717,"T1";ent "LISTEN= 1 ,TALK= 0 ,REMOTE= 1 ",AS 18: if AS="n";1+A 19: if A=1;prt "REMOTE/LOCAL TEST FAIL";spc 3;jmp 2 20: prt "REMOTE/LOCAL TEST PASS";spc 3 21: 0+A 22: prt "LISTEN/TALK TEST";spc 3 23: red 717,A,B;ent "LISTEN= 0 ,TALK= 1 ,REMOTE= 1 ",AS 24: if AS="n";1+A 25: wrt 717,"T1";ent "LISTEN= 1 ,TALK= 0 ,REMOTE= 1 ",AS 26: if AS="n";1+A 27: if A=1;prt "LISTEN/TALK TEST FAIL";spc 3;jmp 2 28: prt "LISTEN/TALK TEST PASS";spc 3 29: prt "END";spc 3 30: cli 7 31: lcl 7 32: end *32472 </pre> | <ol style="list-style-type: none"> (3) Clears 4275A SRQ Status Byte. (5) Sets REN (Remote Enable) line of the bus line to "1". Switches selected devices (Interface Select Code 7) to remote operation allowing parameters and device characteristics to be controlled by data message. (6) Addresses 9825A to talk and 4275A to listen. (8) Sets IFC (Interface Clear) line of the bus line to "1". Unconditionally causes control to pass back to 9825A (independent of the device currently in control) and stops all communication. (10) Sets REN to "0". Removes all devices (Interface Select Code 7) from local lockout mode and causes all devices to revert to local. (12) Sets REN to "1". Switches 4275A to remote operation. (14) Prevents the device operator from switching the unit to manual control. (15) Causes 4275A to revert to manual control for future parameter modifications (REN remains at "1"). (17) Returns to the status of Step 14. (23) Disables listen address by talk address. (25) Disables talk address by listen address. |
|---|--|

PERFORMANCE TESTS

Table 4-10. Controller Instructions and Operator Responses for Test Program 1.

| Controller Instructions | | Operator Response |
|----------------------------------|------------------------|--|
| Displays | Printout | |
| | REMOTE/LOCAL TEST | |
| LISTEN = 1, TALK = 0, REMOTE = 1 | | If 4275A HP-IB Status Indicators and Controller Display are same, press "Y", CONTINUE " in each step. If not, press "n", CONTINUE ". |
| LISTEN = 0, TALK = 0, REMOTE = 1 | | |
| LISTEN = 0, TALK = 0, REMOTE = 0 | | |
| LISTEN = 1, TALK = 0, REMOTE = 1 | | |
| LISTEN = 1, TALK = 0, REMOTE = 0 | | |
| LISTEN = 1, TALK = 0, REMOTE = 1 | | |
| | REMOTE/LOCAL TEST PASS | If all steps are correct, this message is outputted. |
| | REMOTE/LOCAL TEST FAIL | If any step fails, this message is outputted. |
| | LISTEN/TALK TEST | |
| LISTEN = 0, TALK = 1, REMOTE = 1 | | If 4275A HP-IB Status Indicators and Controller Display are same, press "y", CONTINUE " in each step. If not, press "n", CONTINUE ". |
| LISTEN = 1, TALK = 0, REMOTE = 1 | | |
| | LISTEN/TALK TEST PASS | If both steps are correct, this message is outputted. |
| | LISTEN/TALK TEST FAIL | If any step fails, this message is outputted. |
| | END | |

PERFORMANCE TESTS

TEST PROGRAM 2

[PURPOSE]

This test verifies that 4275A Opt. 101 has following capabilities.

- (1) Listener.
- (2) Device Clear.

[PROGRAMMING]

```

0: "LISTENER TEST":
1: dim A$(50),B$(1)
2: prt "LISTENER TEST";spc 3
3: rem 7
4: cli 7
5: enp "Display A ? (1 thru 4)",A;spc 3
6: enp "Display B ? (1 thru 3)",B;spc 3
7: enp "Circuit Mode ? (1 thru 3)",C;spc 3
8: enp "Deviation Meas ? (0 thru 2)",D;spc 3
9: enp "Frequency Step ? (1 thru 22)",F;spc 3
10: enp "High Resolution ? (0 or 1)",H;spc 3
11: enp "Data Ready ? (0 or 1)",I;spc 3
12: enp "Multiplier ? (1 thru 3)",M;spc 3
13: enp "LCRZ Range ? (1 thru 23,31,32)",R;spc 3
14: enp "Self Test ? (0 or 1)",S;spc 3
15: enp "Trigger ? (1 thru 3)",T;spc 3
16: fmt 1,"A",f1.0,"B",f1.0,"C",f1.0,"D",f1.0,"F",f2.0,"H",f1.0,"I",f1.0
17: fmt 2,"M",f1.0,"R",f2.0,"S",f1.0,"T",f1.0
18: wrt 717,"ST"
19: wrt 717.1,A,B,C,D,F,H,I
20: wrt 717.2,M,R,S,T
21: gsb "K"
22: ent "Is key status true ? (y or n)",B$
23: if B$="n";prt "LISTENER TEST" FAIL";spc 3;jmp 2
24: prt "LISTENER TEST" PASS";spc 3
25: prt "DEVICE CLEAR TEST";spc 3
26: clr 717
27: gsb "K"
28: ent "Is key status true ? (y or n)",B$
29: if B$="n";prt "DEVICE CLEAR TEST" FAIL";spc 3;jmp 2
30: prt "DEVICE CLEAR TEST" PASS";spc 3
31: prt "END";spc 3
32: end
33: "K":
34: wrt 717,"K"
35: red 717,A$
36: prt A$;spc 3
37: ret
*14283
    
```

- (18)~(20). Transfers Remote program codes from 9825A to 4275A.
- (26) Initializes device-dependent functions to predefined state.
- (35) Transfers outputted data from 4275A to 9825A.

Table 4-11. Controller Instructions and Operator Responses for Test Program 2.

| Controller Instructions | | Operator Response |
|-----------------------------|--------------------------------|--|
| Displays | Printout | |
| | LISTENER TEST | |
| Display A ? (1 thru 4) | Display A ? (1 thru 4) 1 | Input HP-IB program code suffix in each step (see Table 3-11). Example: A1 B3 C3 D2 F22 H1 I0 M3 R20 S0 T3 |
| Display B ? (1 thru 3) | Display B ? (1 thru 3) 3 | |
| Circuit Mode ? (1 thru 3) | Circuit Mode ? (1 thru 3) 3 | |
| Deviation Meas ? (0 thru 2) | Deviation Meas ? (0 thru 2) | |

PERFORMANCE TESTS

Table 4-11. Controller Instructions and Operator Responses for Test Program 2.(Cont'd).

| Controller Instructions | | Operator Response |
|---------------------------------|------------------------------------|---|
| Displays | Printout | |
| | 2 | |
| Frequency Step ? (11 thru 22) | Frequency Step ? (11 thru 22) | A1 L B3 ESR/G C3  D2 Δ% |
| | 18 | F18 2(3)MHz H1 ON I0 OFF M3 x1 R15 1000μH S0 OFF T3 HOLD/MANUAL |
| High Resolution ? (0 or 1) | High Resolution ? (0 or 1) | |
| | 1 | |
| Data Ready ? (0 or 1) | Data Ready ? (0 or 1) | |
| | 0 | |
| Multiplier ? (1 thru 3) | Multiplier ? (1 thru 3) | |
| | 3 | |
| LCRZ Range ? (11 thru 23,31,32) | LCRZ Range ? (11 thru 23,31,32) | |
| | 15 | |
| Self Test ? (0 or 1) | Self Test ? (0 o r 1) | |
| | 0 | |
| Trigger ? (1 thru 3) | Trigger ? (1 thr u 3) | |
| | 3 | |
| | A1B3C3D0F18H1I0 M3R15S0T3 | This is the key status data of 4275A when it accepts input remote program codes from con- troller. |
| Is key status true ? (y or n) | LISTENER TEST PASS | If input remote program codes and outputted key status data are same, press "y", [CONTINUE]. If not, press "n", [CONTINUE]. |
| | LISTENER TEST FAIL | |
| | DEVICE CLEAR TES T | |
| | A2B1C1D0F15H0I0 M3R31S0T1 | This is the key status data of 4275A when it accepts SDC (Se- lected Device Clear) command from controller. |
| Is key status true ? (y or n) | DEVICE CLEAR TES T PASS | If outputted key status data and initial control settings (A2 B1 C1 D0 F17 H0 I0 M3 R31 S0 T1) are same, press "y", [CONTINUE]. If not, press "n", [CONTINUE]. |
| | DEVICE CLEAR TES T FAIL | |
| | END | |

PERFORMANCE TESTS

TEST PROGRAM 3

[PURPOSE]

This test verifies that 4275A Opt. 101 has following capabilities:

- (1) Talker.
- (2) Device Trigger.

[PROGRAMMING]

```

0: "TALKER TEST":
1: prt "TALKER TEST";spc 3
2: dsp "Connect a capacitor to 16047A.";stp
3: prt "DATA OUTPUT TEST"
4: dim A$[50],B$[50],C$[50],D$[50],E$[50],F$[1]
5: rds(717)+C
6: lcl 7
7: flt 5
8: rem 7
9: cli 7
10: clr 717
11: wrt 717,"T3E"
12: red 717,A,B
13: prt A,B;spc 2
14: ent "Is output data true ? (y or n)",F$[1]
15: if F$="n";prt "DATA OUTPUT TEST      FAIL";spc 3;jmp 2
16: prt "DATA OUTPUT TEST      PASS";spc 3
17: prt "COMPLETE DATA OUTPUT TEST"
18: wrt 717,"E"
19: red 717,A$
20: prt A$;spc 2
21: ent "Is output data true ? (y or n)",F$[1]
22: if F$="n";prt "COMPLETE DATA OUTPUT TEST  FAIL";spc 3;jmp 2
23: prt "COMPLETE DATA OUTPUT TEST  PASS";spc 3
24: prt "DEVICE TRIGGER TEST"
25: trg 717
26: red 717,B$
27: prt B$;spc 2
28: ent "Is output data true ? (y or n)",F$[1]
29: if F$="n";prt "DEVICE TRIGGER TEST  FAIL";spc 3;jmp 2
30: prt "DEVICE TRIGGER TEST  PASS";spc 3
31: prt "REFERENCE VALUE TEST"
32: wrt 717,"ST"
33: wrt 717,"RE"
34: red 717,C$
35: prt C$;spc 2
36: ent "Is output data true ? (y or n)",F$[1]
37: if F$="n";prt "REFERENCE VALUE TEST  FAIL";spc 3;jmp 2
38: prt "REFERENCE VALUE TEST  PASS";spc 3
39: prt "TEST SIG LEVEL CHECK TEST"
40: wrt 717,"LV"
41: red 717,D$
42: prt D$;spc 1
43: wrt 717,"LA"
44: red 717,E$
45: prt E$;spc 2
46: ent "Is output data true ? (y or n)",F$[1]
47: if F$="n";prt "TEST SIG LEVEL CHECK TEST  FAIL";spc 3;jmp 2
48: prt "TEST SIG LEVEL CHECK TEST  PASS";spc 3
49: prt "END";spc 3
50: end
*9606

```

- (25) Causes 4275A to simultaneously initiate a device-dependent action.

Table 4-12. Controller Instructions and Operator Responses for Test Program 3.

| Controller Instructions | | Operator Response |
|-------------------------------|----------------------------|--|
| Displays | Printout | |
| | TALKER TEST | |
| Connect a capacitor to 16047A | | Connect a capacitor (1000pF~1000nF) to 16047A Test Fixture. Press " CONTINUE ". |
| | DATA OUTPUT TEST | |
| | 2.74300e-09 5.00000e-04 | |

PERFORMANCE TESTS

Table 4-12. Controller Instructions and Operator Responses for Test Program 3 (Cont'd).

| Controller Instructions | | Operator Response |
|-------------------------------|---------------------------------|---|
| Displays | Printout | |
| Is output data true? (y or n) | DATA OUTPUT TEST PASS | If outputted data and values of DISPLAY A and B are same, press "y", CONTINUE ". If not, press "n", CONTINUE ". |
| | DATA OUTPUT TEST FAIL | |
| | COMPLETE DATA OUTPUT TEST | |
| | PLNC+0.27440E-08,ND+0.00040E+00 | |
| Is output data true? (y or n) | COMPLETE DATA OUTPUT TEST PASS | If outputted data is true, press "y", CONTINUE " (see paragraph 3-84). If not, press "n", CONTINUE ". |
| | COMPLETE DATA OUTPUT TEST FAIL | |
| | DEVICE TRIGGER TEST | |
| | PLNC+0.27430E-08,ND+0.00030E+00 | |
| Is output data true? (y or n) | DEVICE TRIGGER TEST PASS | If outputted data is true, press "y", CONTINUE " (see paragraph 3-84). If not, press "n", CONTINUE ". |
| | DEVICE TRIGGER TEST FAIL | |
| | REFERENCE VALUE TEST | |
| | C+0.27430E-08 | Press RECALL key on 4275A front panel and read stored reference value. |
| Is output data true? (y or n) | REFERENCE VALUE TEST PASS | If outputted data is true, press "y", CONTINUE " (see paragraph 3-86). If not, press "n", CONTINUE ". |
| | REFERENCE VALUE TEST FAIL | |
| | TEST SIG LEVEL CHECK TEST | |
| | NV+1.03E+00 NR+0.17E-04 | Press TEST SIG LEVEL CHECK keys on 4275A front panel and read test signal level. |
| Is output data true? (y or n) | TEST SIG LEVEL CHECK TEST PASS | If outputted data is true, press "y", CONTINUE " (see paragraph 3-88). If not, press "n", CONTINUE ". |
| | TEST SIG LEVEL CHECK TEST FAIL | |
| | END | |

PERFORMANCE TESTS

TEST PROGRAM 4

[PURPOSE]

This test program verifies that 4275A Opt. 101 has following capabilities:

- (1) Service Request.
- (2) Serial Poll.

[PROGRAMMING]

```

0: "SRQ TEST":
1: prt "SRQ TEST";spc 3
2: fxd 0
3: oni 7,"SRQ"
4: rem 7
5: cli 7
6: clr 717
7: rds(717)+A
8: 0+A;prt "DATA READY";wrt 717,"IIT3E";gsb "LOOP"
9: 0+A;prt "SELF TEST -PASS";wrt 717,"IOS1";gsb "LOOP"
10: 0+A;prt "SELF TEST -FAIL";wrt 717,"A1";gsb "LOOP"
11: 0+A;prt "ZERO OFFSET -PASS";wrt 717,"S0Z0";gsb "LOOP"
12: 0+A;prt "ZERO OFFSET -FAIL(Err1)";wrt 717,"ZS";gsb "LOOP"
13: 0+A;prt "Err5";wrt 717,"T1";wait 9000
14: wrt 717,"ST";gsb "LOOP"
15: 0+A;prt "SYNTAX ERROR";wrt 717,"A5";gsb "LOOP"
16: prt "END";spc 3
17: end
18: "LOOP":eir 7,128
19: if bit(0,A)=1;prt A;spc 3;ret
20: if bit(1,A)=1;prt A;spc 3;ret
21: if bit(2,A)=1;prt A;spc 3;ret
22: if bit(3,A)=1;prt A;spc 3;ret
23: gto "LOOP"
24: "SRQ":rds(717)+A
25: if bit(6,A)=1;jmp 2
26: prt "OTHER DEVICE SRQ";spc 3
27: "IRET":eir 7,128
28: iret
*13153

```

(3) Designates label (SRQ) for service routing to be performed when an interrupt is set by a device on select code 7 bus line.

(18) Labels Loop. Enables Service Request to be sent from device on select code 7 Bus Line. Checks status of SRQ line on the bus line.

(27) Again enables acceptance of SRQ from device because SRQ is disabled when Status Byte signal transfer is completed.

(28) After service subroutine is completed, return to the step that follows step 7, 8 or 9 (as appropriate) to main programming sequence.

PERFORMANCE TESTS

Table 4-13. Controller Instructions and Operator Responses for Test Program 4.

| Controller Instructions (Printout) | Operator Response |
|------------------------------------|---|
| SRQ TEST | |
| DATA READY | Outputted SRQ Status Byte data should be 65 (= 01000001). |
| 65 | |
| SELF TEST -PASS | Outputted SRQ Status Byte data should be 68 (= 01000100). |
| 68 | |
| SELF TEST -FAIL | Outputted SRQ Status Byte data should be 76 (= 01001100). |
| 76 | |
| ZERO OFFSET -PASS | Outputted SRQ Status Byte data should be 68 (= 01000100). |
| 68 | |
| ZERO OFFSET -FAIL (Err1) | Outputted SRQ Status Byte data should be 76 (= 01001100). |
| 76 | |
| Err5 | Outputted SRQ Status Byte data should be 72 (= 01001000). |
| 72 | |
| SYNTAX ERROR | Outputted SRQ Status Byte data should be 66 (= 01000010). |
| 66 | |
| END | |

| Paragraph Number | TEST | Results | | | |
|------------------|---------------------------|--|----------------------------|---------------------------|---------------------------|
| | | Minimum | Actual | Maximum | |
| 4-15 | CAPACITANCE ACCURACY TEST | | | | |
| | 1pF | MULTIPLIER x1 | | | |
| | 40.0kHz (D) | C.V. -5.10fF -0.00360 | _____ | C.V. +5.10fF 0.00360 | |
| | 100kHz (D) | C.V. -4.50fF -0.00210 | _____ | C.V. +4.50fF 0.00210 | |
| | 400kHz (D) | C.V. -4.60fF -0.00260 | _____ | C.V. +4.60fF 0.00260 | |
| | 1.00MHz (D) | C.V. -4.30fF -0.00170 | _____ | C.V. +4.30fF 0.00170 | |
| | 4.00MHz (D) | C.V. -14.00fF -0.00710 | _____ | C.V. +14.00fF 0.00710 | |
| | 10.0MHz (D) | C.V. -24.00fF -0.01110 | _____ | C.V. +24.00fF 0.01110 | |
| | 1pF | MULTIPLIER x0.1 | | | |
| | 40.0kHz (D) | C.V. -15.0fF -0.00360 | _____ | C.V. +15.0fF 0.00360 | |
| | 100kHz (D) | C.V. -9.0fF -0.00210 | _____ | C.V. +9.0fF 0.00210 | |
| | 400kHz (D) | C.V. -10.0fF -0.00260 | _____ | C.V. +10.0fF 0.00260 | |
| | 1.00MHz (D) | C.V. -7.0fF -0.00170 | _____ | C.V. +7.0fF 0.00170 | |
| | 4.00MHz (D) | C.V. -32.0fF -0.00710 | _____ | C.V. +32.0fF 0.00710 | |
| | 10.0MHz (D) | C.V. -42.0fF -0.01110 | _____ | C.V. +42.0fF 0.01110 | |
| | 10pF | MULTIPLIER x1 | | | |
| | 10.0kHz (D) | C.V. -0.0130pF -0.00090 | _____ | C.V. +0.0130pF 0.00090 | |
| | 20.0kHz (D) | C.V. -0.0120pF -0.00075 | _____ | C.V. +0.0120pF 0.00075 | |
| | 40.0kHz (D) | C.V. -0.0420pF -0.00360 | _____ | C.V. +0.0420pF 0.00360 | |
| | 100kHz (D) | C.V. -0.0360pF -0.00210 | _____ | C.V. +0.0360pF 0.00210 | |
| | 200kHz (D) | C.V. -0.0120pF -0.00075 | _____ | C.V. +0.0120pF 0.00075 | |
| | 400kHz (D) | C.V. -0.0160pF -0.00135 | _____ | C.V. +0.0160pF 0.00135 | |
| | 1.00MHz (D) | C.V. -0.0130pF -0.00090 | _____ | C.V. +0.0130pF 0.00090 | |
| | 2.00MHz (D) | C.V. -0.0330pF -0.00260 | _____ | C.V. +0.0330pF 0.00260 | |
| | 4.00MHz (D) | C.V. -0.1220pF -0.00710 | _____ | C.V. +0.1220pF 0.00710 | |
| | 10.0MHz (D) | C.V. -0.2220pF -0.01110 | _____ | C.V. +0.2220pF 0.01110 | |
| | | Opt. freq. (Hz) (D) | _____ | _____ | |
| | | Opt. freq. (Hz) (D) | _____ | _____ | |
| | |  1.00MHz (D) | C.V. -0.0130pF -0.00090 | _____ | C.V. +0.0130pF 0.00090 |

C.V. = Calibrated Value

| Paragraph Number | TEST | Results | | |
|------------------|----------------------|----------------------------|--------|--------------------------|
| | | Minimum | Actual | Maximum |
| 4-15 | 10pF MULTIPLIER x0.1 | | | |
| | 10.0kHz (D) | C.V. -0.0130pF -0.00090 | _____ | C.V +0.0130pF 0.00090 |
| | 20.0kHz (D) | C.V. -0.0120pF -0.00075 | _____ | C.V +0.0120pF 0.00075 |
| | 40.0kHz (D) | C.V. -0.0420pF -0.00360 | _____ | C.V +0.0420pF 0.00360 |
| | 100kHz (D) | C.V. -0.0360pF -0.00210 | _____ | C.V +0.0360pF 0.00210 |
| | 200kHz (D) | C.V. -0.0120pF -0.00075 | _____ | C.V +0.0120pF 0.00075 |
| | 400kHz (D) | C.V. -0.0160pF -0.00135 | _____ | C.V +0.0160pF 0.00135 |
| | 1.00MHz (D) | C.V. -0.0130pF -0.00090 | _____ | C.V +0.0130pF 0.00090 |
| | 2.00MHz (D) | C.V. -0.0330pF -0.00260 | _____ | C.V +0.0330pF 0.00260 |
| | 4.00MHz (D) | C.V. -0.1220pF -0.00710 | _____ | C.V +0.1220pF 0.00710 |
| | 10.0MHz (D) | C.V. -0.2220pF -0.01110 | _____ | C.V +0.2220pF 0.01110 |
| | Opt. freq. (Hz) (D) | _____ | _____ | _____ |
| | Opt. freq. (Hz) (D) | _____ | _____ | _____ |
| | 100pF MULTIPLIER x1 | | | |
| | 10.0kHz (D) | C.V. -0.130pF -0.00090 | _____ | C.V +0.130pF 0.00090 |
| | 20.0kHz (D) | C.V. -0.120pF -0.00075 | _____ | C.V +0.120pF 0.00075 |
| | 40.0kHz (D) | C.V. -0.160pF -0.00135 | _____ | C.V +0.160pF 0.00135 |
| | 100kHz (D) | C.V. -0.130pF -0.00090 | _____ | C.V +0.130pF 0.00090 |
| | 200kHz (D) | C.V. -0.120pF -0.00075 | _____ | C.V +0.120pF 0.00075 |
| | 400kHz (D) | C.V. -0.160pF -0.00135 | _____ | C.V +0.160pF 0.00135 |
| | 1.00MHz (D) | C.V. -0.130pF -0.00090 | _____ | C.V +0.130pF 0.00090 |
| | 2.00MHz (D) | C.V. -0.330pF -0.00260 | _____ | C.V +0.330pF 0.00260 |
| | 4.00MHz (D) | C.V. -1.202pF -0.00710 | _____ | C.V +1.202pF 0.00710 |
| | 10.0MHz (D) | C.V. -2.200pF -0.01110 | _____ | C.V +2.200pF 0.01110 |
| | Opt. freq. (Hz) (D) | _____ | _____ | _____ |
| | Opt. freq. (Hz) (D) | _____ | _____ | _____ |

C.V. = Calibrated Value

| Paragraph Number | TEST | Results | | |
|------------------|-------------------------|--------------------------|--------|-------------------------|
| | | Minimum | Actual | Maximum |
| 4-15 | 100pF MULTIPLIER x0.1 | | | |
| | 10.0kHz (D) | C.V.-0.130pF -0.00090 | _____ | C.V.+0.130pF 0.00090 |
| | 20.0kHz (D) | C.V.-0.120pF -0.00075 | _____ | C.V.+0.120pF 0.00075 |
| | 40.0kHz (D) | C.V.-0.160pF -0.00135 | _____ | C.V.+0.160pF 0.00135 |
| | 100kHz (D) | C.V.-0.130pF -0.00090 | _____ | C.V.+0.130pF 0.00090 |
| | 200kHz (D) | C.V.-0.120pF -0.00075 | _____ | C.V.+0.120pF 0.00075 |
| | 400kHz (D) | C.V.-0.160pF -0.00135 | _____ | C.V.+0.160pF 0.00135 |
| | 1.00MHz (D) | C.V.-0.130pF -0.00090 | _____ | C.V.+0.130pF 0.00090 |
| | 2.00MHz (D) | C.V.-0.330pF -0.00260 | _____ | C.V.+0.330pF 0.00260 |
| | 4.00MHz (D) | C.V.-1.202pF -0.00710 | _____ | C.V.+1.202pF 0.00710 |
| | 10.0MHz (D) | C.V.-2.200pF -0.01110 | _____ | C.V.+2.200pF 0.01110 |
| | Opt. freq. (Hz) (D) | _____ | _____ | _____ |
| | Opt. freq. (Hz) (D) | _____ | _____ | _____ |
| | 1000pF MULTIPLIER x1 | | | |
| | 10.0kHz (D) | C.V.-1.30pF -0.00090 | _____ | C.V.+1.30pF 0.00090 |
| | 20.0kHz (D) | C.V.-1.20pF -0.00075 | _____ | C.V.+1.20pF 0.00075 |
| | 40.0kHz (D) | C.V.-1.60pF -0.00135 | _____ | C.V.+1.60pF 0.00135 |
| | 100kHz (D) | C.V.-1.30pF -0.00090 | _____ | C.V.+1.30pF 0.00090 |
| | 200kHz (D) | C.V.-1.20pF -0.00075 | _____ | C.V.+1.20pF 0.00075 |
| | 400kHz (D) | C.V.-1.60pF -0.00135 | _____ | C.V.+1.60pF 0.00135 |
| | 1.00MHz (D) | C.V.-1.30pF -0.00090 | _____ | C.V.+1.30pF 0.00090 |
| | 2.00MHz (D) | C.V.-3.30pF -0.00230 | _____ | C.V.+3.30pF 0.00260 |
| | 4.00MHz (D) | C.V.-32.0pF -0.01130 | _____ | C.V.+32.0pF 0.01210 |
| | 10.0MHz (D) | C.V.-32.0pF -0.01210 | _____ | C.V.+32.0pF 0.01510 |
| | Opt. freq. (Hz) (D) | _____ | _____ | _____ |
| | Opt. freq. (Hz) (D) | _____ | _____ | _____ |

C.V. = Calibrated Value

| Paragraph Number | TEST | Results | | | |
|----------------------|------------------------|--------------------------|--------------|-------------------------|--------------|
| | | Minimum | Actual | Maximum | |
| 4-15 | 1000pF MULTIPLIER x0.1 | | | | |
| | 10.0kHz (D) | C.V. -1.30pF -0.00090 | _____ | C.V. +1.30pF 0.00090 | |
| | 20.0kHz (D) | C.V. -1.20pF -0.00075 | _____ | C.V. +1.20pF 0.00075 | |
| | 40.0kHz (D) | C.V. -1.60pF -0.00135 | _____ | C.V. +1.60pF 0.00135 | |
| | 100kHz (D) | C.V. -1.30pF -0.00090 | _____ | C.V. +1.30pF 0.00090 | |
| | 200kHz (D) | C.V. -1.20pF -0.00075 | _____ | C.V. +1.20pF 0.00075 | |
| | 400kHz (D) | C.V. -1.60pF -0.00135 | _____ | C.V. +1.60pF 0.00135 | |
| | 1.00MHz (D) | C.V. -1.30pF -0.00090 | _____ | C.V. +1.30pF 0.00090 | |
| | 2.00MHz (D) | C.V. -3.30pF -0.00230 | _____ | C.V. +3.30pF 0.00260 | |
| | 4.00MHz (D) | C.V. -32.0pF -0.01130 | _____ | C.V. +32.0pF 0.01210 | |
| | 10.0MHz (D) | C.V. -32.0pF -0.01210 | _____ | C.V. +32.0pF 0.01510 | |
| | Opt. freq. (Hz) | _____ | _____ | _____ | |
| | Opt. freq. (Hz) | _____ | _____ | _____ | |
| | Opt. freq. (Hz) | _____ | _____ | _____ | |
| | 4-17 | RESISTANCE ACCURACY TEST | | | |
| | | 100Ω MULTIPLIER x1 | | | |
| | | 10.0kHz | C.V. -0.130Ω | _____ | C.V. +0.130Ω |
| 20.0kHz | | C.V. -0.130Ω | _____ | C.V. +0.130Ω | |
| 40.0kHz | | C.V. -0.130Ω | _____ | C.V. +0.130Ω | |
| 100kHz | | C.V. -0.130Ω | _____ | C.V. +0.130Ω | |
| 200kHz | | C.V. -0.230Ω | _____ | C.V. +0.230Ω | |
| 400kHz | | C.V. -0.230Ω | _____ | C.V. +0.230Ω | |
| 1.00MHz | | C.V. -0.230Ω | _____ | C.V. +0.230Ω | |
| 2.00MHz | | C.V. -0.550Ω | _____ | C.V. +0.550Ω | |
| 4.00MHz | | C.V. -2.070Ω | _____ | C.V. +2.070Ω | |
| 10.0MHz | | C.V. -2.070Ω | _____ | C.V. +2.070Ω | |
| Opt. freq. (Hz) | | _____ | _____ | _____ | |
| Opt. freq. (Hz) | | _____ | _____ | _____ | |
| 100Ω MULTIPLIER x0.1 | | | | | |
| 10.0kHz | | C.V. -0.130Ω | _____ | C.V. +0.130Ω | |
| 20.0kHz | | C.V. -0.130Ω | _____ | C.V. +0.130Ω | |
| 40.0kHz | | C.V. -0.130Ω | _____ | C.V. +0.130Ω | |
| 100kHz | | C.V. -0.130Ω | _____ | C.V. +0.130Ω | |
| 200kHz | | C.V. -0.230Ω | _____ | C.V. +0.230Ω | |
| 400kHz | C.V. -0.230Ω | _____ | C.V. +0.230Ω | | |
| 1.00MHz | C.V. -0.230Ω | _____ | C.V. +0.230Ω | | |
| 2.00MHz | C.V. -0.550Ω | _____ | C.V. +0.550Ω | | |
| 4.00MHz | C.V. -2.070Ω | _____ | C.V. +2.070Ω | | |
| 10.0MHz | C.V. -2.070Ω | _____ | C.V. +2.070Ω | | |

C.V. = Calibrated Value

| Paragraph Number | TEST | Results | | |
|----------------------|-----------------------|---------------|---------------|---------------|
| | | Minimum | Actual | Maximum |
| 4-17 | 1000Ω MULTIPLIER x1 | | | |
| | 10.0kHz | C.V. -4.0Ω | _____ | C.V. +4.0Ω |
| | 20.0kHz | C.V. -4.0Ω | _____ | C.V. +4.0Ω |
| | 40.0kHz | C.V. -4.0Ω | _____ | C.V. +4.0Ω |
| | 100kHz | C.V. -4.0Ω | _____ | C.V. +4.0Ω |
| | 200kHz | C.V. -5.0Ω | _____ | C.V. +5.0Ω |
| | 400kHz | C.V. -5.0Ω | _____ | C.V. +5.0Ω |
| | 1.00MHz | C.V. -5.0Ω | _____ | C.V. +5.0Ω |
| | 2.00MHz | C.V. -12.0Ω | _____ | C.V. +12.0Ω |
| | 4.00MHz | C.V. -33.0Ω | _____ | C.V. +33.0Ω |
| | 10.0MHz | C.V. -33.0Ω | _____ | C.V. +33.0Ω |
| | Opt. freq. (Hz) | _____ | _____ | _____ |
| | Opt. freq. (Hz) | _____ | _____ | _____ |
| | 1000Ω MULTIPLIER x0.1 | | | |
| | 10.0kHz | C.V. -4.0Ω | _____ | C.V. +4.0Ω |
| | 20.0kHz | C.V. -4.0Ω | _____ | C.V. +4.0Ω |
| | 40.0kHz | C.V. -4.0Ω | _____ | C.V. +4.0Ω |
| | 100kHz | C.V. -4.0Ω | _____ | C.V. +4.0Ω |
| | 200kHz | C.V. -5.0Ω | _____ | C.V. +5.0Ω |
| | 400kHz | C.V. -5.0Ω | _____ | C.V. +5.0Ω |
| | 1.00MHz | C.V. -5.0Ω | _____ | C.V. +5.0Ω |
| | 2.00MHz | C.V. -12.0Ω | _____ | C.V. +12.0Ω |
| | 4.00MHz | C.V. -33.0Ω | _____ | C.V. +33.0Ω |
| | 10.0MHz | C.V. -33.0Ω | _____ | C.V. +33.0Ω |
| | Opt. freq. (Hz) | _____ | _____ | _____ |
| | Opt. freq. (Hz) | _____ | _____ | _____ |
| | 10kΩ MULTIPLIER x1 | | | |
| | 10.0kHz | C.V. -0.040kΩ | _____ | C.V. +0.040kΩ |
| | 20.0kHz | C.V. -0.040kΩ | _____ | C.V. +0.040kΩ |
| | 40.0kHz | C.V. -0.040kΩ | _____ | C.V. +0.040kΩ |
| | 100kHz | C.V. -0.040kΩ | _____ | C.V. +0.040kΩ |
| | 200kHz | C.V. -0.050kΩ | _____ | C.V. +0.050kΩ |
| | 400kHz | C.V. -0.050kΩ | _____ | C.V. +0.050kΩ |
| 1.00MHz | C.V. -0.050kΩ | _____ | C.V. +0.050kΩ | |
| Opt. freq. (Hz) | _____ | _____ | _____ | |
| Opt. freq. (Hz) | _____ | _____ | _____ | |
| 10kΩ MULTIPLIER x0.1 | | | | |
| 10.0kHz | C.V. -0.040kΩ | _____ | C.V. +0.040kΩ | |
| 20.0kHz | C.V. -0.040kΩ | _____ | C.V. +0.040kΩ | |
| 40.0kHz | C.V. -0.040kΩ | _____ | C.V. +0.040kΩ | |
| 100kHz | C.V. -0.040kΩ | _____ | C.V. +0.040kΩ | |
| 200kHz | C.V. -0.050kΩ | _____ | C.V. +0.050kΩ | |
| 400kHz | C.V. -0.050kΩ | _____ | C.V. +0.050kΩ | |
| 1.00MHz | C.V. -0.050kΩ | _____ | C.V. +0.050kΩ | |
| Opt. freq. (Hz) | _____ | _____ | _____ | |
| Opt. freq. (Hz) | _____ | _____ | _____ | |

C.V. = Calibrated Value

| Paragraph Number | TEST | Results | | |
|------------------|-------------------------------|----------------------|-----------------|----------------------|
| | | Minimum | Actual | Maximum |
| 4-17 | 100k Ω MULTIPLIER x1 | | | |
| | 10.0kHz | C.V. -0.40k Ω | _____ | C.V. +0.40k Ω |
| | 20.0kHz | C.V. -0.40k Ω | _____ | C.V. +0.40k Ω |
| | 40.0kHz | C.V. -0.40k Ω | _____ | C.V. +0.40k Ω |
| | 100kHz | C.V. -0.40k Ω | _____ | C.V. +0.40k Ω |
| | Opt. freq. (Hz) | _____ | _____ | _____ |
| | Opt. freq. (Hz) | _____ | _____ | _____ |
| | 100k Ω MULTIPLIER x0.1 | | | |
| | 10.0kHz | C.V. -0.40k Ω | _____ | C.V. +0.40k Ω |
| | 20.0kHz | C.V. -0.40k Ω | _____ | C.V. +0.40k Ω |
| | 40.0kHz | C.V. -0.40k Ω | _____ | C.V. +0.40k Ω |
| | 100kHz | C.V. -0.40k Ω | _____ | C.V. +0.40k Ω |
| | Opt. freq. (Hz) | _____ | _____ | _____ |
| | Opt. freq. (Hz) | _____ | _____ | _____ |
| 4-21 | FREQUENCY-PHASE ACCURACY TEST | | | |
| | 1000m Ω | | | |
| | 10.0kHz | -1.50m Ω | _____ | 1.50m Ω |
| | 20.0kHz | -1.50m Ω | _____ | 1.50m Ω |
| | 40.0kHz | -1.50m Ω | _____ | 1.50m Ω |
| | 100kHz | -1.69m Ω | _____ | 1.69m Ω |
| | 200kHz | -1.87m Ω | _____ | 1.87m Ω |
| | 400kHz | -2.25m Ω | _____ | 2.25m Ω |
| | 1.00MHz | -3.38m Ω | _____ | 3.38m Ω |
| | 10 Ω | | | |
| | 10.0kHz | -0.0130 Ω | _____ | 0.0130 Ω |
| | 20.0kHz | -0.0130 Ω | _____ | 0.0130 Ω |
| | 40.0kHz | -0.0130 Ω | _____ | 0.0130 Ω |
| | 100kHz | -0.0136 Ω | _____ | 0.0136 Ω |
| | 200kHz | -0.0142 Ω | _____ | 0.0142 Ω |
| | 400kHz | -0.0155 Ω | _____ | 0.0155 Ω |
| | 1.00MHz | -0.0193 Ω | _____ | 0.0193 Ω |
| | 2.00MHz | -0.0275 Ω | _____ | 0.0275 Ω |
| 4.00MHz | -0.1400 Ω | _____ | 0.1400 Ω | |
| 10.0MHz | -0.1780 Ω | _____ | 0.1780 Ω | |

C.V. = Calibrated Value

| Paragraph Number | TEST | Results | | |
|------------------|--|---------|--------|---------|
| | | Minimum | Actual | Maximum |
| 4-23 | INT DC BIAS SUPPLY TEST (OPTION 001 ONLY) | | | |
| | .000V | -.0020V | _____ | .0020V |
| | .002V | .0000V | _____ | .0040V |
| | .005V | .0030V | _____ | .0070V |
| | .010V | .0080V | _____ | .0120V |
| | .020V | .0179V | _____ | .0221V |
| | .050V | .0478V | _____ | .0522V |
| | .100V | .0975V | _____ | .1025V |
| | .200V | .1970V | _____ | .2030V |
| | .500V | .4955V | _____ | .5045V |
| | 1.00V | .9910V | _____ | 1.009V |
| | 2.00V | 1.986V | _____ | 2.014V |
| | 5.00V | 4.972V | _____ | 5.028V |
| | 10.0V | 9.930V | _____ | 10.07V |
| 20.0V | 19.88V | _____ | 20.12V | |
| 30.0V | 29.82V | _____ | 30.16V | |
| 4-25 | INT DC BIAS SUPPLY TEST (OPTION 002 ONLY) | | | |
| | 00.0V | -0.040V | _____ | 0.040V |
| | 00.2V | 0.156V | _____ | 0.244V |
| | 00.5V | 0.450V | _____ | 0.550V |
| | 01.0V | 0.940V | _____ | 1.060V |
| | 02.0V | 1.920V | _____ | 2.08V |
| | 05.0V | 4.86V | _____ | 5.14V |
| | 10.0V | 9.76V | _____ | 10.24V |
| | 20.0V | 19.56V | _____ | 20.44V |
| | 50.0V | 48.97V | _____ | 51.03V |
| 90.0V | 88.18V | _____ | 91.82V | |

Table 5-0. Recommended Test Equipment.

| Equipment | Critical Specifications | Recommended Model/Note | Use |
|--------------------------------------|---|--|--------|
| Digital Voltmeter | Voltage range: 10mV to 100V f.s. Accuracy: 0.05% Input impedance: >10M Ω | HP 3465A/B | A T |
| Oscilloscope | Bandwidth: 100MHz Sensitivity: 5mV/div Dual channel input. | HP 1740A | A T |
| RF Voltmeter | Voltage range: 1mV to 3Vrms f.s. Bandwidth: 10KHz to 10MHz Accuracy | HP 3403C | A |
| Pulse Generator | Output: 5V p-p to 50 Ω load. Pulsewidth: 100mS Duty: 50% | HP 8011A | A |
| Signature Analyzer | | HP 5004A | T |
| Capacitance Standards | 1pF \pm 0.03% 10pF \pm 0.03% 100pF \pm 0.03% 1000pF \pm 0.03% | HP 16381A HP 16382A HP 16383A HP 16384A | A |
| Resistance Standards | 100 Ω \pm 0.03% 1K Ω \pm 0.03% 10K Ω \pm 0.03% 100K Ω \pm 0.03% Open termination Short termination | HP 16074A Standard Resistor Set | A T |
| Bias Controller | (Option 001 or 002 only) | HP 16023B | A |
| Test Leads | Accessory test leads, 1m | HP 16048A | A |
| Bracket | (Accessory for HP 16048A) | 1 ea. | A |
| DVM input cable | Dual banana-to-alligator clip cable | 1 ea. | AT |
| Oscilloscope probe | 10M Ω , 10:1 | HP 10004D | AT |
| BNC cable | 20cm or less | 1 ea. | A |
| | 10cm | 4 ea. | A |
| 50 Ω Feed-through Termination | | -hp- 11048C | A |
| BNC Tee Adapter | Female-to-female-to-male | -hp- 1250-0781 | A |
| Reed relay | Drive voltage: 5V | -hp- 0490-0916 | A |
| Resistor | 500 Ω 10% 5K Ω 10% | -hp- 0757-0416 -hp- 0757-0438 | A |
| Extender board | - | -hp- 5060-4025 | AT |

A: Adjustment T: Troubleshooting

SECTION V ADJUSTMENT

5-1. INTRODUCTION.

5-2. This section provides the information needed to adjust the 4275A to its specifications (listed in Table 1-1). The prime purpose of adjustment is to return the instrument to its peak operating capabilities after repairs have been made. Adjustment procedures can also be periodically performed to maintain top notch performance. Recommended adjustment cycle for the 4275A is once every six months. All adjustable components referred to in individual adjustments are summarized in Table 5-1. If proper performance cannot be achieved after adjustment procedure has been performed, refer to Section VIII Troubleshooting Procedures.

Note

Before proceeding to any adjustment, allow a warm up time of more than 30 minutes to stabilize operating conditions.

5-3. SAFETY REQUIREMENTS.

5-4. Although the instrument has been designed in accordance with international safety standards, this manual contains information, cautions and warnings which must be followed to ensure safe operation and to keep the instrument in safe condition. Adjustments described in this section should be performed only by qualified service personnel.

WARNING

ANY INTERRUPTION OF THE PROTECTIVE (GROUNDED) CONDUCTOR (INSIDE OR OUTSIDE OF THE INSTRUMENT) OR DISCONNECTION OF THE PROTECTIVE EARTH TERMINAL IS LIKELY TO MAKE THE INSTRUMENT DANGEROUS. INTENTIONAL INTERRUPTION IS PROHIBITED.

5-5. The opening of covers for removal of parts, except those to which access can be gained by hand, is likely to expose live parts.

5-6. Capacitors inside instrument may still be charged even if instrument has been disconnected from its source of supply.

WARNING

ADJUSTMENTS DESCRIBED HEREIN ARE PERFORMED WITH POWER SUPPLIED TO THE INSTRUMENT AFTER PROTECTIVE COVERS HAVE BEEN REMOVED. ENERGY EXISTING AT MANY POINTS MAY, IF CONTACTED, RESULT IN PERSONAL INJURY.

5-7. EQUIPMENT REQUIRED.

5-8. The equipment needed to adjust the Model 4275A is listed in Table 5-0 (page 5-0). This equipment should always be calibrated to satisfy its own specifications and those of the required characteristics. If the recommended model is not available, any instrument that has specifications equal to or better than required specifications may be substituted.

5-9. FACTORY SELECTED COMPONENTS.

5-10. Factory selected components can be recognized by an asterisk adjacent to the reference designator on the schematic diagrams in Section VIII (nominal value is shown). Table 5-2 lists all factory selected components with their nominal value ranges and their influence on instrument performance.

Adjustable components, with reference designators are listed in Table 5-1. The table gives the name of the control to be adjusted and the purpose of its adjustment.

5-11. ADJUSTMENT RELATIONSHIPS.

5-12. The adjustment procedures, beginning with paragraph 5-18, should be performed in step sequence as they are interactive. Neglecting or changing procedures may make it impossible to obtain best 4275A performance. Table 5-3 shows necessary adjustment procedures to be used after repair to the instrument.

5-13. ADJUSTMENT LOCATIONS.

5-14. To help you to identify the appropriate adjustment points, the locations of the components to be adjusted are illustrated throughout the adjustment procedures. The locations of the factory selected components, connectors and other components related to the adjustments are shown in the individual board assembly component illustrations (fold-out service sheet).

Table 5-1. Adjustable Components.

| Reference Designator | Name of Control | Purpose |
|---|--------------------------------------|--|
| A1C5 C19 (Para 5-40) | | To properly compensate for range resistor signal phase shift due to residual reactive factors in the range resistor input/output circuits (at 4MHz and 10MHz test frequencies). |
| A1C20 C21 C22 C23 (Para 5-36) | | To compensate for stray capacitances in the range resistor circuit and to eliminate measurement errors due to range resistor current phase shift. |
| A1R1 R2 (Para 5-40) | | To properly compensate for range resistor signal amplitude error due to residual resistive factors in the range resistor input/output circuits (at 4MHz and 10MHz test frequencies). |
| A1R3 (Para 5-34) (Para 5-38) | | To properly compensate for residual impedances in range resistor input/output circuits. |
| A1R28 R29 R30 R31 (Para 5-36) | | To set range resistor values for maximizing measurement accuracy on each measurement range. |
| A2C8 C9 C13 C14 (Para 5-26) | Q1 ADJ Q2 ADJ Q3 ADJ Q4 ADJ | To optimize bridge balance settling time. |
| A2R13 R14 (Para 5-26) | OS1 ADJ OS2 ADJ | To eliminate phase errors from modulator circuit and to optimize bridge circuit balance condition. |
| A2R92 (Para 5-32) | LEVEL ADJ | To set sensitivity of test signal level monitor circuitry and to maximize monitor display accuracy. |
| A3C13 (Para 5-24) | | To equalize test signal level for all test signal frequencies. |
| A3R1 (Para 5-22) (Para 5-32) | | To set maximum test signal level (1V) applicable to samples. |

Table 5-1. Adjustable Components (Cont'd).

| Reference Designator | Name of Control | Purpose |
|------------------------------|-------------------------------|--|
| A3R9 (Para 5-22) | | To set test signal level variable range as well as to calibrate level control dial. |
| A4A1C3 (Para 5-28) | PHASE | To equalize phase characteristics for the two channel amplifiers in process amplifier input stages and to maximize accuracy at higher test frequencies. |
| A4A1R1 (Para 5-20) | TRACKING | To eliminate a dc offset voltage from process amplifier. |
| A4A1R8 (Para 5-28) | AMP | To set process amplifier gain for maximizing measurement accuracy. |
| A4A2R1 (Para 5-20) | TRACKING | To eliminate dc offset voltage from process amplifier. |
| A4A3C3 R10 (Para 5-30) | PHASE AMP | To eliminate both attenuation errors and phase shift from process amplifier gain attenuator circuits and to maximize accuracy of measurement for each test signal level MULTIPLIER setting (x1, x0.1 and x0.01). |
| A4A4C3 R2 (Para 5-30) | PHASE AMP | |
| A5C15 (Para 5-30) | 1/4 ϕ ADJ | To eliminate both attenuation errors and phase shift from A-D converter input attenuator circuits and to maximize measurement accuracy for each test signal level MULTIPLIER setting (x1, x0.1 and x0.01). |
| A5R4 R11 (Para 5-30) | 1/2 ϕ ADJ 1/2 AMP ADJ | |
| A5R16 (Para 5-30) | 1/4 AMP ADJ | |
| A5R120 (Para 5-18) | REF ADJ | To maximize conversion accuracy of A-D converter circuit. |
| A11R3 (Para 5-16) | STD ADJ | To set dc power supply output voltages. |

Table 5-2. Factory Selected Components.

| Component | Nominal Value Range | Effect on Performance |
|--------------|---|---|
| A1C24 C25 | HP P/N 0160-2236 C:FXD 1.0pF HP P/N 0160-2241 C:FXD 2.2pF HP P/N 0150-0059 C:FXD 3.3pF * HP/P/N 0160-2248 C:FXD 4.3pF HP P/N 0160-2251 C:FXD 5.6pF HP P/N 0160-2253 C:FXD 6.8pF HP P/N 0160-2255 C:FXD 8.2pF HP P/N 0160-2257 C:FXD 10.0pF | Changes phase compensation adjustment range for 100Ω range resistor. |
| A1C26 | HP P/N 0160-2239 C:FXD 1.8pF HP P/N 0160-2243 C:FXD 2.7pF HP P/N 0160-2247 C:FXD 3.9pF * HP P/N 0160-2250 C:FXD 5.1pF HP P/N 0160-2252 C:FXD 6.2pF HP P/N 0160-2254 C:FXD 7.5pF HP P/N 0160-2255 C:FXD 8.2pF HP P/N 0160-2257 C:FXD 10.0pF | Changes phase compensation adjustment range for 1000Ω range resistor. |
| A1C27 | HP P/N 0160-2239 C:FXD 1.8pF HP P/N 0160-2243 C:FXD 2.7pF HP P/N 0160-2247 C:FXD 3.9pF HP P/N 0160-2250 C:FXD 5.1pF * HP P/N 0160-2252 C:FXD 6.2pF HP P/N 0160-2254 C:FXD 7.5pF HP P/N 0160-2255 C:FXD 8.2pF HP P/N 0160-2256 C:FXD 9.1pF HP P/N 0160-2257 C:FXD 10.0pF | Changes phase compensation adjustment range for 10kΩ range resistor. |
| A1C28 | HP P/N 0140-0190 C:FXD 39.0pF HP P/N 0160-2200 C:FXD 43.0pF HP P/N 0160-2201 C:FXD 51.0pF * HP P/N 0140-0205 C:FXD 62.0pF HP P/N 0160-2202 C:FXD 75.0pF HP P/N 0140-0193 C:FXD 82.0pF | Changes range resistor phase compensation adjustment range for 10MHz test signal frequency. |
| A1R4 | HP P/N 0698-3132 R:FXD 261.0Ω HP P/N 0698-3443 R:FXD 287.0Ω * HP P/N 0698-3444 R:FXD 316.0Ω | Changes compensation adjustment range for display offset error count due to residual impedances in range resistor signal circuit. |
| A3C6 C21 | HP P/N 0160-2256 C:FXD 9.1pF HP P/N 0160-2257 C:FXD 10.0pF * HP P/N 0160-2258 C:FXD 11.0pF HP P/N 0160-2259 C:FXD 12.0pF HP P/N 0160-2260 C:FXD 13.0pF | Changes magnitude of frequency compensation value in test signal level attenuation circuitry (which responds to MULTIPLIER function setting). |
| A3C20 C22 | HP P/N 0160-2206 C:FXD 160.0pF HP P/N 0140-0197 C:FXD 180.0pF HP P/N 0140-0198 C:FXD 200.0pF * HP P/N 0160-0134 C:FXD 220.0pF HP P/N 0140-0199 C:FXD 240.0pF HP P/N 0140-0210 C:FXD 270.0pF HP P/N 0160-2207 C:FXD 300.0pF | |

Figure 5-2. Factory Selected Components (Cont'd).

| Component | Nominal Value Range | Effect on Performance |
|-----------|---|---|
| A3C76 | HP P/N 0160-2205 C:FXD 120.0pF * HP P/N 0160-2206 C:FXD 160.0pF HP P/N 0140-0197 C:FXD 180.0pF HP P/N 0140-0198 C:FXD 220.0pF | Changes sensitivity of test signal level monitor display at high frequencies. |
| A4A2C3 | HP P/N 0160-2236 C:FXD 1.0pF HP P/N 0160-2239 C:FXD 1.8pF HP P/N 0160-2243 C:FXD 2.7pF * HP P/N 0160-2246 C:FXD 3.6pF HP P/N 0160-2248 C:FXD 4.3pF HP P/N 0160-2249 C:FXD 4.7pF | Changes process amplifier frequency response adjustment range. |
| A5C70 | None HP P/N 0160-2201 C:FXD 51.0pF HP P/N 0160-2204 C:FXD 100.0pF HP P/N 0140-0196 C:FXD 150.0pF HP P/N 0140-0198 C:FXD 200.0pF HP P/N 0140-0199 C:FXD 240.0pF HP P/N 0160-2207 C:FXD 300.0pF HP P/N 0160-2209 C:FXD 360.0pF HP P/N 0160-0939 C:FXD 430.0pF HP P/N 0160-2210 C:FXD 470.0pF | Eliminates display count errors due to A-D converter output zero offset. |

Note: Component marked (*) in table is usually used.

INITIAL OPERATING PROCEDURE.

Preparatory to adjusting the 4275A, do the following to locate and to gain access to the adjustment controls (this procedure facilitates a thoroughgoing adjustment):

[FUNDAMENTAL OPERATING CHECKS]

Confirm that instrument power line selector switches are set for local power line voltage. Program Memory Test described on page 3-1 and the SELF TEST procedure in Figure 3-0 on page 3-0 should be completely performed and successfully passed before progressing to adjustment procedure.

[TOP COVER REMOVAL]

Remove top cover as follows:

- Loosen the retaining screw at rear of top cover.
- Pull top cover towards the rear and lift off.

WARNING

TO INSURE PERSONAL SAFETY FROM POSSIBLE ELECTRICAL SHOCK HAZARDS AND RESULTANT INJURY, USE INSULATED ADJUSTMENT TOOL.

Table 5-3. Adjustment Requirements.

| Assembly repaired or replaced | Required adjustment(s) |
|---|-------------------------------|
| A1 04275-66501 (Range Resistor & Null Detector) | Para. 5-33, 5-35, 5-37, 5-39. |
| A2 04275-66502 (Modulator) | Para. 5-25, 5-31. |
| A3 04275-66503 (Power Amplifier) | Para. 5-21, 5-23, 5-31. |
| A4 04275-66504 (Process Amplifier) | Para. 5-19, 5-27, 5-29. |
| A5 04275-66505 (A-D Converter) | Para. 5-17, 5-29. |
| A6 04275-66506 (Oscillator) | None. |
| A7 04275-66507 A8 04274-66508 A9 04275-66513 A10 04275-66520 | None. |
| A11 04274-66511 (Power Supply) | Para. 5-15. |
| A21 04274-66521 (Opt. 001 DC Bias) | Para. 5-41. |
| A22 04274-66522 | None. |
| A23 04274-66523 (Opt. 002 DC Bias) | Para. 5-42. |

ADJUSTMENTS

5-15. DC POWER SUPPLY VOLTAGE ADJUSTMENT (A11).

5-16. This adjustment sets internal dc power supply output voltages to their nominal values to ensure that the instrument functions under proper operating voltages.

EQUIPMENT:

Digital Voltmeter HP 3465 A/B
Voltmeter input cable Dual banana to
dual alligator clip cable

PROCEDURE:

1. Connect Digital Voltmeter input to TP1 (+12V) on 4275A A11 Power Supply board.
2. Set DVM range as appropriate to measure 12V and read the display output.
3. Adjust potentiometer A11R3 (STD ADJ) so that the display readout is within 11.76V to 12.12V.
4. Check voltages at A11TP5, TP10 and TP17. DVM display readouts should satisfy the test limits given in Table 5-4. If any check fails, re-adjust A11R3.

Table 5-4. DC Power Supply Voltage Test Limits.

| Test Point | Test limits |
|------------|-------------------|
| TP 1 | 11.76 to 12.12V |
| TP 5 | -11.79 to -12.15V |
| TP10 | - 4.89 to - 5.04V |
| TP17 | 4.81 to 4.96V |

5-17. A-D CONVERTER ACCURACY ADJUSTMENT (A5).

5-18. This adjustment equalizes the (absolute) values of both positive and negative reference voltages used in the A-D converter and optimizes A-D conversion accuracy.

EQUIPMENT:

No test equipment is required for this adjustment.

PROCEDURE:

1. Press SELF TEST key. Verify that the key indicator lamp lights. Next, press DISPLAY B "D" function key. Test step item number "1" is displayed in DISPLAY A unit indicator as shown below.



2. Set test frequency to 100kHz by pressing FREQUENCY STEP DOWN or UP key.

ADJUSTMENTS

3. Check that DISPLAY A readout is .00 within ± 3 counts.

Note

If the display readout exceeds the above test limits, change capacitance value of A5*C70. Increasing the capacitance value by 30pF decreases the display by 1 count. Selectable capacitance value range is 500pF maximum.

4. Adjust potentiometer A5R120 (DC ref ADJ) so that DISPLAY B display output is .00 within ± 10 counts. See page 5-19 for the location of R120.

-----Troubleshooting hints-----

If the A5R120 adjustment can not be achieved, an excessive dc offset voltage of A5U16 or a failure in A5U11 circuitry is a probable cause of the trouble. Relative difference in resistance values of A5R116 and R117 is also one of the possibilities.

5-19. PROCESS AMPLIFIER DC OFFSET ADJUSTMENT (A4).

5-20. This adjustment eliminates any residual dc offset voltage from A4 Process Amplifier and maximizes accuracy of measurement.

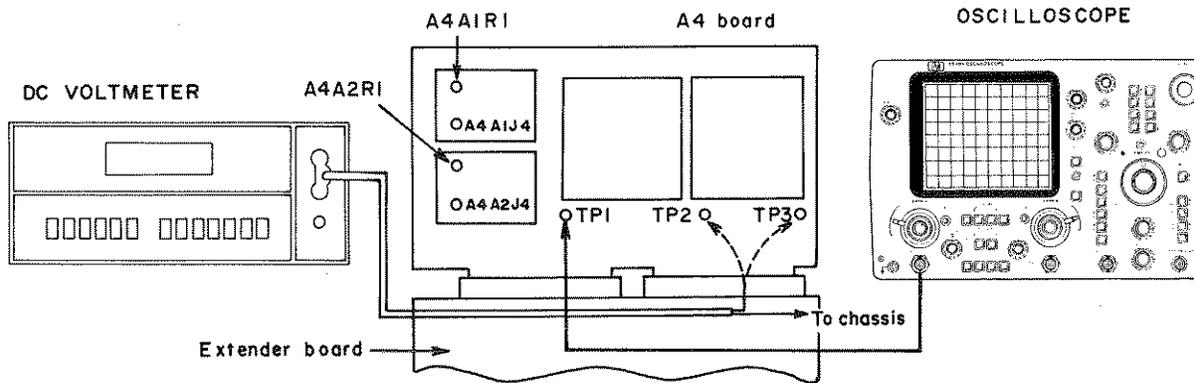


Figure 5-1. Process Amplifier DC Offset Adjustment Setup.

EQUIPMENT:

- | | |
|-----------------------------------|--|
| Digital Voltmeter | HP 3465 A/B |
| Voltmeter input cable | Dual banana to dual alligator clip cable |
| Oscilloscope | HP 1740A |
| Probe (10M Ω , 10:1) | HP 10004D |

Note

Use extender board (HP Part No: 5060-4025) to gain access to test points and adjustment components on A4 board.

ADJUSTMENTS

PROCEDURE:

1. Disconnect the two coaxial cable SMB connectors from A4A1J4 (ERR BLK) and A4A2J4 (EDUT WHT).
2. Connect Digital Voltmeter input to 4275A A4 Process Amplifier board TP2 (-10). Voltmeter display readout should be -10.3V dc within $\pm 0.5V$.
3. Connect voltmeter input to A4TP3 (+10). Verify that voltmeter readout is 10.3V within $\pm 0.5V$.
4. Remove voltmeter input cable.
5. Set oscilloscope controls as follows:

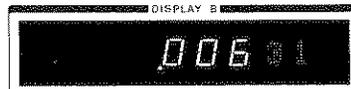
Vertical sensitivity 5mV/div
Sweep time 10ms/div

Center baseline with vertical position adjustment control. Externally trigger the oscilloscope from A5TP2.

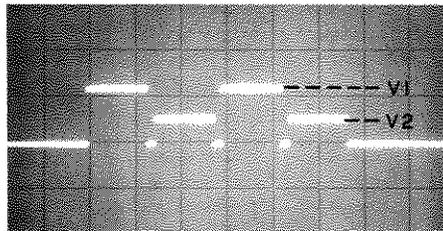
6. Set 4275A controls as follows:

SELF TEST on
MULTIPLIER X1
OSC LEVEL fully cw
Test signal frequency 100kHz

Press REF VALUE STORE key (to select self test step 20, 21, 22, 31, 41 or 51). Now select test step 31 by repeatedly pressing LCRZ RANGE DOWN or UP key (as necessary). The selected test step number is displayed in DISPLAY B unit indicator as shown below:



7. Connect oscilloscope input probe (10:1) to A4TP1. The waveform observed on the oscilloscope will probably be quite similar to that shown in Figure 5-2 below.



The waveform varies depending on amount of the adjustment error and type of misadjustment.

Figure 5-2. Waveform at A4TP1.

ADJUSTMENTS

- Individually adjust potentiometers *A4A1R1 and *A4A2R1 so that peak voltages of both V1 and V2 are 0V within $\pm 20\text{mV}$ peak (2 minor scale divisions).

***Note**

These potentiometers are accessible through an adjustment hole in the shield cover of each sub-board.

-----Troubleshooting hints-----

If either A4A1R1 or A4A2R1 adjustment can not be achieved, excessive pinch-off current in A4A1Q1 or A4A2Q1 is a probable cause of the trouble. These transistors should be selected in terms of their current characteristics.

- Reconnect coaxial cable SMB connectors to A4A1J4 and A4A2J4.

5-21. TEST SIGNAL LEVEL ADJUSTMENT (A3).

5-22. This adjustment properly sets test signal level variable range and calibrates front panel level control dial (dial accuracy is unspecified).

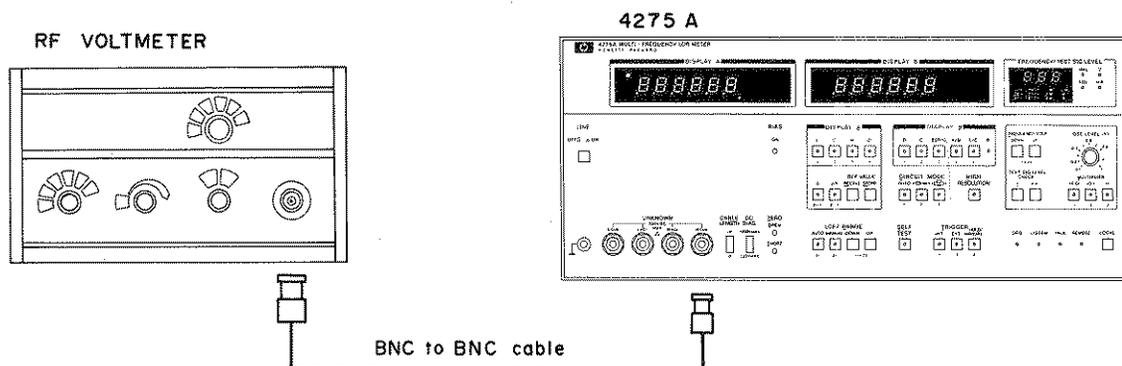


Figure 5-3. Test Signal Level Adjustment Setup.

EQUIPMENT:

- RF Voltmeter HP 3403C
or HP 400E
- Voltmeter input cable BNC to BNC cable

PROCEDURE:

- Connect a BNC to BNC cable between RF voltmeter input and 4275A UNKNOWN H_{CUR} terminal.
- Set RF voltmeter range to 1V f.s.

ADJUSTMENTS

3. Set 4275A test signal as follows:

Test signal frequency 100kHz
MULTIPLIER X1
OSC LEVEL fully cw

4. Read voltmeter indication and note its value.

Voltmeter reading _____ mV rms

5. Set 4275A OSC LEVEL control to 0.1 and RF voltmeter range to 0.1V f.s.

6. Adjust potentiometer A3R9 so that voltmeter readout is 1/10 of the voltage value noted in step 4 (within $\pm 1\text{mV}$ rms).

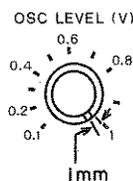
7. Set 4275A MULTIPLIER to x1 and RF voltmeter range to 1V f.s.

8. Set 4275A OSC LEVEL control knob to its 1V dial scale point on the front panel.

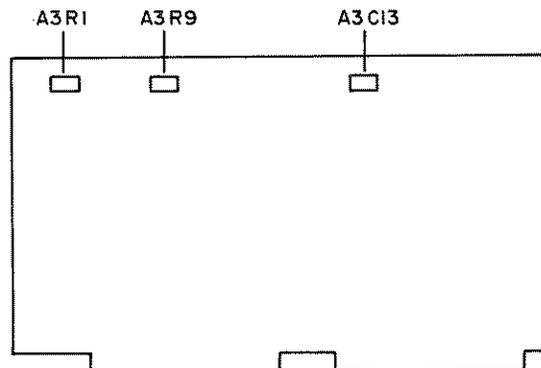
9. Adjust A3R1 so that voltmeter readout is 1.00V rms $\pm 0.01\text{V}$.

Note

If OSC LEVEL control knob has been mechanically shifted from its normal position, restore as follows:



1. Rotate the knob fully cw.
2. Loosen knob retaining screws (two) and set the knob as illustrated at left.
3. Fasten the knob at this position.



A3 Board Adjustment Locations.

ADJUSTMENTS

5-23. TEST SIGNAL LEVEL FLATNESS ADJUSTMENT (A3).

5-24. This adjustment equalizes test signal level for all selectable test frequency points.

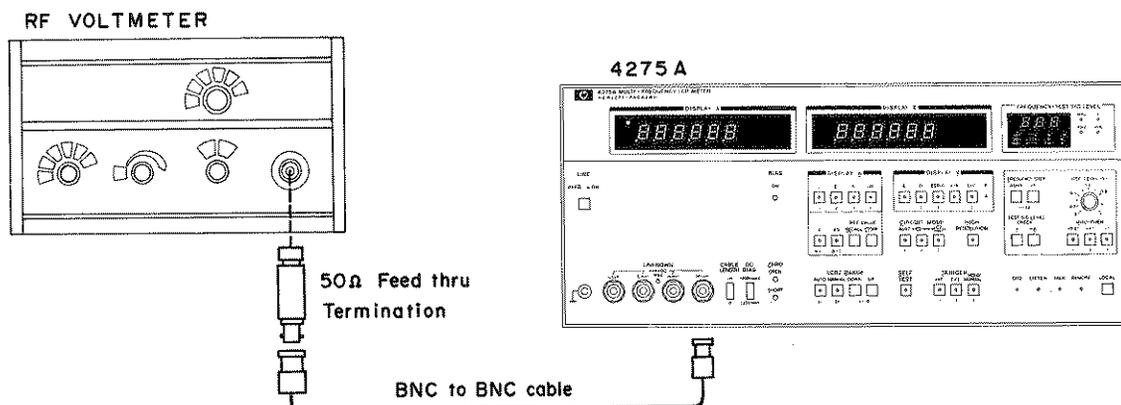


Figure 5-4. Test Signal Level Flatness Adjustment Setup.

EQUIPMENT:

- RF Voltmeter HP 3403C
or HP 400E
- 50Ω feed-through termination -hp- 11048C
- Voltmeter input cable BNC to BNC cable
(20cm or less)

PROCEDURE:

1. Connect a 50Ω feed through termination between 4275A UNKNOWN H CUR terminal and RF voltmeter input using a BNC to BNC cable. See Figure 5-4.
2. Set 4275A controls as follows:

Test frequency 100kHz
MULTIPLIER x1
OSC LEVEL fully cw

3. Set RF voltmeter range to 1V f.s.
4. Read voltmeter indication and note its value.

Voltmeter reading _____ mV rms.

5. Set 4275A test signal frequency to 10MHz.
6. Adjust trimmer capacitor A3C13 so that voltmeter readout is identical to the value noted in step 4 (within ±10mV rms).

ADJUSTMENTS

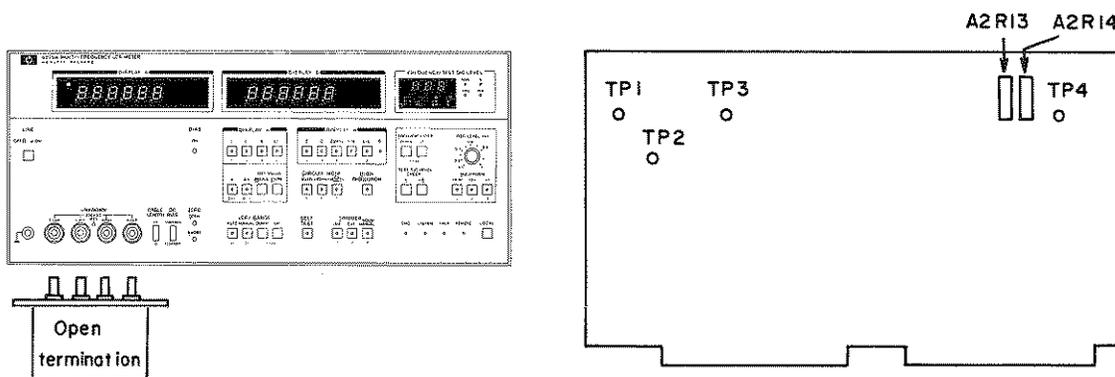
5-25. BRIDGE BALANCE ADJUSTMENT (A2).

5-26. The bridge balance adjustment is comprised of two independent adjustments for bringing measurement bridge circuit into the optimum balance condition and for maximizing accuracy of measurement. The adjustments included are:

- 1) Bridge zero offset adjustment.
- 2) Balance control phase tracking adjustment.

1. Bridge zero offset adjustment (preliminary).

This adjustment is a preliminary operation to facilitate optimizing the bridge zero offset adjustment. By appropriately performing the zero offset adjustment, any balance control phase error which could cause a slight bridge unbalance with a resultant offset phase count error in the measurement display output to occur is minimized. Final adjustment should be done after the phase tracking adjustment is completed.



A2 Board Adjustment Locations.

Figure 5-5. Bridge Zero Offset Adjustment Setup.

EQUIPMENT:

Open termination HP 16074A Standard Resistor Set

Note

If the 16074A Standard Resistor Set is unavailable, use two BNC cables (10cm long).

PROCEDURE:

1. Set 4275A CABLE LENGTH switch to "0" position.
2. Connect "Open" termination (of the HP 16074A Standard Resistor Set) direct to 4275A UNKNOWN terminals.

Note

Otherwise, connect H CUR and H POT terminals together with a short BNC cable. Similarly connect L CUR and L POT terminals together.

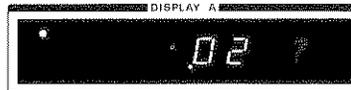
ADJUSTMENTS

3. Set 4275A controls as follows:

```

DISPLAY A function ..... R
Test signal frequency ..... 100kHz
MULTIPLIER ..... x1
OSC LEVEL ..... fully cw
SELF TEST ..... on
    
```

4. Press Δ% key to select self test step "7". Test step number "7" is displayed in DISPLAY A unit indicator as illustrated below:



5. Adjust A2R13 (OS1 ADJ) so that DISPLAY A readout is .00±30 counts.
6. Adjust A2R14 for (OS2 ADJ) for .00±30 counts on DISPLAY B.
7. Since the A2R13 and R14 adjustments interact, alternately perform steps 5 and 6 until both DISPLAY A and DISPLAY B readouts meet the allowable range limits.
8. Set test signal frequency to 4MHz and verify that both DISPLAY A and DISPLAY B display outputs are .00 within ±30 counts. If either of the display outputs exceeds the test limits, repeat steps 5 and 6.

----- Troubleshooting hints -----

If either A2R13 or A2R14 adjustment can not be achieved, an excessive output offset voltage in A2U3 or A2U4 is a probable cause of the trouble.

2. Balance control phase tracking adjustment.

This adjustment optimizes the bridge circuit balance settling time (when a sample device is connected to the UNKNOWN terminals).

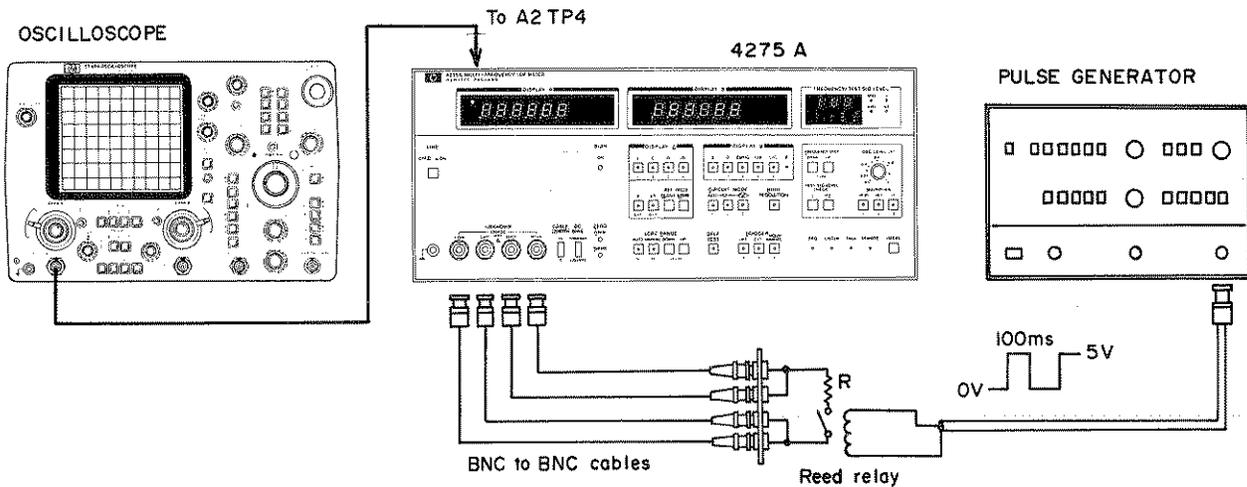


Figure 5-6. Balance Control Phase Tracking Adjustment Setup.

ADJUSTMENTS

EQUIPMENT:

| | |
|-----------------------------------|--|
| OSCILLOSCOPE | HP 1740A |
| Probe (10M Ω , 10:1) | HP 10004D |
| Pulse Generator | HP 8011A |
| Cable | BNC to BNC Cable (10cm long, 4ea. required) |
| | BNC cable |
| Reed relay (5V) | -hp- 0490-0916 or equivalent |
| Resistor: 500 Ω | -hp- 0757-0416 (511 Ω) |
| 5k Ω | -hp- 0757-0438 (5.11k Ω) |
| Bracket | HP 16048A accessory |

PROCEDURE:

1. Connect test equipment as illustrated in Figure 5-6.

Note

Connect a short lead (0 Ω) instead of resistor R shown in the figure.

2. Set 4275A controls as follows:

| | |
|--------------------------|----------|
| DISPLAY A function | R |
| Test frequency | 10MHz |
| MULTIPLIER | x1 |
| OSC LEVEL | fully cw |
| SELF TEST | on |
| CABLE LENGTH | 0 |

3. Press REF VALUE STORE key.
4. Press 4275A LCRZ RANGE UP and DOWN key until self test step "21" is selected. The selected test step number is displayed in DISPLAY B unit indicator as shown below:



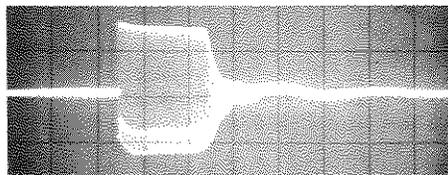
(Ω unit is displayed in DISPLAY A.)

5. Set pulse generator output for a 5V peak ($0V$ ) squarewave with a periodic rate of 200ms.
6. Set oscilloscope controls as follows:

| | |
|----------------------------|----------|
| Vertical sensitivity | 0.2V/div |
| Sweep time | 1ms/div |

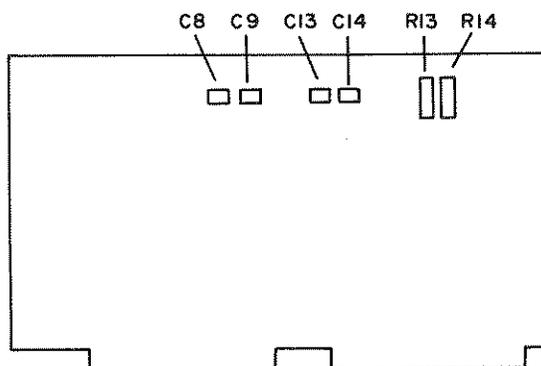
Trigger the oscilloscope externally from pulse generator.

7. Connect oscilloscope to A2TP4 to observe waveform.
8. Adjust trimmer capacitors A2C8 and C13 so that damped vibration waveform at A2TP4 decays in the shortest time (see illustration below).



ADJUSTMENTS

- Since the A2C8 and C13 adjustments interact, alternately repeat the adjustments several times.
9. Change 4275A test signal frequency, in turn, to 4MHz, 2MHz and to 1MHz. Verify that transient time T of the damped vibration waveform at each test frequency is shorter than that at 10MHz test frequency.
 10. Connect a 500 Ω resistor in series with the reed relay contacts (see Figure 5-5).
 11. Press 4275A LCRZ RANGE UP and DOWN key until self test step "20" is selected.
 12. Check that the transient time T of the waveform at A2TP4 is within 20ms at 10MHz, 4MHz, 2MHz and 1MHz test frequencies.
 13. Connect a 5k Ω resistor in place of the 500 Ω resistor.
 14. Press 4275A LCRZ RANGE UP and DOWN key until self test step "31" is selected. Set test signal frequency to 10MHz.
 15. Adjust trimmer capacitors A2C9 and C14 so that the transient time T of the waveform at A2TP4 is as short as possible.
 16. Check that the transient time T is within 20ms at 4MHz, 2MHz and 1MHz test frequencies.
3. Bridge zero offset adjustment (final adjustment).
 1. Perform preliminary adjustment procedure steps 1, 2 and 3.
 2. Alternately adjust A2R13 and R14 so that both DISPLAY A and DISPLAY B readouts are .00 within ± 30 counts.



A2 Board Adjustment Locations.

ADJUSTMENTS

5-27. PROCESS AMPLIFIER GAIN ADJUSTMENT (A4).

5-28. This adjustment eliminates any amplification factor errors from A4 Process Amplifier so that bridge circuit vector signal voltages are exactly detected thus maximizing accuracy of measurement.

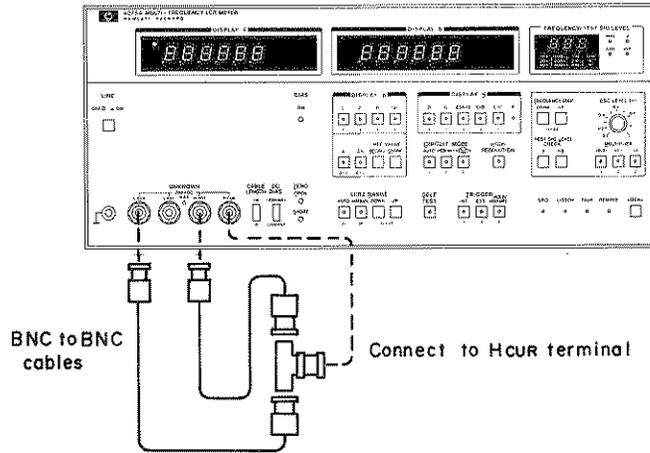


Figure 5-7. Process Amplifier Gain Adjustment Setup.

EQUIPMENT:

- Connection cable (10cm long) BNC to BNC cable
 2ea. required
- BNC Tee adapter -hp- 1250-0781

Note

The relative difference in cable length of the two BNC cables used must be within $\pm 0.3\text{cm}$.

PROCEDURE:

1. Connect BNC cables and a BNC Tee adapter as illustrated in Figure 5-7.
2. Disconnect coaxial cable connector from A1J2 (Lc) and connect it to A4A1J4 in place of the normal cable connector.
3. Set 4275A controls as follows:

DISPLAY A function R
 Test signal frequency..... 100kHz
 MULTIPLIER x1
 OSC LEVEL fully cw
 SELF TEST on

4. Press REF VALUE STORE key.
5. Press LCRZ RANGE UP and DOWN key until self test step "20" is selected and is displayed in DISPLAY B unit indicator as shown below:



ADJUSTMENTS

6. Adjust potentiometer A4A1R8 so that DISPLAY A display output is -100000 within ± 20 counts.
7. Set test signal frequency to 10MHz.
8. Adjust trimmer capacitor A4A1C3 so that DISPLAY B display output is .000 within ± 20 counts.

Note

Check that DISPLAY A readout is within 100000 ± 300 counts (after doing the A4A1C3 adjustment).

9. Reconnect the cables shifted in step 2 to their normal connection points.

----- Troubleshooting hints -----

If the A4A1C3 adjustment can not be achieved, change value of A4A2C3 (normally 3.6pF) to a value calculated from the DISPLAY B offset count by using the equation below:

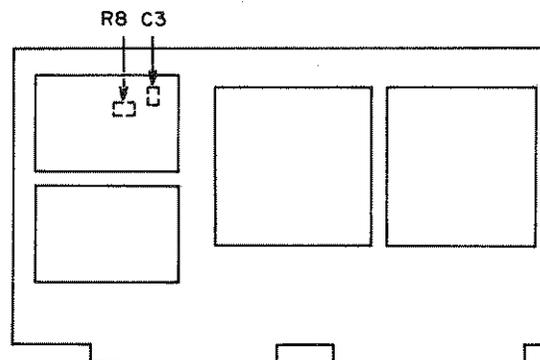
A4A1C3 is in its fully ccw position --

$$\text{Value of A4A2C3} = \left(5.6 + \frac{\text{Offset count}}{135} \right) \text{ pF}$$

A4A1C3 is in its fully cw position --

$$\text{Value of A4A2C3} = \left(1.6 - \frac{\text{Offset count}}{135} \right) \text{ pF}$$

C3 selectable value range is 0pF to 8pF.



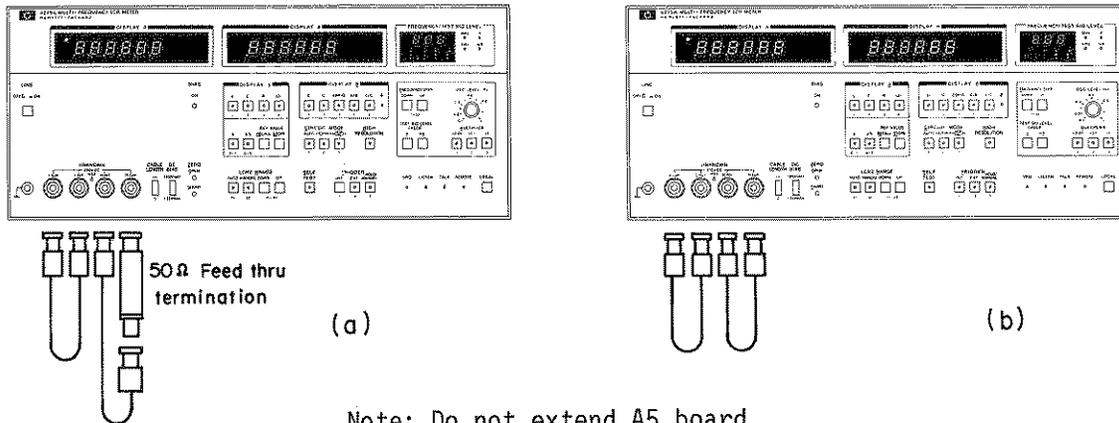
A4 Board Adjustment Locations.

ADJUSTMENTS

5-29. ATTENUATOR ADJUSTMENT (A5, A4).

5-30. This adjustment eliminates errors in the attenuation circuit attenuation ratios from A5 A-D Converter input circuit for maximizing accuracy of measurement for each test signal level setting. This adjustment consists of four adjustment steps, which are:

- 1) 1/2 attenuator adjustment (A5)
- 2) 1/4 attenuator adjustment (A5)
- 3) 1/10 attenuator adjustment (A4)
- 4) 1/100 attenuator adjustment (A4)



Note: Do not extend A5 board.

Figure 5-8. Attenuator Adjustment Setup.

EQUIPMENT:

- 50Ω feed-through termination -hp- 11048C
- Connection cable (10cm long) BNC to BNC cables
 2ea. required

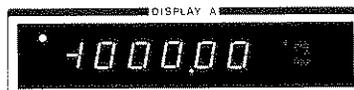
PROCEDURE:

1) 1/2 attenuator adjustment.

1. Connect a 50Ω feed-through termination and two BNC cables to 4275A UNKNOWN terminals as shown in Figure 5-8 (a).
2. Set 4275A controls as follows:

Test signal frequency 100kHz
 MULTIPLIER x1
 OSC LEVEL fully cw
 CABLE LENGTH 0
 SELF TEST on

3. Press DISPLAY B function Q button to select self test step "2". The test step number "2" is displayed in DISPLAY A unit indicator as shown below:



ADJUSTMENTS

4. Adjust potentiometer A5R11 so that DISPLAY A display output is -100000 within ± 10 counts.
5. Set test signal frequency to 10MHz.
6. Adjust potentiometer A5R4 (1/2 ϕ ADJ) so that DISPLAY B display output is .00 within ± 20 counts.

Note

Check that DISPLAY A display output is -100000 within ± 600 counts after doing the A5R4 adjustment.

2) 1/4 attenuator adjustment.

1. Remove 50 Ω feed-through termination and connect BNC cable between UNKNOWN H CUR and H POT terminals. See Figure 5-8 (b).
2. Set 4275A controls as follows:

Test signal frequency 100kHz
 MULTIPLIER x1
 OSC LEVEL fully cw
 SELF TEST on

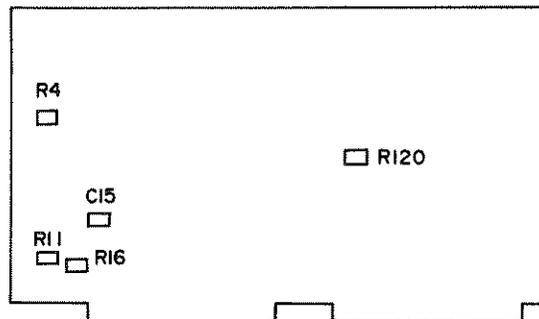
3. Press DISPLAY B function ESR/G key to select self test step "3". DISPLAY A unit indicator displays the number "3" as shown below.



4. Adjust potentiometer A5R16 so that DISPLAY A display readout is -100000 within ± 10 counts.
5. Set test signal frequency to 10MHz.
6. Adjust trimmer capacitor A5C15 (1/4 ϕ ADJ) so that DISPLAY B display output is .00 within ± 20 counts.

Note

Check that DISPLAY A display output is -100000 within ± 600 counts (after doing the A5C15 adjustment).



A5 Board Adjustment Locations.

ADJUSTMENTS

3) 1/10 attenuator adjustment.

1. Connect BNC cables to UNKNOWN terminals as shown in Figure 5-8 (b).
2. Set 4275A controls as follows:

Test signal frequency 100kHz
MULTIPLIER x0.1
OSC LEVEL fully cw
SELF TEST on

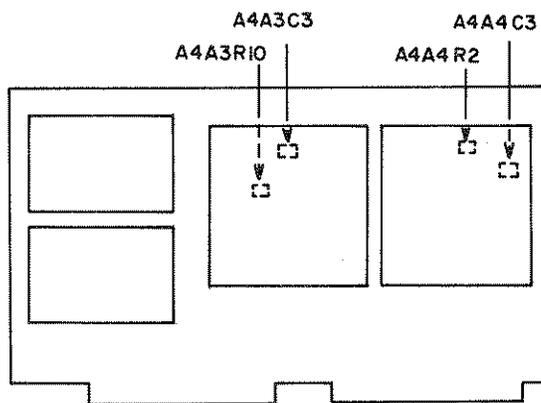
3. Press DISPLAY B function X/B key to select self test step "4".
DISPLAY A unit indicator displays the number "4" as shown below.



4. Adjust potentiometer A4A3R10 so that DISPLAY A display output is -100000 within ± 10 counts.
5. Set test signal frequency to 10MHz.
6. Adjust trimmer capacitor A4A3C3 so that DISPLAY B display output is .00 within ± 40 counts.

Note

Check that DISPLAY A display output is -100000 within ± 800 counts (after doing the A4A3C3 adjustment).



A4 Board Adjustment Locations.

ADJUSTMENTS

- 4) 1/100 attenuator adjustment.
1. Connect BNC cables to UNKNOWN terminals as shown in Figure 5-8 (b).
 2. Set 4275A controls as follows:

```

Test signal frequency ..... 100kHz
MULTIPLIER ..... x0.01
OSC LEVEL ..... fully cw
SELF TEST ..... on

```

3. Press DISPLAY B function L/C key to select self test step "5".
DISPLAY A unit indicator displays the number "5" as shown below:



4. Adjust potentiometer A4A4R2 so that DISPLAY A display output is -100000 within ± 10 counts.
5. Set test signal frequency to 10MHz.
6. Adjust trimmer capacitor A4A4C3 so that DISPLAY B display output is .00 within ± 40 counts.

Note

Check that DISPLAY A display output is -100000 within ± 800 counts (after doing the A4A4C3 adjustment).

ADJUSTMENTS

5-31. TEST SIG LEVEL CHECK ACCURACY ADJUSTMENT (A3, A2).

5-32. This adjustment appropriately adjusts the test signal level monitor circuit for appropriate sensitivity and frequency flatness to maximize the accuracy of test signal level display (FREQUENCY/TEST SIG LEVEL display) for all test signal level and frequency settings.

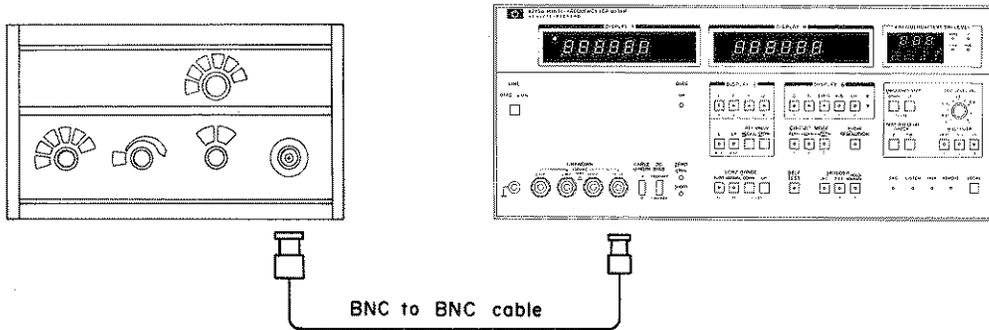


Figure 5-9. Test Signal Level Check Accuracy Adjustment Setup.

EQUIPMENT:

- RF Voltmeter HP 3403C
 or HP 400E
- Voltmeter input cable BNC to BNC cable
- Open termination HP 16074 Standard
 Resistor Set

Note

If the 16074A Standard Resistor Set is unavailable, use two BNC cables (10cm long).

PROCEDURE:

1. Connect "Open" termination (of the HP 16074A Standard Resistor Set) to 4275A UNKNOWN terminals.

Note

Otherwise, connect H_{CUR} and H_{POT} terminals together with a short BNC cable. Similarly connect L_{CUR} and L_{POT} terminals.

2. Set 4275A controls as follows:

- DISPLAY A function C
- DISPLAY B function ESR/G
- Test signal frequency 100kHz
- MULTIPLIER x1
- OSC LEVEL 1
- LCRZ RANGE AUTO

ADJUSTMENTS

Note

Set OSC LEVEL control knob to its "1" dial position (not to its full cw position).

Note

Check that both DISPLAY A and DISPLAY B display outputs are $.0 \pm 20$ counts.

3. Press and hold TEST SIG LEVEL CHECK V key.
4. Adjust potentiometer A3R1 so that FREQUENCY/TEST SIG LEVEL display output is 1.00 (V) within ± 1 count.

*Note

If the A3R1 has been well-adjusted (and need not be adjusted), omit steps 5 and 6 that follow.

- *5. Connect RF voltmeter input to 4275A UNKNOWN H CUR terminal with a BNC to BNC connector as shown in Figure 5-9.
- *6. Adjust potentiometer A2R92 for $1.00V \pm 0.01V$ rms on the RF voltmeter indication.
7. Set test signal frequency to 10MHz. Connect "Open" termination to 4275A UNKNOWN terminals.
8. Check that FREQUENCY/TEST SIG LEVEL display output is 0.90 (V) within ± 5 counts.

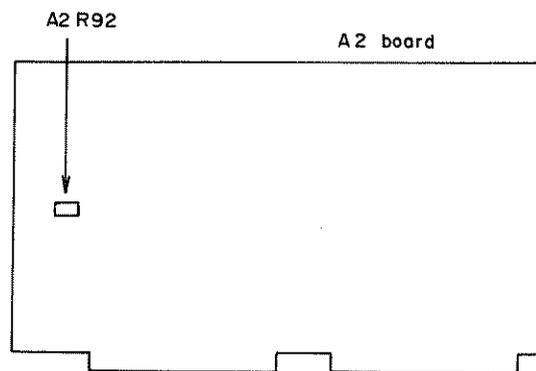
Note

Do not use an extender board with A3 board for this check.

Note

Test signal level actually falls to about 0.9V rms at 10MHz.

9. If the display output is too high or too low, change value of capacitor A3C76 (normally 51pF). Increasing the capacitance value increases the displayed voltage value. Adjustable capacitance value range is 30nF to 200pF.



A2 Board Adjustment Location.

ADJUSTMENTS

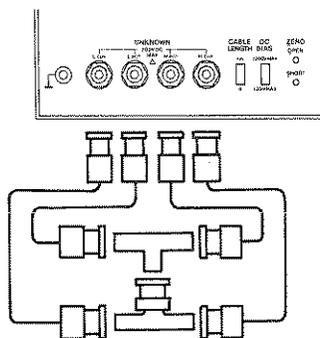
Confirmation check 1

Set MULTIPLIER to x0.1 and to x0.01. Check that the test limits given in the table below are satisfied (at 10MHz).

| MULTIPLIER Setting | TEST SIG LEVEL display |
|--------------------|------------------------|
| x0.1 | .088 to .112 |
| x0.01 | .007 to .013 |

Confirmation check 2

- a. Connect "Short" termination (of the HP 16074A Standard Resistor Set) to 4275A UNKNOWN terminals.



Note

Otherwise, connect short BNC cables and BNC Tee adapters as illustrated at left.

- b. Set 4275A controls as follows:

```

DISPLAY A function ..... R
DISPLAY B function ..... X/B
Test signal frequency ..... 100kHz
MULTIPLIER ..... x1
OSC LEVEL ..... 1
LCRZ RANGE ..... AUTO
    
```

- c. Press and hold TEST SIG LEVEL CHECK mA key.
- d. Check that FREQUENCY/TEST SIG LEVEL display output is 10.0mA within ± 0.5 mA.

ADJUSTMENTS

5-33. CMR AMPLIFIER GAIN ADJUSTMENT (A1).

5-34. This adjustment properly sets the amplification factor of A1 CMR amplifier which compensates for test signal propagation losses in the range resistor circuit (internal wiring losses) to maximize accuracy of measurement.

EQUIPMENT:

Cable (10cm long) BNC to BNC cable

PROCEDURE:

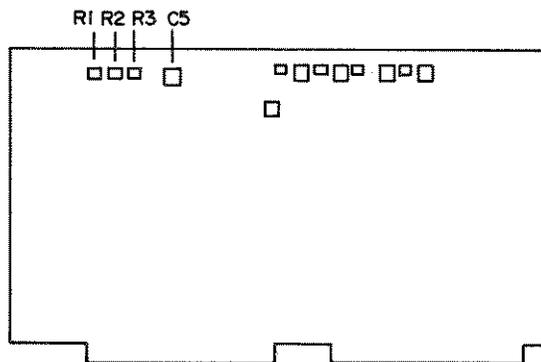
1. Connect 4275A UNKNOWN H CUR and H POT terminals together with a short BNC cable.
2. Set 4275A controls as follows:
 Test signal frequency 100kHz
 OSC LEVEL fully cw
 SELF TEST on
3. Press REF VALUE RECALL key to select self test step "8". DISPLAY A unit indicator displays the number "8" as shown below.



4. Adjust potentiometer AIR3 for minimum display readout (less than 10 counts) on DISPLAY A.

Note

If the AIR3 adjustment can not be achieved, change value of AIR4 (normally 316Ω). Adjustable range is 256Ω to 316Ω.



A1 Board Adjustment Locations.

ADJUSTMENTS

5-35. RANGE RESISTOR ADJUSTMENTS (A1).

5-36. The range resistor adjustments fix the values of the bridge circuit reference resistor elements (range resistors) to maximize accuracy on each measurement range. The adjustments are made by connecting a standard resistor or a standard capacitor as a DUT, and by setting the range resistor adjustment potentiometers and phase compensators for the calibrated values of the standard on measurement display outputs.

EQUIPMENT:

Standard resistors HP 16074A Standard
(100 Ω , 1k Ω , 10k Ω , 100k Ω \pm 0.03%) Resistor Set

10pF Standard capacitor (\pm 0.03%) HP 16382A

Note

The HP 16382A is a component of
the HP 16380A Standard Capacitor Set.

PROCEDURE:

1) Range resistor adjustments.

1. Set 4275A controls as follows:

DISPLAY A function R
DISPLAY B function X
Test signal frequency 100kHz
MULTIPLIER x0.1
OSC LEVEL fully cw
SELF TEST on
CABLE LENGTH switch 0

2. Press REF VALUE STORE key. Self test step number "21" is displayed in DISPLAY B unit indicator as shown below:



3. Press LCRZ RANGE UP or DOWN key to select self test step "50" (monitor DISPLAY B unit indicator display).

4. Connect a 100k Ω standard resistor (direct) to 4275A UNKNOWN terminals.

5. Adjust potentiometer A1R31 so that DISPLAY A display output is the calibrated value of the standard resistor within \pm 20 counts.

Note

Unit indicator displays " μ S" instead of k Ω .

6. Press LCRZ RANGE DOWN key once to select self test step "40".

7. Connect a 10k Ω standard resistor in place of the 100k Ω resistor.

8. Adjust potentiometer A1R30 so that DISPLAY A display output is the calibrated value of the standard resistor within \pm 20 counts.

ADJUSTMENTS

9. Press LCRZ RANGE DOWN key once to select self test step "30".
10. Connect a 1kΩ standard resistor in place of the 10kΩ resistor.
11. Adjust potentiometer A1R29 so that DISPLAY A display output is the calibrated value of the standard resistor within ±20 counts.
12. Press LCRZ RANGE DOWN key once to select self test step "20".

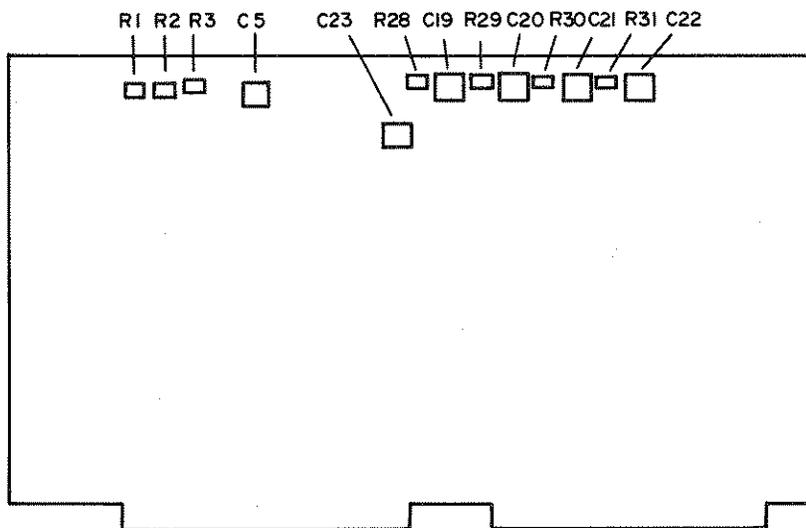
Note

DISPLAY A unit indicator displays "ms".

13. Connect a 100Ω standard resistor in place of the 1kΩ resistor.
 14. Adjust potentiometer A1R28 so that DISPLAY A display output is the calibrated value of the standard resistor within ±20 counts.
- 2) Range resistor phase adjustments.
1. Set 4275A controls as follows:

```

DISPLAY A function ..... C
DISPLAY B function ..... D
Test signal frequency ..... 100kHz
MULTIPLIER ..... X0.1
OSC LEVEL ..... fully cw
SELF TEST ..... off
HIGH RESOLUTION ..... off
CABLE LENGTH switch ..... 0
LCRZ RANGE ..... AUTO
    
```



A1 Board Adjustment Locations.

ADJUSTMENTS

2. Connect a 10pF standard capacitor direct to 4275A UNKNOWN terminals.

Note

Test leads should not be used for any phase adjustment.

3. Adjust trimmer capacitor A1C22 so that dissipation factor readout on DISPLAY B is within the range of .0000 and .0004.
4. Set test signal frequency to 1MHz.
5. Adjust trimmer capacitor A1C21 so that dissipation factor readout is within the range of -.0001 and .0003.
6. Set test signal frequency to 10MHz.
7. Adjust trimmer capacitor A1C23 so that capacitance readout on DISPLAY A is the calibrated value of the standard capacitor within ± 20 counts ($\pm 0.02\text{pF}$).
8. Adjust trimmer capacitor A1C20 so that dissipation factor readout on DISPLAY B is .0010 within ± 20 counts.

--- Troubleshooting hints ---

- 1) If any trimmer capacitor adjustment can not be achieved, firstly try to the particular range resistor slightly upward on the printed circuit board (to reduce stray capacitances).
- 2) If A1C21 adjustment can not be achieved, change value of capacitor A1C27 (normally 7.5pF). Increasing the capacitance of C27 decreases DISPLAY A display counts. Adjustable value range is 0 to 10pF.
- 3) If A1C23 adjustment can not be achieved, change value of capacitor A1C28 (normally 62pF). Increasing the capacitance of C28 decreases DISPLAY A display counts. Adjustable value range is 37 to 87pF.
- 4) If A1C20 adjustment can not be achieved, change value of capacitor A1C26 (normally 5.1pF). Increasing the capacitance of C26 decreases DISPLAY B display counts. Adjustable value range is 0 to 10pF.

ADJUSTMENTS

5-37. CMR AMPLIFIER 2MHz GAIN ADJUSTMENT (A1).

5-38. This adjustment optimizes CMR amplifier gain (preliminarily adjusted in paragraph 5-34) to maximize accuracy of measurement at 2MHz test signal frequency.

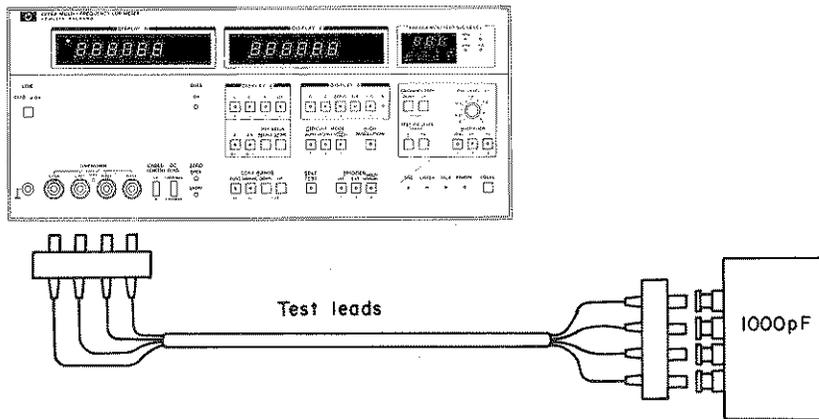


Figure 5-10. CMR Amplifier 2MHz Gain Adjustment Setup.

EQUIPMENT:

1000pF standard capacitor HP 16384A
Test leads (1m long) HP 16048A

Note

The HP 16384A is a component of the Hp 16380A Standard Capacitor Set.

PROCEDURE:

1. Set 4275A controls as follows:

DISPLAY A function C
DISPLAY B function D
CIRCUIT MODE AUTO
Test signal frequency 2MHz
MULTIPLIER x0.1
OSC LEVEL fully cw
CABLE LENGTH 0

2. Connect a 1000pF standard capacitor direct to 4275A UNKNOWN terminals.
3. Read dissipation factor display output on DISPLAY B and note its value as "X".
4. Set 4275A CABLE LENGTH switch to "1m" position.
5. Connect the 1000pF standard capacitor using 1m test leads as shown in Figure 5-10.

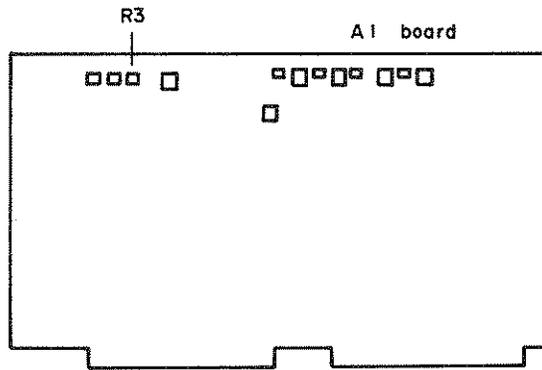
ADJUSTMENTS

6. Read dissipation factor display output (as "Y" value).
7. Calculate the value given by the following equation:

$$X_{adj} = \frac{X+Y}{2}$$

8. Adjust potentiometer AIR3 so that the dissipation factor readout (on DISPLAY B) is identical to the calculated X_{adj} value.
9. Repeat steps 1 through 5 until the following condition is satisfied.

$$X_{adj} = \frac{X+Y}{2} \pm 5 \text{ counts}$$



AI Board Adjustment Locations.

5-39. 4MHz/10MHz CMR AMPLIFIER AND RANGE RESISTOR PHASE ADJUSTMENTS (A1).

5-40. This adjustment optimizes CMR amplifier gain and properly sets range resistor signal phase compensator to maximize accuracy of measurement at 4MHz and 10MHz test signal frequencies.

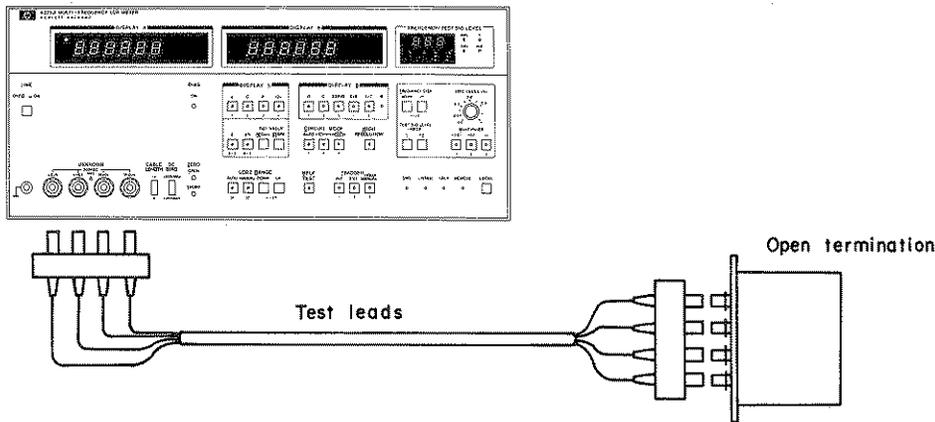


Figure 5-11. 10MHz CMR Amplifier and Range Resistor phase Adjustment Setup.

ADJUSTMENTS**EQUIPMENT:**

| | |
|-------------------------------|-----------------------------|
| Standard capacitor 10pF | HP 16382A |
| 100pF | HP 16383A |
| Test leads (1m long) | HP 16048A |
| Open termination | HP 16074A |
| Short termination | Standard Resistor Set |

Note

The 16074A accessory test leads can be used as 1m test leads (instead of HP 16048A).

PROCEDURE:

1. Set 4275A controls as follows:

| | |
|-----------------------------|----------|
| DISPLAY A function | C |
| DISPLAY B function | D |
| Test signal frequency | 10MHz |
| MULTIPLIER | x0.1 |
| OSC LEVEL | fully cw |
| CABLE LENGTH | 1m |

2. Connect 1m test leads to 4275A UNKNOWN terminals and to "Open" termination (of the 16074A Standard Resistor Set) as illustrated in Figure 5-11.
3. Press 4275A ZERO OPEN button to perform (open) zero offset adjustment.
4. Connect "Short" termination (of the 16074A Standard Resistor Set) in place of the "Open" termination.
5. Press ZERO SHORT button to perform (short) zero offset adjustment.
6. Connect a 10pF standard capacitor at end of test leads in place of the "Short" termination.
7. Read capacitance and dissipation factor display outputs (in DISPLAY A and DISPLAY B). Note the readouts in counts as follows:

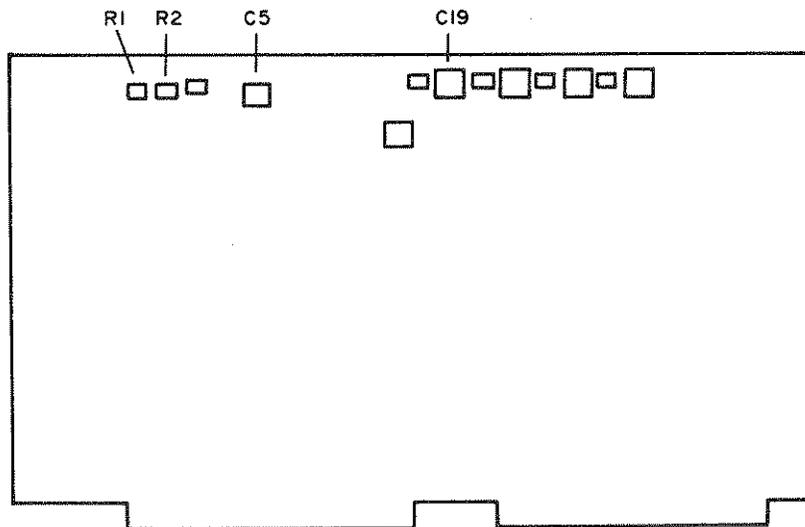
| | |
|--------------------------------|----------|
| Capacitance value | X counts |
| Dissipation factor value | Y counts |
8. Connect a 100pF standard capacitor in place of the 10pF capacitor.
9. Adjust trimmer capacitor A1C5 so that capacitance display output in DISPLAY A is X counts within ± 50 counts.
10. Adjust potentiometer A1R2 so that dissipation factor display output in DISPLAY B is Y counts within ± 50 counts.
11. Since A1C5 and A1R2 adjustments interact, repeat steps 7 and 10 several times.

ADJUSTMENTS

12. Set test signal frequency to 4MHz.
13. Adjust potentiometer A1R1 so that dissipation factor display output in DISPLAY B is 00 counts within ± 20 counts.
14. Disconnect test leads. Set 4275A CABLE LENGTH switch to "0" position.
15. Connect "Open" termination direct to 4275A UNKNOWN terminals.
16. Press ZERO OPEN button to perform (open) zero offset adjustment.
17. Connect "Short" termination direct to 4275A UNKNOWN terminals in place of the "Open" termination.
18. Press ZERO SHORT button to perform (short) zero offset adjustment.
19. Connect a 100pF standard capacitor direct to 4275A UNKNOWN terminals in place of the "Short" termination.
20. Adjust trimmer capacitor A1C19 so that dissipation factor display output in DISPLAY B is .0010 within ± 20 counts.
21. Since A1C5, A1R2, A1R1 and A1C19 adjustments interact, again perform steps 1 through 20 (to improve adjustment accuracy).

----- Troubleshooting hints -----

If A1C19 adjustment can not be achieved, change values of both A1C24 and C25 (normally 4.3pF). Increasing the value increases display counts. Adjustable value range is 0pF to 10pF.



A1 Board Adjustment Locations.

ADJUSTMENTS**5-41. $\pm 35V$ INTERNAL DC BIAS SUPPLY ADJUSTMENT (A21) (Opt. 001 only).****PURPOSE:**

To set internal dc voltage and the gain of DAC and Amplifier so that accurate dc bias voltages can be applied to the sample in response to bias control input.

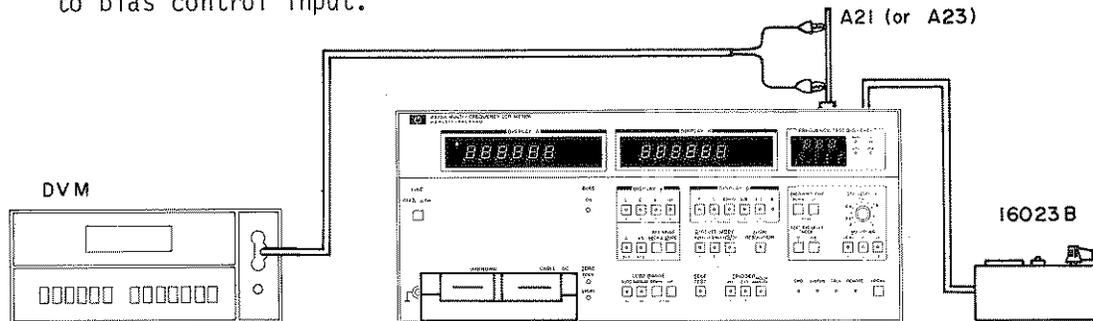


Figure 5-12. Internal DC Bias Supply Adjustment Setup.

EQUIPMENT:

Bias Controller HP 16023B
Digital Voltmeter HP 3465B

PROCEDURE:

1. Set 4275A controls as follows:

DC BIAS Switch..... $\pm 35v$ MAX
DISPLAY A function C
TRIGGER MANUAL
MULTIPLIER X .01
OSC LEVEL Fully CCW
Other Controls Any Settings
DC BIAS Selector SW INT 35V/100V ($C \leq .1\mu F$)
(rear panel)

2. Set 16023B DC Bias Controller thumbwheel switch to 0.00 and connect its 24 pin male connector to INT DC BIAS CONTROL Connector on the 4275A rear panel. See Figure 5-12.
3. Take out A21 board. Install extender board in A21 slot and install A21 board in extender.

CAUTION:

Before taking A21 board out, DC Bias connector board must be pulled out toward the rear panel by loosening its two screws.

4. Set DVM controls as follows:

FUNCTION V
RANGE 200V

5. Connect DVM plus input to the negative lead of A21C19 ($-42V$) and minus input to the positive lead of A21C19 (GND) with dual banana to alligator clip cable.

ADJUSTMENTS

6. Adjust A21R83 so the DVM reads $-42V \pm 0.1V$ and check that the voltage across A21C18 is within $+42.0V \pm 1.0V$.

Note

Change DVM range control to the appropriate setting for the adjustments that follow.

7. Change 16023B thumbwheel switch setting to $-.00V \times 1$. Press ENTER button.
8. Connect DVM plus input to A21TP3 and minus input to XA21 16R connector pin (GND ∇).
9. Adjust A21R12 until the DVM reads $0V \pm 0.1mV$.
10. Change 16023B thumbwheel switch setting to $+.00V \times 1$. Press ENTER button.
11. Adjust A21R11 until the DVM reads $0V \pm 0.1mV$.
12. Remove DVM plus input from A21TP3 and connect it to TP2.
13. Adjust A21R8 until the DVM reads $0V \pm 0.1mV$.
14. Change 16023B thumbwheel switch setting to $-9.00V \times 1$. Press ENTER button.
15. Adjust A21R13 until the DVM reads $-9V \pm .002V$.
16. Remove DVM input cable and 16023B from 4275A.

Note

Although the variable resistor A21R48 is mounted on the A21 board, it is a "factory only" adjustable component and is not field adjustable.

5-42. $\pm 100V$ INTERNAL DC BIAS SUPPLY ADJUSTMENT (A23) (Opt. 002 only).

PURPOSE and EQUIPMENT:

Same as in Para. 5-41.

PROCEDURE:

1. Set 4275A controls as follows:

DC BIAS Switch $\pm 200V$ MAX
TRIGGER MANUAL
DISPLAY A function C
OSC LEVEL Fully CCW
Other Controls Any settings
DC BIAS Selector SW INT 35V/100V ($C \leq .1\mu F$)
(rear panel)

2. Set 16023B DC Bias Controller thumbwheel switch to .000 and connect its 24 pin male connector to INT DC BIAS CONTROLLER connector on the 4275A rear panel. Refer to Figure 5-12 except for the difference in test pins and board number.

ADJUSTMENTS

3. Take out A23 board. Install extender board in A23 slot and install A23 board in extender.

Note

Before taking A23 board out, DC Bias connector board must be pulled out toward rear panel by loosening its two screws.

4. Set DVM controls as follows:

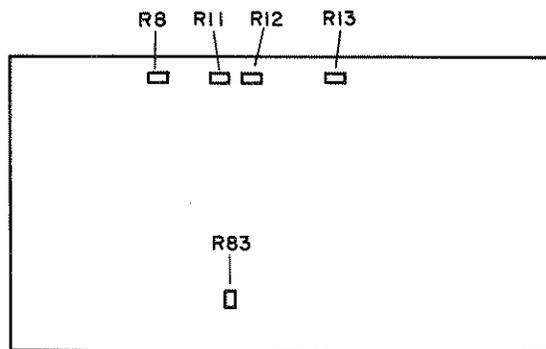
FUNCTION V
RANGE 200V

5. Connect DVM plus input to the negative lead of A23C26 and minus input to the positive lead of A23C26 with dual banana to alligator clip cable.
6. Adjust A23R55 until the DVM reads $-42.0V \pm 0.1V$.

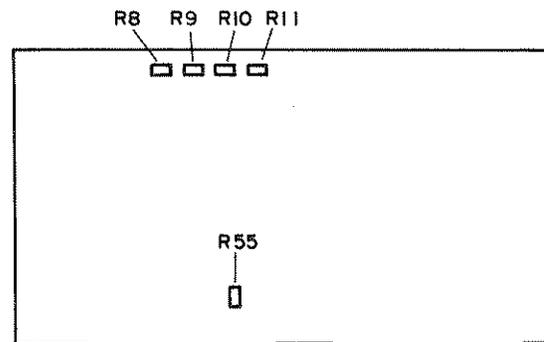
Note

Change DVM range control to the appropriate setting for the adjustments that follow:

7. Connect DVM plus input to the A23TP2 and minus input to the XA23 16R connector pin (GND ∇).
8. Set 16023B thumbwheel switch control to $-.00V \times 1$. Press ENTER button.
9. Adjust A23R11 until the DVM reads $0V \pm 0.1mV$.
10. Change 16023B thumbwheel switch setting to $+0.00 \times 1$. Press ENTER button.
11. Adjust A23R10 until the DVM reads $0V \pm 0.1mV$.
12. Disconnect DVM plus input from A23TP2 and connect it to TP1.
13. Change 16023B thumbwheel switch setting to $-0.00V \times 1$. Press ENTER button.
14. Adjust A23R8 until the DVM reads $0V \pm 2mV$.
15. Change 16023B thumbwheel switch setting to $-9.00V \times 1$. Press ENTER button.
16. Adjust A23R9 until the DVM reads $-90V \pm 40mV$.
17. Remove DVM input cable and 16023B from 4275A.



A21 Board Adjustment Locations.



A23 Board Adjustment Locations.

- c. A description of the part.
- d. A typical manufacturer of the part in a five-digit code.
- e. The manufacturer's number for the part.

The total quantity for each part is given only once at the first appearance of the part number in the list.

6-7. ORDERING INFORMATION.

6-8. To order a part listed in the replaceable parts table, give the Hewlett-Packard part number, indicate the quantity required, and address the order to the nearest Hewlett-Packard office.

6-9. To order a part that is not listed in the replaceable parts table, state the full instrument model and serial number, the description and function of the part, and the number of parts required. Address your order to the nearest Hewlett-Packard office.

6-10. SPARE PARTS KIT.

6-11. Stocking spare parts for an instrument is often done to insure quick return to service after a malfunction occurs. Hewlett-Packard has a Spare Parts Kit available for this purpose. The kit consists of selected replaceable assemblies and components for this instrument. The contents of the kit and

the Recommended Spares List are based on failure reports and repair data, and parts support for one year. A complimentary Recommended Spares List for this instrument may be obtained on request and the Spare Parts Kit may be ordered through your nearest Hewlett-Packard office.

6-12. DIRECT MAIL ORDER SYSTEM.

6-13. Within the USA, Hewlett-Packard can supply parts through a direct mail order system. Advantages of using the system are:

- a. Direct ordering and shipment from the HP Parts Center in Mountain View, California.
- b. No maximum or minimum on any mail order (there is a minimum order amount for parts ordered through a local HP Office when the orders require billing and invoicing).
- c. Prepaid transportation (there is a small handling charge for each order).
- d. No invoices --- to provide these advantages, a check or money order must accompany each order.

6-14. Mail order forms and specific ordering information is available through your local HP Office. Addresses and phone numbers are located at the back of this manual.

Table 6-2. Manufacturers Code Lists.

| NFR NO. | MANUFACTURER NAME | ADDRESS | ZIP CODE |
|---------|-------------------------------------|------------------|----------|
| 00633 | AKTIEBOLAGET RIFA | BROMMA SE | |
| 00000 | ANY SATISFACTORY SUPPLIER | | |
| 01121 | ALLEN-BRADLEY CO | MILWAUKEE WI | 53204 |
| 01295 | TEXAS INSTR INC SEMICOND CMPNT DIV | DALLAS TX | 75222 |
| 01928 | RCA CORP SOLID STATE DIV | SOMERVILLE NJ | 08876 |
| 02111 | SPECTROL ELECTRONICS CORP | CITY OF IND CA | 91745 |
| 02114 | FERROXCUBE CORP | SAUGERTIES NY | 12477 |
| 03888 | KDI PYROFILM CORP | WHIPPANY NJ | 07981 |
| 04713 | MOTOROLA SEMICONDUCTOR PRODUCTS | PHOENIX AZ | 85062 |
| 07263 | FAIRCHILD SEMICONDUCTOR DIV | MOUNTAIN VIEW CA | 94042 |
| 12954 | SIEMENS CORP COMPONENTS GROUP | SCOTTSDALE AZ | 85252 |
| 18324 | SIGNETICS CORP | SUNNYVALE CA | 94086 |
| 19701 | NEPCO/ELECTRA CORP | MINERAL WELLS TX | 76067 |
| 24046 | TRANSITRON ELECTRONIC CORP | WAKEFIELD MA | 01880 |
| 24355 | ANALOG DEVICES INC | NORWOOD MA | 02062 |
| 24546 | CORNING GLASS WORKS (BRADFORD) | BRADFORD PA | 16701 |
| 27014 | NATIONAL SEMICONDUCTOR CORP | SANTA CLARA CA | 95051 |
| 27167 | CORNING GLASS WORKS (WILMINGTON) | WILMINGTON NC | 28401 |
| 28480 | HEWLETT-PACKARD CO CORPORATE HQ | PALO ALTO CA | 94304 |
| 30983 | NEPCO/ELECTRA CORP | SAN DIEGO CA | 92121 |
| 32293 | INTERSIL INC | CUPERTINO CA | 95014 |
| 32997 | BOURNS INC TRIMPOT PROD DIV | RIVERSIDE CA | 92507 |
| 34649 | INTEL CORP | MOUNTAIN VIEW CA | 95051 |
| 52763 | STETTNER-TRUSH INC | CAZENOVIA NY | 13035 |
| 56289 | SPRAGUE ELECTRIC CO | NORTH ADAMS MA | 01247 |
| 72136 | ELECTRO MOTIVE CORP SUB IEC | WILLIMANTIC CT | 06226 |
| 73138 | BECKMAN INSTRUMENTS INC HELIPOT DIV | FULLERTON CA | 92634 |
| 75915 | LITTELFUSE INC | DES PLAINES IL | 60016 |

Table 6-3. Replaceable Parts

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------------------|--------|-----|--|----------------|----------------------------|
| A1 | 04275-66501 05275-26501 | 9 7 | 1 | RANGE RESISTOR & NULL DETECTOR BD, ASSY PC BOARD, BLANK | 28480 28480 | 04275-66501 05275-26501 |
| A1C1 | 0160-2055 | 9 | 120 | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A1C2 | 0180-1083 | 3 | 51 | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A1C3 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A1C4 | 0160-2260 | 8 | 2 | CAPACITOR-FXD 13PF +-5% 500VDC CER 0+-30 | 28480 | 0160-2260 |
| A1C5 | 0121-0105 | 4 | 4 | CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG | 52763 | 304324 9/35PF N650 |
| A1C6 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A1C7 | 0180-1077 | 5 | 12 | CAPACITOR-FXD 220uF +50-10% 16VDC | 28480 | 0180-1077 |
| A1C8 | 0180-1083 | 5 | 46 | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0180-1083 |
| A1C9 | 0160-3443 | 1 | 33 | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 |
| A1C10 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A1C11 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A1C12 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A1C13 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A1C14 | 0160-3443 | 1 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 |
| A1C15 | 0160-2307 | 4 | 6 | CAPACITOR-FXD 47PF +-5% 300VDC MICA | 28480 | 0160-2307 |
| A1C16 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A1C17 | 0160-3443 | 1 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 |
| A1C18 | 0160-3443 | 1 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 |
| A1C19 | 0121-0453 | 0 | 2 | CAPACITOR-V TRMR-CER 5.5-18PF 350V | 52763 | 304324 5.5/18PF NPD |
| A1C20 | 0121-0453 | 5 | 3 | CAPACITOR-V TRMR-AIR 1.3-5.4PF 250V | 74970 | 187-0303-105 |
| A1C21 | 0121-0453 | 5 | | CAPACITOR-V TRMR-AIR 1.3-5.4PF 250V | 74970 | 187-0303-105 |
| A1C22 | 0121-0453 | 5 | | CAPACITOR-V TRMR-AIR 1.3-5.4PF 250V | 74970 | 187-0303-105 |
| A1C23 | 0121-0105 | 4 | | CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG | 52763 | 304324 9/35PF N650 |
| A1C24 | 0160-2248 | 2 | 2 | CAPACITOR-FXD 4.3PF +-25PF 500VDC CER | 28480 | 0160-2248 |
| A1C25 | 0160-2248 | 2 | 2 | CAPACITOR-FXD 4.3PF +-25PF 500VDC CER | 28480 | 0160-2248 |
| A1C26 | 0160-2250 | 6 | 2 | CAPACITOR-FXD 5.1PF +-25PF 500VDC CER | 28480 | 0160-2250 |
| A1C27 | 0160-2254 | 0 | 1 | CAPACITOR-FXD 7.5PF +-25PF 500VDC CER | 28480 | 0160-2254 |
| A1C28 | 0160-2205 | 5 | 1 | CAPACITOR-FXD 62PF +-5% 300VDC MICA | 72136 | DM15E620J0300HVICR |
| A1C29 | 0180-1077 | 5 | | CAPACITOR-FXD 220uF +50-10% 16VDC | 28480 | 0180-1077 |
| A1C30 | 0180-1077 | 5 | | CAPACITOR-FXD 220uF +50-10% 16VDC | 28480 | 0180-1077 |
| A1C31 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A1C32 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A1C33 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A1C34 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A1C35 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A1C36 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A1C37 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A1C38 | 0180-1083 | 3 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0180-1083 |
| A1C39 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A1C40 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A1C41 | 0160-3443 | 1 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 |
| A1C42 | 0160-3443 | 1 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 |
| A1C43 | 0160-3443 | 1 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 |
| A1C44 | 0160-2260 | 4 | 2 | CAPACITOR-FXD 330PF +-5% 300VDC MICA | 28480 | 0160-2260 |
| A1C45 | 0160-2307 | 4 | | CAPACITOR-FXD 47PF +-5% 300VDC MICA | 28480 | 0160-2307 |
| A1C46 | 0160-3443 | 1 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 |
| A1C47 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A1C48 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A1C49 | 0160-3443 | 1 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 |
| A1C50 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A1C51 | 0160-3443 | 1 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 |
| A1C52 | 0180-1083 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0180-1083 |
| A1C53 | 0160-3443 | 1 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 |
| A1C54 | 0180-1083 | 3 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0180-1083 |
| A1C55 | 0160-2260 | 2 | 1 | CAPACITOR-FXD 20PF +-5% 500VDC CER 0+-30 | 28480 | 0160-2260 |
| A1C56 | 0160-2204 | 0 | 5 | CAPACITOR-FXD 100PF +-5% 300VDC MICA | 28480 | 0160-2204 |
| A1C57 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A1C58 | 0160-3443 | 1 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 |
| A1C59 | 0160-3443 | 1 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 |
| A1C60 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A1C61 | 0160-3443 | 1 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 |
| A1C62 | 0160-2249 | 3 | 7 | CAPACITOR-FXD 4.7PF +-25PF 500VDC CER | 28480 | 0160-2249 |
| A1C63 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A1C64 | 0180-1051 | 3 | 2 | CAPACITOR, FXD 100 UF 16V M | 28480 | 0180-1051 |
| A1C65 | 0180-1051 | 5 | | CAPACITOR, FXD 100 UF 16V M | 28480 | 0180-1051 |
| A1C66 | 0160-2249 | 3 | | CAPACITOR-FXD 4.7PF +-25PF 500VDC CER | 28480 | 0160-2249 |
| A1C67 | 0160-2204 | 0 | | CAPACITOR-FXD 100PF +-5% 300VDC MICA | 28480 | 0160-2204 |
| A1C68 | 0160-2205 | 4 | | CAPACITOR-FXD 330PF +-5% 300VDC MICA | 28480 | 0160-2205 |
| A1C69 | 0160-2150 | 5 | 2 | CAPACITOR-FXD 33PF +-5% 300VDC MICA | 28480 | 0160-2150 |
| A1C70 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|---|--|-----------|-----------------|
| A1C71 | 0160-2095 | 9 | 1 | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2095 |
| A1C72 | 0160-2095 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2095 |
| A1C73 | 0160-1088 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1088 |
| A1C74 | 0150-0059 | 8 | | CAPACITOR-FXD 3.3PF +/- .25PF 500VDC CER | 28480 | 0150-0059 |
| A1C75 | 0160-3443 | 1 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 |
| A1C76 | 0160-1088 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1088 |
| A1C77 | 0160-1088 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1088 |
| A1C78 | 0160-3443 | 1 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 |
| A1C79 | 0160-1088 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1088 |
| A1C80 | 0160-2260 | 8 | | CAPACITOR-FXD 13PF +/-5% 500VDC CER 0+30 | 28480 | 0160-2260 |
| A1C81 | 0160-3443 | 1 | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 | |
| A1C82 | 0160-2249 | 3 | CAPACITOR-FXD 4.7PF +/- .25PF 500VDC CER | 28480 | 0160-2249 | |
| A1C83 | 0160-3443 | 1 | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 | |
| A1C84 | 0160-2249 | 3 | CAPACITOR-FXD 4.7PF +/- .25PF 500VDC CER | 28480 | 0160-2249 | |
| A1C85 | 0160-2095 | 9 | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2095 | |
| A1C86 | 0160-2095 | 9 | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2095 | |
| A1C87 | 0160-2095 | 9 | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2095 | |
| A1C88 | 0160-2095 | 9 | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2095 | |
| A1C89 | 0160-2095 | 9 | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2095 | |
| A1C90 | 0160-2095 | 9 | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2095 | |
| A1C91 | 0160-2095 | 9 | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2095 | |
| A1C92 | 0160-2095 | 9 | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2095 | |
| A1C93 | 0160-2095 | 9 | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2095 | |
| A1C94 | 0160-2095 | 9 | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2095 | |
| A1C95 | 0160-2095 | 9 | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2095 | |
| A1C96 | 0160-2095 | 9 | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2095 | |
| A1C97 | 0160-2095 | 9 | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2095 | |
| A1C98 | 0160-2095 | 9 | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2095 | |
| A1C99 | 0160-2095 | 9 | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2095 | |
| A1C100 | 0160-2095 | 9 | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2095 | |
| A1C101 | 0160-2095 | 9 | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2095 | |
| A1C102 | 0160-1088 | 5 | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1088 | |
| A1C103 | 0160-1077 | 5 | CAPACITOR-FXD 220UF +50-10% 16VDC | 28480 | 0160-1077 | |
| A1C104 | 0160-1077 | 5 | CAPACITOR-FXD 220UF +50-10% 16VDC | 28480 | 0160-1077 | |
| A1C105 | 0160-1088 | 5 | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1088 | |
| A1C106 | 0160-1088 | 5 | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1088 | |
| A1C107 | 0160-1088 | 5 | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1088 | |
| A1C108 | 0160-1088 | 5 | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1088 | |
| A1C109 | 0160-1088 | 5 | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1088 | |
| A1C110 | 0160-2255 | 1 | CAPACITOR-FXD 5.2PF +/- .25PF 500VDC CER | 28480 | 0160-2255 | |
| A1C111 | 0160-3443 | 1 | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 | |
| A1C112 | 0160-1088 | 5 | CAPACITOR-FXD 33uF +50-30% 16VDC | 28480 | 0160-1088 | |
| A1C130 | 0160-2203 | 9 | CAPACITOR-FXD 91PF +/-5% 300VDC MICA 0+70 | 28480 | 0160-2203 | |
| A1CR1 | 1901-0040 | 1 | 76 | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| A1CR2 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| A1CR3 | 1902-3149 | 9 | | DIODE-ZNR 9.09V 5% DO-7 PDS,4W TC=+.057% | 28480 | 1902-3149 |
| A1CR4 | 1902-3149 | 9 | | DIODE-ZNR 9.09V 5% DO-7 PDS,4W TC=+.057% | 28480 | 1902-3149 |
| A1CR5 | 1901-0033 | 2 | | DIODE-GEN PRP 180V 200MA DO-7 | 28480 | 1901-0033 |
| A1CR6 | 1901-0033 | 2 | | DIODE-GEN PRP 180V 200MA DO-7 | 28480 | 1901-0033 |
| A1CR7 | 1901-0033 | 2 | | DIODE-GEN PRP 180V 200MA DO-7 | 28480 | 1901-0033 |
| A1CR8 | 1901-0033 | 2 | | DIODE-GEN PRP 180V 200MA DO-7 | 28480 | 1901-0033 |
| A1CR9 | 1901-0033 | 2 | | DIODE-GEN PRP 180V 200MA DO-7 | 28480 | 1901-0033 |
| A1CR10 | 1901-0033 | 2 | | DIODE-GEN PRP 180V 200MA DO-7 | 28480 | 1901-0033 |
| A1CR11 | 1901-0025 | 2 | 8 | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A1CR12 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A1CR13 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A1CR14 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A1CR15 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A1CR16 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A1CR17 | 1901-0029 | 6 | 4 | DIODE-PWR RECT 600V 750MA DO-29 | 28480 | 1901-0029 |
| A1CR18 | 1901-0029 | 6 | | DIODE-PWR RECT 600V 750MA DO-29 | 28480 | 1901-0029 |
| A1CR19 | 1901-0029 | 6 | | DIODE-PWR RECT 600V 750MA DO-29 | 28480 | 1901-0029 |
| A1CR20 | 1901-0033 | 2 | | DIODE-GEN PRP 180V 200MA DO-7 | 28480 | 1901-0033 |
| A1CR21 | 1901-0033 | 2 | | DIODE-GEN PRP 180V 200MA DO-7 | 28480 | 1901-0033 |
| A1CR22 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| A1CR23 | 1902-0049 | 2 | 7 | DIODE-ZNR 6.19V 5% DO-7 PDS,4W TC=+.022% | 28480 | 1902-0049 |
| A1CR24 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| A1CR25 | 1902-0049 | 2 | | DIODE-ZNR 6.19V 5% DO-7 PDS,4W TC=+.022% | 28480 | 1902-0049 |
| A1CR26 | 1902-0049 | 2 | | DIODE-ZNR 6.19V 5% DO-7 PDS,4W TC=+.022% | 28480 | 1902-0049 |
| A1CR27 | 1902-0049 | 2 | | DIODE-ZNR 6.19V 5% DO-7 PDS,4W TC=+.022% | 28480 | 1902-0049 |
| A1CR28 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A1CR29 | 1902-3082 | 9 | | DIODE-ZNR 4.68V 5% DO-7 PDS,4W TC=+.023% | 28480 | 1902-3082 |
| A1CR30 | 1902-0049 | 2 | DIODE-ZNR 6.19V 5% DO-7 PDS,4W TC=+.022% | 28480 | 1902-0049 | |
| A1CR31 | 1901-0040 | 1 | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 | |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|---|----------|--------------------|
| A1K1 | 0490-0234 | 9 | 7 | RELAY-REED | 28480 | |
| A1K2 | 0490-0234 | 9 | | RELAY-REED | 28480 | |
| A1K3 | 0490-0240 | 1 | 11 | RELAY, REED | 28480 | |
| A1K4 | 0490-0240 | 1 | | RELAY, REED | 28480 | |
| A1K5 | 0490-0234 | 1 | | RELAY, REED | 28480 | 0490-0234 |
| A1K6 | 0490-0234 | 1 | | RELAY, REED | 28480 | 0490-0234 |
| A1K7 | 0490-0234 | 1 | | RELAY, REED | 28480 | 0490-0234 |
| A1K8 | 0490-0234 | 1 | | RELAY, REED | 28480 | 0490-0234 |
| A1K9 | 0490-0234 | 1 | | RELAY, REED | 28480 | 0490-0234 |
| A1K10 | 0490-0234 | 1 | | RELAY, REED | 28480 | 0490-0234 |
| A1K11 | 0490-0234 | 1 | | RELAY, REED | 28480 | 0490-0234 |
| A1K12 | 0490-0240 | 9 | | RELAY-REED | 28480 | 0490-0240 |
| A1K13 | 0490-0240 | 9 | | RELAY-REED | 28480 | 0490-0240 |
| A1K14 | 0490-0240 | 9 | | RELAY-REED | 28480 | 0490-0240 |
| A1L1 | 9170-0029 | 3 | 36 | CORE-SHIELDING BEAD | 28480 | 9170-0029 |
| A1L2 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 28480 | 9170-0029 |
| A1L3 | 9140-0210 | 1 | 4 | COIL-MLD 100UH 5% Q=50 .155DX,375LG-NOM | 28480 | 9140-0210 |
| A1L4 | 9140-0210 | 1 | | COIL-MLD 100UH 5% Q=50 .155DX,375LG-NOM | 28480 | 9140-0210 |
| A1L5 | 9140-0210 | 1 | | COIL-MLD 100UH 5% Q=50 .155DX,375LG-NOM | 28480 | 9140-0210 |
| A1L6 | 9140-0137 | 1 | 1 | COIL-MLD 1MM 5% Q=60 .190X,44LG-NOM | 28480 | 9140-0137 |
| A1L7 | 9140-0179 | 1 | 5 | COIL-MLD 22UH 10% Q=75 .155DX,375LG-NOM | 28480 | 9140-0179 |
| A1L8 | 9140-0179 | 1 | | COIL-MLD 22UH 10% Q=75 .155DX,375LG-NOM | 28480 | 9140-0179 |
| A101 | 1853-0018 | 0 | 1 | TRANSISTOR PNP SI TO-72 PD=200MW FT=1GHZ | 28480 | 1853-0018 |
| A102 | 1854-0130 | 9 | 1 | TRANSISTOR NPN SI PD=350mW FT=4.5GHZ | 28480 | 1854-0130 |
| A103 | 1854-0092 | 2 | 31 | TRANSISTOR NPN SI PD=200MW FT=600MHZ | 28480 | 1854-0092 |
| A104 | 1853-0081 | 1 | 13 | TRANSISTOR J-FET N-CHAN D-MODE SI | 01295 | 2N5245 |
| A105 | 1853-0020 | 4 | 13 | TRANSISTOR PNP SI PD=300MW FT=150MHZ | 28480 | 1853-0020 |
| A106 | 1854-0345 | 8 | 10 | TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW | 04713 | 2N5179 |
| A107 | 1854-0345 | 8 | | TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW | 04713 | 2N5179 |
| A108 | 1854-0071 | 7 | 28 | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| A109 | 1854-0071 | 7 | | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| A1010 | 1854-0071 | 7 | | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| A1011 | 1854-0071 | 7 | | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| A1012 | 1854-0071 | 7 | | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| A1013 | 1854-0071 | 7 | | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| A1014 | 1854-0071 | 7 | | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| A1015 | 1854-0071 | 7 | | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| A1016 | 1854-0345 | 8 | | TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW | 04713 | 2N5179 |
| A1017 | 1854-0123 | 2 | 1 | TRANSISTOR DUAL-FET N-CHANNEL V _{max} =30V | 28480 | 1854-0123 |
| A1018 | 1853-0020 | 4 | | TRANSISTOR PNP SI PD=300MW FT=150MHZ | 28480 | 1853-0020 |
| A1019 | 1854-0019 | 3 | 5 | TRANSISTOR NPN SI TO-18 PD=360MW | 28480 | 1854-0019 |
| A1020 | 1854-0345 | 8 | | TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW | 04713 | 2N5179 |
| A1021 | 1854-0477 | 7 | 3 | TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW | 04713 | 2N2222A |
| A1022 | 1853-0007 | 7 | 1 | TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW | 04713 | 2N3251 |
| A1023 | 1854-0092 | 2 | | TRANSISTOR NPN SI PD=200MW FT=600MHZ | 28480 | 1854-0092 |
| A1024 | 1854-0092 | 2 | | TRANSISTOR NPN SI PD=200MW FT=600MHZ | 28480 | 1854-0092 |
| A1025 | 1854-0092 | 2 | | TRANSISTOR NPN SI PD=200MW FT=600MHZ | 28480 | 1854-0092 |
| A1026 | 1854-0071 | 7 | | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| A1027 | 1854-0071 | 7 | | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| A1028 | 1854-0071 | 7 | | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| A1029 | 1854-0092 | 2 | | TRANSISTOR NPN SI PD=200MW FT=600MHZ | 28480 | 1854-0092 |
| A1030 | 1854-0092 | 2 | | TRANSISTOR NPN SI PD=200MW FT=600MHZ | 28480 | 1854-0092 |
| A1031 | 1854-0092 | 2 | | TRANSISTOR NPN SI PD=200MW FT=600MHZ | 28480 | 1854-0092 |
| A1032 | 1854-0092 | 2 | | TRANSISTOR NPN SI PD=200MW FT=600MHZ | 28480 | 1854-0092 |
| A1033 | 1854-0092 | 2 | | TRANSISTOR NPN SI PD=200MW FT=600MHZ | 28480 | 1854-0092 |
| A1034 | 1854-0092 | 2 | | TRANSISTOR NPN SI PD=200MW FT=600MHZ | 28480 | 1854-0092 |
| A1035 | 1853-0261 | 9 | 4 | TRANSISTOR MOS-FET PD=100mW ID=15mA | 28480 | 1853-0261 |
| A1036 | 1854-0071 | 7 | | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| A1037 | 1853-0020 | 4 | | TRANSISTOR PNP SI PD=300MW FT=150MHZ | 28480 | 1853-0020 |
| A1038 | 1853-0020 | 4 | | TRANSISTOR PNP SI PD=300MW FT=150MHZ | 28480 | 1853-0020 |
| A1039 | 1854-0071 | 7 | | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| A1040 | 1854-0071 | 7 | | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| A1041 | 1854-0071 | 7 | | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| A1042 | 1854-0092 | 2 | | TRANSISTOR NPN SI PD=200MW FT=600MHZ | 28480 | 1854-0092 |
| A1043 | 1854-0092 | 2 | | TRANSISTOR NPN SI PD=200MW FT=600MHZ | 28480 | 1854-0092 |
| A1044 | 1854-0092 | 2 | | TRANSISTOR NPN SI PD=200MW FT=600MHZ | 28480 | 1854-0092 |
| A1R1 | 2100-2489 | 9 | 1 | RESISTOR-TMR 5K 10% C SIDE=ADJ 1-TRN | 30963 | E750X502 |
| A1R2 | 2100-2521 | 0 | 2 | RESISTOR-TMR 2K 10% C SIDE=ADJ 1-TRN | 30983 | E750X202 |
| A1R3 | 2100-2432 | 4 | 1 | RESISTOR-TMR 100 10% C SIDE=ADJ 1-TRN | 30983 | E750X101 |
| A1R4 | 0690-3444 | 1 | 26 | RESISTOR 316 1% .125W P TC=0+-100 | 24546 | C4-1/8-T0-316R-F |
| A1R5 | 0690-3082 | 7 | 8 | RESISTOR 464 1% .125W P TC=0+-100 | 24546 | C4-1/8-T0-464R-F |
| A1R6 | 0757-0416 | 7 | 10 | RESISTOR 511 1% .125W P TC=0+-100 | 24546 | C4-1/8-T0-511R-F |
| A1R7 | 0757-0438 | 3 | 5 | RESISTOR 5.11K 1% .125W P TC=0+-100 | 24546 | C4-1/8-T0-5111-F |
| A1R8 | 0757-0280 | 3 | 40 | RESISTOR 1K 1% .125W P TC=0+-100 | 24546 | C4-1/8-T0-1001-F |
| A1R9 | 0690-3430 | 5 | 1 | RESISTOR 21.5 1% .125W P TC=0+-100 | 03888 | PM55-1/8-T0-21R5-F |
| A1R10 | 0757-0410 | 1 | 4 | RESISTOR 301 1% .125W P TC=0+-100 | 24546 | C4-1/8-T0-301R-F |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|--|----------|------------------|
| A1R11 | 0683-1035 | 1 | 17 | RESISTOR 10K 5% .25W FC TC=400/+700 | 01121 | CB1035 |
| A1R11 | 0797-0416 | 7 | | RESISTOR 511 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=511R=F |
| A1R12 | 0683-1025 | 9 | 30 | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A1R13 | 0683-2225 | 3 | 34 | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A1R16 | 0683-4705 | 8 | 43 | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A1R17 | 0797-1094 | 9 | 3 | RESISTOR 1.47K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1471=F |
| A1R18 | 0698-2342 | 1 | 1 | RESISTOR 40.2 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=4022=F |
| A1R19 | 0683-1015 | 7 | 12 | RESISTOR 100 5% .25W FC TC=400/+500 | 01121 | CB1015 |
| A1R20 | 0683-1005 | 5 | 14 | RESISTOR 10 5% .25W FC TC=400/+500 | 01121 | CB1005 |
| A1R21 | 0797-0401 | 0 | 12 | RESISTOR 100 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=101=F |
| A1R22 | 0683-4705 | 6 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A1R23 | 0683-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A1R24 | 0797-0417 | 0 | 3 | RESISTOR 562 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=562R=F |
| A1R25 | 0797-0401 | 0 | | RESISTOR 100 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=101=F |
| A1R26 | 0683-1015 | 7 | 0 | RESISTOR 100 5% .25W FC TC=400/+500 | 01121 | CB1015 |
| A1R27 | 0683-1005 | 5 | | RESISTOR 10 5% .25W FC TC=400/+500 | 01121 | CB1005 |
| A1R28 | 2100-2522 | 1 | 1 | RESISTOR=TRMR 10K 10% C SIDE=ADJ 1-TRN | 30983 | ET50X103 |
| A1R29 | 2100-3199 | 0 | 2 | RESISTOR=TRMR 20 20% C SIDE=ADJ 1-TRN | 30983 | ET50X200 |
| A1R30 | 2100-2413 | 0 | 1 | RESISTOR=TRMR 200 10% C SIDE=ADJ 1-TRN | 30983 | ET50X201 |
| A1R31 | 2100-2521 | 9 | 0 | RESISTOR=TRMR 2K 10% C SIDE=ADJ 1-TRN | 30983 | ET50X202 |
| A1R32 | 0797-0436 | 3 | | RESISTOR 5.11K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=5111=F |
| A1R33 | 0698-2316 | 4 | 2 | RESISTOR, PKD MET FLM 101.3 OHM 0.1% 1/8 | 24546 | C4=1/8-T0=51R1=F |
| A1R34 | 0797-0394 | 0 | 1 | RESISTOR 51.1 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=51R1=F |
| A1R35 | 0698-2336 | 0 | 1 | RESISTOR 950 1% .125W | 24546 | 0698-2336 |
| A1R36 | 0698-2441 | 8 | 3 | RESISTOR 215 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=215R=F |
| A1R37 | 0698-2339 | 1 | 1 | RESISTOR 10.5K 1% .125W | 24546 | 0698-2339 |
| A1R38 | 0797-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001=F |
| A1R39 | 0698-2340 | 4 | 1 | RESISTOR 95K 1% .125W | 24546 | 0698-2340 |
| A1R40 | 0683-5605 | 9 | 1 | RESISTOR 56 5% .25W FC TC=400/+500 | 01121 | CB5605 |
| A1R41 | 0683-1035 | 1 | | RESISTOR 10K 5% .25W FC TC=400/+700 | 01121 | CB1035 |
| A1R42 | 0683-4725 | 2 | 35 | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A1R43 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A1R44 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A1R45 | 0683-1035 | 1 | | RESISTOR 10K 5% .25W FC TC=400/+700 | 01121 | CB1035 |
| A1R46 | 0683-1035 | 1 | | RESISTOR 10K 5% .25W FC TC=400/+700 | 01121 | CB1035 |
| A1R47 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A1R48 | 0797-0442 | 3 | 19 | RESISTOR 10K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1002=F |
| A1R49 | 0797-0280 | 9 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001=F |
| A1R50 | 0797-0401 | 0 | | RESISTOR 100 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=101=F |
| A1R51 | 0797-0465 | 6 | 11 | RESISTOR 100K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1003=F |
| A1R52 | 0797-0442 | 9 | | RESISTOR 10K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1002=F |
| A1R53 | 0683-3325 | 6 | 10 | RESISTOR 3.3K 5% .25W FC TC=400/+700 | 01121 | CB3325 |
| A1R54 | 0698-3195 | 1 | 19 | RESISTOR 4.64K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=4641=F |
| A1R55 | 0698-0084 | 9 | 18 | RESISTOR 2.15K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=2151=F |
| A1R56 | 0797-0426 | 1 | 3 | RESISTOR 1.62K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1621=F |
| A1R57 | 0698-0083 | 8 | 4 | RESISTOR 1.96K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1961=F |
| A1R58 | 0698-0083 | 8 | | RESISTOR 1.96K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1961=F |
| A1R59 | 0797-0450 | 7 | 1 | RESISTOR 51.1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=5112=F |
| A1R60 | 2100-1766 | 9 | 2 | RESISTOR=TRMR 500 10% C TOP=ADJ 1-TRN | 73138 | B2PR500 |
| A1R61 | 0683-1035 | 1 | | RESISTOR 10K 5% .25W FC TC=400/+700 | 01121 | CB1035 |
| A1R62 | 0683-4705 | 6 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A1R63 | 0797-0416 | 9 | 3 | RESISTOR 619 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=619R=F |
| A1R64 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A1R65 | 0797-0346 | 2 | 7 | RESISTOR 10 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=10R0=F |
| A1R66 | 0797-0346 | 2 | | RESISTOR 10 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=10R0=F |
| A1R67 | 0683-2205 | 9 | 22 | RESISTOR 22 5% .25W FC TC=400/+500 | 01121 | CB2205 |
| A1R68 | 0797-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001=F |
| A1R69 | 0797-0279 | 0 | 10 | RESISTOR 3.16K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=316R=F |
| A1R70 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A1R71 | 0797-0346 | 2 | | RESISTOR 10 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=10R0=F |
| A1R72 | 0683-4705 | 6 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A1R73 | 0797-0416 | 7 | | RESISTOR 511 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=511R=F |
| A1R74 | 0797-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001=F |
| A1R75 | 0797-0346 | 2 | | RESISTOR 10 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=10R0=F |
| A1R76 | 0797-0416 | 7 | | RESISTOR 511 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=511R=F |
| A1R77 | 0797-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001=F |
| A1R78 | 0698-3444 | 1 | | RESISTOR 316 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=316R=F |
| A1R79 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A1R80 | 0683-2205 | 9 | | RESISTOR 22 5% .25W FC TC=400/+500 | 01121 | CB2205 |
| A1R81 | 0698-3444 | 1 | | RESISTOR 316 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=316R=F |
| A1R82 | 0797-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001=F |
| A1R83 | 0683-4705 | 6 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A1R84 | 0797-0403 | 2 | 4 | RESISTOR 121 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=121R=F |
| A1R85 | 0698-0084 | 9 | | RESISTOR 2.15K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=2151=F |
| A1R86 | 0683-1035 | 1 | | RESISTOR 10K 5% .25W FC TC=400/+700 | 01121 | CB1035 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|--------------------------------------|----------|------------------|
| A1R87 | 0683-1035 | 1 | | RESISTOR 10K 5% .25W FC TC=400/+700 | 01121 | CB1035 |
| A1R88 | 0683-2205 | 1 | | RESISTOR 22 5% .25W FC TC=400/+500 | 01121 | CB2205 |
| A1R89 | 0683-2205 | 9 | | RESISTOR 22 5% .25W FC TC=400/+500 | 01121 | CB2205 |
| A1R90 | 0683-1035 | 1 | | RESISTOR 10K 5% .25W FC TC=400/+700 | 01121 | CB1035 |
| A1R91 | 0683-2205 | 9 | | RESISTOR 22 5% .25W FC TC=400/+500 | 01121 | CB2205 |
| A1R92 | 0757-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001-F |
| A1R93 | 0757-0279 | 0 | | RESISTOR 3.16K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=3161-F |
| A1R94 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A1R95 | 0683-2205 | 9 | | RESISTOR 22 5% .25W FC TC=400/+500 | 01121 | CB2205 |
| A1R96 | 0757-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001-F |
| A1R97 | 0757-0279 | 0 | | RESISTOR 3.16K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=3161-F |
| A1R98 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A1R100 | 0698-0054 | 0 | | RESISTOR 2.15K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=2151-F |
| A1R101 | 0757-0418 | 9 | 5 | RESISTOR 619 1% .125W F TC=0/+100 | 24546 | |
| A1R102 | 0757-1094 | 9 | | RESISTOR 1.47K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1471-F |
| A1R103 | 0757-0279 | 0 | | RESISTOR 3.16K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=3161-F |
| A1R104 | 0683-2205 | 9 | | RESISTOR 22 5% .25W FC TC=400/+500 | 01121 | CB2205 |
| A1R105 | 0698-3444 | 1 | | RESISTOR 316 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=316R-F |
| A1R106 | 0757-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001-F |
| A1R107 | 0683-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A1R108 | 0698-3444 | 1 | | RESISTOR 316 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=316R-F |
| A1R109 | 0757-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001-F |
| A1R110 | 0683-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A1R111 | 0683-1035 | 1 | | RESISTOR 10K 5% .25W FC TC=400/+700 | 01121 | CB1035 |
| A1R112 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A1R113 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A1R114 | 0683-3335 | 8 | 6 | RESISTOR 33K 5% .25W FC TC=400/+800 | 01121 | CB3335 |
| A1R115 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A1R116 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A1R117 | 0683-2205 | 9 | | RESISTOR 22 5% .25W FC TC=400/+500 | 01121 | CB2205 |
| A1R118 | 0683-1035 | 1 | | RESISTOR 10K 5% .25W FC TC=400/+700 | 01121 | CB1035 |
| A1R119 | 0683-1035 | 1 | | RESISTOR 10K 5% .25W FC TC=400/+700 | 01121 | CB1035 |
| A1R120 | 0683-1035 | 1 | | RESISTOR 10K 5% .25W FC TC=400/+700 | 01121 | CB1035 |
| A1R121 | 0683-1025 | 1 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A1R122 | 0683-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A1R123 | 0683-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A1R124 | 0683-0475 | 1 | 2 | RESISTOR 4.7 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A1R124 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A1R125 | 0683-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A1R126 | 0683-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A1R127 | 0683-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A1R128 | 0683-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A1R129 | 0683-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A1R130 | 0683-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A1R131 | 0683-0475 | 1 | | RESISTOR 4.7 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A1R131 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A1R132 | 0683-1035 | 1 | | RESISTOR 10K 5% .25W FC TC=400/+700 | 01121 | CB1035 |
| A1R133 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A1R133 | 0683-3325 | 6 | | RESISTOR 3.3K 5% .25W FC TC=400/+700 | 01121 | CB3325 |
| A1R136 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A1R137 | 0683-2205 | 9 | | RESISTOR 22 5% .25W FC TC=400/+500 | 01121 | CB2205 |
| A1R138 | 0757-0416 | 7 | | RESISTOR 511 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=511R-F |
| A1R139 | 0757-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001-F |
| A1R140 | 0757-0279 | 0 | | RESISTOR 3.16K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=3161-F |
| A1R141 | 0757-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001-F |
| A1R142 | 0683-2205 | 9 | | RESISTOR 22 5% .25W FC TC=400/+500 | 01121 | CB2205 |
| A1R143 | 0698-3444 | 1 | | RESISTOR 316 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=316R-F |
| A1R144 | 0757-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001-F |
| A1R145 | 0683-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A1R146 | 0698-3268 | 7 | 1 | RESISTOR 11.5K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=115R-F |
| A1R147 | 0757-0416 | 7 | | RESISTOR 511 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=511R-F |
| A1R148 | 0757-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001-F |
| A1R149 | 0757-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001-F |
| A1R150 | 0757-0279 | 0 | | RESISTOR 3.16K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=3161-F |
| A1R151 | 0698-3444 | 1 | | RESISTOR 316 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=316R-F |
| A1R160 | 0698-3153 | 9 | 4 | RESISTOR 3.83K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=3831-F |
| A1T1 | 9100-0877 | 2 | 1 | TRANSFORMER-SIGNAL 300uH 1:1:1 | 28480 | 9100-0877 |
| A1T2 | 9100-0879 | 4 | 3 | TRANSFORMER-SIGNAL 10mH 20% | 28480 | 9100-0879 |
| A1T3 | 9100-0879 | 4 | 8 | TRANSFORMER-SIGNAL 10mH 20% | 28480 | 9100-0879 |
| A1T4 | 9100-0823 | 8 | 5 | TRANSFORMER(YDK113B1) 1:1:1 | 28480 | 9100-0823 |
| A1U1 | 1826-0319 | 7 | 2 | IC OP AMP TC=99 | 27014 | LF356H |
| A1U2 | 1820-0203 | 6 | 1 | IC OP AMP GP TC=99 | 01928 | CA741CT |

A1 MISCELLANEOUS PARTS

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|--|----------|--------------------|
| | 1250-0257 | 1 | 12 | CONNECTOR-RF 8MB M PC 50-OHM | 28480 | 1250-0257 |
| | 04275-00602 | 3 | 1 | PLATE SHIELD, A1 | 28480 | 04275-00602 |
| | 04275-00621 | 6 | 1 | PLATE, SHIELD | 28480 | 04275-00621 |
| A2 | 04275-66502 | 0 | 1 | MODULATOR BOARD ASSEMBLY | 28480 | 04275-66502 |
| | 04275-26502 | 6 | | PC BOARD, BLANK | 28480 | 04275-26502 |
| A2C1 | 0150-0121 | 5 | 27 | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 |
| A2C2 | 0160-2940 | 1 | 6 | CAPACITOR-FXD 470PF +-5% 300VDC MICA | 28480 | 0160-2940 |
| A2C3 | 0160-2940 | 1 | | CAPACITOR-FXD 470PF +-5% 300VDC MICA | 28480 | 0160-2940 |
| A2C4 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 |
| A2C5 | 0160-2255 | 1 | 6 | CAPACITOR-FXD 8.2PF +--.25PF 500VDC CER | 28480 | 0160-2255 |
| A2C6 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A2C7 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 |
| A2C8 | 0181-0105 | 4 | | CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG | 52763 | 304324 9/35PF N650 |
| A2C9 | 0121-0105 | 7 | 5 | CAPACITOR-V TRMR-CER 9-35PF 350V PC-MTG | 52763 | |
| A2C10 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A2C11 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A2C12 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 |
| A2C13 | 0121-0105 | 4 | | CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG | 52763 | 304324 9/35PF N650 |
| A2C14 | 0121-0105 | 7 | | CAPACITOR-V TRMR-CER 9-35PF 350V PC-MTG | 52763 | |
| A2C15 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A2C16 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A2C17 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 |
| A2C18 | 0160-0174 | 9 | 1 | CAPACITOR-FXD .47UF +80-20% 25VDC CER | 28480 | 0160-0174 |
| A2C19 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 |
| A2C20 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 |
| A2C21 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 |
| A2C22 | 0160-0197 | 8 | 10 | CAPACITOR-FXD 2.2UF+-10% 20VDC TA | 56289 | 150D225X9020A2 |
| A2C23 | 0160-2265 | 3 | 9 | CAPACITOR-FXD 22PF +-5% 500VDC CER 0+-30 | 28480 | 0160-2265 |
| A2C24 | 0160-2265 | 3 | | CAPACITOR-FXD 22PF +-5% 500VDC CER 0+-30 | 28480 | 0160-2265 |
| A2C25 | 0160-2265 | 3 | | CAPACITOR-FXD 22PF +-5% 500VDC CER 0+-30 | 28480 | 0160-2265 |
| A2C26 | 0160-2265 | 3 | | CAPACITOR-FXD 22PF +-5% 500VDC CER 0+-30 | 28480 | 0160-2265 |
| A2C27 | 0160-0127 | 2 | 26 | CAPACITOR-FXD 1UF +-20% 25VDC CER | 28480 | 0160-0127 |
| A2C28 | 0160-0197 | 8 | | CAPACITOR-FXD 2.2UF+-10% 20VDC TA | 56289 | 150D225X9020A2 |
| A2C29 | 0160-2265 | 3 | | CAPACITOR-FXD 22PF +-5% 500VDC CER 0+-30 | 28480 | 0160-2265 |
| A2C30 | 0160-2265 | 3 | | CAPACITOR-FXD 22PF +-5% 500VDC CER 0+-30 | 28480 | 0160-2265 |
| A2C31 | 0160-2265 | 3 | | CAPACITOR-FXD 22PF +-5% 500VDC CER 0+-30 | 28480 | 0160-2265 |
| A2C32 | 0160-2265 | 3 | | CAPACITOR-FXD 22PF +-5% 500VDC CER 0+-30 | 28480 | 0160-2265 |
| A2C33 | 0160-0127 | 2 | | CAPACITOR-FXD 1UF +-20% 25VDC CER | 28480 | 0160-0127 |
| A2C34 | 0160-2255 | 1 | | CAPACITOR-FXD 8.2PF +--.25PF 500VDC CER | 28480 | 0160-2255 |
| A2C35 | 0160-2255 | 1 | | CAPACITOR-FXD 8.2PF +--.25PF 500VDC CER | 28480 | 0160-2255 |
| A2C36 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 |
| A2C37 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 |
| A2C38 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 |
| A2C39 | 0160-0197 | 8 | | CAPACITOR-FXD 2.2UF+-10% 20VDC TA | 56289 | 150D225X9020A2 |
| A2C40 | 0160-0197 | 8 | | CAPACITOR-FXD 2.2UF+-10% 20VDC TA | 56289 | 150D225X9020A2 |
| A2C41 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 |
| A2C42 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A2C43 | 0140-0190 | 7 | 1 | CAPACITOR-FXD 39PF +-5% 300VDC MICA | 72136 | DM15E39J0300HV1CR |
| A2C44 | 0160-0158 | 9 | 1 | CAPACITOR-FXD 560PF +-10% 200VDC POLYE | 28480 | 0160-0158 |
| A2C47 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A2C48 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 |
| A2C49 | 0140-0178 | 1 | 1 | CAPACITOR-FXD 960PF +-2% 300VDC MICA | 72136 | DM15F56160300HV1CR |
| A2C49 | 0160-0197 | 8 | | CAPACITOR-FXD 2.2UF+-10% 20VDC TA | 56289 | 150D225X9020A2 |
| A2C50 | 0160-0197 | 8 | | CAPACITOR-FXD 2.2UF+-10% 20VDC TA | 56289 | 150D225X9020A2 |
| A2C51 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 |
| A2C52 | 0160-0197 | 8 | | CAPACITOR-FXD 2.2UF+-10% 20VDC TA | 56289 | 150D225X9020A2 |
| A2C53 | 0160-2259 | 0 | 6 | CAPACITOR-FXD 12PF +-5% 500VDC CER 0+-30 | 28480 | 0160-2259 |
| A2C54 | 0140-0193 | 0 | 2 | CAPACITOR-FXD 82PF +-5% 300VDC MICA | 72136 | DM15E82J0300HV1CR |
| A2C55 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 |
| A2C56 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 |
| A2C57 | 0160-0197 | 8 | | CAPACITOR-FXD 2.2UF+-10% 20VDC TA | 56289 | 150D225X9020A2 |
| A2C58 | 0160-2259 | 5 | | CAPACITOR-FXD 12PF +-5% 500VDC CER 0+-30 | 28480 | 0160-2259 |
| A2C59 | 0140-0193 | 0 | | CAPACITOR-FXD 82PF +-5% 300VDC MICA | 72136 | DM15E82J0300HV1CR |
| A2C60 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 |
| A2C61 | 0160-2940 | 1 | | CAPACITOR-FXD 470PF +-5% 300VDC MICA | 28480 | 0160-2940 |
| A2C62 | 0160-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0160-1083 |
| A2C63 | 0160-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0160-1083 |
| A2C64 | 0160-2940 | 1 | | CAPACITOR-FXD 470PF +-5% 300VDC MICA | 28480 | 0160-2940 |
| A2C65 | 0160-2940 | 1 | | CAPACITOR-FXD 470PF +-5% 300VDC MICA | 28480 | 0160-2940 |
| A2C66 | 0160-2150 | 5 | | CAPACITOR-FXD 33PF +-5% 300VDC MICA | 28480 | 0160-2150 |
| A2C67 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A2C68 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A2C69 | 0160-0127 | 2 | | CAPACITOR-FXD 1UF +-20% 25VDC CER | 28480 | 0160-0127 |
| A2C70 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 |
| A2C71 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|---|----------|-----------------|
| A2C72 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A2C73 | 0160-0127 | 2 | | CAPACITOR-FXD 1UF +-20% 25VDC CER | 28480 | 0160-0127 |
| A2C74 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A2C75 | 0160-2255 | 1 | | CAPACITOR-FXD 8.2PF +-25PF 500VDC CER | 28480 | 0160-2255 |
| A2C76 | 0160-0127 | 2 | | CAPACITOR-FXD 1UF +-20% 25VDC CER | 28480 | 0160-0127 |
| A2C77 | 0160-0197 | 6 | | CAPACITOR-FXD 2.2UF +-10% 20VDC TA | 56289 | 150D225K9020A2 |
| A2C78 | 0160-0127 | 2 | | CAPACITOR-FXD 1UF +-20% 25VDC CER | 28480 | 0160-0127 |
| A2C79 | 0160-2255 | 1 | | CAPACITOR-FXD 8.2PF +-25PF 500VDC CER | 28480 | 0160-2255 |
| A2C80 | 0160-0127 | 2 | | CAPACITOR-FXD 1UF +-20% 25VDC CER | 28480 | 0160-0127 |
| A2C81 | 0160-0127 | 2 | | CAPACITOR-FXD 1UF +-20% 25VDC CER | 28480 | 0160-0127 |
| A2C82 | 0160-0127 | 2 | | CAPACITOR-FXD 1UF +-20% 25VDC CER | 28480 | 0160-0127 |
| A2C83 | 0160-1603 | 1 | 2 | CFXD MY 1 UF 10X 100VDCW | 28480 | 0160-1603 |
| A2C84 | 0190-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0190-0121 |
| A2C85 | 0160-2940 | 1 | | CAPACITOR-FXD 470PF +-5% 300VDC MICA | 28480 | 0160-2940 |
| A2C86 | 0160-1603 | 1 | | CFXD MY 1 UF 10X 100VDCW | 28480 | 0160-1603 |
| A2C87 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 |
| A2C88 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A2C89 | 0180-1083 | 3 | | | 28480 | 0180-1083 |
| A2C90 | 0160-0127 | 2 | | CAPACITOR-FXD 1UF +-20% 25VDC CER | 28480 | 0160-0127 |
| A2C91 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A2C92 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A2C93 | 0160-2255 | 5 | | CAPACITOR-FXD 12PF +-5% 500VDC CER 0+-30 | 28480 | 0160-2255 |
| A2C94 | 0160-2241 | 5 | 2 | CAPACITOR-FXD 2.2PF +-25PF 500VDC CER | 28480 | 0160-2241 |
| A2C95 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A2C96 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 |
| A2C97 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A2C98 | 0160-2203 | 4 | 6 | CAPACITOR-FXD 91PF +-5% 300VDC MICA | 72136 | |
| A2C99 | 0160-2217 | 4 | 3 | CAPACITOR-FXD 910PF +-5% 300VDC MICA | 28480 | |
| A2C100 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A2C101 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A2C102 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A2C103 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A2C104 | 0160-0127 | 2 | | CAPACITOR-FXD 1UF +-20% 25VDC CER | 28480 | 0160-0127 |
| A2C105 | 0160-2255 | 5 | | CAPACITOR-FXD 12PF +-5% 500VDC CER 0+-30 | 28480 | 0160-2255 |
| A2C106 | 0160-0127 | 2 | | CAPACITOR-FXD 1UF +-20% 25VDC CER | 28480 | 0160-0127 |
| A2C107 | 0160-2241 | 5 | | CAPACITOR-FXD 2.2PF +-25PF 500VDC CER | 28480 | 0160-2241 |
| A2C108 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A2C109 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A2C110 | 0160-0127 | 2 | | CAPACITOR-FXD 1UF +-20% 25VDC CER | 28480 | 0160-0127 |
| A2C111 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A2C112 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A2C113 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A2C114 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A2CP1 | 1990-0104 | 5 | 2 | PHOTOCELL LAMP | 28480 | 1990-0104 |
| A2CR1 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| A2CR2 | 1901-0518 | 8 | 10 | DIODE-SCHOTTKY | 28480 | 1901-0518 |
| A2CR3 | 1901-0518 | 6 | | DIODE-SCHOTTKY | 28480 | 1901-0518 |
| A2CR4 | 1901-0518 | 6 | | DIODE-SCHOTTKY | 28480 | 1901-0518 |
| A2CR5 | 1902-0041 | 4 | 2 | DIODE-ZNR 5.11V 5X DO-7 PDS.4W TCR=-.009X | 28480 | 1902-0041 |
| A2CR6 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| A2CR7 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| A2CR8 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| A2CR9 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| A2CR10 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| A2CR11 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| A2CR12 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| A2CR13 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| A2CR14 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| A2CR15 | 1902-3036 | 3 | 4 | DIODE-ZNR 3.16V 5X DO-7 PDS.4W TCR=-.064X | 28480 | 1902-3036 |
| A2CR16 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| A2CR17 | 1902-3036 | 3 | | DIODE-ZNR 3.16V 5X DO-7 PDS.4W TCR=-.064X | 28480 | 1902-3036 |
| A2CR18 | 1902-3036 | 3 | | DIODE-ZNR 3.16V 5X DO-7 PDS.4W TCR=-.064X | 28480 | 1902-3036 |
| A2CR19 | 1902-3036 | 3 | | DIODE-ZNR 3.16V 5X DO-7 PDS.4W TCR=-.064X | 28480 | 1902-3036 |
| A2CR20 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| A2CR25-28 | 0490-0240 | 9 | | RELAY-REED | 28480 | 0490-0240 |
| A2K1 | 0490-0240 | 9 | | RELAY-REED | 28480 | 0490-0240 |
| A2K2 | 0490-0240 | 9 | | RELAY-REED | 28480 | 0490-0240 |
| A2L1 | 9100-0880 | 7 | 4 | COIL-FXD 22uH 5% | 28480 | 9100-0880 |
| A2L2 | 9100-0880 | 7 | | COIL-FXD 22uH 5% | 28480 | 9100-0880 |
| A2L3 | 9100-0880 | 7 | | COIL-FXD 22uH 5% | 28480 | 9100-0880 |
| A2L4 | 9100-0880 | 7 | | COIL-FXD 22uH 5% | 28480 | 9100-0880 |
| A2L5 | 9100-0881 | 6 | 4 | COIL-FXD 5.6uH 5% | 28480 | 9100-0881 |
| A2L6 | 9100-0881 | 6 | | COIL-FXD 5.6uH 5% | 28480 | 9100-0881 |
| A2L7 | 9100-0881 | 6 | | COIL-FXD 5.6uH 5% | 28480 | 9100-0881 |
| A2L8 | 9100-0881 | 6 | | COIL-FXD 5.6uH 5% | 28480 | 9100-0881 |
| A2L9 | 9140-0114 | 4 | 6 | COIL-MLD 10UM 10% 0=55 .155DX,375LG-NOM | 28480 | 9140-0114 |
| A2L10 | 9140-0114 | 4 | | COIL-MLD 10UM 10% 0=55 .155DX,375LG-NOM | 28480 | 9140-0114 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|--|----------|------------------|
| A2L11- A2L20 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 28480 | 9170-0029 |
| A2B1 | 1854-0215 | 1 | 28 | TRANSISTOR NPN SI PD=350MH FT=300MHZ | 04713 | 2N3904 |
| A2B2 | 1854-0215 | 1 | | TRANSISTOR NPN SI PD=350MH FT=300MHZ | 04713 | 2N3904 |
| A2B3 | 1854-0071 | 7 | | TRANSISTOR NPN SI PD=300MH FT=200MHZ | 28480 | 1854-0071 |
| A2B4 | 1854-0215 | 1 | | TRANSISTOR NPN SI PD=350MH FT=300MHZ | 04713 | 2N3904 |
| A2B5 | 1853-0089 | 5 | 6 | TRANSISTOR PNP 2N4917 SI PD=200MH | 07263 | 2N4917 |
| A2B6 | 1853-0089 | 5 | | TRANSISTOR PNP 2N4917 SI PD=200MH | 07263 | 2N4917 |
| A2B7 | 1853-0089 | 5 | | TRANSISTOR PNP 2N4917 SI PD=200MH | 07263 | 2N4917 |
| A2B8 | 1854-0215 | 1 | | TRANSISTOR NPN SI PD=350MH FT=300MHZ | 04713 | 2N3904 |
| A2B9 | 1853-0089 | 1 | | TRANSISTOR PNP 2N4917 SI PD=200MH | 07263 | 2N4917 |
| A2B10 | 1855-0261 | 9 | | TRANSISTOR MOS-FET PD=100mW ID=15mA | 28480 | 1855-0261 |
| A2B11 | 1855-0091 | 3 | 21 | TRANSISTOR J-FET N-CHAN D-MODE SI | 28480 | 1855-0091 |
| A2B12 | 1855-0091 | 3 | | TRANSISTOR J-FET N-CHAN D-MODE SI | 28480 | 1855-0091 |
| A2B13 | 1854-0215 | 1 | | TRANSISTOR NPN SI PD=350MH FT=300MHZ | 04713 | 2N3904 |
| A2B14 | 1855-0091 | 3 | | TRANSISTOR J-FET N-CHAN D-MODE SI | 28480 | 1855-0091 |
| A2B15 | 1854-0215 | 1 | | TRANSISTOR NPN SI PD=350MH FT=300MHZ | 04713 | 2N3904 |
| A2B16 | 1854-0215 | 1 | | TRANSISTOR NPN SI PD=350MH FT=300MHZ | 04713 | 2N3904 |
| A2B17 | 1855-0091 | 3 | | TRANSISTOR J-FET N-CHAN D-MODE SI | 28480 | 1855-0091 |
| A2B18 | 1854-0215 | 1 | | TRANSISTOR NPN SI PD=350MH FT=300MHZ | 04713 | 2N3904 |
| A2B19 | 1854-0071 | 7 | | TRANSISTOR NPN SI PD=300MH FT=200MHZ | 28480 | 1854-0071 |
| A2B20 | 1854-0215 | 1 | | TRANSISTOR NPN SI PD=350MH FT=300MHZ | 04713 | 2N3904 |
| A2B21 | 1854-0477 | 7 | | TRANSISTOR NPN 2N222A SI TO=18 PD=500MH | 04713 | 2N222A |
| A2B22 | 1853-0089 | 9 | 2 | TRANSISTOR PNP 2N2907A SI TO=18 PD=400MH | 04713 | 2N2907A |
| A2B23 | 1853-0089 | 9 | | TRANSISTOR PNP 2N4917 SI PD=200MH | 07263 | 2N4917 |
| A2B24 | 1854-0215 | 1 | | TRANSISTOR NPN SI PD=350MH FT=300MHZ | 04713 | 2N3904 |
| A2B25 | 1854-0215 | 1 | | TRANSISTOR NPN SI PD=350MH FT=300MHZ | 04713 | 2N3904 |
| A2B26 | 1854-0071 | 7 | | TRANSISTOR NPN SI PD=300MH FT=200MHZ | 28480 | 1854-0071 |
| A2B27 | 1854-0071 | 7 | | TRANSISTOR NPN SI PD=300MH FT=200MHZ | 28480 | 1854-0071 |
| A2B28 | 1854-0477 | 7 | | TRANSISTOR NPN 2N222A SI TO=18 PD=500MH | 04713 | 2N222A |
| A2B29 | 1853-0089 | 9 | | TRANSISTOR PNP 2N2907A SI TO=18 PD=400MH | 04713 | 2N2907A |
| A2B30 | 1853-0089 | 5 | | TRANSISTOR PNP 2N4917 SI PD=200MH | 07263 | 2N4917 |
| A2B31 | 1854-0215 | 1 | | TRANSISTOR NPN SI PD=350MH FT=300MHZ | 04713 | 2N3904 |
| A2B32 | 1854-0215 | 1 | | TRANSISTOR NPN SI PD=350MH FT=300MHZ | 04713 | 2N3904 |
| A2B33 | 1854-0215 | 1 | | TRANSISTOR NPN SI PD=350MH FT=300MHZ | 04713 | 2N3904 |
| A2R1 | 0698-3160 | 8 | 4 | RESISTOR 31.6K 1% .125W F TC=0+100 | 24546 | C4=1/8-T0=3162-F |
| A2R2 | 0797-0199 | 3 | 4 | RESISTOR 21.5K 1% .125W F TC=0+100 | 24546 | C4=1/8-T0=2152-F |
| A2R3 | 0797-0199 | 3 | | RESISTOR 21.5K 1% .125W F TC=0+100 | 24546 | C4=1/8-T0=2152-F |
| A2R4 | 0698-3160 | 8 | | RESISTOR 31.6K 1% .125W F TC=0+100 | 24546 | C4=1/8-T0=3162-F |
| A2R5 | 0797-0278 | 9 | 10 | RESISTOR 1.78K 1% .125W F TC=0+100 | 24546 | C4=1/8-T0=1781-F |
| A2R6 | 0693-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A2R7 | 0797-0278 | 9 | | RESISTOR 1.78K 1% .125W F TC=0+100 | 24546 | C4=1/8-T0=1781-F |
| A2R8 | 0693-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A2R9 | 0693-3325 | 6 | | RESISTOR 3.3K 5% .25W FC TC=400/+700 | 01121 | CB3325 |
| A2R10 | 0693-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A2R11 | 0698-3447 | 3 | | RESISTOR 422 1% .125W F TC=0+100 | 24546 | |
| A2R12 | 0698-3447 | 3 | | RESISTOR 422 1% .125W F TC=0+100 | 24546 | |
| A2R13 | 2100-3161 | 6 | 2 | RESISTOR-TRMR 20K 10% C-SIDE-ADJ 17-TRN | 02111 | 43P203 |
| A2R14 | 2100-3161 | 6 | | RESISTOR-TRMR 20K 10% C-SIDE-ADJ 17-TRN | 02111 | 43P203 |
| A2R15 | 0693-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A2R16 | 0693-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A2R17 | 0693-3325 | 6 | | RESISTOR 3.3K 5% .25W FC TC=400/+700 | 01121 | CB3325 |
| A2R18 | 0693-1025 | 6 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A2R19 | 0693-3325 | 6 | | RESISTOR 3.3K 5% .25W FC TC=400/+700 | 01121 | CB3325 |
| A2R20 | 0797-0442 | 9 | | RESISTOR 10K 1% .125W F TC=0+100 | 24546 | C4=1/8-T0=1002-F |
| A2R21 | 0693-1045 | 3 | 13 | RESISTOR 100K 5% .25W FC TC=400/+800 | 01121 | CB1045 |
| A2R22 | 0693-2245 | 7 | 1 | RESISTOR 220K 5% .25W FC TC=800/+900 | 01121 | CB2245 |
| A2R23 | 0693-1045 | 3 | | RESISTOR 100K 5% .25W FC TC=400/+800 | 01121 | CB1045 |
| A2R24 | 0693-4735 | 4 | 9 | RESISTOR 47K 5% .25W FC TC=400/+800 | 01121 | CB4735 |
| A2R25 | 0693-1825 | 7 | 7 | RESISTOR 1.8K 5% .25W FC TC=400/+700 | 01121 | CB1825 |
| A2R26 | 0693-2725 | 8 | 8 | RESISTOR 2.7K 5% .25W FC TC=400/+700 | 01121 | CB2725 |
| A2R27 | 0693-2725 | 8 | | RESISTOR 2.7K 5% .25W FC TC=400/+700 | 01121 | CB2725 |
| A2R28 | 0797-0442 | 9 | | RESISTOR 10K 1% .125W F TC=0+100 | 24546 | C4=1/8-T0=1002-F |
| A2R29 | 0693-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A2R30 | 0693-1525 | 4 | 2 | RESISTOR 1.5K 5% .25W FC TC=400/+700 | 01121 | CB1525 |
| A2R31 | 0693-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A2R32 | 0693-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A2R33 | 0797-0442 | 9 | | RESISTOR 10K 1% .125W F TC=0+100 | 24546 | C4=1/8-T0=1002-F |
| A2R34 | 0693-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A2R35 | 0693-1525 | 4 | | RESISTOR 1.5K 5% .25W FC TC=400/+700 | 01121 | CB1525 |
| A2R36 | 0693-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A2R37 | 0693-4735 | 4 | | RESISTOR 47K 5% .25W FC TC=400/+800 | 01121 | CB4735 |
| A2R38 | 0693-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A2R39 | 0693-2235 | 5 | 17 | RESISTOR 22K 5% .25W FC TC=400/+800 | 01121 | CB2235 |
| A2R40 | 0693-2235 | 5 | | RESISTOR 22K 5% .25W FC TC=400/+800 | 01121 | CB2235 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|--------------------------------------|----------|-------------------|
| A2R41 | 0683-4735 | 4 | | RESISTOR 47K 5% .25W FC TC=400/+800 | 01121 | CB4735 |
| A2R42 | 0683-1825 | 7 | | RESISTOR 1.8K 5% .25W FC TC=400/+700 | 01121 | CB1825 |
| A2R43 | 0683-2725 | 8 | | RESISTOR 2.7K 5% .25W FC TC=400/+700 | 01121 | CB2725 |
| A2R44 | 0698-3700 | 2 | 4 | RESISTOR 1/8 1% .125W F TC=0+-100 | 24546 | C4=1/8-T0=715R-F |
| A2R45 | 0698-3700 | 2 | | RESISTOR 715 1% .125W F TC=0+-100 | 24546 | C4=1/8-T0=715R-F |
| A2R46 | 0683-2725 | 8 | | RESISTOR 2.7K 5% .25W FC TC=400/+700 | 01121 | CB2725 |
| A2R47 | 0698-3700 | 2 | | RESISTOR 715 1% .125W F TC=0+-100 | 24546 | C4=1/8-T0=715R-F |
| A2R48 | 0698-3700 | 2 | | RESISTOR 715 1% .125W F TC=0+-100 | 24546 | C4=1/8-T0=715R-F |
| A2R49 | 0683-4735 | 4 | | RESISTOR 47K 5% .25W FC TC=400/+800 | 01121 | CB4735 |
| A2R50 | 0683-1825 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1825 |
| A2R51 | 0683-1055 | 5 | 6 | RESISTOR 1M 5% .25W FC TC=800/+900 | 01121 | CB1055 |
| A2R52 | 0683-1055 | 5 | | RESISTOR 1M 5% .25W FC TC=800/+900 | 01121 | CB1055 |
| A2R53 | 0683-1035 | 1 | | RESISTOR 10K 5% .25W FC TC=400/+700 | 01121 | CB1035 |
| A2R54 | 0683-2725 | 6 | | RESISTOR 2.7K 5% .25W FC TC=400/+700 | 01121 | CB2725 |
| A2R55 | 0698-3447 | 3 | | RESISTOR 422 1% .125W F TC=0+-100 | 24546 | |
| A2R56 | 0683-1055 | 5 | | RESISTOR 1M 5% .25W FC TC=800/+900 | 01121 | CB1055 |
| A2R57 | 0683-2725 | 8 | | RESISTOR 2.7K 5% .25W FC TC=400/+700 | 01121 | CB2725 |
| A2R58 | 0683-1035 | 1 | | RESISTOR 10K 5% .25W FC TC=400/+700 | 01121 | CB1035 |
| A2R59 | 0683-2725 | 8 | | RESISTOR 2.7K 5% .25W FC TC=400/+700 | 01121 | CB2725 |
| A2R60 | 0698-3447 | 3 | | RESISTOR 422 1% .125W F TC=0+-100 | 24546 | |
| A2R61 | 0683-1055 | 5 | | RESISTOR 1M 5% .25W FC TC=800/+900 | 01121 | CB1055 |
| A2R62 | 0683-2725 | 8 | | RESISTOR 2.7K 5% .25W FC TC=400/+700 | 01121 | CB2725 |
| A2R63 | 0683-8215 | 3 | 1 | RESISTOR 820 5% .25W FC TC=400/+600 | 01121 | CB8215 |
| A2R64 | 0698-6624 | 5 | 4 | RESISTOR 2K .1% .125W F TC=0+-25 | 28480 | 0698-6624 |
| A2R65 | 0683-4715 | 0 | 8 | RESISTOR 470 5% .25W FC TC=400/+600 | 01121 | CB4715 |
| A2R66 | 0698-6624 | 5 | | RESISTOR 2K .1% .125W F TC=0+-25 | 28480 | 0698-6624 |
| A2R67 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A2R68 | 0683-3325 | 6 | | RESISTOR 3.3K 5% .25W FC TC=400/+700 | 01121 | CB3325 |
| A2R69 | 0683-3325 | 6 | | RESISTOR 3.3K 5% .25W FC TC=400/+700 | 01121 | CB3325 |
| A2R70 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A2R71 | 0698-6624 | 5 | | RESISTOR 2K .1% .125W F TC=0+-25 | 28480 | 0698-6624 |
| A2R72 | 0683-4715 | 0 | | RESISTOR 470 5% .25W FC TC=400/+600 | 01121 | CB4715 |
| A2R73 | 0698-6624 | 5 | | RESISTOR 2K .1% .125W F TC=0+-25 | 28480 | 0698-6624 |
| A2R74 | 0683-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A2R75 | 0683-1825 | 7 | | RESISTOR 1.8K 5% .25W FC TC=400/+700 | 01121 | CB1825 |
| A2R76 | 0698-3457 | 6 | 3 | RESISTOR 316K 1% .125W F TC=0+-100 | 28480 | 0698-3457 |
| A2R77 | 0757-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0+-100 | 24546 | C4=1/8-T0=1001-F |
| A2R78 | 0757-0280 | 1 | 1 | RESISTOR 9.09K 1% .125W F TC=0+-100 | 19701 | MF4C1/8-T0=9091-F |
| A2R79 | 0698-3260 | 9 | 5 | RESISTOR 464K 1% .125W F TC=0+-100 | 28480 | 0698-3260 |
| A2R80 | 0757-0668 | 6 | | RESISTOR 100K 1% .125W F TC=0+-100 | 24546 | C4=1/8-T0=1003-F |
| A2R81 | 0757-0465 | 6 | | RESISTOR 100K 1% .125W F TC=0+-100 | 24546 | C4=1/8-T0=1003-F |
| A2R82 | 0683-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A2R83 | 0683-1035 | 1 | | RESISTOR 10K 5% .25W FC TC=400/+700 | 01121 | CB1035 |
| A2R84 | 0698-7842 | 1 | 4 | RESISTOR 26.1K .1% .125W F TC=0+-25 | 19701 | MF4C1/8-T0=2612-B |
| A2R85 | 0698-6943 | 1 | 4 | RESISTOR 20K .1% .125W F TC=0+-50 | 28480 | 0698-6943 |
| A2R86 | 0698-6943 | 1 | | RESISTOR 20K .1% .125W F TC=0+-50 | 28480 | 0698-6943 |
| A2R87 | 0698-7842 | 1 | | RESISTOR 26.1K .1% .125W F TC=0+-25 | 19701 | MF4C1/8-T0=2612-B |
| A2R88 | 0698-7842 | 1 | | RESISTOR 26.1K .1% .125W F TC=0+-25 | 19701 | MF4C1/8-T0=2612-B |
| A2R89 | 0698-6943 | 1 | | RESISTOR 20K .1% .125W F TC=0+-50 | 28480 | 0698-6943 |
| A2R90 | 0698-6943 | 1 | | RESISTOR 20K .1% .125W F TC=0+-50 | 28480 | 0698-6943 |
| A2R91 | 0698-7842 | 1 | | RESISTOR 26.1K .1% .125W F TC=0+-25 | 19701 | MF4C1/8-T0=2612-B |
| A2R92 | 2100-2574 | 9 | | RESISTOR-TMR 500 10% C TOP-ADJ 1-TMR | 73138 | |
| A2R93 | 0683-2235 | 5 | | RESISTOR 22K 5% .25W FC TC=400/+600 | 01121 | CB2235 |
| A2R94 | 0683-1015 | 9 | | RESISTOR 100 5% .25W FC TC=400/+500 | 01121 | CB1015 |
| A2R95 | 0698-3260 | 7 | | RESISTOR 464K 1% .125W F TC=0+-100 | 28480 | 0698-3260 |
| A2R97 | 0683-3315 | 4 | 1 | RESISTOR 330 5% .25W FC TC=400/+600 | 01121 | CB3315 |
| A2R98 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A2R100 | 0683-1225 | 1 | 2 | RESISTOR 1.2K 5% .25W FC TC=400/+700 | 01121 | CB1225 |
| A2R101 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A2R102 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A2R103 | 0757-0442 | 9 | | RESISTOR 10K 1% .125W F TC=0+-100 | 24546 | C4=1/8-T0=1002-F |
| A2R104 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A2R105 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A2R106 | 0683-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A2R107 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A2R108 | 0683-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A2R109 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A2R110 | 0683-1825 | 7 | | RESISTOR 1.8K 5% .25W FC TC=400/+700 | 01121 | CB1825 |
| A2R111 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A2R112 | 0683-1225 | 1 | | RESISTOR 1.2K 5% .25W FC TC=400/+700 | 01121 | CB1225 |
| A2R113 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A2R114 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A2R115 | 0757-0442 | 9 | | RESISTOR 10K 1% .125W F TC=0+-100 | 24546 | C4=1/8-T0=1002-F |
| A2R116 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A2R117 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|--------------------------------------|----------|------------------|
| A2R116 | 0683-4705 | 6 | | RESISTOR 47 5K .25W FC TC=400/+500 | 01121 | CB4705 |
| A2R119 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A2R120 | 0683-4705 | 8 | | RESISTOR 47 5K .25W FC TC=400/+500 | 01121 | CB4705 |
| A2R121 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A2R122 | 0683-1825 | 7 | | RESISTOR 1.8K 5% .25W FC TC=400/+700 | 01121 | CB1825 |
| A2R123 | 0698-3433 | 2 | 2 | RESISTOR 196K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1963=F |
| A2R124 | 0757-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001=F |
| A2R125 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A2R126 | 0698-3433 | 2 | | RESISTOR 196K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1963=F |
| A2R127 | 0757-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001=F |
| A2R128 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A2R129 | 0683-2205 | 9 | | RESISTOR 22 5% .25W FC TC=400/+500 | 01121 | CB2205 |
| A2R130 | 0683-2205 | 9 | | RESISTOR 22 5% .25W FC TC=400/+500 | 01121 | CB2205 |
| A2R131 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A2R132 | 0683-6805 | 3 | 2 | RESISTOR 68 5% .25W FC TC=400/+500 | 01121 | CB6805 |
| A2R133 | 0683-1015 | 7 | | RESISTOR 100 5% .25W FC TC=400/+500 | 01121 | CB1015 |
| A2R134 | 0698-3444 | 1 | | RESISTOR 316 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=316R=F |
| A2R135 | 0757-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001=F |
| A2R136 | 0698-3160 | 8 | | RESISTOR 31.6K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=3162=F |
| A2R137 | 0683-3325 | 6 | | RESISTOR 3.3K 5% .25W FC TC=400/+700 | 01121 | CB3325 |
| A2R138 | 0683-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A2R139 | 0757-0277 | 8 | 5 | RESISTOR 49.9 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=4992=F |
| A2R140 | 0683-1825 | 7 | | RESISTOR 1.8K 5% .25W FC TC=400/+700 | 01121 | CB1825 |
| A2R141 | 0757-0277 | 8 | | RESISTOR 49.9 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=4992=F |
| A2R142 | 0757-0123 | 3 | 1 | RESISTOR 34.8K 1% .125W F TC=0/+100 | 26480 | 0757-0123 |
| A2R143 | 0683-1035 | 1 | | RESISTOR 10K 5% .25W FC TC=400/+700 | 01121 | CB1035 |
| A2R144 | 0683-1055 | 5 | | RESISTOR 1M 5% .25W FC TC=800/+900 | 01121 | CB1055 |
| A2R145 | 0683-1055 | 5 | | RESISTOR 1M 5% .25W FC TC=800/+900 | 01121 | CB1055 |
| A2R146 | 0683-4705 | 6 | | RESISTOR 47 5K .25W FC TC=400/+500 | 01121 | CB4705 |
| A2R147 | 0683-2205 | 9 | | RESISTOR 22 5% .25W FC TC=400/+500 | 01121 | CB2205 |
| A2R148 | 0683-2205 | 9 | | RESISTOR 22 5% .25W FC TC=400/+500 | 01121 | CB2205 |
| A2R149 | 0683-6805 | 3 | | RESISTOR 68 5% .25W FC TC=400/+500 | 01121 | CB6805 |
| A2R150 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A2R151 | 0683-1015 | 7 | | RESISTOR 100 5% .25W FC TC=400/+500 | 01121 | CB1015 |
| A2R152 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A2R153 | 0757-0277 | 8 | | RESISTOR 49.9 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=4992=F |
| A2R154 | 0683-1825 | 7 | | RESISTOR 1.8K 5% .25W FC TC=400/+700 | 01121 | CB1825 |
| A2R155 | 0757-0277 | 8 | | RESISTOR 49.9 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=4992=F |
| A2R156 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A2R156 | 0698-3444 | 1 | | RESISTOR 316 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=316R=F |
| A2R157 | 0757-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001=F |
| A2R159 | 0683-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A2R160 | 0683-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A2R161 | 0683-3335 | 8 | | RESISTOR 33K 5% .25W FC TC=400/+800 | 01121 | CB3335 |
| A2R162 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A2R163 | 0683-2235 | 5 | | RESISTOR 22K 5% .25W FC TC=400/+800 | 01121 | CB2235 |
| A2R164 | 0683-2235 | 5 | | RESISTOR 22K 5% .25W FC TC=400/+800 | 01121 | CB2235 |
| A2R165 | 0683-1835 | 9 | 3 | RESISTOR 18K 5% .25W FC TC=400/+800 | 01121 | CB1835 |
| A2R166 | 0683-1835 | 9 | | RESISTOR 18K 5% .25W FC TC=400/+800 | 01121 | CB1835 |
| A2R167 | 0683-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A2R168 | 0683-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A2R169 | 0683-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A2R170 | 0683-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A2R171 | 0683-2235 | 5 | | RESISTOR 22K 5% .25W FC TC=400/+800 | 01121 | CB2235 |
| A2R172 | 0683-2235 | 5 | | RESISTOR 22K 5% .25W FC TC=400/+800 | 01121 | CB2235 |
| A2R173 | 0683-1835 | 9 | | RESISTOR 18K 5% .25W FC TC=400/+800 | 01121 | CB1835 |
| A2R174 | 0683-1015 | 7 | | RESISTOR 100 5% .25W 250WVDC | | |
| A2T1 | 9100-0855 | 6 | 5 | TRANSFORMER-PULSE 1:1:1 | 26480 | 9100-0855 |
| A2T2 | 9100-0855 | 6 | | TRANSFORMER-PULSE 1:1:1 | 26480 | 9100-0855 |
| A2T3 | 9100-0855 | 6 | | TRANSFORMER-PULSE 1:1:1 | 26480 | 9100-0855 |
| A2T4 | 9100-0855 | 6 | | TRANSFORMER-PULSE 1:1:1 | 26480 | 9100-0855 |
| A2T5 | 9100-0855 | 6 | | TRANSFORMER-PULSE 1:1:1 | 26480 | 9100-0855 |
| A2T6 | 9100-0879 | 4 | | TRANSFORMER-SIGNAL 10mH 20% | 26480 | 9100-0879 |
| A2T7 | 9100-0823 | 8 | | TRANSFORMER(TDK113B1) 1:1:1 | 26480 | 9100-0823 |
| A2U1 | 1826-0139 | 9 | 4 | IC OP AMP GP DUAL 8-DIP-P | 01928 | CA14966 |
| A2U2 | 1820-0427 | 6 | 5 | IC MODULATOR T0=100 | 04713 | MC14966 |
| A2U3 | 5080-3056 | 6 | | IC MODULATOR T0=100 | 04713 | |
| A2U4 | 5080-3056 | 6 | | IC MODULATOR T0=100 | 04713 | |
| A2U5 | 1826-0139 | 9 | | IC OP AMP GP DUAL 8-DIP-P | 01928 | CA14966 |
| A2U6 | 1820-0427 | 6 | | IC MODULATOR T0=100 | 04713 | MC14966 |
| A2U7 | 1820-0427 | 6 | | IC MODULATOR T0=100 | 04713 | MC14966 |
| A2U8 | 1826-0111 | 6 | 2 | IC OP AMP LOW-BIAS-H=IMPD T0=99 | 27014 | |
| A2U9 | 1826-0111 | 6 | | IC OP AMP LOW-BIAS-H=IMPD T0=99 | 27014 | |
| A2U10 | 1826-0138 | 6 | 9 | IC COMPARATOR GP QUAD 14-DIP-P | 04713 | MLM3399 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|------------------------|----------------|-----|-----|---|----------|--------------------|
| A2 MISCELLANEOUS PARTS | | | | | | |
| | 04275-00606 | 7 | 1 | PLATE SHIELD, A2 | 28480 | 04275-00606 |
| | 04275-00607 | 6 | 1 | PLATE SHIELD, A2 | 28480 | 04275-00607 |
| | 04275-00622 | 7 | 2 | PLATE SHIELD | 28480 | 04275-00622 |
| | 04275-00623 | 6 | 1 | PLATE SHIELD | 28480 | 04275-00623 |
| A3 | 04275-66503 | 1 | 1 | POWER AMPLIFIER BOARD ASSEMBLY | 28480 | 04275-66503 |
| | 04275-26503 | 7 | | PC BOARD, BLANK | 28480 | 04275-26503 |
| ASC1 | 0160-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1085 |
| ASC2 | 0160-3443 | 1 | | CAPACITOR-FXD .1uF +80-20% 50VDC CER | 28480 | 0160-3443 |
| ASC3 | 0160-2055 | 9 | | CAPACITOR-FXD .01uF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC4 | 0160-2055 | 9 | | CAPACITOR-FXD .01uF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC5 | 0160-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1085 |
| ASC6 | 0160-2258 | 4 | 4 | CAPACITOR-FXD 11PF +-5% 500VDC CER 0+-30 | 28480 | 0160-2258 |
| ASC7 | 0160-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1085 |
| ASC8 | 0160-2249 | 3 | | CAPACITOR-FXD 4.7PF +-25PF 500VDC CER | 28480 | 0160-2249 |
| ASC9 | 0160-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1085 |
| ASC10 | 0160-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1085 |
| ASC11 | 0160-2055 | 9 | | CAPACITOR-FXD .01uF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC12 | 0160-2207 | 3 | 1 | CAPACITOR-FXD 300PF +-5% 300VDC MICA | 28480 | 0160-2207 |
| ASC13 | 0121-0059 | 7 | | CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG | 52763 | 304324 2/8PF NPO |
| ASC14 | 0160-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1085 |
| ASC15 | 0160-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0160-1083 |
| ASC16 | 0160-3443 | 1 | | CAPACITOR-FXD .1uF +80-20% 50VDC CER | 28480 | 0160-3443 |
| ASC17 | 0160-3443 | 1 | | CAPACITOR-FXD .1uF +80-20% 50VDC CER | 28480 | 0160-3443 |
| ASC18 | 0160-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1085 |
| ASC19 | 0160-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1085 |
| ASC20 | 0160-0134 | 1 | 3 | CAPACITOR-FXD 220PF +-5% 300VDC MICA | 28480 | 0160-0134 |
| ASC21 | 0160-2258 | 4 | | CAPACITOR-FXD 11PF +-5% 500VDC CER 0+-30 | 28480 | 0160-2258 |
| ASC22 | 0160-0134 | 1 | | CAPACITOR-FXD 220PF +-5% 300VDC MICA | 28480 | 0160-0134 |
| ASC23 | 0160-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0160-1083 |
| ASC24 | 0160-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0160-1083 |
| ASC25 | 0160-1086 | 6 | | CAPACITOR-FXD 33uF +50-30% 16VDC | 28480 | 0160-1086 |
| ASC26 | 0160-0052 | 1 | 4 | CAPACITOR-FXD .05uF +-20% 400VDC CER | 28480 | 0160-0052 |
| ASC27 | 0160-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1085 |
| ASC28 | 0160-1077 | 5 | | CAPACITOR-FXD 220uF +50-10% 16VDC | 28480 | 0160-1077 |
| ASC29 | 0160-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1085 |
| ASC30 | 0160-1077 | 5 | | CAPACITOR-FXD 220uF +50-10% 16VDC | 28480 | 0160-1077 |
| ASC31 | 0160-2055 | 9 | | CAPACITOR-FXD .01uF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC32 | 0160-2055 | 9 | | CAPACITOR-FXD .01uF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC33 | 0160-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1085 |
| ASC34 | 0160-3443 | 1 | | CAPACITOR-FXD .1uF +80-20% 50VDC CER | 28480 | 0160-3443 |
| ASC35 | 0160-2055 | 9 | | CAPACITOR-FXD .01uF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC36 | 0160-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1085 |
| ASC37 | 0160-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0160-1083 |
| ASC38 | 0160-0197 | 4 | | CAPACITOR-FXD 180PF +-5% 300VDC MICA | 72136 | DM15F181J0300HVICR |
| ASC40 | 0160-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1085 |
| ASC41 | 0160-3443 | 1 | | CAPACITOR-FXD .1uF +80-20% 50VDC CER | 28480 | 0160-3443 |
| ASC42 | 0160-2055 | 9 | | CAPACITOR-FXD .01uF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC43 | 0160-2055 | 9 | | CAPACITOR-FXD .01uF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC44 | 0160-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1085 |
| ASC45 | 0160-2258 | 4 | | CAPACITOR-FXD 11PF +-5% 500VDC CER 0+-30 | 28480 | 0160-2258 |
| ASC46 | 0160-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1085 |
| ASC47 | 0160-2249 | 3 | | CAPACITOR-FXD 4.7PF +-25PF 500VDC CER | 28480 | 0160-2249 |
| ASC48 | 0160-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1085 |
| ASC49 | 0160-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1085 |
| ASC50 | 0160-2055 | 9 | | CAPACITOR-FXD .01uF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC51 | 0160-0199 | 6 | 1 | CAPACITOR-FXD 240PF +-5% 300VDC MICA | 72136 | DM15F241J0300HVICR |
| ASC52 | 0160-2258 | 6 | | CAPACITOR-FXD 5.1PF +-25PF 500VDC CER | 28480 | 0160-2258 |
| ASC53 | 0160-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1085 |
| ASC54 | 0160-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0160-1083 |
| ASC55 | 0160-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1085 |
| ASC56 | 0160-3443 | 1 | | CAPACITOR-FXD .1uF +80-20% 50VDC CER | 28480 | 0160-3443 |
| ASC57 | 0160-3443 | 1 | | CAPACITOR-FXD .1uF +80-20% 50VDC CER | 28480 | 0160-3443 |
| ASC58 | 0160-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0160-1085 |
| ASC59 | 0160-0195 | 9 | | CAPACITOR-FXD 130PF +-5% 300VDC MICA 0+70 | 28480 | 0160-0195 |
| ASC60 | 0160-2258 | 4 | | CAPACITOR-FXD 11PF +-5% 500VDC CER 0+-30 | 28480 | 0160-2258 |
| ASC61 | 0160-0199 | 1 | | CAPACITOR-FXD 240PF +-5% 300VDC MICA | 28480 | 0160-0199 |
| ASC62 | 0160-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0160-1083 |
| ASC63 | 0160-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0160-1083 |
| ASC64 | 0160-1086 | 6 | | CAPACITOR-FXD 33uF +50-30% 16VDC | 28480 | 0160-1086 |
| ASC65 | 0160-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0160-1083 |

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|---|----------|--------------------|
| A3C66 | 0140-0197 | 4 | | CAPACITOR-FXD 180PF +-5% 300VDC MICA | 72136 | DM15F181J0300HV1CR |
| A3C67 | 0180-1077 | 5 | | CAPACITOR-FXD 220uF +50-10% 16VDC | 28480 | 0180-1077 |
| A3C68 | 0180-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0180-1085 |
| A3C69 | 0180-1077 | 5 | | CAPACITOR-FXD 220uF +50-10% 16VDC | 28480 | 0180-1077 |
| A3C70 | 0160-3443 | 1 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 |
| A3C71 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A3C72 | 0180-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0180-1085 |
| A3C73 | 0160-3443 | 1 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 |
| A3C74 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A3C75 | 0180-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0180-1085 |
| A3C76 | 0140-0191 | 2 | 2 | CAPACITOR-FXD 56PF +-5% 300VDC MICA | 28480 | |
| A3C77 | 0160-3443 | 1 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 |
| A3C78 | 0180-1077 | 5 | | CAPACITOR-FXD 220uF +50-10% 16VDC | 28480 | 0180-1077 |
| A3C79 | 0160-3443 | 1 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 |
| A3C80 | 0160-3443 | 1 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 |
| A3C81 | 0180-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0180-1085 |
| A3C82 | 0180-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0180-1085 |
| A3C83 | 0180-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 28480 | 0180-1085 |
| A3C84 | 0180-1077 | 5 | | CAPACITOR-FXD 220uF +50-10% 16VDC | 28480 | 0180-1077 |
| A3C85 | 0180-1077 | 5 | | CAPACITOR-FXD 220uF +50-10% 16VDC | 28480 | 0180-1077 |
| A3C86 | 0180-1078 | 6 | 1 | CAPACITOR-FXD 330uF +50-10% 6.3VDC | 28480 | 0180-1078 |
| A3C87 | 0160-3443 | 1 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 |
| A3C88 | 0160-3443 | 1 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-3443 |
| A3CR1 | 1902-3160 | 4 | 4 | DIODE-ZNR 10V 2% DO-7 PDB,4W TC=+.06% | 28480 | 1902-3160 |
| A3CR2 | 1902-0049 | 2 | | DIODE-ZNR 6.19V 5% DO-7 PDB,4W TC=+.022% | 28480 | 1902-0049 |
| A3CR3 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 28480 | 1901-0040 |
| A3CR4 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 28480 | 1901-0040 |
| A3CR5 | 1901-0033 | 2 | | DIODE-GEN PRP 180V 200MA DO-7 | 28480 | 1901-0033 |
| A3CR6 | 1901-0033 | 2 | | DIODE-GEN PRP 180V 200MA DO-7 | 28480 | 1901-0033 |
| A3CR7 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 28480 | 1901-0040 |
| A3CR8 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 28480 | 1901-0040 |
| A3CR9 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 28480 | 1901-0040 |
| A3CR10 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 28480 | 1901-0040 |
| A3CR11 | 1902-0049 | 2 | | DIODE-ZNR 6.19V 5% DO-7 PDB,4W TC=+.022% | 28480 | 1902-0049 |
| A3CR12 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 28480 | 1901-0040 |
| A3CR13 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 28480 | 1901-0040 |
| A3CR14 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 28480 | 1901-0040 |
| A3CR15 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 28480 | 1901-0040 |
| A3CR16 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 28480 | 1901-0040 |
| A3CR17 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 28480 | 1901-0040 |
| A3CR18 | 1902-3160 | 4 | | DIODE-ZNR 10V 2% DO-7 PDB,4W TC=+.06% | 28480 | 1902-3160 |
| A3CR19 | 1902-3160 | 4 | | DIODE-ZNR 10V 2% DO-7 PDB,4W TC=+.06% | 28480 | 1902-3160 |
| A3CR20 | 1902-3160 | 4 | | DIODE-ZNR 10V 2% DO-7 PDB,4W TC=+.06% | 28480 | 1902-3160 |
| A3CR21 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A3CR22 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A3CR23 | 1902-0064 | 1 | 1 | DIODE-ZNR 7.5V 5% DO-7 PDB,4W TC=+.05% | 28480 | 1902-0064 |
| A3J1 | 1250-0257 | 1 | | CONNECTOR-RF 8MB M PC 50-OHM | 28480 | 1250-0257 |
| A3J2 | 1250-0257 | 1 | | CONNECTOR-RF 8MB M PC 50-OHM | 28480 | 1250-0257 |
| A3J3 | 1250-0257 | 1 | | CONNECTOR-RF 8MB M PC 50-OHM | 28480 | 1250-0257 |
| A3J4 | 1250-0257 | 1 | | CONNECTOR-RF 8MB M PC 50-OHM | 28480 | 1250-0257 |
| A3K1 | 0490-0234 | 1 | | RELAY, REED | 28480 | 0490-0234 |
| A3K2 | 0490-0234 | 1 | | RELAY, REED | 28480 | 0490-0234 |
| A3L1 | 9140-0179 | 1 | | COIL-MLD 22UH 10% QW75 .155DX.375LG-NOM | 28480 | 9140-0179 |
| A3L2 | 9140-0179 | 1 | | COIL-MLD 22UH 10% QW75 .155DX.375LG-NOM | 28480 | 9140-0179 |
| A3L3 | 9140-0210 | 1 | | COIL-MLD 100UH 5% QW50 .155DX.375LG-NOM | 28480 | 9140-0210 |
| A3M1 | 1854-0345 | 6 | | TRANSISTOR NPN 2N5179 SI TO-72 PDB=200MW | 04713 | 2N5179 |
| A3M2 | 1854-0261 | 9 | | TRANSISTOR MOS-FET PD=100mW ID=15mA | 28480 | 1854-0261 |
| A3M3 | 1854-0019 | 3 | | TRANSISTOR NPN SI TO-18 PDB=360MW | 28480 | 1854-0019 |
| A3M4 | 1854-0092 | 2 | | TRANSISTOR NPN SI PDB=200MW FT=600MHZ | 28480 | 1854-0092 |
| A3M5 | 1854-0071 | 7 | | TRANSISTOR NPN SI PDB=300MW FT=200MHZ | 28480 | 1854-0071 |
| A3M6 | 1854-0092 | 2 | | TRANSISTOR NPN SI PDB=200MW FT=600MHZ | 28480 | 1854-0092 |
| A3M7 | 1854-0092 | 2 | | TRANSISTOR NPN SI PDB=200MW FT=600MHZ | 28480 | 1854-0092 |
| A3M8 | 1854-0092 | 2 | | TRANSISTOR NPN SI PDB=200MW FT=600MHZ | 28480 | 1854-0092 |
| A3M9 | 1854-0071 | 7 | | TRANSISTOR NPN SI PDB=300MW FT=200MHZ | 28480 | 1854-0071 |
| A3M10 | 1854-0345 | 6 | | TRANSISTOR NPN 2N5179 SI TO-72 PDB=200MW | 04713 | 2N5179 |
| A3M11 | 1854-0345 | 6 | | TRANSISTOR NPN 2N5179 SI TO-72 PDB=200MW | 04713 | 2N5179 |
| A3M12 | 1854-0203 | 5 | 4 | TRANSISTOR PNP SI PDB=360MW FT=700MHZ | 28480 | 1854-0203 |
| A3M13 | 1854-0019 | 3 | | TRANSISTOR NPN SI TO-18 PDB=360MW | 28480 | 1854-0019 |
| A3M14 | 1854-0247 | 2 | 2 | TRANSISTOR NPN SI TO-39 PDB=1W FT=800MHZ | 28480 | 1854-0247 |
| A3M15 | 1854-0203 | 5 | | TRANSISTOR PNP SI PDB=360MW FT=700MHZ | 28480 | 1854-0203 |
| A3M16 | 1854-0012 | 4 | 5 | TRANSISTOR PNP 2N2904A SI TO-39 PDB=600MW | 01295 | 2N2904A |
| A3M17 | 1854-0345 | 6 | | TRANSISTOR NPN 2N5179 SI TO-72 PDB=200MW | 04713 | 2N5179 |
| A3M18 | 1854-0261 | 9 | | TRANSISTOR MOS-FET PD=100mW ID=15mA | 28480 | 1854-0261 |
| A3M19 | 1854-0019 | 3 | | TRANSISTOR NPN SI TO-18 PDB=360MW | 28480 | 1854-0019 |
| A3M20 | 1854-0092 | 2 | | TRANSISTOR NPN SI PDB=200MW FT=600MHZ | 28480 | 1854-0092 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|--|----------|------------------|
| A3Q21 | 1854-0071 | 7 | | TRANSISTOR NPN 8I PD=300MH FT=200MHZ | 28480 | 1854-0071 |
| A3Q22 | 1854-0092 | 2 | | TRANSISTOR NPN 8I PD=300MH FT=600MHZ | 28480 | 1854-0092 |
| A3Q23 | 1854-0092 | 2 | | TRANSISTOR NPN 8I PD=200MH FT=600MHZ | 28480 | 1854-0092 |
| A3Q24 | 1854-0092 | 2 | | TRANSISTOR NPN 8I PD=200MH FT=600MHZ | 28480 | 1854-0092 |
| A3Q25 | 1854-0071 | 7 | | TRANSISTOR NPN 8I PD=300MH FT=200MHZ | 28480 | 1854-0071 |
| A3Q26 | 1854-0345 | 6 | | TRANSISTOR NPN 2N5179 8I TO=72 PD=200MH | 04713 | 2N5179 |
| A3Q27 | 1854-0345 | 6 | | TRANSISTOR NPN 2N5179 8I TO=72 PD=200MH | 04713 | 2N5179 |
| A3Q28 | 1853-0203 | 5 | | TRANSISTOR PNP 8I PD=360MH FT=700MHZ | 28480 | 1853-0203 |
| A3Q29 | 1854-0019 | 3 | | TRANSISTOR NPN 8I TO=16 PD=360MH | 28480 | 1854-0019 |
| A3Q30 | 1854-0247 | 9 | | TRANSISTOR NPN 8I TO=39 PD=1W FT=800MHZ | 28480 | 1854-0247 |
| A3Q31 | 1853-0203 | 5 | | TRANSISTOR PNP 8I PD=360MH FT=700MHZ | 28480 | 1853-0203 |
| A3Q32 | 1853-0012 | 4 | | TRANSISTOR PNP 2N2904A 8I TO=39 PD=600MH | 01295 | 2N2904A |
| A3Q33 | 1853-0084 | 0 | 2 | TRANSISTOR PNP 2N4918 8I PD=30W FT=3MHZ | 04713 | 2N4918 |
| A3Q34 | 1854-0369 | 0 | 2 | TRANSISTOR NPN 2N4922 8I PD=30W FT=3MHZ | 04713 | 2N4922 |
| A3Q35 | 1854-0071 | 7 | | TRANSISTOR NPN 8I PD=300MH FT=200MHZ | 28480 | 1854-0071 |
| A3R1 | 2100-0552 | 3 | 1 | RESISTOR-TMR 50 10% C SIDE=ADJ 1-TRN | 28480 | 2100-0552 |
| A3R2 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A3R3 | 0757-0279 | 0 | | RESISTOR 3.16K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=3161-F |
| A3R4 | 0683-1045 | 3 | | RESISTOR 100K 5% .25W FC TC=400/+800 | 01121 | CB1045 |
| A3R5 | 0683-1045 | 3 | | RESISTOR 100K 5% .25W FC TC=400/+800 | 01121 | CB1045 |
| A3R6 | 0698-2234 | 8 | 1 | RESISTOR 330 5% .125W | 28480 | 0698-2234 |
| A3R7 | 0683-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A3R8 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A3R9 | 2100-3207 | 1 | 1 | RESISTOR-TMR 5K 10% C SIDE=ADJ 1-TRN | 28480 | 2100-3207 |
| A3R10 | 0698-0084 | 9 | | RESISTOR 2.15K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=2151-F |
| A3R11 | 0757-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001-F |
| A3R12 | 0757-0416 | 7 | | RESISTOR 511 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=511R-F |
| A3R13 | 0698-0433 | 0 | 2 | RESISTOR 2.26K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=2261-F |
| A3R14 | 0698-0084 | 9 | | RESISTOR 2.15K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=2151-F |
| A3R15 | 0698-0084 | 9 | | RESISTOR 2.15K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=2151-F |
| A3R16 | 0757-0401 | 0 | | RESISTOR 100 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=101-F |
| A3R17 | 0757-0416 | 7 | | RESISTOR 511 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=511R-F |
| A3R18 | 0757-0416 | 7 | | RESISTOR 511 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=511R-F |
| A3R19 | 0757-0420 | 3 | 10 | RESISTOR 750 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=751-F |
| A3R20 | 0757-0420 | 3 | | RESISTOR 750 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=751-F |
| A3R21 | 0757-0402 | 1 | 5 | RESISTOR 110 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=111-F |
| A3R22 | 0757-0410 | 1 | | RESISTOR 301 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=301R-F |
| A3R23 | 0683-4705 | 6 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A3R24 | 0698-3404 | 1 | | RESISTOR 316 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=316R-F |
| A3R25 | 0683-4705 | 6 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A3R26 | 0683-4705 | 6 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A3R27 | 0698-0082 | 7 | | RESISTOR 464 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=4640-F |
| A3R28 | 0757-0405 | 4 | 3 | RESISTOR 162 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=162R-F |
| A3R29 | 0757-0402 | 1 | | RESISTOR 110 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=111-F |
| A3R30 | 0698-0084 | 9 | | RESISTOR 2.15K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=2151-F |
| A3R31 | 0757-0402 | 1 | | RESISTOR 110 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=111-F |
| A3R32 | 0698-0084 | 9 | | RESISTOR 2.15K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=2151-F |
| A3R33 | 0683-4705 | 6 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A3R34 | 0683-4705 | 6 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A3R35 | 0683-1005 | 5 | | RESISTOR 10 5% .25W FC TC=400/+500 | 01121 | CB1005 |
| A3R36 | 0698-3404 | 3 | 4 | RESISTOR 383 1% .5W F TC=0/+100 | 28480 | 0698-3404 |
| A3R37 | 0698-3404 | 3 | | RESISTOR 383 1% .5W F TC=0/+100 | 28480 | 0698-3404 |
| A3R38 | 0698-3404 | 3 | | RESISTOR 383 1% .5W F TC=0/+100 | 28480 | 0698-3404 |
| A3R39 | 0698-3404 | 3 | | RESISTOR 383 1% .5W F TC=0/+100 | 28480 | 0698-3404 |
| A3R40 | 0698-3404 | 3 | | RESISTOR 383 1% .5W F TC=0/+100 | 28480 | 0698-3404 |
| A3R41 | 0683-3335 | 6 | | RESISTOR 3.3K 5% .25W FC TC=400/+700 | 01121 | CB3335 |
| A3R42 | 0683-3335 | 6 | | RESISTOR 3.3K 5% .25W FC TC=400/+700 | 01121 | CB3335 |
| A3R43 | 0683-2205 | 9 | | RESISTOR 22 5% .25W FC TC=400/+500 | 01121 | CB2205 |
| A3R44 | 0683-3335 | 6 | | RESISTOR 3.3K 5% .25W FC TC=400/+700 | 01121 | CB3335 |
| A3R45 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A3R46 | 0683-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A3R47 | 0683-2205 | 9 | | RESISTOR 22 5% .25W FC TC=400/+500 | 01121 | CB2205 |
| A3R48 | 0698-3450 | 9 | 1 | RESISTOR 42.2K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=4222-F |
| A3R49 | 0683-1515 | 2 | 5 | RESISTOR 150 5% .25W FC TC=400/+600 | 01121 | CB1515 |
| A3R50 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A3R51 | 0683-1005 | 5 | | RESISTOR 10 5% .25W FC TC=400/+500 | 01121 | CB1005 |
| A3R52 | 0683-1005 | 5 | | RESISTOR 10 5% .25W FC TC=400/+500 | 01121 | CB1005 |
| A3R53 | 0757-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001-F |
| A3R54 | 0683-4705 | 6 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A3R55 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A3R56 | 0683-3305 | 2 | 4 | RESISTOR 33 5% .25W FC TC=400/+500 | 01121 | CB3305 |
| A3R57 | 0698-4458 | 9 | 2 | RESISTOR 590 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=590R-F |
| A3R58 | 0683-3305 | 2 | | RESISTOR 33 5% .25W FC TC=400/+500 | 01121 | CB3305 |
| A3R59 | 0683-4705 | 6 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A3R60 | 0683-4705 | 6 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd)

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|--------------------------------------|----------|------------------|
| ASR61 | 0757-0274 | 5 | | RESISTOR 1.21K 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=1213-F |
| ASR62 | 0683-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| ASR63 | 0698-3444 | 1 | | RESISTOR 316 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=316R-F |
| ASR64 | 0683-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| ASR66 | 0683-1535 | 6 | 2 | RESISTOR 15K 5% .25W FC TC=400/+800 | 01121 | CB1535 |
| ASR67 | 0683-1935 | 6 | | RESISTOR 15K 5% .25W FC TC=400/+800 | 01121 | CB1935 |
| ASR67 | 0683-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| ASR68 | 0757-0277 | 8 | | RESISTOR 49.9 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=4992-F |
| ASR69 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| ASR70 | 0757-0279 | 0 | | RESISTOR 3.16K 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=3161-F |
| ASR71 | 0683-1045 | 3 | | RESISTOR 100K 5% .25W FC TC=400/+800 | 01121 | CB1045 |
| ASR72 | 0683-1045 | 3 | | RESISTOR 100K 5% .25W FC TC=400/+800 | 01121 | CB1045 |
| ASR73 | 0757-0411 | 2 | 1 | RESISTOR 332 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=332R-F |
| ASR74 | 0683-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| ASR75 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| ASR76 | 0698-0054 | 9 | | RESISTOR 2.15K 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=2151-F |
| ASR77 | 0757-0280 | 4 | | RESISTOR 1K 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=1001-F |
| ASR78 | 0698-3447 | 3 | 1 | RESISTOR 422 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=422R-F |
| ASR79 | 0683-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| ASR79 | 0698-4433 | 0 | | RESISTOR 2.26K 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=2261-F |
| ASR80 | 0698-0084 | 9 | | RESISTOR 2.15K 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=2151-F |
| ASR81 | 0698-0084 | 9 | | RESISTOR 2.15K 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=2151-F |
| ASR82 | 0757-0401 | 0 | | RESISTOR 100 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=101-F |
| ASR83 | 0757-0416 | 7 | | RESISTOR 511 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=511R-F |
| ASR84 | 0698-4460 | 3 | 1 | RESISTOR 649 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=649R-F |
| ASR85 | 0757-0433 | 2 | 1 | RESISTOR 3.32K 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=111-F |
| ASR86 | 0757-0402 | 1 | | RESISTOR 110 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=111-F |
| ASR87 | 0757-0410 | 1 | | RESISTOR 301 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=301R-F |
| ASR88 | 0683-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| ASR89 | 0698-3444 | 1 | | RESISTOR 316 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=316R-F |
| ASR90 | 0683-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| ASR91 | 0683-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| ASR92 | 0698-3442 | 9 | 1 | RESISTOR 237 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=237R-F |
| ASR93 | 0757-0280 | 4 | | RESISTOR 1K 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=111-F |
| ASR94 | 0757-0402 | 1 | | RESISTOR 110 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=111-F |
| ASR95 | 0698-0084 | 9 | | RESISTOR 2.15K 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=2151-F |
| ASR96 | 0683-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| ASR98 | 0683-1005 | 5 | | RESISTOR 10 5% .25W FC TC=400/+500 | 01121 | CB1005 |
| ASR99 | 0683-1005 | 5 | | RESISTOR 10 5% .25W FC TC=400/+500 | 01121 | CB1005 |
| ASR100 | 0683-3325 | 6 | | RESISTOR 3.3K 5% .25W FC TC=400/+700 | 01121 | CB3325 |
| ASR101 | 0683-3335 | 8 | | RESISTOR 33K 5% .25W FC TC=400/+800 | 01121 | CB3335 |
| ASR102 | 0683-2205 | 9 | | RESISTOR 22 5% .25W FC TC=400/+500 | 01121 | CB2205 |
| ASR103 | 0683-3335 | 8 | | RESISTOR 33K 5% .25W FC TC=400/+800 | 01121 | CB3335 |
| ASR104 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| ASR105 | 0683-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| ASR106 | 0683-2205 | 9 | | RESISTOR 22 5% .25W FC TC=400/+500 | 01121 | CB2205 |
| ASR107 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| ASR108 | 0683-1005 | 5 | | RESISTOR 10 5% .25W FC TC=400/+500 | 01121 | CB1005 |
| ASR109 | 0683-1005 | 5 | | RESISTOR 10 5% .25W FC TC=400/+500 | 01121 | CB1005 |
| ASR110 | 0757-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=1001-F |
| ASR111 | 0683-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| ASR112 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| ASR113 | 0683-3305 | 2 | | RESISTOR 33 5% .25W FC TC=400/+500 | 01121 | CB3305 |
| ASR114 | 0698-4458 | 9 | | RESISTOR 590 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=590R-F |
| ASR115 | 0683-3305 | 2 | | RESISTOR 33 5% .25W FC TC=400/+500 | 01121 | CB3305 |
| ASR116 | 0683-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| ASR117 | 0683-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| ASR118 | 0757-0274 | 5 | | RESISTOR 1.21K 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=1213-F |
| ASR119 | 0683-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| ASR120 | 0698-3444 | 1 | | RESISTOR 316 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=316R-F |
| ASR121 | 0683-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| ASR122 | 0683-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| ASR123 | 0698-2344 | 1 | | RESISTOR 2.45K .25% .125W | 28480 | 0698-2344 |
| ASR124 | 0683-1515 | 2 | | RESISTOR 150 5% .25W FC TC=400/+600 | 01121 | CB1515 |
| ASR125 | 0683-1205 | 7 | 8 | RESISTOR 12 5% .25W FC TC=400/+500 | 01121 | CB1205 |
| ASR126 | 0683-1205 | 7 | | RESISTOR 12 5% .25W FC TC=400/+500 | 01121 | CB1205 |
| ASR127 | 0683-1515 | 2 | | RESISTOR 150 5% .25W FC TC=400/+600 | 01121 | CB1515 |
| ASR128 | 0683-1515 | 2 | | RESISTOR 150 5% .25W FC TC=400/+600 | 01121 | CB1515 |
| ASR129 | 0683-1205 | 7 | | RESISTOR 12 5% .25W FC TC=400/+500 | 01121 | CB1205 |
| ASR130 | 0683-1205 | 7 | | RESISTOR 12 5% .25W FC TC=400/+500 | 01121 | CB1205 |
| ASR131 | 0757-0448 | 9 | | RESISTOR 10K 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=1002-F |
| ASR132 | 0757-0401 | 0 | | RESISTOR 100 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0=101-F |
| ASR133 | 1810-0203 | 7 | 2 | NETWORK=RES 8=8IP4.7K OHM X 7 | 01121 | 208A472 |
| ASR134 | 1810-0203 | 7 | | NETWORK=RES 8=8IP4.7K OHM X 7 | 01121 | 208A472 |
| ASR135 | 1810-0212 | 6 | 1 | NETWORK=RES 16=1IP22.0K OHM X 8 | 01121 | 3168223 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|------------------------|----------------|-----|-----|--|----------|-----------------|
| A3R136 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A3R137 | 0683-2235 | 5 | | RESISTOR 22K 5% .25W FC TC=400/+800 | 01121 | CB2235 |
| A3R138 | 0683-2343 | 7 | 5 | RESISTOR 50 .1% .125W | 28480 | 0683-2343 |
| A3R139 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A3R140 | 0683-4715 | 0 | | RESISTOR 470 5% .25W FC TC=400/+600 | 01121 | CB4715 |
| A3R141 | 0683-2235 | 5 | | RESISTOR 22K 5% .25W FC TC=400/+800 | 01121 | CB2235 |
| A3R142 | 0683-2235 | 5 | | RESISTOR 22K 5% .25W FC TC=400/+800 | 01121 | CB2235 |
| A3T1 | 9100-0823 | 8 | | TRANSFORMER(YDK11381) 1:1:1 | 28480 | 9100-0823 |
| A3T2 | 9100-0876 | 1 | 2 | TRANSFORMER-SIGNAL 2mH 30% 1:1 | 28480 | 9100-0876 |
| A3T3 | 9100-0823 | 8 | | TRANSFORMER(YDK11381) 1:1:1 | 28480 | 9100-0823 |
| A3T4 | 9100-0822 | 7 | 4 | TRANSFORMER(PULSE(11307) | 28480 | 9100-0822 |
| A3T5 | 9100-0823 | 8 | | TRANSFORMER(YDK11381) 1:1:1 | 28480 | 9100-0823 |
| A3T6 | 9100-0876 | 1 | | TRANSFORMER-SIGNAL 2mH 30% 1:1 | 28480 | 9100-0876 |
| A3T7 | 9100-0822 | 7 | | TRANSFORMER(PULSE(11307) | 28480 | 9100-0822 |
| A3U1 | 1826-0138 | 8 | | IC COMPARATOR GP QUAD 14-DIP-P | 04713 | MLM339P |
| A3U2 | 1826-0138 | 8 | | IC COMPARATOR GP QUAD 14-DIP-P | 04713 | MLM339P |
| A3U3 | 1826-0138 | 8 | | IC COMPARATOR GP QUAD 14-DIP-P | 04713 | MLM339P |
| A3U4 | 1820-1730 | 6 | 6 | IC PP TTL LS D-TYPE POS-EDGE-TRIG COM | 01295 | 8N74LS273N |
| A3U5 | 1820-1730 | 6 | | IC PP TTL LS D-TYPE POS-EDGE-TRIG COM | 01295 | 8N74LS273N |
| A3 MISCELLANEOUS PARTS | | | | | | |
| | 1205-0050 | 7 | 4 | HEAT SINK TO-5/TO-39-C8 | 28480 | 1205-0050 |
| | 04275-00612 | 4 | 1 | SHIELD PLATE A3 | 28480 | 04275-00612 |
| | 04275-00608 | 9 | 1 | SHIELD PLATE A3 | 28480 | 04275-00608 |
| | 04275-00609 | 0 | 1 | SHIELD PLATE A3 | 28480 | 04275-00609 |
| | 04275-00610 | 3 | 1 | SHIELD PLATE A3 | 28480 | 04275-00610 |
| A4 | 04275-66504 | 2 | 1 | PROCESS AMPLIFIER BOARD ASSEMBLY | 28480 | 04275-66504 |
| | 04275-26504 | 8 | | PC BOARD, BLANK | 28480 | 04275-26504 |
| A4C1 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A4C2 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A4C3 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A4C4 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A4C5 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A4C6 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A4C7 | 0180-3456 | 6 | 6 | CAPACITOR-FXD 1000PF +/-10% 1KVDC CER | 28480 | 0180-3456 |
| A4C8 | 0180-3456 | 6 | | CAPACITOR-FXD 1000PF +/-10% 1KVDC CER | 28480 | 0180-3456 |
| A4C9 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A4C10 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A4C11 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A4C12 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A4C13 | 0180-3456 | 6 | | CAPACITOR-FXD 1000PF +/-10% 1KVDC CER | 28480 | 0180-3456 |
| A4C14 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A4C15 | 0180-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0180-2055 |
| A4C16 | 0180-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0180-2055 |
| A4C17 | 0180-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0180-1083 |
| A4CR1 | 1901-0376 | 6 | 25 | DIODE-GEN PRP 35V 50MA DO-35 | 28480 | 1901-0376 |
| A4CR2 | 1901-0376 | 6 | | DIODE-GEN PRP 35V 50MA DO-35 | 28480 | 1901-0376 |
| A4CR3 | 1901-0376 | 6 | | DIODE-GEN PRP 35V 50MA DO-35 | 28480 | 1901-0376 |
| A4CR4 | 1901-0376 | 6 | | DIODE-GEN PRP 35V 50MA DO-35 | 28480 | 1901-0376 |
| A4CR5 | 1901-0376 | 6 | | DIODE-GEN PRP 35V 50MA DO-35 | 28480 | 1901-0376 |
| A4L1 | 9140-0129 | 1 | 12 | COIL=MLO 220UH 5% Q665 .155DX,375LG-NOM | 28480 | 9140-0129 |
| A4L2 | 9140-0129 | 1 | | COIL=MLO 220UH 5% Q665 .155DX,375LG-NOM | 28480 | 9140-0129 |
| A4L3 | 9140-0129 | 1 | | COIL=MLO 220UH 5% Q665 .155DX,375LG-NOM | 28480 | 9140-0129 |
| A4L4 | 9140-0129 | 1 | | COIL=MLO 220UH 5% Q665 .155DX,375LG-NOM | 28480 | 9140-0129 |
| A4L5 | 9140-0129 | 1 | | COIL=MLO 220UH 5% Q665 .155DX,375LG-NOM | 28480 | 9140-0129 |
| A4L6 | 9140-0129 | 1 | | COIL=MLO 220UH 5% Q665 .155DX,375LG-NOM | 28480 | 9140-0129 |
| A4L7 | 9100-1788 | 6 | 7 | CHOK= WIDE BAND ZMAX=680 OHMS 180 MHZ | 02114 | VK200 20/48 |
| A4L8 | 9100-1788 | 6 | | CHOK= WIDE BAND ZMAX=680 OHMS 180 MHZ | 02114 | VK200 20/48 |
| A481 | 1853-0091 | 3 | | TRANSISTOR J-FET N-CHAN D-MODE SI | 28480 | 1853-0091 |
| A482 | 1853-0091 | 3 | | TRANSISTOR J-FET N-CHAN D-MODE SI | 28480 | 1853-0091 |
| A483 | 1853-0300 | 3 | 4 | TRANSISTOR PNP SI TO-18 PD=300MH | 28480 | 1853-0300 |
| A484 | 1853-0012 | 3 | | TRANSISTOR PNP 2N2904A SI TO-39 PD=600MH | 01295 | 2N2904A |
| A485 | 1853-0300 | 4 | | TRANSISTOR PNP SI TO-18 PD=300MH | 28480 | 1853-0300 |
| A486 | 1854-0071 | 7 | | TRANSISTOR NPN SI PD=300MH FT=200MHZ | 28480 | 1854-0071 |
| A487 | 1854-0039 | 7 | 3 | TRANSISTOR NPN 2N3053B SI TO-39 PD=1W | 01928 | 2N3053B |
| A488 | 1854-0071 | 7 | | TRANSISTOR NPN SI PD=300MH FT=200MHZ | 28480 | 1854-0071 |
| A489 | 1853-0091 | 3 | | TRANSISTOR J-FET N-CHAN D-MODE SI | 28480 | 1853-0091 |
| A4810 | 1853-0020 | 4 | | TRANSISTOR PNP SI PD=300MH FT=150MHZ | 28480 | 1853-0020 |
| A4811 | 1853-0091 | 3 | | TRANSISTOR J-FET N-CHAN D-MODE SI | 28480 | 1853-0091 |
| A4R1 | 0757-0487 | 2 | 25 | RESISTOR 825K 1% .125W F TC=0/+100 | 28480 | 0757-0487 |
| A4R2 | 0757-0487 | 2 | | RESISTOR 825K 1% .125W F TC=0/+100 | 28480 | 0757-0487 |
| A4R3 | 0757-0487 | 2 | | RESISTOR 825K 1% .125W F TC=0/+100 | 28480 | 0757-0487 |
| A4R4 | 0757-0487 | 2 | | RESISTOR 825K 1% .125W F TC=0/+100 | 28480 | 0757-0487 |
| A4R5 | 1810-0267 | 9 | 4 | NETWORK-RES 8-SIP22.0K OHM X 7 | 01121 | 206A223 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|------------------------|----------------|-----|-----|---|----------|--------------------|
| A4R6 | 1610-0207 | 9 | | NETWORK-RES 8-81P22.0K OHM X 7 | 01121 | 206A223 |
| A4R7 | 0757-0442 | 9 | | RESISTOR 10K 1% .125W F TC0+/-100 | 24546 | C4=1/8-T0=1002=F |
| A4R8 | 0757-0289 | 2 | 1 | RESISTOR 13.3K 1% .125W F TC0+/-100 | 19701 | MF4C1/8-T0=1332=F |
| A4R9 | 0698-3155 | 1 | | RESISTOR 4.64K 1% .125W F TC0+/-100 | 24546 | C4=1/8-T0=4641=F |
| A4R10 | 0693-2745 | 2 | 2 | RESISTOR 270K 5% .25W FC TC0=800/+900 | 01121 | CB2745 |
| A4R11 | 0693-2745 | 2 | | RESISTOR 270K 5% .25W FC TC0=800/+900 | 01121 | CB2745 |
| A4R12 | 0693-1545 | 5 | 2 | RESISTOR 150K 5% .25W FC TC0=800/+900 | 01121 | CB1545 |
| A4R13 | 0757-0445 | 5 | | RESISTOR 150K 5% .25W FC TC0=800/+900 | 01121 | CB1545 |
| A4R14 | 0693-0275 | 9 | 4 | RESISTOR 2.7 5% .25W FC TC0=400/+500 | 01121 | CB275 |
| A4R15 | 0757-0275 | 9 | | RESISTOR 1.78K 1% .125W F TC0+/-100 | 24546 | C4=1/8-T0=1781=F |
| A4R16 | 0757-0275 | 9 | | RESISTOR 1.78K 1% .125W F TC0+/-100 | 24546 | C4=1/8-T0=1781=F |
| A4R17 | 0693-0275 | 9 | | RESISTOR 2.7 5% .25W FC TC0=400/+500 | 01121 | CB275 |
| A4R17 | 0757-0442 | 9 | | RESISTOR 10K 1% .125W F TC0+/-100 | 24546 | C4=1/8-T0=1002=F |
| A4R19 | 0757-0275 | 9 | | RESISTOR 1.78K 1% .125W F TC0+/-100 | 24546 | C4=1/8-T0=1781=F |
| A4R20 | 0757-0275 | 9 | | RESISTOR 1.78K 1% .125W F TC0+/-100 | 24546 | C4=1/8-T0=1781=F |
| A4R21 | 0757-0442 | 9 | | RESISTOR 10K 1% .125W F TC0+/-100 | 24546 | C4=1/8-T0=1002=F |
| A4R22 | 0698-3150 | 6 | 3 | RESISTOR 2.37K 1% .125W F TC0+/-100 | 24546 | C4=1/8-T0=2371=F |
| A4R23 | 0757-1094 | 9 | | RESISTOR 1.47K 1% .125W F TC0+/-100 | 24546 | C4=1/8-T0=1471=F |
| A4R24 | 0757-0275 | 9 | | RESISTOR 1.78K 1% .125W F TC0+/-100 | 24546 | C4=1/8-T0=1781=F |
| A4R25 | 0757-0467 | 2 | | RESISTOR 825K 1% .125W F TC0+/-100 | 26480 | 0757-0467 |
| A4R26 | 0757-0487 | 2 | | RESISTOR 825K 1% .125W F TC0+/-100 | 26480 | 0757-0487 |
| A4R27 | 0698-3155 | 1 | | RESISTOR 4.64K 1% .125W F TC0+/-100 | 24546 | C4=1/8-T0=4641=F |
| A4R28 | 0757-0487 | 2 | | RESISTOR 825K 1% .125W F TC0+/-100 | 26480 | 0757-0487 |
| A4R29 | 0757-0487 | 2 | | RESISTOR 825K 1% .125W F TC0+/-100 | 26480 | 0757-0487 |
| A4R30 | 0757-0275 | 9 | | RESISTOR 1.78K 1% .125W F TC0+/-100 | 24546 | C4=1/8-T0=1781=F |
| A4T1 | 9100-0871 | 6 | 3 | TRANSFORMER-SIGNAL 500uH 20% 1:1:1 | 26480 | 9100-0871 |
| A4U1 | 1826-0138 | 8 | | IC COMPARATOR GP QUAD 14-DIP-P | 04713 | MLH339P |
| A4U2 | 1826-0138 | 8 | | IC COMPARATOR GP QUAD 14-DIP-P | 04713 | MLH339P |
| A4U3 | 1826-0138 | 8 | | IC COMPARATOR GP QUAD 14-DIP-P | 04713 | MLH339P |
| A4 MISCELLANEOUS PARTS | | | | | | |
| | 04275-00612 | 5 | 2 | SHIELD COVER A4 | 26480 | 04275-00612 |
| | 04275-00613 | 6 | 2 | SHIELD COVER A4 | 26480 | 04275-00613 |
| A4A1 | 04275-66541 | 7 | 1 | ERR BUFFER AMPLIFIER BOARD ASSEMBLY | 26480 | 04275-66541 |
| | 04275-26541 | 3 | | PC BOARD, BLANK | 26480 | 04275-26541 |
| A4A1C1 | 0160-3060 | 6 | 36 | CAPACITOR-PXD .1UF +/-20% 25VDC CER | 26480 | 0160-3060 |
| A4A1C2 | 0160-3060 | 6 | | CAPACITOR-PXD .1UF +/-20% 25VDC CER | 26480 | 0160-3060 |
| A4A1C3 | 0121-0517 | 6 | 1 | CAPACITOR-V TRMR-95TN 68-4.5PF 750V | 18736 | |
| A4A1C4 | 0160-3060 | 6 | | CAPACITOR-PXD .1UF +/-20% 25VDC CER | 26480 | 0160-3060 |
| A4A1C5 | 0150-0052 | 1 | | CAPACITOR-PXD .05UF +/-20% 400VDC CER | 26480 | 0150-0052 |
| A4A1C6 | 0160-3060 | 8 | | CAPACITOR-PXD .1UF +/-20% 25VDC CER | 26480 | 0160-3060 |
| A4A1C7 | 0160-3060 | 8 | | CAPACITOR-PXD .1UF +/-20% 25VDC CER | 26480 | 0160-3060 |
| A4A1C8 | 0160-3456 | 6 | | CAPACITOR-PXD 1000PF +/-10% 1KVDC CER | 26480 | 0160-3456 |
| A4A1CR1 | 1901-0050 | 3 | 4 | DIODE-SWITCHING 80V 200MA 2NS DO-35 | 26480 | 1901-0050 |
| A4A1CR2 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 26480 | 1901-0040 |
| A4A1CR3 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 26480 | 1901-0040 |
| A4A1CR4 | 1901-0050 | 3 | | DIODE-SWITCHING 80V 200MA 2NS DO-35 | 26480 | 1901-0050 |
| A4A1CR5 | 1901-0376 | 6 | | DIODE-GEN PRP 35V 50MA DO-35 | 26480 | 1901-0376 |
| A4A1CR6 | 1901-0376 | 6 | | DIODE-GEN PRP 35V 50MA DO-35 | 26480 | 1901-0376 |
| A4A1CR7 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 26480 | 1901-0040 |
| A4A1J4 | 1250-0257 | 1 | | CONNECTOR-RF SMB M PC 50-OHM | 26480 | 1250-0257 |
| A4A1L1 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 26480 | 9170-0029 |
| A4A1L2 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 26480 | 9170-0029 |
| A4A1L3 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 26480 | 9170-0029 |
| A4A1L4 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 26480 | 9170-0029 |
| A4A1L5 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 26480 | 9170-0029 |
| A4A1L6 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 26480 | 9170-0029 |
| A4A1Q1 | 1855-0268 | 6 | 2 | TRANSISTOR J-FET N-CHAN D-MODE T0-92 SI | 17856 | J309 |
| A4A1Q2 | 1855-0628 | 0 | 9 | TRANSISTOR NPN SI T0-92 PD=625MW | 04713 | MP8=H17 |
| A4A1Q3 | 1855-0091 | 3 | | TRANSISTOR J-FET N-CHAN D-MODE SI | 26480 | 1855-0091 |
| A4A1Q4 | 1853-0020 | 4 | | TRANSISTOR PNP SI PD=300MW FT=150MHZ | 26480 | 1853-0020 |
| A4A1Q5 | 1855-0628 | 0 | | TRANSISTOR NPN SI T0-92 PD=625MW | 04713 | MP8=H17 |
| A4A1Q6 | 1855-0354 | 7 | 12 | TRANSISTOR PNP SI T0-92 PD=350MW | 26480 | 1855-0354 |
| A4A1R1 | 2100-3252 | 6 | 2 | RESISTOR-TRMR 5K 10% C TOP=ADJ 1-TRN | 26480 | 2100-3252 |
| A4A1R2 | 0698-3136 | 6 | 5 | RESISTOR 17.8K 1% .125W F TC0+/-100 | 24546 | C4=1/8-T0=1782=F |
| A4A1R3 | 0698-3429 | 2 | 8 | RESISTOR 19.6 1% .125W F TC0+/-100 | 03888 | PM55=1/8-T0=19R6=F |
| A4A1R4 | 0698-3457 | 6 | | RESISTOR 316K 1% .125W F TC0+/-100 | 26480 | 0698-3457 |
| A4A1R5 | 0698-3136 | 6 | | RESISTOR 17.8K 1% .125W F TC0+/-100 | 24546 | C4=1/8-T0=1782=F |
| A4A1R6 | 0698-3439 | 4 | 2 | RESISTOR 178 1% .125W P TC0+/-100 | 24546 | C4=1/8-T0=178R=F |
| A4A1R7 | 0698-4037 | 0 | 4 | RESISTOR 46.4 1% .125W F TC0+/-100 | 24546 | C4=1/8-T0=46R4=F |
| A4A1R8 | 2100-3199 | 0 | | RESISTOR-TRMR 20 20% C SIDE=ADJ 1-TRN | 30983 | ET5X200 |
| A4A1R9 | 0757-0439 | 4 | 3 | RESISTOR 6.81K 1% .125W F TC0+/-100 | 24546 | C4=1/8-T0=6811=F |
| A4A1R10 | 0698-3429 | 2 | | RESISTOR 19.6 1% .125W F TC0+/-100 | 03888 | PM55=1/8-T0=19R6=F |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|--|----------|---------------------|
| AA1R11 | 0757-0420 | 3 | | RESISTOR 750 1% .125W F TC0+100 | 24546 | C4-1/8-T0-751-F |
| AA1R12 | 0757-0420 | 3 | | RESISTOR 750 1% .125W F TC0+100 | 24546 | C4-1/8-T0-751-F |
| AA1R13 | 0757-0487 | 2 | | RESISTOR 825K 1% .125W F TC0+100 | 28480 | 0757-0487 |
| AA1R14 | 0757-0487 | 2 | | RESISTOR 825K 1% .125W F TC0+100 | 28480 | 0757-0487 |
| AA1R15 | 0757-0436 | 3 | | RESISTOR 5.11K 1% .125W F TC0+100 | 24546 | C4-1/8-T0-5111-F |
| AA1R16 | 0698-0084 | 9 | | RESISTOR 2.15K 1% .125W F TC0+100 | 24546 | C4-1/8-T0-2151-F |
| AA1R17 | 0698-3444 | 1 | | RESISTOR 316 1% .125W F TC0+100 | 24546 | C4-1/8-T0-316R-F |
| AA1T1 | 9100-0871 | 6 | | TRANSFORMER-SIGNAL 500uH 20% 1:1:1 | 28480 | 9100-0871 |
| | | | | AA41 MISCELLANEOUS PARTS | | |
| | 1251-0600 | 0 | 5 | CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ 8Q | 28480 | 1251-0600 |
| AA42 | 04275-66542 | 8 | 1 | EDUT BUFFER AMPLIFIER BOARD ASSEMBLY | 28480 | 04275-66542 |
| | 04275-26542 | 8 | | PC BOARD, BLANK | 28480 | 04275-26542 |
| AA42C1 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +-20% 25VDC CER | 28480 | 0160-3060 |
| AA42C2 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +-20% 25VDC CER | 28480 | 0160-3060 |
| AA42C3 | 0160-2246 | 0 | 1 | CAPACITOR-FXD 3.6PF +-25PF 500VDC CER | 28480 | 0160-2246 |
| AA42C4 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +-20% 25VDC CER | 28480 | 0160-3060 |
| AA42C5 | 0150-0052 | 1 | | CAPACITOR-FXD .05UF +-20% 400VDC CER | 28480 | 0150-0052 |
| AA42C6 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +-20% 25VDC CER | 28480 | 0160-3060 |
| AA42C7 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +-20% 25VDC CER | 28480 | 0160-3060 |
| AA42C8 | 0160-3456 | 6 | | CAPACITOR-FXD 1000PF +-10% 1KVDC CER | 28480 | 0160-3456 |
| AA42CR1 | 1901-0050 | 3 | | DIODE-SWITCHING 80V 200MA 2N8 DO-35 | 28480 | 1901-0050 |
| AA42CR2 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| AA42CR3 | 1901-0040 | 6 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| AA42CR4 | 1901-0376 | 1 | | DIODE-GEN PRP 35V 50MA DO-35 | 28480 | 1901-0376 |
| AA42CR5 | 1901-0050 | 3 | | DIODE-SWITCHING 80V 200MA 2N8 DO-35 | 28480 | 1901-0050 |
| AA42CR6 | 1901-0376 | 6 | | DIODE-GEN PRP 35V 50MA DO-35 | 28480 | 1901-0376 |
| AA42CR7 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| AA42J4 | 1250-0257 | 1 | | CONNECTOR-RF 8MB M PC 50-OHM | 28480 | 1250-0257 |
| AA42L1 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 28480 | 9170-0029 |
| AA42L2 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 28480 | 9170-0029 |
| AA42L3 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 28480 | 9170-0029 |
| AA42L4 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 28480 | 9170-0029 |
| AA42L5 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 28480 | 9170-0029 |
| AA42L6 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 28480 | 9170-0029 |
| AA42Q1 | 1855-0268 | 6 | | TRANSISTOR J-FET N-CHAN D-MODE TO-92 S1 | 17856 | J309 |
| AA42Q2 | 1854-0628 | 0 | | TRANSISTOR NPN S1 TO-92 PD625MW | 04713 | MP8-H17 |
| AA42Q3 | 1855-0091 | 3 | | TRANSISTOR J-FET N-CHAN D-MODE S1 | 28480 | 1855-0091 |
| AA42Q4 | 1853-0020 | 4 | | TRANSISTOR PNP S1 PD300MW FT=150MHZ | 28480 | 1853-0020 |
| AA42Q5 | 1854-0628 | 0 | | TRANSISTOR NPN S1 TO-92 PD625MW | 04713 | MP8-H17 |
| AA42Q6 | 1853-0354 | 7 | | TRANSISTOR PNP S1 TO-92 PD350MW | 28480 | 1853-0354 |
| AA42R1 | 2100-3252 | 6 | | RESISTOR-TMR 5K 10% C TOP=ADJ 1-YRN | 28480 | 2100-3252 |
| AA42R2 | 0698-3136 | 8 | | RESISTOR 17.5K 1% .125W F TC0+100 | 24546 | C4-1/8-T0-1782-F |
| AA42R3 | 0698-3429 | 2 | | RESISTOR 19.6 1% .125W F TC0+100 | 03886 | PME55-1/8-T0-19R6-F |
| AA42R4 | 0698-3457 | 6 | | RESISTOR 316K 1% .125W F TC0+100 | 28480 | 0698-3457 |
| AA42R5 | 0698-3136 | 8 | | RESISTOR 17.5K 1% .125W F TC0+100 | 24546 | C4-1/8-T0-1782-F |
| AA42R6 | 0698-3439 | 4 | | RESISTOR 178 1% .125W F TC0+100 | 24546 | C4-1/8-T0-178R-F |
| AA42R7 | 0698-4037 | 0 | | RESISTOR 46.4 1% .125W F TC0+100 | 24546 | C4-1/8-T0-46R4-F |
| AA42R8 | 0757-0346 | 2 | | RESISTOR 10 1% .125W F TC0+100 | 24546 | C4-1/8-T0-10R0-F |
| AA42R9 | 0757-0439 | 4 | | RESISTOR 6.81K 1% .125W F TC0+100 | 24546 | C4-1/8-T0-6811-F |
| AA42R10 | 0698-3429 | 2 | | RESISTOR 19.6 1% .125W F TC0+100 | 03886 | PME55-1/8-T0-19R6-F |
| AA42R11 | 0757-0420 | 3 | | RESISTOR 750 1% .125W F TC0+100 | 24546 | C4-1/8-T0-751-F |
| AA42R12 | 0757-0420 | 3 | | RESISTOR 750 1% .125W F TC0+100 | 24546 | C4-1/8-T0-751-F |
| AA42R13 | 0757-0487 | 2 | | RESISTOR 825K 1% .125W F TC0+100 | 28480 | 0757-0487 |
| AA42R14 | 0757-0487 | 2 | | RESISTOR 825K 1% .125W F TC0+100 | 28480 | 0757-0487 |
| AA42R15 | 0757-0436 | 3 | | RESISTOR 5.11K 1% .125W F TC0+100 | 24546 | C4-1/8-T0-5111-F |
| AA42R16 | 0698-0084 | 9 | | RESISTOR 2.15K 1% .125W F TC0+100 | 24546 | C4-1/8-T0-2151-F |
| AA42R17 | 0698-3444 | 1 | | RESISTOR 316 1% .125W F TC0+100 | 24546 | C4-1/8-T0-316R-F |
| AA4T1 | 9100-0871 | 6 | | TRANSFORMER-SIGNAL 500uH 20% 1:1:1 | 28480 | 9100-0871 |
| | | | | AA42 MISCELLANEOUS PARTS | | |
| | 1251-4683 | 7 | 23 | CONNECTOR-SGL CONT SKY .04-IN-BSC-SZ RND | 28480 | 1251-4683 |
| AA43 | 04275-66543 | 9 | 1 | AM AMPLIFIER BOARD ASSEMBLY | 28480 | 04275-66543 |
| | 04275-26543 | 5 | | PC BOARD, BLANK | 28480 | 04275-26543 |
| AA43C1 | 0160-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0160-1083 |
| AA43C2 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +-20% 25VDC CER | 28480 | 0160-3060 |
| AA43C3 | 0121-0059 | 7 | | CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG | 52763 | 304324 2/8PF NPO |
| AA43C4 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +-20% 25VDC CER | 28480 | 0160-3060 |
| AA43C5 | 0160-2307 | 4 | | CAPACITOR-FXD 47PF +-5% 300VDC MICA | 28480 | 0160-2307 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|---|----------|-------------------|
| AA3C6 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +/-20% 25VDC CER | 28480 | 0160-3060 |
| AA3C7 | 0160-2265 | 3 | | CAPACITOR-FXD 22PF +/-5% 500VDC CER 0+-30 | 28480 | 0160-2265 |
| AA3C8 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +/-20% 25VDC CER | 28480 | 0160-3060 |
| AA3C9 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +/-20% 25VDC CER | 28480 | 0160-3060 |
| AA3C10 | 0160-0127 | 2 | | CAPACITOR-FXD 1UF +/-20% 25VDC CER | 28480 | 0160-0127 |
| AA3C11 | 0160-0127 | 2 | | CAPACITOR-FXD 1UF +/-20% 25VDC CER | 28480 | 0160-0127 |
| AA3C12 | 0160-0127 | 2 | | CAPACITOR-FXD 1UF +/-20% 25VDC CER | 28480 | 0160-0127 |
| AA3C13 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +/-20% 25VDC CER | 28480 | 0160-3060 |
| AA3C14 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +/-20% 25VDC CER | 28480 | 0160-3060 |
| AA3C15 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +/-80-20% 100VDC CER | 28480 | 0160-2055 |
| AA3C16 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +/-20% 25VDC CER | 28480 | 0160-3060 |
| AA3C17 | 0160-1083 | 3 | | CAPACITOR-FXD 33UF +/-5-10% 25VDC | 28480 | 0160-1083 |
| AA3C18 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +/-80-20% 100VDC CER | 28480 | 0160-2055 |
| AA3CR1 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2ND DO-35 | 28480 | 1901-0040 |
| AA3CR2 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2ND DO-35 | 28480 | 1901-0040 |
| AA3CR3 | 1901-0376 | 6 | | DIODE-GEN PRP 35V 50MA DO-35 | 28480 | 1901-0376 |
| AA3CR4 | 1901-0376 | 6 | | DIODE-GEN PRP 35V 50MA DO-35 | 28480 | 1901-0376 |
| AA3CR5 | 1901-0376 | 6 | | DIODE-GEN PRP 35V 50MA DO-35 | 28480 | 1901-0376 |
| AA3CR6 | 1901-0376 | 6 | | DIODE-GEN PRP 35V 50MA DO-35 | 28480 | 1901-0376 |
| AA3CR7 | 1901-0376 | 6 | | DIODE-GEN PRP 35V 50MA DO-35 | 28480 | 1901-0376 |
| AA3L1 | 9100-1629 | 4 | 5 | COIL-MLD 47UH 5% Q855 .155DX.375LG-NOM | 28480 | 9100-1629 |
| AA3L2 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 28480 | 9170-0029 |
| AA3L3 | 9100-1629 | 4 | | COIL-MLD 47UH 5% Q855 .155DX.375LG-NOM | 28480 | 9100-1629 |
| AA3Q1 | 1853-0215 | 1 | | TRANSISTOR NPN SI PD=350MH FT=300MHZ | 04713 | 2N3904 |
| AA3Q2 | 1853-0091 | 1 | | TRANSISTOR J-PET N-CHAN D-MODE SI | 01295 | 2N5245 |
| AA3Q3 | 1853-0215 | 1 | | TRANSISTOR NPN SI PD=350MH FT=300MHZ | 04713 | 2N3904 |
| AA3Q4 | 1853-0091 | 1 | | TRANSISTOR J-PET N-CHAN D-MODE SI | 01295 | 2N5245 |
| AA3Q5 | 1853-0354 | 7 | | TRANSISTOR PNP SI TD=92 PD=350MH | 28480 | 1853-0354 |
| AA3Q6 | 1853-0215 | 1 | | TRANSISTOR NPN SI PD=350MH FT=300MHZ | 04713 | 2N3904 |
| AA3Q7 | 1853-0354 | 7 | | TRANSISTOR PNP SI TD=92 PD=350MH | 28480 | 1853-0354 |
| AA3Q8 | 1853-0091 | 3 | | TRANSISTOR J-PET N-CHAN D-MODE SI | 28480 | 1853-0091 |
| AA3Q9 | 1853-0020 | 4 | | TRANSISTOR PNP SI PD=300MH FT=150MHZ | 28480 | 1853-0020 |
| AA3Q10 | 1853-0628 | 0 | | TRANSISTOR NPN SI TD=92 PD=25MH | 04713 | MF8-M17 |
| AA3Q11 | 1853-0628 | 0 | | TRANSISTOR NPN SI TD=92 PD=25MH | 04713 | MF8-M17 |
| AA3Q12 | 1853-0091 | 3 | | TRANSISTOR J-PET N-CHAN D-MODE SI | 01295 | 2N5245 |
| AA3Q13 | 1853-0091 | 3 | | TRANSISTOR J-PET N-CHAN D-MODE SI | 28480 | 1853-0091 |
| AA3Q14 | 1853-0091 | 1 | | TRANSISTOR J-PET N-CHAN D-MODE SI | 01295 | 2N5245 |
| AA3Q15 | 1853-0020 | 4 | | TRANSISTOR PNP SI PD=300MH FT=150MHZ | 28480 | 1853-0020 |
| AA3R16 | 1853-0020 | 4 | | TRANSISTOR PNP SI PD=300MH FT=150MHZ | 28480 | 1853-0020 |
| AA3R17 | 1853-0354 | 7 | | TRANSISTOR PNP SI TD=92 PD=350MH | 28480 | 1853-0354 |
| AA3R18 | 1853-0354 | 7 | | TRANSISTOR PNP SI TD=92 PD=350MH | 28480 | 1853-0354 |
| AA3R1 | 0698-3155 | 9 | | RESISTOR 3.63K 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0-3631-F |
| AA3R2 | 0698-2205 | 9 | | RESISTOR 22 5% .25W FC TC=400/+500 | 01121 | CB2205 |
| AA3R3 | 0698-3160 | 8 | | RESISTOR 31.6K 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0-3162-F |
| AA3R4 | 0757-0180 | 2 | 11 | RESISTOR 31.6 1% .125W F TC=0+/-100 | 28480 | 0757-0180 |
| AA3R5 | 0698-1005 | 5 | | RESISTOR 10 5% .25W FC TC=400/+500 | 01121 | CB1005 |
| AA3R6 | 0757-0399 | 5 | 1 | RESISTOR 82.5 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0-82R5-F |
| AA3R7 | 0757-0487 | 3 | | RESISTOR 750 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0-751-F |
| AA3R8 | 0698-3441 | 6 | | RESISTOR 215 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0-215R-F |
| AA3R9 | 0757-0405 | 4 | | RESISTOR 162 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0-162R-F |
| AA3R10 | 2100-0589 | 4 | | RESISTOR-TMR 10 10% C SIDE=ADJ 1-TRN | 28480 | 2100-0589 |
| AA3R11 | 0757-0487 | 2 | | RESISTOR 825K 1% .125W F TC=0+/-100 | 28480 | 0757-0487 |
| AA3R12 | 0757-0487 | 2 | | RESISTOR 825K 1% .125W F TC=0+/-100 | 28480 | 0757-0487 |
| AA3R13 | 0698-3260 | 9 | | RESISTOR 464K 1% .125W F TC=0+/-100 | 28480 | 0698-3260 |
| AA3R14 | 0757-0180 | 2 | | RESISTOR 31.6 1% .125W F TC=0+/-100 | 28480 | 0757-0180 |
| AA3R15 | 0698-1005 | 5 | | RESISTOR 10 5% .25W FC TC=400/+500 | 01121 | CB1005 |
| AA3R16 | 0757-0180 | 2 | | RESISTOR 31.6 1% .125W F TC=0+/-100 | 28480 | 0757-0180 |
| AA3R17 | 0698-3155 | 9 | | RESISTOR 3.63K 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0-3631-F |
| AA3R18 | 0698-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| AA3R19 | 0698-2239 | 0 | 4 | RESISTOR 1.5 | 28480 | 0698-2239 |
| AA3R20 | 0698-2343 | 7 | | RESISTOR 50 .1% .125W | 28480 | 0698-2343 |
| AA3R21 | 0698-3155 | 9 | | RESISTOR 4.64K 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0-4641-F |
| AA3R22 | 0757-0294 | 1 | 5 | RESISTOR 17.8 1% .125W F TC=0+/-100 | 19701 | MF4C1/8-T0-17R8-F |
| AA3R23 | 0757-0294 | 9 | | RESISTOR 17.8 1% .125W F TC=0+/-100 | 19701 | MF4C1/8-T0-17R8-F |
| AA3R24 | 0698-3151 | 7 | 2 | RESISTOR 2.87K 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0-2871-F |
| AA3R25 | 0757-0401 | 0 | | RESISTOR 100 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0-101-F |
| AA3R26 | 0698-2205 | 9 | | RESISTOR 22 5% .25W FC TC=400/+500 | 01121 | CB2205 |
| AA3R27 | 0698-2342 | 6 | 2 | RESISTOR 450 .1% .125W | 28480 | 0698-2342 |
| AA3R28 | 0757-0487 | 2 | | RESISTOR 825K 1% .125W F TC=0+/-100 | 28480 | 0757-0487 |
| AA3R29 | 0757-0180 | 2 | | RESISTOR 31.6 1% .125W F TC=0+/-100 | 28480 | 0757-0180 |
| AA3R30 | 0757-0274 | 5 | | RESISTOR 1.21K 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0-1213-F |
| AA3R31 | 0757-0487 | 3 | | RESISTOR 750 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0-751-F |
| AA3R32 | 0698-0662 | 7 | | RESISTOR 464 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0-4640-F |
| AA3R33 | 0757-0417 | 6 | | RESISTOR 562 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0-562R-F |
| AA3R34 | 0698-0083 | 8 | | RESISTOR 1.96K 1% .125W F TC=0+/-100 | 24546 | C4=1/8-T0-1961-F |
| AA3R35 | 0698-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|--|----------|-------------------|
| AA43R37 | 0698-3155 | 1 | | RESISTOR 4.64K 1% .125W F TC0+100 | 24546 | C4=1/8-T0=4641-F |
| | 1251-4683 | 7 | | AA43 MISCELLANEOUS PARTS | | |
| | | | | CONNECTOR-SGL CONT SKT .04-IN-BSC-6Z RND | 28480 | 1251-4683 |
| AA44 | 04275-66544 | 0 | 1 | AM AMPLIFIER BOARD ASSEMBLY | 28480 | 04275-66544 |
| | 04275-26544 | 6 | | PC BOARD, BLANK | 28480 | 04275-26544 |
| AA44C1 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| AA44C2 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| AA44C3 | 0181-0059 | 7 | | CAPACITOR-V TRMR-CER 2=8PF 350V PC-MTG | 52763 | 304324 2/8PF NPO |
| AA44C4 | 0160-2259 | 5 | | CAPACITOR-FXD 12PF +-5% 500VDC CER 0+-30 | 28480 | 0160-2259 |
| AA44C5 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +-20% 25VDC CER | 28480 | 0160-3060 |
| AA44C6 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +-20% 25VDC CER | 28480 | 0160-3060 |
| AA44C7 | 0160-2307 | 4 | | CAPACITOR-FXD 47PF +-5% 300VDC MICA | 28480 | 0160-2307 |
| AA44C8 | 0160-0127 | 2 | | CAPACITOR-FXD 1UF +-20% 25VDC CER | 28480 | 0160-0127 |
| AA44C9 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +-20% 25VDC CER | 28480 | 0160-3060 |
| AA44C10 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +-20% 25VDC CER | 28480 | 0160-3060 |
| AA44C11 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +-20% 25VDC CER | 28480 | 0160-3060 |
| AA44C12 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +-20% 25VDC CER | 28480 | 0160-3060 |
| AA44C13 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +-20% 25VDC CER | 28480 | 0160-3060 |
| AA44C14 | 0160-0127 | 2 | | CAPACITOR-FXD 1UF +-20% 25VDC CER | 28480 | 0160-0127 |
| AA44C15 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +-20% 25VDC CER | 28480 | 0160-3060 |
| AA44C16 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +-20% 25VDC CER | 28480 | 0160-3060 |
| AA44CR1 | 1901-0376 | 6 | | DIODE-GEN PRP 35V 50MA DO-35 | 28480 | 1901-0376 |
| AA44CR2 | 1901-0376 | 6 | | DIODE-GEN PRP 35V 50MA DO-35 | 28480 | 1901-0376 |
| AA44CR3 | 1901-0376 | 6 | | DIODE-GEN PRP 35V 50MA DO-35 | 28480 | 1901-0376 |
| AA44CR4 | 1901-0376 | 6 | | DIODE-GEN PRP 35V 50MA DO-35 | 28480 | 1901-0376 |
| AA44CR5 | 1901-0376 | 6 | | DIODE-GEN PRP 35V 50MA DO-35 | 28480 | 1901-0376 |
| AA44CR6 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| AA44CR7 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| AA44CR8 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| AA44CR9 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| AA44CR10 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| AA44CR11 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| AA44L1 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 28480 | 9170-0029 |
| AA44Q1 | 1853-0354 | 7 | | TRANSISTOR PNP 8I T0-92 PD=350MW | 28480 | 1853-0354 |
| AA44Q2 | 1853-0091 | 3 | | TRANSISTOR J-FET N-CHAN D=MODE 8I | 28480 | 1853-0091 |
| AA44Q3 | 1853-0091 | 3 | | TRANSISTOR J-FET N-CHAN D=MODE 8I | 28480 | 1853-0091 |
| AA44Q4 | 1853-0081 | 1 | | TRANSISTOR J-FET N-CHAN D=MODE 8I | 01295 | 2N5245 |
| AA44Q5 | 1853-0081 | 1 | | TRANSISTOR J-FET N-CHAN D=MODE 8I | 01295 | 2N5245 |
| AA44Q6 | 1854-0628 | 0 | | TRANSISTOR NPN 8I T0-92 PD=625MW | 04713 | MP8=H17 |
| AA44Q7 | 1853-0354 | 7 | | TRANSISTOR PNP 8I T0-92 PD=350MW | 28480 | 1853-0354 |
| AA44Q8 | 1854-0628 | 0 | | TRANSISTOR NPN 8I T0-92 PD=625MW | 04713 | MP8=H17 |
| AA44Q9 | 1853-0354 | 7 | | TRANSISTOR PNP 8I T0-92 PD=350MW | 28480 | 1853-0354 |
| AA44Q10 | 1853-0354 | 7 | | TRANSISTOR PNP 8I T0-92 PD=350MW | 28480 | 1853-0354 |
| AA44Q11 | 1854-0628 | 0 | | TRANSISTOR NPN 8I T0-92 PD=625MW | 04713 | MP8=H17 |
| AA44Q12 | 1853-0354 | 7 | | TRANSISTOR PNP 8I T0-92 PD=350MW | 28480 | 1853-0354 |
| AA44Q13 | 1853-0039 | 7 | | TRANSISTOR NPN 2N3053B 8I T0-39 PD=1W | 01929 | 2N3053B |
| AA44Q14 | 1853-0012 | 4 | | TRANSISTOR PNP 2N2904A 8I T0-39 PD=600MW | 01295 | 2N2904A |
| AA44R1 | 0698-2342 | 6 | | RESISTOR 450 .1% .125W | 28480 | 0698-2342 |
| AA44R2 | 2100-0589 | 6 | | RESISTOR-TRMR 10 10% C SIDE=ADJ 1-TRN | 28480 | 2100-0589 |
| AA44R3 | 0698-2343 | 7 | | RESISTOR 50 .1% .125W | 28480 | 0698-2343 |
| AA44R4 | 0698-2239 | 0 | | RESISTOR 1.5 | 28480 | 0698-2239 |
| AA44R5 | 0698-3155 | 1 | | RESISTOR 4.64K 1% .125W F TC0+100 | 24546 | C4=1/8-T0=4641-F |
| AA44R6 | 0757-0487 | 2 | | RESISTOR 825K 1% .125W F TC0+100 | 28480 | 0757-0487 |
| AA44R7 | 0757-0487 | 2 | | RESISTOR 825K 1% .125W F TC0+100 | 28480 | 0757-0487 |
| AA44R8 | 0757-0487 | 2 | | RESISTOR 825K 1% .125W F TC0+100 | 28480 | 0757-0487 |
| AA44R9 | 0757-0487 | 2 | | RESISTOR 825K 1% .125W F TC0+100 | 28480 | 0757-0487 |
| AA44R10 | 0698-3260 | 9 | | RESISTOR 464K 1% .125W F TC0+100 | 28480 | 0698-3260 |
| AA44R11 | 0698-3155 | 1 | | RESISTOR 4.64K 1% .125W F TC0+100 | 24546 | C4=1/8-T0=4641-F |
| AA44R12 | 0757-0160 | 2 | | RESISTOR 31.6 1% .125W F TC0+100 | 28480 | 0757-0160 |
| AA44R13 | 0757-0160 | 2 | | RESISTOR 31.6 1% .125W F TC0+100 | 28480 | 0757-0160 |
| AA44R14 | 0757-0298 | 9 | | RESISTOR 17.8 1% .125W F TC0+100 | 19701 | MF4C1/8-T0=1780-F |
| AA44R15 | 0698-3434 | 9 | 1 | RESISTOR 34.8 1% .125W F TC0+100 | 24546 | C4=1/8-T0=3480-F |
| AA44R16 | 0757-0620 | 3 | | RESISTOR 750 1% .125W F TC0+100 | 24546 | C4=1/8-T0=751-F |
| AA44R17 | 0757-0294 | 9 | | RESISTOR 17.8 1% .125W F TC0+100 | 19701 | MF4C1/8-T0=1780-F |
| AA44R18 | 0757-0274 | 5 | | RESISTOR 1.21K 1% .125W F TC0+100 | 24546 | C4=1/8-T0=1213-F |
| AA44R19 | 0698-3441 | 6 | | RESISTOR 215 1% .125W F TC0+100 | 24546 | C4=1/8-T0=215R-F |
| AA44R20 | 0698-3155 | 1 | | RESISTOR 4.64K 1% .125W F TC0+100 | 24546 | C4=1/8-T0=4641-F |
| AA44R21 | 0757-0620 | 3 | | RESISTOR 750 1% .125W F TC0+100 | 24546 | C4=1/8-T0=751-F |
| AA44R22 | 0698-3151 | 7 | | RESISTOR 2.87K 1% .125W F TC0+100 | 24546 | C4=1/8-T0=2871-F |
| AA44R23 | 0757-0403 | 4 | | RESISTOR 162 1% .125W F TC0+100 | 24546 | C4=1/8-T0=162R-F |
| AA44R24 | 0698-0082 | 7 | | RESISTOR 464 1% .125W F TC0+100 | 24546 | C4=1/8-T0=4640-F |
| AA44R25 | 0757-0417 | 6 | | RESISTOR 562 1% .125W F TC0+100 | 24546 | C4=1/8-T0=562R-F |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|--|----------|---------------------|
| A6A4R26 | 0757-0063 | 2 | | RESISTOR 121 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0-121R-F |
| A6A4R27 | 0695-0083 | 8 | | RESISTOR 1.9K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0-1961R-F |
| A6A4R28 | 0695-3444 | 1 | | RESISTOR 316 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0-316R-F |
| A6A4R29 | 0683-2205 | 9 | | RESISTOR 22 5% .25W FC TC=-400/+500 | 01121 | C82205 |
| A6A4R30 | 0683-2205 | 9 | | RESISTOR 22 5% .25W FC TC=-400/+500 | 01121 | C82205 |
| A6A4R31 | 0683-1085 | 9 | | RESISTOR 1K 5% .25W FC TC=-400/+600 | 01121 | C81025 |
| | | | | AAA4 MISCELLANEOUS PARTS | | |
| | 1251-4663 | 7 | | CONNECTOR-SGL CONY SKT .04-IN-B8C-8Z RND | 28480 | 1251-4663 |
| AS | 04275-66505 | 3 | 1 | A-D CONVERTER BOARD ASSEMBLY | 28480 | 04275-66505 |
| | 04275-26305 | 9 | | PC BOARD, BLANK | 28480 | 04275-26305 |
| ASC1 | 0160-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0160-1083 |
| ASC2 | 0160-2261 | 9 | | CAPACITOR-PXD 15PF +-5% 500VDC CER 0+30 | 28480 | 0160-2261 |
| ASC3 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +-20% 25VDC CER | 28480 | 0160-3060 |
| ASC4 | 0160-0127 | 2 | | CAPACITOR-PXD .1UF +-20% 25VDC CER | 28480 | 0160-0127 |
| ASC5 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +-20% 25VDC CER | 28480 | 0160-3060 |
| ASC6 | 0160-2261 | 9 | | CAPACITOR-PXD 15PF +-5% 500VDC CER 0+30 | 28480 | 0160-2261 |
| ASC7 | 0160-2239 | 1 | 2 | CAPACITOR-FXD 1.8PF +-25PF 500VDC CER | 28480 | 0160-2239 |
| ASC8 | 0160-2239 | 1 | | CAPACITOR-FXD 1.8PF +-25PF 500VDC CER | 28480 | 0160-2239 |
| ASC9 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +-20% 25VDC CER | 28480 | 0160-3060 |
| ASC10 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +-20% 25VDC CER | 28480 | 0160-3060 |
| ASC11 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +-20% 25VDC CER | 28480 | 0160-3060 |
| ASC12 | 0160-2200 | 6 | 1 | CAPACITOR-FXD 43PF +-5% 300VDC MICA | 28480 | 0160-2200 |
| ASC13 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +-20% 25VDC CER | 28480 | 0160-3060 |
| ASC14 | 0160-0127 | 2 | | CAPACITOR-PXD .1UF +-20% 25VDC CER | 28480 | 0160-0127 |
| ASC15 | 0121-0036 | 0 | | CAPACITOR-V TRMR-CER 5.5-18PF 350V | 52763 | 304324 5.5/18PF NPO |
| ASC16 | 0160-0127 | 2 | | CAPACITOR-PXD .1UF +-20% 25VDC CER | 28480 | 0160-0127 |
| ASC17 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +-20% 25VDC CER | 28480 | 0160-3060 |
| ASC18 | 0160-0127 | 2 | | CAPACITOR-PXD .1UF +-20% 25VDC CER | 28480 | 0160-0127 |
| ASC19 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +-20% 25VDC CER | 28480 | 0160-3060 |
| ASC20 | 0160-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0160-1083 |
| ASC21 | 0160-2257 | 3 | 1 | CAPACITOR-FXD 10PF +-5% 500VDC CER 0+60 | 28480 | 0160-2257 |
| ASC22 | 0160-3060 | 8 | | CAPACITOR-FXD .1UF +-20% 25VDC CER | 28480 | 0160-3060 |
| ASC23 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC24 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC25 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC26 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC27 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC28 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC29 | 0160-3456 | 6 | | CAPACITOR-FXD 1000PF +-10% 1KVDC CER | 28480 | 0160-3456 |
| ASC30 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC31 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC32 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC33 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC34 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC35 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC36 | 0160-0939 | 4 | 1 | CAPACITOR-FXD 430PF +-5% 300VDC MICA | 28480 | 0160-0939 |
| ASC37 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC38 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC39 | 0160-1674 | 6 | 1 | CAPACITOR-FXD .33uF 5% 200VDC | 28480 | 0160-1674 |
| ASC40 | 0160-0197 | 8 | | CAPACITOR-PXD 2.2UF+-10% 20VDC TA | 56289 | 150D223X9020A2 |
| ASC41 | 0160-2204 | 0 | | CAPACITOR-PXD 100PF +-5% 300VDC MICA | 28480 | 0160-2204 |
| ASC42 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC43 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC44 | 0160-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0160-1083 |
| ASC45 | 0160-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0160-1083 |
| ASC46 | 0160-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0160-1083 |
| ASC47 | 0160-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0160-1083 |
| ASC48 | 0160-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0160-1083 |
| ASC49 | 0160-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0160-1083 |
| ASC50 | 0160-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0160-1083 |
| ASC51 | 0160-1083 | 3 | | CAPACITOR-FXD 33uF +75-10% 25VDC | 28480 | 0160-1083 |
| ASC52 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC53 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC54 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC55 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC56 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| ASC57 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| ASC58 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| ASC59 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| ASC60 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| ASC61 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| ASC62 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| ASC63 | 1901-0376 | 4 | | DIODE-GEN PRP 35V 50MA DO-35 | 28480 | 1901-0376 |
| ASC64 | 1901-0376 | 6 | | DIODE-GEN PRP 35V 50MA DO-35 | 28480 | 1901-0376 |
| ASC65 | 1901-0376 | 6 | | DIODE-GEN PRP 35V 50MA DO-35 | 28480 | 1901-0376 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|--|----------|-----------------|
| ASCR11 | 1901-0376 | 6 | | DIODE-GEN PRP 35V 50MA DO-35 | 28480 | 1901-0376 |
| ASCR12 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| ASCR13 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| ASCR14 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| ASCR15 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| ASCR16 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| ASCR17 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| ASCR18 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| ASCR19 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| ASCR20 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| ASCR21 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| ASCR22 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| ASCR23 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| ASCR24 | 1901-0376 | 6 | | DIODE-GEN PRP 35V 50MA DO-35 | 28480 | 1901-0376 |
| ASCR25 | 1901-0376 | 6 | | DIODE-GEN PRP 35V 50MA DO-35 | 28480 | 1901-0376 |
| ASCR26 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| ASCR27 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| ASCR28 | 1901-1011 | 6 | 1 | DIODE-ARRAY VF DIFF 5MV | 28480 | 1901-1011 |
| ASCR29 | 1902-0049 | 2 | | DIODE-ZNR 6.19V 5% DO-7 PDS 4W TC=0.022K | 28480 | 1902-0049 |
| ASCR30 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| ASCR31 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2N8 DO-35 | 28480 | 1901-0040 |
| ASCR32 | 1901-0518 | 8 | | DIODE-SCHOTTKY | 28480 | 1901-0518 |
| ASCR33 | 1901-0518 | 8 | | DIODE-SCHOTTKY | 28480 | 1901-0518 |
| ASL1 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 28480 | 9170-0029 |
| ASL2 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 28480 | 9170-0029 |
| ASL3 | 9140-0114 | 4 | | COIL-MLD 16UH 10% Q=55 .15SDX.175LQ-NOM | 28480 | 9140-0114 |
| ASL4 | 9140-0114 | 4 | | COIL-MLD 16UH 10% Q=55 .15SDX.175LQ-NOM | 28480 | 9140-0114 |
| ASL5 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 28480 | 9170-0029 |
| ASL6 | 9100-1788 | 6 | | CHOKE-WIDE BAND ZMAX=660 OHMS 180 MHZ | 02114 | VK200 20/48 |
| ASL7 | 9100-1788 | 6 | | CHOKE-WIDE BAND ZMAX=660 OHMS 180 MHZ | 02114 | VK200 20/48 |
| ASL8 | 9100-1788 | 6 | | CHOKE-WIDE BAND ZMAX=660 OHMS 180 MHZ | 02114 | VK200 20/48 |
| ASL9 | 9100-1788 | 6 | | CHOKE-WIDE BAND ZMAX=660 OHMS 180 MHZ | 02114 | VK200 20/48 |
| ASQ1 | 1854-0215 | 1 | | TRANSISTOR NPN SI PD=350MW FT=300MHZ | 04713 | 2N3904 |
| ASQ2 | 1854-0215 | 1 | | TRANSISTOR NPN SI PD=350MW FT=300MHZ | 04713 | 2N3904 |
| ASQ3 | 1855-0091 | 1 | | TRANSISTOR J-FET N-CHAN D=MODE SI | 01295 | 2N5245 |
| ASQ4 | 1855-0127 | 9 | 1 | TRANSISTOR FET N-CHANNEL SI | 28480 | |
| ASQ5 | 1854-0215 | 1 | | TRANSISTOR NPN SI PD=350MW FT=300MHZ | 04713 | 2N3904 |
| ASQ6 | 1855-0091 | 1 | | TRANSISTOR J-FET N-CHAN D=MODE SI | 01295 | 2N5245 |
| ASQ7 | 1853-0015 | 7 | 2 | TRANSISTOR PNP SI PD=200MW FT=500MHZ | 28480 | 1853-0015 |
| ASQ8 | 1854-0092 | 2 | | TRANSISTOR NPN SI PD=200MW FT=600MHZ | 28480 | 1854-0092 |
| ASQ9 | 1854-0092 | 2 | | TRANSISTOR NPN SI PD=200MW FT=600MHZ | 28480 | 1854-0092 |
| ASQ10 | 1853-0015 | 7 | | TRANSISTOR PNP SI PD=200MW FT=500MHZ | 28480 | 1853-0015 |
| ASQ11 | 1854-0092 | 2 | | TRANSISTOR NPN SI PD=200MW FT=600MHZ | 28480 | 1854-0092 |
| ASQ12 | 1854-0092 | 2 | | TRANSISTOR NPN SI PD=200MW FT=600MHZ | 28480 | 1854-0092 |
| ASQ13 | 1855-0091 | 3 | | TRANSISTOR J-FET N-CHAN D=MODE SI | 28480 | 1855-0091 |
| ASQ14 | 1855-0091 | 3 | | TRANSISTOR J-FET N-CHAN D=MODE SI | 28480 | 1855-0091 |
| ASQ15 | 1853-0020 | 4 | | TRANSISTOR PNP SI PD=300MW FT=150MHZ | 28480 | 1853-0020 |
| ASQ16 | 1855-0091 | 1 | | TRANSISTOR J-FET N-CHAN D=MODE SI | 01295 | 2N5245 |
| ASQ17 | 1853-0020 | 4 | | TRANSISTOR PNP SI PD=300MW FT=150MHZ | 28480 | 1853-0020 |
| ASQ18 | 1853-0020 | 4 | | TRANSISTOR PNP SI PD=300MW FT=150MHZ | 28480 | 1853-0020 |
| ASQ19 | 1855-0091 | 1 | | TRANSISTOR J-FET N-CHAN D=MODE SI | 01295 | 2N5245 |
| ASQ20 | 1853-0354 | 7 | | TRANSISTOR PNP SI TO=92 PD=350MW | 28480 | 1853-0354 |
| ASQ21 | 1855-0111 | 8 | 8 | TRANSISTOR FET N-CHANNEL | 28480 | 1855-0111 |
| ASQ22 | 1855-0111 | 8 | | TRANSISTOR FET N-CHANNEL | 28480 | 1855-0111 |
| ASQ23 | 1855-0111 | 8 | | TRANSISTOR FET N-CHANNEL | 28480 | 1855-0111 |
| ASQ24 | 1855-0111 | 8 | | TRANSISTOR FET N-CHANNEL | 28480 | 1855-0111 |
| ASQ25 | 1855-0111 | 8 | | TRANSISTOR FET N-CHANNEL | 28480 | 1855-0111 |
| ASQ26 | 1855-0111 | 8 | | TRANSISTOR FET N-CHANNEL | 28480 | 1855-0111 |
| ASQ27 | 1855-0111 | 8 | | TRANSISTOR FET N-CHANNEL | 28480 | 1855-0111 |
| ASQ28 | 1855-0111 | 8 | | TRANSISTOR FET N-CHANNEL | 28480 | 1855-0111 |
| ASQ29 | 1854-0092 | 2 | | TRANSISTOR NPN SI PD=200MW FT=600MHZ | 28480 | 1854-0092 |
| ASQ30 | 1854-0092 | 2 | | TRANSISTOR NPN SI PD=200MW FT=600MHZ | 28480 | 1854-0092 |
| ASQ31 | 1854-0092 | 2 | | TRANSISTOR NPN SI PD=200MW FT=600MHZ | 28480 | 1854-0092 |
| ASQ32 | 1854-0092 | 2 | | TRANSISTOR NPN SI PD=200MW FT=600MHZ | 28480 | 1854-0092 |
| ASQ33 | 1854-0092 | 2 | | TRANSISTOR NPN SI PD=200MW FT=600MHZ | 28480 | 1854-0092 |
| ASQ34 | 1854-0092 | 2 | | TRANSISTOR NPN SI PD=200MW FT=600MHZ | 28480 | 1854-0092 |
| ASQ35 | 1855-0091 | 3 | | TRANSISTOR J-FET N-CHAN D=MODE SI | 28480 | 1855-0091 |
| ASQ36 | 1855-0091 | 3 | | TRANSISTOR J-FET N-CHAN D=MODE SI | 28480 | 1855-0091 |
| ASQ37 | 1854-0071 | 7 | | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |
| ASQ38 | 1853-0300 | 3 | | TRANSISTOR PNP SI TO=18 PD=300MW | 28480 | 1853-0300 |
| ASQ39 | 1853-0018 | 3 | | TRANSISTOR PNP 2N2904A SI TO=19 PD=600MW | 01295 | 2N2904A |
| ASQ40 | 1853-0300 | 3 | | TRANSISTOR PNP SI TO=18 PD=300MW | 28480 | 1853-0300 |
| ASQ41 | 1854-0039 | 7 | | TRANSISTOR NPN 2N3053B SI TO=19 PD=1W | 01928 | 2N3053B |
| ASQ42 | 1854-0071 | 7 | | TRANSISTOR NPN SI PD=300MW FT=200MHZ | 28480 | 1854-0071 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|--|--------------------------------------|---------------------|---------------------|
| ASR1 | 0698-0337 | 0 | 1 | RESISTOR 46.4 1% .125W F TC0+100 | 24546 | C4=1/8-T0-46R4-F |
| ASR2 | 0757-0280 | 3 | | RESISTOR 1K 1% .125W F TC0+100 | 24546 | C4=1/8-T0-1001-F |
| ASR3 | 0698-3444 | 1 | | RESISTOR 316 1% .125W F TC0+100 | 24546 | C4=1/8-T0-316R-F |
| ASR4 | 2100-3273 | 1 | | RESISTOR-TMR 2K 10% C SIDE-ADJ 1-TRN | 24480 | 2100-3273 |
| ASR5 | 0698-3429 | 2 | | RESISTOR 19.6 1% .125W F TC0+100 | 03888 | PME55-1/8-T0-19R6-F |
| ASR6 | 0698-3444 | 1 | RESISTOR 316 1% .125W F TC0+100 | 24546 | C4=1/8-T0-316R-F | |
| ASR7 | 0757-0280 | 3 | RESISTOR 1K 1% .125W F TC0+100 | 24546 | C4=1/8-T0-1001-F | |
| ASR8 | 0698-0337 | 0 | RESISTOR 46.4 1% .125W F TC0+100 | 24546 | C4=1/8-T0-46R4-F | |
| ASR9 | 0757-0487 | 2 | RESISTOR 825K 1% .125W F TC0+100 | 24480 | 0757-0487 | |
| ASR10 | 0757-0487 | 2 | RESISTOR 825K 1% .125W F TC0+100 | 24480 | 0757-0487 | |
| ASR11 | 2100-0589 | 6 | RESISTOR-TMR 10 10% C SIDE-ADJ 1-TRN | 24480 | 2100-0589 | |
| ASR12 | 0698-3216 | 4 | RESISTOR, FND MEY FLM 101.3 OHM 0.1% 1/8 | | | |
| ASR13 | 0698-3429 | 2 | RESISTOR 19.6 1% .125W F TC0+100 | 03888 | PME55-1/8-T0-19R6-F | |
| ASR14 | 0757-0180 | 2 | RESISTOR 31.6 1% .125W F TC0+100 | 24480 | 0757-0180 | |
| ASR15 | 0698-3260 | 9 | RESISTOR 464K 1% .125W F TC0+100 | 24480 | 0698-3260 | |
| ASR16 | 2100-0589 | 6 | RESISTOR-TMR 10 10% C SIDE-ADJ 1-TRN | 24480 | 2100-0589 | |
| ASR17 | 0698-2343 | 7 | RESISTOR 50 .1% .125W | 24480 | 0698-2343 | |
| ASR18 | 0698-2239 | 0 | RESISTOR 1.5 | 24480 | 0698-2239 | |
| ASR19 | 0757-0346 | 2 | RESISTOR 10 1% .125W F TC0+100 | 24546 | C4=1/8-T0-10R0-F | |
| ASR20 | 0757-0346 | 2 | RESISTOR 10 1% .125W F TC0+100 | 24546 | C4=1/8-T0-10R0-F | |
| ASR21 | 0757-0180 | 2 | RESISTOR 31.6 1% .125W F TC0+100 | 24480 | 0757-0180 | |
| ASR22 | 0757-0401 | 0 | RESISTOR 100 1% .125W F TC0+100 | 24546 | C4=1/8-T0-101-F | |
| ASR23 | 0757-0401 | 0 | RESISTOR 100 1% .125W F TC0+100 | 24546 | C4=1/8-T0-101-F | |
| ASR24 | 0757-0401 | 0 | RESISTOR 100 1% .125W F TC0+100 | 24546 | C4=1/8-T0-101-F | |
| ASR25 | 0757-0418 | 9 | RESISTOR 619 1% .125W F TC0+100 | 24546 | C4=1/8-T0-619R-F | |
| ASR26 | 0698-3153 | 9 | RESISTOR 3.03K 1% .125W F TC0+100 | 24546 | C4=1/8-T0-3031-F | |
| ASR27 | 0757-0401 | 0 | RESISTOR 100 1% .125W F TC0+100 | 24546 | C4=1/8-T0-101-F | |
| ASR28 | 0757-0180 | 2 | RESISTOR 31.6 1% .125W F TC0+100 | 24480 | 0757-0180 | |
| ASR29 | 0757-0180 | 2 | RESISTOR 31.6 1% .125W F TC0+100 | 24480 | 0757-0180 | |
| ASR30 | 0757-0487 | 2 | RESISTOR 825K 1% .125W F TC0+100 | 24480 | 0757-0487 | |
| ASR31 | 0757-0487 | 2 | RESISTOR 825K 1% .125W F TC0+100 | 24480 | 0757-0487 | |
| ASR32 | 0757-0487 | 2 | RESISTOR 825K 1% .125W F TC0+100 | 24480 | 0757-0487 | |
| ASR33 | 0757-0487 | 2 | RESISTOR 825K 1% .125W F TC0+100 | 24480 | 0757-0487 | |
| ASR34 | 0698-2239 | 0 | RESISTOR 1.5 | 24480 | 0698-2239 | |
| ASR35 | 0757-0294 | 9 | RESISTOR 17.6 1% .125W F TC0+100 | 19701 | MF4C1/8-T0-17R6-F | |
| ASR36 | 0698-3429 | 2 | RESISTOR 19.6 1% .125W F TC0+100 | 03888 | PME55-1/8-T0-19R6-F | |
| ASR37 | 0698-3150 | 6 | RESISTOR 2.37K 1% .125W F TC0+100 | 24546 | C4=1/8-T0-2371-F | |
| ASR38 | 0757-0418 | 9 | RESISTOR 619 1% .125W F TC0+100 | 24546 | C4=1/8-T0-619R-F | |
| ASR39 | 0757-0428 | 1 | RESISTOR 1.62K 1% .125W F TC0+100 | 24546 | C4=1/8-T0-1621-F | |
| ASR40 | 0698-3429 | 2 | RESISTOR 19.6 1% .125W F TC0+100 | 03888 | PME55-1/8-T0-19R6-F | |
| ASR41 | 0698-3150 | 6 | RESISTOR 2.37K 1% .125W F TC0+100 | 24546 | C4=1/8-T0-2371-F | |
| ASR42 | 0698-0084 | 9 | RESISTOR 2.015K 1% .125W F TC0+100 | 24546 | C4=1/8-T0-2015-F | |
| ASR43 | 0757-0419 | 0 | RESISTOR 681 1% .125W F TC0+100 | 24546 | C4=1/8-T0-681R-F | |
| ASR44 | 0757-0428 | 1 | RESISTOR 1.62K 1% .125W F TC0+100 | 24546 | C4=1/8-T0-1621-F | |
| ASR45 | 0757-0180 | 2 | RESISTOR 31.6 1% .125W F TC0+100 | 24480 | 0757-0180 | |
| ASR46 | 0757-0428 | 3 | RESISTOR 5.11K 1% .125W F TC0+100 | 24546 | C4=1/8-T0-5111-F | |
| ASR47 | 0698-2343 | 7 | RESISTOR 50 .1% .125W | 24480 | 0698-2343 | |
| ASR48 | 0757-0280 | 3 | RESISTOR 1K 1% .125W F TC0+100 | 24546 | C4=1/8-T0-1001-F | |
| ASR49 | 0698-4479 | 4 | RESISTOR 14K 1% .125W F TC0+100 | 24546 | C4=1/8-T0-1402-F | |
| ASR50 | 0698-3157 | 3 | RESISTOR 19.6K 1% .125W F TC0+100 | 24546 | C4=1/8-T0-1962-F | |
| ASR51 | 0698-3436 | 3 | RESISTOR 147 1% .125W F TC0+100 | 24546 | C4=1/8-T0-147R-F | |
| ASR52 | 0698-3436 | 3 | RESISTOR 147 1% .125W F TC0+100 | 24546 | C4=1/8-T0-147R-F | |
| ASR53 | 0698-3436 | 3 | RESISTOR 147 1% .125W F TC0+100 | 24546 | C4=1/8-T0-147R-F | |
| ASR54 | 0698-3154 | 0 | RESISTOR 4.22K 1% .125W F TC0+100 | 24546 | C4=1/8-T0-4221-F | |
| ASR55 | 0757-0280 | 3 | RESISTOR 1K 1% .125W F TC0+100 | 24546 | C4=1/8-T0-1001-F | |
| ASR56 | 0698-4479 | 4 | RESISTOR 14K 1% .125W F TC0+100 | 24546 | C4=1/8-T0-1402-F | |
| ASR57 | 0698-3157 | 3 | RESISTOR 19.6K 1% .125W F TC0+100 | 24546 | C4=1/8-T0-1962-F | |
| ASR58 | 0698-3436 | 3 | RESISTOR 147 1% .125W F TC0+100 | 24546 | C4=1/8-T0-147R-F | |
| ASR59 | 0698-3436 | 3 | RESISTOR 147 1% .125W F TC0+100 | 24546 | C4=1/8-T0-147R-F | |
| ASR60 | 0698-3436 | 3 | RESISTOR 147 1% .125W F TC0+100 | 24546 | C4=1/8-T0-147R-F | |
| ASR61 | 0757-0442 | 9 | RESISTOR 10K 1% .125W F TC0+100 | 24546 | C4=1/8-T0-1002-F | |
| ASR62 | 1810-0207 | 1 | NETWORK-RES 6-81P22.0K OHM X 7 | 01121 | 208A223 | |
| ASR63 | 0698-3444 | 1 | RESISTOR 316 1% .125W F TC0+100 | 24546 | C4=1/8-T0-316R-F | |
| ASR64 | 0698-3436 | 3 | RESISTOR 147 1% .125W F TC0+100 | 24546 | C4=1/8-T0-147R-F | |
| ASR65 | 0698-3444 | 1 | RESISTOR 316 1% .125W F TC0+100 | 24546 | C4=1/8-T0-316R-F | |
| ASR66 | 0698-3444 | 1 | RESISTOR 316 1% .125W F TC0+100 | 24546 | C4=1/8-T0-316R-F | |
| ASR67 | 0698-3436 | 3 | RESISTOR 147 1% .125W F TC0+100 | 24546 | C4=1/8-T0-147R-F | |
| ASR68 | 0698-3444 | 1 | RESISTOR 316 1% .125W F TC0+100 | 24546 | C4=1/8-T0-316R-F | |
| ASR69 | 0698-3444 | 1 | RESISTOR 316 1% .125W F TC0+100 | 24546 | C4=1/8-T0-316R-F | |
| ASR70 | 0698-3436 | 3 | RESISTOR 147 1% .125W F TC0+100 | 24546 | C4=1/8-T0-147R-F | |
| ASR71 | 0698-3444 | 1 | RESISTOR 316 1% .125W F TC0+100 | 24546 | C4=1/8-T0-316R-F | |
| ASR72 | 0757-0401 | 0 | RESISTOR 100 1% .125W F TC0+100 | 24546 | C4=1/8-T0-101-F | |
| ASR73 | 0757-0280 | 3 | RESISTOR 1K 1% .125W F TC0+100 | 24546 | C4=1/8-T0-1001-F | |
| ASR74 | 0683-5615 | 1 | RESISTOR 560 5% .25W FC TC=400/+600 | 01121 | CB5615 | |
| ASR75 | 0683-5615 | 1 | RESISTOR 560 5% .25W FC TC=400/+600 | 01121 | CB5615 | |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|--|----------|------------------|
| ASR76 | 0683-5615 | 1 | | RESISTOR 560 5% .25W FC TC=400/+600 | 01121 | CB5615 |
| ASR77 | 0683-5615 | 1 | | RESISTOR 560 5% .25W FC TC=400/+600 | 01121 | CB5615 |
| ASR78 | 0683-5615 | 1 | | RESISTOR 560 5% .25W FC TC=400/+600 | 01121 | CB5615 |
| ASR79 | 0683-5615 | 1 | | RESISTOR 560 5% .25W FC TC=400/+600 | 01121 | CB5615 |
| ASR80 | 0683-3315 | 6 | 4 | RESISTOR 330 5% .25W FC TC=400/+600 | 01121 | |
| ASR81 | 0683-5615 | 1 | | RESISTOR 560 5% .25W FC TC=400/+600 | 01121 | CB5615 |
| ASR82 | 0683-5615 | 1 | | RESISTOR 560 5% .25W FC TC=400/+600 | 01121 | CB5615 |
| ASR83 | 0683-5615 | 1 | | RESISTOR 560 5% .25W FC TC=400/+600 | 01121 | CB5615 |
| ASR84 | 0683-5615 | 1 | | RESISTOR 560 5% .25W FC TC=400/+600 | 01121 | CB5615 |
| ASR85 | 0683-5615 | 1 | | RESISTOR 560 5% .25W FC TC=400/+600 | 01121 | CB5615 |
| ASR86 | 0683-5615 | 1 | | RESISTOR 560 5% .25W FC TC=400/+600 | 01121 | CB5615 |
| ASR87 | 0683-5615 | 1 | | RESISTOR 560 5% .25W FC TC=400/+600 | 01121 | CB5615 |
| ASR88 | 0683-5615 | 1 | | RESISTOR 560 5% .25W FC TC=400/+600 | 01121 | CB5615 |
| ASR89 | 0683-3315 | 6 | | RESISTOR 330 5% .25W FC TC=400/+600 | 01121 | |
| ASR90 | 0698-0082 | 7 | | RESISTOR 464 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=4640=F |
| ASR91 | 0757-0463 | 2 | | RESISTOR 121 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=121R=F |
| ASR92 | 0757-0442 | 9 | | RESISTOR 10K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1002=F |
| ASR93 | 0757-0444 | 1 | 4 | RESISTOR 12.1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=121R=F |
| ASR94 | 0698-3155 | 1 | | RESISTOR 4.64K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=4641=F |
| ASR95 | 0683-5615 | 1 | | RESISTOR 560 5% .25W FC TC=400/+600 | 01121 | CB5615 |
| ASR96 | 0757-0316 | 6 | 2 | RESISTOR 42.2 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=42R2=F |
| ASR97 | 0698-0082 | 7 | | RESISTOR 464 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=4640=F |
| ASR98 | 0757-0403 | 2 | | RESISTOR 121 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=121R=F |
| ASR99 | 0757-0442 | 9 | | RESISTOR 10K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1002=F |
| ASR100 | 0757-0444 | 1 | | RESISTOR 12.1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=121R=F |
| ASR101 | 0698-3155 | 1 | | RESISTOR 4.64K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=4641=F |
| ASR102 | 0757-0439 | 4 | | RESISTOR 4.81K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=4811=F |
| ASR103 | 0757-0440 | 7 | 3 | RESISTOR 7.5K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=7501=F |
| ASR104 | 0698-0084 | 9 | | RESISTOR 2.15K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=2151=F |
| ASR105 | 0757-0444 | 1 | | RESISTOR 12.1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=121R=F |
| ASR106 | 0757-0444 | 1 | | RESISTOR 12.1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=121R=F |
| ASR107 | 0698-0066 | 9 | | RESISTOR 2.15K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=2151=F |
| ASR108 | 0757-0440 | 7 | | RESISTOR 7.5K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=7501=F |
| ASR109 | 0757-0440 | 7 | | RESISTOR 7.5K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=7501=F |
| ASR110 | 0757-0442 | 9 | | RESISTOR 10K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1002=F |
| ASR111 | 0757-0442 | 9 | | RESISTOR 10K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1002=F |
| ASR112 | 0757-0279 | 0 | | RESISTOR 3.16K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=3161=F |
| ASR113 | 0757-0447 | 4 | 1 | RESISTOR 16.2K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=162R=F |
| ASR114 | 0698-3158 | 4 | 2 | RESISTOR 23.7K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=237R=F |
| ASR115 | 0698-3158 | 4 | | RESISTOR 23.7K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=237R=F |
| ASR116 | 0698-4158 | 1 | 2 | RESISTOR 100K -1% .125W F TC=0/+25 | 28480 | |
| ASR117 | 0698-4158 | 1 | | RESISTOR 100K -1% .125W F TC=0/+25 | 28480 | |
| ASR118 | 0757-0279 | 0 | | RESISTOR 3.16K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=3161=F |
| ASR119 | 0757-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001=F |
| ASR120 | 2100-3350 | 5 | 1 | RESISTOR-YMHR 200 10% C SIDE=ADJ 1=TRN | 28480 | 2100-3350 |
| ASR121 | 0698-3158 | 1 | | RESISTOR 4.64K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=4641=F |
| ASR122 | 0698-3158 | 1 | | RESISTOR 4.64K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=4641=F |
| ASR123 | 0698-3158 | 1 | | RESISTOR 4.64K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=4641=F |
| ASR124 | 0698-6943 | 3 | | RESISTOR 20K 1% .125W F TC=0/+100 | 24546 | |
| ASR125 | 0698-6943 | 3 | | RESISTOR 20K -1% .125W F TC=0/+100 | 24546 | |
| ASR126 | 0757-0443 | 0 | 1 | RESISTOR 11K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1102=F |
| ASR127 | 0757-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001=F |
| ASR128 | 0757-0482 | 7 | 1 | RESISTOR 9.1K 1% .125W F TC=0/+100 | 24546 | 0757-0482 |
| ASR129 | 0698-3158 | 8 | | RESISTOR 17.8K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=178R=F |
| ASR130 | 0698-3158 | 1 | | RESISTOR 4.64K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=4641=F |
| ASR131 | 0698-3158 | 1 | | RESISTOR 4.64K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=4641=F |
| ASR132 | 0683-0275 | 9 | | RESISTOR 2.7 5% .25W FC TC=400/+500 | 01121 | CB2755 |
| ASR133 | 0683-0275 | 9 | | RESISTOR 2.7 5% .25W FC TC=400/+500 | 01121 | CB2755 |
| ASR134 | 0757-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001=F |
| ASR135 | 0757-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001=F |
| ASR136 | 0757-0442 | 9 | | RESISTOR 10K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1002=F |
| ASR137 | 0757-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001=F |
| ASR138 | 0757-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001=F |
| ASR139 | 0757-0442 | 9 | | RESISTOR 10K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1002=F |
| AS71 | 9100-0822 | 7 | | TRANSFORMER:PULSE(11307) | 28480 | 9100-0822 |
| AS72 | 9100-0822 | 7 | | TRANSFORMER:PULSE(11307) | 28480 | 9100-0822 |
| ASU1 | 1820-0817 | 8 | 6 | IC PF ECL D=M/S DUAL | 04713 | MC10131P |
| ASU2 | 1820-0808 | 7 | 4 | IC GATE ECL NOR DUAL 3=INP | 04713 | MC10111P |
| ASU3 | 1820-0808 | 7 | | IC GATE ECL NOR DUAL 3=INP | 04713 | MC10111P |
| ASU4 | 1820-0817 | 6 | | IC PF ECL D=M/S DUAL | 04713 | MC10131P |
| ASU5 | 1820-0809 | 8 | 1 | IC RCVR ECL LINE RCVR QUAD 2=INP | 04713 | MC10151P |
| ASU6 | 1820-0817 | 8 | | IC PF ECL D=M/S DUAL | 04713 | MC10131P |
| ASU7 | 1820-0808 | 7 | | IC GATE ECL NOR DUAL 3=INP | 04713 | MC10111P |
| ASU8 | 1820-0808 | 7 | | IC GATE ECL NOR DUAL 3=INP | 04713 | MC10111P |
| ASU9 | 1820-0817 | 8 | | IC PF ECL D=M/S DUAL | 04713 | MC10131P |
| ASU10 | 1820-0806 | 5 | 1 | IC GATE ECL OR-NOR DUAL 4=3=INP | 04713 | MC10109P |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|------------------------|----------------|-----|-----|--|----------|--------------------|
| ASU11 | 1826-0013 | 8 | 2 | IC OP AMP LOW-NOISE TO-99 | 06665 | 888741CJ |
| ASU12 | 1826-0013 | 8 | | IC OP AMP LOW-NOISE TO-99 | 06665 | 888741CJ |
| ASU13 | 1826-0136 | 8 | | IC COMPARTOR GP QUAD 14-DIP-P | 04713 | MLM339P |
| ASU14 | 1826-1195 | 7 | 1 | IC FF TTL L8 D-TYPE POS-EDGE-TRIG COM | 01295 | 8N74L8273N |
| ASU15 | 1826-0136 | 8 | | IC COMPARTOR GP QUAD 14-DIP-P | 04713 | MLM339P |
| ASU16 | 1826-0035 | 4 | 1 | IC OP AMP LOW-DRIFT TO-99 | 27014 | LM308AH |
| ASU17 | 1826-0081 | 0 | 1 | IC OP AMP HB TO-99 | 27014 | LM318H |
| ASU18 | 1826-0319 | 7 | | IC OP AMP TO-99 | 27014 | LF356H |
| ASU19 | 1820-1730 | 6 | | IC FF TTL L8 D-TYPE POS-EDGE-TRIG COM | 01295 | 8N74L8273N |
| ASU20 | 1820-1730 | 6 | | IC FF TTL L8 D-TYPE POS-EDGE-TRIG COM | 01295 | 8N74L8273N |
| ASU21 | 1820-1730 | 6 | | IC FF TTL L8 D-TYPE POS-EDGE-TRIG COM | 01295 | 8N74L8273N |
| ASU22 | 1826-0210 | 7 | 1 | IC COMPARTOR HB 14-DIP-P | 27014 | LM361N |
| AS MISCELLANEOUS PARTS | | | | | | |
| | 04275-00614 | 7 | 1 | PLATE-SHIELD | 26480 | 04275-00614 |
| A6 | 04275-66506 | 4 | 1 | OSCILLATOR BOARD ASSEMBLY | 26480 | 04275-66506 |
| | 04275-26506 | 0 | | PC BOARD, BLANK | 26480 | 04275-26506 |
| A6C1 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 26480 | 0160-2055 |
| A6C2 | 0190-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 26480 | 0190-0121 |
| A6C3 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 26480 | 0160-2055 |
| A6C4 | 0160-0127 | 2 | | CAPACITOR-FXD 1UF +20% 25VDC CER | 26480 | 0160-0127 |
| A6C5 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 26480 | 0160-2055 |
| A6C6 | 0160-2217 | 4 | | CAPACITOR-FXD 910PF +-5% 300VDC MICA | 26480 | |
| A6C7 | 0160-2055 | 4 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 26480 | 0160-2055 |
| A6C8 | 0160-2203 | 9 | | CAPACITOR-FXD 91PF +-5% 300VDC MICA | 72136 | |
| A6C9 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 26480 | 0160-2055 |
| A6C11 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 26480 | 0150-0121 |
| A6C12 | 0190-0374 | 3 | 7 | CAPACITOR-FXD 10UF+-10% 20VDC TA | 56289 | 150D106X9020B2 |
| A6C13 | 0180-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 26480 | 0180-1085 |
| A6C14 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 26480 | 0160-2055 |
| A6C15 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 26480 | 0160-2055 |
| A6C16 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 26480 | 0160-2055 |
| A6C17 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 26480 | 0160-2055 |
| A6C18 | 0180-0376 | 4 | 4 | CAPACITOR-FXD .47UF+-10% 35VDC TA | 56289 | 150D474X9035A2 |
| A6C19 | 0180-0376 | 5 | | CAPACITOR-FXD .47UF+-10% 35VDC TA | 56289 | 150D474X9035A2 |
| A6C20 | 0180-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 26480 | 0180-1085 |
| A6C21 | 0180-1050 | 4 | 3 | CAPACITOR-FXD 470uF +50-10% 16VDC | 26480 | 0180-1050 |
| A6C22 | 0180-1085 | 4 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 26480 | 0180-1085 |
| A6C23 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 26480 | 0160-2055 |
| A6C24 | 0160-0127 | 2 | | CAPACITOR-FXD 1UF +20% 25VDC CER | 26480 | 0160-0127 |
| A6C25 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 26480 | 0160-2055 |
| A6C26 | 0160-2217 | 4 | | CAPACITOR-FXD 910PF +-5% 300VDC MICA | 26480 | |
| A6C27 | 0160-2055 | 4 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 26480 | 0160-2055 |
| A6C28 | 0160-2203 | 9 | | CAPACITOR-FXD 91PF +-5% 300VDC MICA | 72136 | |
| A6C29 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 26480 | 0160-2055 |
| A6C31 | 0180-0374 | 3 | | CAPACITOR-FXD 10UF+-10% 20VDC TA | 56289 | 150D106X9020B2 |
| A6C32 | 0180-1050 | 4 | | CAPACITOR-FXD 470uF +50-10% 16VDC | 26480 | 0180-1050 |
| A6C33 | 0160-0127 | 2 | | CAPACITOR-FXD 1UF +20% 25VDC CER | 26480 | 0160-0127 |
| A6C34 | 0180-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 26480 | 0180-1085 |
| A6C35 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 26480 | 0160-2055 |
| A6C36 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 26480 | 0160-2055 |
| A6C37 | 0160-0127 | 2 | | CAPACITOR-FXD 1UF +20% 25VDC CER | 26480 | 0160-0127 |
| A6C38 | 0160-0127 | 2 | | CAPACITOR-FXD 1UF +20% 25VDC CER | 26480 | 0160-0127 |
| A6C39 | 0180-0376 | 5 | | CAPACITOR-FXD .47UF+-10% 35VDC TA | 56289 | 150D474X9035A2 |
| A6C40 | 0180-0376 | 5 | | CAPACITOR-FXD .47UF+-10% 35VDC TA | 56289 | 150D474X9035A2 |
| A6C41 | 0180-0374 | 3 | | CAPACITOR-FXD 10UF+-10% 20VDC TA | 56289 | 150D106X9020B2 |
| A6C42 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 26480 | 0160-2055 |
| A6C43 | 0180-1085 | 5 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 26480 | 0180-1085 |
| A6C44 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 26480 | 0150-0121 |
| A6C45 | 0180-1050 | 4 | | CAPACITOR-FXD 470uF +50-10% 16VDC | 26480 | 0180-1050 |
| A6C46 | 0140-0208 | 8 | 2 | CAPACITOR-FXD 680PF +-5% 300VDC MICA | 72136 | DM15F681J0300HV1CR |
| A6C47 | 0140-0197 | 4 | | CAPACITOR-FXD 180PF +-5% 300VDC MICA | 72136 | DM15F181J0300HV1CR |
| A6C48 | 0140-0208 | 8 | | CAPACITOR-FXD 680PF +-5% 300VDC MICA | 72136 | DM15F681J0300HV1CR |
| A6C49 | 0160-2206 | 2 | | CAPACITOR-FXD 160PF +-5% 300VDC MICA | 26480 | 0160-2206 |
| A6C50 | 0160-2200 | 0 | 1 | CAPACITOR-FXD 390PF +-5% 300VDC MICA | 72136 | DM15F391J0300HV1CR |
| A6C51 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 26480 | 0160-2055 |
| A6C52 | 0180-1085 | 4 | | CAPACITOR-FXD 4.7uF 20% 16VDC | 26480 | 0180-1085 |
| A6C53 | 0160-2307 | 5 | | CAPACITOR-FXD 47PF +-5% 300VDC MICA | 26480 | 0160-2307 |
| A6C54 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 26480 | 0150-0121 |
| A6C55 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 26480 | 0150-0121 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|--------|-----|--|-------------|-----------------|
| A6C56 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A6C57 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A6C58 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A6C59 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A6C60 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A6C61 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A6C62 | 0160-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0160-0121 |
| A6C63 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A6C64 | 0160-2307 | 4 | | CAPACITOR-FXD 47PF +-5% 300VDC MICA | 28480 | 0160-2307 |
| A6C65 | 0160-2259 | 5 | | CAPACITOR-FXD 12PF +-5% 500VDC CER 0+-30 | 28480 | 0160-2259 |
| A6C66 | 0160-2249 | 3 | | CAPACITOR-FXD 4.7PF +-25PF 500VDC CER | 28480 | 0160-2249 |
| A6C67 | 0160-2204 | 0 | | CAPACITOR-FXD 100PF +-5% 300VDC MICA | 28480 | 0160-2204 |
| A6C68 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A6C69 | 0160-2204 | 0 | | CAPACITOR-FXD 100PF +-5% 300VDC MICA | 28480 | 0160-2204 |
| A6C70 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A6C71 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A6C72 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A6C73 | 0160-0374 | 3 | | CAPACITOR-FXD 10UF+-10% 20VDC TA | 56289 | 150D106X902082 |
| A6C74 | 0160-0374 | 3 | | CAPACITOR-FXD 10UF+-10% 20VDC TA | 56289 | 150D106X902082 |
| A6C75 | 0160-0374 | 3 | | CAPACITOR-FXD 10UF+-10% 20VDC TA | 56289 | 150D106X902082 |
| A6C76 | 0160-0374 | 3 | | CAPACITOR-FXD 10UF+-10% 20VDC TA | 56289 | 150D106X902082 |
| A6CP1 | 1990-0104 | 5 | | PHOTOCELL LAMP | 28480 | 1990-0104 |
| A6CR1 | 1901-0518 | 8 | | DIODE-SCHOTTKY | 28480 | 1901-0518 |
| A6CR2 | 1901-0518 | 8 | | DIODE-SCHOTTKY | 28480 | 1901-0518 |
| A6CR3 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 28480 | 1901-0040 |
| A6CR4 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 28480 | 1901-0040 |
| A6CR5 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 28480 | 1901-0040 |
| A6CR6 | 1902-0041 | 8 | | DIODE-ZNR 5.11V 5% DO-7 PDB,4W TC=,009% | 28480 | 1902-0041 |
| A6CR7 | 1901-0518 | 8 | | DIODE-SCHOTTKY | 28480 | 1901-0518 |
| A6CR8 | 1901-0518 | 8 | | DIODE-SCHOTTKY | 28480 | 1901-0518 |
| A6CR9 | 1901-0518 | 8 | | DIODE-SCHOTTKY | 28480 | 1901-0518 |
| A6CR10 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 28480 | 1901-0040 |
| A6CR11 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 28480 | 1901-0040 |
| A6CR12 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 28480 | 1901-0040 |
| A6CR13 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 28480 | 1901-0040 |
| A6CR14 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 28480 | 1901-0040 |
| A6CR15 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 28480 | 1901-0040 |
| A6CR16 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 28480 | 1901-0040 |
| A6CR17 | 1901-0040 | 1 | | DIODE-SWITCHING 30V 50MA 2NS DO-35 | 28480 | 1901-0040 |
| A6CR18 | 1902-3082 | 9 | | DIODE-ZNR 4.64V 5% DO-7 PDB,4W TC=,023% | 28480 | 1902-3082 |
| A6CR19 | 1902-3082 | 9 | | DIODE-ZNR 4.64V 5% DO-7 PDB,4W TC=,023% | 28480 | 1902-3082 |
| A6CR20 | 1902-3082 | 9 | | DIODE-ZNR 4.64V 5% DO-7 PDB,4W TC=,023% | 28480 | 1902-3082 |
| A6CR21 | 1902-3082 | 9 | | DIODE-ZNR 4.64V 5% DO-7 PDB,4W TC=,023% | 28480 | 1902-3082 |
| A6CR22 | 1902-3082 | 9 | | DIODE-ZNR 4.64V 5% DO-7 PDB,4W TC=,023% | 28480 | 1902-3082 |
| A6CR23 | 1902-3082 | 9 | | DIODE-ZNR 4.64V 5% DO-7 PDB,4W TC=,023% | 28480 | 1902-3082 |
| A6CR24 | 1902-3082 | 9 | | DIODE-ZNR 4.64V 5% DO-7 PDB,4W TC=,023% | 28480 | 1902-3082 |
| A6CR25 | 1902-3082 | 9 | | DIODE-ZNR 4.64V 5% DO-7 PDB,4W TC=,023% | 28480 | 1902-3082 |
| A6J1 | 1250-0257 | 1 | | CONNECTOR-RF SMB M PC 50-OHM | 28480 | 1250-0257 |
| A6J2 | 1250-0257 | 1 | | CONNECTOR-RF SMB M PC 50-OHM | 28480 | 1250-0257 |
| A6L1 | 9140-0129 | 1 | | COIL-MLD 220UH 5% Q=65 .155DX,375LG-NOM | 28480 | 9140-0129 |
| A6L2 | 9140-0129 | 1 | | COIL-MLD 220UH 5% Q=65 .155DX,375LG-NOM | 28480 | 9140-0129 |
| A6L3 | 9140-0129 | 1 | | COIL-MLD 220UH 5% Q=65 .155DX,375LG-NOM | 28480 | 9140-0129 |
| A6L4 | 9100-1629 | 4 | | COIL-MLD 47UH 5% Q=55 .155DX,375LG-NOM | 28480 | 9100-1629 |
| A6L5 | 9140-0114 | 4 | | COIL-MLD 10UH 10% Q=55 .155DX,375LG-NOM | 28480 | 9140-0114 |
| A6L6 | 9100-1629 | 4 | | COIL-MLD 47UH 5% Q=55 .155DX,375LG-NOM | 28480 | 9100-1629 |
| A6L7 | 9140-0179 | 1 | | COIL-MLD 22UH 10% Q=75 .155DX,375LG-NOM | 28480 | 9140-0179 |
| A6L8 | 9100-1629 | 4 | | COIL-MLD 47UH 5% Q=55 .155DX,375LG-NOM | 28480 | 9100-1629 |
| A6L9 | 9140-0114 | 4 | | COIL-MLD 10UH 10% Q=55 .155DX,375LG-NOM | 28480 | 9140-0114 |
| A6L10 | 9100-2254 | 3 | 2 | COIL-MLD 390NH 10% Q=35 .095DX,25LG-NOM | 28480 | 9100-2254 |
| A6L11 | 9100-2254 | 3 | | COIL-MLD 390NH 10% Q=35 .095DX,25LG-NOM | 28480 | 9100-2254 |
| A6L12 | 9100-1786 | 6 | | CHOKE-WIDE BAND ZMAX=680 OHMS 180 MHZ | 02114 | VK200 20/48 |
| A6L13 | 9140-0129 | 1 | | COIL-MLD 220UH 5% Q=65 .155DX,375LG-NOM | 28480 | 9140-0129 |
| A6L14 | 9140-0129 | 1 | | COIL-MLD 220UH 5% Q=65 .155DX,375LG-NOM | 28480 | 9140-0129 |
| A6L15 | 9100-3139 | 5 | 1 | COIL 75UH 15% 5DX,875LG-NOM | 28480 | 9100-3139 |
| A6L16 | 9140-0129 | 1 | | COIL-MLD 220UH 5% Q=65 .155DX,375LG-NOM | 28480 | 9140-0129 |
| A6L17 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 28480 | 9170-0029 |
| A6L18 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 28480 | 9170-0029 |
| A6L19 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 28480 | 9170-0029 |
| A6L20 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 28480 | 9170-0029 |
| A6L21 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 28480 | 9170-0029 |
| A6L22 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 28480 | 9170-0029 |
| A6L23 | 9170-0029 | 3 | | CORE-SHIELDING BEAD | 28480 | 9170-0029 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|---|--------------------------------------|------------------|--------------------|
| A661 | 1854-0215 | 1 | 4 | TRANSISTOR NPN SI PD=350mW FT=300MHZ | 04713 | 2N3904 |
| A662 | 1854-0215 | 1 | | TRANSISTOR NPN SI PD=350mW FT=300MHZ | 04713 | 2N3904 |
| A663 | 1855-0081 | 1 | | TRANSISTOR J-PEY N-CHAN D=MODE SI | 01295 | 2N5245 |
| A664 | 1854-0129 | 6 | | TRANSISTOR NPN SI PD=300mW FT=30MHZ | 28480 | 1854-0129 |
| A665 | 1854-0129 | 6 | | TRANSISTOR NPN SI PD=300mW FT=30MHZ | 28480 | 1854-0129 |
| A666 | 1854-0215 | 1 | | TRANSISTOR NPN SI PD=350mW FT=300MHZ | 04713 | 2N3904 |
| A667 | 1854-0215 | 1 | TRANSISTOR NPN SI PD=350mW FT=300MHZ | 04713 | 2N3904 | |
| A668 | 1854-0215 | 1 | TRANSISTOR NPN SI PD=350mW FT=300MHZ | 04713 | 2N3904 | |
| A669 | 1855-0081 | 1 | TRANSISTOR J-PEY N-CHAN D=MODE SI | 01295 | 2N5245 | |
| A6610 | 1854-0129 | 6 | TRANSISTOR NPN SI PD=300mW FT=30MHZ | 28480 | 1854-0129 | |
| A6611 | 1854-0129 | 6 | TRANSISTOR NPN SI PD=300mW FT=30MHZ | 28480 | 1854-0129 | |
| A6612 | 1854-0215 | 1 | TRANSISTOR NPN SI PD=350mW FT=300MHZ | 04713 | 2N3904 | |
| A6613 | 1854-0215 | 1 | TRANSISTOR NPN SI PD=350mW FT=300MHZ | 04713 | 2N3904 | |
| A6614 | 1855-0036 | 2 | TRANSISTOR PNP SI PD=310mW FT=250MHZ | 28480 | 1855-0036 | |
| A6615 | 1855-0091 | 3 | TRANSISTOR J-PEY N-CHAN D=MODE SI | 28480 | 1855-0091 | |
| A6616 | 1855-0036 | 2 | TRANSISTOR PNP SI PD=310mW FT=250MHZ | 28480 | 1855-0036 | |
| A6617 | 1855-0091 | 3 | TRANSISTOR J-PEY N-CHAN D=MODE SI | 28480 | 1855-0091 | |
| A6618 | 1855-0091 | 3 | TRANSISTOR J-PEY N-CHAN D=MODE SI | 28480 | 1855-0091 | |
| A6619 | 1854-0215 | 1 | TRANSISTOR NPN SI PD=350mW FT=300MHZ | 04713 | 2N3904 | |
| A6620 | 1854-0369 | 0 | TRANSISTOR NPN 2N4922 SI PD=30W FT=3MHZ | 04713 | 2N4922 | |
| A6621 | 1855-0084 | 0 | TRANSISTOR PNP 2N4918 SI PD=30W FT=3MHZ | 04713 | 2N4918 | |
| A6R1 | 0683-4715 | 0 | 2 | RESISTOR 470 5% .25W FC TC=400/+600 | 01121 | CB4715 |
| A6R2 | 0757-0419 | 0 | | RESISTOR 681 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=681R=F |
| A6R3 | 0698-3440 | 7 | | RESISTOR 196 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=196R=F |
| A6R4 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A6R5 | 0683-2235 | 5 | | RESISTOR 22K 5% .25W FC TC=400/+800 | 01121 | CB2235 |
| A6R6 | 0683-6815 | 5 | | RESISTOR 680 5% .25W FC TC=400/+600 | 01121 | CB6815 |
| A6R7 | 0683-6815 | 5 | RESISTOR 680 5% .25W FC TC=400/+600 | 01121 | CB6815 | |
| A6R8 | 0683-4725 | 2 | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 | |
| A6R9 | 0757-0278 | 9 | RESISTOR 1.78K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1781=F | |
| A6R10 | 0683-1015 | 7 | RESISTOR 100 5% .25W FC TC=400/+500 | 01121 | CB1015 | |
| A6R11 | 0683-2235 | 5 | 3 | RESISTOR 22K 5% .25W FC TC=400/+800 | 01121 | CB2235 |
| A6R12 | 0683-4745 | 6 | | RESISTOR 470K 5% .25W FC TC=800/+900 | 01121 | CB4745 |
| A6R13 | 0683-1015 | 7 | | RESISTOR 100 5% .25W FC TC=400/+500 | 01121 | CB1015 |
| A6R14 | 0683-4745 | 6 | | RESISTOR 470K 5% .25W FC TC=800/+900 | 01121 | CB4745 |
| A6R15 | 0683-1015 | 7 | | RESISTOR 100 5% .25W FC TC=400/+500 | 01121 | CB1015 |
| A6R16 | 0757-0465 | 6 | | RESISTOR 100K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=100K=F |
| A6R17 | 0757-0465 | 6 | RESISTOR 100K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=100K=F | |
| A6R18 | 0683-4735 | 4 | RESISTOR 47K 5% .25W FC TC=400/+800 | 01121 | CB4735 | |
| A6R19 | 0683-4735 | 4 | RESISTOR 47K 5% .25W FC TC=400/+800 | 01121 | CB4735 | |
| A6R20 | 0757-0465 | 6 | RESISTOR 100K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=100K=F | |
| A6R21 | 0757-0465 | 6 | RESISTOR 100K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=100K=F | |
| A6R22 | 0683-2235 | 5 | 1 | RESISTOR 22K 5% .25W FC TC=400/+800 | 01121 | CB2235 |
| A6R23 | 0698-3132 | 4 | | RESISTOR 261 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=2610=F |
| A6R24 | 0698-3443 | 8 | | RESISTOR 26.7 1% .125W F TC=0/+100 | 03868 | PM55=1/8-T0=28R7=F |
| A6R25 | 0757-0419 | 0 | | RESISTOR 681 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=681R=F |
| A6R26 | 0698-3440 | 7 | | RESISTOR 196 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=196R=F |
| A6R27 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A6R28 | 0683-2235 | 5 | RESISTOR 22K 5% .25W FC TC=400/+800 | 01121 | CB2235 | |
| A6R29 | 0683-6815 | 5 | RESISTOR 680 5% .25W FC TC=400/+600 | 01121 | CB6815 | |
| A6R30 | 0683-6815 | 5 | RESISTOR 680 5% .25W FC TC=400/+600 | 01121 | CB6815 | |
| A6R31 | 0683-2235 | 5 | 2 | RESISTOR 22K 5% .25W FC TC=400/+800 | 01121 | CB2235 |
| A6R32 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A6R33 | 0698-3444 | 1 | | RESISTOR 316 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=316R=F |
| A6R34 | 0683-1015 | 7 | | RESISTOR 100 5% .25W FC TC=400/+500 | 01121 | CB1015 |
| A6R35 | 0683-2235 | 5 | | RESISTOR 22K 5% .25W FC TC=400/+800 | 01121 | CB2235 |
| A6R36 | 0683-2235 | 5 | | RESISTOR 22K 5% .25W FC TC=400/+800 | 01121 | CB2235 |
| A6R37 | 0683-4745 | 6 | 7 | RESISTOR 470K 5% .25W FC TC=800/+900 | 01121 | CB4745 |
| A6R38 | 0683-1015 | 7 | | RESISTOR 100 5% .25W FC TC=400/+500 | 01121 | CB1015 |
| A6R39 | 0757-0278 | 9 | | RESISTOR 1.78K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1781=F |
| A6R40 | 0683-1015 | 7 | | RESISTOR 100 5% .25W FC TC=400/+500 | 01121 | CB1015 |
| A6R41 | 0757-0465 | 6 | | RESISTOR 100K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=100K=F |
| A6R42 | 0757-0465 | 6 | | RESISTOR 100K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=100K=F |
| A6R43 | 0683-4735 | 4 | 4 | RESISTOR 47K 5% .25W FC TC=400/+800 | 01121 | CB4735 |
| A6R44 | 0683-4735 | 4 | | RESISTOR 47K 5% .25W FC TC=400/+800 | 01121 | CB4735 |
| A6R45 | 0757-0465 | 6 | | RESISTOR 100K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=100K=F |
| A6R46 | 0757-0465 | 6 | | RESISTOR 100K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=100K=F |
| A6R47 | 0683-1005 | 5 | | RESISTOR 10 5% .25W FC TC=400/+500 | 01121 | CB1005 |
| A6R48 | 0683-1005 | 5 | | RESISTOR 10 5% .25W FC TC=400/+500 | 01121 | CB1005 |
| A6R49 | 0683-2225 | 3 | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 | |
| A6R50 | 0757-0442 | 9 | RESISTOR 10K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=100K=F | |
| A6R51 | 0683-1205 | 7 | RESISTOR 12 5% .25W FC TC=400/+500 | 01121 | CB1205 | |
| A6R52 | 0683-1205 | 7 | 6 | RESISTOR 12 5% .25W FC TC=400/+500 | 01121 | CB1205 |
| A6R53 | 0683-2715 | 6 | | RESISTOR 270 5% .25W FC TC=400/+600 | 01121 | CB2715 |
| A6R54 | 0683-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A6R55 | 0683-1205 | 7 | | RESISTOR 12 5% .25W FC TC=400/+500 | 01121 | CB1205 |
| A6R56 | 0683-1205 | 7 | | RESISTOR 12 5% .25W FC TC=400/+500 | 01121 | CB1205 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|------------------------|----------------|-----|-----|---------------------------------------|----------|-------------------|
| A6R57 | 0683-2715 | 6 | | RESISTOR 270 5% .25W FC TC=400/+600 | 01121 | CB2715 |
| A6R58 | 0683-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A6R59 | 0683-1015 | 7 | | RESISTOR 100 5% .25W FC TC=400/+500 | 01121 | CB1015 |
| A6R60 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A6R61 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A6R62 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A6R63 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A6R64 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A6R65 | 0683-1045 | 3 | | RESISTOR 100K 5% .25W FC TC=400/+800 | 01121 | CB1045 |
| A6R67 | 0683-1045 | 3 | | RESISTOR 100K 5% .25W FC TC=400/+800 | 01121 | CB1045 |
| A6R68 | 0683-2235 | 5 | | RESISTOR 22K 5% .25W FC TC=400/+800 | 01121 | CB2235 |
| A6R69 | 0683-1045 | 3 | | RESISTOR 100K 5% .25W FC TC=400/+800 | 01121 | CB1045 |
| A6R70 | 0683-1045 | 3 | | RESISTOR 100K 5% .25W FC TC=400/+800 | 01121 | CB1045 |
| A6R71 | 0757-0410 | 1 | | RESISTOR 301 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=301R-F |
| A6R72 | 0683-1045 | 3 | | RESISTOR 100K 5% .25W FC TC=400/+800 | 01121 | CB1045 |
| A6R73 | 0683-1045 | 3 | | RESISTOR 100K 5% .25W FC TC=400/+800 | 01121 | CB1045 |
| A6R74 | 0683-1045 | 3 | | RESISTOR 100K 5% .25W FC TC=400/+800 | 01121 | CB1045 |
| A6R75 | 0683-4735 | 4 | | RESISTOR 47K 5% .25W FC TC=400/+800 | 01121 | CB4735 |
| A6R76 | 0683-4715 | 0 | | RESISTOR 470 5% .25W FC TC=400/+600 | 01121 | CB4715 |
| A6R77 | 0683-4705 | 8 | | RESISTOR 47 5% .25W FC TC=400/+500 | 01121 | CB4705 |
| A6R78 | 0757-0379 | 1 | 1 | RESISTOR 12.1 1% .125W F TC=0/+100 | 19701 | MF4C1/8-T0=12R1-F |
| A6R79 | 0698-3444 | 1 | | RESISTOR 316 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=316R-F |
| A6R80 | 0698-0082 | 7 | | RESISTOR 464 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=4640-F |
| A6R81 | 0698-0082 | 7 | | RESISTOR 464 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=4640-F |
| A6R82 | 0683-4715 | 0 | | RESISTOR 470 5% .25W FC TC=400/+600 | 01121 | CB4715 |
| A6R83 | 0683-4715 | 0 | | RESISTOR 470 5% .25W FC TC=400/+600 | 01121 | CB4715 |
| A6R84 | 0683-4715 | 0 | | RESISTOR 470 5% .25W FC TC=400/+600 | 01121 | CB4715 |
| A6R85 | 1810-0203 | 5 | 5 | NETWORK-RES 8-8IP470.0 OHM X 7 | 01121 | 208A471 |
| A6R86 | 1810-0203 | 5 | | NETWORK-RES 8-8IP470.0 OHM X 7 | 01121 | 208A471 |
| A6R87 | 1810-0203 | 5 | | NETWORK-RES 8-8IP470.0 OHM X 7 | 01121 | 208A471 |
| A6R88 | 1810-0305 | 8 | 1 | NETWORK-RES 9-8IP4.7K OHM X 8 | 28480 | 1810-0305 |
| A6R89 | 1810-0269 | 3 | 1 | NETWORK-RES 9-8IP10.0K OHM X 8 | 28480 | 1810-0269 |
| A6R90 | 1810-0203 | 5 | | NETWORK-RES 8-8IP470.0 OHM X 7 | 01121 | 208A471 |
| A6R91 | 1810-0207 | 9 | | NETWORK-RES 8-8IP22.0K OHM X 7 | 01121 | 208A223 |
| A6R92 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A6R93 | 1810-0203 | 5 | | NETWORK-RES 8-8IP470.0 OHM X 7 | 01121 | 208A471 |
| A6R94 | 0683-1515 | 2 | | RESISTOR 150 5% .25W FC TC=400/+600 | 01121 | CB1515 |
| A6R95 | 0757-0316 | 6 | | RESISTOR 42.2 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=42R2-F |
| A6R96 | 0683-8205 | 1 | 1 | RESISTOR 82 5% .25W FC TC=400/+500 | 01121 | CB8205 |
| A6U1 | 1826-0139 | 9 | | IC OP AMP GP DUAL 8-DIP-P | 01928 | CA14588 |
| A6U2 | 1826-0139 | 9 | | IC OP AMP GP DUAL 8-DIP-P | 01928 | CA14588 |
| A6U3 | 1826-0215 | 2 | 1 | IC V RGLTR T0=220 | 04713 | MC7905.2CY |
| A6U4 | 1826-0174 | 2 | 1 | IC COMPARATOR GP QUAD 14-DIP-P | 28480 | 1826-0174 |
| A6U5 | 1820-1730 | 6 | | IC FF TTL L8 D-TYPE POS-EDGE-TRIG COM | 01295 | 8N74LS275N |
| A6U6 | 1820-0802 | 1 | 5 | IC GATE ECL NOR QUAD 2-INP | 04713 | MC10102P |
| A6U7 | 1820-0802 | 1 | | IC GATE ECL NOR QUAD 2-INP | 04713 | MC10102P |
| A6U8 | 1820-0802 | 1 | | IC GATE ECL NOR QUAD 2-INP | 04713 | MC10102P |
| A6U9 | 1820-0817 | 8 | | IC FF ECL D-M/S DUAL | 04713 | MC10131P |
| A6U10 | 1820-0817 | 8 | | IC FF ECL D-M/S DUAL | 04713 | MC10131P |
| A6U11 | 1820-1383 | 5 | 4 | IC CNTR ECL BCD POS-EDGE-TRIG | 04713 | MC10136L |
| A6U12 | 1820-1383 | 5 | | IC CNTR ECL BCD POS-EDGE-TRIG | 04713 | MC10136L |
| A6U13 | 1820-1383 | 5 | | IC CNTR ECL BCD POS-EDGE-TRIG | 04713 | MC10136L |
| A6U14 | 1820-0802 | 1 | | IC GATE ECL NOR QUAD 2-INP | 04713 | MC10102P |
| A6U15 | 1820-1383 | 5 | | IC CNTR ECL BCD POS-EDGE-TRIG | 04713 | MC10136L |
| A6U16 | 1820-1399 | 5 | 1 | IC MUXR/DATA-BEL ECL 4-T0=1-LINE DUAL | 04713 | MC10174P |
| A6U17 | 1820-0802 | 1 | | IC GATE ECL NOR QUAD 2-INP | 04713 | MC10102P |
| A6U18 | 1820-1950 | 2 | 1 | IC GATE ECL OR-NOR 3-INP | 04713 | MC10212P |
| A6Y1 | 0410-0213 | 8 | 1 | CRYSTAL-QUARTZ 80.000MHz +-20ppm | 28480 | 0410-0213 |
| A6Y2 | 0410-0214 | 9 | 1 | CRYSTAL-QUARTZ 32.000MHz +-20ppm | 28480 | 0410-0214 |
| A6 MISCELLANEOUS PARTS | | | | | | |
| | 04275-00615 | 8 | 1 | PLATE-SHIELD | 28480 | 04275-00615 |
| | 04275-00616 | 9 | 2 | PLATE-SHIELD A5 | 28480 | 04275-00616 |
| | 04275-00617 | 0 | 3 | PLATE-SHIELD | 28480 | 04275-00617 |
| OPTION 004 | | | | | | |
| A6Y2 | 0410-0215 | | 1 | CRYSTAL-QUARTZ 24.000 MHz | | |
| A6C67 | 0140-0196 | | 1 | CAPACITOR-FXD 150pF 5% | | |
| A6C69 | 0140-0197 | | 1 | CAPACITOR-FXD 180pF 5% | | |

See introduction to this section for ordering information
 *Indicates factory selected value



Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|--|----------|-----------------|
| A7 | 04275-66507 | 4 | 1 | PERIPHERAL CONTROL BOARD ASSEMBLY | 28480 | 04275-66507 |
| A7 | 04275-66537 | 0 | 1 | PERIPHERAL CONTROL BOARD ASSEMBLY (FOR OPTION 004 ONLY) | 28480 | 04275-66537 |
| A7C1 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A7C2 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 |
| A7C3 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A7C4 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A7C5 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A7C6 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A7C7 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A7C8 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A7C9 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A7C10 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A7C11 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A7C12 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 |
| A7C13 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A7C14 | 0180-0197 | 8 | | CAPACITOR-FXD 2.2UF+/-10% 20VDC TA | 56289 | 150D225X9020A2 |
| A7C15 | 0180-0197 | 8 | | CAPACITOR-FXD 2.2UF+/-10% 20VDC TA | 56289 | 150D225X9020A2 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|--|----------|-----------------|
| A7C16 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A7C17 | 0180-0197 | 8 | | CAPACITOR-FXD 2.2UF+10% 20VDC TA | 56289 | 150D225X9020A2 |
| A7C18 | 0180-0228 | 6 | | CAPACITOR-FXD 22UF+10% 15VDC TA | 56289 | 1500226X9015B2 |
| A7C19 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 |
| A7C20 | 0160-2247 | | | | | |
| A7CR1 | 1902-0041 | 4 | | DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009% | 28480 | 1902-0041 |
| A7J2 | 1200-0608 | 1 | 5 | SOCKET-IC 40-CONT | 28480 | 1200-0608 |
| A7J3 | 1200-0613 | 8 | 1 | SOCKET-IC 28-CONT DIP-SLDR | 28480 | 1200-0613 |
| A7L1 | 9100-1788 | 6 | 6 | CHOKE-WIDE BAND ZMAX=680 OHMS 180 MHZ | 02114 | VK200 20/48 |
| A7L2 | 9100-1788 | 6 | 6 | CHOKE-WIDE BAND ZMAX=680 OHMS 180 MHZ | 02114 | VK200 20/48 |
| A7L3 | 9100-1788 | 6 | 6 | CHOKE-WIDE BAND ZMAX=680 OHMS 180 MHZ | 02114 | VK200 20/48 |
| A7L4 | 9100-1788 | 5 | 5 | COIL 75UH 15% .5DX.875LG-NOM | 28480 | 9100-1788 |
| A7R1 | 1810-0269 | 3 | 15 | NETWORK-RES 9-PIN-SIP .1-PIN-SPCG | 28480 | 1810-0269 |
| A7R2 | 0683-1235 | 3 | 13 | RESISTOR 12K 5% .25W FC TC=-400/+800 | 01121 | CB1235 |
| A7R3 | 0683-6825 | 7 | 1 | RESISTOR 6.8K 5% .25W FC TC=-400/+700 | 01121 | CB6825 |
| A7R4 | 1810-0269 | 3 | 3 | NETWORK-RES 9-PIN-SIP .1-PIN-SPCG | 28480 | 1810-0269 |
| A7R5 | 1810-0269 | 3 | 3 | NETWORK-RES 9-PIN-SIP .1-PIN-SPCG | 28480 | 1810-0269 |
| A7R6 | 1810-0269 | 3 | 3 | NETWORK-RES 9-PIN-SIP .1-PIN-SPCG | 28480 | 1810-0269 |
| A7R7 | 1810-0269 | 3 | 3 | NETWORK-RES 9-PIN-SIP .1-PIN-SPCG | 28480 | 1810-0269 |
| A7R8 | 1810-0269 | 3 | 3 | NETWORK-RES 9-PIN-SIP .1-PIN-SPCG | 28480 | 1810-0269 |
| A7R9 | 0683-5615 | 1 | 6 | RESISTOR 560 5% .25W FC TC=-400/+600 | 01121 | CB5615 |
| A7R10 | 0683-2215 | 1 | 2 | RESISTOR 220 5% .25W FC TC=-400/+600 | 01121 | CB2215 |
| A7R11 | 0683-1825 | 7 | | RESISTOR 1.8K 5% .25W FC TC=-400/+700 | 01121 | CB1825 |
| A7R12 | 0683-2215 | 1 | | RESISTOR 220 5% .25W FC TC=-400/+600 | 01121 | CB2215 |
| A7T1 | 9100-0822 | 7 | 2 | TRANSFORMER, PULSE | 28480 | 9100-0822 |
| A7T2 | 9100-0822 | 7 | 2 | TRANSFORMER, PULSE | 28480 | 9100-0822 |
| A7U1 | 1820-0909 | 9 | 1 | IC MULTR TTL | 01295 | SN74167N |
| A7U2 | 1820-1112 | 8 | | IC FF TTL LS D-TYPE POS-EDGE-TRIG | 01295 | SN74LS74N |
| A7U3 | 1820-1199 | 1 | | IC INV TTL LS HEX 1-INP | 01295 | SN74LS04N |
| A7U4 | 1820-1112 | 8 | | IC FF TTL LS D-TYPE POS-EDGE-TRIG | 01295 | SN74LS74N |
| A7U5 | 1820-1197 | 9 | | IC GATE TTL LS NAND QUAD 2-INP | 01295 | SN74LS00N |
| A7U6 | 1820-1112 | 8 | | IC FF TTL LS D-TYPE POS-EDGE-TRIG | 01295 | SN74LS74N |
| A7U7 | 1820-1201 | 6 | 1 | IC GATE TTL LS AND QUAD 2-INP | 01295 | SN74LS08N |
| A7U8 | 1820-1112 | 8 | | IC FF TTL LS D-TYPE POS-EDGE-TRIG | 01295 | SN74LS74N |
| A7U9 | 1820-1211 | 8 | 1 | IC GATE TTL LS EXCL-OR QUAD 2-INP | 01295 | SN74LS86N |
| A7U10 | 1820-1199 | 1 | | IC INV TTL LS HEX 1-INP | 01295 | SN74LS04N |
| A7U11 | 1820-1730 | 6 | | IC FF TTL LS D-TYPE POS-EDGE-TRIG COM | 01295 | SN74LS273N |
| A7U12 | 1820-1430 | 3 | | IC CNTR TTL LS BIN SYNCHRO POS-EDGE-TRIG | 01295 | SN74LS161AN |
| A7U13 | 1820-1197 | 9 | | IC GATE TTL LS NAND QUAD 2-INP | 01295 | SN74LS00N |
| A7U15 | 1820-0054 | 9 | | IC GATE TTL LS NAND QUAD 2-INP | 01295 | SN74LS00N |
| A7U16 | 1820-1828 | 3 | 4 | IC DRVR TTL BUS DRVR QUAD | 18324 | N8T28N |
| A7U17 | 1820-1481 | 4 | 3 | IC PIA NMOS | 04713 | MC6821L |
| A7U18 | 1820-1828 | 3 | | IC DRVR TTL BUS DRVR QUAD | 18324 | N8T28N |
| A7U19 | 1820-1470 | 1 | 2 | IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD | 01295 | SN74LS157N |
| A7U20 | 1820-1112 | 8 | | IC FF TTL LS D-TYPE POS-EDGE-TRIG | 01295 | SN74LS74N |
| A7U21 | 1820-1206 | 1 | 1 | IC GATE TTL LS NOR TPL 3-INP | 01295 | SN74LS32N |
| A7U22 | 1820-1430 | 3 | | IC CNTR TTL LS BIN SYNCHRO POS-EDGE-TRIG | 01295 | SN74LS161AN |
| A7U23 | 1820-1430 | 3 | | IC CNTR TTL LS BIN SYNCHRO POS-EDGE-TRIG | 01295 | SN74LS161AN |
| A7U24 | 1820-1144 | 6 | | IC GATE TTL LS NOR QUAD 2-INP | 01295 | SN74LS02N |
| A7U25 | 1820-2255 | 6 | 1 | IC CNTR C-MOS | 28480 | U20-131 |
| A7U26 | 1820-1210 | 7 | | IC GATE TTL LS AND-OR-INV DUAL 2-INP | 01295 | SN74LS51N |
| A7U27 | 1820-1828 | 3 | | IC DRVR TTL BUS DRVR QUAD | 18324 | N8T28N |
| A7U28 | 1820-1828 | 3 | | IC DRVR TTL BUS DRVR QUAD | 18324 | N8T28N |
| A7U29 | 1820-1470 | 1 | | IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD | 01295 | SN74LS157N |
| A7U30 | 1820-1216 | 3 | 4 | IC DCDR TTL LS 3-TO-8-LINE 3-INP | 01295 | SN74LS158N |
| A7U31 | 1820-0495 | 6 | 3 | IC DCDR TTL 4-TO-16-LINE 4-INP | 01295 | SN74LS4N |
| A7U32 | 1820-1430 | 3 | | IC CNTR TTL LS BIN SYNCHRO POS-EDGE-TRIG | 01295 | SN74LS161AN |
| A7U33 | 1820-1430 | 3 | | IC CNTR TTL LS BIN SYNCHRO POS-EDGE-TRIG | 01295 | SN74LS161AN |
| A7W4 | 8159-0005 | 0 | | WIRE 22AWG W PVC 1X22 80C | 28480 | 8159-0005 |
| A7W5 | 8159-0005 | 0 | | WIRE 22AWG W PVC 1X22 80C | 28480 | 8159-0005 |
| A7W6 | 8159-0005 | 0 | | WIRE 22AWG W PVC 1X22 80C | 28480 | 8159-0005 |
| A7W7 | 8159-0005 | 0 | | WIRE 22AWG W PVC 1X22 80C | 28480 | 8159-0005 |
| A7W9 | 8159-0005 | 0 | | WIRE 22AWG W PVC 1X22 80C | 28480 | 8159-0005 |
| A7Y1 | 0410-0211 | 6 | 1 | CRYSTAL, QUARTZ 9.95 MHZ | 28480 | 0410-0211 |
| | | | | A7 MISCELLANEOUS PARTS | | |
| | 04274-26507 | 0 | | PC BOARD, BLANK | 28480 | 04274-26507 |
| A8 | 04274-66508 | 5 | 1 | DISPLAY AND KEY CONTROL BOARD ASSEMBLY | 28480 | 04274-66508 |
| A8C1 | 0160-2055 | 9 | | 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 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A8C5 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|---|----------|-----------------|
| A8C6 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A8C7 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A8C8 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A8C9 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A8C10 | 0160-0155 | 8 | | CAPACITOR-FXD 3.3NF +-10% 200VDC POLYE | 56289 | |
| A8C11 | 0160-0155 | 8 | | CAPACITOR-FXD 3.3NF +-10% 200VDC POLYE | 56289 | |
| A8C12 | 0160-0155 | 8 | | CAPACITPR-FXD 3.3NF +-10% 200VDC POLYE | 56289 | |
| A8C13 | 0180-1050 | 4 | | CAPACITOR, FXD 100 UF 25VDCW | 28480 | 0180-1050 |
| A8C14 | 0180-0228 | 6 | | CAPACITOR-FXD 22UF+-10% 15VDC TA | 56289 | 150D226X901582 |
| A8C15 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A8C16 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A8C17 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A8C18 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A8C19 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A8C20 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A8C21 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A8C22 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A8C23 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 |
| A8C24 | 0180-0228 | 6 | | CAPACITOR-FXD 22UF+-10% 15VDC TA | 56289 | 150D226X901582 |
| A8L1 | 9100-3139 | 5 | | COIL 75UH 15% .5DX,875LG=NOM | 28480 | 9100-3139 |
| A8L2 | 9100-3139 | 5 | | COIL 75UH 15% .5DX,875LG=NOM | 28480 | 9100-3139 |
| A8L3 | 9100-1788 | 6 | | CHOKE-WIDE BAND ZMAX=680 OHMS 180 MHZ | 02114 | VN200 20/48 |
| A8Q1 | 1854-0019 | 3 | 1 | TRANSISTOR NPN SI TO-18 PD=360MW | 28480 | 1854-0019 |
| A8R1 | 1810-0205 | 7 | | NETWORK-RES 8-PIN-SIP .1-PIN-SPCG | 01121 | 208A472 |
| A8R2 | 1810-0205 | 7 | | NETWORK-RES 8-PIN-SIP .1-PIN-SPCG | 01121 | 208A472 |
| A8R3 | 1810-0205 | 7 | | NETWORK-RES 8-PIN-SIP .1-PIN-SPCG | 01121 | 208A472 |
| A8R4 | 1810-0301 | 4 | 3 | NETWORK-RES 16-PIN-DIP .1-PIN-SPCG | 01121 | 3168510 |
| A8R7 | 1810-0301 | 4 | | NETWORK-RES 16-PIN-DIP .1-PIN-SPCG | 01121 | 3168510 |
| A8R8 | 1810-0301 | 4 | | NETWORK-RES 16-PIN-DIP .1-PIN-SPCG | 01121 | 3168510 |
| A8R9 | 1810-0205 | 7 | | NETWORK-RES 8-PIN-SIP .1-PIN-SPCG | 01121 | 208A472 |
| A8R10 | 0683-1205 | 2 | | RESISTOR 12 5% .25W FC TC=400/+600 | 01121 | |
| A8R11 | 0683-1205 | 2 | | RESISTOR 12 5% .25W FC TC=400/+600 | 01121 | |
| A8R12 | 0683-1205 | 2 | | RESISTOR 12 5% .25W FC TC=400/+600 | 01121 | |
| A8S1 | 3101-2061 | 6 | 1 | SWITCH, TOGGLE DIP-ROCKER | 28480 | 3101-2061 |
| A8U1 | 1858-0023 | 7 | 3 | TRANSISTOR ARRAY | 01928 | CA3081E |
| A8U2 | 1858-0023 | 7 | | TRANSISTOR ARRAY | 01928 | CA3081E |
| A8U3 | 1858-0023 | 7 | | TRANSISTOR ARRAY | 01928 | CA3081E |
| A8U4 | 1820-0628 | 9 | 6 | IC TTL 64-BIT RAM 60-NS 0=C | 01295 | 8N7489N |
| A8U5 | 1820-0628 | 9 | | IC TTL 64-BIT RAM 60-NS 0=C | 01295 | 8N7489N |
| A8U6 | 1820-0628 | 9 | | IC TTL 64-BIT RAM 60-NS 0=C | 01295 | 8N7489N |
| A8U7 | 1820-1194 | 6 | 1 | IC CNTR TTL LS 8IN UP/DOWN SYNCHRO | 01295 | 8N74LS193N |
| A8U8 | 1820-1278 | 7 | 2 | IC CNTR TTL LS 8IN UP/DOWN SYNCHRO | 01295 | 8N74LS191N |
| A8U9 | 1820-1112 | 8 | | IC FF TTL LS D-TYPE POS-EDGE-TRIG | 01295 | 8N74LS74N |
| A8U10 | 1820-0628 | 9 | | IC TTL 64-BIT RAM 60-NS 0=C | 01295 | 8N7489N |
| A8U11 | 1820-0628 | 9 | | IC TTL 64-BIT RAM 60-NS 0=C | 01295 | 8N7489N |
| A8U12 | 1820-0628 | 9 | | IC TTL 64-BIT RAM 60-NS 0=C | 01295 | 8N7489N |
| A8U13 | 1820-1199 | 1 | | IC INV TTL LS HEX 1-INP | 01295 | 8N74LS04N |
| A8U14 | 1820-1415 | 4 | 1 | IC SCHMITT-TRIG TTL LS NAND DUAL 4-INP | 01295 | 8N74LS13N |
| A8U15 | 1820-1278 | 7 | | IC CNTR TTL LS 8IN UP/DOWN SYNCHRO | 01295 | 8N74LS191N |
| A8U16 | 1820-1202 | 7 | 1 | IC GATE TTL LS NAND TPL 3-INP | 01295 | 8N74LS10N |
| | | | | AB MISCELLANEOUS PARTS | | |
| A8Z1 | 04274-26508 | 1 | | PC BOARD, BLANK | 28480 | 04274-26508 |
| A9 | | | | | | |
| A9 | | | | | | |
| A9 | 04275-66509 | 6 | | MPU BOARD ASSEMBLY (FOR OPT. 101 ONLY) | 28480 | |
| A9 | 04275-66519 | 7 | 1 | FOR OPT. 101 USE U10 ONLY MPU BOARD ASSEMBLY (FOR OPT. 003 PLUS 101 ONLY) FOR OPT. 003 PLUS 101 USE U14, U15, U25, AND U10) | 28480 | |
| A9C1 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A9C2 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A9C3 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A9C4 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A9C5 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A9C6 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A9C7 | 0160-0134 | 1 | | CAPACITOR-FXD 220PF +-5% 300VDC MICA | 28480 | 0160-0134 |
| A9C8 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A9C9 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 |
| A9C10 | 0160-2307 | 4 | 2 | CAPACITOR-FXD 47PF +-5% 300VDC MICA | 28480 | 0160-2307 |

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number | |
|-----------------------|----------------|-----|---------------------------------------|--|--------------------------------|-----------------|-----------|
| A9C11 | 0160-2307 | 4 | 1 | CAPACITOR-FXD 47PF +-5% 300VDC MICA | 28480 | 0160-2307 | |
| A9C12 | 0180-0229 | 7 | | CAPACITOR-FXD 33UF+-10% 10VDC TA | 56289 | 150D336X901082 | |
| A9C13 | 0180-0291 | 3 | | CAPACITOR-FXD 1UF+-10% 35VDC TA | 56289 | 150D105X9035A2 | |
| A9C14 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 | |
| A9C15 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 | |
| A9C16 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 | |
| A9C17 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 | |
| A9C18 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 | |
| A9C19 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 | |
| A9C20 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 | |
| A9C21 | 0150-0121 | 5 | | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 | |
| A9C22 | 0180-0197 | 8 | | CAPACITOR-FXD 2.2UF+-10% 20VDC TA | 56289 | 150D225X9020A2 | |
| A9C23 | 0180-0226 | 6 | | CAPACITOR-FXD 22UF+-10% 15VDC TA | 56289 | 150D226X9015B2 | |
| A9C24 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 | |
| A9C25 | 0180-0197 | 8 | | CAPACITOR-FXD 2.2UF+-10% 20VDC TA | 56289 | 150D225X9020A2 | |
| A9C26 | 0150-0121 | 5 | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 | | |
| A9C27 | 0150-0121 | 5 | CAPACITOR-FXD .1UF +80-20% 50VDC CER | 28480 | 0150-0121 | | |
| A9C28 | 0160-2208 | 4 | CAPACITOR-FXD 330PF +-5% 300VDC MICA | 28480 | 0160-2208 | | |
| A9CR1 | 1901-0518 | 8 | DIODE-8CHOTTKY | 28480 | 1901-0518 | | |
| A9CR2 | 1901-0518 | 8 | DIODE-8CHOTTKY | 28480 | 1901-0518 | | |
| A9CR3 | 1901-0025 | 2 | DIODE-GEN PRP 100V 200MA DO=7 | 28480 | 1901-0025 | | |
| A9CR4 | 1901-0025 | 2 | DIODE-GEN PRP 100V 200MA DO=7 | 28480 | 1901-0025 | | |
| A9CR5 | 1901-0040 | 1 | DIODE-SWITCHING 30V 50MA 2NS DO=35 | 28480 | 1901-0040 | | |
| A9J12 | 1200-0608 | 1 | SOCKET-IC 40-CONT | 28480 | 1200-0608 | | |
| A9L1 | 9100-1786 | 6 | CHOKE-WIDE BAND ZMAX=680 OHMS 180 MHZ | 02114 | VK200 20/48 | | |
| A9L2 | 9100-3139 | 5 | COIL 75UH 15% .5DX.875LG=NOM | 28480 | 9100-3139 | | |
| A9Q1 | 1853-0015 | 7 | 2 | TRANSISTOR PNP SI PDR=200MHZ FT=500MHZ | 28480 | 1853-0015 | |
| A9Q2 | 1853-0015 | 7 | | TRANSISTOR PNP SI PDR=200MHZ FT=500MHZ | 28480 | 1853-0015 | |
| A9R1 | 1810-0305 | 8 | 3 | NETWORK-RES 9-PIN-SIP .1-PIN-SPCG | 28480 | 1810-0305 | |
| A9R2 | 1810-0305 | 8 | | NETWORK-RES 9-PIN-SIP .1-PIN-SPCG | 28480 | 1810-0305 | |
| A9R3 | 1810-0305 | 8 | | NETWORK-RES 9-PIN-SIP .1-PIN-SPCG | 28480 | 1810-0305 | |
| A9R4 | 0683-1035 | 1 | 1 | RESISTOR 10K 5% .25W FC TC=400/+700 | 01121 | CB1035 | |
| A9R5 | 0683-2205 | 9 | | RESISTOR 22 5% .25W FC TC=400/+500 | 01121 | CB2205 | |
| A9R6 | 0683-1205 | 7 | | RESISTOR 12 5% .25W FC TC=400/+500 | 01121 | CB1205 | |
| A9R7 | 0683-2205 | 9 | | RESISTOR 22 5% .25W FC TC=400/+500 | 01121 | CB2205 | |
| A9R8 | 0683-1205 | 7 | | RESISTOR 12 5% .25W FC TC=400/+500 | 01121 | CB1205 | |
| A9R9 | 0683-1515 | 2 | | RESISTOR 150 5% .25W FC TC=400/+600 | 01121 | CB1515 | |
| A9R10 | 0683-1515 | 2 | | RESISTOR 150 5% .25W FC TC=400/+600 | 01121 | CB1515 | |
| A9R11 | 1810-0269 | 3 | | NETWORK-RES 9-PIN-SIP .1-PIN-SPCG | 28480 | 1810-0269 | |
| A9R12 | 0683-2715 | 6 | | RESISTOR 270 5% .25W FC TC=400/+600 | 01121 | CB2715 | |
| A9R13 | 0683-2715 | 6 | | RESISTOR 270 5% .25W FC TC=400/+600 | 01121 | CB2715 | |
| A9R14 | 0683-4715 | 0 | RESISTOR 470 5% .25W FC TC=400/+600 | 01121 | CB4715 | | |
| A9R15 | 0698-4501 | 3 | RESISTOR 59K 1% .125W P TC=0/+100 | 24546 | C4-1/8-T0-5902=P | | |
| A9R17 | 0683-1035 | 1 | 1 | RESISTOR 10K 5% .25W FC TC=400/+700 | 01121 | CB1035 | |
| A9R18 | 0683-1035 | 1 | | RESISTOR 10K 5% .25W FC TC=400/+700 | 01121 | CB1035 | |
| A9R19 | 0683-4745 | 6 | | RESISTOR 470K 5% .25W FC TC=800/+900 | 01121 | CB4745 | |
| A9R20 | 0683-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 | |
| A9R21 | 1810-0269 | 3 | | NETWORK-RES 9-PIN-SIP .1-PIN-SPCG | 28480 | 1810-0269 | |
| A9R22 | 0683-4745 | 6 | | RESISTOR 470K 5% .25W FC TC=800/+900 | 01121 | CB4745 | |
| A9R23 | 0683-1015 | 7 | 1 | RESISTOR 100 5% .25W FC TC=400/+500 | 01121 | CB1015 | |
| A9R24 | 0683-1035 | 1 | | RESISTOR 10K 5% .25W FC TC=400/+700 | 01121 | CB1035 | |
| A9R25 | 0683-1035 | 1 | | RESISTOR 10K 5% .25W FC TC=400/+700 | 01121 | CB1035 | |
| A9S1 | 3101-1973 | 7 | | 2 | SWITCH, SLIDE 7=1A=N8 | 28480 | 3101-1973 |
| A9U1 | 1818-1134 | 7 | | 1 | IC, MASK-ROM | 28480 | |
| A9U3 | 1818-1135 | 7 | 1 | IC, MASK-ROM | 28480 | | |
| A9U5 | 1818-1136 | 9 | 1 | IC, MASK-ROM | 28480 | | |
| A9U7 | 1818-1137 | 1 | 1 | IC, MASK-ROM | 28480 | | |
| A9U10 | 1818-1139 | 3 | 1 | IC, MASK-ROM | 28480 | | |
| A9U12 | 1818-0438 | 4 | | 2 | IC NMOS 4K RAM STAT 450=NS 3=S | 34649 | P2114 |
| A9U13 | 1818-0438 | 4 | 2 | IC NMOS 4K RAM STAT 450=NS 3=S | 34649 | P2114 | |
| A9U14 | 1818-0796 | 7 | | IC CMOS 1K RAM STAT 350=NS 3=S | 28480 | 1818-0796 | |
| A9U15 | 1818-0796 | 7 | | IC CMOS 1K RAM STAT 350=NS 3=S | 28480 | 1818-0796 | |
| A9U16 | 1820-1216 | 3 | | IC DCDR TTL L8 3=TO=8-LINE 3=INP | 01295 | 8N74LS138N | |
| A9U17 | 1820-2024 | 3 | | 6 | IC DRVR TTL L8 LINE DRVR OCTL | 01295 | 8N74LS24N |
| A9U18 | 1820-1480 | 3 | | 1 | IC MICPROC NMOS 8=BIT | 04713 | MC6800L |
| A9U19 | 1820-1144 | 6 | | | IC GATE TTL L8 NOR QUAD 2=INP | 01295 | 8N74LS02N |
| A9U20 | 1820-0683 | 6 | IC INV TTL 8 HEX 1=INP | | 01295 | 8N74804N | |
| A9U21 | 1820-1197 | 9 | IC GATE TTL L8 NAND QUAD 2=INP | | 01295 | 8N74LS00N | |
| A9U22 | 1820-1216 | 3 | IC DCDR TTL L8 3=TO=8-LINE 3=INP | | 01295 | 8N74LS138N | |
| BT | 1420-0125 | | | | BATTERY LITHIUM 2.8V | | |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|------------------------|----------------|-----|-----|--|----------|--------------------|
| A9U23 | 1820-1491 | 6 | 2 | IC BFR TTL LS NON=INV HEX 1=INP | 01295 | 8N74LS367AN |
| A9U25 | 1826-0408 | 5 | 1 | 8=OIP=P | 32293 | ICL8212CPA |
| A9U26 | 1820-0661 | 0 | 1 | IC GATE TTL OR QUAD 2=INP | 01295 | 8N7432N |
| A9U27 | 1820-1197 | 9 | | IC GATE TTL LS NAND QUAD 2=INP | 01295 | 8N74LS00N |
| A9U28 | 1820-1216 | 3 | | IC OCDR TTL LS 3=TO=8=LINE 3=INP | 01295 | 8N74LS138N |
| A9U29 | 1820-2024 | 3 | | IC DRVR TTL LS LINE DRVR OCTL | 01295 | 8N74LS244N |
| A9U30 | 1906-0075 | 2 | 1 | DIODE=ARRAY 40V 400MA | 28480 | 1906-0075 |
| A9U31 | 1820-1994 | 4 | 2 | IC DRVR TTL LS LINE DRVR OCTL | 01295 | 8N74LS243N |
| A9U32 | 1820-1994 | 4 | 4 | IC DRVR TTL LS LINE DRVR OCTL | 01295 | 8N74LS243N |
| A9U33 | 1820-1491 | 6 | | IC BFR TTL LS NON=INV HEX 1=INP | 01295 | 8N74LS367AN |
| A9U34 | 1820-1199 | 1 | | IC INV TTL LS HEX 1=INP | 01295 | 8N74LS04N |
| A9U35 | 1826-0180 | 0 | 1 | IC TIMER TTL MONO/ASTBL | 04713 | MC1455P1 |
| A9W1 | 8159-0005 | 0 | | WIRE 22AWG W PVC 1X22 80C | 28480 | 8159-0005 |
| A9W2 | 8159-0005 | 0 | | WIRE 22AWG W PVC 1X22 80C | 28480 | 8159-0005 |
| A9W3 | 8159-0005 | 0 | | WIRE 22AWG W PVC 1X22 80C | 28480 | 8159-0005 |
| A9W4 | 8159-0005 | 0 | | WIRE 22AWG W PVC 1X22 80C | 28480 | 8159-0005 |
| A9W5 | 8159-0005 | 0 | | WIRE 22AWG W PVC 1X22 80C | 28480 | 8159-0005 |
| A9W6 | 8159-0005 | 0 | | WIRE 22AWG W PVC 1X22 80C | 28480 | 8159-0005 |
| A9 MISCELLANEOUS PARTS | | | | | | |
| | 04274-26509 | 2 | | PC BOARD, BLANK | 28480 | 04274-26509 |
| A10 | 04275-66520 | 9 | 1 | DISPLAY AND KEYBOARD ASSEMBLY | 28480 | 04275-66520 |
| A10C1 | 0160-0228 | 6 | | CAPACITOR=FXD 22UF+10% 15VDC TA | 56289 | 150D226X9015B2 |
| A10C2 | 0160-2055 | 9 | | CAPACITOR=FXD .01UF +80=20% 100VDC CER | 28480 | 0160-2055 |
| A10C3 | 0160-2055 | 9 | | CAPACITOR=FXD .01UF +80=20% 100VDC CER | 28480 | 0160-2055 |
| A10C4 | 0160-2055 | 9 | | CAPACITOR=FXD .01UF +80=20% 100VDC CER | 28480 | 0160-2055 |
| A10C5 | 0160-2055 | 9 | | CAPACITOR=FXD .01UF +80=20% 100VDC CER | 28480 | 0160-2055 |
| A10C6 | 0160-2055 | 9 | | CAPACITOR=FXD .01UF +80=20% 100VDC CER | 28480 | 0160-2055 |
| A10C7 | 0160-2055 | 9 | | CAPACITOR=FXD .01UF +80=20% 100VDC CER | 28480 | 0160-2055 |
| A10C8 | 0160-2055 | 9 | | CAPACITOR=FXD .01UF +80=20% 100VDC CER | 28480 | 0160-2055 |
| A10C9 | 0160-2055 | 9 | | CAPACITOR=FXD .01UF +80=20% 100VDC CER | 28480 | 0160-2055 |
| A10C10 | 0160-2055 | 9 | | CAPACITOR=FXD .01UF +80=20% 100VDC CER | 28480 | 0160-2055 |
| A10C11 | 0160-2055 | 9 | | CAPACITOR=FXD .01UF +80=20% 100VDC CER | 28480 | 0160-2055 |
| A10C12 | 0160-2055 | 9 | | CAPACITOR=FXD .01UF +80=20% 100VDC CER | 28480 | 0160-2055 |
| A10C13 | 0160-2055 | 9 | | CAPACITOR=FXD .01UF +80=20% 100VDC CER | 28480 | 0160-2055 |
| A10D81 | 1990-0486 | 6 | 35 | LED=VISIBLE LUM=INT#1MCD IF#20MA=MAX | 28480 | 5082-4684 |
| A10D82 | 1990-0540 | 3 | 12 | DISPLAY=NUM=SEG 1=CHAR .43=H | 28480 | 5082-7650 |
| A10D83 | 1990-0540 | 3 | | DISPLAY=NUM=SEG 1=CHAR .43=H | 28480 | 5082-7650 |
| A10D84 | 1990-0540 | 3 | | DISPLAY=NUM=SEG 1=CHAR .43=H | 28480 | 5082-7650 |
| A10D85 | 1990-0540 | 3 | | DISPLAY=NUM=SEG 1=CHAR .43=H | 28480 | 5082-7650 |
| A10D86 | 1990-0540 | 3 | | DISPLAY=NUM=SEG 1=CHAR .43=H | 28480 | 5082-7650 |
| A10D87 | 1990-0540 | 3 | | DISPLAY=NUM=SEG 1=CHAR .43=H | 28480 | 5082-7650 |
| A10D88 | 1990-0617 | 5 | 4 | DISPLAY=AN=DOT MAT 1=CHAR .3=H | 28480 | 1990-0617 |
| A10D89 | 1990-0617 | 5 | | DISPLAY=AN=DOT MAT 1=CHAR .3=H | 28480 | 1990-0617 |
| A10D910 | 1990-0540 | 3 | | DISPLAY=NUM=SEG 1=CHAR .43=H | 28480 | 5082-7650 |
| A10D911 | 1990-0540 | 3 | | DISPLAY=NUM=SEG 1=CHAR .43=H | 28480 | 5082-7650 |
| A10D912 | 1990-0540 | 3 | | DISPLAY=NUM=SEG 1=CHAR .43=H | 28480 | 5082-7650 |
| A10D913 | 1990-0540 | 3 | | DISPLAY=NUM=SEG 1=CHAR .43=H | 28480 | 5082-7650 |
| A10D914 | 1990-0540 | 3 | | DISPLAY=NUM=SEG 1=CHAR .43=H | 28480 | 5082-7650 |
| A10D915 | 1990-0540 | 3 | | DISPLAY=NUM=SEG 1=CHAR .43=H | 28480 | 5082-7650 |
| A10D916 | 1990-0617 | 5 | | DISPLAY=AN=DOT MAT 1=CHAR .3=H | 28480 | 1990-0617 |
| A10D917 | 1990-0617 | 5 | | DISPLAY=AN=DOT MAT 1=CHAR .3=H | 28480 | 1990-0617 |
| A10D918 | 1990-0434 | 4 | 3 | DISPLAY=NUM=SEG 1=CHAR .3=H | 28480 | 5082-7730, CAT B=E |
| A10D919 | 1990-0434 | 4 | | DISPLAY=NUM=SEG 1=CHAR .3=H | 28480 | 5082-7730, CAT B=E |
| A10D920 | 1990-0434 | 4 | | DISPLAY=NUM=SEG 1=CHAR .3=H | 28480 | 5082-7730, CAT B=E |
| A10D921 | 1990-0486 | 6 | | LED=VISIBLE LUM=INT#1MCD IF#20MA=MAX | 28480 | 5082-4684 |
| A10D922 | 1990-0486 | 6 | | LED=VISIBLE LUM=INT#1MCD IF#20MA=MAX | 28480 | 5082-4684 |
| A10D923 | 1990-0486 | 6 | | LED=VISIBLE LUM=INT#1MCD IF#20MA=MAX | 28480 | 5082-4684 |
| A10D924 | 1990-0486 | 6 | | LED=VISIBLE LUM=INT#1MCD IF#20MA=MAX | 28480 | 5082-4684 |
| A10D925 | 1990-0517 | 4 | 1 | LED=VISIBLE LUM=INT#3MCD IF#20MA=MAX | 28480 | 5082-4655 |
| A10D926 | 1990-0665 | 6 | | LED=VISIBLE LUM=INT#1MCD IF#20MA=MAX | 28480 | |
| A10D927 | 1990-0665 | 6 | | LED=VISIBLE LUM=INT#1MCD IF#20MA=MAX | 28480 | |
| A10D928 | 1990-0665 | 6 | | LED=VISIBLE LUM=INT#1MCD IF#20MA=MAX | 28480 | |
| A10D929 | 1990-0665 | 6 | | LED=VISIBLE LUM=INT#1MCD IF#20MA=MAX | 28480 | |
| A10D930 | 1990-0665 | 6 | | LED=VISIBLE LUM=INT#1MCD IF#20MA=MAX | 28480 | |
| A10D931 | 1990-0665 | 6 | | LED=VISIBLE LUM=INT#1MCD IF#20MA=MAX | 28480 | |
| A10D932 | 1990-0665 | 6 | | LED=VISIBLE LUM=INT#1MCD IF#20MA=MAX | 28480 | |
| A10D933 | 1990-0665 | 6 | | LED=VISIBLE LUM=INT#1MCD IF#20MA=MAX | 28480 | |
| A10D934 | 1990-0665 | 6 | | LED=VISIBLE LUM=INT#1MCD IF#20MA=MAX | 28480 | |
| A10D935 | 1990-0486 | 6 | | LED=VISIBLE LUM=INT#1MCD IF#20MA=MAX | 28480 | 5082-4684 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|---|----------|-----------------|
| A10D836 | 1990-0665 | 6 | | LED-VISIBLE LUM=INT=1MCD IF=20MA=MAX | 28480 | |
| A10D837 | 1990-0665 | 6 | | LED-VISIBLE LUM=INT=1MCD IF=20MA=MAX | 28480 | |
| A10D838 | 1990-0665 | 6 | | LED-VISIBLE LUM=INT=1MCD IF=20MA=MAX | 28480 | |
| A10D839 | 1990-0665 | 6 | | LED-VISIBLE LUM=INT=1MCD IF=20MA=MAX | 28480 | |
| A10D840 | 1990-0665 | 6 | | LED-VISIBLE LUM=INT=1MCD IF=20MA=MAX | 28480 | |
| A10D841 | 1990-0665 | 6 | | LED-VISIBLE LUM=INT=1MCD IF=20MA=MAX | 28480 | |
| A10D842 | 1990-0486 | 6 | | LED-VISIBLE LUM=INT=1MCD IF=20MA=MAX | 28480 | 5082-4684 |
| A10D843 | 1990-0665 | 6 | | LED-VISIBLE LUM=INT=1MCD IF=20MA=MAX | 28480 | |
| A10D844 | 1990-0665 | 6 | | LED-VISIBLE LUM=INT=1MCD IF=20MA=MAX | 28480 | |
| A10D845 | 1990-0665 | 6 | | LED-VISIBLE LUM=INT=1MCD IF=20MA=MAX | 28480 | |
| A10D846 | 1990-0665 | 6 | | LED-VISIBLE LUM=INT=1MCD IF=20MA=MAX | 28480 | |
| A10D847 | 1990-0665 | 6 | | LED-VISIBLE LUM=INT=1MCD IF=20MA=MAX | 28480 | |
| A10D848 | 1990-0665 | 6 | | LED-VISIBLE LUM=INT=1MCD IF=20MA=MAX | 28480 | |
| A10D849 | 1990-0665 | 6 | | LED-VISIBLE LUM=INT=1MCD IF=20MA=MAX | 28480 | |
| A10D850 | 1990-0665 | 6 | | LED-VISIBLE LUM=INT=1MCD IF=20MA=MAX | 28480 | |
| A10D851 | 1990-0665 | 6 | | LED-VISIBLE LUM=INT=1MCD IF=20MA=MAX | 28480 | |
| A10D852 | 1990-0486 | 6 | | LED-VISIBLE LUM=INT=1MCD IF=20MA=MAX | 28480 | 5082-4684 |
| A10D853 | 1990-0486 | 6 | | LED-VISIBLE LUM=INT=1MCD IF=20MA=MAX | 28480 | 5082-4684 |
| A10D854 | 1990-0486 | 6 | | LED-VISIBLE LUM=INT=1MCD IF=20MA=MAX | 28480 | 5082-4684 |
| A10D855 | 1990-0486 | 6 | | LED-VISIBLE LUM=INT=1MCD IF=20MA=MAX | 28480 | 5082-4684 |
| A10J2 | 1200-0638 | 9 | 12 | SOCKET-IC 14=CONT DIP=SLDR SOCKET FOR DS2 THROUGH DS7 | 28480 | |
| A10J3 | 1200-0638 | 9 | | SOCKET-IC 14=CONT DIP=SLDR | 28480 | |
| A10J4 | 1200-0638 | 9 | | SOCKET-IC 14=CONT DIP=SLDR | 28480 | |
| A10J5 | 1200-0638 | 9 | | SOCKET-IC 14=CONT DIP=SLDR | 28480 | |
| A10J6 | 1200-0638 | 9 | | SOCKET-IC 14=CONT DIP=SLDR | 28480 | |
| A10J7 | 1200-0638 | 9 | | SOCKET-IC 14=CONT DIP=SLDR | 28480 | |
| A10J8 | 1200-0424 | 9 | 4 | SOCKET-ELEC (MISC ITEM) 14=PIN SOCKET FOR DS8, 9, 16, AND 17 | 28480 | 1200-0424 |
| A10J9 | 1200-0424 | 9 | | SOCKET-ELEC (MISC ITEM) | 28480 | 1200-0424 |
| A10J10 | 1200-0638 | 9 | | SOCKET-IC 14=CONT DIP=SLDR | 28480 | |
| A10J11 | 1200-0638 | 9 | | SOCKET-IC 14=CONT DIP=SLDR | 28480 | |
| A10J12 | 1200-0638 | 9 | | SOCKET-IC 14=CONT DIP=SLDR | 28480 | |
| A10J13 | 1200-0638 | 9 | | SOCKET-IC 14=CONT DIP=SLDR | 28480 | |
| A10J14 | 1200-0638 | 9 | | SOCKET-IC 14=CONT DIP=SLDR | 28480 | |
| A10J15 | 1200-0638 | 9 | | SOCKET-IC 14=CONT DIP=SLDR | 28480 | |
| A10J16 | 1200-0424 | 9 | | SOCKET-ELEC (MISC ITEM) | 28480 | 1200-0424 |
| A10J17 | 1200-0424 | 9 | | SOCKET-ELEC (MISC ITEM) | 28480 | 1200-0424 |
| A10J18 | 1200-0508 | 0 | 3 | SOCKET-IC 14=CONT DIP=SLDR SOCKET FOR DS18 THROUGH DS20 | 28480 | 1200-0508 |
| A10J19 | 1200-0508 | 0 | | SOCKET-IC 14=CONT DIP=SLDR | 28480 | 1200-0508 |
| A10J20 | 1200-0508 | 0 | | SOCKET-IC 14=CONT DIP=SLDR | 28480 | 1200-0508 |
| A10KC1 | 5041-0252 | 7 | 6 | KEY CAP | 28480 | 5041-0252 |
| A10KC2 | 5041-0252 | 7 | | KEY CAP | 28480 | 5041-0252 |
| A10KC3 | 5041-0351 | 7 | 3 | KEY CAP | 28480 | 5041-0351 |
| A10KC4 | 5041-0252 | 7 | | KEY CAP | 28480 | 5041-0252 |
| A10KC5 | 5041-0252 | 7 | | KEY CAP | 28480 | 5041-0252 |
| A10KC6 | 5041-0252 | 7 | | KEY CAP | 28480 | 5041-0252 |
| A10KC7 | 5041-0252 | 7 | | KEY CAP | 28480 | 5041-0252 |
| A10KC8 | 5041-0351 | 7 | | KEY CAP | 28480 | 5041-0351 |
| A10KC9 | 5041-0351 | 7 | | KEY CAP | 28480 | 5041-0351 |
| A10KC10 | 5041-0309 | 5 | 8 | KEY CAP | 28480 | 5041-0309 |
| A10KC11 | 5041-0309 | 5 | | KEY CAP | 28480 | 5041-0309 |
| A10KC12 | 5041-0318 | 6 | 15 | *LK CAP= PTY GRAY | 28480 | 5041-0318 |
| A10KC13 | 5041-0318 | 6 | | *LK CAP= PTY GRAY | 28480 | 5041-0318 |
| A10KC14 | 5041-0309 | 5 | | KEY CAP | 28480 | 5041-0309 |
| A10KC15 | 5041-0309 | 5 | | KEY CAP | 28480 | 5041-0309 |
| A10KC16 | 5041-0318 | 6 | | *LK CAP= PTY GRAY | 28480 | 5041-0318 |
| A10KC17 | 5041-0318 | 6 | | *LK CAP= PTY GRAY | 28480 | 5041-0318 |
| A10KC18 | 5041-0318 | 6 | | *LK CAP= PTY GRAY | 28480 | 5041-0318 |
| A10KC19 | 5041-0318 | 6 | | *LK CAP= PTY GRAY | 28480 | 5041-0318 |
| A10KC20 | 5041-0309 | 5 | | KEY CAP | 28480 | 5041-0309 |
| A10KC21 | 5041-0309 | 5 | | KEY CAP | 28480 | 5041-0309 |
| A10KC22 | 5041-0318 | 6 | | *LK CAP= PTY GRAY | 28480 | 5041-0318 |
| A10KC23 | 5041-0318 | 6 | | *LK CAP= PTY GRAY | 28480 | 5041-0318 |
| A10KC24 | 5041-0318 | 6 | | *LK CAP= PTY GRAY | 28480 | 5041-0318 |
| A10KC25 | 5041-0318 | 6 | | *LK CAP= PTY GRAY | 28480 | 5041-0318 |
| A10KC30 | 5041-0318 | 6 | | *LK CAP= PTY GRAY | 28480 | 5041-0318 |
| A10KC31 | 5041-0318 | 6 | | *LK CAP= PTY GRAY | 28480 | 5041-0318 |
| A10KC32 | 5041-0309 | 5 | | KEY CAP | 28480 | 5041-0309 |
| A10KC33 | 5041-0309 | 5 | | KEY CAP | 28480 | 5041-0309 |
| A10KC34 | 5041-0375 | 5 | 1 | KEY-Q-SMOKE GRAY | 28480 | 5041-0375 |
| A10KC35 | 5041-0318 | 6 | | *LK CAP= PTY GRAY | 28480 | 5041-0318 |
| A10KC36 | 5041-0318 | 6 | | *LK CAP= PTY GRAY | 28480 | 5041-0318 |
| A10KC37 | 5041-0318 | 6 | | *LK CAP= PTY GRAY | 28480 | 5041-0318 |
| A10KC38 | 5041-0384 | 6 | 1 | KEY-Q-SMOKE GRAY | 28480 | 5041-0384 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|--------------------------------------|--------------------------------------|------------------|------------------|
| A10R1 | 0757-0400 | 9 | 14 | RESISTOR 90.9 1% .125W F TC=0+100 | 24546 | C4=1/8-T0-90R9=F |
| A10R2 | 0757-0400 | 9 | | RESISTOR 90.9 1% .125W F TC=0+100 | 24546 | C4=1/8-T0-90R9=F |
| A10R3 | 0757-0400 | 9 | | RESISTOR 90.9 1% .125W F TC=0+100 | 24546 | C4=1/8-T0-90R9=F |
| A10R4 | 0757-0400 | 9 | | RESISTOR 90.9 1% .125W F TC=0+100 | 24546 | C4=1/8-T0-90R9=F |
| A10R5 | 1810-0205 | 7 | | NETWORK-RES 8-PIN-SIP .1-PIN-SPCG | 01121 | 208A472 |
| A10R6 | 1810-0205 | 7 | NETWORK-RES 8-PIN-SIP .1-PIN-SPCG | 01121 | 208A472 | |
| A10R7 | 1810-0205 | 7 | NETWORK-RES 8-PIN-SIP .1-PIN-SPCG | 01121 | 208A472 | |
| A10R8 | 0698-3447 | 4 | RESISTOR 422 1% .125W F TC=0+100 | 24546 | C4=1/8-T0-422R=F | |
| A10R9 | 0757-0400 | 9 | RESISTOR 90.9 1% .125W F TC=0+100 | 24546 | C4=1/8-T0-90R9=F | |
| A10R10 | 0757-0400 | 9 | RESISTOR 90.9 1% .125W F TC=0+100 | 24546 | C4=1/8-T0-90R9=F | |
| A10R11 | 0757-0400 | 9 | RESISTOR 90.9 1% .125W F TC=0+100 | 24546 | C4=1/8-T0-90R9=F | |
| A10R12 | 0683-1215 | 9 | 16 | RESISTOR 120 5% .25W FC TC=-400/+600 | 01121 | CB1215 |
| A10R13 | 0683-1215 | 9 | | RESISTOR 120 5% .25W FC TC=-400/+600 | 01121 | CB1215 |
| A10R14 | 0683-1215 | 9 | | RESISTOR 120 5% .25W FC TC=-400/+600 | 01121 | CB1215 |
| A10R15 | 0683-1215 | 9 | | RESISTOR 120 5% .25W FC TC=-400/+600 | 01121 | CB1215 |
| A10R16 | 0683-1215 | 9 | | RESISTOR 120 5% .25W FC TC=-400/+600 | 01121 | CB1215 |
| A10R17 | 0683-1215 | 9 | RESISTOR 120 5% .25W FC TC=-400/+600 | 01121 | CB1215 | |
| A10R18 | 0683-1215 | 9 | RESISTOR 120 5% .25W FC TC=-400/+600 | 01121 | CB1215 | |
| A10R19 | 0683-1215 | 9 | RESISTOR 120 5% .25W FC TC=-400/+600 | 01121 | CB1215 | |
| A10R20 | 0683-1215 | 9 | RESISTOR 120 5% .25W FC TC=-400/+600 | 01121 | CB1215 | |
| A10R21 | 0683-1215 | 9 | RESISTOR 120 5% .25W FC TC=-400/+600 | 01121 | CB1215 | |
| A10R22 | 0683-1215 | 9 | RESISTOR 120 5% .25W FC TC=-400/+600 | 01121 | CB1215 | |
| A10R23 | 0683-1215 | 9 | RESISTOR 120 5% .25W FC TC=-400/+600 | 01121 | CB1215 | |
| A10R24 | 0683-1215 | 9 | RESISTOR 120 5% .25W FC TC=-400/+600 | 01121 | CB1215 | |
| A10R25 | 0683-1215 | 9 | RESISTOR 120 5% .25W FC TC=-400/+600 | 01121 | CB1215 | |
| A10R26 | 0683-1215 | 9 | RESISTOR 120 5% .25W FC TC=-400/+600 | 01121 | CB1215 | |
| A10R27 | 0683-1215 | 9 | RESISTOR 120 5% .25W FC TC=-400/+600 | 01121 | CB1215 | |
| A10R28 | 2100-1174 | 7 | 1 | RESISTOR, VAR 2K 10% | 26480 | 2100-1174 |
| A10R29 | 0757-0400 | 9 | | RESISTOR 90.9 1% .125W F TC=0+100 | 24546 | C4=1/8-T0-90R9=F |
| A10R30 | 0757-0400 | 9 | | RESISTOR 90.9 1% .125W F TC=0+100 | 24546 | C4=1/8-T0-90R9=F |
| A10R31 | 0757-0400 | 9 | RESISTOR 90.9 1% .125W F TC=0+100 | 24546 | C4=1/8-T0-90R9=F | |
| A10R32 | 0757-0400 | 9 | RESISTOR 90.9 1% .125W F TC=0+100 | 24546 | C4=1/8-T0-90R9=F | |
| A10R33 | 0757-0400 | 9 | RESISTOR 90.9 1% .125W F TC=0+100 | 24546 | C4=1/8-T0-90R9=F | |
| A10R34 | 0757-0400 | 9 | RESISTOR 90.9 1% .125W F TC=0+100 | 24546 | C4=1/8-T0-90R9=F | |
| A10R35 | 0757-0400 | 9 | RESISTOR 90.9 1% .125W F TC=0+100 | 24546 | C4=1/8-T0-90R9=F | |
| A10S1- | | | 33 | PUSHBUTTON SWITCH P.C. MOUNT | 26480 | 5060-9436 |
| A10S25 | 5060-9436 | 7 | | SWITCH, SLIDE DPDT-NS | 26480 | 3101-2046 |
| A10S27 | 3101-2046 | 7 | | SWITCH, PUSHBUTTON SPST NO | 26480 | 3101-1074 |
| A10S28 | 3101-1074 | 9 | | SWITCH, PUSHBUTTON SPST NO | 26480 | 3101-1074 |
| A10S29 | 3101-1074 | 9 | | SWITCH, SLIDE DPDT-NS | 26480 | 3101-1074 |
| A10S26 | 3101-2046 | 7 | | | | |
| A10S30- | | | 7 | PUSHBUTTON SWITCH P.C. MOUNT | 26480 | 5060-9436 |
| A10S38 | 5060-9436 | 7 | | | | |
| A10U1 | 1858-0038 | 4 | 4 | TRANSISTOR ARRAY | 26480 | 1858-0038 |
| A10U2 | 1858-0038 | 4 | | TRANSISTOR ARRAY | 26480 | 1858-0038 |
| A10U3 | 1858-0038 | 4 | | TRANSISTOR ARRAY | 26480 | 1858-0038 |
| A10U4 | 1858-0038 | 4 | | TRANSISTOR ARRAY | 26480 | 1858-0038 |
| A10U5 | 1820-0668 | 7 | | IC BFR TTL NON-INV HEX 1-INP | 01295 | 8N7407N |
| A10U6 | 1820-0668 | 7 | IC BFR TTL NON-INV HEX 1-INP | 01295 | 8N7407N | |
| A10U7 | 1820-0668 | 7 | IC BFR TTL NON-INV HEX 1-INP | 01295 | 8N7407N | |
| A10U8 | 1820-0495 | 8 | IC DCOR TTL 4-T0-16-LINE 4-INP | 01295 | 8N74154N | |
| A10U9 | 1820-0495 | 8 | IC DCOR TTL 4-T0-16-LINE 4-INP | 01295 | 8N74154N | |
| A10W1 | 04274-61621 | 3 | 1 | WIRING ASSEMBLY | 26480 | 04274-61621 |
| | 0360-1706 | 9 | | CABLE TRANSITION | 26480 | 0360-1706 |
| | | | | A10 MISCELLANEOUS PARTS | | |
| | 04274-26510 | 5 | | PC BOARD, BLANK | 26480 | 04274-26510 |
| A11 | 04274-66511 | 0 | 1 | POWER SUPPLY BOARD ASSEMBLY | 26480 | 04274-66511 |
| A11C1 | 0180-1073 | 1 | 1 | CAPACITOR-FXD 22000uF +30-10% 16VDC | 26480 | 0180-1073 |
| A11C2 | 0180-1071 | 9 | | CAPACITOR-FXD 15000uF +30-10% 16VDC | 26480 | 0180-1071 |
| A11C3 | 0180-1072 | 0 | | CAPACITOR-FXD 10000uF +30-10% 25VDC | 26480 | 0180-1072 |
| A11C4 | 0180-1072 | 0 | | CAPACITOR-FXD 10000uF +30-10% 25VDC | 26480 | 0180-1072 |
| A11C5 | 0180-1074 | 2 | | CAPACITOR-FXD 470uF +5075-10% 100VDC | 26480 | 0180-1074 |
| A11C6 | 0180-1074 | 2 | 6 | CAPACITOR-FXD 470uF +50-10% 100VDC | 26480 | 0180-1074 |
| A11C7 | 0180-1076 | 4 | | CAPACITOR-FXD 470uF +50-10% 35VDC | 26480 | 0180-1076 |
| A11C8 | 0180-1076 | 4 | | CAPACITOR-FXD 470uF +50-10% 35VDC | 26480 | 0180-1076 |
| A11C9 | 0180-1076 | 4 | | CAPACITOR-FXD 470uF +50-10% 35VDC | 26480 | 0180-1076 |
| A11C10 | 0180-1076 | 4 | | CAPACITOR-FXD 470uF +50-10% 35VDC | 26480 | 0180-1076 |
| A11C11 | 0180-1076 | 4 | 1 | CAPACITOR-FXD 470uF +50-10% 35VDC | 26480 | 0180-1076 |
| A11C12 | 0180-1051 | 5 | | CAPACITOR, FXD 100 UF 16V M | 26480 | 0180-1051 |
| A11C13 | 0180-1076 | 4 | | CAPACITOR-FXD 470uF +50-10% 35VDC | 26480 | 0180-1076 |
| A11C14 | 0180-1075 | 3 | | CAPACITOR-FXD 2200uF +30-10% 16VDC | 26480 | 0180-1075 |
| A11C15 | 0180-1075 | 3 | | CAPACITOR-FXD 2200uF +30-10% 16VDC | 26480 | 0180-1075 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|--|----------|------------------|
| A11C16 | 0180-1075 | 3 | | CAPACITOR-FXD 2200uF +30-10% 16VDC | 28480 | 0180-1075 |
| A11C17 | 0180-1075 | 3 | | CAPACITOR-FXD 2200uF +30-10% 16VDC | 28480 | 0180-1075 |
| A11CR1 | 1901-0416 | 5 | 10 | DIODE-PWR RECT 200V 1.5A | 28480 | 1901-0416 |
| A11CR2 | 1901-0416 | 5 | | DIODE-PWR RECT 200V 1.5A | 28480 | 1901-0416 |
| A11CR3 | 1901-0416 | 5 | | DIODE-PWR RECT 200V 1.5A | 28480 | 1901-0416 |
| A11CR4 | 1901-0416 | 5 | | DIODE-PWR RECT 200V 1.5A | 28480 | 1901-0416 |
| A11CR5 | 1901-0416 | 5 | | DIODE-PWR RECT 200V 1.5A | 28480 | 1901-0416 |
| A11CR6 | 1901-0416 | 5 | | DIODE-PWR RECT 200V 1.5A | 28480 | 1901-0416 |
| A11CR7 | 1901-0416 | 5 | | DIODE-PWR RECT 200V 1.5A | 28480 | 1901-0416 |
| A11CR8 | 1901-0416 | 5 | | DIODE-PWR RECT 200V 1.5A | 28480 | 1901-0416 |
| A11CR9 | 1901-0416 | 5 | | DIODE-PWR RECT 200V 1.5A | 28480 | 1901-0416 |
| A11CR10 | 1901-0416 | 5 | | DIODE-PWR RECT 200V 1.5A | 28480 | 1901-0416 |
| A11CR11 | 1902-0021 | 0 | 2 | DIODE-ZNR 1N2992R8 39V 5% DO-4 PD=10W | 04713 | 1N2992R8 |
| A11CR12 | 1902-0021 | 0 | | DIODE-ZNR 1N2992R8 39V 5% DO-4 PD=10W | 04713 | 1N2992R8 |
| A11CR13 | 1901-0364 | 2 | 2 | DIODE-PW BRDG 200V 1A | 28480 | 1901-0364 |
| A11CR14 | 1901-0364 | 2 | | DIODE-PW BRDG 200V 1A | 28480 | 1901-0364 |
| A11CR15 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A11CR16 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A11CR17 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A11CR18 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A11CR19 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A11CR20 | 1902-3094 | 3 | 1 | DIODE-ZNR 5.11V 2% DO-7 PD=.4W TC=+.009% | 28480 | 1902-3094 |
| A11CR21 | 1902-0033 | 4 | 1 | DIODE-ZNR 1N823 6.2V 5% DO-7 PD=.4W | 24046 | 1N823 |
| A11CR22 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A11CR23 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A11CR24 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A11CR25 | 1901-0028 | 5 | 2 | DIODE-PWR RECT 400V 750MA DO-29 | 28480 | 1901-0028 |
| A11CR26 | 1901-0028 | 5 | | DIODE-PWR RECT 400V 750MA DO-29 | 28480 | 1901-0028 |
| A11CR27 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A11CR28 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A11CR29 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A11CR30 | 1902-1200 | 9 | 2 | DIODE-ZNR 1N2980B 16V 5% DO-4 PD=10W | 12954 | 1N2980B |
| A11CR31 | 1902-1200 | 9 | | DIODE-ZNR 1N2980B 16V 5% DO-4 PD=10W | 12954 | 1N2980B |
| A11CR32 | 1902-1232 | 7 | 2 | DIODE-ZNR 1N3997AR 5.6V 5% DO-4 PD=10W | 04713 | 1N3997AR |
| A11CR33 | 1902-1232 | 7 | | DIODE-ZNR 1N3997AR 5.6V 5% DO-4 PD=10W | 04713 | 1N3997AR |
| A11DP1 | 1970-0076 | 8 | 1 | TUBE-ELECTRON SURGE V PTCYR | 28480 | 1970-0076 |
| A11F1 | 2110-0007 | 4 | 3 | FUSE 1A 250V SLO-BLO 1.25X.25 UL | 75915 | 313001 |
| A11F2 | 2110-0007 | 4 | | FUSE 1A 250V SLO-BLO 1.25X.25 UL | 75915 | 313001 |
| A11F3 | 2110-0303 | 3 | 1 | FUSE 2A 250V SLO-BLO 1.25X.25 UL | 28480 | 2110-0303 |
| A11F4 | 2110-0014 | 3 | 1 | FUSE 4A 250V SLO-BLO 1.25X.25 UL | 75915 | 313004 |
| A11F5 | 2110-0201 | 0 | 1 | FUSE .25A 250V SLO-BLO 1.25X.25 UL | 75915 | 313.250 |
| A11F6 | 2110-0012 | 1 | 1 | FUSE .5A 250V FAST-BLO 1.25X.25 UL | 28480 | 2110-0012 |
| A11F7 | 2110-0007 | 4 | | FUSE 1A 250V SLO-BLO 1.25X.25 UL | 75915 | 313001 |
| A11K1 | 0490-0238 | 5 | 1 | RELAY-REED | 28480 | 0490-0238 |
| A11Q1 | 1853-0027 | 1 | | TRANSISTOR PNP SI TO-18 PD=1W FT=100MHZ | 28480 | 1853-0027 |
| A11Q2 | 1853-0027 | 1 | | TRANSISTOR PNP SI TO-18 PD=1W FT=100MHZ | 28480 | 1853-0027 |
| A11Q3 | 1854-0448 | 2 | 1 | TRANSISTOR NPN SI TO-18 PD=360MW | 04713 | 1854-0448 |
| A11Q4 | 1854-0448 | 2 | | TRANSISTOR NPN SI TO-18 PD=360MW | 04713 | 1854-0448 |
| A11Q5 | 1854-0448 | 2 | | TRANSISTOR NPN SI TO-18 PD=360MW | 04713 | 1854-0448 |
| A11Q6 | 1853-0281 | 9 | 4 | TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW | 04713 | 2N2907A |
| A11Q7 | 1853-0281 | 9 | | TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW | 04713 | 2N2907A |
| A11Q8 | 1853-0281 | 9 | | TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW | 04713 | 2N2907A |
| A11Q9 | 1853-0281 | 9 | | TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW | 04713 | 2N2907A |
| A11R1 | 0690-1541 | 9 | 1 | RESISTOR 150K 10% 1W CC TC=0+882 | 01121 | GB1541 |
| A11R2 | 0768-0001 | 9 | 1 | RESISTOR 1K 10% 3W MO TC=0+250 | 27167 | FP3-3-250=1001-K |
| A11R3 | 2100-3212 | 8 | 1 | RESISTOR-TRMR 200 10% C TOP-ADJ 1-TRN | 28480 | 2100-3212 |
| A11R4 | 0812-0072 | 9 | 2 | RESISTOR .23 5% 3W PW TC=0+90 | 28480 | 0812-0072 |
| A11R5 | 0683-3325 | 9 | | RESISTOR 3.3K 5% .25W FC TC=400/+700 | 01121 | CB3325 |
| A11R6 | 0812-0072 | 9 | | RESISTOR .23 5% 3W PW TC=0+90 | 28480 | 0812-0072 |
| A11R7 | 0683-1015 | 7 | | RESISTOR 100 5% .25W FC TC=400/+500 | 01121 | CB1015 |
| A11R8 | 0683-1525 | 4 | 3 | RESISTOR 1.5K 5% .25W FC TC=400/+700 | 01121 | CB1525 |
| A11R9 | 0683-1015 | 7 | | RESISTOR 100 5% .25W FC TC=400/+500 | 01121 | CB1015 |
| A11R10 | 0683-1035 | 1 | | RESISTOR 10K 5% .25W FC TC=400/+700 | 01121 | CB1035 |
| A11R11 | 0698-3445 | 2 | | RESISTOR 348 1% .125W F TC=0+100 | 24546 | C4=1/8=TO=348RF |
| A11R12 | 0698-3438 | 3 | 1 | RESISTOR 147 1% .125W F TC=0+100 | 24546 | C4=1/8=TO=147RF |
| A11R13 | 0811-2771 | 7 | 1 | RESISTOR 18 3% 3W PW TC=0+90 | 28480 | 0811-2771 |
| A11R14 | 0683-3325 | 6 | | RESISTOR 3.3K 5% .25W FC TC=400/+700 | 01121 | CB3325 |
| A11R15 | 0811-3290 | 7 | 2 | RESISTOR .1 5% 2W PW TC=0+800 | 28480 | 0811-3290 |
| A11R16 | 0811-3290 | 7 | | RESISTOR .1 5% 2W PW TC=0+800 | 28480 | 0811-3290 |
| A11R17 | 0683-8215 | 3 | 3 | RESISTOR 620 5% .25W FC TC=400/+600 | 01121 | CB8215 |
| A11R18 | 0683-1025 | 9 | | RESISTOR 1K 5% .25W FC TC=400/+600 | 01121 | CB1025 |
| A11R19 | 0683-2235 | 5 | | RESISTOR 22K 5% .25W FC TC=400/+800 | 01121 | CB2235 |
| A11R20 | 0686-1235 | 9 | 1 | RESISTOR 12K 5% .5W CC TC=0+765 | 01121 | EB1235 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|--------|-----|--------------------------------------|----------|------------------|
| A11R21 | 0683-2235 | 5 | | RESISTOR 22K 5% .25W FC TC=400/+800 | 01121 | C82235 |
| A11R22 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | C84725 |
| A11R23 | 0683-0475 | 1 | | RESISTOR 4.7 5% .25W FC TC=400/+500 | 01121 | C84705 |
| A11R24 | 0683-0475 | 1 | | RESISTOR 4.7 5% .25W FC TC=400/+500 | 01121 | C84705 |
| A11R25 | 0683-3325 | 6 | | RESISTOR 3.3K 5% .25W FC TC=400/+700 | 01121 | C83325 |
| A11R26 | 0683-1015 | 7 | | RESISTOR 100 5% .25W FC TC=400/+500 | 01121 | C81015 |
| A11R27 | 0757-0442 | 9 | | RESISTOR 10K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1002-F |
| A11R28 | 0757-0442 | 9 | | RESISTOR 10K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1002-F |
| A11R29 | 0683-1015 | 7 | | RESISTOR 100 5% .25W FC TC=400/+500 | 01121 | C81015 |
| A11R30 | 0757-0436 | 3 | 1 | RESISTOR 5.11K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=5111-F |
| A11R31 | 0698-4471 | 6 | 1 | RESISTOR 7.15K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=7151-F |
| A11R32 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | C82225 |
| A11R33 | 0757-0280 | 3 | | RESISTOR 1K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1001-F |
| A11R34 | 0683-1015 | 7 | | RESISTOR 100 5% .25W FC TC=400/+500 | 01121 | C81015 |
| A11R35 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | C84725 |
| A11R36 | 0683-1045 | 3 | | RESISTOR 100K 5% .25W FC TC=400/+800 | 01121 | C81045 |
| A11R37 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | C82225 |
| A11R38 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | C82225 |
| A11R39 | 0683-1045 | 3 | | RESISTOR 100K 5% .25W FC TC=400/+800 | 01121 | C81045 |
| A11R40 | 0757-0442 | 9 | | RESISTOR 10K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1002-F |
| A11R41 | 0757-0442 | 9 | | RESISTOR 10K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=1002-F |
| A11U1 | 1820-0493 | 6 | 5 | OP AMP GP 8-DIP-P | 27014 | LM307N |
| A11U2 | 1820-0493 | 6 | | OP AMP GP 8-DIP-P | 27014 | LM307N |
| A11U3 | 1820-0493 | 6 | | OP AMP GP 8-DIP-P | 27014 | LM307N |
| A11U4 | 1820-0493 | 6 | | OP AMP GP 8-DIP-P | 27014 | LM307N |
| A11U5 | 1820-0493 | 6 | | OP AMP GP 8-DIP-P | 27014 | LM307N |
| A11W1 | 1251-3198 | 7 | 2 | CONNECTOR 15-PIN M POST TYPE | 28480 | 1251-3198 |
| A11W2 | 1251-3198 | 7 | | CONNECTOR 15-PIN M POST TYPE | 28480 | 1251-3198 |
| A11W3 | 1251-3197 | 6 | 1 | CONNECTOR 12-PIN M POST TYPE | 28480 | 1251-3197 |
| | | | | A11 MISCELLANEOUS PARTS | | |
| | 04274-26511 | 6 | | PC BOARD, BLANK | 28480 | 04274-26511 |
| A12 | 04274-66512 | 1 | 1 | MOTHER BOARD ASSEMBLY | 28480 | 04274-66512 |
| A12J1 | 1251-3141 | 0 | 1 | CONNECTOR 50-PIN M RECTANGULAR | 28480 | 1251-3141 |
| A12XA1L | 1251-5564 | 7 | 22 | CONNECTOR-PC EDGE 22-CONT/ROW 2=ROWS | 28480 | |
| A12XA1R | 1251-5564 | 7 | | CONNECTOR-PC EDGE 22-CONT/ROW 2=ROWS | 28480 | |
| A12XA2L | 1251-5564 | 7 | | CONNECTOR-PC EDGE 22-CONT/ROW 2=ROWS | 28480 | |
| A12XA2R | 1251-5564 | 7 | | CONNECTOR-PC EDGE 22-CONT/ROW 2=ROWS | 28480 | |
| A12XA3L | 1251-5564 | 7 | | CONNECTOR-PC EDGE 22-CONT/ROW 2=ROWS | 28480 | |
| A12XA3R | 1251-5564 | 7 | | CONNECTOR-PC EDGE 22-CONT/ROW 2=ROWS | 28480 | |
| A12XA4L | 1251-5564 | 7 | | CONNECTOR-PC EDGE 22-CONT/ROW 2=ROWS | 28480 | |
| A12XA4R | 1251-5564 | 7 | | CONNECTOR-PC EDGE 22-CONT/ROW 2=ROWS | 28480 | |
| A12XA5L | 1251-5564 | 7 | | CONNECTOR-PC EDGE 22-CONT/ROW 2=ROWS | 28480 | |
| A12XA5R | 1251-5564 | 7 | | CONNECTOR-PC EDGE 22-CONT/ROW 2=ROWS | 28480 | |
| A12XA6L | 1251-5564 | 7 | | CONNECTOR-PC EDGE 22-CONT/ROW 2=ROWS | 28480 | |
| A12XA6R | 1251-5564 | 7 | | CONNECTOR-PC EDGE 22-CONT/ROW 2=ROWS | 28480 | |
| A12XA7L | 1251-5564 | 7 | | CONNECTOR-PC EDGE 22-CONT/ROW 2=ROWS | 28480 | |
| A12XA7R | 1251-5564 | 7 | | CONNECTOR-PC EDGE 22-CONT/ROW 2=ROWS | 28480 | |
| A12XA8L | 1251-5564 | 7 | | CONNECTOR-PC EDGE 22-CONT/ROW 2=ROWS | 28480 | |
| A12XA8R | 1251-5564 | 7 | | CONNECTOR-PC EDGE 22-CONT/ROW 2=ROWS | 28480 | |
| A12XA9L | 1251-5564 | 7 | | CONNECTOR-PC EDGE 22-CONT/ROW 2=ROWS | 28480 | |
| A12XA9R | 1251-5564 | 7 | | CONNECTOR-PC EDGE 22-CONT/ROW 2=ROWS | 28480 | |
| A12XA11L | 1251-4189 | 8 | 2 | CONNECTOR-PC EDGE 15-CONT/ROW 2=ROWS | 28480 | 1251-4189 |
| A12XA11R | 1251-4189 | 8 | | CONNECTOR-PC EDGE 15-CONT/ROW 2=ROWS | 28480 | 1251-4189 |
| A12XA21L | 1251-5564 | 7 | | CONNECTOR-PC EDGE 22-CONT/ROW 2=ROWS | 28480 | |
| A12XA21R | 1251-5564 | 7 | | CONNECTOR-PC EDGE 22-CONT/ROW 2=ROWS | 28480 | |
| A12XA22L | 1251-5564 | 7 | | CONNECTOR-PC EDGE 22-CONT/ROW 2=ROWS | 28480 | |
| A12XA22R | 1251-5564 | 7 | | CONNECTOR-PC EDGE 22-CONT/ROW 2=ROWS | 28480 | |
| | | | | A12 MISCELLANEOUS PARTS | | |
| | 04274-26512 | 7 | | PC BOARD, BLANK | 28480 | 04274-26512 |
| A13 | | | | NOT ASSIGNED | | |
| A14 | | | | NOT ASSIGNED | | |
| A15 | 04274-66515 | 4 | 1 | HP-IB CONNECTOR BOARD ASSEMBLY | 28480 | 04274-66515 |
| A15J1 | 1251-3283 | 1 | 1 | CONNECTOR 24-PIN F MICROIBSON | 28480 | 1251-3283 |
| A15J2 | 1251-2159 | 8 | 2 | CONNECTOR-PC EDGE 12-CONT/ROW 2=ROWS | 28480 | 1251-2159 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|---|----------|--------------------|
| | 04274-26515 | 0 | | PC BOARD, BLANK | 28480 | 04274-26515 |
| A16 | 04274-66516 | 5 | 1 | DC BIAS CONNECTOR BOARD ASSEMBLY | 28480 | 04274-66516 |
| A16J1 | 1251-0292 | 6 | 1 | CONNECTOR 24-PIN F MICRO RIBBON | 28480 | 1251-0292 |
| A16J2 | 1251-2159 | 8 | | CONNECTOR-PC EDGE 12-CONT/ROW 2-ROWS | 28480 | 1251-2159 |
| | 04274-26515 | 0 | | PC BOARD, BLANK | 28480 | 04274-26515 |
| A17 | | | | NOT ASSIGNED | | |
| A18 | | | | NOT ASSIGNED | | |
| A19 | | | | NOT ASSIGNED | | |
| A20 | | | | NOT ASSIGNED | | |
| A21 | 04274-66521 | 2 | 1 | DC BIAS(+/-35V) BOARD ASSEMBLY (OPTION 001 ONLY) | 28480 | 04274-66521 |
| A21C1 | 0160-2204 | 0 | | CAPACITOR-FXD 100PF +/-5% 300VDC MICA | 28480 | 0160-2204 |
| A21C2 | 0160-2242 | 6 | 1 | CAPACITOR-FXD 2.4PF +/-25PF 500VDC CER | 28480 | 0160-2242 |
| A21C3 | 0160-2257 | 3 | | CAPACITOR-FXD 10PF +/-5% 500VDC CER 0+-60 | 28480 | 0160-2257 |
| A21C5 | 0160-2261 | 9 | 1 | CAPACITOR-FXD 15PF +/-5% 500VDC CER 0+-30 | 28480 | 0160-2261 |
| A21C9 | 0140-0191 | 8 | 1 | CAPACITOR-FXD 56PF +/-5% 300VDC MICA | 72136 | DM15E560J0300WV1CR |
| A21C10 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A21C11 | 0180-1050 | 4 | | CAPACITOR, FXD 100 UF 25VDCW | 28480 | 0180-1050 |
| A21C12 | 0180-1050 | 4 | | CAPACITOR, FXD 100 UF 25VDCW | 28480 | 0180-1050 |
| A21C13 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A21C14 | 0160-0859 | 7 | 1 | CAPACITOR-FXD 1UF +/-10% 50VDC POLYE | 28480 | 0160-0859 |
| A21C14 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A21C15 | 0180-1084 | 4 | 1 | CAPACITOR, FXD 100 UF 50VDCW B1 | 28480 | 0180-1084 |
| A21C16 | 0180-1081 | 1 | 9 | CAPACITOR, FXD 47 UF 50 VDCW AL | 28480 | 0180-1081 |
| A21C18 | 0180-1081 | 1 | | CAPACITOR, FXD 47 UF 50 VDCW AL | 28480 | 0180-1081 |
| A21C19 | 0180-1081 | 1 | | CAPACITOR, FXD 47 UF 50 VDCW AL | 28480 | 0180-1081 |
| A21C20 | 0180-1082 | 2 | 6 | CAPACITOR, FXD 10 UF 100VDCW AL | 28480 | 0180-1082 |
| A21C21 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A21C22 | 0180-1050 | 4 | | CAPACITOR, FXD 100 UF 25VDCW | 28480 | 0180-1050 |
| A21C23 | 0180-1081 | 1 | | CAPACITOR, FXD 47 UF 50 VDCW AL | 28480 | 0180-1081 |
| A21C24 | 0180-1050 | 4 | | CAPACITOR, FXD 100 UF 25VDCW | 28480 | 0180-1050 |
| A21C25 | 0180-1050 | 4 | | CAPACITOR, FXD 100 UF 25VDCW | 28480 | 0180-1050 |
| A21C26 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A21C27 | 0180-2951 | 6 | 6 | CAPACITOR-FXD 33UF+-20% 16VDC AL | 28480 | 0180-2951 |
| A21C28 | 0180-2951 | 6 | | CAPACITOR-FXD 33UF+-20% 16VDC AL | 28480 | 0180-2951 |
| A21C29 | 0180-2951 | 6 | | CAPACITOR-FXD 33UF+-20% 16VDC AL | 28480 | 0180-2951 |
| A21C30 | 0180-1082 | 2 | | CAPACITOR, FXD 10 UF 100VDCW AL | 28480 | 0180-1082 |
| A21CR1 | 1902-3234 | 3 | 4 | DIODE-ZNR 19.6V 5% DO-7 PDS.4W TCR+.073% | 28480 | 1902-3234 |
| A21CR2 | 1902-3234 | 3 | | DIODE-ZNR 19.6V 5% DO-7 PDS.4W TCR+.073% | 28480 | 1902-3234 |
| A21CR3 | 1902-3234 | 3 | | DIODE-ZNR 19.6V 5% DO-7 PDS.4W TCR+.073% | 28480 | 1902-3234 |
| A21CR4 | 1902-3234 | 3 | | DIODE-ZNR 19.6V 5% DO-7 PDS.4W TCR+.073% | 28480 | 1902-3234 |
| A21CR5 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A21CR6 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A21CR7 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A21CR8 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A21CR9 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A21CR10 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A21CR11 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A21CR12 | 1902-1259 | 8 | 4 | DIODE-ZNR 1N5357B 20V 5% PDS.5W IR=500NA | 04713 | 1N5357B |
| A21CR13 | 1902-1259 | 8 | | DIODE-ZNR 1N5357B 20V 5% PDS.5W IR=500NA | 04713 | 1N5357B |
| A21CR14 | 1902-1259 | 8 | | DIODE-ZNR 1N5357B 20V 5% PDS.5W IR=500NA | 04713 | 1N5357B |
| A21CR15 | 1902-1259 | 8 | | DIODE-ZNR 1N5357B 20V 5% PDS.5W IR=500NA | 04713 | 1N5357B |
| A21CR16 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A21CR17 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A21CR18 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A21CR19 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A21CR20 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A21CR21 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A21CR22 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A21CR23 | 1901-0460 | 9 | 2 | DIODE-STABISTOR 30V 150MA DO-7 | 28480 | 1901-0460 |
| A21CR24 | 1901-0460 | 9 | | DIODE-STABISTOR 30V 150MA DO-7 | 28480 | 1901-0460 |
| A21CR25 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A21CR26 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A21CR27 | 1902-3122 | 8 | 2 | DIODE-ZNR 6.65V 2% DO-7 PDS.4W TCR+.038% | 28480 | 1902-3122 |
| A21CR28 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A21CR29 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|--|----------|------------------|
| A21J1 | 1200-0473 | 8 | 4 | SOCKET-IC 16-CONT DIP DIP-SLDR | 28480 | 1200-0473 |
| A21J2 | 1200-0473 | 8 | | SOCKET-IC 16-CONT DIP DIP-SLDR | 28480 | 1200-0473 |
| A21J3 | 1200-0608 | 1 | | SOCKET-IC 40-CONT | 28480 | 1200-0608 |
| A21J4 | 1200-0658 | 1 | 2 | SOCKET-IC 24-CONT DIP-SLDR | 28480 | 1200-0658 |
| A21K1 | 0490-0240 | 9 | | RELAY-REED 1A | 28480 | 0490-0240 |
| A21K2 | 0490-0242 | 1 | 1 | RELAY-REED | 28480 | 0490-0242 |
| A21L1 | 9100-1618 | 1 | 4 | COIL-MLD 5.6UH 10% Q#45 .155DX,375LG-NOM | 28480 | 9100-1618 |
| A21L2 | 9100-1618 | 1 | | COIL-MLD 5.6UH 10% Q#45 .155DX,375LG-NOM | 28480 | 9100-1618 |
| A21L3 | 9100-3139 | 5 | | COIL 75UH 15% .5DX,875LG-NOM | 28480 | 9100-3139 |
| A21Q1 | 1853-0204 | 6 | 7 | TRANSISTOR PNP 2N4920 SI PD=30W FT=3MHZ | 04713 | 2N4920 |
| A21Q1 | 1854-0271 | 9 | 2 | TRANSISTOR NPN SI TC=39 PD=1W FT=150MHZ | 28480 | 1854-0271 |
| A21Q2 | 1853-0232 | 0 | 1 | TRANSISTOR PNP SI TC=39 PD=1W FT=200MHZ | 28480 | 1853-0232 |
| A21Q3 | 1853-0080 | 6 | 12 | TRANSISTOR PNP SI PD=300MW FT=30MHZ | 28480 | 1853-0080 |
| A21Q4 | 1854-0474 | 4 | 12 | TRANSISTOR NPN SI PD=310MW FT=100MHZ | 04713 | 2N5551 |
| A21Q5 | 1854-0474 | 4 | | TRANSISTOR NPN SI PD=310MW FT=100MHZ | 04713 | 2N5551 |
| A21Q6 | 1853-0080 | 6 | | TRANSISTOR PNP SI PD=300MW FT=30MHZ | 28480 | 1853-0080 |
| A21Q7 | 1855-0111 | 8 | | TRANSISTOR J-FET N-CHAN SI | 28480 | 1855-0111 |
| A21Q8 | 1855-0111 | 8 | | TRANSISTOR J-FET N-CHAN SI | 28480 | 1855-0111 |
| A21Q9 | 1855-0111 | 8 | | TRANSISTOR J-FET N-CHAN SI | 28480 | 1855-0111 |
| A21Q10 | 1855-0111 | 8 | | TRANSISTOR J-FET N-CHAN SI | 28480 | 1855-0111 |
| A21Q11 | 1855-0111 | 8 | | TRANSISTOR J-FET N-CHAN SI | 28480 | 1855-0111 |
| A21Q12 | 1855-0111 | 8 | | TRANSISTOR J-FET N-CHAN SI | 28480 | 1855-0111 |
| A21Q13 | 1853-0204 | 6 | | TRANSISTOR PNP 2N4920 SI PD=30W FT=3MHZ | 04713 | 2N4920 |
| A21Q14 | 1853-0080 | 6 | | TRANSISTOR PNP SI PD=300MW FT=30MHZ | 28480 | 1853-0080 |
| A21Q15 | 1854-0474 | 4 | | TRANSISTOR NPN SI PD=310MW FT=100MHZ | 04713 | 2N5551 |
| A21Q16 | 1853-0080 | 6 | | TRANSISTOR PNP SI PD=300MW FT=30MHZ | 28480 | 1853-0080 |
| A21Q17 | 1853-0204 | 6 | | TRANSISTOR PNP 2N4920 SI PD=30W FT=3MHZ | 04713 | 2N4920 |
| A21Q18 | 1853-0080 | 6 | | TRANSISTOR PNP SI PD=300MW FT=30MHZ | 28480 | 1853-0080 |
| A21Q19 | 1853-0204 | 6 | | TRANSISTOR PNP 2N4920 SI PD=30W FT=3MHZ | 04713 | 2N4920 |
| A21Q20 | 1854-0347 | 0 | 4 | TRANSISTOR NPN 2N4923 SI PD=30W FT=3MHZ | 04713 | 2N4923 |
| A21Q21 | 1854-0474 | 4 | | TRANSISTOR NPN SI PD=310MW FT=100MHZ | 04713 | 2N5551 |
| A21Q22 | 1853-0080 | 6 | | TRANSISTOR PNP SI PD=300MW FT=30MHZ | 28480 | 1853-0080 |
| A21Q23 | 1854-0474 | 4 | | TRANSISTOR NPN SI PD=310MW FT=100MHZ | 04713 | 2N5551 |
| A21Q24 | 1854-0347 | 0 | | TRANSISTOR NPN 2N4923 SI PD=30W FT=3MHZ | 04713 | 2N4923 |
| A21Q25 | 1854-0474 | 4 | | TRANSISTOR NPN SI PD=310MW FT=100MHZ | 04713 | 2N5551 |
| A21Q26 | 1854-0347 | 0 | | TRANSISTOR NPN 2N4923 SI PD=30W FT=3MHZ | 04713 | 2N4923 |
| A21Q27 | 1853-0080 | 6 | | TRANSISTOR PNP SI PD=300MW FT=30MHZ | 28480 | 1853-0080 |
| A21Q28 | 1854-0474 | 4 | | TRANSISTOR NPN SI PD=310MW FT=100MHZ | 04713 | 2N5551 |
| A21Q29 | 1853-0204 | 6 | | TRANSISTOR PNP 2N4920 SI PD=30W FT=3MHZ | 04713 | 2N4920 |
| A21R1 | 0683-1835 | 9 | | RESISTOR 16K 5% .25W FC TC=400/+800 | 01121 | C81835 |
| A21R2 | 0683-8215 | 3 | | RESISTOR 820 5% .25W FC TC=400/+600 | 01121 | C88215 |
| A21R4 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | C82225 |
| A21R5 | 0683-1225 | 1 | 11 | RESISTOR 1.2K 5% .25W FC TC=400/+700 | 01121 | C81225 |
| A21R6 | 0683-1235 | 3 | | RESISTOR 12K 5% .25W FC TC=400/+800 | 01121 | C81235 |
| A21R7 | 0683-5615 | 1 | | RESISTOR 560 5% .25W FC TC=400/+600 | 01121 | C85615 |
| A21R8 | 2100-3274 | 2 | | RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN | 28480 | 2100-3274 |
| A21R9 | 0683-1835 | 9 | | RESISTOR 16K 5% .25W FC TC=400/+800 | 01121 | C81835 |
| A21R10 | 0683-1835 | 9 | | RESISTOR 16K 5% .25W FC TC=400/+800 | 01121 | C81835 |
| A21R11 | 2100-3274 | 2 | | RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN | 28480 | 2100-3274 |
| A21R12 | 2100-3274 | 2 | | RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN | 28480 | 2100-3274 |
| A21R13 | 2100-3426 | 6 | | RESISTOR-TRMR 20 10% C SIDE-ADJ 1-TRN | 28480 | 2100-3426 |
| A21R14 | 0683-1515 | 2 | | RESISTOR 150 5% .25W FC TC=400/+600 | 01121 | C81515 |
| A21R16 | 0683-8215 | 3 | | RESISTOR 820 5% .25W FC TC=400/+600 | 01121 | C88215 |
| A21R17 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | C82225 |
| A21R18 | 0683-1225 | 1 | | RESISTOR 1.2K 5% .25W FC TC=400/+700 | 01121 | C81225 |
| A21R19 | 0683-1235 | 3 | | RESISTOR 12K 5% .25W FC TC=400/+800 | 01121 | C81235 |
| A21R20 | 0683-5615 | 1 | | RESISTOR 560 5% .25W FC TC=400/+600 | 01121 | C85615 |
| A21R21 | 0698-3260 | 9 | 2 | RESISTOR 464K 1% .125W F TC=0+100 | 28480 | 0698-3260 |
| A21R22 | 0757-0458 | 7 | | RESISTOR 51.1K 1% .125W F TC=0+100 | 24546 | C4=1/8-T0=5112=F |
| A21R23 | 0757-0458 | 7 | | RESISTOR 51.1K 1% .125W F TC=0+100 | 24546 | C4=1/8-T0=5112=F |
| A21R24 | 0698-3260 | 9 | | RESISTOR 464K 1% .125W F TC=0+100 | 28480 | 0698-3260 |
| A21R25 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | C84725 |
| A21R26 | 0699-0391 | 3 | 4 | RESISTOR 25K .1% .125W F TC=0+25 | 28480 | 0699-0391 |
| A21R27 | 0699-0391 | 3 | | RESISTOR 25K .1% .125W F TC=0+25 | 28480 | 0699-0391 |
| A21R28 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | C84725 |
| A21R29 | 0698-3442 | 9 | 4 | RESISTOR 237 1% .125W F TC=0+100 | 24546 | C4=1/8-T0=237R=F |
| A21R30 | 0757-0403 | 2 | | RESISTOR 121 1% .125W F TC=0+100 | 24546 | C4=1/8-T0=121R=F |
| A21R33 | 0699-0390 | 2 | 2 | RESISTOR 450K .1% .125W F TC=0+25 | 28480 | 0699-0390 |
| A21R34 | 0698-2198 | 0 | 2 | RIFXD MET FLM 50K OHM 0.1% 1/8W | 28480 | 0698-2198 |
| A21R35 | 0683-8205 | 1 | 1 | RESISTOR 82 5% .25W FC TC=400/+500 | 01121 | C88205 |
| A21R36 | 0683-1225 | 1 | | RESISTOR 1.2K 5% .25W FC TC=400/+600 | 01121 | C81225 |
| A21R37 | 0683-5615 | 1 | | RESISTOR 560 5% .25W FC TC=400/+600 | 01121 | C85615 |
| A21R38 | 0698-2198 | 0 | | RIFXD MET FLM 50K OHM 0.1% 1/8W | 28480 | 0698-2198 |
| A21R39 | 0699-0390 | 2 | | RESISTOR 450K .1% .125W F TC=0+25 | 28480 | 0699-0390 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|--|----------|------------------|
| A21R40 | 0683-5625 | 3 | | RESISTOR 5.6K 5% .25W FC TC=400/+700 | 01121 | CB5625 |
| A21R41 | 0683-5625 | 3 | | RESISTOR 5.6K 5% .25W FC TC=400/+700 | 01121 | CB5625 |
| A21R42 | 0683-5625 | 3 | | RESISTOR 5.6K 5% .25W FC TC=400/+700 | 01121 | CB5625 |
| A21R43 | 0683-5625 | 3 | | RESISTOR 5.6K 5% .25W FC TC=400/+700 | 01121 | CB5625 |
| A21R44 | 0683-1235 | 3 | | RESISTOR 12K 5% .25W FC TC=400/+800 | 01121 | CB1235 |
| A21R45 | 0683-1235 | 3 | | RESISTOR 12K 5% .25W FC TC=400/+800 | 01121 | CB1235 |
| A21R46 | 0683-3335 | 8 | | RESISTOR 33K 5% .25W FC TC=400/+800 | 01121 | CB3335 |
| A21R47 | 0683-1835 | 9 | | RESISTOR 18K 5% .25W FC TC=400/+800 | 01121 | CB1835 |
| A21R48 | 2100-3353 | 8 | | RESISTOR-TRMR 20K 10% C 61DE-ADJ 1-TRN | 32997 | 3386X-Y46-203 |
| A21R49 | 0683-5625 | 3 | | RESISTOR 5.6K 5% .25W FC TC=400/+700 | 01121 | CB5625 |
| A21R50 | 0698-3442 | 9 | | RESISTOR 237 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=237R-F |
| A21R51 | 0698-3442 | 9 | | RESISTOR 237 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=237R-F |
| A21R52 | 0698-3442 | 9 | | RESISTOR 237 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=237R-F |
| A21R53 | 0683-1835 | 9 | | RESISTOR 18K 5% .25W FC TC=400/+800 | 01121 | CB1835 |
| A21R54 | 0683-1505 | 0 | 2 | RESISTOR 15 5% .25W FC TC=400/+800 | 01121 | CB1505 |
| A21R55 | 0683-3335 | 8 | | RESISTOR 33K 5% .25W FC TC=400/+800 | 01121 | CB3335 |
| A21R56 | 0683-5605 | 9 | 3 | RESISTOR 56 5% .25W FC TC=400/+500 | 01121 | CB5605 |
| A21R57 | 0698-3450 | 9 | | RESISTOR 42.2K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=4222-F |
| A21R58 | 0698-3450 | 9 | | RESISTOR 42.2K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=4222-F |
| A21R59 | 0683-4735 | 4 | | RESISTOR 47K 5% .25W FC TC=400/+800 | 01121 | CB4735 |
| A21R60 | 0683-1225 | 1 | | RESISTOR 1.2K 5% .25W FC TC=400/+700 | 01121 | CB1225 |
| A21R61 | 0683-1235 | 3 | | RESISTOR 12K 5% .25W FC TC=400/+800 | 01121 | CB1235 |
| A21R62 | 0683-1235 | 3 | | RESISTOR 12K 5% .25W FC TC=400/+800 | 01121 | CB1235 |
| A21R63 | 0683-1225 | 1 | | RESISTOR 1.2K 5% .25W FC TC=400/+700 | 01121 | CB1225 |
| A21R64 | 0683-3335 | 8 | | RESISTOR 33K 5% .25W FC TC=400/+800 | 01121 | CB3335 |
| A21R65 | 0683-5615 | 1 | | RESISTOR 560 5% .25W FC TC=400/+600 | 01121 | CB5615 |
| A21R66 | 0757-0439 | 4 | | RESISTOR 6.81K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=6811-F |
| A21R67 | 0757-0439 | 4 | | RESISTOR 6.81K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=6811-F |
| A21R68 | 1810-0269 | 3 | | NETWORK-RES 9-PIN-SIP .1-PIN-SPCG | 28480 | 1810-0269 |
| A21R69 | 0683-1055 | 5 | | RESISTOR 1M 5% .25W FC TC=800/+900 | 01121 | CB1055 |
| A21R70 | 0683-1835 | 9 | | RESISTOR 18K 5% .25W FC TC=400/+800 | 01121 | CB1835 |
| A21R71 | 0683-1505 | 0 | | RESISTOR 15 5% .25W FC TC=400/+800 | 01121 | CB1505 |
| A21R72 | 0683-3335 | 8 | | RESISTOR 33K 5% .25W FC TC=400/+800 | 01121 | CB3335 |
| A21R73 | 0683-5605 | 9 | | RESISTOR 56 5% .25W FC TC=400/+500 | 01121 | CB5605 |
| A21R74 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A21R75 | 0683-3335 | 8 | | RESISTOR 33K 5% .25W FC TC=400/+800 | 01121 | CB3335 |
| A21R76 | 0683-4735 | 4 | | RESISTOR 47K 5% .25W FC TC=400/+800 | 01121 | CB4735 |
| A21R77 | 0683-1225 | 1 | | RESISTOR 1.2K 5% .25W FC TC=400/+700 | 01121 | CB1225 |
| A21R78 | 0683-1235 | 3 | | RESISTOR 12K 5% .25W FC TC=400/+800 | 01121 | CB1235 |
| A21R79 | 0683-1835 | 9 | | RESISTOR 18K 5% .25W FC TC=400/+800 | 01121 | CB1835 |
| A21R80 | 0683-1225 | 1 | | RESISTOR 1.2K 5% .25W FC TC=400/+700 | 01121 | CB1225 |
| A21R81 | 0683-5605 | 9 | | RESISTOR 56 5% .25W FC TC=400/+500 | 01121 | CB5605 |
| A21R82 | 1810-0269 | 3 | | NETWORK-RES 9-PIN-SIP .1-PIN-SPCG | 28480 | 1810-0269 |
| A21R83 | 2100-3252 | 6 | | RESISTOR-TRMR 5K 10% C TOP-ADJ 1-TRN | 28480 | 2100-3252 |
| A21R84 | 1810-0269 | 3 | 2 | NETWORK-RES 9-PIN-SIP .1-PIN-SPCG | 28480 | 1810-0269 |
| A21R85 | 0683-1235 | 3 | | RESISTOR 12K 5% .25W FC TC=400/+800 | 01121 | CB1235 |
| A21R86 | 0683-5625 | 3 | | RESISTOR 5.6K 5% .25W FC TC=400/+700 | 01121 | CB5625 |
| A21U1 | 1826-0319 | 7 | | OP AMP BIFET T0-99 | 27014 | LF356H |
| A21U2 | 1826-0357 | 3 | | OP AMP WB T0-99 | 27014 | LF357H |
| A21U3 | 1826-0319 | 7 | | OP AMP BIFET T0-99 | 27014 | LF356H |
| A21U4 | 1820-1856 | 7 | 2 | CONV 12-B-D/A 24-DIP-C | 24355 | AD563KD/BCD |
| A21U5 | 1820-1730 | 6 | | IC FF TTL LS D-TYPE POS-EDGE-TRIG COM | 01295 | SN74LS273N |
| A21U6 | 1826-0122 | 0 | | IC 7805 V RGLTR T0-220 | 07263 | 7805UC |
| A21U7 | 1826-0174 | 2 | | COMPARATOR GP QUAD 14-DIP-P | 28480 | 1826-0174 |
| A21U8 | 1820-1730 | 6 | | IC FF TTL LS D-TYPE POS-EDGE-TRIG COM | 01295 | SN74LS273N |
| A21U9 | 1826-0222 | 1 | | OP AMP GP QUAD 14-DIP-P | 07263 | UA4136PC |
| A21U10 | 1820-1197 | 9 | | IC GATE TTL LS NAND QUAD 2-INP | 01295 | SN74LS00N |
| A21U11 | 1820-1481 | 4 | | IC PIA NMOS | 04713 | MC6821L |
| A21U12 | 1820-2024 | 3 | | IC DRVR TTL LS LINE DRVR OCTL | 01295 | SN74LS244N |
| A21U13 | 1820-2024 | 3 | | IC DRVR TTL LS LINE DRVR OCTL | 01295 | SN74LS244N |
| | | | | A21 MISCELLANEOUS PARTS | | |
| | 04274-26521 | 8 | | PC BOARD, BLANK | 28480 | 04274-26521 |
| A22 | 04274-66522 | 3 | 1 | HP-IB INTERFACE BOARD ASSEMBLY (OPTION 101 ONLY) | 28480 | 04274-66522 |
| A22C1 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A22C2 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A22C3 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A22C4 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80-20% 100VDC CER | 28480 | 0160-2055 |
| A22C5 | 0160-0226 | 6 | | CAPACITOR-FXD 22UF+/-10% 15VDC TA | 56289 | 1500226X015B2 |
| A22J1 | 1200-0608 | 1 | | SOCKET-IC 40-CONT | 28480 | 1200-0608 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|--|----------|--------------------|
| A22L1 | 9100-3139 | 5 | | COIL 75UH 15% 5DX, 875LG-NOM | 28480 | 9100-3139 |
| A22L2 | 9100-1788 | 6 | | CHOKE-WIDE BAND 2MAX680 OHM@ 180 MHZ | 02114 | VK200 28/48 |
| A22R1 | 1810-0269 | 3 | | NETWORK-RES 9-PIN-SIP .1-PIN-8PC6 | 28480 | 1810-0269 |
| A22R2 | 0683-1835 | 9 | | RESISTOR 18K 5% .25W FC TC=-400/+800 | 01121 | C81835 |
| A22R3 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=-400/+700 | 01121 | C84725 |
| A22R4 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=-400/+700 | 01121 | C84725 |
| A22R5 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=-400/+700 | 01121 | C84725 |
| A22R6 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=-400/+700 | 01121 | C84725 |
| A22R7 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=-400/+700 | 01121 | C84725 |
| A2291 | 3101-1973 | 7 | | SWITCH-SL 7-1A DIP-SLIDE-ASSY .1A 50VDC | 28480 | 3101-1973 |
| A22U1 | 1820-1873 | 8 | 1 | IC BFR TTL LS INV OCTL 2-INP | 27014 | DM81598N |
| A22U2 | 1820-1204 | 9 | 1 | IC GATE TTL LS NAND DUAL 4-INP | 01295 | SN74LS20N |
| A22U3 | 1820-2113 | 1 | 1 | IC MICPROC-ACCESS NMOS | 04713 | MC68088L |
| A22U4 | 1820-1199 | 1 | 1 | IC INV TTL LS HEX 1-INP | 01295 | SN74LS04N |
| A22U5 | 1820-2058 | 3 | 4 | IC MISC TTL S QUAD | 28480 | 1820-2058 |
| A22U6 | 1820-2058 | 3 | | IC MISC TTL S QUAD | 28480 | 1820-2058 |
| A22U8 | 1820-1144 | 6 | | IC GATE TTL LS NOR QUAD 2-INP | 01295 | SN74LS02N |
| A22U9 | 1820-2058 | 3 | | IC MISC TTL S QUAD | 28480 | 1820-2058 |
| A22U10 | 1820-2058 | 3 | | IC MISC TTL S QUAD | 28480 | 1820-2058 |
| A22W1 | 8159-0005 | 0 | | WIRE 22AWG W PVC 1X22 80C | 28480 | 8159-0005 |
| A22W2 | 8159-0005 | 0 | | WIRE 22AWG W PVC 1X22 80C | 28480 | 8159-0005 |
| | | | | A22 MISCELLANEOUS PARTS | | |
| | 04274-26522 | 9 | | PC BOARD, BLANK | 28480 | 04274-26522 |
| A23 | 04274-66523 | 4 | 1 | DC BIAS (+/-100V) BOARD ASSEMBLY (OPTION 002 ONLY) | 28480 | 04274-66523 |
| A23C1 | 0140-0210 | 2 | 1 | CAPACITOR-FXD 270PF +/-5% 300VDC MICA | 72136 | DM35F271J0300MVICR |
| A23C3 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80=20% 100VDC CER | 28480 | 0160-2055 |
| A23C4 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80=20% 100VDC CER | 28480 | 0160-2055 |
| A23C5 | 0180-1050 | 4 | | CAPACITOR-FXD 100uF +50=10% 25VDC | 28480 | 0180-1050 |
| A23C6 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80=20% 100VDC CER | 28480 | 0160-2055 |
| A23C7 | 0160-0127 | 2 | | CAPACITOR-FXD 1UF +/-20% 25VDC CER | 28480 | 0160-0127 |
| A23C8 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80=20% 100VDC CER | 28480 | 0160-2055 |
| A23C9 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80=20% 100VDC CER | 28480 | 0160-2055 |
| A23C10 | 0180-1080 | 0 | 2 | CAPACITOR-FXD 4.7uF +100=10% 160VDC | 28480 | 0180-1080 |
| A23C11 | 0180-1080 | 0 | | CAPACITOR-FXD 4.7uF +100=10% 160VDC | 28480 | 0180-1080 |
| A23C12 | 0180-1082 | 2 | | CAPACITOR-FXD 10uF +50=10% 100VDC | 28480 | 0180-1082 |
| A23C13 | 0180-1082 | 2 | | CAPACITOR-FXD 10uF +50=10% 100VDC | 28480 | 0180-1082 |
| A23C14 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80=20% 100VDC CER | 28480 | 0160-2055 |
| A23C15 | 0180-1050 | 4 | | CAPACITOR-FXD 100uF +50=10% 25VDC | 28480 | 0180-1050 |
| A23C16 | 0170-0066 | 9 | 2 | CAPACITOR-FXD .027UF +/-10% 200VDC POLYE | 28480 | 0170-0066 |
| A23C17 | 0170-0066 | 9 | | CAPACITOR-FXD .027UF +/-10% 200VDC POLYE | 28480 | 0170-0066 |
| A23C18 | 0160-3456 | 6 | | CAPACITOR-FXD 1000PF +/-10% 1KVDC CER | 28480 | 0160-3456 |
| A23C19 | 0160-3456 | 6 | | CAPACITOR-FXD 1000PF +/-10% 1KVDC CER | 28480 | 0160-3456 |
| A23C20 | 0160-3456 | 6 | | CAPACITOR-FXD 1000PF +/-10% 1KVDC CER | 28480 | 0160-3456 |
| A23C21 | 0180-1050 | 4 | | CAPACITOR-FXD 100uF +50=10% 25VDC | 28480 | 0180-1050 |
| A23C22 | 0180-1050 | 4 | | CAPACITOR-FXD 100uF +50=10% 25VDC | 28480 | 0180-1050 |
| A23C23 | 0180-1081 | 1 | | CAPACITOR-FXD 47uF +50=10% 50VDC | 28480 | 0180-1081 |
| A23C24 | 0180-1081 | 1 | | CAPACITOR-FXD 47uF +50=10% 50VDC | 28480 | 0180-1081 |
| A23C25 | 0180-1081 | 1 | | CAPACITOR-FXD 47uF +50=10% 50VDC | 28480 | 0180-1081 |
| A23C26 | 0180-1081 | 1 | | CAPACITOR-FXD 47uF +50=10% 50VDC | 28480 | 0180-1081 |
| A23C27 | 0180-1082 | 2 | | CAPACITOR-FXD 10uF +50=10% 100VDC | 28480 | 0180-1082 |
| A23C28 | 0180-1082 | 2 | | CAPACITOR-FXD 10uF +50=10% 100VDC | 28480 | 0180-1082 |
| A23C29 | 0180-1050 | 4 | | CAPACITOR-FXD 100uF +50=10% 25VDC | 28480 | 0180-1050 |
| A23C30 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80=20% 100VDC CER | 28480 | 0160-2055 |
| A23C31 | 0180-1081 | 1 | | CAPACITOR-FXD 47uF +50=10% 50VDC | 28480 | 0180-1081 |
| A23C32 | 0180-1050 | 4 | | CAPACITOR-FXD 100uF +50=10% 25DC | 28480 | 0180-1050 |
| A23C33 | 0180-1050 | 4 | | CAPACITOR-FXD 100uF +50=10% 25DC | 28480 | 0180-1050 |
| A23C34 | 0160-2055 | 9 | | CAPACITOR-FXD .01UF +80=20% 100VDC CER | 28480 | 0160-2055 |
| A23C35 | 0180-2951 | 6 | | CAPACITOR-FXD 33UF +/-20% 16VDC AL | 28480 | 0180-2951 |
| A23C36 | 0180-2951 | 6 | | CAPACITOR-FXD 33UF +/-20% 16VDC AL | 28480 | 0180-2951 |
| A23C37 | 0180-2951 | 6 | | CAPACITOR-FXD 33UF +/-20% 16VDC AL | 28480 | 0180-2951 |
| A23CR1 | 1902-3385 | 5 | 4 | DIODE-ZNR 69.8V 2% DO-7 PDM, 4W TC=+.079% | 28480 | 1902-3385 |
| A23CR2 | 1902-3385 | 5 | | DIODE-ZNR 69.8V 2% DO-7 PDM, 4W TC=+.079% | 28480 | 1902-3385 |
| A23CR3 | 1902-3385 | 5 | | DIODE-ZNR 69.8V 2% DO-7 PDM, 4W TC=+.079% | 28480 | 1902-3385 |
| A23CR4 | 1902-3385 | 5 | | DIODE-ZNR 69.8V 2% DO-7 PDM, 4W TC=+.079% | 28480 | 1902-3385 |
| A23CR5 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A23CR6 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A23CR7 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DO-7 | 28480 | 1901-0025 |
| A23CR8 | 1901-0033 | 2 | | DIODE-GEN PRP 180V 200MA DO-7 | 28480 | 1901-0033 |
| A23CR9 | 1901-0033 | 2 | | DIODE-GEN PRP 180V 200MA DO-7 | 28480 | 1901-0033 |
| A23CR10 | 1901-0033 | 2 | | DIODE-GEN PRP 180V 200MA DO-7 | 28480 | 1901-0033 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|--|----------|------------------|
| A23CR11 | 1901-0033 | 2 | | DIODE-GEN PRP 180V 200MA DD-7 | 28480 | 1901-0033 |
| A23CR12 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DD-7 | 28480 | 1901-0025 |
| A23CR13 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DD-7 | 28480 | 1901-0025 |
| A23CR14 | 1901-0025 | 2 | | DIODE-GEN PRP 100V 200MA DD-7 | 28480 | 1901-0025 |
| A23CR15 | 1902-3122 | 8 | | DIODE-ZNR 6.85V 2X DO-7 PD=.4W TC=+.038% | 28480 | 1902-3122 |
| A23J1 | 1200-0473 | 8 | | SOCKET-IC 16-CONT DIP DIP-SLDR | 28480 | 1200-0473 |
| A23J2 | 1200-0473 | 8 | | SOCKET-IC 16-CONT DIP DIP-SLDR | 28480 | 1200-0473 |
| A23J3 | 1200-0608 | 1 | | SOCKET-IC 40-CONT | 28480 | 1200-0608 |
| A23J4 | 1200-0656 | 1 | | SOCKET-IC 24-CONT DIP-SLDR | 28480 | 1200-0656 |
| A23L1 | 9140-0137 | 1 | 6 | COIL-MLD 1MH 5% Q=60 .19DX.44LG=NOM | 28480 | 9140-0137 |
| A23L2 | 9140-0137 | 1 | | COIL-MLD 1MH 5% Q=60 .19DX.44LG=NOM | 28480 | 9140-0137 |
| A23L3 | 9140-0137 | 1 | | COIL-MLD 1MH 5% Q=60 .19DX.44LG=NOM | 28480 | 9140-0137 |
| A23L4 | 9140-0137 | 1 | | COIL-MLD 1MH 5% Q=60 .19DX.44LG=NOM | 28480 | 9140-0137 |
| A23L5 | 9140-0137 | 1 | | COIL-MLD 1MH 5% Q=60 .19DX.44LG=NOM | 28480 | 9140-0137 |
| A23L6 | 9140-0137 | 1 | | COIL-MLD 1MH 5% Q=60 .19DX.44LG=NOM | 28480 | 9140-0137 |
| A23L7 | 9100-1618 | 1 | | COIL-MLD 5.6UH 10% Q=45 .155DX.375LG=NOM | 28480 | 9100-1618 |
| A23L8 | 9100-1618 | 1 | | COIL-MLD 5.6UH 10% Q=45 .155DX.375LG=NOM | 28480 | 9100-1618 |
| A23L9 | 9100-3139 | 5 | | COIL 75UH 15% .5DX.875LG=NOM | 28480 | 9100-3139 |
| A23Q1 | 1853-0044 | 0 | 1 | TRANSISTOR PNP 2N6423 SI TO-66 PD=35W | 04713 | 2N6423 |
| A23Q2 | 1854-0324 | 3 | 1 | TRANSISTOR NPN 2N3739 SI TO-66 PD=20W | 04713 | 2N3739 |
| A23Q3 | 1854-0474 | 4 | | TRANSISTOR NPN SI PD=310MW FT=100MHZ | 04713 | 2N5551 |
| A23Q4 | 1853-0080 | 6 | | TRANSISTOR PNP SI PD=300MW FT=30MHZ | 28480 | 1853-0080 |
| A23Q5 | 1855-0111 | 8 | | TRANSISTOR J-FET N-CHAN SI | 28480 | 1855-0111 |
| A23Q6 | 1855-0111 | 8 | | TRANSISTOR J-FET N-CHAN SI | 28480 | 1855-0111 |
| A23Q7 | 1853-0204 | 6 | | TRANSISTOR PNP 2N4920 SI PD=30W FT=3MHZ | 04713 | 2N4920 |
| A23Q8 | 1853-0037 | 3 | 1 | TRANSISTOR PNP SI TO-39 PD=1W FT=100MHZ | 28480 | 1853-0037 |
| A23Q9 | 1854-0271 | 9 | | TRANSISTOR NPN SI TO-39 PD=1W FT=150MHZ | 28480 | 1854-0271 |
| A23Q10 | 1854-0474 | 4 | | TRANSISTOR NPN SI PD=310MW FT=100MHZ | 04713 | 2N5551 |
| A23Q11 | 1853-0080 | 6 | | TRANSISTOR PNP SI PD=300MW FT=30MHZ | 28480 | 1853-0080 |
| A23Q12 | 1854-0347 | 0 | | TRANSISTOR NPN 2N4923 SI PD=30W FT=3MHZ | 04713 | 2N4923 |
| A23Q13 | 1854-0474 | 4 | | TRANSISTOR NPN SI PD=310MW FT=100MHZ | 04713 | 2N5551 |
| A23Q14 | 1853-0080 | 6 | | TRANSISTOR PNP SI PD=300MW FT=30MHZ | 28480 | 1853-0080 |
| A23Q15 | 1853-0204 | 6 | | TRANSISTOR PNP 2N4920 SI PD=30W FT=3MHZ | 04713 | 2N4920 |
| A23Q16 | 1853-0080 | 6 | | TRANSISTOR PNP SI PD=300MW FT=30MHZ | 28480 | 1853-0080 |
| A23Q17 | 1854-0474 | 4 | | TRANSISTOR NPN SI PD=310MW FT=100MHZ | 04713 | 2N5551 |
| A23Q18 | 1853-0080 | 6 | | TRANSISTOR PNP SI PD=300MW FT=30MHZ | 28480 | 1853-0080 |
| A23Q19 | 1854-0474 | 4 | | TRANSISTOR NPN SI PD=310MW FT=100MHZ | 04713 | 2N5551 |
| A23R1 | 0683-2725 | 8 | 2 | RESISTOR 2.7K 5% .25W FC TC=400/+700 | 01121 | CB2725 |
| A23R2 | 0683-5625 | 3 | | RESISTOR 5.6K 5% .25W FC TC=400/+700 | 01121 | CB5625 |
| A23R4 | 0683-3335 | 8 | | RESISTOR 33K 5% .25W FC TC=400/+800 | 01121 | CB3335 |
| A23R5 | 0683-3325 | 6 | | RESISTOR 3.3K 5% .25W FC TC=400/+700 | 01121 | CB3325 |
| A23R6 | 0683-1535 | 6 | | RESISTOR 15K 5% .25W FC TC=400/+800 | 01121 | CB1535 |
| A23R7 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A23R8 | 2100-3274 | 2 | | RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN | 28480 | 2100-3274 |
| A23R9 | 2100-3207 | 1 | | RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN | 28480 | 2100-3207 |
| A23R10 | 0683-4755 | 8 | 2 | RESISTOR 4.7M 5% .25W FC TC=900/+1100 | 01121 | CB4755 |
| A23R10 | 2100-3274 | 2 | | RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN | 28480 | 2100-3274 |
| A23R11 | 0683-4755 | 8 | | RESISTOR 4.7M 5% .25W FC TC=900/+1100 | 01121 | CB4755 |
| A23R11 | 2100-3274 | 2 | | RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN | 28480 | 2100-3274 |
| A23R12 | 0683-3335 | 8 | | RESISTOR 33K 5% .25W FC TC=400/+800 | 01121 | CB3335 |
| A23R13 | 0683-1835 | 9 | | RESISTOR 18K 5% .25W FC TC=400/+800 | 01121 | CB1835 |
| A23R14 | 0683-2725 | 8 | | RESISTOR 2.7K 5% .25W FC TC=400/+700 | 01121 | CB2725 |
| A23R15 | 0683-5625 | 3 | | RESISTOR 5.6K 5% .25W FC TC=400/+700 | 01121 | CB5625 |
| A23R17 | 0683-3335 | 8 | | RESISTOR 33K 5% .25W FC TC=400/+800 | 01121 | CB3335 |
| A23R18 | 0683-3325 | 6 | | RESISTOR 3.3K 5% .25W FC TC=400/+700 | 01121 | CB3325 |
| A23R19 | 0683-1535 | 6 | | RESISTOR 15K 5% .25W FC TC=400/+800 | 01121 | CB1535 |
| A23R20 | 0683-2225 | 3 | | RESISTOR 2.2K 5% .25W FC TC=400/+700 | 01121 | CB2225 |
| A23R22 | 0757-0464 | 5 | 2 | RESISTOR 90.9K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=9092=F |
| A23R23 | 0699-0391 | 3 | | RESISTOR 25K 1% .125W F TC=0/+25 | 28480 | 0699-0391 |
| A23R24 | 0699-0391 | 3 | | RESISTOR 25K 1% .125W F TC=0/+25 | 28480 | 0699-0391 |
| A23R25 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A23R26 | 0698-4486 | 3 | 2 | RESISTOR 24.9K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=2492=F |
| A23R27 | 0698-4486 | 3 | | RESISTOR 24.9K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=2492=F |
| A23R29 | 0683-2235 | 5 | | RESISTOR 22K 5% .25W FC TC=400/+800 | 01121 | CB2235 |
| A23R30 | 0757-0488 | 3 | | RESISTOR 909K 1% .125W F TC=0/+100 | 28480 | 0757-0488 |
| A23R31 | 0757-0484 | 5 | | RESISTOR 90.9K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=9092=F |
| A23R32 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=400/+700 | 01121 | CB4725 |
| A23R33 | 0683-1835 | 9 | | RESISTOR 18K 5% .25W FC TC=400/+800 | 01121 | CB1835 |
| A23R34 | 0683-1835 | 9 | | RESISTOR 18K 5% .25W FC TC=400/+800 | 01121 | CB1835 |
| A23R35 | 0683-3335 | 8 | | RESISTOR 33K 5% .25W FC TC=400/+800 | 01121 | CB3335 |
| A23R36 | 0698-3450 | 9 | | RESISTOR 42.2K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=4222=F |
| A23R37 | 0698-3450 | 9 | | RESISTOR 42.2K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=4222=F |
| A23R38 | 0683-4735 | 4 | | RESISTOR 47K 5% .25W FC TC=400/+800 | 01121 | CB4735 |
| A23R39 | 0683-1225 | 1 | | RESISTOR 1.2K 5% .25W FC TC=400/+700 | 01121 | CB1225 |
| A23R40 | 0683-1235 | 3 | | RESISTOR 12K 5% .25W FC TC=400/+800 | 01121 | CB1235 |
| A23R41 | 0683-1525 | 4 | | RESISTOR 1.5K 5% .25W FC TC=400/+700 | 01121 | CB1525 |
| A23R42 | 0683-1005 | 5 | | RESISTOR 10 5% .25W FC TC=400/+500 | 01121 | CB1005 |

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number | | |
|-----------------------|----------------|-----|-----|--|----------|--------------------|-------|-------------|
| A23R43 | 0683-1005 | 5 | | RESISTOR 10 5% .25W FC TC=-400/+500 | 01121 | C81005 | | |
| A23R44 | 0683-1525 | 4 | | RESISTOR 1.5K 5% .25W FC TC=-400/+700 | 01121 | C81525 | | |
| A23R45 | 0683-2235 | 5 | | RESISTOR 22K 5% .25W FC TC=-400/+800 | 01121 | C82235 | | |
| A23R46 | 0683-2235 | 5 | | RESISTOR 22K 5% .25W FC TC=-400/+800 | 01121 | C82235 | | |
| A23R47 | 0683-4735 | 4 | | RESISTOR 47K 5% .25W FC TC=-400/+800 | 01121 | C84735 | | |
| A23R48 | 0683-1535 | 6 | | RESISTOR 15K 5% .25W FC TC=-400/+800 | 01121 | C81535 | | |
| A23R49 | 0683-1535 | 6 | | RESISTOR 15K 5% .25W FC TC=-400/+800 | 01121 | C81535 | | |
| A23R50 | 0683-3335 | 6 | | RESISTOR 33K 5% .25W FC TC=-400/+800 | 01121 | C83335 | | |
| A23R51 | 0683-4725 | 2 | | RESISTOR 4.7K 5% .25W FC TC=-400/+700 | 01121 | C84725 | | |
| A23R52 | 0683-4735 | 4 | | RESISTOR 47K 5% .25W FC TC=-400/+800 | 01121 | C84735 | | |
| A23R53 | 0683-1225 | 1 | | RESISTOR 1.2K 5% .25W FC TC=-400/+700 | 01121 | C81225 | | |
| A23R54 | 0683-1235 | 3 | | RESISTOR 12K 5% .25W FC TC=-400/+800 | 01121 | C81235 | | |
| A23R55 | 2100-3252 | 6 | | RESISTOR-TRMR 5K 10% C TOP=ADJ 1-TRN | 28480 | 2100-3252 | | |
| A23R56 | 0683-1225 | 1 | | RESISTOR 1.2K 5% .25W FC TC=-400/+700 | 01121 | C81225 | | |
| A23R57 | 0683-3335 | 8 | | RESISTOR 33K 5% .25W FC TC=-400/+800 | 01121 | C83335 | | |
| A23R58 | 0683-5615 | 1 | | RESISTOR 560 5% .25W FC TC=-400/+600 | 01121 | C85615 | | |
| A23R59 | 0757-0439 | 4 | | RESISTOR 6.81K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=6811-F | | |
| A23R60 | 0757-0439 | 4 | | RESISTOR 6.81K 1% .125W F TC=0/+100 | 24546 | C4=1/8-T0=6811-F | | |
| A23R61 | 0683-1835 | 9 | | RESISTOR 18K 5% .25W FC TC=-400/+800 | 01121 | C81835 | | |
| A23R62 | 0683-1225 | 1 | | RESISTOR 1.2K 5% .25W FC TC=-400/+700 | 01121 | C81225 | | |
| A23R63 | 0683-1015 | 7 | | RESISTOR 100 5% .25W FC TC=-400/+500 | 01121 | C81015 | | |
| A23R64 | 0683-1015 | 7 | | RESISTOR 100 5% .25W FC TC=-400/+500 | 01121 | C81015 | | |
| A23R65 | 1810-0269 | 3 | | NETWORK-RES 9-PIN-SIP .1-PIN-SPCG | 28480 | 1810-0269 | | |
| A23R66 | 1810-0269 | 3 | | NETWORK-RES 9-PIN-SIP .1-PIN-SPCG | 28480 | 1810-0269 | | |
| A23R67 | 1810-0269 | 3 | | NETWORK-RES 9-PIN-SIP .1-PIN-SPCG | 28480 | 1810-0269 | | |
| A23R68 | 0683-1235 | 3 | | RESISTOR 12K 5% .25W FC TC=-400/+800 | 01121 | C81235 | | |
| A23R69 | 0683-5625 | 3 | | RESISTOR 5.6K 5% .25W FC TC=-400/+700 | 01121 | C85625 | | |
| A23R70 | 0683-1235 | 3 | | RESISTOR 12K 5% .25W FC TC=-400/+800 | 01121 | C81235 | | |
| A23R71 | 0683-1005 | 5 | | RESISTOR 10 5% .25W FC TC=-400/+500 | 01121 | C81005 | | |
| A23U1 | 1826-0319 | 7 | | OP AMP BIFET T0-99 | 27014 | LF356H | | |
| A23U2 | 1826-0319 | 7 | | OP AMP BIFET T0-99 | 27014 | LF356H | | |
| A23U3 | 1826-0319 | 7 | | OP AMP BIFET T0-99 | 27014 | LF356H | | |
| A23U4 | 1820-1856 | 7 | | CONV 12=8-D/A 24-DIP=C | 24355 | AD563KD/BCD | | |
| A23U5 | 1826-0122 | 0 | | IC 7805 V RGLTR T0-220 | 07263 | 7805UC | | |
| A23U6 | 1826-0161 | 7 | 3 | OP AMP GP QUAD 14-DIP=P | 04713 | MLM324P | | |
| A23U7 | 1826-0161 | 7 | | OP AMP GP QUAD 14-DIP=P | 04713 | MLM324P | | |
| A23U8 | 1826-0161 | 7 | | OP AMP GP QUAD 14-DIP=P | 04713 | MLM324P | | |
| A23U9 | 1826-0174 | 2 | | COMPARATOR GP QUAD 14-DIP=P | 28480 | 1826-0174 | | |
| A23U10 | 1820-1730 | 6 | | IC FF TTL LS D-TYPE POS-EDGE=TRIG COM | 01295 | SN74LS273N | | |
| A23U11 | 1820-1730 | 6 | | IC FF TTL LS D-TYPE POS-EDGE=TRIG COM | 01295 | SN74LS273N | | |
| A23U12 | 1826-0319 | 7 | | OP AMP BIFET T0-99 | 27014 | LF356H | | |
| A23U13 | 1826-0222 | 1 | | OP AMP GP QUAD 14-DIP=P | 07263 | UA4136PC | | |
| A23U14 | 1820-1197 | 9 | | IC GATE TTL LS NAND QUAD 2-INP | 01295 | SN74LS00N | | |
| A23U15 | 1820-1481 | 4 | | IC PIA NMOS | 04713 | MC6821L | | |
| A23U16 | 1820-2024 | 3 | | IC DRVR TTL LS LINE DRVR OCTL | 01295 | SN74LS244N | | |
| A23U17 | 1820-2024 | 3 | | IC DRVR TTL LS LINE DRVR OCTL | 01295 | SN74LS244N | | |
| | | | | A23 MISCELLANEOUS PARTS | | | | |
| | | | | 04274-26523 | 0 | PC BOARD, BLANK | 28480 | 04274-26523 |
| | | | | CHASSIS MOUNTED COMPONENTS | | | | |
| C1 | 0140-4259 | 9 | 1 | CAPACITOR, FXD .22UF +/-10% 250VDCW | C0633 | PME271M622 | | |
| C2 | 0140-0200 | 0 | 4 | CAPACITOR-FXD 390PF +/-5% 300VDC MICA | 72136 | DM15F391J0300NV1CR | | |
| C3 | 0140-0200 | 0 | | CAPACITOR-FXD 390PF +/-5% 300VDC MICA | 72136 | DM15F391J0300NV1CR | | |
| C4 | 0140-0200 | 0 | | CAPACITOR-FXD 390PF +/-5% 300VDC MICA | 72136 | DM15F391J0300NV1CR | | |
| C5 | 0140-0200 | 0 | | CAPACITOR-FXD 390PF +/-5% 300VDC MICA | 72136 | DM15F391J0300NV1CR | | |
| C6 | 0150-0070 | 3 | 3 | CAPACITOR-FXD .02UF +/-20% 500VDC CER | 28480 | 0150-0070 | | |
| C7 | 0150-0070 | 3 | | CAPACITOR-FXD .02UF +/-20% 500VDC CER | 28480 | 0150-0070 | | |
| C8 | 0150-0070 | 3 | | CAPACITOR-FXD .02UF +/-20% 500VDC CER | 28480 | 0150-0070 | | |
| CR1 | 1901-0496 | 1 | | DIODE=PWR RECT 100V 12A DO-4 | 04713 | MR1121 | | |
| CR2 | 1901-0496 | 1 | | DIODE=PWR RECT 100V 12A DO-4 | 04713 | MR1121 | | |
| F1 | 2110-0059 | 5 | 1 | FUSE 1.5A 250V SLO-BLO 1.25X.25 UL | 75915 | | | |
| | 2110-0360 | 5 | 1 | FUSE 0.75A 250V SLO-BLO 1.25X.25 UL | 75915 | | | |
| FL1 | 9135-0035 | 7 | 1 | FILTER-LINE WIRES=TERMS | 28480 | 9135-0035 | | |
| L1 | 04274-85008 | 0 | 1 | COIL ASSEMBLY | 28480 | 04274-85008 | | |
| Q1 | 1854-0313 | 0 | 1 | TRANSISTOR NPN 2N3771 SI T0-3 PD=150W | 01928 | 2N3771 | | |
| Q2 | 1854-0063 | 7 | 1 | TRANSISTOR NPN 2N3055 SI T0-3 PD=115W | 28480 | 1854-0063 | | |
| Q3 | 1853-0252 | 4 | 2 | TRANSISTOR PNP 81 T0-3 PD=150W FT=4MHZ | 28480 | 1853-0252 | | |
| Q4 | 1853-0252 | 4 | | TRANSISTOR PNP 81 T0-3 PD=150W FT=4MHZ | 28480 | 1853-0252 | | |
| S2 | 3101-2298 | 1 | 2 | SWITCH, SLIDE DPDT=NS | 28480 | 3101-2298 | | |
| S3 | 3101-2298 | 1 | | SWITCH, SLIDE DPDT=NS | 28480 | 3101-2298 | | |
| B1 | 3160-0311 | | | BLOWER | | | | |

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-3. Replaceable Parts (Cont'd).

| Reference Designation | HP Part Number | C D | Qty | Description | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----|--|----------|----------------------|
| W1 | 04275-61601 | 9 | 1 | CABLE ASSEMBLY, INPUT(LC) (40 CM) | 28480 | 04275-61601 |
| W2 | 04275-61602 | 9 | 1 | CABLE ASSEMBLY, INPUT(LP) (32 CM) | 28480 | 04275-61602 |
| W3 | 04275-61603 | 1 | 1 | CABLE ASSEMBLY, INPUT(MC) (50 CM) | 28480 | 04275-61603 |
| W4 | 04275-61604 | 2 | 1 | CABLE ASSEMBLY, INPUT (HP) (40 CM) | 28480 | 04275-61604 |
| W5 | 04275-61605 | 3 | 1 | CABLE ASSEMBLY, INPUT(A1 THRU A3) (40 CM) | 28480 | 04275-61605 |
| W6 | 04275-61606 | 1 | 1 | CABLE ASSEMBLY, INPUT (A1 THRU A4) (48 CM) | 28480 | 04275-61606 |
| W7 | 04275-61607 | 4 | 1 | CABLE ASSEMBLY, INPUT (A5 THRU A6) (36 CM) | 28480 | 04275-61607 |
| W8 | 04275-61608 | 5 | 1 | CABLE ASSEMBLY, INPUT (A5 THRU A6) (31 CM) | 28480 | 04275-61608 |
| XF1 | 2110-0565 | 9 | 2 | FUSEHOLDER CAP 12A MAX FOR UL | 28480 | 2110-0565 |
| XF1 | 2110-0565 | 9 | | FUSEHOLDER CAP 12A MAX FOR UL | 28480 | 2110-0565 |
| MISCELLANEOUS PARTS | | | | | | |
| 1 | 5040-7219 | 8 | 2 | FRONT CAP | 28480 | 5040-7219 |
| 2 | 5060-9805 | 4 | 2 | HANDLE | 28480 | 5060-9805 |
| 3 | 5060-9943 | 1 | 2 | SIDE COVER | 28480 | 5060-9943 |
| 4 | 5040-7220 | 1 | 2 | REAR CAP | 28480 | 5040-7220 |
| 5 | 2880-0172 | 1 | 4 | SCREW-MACH 10-32 .375-IN-LG 100 DEG | 28480 | 2880-0172 |
| 6 | 3101-2216 | 3 | 1 | SWITCH-PB DPDT ALTNQ 4A 250VAC | 28480 | 3101-2216 |
| 7 | 0570-0368 | 2 | 2 | SCREW | 28480 | 0570-0368 |
| 8 | 2190-0225 | 6 | 2 | WASHER | 28480 | 2190-0225 |
| 9 | 1200-0080 | 3 | 4 | INSULATOR-DIO ALUMINUM HO-ANDZ | 28480 | 1200-0080 |
| 10 | 3050-0226 | 2 | 4 | WASHER-FL MTLN NO. 10 .203-IN-ID | 28480 | 3050-0226 |
| 11 | 2740-0003 | 5 | 2 | NUT-HEX-W/LKWR 10-32-THD .125-IN-THK | 00000 | ORDER BY DESCRIPTION |
| 12 | 1901-0496 | 1 | 4 | DIODE-PWR RECT 100V 12A DD-4 | 04713 | MR1121 |
| 13 | 9100-0870 | 5 | 1 | TRANSFORMER | 28480 | 9100-0870 |
| 14 | 1250-0118 | 2 | 4 | CONNECTOR RF BNC | 28480 | 1250-0118 |
| 15 | 5040-0345 | 7 | 6 | INSULATOR;CONNECTOR | 28480 | 5040-0345 |
| 16 | 0624-0260 | 8 | 8 | SCREW-TPG 6-20 .5-IN-LG PAN-HD-PHL STL | 00000 | ORDER BY DESCRIPTION |
| 17 | 2190-0020 | 9 | 6 | WASHER-LK MLCN NO. 5 .128-IN-ID | 28480 | 2190-0020 |
| 18 | 0340-0833 | 9 | 4 | INSULATOR-XSTR NYLON BLACK | 28480 | 0340-0833 |
| 19 | 0624-0248 | 2 | 4 | SCREW-TPG 8-32 .75-IN-LG HEX WSHR-HD STL | 28480 | 0624-0248 |
| 20 | 0370-2994 | 0 | 1 | KNOB | 28480 | 0370-2994 |
| 21 | 2510-0045 | 8 | 4 | SCREW-MACH 8-32 .375-IN-LG PAN-HD-POZI | 00000 | ORDER BY DESCRIPTION |
| 22 | 0360-0270 | 0 | 1 | TERMINAL-SLDR LUG LK-MTG FOR-#10-SCR | 28480 | 0360-0270 |
| 23 | 3100-1205 | 6 | 1 | SWITCH-ROTARY | 28480 | 3100-1205 |
| 24 | 0360-1190 | 5 | 4 | TERMINAL-SLDR LUG PL-MTG FOR-#1/8-SCR | 28480 | 0360-1190 |
| 25 | 2950-0001 | 8 | 4 | NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK | 00000 | ORDER BY DESCRIPTION |
| 26 | 5020-8806 | 9 | 1 | REAR FRAME | 28480 | 5020-8806 |
| 27 | 5060-9836 | 1 | 1 | TOP COVER | 28480 | 5060-9836 |
| 28 | 04274-00617 | 9 | 1 | PLATE | 28480 | 04274-00617 |
| 29 | 04274-00602 | 2 | 2 | PLATE SHIELD | 28480 | 04274-00602 |
| 30 | 5040-7202 | 9 | 1 | TRIM, TOP | 28480 | 5040-7202 |
| 31 | 5020-8805 | 8 | 1 | FRONT FRAME | 28480 | 5020-8805 |
| 32 | 04274-25002 | 8 | 1 | WINDOW (FREQ) | 28480 | 04274-25002 |
| 33 | 0370-1097 | 2 | 1 | KNOB | 28480 | 0370-1097 |
| 34 | 04275-00201 | 9 | 1 | FRONT PANEL (YHP) | 28480 | 04275-00201 |
| 34 | 04275-00211 | 0 | 1 | FRONT PANEL (HP) | 28480 | 04275-00211 |
| 35 | 04274-25001 | 7 | 2 | WINDOW DISP. A,B) | 28480 | 04274-25001 |
| 36 | 7120-1254 | 1 | 1 | NAMEPLATE .312-IN-WD .54-IN-LG AL | 28480 | 7120-1254 |
| 36 | 7120-0478 | 9 | 1 | TRADE MARK (YHP) | 28480 | 7120-0478 |
| 37 | 04271-50024 | 4 | 4 | INSULATOR | 28480 | 04271-50024 |
| 38 | 2950-0035 | 8 | 4 | NUT-HEX-DBL-CHAM 15/32-32-THD | 00000 | ORDER BY DESCRIPTION |
| 39 | 1510-0038 | 8 | 1 | BINDING POST ASSY SGL THD-STUD | 28480 | 1510-0038 |
| 40 | 1250-0252 | 6 | 4 | CONNECTOR-RF BNC FEM SGL-HOLE-RR 50-OHM | 28480 | 1250-0252 |
| 41 | 04271-50025 | 5 | 4 | INSULATOR | 28480 | 04271-50025 |
| 42 | 5041-0564 | 4 | 1 | KEY CAP | 28480 | 5041-0564 |
| 43 | 0370-0451 | 0 | 2 | BEZEL | 28480 | 0370-0451 |
| 44 | 1460-1345 | 5 | 2 | TILT STAND SST | 28480 | 1460-1345 |
| 45 | 5040-7201 | 8 | 4 | FOOT(STANDARD) | 28480 | 5040-7201 |
| 46 | 5020-8838 | 7 | 4 | STRUT | 28480 | 5020-8838 |
| 47 | 04274-40001 | 9 | 1 | ROD (POWER SWITCH) | 28480 | 04274-40001 |
| 48 | 04274-01202 | 0 | 1 | ANGLE (POWER SWITCH) | 28480 | 04274-01202 |
| 49 | 04274-40002 | 0 | 3 | GUIDE (ANGLE) | 28480 | 04274-40002 |
| 50 | 04274-00618 | 0 | 3 | PLATE, SHIELD | 28480 | 04274-00618 |
| 51 | 04274-00601 | 1 | 5 | PLATE, SHIELD | 28480 | 04274-00601 |
| 52 | 5060-9848 | 5 | 1 | BOTTOM COVER | 28480 | 5060-9848 |
| 53 | 04274-00205 | | | SUB PANEL | | |
| 54 | 04275-60203 | | | REAR PANEL | | |

See introduction to this section for ordering information
 *Indicates factory selected value

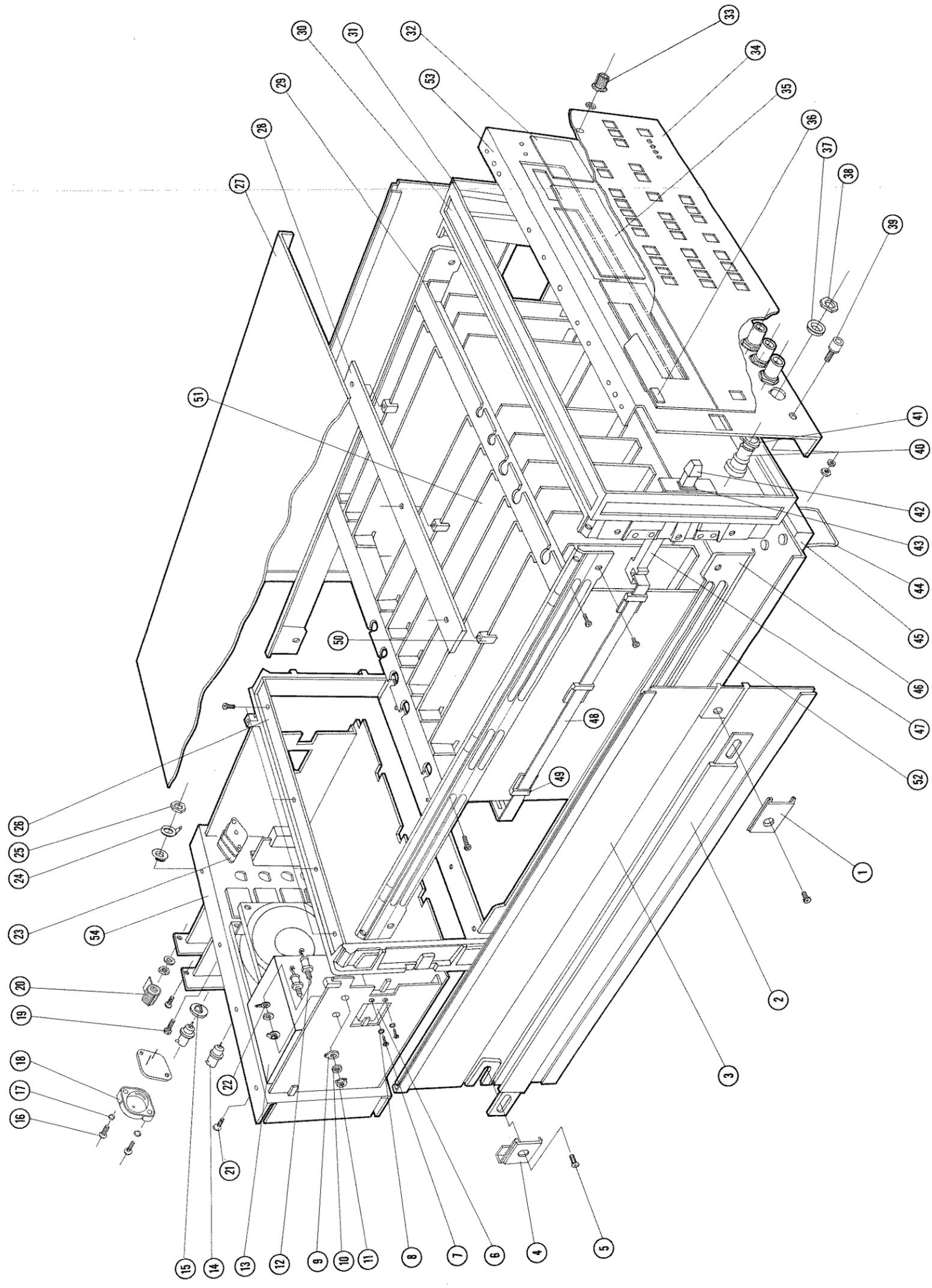


Figure 6-1. Major Mechanical Parts - Exploded View.
6-47

SECTION VII MANUAL CHANGES

7-1. INTRODUCTION.

7-2. This section contains information for adapting this manual to instruments to which the contents do not directly apply. The following paragraphs explain how to adapt this manual to apply to other instruments with lower serial prefixes.

7-3. MANUAL CHANGES.

7-4. To adapt this manual to your particular instrument, refer to Table 7-1 and make all of the manual changes listed opposite your instrument serial number. Perform these changes in the summary by assembly.

7-5. If your instrument serial number is not listed on the title page of this manual or in Table 7-1 to the right, it may be documented in a yellow MANUAL CHANGES supplement. For additional information about serial number coverage, refer to INSTRUMENT COVERED BY MANUAL in Section I.

Table 7-1. Manual Changes by Serial Number.

| Serial Prefix or Number | Make Manual Changes |
|----------------------------|---------------------|
| 1851J00232 and below | A, B, C, D, E, F, G |
| 1851J00262 and below | B, C, D, E, F, G |
| 1851J00299 and below | C, D, E, F, G |
| 1851J00392 and below | D, E, F, G |
| 1851J00527 and below | E, F, G |
| 1851J00577 and below | F, G |
| 2016J00862 and below | G |

Table 7-2. Summary of Changes by Assembly (Sheet 1 of 2).

| CHANGE | Assembly | | | | | | | | | |
|--------|----------|---------------------------------|-----------------|----|----|---------------------|----|----|----------------|-----|
| | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 |
| A | | | | | | | | | U1, U5 C70* | |
| B | | C25~28 | | | | | | | | |
| C | | C9, C14 R11, R12 R55, R60 | C59, C61 R93 | | | | | | | |
| D | | C98, C99 C100 | | | | C10, C30 C6, C26 | | | | |
| E | | | | | S1 | | | | | |
| F | | R174 | | | | | | | | |
| G | | | | | | | | | U1~U10 W7 | |
| | | | | | | | | | | |

Section VII

CHANGE A

Page 6-34, Table 6-3. Replaceable Parts, A9U1 and U5:
Change the part number for A9U1 and U5 to read:

A9U1; 04274-85021 (PROM)
A9U5; 04274-85015 (PROM)

Note

04274-85031 (new U1) cannot be used with 04274-85015 (old U5).
Also, 04274-85025 (new U5) cannot be utilized with 04274-85021
(old U1).

Page 6-22, Table 6-3. Replaceable Part:
Delete the following part:

A5C70*; 0140-0197 CAPACITOR-FXD 180PF +-5% 300WVDC MICA

CHANGE B

Page 6-9, Table 6-3. Replaceable Parts:
Delete the following parts:

A2CR25 to CR28 1901-0040 DIODE-SWITCHING

Page 8-63, Figure 8-45. A2 Component Locations:
Partially change the diagram as follows:

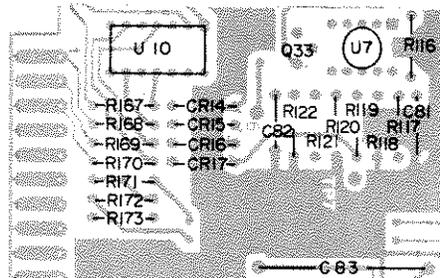


Figure 8-45. A2 Component Locations.

CHANGE C

Page 6-8, Table 6-3. Replaceable Parts, A2C9 and C14:

Change the part numbers and descriptions for A2C9 and C14 to read:

0121-0059 CAPACITOR-V TRMR-CER 2 8PF

Page 6-10, Table 6-3. Replaceable Parts, A2R11 and R12:

Change the part numbers and descriptions for A2R11 and R12 to read:

0757-0280 RESISTOR 1K 1%

Page 6-11, Table 6-3. Replaceable Parts, A2R55 and R60:

Change the part numbers and descriptions for A2R55 and R60 to read:

0757-0280 RESISTOR 1K 1%

Page 6-13, Table 6-3. Replaceable Parts, A3C59 and C61:

Change the part numbers and descriptions for A3C59 and C61 to read:

A3C59; 0160-2203 CAPACITOR-FXD 91PF
A3C61; 0160-0134 CAPACITOR-FXD 220PF

Page 6-16, Table 6-3. Replaceable Parts, A3R93:

Change the part number and description for A3R93 to read:

0698-0084 RESISTOR 2.15K 1%

CHANGE D

Page 6-9, Table 6-3. Replaceable Parts:

Add the following part:

A2C98; 0160-2261 CAPACITOR-FXD 15PF +-5%

Change the part numbers and descriptions for A2C99 and C100 to read:

A2C99; 0140-0197 CAPACITOR-FXD 180PF +-5%
A2C100; 0160-2224 CAPACITOR-FXD 1800PF +-5%

Page 6-26, Table 6-3. Replaceable Parts:

Add the following parts:

A6C10; 0160-2262 CAPACITOR-FXD 16PF +-5%
A6C30; 0160-2262 CAPACITOR-FXD 16PF +-5%

Change the part numbers and descriptions for A6C6 and C26 to read:

0160-2224 CAPACITOR-FXD 1800PF +-5%

Change the part numbers and descriptions for A6C8 and C28 to read:

0140-0197 CAPACITOR-FXD 180PF +-5%

Page 8-63, Figure 8-45. A2 Component Locations:
Partially change the diagram as follows:

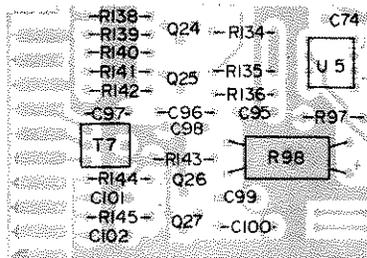


Figure 8-45. A2 Component Locations:

Page 8-63, Figure 8-46. A2 Schematic Diagram:
Partially change the diagram as follows:

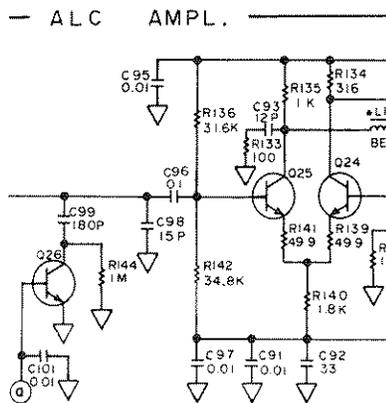


Figure 8-46. A2 Schematic Diagram.

Page 8-71, Figure 8-57. A6 Component Locations:
Partially change the diagram as follows:

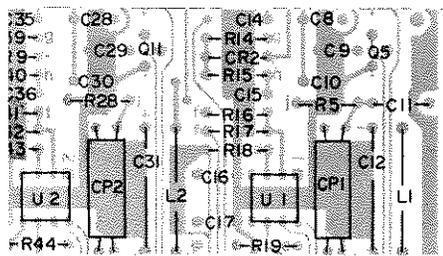


Figure 8-57. A6 Component Locations.

Page 8-72, Figure 8-58 (B). A6 Schematic Diagram (Sheet 2 of 2):
Partially change the diagram as follows:

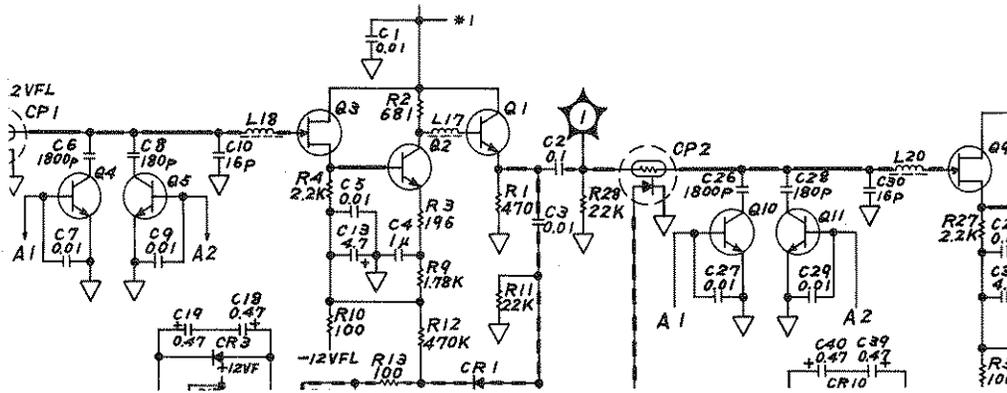


Figure 8-58 (B). A6 Schematic Diagram.

CHANGE E

Page 6-25, Table 6-3. Replaceable Parts, A5S1:
Add the following part:

A5S1; 3101-1274 SWITCH-SL SPOT

Page 8-69, Figure 8-54. A5 Component Locations:
Partially change the diagram as follows:

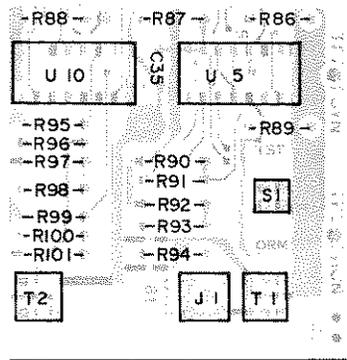


Figure 8-54. A5 Component Locations.

Page 8-50 and 8-76, signatures table:
Change the table as follows:

This table can be used to check signatures at A9U1 thru A9U10 ROM's. Signature test point is established at input of Data Buffer (pins 8 thru 6 of A9U31 and A9U32) instead of the respective ROM outputs (A9U1 thru A9U10). This signature list can be used for units with its serial number suffixes of -00266 and above.

For other instruments whose serial number suffixes are earlier than 00266, check that unstable signature display appears or that output states of these ROM's pull up and pull down. If you find above states active in earlier instruments, the program contents in these ROM may be alive.

| TEST PIN NO | | DSA NAME | DSA-12 | DSA-14 | DSA-15 | DSA-16 | DSA-17 | DSA-18 | DSA-19 | DSA-20 | DSA-21 | DSA-13 |
|-------------|--------------------|----------|--------------|--------------|--------------|--------------|--------|--------|--------|--------|--------|--------|
| SIGNAL NAME | ROM NO. TEST POINT | A9U1 | A9U1 A9U2 | A9U3 A9U4 | A9U5 A9U6 | A9U7 A9U8 | A9U1 | A9U3 | A9U5 | A9U7 | A9U10 | |
| WINDOW(+5V) | U1 pin-24 | 755U | P254 | P254 | P254 | P254 | 826P | 826P | 826P | 826P | 826P | |
| DB0 | U31 pin-3 | 475P | 853H | 7994 | 264C | 0H5H | H084 | 1FFU | 4840 | 00AC | UUPA | |
| DB1 | pin-4 | 594H | A0AH | 307F | 08CA | U02C | UU0F | H20P | 63UF | 69F4 | HAUH | |
| DB2 | pin-5 | F997 | 57U9 | HPF4 | 9FBF | 8102 | A41A | 7303 | CP67 | FA15 | A63F | |
| DB3 | pin-6 | H561 | H926 | 379A | CP1U | 741F | 6927 | 23FF | 9587 | 2110 | 3094 | |
| DB4 | U32 pin-3 | 897F | C6U0 | 2U43 | 5H23 | A2H2 | A0FP | 3987 | F598 | 4HCH | 565C | |
| DB5 | pin-4 | 8F6H | 2562 | 5410 | U899 | 2UHU | 6824 | HF08 | UF80 | F389 | 501H | |
| DB6 | pin-5 | 2116 | AF61 | 69HH | 89PP | 3265 | FF7P | U888 | 521H | A092 | 39A1 | |
| DB7 | pin-6 | UFF8 | 56PC | 0P76 | FP5F | 52AC | UA7H | A33H | 5H5C | AU4F | F454 | |

Page 8-76, Signature Connections tables:

Add the tables for DSA-18, DSA-19, DSA-20 and DSA-21 as follows:

Change the table for DSA-12, DSA-14, DSA-15, DSA-16 and DSA-17 as follows:

Signature Connections Window (+5V): CCC3

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|--------|---|---|---|--|
| DSA-10 | A9Tp-13 | A9Tp-13 | A9Tp-7 | OFF  ON |
| IRQ |  |  |  | |

Signature Connections Window (+5V) : P254

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|------------|---|---|---|--|
| DSA-16 | A9U16-13 | A9U16-12 | A9Tp-6 | OFF  ON |
| NOP (U5,6) |  |  |  | |

Signature Connections Window (+5V) : 0003

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|-------------|---|---|---|--|
| DSA-11 | A9Tp-3 | A9Tp-3 | A9Tp-6 | OFF  ON |
| NOP ADDRESS |  |  |  | |

Signature Connections Window (+5V) : P254

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|------------|---|---|---|--|
| DSA-17 | A9U16-15 | A9U16-14 | A9Tp-6 | OFF  ON |
| NOP (U7,8) |  |  |  | |

Signature Connections Window (+5V) : 755U

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|-------------|---|---|---|--|
| DSA-12 | A9U27-11 | A9U16-5 | A9Tp-6 | OFF  ON |
| NOP (U7~U8) |  |  |  | |

Signature Connections Window (+5V) : 826P

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|----------|---|---|---|--|
| DSA-18 | A9U16-9 | A9U16-7 | A9Tp-6 | OFF  ON |
| NOP (U1) |  |  |  | |

Signature Connections Window (+5V) : 826P

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|-----------|---|---|---|---|
| DSA-13 | A9U22-9 | A9U10-20 | A9Tp-6 | OFF  ON |
| NOP (U10) |  |  |  | |

Signature Connections Window (+5V) : 826P

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|----------|---|---|---|---|
| DSA-19 | A9U16-11 | A9U16-10 | A9Tp-6 | OFF  ON |
| NOP (U3) |  |  |  | |

Signature Connections Window (+5V) : P254

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|------------|---|---|---|--|
| DSA-14 | A9U16-9 | A9U16-7 | A9Tp-6 | OFF  ON |
| NOP (U1,2) |  |  |  | |

Signature Connections Window (+5V) : 826P

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|----------|---|---|---|--|
| DSA-20 | A9U16-13 | A9U16-12 | A9Tp-6 | OFF  ON |
| NOP (U5) |  |  |  | |

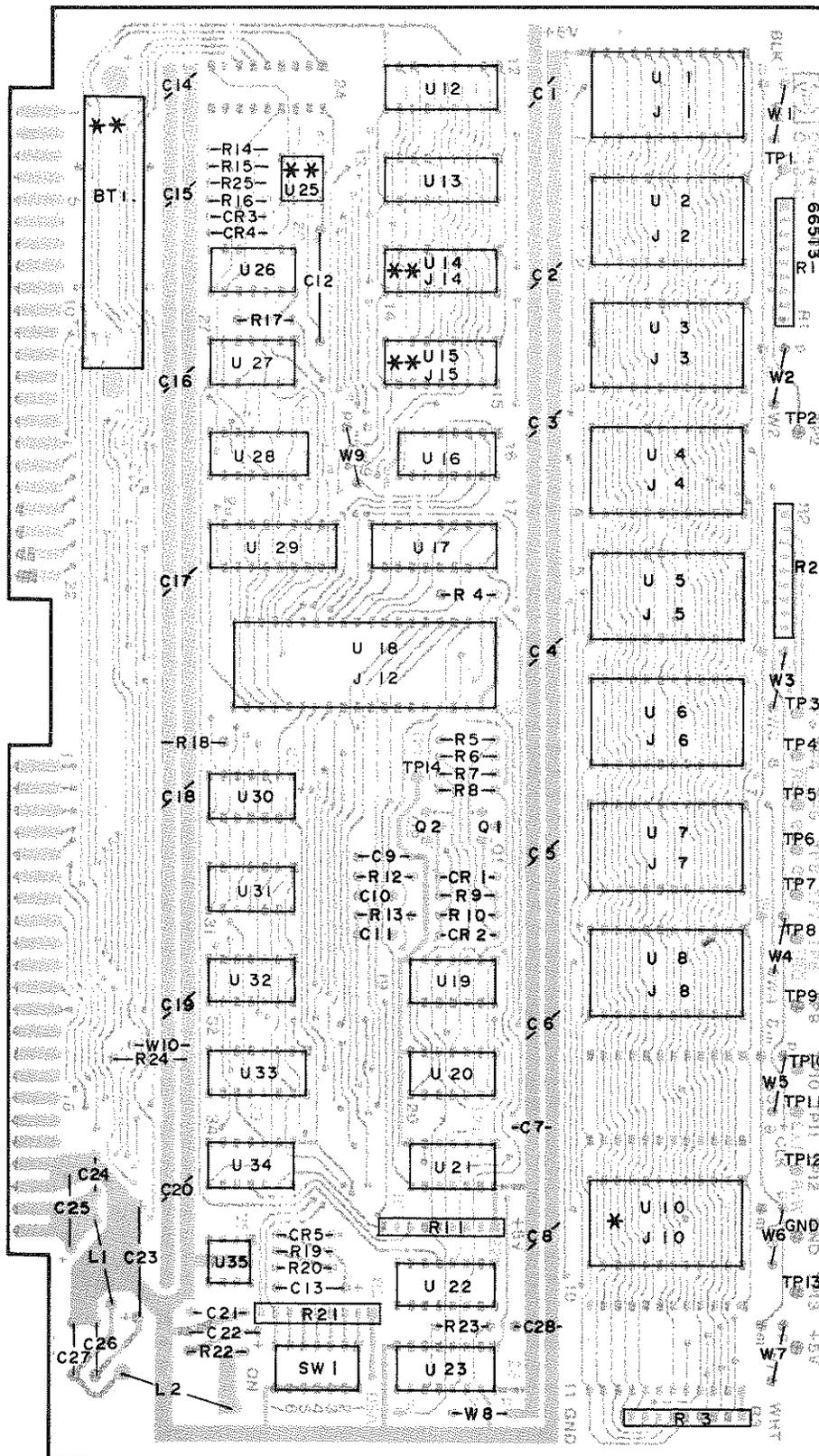
Signature Connections Window (+5V) : P254

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|------------|---|---|---|--|
| DSA-15 | A9U16-11 | A9U16-10 | A9Tp-6 | OFF  ON |
| NOP (U3,4) |  |  |  | |

Signature Connections Window (+5V) : 826P

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|----------|---|---|---|--|
| DSA-21 | A9U16-15 | A9U16-14 | A9Tp-6 | OFF  ON |
| NOP (U7) |  |  |  | |

Page 8-77, Figure 8-63. A9 Component Locations:
Partially change the diagram as follows:



* U10... ONLY FOR OPT 101
** U14, 15, 25... ONLY FOR OPT 003

Figure 8-63. A9 Component Locations.



SECTION VIII

SERVICE

8-1. INTRODUCTION

8-2. This manual section provides the information and instructions required for servicing the HP Model 4275A MULTI-FREQUENCY LCR Meter. Included are Theory of Operation and Troubleshooting Guide with Circuit Schematics. The Theory of Operation describes fundamental principles and circuit operating theory of the 4275A with block diagrams. Circuit schematics, locator illustrations, troubleshooting guide, and other technical data necessary for repairs are integrated into the service sheet foldouts. An illustration of the instrument interior is shown in Figure 8-49.

Note

When the instrument circuitry includes expanded capabilities provided by optional equipment, refer to paragraphs entitled OPTIONS for specific option service information.

WARNING

TROUBLESHOOTING AND REPAIR ARE ALLOWED FOR QUALIFIED TECHNICAL PERSONNEL ONLY. IF YOUR INSTRUMENT FAILS, REFER INSTRUMENT TO SERVICE PERSONNEL. H-P SERVICE OFFICES OFFER YOU THE BEST ANSWER TO YOUR PROBLEM. A GUIDE TO YOUR LOCAL H-P SERVICE OFFICES MAY BE FOUND ON THE BACK COVER OF THIS MANUAL.

8-3. THEORY OF OPERATION.

8-4. This theory of operation has been organized into three sections: basic theory, a block diagram discussion, and circuit analysis. The basic theory, beginning with paragraph 8-11, explains the concepts and fundamental theory of the 4275A instrument technique adapted for accurately measuring the DUT and for fully achieving automated measurement performance. The block diagram discussion describes the overall circuit operating theory of the 4275A with block-to-block signal flow. Included are block and timing diagrams. The circuit analysis provides a detailed description of how the circuit on

each board functions. For reference convenience, when servicing the instrument, a circuit description is included in the service sheets.

8-5. TROUBLESHOOTING.

8-6. This troubleshooting guide provides instructions and information for locating a faulty circuit instrument component that requires service. All instructions consider the safety of service personnel who will perform the procedures. These diagnostic guides are in the form of step-by-step procedures with flow diagrams. The board level troubleshooting diagrams are the procedures for isolating the problem to an individual malfunctioning circuit board assembly. The guides for locating a defective component are given on the individual board service sheets and integrate service support data -- test point locations, waveform illustrations, voltage data, timing diagrams, and other technical information in addition to providing schematic diagrams for each board.

8-7. RECOMMENDED TEST EQUIPMENT.

8-8. The test equipment required to perform operations outlined in this section is listed in Table 5-0. The table includes: type of instrument required, critical specifications, use, and recommended model. If the recommended model is not available, equipment which meets or exceeds critical specifications listed may be substituted.

8-9. REPAIR.

8-10. Repair explanations tell how to replace defective circuit components. The recommended replacement procedures for components and parts which require special repair, replacement tools, or test equipment should be observed. Correct disassembly and the exchange procedures for such special parts are outlined in Paragraphs 8-89. To prevent damage from improper repair procedure, refer to the appropriate manual section before proceeding with repair.

8-11. BASIC THEORY

8-12. To ascertain unknown ac impedance values, most modern instruments use a bridge circuit or the vector voltage-current measurement method. The vector voltage-current measurement method applies a test frequency signal to the sample to be measured and calculates the unknown impedance as the ratio of the test signal voltage to the sample current detected. As this method permits a multi-terminal measurement circuit configuration (three terminal, kelvin connection, or four terminal pair) which can eliminate the effects of residual impedances in the measuring circuit and, in addition, because the measurement circuit is relatively simple, wide range capabilities can be featured. Furthermore, the balance control that is typically used in a bridge circuit is not required. This hardware advantage facilitates high speed measurement and ease of operation. The 4275A employs vector voltage current measurement architecture in its measuring circuit.

8-13. Figure 8-1 is the block diagram of the 4275A. In the figure, the measuring circuit is denoted as a bridge circuit consisting of the unknown sample, a Range Resistor, Null Detector and Modulator. Actually, the 4275A incorporates the advantages of an auto-balance (controlled) bridge to extend the measurement capability of the vector voltage-current measurement method at high frequencies. The principle of the 4275A vector measurement method is outlined in Figure 8-2 comparing it to an ordinary vector voltage-current measurement method.

8-14. If the range resistor value is appropriately set, the "bridge" circuit is automatically balanced for the DUT impedance under control of the Null Detector and Modulator. When the bridge is balanced, the potential at Lpot (Lcur) terminal is zero volts. The current flowing through the DUT is then equal to that flowing through the range resistor. The DUT current is related to the voltage across the range resistor by the following equation:

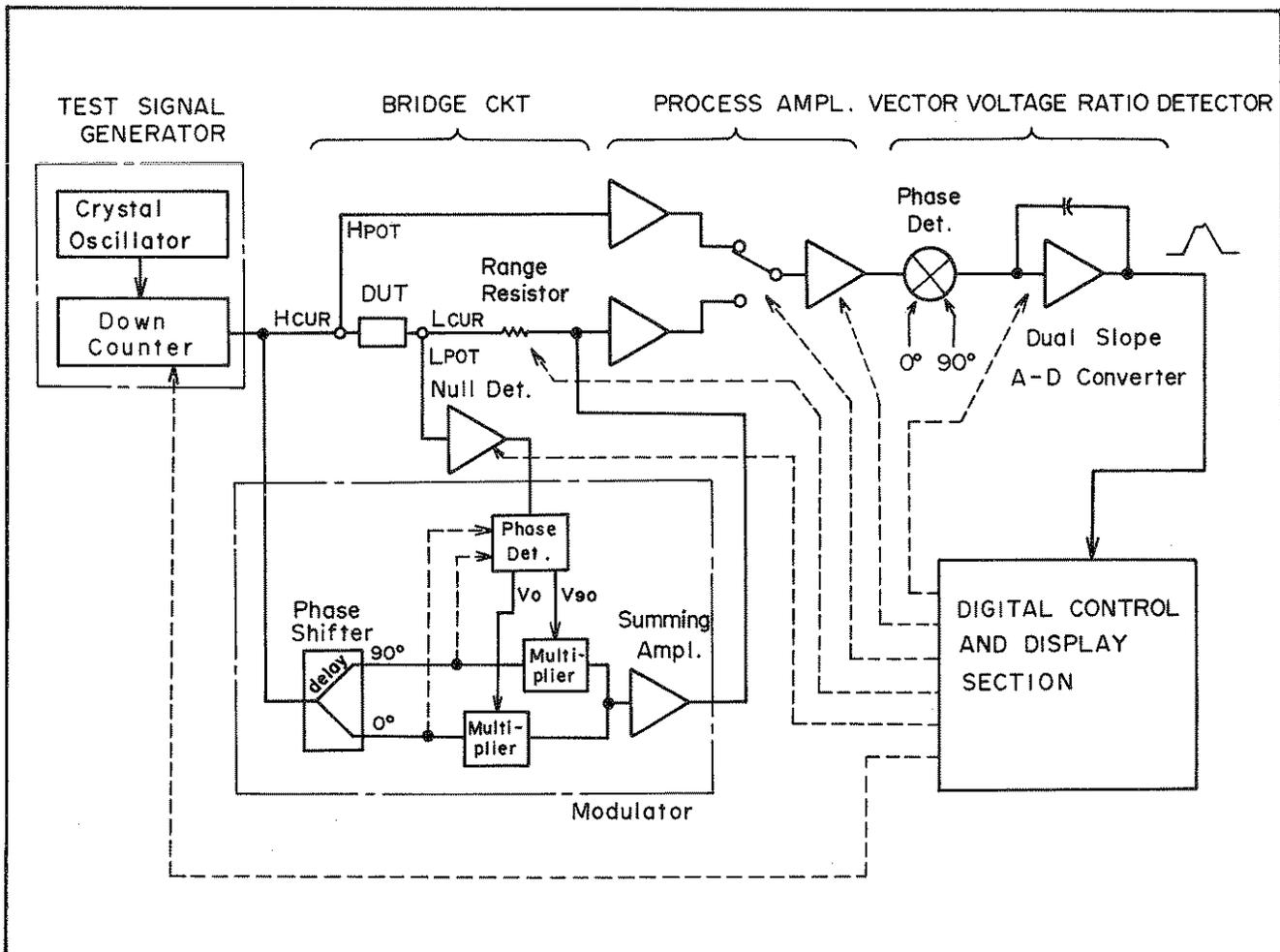


Figure 8-1. 4275A block Diagram.

$$i_x = \frac{E_{dut}}{Z_x} = \frac{Err}{R_r} \text{----- (8-1)}$$

Where E_{dut} is the voltage applied to the DUT (that is, the test signal voltage).
 Z_x is DUT impedance value.
 Err is voltage across range resistor.
 R_r is range resistor value.

The unknown impedance Z_x (or admittance Y_x) can be calculated from the measured E_{dut} and Err signals as:

$$Z_x = R_r \frac{E_{dut}}{Err} \text{----- (8-2)}$$

or
$$Y_x = \frac{1}{R_r} \frac{Err}{E_{dut}} \text{----- (8-3)}$$

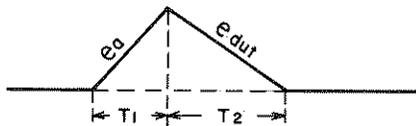
The Process Amplifier selectively and serially feeds the E_{dut} or Err signal in sequence to the Vector Voltage Ratio Detector section. Selection rules and timing for this operation are described in paragraph 8-16.

8-15. In general, the vector voltage ratio Err/E_{dut} (or E_{dut}/Err) is measured in the following manner:

Figure 8-3 is a graphic representation of the E_{dut} and Err signal vectors (E_{dut} signal is taken as the reference for the phase angle of the Err signal). The Err signal vector can be divided into its real and imaginary components:

$$Err = E_a + jE_b \text{----- (8-4)}$$

The vector ratios E_a/E_{dut} and E_b/E_{dut} represent the real and imaginary components of the unknown admittance, that is, the conductance and susceptance value of the sample, respectively. The vector voltage components E_a and E_b are obtained by phase detecting the Err signal using detection phase signals which have 0° and 90° phase angles referenced to the E_{dut} signal. A dual slope integration technique is used for measuring the ratio of the E_a (or E_b) and E_{dut} signals. In a typical voltage ratio measurement, an integrator charges and discharges in proportion to the E_a and E_{dut} signals, respectively, as illustrated below:



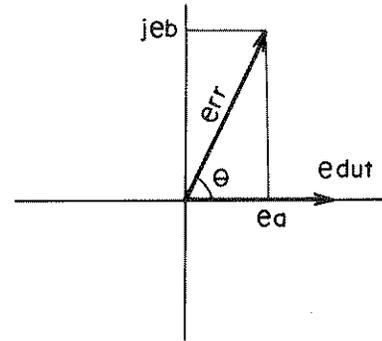
T_1 : Charge period by E_a signal
 T_2 : Discharge period by E_{dut} signal

The charge and discharge relationship is represented by the following equations:

$$k_1 \cdot E_a \cdot T_1 + k_2 \cdot E_{dut} \cdot T_2 = 0$$

$$k \frac{E_a}{E_{dut}} = \frac{T_2}{T_1} \quad (k = \text{constant})$$

As the charge time T_1 is fixed, the E_a/E_{dut} value (conductance value) can be derived by counting time T_2 . The ratio for the E_b and E_{dut} signals are also derived in the same manner. Thus, basically, two integrator operating cycles are performed in one measurement.



Basic Vector Detection

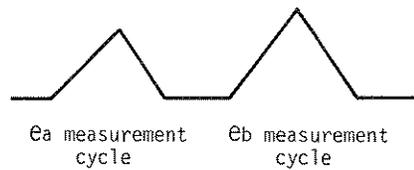


Figure 8-3. Usual Vector Voltage Ratio Measurement.

8-16. The 4275A employs a relative phase detection method to enhance its measurement accuracy over a broad measurement frequency region. The basic vector ratio measurement method, outlined in the above paragraph, requires that the detection phase signals must be exactly in phase or at right angles with respect to the E_{dut} (or Err) signal. However, in actuality, it is difficult to produce detection phases with high accuracy at the multiple test frequencies ranging from 10kHz to 10MHz at which the instrument operates. This is because of the phase shifts in the detection phases that are incident to the amplifiers, lines and other circuits. Furthermore, the S/N ratio of the E_{dut} signal is apt to be degraded because measuring circuit is exposed to external fields. The relative phase detection method improves vector component detection accuracy by eliminating performance limitations attributable to these effects.

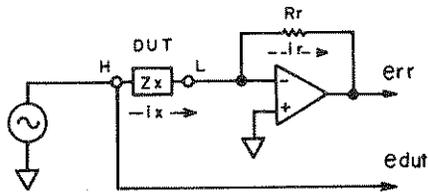


Figure A. Low Frequency Vector Voltage-Current Method with Feedback Amplifier.

In the low frequency vector voltage-current method, a high gain amplifier which has a feedback resistor (range resistor) R_r operates as current-to-voltage (I-V) converter. The feedback amplifier causes a range resistor current I_r equal to DUT current I_x to flow (irrespective of the range resistor value). Amplifier output voltage Err is equal to the product of R_r and I_r values. Thus, the Err voltage is proportional to DUT current I_x . The I_x value is calculated as follows:

$$I_x = \frac{Edut}{Z_x} = \frac{Err}{R_r}$$

Accordingly, the DUT impedance value Z_x can be derived by measuring the $Edut$ and Err voltages:

$$Z_x = R_r \frac{Edut}{Err}$$

As is explained in the feedback theory, the voltage at the "L" terminal is approximately zero volts (virtual ground). Thus, the range resistor value has no effect on DUT current I_x (the I_x value is determined only by the test signal voltage and DUT value). Though this method features simple circuit configuration and a relatively high accuracy, it is difficult to design a range resistor amplifier which can cause the range resistor feedback current to be in exact proportion to the DUT current (with negligibly low phase shift) at high frequencies.

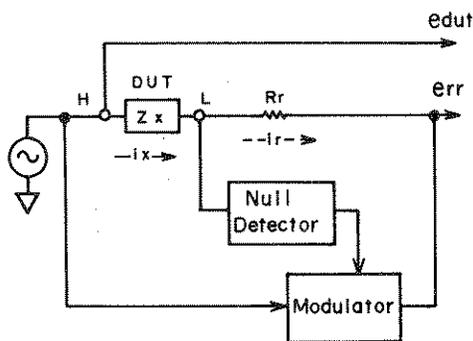
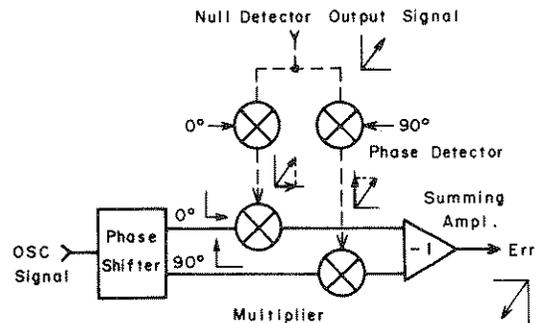


Figure 8-2. 4275A Vector Voltage-current Method.

An auto-balance bridge employed in the 4275A operates to establish accurate DUT current-range resistor current relationships such as outlined above. To cause an accurate range resistor current to flow (at high frequencies), the amplitude and phase of the Err signal is appropriately controlled by the Modulator. See Figure 8-2B. When the bridge circuit is unbalanced, the Null Detector picks up the unbalance current through the UNKNOWN "L" terminal. The null detector output vector indicates how the bridge is unbalanced for the real and imaginary vector components of the Err signal. The Multipliers develop products of the null detector output vector components and the orthogonal vector signals which are produced from test frequency input signal. As a result of this multiplication, the real and imaginary vector component magnitudes of the null detector output signal are transferred to the orthogonal vectors of the test frequency input signal. The summing amplifier compounds the multiplier output signal vectors to establish the Err signal. The Err signal is, consequently, a reverse directional vector for the null detector input, that is an unbalance current (the summing amplifier performs an inverting amplification). The Err signal responds to the unbalance current so as to suppress an increase in the unbalance current. The Err signal vector is controlled with respect to the individual magnitude of the real and imaginary components of the unbalance current. Thus, the unbalance current approaches exact zero (for both vector components). This balance control loop operates quickly and continuously.



4275A Modulator Operating Principle.

Figure B. 4275A Vector Voltage-Current Method with Auto-balance Bridge.

This method uses a set of detection phase signals each different by exactly 90 degrees in phase from the other. Neither of the detection phase signals need be in phase with the E_{dut} (or E_{err}) signal. With these detection phase signals, both E_{err} and E_{dut} signals are respectively divided into orthogonal phase components. See Figure 8-4. Impedance or admittance values of the DUT are calculated from the four phase components E_a , E_b , E_c and E_d in accord with the following equations:

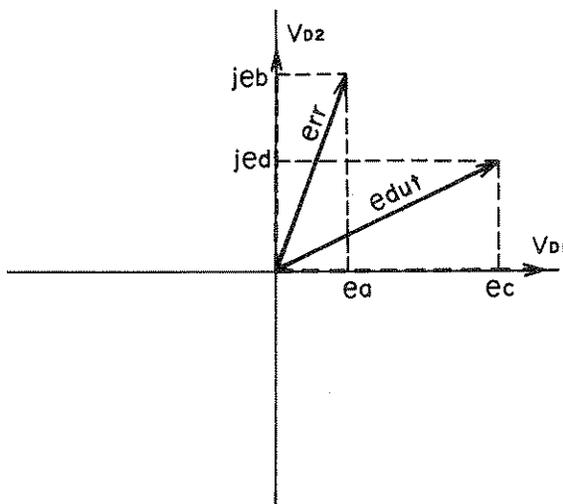
$$Z_x = R_r \frac{E_{dut}}{E_{err}} = R_r \frac{E_c + jE_d}{E_a + jE_b}$$

$$= R_r \frac{E_a E_c + E_b E_d + j(E_a E_d - E_b E_c)}{E_a^2 + E_b^2} \text{ ---- (8-6)}$$

$$Y_x = \frac{1}{R_r} \frac{E_{err}}{E_{dut}} = \frac{1}{R_r} \frac{E_a + jE_b}{E_c + jE_d}$$

$$= R_r \frac{E_a E_c + E_b E_d + j(E_b E_c - E_a E_d)}{E_c^2 + E_d^2} \text{ ---- (8-7)}$$

The calculated Z_x and Y_x values are constant for the rotation of the coordinate axes around the origin. Therefore, the phase relationships of the detection phase signals and measurement signals (E_{err} and E_{dut}) have no effect on the calculation results if the relative phase angle of the detection phase signals is exactly 90 degrees. Since any possible phase shift in the circuits rotates both the 0° and 90° detection phases by the same angle, an exact orthogonal phase relationship is maintained. Consequently, accurate detection of the vector components over the entire test frequency range is enabled.



V_{D1} , V_{D2} : Orthogonal phase detection signals

Figure 8-4. 4275A Relative Vector Detection.

Resistance and reactance (conductance and susceptance) values of the sample are calculated as follows:

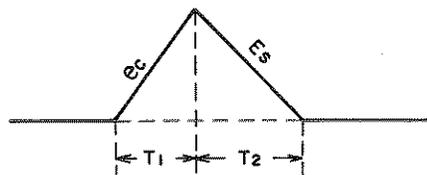
$$R_x = Z_x | \text{real} = R_r \frac{E_a E_c + E_b E_d}{E_a^2 + E_b^2} \text{ ---- (8-8)}$$

$$X_x = Z_x | \text{imaginary} = R_r \frac{E_a E_d - E_b E_c}{E_a^2 + E_b^2} \text{ ---- (8-9)}$$

$$G_x = Y_x | \text{real} = R_r \frac{E_a E_c + E_b E_d}{E_c^2 + E_d^2} \text{ ---- (8-10)}$$

$$B_x = Y_x | \text{imaginary} = R_r \frac{E_b E_c - E_a E_d}{E_c^2 + E_d^2} \text{ ---- (8-11)}$$

To measure the magnitude of each vector component (E_a , E_b , E_c and E_d), the phase detected vector voltages are sequentially converted to time periods. In the first integration cycle, for example, the E_c voltage charges the integrator for a constant time T_1 . The decay slope in the integrator discharge period is developed by using a dc reference voltage (E_s or $-E_s$) as in the popular dual slope DVM method. Relationship of the integrator input voltages and time periods are:



$$k_1 E_c T_1 = k_2 E_s T_2$$

$$E_c = k \cdot E_s \frac{T_2}{T_1} \quad E_c \propto T_2 \text{ ---- (8-12)}$$

Where, constant k is the product of: (process amplifier gain) x (phase detector efficiency) x (integrator time constant).

Note

The integrator charge time constant (T_1) is set to a multiple of the selected test frequency cycle period and is approximately 10ms. This suppresses the effects of any phase detector output ripple voltage which can not be fully filtered out because a small filtering time constant is used for shortening transient response time. The result of charge time (T_1) control is stable measurement display outputs with low fluctuation.

The dual slope integration operation is done in four cycles to measure times T2 for Ea, Eb, Ec and Ed vector components (Ta, Tb, Tc and Td) in one measurement. The timing of the vector voltage ratio detector input/output signal is illustrated in Figure 8-5.

8-17. Equations 8-8 through 8-11 can be represented in terms of the counted time periods Ta, Tb, Tc and Td as follows:

$$R_x = \frac{T_a T_c + T_b T_d}{T_a^2 + T_b^2} \text{ ----- (8-13)}$$

$$X_x = \frac{T_a T_d - T_b T_c}{T_a^2 + T_b^2} \text{ ----- (8-14)}$$

$$G_x = \frac{T_a T_c + T_b T_d}{T_c^2 + T_d^2} \text{ ----- (8-15)}$$

$$B_x = \frac{T_b T_c - T_a T_d}{T_c^2 + T_d^2} \text{ ----- (8-16)}$$

When the sample impedance value is measured on a range below 100Ω, the 4275A calculates the vector impedance component values Rx and Xx. For samples which have higher impedance values, the 4275A calculates the vector admittance component values Gx and Bx. Other measurement parameter values are subsequently calculated from the measured Rx and Xx (Gx and Bx) values using memorized parameter conversion formulas.

8-18. When a high impedance sample is measured, a constant test signal voltage is applied to the sample irrespective of the sample value. Therefore, the Eref voltage is constant and the voltage across range resistor (Err) changes in proportion to the sample value. On the other hand, when a low impedance sample is measured, a 100Ω source resistor (test signal generator output resistor) causes a constant test signal cur-

rent to flow through the sample. In this case, the range resistor voltage Err is constant and, the voltage across the sample (Edut) is proportional to the sample value. The relationship of the test signal voltage and current to the sample impedance value is given in Figure 8-6.

8-19. The dual slope A-D conversion sequence adds two auto offset cycles to eliminate the effects of residual dc offset voltages in the Vector Voltage Ratio Detector. One offset cycle precedes the four vector measurement cycles each time a measurement is taken. When (and only when) the test frequency is set at 2MHz or a higher frequency, another offset cycle follows after completion of the vector measurement cycles. During the offset measurement periods, the process amplifier (Edut and Err) selector switches are opened to accept no input. The integrator develops a low level dual slope waveform and time T0 (T5) is proportional to the comprehensive residual offset voltage at the integrator output. At high frequencies, the offset measurement is performed for each of the 0° and 90° detection phase operations because the residual dc offset voltage differs for the respective detection phases. Times T0 and T5 are arithmetically subtracted from the counted vector measurement time values as:

$$\begin{aligned} T_a' &= T_a - T_0 \\ T_b' &= T_b - T_0 \\ T_c' &= T_c - T_5 \\ T_d' &= T_d - T_5 \end{aligned}$$

where the prime mark (') indicates compensated time values. When an offset measurement cycle (T5) is not implemented, time value T0 is used for (instead of) T5.

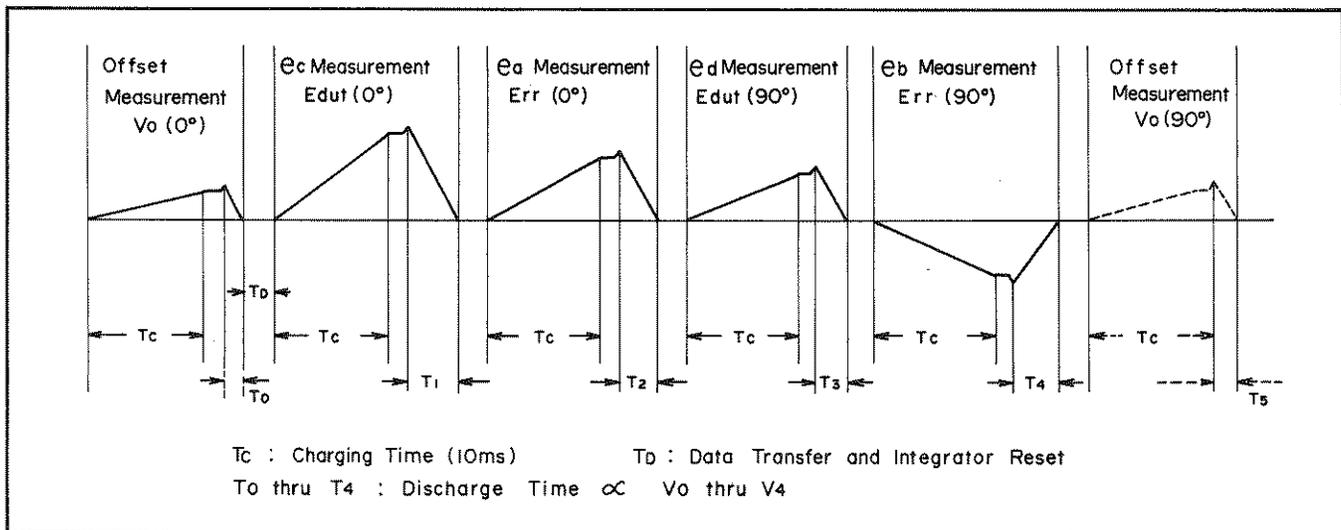
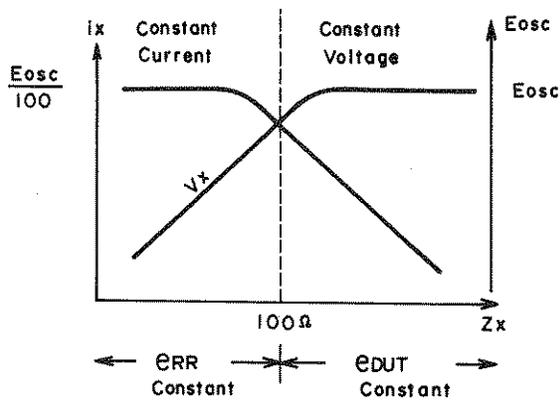


Figure 8-5. Integrator Vector Voltage Ratio Detection Timing.



Where, Zc: Corrected impedance value
 Yc: Corrected admittance value
 Zo: Residual impedance value
 Yo: Residual admittance value
 Zm: Measured DUT impedance value
 Ym: Measured DUT admittance value

Figure 8-6. Test Signal Voltage and Current Relationship to Sample Impedance.

8-20. Range resistor value is selected as either 100Ω, 1kΩ, 10kΩ and 100kΩ depending on the DUT value. To magnify measurement range capabilities, the process amplifier gain can be attenuated by 1/10 or 1/100. This permits developing vector voltage ratios equivalent to that obtained when lower or higher range resistor values are used. For example, when the process amplifier gain is decreased by 1/10 during integrator charge or discharge periods, the calculated Rx and Xx values are 10 times that measured without the attenuation process.

Note

When Ea and Eb signals are attenuated by 1/10 in Process Amplifier, calculated resistance value Rx is magnified and is given by the equation below:

$$Rx' = Rr \frac{0.1 EaEc + 0.1 EbEd}{(0.1 Ea)^2 + (0.1 Eb)^2}$$

$$= 10Rr \frac{EaEc + EbEd}{Ea^2 + Eb^2} = 10Rx$$

8-21. Zero Offset Adjustment (Open and Short) function measures residual impedance of the test fixture under short-circuit conditions and residual admittance under open-circuited conditions. Correction calculations in the subsequent DUT measurements are made using the following equations:

$$Zc = \frac{Zm - Zo}{1 - YoZm} \text{ -----(8-17)}$$

$$Yc = \frac{Ym - Yo}{1 - ZoYm} \text{ -----(8-18)}$$

8-22. BLOCK DIAGRAM DISCUSSION

8-23. A6 OSCILLATOR

8-24. Demands for accurate and high resolution measurements necessitate a stable test frequency signal of high accuracy with low distortion (including minimum harmonics and noise). To generate 10 standard spot test frequencies, the 80MHz and 32MHz crystal oscillator frequencies are first counted down to 8f (8 times the selected frequency) signal. The 80MHz oscillator provides the source frequency for the 10kHz, 20kHz 100kHz 200kHz, 1MHz, 2MHz and 10MHz test frequencies. For 20kHz, 200kHz and 2MHz frequencies, a 16MHz source frequency divided down (by 5) from 80MHz oscillator frequency is used. On the other hand, a 32MHz oscillator provides the source frequency for the 40kHz, 400kHz and 4MHz test frequencies. The source frequency signals are gated for selecting the decade down-counter input frequency signal (to be divided into lower test frequency signals). Source frequency selection and frequency count-down rules are summarized in Table 8-1.

8-25. The sinusoidal waveform synthesizer generates a periodic staircase waveform whose envelope is similar to a sinusoidal waveform. The staircase waveform has appropriate step voltages developed by level synthesis circuitry in synchronism with the "8f" pulse signal. See Figure 8-8. A Harmonic Suppressor Adjustment control permits adjusting the step voltage levels so that the periodic staircase signal, whose cyclic period is that of the selected test frequency, includes only lower order magnitudes of the third and the fifth harmonics (theoretically, even degree harmonics are not included in the signal).

8-26. The three LPF(Low Pass Filter) stages pass the fundamental of the sinusoidal waveform synthesizer output signal and eliminate the harmonics to a level of -50dB or more from the fundamental. The filter roll-off frequency automatically follows the input fundamental frequency so that the filtered output (sinusoidal waveform) is maintained at a constant level. Operating theory for the frequency follow-up filter circuit is illustrated in Figure 8-9. The roll-off frequency control range is varied to cover all test frequencies in three decade ranges as follows:

- Range 1: 10kHz to 100kHz
- Range 2: 100kHz to 1MHz (excludes 100kHz)
- Range 3: 1MHz to 10MHz (excludes 1MHz)

Because the test frequency always comes at a particular point on the characteristic slope of the filter, the filtering effect(harmonic rejection) is constant for all test frequencies.

8-27. 1-3-5 step test frequency (Opt. 004). Option 004 unit employs 24MHz instead of the standard 32MHz crystal oscillator frequency and 40MHz divided down from 80MHz (by 2) instead of the 16MHz source frequency. Frequency selection method for option 004 test frequencies is summarized in Table 8-2.

8-28. Installation of a special test frequency option adds a crystal resonator to the oscillator circuit which has a resonant frequency which is appropriate for use at the optional frequency. Additionally, appropriate inductor and capacitor values are used as blank circuitry to complete the optional oscillator circuit.

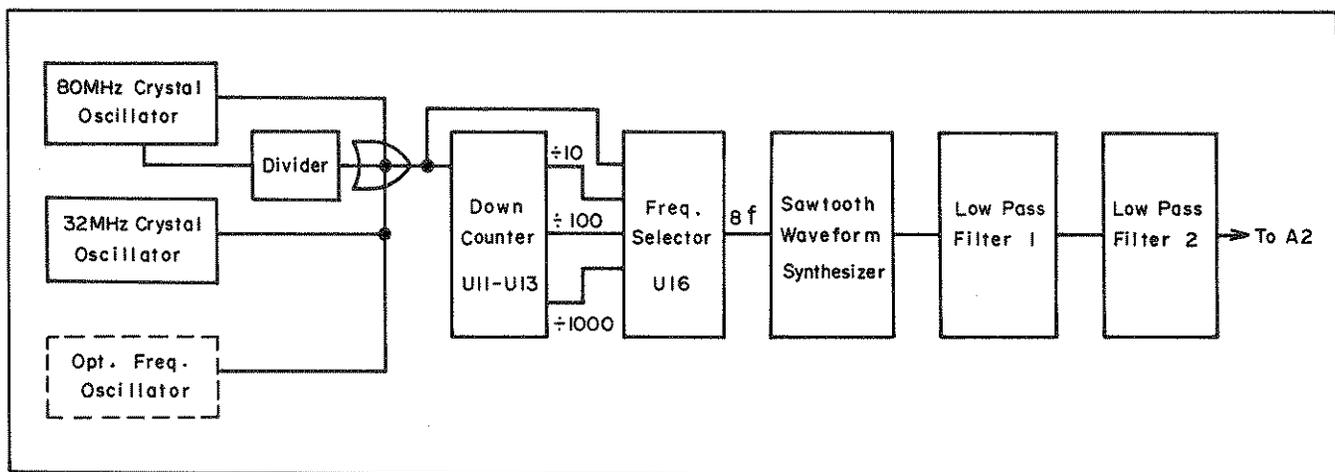


Figure 8-7. A6 Oscillator Block Diagram.

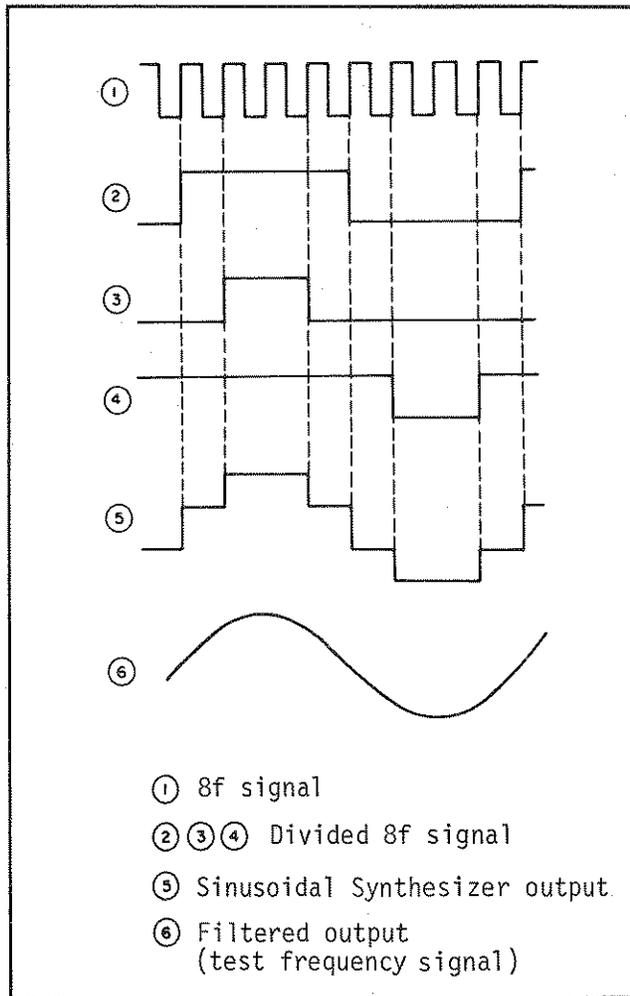


Figure 8-8. Sinusoidal Synthesizer Waveforms.

8-29. A3 POWER AMPLIFIER

8-30. The sinusoidal test frequency signal of 500mVrms is processed in the Power Amplifier section to allow control of test signal amplitude and the application of any desired dc bias. Additionally, the modulator output signal (Err) flows in the other amplifier channel which has almost the same circuit configuration as that for the test signal channel. The modulator output signal amplitude is also controlled in proportion to the test signal amplitude to maintain the bridge balance condition constant. The 1/10 and 1/100 attenuators in the middle stage amplifiers provide attenuation linked to the test signal level MULTIPLIER control. Front panel OSC LEVEL control changes feedback amplification gain of the preamplifier stages. The power amplifier circuit feeds the test frequency signal to the DUT and the modulator signal to the range resistor circuit with low amplifier output impedance.

8-31. A1 RANGE RESISTOR/NUL DETECTOR

8-32. The A1 board assembly combines two circuit sections: the Range Resistor circuit (on the upper part) and the Null Detector (on the lower part of the circuit board).

1) Range Resistor circuit.

To ensure accurate range resistor value and minimum residual reactance (mainly stray capacitance) effects, an adjustment potentiometer and a phase compensation trimmer capacitor are provided in association with in-

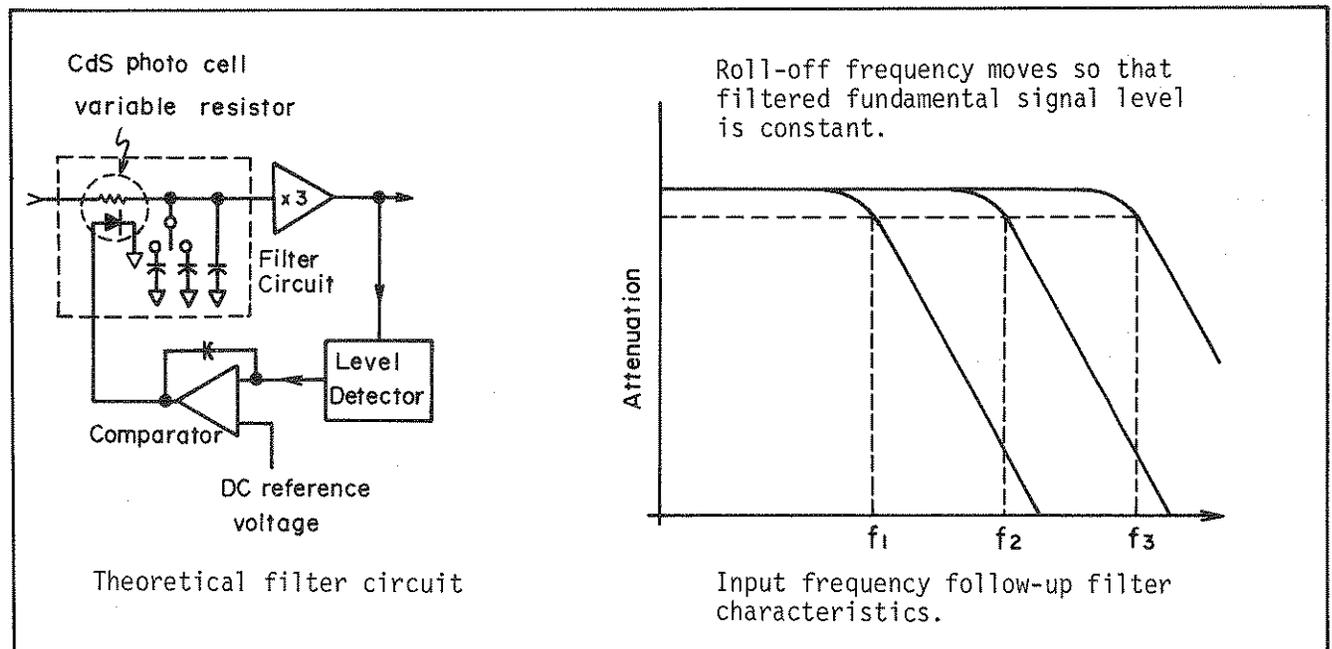


Figure 8-9. Frequency Follow-up Filter Operating Theory.

dividual range resistors. The CMR (Common Mode Rejection) amplifier properly compensates for any voltage drop in the range resistor signal which is caused by impedance inherent in the internal cabling. The Cable Length Compensator delays the range resistor signal to offset the effect of long test cables (when 1m test cables are used).

2) Null Detector

Bridge unbalance vector current is converted into a vector voltage at the I-V converter output. To improve amplifier gain at high frequencies, the I-V converter employs a staggered amplifier circuit configuration.

Because I-V converter feedback magnitude varies depending on the DUT impedance, the feedback circuit element value is changed in response to selection of measurement range.

The Level Normalizer Amplifier amplifies the unbalance signal vector voltage maintaining the output signal level constant (irrespective of the OSC LEVEL control setting). These gain controls (in the I-V Converter and the Level Normalizer Amplifier) suppress variations in the bridge balance control loop gain. Consequently, bridge balance settling time (transient response time when bringing the bridge into balance) is almost equal for various measurement conditions.

Table 8-1. Test Frequency Selection (Standard).

| Test Signal frequency | Oscillator source frequency | Division fraction | | | Total division fraction | 8f frequency |
|-----------------------|-----------------------------|-------------------|------|------|-------------------------|--------------|
| | | 1st | 2nd | 3rd | | |
| 10kHz | 80MHz | 1/10 | 1/10 | 1/10 | 1/1000 | 80kHz |
| 20kHz | 16MHz | 1/10 | 1/10 | — | 1/100 | 160kHz |
| 40kHz | 32MHz | 1/10 | 1/10 | — | 1/100 | 320kHz |
| 100kHz | 80MHz | 1/10 | 1/10 | — | 1/100 | 800kHz |
| 200kHz | 16MHz | 1/10 | — | — | 1/10 | 1.6MHz |
| 400kHz | 32MHz | 1/10 | — | — | 1/10 | 3.2MHz |
| 1MHz | 80MHz | 1/10 | — | — | 1/10 | 8MHz |
| 2MHz | 16MHz | — | — | — | — | 16MHz |
| 4MHz | 32MHz | — | — | — | — | 32MHz |
| 10MHz | 80MHz | — | — | — | — | 80MHz |

Table 8-2. Test Frequency Selection (Opt. 004).

| Test signal frequency | Oscillator source frequency | Division fraction | | | Total division fraction | 8f frequency |
|-----------------------|-----------------------------|-------------------|------|------|-------------------------|--------------|
| | | 1st | 2nd | 3rd | | |
| 10kHz | 80MHz | 1/10 | 1/10 | 1/10 | 1/1000 | 80kHz |
| 30kHz | 24MHz | 1/10 | 1/10 | — | 1/100 | 240kHz |
| 50kHz | 40MHz | 1/10 | 1/10 | — | 1/100 | 400kHz |
| 100kHz | 80MHz | 1/10 | 1/10 | — | 1/100 | 800kHz |
| 300kHz | 24MHz | 1/10 | — | — | 1/10 | 2.4MHz |
| 500kHz | 40MHz | 1/10 | — | — | 1/10 | 4MHz |
| 1MHz | 80MHz | 1/10 | — | — | 1/10 | 8MHz |
| 3MHz | 24MHz | — | — | — | — | 24MHz |
| 5MHz | 40MHz | — | — | — | — | 40MHz |
| 10MHz | 80MHz | — | — | — | — | 80MHz |

8-33. A2 MODULATOR

8-34. Simplified block diagram of the A2 Modulator is shown in Figure 8-10. The test frequency input signal, which is transformed into a range resistor signal (Err) for counter-balancing the bridge circuit, splits into 0° and 90° phase signals at the Phase Shifter output. The auto-phase adjustment circuit adopted in the phase shifter continuously operates to bring the relative difference in phase of the phase shifter output signals to an accurate 90 degrees. Discrimination of the phase difference is performed by phase detecting the 90° phase signal using the 0° phase signal as the detection signal. When an accurate 90° phase difference occurs, the detector signal level is zero. The phase detector output voltage controls the 90° phase shifter so that the phase error is minimum.

8-35. Null detector output signal is phase detected to extract the vector components of the unbalance current. DC levels at the integrator outputs are proportional to magnitudes of the null detector signal vector components. These dc voltages, proportional to the 0° and 90° phase components of the unbalance current, are the control signals for transforming the test frequency signal (divided into 0° and 90° phase signals) into the required Err signal. The Phase Tracking Amplifiers compensate for any phase shift in detection phase signals to ensure accurate phase detector outputs over the entire test frequency range.

8-36. The Multipliers are the key circuits for controlling the Err signal vector voltage. The multipliers provide individual outputs proportional to the product of their input signals. Thus, the two multipliers produce outputs which can be represented by the following equations:

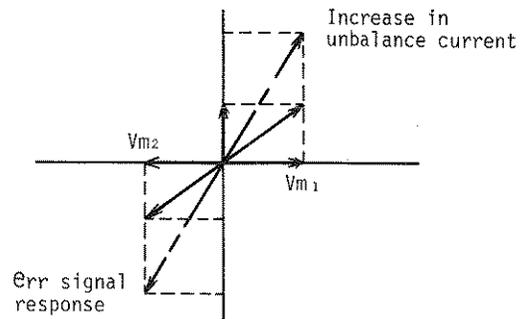
- 1) $V_s(0) \times V_c(0) = V_{m1}$
- 2) $V_s(90) \times V_c(90) = V_{m2}$

Where, $V_s(0)$: 0° phase test frequency signal
 $V_s(90)$: 90° phase test frequency signal
 $V_c(0)$: Null detector output 0° phase component (dc)
 $V_c(90)$: Null detector output 90° phase component (dc)
 V_{m1}, V_{m2} : Multiplier output signals

The Summing Amplifier sums the V_{m1} and V_{m2} signals which are the products of the null detector output (unbalance current). The blended signal comprises the Err signal and may be represented as:

$$Err = -(V_{m1} + V_{m2})$$

8-37. If the imaginary component of the unbalance current increases, it causes the $V_c(90)$ signal level to simultaneously increase. Thereupon, the Err signal changes to a new vector voltage which is composed of a greater $-V_{m2}$ vector component magnitude. Note that the Err signal is the reverse vector of the composite vector V_{m1} plus V_{m2} . See illustration below:



The response of the Err signal increases the reverse vector of the unbalance current and, thus, the unbalance current is reduced (approaches zero).

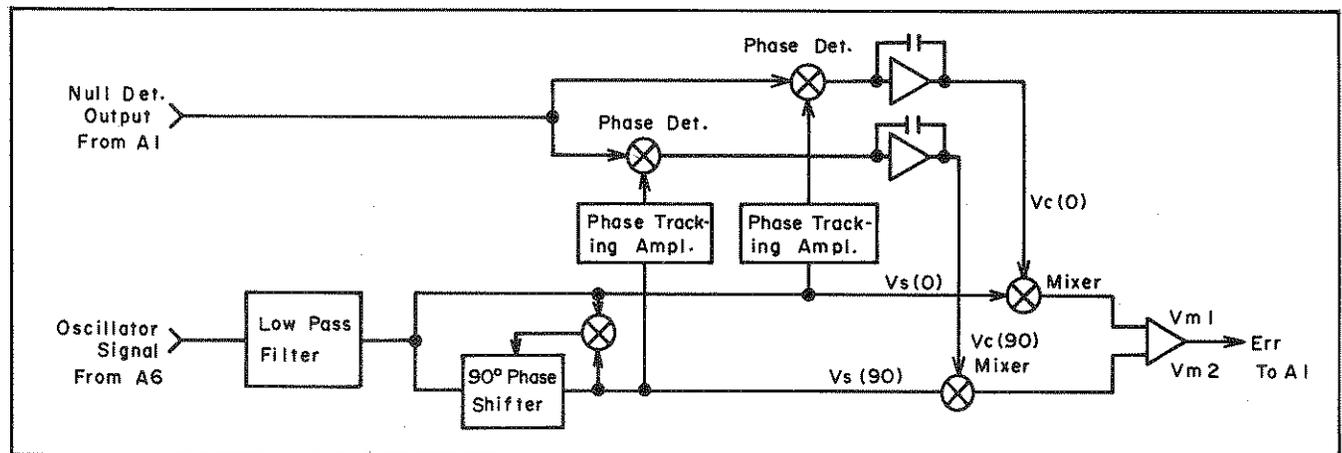


Figure 8-10. A2 Modulator Block Diagram.

8-38. A4 PROCESS AMPLIFIER

8-39. The Err and Edut Buffer Amplifier (A4A1 and A4A2) detect the bridge circuit measurement signals (Err and Edut) with a minimum phase error (to 10MHz). The signal selector switches at the output stage of the Buffer Amplifiers turn on and off according to the measurement sequence and allow transmission of either the Err or Edut signal to the later amplifier stages. For switch control timing, refer to Figure 8-17 Timing Diagram.

The signal selector switches channel the test frequency input signal which is fed at 10mVrms from the A6 Oscillator when TEST SIGNAL LEVEL CHECK function is activated. Test signal voltage or current is calculated from the detected Edut, Err and the 10mV reference test signal level (by the microprocessor). These selector switches do not connect with any input channel during the A-D converter offset control period.

8-40. The AM Amplifier (A4A3 and A4A4) expand measurement range capabilities and compress variations of the Err and Edut signals in relation to the test frequency signal level. The two 1/10 attenuators located between the series amplifier stages are used for the following purposes:

- 1) They change the attenuation factors in conjunction with the test signal level MULTIPLIER settings as follows:

| MULTIPLIER setting | Attenuation factor |
|--------------------|---------------------|
| x 1 | 1/100 (1/10 x 1/10) |
| x 0.1 | 1/10 (1/10 x 1) |
| x 0.01 | 1 (1 x 1) |

- 2) Their attenuation only applies to the Err or Edut signal depending on the selected range. This selective attenuation magnifies the ratio of the Err and Edut signal levels to 10 or 100 times the normal ratio. Thereby, the measurement range can be multiplied by the same factors.

The Level Comparator monitors the OSC LEVEL control setting to compare the control signal level with the four step voltage ranges. When the OSC LEVEL control is rotated from its minimum to maximum position, the Level Comparator changes its output logic at the "A" to "D" outputs from low to high level (in D to A order). The comparator outputs an amplification gain change to the individual x10 amplifiers (x10, x4 or x2). The relationship of the OSC LEVEL control setting and the amplification gain is illustrated in Figure 8-12.

As the result of the attenuation (amplification) control for a desired change of test signal level, the amplitude of the AM amplifier output is corrected at an approximately constant level. This maintains the A-D converter input signal level constant and improves vector ratio detection accuracy for low level test signal measurements. Note that the ratio of the Err and Edut signal levels are preserved throughout these processes.

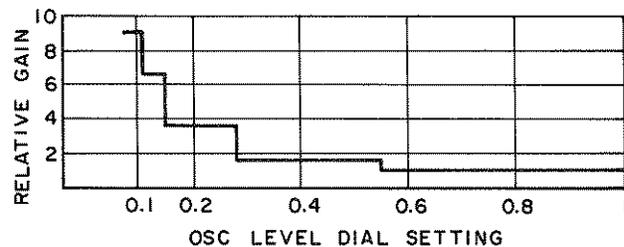


Figure 8-12. AM Amplifier Gain Control.

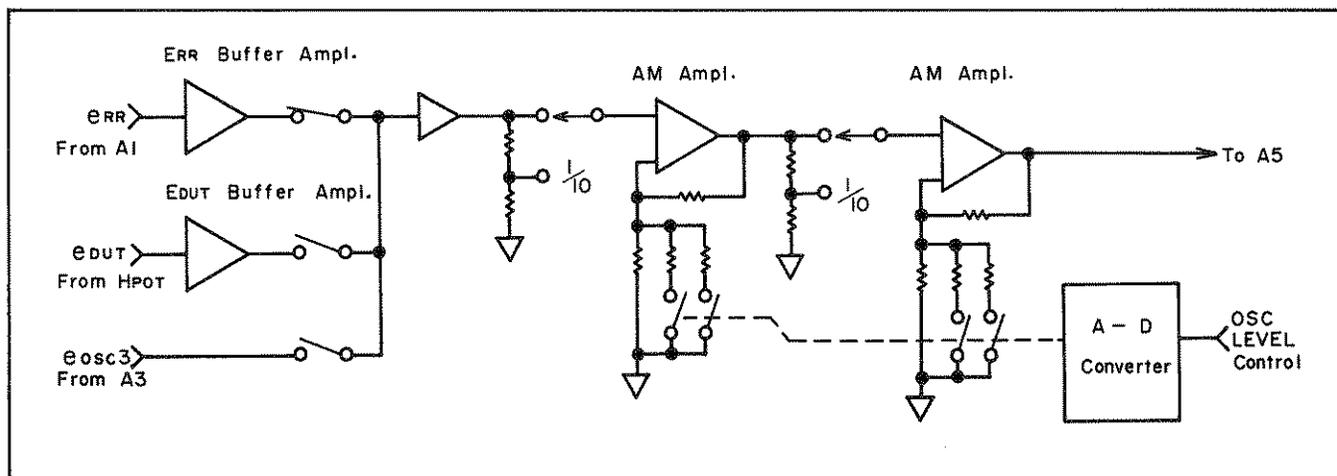
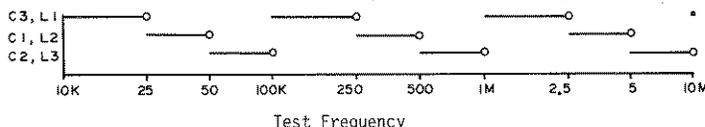


Figure 8-11. A4 Process Amplifier Block Diagram.

Table 8-3. Range Resistor and AM Attenuator Control Matrix.

| Function | Test Frequency | L, C, R, Z Range | | | | | | | | |
|--|----------------|--------------------|--------------|--------------|---------------|--------------|---------------|--------------|---------------|-----|
| | | Z-1 | Z-2 | Z-3 | Y-5 | Y-4 | Y-3 | Y-2 | Y-1 | |
| C Capacitance | 10kHz~24.9kHz | 100 μ F | 10 μ F | 1000nF | 100mF | 10nF | 1000pF | 100pF | 10pF | |
| | 25kHz~249kHz | 10 μ F | 1000nF | 100nF | 10nF | 1000pF | 100pF | 10pF | 1000fF | |
| | 250kHz~2.49MHz | 1000nF | 100nF | 10nF | 1000pF | 100pF | 10pF | 1000fF | — | |
| | 2.5MHz~10MHz | — | 10nF | 1000pF | 100pF | 10pF | 1000fF | — | — | |
| L Inductance | 10kHz~99.9kHz | 10 μ H | 100 μ H | 1000 μ H | 10mH | 100mH | 1000mH | — | — | |
| | 100kHz~999kHz | 1000nH | 10 μ H | 100 μ H | 1000 μ H | 10mH | 100mH | — | — | |
| | 1MHz~9.99MHz | 100nH | 1000nH | 10 μ H | 100 μ H | 1000 μ H | 10mH | — | — | |
| | 10MHz | — | 100nH | 1000nH | 10 μ H | 100 μ H | — | — | — | |
| R, Z Resistance Impedance | 10kHz~10MHz | 1000m Ω | 10 Ω | 100 Ω | 1000 Ω | 10k Ω | 100k Ω | 1M Ω | 10M Ω | |
| Range resistor used | | 100 Ω | 100 Ω | 100 Ω | 100 Ω | 100 Ω | 1k Ω | 10k Ω | 100k Ω | |
| Combination of AM and AF attenuator control | C1 | AM | x10 | x1 | x1 | x1 | x10 | x10 | x10 | x10 |
| | | AF | 2 | 2 | 1 | 4 | 4 | 4 | 4 | 4 |
| | C2 | AM | x10 | x1 | x1 | x1 | x10 | x10 | x10 | x10 |
| | | AF | 4 | 4 | 1 | 2 | 2 | 2 | 2 | 2 |
| | C3 | AM | x100 | x10 | x1 | x1 | x10 | x10 | x10 | x10 |
| | | AF | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | L1 | AM | x100 | x10 | x1 | x1 | x10 | x10 | x10 | x10 |
| | | AF | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | L2 | AM | x10 | x1 | x1 | x1 | x10 | x10 | x10 | x10 |
| | | AF | 4 | 4 | 1 | 2 | 2 | 2 | 2 | 2 |
| | L3 | AM | x10 | x1 | x1 | x1 | x10 | x10 | x10 | x10 |
| | | AF | 2 | 2 | 1 | 4 | 4 | 4 | 4 | 4 |
| R, Z | AM | x100 | x10 | x1 | x1 | x10 | x10 | x10 | x10 | |
| | AF | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |

Note: C1, C2, C3, L1, L2 and L3 indicates capacitance and inductance measurements in the following test frequency ranges:



This table applies only when MULTI-PLIER is set to X1.

8-41. A5 A-D CONVERTER

8-42. For both capacitance and inductance measurements, the attenuator at the input stage of the A-D Converter equalizes the input signal (Edut and Err) level for any test frequency. The Edut or Err signal level detected for the same sample value (capacitance or inductance) changes in proportion to (or in inverse proportion to) the test signal frequency. The attenuation factor is set to 1/2 or 1/4 so that the Edut and Err input signal levels are, respectively, almost equal in one decade frequency range (for example, at 100kHz, 200kHz and 400kHz). In the same manner, the input signal levels are also equalized for other decade frequency ranges in combination with different range resistor values or process amplifier attenuation factors.

8-43. The Phase Detector extracts 0° phase and 90° phase vector components independent-

ly with appropriate timing from the Edut and Err input signals. The phase detector employs a unique circuit configuration for decreasing odd order harmonic component signals which may occur in the output signal. When a square waveform detection signal is used (as is popular), the phase detector output signal also includes low amplitude harmonics corresponding to their vector products [harmonics (distortion) of the input signal multiplied by harmonic components of the square waveform detection signal (in the same frequency vector)]. These harmonic signals, mainly consisting of odd order components, cause a measurement error to occur. Use of a sinusoidal waveform detection signal ensures less harmonics but offers more difficulty in achieving detection phase accuracy in comparison to the square waveform operation.

The phase detector employed in the vector ratio detector uses a periodic staircase waveform detection signal synthesized into a sinusoidal waveform. See Figure 8-14. The quasi-sinusoidal waveform detection signal generates lower order third and fifth degree harmonics. This new phase detector circuit configuration is a parallel connection of two ordinary phase detectors. To accomplish phase detection on the basis of this concept, four switching signals operate in synchronization for each detection phase (0° and 90°). The combined circuit operation of these switching signals is in consonance with theoretical phase detection. The phase detector output current waveform is the sum of the input signal segments detected for the individual switching time periods (as shown in Figure 8-14).

8-44. The Detection Phase Generator develops the synchronized switching signals by counting down the frequency of the 8f pulse signal (fed from A6 Oscillator). The switching pulses generate one cycle for each 8 cycle period of the 8f signal. Thus, the 0° and 90° detection phase signals are exactly synchronized with the test frequency signal. Selection of the detection phase is performed by shifting the timing of the down counter by 2 cycle periods of the 8f signal.

8-45. A dual slope A-D converter charges on the phase detector output signal (a vector component of the Edut or Err signal) during

the time the input switch is closed for a constant period (approximately 10ms). The charge time interval is set to an exact multiple of the test signal cycle period. See Figure 8-17 Timing Diagram. A short hold time is provided before beginning charge and before beginning with the discharge period. During the hold time, the integrator input switch is opened to intercept any transient response signals incident to switching of measurement vector signal. A small triangular precharge waveform done before going into the discharge period improves measurement accuracy when input signal is of extremely low level. The integrator discharges at a constant decay rate until the output voltage reaches zero volts. The reference voltage supply circuit feeds a positive or negative dc voltage to discharge the integrator depending on the polarity of the charge input. The positive and negative reference voltages do not effect measurement results if their absolute values are equal. The Zero Detector reverses its output logic the moment the integrator output crosses the zero level. This signals completion of the discharge to the digital section. The amplifier combined with the integrator magnifies the integrator output waveform to facilitate detection of crossing the zero level point with minimum time error. The feedback loop switch (A5Q36) closes when a dual slope integration operation is being performed.

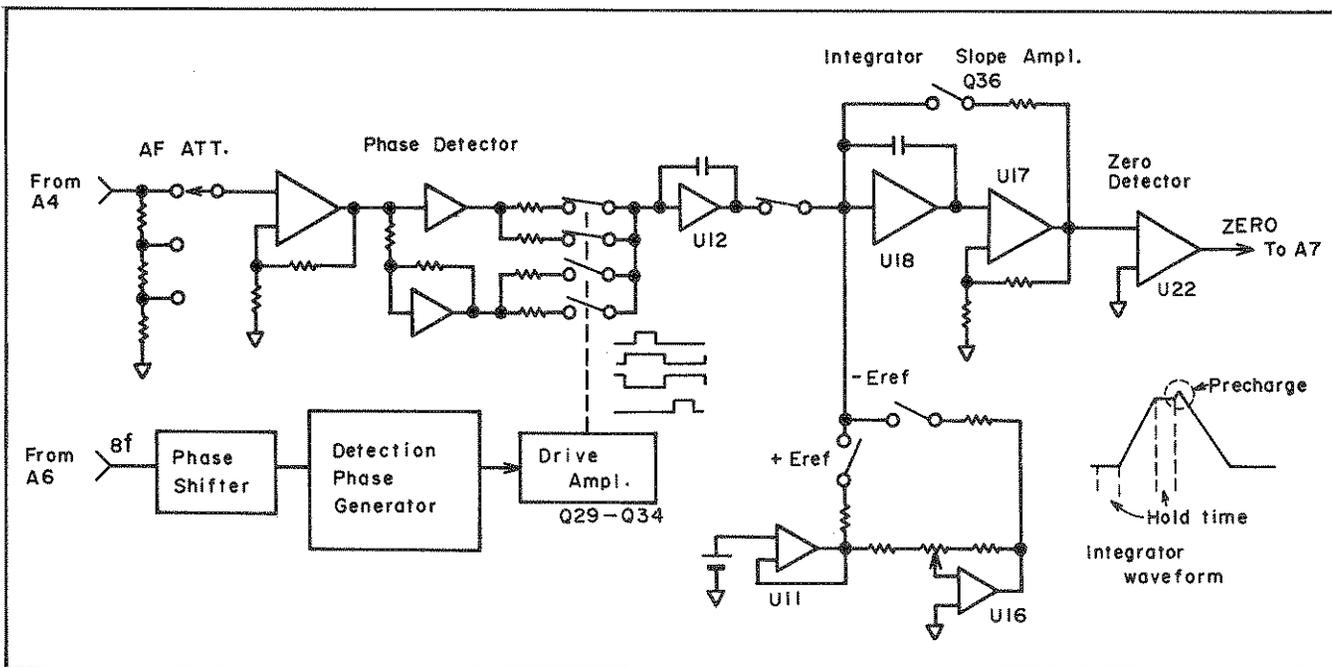


Figure 8-13. A5 A-D Converter Block Diagram.

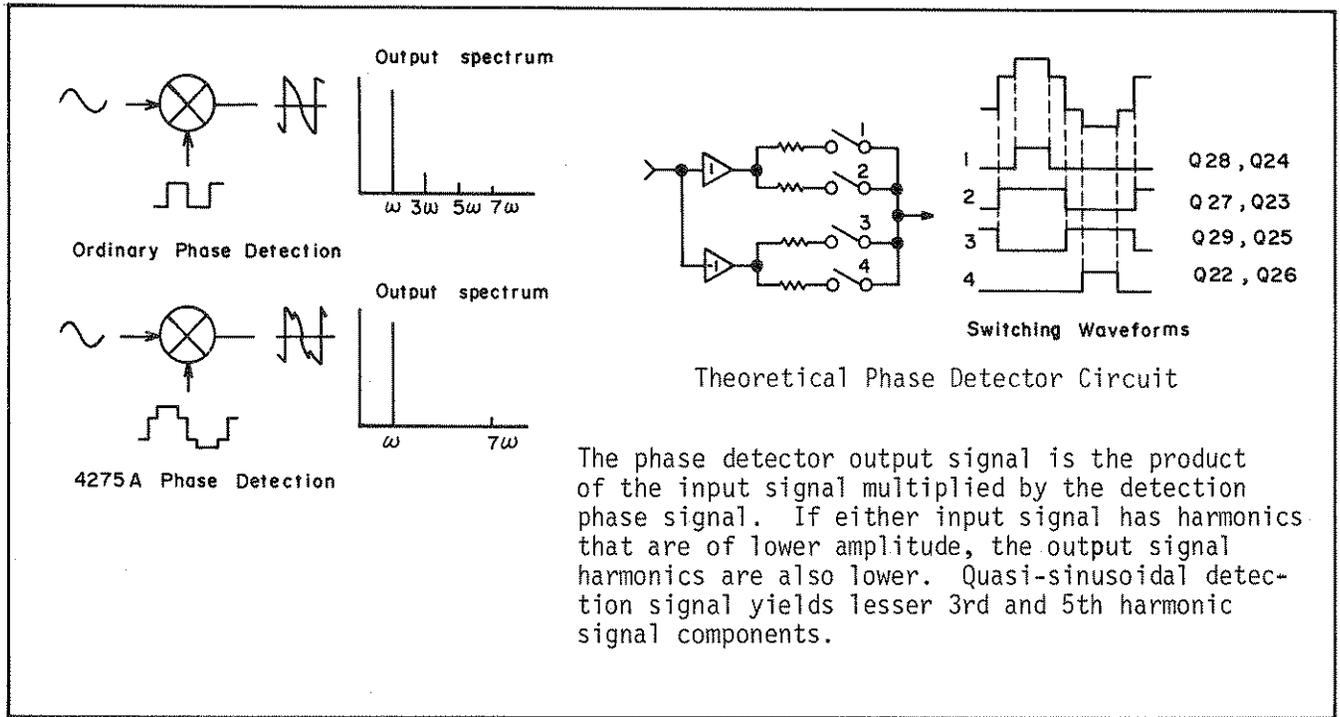


Figure 8-14. 4275A Phase Detector Operating Principle.

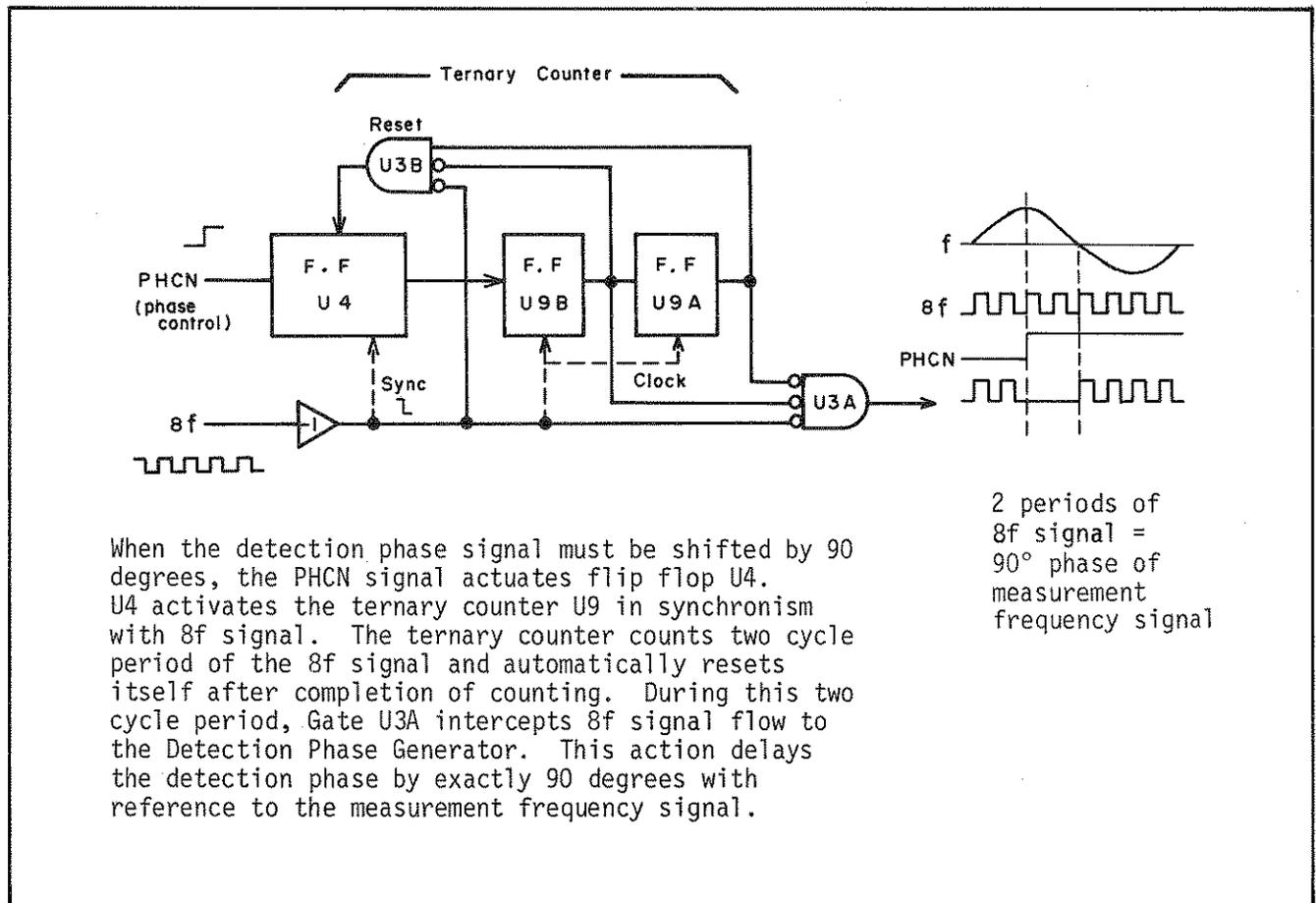


Figure 8-15. Detection Phase Shifter Operating Principle.



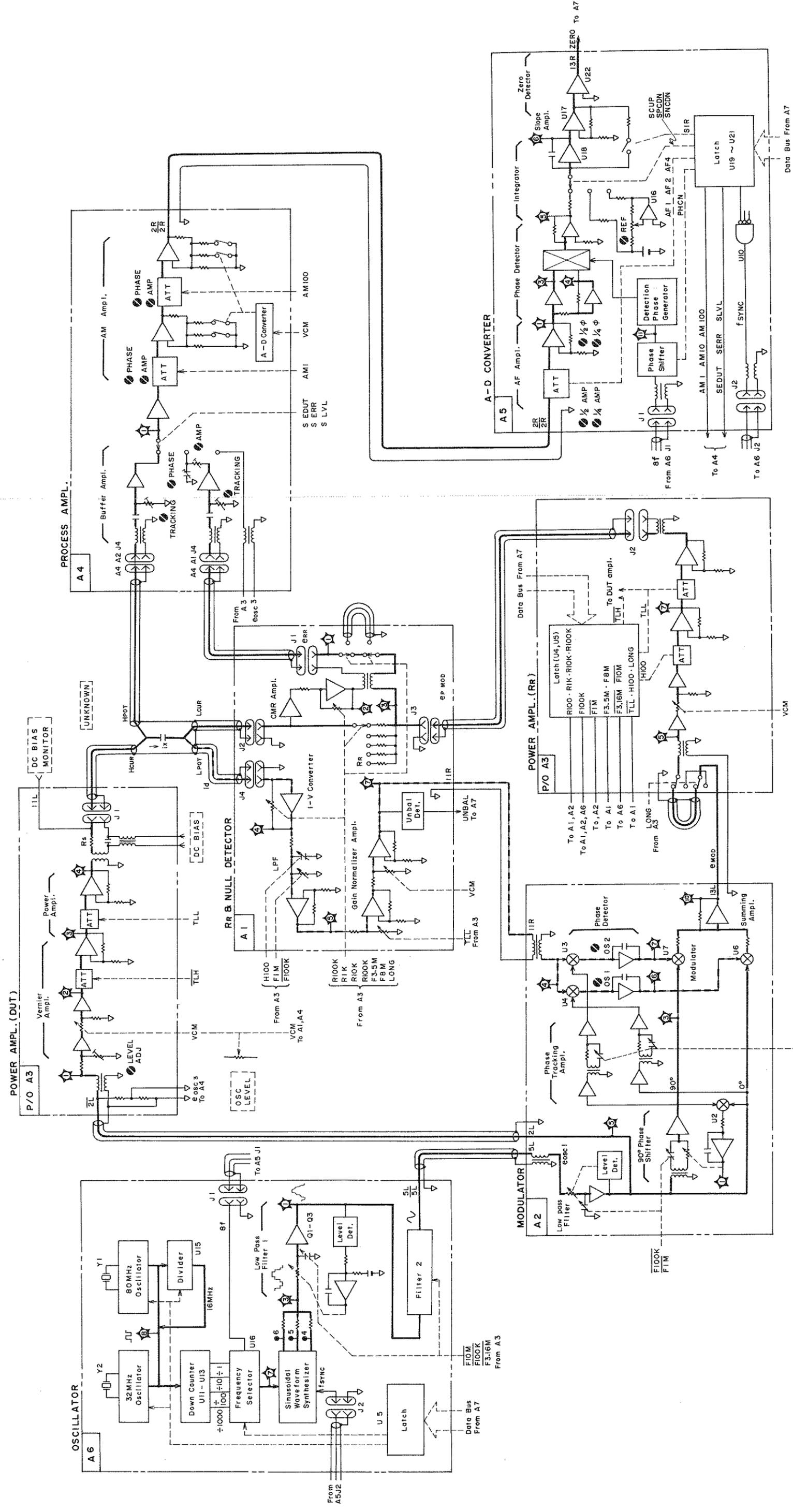


Figure 8-16. Analog Measurement Section Schematic Block Diagram.

Figure 8-17

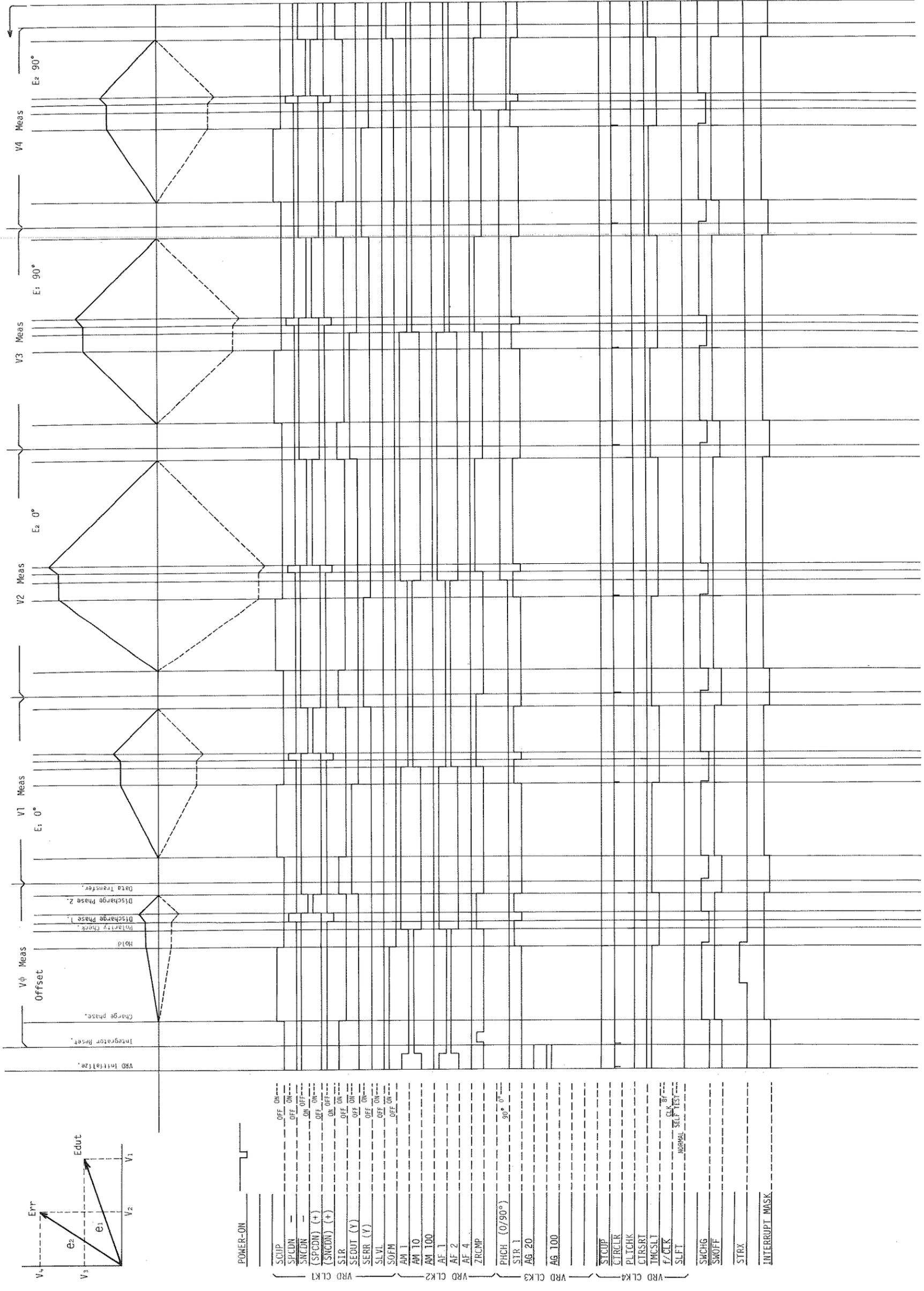


Figure 8-17. Timing Diagram.

Paragraphs 8-46 to 8-50

8-46. DIGITAL CONTROL SECTION.

8-47. Figure 8-24 is the block diagram of the 4275A digital control section. The basic instrument includes three logic circuit boards and an operational keyboard combined with displays. These are integrated as necessary to handle their various functions and comprise the following assembly units:

- A7 Peripheral Control Board Assembly.
- A8 Microprocessor Unit Board Assembly.
- A9 Display and Keyboard Control Board Assembly.
- A11 Display and Keyboard Assembly.

The instruments allow the installation of one or two additional board assemblies for adding optional capabilities. These boards provide the circuits necessary for equipping the instrument with the following options:

- A21 DC Bias Supply Board Assembly (Option 001)
- A22 HP-IB Board Assembly (Option 101)
- A23 DC Bias Supply Board Assembly (Option 002)

Optional boards can not offer their utility without the installation of an additional ROM on the microprocessor board for memorizing optional control programs. Installation of an optional board without the requisite program ROM disables normal operation of the instrument.

8-48. A9 MICROPROCESSOR UNIT.

8-49. The microprocessor interfaces with other devices through the three data bus lines and governs all digital data processing as well as providing analog measurement circuit timing control. These bus lines are allotted for the following purposes:

Data Bus Line (8 bit): Bidirectional bus line for transfer of program and measurement data from/to the microprocessor.

Address Bus Line (16 bit): Unidirectional bus line from microprocessor for addressing program ROM and data RAM. Additionally, sets PIA (Peripheral Interface Adapter) or Microport to enable data transfer to/from microprocessor.

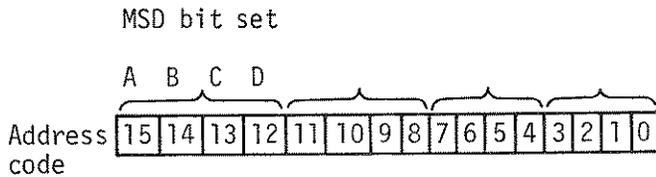
Control Bus Line (VMA, R/\bar{W} , $\phi 1$, $\phi 2$, \overline{RST}): Unidirectional bus line for transfer of digital section control signals. VMA line controls synchronous access timing of RAM, PIA and Microport in con-

junction with clock signal. R/\bar{W} control line sets RAM, PIA or Microport to "read" or "write" operating mode to control data transfer direction (in time sharing) on the Data Bus Line from/to the microprocessor (definition for the R/\bar{W} control logic is described in paragraph 8-53). $\phi 1$ and $\phi 2$ signal lines offer a set of clock pulse trains for mutual timing synchronization in the digital control circuits. \overline{RST} line resets PIA's and Microport devices to their initial "clear" states after power-on and each time before the measurement is taken.

8-50. Program Control ROM has an 18 kilobyte total memory capacity and has already memorized the analog section control programs along with digital data processing routines (counting, calculation, transfer and storage of data). To accept the measurement control instructions from the Program ROM, the microprocessor sequentially addresses the ROM through the address bus line. The measurement control instructions, timely outputted from the ROM, are stored in the latches in the analog section via A7 Peripheral Control. The microprocessor also addresses the Data RAM and bus line control devices (PIA's and Microport) to sequentially execute microprocessor program steps in accord with the program given by the ROM.

A 16 bit address code comprises an unique 4 digit number (from 0000 to FFFF). Each digit number of the address is represented by a 4 bit code set (from 0 to F). The two more significant bits of the most significant digit address number assign a particular memory group or bus control devices as shown below:

| Designation | Address code | MSD bit status ABCD |
|------------------|--------------|---------------------|
| ROM | FFFF C000 | 11xx |
| PIA or Microport | 8000 | 10xx |
| ROM (for option) | 4000 | 01xx |
| RAM | 0000 | 00xx |



A program ROM is accessible while the status for AB of the MSD (most significant digit) bit set, ABCD, is 11 (or 01). The two lesser significant bits of the set (C D) of the MSD assign each individual ROM device. When both 15th and 14th bit states are 1 (AB = 11) Gate A9U27D turns its output logic to low level. This activates ROM Selector U16. The ROM selector decodes 13th, 12th and 11th bit address signals to 8 bit CSA (Chip Select A) signals which cause the appropriate ROM device to become valid (low level sets the RAM). When both the 15th and 14th bit states are 0 (AB = 00), the RAM Selector U28 is activated. The RAM selector decodes 11th and 10th bit address signals to 3 bit CSB (Chip Select B) signals. The CSB signals enable RAM devices or a data register in the following manner:

| Designation | CSB control |
|------------------------------------|-------------|
| DSA switch data register | CSB 3 |
| Memory backup RAM (for option 003) | CSB 2 |
| Data RAM | CSB 0 |

VMA (Valid Memory Address) and $\phi 2$ clock signals cooperate for securely addressing correct devices. A9U27A gates the VMA and $\phi 2$ clock signals to pull down its output to a low level only when both input signals are at high level. During this period, address bus data can be recognized by the addressed device. See Figure 8-18.

8-51. The Turn-on reset circuit (A9U35) always sets the microprocessor to its definite initial states after a 1 second delay when the instrument is turned on. The microprocessor initially accesses ROM address FFFF to read the memory data. The microprocessor program sequential steps progress in synchronism with a pair of 995 kHz complementary clock signals ($\phi 1$ and $\phi 2$ fed from A7 board). High level intervals of the clock signal must extend over the low level intervals of the other clock (as shown in Figure 8-18).

8-52. IRQ (Interrupt Request) control line transmits the response demand to the function control input from keyboard or from the HP-IB control line. When a 4275A function is selected or changed, the IRQ line goes to low level. The regular measurement sequence control of the microprocessor immediately pauses to determine the nature of the control input except during integrator operating periods (dual slope A-D conversion operation). Program address jumps to IRQ service program routine to manage the function control prior to program processes. The IRQ control line is always active so as to allow for servicing of interrupt requests.

8-53. A Read/Write (R/W) timing control signal manipulates memory devices, registers, PIA's and microport in the following manner:

Read: Causes Register or Memory to output data or sets PIA or Microport to driver mode. Microprocessor accesses (reads) the data sent from the addressed device.

Write: Enables Register or RAM to store data or set PIA or Microport to receiver mode. Microprocessor sends (writes out) data to the device.

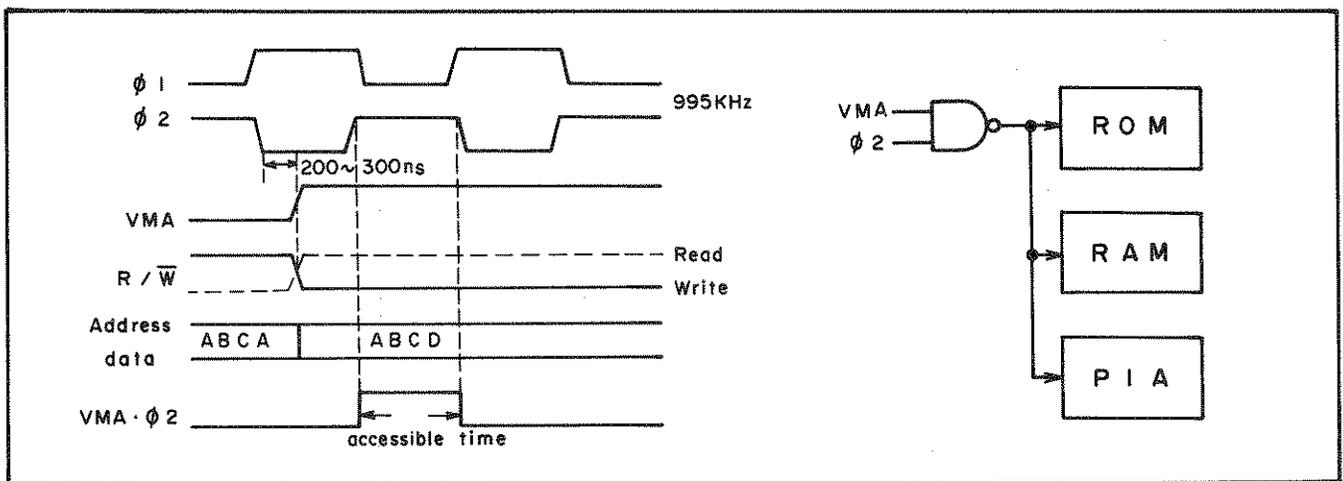


Figure 8-18. Address Timing Control.

The read/write control is performed in conjunction with address signals to qualify the valid device for the data transfer.

8-54. Optional Circuits.

8-55. The ROM selector A9U22 decodes its address bus inputs (11th, 12th and 13th bit set) to select optional program ROM (U9, U10 or U11) when 15th and 14th address bit states are 01. The Memory Backup RAM (U14 and U15) stores 8 bit data (4 bits for each RAM device) which are continuously protected by a lithium battery. When instrument operating power is lost, the battery feeds minimum power sufficient for preservation of the stored memory in the RAM. Simultaneously the Level Detector (U25) disables writing to the RAM to avoid memorizing random data at the moment the power line voltage drops.

8-56. A7 PERIPHERAL CONTROL.

8-57. The key function of the A7 Peripheral Control is to manage the analog section control signals and to count the measurement quantities transferred in the form of time intervals. The PIA (Peripheral Interface Adapter) directs the incoming or outgoing data stream to/from the A7 board. Internal

circuit configuration of the PIA is illustrated in Figure 8-19. When the 15th, 14th and third bit states of the address signal are set to (1, 0, 1), the PIA has access to the microprocessor. Address bus A0 and A1 bit set selects internal control register and data output register in the PIA which momentarily stores the input data. When R/W control line is pulled down to low level, the PIA allows transfer of data from the microprocessor to Bus Buffer/Data Control (U16, U18, U27 and U28) in channels A or B. PA7 and CA2 (PIA control output) signals control the direction of the input/output data which can flow through the Bus Buffer/Data control. Measurement control signals are transferred through the 8 bit PDB bus line and are registered in the latches (of A3, A5 and A6 boards). These control signals designate the states of the analog switches to be set for the temporary measurement phase. For accurate measurement timing control, the Strobe Clock Decoder (U31) transfers properly timed measurement clock signals to the latches. The measurement clock signals cause specific latch(es) to store the data and to output the control signals to individual analog switches. Additionally, the Strobe Clock Decoder also acts to enable the display data RAM of A8 Display Control to store measurement display data which are transferred from the microprocessor.

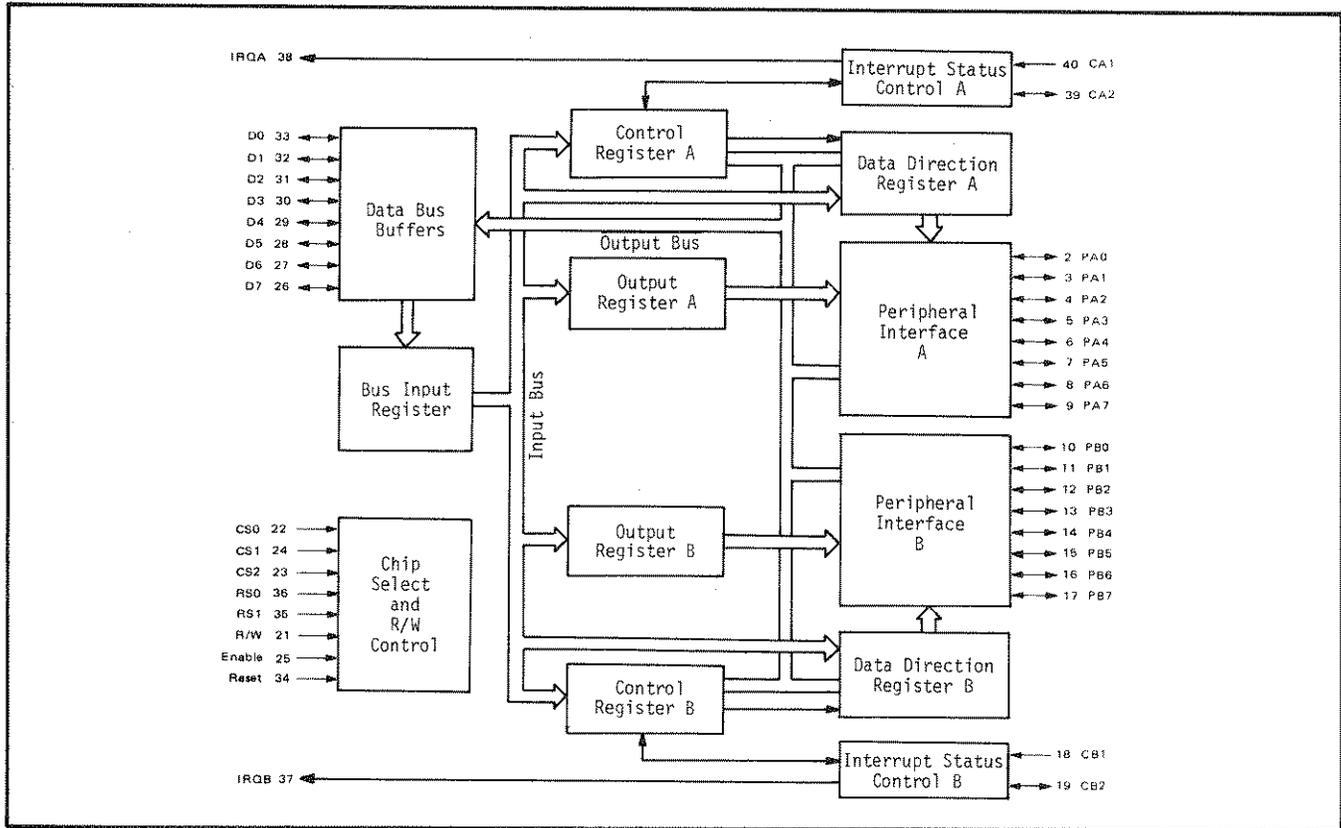


Figure 8-19. PIA Internal Circuit Configuration.

8-58. The Timer Counter (U22, U32, U23 and U33) generates an integrator charge time (approximately 10ms) by counting a *1MHz clock signal. This programmable counter begins counting the clock from the preset number toward the maximum counts. The program number is first set to U22 and U32 in 8 bit data format and, successively, to U23 and U33 (thus, two LOAD control signals are used). When the Timer Counter overflows, TMEND output signal (at TP24) causes the Timing End Decoder (U6, U7A and U7B) to develop integrator switch control signals (SWOFF and SWCHG).

*Note

When test frequency is 10kHz, the Timer Counter counts 8f signal (fed from A6 Oscillator) instead of the 1MHz clock.

The Clock Synchronizer gate circuit (U26) selects the timer counter clock signal from either the 8f signal or 1MHz clock generator signal. The 1MHz (actually 995kHz) clock signal is counted down from the 9.95MHz crystal oscillator (U15 A/D) signal. When the integrator charge period ends, the Data Counter (U25) begins counting the integrator discharge time interval using the 1MHz clock signal in response to a CTRSRT Signal (sent from U11). The Data Counter stops counting when a ZERO signal is transferred from the A5 board to signal that the integrator output has crossed the zero level. Successively, the Data Counter outputs the data towards the 4 bit bus line in series data transfer fashion in LSD to MSD order. If the counted number exceeds 199999 counts, flip flop U12 generates an OVFW (overflow) signal. To accommodate the measurement data, R/W signal sets the PIA to driver mode. The microprocessor accesses the data counter output through the PIA.

8-59. The Polarity Detector (U8) monitors the ZERO signal level to discriminate between positive and negative going integrator ramps in the integrator charge period. During the charge period, the microprocessor accesses the polarity data and determines the polarity of the reference voltage used for discharging the integrator. When the bridge circuit is unbalanced, an UNBAL input signal turns output logic of Flip-flop U20. The UNBAL signal is detected at the charge period of the first integrator operating cycle. When a keyboard function control button is pushed, KYIPT line (TP7) goes to low level. The PIA pulls down the IRQ line (TP8) to low level to annunciate the interrupt request to the microprocessor.

8-60. A8 DISPLAY CONTROL.

8-61. The Display Control section consists of three major circuits: Display Decoder RAMs, Display Drivers and Key Scan Counter. The Display Decoder RAM (U4, U5, U6, U10, U11 and U12) does conversion and storage of measured data to be displayed on the seven segment numeric (and dot matrix alphanumeric) displays. Before beginning transfer of the measurement display data to the RAM, the RAM address for initially storing the data is sent to the RAM Address/Anode Counter U7. Successively, the display data is transferred to the RAM as the Address/Anode Counter simultaneously advances the address (4 bit) from the preceding address for each incoming display data fraction (serially transferred from the microprocessor through A7 board). The 7 bit display data fractions are previously coded by the microprocessor as appropriate for driving the seven segment (or dot matrix) displays when the data is, in turn, written out from the RAM. Three pairs of 4 bit RAMs do the storage of the 7 bit display data in the following manner:

U4 and U10: Stores 7 segment numeric display data for DISPLAY A, DISPLAY B and FREQUENCY/TEST SIG LEVEL displays (including unit lamp indicator).

U5 and U11: Stores dot matrix display data for DISPLAY A unit indicator and part of pushbutton lamp annunciator data.

U6 and U11: Stores dot matrix display data for DISPLAY B unit indicator and part of pushbutton lamp annunciator data.

Write Enable (WE1, WE2 and WE3) signals cause the appropriate pair of RAMs to become valid for the data store period. Since the RAM Address/Anode Counter can start counting from the desired address number, it is possible to change a part of the memory in the RAM to new display data.

8-62. Each Display Decoder RAM memorizes 16 sets of 7 bit display data fractions. When Write Enable signals are at high level, the Display Decoder RAM writes out the data as periodically addressed by the RAM Address/Anode Counter. The address number advances in the reverse direction of the memory store mode. The RAM outputs the display segment signals which alternately illuminate the numeric figure of each measured count digit of the displays. The RAM address signals are simultaneously decoded by the Anode Scan Decoder (A10U8) to periodic anode scan signals which activate, in sequence, the display for each digit (and for each dot matrix row segment). Synchronous operation of the display data RAM and the Anode Scan Decoder accomplishes matrix drive of the display.

8-63. The Clock Generator (U8 and U9) drives the RAM Address/Anode Counter with a 100kHz clock frequency counted down from the $\phi 2$ clock signal. Additionally, down counter U8 feeds a 1/32MHz clock pulse signal to drive the Key Scan Counter (U15). When the display data RAM is set to "write" mode, STPSCN signal stops the clock signal flow to reverse count input of the RAM Address/Anode Counter and blanks the display. After the instrument is turned on, RST signal actuates to blank display (so as to prevent a meaningless display from occurring) until all circuits are settled in their normal conditions.

8-64. The Key Scan Counter U15 outputs periodic KY signals (KY0 to KY3) to A10 board. These 4 bit output signals are decoded by the Multiplexer (A10U9) to keyboard scan signals which, in turn, cause individual keys of three particular key groups to become valid. Each control key in the key group is enabled, in sequence, to perform its function. When a keyboard pushbutton (for example, "Z" key) is pressed, one of the keyboard output lines KY4, KY5 or KY6 goes to low level at the moment the pushbutton switch input is pulled down to low level by keyboard scan signal (in this example, KY4 line goes to low level when the Multiplexer turns its K4 control output line to low level). The output logic of the Key Decoder U14A goes to low level and subsequently the Key Scan Counter stops. The contents of the Key Scan Counter and the keyboard output states given by KY4, KY5 and KY6 signals are coordinated with the address of the key depressed. Simultaneously, gate U13C outputs KYIPT signal causing the IRQ line to go to low level (interrupt request is set). The microprocessor reads the scan counter and keyboard output data to identify the pushbutton function actuated.

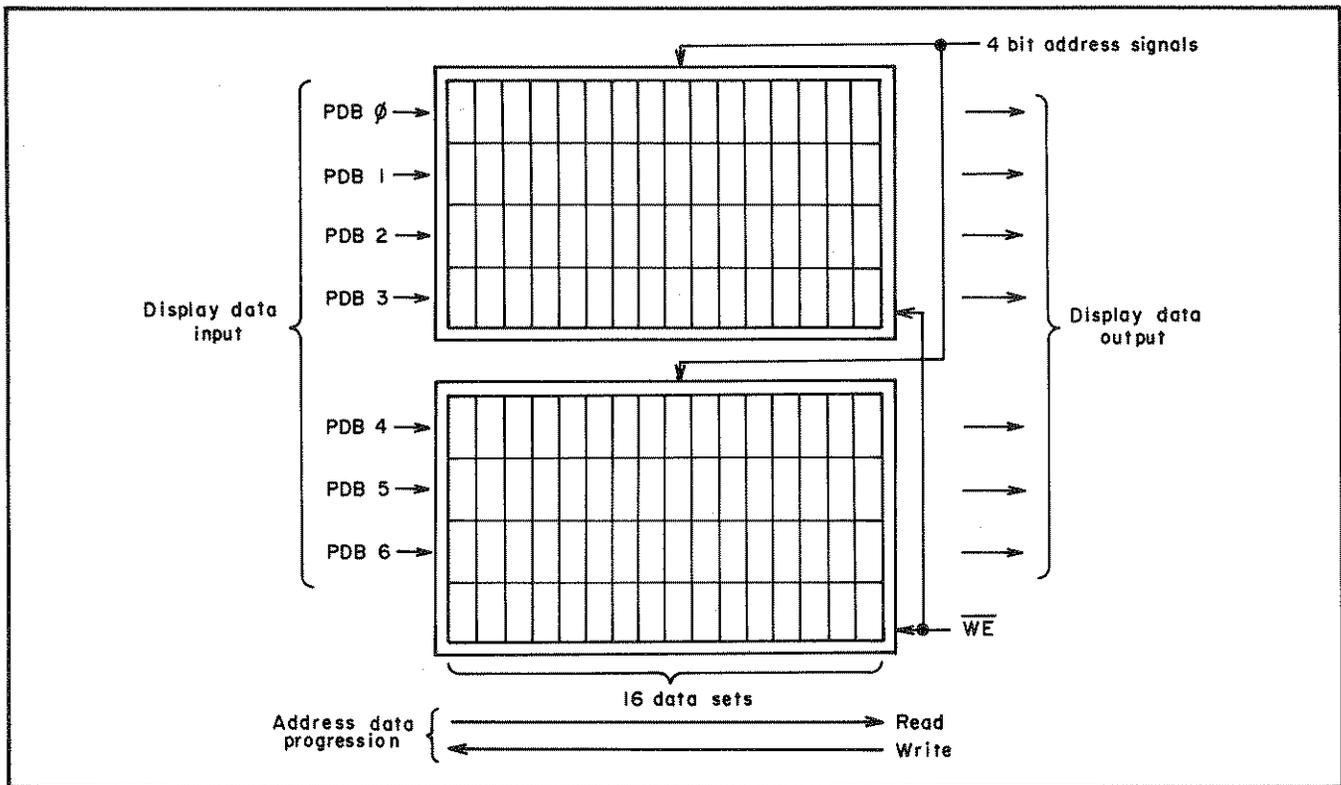


Figure 8-20. Display Data RAM Read/Write Operating Sequence.

8-65. OPTIONS.

8-66. OPTION 001: $\pm 35V$ DC BIAS SUPPLY (A21).

8-67. The A21 DC Bias Supply is linked to the microprocessor control bus lines via PIA (U11) which manages bias control data input/output timing. External bias controller setting data is sent to Latches U12 and U13 through the rear panel INT DC BIAS CONTROL connector. When the bias controller ENTER button is depressed, LOAD line goes to low level causing the PIA to output IRQ signal. An R/W control signal sets the PIA to driver mode and the Latches hold the bias control input data. Subsequently, the microprocessor accesses the bias control input data to translate it to data appropriate for setting 12 bit DAC (Digital to Analog Converter) and voltage range/polarity selector of the DC Bias Supply. The bias supply control data, transferred from the microprocessor, is stored in Latches U5 and U8 (PIA is set to receiver mode).

8-68. The DAC (U4) outputs an accurate dc voltage in the range of 0 volts and 10 volts in accord with the voltage data assigned by 12 bit binary input code. The Polarity Selector switches (Q7 and Q8) permit selecting either positive or negative dc bias in response to bias controller polarity setting. The Output Amplifier is capable of changing its amplification factor to $\times 1/10$, $\times 1$ or $\times 10$ to magnify the bias output variable range depending on the bias controller MULTIPLIER setting. The simplified schematic for the output amplifier gain control circuit is shown in Figure 8-21. The filter circuit at the output stage of the amplifier eliminates pulse noises from the dc bias output. The filter capacitor is essentially located in series with the measurement circuit as illustrated in Figure 8-22. Note that the A21 board is of a floating bias supply design.

Because this filter capacitor decreases the actual test signal level applied to the sample, the filter capacitor value must be selected (from $1\mu F$ and $100\mu F$) so that capacitor impedance value is less than $1/10$ times the sum of the sample impedance and source resistor impedance. Filter selection relays K1 and K2 are energized when rear panel DC BIAS Selector switch is set to its INT 35V/100V ($\leq 1\mu F$) position. Sockets SC1 and SC2 configure a signature test circuit loop consisting of PIA and latches when a jumper element or a low value ladder resistor device (below 100Ω) is installed in each socket.

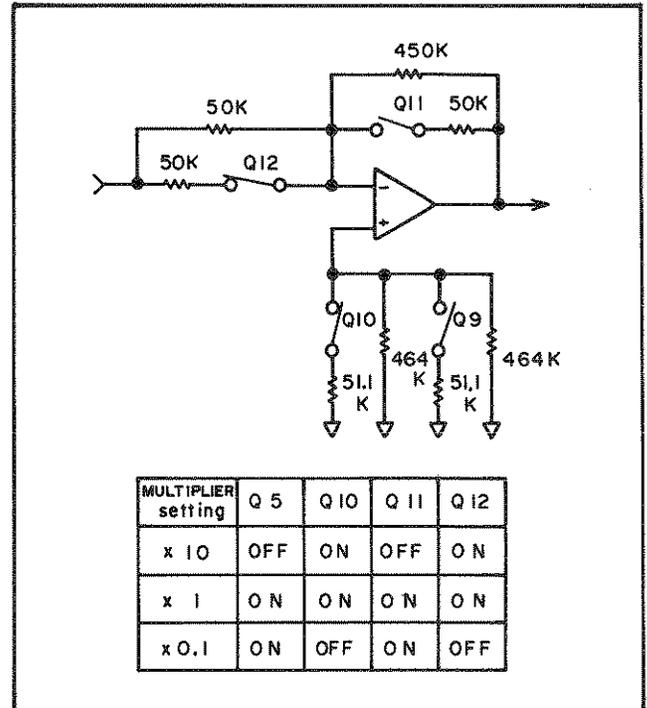


Figure 8-21. Bias Output Amplifier Gain Control.

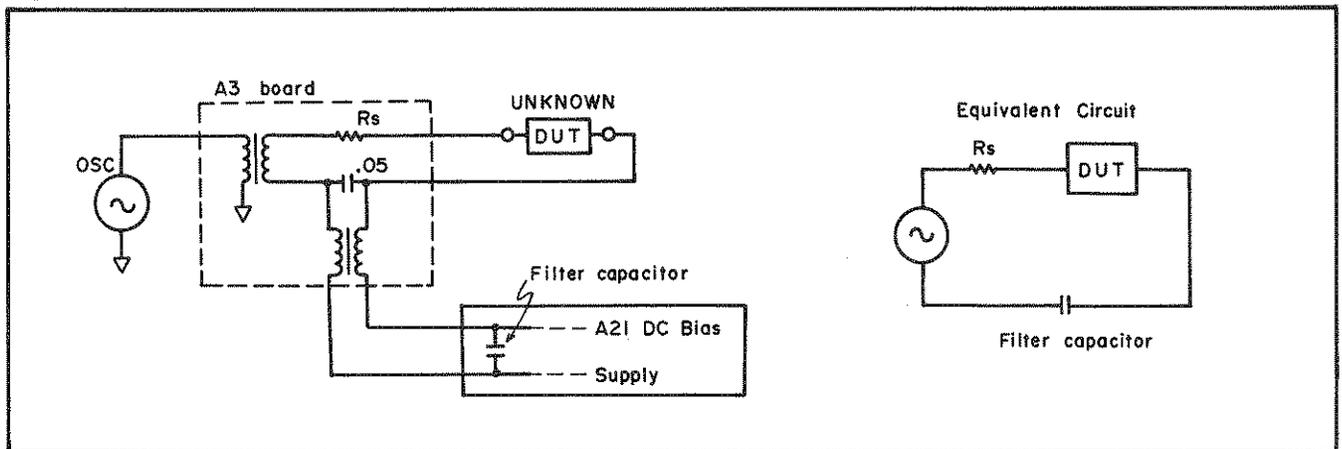


Figure 8-22. Equivalent DC Bias Circuit.

8-69. OPTION 002: $\pm 100V$ DC BIAS SUPPLY (A23)

8-70. Option 002 DC BIAS Supply has a circuit configuration similar to the A21 circuit board (Option 001). This paragraph and that following describe only the circuit unique to Option 002. Therefore, it is suggested that you read paragraphs 8-66 and 8-67 to become acquainted with circuit operating theory common to both Option 001 and 002 before proceeding to the following paragraph.

8-71. Gate U14D resets latches U10 and U11 to their "clear" states when front panel DC BIAS switch is set to $\pm 35V$ MAX position. Thereby, the DAC (U4) output voltage falls to zero volts in response to zero input. This inhibits a bias voltage from being fed to an inappropriate test fixture of 35V dc bias design. Comparators U6, U7 and U8 provide stable control input data to DAC and prevent digital pulse noises from appearing on DAC output voltage. The Output Amplifier multiplies the DAC output voltage by 10 to step up the bias voltage control range.

8-72. OPTION 101: HP-IB INTERFACE (A22).

8-73. All the HP-IB interface functions are accomplished by the integrated Microport device which mediate the "handshake" of the microprocessor and external HP-IB equipment on an HP-IB program basis. The microport circuit architecture is illustrated in Figure 8-23. The stack of 8 register pairs of the Microport connects the data transferred to/from external equipment as directed by asynchronous operation of the control bus signals. Each register pair stores the data fraction which flows through one of the 8 bit data bus lines. When the instrument is turned on, the Microport pulls down its \overline{ASE} control line to low level. The microprocessor accesses the HP-IB address data in register U1 to display the instrument address number on the front panel display.

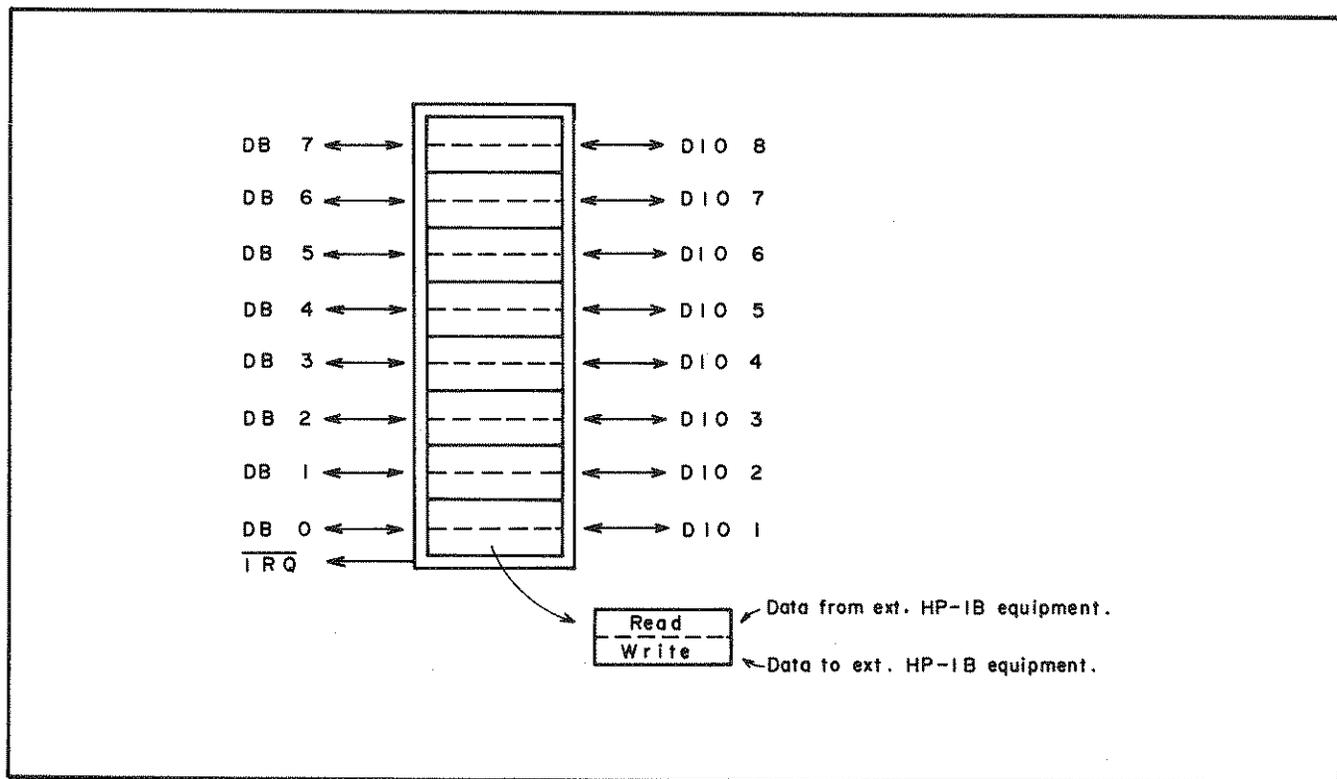


Figure 8-23. Microport Internal Register Configuration.

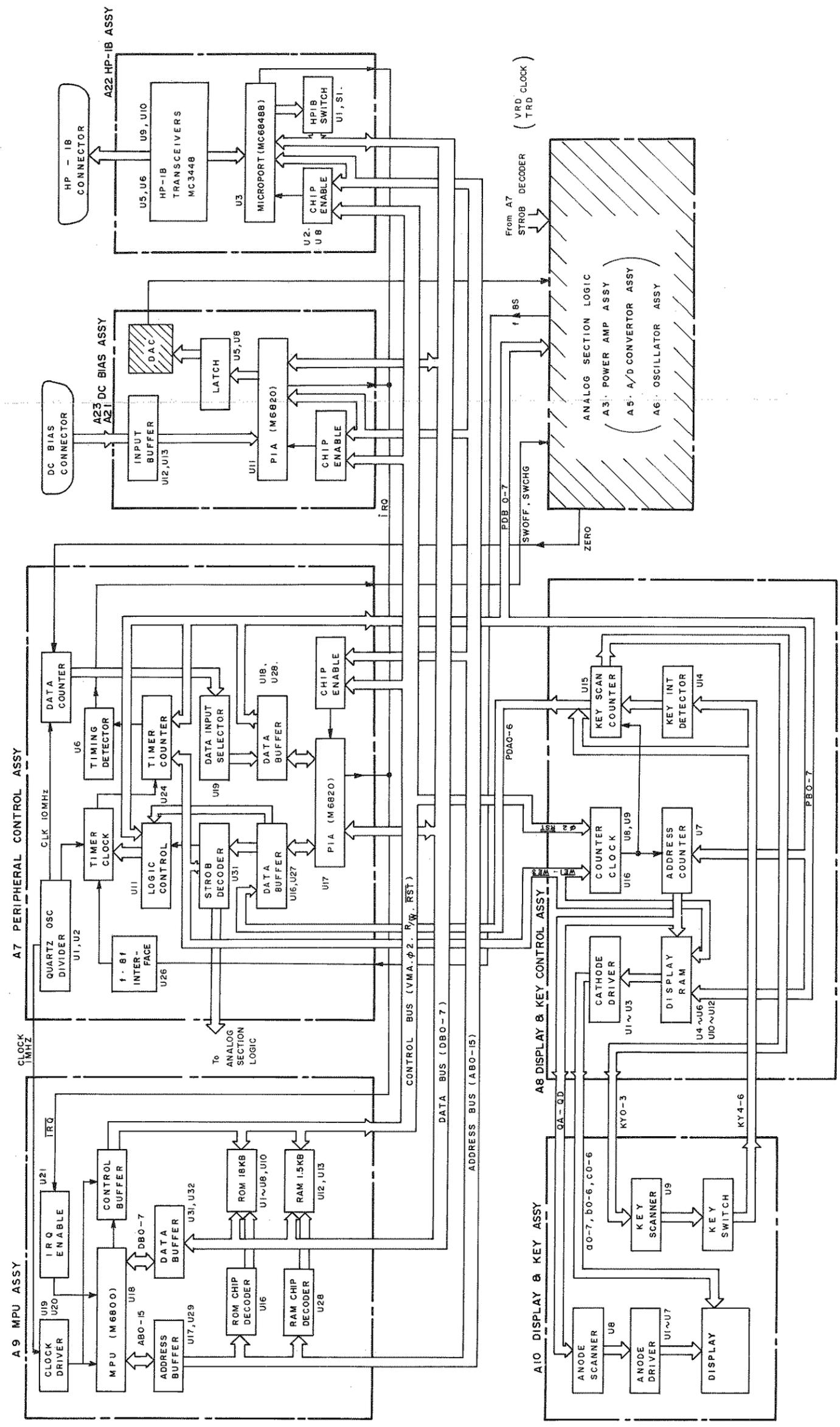


Figure 8-24. Digital Control Section Block Diagram.

8-74. TROUBLESHOOTING.

CAUTION

THE OPENING OF COVERS OR REMOVAL OF PARTS, EXCEPT THOSE TO WHICH ACCESS CAN BE GAINED BY HAND, IS LIKELY TO EXPOSE LIVE PARTS; IN ADDITION, ACCESSIBLE TERMINALS MAY ALSO BE LIVE.

THE APPARATUS SHALL BE DISCONNECTED FROM ALL VOLTAGE SOURCES BEFORE ANY ADJUSTMENT, PARTS REPLACEMENT OR MAINTENANCE AND REPAIR ARE PERFORMED FOR WHICH THE APPARATUS MUST BE OPENED.

IF, AFTERWARDS, ANY ADJUSTMENT, MAINTENANCE OR REPAIR OF THE OPENED APPARATUS UNDER VOLTAGE IS REQUIRED, IT SHALL BE CARRIED OUT ONLY BY A SKILLED PERSON WHO IS AWARE OF THE HAZARD INVOLVED.

8-75. Figure 8-25 "How to Use Troubleshooting Guides" is helpful when starting to troubleshoot the 4275A. As the analog boards include the latches which are controlled through bus lines by the MPU, the signature analysis technique is useful for analog board troubleshooting. The sequence of the digital section troubleshooting depends upon the program routine and it is difficult to provide individual flow diagrams. AL thru GL all contain digital section troubleshooting aids.

8-76. Follow the troubleshooting procedure in Figure 8-29 which provides specific instructions for isolating the Analog and Digital section from each other.

WARNING

WHENEVER IT IS LIKELY THAT THE PROTECTION PROVIDED BY THE FUSES HAS BEEN IMPAIRED, THE INSTRUMENT MUST BE MADE IN OPERATING AND MUST BE SECURED AGAINST ANY UNINTENDED OPERATION.

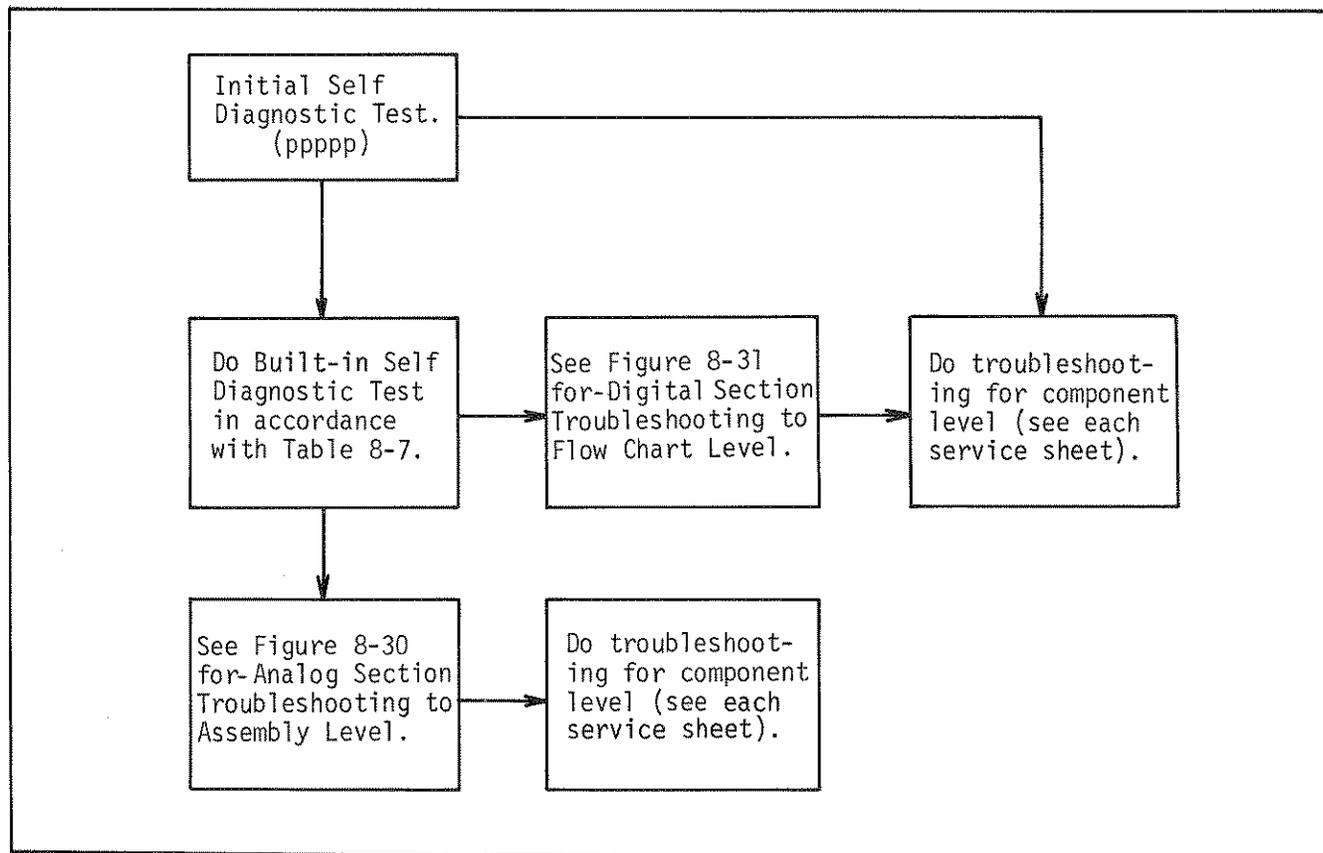


Figure 8-25. How to Use Troubleshooting guides.

CAUTION

CAPACITORS INSIDE THE INSTRUMENT MAY STILL BE CHARGED EVEN IF THE INSTRUMENT HAS BEEN DISCONNECTED FROM ALL VOLTAGE SOURCES.

BE SURE THAT ONLY FUSES OF THE REQUIRED RATED CURRENT AND OF THE SPECIFIED TYPE ARE USED FOR REPLACEMENT. THE USE OF MENDED FUSES AND THE SHORT-CIRCUITING OF FUSE HOLDERS MUST BE AVOIDED.

8-77. Troubleshooting Analog Section to Assembly Level. Follow the troubleshooting procedure in Figure 8-30 Analog Section Troubleshooting Guide to isolate an analog fault to a board assembly. Troubleshooting to component level is covered in the service sheet for each assembly.

8-78. Digital Section Troubleshooting
Figure 8-31 is helpful in speeding the troubleshooting. The signals circulate through the bus line and the flow diagrams are given in accordance with the main instructions of the 4275A for efficient problem isolation. The signature analysis technique is a most helpful method for following the component isolation flows AL thru GL (A Logic flow thru G Logic flow). Except for the HP 5004A Signature Analyzer, no additional boards or equipment are necessary.

8-79. INITIAL MEMORY TEST.

8-80. The initial operating program of the 4275A is a brief memory test routine begun immediately after the instrument power is turned on. This memory test confirms integral memory of the measurement control programs stored in the program ROM and the normal read/write operating capability of the data RAM. The program memory test is accomplished in a short time (about 1 second) by using the popular "check sum" method.

Before proceeding with the initial measurement function control, the microprocessor calculates the sum of the binary numbers of the program codes for all memory addresses and checks this result with the correct number.

The check sum procedure proves the memory of each individual ROM to be faultless. As the last of the memory test, test data is memorized in the RAM and is written out to verify its complete data registration capability.

8-81. The instrument indicates the normal test result by the display of five P figures when a perfect test result is identified. The P figures appear in DISPLAY A and progress in a left to right direction. If not all the tests are passed with normal results, the process test stops halfway and the instrument can not go through the subsequent automatic control settings. In such case, the number of P figures displayed indicates the ROM or RAM in which an abnormality is detected as follows:

- *No display A9U10
- P A9U7 or U8
- PP A9U5 or U6
- PPP A9U3 or U4
- PPPP A9U1 or U2
- PPPPP A9U12 or U13

*Note

No P figure also appears in the following cases:

- 1) Microprocessor malfunctions.
- 2) A faulty component obstructs normal addressing of the ROM (RAM) or a function of the data bus line.
- 3) Self test program ROM (A9U3) is defective. There is also the rare possibility of a defective A9U1

8-82. SELF TEST INSTRUCTIONS.

8-83. The built-in self diagnostic test function which is operated from front panel keys provides various display outputs helpful in maintenance of the 4275A. This automatic diagnostic test capability, featured in the 4275A decreases the loading of users and service personnel who are concerned with performance testing, adjustment, calibration and repair.

The self diagnostic test function is designed to perform functional testing of the major circuit sections of the sophisticated 4275A measurement circuit in accord with programmed procedures and to display the diagnostic test results for each test.

The test program is organized in a total of 19 test routines (sequentially executed) for the automatic test. Nine independent tests can be done selectively from these automatic tests or exclusively by manual operation. The self test program organization is given in Table 8-4.

8-84. Automatic Self Diagnostic Test.

8-85. The automatic self diagnostic test function sequentially performs all test steps and displays the decision results of go/no-go comparisons with the memorized test limits. The test items are divided into two sequential routines which require different UNKNOWN terminal connection configurations (Open and Short tests). These tests are accomplished by pressing the front panel SELF TEST button using the test setup given in Table 8-5. Normal diagnostic results are indicated by a display of OP for open test or of SH for the short test on DISPLAY A. If an abnormal result occurs during an open or short test, the number of the abnormal test step is displayed in DISPLAY A as OP3 or SH24. For detailed instructions of the automatic self test procedure, refer to 4275A Operating Manual Page 3-0.

8-86. Manual Step Selection
of Self Diagnostic Tests.

8-87. The circuit test operating modes which can be independently set by front panel pushbutton operation are used for supplemental accuracy checks of performance testing as well as for facilitating adjustment procedures. Furthermore, display outputs of the

test results offer considerable clues and hints useful in troubleshooting. If the analog measurement section malfunctions, the abnormal measurement outputs which arise from the faulty circuit sometimes obstructs the process of the normal measurement control sequence and, therefore, measurement triggering stops. In such cases, uncontrolled circuits cause some difficulty in attempts at trouble isolation. The self test function relieves service personnel from this kind of blind alley troubleshooting. During the circuit test mode of operation, periodic triggering never stops because of any trouble in the analog measurement section and thus the analog circuits are operated under the regular control signals of test program. This allows checking circuits by means of signal flow tracing using defined control rules. For setting individual test function modes, press SELF TEST button beforehand (to activate SELF TEST function) then press a pushbutton selected from Table 8-6.

Table 8-6. Self Test Step Selection.

| Test step | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|--------------------------|--------------------------|
| Selection button | D | Q | ESR/G | X/B | L/C | Δ | Δ% | RECALL | STORE |
| | <input type="radio"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Note: The number of the selected test step, except for step 9, is displayed in DISPLAY A unit indicator.

8-88. Display outputs for manually selected test steps are the numbers of the measurement results obtained by the test condition. The circuit tested, test circuit operation, meanings of the display outputs for each individual test steps are outlined in the tabulation below.

Note

Test limit values in the table are comparison reference values used in automatic diagnosis. In the automatic test, test step numbers for the abnormal test steps are displayed in DISPLAY A (instead of measurement data).

Note

OSC LEVEL control should be set to its fully cw position for all self test steps.

Table 8-4. Self Test Program Organization.

| Test step | | Item | Test step | | Item |
|----------------------------------|----------------|--|----------------------------------|----------------|--|
| Auto test | Manual test | | Auto test | Manual test | |
| OP 1 ($\leq 100\text{kHz}$) | 1 | A-D converter test (A4 and A5) | OP14 | Auto test only | Bridge balance test on $100\mu\text{S}$ Y range MULTIPLIER x1 setting (A1) |
| OP 2 | 2 | AF4 attenuator test (A5) | OP15 | Auto test only | Bridge balance test on $1000\mu\text{S}$ Y range at MULTIPLIER x1 setting (A1) |
| OP 3 | 3 | AF2 attenuator test (A5) | | | |
| OP 4 | 4 | AM10 attenuator test (A4) | OP16 | Auto test only | Bridge balance test on $1000\mu\text{S}$ Y range at MULTIPLIER x0.1 setting (A1) |
| OP 5 | 5 | AM100 attenuator test (A4) | | | |
| Test step 6 is non-existent | | | OP17 ($\leq 1\text{MHz}$) | Auto test only | Bridge balance test on 10mS Y range at MULTIPLIER x0.01 setting (A1) |
| OP 7 ($\leq 1\text{MHz}$) | 7 | Modulator phase offset test (A2) | | | |
| Manual test only | 8 | CMR amplifier test (A1) | SH21 | Auto test only | Bridge balance test on 100Ω Z range at MULTIPLIER x0.1 setting (A1) |
| Manual test only | 9 | Range control and Z or Y measurement test (all analog boards) | | | |
| OP10 ($\leq 1\text{MHz}$) | Auto test only | 1V test signal level test (A3 and A6) | SH22 ($\leq 100\text{kHz}$) | Auto test only | Bridge balance test on 100Ω Z range at MULTIPLIER x0.01 setting (A1) |
| OP11 ($\leq 1\text{MHz}$) | Auto test only | 0.1V test signal level test (A3) | | | |
| OP12 ($\leq 1\text{MHz}$) | Auto test only | 0.01V test signal level test (A3) | SH23 | Auto test only | Bridge balance test on 100Ω Z range at MULTIPLIER x1 setting (A1) |
| OP13 ($\leq 1\text{MHz}$) | Auto test only | Bridge balance test on $10\mu\text{S}$ Y range at MULTIPLIER x1 setting (A1) | SH24 ($\leq 1\text{MHz}$) | Auto test only | Test signal current test (A4) |
| | | | SH25 ($\leq 1\text{MHz}$) | Auto test only | 100Ω , $1\text{k}\Omega$ and $10\text{k}\Omega$ range resistor check (A1) |

Note: When the test frequency setting is higher than the limit frequency given for the specific test steps, such test steps are omitted from automatic diagnostic test sequence.

Table 8-5. Automatic Self Test Setups.

| Test step | UNKNOWN terminals | DISPLAY A function | OSC LEVEL control |
|--------------------------------|---|--------------------|-------------------|
| Open test (steps 1 to 17) | Open Connect 16047A Test Fixture with nothing as DUT. | C | fully cw |
| Short test (steps 21 to 25) | Short Connect 16047A Test Fixture with a shorting strap. | L or R | fully cw |

Table 8-7. Self Diagnostic Test Instructions.

| Test step 1 | A-D Converter test (A4, A5) | |
|---|---|----------------|
| <p>Test condition: Integrator develops small precharge waveforms for two integrator operating cycles under a no input signal condition (A4 AM Amplifier input is grounded). For the other two integrator operating cycles, a dc -Eref voltage charges the integrator and the +Eref voltage causes it to discharge (integrator input switch A5Q35 is open). Test signal frequency should be below 100kHz to obtain correct DISPLAY A display output.</p> <p>Note: The integrator section (Integrator, Slope Amplifier, Zero Detector, DC Reference Voltage Supply and associated control switches) is operated independent of prior circuit stages (Phase Detector etc.) with respect to DISPLAY B display output. Thus this test positively isolates possible integrator trouble from any other sections.</p> | | |
| Display section | Display meanings | Test limits |
| DISPLAY A | Total operating delay time of the integrator slope amplifier and zero detector. | .00±160 counts |
| DISPLAY B | Difference in absolute values between dc -Eref and +Eref voltages. | .00±160 counts |
| <p>ADJUSTMENT: A5R120 and *A5C70.</p> <p>TROUBLESHOOTING HINTS:</p> <p>If DISPLAY B output is abnormal, check A5 Integrator, Zero Detector, DC Reference Voltage Supply and Decoder/Latch. If only DISPLAY A output is abnormal, check dc offset error of AM Amplifier (A4) and AF Amplifier (A5).</p> | | |

| | |
|--------------|---------------------------|
| Test step 2. | AF 4 Attenuator test (A5) |
| Test step 3. | AF 2 Attenuator test (A5) |

Test condition: UNKNOWN H_{CUR} and H_{POT} terminals must be connected to each other. MULTIPLIER should be set to x1. Edut signal is timely attenuated by AF2 attenuator (or alternately with AF4 attenuator for step 2) and is phase detected to compare the vector voltage ratio of the attenuated signal to the original (non-attenuated) signal by the integrator.

| Display section | Display meanings | Test limits |
|-----------------|--|------------------------------|
| DISPLAY A | Attenuation accuracy of in-phase signal component. | -100000 \pm *160 counts |
| DISPLAY B | Attenuation phase error represented by magnitude of 90 degree out-of-phase signal component. | .00 \pm *160 counts |

Note: *1280 counts for test frequencies above 1MHz.

ADJUSTMENT: A5R11, A5R16, A5R4 and A5C15.

TROUBLESHOOTING HINTS:

If a failure is located in the A6, A3, A4 or A5 circuit boards ahead of the integrator, an abnormal test result may first occur in step 2 and for all subsequent test steps. If step 3 is normal, A5 AF4 attenuator is faulty.

| | |
|-------------|-----------------------------|
| Test step 4 | AM10 Attenuator test (A4). |
| Test step 5 | AM100 Attenuator test (A4). |

Test condition: UNKNOWN H_{CUR} and H_{POT} terminals must be connected to each other. MULTIPLIER should be set to x0.1 for step 4 and to x0.01 for step 5. Edut signal is timely attenuated by A4A3 AM attenuator (or alternately with A4A4 AM attenuator for step 5) and is phase detected to compare the vector voltage ratio of the attenuated signal with the original (non-attenuated) signal by the integrator.

| Display section | Display meanings | Test limits |
|-----------------|--|------------------------------|
| DISPLAY A | Attenuation accuracy of in-phase signal component. | -100000 \pm *160 counts |
| DISPLAY B | Attenuation phase error represented by magnitude of 90 degree out-of-phase signal component. | .00 \pm *160 counts |

Note: *1280 counts for test frequencies above 1MHz.

ADJUSTMENT: A4A3R10 and A4A4R2.

TROUBLESHOOTING HINTS:

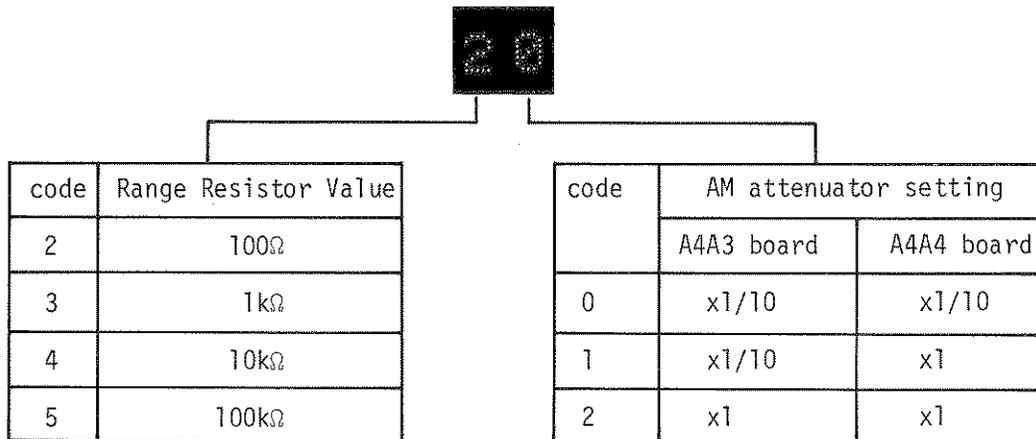
The attenuation and phase errors indicated on displays are cumulative values which represent both AM and AF attenuators.

| Test step 7 | | Modulator phase offset test (A2) | |
|---|--|----------------------------------|-----------------|
| <p>Test condition: UNKNOWN terminals must be so connected as to constitute an open measurement condition (attach 16047A test fixture with nothing connected as DUT). Test frequency should be below 1MHz.</p> <p>Measurement is taken to detect the bridge balance error which arises from phase detector residual offset voltage in the Modulator. To maximize the offset voltage effects on the displays (to facilitate detection), null detector amplification gain is set to minimum. Range resistor value is automatically set to 100Ω</p> | | | |
| Display section | Display meanings | | Test limits |
| DISPLAY A | Bridge balance error for in-phase (real) vector signal component. | | .00±1280 counts |
| DISPLAY B | Bridge balance error for 90 degree out-of-phase (imaginary) vector signal component. | | .00±1280 counts |
| <p>ADJUSTMENT: A2R13 and R14.</p> <p>TROUBLESHOOTING HINTS.</p> <p>If display outputs are quite different from normal values, bridge circuit is not being balanced. A1, A2 or A3 board is faulty.</p> | | | |

| Test step 8 | | CMR Amplifier test (A1) | |
|---|---|-------------------------|--|
| <p>Test condition: UNKNOWN H_{CUR} and H_{POT} terminals are connected to each other (no connection to L_{CUR} and L_{POT} terminals). Test frequency should be below 100kHz. Err signal is fed to CMR Amplifier input through 100Ω range resistor from A2 Modulator. Because DUT current is zero, the Err signal detected by A4 Process Amplifier must also be zero. If CMR amplifier gain is appropriate, the amplifier output transformer current completely offsets the Err signal current to zero. This test measures the Err voltage detected by the Process Amplifier to determine CMR amplifier gain error.</p> | | | |
| Display section | Display meanings | | Test limits |
| DISPLAY A | Err signal offset error which arises from CMR amplifier gain misadjustment. | | (.00±10 counts at well adjusted condition) |
| <p>ADJUSTMENT: A1R3</p> <p>TROUBLESHOOTING HINTS:</p> <p>If test step 7 is passed with a normal result, A1 CMR Amplifier is faulty.</p> | | | |

Test step 9 Range control and Z or Y measurement test.

This self test mode enables selecting the desired range resistor value and AM attenuator setting by pressing LCRZ RANGE UP and DOWN keys. DISPLAY B unit indicator provides a display of 2 digit numeric codes which indicate the selected range resistor and AM attenuator settings as shown below:



When 100Ω range resistor value is selected, DISPLAY A and B provide display outputs for resistance and reactance values, respectively, of the measurement result taken under the test condition. When a 1kΩ (or greater) range resistor value is selected, conductance and susceptance measurement values are displayed. This test helps troubleshoot the bridge circuit and process amplifier sections.

Test step 10 1V test signal level test (A3 and A6)

Test step 11 0.1V test signal level test (A3)

Test step 12 0.01V test signal level test (A3)

Test condition: UNKNOWN terminals must be so connected as to constitute an open measurement condition (attach 16047A test fixture with nothing connected as DUT). Test frequency should be below 1MHz. Test signal voltage is measured for each MULTIPLIER setting (x1, x0.1 and x0.01).

| Display section | Display meanings | Test limits |
|-----------------|--|-------------------------|
| DISPLAY B | OP10, OP11 or OP12 figure appears when the test signal level is too high or too low. | 1V (0.1V or 0.01V) ±20% |

ADJUSTMENT: A3R1 and A3R9

TROUBLESHOOTING HINTS:

A3, A4 or A6 board is faulty. If abnormal test results occur only on test steps 10, 11, 12 and 24 (all), Eosc3 input channel of A4 board is faulty.

| | |
|--------------|---|
| Test step 13 | 10μS bridge balance test (MULTIPLIER: x1) |
| Test step 14 | 100μS bridge balance test (MULTIPLIER: x1) |
| Test step 15 | 1000μS bridge balance test (MULTIPLIER: x1) |
| Test step 16 | 1000μS bridge balance test (MULTIPLIER: x0.1) |
| Test step 17 | 10mS bridge balance test (MULTIPLIER: x0.01) |

Test condition: UNKNOWN terminals must be so connected as to constitute an open measurement condition (attach 16047A test fixture with nothing connected as DUT) Test steps 13 and 17 should be done at a test frequency below 1MHz. Admittance measurements (G-B) are taken for ascertaining bridge balance condition at a given range and MULTIPLIER control setting.

| Display section | Display meanings | Step | Test limits |
|-----------------|---|------|-------------------------|
| DISPLAY B | One or more of OP13 through OP17 annunciators appear when an abnormal bridge balance error is detected. | 13 | .00±(160+200πf)* counts |
| | | 14 | .00±(160+20πf)* counts |
| | | 15 | .00±(160+2πf)* counts |
| | | 16 | .00±(160+2πf)* counts |
| | | 17 | .00±1280 counts |

*f: Test frequency in kHz.

TROUBLESHOOTING HINTS:

If abnormal test result occurs at a specific test step in steps 13 through 17, a range resistor is open (OS) or shorted (0Ω). Otherwise, a range resistor selection relay is not properly operating. The range resistors associated with the individual test steps are listed below:

| Test step | Range resistor | MULTIPLIER setting |
|-----------|----------------|--------------------|
| 13 | 100kΩ | x1 |
| 14 | 100kΩ | x1 |
| 15 | 10kΩ | x1 |
| 16 | 10kΩ | x0.1 |
| 17 | 1kΩ | x0.01 |

If abnormality occurs only on step 16 and/or 17, a defective MULTIPLIER function control (TLL or TLH) switch in the A1 or A3 board is the probable cause of trouble.

| | |
|--------------|--|
| Test step 21 | 100Ω bridge balance test (MULTIPLIER: x0.1) |
| Test step 22 | 100Ω bridge balance test (MULTIPLIER: x0.01) |
| Test step 23 | 100Ω bridge balance test (MULTIPLIER: x1) |

Test condition: UNKNOWN terminals must be so connected as to constitute a short circuit condition (attach 16047A test fixture with a shorting strap). Test step 22 should be done at a test frequency below 100kHz. Impedance measurements (R-X) are taken for ascertaining bridge balance condition at a given range and MULTIPLIER control setting.

| Display section | Display meanings | Step | Test limits |
|-----------------|--|------|------------------------|
| DISPLAY B | SH21, SH22 or SH23 figure appears when an abnormal bridge balance error is detected. | 21 | .00±(160+20πf)* counts |
| | | 22 | .00±1280 counts |
| | | 23 | .00±(160+20πf)* counts |

*f: test frequency in kHz.

TROUBLESHOOTING HINTS:

If abnormal test result occurs on all of these test steps, the 100Ω range resistor is open (OS) or shorted (OΩ). Otherwise, the associated range resistor selection relay is not properly operating. If the abnormality occurs on specific test step(s), a defective MULTIPLIER function control (TLL or TLH) switch in the A1 or A3 board is the probable cause of trouble.

| | |
|--------------|-----------------------------------|
| Test step 24 | Test signal current test (A3, A4) |
|--------------|-----------------------------------|

Test condition: UNKNOWN terminals must be so connected as to constitute a short circuit condition (attach 16047A test fixture with a shorting strap). Test frequency should be below 1MHz. Test signal current across the short circuited UNKNOWN terminals for MULTIPLIER setting of x1 is measured.

| Display section | Display meanings | Test limits |
|-----------------|--|-------------|
| DISPLAY B | SH24 figure appears when test signal current detected is abnormally low or high. | 10±2mA |

TROUBLESHOOTING HINTS:

If abnormal test result only occurs on this test step, source resistor on A3 board is defective.

| Test step 25 | 100Ω, 1kΩ and 10kΩ range resistor test | |
|---|--|--|
| <p>Test condition: UNKNOWN terminals must be so connected as to constitute a short circuit condition (attach 16047A test fixture with a shorting strap). Test frequency should be below 1MHz.</p> | | |
| <p>This test compares the Err signal voltages detected for a range resistance of 100Ω and for the parallel synthetic resistance of 100Ω, 1kΩ and 10kΩ range resistors. This comparison test helps check range resistor selection relay operations and to find a range resistor which may be open.</p> | | |
| Display section | Display meanings | Test limits |
| DISPLAY B | SH25 figure appears when the parallel synthetic resistance is too high in comparison with the 100Ω range resistor. | Parallel synthetic resistance value must be less than 90.75% of 100Ω range resistor. |
| <p>TROUBLESHOOTING HINTS:</p> <p>The 100Ω, 1kΩ and 10kΩ range resistors should be checked for change from their nominal values.</p> | | |

8-89. Disassembly of A10 (Display and Key) Board.

To replace the parts mounted on A10 board assembly, the front panel has to be removed from the front frame of the 4275A. The procedure is as follows:

1. Carefully remove trim strip from top of front frame (without bending trim strip).
2. Remove the three screws from top of front frame.
3. Remove the two foot assemblies and three screws from bottom of front frame.
4. Press front panel assembly forward (from inside) without adding strong stress to the cable assemblies which are connected between front panel and main body.
5. Remove the nine (9) screws from A10 board assembly and the now accessible associated parts around the front panel and the A10 board assembly.

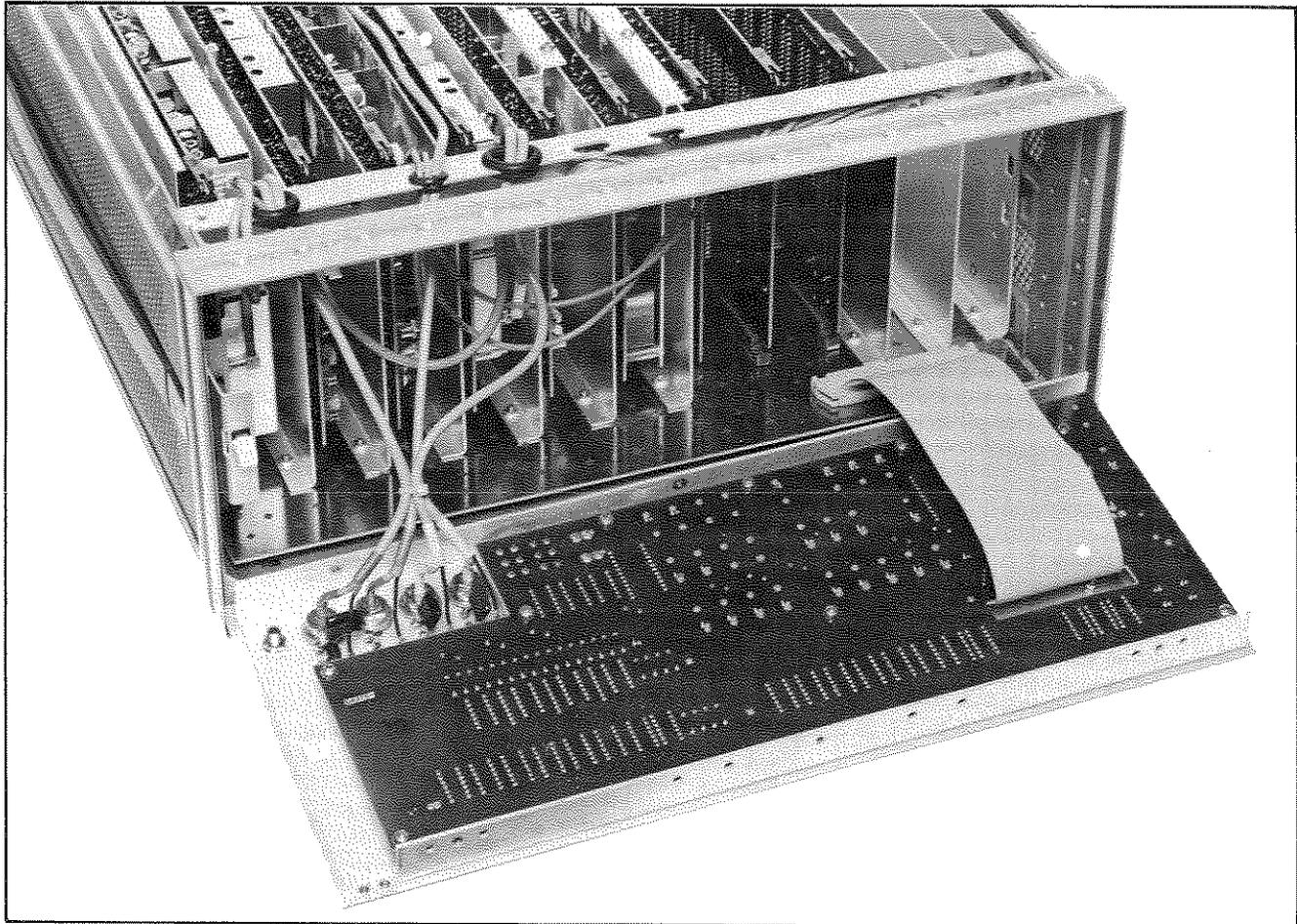


Figure 8-26. A10 Display and Key Board Disassembly.

8-90. PRODUCT SAFETY CHECKS.

WARNING

WHENEVER IT APPEARS LIKELY THAT SAFETY PROTECTIVE PROVISIONS HAVE BEEN IMPAIRED, THE APPARATUS SHALL BE MADE INOPERATIVE AND BE SECURED AGAINST ANY UNINTENDED OPERATION. THE PROTECTION IS LIKELY TO BE COMPROMISED IF, FOR EXAMPLE:

- THE APPARATUS SHOWS VISIBLE DAMAGE.
- THE INSTRUMENT FAILS TO PERFORM THE INTENDED MEASUREMENT.
- THE UNIT HAS UNDERGONE PROLONGED STORAGE UNDER UNFAVORABLE CONDITIONS.
- THE INSTRUMENT HAS SUFFERED SEVERE TRANSPORT STRESS.

8-91. The following five checks are recommended to verify the product safety of the 4275A LCR Meter (these checks may also be done to check for product safety after troubleshooting and repair). When such checks are needed, perform the following:

1. Visually inspect interior of instrument for any signs of abnormal internally generated heat such as discolored printed circuit boards or components, damaged insulation, or evidence of arcing. Determine and remedy cause of any such condition.
2. Using a suitable ohmmeter, check resistance from instrument enclosure to ground pin on power cord plug. The reading must be less than 0.5 ohm. Flex the power cord while making this measurement to determine whether intermittent discontinuities exist.
3. Check GUARD terminal on front panel using procedure (2).

4. Disconnect instrument from power source. Turn power switch to on. Check resistance from instrument enclosure to line and neutral (tied together). The minimum acceptable resistance is two megohms. Replace any component which fails or causes a failure.
5. Check line fuse to verify that a correctly rated fuse is installed.

Digital Section Troubleshooting Using Signature Analyzer.

The advantage of troubleshooting based on "Signature Analysis" is accuracy and ease in finding failures. It is generally difficult to search for an error by means of observing waveforms on an oscilloscope for the reason that bit trains in a digital circuit seem to be much the same whichever is observed. Specifically, to find the errors in a stream of large bit size (or word length) data takes much time and requires the use of an instrument such as a logic state analyzer. Hewlett-Packard has proposed a method called "Signature Analysis" which recognizes the bit pattern measured in a 4 digit hexa-decimal code (signature) for running an easy diagnostic test program. With the Signature Analyzer (HP 5004A), the signatures are displayed in a readable 4 digit-figure set of alphanumeric figures (0 1 2 3 4 5 6 7 8 9 A C F H P U). The signature analysis is based the usual signal tracing method followed in troubleshooting an analog circuit. According to signature analysis, devices in a digital circuit are checked with the signal analyzer by comparing signal input and output signatures to and from each device for the "correct" signature denoted in the service manual signature map. If a signature is not identical, the troubleshooter need only trace the bit train in opposite direction to the signal flow and, when a device is noted which generates an erratic signature despite a correct input, the component may be regarded as faulty.

Signature Analysis for the 4275A.

For doing signature analysis, a DSA (Data Stream Analysis) switch is provided on the A9 (MPU) board of the 4275A. No additional test board is required. There are twenty-one (21) kinds of DSA for performing signature troubleshootings and they are identified by the abbreviated names of DSA-1 thru DSA-21. These names are denoted around the signature pattern in the respective schematic and troubleshooting trees for setting the signature analyzer and the 4275A for appropriate control settings, window setting, DSA switch position of A9 board and other necessary conditions of the 4275A.

SIGNATURE ANALYZER TECHNIQUE.

An active digital hand-held logic tracer coupled with an active pod (with four miniature clip connection leads) is sufficient for detecting the test signal and for development of the signature on the Signature Analyzer display. The active probe has access to the desired node in the circuit being tested and transfers this input data to the analyzer. The four input leads of the test cable active pod connect the gate signals --- START, STOP and CLOCK --- from the instrument being tested to the analyzer. The remaining lead is connected to instrument GND. The START signal is an open "window" (measurement gate) signal which causes the signature analyzer to prepare for receiving data via the active probe. The STOP signal causes the window to close. The CLOCK is taken from the time base of the instrument and permits receiving input data and gate signals in synchronization. Polarity of the gate signal active (enable) edges (positive or negative) can be selected by the front panel controls of the signature analyzer. Probing points and connection locations of START, STOP and CLOCK leads are designated on the troubleshooting flow diagrams.

Figure 8-27. Signature Analysis Guide (Sheet 1 of 2).

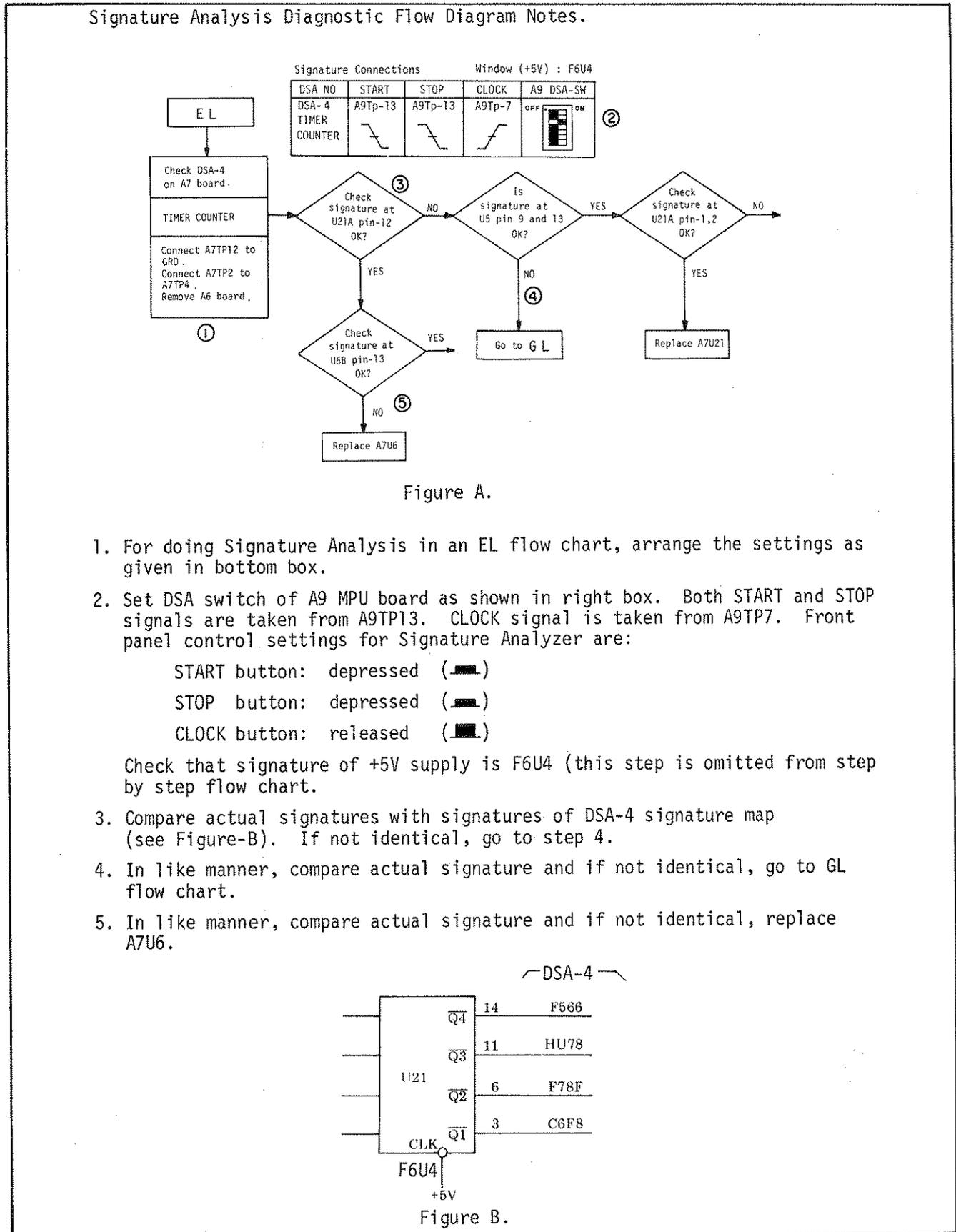
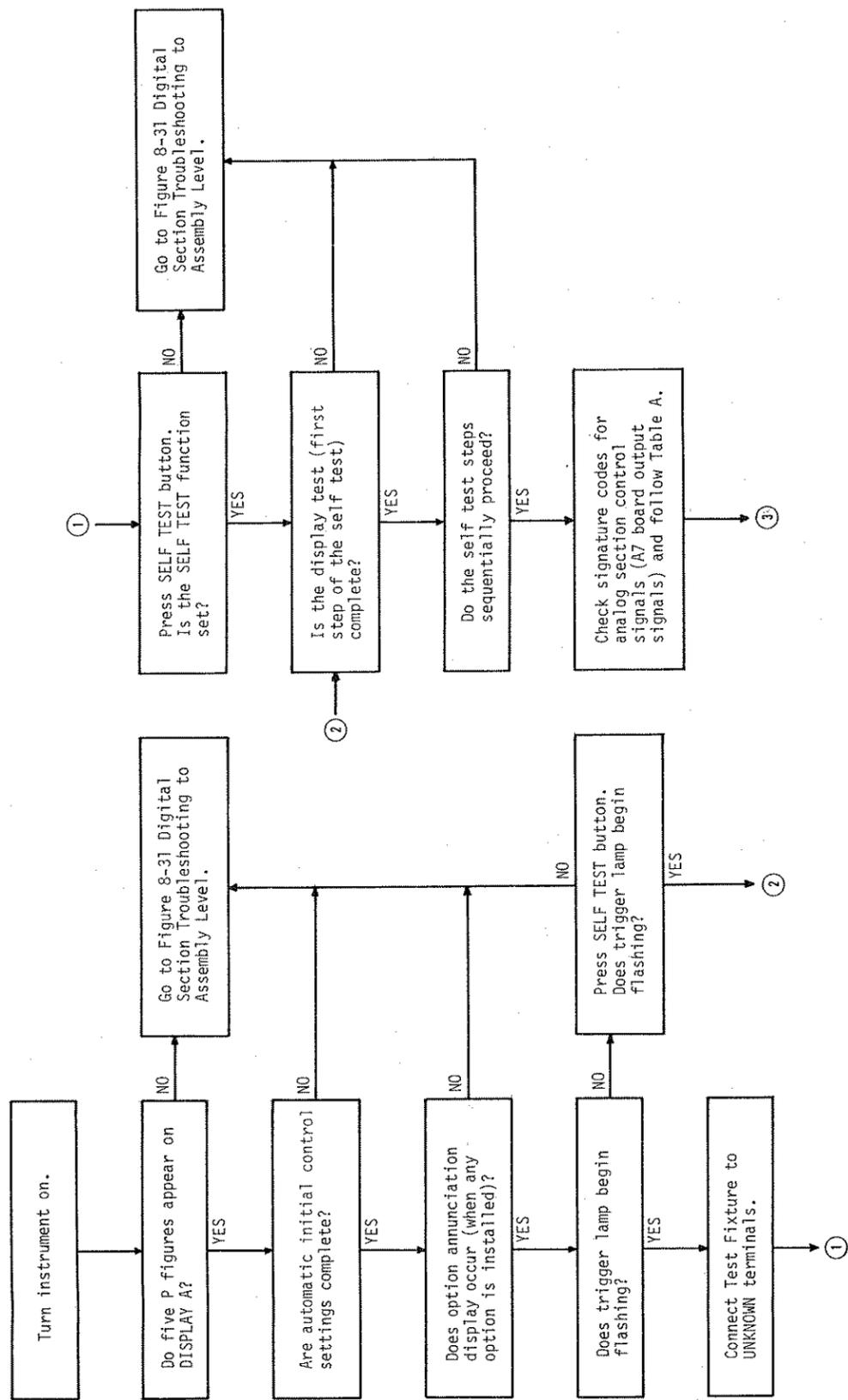


Figure 8-27. Signature Analysis Guide (Sheet 2 of 2).

Table 8-8. Front Panel Troubleshooting Guide.

| Symptom | Probable faulty board |
|--|-----------------------|
| Measured value is incorrect at a particular range setting. | A1, A4 |
| Measurement is not made correctly at particular MULTIPLIER setting(s). | A2, A3 |
| Measurement is not made correctly at particular test frequency setting(s). | A6 |
| Measurement is not made correctly only at 10kHz test frequency. | A1, A7 |
| Measured value is 1/100, 1/10, 10, or 100 times the normal value. | A4 |
| OF annunciation display occurs on all ranges. | A1, A2, A3 |
| Trigger lamp does not light or stays lit but begins flashing when SELF TEST function is set. | A5, A6 |
| Figure(s) in numeric (or alphanumeric) display is (are) defective. | A8, A9 |
| An indicator lamp does not light or stays lit. | A8, A10 |
| SELF TEST function can not be activated (triggering stops). | A7, A9 |
| Pushbutton controls do not work (always invalid). | A8, A7 |
| All numeric displays or all except one digit are blank. | A9, A10 |
| Autorange control malfunctions. | A7 |



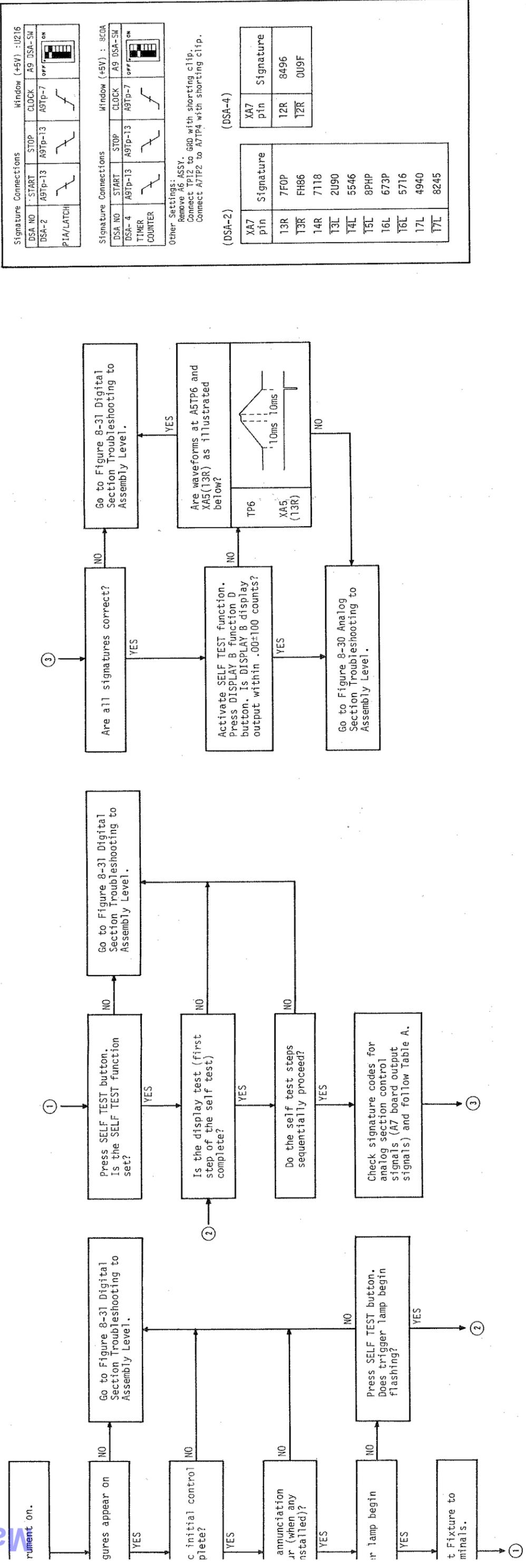


Table A. Signature Test Codes.

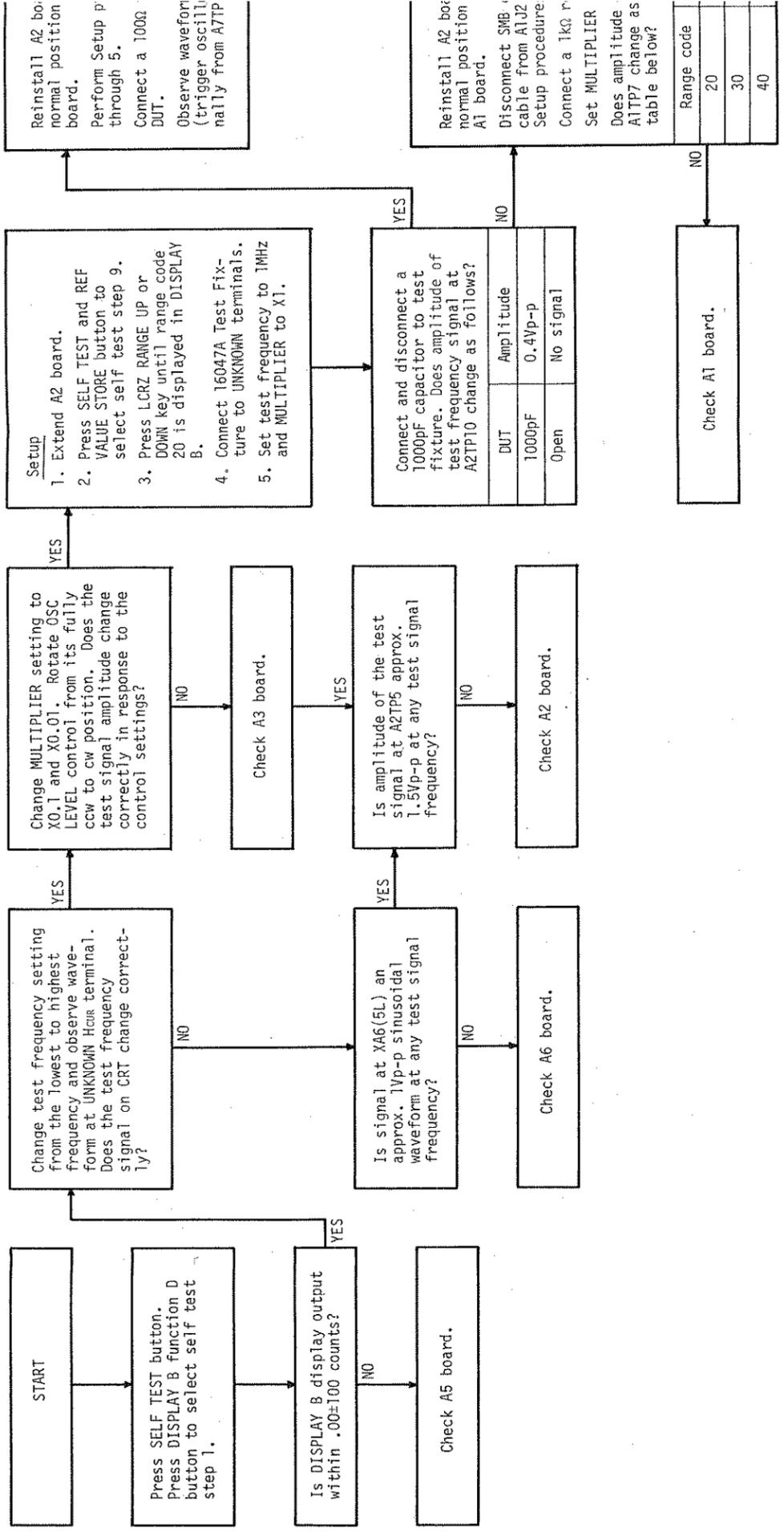
| Signature Connections Window (+5V) :U216 | | | |
|--|---------|---------|--------|
| DSA NO | START | STOP | CLOCK |
| DSA-2 | A9Tp-13 | A9Tp-13 | A9Tp-7 |
| PIA/LATCH | | | |

| Signature Connections Window (+5V) : 3CDA | | | |
|---|---------|---------|--------|
| DSA NO | START | STOP | CLOCK |
| DSA-4 | A9Tp-13 | A9Tp-13 | A9Tp-7 |
| TIMER COUNTER | | | |

Other Settings:
 Remove A6 ASSY.
 Connect TP12 to GND with shorting clip.
 Connect A7TP2 to A7TP4 with shorting clip.

| (DSA-2) | | (DSA-4) | |
|---------|-----------|---------|-----------|
| XA7 pin | Signature | XA7 pin | Signature |
| 13R | 7F0P | 12R | 8496 |
| 13R | FH86 | 12R | 0U9F |
| 14R | 7118 | | |
| 13L | 2U90 | | |
| 14L | 5546 | | |
| 15L | 8PHP | | |
| 16L | 673P | | |
| 16L | 5716 | | |
| 17L | 4940 | | |
| 17L | 8245 | | |

Figure 8-29. Analog and Digital Section Isolation Procedure. 8-45



* Satuu

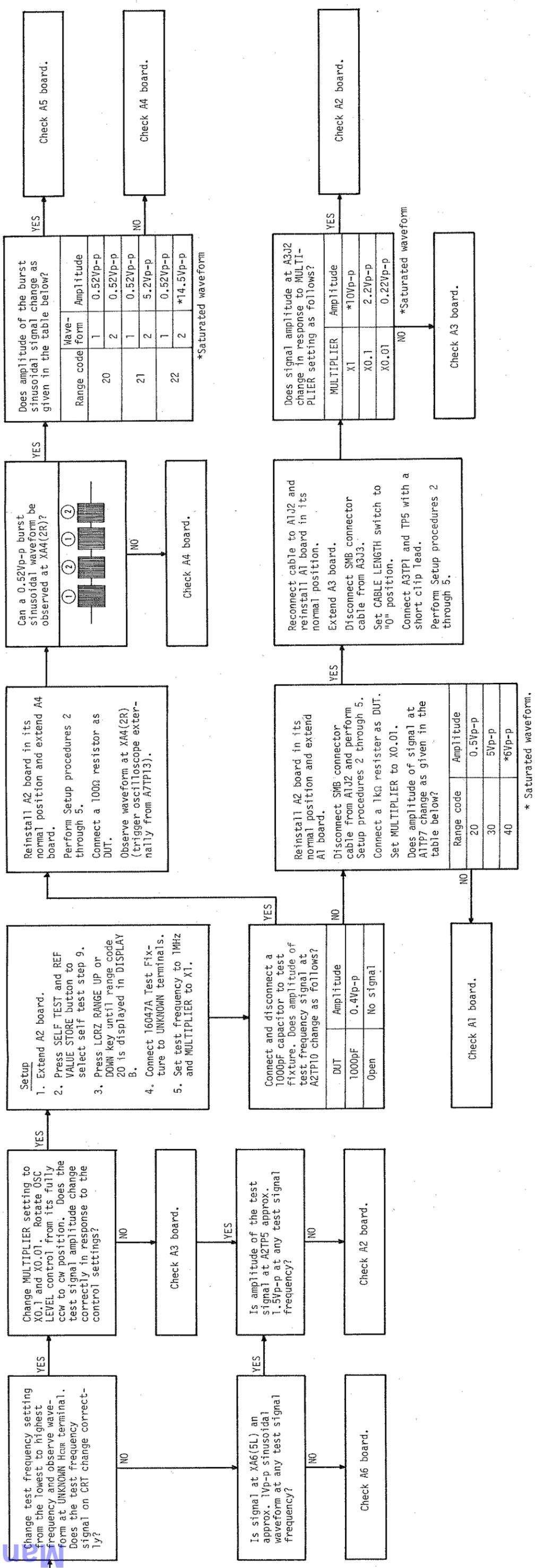
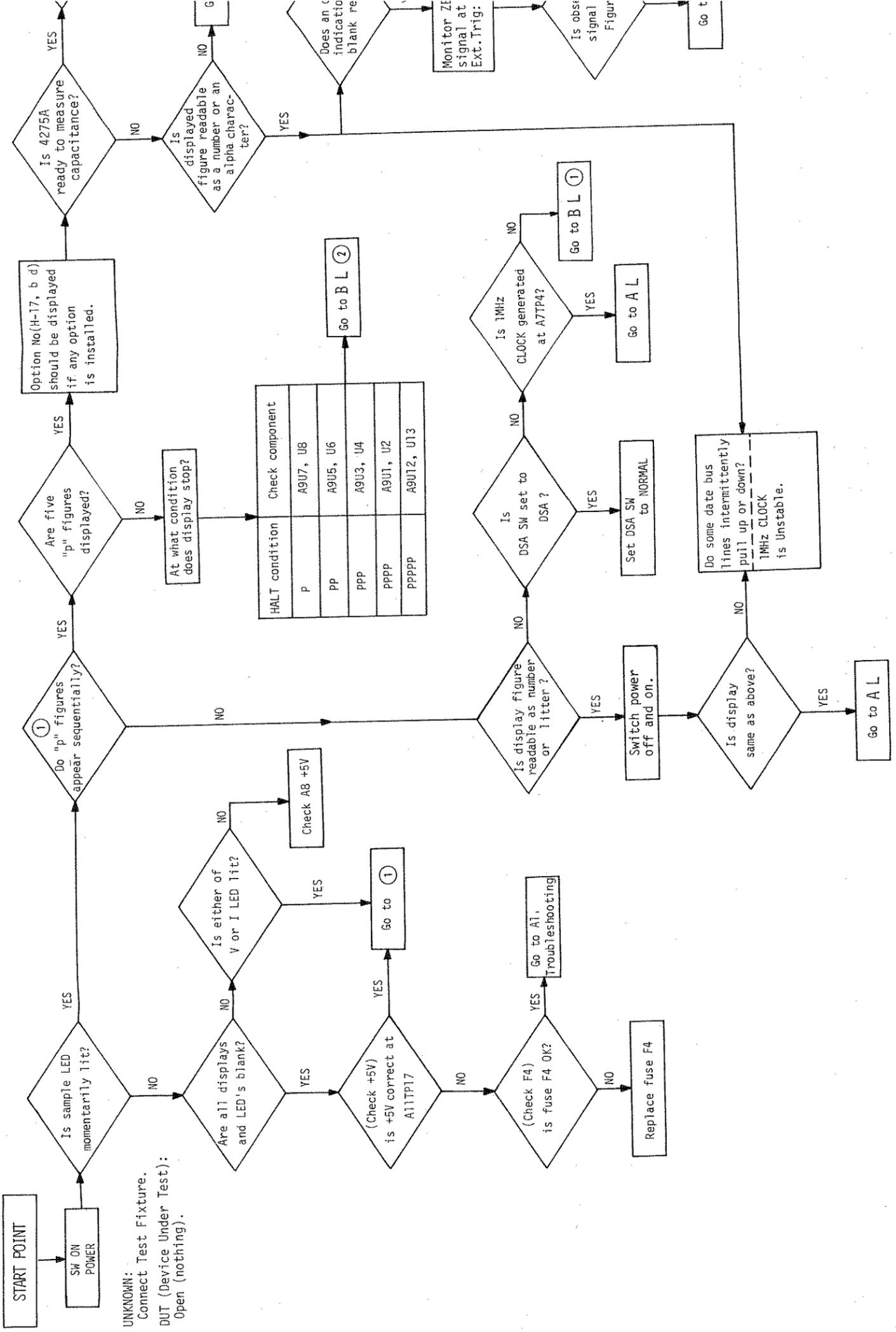


Figure 8-30. Analog Section Troubleshooting to Assembly Level.



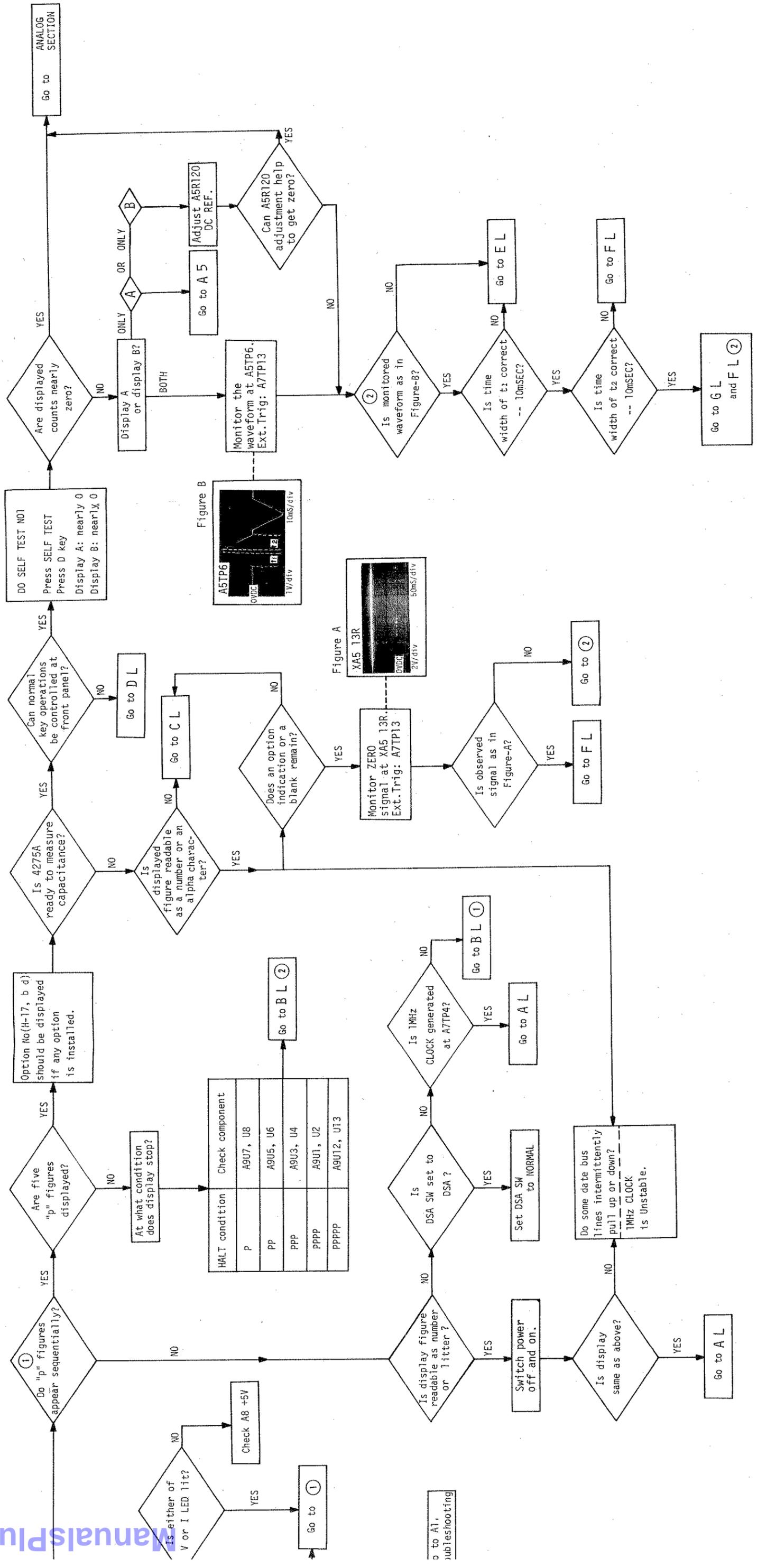


Figure 8-31. Digital Section Troubleshooting to Assembly Level.

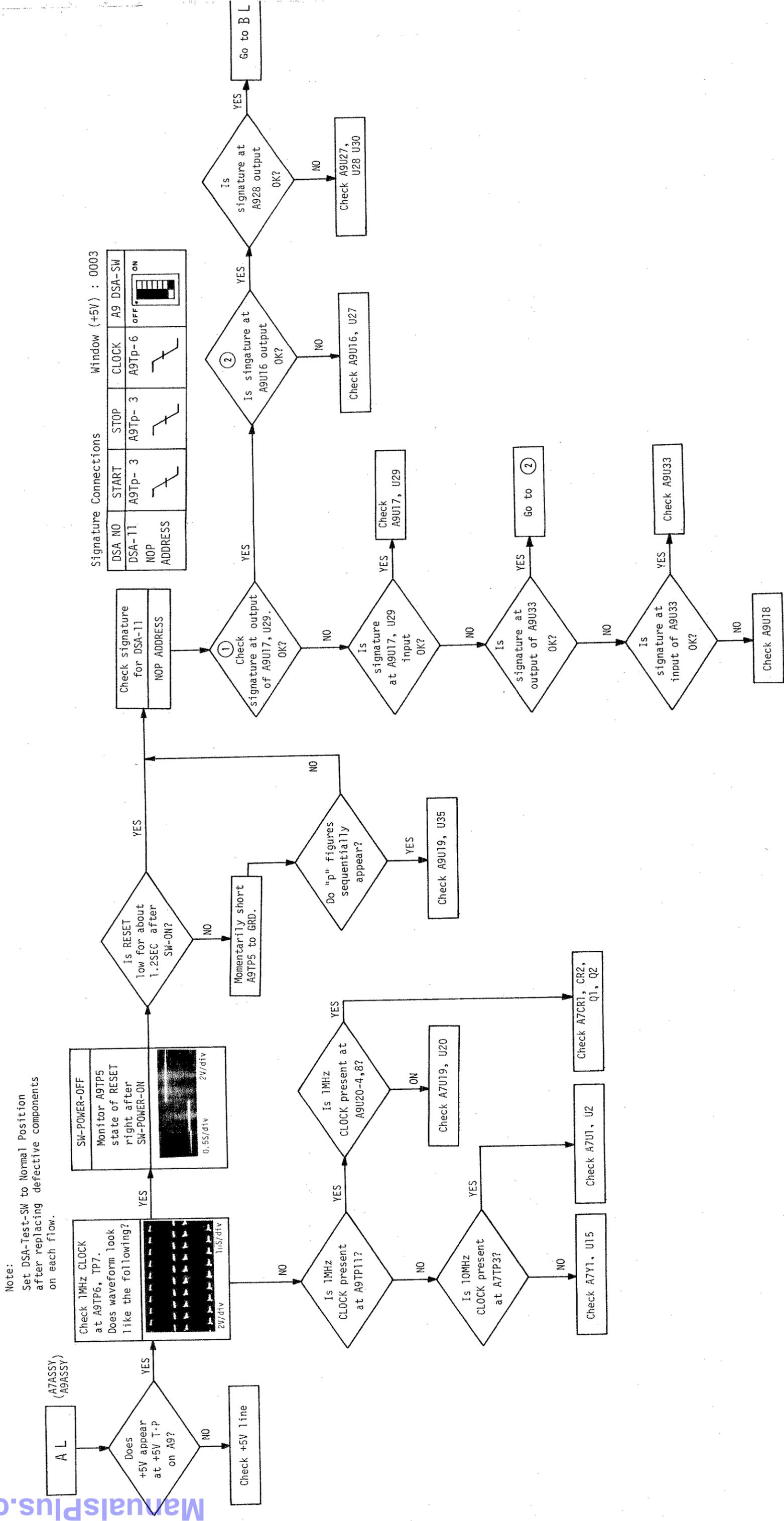
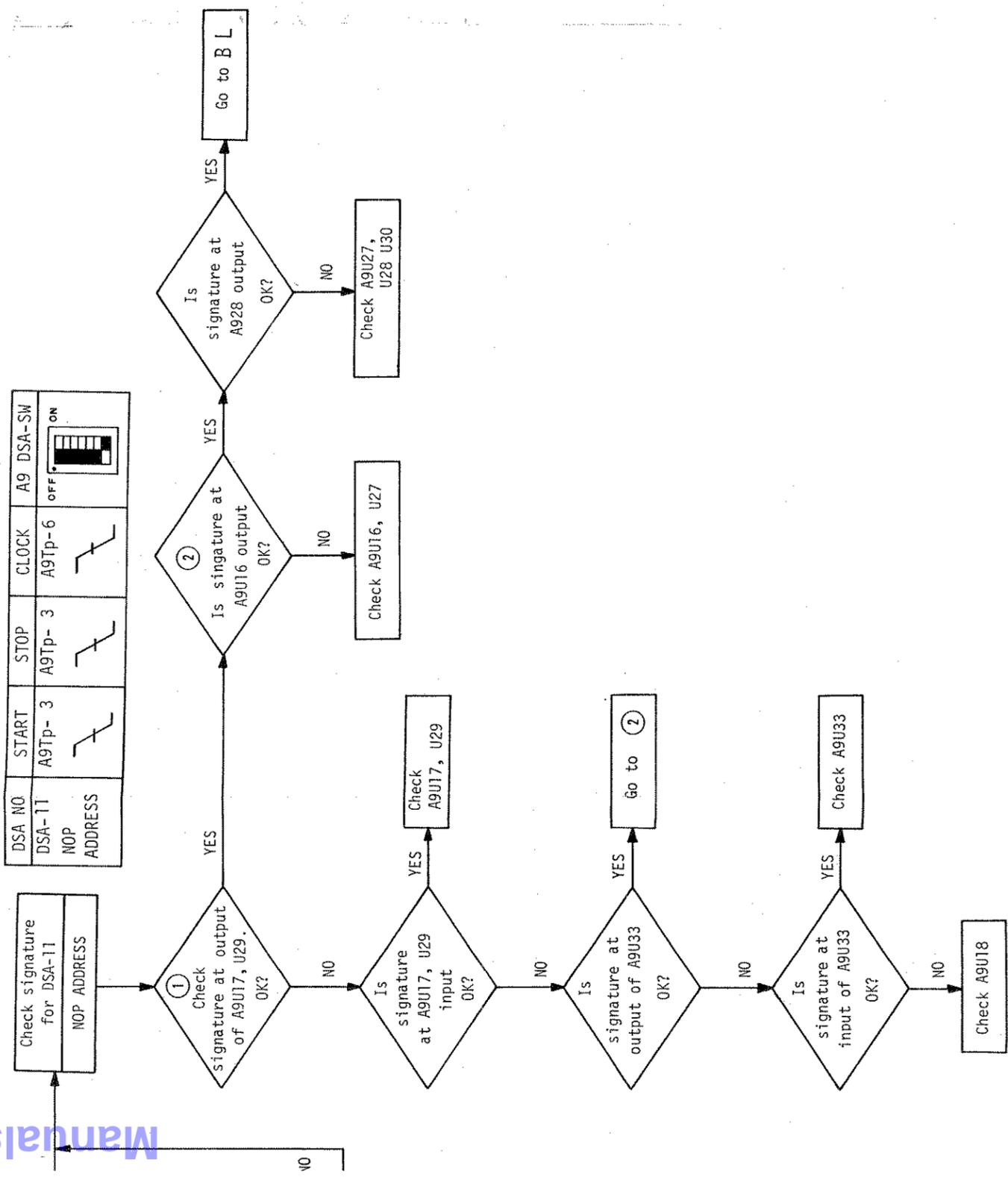


Figure 8-32. Digital Section Troubleshooting Flow Diagram AL.

Signature Connections Window (+5V) : 0003

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|-------------|--------|--------|--------|-----------|
| DSA-11 | A9Tp-3 | A9Tp-3 | A9Tp-6 | OFF |
| NOP ADDRESS | | | | ON |



This table can be used to check signatures at A9U1 thru A9U10 ROM's. Signature test point is established at input of Data Buffer (pins 8 thru 6 of A9U31 and A9U32) instead of the respective ROM outputs (A9U1 thru A9U10). This signature list can be used for units with its serial number suffixes of -00266 and above.

For other instruments whose serial number suffixes are earlier than 00266, check that unstable signature display appears or that output states of these ROM's pull up and pull down. If you find above states active in earlier instruments, the program contents in these ROM may be alive.

| TEST PIN NO | DSA NAME | | DSA-12 | DSA-14 | DSA-15 | DSA-16 | DSA-17 | DSA-13 |
|-------------|-------------|------------|--------|--------|--------|--------|--------|--------|
| | SIGNAL NAME | TEST POINT | | | | | | |
| WINDOW(+5V) | | ROM | A9U1 | A9U1 | A9U3 | A9U5 | A9U7 | A9U10 |
| | | TEST NO. | | | | | | |
| | | POINT | | | | | | |
| DB0 | U1 pin-24 | | 755U | P254 | P254 | P254 | P254 | 826P |
| DB1 | U31 pin-3 | | 8081 | 42P2 | 7994 | 264C | 0H5H | UUPA |
| DB2 | pin-4 | | 60A9 | 9949 | 307F | 08CA | U02C | HAUH |
| DB3 | pin-5 | | 11C6 | 8UH8 | HPF4 | 9FBF | 8102 | A63F |
| DB4 | pin-6 | | P54P | P909 | 379A | CP1U | 741F | 3094 |
| DB5 | U32 pin-3 | | C375 | 8FU9 | 2U43 | 5H23 | A2H2 | 565C |
| DB6 | pin-4 | | 615C | F854 | 5410 | U899 | 2UHU | 501H |
| DB7 | pin-5 | | P3CU | 6PF8 | 69HH | 89PP | 3265 | 39A1 |
| | pin-6 | | AU0H | 052P | 0P76 | FP5F | 52AC | F454 |

Troubleshooting Flow Diagram AL.

Signature Connections for DSA-1 and DSA-12 thru DSA-21.

Signature Connections Window (+5V) : P254

| | | | | |
|--------------|---------|---------|--------|-----------|
| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
| DSA-1 | A9Tp-13 | A9Tp-13 | A9Tp-7 | OFF ON |
| RAM DATA BUS | | | | |

Signature Connections Window (+5V) : 755U

| | | | | |
|-------------|----------|---------|--------|-----------|
| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
| DSA-12 | A9U27-11 | A9U16-5 | A9Tp-6 | OFF ON |
| NOP (U1~U8) | | | | |

Signature Connections Window (+5V) : 826P

| | | | | |
|-----------|----------|----------|--------|-----------|
| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
| DSA-13 | A9 U22-9 | A9U10-20 | A9Tp-6 | OFF ON |
| NOP (U10) | | | | |

Signature Connections Window (+5V) : P254

| | | | | |
|------------|---------|---------|--------|-----------|
| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
| DSA-14 | A9U16-9 | A9U16-7 | A9Tp-6 | OFF ON |
| NOP (U1,2) | | | | |

Signature Connections Window (+5V) : P254

| | | | | |
|------------|-----------|----------|--------|-----------|
| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
| DSA-15 | A9 U16-11 | A9U16-10 | A9Tp-6 | OFF ON |
| NOP (U3,4) | | | | |

Signature Connections Window (+5V) : P254

| | | | | |
|------------|----------|----------|--------|-----------|
| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
| DSA-16 | A9U16-13 | A9U16-12 | A9Tp-6 | OFF ON |
| NOP (U5,6) | | | | |

Signature Connections Window (+5V) : P254

| | | | | |
|------------|----------|----------|--------|-----------|
| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
| DSA-17 | A9U16-15 | A9U16-14 | A9Tp-6 | OFF ON |
| NOP (U7,8) | | | | |

Signature Connections Window (+5V) : 826P

| | | | | |
|----------|----------|----------|--------|-----------|
| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
| DSA-18 | A9 U16-9 | A9 U16-7 | A9Tp-6 | OFF ON |
| NOP (U1) | | | | |

Signature Connections Window (+5V) : 826P

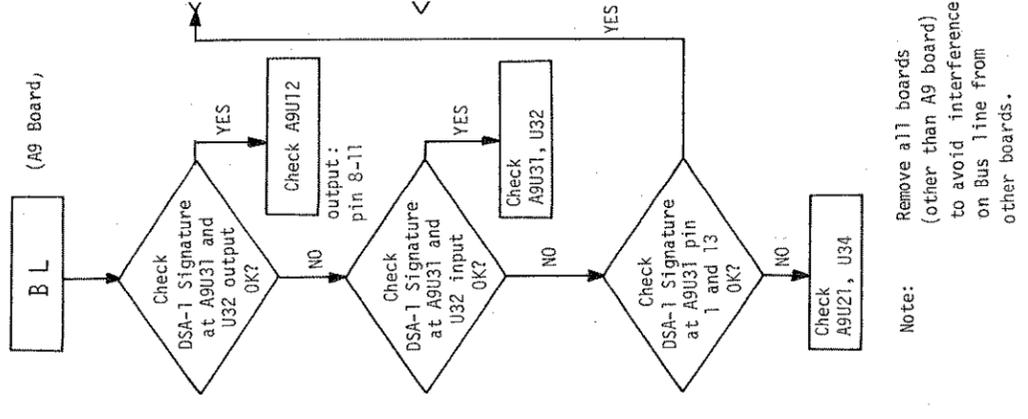
| | | | | |
|----------|-----------|----------|--------|-----------|
| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
| DSA-19 | A9 U16-11 | A9U16-10 | A9Tp-6 | OFF ON |
| NOP (U3) | | | | |

Signature Connections Window (+5V) : 826P

| | | | | |
|----------|----------|----------|--------|-----------|
| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
| DSA-20 | A9U16-13 | A9U16-12 | A9Tp-6 | OFF ON |
| NOP (U5) | | | | |

Signature Connections Window (+5V) : 826P

| | | | | |
|----------|----------|----------|--------|-----------|
| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
| DSA-21 | A9U16-15 | A9U16-14 | A9Tp-6 | OFF ON |
| NOP (U7) | | | | |



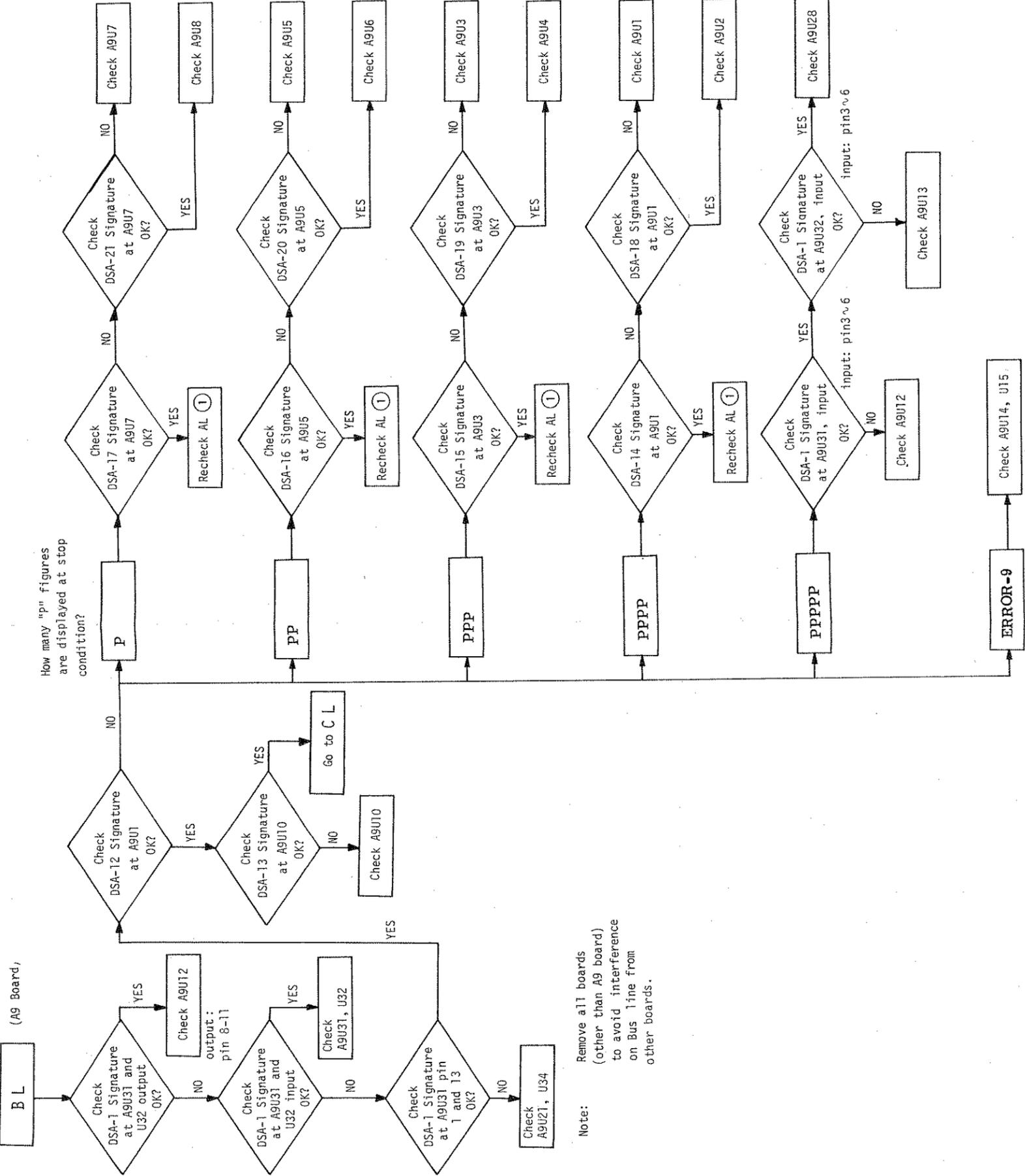


Figure 8-33. Digital Section Troubleshooting Flow Diagram BL-8-51

Signature Connections Window (+5V) : P254

| | | | | |
|------------|----------|----------|--------|-----------|
| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
| DSA-17 | A9U16-15 | A9U16-14 | A9Tp-6 | OFF |
| NOP (U7,8) | | | | ON |

Signature Connections Window (+5V) : 826P

| | | | | |
|----------|---------|---------|--------|-----------|
| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
| DSA-18 | A9U16-9 | A9U16-7 | A9Tp-6 | OFF |
| NOP (U1) | | | | ON |

Signature Connections Window (+5V) : 826P

| | | | | |
|----------|----------|----------|--------|-----------|
| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
| DSA-19 | A9U16-11 | A9U16-10 | A9Tp-6 | OFF |
| NOP (U3) | | | | ON |

Signature Connections Window (+5V) : 826P

| | | | | |
|----------|----------|----------|--------|-----------|
| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
| DSA-20 | A9U16-13 | A9U16-12 | A9Tp-6 | OFF |
| NOP (U5) | | | | ON |

Signature Connections Window (+5V) : 826P

| | | | | |
|----------|----------|----------|--------|-----------|
| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
| DSA-21 | A9U16-15 | A9U16-14 | A9Tp-6 | OFF |
| NOP (U7) | | | | ON |

Signature Connections Window (+5V) : APC4

| | | | |
|----------|--------|-------|-----------|
| START | STOP | CLOCK | A9 DSA-SW |
| A9U16-13 | A9Tp-7 | | OFF |
| | | | ON |

Signature Connections Window (+5V) : 755U

| | | | |
|----------|---------|--------|-----------|
| START | STOP | CLOCK | A9 DSA-SW |
| A9U16-11 | A9U16-5 | A9Tp-6 | OFF |
| | | | ON |

Signature Connections Window (+5V) : 826P

| | | | |
|-------|----------|--------|-----------|
| START | STOP | CLOCK | A9 DSA-SW |
| U22-9 | A9U10-20 | A9Tp-6 | OFF |
| | | | ON |

Signature Connections Window (+5V) : P254

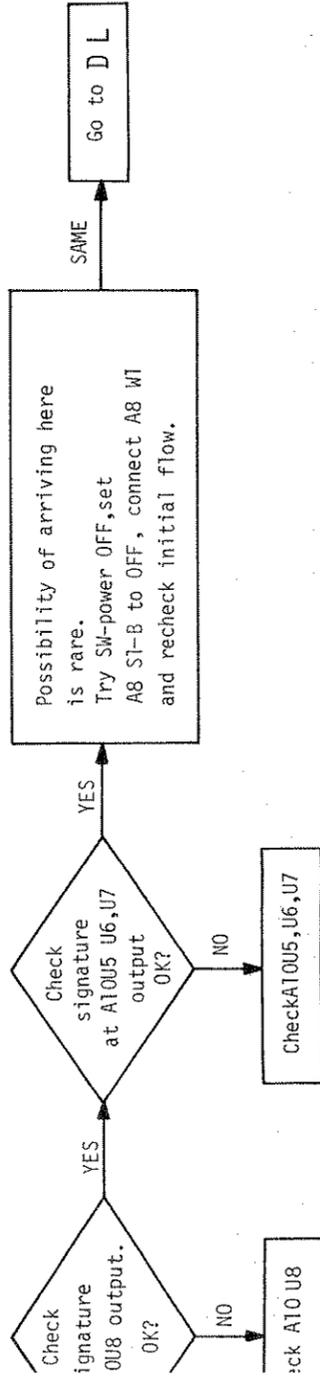
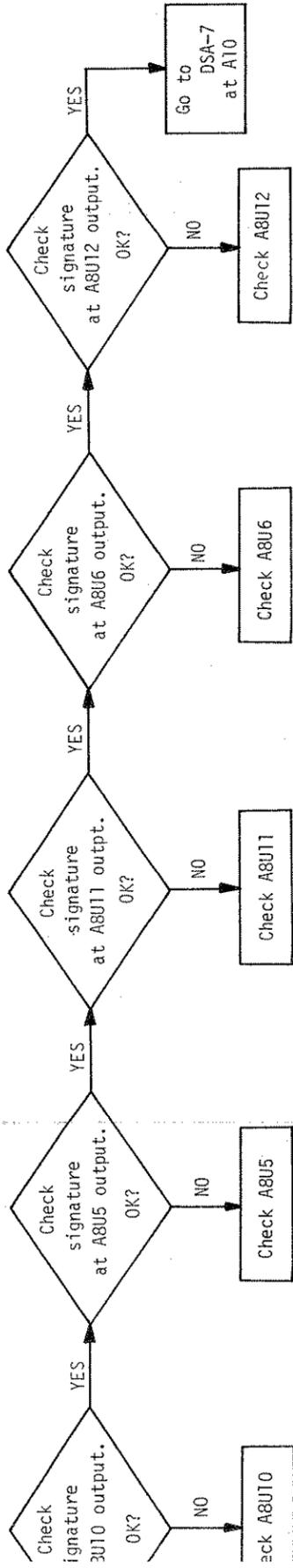
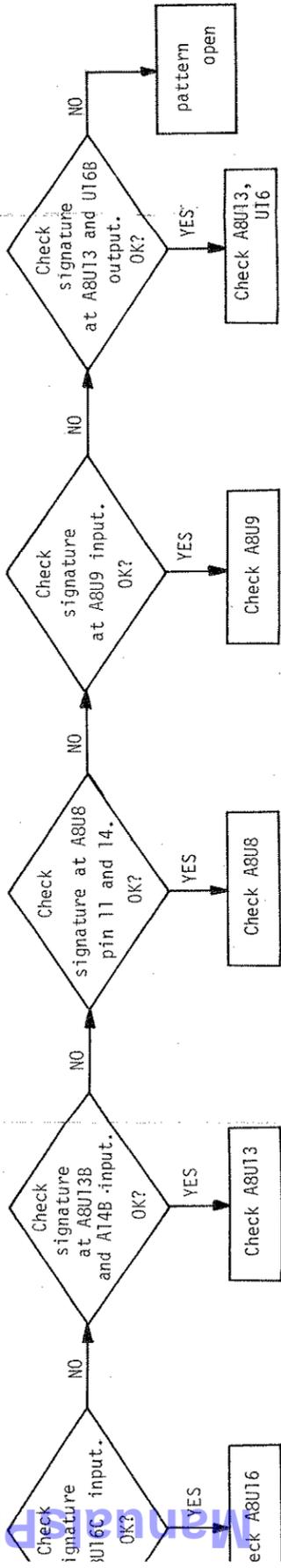
| | | | |
|-------|---------|--------|-----------|
| START | STOP | CLOCK | A9 DSA-SW |
| U16-9 | A9U16-7 | A9Tp-6 | OFF |
| | | | ON |

Signature Connections Window (+5V) : P254

| | | | |
|--------|----------|--------|-----------|
| START | STOP | CLOCK | A9 DSA-SW |
| U16-11 | A9U16-10 | A9Tp-6 | OFF |
| | | | ON |

Signature Connections Window (+5V) : P254

| | | | |
|----------|----------|--------|-----------|
| START | STOP | CLOCK | A9 DSA-SW |
| A9U16-13 | A9U16-12 | A9Tp-6 | OFF |
| | | | ON |



Section Troubleshooting Flow Diagram CL.

Signature Connections Window (+5V) : 7UUP

| | | | | |
|--------|---------|---------|--------|-----------|
| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
| DSA-6 | A9Tp-13 | A9Tp-13 | A9Tp-7 | ON |
| KEY | | | | |

DL

Check DSA-6 on A8, A10 and A7.

KEY

Set A8 S1-B to on

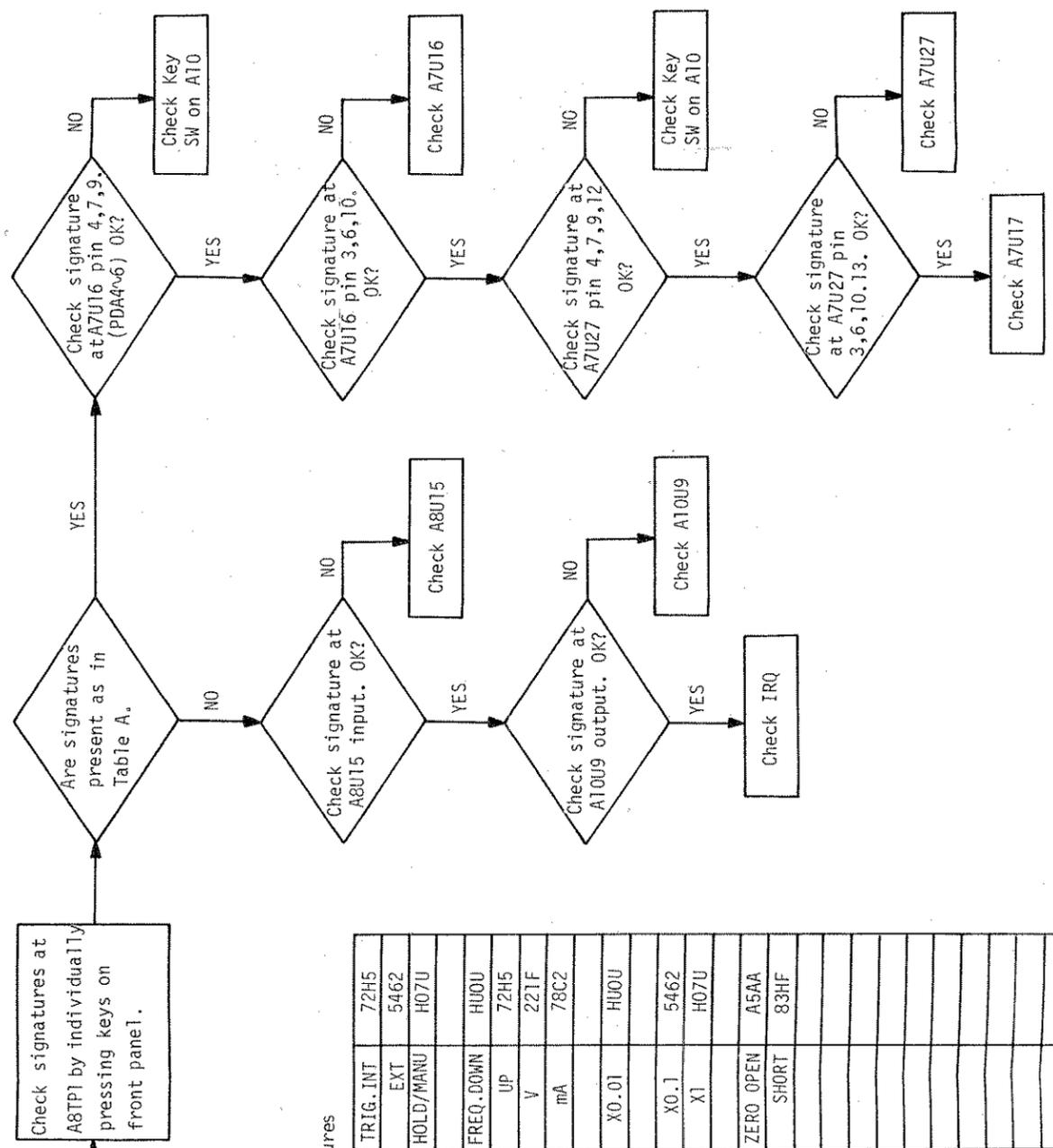


Table 2. A10U9 Signatures

| Pin | Key | signature | pin | Key | signature |
|-----|-----------|-----------|-----|-------|-----------|
| 1 | SELF TEST | 0000 | 9 | STORE | 074F |
| 2 | L | 2HCC | 10 | Δ | UF4A |
| 3 | C | FFA4 | 11 | Δ% | 0F9A |
| 4 | R | P45P | | | |
| 5 | Z | 7281 | 15 | X0.01 | 0H2C |
| 6 | L/C | HA54 | 16 | X0.1 | 2C9F |
| 7 | SHORT | UF22 | 17 | X1 | AU81 |
| 8 | RECALL | 5HP2 | | | |

Table-1. A8Tp-1 Signatures

| | | | |
|--------------|------|------------|------|
| L | 5245 | TRIG. INT | 72H5 |
| C | C35A | EXT | 5462 |
| R | 9CA0 | HOLD/MANU | H07U |
| Z | 0H7U | FREQ. DOWN | HU0U |
| Δ | 83C4 | UP | 72H5 |
| Δ% | 7364 | V | 221F |
| RECALL | 221F | mA | 78C2 |
| STORE | 78C2 | | |
| D | 5245 | X0.01 | HU0U |
| Q | C35A | X0.1 | 5462 |
| ESR/G | 9CA0 | X1 | H07U |
| X/B | 0H7U | ZERO OPEN | A5AA |
| L/C | A5AA | SHORT | 83HF |
| CIRCUIT AUTO | 5245 | | |
| | C35A | | |
| | 9CA0 | | |
| H.R | 7UUP | | |
| AUTO R | 78C2 | | |
| MANUAL | 221F | | |
| DOWN | 83C4 | | |
| UP | 7364 | | |
| SELF.T | 7UUP | | |

Table 3. A7U16, U27 Signatures

| SIGNAL | TEST PIN | SIGNATURE | TEST PIN | SIGNATURE |
|--------|----------|-----------|----------|-----------|
| PDA 0 | U27-4 | P48F | U27-3 | 7686 |
| 1 | -7 | 7CAA | -6 | H68U |
| 2 | -9 | 1067 | -10 | 7FUF |
| 3 | -12 | C704 | -13 | PP7U |
| 4 | U16-4 | 0000 | U16-3 | PP7U |
| 5 | -7 | 0000 | -6 | PP7U |
| 6 | -9 | 0000 | -10 | PP7U |

Figure 8-35. Digital Section Troubleshooting Flow Diagram DL. 8-53

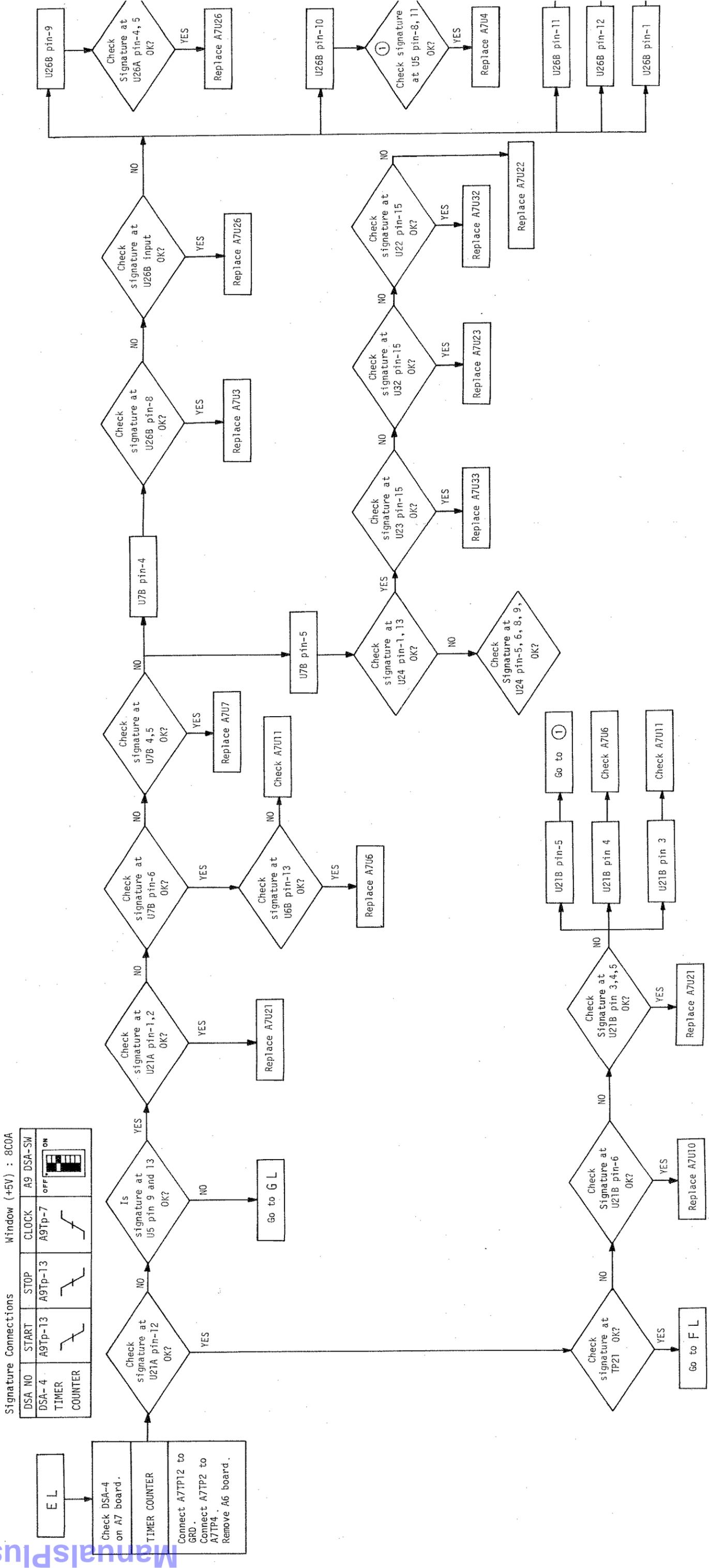
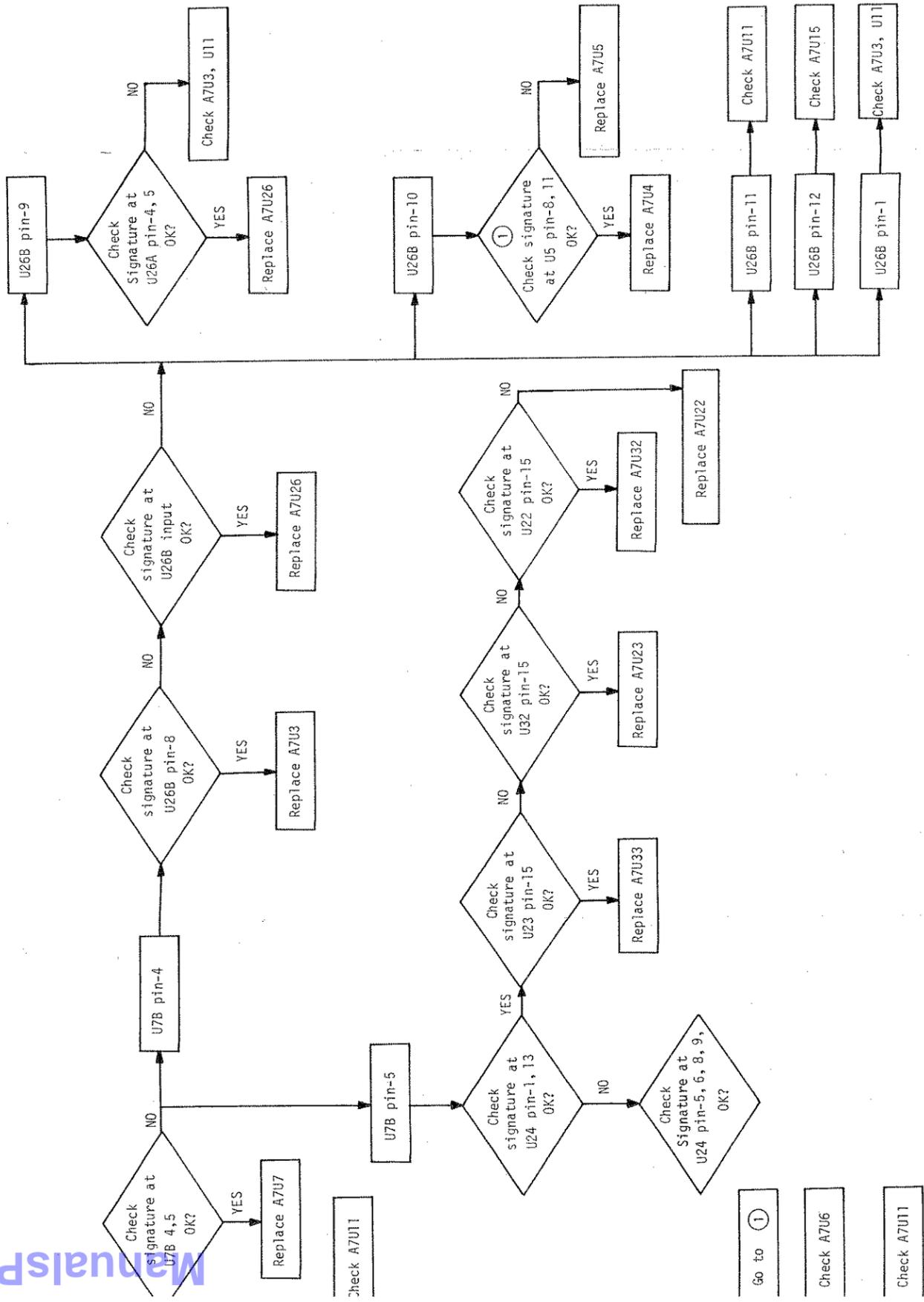
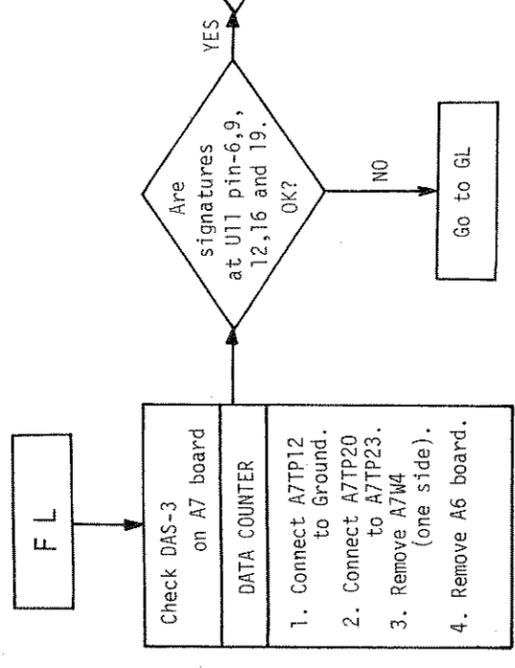


Figure 8-36. Digital Section Troubleshooting Flow Diagram EL.

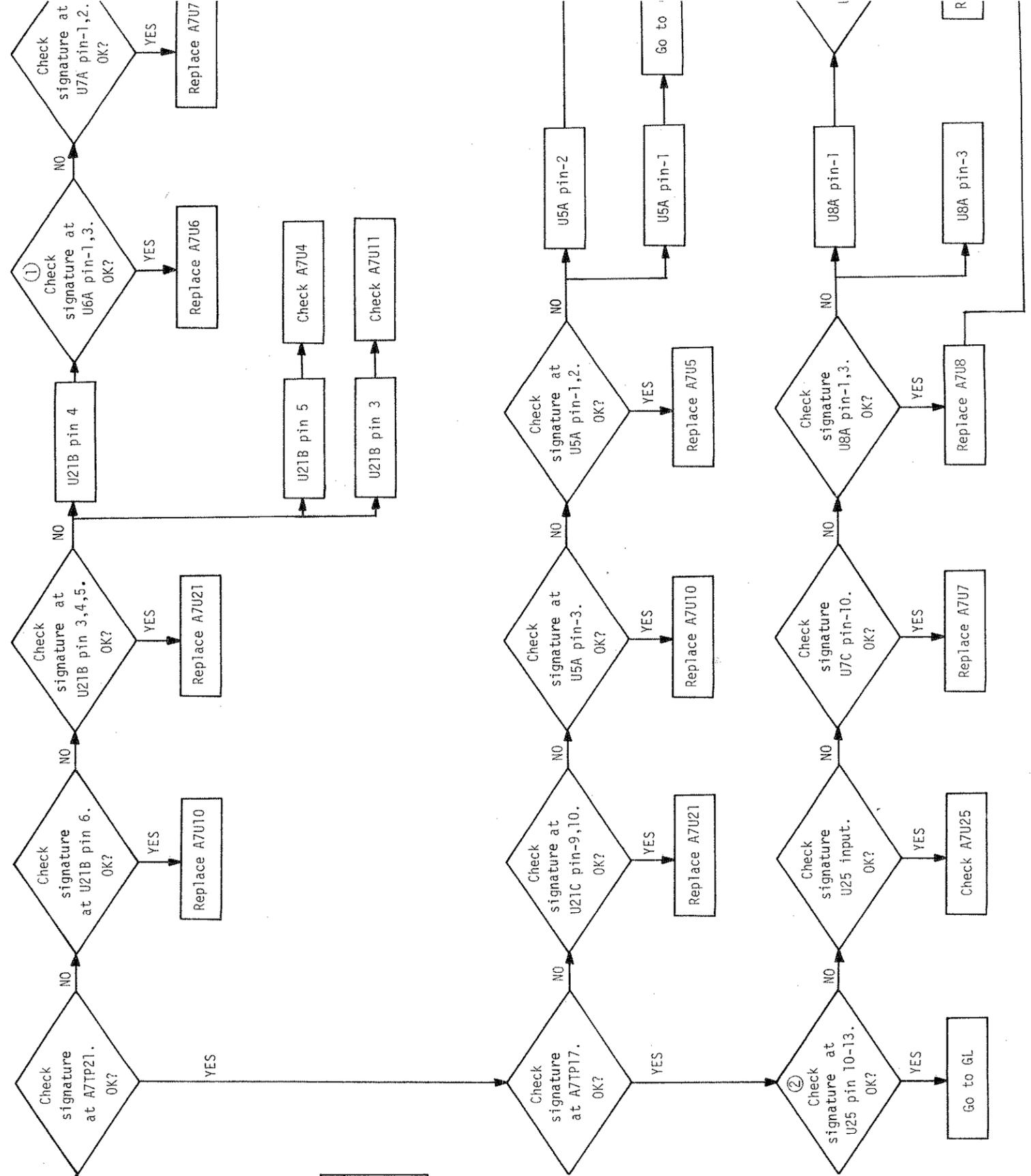


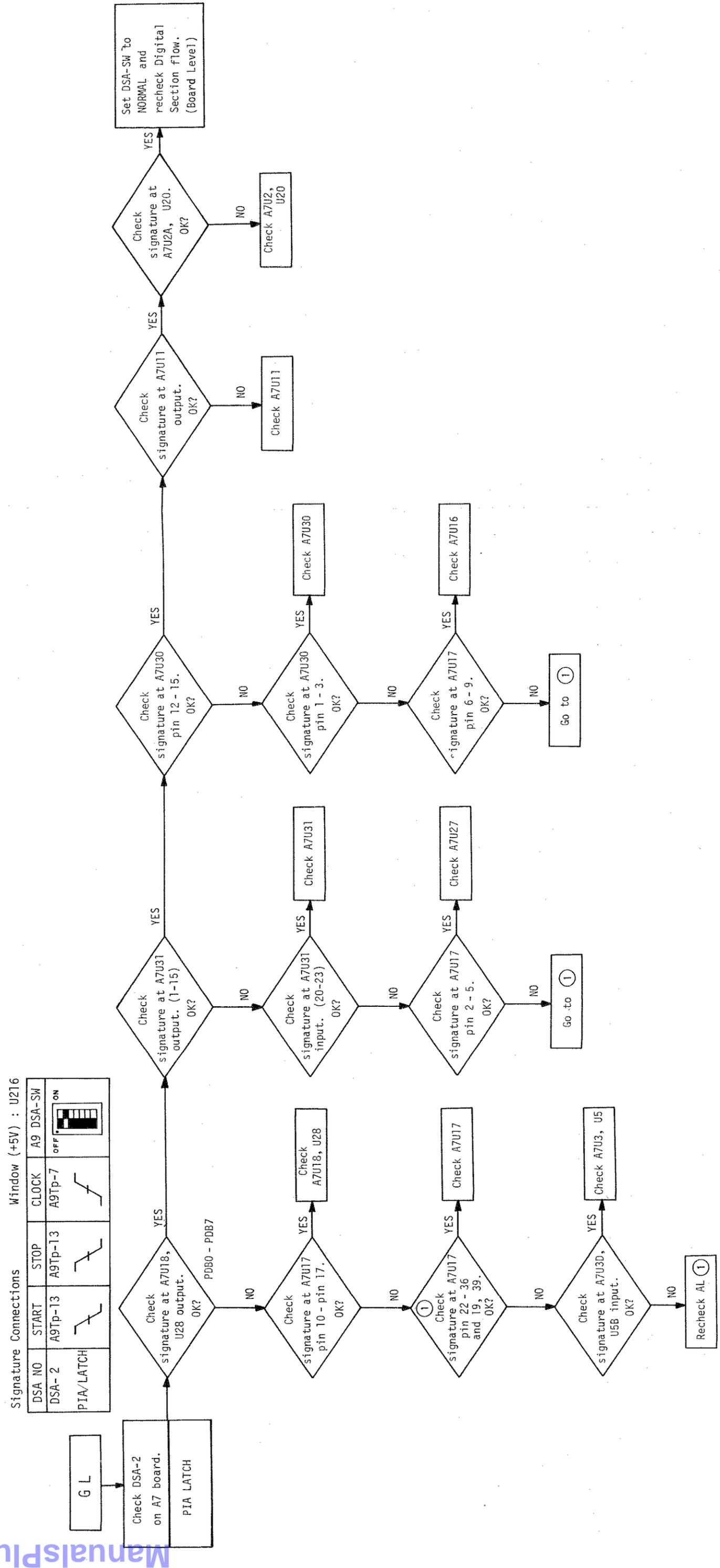
Section Troubleshooting Flow Diagram EL.

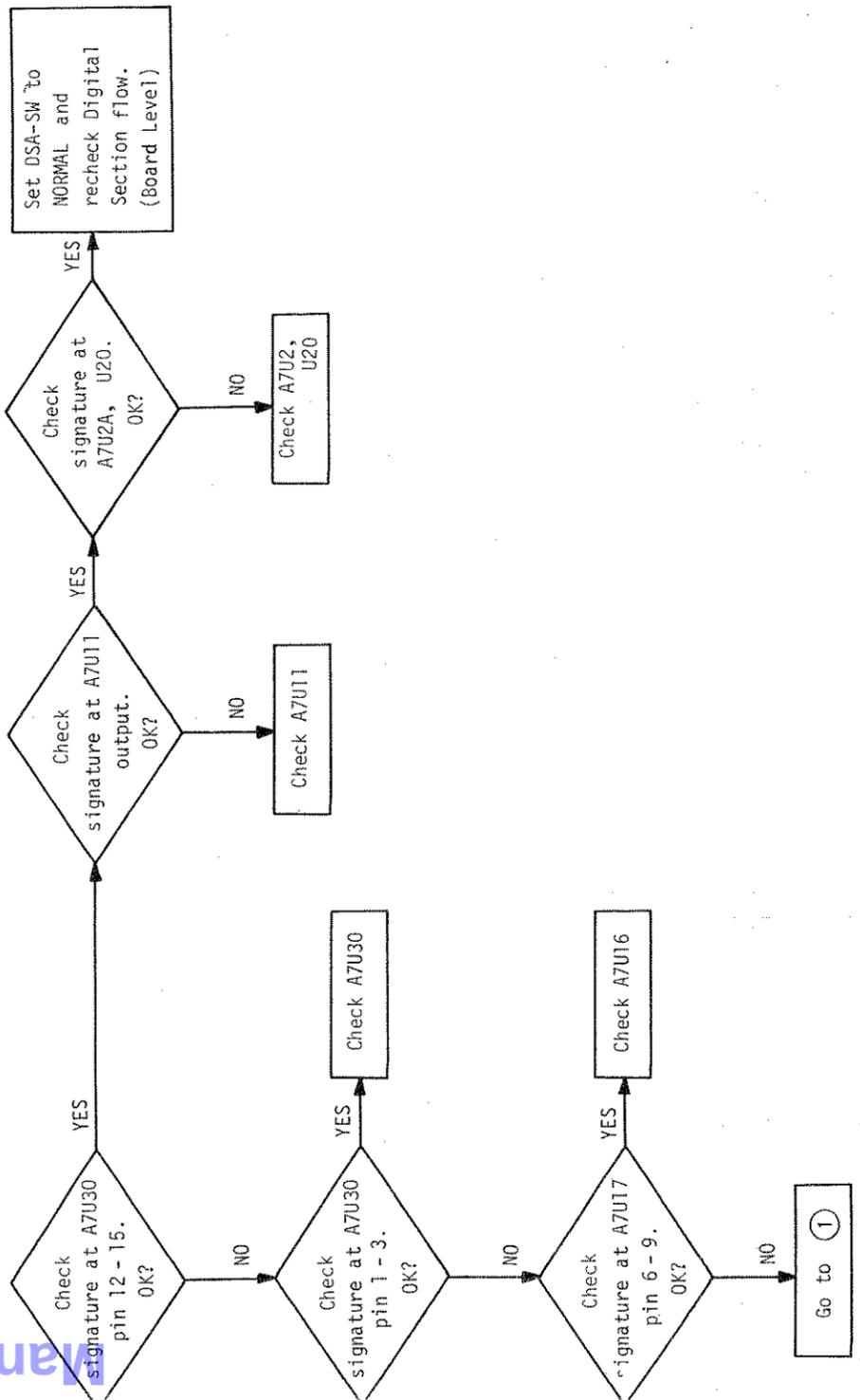


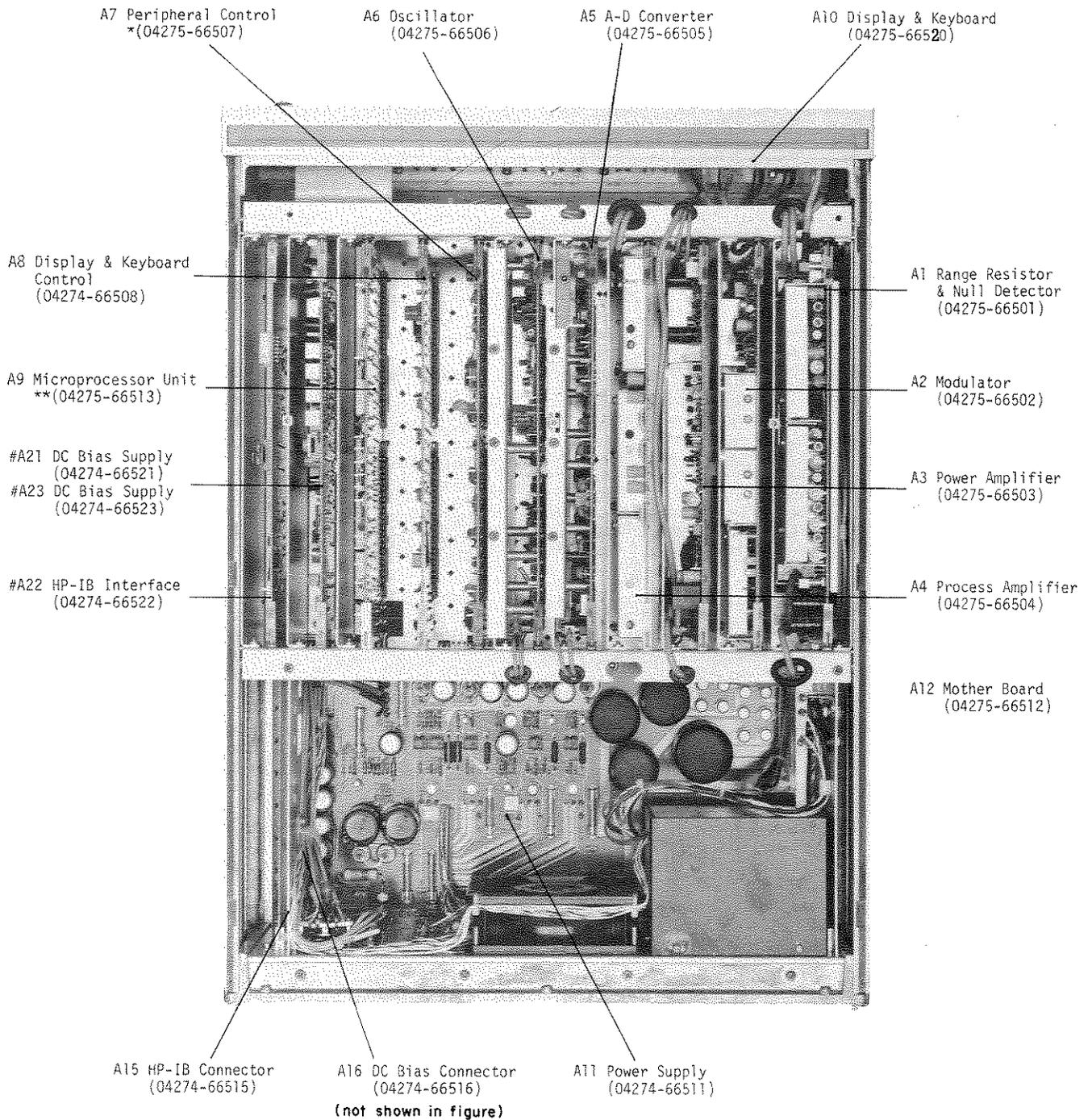
Signature Connections Window (+5V) : UH5U

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|--------|---------|---------|--------|-----------|
| DSA-3 | A9Tp-13 | A9Tp-13 | A9Tp-7 | OFF |









#A21: Option 001 only.
#A22: Option 101 only.
#A23: Option 002 only.

*P/N 04275-66537 for Option 004
**P/N 04275-66514 for Option 003
P/N 04275-66517 for Option 101
P/N 04275-66518 for Option 003 plus 101

Figure 8-39. Assembly Locations.

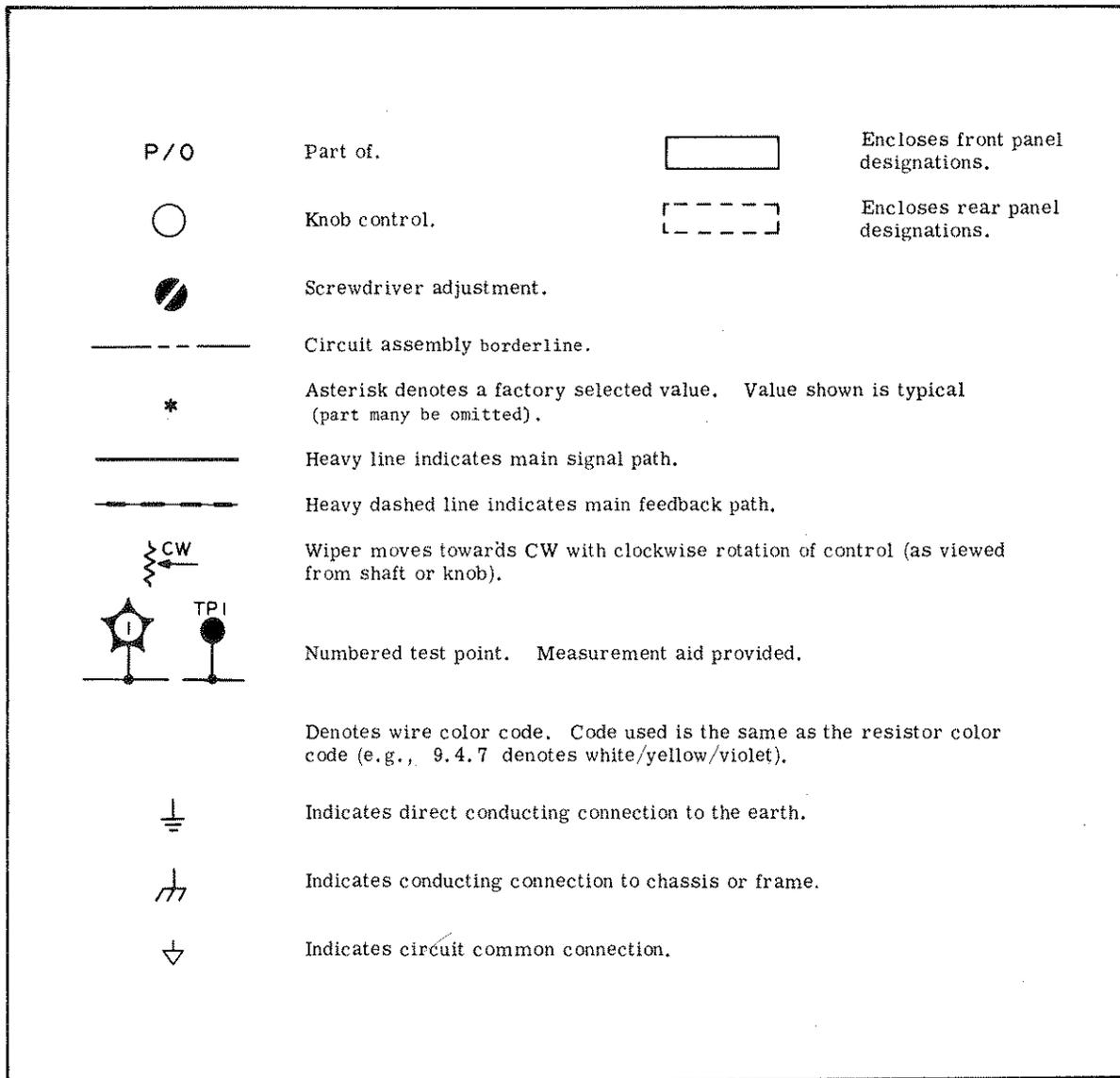


Figure 8-40. Schematic Diagram Notes.

A1 Board Troubleshooting Flow Diagram Notes.

1. If the instrument malfunctions or measurement error increases under CABLE LENGTH switch settings of either "0" or "1 m" positions, check Q15 collector voltage, K1 and K2.

| CABLE LENGTH setting | Q15 collector | K1 | K2 |
|----------------------|---------------|-----|-----|
| 0 | 12V | OFF | OFF |
| 1 m | 0V | ON | ON |

If normal voltage is observed, check relays A1K1 and K2.

2. If measurement error increases at specific test frequency setting(s), check the following control signals:

| Check points | Test frequency setting | | | |
|---------------|------------------------|-------|--------|--------|
| | 100 kHz | 1 MHz | *4 MHz | 10 MHz |
| Q13 collector | +12V | +12V | +12V | 0V |
| Q14 collector | +12V | +12V | 0V | +12V |
| Q37 collector | - 3V | + 2V | -4.3V | -4.3V |
| Q38 collector | + 2V | - 3V | -4.3V | -4.3V |

* 5 MHz for option 004

If these voltages are normal, check the following components associated with these control signals:

| | |
|-----|---|
| K3 | Turns on at 4 MHz |
| K4 | Turns on at 10 MHz |
| Q27 | Turns on at 10 kHz, 20 kHz 40 kHz and 100 kHz |
| Q28 | Turns on at 200 kHz, 400 kHz and 1 MHz |

Check that signal waveforms at Q27 and Q28 collector leads individually disappear when the respective transistors are on.

3. If measurement error increases on low impedance measurement ranges (high capacitance and low inductance ranges), check CMR Amplifier circuit (A1Q1 through Q8).
4. States of the range resistor relays are summarized in the tabulation below:
Condition – Function: R-X, Test frequency: 10 kHz

| Range | Relay states (drive transistors) | | | | | | |
|----------------|----------------------------------|-----------------|------------------|-------------|--------------|--------------|--------------|
| | K5, K6 (Q12) | K7, K8 (Q11) | K9, K10 (Q10) | K11 (Q9) | K12 (Q41) | K13 (Q40) | K14 (Q39) |
| 10 k Ω | ON | OFF | OFF | OFF | OFF | OFF | ON |
| 100 k Ω | OFF | ON | OFF | OFF | OFF | ON | OFF |
| 1 M Ω | OFF | OFF | ON | OFF | ON | OFF | OFF |
| 10 M Ω | OFF | OFF | OFF | ON | OFF | OFF | OFF |

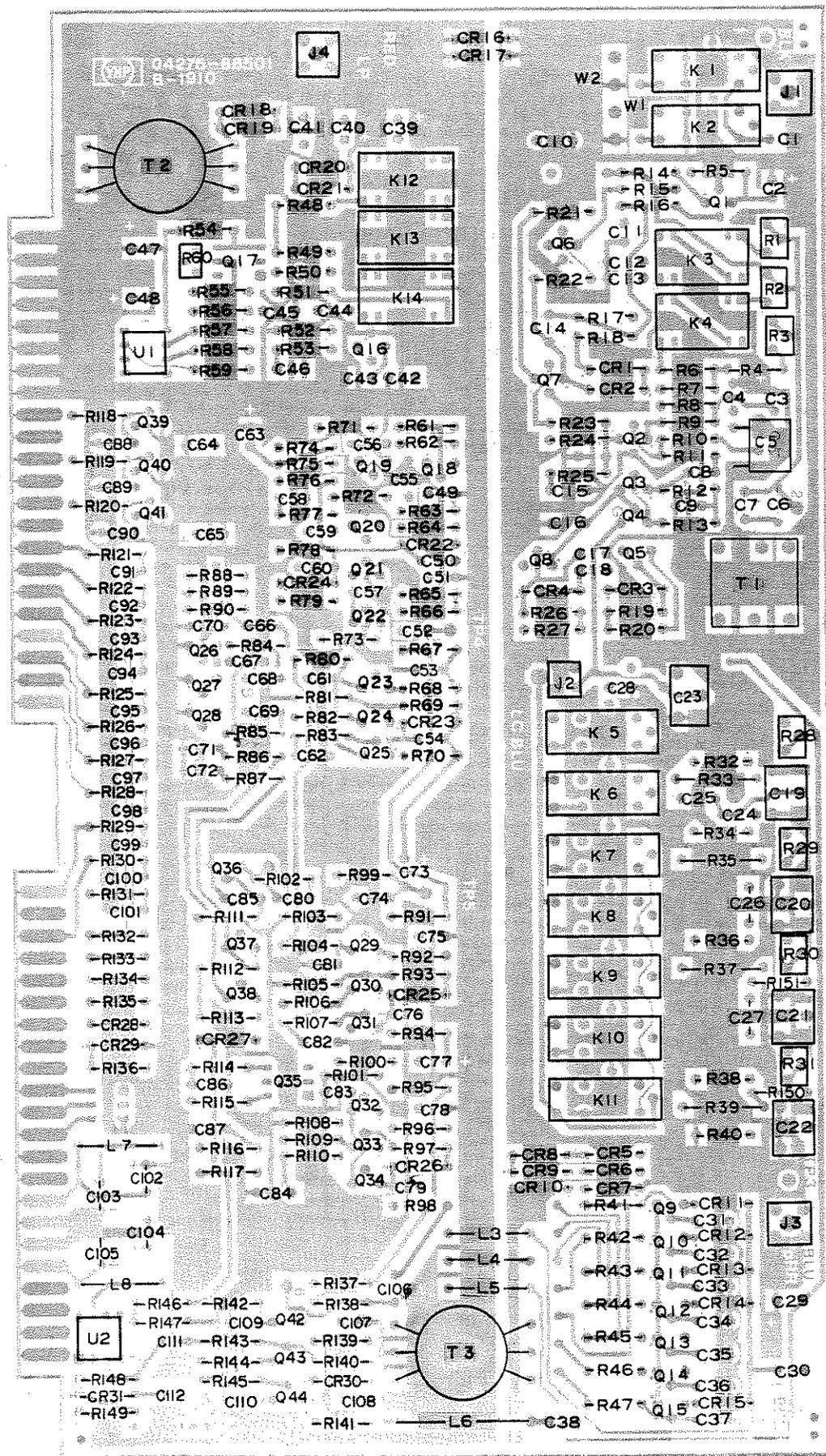


Figure 8-42. AI Range Resistor and Null Detector Board Assembly Component Locations.

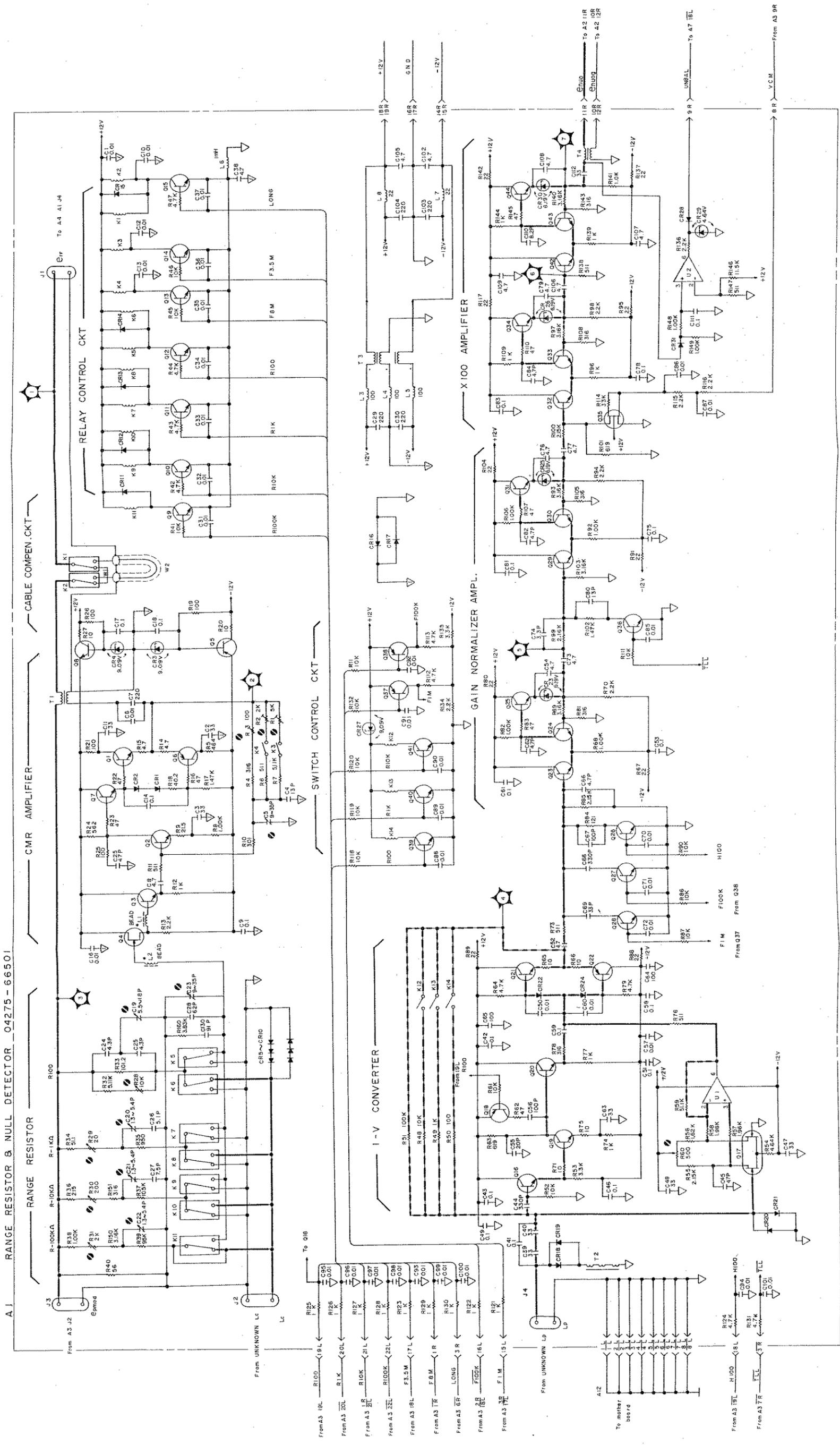


Figure 8-43. AI Range Resistor and Null Detector Assembly Schematic Diagram.

A2 Board Troubleshooting Flow Diagram Notes.

1. If the instrument malfunctions or measurement error increases at specific test frequencies or on specific range settings, first check A2U1 using the table below:

Condition – Function: R-X, Test frequency: 10 kHz

| | | Control output signals | | | | | |
|-------------------|-----------------|------------------------|-------|------|------|------|-------|
| | | a | b | c | d | e | f |
| Frequency Setting | 100 kHz | -1.1V | +0.7V | -11V | 0V | - | - |
| | 1 MHz | +0.7V | -1.1V | 0V | -11V | - | - |
| Range Setting | 100 k Ω | - | - | - | - | -11V | +0.7V |
| | 1000 k Ω | - | - | - | - | +11V | -1.1V |

2. The ALC Amplifier performs leveling of the test frequency input signal using an automatic level control operation in the frequency follow-up filter circuit. For the frequency follow-up filter operating theory, see Figure 8-9.

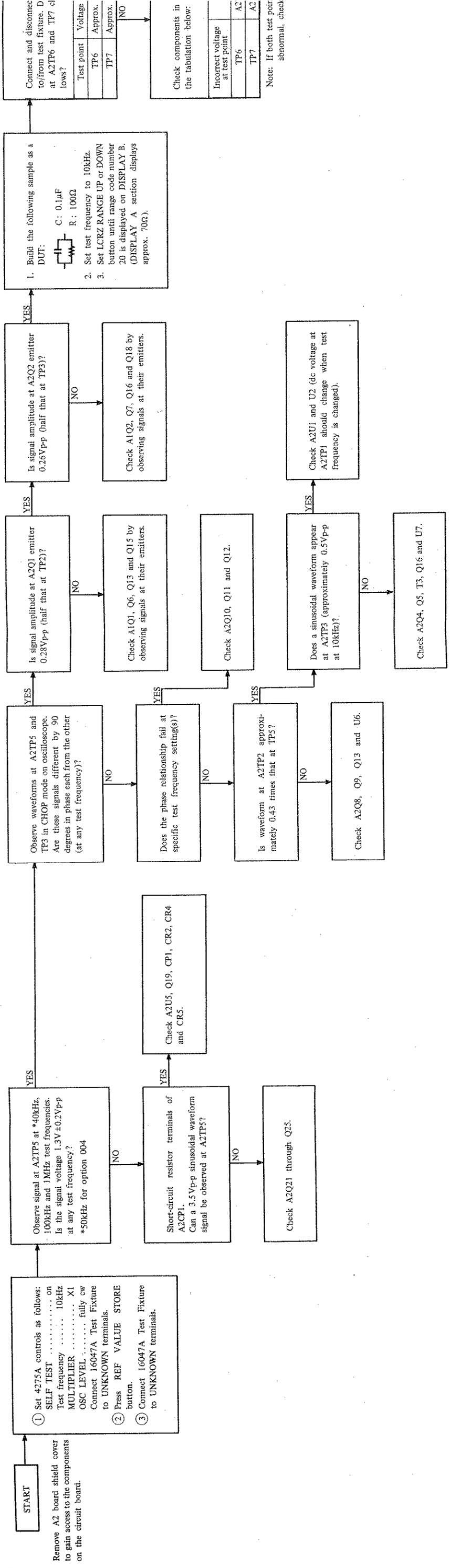


Figure 8-44. A2 Modulator Board Troubleshooting Tree.

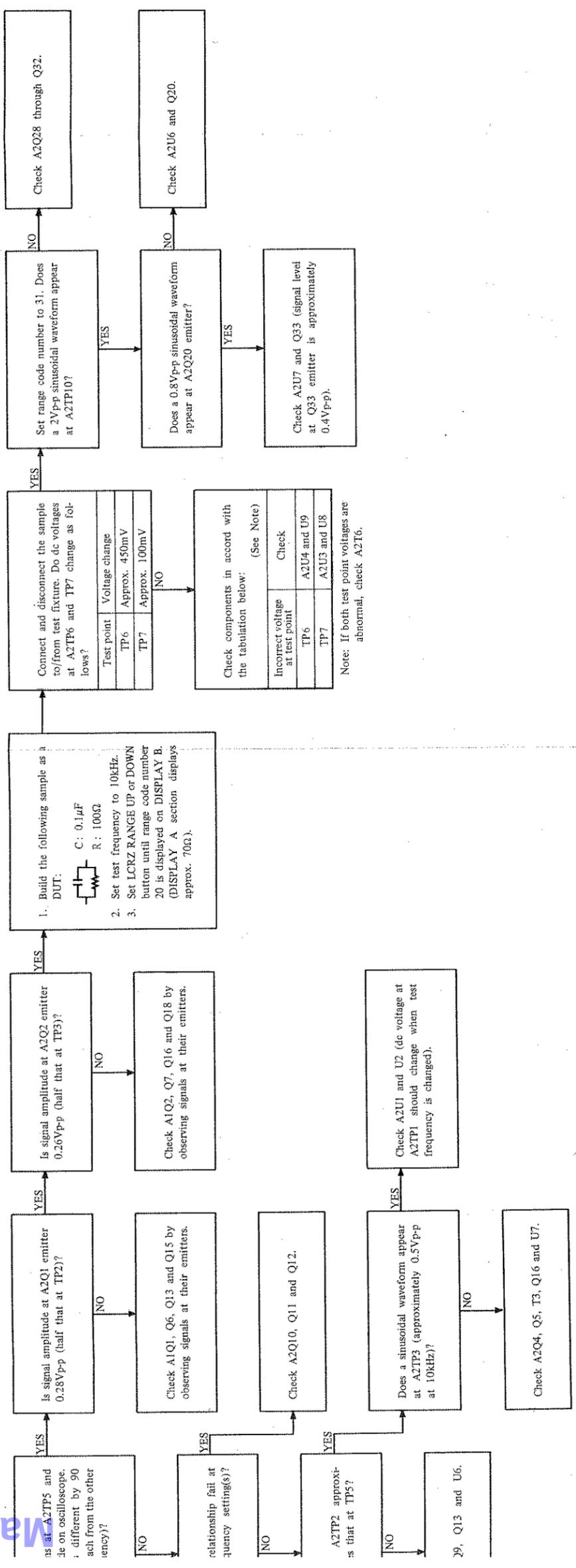


Figure 8-44. A2 Modulator Board Troubleshooting Tree.

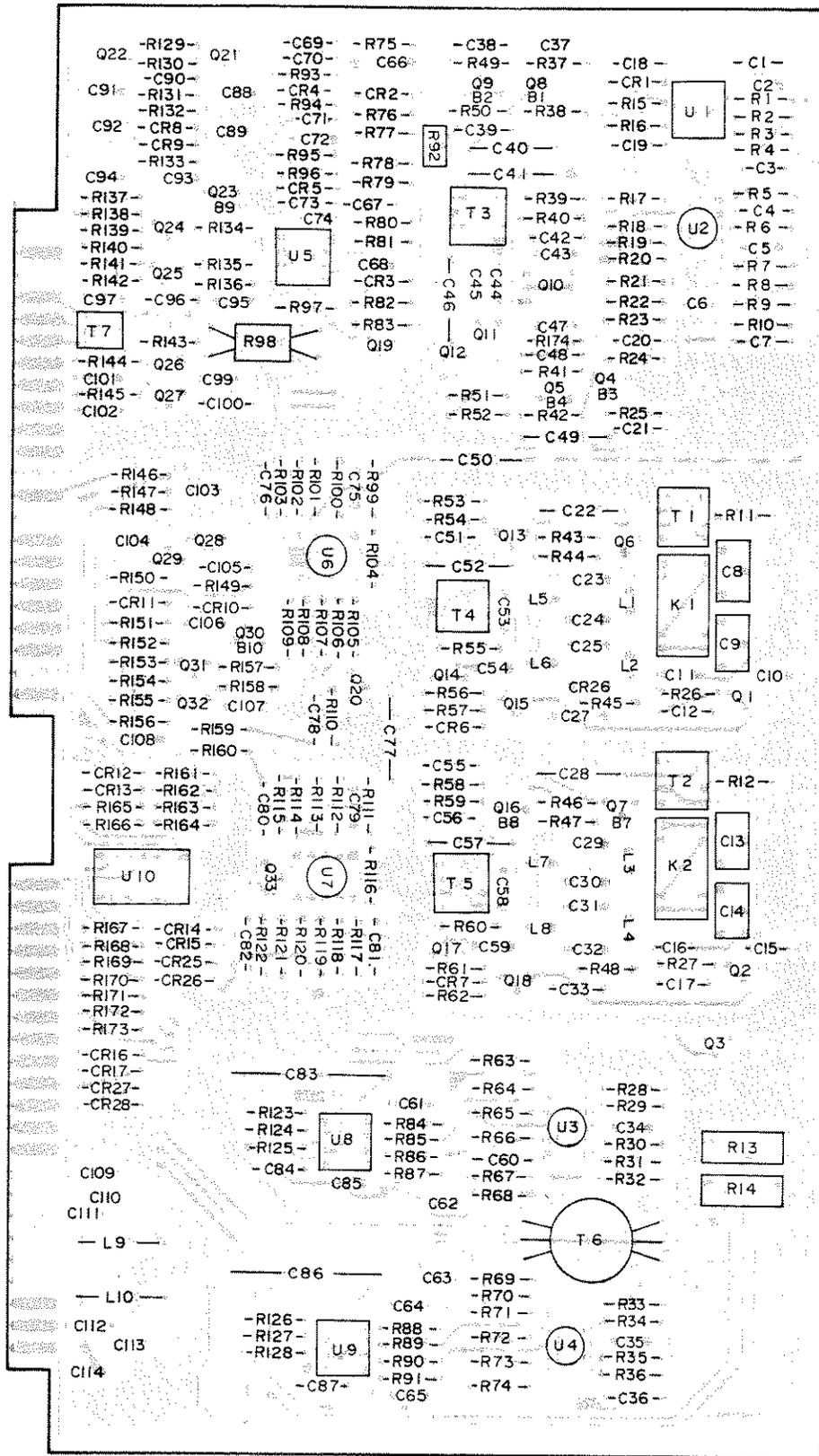
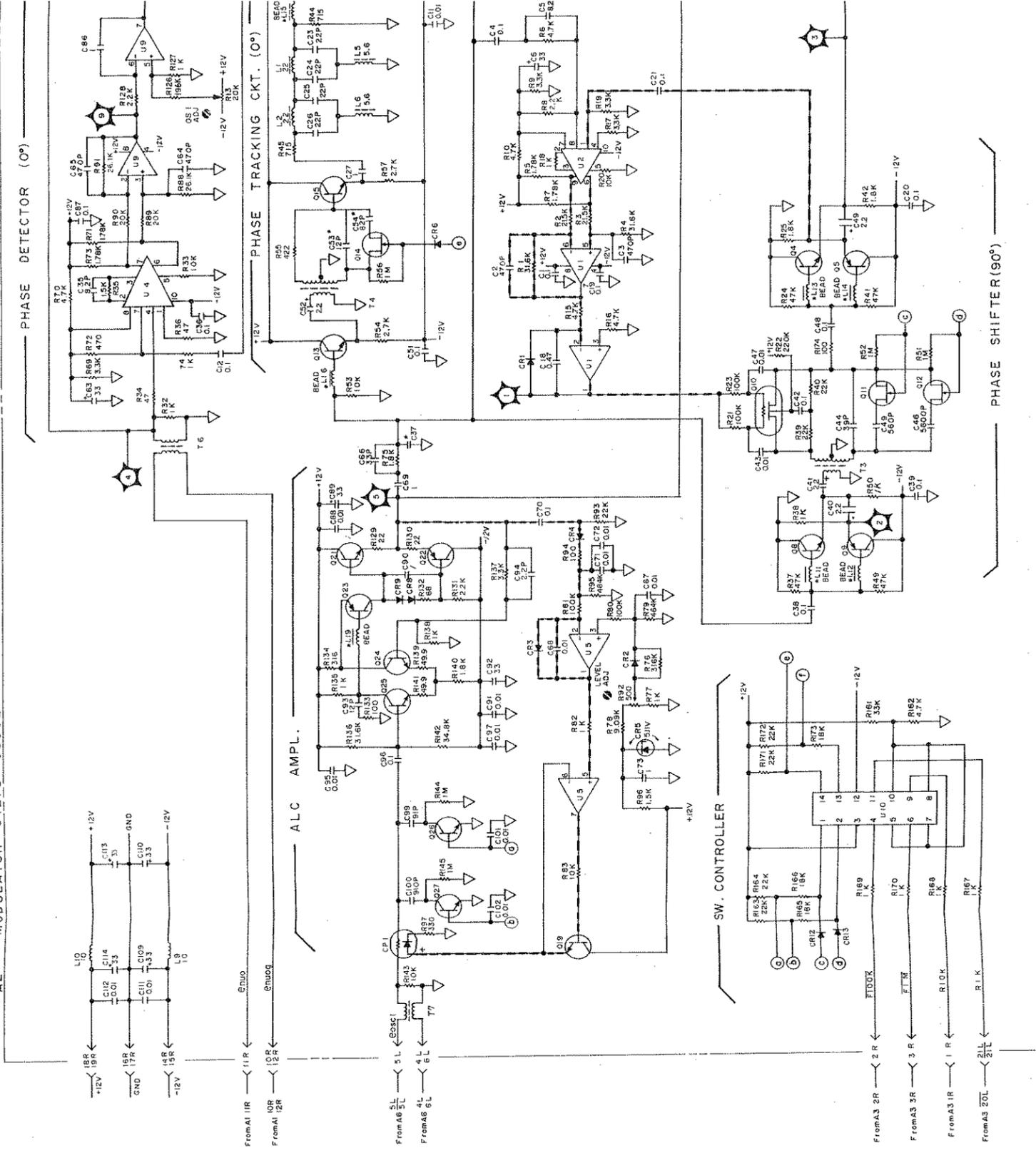


Figure 8-45. A2 Modulator Board Assembly Component Locations.

A2 MODULATOR 04275-66502



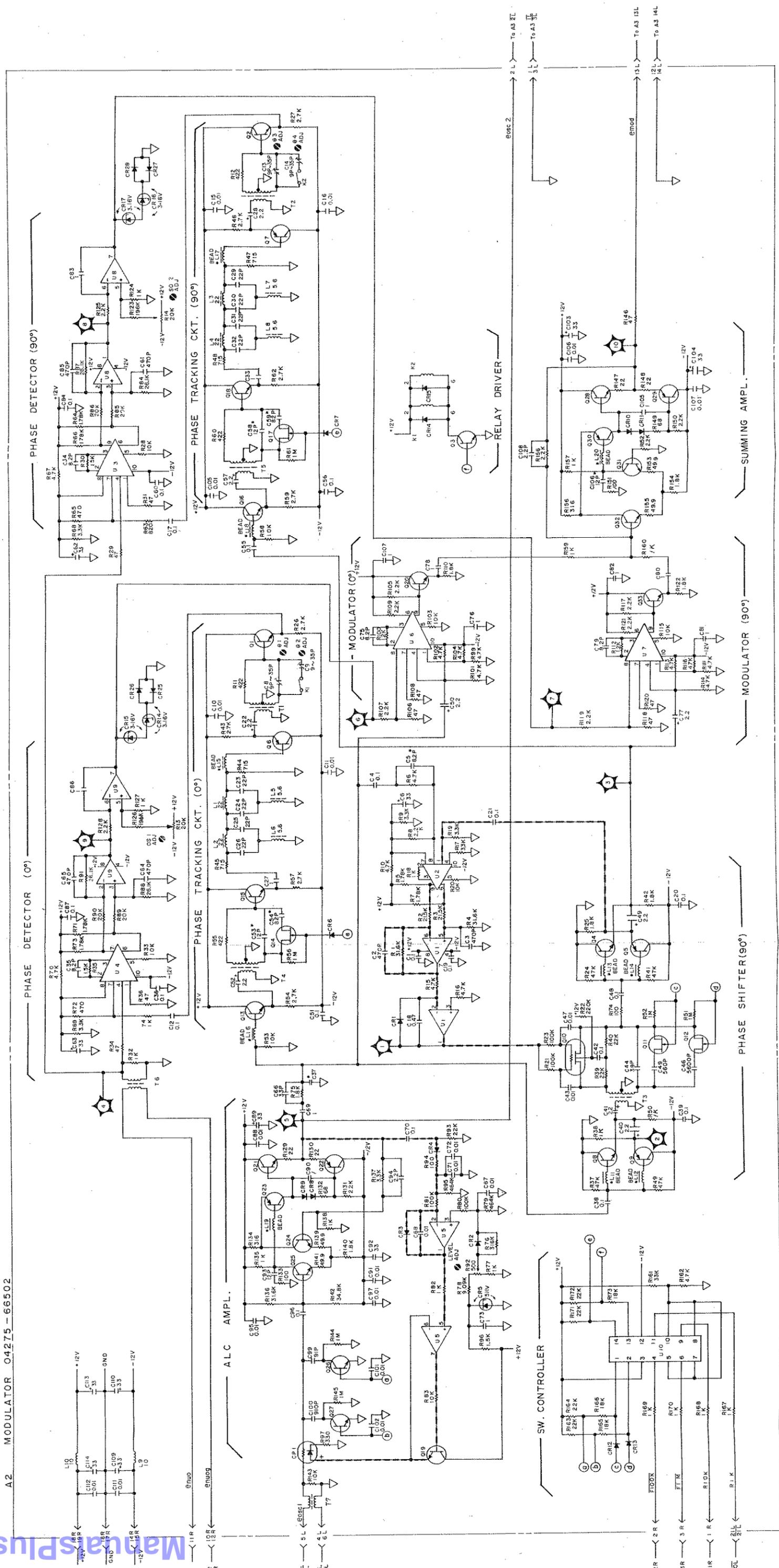


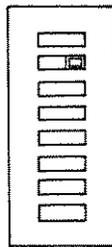
Figure 8-46. A2 Modulator Board Assembly Schematic Diagram.

A3 Board Troubleshooting Flow Diagram Notes.

1. If measurement error increases under CABLE LENGTH switch settings of either the "0" or "1 m" positions, first check Phase Delay circuit in accord with the tabulation below:

| CABLE LENGTH setting | Q35 collector | K1 | K2 |
|----------------------|---------------|-----|-----|
| 0 | 12V | OFF | OFF |
| 1 m | 0V | ON | ON |

2. If no dc bias can be applied to sample, check A3T3 for open-circuit.
3. To check level shifters and latch circuitry (A3U1 through U5), set DSA switch on A9 board (A9S1) as follows:



Set second bit switch to on and the others to off.

Verify that periodic pulse waveforms can be observed at U4 and U5 outputs. If OK, observe waveforms at U1, U2 and U3 outputs (similar or inverted waveforms with respect to U4 and U5 outputs). After these checks are completed, reset the DSA switch to its normal position.

4. \overline{TLH} and $\overline{HI00}$ control signal logic is given in the table below:

| MULTIPLIER setting | \overline{TLH} | | * $\overline{HI00}$ | |
|--------------------|------------------|----------|---------------------|-----------|
| | A3Q5 | U1 pin 2 | A3Q21 | U1 pin 13 |
| X1 | OFF | -4V | OFF | -4V |
| X0.1 | ON | +4.2V | ON | +4.2V |
| X0.01 | ON | +4.2V | ON | +4.2V |

* Activate SELF TEST function. Press REF VALUE STORE button. Press LCRZ RANGE UP or DOWN button until range code number 20 is displayed on DISPLAY B.

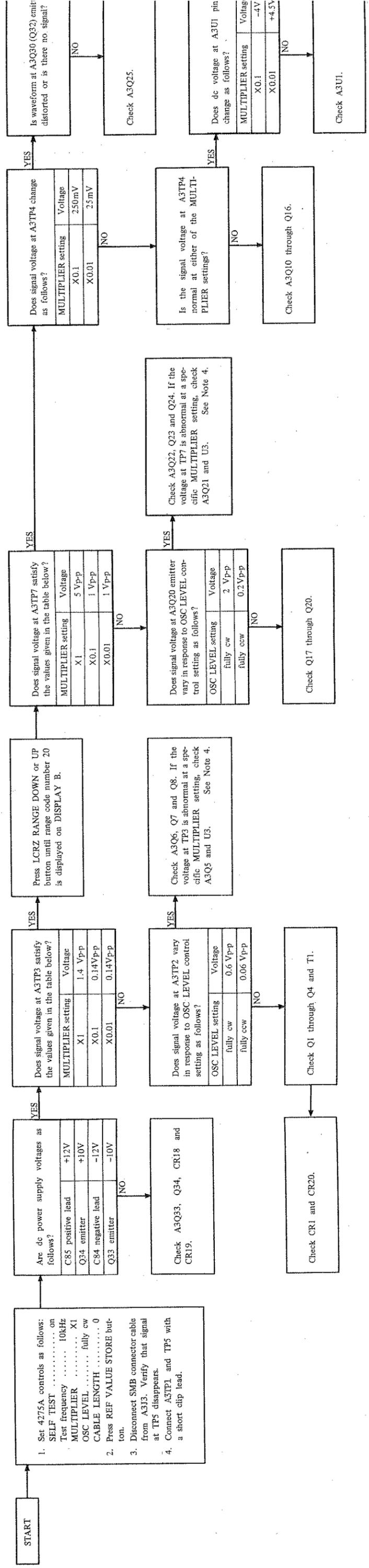
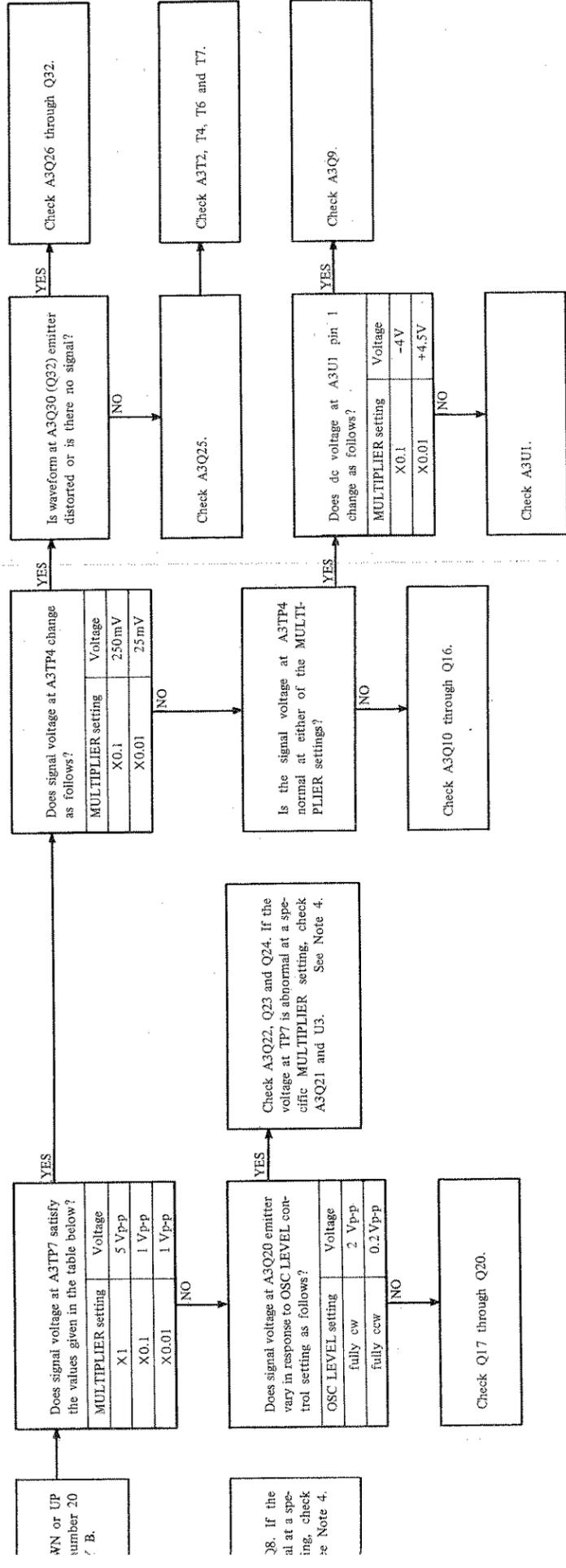


Figure 8-47. A3 Power Amplifier Board Troubleshooting Tree.



3 Power Amplifier Board Troubleshooting Tree.

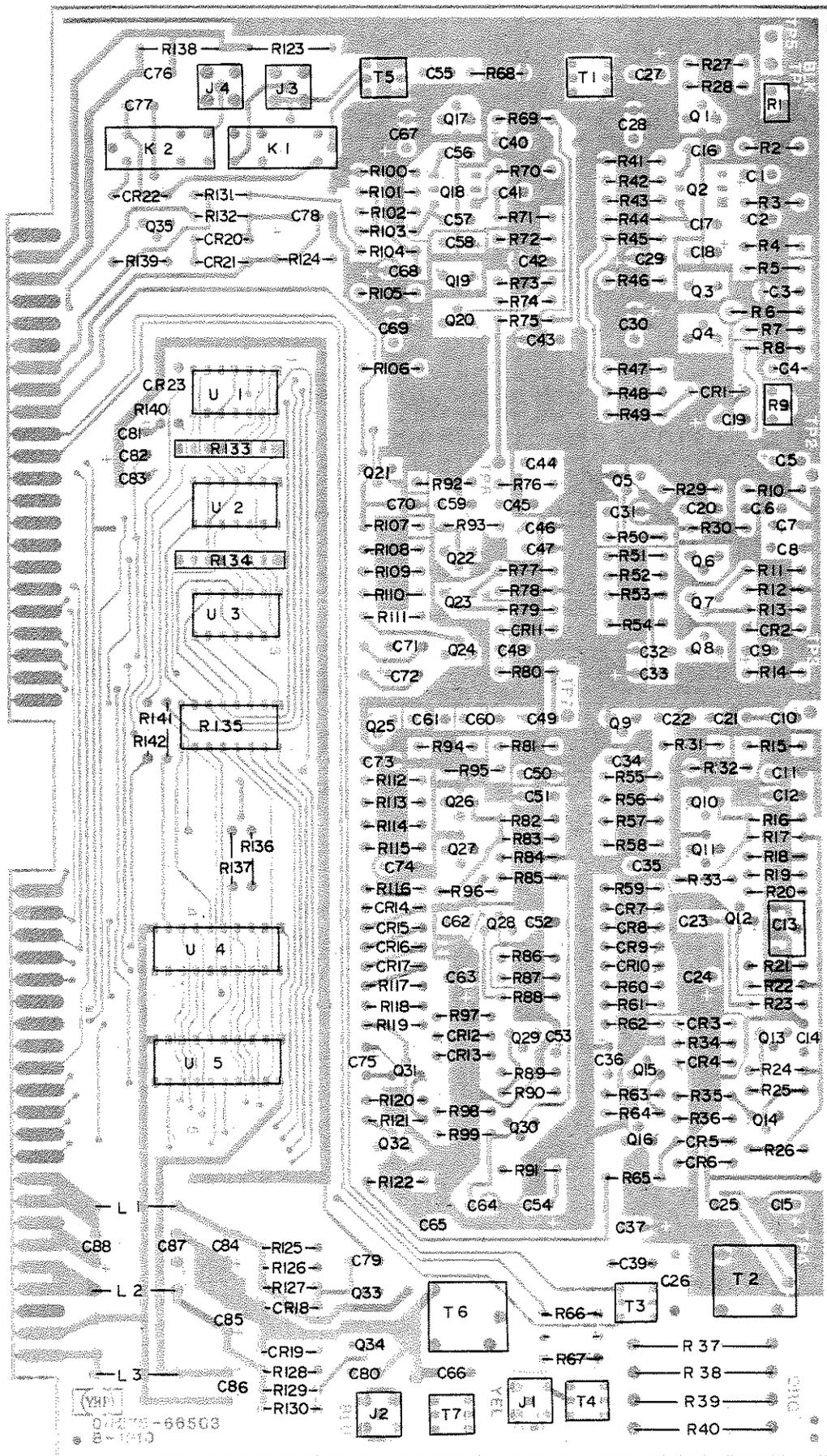


Figure 8-48. A3 Power Amplifier Board Assembly Component Locations.

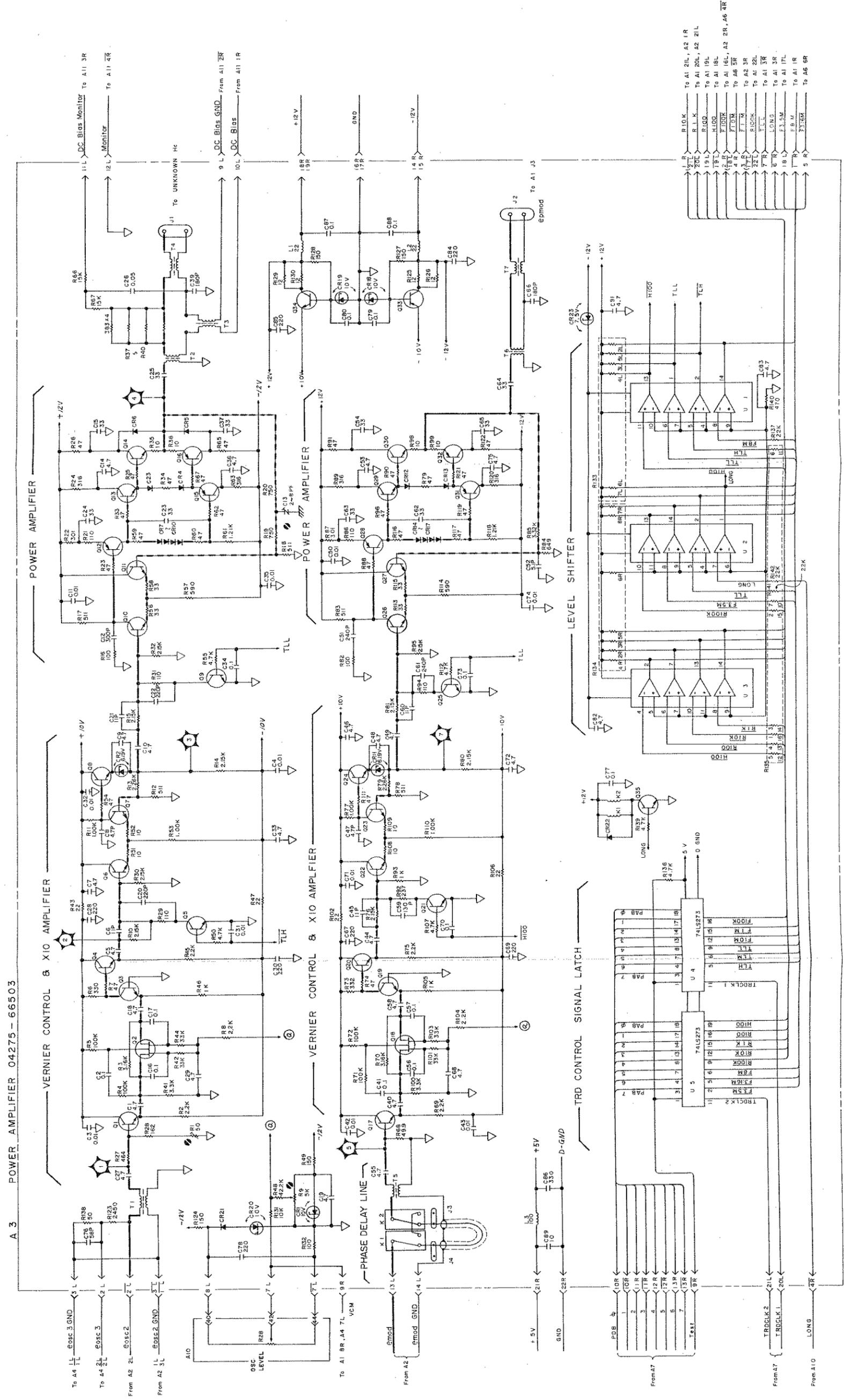


Figure 8-49. A3 Power Amplifier Board Assembly Schematic Diagram.

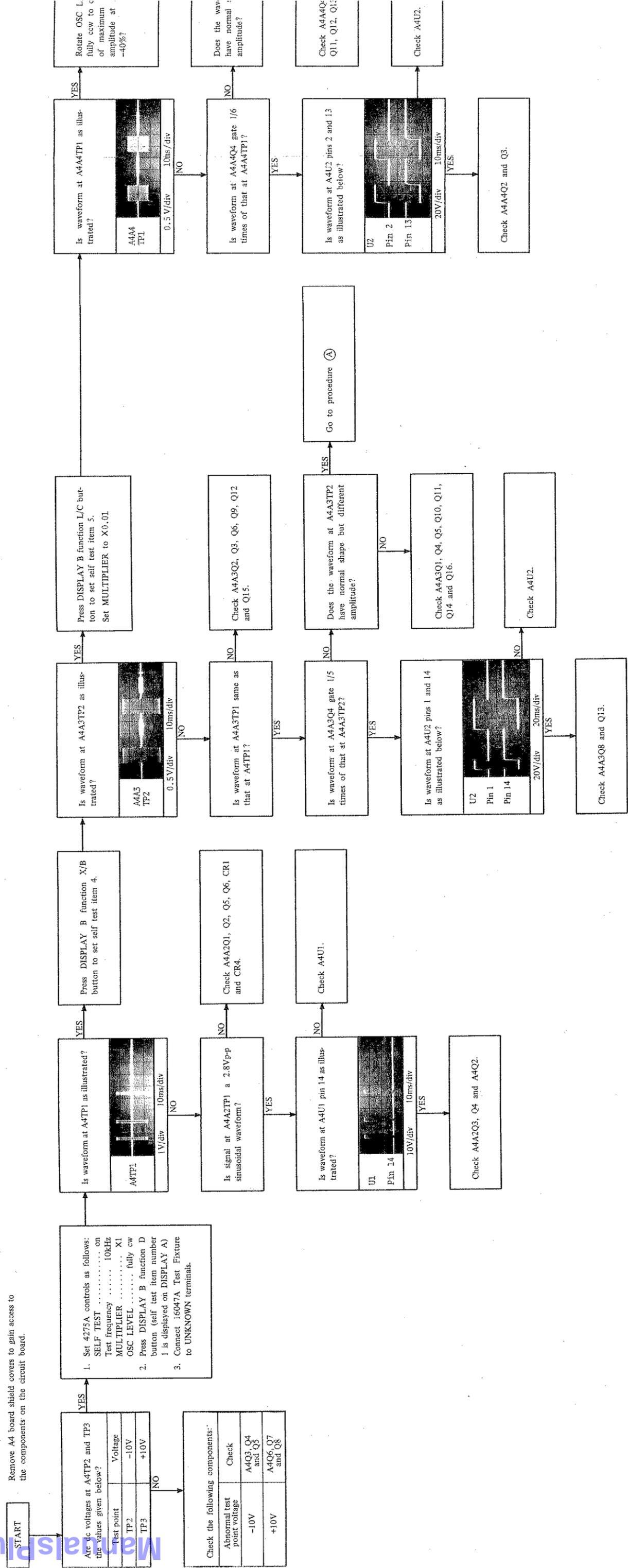
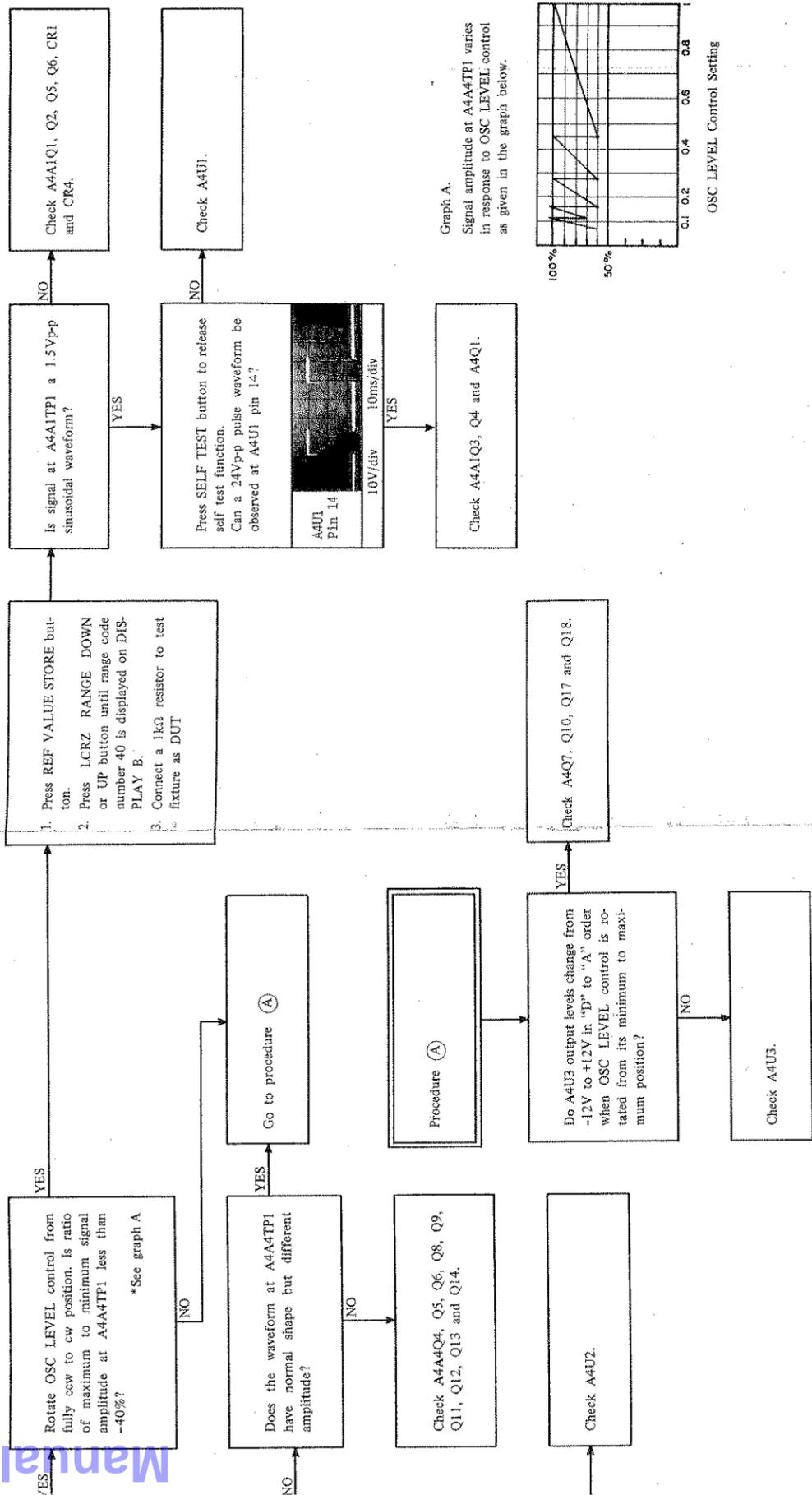


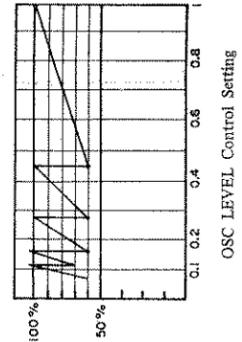
Figure 8-50. A4 Process Amplifier Board Troubleshooting Tree.

A4 Board Troubleshooting Flow Diagram Notes.

1. If measurement functions are normal but TEST SIG LEVEL CHECK function is faulty, first check that voltage at A4U1 pin 2 changes from -12V to +12V when TEST SIG LEVEL "V" or "mA" button is pushed normal, check A4Q9, Q10 and Q11.
2. If the waveform at A4TP1 shows a 20mVp-p sinusoidal signal superposed on the normal signal, check (pin 2 should normally be at -12V).
3. Signal waveforms at A4Q7, Q10, Q17 and Q18 collector leads individually disappear when the respective transistor turn on.



Graph A.
Signal amplitude at A4A4TP1 varies in response to OSC LEVEL control as given in the graph below.



A4 Board Troubleshooting Flow Diagram Notes.

1. If measurement functions are normal but TEST SIG LEVEL CHECK function is faulty, first check that the dc voltage at A4U1 pin 2 changes from -12V to $+12\text{V}$ when TEST SIG LEVEL "V" or "mA" button is pushed. If normal, check A4Q9, Q10 and Q11.
2. If the waveform at A4TP1 shows a 20 mVp-p sinusoidal signal superposed on the normal signal, check A4U1 (pin 2 should normally be at -12V).
3. Signal waveforms at A4Q7, Q10, Q17 and Q18 collector leads individually disappear when the respective transistors turn on.

CR1

varies
control



ting

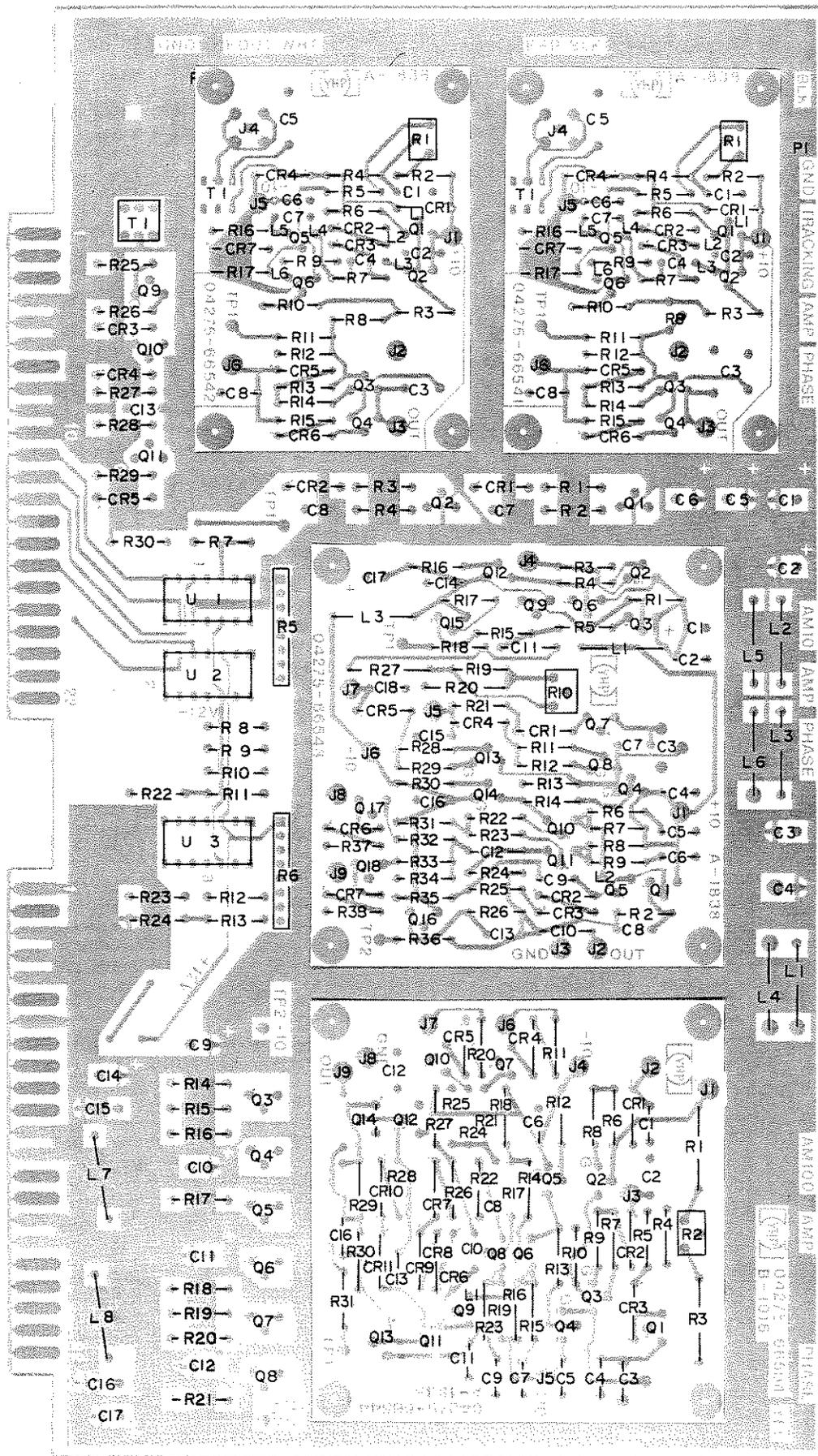


Figure 8-51. A4 Process Amplifier Board Assembly Component Locations.

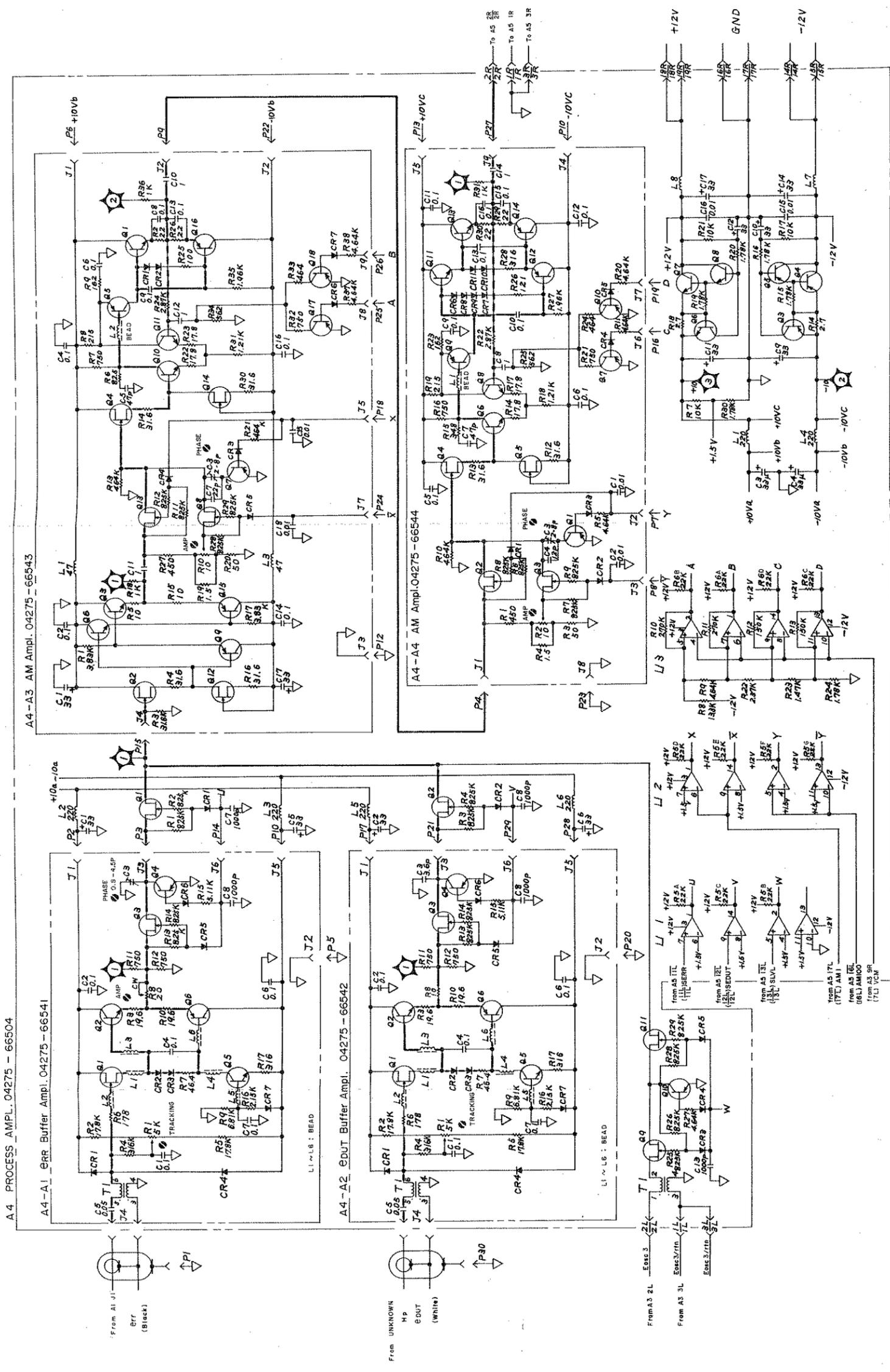


Figure 8-52. A4 Process Amplifier Board Assembly Schematic Diagram.

A5 Board Troubleshooting Flow Diagram Notes.

1. Connect A5TP11 to circuit common. Check that all "Q" outputs of flip flops U1 and U6 are at high level. These flip flops output 0V as high level (-5V as low level). This check allows locating the defective flip flop component with a 50% possibility.
2. Connect A5TP12 to circuit common. Check that all "Q" outputs of flip flops U4 and U9 are at high level. These flip flops outputs 0V as high level (-5V as low level). This check allows locating the defective flip flop with a 50% possibility.
3. A6U10 outputs a single pulse when the instrument is turned on or test frequency setting is changed. The pulse width is equal to that of 8f input signal (at A5J1). This signal synchronizes the phase detector detection signals with the oscillator signal (of A6 board) to enhance stability of the measurement results at high frequencies (in MHz region). If this circuit fails, measurement display output will sometimes differ approximately 0.5% (at 10 MHz) when the test frequency is changed and is again set to the preceding frequency.

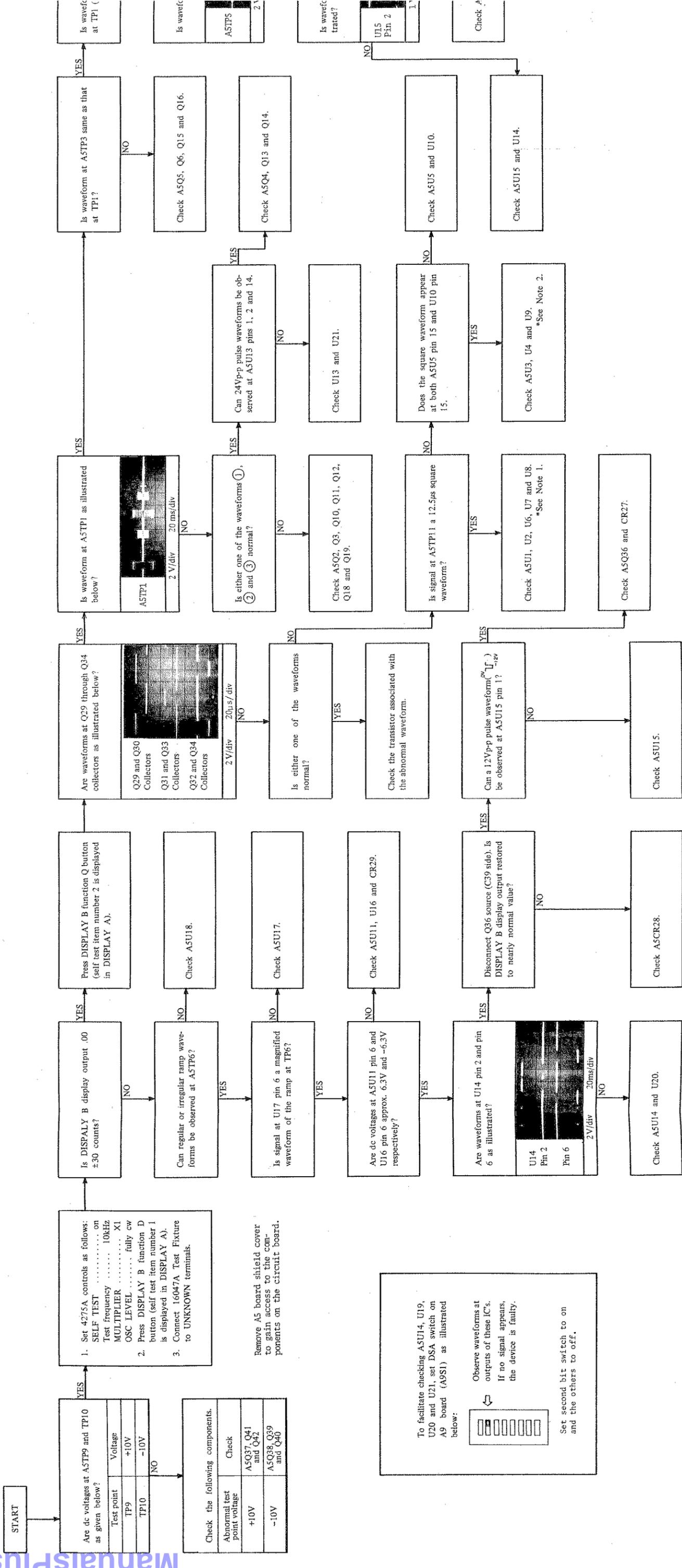


Figure 8-53. A5 A-D Converter Board Troubleshooting Tree.

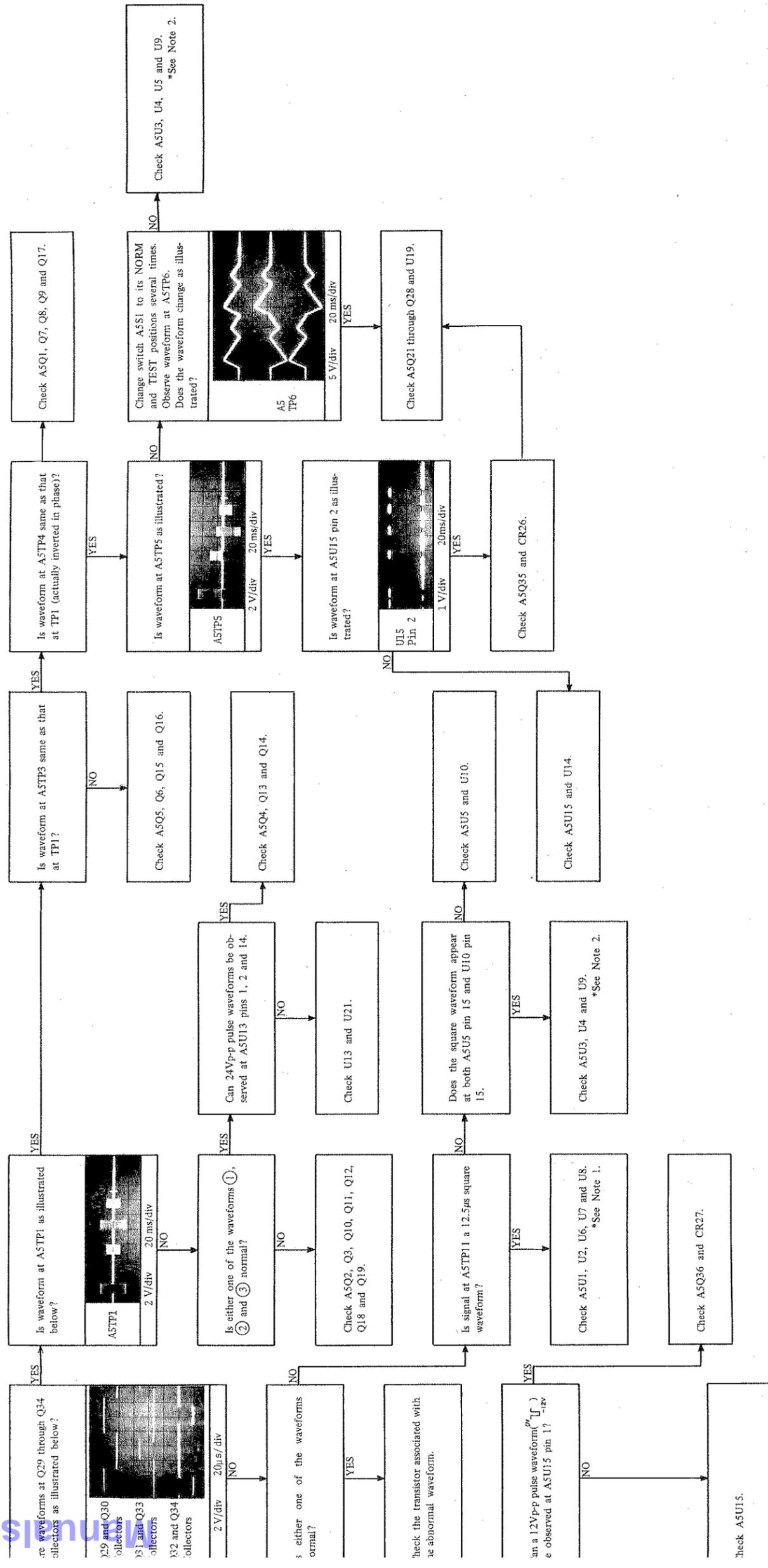


Figure 8-53. A5 A-D Converter Board Troubleshooting Tree.

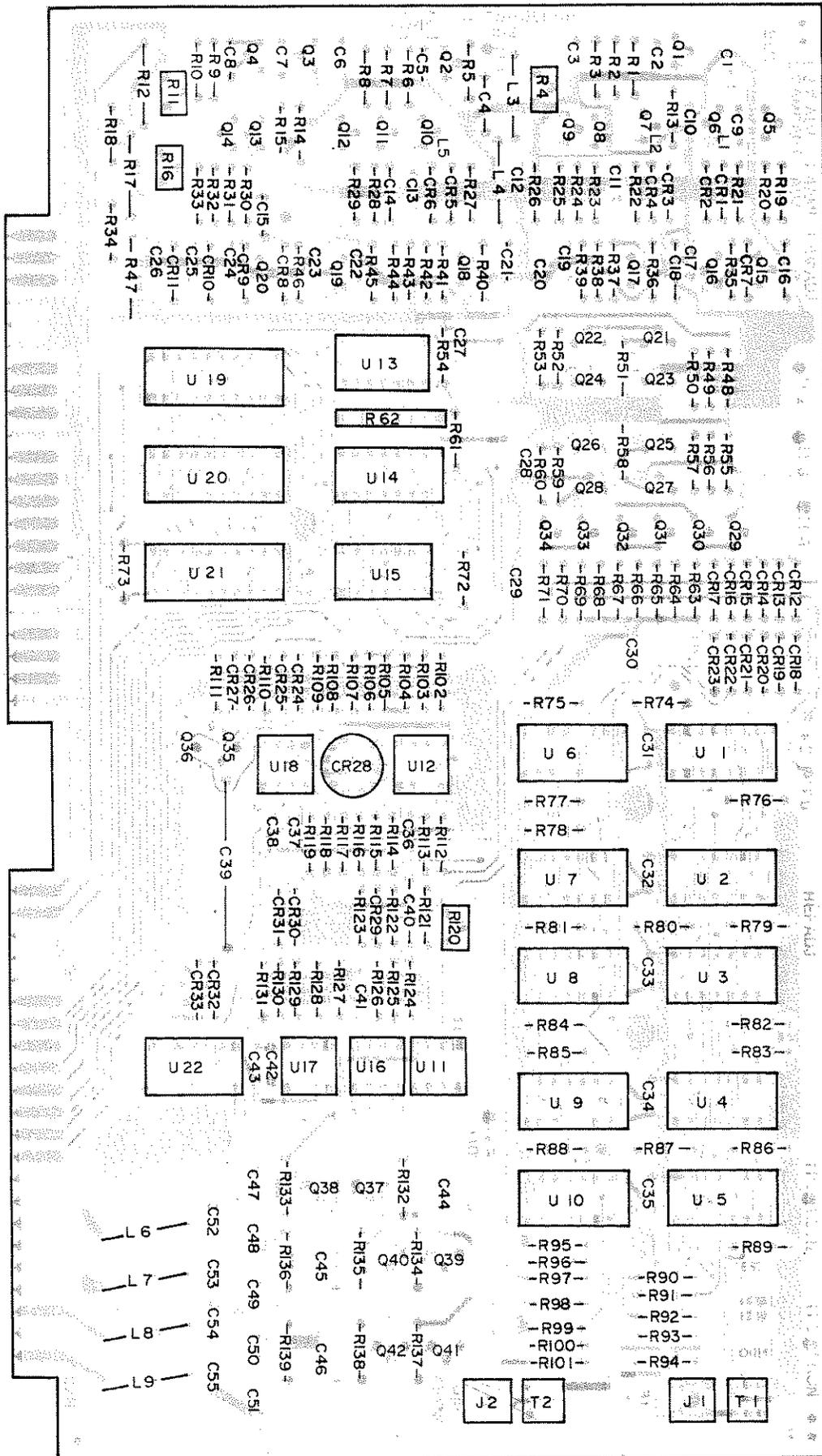


Figure 8-54. A5 A-D Converter Board Assembly Component Locations.

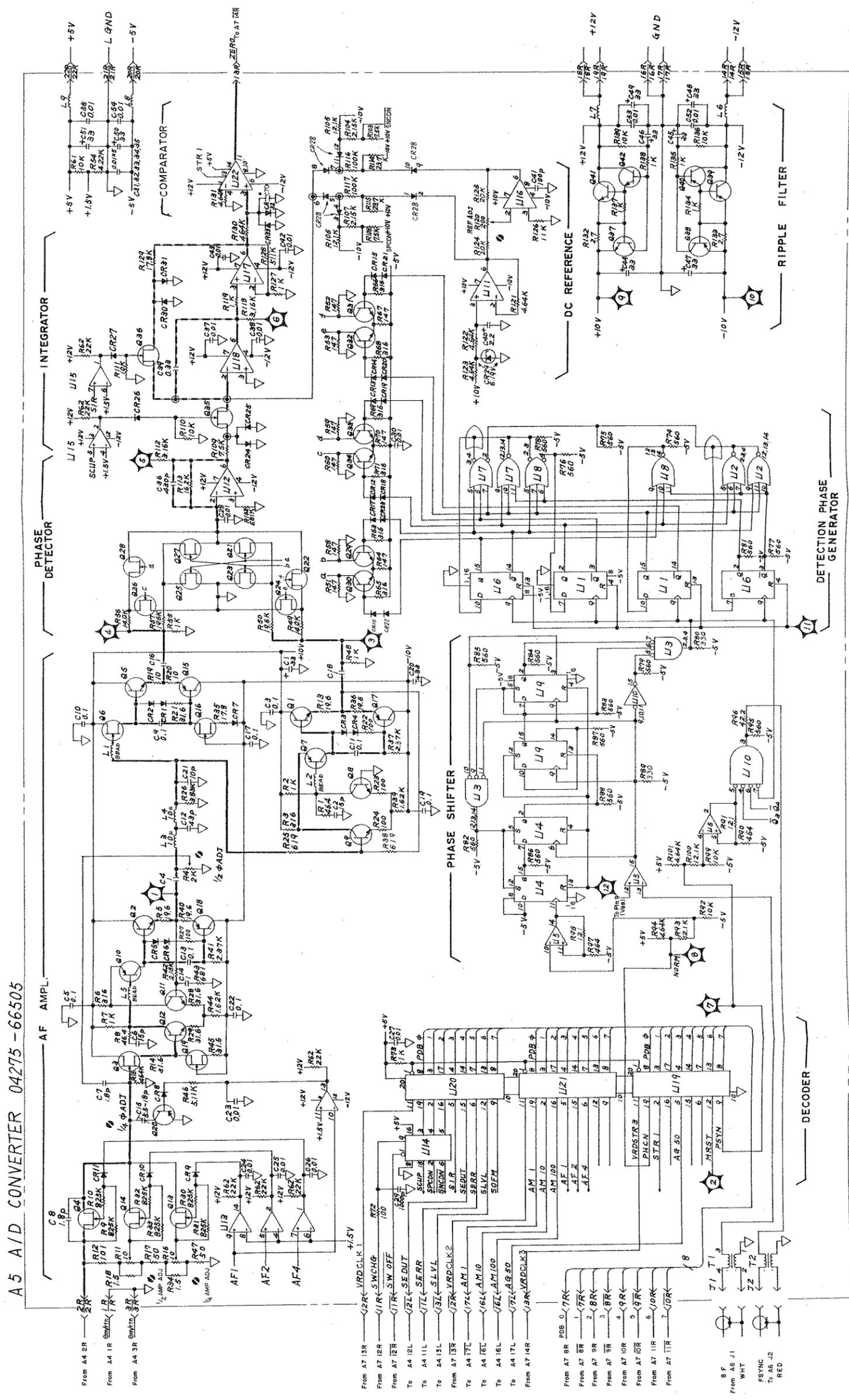


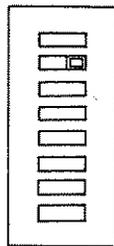
Figure 8-55. A5 A-D Converter Board Assembly Schematic Diagram.

A6 Board Troubleshooting Flow Diagram Notes.

1. A6U16 control input logic (at pins 7 and 9) is given in the table below:

| Test frequency | U16 pin 7 | U16 pin 9 |
|--|-----------|-----------|
| 10 kHz | H | H |
| 20 kHz, 40 kHz (30 kHz, 50 kHz) and 100 kHz | L | H |
| 200 kHz, 400 kHz (300 kHz, 500 kHz) and 1 MHz | H | L |
| 2 MHz, 4 MHz (3 MHz, 5 MHz) and 10 MHz | L | L |

2. To facilitate checking operation of A6U5 decoder, set DSA switch (A9S1) on A9 board as illustrated below:



Set second bit switch to on
and the others to off.

Check that periodic pulse waveforms appear at U5 output pins.

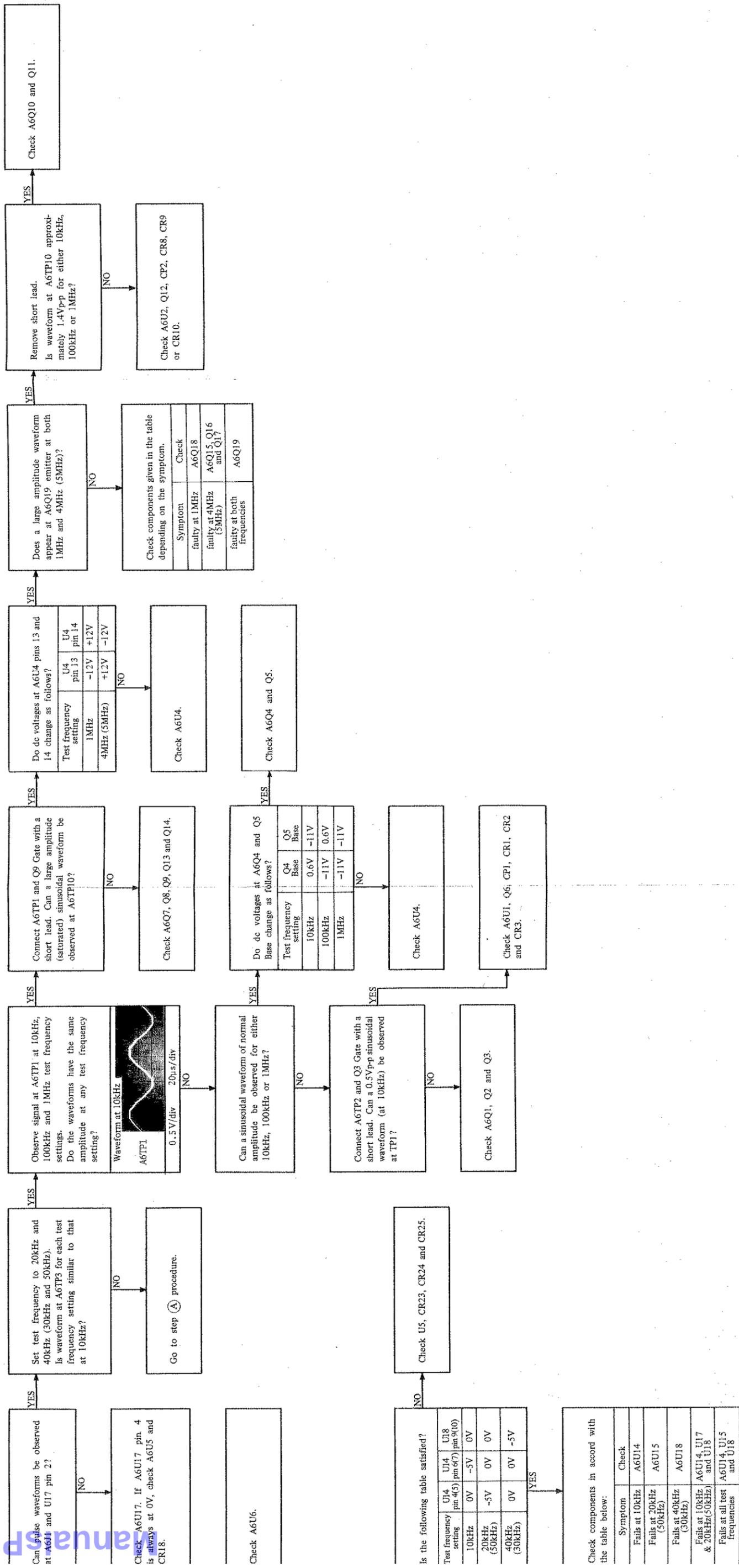


Figure 8-56. A6 Oscillator Board Troubleshooting Tree.

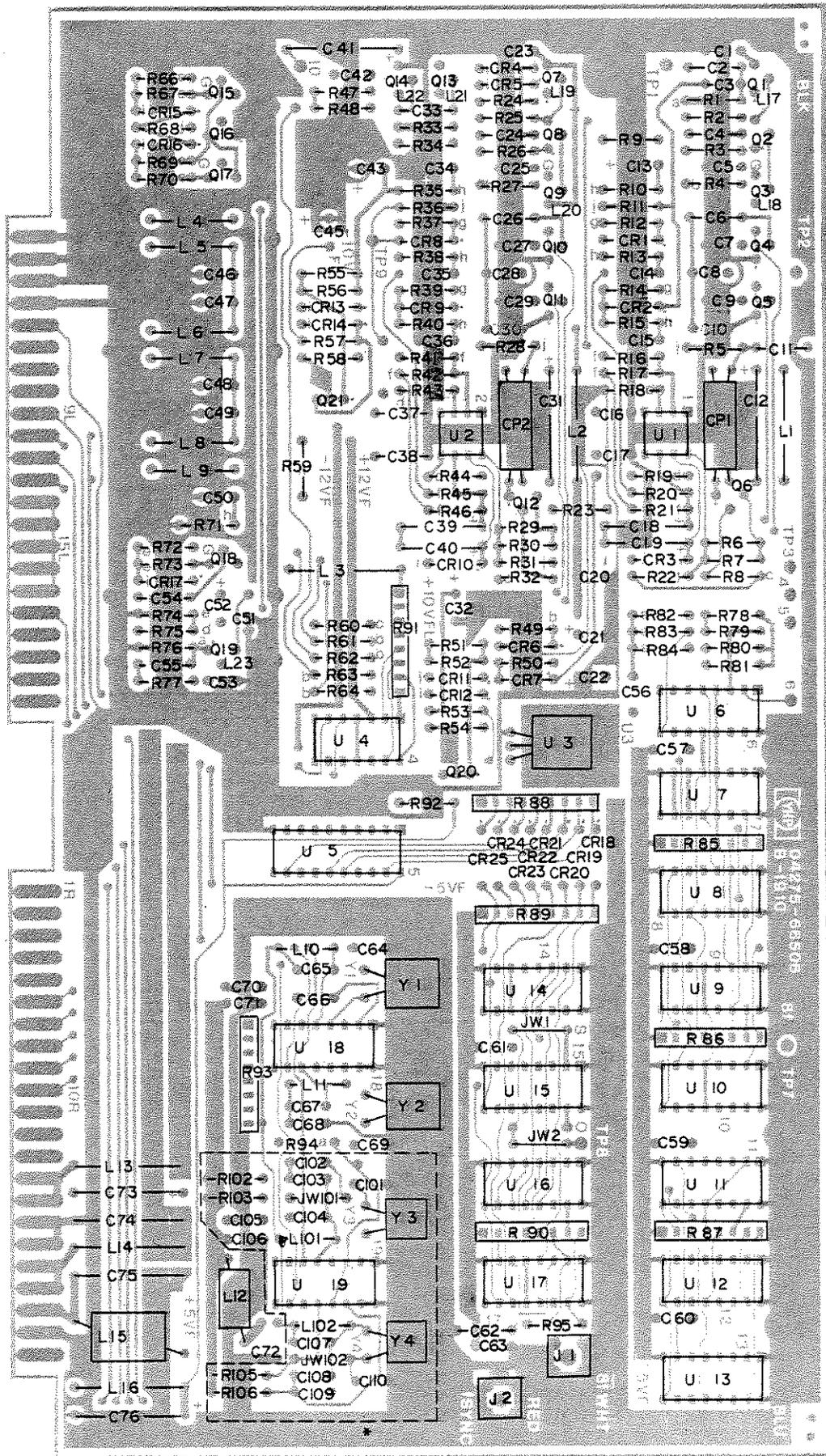


Figure 8-57. A6 Oscillator Board Assembly Component Locations.

Signature Connections Window (+5V): U216

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|---------------------|--|--|---|--|
| DSA- 2 PIA/LATCH | A9Tp-13  | A9Tp-13  | A9Tp-7  | OFF  ON |

Signature Connections Window (+5V): UH5U

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|--------|--|--|---|--|
| DSA- 3 | A9Tp-13  | A9Tp-13  | A9Tp-7  | OFF  ON |

Other Settings:

- Remove A6 ASSY.
- Connect TP12 to GRD with shorting clip.
- Connect TP20 to TP23 with shorting clip.
- Remove A7W4 one side.
- Remove A7U14 from the socket.

Signature Connections Window (+5V): 8COA

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|----------------------------|--|--|---|--|
| DSA- 4 TIMER COUNTER | A9Tp-13  | A9Tp-13  | A9Tp-7  | OFF  ON |

Other Settings:

- Remove A6 ASSY.
- Connect TP12 to GRD with shorting clip.
- Connect A7TP2 to A7TP4 with shorting clip.
- Remove A7U14 from the socket.

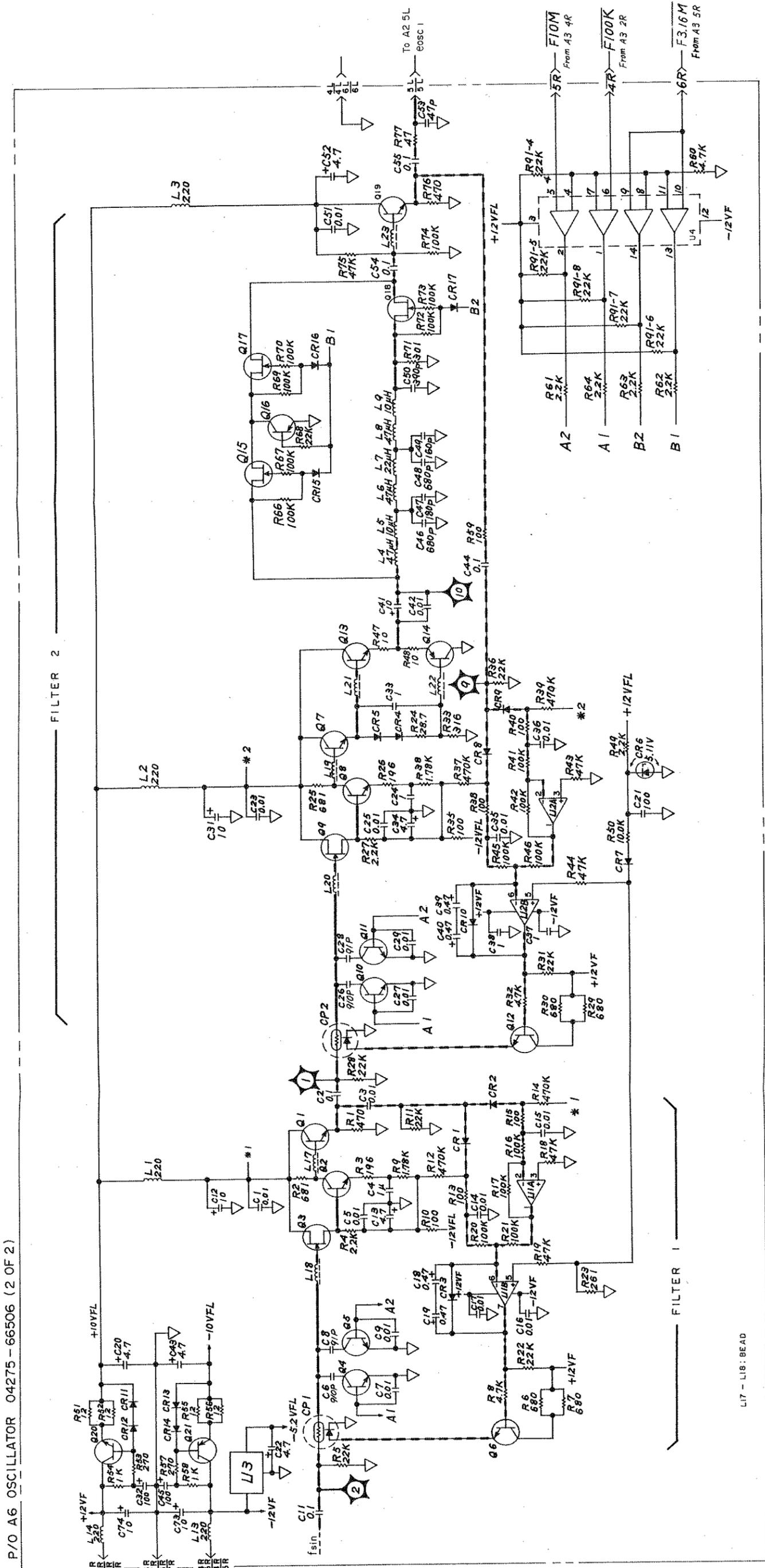
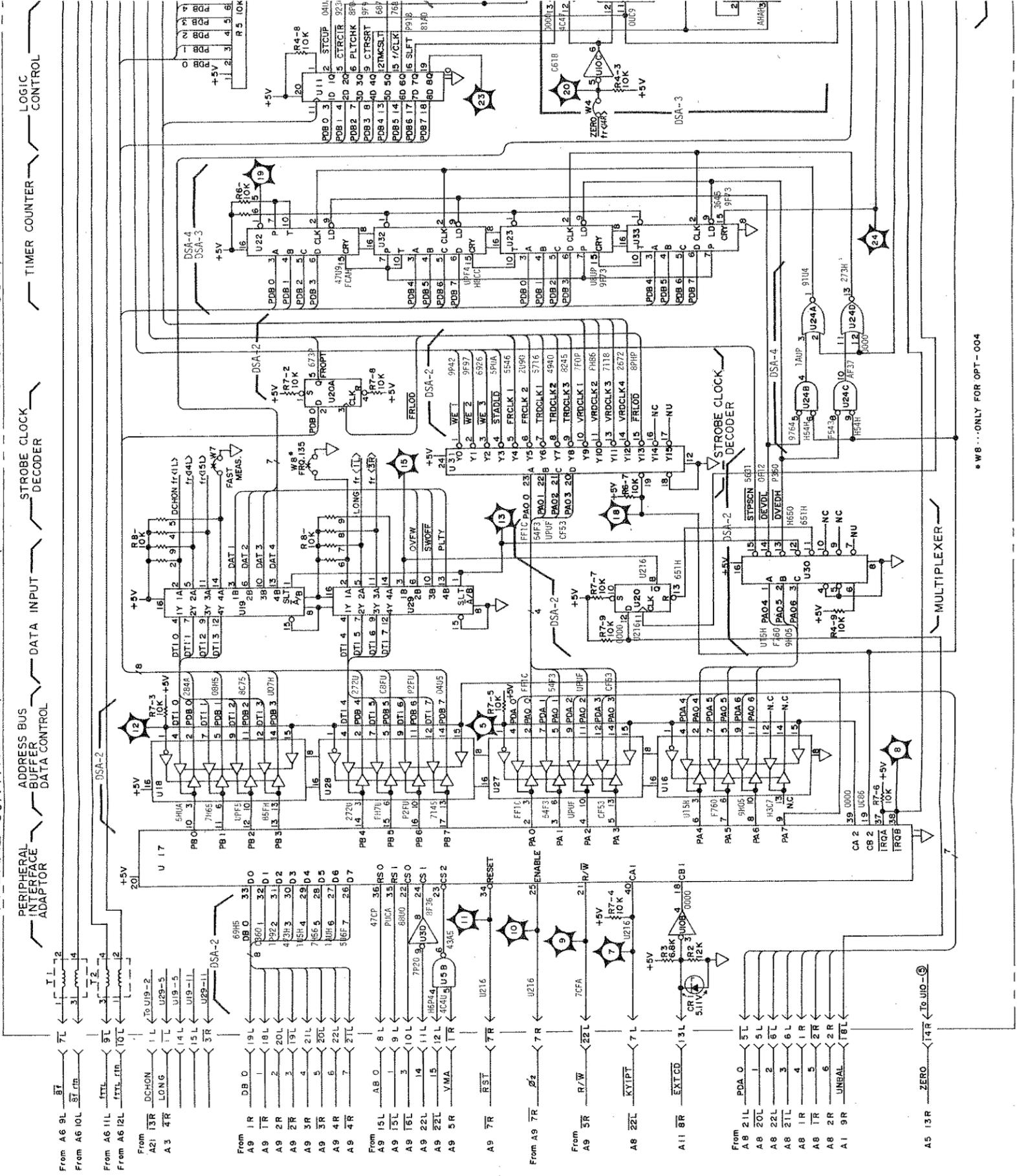


Figure 8-58(B). A6 Oscillator Board Assembly Schematic Diagram (Sheet 2 of 2).

A7 PERIPHERAL CONTROL ASSY 04275-66507 (04275-66537 FOR OPT-004)



*W8...ONLY FOR OPT-004

PERIPHERAL CONTROL ASSY 04275-66507 (04275-66537 FOR OPT-004)

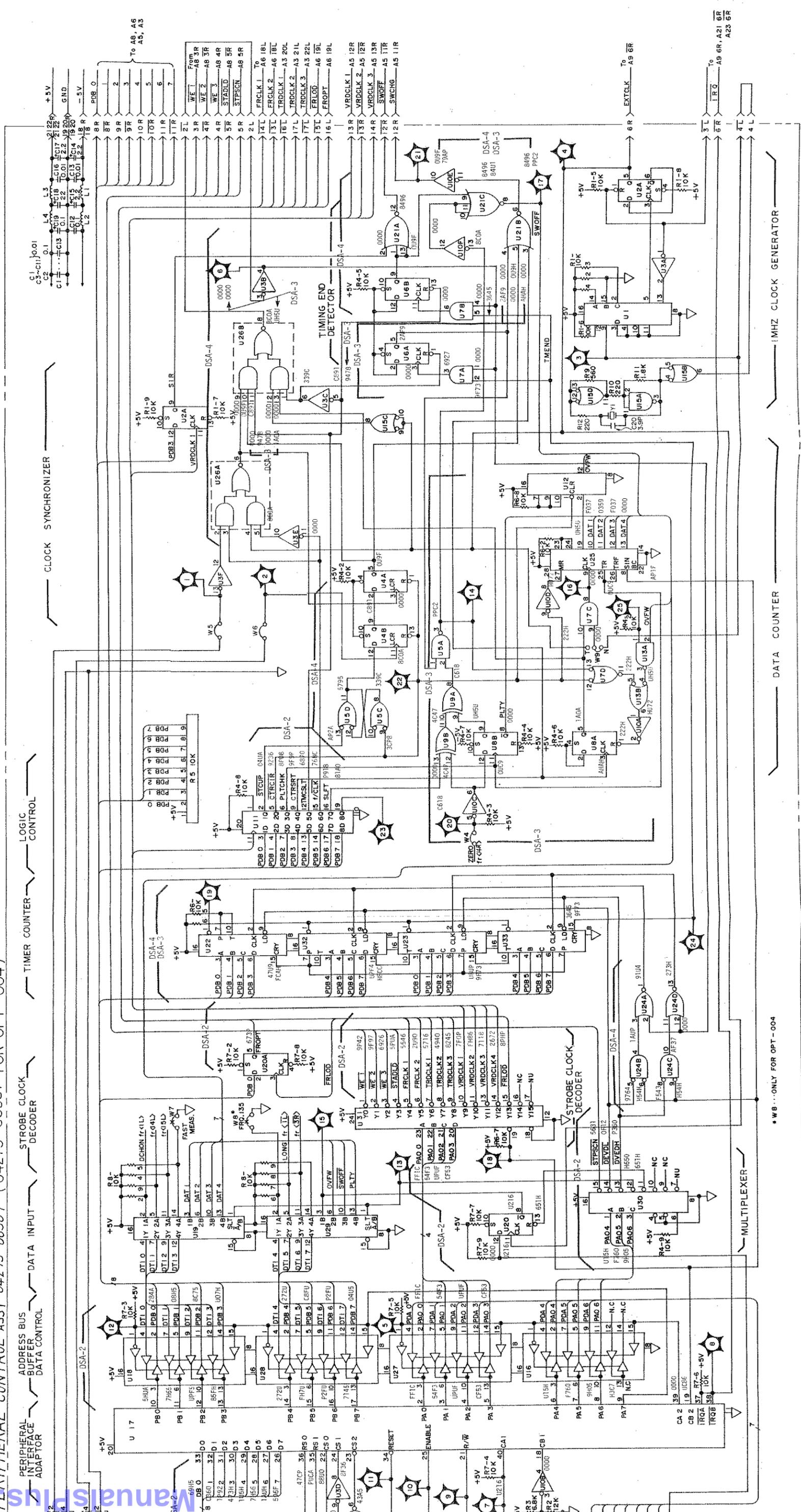


Figure 8-60. A7 Peripheral Control Board Assembly Schematic Diagram.

Signature Connections Window (+5V) : 7UUP

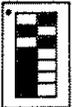
| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|---------------|--|--|---|--|
| DSA- 6 KEY | A9Tp-13  | A9Tp-13  | A9Tp-7  | OFF  ON |

Other settings:

Set A8S1-B switch to ON.

Observe respective signatures at A8TP1
for every key on front panel (push in turn).

Signature Connections Window (+5V) : 7UUP

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|-------------------|--|--|---|--|
| DSA- 7 DISPLAY | A9Tp-13  | A9Tp-13  | A9Tp-7  | OFF  ON |

Other Settings:

Set A8S1-B switch to ON.

Disconnect one side of A8W1.

← 7R

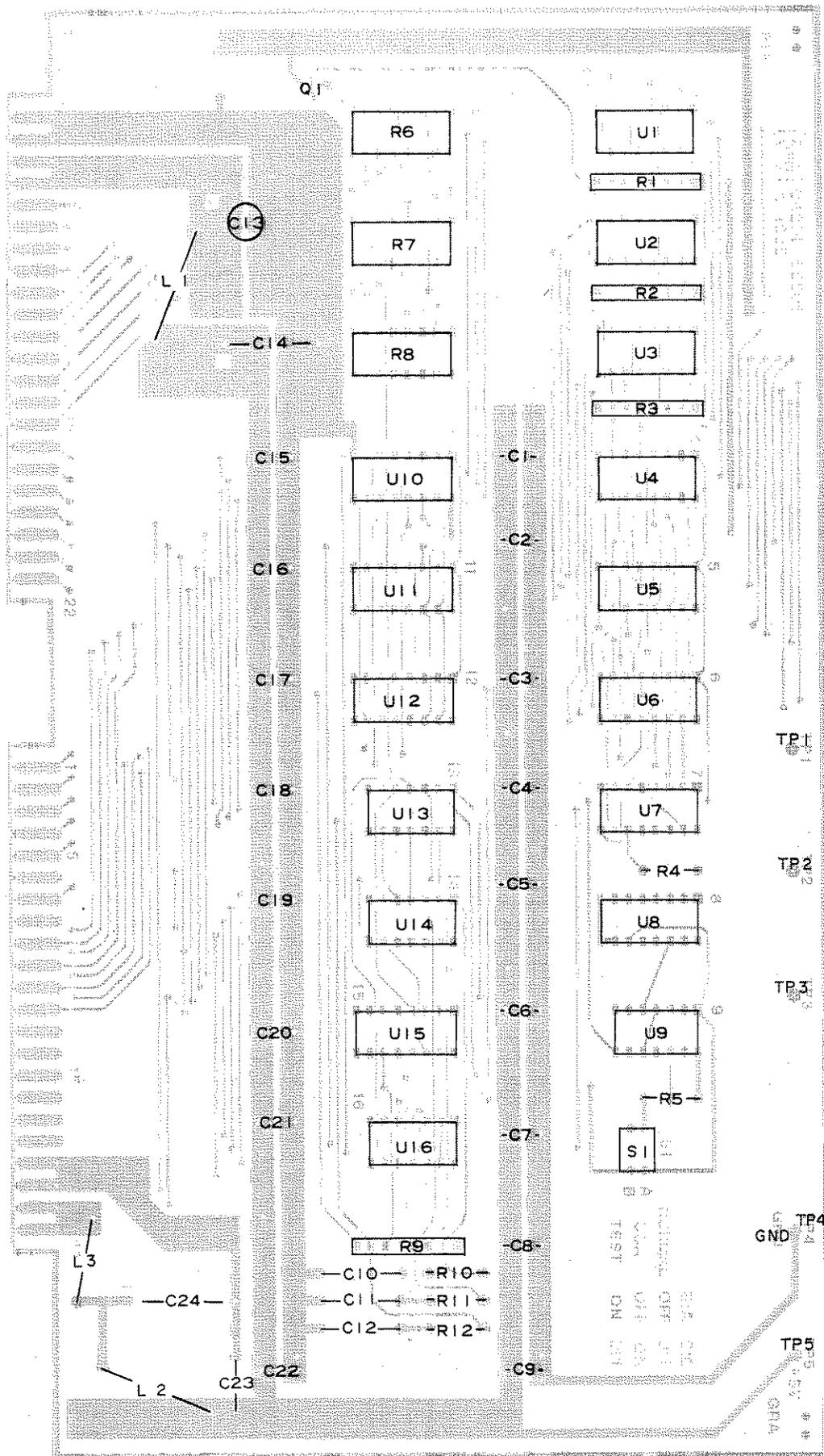


Figure 8-61. A8 Display Control Board Assembly Component Locations.

A8 DISPLAY & KEY CONTROL ASSY 04274-66508

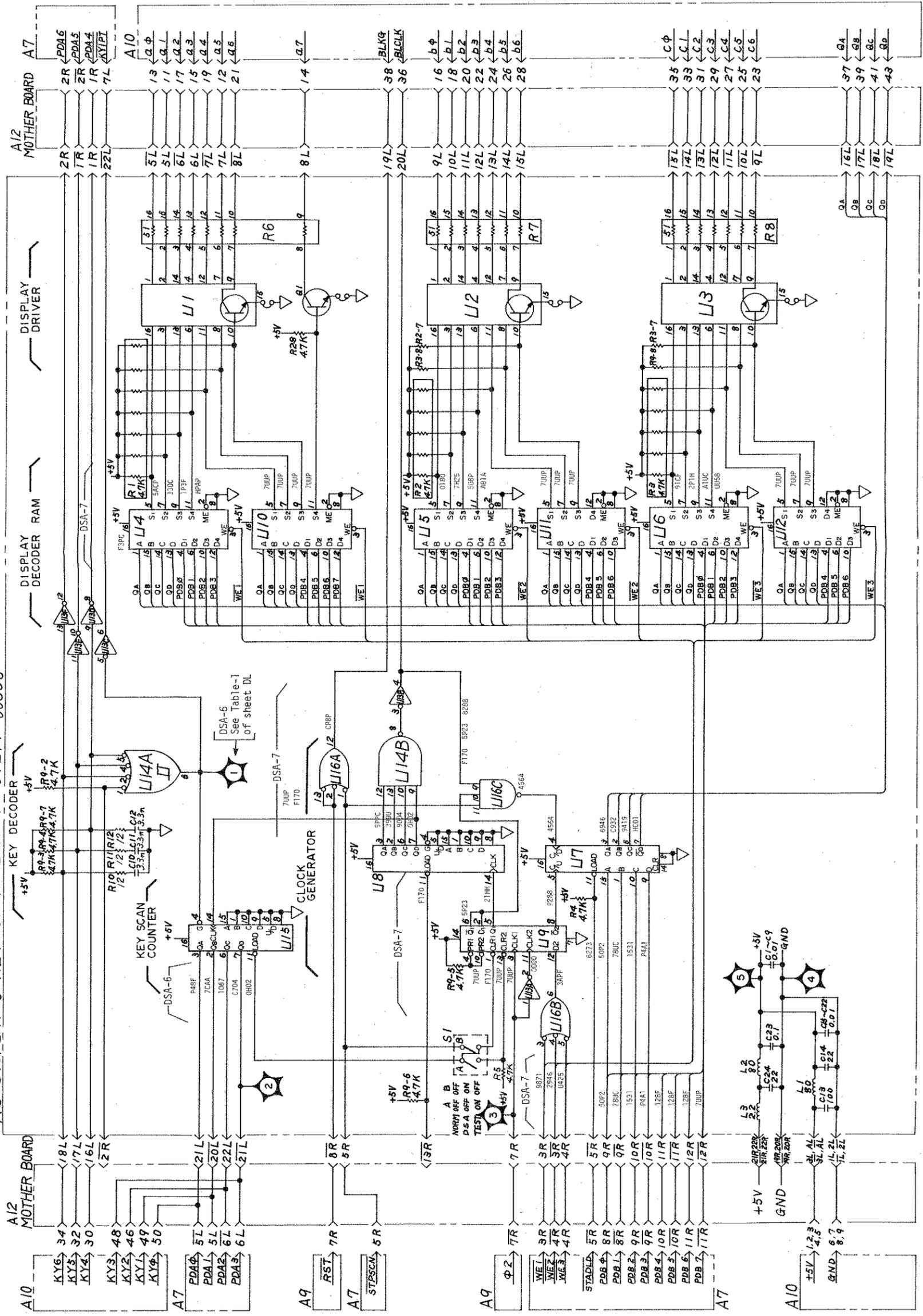


Figure 8-62. A8 Display Control Board Assembly Schematic Diagram.

This table can be used to check signatures at A9U1 thru A9U10 ROM's. Signature test point is established at input of Data Buffer (pins 8 thru 6 of A9U31 and A9U32) instead of the respective ROM outputs (A9U1 thru A9U10). This signature list can be used for units with its serial number suffixes of -00266 and above.

For other instruments whose serial number suffixes are earlier than 00266, check that unstable signature display appears or that output states of these ROM's pull up and pull down. If you find above states active in earlier instruments, the program contents in these ROM may be alive.

| TEST PIN NO | DSA NAME | | ROM TEST NO. / POINT | DSA-12 | DSA-14 | DSA-15 | DSA-16 | DSA-17 | DSA-13 |
|-------------|-----------|------|----------------------|--------|--------|--------|--------|--------|--------|
| | UT | A9U1 | | | | | | | |
| DB0 | UT pin-24 | A9U1 | 755U | A9U1 | A9U3 | P254 | A9U5 | A9U7 | A9U10 |
| DB1 | U31 pin-3 | | 808I | 42P2 | 7994 | 264C | P254 | OH5H | 826P |
| DB2 | pin-4 | | 60A9 | 9949 | 307F | 08CA | U02C | HAUH | UUPA |
| DB3 | pin-5 | | 11C6 | 8UH8 | HPF4 | 9FBF | 8102 | A63F | |
| DB4 | pin-6 | | P54P | P909 | 379A | CPIU | 741F | 3094 | |
| DB5 | U32 pin-3 | | C375 | 8FU9 | 2U43 | 5H23 | A2H2 | 565C | |
| DB6 | pin-4 | | 615C | F854 | 5410 | U899 | 2UHU | 501H | |
| DB7 | pin-5 | | P3CU | 6PF8 | 69HH | 89PP | 3265 | 39AT | |
| | pin-6 | | AUOH | 052P | OP76 | FP5F | 52AC | F454 | |

Signature Connections Window (+5V): CCC3

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|--------|---------|---------|--------|-----------|
| DSA-10 | A9Tp-13 | A9Tp-13 | A9Tp-7 | OFF |
| IRQ | | | | ON |

Signature Connections Window (+5V): P254

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|----------|----------|---------|--------|-----------|
| DSA-14 | A9U16-10 | A9U16-7 | A9Tp-6 | OFF |
| NOP (U1) | | | | ON |

Signature Connections Window (+5V): 0003

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|-------------|--------|--------|--------|-----------|
| DSA-11 | A9Tp-3 | A9Tp-3 | A9Tp-6 | OFF |
| NOP ADDRESS | | | | ON |

Signature Connections Window (+5V): P254

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|----------|----------|---------|--------|-----------|
| DSA-15 | A9U16-11 | A9U16-7 | A9Tp-6 | OFF |
| NOP (U3) | | | | ON |

Signature Connections Window (+5V): 755U

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|-------------|----------|---------|--------|-----------|
| DSA-12 | A9U27-11 | A9U16-5 | A9Tp-6 | OFF |
| NOP (UT~U7) | | | | ON |

Signature Connections Window (+5V): P254

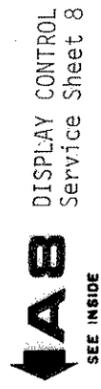
| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|----------|----------|----------|--------|-----------|
| DSA-16 | A9U16-13 | A9U16-10 | A9Tp-6 | OFF |
| NOP (U5) | | | | ON |

Signature Connections Window (+5V): 826P

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|-----------|---------|----------|--------|-----------|
| DSA-13 | A9U22-9 | A9U10-20 | A9Tp-6 | OFF |
| NOP (U10) | | | | ON |

Signature Connections Window (+5V): P254

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|----------|----------|----------|--------|-----------|
| DSA-17 | A9U16-15 | A9U16-12 | A9Tp-6 | OFF |
| NOP (U7) | | | | ON |



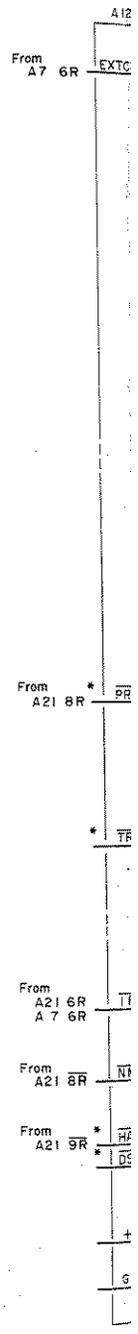
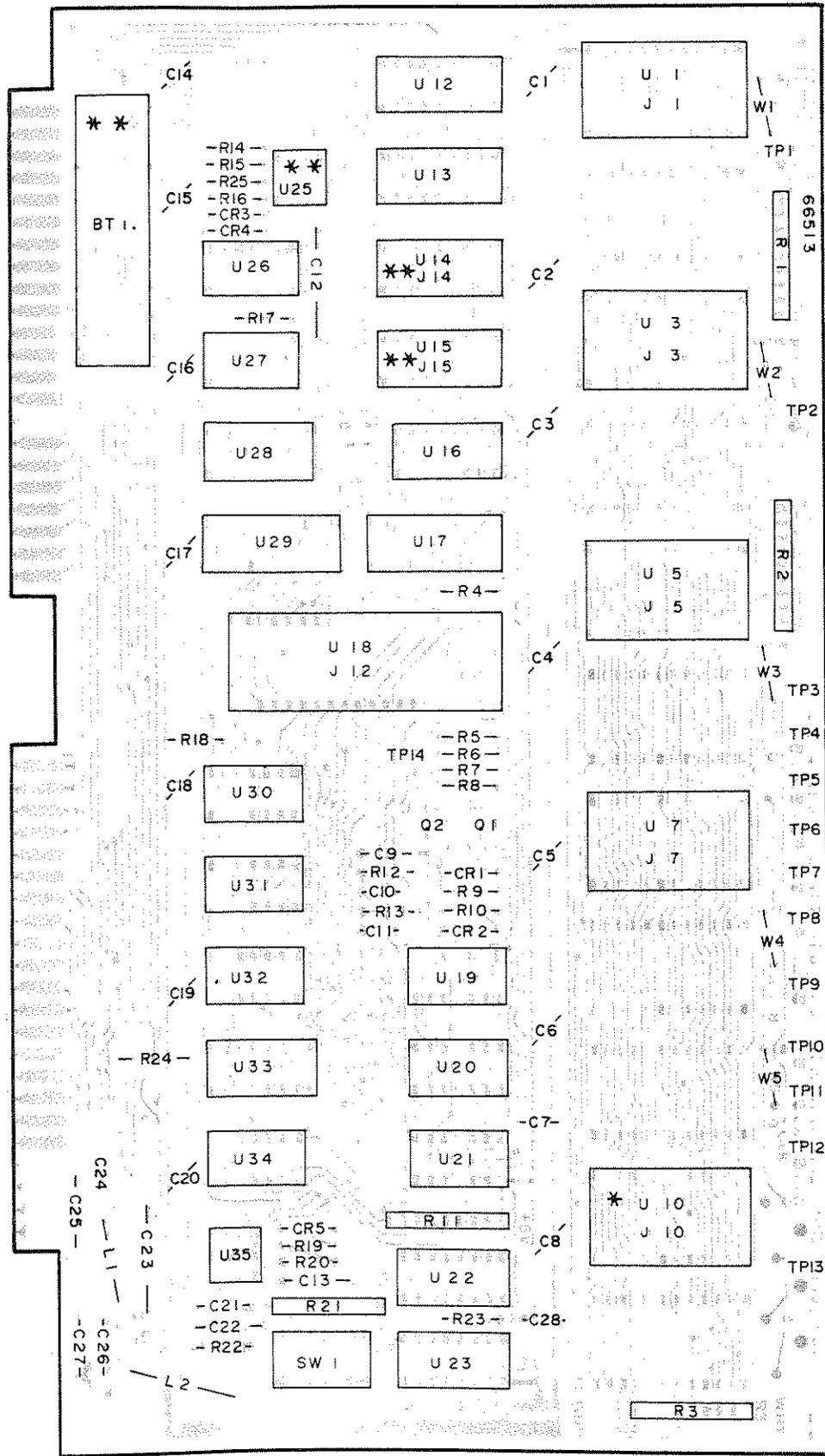


Figure 8-63. A9 Microprocessor Unit Board Assembly Component Locations.

A9 MPU ASSY 04275-66513 (OPT 003-66514) (OPT IO1-66517) (OPT 003+OPT IO1-66518)

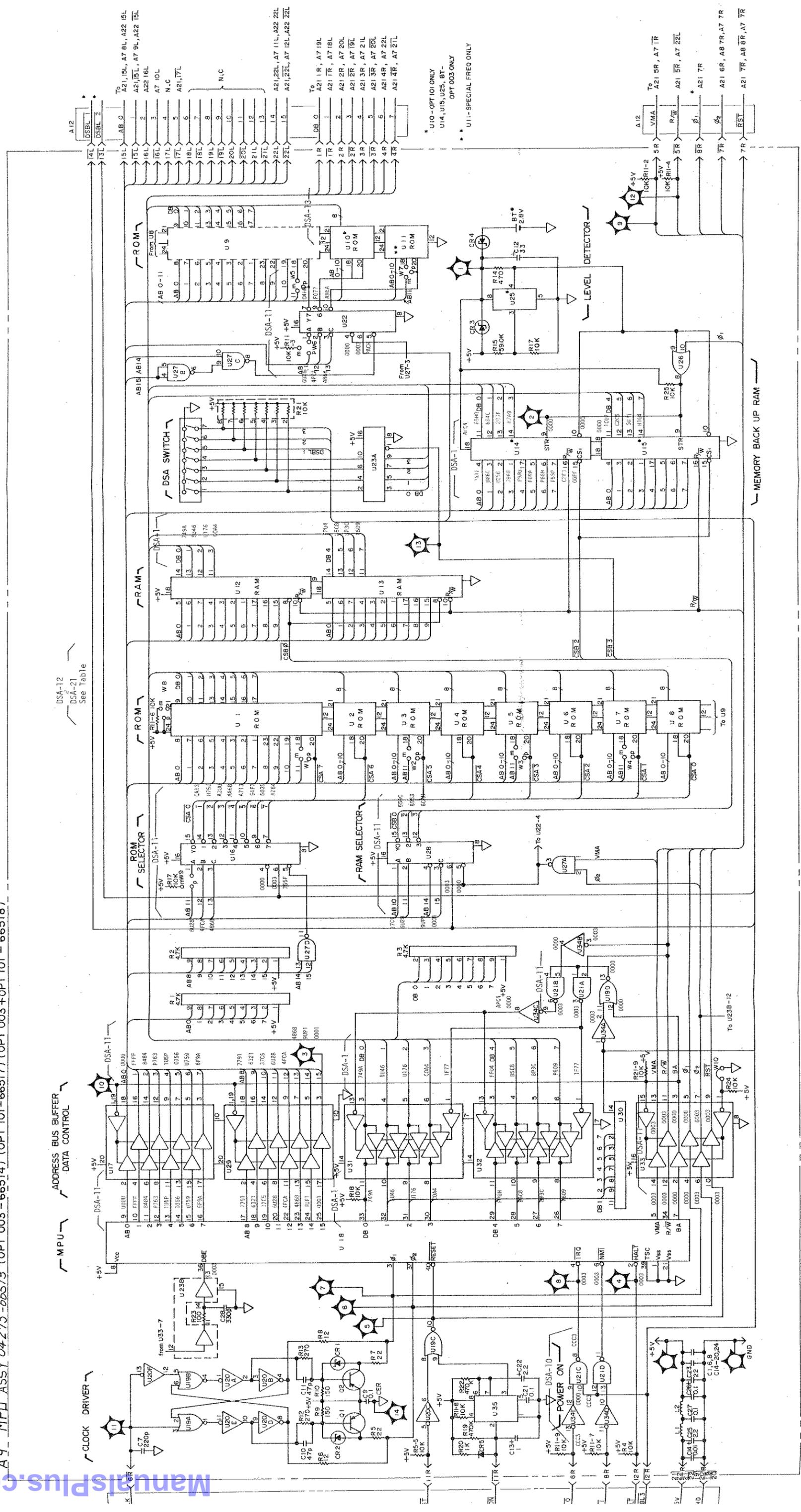


Figure 8-64. A9 Microprocessor Unit Board Assembly Schematic Diagram.

Signature Connections

Window (+5V) : 7UUP

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|------------------|--|--|---|---|
| DSA-7 DISPLAY | A9Tp-13  | A9Tp-13  | A9Tp-7  | OFF  ON |

Other Settings:

Set A8S1-B switch to ON.

Disconnect one side of A8W1.

A807
A811

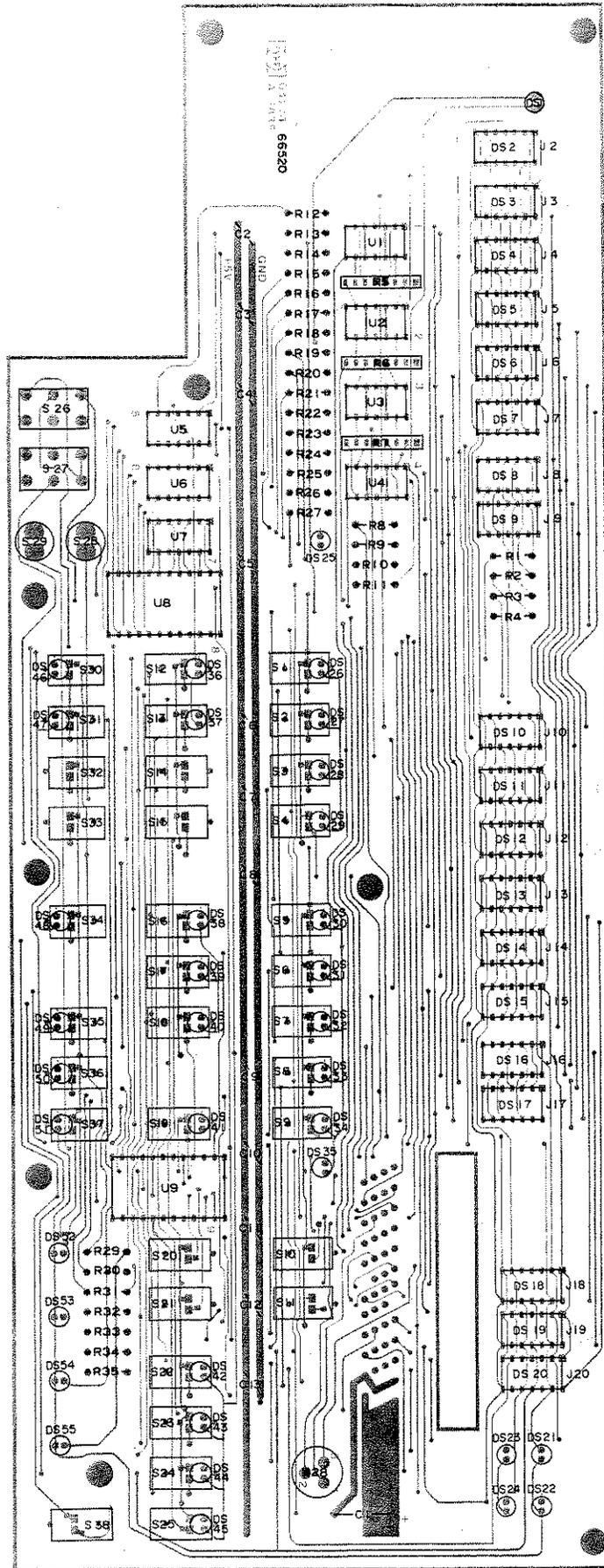


Figure 8-65. A10 Display and Keyboard Assembly Component Locations.

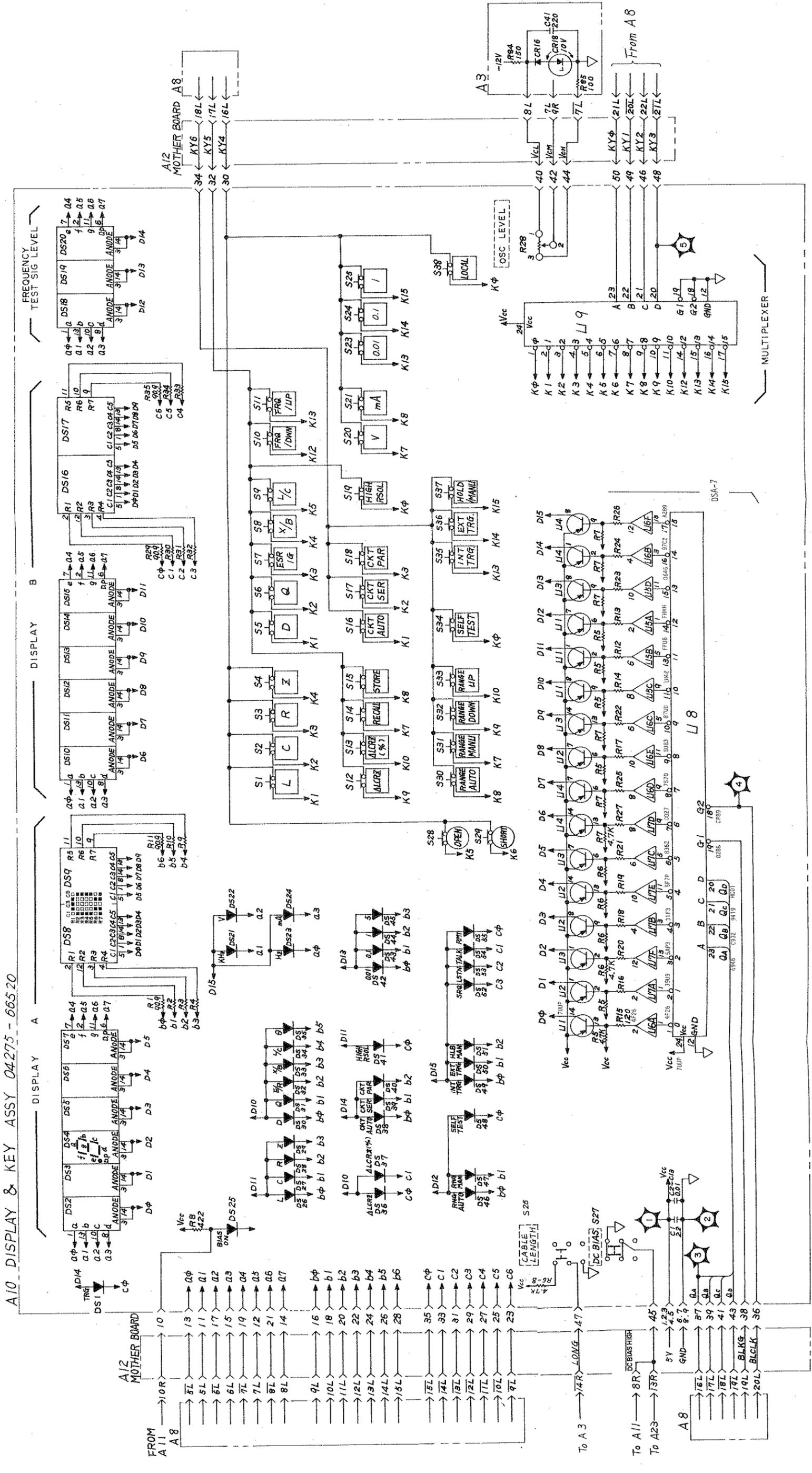


Figure 8-66. A10 Display and Keyboard Assembly Schematic Diagram.

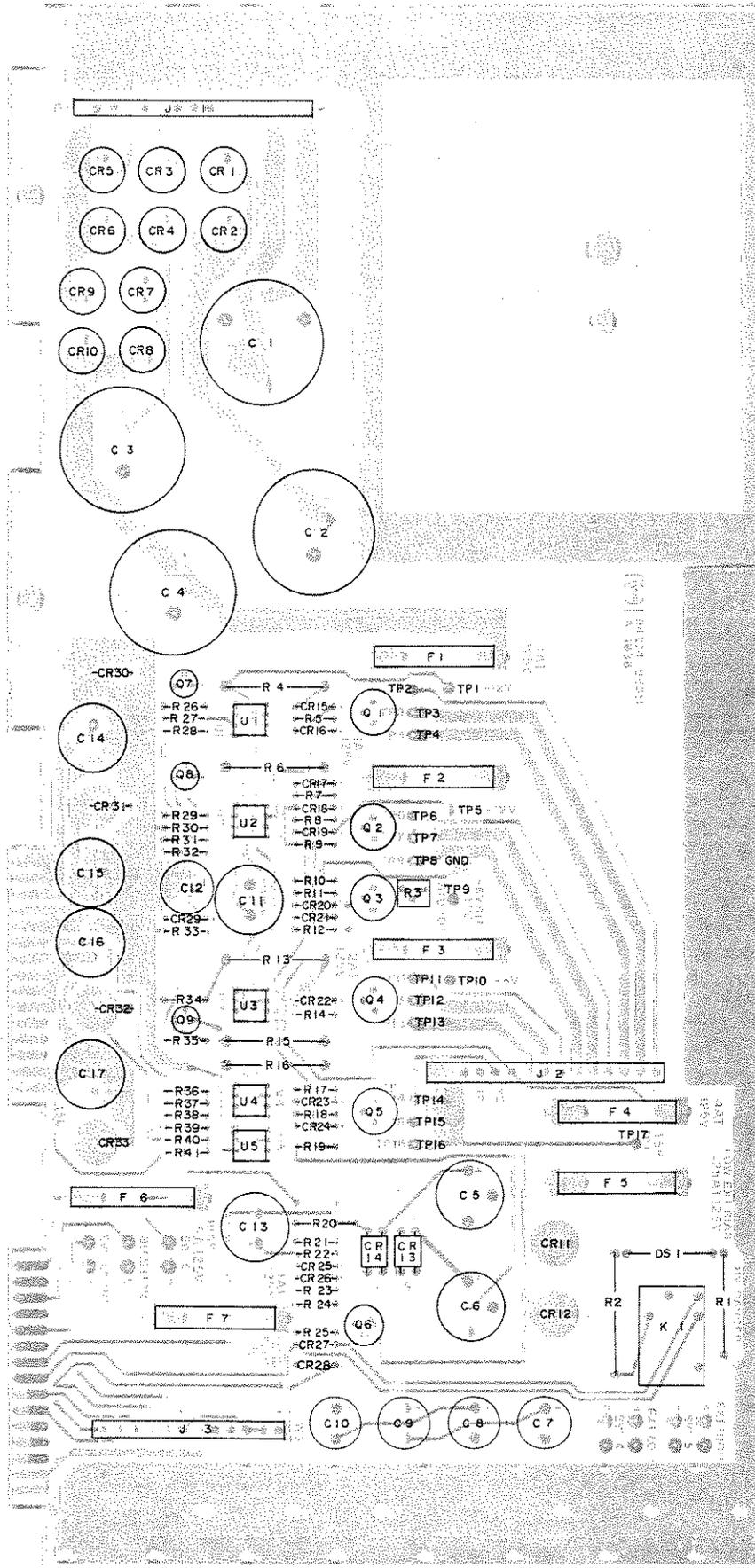


Figure 8-67. All Power Supply Board Assembly Component Locations.

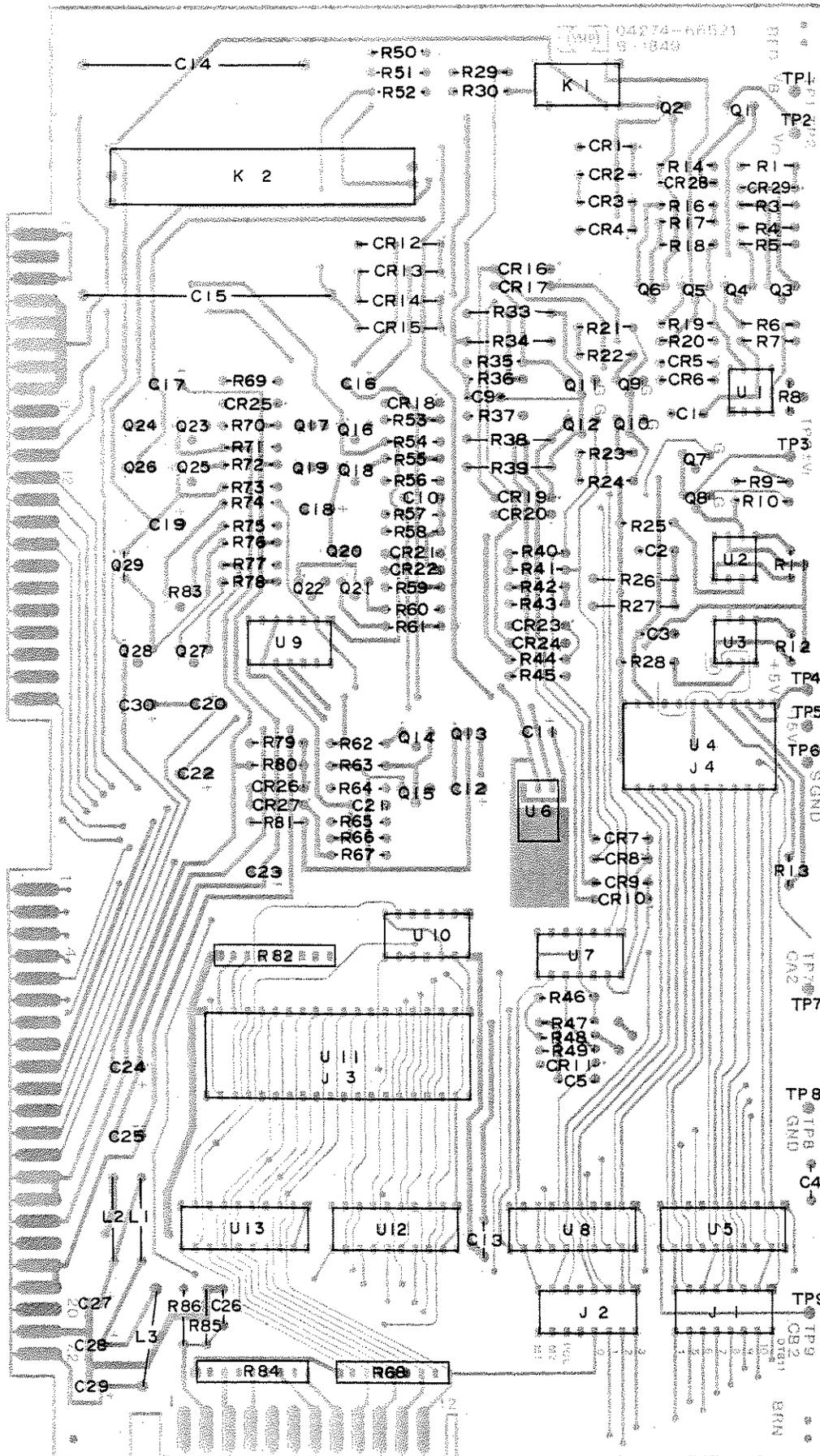
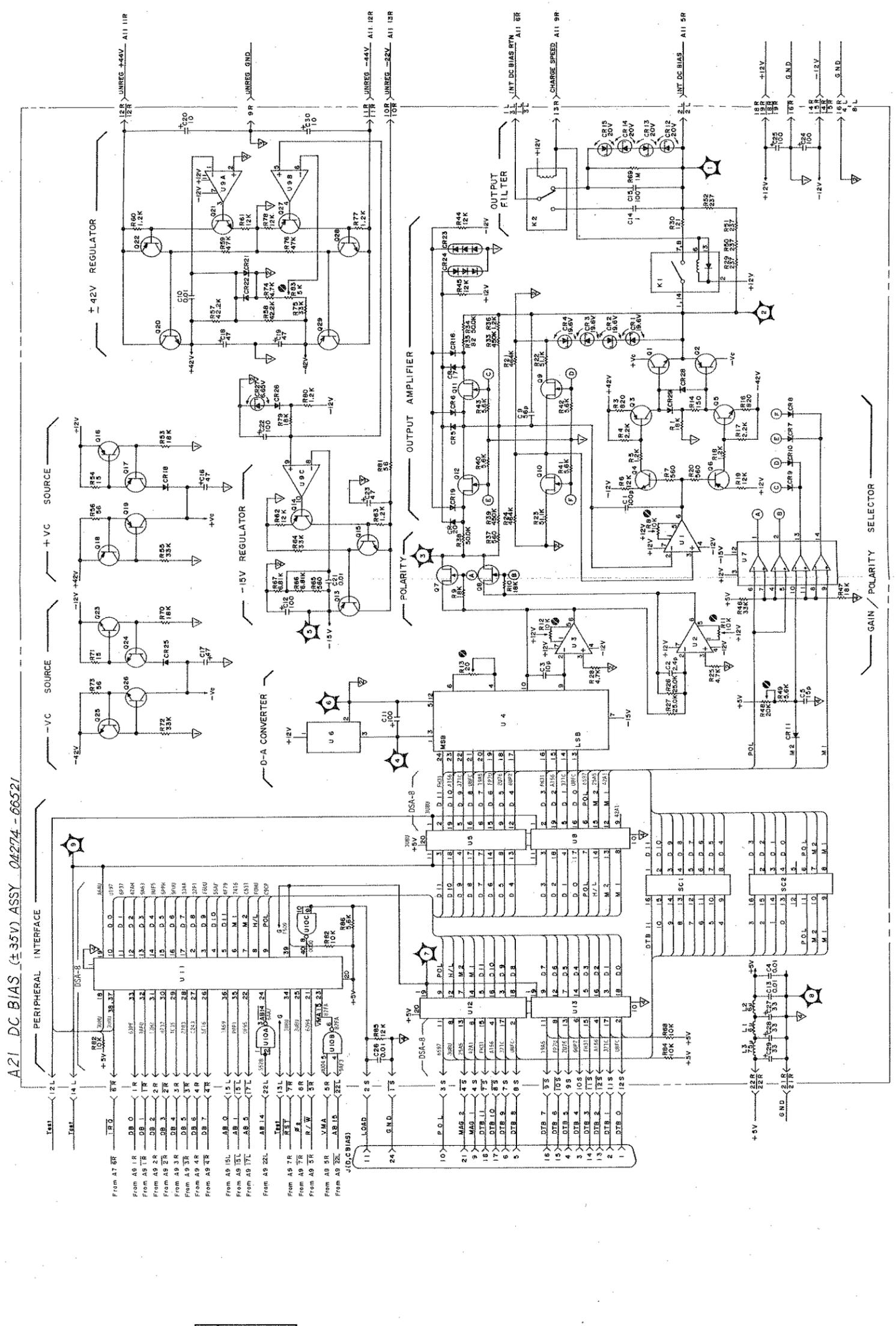


Figure 8-69. A21 DC Bias Supply Board Assembly Component Locations.



Signature Connections Window (+5V): 3U8U

| | | | |
|---------|---------|---------|--------|
| DSA NO | START | STOP | CLOCK |
| DSA-8 | A9Tp-13 | A9Tp-13 | A9Tp-7 |
| DC-Bias | | | |

ON OFF

Other Settings:
 Connect dual in-line jumpers to A21SC1 (J1) and SC2 (J2).
 If the jumper module is not available, use a dual in-line resistor pack below 100Ω.

Figure 8-70. A21 DC Bias Supply Board Assembly Schematic Diagram.

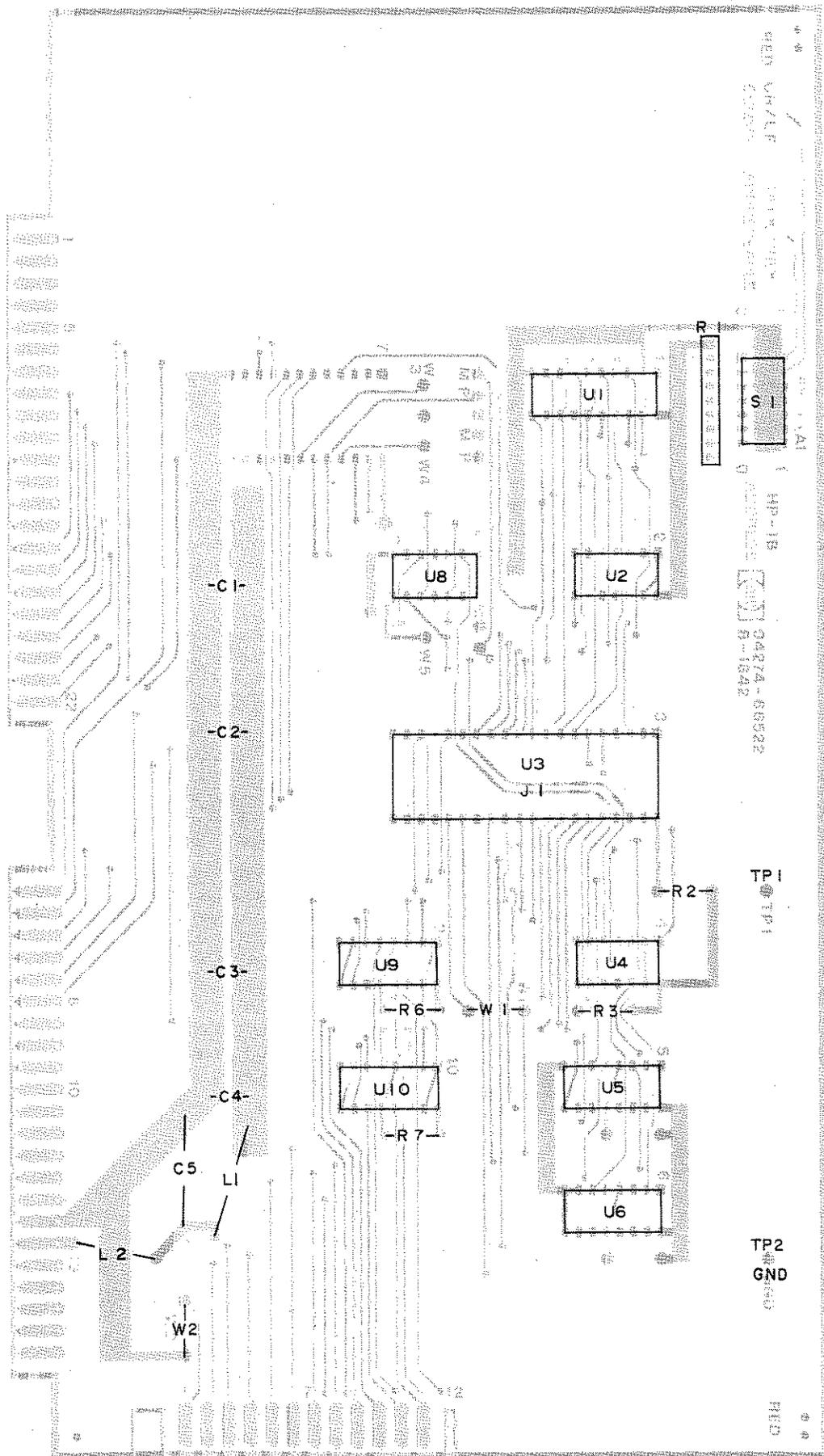
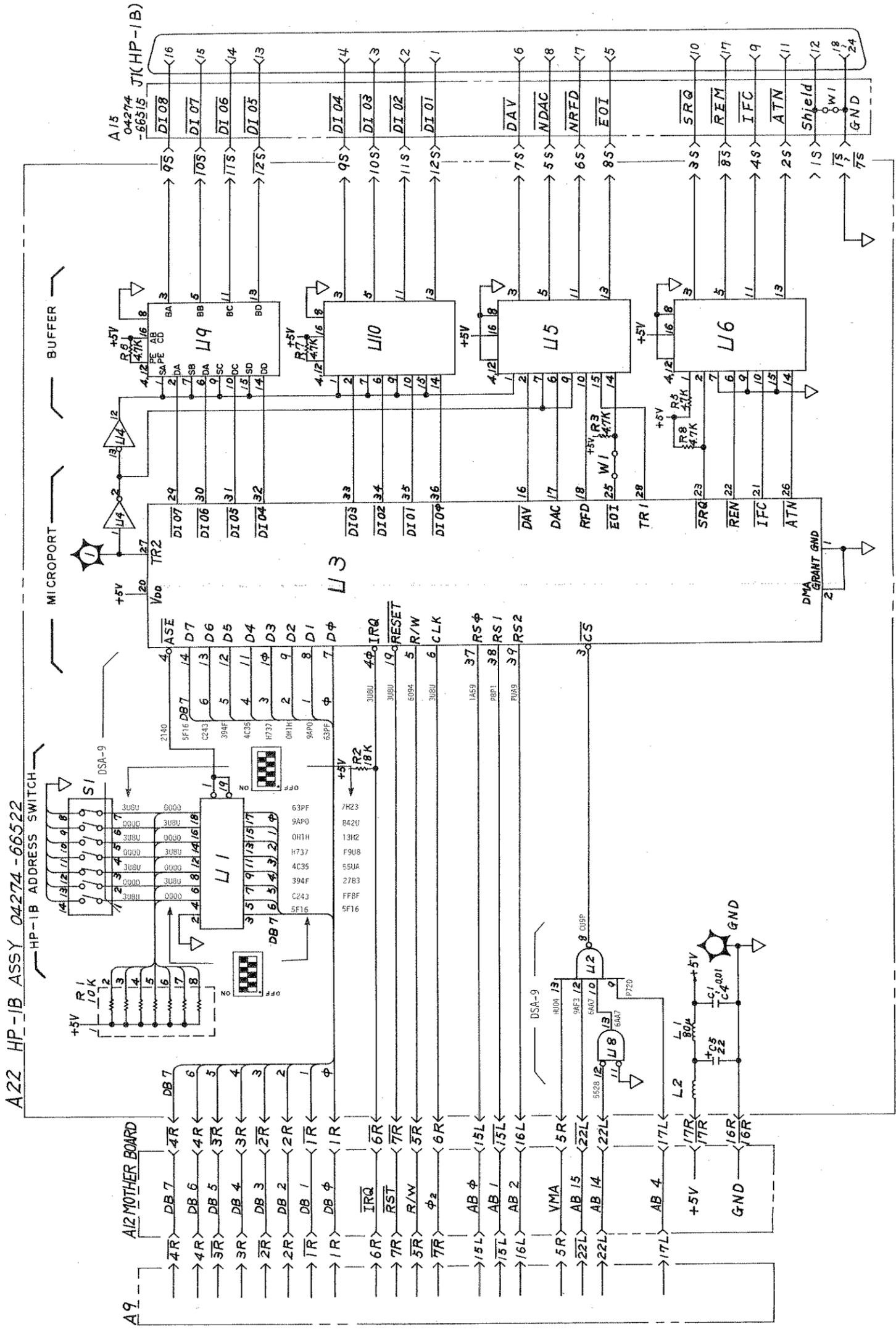


Figure 8-71. A22 HP-IB Interface Board Assembly Component Locations.

| |
|-----|
| Sig |
| DS/ |
| DS/ |
| HP- |
| Oth |



Set A22S switch (DSA-SW) as shown in schematic.

Figure 8-72. A22 HP-IB Interface Board Assembly Schematic Diagram.

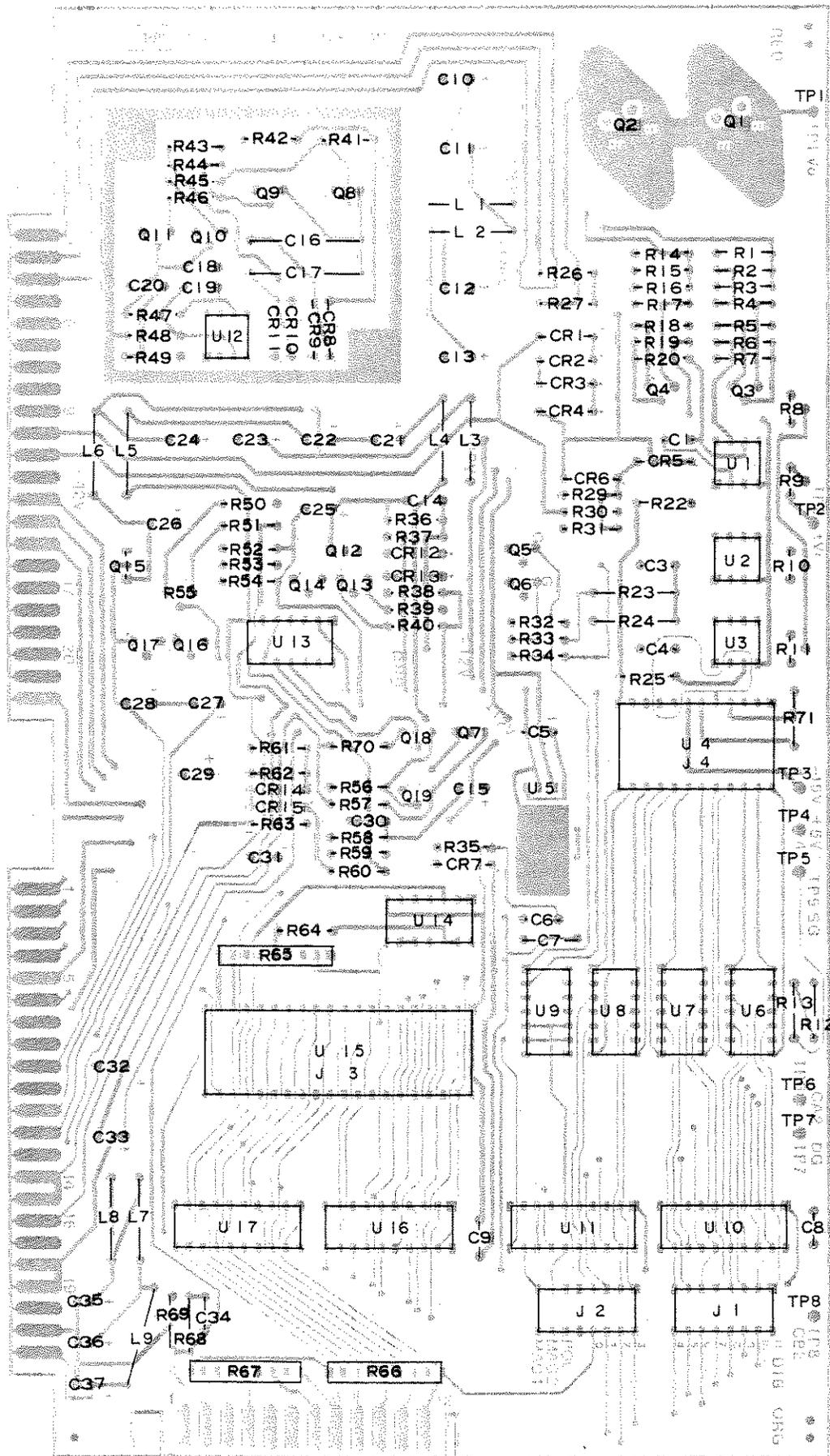


Figure 8-73. A23 DC Bias Supply Board Assembly Component Locations.

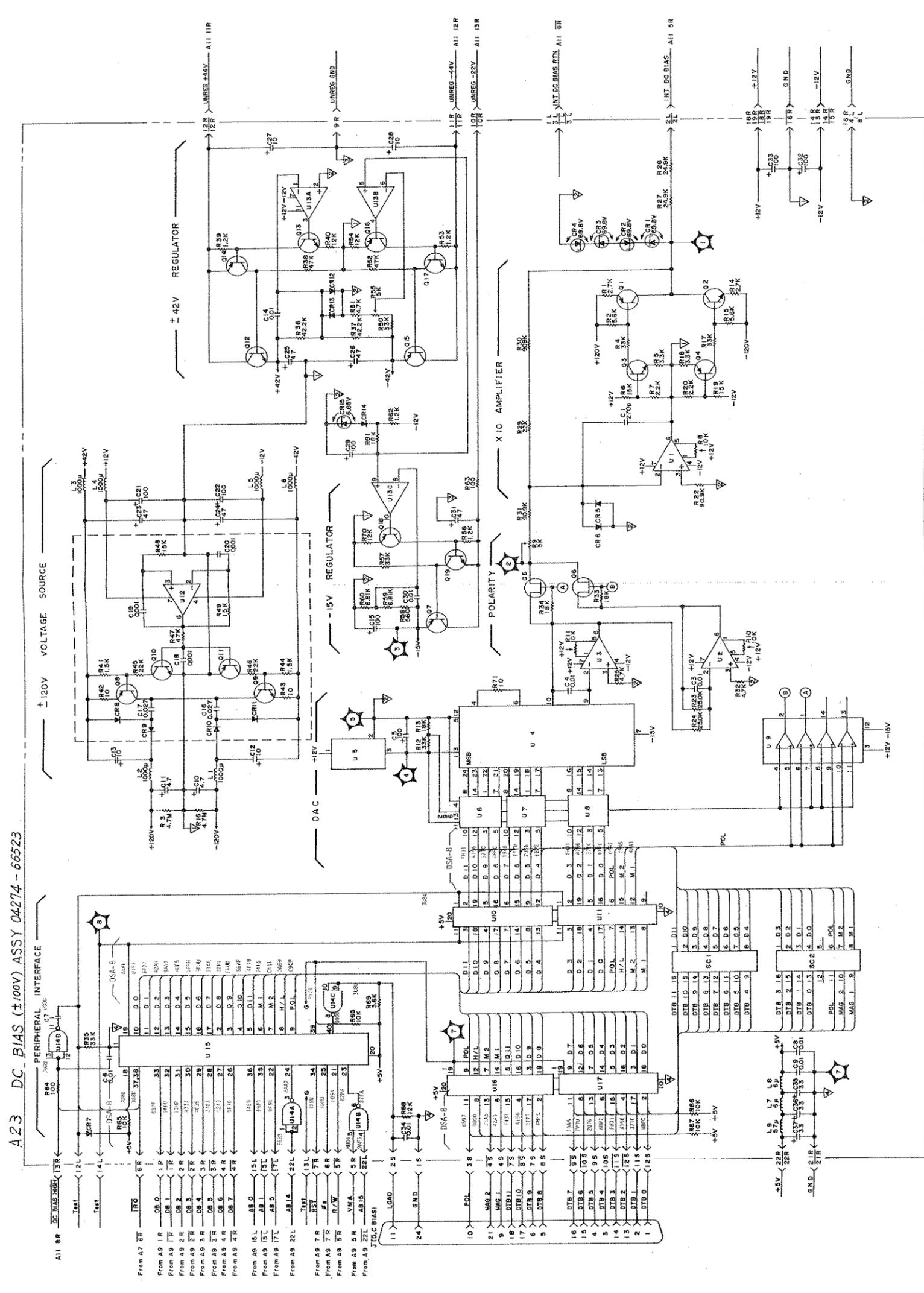


Figure 8-74. A23 DC Bias Supply Board Assembly Schematic Diagram.

Signature Connections Window (+5V): 3U8U

| DSA NO | START | STOP | CLOCK | A9 DSA-SW |
|---------|---------|---------|--------|-----------|
| DSA-8 | A9Tp-13 | A9Tp-13 | A9Tp-7 | OFF |
| DC-Bias | | | | ON |

Other Settings:
Connect a dual in-line jumper to A23C1 (J1) and SC2 (J2).
If the jumper module is not available, use a dual in-line resistor pack below 100Ω.

4275A

MULTI-FREQUENCY LCR METER

MANUAL IDENTIFICATION

Model Number: 4275A (SVC)
Date Printed: AUG. 1980
Part Number: FEB., OCT. 1981
04275-90012

This supplement contains important information for correcting manual errors and for adapting the manual to instruments containing improvements made after the printing of the manual.

To use this supplement:
Make all ERRATA corrections.
Make all appropriate serial number related changes indicated in the tables below.

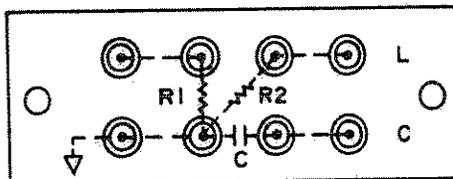
| SERIAL PREFIX OR NUMBER | MAKE MANUAL CHANGES | SERIAL PREFIX OR NUMBER | MAKE MANUAL CHANGES |
|-------------------------|---------------------|-------------------------|---------------------|
| ALL | ERRATA | 2045J00923 and above | 4 |
| ALL | 1 | 2045J01043 and above | 5 |
| 1851J00702 and above | 2 | | |
| 2016J00743 and above | 3 | | |

► NEW ITEM

ERRATA

► Page 4-16, Figure 4-6,

Change the figure of the 16074A Quasi-inductor as shown below:



NOTE

Manual change supplements are revised as often as necessary to keep manuals as current and accurate as possible. Hewlett-Packard recommends that you periodically request the latest edition of this supplement. Free copies are available from all HP offices. When requesting copies quote the manual identification information from your supplement, or the model number and print date from the title page of the manual.

Date/Div: OCT. 15, 1981/33

Page 1 of 9



Printed in Japan

▶ Page 4-24, TEST PROGRAM 1:
Change program listing as follows:

```
0: "REMOTE/LOCAL TEST":
1: dim A$(1)
2: O>A
3: rds(717)>B
4: prt "REMOTE/LOCAL TEST";spc 3
5: rem 7
6: wrt 717,"T1";ent "LISTEN=1, TALK=0, REMOTE=1",A$
7: if A$="n";1>A
8: cli 7;ent "LISTEN=0, TALK=0, REMOTE=1",A$
9: if A$="n";1>A
10: lcl 7;ent "LISTEN=0, TALK=0, REMOTE=0",A$
11: if A$="n";1>A
12: rem 717;ent " REMOTE=1",A$
13: if A$="n";1>A
14: llo 7
15: lcl 717;ent " REMOTE=0",A$
16: if A$="n";1>A
17: wrt 717,"T1";ent "LISTEN=1, TALK=0, REMOTE=1",A$
18: if A$="n";1>A
19: if A=1;prt "REMOTE/LOCAL TEST          FAIL";spc 3;jmp 2
20: prt "REMOTE/LOCAL TEST          PASS";spc 3
21: O>A
22: prt "LISTEN/TALK TEST";spc 3
23: red 717,A,B;ent "LISTEN=0, TALK=1, REMOTE=1",A$
24: if A$="n";1>A
25: wrt 717,"T1";ent "LISTEN=1, TALK=0, REMOTE=1",A$
26: if A$="n";1>A
27: if A=1;prt "LISTEN/TALK TEST          FAIL";spc 3;jmp 2
28: prt "LISTEN/TALK TEST          PASS";spc 3
29: prt "END";spc 3
30: cli 7
31: lcl 7
32: end
*3023
```

► Page 4-25, Table 4-10, Controller Instructions and Operator Responses for Test Program 1:

| Controller Instructions | | Operator Response |
|----------------------------------|-----------------------------|--|
| Displays | Printout | |
| | REMOTE LOCAL TEST | |
| LISTEN = 1, TALK = 0, REMOTE = 1 | | If 4275A HP-IB Status Indicators and Controller Display are same, press "Y"; CONTINUE " in each step. If not, press "N", CONTINUE ". |
| LISTEN = 0, TALK = 0, REMOTE = 1 | | |
| LISTEN = 0, TALK = 0, REMOTE = 0 | | |
| REMOTE = 1 | | |
| REMOTE = 0 | | |
| LISTEN = 1, TALK = 0, REMOTE = 1 | | |
| | REMOTE/LOCAL TEST T PASS | If all steps are correct, this message is output. |
| | REMOTE/LOCAL TEST T FAIL | If any step fails, this message is output. |
| | LISTEN/TALK TEST | |
| LISTEN = 0, TALK = 1, REMOTE = 1 | | If 4275A HP-IB Status Indicators and Controller Display are same, press "Y"; CONTINUE " in each step. If not, press "N", CONTINUE ". |
| LISTEN = 1, TALK = 0, REMOTE = 1 | | |
| | LISTEN/TALK TEST PASS | If both steps are correct, this message is output. |
| | LISTEN/TALK TEST FAIL | If any step fails, this message is output. |
| | END | |

Page 6-19, Table 6-3,
Change A4A2CR3 listed with part number 1901-0376 as follows:

A4A2CR4: P/N 1901-0050; DIODE-SWITCHING 80V 200MA 2NS DO-35

Change A4A2CR4 as follows:

A4A2CR5: P/N 1901-0376; DIODE-GEN PRP 35V 50MA DO-35

Change reference designation (only) of A4A2CR5 to A4A2CR6.

▶ Page 8-5, Paragraph 8-16,
Change equations 8-7, 8-10 and 8-11 as follows:

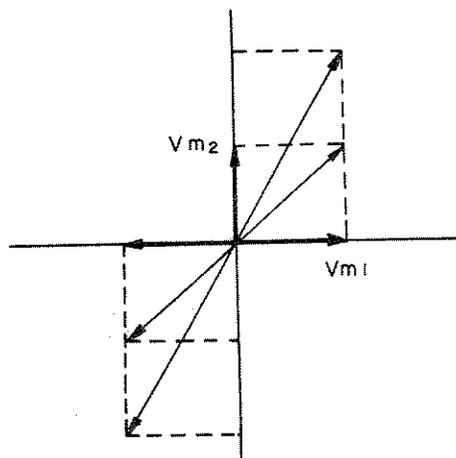
$$\left(\frac{1}{R_r}\right) \frac{E_a E_c + E_b E_d + j(E_b E_c - E_a E_d)}{E_c^2 + E_d^2} \text{----- (8-7)}$$

$$G_x = Y_x | \text{real} = \left(\frac{1}{R_r}\right) \frac{E_a E_c + E_b E_d}{E_c^2 + E_d^2} \text{----- (8-10)}$$

$$B_x = Y_x | \text{imaginary} = \left(\frac{1}{R_r}\right) \frac{E_b E_c - E_a E_d}{E_c^2 + E_d^2} \text{----- (8-11)}$$

▶ Page 8-8, Figure 8-7,
Change "Sawtooth Waveform Synthesizer" in the figure to read
"Sinusoidal Waveform Synthesizer".

▶ Page 8-11, Paragraph 8-37,
Change the vector diagram as shown below:

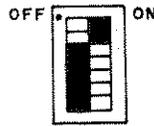


Pages 8-50 and 8-76, line 4,
Change the serial number -00266 to read -00863

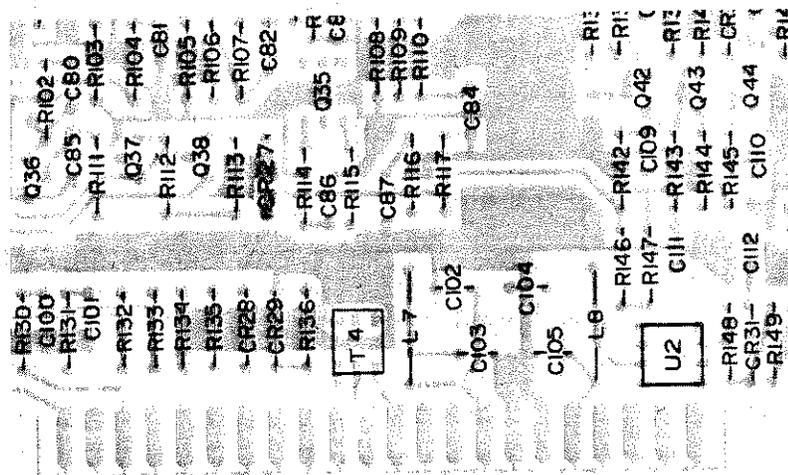
Page 8-55, Figure 8-37,
Add the following description to the first step of the Digital
Section Troubleshooting Flow Diagram, FL:

5. Remove A7U14 from socket.

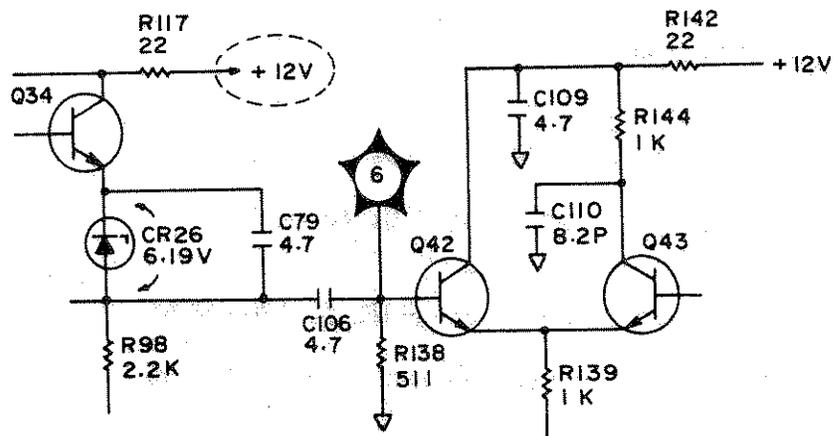
Change the A9 DSA-SW setting in the table of the Signature
Connections as follows:



Page 8-61, Figure 8-42,
Add the transformer T4 to the figure of the A1 Board Component
Locations as follows:



Page 8-61, Figure 8-43,
Change the schematic of the x100 Amplifier in Figure 8-43 as
follows:



Page 8-63, Figure 8-45,
Change R98 in Figure 8-45 to CP1.

Page 8-77, Figure 8-63,
Change the part number of the board assembly shown in Figure
8-63 to 04275-66509.

Page 8-77, Figure 8-64,
Change the part number of the board assembly shown in the
schematic diagram as follows:

A9 MPU Ass'y 04275-66509 (Opt. 003 - 66519).

Change signature code 8264 for A9U16 pin 7 (CSA 7) to 826H.

Page 8-83, Figure 8-70,
Add the following example of the dual in-line resistor pack
required for signature analysis troubleshooting:

P/N 1810-0493 (contains eight 5 Ω resistors).

Page 8-85, Figure 8-72,
Change signature code FF8F for A22U1 pin 5 (DB6) to AF8F.

CHANGE 1

Page 6-3, Table 6-3. Replaceable Parts:
Change the part number and description for A1C27 to read:

A1C27: P/N 0160-2261; CAPACITOR-FXD 15pF \pm .25pF 500VDC CER

Page 6-5, Table 6-3. Replaceable Parts:
Change the part number for A1K1/K2 and K5 to K11 to read:

0490-1269

Change the part number for A1Q17 to read:

1855-0125

Page 6-14, Table 6-3. Replaceable Parts, A3K1 and K2:
Change the part number for A3K1 and K2 to read:

0490-1269

Page 6-32, Table 6-3,
Change the part number of A7J2 to 1200-0654.

Change the part number of A7J3 to 1200-0567.

Page 6-34, Table 6-3,
Change the part number of A9J12 to 1200-0654.

Change the part number of A9U10 to 1818-1548.

Page 6-40, Table 6-3,
Change the part numbers of A21CR5, CR6, CR16, CR17, CR19 and
CR20 to 1901-0033.

Page 6-41, Table 6-3,
Change the part number of A21J3 to 1200-0654.

Page 6-42, Table 6-3 and Page 8-83, Figure 8-70,
Change the part number and description for A21R48 as follows:

A21R48: P/N 2100-3354; RESISTOR-TRMR 50K 10%

Page 6-42, Table 6-3,
Change the part number of A22J1 to 1200-0654.

Page 6-44, Table 6-3,
Change the part number of A23J3 to 1200-0654.

CHANGE 2

Page 6-8, Table 6-3,
Change the part numbers and descriptions for A2C54 and C59 as
follows:

A2C54: P/N 0160-2206; CAPACITOR-FXD 160pF $\pm 5\%$ 300VDC MICA

A2C59: P/N 0160-2206; CAPACITOR-FXD 160pF $\pm 5\%$ 300VDC MICA

CHANGE 3

Page 6-37, Table 6-3 and Page 8-79, Figure 8-66,
Change the part numbers and descriptions for A10R5, R6 and R7 as
follows:

A10R5: P/N 1810-0203; NETWORK-RES 470 Ω 8-PIN-SIP

A10R6: P/N 1810-0203; NETWORK-RES 470 Ω 8-PIN-SIP

A10R7: P/N 1810-0203; NETWORK-RES 470 Ω 8-PIN-SIP

Page 6-37, Table 6-3 and Page 8-81, Figure 8-68,
Change the part number of the A11 board assembly to 04274-66551.

Note: The new 04274-66551 is not replaceable with the old
04274-66511 (and vice versa).

Page 6-39, Table 6-3,
Change the part number for the blank PC board of the A11 board assembly to 04274-26551.

Change the part number of the A12 board assembly to 04274-66552.

Note: The new 04274-66552 is not replaceable with the old 04274-66512 (and vice versa).

Change the part numbers of A12XA11L and A12XA11R to 1251-4978.

Change the part number for the blank PC board of the A12 board to 04274-26552.

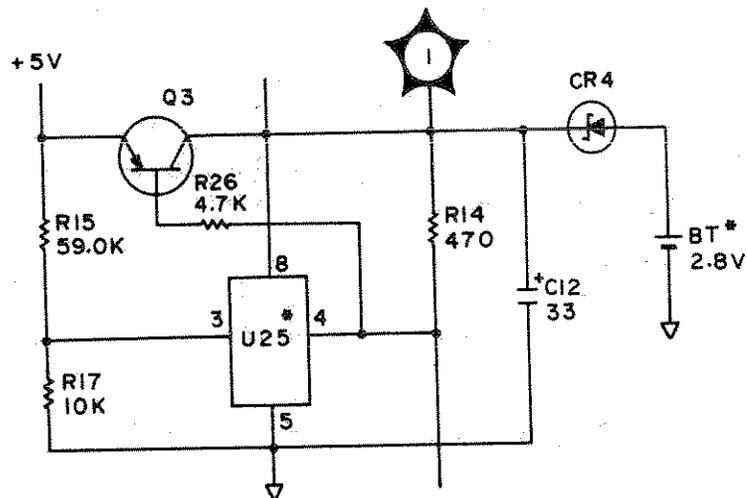
CHANGE 4

Page 6-34, Table 6-3,
Add the following parts:

A9Q3: P/N 1853-0405; TRANSISTOR PNP SI PD=700mW

A9R26: P/N 0683-4725; RESISTOR 4.7K 5% 0.25W TC=-400/+700

Page 8-77, Figure 8-64,
Change the schematic of the Level Detector circuit as follows:



CHANGE 5

Pages 8-50 and 8-76,
Change the signature table for DSA-13 as follows:

| | |
|------------|--------|
| DSA NAME → | DSA-13 |
| ROM NO. → | A9U10 |
| WINDOW | 826P |
| DB0 | 1H62 |
| DB1 | FOAP |
| DB2 | 46A9 |
| DB3 | 2UFA |
| DB4 | 54F9 |
| DB5 | F63A |
| DB6 | 9208 |
| DB7 | F15P |

Note: Apply these signatures to the instruments with the listed serial numbers and to those which have had A9U10 ROM replaced with P/N 1818-1548.

