Errata

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Manual Part Number: 08757-90072

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HP References in this Manual

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

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HP 8757C/E SCALAR NETWORK ANALYZER SERVICE MANUAL

SERIAL NUMBERS

This manual applies directly to any HP 8757C Scalar Network Analyzer having serial number prefix 3026A and higher, and any HP 8757E Scalar Network Analyzer having a serial prefix 3025A and higher.

For instruments with lower serial number prefixes, see section 7, "Manual Backdating."

For additional information about serial numbers, refer to "Instruments Covered by Manual" in Section 1.

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Part of HP Part Number 08757-90067

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Edition 4

HEWLETT PACKARD

CERTIFICATION

Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology (NIST, formerly NBS), to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members.

WARRANTY

This Hewlett-Packard instrument product is warranted against defects in material and workmanship for a period of one year from date of delivery. During the warranty period, Hewlett-Packard Company will, at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by HP. Buyer shall prepay shipping charges to HP and HP shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to HP from another country.

HP warrants that its software and firmware designated by HP for use with an instrument will execute its programming instructions when properly installed on that instrument. HP does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

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8P21.2

SAFETY CONSIDERATIONS

GENERAL

This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation. This product has been designed and tested in accordance with international standards.

SAFETY SYMBOLS

⚠ Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual (refer to Table of Contents).

Indicates hazardous voltages.

⏚ Indicates earth (ground) terminal.

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

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

SAFETY EARTH GROUND

This is a Safety Class I product (provided with a protective earthing terminal). An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power, cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and secured against any unintended operation.

BEFORE APPLYING POWER

Verify that the product is configured to match the available main power source per the input power configuration instructions provided in this manual.

If this product is to be energized via an autotransformer make sure the common terminal is connected to the neutral (grounded side of the mains supply).

SERVICING

WARNING

Any servicing, adjustment, maintenance, or repair of this product must be performed only by qualified personnel.

Adjustments described in this manual may be performed with power supplied to the product while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

Capacitors inside this product may still be charged even when disconnected from their power source.

To avoid a fire hazard, only fuses with the required current rating and of the specified type (normal blow, time delay, etc.) are to be used for replacement.

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Section 4. Performance Tests

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INTRODUCTION

These procedures test the electrical performance of the HP 8757C/E Scalar Network Analyzer to the specifications listed in table 1-1 of the operating manual. Access to the interior of the instrument is not required. The performance tests must be performed in the order given. If a simpler functional operation test is desired, use the "Operator's Check" in the *Operating Reference*.

Measurement results depend on calibration constants stored within the instrument using the HP 11613A/B calibrator. The HP 11613A/B, used with an HP 9000 series 200 or 300 computer and HP BASIC language, calibrates the log amplifiers independently of any detectors by injecting a 27.778 kHz square wave modulated signal at different power levels. The HP 11613A/B is supplied with a calibration program stored on a 3.5 inch disk and a 5.25 inch disk. For instructions on performing the calibration constant loading procedure, refer to the *HP 11613A/B Operating and Service Manual*.

EQUIPMENT REQUIRED

Equipment required for the performance tests is listed in table 4-1. Any equipment that satisfies the critical specifications given may be substituted for the recommended models.

PERFORMANCE TEST RECORD CARD

A performance test record card is provided at the end of this section for recording results of the performance tests. The specifications are listed along with space for recording actual measurements.

Table 4-1. Recommended Test Equipment

Instrument	Critical Specifications	Recommended Model or HP Part Number (P/N)	Use[1]
Sweep Oscillator	0-10V SWEEP OUT ramp Positive Z-axis blanking HP-IB programmable	HP 8350B (serial prefix 2410 or higher) or HP 8340/41	P,T
RF Plug-In (with HP 8350B)	Compatible with sweep oscillator Frequency range: includes 50 MHz Leveled Power output: ≥13 dBm at 50 MHz	HP 83592B (serial prefix 2502 or higher)	P,T
Detector	No substitute	HP 11664A (serial prefix 25000 or higher) or 11664E	P,T
Calibrator	No substitute	HP 11613A/B	P,A,T
Oscilloscope with 10:1 Probes	Dual channel Bandwidth: ≥100 MHz	HP 1740A/HP 10041A	P,T
Universal Counter	Frequency range: ≥1 MHz Frequency resolution: ≤1 Hz Time interval resolution: ≤100 ns	HP 5316A	P,T
Digital Voltmeter	Accuracy: ≤0.03% Resolution: ≤0.1 mV Input impedance (DC): ≥10 MΩ	HP 3456A	A,T
Power Meter with Sensor		HP 436A/HP8481A	T
Photometer with Probe[2]		Tektronix J16/J6503	A
Adapter BNC Tee (m)(f)(f) (2 required)		HP P/N 1250-0781	P
Termination 50 ohm		HP 11593A	P
HP-IB Cable		HP 10833	P
BNC Cables (3 required)		HP P/N 8120-1839	P
Signature Multimeter	Signature analyzer clock frequency: ≥10 MHz	HP 5005A/B	T
Service Kit	No substitute	HP P/N 08757-60048	T
Additional equipment required for alternative dynamic accuracy performance test.			
Step Attenuator 12 dB	1 dB steps Type-N (f) connectors Calibration data at 50 MHz to 0.01 dB resolution	HP 355C Opt. 001/890	P
Step Attenuator 120 dB	10 dB steps Type-N (f) connectors Calibration data at 50 MHz to 0.01 dB resolution	HP 355D Opt. 001/890	P
Attenuator 3 dB		HP 8491B	P
Bandpass Filter 50 MHz		HP P/N 08757-80027	P

1. P = Performance Tests, A = Adjustments, T = Troubleshooting.
2. Optional, does not affect instrument performance.

Self-Test

DESCRIPTION AND PROCEDURE

The HP 8757C/E is preset to initiate a built-in self-test routine. The self-test checks major parts of the analog and digital circuitry. The self-test results are displayed on the CRT. No additional equipment is required for this test.

1. Connect the analyzer to line power and turn the LINE switch on.
2. The self-test runs automatically and takes approximately five seconds. If the test runs successfully and passes, the graticule and top-level softkey menu will appear on the display. If the self-test fails, an error or warning message will be displayed. Record PASS or FAIL on the performance test record card.

IF THE INSTRUMENT FAILS THIS TEST

Refer to "Self-Test and Error Codes" in the "Service" section.

Dynamic Power Accuracy

The dynamic power accuracy specification of the HP 8757C/E is a system level specification that depends on the detector used. To test the analyzer for dynamic power accuracy independently from any detector, use the HP 11613A/B calibrator. Follow the calibration procedure given in the *HP 11613A/B Operating and Service Manual*. **This automated procedure is the recommended method for testing dynamic accuracy and provides full analyzer traceability to NIST** (formally NBS). Using the calibrator, the entire analyzer is characterized in just a few minutes. Attach test results (graphs) for each input to the performance test record card.

EQUIPMENT

Calibrator .... HP 11613A/B
Computer with 5.25 or 3.5 inch disk drive ..... HP 9000 Series 200/300
Printer (optional; for printed graph results) .... Any HP-IB printer

Alternative Dynamic Power Accuracy Test

A substitute system level test may be used if no calibrator is available. It measures the analyzer's response to various RF input levels. Attenuator inaccuracy contributes errors to these measurements, so calibrated attenuators are used. The test measures to the limits of the detector used. In addition, it is limited to +10 dBm instead of the specified +16 dBm unless an external amplifier is used. This alternative test is the last test in this section (preceeding the performance test record card.)

Modulator Drive

EQUIPMENT

Oscilloscope	HP 1740A
Universal Counter	HP 5316A
Adapter, BNC tee (m)(f)(f) 2 required	HP P/N 1250-0781
Termination 50 Ohm	HP 11593A
BNC Cable (3 required)	HP P/N 8120-1839

NOTE: The HP 1740A Oscilloscope's 50 ohm input will dissipate 5 VRMS. If another oscilloscope is used, its 50 ohm input must be able to dissipate 3 VRMS or about 200 mW. If not, use the oscilloscope's high impedance input and externally terminate the input with a BNC tee and 50 ohm termination.

DESCRIPTION AND PROCEDURE

The modulator drive is tested in two parts. The amplitude of the modulator drive (into 50 ohms) is checked with an oscilloscope. The frequency and symmetry of the modulator drive are measured with a universal counter.

Voltage Amplitude

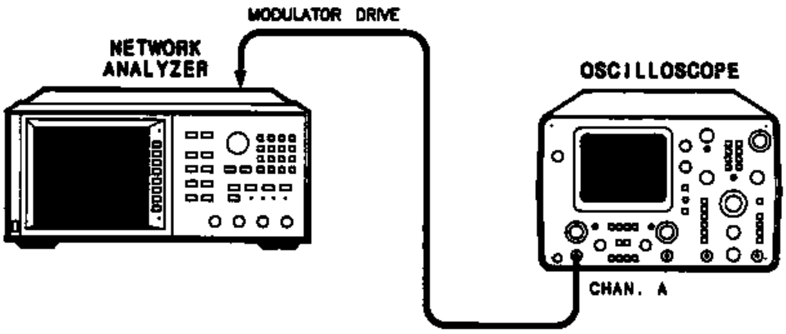


Figure 4-1. Voltage Amplitude Test Setup

1. Connect the equipment as shown in Figure 4-1. Allow 30 minutes warm-up.
2. On the analyzer, press **[PRESET]**. The analyzer resets with modulation turned on.
3. On the oscilloscope, press DISPLAY A, TRIGGER A. Set CHAN A VOLTS/DIV to 1. Set TIME/DIV to 5 µs. Set AUTO TRIG horizontal display mode to MAIN. Set all other buttons out.

   Set the oscilloscope input to GND; adjust POSN to vertically center the trace; reset the input to 50 OHM.

   Adjust TRIGGER LEVEL for a stable display.

4. Compare the absolute magnitude of the positive and negative portions of the square wave to the specification. Record the smaller of the two values on the performance test record card.

Frequency Accuracy and Symmetry

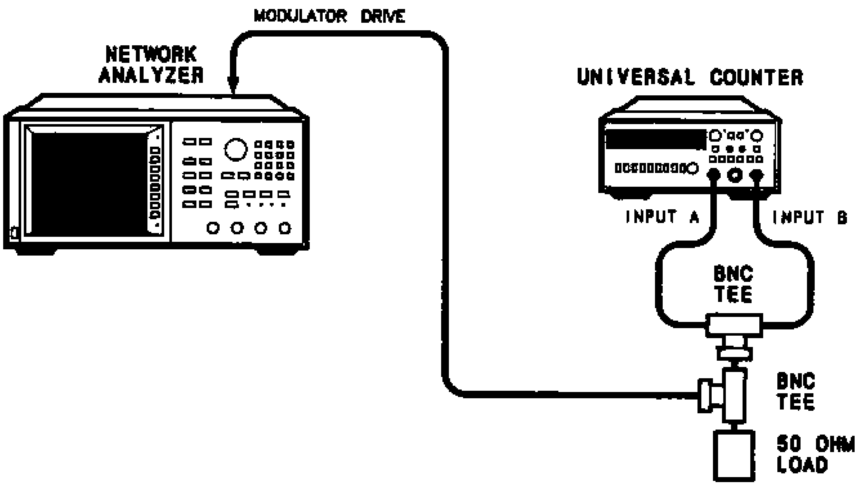


Figure 4-2. Frequency Accuracy and Symmetry Test Setup

1. Connect the equipment as shown in figure 4-2 with no connection to the universal counter inputs A and B. Press **[FREQ A]** and set all other buttons out.
2. On the counter, rotate channel A LEVEL/SENS knob counterclockwise until the TRIGGER LEVEL LED lights. Rotate the knob clockwise until the LED just goes out. Repeat this procedure for channel B. This sets the trigger levels to 0.0V. Once set, do not readjust these two knobs.
3. Connect the cables from the BNC TEE to the counter inputs A and B. On the counter, set channel A to _/‾ (rising edge) and channel B to ‾_ (falling edge) to define channel A and B trigger levels.
4. Record the modulation frequency on the performance test record card and compare it to the specification.
5. Set the blue key in and select TI AVG A →B to measure the positive half cycle. Record this value on the performance test record card and compare it to the specification.
6. Reset channel A to trigger on the falling edge and channel B on the rising edge. Record this value for the negative half cycle on the performance test record card and compare it to the specification.

IF THE INSTRUMENT FAILS THIS TEST

If the analyzer fails any part of the modulator drive test, refer to "A5 Troubleshooting."

HP Interface Bus and 8757 Interface

EQUIPMENT

HP-IB Cable .... HP 10833A/B/C/D

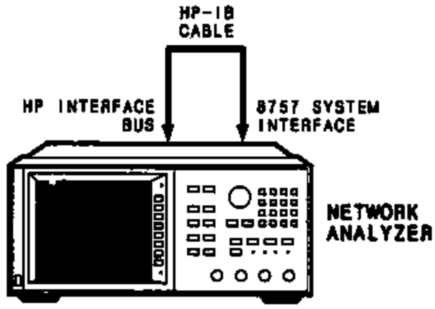


Figure 4-3. HP Interface Bus and 8757 System Interface Test Setup

DESCRIPTION AND PROCEDURE

An HP-IB cable connects the HP INTERFACE BUS to the 8757 SYSTEM INTERFACE. Internal diagnostic routines check the ability of both ports to send and accept data. This procedure is also used as an operator's check of the remote mode.

1. Set up the equipment as shown in figure 4-3. The HP-IB cable connects the HP INTERFACE BUS and the 8757 SYSTEM INTERFACE ports on the analyzer rear panel.

2. Press **[PRESET]** *[SYSTEM] [MORE] [SERVICE] [A6 HPIB INSTBUS] [HPIB TESTS] [HPIB TALK]* to run the first diagnostic test.

   The HP interface bus sends test data (talks) to the 8757 system interface. When the test is successfully completed, HPIB TALK PASS is displayed on the CRT. If the test fails, other messages are displayed. Record PASS or FAIL on the performance test record card.

3. Press *[HPIB LISTEN]* to run the second diagnostic test. The HP interface bus accepts test data (listens) from the 8757 system interface. When the test is successfully completed, HPIB LISTEN PASS is displayed on the CRT; other messages indicate the test failed. Record PASS or FAIL on the performance test record card.

4. Press **[PRESET]** or *[EXIT SERVICE]* to exit the diagnostic test.

IF THE INSTRUMENT FAILS THIS TEST

If either of these tests fail, refer to "A6 Troubleshooting."

Detector Control Circuitry

EQUIPMENT

Detector .... HP 11664A serial number >25000
or HP 11664E

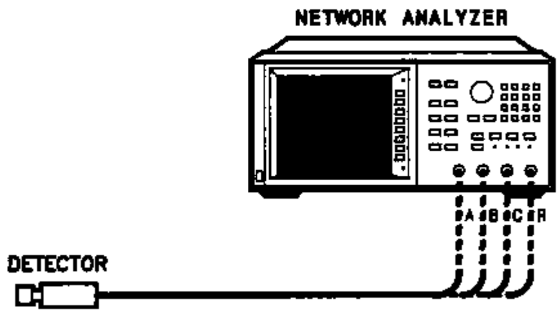


Figure 4-4. Detector Control Circuitry Test Setup

DESCRIPTION AND PROCEDURE

Instrument preset verifies most of the detector control circuitry. To complete the verification, the A4 internal sense resistor (1.0 kΩ) is measured. The voltage drop is measured across the resistor when a detector (which also contains a 1 kΩ resistor) is connected to the input. If no detector is available, a 1 KΩ resistor can be substituted. Connect it between pin 3 of the analyzer detector input and chassis ground in step 3.

1. On the analyzer, with the detector *not* connected to any input, press **[PRESET]**. The self-test runs automatically and takes approximately five seconds. If the test runs successfully and passes, the graticule and top-level softkey menu will appear on the display. If the self-test fails, an error message will be displayed. This test verifies most of the detector control circuitry.

2. Press **[SYSTEM]** ***[MORE] [SERVICE] [A4 ADC] [MORE]***.

   Press ***[CHANNEL VOLTS] [CHANV DET DAC] [MODE 1] [DET DAC MAX]***. The CRT displays the DRIVE and SENSE voltages for each of the inputs.

3. Connect the detector to input A of the analyzer as shown in figure 4-4. Note the CHAN A SENSE and DRIVE voltages displayed. With the detector connected to the input, the SENSE voltage drops to one half of the DRIVE voltage ±3%. Record the results as PASS or FAIL on the performance test record card for CHAN A SENSE.

4. Repeat step 3 for inputs B, C (HP 8757C Option 001), and R. Record the results for each input on the performance test record card.

IF THE INSTRUMENT FAILS THIS TEST

If any input fails this test, refer to "A4 Troubleshooting."

Alternative Dynamic Power Accuracy Test

EQUIPMENT

Sweep Oscillator Mainframe	HP 8350B[1]
RF Plug-in	HP 83592B[2]
Calibrated 120 dB Step Attenuator	HP 355D Option 001/890
Calibrated 12 dB Step Attenuator	HP 355C Option 001/890
50 MHz Bandpass Filter	HP P/N 08757-80027
3 dB Pad	HP 8491B
Detector	HP 11664A[3] or HP 11664E

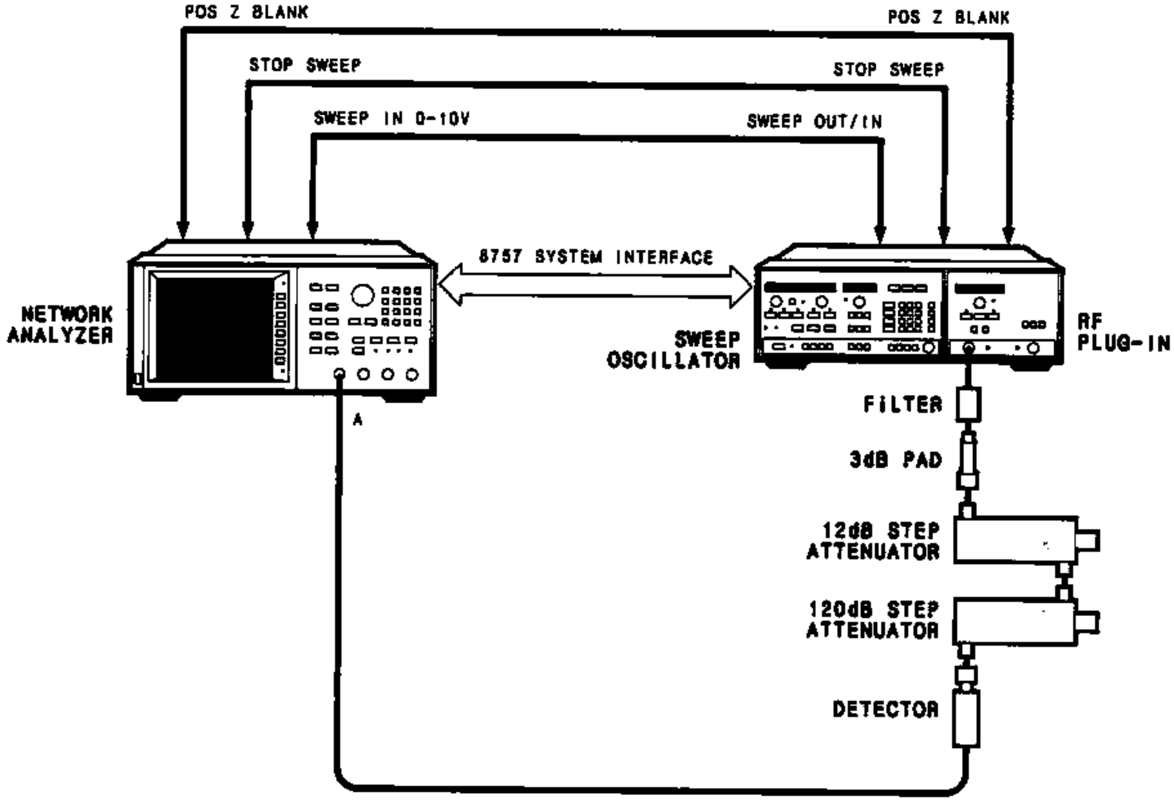


Figure 4-5. Dynamic Power Accuracy Test Setup

DESCRIPTION AND PROCEDURE

This test measures system specifications only and is an indication of the performance of the source, detector, and analyzer. The accuracy of the test varies with the detector used. The specification for this test is based on the specification of the detector. The HP 11664A/E is used because of its superior dynamic power accuracy specification. Actual detector performance must be considered. Other detectors can be used but the specification limits must be increased to match those given in the detector's operating manual.

Calibrated step attenuators include a calibration report at 50 MHz that lists the actual attenuation of each step. The calibration is available as an option with the step attenuator.

1. Serial prefix 2410 or higher.
2. Serial prefix 2502 or higher.
3. Serial prefix 25000 or higher.

1. Connect the equipment as shown in figure 4-5 with the detector connected to input A. Set the 120 dB attenuator to the first value in column 2 (+10), and the 12 dB attenuator to the first value in column 3 (0). Allow 30 minutes warm-up. Press **[PRESET]**, both the analyzer and the source will reset.

2. For each power level (attenuator setting) specified in column 2 of the performance test record card, record the calibration data (from the calibration report) of the 120 dB step attenuator in column 4. For each of the power levels specified in column 3 of the performance test record card, record the calibration data of the 12 dB step attenuator in column 5.

3. Calculate the calibrated power level (CAL PWR LVL) for each power level and record this value in column 6.

   CAL PWR LVL = 10 dBm − (column 4 + column 5)

4. On the source, press **[CW] [5] [0] [MHz]**.

5. On the HP 8757C, press ***[CHAN 2 OFF]*** **[CURSOR]**. For the HP 8757E only, instead press CHANNEL **[2]** twice, then press **[CURSOR]**.

   Rotate the POWER knob on the RF plug-in to set the cursor value to the value in column 2 minus the value in column 4 for the first power level setting.

6. Record the cursor value on the performance test record card in column 7.

7. Set both attenuators to 0 dB attenuation. Note the cursor value. Calculate the dynamic accuracy error as follows:

   Dynamic accuracy error = cursor value minus CAL PWR LVL.

   Include and preserve signs in this calculation. Enter this value for Dynamic ACC Error (dBm), column 8, of the performance test record card.

8. Set the attenuators for the next Nominal PWR LVL, column 1.

NOTE: For power levels of −40 dBm and below, use the averaging factor specified on the performance test record card to reduce trace noise. Set the attenuators for the desired power level. Press **[AVG]** ***[AVG FACTOR]*** and use the step keys to adjust for the appropriate averaging factor. Press **[CURSOR]**. When the trace settles, record the cursor value in column 7 of the performance test record card. Press ***[AVG ON OFF]*** to turn off the averaging factor before resetting the attenuators.

9. Repeat steps 6 through 8 for each power level in column 1.

10. Set the 120 dB attenuator to 10 dB attenuation and the 12 dB attenuator to 0 dB attenuation. If the cursor value is not within 0.02 dB of the value recorded in step 6, repeat steps 5 through 9.

11. Connect the detector to input B.

12. Measure input B by pressing **[MEAS]** ***[B]***. Repeat steps 5 through 10.

13. f the analyzer is an HP 8757C Option 001, connect the detector to input C. Press **[MEAS]** ***[C]***. Repeat steps 5 through 10.

14. Connect the detector to input R. Press **[MEAS]** ***[R]***. Repeat steps 5 through 10.

IF THE INSTRUMENT FAILS THIS TEST

Refer to "In Case of Difficulty", in the operating manual, or "Service", in this service manual. The problem could be in the detector used.

Performance Test Record

Test	Specification	Result
Self Test	PASS/FAIL	________
Dynamic Power Accuracy		
11613A/B Test Results (Attach printout for each input.)		
Input A	PASS/FAIL	________
Input B	PASS/FAIL	________
Input C (Opt 001 only)	PASS/FAIL	________
Input R	PASS/FAIL	________

NOTE: For the alternate Dynamic Power Accuracy test that is documented in this section, use the next page of this performance test record card to record results.

Test	Specification	Result
Modulator Drive		
Voltage Amplitude		
Absolute Magnitude	≥ ±2.2V	________
Frequency Accuracy and Symmetry		
Modulation Frequency	27.766 to 27.790 kHz	________
Positive Half Cycle	17.65 to 18.35 μs	________
Negative Half Cycle	17.65 to 18.35 μs	________
HP INTERFACE BUS and 8757 SYSTEM INTERFACE		
HPIB TALK	PASS/FAIL	________
HPIB LISTEN	PASS/FAIL	________
Detector Control Circuitry		
CHAN A SENSE	1/2 CHAN A DRIVE V ±3%	________
CHAN B SENSE	1/2 CHAN B DRIVE V ±3%	________
CHAN C SENSE (HP 8757C Option 001)	1/2 CHAN C DRIVE V ±3%	________
CHAN R SENSE	1/2 CHAN R DRIVE V ±3%	________

Alternate Dynamic Power Accuracy Test

Input ______ (Perform last five measurements with Averaging ON. Averaging Factor is listed in column 2 and placed within parentheses.)

1. Nominal PWR LVL (dbm)	2. Nominal 120 dB ATTEN Setting (dB)	3. Nominal 12 dB ATTEN Setting (dB)	4. CAL ATTEN (120 dB ATTN)	5. CAL ATTEN (12 DB ATTN)	6. CAL PWR LVL (dBm) (10 dBm − CAL ATTN)	7. MEAS PWR LVL (Cursor) (dBm)	8. Dynamic ACC Error (dBm)	9. Upper Limit (Absolute Value)
0	+10	0		0			REF	REF
+10	0	0	0	0				0.20
+6	0	4	0					0.16
+3	0	7	0					0.13
0	10	0		0			REF	REF
−3	10	3						0.13
−6	10	6						0.16
−10	20	0		0				0.20
−13	20	3						0.23
−16	20	6						0.26
−20	30	0		0				0.30
−25	30	5						0.30
−30	40	0		0				0.30
−35	40	5						0.30
−40	50 (16)	0		0				0.30
−45	50 (32)	5						0.35
−50	60 (64)	0		0				0.40
−55	60 (64)	5						0.80
−60	70 (64)	0		0				1.20

Section 5. Adjustments

CONTENTS

INTRODUCTION

These are the adjustment procedures for the HP 8757C/E Scalar Network Analyzer. Use these procedures only in the following cases:

- After replacement of an analyzer part.
- When performance tests show that the analyzer has not met the specifications of table 1-1.

Let the analyzer warm-up 30 minutes before performing any adjustments.

SAFETY CONSIDERATIONS

This product has been manufactured and tested in accordance with international safety standards. A complete list of safety considerations is provided at the front of this manual. Service and adjustments should be performed only by a skilled person who is aware of the hazards.

WARNING

Adjustments are performed with power applied to the analyzer and its protective covers removed. Voltages exist at points which can cause personal injury if contacted. Capacitors inside the analyzer may also still be charged even with the power supply disconnected.

EQUIPMENT REQUIRED

Table 4-1 lists the equipment recommended for the adjustment procedures. If the recommended test equipment is not available, substitute other equipment only if its performance meets the critical specifications listed in the table.

RELATED ADJUSTMENTS

Some adjustments are interactive. These are noted in the adjustment procedures. Table 5-1 lists the adjustments that must be performed if an assembly has been repaired or replaced.

LOCATION OF TEST POINTS AND ADJUSTMENT CONTROLS

Table 5-2 lists the adjustment controls by the names that appear on the PC boards. The table also describes the function of each adjustment control. Each adjustment procedure includes a figure which shows the equipment set-up and the test points for measuring adjustment results.

Table 5-1. Related Adjustments

Assembly Repaired	Perform the Following Procedures and Adjustments
A1/A2 Front Panel	None
A3 CPU	Re-store calibration constants with HP 11613A/B Display Intensity Adjustments
A4 ADC	DAC ADJ Re-store calibration constants with HP 11613A/B if any of these parts are changed: R46, R47, U5, U28, or U30.
A5 Modulator	None
A6 HP-IB	None
A7, A8, A9, A10 Log Amplifiers	Re-store calibration constants with the HP 11613A/B if any of these parts are changed: any 0.1% resistor, any transistor, filters L1, L2, or L3, CR7, CR8, U5, U7, U10, U13, VR2.
A11 Motherboard	None
A12 Power Supply	Power Supply Adjustments
A13 Rear Panel	None
A14 Display Interface	Display Intensity Adjustments
A15 Display	Display Intensity Adjustments Vertical Position (if required)
A16 Rear Panel Video Interface	None

Table 5-2. Adjustment Controls

Name	Function
DAC ADJ	Adjusts sweep DAC gain for −10.2375 V dc
+15 V	Adjusts instrument +15 V power supply
−15 V	Adjusts instrument −15 V power supply
+5 DSP	Adjusts display +5 V power supply
+5 DIG	Adjusts instrument +5 V power supply
−12.6	Adjusts −12.6 V power supply

NOTE: Adjustments related to the power supply of the A15 display are documented in this section. Additionally, all adjustments related to the A15 display are documented separately, in "Service", section 8.

Power Supply Adjustments

EQUIPMENT

Digital Voltmeter (DVM) .... HP 3456A

DESCRIPTION AND PROCEDURE

The display and instrument power supplies are adjusted on the A12 board for proper voltage levels.

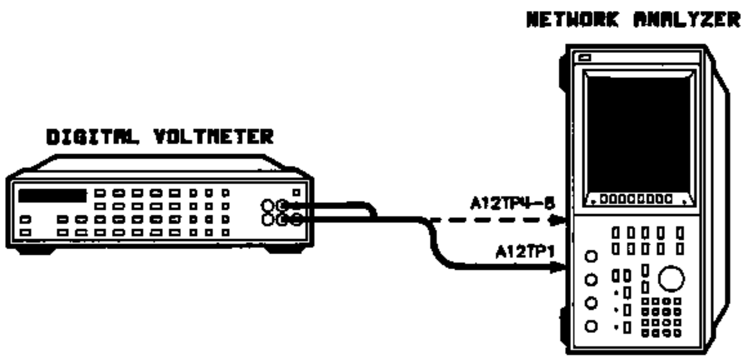


Figure 5-1. Power Supply Adjustments Set-up

1. Set the analyzer LINE switch to ON. Allow 30 minutes warm-up time.
2. Position the analyzer on its side (see figure 5-1). Remove the analyzer bottom cover by removing the screw from the center of the rear portion of the cover (beneath the fan). Slide the bottom cover off.
3. Connect the equipment as shown in figure 5-1 with DVM LO connected to A12TP1 (GND). Figure 5-2 shows the location of the A12 PC board in the analyzer and figure 5-3 shows the adjustment locations on the A12 PC board.

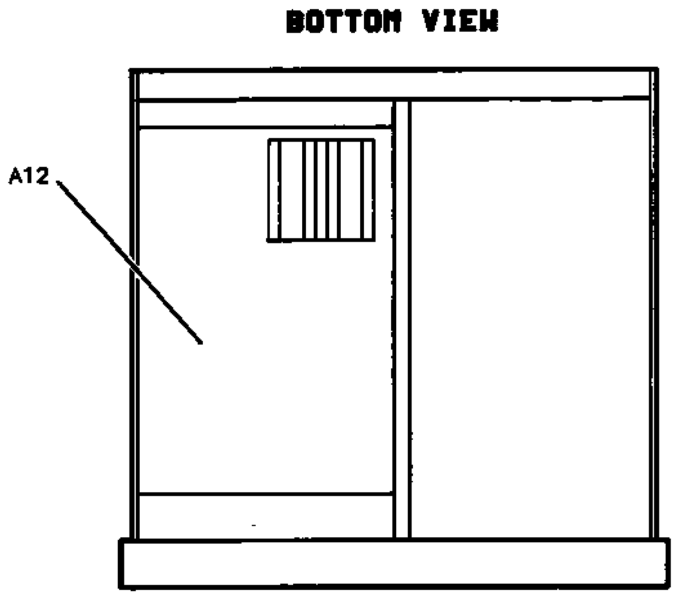


Figure 5-2. A12 Assembly Location

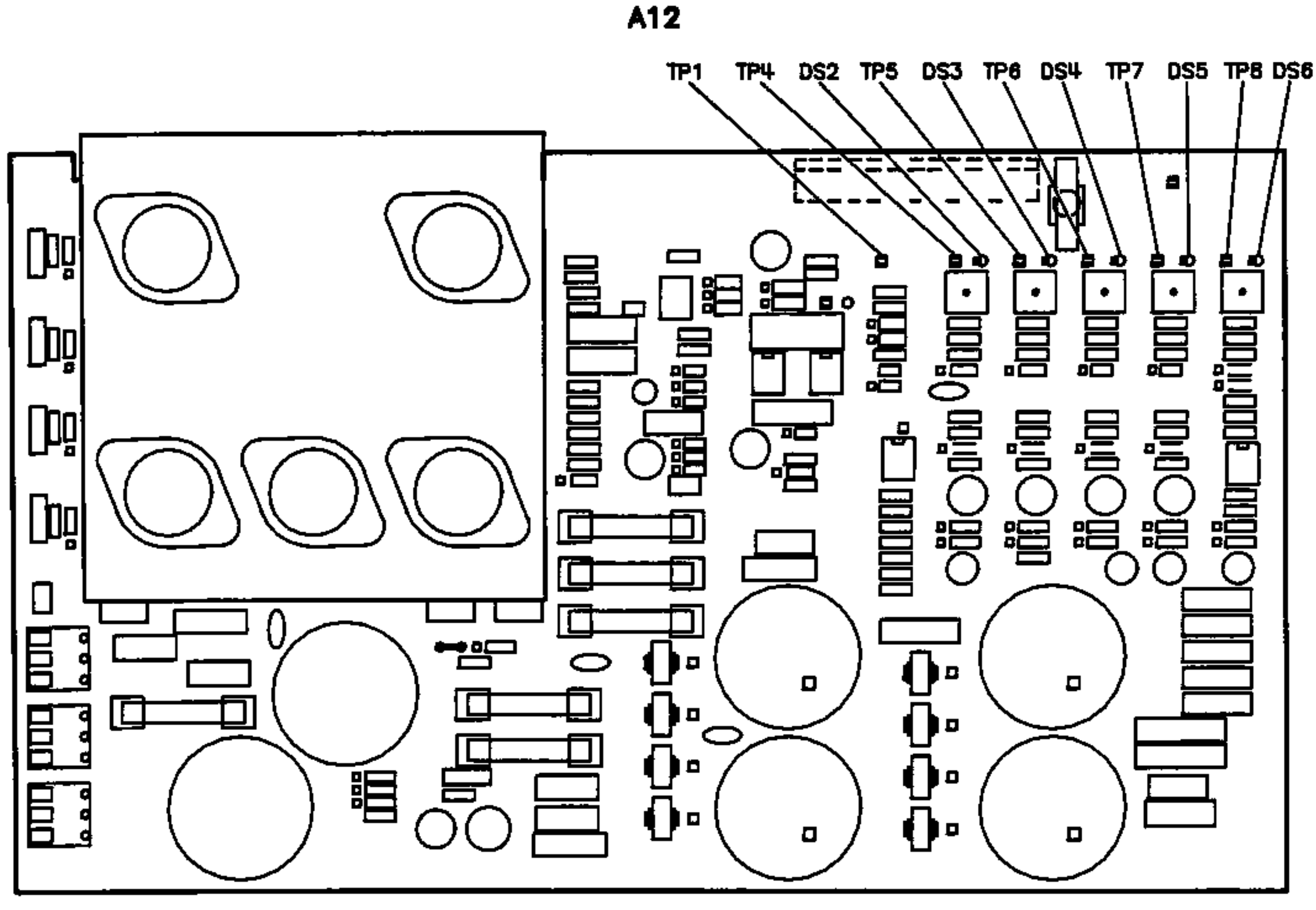


Figure 5-3. Power Supply Adjustment Locations

SWEEP DAC GAIN ADJUSTMENT

EQUIPMENT

Digital Voltmeter (DVM) .... HP 3456A

DESCRIPTION AND PROCEDURE

The sweep DAC gain is adjusted on the A4 board to exactly 2.5 mV per bit. This causes the 0 to −10V sweep ramp to exactly fill the CRT.

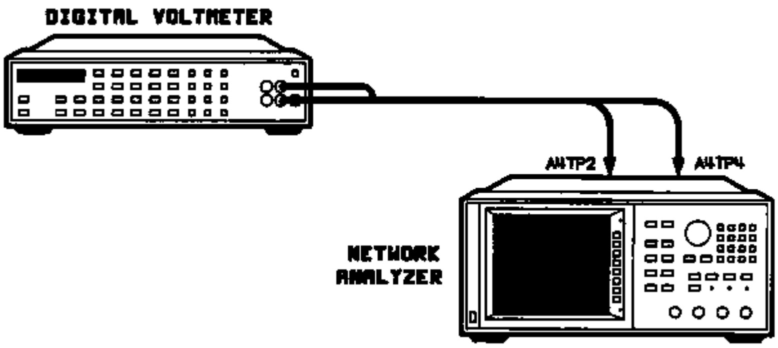


Figure 5-4. Sweep DAC Gain Adjustment Set-up

1. Set the analyzer LINE switch to ON. Allow 30 minutes warm-up time.
2. Remove the analyzer top cover by removing the screw in the center of the rear portion of the cover (above the fan). Slide the cover off.
3. Connect the equipment as shown in figure 5-4. The test points and adjustment control are accessible without removing the logger cover. Figure 5-5 shows the location of the A4 ADC assembly and figure 5-6 shows the adjustment locations on the A4 assembly.
4. Connect DVM LO to A4TP4 (AGND) and DVM HI to A4TP2 (DAC).
5. Press **[PRESET]** on the analyzer.
6. Note the maximum SWEEP DAC VOLTAGE (approximately 0.0 V) indicated on the DVM by pressing **[SYSTEM]** ***[MORE] [SERVICE] [A4 ADC] [MORE] [CHANNEL VOLTS] [CHANV OTHER] [SWP DAC MAX]***.
7. Note the minimum SWEEP DAC VOLTAGE on the DVM by pressing ***[SWP DAC MIN]***. The *difference* between this value and the value noted in step 6 should be −10.2375 ±0.0005 V dc. If not, adjust R6 (DAC ADJ) to bring the difference within specification.

8. Note the maximum SWEEP DAC VOLTAGE on the DVM again by pressing ***[SWP DAC MAX]***. Repeat step 7 and either confirm that the difference is now −10.2375 ±0.0005 V dc or repeat steps 7 and 8 until that difference is attained.

9. If the analyzer cannot be adjusted to the specifications in this procedure, see "In Case of Difficulty" in section 3.

10. If no further access to the interior of the analyzer is required, replace the top cover by reversing step 2.

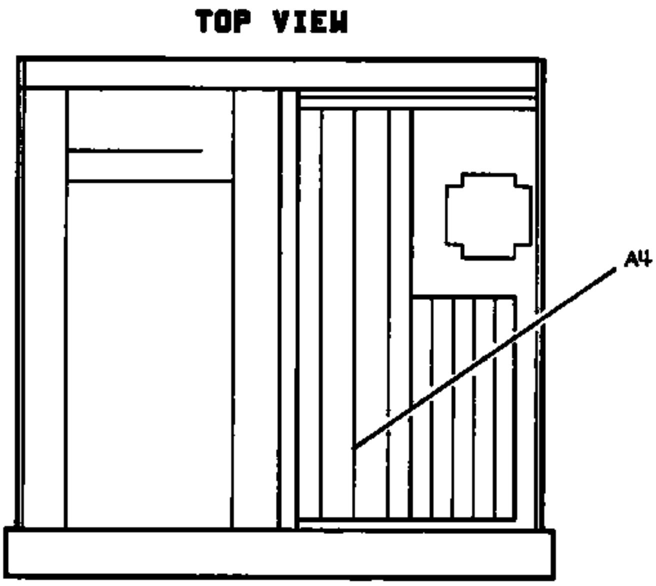


Figure 5-5. ADC Assembly Location

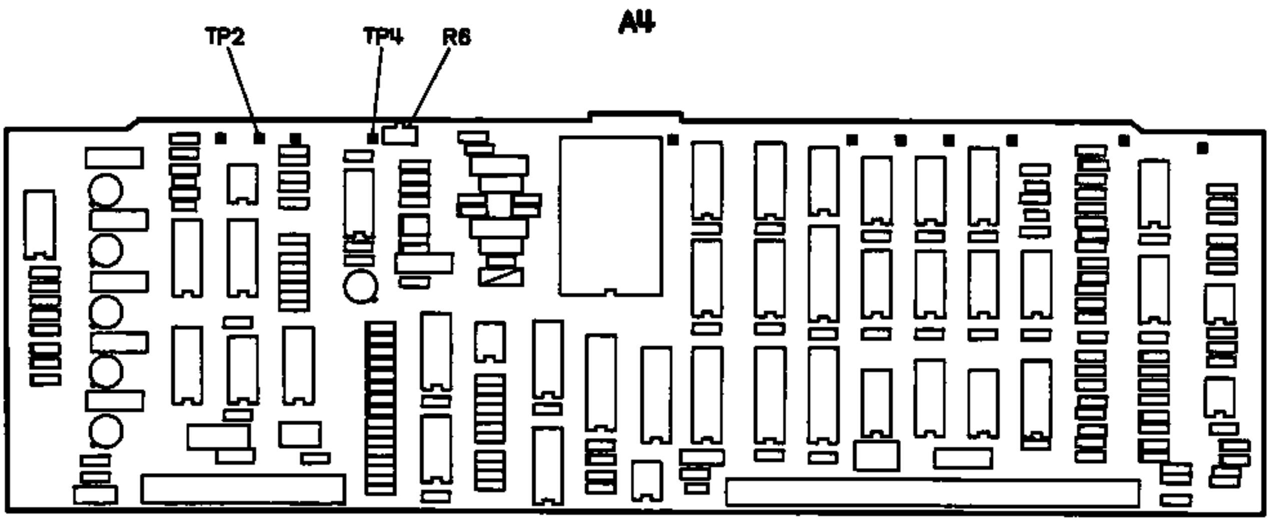


Figure 5-6. Sweep DAC Gain Adjustment Locations

DISPLAY INTENSITY ADJUSTMENTS

These procedures are a set of 3 display intensity adjustments. Perform these procedures consecutively if they are required (usually after the A3, A14, or A15 assemblies have been replaced). These adjustments are for cosmetic purposes only and do *not* affect the analyzer usability or calibration.

NOTE: Values shown are for the HP 8757C. Values for the HP8757E are given in parenthesis.

BACKGROUND ADJUSTMENT

DESCRIPTION AND PROCEDURE

The background adjustment sets the black level of the display. It is set so that the minimum intensity that can be drawn is just visible when the display is located in a dimly lit room or shaded from bright lights.

NOTE: This is the first in a series of three Display Intensity Adjustments. No additional equipment is needed for this first adjustment.

1. On the analyzer, remove the top cover by removing the screw in the center rear portion of the cover (above the fan). Slide the cover off.
2. Set the analyzer LINE switch to ON and allow 30 minutes warm-up.
3. In a dimly lit room (or with the analyzer CRT shaded from bright lights, press **[PRESET] [SYSTEM]** ***[MORE] [SERVICE] [DISPLAY] [BCKGRND ADJUST]***. Alternating vertical bars of three different intensities will be drawn on the CRT. Each bar has a number written below it (either 0, 1, or 2).
4. Adjust the analyzer front panel knob until the vertical bar labeled "1" is just barely visible against the black border. Vertical bar "0" must not be visible.
5. On the analyzer, press any softkey. The current DAC value (Background Level) is shown on the CRT. Close switch A3S1-E, labeled WR PROTECT, to disable write protection (move the switch to the left). The switch is accessable without removing the logger cover.
6. On the analyzer, press ***[SAVE VALUE]***. The value is saved in EEROM and you are returned to the previous menu.
7. This completes the first in a series of three Display Intensity Adjustments. Do not replace the analyzer's top cover; do not open switch A3S1-E. Proceed to "Nominal Intensity Adjustment".

NOMINAL INTENSITY ADJUSTMENT

EQUIPMENT

Photometer .... Tektronix J16
Photometer Probe .... Tektronix J6503

DESCRIPTION AND PROCEDURE

This procedure adjusts the nominal intensity level of the display. The 100% level display intensity is set to 100 nits (77 nits) using a photometer to measure the output light. This adjustment does *not* change the intensity of the light output from the display; it is still capable of the same minimum and maximum intensity values. This adjustment ensures that the light output at the 100% intensity level is equal to 100 nits (77 nits).

NOTE: This is the second in a series of three Display Intensity Adjustments. The analyzer 30 minute warm-up is already complete. The DISPLAY menu is active on the CRT.

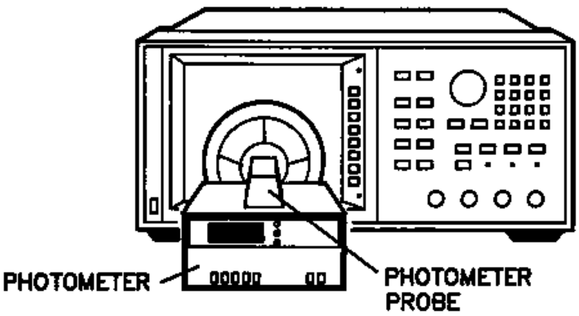


Figure 5-7. Nominal Intensity Adjustment Set-up

1. Set the photometer probe to NORMAL. Press **[POWER]** on the photometer to turn it on and allow 30 minutes warm-up. Zero the photometer according to the manufacturer's instructions.
2. On the analyzer, press ***[NOMINAL INT ADJ]***.
3. Center the photometer on the analyzer CRT as shown in figure 5-7. Adjust the analyzer front panel knob until the photometer registers 100 cd/m² NITS (77 cd/m²) of output light if the glass bezel assembly is *not* installed. Adjust for 60 nits (46 nits) if the glass bezel *is* installed (the glass filter transmits 60% of the light).
4. On the analyzer, press any softkey. The current DAC value (Normal Intensity Level) is shown on the CRT. 0 = full intensity; 255 = minimum.
5. On the analyzer, press ***[SAVE VALUE]***. The value is saved in EEROM and you are returned to the previous (DISPLAY) menu.
6. This completes the second in a series of three Display Intensity Adjustments. Do not replace the analyzer's top cover; do not open switch A3S1-E. Proceed to "Minimum Intensity Adjustment".

MINIMUM INTENSITY ADJUSTMENT

EQUIPMENT

Photometer .... Tektronix J16
Photometer Probe .... Tektronix J6503

DESCRIPTION AND PROCEDURE

This adjustment sets the default level of minimum display intensity. The analyzer normally presets and powers on to the same intensity level that was last used. However, if the last used intensity level was set below the minimum display intensity, the analyzer will default to the minimum display intensity to ensure that the display is visible and eliminate concern that the display may not be functioning.

NOTE: This is the third in a series of three Display Intensity Adjustments. The analyzer and photometer 30 minute warm-up is already complete. The DISPLAY menu is active on the CRT.

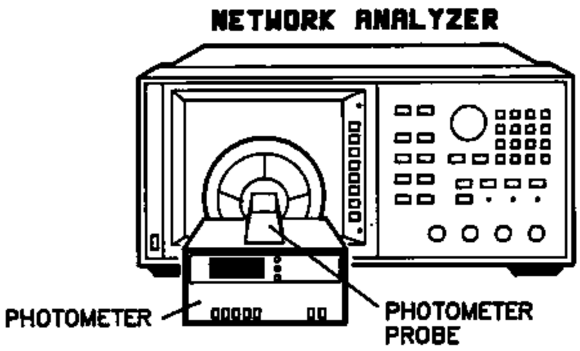


Figure 5-8. Minimum Intensity Adjustment Set-up

1. On the analyzer, press ***[MINIMUM INT ADJ]***.

2. Center the photometer on the analyer CRT as shown in figure 5-8. Adjust the analyzer front panel knob until the photometer registers 20 cd/m^2 NITS (15 cd/m^2) of output light if the glass bezel assembly is *not* installed. Adjust for 12 nits (9 nits) if the glass bezel *is* installed.

3. On the analyzer, press any softkey. The current DAC value (Normal Intensity Level) is shown on the CRT. 0 = full intensity; 255 = minimum.

4. On the analyzer, press ***[SAVE VALUE]***. The value is saved in EEROM and you are returned to the previous (DISPLAY) menu.

5. This completes the series of three Display Intensity Adjustments. Open switch A3S1-E (move the switch to the right.) If no further access to the interior of the analyzer is required, replace the top cover by sliding the cover onto the instrument and replacing the screw in the center of the rear portion of the cover (above the fan).

VERTICAL POSITION AND FOCUS ADJUSTMENT

DESCRIPTION AND PROCEDURE

This procedure adjusts the display vertical position and focus. It may be necessary to perform this adjustment if the A15 Display is replaced. No additional equipment is required.

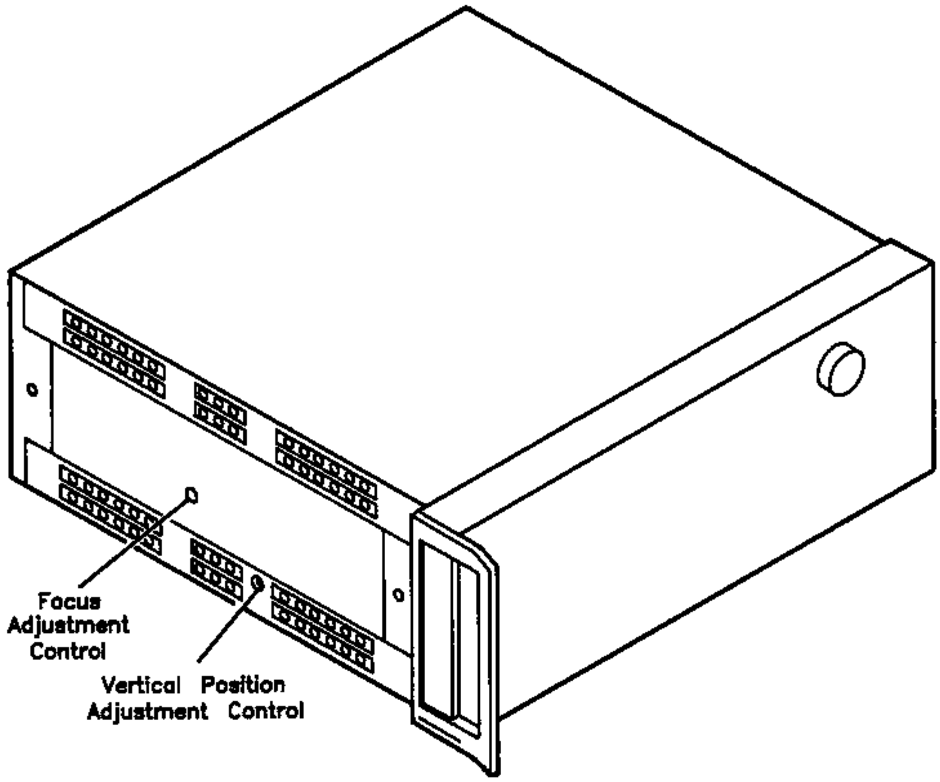


Figure 5-9. Vertical Position Adjustment Control

1. Set the analyzer LINE switch to ON. Allow 30 minutes warm-up time.
2. Remove the analyzer's left side cover next to the display. Remove the screw from the side cover and slide the cover off. Figure 5-9 shows the location of the adjustment control.
3. Insert a narrow, (preferably non-conductive) flat-head screwdriver (at least 2 inches long) into the hole in the lower corner strut that lines up with the hole in the display. This is the eighth hole from the front of the analyzer.
4. Adjust the control until the softkey labels are aligned with the softkeys.
5. Insert the flat-head screwdriver into the focus adjustment control (Figure 5-9). Adjust the focus while viewing test pattern number 10.
6. Replace the side cover by sliding it back on and replacing the screw in the cover at the rear of the instrument.

Section 6. Replaceable Parts

CONTENTS

INTRODUCTION

This section contains parts ordering information. Reference designators and abbreviations are defined and a list of manufacturers is provided. Replaceable parts are listed in reference designator order, by assembly, and illustrations are provided to help with parts identification.

PARTS LIST ORGANIZATION

Table 6-3 is the list of replaceable parts and is organized as follows:

1. Electrical assemblies and their components in alpha-numerical order by reference designation.
2. Options.
3. Miscellaneous parts and literature part numbers.

Figure 6-2 provides photographic illustrations of the analyzer for parts identification of the electrical and cable assemblies, and the hardware.

The parts lists provide the following information:

- Reference Designation —The component or assembly is identified with this code on the schematics in this manual. The alphabetic code used in the reference designation is defined in table 6-2.
- The HP Part Number —Use this number to order the replacement part from Hewlett-Packard.
- CD (Check Digit) —Use this number, in addition to the HP Part Number, to order replacement parts. The check digit is cross-referenced to the HP Part Number as a doublecheck of the part number accuracy.
- Qty —The total quantity of the part in the assembly. The quantity for each part is given once —at the first appearance of the part in the list.
- Description —The description of the replacement part. The abbreviations used in the descriptions are defined in table 6-2.
- Mfr Code —The five digit code of the primary manufacturer of the part. See table 6-2 for the list of manufacturers corresponding to the codes.
- Mfr Part Number —The primary manufacturer's part number for the part.

ORDERING INFORMATION

To order a part listed in the replaceable parts list, quote the Hewlett-Packard part number (with the check digit), indicate the quantity required, and address the order to the nearest Hewlett-Packard office.

To order a part that is not listed in the replaceable parts lists, include the instrument model number, serial number, the description and function of the part, and the quantity required. Address the order to the nearest Hewlett-Packard office.

RESTORED EXCHANGE ASSEMBLIES

Some replacement parts are available as either new or restored assemblies. The Module Exchange Program (figure 6-1) describes the process for exchanging a defective assembly with a restored assembly. The restored assembly is more economical than a new assembly and, as with new assemblies, a 90-day warranty applies through the instrument's support life. The defective assembly must be returned for credit (after you receive the replacement). For this reason, new assemblies must be ordered for spare parts. The part numbers for both new and restored assemblies are given in table 6-1.

Table 6-1. Restored Exchange Assemblies

Reference Designator	New Part Number	Restored Exhange Part Number	Description
A7, A8, A9, A10	08757-60058	08757-69058	Log Amplifier
A14	08757-60065	08757-69065	Display Interface
A15	2090-0210	5180-8484	Display

The module exchange program described here is a fast, efficient, economical method of keeping your Hewlett-Packard instrument in service.

Locate defective module using troubleshooting procedures and service sheets in this manual.

Is a replacement module on hand?

YES

Install the replacement module. Keep the defective module for return to HP.

Order restored-exchange module from HP. Refer to the replaceable parts section for part numbers.

Put restored exchange module in spares stock.

Return defective module to HP.

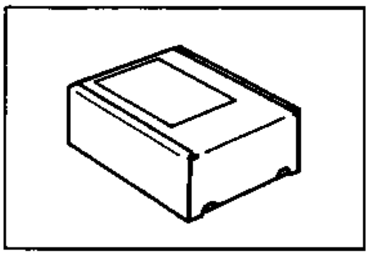
NO

Order restored-exchange module from HP. Refer to the replaceable parts section for part numbers.

Swap replacement module and defective module.

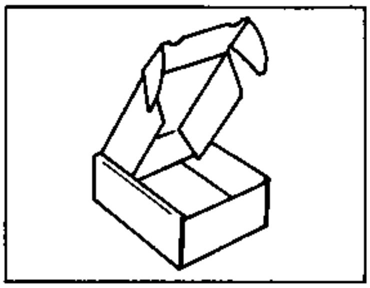
Return defective module to HP.

A.



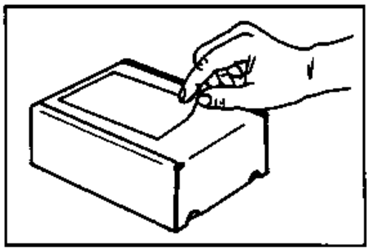
Restored-exchange modules are shipped individually in boxes like this. In addition to the circuit module, the box contains:
- Exchange assembly failure report
- Return address label

B.



Open box carefully - it will be used to return defective module to HP. Complete failure report. Place it and defective module in box. Be sure to remove enclosed return address label.

C.



Seal box with tape. Inside U.S.A.*, stick preprinted return address label over label already on box, and return box to HP. Outside U.S.A., do not use address label; instead address box to the nearest HP office.

*HP pays postage on boxes mailed in U.S.A.

Figure 6-1. Module Exchange Program

Table 6-2. Reference Designations, Abbreviations, and Manufacturer's Code List (1 of 4)

REFERENCE DESIGNATIONS

A .... Assembly
AT .... Attenuator, Isolator, Limiter, Termination
B .... Fan, Motor
C .... Capacitor
CP .... Coupler
CR .... Diode, Diode Thyristor, Step Recovery Diode (SCR), Varactor
DC .... Directional Coupler
DS .... Annunciator, Lamp, Light Emitting Diode (LED), Signaling Device (Audible or Visible)
E .... Miscellaneous Electrical Part
F .... Fuse
FL .... Filter
H .... Hardware
J .... Electrical Connector (Stationary Portion), Jack
K .... Relay
L .... Coil, Inductor
M .... Meter
MP .... Miscellaneous Mechanical Part
P .... Electrical Connector (Movable Portion), Plug
Q .... Silicon Controlled Rectifier (SCR), Transistor, Triode Thyristor
R .... Resistor
RT .... Thermistor
S .... Switch
T .... Transformer
TB .... Terminal Board
TP .... Test Point
U .... Integrated Circuit, Microcircuit
V .... Electron Tube
VR .... Breakdown Diode (Zener), Voltage Regulator
W .... Cable, Transmission Path, Wire
X .... Socket
Y .... Crystal Unit (Piezoelectric, Quartz)
Z .... Tuned Cavity, Tuned Circuit

ABBREVIATIONS

A

A .... Across Flats, Acrylic, Air (Dry Method), Ampere
ADJ .... Adjust, Adjustment
AL .... Aluminum
ALC .... Alcohol, Automatic Level Control
AMP .... Amperage
AMPL .... Amplifier
ANDZ .... Anodized
ANLG .... Analog
ASSY .... Assembly
ASTBL .... Astable
ATTEN .... Attenuation, Attenuator
AWG .... American Wire Gauge

B

BCKT .... Bracket
BD .... Board, Bundle
BE .... Baume, Beryllium
BFR .... Before, Buffer
BLK .... Black, Blank, Block
BNC .... Type of Connector
BSC .... Basic
BVR .... Reverse, Breakdown Voltage

C

C .... Capacitance, Capacitor, Center Tapped, Centistoke, Ceramic, Cermet, Circular Mil Foot, Closed Cup, Cold, Compression
CBL .... Cable
CER .... Ceramic
CH .... Center Hole
CHAM .... Chamfer
CHAN .... Channel
COAX .... Coaxial
COM .... Commercial, Common
CONN .... Connect, Connection, Connector
CONT .... Contact, Continuous, Control, Controller
CONV .... Converter
CP .... Cadmium Plate, Candle Power, Centipoise, Conductive Plastic, Cone Point
CRP .... Crepe, Crimp
CTR .... Center
CURRNT .... Current

D

D .... Deep, Depletion, Depth, Diameter, Direct Current
D/A .... Digital-to-Analog
DAP .... Diallyl Phthalate
DB .... Decibel, Double Break
DC .... Direct Current, Double Contact
DBL .... Double
DCDR .... Decoder
DEG .... Degree
DIA .... Diameter
DIFF .... Differential
DIP .... Dual In-Line Package
DO .... Package Type Designation
DRVR .... Driver

E

E .... Enamel (Insulation, Enhancement, Extension)
E-MODE .... Enhancement Mode
EPROM .... Eraseable Programmable Read Only Memory
EXCL .... Excluding, Exclusive
EXT .... Extended, Extension, External, Extinguish

F

F .... Fahrenheit, Farad, Female, Film, (Resistor), Fixed, Flange, Flint, Flourine, Frequency
FDTHRU .... Feed Through
FEM .... Female
FF .... Flange, Female Connection; Flip Flop
FL .... Flash, Flat, Fluid
FLEX .... Flexible
FLG .... Flange
FLTR .... Filter, Floater
FT .... Current Gain Bandwidth
FM .... Flange, Male Connection; Foam, Frequency Modulation Product (Transition Frequency); Feet, Foot
FXD .... Fixed

G

GEN .... General, Generator
GHZ .... Gigahertz
GP .... General Purpose Group
GL .... Glass
GRN .... Green
GRV .... Grooved

H

H .... Henry, Hermaphrodite, High, Hole Diameter, Hot, Hub Inside Diameter, Hydrogen
HD .... Hand, Hard, Head, Heavy Duty
HEX ..... Hexadecimal, Hexagon, Hexagonal
HGT .... Height

I

IC .... Collector Current, Integrated Circuit
ID .... Identification, Inside Diameter
IF .... Forward Current, Intermediate Frequency
IMPD .... Impedance
IN .... Inch, Indium
INP .... Input
INS ..... Insert, Inside, Insulation, Insulator
INT .... Integral, Intensity, Internal
INTL .... Internal, International
INV .... Invert, Inverter

J

JFET .... Effect Transistor

K

K .... Kelvin, Key, Kilo, Potassium
KB .... Knob

L

LED ... ... Light Emitting Diode
LG .... Length, Long
LIN .... Linear, Linear Taper, Linearity
LK .... Link, Lock
LKG .... Leakage, Locking
LKWR .... Lockwasher
LS .... Loudspeaker, Low Power Schottky, Series Inductance
LUM .... Luminous

M

M .... Male, Maximum, Mega, Mil, Milli, Mode, Momentary, Mounting Hole Centers, Mounting Hole Diameter
MA .... Milliampere
MACH .... Machined
MAX .... Maximum
MCD .... Millacandela
MICPROC .... Microprocessor
MIN .... Miniature, Minimum, Minor, Minute
MLD .... Mold, Molded
MM .... Magnetized Material (Restricted Articles Code), Millimeter
MO .... Metal Oxide, Milliounce, Molybdenum
MOD .... Model, Modified Modular, Modulated, Modulator
MOM .... Momentary, Motherboard
MTG .... Mounting
MTLC .... Metallic
MTR .... Meter
MULTIPLXR .... Multiplexer
MULTR .... Multiplier
MUW .... Music Wire
MW .... Milliwatt

N

N-CHAN .... N-Channel Metal Oxide Semiconductor
NB .... Niobium
NCH .... Notched
NEG .... Negative
NH .... Nanohenry
NM .... Nanometer, Nonmetallic
NO .... Normally Open, Number
NPN .... Negative Positive Negative (Transistor)
NS .... Nanosecond, Non-Shorting, Nose
NYL .... Nylon (Polyamide)

O

OCTL .... Octal
OD .... Olive Drab, Outside Diameter
OP .... Operational
OPT ...... Optical, Option, Optional
OXD .... Oxide

P

PAN-HD .... Pan Head
PC .... Picocoulomb, Piece, Printed Circuit
P.C. .... Printed Circuit
PCB .... Printed Circuit Board
PD .... Pad, Palladium, Pitch Diameter, Power Dissipation
PF .... Picofarad; Pipe, Female Connection; Power Factor
PKG .... Package
PL .... Phase Lock, Plain, Plate, Plug
PL-MTG .... Plate Mounting
PLSTC .... Plastic
PN .... Part Number
PNP .... Positive Negative Positive (Transistor)
POLYC .... Polycarbonate
POLYE .... Polyester
POLYI .... Polyimide
POS .... Position, Positive
POZI .... Pozidrive Recess
PRCN .... Precision
PRIM .... Primary
PRL .... Parallel
PRP .... Purple, Purpose
P/S .... Power Supply
PT .... Part, Pint, Platinum, Point, Pulse Time
PVC .... Polyvinyl Chloride
PW .... Power Wirewound, Pulse Width

Q

QUAD .... Set of Four

R

RBN .... Ribbon
RCVR .... Receiver
RECT .... Rectangle, Rectangular, Rectifier
RES ...... Research, Resistance, Resistor, Resolution
RET .... Retaining
RF .... Radio Frequency
RFI .... Radio Frequency Interference
RFLTR .... Regulator
RKR .... Rocker
RND .... Round
RPG ..... Rotary Pulse Generator
RR .... Rear
RVT .... Rivet, Riveted

S

SCR .... Screw, Scrub, Silicon Controlled Rectifier
SEC .... Secondary
SER .... Serial, Series
SGL .... Single
SHFT .... Shaft
SHLDR .... Shoulder
SI .... Silicon, Square Inch
SIG .... Signal, Significant
SIP .... Single In-Line Package
SKT .... Skirt, Socket
SLDR .... Solder
SM ...... Samarium, Seam, Small, Square Meter, Sub Modular, Subminiature
SMB .... Subminiature, B Type (Snap-On Connector)

Table 6-2. Reference Designations, Abbreviations , and Manufacturer's Code List (3 of 4)

SNP	Snap
SPCL	Special
SQ	Square
SST	Stainless Steel
STDF	Standoff
SZ	Size
T	
T	Tab Width, Taper, Teeth, Temperature, Tera, Tesla, Thermoplastic (Insulation), Thickness, Time, Timed, Tooth, Turns Ratio, Typical
TA	Ambient Temperature, Tantalum
TC	Thermoplastic
TFE	Polytetrafluro - ethylene, Teflon
THD	Thread, Threaded
THK	Thick
TO	Package Type
TPL	Triple
TRIG	Trigger, Triggerable, Triggering, Trigonometry
TRMR	Trimmer
TRN	Turn, Turns
TTL	Tan Translucent, Transistor, Transistor Logic
U	
UCD	Microcandela
UNCT	Undercut
UF	Microfarad
V	
V	Vanadium, Variable, Violet, Volt, Voltage
VA	Volt Ampere
VDC	Volts, Direct Current
VID	Video
W	
W	Watt, Wattage, White,
WB	Wide Band Wide, Width, Wire
WD	Width, Wood
X	
XSTR	Transistor
Y	
YIG	Yytrium-iron-garnet
YTM	YIG Tuned Multiplier
Z	
ZN-P	Zinc Plate
ZNR	Zener

MANUFACTURER'S CODE LIST

Mfr Code	Manufacturer Name	Address		Zip Code
01121	Allen-Bradley Co	Milwaukee	WI	53204
C1433	AB Elektronik GMBH	Salzburg	AU	A-501
D8439	Roederstein/Resista GMBH	Landshut	GM	8300
K8479	Holsworthy Electronics Ltd	Holsworthy	EG	
S0545	NEC Electronics Inc	Mtn View	CA US	94043
S4013	Hitachi America Ltd	Sunnyvale	CA US	94086
00000	Any Satisfactory Supplier			
00779	AMP Inc	Harrisburg	PA US	17111
00815	NEL Frequency Control Inc	Burlington	WI US	53105
01295	Texas Instruments Inc	Dallas	TX US	75265
02085	Corc Corcom Inc	Libertyville	IL	60048
02768	ITW Fastex	Des Plaines	IL US	60016
03888	KDI Pyrofoam Corp	Whippany	NJ	07981
04222	AVX Corp	Great Neck	NY US	11021
04713	Motorola Inc	Roselle	IL US	60195
06665	Precision Monolithics Inc.	Santa Clara	CA	95050
06776	Robinson Nugent Inc	New Albany	IN US	47150
07263	Fairchild Semiconductor Corp	Cupertino	CA US	95014
08777	Marbelette Corp div Allied Products	Long Island	NY	11101
08800	GE CO Insulating Materials Prod	Schenectady	NY	12306
09709	I-T-E Imperial Corp Distr & Cont GP	Detroit	MI	48211
09922	Burndy Corp	Norwalk	CT US	06856
09969	Dale Electronics Inc	Yankton	SD US	57078
10582	CTS Corp Asheville Div	Skyland	NC US	28776
10858	Linear Technology Corp	Milpitas	CA	95035
11176	Crescent Mold Engineering Corp	Sun Valley	CA	91352
11870	Melabs Inc	Palo Alto	CA	94304
11983	Nortronics Co Inca	Minneapolis	MN	55427
12193	Fluid Dynamics Div Brunswick Corp	Cedar Knolls	NJ	07927
12344	Tally Corp	Kent	WA	98031
12403	Canfiled H O Co of Indiana Inc The	Seymour	IN	47274
12474	Bel-Ray Co Inc	Farmingdale	NJ	07727
12498	Crystalonics, Div Teledyne	Cambridge	MA	02140
13103	Thermalloy Inc	Dallas	TX US	75234
18324	Signetic Corp	Sunnyvale	CA US	94086
18565	Chomerics Inc	Woburn	MA	01801
19701	Mepco/Centralab Inc	Riviera	FL US	33404
2M627	Rohm Corp	Irvine	CA US	92713
24355	Analog Devices Inc	Norwood	MA US	02062
24546	Corning Glass Works	Bradford	PA	16701
24931	Specialty Connector Co	Franklin	IN US	46131
27014	National Semiconductor Corp	Santa Clara	CA US	95052
28480	Hewlett-Packard Co Corporate HQ	Palo Alto	CA	94304
34335	Advanced Micro Devices Inc.	Sunnyvale	CA	94086
34649	Intel Corp	Santa Clara	CA US	95054
34677	Solitron Devices Inc	Palm Beach	FL US	33404
46384	Penn Engineering & Mfg Corp	Doylestown	PA US	18901
55285	Bergquist Co	Minneapolis	MN	55420
56289	Sprague Electric Co	Lexington	MA US	02173
72799	General Electric Co	Fairfield	CT US	06430
72962	Elastic Stop Nut Div of Harvard	Union	NJ US	07083
75915	Littelfuse Inc	Des Plaines	IL US	60016
78189	Illinois Tool Works Inc Shakeproof	Elgin	IL	60126
81073	Grayhill Inc	La Grange	IL US	60525
84411	American Shizuki Corp	Canoga Park	CA US	91304
9M011	Intl Rectifier Corp	Los Angeles	CA US	90069
9N171	Unitrode Corp	Lexington	MA US	02173
91506	Augat Inc	Mansfield	MA US	02048
91637	Dale Electronics Inc	Columbus	NE US	68601

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1	08757-60078	1	FRONT PANEL KEYBOARD ASSEMBLY	28480	08757-60078
A1DS1	1990-0858	4	LED-LAMP LUM-INT=15UCD IF=25MA-MAX	28480	1990-0858
A1DS2	1990-0858		LED-LAMP LUM-INT=15UCD IF=25MA-MAX	28480	1990-0858
A1DS3	1990-0858		LED-LAMP LUM-INT=15UCD IF=25MA-MAX	28480	1990-0858
A1DS4	1990-0858		LED-LAMP LUM-INT=15UCD IF=25MA-MAX	28480	1990-0858
A1MP1			NOT ASSIGNED		
A1MP2	5040-6858	1	LED STDF STRIP	28480	5040-6858
A1MP3	5041-4568	1	KEY H CAL	28480	5041-4568
A1MP4	5041-4569	1	KEY H AVG	28480	5041-4569
A1MP5	5041-0772	1	KEY H-LOCAL	28480	5041-0772
A1MP6	5041-1611	1	KEY H RECALL	28480	5041-1611
A1MP7	5041-0855	1	KEYCAP-HALF "PG ARW"	28480	5041-0855
A1MP8	5041-1755	1	KEY CAP-QUARTER "DECIMAL"	28480	5041-1755
A1MP9	5041-1756	1	KEY CAP-QUARTER,GRAY "0"	28480	5041-1756
A1MP10	5041-1757	1	KEY CAP-QUARTER,GRAY "1"	28480	5041-1757
A1MP11	5041-1758	1	KEYCAP-QUARTER,GRAY "2"	28480	5041-1758
A1MP12	5041-1759	1	KEYCAP-QUARTER,GRAY "3"	28480	5041-1759
A1MP13	5041-1760	1	KEYCAP-QUARTER,GRAY "4"	28480	5041-1760
A1MP14	5041-1761	1	KEYCAP-QUARTER,GRAY "5"	28480	5041-1761
A1MP15	5041-1762	2	KEYCAP-QUARTER,GRAY "6"	28480	5041-1762
A1MP16	5041-1763	1	KEYCAP-QUARTER,GRAY "7"	28480	5041-1763
A1MP17	5041-1764	1	KEYCAP-QUARTER,GRAY "8"	28480	5041-1764
A1MP18	5041-1769	1	KEYCAP-QUARTER "BK SP"	28480	5041-1769
A1MP19	5041-1770	1	KEYCAP-QUARTER "MINUS"	28480	5041-1770
A1MP20	5041-1940	1	KEYCAP-QUARTER "DBM"	28480	5041-1940
A1MP21	5041-2804	1	KEY H REF	28480	5041-2804
A1MP22	5041-2808	1	KEY H DISPLAY	28480	5041-2808
A1MP23	5041-2805	1	KEY H SCALE	28480	5041-2805
A1MP24	5041-4566	1	KEY H CURSOR	28480	5041-4566
A1MP25	5041-4567	1	KEY H SPCL	28480	5041-4567
A1MP26	5041-2809	1	KEY H SAVE	28480	5041-2809
A1MP27	5041-4570	1	KEY H MEAS	28480	5041-4570
A1MP28	5041-2803	1	KEY Q ENT	28480	5041-2803
A1MP29	5041-2802	1	KEY Q ENT-OFF	28480	5041-2802
A1MP30	5041-2099	1	KEY H PRESET	28480	5041-2099
A1MP31	5041-9112	8	KEY H SMK GRA AND KEYCAP EXTENDER	28480	5041-9112
A1MP32	5041-4571	1	KEY H SYSTEM	28480	5041-4571
A1MP33	5041-0847	1	KEY H 1	28480	5041-0847
A1MP34	5041-0848	1	KEY H 2	28480	5041-0848
A1S41	5060-9436	41	PUSHBUTTON SWITCH P C. MOUNT	28480	5060-9436
A1W1	08757-60045	1	CBL AY 26C 28G	28480	08757-60045

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2	08757-60055	1	FRONT PANEL INTERFACE	28480	08757-60055
A2C1	0180-4135	1	CAPACITOR-FXD 33UF ±10% 10VDC TA	28480	0180-4135
A2C2	0160-4835	8	CAPACITOR-FXD 1UF ±10% 50VDC CER	28480	0160-4835
A2C3	0180-4131	10	CAPACITOR-FXD 4.7UF ±10% 35VDC TA	28480	0180-4131
A2C4	0180-4131		CAPACITOR-FXD 4.7UF ±10% 35VDC TA	28480	0180-4131
A2C5	0180-4131		CAPACITOR-FXD 4.7UF ±10% 35VDC TA	28480	0180-4131
A2C6	0180-4131		CAPACITOR-FXD 4.7UF ±10% 35VDC TA	28480	0180-4131
A2C7	0180-4131		CAPACITOR-FXD 4.7UF ±10% 35VDC TA	28480	0180-4131
A2C8	0180-4131		CAPACITOR-FXD 4.7UF ±10% 35VDC TA	28480	0180-4131
A2C9	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A2C10	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A2C11	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A2C12	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A2C13	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A2C14	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A2C15	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A2C16			NOT ASSIGNED		
A2C17	0180-4131		CAPACITOR-FXD 4.7UF ±10% 35VDC TA	28480	0180-4131
A2C18	0180-4131		CAPACITOR-FXD 4.7UF ±10% 35VDC TA	28480	0180-4131
A2C19	0160-4801	1	CAPACITOR-FXD 100PF ±5% 100VDC CER	28480	0160-4801
A2C20	0160-4574	2	CAPACITOR-FXD 1000PF ±10% 100VDC CER	28480	0160-4574
A2C21	0160-4574		CAPACITOR-FXD 1000PF ±10% 100VDC CER	28480	0160-4574
A2C22	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A2C23	0180-4131		CAPACITOR-FXD 4.7UF ±10% 35VDC TA	28480	0180-4131
A2C24	0180-4131		CAPACITOR-FXD 4.7UF ±10% 35VDC TA	28480	0180-4131
A2C25	0180-3627	2	CAPACITOR .22UF ± 10% 35VDC TA	28480	0180-3627
A2C26	0180-3627		CAPACITOR .22UF ±10% 35VDC TA	28480	0180-3627
A2C27	0180-4136	1	CAPACITOR 10UF ± 10% 20VDC TA	28480	0180-4136
A2CR1	1901-0050	9	DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR3			NOT ASSIGNED		
A2CR4			NOT ASSIGNED		
A2CR5	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR6	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR7			NOT ASSIGNED		
A2CR8			NOT ASSIGNED		
A2CR9	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR10	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR11			NOT ASSIGNED		
A2CR12			NOT ASSIGNED		
A2CR13	1901-0050		DIODE-SWITCHING 80V 200MA 2NA DO-35	28480	1901-0050
A2CR14	1901-0050		DIODE-SWITCHING 80V 200MA 2NA DO-35	28480	1901-0050
A2CR15			NOT ASSIGNED		
A2CR16			NOT ASSIGNED		
A2CR17	1901-0050		DIODE-SWITCHING 80V 200MA 2NA DO-35	28480	1901-0050
A2J1	1251-8828	1	CONNECTOR40-PIN M POST TYPE	28480	1251-8828
A2J2	1251-8248	1	CONNECTOR26-PIN M POST TYPE	28480	1251-8248
A2J3	1251-6515	4	CONNECTOR6-PIN M POST TYPE	28480	1251-6515
A2J4	1251-6515		CONNECTOR6-PIN M POST TYPE	28480	1251-6515
A2J5	1251-6515		CONNECTOR6-PIN M POST TYPE	28480	1251-6515
A2J6	1251-6515		CONNECTOR6-PIN M POST TYPE	28480	1251-6515
A2J7	1251-7554	1	CONN-POST TYPE .100-PIN-SPCG 6-CONT	28480	1251-7554
A2L1	08503-80001	3	COIL TORROID	28480	08503-80001
A2L2	9100-2573	8	INDUCTOR RF-CH-MLD 1MH 10% .161DX.385LG	28480	9100-2573
A2L3	9100-2578	8	INDUCTOR RF-CH-MLD 2.7MH 10%	28480	9100-2578
A2L4	9100-2573		INDUCTOR RF-CH-MLD 1MH 10% .161DX.385LG	28480	9100-2573
A2L5	9100-2578		INDUCTOR RF-CH-MLD 2.7MH 10%	28480	9100-2578
A2L6	9100-2573		INDUCTOR RF-CH-MLD 1MH 10% .161DX.385LG	28480	9100-2573
A2L7	9100-2578		INDUCTOR RF-CH-MLD 2.7MH 10%	28480	9100-2578
A2L8	9100-2573		INDUCTOR RF-CH-MLD 1MH 10% .161DX.385LG	28480	9100-2573
A2L9	9100-2578		INDUCTOR RF-CH-MLD 2.7MH 10%	28480	9100-2578
A2L10	9100-2573		INDUCTOR RF-CH-MLD 1MH 10% .161DX.385LG	28480	9100-2573
A2L11	9100-2578		INDUCTOR RF-CH-MLD 2.7MH 10%	28480	9100-2578
A2L12	9100-2573		INDUCTOR RF-CH-MLD 1MH 10% .161DX.385LG	28480	9100-2573
A2L13	9100-2578		INDUCTOR RF-CH-MLD 2.7MH 10%	28480	9100-2578
A2L14	9100-2573		INDUCTOR RF-CH-MLD 1MH 10% .161DX.385LG	28480	9100-2573
A2L15	9100-2578		INDUCTOR RF-CH-MLD 2.7MH10%	28480	9100-2578
A2L16	9100-2573		INDUCTOR RF-CH-MLD 1MH 10% .161 DX 385LG	28480	9100-2573
A2L17	9100-2578		INDUCTOR RF-CH-MLD 2.7MH 10%	28480	9100-2578
A2MP1			NOT ASSIGNED		
A2MP2	0380-1246	1	SPACER-RVT-ON 6-MM-LG 2.8-MM-ID	00000	ORDER BY DESC
A2Q1	1855-0567	1	TRANSISTOR MOSFET P-CHAN E-MODE SI	28480	1855-0567

Table 6–3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2Q2	1855–0423	1	TRANSISTOR MOSFET N–CHAN E–MODE TO–237	28480	1855–0423
A2Q3	1855–0516	1	TRANSISTOR MOSFET N–CHAN E–MODE SI	28480	1855–0516
A2R1	0757–0401	3	RESISTOR 100 1% .125W F TC=0±100	24546	C4–1/8–TO–101–F
A2R2	0698–3155	1	RESISTOR 4.64K 1% .125W F TC=0±100	24546	C4–1/8–TO–4641–F
A2R3	0757–0346	1	RESISTOR 10 1% .125W F TC=0±100	24546	C4–1/8–TO–10R0–F
A2R4	0698–7236	4	RESISTOR 1K 1% .05W F TC=0±100	24546	C3–1/8–TO–1001–F
A2R5	0698–7236		RESISTOR 1K 1% .05W F TC=0±100	24546	C3–1/8–TO–1001–F
A2R6	0698–7236		RESISTOR 1K 1% .05W F TC=0±100	24546	C3–1/8–TO–1001–F
A2R7	0698–7236		RESISTOR 1K 1% .05W F TC=0±100	24546	C3–1/8–TO–1001–F
A2R8	0757–0401		RESISTOR 100 1% .125W F TC=0±100	24546	C4–1/8–TO–101–F
A2R9	0757–0401		RESISTOR 100 1% .125W F TC=0±100	24546	C4–1/8–TO–101–F
A2R10	0698–3403	1	RESISTOR 348 ±1% .5W TF TC=0±100	28480	0698–3403
A2R11	0757–0442	1	RESISTOR 10K ± 1% .125W TF TC=0± 100	28480	0757–0442
A2R12	0698–3402	1	RESISTOR 316 ±1% .5W TF TC=0±100	28480	0698–3402
A2R14	0757–0290	1	RESISTOR 6. 9K ±1% .125W TF TC=0±100	28480	0757–0290
A2R15	0757–0443	1	RESISTOR 11K ± 1% .125W TF TC=0± 100	28480	0757–0443
A2R16	0698–4474	1	RESISTOR 8.45K ±1% .125W TF TC=0±100	28480	0698–4474
A2R17	0757–0438	1	RESISTOR 5.11K ±1% .125W TF TC=0±100	28480	0757–0438
A2R18	0698–3162	1	RESISTOR 46 .4K ±1% .125W TF TC=0±100	28480	0698–3162
A2R19	0757–0465	1	RESISTOR 100K ± 1% .125W TF TC=0±100	28480	0757–0465
A2R20	0698–3158	1	RESISTOR 23.7K ±1% .125W TF TC=0±100	28480	0698–3158
A2R21	0757–0280	1	RESISTOR 1K ±1% .125W TF TC=0±100	28480	0757–0280
A2TP1	0360–0535	6	TERMINAL TEST POINT PCB	00000	ORDER BY DESC
A2TP2	0360–0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESC
A2TP3	0360–0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESC
A2TP4	0360–0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESC
A2TP5	0360–0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESC
A2TP6	0360–0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESC
A2U1	1820–1112	1	IC FF TTL LS D–TYPE POS–EDGE–TRIG	01295	SN74LS74AN
A2U2	1820–1197	1	IC GATE TTL LS NAND QUAD2–INP	01295	SN74LS00N
A2U3	1820–1416	1	IC SCHMITT–TRIG TTL LS INV HEX 1–INP	01295	SN74LS14N
A2U4	1820–1414	1	IC GATE TTL LS NAND TPL3–INP	01295	SN74LS12N
A2U5	1820–1240	1	IC DCDR TTL S 3–TO–8–LINE 3–INP	01295	SN74S138N
A2U6	1810–0279	2	NETWORK–RES 10–SIP4 .7K OHM X 9	01121	210A472
A2U7	1820–1199	1	IC INV TTL LS HEX 1–INP	01295	SN74LS04N
A2U8	1820–1207	1	IC GATE TTL LS NAND 8–INP	01295	SN74LS30N
A2U9	1810–0279		NETWORK–RES 10–SIP4 .7K OHM X 9	01121	210A472
A2U10	1820–2024	1	IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS244N
A2U11	1820–1730	2	IC FF TTL LS D–TYPE POS–EDGE–TRIG COM	01295	SN74LS273N
A2U12	1820–1730		IC FF TTL LS D–TYPE POS–EDGE–TRIG COM	01295	SN74LS273N
A2U13	1820–2270	1	IC CNTR TTL LS BIN UP/DOWN SYNCHRO	34335	AM25LS2569DC
A2U14	1820–1470	1	IC 74LS157P4MUXR	28480	1820–1470
A2U15	1826–0138	2	IC 339 P4COMPT	28480	1826–0138
A2U16	1826–0138		IC 339 P4COMPT	28480	1826–0138
A2U17	1810–0316	1	ICV RGLTR–V–REF–FXD 10V TO–5 PKG	28480	1810–0316
A2U18	1826–0180	1	TTL MONO/ASTBL	28480	1826–0180
A2VR1			NOT ASSIGNED		
A2VR2			NOT ASSIGNED		
A2VR3	1902–0556	8	DIODE–ZNR 20V 5% PD=1W IR=5UA	28480	1902–0556
A2VR4	1902–0556		DIODE–ZNR 20V 5% PD=1W IR=5UA	28480	1902–0556
A2VR5			NOT ASSIGNED		
A2VR6			NOT ASSIGNED		
A2VR7	1902–0556		DIODE–ZNR 20V 5% PD=1W IR=5UA	28480	1902–0556
A2VR8	1902–0556		DIODE–ZNR 20V 5% PD=1W IR=5UA	28480	1902–0556
A2VR9			NOT ASSIGNED		
A2VR10			NOT ASSIGNED		
A2VR11	1902–0556		DIODE–ZNR 20V 5% PD=1W IR=5UA	28480	1902–0556
A2VR12	1902–0556		DIODE–ZNR 20V 5% PD=1W IR=5UA	28480	1902–0556
A2VR13			NOT ASSIGNED		
A2VR14			NOT ASSIGNED		
A2VR15	1902–0556		DIODE–ZNR 20V 5% PD=1W IR=5UA	28480	1902–0556
A2VR16	1902–0556		DIODE–ZNR 20V 5% PD=1W IR=5UA	28480	1902–0556

Table 6–3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3	~~08757–60121~~	1	CPU (HP 8757C)	28480	08757–60121
A3	08757–60121	1	CPU (HP 8757E)	28480	08757–60121
A3BT1	1420–0519	1	CATALYST RESEARCH SYSTEMS BATTERY	08800	B–1000
A3BT1	1420–0394	1	PANASONIC BATTERY	08800	B–1000
A3C1	0160–4084	20	CAPACITOR–FXD .1UF ±20% 50VDC CER	09969	RPE122–139X7R104MSOV
A3C2	0160–4084		CAPACITOR–FXD .1UF ±20% 50VDC CER	09969	RPE122–139X7R104MSOV
A3C3	0180–3833	3	CAPACITOR–FXD 22UF±10% 10VDC TA	12344	T398E226M010AS
A3C4	0160–4084		CAPACITOR–FXD .1UF ±20% 50VDC CER	09969	RPE122–139X7R104MSOV
A3C5	0160–4084		CAPACITOR–FXD .1UF ±20% 50VDC CER	09969	RPE122–139X7R104MSOV
A3C6	0180–3833		CAPACITOR–FXD 22UF±10% 10VDC TA	12344	T398E226M010AS
A3C7	0160–4084		CAPACITOR–FXD .1UF ±20% 50VDC CER	09969	RPE122–139X7R104MSOV
A3C8	0160–4084		CAPACITOR–FXD .1UF ±20% 50VDC CER	09969	RPE122–139X7R104MSOV
A3C9	0160–4084		CAPACITOR–FXD .1UF ±20% 50VDC CER	09969	RPE122–139X7R104MSOV
A3C10	0160–4084		CAPACITOR–FXD .1UF ±20% 50VDC CER	09969	RPE122–139X7R104MSOV
A3C11	0160–4084		CAPACITOR–FXD .1UF ±20% 50VDC CER	09969	RPE122–139X7R104MSOV
A3C12	0160–4084		CAPACITOR–FXD .1UF ±20% 50VDC CER	09969	RPE122–139X7R104MSOV
A3C13	0160–4084		CAPACITOR–FXD .1UF ±20% 50VDC CER	09969	RPE122–139X7R104MSOV
A3C14	0160–4084		CAPACITOR–FXD .1UF ±20% 50VDC CER	09969	RPE122–139X7R104MSOV
A3C15	0160–4084		CAPACITOR–FXD .1UF ±20% 50VDC CER	09969	RPE122–139X7R104MSOV
A3C16	0160–4084		CAPACITOR–FXD .1UF ±20% 50VDC CER	09969	RPE122–139X7R104MSOV
A3C17	0160–4084		CAPACITOR–FXD .1UF ±20% 50VDC CER	09969	RPE122–139X7R104MSOV
A3C18	0160–4084		CAPACITOR–FXD .1UF ±20% 50VDC CER	09969	RPE122–139X7R104MSOV
A3C19	0160–4084		CAPACITOR–FXD .1UF ±20% 50VDC CER	09969	RPE122–139X7R104MSOV
A3C20	0160–4084		CAPACITOR–FXD .1UF ±20% 50VDC CER	09969	RPE122–139X7R104MSOV
A3C21	0160–4084		CAPACITOR–FXD .1UF ±20% 50VDC CER	09969	RPE122–139X7R104MSOV
A3C22	0180–3833		CAPACITOR–FXD 22UF±10% 10VDC TA	12344	T398E226M010AS
A3C23	0160–4084		CAPACITOR–FXD .1UF ±20% 50VDC CER	09969	RPE122–139X7R104MSOV
A3C24	0180–3771	1	CAPACITOR–FXD 1UF±10% 35VDC TA	12344	T398E226M010AS
A3C25	0180–3845	1	CAPACITOR–FXD 4.7UF ± 10% 35VDC TA	12344	T398E226M010AS
A3CR1	1901–0033	1	DIODE–GEN PRP 180V 200MA DO–35	9N171	1N645
A3DS1	1990–0652	2	LED–LAMP ARRAY LUM–INT=200UCD IF=SMA–MAX	28480	HLMP–6620 SELECTED
A3DS2	1990–0652		LED–LAMP ARRAY LUM–INT=200UCD IF=SMA–MAX	28480	HLMP–6620 SELECTED
A3DS3	1990–0685	1	LED–LAMP LUM–INT=200UCD	28480	HLMP–6620
A3L1	08503–80001	1	COIL TOROID	28480	08503–80001
A3MP1			NOT ASSIGNED		
A3MP2	4040–0751	2	EXTR–PC BD ORN POLYC .062–IN–BD– THKNS	28480	4040–0751
A3MP3	1480–0073	2	PIN–ROLL .062–IN–DIA .25–IN–LG BE–CU	72962	99–012–062–0250
A3MP4	1480–0073		PIN–ROLL .062–IN–DIA .25–IN–LG BE–CU	72962	99–012–062–0250
A3P1	1251–7907	1	CONN–POST TYPE.100–PIN–SPCG80–CONT	28480	1251–7907
A3R1	0757–0280	3	RESISTOR 1K ±1% .125W TF TC=0±100	12498	CT4–1/8–TO–1001–F
A3R2	0757–0442	1	RESISTOR 10K ±1% .125W TF TC=0±100	12498	CT4–1/8–TO–1002–F
A3R3	0698–3155	3	RESISTOR 4.64K ±1% .125W TF TC=0±100	12498	CT4–1/8–TO–4641–F
A3R4	0698–3155		RESISTOR 4.64K ±1% .125W TF TC=0±100	12498	CT4–1/8–TO–4641–F
A3R5	0698–3155		RESISTOR 4.64K ±1% .125W TF TC=0±100	12498	CT4–1/8–TO–4641–F
A3R6	0757–0465	1	RESISTOR 100K ±1% .125W TF TC=0±100	12498	CT4–1/8–TO–1003–F
A3R7	0757–0280		RESISTOR 1K ±1% .125W TF TC=0±100	12498	CT4–1/8–TO–1001–F
A3R8	0757–0280		RESISTOR 1K ±1% .125W TF TC=0±100	12498	CT4–1/8–TO–1001–F
A3R9	0757–0419	1	RESISTOR 681 ±1% .125W TF TC=0±100	12498	CT4–1/8–TO–681R–F
A3S1	3101–2340	1	SWITCH–DIP RKR 5–1A 0.05A 30VDC	81073	76PSBO5S
A3TP1	0360–0535	13	CONNECTOR–SGL CONT TML–TS–PT	28480	0360–0535
A3TP2	0360–0535		CONNECTOR–SGL CONT TML–TS–PT	28480	0360–0535
A3TP3	0360–0535		CONNECTOR–SGL CONT TML–TS–PT	28480	0360–0535
A3TP4	0360–0535		CONNECTOR–SGL CONT TML–TS–PT	28480	0360–0535
A3TP5	0360–0535		CONNECTOR–SGL CONT TML–TS–PT	28480	0360–0535
A3TP6	0360–0535		CONNECTOR–SGL CONT TML–TS–PT	28480	0360–0535
A3TP7–42	1251–6799	1	CONN–POST TYPE.100–PIN–SPCG36–CONT	28480	1251–6799
A3TP43	0360–0535		CONNECTOR–SGL CONT TML–TS–PT	28480	0360–0535
A3TP44	0360–0535		CONNECTOR–SGL CONT TML–TS–PT	28480	0360–0535
A3TP45	0360–0535		CONNECTOR–SGL CONT TML–TS–PT	28480	0360–0535
A3TP46	0360–0535		CONNECTOR–SGL CONT TML–TS–PT	28480	0360–0535
A3TP47	0360–0535		CONNECTOR–SGL CONT TML–TS–PT	28480	0360–0535
A3TP48	0360–0535		CONNECTOR–SGL CONT TML–TS–PT	28480	0360–0535
A3TP49	0360–0535		CONNECTOR–SGL CONT TML–TS–PT	28480	0360–0535
A3U1	1820–3318	3	IC FF TTL ALS D–TYPE POS–EDGE–TRIG COM	01295	SN74ALS273N
A3U2	1810–0279	3	NETWORK–RES10–SIP 4.7K OHM X 9	C1433	750–101
A3U3	1820–3145	2	IC DRVR TTL ALS BUS OCTL	01295	SN74ALS244AN
A3U4	1818–4227	2	IC NMOS 16384 (16K) ELEC–ER–PROM 200–NS	10582	X2816BP–20
A3U5	1818–4228	4	IC CMOS 262144 (256K) STAT RAM 120–NS	S4013	HM62256LP–12SL
A3U6	1818–4228		IC CMOS 262144 (256K) STAT RAM 120–NS	S4013	HM62256LP–12SL
A3U7	08757–60098	2	NOT SEPARATELY REPLACEABLE, ORDER EPROM KIT, CONTAINS 1 SET EPROMS HP 8757E ONLY	28480	08757–60098

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3U7	08757-60099	2	NOT SEPARATELY REPLACEABLE, ORDER EPROM KIT CONTAINS 1 SET EPROMS HP 8757C ONLY	28480	08757-60099
A3U8	08757-60098	2	NOT SEPARATELY REPLACEABLE, ORDER EPROM KIT, CONTAINS 1 SET EPROMS HP 8757E ONLY	28480	08757-60098
A3U8	08757-60099	2	NOT SEPARATELY REPLACEABLE, ORDER EPROM KIT, CONTAINS 1 SET EPROMS HP 8757C ONLY	28480	08757-60099
A3U9	1820-4570	1	IC-16-BIT,10MHZ,PLSTC,MPU,32-B DATA BUS	04713	MC68000P10
A3U10	08757-80057	1	PAL-CPU	28480	08757-80057
A3U11	1810-0371	1	NETWORK-RES 8-SIP 100.0K OHM X 7	C1433	750-81
A3U12	1820-1200	2	IC INV TTL LS HEX	01295	SN74LS05N
A3U13	1826-0180	1	IC TIMER TTL MONO/ASTBL	18324	NE555N
A3U14	1813-0185	1	CLOCK-OSCILLATOR-XTAL 20-MHZ 0.05%	00815	HS-109
A3U15	1820-3645	1	IC CNTR TTL F DECD SYNCHRO POS-EDGE-TRIG	07263	74F160APC
A3U16	1820-5497	2	IC-NONVOLATILE MEMORY CONTROLLER	12193	DS1210
A3U17	1820-5497		IC-NONVOLATILE MEMORY CONTROLLER	12193	DS1210
A3U18	1258-0177	1	SHUNT-PROGRAMMABLE 8 DBL PIN SETS; .800	91506	8136-475G8
A3U19	1820-3145		IC DRVR TTL ALS BUS OCTL	01295	SN74ALS244AN
A3U20	1810-0279		NETWORK-RES 10-SIP 4.7K OHM X 9	C1433	750-101
A3U21	1820-2773	1	IC GATE TTL ALS NAND 8-INP	01295	SN74ALS30AN
A3U22	1820-1851	1	IC ENCDR TTL LS	01295	SN74LS148N
A3U23	1810-0279		NETWORK-RES 10-SIP 4 .7K OHM X 9	C1433	750-101
A3U24	1820-3185	1	IC SCHMITT-TRIG CMOS/74HC INV HEX	27014	MM74HC14N
A3U25	1820-2685	1	IC GATE TTL F NOR QUAD 2-INP	07263	74F02PC
A3U26	1818-4227		IC NMOS 16384 (16K) ELEC-ER-PROM 200-NS	10562	X2816BP-20
A3U27	1818-4228		IC CMOS 262144 (256K) STAT RAM 120-NS	S4013	HM62256LP-12SL
A3U28	1818-4228		IC CMOS 262144 (256K) STAT RAM 120-NS	S4013	HM62256LP-12SL
A3U29	08757-60098	2	NOT SEPARATELY REPLACEABLE, ORDER EPROM KIT, CONTAINS 1 SET EPROMS HP 8757E ONLY	28480	08757-60098
A3U29	08757-60099	2	NOT SEPARATELY REPLACEABLE, ORDER EPROM KIT, CONTAINS 1 SET EPROMS HP 8757C ONLY	28480	08757-60099
A3U30	08757-60098	2	NOT SEPARATELY REPLACEABLE, ORDER EPROM KIT, CONTAINS 1 SET EPROMS HP 8757E ONLY	28480	08757-60098
A3U30	08757-60099	2	NOT SEPARATELY REPLACEABLE, ORDER EPROM KIT, CONTAINS 1 SET EPROMS HP 8757C ONLY	28480	08757-60099
A3U31	08757-80058	1	PAL-MEM DECODER	28480	08757-80058
A3U32	08757-80059	1	PAL-IO	28480	08757-80059
A3U33	1820-2506	1	IC INV TTL F HEX	07263	74F04PC
A3U34	1820-3121	2	IC TRANSCEIVER TTL ALS BUS OCTL	01295	SN74ALS245AN
A3U35	1820-3121		IC TRANSCEIVER TTL ALS BUS OCTL	01295	SN74ALS245AN
A3U36	1820-3093	1	IC-8000-SERIES PROGRAMMABLE TIMER	34649	P8254
A3U37	1820-3318		IC FF TTL ALS D-TYPE POS-EDGE-TRIG COM	01295	SN74ALS273N
A3U38	1820-2656	1	IC GATE TTL ALS NAND QUAD 2-INP	01295	SN74ALS00AN
A3U39	1820-3318		IC FF TTL ALS D-TYPE POS-EDGE-TRIG COM	01295	SN74ALS273N
A3U40	1820-1200		IC INV TTL LS HEX	01295	SN74LS05N
A3U41	1820-2778	1	IC CNTR TTL ALS DECD SYNCHRO	01295	SN74ALS162BN
A3U42	1820-3649	1	IC SHF-RGTR TTL F SYNC/ASYNC SERIAL-IN	07263	74F164PC
A3U43	1820-2779	1	IC CNTR TTL ALS BIN SYNCHRO	01295	SN74ALS163BN
A3X1	1200-0607	1	SOCKET-IC-DIP 16-CONT DIP DIP-SLDR	01295	C8716-01
A3X2	1200-1326	4	SOCKET-IC-DIP 32-CONT DIP DIP-SLDR	06776	IC T-326-TT
A3X3	1200-0639	1	SOCKET-IC-DIP 20-CONT DIP DIP-SLDR	01295	C8720-01
A3X4	1200-1107	2	SOCKET-IC-DIP 24-CONT DIP DIP-SLDR	00779	641932-1

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4	08757-60004	1	**ADC ANALOG-TO-DIGITAL CONVERTER**	28480	08757-60004
A4C1	0180-3713	1	CAPACITOR-FXD 2.2UF ±10% 20VDC TA	28480	0180-3713
A4C2	0160-4807	1	CAPACITOR-FXD 33PF ±5% 100VDC CER 0±30	28480	0160-4807
A4C3	0160-4835	11	CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A4C4	0160-4682	5	CAPACITOR-FXD 1000PF ±2.5% 160VDC POLYP	28480	0160-4682
A4C5	0160-4682		CAPACITOR-FXD 1000PF ±2.5% 160VDC POLYP	28480	0160-4682
A4C6	0160-4682		CAPACITOR-FXD 1000PF ±2.5% 160VDC POLYP	28480	0160-4682
A4C7	0160-4682		CAPACITOR-FXD 1000PF ±2.5% 160VDC POLYP	28480	0160-4682
A4C8	0160-4682		CAPACITOR-FXD 1000PF ±2.5% 160VDC POLYP	28480	0160-4682
A4C9	0160-4831	2	CAPACITOR-FXD 4700PF ±10% 100VDC CER	28480	0160-4831
A4C10	0160-4831		CAPACITOR-FXD 4700PF ±10% 100VDC CER	28480	0160-4831
A4C11	0160-4832	4	CAPACITOR-FXD .01UF ±10% 100VDC CER	28480	0160-4832
A4C12	0180-4135	3	CAPACITOR-FXD 33UF ±10% 10VDC TA	28480	0180-4135
A4C13	0180-4132	2	CAPCITOR-FXD 6.8UF ±10% 35VDC TA	28480	0180-4132
A4C14	0160-4832		CAPACITOR-FXD .01UF ±10% 100VDC CER	28480	0160-4832
A4C15	0160-4832		CAPACITOR-FXD .01UF ±10% 100VDC CER	28480	0160-4832
A4C16	0180-4132		CAPACITOR-FXD 6.8UF ±10% 35VDC TA	28480	0180-4132
A4C17	0160-4832		CAPACITOR-FXD .01UF ±10% 100VDC CER	28480	0160-4832
A4C18	0160-4830	1	CAPACITOR-FXD 2200PF ±10% 100VDC CER	28480	0160-4830
A4C19	0160-4812	3	CAPACITOR-FXD 220PF ±5% 100VDC CER	28480	0160-4812
A4C20	0160-4812		CAPACITOR-FXD 220PF ±5% 100VDC CER	28480	0160-4812
A4C21	0160-4808	2	CAPACITOR-FXD 470PF ±5% 100VDC CER	28480	0160-4808
A4C22	0160-4808		CAPACITOR-FXD 470PF ±5% 100VDC CER	28480	0160-4808
A4C23	0160-4801	1	CAPACITOR-FXD 100PF ±5% 100VDC CER	28480	0160-4801
A4C24	0180-4129	2	CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A4C25	0160-4832	1	CAPACITOR-FXD .01UF ±10% 100VDC CER	28480	0160-4832
A4C26	0180-4135		CAPACITOR-FXD 33UF ±10% 10VDC TA	28480	0180-4135
A4C27	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A4C28	0180-4135		CAPACITOR-FXD 33UF ±10% 10VDC TA	28480	0180-4135
A4C29	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A4C30	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A4C31	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A4C32	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A4C33	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A4C34	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A4C35	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A4C36	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A4C37	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A4C38	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A4C39	0160-4812		CAPACITOR-FXD 220PF ±5% 100VDC CER	28480	0160-4812
A4C40	0160-5301	16	CAPACITOR-FXD .047UF ±20% 50VDC CER	28480	0160-5301
A4C41	0160-5301		CAPACITOR-FXD .047UF ±20% 50VDC CER	28480	0160-5301
A4C42	0160-5301		CAPACITOR-FXD .047UF ±20% 50VDC CER	28480	0160-5301
A4C43	0160-5301		CAPACITOR-FXD .047UF ±20% 50VDC CER	28480	0160-5301
A4C44	0160-5301		CAPACITOR-FXD .047UF ±20% 50VDC CER	28480	0160-5301
A4C45	0160-5301		CAPACITOR-FXD .047UF ±20% 50VDC CER	28480	0160-5301
A4C46	0160-5301		CAPACITOR-FXD .047UF ±20% 50VDC CER	28480	0160-5301
A4C47	0160-5301		CAPACITOR-FXD .047UF ±20% 50VDC CER	28480	0160-5301
A4C48	0160-5301		CAPACITOR-FXD .047UF ±20% 50VDC CER	28480	0160-5301
A4C49	0160-5301		CAPACITOR-FXD .047UF ±20% 50VDC CER	28480	0160-5301
A4C50	0160-5301		CAPACITOR-FXD .047UF ±20% 50VDC CER	28480	0160-5301
A4C51	0160-5301		CAPACITOR-FXD .047UF ±20% 50VDC CER	28480	0160-5301
A4C52	0160-5301		CAPACITOR-FXD .047UF ±20% 50VDC CER	28480	0160-5301
A4C53	0160-5301		CAPACITOR-FXD .047UF ±20% 50VDC CER	28480	0160-5301
A4C54	0160-5301		CAPACITOR-FXD .047UF ±20% 50VDC CER	28480	0160-5301
A4C55	0160-5301		CAPACITOR-FXD .047UF ±20% 50VDC CER	28480	0160-5301
A4CR1	1901-0050	20	DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A4CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A4CR3	1901-0050		DIODE-SWITCHING 80V 200MA 2NSDO-35	28480	1901-0050
A4CR4	1901-0050		DIODE-SWITCHING 80V 200MA 2NSDO-35	28480	1901-0050
A4CR5	1901-0050		DIODE-SWITCHING 80V 200MA 2NSDO-35	28480	1901-0050
A4CR6	1901-0050		DIODE-SWITCHING 80V 200MA 2NSDO-35	28480	1901-0050
A4CR7	1901-0050		DIODE-SWITCHING 80V 200MA 2NSDO-35	28480	1901-0050
A4CR8	1901-0050		DIODE-SWITCHING 80V 200MA 2NSDO-35	28480	1901-0050
A4CR9	1901-0050		DIODE-SWITCHING 80V 200MA 2NSDO-35	28480	1901-0050
A4CR10	1901-0050		DIODE-SWITCHING 80V 200MA 2NSDO-35	28480	1901-0050
A4CR11	1901-0050		DIODE-SWITCHING 80V 200MA 2NSDO-35	28480	1901-0050
A4CR12	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A4CR13	1901-0743	3	DIODE-PWR RECT 1N4004 400V 1A DO-41	01295	1N4004
A4CR14	1901-0743		DIODE-PWR RECT 1N4004 400V 1A DO-41	01295	1N4004
A4CR15	1901-0743		DIODE-PWR RECT 1N4004 400V 1A DO-41	01295	1N4004
A4CR16			NOT ASSIGNED		

Table 6–3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4CR17	1901–0050		DIODE–SWITCHING 80V 200MA 2NS DO–35	28480	1901–0050
A4CR18	1901–0050		DIODE–SWITCHING 80V 200MA 2NS DO–35	28480	1901–0050
A4CR19	1901–0050		DIODE–SWITCHING 80V 200MA 2NS DO–35	28480	1901–0050
A4CR20	1901–0050		DIODE–SWITCHING 80V 200MA 2NS DO–35	28480	1901–0050
A4CR21	1901–0539	2	DIODE–SM SIG SCHOTTKY	28480	1901–0539
A4CR22	1901–0050		DIODE–SWITCHING 80V 200MA 2NS DO–35	28480	1901–0050
A4CR23	1901–0539		DIODE–SM SIG SCHOTTKY	28480	1901–0539
A4CR26	1901–0050		DIODE–SWITCHING 80V 200MA 2NS DO–35	28480	1901–0050
A4CR27			NOT ASSIGNED		
A4CR28			NOT ASSIGNED		
A4CR29	1901–0050		DIODE–SWITCHING 80V 200MA 2NS DO–35	28480	1901–0050
A4CR30	1901–0050		DIODE–SWITCHING 80V 200MA 2NS DO–35	28480	1901–0050
A4L1	9100–2562	3	INDUCTOR RF–CH–MLD 100UH 10%	28480	9100–2562
A4L2	9100–2562		INDUCTOR RF–CH–MLD 100UH 10%	28480	9100–2562
A4L3	9100–2562		INDUCTOR RF–CH–MLD 100UH 10%	28480	9100–2562
A4L4	9100–2552	2	INDUCTOR RF–CH–MLD 15UH 10% .161DX.385LG	28480	9100–2552
A4L5	9100–1788	2	CORE–FERRITE CHOKE–WIDEBAND; IMP:680	28480	9100–1788
A4L6	9100–2552		INDUCTOR RF–CH–MLD 15UH 10% .161DX.385LG	28480	9100–2552
A4L7	9100–1788		CORE–FERRITE CHOKE–WIDEBAND; IMP:680	28480	9100–1788
A4MP1			NOT ASSIGNED		
A4MP2	4040–0752	2	EXTR–PC BD YEL POLYC .062–BD–THKNS	28480	4040–0752
A4MP3	1480–0073	2	PIN–ROLL .062–IN–DIA .25–IN–LG BE–CU	28480	1480–0073
A4MP4	0403–0026	1	PLUG–HOLE BDR–HD FOR .187–D–HOLE NYL	02768	207–120241–03–0101
A4P1	1251–7906	1	CONNECTOR–POST 36 FEMALE 2R	28480	1251–7906
A4P2	1251–7907	1	CONNECTOR–POST 80 FEMALE 2R	28480	1251–7907
A4R1	0757–0280	4	RESISTOR 1K 1% .125W F TC=0±100	24546	C4–1/8–TO–1001–F
A4R2	0757–0442	28	RESISTOR 10 K1% .125W F TC=0±100	24546	C4–1/8–TO–1002–F
A4R3	0757–0394	1	RESISTOR 51.1 1% .125W F TC=0±100	24546	C4–1/8–TO–51R1–F
A4R4	0757–0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4–1/8–TO–1002–F
A4R5	0698–3438	1	RESISTOR 147 1% .125W F TC=0±100	24546	C4–1/8–TO–147R–F
A4R6	2100–3350	1	RESISTOR–TRMR 200 10% C SIDE–ADJ 1–TRN	28480	2100–3350
A4R7	0698–6343	1	RESISTOR 9K .1% .125W F TC=0±25	28480	0698–6343
A4R8	0757–0280		RESISTOR 1K 1% .125W F TC=0±100	24546	C4–1/8–TO–1001–F
A4R9	0757–0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4–1/8–TO–1002–F
A4R10	0757–0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4–1/8–TO–1002–F
A4R11	0698–6360	4	RESISTOR 10K .1% .125 W F TC=0±25	28480	0698–6360
A4R12			NOT ASSIGNED		
A4R13	0698–6361	4	RESISTOR 8K .1% .125W F TC=0±25	28480	0698–6361
A4R14	0698–8608	1	RESISTOR 4.525K .1% .125W F TC=0±25	28480	0698–8608
A4R15	0698–8061	1	RESISTOR 8.25K .1% .125W F TC=0±25	19701	C4–1/8–TO–8251–F
A4R16	0757–0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4–1/8–TO–1002–F
A4R17	0698–3156	5	RESISTOR 14.7K 1% .125W F TC=0±100	24546	C4–1/8–TO–1472–F
A4R18	0757–0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4–1/8–TO–102–F
A4R19	0698–6362	4	RESISTOR 1K .1% 125W F TC=0±25	28480	0698–6362
A4R20	0757–0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4–1/8–TO–1002–F
A4R21	0698–3156		RESISTOR 14.7K 1% .125W F TC=0±100	24546	C4–1/8–TO–1472–F
A4R22	0757–0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4–1/8–TO–1002–F
A4R23	0698–6362		RESISTOR 1K .1% .125W F TC=0±100	28480	0698–6362
A4R24	0757–0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4–1/8–TO–1002–F
A4R25	0698–3156		RESISTOR 14.7K 1% .125W F TC=0±100	24546	C4–1/8–TO–1472–F
A4R26	0757–0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4–1/8–TO–1002–F
A4R27	0698–6362		RESISTOR 1K .1% .125W F TC=0±100	28480	0698–6362
A4R28	0757–0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4–1/8–TO–1002–F
A4R29	0698–3156		RESISTOR 14.7K 1% .125W F TC=0±100	24546	C4–1/8–TO–1472–F
A4R30	0757–0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4–1/8–TO–1472–F
A4R31	0698–6362		RESISTOR 1K .1% .125W F ±C=0 ±25	28480	0698–6362
A4R32	0698–5350	2	RESISTOR 2.613K .1% .125 F TC=0±25	28480	0698–5350
A4R33	0698–5350		RESISTOR 2.613K .1% .125 F TC=0±25	28480	0698–5350
A4R34	0698–6321	1	RESISTOR 9.9K .1% .125W F TC=0±25	03888	PME55–1/8–T9–9901–B
A4R35	0757–0280		RESISTOR 1K 1% .125W F TC=0±100	24546	C4–1/8–TO–1001–F
A4R36	0757–0279	2	RESISTOR 3.16K 1% .125W F TC=0±100	24546	C4–1/8–TO–3161–F
A4R37	0757–0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4–1/8–TO–1002–F
A4R38	0757–0279		RESISTOR 3.16K 1% .125W F TC=0±100	24546	C4–1/8–TO–3161–F
A4R39	0757–0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4–1/8–TO–1002–F
A4R40	0698–6360		RESISTOR 10K .1% .125W F TC=0±100 100	28480	0698–6360
A4R41	0698–6361		RESISTOR 8K .1% .125W F TC=0±25	28480	0698–6361
A4R42	0698–6360		RESISTOR 10K .1% .125W F TC=0±25	28480	0698–6360
A4R43	0698–6361		RESISTOR 8K .1% .125W F TC=0±25	28480	0698–6361
A4R44	0757–0465	1	RESISTOR 100K 1% .125W F TC=0±100	24546	C4–1/8–TO–1003–F
A4R45	0757–0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4–1/8–TO–1002–F
A4R46	0698–6624	1	RESISTOR 2K .1% .125W F TC=0±25	28480	0698–6624
A4R47	0698–6355	1	RESISTOR 400.1% .125W F TC=0±25	28480	0698–6355

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4R48	0698-0083	1	RESISTOR 1.96K 1% .125W F TC=0±100	24546	C4-1/8-TO-1961-F
A4R49	0757-0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4-1/8-TO-1002-F
A4R50	0683-6855	1	RESISTOR 6.8M 5% .25W FC TC=900/±1100	01121	CB6855
A4R51	0757-0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4-1/8-TO-1002-F
A4R52	0698-6630	4	RESISTOR 20K .1% .125W F TC=0±25	28480	0698-6630
A4R53	0698-6630		RESISTOR 20K .1% .125W F TC=0±25	28480	0698-6630
A4R54	0698-6630		RESISTOR 20K .1% .125W F TC=0±25	28480	0698-6630
A4R55	0698-6630		RESISTOR 20K .1% .125W F TC=0±25	28480	0698-6630
A4R56	0698-6630		RESISTOR 10K .1% 125W F ±C=0±25	28480	0698-6630
A4R57	0698-6361		RESISTOR 8K .1% .125W F TC=0±25	28480	0698-6361
A4R58	0757-0290	1	RESISTOR 6.19K 1% .125W F TC=0±100	19701	MF4C1/8-TO-6191-F
A4R59	0698-8826	1	RESISTOR 825K 1% .125W F TC=0±100	28480	0698-8826
A4R60	0698-3156		RESISTOR 14.7K 1% .125W F TC=0±100	24546	C4-1/8-TO-1472-F
A4R61	0699-0070	2	RESISTOR 3.16M 1% .125W F TC=0±100	28480	0699-0070
A4R62	0757-0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4-1/8-TO-1002-F
A4R63	0699-0070		RESISTOR 3.16M 1% .125W F TC=0±100	28480	0699-0070
A4R64	0757-0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4-1/8-TO-1002-F
A4R65	0757-0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4-1/8-TO-1002-F
A4R66	0757-0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4-1/8-TO-1002-F
A4R67	0757-0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4-1/8-TO-1002-F
A4R68	0757-0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4-1/8-TO-1002-F
A4R69	0757-0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4-1/8-TO-1002-F
A4R70	0698-3160	2	RESISTOR 31.6K 1% .125W F TC=0±100	24546	C4-1/8-TO-3162-F
A4R71	0757-0458	1	RESISTOR 51.1K 1% .125W F TC=0±100	24546	C4-1/8-TO-5112-F
A4R72	0757-0462	1	RESISTOR 75K 1% .125W F TC=0±100	24546	C4-1/8-TO-7502-F
A4R73	0698-3160		RESISTOR 31.6K 1% .125 F TC=0±100	24546	C4-1/8-TO-3162-F
A4R74	0698-3159	1	RESISTOR 26.1K 1% .125W F TC=0±100	24546	C4-1/8-TO-2612-F
A4R75	0698-3157	1	RESISTOR 19.6K 1% .125W F TC=0±100	24546	C4-1/8-TO-1962-F
A4R76	0757-0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4-1/8-TO-1002-F
A4R77	0757-0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4-1/8-TO-1002-F
A4R78	0757-0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4-1/8-TO-1002-F
A4R79	0757-0442		RESISTOR 10K 1% .125W F TC=0±100	24546	C4-1/8-TO-1002-F
A4R80	0757-0401	1	RESISTOR 100 1% .125W F TC=0±100	24546	C4-1/8-TO-101-F
A4R81	0757-0416	1	RESISTOR 511 1% .125W F TC=0±100	24546	C4-1/8-TO-511R-F
A4R82	0757-0280		RESISTOR 1K 1% .125W F TC=0±100	24546	C4-1/8-TO-100-F
A4R83-96			NOT ASSIGNED		
A4R97	0757-0278	1	RESISTOR 1.78K 1% .125 F TC=0±100	24546	C4-1/8-TO-1781-F
A4R98	0757-0438	1	RESISTOR 5.11K 1% .125 F TC=0±100	24546	C4-1/8-TO-5111-F
A4R99	0757-0280		RESISTOR 1K 1% .125W F TC=0±100	24546	C4-1/8-TO-1001-F
A4TP1	0360-0535	11	TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A4TP2	0360-0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A4TP3	0360-0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A4TP4	0360-0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A4TP5	0360-0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A4TP6	0360-0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A4TP7	0360-0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A4TP8	0360-0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A4TP9	0360-0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A4TP10	0360-0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A4TP11	0360-0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A4U1	1826-0315	3	IC OP AMP GP QUAD 14-DIP-C PKG	27014	LM348N
A4U2	1826-0791	5	IC SMPL/HOLD 8 -DIP-P	27014	LF398N
A4U3	1826-0961	3	IC OP AMP LOW-BIAS-H-IMPD 8-DIP-C PKG	27014	TDA2654
A4U4	1826-0315		IC OP AMP GP QUAD14-DIP-C PKG	27014	LM348N
A4U5	1813-0450	1	IC 71K C1 ADC	28480	1813-0450
A4U6	1820-1447	5	IC TTL LS 16-BIT STAT RAM 45-NS 3-S	01295	SN74LS670N
A4U7	1820-1447		IC TTL LS 16-BIT STAT RAM 45-NS3-S	01295	SN74LS670N
A4U8	1820-1206	1	IC GATE TTL LS NOR TPL3-INP	01295	SN74LS27N
A4U9	1820-1199	2	IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A4U10	1820-1285	1	IC GATE TTL LS AND-OR-INV 4-INP	01295	SN74LS54N
A4U11	1820-1437	2	IC MV TTL LS MONOSTBL DUAL	01295	SN74LS221N
A4U12	1826-0138	2	IC 339 P4COMPT	28480	1826-0138
A4U13	1826-0791		IC SIMPL/HOLD TO-99 PKG	27014	LF398N
A4U14	1826-0609	2	IC MULTIPLXR ANLG 16-DIP-C PKG	06665	MUX08FQ
A4U15	1826-0609		IC MULTIPLXR ANLG 16-DIP-C PKG	06665	MUX08FQ
A4U16	1826-0742	1	IC V RGLTR-V-REF-FXD 10V TO-5 PKG	28480	1826-0742
A4U17	1820-1447		IC TTL LS 16-BIT STAT RAM 45-NS 3-S	01295	SN74LS670N
A4U18	1820-1447		IC TTL LS 16-BIT STAT RAM 45-NS 3-S	01295	SN74LS670N
A4U19	1820-2024	1	IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS244N
A4U20	1820-1112	3	IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A4U21	1820-1208	1	IC GATE TTL LS OR QUAD 2-INP	01295	SN74LS32N
A4U22	1820-1112		IC FF TTL LSD-TYPE POS-EDGE-TRIG	01295	SN74LS74AN

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4U23	1820-1112		IC FF TTL LSD-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A4U24	1826-0138		IC 339 P4COMPT	28480	1826-0138
A4U25	1826-0961		IC OP AMP LOW-BIAS-H-IMPD 8-DIP-C PKG	27014	TDA2654
A4U26	1826-0791		IC SMPL/HOLD 8-DIP-P	27014	LF398N
A4U27	1826-0791		IC SMPL/HOLD 8-DIP-P	27014	LF398N
A4U28	1810-0548	2	NETWORK-RES 16-DIP 10.0K OHM X 8	28480	1810-0548
A4U29	1826-0315		IC OP AMP GP QUAD 14-DIP-C PKG	27014	LM348N
A4U30	1810-0548		NETWORK-RES 16-DIP 10.0K OHM X 8	28480	1810-0548
A4U31	1826-0610	1	IC MULTIPLXR 4-CHAN-ANLG DUAL 16-DIP-C	06665	MUX24FQ
A4U32	1826-0962	2	IC OP AMP LOW-BIAS-H-IMPD DUAL8-DIP-C	27014	LF411CN
A4U33	1820-1447		IC TTL LS 16-BIT STAT RAM 45-NS 3-S	01295	SN74LS670N
A4U34	1826-1379	1	D/A8-DGT 20-PLASTIC CMOS	28480	1826-1379
A4U35	1826-1400	1	ANALOG CONVERTER	28480	1825-1400
A4U36	1820-1730	3	IC FF TTL LSD-TYPE POS-EDGE-TRIG COM	01295	SN74LS273N
A4U37	1820-1730		IC FF TTL LSD-TYPE POS-EDGE-TRIG COM	01295	SN74LS273N
A4U38	1820-1730		IC FF TTL LSD-TYPE POS-EDGE-TRIG COM	01295	SN74LS273N
A4U39	1820-1199		IC INV TTL LS HEX1-INP	01295	SN74LS04N
A4U40	1820-1216	1	IC DCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N
A4U41	1820-1193	1	IC CNTR TTL LS BIN ASYNCHRO	01295	SN74LS197N
A4U42	1820-1437		IC MV TTL LS MONOSTBL DUAL	01295	SN74LS221N
A4U43	1826-0962		IC OP AMP LOW-BIAS-H-IMPD DUAL 8-DIP-C	27014	LF411CN
A4U44	1826-0791		IC SMPL/HOLD TO-99 PKG	27014	LF398N
A4U45	1826-0600	1	IC 074A P4 OP AMP	28480	1826-0600
A4U46	1826-0720	1	IC SWITCH ANLG QUAD 16-DIP-C PKG	06665	SW-02FQ
A4U47	1826-0961		IC OP AMP LOW-BIAS-H-IMPD 8-DIP-C PKG	01295	TL071ACJG (PER HP DWG)
A4VR1	1902-0041	1	DIODE-ZNR 5.11V 5% DO-35 PD=.4W	28480	1902-0041
A4VR2	1902-0049	1	DIODE-ZNR 6.19V 5% DO-35 PD=.4W	28480	1902-0041

Table 6–3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A5	08757-60005	1	**MODULATOR DRIVER**	28480	08757-60005
A5C1	0160-4791	1	CAPACITOR-FXD 10PF ±5% 100VDC CER 0±30	28480	0160-4791
A5C2	0160-4806	1	CAPACITOR-FXD 39PF ±5% 100VDC CER 0±30	28480	0160-4806
A5C3	0160-4810	1	CAPACITOR-FXD 330PF ±5% 100VDC CER	28480	0160-4810
A5C4	0160-4814	1	CAPACITOR-FXD 150PF ±5% 100VDC CER	28480	0160-4814
A5C5	0160-4832	4	CAPACITOR-FXD .01UF ±10% 100VDC CER	28480	0160-4832
A5C6	0180-4132	4	CAPACITOR-FXD 6.8UF ±10% 35VDC TA	28480	0180-4132
A5C7	0180-4132		CAPACITOR-FXD 6.8UF ±10% 35VDC TA	28480	0180-4132
A5C8	0180-4132		CAPACITOR-FXD 6.8UF ±10% 35VDC TA	28480	0180-4132
A5C9	0180-4132		CAPACITOR-FXD 6.8UF ±10% 35VDC TA	28480	0180-4132
A5C10	0180-4170	2	CAPACITOR-FXD 22UF ±20% 35VDC TA	28480	0180-4170
A5C11	0160-4832		CAPACITOR-FXD .01UF ±10% 100VDC CER	28480	0160-4832
A5C12	0180-4170		CAPACITOR-FXD 22UF ±20% 35VDC TA	28480	0180-4170
A5C13	0160-4832		CAPACITOR-FXD .01UF ±10% 100VDC CER	28480	0160-4832
A5C14	0180-4135	1	CAPACITOR-FXD 33UF ±10% 10VDC TA	28480	0180-4135
A5C15	0160-4832		CAPACITOR-FXD .01UF ±10% 100VDC CER	28480	0160-4832
A5C16	0160-4835	2	CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A5C17	0160-4835	6	CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A5CR1	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A5CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A5CR3	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A5CR4	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A5CR5	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A5CR6	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A5J1	1250-0543	1	CONNECTOR-RF SM-SNP M PC 50-OHM	28480	1250-0543
A5L1	9100-2578	1	INDUCTOR RF-CH-MLD 2.7MH 10%	28480	9100-2578
A5L2	9100-2555	2	INDUCTOR RF-CH-MLD 27UH10% .161DX.385LG	28480	9100-2555
A5L3	9100-2555		INDUCTOR RF-CH-MLD 27UH10% .161DX385LG	28480	9100-2555
A5L4	9100-2562	1	INDUCTOR RF-CH-MLD 100UH 10%	28480	9100-2562
A5MP1			NOT ASSIGNED		
A5MP2	4040-0753	2	EXTR-PC BD GRN POLYC .062-BD- THK NS	28480	4040-0753
A5MP3	1480-0073	2	PIN-ROLL .062-IN-DIA .25-IN-LG BE-CU	28480	1480-0073
A5MP4	1205-0011	1	HEATSINK TO-5/TO-39-CS	28480	1251-0011
A5P1	1251-7906	1	CONNECTOR-POST 36 FEMALE 2R	28480	1251-7906
A5Q1	1854-0477	1	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A5Q2			NOT ASSIGNED		
A5Q3	1854-0637	1	TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A5Q4			NOT ASSIGNED		
A5Q5	1853-0314	1	TRANSISTOR PNP 2N2905A SI TO-39 PD=600MW	04713	2N2905A
A5R1	0698-3449	2	RESISTOR 28.7K 1% .125W F TC=0±100	24546	C4-1/8-TO-2872-F
A5R2	0698-3449		RESISTOR 28.7K 1% .125W F TC=0±100	24546	C4-1/8-TO-2872-F
A5R3	0698-3266	1	RESISTOR 237K 1% .125W F TC=0±100	24546	C4-1/8-TO-2373-F
A5R4	0757-0444	2	RESISTOR 12.1K 1% .125W F TC=0±100	24546	C4-1/8-TO-1212-F
A5R5	0698-0085	5	RESISTOR 2.61K 1% .125W F TC=0±100	24546	C4-1/8-TO-2611-F
A5R6	0698-3155	3	RESISTOR 4.64K 1% .125W F TC=0±100	24546	C4-1/8-TO-4641-F
A5R7	0698-3155		RESISTOR 4.64K 1% .125W F TC=0±100	24546	C4-1/8-TO-4641-F
A5R8	0699-0766	1	RESISTOR 22.6K .1% .125W F TC=0±25	28480	0699-0766
A5R9	0698-3155		RESISTOR 4.64K 1% .125W F TC=0±100	24546	C4-1/8-TO-4641-F
A5R10	0698-0085		RESISTOR 2.61K 1% .125W F TC=0±100	24546	C4-1/8-TO-2611-F
A5R11	0698-0085		RESISTOR 2.61K 1% .125W F TC=0±100	24546	C4-1/8-TO-2611-F
A5R12	0698-3156	1	RESISTOR 14.7K 1% .125W F C=0±100	24546	C4-1/8-TO-1472-F
A5R13	0757-0444		RESISTOR 12.1K 1% .125W F TC=0±100	24546	C4-1/8-TO-1212-F
A5R14	0698-0085		RESISTOR 2.61K 1% .125W F TC=0±100	24546	C4-1/8-TO-2611-F
A5R15	0757-0706	2	RESISTOR 51.1 1% .25W F TC=0±100	24546	C4-1/8-TO-51R1-F
A5R16	0757-0706		RESISTOR 51.1 1% .25W F TC±100	24546	C4-1/8-TO-51R1-F
A5R17	0757-0416	3	RESISTOR 511 1% .125 F TC=0±100	24546	C4-1/8-TO-511R-F
A5R18	0757-0416		RESISTOR 511 1% .125W F TC=0±100	24546	C4-1/8-TO-511R-F
A5R19	0757-0401	2	RESISTOR 100 1% .125W F TC=0±100	24546	C4-1/8-TO-101-F
A5R20	0757-0401		RESISTOR 100 1% .125W F TC=0±100	24546	C4-1/8-TO-101-F
A5R21	0698-0085		RESISTOR 2.61K 1% .125W F TC=0±100	24546	C4-1/8-TO-2611-F
A5R22	0757-0416		RESISTOR 511 1% .125W F TC=0±100	24546	C4-1/8-TO-511R-F
A5TP1	0360-0535	4	TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A5TP2	0360-0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A5TP3	0360-0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A5TP4	0360-0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A5U1	1820-3200	1	IC CNTR CMOS/74HC BIN ASYNCHRO	28480	1820-3200
A5U2	1826-0081	1	IC OP AMP WB TO-99 PKG	27014	LM318H
A5Y1	0410-1561	1	XTAL 444.4 4 KHZ	28480	0410-1561

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A6	08757-60006	1	HPIB ASSEMBLY	28480	08757-60006
A6C1	0180-3888	2	CAPACITOR-FXD 15UF ±10% 20VDC TA	56289	150D156X9020B2
A6C2	0180-3888		CAPACITOR-FXD 15UF ±10% 20VDC TA	56289	150D156X9020B2
A6C3	0160-4835	10	CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A6C4	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A6C5	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A6C6	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A6C7	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A6C8	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A6C9	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A6C10	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A6C11	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A6C12	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A6L1	08503-80001		COIL TOROID	28480	08503-80001
A6MP1			NOT ASSIGNED		
A6MP2	4040-0754	2	EXTR-PC BD BLU POLYC .062-BD-THKNS	28480	4040-0754
A6MP3	1480-0073	2	PIN-ROLL .062-IN-DIA .25-IN-LG BE-CU	28480	1480-0073
A6P1	1251-7907	1	CONNECTOR-POST 80 FEMALE 2R	28480	1251-7907
A6R1	0757-0442	1	RESISTOR 10K 1% .125W F TC=0±100	24546	C4-1/8-TO-1002-F
A6TP1	0360-0535	8	TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A6TP2	0360-0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A6TP3	0360-0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A6TP4	0360-0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A6TP5	0360-0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A6TP6	0360-0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A6TP7	0360-0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A6TP8	0360-0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A6U1	1820-2548	2	IC-GENERAL PURPOSE INTERFACE BUS ADAPTER	28480	1820-2548
A6U2	1820-2548		IC-GENERAL PURPOSE INTERFACE BUS ADAPTER	28480	1820-2548
A6U3	1820-2075	1	IC TRANSCEIVER TTL LS BUS OCTL	28480	1820-2075
A6U4	1820-1216	1	IC DCDR TTL L 3-TO-8-LINE 3-INP	01295	SN74LS138N
A6U5	1820-2075	1	IC TRANSCEIVER TTL LS BUS OCTL	28480	1820-2075
A6U6	1820-1997	2	IC FF TTL LSD-TYPE POS-EDGE-TRIG PRL-IN	01295	SN74LS274N
A6U7	1820-3513	2	IC RCVR TTL LS BUS OCTL	01295	SN75161BN
A6U8	1820-1997		IC FF TTL LSD-TYPE POS-EDGE-TRIG PRL-IN	01295	SN74LS374N
A6U9	1820-3431	2	IC RCVR TTL LS BUS OCTL	01295	SN75160BN
A6U10	1820-3431		IC RCVR TTL LS BUS OCTL	01295	SN75160BN
A6U11	1820-3513		IC RCVR TTL LS BUS OCTL	01295	SN75161BN

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A7	08757-60058	1	LOG AMPLIFIER	28480	08757-60058
A7C1	0180-4129	32	CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C2	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C3	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C4			NOT ASSIGNED		
A7C5	0160-4801	1	CAPACITOR-FXD 100PF ±5% 100VDC CER	28480	0160-4801
A7C6	0160-4918	2	CAPACITOR-FXD .022UF ±10% 50VDC CER	28480	0160-4918
A7C7	0160-4918		CAPACITOR-FXD .022UF ±10% 50VDC CER	28480	0160-4918
A7C8	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C9	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C10	0160-4835	21	CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A7C11	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C12	0160-4824	2	CAPACITOR-FXD 680PF ±5% 100VDC CER	28480	0160-4824
A7C13	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A7C14	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C15	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C16	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C17	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	1060-4835
A7C18	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C19	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C20	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A7C21	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A7C22			NOT ASSIGNED		
A7C23	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C24	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C25	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A7C26	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A7C27	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C28	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C29	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	1060-4835
A7C30	0180-4132	2	CAPACITOR-FXD 6.8UF ±10% 35VDC TA	28480	0180-4132
A7C31	0180-4132		CAPACITOR-FXD 6.8UF ±10% 35VDC TA	28480	0180-4132
A7C32	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C33	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C34	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C35	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C36	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A7C37	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A7C38	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A7C39	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A7C40	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A7C41			NOT ASSIGNED		
A7C42			NOT ASSIGNED		
A7C43	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A7C44			NOT ASSIGNED		
A7C45			NOT ASSIGNED		
A7C46	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A7C47	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A7C48	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A7C49	0180-4129	1	CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C50	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C51	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C52	0150-4835		CAPACITOR-FXD .1UF ±10% 50VCER	28480	0160-4835
A7C53	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C54	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C55	0160-4835	1	CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A7C56	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C57	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	28480	0160-4835
A7C58	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C59	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C60	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C61			NOT ASSIGNED		
A7C62	0160-4834	2	CAPACITOR-FXD .047UF ±10% 100VDC CER	28480	0160-4834
A7C63	0160-4814	1	CAPACITOR-FXD 150PF ±5% 100VDC CER	28480	0160-4814
A7C64			NOT ASSIGNED		
A7C65	0160-4834		CAPACITOR-FXD .047UF ±10% 100VDC CER	28480	0160-4834
A7C66			NOT ASSIGNED		
A7C67	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C68	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	28480	0180-4129
A7C69	0160-4824		CAPACITOR-FXD 680PF ±5% 100VDC CER	28480	0160-4824
A7C70	0160-4624	2	CAPACITOR-FXD 8200PF ±5% 50VDC CER	28480	0160-4624
A7C71	0160-4811	1	CAPACITOR-FXD 270PF ±5% 100VDC CER	28480	0160-4811

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A7C72	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	56289	150D105X9035A2
A7C73	0180-4129		CAPACITOR-FXD 1UF ±10% 35VDC TA	56289	150D105X9035A2
A7C74	0160-4624		CAPACITOR-FXD 8200PF ±5% 50VDC CER	28480	0160-4624
A7C75	0160-4820	1	CAPACITOR-FXD 1800PF ±5% 100VDC CER	28480	0160-4820
A7C76	0160-4807		CAPACITOR-FXD 33PF ±5% 100VDC CER0±30	28480	0160-4807
A7CR1	1901-0050	6	DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A7CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A7CR3	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A7CR4	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A7CR5	1901-0535	4	DIODE-SM SIG SCHOTTKY	28480	1901-0535
A7CR6	1901-0535		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A7CR7	1901-0535		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A7CR8	1901-0535		DIODE-SM SIG SCHOTTKY	28480	1901-0535
A7CR9	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A7CR10	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A7CR11	1901-0376	24	DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A7CR12	1901-0376		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A7CR13	1901-0376		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A7CR14	1901-0376		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A7CR15	1901-0376		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A7CR16	1901-0376		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A7CR17	1901-0376		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A7CR18	1901-0376		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A7CR19	1901-0376		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A7CR20	1901-0376		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A7CR21	1901-0376		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A7CR22	1901-0376		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A7CR23	1901-0376		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A7CR24	1901-0376		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A7CR25	1901-0376		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A7CR26	1901-0376		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A7CR27	1901-0376		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A7CR28	1901-0376		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A7CR29	1901-0376		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A7CR30	1901-0376		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A7CR31	1901-0376		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A7CR32	1901-0376		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A7CR33	1901-0376		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A7CR34	1901-0376		DIODE-GEN PRP 35V 50MA DO-35	28480	1901-0376
A7FLT1	08757-80029	1	TUNED FILTER ASSEMBLY	28480	08757-80029
A7FLT2	08757-80030	1	TUNED FILTER ASSEMBLY	28480	08757-80030
A7FLT3	08757-80031	1	TUNED FILTER ASSEMBLY	28480	08757-80031
A7L1	9100-2562	2	INDUCTOR RF-CH-MLD 100UH 10%	28480	9100-2562
A7L2	9100-2562		INDUCTOR RF-CH-MLD 100UH 10%	28480	9100-2562
A7MP1			NOT ASSIGNED		
A7MP2	4040-0756	2	EXTR-PC BD WHT POLYC .062-BD-THKNS	28480	4040-0756
A7MP3	1480-0073	2	PIN-ROLL .062-IN-DIA .25-IN-LG BE-CU	28480	1480-0073
A7MP4 – A7MP6			NOT ASSIGNED		
A7MP7	08757-20027	1	CAN-RECT 1.23X.98	28480	08757-20027
A7MP8	08757-20026	1	COV-RECT.93X1.16	28480	08757-20026
A7P1	1251-7906	1	CONNECTOR-POST 36 FEMALE 2R	28480	1251-7906
A7Q1	1853-0451	3	TRANSISTOR PNP 2N3799 SI TO-18 PD=360MW	01295	2N3799
A7Q2	1853-0451		TRANSISTOR PNP 2N3799 SI TO-18PD=360MW	01295	2N3799
A7Q3	1853-0451		TRANSISTOR PNP 2N3799 SI TO-18PD=360MW	01295	2N3799
A7Q4	1854-0404	6	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A7Q5	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A7Q6	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A7Q7	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A7Q8	1854-0753	1	TRANSISTOR-DUAL NPN TO-71 PD=500MW	28480	1854-0753
A7Q9	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A7Q10	1855-0420	1	TRANSISTOR J-FET 2N4391 N-CHAN D-MODE	01295	2N4391
A7Q11	1854-0907	2	TRANSISTOR NPN 2N2484 TO-18 PD=360MW	28480	1854-0907
A7Q12	1854-0907		TRANSISTOR NPN 2N2484 TO-18 PD=360MW	28480	1854-0907
A7Q13	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A7R1	0757-0199	10	RESISTOR 21.5K 1% .125W F TC=0±100	24546	C4-1/8-TO-2152-F
A7R2	0698-3447	2	RESISTOR 422 1% .125W F TC=0±100	24546	C4-1/8-TO-422R-F
A7R3			NOT ASSIGNED		
A7R4	0757-0199		RESISTOR 21.5K 1% .125W F TC=0±10	24546	C4-1/8-TO-2152-F
A7R5	0757-0199		RESISTOR 21.5K1% .125W F TC=0±100	24546	C4-1/8-TO-2152-F
A7R6	0698-6362	8	RESISTOR 1K 1% .125W F TC=0±25	28480	0698-6362
A7R7			NOT ASSIGNED		

Table 6−3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A7R8	0698−3433	4	RESISTOR 28.7 1% .125W F TC=0±100	03888	PME55−1.8−TO−2BR7−
A7R9	0698−0085	3	RESISTOR 2.61K 1% .125W F TC=0±100	24546	C4−1/8−TO−2611−F
A7R10	0698−8606	2	RESISTOR 450.1% .125W F TC=0±25	28480	0698−8606
A7R11	0698−8606		RESISTOR 450.1% .125W F TC=0±25	28480	0698−8606
A7R12	0698−3433		RESISTOR 28.71% .125W F TC±0±100	03888	PME55.1/8−TO−2BR7−
A7R13	0698−0085		RESISTOR 2.61K 1% .125W F TC=0±100	24546	C4−1/8−TO−2611−F
A7R14	0757−0438	6	RESISTOR 5.11K 1% .125W F TC=0±100	24546	C4−1/8−TO−5111−F
A7R15	0698−3153	1	RESISTOR 3.83K 1% .125W F TC=0±100	24546	C4−1/8−TO−3831−F
A7R16	0698−3447		RESISTOR 422 1% .125W F TC=0±100	24546	0698−3447
A7R17	0757−0401	28	RESISTOR 100 1% .125W F TC=0±100	24546	C4−1/8−TO−101−F
A7R18	0757−0401		RESISTOR 100 1% .125W F TC=0±100	24546	C4−1/8−TO−101−F
A7R19	0757−0419	1	RESISTOR 681 1% .125W F TC=0±100	24546	C3−1/8−TO−681R−F
A7R20	0757−0438		RESISTOR 5.11K 1% .125W F TC=0±100	24546	C4−1/8−TO−5111−F
A7R21	0757−0438		RESISTOR 5.11K 1% .125W F TC=0±100	24546	C4−1/8−TO−5111−F
A7R22	0757−0199		RESISTOR 21.5K 1% .125W F TC=0±100	24546	0757−0199
A7R23	0698−0083	2	RESISTOR 1.96K 1% .125W F TC=0±100	24546	C4−1/8−TO−1961−F
A7R24	0698−3450	2	RESISTOR 42.2K 1% .125W F TC=0±100	24546	C4−1/8−TO−4222−F
A7R25	0698−3433		RESISTOR 28.71% .125W F TC=0±100	03888	PME55−1/8−TO−2BR7−
A7R26	0698−3433		RESISTOR 28.71% .125W F TC=0±100	03888	PME55−1/8−TO−2BR7−
A7R27	0698−8756	1	RESISTOR 166.7.1% .125W F TC=0±25	28480	0698−8756
A7R28	0698−6616	2	RESISTOR 750.1% .125W F TC=0±25	28480	0698−6616
A7R29	0698−6364	1	RESISTOR 50.1% .125W F TC=0±25	28480	0698−6364
A7R30	0698−3450		RESISTOR 42.2K 1% .125W F TC=0±100	24546	C4−2/8−TO−4222−F
A7R31	0757−0199		RESISTOR 21.5K 1% .125W F TC=0±100	24546	0757−0199
A7R32	0698−0083		RESISTOR 1.96K 1% .125W F TC=0±100	24546	C4−1/8−TO−1961−F
A7R33	0757−0280	11	RESISTOR 1K 1% .125W F TC=0±100	24546	C4−1/8−TO−1001−F
A7R34	0757−0280		RESISTOR 1K 1% .125W F TC=0±100	24546	C4−1/8−TO−1001−F
A7R35	0757−0401		RESISTOR 100 1% .125W F TC=0±100	24546	C4−1/8−TO−101−F
A7R36	0757−0401		RESISTOR 100 1% .125W F TC=0±100	24546	C4−1/8−TO−101−F
A7R37	0757−0401		RESISTOR 100 1% .125W F TC=0±100	24546	C4−1/8−TO−101−F
A7R38	0757−0280		RESISTOR 1K 1% .125W F TC=0±100	24546	C4−1/8−TO−1001−F
A7R39	0757−0280		RESISTOR 1K 1% .125W F TC=0±100	24546	C4−1/8−TO−1001−F
A7R40	0698−3440	2	RESISTOR 196 1% .125W F TC=0±100	24546	C4−1/8−TO−196R−F
A7R41	0757−0401		RESISTOR 100 1% .125W F TC=0±100	24546	C4−1/8−TO−101−F
A7R42	0757−0401		RESISTOR 100 1% .125W F TC±0±100	24546	C4−1/8−TO−101−F
A7R43	0699−0400	7	RESISTOR 3.6K .1% .125W F TC=0±25	28480	0699−0400
A7R44	0698−6362		RESISTOR 1K .1% .125W F TC=0±25	28480	0698−6362
A7R45			NOT ASSIGNED		
A7R46	0757−0280		RESISTOR 1K 1% .125W F TC=0±100	24546	C4−1/8−TO−1001−F
A7R47	0699−0400		RESISTOR 3.6K .1% .125W F TC=0±25	28480	0699−0400
A7R48	0698−6362		RESISTOR 1K .1% .125W F TC=0±25	28480	0698−6362
A7R49	0757−0280		RESISTOR 1K 1% .125W F TC=0±100	24546	C4−1/8−TO−1001−F
A7R50	0757−0280		RESISTOR 1K 1% .125W F TC=0±100	24546	C4−1/8−TO−1001−F
A7R51	0757−0401		RESISTOR 100 1% .125W F TC=0±100	24546	C4−1/8−TO−101−F
A7R52	0757−0401		RESISTOR 100 1% .125W F TC±0±100	24546	C4−1/8−TO−101−F
A7R53	0699−0400		RESISTOR 3.6K .1% .125W F TC=0±25	28480	0699−0400
A7R54	0698−6362		RESISTOR 1K .1% .125W F TC=0±25	28480	0698−6362
A7R55			NOT ASSIGNED		
A7R56	0757−0280		RESISTOR 1K 1% .125W F TC=0±100	24546	C4−1/8−TO−1001−F
A7R57	0699−0400		RESISTOR 3.6K .1% .125W F TC=0±25	28480	0699−0400
A7R58	0698−6362		RESISTOR 1K .1% .125W F TC=0±25	28480	0698−6362
A7R59			NOT ASSIGNED		
A7R60	0757−0280		RESISTOR 1K 1% .125WTC=0±100	24546	C4−1/8−TO−1001−F
A7R61	0757−0401		RESISTOR 100 1% .125W F TC=0±100	24546	C4−1/8−TO−101−F
A7R62	0757−0401		RESISTOR 100 1% .125W F TC±0±100	24546	C4−1/8−TO−101−F
A7R63	0699−0400		RESISTOR 3.6K .1% .125W F TC=0±25	28480	0699−0400
A7R64	0698−6362		RESISTOR 1K .1% .125W F TC=0±25	28480	0698−6362
A7R65			NOT ASSIGNED		
A7R66	0757−0280		RESISTOR 1K 1% .125WTC=0±100	24546	C4−1/8−TO−1001−F
A7R67	0699−0400		RESISTOR 3.6K .1% .125W F TC=0±25	28480	0699−0400
A7R68	0698−6362		RESISTOR 1K .1% .125W F TC=0 ±25	28480	0698−6362
A7R69	0698−6619	1	RESISTOR 15K .1% .125W F TC=0±25	28480	0698−6619
A7R70	0757−0401		RESISTOR 100 1% .125W F TC±0±100	24546	C4−1/8−TO−101−F
A7R71	0699−1011	1	RESISTOR 3.32K .1% .125W F TC=0±25	28480	0699−1011
A7R72	0757−0401		RESISTOR 100 1% .125W F TC±0±100	24546	C4−1/8−TO−101−F
A7R73	0699−0400		RESISTOR 3.6K .1% .125W F TC=0±25	28480	0699−0400
A7R74	0757−0401		RESISTOR 100 1% .125W F TC=0±100	24546	C4−1/8−TO−101−F
A7R75	0698−6362		RESISTOR 1K .1% .125W F TC=0±25	28480	0698−6362
A7R76	0698−6616		RESISTOR 750.1% .125W F TC=0±25	28480	0699−6616
A7R77	0757−0401		RESISTOR 100 1% .125W F TC=0± 100	24546	C4−1/8−TO−101−F
A7R78	0698−7576	1	RESISTOR 217.1% .125W F TC=0±25	19701	MF4C1/8−T9−217R−B
A7R79	0757−0421	12	RESISTOR 825 1% .125W TC=0±100	24546	C4−1/8−TO825R−F

Table 6–3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A7R80	0757–0421		RESISTOR 825 1% .125 W TC=0± 100	24546	C4–1/8–TO–825R–F
A7R81	0757–0421		RESISTOR 825 1% .125W TC=0±100	24546	C4–1/8–TO–825R–F
A7R82	0757–0421		RESISTOR 825 1% .125W TC=0±100	24546	C4–1/8–TO–825R–F
A7R83	0757–0421		RESISTOR 825 1% .125W TC=0±100	24546	C4–1/8–TO–825R–F
A7R84	0757–0421		RESISTOR 825 1% .125W TC=0±100	24546	C4–1/8–TO–825R–F
A7R85	0757–0421		RESISTOR 825 1% .125W TC=0±100	24546	C4–1/8–TO–825R–F
A7R86	0757–0421		RESISTOR 825 1% .125W TC=0±100	24546	C4–1/8–TO–825R–F
A7R87	0757–0421		RESISTOR 825 1% .125W TC=0±100	24546	C4–1/8–TO–825R–F
A7R88	0757–0421		RESISTOR 825 1% .125W TC=0±100	24546	C4–1/8–TO–825R–F
A7R89	0757–0421		RESISTOR 825 1% .125W TC=0±100	24546	C4–1/8–TO–825R–F
A7R90	0757–0421		RESISTOR 825 1% .125W TC=0±100	24546	C4–1/8–TO–825R–F
A7R91	0757–0397	1	RESISTOR 68.1 1% .125W F TC=0±100	24546	C4–1/8–TO–68R1–F
A7R92	0757–0447	2	RESISTOR 16.2K 1% 125W F TC=0 ± 100	24546	C4–1/8–TO–1622–F
A7R93	0699–0018	1	RESISTOR 519.62 .1% .125W F TC=0±25	28480	0699–0018
A7R94	0757–0438		RESISTOR 5.11K 1% .125W F TC=0±100	24546	C4–1/8–TO–5111–F
A7R95	0698–0085		RESISTOR 2. 61K 1% .125W F TC=0±100	24546	C4–1/8–TO–2611–F
A7R96	0698–4436	2	RESISTOR 3.09K 1% .125W F TC=0±100	24546	C4–1/8–TO–3091–F
A7R97	0757–0438		RESISTOR 5.11K 1% .125W FTC=0±100	24546	C4–1/8–TO–5111–F
A7R98	0757–0438		RESISTOR 5.11K 1% .125W F TC=0±100	24546	C4–1/8–TO–5111–F
A7R99	0757–0420	1	RESISTOR 750 1% .125W F TC=0±100	24546	C4–1/8–TO–751–F
A7R100	0757–0401		RESISTOR 100 1% .125W FTC=0±100	24546	C4–1/8–TO–101–F
A7R101	0699–0692	1	RESISTOR 1.4K 1% .125W F TC=0±25	28480	0699–0692
A7R102	0757–0401		RESISTOR 100 1% .125W F TC=0±100	24546	C4–1/8–TO–101–F
A7R103	0698–6320	5	RESISTOR 5K .1% .125W F TC=0±25	03888	PME55–1/8–T9–5001–
A7R104	0698–6320		RESISTOR 5K .1% .125W F TC=0±25	03888	PME55–1/8–T9–5001–
A7R105	0698–6360	4	RESISTOR 10K .1% .125W F TC=0±25	28480	0698–6360
A7R106	0757–0401		RESISTOR 100 1% .125W F TC=0±100	24546	C4–1/8–TO–101–F
A7R107	0698–6360		RESISTOR 10K .1% 125W F TC=0±25	28480	0698–6360
A7R108	0757–0401		RESISTOR 100 1% .125W F TC=0±100	24546	C4–1/8–TO–101–F
A7R109	0698–6360		RESISTOR 10K .1% .125W F TC=0±25	28480	0698–6360
A7R110	0698–6320		RESISTOR 5K .1% .125W F TC=0±25	03888	PME55–1/8–T9–5001–
A7R111	0698–6363	1	RESISTOR 40K .1% .125W F TC=0±25	28480	0698–6363
A7R112	0698–6353	1	RESISTOR 50K .1% .125W F TC=0±25	28480	0698–6353
A7R113	0698–8642	2	RESISTOR 56.2K .1% .125W F TC=0±25	28480	0698–8642
A7R114	0698–8642		RESISTOR 56.2K .1% .125W F TC=0±25	28480	0698–8642
A7R115	0698–4473	1	RESISTOR 8.06K 1% .125W F TC=0±100	24546	C4–1/8–TO–8061–F
A7R116	0757–0401		RESISTOR 100 1% .125W F TC=0±100	24546	C4–1/8–TO–101–F
A7R117	0757–0401		RESISTOR 100 1% .125W F TC=0±100	24546	C4–1/8–TO–101–F
A7R118	0757–0401		RESISTOR 100 1% .125W F TC=0±100	24546	C4–1/8–TO–101–F
A7R119	0699–0768	2	RESISTOR 22 .6K 1% .125W F TC=0±25	28480	0699–0768
A7R120	0699–0768		RESISTOR 22 .6K .1% .125W F TC=0±25	28480	0699–0768
A7R121	0698–4436		RESISTOR 3.09K 1% .125W F TC=0±100	24546	C4–1/8–TO–3091–F
A7R122	0757–0401		RESISTOR 100 1% .125W F TC=0±100	24546	C4–1/8–TO–101–F
A7R123	0757–0280		RESISTOR 1K 1% .125W F TC=0±100	24546	C4–1/8–TO–1001–F
A7R124	0757–0401		RESISTOR 100 1% .125W F TC=0±100	24546	C4–1/8–TO–101–F
A7R125	0757–0401		RESISTOR 100 1% .125W F TC=0±100	24546	C4–1/8–TO–101–F
A7R126	0757–0401		RESISTOR 100 1% .125W F TC=0±100	24546	C4–1/8–TO–101–F
A7R127	0757–0199		RESISTOR 21.5K 1% .125W F TC=0±100	24546	0757–0199
A7R128	0757–0199		RESISTOR 21.5K 1% .125W F TC=0±100	24546	0757–0199
A7R129	0757–0199		RESISTOR 21.5K 1% .125W F TC=0±100	24546	0757–0199
A7R130	0757–0199		RESISTOR 21.5K 1% .125W F TC=0±100	24546	0757–0199
A7R131	0757–0401		RESISTOR 100 1% .125W F TC=0±100	24546	C4–1/8–TO–101–F
A7R132	0757–0401		RESISTOR 100 1% .125W F TC=0±100	24546	C4–1/8–TO–101–F
A7R133	0698–6320		RESISTOR 5K .1% .125W F TC=0±25	03888	PME55–1/8–T9–5001–
A7R134	0698–6320		RESISTOR 5K .1% .125W F TC=0±25	03888	PME55–1/8–T9–5001–
A7R135	0698–6360		RESISTOR 10K 1% .125W F TC=0±25	28480	0698–6360–T9–5001–
A7R136	0757–0447		RESISTOR 16.2K 1% .125W F TC=0±100	24546	C4–1/8–TO–1622–F
A7R137	0757–0199		RESISTOR 21.5K 1% .125W F TC=0±100	24546	0757–0199
A7R138	0698–3440		RESISTOR 196 1% .125W F TC=0±100	24546	C4–1/8–TO–196R–F
A7R139	0757–0442	1	10K 1% .125W		
A7TP1	0360–0535	10	TERMINAL TESTPOINT PCB	00000	ORDER BY DESCRIPTION
A7TP2	0360–0535		TERMINAL TESTPOINT PCB	00000	ORDER BY DESCRIPTION
A7TP3	0360–0535		TERMINAL TESTPOINT PCB	00000	ORDER BY DESCRIPTION
A7TP4	0360–0535		TERMINAL TESTPOINT PCB	00000	ORDER BY DESCRIPTION
A7TP5	0360–0535		TERMINAL TESTPOINT PCB	00000	ORDER BY DESCRIPTION
A7TP6	0360–0535		TERMINAL TESTPOINT PCB	00000	ORDER BY DESCRIPTION
A7TP7	0360–0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A7TP8	0360–0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A7TP9	0360–0535		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A7TP10	0360–0535		TERMINAL TESTPOINT PCB	00000	ORDER BY DESCRIPTION
A7U1	1826–0547	6	IC OP AMP LOW–BIAS–H–IMPD DUAL 8–DIP–C	28480	1826–0547
A7U2	1826–0547		IC OP AMP LOW–BIAS–H–IMPD DUAL 8–DIP–C	28480	1826–0547

Table 6–3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A7U3	1828–0547		IC OP AMP LOW–BIAS–H–IMPD DUAL 8–DIP–C	28480	1828–0543
A7U4	1826–0740	1	IC SWITCH ANLG DUAL 16–DIP–C PKG	28480	1826–0740
A7U5	1828–1049	2	IC OP AMP PRCN 8–DIP–C PKG	28480	1826–1049
A7U6	1826–1298	2	IC 14C C20PAMP	28480	1826–1298
A7U7	1826–1049		IC OP AMP PRCN 8–DIP–C PKG	28480	1828–1049
A7U8	1828–0547		IC OP AMP LOW–BIAS–H–IMPD DUAL 8–DIP–C	28480	1826–0547
A7U9	1828–0547		IC OP AMP LOW–BIAS–H–IMPD DUAL 8–DIP–C	28480	1828–0547
A7U10	1DK8–0003	1	IC LOGGER 20DIPC	28480	1DK8–0003
A7U11	1828–0547		IC OP AMP LOW–BIAS–H–IMPD DUAL 8–DIP–C	28480	1828–0547
A7U12	1826–1048	1	IC OP AMP PRCN 8–DIP–C PKG	28480	1826–1048
A7U13	1826–1298		IC 14C C20PAMP	28480	1826–1298
A7VR1			NOT ASSIGNED		
A7VR2	1902–0892	1	DIODE–ZNR 6.3V 1% DO–7PD=.4W TC=±.001%	28480	1902–0892
A7VR3	1902–0048	2	DIODE–ZNR 6.81V 5% DO–35 PF=.4W	28480	1902–0048
A7VR4	1902–0048		DIODE–ZNR 6.81V 5% DO–35PD=.4W	28480	1902–0048
A8 – A10			SAME AS A7		

Table 6–3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A11	08157–60066	1	**MOTHER BOARD ASSEMBLY**	28480	08757–60066
A11J1	1252–2870	1	CONNECTOR HDR 40 MALE 2R	28480	1252–2870
A11J2	1251–6932	4	CONNECTOR 3–PIN M METRIC POST TYPE	28480	1251–6932
A11J3	1251–6932		CONNECTOR 3–PIN M METRIC POST TYPE	28480	1251–6932
A11J4	1251–6932		CONNECTOR 3–PIN M METRIC POST TYPE	28480	1251–6932
A11J5	1251–6932		CONNECTOR 3–PIN M METRIC POST TYPE	28480	1251–6932
A11J6	1252–2918	1	CONNECTOR SKT 15 FEMALE 1R	28480	1252–2918
A11J7	1252–2370	1	CONNECTOR HDR 34 MALE 2R	28480	1252–2370
A11J8	1252–2828	1	CONNECTOR HDR 60 MALE 2R	28480	1252–2828
A11 MP1			NOT ASSIGNED		
A11MP2	0590–1095	5	INSERT M3.0X0.5	28480	0590–1095
A11XA1			NOT ASSIGNED		
A11XA2			NOT ASSIGNED		
A11XA3J1	1251–7908	3	CONNECTOR–POST 80 MALE 2R	28480	1251–7908
A11XA4J1	1251–7905	6	CONNECTOR–POST 36 MALE 2R	28480	1251–7905
A11XA4J2	1251–7908		CONNECTOR–POST 80 MALE 2R	28480	1251–7908
A11XA5J1	1251–7905		CONNECTOR–POST 36 MALE 2R	28480	1251–7905
A11XA6J1	1251–7908		CONNECTOR–POST 80 MALE 2R	28480	1251–7908
A11XA7J1	1251–7905		CONNECTOR–POST 36 MALE 2R	28480	1251–7905
A11XA8J1	1251–7905		CONNECTOR–POST 36 MALE 2R	28480	1251–7905
A11XA9J1	1251–7905		CONNECTOR–POST 36 MALE 2R	28480	1251–7905
A11XA10J1	1251–7905		CONNECTOR–POST 36 MALE 2R	28480	1251–7905

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A12	08757-60102	1	POWER SUPPLY	28480	08757-60102
A12C1	0160-4129	4	CAPACITOR-FXD 1 UF ± 10% 35VDC TA	28480	0180-4129
A12C2	0180-4129		CAPACITOR-FXD 1 UF ± 10% 35VDC TA	28480	0180-4129
A12C3	0180-4129		CAPACITOR-FXD 1 UF ± 10% 35VDC TA	28480	0180-4129
A12C4	0180-4129		CAPACITOR-FXD 1 UF ± 10% 35VDC TA	28480	0180-4129
A12C5	0160-4386	1	CAPACITOR-FXD 33PF ± 5% 200VDC CER 0±30	04222	SR152A330JAA
A12C6	0160-0161	2	CAPACITOR-FXD .01UF ±10% 200VDC POLYE	19701	708D1CC10 3PK201AX
A12C7	0160-5755	1	CAPACITOR-FXD .1UF ±10% 100VDC CER	04222	SA401C1 04KAA
A12C8	0180-2211	1	CAPACITOR-FXD 5UF±50-10% 150VDC AL	56289	30DSOSF150CC2
A12C9	0160-0168	2	CAPACITOR-FXD .1UF ±10% 200VDC POLYE	19701	708D1MR10 4PK201AX
A12C10	0160-4574	1	CAPACITOR-FXD 1000PF ±10% 100VDC CER	12474	CAC02X7R1 02K100A
A12C11	0160-2055	4	CAPACITOR-FXD .01UF±80-20% 100VDC CER	28480	0160-2055
A12C12	0180-3849	1	CAPACITOR-FXD 47UF±10% 10VDC TA	12344	T398H4 76K01OAS
A12C13	0160-0168		CAPACITOR-FXD .1UF ±10% 200VDC POLYE	19701	708D1MR10 4PK201AX
A12C14	0160-4832	2	CAPACITOR-FXD .01UF ±10% 100VDC CER	12474	CAC02X7R1 03K100A
A12C15	0180-3831	3	CAPACITOR-FXD 10UF±10% 35VDC TA	12344	T398G1 06K035AS
A12C16	0180-3831		CAPACITOR-FXD 10UF±10% 35VDC TA	12344	T398G1 06K035AS
A12C17	0160-4832		CAPACITOR-FXD .01UF±10% 100VDC CER	12474	CAC02X7R103K100A
A12C18	0180-3831		CAPACITOR-FXD 10UF±10% 35VDC TA	12344	T398G106K035AS
A12C19	0160-5708	4	CAPACITOR-FXD .33UF ±5% 100VDC	84411	HEW 757 0.33UF/5% /100VDC
A12C20	0160-5708		CAPACITOR-FXD .33UF ±5% 100VDC	84411	HEW 757 0.33UF/5% /100VDC
A12C21	0160-2055		CAPACITOR-FXD .01UF ±80-20% 100VDC CER	28480	0160-2055
A12C22	0160-2055		CAPACITOR-FXD .01UF ±80-20% 100VDC CER	28480	0160-2055
A12C23	0180-3713	1	CAPACITOR-FXD 2.2UF±10% 20VDC TA	28480	0180-3713
A12C24	0160-5708		CAPACITOR-FXD .33UF ±5% 100VDC	84411	HEW 757 0.33UF/5% /100VDC
A12C25	0180-4073	2	CAPACITOR-FXD .017F±30-10% 25VDC AL	56289	80D173P025MD2B
A12C26	0180-4073		CAPACITOR-FXD .017F±30-10% 25VDC AL	56289	80D173P025MD2B
A12C27	0160-5708		CAPACITOR-FXD .33UF ±5% 100VDC	84411	HEW 757 0.33UF/5% /100VDC
A12C28	0160-2055		CAPACITOR-FXD .01UF ±80-20% 100VDC CER	28480	0160-2055
A12C29	0180-4132	3	CAPACITOR-FXD 6.8UF±10% 35VDC TA	28480	0180-4132
A12C30	0180-4132		CAPACITOR-FXD 6.8UF±10% 35VDC TA	28480	0180-4132
A12C31	0180-4071	2	CAPACITOR-FXD 7400UF±30-10% 50VDC AL	56289	80D742POSOMD2B
A12C32	0180-4071		CAPACITOR-FXD 7400UF±30-10% 50VDC AL	56289	80D742POSOMD2B
A12C33	0180-4132		CAPACITOR-FXD 6.8UF±10% 35VDC TA	28480	0180-4132
A12C34	0180-4134	2	CAPACITOR-FXD 22UF±10% 15VDC TA	28480	0180-4134
A12C35	0180-4134		CAPACITOR-FXD 22UF ± 10% 15VDC TA	28480	0180-4134
A12C36	0180-4168	2	CAPACITOR-FXD 47UF±10% 20VDC TA	28480	0180-4168
A12C37	0180-4168		CAPACITOR-FXD 47UF±10% 20VDC TA	28480	0180-4168
A12C38	0160-0161		CAPAC ITOR-FXD .01UF ± 10% 200VDC POLYE	19701	708D1CC103PK201AX
A12C45	0180-4072	2	CAPACITOR-FXD 1000UF±30-10% 200VDC AL	56289	80D102P200MD2B
A12C46	0180-4072		CAPACITOR-FXD 1000UF±30-10% 200VDC AL	56289	80D102P200MD2B
A12CR1	1901-0731	17	DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR2	1901-0731		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR3	1901-0731		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR4	1901-0731		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR5	1901-0033	6	DIODE-GEN PRP 180V 200MA DO-35	9N171	1N645
A12CR6	1901-0033		DIODE-GEN PRP 180V 200MA DO-35	9N171	1N645
A12CR7	1901-0033		DIODE-GEN PRP 180V 200MA DO-35	9N171	1 N645
A12CR8	1901-0033		DIODE-GEN PRP 180V 200MA DO-35	9N171	1N645
A12CR9	1901-0731		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR10	1901-0731		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR11	1901-0033		DIODE-GEN PRP 180V 200MA DO-35	9N171	1N645
A12CR12	1901-0033		DIODE-GEN PRP 180V 200MA DO-35	9N171	1N645
A12CR13	1901-0731		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR14	1901-0731		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR15	1901-0731		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR16	1901-0731		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR17	1901-0731		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR18	1901-0731		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR19	1901-0731		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR20	1901-0731		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR21	1901-0518	1	DIODE-SCHOTTKY SM SIG	12403	5082-2800
A12CR22	1901-0731		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR23	1901-0731		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR24	1901-0731		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR25	1901-0200	1	DIODE-PWR RECT 100V 1.5A	28480	1901-0200
A12CR26	1901-0662	4	DIODE-PWR RECT 100V 6A	04713	MR751
A12CR27	1901-0662		DIODE-PWR RECT 100V 6A	04713	MR751
A12CR28	1901-0662		DIODE-PWR RECT 100V 6A	04713	MR751
A12CR29	1906-0269	1	DIODE-CT-RECT 40V 108A	9M011	12CTQ040
A12CR30	1901-0662		DIODE-PWR RECT 100V 6A	04713	MR751
A12CR31	1901-0767	4	DIODE-PWR RECT 400V 6A	04713	MR754

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A12CR32	1901-0767		DIODE-PWR RECT 400V 6A	04713	MR754
A12CR33	1901-0767		DIODE-PWR RECT 400V 6A	04713	MR754
A12CR34	1901-0767		DIODE-PWR RECT 400V 6A	04713	MR754
A12DS1	1990-0678	6	LED-LAMP LUM-INT=800UCD IF=30MA-MAX	28480	HLMP-6500
A12DS2	1990-0678		LED-LAMP LUM-INT=800UCD IF=30MA-MAX	28480	HLMP-6500
A12DS3	1990-0678		LED-LAMP LUM-INT=800UCD IF=30MA-MAX	28480	HLMP-6500
A12DS4	1990-0678		LED-LAMP LUM-INT=800UCD IF=30MA-MAX	28480	HLMP-6500
A12DS5	1990-0678		LED-LAMP LUM-INT=800UCD IF=30MA-MAX	28480	HLMP-6500
A12DS6	1990-0678		LED-LAMP LUM-INT=800UCD IF=30MA-MAX	28480	HLMP-6500
A12E1	0360-2341	3	TERMINAL BLOCK 3-TERM SCREW POLYA	11176	1713037
A12E2	0360-2341		TERMINAL BLOCK 3-TERM SCREWP OLYA	11176	1713037
A12E3	0360-2341		TERMINAL BLOCK 3-TERM SCREWPOLYA	11176	1713037
A12F1			NOT ASSIGNED		
A12F2	2110-0001	3	FUSE (INCH) 1A 250V NTD FE UL	75915	312001
A12F3			NOT ASSIGNED		
A12F4	2110-0001		FUSE (INCH) 1A 250V NTD FE UL	75915	312001
A12F5	2110-0055	2	FUSE (INCH) 4A 250V NTD FE UL	75915	312004
A12F6	2110-0055		FUSE (INCH) 4A 250V NTD FE UL	75915	312 004
A12F7	2110-0043	1	FUSE (INCH) 1.5A 250V NTD FE UL	11870	04015
A12F8	2110-0001		FUSE (INCH) 1A 250V NTD FE UL	75915	312 001
A12J1	1252-2797	1	CONN-POST TYPE 100-PIN-SPCG 10-CONT	28480	1252-2797
A12J2	1252-2919	1	CONN-POST TYPE .156-PIN-SPCG 15-CONT	28480	1252-2919
A12J3	1251-6932	1	CONN-POST TYPE 2.5-PIN-SPCG 3-CONT	28480	1251-6932
A12MP1			NOT ASSIGNED		
A12MP2	2110-0643	6	FUHLR-CLP-TYP 15A 250V	09709	FH-8000
A12MP3			NOT ASSIGNED		
A12MP4	0515-1348	3	SCREW-MACH M3 X 6MM-LG PLASTIC	28480	0515-1348
A12MP5	0570-0647	10	STD-PRS-IN M3 X 0.5 15.000 PH-BRZ	4638 4	KFH-M3-15-ET
A12MP6	08757-20072	1	HEATSINK	28480	08757-20072
A12MP7	3050-1186	10	WASHER-SHLDR NO. 4 12-IN-ID .25-IN-OD	28480	3050-1186
A12MP8	3050-1021	3	WASHER-SHLDR NO. 4 116-IN-ID .215-IN-OD	13103	7721-7PPS
A12MP9	0340-1114	5	INSULATOR-XSTR THRM-CNDCT	5528 5	K-4-05
A12MP10	2190-0005	10	WASHER-LK EXT T NO. 4 .116-IN-ID	78189	1804-01
A12MP11	0380-1247	2	SPACER-RVT-ON 6-MM-LG 3.8-MM-ID	28480	0380-1247
A12MP13	0340-1216	3	INSULATOR-XSTR MICA BLUE	28480	0340-1216
A12MP14	0535-0004	10	NUT-HEX DBL-CHAM M3 X 0.5 2.9MM- THK	00000	ORDER BY DESCRIPTION
A12MP16	1400-1450	1	CLAMP-CABLE .75-DIA .25-WD NYL	02768	220-242400-07-0101
A12MP17	0380-2011	2	SPACER-SNP-IN .75-IN-LG NYL NAT	02768	215-150912-04-01
A12Q1	1854-1162	1	TRANSISTOR NPN SI TO-204AA PD=250W	04713	MJ15024
A12Q2	1884-0344	6	THYRISTOR-SCRV RRM=400	04713	MCR218-6FP
A12Q3	1854-0477	1	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A12Q4	1853-0221	1	TRANSISTOR PNP 2N5416 SI TO-5 PD=1W	34677	2N5416
A12Q5	1854-0234	1	TRANSISTOR NPN 2N3440 SI TO-5PD=1W	72799	2N3440
A12Q6	1844-0344		THYRISTOR-SCR VRRM=400	04713	MCR218-6FP
A12Q7	1644-0344		THYRISTOR-SCR VRRM=400	04713	MCR218-6FP
A12Q8	1844-0344		THYRISTOR-SCR VRRM=400	04713	MCR218-6FP
A12Q9	1644-0344		THYRISTOR-SCR VRRM=400	04713	MCR218-6FP
A12Q10	1854-0749	1	TRANSISTOR NPN SI TO-220AB PD=30W	04713	MJE2361
A12Q11	1844-0344		THYRISTOR-SCR VRRM=400	04713	MCR218-6FP
A12R1	0757-0418	4	RESISTOR 619 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-619R-F
A12R2	0757-0416	3	RESISTOR 511 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-511R-F
A12R3	0757-0416		RESISTOR 511 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-511R-F
A12R4	0757-0418		RESISTOR 619 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-619R-F
A12R5	0698-6360	1	RESISTOR 10K ±0.1% .125W TF TC=0±25	12498	NE55
A12R6	0698-6320	2	RESISTOR 5K ±0.1% .125W TF TC=0±25	12498	NE55
A12R7	0698-6353	1	RESISTOR 50K ±0.1% .125W TF TC=0±25	2M627	CRB140RCRB25
A12R8	0757-0346	8	RESISTOR 10 ±1% .125W TF TC=0±100	D8439	MK2
A12R9	0811-1079	1	RESISTOR .68 ±5% 3W PWI TC=0±90	91637	CW-2B-39
A12R10	0757-0422	3	RESISTOR 909 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-909R-F
A12R11	0698-3446	3	RESISTOR 383 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-383R-F
A12R12	0698-3446		RESISTOR 383 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-383R-F
A12R13	0698-3428	1	RESISTOR 14.7 ± 1% .125W TF TC=0±100	2M627	CRB14 OR CRB25
A12R14	0757-0422		RESISTOR 909 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-909R-F
A12R15	0698-3446		RESISTOR 383 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-383R-F
A12R16	0757-0346		RESISTOR 10 ±1% .125W TF TC=0±100	D8439	MK2
A12R17	0698-0083	2	RESISTOR 1.96K ±1% 125WTF TC=0± 100	12498	CT4-1/8 TO-1961-F
A12R18	0757-0279	3	RESISTOR 3.16K ±1% .125W TF TC=0±100	12498	CT4-1/8T0-3161-F
A12R19	0764-0020	1	RESISTOR 5.6K ±5% 2WMOTC=0±200	12498	FP-59
A12R20	0757-0346		RESISTOR 10 ± 1% .125W TF TC=0± 100	D8439	MK2
A12R21	0698-3444	5	RESISTOR 316 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-316R-F
A12R22	0757-0422		RESISTOR 909 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-909R-F
A12R23	0698-3441	4	RESISTOR 215 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-215R-F

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A12R24	0764-0018	1	RESISTOR 4.7K ±5% 2W MO TC=0±200	12498	FP-69
A12R25	0698-3406	2	RESISTOR 1.33K ±1% 5W TF TC=0±10 0	K8479	H2
A12R26			NOT ASSIGNED		
A12R27	0757-0418		RESISTOR 619 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-619R-F
A12R28	0757-0418		RESISTOR 619 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-619R-F
A12R29	0699-0272	1	RESISTOR 75K ±0.1% .125W TF TC=0±25	12498	NE55
A12R30	0757-0280	8	RESISTOR 1K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-1001-F
A12R31	0757-0442	2	RESISTOR 10K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-1002-F
A12R32	0698-8827	2	RESISTOR 1M ±1% .125W TF TC=0±100	12498	CT4
A12R33	0757-0279		RESISTOR 3.16K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-3161-F
A12R34	0698-0083		RESISTOR 1.96K ±1% .125W TF TC=0±100	12498	CT4-1/8-TO-1961-F
A12R35	0757-0279		RESISTOR 3.16K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-3161-F
A12R36	0698-3155	1	RESISTOR 4.64K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-4641-F
A12R37	2100-0554	2	RESISTOR-TRMR 500 10% TKF TOP-ADJ 1-TRN	28480	2100-0554
A12R38	0757-0278	2	RESISTOR 1.78K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-1781-F
A12R39	0757-0316	2	RESISTOR 42.2 ±1% .125W TF TC=0±100	D8439	MK2
A12R40	0757-0280		RESISTOR 1K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-1001-F
A12R41	0698-8911	1	RESISTOR 1.3K ±0.1% .125W TF TC=0±25	12498	NE55
A12R42	0698-3444		RESISTOR 316 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-316R-F
A12R43	0757-0346		RESISTOR 10 ± 1% .125W TF TC=0± 100	D8439	MK2
A12R44	2100-0554		RESISTOR-TRMR50010% TKFTOP-ADJ1-TRN	28480	2100-0554
A12R45	0757-0278		RESISTOR 1. 78K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-1781-F
A12R46	0757-0316		RESISTOR 42.2 ±1% .125W TF TC=0±100	D8439	MK2
A12R47	0757-0280		RESISTOR 1K ± 1% .125W TF TC=0± 100	12498	CT4-1/8-T0-1001-F
A12R48	0698-6320		RESISTOR 5K ±0.1% .125W TF TC=0±25	12498	NE55
A12R49	0698-3444		RESISTOR 316 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-316R-F
A12R50	0757-0346		RESISTOR 10 ± 1% .125W TF TC=0±100	D8439	MK2
A12R51	2100-3211	3	RESISTOR-TRMR 1K 10% TKF TOP-ADJ 1-TRN	28480	2100-3211
A12R52	0757-0438	2	RESISTOR 5.11K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-5111-F
A12R53	0698-3441		RESISTOR 215 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-215R-F
A12R54	0757-0280		RESISTOR 1K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-1001-F
A12R55	0698-6619	2	RESISTOR 15K ±0.1% .125W TF TC=0±25	12498	NE55
A12R56	0698-3444		RESISTOR 316 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-316R-F
A12R57	0757-0346		RESISTOR 10 ± 1% .125W TF TC=0± 100	D8439	MK2
A12R58	2100-3211		RESISTOR-TRMR 1 K 10% TKF TOP-ADJ 1 -TRN	28480	2100-3211
A12R59	0757-0438		RESISTOR 5.11K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-5111-F
A12R60	0698-3441		RESISTOR 215 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-215R-F
A12R61	0757-0280		RESISTOR 1K ± 1% .125W TF TC=0± 100	12498	CT4-1/8-T0-1001-F
A12R62	0698-6619		RESISTOR 15K ±0.1% .125W TF TC=0±25	12498	NE55
A12R63	0698-3444		RESISTOR 316 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-316R-F
A12R64	0757-0346		RESISTOR 10 ± 1% .125W TF TC=0± 100	D8439	MK2
A12R65	2100-3211		RESISTOR-TRMR 1 K 10% TKF TOP-ADJ 1 -TRN	28480	2100-3211
A12R66	0698-3154	1	RESISTOR 4.22K ±1% .125W TF TC=0±100	12498	CT4-1/8-TO-4221-F
A12R67	0698-3441		RESISTOR 215 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-215R-F
A12R68	0757-0280		RESISTOR 1K ± 1% .125W TF TC=0± 100	12498	CT4-1/8-T0-1001-F
A12R69	0698-8191	1	RESISTOR 12.5K ±0.1% .125W TF TC=0±25	19701	5033R-1/8-T9-1252-B
A12R70	0698-8827		RESISTOR 1M ±1% .125W TF TC=0±100	12498	CT4
A12R71	0757-0442		RESISTOR 10K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-1002-F
A12R72	0698-6362	1	RESISTOR 1K ±0.1% .125W TF TC=0±25	12498	NE55
A12R73	0757-0158	1	RESISTOR 619 ±1% 5W TF TC=0±10 0	K8479	H2
A12R74	0757-0416		RESISTOR 511 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-511R-F
A12R75	0757-0419	1	RESISTOR 681 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-681R-F
A12R76	0757-0346		RESISTOR 10 ±1% .125W TF TC=0±100	D8439	MK2
A12R77	0698-3406		RESISTOR 1.33K ±1% .5W TF TC=0±10 0	K8479	H2
A12R78	0698-3647	1	RESISTOR 15K ±5% 2WMOTC=0±200	12498	FP-69
A12TP1	1460-2201	11	CONNECTOR-SGL CONT TML-TS-PT	28480	1460-2201
A12TP2	1460-2201		CONNECTOR-SGL CONT TML-TS-PT	28480	1460-2201
A12TP3	1460-2201		CONNECTOR -SGL CONT TML-TS-PT	28480	1460-2201
A12TP4	1460-2201		CONNECTOR -SGL CONT TML-TS-PT	28480	1460-2201
A12TP5	1460-2201		CONNECTOR -SGL CONT TML-TS-PT	28480	1460-2201
A12TP6	1460-2201		CONNECTOR -SGL CONT TML-TS-PT	28480	1460-2201
A12TP7	1460-2201		CONNECTOR -SGL CONT TML-TS-PT	28480	1460-2201
A12TP8	1460-2201		CONNECTOR -SGL CONT TML-TS-PT	28480	1460-2201
A12TP9	1460-2201		CONNECTOR-SGL CONT TML-TS-PT	28480	1460-2201
A12TP10	1460-2201		CONNECTOR-SGL CONT TML-TS-PT	28480	1460-2201
A12TP11	1460-2201		CONNECTOR-SGL CONT TML-TS-PT	28480	1460-2201
A12U1	1826-0677	2	IC V RGLTR-ADJ-POS1.2/32V TO-3PKG	27014	LM3 38K
A12U2	1826-0773	1	IC OP AMP GP 8-TO-99 PKG	27014	LM10CH
A12U3	1826-1081	1	IC OP AMP PRCN 8-DIP-P PKG	27014	LF411ACN
A12U4	1826-1437	1	ICV RGLTR-V-REF-FXD 9.995/10.005V	10858	LT1021CCN8-10
A12U5	1826-0065	2	IC COMPARATOR PRCN8-DIP-P PKG	27014	LM311N
A12U6	1826-0065		IC COMPARATOR PRCN 8-DIP-P PKG	27014	LM311N

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A12U7	1826-0677		IC V RGLTR-ADJ-POS 1.2/32V TO-3 PKG	27014	LM338K
A12U8	1826-0423	1	IC V RGLTR-ADJ-POS 1.2/37V TO-3 PKG	27014	LM317K
A12U9	1826-0523	1	IC V RGLTR-ADJ-NEG 1.2/37V TO-3 PKG	27014	LM337K
A12U10	1826-0527	1	IC V RGLTR-ADJ-NEG 1.2/37V TO-220 PKG	27014	LM337T
A12VR1	1902-3036	2	DIODE-ZNR 3.16V 5% DO-7 PD=.4W TC=-.064%	28480	1902-3036
A12VR2	1902-0244	3	DIODE-ZNR 30V 5% PD=1W IR=5UA	28480	1902-0244
A12VR3	1902-0244		DIODE-ZNR 30V 5% PD=1W IR=5UA	28480	1902-0244
A12VR4	1902-0202	1	DIODE-ZNR 15V 5% PD=1W IR=5UA	28480	1902-0202
A12VR5	1902-3224	2	DIODE-ZNR 17.8V 5% DO-35 PD=.4W	28480	1902-3224
A12VR6	1902-3224		DIODE-ZNR 17.8V 5% DO-35 PD=.4W	28480	1902-3224
A12VR7	1902-3036		DIODE-ZNR 3.16V 5% DO-7PD=.4W TC=-.064%	28480	1902-3036
A12VR8	1902-0556	1	DIODE-ZNR 20V 5% PD=1W IR=5UA	28480	1902-0556
A12VR9	1902-0244		DIODE-ZNR 30V 5% PD=1W IR=5UA	28480	1902-0244
A12VR10	1902-3005	2	DIODE-ZNR 2.43V 5% DO-7 PD=.4W TC=-076%	28480	1902-3005
A12VR11	1902-3110	2	DIODE-ZNR 5.9V 2% DO-35 PD=.4W TC=+.017%	28480	1902-3110
A12VR12	1902-3005		DIODE-ZNR 2.43V 5% DO-7 PD=.4W TC=-.076%	28480	1902-3005
A12VR13	1902-3110		DIODE-ZNR 5.9V 2% DO-35PD=.4W TC=+.017%	28480	1902-3110
A12VR14	1902-0025	2	DIODE-ZNR 10V 5% DO-35 PD=.4W TC=+.06%	28480	1902-0025
A12VR15	1902-3220	2	DIODE-ZNR 16.9V 2% DO-35 PD=.4W	28480	1902-3220
A12VR16	1902-0025		DIODE-ZNR 10V 5% DO-35 PD=.4W TC=+.06%	28480	1902-0025
A12VR17	1902-3220		DIODE-ZNR16.9V 2% DO-35 PD=.4W	28480	1902-3220
A12VR18	1902-0064	1	DIODE-ZNR 7.5V 5% DO-35 PD=.4W TC=+.05%	28480	1902-0064
A12VR19	1902-0686	3	DIODE-ZNR 6.2V 2% DO-7 PD=.4W TC=+.002%	04713	1N825
A12VR20	1902-0686		DIODE-ZNR 6.2V 2% DO-7PD=.4W TC=+.002%	04713	1N825
A12VR21	1902-0686		DIODE-ZNR 6.2V 2% DO-7PD=.4W.TC=+.002%	04713	1N825
A12W1	1460-1489	1	WIREFORM BE CU AG	28480	1460-1489

Table 6–3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A13	**08757–60013**	**1**	**REAR PANEL BOARD**	**28480**	**08757–60013**
A13C1	0160–4574	2	CAPACITOR–FXD 1000PF ±10% 100VDC CER	28480	0160–4574
A13C2	0160–4574		CAPACITOR–FXD 1000PF ±10% 100VDC CER	28480	0160–4574
A13C3	0160–4574		CAPACITOR–FXD 1000PF ±10% 100VDC CER	28480	0160–4574
A13CR1	1902–0579	3	ZENER DIODE 5.10V 5% 1.0 W	28480	1902–0579
A13CR2	1902–0579		ZENER DIODE 5.10V 5% 1.0 W	28480	1902–0579
A13CR3	1902–0579		ZENER DIODE 5.10V 5% 1.0 W	28480	1902–0579
A13J1	1251–8061	2	CONNECTOR–R & P 24 FEMALE CONTACT	28480	1251–8061
A13J2	1251–8061		CONNECTOR–R & P 24 FEMALE CONTACT	28480	1251–8061
A13J3	1250–1687	2	CONNECTOR–RF BNC FEM SGL–HOLE–RR 50–OHM	28480	1250–1687
A13J4	1250–1687		CONNECTOR–RF BNC FEM SGL–HOLE–RR 50–OHM	28480	1250–1687
A13J5	1250–1806	6	CONNECTOR–RF BNC FEMALE P.C.	28480	1250–1806
A13J6	1250–1806		CONNECTOR–RF BNC FEMALE P.C.	28480	1250–1806
A13J7	1250–1806		CONNECTOR–RF BNC FEMALE P.C.	28480	1250–1806
A13J8	1250–1806		CONNECTOR–RF BNC FEMALE P.C.	28480	1250–1806
A13J9	1250–1687		CONNECTOR–RF BNC FEMALE P.C.	28480	1250–1687
A13J10	1250–1687		CONNECTOR–RF BNC FEMALE P.C.	28480	1250–1687
A13MP1			NOT ASSIGNED		
A13MP2	0380–1763	4	STANDOFF–RVT–ON .219–IN–LG 6–32THD	28480	0380–1763
A13R1	0757–0795	1	RESISTOR 75 1% .5W F TC=0±100	28480	0757–0795
A1 3W1	08757–60044	1	CBL AY 60C 28G	28480	08757–60044
A1 3W2	08757–60029	1	CABLE ASSY–MOD	28480	08757–60029

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A14	08757-60065	1	**DISPLAY INTERFACE**	28480	08757-60065
A14C1	0160-4835	21	CAPACITOR-FXD .1UF ±10% 50VDC CER	12474	CAC04X7410RK050A
A14C2	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	12474	CAC04X7410RK050A
A14C3	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	12474	CAC04X7410RK050A
A14C4	0160-3878	2	CAPACITOR-FXD 1000PF ±20% 100VDC CER	09969	RPE121-105X7R102M100V
A14C5	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	12474	CAC04X7410RK050A
A14C6	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	12474	CAC04X7410RK050A
A14C7	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	12474	CAC04X7410RK050A
A14C8	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	12474	CAC04X7410RK050A
A14C9	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	12474	CAC04X7410RK050A
A14C10	0160-3878		CAPACITOR-FXD 1000PF ±20% 100VDC CER	09969	RPE121-105X7R102M100V
A14C11	0180-3849	1	CAPACITOR-FXD 47UF±10% 10VDC TA	12344	T398H476K010AS
A14C12	0160-4832	5	CAPACITOR-FXD .01UF ±10% 100VDC CER	12474	CAC02X7R103K100A
A14C13	0160-4832		CAPACITOR-FXD .01UF ±10% 100VDC CER	12474	CAC02X7R103K100A
A14C14	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	12474	CAC04X7410RK050A
A14C15	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	12474	CAC04X7410RK050A
A14C16	0160-4835		CAPACITOR-FXD 1UF ±10% 50VDC CER	12474	CAC04X7410RK050A
A14C17	0160-4835		CAPACITOR-FXD .1UF ± 10% 50VDC CER	12474	CAC04X7410RK050A
A14C18	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	12474	CAC04X7410RK050A
A14C19	0180-3771	2	CAPACITOR-FXD .1UF ±10% 35VDC TA	12344	T398A105K035AS
A14C20	0160-4832		CAPACITOR-FXD .01UF ±10% 100VDC CER	12474	CAC02X7R103K100A
A14C21	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	12474	CAC04X7410RK050A
A14C22	0180-3845	1	CAPACITOR-FXD 4.7UF ±10% 35VDC TA	12344	T398E475K035AS
A14C23	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	12474	CAC04X7410RK050A
A14C24	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	12474	CAC04X7410RK050A
A14C25	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	12474	CAC04X7410RK050A
A14C26	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	12474	CAC04X7410RK050A
A14C27	0180-3771		CAPACITOR-FXD .1UF±10% 35VDC TA	12344	T398A105K035AS
A14C28	0160-4832		CAPACITOR-FXD .01UF ±10% 100VDC CER	12474	CAC02X7R103K100A
A14C29	0160-4832		CAPACITOR-FXD .01UF ±10% 100VDC CER	12474	CAC02X7R103K100A
A14C30	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	12474	CAC04X7410RK050A
A14C31	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	12474	CAC04X7410RK050A
A14C32	0180-3833	1	CAPACITOR-FXD 22UF±10% 10VDC TA	12344	T398E226M010AS
A14C33	0160-4835		CAPACITOR-FXD .1UF ±10% 50VDC CER	12474	CAC04X7410RK050A
A14DS1	1990-0485	1	LED-LAMP LUM-INT=2MCD IF=30MA-MAX BVR=5V	28480	HLMP-1503
A14J1	1252-2385	1	CONN-POST TYPE .100-PIN-SPCG 10-CONT	28480	1252-2385
A14J2	1252-1920	1	CONN-POST TYPE .100-PIN-SPCG 10-CONT	28480	1252-1920
A14J3	1251-8473	1	CONN-POST TYPE .100-PIN-SPCG 20-CONT	28480	1251-8473
A14J4	1251-8474	1	CONN-POST TYPE .100-PIN-SPCG 34-CONT	28480	1251-8474
A14L1	08503-80001	1	COIL TOROID	28480	08503-80001
A14MP1			NOT ASSIGNED		
A14Q1	1854-1028	2	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A14Q2	1854-1028		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A14R1	0757-0280	1	RESISTOR 1K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-1001-F
A14R2	0757-0346	2	RESISTOR 10 ±1% .125W TF TC=0±100	D8439	MK2
A14R3	0698-7191	3	RESISTOR 13.3 ±1% .05W TF TC=0±100	12498	C3-1/8-TO-16R3-F
A14R4	0698-7214	3	RESISTOR 121 ±1% .05W TF TC=0±100	12498	C3-1/8-TO-121R-F
A14R5	0698-7205	3	RESISTOR 51.1 ±1% .05W TF TC=0±100	12498	C3-1/8-TO-51R1-F
A14R6	0698-7205		RESISTOR 51.1 ±1% .05W TF TC=0±100	12498	C3-1/8-TO-51R1-F
A14R7	0698-7205		RESISTOR 51.1 ±1% .05W TF TC=0±100	12498	C3-1/8-TO-51R1-F
A14R8	0698-7191		RESISTOR 13.3 ±1% .05W TF TC=0±100	12498	C3-1/8-TO-16R3-F
A14R9	0698-7214		RESISTOR 121 ±1% .05W TF TC=0±100	12498	C3-1/8-TO-121R-F
A14R10	0698-7191		RESISTOR 13.3 ±1% .05W TF TC=0±100	12498	C3-1/8-TO-16R3-F
A14R11	0698-7214		RESISTOR 121 ±1% .05W TF TC=0±100	12498	C3-1/8-TO-121R-F
A14R12	0757-0346		RESISTOR 10 ±1% .125W TF TC=0±100	D8439	MK2
A14R13	0757-0401	3	RESISTOR 100 ±1% .125W TF TC=0±100	12498	CT4-1/8-TO-101-F
A14R14	0757-0401		RESISTOR 100 ± 1% .125W TF TC=0± 100	12498	CT4-1/8-TO-101-F
A14R15	0757-0401		RESISTOR 100 ±1% .125W TF TC=0±100	12498	CT4-1/8-TO-101-F
A14R16	0757-0418	1	RESISTOR 619 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-619R-F
A14R17	0757-0405	1	RESISTOR 162 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-162R-F
A14R18	0698-3446	1	RESISTOR 383 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-383R-F
A14R19	0698-7252	1	RESISTOR 4.64K ±1% .05W TF TC=0±100	12498	C3-1/8-T0-4641-F
A14TP1	0360-0535	16	CONNECTOR-SGL CONT TML-TS-PT	28480	0360-0535
A14TP2	0360-0535		CONNECTOR -SGL CONT TML-TS-PT	28480	0360-0535
A14TP3	0360-0535		CONNECTOR-SGL CONT TML-TS-PT	28480	0360-0535
A14TP4	0360-0535		CONNECTOR-SGL CONT TML-TS-PT	28480	0360-0535
A14TP5	0360-0535		CONNECTOR-SGL CONT TML-TS-PT	28480	0360-0535
A14TP6	0360-0535		CONNECTOR-SGL CONT TML-TS-PT	28480	0360-0535
A14TP7	0360-0535		CONNECTOR-SGL CONT TML-TS-PT	28480	0360-0535
A14TP8	0360-0535		CONNECTOR-SGL CONT TML-TS-PT	28480	0360-0535

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A14TP9	0360-0535		CONNECTOR-SGL CONT TML-TS-PT	28480	0360-0535
A14TP10	0360-0535		CONNECTOR-SGL CONT TML-TS-PT	28480	0360-0535
A14TP11	0360-0535		CONNECTOR-SGL CONT TML-TS-PT	28480	0360-0535
A14TP12	0360-0535		CONNECTOR-SGL CONT TML-TS-PT	28480	0360-0535
A14TP13	0360-0535		CONNECTOR-SGL CONT TML-TS-PT	28480	0360-0535
A14TP14	0360-0535		CONNECTOR-SGL CONT TML-TS-PT	28480	0360-0535
A14TP15	0360-0535		CONNECTOR-SGL CONT TML-TS-PT	28480	0360-0535
A14TP16	0360-0535		CONNECTOR-SGL CONT TML-TS-PT	28480	0360-0535
A14U1	1820-5897	1	IC-INTERFACE MISC-DGTL	01295	TMS34070N-36
A14U2	1818-4109	16	DRAM 64KX4 120 NS P-ZIP 5V	08777	M5M4C264AL-12
A14U3	1818-4109		DRAM 64KX4 120 NS P-ZIP 5V	08777	M5M4C264AL-12
A14U4	1818-4109		DRAM 64KX4 120 NS P-ZIP 5V	08777	M5M4C264AL-12
A14U5	1818-4109		DRAM 64KX4 120 NS P-ZIP 5V	08777	M5M4C264AL-12
A14U6	1818-4109		DRAM 64KX4 120 NS P-ZIP 5V	08777	M5M4C264AL-12
A14U7	1818-4109		DRAM 64KX4 120 NS P-ZIP 5V	08777	M5M4C264AL-12
A14U8	1818-4109		DRAM 64KX4 120 NS P-ZIP 5V	08777	M5M4C264AL-12
A14U9	1818-4109		DRAM 64KX4 120 NS P-ZIP 5V	08777	M5M4C264AL-12
A14U10	1826-1204	1	D/A 8-BIT 20-PLASTIC CMOS	24355	AD7528JN
A14U11	1820-3121	2	IC TRANSCEIVER TTL ALS BUS OCTL	01295	SN74ALS245AN
A14U12	1820-3121		IC TRANSCEIVER TTL ALS BUS OCTL	01295	SN74ALS245AN
A14U13	1826-0346	1	IC OP AMP GP DUAL 8-DIP-P PKG	27014	LM358N
A14U14	5180-8486	1	PAL-PIXEL PROC	28480	5180-8486
A14U15	1820-2654	2	IC MUXR/DATA-SEL TTL F 2-TO-1-LINE QUAD	07263	74F157PC
A14U16	1820-2654		IC MUXR/DATA-SEL TTL F 2-TO-1-LINE QUAD	07263	74F157PC
A14U17	1818-4109		DRAM 64KX4 120 NS P-ZIP 5V	08777	M5M4C264AL-12
A14U18	1818-4109		DRAM 64KX4 120 NS P-ZIP 5V	08777	M5M4C264AL-12
A14U19	1818-4109		DRAM 64KX4 120 NS P-ZIP 5V	08777	M5M4C264AL-12
A14U20	1818-4109		DRAM 64KX4 120 NS P-ZIP 5V	08777	M5M4C264AL-12
A14U21	1818-4109		DRAM 64KX4 120 NS P-ZIP 5V	08777	M5M4C264AL-12
A14U22	1818-4109		DRAM 64KX4 120 NS P-ZIP 5V	08777	M5M4C264AL-12
A14U23	1818-4109		DRAM 64KX4 120 NS P-ZIP 5V	08777	M5M4C264AL-12
A14U24	1818-4109		DRAM 64KX4 120 NS P-ZIP 5V	08777	M5M4C264AL-12
A14U25	1820-6081	1	IC-32-BIT GRAPHICS SYSTEM PROCESSOR	01295	TMS34010FNL-50
A14U26	1813-0537	1	CLOCK-OSCILLATOR-XTAL 50.00-MHZ 0.05%	04713	K1114AM-50MHZ
A14U27	1810-0205	2	NETWORK-RES 8-SIP 4.7K OHM X 7	C1433	750-81
A14U28	1820-3378	2	IC LCH TTL ALS D-TYPE NEG-EDGE-TRIG OCTL	27014	DM74ALS373N
A14U29	1820-3318	1	IC FF TTL ALS D-TYPE POS-EDGE-TRIG COM	01295	SN74ALS273N
A14U30	1820-2691	1	IC FF TTL F D-TYPE POS-EDGE-TRIG	07263	74F74PC
A14U31	1826-0138	1	IC COMPARATOR GP QUAD 14-DIP-P PKG	27014	LM339N
A14U32	1810-0205		NETWORK-RES 8-SIP 4.7K OHM X 7	C1433	750-81
A14U33	1820-3378		IC LCH TTL ALS D-TYPE NEG-EDGE-TRIG OCTL	27014	DM74ALS373N
A14U34	1818-3538	4	DRAM 64KX4 150 NS PLSTC 5V	S0545	UPD41464C-15
A14U35	1818-3538		DRAM 64KX4 150 NS PLSTC 5V	S0545	UPD41464C-15
A14U36	1818-3538		DRAM 64KX4 150 NS PLSTC 5V	S0545	UPD41464C-15
A14U37	1818-3538		DRAM 64KX4 150 NS PLSTC 5V	S0545	UPD41464C-15
A14U38	1810-0533	2	NETWORK-RES 16-DIP 33.0 OHM X 8	91637	MDP1603-330G
A14U39	1820-7296	2	IC LCH TTL F D-TYPE OCTL	28480	1820-7296
A14U40	1820-7296		IC LCH TTL F D-TYPE OCTL	28480	1820-7296
A14U41	1820-2488	1	IC FF TTL ALS D-TYPE POS-EDGE-TRIG	01295	SN74ALS74AN
A14U42	1813-0484	1	CLOCK-OSCILLATOR-XTAL 35.904-MHZ 0.01%	00815	HS-100-35.904MHZ
A14U43	5180-8487	1	PAL-DISP ACK	28480	5180-8487
A14U44	1810-1175	1	DELAY LINE ACTIVE DEVICE W/DUAL IN-LINE	12193	DS1000-100
A14U45	1820-2684	1	IC GATE TTL F NAND QUAD 2-INP	07263	74F00PC
A14U46	1820-3100	1	IC DCDR TTL ALS BIN 3-TO-8-LINE 3-INP	01295	SN74ALS138N
A14U47	1820-2696	1	IC FF TTL F D-TYPE POS-EDGE-TRIG COM CLK	07263	74F175PC
A14U48	1810-0533		NETWORK-RES 16-DIP 33.0 OHM X 8	91637	MDP1603-330G
A14U49	5180-8488	1	PAL-RAS	28480	5180-8488
A14U50	5180-8485	1	PAL-CAS	28480	5180-8485
A14W1	1258-0141	2	JUMPER-REMOVABLE FOR 0.025 IN SQ PINS	00779	530153-2
A14W2	1258-0141		JUMPER-REMOVABLE FOR 0.025 IN SQ PINS	00779	530153-2
A14X1	1251-5639	2	CONN-POST TYPE .100-PIN-SPCG 2-CONT	28480	1251-5639
A14X3	1200-1274	1	SOCKET-IC-CHP-CARR 68-CONT SQUARE	09922	QILE68P-410T

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A16	08757-60077	1	**RGB INTERFACE (HP 8757C ONLY)**	28480	08757-60077
A16C1	0160-4801	1	CAPACITOR-FXD 100PF ±5% 100VDC CER	12474	CAC02COG101J100A
A16C2	0180-3813	2	CAPACITOR-FXD 10UF±10% 10VDC TA	12344	T398C106M010AS
A16C3	0160-4084	2	CAPACITOR-FXD .1UF ±20% 50VDC CER	09969	RPE122-139X7R104M50V
A16C4	0180-3813		CAPACITOR-FXD 10UF±10% 10VDC TA	12344	T398C106M010AS
A16C5	0160-4084		CAPACITOR-FXD .1UF ±20% 50VDC CER	09969	RPE122-139X7R104M50V
A16C6	0180-3849	1	CAPACITOR-FXD 47UF±10% 10VDC TA	12344	T398H476K010AS
A16C7	0160-4832	3	CAPACITOR-FXD .01UF ±10% 100VDC CER	12474	CAC02X7R103K100A
A16C8	0160-4832		CAPACITOR-FXD .01UF ±10% 100VDC CER	12474	CAC02X7R103K100A
A16C9	0160-4832		CAPACITOR-FXD .01UF ±10% 100VDC CER	12474	CAC02X7R103K100A
A16CR1	1901-0050	11	DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A16CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A16CR3	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A16CR4	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A16CR5	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A16CR6	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A16CR7	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A16CR8	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A16CR9	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A16CR10	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A16CR11	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A16J1	1250-1453	3	CONNECTOR-RF BNC FEM PC-W-STDFS 50-OHM	24931	28JR175-3
A16J2	1250-1453		CONNECTOR-RF BNC FEM PC-W-STDFS 50-OHM	24931	28JR175-3
A16J3	1250-1453		CONNECTOR-RF BNC FEM PC-W-STDFS 50-OHM	24931	28JR175-3
A16J4	08757-60083	1	CONN-AY RGB	28480	08757-60083
A16L1	9140-0261	1	INDUCTOR RF-CH-MLD 100NH ±5%	91637	IM-4.10UH 5%
A16Q1	1853-0281	1	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A16Q2	1854-0477	1	TRANSISTOR NPN 2N2222A SI TO-18 PD=SOOMW	04713	2N2222A
A16R1	0698-3441	3	RESISTOR 215 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-215R-F
A16R2	0698-3441		RESISTOR 215 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-215R-F
A16R3	0698-3441		RESISTOR 215 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-215R-F
A16R4	0698-3430	3	RESISTOR 21.5 ±1% .125W TF TC=0±100	D8439	MK2
A16R5	0698-3430		RESISTOR 21.5 ±1% .125W TF TC=0±100	D8439	MK2
A16R6	0698-3430		RESISTOR 21.5 ±1% .125W TF TC=0±100	D8439	MK2
A16R7	0757-0394	3	RESISTOR 51.1 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-51R1-F
A16R8	0757-0394		RESISTOR 51.1 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-51R1-F
A16R9	0757-0400	1	RESISTOR 90.9 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-90R9-F
A16R10	0757-0394		RESISTOR 51.1 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-51R1-F
A16R11	0757-0346	2	RESISTOR 10 ±1% .125W TF TC=0±100	D8439	MK2
A16R12	0757-0279	3	RESISTOR 3.16K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-3161-F
A16R13	0757-0280	1	RESISTOR 1K ± 1% .125W TF TC=0± 100	12498	CT4-1/8-T0-1001-F
A16R14	0757-0279		RESISTOR 3.16K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-3161-F
A16R15	0757-0279		RESISTOR 3.16K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-3161-F
A16R16	0698-3132	1	RESISTOR 261 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-2610-F
A16R17	0757-0346		RESISTOR 10 ±1% .125W TF TC=0± 100	D8439	MK2
A16U1	1858-0077	1	TRANSISTOR ARRAY 14-PIN PLSTC TO-116	04713	MPQ2222P
A16U2	1820-2656	1	IC GATE TTL ALS NAND QUAD 2-INP	01295	SN74ALS00AN

Table 6–3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
			OPTIONS		
			HP 8757C OPTION 001		
1	08757–00040	1	FRONT DRESS PANEL	28480	08757–00040
2	08757–60034	1	P/O DETECTOR INTERFACE ASSY	28480	08757–60034
3	2190–0584	2	WASHER–LK HLCL 3.0MM 3.1–MM–ID	28480	2190–0584
4	0535–0004	2	NUT–HEX DBL–CHAM M3 X 0.5 2.4MM–THK	28480	0535–0004
A9	08757–60058	1	LOG AMPLIFIER	28480	08757–60058
			HP 8757C OPTION 802		
5	8120–3445	1	CABLE ASSY 24C HP–IB	28480	8120–3445
6	HP 9122C	1	DISC DRIVE	28480	HP 9122C
			HP 8757C/E OPTION 908		
7	5062–3987	1	RACK MOUNT KIT WITHOUT HANDLES	28480	5062–3987
			HP 8757C/E OPTION 913		
8	5062–4072	1	RACK MOUNT KIT WITH HANDLES	28480	5062–4072
			HP 8757C/E OPTION 910		
9	08757–90067	1	HP 8757C/E O/S MANUAL SET	28480	08757–90067
			UPGRADE/RETROFIT/SERVICE KITS		
10	HP11879A	1	HP 8757E TO HP 8757C UPGRADE KIT		HP11879A
			(INSTALLABLE ONLY BY HEWLETT–PACKARD)	28480	
11	08757–60101	1	HP 8757C OPTION 001 RETROFIT KIT	28480	08757–60101
12	08757–60048	1	HP 8757C/E SERVICE KIT	28480	08757–60048
			DOCUMENTATION		
11	08757–90067	1	HP 8757C/E O/S MANUAL SET	28480	08757–90067
12	08757–90073	1	HP8757C/E OPERATING MANUAL	28480	08757–90073
13	08757–90072	1	HP8757C/E SERVICE MANUAL	28480	08757–90072
14	08757–90074	1	HP8757C/E SCALAR NTWK ANALYZERS USER'S GUIDE		08757–90074
15	08757–90075	1	INTRO PROGRAMMING GUIDE FOR THE HP 8757C/E	28480	08757–90075
			SCALAR NTWK ANALYZER WITH THE HP 9000		
			SERIES 200/300 DESKTOP COMPUTER (BASIC)		
16	08757–90076	1	INTRO PROGRAMMING GUIDE FOR THE HP 8757C/E	28480	08757–90076
			SCALAR NTWK ANALYZER WITH THE HP VECTRA		
			PERS CMPTR USING MICROSOFT QUICKBASIC 4.0		
17	08757–90077	1	QUICK REFERENCE GUIDE FOR THE HP8757C/E	28480	08757–90077
			SCALAR NETWORK ANALYZER		
18	08510–90064	1	MICROWAVE CONNECTOR CARE	28480	08510–90064
19	5952–6664	1	HP 8757C/E SCALAR NETWORK ANALYZERS	28480	5952–6664
			TECHNICAL DATA SHEET		
20	5954–1566	1	CONNECTOR CARE APPLICATION NOTE	28480	5954–1566
21	5952–0156	1	TUTORIAL DESCRIPTION OF THE HP–IB	28480	5952–0156
22	5953–8868	1	INTRO OPERATING GUIDE FOR THE HP 8350B	28480	5953–8868
			SWEEP OSCILLATOR WITH THE HP 9000		
			SERIES COMPUTERS (BASIC)		
23	5953–8866	1	QUICK REFERENCE GUIDE FOR THE HP 8550B	28480	5953–8866
			SWEEP OSCILLATOR		
24	5952–9337	1	INTRO OPERATING GUIDE FOR THE HP 8340A	28480	5952–9337
			SYNTHESIZED SWEEPER WITH THE HP 9000		
			SERIES 200 COMPUTERS (BASIC)		
25	5954–1591	1	QUICK REFERENCE GUIDE FOR THE HP 8340B	28480	5954–1591
			SYNTHESIZED SWEEPER		
26	59401–90030	1	CONDENSED DESCRIPTION OF THE HP–IB	28480	59401–90030
27	82990–90001	1	HP 82990A HP–IB COMMAND LIBRARY MANUAL	28480	82990–90001
			PACKAGING		
28	08756–80009	1	CARTON – INNER	28480	08756–80009
29	08756–80010	2	FOAM PADS	28480	08756–80010
30	4114–1051	1	PINK PLASTIC	28480	4114–1051
31	9211–4499	1	CARTON – OUTER	28480	9211–4499
			MISCELLANEOUS		
32	8500–2163	1	CLEANER FOR OPTICAL COMPONENTS	28480	8500–2163
33	HP 10833	1	HP–IB CABLES	28480	HP 10833
			SYSTEM II PLUS CABINET TOUCH–UP PAINT		
34	6010–1146	1	DOVE GRAY	28480	6010–1146
35	6010–1147	1	FRENCH GRAY	28480	6010–1147
36	6010–1148	1	PARCHMENT GRAY	28480	6010–1148
37	6010–1140	1	COBBLESTONE GRAY	28480	6010–1140
38	8710–1833	1	GSP EXTRACTOR TOOL	28480	8710–1833
			LABELS		
39	7120–6853	1	HP–IB ADDRESS LABEL	28480	7120–6853
40	7120–4163	1	WARNING LABEL .5–IN–WD 1–IN–LG AL	28480	7120–4163
41	7120–4293	1	WARNING LABEL 1–IN–WD 2–IN–LG AL	28480	7120–4293
			FUSES		
42	2110–0083	1	FUSE(INCH) 2.5A 250V NTD FE UL	00000	ORDER BY DESC
43	2110 0043	1	FUSE (INCH) 1 .SA 250V NTD FE UL	00000	ORDER BY DESC

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
1	NOT ASSIGNED				
2	08757-00040	1	FRONT DRESS PANEL (OPTION 001)	28480	08757-00040
3	5041-4570	1	KEY H MEAS	28480	5041-4570
4	5041-0847	1	KEY H1	28480	5041-0847
5	5041-4566	1	KEY H CURSOR	28480	5041-4566
6	5041-0848	1	KEY H2	28480	5041-0848
7	5041-4580	1	KEY CAP-HALF POINTING ARROW	28480	5041-4580
8	5041-4580	1	KEY CAP-HALF POINTING ARROW	28480	5041-4580
9	0370-2992	1	KNOB-BASE 1 1/8 JGK .252-IN-ID	28480	0370-2992
10	5041-1756	1	KEY CAP-QUARTER, GRAY 0	28480	5041-1756
11	5041-1757	1	KEY CAP-QUARTER, GRAY 1	28480	5041-1757
12	5041-1760	1	KEY CAP-QUARTER, GRAY 4	28480	5041-1760
13	5041-1763	1	KEY CAP-QUARTER, GRAY 7	28480	5041-1763
14	5041-1761	1	KEY CAP-QUARTER, GRAY 5	28480	5041-1761
15	5041-1764	1	KEY CAP-QUARTER, GRAY 8	28480	5041-1764
16	5041-1762	1	KEY CAP-QUARTER, GRAY 6	28480	5041-1762
17	5041-1762	1	KEY CAP-QUARTER, GRAY 9	28480	5041-1762
18	5041-2802	1	KEY Q ENT-OFF	28480	5041-2802
19	5041-2803	1	KEY Q ENT	28480	5041-2803
20	5041-1759	1	KEY CAP-QUARTER, GRAY 3	28480	5041-1759
21	5041-1940	1	KEY CAP-QUARTER, DBM	28480	5041-1940
22	5041-1758	1	KEY CAP-QUARTER, GRAY 2	28480	5041-1758
23	5041-1769	1	KEY CAP-QUARTER, BK SP	28480	5041-1769
24	5041-1770	1	KEY CAP-QUARTER, MINUS	28480	5041-1770
25	5041-1775	1	KEY CAP-QUARTER, DECIMAL	28480	5041-1775
26	5041-2099	1	KEY H PRESET	28480	5041-2099
27	1990-0858	4	LED-LAMP LUM-INT=15UCD IF=25MA-MAX	28480	1990-0858
28	5041-1611	1	KEY H RECALL	28480	5041-1611
29	08757-60034	1	P/O DETECTOR INTFC ASSY (HP 8757C OPT 001)	28480	08757-60034
30	5041-2809	1	KEY H SAVE	28480	5041-2809
31	08757-60034	3	P/O DETECTOR INTFC ASSY	28480	08757-60034
32	5041-4571	1	KEY H SYSTEM	28480	5041-4571
33	2190-0584	6	WASHER-LK HLCL 3.0MM 3.1-MM-ID	28480	2190-0584
34	2950-0043	6	HEX NUT	28480	2950-0043
35	5041-0772	1	KEY H LOCAL	28480	5041-0772
36	5041-4567	1	KEY H SPCL	28480	5041-4567
37	5041-4568	1	KEY H CAL	28480	5041-4568
38	5041-4569	1	KEY H AVG	28480	5041-4569
39	5041-2804	1	KEY H REF	28480	5041-2804
40	5041-2805	2	KEY H SCALE	28480	5041-2805
41	5041-2808	1	KEY H DISPLAY	28480	5041-2808
42	08757-40012	1	BUTTON COVER	28480	08757-40012
43	0515-2113	2	TORX SCREW	28480	0515-2113
44	5062-7208	1	BEZEL WITH GLASS FILTER	28480	5062-7208
45	08757-40003	1	BEZEL SUPPORT	28480	08757-40003
46	08757-40005	1	LINE BUTTON	28480	08757-40005

Figure 6-2. Front View (1 of 13)

NOTE: This page and the following two pages apply to the following instruments only:

- HP 8757Cs with serial number 3026A02331 and below
- HP 8757Es with serial number 3025A00486 and below
- All HP 8757Cs with Option 001

NOTE: This page, the previous page, and the following page apply to the following instruments only:

- HP 8757Cs with serial number 3026A02331 and below
- HP 8757Es with serial number 3025A00486 and below
- All HP 8757Cs with Option 001

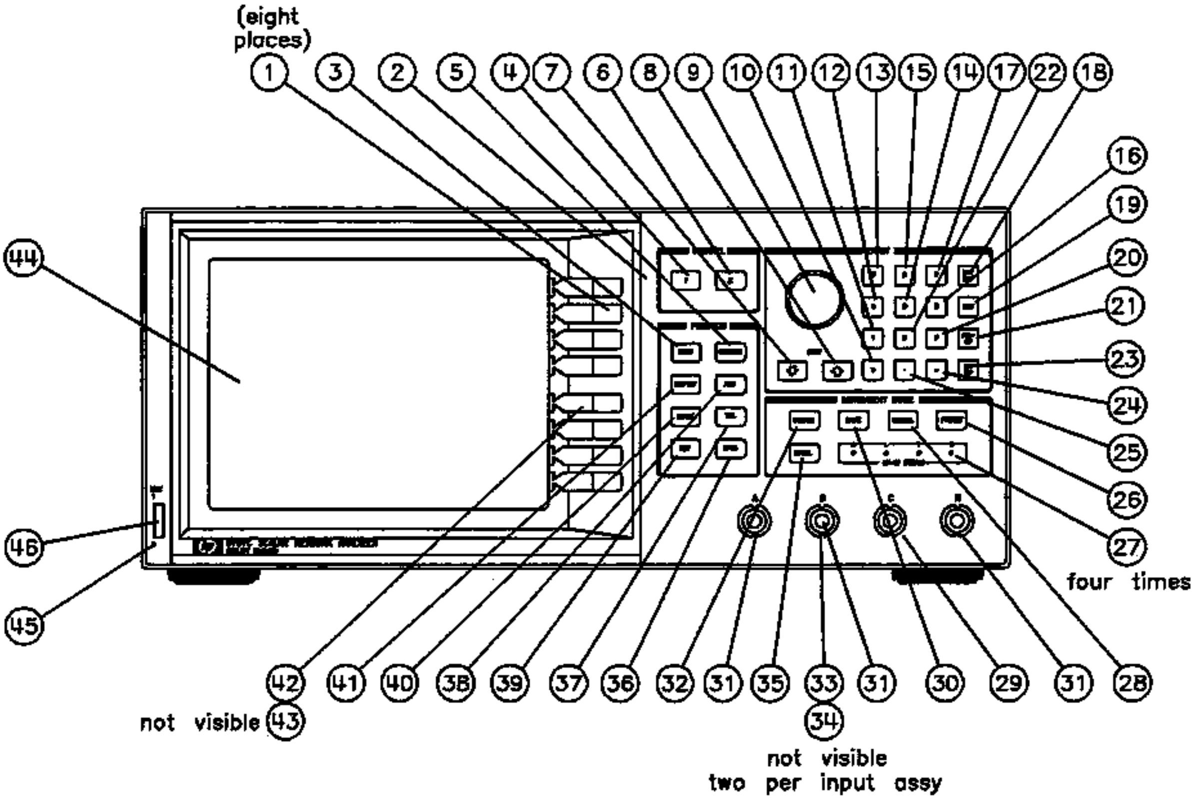
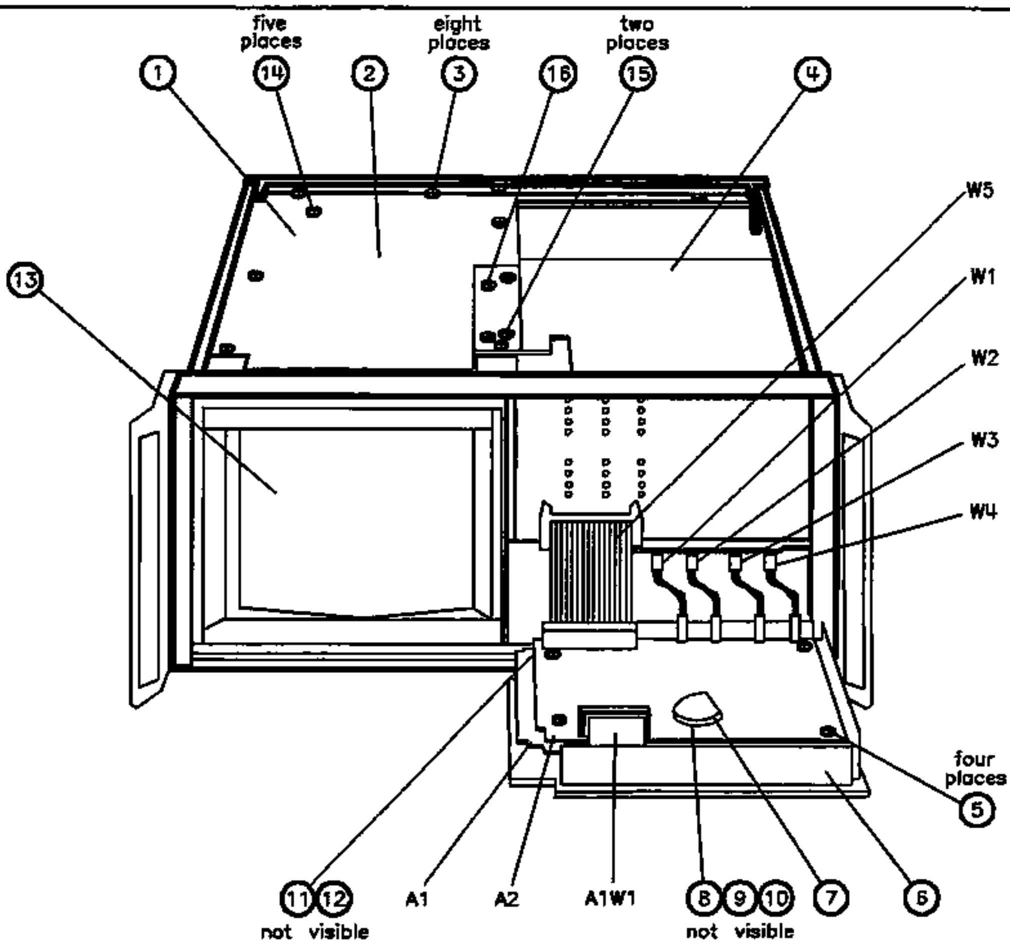


Figure 6–2. Front View (2 of 13)



Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
1	08757-00053	1	CRT SHIELD	28480	08757-00053
2	7120-4293	1	WARNING LABEL	28480	7120-4293
3	0515-0380	8	SCREW-MACH M4.0 x 10MM-LG PAN-HD	00000	ORDER BY DESC.
4	08757-00056	1	LOGGER COVER	28480	08757-00056
5	0515-1411	4	SCREW-MACH M3 X 0.5 20MM-LG PAN-HD	00000	ORDER BY DESC.
6	08757-00002	1	FRONT SUBPANEL	28480	08757-00002
7	08757-60053	1	RPG ASSEMBLY	28480	08757-60053
8	2190-0016	1	WASHER-LK INTL T 3/8 IN .377-IN-ID	28480	2190-0016
9	2950-0001	1	NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	28480	2950-0001
10	2950-0043	1	NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	28480	2950-0043
11	0510-1148	4	RETAINER-PUSH ON KB-TO-SHFT EXT	00000	ORDER BY DESC.
12	0515-0374	8	SCREW-MACH M3 0.5 10MM-LG PAN-HD	00000	ORDER BY DESC.
13	5062-7208	1	DISPLAY GASKET AND GLASS BEZEL	28480	08757-40010
14	0515-0372	5	SCREW-MACHINE ASSEMBLY M3 X 0.5 10MM-LG (NOT SHOWN)	00000	ORDER BY DESC.
15	0515-0372	2	SCREW-MACHINE ASSEMBLY M3 X 0.5 10MM-LG (NOT SHOWN)	00000	ORDER BY DESC.
16	0515-0372	2	SCREW-MACHINE ASSEMBLY M3 X 0.5 10MM-LG (NOT SHOWN)	00000	ORDER BY DESC.
A1	08757-60078	1	FRONT PANEL KEYBOARD ASSY	28480	08757-60078
A2	08757-60135	1	FRONT PANEL INTERFACE	28480	08757-60135
A1W1	08757-60045	1	FRONT PANEL KEYBOARD/INTERFACE CABLE	28480	08757-60045
W1	08757-60034	1	FRONT PANEL DETECTOR INTERFACE ASSY	28480	08757-60034
W2	08757-60034	1	FRONT PANEL DETECTOR INTERFACE ASSY	28480	08757-60034
W3	08757-60034	1	FRONT PANEL DETECTOR INTERFACE ASSY	28480	08757-60034
W4	08757-60034	1	FRONT PANEL DETECTOR INTERFACE ASSY	28480	08757-60034
W5	8120-4112	1	FRONT PANEL INTERFACE CABLE	28480	8120-4112

Figure 6-2. Front View Interior (3 of 13)

NOTE: This page and the previous two pages apply to the following instruments only:

- HP 8757Cs with serial number 3026A02331 and below
- HP 8757Es with serial number 3025A00486 and below
- All HP 8757Cs with Option 001

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
1	08757-40016		KEYPAD – RUBBER	28480	08757-40016
2	08757-80087	1	FRONT PANEL OVERLAY (STANDARD)	28480	08757-80087
3	01650-47401	1	KNOB-BASE 1 1/8 JGK	28480	01650-47401
4	1990-0856	4	LED-LAMP LUM-INT=15UCD IF=25MA-MAX	28480	1990-0856
5	08757-60034	3	P/O DETECTOR INTFC ASSY	28480	08757-60034
6	2190-0584	6	WASHER-LK HLCL 3.0MM 3.1-MM-ID	28480	2190-0584
7	0535-0004	6	NUT-HEX DBL-CHAM M3 X 0.5 2.4MM-THK	00000	ORDER BY DESC.
8	08757-40012	1	BUTTON COVER	28480	08757-40012
9	0515-0898	2	SCREW-MACH M4 X 0.7 6MM-LG PAN-HD	00000	ORDER BY DESC.
10	0515-2041	1	BEZEL WITH GLASS FILTER	28480	0515-2041
11	08757-40003	1	BEZEL SUPPORT	28480	08757-40003
12	08757-40005	1	LINE BUTTON	28480	08757-40005

Figure 6–2. Front View (4 of 13)

NOTE: This page and the following two pages apply to the following instruments only:

- HP 8757Cs with serial number 3026A02332 and above without option 001
- HP 8757Es with serial number 3025A00487 and above

NOTE: This page, the previous page, and the following page apply to the following instruments only:

- HP 8757Cs with serial number 3026A02332 and above without option 001
- HP 8757Es with serial number 3025A00487 and above

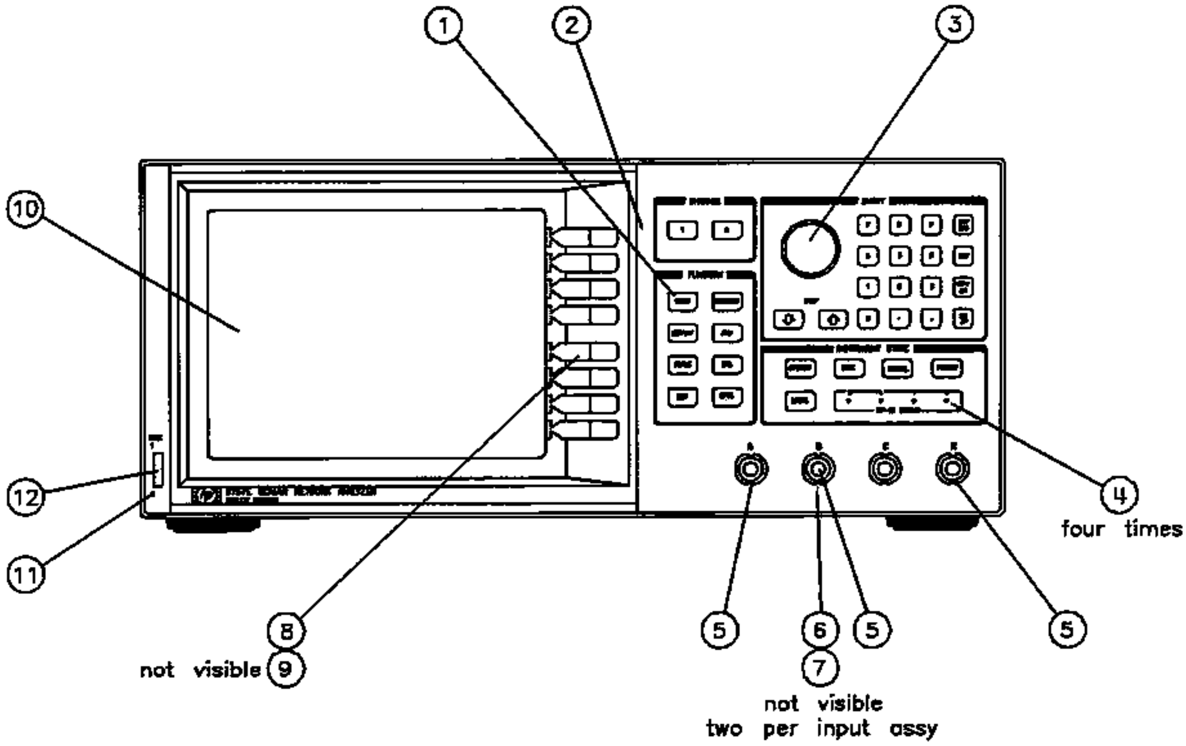
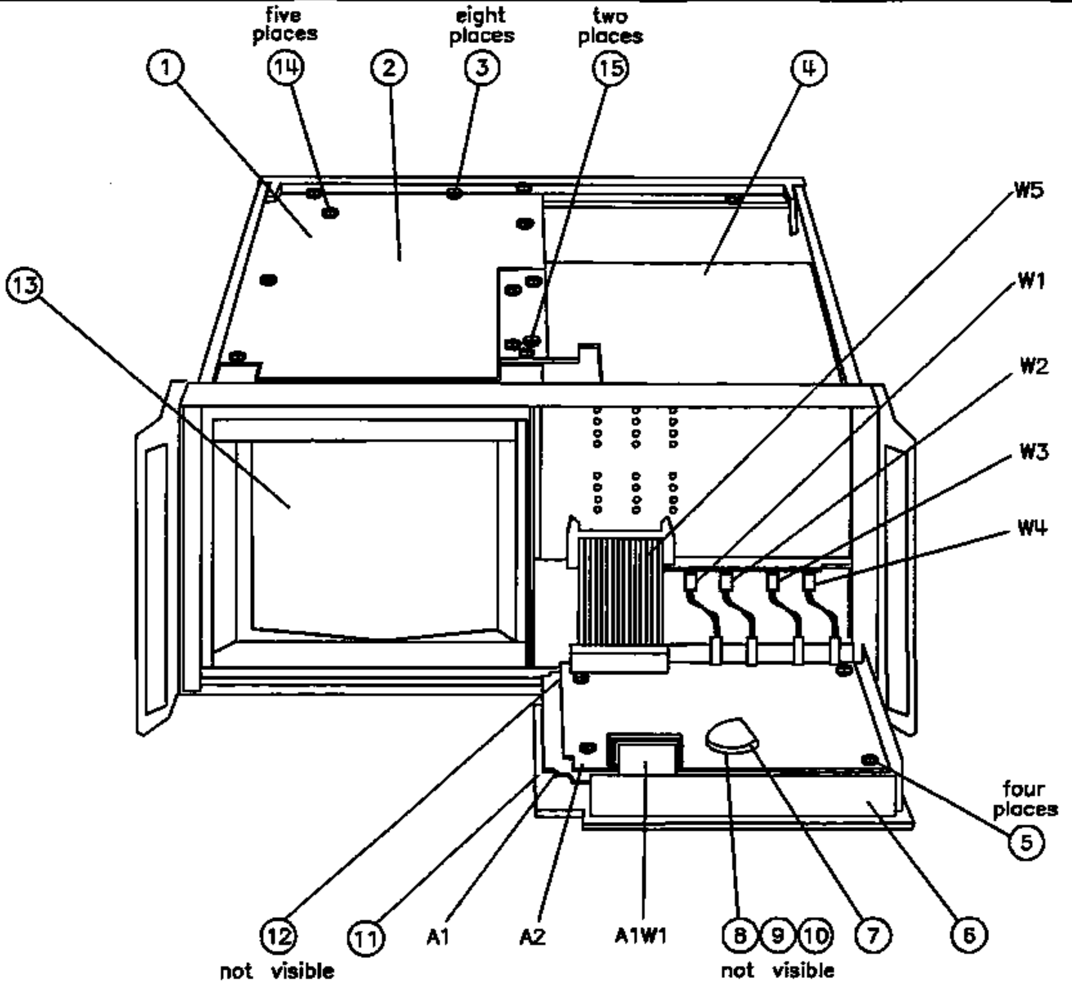


Figure 6−2. Front View (5 of 13)

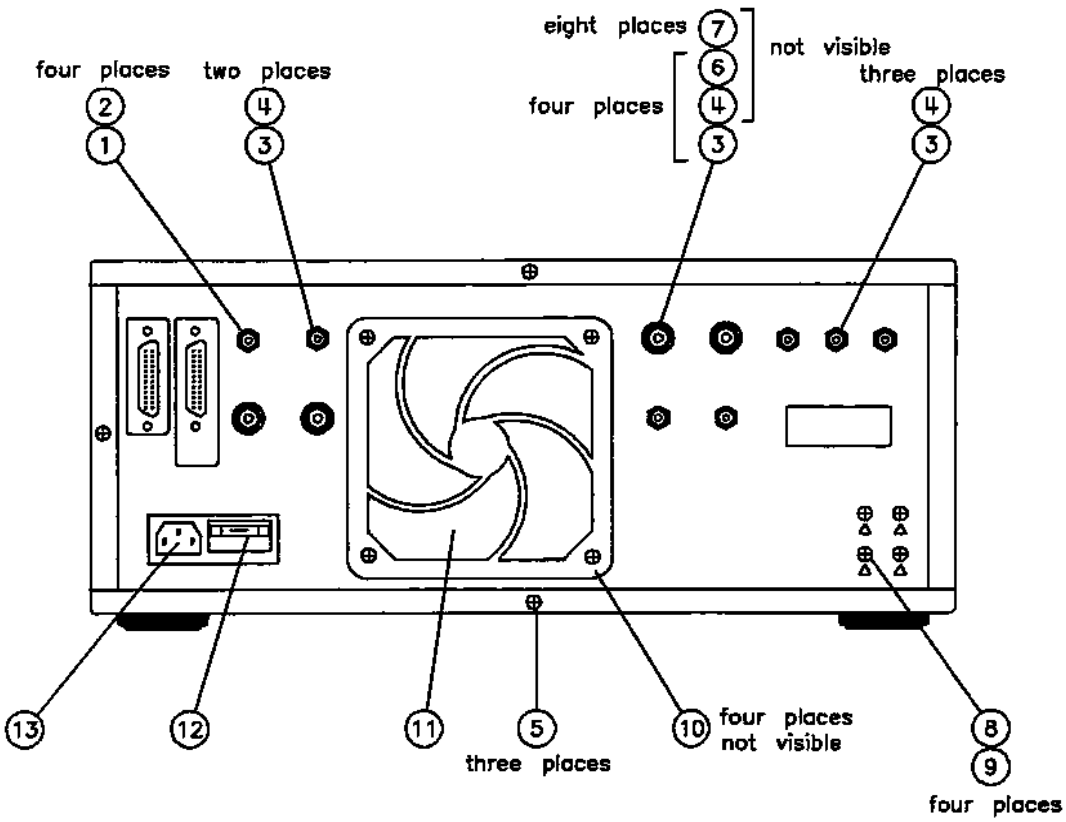


Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
1	08757-40009	1	CRT SHIELD	28480	08757-40009
2	7120-4293	1	WARNING LABEL	28480	7120-4293
3	0515-0380	8	SCREW-MACH M4 X 0.7 8MM-LG PAN-HD	00000	ORDER BY DESC.
4	08757-00056	1	LOGGER COVER	28480	08757-00056
5	0515-1410	4	SCREW-MACH M3 X 0.5 20MM-LG PAN-HD	00000	ORDER BY DESC.
6	08757-00062	1	FRONT SUBPANEL	28480	08757-00062
7	1990-1525	1	RPG ASSEMBLY	28480	1990-1525
8	2190-0016	1	WASHER-LK INTL T 3/8 IN .377-IN-ID	28480	2190-0016
9	2950-0001	1	NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	28480	2950-0001
10	2950-0043	1	NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	28480	2950-0043
11	08757-40016		KEYPAD -RBR	28480	08757-40016
12	0515-0374	8	SCREW-MACH M3 0.5 10MM-LG PAN-HD	00000	ORDER BY DESC.
13	08757-40010	1	DISPLAY GASKET	28480	08757-40010
14	0515-0372	5	SCREW-MACHINE ASSEMBLY M3 X 0.5 10MM-LG (NOT SHOWN)	00000	ORDER BY DESC.
15	0515-0372	2	SCREW-MACHINE ASSEMBLY M3 X 0.5 10MM-LG (NOT SHOWN)	00000	ORDER BY DESC.
A1	08757-60112	1	FRONT PANEL KEYBOARD ASSY	28480	08757-60112
A2	08757-60135	1	FRONT PANEL INTERFACE	28480	08757-60135
A1W1	08757-60045	1	FRONT PANEL KEYBOARD/INTERFACE CABLE	28480	08757-60045
W1	08757-60034	1	FRONT PANEL DETECTOR INTERFACE ASSY	28480	08757-60034
W2	08757-60034	1	FRONT PANEL DETECTOR INTERFACE ASSY	28480	08757-60034
W3	08757-60034	1	FRONT PANEL DETECTOR INTERFACE ASSY	28480	08757-60034
W4	08757-60034	1	FRONT PANEL DETECTOR INTERFACE ASSY	28480	08757-60034
W5	8120-4112	1	FRONT PANEL INTERFACE CABLE	28480	8120-4112

Figure 6-2. Front View Interior (6 of 13)

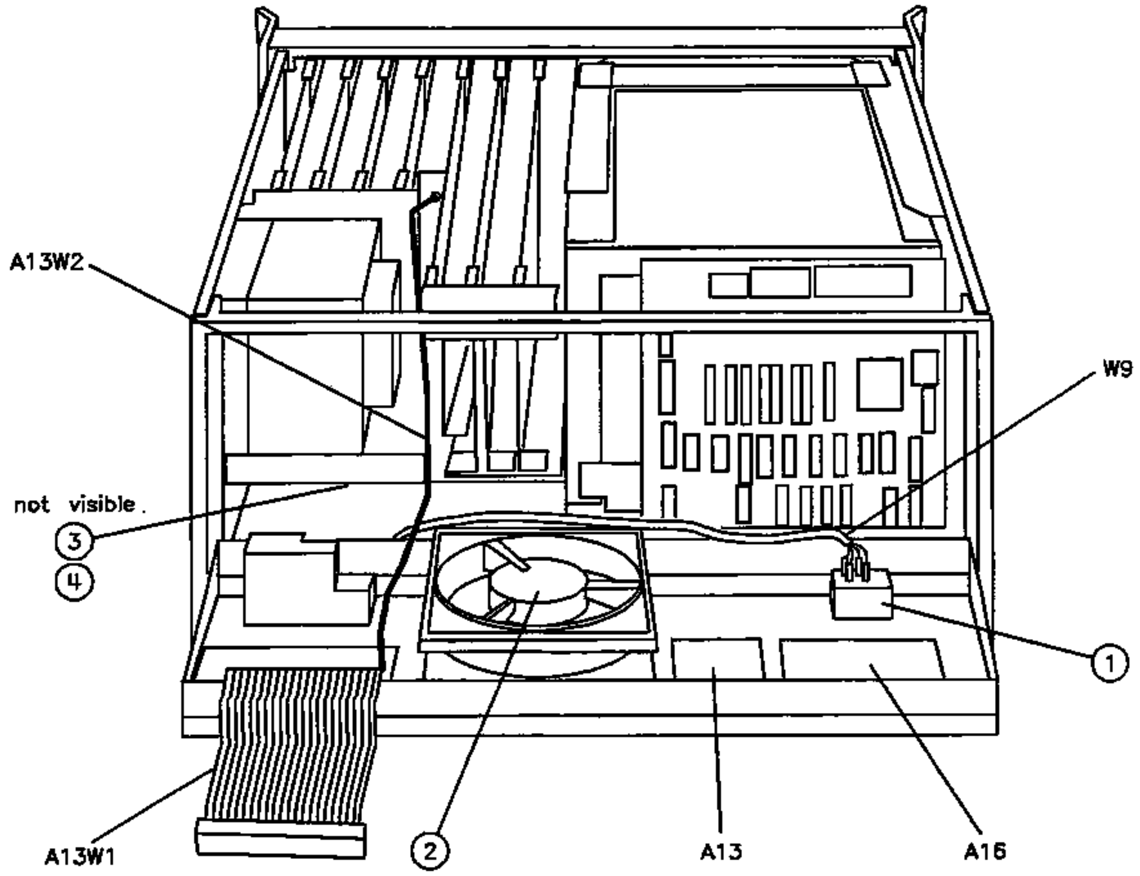
NOTE: This page and the previous two pages apply to the following instruments only:

- HP 8757Cs with serial number 3026A02332 and above without option 001
- HP 8757Es with serial number 3025A00487 and above



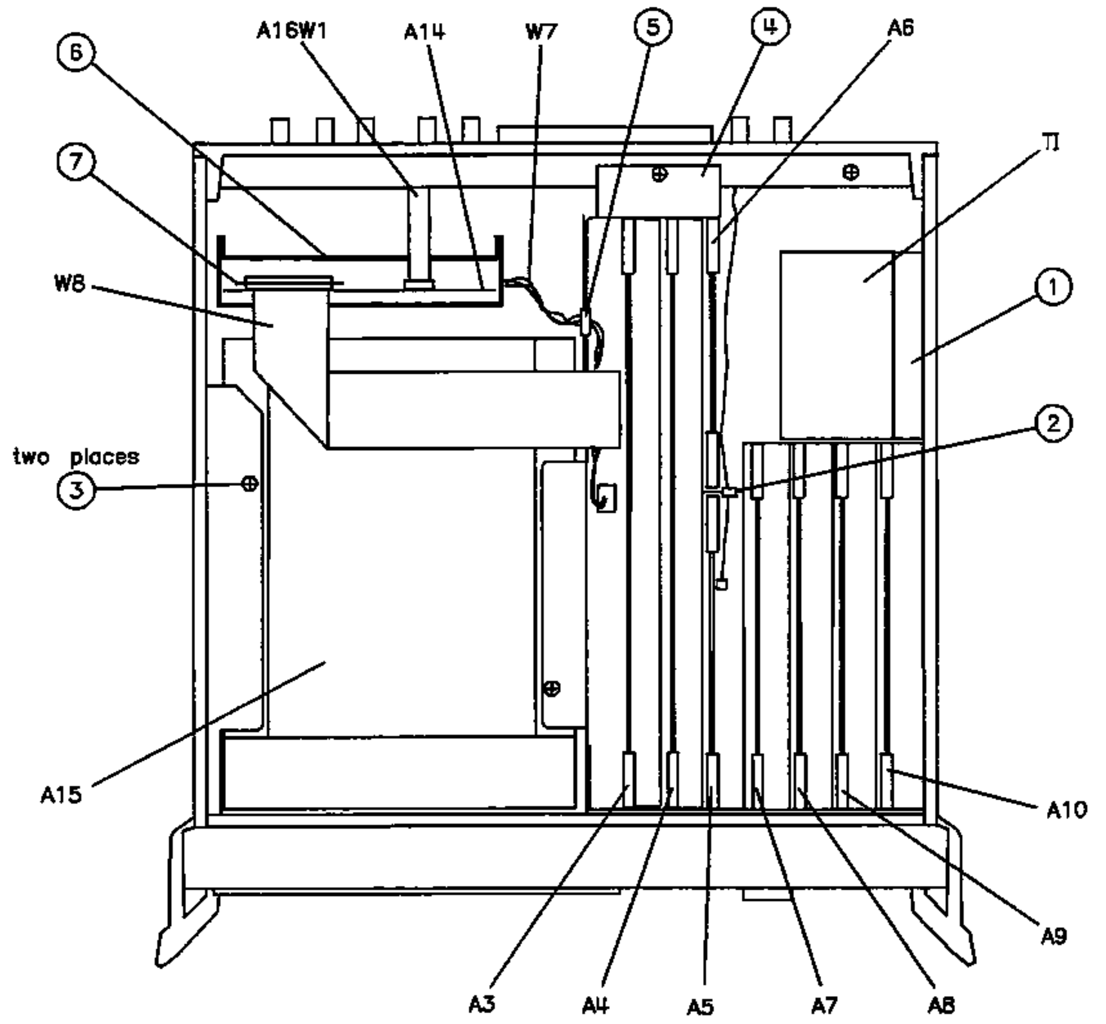
Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
1	0380-0643	4	STANDOFF-HEX .255-IN-LG 6-32THD	00000	ORDER BY DESC.
2	2190-0017	4	WASHER-LK HLCL NO.8 .168-IN-ID	28480	2190-0017
3	0515-0375	11	NUT-HEX-DBL-CHAM 15/32-32-THD	00000	ORDER BY DESC.
4	0515-0372	11	WASHER-LK INTL T 15/32 IN .472-IN-ID	28480	0515-0372
5	0515-0380	3	SCREW-SPCL M3.5 X 0.6 12MM-LG	00000	ORDER BY DESC.
6	3050-1094	4	WASHER-FL MTLC 1/2 IN .505-IN-ID	28480	3050-1094
7	5040-8857	8	WASHER-SHOULDER	28480	5040-8857
8	0624-0324	4	SCREW-TPG 4-20 .312-IN-LG PAN HP-POZI	00000	ORDER BY DESC.
9	3050-0891	4	WASHER-FL MTLC 3.0MM 3.3-MM-ID	28480	3050-0891
10	0515-2041	4	SCREW-MACH M3.5 X 0.6 25MM-LG	00000	ORDER BY DESC.
11	3150-0484	1	FILTER/GUARD/RETAINER-FAN	28480	3150-0484
12	2110-0083	1	FUSE (INCH) 2.5A 250V NTD FE UL	00000	ORDER BY DESC.
	2110-0043	1	FUSE (INCH) 1.5A 250V NTD FE UL	00000	ORDER BY DESC.
13	0960-0443	1	LINE MODULE-FILTERED	02085	F2058D
			1.For the HP 8757E, these parts are replaced with HP Part Number 6960-0041.		

Figure 6-2. Rear View (7 of 13)



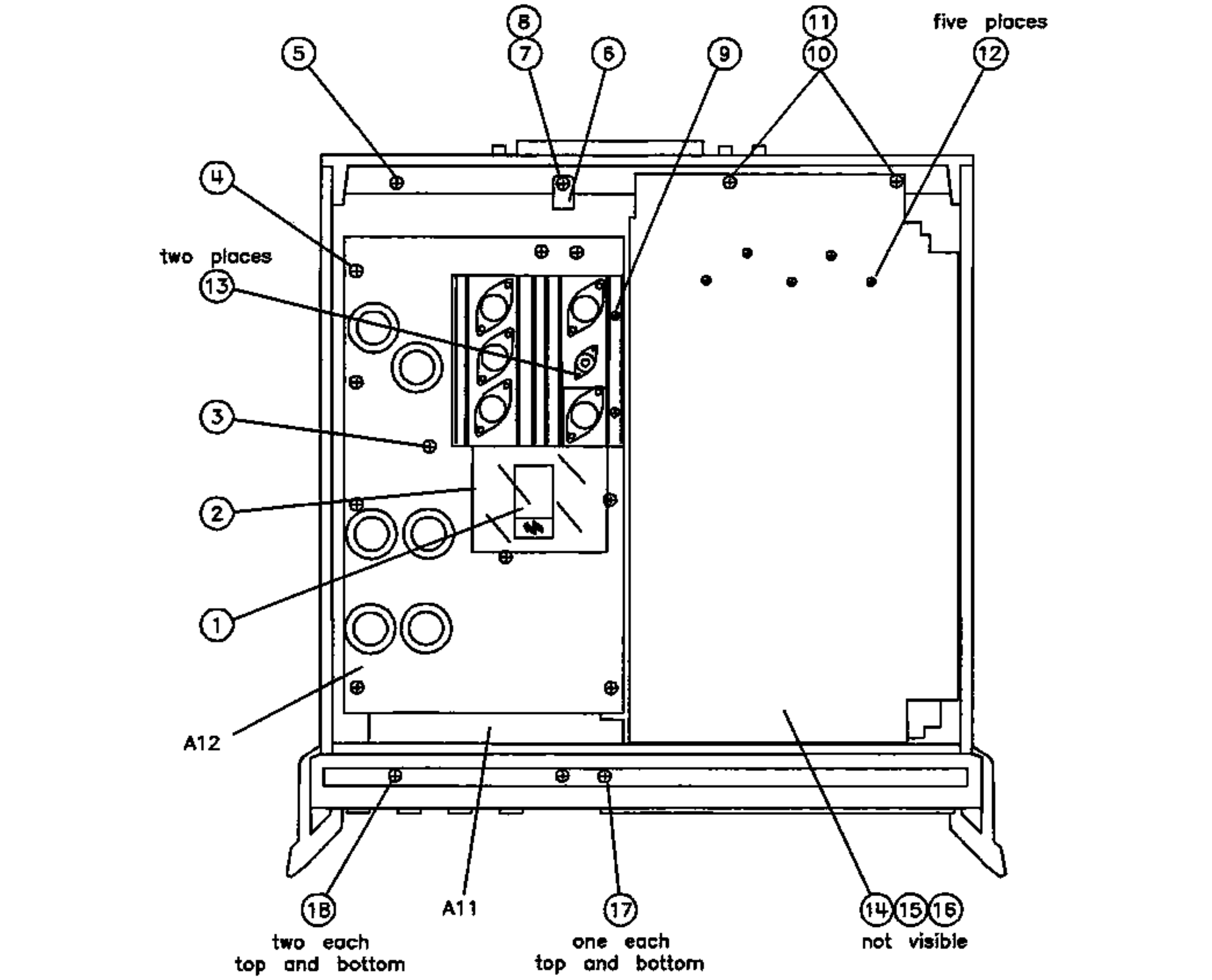
Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
1	3101-2780	2	SWITCH DPST (PART OF W9)	28480	3101-2780
2	08757-60104	1	FAN-MODIFIED	28480	08757-60104
3	1251-3967	1	CONTACT-CONN U/W-POST-TYPE FEM CRP	28480	1251-3967
4	1251-4933	1	CONN-POST TYPE 2.5-PIN-SPCG 3-CONT	28480	1251-4933
A13	08757-60013	1	REAR PANEL ASSEMBLY	28480	08757-60013
A13W1	08757-60029	1	REAR PANEL/MOTHERBOARD CABLE	28480	08757-60029
A13W2	08757-60044	1	REAR PANEL/ MODULATOR BOARD CABLE	28480	08757-60044
A16	08757-60077	1	RGB INTERFACE	28480	08757-60077
W9	08757-60033	1	POWER CABLE ASSEMBLY (INCLUDES SWITCH)	28480	08757-60033

Figure 6–2. Rear View Interior (8 of 13)



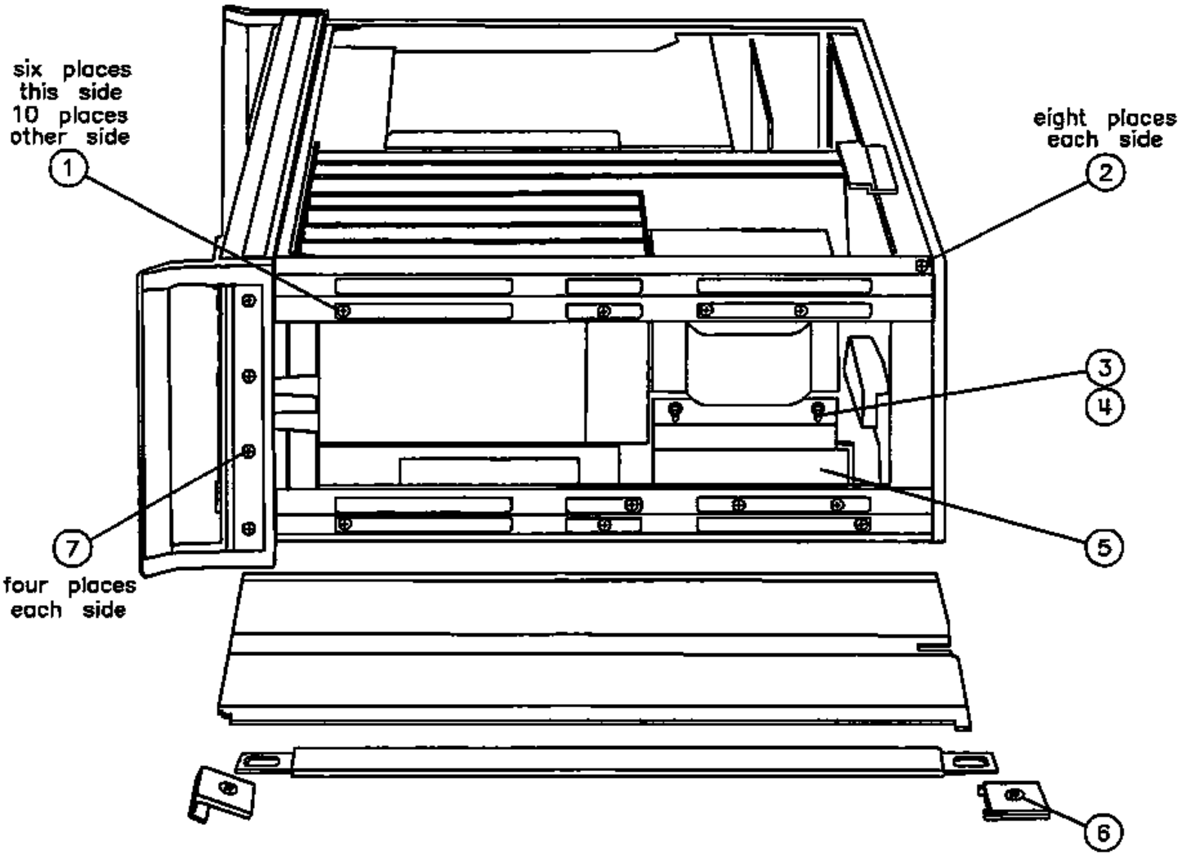
Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
1	08757-00045	1	TRANSFORMER MOUNTING FRAME	28480	08757-00045
2	0400-0009	1	GROMMET-RND .125-IN-ID .25-IN-GRV-OD	00000	ORDER BY DESC.
3	0515-0380	2	SCREW-MACH M4 X 0.7 8MM-LG PAN-HD	00000	ORDER BY DESC.
4	08757-00032	1	REAR SUPPORT	28480	08757-00032
5	0400-0002	1	GROMMET-RND .188-IN-ID .312-IN-GRV-OD	00000	ORDER BY DESC.
6	08757-00054	1	ENCLOSURE - GSP	28480	08757-00054
7	1252-2537	1	CLIP RETAINER 3mm	28480	1252-2537
A3	08757-60068	1	CPU ASSEMBLY (HP 8757C)	28480	08757-60068
A3	08757-60088	1	CPU ASSEMBLY (HP 8757E)	28480	08757-60088
A4	08757-60004	1	ADC ASSEMBLY	28480	08757-60004
A5	08757-60005	1	MODULATOR DRIVE ASSEMBLY	28480	08757-60005
A6	08757-60006	1	HP-IB ASSEMBLY	28480	08757-60006
A7-A10	08757-60058	4	LOG AMPLIFIER (A9 HP 8757C OPT 001 ONLY)	28480	08757-60058
A14	08757-60065	1	DISPLAY INTERFACE	28480	08757-60065
A15	2090-0210	1	DISPLAY	28480	2090-0210
A16W1	08757-60083	1	RGB INTERFACE CABLE (HP 8757C ONLY)	28480	8120-3308
T1	9100-4766	1	POWER TRANSFORMER	28480	9100-4766
W7	08757-60071	1	A14 POWER CABLE	28480	08757-60071
W8	08757-60076	1	CABLE AY-34C 28AWG	28480	08757-60076

Figure 6-2. Top View (9 of 13)



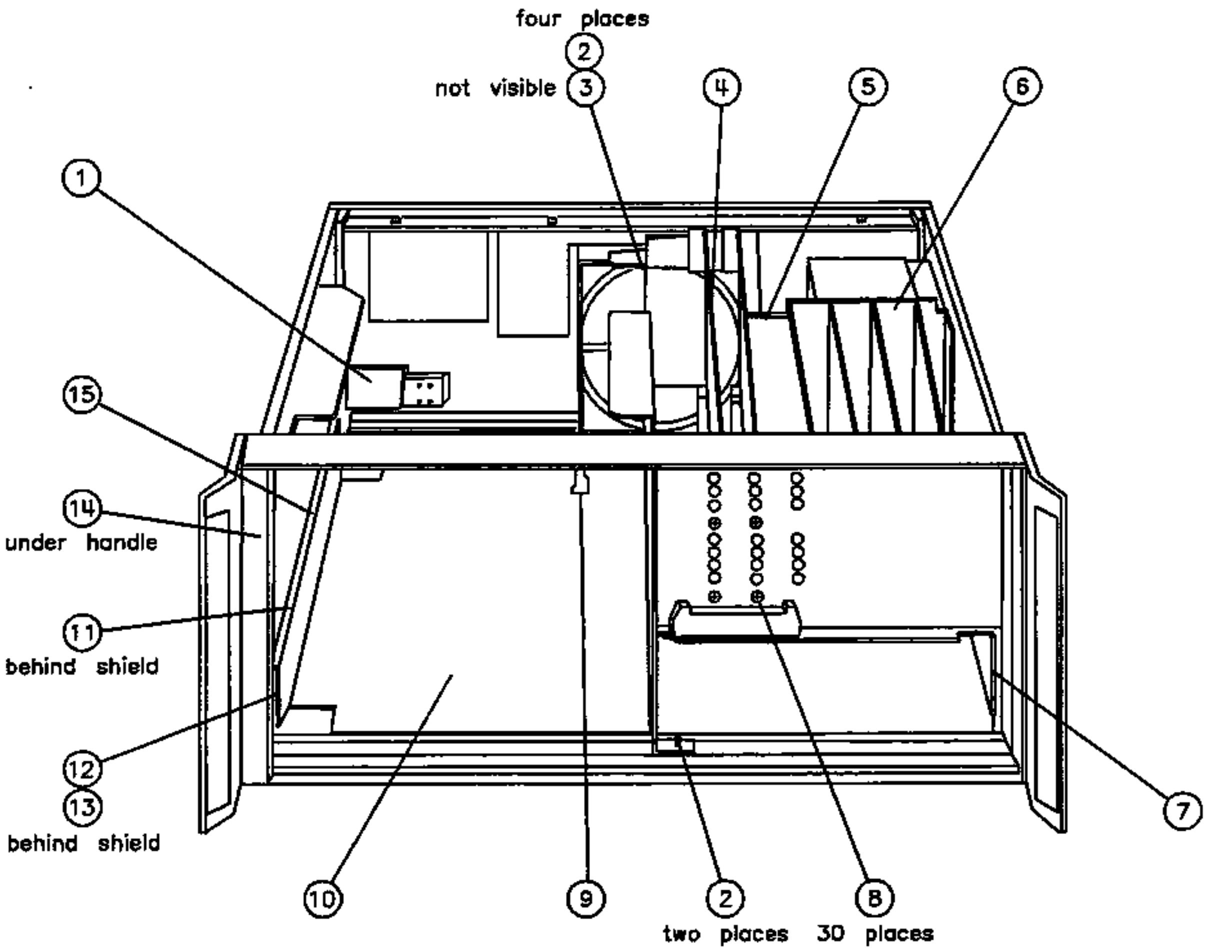
Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
1	7120-4293	1	WARNING LABEL	28480	7120-4293
2	08757-20084	1	SHIELD	28480	08757-20084
3	0515-1111	2	SCREW-MACH M3 X 0.5 16MM-LG PAN HD	00000	ORDER BY DESC.
4	0515-1059	5	SCREW-MACH M2.5 X 0.45 28MM-LG PAN-HD	00000	ORDER BY DESC.
5	0515-0380	1	SCREW-MACH M4 X 10MM-LG PAN-HD	00000	ORDER BY DESC.
6	1400-0024	1	CLAMP-CABLE .25-DIA .5-WD NYL	00000	ORDER BY DESC.
7	0515-0380	1	SCREW-MACH M4 X 10MM-LG PAN-HD	00000	ORDER BY DESC.
8	3050-0893	1	WASHER-FL MTLC 4.0 MM 4.4-MM-ID	00000	ORDER BY DESC.
9	0515-0374	2	SCREW-MAC M3.0 10MM-LG PAN-HD	00000	ORDER BY DESC.
10	3050-0893	2	WASHER-FL MTLC 4.0 MM 4.4-MM-ID	00000	ORDER BY DESC.
11	0515-0380	2	SCREW-MACH M4 X 10MM-LG PAN-HD	00000	ORDER BY DESC.
12	0515-2032	5	SCREW-MACHINE M3 X 0.5 8MM-LG 90-DEG-FLH-HD	00000	ORDER BY DESC.
13	0515-0372	2	SCREW-MACH ASSY M3 X 8MM-LG PAN-HD	00000	ORDER BY DESC.
14	8160-0649	1	RFI CONTACT	28480	8160-0649
15	08757-00041	1	RFI BASE PLATE	28480	08757-00041
16	0515-0885	2	SCREW-MACH M4 X 0.7 8MM-LG PAN-HD	00000	ORDER BY DESC.
17	0515-2086	2	SCREW-MACH M4 X 0.7 7mm-LG FLP	00000	ORDER BY DESC.
18	0515-2086	4	SCREW-MACH M4 X 0.7 7mm-LG FLP	00000	ORDER BY DESC.
A11	08757-60066	1	MOTHERBOARD	28480	08757-60066
A12	08757-60102	1	POWER SUPPLY BOARD	28480	08757-60102

Figure 6-2. Bottom View (10 of 13)



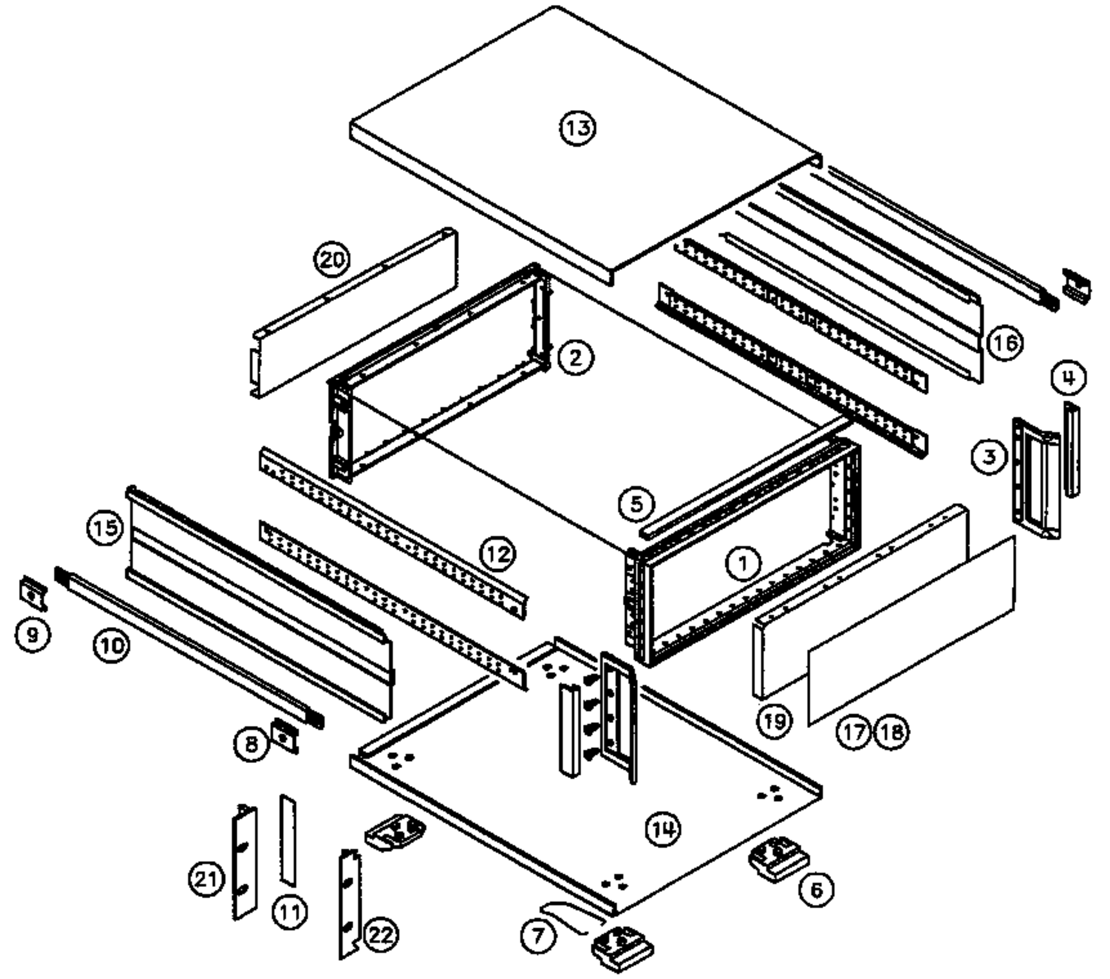
Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
1	0515–0380	16	SCREW–MACH M4.0 X 10MM–LG	00000	ORDER BY DESC.
2	0515–2043	16	SCREW–MACH M4.0 X 8MM–LG–FLP	00000	ORDER BY DESC.
3	0515–1026	2	SCREW–MACH M4 X 0.7 80MM–LG PAN–HD	00000	ORDER BY DESC.
4	3050–0152	4	SCREW–SKT–HD–CAP M5 X 1.0 40MM–LG	00000	ORDER BY DESC.
5	08757–00045	1	TRANSFORMER MOUNTING FRAME	28480	08757–00045
6	0515–1384	2	SCREW–MACH M5 X 0.8 10MM–LG	00000	ORDER BY DESC.
7	0515–2044	8	SCREW–MACH M4 X 0.7 10MM–LG	00000	ORDER BY DESC.

Figure 6–2. Side View (11 of 13)



Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
1	08757–40009	1	ACTUATOR EXTENDER	28480	08757–40009
2	0515–0372	6	SCREW–MACH ASSY M3 X 0.5 8MM–LG	00000	ORDER BY DESC.
3	08757–20071	1	POWER SUPPLY MOUNTNG BAR	28480	08757–20071
4	08757–00006	1	DIVIDER	28480	08757–00006
5	08757–00012	1	SEPARATOR	28480	08757–00012
6	08757–00028	1	LOGGER ENCLOSURE	28480	08757–00028
7	08757–00037	1	RIGHT SUPPORT	28480	08757–00037
8	0515–0372	30	SCREW–MACH M3 X 0.5 8MM–LG PAN HD	00000	ORDER BY DESC.
9	5040–0170	1	PC SUPPORT	28480	5040–0170
10	08757–00055	1	CRT SHIELD	28480	08757–00055
11	08757–20030	1	ACTUATOR ROD	28480	08757–20030
12	08757–40008	1	SWITCH GUIDE	28480	08757–40008
13	1460–1573	1	EXTENSION SPRING	28480	1460–1543
14	0515–2043	3	SCREW–MACH M4 X 8MM–LG FLP	00000	ORDER BY DESC.
15	1400–0510	1	CLIP	28480	1400–0510

Figure 6–2. Cage Assembly and CRT Shield (12 of 13)



Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
1	5021–8405	1	FRONT FRAME	28480	5021–8405
2	5021–5806	1	REAR FRAME	28480	5021–5806
3	5062–3990	1	FRONT HANDLE KIT	28480	5062–3990
4	5021–8497	2	FRONT HANDLE TRIM (P/O ITEM 3)	28480	5021–8497
5	5041–8802	1	TOP TRIM STRIP	28480	5041–8802
6	5041–8801	4	BOTTOM FOOT	28480	5041–8801
7	1460–1345	2	TILT STAND	28480	1460–1345
8	5041–8819	1	STRAP HANDLE END COVER (FR)	28480	5041–8819
9	5041–8820	1	STRAP HANDLE END COVER (FM)	28480	5041–8820
10	5062–3703	1	STRAP HANDLE	28480	5062–3703
11	5001–0540	2	SIDE TRIM STRIP	28480	5001–0540
12	5021–5836	4	CORNER STRUT	28480	5021–5836
13	5062–3734	1	TOP COVER (FM)	28480	5062–3734
14	5062–3746	1	BOTTOM COVER (FM)	28480	5062–3746
15	5062–3841	1	PERFORATED SIDE COVER W/ HANDLE RECESS	28480	5062–3816
16	5062–3816	1	PERFORATED SIDE COVER	28480	5062–3841
17	08757–80087	1	FRONT DRESS PANEL (STANDARD) – (HP 8757C and HP 8757E)	28480	08757–80087
18	08757–00040	1	FRONT DRESS PANEL (HP 8757C OPT 001)	28480	08757–00040
19	08757–00002	1	FRONT SUBPANEL – (HP 8757C OPTION 001)	28480	08757–00002
19	08757–00062	1	FRONT SUBPANEL – (HP 8757C & HP 8757E)	28480	08757–00062
20	08757–00035	1	REAR PANEL	28480	08757–00035
21	5062–3976	1	P/O RACK MOUNT W/O HANDLE KIT (OPT 908)	28480	5062–3976
22	5062–4072	1	P/O RACK MOUNT WITH HANDLE KIT (OPT 913)	28480	5062–4072

Figure 6–2. Frame Exploded View (13 of 13)

Section 7. Manual Backdating

INTRODUCTION

This manual documents the current production versions of the HP 8757C/E instruments. Earlier versions of these instruments have slight differences which are documented in this section.

With the information provided in this section, this manual can be adapted to apply to any earlier instrument version.

HOW TO USE BACKDATING

Find the serial prefix number of your instrument in the appropriate table (either HP 8757C or 8757E). Make the changes that are listed for that prefix. The actual changes are on the following pages.

Table 7-1. HP 8757C Manual Backdating Changes

Serial Prefix Number	Make Backdating Change
3026A	E through D
3004A	E through C
2932A	E through B
2834A	E through A

Table 7-2. HP 8757E Manual Backdating Changes

Serial Prefix Number	Make Backdating Change
3025A	D
3004A	D through C
2932A	D through B
2904A	D through A

NOTE: Incorporate the backdating changes in reverse alphabetical order. For example: the instrument has serial number prefix 2932A. Beginning with backdating Change B, make the changes given, then implement Change A.

CHANGE E

Delete all references to the ***[ALL HOLD]*** softkey in the Operating Reference and the LFH remote command in the Quick Reference Guide.

Delete all references to the ***[MEAS-MEM]*** softkey in the Operating Reference and the SFN remote command in the Quick Reference Guide.

CHANGE D

Replace the title pages of the operating and service manuals with the title pages contained in this change (D).

Delete all references to the ***[CSR FMT SWR dB]*** softkey in the operating reference and the FR0 or FR1 remote commands in the quick reference guide.

Delete all references to the ***[PLT BUF ON OFF]*** softkey in the operating reference and the BFm remote command in the quick reference guide.

Delete all references to the ***[STEP SW ON OFF]*** softkey in the operating reference and the FSm remote command in the quick reference guide.

HP 8757C/E SCALAR NETWORK ANALYZER OPERATING MANUAL

SERIAL NUMBERS

This manual applies directly to any HP 8757C Scalar Network Analyzer having a serial number prefix 3024A and any HP 8757E Scalar Network Analyzer having a serial number prefix 3004A.

For instruments with lower serial number prefixes, see section 7, "Manual Backdating."

For additional information about serial numbers, see "Instruments Covered by Manual" in section 1.

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Edition 2

HEWLETT PACKARD

CERTIFICATION

Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology (NIST, formerly NBS), to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members.

WARRANTY

This Hewlett-Packard instrument product is warranted against defects in material and workmanship for a period of one year from date of delivery. During the warranty period, Hewlett-Packard Company will, at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by HP. Buyer shall prepay shipping charges to HP and HP shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to HP from another country.

HP warrants that its software and firmware designated by HP for use with an instrument will execute its programming instructions when properly installed on that instrument. HP does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

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BP21.2

HP 8757C/E SCALAR NETWORK ANALYZER SERVICE MANUAL

SERIAL NUMBERS

This manual applies directly to any HP 8757C Scalar Network Analyzer having a serial number prefix 3024A and any HP 8757E Scalar Network Analyzer having a serial number prefix 3004A.

For instruments with lower serial number prefixes, see section 7, "Manual Backdating."

For additional information about serial numbers, see "Instruments Covered by Manual" in section 1.

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HEWLETT PACKARD

CERTIFICATION

Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology (NIST, formerly NBS), to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members.

WARRANTY

This Hewlett-Packard instrument product is warranted against defects in material and workmanship for a period of one year from date of delivery. During the warranty period, Hewlett-Packard Company will, at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by HP. Buyer shall prepay shipping charges to HP and HP shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to HP from another country.

HP warrants that its software and firmware designated by HP for use with an instrument will execute its programming instructions when properly installed on that instrument. HP does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

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8P21.2

HP 8757C/E Operating Manual
TABLE OF CONTENTS

IN CASE OF DIFFICULTY

CONNECTOR CARE

GLOSSARY

INDEX

Section 1. General Information

CONTENTS

INTRODUCTION

This operating manual contains installation and operation information for the HP 8757C and HP 8757E Scalar Network Analyzers. This manual is part of a 2-manual set that also includes a service manual for performance tests, adjustments, and service. See "Replaceable Parts" in the service manual for part numbers to order additional manuals. The two manuals are available separately or as a set.

ANALYZER SIMILARITIES

The HP 8757E analyzer provides the critical elements of scalar network measurements: frequency coverage, measurement accuracy, and speed. The HP 8757C analyzer provides all the capabilities of the HP 8757E, plus additional features and enhancements. This manual set is written to apply to both the HP 8757C and HP 8757E analyzers.

HP 8757C ONLY

Text that applies *only* to the HP 8757C is enclosed with these symbols. In a table, text that is HP 8757C-only is referenced to a footnote.

MANUAL SET ORGANIZATION

The text in this manual is organized as follows:

a. Title page and warranty statement.

b. **Table of Contents:** This is a list of all primary and secondary headings. A list of illustrations and tables follows.

c. **Section 1. General Information:** This section includes a brief description of the instrument and available options, safety considerations, accessories supplied, and tables of specifications and supplemental performance characteristics.

d. **Section 2. Installation:** This section provides information for initial inspection, preparation for use, line voltage and fuse selection, connectors and cables, rack mounting, interconnections with sources and with external monitors, storage, and shipment.

e. **Section 3. Operation:** This section is divided into subsections: "Local Operation", "Remote Operation" and "In Case of Difficulty".

"Local Operation" contains feature descriptions of the analyzer, softkey menu structure maps, and instructions for typical measurements.

"Remote Operation" provides information on remote operation of the analyzers with a controller. The programming notes identify programming commands and provide example programs to demonstrate the remote control use of the analyzer.

"In Case of Difficulty" provides first-line problem identification and troubleshooting information.

f. **Connector Care:** This part of the manual contains a separately bound guide to care and cleaning of microwave connectors.

g. **Glossary and Index:** The "Glossary" contains definitions of terms that are unique to the manual or that require special understanding. The "Index" is an alphabetized subject guide to the manual.

The separate service manual is organized as follows:

a. Title page and warranty statement.

b. **Table of Contents:** This is a list of all primary and secondary headings. A list of illustrations and tables follows.

c. **Section 4. Performance Tests:** This section contains tests to verify that the instrument performance meets the specifications listed in table 1-1 in "General Information".

d. **Section 5. Adjustments:** This section provides information required to properly adjust and align the instrument after repair or replacement of an assembly.

e. **Section 6. Replaceable Parts:** This section provides lists and illustrations of all replaceable parts and assemblies in the instrument. Ordering information is provided.

f. **Section 7. Manual Backdating:** This section contains backdating information required to make this manual compatible with earlier shipment configurations of the instrument.

g. **Section 8. Service:** This section supplies information to troubleshoot and repair the instrument. An overall block diagram is provided, and each assembly is documented separately with a circuit description, schematic diagram, component locations diagram, and troubleshooting information.

h. **Index:** This is an alphabetized subject guide to the manual.

EQUIPMENT REQUIRED BUT NOT SUPPLIED

A swept RF or microwave source and from one to three detectors or directional bridges are required to make measurements with your standard analyzer.

> **HP 8757C ONLY**
>
> Four detectors or bridges can be used with the Option 001.

For AC detection measurements, square wave modulation capability at 27.778 kHz is required (internally or through the use of an external modulator). The data sheet for the HP 8757C/E describes typical equipment setups and lists equipment available. For further information, contact your local Hewlett-Packard office.

RECOMMENDED TEST EQUIPMENT

Equipment required to test and service your analyzer is listed in table 4-1 of this manual. Other equipment may be substituted if it meets or exceeds the critical specifications listed in the table.

Table 1-1. Specifications and General Requirements (1 of 2)

HP 8757C/E SPECIFICATIONS

Specifications describe the instrument's warranted performance over the temperature range of 0°to +55°C (+32°to +131°F) except where noted.

Function: Four (two in the HP 8757E) independent display channels process signals from the HP 85025, 85026, or 11664 Detectors and the HP 85020/27 Bridges. The data is logarithmically displayed, in single input or ratio mode, with respect to frequency, on the internal CRT. Three detector inputs (A, B, and R) accept AC or DC detected signals from detectors or bridges.

The Option 001 has four detector inputs (A, B, C, and R).[1]

Modulator Drive: The modulator drive output of the analyzer provides the circuitry to drive the HP 8340 and 8341 Synthesized Sweepers and the HP 11665B Modulator. Modulator drive may be turned on and off via the front panel or HP-IB. In the OFF state the modulator drive signal turns the HP 11665B fully on for minimum insertion loss.

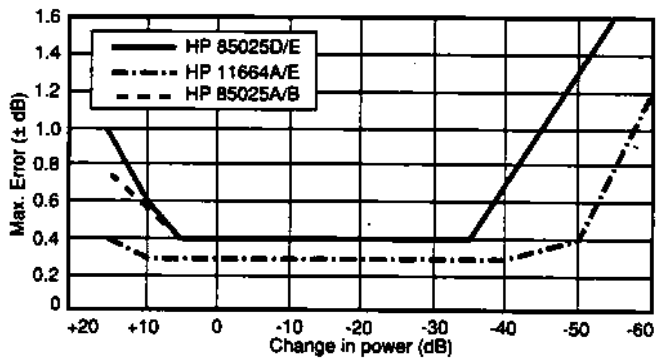
Frequency: 27.778 kHz ±12 Hz
Symmetry: 50% ±1%

Dynamic Range, Dynamic Power Accuracy, Absolute Power Accuracy: These are system specifications and depend on the detector being used. The following examples show frequently used Hewlett-Packard detectors.

Dynamic Range:

Detector	Dynamic Range
HP 11664A/E (AC mode):	+16 to −60 dBm
HP 85025-series (AC mode):	+16 to −55 dBm
(DC mode):	+16 to −50 dBm

Dynamic Power Accuracy (50 MHz, 25 ±5°C, 0 dBm reference):



Note: For ≤20 dB change of power within +10 to −40 dBm the specification for the HP 8757C/E with the HP 11664A/E is ±(0.1 dB +0.01 dB/dB).

1. HP 8757C only.

Section 3. Operation

CONTENTS

INTRODUCTION

This section contains operating information organized as follows:

The "Local Operation" subsection contains the *Operating Reference* and the *User's Guide*. The *Operating Reference* explains the analyzer's front and rear panel operating features and front panel key and softkey functions. It also contains the Operator's Check, which is used to verify that your analyzer is functioning properly. The *User's Guide* contains typical measurement setups and example transmission and reflection measurements.

The "Remote Operation" subsection contains programming guides with example programs and a listing of commands that are compatible with the analyzer.

"In Case of Difficulty" explains what to do when a problem is encountered with the analyzer. It gives suggestions for minor problems that do not involve defects in the internal circuitry. If a problem is encountered that is not solved using any of these suggestions, go to section 8 of the service manual for troubleshooting information.

SYSTEM OPERATION

If the analyzer is configured as the system controller with other instruments connected to the 8757 system interface bus, problems may occur in the configuration itself, rather than in a specific instrument.

General

- Press **[PRESET]** on each instrument (or cycle the power). In normal operation avoid pressing [PRESET] on the source; this may cause a system lock-up.
- Isolate each instrument by disconnecting and reconnecting them one at a time from the analyzer system interface. This helps locate a problem in an instrument or its connections.
- Clean the filter on the AC fan on the rear panel. All instrument filters should be cleaned regularly, at least monthly. A clogged filter will cause overheating and consequent degradation of performance.
- If the system cannot be controlled from the analyzer front panel, cycle the power with the LINE switch on the analyzer.
- Be sure that the source is compatible with the analyzer. The HP 8350B Sweep Oscillator can be used with an HP 83500-series RF Plug-in, or with an HP 86200-series RF Plug-in with an HP 11869A Adapter. Some of these plug-ins require an external modulator for AC compatibility with the analzyer. The HP 8340-and 8341-series Synthesized Sweepers are also compatible with the analyzer.

HP-IB Connections and Addresses

If the instrument addresses are not set correctly, or if the HP-IB cables are not connected properly, a system malfunction may occur.

- Verify that the HP-IB cables are functional. Check for shorts and opens. Make certain that the connectors are not damaged.
- Make sure that the cables for the source and other peripherals are connected to the 8757 SYSTEM INTERFACE connector, not the HP INTERFACE BUS connector. Only a system controller should be connected to the HP INTERFACE BUS connector.
- Make sure that the system interface is on. When it is *off*, SYS INTF OFF is shown in the status line on the CRT.
- Check that the HP-IB address of each instrument is set correctly and that no two instruments are set to the same address. To check the expected address for each instrument in the system, press **[LOCAL]**. Then press the softkey for each instrument and the HP-IB addresses will be shown on the CRT. Check the address for each instrument and verify that they correspond to the expected addresses.

  If the addresses do not agree, change them using the local menu, or reset the HP-IB address on the instrument itself.

Other Cable Connections

For most uses, the STOP SWEEP, POS Z BLANK, and SWEEP OUT/IN analyzer outputs must be connected to the source. Section 2 "Installation" describes how to make these connections with the HP 8350B Sweep Oscillator and the HP 8340-and 8341-series Synthesized Sweepers. Other connections may be necessary for different applications.

Remote Operation

Most remote operation problems occur due to improper programming.

- Check all program code for proper syntax. Ensure that the proper number of bytes are transferred when sending or requesting data to and from the analyzer.
- When transferring binary data, ensure that an HP 9876A Printer is *not* connected to the bus. This may prevent proper transfer.
- If a printer is connected to the 8757 system interface, do not set it to send out an SRQ if the paper runs out. If this happens, it will significantly slow system performance.
- Do not set the HP-IB address of any instrument on the 8757 system interface to a value one digit greater or smaller than the analyzer's HP-IB address. (To do so will cause conflict with the analyzer's passthrough address. See "Remote Operation" for more information on passthrough addresses.)

INACCURATE OPERATION

If the analyzer is functional but you doubt the accuracy of the measurements, the problem may be with calibration or with the modulation frequency of the input signals.

Calibration

- Make sure the system is correctly configured for the detectors connected. The system automatically reconfigures whenever a detector is replaced or exchanged. Press **[CAL]** ***[CONFIG SYSTEM]***. The analyzer will determine the types of detectors connected and calibrate each input.
- If you are using DC detection, make sure the detectors are zeroed to compensate for the effects of DC drift. Press **[CAL]** ***[DC DET ZERO]*** and choose manual or automatic zeroing.
- Make sure the correct value of detector offset is entered. The status line shows which detectors have an offset entered. Press **[CAL]** ***[DET OFFSET]***, and verify or change the offset values for each detector input. Remember that instrument preset does *not* reset the offset values to zero.
- For further information on calibration procedures, see "[CAL] Calibration Menus" in the *Operating Reference*.

Modulation Characteristics

- If you are using AC detection, verify that the modulation frequency of the input signals to the detectors is 27.778 kHz ±20 Hz. The ON/OFF ratio must be at least 30 dB, with an ON/OFF symmetry of 50/50 ±5%.

Sweep Speed

- If the 8757 system interface is used, the analyzer will automatically limit the sweep speed. Without the system interface, it is the responsibility of the user to ensure proper sweep speed.

If a problem occurs that is not solved with these suggestions, see section 8 of the service manual.

MISCELLANEOUS PROBLEMS

The following paragraphs provide additional information that may clarify some analyzer features.

Alternate Sweep

The alternate sweep feature allows the source and analyzer to show two successive sweeps of different frequency ranges and power levels simultaneously on the CRT. Alternate sweep is defined by the source.

To correctly perform an alternate sweep, store the source register settings in reverse order. Always save the alternate register first. Use it to save sweep information only (this includes markers, power level, and other source configuration settings). Then configure both analyzer channels. One is for the primary sweep; the other is for the alternate sweep. Store these analyzer settings in another register along with the primary sweep frequency information.

When you engage the alternate function, the channel that is active when you store the primary sweep and channel configurations, will be the channel which shows the primary sweep. The other channel will display the alternate sweep. Recall the last-stored register first. Then alternate with the register you stored first (the one with frequency settings only). Try the example in the *User's Guide* in this manual.

HP 8757C ONLY

Number of Trace Points and Trace Memory

The number of channels that can be shown on the CRT is limited by the number of trace points selected. All four channels can be shown when 101, 201, or 401 points are selected. With 801 trace points, only channels 1 and 2 are available. With 1601 trace points, only channel 1 is available.

The channel trace memory for channels that are turned off will be destroyed when you choose 801 or 1601 points.

Autozero of DC Detectors

When the analyzer is in DC detection mode, it must periodically zero its AC/DC detectors to maintain accurate low-level measurements. When using a source connected to the 8757 system interface, you can engage the autozero function and let the analyzer control the source power off/on sequence. In order to preserve the front panel settings of the source, the analyzer must use save/recall register 9 on both the source and the analyzer. Register 9 is accessed each time an autozero is performed, whether it is forced by the operator or the autozero repeat function is engaged. Do not use register 9 for storing other information. The information will be lost when the analyzer writes over it.

Save/Recall Registers

The save/recall registers store most of the front panel settings, with a few exceptions. Some of the system menu functions are not stored because they apply to every instrument state, rather than to a specific channel. The following information is stored in the save/recall registers:

- The channel status (which channel is active, and which channels are on.)
- For all channels:
  - Measurement selected (A, A/R, etc.).
  - Display mode (MEAS, MEM, etc.).
  - Averaging on/off status.
  - Averaging factor.
  - Reference level.
  - Reference position.
  - Scale per division.
  - Smoothing on/off status.
  - Smoothing factor.
- Detection mode (AC or DC).
- Number of trace points.
- Internal modulation on/off status.
- Cursor on/off status.
- Cursor position.
- Cursor delta on/off status.
- Cursor delta position.
- Cursor search value.
- Adaptive normalization on/off status.[1]
- Non-standard sweep on/off status.
- Limit line on/off status (channels 1 and 2).[1]

Registers 1 through 4 also save the following:

- Trace memory at 401 points for channels 1 and 2.
- Limit line entries for channels 1 and 2.[1]
- Title.

1. HP 8757C only.

The following information applies to the entire instrument rather than the individual channels, and is not saved:

- System Interface on/off status.
- Labels on/off status.
- Title on/off status.
- Frequency labels on/off status.
- Repeat autozero on/off status.
- Color selection.[1]
- CRT intensity.
- HP-IB addresses.
- Disk unit number.[1]
- Disk volume number.[1]

System Interface On/Off

The analyzer uses the 8757 system interface bus to control the other instruments connected to the system interface. The 8757 system interface should be on in most applications. To verify that it is on, check the CRT status line. SYS INTF OFF appears when the system interface is off. When the system interface is off, the analyzer has no control or knowledge of the existence of any HP-IB instrument connected to this interface. To turn the system interface on, press **[SYSTEM]** ***[MORE] [SWEEP MODE] [SYSINTF ON]***.

It is important that no two instruments connected to the system interface have the same HP-IB address. If this occurs, the analyzer may freeze operation until the situation is corrected. "HP-IB Address Selection" in "Installation" explains how to verify or change the addresses the analyzer is expecting.

When the system interface is off, the following analyzer system functions are not possible:

- Autozero of DC detectors.
- Alternate sweep.
- Start/stop/cursor frequency annotation.
- System save/recall and preset.
- System CW and manual sweep modes.
- Adaptive normalization.[1]
- Hard copy plot and print.
- Disk access.[1]

If you try to plot or print with the system interface turned off, the analyzer will perform an instrument preset after a few seconds.

1. HP 8757C only.

Measurement-Memory→Memory

This function can only be used with ratio measurements.

HP 8757C ONLY

Cursor Search

Search functions differ from normal cursor operation. The cursor is updated with every sweep to reflect the present amplitude response at the cursor frequency. In search left, search right, and bandwidth modes, the trace is put into hold after the first search, and the trace freezes on the CRT. This makes it possible to inspect the trace without it changing.

There are two ways to exit search mode and return to the normal cursor mode. Press ***[PRIOR MENU] [CURSOR OFF]***. Or press **[CURSOR]**.

ON-SITE SERVICE — REPAIRS

On-site analyzer repair includes assembly level troubleshooting, replacement of the defective assembly, and possible re-calibration. The equipment required to re-calibrate varies with the failure. The service manual gives complete troubleshooting instructions. This guide will quickly resolve 90% of the failures where error messages are displayed and other obvious failures (such as a dead A, B, or R input). The motherboard must be functional, with no opens or shorts. This guide is organized by error code or error message. Error code interpretation is described in "Error Codes."

Notes on Equipment Required:

Where the HP 11613A/B Calibrator is listed as required equipment, a computer with disk drive is also required. Only an HP 9000 series 200/300 Computer with a compatible disk drive can be used. The software provided with the HP 11613 includes both 3.5 inch and 5.25 inch formats. Follow the instructions provided with the calibrator.

Where a DVM is listed, use a digital voltmeter with at least 4.5 digits of resolution, except during adjustment of the A4 board, where 5.5 digits are required.

Notes on Re-calibration:

- If the A1, A2, A5, A6, A11, A13, or A14 assemblies are replaced, perform no adjustments.
- If the A3, A4, A7, A8, A9, or A10 assemblies are replaced, regenerate the cal constants with the HP 11613A/B.
- If the A12 power supply is replaced, adjust all supply voltages. Adjust all power supplies within 0.05 volts of their nominal voltages. Adjust the 5 volt supplies to 5.1 volts.
- Replacing the A15 display requires no adjustments although the intensity levels may vary slightly from the previous display.
- If the A4 ADC board is replaced, check the DAC gain adjustment with a DVM. Use this following procedure after the analyzer has warmed up:

CHANGE C

Replace the title pages of the operating and service manuals with the title pages contained in this change (C).

Replace pages iii and iv in the Table of Contents with pages iii and iv contained in this change (C).

Replace pages 8-185 through 8-188 in the "A15 Display" with the pages with the same numbers that are contained in this change (C).

HP 8757C/E
SCALAR NETWORK ANALYZER
OPERATING MANUAL

SERIAL NUMBERS

This manual applies directly to any HP 8757C Scalar Network Analyzer having a serial number prefix 3004A and any HP 8757E Scalar Network Analyzer having a serial number prefix 3004A.

For instruments with lower serial number prefixes, see section 7, "Manual Backdating."

For additional information about serial numbers, see "Instruments Covered by Manual" in section 1.

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MANUAL PART NO. 08757-90073
Part of HP Part Number: 08757-90067
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Printed: JANUARY 1990
Edition 2

HEWLETT PACKARD

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HP 8757C/E
SCALAR NETWORK ANALYZER
SERVICE MANUAL

SERIAL NUMBERS

This manual applies directly to any HP 8757C Scalar Network Analyzer having a serial number prefix 3004A and any HP 8757E Scalar Network Analyzer having a serial number prefix 3004A.

For instruments with lower serial number prefixes, see section 7, "Manual Backdating."

For additional information about serial numbers, see "Instruments Covered by Manual" in section 1.

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LIST OF ILLUSTRATIONS

SECTION 4. PERFORMANCE TESTS

SECTION 5. ADJUSTMENTS

SECTION 6. REPLACEABLE PARTS

SECTION 8. SERVICE

A15 DISPLAY

CONTENTS

DESCRIPTION

The A15 display incorporates a 7.5 inch raster scan CRT along with associated drive circuitry. In the HP 8757C, full color capability is provided while in the HP 8757E, only green is provided. The display is a self-contained unit. No field repair of the display is possible and no technical documentation is provided. Instead, the display is set up on Hewlett-Packard's exchange program. Should any problem arise, the display can be quickly exchanged for a tested, rebuilt unit. See "Restored Exchange Assemblies" in "Replaceable Parts". The information that follows is provided to help isolate any problems to the A15 display itself or some other assembly.

The display is a raster scan display with a horizontal scan rate of 25.5 kHz. The vertical scan rate is 60 Hz. The A14 display interface provides 425 horizontal scan lines although only 400 are actually displayed. Inputs to the display include digital TTL horizontal and vertical sync signals; red, green and blue (RGB) video signals; intensity and background signals; and a +65 V power supply. The expected video signal levels for the RGB inputs are the following: 0.7 Vp-p video; 0.3 V = black; 1V = white. The video input to the display is first terminated in 75 ohms and then AC coupled to the display circuitry so that DC offsets are blocked. Under nominal conditions the typical video drive signal is actually 0.8 V p-p, thus providing a guarantee that full brightness can be achieved. To eliminate any magnetization of the CRT, automatic degaussing is enabled each time the instrument is turned on.

TROUBLESHOOTING

If the display appears defective, the source of the problem should be verified before exchanging the display. This can be done three ways:

1. For an HP 8757C, connect an external compatible display to the rear panel R, G, B outputs to verify that the A14 display interface board is working properly. If the external display appears good, then most likely the A15 display is defective. If the external display appears identical to the A15 display, then the problem lies elsewhere. Refer to A14 troubleshooting to determine the cause.
2. Set up a known test pattern (preferably number 5 or 12) and verify all inputs to the display with an oscilloscope. If they appear correct then the display is probably defective. See A14 troubleshooting for specific information.
3. If another working HP 8757C/E is available, try substituting the display from the working unit.

Should the display become magnetized or if color purity is a problem, try cycling the power several times, leaving the instrument off for at least 15 seconds during each cycle. This will activate the automatic degaussing circuit in the display. If this is insufficient to achieve color purity, a commercially available demagnetizer must be used (either a CRT demagnetizer or a bulk tape eraser can be used). Follow the manufacturer's instructions keeping in mind the following: If one of these items is used, it is *imperative* that, at first, it be placed no closer that 4 inches (10 cm) to the face of the CRT. If this distance is too far to completely demagnetize the CRT, try again at a slightly closer distance until the CRT is demagnetized.

CAUTION

Applying an excessively strong magnetic field to the CRT face can permanently destroy the CRT resulting in an expensive repair which could have been avoided.

Like most displays, the CRT can be sensitive to large magnetic fields generated from unshielded line transformers and motors. This usually does not pose a problem if the field is generated with a 60 Hz line frequency, since the vertical scan rate is also 60 Hz. However in countries that use 50 Hz, some 10 Hz jitter may be observed. If this problem is observed, remove the device causing the magnetic field.

During any solid (filled-in) display or test pattern, an extremely thin full-screen horizontal line may be seen about 1/4 screen height from the bottom. This condition is characteristic of the CRT does not indicate any problem.

ADJUSTMENTS

VERTICAL POSITION AND FOCUS

Only vertical position and focus can be adjusted in the field (this includes both customers and service centers). Any other adjustment to the display will *void* the warranty. Vertical positioning and focus are described in section 5, "Adjustments."

REMOVING THE DISPLAY

Use this procedure to remove the display.

1. Remove the softkey button cover. This is the plastic cover through which the front panel soft keys protrude. Insert a thin flat screwdriver blade, or a fingernail, between it and the glass filter. Be careful not to scratch the glass or its coating. Carefully pull the button cover forward and off.
2. Remove the two screws that are now uncovered. Remove the bezel (with the glass filter) by pulling out the end that is now free and pivoting it around its left edge until it is released. Remove the "rubber" CRT gasket by pulling it away from the CRT.
3. Remove the logger cover by removing the two screws that hold it in place.

WARNING

The analyzer must lie on a flat surface. After the next step, the display is free of the analyzer and could slide out, causing both instrument damage and personal injury.

4. Remove the CRT cover shield by removing the six screws that hold it (and the display) in place. Disconnect the 20 pin ribbon cable that connects the A15 display to the A14 display interface board.
5. Carefully slide the display out of the analyzer.
6. If the display is to be exchanged with a new or rebuilt unit, it will be necessary to remove the spring clip grounding plate attached to the bottom of the display with two screws.

NOTE: This plate is *not* considered part of the display and will need to be attached to the new or rebuilt display when it is installed.

CLEANING THE DISPLAY AND GLASS FILTER

Because of the high voltage associated with the CRT, minute dust particles may collect around the edges of the CRT and on the inside surface of the glass filter. These particles will dim and diffuse the display image if they are not cleaned off regularly.

NOTE: Clean the glass filter with care. Its optical coating, which eliminates reflections, is fragile. Use only a soft cloth and cleaning solutions recommended for coated surfaces. See "Replaceable Parts" for a part number and ordering information for a recommended cleaning solution.

Remove the front bezel to clean the CRT and glass filter. Follow this procedure.

1. Remove the button cover. This is the plastic cover through which the front panel soft keys protrude. Insert a thin flat screwdriver blade, or a fingernail, between it and the glass filter. Be careful not to scratch the glass or its coating. Carefully pull the button cover forward and off.
2. Remove the two screws that are now uncovered.
3. Remove the bezel (with the glass filter) by pulling out the end that is now free and pivoting it around its left edge until it is released.

You may be able to clean the CRT and glass filter with the cloth alone or some cleaning solution may be needed. Use the solution sparingly, if required and clean the surfaces gently. Allow the surfaces to dry before reassembling the instrument.

CHANGE B

Replace the title pages of the operating and service manuals with the title pages contained in this change (B).

The following replacement pages document the analyzer *without* the GSP enclosure which was added to comply with FTZ regulations for radiated emissions. After replacing the indicated pages, this page can be discarded. Complete any other changes indicated by table 7-1 or 7-2 which apply to your instrument version. Any remaining changes will not apply to your instrument and can also be discarded.

Replace pages 6-35/6-36, 6-39/6-40, and 6-41/6-42 in "Replaceable Parts" with the pages with the same page numbers that are contained in this change (B).

HP 8757C/E SCALAR NETWORK ANALYZER SERVICE MANUAL

SERIAL NUMBERS

This manual applies directly to any HP 8757C Scalar Network Analyzer having a serial number prefix 2932A and any HP 8757E Scalar Network Analyzer having a serial number prefix 2932A.

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MANUAL PART NO. 08757-90072
Part of HP Part Number: 08757-90067
Microfiche Part Number 08757-90078

Printed: AUGUST 1989

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HP 8757C/E SCALAR NETWORK ANALYZER OPERATING MANUAL

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MANUAL PART NO. 08757-90073
Part of HP Part Number: 08757-90067
Microfiche Part Number 08757-90078

Printed: AUGUST 1989

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HP 8757C/E Service Manual
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SECTION 4. PERFORMANCE TESTS

SECTION 5. ADJUSTMENTS

SECTION 6. REPLACEABLE PARTS

SECTION 7. MANUAL BACKDATING

SECTION 8. SERVICE

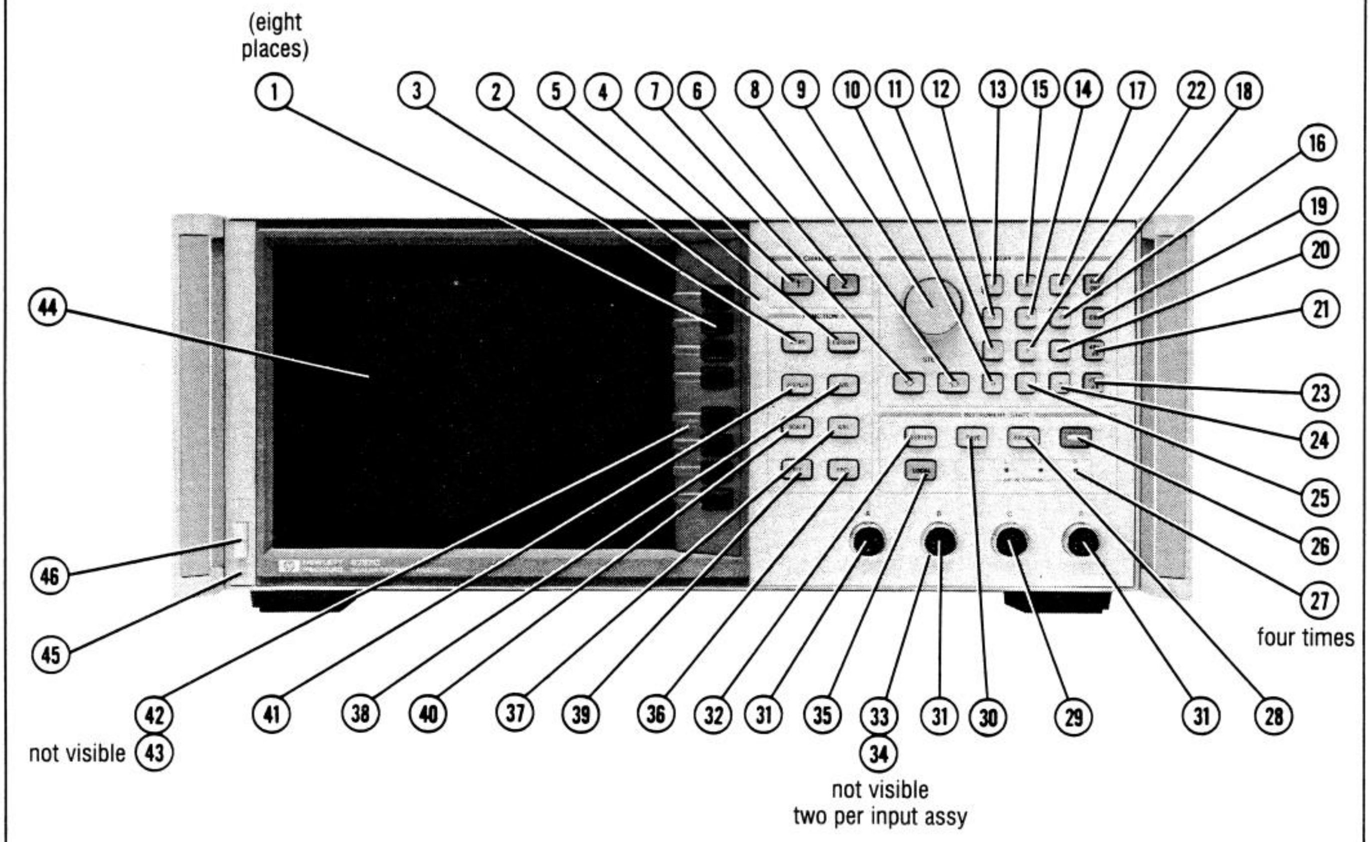
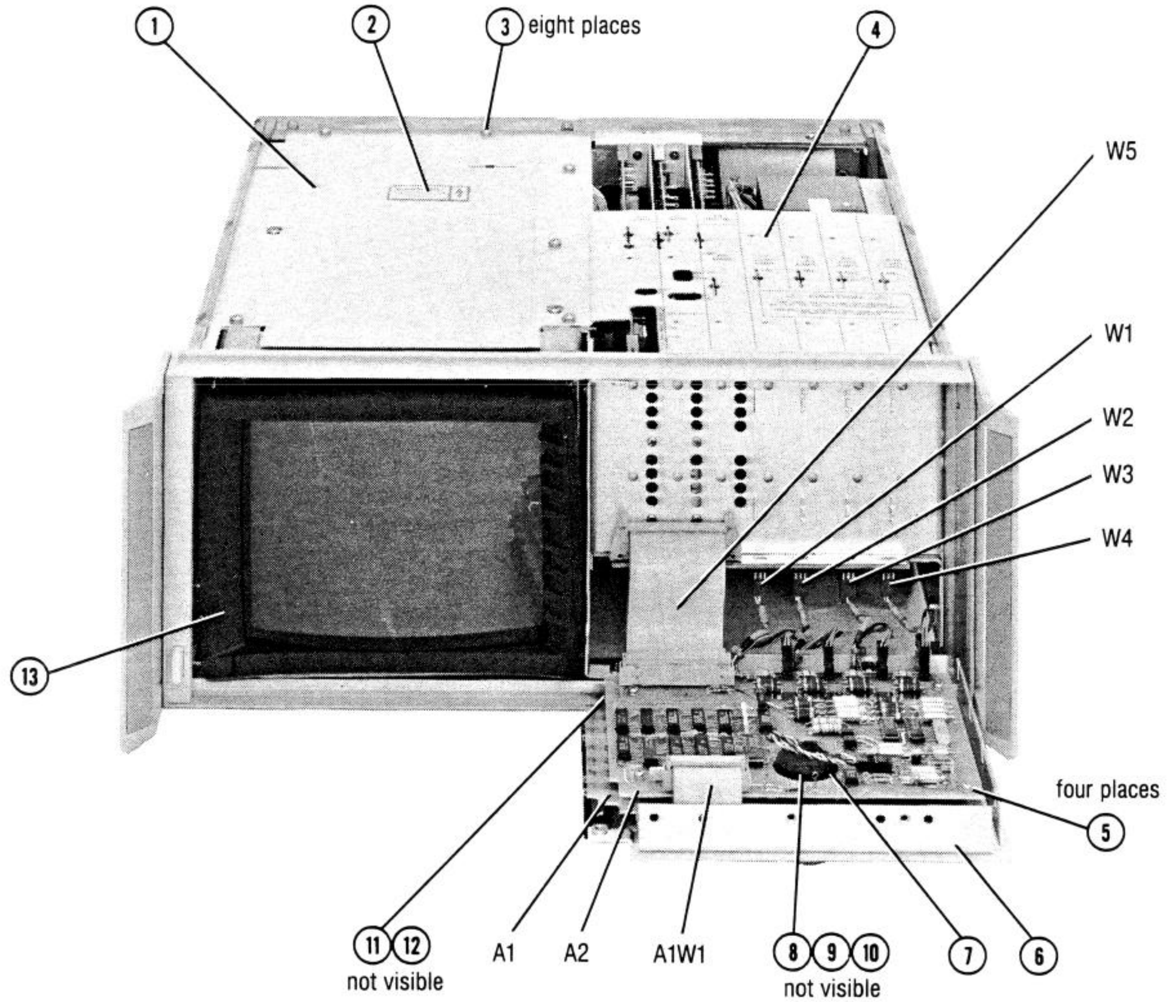
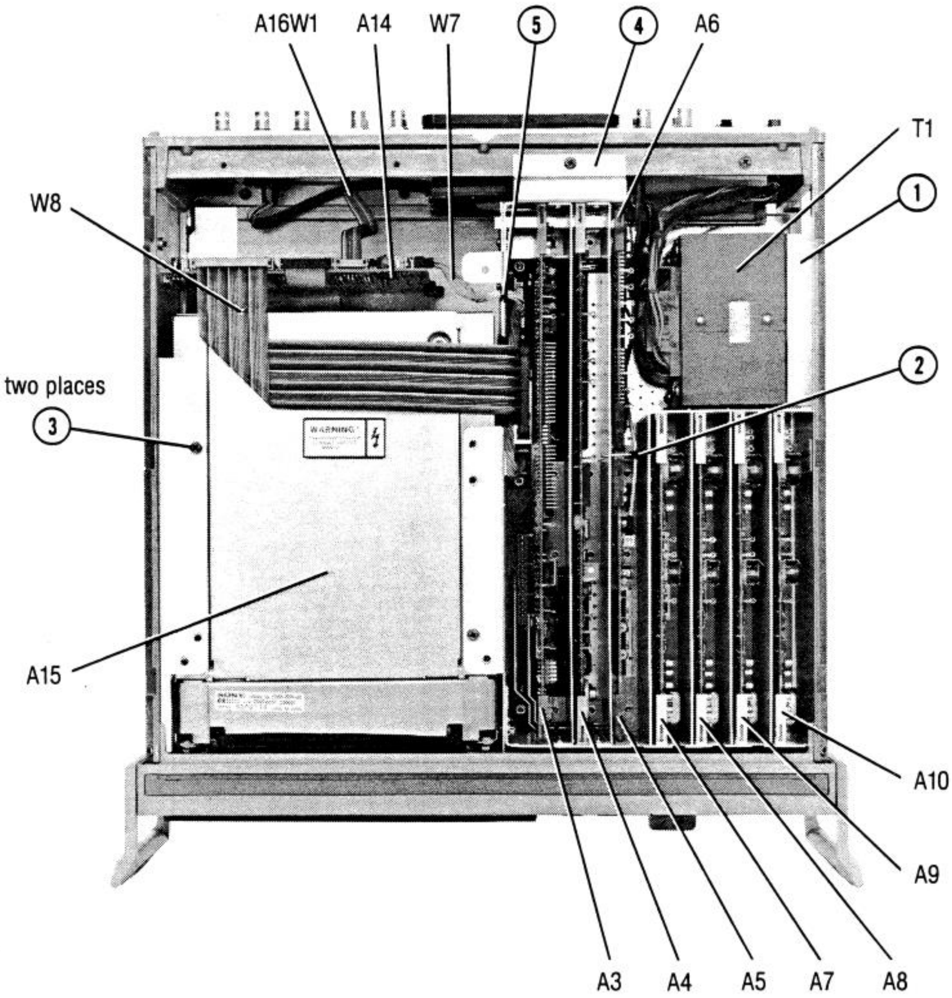


Figure 6-2. Front View (2 of 10)



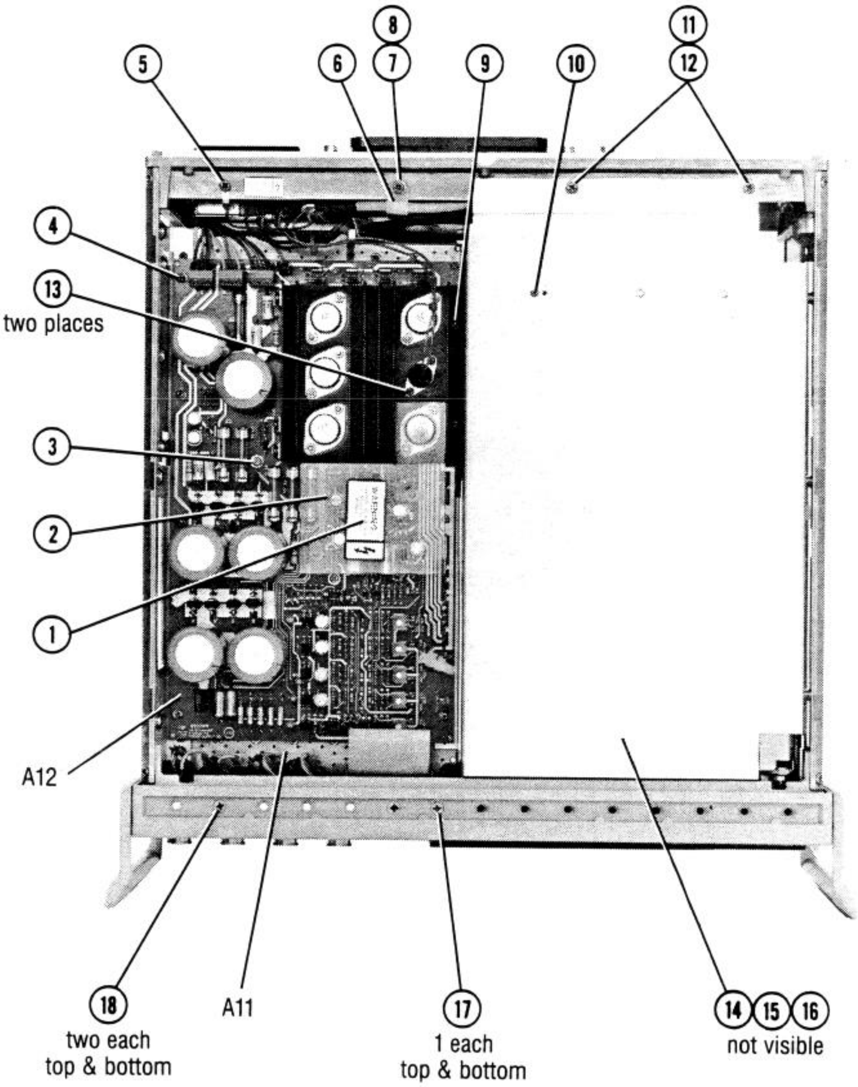
Item	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
1	08757-00031	3	1	CRT SHIELD	28480	08757-00031
2	7120-4293	4	1	WARNING LABEL	28480	7120-4293
3	0515-0885	2	8	SCREW-MACH M4 X 0.7 8MM-LG PAN-HD	00000	ORDER BY DESC.
4	08757-00036	8	1	LOGGER COVER	28480	08757-00036
5	0515-1112	0	4	SCREW-MACH M3 X 0.5 20MM-LG PAN-HD	00000	ORDER BY DESC.
6	08757-00002	8	1	FRONT SUBPANEL	28480	08757-00002
7	08757-60053	3	1	RPG ASSEMBLY	28480	08757-60053
8	2190-0016	3	1	WASHER-LK INTL T 3/8 IN .377-IN-ID	28480	2190-0016
9	2950-0001	8	1	NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	28480	2950-0001
10	2950-0043	8	1	NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	28480	2950-0043
11	0510-1148	2	4	RETAINER-PUSH ON KB-TO-SHFT EXT	00000	ORDER BY DESC.
12	0515-1105	1	8	SCREW-MACH M3 0.5 10MM-LG PAN-HD	00000	ORDER BY DESC.
13	08757-40010	2	1	DISPLAY GASKET	28480	08757-40010
A1	08757-60078	4	1	FRONT PANEL KEYBOARD ASSY	28480	08757-60078
A2	08757-60055	7	1	FRONT PANEL INTERFACE	28480	08757-60055
A1W1	08757-60045	7	1	FRONT PANEL KEYBOARD/INTERFACE CABLE	28480	08757-60045
W1	08757-60034	2	1	FRONT PANEL DETECTOR INTERFACE ASSY	28480	08757-60034
W2	08757-60034	2	1	FRONT PANEL DETECTOR INTERFACE ASSY	28480	08757-60034
W3	08757-60034	2	1	FRONT PANEL DETECTOR INTERFACE ASSY	28480	08757-60034
W4	08757-60034	2	1	FRONT PANEL DETECTOR INTERFACE ASSY	28480	08757-60034
W5	8120-4112	7	1	FRONT PANEL INTERFACE CABLE	28480	8120-4112

Figure 6-2. Front View Interior (3 of 10)



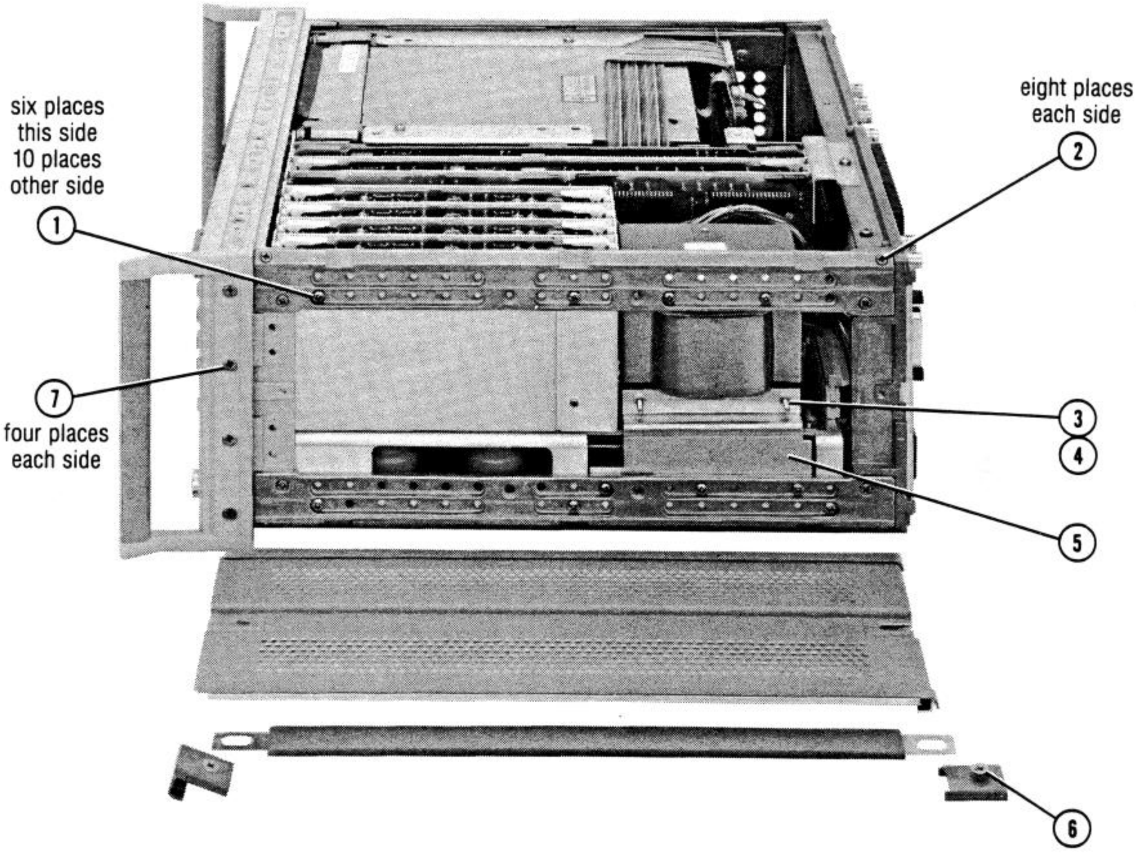
Item	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
1	08757-00045	9	1	TRANSFORMER MOUNTING FRAME	28480	08757-00045
2	0400-0009	9	1	GROMMET-RND .125-IN-ID .25-IN-GRV-OD	00000	ORDER BY DESC.
3	0515-0885	2	2	SCREW-MACH M4 X 0.7 8MM-LG PAN-HD	00000	ORDER BY DESC.
4	08757-00032	4	1	REAR SUPPORT	28480	08757-00032
5	0400-0002	2	1	GROMMET-RND .188-IN-ID .312-IN-GRV-OD	00000	ORDER BY DESC.
A3	08757-60068	2	1	CPU ASSEMBLY (HP 8757C)	28480	08757-60068
A3	08757-60088	6	1	CPU ASSEMBLY (HP 8757E)	28480	08757-60088
A4	08757-60004	6	1	ADC ASSEMBLY	28480	08757-60004
A5	08757-60005	7	1	MODULATOR DRIVE ASSEMBLY	28480	08757-60005
A6	08757-60006	8	1	HP-IB ASSEMBLY	28480	08757-60006
A7-A10	08757-60058	0	4	LOG AMPLIFIER (A9 HP 8757C OPT 001 ONLY)	28480	08757-60058
A14	08757-60065	9	1	DISPLAY INTERFACE	28480	08757-60065
A15	2090-0210	7	1	DISPLAY	28480	2090-0210
A16W1	08757-60083	1	1	RGB INTERFACE CABLE (HP 8757C ONLY)	28480	8120-3308
T1	9100-4766	6	1	POWER TRANSFORMER	28480	9100-4766
W7	08757-60071	7	1	A14 POWER CABLE	28480	08757-60071
W8	08757-60076	2	1	CABLE AY-34C 28AWG	28480	08757-60076

Figure 6-2. Top View (6 of 10)



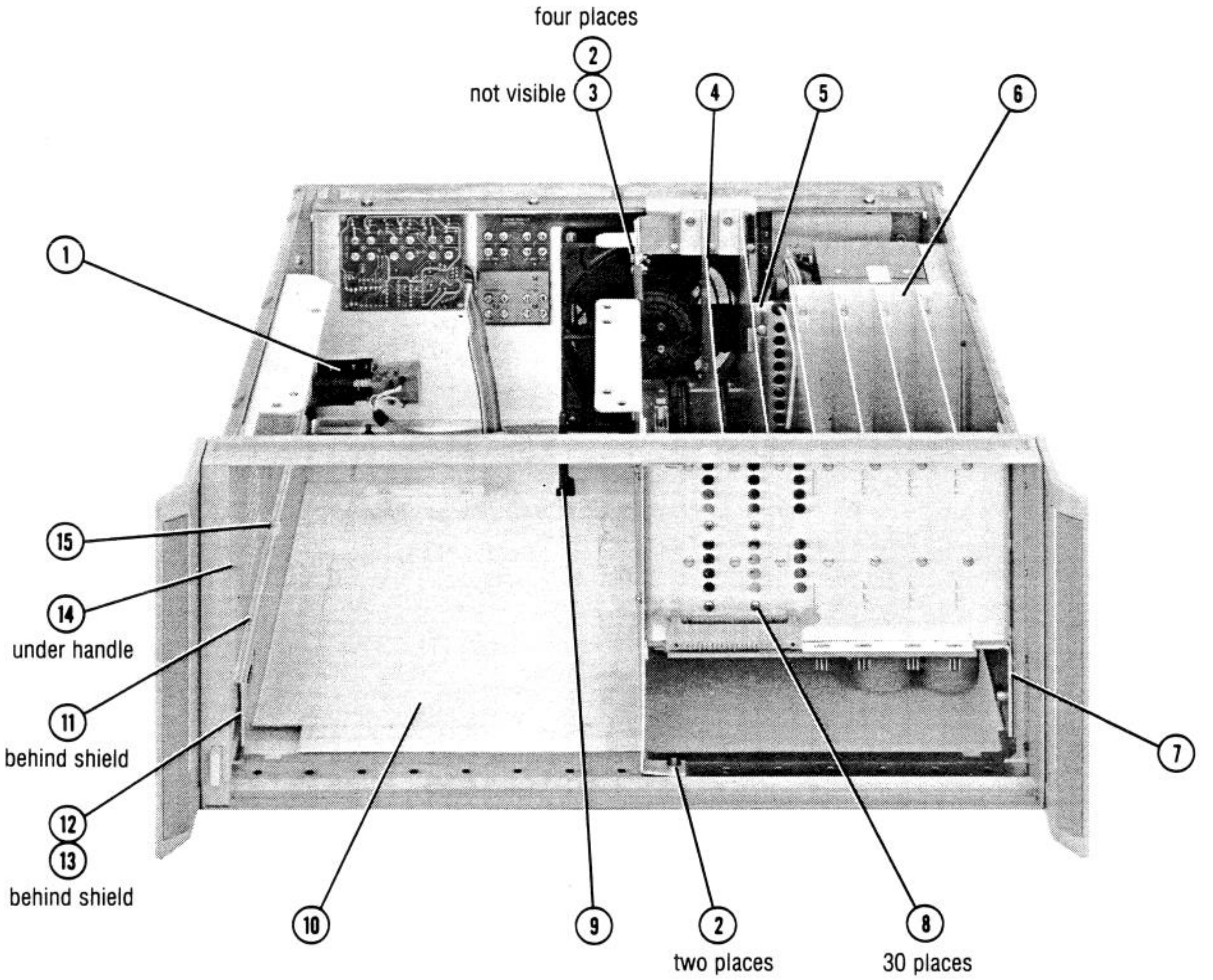
Item	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
1	7120-4293	4	1	WARNING LABEL	28480	7120-4293
2	08757-20084	8	1	SHIELD	28480	08757-20084
3	0515-1111	9	2	SCREW-MACH M3 X 0.5 16MM-LG PAN HD	00000	ORDER BY DESC.
4	0515-1059	4	6	SCREW-MACH M2.5 X 0.45 28MM-LG PAN-HD	00000	ORDER BY DESC.
5	0515-0885	2	1	SCREW-MACH M4 X 0.7 8MM-LG PAN-HD	00000	ORDER BY DESC.
6	1400-0024	9	1	CLAMP-CABLE .25-DIA .5-WD NYL	00000	ORDER BY DESC.
7	0515-1368	8	1	SCREW-MACH M4 X 14 PN PD	00000	ORDER BY DESC.
8	3050-0893	9	1	WASHER-FL MTLC 4.0 MM 4.4-MM-ID	00000	ORDER BY DESC.
9	0515-1453	2	2	SCREW-MAC M4 X 14 PN PD	00000	ORDER BY DESC.
10	2200-0601	5	1	SCREW-MACH 4-40 .25-IN-LG 82 DEG	00000	ORDER BY DESC.
11	3050-0893	9	2	WASHER-FL MTLC 4.0 MM 4.4-MM-ID	00000	ORDER BY DESC.
12	0515-1368	8	2	SCREW-MACH M4 X 14 PN PD	00000	ORDER BY DESC.
13	0515-1079	8	2	SCREW-MACH ASSY M3 X 0.5 8MM-LG	00000	ORDER BY DESC.
14	8160-0649	1	1	RFI CONTACT	28480	8160-0649
15	08757-00041	5	1	RFI BASE PLATE	28480	08757-00041
16	0515-0885	2	2	SCREW-MACH M4 X 0.7 8MM-LG PAN-HD	00000	ORDER BY DESC.
17	0515-0396	0	2	SCREW-MACH M4 X 0.7 10MM-LG	00000	ORDER BY DESC.
18	0515-1367	7	4	SCREW-MACH M4	00000	ORDER BY DESC.
A11	08757-60066	0	1	MOTHERBOARD	28480	08757-60066
A12	08757-60067	1	1	POWER SUPPLY BOARD	28480	08757-60067

Figure 6-2. Bottom View (7 of 10)



Item	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
1	0515-0885	3	16	SCREW-MACH M3 X 0.5	00000	ORDER BY DESC.
2	0515-1131	3	16	SCREW-MACH M5 X 0.8 25MM-LG	00000	ORDER BY DESC.
3	0515-1145	9	2	SCREW-MACH M4 X 0.7 80MM-LG PAN-HD	00000	ORDER BY DESC.
4	3050-0152	3	4	SCREW-SKT-HD-CAP M6 X 1.0 40MM-LG	00000	ORDER BY DESC.
5	08757-00045	9	1	TRANSFORMER MOUNTING FRAME	28480	08757-00045
6	0515-1132	4	2	SCREW-MACH M5 X 0.8 10MM-LG	00000	ORDER BY DESC.
7	0515-0896	5	8	SCREW-MACH M4 X 0.7 10MM-LG	00000	ORDER BY DESC.

Figure 6-2. Side View (8 of 10)



Item	HP Part Number	C D	Qty.	Description	Mfr. Code	Mfr. Part Number
1	08757-40009	9	1	ACTUATOR EXTENDER	28480	08757-40009
2	0515-1079	8	6	SCREW-MACH ASSY M3 X 0.5 8MM-LG	00000	ORDER BY DESC.
3	08757-20071	3	1	POWER SUPPLY MOUNTNG BAR	28480	08757-20071
4	08757-00006	2	1	DIVIDER	28480	08757-00006
5	08757-00012	0	1	SEPARATOR	28480	08757-00012
6	08757-00028	8	1	LOGGER ENCLOSURE	28480	08757-00028
7	08757-00037	9	1	RIGHT SUPPORT	28480	08757-00037
8	0515-0886	3	30	SCREW-MACH M3 X 0.5 6MM-LG PAN HD	00000	ORDER BY DESC.
9	5040-0170	6	1	PC SUPPORT	28480	5040-0170
10	08757-00030	2	1	CRT SHIELD	28480	08757-00030
11	08757-20030	4	1	ACTUATOR ROD	28480	08757-20030
12	08757-40008	8	1	SWITCH GUIDE	28480	08757-40008
13	1460-1573	1	1	EXTENSION SPRING	28480	1460-1543
14	0515-1367	7	3	SCREW-MACH M4	00000	ORDER BY DESC.
15	1400-0510	8	1	CLIP	28480	1400-0510

Figure 6-2. Cage Assembly and CRT Shield (9 of 10)

CHANGE A

Replace the title pages of the operating and service manuals with the title pages contained in this change (A).

The following replacement pages document a previous version of the A12 power supply assembly. This version contained a thyristor-SCR which was later discontinued by the manufacturer. After replacing the indicated pages, this page can be discarded. Complete any other changes indicated by table 7-1 or 7-2 which apply to your instrument version. Any remaining changes will not apply to your instrument and can also be discarded.

Replace pages 6-25 through 6-28 in "Replaceable Parts" with the pages with the same page numbers that are contained in this change (A).

Replace pages 8-143 through 8-146 in "A12 Power Supply" with the pages with the same page numbers that are contained in this change (A).

HP 8757C/E
SCALAR NETWORK ANALYZER
SERVICE MANUAL

SERIAL NUMBERS

This manual applies directly to any HP 8757C Scalar Network Analyzer having a serial number prefix 2834A and any HP 8757E Scalar Network Analyzer having a serial number prefix 2904A.

For additional information about serial numbers, see "Instruments Covered by Manual" in section 1.

1400 FOUNTAINGROVE PARKWAY, SANTA ROSA, CA 95403 U.S.A.

MANUAL PART NO. 08757-90072
Part of HP Part Number: 08757-90067
Microfiche Part Number 08757-90078

Printed: DECEMBER 1988

HEWLETT PACKARD

CERTIFICATION

Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology (NIST, formerly NBS), to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members.

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For warranty service or repair, this product must be returned to a service facility designated by HP. Buyer shall prepay shipping charges to HP and HP shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to HP from another country.

HP warrants that its software and firmware designated by HP for use with an instrument will execute its programming instructions when properly installed on that instrument. HP does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

LIMITATION OF WARRANTY

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BP21.2

HP 8757C/E SCALAR NETWORK ANALYZER OPERATING MANUAL

SERIAL NUMBERS

This manual applies directly to any HP 8757C Scalar Network Analyzer having a serial number prefix 2834A and any HP 8757E Scalar Network Analyzer having a serial number prefix 2904A.

For additional information about serial numbers, see "Instruments Covered by Manual" in section 1.

MANUAL PART NO. 08757-90073
Part of HP Part Number: 08757-90067
Microfiche Part Number 08757-90078

Printed: DECEMBER 1988

HEWLETT PACKARD

CERTIFICATION

Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology (NIST, formerly NBS), to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members.

WARRANTY

This Hewlett-Packard instrument product is warranted against defects in material and workmanship for a period of one year from date of delivery. During the warranty period, Hewlett-Packard Company will, at its option, either repair or replace products which prove to be defective.

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BP21.2

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A12	08757-60067	1	1	POWER SUPPLY	28480	08757-60067
A12C1	0180-0291	3	4	CAPACITOR-FXD 1UF±10% 35VDC TA	56289	150D105X9035A2
A12C2	0180-0291	3		CAPACITOR-FXD 1UF±10% 35VDC TA	56289	150D105X9035A2
A12C3	0180-0291	3		CAPACITOR-FXD 1UF±10% 35VDC TA	56289	150D105X9035A2
A12C4	0180-0291	3		CAPACITOR-FXD 1UF±10% 35VDC TA	56289	150D105X9035A2
A12C5	0160-4386	3	1	CAPACITOR-FXD 33PF ±5% 200VDC CER 0±30	04222	SR152A330JAA
A12C6	0160-0161	4	2	CAPACITOR-FXD .01UF ±10% 200VDC POLYE	19701	708D1CC103PK201AX
A12C7	0160-5755	2	1	CAPACITOR-FXD .1UF ±10% 100VDC CER	04222	SA401C104KAA
A12C8	0180-2211	1	1	CAPACITOR-FXD 5UF+50-10% 150VDC AL	56289	30D505F150CC2
A12C9	0160-0168	1	2	CAPACITOR-FXD .1UF ±10% 200VDC POLYE	19701	708D1MR104PK201AX
A12C10	0160-4574	1	1	CAPACITOR-FXD 1000PF ±10% 100VDC CER	12474	CAC02X7R102K100A
A12C11	0160-2055	9	4	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C12	0180-3849	3	1	CAPACITOR-FXD 47UF±10% 10VDC TA	12344	T398H476K010AS
A12C13	0160-0168	1		CAPACITOR-FXD .1UF ±10% 200VDC POLYE	19701	708D1MR104PK201AX
A12C14	0160-4832	4	2	CAPACITOR-FXD .01UF ±10% 100VDC CER	12474	CAC02X7R103K100A
A12C15	0180-3831	3	3	CAPACITOR-FXD 10UF±10% 35VDC TA	12344	T398G106K035AS
A12C16	0180-3831	3		CAPACITOR-FXD 10UF±10% 35VDC TA	12344	T398G106K035AS
A12C17	0160-4832	4		CAPACITOR-FXD .01UF ±10% 100VDC CER	12474	CAC02X7R103K100A
A12C18	0180-3831	3		CAPACITOR-FXD 10UF±10% 35VDC TA	12344	T398G106K035AS
A12C19	0160-5708	5	4	CAPACITOR-FXD .33UF ±5% 100VDC	84411	HEW 757 0.33UF/5%/100VDC
A12C20	0160-5708	5		CAPACITOR-FXD .33UF ±5% 100VDC	84411	HEW 757 0.33UF/5%/100VDC
A12C21	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C22	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C23	0180-0197	8	1	CAPACITOR-FXD 2.2UF±10% 20VDC TA	56289	150D225X9020A2
A12C24	0160-5708	5		CAPACITOR-FXD .33UF ±5% 100VDC	84411	HEW 757 0.33UF/5%/100VDC
A12C25	0180-4073	7	2	CAPACITOR-FXD .017F+30-10% 25VDC AL	56289	80D173P025MD2B
A12C26	0180-4073	7		CAPACITOR-FXD .017F+30-10% 25VDC AL	56289	80D173P025MD2B
A12C27	0160-5708	5		CAPACITOR-FXD .33UF ±5% 100VDC	84411	HEW 757 0.33UF/5%/100VDC
A12C28	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12C29	0180-0116	1	3	CAPACITOR-FXD 6.8UF±10% 35VDC TA	56289	150D685X9035B2
A12C30	0180-0116	1		CAPACITOR-FXD 6.8UF±10% 35VDC TA	56289	150D685X9035B2
A12C31	0180-4071	5	2	CAPACITOR-FXD 7400UF+30-10% 50VDC AL	56289	80D742P050MD2B
A12C32	0180-4071	5		CAPACITOR-FXD 7400UF+30-10% 50VDC AL	56289	80D742P050MD2B
A12C33	0180-0116	1		CAPACITOR-FXD 6.8UF±10% 35VDC TA	56289	150D685X9035B2
A12C34	0180-0228	6	2	CAPACITOR-FXD 22UF±10% 15VDC TA	56289	150D226X9015B2
A12C35	0180-0228	6		CAPACITOR-FXD 22UF±10% 15VDC TA	56289	150D226X9015B2
A12C36	0180-2249	5	2	CAPACITOR-FXD 47UF±10% 20VDC TA	56289	150D476X9020R2
A12C37	0180-2249	5		CAPACITOR-FXD 47UF±10% 20VDC TA	56289	150D476X9020R2
A12C38	0160-0161	4		CAPACITOR-FXD .01UF ±10% 200VDC POLYE	19701	708D1CC103PK201AX
A12C45	0180-4072	6	2	CAPACITOR-FXD 1000UF+30-10% 200VDC AL	56289	80D102P200MD2B
A12C46	0180-4072	6		CAPACITOR-FXD 1000UF+30-10% 200VDC AL	56289	80D102P200MD2B
A12CR1	1901-0731	7	17	DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR2	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR3	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR4	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR5	1901-0033	2	6	DIODE-GEN PRP 180V 200MA DO-35	9N171	1N645
A12CR6	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-35	9N171	1N645
A12CR7	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-35	9N171	1N645
A12CR8	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-35	9N171	1N645
A12CR9	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR10	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR11	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-35	9N171	1N645
A12CR12	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-35	9N171	1N645
A12CR13	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR14	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR15	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR16	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR17	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR18	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR19	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR20	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR21	1901-0518	8	1	DIODE-SCHOTTKY SM SIG	12403	5082-2800
A12CR22	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR23	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR24	1901-0731	7		DIODE-PWR RECT 400V 1A	28480	1901-0731
A12CR25	1901-0200	5	1	DIODE-PWR RECT 100V 1.5A	28480	1901-0200
A12CR26	1901-0662	3	4	DIODE-PWR RECT 100V 6A	04713	MR751
A12CR27	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A12CR28	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751
A12CR29	1906-0269	6	1	DIODE-CT-RECT 40V 10.8A	9M011	12CTQ040
A12CR30	1901-0662	3		DIODE-PWR RECT 100V 6A	04713	MR751

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A12CR31	1901-0767	9	4	DIODE-PWR RECT 400V 6A	04713	MR754
A12CR32	1901-0767	9		DIODE-PWR RECT 400V 6A	04713	MR754
A12CR33	1901-0767	9		DIODE-PWR RECT 400V 6A	04713	MR754
A12CR34	1901-0767	9		DIODE-PWR RECT 400V 6A	04713	MR754
A12DS1	1990-0678	8	6	LED-LAMP LUM-INT=800UCD IF=30MA-MAX	28480	HLMP-6500
A12DS2	1990-0678	8		LED-LAMP LUM-INT=800UCD IF=30MA-MAX	28480	HLMP-6500
A12DS3	1990-0678	8		LED-LAMP LUM-INT=800UCD IF=30MA-MAX	28480	HLMP-6500
A12DS4	1990-0678	8		LED-LAMP LUM-INT=800UCD IF=30MA-MAX	28480	HLMP-6500
A12DS5	1990-0678	8		LED-LAMP LUM-INT=800UCD IF=30MA-MAX	28480	HLMP-6500
A12DS6	1990-0678	8		LED-LAMP LUM-INT=800UCD IF=30MA-MAX	28480	HLMP-6500
A12E1	0360-2341	0	3	TERMINAL BLOCK 3-TERM SCREW POLYA	11176	1713037
A12E2	0360-2341	0		TERMINAL BLOCK 3-TERM SCREW POLYA	11176	1713037
A12E3	0360-2341	0		TERMINAL BLOCK 3-TERM SCREW POLYA	11176	1713037
A12F1				NOT ASSIGNED		
A12F2	2110-0001	8	3	FUSE (INCH) 1A 250V NTD FE UL	75915	312 001
A12F3				NOT ASSIGNED		
A12F4	2110-0001	8		FUSE (INCH) 1A 250V NTD FE UL	75915	312 001
A12F5	2110-0055	2	2	FUSE (INCH) 4A 250V NTD FE UL	75915	312 004
A12F6	2110-0055	2		FUSE (INCH) 4A 250V NTD FE UL	75915	312 004
A12F7	2110-0043	8	1	FUSE (INCH) 1.5A 250V NTD FE UL	11870	04.015
A12F8	2110-0001	8		FUSE (INCH) 1A 250V NTD FE UL	75915	312 001
A12J1	1252-2797	2	1	CONN-POST TYPE .100-PIN-SPCG 10-CONT	28480	1252-2797
A12J2	1252-2919	0	1	CONN-POST TYPE .156-PIN-SPCG 15-CONT	28480	1252-2919
A12J3	1251-6932	3	1	CONN-POST TYPE 2.5-PIN-SPCG 3-CONT	28480	1251-6932
A12MP1				NOT ASSIGNED		
A12MP2	2110-0643	4	6	FUHLR-CLP-TYP 15A 250V	09709	FH-8000
A12MP3				NOT ASSIGNED		
A12MP4	0515-1105	1	3	SCREW-MACH M3 X 0.5 10MM-LG PAN-HD	28480	0515-1105
A12MP5	0570-0647	0	10	STD-PRS-IN M3 X 0.5 15.000 PH-BRZ	46384	KFH-M3-15-ET
A12MP6	08757-20072	4	1	HEATSINK	28480	08757-20072
A12MP7	3050-1186	5	10	WASHER-SHLDR NO. 4 .12-IN-ID .25-IN-OD	28480	3050-1186
A12MP8	3050-1021	7	3	WASHER-SHLDR NO. 4 .116-IN-ID .215-IN-OD	13103	7721-7PPS
A12MP9	0340-1114	1	5	INSULATOR-XSTR THRM-CNDCT	55285	K-4-05
A12MP10	2190-0005	0	10	WASHER-LK EXT T NO. 4 .116-IN-ID	78189	1804-01
A12MP11	0380-1247	5	2	SPACER-RVT-ON 8-MM-LG 3.8-MM-ID	28480	0380-1247
A12MP13	0340-1187	8	3	INSULATOR-XSTR MICA BLUE	18565	60-11-8302-1674
A12MP14	0535-0004	9	10	NUT-HEX DBL-CHAM M3 X 0.5 2.9MM-THK	00000	ORDER BY DESCRIPTION
A12MP16	1400-1450	7	1	CLAMP-CABLE .75-DIA .25-WD NYL	02768	220-242400-07-0101
A12MP17	0380-2011	3	2	SPACER-SNP-IN .75-IN-LG NYL NAT	02768	215-150912-04-01
A12Q1	1854-1162	9	1	TRANSISTOR NPN SI TO-204AA PD=250W	04713	MJ15024
A12Q2	1884-0244	9	6	THYRISTOR-SCR VRRM=400	11983	S26002A
A12Q3	1854-0477	7	1	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A12Q4	1853-0221	7	1	TRANSISTOR PNP 2N5416 SI TO-5 PD=1W	34677	2N5416
A12Q5	1854-0234	4	1	TRANSISTOR NPN 2N3440 SI TO-5 PD=1W	72799	2N3440
A12Q6	1884-0244	9		THYRISTOR-SCR VRRM=400	11983	S26002A
A12Q7	1884-0244	9		THYRISTOR-SCR VRRM=400	11983	S26002A
A12Q8	1884-0244	9		THYRISTOR-SCR VRRM=400	11983	S26002A
A12Q9	1884-0244	9		THYRISTOR-SCR VRRM=400	11983	S26002A
A12Q10	1854-0749	6	1	TRANSISTOR NPN SI TO-220AB PD=30W	04713	MJE2361
A12Q11	1884-0244	9		THYRISTOR-SCR VRRM=400	11983	S26002A
A12R1	0757-0418	9	4	RESISTOR 619 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-619R-F
A12R2	0757-0416	7	3	RESISTOR 511 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-511R-F
A12R3	0757-0416	7		RESISTOR 511 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-511R-F
A12R4	0757-0418	9		RESISTOR 619 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-619R-F
A12R5	0698-6360	6	1	RESISTOR 10K ±0.1% .125W TF TC=0±25	12498	NE55
A12R6	0698-6320	8	2	RESISTOR 5K ±0.1% .125W TF TC=0±25	12498	NE55
A12R7	0698-6353	7	1	RESISTOR 50K ±0.1% .125W TF TC=0±25	2M627	CRB14 OR CRB25
A12R8	0757-0346	2	8	RESISTOR 10 ±1% .125W TF TC=0±100	D8439	MK2
A12R9	0811-1079	6	1	RESISTOR .68 ±5% 3W PWI TC=0±90	91637	CW-2B-39
A12R10	0757-0422	5	3	RESISTOR 909 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-909R-F
A12R11	0698-3446	3	3	RESISTOR 383 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-383R-F
A12R12	0698-3446	3		RESISTOR 383 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-383R-F
A12R13	0698-3428	1	1	RESISTOR 14.7 ±1% .125W TF TC=0±100	2M627	CRB14 OR CRB25
A12R14	0757-0422	5		RESISTOR 909 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-909R-F
A12R15	0698-3446	3		RESISTOR 383 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-383R-F
A12R16	0757-0346	2		RESISTOR 10 ±1% .125W TF TC=0±100	D8439	MK2
A12R17	0698-0083	8	2	RESISTOR 1.96K ±1% .125W TF TC=0±100	12498	CT4-1/8-TO-1961-F
A12R18	0757-0279	0	3	RESISTOR 3.16K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-3161-F
A12R19	0764-0020	4	1	RESISTOR 5.6K ±5% 2W MO TC=0±200	12498	FP-69
A12R20	0757-0346	2		RESISTOR 10 ±1% .125W TF TC=0±100	D8439	MK2
A12R21	0698-3444	1	5	RESISTOR 316 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-316R-F
A12R22	0757-0422	5		RESISTOR 909 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-909R-F

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A12R23	0698-3441	8	4	RESISTOR 215 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-215R-F
A12R24	0764-0018	0	1	RESISTOR 4.7K ±5% 2W MO TC=0±200	12498	FP-69
A12R25	0698-3406	5	2	RESISTOR 1.33K ±1% .5W TF TC=0±100	K8479	H2
A12R26				NOT ASSIGNED		
A12R27	0757-0418	9		RESISTOR 619 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-619R-F
A12R28	0757-0418	9		RESISTOR 619 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-619R-F
A12R29	0699-0272	9	1	RESISTOR 75K ±0.1% .125W TF TC=0±25	12498	NE55
A12R30	0757-0280	3	6	RESISTOR 1K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-1001-F
A12R31	0757-0442	9	2	RESISTOR 10K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-1002-F
A12R32	0698-8827	4	2	RESISTOR 1M ±1% .125W TF TC=0±100	12498	CT4
A12R33	0757-0279	0		RESISTOR 3.16K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-3161-F
A12R34	0698-0083	8		RESISTOR 1.96K ±1% .125W TF TC=0±100	12498	CT4-1/8-TO-1961-F
A12R35	0757-0279	0		RESISTOR 3.16K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-3161-F
A12R36	0698-3155	1	1	RESISTOR 4.64K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-4641-F
A12R37	2100-0554	5	2	RESISTOR-TRMR 500 10% TKF TOP-ADJ 1-TRN	28480	2100-0554
A12R38	0757-0278	9	2	RESISTOR 1.78K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-1781-F
A12R39	0757-0316	6	2	RESISTOR 42.2 ±1% .125W TF TC=0±100	D8439	MK2
A12R40	0757-0280	3		RESISTOR 1K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-1001-F
A12R41	0698-8911	7	1	RESISTOR 1.3K ±0.1% .125W TF TC=0±25	12498	NE55
A12R42	0698-3444	1		RESISTOR 316 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-316R-F
A12R43	0757-0346	2		RESISTOR 10 ±1% .125W TF TC=0±100	D8439	MK2
A12R44	2100-0554	5		RESISTOR-TRMR 500 10% TKF TOP-ADJ 1-TRN	28480	2100-0554
A12R45	0757-0278	9		RESISTOR 1.78K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-1781-F
A12R46	0757-0316	6		RESISTOR 42.2 ±1% .125W TF TC=0±100	D8439	MK2
A12R47	0757-0280	3		RESISTOR 1K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-1001-F
A12R48	0698-6320	8		RESISTOR 5K ±0.1% .125W TF TC=0±25	12498	NE55
A12R49	0698-3444	1		RESISTOR 316 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-316R-F
A12R50	0757-0346	2		RESISTOR 10 ±1% .125W TF TC=0±100	D8439	MK2
A12R51	2100-3211	7	3	RESISTOR-TRMR 1K 10% TKF TOP-ADJ 1-TRN	28480	2100-3211
A12R52	0757-0438	3	2	RESISTOR 5.11K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-5111-F
A12R53	0698-3441	8		RESISTOR 215 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-215R-F
A12R54	0757-0280	3		RESISTOR 1K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-1001-F
A12R55	0698-6619	8	2	RESISTOR 15K ±0.1% .125W TF TC=0±25	12498	NE55
A12R56	0698-3444	1		RESISTOR 316 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-316R-F
A12R57	0757-0346	2		RESISTOR 10 ±1% .125W TF TC=0±100	D8439	MK2
A12R58	2100-3211	7		RESISTOR-TRMR 1K 10% TKF TOP-ADJ 1-TRN	28480	2100-3211
A12R59	0757-0438	3		RESISTOR 5.11K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-5111-F
A12R60	0698-3441	8		RESISTOR 215 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-215R-F
A12R61	0757-0280	3		RESISTOR 1K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-1001-F
A12R62	0698-6619	8		RESISTOR 15K ±0.1% .125W TF TC=0±25	12498	NE55
A12R63	0698-3444	1		RESISTOR 316 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-316R-F
A12R64	0757-0346	2		RESISTOR 10 ±1% .125W TF TC=0±100	D8439	MK2
A12R65	2100-3211	7		RESISTOR-TRMR 1K 10% TKF TOP-ADJ 1-TRN	28480	2100-3211
A12R66	0698-3154	0	1	RESISTOR 4.22K ±1% .125W TF TC=0±100	12498	CT4-1/8-TO-4221-F
A12R67	0698-3441	8		RESISTOR 215 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-215R-F
A12R68	0757-0280	3		RESISTOR 1K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-1001-F
A12R69	0698-8191	5	1	RESISTOR 12.5K ±0.1% .125W TF TC=0±25	19701	5033R-1/8-T9-1252-B
A12R70	0698-8827	4		RESISTOR 1M ±1% .125W TF TC=0±100	12498	CT4
A12R71	0757-0442	9		RESISTOR 10K ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-1002-F
A12R72	0698-6362	8	1	RESISTOR 1K ±0.1% .125W TF TC=0±25	12498	NE55
A12R73	0757-0158	4	1	RESISTOR 619 ±1% .5W TF TC=0±100	K8479	H2
A12R74	0757-0416	7		RESISTOR 511 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-511R-F
A12R75	0757-0419	0	1	RESISTOR 681 ±1% .125W TF TC=0±100	12498	CT4-1/8-T0-681R-F
A12R76	0757-0346	2		RESISTOR 10 ±1% .125W TF TC=0±100	D8439	MK2
A12R77	0698-3406	5		RESISTOR 1.33K ±1% .5W TF TC=0±100	K8479	H2
A12R78	0698-3647	6	1	RESISTOR 15K ±5% 2W MO TC=0±200	12498	FP-69
A12TP1	0360-0535	0	9	CONNECTOR-SGL CONT TML-TS-PT	28480	0360-0535
A12TP2	0360-0535	0		CONNECTOR-SGL CONT TML-TS-PT	28480	0360-0535
A12TP3	0360-0535	0		CONNECTOR-SGL CONT TML-TS-PT	28480	0360-0535
A12TP4	0360-0535	0		CONNECTOR-SGL CONT TML-TS-PT	28480	0360-0535
A12TP5	0360-0535	0		CONNECTOR-SGL CONT TML-TS-PT	28480	0360-0535
A12TP6	0360-0535	0		CONNECTOR-SGL CONT TML-TS-PT	28480	0360-0535
A12TP7	0360-0535	0		CONNECTOR-SGL CONT TML-TS-PT	28480	0360-0535
A12TP8	0360-0535	0		CONNECTOR-SGL CONT TML-TS-PT	28480	0360-0535
A12TP9	0360-0535	0		CONNECTOR-SGL CONT TML-TS-PT	28480	0360-0535
A12U1	1826-0677	0	2	IC V RGLTR-ADJ-POS 1.2/32V TO-3 PKG	27014	LM338K
A12U2	1826-0773	7	1	IC OP AMP GP 8-TO-99 PKG	27014	LM10CH
A12U3	1826-1081	2	1	IC OP AMP PRCN 8-DIP-P PKG	27014	LF411ACN
A12U4	1826-1437	2	1	IC V RGLTR-V-REF-FXD 9.995/10.005V	10858	LT1021CCN8-10
A12U5	1826-0065	0	2	IC COMPARATOR PRCN 8-DIP-P PKG	27014	LM311N

Table 6-3. Replaceable Parts

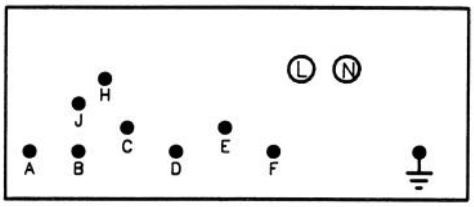
Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A12U6	1826-0065	0		IC COMPARATOR PRCN 8-DIP-P PKG	27014	LM311N
A12U7	1826-0677	0		IC V RGLTR-ADJ-POS 1.2/32V TO-3 PKG	27014	LM338K
A12U8	1826-0423	4	1	IC V RGLTR-ADJ-POS 1.2/37V TO-3 PKG	27014	LM317K
A12U9	1826-0523	5	1	IC V RGLTR-ADJ-NEG 1.2/37V TO-3 PKG	27014	LM337K
A12U10	1826-0527	9	1	IC V RGLTR-ADJ-NEG 1.2/37V TO-220 PKG	27014	LM337T
A12VR1	1902-3036	3	2	DIODE-ZNR 3.16V 5% DO-7 PD=.4W TC=-.064%	28480	1902-3036
A12VR2	1902-0244	9	3	DIODE-ZNR 30V 5% PD=1W IR=5UA	28480	1902-0244
A12VR3	1902-0244	9		DIODE-ZNR 30V 5% PD=1W IR=5UA	28480	1902-0244
A12VR4	1902-0202	9	1	DIODE-ZNR 15V 5% PD=1W IR=5UA	28480	1902-0202
A12VR5	1902-3224	1	2	DIODE-ZNR 17.8V 5% DO-35 PD=.4W	28480	1902-3224
A12VR6	1902-3224	1		DIODE-ZNR 17.8V 5% DO-35 PD=.4W	28480	1902-3224
A12VR7	1902-3036	3		DIODE-ZNR 3.16V 5% DO-7 PD=.4W TC=-.064%	28480	1902-3036
A12VR8	1902-0556	6	1	DIODE-ZNR 20V 5% PD=1W IR=5UA	28480	1902-0556
A12VR9	1902-0244	9		DIODE-ZNR 30V 5% PD=1W IR=5UA	28480	1902-0244
A12VR10	1902-3005	6	2	DIODE-ZNR 2.43V 5% DO-7 PD=.4W TC=-.076%	28480	1902-3005
A12VR11	1902-3110	4	2	DIODE-ZNR 5.9V 2% DO-35 PD=.4W TC=+.017%	28480	1902-3110
A12VR12	1902-3005	6		DIODE-ZNR 2.43V 5% DO-7 PD=.4W TC=-.076%	28480	1902-3005
A12VR13	1902-3110	4		DIODE-ZNR 5.9V 2% DO-35 PD=.4W TC=+.017%	28480	1902-3110
A12VR14	1902-0025	4	2	DIODE-ZNR 10V 5% DO-35 PD=.4W TC=+.06%	28480	1902-0025
A12VR15	1902-3220	7	2	DIODE-ZNR 16.9V 2% DO-35 PD=.4W	28480	1902-3220
A12VR16	1902-0025	4		DIODE-ZNR 10V 5% DO-35 PD=.4W TC=+.06%	28480	1902-0025
A12VR17	1902-3220	7		DIODE-ZNR 16.9V 2% DO-35 PD=.4W	28480	1902-3220
A12VR18	1902-0064	1	1	DIODE-ZNR 7.5V 5% DO-35 PD=.4W TC=+.05%	28480	1902-0064
A12VR19	1902-0686	3	3	DIODE-ZNR 6.2V 2% DO-7 PD=.4W TC=+.002%	04713	1N825
A12VR20	1902-0686	3		DIODE-ZNR 6.2V 2% DO-7 PD=.4W TC=+.002%	04713	1N825
A12VR21	1902-0686	3		DIODE-ZNR 6.2V 2% DO-7 PD=.4W TC=+.002%	04713	1N825
A12W1	1460-1489	8	1	WIREFORM BE CU AG	28480	1460-1489

NOTES

1. Refer to figure 8-1 for detailed schematic diagram symbology notes.

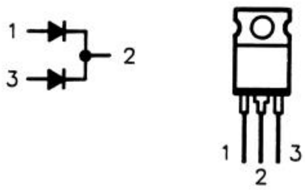
2. Resistance values shown are in ohms, capacitance in microfarads, and inductance in microhenries unless otherwise noted.

3. Line module PC board diagram as seen from assembly connection side:



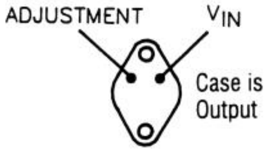
Refer to section 2, "Installation" for line voltage selection procedure.

4. CR29 is attached to side of heat sink.

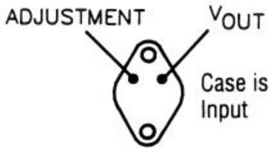


FRONT VIEW
CR29

5. U1, U7, U8, and U9 are mounted to a common heat sink. The case of each device is one of three active terminals. The case electrically connects to the A12 PC board via the mounting screws. The other two pins connect through holes in the heat sink to pin sockets. These pins may be probed without removing the device at: (1) fuse at input; (2) test point at output; or (3) PC pads (not test points) labeled "7R" for U7, "8R" for U8, etc.

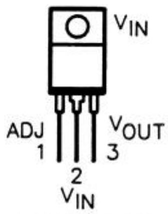


BOTTOM VIEW
U1, U7, U8

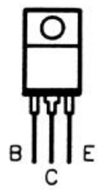


BOTTOM VIEW
U9

6. U10 and Q10 are attached to the side of heat sink.

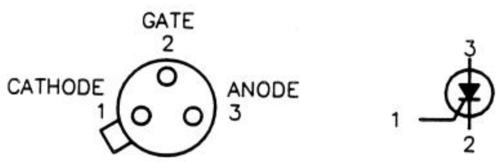


FRONT VIEW
U10



FRONT VIEW
Q10

7. Q2, Q6, Q7, Q8, Q9, Q11



BOTTOM VIEW

Figure 8-33. A12 Power Supply and Component Illustrations (1 of 2)

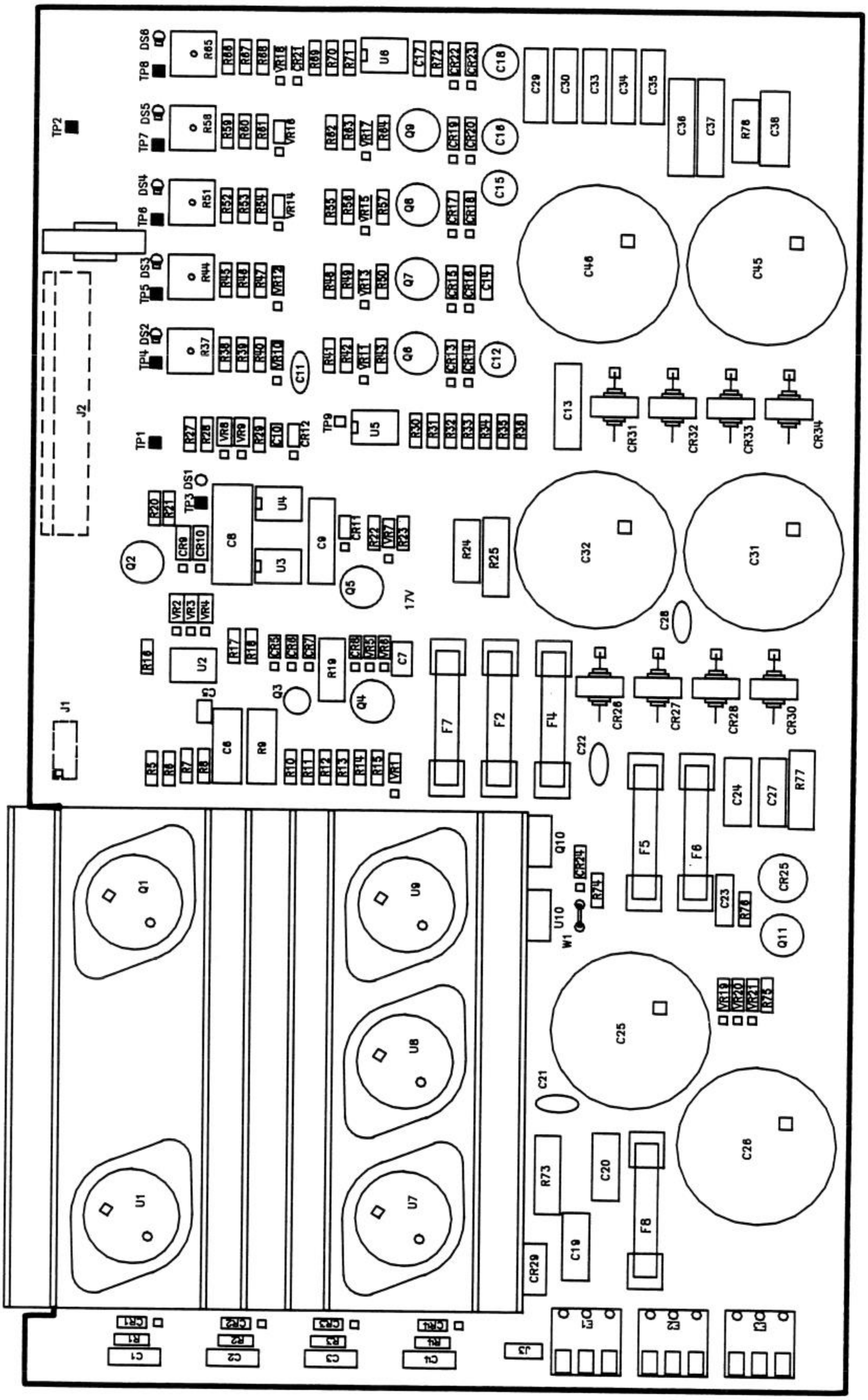


Figure 8-33. A12 Component Locations Diagram (2 of 2)

CONTENTS

INTRODUCTION

This section provides instructions for troubleshooting and repairing the HP 8757C/E Scalar Network Analyzer. The information provided includes self-tests and diagnostic tests, circuit descriptions, troubleshooting procedures, schematics, and component locations diagrams.

Self-tests are tests performed by the analyzer at power-on or preset that check the internal circuitry of the instrument to verify normal operation. Diagnostic tests are tests initiated by the operator to verify specific functional areas of the instrument.

Overall circuit description and troubleshooting information is provided to isolate problems to the assembly level. Tabbed subsections of this section then document each PC board assembly in numerical order from A1 through A16. Each assembly subsection provides a circuit description, diagnostic tests, troubleshooting information, pin-outs, component locations diagrams, and schematic diagrams.

SCHEMATIC DIAGRAM NOTES

Figure 8-1, "Schematic Diagram Notes", provides a key to the symbols and abbreviations used in the schematic diagrams.

RECOMMENDED TEST EQUIPMENT

Test equipment required for repairing and troubleshooting the analyzer is listed in table 4-1. If the equipment listed is not available, equipment that meets the minimum specifications shown can be substituted.

WIRING LIST AND MNEMONICS

Table 8-26, "Motherboard Wiring List", alphabetically lists and describes all analyzer signal mnemonics. The source of each signal is identified, and the point-to-point distribution is referenced to and from the PC board sockets and rear panel and motherboard connectors. This table is located in the A11/A13 subsection.

The internal interconnect cables are listed in table 6-3, "Replaceable Parts".

TROUBLESHOOTING

WARNING

With the AC power cable connected to the instrument, the AC line voltage is present at the terminals of the power line module on the rear panel and at the line switch assembly, whether the line switch is on or off. Contact with these voltages can cause fatal electrical shock. Capacitors inside the instrument may also remain charged even though the instrument has been disconnected from its AC power source.

After repair, make sure all safety features are intact and functioning, and all protective grounds are solidly connected.

Troubleshooting information in this manual is generally divided into two levels. The first level isolates the problem to an assembly. This level includes self-tests and associated error codes, overall instrument troubleshooting information, and the overall troubleshooting block diagram. Some operator-initiated diagnostic tests are also available at this level.

The second troubleshooting level isolates the problem to the defective component. This information is provided in the tabbed subsections for each assembly. This component-level troubleshooting information includes circuit descriptions, operator-initiated diagnostic tests, and schematic diagrams for the individual assemblies.

CAUTION

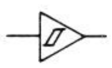
The A3 CPU, A4 ADC, and A7-A10 log amplifier assemblies CANNOT be interchanged or replaced without recalibrating the analyzer. Boards can be temporarily interchanged for troubleshooting purposes, but each board must be returned to its original position. Recalibration of the analyzer requires the use of an HP 11613A/B calibrator and an HP 9000 Series 200/300 computer.

BASIC COMPONENT SYMBOLOGY

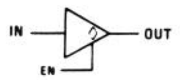
R, L, C	Resistance is in ohms, inductance is in microhenries, capacitance is in microfarads, unless otherwise noted.
P/O	Part of.
*	Indicates a factory selected component.
	Panel Control.
	Screwdriver adjustment.
	Encloses front panel designation.
	Encloses rear panel designation.
	Circuit assembly borderline.
	Other assembly borderline.
	Heavy line with arrows indicates path and direction of main signal.
	Indicates path and direction of main feedback.
	Earth ground symbol.
	Assembly ground. May be accompanied by a number or letter to specify a particular ground.
	Chassis ground.
n	Represents n number of transmission paths.
	Test Point: Terminal provided for test probe.
	Pin Edge Connector output of PC board.
92	Indicates wire or cable color code. Color code same as resistor color code. First number indicates base color, second and third numbers indicate colored stripes.
	Indicates shielding conductor for cables.
	Indicates a plug-in connection.
	Indicates a soldered or mechanical connection.
	Connection symbol indicating a male connection.
	Connection symbol indicating a female connection.
	Resistor.
	Variable Resistor.
	General purpose diode.
	Step recovery diode.
	Schottky diode.
	Breakdown Diode: Zener
	Light-Emitting Diode.
	SCR (Silicon Controlled Rectifier).
T	**Thermistor**
	FET: Field Effect Transistor (N-channel).
	FET: Field Effect Transistor-Guarded gate- (N channel).
	Dual Transistor.
	Transistor NPN
	Transistor PNP
	Electrolytic Capacitor.
	Toroid: Magnetic core inductor.
	Operational Amplifier.
	Fuse
	Pushbutton Switch.
	Toggle Switch.
	Thermal Switch.
Σ	Summing Point.
	Oscillator; RPG (Rotary Pulse Generator).
BI	Fan, Motor.
	Toroidal Transformer

Figure 8-1. Schematic Diagram Notes (1 of 3)

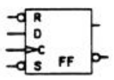
INTEGRATED CIRCUIT SYMBOLOGY



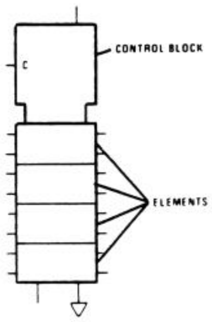
Schmitt Trigger: The gate of the Schmitt Trigger switches at different points for positive - and negative-going signals. The difference between the positive and negative thresholds is defined as hysteresis voltage.



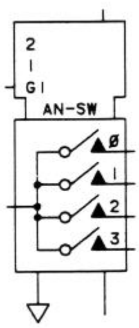
3-State Buffer: Three States:
Enable (EN) Input low: High impedence output.
Enable input high: Output = 0 or Output = 1



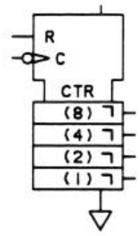
Data Flip-Flop: Set (S) and Reset (R) are asynchronous controls. Active S sets the noninverting output high and the inverting output (O—) low; active R resets both outputs. When S and R are both inactive, the outputs remain latched in the last state. An active clock (-⊵) enables the D input, at which time the noninverting output = D, and the inverting output = $\bar{D}$.



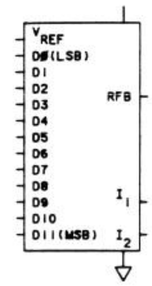
Control Block: All controlling inputs (gates, clocks, inhibits, etc.) connect to the control block.
Elements: Can be one or more of any logic function (flip-flop, counter, gate, RAM, etc.). Data inputs are on the left side of element, data outputs on the right.



Analog Switch: Control lines 1 and 2 decode to select one of four inputs. G1, high=enable.



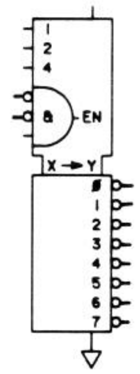
Counter: Binary-weighted registers count on the falling edge of each clock pulse. Active (high) R clears all registers.



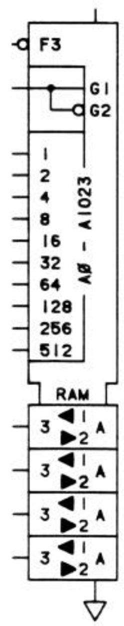
Digital to Analog Converter (DAC): Provides a scaled current output (I_1), the product of V_{REF} and the fractional binary input:

$$D_{11}2^{-1} + D_{10}2^{-2} + D_9 2^{-3} + \dots D_0 2^{-12}$$

The product of V_{REF} and complement of the binary input appears at I_2.



Decoder: The logic states of the three select lines A, B, and C, and the three enable inputs (EN), determine which one of the eight outputs will be decoded. The selected output will be low, while all others are high.



Random-Access Memory (RAM):
Binary addresses (A0 to A9) access one of 1024 registers in RAM. When G1 is high, bits appearing at D0 to D3 will be written to the addressed location (A0 to A9). When G2 is low, bits appearing at D0 to D3 have been accessed from the addressed location.

Figure 8-1. Schematic Diagram Notes (2 of 3)

LINE LABEL ABBREVIATIONS

CK, C	Clock Input	MSB	Most Significant Bit	T	Trigger Input (Monostable)
D	Data or Delay Input (Flip-Flop)	Q	Output	WR	Write
EN	Enable	$\overline{Q}$	Not Q Complement of Q	+1	Count Up
F	3-State Enable Input	R	Reset or Clear Input	−1	Count Down
G	Gating Input	RD	Read	3-ST	3-State (placed by function)
LSB	Least Significant Bit	S	Set Input		

FUNCTION LABEL ABBREVIATIONS

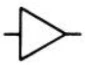
Σ	Adder	◊	Open Collector	LED	Light-Emitting Diode
	Amplifier/Buffer		Monostable Multivibrator	MUX	Multiplexer
	Schmitt Trigger	BCD	Binary Coded Decimal	RAM	Random-Access Memory
&	AND	CTR	Counter	REG	Register
≥1	OR	DAC	Digital-to-Analog Converter	ROM	Read Only Memory
=1	Exclusive OR	FF	Flip-Flop	RPG	Rotary Pulse Generator
X→Y	Encoder, Decoder	I/O	Input/Output		

Figure 8-1. Schematic Diagram Notes (3 of 3)

SELF-TESTS

Each time the analyzer is powered-on or preset it performs a self-test routine. This routine consists of a series of fifteen self-tests numbered in descending numerical order from 15 to 1, and four calibration constant checksum tests (one for each input). Self-test 1 is an instrument verify routine that consists of additional self-checks that can also be accessed from the service menu. If any part of the self-test routine fails, an error code or error message is generated.

In addition to the self-tests performed automatically by the analyzer, several diagnostic tests are available that can be forced by the operator if the front panel is not functioning. These tests, error codes, and error messages are described in more detail in "Error Codes".

For troubleshooting purposes, the entire self-test sequence can be bypassed by closing switch A3S1D and pressing **[PRESET]**. The microprocessor will skip the self-tests and begin executing the routines associated with normal operation, if possible.

Error Codes

The self-test routine performed by the analyzer at power-on or preset checks major functional areas of the instrument to verify normal operation. If any portion of the self-test routine fails, an error code between 15 and 1 is generated to indicate the nature of the failure and to guide troubleshooting. A summary of self-tests and error codes is provided in table 8-1. Error codes are displayed in one or more of the following three places:

1. **A3 CPU LEDs.**

   Four red LEDs on the A3 CPU assembly (labeled MSB) indicate an error code between 15 and 0 (0 indicates pass). This is referred to as the *main* error code. The LEDs have a binary weight of 8-4-2-1 from left to right. This is the most reliable of the three error condition indicators. There are an additional four LEDs on this board that provide more specific error analysis. These are labeled "LSB" and are referred to as the *sub* error code.

2. **Front Panel HP-IB STATUS Lights.**

   The four HP-IB STATUS lights on the front panel also indicate a main error code between 15 and 0. These lights are labeled R-L-T-S, from left to right, and have a binary weight of 8-4-2-1 respectively. This error code indication is identical to the A3 error code, although it functions only if the A1/A2 front panel assemblies and the instrument bus are working properly.

3. **Display.**

   The front panel display may indicate error or warning messages. Error messages occur in conjunction with some error codes to provide additional failure information. Warning messages indicate other conditions that may affect accuracy, prevent normal operation, or require service attention. Warning messages are not associated with error codes. Error messages and warning messages are available only if the A15 display and its associated circuitry is working.

Table 8-1. Self Test and Main Error Code Summary

MSB LED Reading 8-4-2-1	MAIN Error Code	Test Description/Explanation	Additional Information
1-1-1-1	15	Microprocessor kernel	A3 CPU
1-1-1-0	14	ROM checksum	A3 CPU
1-1-0-1*	13	RAM checksum	A3 CPU
1-1-0-0	12	Power supply failure	A12 Power Supply
1-0-1-1	11	Instrument bus	A3 CPU
1-0-1-0	10	Display interface −GSP	A14 Display interface
1-0-0-1	9	Display interface −DRAM	A14 Display interface
1-0-0-0	8	Display interface −DRAM load	A14 Display interface
0-1-1-1	7	Display interface −DRAM cell	A14 Display interface
0-1-1-0	6	Display interface −VRAM	A14 Display interface
0-1-0-1*	5	Display interface −VRAM cell	A14 Display interface
0-1-0-0	4	Display interface −Control	A14 Display interface
0-0-1-1	3	Display interface −R,G,B	A14 Display interface
0-0-1-0	2	Interrupt	A3 CPU
0-0-0-1	1	Instrument Verify and other tests	Instrument Verify (in this subsection)
0-0-0-0	0	Pretest pass	N/A

*Performed only at power-up and manual instrument verify.

Self-Test Sequence

The self-tests are performed in the following sequence:

Self-test 15	Failure generates error code 15
14	14
13	13 Performed at power-up.
12	12
11	11
10	10
9	9
8	8
7	7
6	6
5	5 Performed at power-up.
4	4
3	3
2	2
1	1
0	Self-test passes

Calibration constant checksum for input A.
Calibration constant checksum for input B.
Calibration constant checksum for input C (HP 8757C Option 001 only).
Calibration constant checksum for input R.

Self-test 1 includes these instrument verify routines:

- RAM.
- Instrument bus.
- Display bus.
- Timer.
- ADC measurement.
- ADC bit check.
- DAC bit check.
- Sweep compare.
- Detector control.
- Unexpected keypress.
- EEROM write enable.
- Battery failure.
- Configuration error.

Self-test 1 is described in "Instrument Verify".

Calibration checksum warning messages are described in "Calibration Constants".

For error codes other than 1, see table 8-1. This table references the subsections that provide troubleshooting information pertinent to each error code. Many error codes cause the CPU to enter a cycle that repeats the self-test continuously. This produces a repeatable pattern for troubleshooting purposes.

Instrument Verify

This routine is a collection of nine major self-checks. These tests are performed at power-on and during an instrument preset. They can also be run at any time by pressing the ***[INST VERIFY]*** softkey in the service menu. If an instrument verify test fails (error code 1), the routine does not automatically enter into any cyclical tests as the other self-test routines do. Instead you have a choice of repeating the instrument verify test, entering the service menu, or entering the normal measurement routine (ignoring the failure).

The tests performed as part of the instrument verify routine are listed in table 8-2, along with references for more information. The first three tests are similar to self-tests 13, 11, and 10.

Table 8-2. Instrument Verify Table

Test	More Information
RAM	A3 Troubleshooting, Error Code 13
Instrument bus	A6 Troubleshooting, Instrument Bus Test
Display bus	A14 Troubleshooting, Error Code 10
Timer	A3 Troubleshooting, Timer Test
ADC measurement	A4 ADC Diagnostic Tests
ADC bit check	A4 ADC Diagnostic Tests
DAC bit check	A4 ADC Diagnostic Tests
Sweep compare	A4 ADC Diagnostic Tests
Detector control	A4 ADC Diagnostic Tests

Forced Diagnostic Tests

To call up most diagnostic tests the A1 front panel and A2 front panel interface assemblies must work correctly. However, some diagnostic tests can be called during self-test without a functioning front panel. To access these tests, close the indicated status switch sections of A3S1 on the A3 CPU assembly. Then press **[PRESET]**, or cycle the power momentarily to start the self-test. During self-test, the microprocessor reads the status lines and jumps immediately to the required test. The tests are listed in table 8-3, along with the switch sections to be closed. Closed, in this case, means setting the switch toward the left side of the instrument when viewed from the front. A closed switch is indicated by a "0"; an open switch by a "1". Do not confuse the EEPROM write protect switch with one of the status switches. The write protect switch is A3S1-E; the status switches consist of A3S1-A through A3S1-D. The write protect switch is listed solely to prevent confusion while viewing switch positions; it should always be open "1".

Table 8-3. Forced Diagnostic Tests

To Perform this Test	Close "0" the Indicated Status Switches, then Press [PRESET]					More Information
	A3S1-A	A3S1-B	A3S1-C	A3S1-D	A3S1-E	
Normal operation	1	1	1	1	1	N/A
A3 CPU read/write cycle	0	1	1	1	1	A3 CPU
Instrument bus cycle	1	0	1	1	1	A6 HP-IB
Display bus test cycle	0	0	1	1	1	A14 display interface
Front panel cycle	1	1	0	1	1	A1/A2 front panel
Read key cycle	0	1	0	1	1	A1/A2 front panel
CPU interrupt test	1	0	0	1	1	A3 CPU
Skip ROM checksum	0	0	0	1	1	N/A
Skip all self tests	1	1	1	0	1	N/A
A14 DRAM cycle	0	1	1	0	1	A14 Display interface
A14 VRAM bank 0 cycle	1	0	1	0	1	A14 Display interface
A14 VRAM bank 1 cycle	0	0	1	0	1	A14 Display interface
A14 VRAM bank 2 cycle	1	1	0	0	1	A14 Display interface
A14 VRAM bank 3 cycle	0	1	0	0	1	A14 Display interface
A14 VRAM device indicator	1	0	0	0	1	A14 Display interface
A14 repeating gray scale	0	0	0	0	1	A14 Display interface

Calibration Constants and Checksum Errors

The HP 8757C/E has over one thousand calibration points stored in two EEPROMs on the A3 CPU assembly. This data is matched to each individual log amplifier assembly, and is used to correct for differences in gain, log shaping, and offsets in each board. This data is only valid if all the boards remain in their designated input locations (they are not swapped with each other). In addition, the calibration data is only valid with a specific A4 ADC assembly. Therefore the A3 CPU, A4 ADC, and A7-A10 log amplifier assemblies *cannot* be interchanged or replaced without recalibrating the analyzer. If necessary, boards can be temporarily interchanged for troubleshooting purposes, but each board must be returned to its original position. Recalibration of the analyzer requires the use of a specific calibrator (HP 11613A/B) and an HP 9000 Series 200/300 computer.

After the self-tests have been completed the CPU performs a checksum test on each of the four portions of EEPROM that contain the calibration data for each input. If the checksum does not correspond with the stored data, the warning message `Default calibration table used on X` is displayed on the CRT, where X equals all the input channels (A, B, C, or R) that failed the checksum test. If one or more of the checksums passes while one or more fails, the CPU duplicates the calibration data of a passing input for those that fail. This results in improper calibration, and degrades the dynamic accuracy of the affected inputs by about ±1 dB, but the analyzer can be used with these limitations until a recalibration can be performed.

If the checksums fail for all the inputs, the CPU generates a default table to be used by all inputs. This degrades the dynamic accuracy by about ±2 dB.

Other Error Messages

The error messages listed below, used mostly for firmware development, should normally never appear. If they do, it indicates that the microprocessor is "confused" and has attempted an illegal command. Some of the possible conditions that cause this are:

- Anomalies in the firmware.
- Failure of one or more ROMs.
- Failure of one or more RAMs.
- Intermittent shorts or opens on the A3 CPU address or data lines.
- Failures in the I/O timing.

The possible error messages are:

- Bus ERROR.
- Adrs Error.
- Code Err.
- ZERO DIV.
- CHK INSTR.
- TRAPV INSTR.
- PRIV VIOLATION.
- TRACE.
- 1010 EMULATOR.
- 1111 EMULATOR.
- Processing Error.

Notes on Self-tests

1. Most self-tests performed at preset or power-on will enter a continuous loop if the test fails. This allows the technician to observe and track down shorted or open address, data, and control lines, even if the front panel or CRT is not operable. For instance, if the instrument bus test fails (error code 11), which may render the front panel and CRT useless, the A3 CPU enters the instrument bus cycle test automatically. This writes a known pattern to the address and data lines to make troubleshooting a simple, straight-forward procedure.

2. Most of the cyclical self-tests produce a TTL trigger pulse at the CONTROL 1 output connector on the rear panel. The falling edge of this pulse occurs at the beginning of each repetition of a cycle, to trigger an oscilloscope. This allows for one simple setup using the external trigger input of the oscilloscope, without the difficulty normally associated with reliably triggering on multiple digital pulses. The external trigger of the oscilloscope should be DC coupled and set for a negative-going transition at about +3 V. Most waveforms illustrated in this service section were obtained using this pulse as a trigger.

3. Many self-tests write a *walking 1* pattern to one or more devices via the data bus. These tests verify that each of the sixteen data lines can be controlled independently and that data can be written and then read back. The TTL trigger pulse previously described is sent at the beginning of each cycle.

   The walking 1 pattern begins with the CPU writing all ones to a memory location and then reading it back. It then writes all zeros and reads it back. Then a logical 1 is written to D0 (the least significant bit) while the other data lines are 0 (0000 0000 0000 0001). This information is then read back. Then the logical 1 is shifted to the next more significant bit (0000 0000 0000 0010) and read again. This cycle is continued until the most significant bit is a logical 1 (1000 0000 0000 0000). Since each step consists of a write and a read, this will produce an 18 step double-pulse walking 1 pattern. Any discrepancy between data written and data read back is reported as an error. A sample of part of this double-pulse walking 1 pattern during the instrument bus test is shown in figure 8-28.

4. In tests involving the data lines, any failure of a data bit is indicated by a "1" in the appropriate location on the display. Bit positions are always shown with the most significant bit (MSB) on the left and the least significant bit (LSB) on the right.

5. The waveforms in this manual show the test patterns of a normally working instrument. When a failure occurs, more than one line may be affected. In addition, the timing of individual parts of a cycle may be very different from that shown in the waveforms. How the test is entered can also make a difference. For example, the display bus cycle test takes about 93 μS if entered from the front panel softkeys. As a forced diagnostic test, it takes about 91 μS. If the test is automatically entered upon a bus failure, it takes about 155 μS. If the display ribbon cable happens to be disconnected and the test is automatically entered at preset, the duration of the test is 325 μS. Remember that upon failure, timing relationships can vary considerably.

6. Waveforms shown in this manual were actually taken from a working instrument. Most were taken using the CONTROL 1 trigger pulse on the rear panel (see item 2). Where many waveforms are shown on one graph, each trace shows a digital signal. The amplitude is 5 or 6 volts per division unless noted otherwise. This is sufficient to show the logical condition of each part of the trace. Where analog traces are shown, the amplitude per division is noted and the zero volt DC level is indicated.

OPERATOR-INITIATED DIAGNOSTIC TESTS

Diagnostic tests are tests initiated by the operator to verify specific functional areas of the instrument. These tests are available in five levels of menus subsidiary to the service menu. The service menu is obtained by pressing **[SYSTEM]** ***[MORE] [SERVICE]***. The diagnostic tests are listed by menu level in table 8-3. For information on performing these tests, see "Diagnostic Tests" in the individual assembly subsections.

Hexadecimal Tests

The following tests are accessed using the ***[HEX TESTS]*** softkey in the service menu. These hexadecimal read/write and rotate tests are general in nature, and can be used to test many different parts of the instrument. Using hex read/write, the CPU is instructed to access a user-specified memory or I/O address and read or write data from or to that address, or write a rotating 1 data pattern.

These tests use the hexadecimal (hex) numbering system. Hex digits from 0 to 9 and A to F represent decimal numbers from 0 to 15, as shown in table 8-4. Each hex digit represents four binary digits or bits. An address is specified by six hex digits, while a data word is specified by four hex digits.

During hex read/write, certain ENTRY keys are redefined to represent hex digits A through F, as shown in figure 8-2.

to write, must switch position E dip switch on A3 CPU board.

Table 8-4. Hexadecimal Equivalents

Hexadecimal	Binary	Decimal
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	8
9	1001	9
A	1010	10
B	1011	11
C	1100	12
D	1101	13
E	1110	14
F	1111	15

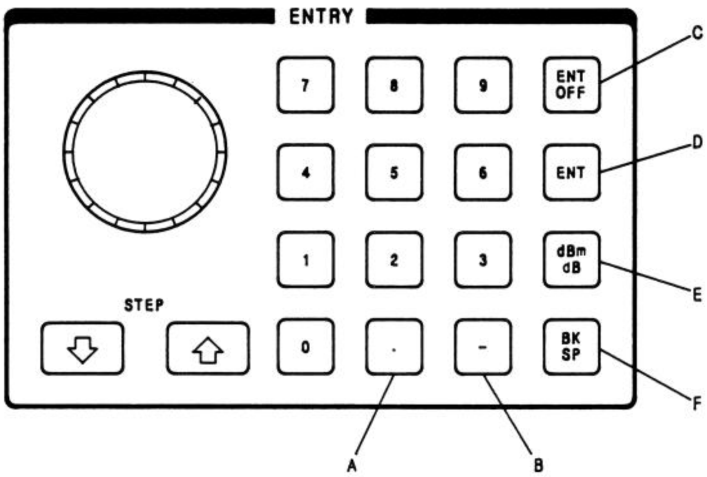


Figure 8-2. Hexadecimal Entry Keys

[ADDRESS]

This key is used to enter the hexadecimal address of a memory or I/O device in the instrument. Press ***[ADDRESS]***, then enter six hexadecimal characters for the address location, using the redefined ENTRY keys. Include any leading or trailing zeros. Only even addresses are allowed; any odd address entered is automatically decremented by 1.

After entering the address, press ***[READ]***, ***[WRITE]***, or ***[ROTATE]*** for the following functions.

[READ]

This key tells the CPU to read and display data from the specified address. Press ***[READ]***, and the message RD DATA is displayed, together with four hex digits of data read from the addressed location. The read function is repeated, so if the data changes, new data is displayed. FFFF is usually shown when data is read from an illegal (write-only) address. Be sure that the read mode is applicable at the address in question.

Press ***[ADDRESS]*** to enter a new address, or use the STEP keys to automatically read the next sequential address.

[WRITE]

This key writes data to the specified hexadecimal address. Press ***[WRITE]***, then enter four hex digits of data to be written to the addressed location, using the redefined ENTRY keys. Leading or trailing zeros must be entered. The data is written automatically upon entry of the last digit of the four-digit entry. Data is written one time only. To write data again, press the ***[WRITE]*** key again.

Press ***[ADDRESS]*** to enter a new address. Or press ***[READ]***, ***[WRITE]***, or ***[ROTATE]*** to read data, write new data, or write the rotating data pattern to the same address.

[ROTATE]

This test is particularly helpful to find missing, shorted, or stuck data bits. This test sends a *rotating 1* data pattern to the address selected. The data pattern is a sixteen-bit word, with one bit high and the remaining fifteen low. Each successive bit (D0 through D15) is written high in turn. The test is continuous and repetitive with a trigger pulse available at the CONTROL1 output on the rear panel. A typical hex data rotate waveform for several instrument bus data lines is shown in figure 8-3.

CAUTION

Never attempt to perform a hex data rotate on EEPROM (address 0C0000 to 0FFFFE) with the write-protect switch closed. The EEPROMs can accept only a limited number of write cycles. Because this test repeats continuously, it will quickly destroy the memory retention capability of the EEPROMs.

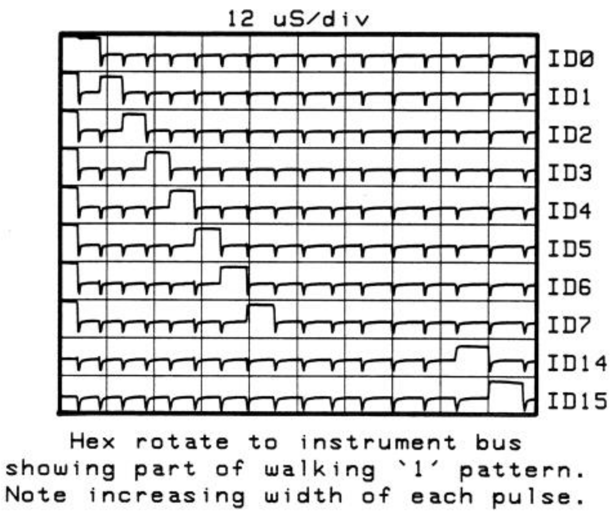


Figure 8-3. Hex Data Rotate Waveforms

Table 8-5. Operator-Initiated Diagnostic Tests (1 of 2)

The service menu is accessed by pressing **[PRESET] [SYSTEM]** ***[MORE] [SERVICE]***.

Menu Level within Service Menu				
1	**2**	**3**	**4**	**5**
DISPLAY	NOMINAL INT ADJ	SAVE VALUE		
		PRIOR MENU		
	MINIMUM INT ADJ	SAVE VALUE		
		PRIOR MENU		
	BCKGRND ADJUST	SAVE VALUE		
		PRIOR MENU		
	TEST PATTERN	PRIOR MENU		
		EXIT SERVICE		
	DISPLAY TEST	REPEAT		
		CYCLE[1]		
		PRIOR MENU		
		EXIT SERVICE		
	MORE	BCKGRND RAMP[1]		
		INTNSTY RAMP[1]		
		PRIOR MENU		
		EXIT SERVICE		
	PRIOR MENU			
	EXIT SERVICE			
HEX TESTS	ADDRESS	ADDRESS		
		READ		
		WRITE		
		ROTATE[1]		
		PRIOR MENU		
		EXIT SERVICE		
	PRIOR MENU			
	EXIT SERVICE			
A1/2 FP	READ RPG[1]			
	READ KEY[1]			
	CYCLE[1]			
	LEDS[1]			
	PRESET DISABLE[1]			
	PRIOR MENU			
	EXIT SERVICE			
A3 CPU	RAM TEST	REPEAT		
		PRIOR MENU		
		EXIT SERVICE		
	TIMER[1]			
	EEROM TEST	EXECUTE		
		PRIOR MENU		
		EXIT SERVICE		
	READ STATUS[1]			
	INTRPT			
	PRIOR MENU			
	EXIT SERVICE			
A4 ADC	ADC MEAS	DATA READY[1,2]		
		READ DATA[1,2]		

1. Indicates a cycling self-test with an oscilloscope trigger pulse available at the CONTROL 1 BNC connector on the rear panel, even though test results displayed on the CRT are not necessarily updated. This feature is very useful for troubleshooting.

2. Indicates a failure mode menu that appears only when the previous level test has failed.

Table 8-5. Operator-Initiated Diagnostic Tests (2 of 2)

Menu Level within Service Menu				
1	**2**	**3**	**4**	**5**
A4 ADC (cont'd)	ADC BIT CHECK			
	DAC BIT CHECK			
	DET CONTROL[1]	MODE 1[2]		
		MODE 2[2]		
		MODE 3[2]		
		CHANV DETDAC[1,2]		
		PRIOR MENU[2]		
		EXIT SERVICE[2]		
	SWEEP COMPARE	BLANK[1,2]		
		SWEEP TOO FAST[1,2]		
		RETRACE[1,2]		
		MARKER[1,2]		
		PRIOR MENU[2]		
		EXIT SERVICE[2]		
	MORE	RAMP[1]		
		CHANNEL VOLTS	CHANV LOGGER[1]	
			CHANV DETDAC[1]	DET DAC ENTER
				DET DAC MAX
				DET DAC MIN
				MODE 1
				MODE 2
				MODE 3
				PRIOR MENU
				EXIT SERVICE
			CHANV OTHER[1]	SWP DAC ENTER
				SWP DAC MAX
				SWP DAC MIN
				PRIOR MENU
				EXIT SERVICE
			PRIOR MENU	
			EXIT SERVICE	
		DATA READY[1]		
		READ DATA[1]		
		PRIOR MENU		
		EXIT SERVICE		
	PRIOR MENU			
	EXIT SERVICE			
A6 HPIB INSTBUS	HPIB TESTS	HPIB TALK		
		HPIB LISTEN		
		PRIOR MENU		
		EXIT SERVICE		
	INSTBUS TESTS	REPEAT		
		CYCLE[1]		
		PRIOR MENU		
		EXIT SERVICE		
	PRIOR MENU			
	EXIT SERVICE			
INST VERIFY				
EXIT SERVICE				

1. Indicates a cycling self-test with an oscilloscope trigger pulse available at the CONTROL 1 BNC connector on the rear panel, even though test results displayed on the CRT are not necessarily updated. This feature is very useful for troubleshooting.

2. Indicates a failure mode menu that appears only when the previous level test has failed.

OVERALL INSTRUMENT DESCRIPTION

Refer to figure 8-4, "HP 8757C/E Simplified Block Diagram".

The HP 8757C/E Scalar Network Analyzer is a microprocessor-based receiver for making scalar (magnitude only) transmission and reflection measurements on microwave devices. Any of three inputs in the standard instrument (A, B, and R) or four inputs in the HP 8757C Option 001 (A, B, C, and R) may be chosen to make absolute or ratio measurements on four (two for the HP 8757E) identical but independent measurement channels. In addition to the HP 8757C/E receiver, a typical measurement setup includes a swept microwave source, compatible microwave detectors, directional bridges, and couplers.

The analyzer uses either AC or DC detection techniques of scalar network analysis. In AC detection, the microwave source is amplitude modulated on and off at 27.778 kHz with a 50% duty cycle square wave. External detectors peak detect the microwave signal after it has passed through any device under test or directional accessories. In DC detection, an AC/DC detector or bridge modulates the detected signal at 27.778 kHz. This eliminates the need for amplitude modulation of the source. Although the square wave frequency is fixed at 27.778 kHz (regardless of the microwave frequency), its amplitude corresponds to the power level of the microwave signal. Because the amplitude information is carried at 27.778 kHz, the analyzer is AC coupled and tuned to 27.778 kHz to reduce DC offset errors and noise.

Overview

The A, B, C (HP 8757C Option 001), and R detector inputs are logarithmically shaped and rectified by identical log amplifiers A7, A8, A9 (HP 8757C Option 001 only), and A10. The outputs are DC voltages representing a microwave power level for each input. These analog signals are converted to digital data by the A4 ADC (analog-to-digital converter) and read by the A3 CPU (central processing unit). The A3 CPU processes the data and sends it to the A14 display interface which then formats it to be viewed on the A15 display. The A3 CPU also interfaces with the A1/A2 front panel, and can communicate with other instruments through the A6 HP-IB over two HP-IB ports. The A5 modulator driver provides a 27.778 kHz drive at the rear panel to amplitude modulate the microwave source or an external modulator, if required. The A12 power supply provides four supply voltages for the analyzer, as well as two independent supplies for the A14 display interface and A15 display.

A7/A8/A9/A10 Log Amplifiers

The A7/A8/A9/A10 log amplifiers buffer, filter, log, and rectify the front panel input signals. The output from each log amplifier is a DC voltage proportional to the 27.778 kHz modulation envelope being detected at each of the inputs.

External microwave accessories (detectors or bridges) detect the 27.778 kHz amplitude modulated signal received. The amplitude of the 27.778 kHz detector output represents the microwave power level of the input. The A, B, C, and R inputs are connected to the A7, A8, A9, and A10 log amplifiers respectively. The buffer at the input of each log amplifier assembly isolates the signal and eliminates common-mode noise. A bandpass filter with a 27.778 kHz center frequency further reduces noise and filters the square wave into a sine wave. The logarithmic amplifier circuit produces an output waveform proportional to the logarithm of its input signal. This output waveform represents the input in dB. The precision rectifier then peak detects the log shaped 27.778 kHz sine wave, producing a DC voltage proportional to the 27.778 kHz detector output in dB.

A4 Analog-to-Digital Converter (ADC)

The A4 ADC assembly converts the DC voltages from the A7/A8/A9/A10 log amplifiers into digital information to be read by the A3 CPU.

Each output from the A7/A8/A9/A10 log amplifiers goes to a buffer and sample/hold circuit on the A4 ADC assembly. The A4 ADC samples and digitizes the DC voltage representing the microwave power level (the vertical or Y-axis on the display) at 101 to 1601 points (HP 8757C) or 101 to 401 points (HP 8757E) during a sweep (the horizontal or X-axis on the display). The sample/hold timing is controlled by the sweep comparator. The sweep comparator has two inputs: the 0 to 10 V dc SWEEP IN ramp from the external source, proportional to frequency, and internal sweep DAC (digital-to-analog converter) voltage, controlled by the A3 CPU.

With the sample/hold switches closed (sample mode), the sample/hold sequence is the following:

1. The A3 CPU sets the sweep DAC to a voltage corresponding to one of the points along the 0 to 10 V dc SWEEP IN ramp. The inputs (a maximum of four) to be digitized are also selected.
2. The sweep ramp from the source rises smoothly until it equals the sweep DAC voltage, firing the sweep comparator and opening the sample/hold switches (hold mode).
3. The ADC converts the analog signals into digital form, and stores them into temporary memory.
4. The sample/hold switches are closed (sample mode).
5. The A3 CPU reads the digitized outputs from the temporary memory.
6. The A3 CPU sets the next DAC voltage, enables the sweep comparator, and the cycle repeats for the rest of the sweep.

The blank/marker detector decodes the various levels on the POS Z BLANK input from the source. The blank/marker detector recognizes four distinct levels for the A3 CPU to read:

- +5 V dc = Blank (retrace and bandswitch points).
- 0 V dc = Display (normal trace, forward sweep).
- −4 V dc = Marker (intensity markers).
- −8 V dc = Active marker (high intensity markers).

The A3 CPU can halt the forward sweep of the source with the stop sweep driver.

Also located on this assembly is the detector control circuitry. This allows the A3 CPU to monitor the detector's characteristics and control its operating mode.

A3 Central Processing Unit (CPU)

The A3 CPU (essentially a small computer) coordinates and controls all major functions in the analyzer. It communicates with other assemblies via the instrument bus. In this way, the A3 CPU reads the digitized inputs from the A4 ADC, processes and formats the data, and sends it to the A14 display interface board. The A3 CPU communicates with the A1/A2 front panel via the instrument bus, and with external instruments or a controller via the A6 HP-IB assembly.

The microprocessor steps through its program, executing program instructions from ROM (read-only memory) via its internal digital bus. The microprocessor also stores and retrieves temporary data in RAM (random access memory). The RAM is protected with a battery supply so that data is not lost when line power is switched off. The instrument bus interface provides buffering for the instrument bus to communicate with other major assemblies. Calibration data is stored in non-volatile EEPROM.

In normal operation, the microprocessor reads digital information from the A4 ADC through the instrument bus to determine the A, B, C, and R input values. In most cases, the microprocessor performs several calculations on the raw data (error correction with calibration constants, normalization, averaging, and two-channel ratioing) using data from RAM. Then the A3 CPU formats the information and sends it to the A14 display interface to be viewed.

The A3 CPU also communicates with the A1/A2 front panel and the A6 HP-IB via the instrument bus.

A14 Display Interface, A15 Display

The A14 display interface assembly receives digital information from the A3 CPU and generates the analog signals used to display data on the A15 display.

The A14 display interface assembly is a TMS-34010 based graphics system processor. The digital interface is directly microprocessor-compatible, and is connected to the A3 CPU via the instrument bus. Internal memory makes display refreshing automatic without the need for microprocessor intervention. The digital interface produces horizontal and vertical sync signals for the A15 raster scan display. Separate red, green, and blue (RGB) signals are generated and sent to the A15 display. For the HP 8757E, only a green signal is generated. In the HP 8757C, additional RGB outputs are also sent to the A16 RGB interface board.

A16 RGB Interface (HP 8757C only)

This board buffers the RGB information and combines the sync signals upon the green video such that the output signals on the rear panel are compatible with most multi-sync color monitors. This allows large screen color displays to be used with the HP 8757C.

A1/A2 Front Panel

The A1 front panel and A2 front panel interface allow the user to select measurement modes and alter measurement parameters with the front panel keys and rotary knob. The instrument's HP-IB status is indicated on the front panel with LEDs.

The A1 front panel and A2 front panel interface provide the interface between the A3 CPU and the user. The keyboard interface and RPG (rotary pulse generator) interface decode the pushbutton keyboard and RPG knob for the A3 CPU to read. The detector bias circuits, part of the A2 front panel interface, provide bias supplies for external detectors through the front panel input connectors.

A6 HP-IB

The A6 HP-IB (Hewlett-Packard Interface Bus) assembly provides two IEEE-488 ports with rear panel connectors, for the analyzer to communicate with other instruments and controllers.

HP-IB interfaces allow the synchronous A3 CPU to interface with the asynchronous IEEE-488 format. Bidirectional HP-IB drivers buffer and drive the two ports. Although the two HP-IB ports are electrically identical, they are *not* interchangeable. The HP INTERFACE BUS port is the general purpose HP-IB port, and is normally connected to an external controller such as a calculator or desktop computer. The controller then remotely controls the analyzer. Other instruments can also be connected to the HP INTERFACE BUS port in a system configuration with the external controller. The 8757 SYSTEM INTERFACE port, however, allows the analyzer itself to control a compatible source, plotter, and printer. External controllers cannot normally use this port.

A5 Modulator Driver

The A5 modulator driver provides a 27.778 kHz square wave output at the rear panel to amplitude modulate the microwave source or an external modulator when the analyzer is in AC mode.

If the source has accurate internal 27.778 kHz ±20 Hz square wave modulation, no connection to the MODULATOR connector of the analyzer is required. If the source does not have internal square wave modulation, the signal from the MODULATOR connector can be used to control the AM or pulse modulation inputs of the source. The A3 CPU controls the square wave modulation on/off function through the instrument bus.

A12 Power Supply

The A12 power supply provides two sets of regulated DC supply voltages for the analyzer. One set consists of the +15 V, +5 V, −15 V, and −12.6 V regulated power supplies. The +15 V, +5 V, and −15 V supplies are used to power the analog and digital circuitry in the analyzer. The +15 V and −12.6 V supplies are used to bias external detectors through the front panel input connectors. A separate set of display power supplies provide +65 V and +5 V for the A14 display interface and A15 display.

OVERALL INSTRUMENT TROUBLESHOOTING

Refer to figure 8-5, "HP 8757C/E Overall Troubleshooting Block Diagram".

This section describes the first level of troubleshooting procedures to diagnose and repair a faulty analyzer. Failures are described by symptom and are listed in the order in which these symptoms should be checked. This is because the microprocessor and front panel must be functioning properly for other problems to be effectively diagnosed.

Most procedures isolate a failure to a single major assembly. Refer to the troubleshooting sections for the individual assemblies for additional information.

Line Power and Power Supplies

Assumptions: None.

Symptoms:

- The fan does not rotate when line power is turned on.
- The display is blank.
- The front panel LEDs are all off.

(Power supply failures may be responsible for many apparently unrelated symptoms.)

Connect the analyzer to a known good line power source and turn on the line power switch. (Be sure that the correct fuse is installed.) Listen for the fan rotating. If the fan is not rotating, check the voltage selector card and line fuse on the rear panel line module.

The fan is a DC fan operating from the −15 V unregulated supply. If it is not operating check fuse A12F8.

A thermal switch is wired in series with the line power switch to shut down the analyzer if the heat sink on the A12 power supply exceeds 90°C. If the analyzer shuts itself down, turn the line switch off and allow the instrument to cool. Check the fan filter and ensure it is clean. All instrument filters should be cleaned regularly, once a month or more often. A clogged filter will cause overheating and consequent degradation of performance.

Remove the bottom cover and check the A12 power supply. There are two supply voltages for the A14/A15 display and four more for the remaining assemblies. All six supplies are monitored by six green LEDs. These LEDs light when the corresponding supply voltages are within approximately 20% of nominal. If one or more LEDs does not light, check the six fuses on the A12 power supply. Test points are also available near each LED so that each supply voltage can be measured with a DVM. Refer to A12 power supply "Troubleshooting" for details. Failures in any supply other than the +5 V instrument supply should be caught with the self-tests upon power up (error code 12).

Self-Test and Error Codes

Assumptions: Line power is present, power supplies are verified.

Symptoms:

- A binary error code is displayed on the A3 CPU LEDs or the front panel HP-IB STATUS LEDs.
- An error message is displayed on the CRT.

Turn on the line power or press **[PRESET]** to cause the analyzer to go through its preset routine. This brief but thorough self-test routine verifies that key parts of the analyzer are functioning. If any part of the self-test fails, the resulting error condition is indicated in one or more of three places:

1. A3 CPU. Four red LEDs on the A3 CPU (labeled "MSB") indicate an error code between 15 and 0. The LEDs have a binary weight of 8-4-2-1 from left to right. These error code indicators are the most reliable.
2. Front Panel R-L-T-S. The four HP-IB STATUS lights on the front panel also indicate an error code between 15 and 0 (identical to the A3 board). These lights are labeled R-L-T-S, from left to right, and have a binary weight of 8-4-2-1 respectively. This error code indicator functions only if the A1/A2 front panel assembly and the instrument bus are working correctly.
3. Display. The CRT display indicates other error conditions and more detailed error messages. This error indicator functions only if the A14 and A15 display assemblies are working correctly.

Turn on the analyzer or press **[PRESET]**. If any error code or other message appears on any of the three error code indicators, refer to "Self Tests" and table 8-1 for further information on where to look for troubleshooting techniques.

Front Panel

Refer directly to A1 front panel and A2 front panel interface "Diagnostic Tests" and "Troubleshooting" for all front panel problems.

Display

Refer directly to A14 display interface "Diagnostic Tests" or "Troubleshooting" for all display problems. From this point it should be easy to isolate any problem to either the A14 display interface or the A15 display.

Data Acquisition and Sweep Comparators

Assumptions: Power supplies are good; self-test passes; front panel and display function normally. The analyzer is connected and configured as shown in figure 8-5, "HP 8757C/E Overall Troubleshooting Block Diagram", (POS Z BLANK of source connected to POS Z BLANK of HP 8757C/E, and SWEEP OUT of source connected to SWEEP IN 0-10V of HP 8757C/E).

Symptoms:

- No trace on display.

NOTE: This applies when there is no trace whatsoever on the display. This condition is caused when the analyzer is not tracking the SWEEP IN 0-10V or POS Z BLANK from the source. This condition prevents any data from being taken or displayed. If *any* trace appears on the display, regardless of whether it is noisy or whether the amplitude is correct, refer directly to "Analog Accuracy".

Check A4TP17 (SWP) for a 0 V to −10 V sweep ramp (inverted). If it is absent, check the SWEEP OUT signal from the source, and the connections. Lack of a sweep may indicate that the source's STOP SWEEP line is held low. Remove any connection to the STOP SWEEP line from the source. If the source's sweep ramp is present but there is still no sweep ramp at TP17, refer to A4 ADC "Troubleshooting", especially the sweep buffer information.

Check A4TP15 (DAC) for a 0 V to +10 V ramp. Also check A4TP13 (HOLD), A4TP11 (L CNV), and A4TP10 (L CC) for activity. If any or all signals are absent, refer to A4 ADC "Troubleshooting."

Analog-to-Digital Conversion and Analog Accuracy

Assumptions: Power supplies are present and accurate (refer to A12 power supply "Troubleshooting" for nominal voltages and limits). Self test passes; front panel and display function normally; A4TP15 (DAC) shows a 0 V to +10 V ramp; A4TP13 (HOLD), A4TP11 (L CNV), and A4TP10 (L CC) show bursts of activity. The analyzer is connected to an HP 8350B Sweep Oscillator and configured as shown in figure 8-5, "HP 8757C/E Overall Troubleshooting Block Diagram".

Symptoms: There is a *horizontal* trace on the display, but the *vertical* information is one of the following:

- Noisy.
- On the extreme top or bottom graticule, or at +20 dBm or −70 dBm (for a single input measurement).
- Does not reflect the actual detector input power within ±1.0 dB.

Set up a known square wave modulated power level to the detector. Determine which of the inputs (A, B, C, or R) is defective. If all the inputs appear defective, perform a system configuration by pressing **[CAL]** ***[CONFIG SYSTEM]***. Check the detector, source, square wave modulation, and the bias voltages to the front panel detector input connectors.

Remove the bottom cover and check the cables and connections between the front panel input connectors and the A11 motherboard (these cables are P/O W1, W2, W3, and W4). Check the bias connections to the A2 front panel interface (P/O W1-4). Check the bias to the detectors at the front panel jacks.

Check the output voltages from the log amplifiers A7/A8/A9/A10 to the A4 ADC first with a +10 dBm modulated signal applied to the detectors and then at the noise floor (no signal applied). The typical log amplifier output voltage is approximately +6.5 V at +10 dBm and approximately −6.3 V at the noise floor. If these voltages are present, the corresponding log amplifiers are probably functional. If not, press **[MEAS]** and select the defective input. Then press **[CAL]** ***[MORE] [AUTOCAL OFF] [TEMPCAL OFF]*** and remove the corresponding log amplifier from its connector. The display should indicate approximately −32 dBm. If so, refer to A7/A8/A9/A10 log amplifier "Troubleshooting." If not, refer to A4 ADC "Troubleshooting." Note that if ***[CONFIG SYSTEM]*** is pressed while a log amplifier assembly is removed, the displayed data is completely invalid.

CAUTION

The A7-A10 log amplifier assemblies CANNOT be interchanged or replaced without recalibrating the analyzer. Boards can be temporarily interchanged for troubleshooting purposes, but each board must be returned to its original position. Recalibration is also required if adjustments are altered on the log amplifiers. Recalibration of the analyzer requires the use of an HP 11613A/B calibrator and an HP 9000 Series 200/300 computer.

HP-IB

Assumptions: Self test passes; analyzer functions normally in manual operation.

Symptoms:

- The HP interface bus or 8757 system interface does not function correctly.
- The analyzer does not respond to the controller through the HP INTERFACE BUS port.
- The analyzer cannot control the HP 8350B, 8340A/B, 8341A/B, printer, or plotter through the 8757 system interface.

Check the connections between the analyzer and other instruments or the controller. The HP INTERFACE BUS port must be connected to a computer controller (such as the HP 9836A) and cannot be used when the analyzer is acting as controller. The 8757 SYSTEM INTERFACE port must be connected only to a compatible source, printer, or plotter, not to an external controller. Other instruments are not allowed (unless ***[SYSINTF ON OFF]*** in the sweep mode menu is set to ***[OFF]***). Refer to the *Operating Reference* in section 3 of the operating manual for details. There must be no bus connection between the two ports.

Check the addresses of all equipment attached to either port. The analyzer must not be set to the same address as any other device connected to either the HP INTERFACE BUS port or the 8757 SYSTEM INTERFACE port. Refer to the description of the local menu in the *Operating Reference* for more information.

Check the controller software used to command the analyzer. Software errors are often the source of HP-IB problems. If in doubt, run the example programs given in the introductory programming guides included in section 3 of the operating manual. Do not use an HP 9876A printer, if transferring digital data, as this may cause the system to lock up.

Verify the two ports with internal diagnostic tests. Remove all connections from both ports, and attach only a single HP-IB cable between the HP INTERFACE BUS port and the 8757 SYSTEM INTERFACE port. On the analyzer, press **[PRESET] [SYSTEM]** ***[MORE] [SERVICE] [A6 HPIB INSTBUS] [HPIB TESTS] [HPIB TALK]***.

The message HPIB TALK PASS indicates that the HP INTERFACE BUS port can send data to the 8757 SYSTEM INTERFACE port. Next press ***[HPIB LISTEN]***. The message HPIB LISTEN PASS indicates that the HP INTERFACE BUS port can accept data from the 8757 SYSTEM INTERFACE port. Any other message indicates a failure. (In both tests, the 8757 SYSTEM INTERFACE acts as the bus controller.) Refer to A6 HP-IB "Troubleshooting" for further information.

Modulation

Refer directly to A5 modulator "Troubleshooting" for all modulation drive problems.

A1 FRONT PANEL AND A2 FRONT PANEL INTERFACE

CONTENTS

CIRCUIT DESCRIPTION

The A1 front panel and A2 front panel interface are documented together. The circuit description is organized functionally and applies to both assemblies.

The A1 front panel and A2 front panel interface provide the interface between the A3 CPU (central processing unit) and the user. In manual operation, the user specifies measurement modes, selects inputs, enters reference or scaling values, and controls other functions with the front panel pushbutton keys and the RPG (rotary pulse generator) knob. The A3 CPU reads the keyboard and RPG through the A2 front panel interface, and takes the appropriate action. The A3 CPU also causes a display of the current HP-IB status using LEDs (light emitting diodes) on the front panel. Refer to the A1/A2 schematic, figure 8-11, for the following descriptions.

A. ADDRESS DECODER/RESET

The A3 CPU reads from and writes to the A1/A2 front panel through the instrument bus. The address decoder decodes the instrument bus address lines to select the proper circuit to send or receive the information on the data lines. Three-to-eight decoder U5 decodes address lines IA1, IA2, and IA3 to pulse one of six output lines low. Address lines IA4 through IA8, plus L IOS, enable the outputs and control the timing. Inverter U7 buffers and inverts two lines. One address decoder output resets the RPG circuit (rather than controlling the flow of data.) Table 8-6 lists the six address decoder outputs, together with the appropriate addresses to activate them and the functions they perform.

The reset filter buffers the L RESET line from the A3 CPU to the A2 front panel interface. L RESET goes low to reset the keyboard interface column driver and LED drivers. The L RESET line is filtered to prevent front panel noise pulses from resetting other assemblies in the instrument.

B, C. RPG INTERFACE, RPG

The RPG (rotary pulse generator) and the RPG interface allow the operator to change reference, scale, and other values with a rotary knob. The RPG outputs two TTL square wave pulse trains when it is rotated. The frequency of the pulse trains depends on how fast the RPG is turned, and the phase relation between the two pulse trains depends on the direction of rotation. Inverters U3B and U3C buffer the pulse trains to up/down counter U13. One line clocks U13 one count on its rising edge; the other controls the up/down input, causing the counter to increment when the line is high and decrement when the line is low at each rising clock. The A3 CPU reads the count from U13 on the data bus at regular intervals to determine whether the RPG is being turned, how fast, and in which direction. After reading U13 each time, the A3 CPU resets it to zero.

D, E. LED DRIVER, LEDs

The front panel LEDs labeled R (remote), L (listen), T (talk), and S (service request) indicate the current HP-IB status or error code. One half of an eight-bit register, U12, drives the LEDs from the data bus. The A3 CPU writes the appropriate pattern to each register: a data bit low turns the corresponding LED on; a data bit high turns the LED off. Resistors R4, R5, R6, and R7 limit the current drawn through each LED. Under normal conditions, this data is passed through multiplexer U14. However, if excessive current is drawn by any detector, the short circuit protection circuit will switch the multiplexer to flash all four LEDs at a 3 Hz rate (see "M. Power Supply/Short Circuit Protection").

F, G. PRESET BUFFER, [PRESET] KEY

When U3C pin 11 is enabled high, the **[PRESET]** key, when pressed, resets the A3 CPU microprocessor. When the **[PRESET]** key is released, the HP 8757C/E goes through its turn-on procedure and sets up a known instrument preset state. When the **[PRESET]** key is pressed, L PRESET KEY goes low. U3E inverts L PRESET KEY for NAND gate U3C. U3C then pulls its open-collector output L IPRESET low to reset the A3 CPU. The CPU can disable the **[PRESET]** key (such as during HP-IB remote operation) by writing a high to U3A. This makes U3C pin 11 low and forces U3C pin 8 high (inactive) whether the **[PRESET]** key is pressed or not. Note that L IPRESET controls L RESET indirectly through the A3 CPU.

H, I. KEYBOARD INTERFACE, KEYBOARD

The front panel keyboard is electrically arranged in a matrix of five columns and eight rows. The A3 CPU detects a depressed key by writing to column strobing register U11A and reading row sensing buffer U10. In normal operation, the CPU writes low to KCOL0 through KCOL4. Then, once per millisecond, the CPU reads KROW0 through KROW7 via U10. If all row lines are high, no keys have been pressed, and the A3 CPU takes no action. If any row line is low, the A3 CPU recognizes that a key has been pressed, and can identify the row but not the column. Now the CPU writes high to KCOL0 through KCOL4 except low to one, and reads U10 again to see if the particular row is low. If so, the A3 CPU can now identify both row and column and pinpoint the key pressed. If not, the A3 CPU sets the next column low in sequence, until the column can be identified.

The A3 CPU performs pushbutton de-bouncing in firmware. During remote operation, the entire front panel is ignored except for the **[LOCAL]** key. During remote operation with local lockout, the firmware also ignores the **[LOCAL]** key.

K. FRONT PANEL INTERRUPT

The A3 CPU can also sense RPG or keyboard activity through an interrupt from L SRQFP. Interrupts from the RPG can be generated when U11B pin 6 is set high by the CPU. Keyboard interrupts are enabled by U11B pin 9. Strobing the keyboard or reading the RPG counter will clear the interrupt by resetting U1A or U1B.

L. DETECTOR BIAS/CONTROL

LCL tee-section filters reduce power supply noise to external accessories such as detectors or bridges. The accessories require these supplies to bias detectors and provide power supply voltages for preamplifiers. Note that filtering is referenced to chassis ground. A 10 ohm resistor in the power supply block connects chassis ground to analog ground to provide a DC return path when the front panel assembly is removed from the chassis frame. Detector control lines are clamped by diodes to the +15 volt and −12.6 volt supplies.

M. POWER SUPPLY/SHORT CIRCUIT PROTECTION

An LC filter reduces digital noise on the +5VDIG supply voltage. Local capacitive filtering reduces noise near susceptible components. The +5 V supply for the front panel LEDs is received through A1W1. There are no active components on the A1 front panel assembly.

The short circuit protection will shut down the +15 and −12.6 volt supplies to the front panel detector connectors if more than about 130 or 80 mA, respectively, is drawn from the supplies. Current sensing is performed by sensing the voltage drop across the 1000 μH inductor in each leg of each supply (see "L. Detector Bias/Control). The resistance of this inductor is typically 15 ohms. When the voltage drop exceeds 1.25 or 2 volts, the corresponding comparator will turn on, pulling L BIAS OFF low. This shuts off both supplies by turning off Q1 and Q3. It also enables the 3 Hz flashing of the error code LEDs on the front panel. The voltage at the noninverting inputs of U15 is about 11.35 volts while the voltage at the inverting input of U16 is about 6.52 volts. Note that the sensed voltage at U16 is first divided by two through U17.

DIAGNOSTIC TESTS

Operator-initiated diagnostic tests for the front panel and front panel interface are accessed by pressing **[SYSTEM]** ***[MORE] [SERVICE] [A1/2 FP]***. This sequence presents a menu of tests that are described below.

In some cases, the analyzer can force a diagnostic test even if the front panel is not working. To access this feature, close the indicated status line switches on the A3 CPU and either press **[PRESET]** or momentarily short A3TP46 (L PRST) to ground.

[READ RPG]

Checks the rotary pulse generator (RPG) and its associated counter A2U13, as well as the address decoder and the RPG interrupt circuitry. The display shows the four-bit count in the RPG counter, and the last direction of RPG rotation. Turn the RPG slowly and check that the displayed count changes. Turn the RPG clockwise to increment the count, and counterclockwise to decrement the count. The counter will overflow from 1111 to 0000 or underflow from 0000 to 1111. The counter is not reset during this test, so the L CLR RPG line is not checked.

[READ KEY] (Forced entry: Close A3S1-A and A3S1-C)

Tests the front panel key switches and key matrix, column strobing (A2U11A), row sensing (A2U10), associated address decoding (A2U5 and A2U7C), and the A3 CPU's ability to read keys. The keyboard interrupt circuitry is also checked whenever a key is pressed. Press any key except **[PRESET]**, and the CRT should display the name of the last key pressed. When a key is pressed or held, the display indicates ***ON**. Softkeys are labeled on the right side of the display, except in the case of forced entry when no softkey labels are displayed. Press **[PRESET]** to exit this test.

NOTE: The HP 8757C/E uses two different methods for detecting a front panel key press. One method is used for normal instrument operation; the other is used during the service routines. If the keyboard appears dead during normal operation but the forced ***[READ KEY]*** diagnostic test appears to work, suspect the 1 ms interrupt timer A3U36-Pin 17 and its associated circuitry on the A3 CPU assembly.

[CYCLE] (Forced entry: Close A3S1-C)

[CYCLE] exercises the front panel address decoding (A2U3, A2U4, A2U5) and data lines. All the address decoder lines used are briefly enabled by the A3 CPU. The A3 CPU also writes a data pattern to the column strobing latch A2U11A. Use an oscilloscope to check for activity similar to the waveforms shown in figure 8-6. The cycle is approximately 9 ms long. All the front panel LEDs should light.

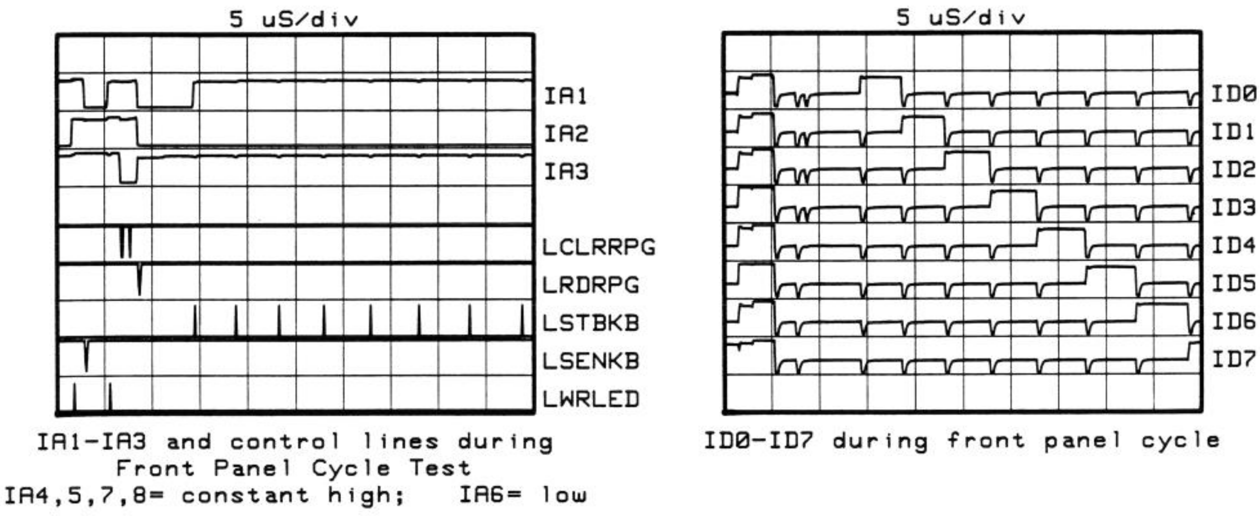


Figure 8-6. Front Panel Cycle Test Waveforms

[LEDS]

This test exercises all the front panel LEDs, driver A2U12, and the address decoding. The LEDs light one at a time in sequence. The sequence repeats continuously. Visually check that all the LEDs light, in sequence, and one at a time.

[PRESET DISABLE]

This test verifies the ability of the preset buffer to disable the preset key by writing a logical 0 to A2U4 pin 11 (logical 1 at U11 pin 5). Press **[PRESET]**, and verify that this has no effect. This preset lockout feature is used when the analyzer is in HP-IB local lockout mode.

TROUBLESHOOTING

NOTE: The A1 front panel and A2 front panel interface assemblies are documented together. The troubleshooting information is organized functionally, treating parts of both assemblies together.

Many diagnostic tests and simple front panel checks can be performed without removing the front panel from the chassis frame. If necessary, however, see "Front Panel Removal Procedure" following this troubleshooting information, to make disassembly and troubleshooting easier.

BASIC CHECKS

The A1/A2 front panel circuits include keyboard functions, LED annunciators, and the RPG.

Turn on the line power or press **[PRESET]** to run the self-test procedure. If the self-test fails, four red LEDs on the A3 CPU will display an error code. The four front panel HP-IB STATUS LEDs and the display may also show error codes or error messages. See table 8-1," Self-Test And Main Error Code Summary" to interpret these results.

If the front panel LEDs or the display flash or blink randomly, see A3 CPU "Troubleshooting" and verify the A3 assembly. If the LEDs flash at a 3 Hz rate, it indicates a possible short circuit in one of the detectors connected to the front panel; remove detectors one at a time to determine the source of the fault.

Check for +5 V at TP5 (+5V). If it is missing, trace the problem back to the A12 power supply.

Check that the front panel interface cable W5 is correctly seated to the motherboard jack A11J1 and the front panel interface connector A2J1. Check that the bias cables W1-4 are properly seated. Check that the RPG wires are connected to A2J7. Check that the front panel cable A1W1 is connected to A2.

Note that the A3 CPU services the front panel on a timed interrupt basis. If there is no response when keys are pressed, but the following checks verify the A2 front panel interface circuits, be sure to verify the A3 CPU timer A3U36, the interrupt controller A3U22, and their associated circuitry.

KEYBOARD AND INSTRUMENT BUS VERIFICATION

First verify the instrument bus connections between the A2 front panel interface and the A3 CPU. (All data lines between the A3 CPU and the A6 HP-IB, which are shared by the A2 front panel interface, are verified during self-test. If not, error code 13 is displayed.) If error code 13 appears, refer to A6 "Troubleshooting" and associated information. Correct the failure before proceeding with troubleshooting the A1/A2 front panel. All A1/A2 front panel functions depend on good instrument bus connections to the A3 CPU. Furthermore, most A1/A2 front panel diagnostic tests are accessed with the keyboard, and therefore require good keyboard interface connections.

If the keys and the display appear to be functioning, run the ***[READ KEY]*** diagnostic test. If this test cannot be called through the keyboard, close A3S1-A and A3S1-C, then press **[PRESET]** or ground A3TP46 (L PRST), to run the test. Press *all* keys and verify that the corresponding label for each appears on the display. If all the key labels are displayed, the instrument bus data lines to the front panel are completely verified.

If this check fails, verify the address lines to the A2 front panel interface by running the ***[CYCLE]*** test. If the keyboard does not function, close switch A3S1-C, then press **[PRESET]** or ground A3TP46 (L PRST) to run the test. While the front panel cycle test is running, all the address decoder outputs used are enabled in turn. Examine each with an oscilloscope for activity similar to the waveforms shown in figure 8-6. If these waveforms are not present, trace the problem to A2U3, U4, or U5, or trace the address lines back to the A3 CPU. Also check for activity on L IOSTB.

In addition, while the front panel cycle test is running, the A3 CPU writes a data pattern to the column strobing latch. Examine the outputs of A2U11A for a "walking 1" pattern. If this is missing, suspect A2U11A or the data line connections. The keyboard matrix itself can be tested with the front panel ***[CYCLE]*** test. (However, the front panel ***[READ KEY]*** diagnostic test is much easier, if it can be run.) The column strobing lines are automatically exercised. Press any key, and verify that the corresponding row sensing line follows the corresponding column strobing line. Use a dual trace oscilloscope to verify timing relationships and rule out shorts. When a key is pressed, a 7 μs upward pulse should be visible at the appropriate row sensing line. Use the rear panel CONTROL 1 output to trigger the oscilloscope. This makes it easier to check timing relationships.

LEDS

If the LEDs appear burned out, press and hold **[PRESET]**. All LEDs, including the eight red LEDs on the A3 CPU, should light. If none of the LEDs light, check the preset functions and the L RESET line. If one LED does not light, suspect a bad LED.

Run the ***[LEDS]*** diagnostic test. All front panel LEDs should light, one at a time, in sequence. This test fully verifies LED address decoding and the data lines.

RPG (Rotary Pulse Generator)

Run the ***[READ RPG]*** diagnostic test. The display indicates the present count from the RPG counter. (The RPG counter is reset upon entering the RPG test, but not again during the test.) Rotate the RPG clockwise to increment the count, counterclockwise to decrement the count. If the displayed count does not change, suspect the clock line of the RPG. Verify the counter U13 with an oscilloscope. If the direction of the count does not change, suspect the RPG's up/down line.

Verify the RPG counter reset line, L CLRRPG, by exiting the read RPG test while the RPG counter indicates a count other than 0000. Re-enter the read RPG test and verify that the displayed count is now 0000.

FRONT PANEL REMOVAL PROCEDURE

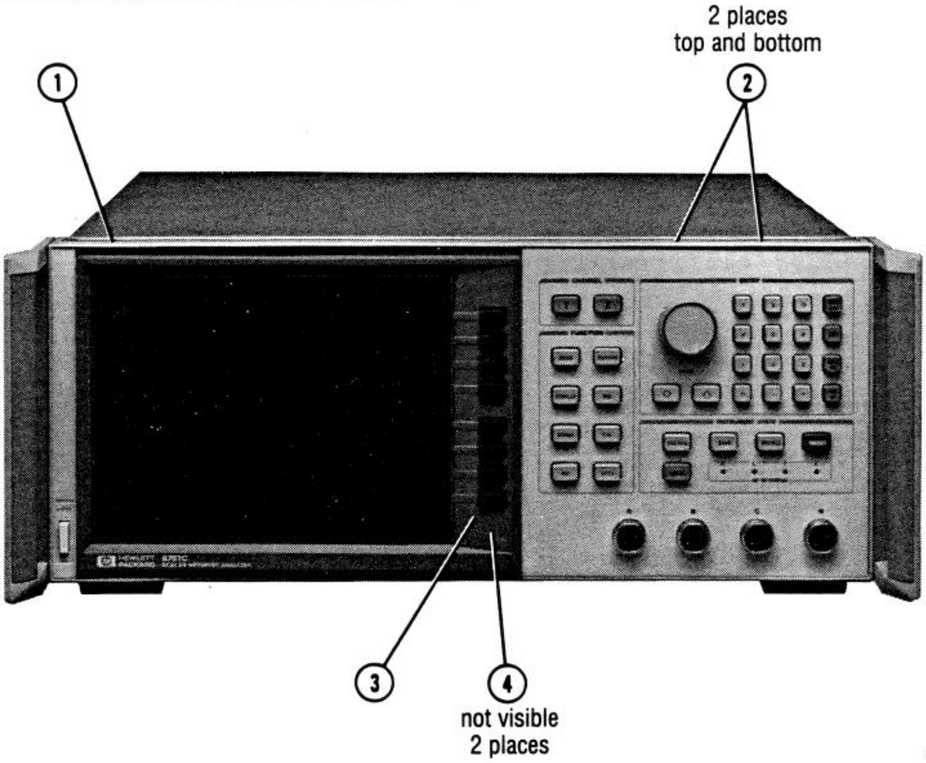


Figure 8-7. Front Panel Removal

To remove the front panel from the analyzer, refer to figure 8-7. The side handles do *not* need to be removed.

At the left edge of the front panel, snap out the softkey button cover (item 3) by inserting a credit card or your fingernail under the cover's left edge and pivoting it out and off. Remove the two round-head machine screws now visible (item 4). Pivot the bezel, with glass filter, out until it releases from the left edge.

Pop off the top trim strip (item 1). Remove the two flat-head machine screws (item 2) revealed on the top right side of the instrument. Place the entire instrument on its left side. Remove the two flat-head machine screws holding the front panel in place at the bottom of the frame (item 2).

The front panel is now held in place by friction only. Its only connections are the cables near its lower edge. You can pivot the top edge of the front panel outward and down for access.

Reinstall the front panel by reversing this sequence.

Table 8-6. A1/A2 Address Decoder Lines

Mnemonic	Address	Destination	Description
L CLRRPG	1FF9B6	U13	Resets RPG counter
L RDRPG	1FF9B8	U13	Reads data from RPG counter
L STBKB	1FF9BA	U11	Writes data to Column Strobing register of keyboard
L SENKB	1FF9BE	U12	Reads data from Row Sensing buffer to sense keyboard
L WRLED	1FF9BE	U12	Writes data to LED register

NOTE: All data is contained on the least significant byte (D0 through D7).

Table 8-7. A1/A2 Pin-Outs

PIN	SIGNAL	I/O	SOURCE/ DESTINATION	FUNCTION BLOCK
1	+5V DIG	IN	A11J6-11	M
2	+5V DIG	IN	A11J6-11	M
3	GND DIG	IN	A11J6-6	M
4	GND DIG	IN	A11J6-6	M
5	ID1	I/O	A3P1-17	D,H
6	ID0	I/O	A3P1-18	D,H
7	ID3	I/O	A3P1-15	D,H
8	ID2	I/O	A3P1-16	D,H
9	ID5	I/O	A3P1-13	F,H
10	ID4	I/O	A3P1-14	H
11	ID7	I/O	A3P1-11	F,H
12	ID6	I/O	A3P1-12	F,H
13	IA7	IN	A3P1-60	A
14	IA8	IN	A3P1-61	A
15	IA5	IN	A3P1-21	A
16	IA6	IN	A3P1-20	A
17	IA3	IN	A3P1-23	A
18	IA4	IN	A3P1-22	A
19	IA1	IN	A3P1-25	A
20	IA2	IN	A3P1-24	A
21	L IOS	IN	A3P1-27	A
22	GND DIG	IN	A11J6-6	M
23	L RESET	IN	A3P1-31	A
24	GND DIG	IN	A11J1-31	M
25	L IPRESET	OUT	A11J1-25	A
26	GND DIG	IN	A11J1-31	M
27	L SRQ FP	OUT	A11J1-27	K
28	GND DIG	IN	A11J1-31	M
29	NC			
30	GND DIG	IN	A11J1-31	M
31	CNTL A	OUT	A4P1-21	L
32	CNTL C	OUT	A4P1-24	L
33	CNTL R	OUT	A4P1-19	L
34	CNTL B	OUT	A4P1-20	L
35	+15V	IN	A11J6-14	M
36	+15V	IN	A11J6-14	M
37	GND PLANE	IN	A11J6-4	M
38	GND PLANE	IN	A11J6-4	M
39	−12.6V	IN	A11J6-10	M
40	−12.6 V	IN	A11J6-10	M

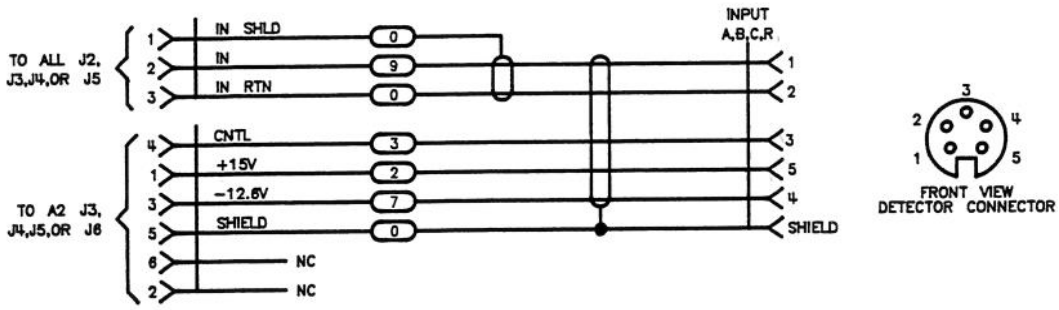


Figure 8-8. W1-4 Detector Interface Cable Schematic

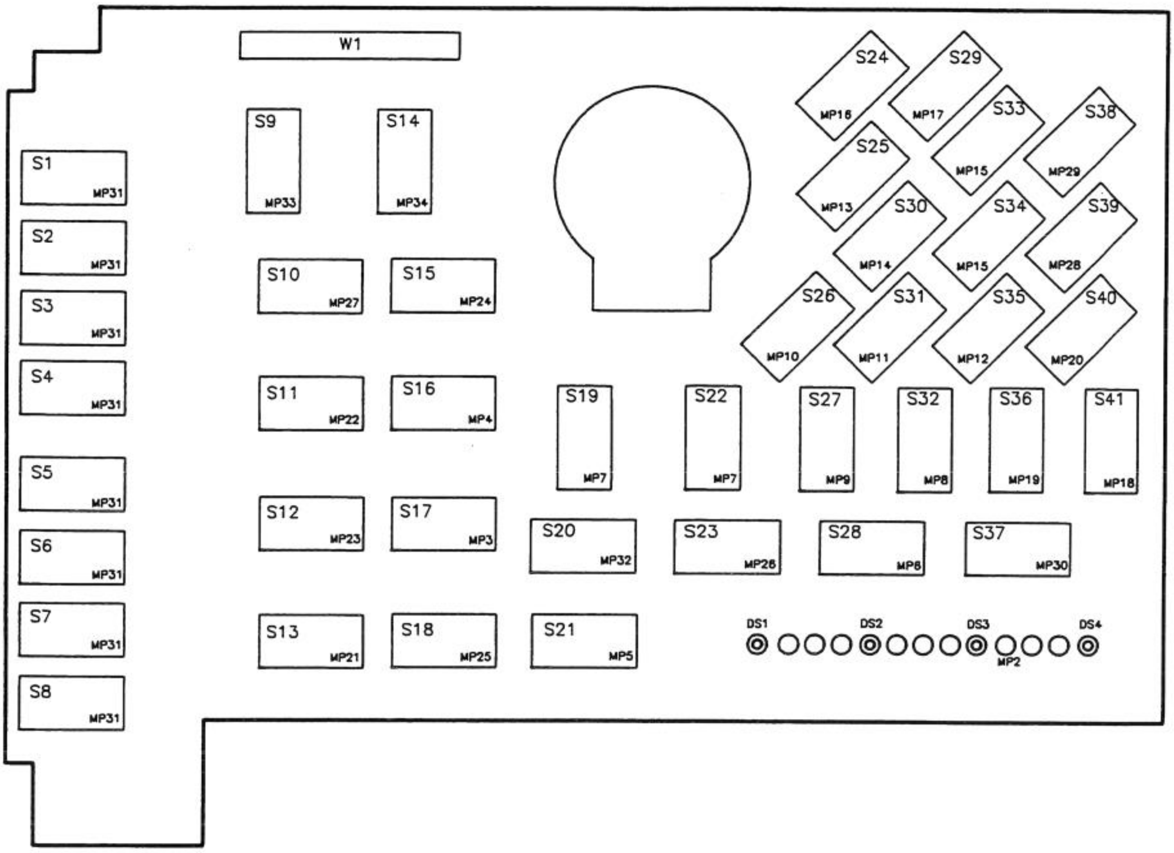


Figure 8-9. A1 Component Locations Diagram

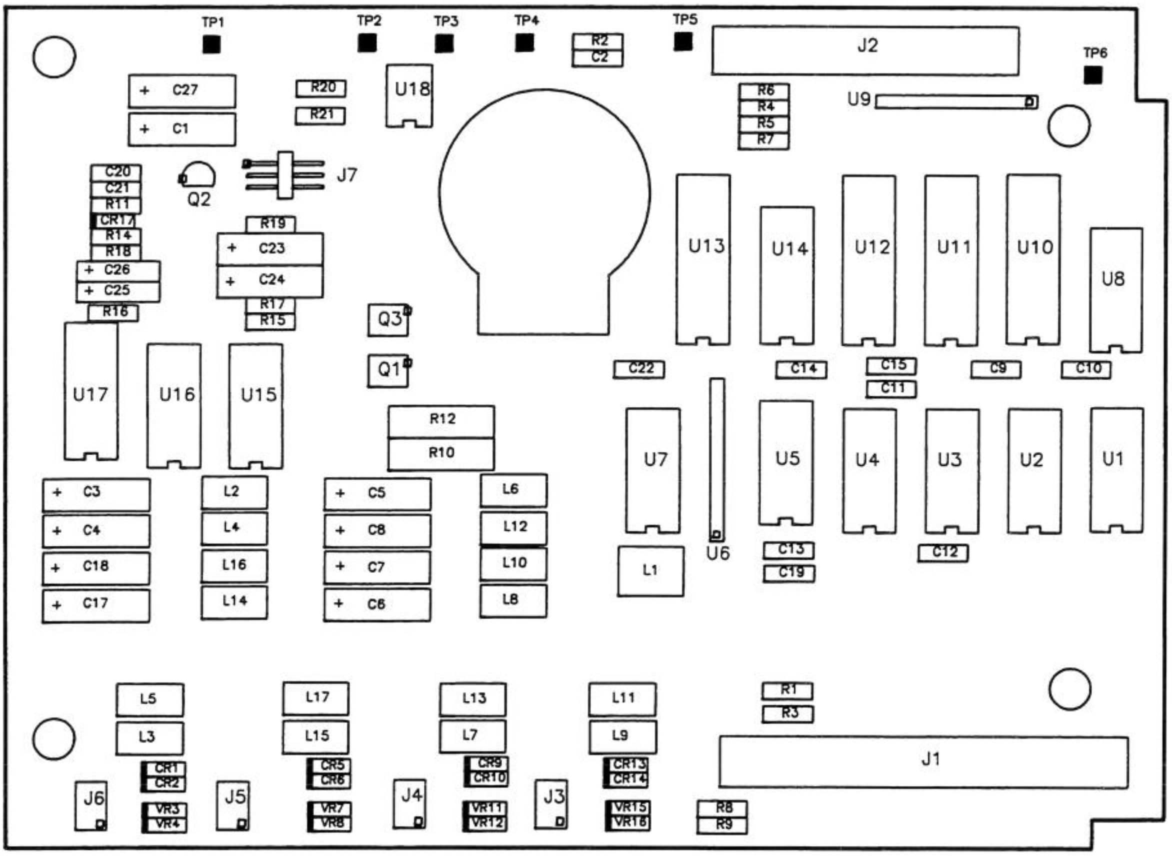


Figure 8-10. A2 Component Locations Diagram

A3 CENTRAL PROCESSING UNIT (CPU)

CONTENTS

CIRCUIT DESCRIPTION

The A3 CPU has digital control of all major assemblies in the instrument. Its microprocessor executes internal program code to read the A, B, C (HP 8757C Option 001), and R inputs through the A4 ADC; to format the data for the A15 display; to receive commands through the A1/A2 front panel; and to communicate with other instruments or a controller through two ports on the A6 HP-IB assembly.

A. CLOCK

The clock generator generates the 10 MHz, 1 MHz, and 200 kHz clock signals used by the CPU, and the 5 MHz clock signal used for the A6 HP-IB assembly.

Oscillator U14 is a TTL buffered 20 MHz free-running crystal oscillator. Counter U15 divides the 20 MHz clock into slower clock signals. The 10 MHz clock is the main system clock for the microprocessor. This signal is also inverted by U25B and is phase shifted by U25A. These two signals are used in the IO timing circuit. The 2 MHz output of U15 drives another divider, U41, to obtain the 1 MHz and 200 kHz timing signals for the timer circuit.

B. POWER-ON/PRESET

The power-on/preset circuit resets the microprocessor when the front panel **[PRESET]** key is pressed. It also controls the power-up sequence.

One-shot timer U13 resets the microprocessor. At power on, C24 keeps U13 pin 2 low momentarily. Then U13 fires to set U13 pin 3 high for about 500 ms and pull L HALT and L MPRESET low to reset the microprocessor. The front panel **[PRESET]** key also triggers U13, resetting the microprocessor. When the instrument is powered down, an interrupt signal will also generate a reset through CR1 after about 1 ms.

L MPRESET is bidirectional (either U12D or microprocessor U9 can pull it low.) U24E and U38A buffer L MPRESET to output L RESET. When low, L RESET resets most major assemblies throughout the instrument to a known state. This occurs at power-on, at preset, or at a microprocessor-forced reset.

C. STATUS/INTERRUPT

The status/interrupt circuitry provides important inputs for the microprocessor: status information, and interrupt source and priority.

Three-state buffer U3 reads status information to the microprocessor on the data bus. When L CPUSTTS goes low, U3 buffers its inputs onto the data bus. Four of the status lines are used to initiate different self-test routines (via S1). See table 8-3, "Forced Diagnostic Tests" for details. One status line is used to determine if the EEPROMs are write enabled, one to determine if any power supply has failed, and two others read the presence of jumpers W1 and W2.

Eight-to-three priority encoder U22 handles interrupts. When one of its eight inputs goes low, U22 encodes the input number on three binary weighted output lines: L IPL0, L IPL1, and L IPL2. If more than one input is low, U22 outputs the highest priority level code. L PF INT has the highest priority and indicates the line power has been disconnected. L DRINT goes low when an analog-to-digital conversion from the A4 ADC assembly is ready. L SRQA and L SRQB go low to request service for the HP interface bus and 8757 system interface, respectively, on the A6 HP-IB assembly. L SRQFP indicates front panel activity, and L STTS INT can indicate one of several conditions from the A4 ADC assembly.

Other sources of interrupts are OR'd together with U21 and have the lowest priority. In order to determine which circuit initiated the interrupt, U19 reads the individual inputs to U21.

D. MICROPROCESSOR

The microprocessor is the heart of the A3 CPU assembly. It controls the entire analyzer, including data input and output operations, and mathematical calculations.

U9 is an MC68000 sixteen-bit microprocessor. It has 23 address lines, although only 20 of them are used to form the address bus. Binary weighted lines A1 through A20 specify an address for the source or destination of data in read or write operations. Test points are available for all the address lines used.

Data lines D0 through D15 form the sixteen-bit data bus. The data bus is bidirectional, and carries data to or from U9. Test points are available for all data lines. U9 pin 9 generates the L WRITE and L READ lines. These control the direction of data transfer on the data bus. (READ always means that U9 is taking in data that some other device has put on the data bus. WRITE always means that U9 is putting out data on the data bus for another device to take in.) U9 pin 6 generates ASTRB (address strobe). ASTRB goes high when the address on the address bus is settled and valid. U9 pins 7 and 8 generate L WRMSB (L =write most significant bits) and L WRLSB (L =write least significant bits). These lines are active when U9 is accessing only eight of its sixteen data lines. (See the following note.)

U9 pin 10 receives the L DTACK (L =data acknowledge) line from I/O timing and U10. L DTACK goes low when data has been received from the data bus. It signals the end of a read or write cycle. See "J. I/O Timing" for details.

NOTE: Address bit A0, the least significant bit, is internal to U9, but it does not appear at a pin and is not part of the address bus. It is used in U9 during eight-bit *byte* operations. When A0 is 1, U9 reads or writes to the least significant data bits D0 through D7. When A0 is 0, U9 reads or writes to the most significant data bits D8 through D15. Byte operations are indicated on U9 pins 7 and 8. During troubleshooting or when using hex data read/write, assume that only full sixteen-bit *word* operations are used, A0 is 0, and all hex addresses are even.

Free run jumper U18 is used during troubleshooting to verify the microprocessor kernel. When U18 is removed, six data line paths are broken. U11B, C, and D, pull D12, D13, and D14 high. U12A, B, and C pull D0, D8, and D15 low. This causes U9 to read a program instruction repeatedly to assist in troubleshooting.

E. ADDRESS DECODER

The address decoder decodes the more significant address lines into control lines that enable major blocks of memory or addressable input/output lines. Refer to table 8-11 for address space allocations, major address decoder lines, destinations, and descriptions. The logic array used for address decoding is also used for determining the proper number of wait states for the data acknowledge line (DTACK) (see "J. I/O Timing").

F. ROM

The ROM (read only memory) stores program data and data constants for the microprocessor to read.

The ROM consists of four 128Kx8 EPROM packages arranged in two pairs to form sixteen-bit words. Each pair is enabled to output data when the appropriate enable line goes low. L ROM must go low to enable the ROMs. Seventeen address lines, A1 through A17, select one of the 128K memory locations within each device. The eight data lines have three-state outputs. Only two of the four possible EPROMs are used. Future firmware upgrades may require all four EPROMs.

G. EEPROM

The EEPROM (electrically erasable programmable read only memory), also known as EEROM, is used as the non-volatile storage location for the calibration constants of all the log amplifier assemblies. Data can be read from it as often as desired, but data can be written to it only a limited number of times. The EEPROM consists of two 2Kx8 packages arranged to form sixteen-bit words. It is enabled when L EEPROM goes low. Data cannot be written to it unless the switch A3S1-E is closed.

CAUTION

The EEPROM contains all the calibration data for all the log amplifiers. NEVER leave switch A3S1-E in the closed position unless you are recalibrating the entire HP 8757 using the HP 11613A/B calibrator, or running the EEROM test, as all the calibration data may be lost.

Data can be written to any given location of EEPROM only a limited number of times (typically >10,000 times). Never perform a hex data rotate at an EEPROM location (hex 0C0000 to 0FFFFE) while the switch is closed. This will quickly destroy the memory retention capability of that location on both EEPROM packages.

Eleven address lines select one of the 2K memory locations within each device. All data lines have three-state outputs.

H. RAM

The RAM (random access memory) is the read and write memory for storing variables. The RAM is protected against power failure by a battery.

The RAM consists of four 32Kx8 memory chips arranged in two pairs to form sixteen-bit words. Each of the four devices is enabled when the appropriate enable line goes low. L READ goes low to read from RAM. All reads are sixteen bits. L WRMSB goes low for writes to the eight most significant bits; and L WRLSB goes low for writes to the eight least significant bits. Writes can be either eight or sixteen bits. Fifteen address lines, A1 through A15, define the 32K memory locations within each device. The data lines have three-state inputs or outputs.

All RAM is protected against data loss during power failure or power off. A battery on the A3 CPU assembly provides the supply voltage to the RAM when the +5VF supply fails. See "M. Power Supply Filtering" for details.

J. I/O TIMING

The I/O timing circuitry controls the timing of data input and output operations and, with the address decoder array logic, generates the L DTACK and L IOS lines. L DTACK goes low either to acknowledge data that has been put on the data bus for the microprocessor by another device (read); or to acknowledge that data has been received from the microprocessor by another device (write). L IOS goes low either to enable devices on the instrument bus to output data on the data bus for the microprocessor (read); or to clock in data from the data bus on either the falling or the rising edge (write).

Shift register U42 and counter U43 form a digital delay line. 10 MHz clocks the shift registers. ASTRB controls the reset pin of the shift register and, in turn, the counter. ASTRB is inactive low, resetting U42 so that all outputs are low. During a read or write operation, the microprocessor establishes the address on the address bus, then sets ASTRB high to indicate a valid address. This allows U42 to clock in a logic high and propagate it through U42. Then each output from U42 goes high a specific time after ASTRB goes high. The delay between successive outputs is 100 ns, with a maximum of 7 wait states before the logic high is transferred to U43, where 15 more wait states are counted before W22 goes high. After pin 15 of U43 goes high the counter is inhibited from further counting until it is reset.

Different devices send or receive data on the data bus at different speeds. To optimize microprocessor speed, the time duration of each read or write operation —from ASTRB going high to L DTACK going low —is matched to the speed of the devices involved in the data transfer. The delayed outputs from U42/43 are selected at U31 and U32 by address decoder enable lines. Thus, each block of address has its own characteristic L DTACK delay and read/write cycle length.

In troubleshooting, U18 is removed for the free run test. R2 pulls L DTACK low continuously, causing the shortest possible read/write cycles. If required for troubleshooting, TP6 (LDT) may be connected to TP44 (LW22) to force a long and fixed L DTACK delay.

L IOS controls the timing of data transfers with assemblies other than A3 CPU. It goes low to enable three-state outputs during read operations, and its falling or rising edge triggers latches during write operations.

K. TIMER

U36 provides a method for timing several different events. Programmable timer U36 provides three separate timers: one is clocked at 1 MHz and the other two at 200 kHz. Each can be programmed to provide an interrupt after a preset time, up to 65535 clock cycles. Interrupts are enabled via U39 and U38. Another interrupt is programmable through U40C and is used for self-testing the interrupt circuitry.

L 27K MOD DR turns the A5 modulator on and off. Two user control lines to the rear panel are buffered by U40A and U12B. These lines are user programmable and are also used in troubleshooting.

L. INSTRUMENT BUS INTERFACE

The instrument bus interface buffers the data bus and address bus lines before they leave the A3 CPU assembly. The microprocessor controls the rest of the analyzer through the instrument bus.

Octal register U37 latches eight address lines, A1 through A8, when LIO goes low. The latched address stays on the instrument bus throughout the LIO cycle and until a new address is latched. These address lines, together with the enable lines L DISP and L WRITE, determine the source (read) or destination (write) of data during an IO operation.

Bidirectional three-state buffers U34 and U35 buffer the sixteen data lines of the instrument bus. L IO enables the three-state buffers. L WRITE controls the direction of data flow.

Several control lines leave the A3 CPU assembly to become part of the instrument bus. L RESET resets most major assemblies during power-on or preset. L WRITE controls the direction of data flow. L IOS controls timing of I/O operations.

M. POWER SUPPLY FILTERING

The power supply filtering circuitry reduces digital noise on the +5VDIG voltage supply lines. It also includes the battery supply for the RAM. This battery is a lithium iodide with a nominal voltage of 2.8 V. Typical lifetime of the battery is about 10 years.

C23, L1, and C22 form a pi section filter to remove noise from the +5VDIG and +5VF voltage supply lines. Additional capacitors provide local filtering.

If the analyzer power is turned off, the L PFW line generates a top priority interrupt to signal the CPU to power down. As the +5 V drops, U24 will signal the CPU that power is off. R6 will pull the input to U24 low if the board is removed from the instrument with power still on. U16 and U17 provide both power and device selection signal to the RAM. These ICs automatically switch power from the 5 volt supply to the battery when power is turned off. In addition, it ensures that the RAM is not selected during the power down sequence. U16 and U17 control power and access to two RAMs each.

DIAGNOSTIC TESTS

Several operator-initiated diagnostic tests are available to help troubleshoot the A3 CPU assembly. These can be accessed by pressing **[SYSTEM]** ***[MORE] [SERVICE] [A3 CPU]***. However, if the CPU board is not working, these tests may be inaccessible. Some of these tests can be forced to run by setting the status switches on the CPU board. With these switches set, the CPU will immediately run the designated test upon power-up or preset.

[RAM TEST]

This test performs a memory test on the RAM without destroying the data it contains. A known pattern is written to each location in RAM and then read back. Any bit position that fails is displayed on the CRT. This test is also used by the instrument before displaying error code 13. Because of the length of this test, it is *only* run during power-up and instrument verify; not during an instrument preset.

[TIMER]

The timer test checks the ability of the programmable timer consisting of U36 and its associated circuitry. Because it is digital, it cannot test for accuracy; just functionality. Accuracy is determined by the accuracy of the 20 MHz clock and its associated circuitry.

[EEROM TEST]

CAUTION

This test can destroy calibration data stored in EEPROM. Perform this test only if absolutely necessary. Read all instructions carefully.

All calibration data is stored in EEPROM (also referred to as EEROM). This test verifies the short term ability of the EEPROM to store and retrieve memory. This test should only be performed if there is serious doubt about the operation or data retention ability of the EEPROM, such as when the error message `WARNING: Default calibration table used on input X` occurs. During this test the existing calibration data is temporarily transferred to RAM for later restoration. However, this data will be lost from RAM if power is lost or if an instrument preset is performed. In this case, perform a recalibration using the HP 11613A/B calibrator.

In order for the EEPROM test to pass, switch A3S1-E must be closed. Start the test by pressing the soft key ***[EXECUTE]***. The routine takes about one minute. Once the test is begun, do *not* attempt to abort it. A data pattern is written to and read back from each address location in EEPROM. When the test is complete, a `PASS` or `FAIL` message is displayed on the CRT. Troubleshoot by checking the continuity of all data lines, and the proper operation (signatures) of all control lines. If these appear correct, suspect either or both of the EEPROMs U4 and U26. If either of these EEPROMs are replaced, recalibrate the analyzer using the HP 11613A/B calibrator.

[READ STATUS]

This cycle test continuously reads and displays the output of the status register U3. Grounding one of the inputs of U3 should cause one of the displayed status bits to change to logic 0. Troubleshoot by momentarily grounding each input of U3 and checking that the corresponding status bit changes from 1 to 0 on the CRT. Status lines 0 through 4 can be grounded by closing switches A3S1A-E. If all the bits fail, check the control lines of U3 or suspect that U3 itself is defective.

[INTRPT] (Forced Entry: Close switch A3S1-B and A3S1-C)

This test is similar to the *[READ STATUS]* test, except that it checks the priority interrupt IC U22. Momentarily grounding the inputs to U22 should produce the proper interrupt levels. The CRT indicates which pin is to be grounded for each interrupt. U22 pin 4 has the highest priority interrupt. Therefore, grounding it may cause a preset or prevent proper instrument operation. If the instrument locks-up, perform an instrument preset or cycle the line power.

CPU READ/WRITE CYCLE (Forced Diagnostic Test Only)

This diagnostic test is accessible only by closing switch A3S1-A and pressing **[PRESET]** or by momentarily grounding L PRESET (A3TP46). It is used to facilitate troubleshooting of several write-associated control lines. The free run test is always in the read mode and therefore does not exercise any control lines associated with write commands. This test should be run if other diagnostic tests are inconclusive. It is most useful when error codes 14 through 10 have been generated. Error code 15 may prevent access to this test.

Typical waveforms are shown in figure 8-12. These waveforms were taken with the oscilloscope triggered from the negative slope of the CONTROL 2 output instead of the usual CONTROL 1 output.

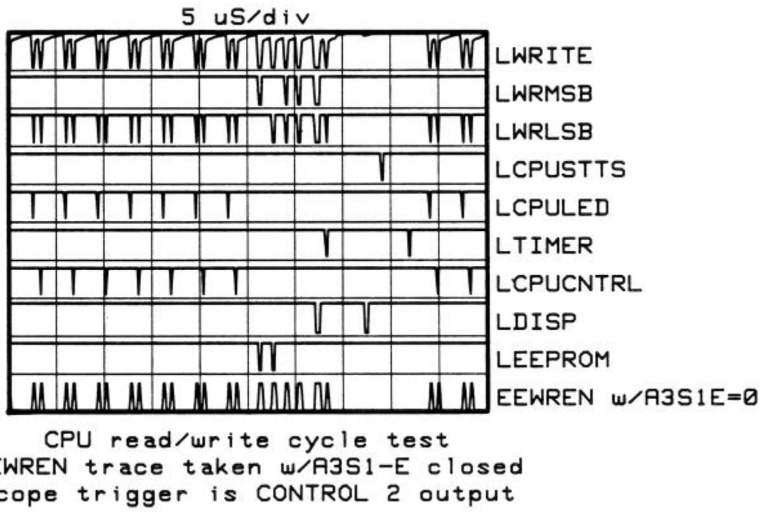


Figure 8-12. CPU Read/Write Cycle

OTHER TESTS

Battery BT1 is a lithium iodide battery with a nominal voltage of 2.8 V. Check the battery voltage between test points VBAT+ and VBAT− with line power to the instrument turned off. The voltage at TP3 (VBAT) should be about 3 V. Also check the voltage drop across R8 (typically about 1 mV at room temperature). If the voltage across R8 is excessive (>4 mV), one of the RAM ICs may be defective. If at any time, the battery voltage drops to a level that causes loss of RAM data, a message will be displayed on the CRT during the next power-up sequence. If the battery is in need of replacement, remember that even after replacement, the next power-up sequence will still show a battery failure message. This will disappear on subsequent power-up cycles.

TROUBLESHOOTING

BASIC CHECKS

Check the +5 V power supply at TP3 (+5V). If the appropriate voltage is not present, refer to A12 power supply "Troubleshooting."

Check for a 10 MHz clock signal at TP49 (L10MHz). For troubleshooting details see "10 MHz Clock Check".

Confirm that L MPRESET (U12 pin 8) and L HALT (U12 pin 10) go low when the front panel **[PRESET]** key is pressed and return high after it is released. In some cases the CPU will prevent **[PRESET]** from functioning. In those instances perform a *hardwire* PRESET by momentarily grounding TP46 (L PRST).

Check that the free run jumper U11 is in place.

NOTE: Improper, intermittent, or erratic operation of the analyzer, where no error code is generated, can indicate a problem in the I/O timing or address decoding portion of the A3 CPU assembly. See "Address Decoders Check" and "I/O Timing Check".

SELF-TESTS

During self-test, the majority of A3 CPU failures are detected and cause an error code to be displayed on the A3 board's error code LEDs. Self-test is performed when the instrument is turned on, or **[PRESET]** is pressed, or A3TP46 (L PRST) is momentarily grounded. During self-test all eight error code LEDs (A3DS1-2) and the HALT LED (A3DS3) should light briefly and then go out. If any of the LEDs do not extinguish, the lit ones indicate an error code in 8-4-2-1 binary (viewed from the component side, left to right). The left hand LEDs indicate a primary error code and this pattern is repeated on the front panel, if possible. The four LEDs on the right indicate a sub error code which gives more specific error analysis. The sub error code is bit specific; each lit LED represents a particular failure. For example: a sub error code of 0001 indicates a specific failure; a sub error code of 0010 indicates a different failure; a sub error code of 0011 indicates the combination of the two failures. Sub error code examples will show examples such as XX1X, where X represents a don't care state and 1 indicates the specific LED that is lit, representing a specific failure.

Primary error codes 15 through 13 indicate problems on the A3 CPU assembly. Error codes 11 and 2 may indicate problems on the A3 CPU board itself or elsewhere in the instrument.

NOTE: Error code information indicates that a specific circuit (or device) has failed. Check the surrounding circuits required to exercise the indicated circuit or device. Test the address decoder using the free run test and signature analysis (described later).

Self-tests are performed in descending order. Therefore, self-tests that pass confirm that certain circuits (especially data and address buses) are functioning properly. Use this information to avoid troubleshooting working circuits.

PRIMARY ERROR CODES

1111 (Error Code 15) or Unstable or Flashing Display: Microprocessor Kernel Failure

NOTE: Do not confuse this with a steady, simultaneous, 3 Hz flashing rate of all front panel LEDs. The 3 Hz flashing display indicates a front panel overload condition and is easily distinguished from a real error code 15 by the fact that the A3 LEDs will not be lit and otherwise normal operation. Refer to the A1/A2 front panel description.

Error code 15 is probably the most difficult to troubleshoot as it has many possible causes. The microprocessor is unable to perform one of its first instructions: decrement the primary error code to 14. The microprocessor is non-functional and will not respond to any normal stimulus. You must troubleshoot this condition in the following sequence. Perform checks 2 through 5 with the A3 board in free run mode. If you need instructions to perform free run mode, see "Free Run Mode" at the back of this subsection.

1. Check the 10 MHz clock.
2. Check the address lines.
3. Check the address decoders.
4. Check the I/O timing.
5. Check the data lines (perform signature analysis on ROM A).

10 MHz Clock Check. This is the first in a series of five procedures. Using an oscilloscope and a 10:1 probe, check for a 10 MHz output from U25B at TP49 (L10MHz). If it is not present, check for a 10 MHz signal at U15 pin 14. If this is not present, check for a 20 MHz signal at U14 pin 8. Also look for 10 MHz at the CPU (U9 pin 15), and at U42 pin 8. All of the signals except LMOD10MHz should be clean TTL square waves, although they may be somewhat distorted by the oscilloscope probe. LMOD10MHz should have a 25% duty cycle.

Address Lines Check. This is the second in a series of five procedures. Perform the "10MHz Clock Check" before doing this procedure. You must be in free run mode to perform this procedure. (See "Free Run Mode").

Check all 20 address lines at TP42 through TP23 with an oscilloscope or frequency counter. A1 at TP42 should be a 1.25 MHz square wave. The A2 frequency at TP41 should be one half the frequency of A1. A3 at TP40 should be one half A2, and so on to A20 at TP23 with a frequency of 2.3842 Hz. To confirm the integrity of the address line traces, refer to the "A3 Central Processing Unit (CPU) Schematic Diagram" and check for the appropriate signal at every IC connected to each address line.

Alternatively, check each address line at every IC with a signature analyzer. Set up for signature analysis as follows:

Conditions:	CPU in free run mode (jumper U18 removed) Signature analyzer mode: NORM Normal TTL levels		
Connections:			
Test Lead	Setting	Test Point	Mnemonic
Clock	Falling Edge	TP48	ASTRB
Start	Rising Edge	TP42	A1
Stop	Falling Edge	TP23	A20
Ground	—	TP4	GND

The characteristic signature for +5 V (TP3) is: 7U39.

Verify the signatures shown in table 8-8 at all available locations on the board.

Table 8-8. Address Signatures

A1: 55H1	A6: 34P0	A11: FAF6	A16: F3U8
A2: 334U	A7: 0U52	A12: 3HPH	A17: 55H1
A3: 0U16	A8: 48C6	A13: U1U8	A18: 334U
A4: 00UP	A9: HAP7	A14: FA75	A19: 0U16
A5: UUUU	A10: 85U4	A15: C5F0	A20: 00UP

If any address lines are bad and there are no shorts or opens, suspect the CPU U9.

Address Decoders Check. This is the third in a series of five procedures. Perform the "10MHz Clock Check" and "Address Lines Check" before doing this procedure. You must be in free run mode to perform this procedure. (See "Free Run Mode".)

The address decoders use A11 through A20 and the LAS, RLW, lines to decode the control lines via PALs U31 and U32. These decoders are most easily checked in the free run mode using signature analysis. Set up for signature analysis as follows:

Conditions:	CPU in free run mode (jumper U18 removed) Signature analyzer mode: NORM Normal TTL levels		
Connections:			
Test Lead	Setting	Test Point	Mnemonic
Clock	Falling Edge	TP48	ASTRB
Start	Rising Edge	TP42	A1
Stop	Falling Edge	TP23	A20
Ground	—	TP4	GND

The characteristic signature for +5 V (TP3) is: 7U39.

First check each signature at the address decoder PAL. Then check each signature at every IC that the control line services (table 8-9). Remember that this test only exercises non-write associated lines. Write associated lines such as LCPULED and EEWREN must be tested using the CPU status loop test described previously.

Table 8-9. Control Signatures

Line	Signature	Line	Signature	Line	Signature
LDTTST	F340	LEEPROM	7F3P	LDISP	P496
LIOS	P25F	LRAMB	UA76	CPUSTTS	C3H0
LDTACK0	00UP	LRAMA	U668	LTIMER	714P
LDTACK1	CF87	LROMB	4U42	LIO	79U3
LROM	OUP7	LROMA	3U9F	LLDS,LUDS	0000

These lines should be at a constant logic 0: EEWREN, FC0.
These lines should be at a constant logic 1: FC1, FC2, LVPA, IPL0-2, LCPULED, RLW, LWRMSB, LWRLSB, LINTACK, LINT1DTK.

I/O Timing Check. This is the fourth in a series of five procedures. Perform "10 MHz Clock Check", "Address Lines Check", and "Address Decoders Check" before doing this procedure. You must be in free run mode to perform this procedure.

There are two simple tests to verify the proper operation of this circuitry. The first test uses the signature analyzer. Set up for signature analysis as follows:

Conditions: CPU in free run mode (jumper U18 removed)
Signature analyzer mode: NORM
Normal TTL levels

Connections:

Test Lead	Setting	Test Point	Mnemonic
Clock	Falling Edge	TP48	ASTRB
Start	Rising Edge	TP42	A1
Stop	Falling Edge	TP23	A20
Ground	—	TP4	GND

The characteristic signature for +5 V (TP3) is: 7U39.

Look for the following signatures:

1. At LIOS (TP47): P25F
2. At LDTTST (TP5): F340

To perform the second test (while still in free run mode), remove the CRT interface W8 and measure the period of A20 at TP23. It should be 419.430 ±0.002 ms.

NOTE: The time periods given are accurate to within ±0.002 ms.

Jumper TP5 (LDTTST) to TP6 (LDT). The period should now be 1.2386 seconds. (If W8 is not removed, the period will be about 780 ms.) Replace W8.

If either one of these tests fails, temporarily jumper TP44 (LW22) to TP6 (LDT) and compare the outputs from U42 and U43 with those shown in figure 8-13. Check all gates for proper operation, and check the address decoder signatures above.

Data Lines Check. This is the last in a series of five procedures. Perform "10 MHz Clock Check", "Address Lines Check", "Address Decoders Check", and "I/O Timing Check" before doing this procedure. You must be in free run mode to perform this procedure.

The analyzer contains only two EPROMs. Future revisions of firmware may require four EPROMs. *Four* EPROMs are documented, since that case is more complex than with two.

Check the data lines by reading the signatures of the contents of ROM A (U7, U29) and ROM B (U8, U30) using the following two signature analysis procedures. Interpret the results using the information following the signature analysis procedures.

Configure the signature analyzer as follows and check the ROM A (U7 and U29), data lines:

Conditions: CPU in free run mode (jumper U18 removed)
Signature analyzer in QUAL function mode
Normal TTL levels

Connections:

Test Lead	Setting	Test Point	Mnemonic
Clock	Falling Edge	TP48	ASTRB
Start/	Falling Edge	TP50*	LROM*
Stop	Rising Edge	—	—
Qual	Low State	TP25	A18
Ground	—	TP4	GND

The characteristic signature for +5V (TP3) is: 0003.

***NOTE:** Early revisions of the CPU board were made with the data line testpoints (TP7-22) on the microprocessor side of the free run jumper. This will prevent any signatures from being made on data lines D0, D8, and D12-15 when using these test points. Instead, use the appropriate data line pin on one of the memory ICs (ROM, RAM or EEPROM). The affected boards have an HP part number of 08757-60068 and a revision date code beginning with the letter "A". This does *not* affect normal operation. Revision "B" boards and boards with a different part number have been corrected and also include a test point labeled LROM (TP50) for user convenience with signature analysis. Without this test point, use U31 pin 20 as the source for LROM.

NOTE: Each time the analyzer firmware is updated, the ROM signatures are changed. These changes are documented in a *Firmware Update* provided with the *Manual Changes Supplement*. (See "Instruments Covered By Manual" in the operating manual for information regarding *Manual Changes Supplements*.) Firmware update information is also supplied with each new set of firmware purchased. Refer to the *Firmware Update* for ROM A signatures. Be sure to use the signatures for the correct firmware revision number.

Incorrect signatures at D15 through D8 indicate a fault in U29. Incorrect signatures at D7 through D0 indicate a failure in U7.

To set up for signature analysis to check ROM B data lines, use the same conditions and connections used for the ROM A check with the exception of the Qual mode setting. This should be set to the high position in order to read ROM B. The characteristic signature for +5 V remains 0003.

NOTE: Refer to the *Firmware Update* for ROM B signatures if applicable. Be sure to use the signatures for the correct firmware revision number.

Incorrect signatures at D15 through D8 indicate a fault in U30. Incorrect signatures at D7 through D0 indicate a failure in U8.

Depending on the failure mode, the CPU read/write cycle test may also be useful for troubleshooting. However, in most cases, error code 15 will prevent execution of this cycle. The CPU read/write cycle is described on an earlier page.

An error in both ROMs indicates that both are probably good, and one or more of the data lines is probably open or shorted. However, the error may be the result of another device improperly attempting to place data on the bus at the same time. To determine whether the error is data line or device related, remove the ROM under test and verify that the signatures on all of the ROM A data lines are 755U (the same as for +5 V), and the signatures on all of the ROM B data lines are either 755U or 0000.

An error in just one of the ROMs (ROM A or ROM B) indicates that only that particular ROM is defective. All self-tests are contained in ROM A. When ROM A is good, the self-tests should find any faults in ROM B. However when ROM A is suspect, it is necessary to analyze ROM B to isolate the fault to either ROM A or the data lines.

This completes the series of tests associated with error code 1111 (15). Replace the free run jumper U11. If the board has passed all of the preceding tests and inspections but still does not work, suspect the CPU U9, or U10 or U32.

ROM SIGNATURES

HP 8757C

U7				U29			
Line	Signatures			Line	Signatures		
	Rev. 3.0	Rev. 3.1	Rev 3.2		Rev 3.0	Rev. 3.1	Rev. 3.2
D0	0AH2	FA82	UA4A	D8	8376	0H2U	7C37
D1	7242	U390	CU11	D9	6HF9	8054	C299
D2	UF5F	72PF	CFUP	D10	H056	U702	707P
D3	5HF2	UA44	A373	D11	24F7	HF33	43C9
D4	U716	HC88	38A6	D12	P5F9	8FU5	UUF4
D5	H26F	6193	9PCU	D13	AHF8	5179	9F3U
D6	3445	PA92	23P7	D14	H597	061P	34F8
D7	9UA5	FCA9	3HAP	D15	H999	33C3	5249

HP 8757E

U7				U29			
Line	Signatures			Line	Signatures		
	Rev. 4.0	Rev. 4.1	Rev 4.2		Rev 4.0	Rev. 4.1	Rev. 4.2
D0	9A5C	63P1	FA69	D8	493C	459U	5PC8
D1	A7C9	F6A3	4AF0	D9	6FH9	46HU	F409
D2	839H	U99U	0F0C	D10	37U0	A5A4	1041
D3	6278	83C1	F2HH	D11	0630	UFA4	3PH9
D4	FP09	34CC	UPHH	D12	FHHC	U511	2298
D5	F564	73A9	A799	D13	6F20	F01U	7892
D6	FF81	PH1U	C57C	D14	H68H	17C0	9F28
D7	U284	0C6A	8613	D15	PU32	112C	9140

1110 (Error Code 14) — ROM Checksum

Sub Error Code 0000 — ROM Checksum Started. The microprocessor has successfully completed the first instruction (to decrement the primary error code indicators to 14). The CPU has started the checksum test of ROM A but is unable to complete it. This failure usually indicates a fault in ROM A (U7 or U29) since the checksum test instructions reside there.

Perform the ROM A signature analysis test described above to determine which ROM is defective, or simply replace all ROMs with the firmware update kit.

Sub Error Code XXX1 — ROM A Checksum Failure. The microprocessor has successfully completed the ROM A checksum test and it has failed. ROM A (U7, U29) is probably defective. Determine which ROM is defective by performing the ROM A signature analysis check in "Data Lines Check" or simply replace all ROMs with the firmware update kit.

Sub Error code XX1X — ROM B Checksum Failure (if applicable). The microprocessor has found the checksum of ROM B (U8, U30) to be bad. Address and data lines to ROM A have been verified. Suspect ROM B or address decoding to ROM B. Verify which ROM is bad by performing the ROM B signature analysis test described above, or simply replace all of the ROMs with the firmware update kit.

1101 (Error Code 13) — RAM Failure

Sub Error Code XXX1 — RAM A LSB (U5) or
Sub Error Code XX1X — RAM A MSB (U27) or
Sub Error Code X1XX — RAM B LSB (U6) or
Sub Error Code 1XXX — RAM B MSB (U28). Error code 13 indicates a failure in the associated RAMs. The data lines have been verified up to ROM A, but the lines could be open between ROM A and the RAM in question. Check for continuity on these lines. Also check the decoded address lines (control lines) and the buffered enable lines. If the address, data, and control lines are good, suspect the indicated RAM.

Sub Error Code 0000 — RAM Checksum Failure. The microprocessor has successfully verified the storage ability of all four RAMs. However the checksum generated before performing the test does not match the checksum generated afterwards. Although unlikely, if this error code appears repeatedly, suspect any of the four RAMs or possible intermittent IC connections.

1100 (Error Code 12) — Power Supply Failure

This error code indicate a supply failure (or significantly out-of-tolerance) supply. The analyzer is not capable of determining which supply has failed, so no sub error codes are used. Refer to the A12 power supply "Troubleshooting" procedure.

1011 (Error Code 11) —Instrument Bus Failure

Sub Error Code XXX1 —All Bits Low Failed or
Sub Error Code XX1X —All Bits High Failed or
Sub Error Code X1XX —Walking 1 Pattern Failed. The microprocessor has passed most of its self-tests but it cannot write data onto the instrument bus and then read the same data back. (The instrument bus consists of buffered address lines 1 through 8 and buffered data lines 0 through 15.) Under these conditions, the CPU will continuously repeat the instrument bus cycle test until it passes. Since the data is written to, and read from a temporary storage device on the A6 HP-IB board, this error code may simply indicate that the A6 board is not in place.

If the A6 board is in place, refer to A6 HP-IB assembly "Troubleshooting" for more information and a complete description of the sub error codes.

1010 —0011 (Error Codes 10-3) —Display Interface Failure

The microprocessor has successfully verified the instrument bus but it has determined that the display interface board is not functioning properly or the display interface cable is missing. Refer to the A14 display interface "Troubleshooting" procedure for a complete description of each test and the meaning of each sub error code.

0010 (Error Code 2) —Interrupt Failure

Sub Error Code XXX1 —Unexpected Interrupt Detected or
Sub Error Code XX1X —No Interrupt Detected or
Sub Error Code X1XX —GSP Interrupt Failed. The microprocessor has passed all critical CPU self tests but has received either an unexpected interrupt or no interrupt when one was expected. During operation, this would prevent the instrument from functioning properly. This kind of interrupt can be experienced on several levels. Fortunately, since the display has been digitally verified, the CPU should indicate on the CRT the level where the interrupt was unexpectedly detected.

Interrupts are generated by U22, which receives its input from several sources. The highest level interrupt, 1, is generated through an L SRQPF signal (power failure warning) at U22 pin 4. The lowest level working interrupt, C (Hex), is generated by the self-test interrupt line, LLEV1INT, U21 pin 2. The interrupts are listed in table 8-10.

Table 8-10. Interrupt Levels

Interrupt Level	U22 Pin	Mnemonic	Interrupt Level	U21 Pin	Mnemonic
1	4	L SRQPF	7	1	LTOINT
2	3	L STTS INT	8	11	LT1INT
3	2	L DRINT	9	6	LT2INT
4	1	L SRQA	A	4	LDISPINT
5	13	L SRQB	B	3	LSUPPLYFL
6	12	L SRQ FP	C	2	LLLEV1INT

If error code 2 appears, first verify that the U22 or U21 input pin corresponding to the interrupt level displayed on the CRT is at a steady logic high. If the input is not high, trace the faulty line back to its source. If all of the inputs to U22 (pins 1 through 4 and 10 through 13) are high, suspect U22 or its three output lines (pins 6, 7, and 9) which also should be high.

Note that grounding TP45 (INT) will prevent all interrupts from occurring (all outputs high).

0001 (Error Code 1) – Instrument Verify Failures

The CPU has passed all of its internal self-tests. Now it tests several other circuits. These additional tests are essentially the same as those done during the instrument verification routine accessible from the service menu. The display has been digitally verified. Thus, as a troubleshooting aid, the CPU attempts to display all subsequent test results on the CRT. However the CPU cannot confirm that the CRT is actually displaying the information it is receiving. For example, the CRT may lack high voltage, or the intensity may be turned down too far for the trace to be visible. If error code 1 is indicated by the LEDs but nothing is visible on the CRT, see A15 Display "Troubleshooting" for further information. Then see "Instrument Verify", at the beginning of this service section, for a more detailed description of the tests performed and additional references for troubleshooting information.

Unexpected Key Pressed. This is part of error code 1. The analyzer has passed all the self-tests and has determined that a front panel key is either stuck or pressed. Because this condition locks up the front panel, it must be corrected. When the CPU detects a pressed or stuck front panel key, it immediately displays the name of that key on the CRT. In this case, troubleshoot the circuits related to the indicated key.

Battery Test Failed. This is part of error code 1. This message will appear if the battery voltage has dropped to the point where the contents of RAM may have been lost. This test is only performed upon power-up. If this test should fail, check the 2.8 V battery on the A3 board. If the voltage is below 2.4 volts, replace it. After replacement, the battery test will again fail on the very next power-up sequence, but future cycles should pass.

Configuration Error 1, 2, or 3. This is part of error code 1. This message will appear if the CPU detects a hardware configuration incompatibility and does not generally indicate a failure. Contact your local HP sales or service office for more information.

0000 (Error Code 0)

This code indicates that the instrument has passed all of the self-tests.

FREE RUN MODE

Perform the "Basic Checks" before this free run test. The free run test is used to verify and troubleshoot the microprocessor kernel and related circuitry. It is used primarily for microprocessor failures when the self-test yields error code 15. It is also useful for verifying the address decoder lines when ROM, RAM or other errors are indicated by error codes 14 or 13.

The free run test generates fixed data at the data inputs of microprocessor U9, and forces U9 into a read mode. U9 executes the instruction contained in the fixed data and then increments the address to seek a new instruction. The actual instruction contained in the fixed data is irrelevant. The goal is to exercise all of the address lines, access every address, and verify this performance using signature analysis while the cycle repeats. Since all addresses are accessed in this cycle, address decoding is also completely exercised and can be verified with signal analysis. I/O timing is also exercised (because each cycle requires an ASTRB/L DTACK response) and can be verified with an oscilloscope.

To perform the free run test, carefully remove the jumper pack U18 from its socket on the A3 CPU assembly. Cycle the power switch to reset the microprocessor. Check that DS3 (HALT) and DS1-2 (error code LEDs) turn on when power is first applied. The L HALT LED should extinguish after about 1/2 second. If DS3 does not go out, check the power on/preset circuitry. Check that the L MPRESET and L HALT lines return to TTL high after 1/2 second. If L MPRESET stays low, the microprocessor U9 may be holding it down.

Check ASTRB at TP48 (ASTRB). Verify that the waveform has a period of 400 ns with a duty cycle of 60%. If the waveform is not correct, the free run test probably is not running. Perform the basic checks described above. At the microprocessor, check the data lines that are affected by the free run jumper U18: D0, D8 and D15 should be low; D12, D13 and D14 should be high; otherwise, troubleshoot U11, U12 and U20.

Jumper TP44 (LW22) to TP8 (LDT) and check for the waveforms shown in figure 8-13, ASTRB/L DTACK Timing with Delay.

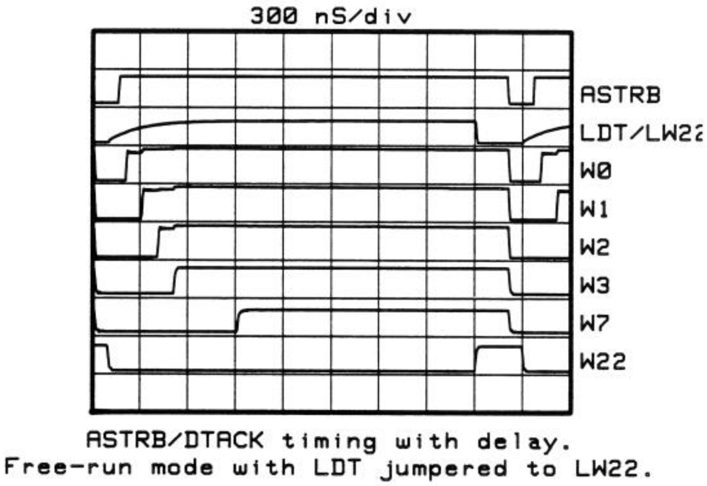


Figure 8-13. ASTRB/DTACK

Table 8-11. A3 CPU Address Decoder Lines

Mnemonic	Address Hexadecimal	Destination	Description
L ROM A	000000-03FFFE	U7, U29	Enables Read from ROM A
L ROM B	040000-07FFFE	U8, U30	Enables Read from ROM B
RAM A	080000-08FFFE	U5, U27	Enables RAM A
RAM B	090000-09FFFE	U6, U28	Enables RAM B
LCPUSTTS	1FC000	U3	Enables Read of Stats
LCPULED	1FC000	U1	Enables Write to Error Code LEDs
L EEPROM	0C000 0FFFFE	U4, U26	Enables EEPROM
LCPUCNTRL	1FC800	U39	Enables timing interrupts and other outputs

Table 8-12. A3 Pin-Outs (1 of 2)

PIN	SIGNAL	I/O	SOURCE/DESTINATION	FUNCTION BLOCK
1 41	+5V DIG +5V DIG	IN IN	A11J6-8,9 A11J6-8,9	M M
2 42	GND DIG GND DIG	IN IN	A11J6-6,7 A11J6-6,7	M M
3 43	ID15 LPFW	I/O IN	A4P2-3, A6P1-43, A11J7-4 A11J6-5	L M
4 44	IDI4 GND DIG	I/O	A4P2-4, A6P1-44, A11J7-3 A4P1-22 NOT USED	L
5 45	IDI3 NC	I/O	A4P2-5, A6P1-45, A11J7-6	L
6 46	IDI2 SPLYFAIL	I/O IN	A4P2-6, A6P1-46, A11J7-5 A11J6-3	L C
7 47	ID11 NC	I/O	A4P2-7, A6P1-47, A11J7-8	L
8 48	ID10 NC	I/O	A4P2-8, A6P1-48, A11J7-7	L
9 49	ID9 NC	I/O	A4P2-9, A6P1-49, A11J7-10	L
10 50	ID8 NC	I/O	A4P2-10, A6P1-50, A11J7-9	L
11 51	ID7 NC	I/O	A4P2-11, A6P1-51, A11J1-11, A11J7-14	L
12 52	ID6 NC	I/O	A4P2-12, A6P1-52, A11J1-12, A11J7-13	L
13 53	ID5 NC	I/O	A4P2-13, A6P1-53, A11J1-9, A11J7-16	L
14 54	ID4 L DISP INT	I/O IN	A4P2-14, A6P1-54, A11J1-10, A11J7-15 A11J1-31	L C
15 55	ID3 L DR INT	I/O IN	A4P2-15, A6P1-55, A11J1-7, A11J7-18 A4P2-55	L C
16 56	ID2 L STTS INT	I/O IN	A4P2-16, A6P1-56, A11J1-8, A11J7-17 A4P2-62	L C
17 57	ID1 NC	I/O	A4P2-17, A6P1-57, A11J1-5, A11J7-20	L
18 58	ID0 NC	I/O	A4P2-81, A6P1-58, A11J1-6, A11J7-19	L
19 59	L SRQ FP NC	IN	A11J1-27	C
20 60	IA6 IA7	OUT OUT	A4P2-60, A6P1-60, A11J1-16 A4P2-19, A4P2-59, A6P1-59, A11J1-13	L L

Table 8-12. A3 Pin-Outs (2 of 2)

PIN	SIGNAL	I/O	SOURCE/DESTINATION	FUNCTION BLOCK
21 61	IA5 IA8	OUT OUT	A4P2-21, A6P1-61, A11J1-15 A4P2-61, A6P1-20, A11J1-14	L L
22 62	IA4 NC	OUT	A4P2-22, A6P1-62, A11J1-18	L
23 63	IA3 NC	OUT	A4P2-23, A6P1-63, A11J1-17, A11J7-24	L
24 64	IA2 NC	OUT	A4P2-24, A6P1-64, A11J1-20, A11J7-23	L
25 65	IA1 NC	OUT	A4P2-25, A6P1-65, A11J1-19, A11J7-26	L
26 66	GND DIG SH NC	I/O	A3P1-28	M
27 67	L IOS NC	OUT	A4P2-27, A6P1-67, A11J1-21	L
28 68	GND DIG SH NC	I/O	A3P1-30	M
29 69	L WRITE NC	OUT	A4P2-29, A6P1-69, A11J7-25	L
30 70	GND DIG SH L SRQA	I/O IN	A3P1-34 A6P1-72	M C
31 71	L RESET NC	OUT	A4P2-31, A6P1-71, A11J1-23, A11J7-32	L
32 72	CAL MOD EN NC	OUT	A5P1-31 NOT USED	
33 53	L SRQB L XACK	IN IN	A6P1-73 A11J7-29	C F
34 74	GND DIG SH L IPRESET	I/O IN	J8-11 A11J1-25	M B
35 75	5MHZ L 27K MOD DR	OUT OUT	A6P1-75 A5P1-32	A K
36 76	NC CAL OSC EN	 OUT	 A5P1-14 NOT USED	
37 77	NC NC			
38 78	L DISP NC	OUT	A11J7-30	L
39 79	NC CNTRL1	 OUT	 A1J8-51	 K
40 80	CNTROL2 GND DIG SH	OUT I/O	A11J8-53	K M

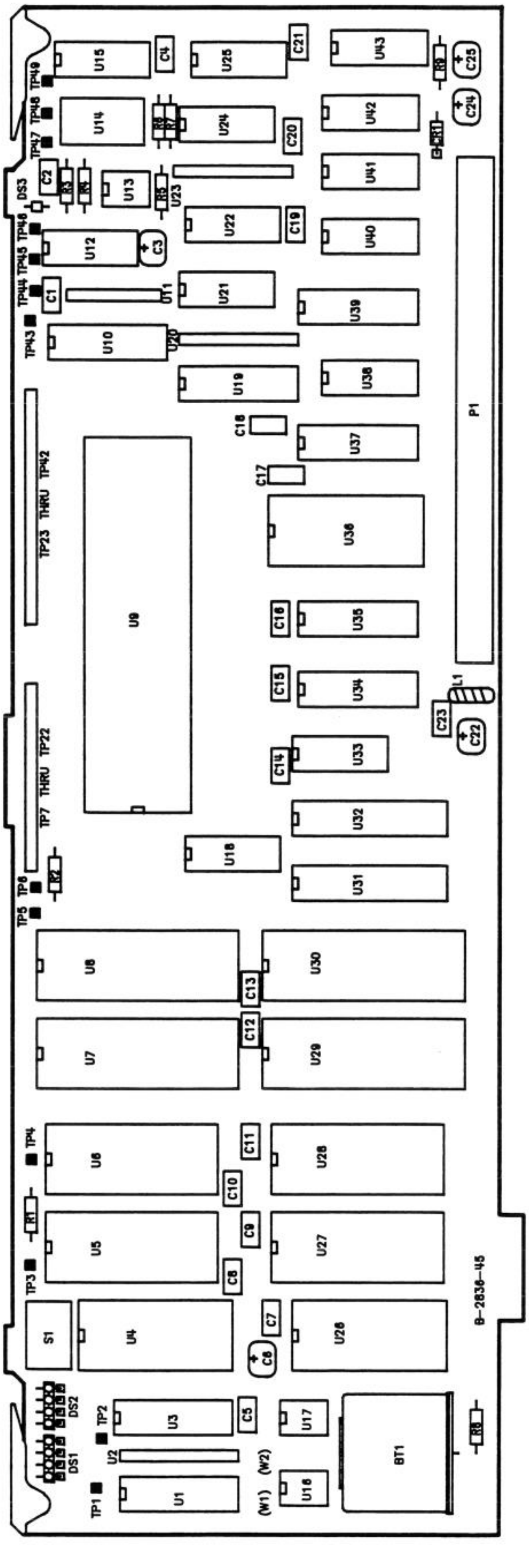


Figure 8-14. A3 Component Locations Diagrams

A4 ANALOG-TO-DIGITAL CONVERTER (ADC)

CONTENTS

CIRCUIT DESCRIPTION

The A4 ADC schematic is documented on two pages. The first page (blocks A, B, C, D, E, F, G, and Q) covers the digital control, detector control, sweep functions, and power supply. These circuits track the horizontal sweep ramp and initiate the data acquisition function. The second page (blocks H through P) covers the analog, ADC, data acquisition, and blanking circuits. These circuits perform the vertical analog-to-digital conversion functions.

The A4 analog-to-digital converter (ADC) converts the A, B, C (HP 8757C Option 001), and R analog outputs from the A7/A8/A9/A10 log amplifiers into digital information to be read, processed, and displayed by the A3 CPU. The SWEEP IN ramp and POS Z BLANK input from the microwave source are also processed by the A4 ADC. In addition, the detector control circuitry is located on this assembly. This circuitry controls and monitors the performance of the detectors.

The A, B, C, and R inputs are logarithmically shaped and DC rectified by the A7, A8, A9, and A10 log amplifiers respectively. These output a DC voltage representing the microwave power level at each input. The analog signals are converted to digital information at 101 to 1601 horizontal points (frequencies) per sweep for the HP 8757C, and 101 to 401 points for the HP 8757E. The SWEEP IN 0-10V ramp from the microwave source is used to determine when the analog signals should be sampled and digitized. The A3 CPU then reads the data, processes and formats it, and sends it to the A14 display for viewing. The POS Z BLANK, representing blanking and intensity marker information, is also processed on the A4 ADC.

A. ADDRESS DECODER

The address decoder decodes the instrument bus address lines to select a single destination or source to write data to or read data from the instrument bus data lines.

Three-to-eight decoder U40 decodes address lines IA3 through IA8 to select one of eight devices on the A4 ADC assembly to read or write data on the data lines. The seventh line, L IOS, controls the timing of the enable pulses. U21A and U21B gate the enable pulses with the L WRITE line to allow only reads at those addresses. Table 8-18 lists the eight address decoder outputs, together with the appropriate hex addresses to activate them, and the functions they perform. Address lines IA1 and IA2 continue on to the control bus where they are later decoded.

B. CONTROL DECODER

The data control register latches data from the instrument bus to control major ADC modes. Three control decoders, U36, U37, and U38, latch data from the instrument data bus at the rising edge of CNTRL WR1 and CNTRL WR2. Most of these lines control ADC and sweep/blanking functions. Two lines, L LOG ZERO and L LOG TEMP, exit the board to control the logger multiplexers on A7 −A10. Other lines exit to the A5 modulator driver.

C. STOP SWEEP

Stop sweep is both an input and an output. The A3 CPU can drive STOP SWEEP low through U24D to halt the sweep from the external source. Or, if the sweep is halted externally, the A3 CPU can sense this condition via the L STOP SWP line.

D. DETECTOR CONTROL

The detector control circuitry allows the analyzer to monitor the detectors that are connected to it. If a compatible detector is connected, the A3 CPU can determine the type of detector (AC only or AC/DC); determine the diode sensitivity; determine the detector temperature; and control the mode of operation (AC or DC). All this can be accomplished using only the control line to the detector (CNTL A, B, C, or R). Current flow through this line is monitored by measuring the voltage drop across the 1.0 K sense resistors R19, R23, R27, and R31.

U34 is a quad 8-bit digital-to-analog converter. Each output can be addressed using IA1 and IA2. The output range is 0 V to +6.6 V with a resolution of about 26 mV. The output at U34 pin 2 is summed in U45A with an offset from R17. The output of U45A is then applied to sense resistor R19. Both sides of R19 are monitored by the ADC through multiplexer U31 and buffer U32B. The output of U32B is divided by 1.32 with R36 and R37. The sense side of R19 is static-protected by diodes CR1 and CR2 and becomes the CNTL A signal. The other outputs of U34, at pins 1, 20, and 19, go through similar circuits to produce the CNTL B, CNTL C, and CNTL R signals.

Analog multiplexer U46 allows three additional offsets to be summed together in U45. This gives three different ranges or modes of operation:

- Mode 1 = +10.13 V to +3.55 V at output of U45.
- Mode 2 = +3.29 V to −3.29 V at output of U45.
- Mode 3 = −3.55 V to −10.13 V at output of U45.

Each mode still retains the full 26 mV resolution. These different modes are used to monitor different characteristics of each detector.

E. SWEEP DAC

The sweep DAC produces a stepped sweep voltage controlled by the A3 CPU. This voltage is compared with the sweep ramp from the source to determine the point in the sweep (frequency) where the inputs should be held and digitized.

The sweep DAC consists of the 12-bit current DAC U35 and the current-to-voltage converter U47. The A3 CPU controls the output voltage VDAC by writing the appropriate data to the data bus. U35 is a 12-bit multiplying DAC with complementary current-sink outputs. Its reference current comes from +DAC REF, which is approximately +10.24 V. U47 converts the DAC's current output to a voltage output in the range of 0 V to −10.24 V. R6 in the reference supply is adjusted to provide an output difference of −10.2375 V from the minimum to the maximum DAC output as measured at TP2 (DAC). The output voltage resolution is 2.5 mV.

Three other outputs are derived from VDAC (also known as DAC). VDAC2 is scaled to one-tenth of VDAC by voltage divider R7 and R8, for finer voltage increments. AUX DAC OUT goes to the rear panel where it is available at the DAC OUT 0-10V connector for troubleshooting or user convenience. This output is inverted from VDAC by U4D, and therefore has a range of 0 V to +10.24 V. VDAC3, used in testing the blanking/marker detector, is derived from U4C, which has a gain of −0.8. Its output voltage range is 0 V to +8.19 V.

In normal use the output of the sweep DAC follows the 0-10 V sweep input by using only 3200 of its 4096 possible values. The sweep comparator circuitry effectively compensates for this by using a lower value resistor on the VDAC input. Thus, for 100 trace points the DAC is incremented by 32 bits for each point (3200/100), while for 1600 trace points the DAC is incremented by only two bits for each point.

F. SWEEP BUFFER

The sweep buffer buffers the 0-10 V sweep ramp from the source.

Swept microwave sources provide a 0-10 V x-axis sweep ramp representing frequency through the rear panel SWEEP IN connector. The center conductor and floating outer conductor are connected differentially to the A4 ADC assembly. Unity-gain buffers U43A and U43B provide high input impedance for the source. R51, R49, and C18 reduce common-mode noise. CR17, CR18, CR19, and CR20 clamp the lines to prevent damage from overvoltage. Open-collector comparator U12A grounds the SWP IN voltage during self-test; U12A pin 2 is open during normal operation. U25A is configured as a unity-gain, differential-input amplifier to reduce common-mode noise. The output at SWP is a 0 V to +10 V ramp with low output impedance. Pads are provided to add a resistor (R100) to divide the sweep input voltage if the ramp from the source is greater than +10 V. The voltage divider consists of R100 and R51. The value selected for R100 should limit the sweep ramp to +10.00 volts.

G. SWEEP COMPARATORS

Sweep comparators compare the sweep DAC voltage with the 0V to +10V SWEEP IN ramp. The forward sweep comparator, via XCMP, sets the analog sample/hold to hold mode and begins the analog-to-digital conversion. The retrace comparator detects when retrace has begun.

The forward sweep comparator U12C detects the points in the sweep where the inputs should be digitized. The sweep DAC voltage and the SWP ramp are summed together at the non-inverting input of U12C. The inverting input of U12C is connected to ground. When the DAC voltage and the sweep voltage sum to 0 V, the comparator changes states. R63 provides hysteresis for noise immunity. At the start of the sweep, SWP IN and SWP are at 0 V dc. The sweep DAC voltage (VDAC) is set to about −0.175 V dc. This partially compensates for the additional current flow through R58 and R59. While the sweep ramp is still at 0 V dc, the A3 CPU increments the DAC voltage until XCMP goes high, indicating that the sum of all the currents is zero (0 V dc at U12C pin 9). The DAC is then incremented to the first step in its staircase (this point varies depending on the number of trace points per sweep). When the sweep ramp reaches this first point (+0.025 V dc for 401 points per sweep), XCMP goes high initiating the measurement sequence. When this sequence is completed, the A3 CPU sets the DAC to the next point. This process continues until the sweep is completed.

Retrace comparator U12B operates much like U12C, except that it is slightly offset by R59. Thus RTRC stays low throughout the forward sweep while the sweep DAC is tracking the sweep input. At retrace, however, the SWEEP IN ramp reverses while the DAC voltage remains constant, causing U12B pin 1 RTRC to go high.

Since the sweep DAC's output is summed through a lower value resistor than the sweep input, the sweep DAC's voltage change over the 0-10 V sweep ramp is only 8 V (R57/R56 x 10 V).

H. SAMPLE AND HOLD

Four identical amplifiers buffer the DC signals from the four log amplifiers. A fifth, nearly identical buffer is used for the AUX ADC IN input from the rear panel ADC IN connector. Sample/hold circuits sample these inputs and hold them for digital conversion when the sweep comparator detects a sampling point.

The A, B, C (HP 8757C Option 001), and R inputs are logarithmically shaped and DC rectified by the A7, A8, A9, and A10 log amplifiers respectively. The log amplifier outputs are connected differentially to the buffers. Buffers U29A, B, C, and D are inverting, unity-gain amplifiers. Buffer U1 has a gain of −0.8 and is protected against static by diodes CR9-CR12.

The sample/holds for the A, B, C, R, and AUX ADC IN inputs are U27, U26, U13, U44, and U2 respectively. Internally, each sampling switch includes an input buffer, switch, switch driver, and output buffer. A low-leakage external capacitor (C4-C8) holds the input voltage when L HOLD is asserted until L HOLD is released.

I. ANALOG MULTIPLEXER

The analog multiplexer selects one of sixteen analog signals, including the A, B, C (HP 8757C Option 001), and R inputs, for input to the ADC circuit.

Eight-channel analog multiplexer switches U15 and U14 select one of sixteen analog inputs to appear at their combined output. The input is selected by the binary-coded MPXA0, MPXA1, MPXA2, and MPXA3 lines from the multiplexer RAM U33, which receives its data from the data bus. See "L. Data Ready" for more information on the RAM sequence. When not enabled, the outputs of multiplexers U15 and U14 are open, and therefore, can be connected together in a wired-OR configuration. Table 8-17 lists the sixteen channels, the voltage ranges, and the binary select codes. Note that the SWP input is divided to 0.74 of its original value to prevent overloading of the ADC circuit.

U15 and U14 are followed by non-inverting buffer U3A. R47 and R46 give U3A a voltage gain of 1.2. This gain maintains all inputs to the ADC within the ±10 V range.

J. ADC

The analog-to-digital converter (ADC) circuit converts the selected analog input into digital form for the A3 CPU to read.

The ADC consists of sixteen-bit, successive-approximation, analog-to-digital converter U5. U5 contains its own internal conversion clock and analog reference. It is externally configured for a fifteen-bit short cycle, with an analog input range of ±10 V dc. The data ready circuit sets L CONVERT low to begin an analog-to-digital conversion. When the conversion is done, U5 pulls pin 18 L CC (low =conversion complete) low, to be inverted by U9D and read by the data ready circuit and by the A3 CPU. The fifteen-bit digital output is a complementary offset binary output (TTL low=1, high=0). In this system, the digital outputs are all low with a +10 V dc input, all high with a −10 V dc input, and the MSB changes state at 0 V dc.

K. OUTPUT DATA REGISTERS

The output data registers store and buffer data from the ADC to the A3 CPU on the instrument bus data lines.

The output data registers consist of four, four-bit-by-four, random-access memory packages U6, U7, U18, and U17. Each package has four, three-state outputs, and each output buffers one of the ADC data outputs. Altogether, sixteen lines are selected and buffered to drive the sixteen data lines of the instrument bus: fifteen from the ADC, and one (STTS FLG) from the status logic circuit. For further information, see "L. Data Ready".

L. DATA READY

The data-ready circuit coordinates the data acquisition and output. This circuit directly controls the sample/hold, multiplexer, ADC, and output data registers. The data-ready circuit allows the conversion of up to four input channels without the need for the A3 CPU to intervene, thus reducing time and code complexity. Also contained in this block is the sweep-too-fast detector, which indicates when the sweep voltage is rising so fast that the A4 ADC does not have time to perform the data acquisition at all required frequency points on all input signals.

The first step in data acquisition is to indicate what inputs (out of sixteen possible) need to be measured. The four bits containing the multiplexer's address information are loaded into the multiplexer RAM U33 from ID0 −ID3. Address lines IA1 and IA2 determine the order in which the measurements are to be made. Thus up to four sets of four multiplexer addresses are stored in U33. On RAM U33, as well as on output registers U7, U6, U18, and U17, there are two different pairs of address inputs. Pins 13 and 14 select the address when data is to be loaded into RAM. Pins 4 and 5 select the address when the stored data is to be read from these random-access memory devices.

The next step in data acquisition is to determine how many inputs need to be digitized. Up to four inputs can be digitized during one cycle. The total number of inputs to be sampled is subtracted from 4, and that number is used to pre-load counter U41 via CVTC0 and CVTC1 (CVTC2 is used only for self-tests). When L XDAC WR goes low after each ADC conversion, this counter is incremented by one. When the output overflows to decimal 4 the data-ready line (DRDY) is high, indicating that all inputs have been measured (DRDY is actually the MSB of the three-bit counter). Thus, if a decimal 0 is pre-loaded into the counter, four measurements are made. If a decimal 3 is pre-loaded, only one measurement is made before DRDY goes high. The counter outputs (CVTA0 and CVTA1) are used to address both the input multiplexer and the output data registers.

Once the above information has been loaded, the A3 CPU writes its first value to the sweep DAC via L XDAC WR. In order to allow for DAC settling time, a 1.6 µs delay from U11A prevents XCMP from immediately going high and initiating the data acquisition cycle. This is accomplished with open-collector comparator U12D, which is connected to XCMP in a wired-OR configuration.

As the sweep ramp voltage increases, XCMP goes high indicating it is time for a data point to be measured. XCMP clocks a low to L HOLD through U23A, and this, in turn, causes the sample/hold circuits to hold their current inputs so that the ADC U5 can read them. L HOLD is used to generate an L CONVERT command to the ADC after a 3.6 µs delay from U42A to allow sufficient settling time for the sample/hold circuits. When the ADC U5 has completed its conversion (after about 50 µs) it pulls L CC low, which sets L DRWR high. After another 3.6 µs the L CONVERT line is enabled again for the next measurement. L DRWR also enables the output data registers to store the ADC reading in memory for later retrieval. The address in which this data is stored depends on the value of the counter outputs CVTA0 and CVTA1.

If more data is still to be read, the counter increments to its next address. This selects the next multiplexer output and the next output data register location. Now the L CONVERT line goes low again following its 3.6 µs delay from U42B. L CC goes low again indicating a conversion was made, and the counter U41 increments by one count. This sequence continues until the counter output reaches a decimal count of 4, at which time DRDY goes high indicating the end of a series of conversions and generating an interrupt to the A3 CPU. The CPU can then read back all four data measurements stored in the output data registers.

Now the sweep DAC needs to be updated to its next measurement point. This occurs when L XDAC WR goes low, which also resets U11, U23, and U41.

The sweep-too-fast detector circuit is composed of U11B and U23B. This circuit detects when the sweep input is rising too fast for the ADC. The SWEEP TOO FAST line is set true whenever XCMP goes high within 3.2 µs (2 x 1.6 µs) after the sweep DAC was set (when L XDAC WR was low). U23A pin 11 clocks the current condition of XCMP through to pin 9. If XCMP is low then SWEEP TOO FAST is low; if XCMP is high then SWEEP TOO FAST is also high.

O. BLANK/MARKER DETECTOR

The blank and marker detector decodes the POS Z BLANK (PZAB) input from the source for blanking, marker, and active marker conditions.

The POS Z BLANK rear panel BNC input receives display blanking and intensity marker information from the source. The following are the four possible levels:

- +5 V dc = Blank (retrace and bandswitch points).
- 0 V dc = Display (normal trace, forward sweep).
- −4 V dc = Markers (intensity markers).
- −8 V dc = Active marker (high-intensity marker).

These levels are detected with three voltage comparators, U24A, B, and C. R69 puts PZAB at 0 V dc (display) when no input is connected. C23 reduces noise; CR2 and CR23 prevent overvoltage damage. R70 and R71 form a voltage divider between the PZAB input and +15 V dc, offsetting the bipolar PZAB input to a unipolar line. After offsetting, the following levels occur at the three comparators during the indicated conditions:

- +8.8 V dc = Blank.
- +5.7 V dc = Display (normal).
- +3.26 V dc = Markers.
- +0.79 V dc = Active markers.

Resistive string R72, R73, R74, and R75 in the power supply block establishes the reference voltage for each comparator. U24A is biased at +7.6 V dc; its output BLNK is normally low, and goes high when blanking occurs. U24B is biased at +4.5 V dc; its output is normally low, and goes high when a marker or active marker occurs. The rising edge clocks flip-flop U22A, setting U22A pin 5 MKR high if MKR EN is high. U24C is biased at +1.9 V dc; its output is normally low, and goes high when an active marker occurs. The rising edge clocks U22B, setting U22B pin 9 ACT MKR high if MKR EN is high. The A3 CPU reads these three outputs through the status buffer and takes the appropriate action. Afterward, the A3 CPU resets U22A and U22B by pulsing L MKR RST (low = marker reset) low.

Analog switch U46D is closed only during self-test. It connects the sweep DAC voltage to the inputs of the comparators, overriding any input at the rear panel connector and allowing the A3 CPU to exercise all blank and marker detector circuitry.

M. STATUS BUFFER

The status buffer allows the A3 CPU to read status information, including blanking and markers, from the A4 ADC.

Three-state buffer U19 sends the status of eight lines on the A4 ADC assembly to the A3 CPU via the instrument bus data lines whenever L STTS RD goes low.

N. INTERRUPT LOGIC

The interrupt logic allows the A4 ADC to interrupt the A3 CPU if one of several conditions has occurred. Two interrupt lines connect the A3 and A4 assemblies together. The first, L DRINT, is the data-ready interrupt which signals the A3 CPU that the ADC has completed its measurement cycle. The second, L STTS INT, indicates one of four different events: blanking, not blanking, marker, and retrace. These events are OR'd together in U10 so that any one can generate an interrupt. Any one or more of these interrupts can be enabled by the A3 CPU with the appropriate interrupt enable line (BLNK IEN, UNBLNK IEN, MKR IEN, or RTRC IEN). The interrupt enable line is then clocked through flip-flops U20A and U20B by the actual event, thus interrupting the A3 CPU if the interrupt enable line is high. The data-ready flip-flop U20A is cleared when the CPU reads the ADC data (when L DRRD goes low). The status interrupt flip-flop U20B is cleared when the CPU reads the status buffer (when L STTS RD goes low).

P. STATUS LOGIC

The status logic allows the A3 CPU to monitor different events without being interrupted. The marker, blanking, retrace, and sweep-too-fast status lines are OR'd together by U8 and U9. CVTA0 and CVTA1 allow the status flag to be set only on the last of the four possible measurement cycles. L STTS FLG is then read by the A3 CPU when it reads the ADC data.

Q. POWER SUPPLY FILTERING

The power supply filtering circuit removes unwanted noise from the voltage supply lines used on the A4 ADC assembly.

LC filters remove noise from the +15VF, +5VF, −15VF, and +5VD lines. A pull-up resistor R82 generates +5VP, which is used as a TTL high. Voltage reference U16 generates a +10 V reference. This is amplified slightly by U4B to produce +DAC REF, which is approximately +10.24 V and is used for the sweep DAC. This is then divided by R14 and R15 and buffered by U4A, producing the +6.6 VREF used on the detector control DAC. R72, R73, R74, and R75 produce three reference voltages from the +15VF line to be used mainly by the blank/marker detector.

DIAGNOSTIC TESTS

These keys are accessed by pressing **[SYSTEM]** ***[MORE] [SERVICE] [A4 ADC]***.

[ADC MEAS]

This diagnostic test checks the ability of the A4 ADC to properly convert an analog signal to digital data. The routine consists of two separate tests. See "[DATA READY]" and "[READ DATA]".

[ADC BIT CHECK]

This checks the ability of all fifteen data lines of the ADC U5 to toggle both high and low. The test ramps the sweep DAC U35 while selecting both the VDAC2 and VDAC3 inputs to the ADC. Each bit of the ADC must be capable of outputting both high and low logic levels. Any bit not capable of this is listed on the CRT. The failed bit position is indicated by a "1" in the appropriate location of the error message.

[DAC BIT CHECK]

This test checks the accuracy of the sweep DAC U35 and the four sections of the detector control DAC U34. Each bit is checked for its proper weighting. Bits that fail are listed on the CRT. A "1" indicates a failed bit position.

[DET CONTROL]

This cycle test verifies the performance of the detector control circuitry up to and including the four outputs of U45. During this test the detector DAC U34 and the mode switch U46 are exercised over their entire range. The resulting output (as viewed at pin 3 of the detector input connectors on the front panel) is shown in figure 8-16.

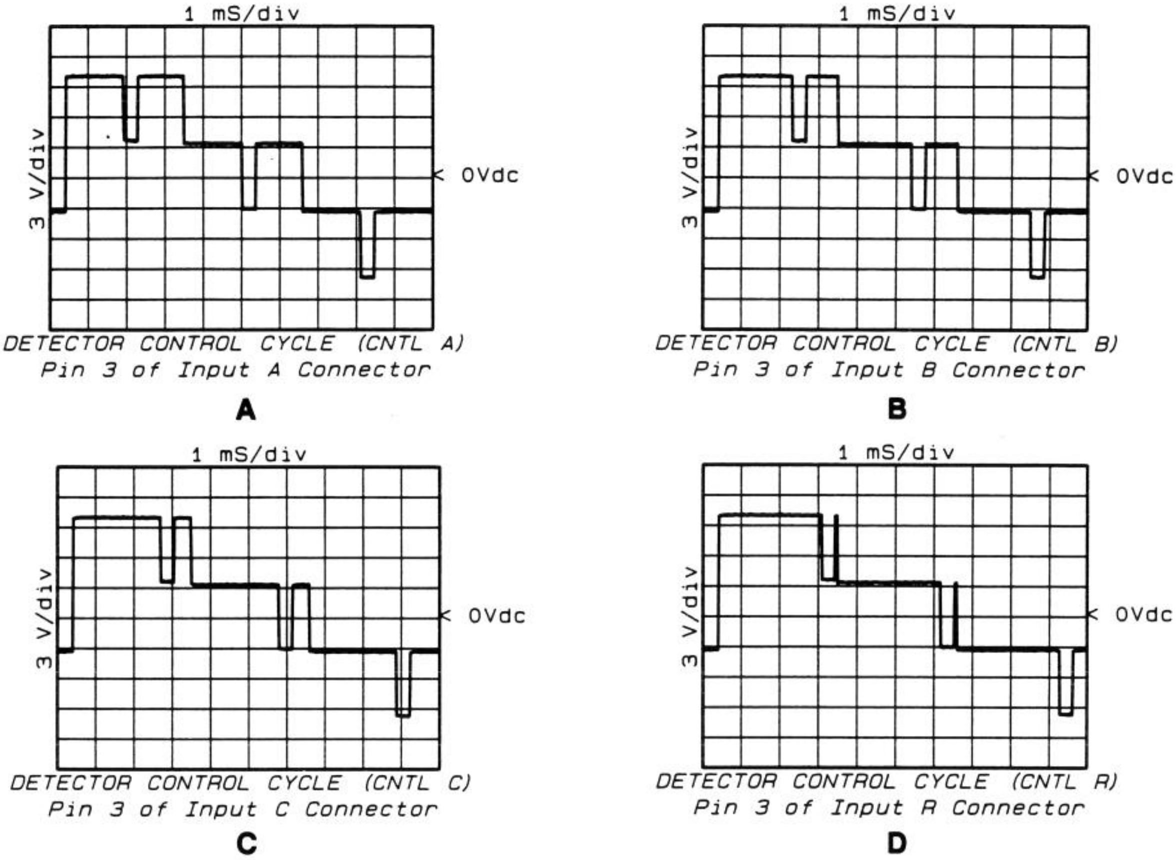


Figure 8-16. Detector Control Cycle Waveforms

If the test fails, the failure mode is displayed together with more softkeys. These keys select one of three modes of operation corresponding to the three sections of the mode switch U46. When one of these keys is pressed, the display indicates which portion of which input channel control line has failed. Another softkey is available to access the channel volts/detector DAC test. Table 8-13 shows the expected voltage output from each section of U45 (each input channel).

Table 8-13. A4 Detector Control Modes

	MAX V	**MIN V**	**U46 (Closed Section)**
Mode 1	+10.17	+3.57	1. pins 3 & 2
Mode 2	+3.28	−3.31	2. pins 6 & 7
Mode 3	−3.67	−10.27	3. pins 11 & 10
MAX = All DAC bits low MIN = All DAC bits high			(Only one section is closed at a time.)

[SWEEP COMPARE]

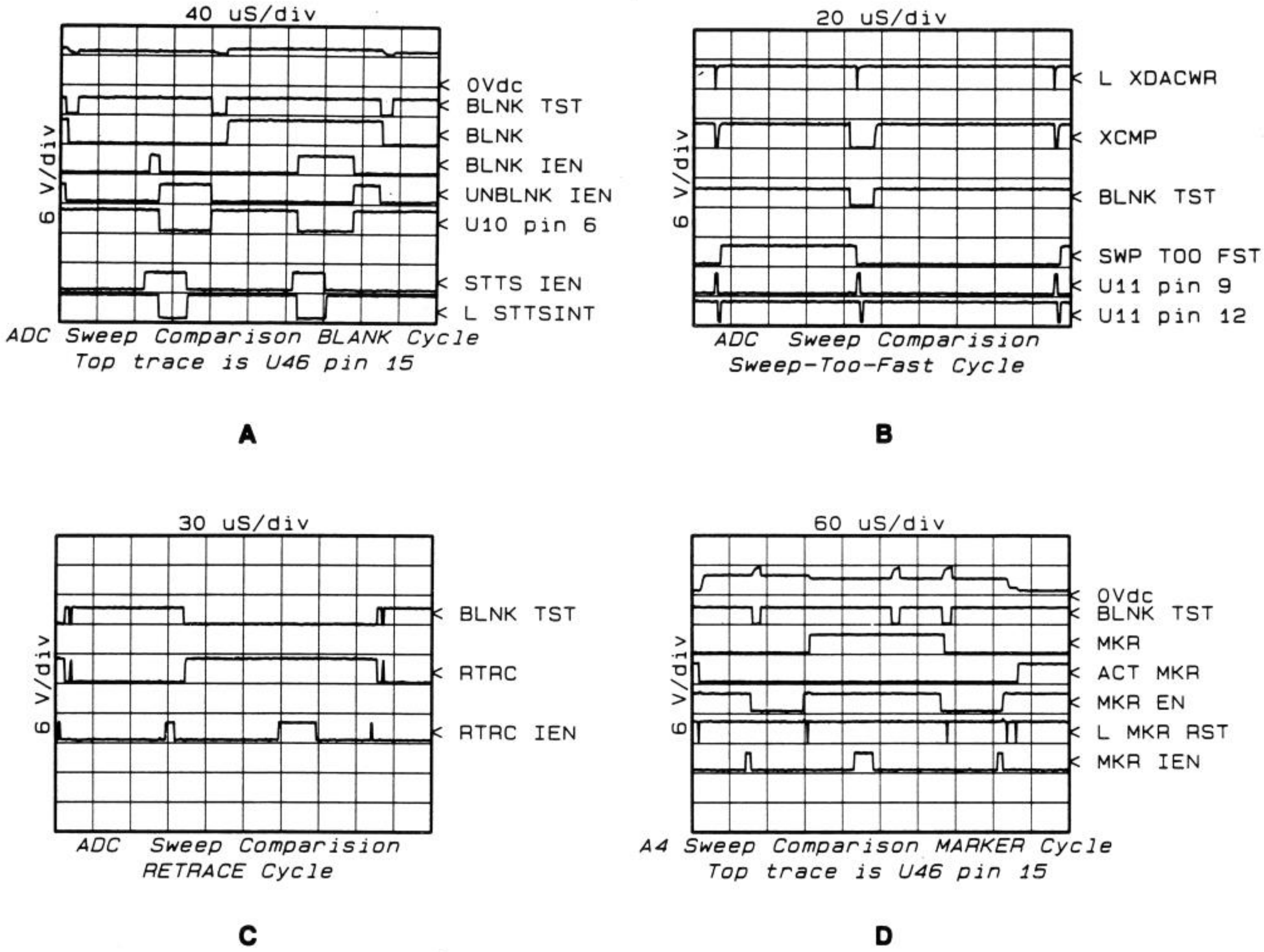


Figure 8-17. Sweep Comparison Cycle Tests Waveforms

[SWEEP COMPARE] performs a large number of tests that verify the operation of most of the sweep control, blanking, and marker circuitry. If any portion of the tests fails, the results are displayed on the CRT. In addition, several more softkeys are then available to further isolate the problem. These softkeys call up cyclical routines to aid in troubleshooting. Typical waveforms for the sweep comparison tests are shown in figure 8-17.

NOTE: Many of these sweep compare diagnostic tests require a properly working sweep DAC and its scaled outputs VDAC, VDAC2, and VDAC3. These outputs are used to test the voltage thresholds of several different comparators. Other tests use switches or comparators to toggle control lines. Failure of any of these components causes a failure of the test.

Table 8-14 shows the circuits checked during this routine in order of execution.

Table 8-14. Sweep Compare Failure Chart

Test	**Areas of Most Probable Failure**[1] (other than actual self-test devices)
Stop sweep circuitry[2]	U24D, U19A
Sweep compare	U12C
Status flag	U8, U9
Status	U19
Interrupt	U9, U10
Blanking	
Status flag	U8, U9E, U24A
Status	U19A
Interrupt	U9C, U10, U20B
Unblank	U9B
Sweep too fast	
Status flag	U11B, U23B, U8A
Status	U19B
Retrace	
Status flag	U12B, U8
Status	U19A
Interrupt	U10
Marker	
Status flag	U24B, U22A, U8B
Status	U19B
Interrupt	U10
Active marker status	U22B, U19B
Marker disable	U22

1. Also check control decoders U36, U37, and U38 for proper decoding of control lines.
2. Rear panel STOP SWEEP BNC must be disconnected for this test to pass.

[RAMP]

This cyclical test continuously ramps the sweep DAC U35 and the detector control DAC U34 from their minimum value to their maximum. Typical outputs are shown in figure 8-18. Note that because the detector DAC is only eight bits and the sweep DAC is twelve bits, the detector DAC completes sixteen ramp cycles per sweep DAC ramp.

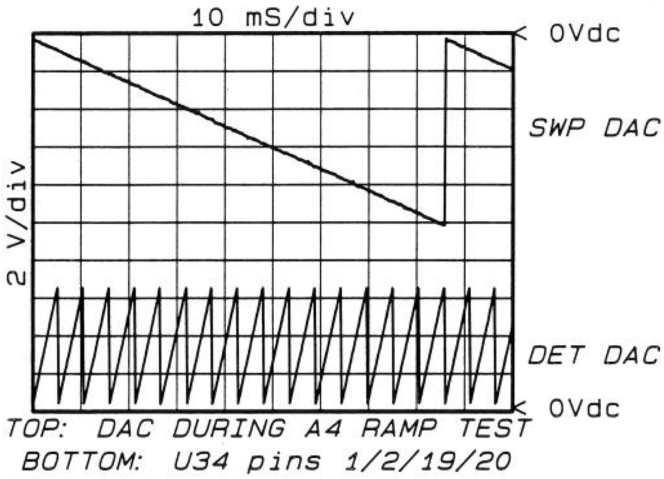


Figure 8-18. DAC Waveforms during A4 Ramp Test

[CHANNEL VOLTS]

This softkey leads to another menu to access a series of cyclical tests. These tests allow the operator to monitor various inputs to the ADC U5 under varying conditions. Typical CRT displays with no external inputs connected are shown in figure 8-19. The actual input voltage to the ADC U5 or the multiplexer U14/U15 may be different from the CRT display. This is due to the different scaling factors used in different parts of the circuit.

```
MORE ADC TESTS                                        CHANV
CHANV LOGGERS                                        LOGGER

INPUT A                                               CHANV
           Data:    -6.187 V                         DETDAC
      DC Offset:    -7.791 V
           Temp:    -1.771 V                          CHANV
INPUT B                                               OTHER
           Data:    -6.479 V
      DC Offset:    -7.774 V
           Temp:    -1.704 V
INPUT C
           Data:    -6.302 V
      DC Offset:    -7.783 V
           Temp:    -1.696 V
INPUT R                                               PRIOR
           Data:    -6.095 V                           MENU
      DC Offset:    -7.782 V
           Temp:    -1.654 V                           EXIT
                                                    SERVICE
```

A

```
MORE ADC TESTS                                      DET DAC
CHANV DETDAC                                          ENTER

   DET DAC ENTRY:  -0.00 V                          DET DAC
                                                        MAX
 Use step keys or  keypad to vary
 Detector DAC vol tage. Terminate                   DET DAC
 with DET DAC ENT ER softkey.                           MIN
---------------- ---------------
       DETECTOR:  MODE 2                            -------
  INPUT A SENSE:   +0.07 V                           MODE 1
          DRIVE:   +0.07 V
  INPUT B SENSE:   +0.04 V                           MODE 2
          DRIVE:   +0.04 V
  INPUT C SENSE:   +0.05 V                           MODE 3
          DRIVE:   +0.05 V                          -------
  INPUT R SENSE:   +0.09 V
          DRIVE:   +0.09 V                            PRIOR
                                                       MENU

                                                       EXIT
                                                    SERVICE
```

B

```
MORE ADC TESTS                                      SWP DAC
CHANV OTHER                                           ENTER

 SWEEP DAC ENTRY: -10.2375 V                        SWP DAC
                                                        MAX
 Use step keys or  keypad to vary
 Sweep DAC voltag e. Terminate                      SWP DAC
 with SWEEP DAC E NTER softkey.                         MIN
---------------- ---------------

          VDAC2:  -1.0258 V
        SWP DAC: -10.2500 V

                                                      PRIOR
                                                       MENU
       6.6VREF:  +6.5745 V
           GND:  -0.0020 V
    AUX ADC IN:  +0.0038 V                             EXIT
      SWEEP IN:  +0.0205 V                          SERVICE
```

C

Figure 8-19. A4 Channel Volts Tests

[CHANV LOGGER]

This test monitors the output of each logger in each of the three states: data, DC offset, and temperature. The voltage displayed should correspond to the output of the log amplifier assembly at TP9 on A7, A8, A9, and A10.

[CHANV DETDAC]

This test monitors the voltage at both the driven and sensed sides of the detector control sense resistors A4R19, R23, R27, and R31. The detector mode switch U46 can be set to any mode and the DAC U34 can be set to any valid value within its mode range. (Refer back to the detector control test for voltage limits.) The output voltages of U45 (the DRIVE side of the sense resistors) are then displayed, along with the voltages at the SENSE side of the sense resistors. The drive voltage should be about the same voltage as the DAC setting. The sense voltage depends upon the load (detector) connected to the appropriate front panel input connector. If the connector is not terminated, the two readings should be the same, as there is no voltage drop across the sense resistor. If the connector is shorted to ground, the reading is zero. If an HP 11664A detector (serial number 25000 or above) or 11664E is connected, the sense voltage is one half of the drive voltage because the HP 11664A/E contains a 1K ohm internal resistor to ground.

The test starts in mode 2 with the DAC set to its mid point. This gives approximately zero volts output for the drive voltage. Any significant variation from zero indicates an offset problem. The DAC output voltage can be stepped one bit at a time using the STEP keys. Each step corresponds to an output change of 26 mV.

[CHANV OTHER]

This test monitors other miscellaneous inputs to the ADC. Also the minimum and maximum sweep DAC output values can be set using the softkeys. The sweep DAC U35 can be set manually using the ***[SWP DAC ENTER]*** key and the keypad or STEP keys. Each step changes the DAC output by 2.5 mV. Note that the sweep DAC output is always a negative voltage, therefore the maximum voltage setting is 0 V while the minimum voltage is −10.2375 V.

The following points are monitored:

VDAC2: This voltage should be one tenth of the sweep DAC setting indicated at the top of the CRT. The ratio is determined by A4R7 and R8 (9K and 1K ohms).

SWP DAC: This voltage should be about the same as the voltage indicated on the CRT for the sweep DAC (also known as VDAC or DAC-A4TP2). The displayed voltage is actually a measurement of VDAC3 multiplied internally by −1.25 to compensate for the effects of A4U4C.

6.6VREF: This monitors the 6.6 V reference voltage used for the detector control DAC U34. The voltage should be within 0.1 V of 6.6 V.

GND: This monitors the ground reference point. Typically this is within a few millivolts of 0 V.

AUX ADC IN: This monitors the AUX ADC input voltage from the rear panel ADC IN connector. The maximum input reading is ±10.417 V.

SWEEP IN: This monitors the sweep input voltage from the rear panel.

[DATA READY]

This cycle test verifies the ability of the ADC U5 to properly complete one analog-to-digital conversion. This is a digital test. The accuracy of the conversion is not checked in this routine, only the proper sequencing of the digital control lines.

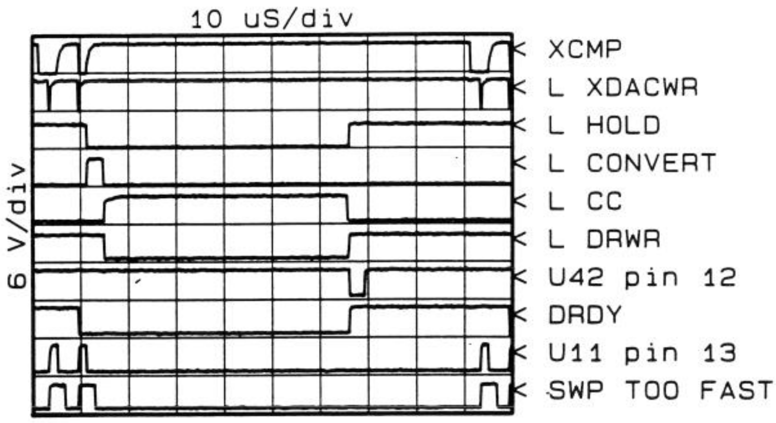


Figure 8-20. Timing of the A4 Data Ready Loop

The digital timing and sequence of events for several control lines is shown in figure 8-20. Table 8-15 shows the items that are checked.

Table 8-15. Data Ready Failure Chart

Control Line	Probable Cause of Failure
XCMP	U12C/D, U19, U11A
DRDY	U42, U39, U41
SWP TOO FAST	U11B, U23B
Set-L DRINT	U20A
Clr-L DRINT	U21B
ADC Timeout	U5

The ADC timeout test verifies that the ADC can complete a conversion cycle within 60 μs.

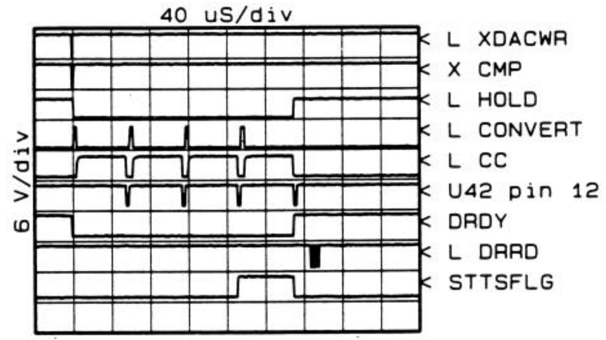
[READ DATA]

This cyclical test verifies the ability of the A4 ADC to accurately complete a full cycle of four conversions. This routine verifies most of the analog multiplexer, ADC, data ready circuit, and output data register (blocks I, J, K, and L). The 6.6 V reference, the detector control DAC U34, and the sweep DAC U35, along with their associated circuits, must already be working properly for this test to pass. A conversion is made on the inputs listed in table 8-16 of the analog multiplexer U15/U14. The voltages indicated are those present at the input to the multiplexer. The test fails if the voltage read is outside the limits shown. The actual voltage at the input to the ADC itself is 20% higher.

Table 8-16. Read Data Tests

Reading	Input	Expected Voltage
DPS2	Detector C DAC is set to its near maximum negative voltage of −10.24 V.	−7.80 ±0.5 V at U14
GND	Analog ground input.	0.00 ±0.065 V
6.6VREF	Reference voltage input.	+6.6 ±0.3 V
VDAC3	Sweep DAC set to its maximum negative voltage of −10.2375 V, inverted by buffer U4C to +8.19 V.	+8.19 ±0.14 V

Figure 8-21 shows the timing relationship of the control lines in this cycle. Note that the voltages at TP1 (SIG) are 20% higher than those listed here.



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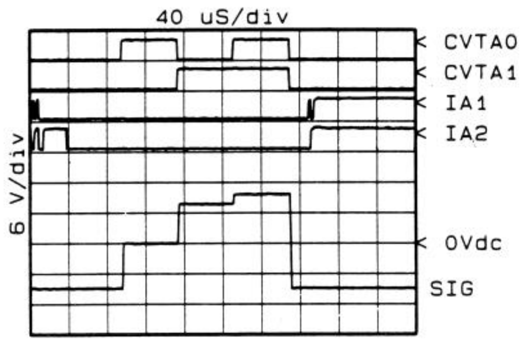

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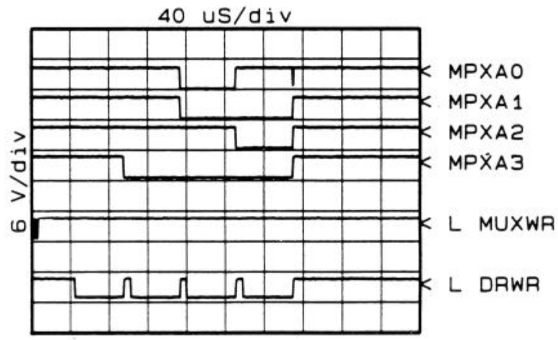


C

Figure 8-21. Timing of the A4 Read Data Loop

TROUBLESHOOTING

The A4 ADC schematic is documented on two sheets. The first page (blocks A, B, C, D, E, F, G, and Q) covers the digital control, detector control, sweep functions, and power supply. These circuits track the horizontal sweep ramp and initiate the data acquisition function. The second page (blocks H through P) covers the analog, ADC, data acquisition, and blanking circuits. These circuits perform the vertical analog-to-digital conversion functions.

BASIC CHECKS

Check the power supply voltages to the A4 ADC assembly, especially the ±15 V supplies. Check that the +10VREF voltage at A4TP3 (+10) is +10.00 ±0.05 V.

SELF-TEST AND ERROR MESSAGES

If any self-test fails at preset or turn-on, refer to "Self-Tests" at the beginning of the service section. The following instrument verify error messages usually apply to A4 ADC failures:

- ADC Measurement.
- ADC Bit Check.
- DAC Bit Check.
- Sweep Compare.
- Detector Control.

These tests are similar to the ones described in the ADC diagnostic tests.

NOTE: Failure of *all* the above self-tests usually indicates the failure of the ADC U5 to perform a conversion.

The internal instrument verify test (performed at preset or turn-on) is a very comprehensive test designed to detect almost any hard failure in either the digital or analog portion of the assembly. ADC accuracy is also verified within certain limits. In fact, the only portion of the assembly *not* thoroughly tested is the sample/hold circuit and part of the stop sweep circuit. However, the stop sweep circuit is checked when the sweep compare diagnostic test is performed (with the STOP SWEEP BNC cable disconnected). The sample/hold circuit is easily checked by viewing the displayed voltages for each input while a known power level is applied to each input with a detector. This procedure is explained later in this section.

If any of the above self-tests fails, go to the A4 service menu using **[SYSTEM]** ***[MORE] [SERVICE] [A4 ADC]*** and run the appropriate diagnostic test. This should isolate any failure to a specific portion of the ADC assembly. Compare the results of the cyclical tests with figures 8-16 through 8-21. Trigger the oscilloscope with the CONTROL 1 negative-edge output signal from the rear panel.

CIRCUITS NOT CHECKED BY SELF-TESTS

Use the troubleshooting setup shown in figure 8-5, "HP 8757C/E Overall Troubleshooting Block Diagram". Set the sweep time to 150 ms minimum.

Sweep In

Verify that the sweep ramp from the source is 0 V to +10 V (figure 8-23) both at the input to the ADC board and at TP10 (SWP). If there is no sweep ramp, no horizontal trace can appear on the CRT (except in CW mode).

Stop Sweep

Terminate the STOP SWEEP BNC output on the rear panel with either a short or a 50 ohm load. Then verify that the stop sweep line reaches the rear panel by performing the sweep compare test. To access this test, press **[SYSTEM]** ***[MORE] [SERVICE] [A4 ADC] [SWEEP COMPARE]***. The test should fail when the STOP SWEEP connector is terminated, and pass when it is disconnected.

ADC IN and DAC OUT

Connect a BNC cable from the DAC OUT 0-10V connector on the rear panel to the ADC IN connector. You can also connect a voltmeter to check accuracy, using a BNC tee. Run the CHANV OTHER diagnostic test using **[SYSTEM]** ***[MORE] [SERVICE] [A4 ADC] [MORE] [CHANNEL VOLTS] [CHANV OTHER]*** and set the sweep DAC to its minimum setting (−10.2375 V). The AUX ADC IN reading (and the voltmeter reading) should then be within a few millivolts of the sweep DAC setting. Vary the sweep DAC output voltage over its range using either the STEP keys or the keypad.

Logger Sample/Hold Circuits

To verify the accuracy of the sample/hold circuits on the log amplifier assemblies, run the CHANV LOGGER diagnostic test. Vary the detector input power over its range and verify that the data reading of the corresponding input changes from about +6.5 V at +10 dBm to about −6 V (noisy) at −60 dBm. Note that the change per dB is not linear.

If greater accuracy is desired, monitor the appropriate log amplifier assembly output with a voltmeter at TP9 in the normal measurement mode (not in the service menus). (The logger output is actually a differential signal.) Then return to the CHANV LOGGER diagnostic test and compare the two voltage readings. The voltage reading at TP9 on the logger assembly is not accurate while the CHANV LOGGER service menu is present, because three separate voltages are multiplexed.

BLOCK-BY-BLOCK TROUBLESHOOTING

A. Address Decoder

In the READ DATA diagnostic test, verify the presence of negative-going pulses at each output of U40, except for pin 7 L MKR RST. If the pulses are not present, suspect U40 or the incoming address lines.

B. Control Decoder

The control decoder outputs are most easily checked by using the hex data rotate routine. Enter the hex tests menu using **[SYSTEM]** ***[MORE] [SERVICE] [HEX TESTS]***. Enter the address 1FF848 and press ***[ROTATE]***. A positive-going pulse should be visible at each output of U38 (a walking 1 pattern). Repeat this test at address 1FF868 and verify each output of both U37 and U36.

C. Stop Sweep

See "Stop Sweep" under "Circuits Not Checked by Self Tests" at the beginning of this troubleshooting section.

D. Detector Control

Using the ***[RAMP]*** diagnostic test, verify a 0 V to +6.6 V ramp at each of the four outputs of U34.

Measure the voltages on pins 3, 6, and 11 of the detector mode switch U46. These should be 0 V at pin 3, −2.59 V at pin 6, and −5.18 V at pin 11. Use the CHANV DETDAC diagnostic test to select modes 1, 2, and 3. Depending on which mode is selected and therefore which switch section in U46 is closed, the non-inverting inputs of U45 should have the same voltage as one of the input pins (3, 6, and 11). Mode 1 closes switch section 1 only, mode 2 section 2 only, and mode 3 section 3 only.

Use an oscilloscope to check the detector control outputs on pin 3 of each detector input connector. The waveforms should be similar to figure 8-16.

E. Sweep DAC

Enter the RAMP diagnostic test, and verify the presence of a 0 V to +10.2375 V ramp at TP2 (DAC).

- VDAC2 should be one-tenth of the voltage at TP2.
- VDAC3 should be inverted and be 80% of the voltage at TP2.
- AUX DAC OUT should be inverted from TP2.

F. Sweep Buffer

This differential buffer has a gain of 1. Verify that the SWP IN signal looks identical to the signal at TP10 (SWP).

G. Sweep Comparator

Enter the sweep comparison test using **[SYSTEM]** ***[MORE] [SERVICE] [A4 ADC] [SWEEP COMPARE]***. Then run the ***[BLANK]***, ***[SWP TOO FAST]***, ***[RETRACE]***, and ***[MARKER]*** diagnostic tests. Compare the RTRC and XCMP (TP11) waveforms for each test with figure 8-17.

H. Sample/Hold

These differential buffers each have a gain of −1 except for U1 which has a gain of −0.8. Verify that the output is similar to the input signal but with opposite polarity.

I, J, K, L. Data Acquisition

(Analog multiplexer, ADC, output data register, data ready circuit.) The data acquisition function is a complex series of events involving several circuits and assemblies. Since the components of the data acquisition chain are arranged in a loop, a failure in any one component may create failure symptoms throughout the entire loop. The following procedure should isolate the problem to a small link of the chain.

First, perform the ***[DATA READY]*** diagnostic test. If this test passes it indicates the proper operation of the data ready circuit, the ability of the ADC to perform a conversion (but not the accuracy), and the operation of the interrupt logic circuit. If any portion of the test fails, use an oscilloscope to compare the timing waveforms to figure 8-20. This should quickly isolate any problem to one or two ICs.

Second, perform the ***[READ DATA]*** diagnostic test. This test verifies the accuracy of four ADC conversions, the operation of the multiplexer, and the operation of the output data registers.

Failure of all the tests may indicate a problem with the ADC or one of the control address lines (CVTA0, IA1, MPXA0, etc.). Use an oscilloscope to compare the waveforms with figure 8-21. In particular, check for the presence of CVTA0, CVTA1, IA1, and IA2 at each of the RAMs (U33 in block I, and U7, U6, U18, and U17 in block K).

If only one of the four measurements fails, check the voltage levels at the appropriate input to the multiplexer.

N, M, P. Interrupt and Status

These circuits are thoroughly tested during self-test. If a problem arises, verify the continuity of all related control lines. If continuity is verified, suspect the IC controlling the indicated function.

O. Blank/Marker Detector

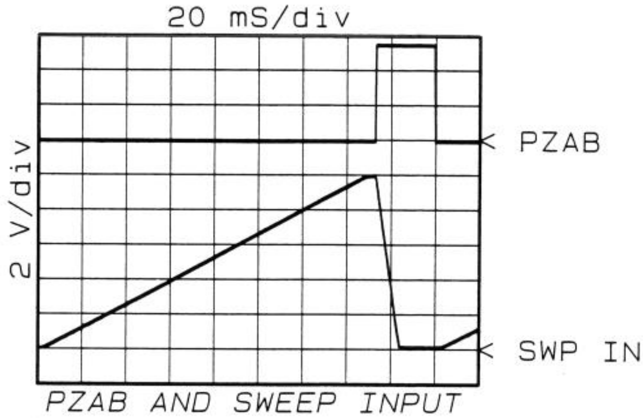
This circuit is also thoroughly tested during self-test. If a failure occurs check the reference voltages, VDAC3, and the continuity of PZAB from R69 to the rear panel.

Table 8-17. A4 Multiplexer Channels

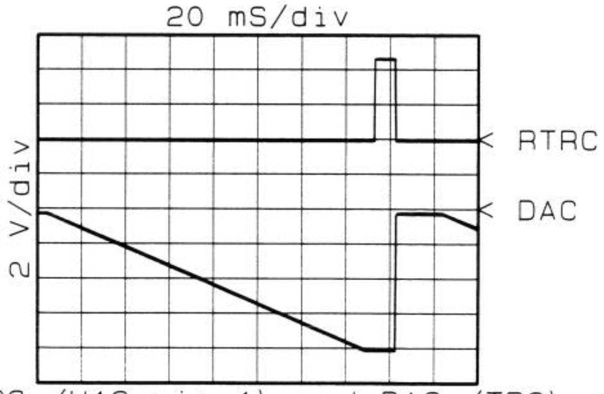
MPXA3	MPXA2	MPXA1	MPXA0	Description		Typical Voltage Range at U14, 15
0	0	0	0	VDAC 2	Sweep DAC ÷ 10	0 to −1.02 V
0	0	0	1	VDAC 3	Sweep DAC × −0.8	0 to +8.2 V
0	0	1	0	NC		
0	0	1	1	NC		
0	1	0	0	+6.6VREF	Detector DAC Reference Voltage	Nominal +6.6 V
0	1	0	1	NC		
0	1	1	0	CAL PWR	Not currently used	
0	1	1	1	GND A	ANALOG GND	0.0 V
1	0	0	0	B HOLD	Sample/Hold from B Logger	Approx. −7.5 at +20 dBM detector input. Approx. +6.1 V at noise floor. (−62 dBm).
1	0	0	1	C HOLD	Sample/Hold from C Logger	
1	0	1	0	A HOLD	Sample/Hold from A Logger	
1	0	1	1	R HOLD	Sample/Hold from R Logger	
1	1	0	0	AUX HOLD	Sample/Hold from AUX ADC ON	±8.0 V
1	1	0	1	SWP	Buffered Sweep Ramp	0 to +7.5 V
1	1	1	0	DPS 1	Detector Parameter Sense 1	±7.7 V
1	1	1	1	DPS2	Detector Parameter Sense 2	±7.7 V

Table 8-18. A4 Address Decoder Lines

Mnemonic	Address Hexadecimal	Destination	Description
L XDAC WR	1FF240	U11, U23, U35, U41	Enables writing of data to sweep DAC.
CNTRL WR1	1FF848	U38	Enables decoding of 8 data lines at U38.
L DRRD	1FF850 - 1FF854	U6, 7, 17, 18, 20	Enables reading of ADC data lines.
L STTS RD	1FF858	U19, U20	Enables reading of status buffer U19.
L MUXWR	1FF860 - 1FF866	U33	Enables writing of data to multiplexer RAM.
CNTROL WR2	1FF868	U36, 37	Enables decoding of 16 data lines at U36, 37.
L DDAC WR	1FF070 - 1FF076	U34	Enables writing of data to detector control DAC.
L MKR RST	1FF878	U22	Resets marker detectors.



SWP (TP10) is similar to SWP IN



RTRC (U12 pin 1) and DAC (TP2)

Figure 8-22. A4 ADC Sweep-Related Waveforms (Sweep Time 150ms)

Table 8-19. A4 Pin-Outs (1 of 3)

A4P1

PIN	SIGNAL	I/O	SOURCE/ DESTINATION	FUNCTION BLOCK
1 19	AUX ADC IN CNTL R	IN OUT	A11J8-58 A11J1-33	H D
2 20	AAI SHLD CNTL B	IN OUT	A11J8-57 A11J1-34	H D
3 21	CAL PWR CNTL A	IN OUT	A5P1-22 A11J1-31	I D
4 22	ATTN BIAS NC	OUT	A5P1-4	UNUSED
5 23	ATTN 20 ATTN EN	OUT OUT	A5P1-23 A5P1-23	UNUSED UNUSED
6 24	ATTN 1 CNTL C	OUT OUT	A5P1-24 A11J1-32	UNUSED D
7 25	CAL ON NC	OUT	A5P1-25	UNUSED
8 26	GND A GND A	IN IN	A11J6-12* A11J6-12*	Q Q
9 27	LOG A LOG A COM	IN IN	A7P1-35 A7P1-34	H H
10 28	LOG B LOG B COM	IN IN	A8P1-35 A8P1-34	H H
11 29	LOG C LOG C COM	IN IN	A9P1-35 A9P1-34	H H
12 30	LOG R LOG R COM	IN IN	A10P1-35 A10P1-34	H H
13 31	NC NC			
14 32	GND A GND A	IN IN	A11J6-15 A11J6-15	Q Q
15 33	+15V +15V	IN IN	A11J6-14 A11J6-14	Q Q
16 34	−15V −15V	IN IN	A11J6-13 A11J6-13	Q Q
17 35	GND GND	IN IN	A11J6-12 A11J6-12	Q Q
18 36	+5V +5V	IN IN	A11J6-11 A11J6-11	Q Q

*Multiple destinations, refer to wiring schematic.

Table 8-19. A4 Pin-Outs (2 of 3)

A4P2

PIN	SIGNAL	I/O	SOURCE/DESTINATION	FUNCTION BLOCK
1 41	+5V DIG +5V DIG	IN IN	A11J6-8 A11J6-8	Q Q
2 42	GND DIG GND DIG	IN IN	A11J6-6 A11J6-6	Q Q
3 43	ID15 NC	I/O	A3P1-3, A6P1-43, A11J7-2	B,K
4 44	ID14 NC	I/O	A3P1-3, A6P1-44, A11J7-9	B,K
5 45	ID13 NC	I/O	A3P1-5, A6P1-45, A11J7-12	B,K
6 46	ID12 NC	I/O	A3P1-6, A6P1-46, A11J7-11	B,K
7 47	ID11 NC	I/O	A3P1-7, A6P1-47, A11J7-14	B,E,K
8 48	ID10 NC	I/O	A3P1-8, A6P1-48, A11J7-13	B,E,K
9 49	ID9 NC	I/O	A3P1-9, A6P1-49, A11J7-16	B,E,K
10 50	ID8 NC	I/O	A3P1-10, A6P1-50, A11J7-15	B,E,K
11 51	ID7 NC	I/O	A3P1-11, A6P1-51, A11J1-11, A11J7-18	B,D,E,K,M
12 52	ID6 NC	I/O	A3P1-12, A6P1-52, A11J1-12, A11J7-17	B,D,E,K,M
13 53	ID5 NC	I/O	A3P1-13, A6P1-53, A11J1-9, A11J7-20	B,D,E,K,M
14 54	ID4 NC	I/O	A3P1-14, A6P1-54, A11J1-10, A11J7-19	B,D,E,K,M
15 55	ID3 L DR INT	I/O IN	A3P1-15, A6P1-55, A11J1-7, A11J7-22 A3P1-55	B,D,E,I,K,M N
16 56	ID2 NC	I/O	A3P1-16, A6P1-56, A11J1-8, A11J7-21	B,D,E,I,K,M
17 57	ID1 NC	I/O	A3P1-17, A6P1-57, A11J1-5, A11J7-24	B,D,E,I,K,M
18 58	ID0 NC	I/O	A3P1-18, A6P1-58, A11J1-6, A11J7-23	B,D,E,I,K,M
19 59	IA7 IA7	IN IN	A3P1-60, A4P2-59, A6P1-59, A11J1-13 A3P1-60, A4P2-19, A6P1-59, A11J1-13	A A
20 60	NC IA6	 IN	 A3P1-20, A6P1-60, A11J1-16	 A

*Multiple destinations, refer to wiring schematic.

Table 8-19. A4 Pin-Outs (3 of 3)

A4P2

PIN	SIGNAL	I/O	SOURCE/DESTINATION	FUNCTION BLOCK
21 61	IA5 IA8	IN IN	A3P1-21, A6P1-61, A11J1-15 A3P1-61, A6P1-20, A11J1-14	A A
22 62	IA4 L STTS TNT	IN OUT	A3P1-22, A6P1-62, A11J1-18 A3P1-56	A N
23 63	IA3 NC	IN	A3P1-23, A6P1-63, A11J1-17	A
24 64	IA2 NC	IN	A3P1-24, A6P1-64, A11J1-20	A,D,I,K
25 65	IA1 NC	IN	A3P1-25, A6P1-65, A11J1-19	A,D,I,K
26 66	GND DIG SH NC		A4P2-28, A4P2-30*	Q
27 67	L IOS NC	IN	A3P1-27, A6P1-67, A11J1-21	A
28 68	GND DIG SH NC		A4P2-26, A4P2-30*	Q
29 69	L WRITE NC	IN	A3P1-29, A6P1-69	A
30 70	GND DIG SH NC		A4P2-26, A4P2-28*	Q
31 71	L RESET NC	IN	A3P1-31, A6P1-71, A11J1-23	B
32 72	NC NC			
33 73	NC NC			
34 74	L LOG TEMP NC	OUT	A7P1-14, A8P1-14, A9P1-14, A10P9-14	B
35 75	L LOG ZERO NC	OUT	A7P1-15, A8P1-15, A9P1-15, A10P1-15	B
36 76	NC NC			
37 77	ADO SHIELD NC	OUT	A11J8-59	E
38 78	AUX DAC OUT STOP SWEEP	OUT OUT	A11J1-60 A11J8-47	E C
39 79	NC SWP RTN	 IN	 A11J8-49	 F
40 80	PZAB SWEEP IN	IN IN	A11J8-48 A11J8-50	O F

*Multiple destinations, refer to wiring schematic.

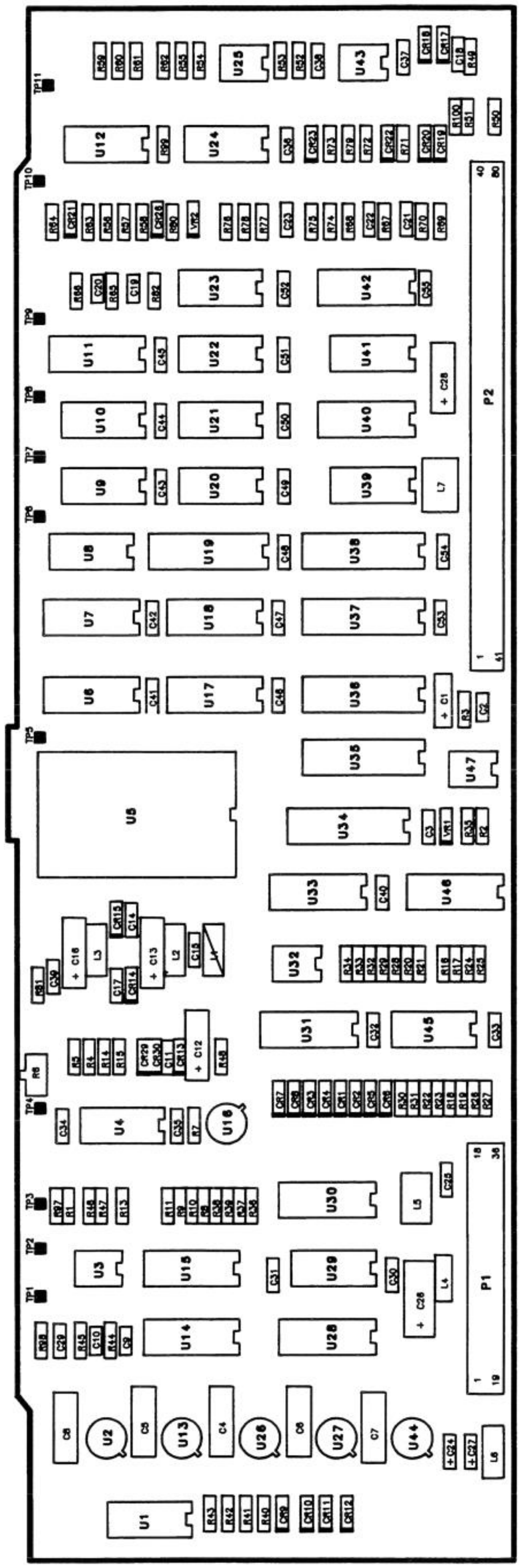


Figure 8-23. A4 Component Locations Diagram

A5 MODULATOR DRIVER

CONTENTS

CIRCUIT DESCRIPTION

The A5 modulator driver supplies a 27.778 kHz symmetrical square wave drive to modulate the microwave source. This drive can be used for external stand-alone microwave modulators, or can be applied to the amplitude modulation or pulse modulation inputs of compatible microwave sources. (If the source has an accurate 27.778 kHz ±20 Hz internal square wave modulation, no additional connections are needed.)

A. OSCILLATOR/DRIVER

The oscillator driver produces a 27.778 kHz signal for the output driver. The 27.778 kHz signal is obtained from a 444.444 kHz crystal oscillator Y1 that is divided by 16. The frequency accuracy of Y1 is better than ±0.05%. U1 contains both the oscillator circuitry and the divide-by-16 circuitry. The output is enabled by a logic zero at U1 pin 12. The ripple counter technique ensures that the divided output signal at pin 7 has perfect symmetry. The output at TP2 is a 0 V to 5 V square wave at 27.778 kHz.

The low-pass filter formed by C2, L1, and C3 shapes the 27.778 kHz signal to control the rise and fall times of the square wave.

B. AMPLIFIER/BUFFER

U2 is an inverting amplifier with a gain of −2.4. This converts the 0 to 5 V square wave signal from the oscillator/driver to a 12 V p-p signal. The voltage divider formed by R9 and R10 offsets this by +6 volts so that the output of U2 is centered about 0 volts. Current gain is provided by Q3 and Q5. Constant current source Q1, together with CR1 through CR4, biases Q5 to prevent crossover distortion. (There is no Q2 or Q4.) The ±6 V output from U2 is current limited by a series 75 ohm resistor located on the A13 rear panel assembly. Therefore, the rear-panel output provides a ±2.4 V signal into 50 ohms.

The output at J1 runs to the A13 rear panel assembly and from there to the rear panel MODULATOR BNC connector via coaxial cable A13W2. The return shields of both the BNC connector and the cable are floating from chassis ground, connected to instrument ground by 511 ohms. The shield is usually connected to ground at the microwave modulator or source, when connected. The shield should not contact ground anywhere else or ground loops will result and may reduce the dynamic range of the analyzer. A 5 V zener diode on the A13 assembly connects the floating return line to chassis ground directly at the BNC output to minimize electrostatic discharge (ESD) effects. The power supply filtering for the modulator driver is capacitively coupled directly to this return line. When modulation is turned off, the output is at its high state (+6 volts), turning an external modulator to its low loss state.

C. POWER SUPPLIES

LC filtering reduces noise on the power supply lines. Additional local filtering keeps unwanted 27.778 kHz noise from getting back to the rest of the instrument.

TROUBLESHOOTING

BASIC CHECKS

Verify the power supply voltages on the A5 modulator driver assembly.

Check the modulator drive cable A13W2 between the A13 rear panel assembly and the A5 assembly.

Modulation can be turned on and off via the HP interface bus. Modulation can also be turned on or off by the A3 CPU, depending on whether or not a source is connected to the 8757 system interface, and whether AC or DC detection mode is selected. Make sure the instrument is in local operating mode for troubleshooting.

When using DC detection mode, turn off the internal modulation of the source. Normally, when the 8757 system interface is used, the analyzer in DC mode automatically turns off the internal modulation of the source. However, this feature is overridden if the modulation control key of the source is pressed. This enables both internal modulation and DC detection at the same time, resulting in a trace that alternates from a high level trace to a noise floor trace. This cycle may repeat several times per second, depending on the beat frequency produced by two separate 27.778 kHz oscillators.

MODULATION ON/OFF CONTROL

Check for a logic 0 at TP1 (L MOD ON) with modulation on. To turn on the modulation, press **[SYSTEM]** ***[MORE] [MOD ON OFF]***. If TP1 does not go low, trace the problem back to the A3 CPU assembly (especially the address decoder). If TP1 does go low, but the oscillator at TP2 does not work, suspect U1 or Y1.

FREQUENCY

There is no adjustment for frequency. If the modulation can be controlled, but is slightly off frequency, replace crystal Y1. If the modulation frequency is extremely inaccurate, the problem is probably with the divide-by-16 circuitry in U1, so U1 should be replaced.

AMPLIFIER/BUFFER

Verify that U2 pins 2 and 3 are at +1.8 V. Verify about −9 V at the emitter of Q1.

If the positive half of the square wave is distorted or missing, suspect Q3 or CR5. If the negative half of the square wave is distorted or missing, suspect Q5, CR6, or Q1.

Table 8-20. A5 Pin-Outs

PIN	SIGNAL	I/O	SOURCE/ DESTINATION	FUNCTION BLOCK
1-8 1-26	NC NC			
9 27	GND PLANE GND PLANE	IN IN	A11J6-4 A11J6-4	C C
10 28	GND PLANE GND PLANE	IN IN	A11J6-4 A11J6-4	C C
11 29	GND PLANE GND PLANE	IN IN	A11J6-4 A11J6-4	C
12 30	GND PLANE GND PLANE	IN IN	A11J6-4 A11J6-4	C C
13 31	NC NC			
14 32	NC L 27K MOD DR	IN	A3PI-75	A
15 33	+15V +15	IN IN	A11J6-14 A11J6-14	C C
16 34	−15V −15V	IN IN	A11J6-13 A11J6-13	C C
17 35	GND PLANE GND PLANE	IN IN	A11J6-4 A11J6-4	C C
18 36	+5V +5V	IN IN	A11J6-11 A11J6-11	C C

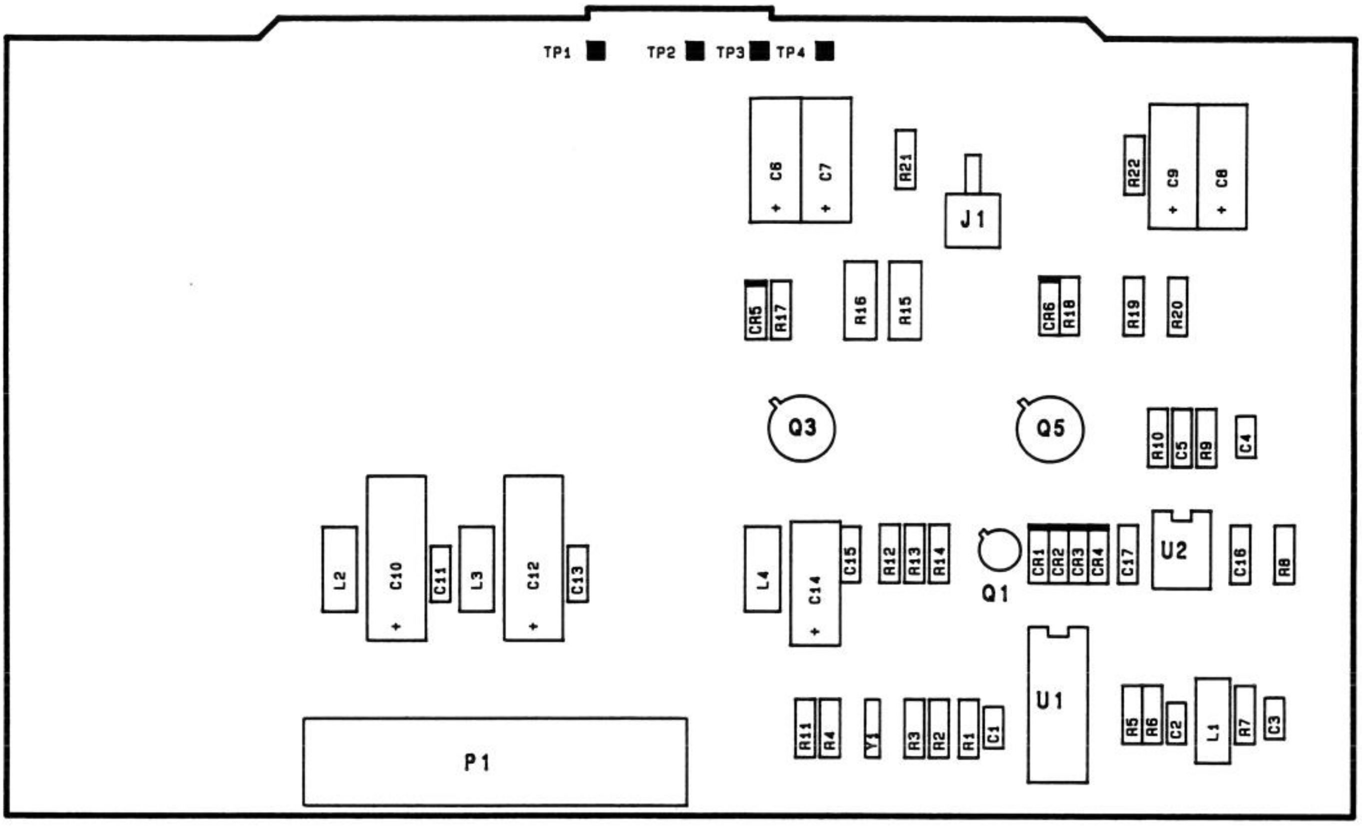


Figure 8-25. A5 Component Locations Diagram

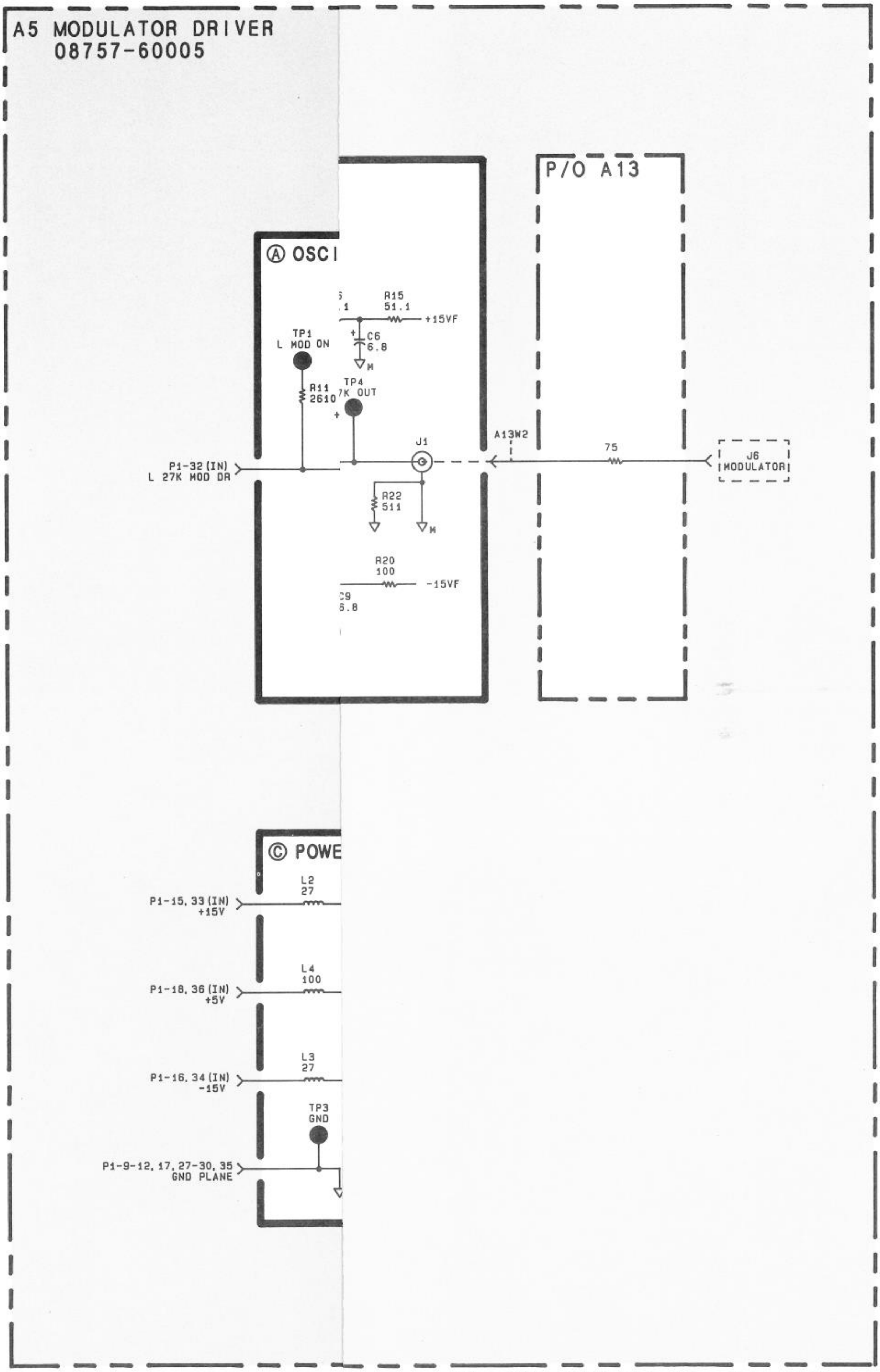


Figure 8-26. A5 Modulator Driver, Schematic Diagram

A6 HP-IB ASSEMBLY

CONTENTS

CIRCUIT DESCRIPTION

The A6 HP-IB assembly provides HP-IB ports for the analyzer to communicate with other external instruments or controllers. HP-IB is Hewlett-Packard's hardware, software, documentation, and support for IEEE-488 and IEC-625 worldwide standards for interfacing instruments.

IEEE-488 carefully defines an instrumentation interface to simplify the integration of up to fifteen instruments or controllers into systems. Data transfer occurs asynchronously in eight-bit parallel, byte-serial fashion. IEEE-488 employs a sixteen line interconnect bus. Eight data lines are used to transmit address and data information, using ASCII code. Five control lines manage all communication on the bus. Three handshake lines control the timing of data transfer using a three-wire interlocked handshake technique.

The HP 8757C/E has two HP-IB ports. Although the two ports are electrically identical, they are not interchangeable. The HP INTERFACE BUS enables remote control of the analyzer by an external controller; the 8757 SYSTEM INTERFACE allows the analyzer itself to control a compatible source, plotter, printer, or disk drive (HP 8757C only).

The HP INTERFACE BUS is the general purpose HP-IB port, and is normally connected to an external controller (such as a calculator or desktop computer). The controller then remotely controls the analyzer. Other instruments can also be connected to the HP INTERFACE BUS port, but they must be set to addresses different from the analyzer address. These instruments are then controlled by the external controller: the analyzer will not control this bus.

The 8757 SYSTEM INTERFACE, however, is controlled by the A3 CPU within the analyzer to communicate with selected compatible microwave sources, plotters, or printers. External controllers and other non-compatible instruments must not be attached to the 8757 SYSTEM INTERFACE port. However, it is possible to send commands from an external controller via the HP interface bus for the analyzer to pass through to instruments attached to the 8757 system interface.

In addition to the HP-IB circuits, a self-test latch is also located on this assembly to verify the proper reading and writing of the sixteen data lines from the A3 CPU assembly. This self-test is exercised during the instrument bus test, which is also performed during preset.

A. ADDRESS DECODER

The address decoder directs the flow of data on the instrument bus between the A3 CPU and A6 HP-IB assemblies.

The A3 CPU reads from and writes to the two HP-IB ports via the instrument bus. The address decoder decodes the instrument bus address lines to select either the HP instrument bus or the 8757 system interface to send or receive the information on the data lines. Three-to-eight decoder U4 decodes address lines IA4, IA5, and IA6 to select L AIB, L BIB, L BLR, or L BLW to pulse low. L IOS controls the timing.

L AIB and L BIB are connected to the HP-IB transceiver U2 and the 8757 system interface transceiver U1, respectively. These lines are used to select one of the two ports. Address lines IA1, IA2, and IA3 are connected to both U1 and U2. These address lines select one of eight internal registers when L AIB and L BIB select one of the two ports.

Refer to table 8-22 for the addresses to activate the L AIB and L BIB outputs, and descriptions of the functions they perform.

B. HP INTERFACE BUS

The HP interface bus transceiver provides the interface between the A3 CPU assembly and the general purpose HP INTERFACE BUS port on the rear panel.

HP-IB transceiver U2 provides the interface between the synchronous instrument bus on the A3 CPU assembly and the asynchronous HP INTERFACE BUS port A13J2. The CPU communicates with U2 via the instrument bus. When the address decoder selects L AIB low, U2 is enabled. The A3 CPU controls the direction of data flow with the L WRITE line. Data is carried on ID0 through ID7, and is buffered by U5. Address lines IA1, IA2, and IA3 select one of sixteen registers (eight for read, eight for write) internal to U2 to send or receive data. Most of these registers control the mode or report the status of U2's internal conditions. Two registers (one for read, one for write) are the interface for data transfer between the instrument bus and the HP interface bus.

Bi-directional bus transceiver U10 buffers data lines L ADIO1 through L ADIO8 to the HP-IB bus. U10 is configured for three-state outputs with the +5VP at pin 11. The direction of data flow is determined by the L TE line, controlled by U2. When L TE is high (talk), data flows out to the HP interface bus. When L TE is low (listen), data flows into the analyzer.

Bidirectional transceiver U11 buffers the five control and three handshake lines between U2 and the HP-IB bus. The outputs are either three-state or open-collector, as defined by IEEE-488. The direction of signals through U11 is a function of L TE, L CONTROLLER, and L ATN.

When the analyzer sends information out on the HP interface bus, the A3 CPU writes a byte to U2. U2 manages the HP interface bus with the control lines, and presents the data on L DIO1 through L DIO8. U2 controls the handshake line L ADAV. The HP-IB acceptor receiving the data controls the handshake lines L ANRFD and L ANDAC. The data byte is transferred asynchronously because external acceptors control two of the handshake lines. However, the 5 MHZ clock times the intervals between various states within U2.

When the analyzer receives data in from the HP interface bus, U2 recognizes its listen address (previously programmed by the A3 CPU to U2) and accepts a byte from the HP-IB port. In this mode, the external controller manages the bus. The external controller also handles the L ADAV line, while U2 controls the L ANDAC and L ANRFD lines. When the byte is accepted, U2 pulls L SRQA low to request service from the A3 CPU. The A3 CPU then reads the byte out of U2 on the instrument bus. U2 is then ready to handshake in another byte from the HP interface bus.

The latch U6 is used as a self-check for the instrument bus test which checks the ability of each data line to be set high independently of the other data lines. The A3 CPU writes a pattern to the data latch, clocks the data through, reads the data back, and then compares it with what was sent. Eighteen different patterns are tested: first all bits low, then all bits high, and finally a walking 1 is sent through all sixteen bits.

C. 8757 SYSTEM INTERFACE

The 8757 system interface transceiver provides the interface between the A3 CPU assembly and the special purpose 8757 SYSTEM INTERFACE port on the rear panel. Only compatible microwave sources, plotters, printers, or disk drives (HP 8757C only) may be connected to this port.

HP-IB transceiver U1 provides the interface between the synchronous instrument bus on the A3 CPU assembly and the asynchronous 8757 SYSTEM INTERFACE port A13J1. The CPU communicates with U1 via the instrument bus. When the address decoder selects L BIB low, U1 is enabled.

Bi-directional bus transceiver U9 buffers data lines L BDIO1 through L BDIO8 to the HP-IB bus. Bi-directional transceiver U7 buffers the five control and three handshake lines between U1 and the HP-IB bus. In all other respects, the 8757 system interface circuits are identical to the HP interface bus circuits, except that data lines ID8 through ID15 are used instead of ID0 through ID7. In firmware, the analyzer is *always* configured as the bus controller for the 8757 SYSTEM INTERFACE port. (The analyzer is never the bus controller for the HP INTERFACE BUS port.) See "B. HP Interface Bus" for circuit details.

D. POWER SUPPLY FILTERING

The power supply filtering removes unwanted digital noise from the voltage supply lines. C1, L1, and C2 are a pi section filter to remove digital noise from the +5V DIG power supply line. C3 through C12 provide additional local decoupling. R1 provides a TTL high pull-up voltage, +5VP.

TROUBLESHOOTING

This troubleshooting procedure assumes failure of at least one of the two internal diagnostic tests described in "HP-IB Diagnostic Tests". If both of these tests pass, the A6 HP-IB assembly, the HP INTERFACE BUS port, the 8757 SYSTEM INTERFACE port, and all interconnects are verified with 95% confidence. Be sure to eliminate HP-IB problems and the possibility of software bugs.

BASIC CHECKS

Check the +5V DIG power supply to the A6 assembly. Check TP7 (5 MHZ) for a 5 MHz clock pulse. If it is missing, trace it back to the A3 CPU assembly.

HP-IB DIAGNOSTIC TESTS

Connect an HP-IB cable between the rear panel HP INTERFACE BUS and 8757 SYSTEM INTERFACE ports. On the front panel, press **[SYSTEM]** ***[MORE] [SERVICE] [A6 HPIB INSTBUS] [HPIB TESTS] [HPIB LISTEN]*** to run the first diagnostic test. In this test, the HP INTERFACE BUS port accepts test data from the 8757 SYSTEM INTERFACE, acting as listener. If the test passes, the message HPIB TEST PASS is displayed on the CRT; other messages indicate the test failed.

Press ***[HPIB TALK]*** to run the second diagnostic test. In this test, the HP INTERFACE BUS sends test data to the 8757 SYSTEM INTERFACE, acting as talker. If the test passes, the message HPIB TEST PASS is displayed on the CRT; other messages indicate the test failed.

If both tests pass but the analyzer in a system configuration still has HP-IB problems, suspect external cabling problems and software bugs. Be sure to eliminate these possibilities before further troubleshooting on the A6 HP-IB assembly. Refer to *Introductory Programming Guide for the HP 8757C/E Scalar Network Analyzer with the HP 9000 Series 200/300 Desktop Computer (BASIC)* for known good programming examples and additional HP-IB information. This introductory programming guide is in the "Remote Operation" portion of section 3 of the operating manual.

If either of the diagnostic tests fails, check cable A13W1 between A11J8 on the motherboard and the A13 rear panel, near transformer T1. Try substituting another HP-IB cable.

If either diagnostic test fails, a FAIL message is displayed. This message assists in determining which line is causing the failure. As in the other tests, a displayed "1" indicates a failed line. However, due to limitations in both hardware and software, the failure message may not always be completely accurate. All control and data lines may be shown as bad when only a handshake line has failed. This test always catches a failure, but the indicated error message should only be used as a starting point for troubleshooting.

CHECKING LINE ACTIVITY

If one diagnostic test fails while the other passes, this additional information may help with troubleshooting.

Connect an HP-IB cable between the HP INTERFACE BUS and 8757 SYSTEM INTERFACE ports and run the tests above. If only one test failed, run that test. While the test is running, check the lines with a logic probe or oscilloscope to find the defective component. Check for high or low activity as shown in table 8-21. *Activity* means that both TTL high and low conditions occur: the logic probe blinks on and off. *High* means TTL high (+5 V): the logic probe lights brightly and does not blink. *Low* means TTL low (0 V): the logic probe goes dark and does not blink. (The third state, high impedance, may occur between pulses.)

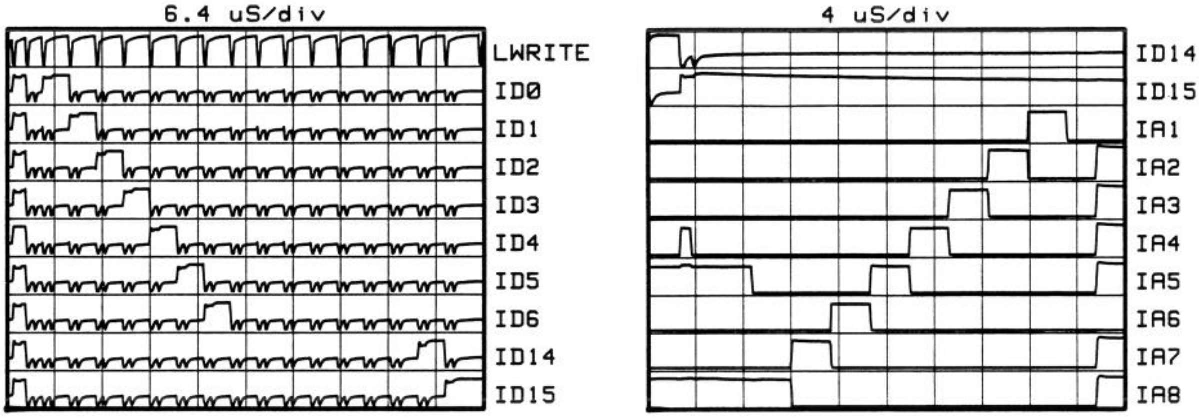
Table 8-21. A6 Line Activity

Lines	Activity
Major Control Lines:	
L RESET	high
5 MHZ	activity
L WRITE	activity
L IOS	activity
Address Lines:	
IA1 through IA5	activity
Address Decoder Lines:	
L AIB (TP5)	activity
L BIB (TP4)	activity
Data Lines:	
ID0 through ID15	activity
L DI01 through L DI08	activity
Interconnects between U1, U3, and U9	activity
Interconnects between U2, U5, and U10	activity
Handshake Lines:	
L NDAC	activity
L NRFD	activity
L DAV (TP8 or TP3)	activity
HP-IB Control Lines:	
L ATN	activity
L SRQ	activity (listen) or high (talk)
L REN	activity (Note that in TALK, between U1 and U7, L REN pulses are extremely narrow and infrequent. They may be missed by a logic probe.)
L IFC	activity
L EOI	activity

INSTRUMENT BUS FAILURES

If the instrument bus test fails (error code 11), it indicates that one or more data lines cannot be toggled both high and low. This error condition will probably prevent the CRT from displaying the proper information. In addition, the error code shown on the front panel may be in error. Always check the four LEDs (labeled MSB) on the A3 CPU board for the correct error code. In the event this test fails, the CPU automatically executes the instrument bus cycle test. It will stay in this mode until the failure is fixed. This allows the operator to check the individual data and address lines.

To eliminate the possibility of shorts on other boards, first remove the display interface cable W8, the front panel interface cable W5, and the A4 ADC assembly. Run the test again. If it still fails, the problem is on either the A3 CPU assembly, the A11 motherboard, or the A6 HP-IB assembly. Using an oscilloscope, verify the correct toggling of each data line from the A3 to the A6 assembly. Typical data and address line patterns are shown in figure 8-27. Lack of a double pulse for each of the eighteen patterns may indicate a defective latch (U6 or U8). If the instrument bus test fails at preset and the cycle is run automatically, the timing of the pulses is slightly different than if the test is performed manually or if the status switches were set to force this diagnostic test. The pattern shown in figure 8-27 was taken when the test was performed manually (forced) which produces a cycle time of about 100 µs. It is best to set the status switches to force this diagnostic test since the resulting waveforms will more closely match those in figure 8-27. For this and all other cycling tests, a negative-going oscilloscope trigger pulse is provided at the CONTROL 1 output connector on the rear panel.



1st half of instrument bus cycle showing typical double-pulse write/read pattern in relationship to LWRITE

2nd half of instrument bus cycle showing address line activity

Figure 8-27. Instrument Bus Cycle

Table 8-22. A6 Address Decoder Lines

Mnemonic	Address	Destination	Description
L AIB	1FE10X	U2	Enables HP Interface Bus to communicate with the A3 CPU.
L BIB	1FE11X	U1	Enables 8757 System Interface to communicate with the A3 CPU.
L BLR	1FF920	U6, U8	Enables the self test latches to output their stored data onto the Instrument Data Bus.
L BLW	1FF930	U6, U8	Enables the self test latches to latch the current data into their memory.

Table 8-23. A6 Pin-Outs (1 of 2)

PIN	SIGNAL	I/O	SOURCE/DESTINATION	FUNCTION BLOCK
1	+5V DIG	IN	A11J6-8, A6P1-1, A3P1-1, A4P2-1, A11J1-1	D
41	+5V DIG	IN	A11J6-9, A6P1-41, A3P1-41, A4P2-41, A11J1-2	D
2	GND DIG	IN	A11J6-6, A6P1-2, A3P1-2, A4P2-2, A11J1-3	D
42	GND DIG	IN	A11J6-7, A6P1-42, A3P1-42, A4P2-42, A11J1-4	D
3	L BDIO 1	I/O	A11J8-1, A13J1-1	C
43	ID15	I/O	A6P1-43, A4P2-3, A1J7-2	B
4	L BDIO 2	I/O	11J8-2, A13J1-2	C
44	ID14	I/O	A3P1-4, A4P2-4, A11J7-9	B
5	L BDIO 3	I/O	A11J8-3, A113J1-3	C
45	ID13	I/O	A3P1-5, A4P2-5, A11J7-12	B
6	L BDIO 4	I/O	A11J8-4, A13J1-4	C
46	ID12	I/O	A3P1-6, A4P2-6, A11J7-11	B
7	L BDIO 5	I/O	A11J8-5, A13J1-13	C
47	ID11	I/O	A3P1-7, A4P2-7, A11J7-14	B
8	L BDIO 6	I/O	A11J8-6, A13J1-14	C
48	ID10	I/O	A3P1-8, A4P2-8, A11J7-13	B
9	L BDIO 7	I/O	A11J8-7, A13J1-15	C
49	ID9	I/O	A3P1-9, A4P2-9, A11J7-16	B
10	L BDIO 8	I/O	A11J8-8, A13J1-6	C
50	ID8	I/O	A3P1-10, A4P2-10, A11J7-15	B
11	NC			
51	ID7	I/O	A3P1-11, A4P2-11, A11J1-11, A11J7-18	B
12	L BREN	OUT	A11J8-9, A13J1-7	C
52	ID6	I/O	A3P1-12, A4P2-12, A11J1-12, A11J7-17	B
13	L BIFC	OUT	A11J8-12, A13J1-9	C
53	ID5	I/O	A3P1-13, A4P2-13, A11J1-9, A11J7-20	B
14	L BNDAC	OUT	A11J8-14, A13J1-8	C
54	ID4	I/O	A3P1-14, A4P2-14, A11J1-10, A11J7-19	B
15	L BNRFD	OUT	A11J8-16, A13J1-6	C
55	ID3	I/O	A3P1-15, A4P2-15, A11J1-7, A11J7-22	B
16	L BDAV	OUT	A11J8-18, A13J1-6	C
56	ID2	I/O	A3P1-16, A4P2-16, A11J1-8, A11J7-21	B
17	L BEOI	OUT	A11J8-10, A13J1-5	C
57	ID1	I/O	A3P1-17, A4P2-17, A11J1-5, A11J7-24	B
18	L BATN	OUT	A11J8-20, A13J1-11	C
58	ID0	I/O	A3P1-18, A4P2-18, A11J1-6. A11J7-23	B
19	L BSQR	OUT	A1J8-22, A13J1-10	C
59	IA7	IN	A3P1-60, A4P2-19, A4P2-59, A11J1-13	A
20	IA8	IN	A3P1-61, A4P2-61, A11J1-14	B
60	IA6	IN	A3P1-20, A4P2-60, A11J1-16	A

Table 8-23. A6 Pin-Outs (2 of 2)

PIN	SIGNAL	I/O	SOURCE/DESTINATION	FUNCTION BLOCK
21 61	NC IA5	 IN	 A3P1-21, A4P2-21, A11J1-15	 A
22 62	NC IA4	 IN	 A3P1-22, A4P2-22, A11J1-18	 A
23 63	NC IA3	 IN	 A3P1-23, A4P2-23, A11J1-17	 B,C
24 64	L ADIO 1 IA2	I/O IN	A11J8-24, A13J2-1 A3P1-24, A4P2-24, A11J1-20	B B,C
25 65	L ADIO 2 IA1	I/O IN	A11J8-25, A13J2-2 A3P1-25, A4P2-25, A11J1-19	B B,C
26 66	L ADIO 3 GND DIG SH	I/O	A11J8-26, A13J2-3 Refer to A11 Wiring Schematic	B D
27 67	L ADIO 4 L IOS	I/O IN	A11J8-27, A13J2-4 A3P1-27, A4P2-27, A11J1-21	B A
28 68	L ADIO 5 GND DIG SH	I/O	A11J8-28, A13J2-13 Refer to A11 Wiring Schematic	B D
29 69	L ADIO 6 L WRITE	I/O IN	A11J8-29, A13J2-14 A3P1-29, A4P2-29	B B,C
30 70	L ADIO 7 GND DIG SH	I/O	A11J8-30, A13J2-15 Refer to A11 Wiring Schematic	B D
31 71	L ADIO 8 L RESET	I/O IN	A11J8-31, A13J2-16 A3P1-31, A4P2-31, A11J1-23	B B
32 72	NC L SRQA	 OUT	 A13P1-70	 B
33 73	L AREN L SRQB	OUT OUT	A11J8-32, A13J2-13 A3P1-33	B C
34 74	L AIFC NC	OUT	A11J8-35, A13J2-9	B
35 75	L ANDAC 5MHZ	OUT IN	A11J8-37, A13J2-8 A3P1-35	B B,C
36 76	L ANRFD NC	OUT	A11J8-39, A13J2-7	B
37 77	L ADAV NC	OUT	A11J8-41, A13J2-6	B
38 78	L AEOI NC	OUT	A11J8-33, A13J2-5	B
39 79	L AATN SPARE	OUT	A11J8-43, A13J2-11 Not currently used.	B
40 80	L ASRQ SPARE GND	OUT	A11J8-45, A13J2-10 Not currently used	B

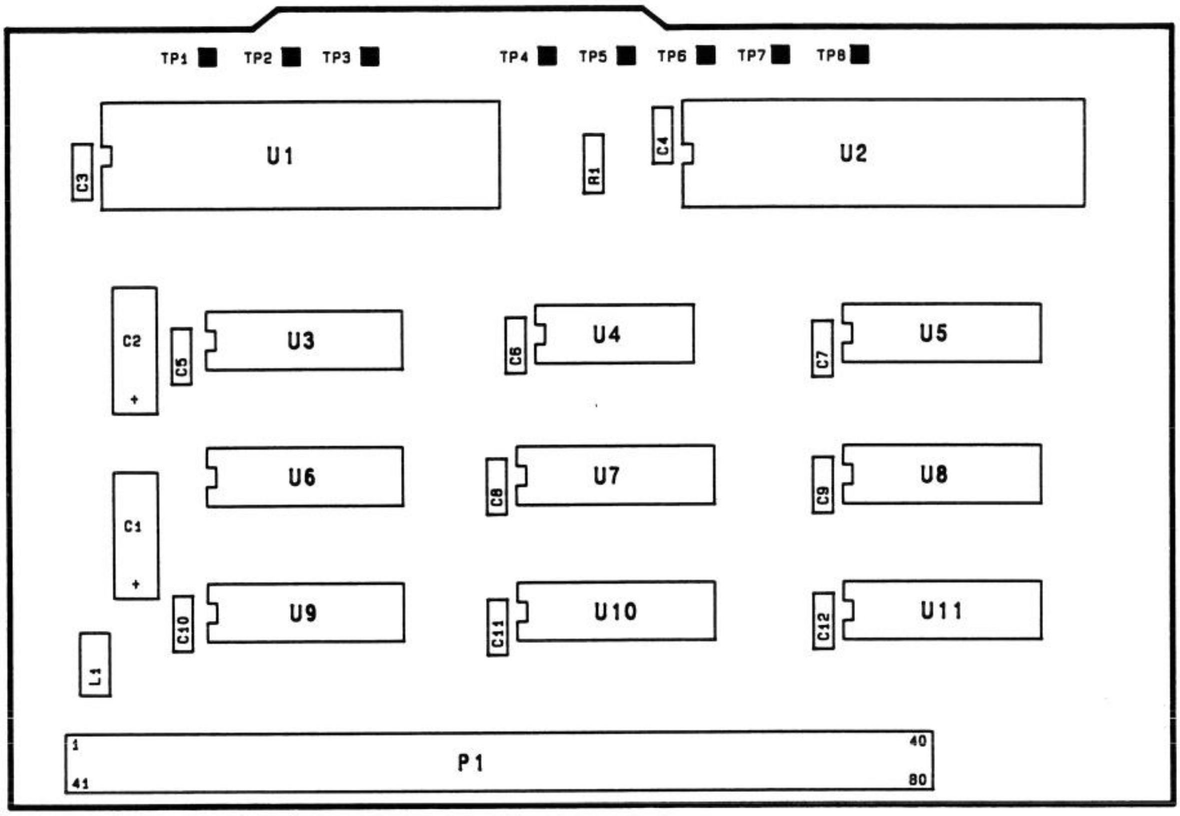


Figure 8-28. A6 Component Locations Diagram

A7/A8/A9/A10 LOG AMPLIFIERS

CONTENTS

CIRCUIT DESCRIPTION

The A7/A8/A9/A10 log amplifiers are identical assemblies. The circuit description, troubleshooting information, component locations diagram and schematic diagram apply to all these assemblies.

The A7, A8, A9 (HP 8757C Option 001 only), and A10 log amplifier assemblies perform the logarithmic shaping and DC rectification of the 27.778 kHz A, B, C (HP 8757C Option 001 only), and R inputs respectively.

The external detectors (or directional bridges) peak detect the 27.778 kHz modulated microwave signal. Thus, the signal at the A, B, C, or R input of the analyzer is a 27.778 kHz square wave with amplitude proportional to the detected power level. The A, B, C, and R inputs are routed to the A7, A8, A9, and A10 log amplifiers respectively. Here each signal is buffered, logged, rectified, and filtered. The resulting signal, which is proportional to the input power level, is then sent to the A4 ADC board for processing.

In addition to performing as a log amplifier, the A7-A10 assembly has the capability to monitor its own temperature and ground reference level. Any of these three signals can be output to the A4 ADC assembly.

Because the log amplifiers do not compensate for the square-law to linear effects of diode detection, the output voltage does not have a 1:1 relationship to power level in dBm. For example, a 1 dB change in power at the detector at +10 dBm produces an output voltage change of about 100 mV. At −10 dBm the change is about 150 mV/dB, and at −20 dBm and below the change is about 200 mV/dB.

A. INPUT AMPLIFIER

Q11 and Q12 form an AC-coupled, low noise, differential-input amplifier biased by constant current source Q13. The differential current then drives FLT1 which provides bandpass filtering, level shifting, and conversion from a double-ended to a single-ended signal. Overvoltage and static protection is provided by CR1, CR2, VR3, VR4, C1, and C3. The overall gain from TP1 to TP2 is about −1 at 27.778 kHz with a bandwidth of 1.9 kHz.

B. 13/26 DB AMPLIFIER

The output of the input amplifier drives Q8, the first stage of a feedback amplifier, which in turn differentially drives Q1 and Q3. The current mirror of Q5 and Q4 then provides the double-ended to single-ended conversion. The resulting single-ended current is driven into R27, R28, and R29, providing feedback to Q8. Q9 and Q2 are 2 mA current sources. The voltage produced at the collector of Q3 is buffered by U1A. R27, R28, and R29 also provide a 13 dB gain tap off. This is buffered by U1B to provide the +13 dB input to the logger.

C. 13 DB GAIN STAGES

The 13 dB amplifiers provide inputs to the logger IC in 13 dB increments starting with the signal at TP3. All stages (except U3A) have input and feedback diodes to limit the output voltages to ±2 diode drops. These, together with the 1K coupling resistors, prevent saturation of the amplifiers. *All* the stages are AC coupled. FLT2 is a bandpass filter which limits the noise reaching the highest gain stages.

D. 13 DB ATTENUATION STAGES

The resistor divider made up of R69, R71, R76, and R78 provides three more taps at 13 dB attenuation increments. These taps are buffered by non-inverting amplifiers U8A, U9A, and U9B and then fed to the logger IC. These stages are attenuated enough that they need no diode limiting. The 0 dB reference stage (the same amplitude as TP3) is reconstructed in U8B by amplifying the 13 dB attenuation stage by 13 dB. This is done to allow clamping of this stage with feedback diodes.

E. 6.3V REFERENCE/BIAS

This circuit keeps the logger bias current at a constant level (approximately 6 mA) over time and temperature. U6B generates the positive supply (from VR2), and U6A generates the negative supply (−8.4 V) to ensure quiet reference levels. R94, R95, and CR10 ensure the start-up of VR2, however, CR10 is reverse biased in normal operation. U12 controls the logger bias current at U10 pins 1 and 2 by comparing a reference level of ≅9.45 V at U12 pin 2 to the voltage across R93. R93 senses the total logger bias current. A feedback loop is formed from the output of U12, through R97 and R98, controlling U10 pins 1 and 2. This, in turn, creates a current of opposite phase at TP7. This current flows through R93 to produce the voltage at U12 pin 3, thereby completing the loop.

F. LOGGER

The twelve gain and attenuation stages are all fed to the logger IC U10, where they drive internal differential transistor pairs. The collector currents are summed, and leave U10 at pins 12 and 13. This produces a log relationship between voltage in and current out. Q6 and Q7 provide low impedance loading of the logger IC U10. FLT3 acts as a bandpass filter and provides a current sensing center tap for the bias circuitry. It also converts the output to a single-ended signal and provides a voltage gain of 2.

G. MULTIPLEXER/RECTIFIER

U4 selects one of three signals to output. The first is the logged signal from U10. The second is a temperature signal, also from U10. This provides a 21 mV/°C output at TP10. The third disconnects the log signal and grounds the input to the rectifier to establish a zero reference point.

The rectifier circuit converts the 27.778 kHz signal to a full-wave rectified dc signal. U5 and its associated feedback components form a half-wave rectifier. The half-wave rectified signal is doubled, inverted, and summed in U7 with the original signal from R103 and R104, resulting in a full-wave rectified signal. U7 also provides some low-pass filtering through C69, as well as a dc offset and a gain of 5. The overall circuit sensitivity is set by R112 to be about 100 mV/dB with a +10 dBm input level to the detector.

H. 5 KHZ LOWPASS FILTER

This circuit contains four poles of a five-pole, lowpass, Butterworth filter with a 5 kHz cutoff and a gain of 1. The fifth pole is in the rectifier stage. U13 controls both stages of the two-pole multiloop lowpass filter.

I. POWER SUPPLY FILTERING

LC filtering is used on the 15 volt supplies to keep the 27.778 kHz signals from propagating to the rest of the instrument. Each op amp has its own local RC filtering circuit on the ±15 volt supply. Because of the small current drain, an RC filter is used on the +5 volt supply.

TROUBLESHOOTING

The A7, A8, A9, and A10 log amplifiers are four identical assemblies corresponding to the four front panel inputs of the HP 8757C Option 001. The A7, A8, A9 (HP 8757C Option 001 only), and A10 assemblies perform the logarithmic shaping and DC rectification of the 27.778 kHz A, B, C (HP 8757C Option 001 only), and R inputs respectively. The troubleshooting information in this section applies to all four assemblies.

CAUTION

Do NOT adjust or interchange any of the log amplifiers.

Calibration data is stored in EEPROM on the A3 CPU assembly to correct variations in the response of each log amplifier. Therefore, adjusting or interchanging log amplifiers, or replacing any component on a log amplifier requires recalibration of the analyzer with the HP 11613A/B. Log amplifier assemblies may be interchanged for troubleshooting purposes, but they must be returned to their original positions.

NOTE: If a problem is seen at only one input (A, B, C, or R), troubleshoot the corresponding log amplifier assembly. If the same problem is seen at all the inputs, suspect problems in the test setup, the detector bias, or the A4 ADC assembly.

Test conditions for the A7, A8, A9, and A10 log amplifiers and all waveforms are as follows:

Power level: +10.0 dBm at an external detector connected to the appropriate input.

Modulation: 27.778 kHz square wave modulation, 50-50 duty cycle, with at least 30 dB on/off ratio. If a source with internal modulation is used, check the modulation frequency with a frequency counter. Note that some overshoot or ringing may be visible at the detector output when internal modulation is used. If an external modulator is used, adjust the power level at the source to compensate for power losses through it. (The waveforms in figure 8-30 were taken using an external modulator.)

Frequency: Any CW frequency within the range of the detector.

NOTE: The LC filter assemblies FLT1, FLT2, and FLT3 are preset and sealed at the factory. If any portion of one of these filters requires repair, replace the entire filter assembly. The capacitor is not separately replaceable. Each filter is tuned to a slightly different frequency. Do not attempt to adjust any of these assemblies.

GENERAL TROUBLESHOOTING

This troubleshooting section is divided into two parts. The first part covers general troubleshooting for instrument problems and defective components. The second part covers the troubleshooting of noisy, unstable, but otherwise functioning and reasonably accurate log amplifiers.

Basic Checks

Set up the equipment as shown in figure 8-5, "Overall Troubleshooting Block Diagram", with the detector connected to the appropriate input. With a +10.0 dBm square wave modulated input to the detector, check for a square wave of approximately 3 V peak-to-peak at the A7/A8/A9/A10 log amplifier input TP1 (block A). If this signal is absent, check the cables W1, W2, W3, and W4 between the A, B, C, and R inputs and the A11 motherboard. Check the bias cables from the A2 front panel interface to the A, B, C, and R inputs. There should be +15 V and −12.6 V bias signals present at each of the input connectors. If no problem is found here, suspect the detector or source. Check the source output power level with modulation off (modulation on causes a drop in measured power level of approximately 3 dB). Check the square wave modulation frequency with a crystal detector and frequency counter. Substitute an external modulator if necessary.

If a 3 V p-p square wave input signal is found at TP1, check the output voltages from the A7/A8/A9/A10 log amplifiers to the A4 ADC assembly, at TP9 (block H). Be certain the detector is connected to the input being measured. The typical log amplifier output voltage, with +10 dBm applied to the detector, is +6.5 V. The typical log amplifier output voltage with −30 dBm applied to the detector is +0.2 V.

If the correct voltages are present, trace the signals to the A4 ADC assembly. See "A4 ADC Troubleshooting" if necessary.

Assembly Troubleshooting

Check the power supply inputs to the board. Check the voltage at VR2 (block E): it should be within 1% of 6.3 V. Verify the reference supplies generated from VR2: the output of Q10 should be +12.6 V; U6 pin 1 should be −8.6 V; and TP7 should be +9.45 V. If these voltages are correct within 3%, but the BIAS 1 and BIAS 2 inputs to the logger IC U10 are not approximately −4 V and −7 V respectively, then U10 is probably defective.

A failure in any of the +13 dB gain stages (block C) will affect succeeding stages. Depending upon its location, any failure in this block will usually produce only a slight error in higher level signals. Low level signals will make any failures in these stages more apparent.

A failure in the 13 dB attenuation stages (block D) will produce large offsets at higher power levels that are usually easy to find.

With +10 dBm applied to the detector, compare the waveforms with figure 8-30. The voltage levels and wave shapes should be nearly identical with the illustration. All inputs to logger U10 (block F) must be centered about 0.0 V. This verifies that the circuits in blocks A, B, C, and D are functional, but does not verify that their gain is correct. The next step is to verify the correct gain of each stage.

The gain of any stage in block B or C is 4.6, or about 13 dB. This, however, is not readily apparent, since most of the stages are clipped. If the gain of any stage is in question, adjust the power level to the detector so that the input to the stage is a 130 mV p-p sine wave. The output should then be a 600 mV p-p sine wave (just below the clipping level).

An alternative method to check the gain is to vary the input power level and observe when the inputs to U10 reach a certain voltage. Table 8-24 gives the approximate detector input power level required to obtain a 600 mV p-p signal at the indicated pin of U10. These power levels are only approximate.

Table 8-24. Pin U10 Versus Power Level

U10 Pin Number	Power Level (dBm) to Obtain 600 mV p-p
19	>+20
18	+17
17	+6
16	−5
15	−14
14	−21
8	−28
7	−34
6	−41
5	−47
4*	−53
3*	−59

*These input pins will be noisy.

If the proper inputs are present at logger U10 and the bias voltages are normal, the output should be similar to the waveform shown for TP8 in figure 8-30. If the waveform is substantially different, suspect U10, FLT3, or U4. The voltage at U10 pins 9 and 11 should be about 0.6 V. This voltage is used as the temperature indicator and will vary about 2.2 mV/°C.

The multiplexer (block G) is most easily checked by performing the channel volts logger cycle. Press **[SYSTEM]** ***[MORE] [SERVICE] [A4 ADC] [MORE] [CHANNEL VOLTS] [CHANV LOGGER]***. The multiplexer is cycled through its three possible states and the A4 ADC reads the resulting voltages and displays them on the CRT. (The L LOG ZERO and L LOG TEMP lines can be checked with an oscilloscope. Both should have groups of four digital pulses, one for each possible input.) The display on the CRT will show the readings for the four logger boards. The DATA reading corresponds to the logged signal output (≅+6.5 V for the +10 dBm input, ≅-6.5 V at the noise floor). The DC OFFSET reading is output when the multiplexer input is grounded. This voltage (because it is offset) should be close to −7.8 V. The TEMP reading is related to the ambient temperature. This reading will vary from unit to unit but is typically around 1 to 3 V and will vary 21 mV/°C.

The rectifier consists of U5 and U7. The output of U5 should be a half-wave rectified signal (the positive portion is clipped in the normal measurement mode). This is summed with the original signal in U7 to produce a full-wave rectified signal as shown in figure 8-30 with a +10 dBm input. The overall gain of this circuit with a DC signal (TEMP or ZERO mode) is 10. Voltages can most easily be traced by grounding U4 pins 10 and 15. This sets the multiplexer to select the input from U10 pin 9. TP9 and TP10 should then be about 10 times this voltage.

Block H is a 5 kHz lowpass filter consisting of U13 and associated circuitry. This stage has a gain of about 1.

Noise Problems

Tracking down noise problems in this circuit may be difficult since the noise may be riding on a 27.778 kHz signal. A differential input oscilloscope is recommended for troubleshooting noise in the reference/bias supplies. If this is not available, use a 1:1 probe for the following checks.

NOTE: Ensure that the capacitor leads on FLT1, 2, and 3 do NOT touch the core of the inductors. This will degrade the noise performance of the log amplifier. Tapping on the cores (or the can of FLT1) should produce noise spikes of less than 0.1 dB. Larger spikes or drift may indicate unwanted contact with the inductor core.

1. With no input applied, check for noise in the reference/bias supply using a differential amplifier, if possible (or a 1:1 probe). Check VR2 and the outputs of Q10, U6A, and U12. Compare the results with a known good board.
2. Ground U4 pin 15 and pin 10. Set the analyzer to read the appropriate input (A, B, C, or R), and observe the resulting trace on the CRT using a scale of 0.1 dB/div to see if the noise is still present. The trace will be around −40 dBm. If the noise is still present, the source is in blocks G or H.
3. Short U1 pins 1 and/or 7 to ground. If the noise is eliminated, the source is probably in blocks A or B.
4. Short TP2 to ground. If the noise is eliminated, the source is probably in block A.
5. Temporarily ground U10 pins 19, 18, 17, and 16 one at a time. Then view the resulting trace on the CRT. If the noise is eliminated, the source is probably in block D.
6. With no input applied, view the outputs of U1, U2, U3, and U11 using a 1:1 probe. Compare these results with a known good board.
7. If tests 2, 5, and 6 do not pinpoint the problem, the fault is either in U10 or in block E.

Table 8-25. A7/A8/A9/A10 Pin Outs (1 of 4)

A7

PIN	SIGNAL	I/O	SOURCE/ DESTINATION	FUNCTION BLOCK
1 19	GND PLANE GND PLANE	IN IN	A11J6-4 A11J6-4	G G
2 20	A IN SHLD A IN SHLD	IN IN	A11J2-1 A11J2-1	A A
3 21	INA INA	IN IN	A11J2-2 A11J2-2	A A
4 22	INARTN INARTN	IN IN	A11J2-3 A11J2-3	A A
5 23	A IN SHLD A IN SHLD	IN IN	A11J2-1 A11J2-1	A A
6 24	GND PLANE GND PLANE	IN IN	A11J6-4 A11J6-4	G G
7 25	−15V −15V	IN IN	A11J6-13 A11J6-13	G G
8 26	NC NC			
9 27	GND PLANE GND PLANE	IN IN	A11J6-4 A11J6-4	G G
10 28	+5V +5V	IN IN	A11J6-11 A11J6-11	G G
11 29	NC NC			
12 30	+15V +15V	IN IN	A11J6-14 A11J6-14	G G
13 31	GND PLANE GND PLANE	IN IN	A11J6-4 A11J6-4	G G
14 32	L LOG TEMP NC	IN	A4P2-34	G
15 33	L LOG ZERO NC	IN	A4P2-35	G
16 34	NC LOG A COM	 OUT	 A4P1-27	 F
17 35	NC LOG A	 OUT	 A4P1-9	 F
18 36	GND PLANE GND PLANE	IN IN	A11J6-4 A11J6-4	G G

Table 8-25. A7/A8/A9/A10 Pin Outs (2 of 4)

A8

PIN	SIGNAL	I/O	SOURCE/ DESTINATION	FUNCTION BLOCK
1 19	GND PLANE GND PLANE	IN IN	A11J6-4 A11J6-4	G G
2 20	B IN SHLD B IN SHLD	IN IN	A11J3-1 A11J3-1	A A
3 21	INB INB	IN IN	A11J3-2 A11J3-2	A A
4 22	INBRTN INBRTN	IN IN	A11J3-3 A11J3-3	A A
5 23	B IN SHLD B IN SHLD	IN IN	A11J3-1 A11J3-1	A A
6 24	GND PLANE GND PLANE	IN IN	A11J6-4 A11J6-4	G G
7 25	−15V −15V	IN IN	A11J6-13 A11J6-13	G G
8 26	NC NC			
9 27	GND PLANE GND PLANE	IN IN	A11J6-4 A11J6-4	G G
10 28	+5V +5V	IN IN	A11J6-11 A11J6-11	G G
11 29	NC NC			
12 30	+15V +15V	IN IN	A11J6-14 A11J6-14	G G
13 31	GND PLANE GND PLANE	IN IN	A11J6-4 A11J6-4	G G
14 32	L LOG TEMP NC	IN	A4P2-34	G
15 33	L LOG ZERO NC	IN	A4P2-35	G
16 34	NC LOG B COM	 OUT	 A4P1-28	 F
17 35	NC LOG B	 OUT	 A4P1-10	 F
18 36	GND PLANE GND PLANE	IN IN	A11J6-4 A11J6-4	G G

Table 8-25. A7/A8/A9/A10 Pin Outs (3 of 4)

A9

PIN	SIGNAL	I/O	SOURCE/ DESTINATION	FUNCTION BLOCK
1 19	GND PLANE GND PLANE	IN IN	A11J6-4 A11J6-4	G G
2 20	C IN SHLD C IN SHLD	IN IN	A11J4-1 A11J4-1	A A
3 21	INC INC	IN IN	A11J4-2 A11J4-2	A A
4 22	INCRTN INCRTN	IN IN	A11J4-3 A11J4-3	A A
5 23	C IN SHLD C IN SHLD	IN IN	A11J4-1 A11J4-1	A A
6 24	GND PLANE GND PLANE	IN IN	A11J6-4 A11J6-4	G G
7 25	−15V −15V	IN IN	A11J6-13 A11J6-13	G G
8 26	NC NC			
9 27	GND PLANE GND PLANE	IN IN	A11J6-4 A11J6-4	G G
10 28	+5V +5V	IN IN	A11J6-11 A11J6-11	G G
11 29	NC NC			
12 30	+15V +15V	IN IN	A11J6-14 A11J6-14	G G
13 31	GND PLANE GND PLANE	IN IN	A11J6-4 A11J6-4	G G
14 32	L LOG TEMP NC	IN	A4P2-34	G
15 33	L LOG ZERO NC	IN	A4P2-35	G
16 34	NC LOG C COM	 OUT	 A4P1-29	 F
17 35	NC LOG C	 OUT	 A4P1-11	 F
18 36	GND PLANE GND PLANE	IN IN	A11J6-4 A11J6-4	G G

Table 8-25. A7/A8/A9/A10 Pin Outs (4 of 4)

A10

PIN	SIGNAL	I/O	SOURCE/ DESTINATION	FUNCTION BLOCK
1 19	GND PLANE GND PLANE	IN IN	A11J6-4 A11J6-4	G G
2 20	R IN SHLD R IN SHLD	IN IN	A11J5-1 A11J5-1	A A
3 21	INR INR	IN IN	A11J5-2 A11J5-2	A A
4 22	INRRTN INRRTN	IN IN	A11J5-3 A11J5-3	A A
5 23	R IN SHLD R IN SHLD	IN IN	A11J5-1 A11J5-1	A A
6 24	GND PLANE GND PLANE	IN IN	A11J6-4 A11J6-4	G G
7 25	−15V −15V	IN IN	A11J6-13 A11J6-13	G G
8 26	NC NC			
9 27	GND PLANE GND PLANE	IN IN	A11J6-4 A11J6-4	G G
10 28	+5V +5V	IN IN	A11J6-11 A11J6-11	G G
11 29	NC NC			
12 30	+15V +15V	IN IN	A11J6-14 A11J6-14	G G
13 31	GND PLANE GND PLANE	IN IN	A11J6-4 A11J6-4	G G
14 32	L LOG TEMP NC	IN	A4P2-34	G
15 33	L LOG ZERO NC	IN	A4P2-35	G
16 34	NC LOG R COM	 OUT	 A4P1-30	 F
17 35	NC LOG R	 OUT	 A4P1-12	 F
18 36	GND PLANE GND PLANE	IN IN	A11J6-4 A11J6-4	G G

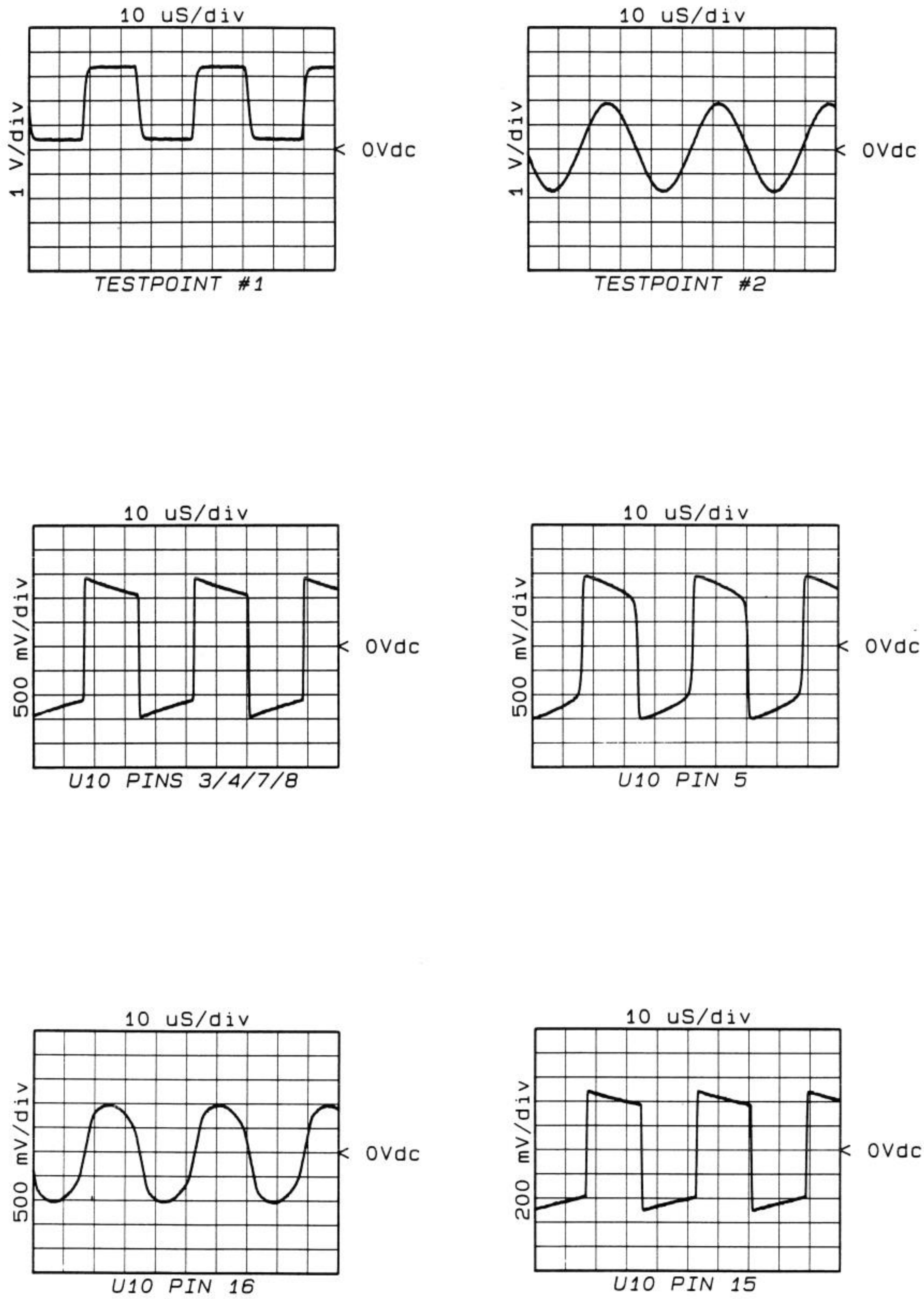
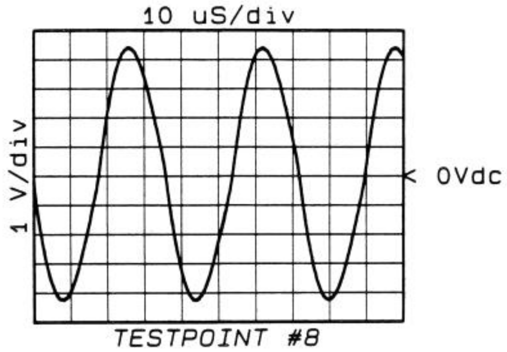
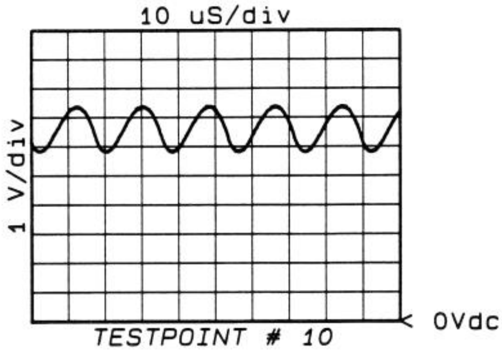
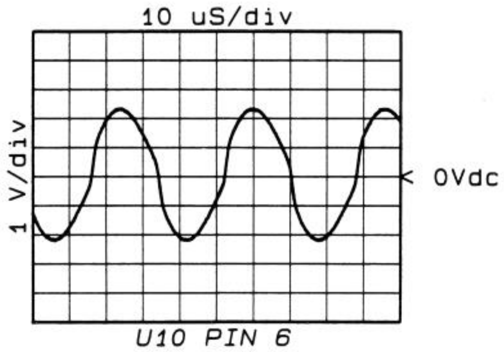
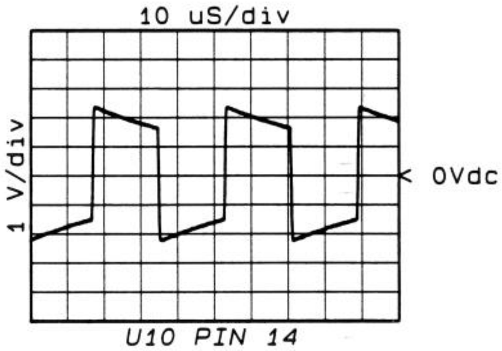


Figure 8-30. Typical Waveforms at Selected Points with +10 dBm Applied to Detector (1 of 2)









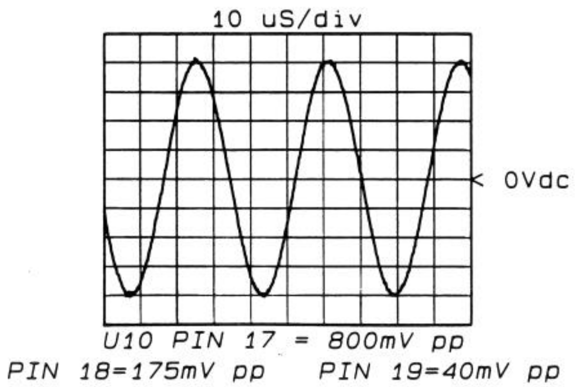


Figure 8-30. Typical Waveforms at Selected Points with +10 dBm Applied to Detector (2 of 2)

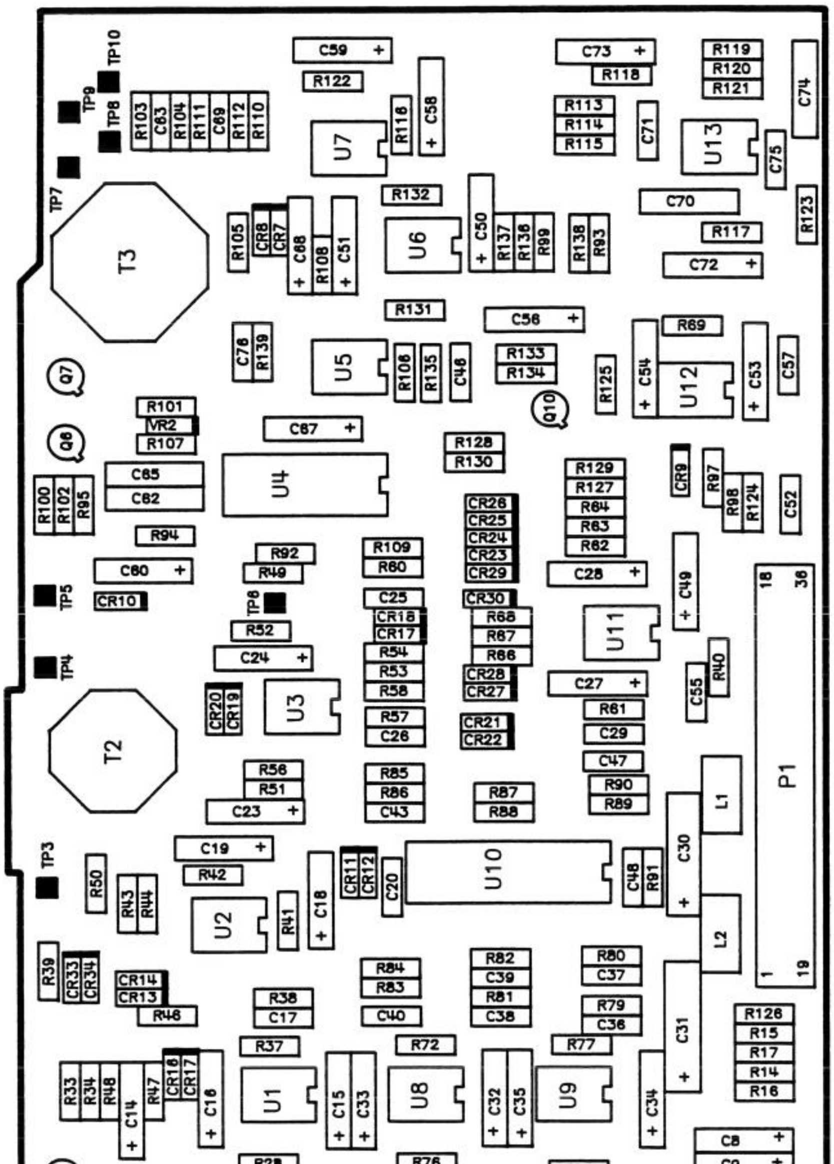


Figure 8-31. A7/A8/A9/A10 Component Locations Diagram

A12 POWER SUPPLY

CONTENTS

CIRCUIT DESCRIPTION

This section documents the A12 power supply assembly and the following assemblies:

- Rear panel power line module.
- Front panel line switch.
- Thermal protection switch.
- Transformer.

The following paragraphs apply to chassis-mounted parts (not part of A12) that are associated with the line power circuits.

POWER LINE MODULE FL1, LINE SWITCH S1, THERMAL SWITCH S2, TRANSFORMER T1

The power line module includes the primary fuse, line filter, and voltage selector. Fuse F1 protects the primary side of the transformer against drawing too much current. F1 is accessible from the rear panel. The line filter reduces noise and transients on the power line.

The front panel LINE power on/off switch S1 controls power to the transformer primary coil. Thermal protection switch S2 protects the regulators from thermal damage if the fan fails or air flow is restricted. S2 is thermally connected to the regulator heat sink (part of A12), and opens at about 90°C to interrupt the line power. S2 closes again when the temperature falls below about 70°C.

The voltage selector configures the instrument to run on 100 V ac, 120 V ac, 220 V ac, or 240 V ac line power. The voltage is selected by inserting the voltage selector card into FL1 at the rear panel in one of four orientations. This effectively switches in or out the various taps of the transformer primary windings.

The transformer secondary consists of three center-tapped windings. The nine wires from the secondary connect directly to the A12 power supply assembly.

NOTE: The following paragraphs apply to the A12 power supply assembly. All reference designators apply to A12.

The A12 power supply provides the regulated power supply voltages for all assemblies in the instrument. There are six independent regulated voltages in all, of which two supply power to the A14/A15 display assembly exclusively. Table 8-26 summarizes the power supplies provided. A power failure detection circuit senses when line power is removed, to allow an orderly shut-down of digital circuitry on the A3 CPU assembly. An additional power supply failure circuit monitors all supplies (except +5 V) and signals the microprocessor if any supply has failed or is substantially low in value.

A. +5V RECTIFIER

CR29 (two diodes) is the full-wave rectifier for the +5 V dc supplies. C25 and C26 filter the full-wave ripple from CR29. C21 is a low impedance path for high frequency pulses. Bleeder resistor R73 discharges C25 and C26 when line power is removed. C19 and C20 prevent the rectifier switching pulses from getting back to the transformer secondary. The +5 V rectifier output is nominally +10 V dc before regulation.

B. OVERVOLTAGE PROTECTION

The overvoltage protection blows the line fuse F1 to protect the instrument from excessive line voltages. It also blows fuse F1 if the voltage selector is set to 100 V ac or 120 V ac and the line is connected to 220 V ac or 240 V ac in error. If the unregulated voltage from the +5 V rectifier exceeds +18.6 V dc, zener diodes VR19, VR20, and VR21 conduct, turning SCR Q1 on through R76. Q11 causes excessive current to flow in the transformer, which causes line fuse F1 to blow. R75 holds Q1 off unless VR19, VR20, and VR21 are conducting. C23 prevents short transients or noise from firing Q1.

NOTE: Five of the six regulator circuits on the A12 power supply assembly are of the same design (+65 V is different). While component values differ slightly for different voltages, and diode and capacitor polarities change for different polarities, the circuits are essentially identical. The +5V regulator is described in detail. For other regulator description details, refer back to the +5V regulator description.

C. +5V REGULATOR

The +5V regulator regulates the +10 V dc from the +5V rectifier to produce the +5 V dc power supply voltage. Fuse F6 prevents excessive currents from destroying the regulator in case of an accidental short circuit. The fuse can also be removed during troubleshooting to isolate the +5V regulator from the +5V rectifier. U1 is an adjustable, three-terminal regulator. Its output voltage is nominally 1.25 V dc above the voltage on reference terminal U1 pin 1. R1 and the series combination of R38 and R37 determine the regulated output voltage. C36 improves power line ripple and noise rejection, and also causes the power supply voltage to rise slowly and without overshoot. The adjustable terminal voltage on U1 pin 1 is accessible at a PC pad (not a test point) labeled "1R". Input bypass capacitor C1 reduces high frequency noise or transients into the regulator. C35 and C11 reduce noise at the output. CR1 provides a safe discharge path for C35 when the regulator input voltage falls below the output voltage. CR14 and CR1 provide safe discharge paths for C36 if either input or output voltage falls below the adjustable terminal voltage. CR13 protects the regulator from negative voltages at the output.

The crowbar circuit provides overvoltage protection for circuits fed by the +5V regulator if U1 or CR1 is shorted. If the output voltage rises above 5.9 V dc, zener diode VR11 conducts and fires SCR Q6 through R43. This shorts the output to ground and blows fuse F6, shutting down that power supply. R42 holds Q6 off unless VR11 conducts.

Test point TP4 (+5V DIG) is available to monitor the output voltage. R40 limits the current if the test point is shorted. LED DS2 turns on when the output voltage is about +4 V dc or greater. VR10 sets the voltage at which DS2 lights. R39 limits the current through DS2. R37 adjusts the output voltage at TP4. Note that the LED, test point, and adjustment are physically located near each other on the board and share the label +5V DIG.

A single regulator controls both the +5V DIG and +5V supplies. However, they exit the board on separate pins and follow independent paths to the rest of the instrument.

D. +5V REGULATOR (DISPLAY)

The +5V regulator (display) supplies the +5 V dc power supply voltage for the A14 display interface board. R44 (+5V DSP) adjusts this output voltage at TP5. This circuit is identical to the +5V regulator.

E. POWER FAILURE WARNING

The power failure warning circuit detects when the line power has been switched off or removed and power supply voltages are about to go down. It sends a warning signal to the A3 CPU to prevent data from being lost during shut-down. The inverting input of comparator U5 is biased at about +3 V dc by R35 and R36 from the output of the +5V regulator. The non-inverting input of U5 is biased by R33 and R34 from the input of the +5V regulator. The unregulated input is normally about +10 V dc, setting U5 pin 2 at +3.8 V dc and L PFW high. When the +5V regulator input falls below about +8 V dc, U5 turns on and pulls L PFW low. R31 is a pull-up resistor for U5. R32 provides hysteresis for noise immunity. C12 holds L PFW low as U5 turns off.

F. ±15V RECTIFIER

The ±15V rectifier rectifies one of the center-tapped transformer secondary windings with two full-wave rectifiers of opposite polarity. CR27 and CR28 provide +15V UNREG (nominally +23 V dc); CR26 and CR30 provide −15V UNREG (nominally −23 V dc). C31 and C32 filter the line ripple. Bleeder resistors R25 and R77 discharge C31 and C32 respectively when line power is removed. C28 and C22 filter noise and transients from the diodes. C24 and C27 prevent rectifier switching transients from reaching the transformer. Fuse F8 limits current to the DC fan which operates from the −15 V unregulated supply.

H. +15V REGULATOR

The +15V regulator provides +15 V dc regulated power supply voltage for all of the instrument. R51 (+15V) adjusts this output voltage at TP6. Except for the difference in voltage, the +15V regulator is identical to the +5V regulator: refer to the +5V circuit description for details.

J. +65V RECTIFIER

The +65V rectifier rectifies transformer secondary winding with a full-wave bridge rectifier. CR31-34 provides the +65V UNREG supply (nominally +90 Vdc). C45 and C46 filter the line ripple. Bleeder resistor R15 discharges these capacitors when line power is removed. C38 filters noise and transients from the diodes. C13 prevents rectifier switching transients from reaching the transformer.

K. +65V REGULATOR

The +65V regulator is a non-adjustable supply used *only* for the A15 display. It incorporates two over-current sensors, an over-voltage sensor, and built-in voltage reference. The voltage reference is designed to keep this supply within 0.4 V of +65 V. The supply is not adjustable and must never be modified to exceed +65 V in order to prevent any X-ray radiation from the CRT.

VR1 and Q4 form a constant current source that drives the darlington pair Q10 and Q1. The +65 V output of Q1 is fed through a current sensing resistor R9 and then off the board to the display. Feedback is provided by a resistor divider consisting of R5-6, and R10. The feedback voltage is chosen to be exactly 10 V. This 10 V is compared (by U3) to the independent 10.00 V reference supplied by U4. Any error voltage will drive Q5, thus "stealing" more or less current (through CR11) from the darlington pair Q10/ Q1 and changing the output voltage accordingly. Because Q5 inverts the drive from U3, the negative feedback from the voltage divider is applied to the non-inverting input of U3 instead of the more expected inverting input. VR7 sets the bias on Q5 so that U3's output voltage will be near its midway point of +8 V. Voltage sensing of both the +65 V and the ground is performed so that the supply *at the display* will be +65 V, independent of any voltage drops in the cabling. Resistors R16 and R8 limit the amount of correction for voltage change.

Over-voltage protection is provided by VR2-4. If the voltage should exceed about 75 V, these diodes will turn on Q2. This shorts the unregulated supply to ground and blows fuse F7.

Over-current protection is provided by two methods. One method is very fast but not very accurate; the other is very accurate but takes slightly longer to engage. If the current through R9 should exceed about 0.7 amp, the voltage across it will turn on Q3 which robs current drive to the darlington pair and reduces the output voltage. This circuit works very quickly but is very dependent upon the characteristics of Q3 and its temperature. At the same time, the voltage across R9 is divided down by R16 and R17. This voltage is then compared to an internal 0.2 V reference developed in U2. If the voltage drop across R9 is great enough, U2 will turn on and steal current from the darlington pair. U2 generates a 0.2 V reference between pins 3 and 4 of U2 but *all* pins of U2 are floating at about +65 V. The supply for U2 is only about 2 V and is provided via the three diode drops between pin 7 and pin 4 of U2, through CR7, Q10, and Q1. Again, these are floating at +65 V.

A +17 V power supply is made up of VR6, and R19 and is used to supply bias to U3 and U4. LED DS1 will light when the supply voltage is at least 50 V as determined by VR8 and VR9. The +65 V is available at TP3.

CAUTION

TP3 (+65V) has no series current limiting resistor. Use care to ensure the testpoint is not shorted to ground or any other point on the board. While a momentary short circuit will not harm the instrument, excessive heat will be generated and Q1 will be destroyed if this testpoint is shorted for extended periods of time.

L. SUPPLY FAILURE INDICATOR

This circuit monitors all the power supplies except the +5V DIG. A failure of any one or more supplies will be reported to the microprocessor via the L SPLYFAIL line. This circuit will also indicate a failure if any supply fails to reach at least 80% of its nominal value.

The circuit consists of comparator U6 and two voltage divider circuits. All the positive supplies are summed together and divided by R72. The negative supplies are summed together and offset by R41 which is tied to the +5V DIG supply. The summing resistors are chosen to place nominal 2.25 V at the non-inverting input of U6 and a nominal 2.10 V at the inverting input. A failure of any positive or negative supply will cause the inverting input voltage to exceed the non-inverting input voltage. This will cause open-collector U6 to turn on, pulling L SPLYFAIL low. C17 provides noise immunity and R70 provides hysteresis. The status of this line is available at TP2. *All* supply voltages must be accurately adjusted (including the +5V DIG) in order for this circuit to perform properly.

M. −15V REGULATOR

The −15V regulator provides the regulated −15 V dc power supply voltage for all of the instrument. R58 (−15V) adjusts this output voltage at TP7. Except for the difference in voltage and the opposite polarity, the −15V regulator is identical to the +5V regulator. Refer to the +5V circuit description for details.

N. −12.6V REGULATOR

The −12.6V regulator provides the regulated −12.6 V dc power supply voltage for the instrument. The −12.6V regulator uses the regulated −15 V dc output to produce −12.6 V dc, therefore no fuse or crowbar circuit is required. In addition, the ripple rejection capacitor C18 is smaller, so no discharge diode is needed. Wire jumper W1 can be removed to isolate the −12.6V regulator during troubleshooting. R65 (−12.6) adjusts this output voltage at TP8. The −12.6 V supply is used to bias external detectors, and is therefore critical to instrument accuracy. Except for the difference in voltage and the opposite polarity, the −12.6 V regulator is identical to the +5V regulator. Refer to the +5V circuit description for details.

P. GROUNDS

The grounds for all six regulators share a common star ground. This ground is attached to the instrument chassis (GNDCH) with sheet metal and hardware. Although connected electrically on the A12 power supply assembly, independent paths for several grounds reduce ground loop noise. GND is the general purpose ground for the instrument. GNDDIG is the high-current ground for digital circuits. GNDA is a special low-current, noise-free ground used for sensitive analog circuits. GND DISP is the ground return for the A14 display interface power supplies.

TROUBLESHOOTING

This section documents the A12 power supply assembly and the following assemblies:

- Rear panel power line module FL1.
- Front panel line switch S1.
- Thermal protection switch S2.
- Transformer T1.

BASIC CHECKS

Check that the rear panel line filter voltage selection card is selected for the correct line voltage. Check that line fuse F1 is good, and is the correct fuse for the line voltage.

LINE POWER

Turn on the line switch, and check that the fan is rotating. If not, check the line fuse F1 and the fan fuse F8. Check the thermal switch S2 (mounted on the A12 heat sink), and replace it if necessary.

TRANSFORMER

Check the outputs of transformer T1 on the A12 power supply. Check E1 for approximately 19 V ac. Check E2 for approximately 38 V ac. Check E3 for approximately 72 V ac. These are all measured across the entire windings of each transformer section. The voltage will be one half if measured with respect to ground. If any of these is missing, trace the problem back to transformer T1.

RECTIFIERS

Check the output of the +5V rectifier for approximately +10 V. Check the output of the ±15V rectifier for approximately ±20 V. Check the output of the +65V rectifier for approximately +90 V. If one of these voltages is missing, suspect the corresponding rectifier. Check that the overvoltage protection is not firing.

ADJUSTABLE REGULATORS

Check all the fuses on the A12 power supply assembly. These fuses may be removed to disconnect the regulators from the rectifiers for troubleshooting.

To verify the voltage regulators, check that the voltage difference between the output and regulation (adjust) terminals is approximately 1.25 V. The regulator (adjust) terminals are available at feedthrough holes (not test points) on the A12 power supply assembly.

To eliminate the possibility of other assemblies in the instrument loading down the supply voltages, remove the major assemblies from their connectors (including the A14 display power supply and the front panel cables), or pull up the A12 power supply assembly so that it is disconnected from the motherboard.

+65 VOLT REGULATOR

First disconnect the A16 display, then apply power. If the supply returns to normal, verify that the current draw of the display is a nominal 300 mA. If it is substantially more than this, a problem with the display is indicated.

If fuse F7 blows, temporarily remove R20 (with the display still disconnected.) Verify +17 and +10.00 V at the test pads indicated on the board. The 17 V supply should develop about 6.3 mA through Q4. Verify this by measuring about 2.4 V across R15. Verify that the voltage at U2 pin 2 is *less* than that at pin 3 and that the voltage drop across R9 is less than a few millivolts. The voltage between R5 and R6 should be 10/65 of the TP3 value. Follow the feedback path through U3, Q5, CR11, Q10 and Q1 to isolate any possible opens or shorts. Pins 2 and 3 of U3 should have identical voltages (+10 V) if the feedback loop is operating properly. The output of U3 should be about +8 V. Also verify the proper voltage drop across VR2-4 if there is a problem with the fuse blowing (although under normal conditions there will be insufficient voltage to turn on all three zeners.)

If the supply voltage is low and the reference voltages are good, the constant current source from Q4 to Q10 could be diverted by either Q3 or U2. Temporarily remove CR5 or Q3 to verify this. Make sure the display is not connected during this time.

Refer to table 8-26 for power supply voltages and tolerances.

Table 8-26. Power Supply Voltages and Tolerances

Block	Power Supply Output	Nominal Voltage	Allowable Range (Vdc)	Maximum Current Drain (A)	Assemblies Where Used
C	+5V[1]	+5.1	+5.05/+5.15	2.6	A1/A2 through A10
D	+5V DISP	+5.1	+5.05/+5.15	2.0	A14, A16
H	+15V	+15	+14.95/+15.05	0.6	A2 (for external detectors) A4, A5, A7, A8, A9, A10
M	−15V	−15	−14.95/−15.05	0.3	A4, A5, A7, A8, A9, A10
N	+12.6V[2]	−12.6	−12.55/−12.65	0.3	A2 (for external detectors
K	+65V	+65.0	+64.6/+65.4	0.5	A15

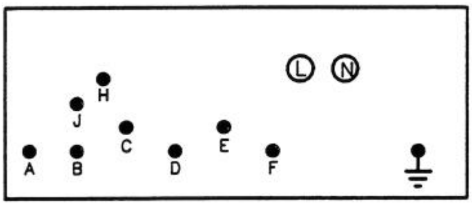
1. Includes both +5V and +5VDIG supplies.
2. The −12.6V supply is derived from the −15V supply with an additional regulator.

NOTES

1. Refer to figure 8-1 for detailed schematic diagram symbology notes.

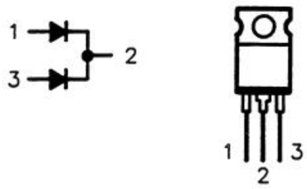
2. Resistance values shown are in ohms, capacitance in microfarads, and inductance in microhenries unless otherwise noted.

3. Line module PC board diagram as seen from assembly connection side:



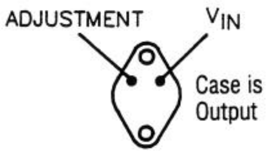
Refer to section 2, "Installation" for line voltage selection procedure.

4. CR29 is attached to side of heat sink.

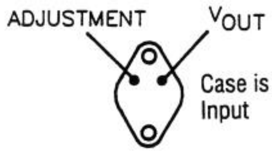


FRONT VIEW
CR29

5. U1, U7, U8, and U9 are mounted to a common heat sink. The case of each device is one of three active terminals. The case electrically connects to the A12 PC board via the mounting screws. The other two pins connect through holes in the heat sink to pin sockets. These pins may be probed without removing the device at: (1) fuse at input; (2) test point at output; or (3) PC pads (not test points) labeled "7R" for U7, "8R" for U8, etc.

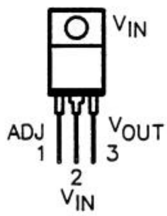


BOTTOM VIEW
U1, U7, U8

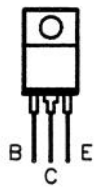


BOTTOM VIEW
U9

6. U10 and Q10 are attached to the side of heat sink.

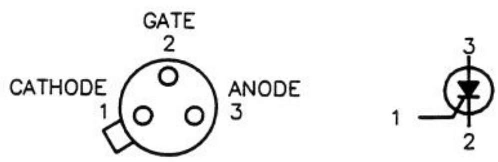


FRONT VIEW
U10



FRONT VIEW
Q10

7. Q2, Q6, Q7, Q8, Q9, Q11



BOTTOM VIEW

Figure 8-33. A12 Power Supply and Component Illustrations (1 of 2)

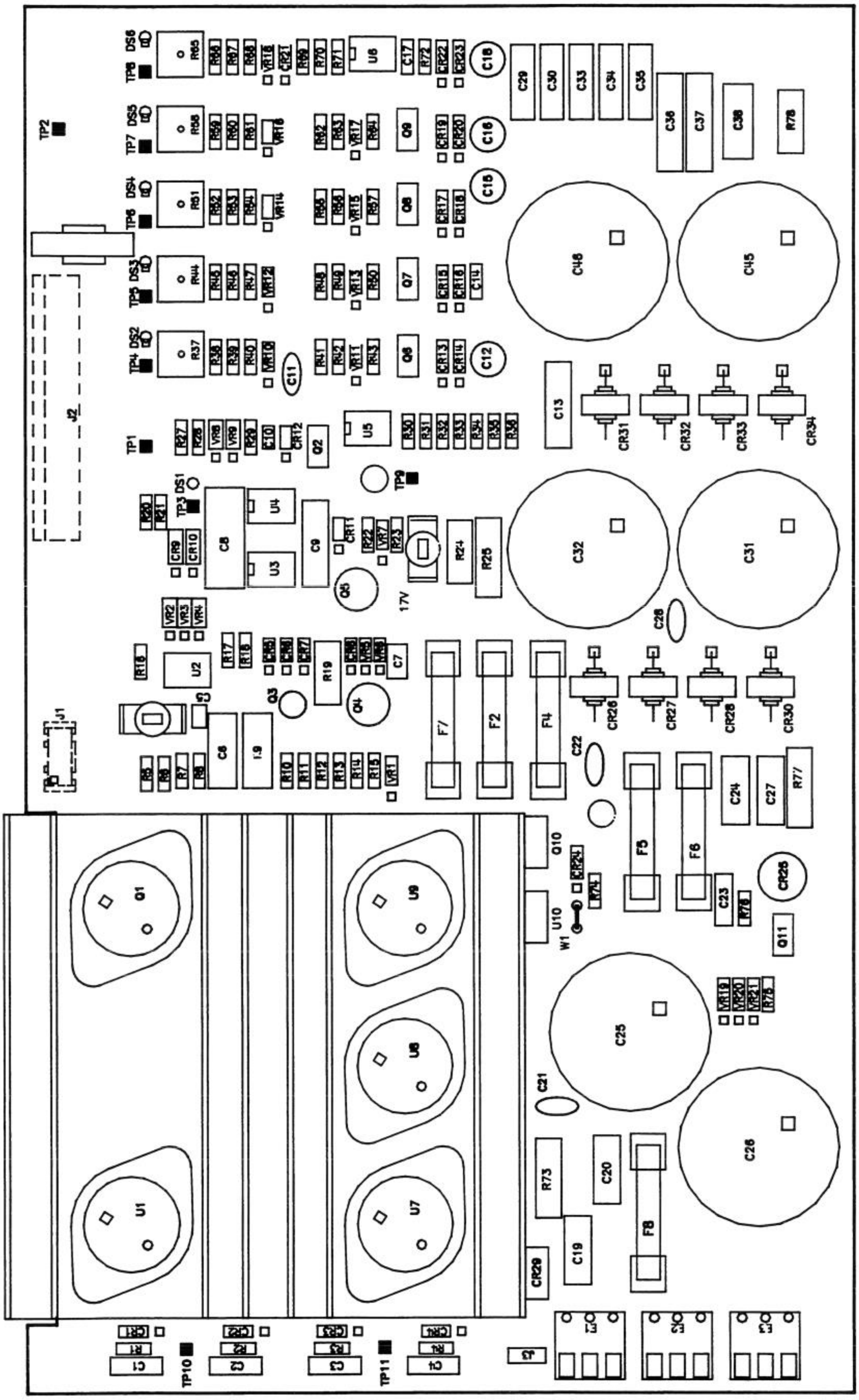


Figure 8-33. A12 Component Locations Diagram (2 of 2)

A11 MOTHERBOARD AND A13 REAR PANEL

CONTENTS

Table 8-27. HP 8757C/E A11 Motherboard Wiring List (1 of 6)

Mnemonic	Source	Description	A1/A2 A11J1	A3 XA3J1	A4 XA4J2	A4 XA4J2	A5 XA5J1	A6 XA6J1	A7 "A" XA7J1	A8 "B" XA8J1	A9 "C" XA9J1
AAI SHLD	A13J8	Auxilliary ADC Input Shield			2						
L AATN	A6P1-39	HP-IB "Attention"						39			
L ADAV	A6P1-37	HP-IB "Data Available"						37			
L ADIO 1	A6P1-24	HP-IB Data Bit 1 (LSB)						24			
L ADIO 2	A6P1-25	HP-IB Data Bit 2						25			
L ADIO 3	A6P1-26	HP-IB Data Bit 3						26			
L ADIO 4	A6P1-27	HP-IB Data Bit 4						27			
L ADIO 5	A6P1-28	HP-IB Data Bit 5						28			
L ADIO 6	A6P1-29	HP-IB Data Bit 6						29			
L ADIO 7	A6P1-30	HP-IB Data Bit 7						30			
L ADIO 8	A6P1-31	HP-IB Data Bit 8						31			
ADO SHLD	A11J8-59	Auxilliary DAC Output Shield				37					
L AEOI	A6J1-38	HP-IB "End or Identify"						38			
L AIFC	A6J1-34	HP-IB "Interface Clear"						34			
A IN SHLD	A11J2-1	Detector A Input Shield							2, 5, 20, 23		
L ANDAC	A6J1-35	HP-IB "Not Data Accepted"						35			
L ANRFD	A6J1-36	HP-IB "Not Ready for Data"						36			
L AREN	A6J1-33	HP-IB "Remote Enable"						33			
L ASRQ	A6J1-40	HP-IB "Service Request"						40			
ATTN BIAS	A4J1-4	Not Currently Used			4		4				
ATTN EN	A4J1-23	Not Currently Used			23		23				
ATTN 1	A4J1-6	Not Currently Used			6		24				
ATTN 20	A4J1-25	Not Currently Used			5		5				
AUX ADC IN	A13J8	Auxilliary ADC Input			1						
AUX DAC OUT	A4J2-38	Auxilliary DAC Output				38					
L BATN	A6J1-18	8757 Syste Intfc "Attention"						18			
L BDAV	A6J1-16	8757 System Intfc "Data Available"						16			
L BDIO 1	A6J1-3	8757 System Intfc Data Bit 1 (LSB)						3			
L BDIO 2	A6J1-4	8757 System Intfc Data Bit 2						4			
L BDIO 3	A6J1-5	8757 System Intfc Data Bit 3						5			
L BDIO 4	A6J1-6	8757 System Intfc Data Bit 4						6			
L BDIO 5	A6J1-7	8757 System Intfc Data Bit 5						7			
L BDIO 6	A6J1-8	8757 System Intfc Data Bit 6						8			
L BDIO 7	A6J1-9	8757 System Intfc Data Bit 7						9			
L BDIO 8	A6J1-10	8757 System Intfc Data Bit 8						10			
L BEOI	A6J1-17	8757 System Intfc "End or Identify"						17			
L BIFC	A6J1-13	8757 System Intfc "Interface Clear"						13			
B IN SHLD	A11J3-1	Detector B Input Shield								2, 5, 20, 23	
L BNDAC	A6J1-14	8757 System Intfc "Not Data Ready"						14			
L BNRFD	A6J1-15	8757 System Intfc "Not Ready for Data"						15			
L BREN	A6J1-12	8757 System Intfc "Remote Enable"						12			
L BSRQ	A6J1-19	8757 System Intfc "Service Request"						19			
CAL MOD EN	A3J1-32	Not Currently Used		32			31				
CAL ON	A3J1-7	Not Currently Used			7		25				
CAL OSC EN	A3J1-76	Not Currently Used		76			14				

Table 8-27. HP 8757C/E A11 Motherboard Wiring List (2 of 6)

A10 "R" XA10J1	"A" Input A11J2	"B" Input A11J3	"C" Input A11J4	"R" Input A11J5	A12 A11J6	A13 A11J8	A14 A11J7	Description	Source	Mnemonic
						57		Auxilliary ADC Input Shield	A13J8	AAI SHLD
						43		HP-IB "Attention"	A6P1-39	L AATN
						41		HP-IB "Data Available"	A6P1-37	L ADAV
						24		HP-IB Data Bit 1 (LSB)	A6P1-24	L ADIO 1
						25		HP-IB Data Bit 2	A6P1-25	L ADIO 2
						26		HP-IB Data Bit 3	A6P1-26	L ADIO 3
						27		HP-IB Data Bit 4	A6P1-27	L ADIO 4
						28		HP-IB Data Bit 5	A6P1-28	L ADIO 5
						29		HP-IB Data Bit 6	A6P1-29	L ADIO 6
						30		HP-IB Data Bit 7	A6P1-30	L ADIO 7
						31		HP-IB Data Bit 8	A6P1-31	L ADIO 8
						59		Auxilliary DAC Output Shield	A11J8-59	ADO SHLD
						33		HP-IB "End or Identify"	A6J1-38	L AEOI
						35		HP-IB "Interface Clear"	A6J1-34	L AIFC
	1							Detector A Input Shield	A11J2-1	A IN SHLD
						37		HP-IB "Not Data Accepted"	A6J1-35	L ANDAC
						39		HP-IB "Not Ready for Data"	A6J1-36	L ANRFD
						32		HP-IB "Remote Enable"	A6J1-33	L AREN
						45		HP-IB "Service Request"	A6J1-40	L ASRQ
								Not Currently Used	A4J1-4	ATTN BIAS
								Not Currently Used	A4J1-23	ATTN EN
								Not Currently Used	A4J1-6	ATTN 1
								Not Currently Used	A4J1-25	ATTN 20
						58		Auxilliary ADC Input	A13J8	AUX ADC IN
						60		Auxilliary DAC Output	A4J2-38	AUX DAC OUT
						20		8757 Syste Intfc "Attention"	A6J1-18	L BATN
						18		8757 System Intfc "Data Available"	A6J1-16	L BDAV
						1		8757 System Intfc Data Bit 1 (LSB)	A6J1-3	L BDIO 1
						2		8757 System Intfc Data Bit 2	A6J1-4	L BDIO 2
						3		8757 System Intfc Data Bit 3	A6J1-5	L BDIO 3
						4		8757 System Intfc Data Bit 4	A6J1-6	L BDIO 4
						5		8757 System Intfc Data Bit 5	A6J1-7	L BDIO 5
						6		8757 System Intfc Data Bit 6	A6J1-8	L BDIO 6
						7		8757 System Intfc Data Bit 7	A6J1-9	L BDIO 7
						8		8757 System Intfc Data Bit 8	A6J1-10	L BDIO 8
						10		8757 System Intfc "End or Identify"	A6J1-17	L BEOI
						12		8757 System Intfc "Interface Clear"	A6J1-13	L BIFC
		1						Detector B Input Shield	A11J3-1	B IN SHLD
						14		8757 System Intfc "Not Data Ready"	A6J1-14	L BNDAC
						16		8757 System Intfc "Not Ready for Data"	A6J1-15	L BNRFD
						9		8757 System Intfc "Remote Enable"	A6J1-12	L BREN
						22		8757 System Intfc "Service Request"	A6J1-19	L BSRQ
								Not Currently Used	A3J1-32	CAL MOD EN
								Not Currently Used	A3J1-7	CAL ON
								Not Currently Used	A3J1-76	CAL OSC EN

Table 8-27. HP 8757C/E A11 Motherboard Wiring List (3 of 6)

Mnemonic	Source	Description	A1/A2 A11J1	A3 XA3J1	A4 XA4J2	A4 XA4J2	A5 XA5J1	A6 XA6J1	A7 "A" XA7J1	A8 "B" XA8J1	A9 "C" XA9J1
CAL PWR	A4J1-3	Not Currently Used			3		22				
C IN SHLD	A11J4-1	Detector C Input Shield (Option 001)									2, 5 20, 23
CNTL A	A4J1-21	Detector A Input Control	31		21						
CNTL B	A4J1-20	Detector B Input Control	34		20						
CNTL C	A4J1-24	Detector C Input Control (Option 001)	32		24						
CNTL R	A4J1-19	Detector R Input Control	33		19						
CNTRL1	A3J1-79	Rear Panel Control Number 1		79							
CNTRL1 GND	A8J1-52	Rear Panel Control Number 1 Ground									
CNTRL2	A3J1-40	Rear Panel Control Number 2		40							
CNTRL2GND	A8J1-54	Rear Panel Control Number 2 Ground									
L DISP	A3J1-38	L=Display Data Strobe		38							
L DISP INT	A14J1-31	L=Display Interrupt									
L DR INT	A4J2-55	L=Data Ready Interrupt		55		55					
IA1	A3J1-25	Instrument Bus Address Bit 1 (LSB)	19	25		25		65			
IA2	A3J1-24	Instrument Bus Address Bit 2	20	24		24		64			
IA3	A3J1-23	Instrument Bus Address Bit 3	17	23		23		63			
IA4	A3J1-22	Instrument Bus Address Bit 4	18	22		22		62			
IA5	A3J1-21	Instrument Bus Address Bit 5	15	21		21		61			
IA6	A3J1-20	Instrument Bus Address Bit 6	16	20		60		60			
IA7	A3J1-60	Instrument Bus Address Bit 7	13	60		59, 19		59			
IA8	A3J1-61	Instrument Bus Address Bit 8 (MSB)	14	61		61		20			
ID0	A3J1-18	Instrument Bus Data Bit 0 (LSB)	6	18		18		58			
ID1	A3J1-17	Instrument Bus Data Bit 1	5	17		17		57			
ID2	A3J1-16	Instrument Bus Data Bit 2	8	16		16		56			
ID3	A3J1-15	Instrument Bus Data Bit 3	7	15		15		55			
ID4	A3J1-14	Instrument Bus Data Bit 4	10	14		14		54			
ID5	A3J1-13	Instrument Bus Data Bit 5	9	13		13		53			
ID6	A3J1-12	Instrument Bus Data Bit 6	12	12		12		52			
ID7	A3J1-11	Instrument Bus Data Bit 7	11	11		11		51			
ID8	A3J1-10	Instrument Bus Data Bit 8		10		10		50			
ID9	A3J1-9	Instrument Bus Data Bit 9		9		9		49			
ID10	A3J1-8	Instrument Bus Data Bit 10		8		8		48			
ID11	A3J1-7	Instrument Bus Data Bit 11		7		7		47			
ID12	A3J1-6	Instrument Bus Data Bit 12		6		6		46			
ID13	A3J1-5	Instrument Bus Data Bit 13		5		5		45			
ID14	A3J1-4	Instrument Bus Data Bit 14		4		4		44			
ID15	A3J1-3	Instrument Bus Data Bit 15		3		3		43			
INA	A11J2-2	Channel A Input							3, 21		
INARTN	A11J2-3	Channel A Input Return							4, 22		
INB	A11J3-2	Channel B Input								21, 3	
INBRTN	A11J3-3	Channel B Input Return								4, 22	
INC	A11J4-2	Channel C Input (Option 001)									21, 3
INCRTN	A11J4-3	Channel C Input Return (Option 001)									4, 22
INR	A11J52-2	Channel R Input									

Table 8-27. HP 8757C/E A11 Motherboard Wiring List (4 of 6)

A10 "R" XA10J1	"A" Input A11J2	"B" Input A11J3	"C" Input A11J4	"R" Input A11J5	A12 A11J6	A13 A11J8	A14 A11J7	Description	Source	Mnemonic
								Not Currently Used	A4J1-3	CAL PWR
			1					Detector C Input Shield (Option 001)	A11J4-1	C IN SHLD
								Detector A Input Control	A4J1-21	CNTL A
								Detector B Input Control	A4J1-20	CNTL B
								Detector C Input Control (Option 001)	A4J1-24	CNTL C
								Detector R Input Control	A4J1-19	CNTL R
						51		Rear Panel Control Number 1	A3J1-79	CNTRL 1
						52		Rear Panel Control Number 1 Ground	A8J1-52	CNTRL 1 GND
						53		Rear Panel Control Number 2	A3J1-40	CNTRL2
						54		Rear Panel Control Number 2 Ground	A8J1-54	CNTRL2 GND
							30	L=Display Data Strobe	A3J1-38	L DISP
							31	L=Display Interrupt	A14J1-31	L DISP INT
								L=Data Ready Interrupt	A4J2-55	L DR INT
							26	Instrument Bus Address Bit 1 (LSB)	A3J1-25	IA1
							23	Instrument Bus Address Bit 2	A3J1-24	IA2
							24	Instrument Bus Address Bit 3	A3J1-23	IA3
								Instrument Bus Address Bit 4	A3J1-22	IA4
								Instrument Bus Address Bit 5	A3J1-21	IA5
								Instrument Bus Address Bit 6	A3J1-20	IA6
								Instrument Bus Address Bit 7	A3J1-60	IA7
								Instrument Bus Address Bit 8 (MSB)	A3J1-61	IA8
							19	Instrument Bus Data Bit 0 (LSB)	A3J1-18	ID0
							20	Instrument Bus Data Bit 1	A3J1-17	ID1
							17	Instrument Bus Data Bit 2	A3J1-16	ID2
							18	Instrument Bus Data Bit 3	A3J1-15	ID3
							15	Instrument Bus Data Bit 4	A3J1-14	ID4
							16	Instrument Bus Data Bit 5	A3J1-13	ID5
							13	Instrument Bus Data Bit 6	A3J1-12	ID6
							14	Instrument Bus Data Bit 7	A3J1-11	ID7
							9	Instrument Bus Data Bit 8	A3J1-10	ID8
							10	Instrument Bus Data Bit 9	A3J1-9	ID9
							7	Instrument Bus Data Bit 10	A3J1-8	ID10
							8	Instrument Bus Data Bit 11	A3J1-7	ID11
							5	Instrument Bus Data Bit 12	A3J1-6	ID12
							6	Instrument Bus Data Bit 13	A3J1-5	ID13
							3	Instrument Bus Data Bit 14	A3J1-4	ID14
							4	Instrument Bus Data Bit 15	A3J1-3	ID15
	2							Channel A Input	A11J2-2	INA
	3							Channel A Input Return	A11J2-3	INARTN
		2						Channel B Input	A11J3-2	INB
		3						Channel B Input Return	A11J3-3	INBRTN
			2					Channel C Input (Option 001)	A11J4-2	INC
			3					Channel C Input Return (Option 001)	A11J4-3	INCRTN
21, 3				2				Channel R Input	A11J5-2	INR

Table 8-27. HP 8757C/E A11 Motherboard Wiring List (5 of 6)

Mnemonic	Source	Description	A1/A2 A11J1	A3 XA3J1	A4 XA4J2	A4 XA4J2	A5 XA5J1	A6 XA6J1	A7 "A" XA7J1	A8 "B" XA8J1	A9 "C" XA9J1
INRRTN	A11J5-3	Channel R Input Return									
L IOS	A3J1-27	L=I/O Strobe	21	27		27		67			
L 1PRESET	A11J1-25	L=Preset (Front Panel Button)	25	74							
LOG A	A7J1-35	Channel A Logger Output			9				35		
LOG A COM	A7J1-34	Channel A Logger Common			27				34		
LOG B	A8J1-35	Channel B Logger Output			10					35	
LOG B COM	A8J1-34	Channel B Logger Common			28					34	
LOG C	A9J1-35	Channel C Logger Output (Option 001)			11						35
LOG C COM	A9J1-34	Channel C Logger Common (Option 001)			29						34
LOG R	A10J1-35	Channel R Logger Output			12						
LOG R COM	A10J1-34	Channel R Logger Common			30						
L LOG TEMP	A4J2-34	Logger Multiplexer Control 1				34			14	14	14
L LOG ZERO	A4J2-35	Logger Multiplexer Control 2				35			15	15	15
LPFW	A11J6-5	Low Power Failure Warning		43							
PZAB	A13J3	Positive Z-Axis Blanking				40					
R IN SHLD	A10J1-22	Detector R Input Shield									
L RESET	A3J1-31	L=Reset (CPU Buffered)	23	31		31		71			
SPARE		Not Currently Used						79			
SPARE GND		Not Currently Used						80			
SPLY FAIL	A12J1-3	Supply Failed		46							
L SRQA	A6J1-72	L=Service Request A (HP Intfc Bus)		70				72			
L SRQB	A6J1-73	L=Service Request B (8757 System Bus)		33				73			
L SRQ FP	A11J1-27	L=Service Request Front Panel	27	19							
STOP SWEEP	A4J2-78	Stop Sweep				78					
L STTS INT	A4J2-62	L=Status Interrupt		56		62					
SWEEP IN	A13J5	Sweep In Ramp				80					
SWEEP RTN	A13J5	Sweep In Return				79					
VBATT	A3J1-44	Not Currently Used									
L WRITE	A3J1-29	L=Write (H=Read)		29		29		69			
L XACK	A11J7-29	L=Transfer Acknowledge		73							
L 27K MOD DR	A3J1-75	L=27 kHz Modulator Drive On		75			32				
5MHZ	A3J1-35	5 MHz Clock (HP-IB)		35				75			
+15V	A11J6-14	+15 Vdc Power Supply	35, 36		15, 33 18, 36		33, 15 18, 36		30, 12 28, 10	30, 12 28, 10	30, 12 28, 10
+5V	A11J68-11	+5 Vdc (Analog) Power Supply									
+5V DIG	A11J6-8	+5 Vdc Digital Power Supply	1, 2	41, 1		41, 1		1, 41			
GND	A11J6-12	Ground (General Analog)			35, 17 14, 32, 8, 26		17, 35				
GND A	A11J6-15	Ground Analog (Low Noise)									
GND DIG	A11J6-6	Ground Digital	3, 4 22, 24, 26, 28, 30	42, 2 26, 28 30, 34		42, 2 26, 28, 30		2, 42 66, 68, 70			
GND DIG SH		Ground Digital Shield									
GND DISP	A11J7-1	Ground Display									
GND PLANE	A11J6-4	Ground Plane (Analog Shield)	37, 38				9, 10 11, 12, 27, 28, 29, 30	36	1, 6, 9, 13, 18, 19, 24, 27, 31, 36	6, 9, 13, 18, 19, 24, 27, 31, 36, 1	19, 24, 27, 31, 36, 6 9, 13, 18, 1
−12.6V	A11J6-10	−12.6 Vdc Power Supply	39, 40								
−15V	A11J6-13	−15 Vdc Power Supply			16, 34		16, 34		25, 7	7, 25	25, 7

Table 8-27. HP 8757C/E A11 Motherboard Wiring List (6 of 6)

A10 "R" XA10J1	"A" Input A11J2	"B" Input A11J3	"C" Input A11J4	"R" Input A11J5	A12 A11J6	A13 A11J8	A14 A11J7	Description	Source	Mnemonic
4, 22				3				Channel R Input Return	A11J5-3	INRRTN
								L=I/O Strobe	A3J1-27	L IOS
								L=Preset (Front Panel Button)	A11J1-25	L 1PRESET
								Channel A Logger Output	A7J1-35	LOG A
								Channel A Logger Common	A7J1-34	LOG A COM
								Channel B Logger Output	A8J1-35	LOG B
								Channel B Logger Common	A8J1-34	LOG B COM
								Channel C Logger Output (Option 001)	A9J1-35	LOG C
								Channel C Logger Common (Option 001)	A9J1-34	LOG C COM
35								Channel R Logger Output	A10J1-35	LOG R
34								Channel R Logger Common	A10J-34	LOG R COM
14								Logger Multiplexer Control 1	A4J2-34	L LOG TEMP
15								Logger Multiplexer Control 2	A4J2-35	L LOG ZERO
					25			Low Power Failure Warning	A11J6-5	LPFW
						48		Positive Z-Axis Blanking	A13J3	PZAB
2, 5, 20, 23				1				Detector R Input Shield	A10J1-22	R IN SHLD
							32	L=Reset (CPU Buffered)	A3J1-31	L RESET
						55		Not Currently Used		SPARE
						56		Not Currently Used		SPARE GND
					3			Supply Failed	A12J1-3	SPLY FAIL
								L=Service Request A (HP Intfc Bus)	A6J1-72	L SRQA
								L=Service Request B (8757 System Bus)	A6J1-73	L SRQB
								L=Service Request Front Panel	A11J1-27	L SRQ FP
						47		Stop Sweep	A4J2-78	STOP SWEEP
								L=Status Interrupt	A4J2-62	L STTS INT
						50		Sweep In Ramp	A13J5	SWEEP IN
						49		Sweep In Return	A13J5	SWEEP RTN
								Battery Voltage	A3J1-44	VBATT
							25	L=Write (H=Read)	A3J1-29	L WRITE
							29	L=Transfer Acknowledge	A11J7-29	L XACK
								L=27 kHz Modular Drive On	A3J1-75	L 27K MOD DR
								5 MHz Clock (HP-IB)	A3J1-35	5MHZ
30, 12					14			+15V Vdc Power Supply	A11J6-14	+15V
28, 10					11			+5 Vdc (Analog) Power Supply	A11J1-11	+5V
					8, 9			+5 Vdc Digital Power Supply	A11J6-8	+5V DIG
					12			Ground (General Analog)	A11J6-12	GND
					15			Ground Analog (Low Noise)	A11J6-15	GND A
					6, 7			Ground Digital	A11J6-6	GND DIG
						11, 13, 15, 17, 19, 21, 23, 34, 36, 38, 40, 42 44, 46		Ground Digital Shield		GND DIG SH
					2		1, 2, 11, 12, 21, 22, 27, 28, 33, 34	Ground Display	A11J7-1	GND DISP
19, 24, 27, 31, 6, 9, 18, 36, 1, 13					4			Ground Plane (Analog Shield)	A11J6-4	GND PLANE
					10			−12.6 Vdc Power Supply	A11J6-10	−12.6V
25, 7					13			−15 Vdc Power Supply	A11J6-13	−15V

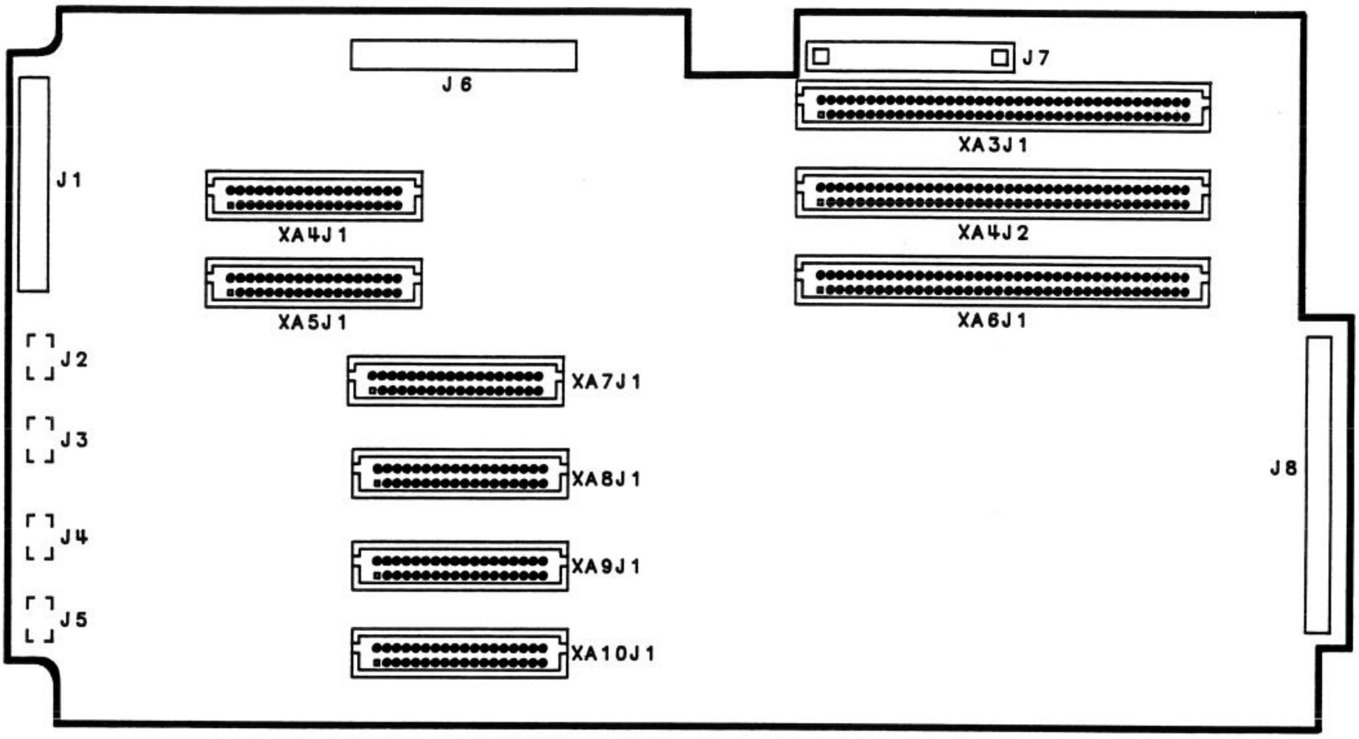


Figure 8-35. A11 Component Locations Diagram

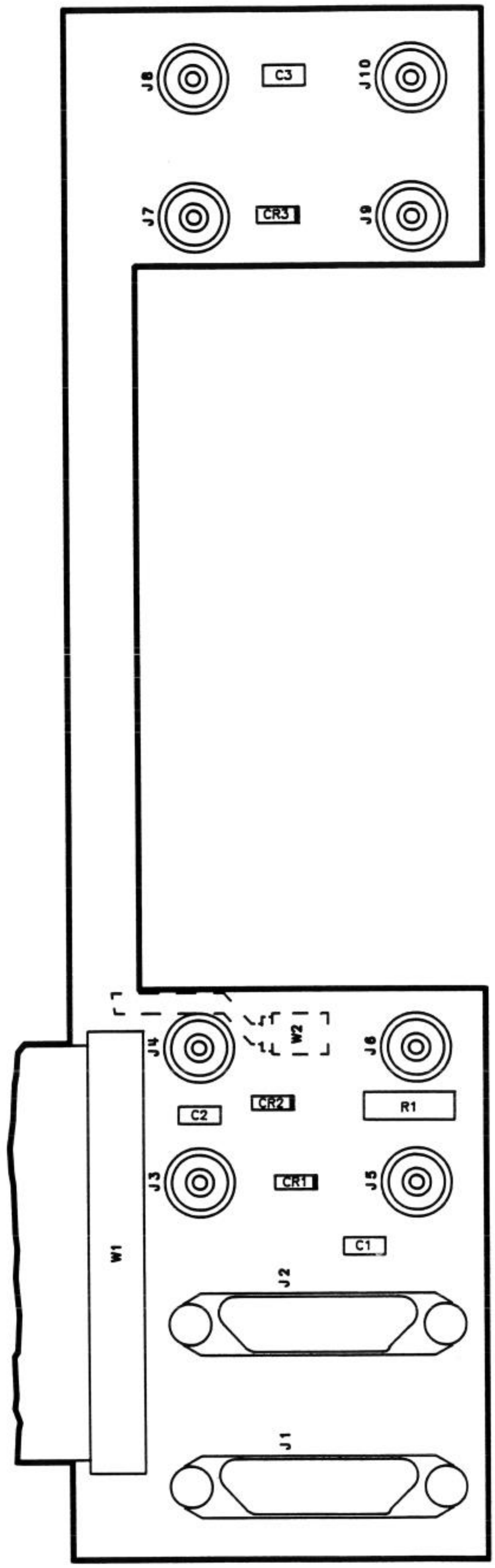


Figure 8-36. A13 Component Locations Diagram

A14 DISPLAY INTERFACE BOARD

CONTENTS

CIRCUIT DESCRIPTION

This board provides an interface between the CPU board and the raster scan display (color or monochrome). The board receives commands from the CPU. It then executes these commands, drawing images (text and trace) to the display.

The display interface board consists of these primary components:

- Graphics System Processor (GSP) chip.
- 64K words of DRAM (1 word =16 bits).
- 256K words of Video DRAM (VRAM).
- Memory address decoding logic.
- Pixel processing circuitry.
- Video test circuitry.
- Video Color Palette chip.

The heart of the display board is the TMS-34010 Graphics System Processor (GSP) chip. This chip is responsible for managing the entire graphics system. It receives graphics drawing commands from the CPU and executes them. It also generates the proper video timing (HSYNC, VSYNC, and BLANK) required by the raster scan display.

The memory address decoding logic is used to select the proper memory banks and to properly address the memory chips.

The 64K of DRAM is used to store the GSP's program and data, and to store the list of drawing commands received from the CPU. The 256K of VRAM is used to store the data for 2 screens of video information. The GSP issues special memory commands which instruct the VRAMs to shift out a serial stream of pixels (picture elements).

The pixel processing circuitry interfaces the pixels coming from the VRAMs to the video color palette chip. It also performs pixel stretching, which widens each pixel to make it more square.

The video color palette chip accepts pixels from the pixel processing circuitry, converts each pixel into one of 4096 colors, and outputs the analog RGB signals which drive the raster display.

Due to the complexity of this board, it is not possible to provide a complete description of the theory of operation. Instead a cursory description follows which, together with the troubleshooting techniques, should provide enough information to repair most failures. For those boards in which the problem cannot be isolated, a tested exchange board can be purchased from Hewlett-Packard (see "Replaceable Parts").

A. CPU INTERFACE

The host 68000 CPU is connected to the GSP via a 34 pin connector (J4). The host interface circuit consists primarily of U11, U12, and U43. U11 and U12 buffer the host data bus between the CPU and the GSP. They are necessary because the GSP must drive the entire instrument bus.

U43 is a registered PAL. Its purpose is to select either the GSP or the intensity/background DAC, depending on the inputs. This PAL is also responsible for generating LDTACK at the proper time, depending on the type of access. DAC accesses take a fixed time, while the GSP accesses take a variable amount of time, determined by the HRDY signal from the GSP.

This PAL also controls the CPU interface timing. Normally the GSP requires some setup and hold time on its address, data, and control inputs. This PAL eliminates these requirements, making the CPU interface timing simpler.

B. INTENSITY / BACKGROUND CONTROL

Intensity and background levels are controlled by a dual DAC (U10). The CPU writes 8 bit values to it to control brightness and contrast of the display. The DAC is used in a non-standard configuration, making it act like a voltage divider. A 1.0 V reference is supplied to Iout (pins 2, 20). Then, depending on the DAC setting, a voltage between 0 and 1.0 V will be seen on the Vref inputs (pins 4, 18) of the DAC. U13 buffers the 0 to 1 V output of the DAC, and maintains this voltage on its inverting inputs (pins 2, 6). This voltage causes a current between 0 and 10 mA to flow through the 100 ohm resistors (R14, R15). These current sinks are connected to the intensity and background inputs of the display, respectively. The intensity output is also monitored by the self-test circuitry to verify proper operation. The background output is not monitored since its failure would have only minor cosmetic effects.

C. GRAPHICS SYSTEM PROCESSOR (GSP)

The GSP (U25) is the heart of the graphics board, controlling all major functions. A 50 MHz crystal oscillator supplies the GSP with its required clock

D. MEMORY DECODING

Memory address decoding is performed by U28, U47, U49, and U50. Latch U28 is used to generate various signals used in decoding. On a shift-register-transfer cycle, LTR/LQE is latched low, creating LSRT. On a RAM refresh cycle, LAD15 is latched low, creating LRF. LAD14 and LAD13 are latched on LRAS, creating logical addresses A26 and A25. A26 and A25 are used as shown in table 8-28.

Table 8-28. Memory Cross-Reference

A26	A25	Memory Device Selected
0	0	VRAM
0	1	VRAM
1	0	Self-test circuit
1	1	DRAM

LAD1 and LAD0 are latched on LRAS, creating logical addresses A13 and A12. A13 and A12 are used to select one of 4 banks of VRAMs.

NAND gate U45C and delay line U47 are used to delay the LLAL by approximately 24ns, which helps provide more accurate timing to the decode PAL. Delay line U47 is used to delay LLAL by 20 ns. This provides the timing required to select LLE1 and LLE2 at the proper times.

Decode PAL U49 is responsible for supplying the LRAS (Row Address Strobe) signal to the DRAMs and VRAMs. Logical address lines A13 and A12 are used to select one of 4 VRAM banks to supply with RAS. When PAL input LRF goes low, a refresh cycle is signaled, and RAS is sent to all VRAMs and DRAMs.

SRTRD goes high upon a VRAM Shift Register Transfer (SRT) cycle. This cycle signals the VRAMs to transfer one row of memory to their on-board, internal shift registers. SRTRD is used to signal U9 to latch the address of the VRAM bank currently selected for shift output. LLE1 and LLE2 are used to select U40 or U39 while addressing the VRAMs and DRAMs.

Decode PAL U50 is responsible for supplying CAS (Column Address Strobe) to the VRAMs or DRAMs. LCASV supplies the VRAMs with CAS. LRASD and LCASD supply the DRAMs with RAS and CAS.

LSRTWR is used to force the SE input on the VRAMs low during reverse SRT cycles. These cycles are used to clear the screen quickly. LTEST is asserted when reading from the test latch.

U46 and U47 are used to select one of 4 banks of VRAMs to be shifted. The selected bank is then latched, resulting in pixels being sent to the pixel processing circuitry.

LSCLK and HSCLK are the shift clock outputs used to clock the VRAMs. These two outputs are used to gate SCLK to the VRAMs. The VRAMs use SCLK to serially clock out pixels. It is necessary to gate SCLK so that this clocking does not begin until the end of horizontal blanking.

E. ADDRESS LATCHING

Latches U39 and U40 are enabled to supply the proper address to the memories. U38 dampens the signal lines. U39 is always used to supply the memories with their address except when U40 is used. These times include VRAM row address (from GSP column address), VRAM shift address, and DRAM and VRAM refresh address. U40 is used to supply the VRAMs with their column address. This column address is actually the GSP's row address output.

F. DRAM

These four 64K x 4 DRAMs provide 64K words (16-bit words) of storage for the display list and the GSP program.

G. VRAM

This block of sixteen 64K x 4 VRAMs provides 256K words of video memory, equivalent to 1 million 4-bit pixels. Since the screen size is 1024 x 400, this is enough memory to store 2.5 screens of information. This enables the processor to display entirely updated screens instantaneously by displaying one screen while updating another.

H. PIXEL PROCESSING

When video data is shifted out of the VRAMs, it comes out as 16-bit quantities (four 4-bit pixels in parallel). U15 and U16 are 2:1 multiplexers which break this 16-bit wide video stream into two streams of 4-bit pixels. The video rate of data entering these multiplexers is 9 MHz. The video rate of data leaving is 18 MHz. This is because the total video data path width has been reduced from 16 bits to 8 bits.

Latch U29 saves the value of the previous pixel. This value is used by PAL U14 when it performs pixel stretching. Inputs to this PAL are the two current pixels and the previous pixel. An enable input is also used to turn stretching off while the color table of the palette chip is being loaded (first line of the display which is blanked by the palette).

Flip-flop U30A takes the 18 MHz output of the palette and divides it by 2. The 9 MHz output is called SCLK, and is used to clock both the GSP and the VRAM's serial output. Flip-flop U41A is used to synchronize the GSP's BLANK with SCLK. The Q-output of U41A is used to gate SCLK to the VRAMs. U41B is used to blank the palette output, and is delayed 1 SCLK cycle from the synchronized blank of U41A. This delay is necessary due to the 1 SCLK delay period that it takes a pixel to move through the pixel processing chain.

J. VIDEO OUTPUT

The video color palette chip U1 performs pixel color look-up and digital to analog conversion. The palette uses video clock U42 to clock analog voltages out. Video clock U42 clocks the palette chip at the video rate of 35.904 MHz. Pixels are clocked into the palette on the rising edge of the palette's CLKOUT signal, which is equal to the DOTCLK video clock input divided by two. Each pixel value that is clocked into the palette is converted into one of 4096 possible RGB values using the internal color look-up table. The resultant analog RGB value is used to drive the RGB display monitor. The voltage range of the analog output of the palette is typically 0.65 V (black) to 2.3 V (white). The resistor dividers on the analog output attenuate the voltage to 49% of its original value. This provides the RGB display with a typical voltage range from 0.3 V to 1.1 V. Since the monitor is AC coupled, it sees a 0.8 V p-p signal. This slightly exceeds what the display expects to see (0.714 V) so that full brightness is guaranteed even under worst case conditions.

Display connector J3 connects to the internal display. It's signals include LVSYNC, LHSYNC, R, G, B, Intensity, Background, +65V and GND. External RGB Monitor Connector J2 supplies raw R, G, B, VSYNC, and HSYNC signals to the rear panel RGB output board (if applicable). The rear panel board buffers them, adds sync on green, and drives an external monitor.

The grounds to these connectors (J2 and J3) are isolated from the board's digital ground via R2, R12, C4, and C10. These components provide a low impedance AC ground path, but not a DC path. This eliminates possible ground loops.

K. VIDEO SELF-TEST

The self-test circuitry consist of U31 and U33. Comparator U31 compares the Red, Green, Blue, and Intensity DAC signals to a known reference voltage of 0.58 V. If the input is above the reference voltage, the comparator's open-collector output is driven low. Buffer U33 is enabled by the GSP to read the signals being tested.

L. POWER SUPPLY FILTERING

The display interface board requires a +5 V supply only. This is supplied by a separate +5 V regulator on the A12 board. The supply is locally filtered and decoupled by a network of capacitors. A coil is used to prevent AC signals from feeding back into the main power supply.

The +65V and MON_GND, along with their associated sense lines, travel across the display interface board to the video connector to provide power to the display. They are not used on the A14 display interface board.

ADJUSTMENTS AND DIAGNOSTIC TESTS

The display interface board has several diagnostics for troubleshooting both the A14 interface board and the display.

The diagnostics consists of the following:

- Self-tests that are performed at power up and preset.
- Self-tests and test loops that can be manually selected.
- Test patterns that both verify circuitry, and also allow easy troubleshooting with an oscilloscope.
- Forced diagnostic tests that can be run by setting switches on the A3 CPU board.

There is no error checking performed on the diagnostic test patterns; it is up to the operator to interpret the results.

Adjustments consist of the following:

- Nominal intensity level (100% level).
- Minimum default intensity.
- Background intensity.

The display diagnostics menu can be reached by pressing the following keys:

[PRESET] [SYSTEM] *[MORE]* (8) *[SERVICE]* (8) *[DISPLAY]* (1)

The number in parenthesis indicates the label corresponding to the softkey, where number 1 is the top softkey and number 8 is the bottom softkey. These numbers are given in case a non-functioning display renders the softkey labels unreadable.

ADJUSTMENTS

The following adjustments are preset at the factory and normally will not need re-adjustment unless the A15 display, the A14 display interface, or the A3 CPU boards are replaced. The user may also wish to customize these adjustments to his environment. If adjustments are made, make the background adjustment first.

Background Adjustment

Access the diagnostic menu, then press ***[BCKGRND ADJUST]*** (3).

The background adjustment sets the black level of the display. It should be set so that the minimum intensity that can be drawn is just barely visible when the display is located in a dimly lit room (or shaded from bright lights).

When ***[BCKGRND ADJUST]*** is pressed, alternating vertical bars of 3 different intensities will be drawn. Each will have a number written below it from 0 to 2. Adjust the RPG until the vertical bar labeled "1" is just barely visible while under low ambient light conditions (but not dark). Vertical bar "0" must not be visible at all. To store the value, press any softkey. Then close switch A3S1-E and press ***[SAVE VALUE]***. Open the switch.

Nominal Intensity

Access the diagnostic menu, then press ***[NOMINAL INT ADJ]*** (1).

The analyzer will display a completely white screen. The RPG (knob) can be turned to adjust the intensity. Using a nit meter, adjust the RPG for an intensity of 100 nits if the glass bezel assembly is *not* installed, or 60 nits if the glass bezel *is* installed (the glass filter transmits 60% of the light). If the specified intensity cannot be reached, set it as close as possible. Once this has been set, press any softkey. The current DAC value will be displayed (0 = full intensity, 255 = minimum). Close switch A3S1-E and press ***[SAVE VALUE]***, then open the switch. This intensity will now become the 100% setting. Note that all display characteristics are specified at 100 nits. While higher intensities may be available, the quality of the images may be slightly degraded. Higher intensities may also shorten the CRT life if left for extended periods of time. The setting of this adjustment will have no effect on the range of brightness available; it only affects the displayed percentage of brightness.

Minimum Intensity

Access the diagnostic menu, then press ***[MINIMUM INT ADJ]*** (2).

Normally the analyzer will preset (or power on) to the same intensity level that was last used. However, if the last used intensity level was at its minimum, it may not be possible to see the display, thus causing concern as to whether or not it is functioning. To prevent this possibility, the analyzer is set to a default level if the previous level was too low.

The procedure to set this default level is the same as the nominal intensity level procedure above, except for the nit values. For this adjustment, set the default levels to 20 nits if no glass filter is present, or 12 nits if it is present.

Test Patterns

Test patterns are useful for display adjustments, diagnostics, and troubleshooting. This information is provided for use in all three situations.

To access the test patterns from the display diagnostics menu, press ***[TEST PATTERN]*** (4).

The test pattern number below can now be input using the keypad and terminated with the **[ENT]** key. Alternately, the RPG or step keys can be used to select the test pattern. There are 15 test patterns which are listed in table 8-29. Because the HP 8757E is monochrome, it uses a green version of the test patterns. Therefore, not all of the test patterns are applicable, although the test pattern numbers remain the same.

Table 8-29. Test Pattern Summary

Number	Test Pattern	Number	Test Pattern
1	All White	9	Inverse Crosshatch
2	All Red	10	H Pattern (focus)
3	All Green	11	Pixel Stretching Test
4	All Blue	12	Repeating Gray Scale
5	16-Step Gray Scale	13	Color Rainbow
6	3-Step Gray Scale	14	Character Set
7	Convergence Test	15	Bandwidth Pattern
8	Crosshatch		

Note: Test pattern 12 can be forced at preset by closing status switches A3S1A through D. See "Forced Diagnostic Tests."

The following is a description of the test patterns.

1. All White. This pattern is used to verify the light output of the display and to check for color purity. In this, and other solid test patterns, an extremely thin full-screen horizontal line will be seen about 1/4 screen height from the bottom. This condition is characteristic of the CRT and does not indicate any problem.

2-4. All Red, Green, Blue. These test patterns verify the color purity of the CRT and also the ability to independently control each gun color. If the purity of the displayed test pattern is a problem, it usually indicates that the face of the CRT needs to be de-gaussed (de-magnetized). If purity is bad, cycling the power a few times may cure the problem. If this does not work, a commercially available de-magnetizer must be used. See instructions and warnings under "A15 DISPLAY".

5. 16-Step Gray Scale. This pattern is used to verify that the palette chip on the A14 board can produce 16 different amplitudes of color (in this case, gray.) This pattern is also very useful when using an oscilloscope for troubleshooting. The staircase pattern it produces will quickly show missing or stuck data bits. A typical palette chip output is shown in figure 8-38.

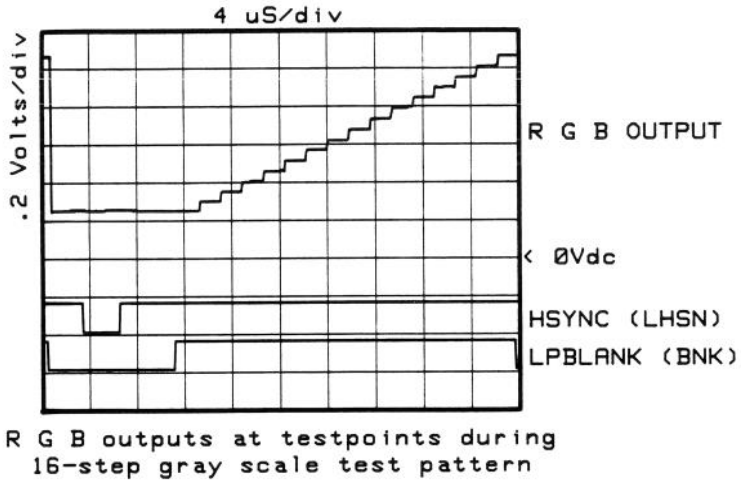


Figure 8-38. 16 Step Gray Scale

6. 3-Step Gray Scale. This pattern consists of the first three gray scale bars of the 16-step gray scale. It is used for adjusting the background level (or 0 step) so that the first bar is not visible, and the second bar is just barely visible.

7. Convergence Pattern. This pattern is used when measuring the accuracy of the color convergence. It is mainly for use by the factory, since convergence cannot be adjusted in the field.

8,9. Crosshatch and Inverse Crosshatch. These patterns are used by the factory to test color convergence, linearity, alignment, and high voltage regulation. No field adjustments are possible.

10. H Pattern. This pattern is used to check the focus of the CRT. Under normal conditions, this should never need to be adjusted. However, it is possible to adjust it in the field by accessing the focus control adjustment at the left rear of the A15 display. See "A15 DISPLAY".

11. Pixel Stretching. This pattern verifies the functionality of the pixel stretching circuit of the A14 display interface board. Under normal conditions, this pattern should appear all white. If a failure occurs in the pixel stretching circuit, the pattern will consist of 16 alternating white and gray vertical stripes. Suspect problems with with the STRETCH line and LFIRSTPIX.

12. Repeating Gray Scale. The repeating gray scale is used for troubleshooting with an oscilloscope. It is similar to the 16 step gray scale but is repeated 32 times across the screen. Each of the 3 outputs of the video palette will then show 32 ramps (instead of one staircase) between each horizontal sync pulse. This pattern is used to troubleshoot the pixel processing circuit of the A14 display interface board. An example of the output is shown in figure 8-43.

13. Color Rainbow. The color rainbow quickly shows the ability of the display interface board to display 15 colors plus white. The numbers written below each bar indicate the tint number used to produce that bar (0 & 100=pure red, 33=pure green, 67=pure blue).

14. Character Set. The character set is provided to conveniently show the user all the different types and sizes of characters available. Three sets of characters are drawn in each of the three character sizes. 125 characters of each size are displayed. Characters 0 and 3 cannot be drawn and several others are really control characters (such as carriage return and line feed).

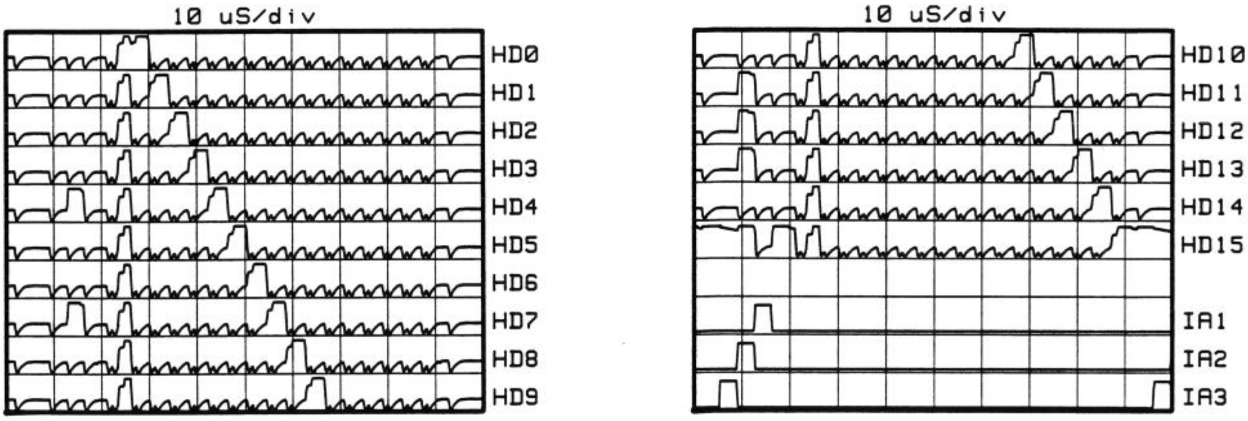
15. Bandwidth Pattern. This pattern provides a quick visual verification of the bandwidth of the display. It consists of multiple alternating white and black vertical stripes. Each stripe should be clearly visible. A limited bandwidth would smear these lines together. No field adjustment is possible.

DIAGNOSTIC TESTS

Display Test

Access the display diagnostics menu, then press ***[DISPLAY TEST]*** (5).

This test verifies the ability of the CPU to write to each of the four registers of the GSP. It writes a different value to each register and then reads them all back. It then writes a walking 1 pattern to one location. Any failure will attempt to be displayed on the CRT, although this may not be possible. This test can be continuously cycled by pressing softkey 2 ***[CYCLE]*** and can also be forced to run by closing status switches A3S1-A and A3S1-B on the A3 CPU board. Typical waveforms are shown in figure 8-39.



Buffered data lines HD0-HD9 during display bus cycle

Buffered data lines HD10-HD15 and address lines IA1-IA3 during display bus cycle

Figure 8-39. Display Cycle

Background and Intensity Ramps

Access the display diagnostics menu, then press ***[MORE]*** (6), then ***[BCKGRND RAMP]*** (1) or ***[INTNSTY RAMP]*** (3).

Both the background and intensity DACs can be continuously ramped to verify the functionality of the dual DAC (U10). With the display disconnected, a 0-1 V ramp will appear at the appropriate test points (BKGD and INT). With the display connected, a negative ramp from about +8 to +1 V should appear. The actual voltages may vary slightly from unit to unit and the ramp may have some curvature at the transition point due to the input capacitance of the display.

Other Adjustments

There are only two adjustments that can be made on the display itself. These are focus and vertical centering. Both should seldom, if ever, require adjustment. Focusing should be adjusted while viewing test pattern 10 (the H pattern). See "A15 DISPLAY" for more information.

FORCED DIAGNOSTIC TESTS

Several A14 tests can be forced to run by closing two or more status switches A3S1A-D on the A3 CPU board. Closing, in this case, means setting the switch toward the left side of the analyzer when viewed from the front. Once set, press **[PRESET]** or cycle the power. The CPU will immediately run the indicated test. Normal operation will resume only after all switches are opened and **[PRESET]** is pressed. Table 8-30 shows switch positions for the forced diagnostic tests.

Table 8-30. Forced Diagnostic Tests

Test	Switch Positions
Display Bus Cycle	Close switch sections A and B
Display Interface DRAM Loop	Close switch sections A and D
Display Interface VRAM bank 0 Loop	Close switch sections B and D
Display Interface VRAM bank 1 Loop	Close switch sections A, B and D
Display Interface VRAM bank 2 Loop	Close switch sections C and D
Display Interface VRAM bank 3 Loop	Close switch sections A, C and D
VRAM Device Error Indicator	Close switch sections B, C and D
Repeating Gray Scale Test Pattern	Close switch sections A, B, C and D

The display bus cycle will set up a walking 1 pattern on the buffered data lines to the GSP chip. It also exercises address lines IA1-IA3. A sample output is shown in figure 8-39. This is the same test as the display test described previously.

The display interface DRAM Loop sets up a walking 1 pattern on the data and address lines of the GSP chip U25. This test is described in detail in "Error Code 9". The data and address lines could be normally high or low. You must look at the lines during the proper transitions of LCAS and LRAS to determine the actual output status. See figure 8-43 for a sample timing diagram.

The display interface VRAM loop (banks 0-3) performs a very similar test to the DRAM loop. The same conditions and precautions as in the DRAM loop, above apply. A sample output of some data lines is shown in figure 8-40.

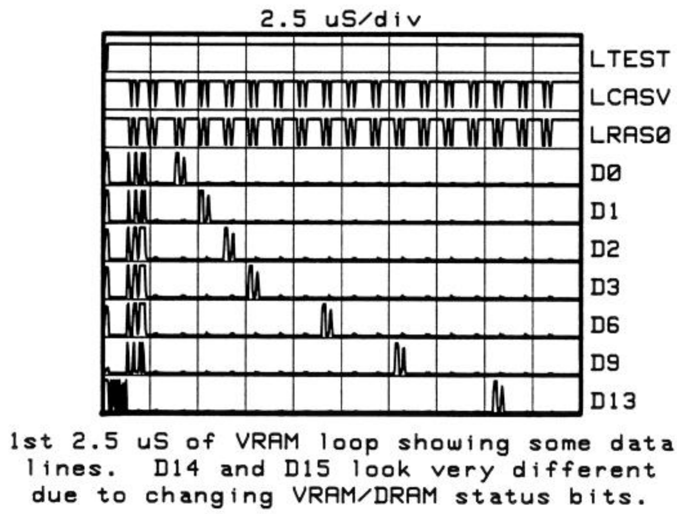


Figure 8-40. VRAM Loop

The VRAM device error indicator test will isolate any VRAM bank failure to a single VRAM, or as many as four, depending upon the type of failure. This test should be performed if *any* VRAM test has failed. To perform this test, close the indicated switches on the A3 CPU board and press **[PRESET]** or cycle the power. The CPU will perform a test on each of the four banks of VRAM and report any indicated failures via the LEDs on the A3 CPU board. The four most significant bits (DS1; labeled MSB) show which of the four banks of VRAM has failed (only the first failed bank is shown). The least significant bits (LSB) show which VRAMs in each bank have failed (the status of all four VRAMs is shown). A lit LED indicates a failure. Use table 8-31 to correlate the fail code with the VRAM reference designator. A "1" indicates a lit LED, a "0" indicates an extinguished LED and an "X" is a don't care state.

Table 8-31. Device Reference Designator Versus VRAM Error Code

LSB **Device Code**		MSB Bank Number			
		Bank 3 **1000**	Bank 2 **0100**	Bank 1 **0010**	Bank 0 **0001**
Bits 0-3	**XXX1**	U8	U6	U4	U2
Bits 4-7	**XX1X**	U9	U7	U5	U3
Bits 8-11	**X1XX**	U23	U21	U19	U17
Bits 12-15	**1XXX**	U24	U22	U20	U18

Hints on using this VRAM test: If all four LSB LEDs light and the MSB indicates bank 0 is defective, then the problem is most likely a bad control line going to the VRAM (since bank 0 is the first bank tested). Any time an error is indicated in bank 0, suspect the control lines and address/data traces before suspecting the individual VRAMs. This test is very useful in isolating problems that generate error code 5 or 6.

The repeating gray scale test is useful for testing the pixel processing portion of the board. Bit patterns during this test produce easily identifiable waveforms that can be used to troubleshoot to the component. Typical outputs are shown in figure 8-43.

TROUBLESHOOTING

WARNING

+65 V lines run from J1 to J3 on the A14 display interface. Do not contact these traces or personal injury may result.

Note: For troubleshooting purposes, the A14 display interface board can be removed from its holder and placed on the rear frame of the analyzer chassis. First disconnect all cables. Place a piece of non-conducting material under the board to prevent shorts to chassis ground. Orient the board, component side up, with the cable connections facing the front of the analyzer. Reconnect all cables to the board.

The A14 display interface board incorporates several self-tests to insure proper operation and to aid troubleshooting. Most of these self-tests are performed during preset and all are performed at power on. Results of these self-tests are displayed on the four front panel LEDs and are duplicated on the A3 CPU board. Additional error analysis is presented by four additional LEDs on the A3 CPU board.

The self-tests verify numerous portions of the board and actually check for reasonably proper operation at the RGB outputs of the board. However, on a board this complex, it is not possible to test for all conceivable failures. It is possible for some failures to occur, yet not be caught by the self-tests. If existence of a problem is questionable in the A14 display interface or the A15 display, the easiest troubleshooting approach is to either connect a compatible display to the external RGB outputs on the rear panel or to substitute another internal display. If all self-tests pass, the RGB and sync signal look good, but the display is blank, missing colors, or distorted; the problem is most likely in the A15 display itself.

The following information should be noted when troubleshooting the display interface board:

- The horizontal scan frequency is 25.5 kHz (a period of 39.216 μs).
- The vertical scan rate is 60 Hz (a period of 16.67 ms).
- The number of horizontal pixels is 1024.
- The number of horizontal lines is 425 (only 400 are actually displayed).
- A new pixel is drawn every 55.7 ns.

BASIC CHECKS

Verify all cables are connected properly. Verify the +5 V power supply is present at TP3 (+5V). Verify the +65 V power supply is present (within ±0.4 V) at pins 2, 4, and 6 of J3. A voltage slightly exceeding 65.4 V probably indicates an open line to the display. Verify 50 MHz and 35.904 MHz at TP14 (50MHz) and TP7 (PCLK) respectively. If DS1 is lit, it indicates that much of the display interface is working.

ERROR CODE DESCRIPTION

During self-test all eight CPU error code LEDs (A3DS1-2) and the HALT LED (A3DS3) should light briefly and then go out. If any of the LEDs do not extinguish, the lit ones indicate an error code in 8-4-2-1 binary (viewed from the component side, left to right). The left hand LEDs indicate a primary error code and this pattern is repeated on the front panel if possible. The four LEDs on the right indicate a sub error code which gives more specific error analysis. The sub error code is bit specific; each lit LED represents a particular failure. For example: a sub error code of 0001 (the far right LED only is lit) indicates a specific failure. A sub error code of 0010 indicates a different failure. A sub error code of 0011 indicates the combination of the two failures. Sub error code listings will show examples such as XX1X, where X represents a don't care state and the "1" indicates the specific LED that is lit; representing a specific failure. The following error codes generally relate only to the A14 display interface board.

1010 (Error Code 10) —Display Interface Failure

Sub Error Code XXX1 —All Bits =0 or
Sub Error Code XX1X —All Bits =1 or
Sub Error Code X1XX —Walking 1 Pattern or
Sub Error Code 1XXX —GSP Register Address. This error code indicates that the CPU board cannot communicate with the four registers contained within the GSP chip on the display interface board. The CPU tries to write all zeros, all ones, and then a walking 1 pattern to the GSP and read them back. It then writes to all four GSP registers and verifies each register can be accessed independently.Since this is the first error code associated with the A14 board, it may simply indicate that the interface cable is not connected or the display 5 V supply is missing. In this case the fail code for `All bits=1` should not be lit since normally the data bus will float high if nothing is driving it. A sub error code of 1XXX could indicate an open IA1 or IA2 line. Other common problems with error code 10 could be the lack of a 50 MHz clock input or lack of the 18 MHz clock that is derived from the 35.904 MHz oscillator.

If this test fails, the CPU will continuously repeat the test until it passes. This places a known pattern on the signal lines and allows the user to troubleshoot by checking for these known signal patterns. An example of the expected signals are shown in figure 8-39. Verify all data bits and address lines IA1-IA3 are functioning properly up to the GSP chip U25.

1001 (Error Code 9) —Display Interface DRAM Failure

Sub Error Code XXX1 —All Bits =0 or
Sub Error Code XX1X —All Bits =1 or
Sub Error Code X1XX —Walking 1 Pattern or
Sub Error Code 1XXX —Addressing. Upon passing error code 10, the CPU has verified that it can communicate with the GSP chip. It now tries to write a data pattern to DRAM and read it back. As in other tests, it writes all zeros, ones, and then a walking 1 pattern and then reports any errors. After it has done this at one location of DRAM, it tests each address line by writing a number to each of 16 addresses (DRAM address 0, 1, 2, 4, 8, 16 etc.). Since only 8 address lines go to each DRAM, the address lines are multiplexed; first the most significant address byte is sent, then the least. This essentially performs a dual walking 1 pattern on the address lines. Any deviation in the expected data is reported as an address error (sub error code 1XXX).

Failures in this test could be the result of several causes. Most likely causes would be the failure of PALs U49 and U50, U39, U28, the GSP chip U25, and the DRAM itself U34-37.

Troubleshooting this loop is best performed by forcing the GSP DRAM loop test by closing A3 switch A3S1-A and A3S1-D, then pressing **[PRESET]**. This will continuously loop the series of the walking 1 and dual walking 1 patterns. Total loop time is 180 μs with the first 80 μs devoted to the walking 1 pattern on the data lines (18 steps) and the last 100 μs devoted to the address line walking 1 pattern (16 steps). To allow for easy scope triggering, the CPU begins the test by reading from the self-test latch, thus providing a negative going trigger pulse at U33 pin 1 (LTEST). See figure 8-41.

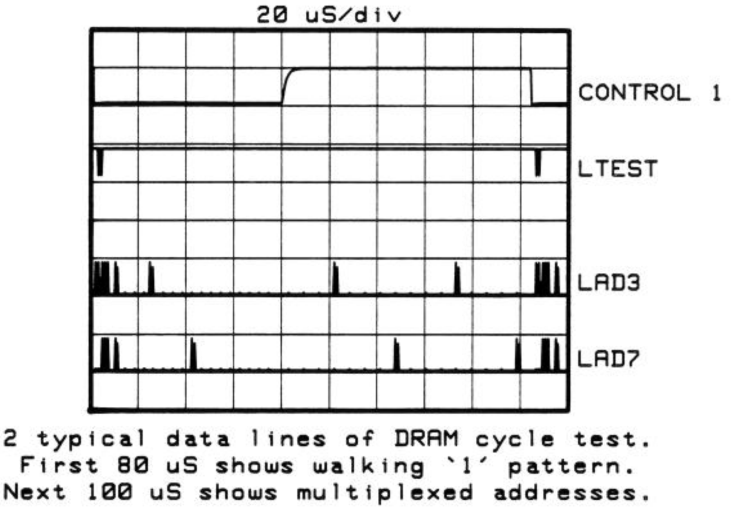


Figure 8-41. DRAM Cycle Test

Checking for the proper waveforms in this test is difficult. Look for a double pulse walking 1 pattern along the 16 data lines during the first 80 μs after the LTEST trigger (one pulse during a write cycle and one during a read cycle). Lack of a double pulse could indicate that a DRAM is not reading or writing properly. In many cases, the double pulse pattern may be obscured by a near constant 6.25 MHz "oscillation". In other cases, the trace may be normally high instead of normally low as shown in figure 8-41. In these cases, it will be necessary to carefully view each walking 1 pulse by triggering on LRASD (which goes low for each write/read cycle) and simultaneously viewing the data lines. This will involve the delay triggering mode of many oscilloscopes. The data line is valid during the rising edge of LRASD. A sample waveform showing one write/read cycle for both a "0" and a "1" is shown in figure 8-42.

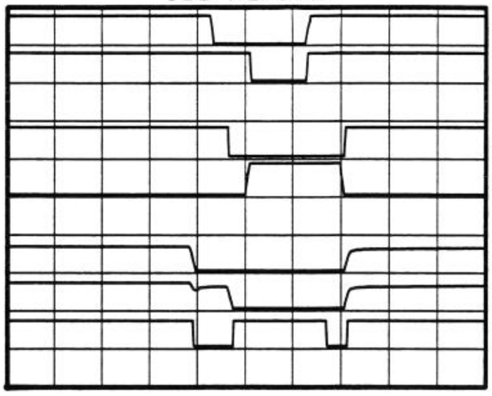


Figure 8-42. DRAM Walking 1 Pattern

The address portion of the test is similar to that above except it will show two double pulse patterns during the 16 step cycle instead of one. This is because the DRAMs have 16 bits of addressing and only 8 data input pins; necessitating the multiplexing of the most significant address byte with the least. During this part of the 16 step cycle, the observer should see a double pulse walking 1 pattern roughly coinciding with the negative edge of LRASD for each write/read cycle. The two double pulses will be spaced apart by eight steps. Thus, if a logic one is found on the first step (for address 0) there will also be another one (though slightly narrower) at step 9 (1+8). See the sample in figure 8-42. These signals may also have a superimposed 6.25 MHz signal on some address lines.

1000 (Error Code 8) —DRAM Download Failure

Sub Error Code XXX1 —Display List Read. The DRAM has been partially verified. The CPU now sets the GSP into an auto increment mode where an internal counter increments each time DRAM is read. The CPU then reads the DRAM 32768 times and verifies that the counter equals 32768. Any discrepancy is reported. Although unlikely, it could fail if a long display interface cable is used or if there is excessive noise on the power supply or ground. Also suspect the GSP chip itself and even the A3 CPU board. This test does *not* check any of the DRAM.

Sub Error Code XX1X —GSP Test Load or
Sub Error Code X1XX —GSP Internal Failure. The CPU downloads subsequent self-tests to DRAM and lets the GSP chip run the tests. This is done because the GSP has more control over timing of signals and is much faster than the CPU. After the CPU downloads the program, it immediately reads it back. Any discrepancies between what was written and what is read back are reported as a test load failure. The GSP is then instructed to run this code from DRAM. If the CPU determines this test is not being run, it reports a GSP internal failure.

Failures of this type could indicate a problem with the DRAM itself or its associated control lines. Suspect U34-37, U50, and U25.

0111 (Error Code 7) — DRAM Cell Test

Sub Error Code XXX1 — Bits 0-3 (U37) or
Sub Error Code XX1X — Bits 4-7 (U36) or
Sub Error Code X1XX — Bits 8-11 (U35) or
Sub Error Code 1XXX — Bits 12-15 (U34). The GSP performs a test on each internal location of DRAM (previous tests only verified a few locations involving each of the 8 address lines). Any failures are reported using the sub error codes. Since all address, data, and control lines to the DRAM have already been verified, the sub error code should correctly indicate the failed component.

0110 (Error Code 6) — VRAM

Sub Error Code XXX1 — All Bits =0 or
Sub Error Code XX1X — All Bits =1 or
Sub Error Code X1XX — Walking 1 Pattern or
Sub Error Code 1XXX — Addressing. The GSP now tries to write a data pattern to VRAM and read it back. As in other tests it writes all zeros, all ones and then a walking 1 pattern and reports any errors. After it has done this at one location of VRAM, it tests each address line by writing a number to each of 16 addresses (VRAM address 0, 1, 2, 4, 8, 16 etc.) Since only 8 address lines go to each VRAM, the address lines are multiplexed; first the most significant address byte is sent, then the least. This essentially performs a walking 1 pattern on the address lines. This is repeated for all four VRAM banks. Any deviation in the expected data is reported as an address error (sub error code 1XXX).

Since the address and data lines have been checked with the DRAM tests, and assuming there are no open traces between VRAMs, the most likely causes of failures would be related to those lines associated only with VRAM: LCASV and LRAS0, 1, 2, and 3.

The first step in troubleshooting this error code should be the performance of the VRAM device error indicator (a forced diagnostic test already described.) In many cases this test will immediately isolate the problem to the defective component. If not, it will at least provide more failure information that can be used in conjunction with the VRAM bank loop described earlier.

0101 (Error Code 5) — VRAM Cell Test

Note: This test is only performed upon power up and instrument verify.

Sub Error Code XXX1 — VRAM Bank 0 (U2, 3, 17, 18) or
Sub Error Code XX1X — VRAM Bank 1 (U4, 5, 19, 20) or
Sub Error Code X1XX — VRAM Bank 2 (U6, 7, 21, 22) or
Sub Error Code 1XXX — VRAM Bank 3 (U8, 9, 23, 24). Once the GSP has determined that it can write to VRAM, a complete cell test is performed that verifies each location of VRAM. Since this test takes about one second, it is not performed during preset; only at power on and instrument verify. The sub error codes should isolate any bad cell to a particular data bank (one of four parts). For further isolation to the component level, perform the forced diagnostic test (14); VRAM device error indicator test described earlier.

0100 (Error Code 4) — Video Control

Sub Error Code XXX1 — VRAM Shift. This sub error code indicates a failure in the ability of the VRAM to internally shift data within each VRAM. This fail code could indicate an internal failure of any of the 16 VRAMs. It is not possible to isolate this problem to any particular device.

Sub Error Code XX1X — Horizontal Sync or
Sub Error Code X1XX — Vertical Sync or
Sub Error Code 1XXX — Blank (LPBLANK). These error codes indicate a failure in the indicated lines. Either the line is not high when it is expected or it is not low when it is expected. The horizontal and vertical sync signals go directly to the display via J3. LPBLANK is a critical signal that, if missing, will prevent the display from operating. The sync signals originate at the GSP chip, but are connected to a few other locations. Should any fail, ensure that there are no shorts pulling the line down. If there are no shorts, suspect the GSP chip. LPBLANK is a slightly delayed (about 220 ns) version of LBLANK which also originates from the GSP chip.

0011 (Error Code 3) — R,G,B

Sub Error Code XXX1 — Red or
Sub Error Code XX1X — Green or
Sub Error Code X1XX — Blue. This error code verifies the ability of the indicated signal to toggle above and below a set voltage. The R, G, and B signals are checked at the output of the board. The expected output voltages range from 0.3 V, when the palette chip is set to minimum, to 1.1 V when the pallet chip is set to maximum. This self-test compares this output to a fixed voltage of 0.58 V. The palette chip is set to both minimum and maximum output levels and the state of the comparator is checked each time. These tests verify that at least some video output should be visible on the display.

Failure of any one color probably indicates a failure in the video palette chip U1. Failures of more than one color may indicate a problem anywhere in the pixel processing portion of the board or in the serial output portion of the VRAM and its associated control lines (LSE0-3, SD0-15 etc.) Also suspect U50, U47 and U46. Troubleshooting is best done by forcing the repeating gray scale test pattern (closing A3S1A-D) and comparing the waveforms with those shown in figure 8-43.

Sub Error Code 1XXX — Intensity DAC. The expected intensity DAC output ranges from 0 to 1 V at the emitter of Q2. Both minimum and maximum output levels are checked against the 0.58 V reference. Any errors are reported. Troubleshoot this by ramping the intensity DAC as described previously. Verify a monotonic 0-1 volt ramp at the emitter of Q2.

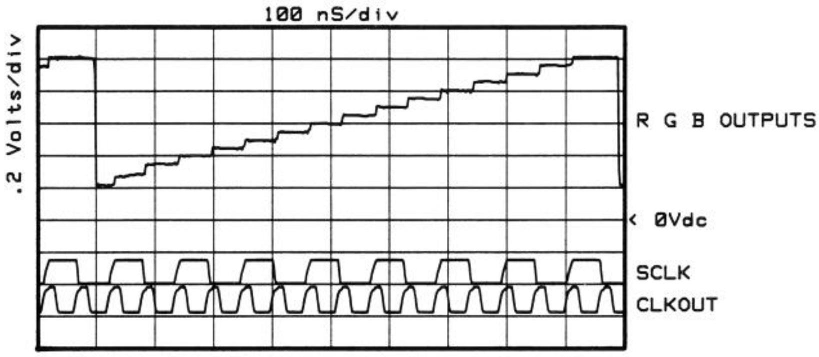
0010 (Error Code 2) — INTERRUPT

Sub Error Code X1XX — GSP Interrupt Fail. While most of this test is associated with only the A3 CPU board, this one test is related to the A14 display interface board. The GSP is set to send an interrupt. If no interrupt is found this error will result. Suspect the GSP chip itself or an open trace between the display interface board and the CPU board.

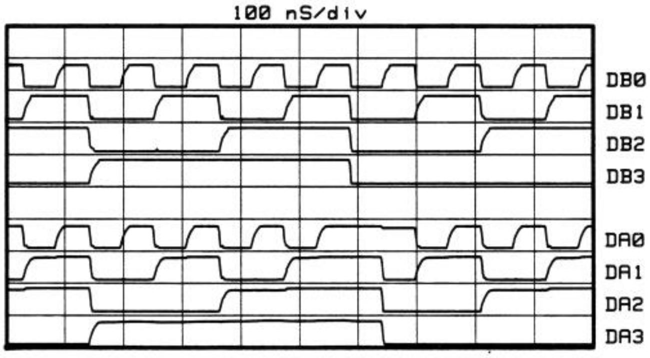
No Error Code; But a Distorted, Blank, or Otherwise Incorrect Display

If no error code is generated, but the CRT shows an incorrect display, then it must first be determined if the problem is with the display or the display interface board. Usually this is easy to determine just by looking at the display. Lack of vertical or horizontal sync even though the signals are present, indicates a failed display. A missing color even though no error code was generated also indicates a failed display. The best method to determine the source of the problem is to substitute a known good display, either directly or via the external R, G, B outputs.

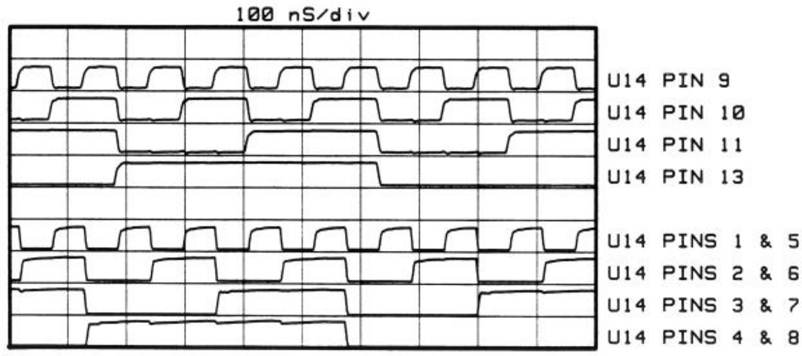
If the problem is not in the display itself, or the connecting cables, then it is probably in the display interface board. Troubleshoot this as if it were an error code 3. Force the repeating gray scale pattern and troubleshoot backwards from the video palette chip using the waveforms in figure 8-43 as a guide. If all else fails, the board can be exchanged for a previously tested rebuilt board.



Video palette output at testpoints during repeating gray scale pattern.



Video palette inputs during repeating gray scale. Note the six clock cycle delay from input to R G or B output.



Inputs to U14 during repeating gray scale

Figure 8-43. Repeating Gray Scale

Table 8-32. A14 Pin-Outs (1 of 2)

A14J1 Pinouts (Power Supply Input)

J1 PIN	SIGNAL	I/O	FUNCTION BLOCK
1	+65V	I	L
2	+65V SENSE	0	L
3	MON GND	I	L
4	MON GND SENSE	0	L
5	+5V DSP	I	L
6	+5V DSP	I	L
7	DIG GND	I	L
8	DIG GND	I	L
9	N.C.		
10	N.C.		

A14J2 Pinouts (RGB Outputs)

J2 PIN	SIGNAL	I/O	FUNCTION BLOCK
1	A GND	0	K
2	BLUE VIDEO	0	K
3	A GND	0	K
4	GREEN VIDEO	0	K
5	LRPSENSE	I	H
6	RED VIDEO	0	K
7	+5VF	0	L
8	LVSYNC	0	C
9	LHSYNC	0	C
10	A GND	0	K

A14J3 Pinouts (Display Output)

J3 PIN	SIGNAL	I/O	FUNCTION BLOCK
1	MON GND SENSE	I	L
2	+65 SENSE	I	L
3	MON GND	0	L
4	+65V	0	L
5	MON GND	0	L
6	+65V	0	L
7	INTEN	0	B
8	BACKGND	0	B
9	A GND	0	K
10	LVSYNC	0	C
11	A GND	0	K
12	LHSYNC	0	C
13	A GND	0	K
14	A GND	0	K
15	RED VIDEO	0	K
16	A GND	0	K
17	GREEN VIDEO	0	K
18	A GND	0	K
19	BLUE VIDEO	0	K
20	A GND	0	K

Table 8-32. A14 Pin-Outs (2 of 2)

A14J4 Pinouts (Display Interface)

J4 PIN	SIGNAL	I/O	FUNCTION BLOCK
1	GND	I	L
2	GND	I	L
3	ID14	I/O	A
4	ID15	I/O	A
5	ID12	I/O	A
6	ID13	I/O	A
7	ID10	I/O	A
8	ID11	I/O	A
9	ID8	I/O	A
10	ID9	I/O	A
11	GND	I	L
12	GND	I	L
13	ID6	I/O	A
14	ID7	I/O	A
15	ID4	I/O	A
16	ID5	I/O	A
17	ID2	I/O	A
18	ID3	I/O	A
19	ID0	I/O	A
20	ID1	I/O	A
21	GND	I	L
22	GND	I	L
23	IA2	I	C
24	IA3	I	A
25	RD/LWR	I	A
26	IA1	I	A
27	GND	I	L
28	GND	I	L
29	LDISPACK	O	A
30	LDISP	I	A
31	LDISPINT	O	C
32	LRESET	I	C
33	GND	I	L
34	GND	I	L

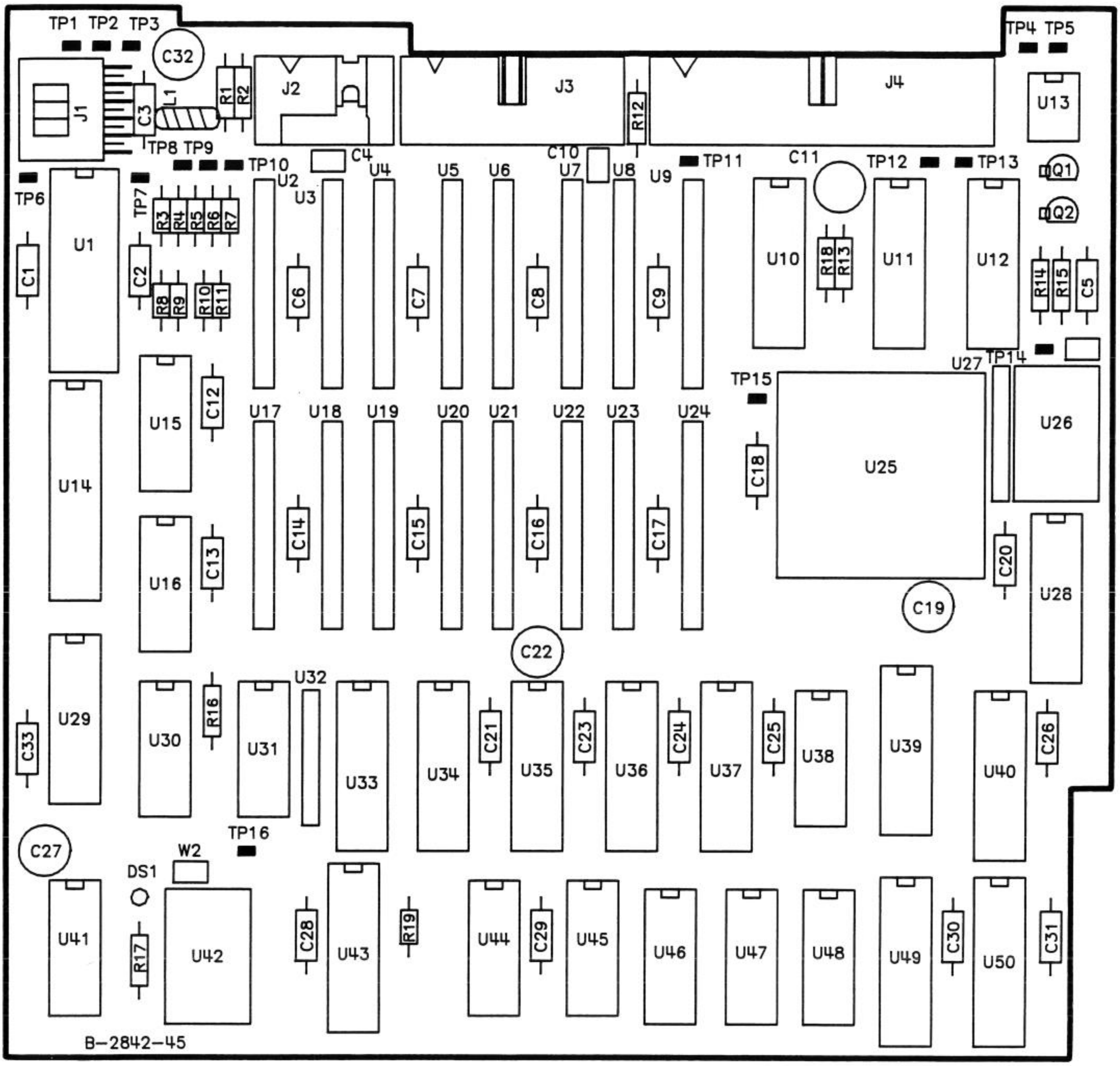


Figure 8-44. A14 Component Locations Diagram

A15 DISPLAY

CONTENTS

DESCRIPTION

The A15 display incorporates a 7.5 inch raster scan CRT along with associated drive circuitry. In the HP 8757C, full color capability is provided while in the HP 8757E, only green is provided. The display is a self-contained unit. No field repair of the display is possible and no technical documentation is provided. Instead, the display is set up on Hewlett-Packard's exchange program. Should any problem arise, the display can be quickly exchanged for a tested, rebuilt unit. See "Restored Exchange Assemblies" in "Replaceable Parts". The information that follows is provided to help isolate any problems to the A15 display itself or some other assembly.

The display is a raster scan display with a horizontal scan rate of 25.5 kHz. The vertical scan rate is 60 Hz. The A14 display interface provides 425 horizontal scan lines although only 400 are actually displayed. Inputs to the display include digital TTL horizontal and vertical sync signals; red, green and blue (RGB) video signals; intensity and background signals; and a +65 V power supply. The expected video signal levels for the RGB inputs are the following: 0.7 Vp-p video; 0.3 V =black; 1V =white. The video input to the display is first terminated in 75 ohms and then AC coupled to the display circuitry so that DC offsets are blocked. Under nominal conditions the typical video drive signal is actually 0.8 V p-p, thus providing a guarantee that full brightness can be achieved. To eliminate any magnetization of the CRT, automatic degaussing is enabled each time the instrument is turned on.

TROUBLESHOOTING

If the display appears defective, the source of the problem should be verified before exchanging the display. This can be done three ways:

1. For an HP 8757C, connect an external compatible display to the rear panel R, G, B outputs to verify that the A14 display interface board is working properly. If the external display appears good, then most likely the A15 display is defective. If the external display appears identical to the A15 display, then the problem lies elsewhere. Refer to A14 troubleshooting to determine the cause.
2. Set up a known test pattern (preferably number 5 or 12) and verify all inputs to the display with an oscilloscope. If they appear correct then the display is probably defective. See A14 troubleshooting for specific information.
3. If another working HP 8757C/E is available, try substituting the display from the working unit.

Should the display become magnetized or if color purity is a problem, try cycling the power several times, leaving the instrument off for at least 15 seconds during each cycle. This will activate the automatic degaussing circuit in the display. If this is insufficient to achieve color purity, a commercially available demagnetizer must be used (either a CRT demagnetizer or a bulk tape eraser can be used). Follow the manufacturer's instructions keeping in mind the following: If one of these items is used, it is *imperative* that, at first, it be placed no closer that 4 inches (10 cm) to the face of the CRT. If this distance is too far to completely demagnetize the CRT, try again at a slightly closer distance until the CRT is demagnetized.

CAUTION

Applying an excessively strong magnetic field to the CRT face can permanently destroy the CRT resulting in an expensive repair which could have been avoided.

Like most displays, the CRT can be sensitive to large magnetic fields generated from unshielded line transformers and motors. This usually does not pose a problem if the field is generated with a 60 Hz line frequency, since the vertical scan rate is also 60 Hz. However in countries that use 50 Hz, some 10 Hz jitter may be observed. If this problem is observed, remove the device causing the magnetic field.

During any solid (filled-in) display or test pattern, an extremely thin full-screen horizontal line may be seen about 1/4 screen height from the bottom. This condition is characteristic of the CRT does not indicate any problem.

ADJUSTMENTS

VERTICAL POSITION AND FOCUS

Only vertical position and focus can be adjusted in the field (this includes both customers and service centers). Any other adjustment to the display will *void* the warranty. Vertical positioning and focus are described in section 5, "Adjustments."

DISPLAY REPLACEMENT PROCEDURE

REMOVING THE DISPLAY

Use this procedure to remove the display.

1. Remove the upper-rear feet and top cover.
2. Remove the softkey button cover. This is the plastic cover through which the front-panel softkeys protrude. Slide your fingernail or a small thin screwdriver under the left edge of the cover. Be careful not to scratch the glass or its coating. Gently pry the softkey cover away from the bezel.
3. Remove the two screws that are now uncovered. Remove the bezel (with the glass filter) by pulling out the end that is now free and pivoting it around its left edge until it is released.
4. Remove the back bezel by pulling it away from the CRT.
5. Remove the logger cover by removing the two screws that hold it in place.

WARNING

The analyzer must lie on a flat surface. After the next step, the display is free of the analyzer and could slide out, causing both instrument damage and personal injury.

6. Remove the CRT cover shield by removing the six screws that hold it (and the display) in place. Disconnect the 20-pin ribbon cable that connects the A15 Display to the A14 Display Interface.
7. Carefully slide the display out of the analyzer.
8. If the display is to be exchanged with a new or rebuilt unit, it will be necessary to remove the spring-clip grounding plate attached to the bottom of the display with two screws.

NOTE: This plate is not considered part of the display and will need to be attached to the new or rebuilt display when it is installed.

REPLACING THE DISPLAY

1. If the display was replaced with a new or rebuilt unit, replace the spring-clip grounding plate by attaching it to the bottom of the display with the two screws that were removed from step 8 above.
2. Carefully slide the display back into the analyzer.
3. Reconnect the 20-pin ribbon cable that connects the A15 Display to the A14 Display Interface. Replace the CRT cover shield by replacing the six screws that hold it (and the display) in place.
4. Replace the logger cover by replacing the two screws that hold it in place.
5. Loosen or remove the remaining screws on top of the display shield. Push the display back slightly.

6. Replace the back bezel. The alignment guides on the four corners of the back bezel should fit around the long screws protruding from the CRT frame.

7. Replace the front bezel with its glass filter by guiding in the left edge first. Secure the right side with the screws removed in step 3 above. Replace the softkey button cover.

8. The display needs to be moved forward so that the back bezel is up against the glass filter. Insert a flat-blade screwdriver in the space between the display shield and the raised portion of the CRT frame as shown in Figure 8-45a. Turn the screwdriver to force the CRT forward.

9. Replace or tighten the screws on top of the display shield. Replace the CRT cover shield and logger cover. Replace the top cover and upper-rear feet.

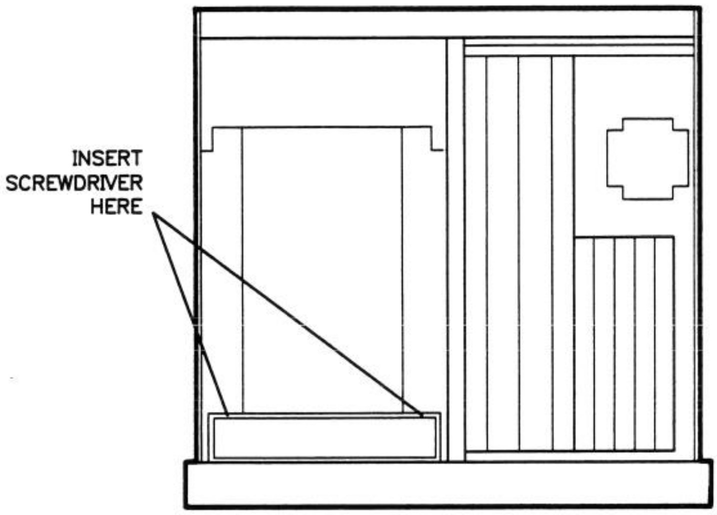


Figure 8-45a. Display Shield and CRT (Top View)

CLEANING THE DISPLAY AND GLASS FILTER

Because of the high voltage associated with the CRT, minute dust particles may collect around the edges of the CRT and on the inside surface of the glass filter. These particles will dim and diffuse the display image if they are not cleaned off regularly.

NOTE: Clean the glass filter with care. Its optical coating, which eliminates reflections, is fragile. Use only a soft cloth and cleaning solutions recommended for coated surfaces. See "Replaceable Parts" for a part number and ordering information for a recommended cleaning solution.

Remove the front bezel to clean the CRT and glass filter. Follow this procedure.

1. Remove the button cover. This is the plastic cover through which the front panel soft keys protrude. Insert a thin flat screwdriver blade, or a fingernail, between it and the glass filter. Be careful not to scratch the glass or its coating. Carefully pull the button cover forward and off.

2. Remove the two screws that are now uncovered.

3. Remove the bezel (with the glass filter) by pulling out the end that is now free and pivoting it around its left edge until it is released.

You may be able to clean the CRT and glass filter with the cloth alone or some cleaning solution may be needed. Use the solution sparingly, if required and clean the surfaces gently. Allow the surfaces to dry before reassembling the instrument.

A16 REAR PANEL VIDEO INTERFACE (RGB INTERFACE)

CONTENTS

DESCRIPTION

The A16 RGB interface assembly provides buffering of the video signals from the A14 display interface to an external color monitor. The color monitor must be compatible with the HP 8757C. To be compatible, the monitor must be designed to operate at a horizontal scan rate of 25.5 kHz. In addition, the video input range must be 0 to 0.7 V with a −0.3 V sync on green.

The red and blue buffer amplifier assemblies are identical. Each consists of a one transistor amplifier which provides a 0.7 V level shift and a gain of about one-half when terminated in its characteristic impedance of 75 ohms.

The green buffer is similar to the red and blue buffers but it also includes circuitry to superimpose the sync signal upon the video signals. U2A is used to combine the horizontal and vertical sync signals. Q1 and Q2 provide added current driving/sinking capability. The combined signal is level-shifted by C4 and is superimposed on the green video signal by U1C. The level-shifted sync signal is also used (as an oscillator) to drive a rectifier circuit composed of CR10, CR11, and C6. This provides a nominal −2 V supply which is used by all 3 buffer amplifiers for proper transistor biasing.

L1, C7,C8, and C2 provide power supply filtering.

TROUBLESHOOTING

BASIC CHECKS

These checks assume that the internal A15 display is properly working. If not, disconnect the A16 interface cable. If the symptom remains, the problem is *not* in the A16 RGB interface. If the symptom is cleared, the problem is probably in U1 or U2 which could affect normal operation of the internal display by loading down one of the five inputs to this board.

If only an external monitor fails to work properly, identify which buffer amplifier is bad by connecting the RGB outputs to an external monitor. Since all three amplifiers are essentially the same, this will allow easy comparisons of the signal levels.

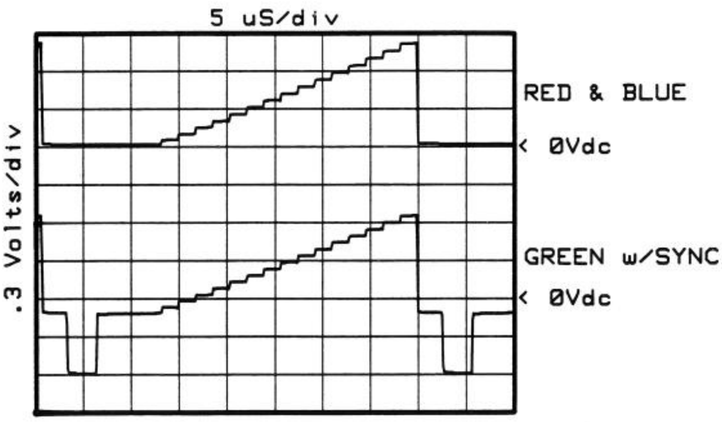
If all three outputs are bad, or the external display fails to sync properly, the problem is most likely in the green amplifier/sync/rectifier circuitry. Verify that about −2 V is present at the trace labeled "−2V", to provide assurance that most of the board is functioning properly.

R, G, B BUFFER AMPLIFIERS

Operation of the red and blue buffer amplifiers is extremely simple. The input level voltage range is a nominal 0.6 to 2.3 V. The output level should be a nominal 0 to 0.8 V when terminated with a 75 ohm load. The green buffer amplifier should have a −0.3 V (or greater) sync signal superimposed on it. See figure 8-46 for a typical output during the 16-step gray scale test pattern when terminated in 75 ohms.

SYNC/RECTIFIER

Verify that −2 V is present at the trace labeled "−2V." If not, trace the combined horizontal/vertical sync back to the input. Horizontal sync is 25.5 kHz while vertical sync is 60 Hz. The collectors of Q1 and Q2 should swing from nearly +5 V to near ground. Verify the combined sync is being superimposed on the green video signal and that it is at least −0.3 V in amplitude. The actual DC level of the entire green waveform may shift depending upon the video signal. This should not matter since most monitors are AC coupled. See figure 8-46.



Rear panel video outputs (into 75 ohms)
during 16-step gray scale test pattern

Figure 8-46. Typical RGB Video Output

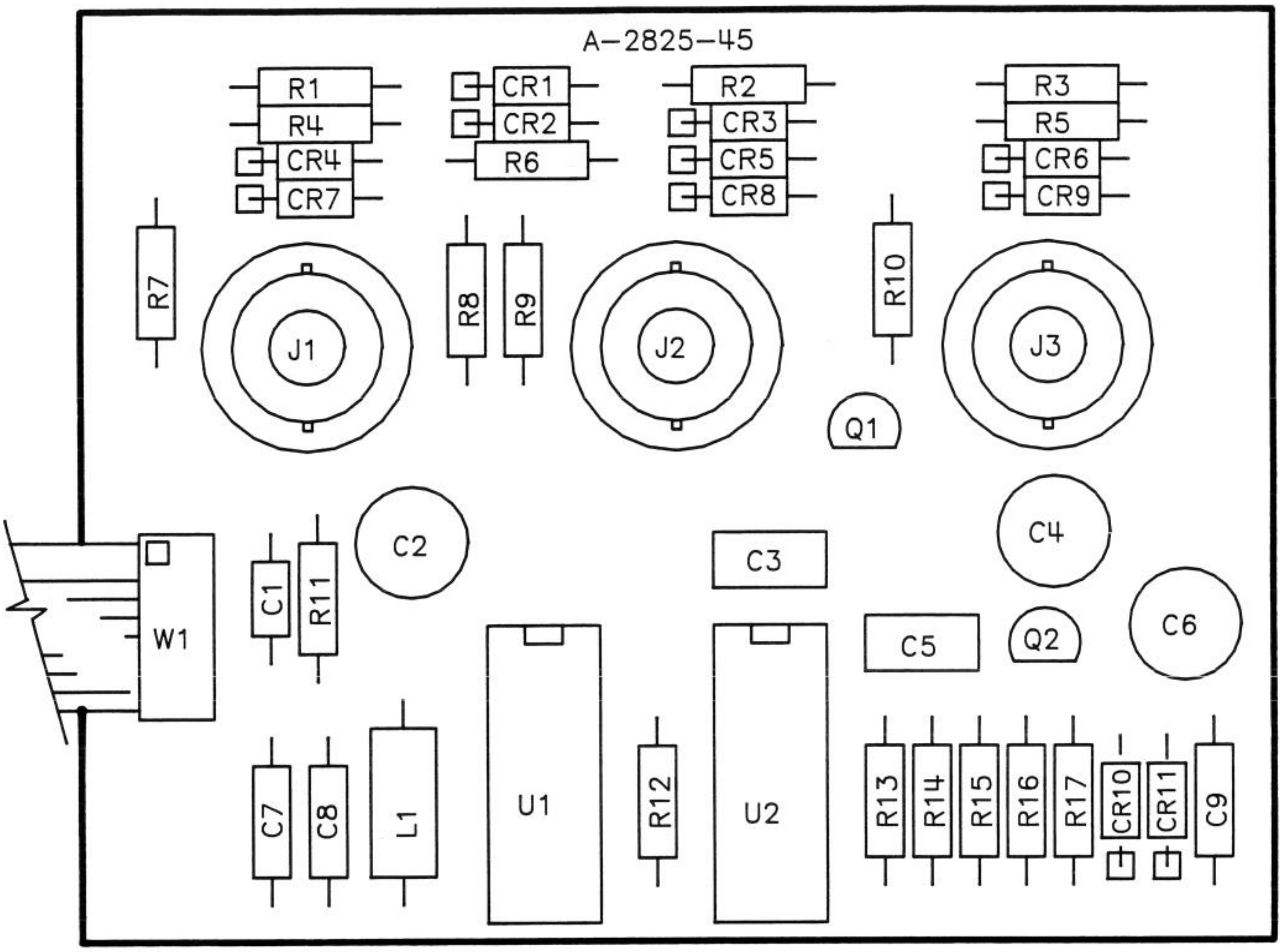


Figure 8-47. A16 Component Locations Diagram

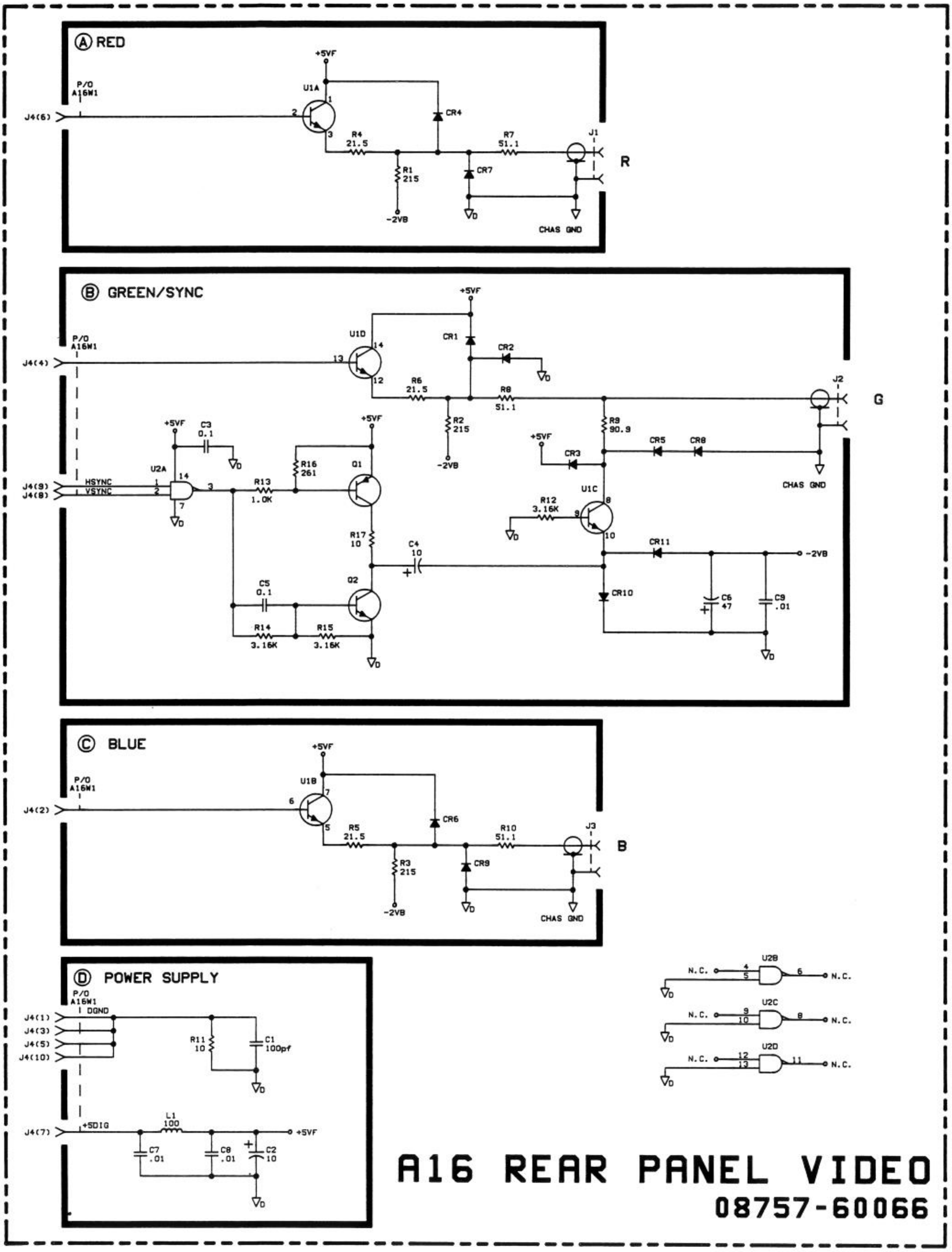


Figure 8-48. A16 RGB Interface Schematic Diagram

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