Agilent 4285A
Precision LCR Meter

Service Manual

MANUAL IDENTIFICATION

Model Number: 4285A
Date Printed: July 2000
Part Number: 04285-90031

This supplement contains information for correcting manual errors and for adapting the manual to newer instruments that contains improvements or modifications not documented in the existing manual.

To use this supplement
1. Make all ERRATA corrections
2. Make all appropriate serial-number-related changes listed below

SERIAL PREFIX OR NUMBER CHANGES	MAKE MANUAL
All	1

SERIAL PREFIX OR NUMBER CHANGES	MAKE MANUAL

◇New Item

Change	Page	Note	Reference Designator	HP Part Number	Description
1	3-5	►A		04284-60001	Inner Frame
	5-A7-7	►C	A7U11	1818-5719	IC CMOS 64K EEPROM
			A7U12	1818-5719	IC CMOS 64K EEPROM
			A7U23	1818-5719	IC CMOS 64K EEPROM
			A7U24	1818-5719	IC CMOS 64K EEPROM
	5-A20-2	►C	A20C1	0180-4403	CAPACITOR-FXD 470UF

►: New Item C: Change D: Delete A: Add

NOTE

Manual change supplement are revised as often as necessary to keep manuals as current and accurate as possible. Agilent Technologies recommends that you periodically request the latest edition of this supplement. Free copies are available from all Agilent Technologies offices. When requesting copies, quote the manual identification information from your supplement, or the model number and print date from the title page of the manual.

PRINTED IN JAPAN

Agilent Technologies

Agilent 4285A Precision LCR Meter (Including Option 001, 002, 201, 202, 301)

Service Manual

SERIAL NUMBERS

This manual applies directly to instruments whose serial number prefix is 3009J-, and whose ROM-based firmware is version 01.00. For additional important information about serial numbers, read SECTION 1, SERIAL NUMBER of this Service Manual.

Agilent Technologies

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Notice

The information contained in this document is subject to change without notice.

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Manual Printing History

The manual printing date and part number indicate its current edition. The printing date changes when a new edition is printed. (Minor corrections and updates that are incorporated at reprint do not cause the date to change.) The manual part number changes when extensive technical changes are incorporated.

April 1990 ..... First Edition (part number: 04285-90031)

July 2000 ..... Second Edition (part number: 04285-90031)

Safety Summary

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific *WARNINGS* elsewhere in this manual may impair the protection provided by the equipment. In addition it violates safety standards of design, manufacture, and intended use of the instrument.
The Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

Ground The Instrument

To avoid electric shock hazard, the instrument chassis and cabinet must be connected to a safety earth ground by the supplied power cable with earth blade.

DO NOT Operate In An Explosive Atmosphere

Do not operate the instrument in the presence of flammable gasses or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

Keep Away From Live Circuits

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with the power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

DO NOT Service Or Adjust Alone

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

DO NOT Substitute Parts Or Modify Instrument

Because of the danger of introducing additional hazards, do not install substitute parts or perform unauthorized modifications to the instrument. Return the instrument to a Agilent Technologies Sales and Service Office for service and repair to ensure that safety features are maintained.

Dangerous Procedure Warnings

Warnings , such as the example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

Warning

Dangerous voltages, capable of causing death, are present in this instrument. Use extreme caution when handling, testing, and adjusting this instrument.

Certification

Agilent Technologies certifies that this product met its published specifications at the time of shipment from the factory. Agilent Technologies further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology, to the extent allowed by the Institution's calibration facility, or to the calibration facilities of other International Standards Organization members.

Warranty

This Agilent Technologies instrument product is warranted against defects in material and workmanship for a period of one year from the date of shipment, except that in the case of certain components listed in *General Information* of this manual, the warranty shall be for the specified period. During the warranty period, Agilent Technologies will, at its option, either repair or replace products that prove to be defective.

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

Agilent Technologies warrants that its software and firmware designated by Agilent Technologies for use with an instrument will execute its programming instruction when property installed on that instrument. Agilent Technologies 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 the environmental specifications for the product, or improper site preparation or maintenance.

No other warranty is expressed or implied. Agilent Technologies specifically disclaims the implied warranties of merchantability and fitness for a particular purpose.

Exclusive Remedies

The remedies provided herein are buyer's sole and exclusive remedies. Agilent Technologies shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

Assistance

Product maintenance agreements and other customer assistance agreements are available for Agilent Technologies products.

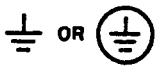
For any assistance, contact your nearest Agilent Technologies Sales and Service Office. Addresses are provided at the back of this manual.

SAFETY SYMBOLS

General Definitions of Safety Symbols Used On Equipment or In Manuals.

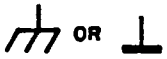
Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect against damage to the instrument.

Indicates dangerous voltage (terminals fed from the interior by voltage exceeding 1000 volts must be so marked).



Protective conductor terminal. For protection against electrical shock in case of a fault. Used with wiring terminals to indicate the terminal which must be connected to ground before operating equipment.

Low-noise or noiseless, clean ground (earth) terminal. Used for a signal common, as well as providing protection against electrical shock in case of fault. A terminal marked with this symbol must be connected to ground in the manner described in the installation (Operating) manual, and before operating the equipment.



Frame or chassis terminal. A connection to the frame (chassis) of the equipment which normally includes all exposed metal structures.

Alternating current (power line).

Direct current (power line).

Alternating or direct current (power line).

WARNING

A **WARNING** denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death to personnel.

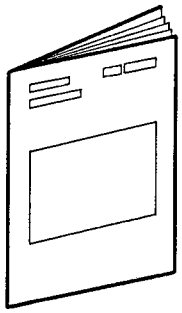
CAUTION

A **CAUTION** sign denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result damage to or destruction of part or all of the product.

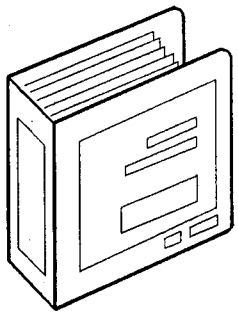
NOTE

A **NOTE** denotes important information. It calls attention to a procedure, practice, condition or the like, which is essential to highlight.

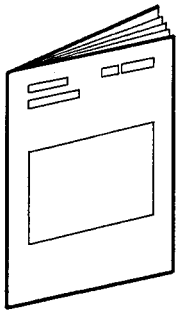
HP 4285A PRECISION LCR METER DOCUMENTATION MAP



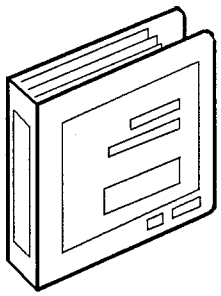
The **GettingStarted Guide** walks you through system setup and initial power-up, shows how to make basic measurements and explains commonly used features.



The **Operation Manual** provides general information, specifications, HP-IB programing information, and in depth reference information.



The **Maintenance Manual** explains how to verify conformance to published specifications.



The **Service Manual** explains how to adjust, troubleshoot, and repair the instrument.

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A-1. INTRODUCTION **A-1**

A-2. MANUAL CHANGES **A-1**

SECTION 1

GENERAL INFORMATION

1-1. INTRODUCTION

This manual contains technical information concerning the adjusting and servicing of the HP 4285A 75 kHz-30 MHz PRECISION LCR METER.

1-2. MANUAL ORGANIZATION

This manual contains five sections. A summary of each section follows.

SECTION 1. GENERAL INFORMATION

Section 1 describes this service manual and lists the recommended test equipment for performance testing, adjusting, and servicing the HP 4285A.

SECTION 2. ADJUSTMENTS

Section 2 provides the necessary adjustments required to ensure that the HP 4285A is within its published specifications after it has been repaired.

SECTION 3. ASSEMBLY REPLACEMENT INFORMATIONS

Section 3 provides information on replacing the HP 4285A's assemblies. The information includes the parts list and the disassembly procedure.

SECTION 4. ASSEMBLY LEVEL TROUBLESHOOTING

Section 4 provides information on troubleshooting the HP 4285A at assembly level. The information includes theory of operation and faulty board isolation procedure.

SECTION 5. SERVICE SHEETS

Section 5 provides a service sheet for each board to use for component level repair of the faulty board. Each service sheet contains a circuit description, troubleshooting aids, replaceable parts list, component locations, and schematic diagram.

Service sheets for the boards set up under the exchange assembly program only contain the exchange board's part number, and the test point information.

NOTE

The performance test procedure is given in the HP 4285A Maintenance Manual (PN 04285-90030).

1-3. INSTRUMENTS COVERED BY THIS MANUAL

Hewlett-Packard uses a two-part, ten character serial number which is stamped on the serial number plate (see Figure 1-1) attached to the instrument's rear panel. The first four digits and the letter are the serial prefix and the last five digits are the suffix. The letter placed between the two sections identifies the country where the instrument was manufactured. The prefix is the same for all identical instruments; it changes only when a change is made to the instrument. The suffix, however, is assigned sequentially and is unique to each instrument. The contents of this manual apply to instruments with the serial number prefixes listed under Serial Numbers on the title page.

Figure 1-1. Serial Number Plate

An instrument manufactured after the printing date of this manual may have a serial number prefix that is not listed on the title page. This unlisted serial number prefix indicates that the instrument is different from those described in this manual. The manual for a new instrument may be accompanied by a yellow Manual Changes supplement or have a different manual part number. The Manual Changes supplement contains "change information" that explains how to adapt the manual to newer instruments.

In addition to change information, the supplement may contain information for correcting errors (Errata) in the manual. To keep this manual as current and accurate as possible, Hewlett-Packard recommends that you periodically request the latest Manual Changes supplement. The supplement for this manual is identified by this manual's printing data and its part number, both of which appear on the manual's title page. Complimentary copies of the supplement are available from Hewlett-Packard. If the serial prefix or number of an instrument is lower than that on the title page of this manual, see APPENDIX A, MANUAL CHANGES.

For information concerning serial number prefixes not listed on the title page or in the Manual Change supplement, contact the nearest Hewlett-Packard office.

1-4. RECOMMENDED TEST EQUIPMENT

Table 1-1 lists the equipment required for adjustment, performance testing, and troubleshooting the HP 4285A. Other equipment may be substituted if it meets or exceeds the critical specifications given in Table 1-1.

Table 1-1. Recommended Test Equipment (1 of 2)

Equipment	Requirements	Recommended Model	Use
Electronic Counter	Frequency: 75 kHz to 30 MHz Accuracy: <<0.01%	HP 5334B	P,T
RMS Voltmeter	Frequency: 75 kHz to 1 MHz Voltage range: 5 m to 2 Vrms Accuracy: <<4%	HP 3458A	P,A,T
Power Meter	Frequency: 1 MHz to 30 MHz Accuracy: <<4%	HP 436A	P,A
Power Sensor	No substitute	HP 8482A	P,A
LCR Meter [1]	No substitute	HP 4284A	P,A
DC Voltmeter [2]	Voltage range: -40 V to 40 V Accuracy: <<0.1%	HP 3458A	P,A,T
Q measurement [3] Adapter	No substitute	HP 42851A	P
Oscilloscope	Band Width: ≥100 MHz Range: 10 mV/div min.	HP 54111D	A,T
Oscilloscope Probe	Division Ratio: 10:1 Input Resistance: 1 MΩ	HP 10431A	A,T
Standard Capacitor Set	No substitute	HP 16380A	P,A
4-Terminal Pair Resistor Set	No substitute	HP 42100A	P,A
20 cm Air Line [4]	No substitute	HP 11567A	P,A
0 Ω Termination [4]	No substitute	04191-85300	P,A
0 S Termination [4]	No substitute	04191-85302	P,A
Step Attenuator [3]	20 dB is calibrated at 1 MHz with uncertainty < 0.025 dB	HP 8495A (001,H04)	P
Fixed Attenuator [3]	Attenuation: 20 dB at 1 MHz	HP 8491A (020)	P
Terminal Adapter	No substitute	HP 16085B	P

[1]: HP 4284A serial number 2940J01456 and above is required
[2]: Required for option 001
[3]: Required for option 002
[4]: Included in the HP 16342A Calibration equipment Kit

Table 1-1. Recommended Test Equipment (2 of 2)

Equipment	Requirements	Recommended Model	Use
1 m Test Leads	No substitute	HP 16048A	P,A
2 m Test Leads	No substitute	HP 16048D	P,A
Interface Box	No Substitute	HP PN 04284-65007	P,A,T
Adapter	BNC(f)-Dual Banana BNC(f)-BNC(f) BNC(m)-N(f) SMB(m)-BNC(m)	HP PN 1251-2277 HP PN 1250-0080 HP PN 1250-1477 HP PN 1251-2277	P,A P,A,T P,A T
Cable	BNC(m)-BNC(m), 30 cm BNC(m)-BNC(m), 61 cm	HP PN 8120-1838 HP PN 8120-1839	P,A,T P,A,T
Power Splitter	No substitute	HP PN 04192-61001	P,A
Test Leads	2 Alligator Clips-Dual Banana Plug	HP 11002A	A,T
HP-IB Cable	HP-IB cable, 1 m	HP 10833A	P,A,T
Computer	HP Technical Computer with BASIC rev. 5.0 or above RAM's capacity: ≥1 M bytes	HP 9000 Series 200 Model 226	P,A,T
Memory Card	(furnished accessory)	HP PN 04278-89001	P
Bias IF Simulator [1]	No substitute	HP PN 42841-65001	P,T
Handler Simulator [2 3]	No substitute	HP PN 04278-65001	P,T
Scanner Simulator [4]	No substitute	HP PN 04278-65301	P,T
Simulator Cable [3]	No substitute	HP PN 04278-61635	P,T
DC Power Source [1 4]	+5 V, 0.1 A	HP 6214C	P,T
Extender Board	For Half Size Board For Digital Board For Analog Board	HP PN 04278-66596 HP PN 04278-66597 HP PN 04278-66598	T T T

[1]: Required for Option 002
[2]: Required for Option 201
[3]: Required for Option 202
[4]: Required for Option 301

SECTION 2

ADJUSTMENTS

2-1. INTRODUCTION

This section describes the adjustments required to ensure that the HP 4285A Precision LCR Meter is within its published specifications after it has been repaired. These adjustments should be performed along with periodic maintenance to keep the HP 4285A in optimum operating condition. The recommended calibration cycle is one year. If proper performance cannot be achieved after adjustment refer to the troubleshooting procedures in this service manual.

NOTE

To ensure proper results and correct instrument operation, Hewlett-Packard suggests a 30 minute warm-up and stabilization period before performing any of the following adjustments.

NOTE

To ensure proper results and correct instrument operation, any of the following adjustments must be performed in an ambient temperature of 23 °C ±5 °C.

2-2. SAFETY CONSIDERATIONS

This manual contains **NOTE**s, **CAUTION**s, and **WARNING**s which must be followed to ensure the safety of the operator and to keep the instrument in a safe and serviceable condition. The adjustments covered in this section must be performed by qualified service personnel.

WARNING

ANY INTERRUPTION OF THE PROTECTIVE GROUND CONDUCTOR (INSIDE OR OUTSIDE THE INSTRUMENT) OR DISCONNECTION OF THE PROTECTIVE GROUND TERMINAL CAN MAKE THE INSTRUMENT DANGEROUS. INTENTIONAL INTERRUPTION OF THE PROTECTIVE GROUND SYSTEM FOR ANY REASON IS PROHIBITED.

The removal or opening of covers for adjustment, or removal of parts other than those which are accessible by hand will expose circuits containing dangerous voltage levels.

Remember that even though you have turned the HP 4285A OFF, and unplugged it, the power supply filter capacitors in the HP 4285A can remained charged for several minutes.

WARNING

THE ADJUSTMENTS DESCRIBED IN THIS SECTION ARE PERFORMED WITH POWER APPLIED AND THE PROTECTIVE COVERS REMOVED. DANGEROUS VOLTAGE LEVELS EXIST AT MANY POINTS AND CAN RESULT IN SERIOUS PERSONAL INJURY OR DEATH IF YOU COME INTO CONTACT WITH THEM.

WARNING

TO PROTECT AGAINST POSSIBLE ELECTRICAL SHOCK, USE INSULATED TOOLS TO MAKE ALL ADJUSTMENTS.

2-3. TEST EQUIPMENT

Table 1-1 lists the test equipment required to perform the adjustments described in this section. Use only calibrated test equipment when adjusting the HP 4285A. If the recommended test equipment is not available, equipment whose specifications are equal to, or surpass those of the recommended test equipment may be used.

2-4. ADJUSTABLE COMPONENTS

Table 2-1 lists the adjustable components in the HP 4285A, the name of the adjustment related to each component, and gives a brief description of each adjustment.

Table 2-1. Adjustable Components

Adjustable Component	Adjustment Name	Description
A1R19	FREQ-ADJ	Power Supply Switching Frequency Adjustment
A1R52	V-ADJ	Power Supply Output Voltage Adjustment
A3R191	0 DEG	Zero Offset Adjustment (0°)
A3R192	90 DEG	Zero Offset Adjustment (90°)
A5C48	VCXO ADJ	Signal Source Adjustment

2-5. ADJUSTMENT INTERACTION

Some of the HP 4285A adjustments are interactive. If you repair or replace an HP 4285A assembly, be sure to perform the related adjustment(s) in the sequence given. Table 2-2 lists the adjustments required for each assembly repaired or replaced. Ignoring or changing the adjustment sequence will make it impossible to obtain optimum performance.

Table 2-2. Required Adjustments

Assembly Replaced or Repaired		Adjustments Required (Paragraph Number)
A1	Power Supply	2-8
A2	Modulator	2-10, 2-13, 2-14
A3	Range Resistor	2-10, 2-11, 2-14
A4	Test Signal Amplifier	2-13
A4	Amp/DC Bias (opt.001)	2-12, 2-13
A5	Signal Source	2-9, 2-10, 2-13, 2-14
A6	Vector Ratio Detector	2-13
A7	Digital Control [1]	2-10, 2-12 [2], 2-13, 2-14
A9	Keyboard	None
A11	Mother Board	None
A13	DC-AC Converter	None
A20	HP-IB Interface	None
A30	Handler Interface (Opt. 201)	None
A31	Handler Interface (Opt. 202)	None
A40	Scanner Interface (Opt. 301)	None
A50	Accessory Control IF (Opt. 002)	None
A81	PLL Synthesizer	None
A90	Keyboard/Display Control	None
A91	LCD Module	None

[1]: When EEPROMs are not replaced, adjustment is not required. Refer to Paragraph 5-14-6 Parts Replacement in the A7 Digital Control Service Sheet.

[2]: Option 001 only

Paragraph Number	Adjustment Name
2-8	Power Supply Adjustment
2-9	VCXO Adjustment
2-10	Phase Tracking Adjustment
2-11	Zero Offset Adjustment
2-12	DC Bias Level Adjustment
2-13	Test Signal Level/Level Monitor Adjustment
2-14	Impedance Measurement Adjustment

2-6. INITIAL OPERATING PROCEDURE

Before you start, perform the following procedure.

1. Remove AC power from the HP 4285A.
2. Remove the two plastic instrument-feet located at the upper corners of the rear panel.
3. Fully loosen the top cover retaining screw located at the back of the top cover.
4. Slide the top cover towards the rear and lift it off.
5. Loosen the five screws that secure the right hand side top shield plate. You don't have to completely remove the screws.
6. Slide the top shield plate towards the front and lift it off.
7. Check that the line voltage selector on the HP 4285A rear panel is properly set.
8. Turn the HP 4285A ON.

NOTE

Steps 9 through 11 must be performed only when the HP 4285A is equipped with Option 002, Accessory Control Interface.

9. Press the **CATALOG/SYSTEM MENU** key and the **'SYSTEM CONFIG'** softkey to display the **SYSTEM CONFIG** page.
10. Move the cursor to the **CONFIG** field, using the **CURSOR** arrow keys.
11. Press the **'OFF'** softkey to disable the Accessory Control Interface.
12. Warm-up the HP 4285A for at least 30 minutes.

2-7. ADJUSTMENT PROGRAM

The Adjustment Program is required when performing parts of the HP 4285A's adjustments. Table 2-2 lists which adjustments require using the adjustment program. When you perform adjustments which require the adjustment program, start the program according to paragraph 2-7-1, Initial Operating Procedure and finish the program according to paragraph 2-7-2, Closing Procedure.

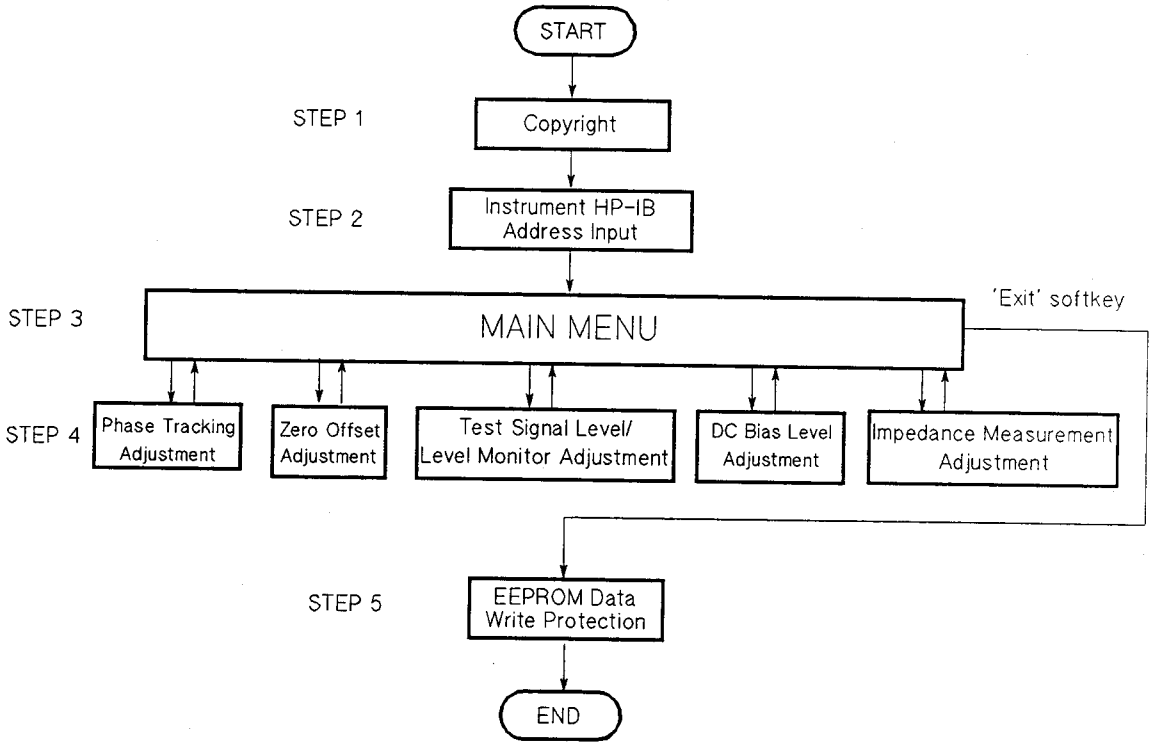
Table 2-3 lists the adjustment program specifications. Figure 2-1 shows the adjustment program flow.

Table 2-2. Adjustment Program Requirement

Adjustment Name	Paragraph	Adjustment Program
Power Supply Adjustment	2-8	Not Required
VCXO Adjustment	2-9	Not Required
Phase Tracking Adjustment	2-10	Required
Zero Offset Adjustment	2-11	Required
DC Bias Level Adjustment	2-12	Required
Test Signal Level/Monitor Adj.	2-13	Required
Impedance measurement Adjustment	2-14	Required

Table 2-3. Adjustment Program Specification

HP Part Number:	04285-65003 (5 inch floppy disk) 04285-65004 (3.5 inch floppy disk)
Language:	HP BASIC (rev. 5.0)
Binary Requirement:	GRAPH, GRAPHX, IO, MAT, KBD, CLOCK, ERR, HPIB, CRTA, COMPLEX, CRTX (HP BASIC rev. 5.0)
Computer Requirement:	HP 9000 series 200 or series 300 computer with more than 1 M byte of RAM.
Write Protection:	Adjustment program is not write protected. Using a backup copy for adjustment program is recommended. Do not copy the program for purposes other than backup.
Adjustment for Options:	Adjustment program automatically identifies the HP 4285A Option 001, and performs the adjustment according to the Options installed.
File Name	ADJ_4285A: Adjustment Main Program INIT_4285A: EEPROM Initialize Program (refer to Paragraph 5-14-4) CAL_DATA: Adjustment Data



STEP1: Copyright and other information are displayed.

STEP2: Test equipment's HP-IB address must be registered to the adjustment program.

STEP3: Adjustments can be selected using the softkeys. The program is finished by pressing the '**Exit**' softkey.

STEP4: Each adjustment is performed.

STEP5: EEPROM write protection is confirmed.

Figure 2-1. Adjustment Program Flow

2-7-1. INITIAL OPERATING PROCEDURE

This paragraph gives the procedure to perform before the adjustments using the Adjustment Program.

EQUIPMENT:

Adjustment Program Disc (5 inch)	PN 04285-65003
Computer	HP 9000 Series 200 Model 226
HP-IB Cable	HP 10833A

PROCEDURE:

1. Turn the HP 4285A OFF and remove the A7 board assembly.
2. Set the HP 4285A's EEPROM write protect jumper (A7W2) from the normal position (**N**) to the test position. Figure 2-2 shows the location of A7W2.

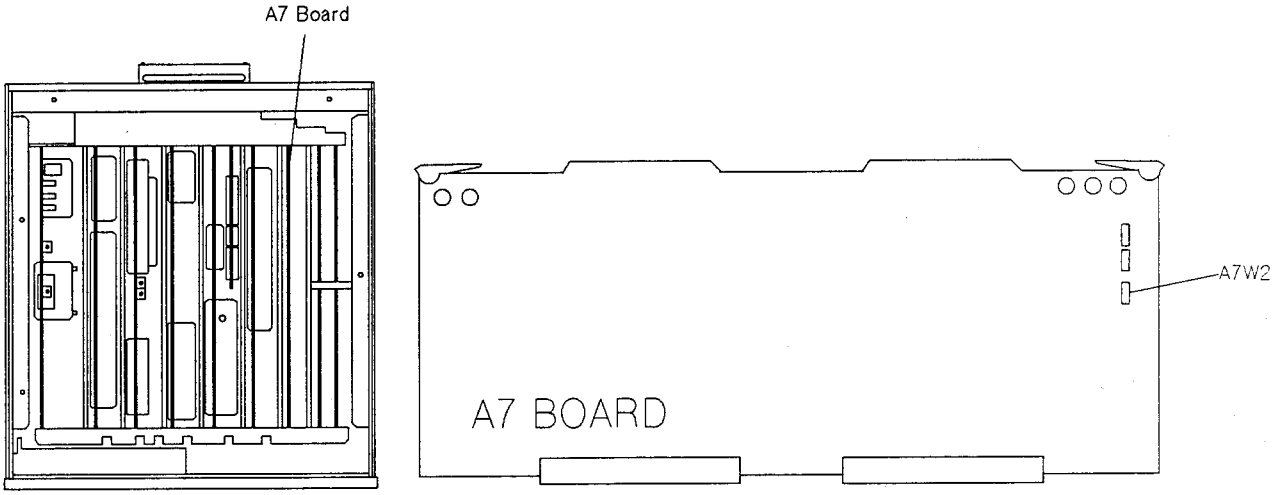


Figure 2-2. A7W2 Write Protect Jumper Location

3. Install the A7 board assembly into the HP 4285A.
4. Connect the HP 4285A to the Computer using the HP-IB Cable. The computer's interface select code must be set to 7.
5. Turn the HP 4285A ON.
6. Boot up BASIC and load the necessary binary files in the computer. The necessary **BASIC BIN**aries for revision 5.0 are as follows.

   GRAPH, GRAPHX, IO, MAT, KBD, CLOCK,
   ERR, HPIB, CRTA, COMPLEX, CRTX

7. Load the adjustment program into the computer, the file name is "**ADJ_4285A**".

NOTE

Do not remove the Adjustment Program Disk from the computer while the adjustment program is running.

8. Press the computer's **RUN** key, then copyright and other information are displayed. Press the '**Next Step**' softkey to continue the program.

10. After the copyright and the equipment list are displayed, the Instrument Registration display will appear. Select the data you want to change using the softkeys, and enter the data using the numeric keys and enter key.

11. Press the **'Next Step'** softkey to display the Main Menu.

NOTE

When you perform the adjustments, refer to paragraph 2-10 Phase Tracking Adjustment, 2-11 Offset Null Adjustment, 2-12 DC Bias Level Adjustment, 2-13 Test Signal Level/Level Monitor Adjustment and 2-14 Impedance Measurement Adjustment.

2-7-2. CLOSING PROCEDURE

This paragraph gives the procedure to finish the adjustment program. Finish the program after all the necessary adjustments are completed.

1. When the Main Menu is displayed on the controller's screen. Press the '**Exit**' softkey to finish the calibration program. The write protect display will appear.

2. Turn the HP 4285A OFF.

3. Replace the HP 4285A's EEPROM write protect jumper (A7W2) to its Normal position (**N**).

4. Replace the shield plate and the top cover.

5. Turn the HP 4285A ON.

6. Press the '**Ready**' softkey to examine the write protection and finish the adjustment program.

2-8. POWER SUPPLY ADJUSTMENTS

The following two part procedure adjusts the switching frequency and the output voltage of the switching power supply.

2-8-1. POWER SUPPLY SWITCHING FREQUENCY ADJUSTMENT

This adjustment sets the switching frequency of the power supply.

EQUIPMENT:

Oscilloscope	HP 54111D
10:1 Divider Oscilloscope Probe, 1 MΩ	HP 10431A

PROCEDURE:

1. Make sure the HP 4285A is turned OFF.
2. Loosen the two screws holding the left hand side top shield plate (the shield plate on which the **WARNING** message is printed), and remove it.

WARNING

DANGEROUS VOLTAGES ARE PRESENT ON THE BOARD UNDER THE SHIELD PLATE. DON'T TOUCH ANYPLACE EXCEPT WHERE INSTRUCTED TO.

3. Connect the 10:1 Probe to the Oscilloscope input.
4. Connect the probe's ground lead to A1TP12 (**GND**). Then connect the probe's tip to A1TP11. Figure 2-4 shows the location of TP11 and TP12.

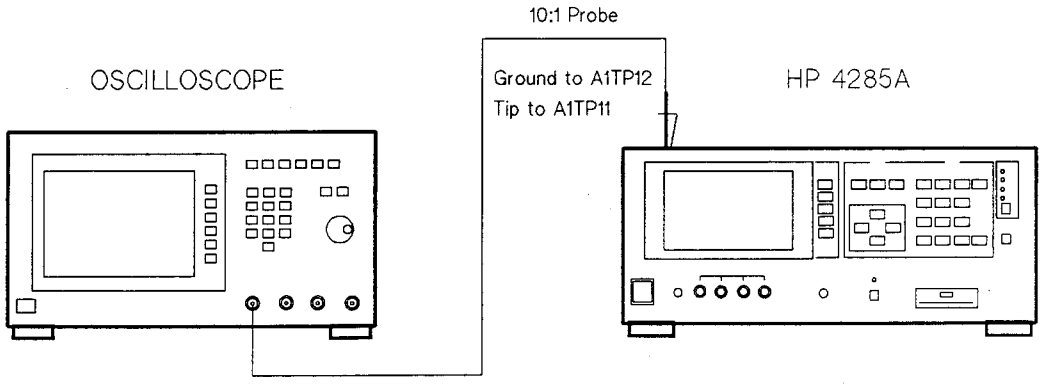


Figure 2-3. Power Supply Frequency Adjustment Setup

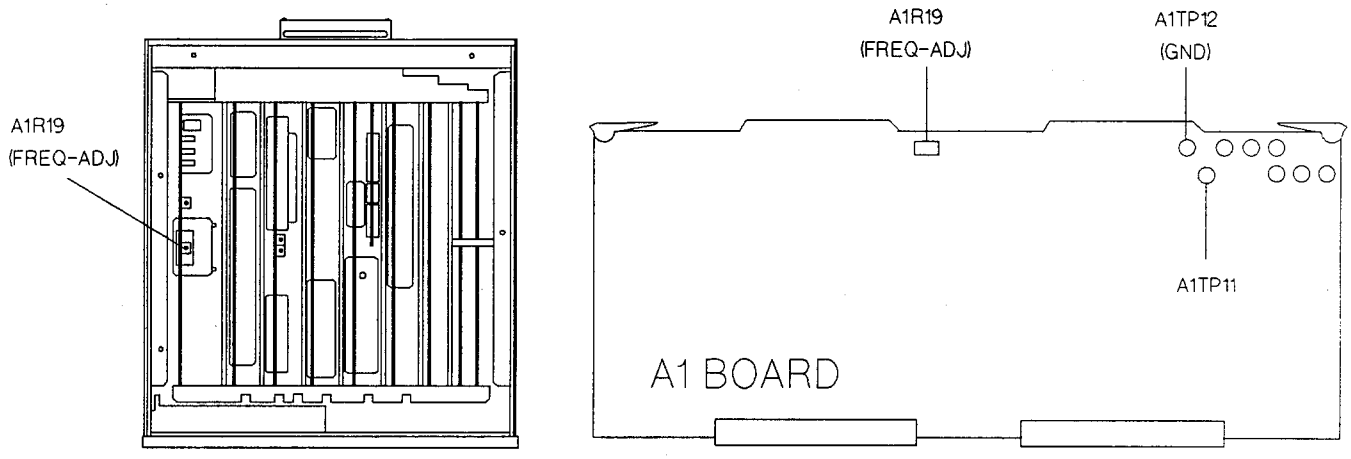


Figure 2-4. Power Supply Frequency Adjustment Location

5. Set the Oscilloscope controls as follows.

INPUT	Range:	40 V
	Offset:	10 V
	Coupling:	DC, 1 MΩ
TIMEBASE	Range:	50 µs

6. Turn the HP 4285A ON.

7. Adjust A1R19 (**FREQ-ADJ**) until the period (T), of the waveform, is 12.5 µs ± 0.5 µs, as shown in Figure 2-5. Figure 2-4 shows A1R19's location.

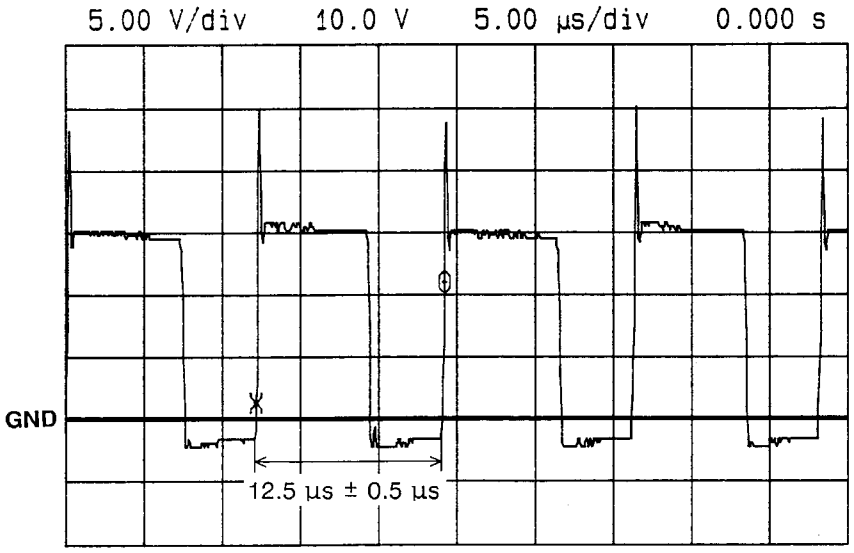


Figure 2-5. Switching Waveform

2-8-2. POWER SUPPLY OUTPUT VOLTAGE ADJUSTMENT

This procedure adjusts the power supply output voltage.

EQUIPMENT:

Multimeter	HP 3458A
Alligator Clips to 1 Dual Banana Plug 2 ea. Test Lead	HP 11002A

PROCEDURE:

1. Turn the HP 4285A OFF.
2. Set the Multimeter to the DC voltage measurement function.
3. Connect the Test Leads to the multimeter.
4. Connect the multimeter's Lo input to A7TP2 (**GND**), and connect the Hi input to A7TP1. Figure 2-7 shows the location of A7TP1 and A7TP2.

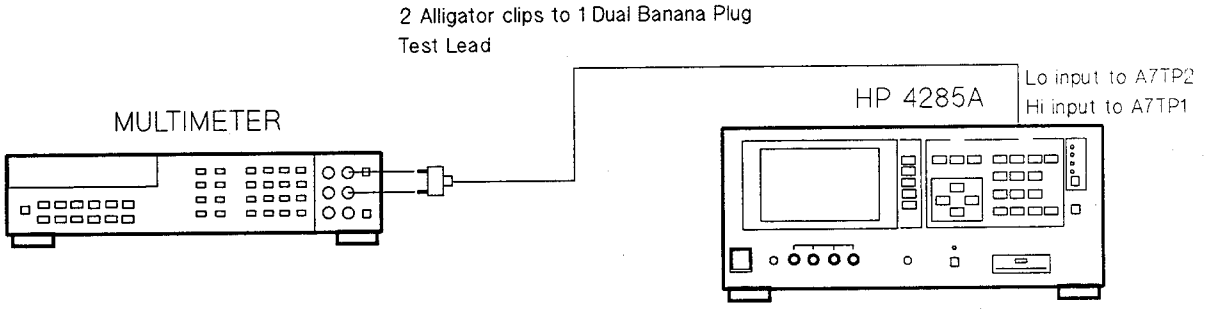


Figure 2-6. Power Supply Voltage Adjustment Setup

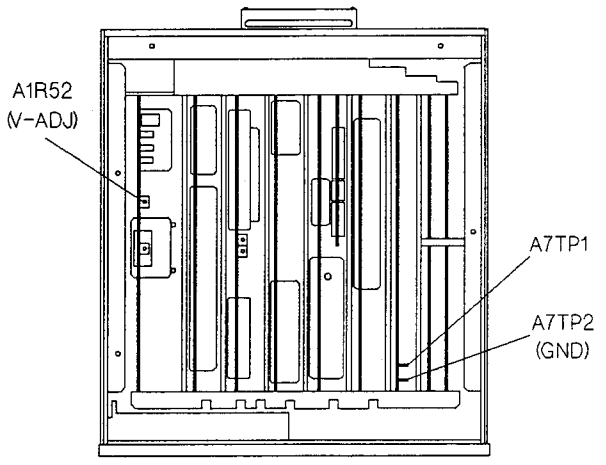


Figure 2-7. Power Supply Voltage Adjustment Location

5. Turn A1R52 (**V-ADJ**) fully **CCW** (Counter Clock Wise). Figure 2-7 shows A1R52's location.

6. Turn the HP 4285A ON.

7. Adjust A1R52 until the multimeter reads 5 V ± 0.05 V.

8. Replace the left hand side top shield plate (the shield plate on which the **WARNING** message is printed).

2-9. VCXO ADJUSTMENT

This adjustment optimizes the VCXO oscillation.

EQUIPMENT:

Multimeter	HP 3458A
Alligator Clips to 1 Dual Banana Plug 2 ea.	
Test Lead	HP 11002A

PROCEDURE:

1. Turn the HP 4285A OFF.
2. Set the multimeter to the DC voltage measurements function.
3. Connect the test lead to the multimeter input.
4. Connect the multimeter Lo input to A5TP2 (**GND**). Then connect the multimeter Hi input to A5TP1 (**VCXO CTL**). Figure 2-9 shows the location of TP1 and TP2.
5. Turn the HP 4285A ON.

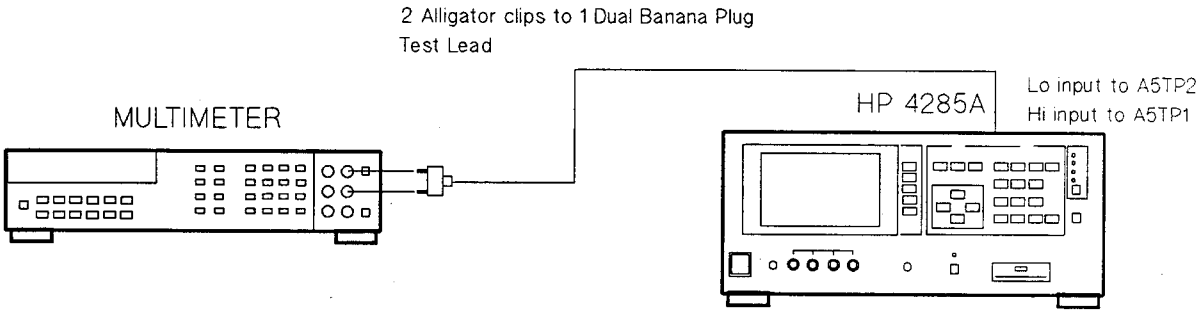


Figure 2-8. VCXO Adjustment Setup

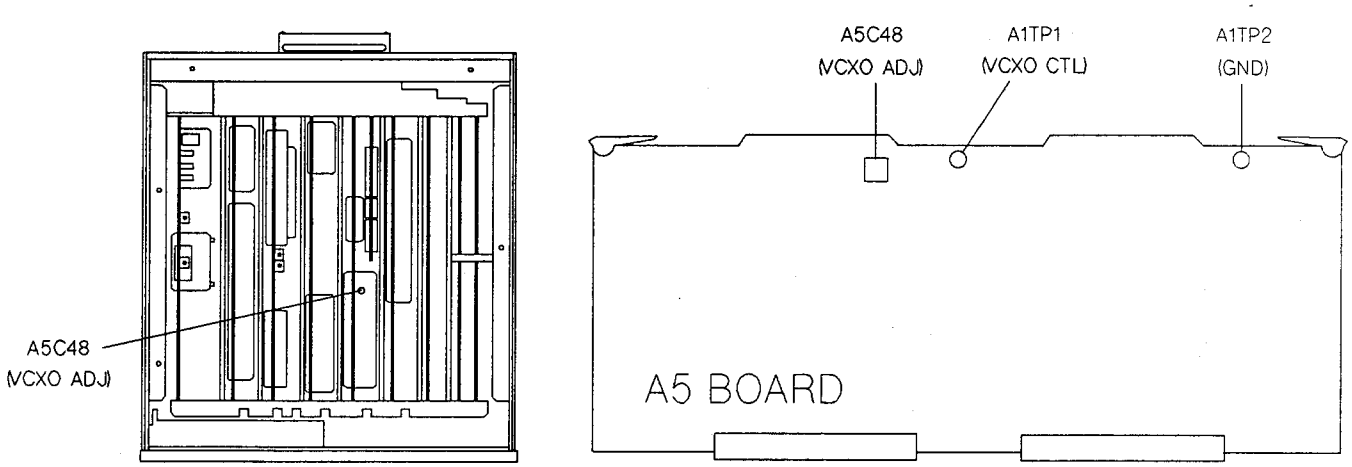


Figure 2-9. VCXO Adjustment Location

6. Adjust A5C48 (**VCXO ADJ**), until the multimeter reads -7.5 ±0.5 V. Figure 2-9 shows location of A5C48.

2-10. PHASE TRACKING ADJUSTMENT

This adjustment updates the EEPROM Data to set Null Loop Phase Tracking. The adjustment program is necessary to perform this adjustment.

EQUIPMENT:

Computer	HP 9826A
HP-IB Cable	HP 10833A
OPEN Termination	HP 42090A
Test Leads (1 m)	HP 16048A
Test Leads (2 m)	HP 16048D

PROCEDURE:

NOTE

The phase tracking adjustment consists of the 0 m, 1 m, and 2 m adjustment. Perform these adjustments at the same time. The adjustment data is updated together after all the adjustments are finished.

1. Display the adjustment program's main menu, referring to paragraph 2-7-2, INITIAL OPERATING PROCEDURE.
2. Press the **'Adj 1'** softkey to select the Phase Tracking Adjustment.
3. Perform the adjustment according to the program's instruction. Figure 2-10 shows the adjustment setup.

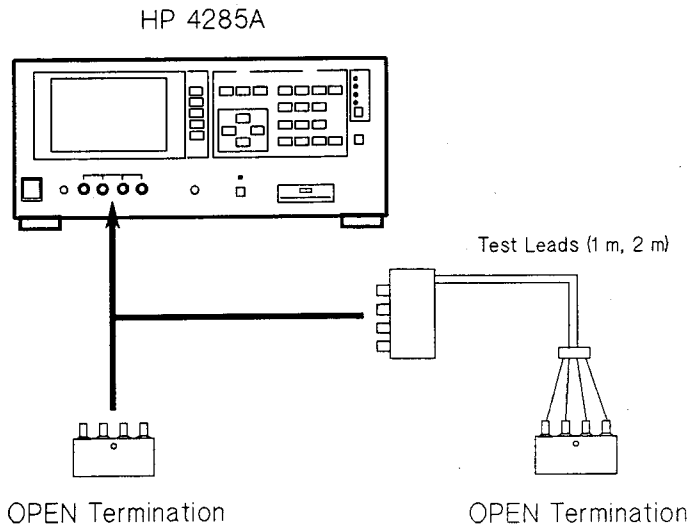


Figure 2-10. Phase Tracking Adjustment Setup

2-11. ZERO OFFSET ADJUSTMENT

This adjustment minimize the offset error of the auto balance bridge.

NOTE

The adjustment program is used to set the HP 4285A to the zero offset adjustment mode.

EQUIPMENT:

Computer	HP 9826A
HP-IB Cable	HP 10833A
OPEN Termination	HP 42090A

PROCEDURE:

1. Display the adjustment program's main menu, referring to paragraph 2-7-2, INITIAL OPERATING PROCEDURE.
2. Press the **'Adj 2'** softkey to select the Zero Offset Adjustment.
3. Perform the Zero Offset adjustment according to the program instructions. Figure 2-11 shows the adjustment setup, Figure 2-12 shows the locations of A3R191 (**0DEG**) and A3R192 (**90DEG**).

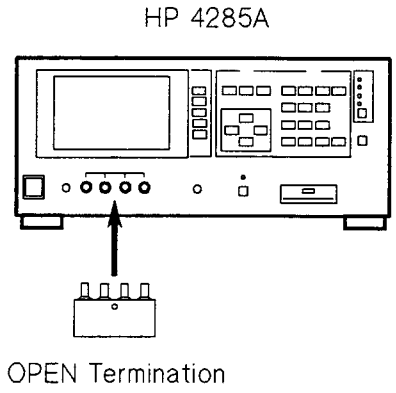


Figure 2-11. Zero Offset Adjustment Setup

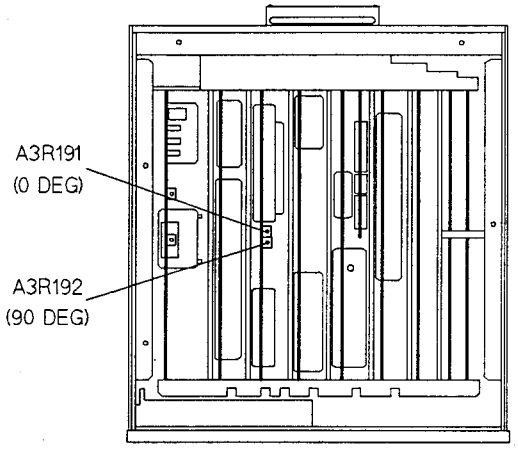


Figure 2-12. Zero Offset Adjustment Location

2-12. DC BIAS LEVEL ADJUSTMENT (OPTION 001 ONLY)

This adjustment updates the EEPROM data to set the DC bias voltage.

EQUIPMENT:

Computer	HP 9826A
Multimeter	HP 3458A
HP-IB Cable	HP 10833A
Interface Box	HP PN 04284-65007
BNC(m) to BNC(m) Cable, 61 cm	HP PN 8120-1839
BNC(f) to Dual Banana Plug Adapter	HP PN 1251-2277

PROCEDURE:

1. Connect the multimeter to the computer, using an HP-IB cable.
2. Display the adjustment program's main menu, refer to paragraph 2-7-2, INITIAL OPERATING PROCEDURE.
3. Press the '**Adj.3**' softkey to select the DC Bias Level Adjustment.
4. Perform the adjustment according to the program instructions. Figure 2-13 shows the adjustment setup.

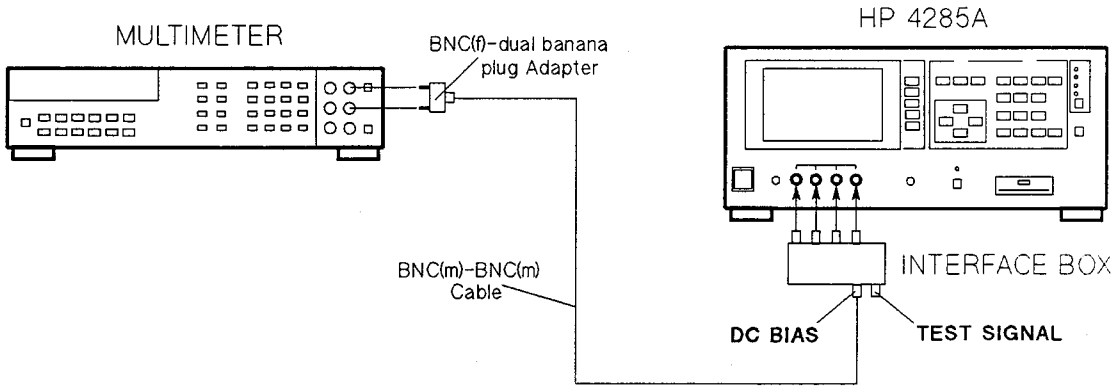


Figure 2-13. DC Bias Level Adjustment Setup

2-13. TEST SIGNAL LEVEL/LEVEL MONITOR ADJUSTMENT

This adjustment updates the EEPROM data to set the test signal level and test signal level monitor reading.

EQUIPMENT:

Computer	HP 9826A
Multimeter	HP 3458A
Power Meter	HP 436A
Power Sensor	HP 8482A
HP-IB Cable	HP 10833A
Interface Box	HP PN 04284-65007
Power Splitter	HP PN 04192-61001
BNC(m)-BNC(m) Cable, 61cm	HP PN 8120-1839
BNC(m)-BNC(m) Adapter	HP PN 1250-0216
N(f)-BNC(m) Adapter	HP PN 1250-1477
BNC(f)-Dual Banana Plug Adapter	HP PN 1251-2277

PROCEDURE:

NOTE

The test signal level/level monitor adjustment consists of the following adjustments.

1. Test Signal Level Monitor Adjustment
   - 1-1. Low Frequency Adjustment
   - 1-2. High Frequency 0 m Adjustment
   - 1-3. High Frequency 1 m Adjustment
   - 1-4. High Frequency 2 m Adjustment

2. Test Signal Level Adjustment
   - 2-1. 0 m Adjustment
   - 2-2. 1 m Adjustment
   - 2-3. 2 m Adjustment

Perform these adjustments at the same time. The adjustment data is updated together after all the adjustments are finished.

1. Connect the multimeter and the Power Meter to the computer, using HP-IB cables.

2. Display the adjustment program's main menu, refer to paragraph 2-7-2, INITIAL OPERATING PROCEDURE.

3. Press the '**Adj. 3**' ('Adj. 4' in Option 001) softkey to select the Test Signal Level/ Level Monitor Adjustment.

4. Perform the Test Signal Level Monitor Adjustment according to the program instructions. Figure 2-14 shows the Low Frequency Adjustment setup. Figure 2-15 shows the High Frequency Adjustment setup.

5. Perform the Test Signal Level Adjustment according to the program instructions. Figure 2-16 shows the adjustment setup.

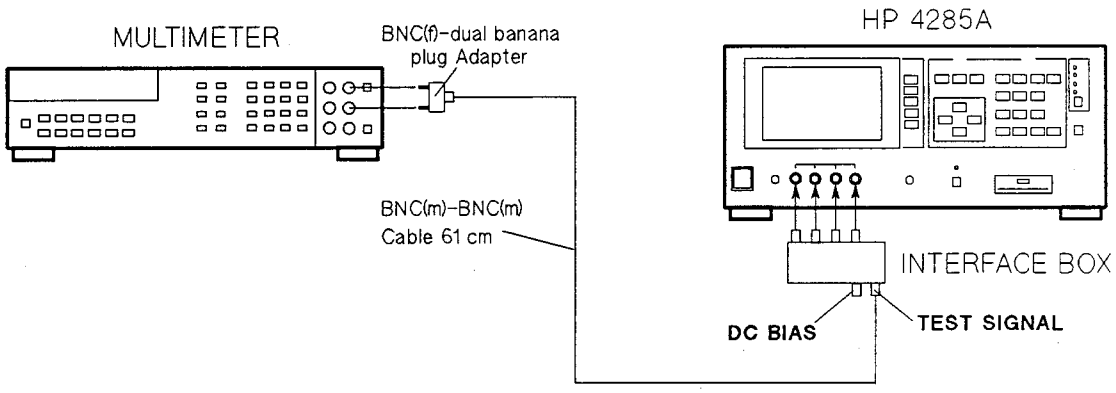


Figure 2-14. Test Signal Level Monitor (LF) Adjustment Setup

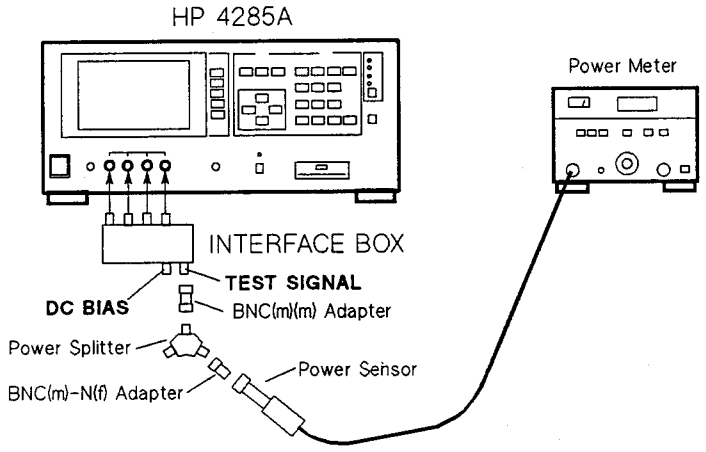


Figure 2-15. Test Signal Level Monitor (HF) Adjustment Setup

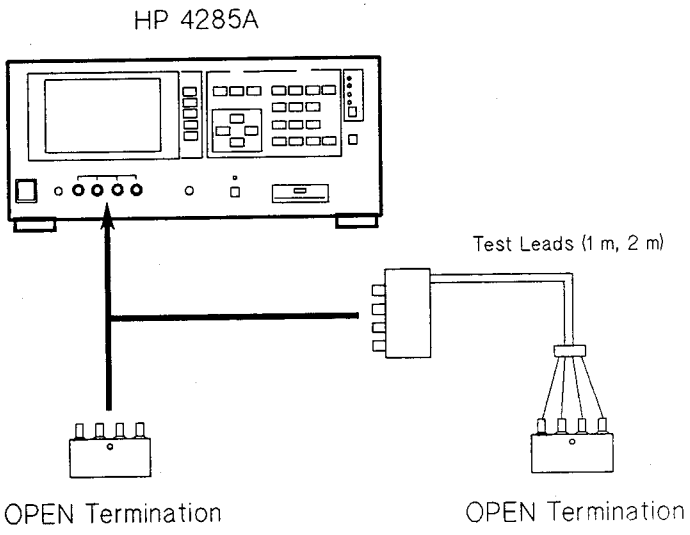


Figure 2-16. Test Signal Level Adjustment Setup

2-14. IMPEDANCE MEASUREMENT ADJUSTMENT

This adjustment updates the EEPROM data to optimize the impedance measurement accuracy.

NOTE

All other adjustments must have been completed before performing this adjustment.

EQUIPMENT:

Computer	HP 9826A
LCR Meter	HP 4284A [1]
HP-IB Cable	HP 10833A
Standard Capacitor	HP 16380A
4 Terminal-Pair Resistor Set	HP 42100A

[1]: HP 4284A serial Numbered 2940J01456 or above must be used.

PROCEDURE:

NOTE

The impedance measurement adjustment consists of the resistor calibration and the 0 m adjustment. Perform these procedures at the same time.

1. Connect the HP 4284A to the computer, using an HP-IB cable.
2. Display the adjustment program's main menu, refer to paragraph 2-7-2, INITIAL OPERATING PROCEDURE.
3. Press the '**Adj. 4**' ('Adj. 5' in Option 001) softkey to select the Impedance Measurement Adjustment.
4. Perform the Resistor Calibration according to the program instructions. Figure 2-17 shows the Resistor Calibration setup.
5. Perform the 0 m Adjustment according to the program's instruction. Figure 2-18 shows the 0 m Adjustment setup.

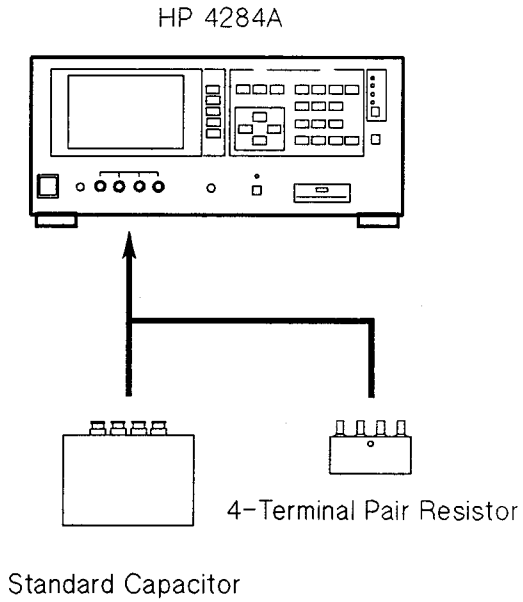


Figure 2-17. Resistor Calibration Setup

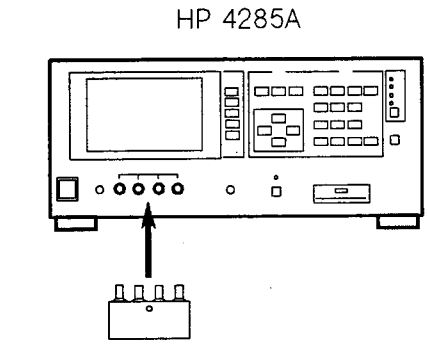


Figure 2-18. 0 m Adjustment Setup

NOTES

SECTION 3

ASSEMBLY REPLACEMENT INFORMATION

3-1. INTRODUCTION

This section provides a replaceable assembly list, replaceable mechanical parts list, and disassembly information.

3-2. REPLACEABLE ASSEMBLY LIST

The replaceable electrical assemblies are listed in Table 3-1. When ordering a replacement assembly listed in the table, specify the Hewlett-Packard part number and the quantity required, and send the order to the nearest Hewlett-Packard office.

Table 3-1. Replaceable Assembly List (1/2)

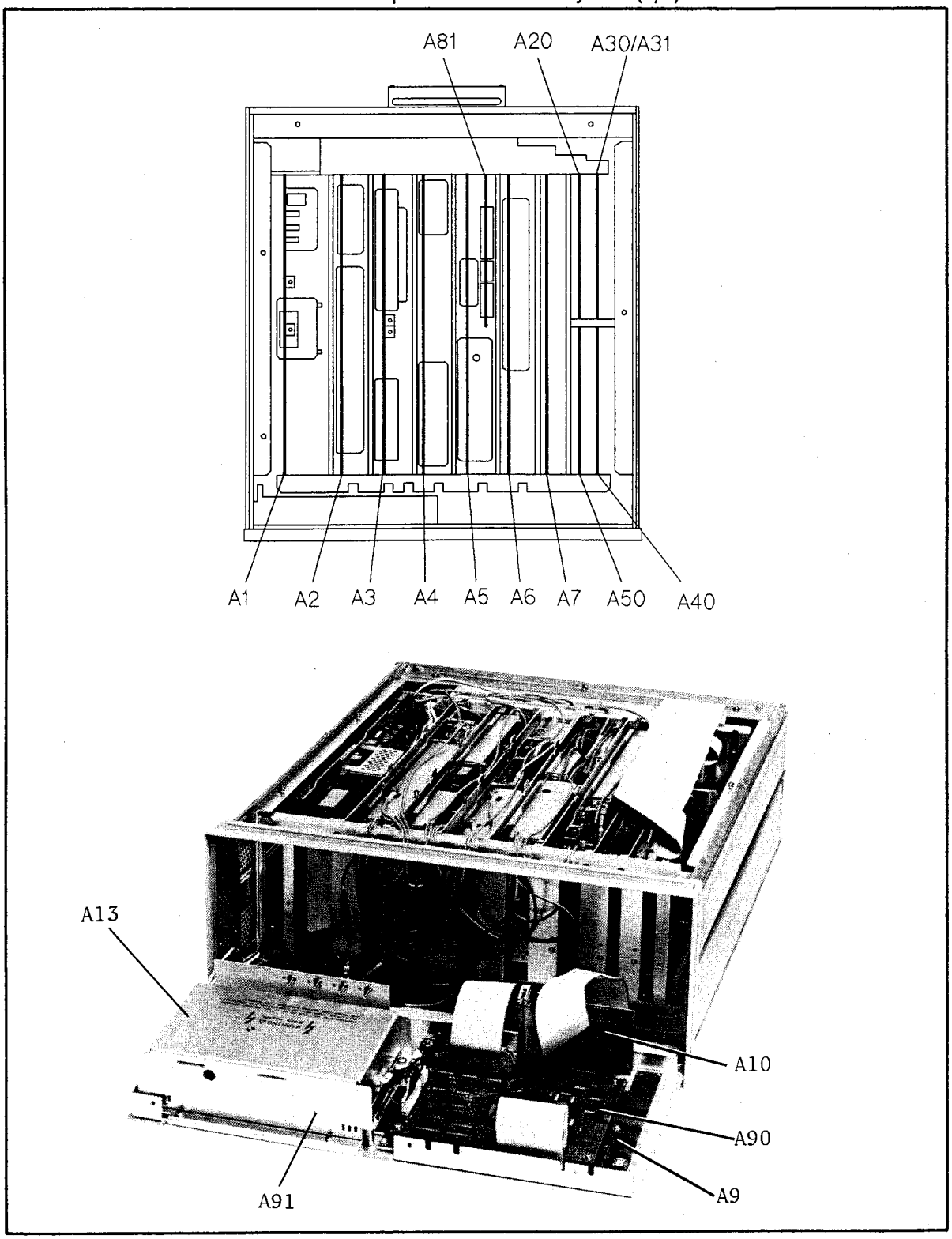


Table 3-1. Replaceable Assembly List (2/2)

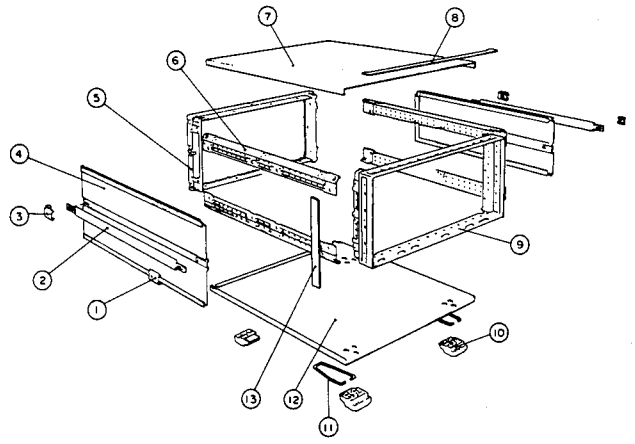
Assembly Number	Part Number	Description
A1	04284-66501	Power Supply
A2	04285-66502	Range Resistor
	04285-69502	Range Resistor (Re-built)
A3	04285-66503	Modulator
	04285-69503	Modulator (Re-built)
A4	04285-66504	Test Signal Amplifier
	04285-69504	Test Signal Amplifier (Re-built)
	04285-66564	Test Signal Amp/DC Bias (Opt.001)
	04285-69564	Test Signal Amp/DC Bias (Re-built)
A5 [1]	04285-66505	Signal Source
	04285-69505	Signal Source (Re-built)
A81 [1]	04285-66581	PLL Synthesizer
	04285-69581	PLL Synthesizer (Re-built)
A6	04285-66506	Vector Ratio Detector
	04285-69506	Vector Ratio Detector (Rebuilt)
A7	04285-66657	Digital Control W/O ROM
	04285-69657	Digital Control W/O ROM (Re-built)
A9	04279-66559	Key Board
A10	04278-66510	Memory Card Interface
A13	04278-66513	DC-AC Converter
A20	04284-66520	HP-IB Interface
A30	04278-66532	Handler Interface (Opt.201)
A31	04278-66531	Handler Interface (Opt.202)
A40	04278-66540	Scanner Compensation Interface (Opt.301)
A50	42841-66551	Accessory Control Interface (Opt.002)
A90	04278-66590	Key Board/Display Control
A91	04278-61102	LCD Module

[1]: A5 assembly does not include A81 assembly.

3-3. REPLACEABLE MECHANICAL PARTS LIST

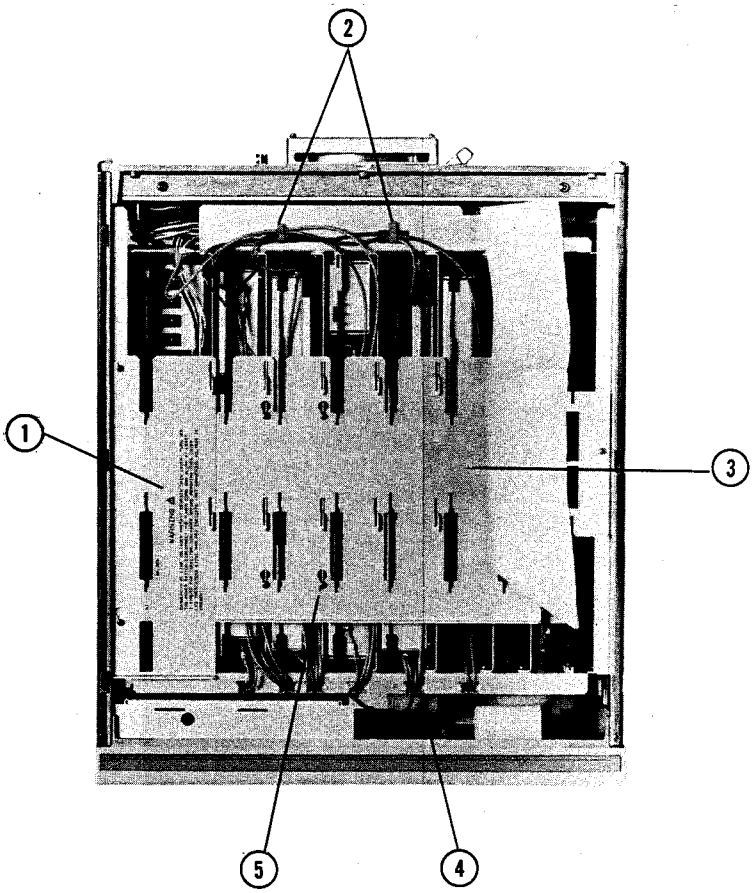
The replaceable mechanical parts are listed in Tables 3-2 to 3-13. When ordering a replacement assembly listed in the table, specify the Hewlett Packard part number and quantity required, and send the order to the nearest Hewlett Packard office.

Table 3-2. Major Mechanical Parts



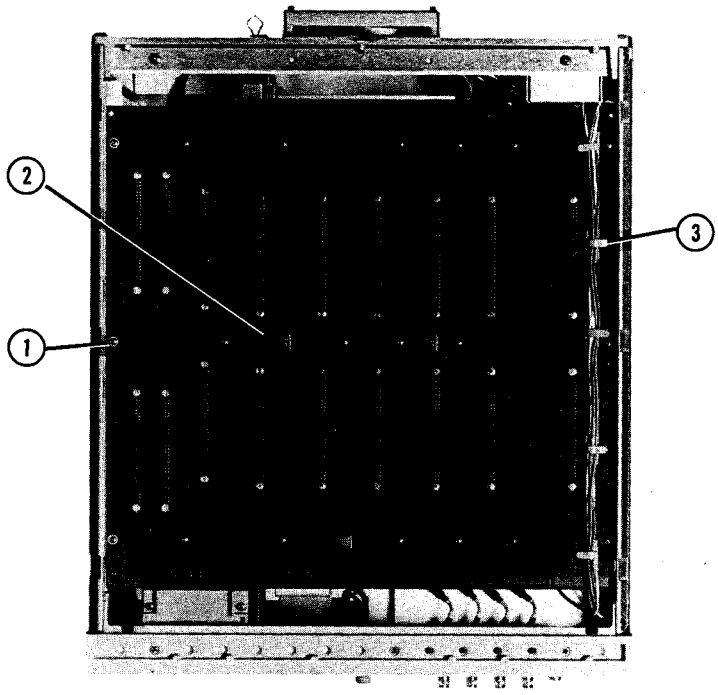
Reference Designator	Part Number	Qty	Description
1	5081-8819	2	Front Cap
2	5062-3704	2	Strap Handle
3	5041-8820	2	Rear Cap
4	5062-3842	2	Side Cover
	8160-0461		Gasket
5	5021-5806	1	Rear Frame
6	5021-5837	4	Corner Strut
7	5062-3735	1	Top Cover
8	5041-8802	1	Top Trim
9	5021-8405	1	Front Frame
10	5041-8801	4	Foot
11	1460-1345	2	Tilt Stand
12	5062-3747	1	Bottom Cover
13	5001-0540	2	Side Trim

Table 3-3. Top View (Top cover removed)



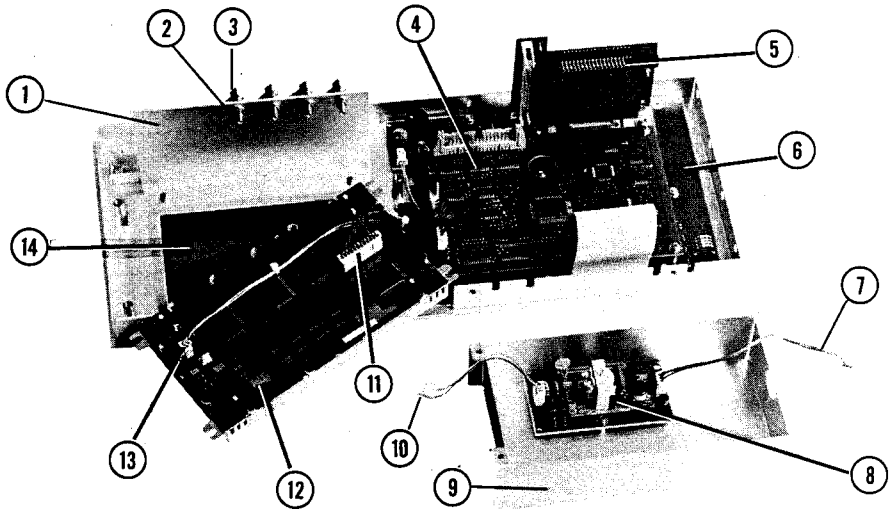
Reference Designator	Part Number	Qty	Description
1	04278-00636	1	Top Plate over A1 board
2	1400-1334	2	Cable Clamp
3	04284-00633	1	Top Plate over A2 thru A7
4	1400-1048	7	Edge Saddle
5	0515-1550	7	Screw

Table 3-4. Bottom View (Bottom cover removed)



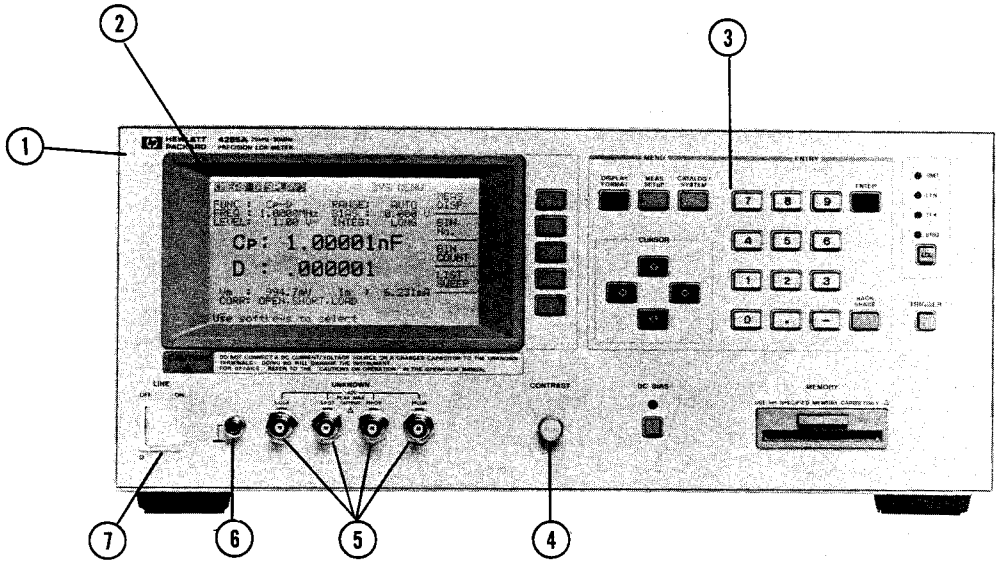
Reference Designator	Part Number	Qty	Description
1	0515-1550	20	Screw Pan-Head
2	0403-0285	3	Rubber Foot
3	1400-1334	5	Cable Clamp

Table 3-5. Front Panel Assembly Components



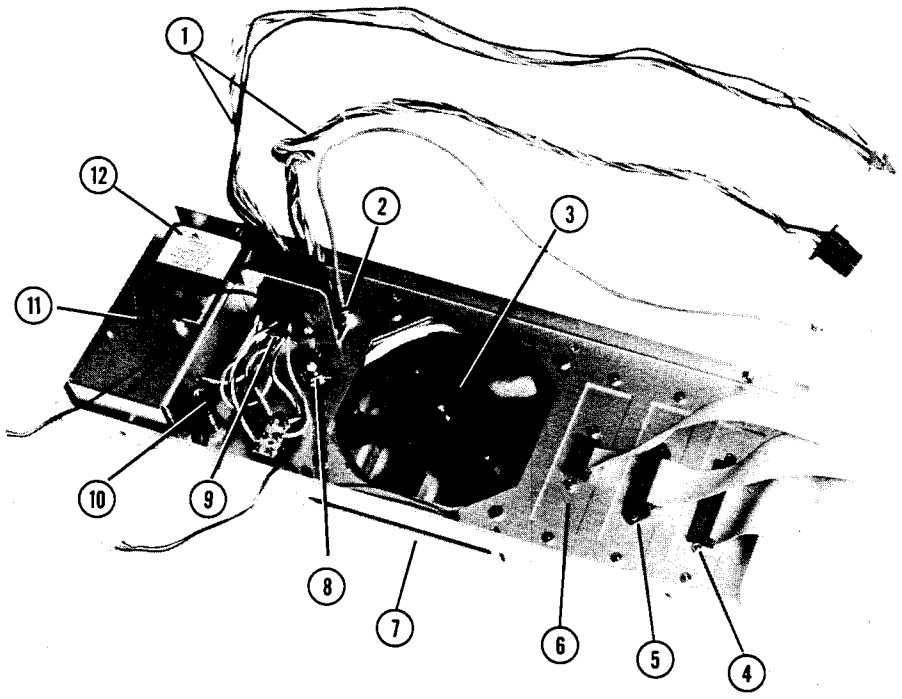
Reference Designator	Part Number	Qty	Description
1	04285-01202	1	Holder
	0535-0031	2	Nut
2	1250-1593	4	Connector SMB (Nut, Washer)
3	04285-61601	4	Cable Assembly
4	04278-66590	1	KEY&DISP Control Unit
	0515-1550	4	Screw
5	04278-66510	1	Memory Card Board
	04278-40002	1	Bezel
	04278-40003	1	Knob
	04278-08001	1	Spring
	3050-0891	4	Washer (F)
	0535-0031	2	Nut
	0515-0920	2	Screw (M3)
	2190-0584	2	Washer -LK HLCL
	0535-0004	2	Nut (M3)
6	04279-66559	1	Keyboard Unit
	04278-40005	1	Bezel
	04278-25001	1	Rubber Key
	0535-0031	7	Nut
7	04278-61615	1	Cable Assembly
8	04278-66513	1	DC-AC Converter Board
	0515-1550	1	Screw
9	04278-00624	1	Shield Case
	1400-1048	1	Edge Saddle
	0515-0910	4	Screw
	2190-0586	4	Washer
10	04278-61630	1	Cable Assembly (3-pin)
11	04278-61616	1	Cable Assembly (12-pin)
12	04278-61102	1	LCD Unit (A91)
13	04278-61631	1	Cable Assembly (2-pin)
14	04278-00205	1	Plate
	3150-0541	1	Filter
	04278-40001	1	Bezel

Table 3-6. Front Panel Components



Reference Designator	Part Number	Qty	Description
1	04285-00201	1	Panel,Front
	04284-00202	1	Sub Panel
2	04278-40001	1	Bezel (Display)
	3150-0541	1	Filter
	04278-00205	1	Plate
	0515-1550	4	Screw
3	04278-25001	1	Rubber Key
	04278-40005	1	Bezel (Key)
4	0370-2446	1	Knob
5	1250-0252	4	BNC Connector
	5040-3324	4	Insulator (outside)
	5040-3325	4	Insulator (inside)
	2950-0035	4	Nut
6	1510-0130	1	Binding Post
	2190-0084	1	Washer
	2950-0006	1	Nut
7	3101-2862	1	Power Switch (included in PN 04284-61611 (Power Switch Cable Assembly))

Table 3-7. Rear Panel Components

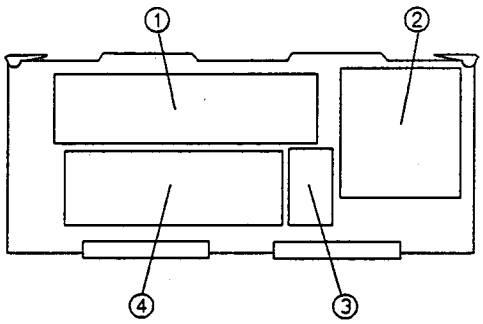


Reference Designator	Part Number	Qty	Description
1	04284-61611	1	Cable Assembly
	3101-2862	1	Power Switch (included in PN 04284-61611)
2			
(std)	6960-0041	1	Plug Hole
(opt001)	1250-0252	1	Connector BNC
	2190-0102	1	Washer
	2950-0035	1	Nut
	04284-61609	1	Cable Assembly
3	04279-61001	1	Fan Assembly
	0515-1598	4	Screw
	2190-0586	4	Washer
	1400-1334	1	Cable Clamp
4			
(std)	04278-00212	1	Blank Plate
	0515-1550	2	Screw
(opt201)	04278-00211	1	I/F Plate
	04278-61622	1	Flat Cable Assembly
	0515-1551	2	Screw for Connector
	0535-0031	2	Nut
	0515-1550	2	Screw for Plate
(opt202)	04278-00213	1	I/F plate
	04278-61622	1	Flat Cable Assembly
	0515-1551	2	Screw for Connector
	0535-0031	2	Nut
	0515-1550	2	Screw for Plate
5			
(std)	04284-00211	1	HP-IB Plate
	04278-61621	1	Flat Cable Assembly
	2190-0577	2	Washer
	0515-1550	2	Screw
(opt109)	04278-00212	1	Blank Plate
	0515-1550	2	Screw

Reference Designator	Part Number	Qty	Description
6			
(std)	04278-00212	1	Blank Panel
	0515-1550	2	Screw
(opt301)	04278-00216	1	I/F Plate
	04278-61632	1	Flat Cable Assembly
	0515-1551	2	Screw for Connector
	0535-0031	2	Nut
	0515-1550	2	Screw for Plate
(opt002)	04285-61621	1	Falt Cable Assembly
7	04279-04001	1	Fan Cover
	0515-1550	4	Screw
8	1250-0083	1	Connector BNC
	0360-1190	1	Lug
	2190-0016	1	Washer
	2950-0001	1	Nut
	04278-61617	1	Cable Assembly
9	04278-61619	1	Cable Assembly
10	2110-0565	1	Cap
	2110-0303	1	Fuse (for 220/240V)
	2110-0381	1	Fuse (for 100/120V)
	2110-0566	1	Fuse Holder
	2110-0569	1	Nut
11	04278-00634	1	Shield
	1400-1334	1	Cable Clamp
	0515-1550	3	Screw
12	04278-61002	1	Filter Assembly
	0515-0910	2	Screw
	2190-0586	2	Washer
	04284-68001	1	Wire Assembly

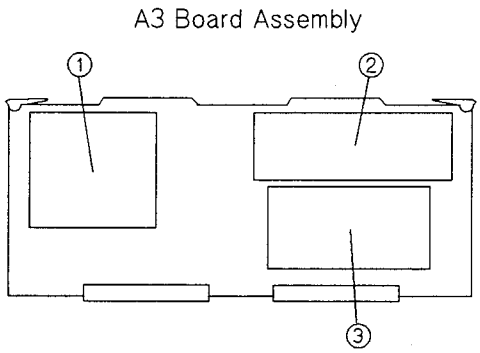
Table 3-8. Shield Case And Heat Sink (1 of 4)

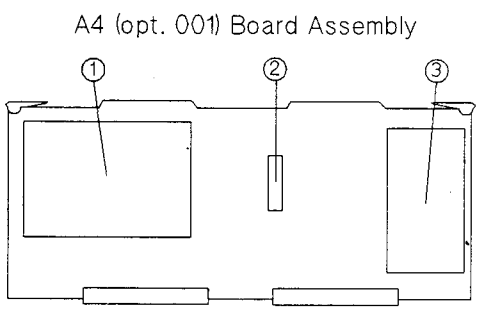
A2 Board Assembly



Board No.	Reference Designator	Part Number	Qty	Description
A1		04278-00601	1	Shield on component side
		0515-1550	4	Screw Pan-Head
		04278-00602	1	Shield on circuit side
		0515-1007	4	Screw Flat-Head
		04278-01204	1	Heat Sink for CR28,CR29,CR30,CR31
		0515-1550	3	Screw Pan-Head
		0515-1551	4	Screw Pan-Head (for CRs)
A2	1	04285-00623	1	Shield on component side
		0515-1550	4	Screw Pan-Head
		04285-00624	1	Shield on circuit side
		0515-0914	4	Screw Flat-Head
	2	04285-00625	1	Shield on component side
		0515-1550	2	Screw Pan-Head
		04285-00626	1	Shield on circuit side
		0515-0914	2	Screw Flat-Head
	3	04285-00627	1	Shield on component side
		0515-1550	2	Screw Pan-Head
		04285-00628	1	Shield on circuit side
		0515-0914	2	Screw Flat-Head
	4	04285-00621	1	Shield on component side
		0515-1550	4	Screw Pan-Head
		04285-00622	1	Shield on circuit side
		0515-0914	4	Screw Flat-Head

Table 3-9. Shield Case And Heat Sink (2 of 4)

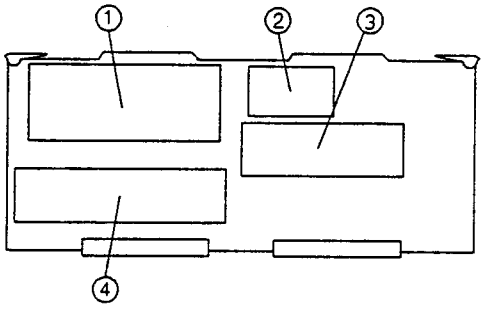




Board No.	Reference Designator	Part Number	Qty	Description
A3	1	04285-00631	1	Shield on component side
		0515-1550	4	Screw Pan-Head
		04285-00632	1	Shield on circuit side
		0515-0914	4	Screw Flat-Head
	2	04285-00635	1	Shield on component side
		0515-1550	4	Screw Pan-Head
		04285-00636	1	Shield on circuit side
		0515-0914	4	Screw Flat-Head
	3	04285-00633	1	Shield on component side
		0515-1550	4	Screw Pan-Head
		04285-00634	1	Shield on circuit side
		0515-0914	4	Screw Flat-Head
A4 (Standard)		04285-00641	1	Shield on component side
		0515-1550	4	Screw Pan-Head
		04285-00642	1	Shield on circuit side
		0515-0914	4	Screw Flat-Head
A4 (Opt.001)	1	04285-00641	1	Shield on component side
		0515-1550	4	Screw Pan-Head
		04285-00642	1	Shield on circuit side
		0515-0914	4	Screw Flat-Head
	2	04284-01202	1	Heat Sink
		0340-1006	2	Insulator
		0515-1550	4	Screw
	3	04285-00643	1	Shield on component side
		0515-1550	2	Screw Pan-Head
		04285-00644	1	Shield on circuit side
		0515-0914	2	Screw Flat-Head

Table 3-10. Shield Case And Heat Sink (3 of 4)

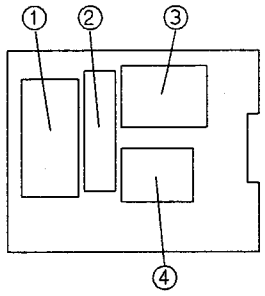
A5 Board Assembly



Board NO.	Reference Designator	Part Number	Qty	Description
A5	1	04285-00651	1	Shield on component side
		04285-01255	1	Plate on 04285-00651
		0515-1550	6	Screw Pan-Head
		04285-00652	1	Shield on circuit side
		0515-0914	4	Screw Flat-Head
	2	04285-00655	1	Shield on component side
		0515-1550	2	Screw Pan-Head
		04285-00656	1	Shield on circuit side
		0515-0914	2	Screw Flat-Head
	3	04285-00657	1	Shield on component side
		0515-1550	2	Screw Pan-Head
		04285-00658	1	Shield on circuit side
		0515-0914	2	Screw Flat-Head
	4	04285-00653	1	Shield on component side
		94802-08001	2	Contact
		1400-1344	1	Cable Clamp
		0515-1550	4	Screw Pan-Head
		04285-00654	1	Shield on circuit side
		0515-0914	4	Screw Flat-Head

Table 3-11. Shield Case And Heat Sink (4 of 4)

A81 Board Assembly

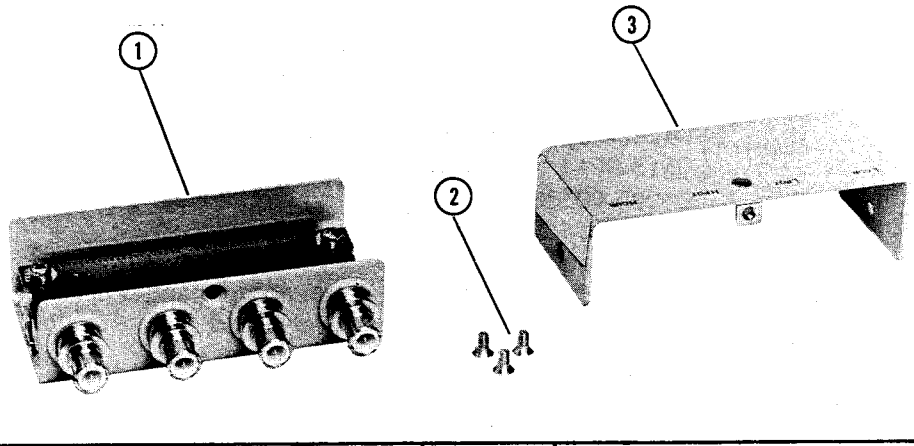


Board NO.	Reference Designator	Part Number	Qty	Description
A6		04285-00661	1	Shield on component side
		0515-0914	2	Screw Flat-Head
		04285-00662	1	Shield on circuit side
		0515-0914	2	Screw Flat-Head
A81	1	04285-00681	1	Shield on component side
		0515-0914	2	Screw Flat-Head
		04285-00682	1	Shield on circuit side
		0515-0914	2	Screw Flat-Head
	2	04285-00683	1	Shield on component side
		0515-1550	2	Screw Pan-Head
		04285-00684	1	Shield on circuit side
		0515-0914	2	Screw Flat-Head
	3	04285-00685	1	Shield on component side
		0515-0914	2	Screw Flat-Head
		04285-00686	1	Shield on circuit side
		0515-0914	2	Screw Flat-Head
	4	04284-00687	1	Shield on component side
		0515-1550	2	Screw Pan-Head
		04284-00688	1	Shield on circuit side
		0515-0914	2	Screw Flat-Head

Table 3-12. Coaxial Cable Assembly

Marker	Part Number	Qty	Description
"A"	04285-61602	1	A2J5 to Lcur
"B"	04285-61603	1	A2J2 to Lpot
"C"	04285-61604	1	A2J7 to Hpot
"D"	04285-61605	1	A4J2 to Hcur
"E"	04285-61606	1	A2J3 to A3J1
"F"	04285-61607	1	A2J8 to A6J1
"G"	04285-61618	1	A2J6 to A3J6
"H"	04285-61609	1	A4J1 to A5J5
"J"	04285-61611	1	A2J4 to A4J5 (opt.001 only)
"K"	04285-61612	1	A2J1 to A4J4 (opt.001 only)
"L"	04285-61613	1	A4J3 to DC BIAS MONITOR (opt. 001 only)
"M"	04285-61614	1	A3J2 to A5J4
"N"	04285-61615	1	A5J3 to A6J3
"O"	04285-61616	1	A3J5 to A5J8
"P"	04285-61617	1	A3J4 to A5J6
"R"	04285-61618	1	A5J9 to A6J6
"S"	04285-61620	1	A5J10 to A5A1J2
"T"	04285-61619	1	A5J7 to A5A1J3

Table 3-13. 100 Ω Resistor (04285-61001) Replaceable Parts



Reference Designator	Part Number	Qty	Description
1	04285-60001	1	100 Ω Assembly
2	0515-0914	3	Screw Flat-Head
3	42090-04001	1	Cover Top

3-4. TOOLS AND FASTENERS

The HP 4285A's mechanical components are secured using metric threaded fasteners. Many fasteners in the HP 4285A may appear to be Phillips type, but they are in fact, Pozidrive type. To avoid damaging them, use only Pozidrive screwdrivers to remove or tighten Pozidrive type fasteners.

3-5. DISASSEMBLY

Disassembly procedures are given in the following paragraphs. The top cover need be removed first to gain access to any of the assemblies. Paragraph 3-5-1 gives how to remove the top cover.

3-5-1. TOP COVER REMOVAL

1. Remove the two plastic instrument-feet located in the upper corners of the rear panel.
2. Fully loosen the top cover retaining screw located at the rear of the top cover.
3. Slide the top cover towards the rear and lift it off.

3-5-2. A1 ASSEMBLY REMOVAL

1. Loosen the two screws which secure the smaller top shield plate with the WARNING message. Don't completely remove them.

WARNING

CAPACITORS ON THE A1 BOARD REMAIN CHARGED WITH HAZARDOUS VOLTAGES FOR A PERIOD OF TIME AFTER THE INSTRUMENT IS TURNED OFF, OR AFTER THE POWER CABLE IS DISCONNECTED. ALLOW AT LEAST ONE MINUTE FOR THE CAPACITORS TO DISCHARGE AFTER THE INSTRUMENT IS TURNED OFF OR THE POWER CABLE IS DISCONNECTED.

2. Slide the top shield plate towards the front and lift it off.
3. Lift the black and the brown board extractors at the top corners of the A1 board.
4. Disconnect the cable that connects between the A1 board and the rear panel.

3-5-3. A2, A3, A4, A6, A7, A20, A30, A31, A40, OR A50 ASSEMBLY REMOVAL

1. Loosen the five screws that secure the larger top shield plate without the WARNING message. Don't remove the screws completely.
2. Slide the top shield plate towards the front and lift it off.
3. Lift the extractors at top corners of the board you are removing.
4. Remove all the cables from the board you are removing.

3-5-4. A5, A81 ASSEMBLY REMOVAL

1. Remove boards A5 and A81 from the chassis, using the same procedure described in paragraph 3-5-3.
2. Remove the two coaxial cables and the flat cable from A81.
3. Remove the two screws that secure A81 to A5.
4. Rotate A81 90 degrees to remove it from A5.

3-5-5. FRONT PANEL ASSEMBLY REMOVAL

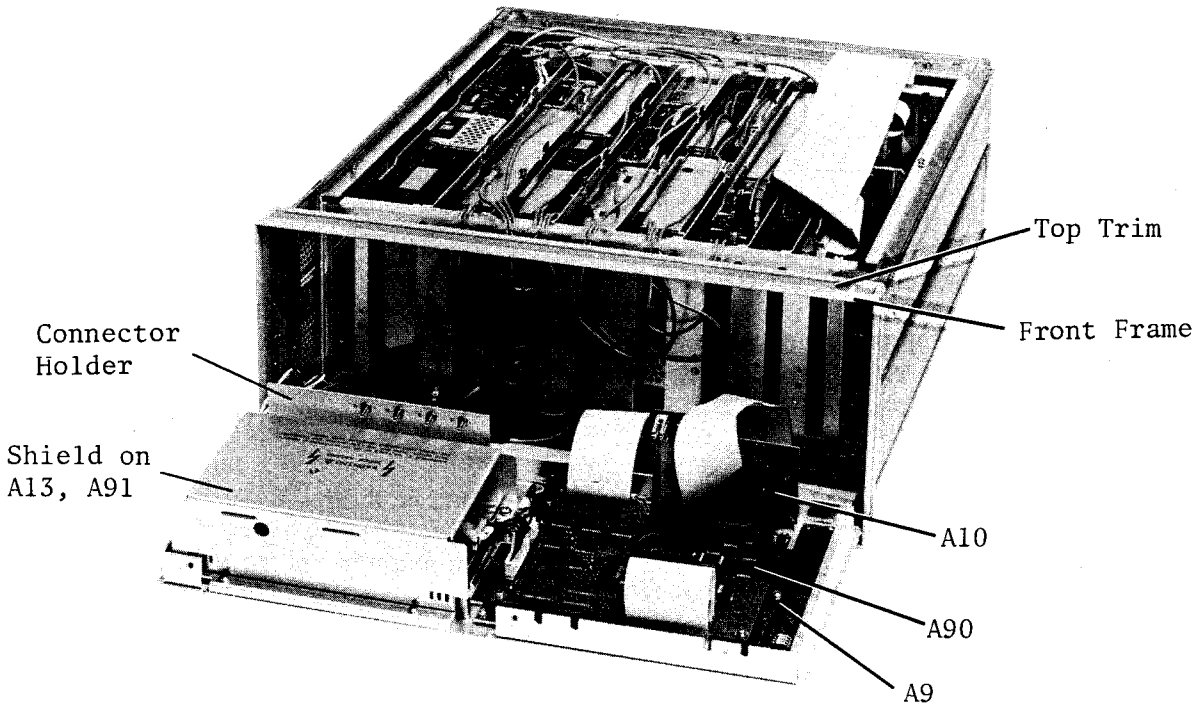


Figure 3-1. Front Panel Removal

1. Remove the top trim from the front frame.
2. Remove the two front feet from the bottom cover.
3. Remove the three screws from the bottom of the front frame.
4. Remove the three screws from the top of the front frame.
5. Carefully remove the front panel unit, and remove four coaxial cables, "A", "B", "C", and "D", from the connector holder.

CAUTION

Don't fully open the front panel, as shown in Figure 3-1, before removing the four coaxial cables, "A", "B", "C", and "D". The four cables are too short to fully open the front panel.

3-5-6. A9 OR A90 ASSEMBLY REMOVAL

1. Remove the front panel unit as described in paragraph 3-5-5.
2. Loosen the two hex set screws on the **CONTRAST** knob and remove it.
3. Disconnect the flat cable from A90.
4. Disconnect the 3 and 13-pin cables from A90.
5. Carefully disconnect the two flat wires from A90.
6. Remove the four screws that secure A90 to A9, and slide A90 out.
7. Disconnect the 3-pin cable from A9.
8. Remove the seven nuts that secure A9, and remove A9.

3-5-7. A10 REMOVAL

1. Remove the front panel as described in paragraph 3-5-5.
2. Disconnect the flat cable from A10.
3. Remove the two screws, nuts, and washers that secure A10 to the MEMORY card bezel, and remove A10.

3-5-8. A13 REMOVAL

1. Remove the front panel unit as described in paragraph 3-5-5.
2. Remove four screws that secure the shield case with the **WARNING** label.
3. Remove the screw that secure A13 to the back of the shield case.
4. Disconnect the 3-pin cable from A90.
5. Disconnect the 3-pin cable from A91, and remove A13.

3-5-9. A91 (LCD MODULE) REMOVAL

1. Remove the front panel unit as described in paragraph 3-5-5.
2. Remove the four screws that secure the shield case with the **WARNING** label.
3. Remove the 2-pin cable, the 3-pin cable, and the 13-pin cable from A91.

NOTE

The A91 LCD module consists of an LCD panel and a control circuit. Do not disassemble the LCD module, the LCD panel and the circuit board must remain together as a unit.

SECTION 4

ASSEMBLY LEVEL TROUBLESHOOTING

4-1. INTRODUCTION

This section provides assembly level troubleshooting information for the HP 4285A PRECISION LCR METER.

4-2. SAFETY CONSIDERATIONS

This section contains **WARNINGS** and **CAUTIONS** that must be followed for your protection and to avoid damaging the equipment.

WARNING

THE MAINTENANCE PROCEDURES DESCRIBED HEREIN ARE PERFORMED WHEN POWER IS SUPPLIED TO THE INSTRUMENT AND ITS PROTECTIVE COVERS ARE REMOVED. THIS TYPE OF MAINTENANCE MUST BE PERFORMED ONLY BY SERVICE-TRAINED PERSONNEL WHO ARE AWARE OF THE HAZARDS INVOLVED (FOR EXAMPLE, FIRE AND ELECTRICAL SHOCK). WHEN MAINTENANCE CAN BE PERFORMED WITHOUT POWER APPLIED TO THE INSTRUMENT, REMOVE POWER FROM THE INSTRUMENT. BEFORE ANY REPAIR IS COMPLETED, ENSURE THAT ALL SAFETY FEATURES ARE INTACT AND FUNCTIONING, AND THAT ALL NECESSARY PARTS ARE PROPERLY CONNECTED TO THE PROTECTIVE GROUNDING SYSTEM.

4-3. RECOMMENDED TEST EQUIPMENT

The required troubleshooting test equipment are listed in Table 1-1. The table lists the type of instruments required, their critical specifications, and the model numbers of the equipment recommended. If the recommended models are not available, equipment which meets or exceeds all of the critical specifications may be substituted.

4-4. AFTER SERVICE PRODUCT SAFETY CHECKS

WARNING

WHENEVER IT APPEARS LIKELY THAT PROTECTIVE SAFETY PROVISIONS HAVE BEEN IMPAIRED, THE APPARATUS SHALL BE MARKED AS INOPERATIVE AND SHOULD BE SECURED AGAINST ANY UNINTENDED OPERATION. THE PROTECTION PROVISIONS WILL HAVE LIKELY BEEN COMPROMISED IF, FOR EXAMPLE:

-- **INSTRUMENT SHOWS VISIBLE DAMAGE.**

-- **THE INSTRUMENT FAILS TO PERFORM THE INTENDED MEASUREMENT.**

-- **THE UNIT HAS UNDERGONE PROLONGED STORAGE UNDER UNFAVORABLE CONDITIONS.**

-- **THE INSTRUMENT WAS SEVERELY STRESSED IN TRANSPORT.**

Perform the following five checks to verify the HP 4285A's safety (these checks may also be used for safety checks after troubleshooting and repair).

1. Visually inspect the interior of the instrument for any signs of abnormal internally generated heat, such as discolored printed circuit boards and components, damaged insulation, or evidence of arcing. Determine the cause and repair.

2. Use an ohmmeter which can accurately measure 0.5 Ω to check the resistance from the instrument enclosure to the power cord's ground pin. The resistance must be less than 0.5 Ω. Flex the power cord while making this measurement to determine if any intermittent discontinuities exist.

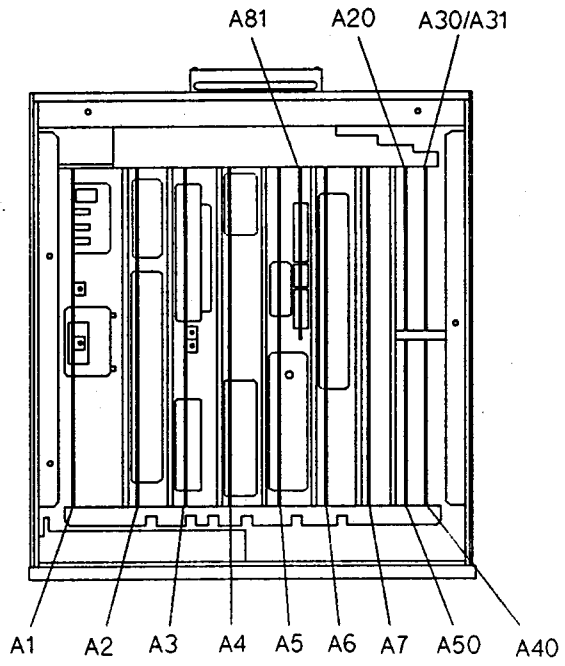
3. Check the **GUARD** terminal on the front panel using the procedure outlined in step 2.

4. Unplug the HP 4285A's power plug from the power source. Set the power switch to **ON**. Tie the line and neutral pins of the power connector together and check the resistance between them and the instrument's enclosure. The minimum acceptable resistance is 2 MΩ. Find and replace any component which causes the instrument to fail this test.

5. Verify that the correct fuse is installed.

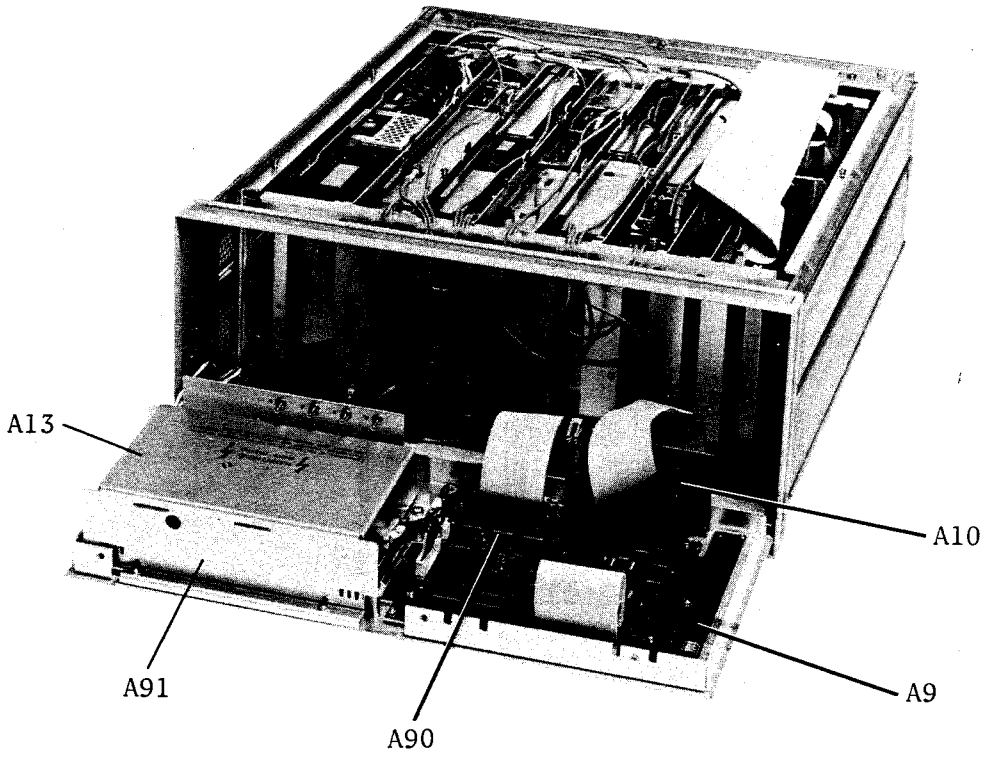
4-5. ASSEMBLY DESIGNATIONS AND LOCATIONS

Assemblies, such as printed circuit boards, are assigned sequential numbers, A1, A2 etc., as shown in Figure 4-1 and 4-2. Figure 4-1 and 4-2 also give the location of the assemblies.



Assembly No.	Assembly Name
A1	Power Supply Board Assembly
A2	Modulator Board Assembly
A3	Range Resistor Board Assembly
A4	Test Signal Amplifier Board Assembly
A4	Test Signal Amp/DC Bias Board Assembly (Option 001)
A5	Signal Source Board Assembly
A6	Phase Detector/A-D Converter Board Assembly
A7	Digital Control Board Assembly
A11	Motherboard Assembly
A20	HP-IB Interface Board Assembly
A30/A31	Handler Interface Board Assembly (Option 201/202)
A40	Scanner Interface Board Assembly (Option 301)
A50	Accessory Control Interface Board Assembly (Option 002)
A81	PLL Synthesizer Board Assembly

Figure 4-1. Assembly Identification (1/2)



Assembly No.	Assembly Name
A9	Keyboard Assembly
A10	Memory Card Board Assembly
A13	DC-AC Converter Board Assembly
A90	Keyboard/Display Control Board Assembly
A91	LCD Module Assembly

Figure 4-2. Assembly Identification (2/2)

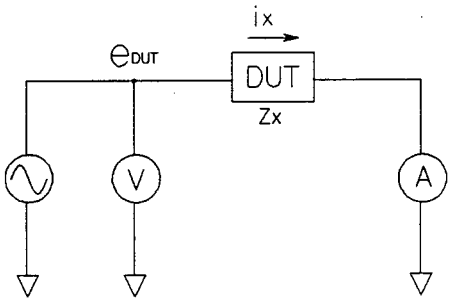
4-6. THEORY OF OPERATION

This paragraph discusses the HP 4285A's principle of operation, and how the HP 4285A's high measurement accuracy and its fully automated measurement performance are achieved.

The HP 4285A is composed of five section blocks: power supply, digital control, source, transducer (TRD), and vector ratio detector (VRD). The overall operation theory is described in section 4-6-1. Each section block is described starting from section 4-6-2. The HP 4285A's analog circuit block diagrams (Source, TRD, and VRD sections) are shown at the end of this paragraph.

4-6-1. OVERALL MEASUREMENT THEORY

The HP 4285A's measurement function is based on the vector voltage-current ratio measurement principle, in which the impedance or admittance of the Device Under Test (DUT) is determined by measuring the vector ratio between the voltage across the DUT and the current through it. Figure 4-3 illustrates this principle.

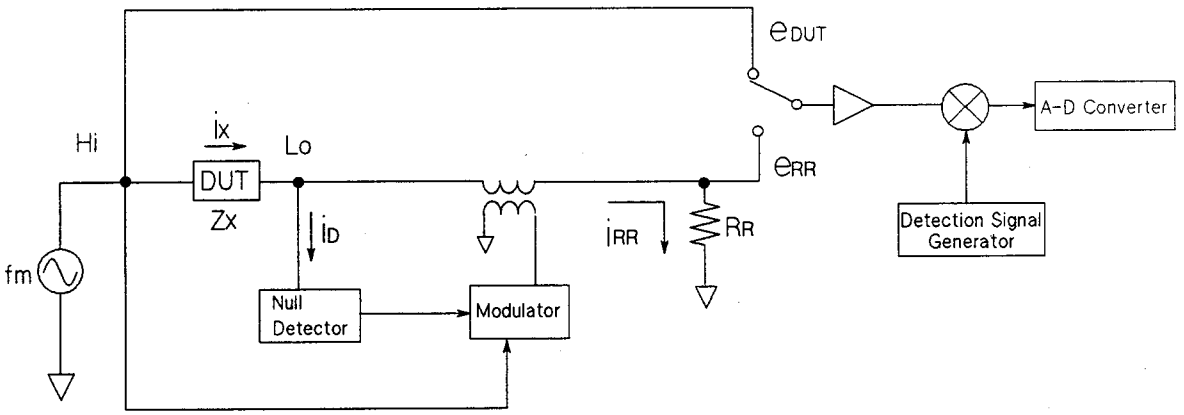


$$Z_X = \frac{e_{DUT}}{i_X}$$

Figure 4-3. Voltage Current Ratio Measurement Principle

The HP 4285A employs an auto balance bridge and a vector ratio detector to measure the voltage across the DUT and the current through it. Figure 4-4 shows a simplified block diagram of the HP 4285A.

When the auto balance bridge is balanced, the potential at the Low terminal is approximately zero and the current "i_D" is approximately zero. In this condition the DUT's impedance can be determined with "e_{DUT}", "e_{RR}", and "R_R" as shown in figure 4-4. "e_{DUT}" and "e_{RR}" are measured by the Vector Ratio Detector.



$$\begin{cases} Z_X = \dfrac{e_{DUT}}{i_X} \\ i_X = i_{RR} + i_D = i_{RR} = \dfrac{e_{RR}}{R_R} \end{cases}$$

$$\therefore \quad Z_X = R_R \times \frac{e_{DUT}}{e_{RR}}$$

Figure 4-4. Analog Section Simplified Block Diagram

4-6-2. POWER SUPPLY BLOCK SECTION

The A1 power supply supplies the DC voltages (+5 V, ±12 V, ±18 V, and -21 V) to each assembly. All service information for the A1 power supply board is given in SECTION 5. SERVICE SHEET. Figure 4-5 shows a simplified block diagram, and Table 4-1 lists the relationship between the output DC voltages from the A1 board and each assembly.

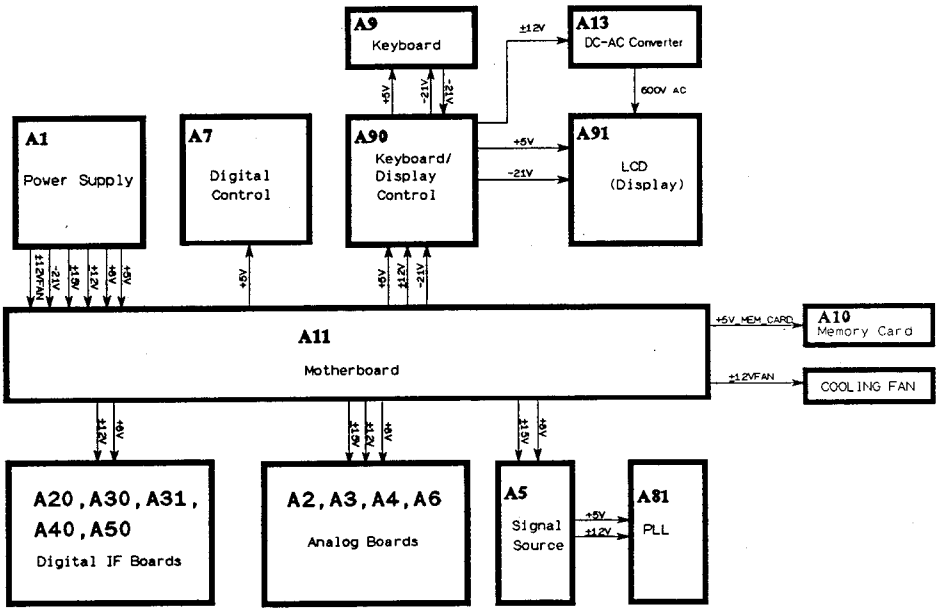


Figure 4-5. Power Supply Simplified Block Diagram

Table 4-1. Relationship between the DCV from A1 and Each Assembly

POWER SUPPLY	A2 to A6	A7	A9	A10	A13	A20 to A50	A90	A91	FAN
+5 V		X	X	X		X	X	X	
+8 V	X								
±12 V	X				X	X	X		
±15 V	X								
-21 V			X				X	X	
±48 V									
+12 V FAN									X

4-6-3. DIGITAL CONTROL SECTION

The digital control functional group consists of the following boards.

A7	Digital Control (CPU)
A9	Keyboard
A10	Memory Card Interface
A20	HP-IB Interface
A30	Handler Interface (Option 201)
A31	Handler Interface (Option 202)
A40	Scanner Compensation/Interface (Option 301)
A50	Accessory Control Interface (Option 002)

The simplified block diagram is shown below.

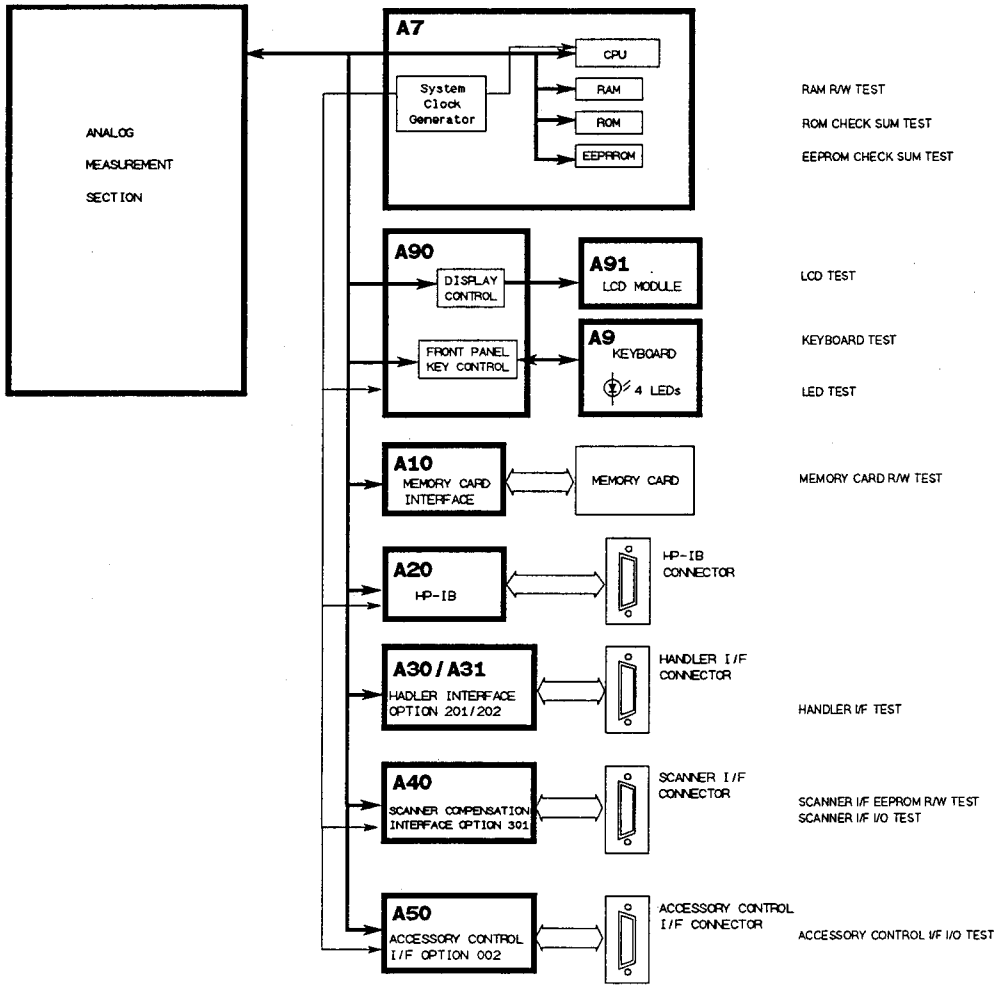


Figure 4-6. Digital Control Simplified Block Diagram

Each board is described in the following paragraphs.

A7 Digital Control (CPU)

The A7 Digital Control (CPU) contains the main CPU (16-bit 68000 microprocessor), programmed ROMs, RAMs, EEPROMs, and the local clock generator. The A7 board is the master controller for the HP 4285A.

A9 Keyboard

The A9 keyboard is the front panel keyboard. LED indicators, beeper, and **CONTRAST** adjustment potentiometer are on the A9 board.

A10 Memory Card Interface

The A10 memory card interface board is the memory card socket board.

A20 HP-IB Interface

The A20 HP-IB interface board controls the handshake between the micropocessor and an external HP-IB controller.

A30/A31 Handler Interface (Option 201/202)

The A30/A31 handler interface board interfaces the HP 4285A to an external handler.

A40 Scanner Compensation/Interface (Option 301)

The A40 Scanner Compensation/Interface board interfaces the HP 4285A to an external scanner. The A40 board has two EEPROMs for storing the OPEN/SHORT/LOAD correction data at seven frequencies for a maximum of 90 external scanner channels.

A50 Accessory Control Interface (Option 002)

The A50 accessory control interface board is used to control the HP 42841A Bias Current Source, and the HP 42851A Precision Q Adapter.

4-6-4. SOURCE SECTION

The source section consists of the A5 Signal Source board, the A81 PLL Synthesizer board, and the A4 Test Signal Amplifier board. The source section generates all analog signals in the HP 4285A, such as test signal, IF signal, etc. The source section block diagram is shown in Figure 4-7. The DC bias circuit is installed on the A4 board when the HP 4285A is equipped with Option 001.

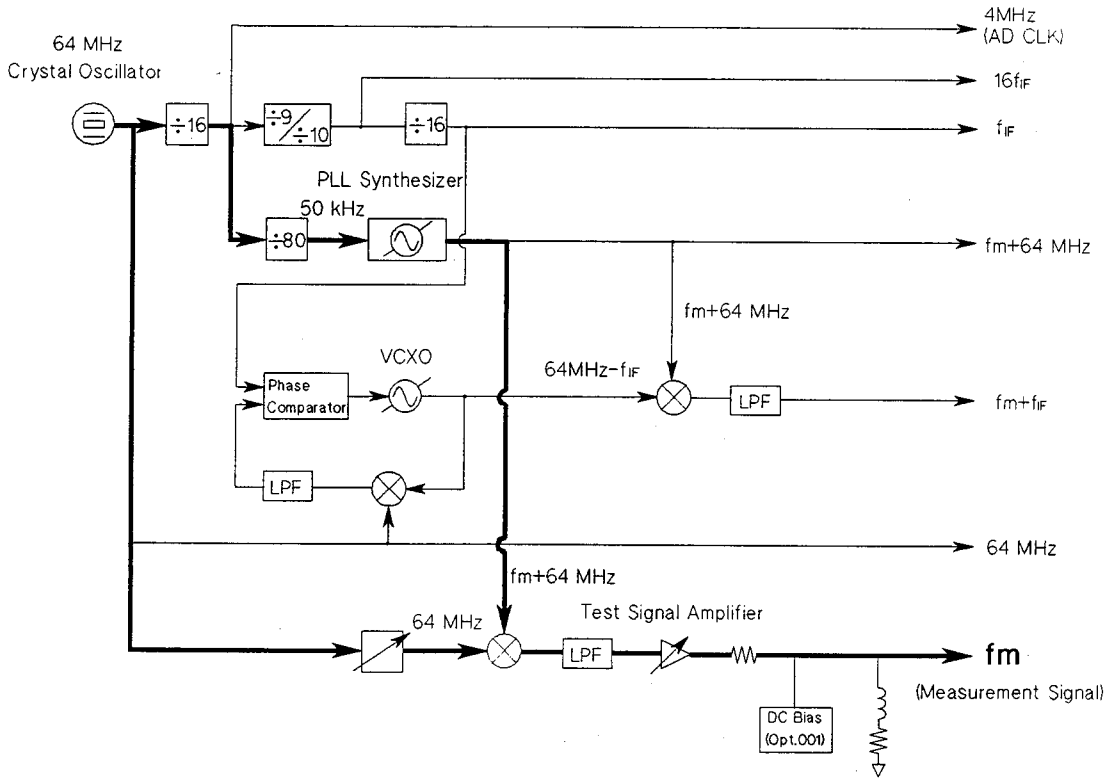


Figure 4-7. Source Block Diagram

4-6-5. TRANSDUCER SECTION

The transducer section consists of the A2 Range Resistor board and the A3 Modulator board. The transducer section diagram is shown in Figure 4-8. The transducer section transforms the DUT (Device Under Test) impedance, or admittance, into two AC signals ("EDUT" and "ERR"). The transducer section principle of operation is shown in Figure 4-4. Each circuit block, shown in Figure 4-8, is described in the following paragraphs.

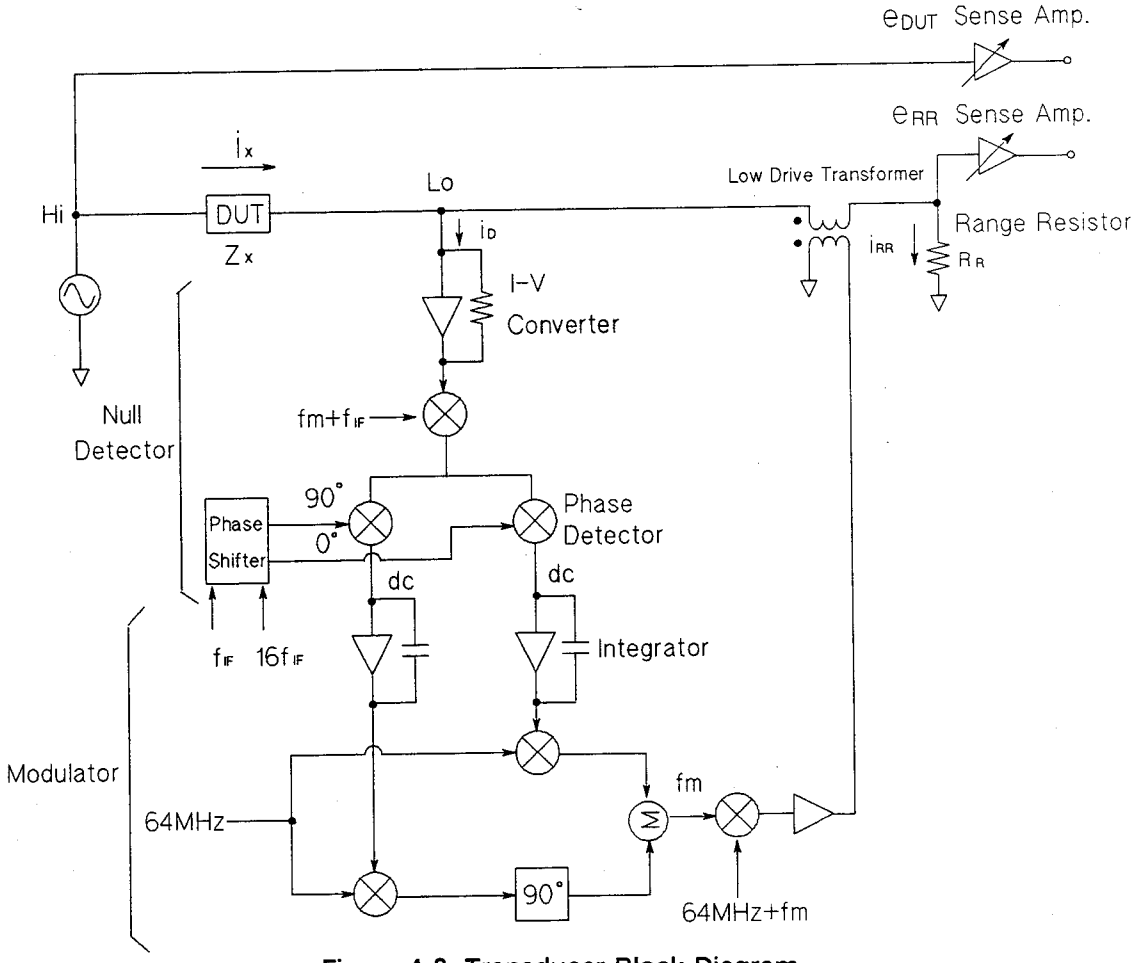


Figure 4-8. Transducer Block Diagram

Null Detector The unbalance current "ID" is detected by the I-V converter and it is converted into an equal phase IF signal by the mixer. The resulting IF signal is converted into two DC voltages, proportional to its orthogonal (quadrature, 90° phase difference) vector components by the phase detector.

The I-V converter operation amplifier holds the Lo terminal at virtual ground.

Modulator Two 64 MHz signals are amplified proportional to the integration of the Null Detector's DC output voltages. One of the 64 MHz signals is shifted 90 ° and the two 64 MHz signals are added to generate a 64 MHz signal which is in phase with the unbalance current. The 64 MHz signal is converted into a frequency equal to the unbalanced current frequency by the mixer. This signal cancels the unbalanced current through the Drive Transformer.

Voltage Sense Amplifier EDUT and ERR voltages are transmitted to the Vector Ratio Detector, through the Sense Amplifiers.

4-6-6. VECTOR RATIO DETECTOR SECTION

The A6 board is the vector ratio detector. Figure 4-9 shows the block diagram of the vector ratio detector. The vector ratio detector converts the transducer output voltages into digital data. The vector ratio detector operation is described in the following paragraphs.

The "eDUT" or "eRR" signal is converted into an equal phase IF signal, by the mixer. The IF signal is converted into two DC voltages proportional to its orthogonal (quadrature, 90° phase difference) vector components. The A-D Converter converts the DC voltages into digital data.

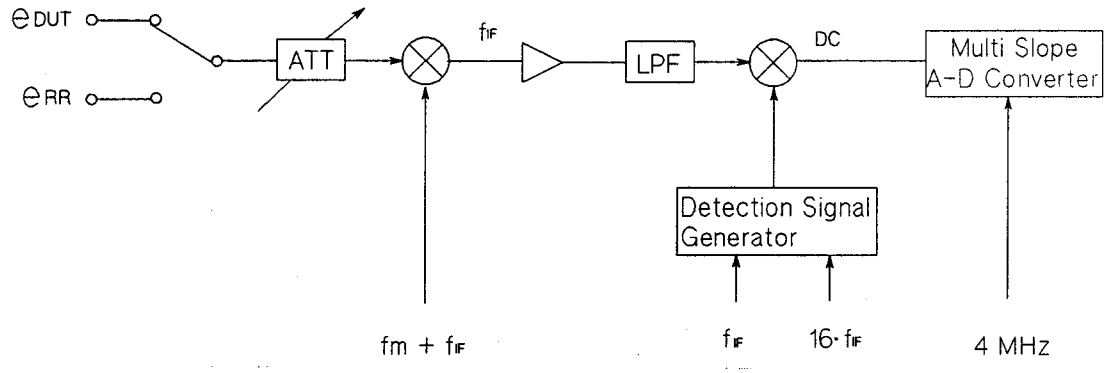
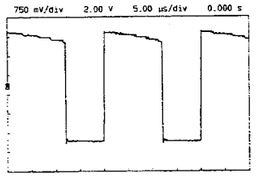
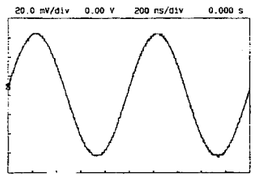


Figure 4-9. Vector Ratio Detector

HP 4285A ANALOG BLOCK DIAGRAM



50K REF 50 kHz, TTL
(Coupling: 1 MΩ DC)



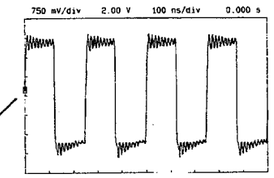
FM 75 kHz to 30 MHz
60 to 340 mVp-p
(Coupling: 50 Ω DC)

A5 Signal Source

A4 Test Signal Amplifier

A2 Range Resistor

A6 Vector Ratio Detector

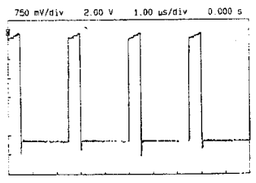


4M CLK 4 MHz, TTL
(Coupling: 1 MΩ DC)

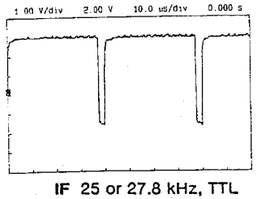
A81 PLL Synthesizer

DC Bias
(Option 001)

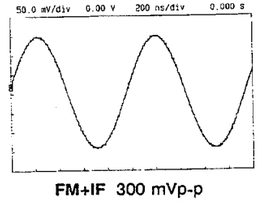
A3 Modulator



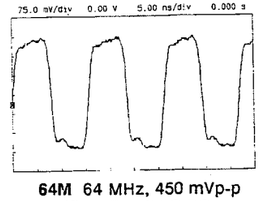
16IF 400 or 444 kHz, TTL
(Coupling: 1 MΩ DC)



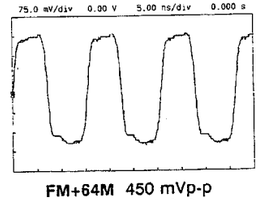
IF 25 or 27.8 kHz, TTL
(Coupling: 1 MΩ DC)



FM+IF 300 mVp-p
(Coupling: 50 Ω DC)



64M 64 MHz, 450 mVp-p
(Coupling 50 Ω DC)



FM+64M 450 mVp-p
(Coupling: 50 Ω C)

Figure 4-10. Analog Section Block Diagram

NOTES

4-7. FAULTY BOARD ISOLATION

This paragraph provides information for isolating faulty boards. The faulty board isolation program is very helpful when trying to isolate faulty board(s), and is described in paragraph 4-7-1.

When the HP 4285A cannot be turned ON or some error message appears on its LCD, the trouble may be easily isolated without using the faulty board isolation program by following the procedures in paragraphs 4-7-2, 4-7-3, and 4-7-4.

NOTE

If the HP 4285A is out of limits by a small margin and fails the impedance measurement accuracy test, perform the impedance measurement adjustment and retest before proceeding to the faulty board isolation techniques.

4-7-1. FAULTY BOARD ISOLATION PROGRAM

The faulty board isolation program isolates a faulty board using a dialogue between the user and the computer. This paragraph describes general faulty board isolation program information and how to use the program. Table 4-1 lists the program specifications. Figure 4-11 shows the program flow.

Table 4-1. Faulty Board Isolation Program Specification

HP Part Number:	04285-65005 (5 inch floppy disk) 04285-65006 (3.5 inch floppy disk)
Language:	HP BASIC (rev. 5.0 and above)
Binary Requirement:	HP-IB, KBD, GRAPH, GRAPHX, PDEV, IO (HP BASIC rev. 5.0)
Computer Requirement:	HP 9000 series 200 or series 300 computer with more than 1 M byte of RAM.
Write Protection:	Faulty Board Isolation program is not write protected. Use a backup copy to run the program. Do not copy the program for purposes other than backup.
File Name	SVC_4285A: FBI Main Program HPIB_ADRS: HP-IB address data CAL_DATA: EEPROM initialization data

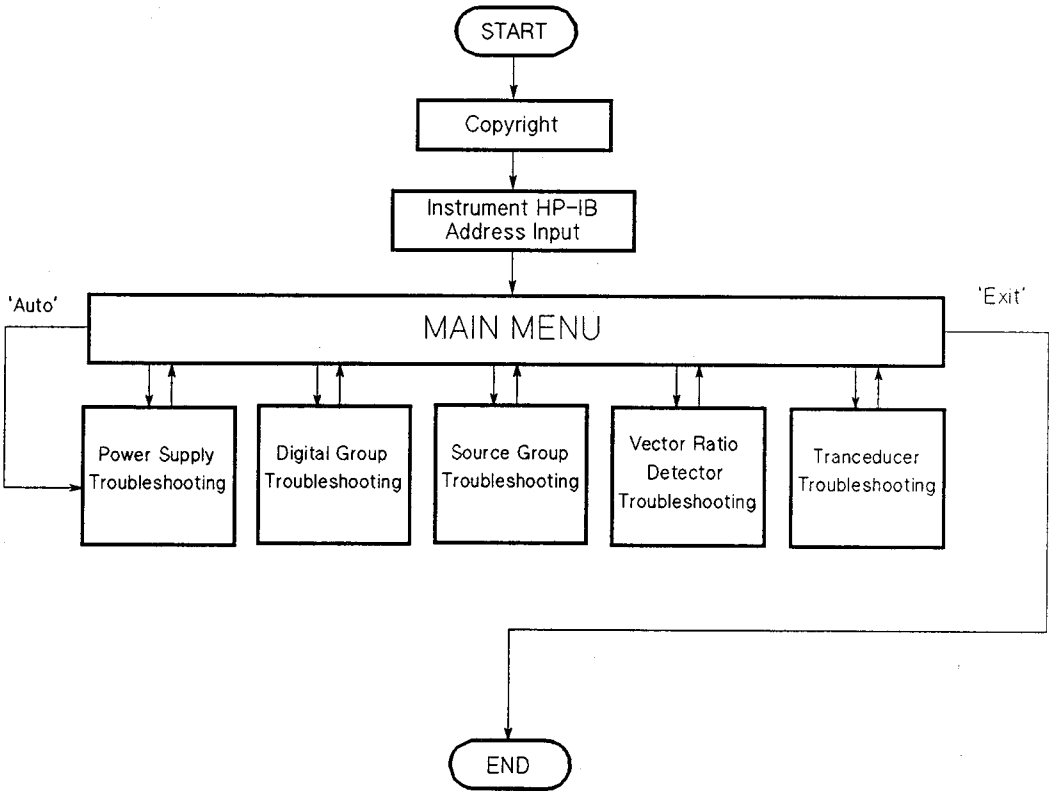


Figure 4-11. Faulty Board Isolation Program Flow

EQUIPMENT:

The required test equipment for each trouble isolation section is shown in Figure 4-11 is listed in Table 4-2.

Table 4-2. Required Test Equipment

Isolation Part	Required Equipment
Power Supply	DC Voltmeter [1]
Digital Group	DC Voltmeter [1]
Source Group	HP 3458A, Frequency Counter [2], Oscilloscope [3]
VRD	DC Voltmeter, Oscilloscope [3]
TRD	Frequency Counter [2], Oscilloscope [3]

[1]: Voltage Range 5 VDC to 100 VDC

[2]: Frequency Range 25 kHz to 100 MHz

[3]: Bandwidth >100 MHz

PROCEDURE:

1. Connect the equipment as shown in Figure 4-12.

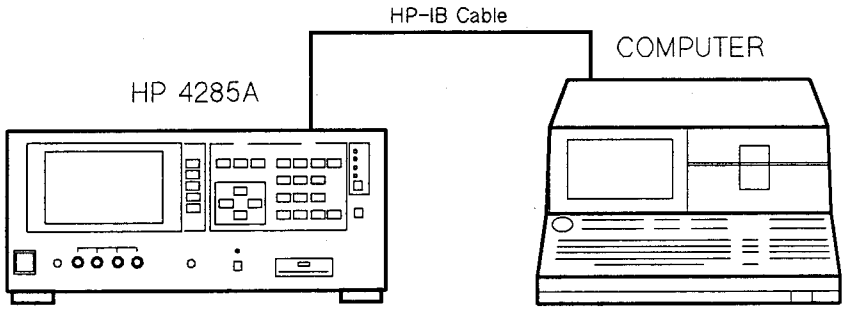


Figure 4-12. Faulty Board Isolation Program Setup

2. Boot up BASIC and load the necessary binary files into the computer.

3. Load the faulty board isolation program into the computer, the file name is **"SVC_4285A"**.

4. Press the computer **RUN** key. The necessary equipment list will be displayed on the computer screen.

5. Press the computer **'NextStep'** softkey to proceed to the HP-IB address registration step.

6. Use the computer softkeys to select an instrument to change the HP-IB Address data if needed, and enter the HP-IB address using the computer numeric keys and **ENTER** key.

7. Press the computer **'NextStep'** softkey to proceed to the Main Menu.

8. The main menu will be displayed on the computer screen as shown in Figure 4-13.

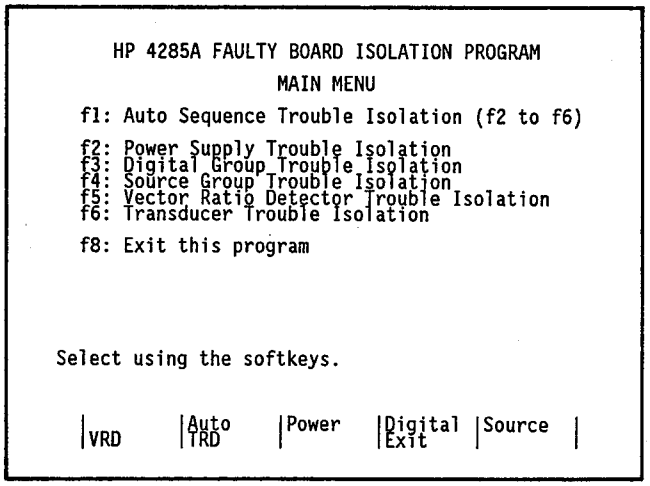


Figure 4-13. Main Menu

9. Use the computer softkeys to select the Trouble Isolation Procedure, and perform trouble isolation according to the program's instructions. The computer main menu softkeys functions are listed in Table 4-3.

Table 4-3. Main Menu Softkeys

Computer Softkey	Description
f1: **'Auto'**	Used to check all groups, and to isolate the faulty board. The checking order is shown in Figure 4-19.
f2: **'Power'**	Used to check the power supply group, and to isolate a fault in the power supply group. The items checked in the power supply group are as follows: • Cooling fan • Output DC voltages on the A1 board • Neon lump on the A13 board • Fuses on the A1 board • VOLTAGE SELECTOR switch and Fuse on the rear panel
f3: **'Digital'**	Used to check the digital group (A7, A20 to A50), and to isolate a fault in the digital group. The items checked in the digital group are as follows: • Power-on self test • Performance test for each digital interface
f4: **'Source'**	Used to check the source group (A4, A5, A5A1), and to isolate a fault in the source group. The items checked in the source group are as follows: • Test signal frequency • Test signal level • DC bias level • A5A1 input signal (50 kHz) • A5A1 output signal (fm+64 MHz)
f5: **'VRD'**	Used to check the A6 Vector Ratio Detector (VRD). The items checked in the VRD are as follows: • V-Sense Amplifier on A2 • A-D Converter on A6 • Phase sensitive detector on A6
f6: **'TRD'**	Used to check the transducer (TRD), and isolate a fault in the TRD (A2, A3). The items checked in the TRD are as follows: • Range Resistor on A2 • I-V Converter on A2
f8: **'Exit'**	Used to exit this program.

NOTE

You can only select the **'TRD'** softkey after you have checked the other groups.

4-7-2. HP 4285A CANNOT BE TURNED ON

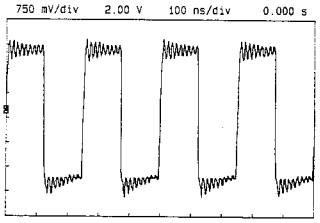
When the HP 4285A cannot be turned ON, check the line fuse and the line voltage level selector setting. If they are correct troubleshoot the A1 board, refer to paragraph 5-8.

4-7-3. ADC ERR (A-D CONVERTER ERROR) APPEARS

When "ADC ERR" appears on the HP 4285A LCD, perform the following troubleshooting procedure.

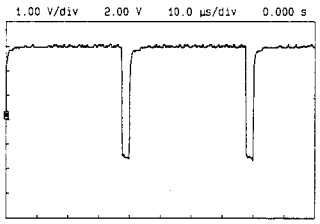
Troubleshooting:

Confirm that the following three signals are correct, refer to Figure 5-A6-1.



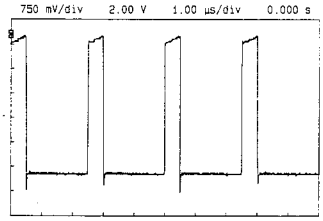
A6TP15 AD_CLK (GND A6TP17)

4 MHz
TTL level



A5TP3 IF (GND A5TP2)

25 kHz or 27.8 kHz
TTL level



A5TP4 16IF (GND A5TP2)

400 kHz or 444 kHz
TTL level

Figure 4-14. ADC ERR Test Point Waveform

If all three signals are correct, replace the A6 board. Otherwise, replace the A5 board assembly.

4-7-4. POWER ON SELF TEST

Every time the HP 4285A is turned ON it performs a power-on self test as part of its power on initialization sequence. The HP 4285A performs the following self tests at power-on.

- ROM check sum test
- RAM R/W test
- EEPROM check sum test

When a test fails, an error message is displayed on the LCD. Troubleshooting procedures corresponding to the error messages are described in the following paragraphs.

1. RAM TEST ERROR

Description: RAM read/write function is defective.

Troubleshooting:

1. Replace the A7 board, according to paragraph 5-14-6.

2. ROM CHECK SUM ERROR NO=X

Description: Check sum of the data in a ROM on the A7 board is incorrect. (Incorrect ROM number is indicated.)

Troubleshooting:

1. Replace the indicated ROM. The following figure shows the ROM locations.

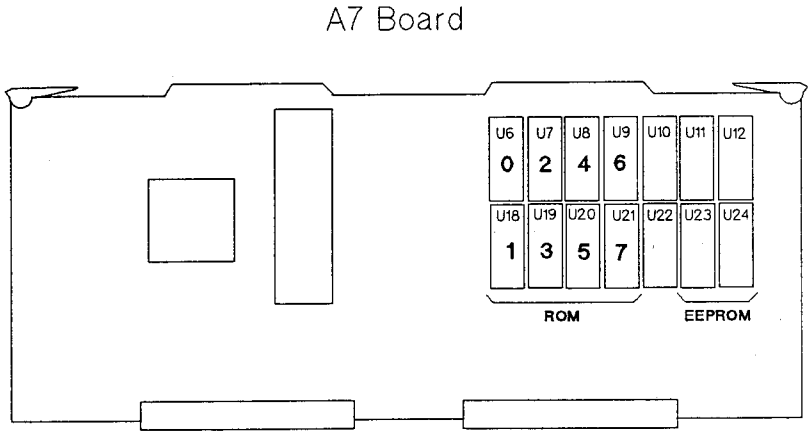


Figure 4-11. A7 ROM Locations

2. If the preceding procedure does not solve the problem, replace the A7 board according to paragraph 5-14-6.

3. SYSTEM DATA CHECK SUM (CSUM) ERROR

Description: The check sum of the system configuration data in the EEPROMs on the A7 board is incorrect.

Troubleshooting:

1. Initialize the EEPROM according to paragraph 5-14-4.
2. If the preceding procedure does not solve the problem, replace the EEPROMs (U11, U23) and initialize them according to paragraph 5-14-4.
3. If preceding procedure does not solve the problem, replace the A7 board according to paragraph 5-14-6.

4. CORRECTION (CORR) DATA CSUM ERROR

Description: The check sum of the OPEN/SHORT/LOAD correction data in EEPROM on the A7 board is incorrect.

Troubleshooting:

1. Initialize the EEPROM according to paragraph 5-14-4.
2. If the preceding procedure does not solve the problem, replace the EEPROMs (U11, U23) and initialize them according to paragraph 5-14-4.
3. If the preceding procedure does not solve the problem, replace the A7 board according to paragraph 5-14-6.

5. CABLE DATA CSUM ERROR

Description: The check sum of the cable correction data in EEPROM on the A7 board is incorrect.

Troubleshooting:

1. Initialize the EEPROM according to paragraph 5-14-4.
2. If the preceding procedure does not solve the problem, replace the EEPROMs (U11, U23) and initialize them according to paragraph 5-14-4.
3. If the preceding procedure does not solve the problem, replace the A7 board according to paragraph 5-14-6.

6. CALIBRATION (CALIB) DATA CSUM ERROR

Description: The check sum of the adjustment data in EEPROM on the A7 board is incorrect.

Troubleshooting:

1. Initialize the EEPROM according to paragraph 5-14-4.

NOTE

Dummy adjustment data is written into the EEPROMs using the procedure given in paragraph 5-14-4. So, adjustment (EEPROM data updating) must be performed after the hardware problem is solved.

2. If the problem has been found, perform the following adjustments according to Section 2.

   - Phase Tracking Adjustment
   - DC Bias Level Adjustment (Option 001 only)
   - Test Signal Level/Level Monitor Adjustment
   - Impedance Measurement Adjustment

3. If above procedures do not solve the problem, replace the EEPROMs (U12, U24) and initialize them according to paragraph 5-14-4. Return to step 2 and reperform the adjustments.

4. If above procedure does not solve the problem, replace the A7 board according to paragraph 5-14-6. Then perform the adjustments listed in step 2.

7. SCANNER DATA CSUM ERROR

Description: The check sum of the multi channel correction data in EEPROM on the A40 board is incorrect.

Troubleshooting:

1. Initialize the EEPROM according to paragraph 5-14-4.

2. If above procedure does not solve the problem, replace the EEPROMs (U12, U24) and initialize them according to paragraph 5-14-4.

3. If above procedure does not solve the problem, replace the A7 board according to paragraph 5-14-6.

NOTE

Every time the HP 4285A turned ON, the power on sequence (for example, initializing the timer on the A7 board) is performed. Check this power on sequence is by watching the LED array (A7DS3, A7DS4). See the following.

LED Pattern (1 = ON 0 = OFF)

Left							Right	Task
1	2	3	4	5	6	7	8	
X	X	X	X	X	X	X	X	Clears memory card read/write flip-flop
X	X	X	X	X	X	X	X	Turns off memory card power supply
1	1	1	1	1	1	1	1	LED test
1	0	0	0	0	0	0	0	LED test
0	1	0	0	0	0	0	0	LED test
0	0	1	0	0	0	0	0	LED test
0	0	0	1	0	0	0	0	LED test
0	0	0	0	1	0	0	0	LED test
0	0	0	0	0	0	1	0	LED test
0	0	0	0	0	0	0	1	LED test
0	0	0	0	0	0	0	0	LED test
1	0	0	0	0	0	0	0	Initializes LCD controller
0	1	0	0	0	0	0	0	Initializes timer on A7
1	1	0	0	0	0	0	0	Initializes timer on A90
0	0	1	0	0	0	0	0	Initializes A90
1	0	1	0	0	0	0	0	Check the bit switch (A7S3)
0	1	1	0	0	0	0	0	Initializes timer on the A-D converter
1	1	1	0	0	0	0	0	Initializes PIA chip on A30 or A31
0	0	0	1	0	0	0	0	Initializes PIA chip on A40
1	0	0	1	0	0	0	0	Clears all interrupt signal
1	0	0	0	0	0	0	0	RAM read/write test
1	0	0	0	0	0	0	0	Clears RAM
1	0	0	0	0	0	0	0	Displays "Copyright" message
1	0	0	0	0	0	0	0	ROM check sum test
1	0	0	0	0	0	0	0	EEPROM check sum test
1	0	0	0	0	0	0	0	EEPROM check sum test for A40
1	0	0	0	0	0	0	0	Starts the measurement

SECTION 5

SERVICE SHEETS

5-1. INTRODUCTION

This section contains a service sheet for each of the HP 4285A's PC board assemblies. Each service sheet is organized into six parts: Circuit Description, Troubleshooting Aids, Board Connector Pin Assignments, Replaceable Parts List, Component Location Drawing, and Schematic Diagram.

5-2. CIRCUIT DESCRIPTION

The circuit description gives a detailed functional circuit description of each board.

5-3. TROUBLESHOOTING AIDS

The troubleshooting aids provide information to help you troubleshoot problems in the HP 4285A. Usually the troubleshooting aids consists of a list of jumpers, a list of test points, and troubleshooting information. The jumper list shows the strapping configuration for each jumper. The test point list gives a description of the signal at each test point. The troubleshooting information includes waveforms for troubleshooting the board, and the measurement setup for viewing the waveform is listed next to the waveform figure, refer to Figure 5-1.

Setting up the oscilloscope:

(1) Set the oscilloscope inputs to DC coupled (1 MΩ).

(2) The settings (using a 1:1 probe) for channel A and B, and the time base setting are displayed with the waveform, refer to Figure 5-1. When a 10:1 divider probe is used, the channel A and B settings must be multiplied by 10.

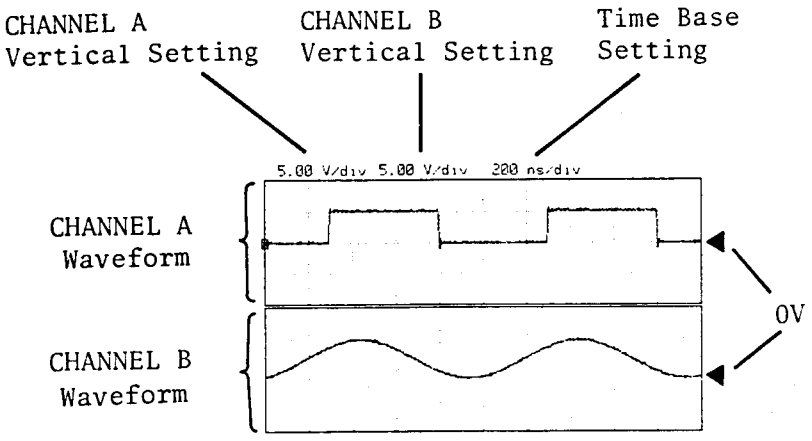


Figure 5-1. Oscilloscope Setup

5-4. BOARD CONNECTOR PIN ASSIGNMENT

The pin assignments for each digital interface board are provided with the component locations using the names listed in Table 5-1.

Table 5-1. Signal Name Used for Pin Assignments

Name	Description
/CLK16MHz	Clock signal for digital interface boards
D0 to *D15*	Data Bus Line for the digital boards
/DTAC	Data acknowledge signal
/HALT	Halt signal
/HANDLER	Handler interface access signal
/HDL_TRG_INT	Trigger interrupt signal from Handler Interface
/ID0 to */ID7*	Board identification signal
/STD_IF	Interrupt to the HP-IB interface
/KEY_LOCK_INT	Keylock interrupt signal from Handler Interface
/LDS	Lower data strobe
/LGND	Logic circuits ground line
/POW_FAIL	*/ALARM* signal to the handler interface
/RESET	Reset signal
R/W	Read/Write signal
/STD_IF	HP-IB access signal
/SCANNER	Scanner interface access signal
/UDS	Upper data strobe
/VMA	Valid memory access signal for CPU
/VPA	Valid peripheral signal

5-5. REPLACEABLE PARTS LIST

The replaceable parts list provides information about the replaceable parts.

5-5-1. ABBREVIATIONS

Table 5-2 lists the abbreviations used throughout this manual. In some cases, three forms of the same abbreviation are used: all upper case, all lower case, and mixed upper and lower case. Abbreviations used in the parts lists are always upper case, and mixed upper- and lower-case letters.

Table 5-2. List of Reference Designators and Abbreviations

REFERENCE DESIGNATORS

A	= assembly	E	= misc electronic part	P	= plug	U	= integrated circuit
B	= motor	F	= fuse	Q	= transistor	V	= vacuum, tube, neon bulb, photocell, etc.
BT	= battery	FL	= filter	R	= resistor		
C	= capacitor	J	= jack	RT	= thermistor	VR	= voltage regulator
CP	= coupler	K	= relay	S	= switch	W	= cable
CR	= diode	L	= inductor	T	= transformer	X	= socket
DL	= delay line	M	= meter	TB	= terminal board	Y	= crystal
DS	= device signaling (lamp)	MP	= mechanical part	TP	= test point		

ABBREVIATIONS

A	= amperes	H	= henries	NPN	= negative-positive-negative	RWV	= reverse working voltage
A. F. C.	= automatic frequency control	HEX	= hexagonal	NRFR	= not recommended for field replacement		
AMPL	= amplifier	HG	= mercury	NSR	= not separately replaceable	S-B	= slow-blow
B. F. O.	= beat frequency oscillator	HR	= hour(s)			SCR	= screw
BE CU	= beryllium copper	Hz	= hertz			SE	= selenium
BH	= binder head	IF	= intermediate freq.	OBD	= order by description	SECT	= section(s)
BP	= bandpass	IMPG	= impregnated	OH	= oval head	SEMICON	= semiconductor
BRS	= brass	INCD	= incandescent	OX	= oxide	SI	= silicon
BWO	= backward wave oscillator	INCL	= include(s)			SIL	= silver
CCW	= counter-clockwise	INS	= insulation(ed)	P	= peak	SL	= slide
CER	= ceramic	INT	= internal	PC	= printed circuit	SPG	= spring
CMO	= cabinet mount only	k	= kilo = 1000	p	= pico = 10^{-12}	SPL	= special
COEF	= coefficient	LH	= left hand	PH BRZ	= phosphor bronze	SST	= stainless steel
COM	= common	LIN	= linear taper	PHL	= Phillips	SR	= split ring
COMP	= composition	LK WASH	= lock washer	PIV	= peak inverse voltage	STL	= steel
COMPL	= complete	LOG	= logarithmic taper	PNP	= positive-negative-positive	TA	= tantalum
CONN	= connector	LPF	= low pass filter	P/O	= part of	TD	= time delay
CP	= cadmium plate	m	= milli = 10^{-3}	POLY	= polystyrene	TGL	= toggle
CRT	= cathode-ray tube	M	= meg = 10^{6}	PORC	= porcelain	THD	= thread
CW	= clockwise	MET FLM	= metal film	POS	= position(s)	TI	= titanium
DEPC	= deposited carbon	MET OX	= metallic oxide	POT	= potentiometer	TOL	= tolerance
DR	= drive	MFR	= manufacturer	PP	= peak-to-peak	TRIM	= trimmer
ELECT	= electrolytic	MINAT	= miniature	PT	= point	TWT	= traveling wave tube
ENCAP	= encapsulated	MOM	= momentary	PWV	= peak working voltage	μ	= micro = 10^{-6}
EXT	= external	MTG	= mounting			VAR	= variable
F	= farads	MY	= "mylar"	RECT	= rectifier	VDCW	= dc working volts
f	= femto = 10^{-15}	n	= nano = 10^{-9}	RF	= radio frequency	W/	= with
FH	= flat head	N/C	= normally closed	RH	= round head or right hand	W	= watts
FIL H	= fillister head	NE	= neon	RMO	= rack mount only	WIV	= working inverse voltage
FXD	= fixed	NI PL	= nickel plate	RMS	= root-mean square	WW	= wirewound
G	= giga = 10^{9}	N/O	= normally open			W/O	= without
GE	= germanium	NPO	= negative positive zero (zero temperature coefficient)				
GL	= glass						
GRD	= ground(ed)						

0001-9700

5-5-2. REPLACEABLE PARTS LISTS

Table 5-3 lists the names and addresses of the manufacturers identified by Mfr. Code in the parts lists. In most cases the information given for each part includes the following information:

1. HP part number.
2. Quantity used in the assembly -- given once -- at the first occurrence of the part number.
3. Five-digit code representing the typical manufacturer.
4. Manufacture's part number.

Table 5-3. Component Manufactures

Mfr Code	Manufacturer Name	Address	Zip Code
S0545	NEC ELECTRONICS LTD	MTN VIEW CA US	94043
S0562	TOSHIBA CORP	TOKYO JP	
S4013	HITACHI AMERICA LTD	SUNNYVALE CA US	94086
01121	ALLEN-BRADLEY CO INC	EL PASO TX US	79935
01295	TEXAS INSTRUMENTS INC	DALLAS TX US	75265
02768	ITW FASTEX	DES PLAINES IL US	60016
03888	K D I PYROFILM CORP	WHIPPANY NJ	07981
04713	MOTOROLA INC SEMI-COND PROD	PHOENIX AZ US	85008
06665	PRECISION MONOLITHICS INC.	SANTA CLARA CA	95050
07263	FAIRCHILD CORP	MOUNTAIN VIEW CA US	94042
09922	BURNDY CORP	NORWALK CT US	06856
1B546	VARO SEMICONDUCTOR INC	GARLAND TX US	75046
11236	CTS CORP BERNE DIV	BERNE IN US	46711
13606	SPRAGUE ELECTRIC SEMICON DIV	CONCORD NH	03301
14433	ITT SEMICONDUCTORS DIV	TUSTIN CA US	92680
16299	CORNING ELECTRONICS	RALEIGH NC US	27604
19701	MEPCO/CENTRALAB INC	WEST PALM BEACH FL US	33407
24046	TRANSITRON ELECTRONIC CORP	WAKEFIELD MA	01880
24355	ANALOG DEVICES INC	NORWOOD MA US	02062
24546	CORNING ELECTRONICS	SANTA CLARA CA US	95050
27014	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA CA US	95052
27167	CORNING GLASS WORKS (WILMINGTON)	WILMINGTON NC	28401
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO CA	94304
3L585	RCA CORP SOLID STATE DIV	SOMERVILLE NJ	
32293	INTERSIL INC	CUPERTINO CA CA	95014
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS MA	01247
73138	BECKMAN INDUSTRIAL CORP	FULLERTON CA US	92632
73899	J F D ELECTRONICS CORP	BROOKLYN NY	11219
75042	TRW INC PHILADELPHIA DIV	PHILADELPHIA PA	19108
75915	LITTELFUSE INC	DES PLAINES IL US	60016
76381	3M CO	ST PAUL MN US	55144
9N171	UNITRODE CORP	LEXINGTON MA US	02173
91637	DALE ELECTRONICS INC	EL PASO TX US	79936
98291	SEALECTRO CORP	MAMARONECK NY	10544

5-5-3. ORDERING INFORMATION

When ordering a replacement part listed in the Replaceable Parts List, specify the Hewlett-Packard part number and the quantity required, and send the order to the nearest Hewlett-Packard office.

When ordering a part not listed on the Replaceable Parts List, state the full instrument model number and serial number, describe the function of the part, and give the quantity required. Send the order to the nearest Hewlett-Packard office.

5-5-4. DIRECT MAILING ORDERING

Within the United States, Hewlett-Packard supplies parts through a direct mail order system. The advantages of using this system are:

-- Direct order and shipment from the HP Parts Center in Mountain View, California.

-- No maximum or minimum on any mail order (there is a minimum order amount for parts ordered through local HP offices when the order requires billing and invoicing).

-- Prepaid shipping (there is a small handling charge for each order).

-- No invoices--a check or money order must accompany the order.

Mail order forms and specific ordering information are available through your local HP office. Addresses and telephone numbers are given at the back of this manual.

5-6. COMPONENT LOCATIONS

The component locations provide you with component position information.

5-7. SCHEMATIC DIAGRAMS

The schematic diagram for each board provides you with circuit information. Figure 5-2 shows the symbols used in the schematic diagrams.

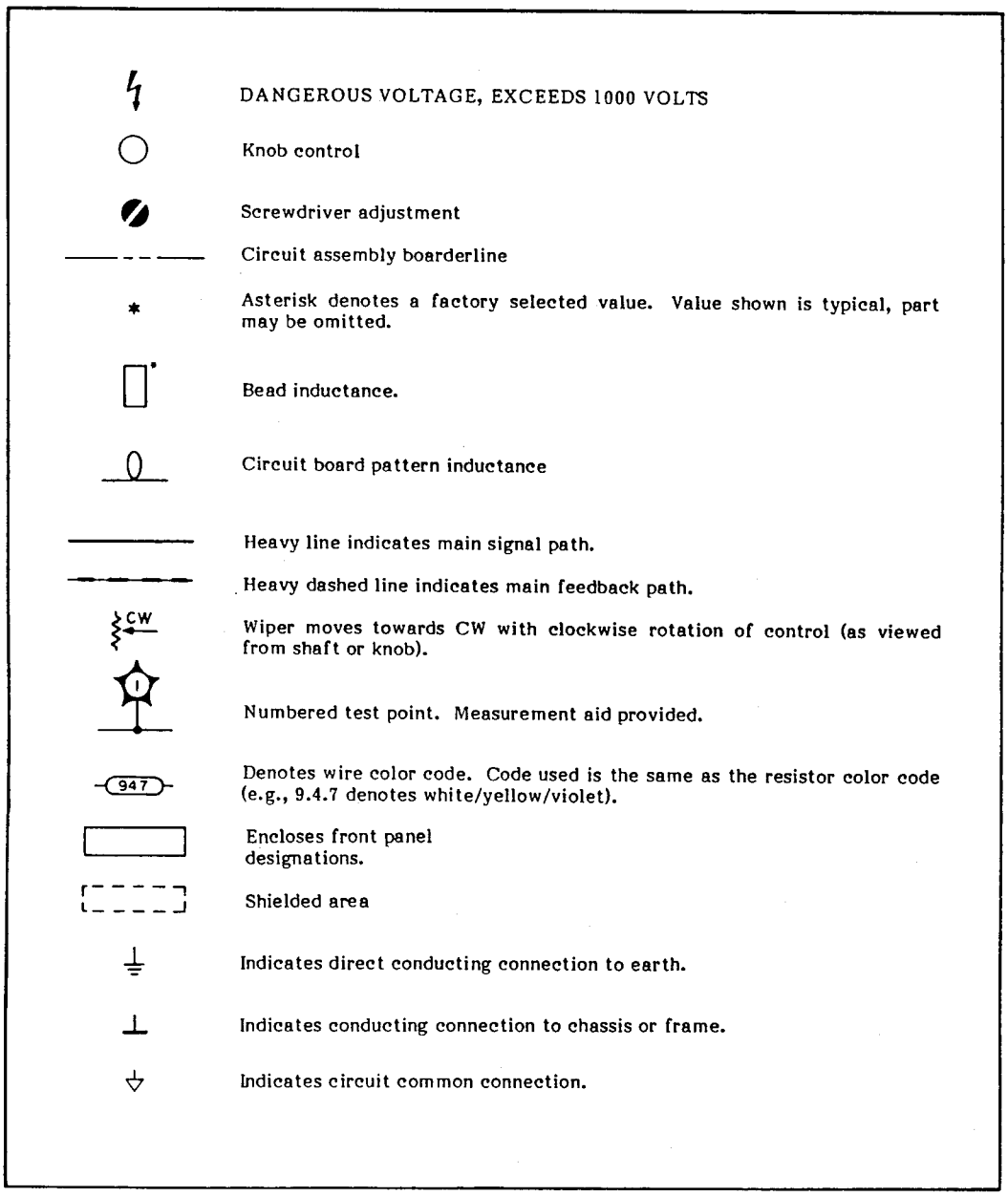


Figure 5-2. Schematic Diagram Symbols

5-8. A1 POWER SUPPIY SERVICE SHEET

5-8-1. CIRCUIT DESCRIPTION

The A1 Power Supply board provides +5 V, +8 V, ±12 V, ±15 V, -21 V, and ±48 V to the A11 Mother Board. The A1 Power Supply board is divided into two sections at transformer A1T3: the primary circuit and the secondary circuit.

The primary circuit consists the following.

1. Primary rectifier
2. Turn-on surge current limiter
3. Slow start circuit
4. Supply voltage controller
5. Switching circuit
6. Shutdown circuit

The secondary circuit consists the following.

1. Secondary rectifier for each output voltage
2. Overvoltage detector

An explanation for each circuit follows.

[Primary Rectifier]

The primary rectifier, composed of A1CR1, A1C2, A1C3, A1C4, and A1C5, rectifies the AC source voltage to supply the unregulated DC voltages. A1CR1 acts as a full wave rectifier when the line voltage selector is set to 220/240 V, and as a voltage doubler when the line voltage selector is set to 100/120 V.

[Surge Current Limiter]

The surge current limiter, composed of A1R1, A1K1, and A1FT1, limits the surge current when the instrument is turned on. A1K1 is activated by the slow start circuit about half a second after the power switch is turned on to by-pass A1R1 (Surge current limit resistor), which protects the primary rectifier from current surges at power up. If A1K1 does not activate, the heat produced by A1R1 will cause thermal fuse A1FT1 to open up.

[Slow Start Circuit]

The slow start circuit, composed of A1Q1, A1Q2, A1Q3, A1Q9, and A1Q10, lengthens the rise time of the supply voltage by limiting the maximum switching pulse width at power up. When the voltage from the primary rectifier becomes greater than about 240 V, the slow start circuit is enabled.

[Supply Voltage Controller]

A1U2 (supply voltage controller), controls the switching circuit. The switching duty cycle is adjusted by A1R19 (FREQ-ADJ).

[Switching Circuit]

The switching circuit used to convert the DC primary voltage to a 40 kHz AC voltage consists of A1Q11, and A1Q12. The duty cycle is the parameter varied to regulate the output voltage, and it is controlled by A1U2 (supply voltage controller), by comparing the 5 V Vref (reference voltage) to the 9 V feedback voltage produced by A1CR21, A1CR22, A1L4, and A1C25.

[Shutdown Circuit]

The shutdown circuit, consisting of A1Q6, A1Q7, A1CR18, and A1CR19, stops both the A1U2's oscillator and the switching circuit if one of the following situations occur.

1. The FAN STOP signal form A1U6 is received by the shutdown circuit.
2. The over voltage signal from A1U5 is received by the shutdown circuit.

[Secondary Rectifier]

The secondary rectifier rectifies the output of the secondary windings of A1T3 and outputs +5 V, +8 V, ±12 V, ±15 V, -21 V, and ±48 V.

[Over Voltage Detector]

A1CR40, A1CR41, A1CR43, A1CR44, A1CR45, and A1CR47 make up the over voltage detector. If any voltage exceeds its limit, the over voltage detector will send a shutdown signal to A1U5 (opto-coupler) which will transfer the signal to the shutdown circuit.

5-8-2. TROUBLESHOOTING AIDS

Table 5-4 shows the troubleshooting waveforms, and Table 5-5 lists the DC output voltage at each test point.

WARNING

DISCONNECT THE POWER CABLE BEFORE WATCHING THE BELOW WAVEFORMS

HP 4285A Setup:

1. Disconnect the power cable.
2. Remove the A1 board.
3. Set A1W1 to the test position.
4. Tie A1TP3 to A1TP10.
5. Supply +12 V DC to A1TP2 referenced to A1TP3.

Table 5-4. Power Supply Troubleshooting Data

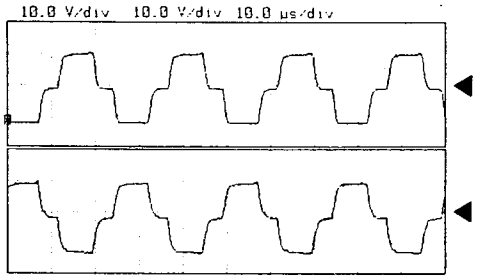
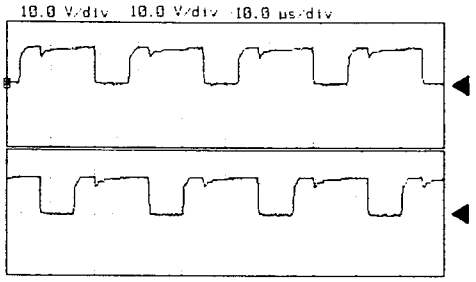
HP 4285A Settings	Measurement Setup	Waveform
See Above	CHAN A: A1TP1 CHAN B: A1TP5 TRIG: CHAN A (Negative)	
See Above	CHAN A: A1TP4 CHAN B: A1TP8 TRIG: CHAN A (Negative)	

Table 5-5. A1 DC Voltage and Test Points

Test Point	Name	Actual DC Voltage
A1TP13	-15V	-16.5 V ±0.7 V
A1TP14	+15V	+16.5 V ±0.7 V
A1TP15	-12V	-12.5 V ±0.5 V
A1TP16	+5V	+5.2 V ±0.2 V
A1TP17	+8V	+8.7 V ±0.4 V
A1TP18	+12V	12.5 V ±0.5 V
X2B22	-21V	-21.5 V ±2 V
X2B18	+48V	+46 V ±3 V
X2B20	-48V	-46 V ±3 V

5-8-3. REPLACEABLE PARTS LISTS

The replaceable parts for the A1 board are listed in Table 5-6.

5-8-4. COMPONENT LOCATIONS

The component locations and pin assignments for the A1 board are shown in Figure 5-3.

5-8-5. SCHEMATIC DIAGRAMS

The A1 board schematic diagram is shown in Figure 5-4.

Table 5-6. A1 Power Supply Replaceable Parts List (1/5)

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A1						
A1	04284-66501	0	1	POWER SUPPLY	28480	04284-66501
A1C1	0160-3969	6	2	CAPACITOR-FXD .015UF +-20PF 250VAC(RMS)	28480	0160-3969
A1C2	0180-3253	3	4	CAPACITOR-FXD 470UF+-20% 250VDC AL	28480	0180-3253
A1C3	0180-3253	3		CAPACITOR-FXD 470UF+-20% 250VDC AL	28480	0180-3253
A1C4	0180-3253	3		CAPACITOR-FXD 470UF+-20% 250VDC AL	28480	0180-3253
A1C5	0180-3253	3		CAPACITOR-FXD 470UF+-20% 250VDC AL	28480	0180-3253
A1C6	0160-3969	6		CAPACITOR-FXD .015UF +-20PF 250VAC(RMS)	28480	0160-3969
A1C7	0180-3586	5	1	CAPACITOR-FXD 2200UF+-20% 35VDC AL	28480	0180-3586
A1C8	0160-4835	7	4	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A1C9	0180-3600	4	5	CAPACITOR-FXD 33UF+-20% 25VDC AL	28480	0180-3600
A1C10	0160-4801	7	1	CAPACITOR-FXD 100PF +-5% 100VDC CER	28480	0160-4801
A1C11	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A1C12	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A1C13	0160-4830	2	2	CAPACITOR-FXD 2200PF +-10% 100VDC CER	28480	0160-4830
A1C14	0160-4830	2		CAPACITOR-FXD 2200PF +-10% 100VDC CER	28480	0160-4830
A1C15	0160-6812	4	2	CAPACITOR-FXD 2.2UF +-10% 250VDC	28480	0160-6812
A1C16	0160-6812	4		CAPACITOR-FXD 2.2UF +-10% 250VDC	28480	0160-6812
A1C17	0180-3600	4		CAPACITOR-FXD 33UF+-20% 25VDC AL	28480	0180-3600
A1C18	0160-4834	6	1	CAPACITOR-FXD .047UF +-10% 100VDC CER	28480	0160-4834
A1C19	0160-6561	0	3	CAPACITOR-FXD .1UF +-20% 50VDC CER	16299	CAC02Z5U104M050A
A1C20	0160-4822	2	1	CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
A1C21	0160-4833	5	2	CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A1C22	0180-3583	2	1	CAPACITOR-FXD 10UF+-20% 50VDC AL	28480	0180-3583
A1C23	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A1C24	0160-3454	4	1	CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A1C25	0160-4832	4	1	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A1C26	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A1C27	0180-3597	8	1	CAPACITOR-FXD 47UF+-20% 25VDC AL	28480	0180-3597
A1C28	0160-3456	6	1	CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A1C29	0180-3600	4		CAPACITOR-FXD 33UF+-20% 25VDC AL	28480	0180-3600
A1C30	0180-3600	4		CAPACITOR-FXD 33UF+-20% 25VDC AL	28480	0180-3600
A1C31	0180-3600	4		CAPACITOR-FXD 33UF+-20% 25VDC AL	28480	0180-3600
A1C32	0180-3587	6	3	CAPACITOR-FXD 1000UF+-20% 50VDC AL	28480	0180-3587
A1C33	0180-3587	6		CAPACITOR-FXD 1000UF+-20% 50VDC AL	28480	0180-3587
A1C34	0180-3587	6		CAPACITOR-FXD 1000UF+-20% 50VDC AL	28480	0180-3587
A1C35	0180-1075	3	3	CAPACITOR-FXD 2200 UF 16VDC AL	28480	0180-1075
A1C36	0160-4808	4	1	CAPACITOR-FXD 470PF +-5% 100VDC CER	28480	0160-4808
A1C37	0160-6561	0		CAPACITOR-FXD .1UF +-20% 50VDC CER	16299	CAC02Z5U104M050A
A1C38	0160-6561	0		CAPACITOR-FXD .1UF +-20% 50VDC CER	16299	CAC02Z5U104M050A
A1C39	0180-1075	3		CAPACITOR-FXD 2200 UF 16VDC AL	28480	0180-1075
A1C40	0180-1075	3		CAPACITOR-FXD 2200 UF 16VDC AL	28480	0180-1075
A1C41	0180-3664	0	1	CAPACITOR-FXD 3300UF+-20% 10VDC AL	28480	0180-3664
A1C42	0180-3603	7	4	CAPACITOR-FXD 10UF+-20% 100VDC AL	28480	0180-3603
A1C43	0180-3603	7		CAPACITOR-FXD 10UF+-20% 100VDC AL	28480	0180-3603
A1C44	0180-3603	7		CAPACITOR-FXD 10UF+-20% 100VDC AL	28480	0180-3603
A1C45	0180-3603	7		CAPACITOR-FXD 10UF+-20% 100VDC AL	28480	0180-3603
A1CR1	1906-0313	1	1	BRIDGE 600V	28480	1906-0313
A1CR2	1906-0006	9	1	DIODE-FW BRDG 400V 1A	1B546	VE48
A1CR3	1902-0969	5	1	DIODE-ZNR 30V 5% DO-35 PD=.4W TC=+.095%	28480	1902-0969
A1CR4	1901-0050	3	30	DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR5	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150

*** Indicates factory selected value.**

Table 5-6. A1 Power Supply Replaceable Parts List (2/5)

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A1CR6	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR7	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR8	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR9	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR10	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR11	1902-3150	2	2	DIODE-ZNR 9.09V 2% DO-35 PD=.4W	28480	1902-3150
A1CR12	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR13	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR14	1902-0943	5	2	DIODE-ZNR 2.4V 5% DO-35 PD=.4W TC=-.037%	28480	1902-0943
A1CR15	1902-0943	5		DIODE-ZNR 2.4V 5% DO-35 PD=.4W TC=-.037%	28480	1902-0943
A1CR16	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR17	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR18	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR19	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR20	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR21	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR22	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR23	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR24	1902-3150	2		DIODE-ZNR 9.09V 2% DO-35 PD=.4W	28480	1902-3150
A1CR25	1902-0953	7	1	DIODE-ZNR 6.2V 5% DO-35 PD=.4W TC=+.053%	28480	1902-0953
A1CR26	1906-0317	5	2	DIODE-CT-RECT 200V 5A	28480	1906-0317
A1CR27	1906-0316	4	3	DIODE-CT-RECT 200V 5A	28480	1906-0316
A1CR28	1906-0317	5		DIODE-CT-RECT 200V 5A	28480	1906-0317
A1CR29	1906-0316	4		DIODE-CT-RECT 200V 5A	28480	1906-0316
A1CR30	1906-0316	4		DIODE-CT-RECT 200V 5A	28480	1906-0316
A1CR31	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR32	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR33	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR34	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR35	1901-0731	7	5	DIODE-PWR RECT 400V 1A	14433	1N4004G
A1CR36	1901-0731	7		DIODE-PWR RECT 400V 1A	14433	1N4004G
A1CR37	1901-0731	7		DIODE-PWR RECT 400V 1A	14433	1N4004G
A1CR38	1901-0731	7		DIODE-PWR RECT 400V 1A	14433	1N4004G
A1CR39	1906-0314	2	1	DIODE-CT-S-BARR 40V 15A	28480	1906-0314
A1CR40	1902-0964	0	2	DIODE-ZNR 18V 5% DO-35 PD=.4W TC=+.09%	28480	1902-0964
A1CR41	1902-3188	6	2	DIODE-ZNR 12.7V 2% DO-35 PD=.4W	28480	1902-3188
A1CR42	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR43	1902-0957	1	1	DIODE-ZNR 9.1V 5% DO-35 PD=.4W TC=+.069%	28480	1902-0957
A1CR44	1902-0951	5	1	DIODE-ZNR 5.1V 5% DO-35 PD=.4W TC=+.035%	28480	1902-0951
A1CR45	1902-3188	6		DIODE-ZNR 12.7V 2% DO-35 PD=.4W	28480	1902-3188
A1CR46	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR47	1902-0964	0		DIODE-ZNR 18V 5% DO-35 PD=.4W TC=+.09%	28480	1902-0964
A1CR48	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR49	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR50	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR51	1901-0731	7		DIODE-PWR RECT 400V 1A	14433	1N4004G
A1CR52	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR53	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR54	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR55	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1DS1	1990-0486	6	2	LED-LAMP LUM-INT=2MCD IF=25MA-MAX BVR=5V	28480	HLMP-1301
A1DS2	1990-0486	6		LED-LAMP LUM-INT=2MCD IF=25MA-MAX BVR=5V	28480	HLMP-1301
A1E1	0837-0337	1	1	THERMISTOR-SURGE PTCTR BKDN V: DC 230V	28480	0837-0337

*** Indicates factory selected value.**

Table 5-6. A1 Power Supply Replaceable Parts List (3/5)

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A1F1	2110-0014	3	1	FUSE 4A 250V TD 1.25X.25 UL	75915	313004
A1F2	2110-0746	8	2	FUSE 4A 125V NTD UL	28480	2110-0746
A1F3	2110-0746	8		FUSE 4A 125V NTD UL	28480	2110-0746
A1F4	2110-0743	5	5	FUSE 2A 125V UL	28480	2110-0741
A1F5	2110-0743	5		FUSE 2A 125V UL	28480	2110-0741
A1F6	2110-0743	5		FUSE 2A 125V UL	28480	2110-0743
A1F7	2110-0743	5		FUSE 2A 125V UL	28480	2110-0743
A1F8	2110-0743	5		FUSE 2A 125V UL	28480	2110-0743
A1FT1	2110-0663	8	1	FUSE-THERMAL 96 DEG C	28480	2110-0663
A1J1	1251-3819	9	1	CONN-UTIL MT-LK 6-CKT 6-CONT	28480	1251-3819
A1K1	0490-1312	8	1	RELAY IC 5VDC-COIL 10A 240VAC	28480	0490-1312
A1L2	9100-3139	5	2	INDUCTOR 75UH 15% .5D-INX.875LG-IN	28480	9100-3139
A1L3	9100-3139	5		INDUCTOR 75UH 15% .5D-INX.875LG-IN	28480	9100-3139
A1L4	9140-1136	2	1	INDUCTOR 27MH 35% .61W-INX.728LG-IN	28480	9140-1136
A1L5	9140-1135	1	1	INDUCTOR 76UH 15% 1.213W-INX1.161LG-IN	28480	9140-1135
A1Q1	1854-0810	2	12	TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A1Q2	1854-0810	2		TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A1Q3	1854-0810	2		TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A1Q4	1854-0810	2		TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A1Q5	1854-0810	2		TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A1Q6	1853-0459	3	4	TRANSISTOR PNP SI PD=625MW FT=200MHZ	28480	1853-0459
A1Q7	1854-0810	2		TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A1Q8	1854-0810	2		TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A1Q9	1854-0810	2		TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A1Q10	1853-0459	3		TRANSISTOR PNP SI PD=625MW FT=200MHZ	28480	1853-0459
A1Q11	1855-0658	8	2	TRANSISTOR MOSFET N-CHAN E-MODE SI	S0562	2SK386
A1Q12	1855-0658	8		TRANSISTOR MOSFET N-CHAN E-MODE SI	S0562	2SK386
A1Q13	1854-0810	2		TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A1Q14	1854-0810	2		TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A1Q15	1854-0810	2		TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A1Q16	1853-0459	3		TRANSISTOR PNP SI PD=625MW FT=200MHZ	28480	1853-0459
A1Q17	1854-0810	2		TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A1Q18	1853-0459	3		TRANSISTOR PNP SI PD=625MW FT=200MHZ	28480	1853-0459
A1R1	0811-3621	8	1	RESISTOR 8 5% 6W PW TC=0+-50	28480	0811-3621
A1R2	0764-0031	7	4	RESISTOR 47K 5% 2W MO TC=0+-200	28480	0764-0031
A1R3	0764-0031	7		RESISTOR 47K 5% 2W MO TC=0+-200	28480	0764-0031
A1R4	0698-0085	0	4	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2611-F
A1R5	0698-0085	0		RESISTOR 2.61K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2611-F
A1R6	0764-0031	7		RESISTOR 47K 5% 2W MO TC=0+-200	28480	0764-0031
A1R7	0764-0031	7		RESISTOR 47K 5% 2W MO TC=0+-200	28480	0764-0031
A1R8	0757-1094	9	1	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1471-F
A1R9	0698-3160	8	1	RESISTOR 31.6K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3162-F
A1R10	0698-3455	4	1	RESISTOR 261K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2613-F
A1R11	0757-0280	3	8	RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A1R12	0757-0442	9	6	RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A1R13	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A1R14	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A1R15	0698-3457	6	2	RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3457
A1R16	0698-3457	6		RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3457
A1R17	0811-1668	9	1	RESISTOR 1.5 5% 2W PW TC=0+-400	75042	BWH2-1R5-J
A1R18	0757-0403	2	1	RESISTOR 121 1% .125W F TC=0+-100	24546	CT4-1/8-T0-121R-F
A1R19	2100-3207	1	1	RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	28480	2100-3207
A1R20	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F

*** Indicates factory selected value.**

Table 5-6. A1 Power Supply Replaceable Parts List (4/5)

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A1R21	0698-0084	9	8	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2151-F
A1R22	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A1R23	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2151-F
A1R24	0698-3155	1	6	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4641-F
A1R25	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4641-F
A1R26	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2151-F
A1R27	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4641-F
A1R28	0757-0394	0	1	RESISTOR 51.1 1% .125W F TC=0+-100	24546	CT4-1/8-T0-51R1-F
A1R29	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2151-F
A1R30	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A1R31	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2151-F
A1R32	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A1R33	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A1R34	0698-4037	0	3	RESISTOR 46.4 1% .125W F TC=0+-100	28480	0698-4037
A1R35	0698-4037	0		RESISTOR 46.4 1% .125W F TC=0+-100	28480	0698-4037
A1R36	0698-3260	9	3	RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A1R37	0698-3260	9		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A1R38	0698-3635	2	1	RESISTOR 680 5% 2W MO TC=0+-200	28480	0698-3635
A1R39	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4641-F
A1R40	0757-0465	6	2	RESISTOR 100K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1003-F
A1R41	0757-0397	3	1	RESISTOR 68.1 1% .125W F TC=0+-100	24546	CT4-1/8-T0-68R1-F
A1R42	0698-3454	3	1	RESISTOR 215K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2153-F
A1R43	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2151-F
A1R44	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A1R45	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A1R46	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4641-F
A1R47	0698-3260	9		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A1R48	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4641-F
A1R49	0698-0082	7	5	RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
A1R50	0757-0401	0	3	RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A1R51	0757-0419	0	1	RESISTOR 681 1% .125W F TC=0+-100	24546	CT4-1/8-T0-681R-F
A1R52	2100-3350	5	1	RESISTOR-TRMR 200 10% C SIDE-ADJ 1-TRN	28480	2100-3350
A1R53	0698-3438	3	1	RESISTOR 147 1% .125W F TC=0+-100	24546	CT4-1/8-T0-147R-F
A1R54	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
A1R55	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1003-F
A1R56	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2151-F
A1R57	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2151-F
A1R58	0698-3628	3	2	RESISTOR 220 5% 2W MO TC=0+-200	28480	0698-3628
A1R59	0698-3628	3		RESISTOR 220 5% 2W MO TC=0+-200	28480	0698-3628
A1R63	0698-3435	0	1	RESISTOR 38.3 1% .125W F TC=0+-100	28480	0698-3435
A1R64	0757-0274	5	2	RESISTOR 1.21K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1211-F
A1R65	0757-0274	5		RESISTOR 1.21K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1211-F
A1R66	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A1R67	0757-0438	3	1	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-F
A1R68	0757-0346	2	2	RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A1R69	0757-0984	4	1	RESISTOR 10 1% .5W F TC=0+-100	28480	0757-0984
A1R70	0757-0279	0	2	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3161-F
A1R71	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3161-F
A1R72	0698-0085	0		RESISTOR 2.61K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2611-F
A1R73	0698-0085	0		RESISTOR 2.61K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2611-F
A1R74	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
A1R75	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A1R76	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F
A1R77	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-T0-101-F

*** Indicates factory selected value.**

Table 5-6. A1 Power Supply Replaceable Parts List (5/5)

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A1R78	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
A1R79	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
A1R80	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A1R81	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A1R82	0698-4037	0		RESISTOR 46.4 1% .125W F TC=0+-100	28480	0698-4037
A1R83	0698-3162	0	2	RESISTOR 46.4K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4642-F
A1R84	0698-3162	0		RESISTOR 46.4K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4642-F
A1RV1	1901-1217	6	2	DIODE-VRTS 150V	28480	1901-1217
A1RV2	1901-1217	6		DIODE-VRTS 150V	28480	1901-1217
A1T1	9100-4618	7	1	XFMR-POWER	28480	9100-4618
A1T2	9100-4499	2	1	TRANSFORMER L(PINS 10 & 11): 5.3 MH+-30%	28480	9100-4499
A1T3	9100-4764	4	1	TRANSFORMER	28480	9100-4764
A1T4	9100-4765	5	1	TRANSFORMER	28480	9100-4765
A1TP1	0360-1653	5	18	CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP2	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP3	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP4	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP5	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP6	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP7	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP8	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP9	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP10	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP11	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP12	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP13	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP14	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP15	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP16	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP17	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP18	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1U1	1826-0147	9	1	IC 7812 V RGLTR TO-220	04713	MC7812CP
A1U2	1826-1599	7	1	IC V RGLTR-SWG 16-DIP-P PKG	28480	1826-1599
A1U3	1826-0122	0	1	IC 7805 V RGLTR TO-220	07263	7805UC
A1U4	1990-1190	1	3	DOUBLE-COUPLER	28480	1990-1190
A1U5	1990-1190	1		DOUBLE-COUPLER	28480	1990-1190
A1U6	1990-1190	1		DOUBLE-COUPLER	28480	1990-1190
A1W1	1251-4822	6	1	CONN-POST TYPE .100-PIN-SPCG 3-CONT	28480	1251-4822
A1X1	1252-1598	9	2	CONN-POST TYPE 2.54-PIN-SPCG 96-CONT	09922	PI96B30P00F50N9
A1X2	1252-1598	9		CONN-POST TYPE 2.54-PIN-SPCG 96-CONT	09922	PI96B30P00F50N9
	0340-1126	5	1	BARRIER-BLOCK 18-TERM INTERNAL FEED THRU	28480	0340-1126
	04278-00601	5	1	BOX SHIELD	28480	04278-00601
	04278-00602	6	1	BOX SHIELD	28480	04278-00602
	04278-01204	6	1	HEAT SINK	28480	04278-01204
	0515-1007	2	4	SCREW-MACH M3 X 0.5 16MM-LG	28480	0515-1007
	0515-1550	0	7	SCREW-MACHINE ASSEMBLY M3 X 0.5 8MM-LG	28480	0515-1550
	0515-1551	1	4	SCREW-MACHINE ASSEMBLY M3 X 0.5 10MM-LG	28480	0515-1551
	1258-0141	8	1	JUMPER-REMOVABLE FOR 0.025 IN SQ PINS	28480	1258-0141
	2110-0269	0	2	FUSEHOLDER-CLIP TYPE.25D-FUSE	28480	2110-0269
	4040-0748	3	1	EXTR-PC BD BLK POLYC .062-IN-BD-THKNS	28480	4040-0748
	4040-0749	4	1	EXTR-PC BD BRN POLYC .062-IN-BD-THKNS	28480	4040-0749

*** Indicates factory selected value.**

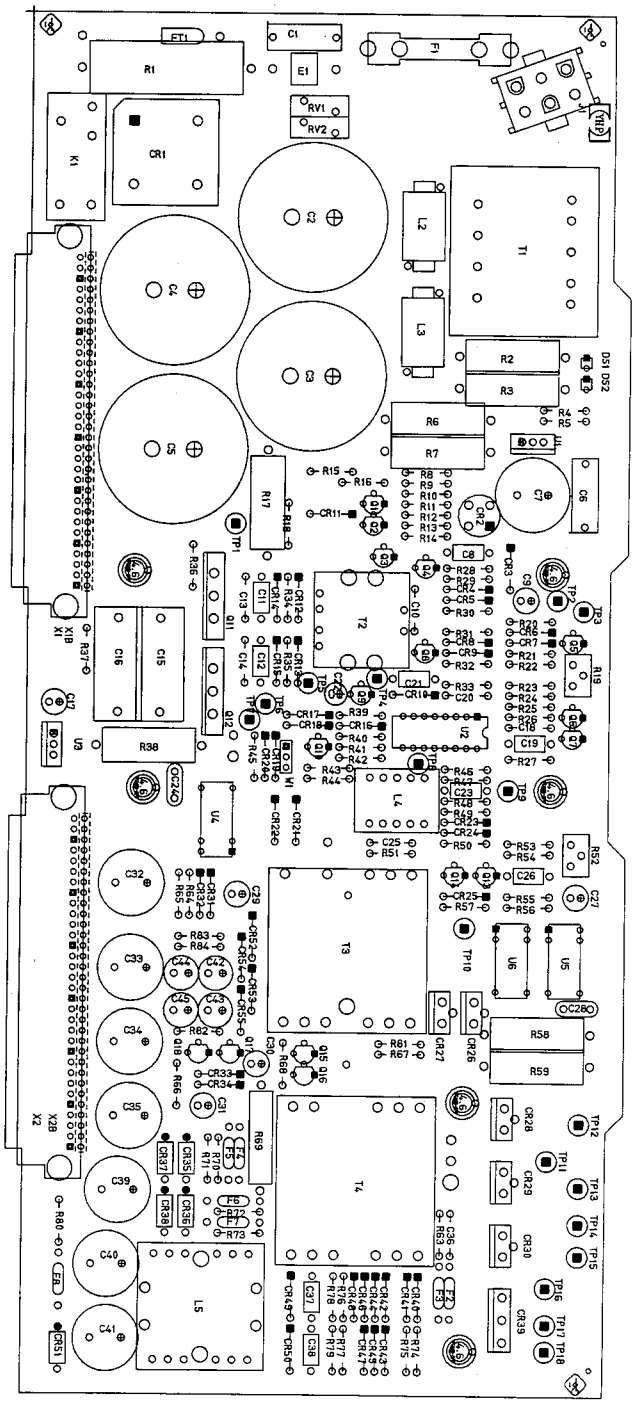
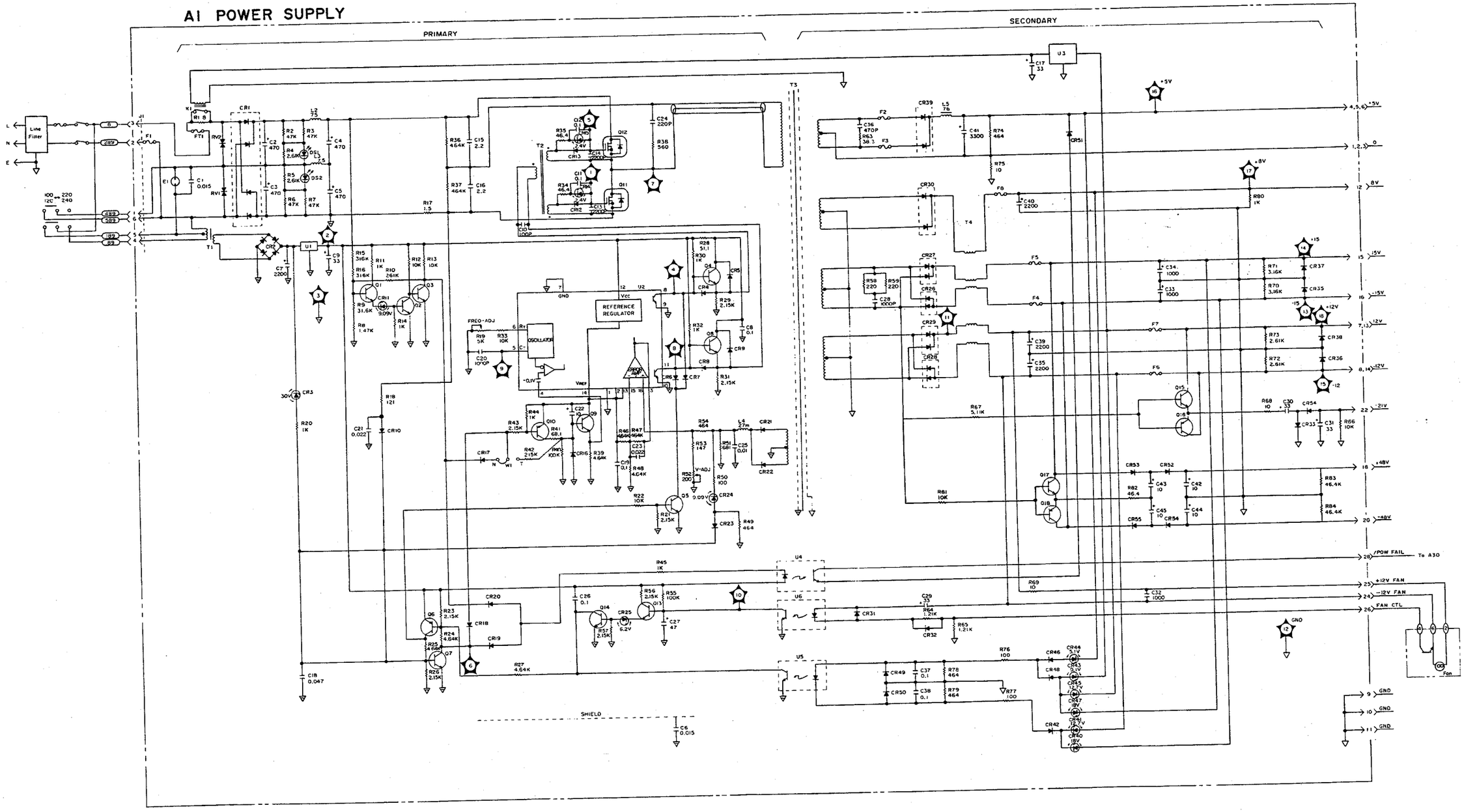


Figure 5-3. A1 Power Supply Component Locations



NOTES:

1. Reference designators within this assembly are abbreviated. Prefix abbreviation with assembly number for complete reference designator.
2. Unless otherwise indicated: Resistance in ohms (Ω)
   Capacitance in micro farads (μF)
   Inductance in micro henries (μH)

Figure 5-4. A1 Power Supply Schematic Diagrams

NOTES

5-9. A2 RANGE RESISTOR SERVICE SHEET

The A2 board is covered by the exchange assembly program. The part number of the A2 rebuilt exchange board is listed in Table 5-A2-1.

Table 5-A2-1. A2 Range Resistor Replaceable Parts List

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A2						
A2	04285-66502 04285-69502	2 8	1	RANGE RESISTOR BD RANGE RESISTOR BD (RE-BUILT)	28480 28480	04285-66502 04285-69502

These troubleshooting aids provide a list of test points. The A2 board test point locations are shown in Figure 5-A2-1.

Table 5-A2-2. A2 Test Points

Test Point	Signal Name	Description
A2TP1	+5V	+5 V DC
A2TP8	GND	Ground Line
A2TP9	-8	-8 V DC
A2TP10	+8	+8 V DC
A2TP11	-12	-12 V DC
A2TP12	+12	+12 V DC

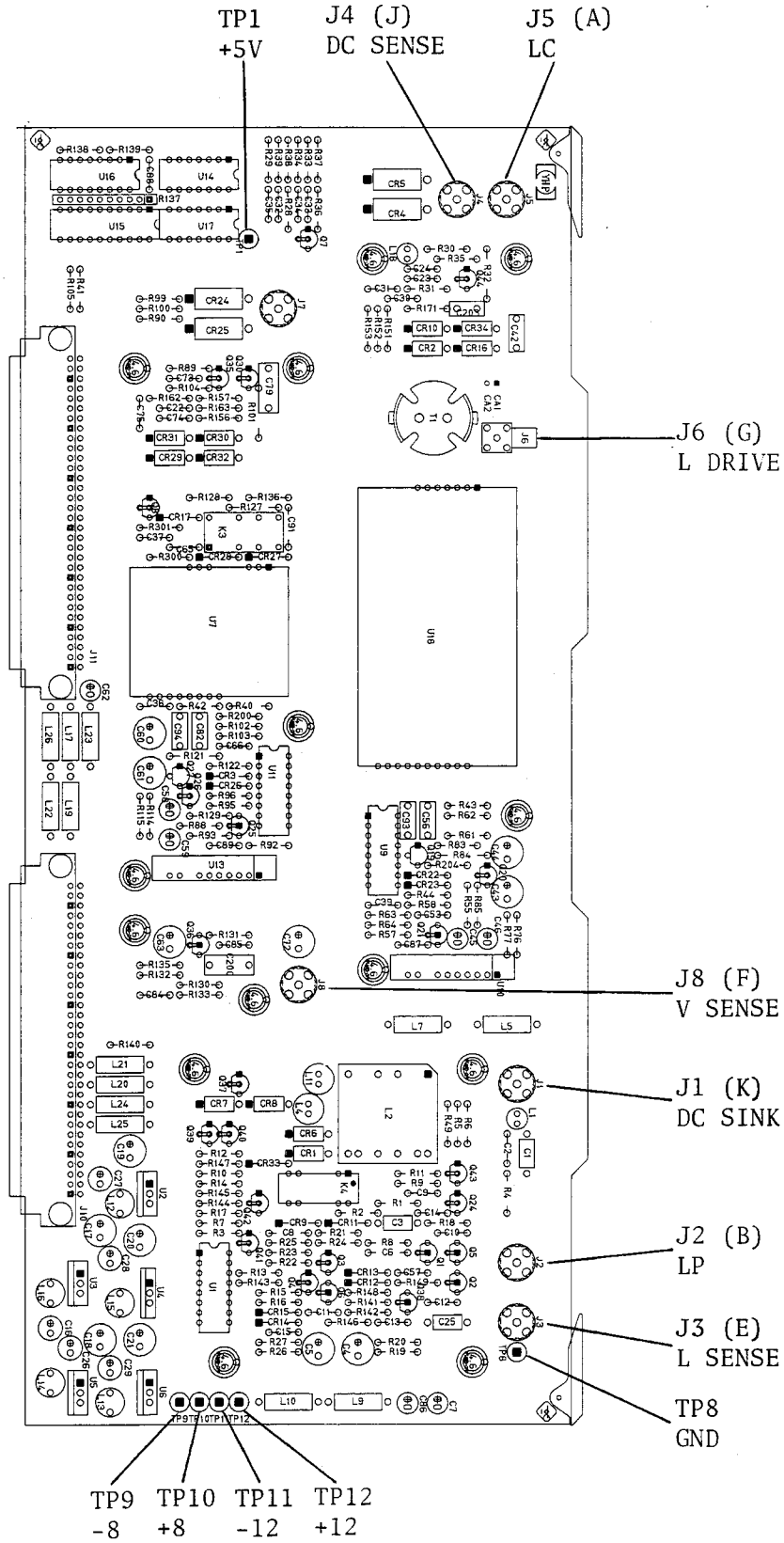


Figure 5-A2-1. A2 Range Resistor Test Point Locations

NOTES

5-10. A3 MODULATOR SERVICE SHEET

The A3 modulator board is covered by the exchange assembly program. The part number of the A3 rebuilt exchange board is listed in Table 5-A3-1. A3 Modulator Replaceable Parts List.

Table 5-A3-1. A3 Modulator Replaceable Parts List

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A3						
A3	04285-66503	3	1	MODULATOR BD	28480	04285-66503
	04285-69503	9		MODULATOR BD (RE-BUILT)	28480	04285-69503

These troubleshooting aids provide a list of test points in Table 5-A3-2. The test point locations are shown in Figure 5-A3-1.

Table 5-A3-2. Test Points List

Test Point	Signal Name	Description
A3TP1	*PSD*	Phase Detector Input
A3TP11	*90*	Integrator Output (0 °)
A3TP12	*0*	integrator Output (90 °)
A3TP16	*LC AMP*	L Drive Amp Input
A3TP19	*GND*	Ground Line
A3TP20	*GND*	Ground Line

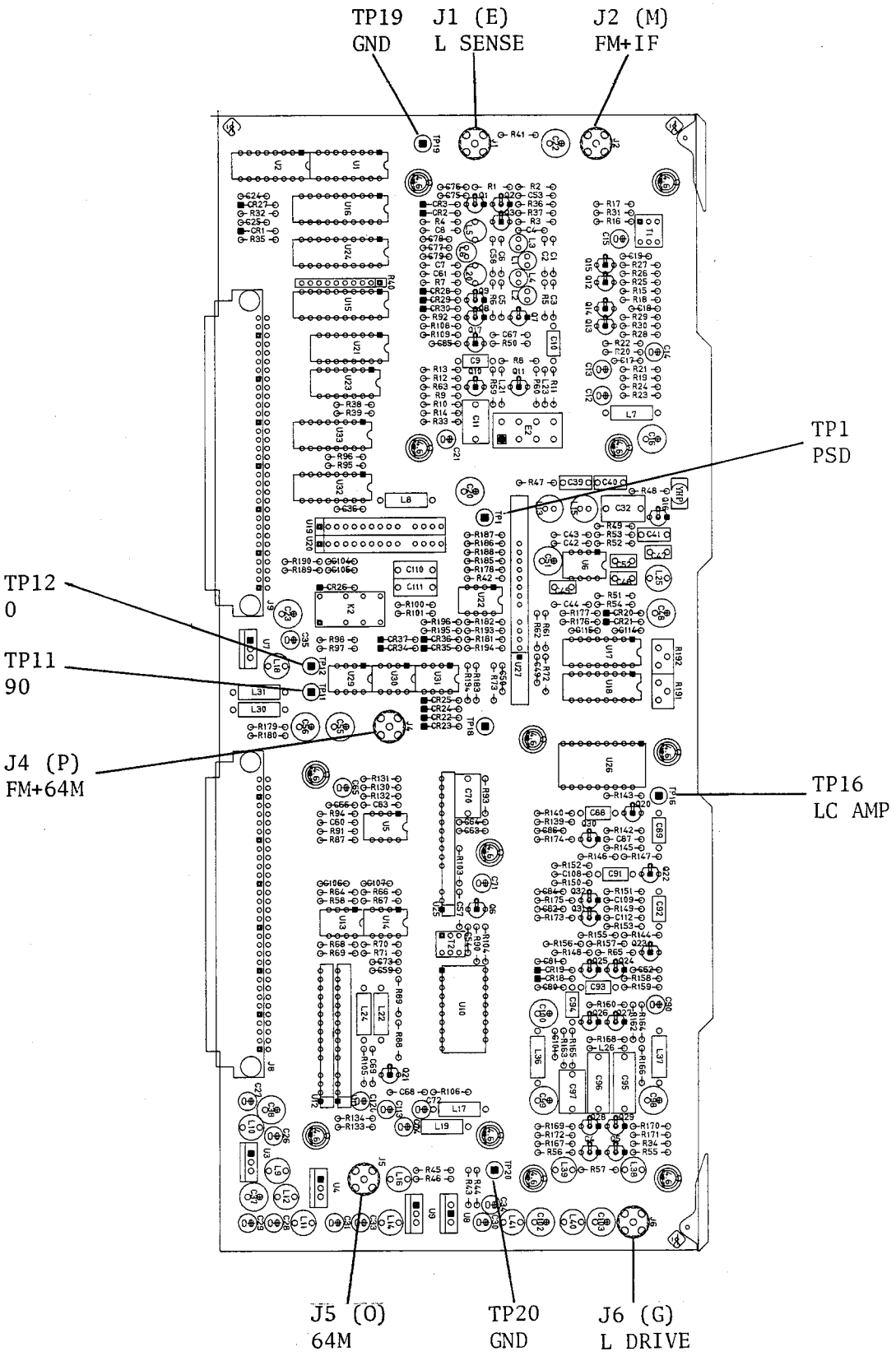


Figure 5-A3-1. A3 Modulator Test Point Locations

NOTES

5-11. A4 TEST SIGNAL AMPLIFIER/DC BIAS SERVICE SHEET

The A4 board is covered by the exchange assembly program. The part number of an A4 rebuilt exchange board is listed in Table 4-A4-1.

Table 4-A4-1. A4 High Power Amplifier/DC Bias Replaceable Parts List

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A4						
A4	04285-66504	4	1	HCUR AMP BD	28480	04285-66504
	04285-69504	0		HCUR AMP BD (RE-BUILT)	28480	04285-69504
	04285-66564	6	1	HCUR AMP/DC BIAS	28480	04285-66564
	04285-69564	2		HCUR AMP DC BIAS (RE-BULILT)	28480	04285-69564

These troubleshooting aids provide a list of test points. Table 5-A4-2 lists the standard A4 test opints. The test point locations are shown in Figure 5-A4-1. Table 5-A4-3 lists the option 001 A4 test points. The test point locations are shown in Figure 5-A4-2.

Table 5-A4-2. A4 (Standard) Test Points List

Test Point	Signal Name	Description
A4TP1	*HCUR*	Output Signal to Hcur Terminal
A4TP2	*GND*	Ground Line
A4TP10	*+5V*	+5 V DC
A4TP11	*-10V*	-10 V DC
A4TP13	*GND*	Ground Line
A4TP14	*+10*	+10 V DC

Table 5-A4-3. A4 (Option 001) Test Points List

Test Point	Signal Name	Description
A4TP1	*HCUR*	Output Signal to Hcur Terminal
A4TP2	*GND*	Ground Line
A4TP3	*DC BIAS*	DC Bias Output
A4TP4	*+5V*	+5 V DC
A4TP5	*GND*	Ground Line
A4TP6	-50V	-50 V DC
A4TP9	DAC OUT	DA Converter Output
A4TP10	*+5V*	+5 V DC
A4TP11	*-10V*	-10 V DC
A4TP13	*GND*	Ground Line
A4TP14	*+10*	+10 V DC

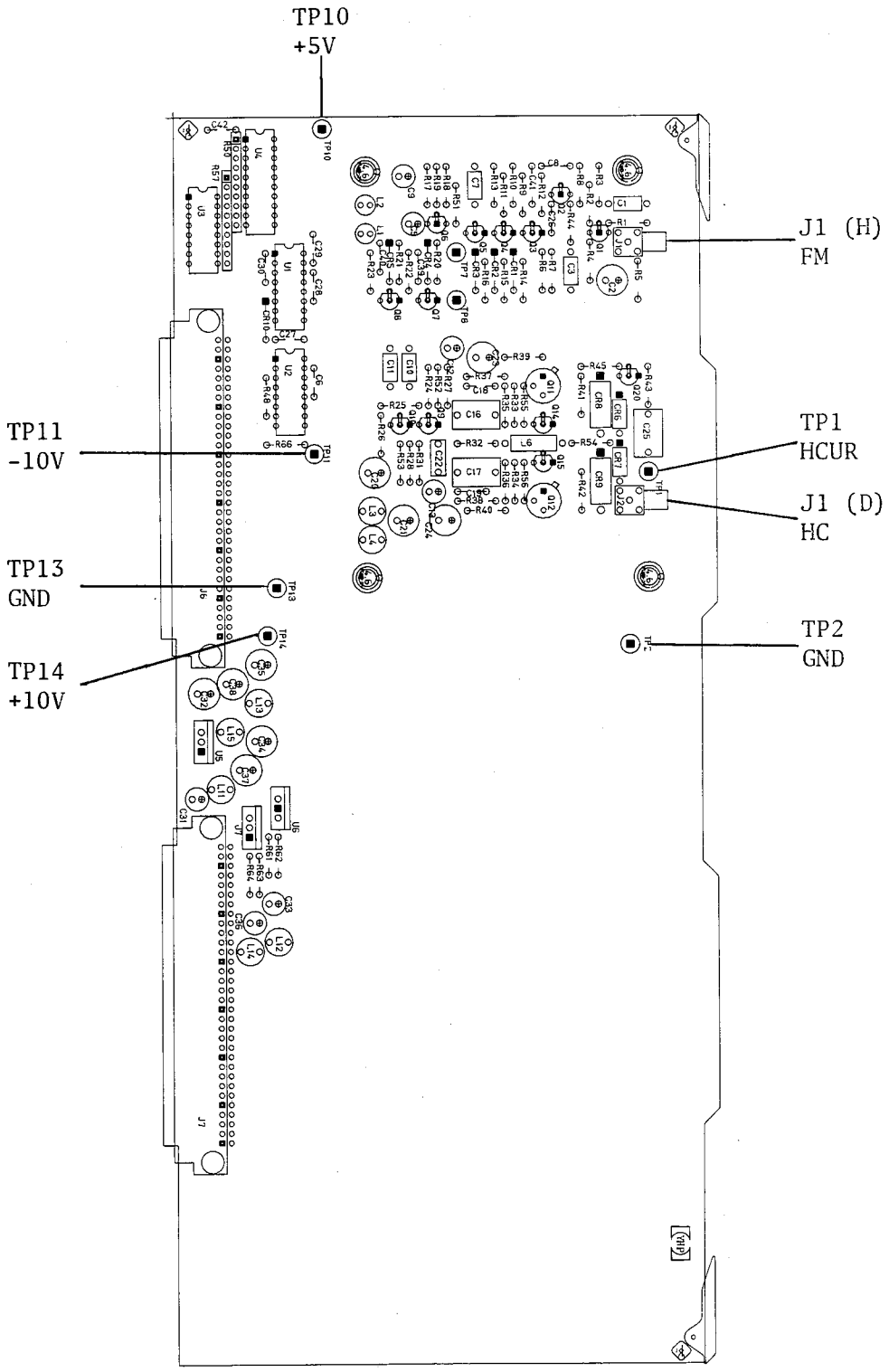


Figure 5-A4-1. A4 Test Signal Amplifier (Std) Test Point Locations

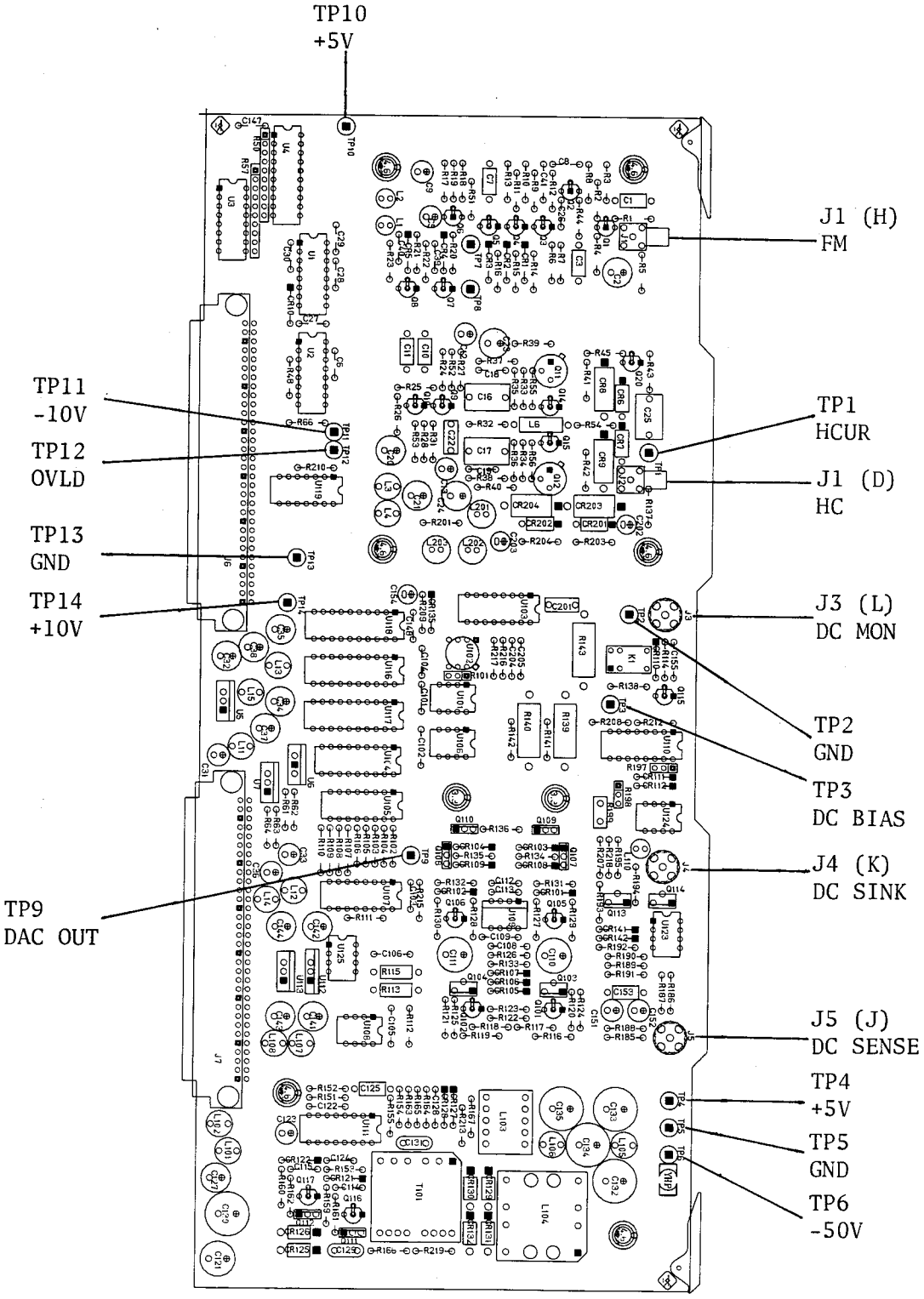


Figure 5-A4-2. A4 Test Signal Amp/DC Bias (Opt.001) Test Point Locations

5-12. A5 SIGNAL SOURCE,A81 PLL SYNTHESIZER SERVICE SHEET

The A5 signal source board and A81 PLL synthesizer board are covered by the exchange assembly program. The part number of A5 and A81 rebuilt exchange boards are listed in Table 5-A5/A8-1.

Table 5-A5/A81-1. A5/A81 Replaceable Parts List

Reference Designator	HP Part Number	CD	Qty.	Description	Mfr Code	Mfr Part Number
A5						
A5	04285-66505	5	1	SIGNAL SOURCE BD	28480	04285-66505
	04285-69505	1		SIGNAL SOURCE BD (RE-BUILT)	28480	04285-69505
A81	04285-66581	7	1	PLL SYNTHESIZER	28480	04285-66581
	04285-69581	3		PLL SYNTHESIZER (RE-BUILT)	28480	04285-69581

These troubleshooting aids provide a list of test points. Table 5-A5/A81-2 lists A5 test points. The test point locations are shown in Figure 5-A5/A81-1. Table 5-A5/A81-3 lists A81 test points. The test point locations are shown in Figure 5-A5/A81-2.

Table 5-A5/A81-2. A5 Test Points List

Test Point	Signal Name	Description
A5TP1	*VCXO* CTL	VCXO Control DC Voltage
A5TP2	*GND*	Ground Line
A5TP3	*IF*	IF Signal
A5TP4	*16IF*	16IF Signal

Table 5-A5/A81-3. A81 Test Points List

Test Point	Signal Name	Description
A81TP1	*GND*	Ground Line
A81TP5	*+12V*	+12 V DC
A81TP6	*-12V*	-12 V DC
A81TP7	*+5VA*	+5 V DC
A81TP8	*+5VB*	+5 V DC
A81TP14	*GND*	Ground Line

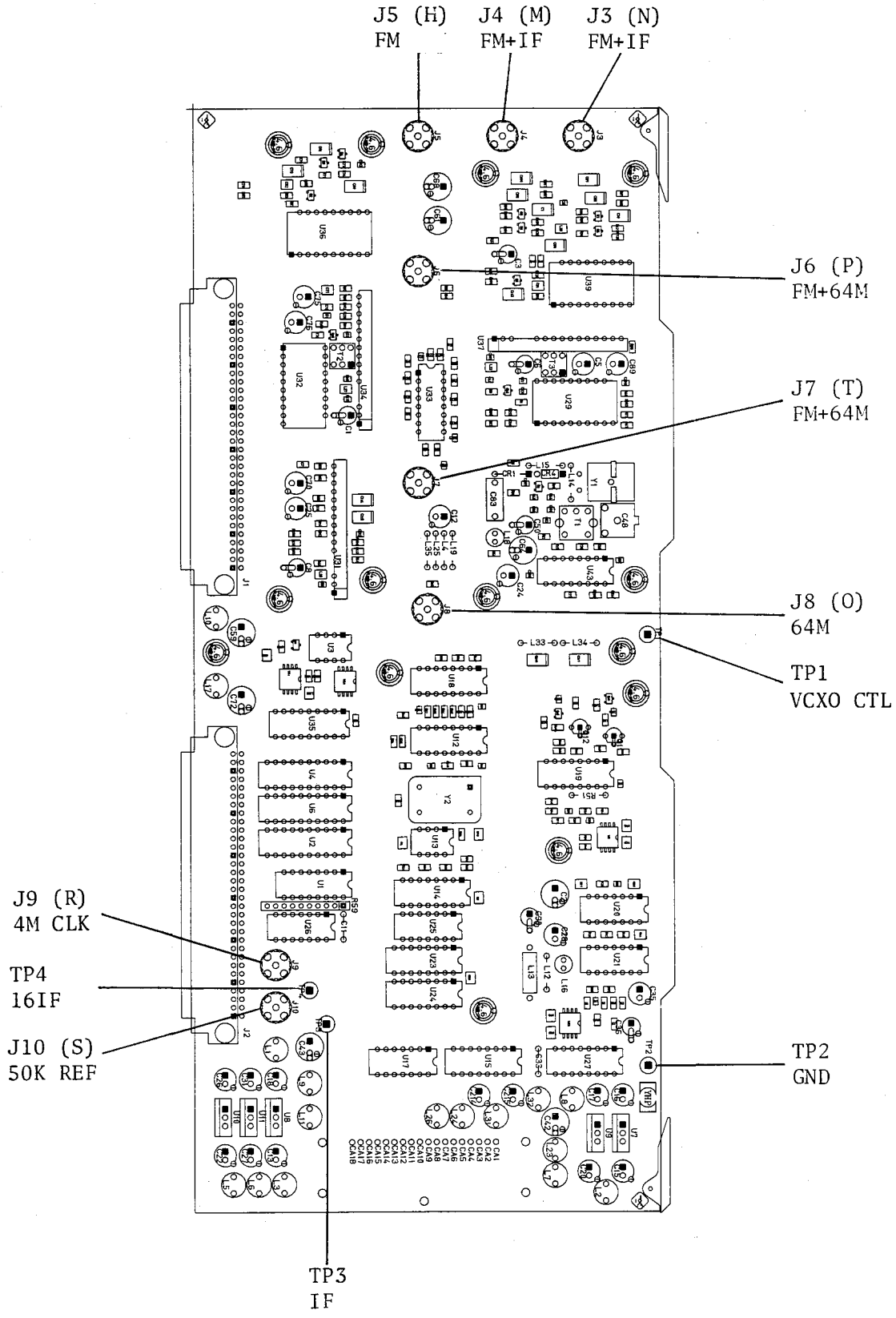


Figure 5-A5/A81-1. A5 Signal Source Test Point Locations

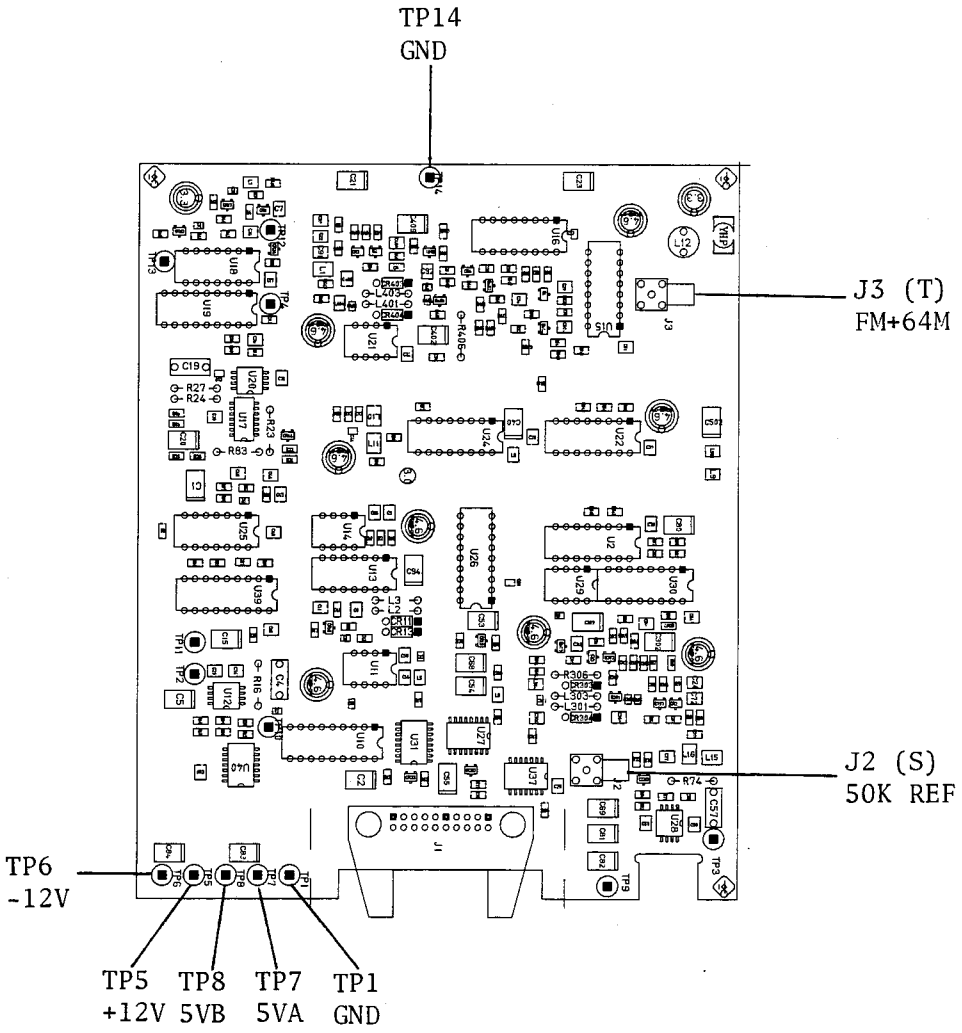


Figure 5-A5/A81-2. A81 PLL Synthesizer Test Point Locations

5-13. A6 VECTOR RATIO DETECTOR SERVICE SHEET

The A6 vector ratio detector board is covered by the exchange assembly program. The part number of an A6 rebuilt exchange board is listed in Table 5-A6-1.

Table 5-A6-1. A6 Replaceable Parts List

Reference Designator	HP Part Number	CD	Qty.	Description	Mfr Code	Mfr Part Number
A6						
A6	04285-66506 04285-69506	6 2	1	VRD BD VRD BD (RE-BUILT)	28480 28480	04285-66506 04285-69506

These troubleshooting aids provide a list of test points in Table 5-A6-2. The test point locations are shown in Figure 5-A6-1.

Table 5-A6-2. A6 Test Points List

Test Point	Signal Name	Description
A6TP3	*INTEG*	ADC Integrator Output
A6TP4	*PSD*	Phase Detector Input
A6TP5	*EOC*	End Of Conversion Signal
A6TP6	*+5V*	+5 V DC
A6TP7	*+8V*	+8 V DC
A6TP8	*-8V*	-8 V DC
A6TP9	*+12V*	+12 V DC
A6TP10	*-12V*	-12 V DC
A6TP11	*ADC*	A-D Converter Input
A6TP12	*FM+IF*	FM+IF Signal
A6TP13	*/IT*	Integration Time Signal
A6TP15	*AD CLK*	Clock for A-D Converter (4 MHz)
A6TP16	*/MEAS*	End of Measurement Signal
A6TP17	*GND*	Ground Line
A6TP18	*GND*	Ground Line
A6TP19	*GND*	Ground Line
A6TP20	*GND*	Ground Line

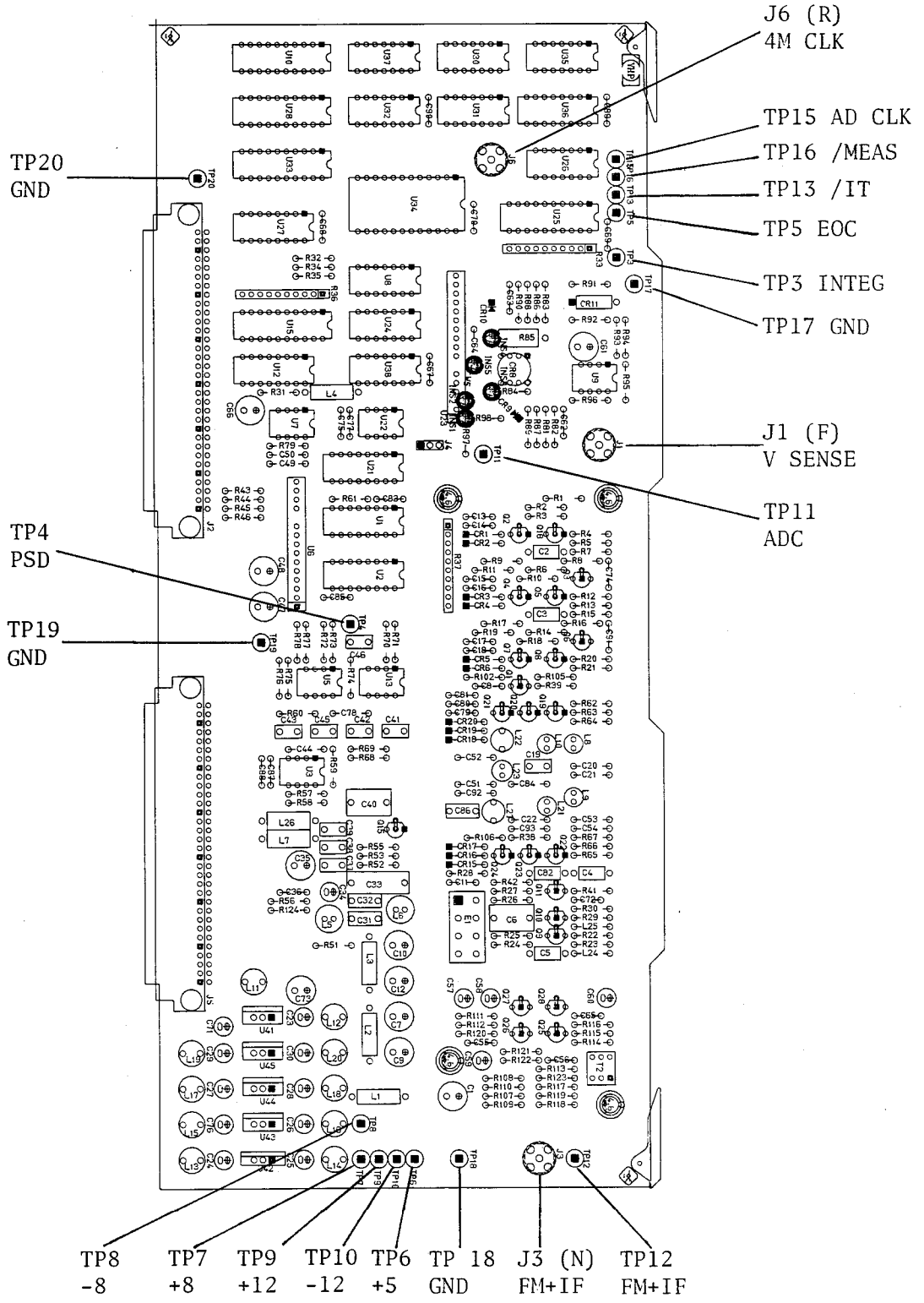


Figure 5-A6-1. A6 Vector Ratio Detector Test Point Locations

NOTES

5-14. A7 DIGITAL CONTROL SERVICE SHEET

5-14-1. CIRCUIT DESCRIPTION

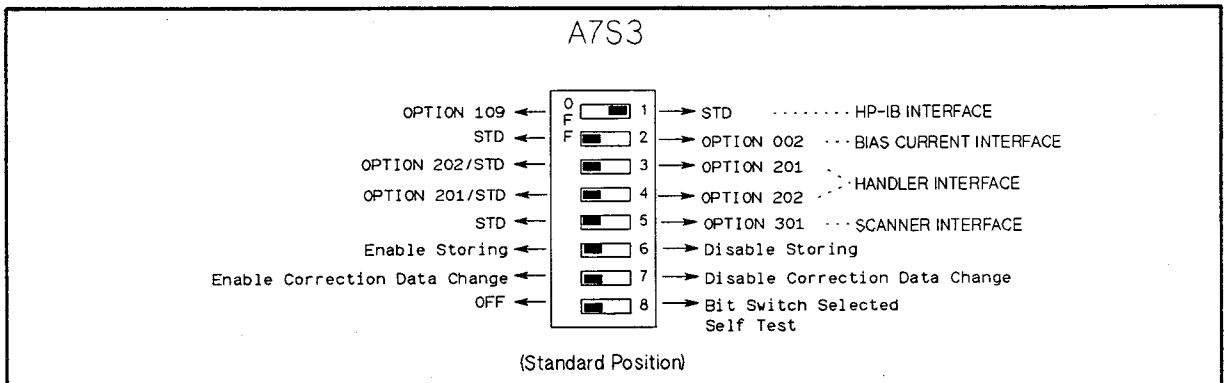
The A7's (Digital Control board) MPU is A7U3 (16-bit micro processor). A7U6, A7U7, A7U8, A7U9, A7U18, A7U19, A7U20, and A7U21 are the programmed ROMs. A7U11, A7U12, A7U23, and A7U24 are EEPROMs. A7W2 is used to set write protection for A7U12 and A7U24 (Protect is in Normal position). A7W3 is used to set the write protection for A7U11 and A7U23 (Unprotect in Normal position). Table 5-A7-1 shows the data map for the EEPROMs.

Table 5-A7-1. EEPROM Data Map

EEPROMs	Stored Data
A7U11/A7U23	System Configuration, Open/Short/Load Correction Cable Correction
A7U12/A7U24	Adjustment (Phase Tracking, Test Signal Level/Monitor, DC Bias Level, Impedance Measurement)

5-14-2. FUNCTION CHANGE SWITCH (A7S3) SETTING

A7 digital control board function changes according to the A7S3 setting. Figure 5-A7-1 shows the switch function.



(Standard Position)

1: HP-IB Interface

OFF: HP-IB is not installed. (Option 109)
ON: HP-IB is installed.

2: Accessory Control Interface

OFF: Accessory Control IF is not installed.
ON: Accessory Control IF is installed. (Option 002)

3/4: Handler Interface

3	4	
OFF	**OFF:**	Handler IF is not installed.
OFF	**ON:**	Handler IF (Option 202) is installed.
ON	**OFF:**	Handler IF (Option 201) is installed.
ON	**ON:**	Not Applicable

5: Scanner Compensation/Interface

OFF: Scanner Comp/IF is not installed.
ON: Scanner Comp/IF is installed. (Option 301)

6: Control Setting Data Protection

OFF: Setting data in EEPROMs and Memory Card can be updated. (Normal setting)
ON: Setting data in EEPROMs and Memory Card is write protected.

7: Correction Data Protection

OFF: Correction data can be updated. (Normal setting)
ON: Correction data is write protected.

8: Self Test/EEPROM initialization

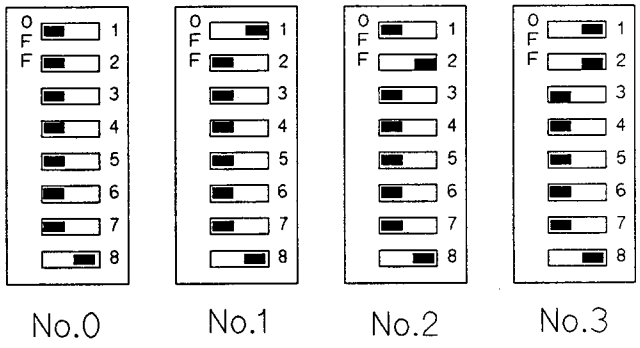
OFF: Normal Mode
ON: Self Test/EEPROM Intialize Mode (Refer to paragraphs 5-13-4 and 5-13-5)

Figure 5-A7-1. A7S3 Functions

5-14-3. SELF TEST

The self tests, listed in Table 5-A7-2 can be performed, by setting the A7S3. Table 5-A7-2 shows the A7S3 settings for the self tests.

Table 5-A7-2. Self Test Selected With A7S3



No.	Description
0	This self test displays the ROM check sum on the LCD display.
1	This self test performs the RAM read/write test.
2	This self test performs the EEPROM read/write test. The time required for completing this test is approximately 17 minutes.
3	This self test perform the front panel keyboard test. Pressed key code and its abbreviated name will be displayed.

NOTE

After performing the test, set A7S3 properly according to Figure 5-A7-1 A7S3 Functions.

5-14-4. EEPROM INITIALIZATION

EEPROMs on the A7 board and the A40 (Scanner Copm/IF) board can be initialized. The EEPROMs on the A7 board are separated into two pairs, U11/U23 and U12/U24, as described in paragraph 5-14-1. EEPROM initialization procedures for the each EEPROM pair are as follows.

1. A7U11/U23 Initialization

Procedure:

1. Set switch A7S3 as shown in Figure 5-A7-2.

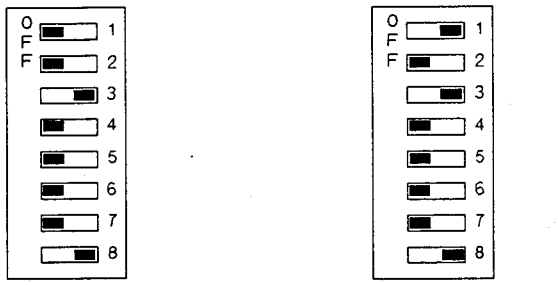


Figure 5-A7-2. A7S3 Settings For EEPROM Initialization

2. Replace the A7 board, then turn ON the HP 4285A.

2. A7U12/U24 Initialization

NOTE

Adjustment Program, described in the Section 2, is needed to initialize A7U12 and A7U24.

NOTE

This procedure writes dummy adjustment data into the EEPROMs. So, the EEPROM data updating adjustment procedure must be performed after the hardware problem is solved.

Procedure:

1. Perform steps 1 to 6 of the Adjustment Program Initial Operating Procedure in paragraph 2-7-2.

2. Load the EEPROM initialization program into the computer, the file name is **"INIT_4285A"**.

3. Press the computer's **RUN** key to start the initialization.

3. A40 EEPROMs Initialization

Procedure:

1. Set the A7S3 as shown in figure 5-A7-2.

2. Replace the A7 board, then turn the HP 4285A ON.

5-14-5. TROUBLESHOOTING AIDS

Since the A7 board has been set up under the exchange program, when the A7 board is defective, you replace it. The board fault isolation procedures are given in SECTION 3.

5-14-6. PARTS REPLACEMENT

The replaceable parts for the A7 board are divided into three groups: a ROMless A7 board, a set of programmed ROMs, and EEPROMs. This protects against the mismatching of ROM versions between the replaced and the defective CPU boards. The EEPROM updating adjustment procedure need not be perormed if the A7 board replacement EEPROMs contain up to date data. Only the ROMless A7 board has been set up under the exchange assembly program.

The replaceable parts for the A7 board are listed in Table 5-A7-3. The part number for a rebuilt exchange board is listed on the first page of the A7 board replaceable parts list. Replacement procedures for each group are as follows.

ROM Replacement

Order a replacement ROM of the correct version for the defective ROM and replace the deective ROM.

EEPROM (U11/U23) Replacement

Replace the defective EEPROM with a new one, and then initialize it according to paragraph 5-14-4.

EEPROM (U12/U24) Replacement

1. Replace the defective EEPROM with a new one.

2. Initialize it according to paragraph 5-14-4 to check its operation.

3. If it operates correctly, perform the following adjustment according to the procedure in section 2.

    - Phase Tracking Adjustment
    - DC Bias Level Adjustment (Option 001 only)
    - Test Signal Level/Level Monitor Adjustment
    - Impedance Measurement Adjustment

A7 ROMless Board Replacement

1. Order the A7 ROMless board.
2. Remove the ROMs and the EEPROMs from the defective A7 board, and replace them into the same position of the new A7 board.
3. Set the new A7 board's A7S3 as same as the defective A7 board's.

5-14-7. COMPONENT LOCATIONS

The component locations for the A7 Digital Control Board are shown in Figure 5-A7-3.

5-14-8. SCHEMATIC DIAGRAM

The A7 Digital control Board's schematic diagram is not supplied since the ROMless A7 board has been set up on the exchange assembly program.

Table 5-A7-3. A7 Digital Control Replaceable Parts Lists

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A7						
A7	04284-66657	7	1	DIGITAL CONTROL W/O ROM	28480	04284-66657
	04284-69657	3		DIGITAL CONTROL W/O ROM (RE-BUILT)	28480	04284-69657
				ROM		
				Version 01.00		
	04285-86001	8		ROMs (version 01.00) Set	28480	04285-86301
A7U6	04285-85001	6	1	ROM 0K BIT0	28480	04285-85301
A7U7	04285-85003	8	1	ROM 20K BIT0	28480	04285-85303
A7U8	04285-85005	0	1	ROM 40K BIT0	28480	04285-85305
A7U9	04285-85007	2	1	ROM 60K BIT0	28480	04285-85305
A7U18	04285-85002	7	1	ROM 0K BIT8	28480	04285-85302
A7U19	04285-85004	9	1	ROM 20K BIT8	28480	04285-85304
A7U20	04285-85006	1	1	ROM 40K BIT8	28480	04285-85306
A7U21	04285-85008	3	1	ROM 60K BIT8	28480	04285-85306
				EEPROM		
A7U11	1818-3801	1	4	IC NMOS 65536 (64K) STAT RAM 150-NS 3-S	S4013	HN58064P-30
A7U12	1818-3801	1		IC NMOS 65536 (64K) STAT RAM 150-NS 3-S	S4013	HN58064P-30
A7U23	1818-3801	1		IC NMOS 65536 (64K) STAT RAM 150-NS 3-S	S4013	HN58064P-30
A7U24	1818-3801	1		IC NMOS 65536 (64K) STAT RAM 150-NS 3-S	S4013	HN58064P-30

*** Indicates factory selected value.**

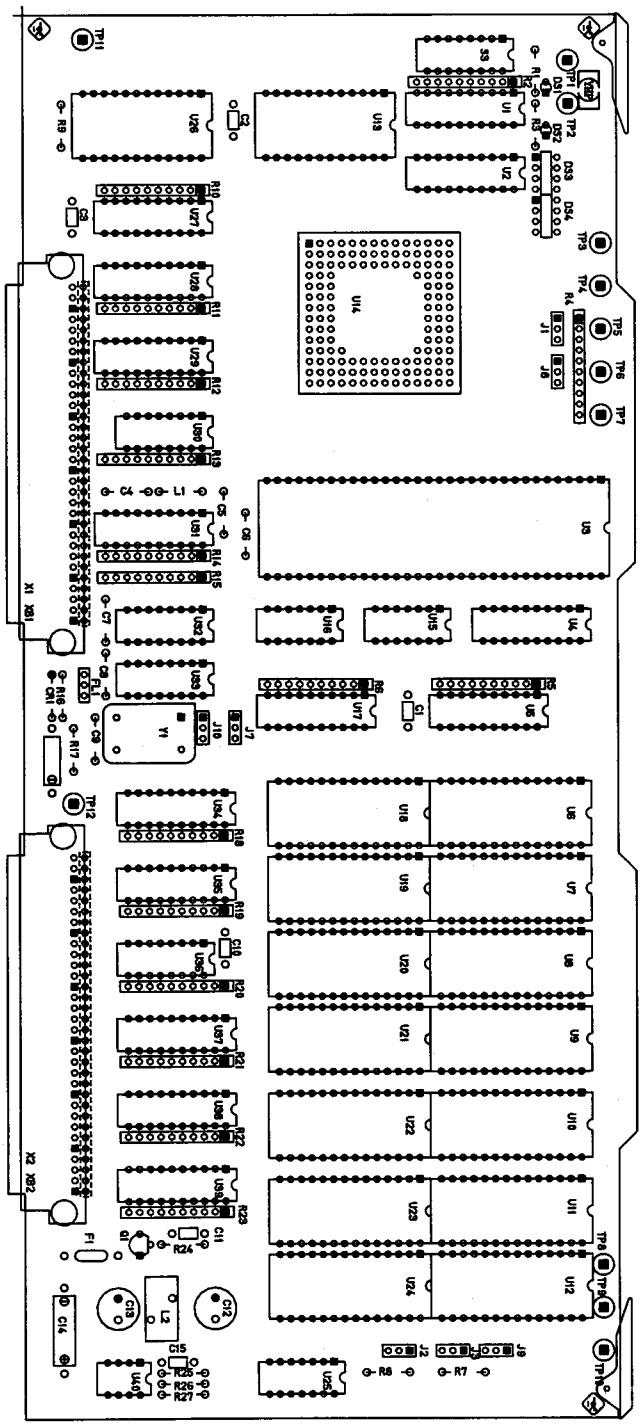


Figure 5-A7-3. A7 Digital Control Component Locations

5-15. A9, A13, A90, AND A91 BOARDS SERVICE SHEET

5-15-1. CIRCUIT DESCRIPTION

The A9 keyboard consists of Key switches, LED indicators, a buzzer, and the LCD contrast potentiometer. The A13 DC-AC Converter Board converts ±12 V DC into 600 V AC to supply the 600 V AC to the A91 LCD Module board to backlight the LCD. The A90 Keyboard/ Display Control Module board interfaces the A7 CPU board to both the A9 Keyboard and the A91 LCD module board. The A91 LCD module is the HP 4284A's display screen.

5-15-2. TROUBLESHOOTING AIDS

Fuse A9F1 for the A90 board and is located on the A9 Keyboard. If the HP 4285A display screen isn't active, check fuse A9F1 first.

The A90 and A91 board assemblies aren't repaired at the component level because the components on each board are surface mounted, and they are difficult to be replace. Thus, A90 or A91 are faulty, repair them at the assembly level only.

5-15-3. REPLACEABLE PARTS LISTS

The replaceable parts for the A9 Keyboard are listed in Table 5-A9/A13/A90/A91-1. The replaceable parts for the A13 DC-AC Converter, the A90 Keyboard/Display Control and the A91 LCD module are listed in Table 5-A9/A13/A90/A91-2. The A90 and A91 boards are repaired at the assembly level only, because the components on each board are surface mounted, and are difficult to replace. So, only the complete assembly part numbers are listed in Table 5-A9/A13/A90/A91-2.

5-15-4. COMPONENT LOCATIONS

The component locations for the A9 Keyboard and the A13 DC-AC Converter board are shown in Figure 5-A9/A13/A90/A91-1. Component locations for the A90 and A91 boards are not shown because these boards are repaired at the assembly level only.

5-15-5. SCHEMATIC DIAGRAMS

The A9 Keyboard, A13 DC-AC Converter, A90 Keyboard/Display Control Unit, and A91 LCD Module schematic diagrams are shown in Figure 5-A9/A13/A90/A91-2.

Table 5-A9/A13/A90/A91-1. A9 Keyboard Replaceable Parts List

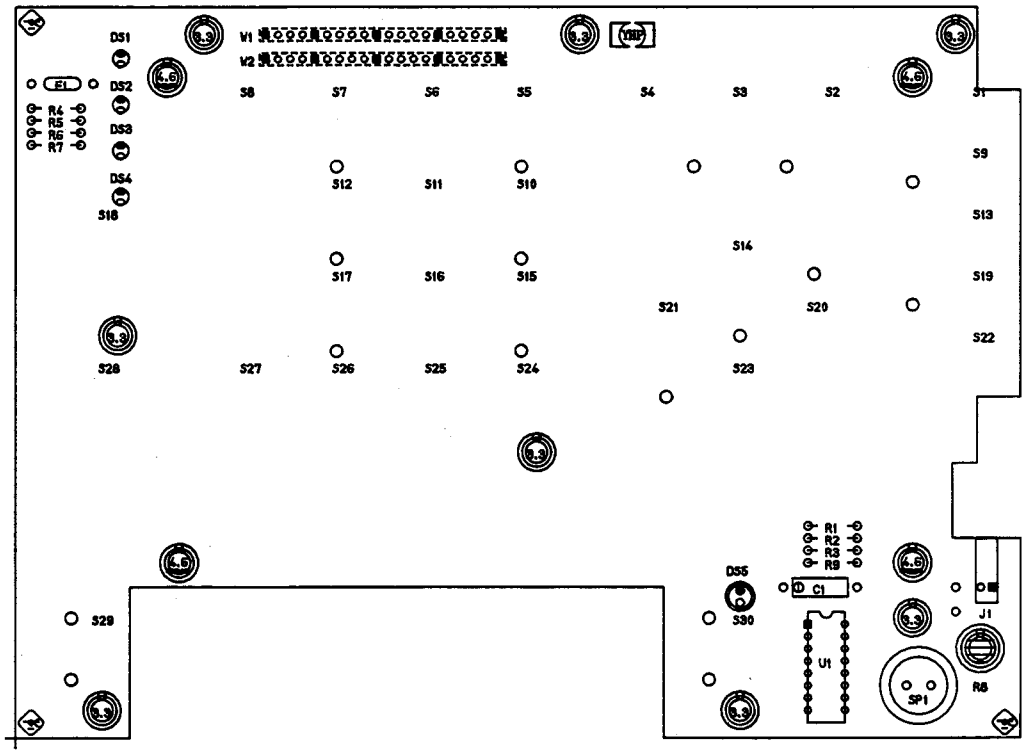
Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A9						
A9	04279-66559	1	1	KEY BOARD	28480	04279-66559
A9C1	0180-0197	8	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A9DS1	1990-0487	7	4	LED-LAMP LUM-INT=2MCD BVR=5V	28480	HLMP-1401
A9DS2	1990-0487	7		LED-LAMP LUM-INT=2MCD BVR=5V	28480	HLMP-1401
A9DS3	1990-0487	7		LED-LAMP LUM-INT=2MCD BVR=5V	28480	HLMP-1401
A9DS4	1990-0487	7		LED-LAMP LUM-INT=2MCD BVR=5V	28480	HLMP-1401
A9DS5	1990-1226	4	1	LED-LAMP LUM-INT=2.2MCD IF=20MA-MAX	28480	1990-1226
A9F1	2110-0741	3	1	FUSE 1A 125V NTD UL	28480	2110-0741
A9J1	1251-4959	0	1	CONNECTOR 2-PIN M METRIC POST TYPE	28480	1251-4959
A9R1	0698-3155	1	2	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4641-F
A9R2	0757-0465	6	1	RESISTOR 100K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1003-F
A9R3	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4641-F
A9R4	0698-0082	7	4	RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
A9R5	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
A9R6	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
A9R7	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
A9R8	2100-4174	3	1	RESISTOR-VAR CONTROL CF 20K 10% LIN	28480	2100-4174
A9R9	0698-3440	7	1	RESISTOR 196 1% .125W F TC=0+-100	24546	CT4-1/8-T0-196R-F
A9SP10	9164-0295	2	1	ALARM-AUDIBLE	28480	9164-0295
A9U1	1820-1423	4	1	IC MV TTL LS MONOSTBL RETRIG DUAL	01295	SN74LS123N
A9W1	8120-4904	5	1	FLEX JUMPER WIRE	28480	8120-4904
A9W2	8120-4910	3	1	FLEX JUMPER WIRE	28480	8120-4910

*** Indicates factory selected value.**

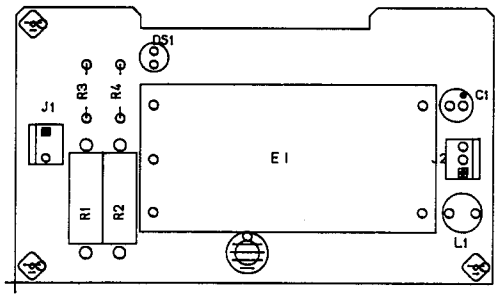
Table 5-A9/A13/A90/A91-2. A13, A90 and A91 Boards Replaceable Parts List

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A13						
A13	04278-66513	6	1	DC-AC CONVERTER	28480	04278-66513
A13C1	0180-3602	6	1	CAPACITOR-FXD 22UF+-20% 50VDC AL	28480	0180-3602
A13DS1	2140-0127	2	1	LAMP-NEON 90V	28480	2140-0127
A13E1	04278-61101	8	1	CONVERTER DCIAC	28480	04278-61101
A13J1	1251-4938	5	2	CONNECTOR 3-PIN M METRIC POST TYPE	28480	1251-4938
A13J2	1251-4938	5		CONNECTOR 3-PIN M METRIC POST TYPE	28480	1251-4938
A13L1	9140-1278	3	1	INDUCTOR 68UH 10% 7.5D-MM Q=60	28480	9140-1278
A13R1	0689-1055	7	2	RESISTOR 1M 5% 1W CC TO=0+1000	01121	GB1055
A13R2	0689-1055	7		RESISTOR 1M 5% 1W CC TO=0+1000	01121	GB1055
A13R3	0698-3454	3	1	RESISTOR 215K 1% .125W F TC=0+-100	24546	CT4-1/8-TO-2153-F
A13R4	0698-3455	4	1	RESISTOR 261K 1% .125W F TC=0+-100	24546	CT4-1/8-TO-2613-F
A90						
A90	04278-66590	9	1	KEYBOARD/DISPLAY CONTROL	28480	04278-66590
A91						
A91	04278-61102	9	1	LCD MODULE	28480	04278-61102

*** Indicates factory selected value.**

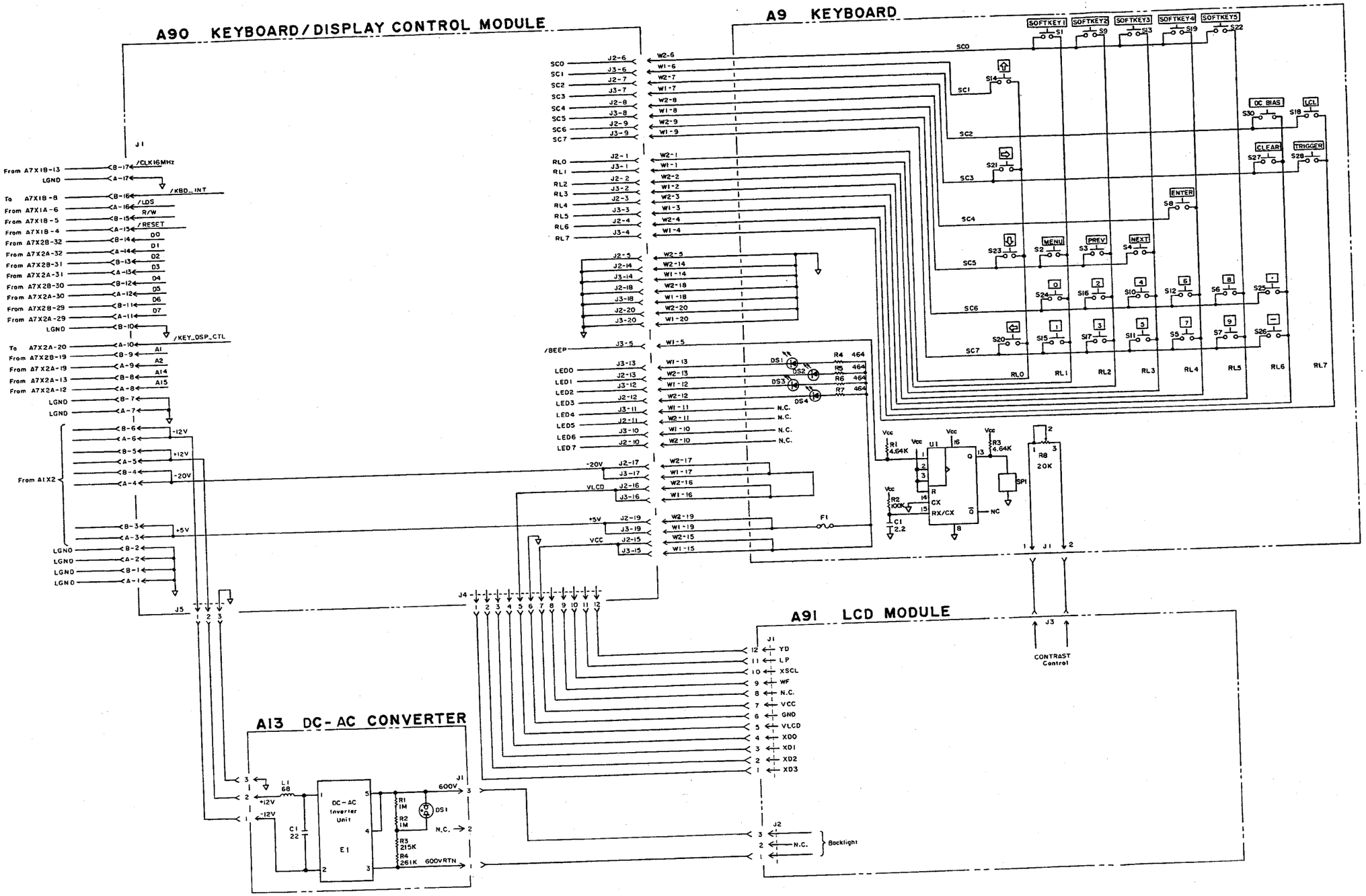


A9 Component Locations



A13 Component Locations

Figure 5-A9/A13/A90/A91-1. A9 Keyboard/A13 DC-AC Converter Component Locations



NOTES:
1. Reference designators within this assembly are abbreviated. Prefix abbreviation with assembly number for complete reference designator.
2. Unless otherwise indicated: Resistance in ohms (Ω)
   Capacitance in micro farads (μF)
   Inductance in micro henries (μH)

Figure 5-A9/A13/A90/A91-2. A9 Keyboard/A13 DC-AC Converter Schematic Diagrams

NOTES

5-16. A10 MEMORY CARD INTERFACE SERVICE SHEET

5-16-1. CIRCUIT DESCRIPTION

The A10 Memory card I/F board contains only connectors for the A7 CPU board and the Memory Card.

5-16-2. TROUBLESHOOTING AIDS

No troubleshooting data is given for the A10 Memory Card I/F board. The pin assignment list gives the information needed for troubleshooting.

5-16-3. REPLACEABLE PARTS LISTS

The replaceable parts for the A10 Memory Card I/F board are listed in Table 5-A10-1.

5-16-4. COMPONENT LOCATIONS

The component locations for the A10 Memory Card Board are shown in Figure 5-A10-1.

5-16-5. SCHEMATIC DIAGRAM

A schematic diagram for the A10 Memory Card I/F board is not supplied, the pin assignments give the information needed for troubleshooting.

Table 5-A10-1. A10 Memory Card Replaceable Parts Lists

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A10						
A10	04278-66510	3	1	MEM CARD SOCKET	28480	04278-66510
A10C1	0160-6561	0	1	CAPACITOR-FXD .1UF+-20% 50VDC CER	16299	CAC02Z5U104M050A
A10X1	1251-3025	9	1	CONN-POST TYPE .100-PIN-SPCG 34-CONT	28480	1251-3025
A10X2	1251-1951	3	1	CONN 38PIN	28480	1252-1951

*** Indicates factory selected value.**

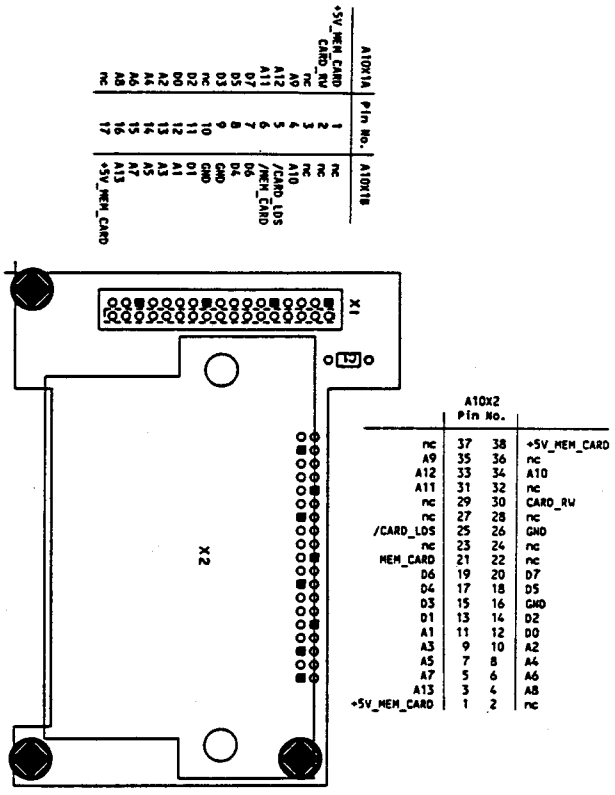


Figure 5-A10-1. A10 Memory Card I/F Component Locations

NOTES

5-17. A11 MOTHERBOARD SERVICE SHEET

5-17-1. CIRCUIT DESCRIPTION

The A11 Motherboard is the common bus for all other boards.

5-17-2. TROUBLESHOOTING AIDS

No troubleshooting data is given for the A11 Motherboard.

5-17-3. REPLACEABLE PARTS LISTS

The replaceable parts for the A11 Motherboard are listed in Table 5-A11-1.

5-17-4. COMPONENT LOCATIONS

The component locations on the A11 motherboard are shown in Figure 5-A11-2.

4-17-5. SCHEMATIC DIAGRAM

A schematic diagram for the A11 Motherboard is not supplied.

Table 5-A11-1. A11 Motherboard Replaceable Parts List

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A11						
A11	04285-66511	2	1	A11 MOTHERBOARD	28480	04284-66511
J1	1251-4938	5	1	CONNECTOR 3-PIN M METRIC POST TYPE	28480	1251-4938
J2	1251-5066	2	1	CONN-POST TYPE 2.5-PIN-SPCG 2-CONT	28480	1251-5066
J3	1251-7406	8	1	CONNECTOR 10-PIN M METRIC POST TYPE	28480	1251-7406
J4	1252-1404	6	2	CONN-POST TYPE 2.54-PIN-SPCG 34-CONT	28480	7834-0000T
J5	1252-1404	6		CONN-POST TYPE 2.54-PIN-SPCG 34-CONT	28480	7834-0000T
X1	1252-1745	8	18	CONN-POST TYPE 64-CONT	28480	1252-1745
X2	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X4	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X5	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X6	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X7	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X8	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X9	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X10	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X11	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X13	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X14	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X15	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X16	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X17	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X18	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X19	1251-4938	5	1	CONNECTOR 3-PIN	28480	1251-4938
X20	1251-5066	2	1	CONN-POST TYPE 2-CONT	28480	1251-5066
X21	1252-1404	6	1	CONN-POST 34-CONT	28480	7834-0000T
	04278-61624	0	1	FL CBL ASSY 34P	28480	04278-61624
	04278-61629	5	1	FL CBL ASSY 34P	28480	04278-61629

*** Indicates factory selected value.**

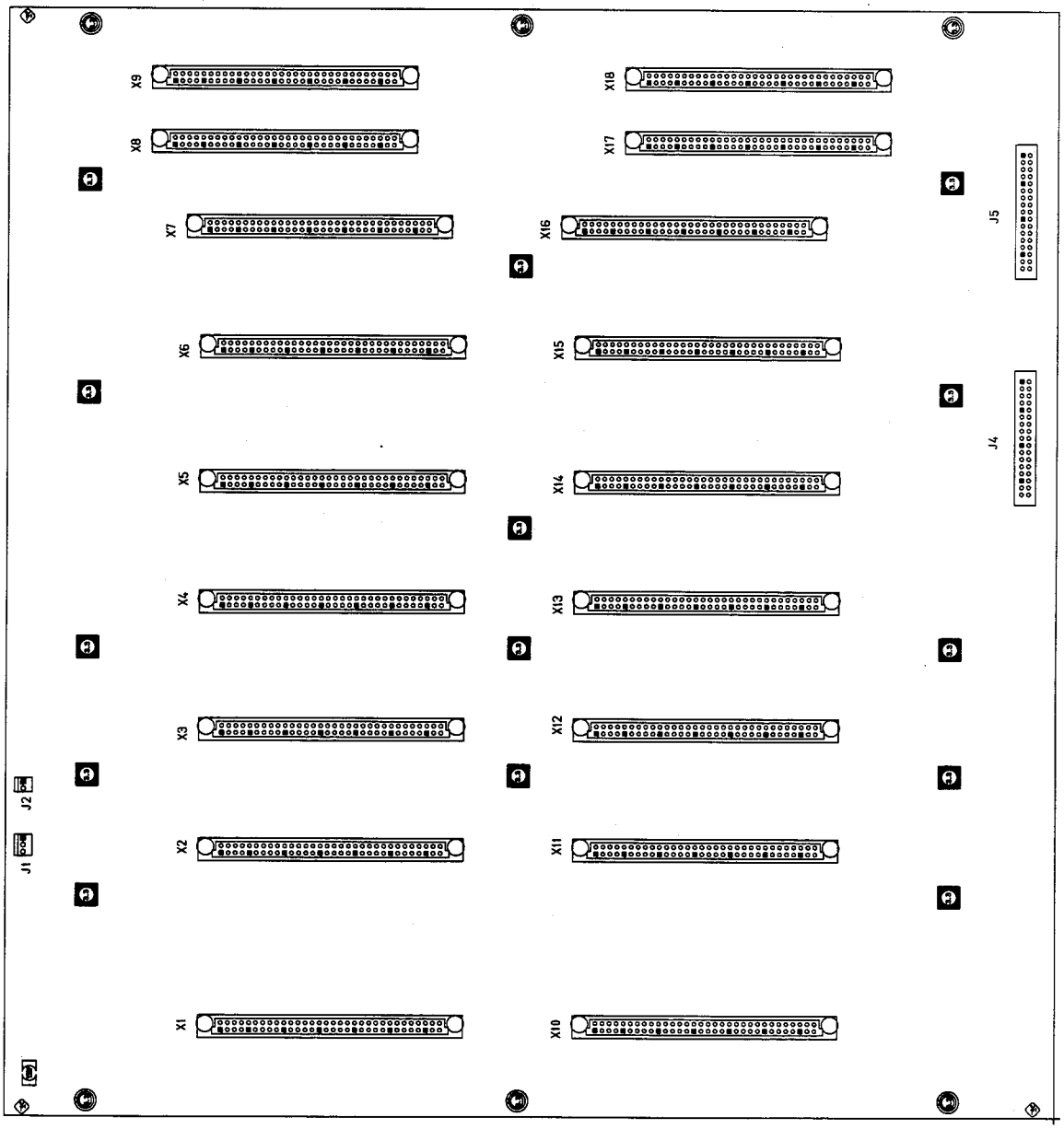


Figure 5-A11-1. A11 Motherboard Component Locations

NOTES

5-18. A20 HP-IB INTERFACE SERVICE SHEET

5-18-1. CIRCUIT DESCRIPTION

The A20 HP-IB Interface board handles all HP-IB interface functions. The HP-IB Interface board controls the handshaking between the Microprocessor and external HP-IB controlled equipment.

5-18-2. TROUBLESHOOTING AIDS

The test points are listed in Table 5-A20-1.

Table 5-A20-1. A20 Test Points

Test Point	Signal Name	Description
A20TP1	*GND*	Ground reference for the +5 V digital supply
A20TP2	*+5V*	+5 V digital supply
A20TP3	*LDS*	Lower Data Strobe Signal
A20TP4	*4MHz*	4 MHz is counted down from the A7 */CLK16MHz*

5-18-3. REPLACEABLE PARTS LISTS

The replaceable parts for the A20 HP-IB Interface board are listed in Table 5-A20-2.

5-18-4. COMPONENT LOCATIONS

The A20 HP-IB Interface board component locations are shown in Figure 5-A20-1.

5-18-5. SCHEMATIC DIAGRAM

The A20 HP-IB Interface board schematic diagram is shown in Figure 5-A20-2.

Table 5-A20-2. A20 HP-IB Interface Replaceable Parts List

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A20						
A20	04284-66520	3	1	HP-IB IF	28480	04284-66520
C1	0180-3590	1	1	CAPACITOR-FXD 470UF 10V AL	28480	0180-3590
C2	0160-6561	0	7	CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CACO2Z5U104M050A
C3	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CACO2Z5U104M050A
C4	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CACO2Z5U104M050A
C5	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CACO2Z5U104M050A
C6	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CACO2Z5U104M050A
C7	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CACO2Z5U104M050A
C8	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CACO2Z5U104M050A
DS1	1990-0665	3	1	LED-VSBL (RED)	28480	1990-9665
F1	2110-0742	4	1	FUSE 1.5A 125V	28480	2110-0741
J1	1251-5650	0	1	CONN-POST TYPE	28480	1251-5650
R1	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8/T0-4641-F
R2	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	CT4-1/8/T0-511R-F
U1	1820-2485	0	1	IC SN75160AN	28480	1820-2485
U2	1820-2483	8	1	IC SN75161AN	28480	1820-2483
U3	1820-2548	6	1	TMS9914ANL	28480	1820-2548
U4	1820-1433	6	1	IC SN74LS164 N	28480	1820-1433
U5	1820-2777	3	1	IC SN74ALS161 N	28480	1820-2777
U6	1820-2657	8	1	IC SN74ALS32N	28480	1820-2657
U7	1820-2634	1	1	IC SN74ALS04N	28480	1820-2634
U8	1820-3376	0	1	IC SN74ALS05AN	28480	1820-3376
U9	1820-3707	1	1	IC-74ALS541	28480	1820-3707
U10	1820-3121	3	1	IC SN74ALS245	28480	1820-3121
W1	8159-0005	0	1	RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005
X1	1252-1598	9	1	CONN-POST TYPE 2.54-PIN-SPCG 96-CONT	09922	PI96B30P00F50N9
	4040-0748	3	1	EXTR-PC BD BLK	28480	4040-0748
	4040-0750	7	1	EXTR-PC BD RED	28480	4040-0750

*** Indicates factory selected value.**

NOTES

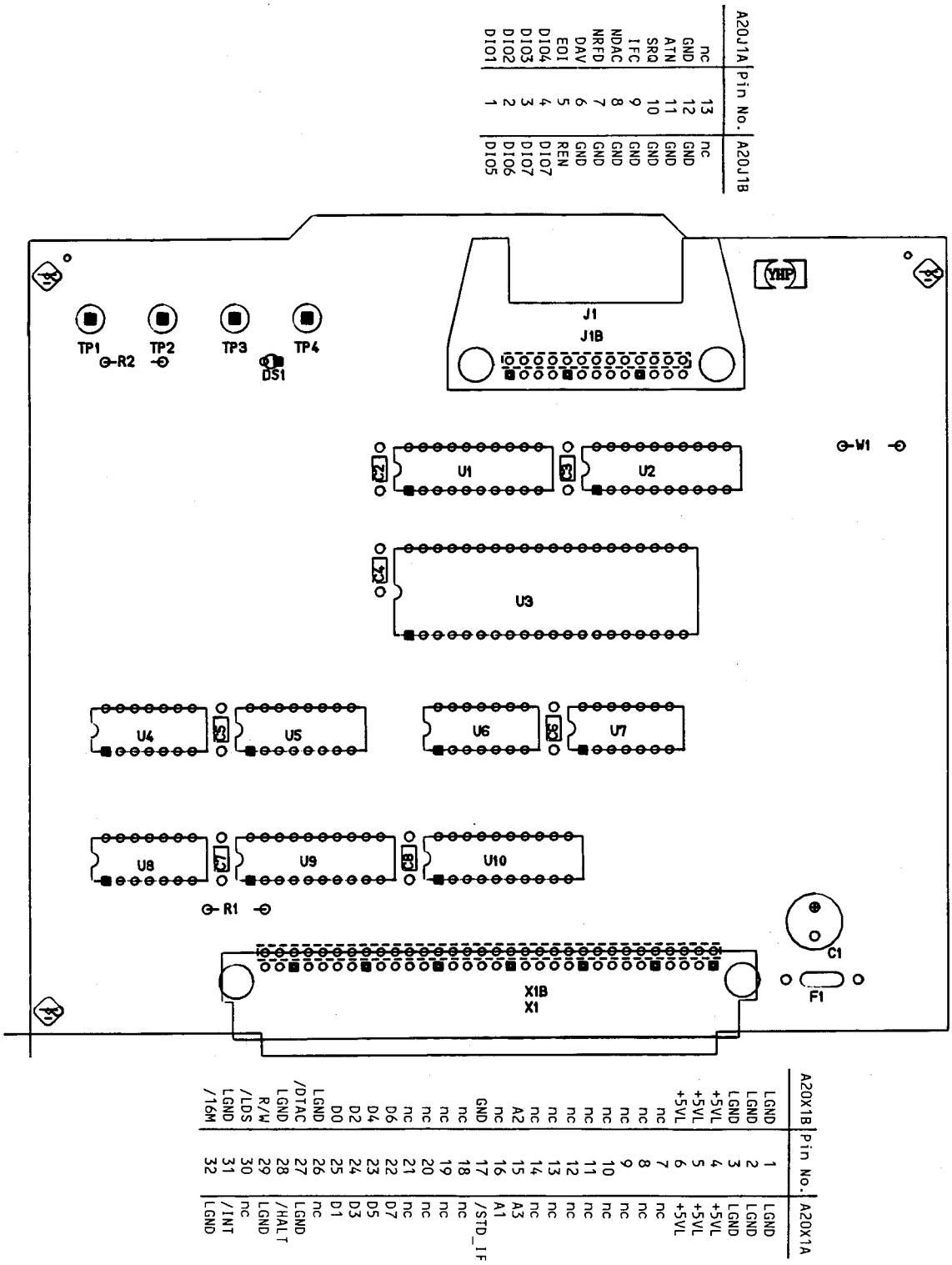
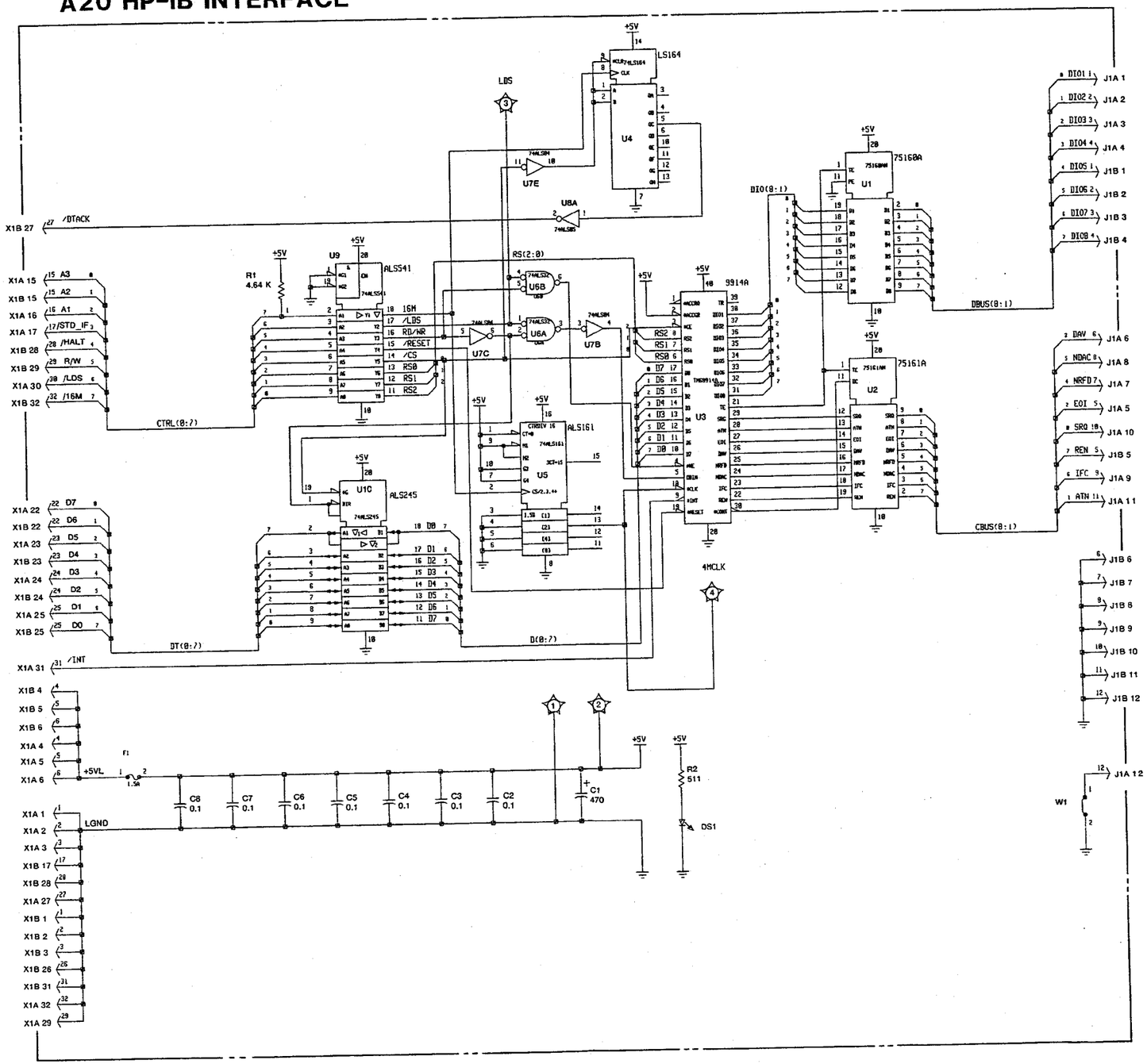


Figure 5-A20-1. A20 HP-IB Interface Component Locations

A20 HP-IB INTERFACE



NOTES:

1. Reference designators within this assembly are abbreviated. Prefix abbreviation with assembly number for complete reference designator.
2. Unless otherwise indicated: Resistance in ohms (Ω)
   Capacitance in micro farads (μF)
   Inductance in micro henries (μH)

Figure 5-A20-2. A20 HP-IB Interface Schematic Diagram

NOTES

5-19. A30 HANDLER INTERFACE (OPT.201) SERVICE SHEET

5-19-1. CIRCUIT DESCRIPTION

The A30 handler interface board consists of photo couplers, and peripheral interface adapters.

[Photo Couplers]

Photo couplers A30U1 through A30U7 opto-isolate the input and output signals. Jumpers (A30W1 through A30W11) are set according to the pull up voltages used. For more detail information about the input/output signals and jumpers, refer to the handler interface operation note in the HP 4285A operation manual.

[Peripheral Interface Adapters]

A30U13 and A30U14 are peripheral interface adapters (PIAs) which interface between the A7 CPU board and the A30 board.

5-19-2. TROUBLESHOOTING AIDS

The test points are listed in Table 5-A30-1.

Table 5-A30-1. Test Point List

Test Point	Signal Name	Description
A30TP1	*GND*	Ground line
A30TP2	*+5V*	+ 5 V DC
A30TP3	*BE*	792 kHz Clock signal
A30TP4		EXT.TRIG signal

Handler Interface Function Test, described in paragraph 1-15 of the HP 4285A Maintenance Manual, is useful to check the A30 operation.

5-19-3. REPLACEABLE PARTS LISTS

The replaceable parts for the A30 handler interface board are listed in Table 5-A30-2.

5-19-4. COMPONENT LOCATIONS

The component locations of the A30 handler interface board and the board connector pin assignments are shown in Figure 5-A30-1.

5-19-5. SCHEMATIC DIAGRAM

The schematic diagram of the A30 handler interface board is shown in Figure 5-A30-2.

Table 5-A30-2. A30 Handler Interface Replaceable Parts List (1 of 2)

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A30						
A30	04278-66532	9	1	HANDLER IF (OPTION 201)	28480	04278-66532
C1	0180-3602	6	1	CAPACITOR-FXD 22UF +-20% 50VDC AL	28480	0180-3602
C2	0180-3363	6	2	CAPACITOR-FXD 22UF +-20% 25VDC CER	28480	0180-3363
C3	0160-4832	4	1	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C4	0160-6561	0	4	CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CACO2Z5U104M050A
C5	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CACO2Z5U104M050A
C6	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CACO2Z5U104M050A
C7	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CACO2Z5U104M050A
C8	0180-3363	6		CAPACITOR-FXD 22UF +-20% 25VDC CER	28480	0180-3363
C9	0180-3217	9	1	CAPACITOR-FXD 470UF+_20% 6.3VDC AL	28480	0180-3217
C10	0160-4822	2	1	CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
F1	2110-0046	1	1	FUSE .5A 125V NTD BI	28480	2110-0046
F2	2110-0741	3	1	FUSE 1A 125V NTD VL	28480	2110-0741
J1	1251-5652	2	1	CONN-POST TYPE .100-PIN-SPCG 40-CONT	28480	1251-5652
J2	1251-4822	6	2	CONN-POST TYPE .100-PIN-SPCG 3-CONT	28480	1251-4822
J3	1251-8736	9	3	CONN-POST TYPE .100-PIN-SPCG 6-CONT	28480	1251-8736
J4	1251-8736	9		CONN-POST TYPE .100-PIN-SPCG 6-CONT	28480	1251-8736
J5	1251-4822	6		CONN-POST TYPE .100-PIN-SPCG 3-CONT	28480	1251-4822
J6	1251-8736	9		CONN-POST TYPE .100-PIN-SPCG 6-CONT	28480	1251-8736
R1	0698-6360	6	1	RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
R2	0698-6362	8	2	RESISTOR 1K 1% .125W F TC=0+-25	28480	0698-6362
R3	0698-3441	8	18	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R4	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R5	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R6	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R7	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R8	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R9	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R10	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R11	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R12	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R13	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R14	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R15	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R16	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R17	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R18	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R19	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R20	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R21	0698-0082	7	3	RESISTOR 414 1% .125W F TC=0+-100	24546	C4-1/8/T0-4640-F
R22	0698-0082	7		RESISTOR 414 1% .125W F TC=0+-100	24546	C4-1/8/T0-4640-F
R23	0698-0082	7		RESISTOR 414 1% .125W F TC=0+-100	24546	C4-1/8/T0-4640-F
R24	0757-0420	3	1	RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8/T0-751-F
R25	0698-3444	1	1	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8/T0-316R-F
R26	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	CT4-1/8/T0-511R-F
R27	0698-6362	8		RESISTOR 1K .1% .125W F TC=0+-25	28480	0698-6362
R28	1810-0279	5	1	NETWORK-RES 10-SIP 4.7K OHM X 9	91637	CSC10A01-472G/MSP
R29	0757-0420	2	1	RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
R30	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8-TO-4641-F

*** Indicates factory selected value.**

Table 5-A30-2. A30 Handler Interface Replaceable Parts List (2 of 2)

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
U1	1990-1179	0	5	PHOTO COUPLER	28480	1990-1179
U2	1990-1179	0		PHOTO COUPLER	28480	1990-1179
U3	1990-1179	0		PHOTO COUPLER	28480	1990-1179
U4	1990-1179	0		PHOTO COUPLER	28480	1990-1179
U5	1990-1180	0		PHOTO COUPLER	28480	1990-1180
U6	1990-1179	6		PHOTO COUPLER	28480	1990-1179
U7	1990-0602	8	1	OPTO-ISOLATOR LED-IC GATE IF=20MA MAX	28480	5082-4361
U8	1820-2711	5	4	IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS541N
U9	1820-2711	5		IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS541N
U10	1820-2711	5		IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS541N
U11	1820-1197	9	1	IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
U12	1820-1199	1	1	IC INV TTL LS HEX 1-INP	01295	SN74LS04N
U13	1820-4888	1	2	CMOS 6321P	28480	1820-4888
U14	1820-4888	1		CMOS 6321P	28480	1820-4888
U15	1820-2711	5		IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS541N
U16	1820-2075	4	2	IC TRANSCEIVER LS BUS OCTL	01295	SN74LS245N
U17	1820-2075	4		IC TRANSCEIVER LS BUS OCTL	01295	SN74LS245N
U18	1820-1200	5	1	IC INV TTL LS HEX	01295	SN74LS05N
U19	1820-1112	8	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
X1	1252-1589	9	1	CONN-POST TYPE 2.54-PIN-SPCG 96-CONT	09922	PI96B30P00F50N9
	1258-0141	8	5	JUMPER-REMOVAL FOR 0.025 IN SQ PINS	28480	1258-0141
	4040-0749	4	1	EXTR-PC BD BRN POLYC .062-BD-THKNS	28480	4040-0749
	4040-0751	8	1	EXTR-PC BD ORN POLYC .062-BD-THNKS	28480	4040-0751

*** Indicates factory selected value.**

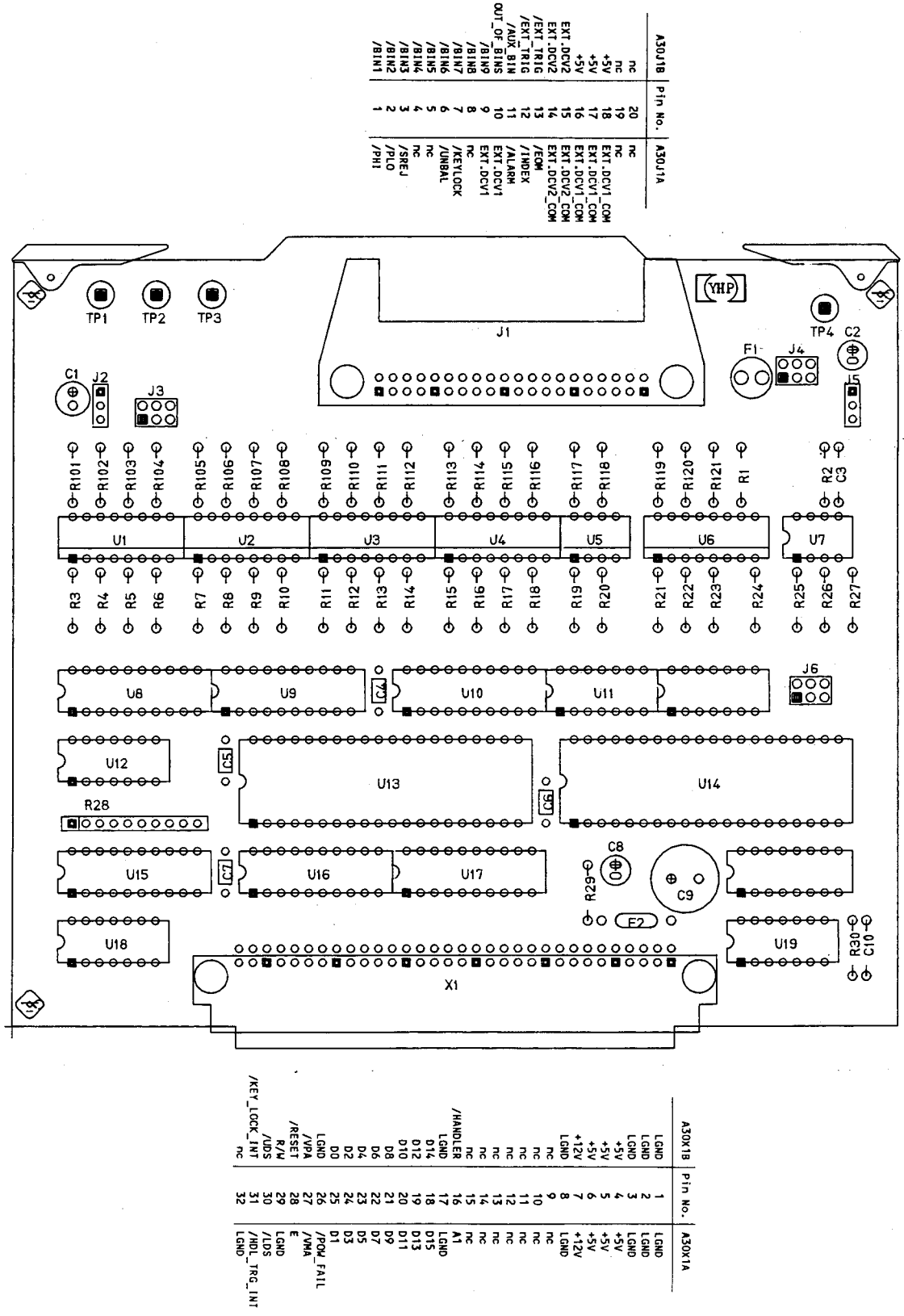
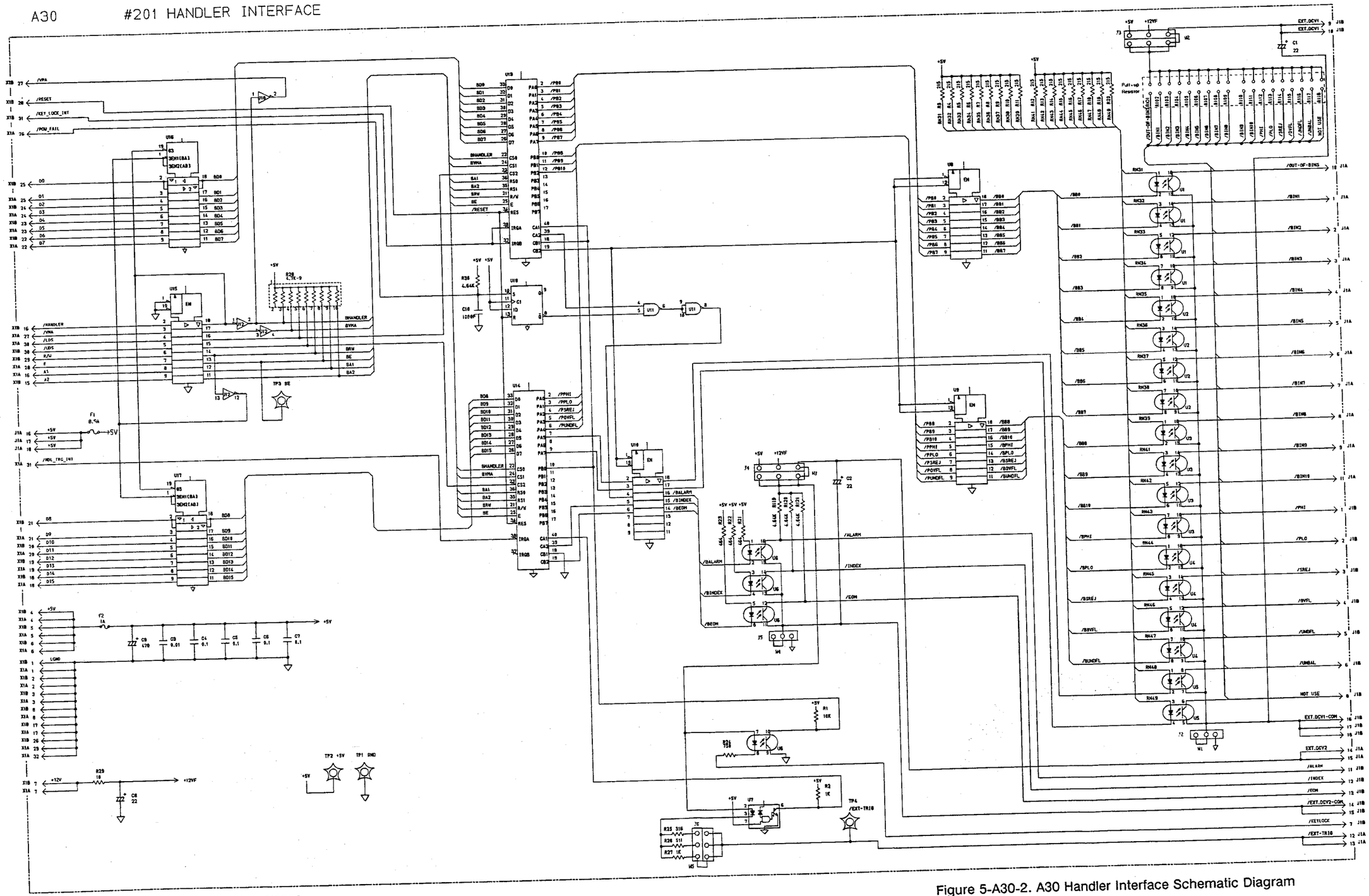


Figure 5-A30-1. A30 Handler Interface Component Locations



NOTES:
1. Reference designators within this assembly are abbreviated. Prefix abbreviation with assembly number for complete reference designator.
2. Unless otherwise indicated: Resistance in ohms (Ω)
   Capacitance in micro farads (μF)
   Inductance in micro henries (μH)

Figure 5-A30-2. A30 Handler Interface Schematic Diagram

NOTES

5-20. A31 HANDLER INTERFACE (OPT.202) SERVICE SHEET

5-20-1. CIRCUIT DESCRIPTION

The A31 handler interface board consists of photo couplers, and peripheral interface adapters (PIAs).

[Photo Couplers]

Photo couplers A31U1 through A31U14 opto-isolate the input and output signals. Then timing of the input/output signals is determined by setting jumpers A31W3 through A31W13. For more detail information about the input/output signals and the jumpers, refer to the handler interface operation note in the HP 4285A Operation Manual.

[Peripheral Interface Adapters]

Peripheral interface adapters (PIAs) A31U19 and A31U20 interface between the A7 CPU board and the A31 board.

5-20-2. TROUBLESHOOTING AIDS

The test points are listed in Table 5-A31-1.

Table 5-A31-1. Test Point List

Test Point	Signal Name	Description
A31TP1	*GND*	Ground line
A31TP2	*+5V*	+5 V DC
A31TP3	*BE*	792 kHz Clock signal
A31TP4		START IN signal

Handler Interface Function Test, described in paragraph 1-16 of the HP 4285A Maintenance Manual, is useful to check the A31 operation.

5-20-3. REPLACEABLE PARTS LISTS

The replaceable parts for the A31 Handler Interface board are listed in Table 5-A31-2.

5-20-4. COMPONENT LOCATIONS

The component locations on the A31 Handler Interface board and the board connector pin assignments are shown in Figure 5-A31-1.

5-20-5. SCHEMATIC DIAGRAM

The schematic diagram of the A31 handler interface board is shown in Figure 5-A31-2.

Table 5-A31-2. A31 Handler Interface Replaceable Parts List (1/2)

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A31						
A31	04278-66531	2	1	HANDLER IF (OPTION 202)	28480	04278-66531
C1	0160-4832	4	1	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C2	0160-4822	2	1	CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
C3	0160-6561	0	5	CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CACO2Z5U104M050A
C4	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CACO2Z5U104M050A
C5	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CACO2Z5U104M050A
C6	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CACO2Z5U104M050A
C7	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CACO2Z5U104M050A
C8	0180-3217	0	1	CAPACITOR-FXD 470UF +-20% 6.3VDC AL	16299	CACO2Z5U104M050A
DS1	0990-0665	6	1	LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4684
F1	2110-0741	3	1	FUSE 1A 125V NTD VL	28480	2110-0741
J1	1251-5652	2	1	CONN-POST TYPE .100-PIN-SPCG 40-CONT	28480	1251-5652
R1	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	CT4-1/8-T0-511R-F
R2	0698-3440	7	13	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R3	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R4	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R5	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R6	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R7	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R8	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R9	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R10	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R11	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R12	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R13	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R14	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R15	0757-0280	3	1	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
R16	1810-0279	5	1	NETWORK-RES 10-SIP 4.7K OHM X 9	91637	CSC10A01-472G/MSP
U1	1990-1199	0	13	OPTO-ISOLATOR	28480	1990-1199
U2	1990-1199	0		OPTO-ISOLATOR	28480	1990-1199
U3	1990-1199	0		OPTO-ISOLATOR	28480	1990-1199
U4	1990-1199	0		OPTO-ISOLATOR	28480	1990-1199
U5	1990-1199	0		OPTO-ISOLATOR	28480	1990-1199
U6	1990-1199	0		OPTO-ISOLATOR	28480	1990-1199
U7	1990-1199	0		OPTO-ISOLATOR	28480	1990-1199
U8	1990-1199	0		OPTO-ISOLATOR	28480	1990-1199
U9	1990-1199	0		OPTO-ISOLATOR	28480	1990-1199
U10	1990-1199	0		OPTO-ISOLATOR	28480	1990-1199
U11	1990-1199	0		OPTO-ISOLATOR	28480	1990-1199
U12	1990-1199	0		OPTO-ISOLATOR	28480	1990-1199
U13	1990-1199	0		OPTO-ISOLATOR	28480	1990-1199
U14	1990-0655	1	1	OPTO-ISOLATOR	28480	1990-0655
U15	1820-2711	5	3	IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS541N
U16	1820-2711	5		IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS541N
U17	1820-1416	5	1	IC SCHMITT TRIG TTL LS INV HEX 1-INP	01295	SN74LS14N
U18	1820-1199	1	1	IC INV TTL LS HEX 1-INP	01295	SN74LS04N
U19	1820-4888	1	2	CMOS 6321P	28480	1820-4888
U20	1820-4888	1		CMOS 6321P	28480	1820-4888

*** Indicates factory selected value.**

Table 5-A31-2. A31 Handler Interface Replaceable Parts List (2/2)

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
U21	1820-2711	5		IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS541N
U22	1820-2075	4	2	IC TRANSCEIVER TTL LS BUS OCTL	01295	SN74LS00N
U23	1820-2075	4		IC TRANSCEIVER TTL LS BUS OCTL	01295	SN74LS00N
U24	1820-1200	5	1	IC INV TTL LS HEX	01295	SN74LS05N
W6	8159-0005	0		RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005
W9	8159-0005	0		RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005
W10	8159-0005	0		RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005
W13	8159-0005	0		RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005
X1	1252-1589	9	1	CONN-POST TYPE 2.54-PIN-SPCG 96-CONT	09922	PI96B30P00F50N9
	4040-0749	4	1	EXTR-PC BD BRN POLYC .062-BD-THKNS	28480	4040-0749
	4040-0751	8	1	EXTR-PC BD ORN POLYC .062-BD-THNKS	28480	4040-0751

*** Indicates factory selected value.**

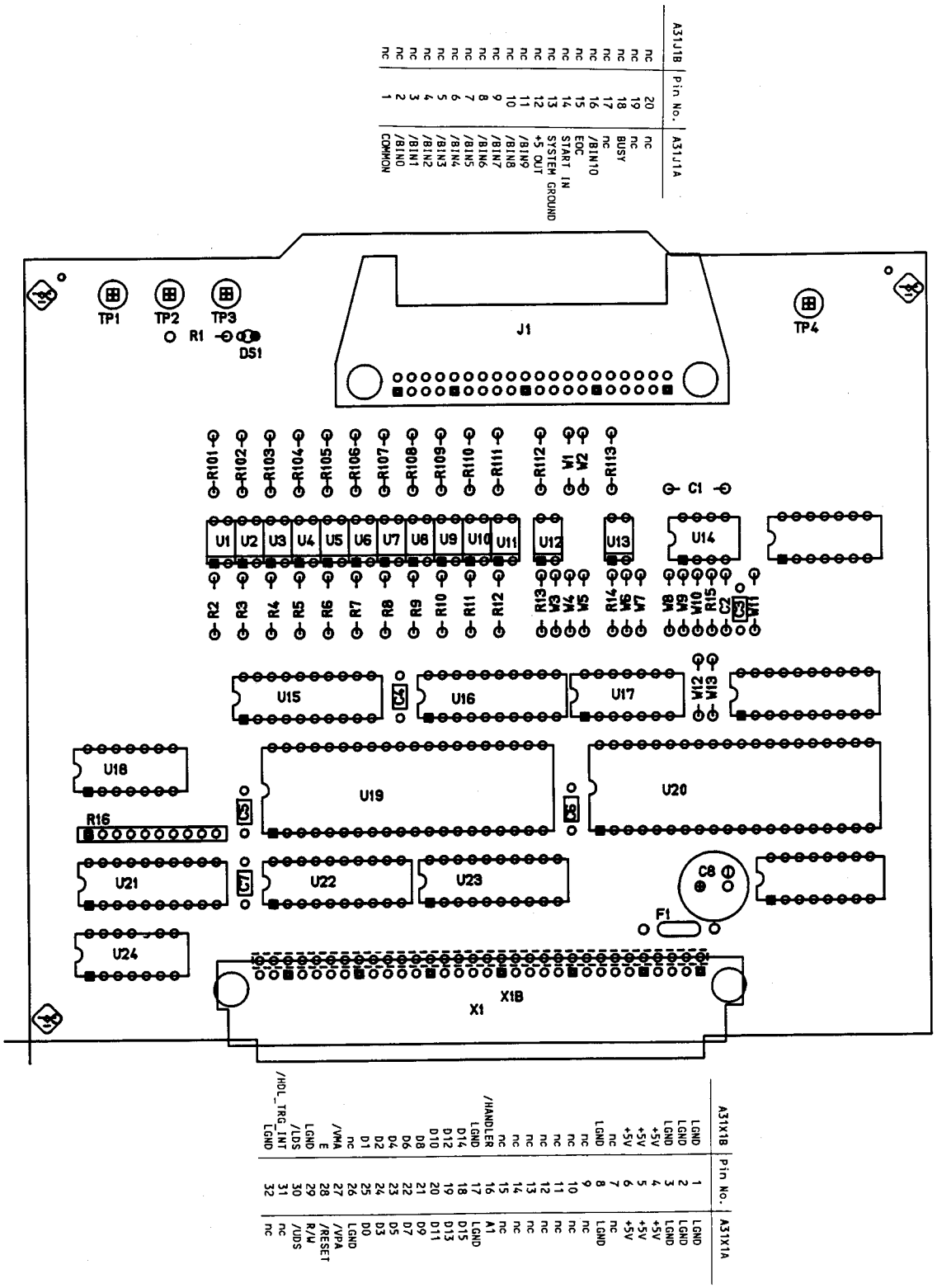
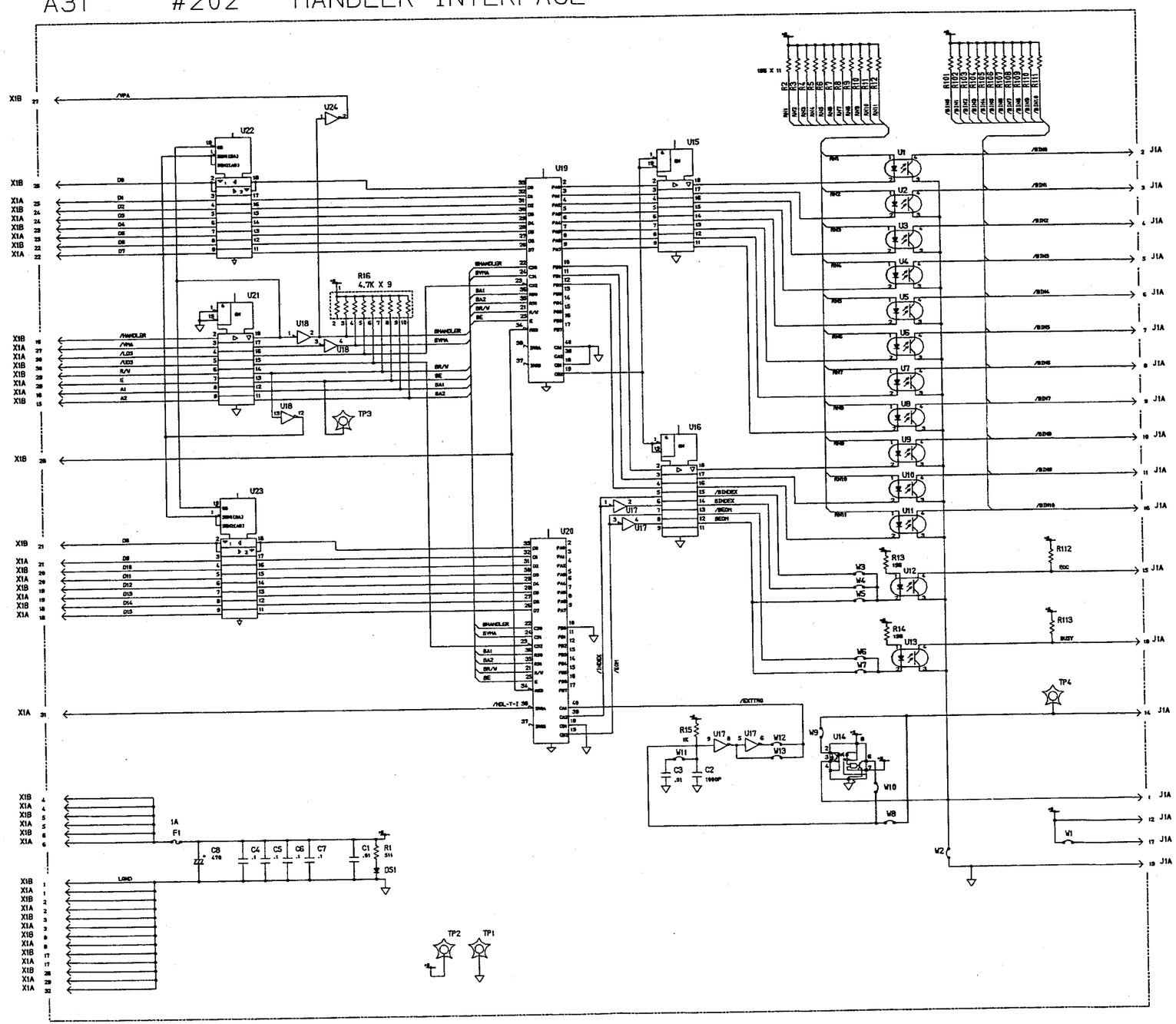


Figure 5-A31-1. A31 Handler Interface Component Locations



NOTES:

1. Reference designators within this assembly are abbreviated. Prefix abbreviation with assembly number for complete reference designator.
2. Unless otherwise indicated: Resistance in ohms (Ω)
   Capacitance in micro farads (μF)
   Inductance in micro henries (μH)

Figure 5-A31-2. A31 Handler Interface Schematic Diagram

NOTES

5-21. A40 SCANNER INTERFACE (OPT.301) SERVICE SHEET

5-21-1. CIRCUIT DESCRIPTION

The A40 Scanner Compensation/Interface board consists of photo couplers, EEPROMs, Static RAMs, and a peripheral interface adapter (PIA).

[Photo Couplers]

When the Scanner Interface connector on the rear panel is used to synchronize an external scanner, the input/output signals are opto-isolated by opto-couplers A40U3, A40U4, A40U5, and A40U6. The pull-up resistors for the input signals are selected using jumpers A40SW1 and A40SW2.

[EEPROMs]

EEPROMs A40U7 and A40U12 (64 K Bytes) are used to store compensation data for 90 external scanner channels.

[Peripheral Interface Adapter]

Peripheral interface adapter (A40U9) interfaces between the A7 CPU board and the 40 board.

5-21-2. TROUBLESHOOTING AIDS

The test points are listed in Table 5-A40-1.

Table 5-A40-1. Test Points

Test Point	Signal Name	Description
A40TP1	*EXT_TRIG*	External trigger signal
A40TP2	*EXT_DCV*	External DC voltage
A40TP3	*COMMON*	Common line
A40TP4	*VCC*	+5 V DC
A40TP5	*GND*	Ground line

Scanner Interface Function Test, described in paragraph 1-17 of the HP 4285A Maintenance Manual, is useful to check the A40 operation.

5-21-3. REPLACEABLE PARTS LISTS

The replaceable parts for the A40 Scanner Compensation/Interface Board are listed in Table 5-A40-2.

5-21-4. COMPONENT LOCATIONS

The component locations on the A40 Scanner Compensation/Interface board and the board connector pin assignments are shown in Figure 5-A40-1.

5-21-5. SCHEMATIC DIAGRAM

The schematic diagram of the A40 Scanner Compensation/Interface board is shown in Figure 5-A40-2.

Table 5-A40-2. A40 Scanner Compensation/Interface Replaceable Parts list (1/2)

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A40						
A40	04278-66540	2	1	SCANNER INTERFACE (OPTION 301)	28480	04278-66540
C1	0180-3363	6	1	CAPACITOR-FXD 22UF+-20% 25VDC AL	28480	0180-3363
C2	0160-6561	0	6	CAPACITOR-FXD .1UF +-20% 50VDC CER	16299	CAC02Z5U104M
C3	0160-4832	4	1	CAPACITOR-FXD .01F +-10% 100VDC CER	28480	0160-4832
C4	0160-4822	2	1	CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
C5	0160-6561	0		CAPACITOR-FXD .1UF +-20% 50VDC CER	16299	CAC02Z5U104M
C6	0160-6561	0		CAPACITOR-FXD .1UF +-20% 50VDC CER	16299	CAC02Z5U104M
C7	0160-6561	0		CAPACITOR-FXD .1UF +-20% 50VDC CER	16299	CAC02Z5U104M
C8	0160-6561	0		CAPACITOR-FXD .1UF +-20% 50VDC CER	16299	CAC02Z5U104M
C9	0160-6561	0		CAPACITOR-FXD .1UF +-20% 50VDC CER	16299	CAC02Z5U104M
C10	0180-3217	9	1	CAPACITOR-FXD 470UF +-20% 6.3VDC AL	28480	0160-4822
F1	2110-0742	4	1	FUSE 1.5A 125V NTD VL	28480	2110-0742
R1	0757-0421	4	18	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R2	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R3	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R4	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R5	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R6	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R7	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R8	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R9	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R10	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R11	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R12	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R13	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R14	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R15	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R16	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R17	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R18	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R19	0757-0280	3	2	RESISTOR 1K 1% .125W F TC =0+-100	24546	C4-1/8-T0-1001-F
R20	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	CT4-1/8-T0-511R-F
R21	0698-3444	1	1	RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-F
R22	0698-0082	7	2	RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
R23	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
R24	0757-0280	3		RESISTOR 1K 1% .125W F TC =0+-100	24546	C4-1/8-T0-1001-F
R25	1810-0273	9	1	NETWORK-RES 10-SIP470.0 OHM X 9	01121	210A471
R26	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8/T0-4641-F
S1	3101-2831	8	2	SWITCH 8P	28480	3101-2831
S2	3101-2831	8		SWITCH 8P	28480	3101-2831
U1	1818-3918	8	2	IC CMOS 262144 (256K) STAT RAM 120-NS	S4013	HM62256LP-12
U2	1818-3918	8		IC CMOS 262144 (256K) STAT RAM 120-NS	S4013	HM62256LP-12
U3	1990-1179	6	3	PHOTO-COUPLER	28480	1990-1179
U4	1990-1179	6		PHOTO-COUPLER	28480	1990-1179
U5	1990-1179	6		PHOTO-COUPLER	28480	1990-1179
U6	1990-0602	8	1	OPTO-ISOLATOR LED-IC GATE IF=20MA-MAX	28480	5082-4316
U7	1818-3801	1	2	IC NMOS 65536 (64K) ELEC-ER-PROM 300-NS	S4013	HN58064P-30
U8	1820-1208	3	2	IC GATE TTL LS OR QUAD 2-PIN	01295	SN74LS32N
U9	1820-4888	1	1	CMOS 6321P	28480	1820-4888
U10	1820-1208	3		IC GATE TTL LS OR QUAD 2-PIN	01295	SN74LS32N

*** Indicates factory selected value.**

Table 5-A40-2. A40 Scanner Compensation/Interface Replaceable Parts list (2/2)

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
U11	1820-1112	8	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
U12	1818-3801	1	2	IC NMOS 65536 (64K) ELEC-ER-PROM 300-NS	S4013	HN58064P-30
U13	1820-1200	5	1	IC INV TTL LS HEX	01295	SN74LS05N
U14	1820-2075	4	5	IC TRANSCEIVER TTL LS BUS OCTL	01295	SN74LS245N
U15	1820-2075	4		IC TRANSCEIVER TTL LS BUS OCTL	01295	SN74LS245N
U16	1820-1199	1	1	IC INV TTL LS HEX 1-INP	01295	SN74LS04N
U17	1820-2075	4		IC TRANSCEIVER TTL LS BUS OCTL	01295	SN74LS245N
U18	1820-2075	4		IC TRANSCEIVER TTL LS BUS OCTL	01295	SN74LS245N
U19	1820-2075	4		IC TRANSCEIVER TTL LS BUS OCTL	01295	SN74LS245N
U20	04278-80004	0	1	PAL	28480	04278-80004
X1	1252-1598	9	1	CONN-POST TYPE 2.54-PIN-SPCG 96 CONT	09922	PI96B30P00F50N9
	4040-0748	3	1	EXTR-PC BD BLK POLYC .62-BD-THKNS	28480	4040-0748
	4040-0752	9	1	EXTR-PC BD YEL POLYC .062-IN-BD-THKNS	28480	4040-0752

*** Indicates factory selected value.**

NOTES

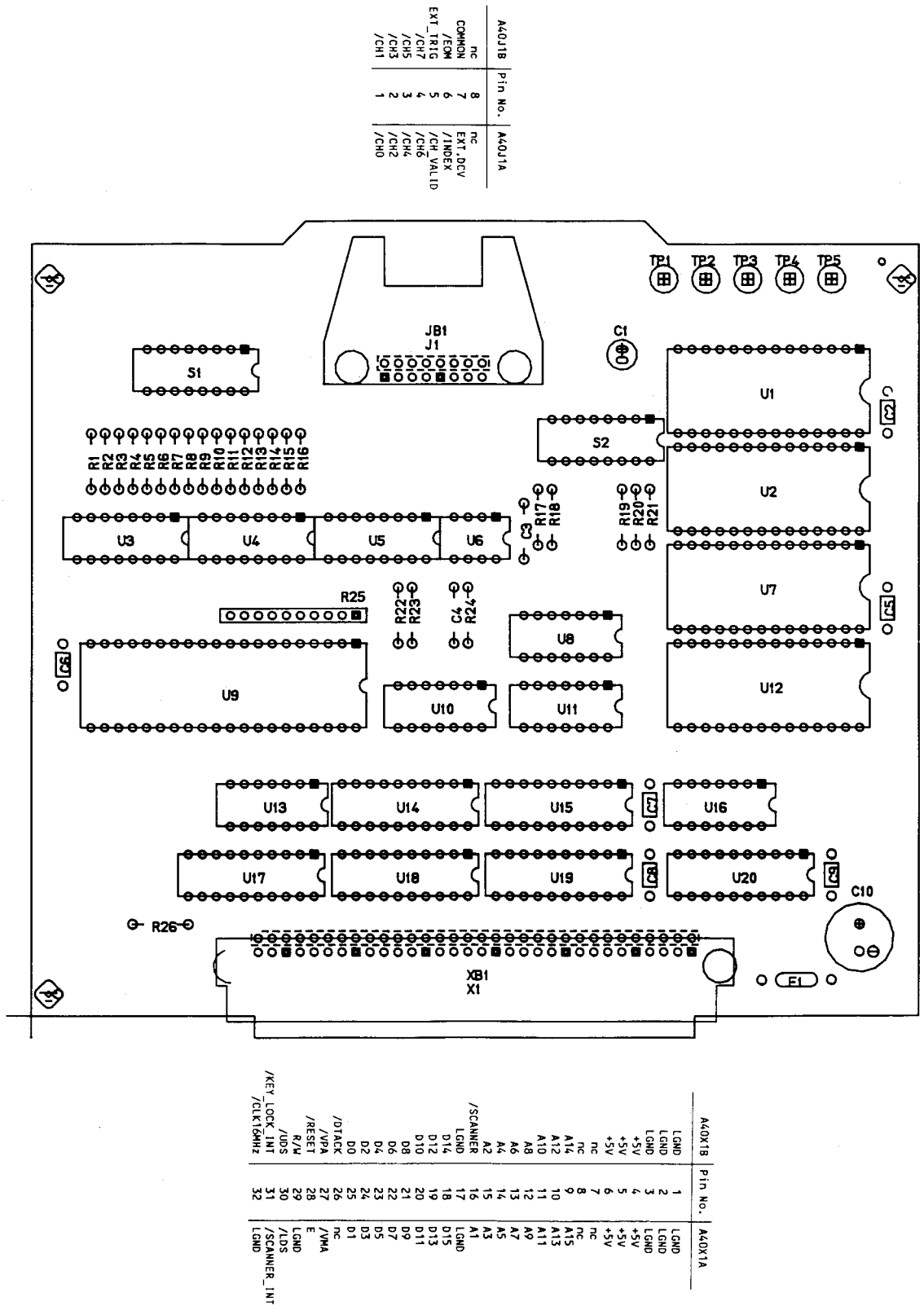
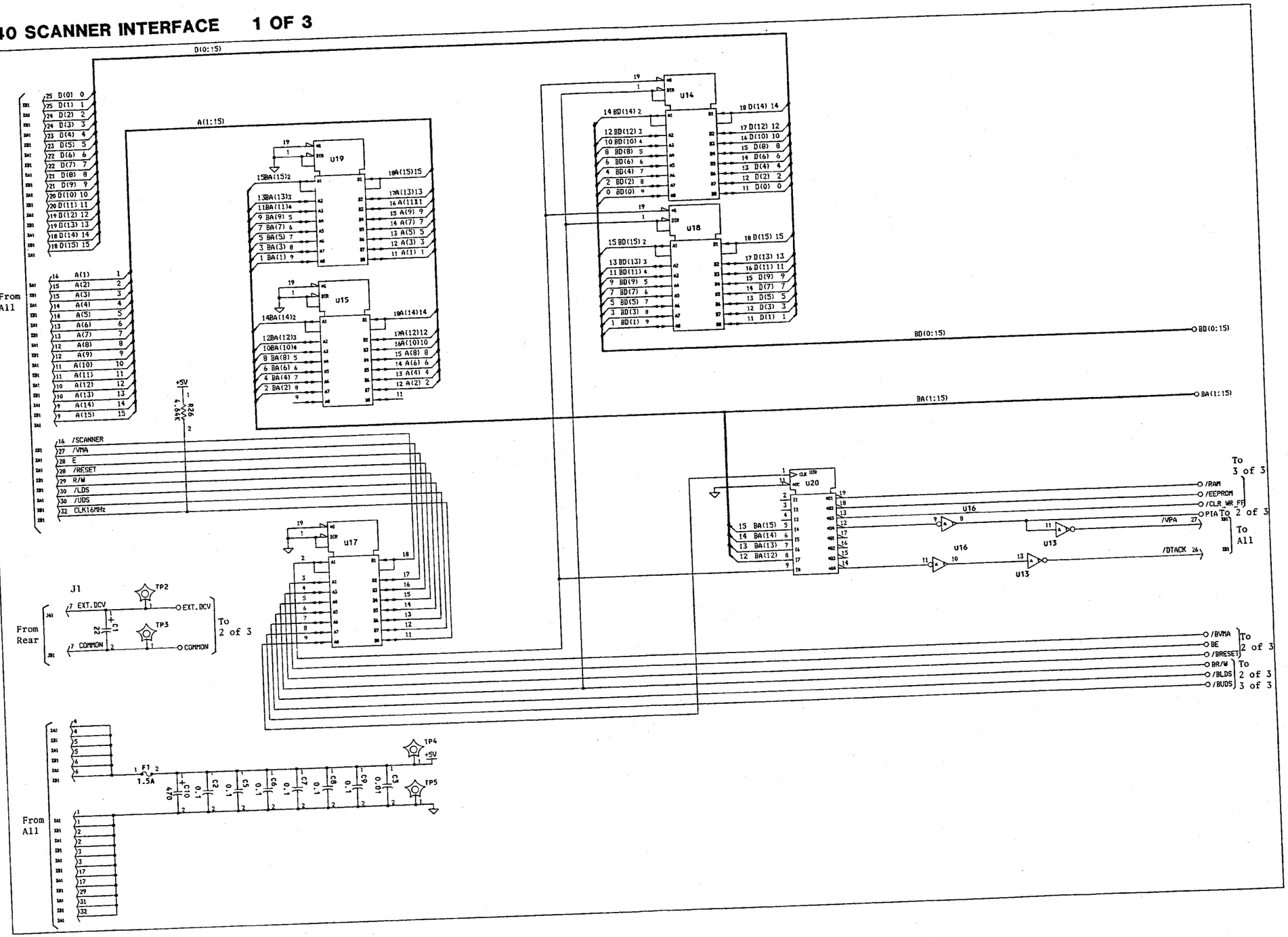


Figure 5-A40-1. A40 Scanner Compensation/Interface Component Locations

A40 SCANNER INTERFACE 1 OF 3



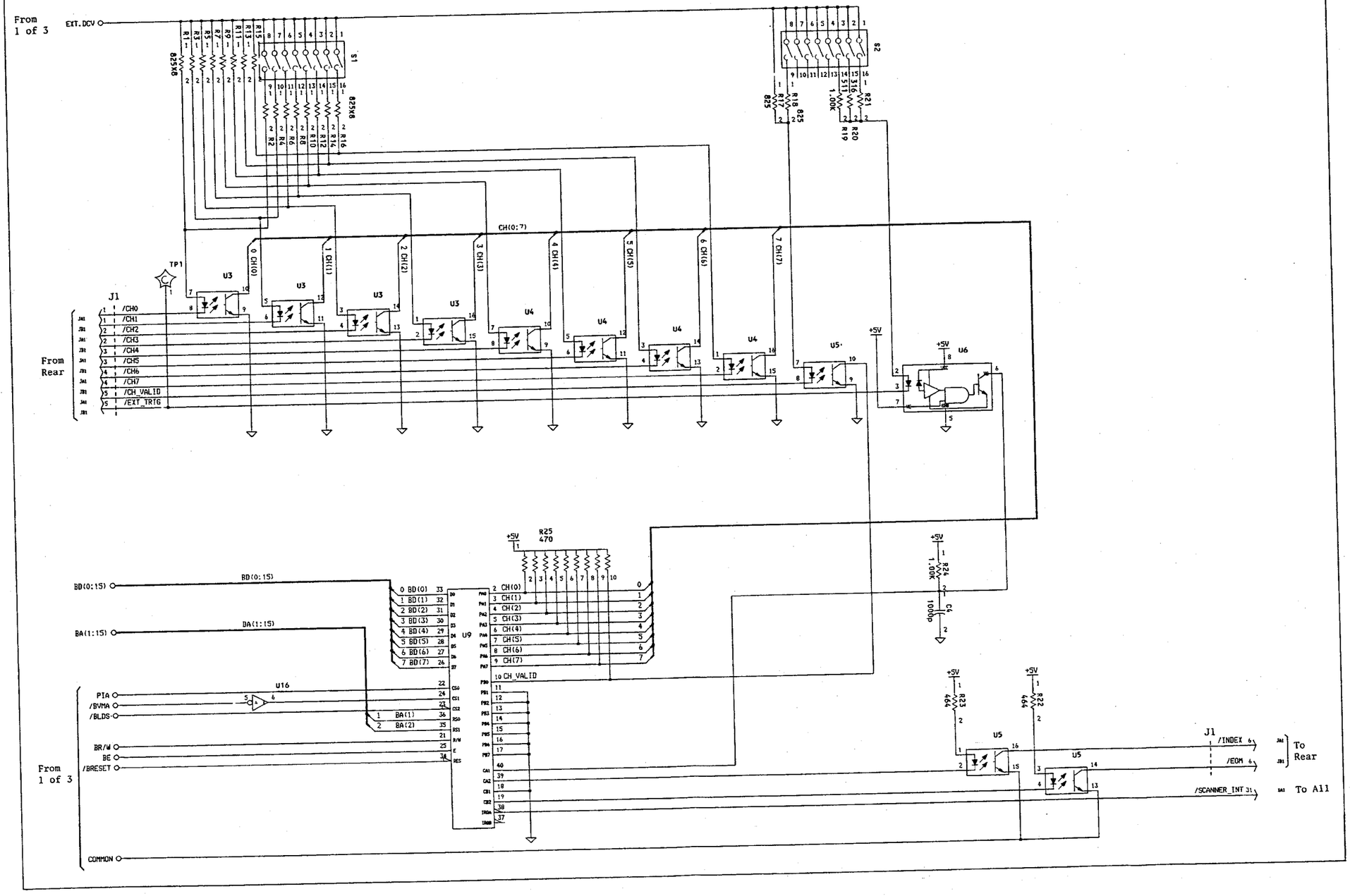
NOTES:

1. Reference designators within this assembly are abbreviated. Prefix abbreviation with assembly number for complete reference designator.
2. Unless otherwise indicated: Resistance in ohms (Ω), Capacitance in micro farads (µF), Inductance in micro henries (µH)

Figure 5-A40-2. A40 Scanner Compensation/Interface Schematic Diagrams (1/3)

NOTES

A40 SCANNER INTERFACE 2 OF 3

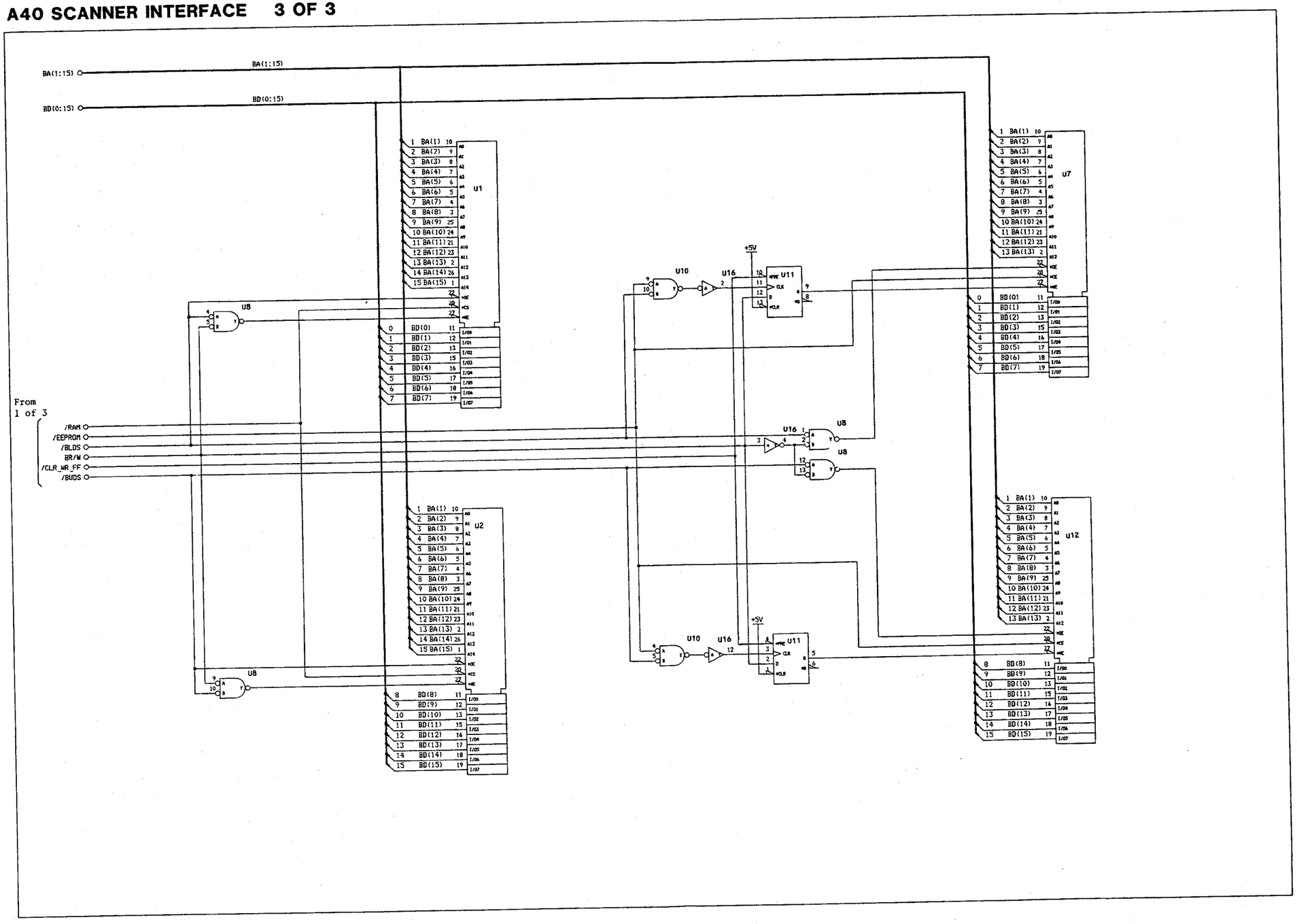


NOTES:
1. Reference designators within this assembly are abbreviated. Prefix abbreviation with assembly number for complete reference designator.
2. Unless otherwise indicated: Resistance in ohms (Ω)
   Capacitance in micro farads (µF)
   Inductance in micro henries (µH)

Figure 5-A40-2. A40 Scanner Compensation/Interface Schematic Diagrams (2/3)

NOTES

A40 SCANNER INTERFACE 3 OF 3



NOTES:

1. Reference designators within this assembly are abbreviated. Prefix abbreviation with assembly number for complete reference designator.
2. Unless otherwise indicated: Resistance in ohms (Ω)
   Capacitance in micro farads (µF)
   Inductance in micro henries (µH)

Figure 5-A40-2. A40 Scanner Compensation/Interface Schematic Diagrams (3/3)

NOTES

5-22. A50 ACCESSORY CONTROL INTERFACE (OPT.002) SERVICE SHEET

5-22-1. CIRCUIT DESCRIPTION

The A50 Accessory Control Interface board consists of TTL gate ICs.

5-22-2. TROUBLESHOOTING AIDS

The test points are listed in Table 5-A40-1.

Table 5-A50-1. Test Points

Test Point	Signal Name	Description
A50TP1	*+5 V*	+5 V power supply
A50TP2	*GND*	Ground reference for +5 V power supply

Accessory Control Interface Function Test, described in paragraph 2-14 of the HP 4285A Maintenance Manual, is useful to check the A50 operation.

5-22-3. REPLACEABLE PARTS LISTS

The replaceable parts for the A50 Accessory Control Interface Board are listed in Table 5-A50-2.

5-22-4. COMPONENT LOCATIONS

The component locations on the A50 Accessory Control Interface board and the board connector pin assignments are shown in Figure 5-A50-1.

5-22-5. SCHEMATIC DIAGRAM

The schematic diagram of the A50 Accessory Control Interface board is shown in Figure 5-A50-2.

Table 5-A50-2. A50 Accessory Control Interface Replaceable Parts list

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A50						
A50	42841-66551	5	1	BIAS IF BOARD	28480	42841-66551
C1	0160-6561	0	4	CAPACITOR-FXD .1UF +-20% 50VDC CER	16299	CAC02Z5U104M
C2	0160-6561	0		CAPACITOR-FXD .1UF +-20% 50VDC CER	16299	CAC02Z5U104M
C3	0160-6561	0		CAPACITOR-FXD .1UF +-20% 50VDC CER	16299	CAC02Z5U104M
C4	0160-6561	0		CAPACITOR-FXD .1UF +-20% 50VDC CER	16299	CAC02Z5U104M
C5	0180-3590	1	1	CAPACITOR-FXD 470UF +-20% 10VDC AL	28480	0180-3590
CR1	1902-0951	5	2	DIODE-ZNR 5.1V 5% DO-35 PD=.4W TC=+0.35%	28480	1902-0951
CR2	1902-0951	5		DIODE-ZNR 5.1V 5% DO-35 PD=.4W TC=+0.35%	28480	1902-0951
F1	2110-0742	4	1	FUSE 1.5A 125V	28480	2110-0742
J1	1251-5653	3	1	CONN-POST TYPE .100-PIN-SPCG 50-CONT	28480	1251-5653
J2	1252-1598	9	1	CONN-POST TYPE 2.54-PIN-SPCG 64-CONT	28480	1252-1598
R1	1810-0280	8	1	NETWORK-RES 10-SIP 10.0K OHM X 9	28480	1810-0280
R2	1810-0275	1	1	NETWORK-RES 10-SIP 1.0K OHM X 9	28480	1810-0275
U1	1820-0668	7	4	IC BFR TTL NON-INV HEX 1-INP	01295	SN7407N
U2	1820-0668	7		IC BFR TTL NON-INV HEX 1-INP	01295	SN7407N
U3	1820-0668	7		IC BFR TTL NON-INV HEX 1-INP	01295	SN7407N
U4	1820-0668	7		IC BFR TTL NON-INV HEX 1-INP	01295	SN7407N
U5	1820-2657	8	7	IC GATE TTL ALS OR QUAD 2-INP	01295	SN74ALS32N
U6	1820-2657	8		IC GATE TTL ALS OR QUAD 2-INP	01295	SN74ALS32N
U7	1820-2657	8		IC GATE TTL ALS OR QUAD 2-INP	01295	SN74ALS32N
U8	1820-2657	8		IC GATE TTL ALS OR QUAD 2-INP	01295	SN74ALS32N
U9	1820-3707	1	2	IC DRVR TTL ALS LINE OCTL	01295	SN74ALS541N
U10	1820-3707	1		IC DRVR TTL ALS LINE OCTL	01295	SN74ALS541N
U11	1820-2635	2	1	IC GATE TTL LS AND QUAD 2-PIN	01295	SN74ALS08N
U12	1820-2634	1	1	IC INV TTL ALS HEX	01295	SN74ALS04BN
U13	1820-2657	8		IC GATE TTL ALS OR QUAD 2-INP	01295	SN74ALS32N
U14	1820-3121	3	2	IC TRANSCEIVER TTL ALS BUS OCTL	01295	SN74ALS245AN
U15	1820-3121	3		IC TRANSCEIVER TTL ALS BUS OCTL	01295	SN74ALS245AN
U16	1820-1433	6	1	IC SHF-RGTR TTL LS R-S SERIAL-IN PRL-OUT	01295	SN74LS164N
U17	1820-2657	8		IC GATE TTL ALS OR QUAD 2-INP	01295	SN74ALS32N
	4040-0749	4	1	EXTR-PC BD BRN POLYC .062-IN-BD-THKNS	28480	4040-0749
	4040-0753	0	1	EXTR-PC BD GRN POLYC .062-IN-BD-THKNS	28480	4040-0753

*** Indicates factory selected value.**

NOTES

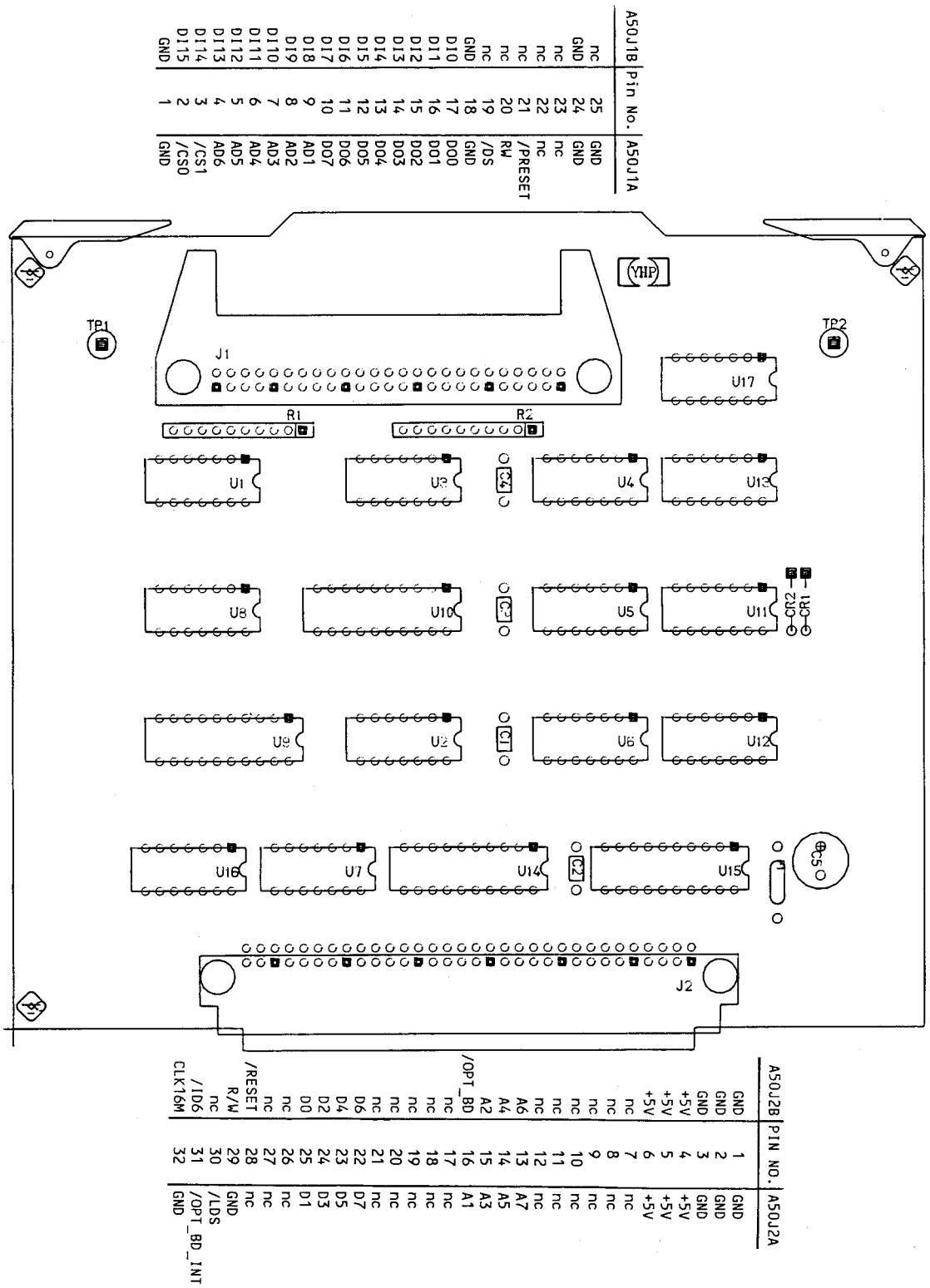
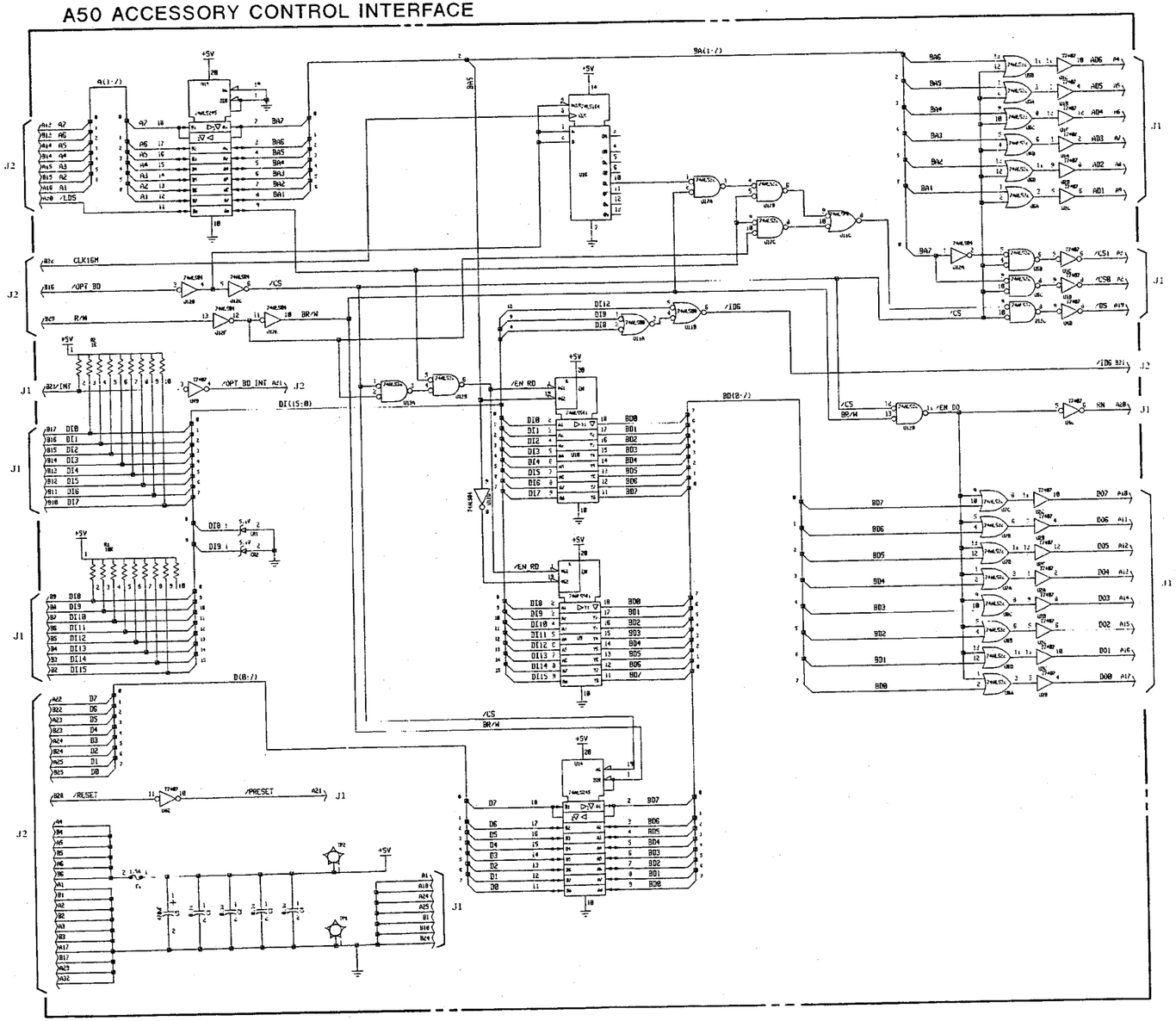


Figure 5-A50-1. A50 Accessory Control Interface Component Locations

A50 ACCESSORY CONTROL INTERFACE



NOTES:

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   Capacitance in micro farads (µF)
   Inductance in micro henries (µH)

Figure 5-A50-2. A50 Accessory Control Interface Schematic Diagrams

NOTES

APPENDIX A

MANUAL CHANGES

A-1.INTRODUCTION

This appendix contains the information required to adapt this manual to earlier versions or configurations of the HP 4285A than the current printing date of this manual. The information in this manual applies directly to HP 4285A Precision LCR Meters whose serial number prefix is listed on the title page of this manual.

A-2. MANUAL CHANGES

To adapt this manual to your HP 4285A, refer to Tables A and B, and make all of the manual changes listed opposite your instrument's serial number and ROM-based firmware's version.

Instruments manufactured after the printing of this manual may be different than those documented in this manual. Later instrument versions will be documented in a manual changes supplement that will accompany the manual shipped with that instrument. If your instrument serial number is not listed on the title page of this manual or in Table A, it may be documented in a **yellow MANUAL CHANGES** supplement.

Refer to the description of the ***IDN?** command in **CHAPTER 9, COMMAND REFERENCE, OPERATION MANUAL** for confirmation of the ROM-based firmware's version. For additional information on serial number coverage, refer to **SECTION 1**.

Table A. Manual Changes by Serial Number

Serial Prefix or Number	Make Manual Changes
	There are no earlier configurations than the printing date of this manual.

Table B. Manual Changes by Firmware's Version

Version	Make Manual Changes
	There are no earlier versions than the printing date of this manual.

NOTES

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