

OPERATING AND SERVICE MANUAL

**MODEL 3498A EXTENDER**



 **HEWLETT  
PACKARD**



**HEWLETT  
PACKARD**

## **OPERATING AND SERVICE MANUAL**

# **MODEL 3498A EXTENDER**

### **Serial Numbers**

**This manual applies to instruments with serial numbers prefixed 2026A.**

### **WARNING**

*Only personnel with a knowledge of electronic circuitry should install, reconfigure, or make repairs to this instrument.*

**Manual Part Number 03498-90001**

**Microfiche Part Number 03498-90051**

**©Copyright Hewlett-Packard Company 1981  
P.O. Box 301, Loveland, Colorado 80537 U.S.A.**

**Printed: March 1982**



### **CERTIFICATION**

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

### **WARRANTY**

This Hewlett-Packard product is warranted against defects in material and workmanship for a period of one year from date of shipment [except that in the case of certain components listed in Section I of this manual, the warranty shall be for the specified period]. During the warranty period, Hewlett-Packard Company will, at its option, either repair or replace products which prove to be defective.

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

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

### **LIMITATION OF WARRANTY**

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

**NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. HEWLETT-PACKARD 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. HEWLETT-PACKARD 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 Hewlett-Packard products.*

*For any assistance, contact your nearest Hewlett-Packard Sales and Service Office. Addresses are provided at the back of this manual.*

## TABLE OF CONTENTS

Section	Page
<b>I. GENERAL INFORMATION</b> .....	1-1
1-1. Introduction .....	1-1
1-3. Applicability .....	1-1
1-5. Safety .....	1-1
1-7. Description .....	1-1
1-9. Decoding Circuitry .....	1-1
1-12. Power Supplies .....	1-1
1-17. Instrument Identification .....	1-1
1-19. Accessories Supplied .....	1-1
1-21. Equipment Required But Not Supplied .....	1-1
1-23. Equipment Available .....	1-2
1-25. Warranty .....	1-3
1-27. Specifications .....	1-3

Section	Page
<b>II. INSTALLATION</b> .....	2-1
2-1. Introduction .....	2-1
2-3. Initial Inspection .....	2-1
2-5. Power Requirements .....	2-1
2-7. Line Voltage and Fuse Selection .....	2-1
2-11. Power Cable and Grounding Requirements .....	2-1
2-13. Operating Environment .....	2-2
2-14. Temperature .....	2-2
2-16. Humidity .....	2-2
2-18. Cooling Fan .....	2-2
2-20. Installation .....	2-2
2-23. Interfacing The 3498A .....	2-2
2-24. Safety Considerations .....	2-2
2-26. Cable Installation .....	2-3
2-29. Storage And Shipment .....	2-4
2-30. Environment .....	2-4
2-32. Packaging .....	2-4

Section	Page
<b>III. OPERATION</b> .....	3-1
3-1. Introduction .....	3-1
3-3. Command Considerations .....	3-1
3-4. Digital Interrupt .....	3-1
3-6. Non-operating Slot Numbers .....	3-1
3-6. Power-on SRQ .....	3-1
3-10. Modifying Extender Addresses .....	3-1
3-11. Factory Address Settings .....	3-1
3-13. Changing The Analog Addresses (Options 10 through 40) .....	3-1
3-17. Changing The Slot Designations .....	3-2

Section	Page
<b>IV. PERFORMANCE TEST</b> .....	4-1

Section	Page
<b>V. ADJUSTMENTS</b> .....	5-1
5-1. Introduction .....	5-1
5-3. Test Point And Adjustment Locations .....	5-1
5-5. Safety Considerations .....	5-1
5-7. Thermocouple Reference Adjustment .....	5-1
5-9. Instrument Preparation .....	5-1
5-11. Adjustment Procedure .....	5-1

Section	Page
<b>VI. REPLACEABLE PARTS</b> .....	6-1
6-1. Introduction .....	6-1
6-4. Ordering Information .....	6-1
6-6. Non-Listed Parts .....	6-1
6-8. Proprietary Parts .....	6-1

Section	Page
<b>VII. BACKDATING</b> .....	7-1

Section	Page
<b>VIII. SERVICE</b> .....	8-1
8-1. Introduction .....	8-1
8-3. Safety Considerations .....	8-1
8-5. Circuit Description .....	8-1
8-7. The Outguard Decoder .....	8-2
8-10. Power Detection Circuits .....	8-2
8-14. Register Address Circuits .....	8-2
8-16. Slot Address Circuits .....	8-2
8-18. Box Address and Data Read/Write .....	8-2
8-20. The Inguard Decoder .....	8-2
8-22. Outguard Power Supply .....	8-2
8-27. Inguard Power Supplies .....	8-3
8-30. Troubleshooting .....	8-3
8-31. Instrument Preparation .....	8-3
8-33. Troubleshooting Logic Circuits .....	8-3
8-35. Troubleshooting The Power Supplies .....	8-3
8-37. Recommended Service Equipment .....	8-3
8-39. Troubleshooting Information .....	8-3

### LIST OF TABLES

Table	Page
1-1. Specifications .....	1-3
5-1. Voltage Jumper Correlations .....	5-2
6-1. List of Abbreviations .....	6-1
6-2. Code List of Manufacturers .....	6-2
6-3. Replaceable Parts .....	6-3

### LIST OF ILLUSTRATIONS

Figure	Page
1-1. Extender Block Diagram .....	1-2
1-2. Space Allocation for Plug-in Cards .....	1-2
1-3. Accessories Supplied .....	1-3
2-1. Subpanel Line Voltage Switches .....	2-1
2-2. Power Cables .....	2-2
2-3. Interface Connections .....	2-3
5-1. Adjustment Locations .....	5-2
8-1. 3498A Block Diagram .....	8-1
8-2. Inguard Decoder .....	8-5
8-3. Outguard Decoder .....	8-7
8-4. Inguard Power Supply .....	8-9
8-5. Outguard Power Supply .....	8-11
8-6. Motherboard .....	8-13



**HEWLETT  
PACKARD**

## **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 violates safety standards of design, manufacture, and intended use of the instrument. Hewlett-Packard Company assumes no liability for the customer's failure to comply with these requirements. This is a Safety Class 1 instrument.

### **GROUND THE INSTRUMENT**

To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument is equipped with a three-conductor ac power cable. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adapter with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet. The power jack and mating plug of the power cable meet International Electrotechnical Commission (IEC) safety standards.

### **DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE**

Do not operate the instrument in the presence of flammable gases 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 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 any unauthorized modification to the instrument. Return the instrument to a Hewlett-Packard 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.

## SAFETY SYMBOLS

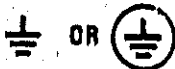
### General Definitions of Safety Symbols Used On Equipment or In Manuals.



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.



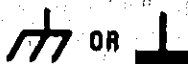
Indicates dangerous voltage (terminals fed from the interior by voltage exceeding 1000 volts must be so marked).



Protective conductor terminal. For protection against electrical shock in case of a fault. Used with field 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 a 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).

**DANGER**

The **DANGER** sign denotes a hazard. It calls attention to an operating procedure, practice, condition or the like, which could result in injury or death to personnel even during normal operation.

**WARNING**

The **WARNING** 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 in injury or death to personnel.

**CAUTION**

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

**NOTE:**

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

# SECTION I

## GENERAL INFORMATION

### 1-1. INTRODUCTION.

1-2. This manual contains the installation and service instructions for the -hp- 3498A Extender.

### 1-3. Applicability.

1-4. The 3498A is intended for use with the -hp- 3497A Data Acquisition/Control Unit by providing a means for additional option card plug-in capability.

### 1-5. SAFETY.

1-6. The 3498A may contain voltages as high as 357 Volts Peak within the cabinet enclosures; only service trained personnel are permitted access to internal devices. Under any circumstances, the following precautions should be taken:

a. Never operate the 3498A without the rear safety cover properly installed.

b. The LINE power switch should be OFF when plug-in cards are removed or replaced.

c. When connecting terminal blocks of plug-in cards, verify that all lead wires are free from voltage sources.

d. The left-rear panel (as viewed from the back of the instrument) and the shields within the instrument are at GUARD potential. Check for voltages developed between chassis and GUARD before reconfiguring the instrument.

### 1-7. DESCRIPTION.

1-8. The 3498A provides extended capabilities for the 3497A Data Acquisition/Control Unit by furnishing decoding circuitry, power supplies, and a support structure for optional plug-in cards (see Figure 1-1).

### 1-9. Decoding Circuitry.

1-10. Decoding circuitry allows the 3498A to perform by utilizing control signals generated in the 3497A. More specifically, the inguard and outguard portions of the 3498A operate as separate entities which are controlled respectively by the inguard and outguard processors in the 3497A. The control and data transfers are accomplished through two digital interfacing cables; analog signals are transferred via a separate analog cable.

1-11. Ten slots are available for optional plug-in cards. For analog cards, the century and decade address for each slot are jumper selectable. For digital cards, the

slot numbers are jumper selectable for decades from 10 to 80.

### NOTE

*Slot numbers 5 through 9 do not exist for digital cards.*

### 1-12. Power Supplies.

1-13. Outguard Supplies. The outguard supplies furnish power to all devices in the instrument that use system ground. Included with the outguard supplies are the line input voltage select switches, line power switch, step down transformer, and cooling fan.

1-14. Inguard Supplies. Inguard supplies are floating (not referenced to chassis ground or to system ground) and provide power to the Inguard Controller and all plug-in cards that operate in conjunction with it.

### 1-15. Support Structure.

1-16. The support structure provides mounting, protection, and cooling for power supplies and optional plug-in cards. Ten slots are accessible from the rear of the instrument for insertion of option cards (see Figure 1-2).

### 1-17. INSTRUMENT IDENTIFICATION.

1-18. Attached to the instrument is a serial number plate. The serial number is in the form: 0000A00000. It is in two parts; the first four digits and the letter are the serial prefix. 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 different for each instrument. The contents of this manual apply to instruments with the serial number prefix(es) listed under SERIAL NUMBERS on the title page.

### 1-19. ACCESSORIES SUPPLIED.

1-20. Figure 1-3 shows the 3498A Extender, Inguard (-hp- 03498-61607) and Outguard (-hp- 03498-61608) Interfacing Cables, Inguard and Outguard Interfacing Plugs (installed in the 3497A -hp- 8120-3186), Interconnecting Analog Cable (-hp- 03498-61602), and AC Power Cord (-hp- 8120-1348).

### 1-21. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

1-22. The 3498A Extender is intended for operation in conjunction with a 3497A Data Acquisition/Control Unit. Refer to 3497A documentation for instructions which control option cards.

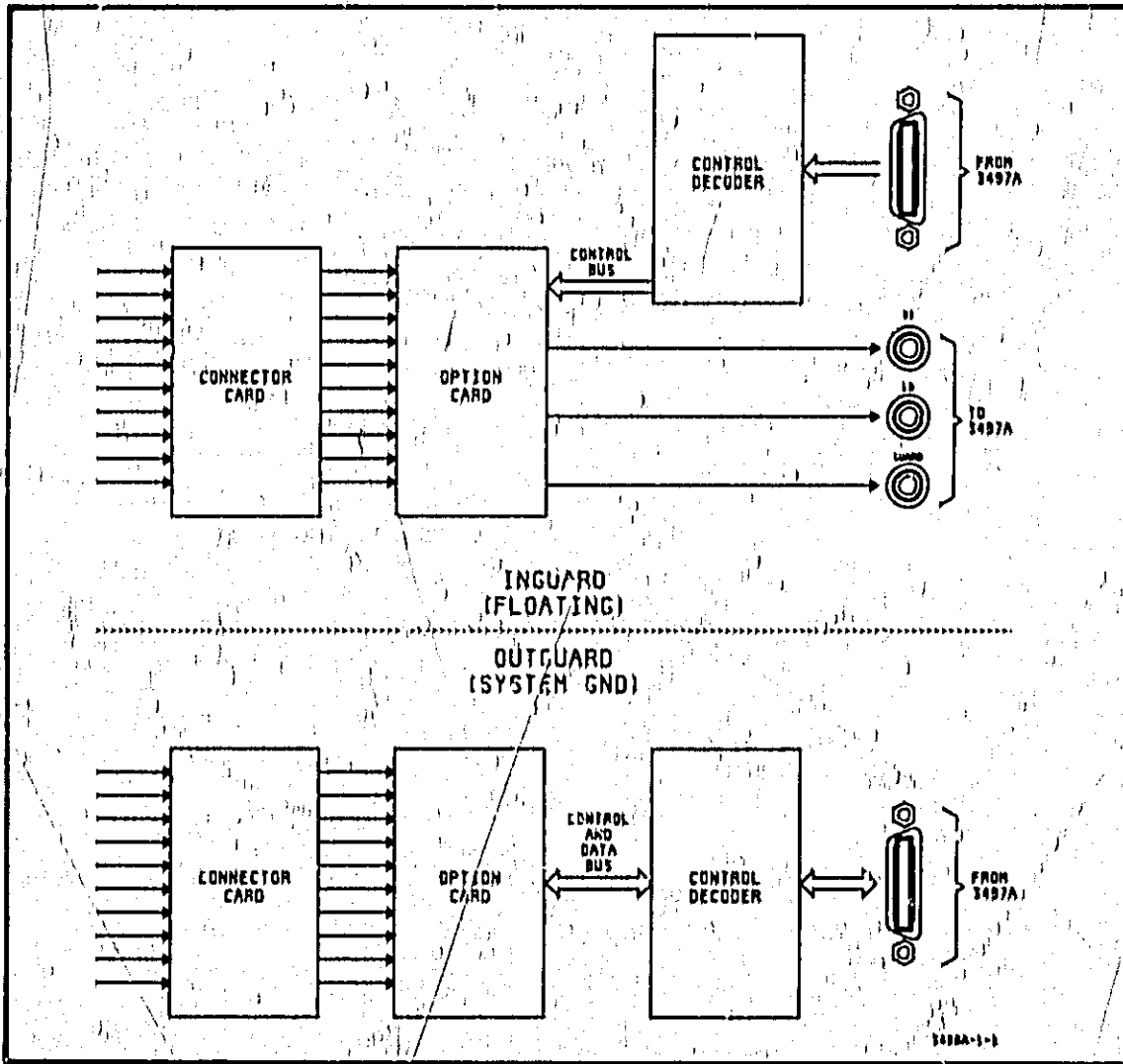


Figure 1-1. Extender Block Diagram.

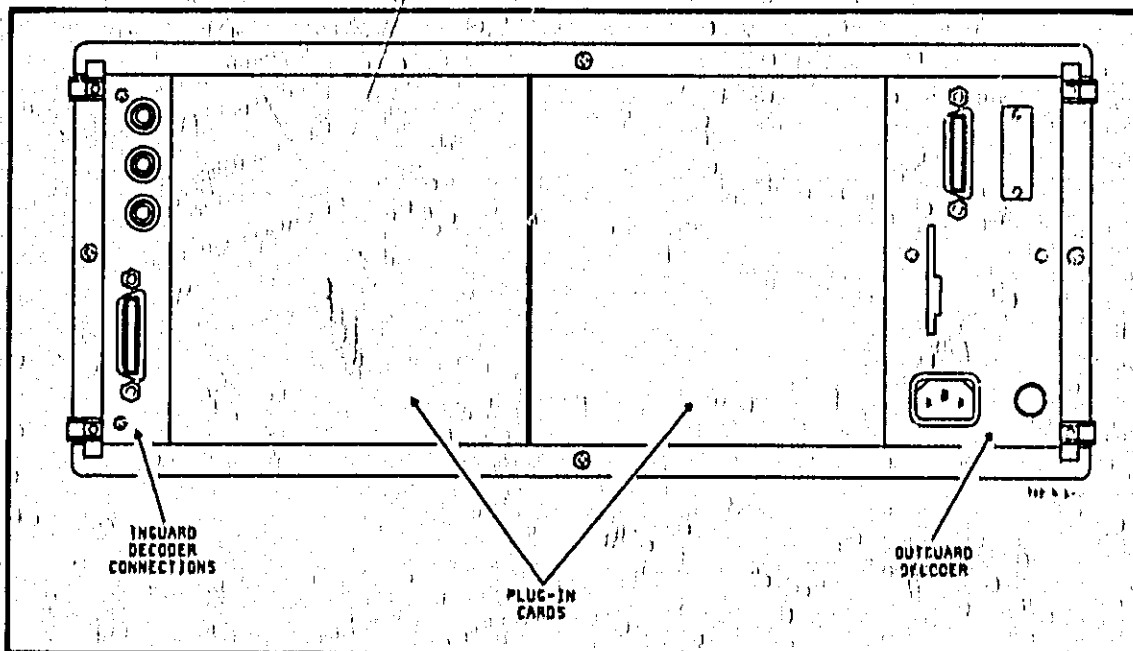


Figure 1-2. Space Allocation for Plug-in Cards.



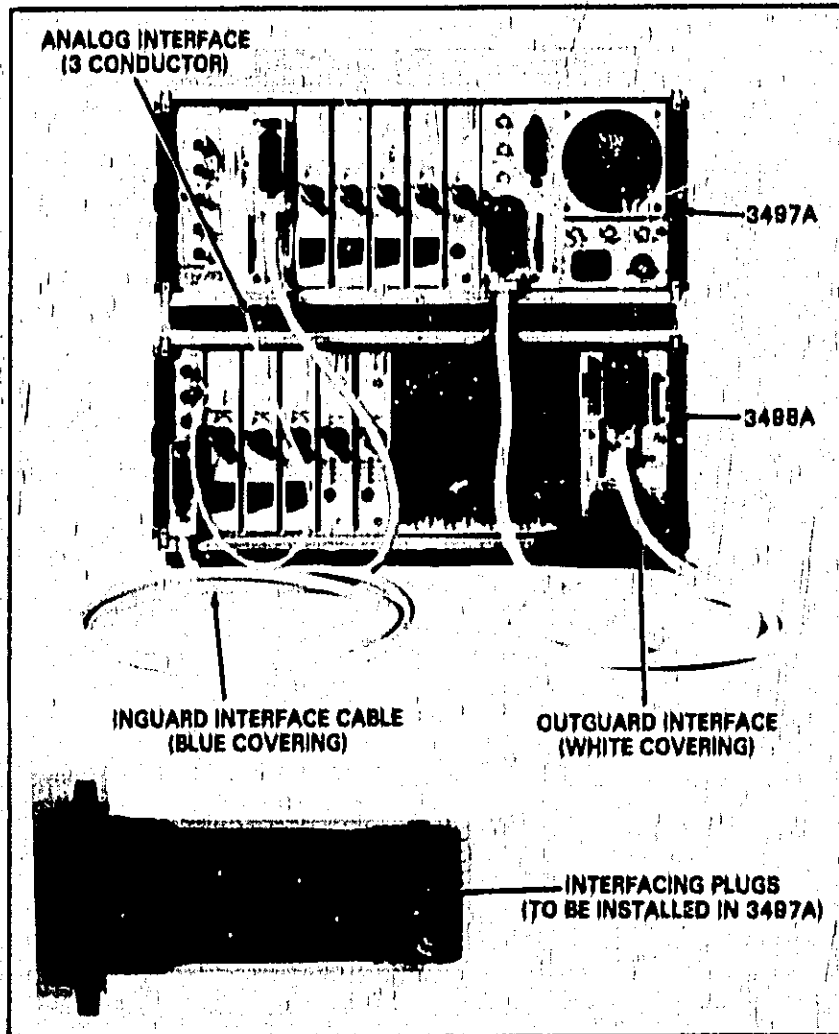


Figure 1-3. Accessories Supplied.

**1-23. EQUIPMENT AVAILABLE.**

1-24. For ease of servicing, extender boards are available for use with the following cards:

- Plug-in Option Cards, . . . .-hp- 03497-67913
- Outguard Decoder  
(03498-66502), . . . . .-hp- 03498-61604

**1-25. WARRANTY.**

1-26. Warranty information, as presented in the front of this manual, applies only to the 3498A and not to the options installed or any other interconnecting equipment.

**1-27. SPECIFICATIONS.**

1-28. The specifications, listed in Table 1-1, are the performance standards or limits against which this instrument are tested.

**NOTE**

*Other specifications for the plug-in options are listed with the corresponding manual.*

Table 1-1. Specifications.

<b>Environmental:</b>	
Operating Temperature:	0°C to +55°C
Non-operating Temperature:	-40°C to +75°C
Humidity:	85% R.H. 0°C to 40°C
Shock:	30G, 11 Msec half sine wave on each of six sides.
Vibration:	10Hz to 55Hz to 0.010 inch peak-to-peak excursion.
Operating Power:	Switch selection of 1C./120/220/240V ± 10%, 48-66Hz, less than 150VA.
<b>Physical Parameters:</b>	
Size:	428.6mm (16.87 inches) wide 520.7mm (20.5 inches) deep 180.5 (7.5 inches) high
Net Weight:	20.4Kg (45 lbs.)
Shipping Weight:	26.3Kg (58 lbs.)

## SECTION II INSTALLATION

### 2-1. INTRODUCTION.

2-2. This section contains information concerning installation and interfacing for the 3498A only. Also included are power and grounding requirements, installation instructions, interfacing procedures and instructions for packing and shipment.

#### NOTE

*Installation of optional plug-in cards is covered in the manual which corresponds to that option.*

### 2-3. INITIAL INSPECTION.

2-4. This instrument was carefully inspected both mechanically and electrically before shipment. It should be in perfect electrical order upon receipt. To confirm this, the instrument should be inspected for physical damage incurred in transit. If the instrument was damaged in transit, file a claim with the carrier. If there is any damage or deficiency, see warranty information given under general information at the beginning of the manual.

### 2-6. POWER REQUIREMENTS.

2-6. The Model 3498A can be operated from any power source supplying 100V, 120V, 220V, 240V ( $\pm 10\%$ ), 48Hz to 66Hz single phase. Power consumption is 150VA.

### 2-7. Line Voltage and Fuse Selection.

2-8. **Factory Switch Settings.** The 3498A is shipped from the factory with the following switch settings and line fuse:

Line Voltage: 120V  
Fuse: 1.25A

#### NOTE

*Line voltage switch settings and fuse type may be different if the instrument is ordered with special line voltage options.*

2-9. **Changing The Power Switch Settings.** The line voltage selection switches are located on a subpanel behind the front panel (see Figure 2-1).

2-10. Fuse type may be changed at the fuse holder located on the right rear panel of the instrument (as viewed from the back).

#### WARNING

*Line voltage and guard voltage are accessible within the instrument cabinet. Only service trained personnel are allowed access to internal devices.*

#### CAUTION

*Always verify that line power is disconnected before removing the fuse.*

### 2-11. Power Cable and Grounding Requirements.

2-12. To protect operating personnel, the National Electrical Manufacturer's Association (NEMA) recommends that the instrument panel and cabinet be grounded. The Model 3498A is equipped with a three-conductor power cord which, when plugged into an appropriate receptacle, grounds the instrument cabinet. The type of power cable plug shipped with each instrument depends on the country of destination. Refer to Figure 2-2 for the part number of the power cable and plug configurations available.

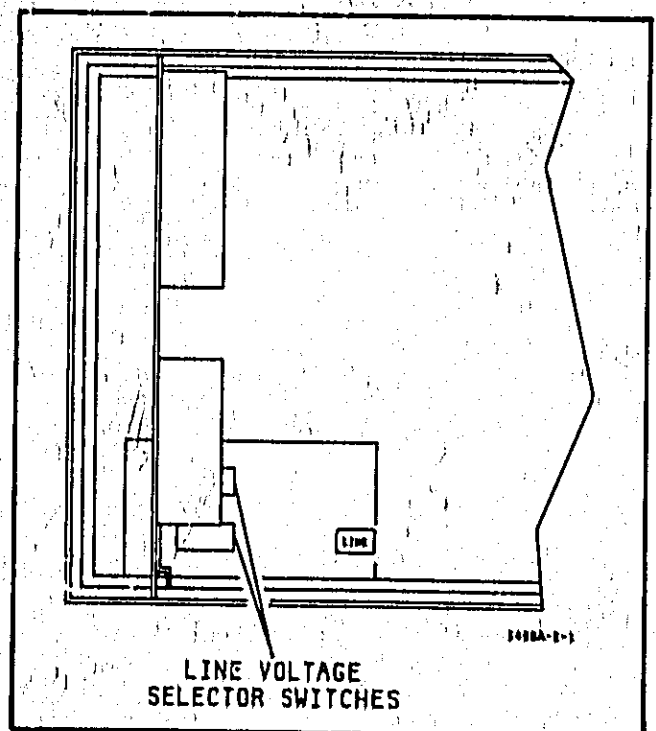


Figure 2-1. Subpanel Line Voltage Switches.

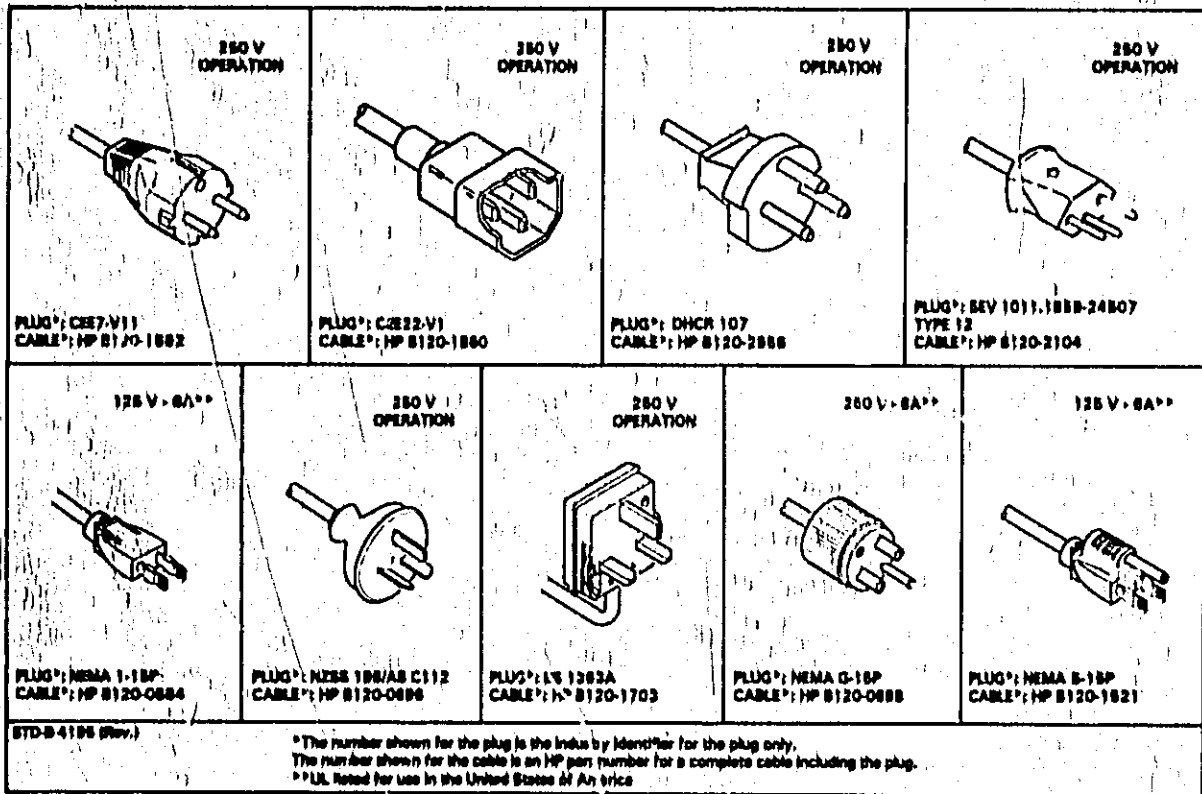


Figure 2-2. Power Cables.

**2-13. OPERATING ENVIRONMENT.****2-14. Temperature.**

2-15. The instrument may be operated in temperatures from 0°C to 55°C.

**2-16. Humidity.**

2-17. The instrument may be operated in environments with humidity up to 95%. However, the instrument should be protected from temperature extremes which cause condensation within the instrument.

**2-18. Cooling Fan.**

2-19. The 3498A is equipped with a cooling fan and filter mounted forward on the left side panel (as seen from the front). The instrument should be installed so that air can freely circulate through it. The filter for the cooling fan can be removed and then cleaned by flushing with soapy water.

**2-20. INSTALLATION.**

2-21. The 3498A is shipped with plastic feet and tilt stand in place, ready for use as a bench instrument. The plastic feet are shaped so that the 3498A may be mounted on top of other -hp- equipment. When operating the instrument, choose a location that pro-

vides at least three inches of clearance at the rear and at least one inch for each side. Failure to provide adequate clearance will result in excessive internal temperature, reducing instrument reliability. The clearances provided by the plastic feet in bench stacking and the filler strip in rack mounting allow air passage across the top and bottom cabinet surfaces.

2-22. Option 908 (Rack Mount Kit) enables the 3498A to be mounted in an equipment cabinet. The rack mount for the 3498A is an EIA standard width of 19 inches. Installation instructions are included with the Rack Mount Kit. Option 908 may be ordered from the nearest -hp- Sales and Service Office under -hp- Part Number 5061-0078.

**2-23. INTERFACING THE 3498A.****2-24. Safety Considerations.**

2-25. The guarded portions of the 3498A are floating with respect to chassis ground. The interconnecting in-guard cable, which has a blue covering, utilizes external shielding and metal plug housings that are connected to GUARD potential. The interfacing cables must be properly installed between the 3498A and a 3497A (or another 3498A) and the safety covers must be in place before external power is applied to the instrument.

**WARNING**

*Do not connect two extender cables together as a means of increasing the distance between a 3498A and a 3497A (or another 3498A). The exposed metal connector plug housings are at GUARD potential (up to 170V) and present a lethal shock hazard! Only service trained personnel should interface the 3498A.*

**2-28. Cable Installation.**

**2-27. Single 3498A's.** Three cables and two connector plugs are provided for interfacing the 3498A to a 3497A. The two connectors with their pigtail plugs require that the Inguard and Outguard Controllers in the 3497A be removed to facilitate installation. To install the connector plugs and cables, perform the following procedure:

- a. Verify that all power is disconnected from the instruments.
- b. On the Outguard Controller of the 3497A (located on the right rear of the instrument as seen from the back), loosen the two retaining fasteners and remove the assembly using the plastic pull ring.
- c. Remove the filler plate from the rear panel and install a connector plug in its place.
- d. The pigtail DIP plug should be installed into the extra socket (J2) provided on the printed circuit board.

- e. Replace the assembly and secure the fasteners.

f. In a similar fashion, install the remaining connector in the Inguard Controller (located on the left rear of the instrument).

g. Connect the cable with the blue covering between the inguard portion of the 3497A and the inguard portion of the 3498A (i.e. left side of the 3497A to the left side of the 3498A). Then use the cable with the white covering to connect the outguard portion of the two instruments together.

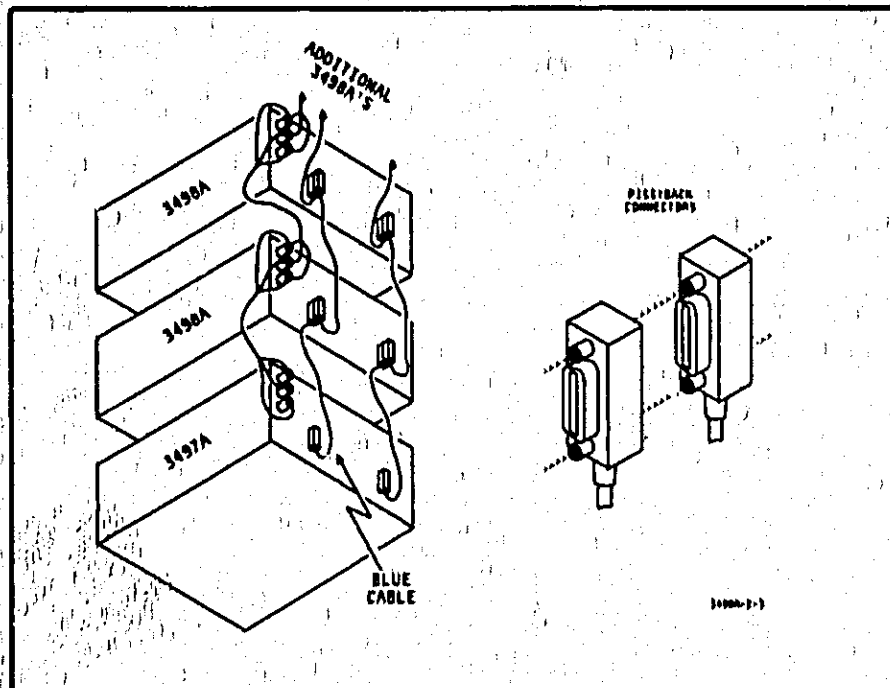
h. Loosen the terminal caps on the inguard analog common bus (located next to the inguard interface plug on both instruments) and securely fasten the analog common interface cable between the two instruments.

i. The instruments are now interfaced and should be ready for insertion or reconnection of option cards.

**2-28. Multiple 3498A's.** When additional 3498A's are added to a 3497A, the interface connections must be made from each successive extender to a previously connected extender. In this manner, the instruments may be "daisy chained" until the maximum permitted number of 3498A's are interfaced together (see 3497A Operating and Service Manual).

**NOTE**

*The 3497A must have only one 3498A directly connected to it; a 3498A may have a 3497A or two 3498A's connected directly to it. This is necessary because of the requirements for safety cover installation.*



**Figure 2-3. Interface Connections.**

**2-28. STORAGE AND SHIPMENT.****2-30. Environment.**

2-31. The instrument may be stored or shipped in environments within the following limits:

Temperature,..... -40°C to +75°C  
Humidity,..... Up to 95%

The instrument should also be protected from extreme changes in temperature which cause condensation within the cabinet.

**2-32. Packaging.**

2-33. **Original Packaging.** Containers and materials identical to those used in factory packaging are available through Hewlett-Packard offices. If the instrument is being returned to Hewlett-Packard for servicing, attach a tag indicating the type of service required, return address, model number, and full serial number. Also, mark the container FRAGILE to ensure careful handling. In any correspondence, refer to the instrument by model number and full serial number.

2-34. **Other Packaging.** The following general instructions should be used for repackaging with commercially available materials:

a. Wrap the instrument in heavy paper or plastic (if shipping to a Hewlett-Packard office or service center, attach a tag indicating the type of service required, the return address, the model number, and the full serial number).

b. Use a strong shipping container. A double-wall carton made of 350 pound test material is adequate.

c. Use a layer of shock-absorbing material 70 to 100mm (3 to 4 inches) thick around all sides of the instrument to provide firm cushioning and to prevent movement inside of the container. Protect the front panel with cardboard.

d. Seal the shipping container securely.

e. Mark shipping container FRAGILE to ensure careful handling.

f. In any correspondence, refer to the instrument by model number and full serial number.

**WARNING**

*The Model 3498A is not intended for outdoor use. Do not expose it to rain or excessive moisture.*

**WARNING**

*Only personnel with a knowledge of electronic circuitry should install, reconfigure, or make repairs to this instrument.*

## SECTION III OPERATION

### 3-1. INTRODUCTION.

3-2. The 3498A operates with those 3497A mainframe instructions that access optional plug-in cards with addresses or slot numbers which are preset in the extender. For the operator or programmer, the 3498A requires no additional programming steps or coding to establish communication; it only extends the 3497A's plug-in capability. There are, however, some commands which merit special attention when the 3498A is used.

### 3-3. COMMAND CONSIDERATIONS.

#### 3-4. Digital Interrupt.

3-5. Digital interrupt is not available for Digital Input cards (Option 50) when they are inserted into a 3498A.

#### 3-6. Non-operating Slot Numbers.

3-7. Slot numbers 5 through 9 do not exist for digital cards. It is important, therefore, to write programs which exclude these slots to avoid syntax errors or inadvertent access to an improper slot.

#### 3-8. Power-on SRQ.

3-9. When multiple extenders are interfaced to a 3497A, any of the interconnected instruments may set the power-on (P-ON) bit in the SRQ register. If the P-ON switch on the 3497A HP-IB address selector is set to OFF, then the power-on interrupt capability in all connected extenders is also disabled (see 3497A manual).

### 3-10. MODIFYING EXTENDER ADDRESSES.

#### 3-11. Factory Address Settings.

3-12. The 3498A is shipped from the factory configured for analog addresses 100 through 299 and slot numbers from 10 through 19. If more than one 3498A is used with a 3497A, address and slot number modification will be required for the additional units.

#### 3-13. Changing the Analog Addresses (Options 10 through 40).

3-14. Jumpers for modifying the analog addresses are located on the Power Supply-Inguard Decoder board. This board is located behind the front panel.

3-15. Each slot contains two decades; each decade may have any decade address from 0 through 999. Therefore, it is possible for all twenty decades (ten slots) to be configured to have the same ten channel addresses!

#### NOTE

*The 3497A may also be configured in the same manner as the 3498A (see 3497A manual).*

#### WARNING

*The shield placed over the Power Supply-Inguard Decoder is at GUARD potential (up to 170V). Only service trained personnel, who are aware of the dangers involved (lethal shock hazard, fire, etc.), should perform maintenance or modifications to the 3498A.*

3-16. Procedure. Perform the following procedure to change analog addresses:

a. Verify that all power is disconnected from the 3498A.

b. Loosen the fastener on the front panel and swing the panel outward.

c. Remove the screws retaining the shield over the Power Supply-Inguard decoder circuit board (03498-66501) and then remove the shield.

d. Locate the CENTURY and DECADE modification jumpers on the circuit board.

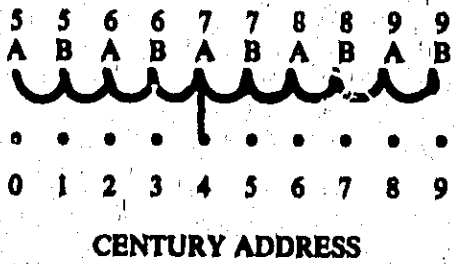
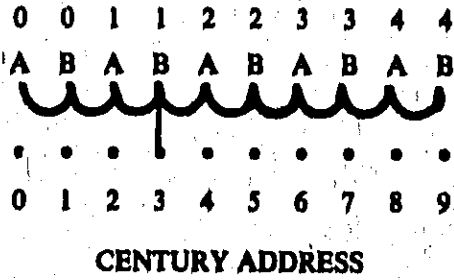
e. Using the following examples as a guide, modify the analog addresses according to your needs. This may require cutting and/or soldering jumpers to achieve the proper configuration. When finished, replace the shield and secure the front panel.

#### CAUTION

*Do not subject the circuit board to electrostatic discharge. Use clean handling techniques to avoid degradation of analog impedances. Verify that the circuit board is properly cleaned after soldering (flux and excess residual solder).*

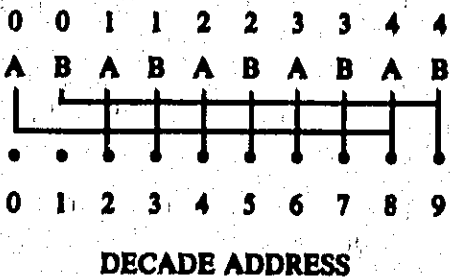
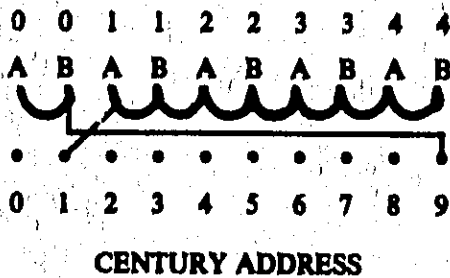
Example 1:

The 3498A has analog addresses 300 to 499 (decades are not modified and are therefore not shown).



Example 2:

Decades A and B of slot 0 (leftmost slot) have addresses 980 - 999 (second CENTURY and DECADE not shown).



3-17. Changing The Slot Designations.

3-16. Plug-in options, which use slot numbers as part of the command structure, are controlled through the outguard portion of the instrument. Slot configuration jumpers for extenders are located on the Outguard Decoder circuit board (located behind the rear right panel of the instrument as seen from the back).

NOTE

The slot configuration numbers of each 3498A must be unique. If two extenders have the same slot numbers, spurious data may result from outguard operations.

3-19. Procedure. To modify the slot designations, perform the following procedure:

- a. Verify that all power sources are disconnected from the 3498A.
- b. On the right rear panel (as seen from the back), loosen the two retaining fasteners and then remove the Outguard Decoder.
- c. Locate the box address selector jumper block on the printed circuit board.
- d. The equation for determining the address of the extender is:<sup>\*</sup>

$$\text{Beginning Slot Address} = [8 - (A + 2B + 4C)] \times 10$$

NOTE

A jumper in place is equal to a one (1) in the equation.

Example: To change the beginning address of the slots to 20 (i.e. slots available are 20-29) cut jumper A.

$$20 = [8 - (0 + 2 + 4)] \times 10$$

e. After modifications have been made, replace the Outguard Decoder and secure the fasteners before power is applied to the instrument.

<sup>\*</sup>Only the first digit of a decade address can be modified.



**SECTION IV  
PERFORMANCE TEST**

Not Applicable

## SECTION V ADJUSTMENTS

### 5-1. INTRODUCTION.

5-2. This section describes the adjustments required to return the 3498A to peak performance when repairs have been made.

### 5-3. TEST POINT AND ADJUSTMENT LOCATIONS.

5-4. Test point and adjustment locations are supplied as an assembly locator (see Figure 5-1). Most test points and adjustments are made with the front panel swung outward.

### 5-5. SAFETY CONSIDERATIONS.

5-6. This section contains warnings and cautions that must be followed for your protection and to avoid damage to the instrument.

#### WARNING

*Maintenance described herein is performed with power supplied to the instrument and protective covers removed. Such maintenance should be performed only by personnel who are aware of the hazards involved (for example, fire and electrical shock).*

#### CAUTION

*Always turn the 3498A LINE switch to OFF and remove all other sources of power before removing or replacing printed circuit assemblies.*

### 5-7. THERMOCOUPLE REFERENCE ADJUSTMENT.

5-8. Thermocouple measurements can be no more accurate than the supplied referenced voltage, therefore, follow the procedure carefully.

### 5-9. Instrument Preparation.

5-10. The thermocouple reference supply is located on the Power Supply-Inguard Decoder circuit board behind the front panel. Perform the following procedure:

a. Disconnect all external connector cards and signal lines from the rear of the instrument (line power may remain connected).

#### WARNING

*Components on portions of the Power Supply-Inguard Decoder printed circuit board are at GUARD potential and not at ground and may represent a lethal shock hazard.*

b. Verify that the LINE switch is OFF.

c. Open the front panel by unscrewing the captive fastener counter-clockwise until it is free. Swing the panel outward until it is perpendicular to the frame.

#### WARNING

*The power supply shield is at GUARD potential (up to 170V) and may represent a lethal shock hazard!*

d. Remove the power supply shield by unscrewing the two retaining screws.

e. The instrument is now ready for the adjustment procedure.

### 5-11. Adjustment Procedure.

### 5-12. Recommended Equipment:

Voltmeter: -hp- 3455A  
Compatible test leads

### 5-13. Perform the following steps:

a. Using Figure 5-1 as a guide, connect the voltmeter between TC GND and -6.9V test points. Install J1-J4.

b. Turn the 3498A LINE switch to ON.

c. Record the voltmeter reading \_\_\_\_\_.

d. Use Table 5-1 and the voltage recorded in step c to determine the appropriate jumpers to cut (J1 through J4).

e. Reconnect the voltmeter positive lead to the -8V test point.

f. Adjust R19 for a voltmeter reading of -8.0000 Volts.

g. Set the 3498A LINE switch to OFF, disconnect the voltmeter, replace the power supply shield, and close and fasten the front panel,

h. This completes the thermocouple reference adjustment.

Table B-1. Voltage Jumper Correlations.

Voltage At -8.8V Test Point		Jumpers			
Min	Max	J4	J3	J2	J1
6.62	6.6859	X	X	X	X
6.6860	6.7424		X	X	X
6.7425	6.7945	X		X	X
6.7946	6.8324			X	X
6.8325	6.8866	X	X		X
6.8867	6.9276		X		X
6.9277	6.9657	X			X
6.9658	7.0012				X
7.0013	7.0343	X	X	X	
7.0344	7.0653		X	X	
7.0654	7.0943	X		X	
7.0944	7.1216			X	
7.1217	7.1474	X	X		
7.1475	7.1716		X		
7.1717	7.1946	X			
7.1947	7.2180				

\*Cut jumpers marked by "X".

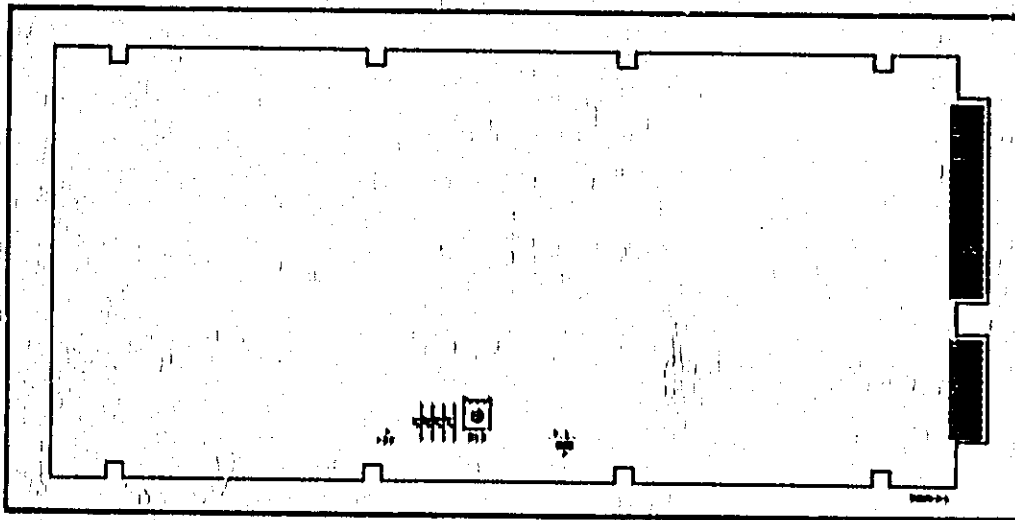


Figure 5-1. Adjustment Locations.

# SECTION VI REPLACEABLE PARTS

## 6-1. INTRODUCTION.

6-2. This section contains information for ordering replacement parts for the Model 3498A only. Table 6-3 lists parts in alphanumeric order of their reference designators and indicates the description, Hewlett-Packard part number of each part, together with any applicable notes, and provides the following:

- a. Total quantity used in the instrument (Qty column). The total quantity of a part is given the first time the part number appears.
- b. Description of the part. (See List of Abbreviations in Table 6-1.)
- c. Typical manufacturer of the part is a five-digit code. (See Table 6-2 for list of manufacturers.)
- d. Manufacturer's part number.

6-3. Miscellaneous parts are listed in Table 6-3 following their respective assemblies. General miscellaneous parts are listed at the conclusion of Table 6-3.

## 6-4. ORDERING INFORMATION.

6-5. To obtain replacement parts, address order or inquiry to your local Hewlett-Packard Field Office. (See Appendix A for list of office locations.) Identify parts by their Hewlett-Packard part numbers. Include instrument model and serial number; board revision letter and serial number.

## 6-6. NON-LISTED PARTS.

6-7. To obtain a part that is not listed, include:

- a. Instrument model number.
- b. Instrument serial number.
- c. Description of the part.
- d. Function and location of the part.

## 6-8. PROPRIETARY PARTS.

6-9. Items marked by a dagger (†) in the reference designator column are available only for repair and service of Hewlett-Packard instruments.

Table 6-1. List of Abbreviations.

ABBREVIATIONS			
<p><b>A</b> silver Al aluminum A. electrical Au gold</p> <p><b>C</b> capacitor Cp capacitor Cf coefficient Cm common Cump pump Cwv connection</p> <p><b>de</b> deposited DPT double pole double throw DST double pole single throw</p> <p><b>dia</b> electrolytic Dnc dielectric</p> <p><b>F</b> (radial) FET field effect transistor Fid fixed</p> <p><b>GAAs</b> gallium arsenide Ghz gigahertz = 10<sup>9</sup> hertz Gd ground Gnd grounded</p> <p><b>H</b> herystal Hg mercury</p>	<p><b>Hz</b> hertz (cyclic) per second</p> <p><b>IO</b> inches diameter Imag integrated Inc incandescent Ins insulated</p> <p><b>MO</b> megohms = 10<sup>6</sup> ohms MHz megahertz = 10<sup>6</sup> hertz</p> <p><b>L</b> inductor Lr linear layer log logarithmic layer</p> <p><b>MA</b> milliamperes = 10<sup>-3</sup> amperes MHz megahertz = 10<sup>6</sup> hertz mm millimeter mf microfarad mc microsecond mg milligram mV millivolt = 10<sup>-3</sup> volts μV microvolt = 10<sup>-6</sup> volts Mylar Mylar</p> <p><b>NA</b> noncomparable = 10<sup>-6</sup> g amperes NC normally closed NO normally open</p>	<p><b>NPO</b> negative positive or a zero (cannot be replaced)</p> <p><b>ns</b> nanosecond = 10<sup>-9</sup> seconds Not not separately replaceable</p> <p><b>S</b> (shunt) Sd order by description SO outside diameter</p> <p><b>Ω</b> ohm pA picoampere pF picofarad (10<sup>-12</sup> farad) pV peak inverse voltage pW part of power poly polystyrene pot potentiometer ppm parts per million PTC precision (temperature) coefficient, long term stability and/or tolerance</p> <p><b>R</b> resistor Rd resistor rms root mean square rdr rdry</p> <p><b>S</b> selenium sect section(s) Soc soccer</p>	<p><b>W</b> width WPTF wide pulse train WPTF wide pulse train</p> <p><b>Y</b> yttrium Zn zinc ZTC zinc telluride ZTC zinc telluride</p> <p><b>V</b> volt VccV charging current working voltage VcrV control voltage VcwV direct current working voltage</p> <p><b>W</b> watt WV with voltage WV with voltage WV without voltage WV without voltage</p> <p>† optimum value selected at factory, average value shown (part may be omitted if no standard type number assigned selected as special type)</p> <p style="text-align: right;">⊗ Dupont de Nemours</p>
DESIGNATORS			
<p><b>A</b> assembly B motor BT battery C capacitor CR diode or thyristor DL delay line DS lamp E elec electronic part F fuse</p>	<p><b>FL</b> filter Hr heater IC integrated circuit J jack K key L inductor M motor MIP mechanical part P plug</p>	<p><b>O</b> oscillator OCR oscillator drive Rd resistor drive RT resistor S switch T transformer TB terminal board TC thermocouple TP test point</p>	<p><b>TS</b> terminal strip U microcircuit V vacuum tube, neon bulb, photocell, etc. W width X base of Y component Z crystal Z network</p>

Table B-2. Code List of Manufacturers.

Mfr No.	Manufacturer Name	Address
H8027	Schurter A G H	Luxern, SW
0000J	GTE Sylvania Miniature Lt Prod.	Hillboro, NH 03244
0048D	United Chemicon Inc.	
01121	Allen-Bradley Co.	Milwaukee, WI 53204
01285	Texas Instr. Inc. Semicond Compt Div.	Dallas, TX 75222
0182B	RCA Corp. Solid State Div.	Somerville, NJ 08876
04713	Motorola Semiconductor Products	Phoenix, AZ 85062
06815	Richco Plastic Co.	Chicago, IL 60646
07263	Fairchild Semiconductor Div.	Mountain View, CA 94042
18701	Mepco/Electra Corp.	Mineral Wells, TX 76067
24546	Coring Glass Works (Bradford)	Bradford, PA 16701
27014	National Semiconductor Corp.	Santa Clara, CA 95051
28480	Hewlett-Packard Co. Corporate Hq.	Palo Alto, CA 94304
56289	Sprague Electric Co.	North Adams, MA 01247
75815	Littelfuse Inc.	Des Plaines, IL 60016



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

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
R21	0701-0220		1	RESISTOR 220 OH 1% 1/4W 7C TC=200/100	2000	0701-0220
R22	0601-1000		1	RESISTOR 1K OH 1% 1/4W 7C TC=200/100	0121	C81000
R23	0701-0220		1	RESISTOR 220 OH 1% 1/4W 7C TC=200/100	2000	CA-1/8-70-0701-07
R24	0701-0220		1	RESISTOR 220 OH 1% 1/4W 7C TC=200/100	2000	CA-1/8-70-0701-07
R25	0701-0220		1	RESISTOR 220 OH 1% 1/4W 7C TC=200/100	2000	CA-1/8-70-0701-07
R26	0701-0220		1	RESISTOR 220 OH 1% 1/4W 7C TC=200/100	2000	CA-1/8-70-0701-07
R27	0701-0220		1	RESISTOR 220 OH 1% 1/4W 7C TC=200/100	2000	CA-1/8-70-0701-07
R28	0701-0220		1	RESISTOR 220 OH 1% 1/4W 7C TC=200/100	2000	CA-1/8-70-0701-07
R29	0701-0220		1	RESISTOR 220 OH 1% 1/4W 7C TC=200/100	2000	CA-1/8-70-0701-07
R30	1010-0270		1	NETWORK-RES 10-0100, 7K OHM X 0	0121	E100070
R31	1010-0270		1	NETWORK-RES 10-0100, 7K OHM X 0	0121	E100070
R32	1010-0270		1	NETWORK-RES 10-0100, 7K OHM X 0	0121	E100070
R33	1010-0270		1	NETWORK-RES 10-0100, 7K OHM X 0	0121	E100070
R34	0601-1000		1	RESISTOR 1K OH 1% 1/4W 7C TC=200/100	2000	06000100
R35	0601-1000		1	RESISTOR 1K OH 1% 1/4W 7C TC=200/100	0121	C81010
U1	1020-0220		1	IC V REGTR TO-220	27010	LH2177
U2	1020-0220		1	HEAT SINK REL TO-220-CB	2000	1200-0310
U3	1020-0220		1	IC 220 V REGTR TO-220	27010	LH2177
U4	1020-0220		1	HEAT SINK REL TO-220-CB	2000	1200-0310
U5	1020-0220		1	IC V REGTR	27010	LH2177-15
U6	1020-0220		1	HEAT SINK REL TO-220-CB	2000	1200-0310
U7	1020-0220		1	IC V REGTR TO-220	20713	UA7015UC
U8	1020-0220		1	HEAT SINK REL TO-220-CB	2000	1200-0310
U9	1020-0220		1	IC CP AMP SP TO-99	01200	LH001AL
U10	1020-0220		1	IC 723 V REGTR 10-DIP-C	04713	MC1723L
U11	1020-0220		1	IC DECOU TTL LB DEC-TO-DEC 8-TO-10-LINE	01200	SN74L0100N
U12	1020-0220		1	IC DECOU TTL LB DEC-TO-DEC 8-TO-10-LINE	01200	SN74L0100N
U13	1020-0220		1	IC DECOU TTL LB DEC-TO-DEC 8-TO-10-LINE	01200	SN74L0100N
U14	1020-0220		1	IC GATE CMOS ON QUAD 2-IMP	01920	CD40710E
U15	1020-0220		1	IC GATE CMOS ON QUAD 2-IMP	01920	CD40710E
U16	1020-0220		1	IC GATE CMOS ON QUAD 2-IMP	01920	CD40710E
U17	1020-0220		1	IC 741 TTL LB NON-INV HEX 1-IMP	01200	SN74L0307AN
U18	1020-0220		1	IC 741 TTL LB NON-INV CCTL	27010	0801L097N
U19	1020-0220		1	IC CP AMP SP DUAL 8-DIP-P	27010	LH200N
U20	1020-0220		1	IC 200 V REGTR TO-3	27010	LH200N
U21	1020-0220		1	HEAT SINK TO-3-CB	2000	1200-0210
				A1 MISCELLANEOUS PARTS		
	0100-0100		1	BRACKET-DIOCK	2000	0100-0100
	0100-0100		1	BRACKET-DUAL DIOCK	2000	0100-0100
	1001-0717		1	CONN-ICP HEADER	2000	1001-0717
	1001-0718		1	CONN-ICP HEADER	2000	1001-0718

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

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

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A2	0149-0650*	Y	1	OUTWARD DECODER	20400	0149-0650
C1	0100-0300	M	2	CAPACITOR-PXD 2.7UF±20K 10VDC YA	20200	100D470K0010AB
C2	0100-0571	M	2	CAPACITOR-PXD .1UF 400-20K 50VDC 50V	20400	0100-0571
C3	0100-0571	M	2	CAPACITOR-PXD .1UF 400-20K 50VDC 50V	20400	0100-0571
C4	0100-0571	M	2	CAPACITOR-PXD .1UF 400-20K 50VDC 50V	20400	0100-0571
C5	0100-0571	M	2	CAPACITOR-PXD .1UF 400-20K 50VDC 50V	20400	0100-0571
C6	0100-0300	M	2	CAPACITOR-PXD 2.7UF±20K 10VDC YA	20200	100D470K0010AB
D1	1001-0033	Q	1		20400	1001-0033
R1	0400-1025	M	0	RESISTOR 10K 1/4W 5% TC=200±100	01201	CH1030
R2	0400-1025	M	0	RESISTOR 10K 1/4W 5% TC=200±100	01201	CH1030
R3	0400-1025	M	0	RESISTOR 10K 1/4W 5% TC=200±100	01201	CH1030
R4	0400-1025	M	0	RESISTOR 10K 1/4W 5% TC=200±100	01201	CH1030
R5	0400-1025	M	0	RESISTOR 10K 1/4W 5% TC=200±100	01201	CH1030
R6	0400-1025	M	0	RESISTOR 10K 1/4W 5% TC=200±100	01201	CH1030
R7	0400-1025	M	0	RESISTOR 2.4K 1/4W 5% TC=200±100	20200	CA-10-10-2001-P
R8	0400-1025	M	0	RESISTOR 4.0K 1/4W 5% TC=200±100	20200	CA-10-10-4001-P
R9	0400-1025	M	0	RESISTOR 10K 1/4W 5% TC=200±100	20200	CA-10-10-1001-P
R10	0400-1025	M	0	RESISTOR 80K 1/4W 5% TC=200±100	20200	CA-10-10-8001-P
R11	0400-1025	M	0	RESISTOR 80K 1/4W 5% TC=200±100	20200	CA-10-10-8001-P
R12	0400-1025	M	0	RESISTOR 1.5K 1/4W 5% TC=200±100	20200	CA-10-10-1501-P
R13	0400-1025	M	0	RESISTOR 1.5K 1/4W 5% TC=200±100	20200	CA-10-10-1501-P
R14	0400-1025	M	0	RESISTOR 4.0K 1/4W 5% TC=200±100	20200	CA-10-10-4001-P
RP1	1010-0130	M	3	NETWORK-REG 10-DIP MULTI-VALUE	20400	1010-0130
RP2	1010-0130	M	3	NETWORK-REG 10-DIP MULTI-VALUE	20200	1010-0130
RP3	1010-0130	M	3	NETWORK-REG 10-DIP MULTI-VALUE	20400	1010-0130
U1	1070-1010	Y	1	IC DCDR TTL LB RECD-YO-DEC 4-YO-10-LINE	01200	0N7AL000N
U2	1070-1010	Y	1	IC BATE TTL LB EXCL-OR QUAD 2-IMP	01200	0N7AL000N
U3	1070-1010	Y	1	IC DRVR TTL LB LINE DRVR OCTL	01200	0N7AL020N
U4	1070-1010	Y	1	IC SCHMITT-TYPE TTL LB HAND QUAD 2-IMP	01200	0N7AL020N
U5	1070-1010	Y	1	IC BATE TTL LB NON DUAL 5-IMP	07003	70L000PC
U6	1080-1010	Y	1	IC SFR TTL LB LINE DRVR OCTL	01200	0N7AL020N
U7	1080-1010	Y	1	IC MISC TTL LB	01200	0N7AL020N
U8	1080-1010	Y	1	IC COMPARATOR OP QUAD 10-DIP-P	01200	0N7AL020N
				AD MISCELLANEOUS PARTS		
	1200-0070	Y	1	SOCKET-IC 16-CONY DIP-SLDR	20400	1200-0070
	1200-0700	M	1	SOCKET-IC 16-CONY DIP-SLDR	20400	1200-0700

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



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

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3	03498-65503	M	1	MOTHER BOARD	28480	03498-65502
C1	0160-4537			C-FXD 001 UF	28480	0160-4537
C2	0160-0570			C-FXD 220UF 10	28480	0160-4537
J2	1291-0592		10	CONNECTOR-PC EDGE 25-CONT/ROM 2-ROHS	28480	1291-0592
J3	1291-0592			CONNECTOR-PC EDGE 25-CONT/ROM 2-ROHS	28480	1291-0592
J4	1291-0592			CONNECTOR-PC EDGE 25-CONT/ROM 2-ROHS	28480	1291-0592
J5	1291-0592			CONNECTOR-PC EDGE 25-CONT/ROM 2-ROHS	28480	1291-0592
J6	1291-0592			CONNECTOR-PC EDGE 25-CONT/ROM 2-ROHS	28480	1291-0592
J7	1291-0592			CONNECTOR-PC EDGE 25-CONT/ROM 2-ROHS	28480	1291-0592
J8	1291-0592			CONNECTOR-PC EDGE 25-CONT/ROM 2-ROHS	28480	1291-0592
J9	1291-0592			CONNECTOR-PC EDGE 25-CONT/ROM 2-ROHS	28480	1291-0592
J10	1291-0592			CONNECTOR-PC EDGE 25-CONT/ROM 2-ROHS	28480	1291-0592
J11	1291-3761			CONNECTOR 60PIN F PDBY TYPE	28480	1291-3761
J12	1291-0592			CONNECTOR-PC EDGE 25-CONT/ROM 2-ROHS	28480	1291-0592
				A3 MISCELLANEOUS PARTS		
	03498-01001	Y	1	CABLE ASSEMBLY-MOTHER BOARD	28480	03498-01001

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

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

Reference Designation	HP Part Number	U D	Qty	Description	Mfr Code	Mfr Part Number
				CHASSIS MOUNTED PARTS ELECTRICAL PARTS		
BI	03490-00501	M	1	FAN ASSEMBLY	20400	03490-00501
CI	0100-3020	M	1	CAPACITOR-PHD .000475-10K 50VDC AL	20400	0100-3020
CS	0100-0102	M	2	CAPACITOR-PHD .002UF 50-10K 50VDC POLYE	20400	0100-0102
CS	0100-0102	M	2	CAPACITOR-PHD .002UF 50-10K 50VDC POLYE	20400	0100-0102
CO	0100-3047	M	1	CAPACITOR-PHD .01UF 100-25 50VDC CER	20400	0100-3047
CR1	1001-0090	M	2	DIODE-PNR RECT 100V 10A DO-4	00710	M0101
CR2	1001-0090	M	2	DIODE-PNR RECT 100V 10A DO-4	00710	M0101
CR3	1001-1000	M	1	DIODE-PNR 1N4007A 5.0V 50 DO-9 POSITION	00710	1N4007A
DB1	2100-0092	M	1	LAMP-INCAND 600 5VDC 60MA T-1-BULB	00003	600 T1P BND
FI	2110-0004	M	1	FUSE 1.25A 250V NTD 1.25A .25 UL REC	20400	2110-0004
FJA	2110-0004	M	1	FUSE .6A 250V NTD 1.25A .25 UL	70910	210,600
GA	1040-0030	M	1	TRANSISTOR NPN 01 TO-3 POSITION PT-04MHE	20400	1040-0030
HI						
SI	3101-1720	M	1	SWITCH-POWER (LINE)	20400	3101-1720
T	9100-2001	M	1	TRANSFORMER-POWER	20400	9100-2001
				CABLES		
W2	03490-01002	M	1	CABLE-EXT N-100	20400	03490-01002
W3	03490-01003	M	1	CABLE ASSEMBLY-INGUARD	20400	03490-01003
W4	03490-01004	M	1	CABLE ASSEMBLY-OUTGUARD	20400	03490-01004
W5	03490-01005	M	1	CABLE-NI-LQ-000	20400	03490-01005
W6	03490-01006	M	1	CABLE ASSEMBLY-MAIN	20400	03490-01006
W7	03490-01007	M	1	CABLE-INGUARD	20400	03490-01007
W8	03490-01008	M	1	CABLE-OUTGUARD	20400	03490-01008
W9	0120-1340	M	1	CABLE ASBY 10AWG 3-COND ALN-JNY	20400	0120-1340
W10	0120-1340	M	1	CABLE ASSEMBLY-07 EXT	20100	0120-1340
				MISCELLANEOUS PARTS		
	1001-0071	M	1	CONNECTOR 2-PIN M UTILITY	20400	1001-0071
	1001-0000	M	1	CONNECTOR 20-PIN M DUAL INLINE	20400	1001-0000
	1001-0007	M	1	CONNECTOR 20-PIN M RIBBON	20400	1001-0007
	1001-0000	M	1	CONNECTOR 20-PIN M RIBBON	20400	1001-0000
	1000-0000	M	1	INSULATOR-NBYP ALUMINUM	2,700	1000-0000
	1000-0000	M	1	INSULATOR-DIG ALUMINUM NO-ANDE	20400	1000-0000
	1000-0000	M	1	INSULATOR-DIG ALUMINUM NO-ANDE	20400	1000-0000
	1000-0000	M	1	LAMPHOLDER M05T-0C-PLG-SKY TUN-YEOM	20400	1000-0000
	1000-0000	M	1	LENS-LAMPHOLDER	20400	1000-0000
	1010-0001	M	1	BINDING POST 00L 00L-YUR JCK RED	20400	1010-0001
	1010-0111	M	1	BINDING POST 00L 00L-YUR JCK RED	20400	1010-0111
	2110-0000	M	1	FUSEHOLDER BODY 10A MAX FOR UL	14007	001,1007
	2110-0000	M	1	FUSEHOLDER CAP 10A MAX FOR UL	20400	2110-0000
	2110-0000	M	1	FUSEHOLDER CAP 10A MAX FOR UL	20400	2110-0000

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

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

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
CHASSIS MECHANICAL PARTS						
	01497-00207		1	SUB-PANEL	20400	01497-00207
	01497-01207		1	PANEL-LATCH BRACKET	20400	01497-01207
	01498-00101		1	DECK-FRONT	20400	01498-00101
	01498-00102		1	DECK-MAIN	20400	01498-00102
	01498-00201		1	PANEL-CONTROL	20400	01498-00201
	01498-00001		1	SHIELD-FRONT	20400	01498-00001
	01498-00002		1	SHIELD-CONNECTOR	20400	01498-00002
	01498-00003		1	SHIELD-TOP	20400	01498-00003
	01498-00004		1	SHIELD-BOTTOM	20400	01498-00004
	01498-01201		1	BRACKET-CONTROL PANEL	20400	01498-01201
	01498-01200		1	BRACKET-REAR COVER	20400	01498-01200
	01498-00101		1	PLATE-LEFT SIDE	20400	01498-00101
	01498-00701		1	SUPPORT-RIGHT GUIDE	20400	01498-00701
	01498-00702		1	SUPPORT-R CASE	20400	01498-00702
	01498-00703		1	SUPPORT-CENTER	20400	01498-00703
	01498-00704		1	SUPPORT-L CASE	20400	01498-00704
	01498-00003		1	PANEL-DRESS (FINISH)	20400	01498-00003
	0171-1200		1	KEY CAP	20400	0171-1200
	0180-1200		2	STANDOFF-NEX 0,8MM-LS 0,83MM-A77 DRD	00000	ORDER BY DESCRIPTION 9100-1200
	0180-1200		2		20400	
	0149-0000		2	INSULATOR-PLS-0000 NYLON	20400	0149-0000
	0149-0000		2	GUIDE-PC RD HMT PLYC 3,5-LS	20400	0149-0000
	0149-0000		20	SCREW-MACH M3,5 X 0,8 10MM-LS PAN-HD	00000	ORDER BY DESCRIPTION
	0149-0000		2	SCREW-MACH M3,5 X 0,8 10MM-LS PAN-HD	00000	ORDER BY DESCRIPTION
	0149-0000		1	SCREW-MACH M3,5 X 0,8 10MM-LS	00000	ORDER BY DESCRIPTION
	0149-0000		3	SCREW-MACH M3,5 X 0,8 10MM-LS	00000	ORDER BY DESCRIPTION
	0149-0000		10	SCREW-MACH M3,5 X 0,8 10MM-LS PAN-HD	00000	ORDER BY DESCRIPTION
	0149-0000		7	SCREW-MACH M3,5 X 0,8 10MM-LS PAN-HD	00000	ORDER BY DESCRIPTION
	0149-0000		2	SCREW-MACH M3,5 X 0,8 10MM-LS PAN-HD	00000	ORDER BY DESCRIPTION
	0149-0000		2	NUT-HEX DBL-CHAN M3 X 0,8 2,8MM-TMR	00000	ORDER BY DESCRIPTION
	0149-0000		5	NUT-HEX DBL-CHAN M3 X 0,7 3,8MM-TMR	00000	ORDER BY DESCRIPTION
	0149-0007		2	NUT-HEX DBL-CHAN M3,5 X 0,8 2,8MM-TMR	00000	ORDER BY DESCRIPTION
	0149-0000		2	SCREW-TYPE 0-20 27-IN-LS PAN-HD-POST STL	20400	0149-0000
	1000-0011		2	CLAMP-CABLE 1/2-DIA 1/2ND PVC	20400	1000-0011
	1000-0077		2	CLAMP-CABLE 1/2-DIA 3/8ND PLYC	20400	1000-0077
	1000-1016		2	CLIP-CABLE 0,375 IN CABLE DIA 1,0 IN	00910	0100-1016 PCAD
	1000-1017		1	CLIP-CABLE 0,375 IN CABLE DIA 0,50 IN	00910	0100-1017 PCAD
	1000-0700		1		20400	1000-0700
	1000-0777		2	WASHER-LK MCLL NO. 10 1/4-IN-ID	20400	1000-0777
	1000-0890		2	WASHER-BPR CRVD 3/8 IN 1/2-IN-ID	20400	1000-0890
	1000-1000		2	WASHER-PL NM NO. 10 1/2-IN-ID	20400	1000-1000
	1000-1020		1	WASHER-BMLDR 3/16 IN 1/2-IN-ID	20400	1000-1020
	1000-0300		1		20400	1000-0300
	1000-1000		1		20400	1000-1000
	1000-0000		1	HALF CARD CASE	20400	1000-0000
	1001-0000		1	PCB, C. BOARD EXTRACTOR	20400	1001-0000
	1001-0000		1	TRIM-SIDE	20400	1001-0000
	1000-0000		1	FRAME-FRONT	20400	1000-0000
	1000-0000		1	FRAME-REAR	20400	1000-0000
	1000-0000		1	STRUT-CORNER	20400	1000-0000
	1000-0000		1	EXTRACTOR, P.C. BOARD	20400	1000-0000
	1000-7201		1	FOOT(STANDARD)	20400	1000-7201
	1000-7202		1	TRIM-TOP	20400	1000-7202
	1000-7210		1	STRAP HANDLE-CAP-FRONT	20400	1000-7210
	1000-7200		1	STRAP HANDLE-CAP-REAR	20400	1000-7200
	1000-7070		1	PUSHROD-SWITCH	20400	1000-7070
	1000-7000		1	STRAP HANDLE-18 INCH	20400	1000-7000
	1000-0000		1	COVER-TOP	20400	1000-0000
	1000-0000		1	COVER-BOTTOM	20400	1000-0000
	1000-0000		1	COVER-SIDE (STD.)	20400	1000-0000
	1000-0017		1	COVER-SIDE (PERFORATED)	20400	1000-0017
	7100-1200		1	NAMEPLATE 1/2-IN-WD 1/4-IN-LS AL	20400	7100-1200
	7101-0370		1	LABEL-D THRU 0	20400	7101-0370
	7102-0000		1	PLATE-BENTAL	20400	7102-0000

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

**SECTION VII  
BACKDATING**

**Not Applicable**

## SECTION VIII SERVICE

### 8-1. INTRODUCTION.

8-2. The Service Section contains information for troubleshooting the 3498A. In addition to schematics and component locators, procedures are provided to aid in diagnosing a problem to a portion of a circuit board. For structural damage to the instrument cabinet, see chassis parts and exploded chassis views in Replaceable Parts, Section VI of this manual.

### 8-3. SAFETY CONSIDERATIONS.

8-4. Service on the 3498A is performed with the option cards removed from the instrument and all inputs and interfacing cables disconnected.

#### WARNING

The 3498A inputs may contain voltages as high as 170V. Verify that all power sources (except LINE power) are disconnected from the instrument before performing any service procedure.

#### WARNING

Service described herein is performed with power supplied to the instrument and protective covers removed. Service should be performed by trained personnel who are aware of the hazards involved (for example, fire and electrical shock).

#### CAUTION

Always turn the 3498A LINE switch to OFF before removing or replacing any of the printed circuit assemblies. Do not subject the circuit boards to electrostatic discharge. Always use clean handling techniques.

### 8-5. CIRCUIT DESCRIPTION.

8-6. The 3498A decodes information from the 3497A to operate optional plug-in assemblies. These circuits and their power supplies are contained on two circuit boards; a third circuit board serves as the back plane (mother board) for plug-in assemblies (see Figure 8-1).

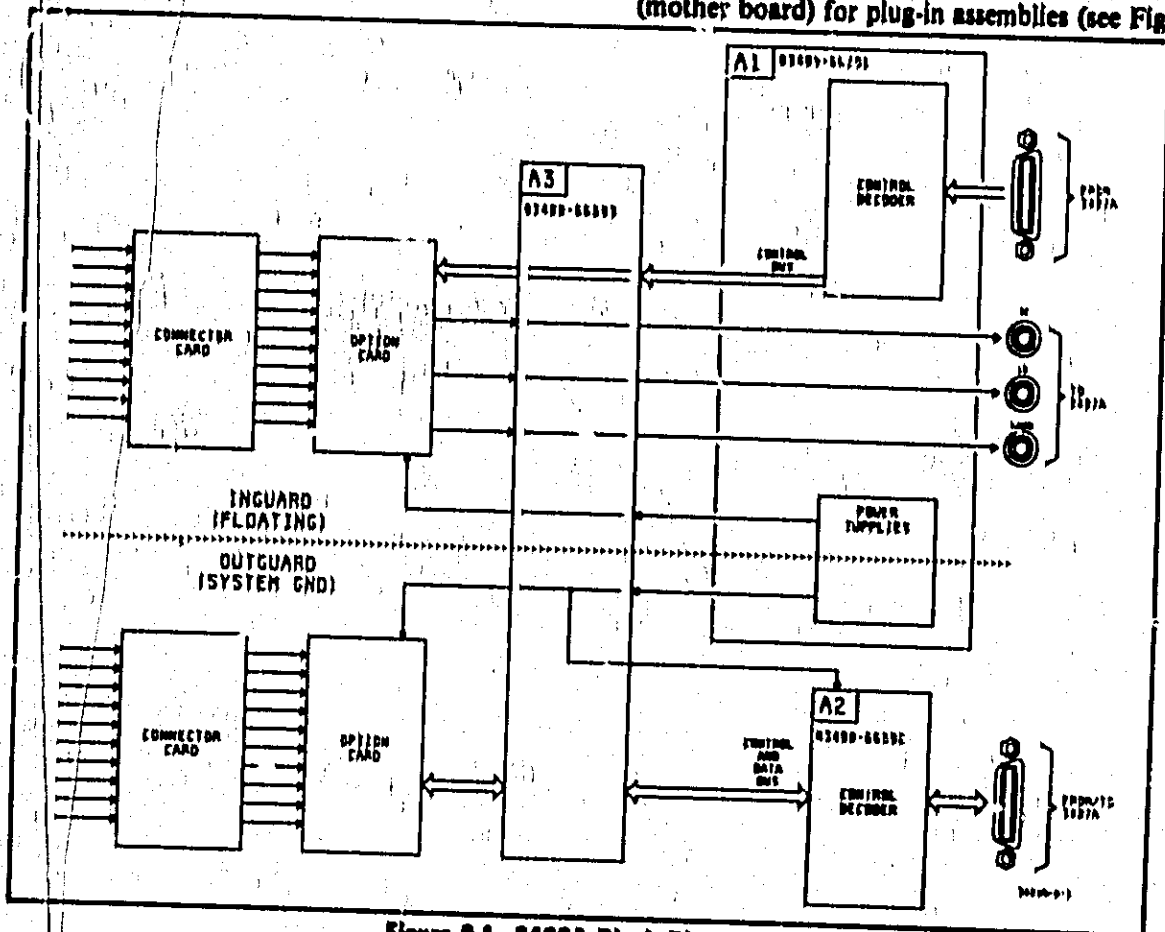


Figure 8-1. 3498A Block Diagram.

**8-7. The Outguard Decoder.**

8-8. The Outguard Decoder (A2 board) is located in the right rear portion of the instrument (as seen from the back). The decoding circuits are referenced to system ground (also chassis ground) and operate entirely independently of the Inguard circuits (see A2 schematic).

8-9. There are four somewhat individual functions on the board:

- a. Power Detection Circuits.
- b. Register Address Circuits.
- c. Slot Address Circuits.
- d. Box Address and Data Read/Write Circuits.

**8-10. Power Detection Circuits.**

8-11. The integrated circuit U8 with its associated components form the power detection circuitry.

8-12. Turn-on. On turn-on, C6 and the network comprised of R5, R8, and R9 establish a RC time constant which determines a time of 35 msec to charge the capacitor from 0 Volts to 3 Volts. At 3 Volts (also established on the inverting input of U8A and U8B), the outputs of the op-amps switch from a TTL logic low to a TTL logic high (note pull-up resistors RP1 and R4). The time of 35 msec allows the power supplies to reach operational output levels during the period in which RESET is held low. Notice that RESET goes to the outguard option cards and LP goes to the 3497A. This is the signal that sets a bit in the SRQ register (when it is enabled by the P-ON switch on the HP-IB address selector of the 3497A).

8-13. Power Interrupt After Turn-on. If power is interrupted after turn-on, comparator U8C senses the decrease of the raw +6.4V supply in relation to the +5V supply (note that the +5V supply stays at a high voltage for a longer period of time, due to the filter capacitors in the logic circuitry). The output from U8C decreases the voltage across capacitor C6, simulating a turn-on condition.

**8-14. Register Address Circuits.**

8-15. Register address data is buffered from the interface cable by U4A, B, C and U6; the data is subsequently decoded in each of the option cards. Note that U4D acts as a low true NOR gate for the RESET signal (i.e., RESET is derived from the 3497A or from the power detection circuitry).

**8-16. Slot Address Circuits.**

8-17. The slots in the 3498A are enabled by the outputs from U1. U1 is a 1 of 10 decoder which utilizes BCD data on the input lines EA3 through EA6. Note that the data here is high true and the slot enabling data is low true. U3 is used to buffer the interface cable which has terminations determined by RP2.

**8-18. Box Address and Data Read/Write.**

8-19. The decade value of the slot addresses are determined by the jumper configuration in the BOX ADDRESS DECODER. A low (jumper installed) signal is exclusive "OR'ed" with the corresponding address input line; a low input results in a low output from U2. U5A acts as a low true "NAND", therefore if all inputs match the jumper configuration and EXT READ is low, a high output from U5A will signal that an external read from this 3498A is being requested. U6 inverts the signal and drives all outguard option card command buffers as well as the bi-directional buffer U7. Note that the default direction of U7 is to take data from the interface cable and transmit it to the option cards. Even though the data is available to all slot locations, the BOX WRITE command must be true before data will be accepted by any one designated slot.

**8-20. The Inguard Decoder.**

8-21. Eight data lines are buffered from the interface cable by U18 and provide data for two BCD digits. One digit determines the decade analog address (DC0 - DC3); the other digit determines the century analog address (CE0 - CE3). U8 - U11 are one of ten decoders which have outputs used for address selection (jumper boxes 1 through 4). The decoders continually output data even while analog addresses are being changed. For a decade to be activated (output to a slot), a decade and a century logic low signal must be received by an "OR" gate in the group comprised of U12 - U16. Note that these "OR" gates function logically as a "LOW TRUE AND". If so desired, the jumpers may be set such that any output can have a decade address in the range of 0 through 999. The units portion of the analog address (UN0 - UN3) and the board command buffer latch instruction (L-LATCH) are buffered from the interface cable by U17. Note that these commands are transmitted to the slot as high true commands.

**8-22. Outguard Power Supply.**

8-23. The outguard supply provides +5V for the Outguard Decoder and outguard options. Also available to the Outguard Decoder is +6.4V Raw (unregulated) which is used for power failure detection.

8-24. The main filter capacitors C1, C2, and C3; diodes CR1, CR2, and CR3; and pass transistor Q1 are located on the sub-chassis next to the power transformer T1. All other components are located on the A1 (03498-66501) board.

8-25. Voltage Sense Circuit. Voltage sense is determined by components U7, R6, R7, and R8. A current source in U7 plus a zener diode establish 7.16V at pin 6. A resistor network provided by R8 and R7 reduces this voltage to +5V which is used as an input to the non-inverting input of an op-amp. The inverting port of the

op-amp senses the output voltage of the supply and causes a correction voltage to drive current source AIQ1 and ultimately the pass transistor Q1 (mounted on the chassis).

**8-26. Current Sense Circuit.** Foldback current protection is determined by the voltage developed across resistors R12 and R13. This differential voltage is scaled by R11 and R5 such that a drop of approximately .28V (corresponding to a current of about 5A) will cause comparator U19A to output a low voltage (<1V) forward biasing CR7 and turning off AIQ1 and pass transistor Q1 (mounted on chassis).

### 8-27. Inguard Power Supplies.

8-28. Inguard supplies are isolated from outguard supplies through the transformer secondary windings. All supplies are regulated by three terminal integrated circuit devices. Jumpers may be removed to isolate a supply from its load.

**8-29. Thermocouple Reference Circuit.** Op-amp U5 has a -6.9V reference, derived from zener CR32, applied to the non-inverting input. The output drives a voltage source Q2 such that the voltage obtained from resistor divider network, comprised of R20 and one or more of resistors R14 - R19 in parallel with R35, provides -6.9V at the inverting input. The -8V reference is calibrated by opening a combination of jumpers in the feedback resistance network and by adjusting R19.

## 8-30. TROUBLESHOOTING.

### 8-31. Instrument Preparation.

8-32. Prepare the 3498A for troubleshooting as follows:

a. Disconnect all power sources from the option cards and the instrument.

b. Remove all option cards and interconnecting cables between the 3497A and the 3498A.

c. Open the front panel and remove the power supply shield.

d. For Outguard Decoder troubleshooting, locate the ribbon cable connected to the left side of the mother board (next to the cooling fan). Disconnect this cable and connect in its place the extender cable used for troubleshooting (actually it's a cable similar to the one that is installed in the instrument).

e. Remove the Outguard Decoder (right rear of instrument as seen from the back) and connect it to the extender cable.

f. The instrument may now be reconnected to LINE power for troubleshooting purposes.

**CAUTION**

Turn instrument LINE switch to OFF when installing ground leads.

### 8-33. Troubleshooting Logic Circuits.

8-34. The logic in the 3498A can be troubleshot on a static basis; that is, there are no edge triggered devices requiring dynamic logic level changes. Where combinational logic inputs are used (decoders, for example), clip leads can be utilized to ground the appropriate data lines. For other types of logic debugging, a pull up resistor (approximately 2 Kohms) and a clip lead for grounding, can induce logic changes; a voltmeter may be used to monitor the results. Or, if available, a logic pulser probe and a logic read out probe may be used to troubleshoot a majority of the circuitry.

### 8-35. Troubleshooting The Power Supplies.

8-36. Power supplies may be serviced by conventional means. An oscilloscope and/or a multimeter can provide all the necessary indications required.

### 8-37. Recommended Service Equipment.

8-38. To avoid unnecessary disassembly of the instrument and to maximize troubleshooting effectiveness, Hewlett-Packard recommends that the following equipment and troubleshooting aids be considered:

Area of Usage	Equipment/Aid	hp Model/Part No.
Outguard Decoder	Logic Probe	hp Model 545A
Inguard Decoder	Logic Pulser	hp Model 546A
	Extension Cable (for Outguard Decoder)	hp 03498-61604
Power Supplies	Multimeter	hp Model 3455A
	Oscilloscope	hp Model 1220A

### 8-39. Troubleshooting Information.

**8-40. Outguard Decoder.** Referring to the A2 schematic (03498-66502), note that combinational logic is needed for U1 and the box address decoding circuitry U2, U3, U5, and U6. For these circuits, use jumpers to ground the appropriate pins of U3 according to Table 8-1. Then pick any one of the grounded leads, disconnect it from ground and pulse that point with a Logic Pulser (or momentarily reground lead) while monitoring the designated output.

#### Example 1:

To verify that the box address is 10 and to turn buffer U7 around (such that the 3498A is writing data out), ground pins 11, 13, 15, and 17 of U3. Pin 14 of U6 should then become a logic low; disconnecting any grounded lead should allow this point to go to a logic high.

Service

Model 3498A

Example 2:

To verify that the SLOT 0 output is functioning, ground pins 2, 4, 6, and 18 of U3. SLOT 0 should become a logic low; disconnecting any ground lead should allow this point to become a logic high.

8-41. Note that all other logic on the board may be tested with a Pulsar Probe (or by grounding the input to

a device) while monitoring the output of the circuit for changing logic levels.

8-42. Inguard Decoder. Refer to Schematic A1 (03498-66501). Check the decade outputs by grounding the corresponding inputs of U18 as indicated in Table 8-2. U17 may be checked by pulsing or grounding inputs while monitoring outputs.

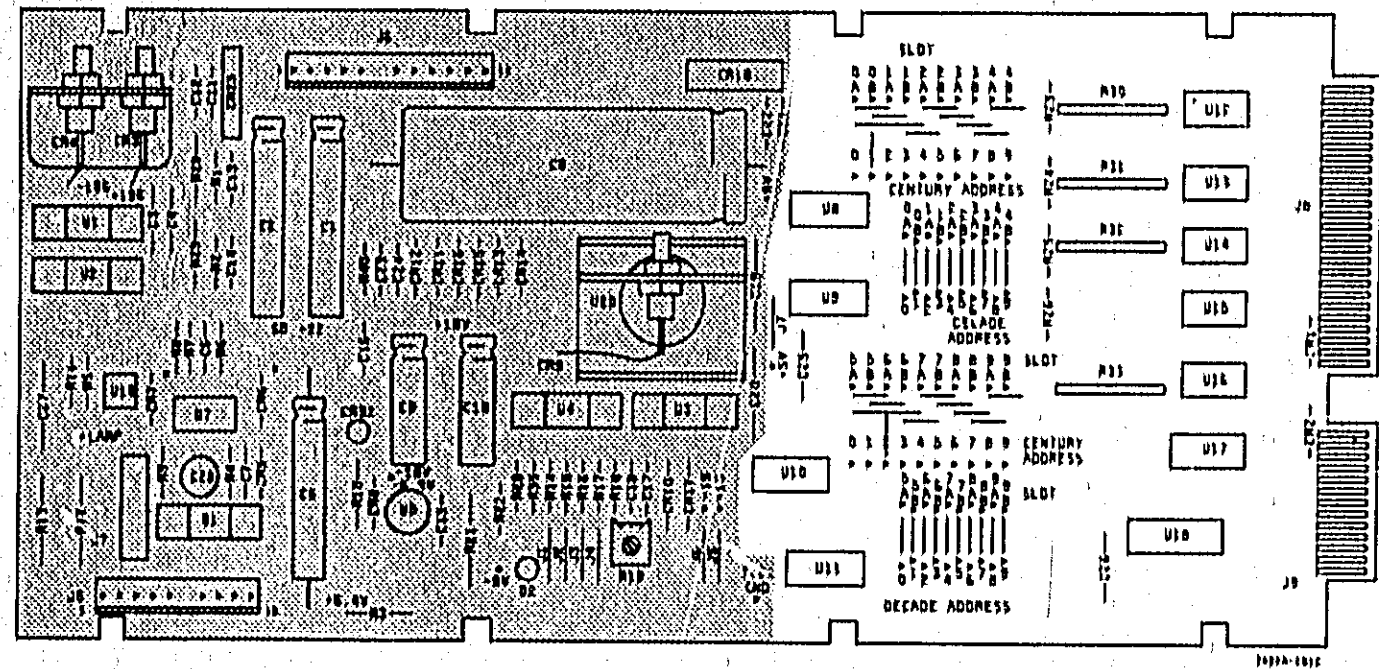
Table 8-1. Combinational Logic For Outguard Decoder.

Pin Grounded On U3	2	4	6	8
Slot Outputs				
Slot 0	X	X	X	X
Slot 1	X	X	X	
Slot 2	X	X		X
Slot 3	X	X		
Slot 4	X		X	X
Slot 5	X		X	
Slot 6	X			X
Slot 7	X			
Slot 8		X	X	X
Slot 9		X	X	
Pin Ground On U3	17	13	15	11
Box Address (For BOX WRITE ground Pin 8 of U6 instead of Pin 17 of U3)				
10	X	X	X	X
20	X	X	X	
30	X	X		X
40	X	X		
50	X		X	X
60	X		X	
70	X			X
80	X			

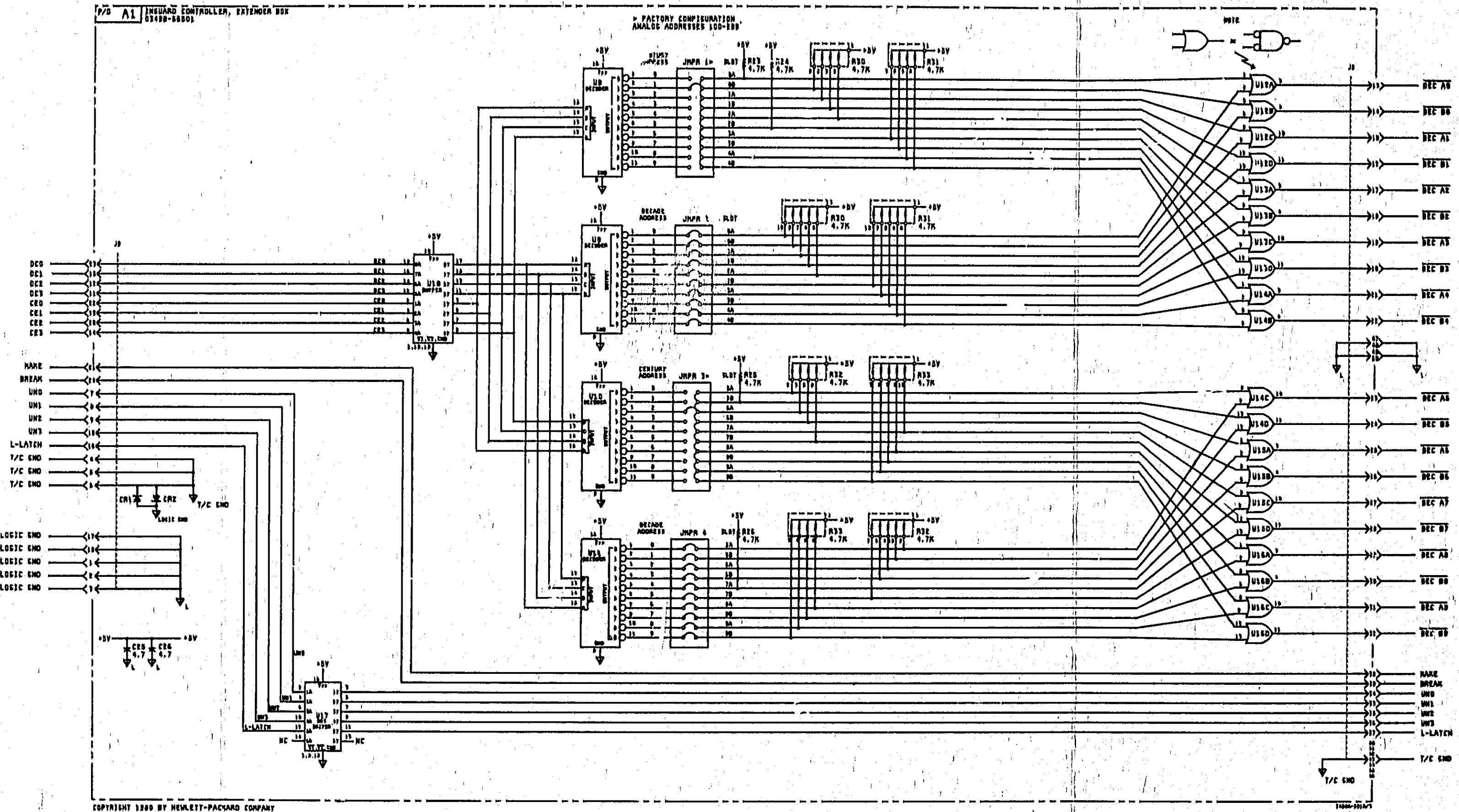
Table 8-2. Combinational Logic For Inguard Decoder.

Pin Grounded On U18	8	6	4	2	12	14	16	18
0	X	X	X	X				
1	X	X	X					
2	X	X		X				
3	X	X						
4	X		X	X				
5	X		X					
6	X			X				
7	X							
8		X	X	X				
9		X	X					
0					X	X	X	X
1					X	X	X	
2					X	X		X
3					X	X		
4					X		X	X
5					X		X	
6					X			X
7					X			
8						X	X	X
9						X	X	





No 03498-0001  
INGUARD DECODER



COPYRIGHT 1960 BY HEMLETT-PACIARD COMPANY

Figure 8-2. Inguard Decoder  
3498A Extender  
8-5/8-6

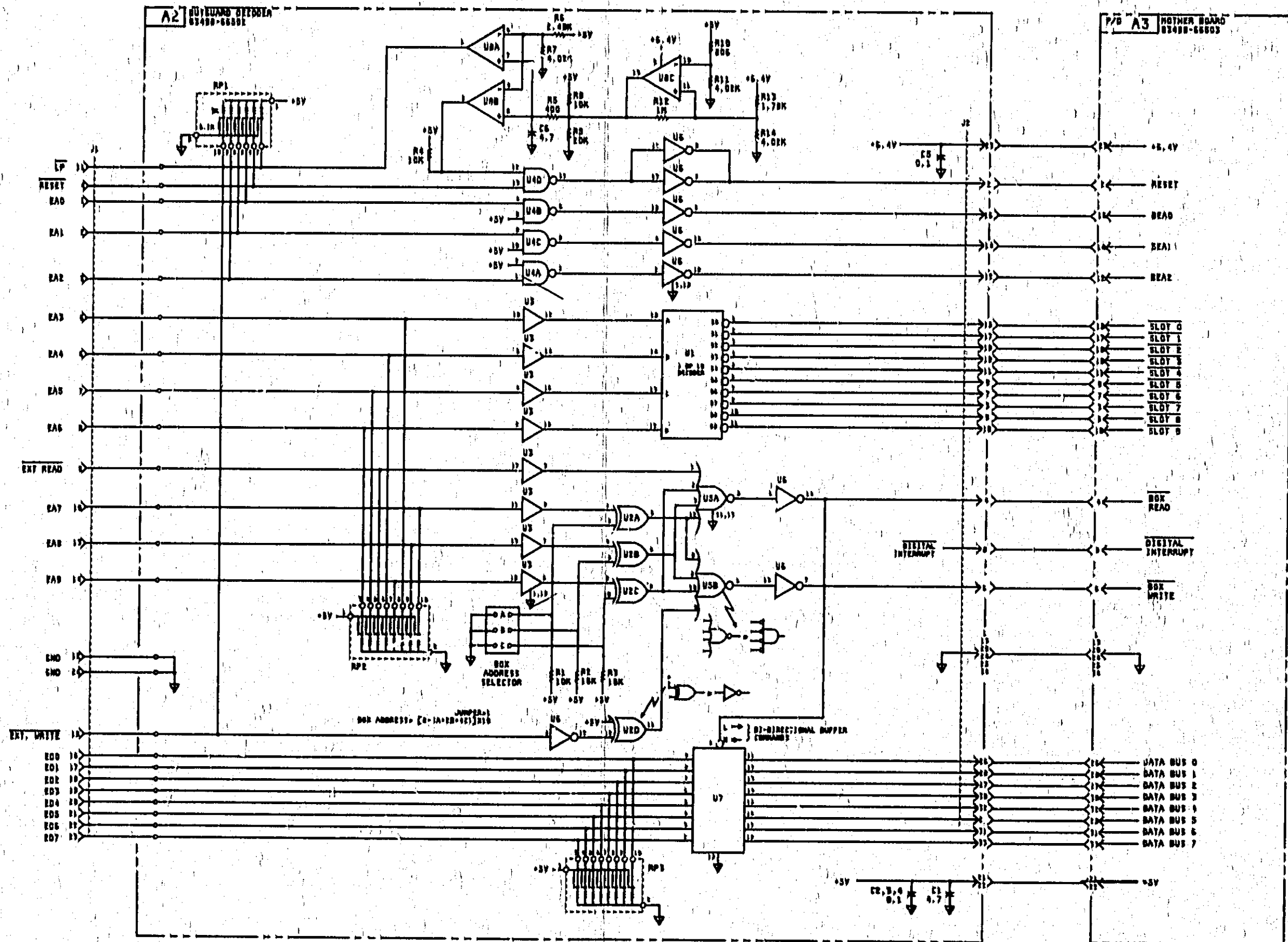
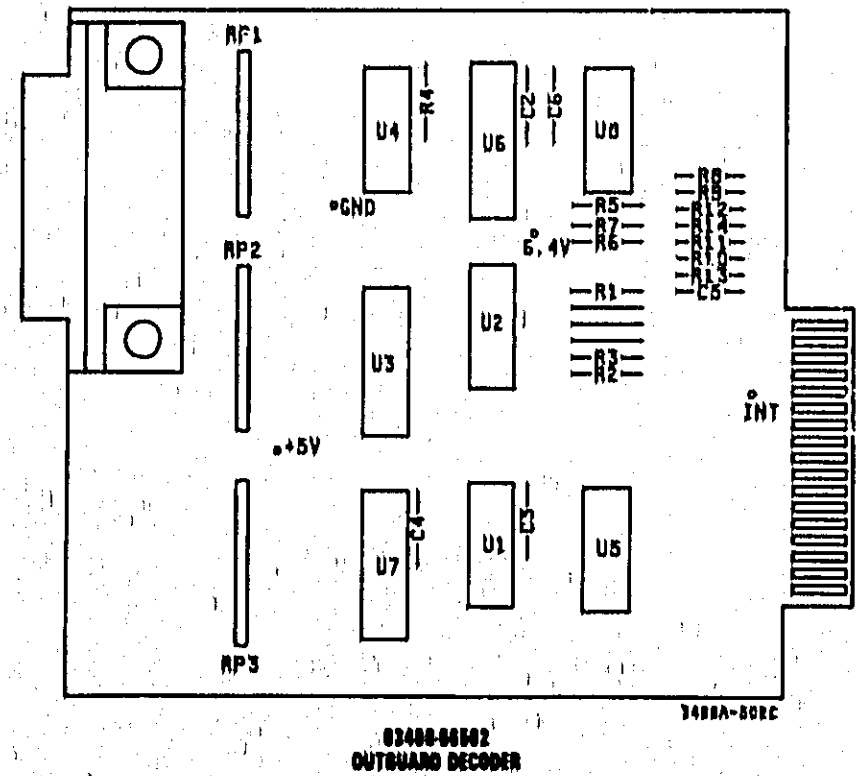
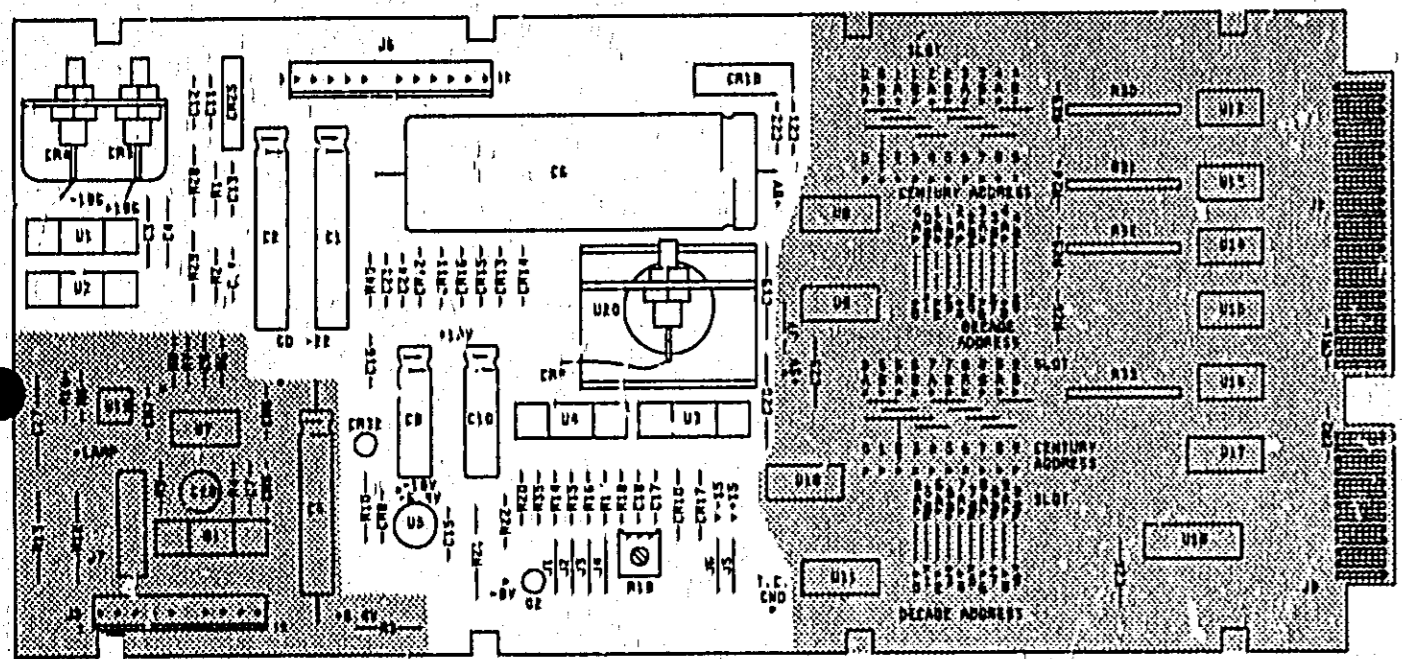


Figure 8-3. Outguard Decoder  
3498A Extender  
8-7/8-8



No 83400-00001  
INGUARD POWER SUPPLY

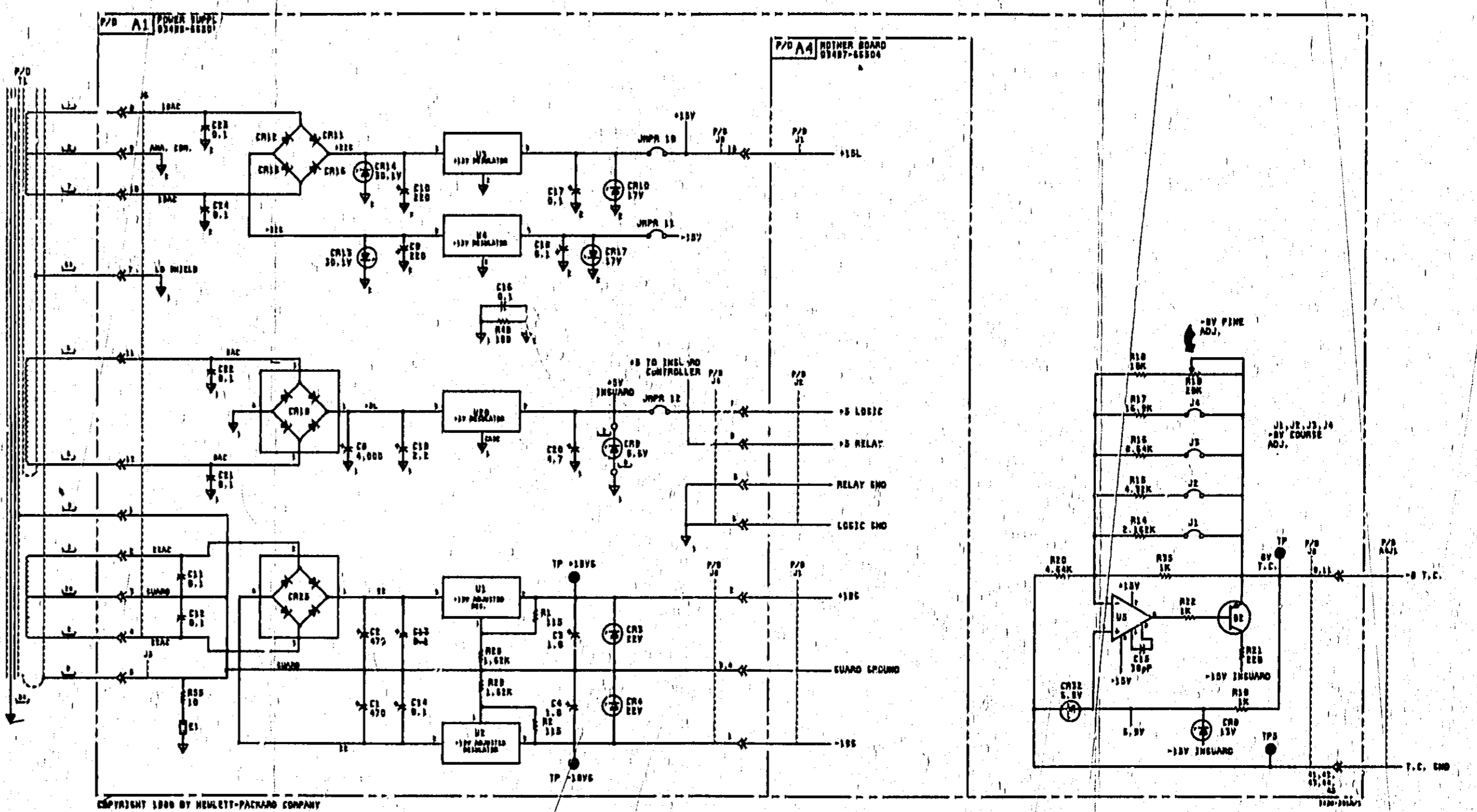
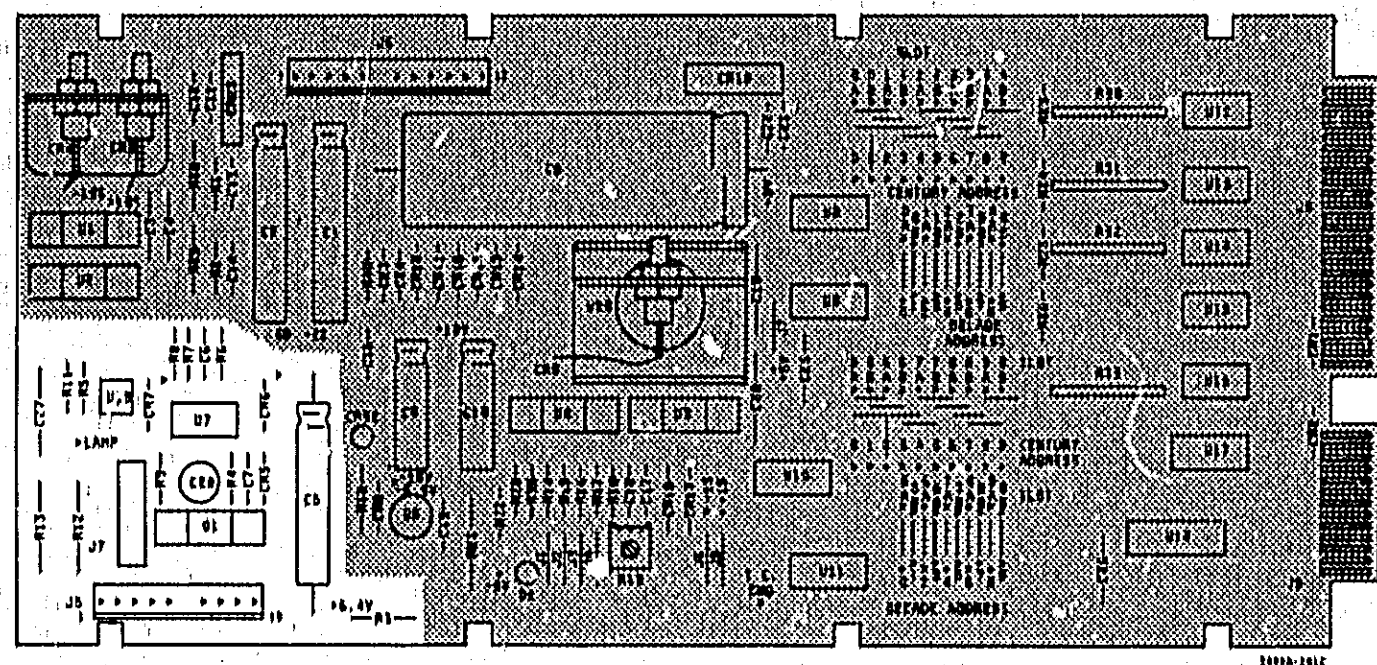


Figure 3-4. Inguard Power Supply  
3498A Extender  
8-9/8-10



No. 03498-00001  
OUTWARD POWER SUPPLY

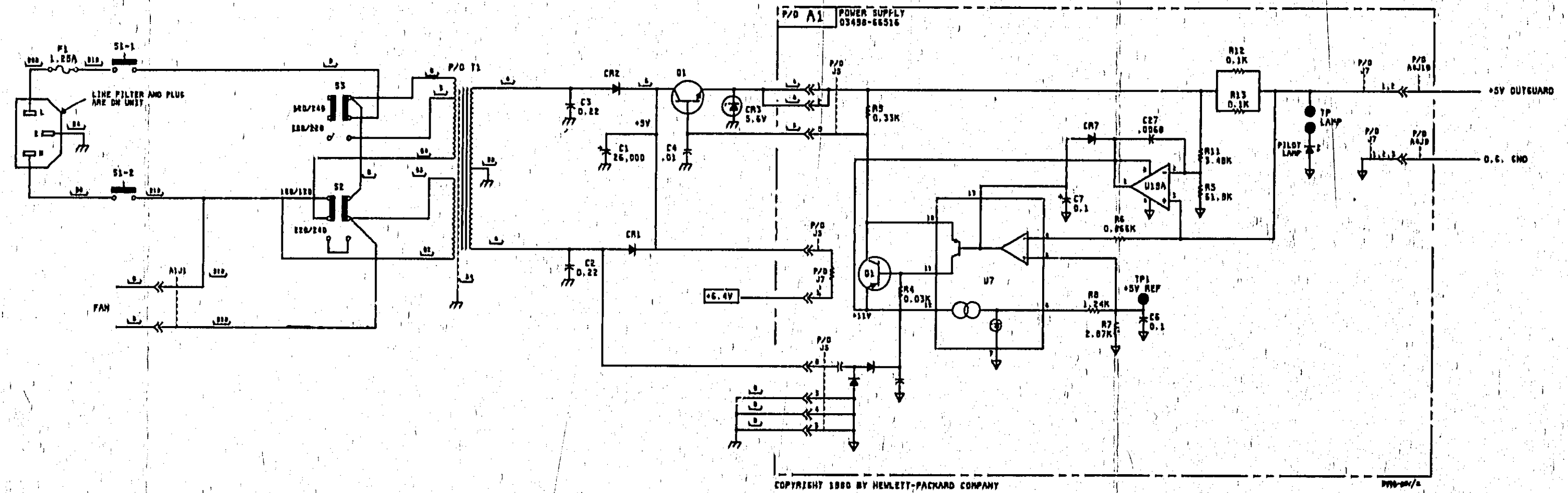
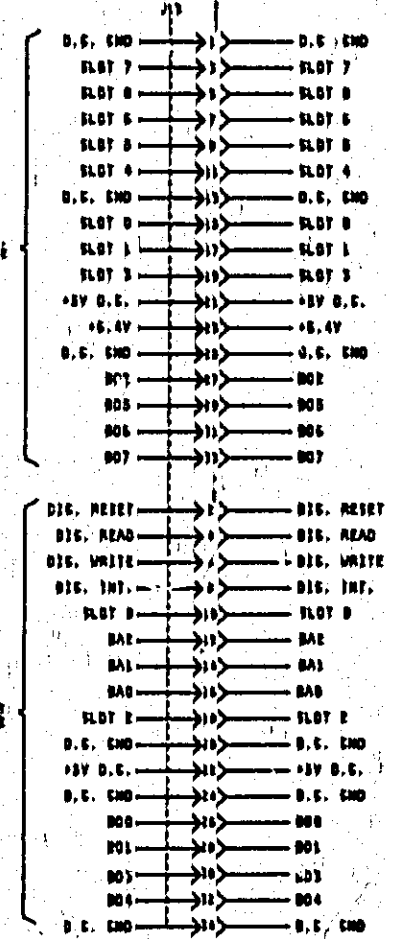
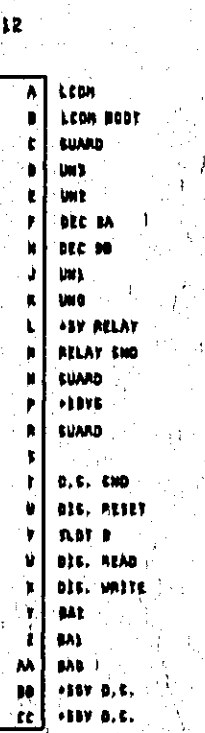
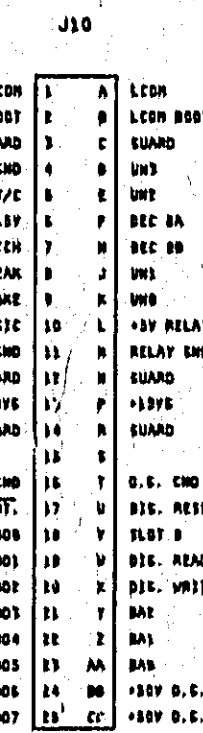
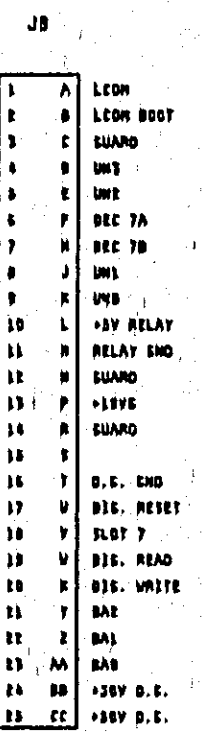
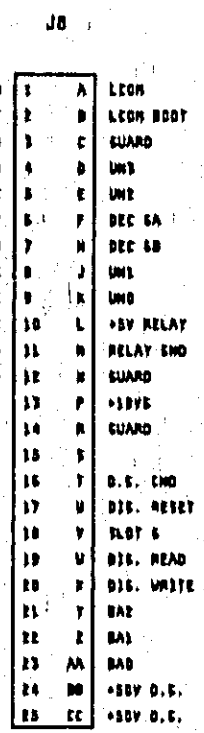
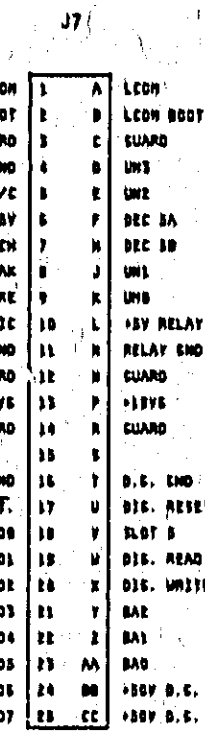
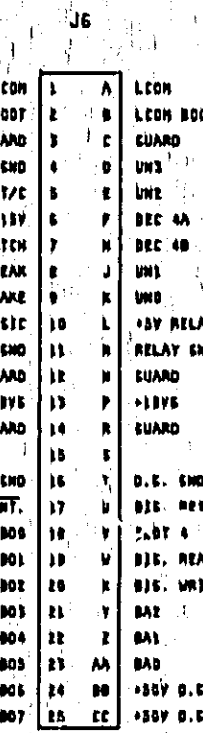
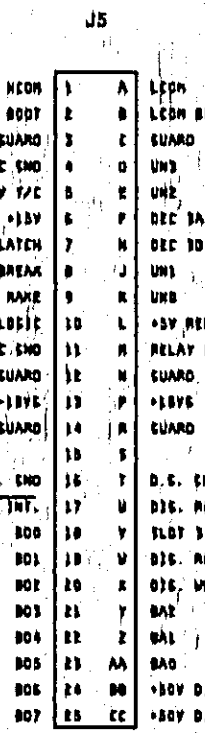
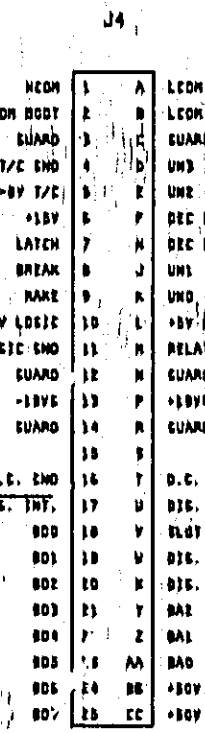
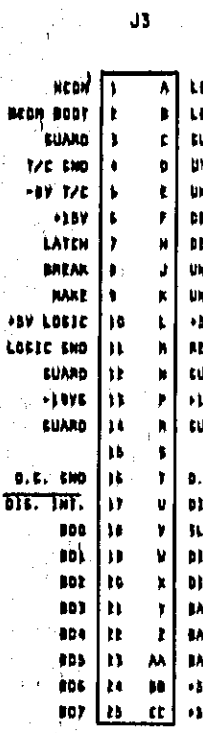
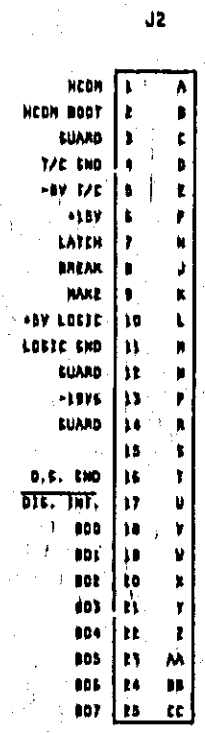
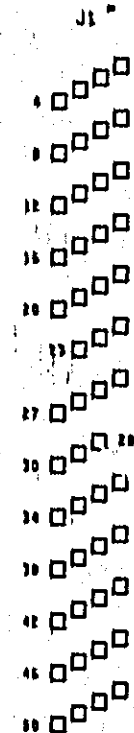


Figure 8-5. Outward Power Supply  
3498A Extender  
8-11/8-12

J1 CONNECTS TO INGUARD EXTENDER CONTROL LOCATED ON POWER SUPPLY BOARD. J1 CONNECTS TO J6 ON POWER SUPPLY BOARD.

J1 DESTINATIONS

PIN	NAME	PIN	NAME
1	+18V6	16	DEC 4B
2	GUARD	17	DEC 7A
3	+18V6	18	DEC 7B
4	GUARD	19	DEC 8A
5	T/C SMD	20	DEC 8B
6	+18V6	21	DEC 9A
7	GUARD	22	DEC 9B
8	+18V6	23	DEC 10A
9	GUARD	24	DEC 10B
10	+18V6	25	DEC 11A
11	GUARD	26	DEC 11B
12	+18V6	27	DEC 12A
13	GUARD	28	DEC 12B
14	+18V6	29	DEC 13A
15	GUARD	30	DEC 13B
16	+18V6	31	DEC 14A
17	GUARD	32	DEC 14B
18	+18V6	33	DEC 15A
19	GUARD	34	DEC 15B
20	+18V6	35	DEC 16A
21	GUARD	36	DEC 16B
22	+18V6	37	DEC 17A
23	GUARD	38	DEC 17B
24	+18V6	39	DEC 18A
25	GUARD	40	DEC 18B
26	+18V6	41	DEC 19A
27	GUARD	42	DEC 19B
28	+18V6	43	DEC 20A
29	GUARD	44	DEC 20B
30	+18V6	45	DEC 21A
31	GUARD	46	DEC 21B
32	+18V6	47	DEC 22A
33	GUARD	48	DEC 22B
34	+18V6	49	DEC 23A
35	GUARD	50	DEC 23B



+5.4V  
+50V D.C.  
+50V D.C.  
D.C. SMD  
D.C. SMD  
D.C. SMD

J13 CONNECTS TO POWER SUPPLY BOARD

J13 CONNECTS TO EXTENDER OUTWARD CONTROL 95499-66202

## Free Manuals Download Website

<http://myh66.com>

<http://usermanuals.us>

<http://www.somanuals.com>

<http://www.4manuals.cc>

<http://www.manual-lib.com>

<http://www.404manual.com>

<http://www.luxmanual.com>

<http://aubethermostatmanual.com>

Golf course search by state

<http://golfingnear.com>

Email search by domain

<http://emailbydomain.com>

Auto manuals search

<http://auto.somanuals.com>

TV manuals search

<http://tv.somanuals.com>