

HEWLETT  PACKARD

## OPERATING AND SERVICE MANUAL



# 12839A

### 8192-WORD MEMORY OPTION

(2114B COMPUTER OPTION 04)

#### Note

This manual should be retained with the Operating and Maintenance Manual (part no. 02114-90399) for the HP 2114B Computer.

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## **CERTIFICATION**

*The Hewlett-Packard Company certifies that this instrument was thoroughly tested and inspected and found to meet its published specifications when it was shipped from the factory. The Hewlett-Packard Company further certifies that its calibration measurements are traceable to the U.S. National Bureau of Standards to the extent allowed by the Bureau's calibration facility.*

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

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## SECTION I

### GENERAL INFORMATION



#### 1-1. INTRODUCTION.

1-2. This manual contains general information, field installation procedures, theory of operation, and maintenance information for the Hewlett-Packard 12839A 8,192 (8K) Word Memory Accessory Kit.

#### 1-3. GENERAL DESCRIPTION.

1-4. The 8K word memory adds 4,096 memory locations to the basic HP 2114B Computer. This increases the total capacity of the computer memory to 8,192 addressable locations of core memory. Each location consists of seventeen core positions which store a 16-bit word and a parity bit. The parity bit is used when the parity option is installed in the computer.

1-5. The 8K word memory is referred to as option 04 when factory installed, and is ready for use when the computer is installed. Field installation of the 8K word memory is accomplished by installing the items supplied in Accessory Kit 12839A.

#### 1-6. ACCESSORY KIT.

1-7. The HP 12839A Accessory Kit contains the circuit and core memory assemblies for expanding the memory capacity of the HP 2114B Computer from 4K memory words to 8K memory words.

1-8. The accessory kit is composed of the following items:

- a. One 8K core stack assembly (part no. 02115-6043).
- b. One inhibit driver card (part no. 02114-60429).

c. One sense amplifier card (part no. 02114-6005).

d. Nine jumper wires (part no. 8159-0005).

e. One operating and service manual (part no. 12839-90001).

1-9. Conversion from the basic 4K memory configuration to the optional 8K memory configuration is accomplished by replacing the 4K memory core stack assembly with the 8K core stack assembly, inserting the two additional plug-in assemblies and adding jumpers to the appropriate plug-in assemblies.

#### 1-10. DOCUMENTATION.

1-11. Maintenance instructions and replaceable parts information contained in this manual are to be used together with information contained in the HP 2114B Computer Operating and Maintenance Manual, Volume Two (part no. 02114-90399).

#### 1-12. IDENTIFICATION.

1-13. Printed-circuit card revisions are identified by a letter and a date code stamped on the card. The letter code identifies the version of the etched trace pattern on the unloaded card. The date code refers to the electrical characteristics of the loaded card. If the date code stamped on a printed circuit card does not agree with the date code shown on the location diagram in section II of this manual, there are differences between your card and the card described in this manual. If these differences affect the procedures or operation described in this manual they will be described in change sheets and manual supplements available at the nearest HP Sales and Service Office.



## SECTION II

### INSTALLATION

#### 2-1. INTRODUCTION.

2-2. This section provides instructions for installing the items supplied with the HP 12839A Accessory Kit. Carefully review the information in the following paragraphs before proceeding with the installation procedure.

#### 2-3. UNPACKING AND INSPECTION.

2-4. If the shipping carton is received in a damaged condition, request that the carrier's agent be present when the kit is unpacked. Inspect the items comprising the kit for damage (cracks, lifted traces, broken components, etc.). If any of the items are damaged, notify both the carrier and the nearest Hewlett-Packard Sales and Service Office immediately. Retain the shipping carton and packing material for the carrier's inspection. The Hewlett-Packard Sales and Service Office will arrange for the repair or replacement of damaged items without waiting for claims against the carrier to be settled. Save all packing materials for use in returning parts for credit or service.

#### 2-5. INSTALLATION PROCEDURE.

2-6. The 8K memory option can be installed by Hewlett-Packard prior to delivery of the computer, or by

conversion in the field using the items supplied with the HP 12839A Accessory Kit. The items supplied with the accessory kit are listed in table 2-1. Installation involves only basic soldering and assembly operations; no special tools or test equipment are required. Save all attaching hardware and parts for use in reassembly.

2-7. To field install this option, proceed as follows:

- a. Set computer POWER switch to OFF.
- b. At the rear panel assembly disconnect the power cord from connector J1.

#### WARNING

Dangerous line voltage is present in the computer even when the POWER switch is in the OFF position. Do not proceed further until complying with step "b" above. Failure to heed this warning could result in death or injury.

- c. Remove the top and left cabinet panels from the computer. Then remove the right-hand air filter (as viewed from the rear of the computer) covering the fan opening of the rear panel assembly.

Table 2-1. Items Supplied in the HP 12839A Accessory Kit

DESCRIPTION	HP PART NO.	QUANTITY SUPPLIED	REFERENCE DESIGNATION
Inhibit Driver Card	02114-60429	1	A4
Sense Amplifier Card	02114-6005	1	A7
8K Core Stack Assembly	02115-6043	1	A400
Jumper Wire	8159-0005	9	A1W1 thru A1W4,  A2W1 thru A2W4,  and A12W2
Manual	12839-9001	1	—
Software (Asterisks denote that this item is configured and supplied per customer system serial number.)	*	*	—



**CAUTION**

Use care to avoid dropping screws and washers into the computer, as they may be difficult to retrieve. Remove dropped hardware items at once. If forgotten and left inside the computer, damage could result during reassembly or when power is applied.

d. After making certain that the power cord has been unplugged at the rear of the computer, remove the screws holding the protective cover on the power supply. Then remove the protective cover.

e. On the backside of the 4K core stack assembly, unsolder the red wire and the gray wire (twisted pair) from the top and bottom feed-through terminals (see figures 2-1 and 2-2). Do not overheat these terminals. If overheated, a loose connection or cold solder joint may result at the opposite end of the terminal.

f. Disconnect the plugs of the interconnecting cables from the hood connectors plugged onto the cards located in slots A1, A2, A3 and A6.

**CAUTION**

Before removing the core stack assembly make sure that it will be placed in a safe place during the completion of the installation procedure. The core stack is fragile and care should be taken to avoid damage to the assembly.

g. While supporting the core stack so as not to allow it to drop, remove the four screws (figure 2-3, items 1 through 4) and retaining nuts securing the mounting bracket to the computer mainframe. Then remove the entire 4K core stack assembly from the computer. Return the 4K core stack assembly to the nearest HP Sales and Service Office for credit. Special packaging is required, refer to paragraph 5-10 for packing instructions.

h. Remove the two screws and retaining nuts securing the angle bracket (see figure 2-1) to the mounting bracket of the 4K core stack assembly.

**Note**

Save all mounting hardware and the angle bracket for installation of the 8K core stack assembly. When performing steps "i" and "j", see figures 2-4 and 2-5 to determine where the jumper wires should be installed. Do not forget to install these jumper wires on spare assemblies also.

i. Remove the driver/switch cards (02114-60427) from slots A1 and A2 and install jumper wires W1 through W4 on both assemblies. Then return the assemblies to the slots.

j. Install the new inhibit driver card (02114-60429) in slot A4.

k. Install the new sense amplifier card (02114-6005) in slot A7.

l. Remove the timing generator card (02114-60426) from slot A12 and install jumper wire W2. Then return the card to the slot.

m. Using the two screws and retaining nuts removed in step "h", install the angle bracket on the mounting bracket of the 8K core stack (02115-6043).

n. Position the 8K core stack assembly on the mainframe of the computer in the same relative position as the 4K core stack assembly was previously mounted. Using the four screws and retaining nuts removed in step "g", secure the mounting bracket to the computer mainframe.

o. Connect the hood connectors from the 8K core stack assembly to the 48-pin edge connectors of the plug-in cards located in slots A1, A2, A3, A4, A6, and A7. Each hood connector is labeled with the reference designation of the card to which it connects.

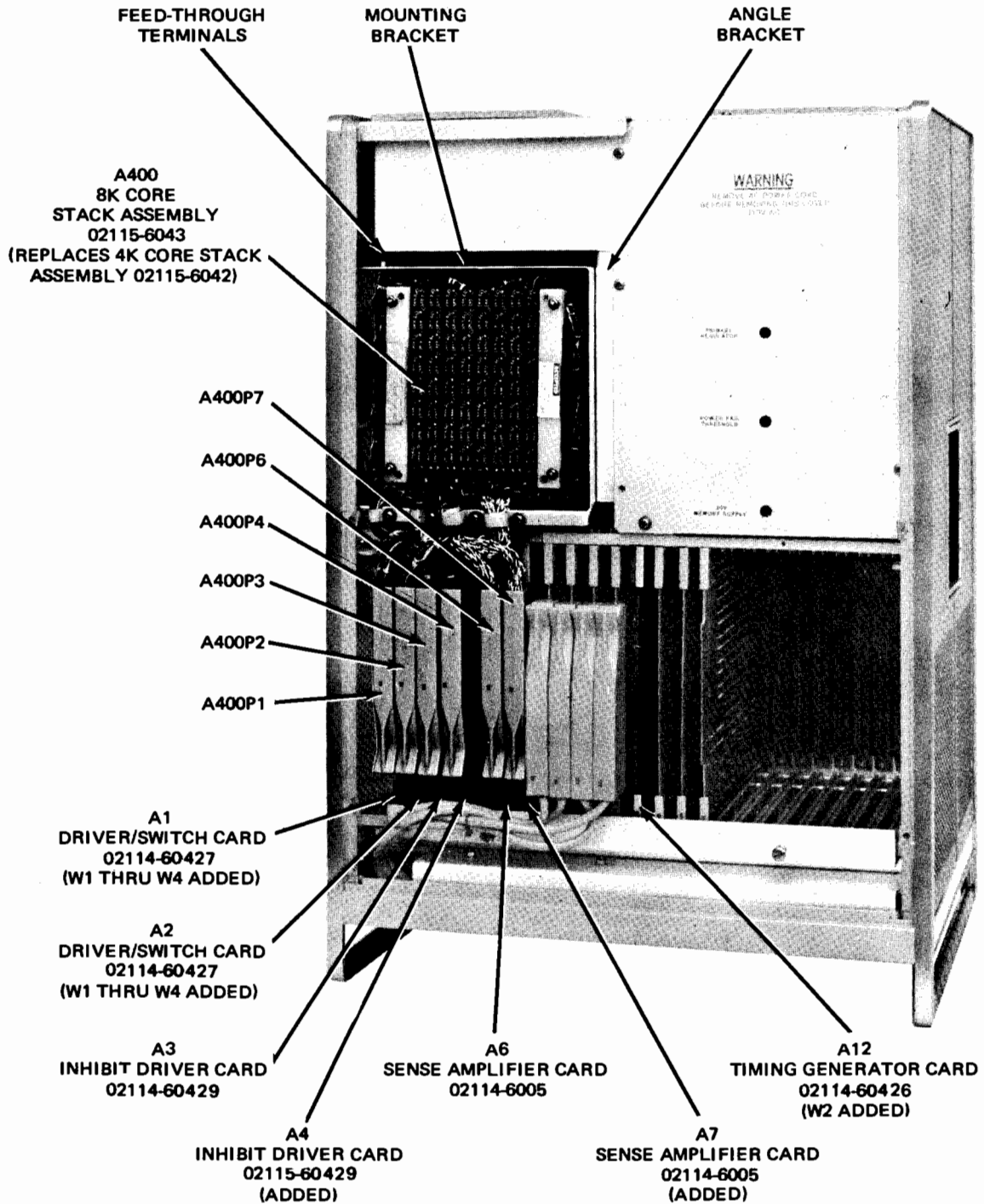
p. On the backside of the 8K core stack assembly, solder the red wire of the twisted pair to the top feed-through terminal, and the gray wire to the bottom feed-through terminal. Again, be sure not to overheat these terminals. (Note that no connections are made at the outside end of the center terminal.)

q. Position the protective cover over the power supply. Replace, but do not tighten, the retaining screws removed in step "d". After all screws are in place, tighten all except the one that secures the protective cover to the bracket on the card cage.

r. Check to make sure that all plug-in cards are properly installed in the guides of the card cage, and snugly inserted in the backplane connectors. Insert an appropriate tool (the shaft of a screwdriver will suffice) in the space between the protective cover and top edge of the card cage. Apply just enough leverage to move the inner side of the card cage toward the front of the computer. (This extra pressure ensures that the card cage guides hold the plug-in assemblies in place so that they will not vibrate loose and become disconnected from the backplane connectors.) Then, while still applying leverage, tighten the screw that secures the protective cover to the bracket on the card cage.

**CAUTION**

Carefully recheck all installation steps to ensure that the computer has been properly reassembled and the modification incorporated correctly. Be certain that the back edge of the protective cover is not making contact with the terminal points at the rear of the power supply. Otherwise, the computer may be damaged when the power cord is plugged in, or when the POWER switch is turned on.



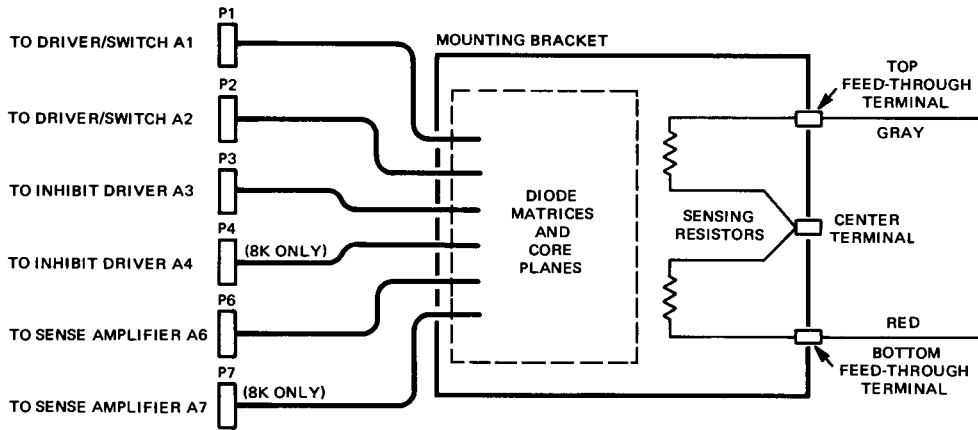
2070-1

Figure 2-1. 8K Word Memory Installation

s. At the rear of the computer, replace the air filter over the fan opening. Then replace the top and side cabinet panels.

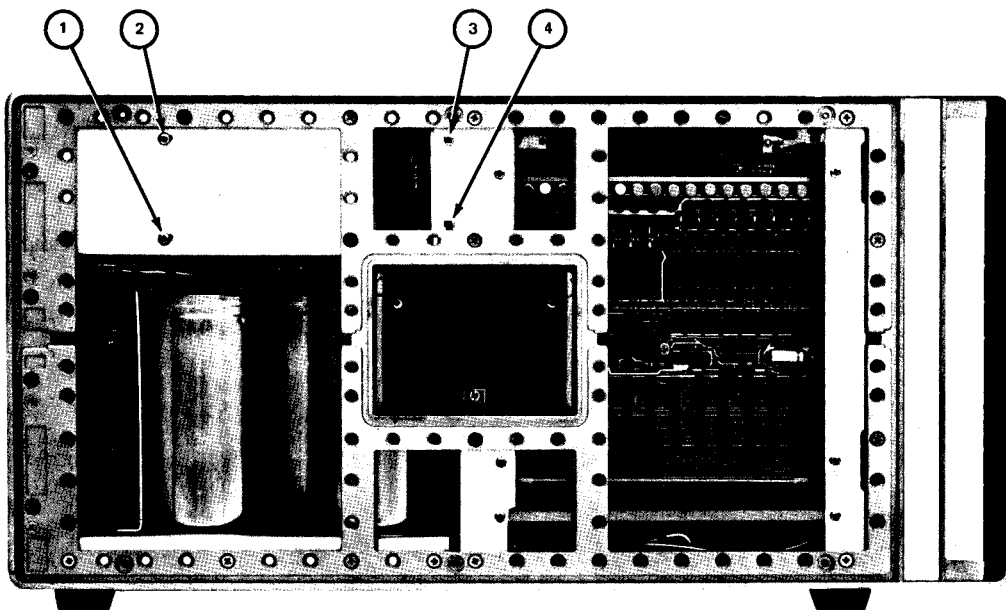
t. Connect the power cord to connector J1. Then set the POWER switch to ON and observe whether power

turn-on is normal. If normal, load the basic binary loader into memory locations 17700 through 17777 and conduct a programmed diagnostic test of the computer. (Refer to the HP 2114B Operation and Maintenance Manual, Volume Two, for instructions.) If test results are normal, the 8,192 word memory option is ready for normal use.



2070-2

Figure 2-2. Core Stack Assembly Wiring Connections



2070-3

Figure 2-3. Location of Attaching Hardware for the Core Stack Assembly

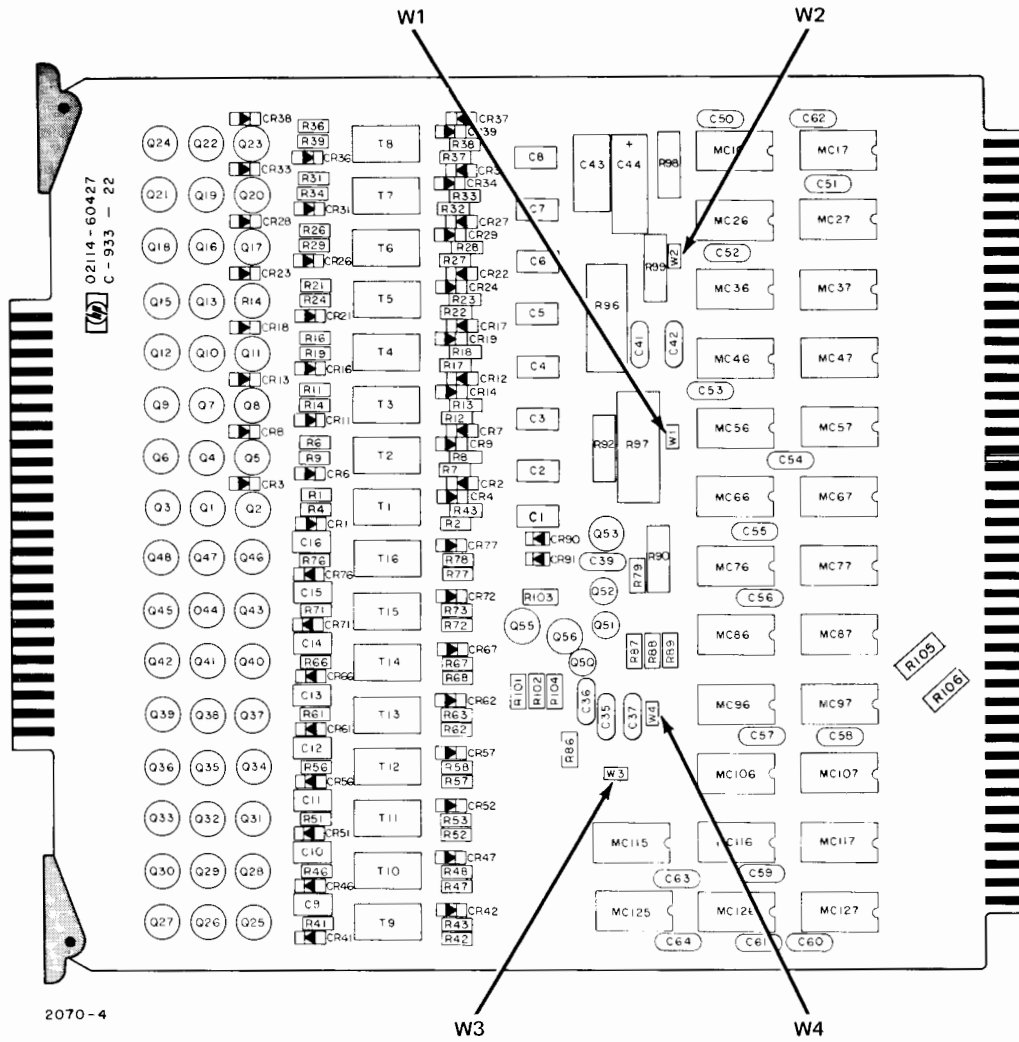


Figure 2-4. Location of Jumper Wires W1 through W4 on the Driver Switch Card (02114-60427)



## SECTION III

### THEORY OF OPERATION

#### 3-1. INTRODUCTION.

3-2. This section contains information concerning the general theory of operation for the 8K word memory. Specific differences between 8K and 4K word memory operation are also given.

#### 3-3. 8K AND 4K CIRCUIT DIFFERENCES.

3-4. The HP 12839A Accessory Kit doubles the memory capacity of the basic HP 2114B Computer. The 8K word memory circuits are an expanded version of the 4-wire, coincident-current, core memory system provided in the basic computer. The principles of operation for both memory systems are essentially the same. In the 8K word memory system, however, bit 12 of the memory address controls the X-current phasing to provide discrete read and write current combinations for the upper 4K memory locations.

3-5. The physical aspects of the 8K installation are shown in figure 2-1. The circuits and core required for this configuration are incorporated by installing additional plug-in assemblies and a new core stack assembly with an 8K word memory capacity. These assemblies fit into the basic computer framework without the need of making structural modifications or changes to the wiring on the backplane assembly. In brief, the differences between the 4K and 8K configurations are as follows:

a. The basic 4K core stack assembly (02115-6042) is replaced by the 8K core stack assembly (02115-6043).

b. An additional inhibit driver card (02114-60429) is installed in slot A4. (This slot is vacant in the 4K configuration, but backplane connector XA4 is prewired to accept this card.)

c. An additional sense amplifier card (02114-6005) is installed in slot A7. (This slot is vacant in the 4K configuration, but backplane connector XA7 is wired to accept this card.)

d. On the driver switch cards (02114-60427) located in slots A1 and A2, jumpers W1 through W4 are installed. (Provisions for these jumpers are included on these plug-in cards, but the jumpers are not connected in the 4K configuration.)

e. On the timing generator card (02114-60426) located in slot A12, jumper wire W2 is added. (Provision for W2 is included on this plug-in card, but W2 is not connected in the 4K configuration.)

#### 3-6. DETAILED CIRCUIT DESCRIPTION.

3-7. The basic operating principles of the 8K word memory are the same as those of the basic 4K memory. The insertion of jumpers on the timing generator and driver switch cards provide for minor corrections to memory timing and drive circuits.

#### 3-8. TIMING GENERATOR CARD.

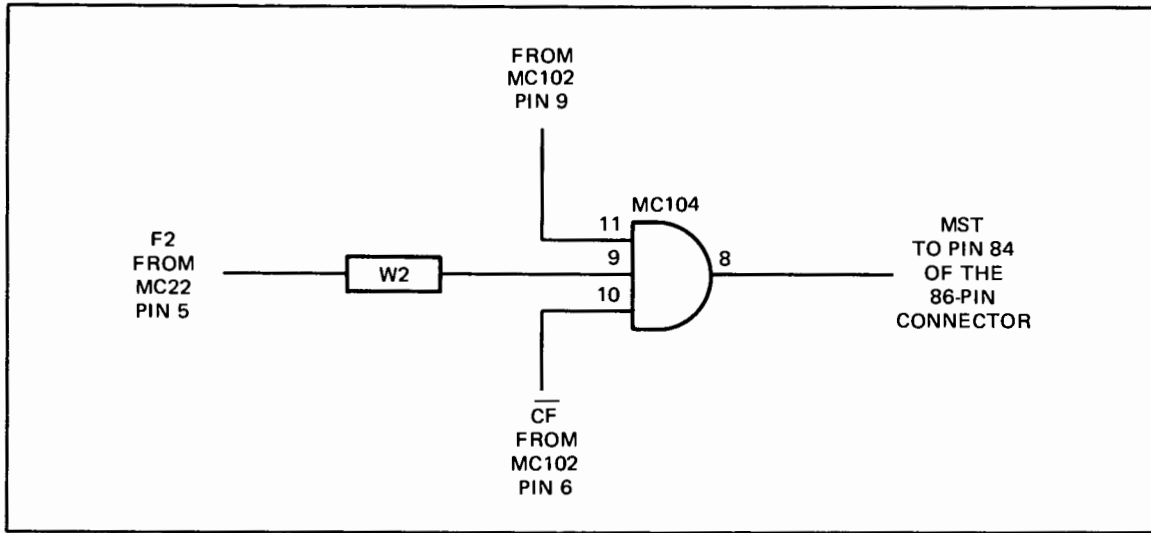
3-9. The timing generator card provides the memory strobe timing (MST) signal to the memory circuits. This signal is used to enable data to be read out of an addressed memory location. The addition of an added 4K of core memory increases the amount of time required for the memory circuits to stabilize or settle. The addition of jumper W2 on the timing generator card (see figure 3-1) allows the output of pin 5 of microcircuit MC22 to hold the MST signal false for an additional 15 nanoseconds. This delay provides the necessary additional settling time.

#### 3-10. DRIVER SWITCH CARDS.

3-11. The driver switch cards provide the current used to control the state of the core memory locations. The addition of another 4K of memory changes the effective impedance of the memory core stack. To compensate for this change jumpers W1, W2, W3, and W4 are added to each of the driver switch cards.

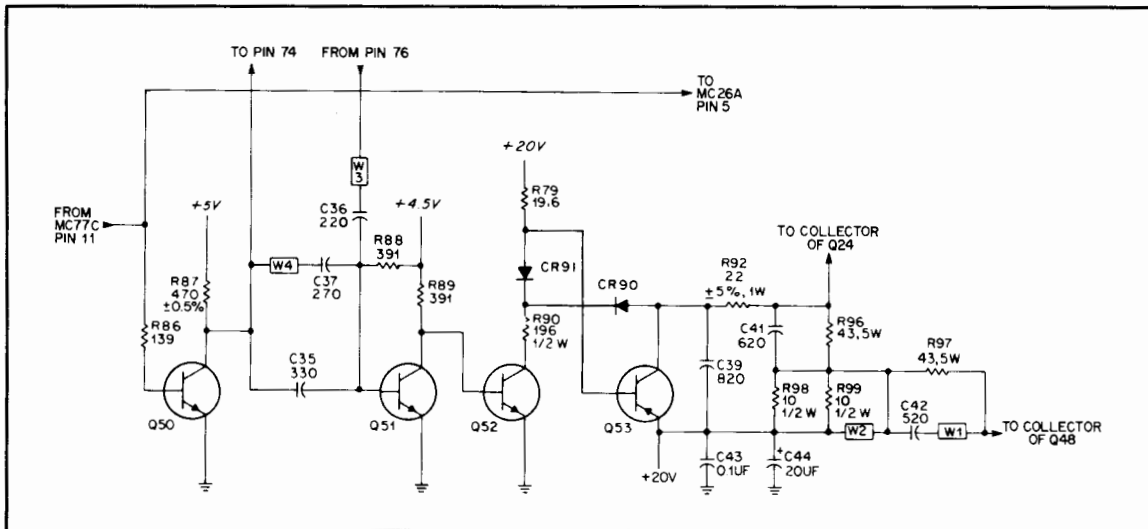
3-12. When jumpers W1 and W2 are installed as shown in figure 3-2, resistors R98 and R99 are bypassed providing a lower resistance path to the collector of transistor Q48. Capacitor C42 is also placed in parallel with R47 forming a current shaping network. This configuration allows the memory circuits to compensate for the increased core-stack impedance.

3-13. When jumpers W3 and W4 are installed as shown in figure 3-2, capacitors C36 and C37 are placed in parallel with C35. The additional capacitance permits the proper timing of the memory current to the collector of transistor Q48.



2070-6

Figure 3-1. Placement of Jumper W2 on the Timing Generator Card



2070-7

Figure 3-2. Placement of Jumpers on the Driver Switch Card

## SECTION IV

### MAINTENANCE

#### 4-1. INTRODUCTION.

4-2. This section contains information concerning maintenance, diagnostics and repair for the HP 12839A Accessory Kit.

#### 4-3. MAINTENANCE PROCEDURE.

4-4. The maintenance procedure for the 8K word memory configuration is the same as for the 4K memory configuration and is given in the HP 2114B Computer Operation and Service Manual, Volume Two.

#### 4-5. DIAGNOSTICS.

4-6. The diagnostic test procedure for the 8K word memory is contained within the diagnostic section of the Operation and Service Manual, Volume Two.

#### 4-7. REPAIR.

##### CAUTION

Do not attempt to repair the core planes or diode matrices of the core stack

assembly, or to remove these items from the mounting bracket. Attempts to effect repairs of the core stack assembly in the field could result in damage to the assembly. If a memory failure is suspected, replace the entire assembly, complete with mounting bracket, and return the defective assembly to the nearest HP Sales and Service Office for testing and repair. Also, before installing replacement plug-in cards into slots A1, A2, or A12, make sure that the jumper wires required for 8K operation have been added to the replacement assembly. Do not use 4K cards in an 8K configuration, or 8K cards in a 4K configuration, otherwise improper memory operation will occur.

4-8. Repair procedures for the 8K word memory configuration are the same as those used for the 4K memory configuration, and are contained in the maintenance section of the Operation and Service Manual, Volume Two.





## SECTION V

### REPLACEABLE PARTS

#### 5-1. INTRODUCTION.

5-2. This section contains information for ordering replacement parts for the HP 12839A 8K Word Memory Option, and for returning parts for credit or servicing.

5-3. Replaceable parts for the 8K computer configuration are the same as for the 4K configuration with the exception of those items listed in table 2-1. The additional plug-in assemblies and jumper wires are documented in the HP 2114B Computer Operation and Maintenance Manual, Volume Two. However any reference to part number 02115-6042 must be changed to 02115-6043.

5-4. The replaceable parts lists in Volume Two contain the following information for each part:

- a. A description of the part with an explanation of abbreviations and reference designations used in the description.
- b. A typical manufacturer of the part in a five digit code (a coded list of manufacturers and their addresses is contained in a separate table).
- c. A manufacturer's part number.

5-5. A separate parts list and part location diagram for each plug-in assembly is also contained in Volume Two. This parts list contains the parts in alphanumeric order of their reference designation.

#### 5-6. ORDERING INFORMATION.

5-7. To order replacement parts, address the order or inquiry to the local Hewlett-Packard Sales and Service Office. (Refer to the list at the back of this manual for addresses.) Specify the following information for each part ordered:

- a. The instrument model and serial number.
- b. The Hewlett-Packard stock number for each part.
- c. A description of each part.
- d. The circuit reference designation (where applicable).

#### 5-8. FIELD EXCHANGE ITEMS.

5-9. If this option is installed in the field, return the 4K word memory core stack assembly, part no. 02115-6042, to the nearest Hewlett-Packard Sales and Service Office for credit.

#### 5-10. REPACKAGING FOR SHIPMENT.

##### 5-11. USING ORIGINAL PACKAGING MATERIAL.

5-12. The same containers and materials used in factory packaging can be used to return parts to Hewlett-Packard for credit or servicing. Containers and packing materials may be obtained from Hewlett-Packard Sales and Service Offices. Attach a tag indicating the type of service required, the return address, model number and full serial number. Also mark the container FRAGILE to assure careful handling.

##### 5-13. USING OTHER PACKAGING MATERIAL.

5-14. The following general instructions should be followed when repackaging with commercially available materials:

- a. Wrap the parts in heavy paper or plastic. (Attach a tag indicating the type of service required, the return address, model number, and full serial number.)
- b. Place the protected part in a cardboard (or other suitable material) container.
- c. Pack the small container in a separate shipping container. Use a strong shipping container. A double-wall carton made of 350 pound test material is adequate.
- d. Use enough shock absorbing material (3- to 4-inch layer) around all sides of the parts to provide a firm cushion and prevent movement inside the container.
- e. Seal the shipping container securely, and mark it FRAGILE to assure careful handling.

#### 5-15. WARRANTY.

5-16. The terms of the warranty on the HP 12839A 8K Word Memory Option are described in the warranty on the inside front cover of this manual. For any additional information concerning warranty, contact the nearest Hewlett-Packard Sales and Service Office listed at the rear of this manual.

