

## OPERATING AND SERVICE MANUAL

**12592A  
12592A-01  
ACCESSORY KITS**

**16,384 WORD MEMORY  
(2116B COMPUTER OPTION 05)**

### Note

This manual should be retained with the Installation and Maintenance Manual (part no. 02116-9153) for the HP 2116B Computer.

## **CERTIFICATION**

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## SECTION I

### GENERAL INFORMATION

#### 1-1. INTRODUCTION.

1-2. The Hewlett-Packard 12592A and 12592A-01 Accessory Kits contain the circuits and core for expanding the memory capacity of the HP 2116B Computer from 8,192 (8K) words to 16,384 (16K) words. These kits include an 8K word memory section that installs in the HP 2116B Computer.

1-3. The 16K word memory is referred to as option 05 when factory installed, and is ready for use when the computer is installed. Field installation of the 16K word memory is accomplished by installing the items supplied in Accessory Kit 12592A or 12592A-01.

#### 1-4. ACCESSORY KIT CONTENTS.

1-5. The HP 12592A Accessory Kit is comprised of the following items:

- a. Two sense amplifier cards (part no. 02115-6001).
- b. Two inhibit driver cards (part no. 02116-6265).
- c. Two driver/switch cards (part no. 02116-6266).
- d. One 8K core stack assembly (part no. 02116-6288).
- e. One manual (part no. 12592-9001).

1-6. The HP 12592A-01 Accessory Kit is the same as the 12592A Accessory Kit except that it contains two sense amplifier cards (part no. 02116-6298) in place of sense amplifier cards 02115-6001.

#### 1-7. DESCRIPTION.

1-8. The 16K memory option adds 8,192 memory locations to the basic HP 2116B Computer. This increases the total capacity of the 2116B memory to 16,384 addressable locations in core. Each location consists of seventeen core positions that can store a 16-bit word and a parity bit. The parity bit is used when the parity option is installed in the computer.

1-9. Conversion from the basic 8K memory configuration to the optional 16K memory configuration is accomplished by installing a second 8K core stack assembly (figure 2-1), and six additional plug-in assemblies (figure 2-2).

#### 1-10. DOCUMENTATION.

1-11. This manual contains field installation procedures, theory of operation, and maintenance instructions for the 16K word memory. Part location diagrams, schematic diagrams, backplane wiring and replaceable parts information are contained in the HP 2116B Installation and Maintenance Manual (part no. 02116-9153).

## SECTION II

### FIELD INSTALLATION

#### 2-1. GENERAL.

2-2. This section provides instructions for installing the items supplied with Accessory Kit 12592A or 12592A-01. 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.

#### 2-5. PREINSTALLATION CHECK.

2-6. Prior to installing the 16K word memory, check the computer to be sure that all installation requirements will be met. This check should be based on the following considerations:

- a. The serial number prefix of the computer.
- b. Compatibility requirements with the HP 2150B Input/Output and Memory Extender.
- c. Field change requirements.
- d. Plug-in card assembly part number and revision requirements.
- e. Accessory kit requirements.

2-7. The information presented in tables 2-1 and 2-2 is based on the above considerations. Use these tables and the instructions in the following paragraphs when making the preinstallation check.

2-8. SERIAL NUMBER PREFIX. Check the serial number prefix of the computer into which the 16K memory is to be installed. Then locate the prefix in table 2-1. This table outlines the installation requirements for each computer.

2-9. HP 2150B COMPATIBILITY. Computers bearing serial number prefixes 845-, 901-, or 912- and above are directly compatible with the HP 2150B Extender. Computers bearing serial number prefixes other than those specified are not compatible with the HP 2150B, unless updated to a compatible prefix by installing the field changes specified in table 2-1.

2-10. FIELD CHANGES. If a computer must be updated for compatibility with the HP 2150B, make sure that all necessary field changes have either been made, or that the required materials, assemblies, and instructions are available to make them. Detailed instructions for incorporating the field changes specified in table 2-1 are contained in applicable Service Notes. If further information or assistance is required, consult the nearest Hewlett-Packard Sales and Service Office listed at the back of this manual. Install all field changes before installing the items supplied in the accessory kit.

2-11. ASSEMBLY REQUIREMENTS. Table 2-2 contains a checklist that specifies assembly numbers, revisions, and quantities required for computer configurations that are either compatible or non-compatible with the HP 2150B. Use this checklist to determine whether the proper assemblies are installed in the computer.

2-12. ACCESSORY KITS. Accessory Kit 12592A-01 must be used when installing the 16K memory option in computers compatible with the HP 2150B (computers bearing serial number prefixes 845-, 901-, and 912- and above). Accessory Kit 12592A must be used when installing the 16K memory in computers that are not compatible with the HP 2150B (computers bearing serial number prefixes other than 845-, 901-, and 912- and above). As specified in table 2-2, Accessory Kit 12592A contains sense amplifier card 02115-6001, and Accessory Kit 12592A-01 contains sense amplifier card 02116-6298. This is the only difference between the two accessory kits.

Table 2-1. Field Installation Checklist

COMPUTER SERIAL NUMBER PREFIX	FIELD CHANGES REQUIRED FOR INSTALLATION OF 16K MEMORY OPTION	COMPUTER SERIAL NUMBER PREFIX AFTER FIELD CHANGE
823-	<p>1. IF COMPATIBILITY WITH THE HP 2150B IS NOT REQUIRED:</p> <p>A. TIMING GENERATOR CARD (A106). On timing generator card 02116-6281, located in slot 106, jumper W1 must be in position "B" (figure 2-3) for computers configured with sense amplifier 02115-6001.</p> <p>B. ACCESSORY KIT. Installation of the items supplied with the 12592A is the only other change required for conversion to the 16K memory.</p>	No Change
	<p>2. IF COMPATIBILITY WITH THE HP 2150B IS REQUIRED:</p> <p>A. BACKPLANE. Three backplane wiring changes are required prior to installation and operation of the 16K memory. The first change updates the 823- configuration to the 824- configuration. The second change, in conjunction with change 2B following, updates the 824- configuration to the 844- configuration. The third change, in conjunction with changes 2C thru 2E, updates the 844-configuration to the 845- configuration.</p> <p>B. INSTRUCTION DECODER CARD (A107). Instruction decoder card 02116-6027, located in slot 107, must be updated to, or replaced by assembly revision K-830-6 or later.</p> <p>C. MEMORY MODULE DECODER CARD (A2). Memory module decoder card 02116-6274, located in slot 2, must be replaced with memory module decoder card 02116-6300.</p> <p>D. SENSE AMPLIFIER CARD (A12 and A13). Sense amplifier card 02115-6001, located in slots 12 and 13, must be replaced with sense amplifier card 02116-6298.</p> <p>E. TIMING GENERATOR CARD (A106). On timing generator card 02116-6281, located in slot 106, jumper W1 must be in position "A" (figure 2-3) for computers configured with sense amplifier 02116-6298.</p> <p>F. ACCESSORY KIT. Installation of the items supplied with the 12592A-01 is the only other change required for conversion to the 16K memory.</p>	845-
824-	<p>1. IF COMPATIBILITY WITH THE HP 2150B IS NOT REQUIRED:</p> <p>A. TIMING GENERATOR CARD (A106). On timing generator card 02116-6281, located in slot 106, jumper W1 must be in position "B" (figure 2-3) for computers configured with sense amplifier 02115-6001.</p> <p>B. ACCESSORY KIT. Installation of the items supplied with the 12592A is the only other change required for conversion to the 16K memory.</p>	No Change

Table 2-1. Field Installation Checklist (Continued)

COMPUTER SERIAL NUMBER PREFIX	FIELD CHANGES REQUIRED FOR INSTALLATION OF 16K MEMORY OPTION	COMPUTER SERIAL NUMBER PREFIX AFTER FIELD CHANGE
	<p>2. IF COMPATIBILITY WITH THE HP 2150B IS REQUIRED:</p> <p>A. BACKPLANE. Two backplane wiring changes are required prior to installation and operation of the 16K memory. The first change, in conjunction with change 2B following, updates the 824- configuration to the 844- configuration. The second, in conjunction with changes 2C thru 2E, updates the 844- configuration to the 845- configuration.</p> <p>B. INSTRUCTION DECODER CARD (A107). Instruction decoder card 02116-6027, located in slot 107, must be updated to, or replaced by assembly revision K-830-6 or later.</p> <p>C. MEMORY MODULE DECODER CARD (A2). Memory module decoder card 02116-6274, located in slot 2, must be replaced with memory module decoder card 02116-6300.</p> <p>D. SENSE AMPLIFIER CARD (A12 and A13). Sense amplifier card 02115-6001, located in slots 12 and 13, must be replaced with sense amplifier card 02116-6298.</p> <p>E. TIMING GENERATOR CARD (A106). On timing generator card 02116-6281, located in slot 106, jumper W1 must be in position "A" (figure 2-3) for computers configured with sense amplifier 02116-6298.</p> <p>F. ACCESSORY KIT. Installation of the items supplied with the 12592A-01 is the only other change required for conversion to the 16K memory.</p>	845-
830-	<p>1. IF COMPATIBILITY WITH THE HP 2150B IS NOT REQUIRED:</p> <p>A. TIMING GENERATOR CARD (A106). On timing generator card 02116-6281, located in slot 106, jumper W1 must be in position "B" (figure 2-3) for computers configured with sense amplifier 02115-6001.</p> <p>B. ACCESSORY KIT. Installation of the items supplied with the 12592A is the only other change required for conversion to the 16K memory.</p>	No Change
	<p>2. IF COMPATIBILITY WITH THE HP 2150B IS REQUIRED:</p> <p>A. BACKPLANE. One backplane wiring change is required prior to installation and operation of the 16K memory. This change, in conjunction with changes 2B thru 2E, updates the 830- configuration to the 845- configuration.</p> <p>B. INSTRUCTION DECODER CARD (A107). Instruction decoder card 02116-6027, located in slot 107, must be updated to, or replaced by, assembly revision K-830-6 or later.</p> <p>C. MEMORY MODULE DECODER CARD (A2). Memory module decoder card 02116-6274, located in slot 2, must be replaced with memory module decoder card 02116-6300.</p>	845-

Table 2-1. Field Installation Checklist (Continued)

COMPUTER SERIAL NUMBER PREFIX	FIELD CHANGES REQUIRED FOR INSTALLATION OF 16K MEMORY OPTION	COMPUTER SERIAL NUMBER PREFIX AFTER FIELD CHANGES
	<p>D. SENSE AMPLIFIER CARD (A12 and A13). Sense amplifier card 02115-6001, located in slots 12 and 13, must be replaced with sense amplifier card 02116-6298.</p> <p>E. TIMING GENERATOR CARD (A106). On timing generator card 02116-6281, located in slot 106, jumper W1 must be in position "A" (figure 2-3) for computers configured with sense amplifier 02116-6298.</p> <p>F. ACCESSORY KIT. Installation of the items supplied with the 12592A-01 is the only other change required for conversion to the 16K memory.</p>	
842-	<p>1. IF COMPATIBILITY WITH THE HP 2150B IS NOT REQUIRED:</p> <p>A. TIMING GENERATOR CARD (A106). On timing generator card 02116-6281, located in slot 106, jumper W1 must be in position "B" (figure 2-3) for computers configured with sense amplifier 02115-6001.</p> <p>B. ACCESSORY KIT. Installation of the items supplied with the 12592A is the only other change required for conversion to the 16K memory.</p>	No Change
	<p>2. IF COMPATIBILITY WITH THE HP 2150B IS REQUIRED:</p> <p>A. BACKPLANE. Two backplane wiring changes are required prior to installation and operation of the 16K memory. One change updates the 842- configuration to the 844- configuration. The second change, in conjunction with changes 2B thru 2D following, updates the 844- configuration to the 845- configuration.</p> <p>B. MEMORY MODULE DECODER CARD (A2). Memory module decoder card 02116-6274, located in slot 2, must be replaced with memory module decoder card 02116-6300.</p> <p>C. SENSE AMPLIFIER CARD (A12 and A13). Sense amplifier card 02115-6001, located in slots 12 and 13, must be replaced with sense amplifier card 02116-6298.</p> <p>D. TIMING GENERATOR CARD (A106). On timing generator card 02116-6281, located in slot 106, jumper W1 must be in position "A" (figure 2-3) for computers configured with sense amplifier 02116-6298.</p> <p>E. ACCESSORY KIT. Installation of the items supplied with the 12592A-01 is the only other change required for conversion to the 16K memory.</p>	845-
844-	<p>1. IF COMPATIBILITY WITH THE HP 2150B IS NOT REQUIRED:</p> <p>A. TIMING GENERATOR CARD (A106). On timing generator card 02116-6281, located in slot 106, jumper W1 must be in position "B" (figure 2-3) for computers configured with sense amplifier 02115-6001.</p>	No Change



Table 2-1. Field Installation Checklist (Continued)

COMPUTER SERIAL NUMBER PREFIX	FIELD CHANGES REQUIRED FOR INSTALLATION OF 16K MEMORY OPTION	COMPUTER SERIAL NUMBER PREFIX AFTER FIELD CHANGES
	B. ACCESSORY KIT. Installation of the items supplied with the 12592A is the only other change required for conversion to the 16K memory.	
	<p>2. IF COMPATIBILITY WITH THE HP 2150B IS REQUIRED:</p> <p>A. BACKPLANE. One backplane wiring change is required prior to installation and operation of the 16K memory. This change, in conjunction with changes 2B thru 2D following, updates the 844-configuration to the 845- configuration.</p> <p>B. MEMORY MODULE DECODER CARD (A2). Memory module decoder card 02116-6274, located in slot 2, must be replaced with memory module decoder card 02116-6300.</p> <p>C. SENSE AMPLIFIER CARD (A12 and A13). Sense amplifier card 02115-6001, located in slots 12 and 13, must be replaced with sense amplifier card 02116-6298.</p> <p>D. TIMING GENERATOR CARD (A106). On timing generator card 02116-6281, located in slot 106, jumper W1 must be in position "A" (figure 2-3) for computers configured with sense amplifier 02116-6298.</p> <p>E. ACCESSORY KIT. Installation of the items supplied with the 12592A-01 is the only other change required for conversion to the 16K memory.</p>	845-
846-	<p>1. IF COMPATIBILITY WITH THE HP 2150B IS NOT REQUIRED:</p> <p>A. TIMING GENERATOR CARD (A106). On timing generator card 02116-6281, located in slot 106, jumper W1 must be in position "B" (figure 2-3) for computers configured with sense amplifier 02115-6001.</p> <p>B. ACCESSORY KIT. Installation of the items supplied with the 12592A is the only other change required for conversion to the 16K memory.</p>	No Change
	<p>2. IF COMPATIBILITY WITH THE HP 2150B IS REQUIRED:</p> <p>A. BACKPLANE. Two backplane wiring changes are required prior to installation and operation of the 16K memory. One change updates the 846- configuration to the 852- configuration. The second change, in conjunction with changes 2B thru 2D following, updates the 852- configuration to the 901- configuration.</p> <p>B. MEMORY MODULE DECODER CARD (A2). Memory module card 02116-6274, located in slot 2, must be replaced with memory module decoder card 02116-6300.</p> <p>C. SENSE AMPLIFIER CARD (A12 and A13). Sense amplifier card 02115-6001, located in slots 12 and 13, must be replaced with sense amplifier card 02116-6298.</p>	901-

Table 2-1. Field Installation Checklist (Continued)

COMPUTER SERIAL NUMBER PREFIX	FIELD CHANGES REQUIRED FOR INSTALLATION OF 16K MEMORY OPTION	COMPUTER SERIAL NUMBER PREFIX AFTER FIELD CHANGES
	<p>D. TIMING GENERATOR CARD (A106). On timing generator card 02116-6281, located in slot 106, jumper W1 must be in position "A" (figure 2-3) for computers configured with sense amplifier 02116-6298.</p> <p>E. ACCESSORY KIT. Installation of the items supplied with the 12592A-01 is the only other change required for conversion to the 16K memory.</p>	
850-	<p>1. IF COMPATIBILITY WITH THE HP 2150B IS NOT REQUIRED:</p> <p>A. TIMING GENERATOR CARD (A106). On timing generator card 02116-6281, located in slot 106, jumper W1 must be in position "B" (figure 2-3) for computers configured with sense amplifier 02115-6001.</p> <p>B. ACCESSORY KIT. Installation of the items supplied with the 12592A is the only other change required for conversion to the 16K memory.</p>	No Change
	<p>2. IF COMPATIBILITY WITH THE HP 2150B IS REQUIRED:</p> <p>A. BACKPLANE. One backplane wiring change is required prior to installation and operation of the 16K memory. This change updates the 850- configuration to the 900- configuration. Changes 2B and 2C following, update the 900- configuration to the 901- configuration.</p> <p>B. SENSE AMPLIFIER CARD (A12 and A13). Sense amplifier card 02115-6001, located in slots 12 and 13, must be replaced with sense amplifier card 02116-6298.</p> <p>C. TIMING GENERATOR CARD (A106). On timing generator card 02116-6281, located in slot 106, jumper W1 must be in position "A" (figure 2-3) for computers configured with sense amplifier 02116-6298.</p> <p>D. ACCESSORY KIT. Installation of the items supplied with the 12592A-01 is the only other change required for conversion to the 16K memory.</p>	901-
852-	<p>1. IF COMPATIBILITY WITH THE HP 2150B IS NOT REQUIRED:</p> <p>A. TIMING GENERATOR CARD (A106). On timing generator card 02116-6281, located in slot 106, jumper W1 must be in position "B" (figure 2-3) for computers configured with sense amplifier 02115-6001.</p> <p>B. ACCESSORY KIT. Installation of the items supplied with the 12592A is the only other change required for conversion to the 16K memory.</p>	No Change

Table 2-1. Field Installation Checklist (Continued)

COMPUTER SERIAL NUMBER PREFIX	FIELD CHANGES REQUIRED FOR INSTALLATION OF 16K MEMORY OPTION	COMPUTER SERIAL NUMBER PREFIX AFTER FIELD CHANGES
	<p>2. IF COMPATIBILITY IWTH THE HP 2150B IS REQUIRED:</p> <p>A. BACKPLANE. One backplane wiring change is required prior to installation and operation of the 16K memory. This change, in conjunction with changes 2B thru 2D following, updates the 852-configuration to the 901- configuration.</p> <p>B. MEMORY MODULE DECODER CARD (A2). Memory module decoder card 02116-6274, located in slot 2, must be replaced with memory module decoder card 02116-6300.</p> <p>C. SENSE AMPLIFIER CARD (A12 and A13). Sense amplifier card 02115-6001, located in slots 12 and 13, must be replaced with sense amplifier card 02116-6298.</p> <p>D. TIMING GENERATOR CARD (A106). On timing generator card 02116-6281, located in slot 106, jumper W1 must be in position "A" (figure 2-3) for computers configured with sense amplifier 02116-6298.</p> <p>E. ACCESSORY KIT. Installation of the items supplied with the 12592A-01 is the only other change required for conversion to the 16K memory.</p>	901-
900-	<p>1. IF COMPATIBILITY WITH THE HP 2150B IS NOT REQUIRED:</p> <p>A. TIMING GENERATOR CARD (A106). On timing generator card 02116-6281, located in slot 106, jumper W1 must be in position "B" (figure 2-3) for computers configured with sense amplifier 02115-6001.</p> <p>B. ACCESSORY KIT. Installation of the items supplied with the 12592A is the only other change required for conversion to the 16K memory.</p>	No Change
	<p>2. IF COMPATIBILITY WITH THE HP 2150B IS REQUIRED:</p> <p>A. BACKPLANE. No backplane changes are required. Changes 2B and 2C following update the 900- configuration to the 901-configuration.</p> <p>B. SENSE AMPLIFIER CARD (A12 and A13). Sense amplifier card 02115-6001, located in slots 12 and 13, must be replaced with sense amplifier card 02116-6298.</p> <p>C. TIMING GENERATOR CARD (A106). On timing generator card 02116-6281, located in slot 106, jumper W1 must be in position "A" (figure 2-3) for computers configured with sense amplifier 02116-6298.</p> <p>D. ACCESSORY KIT. Installation of the items supplied with the 12592A-01 is the only other change required for conversion to the 16K memory.</p>	901-

Table 2-1. Field Installation Checklist (Continued)

COMPUTER SERIAL NUMBER PREFIX	FIELD CHANGES REQUIRED FOR INSTALLATION OF 16K MEMORY OPTION	COMPUTER SERIAL NUMBER PREFIX AFTER FIELD CHANGE
904-	<p>1. IF COMPATIBILITY WITH THE HP 2150B IS NOT REQUIRED:</p> <p>A. TIMING GENERATOR CARD (A106). On timing generator card 02116-6281, located in slot 106, jumper W1 must be in position "B" (figure 2-3) for computers configured with sense amplifier 02115-6001.</p> <p>B. ACCESSORY KIT. Installation of the items supplied with the 12592A is the only other change required for conversion to the 16K memory.</p>	No Change
	<p>2. IF COMPATIBILITY WITH THE HP 2150B IS REQUIRED:</p> <p>A. BACKPLANE. One backplane wiring change is required prior to installation and operation of the 16K memory. This change, in conjunction with change 2B following, updates the 904-configuration to the 905- configuration. Changes 2C and 2D update the 905- configuration to the 912- configuration.</p> <p>B. MEMORY MODULE DECODER CARD (A2). Memory module decoder card 02116-6274, located in slot 2, must be replaced with memory module decoder card 02116-6300.</p> <p>C. SENSE AMPLIFIER CARD (A12 and A13). Sense amplifier card 02115-6001, located in slots 12 and 13, must be replaced with sense amplifier card 02116-6298.</p> <p>D. TIMING GENERATOR CARD (A106). Timing generator card 02116-6281, located in slot 106, must be updated to, or replaced by assembly revision A-912-22 or later. Jumper wire W1 must be in position "A" (figure 2-3) for computers configured with sense amplifier 02116-6298.</p> <p>E. ACCESSORY KIT. Installation of the items supplied with the 12592A-01 is the only other change required for conversion to the 16K memory.</p>	912-
905-	<p>1. IF COMPATIBILITY WITH THE HP 2150B IS NOT REQUIRED:</p> <p>A. TIMING GENERATOR CARD (A106). On timing generator card 02116-6281, located in slot 106, jumper W1 must be in position "B" (figure 2-3) for computers configured with sense amplifier 02115-6001.</p> <p>B. ACCESSORY KIT. Installation of the items supplied with the 12592A is the only other change required for conversion to the 16K memory.</p>	No Change
	<p>2. IF COMPATIBILITY WITH THE HP 2150B IS REQUIRED:</p> <p>A. BACKPLANE. No backplane changes are required. Changes 2B and 2C update the 905- configuration to the 912- configuration.</p>	912-

Table 2-1. Field Installation Checklist (Continued)

COMPUTER SERIAL NUMBER PREFIX	FIELD CHANGES REQUIRED FOR INSTALLATION OF 16K MEMORY OPTION	COMPUTER SERIAL NUMBER PREFIX AFTER FIELD CHANGE
	<p>B. SENSE AMPLIFIER CARD (A12 and A13). Sense amplifier card 02115-6001, located in slots 12 and 13, must be replaced with sense amplifier card 02116-6298.</p> <p>C. TIMING GENERATOR CARD (A106). Timing generator card 02116-6281, located in slot 106, must be updated to, or replaced by assembly revision A-912-22 or later. Jumper W1 must be in position "A" (figure 2-3) for computers configured with sense amplifier 02116-6298.</p> <p>D. ACCESSORY KIT. Installation of the items supplied with the 12592A-01 is the only other change required for conversion to the 16K memory.</p>	
912- and above	<p>1. HP 2150B COMPATIBILITY: All of the subject computers are compatible with the HP 2150B Extender.</p> <p>2. TIMING GENERATOR CARD (A106). On timing generator card 02116-6281, located in slot 106, jumper W1 must be in position "A" (figure 2-3) for computers configured with sense amplifier 02116-6298.</p> <p>3. ACCESSORY KIT. Installation of the items supplied with the 12592A-01 is the only change required for conversion to the 16K memory.</p>	No Change

### 2-13. INSTALLATION PROCEDURE.

2-14. Field installation involves only basic assembly operations. No special tools or test equipment are required. To field install the 16K memory option, proceed as follows:

- a. At the computer front panel, press the POWER switch to turn power off.
- b. At the rear of the computer, disconnect the power cord from connector J1.

#### WARNING

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

- c. Open the door assembly to expose the front of the card cage assembly (5, figure 2-1). Remove the four retaining screws securing the card cage to the mainframe. Fully extend the card cage from the cabinet until it locks

in place. Then swing the card cage to the position shown in figure 2-1 to provide access to where optional core stack assembly A401 is to be mounted.

#### CAUTION

Avoid dropping screws, washers, and other hardware into card cage during installation. These items are difficult to retrieve. Remove dropped hardware items at once. If left inside the computer and forgotten, damage could result when power is applied.

- d. Remove the card cage top cover (1), the memory cable spacing bracket (2), and the core stack dummy plate (3).

- e. Arrange the six memory cables of core stack assembly A401 (4) on top of the card cage in a manner similar to the memory cables of core stack assembly A400 (6). Then position core stack assembly A401 next to core stack assembly A400. Secure A401 to the back of the card cage using the screws and mounting holes which originally held the core stack dummy plate in place.

Table 2-2. Assembly Checklist for Computers Equipped with the 16K Memory Option

DESCRIPTION	REF DESIG.	HP PART NO. REQUIRED		QUANTITY SUPPLIED		TOTAL QUANTITY REQUIRED
		COMPUTERS COMPATIBLE WITH HP 2150B EXTENDER	COMPUTERS NOT COMPATIBLE WITH HP 2150B EXTENDER	WITH THE COMPUTER	WITH THE ACCESSORY KIT	
Memory Module Decoder Card	A2	02116-6300	02116-6274 or 02116-6300	1 (Note 1)	None	1
Inhibit Driver Card	A4, A6, A16, A18	02116-6265	02116-6265	2	2	4
Driver/Switch Card	A8, A9, A14, A15	02116-6266	02116-6266	2	2	4
Sense Amplifier Card	A10, A11, A12, A13	02116-6298	02115-6001	2 (Note 2)	2 (Note 3)	4
Timing Generator Card	A106	02116-6281	02116-6281	1 (Note 4)	None	1
Instruction Decoder Card	A107	02116-6027	02116-6027	1 (Note 5)	None	1
Core Stack Assembly	A400, A401	02116-6288	02116-6288	1	1	2

**NOTES**

1. Memory module decoder card 02116-6274 must be used in computers bearing serial number prefixes other than 845-, 901-, 905- or later, but is replaced by the memory module decoder card 02116-6300 to achieve compatibility with the 2150B Extender (refer to table 2-1).
2. Sense amplifier card 02116-6298 must be used in slots 12 and 13 of computers bearing serial number prefix 845-, 901-, 912- or later. Computers with these serial number prefixes are directly compatible with the HP 2150B Extender. Computers bearing any other serial number prefix must have sense amplifier card 02115-6001 assemblies installed in slots 12 and 13, and are not compatible with the HP 2150B Extender unless the field changes specified in table 2-1 are incorporated. This includes replacing the sense amplifier card 02115-6001 in slots 12 and 13 with sense amplifier card 02116-6298.
3. Sense amplifier card 02115-6001 is supplied in accessory kit 12592A; sense amplifier card 02116-6298 is supplied in accessory kit 12592A-01.
4. Card revision A-912-22 or later must be used in computers bearing serial number prefixes 912- or later.
5. Card revision K-830-6 or later must be used in all computers.

f. Check the routing of the memory cables from A401 to the front of the card cage. Make sure that the cables are not crossed and that the hooded connectors align with the proper card slots (see figure 2-2).

g. Replace the memory cable spacing bracket (2, figure 2-1). When installing this bracket, make sure that the memory cables are not pinched or strained.

h. Carefully inspect the installation of core stack assembly A401. Make sure that all hardware items have been replaced and tightened. Then replace the card cage top cover (1).

i. Swing the card cage into alignment with the slide assembly, release the slide assembly and slide the card cage into the cabinet. Replace the four screws that secure the card cage to the mainframe.

j. Check that the part numbers of the sense amplifiers installed in slots 12 and 13 of the computer are the same as the part numbers of the two sense amplifiers supplied in the accessory kit. The part numbers must be the same. Then install all six optional cards in the slots shown in figure 2-2.

k. Connect the memory cable connectors to the 48-pin edge of the optional cards. The proper connections are indicated by the markings on the cable hoods, as shown in figure 2-2.

l. Remove the timing generator card from slot 106 and check the position of jumper W1 (see figure 2-3). If the sense amplifier cards installed in the computer have

assembly number 02116-6298, jumper W1 must be in position "A". If the sense amplifier cards installed in the computer have assembly number 02115-6001, jumper W1 must be in position "B". After making any necessary changes, return the timing generator card to slot 106.

m. Carefully recheck the information presented in tables 2-1 and 2-2 to ensure that the computer is configured properly. Then recheck all steps of this installation procedure to be sure that the 16K memory option was installed properly.

n. Plug the power cord into connector J1 at the rear of the computer. Then proceed with the installation checkout procedure presented in the following paragraph.

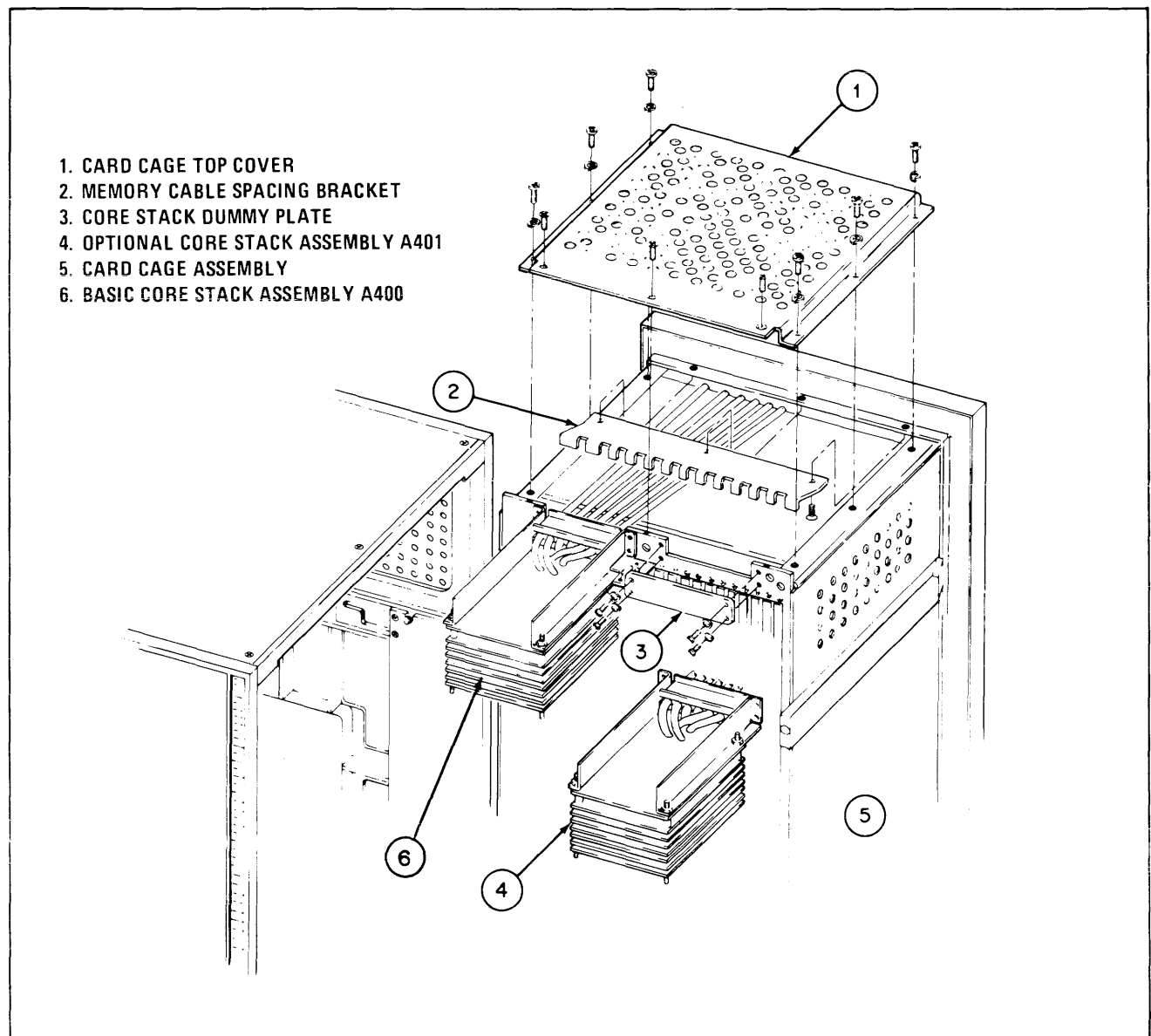


Figure 2-1. Installation of Core Stack Assembly

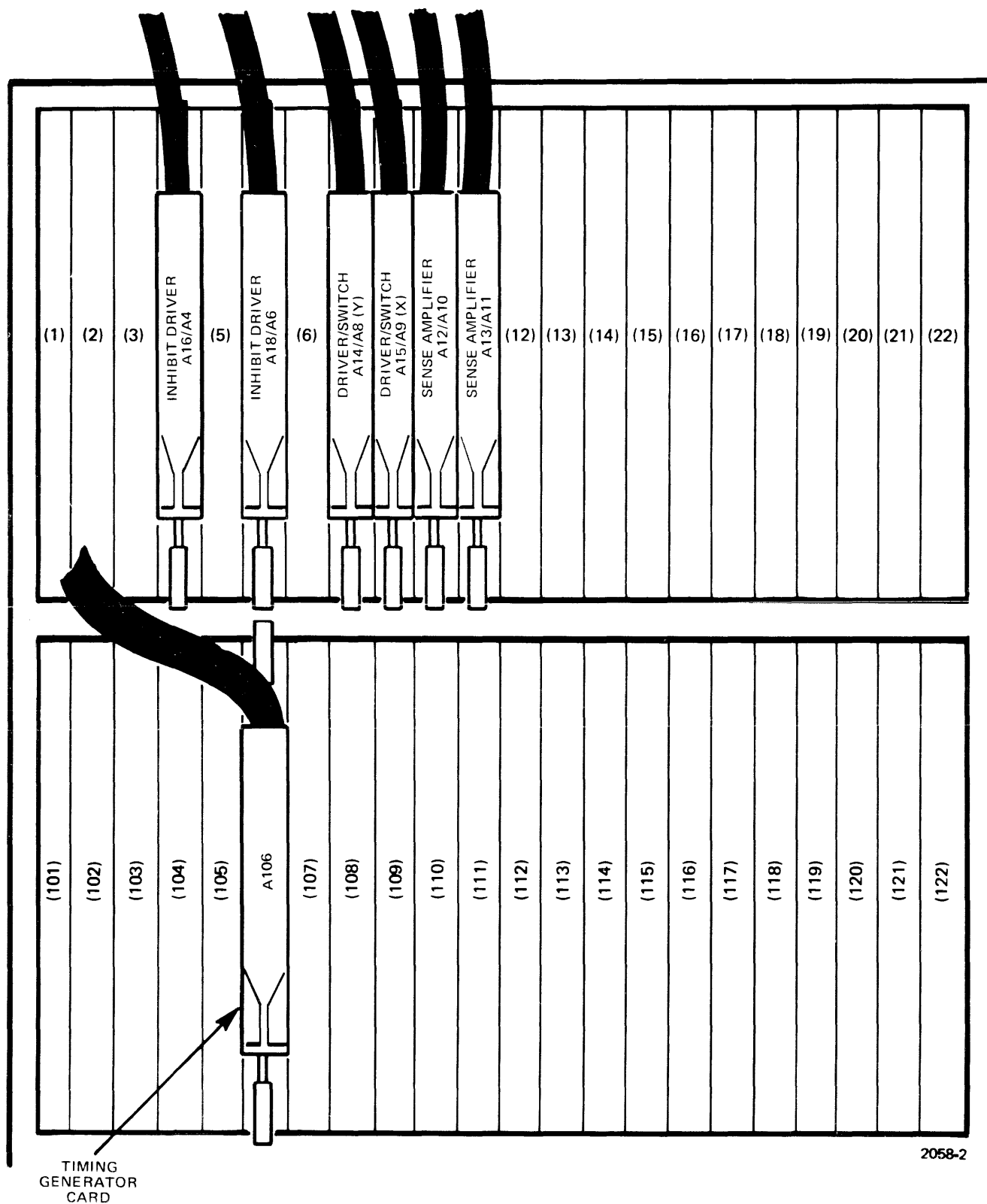


Figure 2-2. Front View of the Card Cage Showing the Location of Cards, Cables, and Connectors Associated with the 16K Memory Option



**2-15. INSTALLATION CHECKOUT.**

2-16. Checkout of the 16K memory option is as follows:

- a. At the computer press the POWER switch on.
- b. Perform the voltage checks and adjustments specified in paragraph 4-4.
- c. Load the basic binary loader program in the highest 64 locations of the 16K memory. Refer to the HP 2116B Installation and Maintenance Manual for loading instructions.

**Note**

To prevent destruction of the loader program in the computer memory, always ensure that the LOADER switch on the computer front panel is in the PROTECTED position before resuming normal computer operation.

- d. Perform the memory address and memory checkerboard tests contained in the HP 2116B Installation and Maintenance Manual Diagnostic Listings. If test results are normal the 16K word memory is ready for operation.

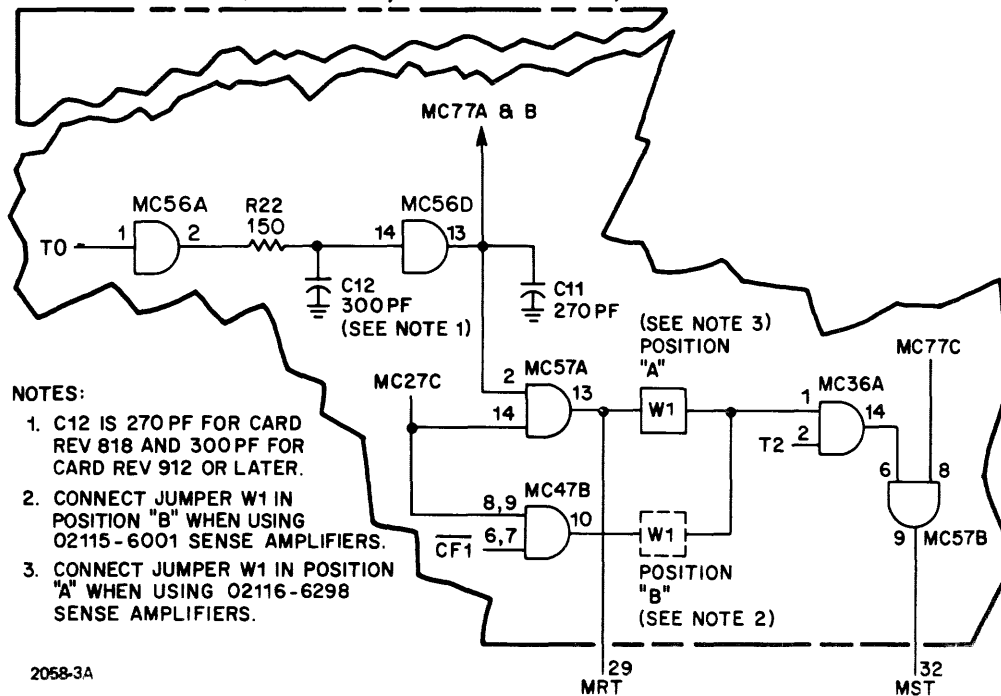
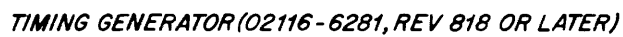


Figure 2-3. Timing Generator Card (02116-6281), Partial Schematic and Part Location Diagram Showing Location of Jumper W1

## SECTION III

### THEORY OF OPERATION

#### 3-1. GENERAL.

3-2. With this option installed, the computer effectively has a complete 16K memory. The basic, or original, 8K memory provides memory addresses 00000 through 17777 and the additional 8K memory of this option provides memory addresses 20000 through 37777. Operation of the new 8K memory module (8K memory core stack assembly, and sense amplifier, inhibit driver, and driver switch cards) is the same as the operation of the basic 8K memory module with the exception of the X and Y read/write signals from the memory module decoder card, A2. With the installation of this option, the X and Y read/write signals must now be switched between the two 8K memory modules in order to address all memory locations. (Refer to figure 3-1.)

#### 3-3. BASIC 8K MEMORY OPERATION.

3-4. When the HP 2116B Computer has only the basic 8K memory (locations 00000 through 17777), the MMD13 signal and the M14 signal are not applied to pins 27 and 29, respectively, of memory module decoder card A2. With no signals to these circuits, inverters and decoding circuits cause the true read/write Y0/1 signal to be continuously applied from pin 5 of the memory module decoder card to the driver/switch circuitry of both the upper and the lower halves of the basic 8K memory core stack assembly. At the same time, the M12 signal, from direct memory logic card A20, is applied to pin 3 of the memory module decoder card. This signal represents the true/false state of M-register bit 12 which, in turn, indicates whether the lower or upper half of the basic 8K memory core stack assembly is being addressed. If the M12 signal is true at pin 3, memory locations between 10000 and 17777 are being addressed. The true M12 signal causes a true read/write X1 signal (pin 6 of the memory module decoder card) to be applied to the driver/switch circuitry for the upper half of the basic 8K memory core stack assembly along with the Y0/1 signal. This enables addressing of the upper half of the basic 8K memory core stack assembly. If the M12 signal is false, memory locations between 00000 and 07777 are being addressed. This condition causes a true read/write X0 signal (pin 4 of the memory module decoder card) to be applied to the driver/switch circuitry for the lower half of the basic 8K memory core stack assembly along with the Y0/1 signal. These two signals enable addressing of the lower half of the basic 8K memory core stack assembly.

#### 3-5. OPTIONAL 8K MEMORY OPERATION.

3-6. When this option is installed, the X and Y read/write signals must also be applied to the upper and lower

halves of the new memory core stack assembly whenever memory locations 20000 through 37777 are being addressed. To accomplish this, the M13 signal (which is not used with the basic 8K memory) is routed from the direct memory logic card, through a jumper on the sense amplifier card in slot A11, and then applied to pin 27 of the memory module decoder card as the MMD13 signal. The MMD13 signal represents the true/false state of M-register bit 13 which, in turn, indicates which of the two 8K memory core stack assemblies is being addressed. If the MMD13 signal at pin 27 of the memory module decoder card is false, memory locations 00000 through 17777 are being addressed and operation of the computer memory is the same as when only the basic 8K memory is installed (paragraph 3-4). When the MMD13 signal at pin 27 is true, locations 20000 through 37777 (the locations contained in the new memory core stack assembly) are being addressed. The true MMD13 signal causes the false Y0/1 read/write signal to be applied to the driver/switch circuitry of the basic 8K memory core stack assembly. This inhibits addressing of the basic 8K memory core stack assembly (memory locations 00000 through 17777). At the same time, the true MMD13 signal causes a true Y2/3 read/write signal to be applied to the driver/switch circuitry of the new 8K memory core stack assembly (memory locations 20000 through 37777). With the Y2/3 read/write signal true, the true/false state of the M12 signal at pin 3 of the memory module decoder card determines whether the upper or lower half of the new memory core stack assembly is to be enabled for addressing. The M12 signal at pin 3 being false enables addressing of memory locations 20000 through 27777 and a true X2 read/write signal to be applied to the driver/switch circuitry for the lower half of the new 8K memory core stack assembly. The M12 signal at pin 3 being true enables the addressing of memory locations 30000 through 37777 and a true X3 read/write signal to be applied to the driver/switch circuitry of the upper half of the new 8K memory core stack assembly. The X0, X1, X2, and X3 read/write signals are also used to enable applicable driver/switch, sense amplifier, and inhibit driver circuits as indicated in figure 3-1.

#### 3-7. PROTECTION OF UPPER 64 MEMORY LOCATIONS.

3-8. Protection of the upper 64 memory locations in the new 8K memory core stack assembly is provided when the sense amplifier card is inserted in card slot A11. This card provides a jumper which connects the M13 signal from the direct memory logic card to the memory module decoder card. When inhibit driver card, A6, is installed, it provides the MPT2 signal, not previously used,

to pin 35 of the memory module decoder card. In the module decoding circuitry the MPT1 and MPT2, M6 through M11, and the LPS (loader protect switch) signals are all applied as inputs to "and" gate MC55 of the memory module decoder card, and in this manner control protection of the upper 64 memory locations. When all inputs to "and" gate MC55 are true, a true MPT signal is

applied to "and" gate MC47A of timing generator card A106. The output of MC47A is inverted through "nor" gate MC46A and applied to "and" gate MC27C to inhibit memory timing whenever memory locations in the protected loader area are being addressed. (Refer to the HP 2116B Installation and Maintenance Manual for a logic diagram of memory module decoder card A2.)

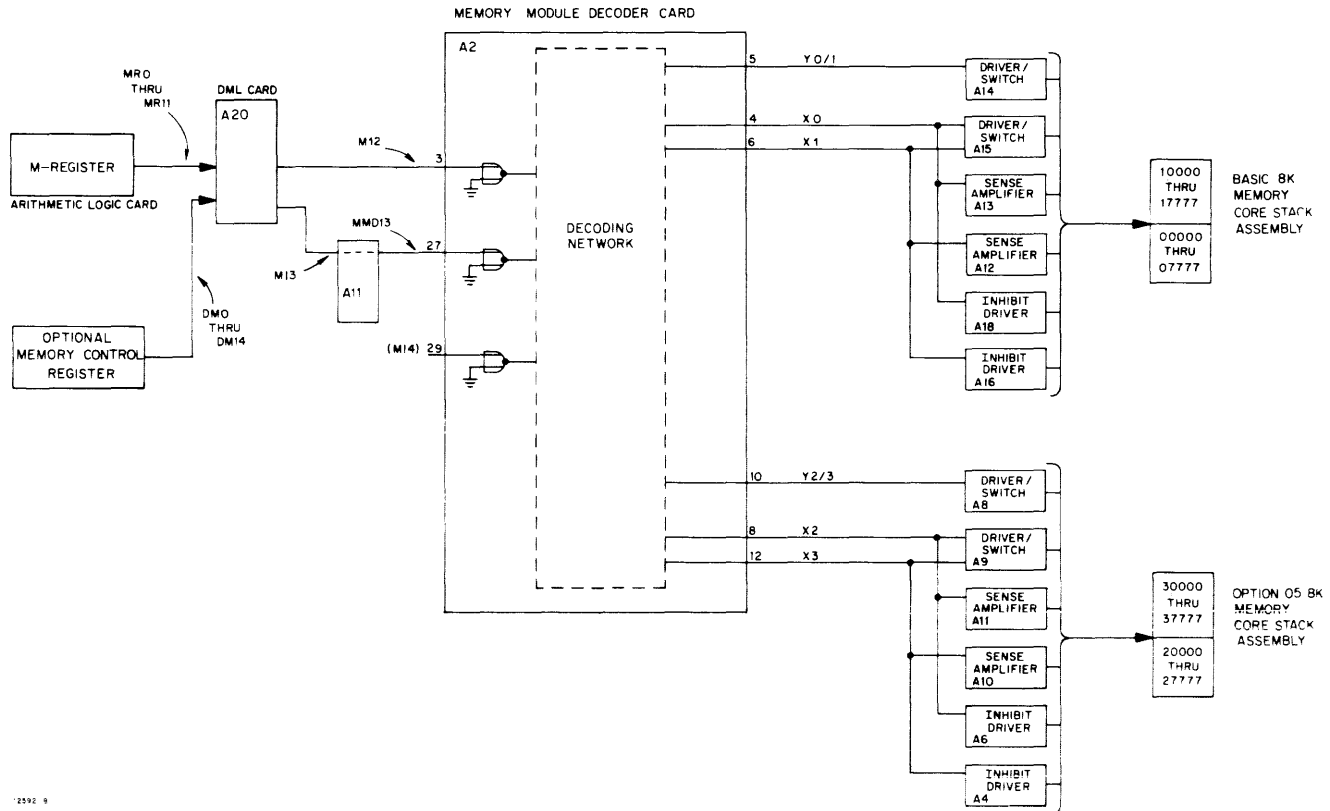


Figure 3-1. 16K Memory Functional Block Diagram

## SECTION IV

### MAINTENANCE

#### 4-1. GENERAL.

4-2. This section contains maintenance information pertaining directly to the items furnished with the 12592A and 12592A-01 accessory kits. Refer to the HP 2116B Installation and Maintenance Manual and the Supplement of Diagnostic Listings (part no. 02116-9153) for referenced diagrams and test procedures.

#### 4-3. PREVENTIVE MAINTENANCE.

4-4. **POWER SUPPLY VOLTAGE CHECKS.** Check the voltages specified in table 4-1 at the test points located on the overvoltage protection assembly. If adjustment is required, refer to the power supply adjustment procedures in the HP 2116B Installation and Maintenance Manual.

4-5. **MEMORY ADDRESS TEST.** Load and run the high and low core memory address test tapes in accordance with the procedures contained in the HP 2116B Installation and Maintenance Manual Diagnostic Supplement.

4-6. **MEMORY CHECKERBOARD TESTS.** Load and run the high and low core memory checkerboard test tapes in accordance with the procedures contained in the

HP 2116B Installation and Maintenance Manual Diagnostic Supplement.

#### Note

While running the memory checkerboard tests, rotate the +22V adjustment of the computer power supply through a plus and minus 2-volt variation (+20.8V to +24.8V at  $25^{\circ}\text{C} \pm 2^{\circ}$ ). The checkerboard tests should continue to run error-free during the voltage variation. Always return the voltage setting to +22.8 volts  $\pm 3\%$  after each test. Conduct this test at  $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$  if possible. At higher ambient temperatures a  $\pm 1.5$  volt variation from nominal setting is acceptable. At lower ambient temperatures a  $\pm 2$  volt variation from nominal setting is acceptable.

#### 4-7. DIAGRAMS, REFERENCE DESIGNATION INDEXES, AND REPLACEABLE PARTS.

4-8. Refer to the HP 2116B Installation and Maintenance Manual for diagrams, reference designation indexes, and replaceable parts information.

Table 4-1. Power Supply Voltage Adjustments

NOMINAL VOLTAGE	TOLERANCE	ADJUST TO	ADJUSTMENT
+22V	$\pm 3\%$ of "Adjust To" value	$+22.8 - (0.04) (T^{\circ}\text{C} - 25^{\circ}\text{C})$	+20 ADJ R140 (A302)
-22V	$\pm 3\%$ of "Adjust To" value	$-22.8 - (0.04) (T^{\circ}\text{C} - 25^{\circ}\text{C})$	-20 ADJ R155 (A302)
+32V	$\pm 3\%$ of "Adjust To" value	$+32.0 - (0.064) (T^{\circ}\text{C} - 25^{\circ}\text{C})$	+32 ADJ R170 (A302)
<b>NOTES</b>  1. The +22V and -22V supplies should be within $\pm 1\%$ of each other, numerically: adjust R155 after adjusting R140.  2. " $T^{\circ}\text{C}$ " is measured ambient temperature in degrees centigrade.			

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