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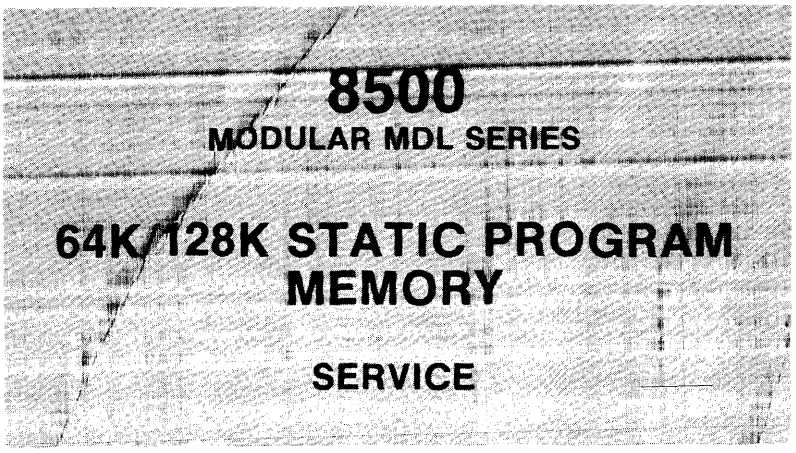
WARNING

THE FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

PLEASE CHECK FOR CHANGE INFORMATION AT THE REAR OF THIS MANUAL.

This manuals supports the following TEKTRONIX products:

8550 Option	8540 Option	Products
04	04	8550F04
05	05	8550F05



Tektronix, Inc.
P.O. Box 500
Beaverton, Oregon 97077

Serial Number _____

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PREFACE

ABOUT THIS MANUAL

This service manual contains servicing information for the 64K/128K Static Program Memory. The manual applies to use of this equipment in 8500 Series Emulation and Development Systems.

MANUAL ORGANIZATION

The 64K/128K Static Program Memory Service Manual is divided into twelve sections:

Section 1 contains general information about the memory and its available option configurations.

Section 2 provides specification details

Section 3 describes the operation of the memory, and includes details on jumper and strap options.

Section 4 contains text and illustrations on the theory of operation.

Section 5 contains procedures for performing functional tests on the memory.

Section 6 contains references to the diagnostic performance checks.

Section 7 provides details on maintenance and troubleshooting.

Section 8 provides details on installation of the memory.

Section 9 provides technical reference material.

Sections 10, 11 and 12 contain the electrical parts list, schematic diagrams, and the mechanical parts list, respectively.

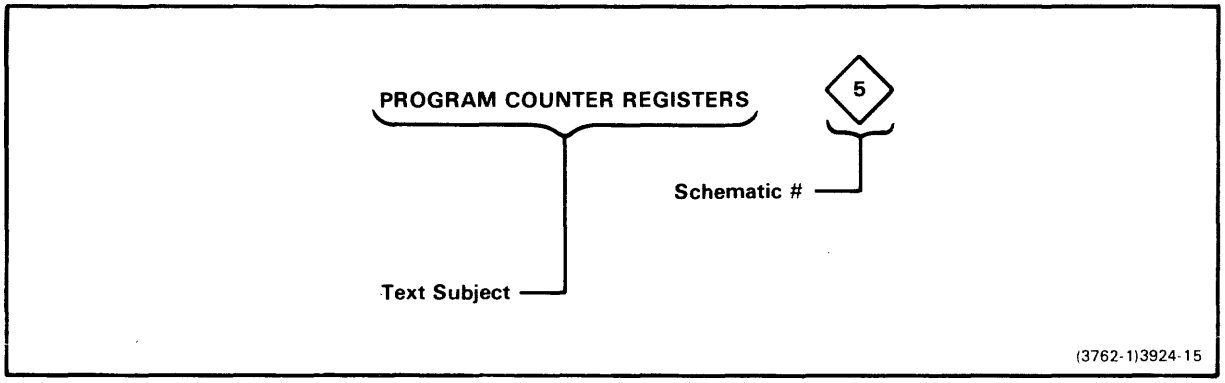
INTENDED USE

This manual is designed to be used by trained service technicians; it is not designed for use as a training guide. The intent is to provide a sufficiently detailed theory or operation and accompanying reference material to enable a technician to isolate a problem to a particular component on a circuit board.

GENERAL INFORMATION

Schematics

The schematics included in this manual have been drawn with grey overlays to highlight functional blocks of circuitry. The text is coordinated with these block overlays. Headings in the text indicate the schematic(s) that depict the circuit under discusion. The following example illustrates a text heading:



This example shows that:

- The subject of the text is the program counter registers:
- These registers appear on schematic 5.

Revision History

As this manual is revised and reprinted, revision history information is included on the text and diagram pages. Original manual pages are identified with an '@' symbol at the bottom inside corner of the page. When existing pages are revised, the '@' symbol is replaced with a revision code and date. New pages added to a section, whether they contain old, new, or revised information, will be identified with the '@' symbol and a date.

Change Information

Change notices are issued by Tektronix, Inc., to document changes to the manual after it has been published. Change information is located at the back of this manual, following the yellow tab marked "CHANGE INFORMATION & TEST EQUIPMENT". When you receive this manual, you should enter any change information into the body of the manual, according to instructions on the change notice.

Slashed Zeros (Ø)

In this manual, zeros are slashed only where necessary for clarity.

DOCUMENTATION OVERVIEW

Support documentation for TEKTRONIX microprocessor emulation systems and system options consists of service manuals, installation manuals, and user's manuals.

Service Manuals

Service manuals provide the information necessary to perform system testing, to isolate hardware problems, and to repair system components. Service manuals are identified by their blue covers and may be purchased from Tektronix as optional accessories.

The following manuals provide service information for related equipment:

- Memory Allocation Controller Service Manual
- 8301 Microprocessor Development Unit Service Manual
- 8501 Data Management Unit Service Manual

User's Manuals

User's manuals describe procedures required to operate both the standard development system and its optional accessories. User's manuals are identified by their grey covers and are provided as a standard accessory in the system package when applicable.

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OPERATORS SAFETY SUMMARY

The general safety information in this part of the summary is for both operating and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear in this summary.

TERMS

In This Manual

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.

WARNING statements identify conditions or practices that could result in personal injury or loss of life.

As Marked on Equipment

CAUTION indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property including the equipment itself.

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

SYMBOLS

As Marked on Equipment

DANGER high voltage.

Protective ground (earth) terminal.

ATTENTION - Refer to manual.

SAFETY PRECAUTIONS

Grounding the Product

This product is grounded through grounding conductors in the interconnecting cables. To avoid electrical shock, plug the supporting system's power cord into a properly wired receptacle. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Use the Proper Power Cord

Use only the power cord and connector specified for your product.

Use only a power cord that is in good condition.

Refer cord and connector changes to qualified service personnel.

Use the Proper Fuse

To avoid fire hazard, use only the fuse specified in the parts list for your product. Be sure the fuse is identical in type, voltage rating, and current rating.

Refer fuse replacement to qualified service personnel.

Do Not Operate in Explosive Atmospheres

To avoid explosion, do not operate this product in an atmosphere of explosive gases unless it has been specifically certified for such operation.

Do Not Remove Covers or Panels

To avoid personal injury, do not remove the product covers or panels. Do not operate the product without the covers and panels properly installed.

SERVICING SAFETY SUMMARY
FOR QUALIFIED SERVICE PERSONNEL ONLY

(Refer also to the preceding Operators Safety Summary)

Do Not Service Alone

Do not perform internal service or adjustment of this product unless another person capable of rendering first aid and resuscitation is present.

Use Care When Servicing With Power On

Dangerous voltages exist at several points in this product. To avoid personal injury, do not touch exposed connections and components while power is on.

Disconnect power before removing protective panels, soldering, or replacing components.

Power Source

This product is intended to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Section 1

GENERAL INFORMATION

INTRODUCTION

The 64K/128K Static Program Memory provides your TEKTRONIX microcomputer development system with additional memory capabilities. The memory incorporates the following features:

- 64K or 128K byte versions
- Byte (8-bit), or Word (16-bit) operation
- Fast (92ns) memory cycle
- Fully strappable 32K memory address block segmentation
- Static memory cell operation
- Low power consumption

The memory is primarily designed for program storage applications, but may be used as system memory in test applications.

The 64K/128K Static Program Memory is designed to be installed in TEKTRONIX 8301 and 8540 mainframes. Table 1-1 indicates the memory options supported by this manual.

Table 1-1. System/Memory Options

System	Option	Product No.	Item Description
8540	04	8550F04	64K Static Program Memory
8550	04	8550F04	64K Static Program Memory
8540	05	8550F05	128K Static Program Memory
8550	05	8550F05	128K Static Program Memory

MEMORY ORGANIZATION

The 128K memory is organized into four 32K blocks. The 64K option uses two of these blocks. Refer to Fig. 1-1.

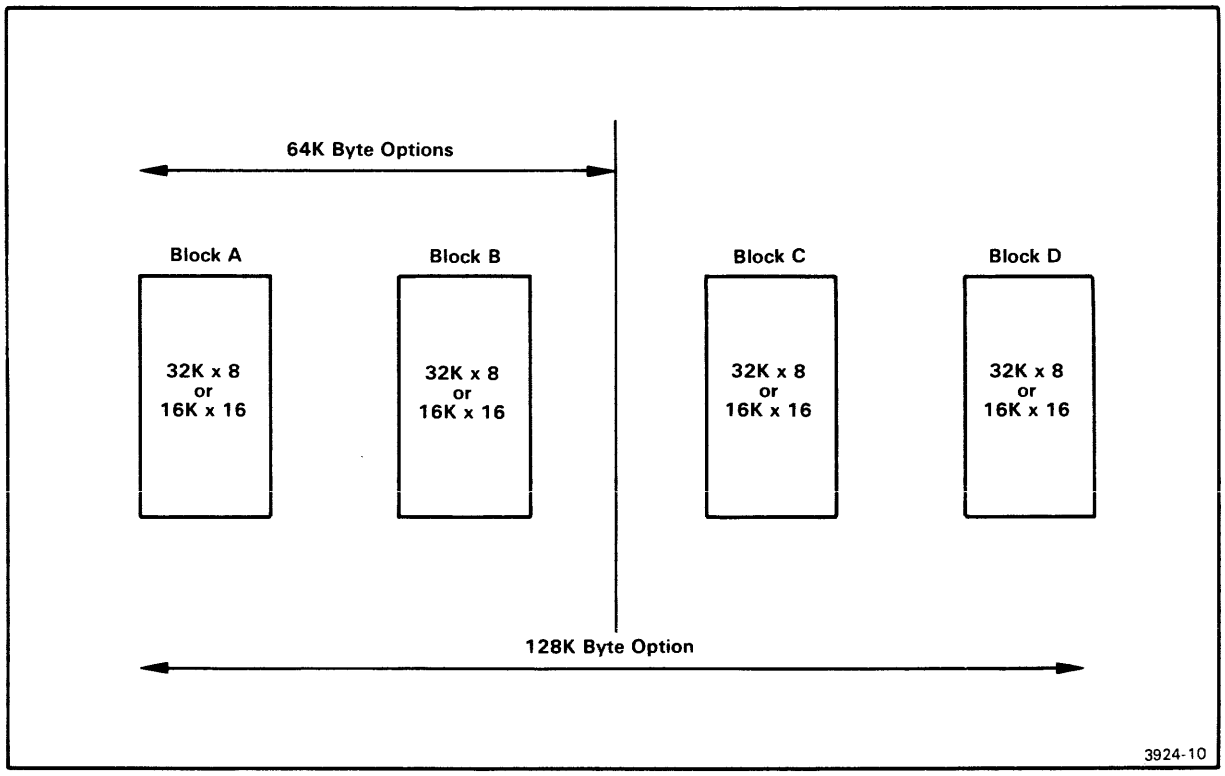


Fig. 1-1. Memory block partitions

Note: 16K x 16 is selected by WD ACCESS (L)
32K x 8 is selected by WD ACCESS (H)

The base address is selected by jumpers controlling address lines A15--A23 for each block. For example, to have 8-bit memory based at 0000 and running to 1FFFF;

Block A - A15--A23 =0
Block B - A15 = 1, A16--A23 = 0
Block C - A15 = 0, A16 = 1, A17--A23 = 0
Block D - A15 = 1, A16 = 1, A17--A23 = 0

Section 3 provides more details on address selection.

Section 2

SPECIFICATIONS

INTRODUCTION

Tables 2-1, 2-2, and 2-3 specify electrical, enviromental, and physical characteristics of the memory board.

Table 2-1.
Electrical Characteristics

Characteristic	Performance Requirements	Supplemental Info.
Power - 128K Config.	Calculated (typical + 20%) Active: 5.2A Standby: 3.9A Measured (NEC devices): Active: 4.0A Standby: 2.2A	Based on 2167 devices drawing 100mA active and 13mA standby
Power - 64K Config.	Calculated (typical + 20%) Active: 4.4A Standby: 3.1A	
Voltage	+5Vdc	
Dissipation		Active: 22W (approx.)

Table 2-2.
Environmental Characteristics

Characteristic	Performance Requirements
Air Temperature	
Operating	0 C to 50 C (+32 F to 122 F)
Storage	-55 C to 75 (-67 F to 167 F)
Humidity	To 95% non-condensing
Altitude	
Operating	To 4 500m (15,000 ft) max.
Storage	To 15 000m (50,000 ft) max.

Table 2-3.
Physical Charactertistics

Characteristic	Performance Requirement
Height	195 mm (7.68 in)
Width	280 mm (11.0 in)
Weight (approx.):	1.36 kg (3.0 lb)

Section 3

OPERATING INFORMATION

INTRODUCTION

This section provides operating information required during servicing of the 64K/128K Static Program Memory. Applicable operating parameters are:

- External Controls
- Internal Controls (straps, jumpers etc.)

External control of the memory is limited to software control. This type of control may be in the form of memory relocation, high/low byte manipulation (A0, Swap, etc.), or inhibit functions. Typically, control signals will originate in either the system processor, the memory allocation controller (MAC board), or the applicable emulator processor. Consult the 8540 or 8550 system and option manuals for descriptions and uses of these signals.

Internal control is obtained using jumpers or wire straps. Jumper and strap selections are described in the following paragraphs.

JUMPERS AND STRAPS

The 64K/128K Static Program Memory has three jumper/strap options:

- System/Program Select
- Address Selection
- Read Delay Select

Physical locations of the jumper/strap options are shown in Fig. 3-1. A description of the jumpers and straps, and instructions for using them are included in the following paragraphs.

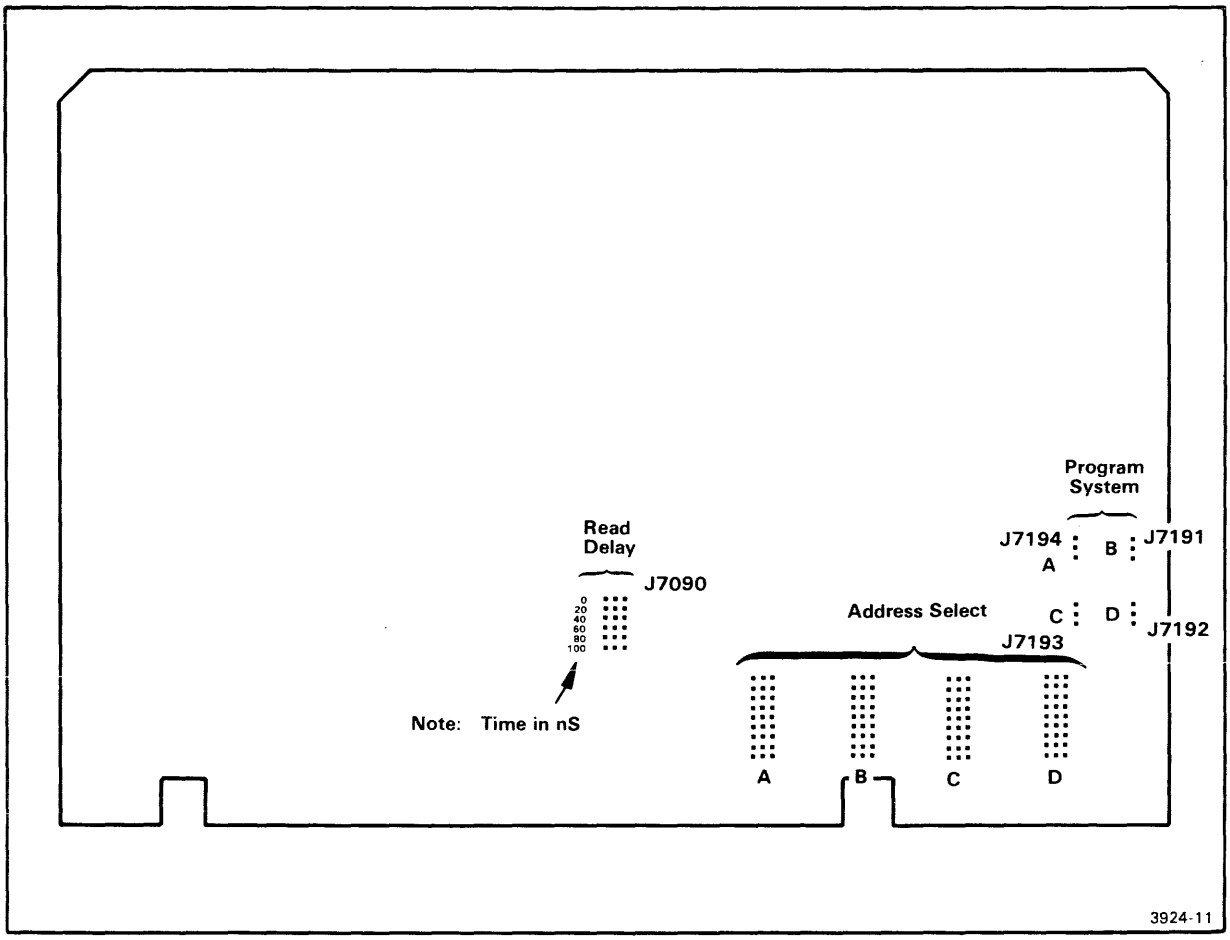


Fig. 3-1. Jumper and strap locations

SYSTEM/PROGRAM SELECT

The strapping of the four System/Program groups (see Fig. 3-1) determines whether the memory module will respond to system or program memory control signals.

The default condition for each group (J7191--J7194) is program select. In the default condition (without any strap), the appropriate memory block (A, B, C, or D, as marked on board) becomes operational when the CMEM(L) signal goes high, indicating program memory selection. When one or more blocks are wire-strapped from the center pad to the system pad, the selected memory blocks become operational when CMEM(L) goes low. This indicates system memory selection.

ADDRESS SELECT

The address select jumpers (J8100--J8160) are located at the lower right of the board (refer to Fig. 3-1). Each of the four jumper groups represents a 32K byte segment of the 128K (or 64K) memory available on the board. In order for any segment to be addressed, the incoming upper address (A15--A23) must match the jumpered configuration.

Note that A15 is included in the upper address. The highest number of addresses available to the lower address block (A0--A14) is 7FFF (32K). This is the address range for a memory segment jumper group strapped for all zeroes. The inclusion of A15 in the upper address also means that the smallest increment of upper range addressing is equal to the size of one memory segment, e.g. 32K. By this means, any of four 32K blocks can be based anywhere within an address range of 0 to FF8000 (16M).

The method of programming an address block is best given by example. Fig. 3-2 depicts jumper information for the address range 10000 (64K) to 18000 (96K).

```
A23-20  A19-16  A15-12  A11-8   A7-4    A3-0
 0000    0001    0000    0000    0000    0000   -- Binary Address
  0       1       0       0       0       0     -- Hexadecimal Address

←—Upper Address→←—   Lower Address    —→
```

Fig. 3-2. Jumper data example.

This illustration shows the hexadecimal equivalent (10000) of the decimal: 65,536 (64K), and its binary equivalent jumper position.

The upper address for the segment is computed by adding the base address to the 32K span of lower addresses, i.e. 10000 (64K) + 8000 (32K) = 18000 (96K).

The jumper positions correspond to the binary address. The above example is implemented as shown in Fig. 3-3

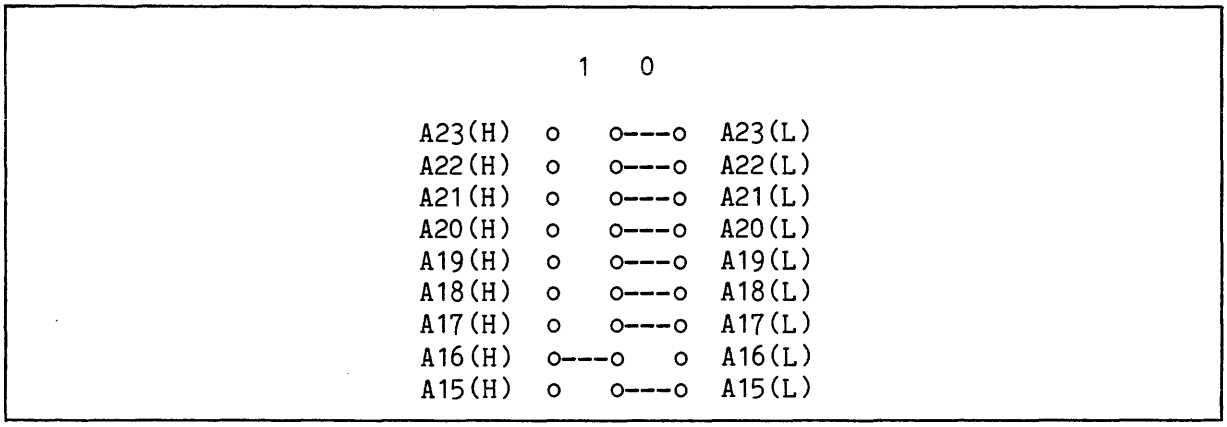


Fig. 3-3. Jumper example in 128K mode

Table 3-1 provides an abbreviated look-up table for jumper connecting contiguous base addresses up to 40000 (256K) and major orders thereafter up to FF8000 (16M). Section 5 (Technical Reference) includes a table listing contiguous addresses through 800000 (8192K), and instructions for jumper connecting base addresses up to the limit of FF8000.

Table 3-1
Address Jumper Condensed Look-up Table

Base Memory Address		Jumper Setting: A23	A22	A21	A20	A19	A18	A17	A16	A15
00000	(0)	0	0	0	0	0	0	0	0	0
08000	(32K)	0	0	0	0	0	0	0	0	1
10000	(64K)	0	0	0	0	0	0	0	1	0
18000	(96K)	0	0	0	0	0	0	0	1	1
20000	(128K	0	0	0	0	0	0	1	0	0
28000	(160K)	0	0	0	0	0	0	1	0	1
30000	(192K)	0	0	0	0	0	0	1	1	0
38000	(224K)	0	0	0	0	0	0	1	1	1
40000	(256K)	0	0	0	0	0	1	0	0	0
80000	(512K)	0	0	0	0	1	0	0	0	0
100000	(1024K)	0	0	0	1	0	0	0	0	0
200000	(2048K)	0	0	1	0	0	0	0	0	0
400000	(4096K)	0	1	0	0	0	0	0	0	0
800000	(8192K)	1	0	0	0	0	0	0	0	0
FF8000	(16352K)	1	1	1	1	1	1	1	1	1

Using the Address Select Jumpers in test mode

This mode provides addressing capabilities when the LAS board is used in the test mode for system memory. Note that for system usage the full capabilities of the board are limited to 64K by the system controller.

To use this mode, remove all the address jumpers on the two memory segments to be addressed except for A15. On the remaining two (unused) memory segments, refer to Table 3-1 and connect a high order address which is outside the range to be addressed. Jumper connections on the two addressed segments are shown in Fig. 3-4.

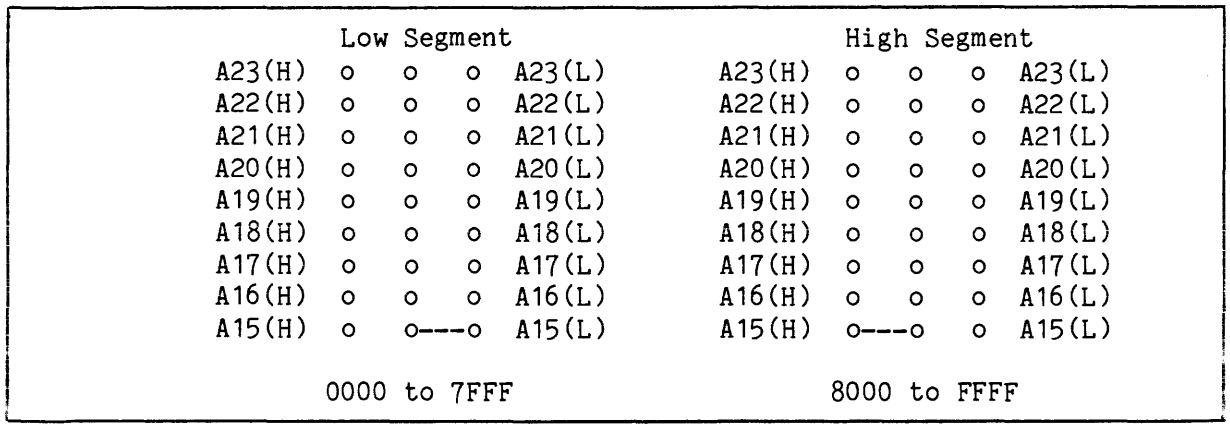


Fig. 3-4. Jumper example for test mode

The board will now respond only to A15 which will operate as a high-low segment select.

READ DELAY JUMPER

The read delay is implemented using J7090. A choice of six delay times from 0 to 100ns, in 20ns increments, is available. The signal being delayed is OPeration REQuest (OPREQ(L)). This delay prevents bus contention in the read mode. A fixed delay is also used to prevent an accidental memory write cycle. The potential for an accidental write is due to the late arrival of RAM INH (RAM inhibit), which would otherwise have prevented memory operation. OPREQ is hardwire delayed at 20ns for the write enable logic, and is strapped at 20ns at the factory for the read enable logic.

The 20ns strapping for the read logic should be satisfactory for use with all types of emulators; however, if bus contention continues (at 20ns delay) when an 8-bit emulator is in use, the selectable delay provision allows for a longer period to be checked against the observed fault.

Section 4

THEORY OF OPERATION

INTRODUCTION

A block diagram of the 64K/128K Static Program Memory is provided in Figure 4-1. The following circuit description is divided into functional units that correspond to both the blocks shown in Figure 4-1, and to the grey-tint blocking shown on the schematics.

Address Buffers

In the 64K/128K Static Program Memory, address lines A0--A14 form the lower address. Address lines A15--A23 constitute the upper address and are used for address block selection (see "Address Select").

As shown at the left side of schematic sheet 1, A0--A14 are separately buffered for each of the four 16K x 16-bit blocks. The buffers used are Schmitt-triggered devices chosen for speed and high fan-out. The resistances in the outputs act as series terminations to minimize line ringing and subsequent undershoot.

The four resulting sets of lower address lines are routed directly to the memory where they address the four 16k x 16 memory blocks (MA0--MA13) using the following schematic designations:

A : First Block
B : Second Block
C : Third Block
D : Fourth Block

Since the memory blocks are arranged as 16K x 16-bits, individual addressing of the upper or lower bytes is required to output 8-bit data. When in byte mode, A0 is the line that controls which byte (upper or lower) is read as the valid address.

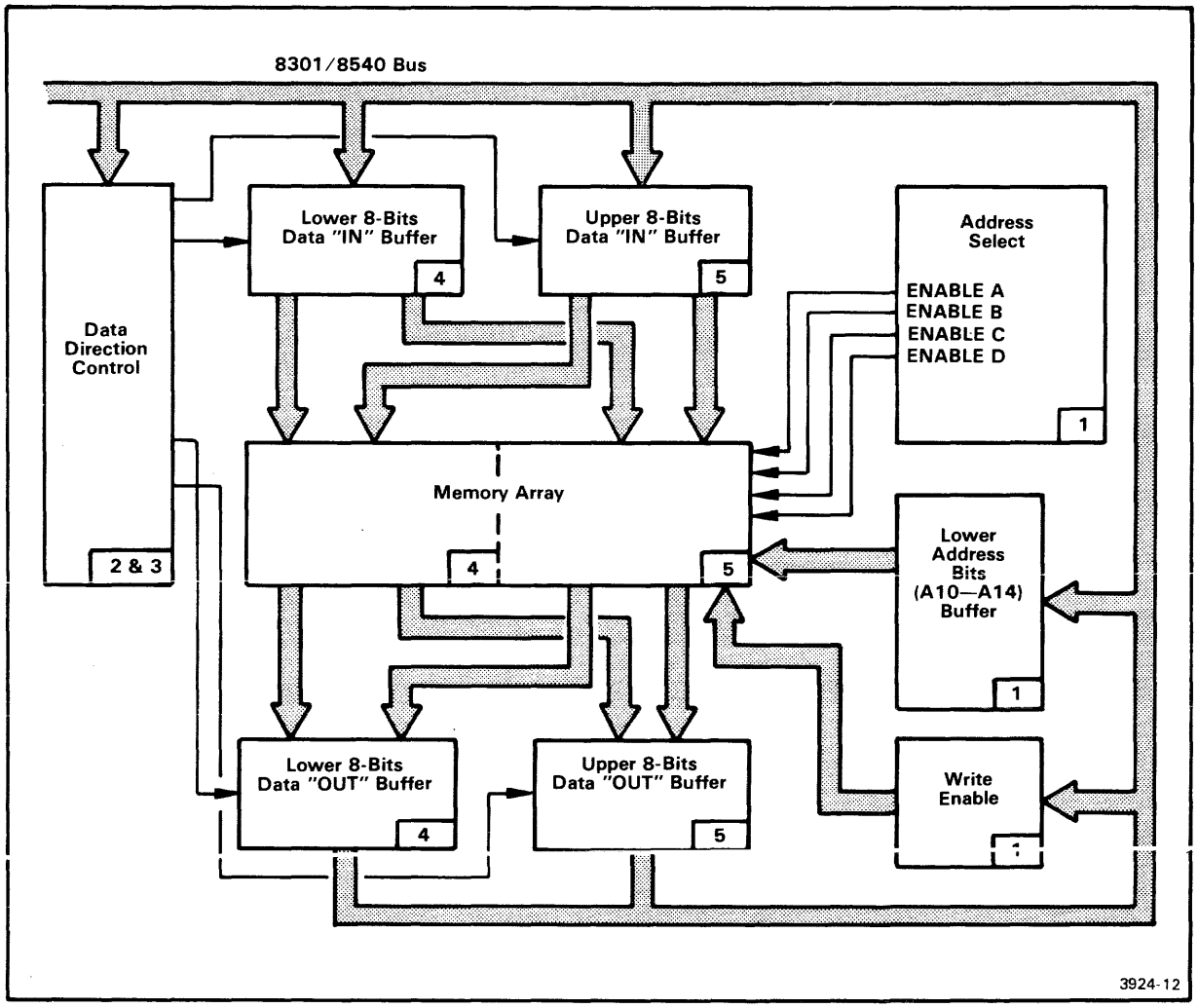


Fig. 4-1. Memory block diagram

Numbers in the lower right of each block indicate the schematic sheet where the logic appears.

Address Select

As shown in the upper center of schematic sheet 1, the block selection is achieved using 13-input AND gates. Each output drives a chip select line corresponding to its 16K x 16 memory block.

Each address line input to the AND gate can be asserted high or low true. This is accomplished using appropriate links in the four sets of jumpers (J8100 through J8160). For example, if an address block lower than 32K is accessed, then the block address select line for that block would be jumper connected high (the address is active low). Similarly, the succeeding block would be jumper connected low (32K --64K). This example explains why all other lines (except A15) are pulled high in the absence of a logic low assertion.

The two remaining signal lines required for block selection are M(H)/IO(L), and (indirectly) CMEM(L). M/IO is the memory select line when high. CMEM is the system's memory select signal. The memory select signal is high for system and low for program memory selection. The CMEM signal is exclusively ORed (U7190) with a selectable high/low input to provide control of the memory type (program or system) the board responds to.

Write Enable

The write enable logic produces write enable controls. The circuit also contains a delay line (U7100). The delay line is used to control the timing of the OPREQ(L) signal. The delay is fixed at 20ns for the OPREQ write function, and strappable in 20ns increments for the OPREQ read function. The delay is included to prevent an unwanted write operation to the memory, which can be caused when OPREQ is asserted and starts a memory cycle. On some processors, this assertion is followed by RAM INH, indicating that this memory cycle should not have occurred.

Data Direction Control

The principal function of this logic is to route and output valid read and write data to the memory data buffers. The eight outputs are divided into low and high block routing (as depicted on schematic sheets 2 and 3 respectively). The read (RD) and write (WR) outputs correspond to the address block designations in Table 4-1. The high and low byte partitioning allows for memory accesses in both 8-bit and 16-bit sizes.

Table 4-1
Address Block Routing

• WRL1(L)	
	D0--D7 on bus - to low block
• RDL1(L)	
• WRL2(L)	
	D8--D15 on bus - to low block
• RDL2(L)	
• WRH1(L)	
	D0--D7 on bus - to high block
• RDH1(L)	
• WRH2(L)	
	D8--D15 on bus - to high block
• RDH2(L)	

An exception to Table 4-1 occurs when the SWAP(L) signal is active. In this situation, the read or write function applies to the same block but the opposite byte level, e.g., any address previously containing a word in low byte, high byte sequence, would now contain it in high byte, low byte sequence.

The enable gating for the data routing can be expressed in the form of a logic truth table. Table 4-2 shows the relationship of the three bus control signals: WD ACCESS(L), SWAP(L), and A0(L), to the four data path multiplex control signals: H1, H2, L1, and L2.

Table 4-2
Enable Logic Truth Table

Bus Control			Multiplex Control			
WD Access	Swap	A0	H2	H1	L2	L1
0	0	0	0	0	0	1
0	0	1	0	1	0	0
0	1	0	0	0	1	1
0	1	1	1	0	0	0
1	0	X	0	1	1	0
1	1	X	1	0	0	1

1=Asserted
0=Not asserted
X=Don't care

The multiplexer control signals H1 and H2, correspond to high block memory segments A and B (see schematics). L1 and L2 correspond to low block segments A and B. The multiplexers route all data to and from the memory devices and the bus.

Memory Array

A fully assembled board contains 64K words of memory. The memory is physically arranged in a matrix of chip select rows and high and low block oriented columns. Each of the four chip select lines can thereby enable eight low-block and eight high-block 16K devices (16K words or 32K bytes/block). The schematics are arranged to show all low block memory (the first eight chips in each chip select line) on schematic sheet 4, and all high block memory on sheet 5.

The pull-up resistors at the base of both schematics (sheets 4 and 5), are included for non-existent memory addressing and result in an all-zeroes output for any unstrapped memory location.

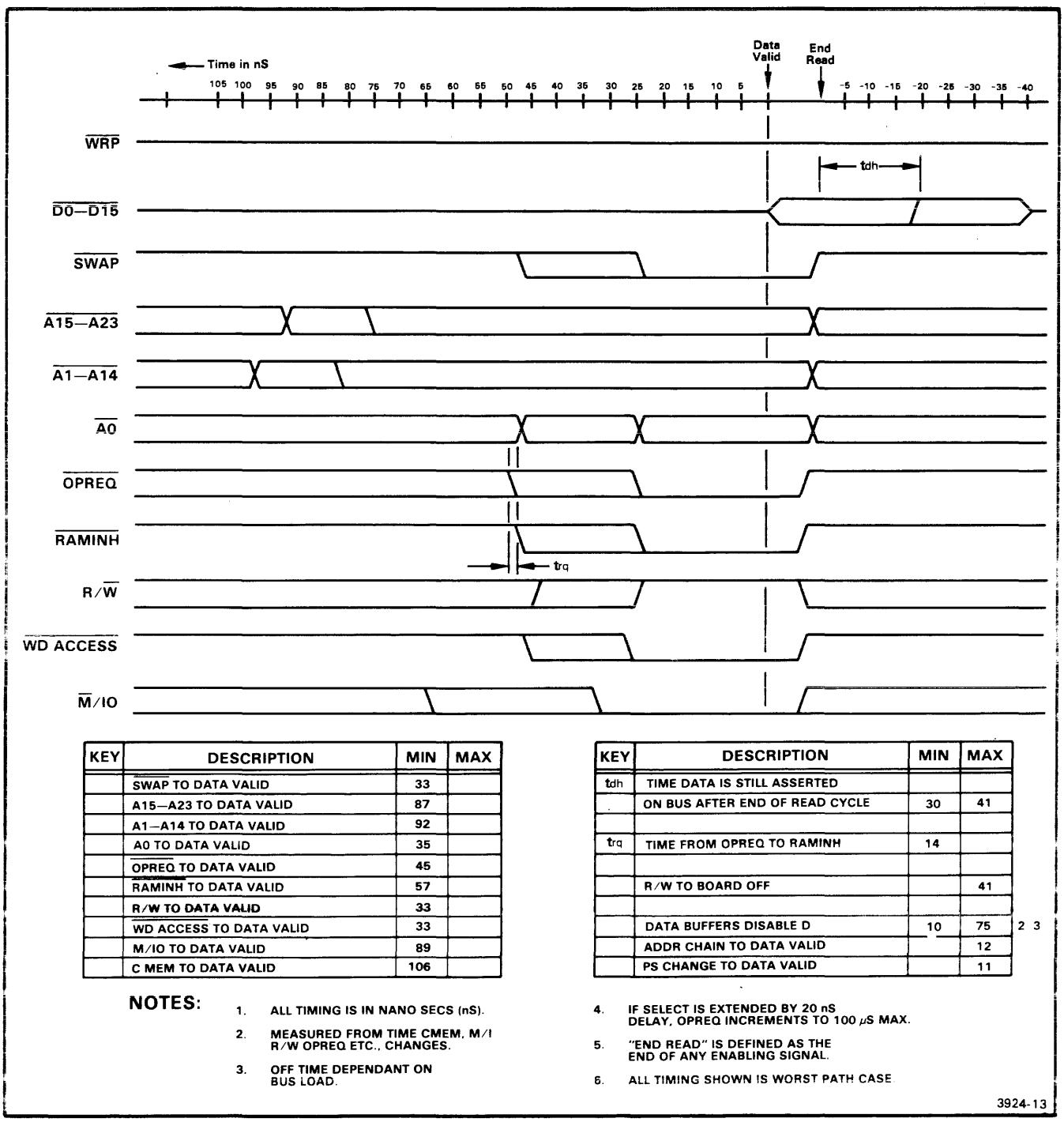
Data Buffers

The memory data buffers are located on the left side of both schematic sheets 4 and 5. These are Schmitt-triggered line drivers grouped in transmit or receive pairs (one byte per pair). Each device pair is duplicated for the low and high blocks, then duplicated again for the high and low bytes. Thus, eight control lines (from the data routing circuitry) are required to control the data flow.

If word access is required, such as used with an 8086 emulator, then the WD ACCESS(L) signal is asserted (low) causing both the high and low block to be simultaneously read and written (A0 has no effect when WD ACCESS is active). If byte access is required, the state of the A0 address line will determine which byte of the addressed word will be accessed. As mentioned earlier, the interpretation of the latter signal is also dependent on the state of the SWAP signal.

TIMING DIAGRAMS AND REFERENCE MATERIAL

Timing diagrams for the 64K/128K Static Program Memory are shown in Figures 4-2 and 4-3. A list of signal mnemonics and their meanings are contained in Section 9.



KEY	DESCRIPTION	MIN	MAX
	SWAP TO DATA VALID	33	
	A15—A23 TO DATA VALID	87	
	A1—A14 TO DATA VALID	92	
	A0 TO DATA VALID	35	
	OPREQ TO DATA VALID	45	
	RAMINH TO DATA VALID	57	
	R/W TO DATA VALID	33	
	WD ACCESS TO DATA VALID	33	
	M/IO TO DATA VALID	89	
	C MEM TO DATA VALID	106	

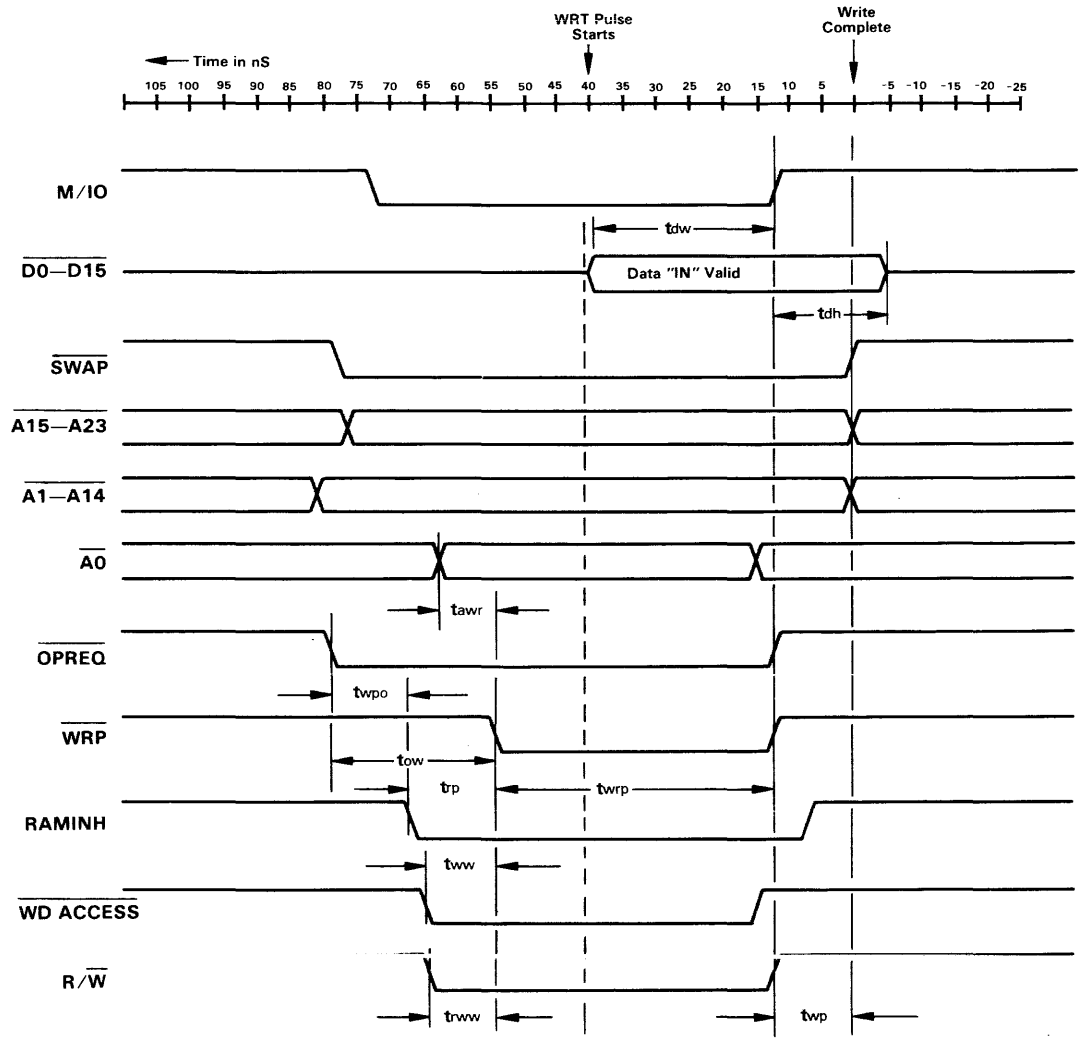
KEY	DESCRIPTION	MIN	MAX	
tdh	TIME DATA IS STILL ASSERTED			
	ON BUS AFTER END OF READ CYCLE	30	41	
trq	TIME FROM OPREQ TO RAMINH	14		
	R/W TO BOARD OFF		41	
	DATA BUFFERS DISABLE D	10	75	2 3
	ADDR CHAIN TO DATA VALID		12	
	PS CHANGE TO DATA VALID		11	

NOTES:

1. ALL TIMING IS IN NANO SECS (nS).
2. MEASURED FROM TIME CMEM, M/I R/W OPREQ ETC., CHANGES.
3. OFF TIME DEPENDANT ON BUS LOAD.
4. IF SELECT IS EXTENDED BY 20 nS DELAY, OPREQ INCREMENTS TO 100 μS MAX.
5. "END READ" IS DEFINED AS THE END OF ANY ENABLING SIGNAL.
6. ALL TIMING SHOWN IS WORST PATH CASE

3924-13

Fig. 4-2. Read timing diagram



KEY	DESCRIPTION	MIN	MAX
	CMRM VALID TO WRITE COMPLETE	97	
	SWAP VALID TO WRITE COMPLETE	58	
	A15—A23 VALID TO WRITE COMPLETE	64	
	A1—A14 VALID TO WRITE COMPLETE	75	
	A0 VALID TO WRITE COMPLETE	57	
	OPREQ VALID TO WRITE COMPLETE	62	
	RAMINH VALID TO WRITE COMPLETE	45	
	R/W VALID TO WRITE COMPLETE	67.5	
	WD ACCESS VALID TO WRITE COMPLETE	67	
	M/IO VALID TO WRITE COMPLETE	75	

KEY	DESCRIPTION	MIN	MAX
twrp	WRP PULSE WIDTH	35	
tdw	DATA VALID TO WRP ↑	43	
tdh	DATA HOLD TIME	18	
twp	WRP ↑ TO WRITE COMPLETE	14	
twpo	OPREQ TO RAMINH	16	
tow	OPREQ TO WRP ↓	13	
tww	WD ACCESS TO WRP ↓	5	
tawr	A0 TO WRP ↓	7	
trp	RAMINH TO WRP ↓	2	
trww	R/W TO WRP ↓	7	

NOTES:

1. ALL TIMING IS IN NANO SECS (nS).
2. WRITE COMPLETE IS DEFINED AS THE END OF ANY ENABLING SIGNAL.
3. ALL TIMING IS BASED ON A 40 nS WRT PULSE AT THE MEMORY. TO FIND THE TIMING TO START OF WRT SUBTRACT 40 nS FROM ALL TIMES.
4. ALL TIMING SHOWN IS WORST PATH CASE.

3924-14

Fig. 4-3. Write timing diagram

Section 5

FUNCTIONAL CHECK PROCEDURES

INTRODUCTION

This section tells how to verify the operation of the 64K/128K Static Program Memory installed in an 8550 Microcomputer Development Lab or an 8540 Integration Unit. To perform verification with the 8550, you'll need a system terminal (connected to the 8301), and the 8550 system diagnostics disc. To perform verification with the 8540, you'll need a system terminal connected to the 8540.

This section is not intended to give you a detailed description of the 8550 disc-resident diagnostics or the 8540 ROM-resident diagnostics. The information provided here simply gives you a procedure to verify the operation of the 64K/128K memory in the quickest way possible.

For more detailed information about your system's disc- or ROM-resident diagnostics, refer to the following documents:

- 8301 Microprocessor Development Unit Service Manual
- 8501 Data Management Unit Service Manual
- 8540 Integration Unit Installation Manual
- 8540 Integration Unit Service Manual

8550 MICROCOMPUTER DEVELOPMENT LAB VERIFICATION

When both the 8501 and 8301 have displayed "boot" messages on the system terminal, you're ready to run the 8550 disc-resident diagnostics.

PROCEDURE

Perform the following procedure to verify 64K/128K Static Program Memory operation.

1. Insert the 8550 system diagnostics disc (label side up) into drive 0 (top drive) of the 8501.
2. Close the drive door.
3. Within 6 seconds, the 8501 will begin a preliminary read of the disc.
4. The system terminal will display the following information:

```
8301 BOOT V x.x
8501 V x.x
8301 BOOT V x.x
```

5. The 8501 will begin reading the disc again.
6. Approximately 12 seconds later, the diagnostic greeting message and first menu will appear on the system terminal. The message and menu are shown in Display 5-1.

NOTE

The 64K/128K Static Program Memory is tested as part of the memory diagnostics. However, to completely verify the 64K/128K memory operation, the installed emulator test must also be run. All relevant tests are run as part of the following system verification.

```
**********************************************************
*                                                        *
*         TEKTRONIX INC.                                 *
*         8550 DISC-RESIDENT DIAGNOSTIC SYSTEM           *
*         VERSION X.X                                    *
*         Copyright (c) 1981 Tektronix, Inc.             *
*                                                        *
**********************************************************

*** 8301 DIAGNOSTIC EXECUTIVE VERSION X.X - LOADED ***

                    RUN MODE MENU
                    -------------

1 - AUTOMATIC MODE    *** default ***
2 - SELECT MODE
H - HELP

Type in desired mode:  {<CR>} or {1, 2, or H and <CR>}?_
```

Display 5-1

System Verification

As soon as the system terminal displays the diagnostic greeting message and RUN MODE MENU, press the RETURN key to select the AUTOMATIC MODE (System Verification). Immediately, another menu is displayed: AUTOMATIC MODE MENU. Press the RETURN key again to select the DISPLAY OPTION menu. Press the RETURN key a third time, to start execution of the AUTOMATIC SYSTEM VERIFICATION tests. No further intervention is required.

Various "test running" messages for both the 8301 and 8501 are displayed as the verification tests are executing. The 8301 (including the Z8001/Z8002 Emulator Processor) is tested first, followed by the 8501. The diagnostic tests take a total of approximately ten minutes to execute. At the end of that time, the system terminal will display either of two messages:

SYSTEM VERIFICATION PASSED

or

SYSTEM VERIFICATION FAILED

If the SYSTEM VERIFICATION FAILED message is displayed, the diagnostic tests found a fault in either the 8301, 8501, or one of the options installed. In that case, refer to the optional 8301 Microprocessor Development Unit Service Manual, 8501 Data Management Unit Service Manual, or the appropriate option service manual for information on performing exhaustive diagnostic troubleshooting.

This completes the functional test procedure for the 64K/128K Static Program Memory.

8540 INTEGRATION UNIT VERIFICATION

PROCEDURE

1. The Mode Selector switch on the System Controller board must be in its normal operating configuration (switch positions 0--2 and 4--7 set to 0, switch position 3 set to 1).

2. Power up the 8540.

3. After the 8540 has displayed its boot message on the system terminal, you're ready to run the 8540 ROM-Based Diagnostics.

4. At the system terminal, enter:

   >SELECT DIAGS <CR>

   The system terminal will display the diagnostic greeting and the Run Mode Menu. The message and menu are shown in Display 5-2.

```
**********************************************
*                                            *
*   TEKTRONIX INC.                           *
*   8540 ROM-RESIDENT DIAGNOSTIC SYSTEM      *
*   VERSION X.X                              *
*   Copyright (c) 1981 Tektronix, Inc.       *
*                                            *
**********************************************


                RUN MODE MENU

1 - AUTOMATIC MODE      ***** Default *****
2 - SELECT MODE

Type mode :
```

Display 5-2

As soon as the system terminal displays the diagnostic greeting message and RUN MODE MENU, press the RETURN key to select the AUTOMATIC MODE (System Verification). Immediately, another menu is displayed: AUTOMATIC MODE MENU. Press the RETURN key again to select the DISPLAY OPTION menu. Press the RETURN key a third time, to start execution of the AUTOMATIC SYSTEM VERIFICATION tests. No further intervention is required.

Various "test running" messages are displayed while the verification tests are executing. The diagnostic tests take a total of approximately ten minutes to execute. At the end of that time, the system terminal will display either of two messages:

SYSTEM VERIFICATION PASSED

or

SYSTEM VERIFICATION FAILED

If the SYSTEM VERIFICATION FAILED message is displayed, refer to your development systems installation and service manuals for information on performing diagnostic troubleshooting.

This completes the functional test procedure for the 64K/128K Static Program Memory.

Section 6

PERFORMANCE VERIFICATION

INTRODUCTION

The performance verification procedure provides a detailed check of the 64K/128K memory board. These checks are extensive and are achieved using the system diagnostics. The memory is tested by the system's memory diagnostics and by individual Emulator Diagnostics. More details on these diagnostics are contained in your development system's installation and service manuals. The following text describes diagnostic features which are unique to the 64K/128K Static Program Memory.

MEMORY DIAGNOSTIC PROGRAM

The system's memory diagnostic tests cannot differentiate the size and type of memory boards installed. That is, a test applicable to the 32K Static Memory Board, for instance, is identical to the one for any 32K block of the 64K/128K Static Program Memory or the 64K System RAM Board. When Program Memory failure is reported and a 64K/128K Static Program Memory is installed, refer to the material in this section for error information. For general diagnostic error information refer to the 8301 and 8540 Service Manuals.

PROGRAM LIMITATIONS

Two types of failure, not detectable through the memory diagnostic program, can occur when running Emulator Diagnostics. The first type is through an error in the WORD mode logic. The memory program initiates from the system side of the bus (byte mode) and is therefore not able to test the memory in WORD mode. If an emulator diagnostic failure occurs which appears to be a memory WORD mode problem, refer to Word Mode Errors in this section for logic used in WORD mode operation.

The second type of problem which may only appear when running an emulator diagnostic are those associated with access times. This is because the System Processor is not able to test the 64K/128K memory at the memory's full speed. One cause of an access time problem could be in the read delay circuit. Check to see if the read delay jumper (see Section 3) is set correctly (20 nS is the nominal delay).

MEMORY MAP

When program memory is detected, the diagnostics will display a memory map which can be used to check the positions of the memory address jumpers. The following example shows a typical printout:

Program Memory Detected at base address:

000000
018000
020000
FF8000

This example shows the physical address of the base, or start, of four 32K blocks of memory.

MEMORY BOARD ADDRESSING

There are four 32K blocks in the 64K/128K memory labeled A through D. The error code explanations, listed later in this section, assume that memory addresses are jumper connected to produce rising increments of base address from A (lowest base address) through D (highest base address).

To make repair of the board as easy as possible, the following base address configuration is suggested for test purposes:

Address	Block
0K — 32K	A
32K — 64K	B
64K — 96K	C
96K — 128K	D

The jumper positions for the suggested test configuration are shown in Table 6-1.

Table 6-1
Address Jumper Configuration for Test Purposes

BLOCK A	BLOCK B	BLOCK C	BLOCK D
A23 o o-o A23(L)	A23 o o-o A23(L)	A23 o o-o A23(L)	A23 o o-o A23(L)
A22 o o-o A22(L)	A22 o o-o A22(L)	A22 o o-o A22(L)	A22 o o-o A22(L)
A21 o o-o A21(L)	A21 o o-o A21(L)	A21 o o-o A21(L)	A21 o o-o A21(L)
A20 o o-o A20(L)	A20 o o-o A20(L)	A20 o o-o A20(L)	A20 o o-o A20(L)
A19 o o-o A19(L)	A19 o o-o A19(L)	A19 o o-o A19(L)	A19 o o-o A19(L)
A18 o o-o A18(L)	A18 o o-o A18(L)	A18 o o-o A18(L)	A18 o o-o A18(L)
A17 o o-o A17(L)	A17 o o-o A17(L)	A17 o o-o A17(L)	A17 o o-o A17(L)
A16 o o-o A16(L)	A16 o o-o A16(L)	A16 o-o o A16(L)	A16 o-o o A16(L)
A15 o o-o A15(L)	A15 o-o o A15(L)	A15 o o-o A15(L)	A15 o-o o A15(L)

ERROR CODES

The following pages list error codes relevant to the memory diagnostics. Included are notes and device numbers common to the 64K/128K Static Program Memory.

02/0001 - ERROR CODE = MEMORY CONFIGURER

CAUSE OF FAILURE - PRIMARY SUSPECT = SYSTEM CONTROLLER BOARD
- SECONDARY SUSPECT = MEMORY BOARD

Three types of failures are possible - memory size is smaller than it should be, larger than it should be, or the Map is incorrect.

LARGER - The most common problem is that one of the address lines is in the don't care state (i.e. a jumper is missing on the address straps), or there is an open pin in the CS select circuit.

NOTE

Maximum memory size is 256K of Program Memory even if more than 256K is detected.

SMALLER - This is usually a problem when one bank cannot be selected, or when one set of data buffers cannot be enabled (in this case the data bus will read 00 which is the same as memory not present).

NOTE

Address line shorts (where two blocks are selected at once) will not be detected in this test.

MAP INCORRECT - If the map printout is different than what the jumpers are set for, the problem could be in one of the upper address lines (A15 - A23).

Table 6-2 lists suspect devices and other possible causes of test failure on the 64K/128K Static Program Memory board. Other (general) causes of this error code are documented in your system service manual.

Table 6-2
Memory Configurer - Suspect Devices

Device	Function/Problem
U8130	CS "A"
U8150	CS "B"
U8170	CS "C"
U8190	CS "D"
U7190	System/Program strap
U8110	Address buffer (A23 - A16)
U8100	Address buffer (A23 - A16)
U7020	RDH1 - Output data buffer enable
U7080	RDH2 - Output data buffer enable
U7040	RDL1 - Output data buffer enable
U7060	RDL2 - Output data buffer enable
U7160	Output data bus enable
U8010	Read enable
-	Two blocks jumpered the same.

02/0002 - ERROR CODE = BANK SELECT TEST (16K BLOCK)

ACTUAL DATA = Data read on the 256th read (last read).
CORRECT DATA = Correct data byte
BANK TESTED = Indicates which 16K bank was being tested.

CAUSE OF FAILURE - PRIMARY SUSPECT = SYSTEM CONTROLLER BOARD
- SECONDARY SUSPECT = MEMORY BOARD

This test is generally used for memory boards with 16K blocks or smaller. The Static Program Memory has 32K blocks. Thus, a failure that would cause this test to fail is a problem with address lines A14 and A15 (i.e. a short or open on the line). The devices listed in Table 6-3 are the I.C.'s that control these two address lines.

Another possible failure would be if the write data buffers were always disabled.

Table 6-3
Bank Select Test - Suspect Devices

Device	Function
U8090	A15 buffer
U6060	A14 buffer
U6030	A14 buffer
U7130	Write enable block C & D
U7140	Write enable block C & D
U7120	Write enable block A & B
U7150	Write enable block A & B
U7050	Write line (WRL2)
U7030	Write line (WRL1)
U7070	Write line (WRH2)
U7010	Write line (WRH1)

02/0003 - ERROR CODE = ROW SELECT TEST (4K BLOCK)

ACTUAL DATA = Data read on the 256th read (last read).
CORRECT DATA = Correct data byte
ADDRESS = Indicates address (actual) of the start of the 4K block that failed.
BANK TESTED = Indicates which 16K bank was being tested.

CAUSE OF FAILURE - Primary Suspect = MEMORY BOARD

This test is generally used to detect failures on memory boards with 4K blocks. Since the Static Program Memory has 32K blocks, this test will only fail if there is a problem on address lines A12 - A13. The I.C.'s listed in Table 6-4 are the ones associated with these two address lines.

Table 6-4
Row Select Test - Suspect Devices

Device	Function
U6060	A12 A13 A14 Address Buffer
U6030	A12 A13 A14 Address Buffer

02/0004 - ERROR CODE = CHIP SELECT TEST

ACTUAL DATA = Incorrect data byte
CORRECT DATA = Correct data byte
ADDRESS = Indicates failing address (actual).
BANK TESTED = Indicates which 16K bank was being tested.

CAUSE OF FAILURE - PRIMARY SUSPECT = MEMORY BOARD

This test will detect bad memory chips and bad data lines. Most addressing failures will not fail this test (address failures will be detected in the address test).

Tables 6-5 and 6-6 list primary (device) suspects if the Chip Select Test fails while using a 64K/128K memory board. Table 6-5 assumes that the memory board is jumper connected according to the introductory notes, e.g.,low memory = block A --> high memory = block D.

Table 6-5
Chip Select Test - Suspect RAM Devices

	EVEN ADDRESS				ODD ADDRESS			
BAD BIT	BLOCK A	BLOCK B	BLOCK C	BLOCK D	BLOCK A	BLOCK B	BLOCK C	BLOCK D
0	u2115	u2135	u2165	u2185	u1015	u1035	u1065	u1085
1	u2110	u2130	u2160	u2180	u1010	u1030	u1060	u1080
2	u1110	u2130	u2160	u2180	u2010	u2030	u2060	u2080
3	u1115	u1135	u1165	u1185	u2015	u2035	u2065	u2085
4	u4115	u4135	u4165	u4185	u3015	u3035	u3065	u3085
5	u4110	u4130	u4160	u4180	u3010	u3030	u3060	u3080
6	u3110	u3130	u3160	u3180	u4010	u4030	u4060	u4080
7	u3115	u3135	u3165	u3185	u4015	u4035	u4065	u4085

Table 6-6
Chip Select Test - Suspect Buffer Devices

Device	Function
U2100	Read/Write data buffer (D7 - D4 even address)
U1100	Read/Write data buffer (D7 - D4 even address)
U5100	Read/Write data buffer (D3 - D0 even address)
U3100	Read/Write data buffer (D3 - D0 even address)
U1090	Read/Write data buffer (D7 - D4 odd address)
U2090	Read/Write data buffer (D7 - D4 odd address)
U3095	Read/Write data buffer (D3 - D0 odd address)
U5090	Read/Write data buffer (D3 - D0 odd address)

02/0005 - ERROR CODE = ADDRESSING TEST

ACTUAL DATA = Incorrect data byte
CORRECT DATA = Correct data byte
ADDRESS = Indicates failing address (actual).
BANK TESTED = Indicates which 16K bank was being tested.

CAUSE OF FAILURE - PRIMARY SUSPECT = MEMORY BOARD.

The tests up until now checked only data bits. This is the first address test. Failures in this test can be tied directly to an address problem.

NOTE

An address problem could also be internal to the RAM device, or a RAM device could cause a problem on the address bus.

Table 6-7
Addressing Test - Suspect Devices

Device	Function
U6010	Address buffers block A & B (A1 - A7)
U6030	Address buffers block A & B (A8 - A14)
U6080	Address buffer block C & D (A1 - A7)
U6060	Address buffer block C & D (A8 - A14)
U8090	Address buffer A0 & A15
U8085	Address buffer A0 & A15

02/0006 - ERROR CODE = REFRESH TEST

ACTUAL DATA = Incorrect data byte
CORRECT DATA = Correct data byte
ADDRESS = Indicates failing address (actual).
BANK TESTED = Indicates which 16K bank was being tested.

CAUSE OF FAILURE - PRIMARY SUSPECT = MEMORY BOARD

The 64K/128K Static Program Memory board does not use REFRESH logic since it uses static memory. However, this test will check data retention capability in the RAMs. Failure is caused by the RAM chip indicated by failing bit and address (see 0004).

02/0009 - ERROR CODE = GALTCOL TEST

ACTUAL DATA = Incorrect data byte
CORRECT DATA = Correct data byte
ADDRESS = Indicates failing address (actual).
BANK TESTED = Indicates which 16K bank was being tested.

CAUSE OF FAILURE - PRIMARY SUSPECT = MEMORY BOARD

This is a pattern sensitivity test. Failure is caused by the RAM chip indicated by failing bit and address (see 0004).

WORD MODE ERRORS

A problem in WORD mode logic will not be detected in the memory test because the System Processor CPU (2650A) cannot operate in word mode. A WORD mode logic failure will be detected in the emulator diagnostic tests. Logic involved in WORD Mode is shown in Table 6-8.

Table 6-8
WORD Mode Logic - Suspect Devices

Device	Function
U1100	Read/Write data buffer (D15 - D8 even address)
U3100	Read/Write data buffer (D15 - D8 even address)
U2090	Read/Write data buffer (D15 - D8 odd address)
U5090	Read/Write data buffer (D15 - D8 odd address)
U7050	Write line (WRL2)
U7070	Write line (WRH2)
U7080	Read line (RDH2)
U7060	Read line (RDL2)

Section 7

MAINTENANCE AND TROUBLESHOOTING

INTRODUCTION

This section describes preventive maintenance procedures that will help to improve equipment reliability. Techniques and aids for troubleshooting, including diagnostic testing routines, are also included in this section. If the equipment fails to operate properly, corrective measures should be taken immediately; an equipment malfunction may cause additional problems to develop.

STATIC-SENSITIVE PARTS

Many components can be damaged by static discharge. Static-caused damage may be catastrophic, or it may only cause degradation in component performance. Either type of damage is costly: destroyed devices must be replaced, and unnoticed marginal devices can cause intermittent equipment malfunction.

To minimize static problems during maintenance or troubleshooting, follow these procedures:

1. Minimize the handling of static-sensitive parts.

2. Transport and store static-sensitive parts in their original containers, on a metal rail, or on conductive foam. Label any container having a static-sensitive assembly or device.

3. Before handling static-sensitive parts, discharge the static charge on yourself by using a grounded metal wrist strap. Static-sensitive assemblies or devices should be serviced only at a static-free work station, and only by qualified personnel.

4. Do not allow anything capable of generating or holding a static charge onto the work station surface.

5. Pick up a part by the body, never by the leads.

6. Keep the device leads shorted together whenever possible.

7. Do not subject a device to sliding movements over any surface.

8. Avoid handling parts in areas having a floor or work surface covering that contributes to the generation of a static charge.

9. Use a soldering iron that has a connection to earth ground.

10. For desoldering, use a special anti-static suction-type tool, such as the Silverstat Soldapulit, or a wick-type desoldering tool.

REDUCING SUSCEPTIBILITY TO STATIC DISCHARGE

This equipment and its supporting system incorporate a number of safeguards to reduce the chance of static discharge damage.

CAUTION

Violation or modification of the following safeguards can result in ground loops and/or static discharge problems.

1. The ground (earth) wire of the primary power cable is connected to the chassis where the cable enters the unit.

2. Shields of interconnecting cables are grounded to the chassis at the point of connection to each unit.

3. Ground loops have been avoided by installing a common ground between all units.

PREVENTIVE MAINTENANCE

Preventive maintenance consists of cleaning, visual inspection, and performance checks. The preventive maintenance schedule established for the equipment should be based on the amount of use, and on the environment in which the equipment is operated.

CLEANING

Clean the equipment often enough to prevent dust or dirt from accumulating in or on it. Dirt acts as a thermal insulator and prevents efficient heat dissipation. It also provides high-resistance electrical leakage paths between conductors or components in a humid environment.

CAUTION

Do not allow water to get inside any enclosed assembly or components, such as a jumper block, capacitor, etc. Do not clean any plastic materials with organic cleaning solvents (such as benzene, toluene, xylene, acetone, or similar compounds); such solvents may damage the plastic.

Exterior

Clean dust from the exposed part of the board by cleaning the surface with a soft cloth or brush. Hardened dirt may be removed with a cloth dampened in water that contains a mild detergent. Abrasive cleaners should not be used.

Interior

Clean surfaces partially covered by components by loosening accumulated dust with a dry, soft brush, then blowing the loosened dirt away with low-pressure air. Hardened dirt or grease may be removed with a cotton-tipped applicator dampened with a solution of mild detergent and water. Abrasive cleaners should not be used. After cleaning, allow exposed and partially covered surfaces to dry thoroughly before applying power to the equipment.

VISUAL INSPECTION

After cleaning, carefully check the equipment for such defects as poor connections and damaged parts. For most visible defects, the remedy is obvious. If heat-damaged parts are discovered, try to determine the cause of overheating before replacing the damaged part; otherwise, the damage may be repeated.

SERVICING AIDS

DIAGRAMS

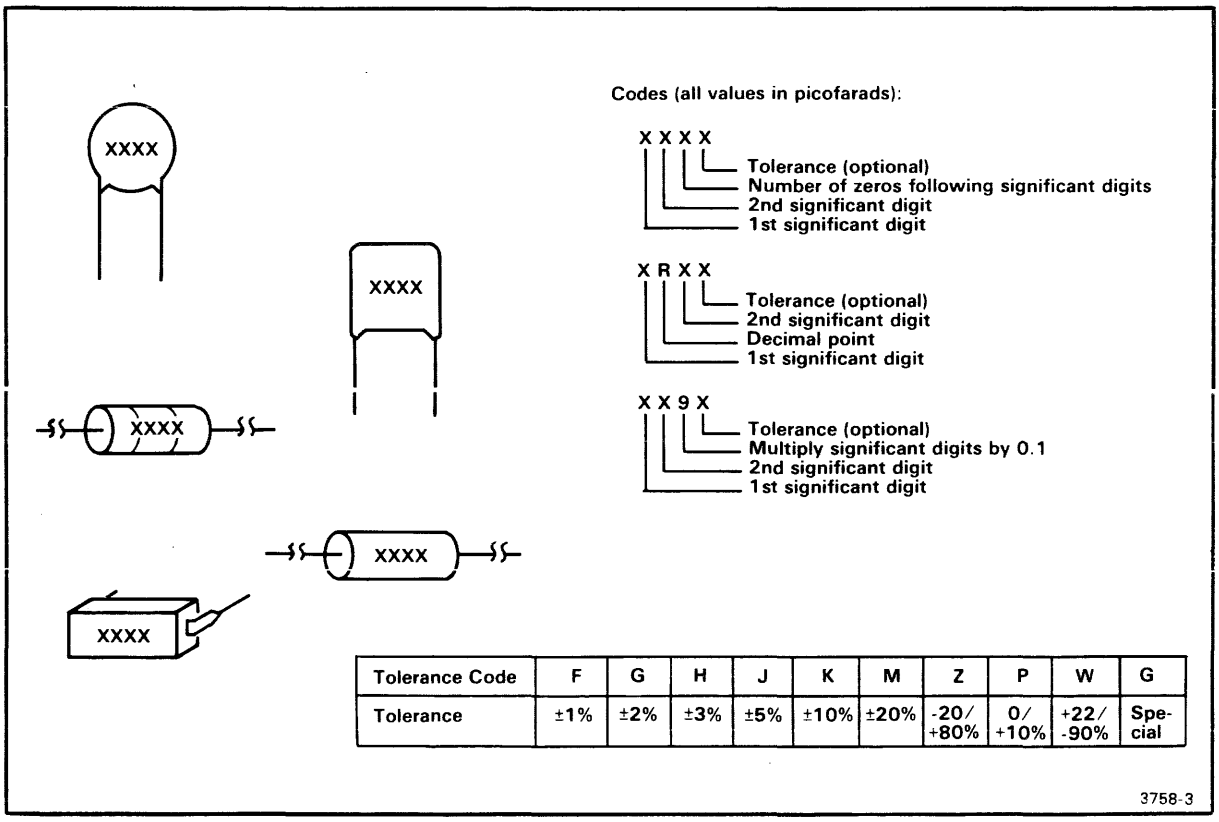
Circuit diagrams appear on foldout pages in the Diagrams section of the manual. The circuit number and electrical value of each component are shown on the diagram. (See the first tab page for an explanation of the symbols used to identify components in each circuit.) Components on circuit boards are assigned vertical and horizontal grid numbers, which correspond to the location of the component on the circuit board. Refer to the Replaceable Electrical Parts List section for a complete description of each component and assembly.

CIRCUIT BOARD ILLUSTRATIONS

Electrical components, connectors, and test points are identified on circuit board illustrations located on the inside fold of the corresponding circuit diagram, or on the back of the preceding diagram. This allows cross-referencing between the diagram and the circuit board, and shows the physical location of components.

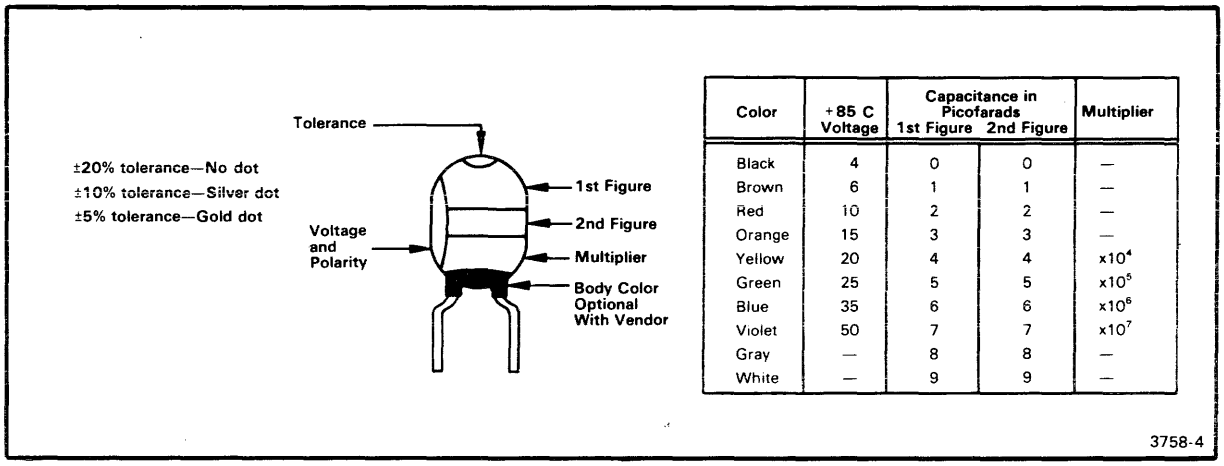
CAPACITOR MARKING

The capacitance (in microfarads or picofarads) and voltage ratings of many ceramic, mica, plastic film, and electrolytic capacitors are marked on the component body. The values of other ceramic disc and plastic film capacitors, as well as monolithic ceramic capacitors (such as DIP and glass insulated types), are marked according to the code shown in Fig. 7-1. Tantalum capacitors are marked in microfarads or according to the color code shown in Fig. 7-2.



Tolerance Code	F	G	H	J	K	M	Z	P	W	G
Tolerance	±1%	±2%	±3%	±5%	±10%	±20%	-20/ +80%	0/ +10%	+22/ -90%	Special

Fig. 7-1. Ceramic and film capacitor code.

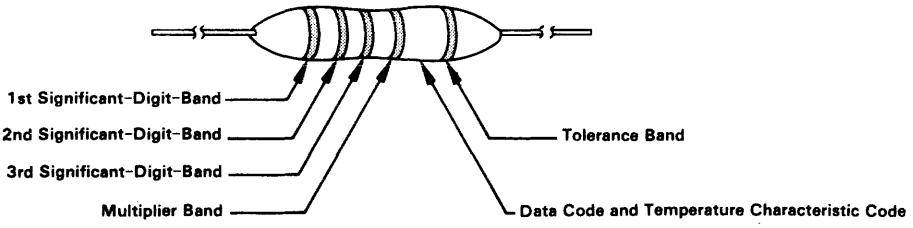


Color	+85 C Voltage	Capacitance in Picofarads 1st Figure	2nd Figure	Multiplier
Black	4	0	0	—
Brown	6	1	1	—
Red	10	2	2	—
Orange	15	3	3	—
Yellow	20	4	4	$x10^4$
Green	25	5	5	$x10^5$
Blue	35	6	6	$x10^6$
Violet	50	7	7	$x10^7$
Gray	—	8	8	—
White	—	9	9	—

Fig. 7-2. Tantalum capacitor color code.

RESISTOR MARKING

Carbon resistors are marked according to the standard 4-band resistor color code. The fifth band, if present, indicates the device's failure rate. Metal film resistors are marked according to either the standard 4-band resistor color code or to the 5-band color code shown in Fig. 7-3.



COLOR BAND INFORMATION

Color	1st Sig. Digit	2nd Sig. Digit	3rd Sig. Digit	Multiplier	Tolerance ± %	
Black	0	0	0	1	—	
Brown	1	1	1	10	1.	F
Red	2	2	2	100	2.	G
Orange	3	3	3	1,000	3.	H
Yellow	4	4	4	10,000	—	
Green	5	5	5	100,000	.5	D
Blue	6	6	6	1,000,000	.25	C
Violet	7	7	7	10,000,000	.1	B
Grey	8	8	8	100,000,000	.05	A
White	9	9	9	1,000,000,000	—	
Gold				.1	5.	J
Silver				.01	10.	K
No Color					15.	L
No Color					20.	M

DATA CODE INFORMATION

YYWW
- WW — Week of the year (may be from 01-52).
- YY — Last two digits of the year.

TEMPERATURE CHARACTERISTIC INFORMATION

Temperature Characteristic Code	Temperature Coefficient (PPM/°C)	Temperature Range (°C)
T-0 D (C-0)	0 to ±150	-55 to +175
T-00	0 to ±200	-55 to +175
T-1 D (C-1)	0 to ±100	-55 to +175
T-2 C (C-2)	0 to ± 50	-55 to +175
T-9 E (C-3)	0 to ± 25	-55 to +175
T-10	0 to ± 15	-20 to + 85
T-13	0 to ± 10	-20 to + 85
T-14	0 to ± 20	-20 to + 85
T-15	0 to ± 25	-20 to + 85
T-16	0 to ± 5	-20 to + 85
T-18	0 to ± 2	0 to + 60
T-18	0 to ± 5	-55 to +125
T-B	0 to ± 10	25 to +125
T-E	0 to +100 -500	-55 to +175
T-R	0 to +100 -250	-55 to +175

3758-5

Fig. 7-3. Metal film resistor color code.

DIODE CODE

Diode cathodes are marked by a stripe, a series of stripes, or a dot on the diode body. Some diodes have a diode symbol printed on one side. Figure 7-4 illustrates some common diode types and polarity markings.

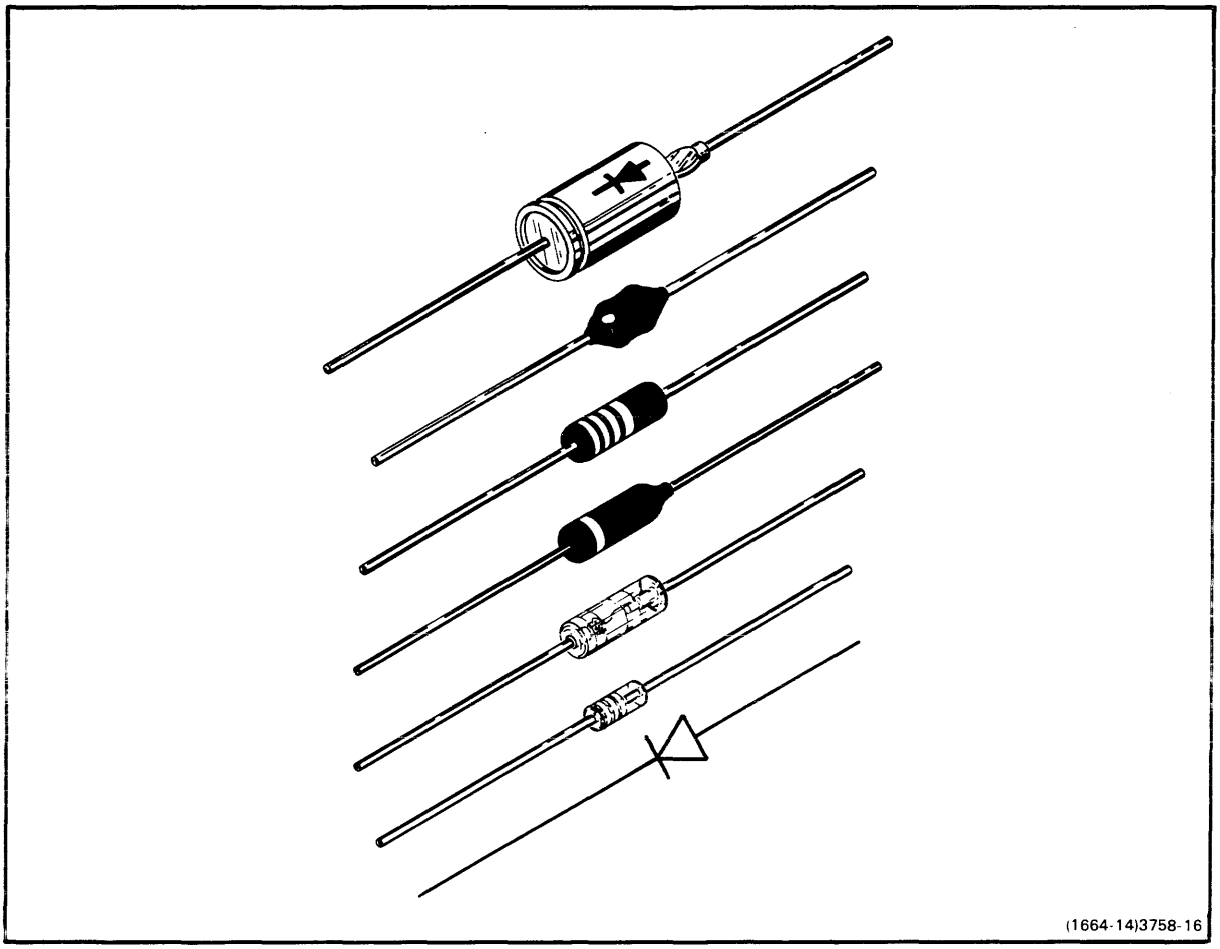


Fig. 7-4. Diode polarity markings.

TRANSISTOR AND INTEGRATED CIRCUIT PIN CONFIGURATION

Lead identification drawings for transistors and 3-lead integrated circuits are included with the schematic diagrams. Pin 1 identification for typical DIP intergrated circuits is illustrated in Fig. 7-5.

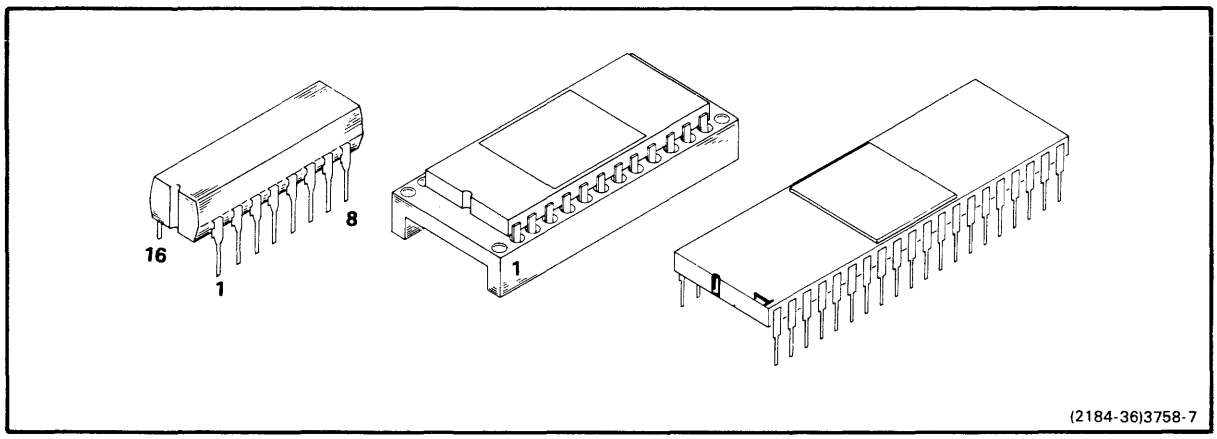


Fig. 7-5. Integrated circuit pin 1 identification.

OBTAINING REPLACEMENT PARTS

Most electrical and mechanical parts are available through your local Tektronix Field Office or representative. The Replaceable Electrical and Mechanical Parts List sections contain information on how to order these replacement parts. When replacing parts, their orientation and lead dress should be duplicated, since orientation may affect circuit interaction.

If a component you have ordered has been replaced with a new or improved part, your local Field Office or representative will contact you concerning the change in the part number.

TROUBLESHOOTING

Sections 5 and 6 provide a means to diagnose most memory faults. Section 5 describes Functional Check Procedures and provides a fast way to check the board, as well as serving as the customer acceptance check under normal circumstances. Section 6 describes the Performance Check Procedures and provides a lengthy and detailed check of the memory where this is warranted by a suspect part, or by an error detected in the functional check.

Before removing any part, check your warranty or service agreement. For your warranty to remain in effect, all service must be performed by Tektronix, Inc. for the first 90 days following delivery.

Section 8

INSTALLATION

INTRODUCTION

The following procedures tell how to install the 64K/128K Static Program Memory in your TEKTRONIX Microcomputer Development System.

CAUTION

Under no circumstances should more than one 128K memory module be installed without field service office consultation. Excessive power supply loading could result.

PROCEDURE

1. Verify that primary power (115 or 230 Vac) to the microcomputer development system is OFF.

2. Remove the cover retainers at the upper corners on the rear of the mainframe - see Fig. 8-1.

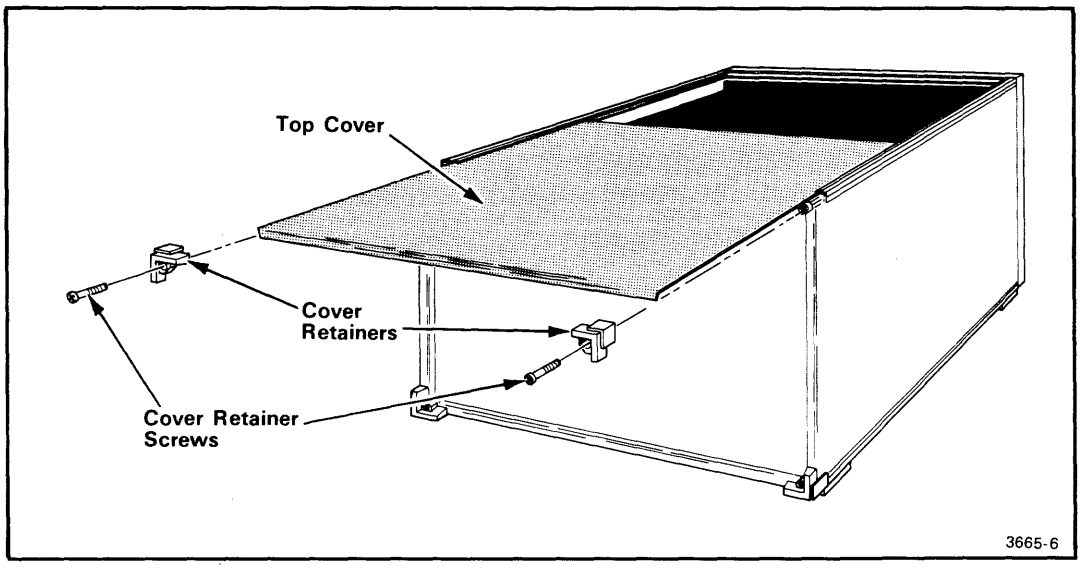


Fig. 8-1. Removal/Installation of top cover

3. Remove the top cover by sliding it straight back, then set it aside.

NOTE

The memory slot options are slightly different for the 8540 and 8301/8550 development system mainframes - see Figs. 8-2 and 8-3. In both mainframes, the program memory modules fit into the slots marked "Spare" and/or "Program Memory" on the "Program Section" side of the main interconnect board. If the module is intended for test purposes as system memory, then the module requires insertion into the slot(s) marked "System Memory" or "Spare" on the "System Section" side of the main interconnect board.

4. Facing the front of the mainframe, hold the memory module by the upper edges, component side facing left, and align it with other modules in the mainframe.

5. Guide the module down the vertical channels of selected position (see Note following step 3).

6. When the module reaches the connector on the main interconnect board, press down firmly and evenly on the top edge of the module until it snaps into place.

7. Slide the top cover back into the guide tracks at the top of the mainframe. Be sure the cover is properly seated in the slot at the front of the mainframe guide tracks.

8. Install the cover retainers (removed in step 2) at the upper corners on the rear of the mainframe (Fig. 8-1). Tighten the cover retainer screws securely.

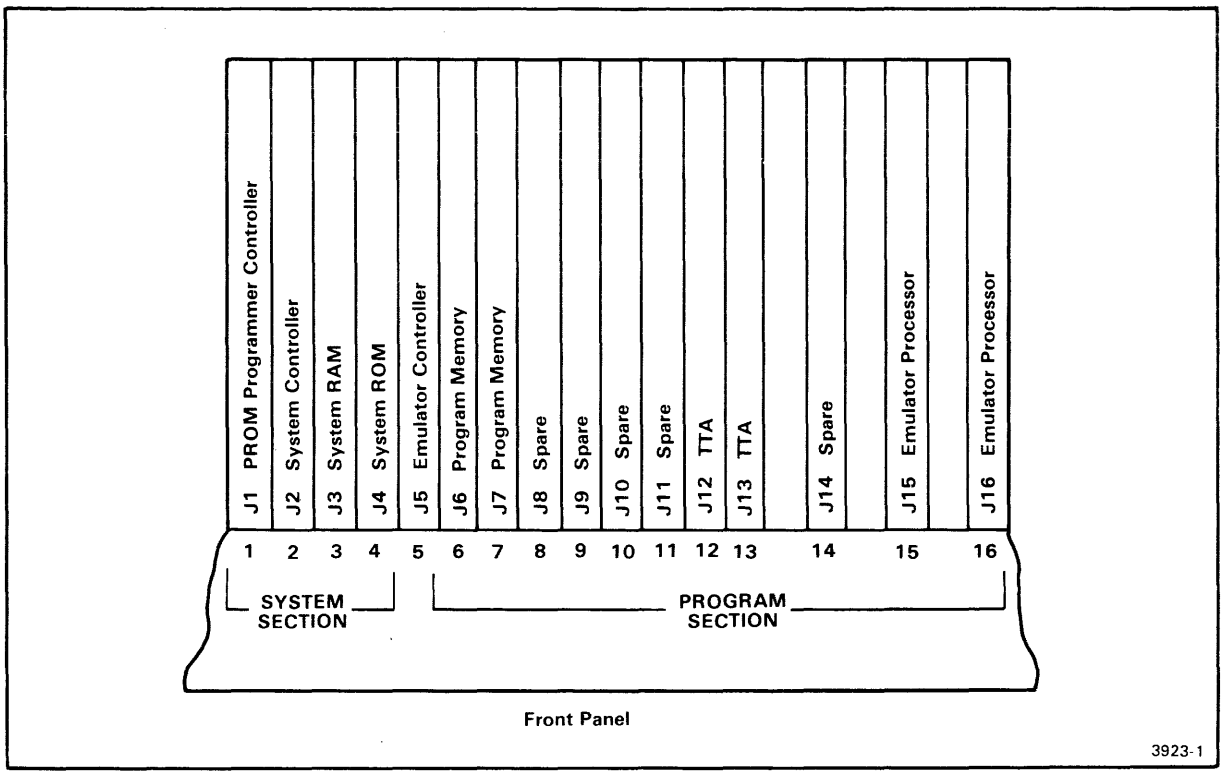


Fig. 8-2. 8540 I.U. module arrangement

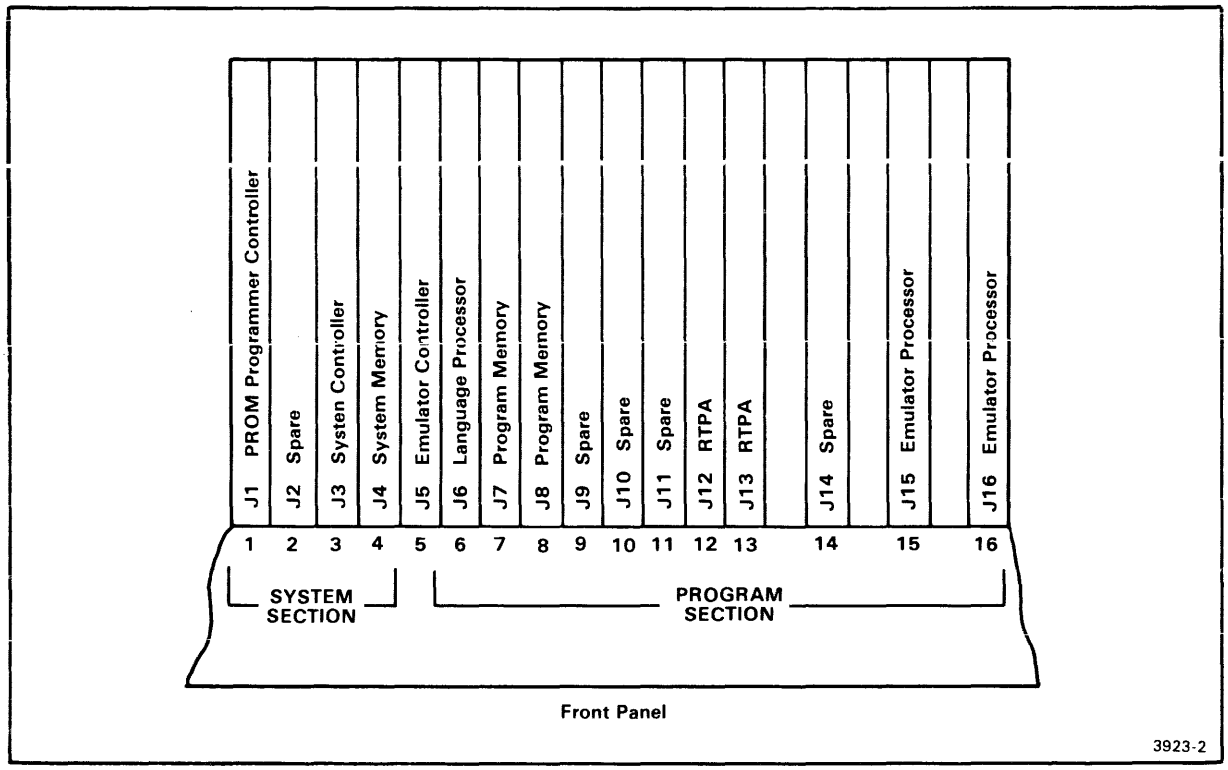


Fig. 8-3. 8301/8550 MDU module arrangement

Section 9

REFERENCE MATERIAL

INTRODUCTION

This section contains definitions of signal mnemonics used by the memory, and also a table providing complete coverage of address jumper options.

MEMORY MNEMONICS

Table 9-1 contains a list of signal mnemonics used in the schematics (Section 11), and the Theory of Operations (Section 4). Included in the list is a brief description of the signal meaning and usage.

Table 9-1
List of Memory Mnemonics

Mnemonic	Description
A0 — A23(L)	Address lines. Note that A0 is used to determine high or low block addressing except when WD ACCESS is active. When WD ACCESS is asserted (active low) A0 is in the "don't care" catagory. A1 --A14 is used for memory segment addressing via the Chip Select (CSx) lines.
D0 — D15(L)	Data Lines. Each full data word is split into two bytes (D0--D7 and D8--D15) stored simultaneously when WD ACCESS is active (low). The physical storage positions of each byte are determined by SWAP and A0. The best way to remember this is that SWAP swap's bytes and A0 swap's blocks.
CMEM(L)	Bank switch for memory. When high, the LAS memory responds to program calls. When low (asserted), the memory responds to the system side.
RAMINH(L)	RAM Inhibit. When asserted, this signal disables read and write operations.
WD ACCESS(L)	Word Access. When asserted, this signal provides storage and access of 16-bit data words. When not asserted (high), the LAS memory stores and retrieves data in the byte mode. Refer to Table

2-1 for explicit interactions with other signals.

M(L)/IO	Indicates whether the emulator/system processor is addressing memory or I/O. Specifies memory when high and I/O when low.
WRP(L)	Indicates that data on the bus is valid for a write operation. Used only for control setup by system processor during write operations.
OPREQ(L)	Operation Request. Received for control setup by system processor or emulator. Indicates start of memory read or write operation.
R(L)/W	Signifies read or write operations on the bus.
SWAP(L)	Swap's (reverses) normal byte positions, e.g., typically (when SWAP is low), the data will be read-from/written-to the D15--D8 lines instead of D7--D0. Used in conjunction with WD ACCESS and A0 (refer to Table 2-1).
CS	Chip Select. Same as Chip Enable. WHen asserted - enables whole chip (discrete memory device).
WRT EN(L)	Write Enable. Used in conjunction with CS to enable a write cycle.

JUMPER STRAPPING

Table 9-2 provides a jumper look-up reference for all memory base addresses between 0 and 800000 (8192K). This number constitutes the first 256 32K blocks in a possible total of 511 contiguous blocks, or half the addressable memory.

The highest strappable base address at FF8000 (16352K) as also listed. To interpolate between 800000 and FF8000:

1. Subtract 800000 (8192K) from the required base address.
2. Use the result to find the jumper positions in the look-up table.
3. Add a strap at A23 (i.e. add 256K of base memory).

Let's say, for example, that a base address of A00000 (10240K) is required:

1. A00000 - 800000 = 200000 (2048K).
2. Find 200000 in the look-up table and implement this address.
3. Add the strap at A23

The result should look the same as Fig. 9-1.

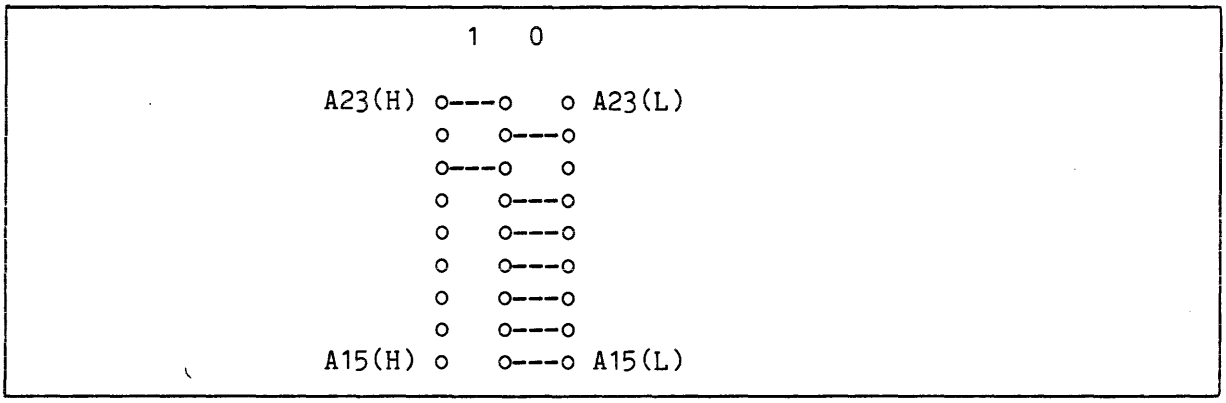


Fig. 9-1. Jumper configuration for base address of A00000

Table 9-2
Address Jumper Look-up Table

Memory Base Address	Jumper Setting A23	A22	A21	A20	A19	A18	A17	A16	A15
00000	0	0	0	0	0	0	0	0	0
08000	0	0	0	0	0	0	0	0	1
10000	0	0	0	0	0	0	0	1	0
18000	0	0	0	0	0	0	0	1	1
20000	0	0	0	0	0	0	1	0	0
28000	0	0	0	0	0	0	1	0	1
30000	0	0	0	0	0	0	1	1	0
38000	0	0	0	0	0	0	1	1	1
40000	0	0	0	0	0	1	0	0	0
48000	0	0	0	0	0	1	0	0	1
50000	0	0	0	0	0	1	0	1	0
58000	0	0	0	0	0	1	0	1	1
60000	0	0	0	0	0	1	1	0	0
68000	0	0	0	0	0	1	1	0	1
70000	0	0	0	0	0	1	1	1	0
78000	0	0	0	0	0	1	1	1	1
80000	0	0	0	0	1	0	0	0	0
88000	0	0	0	0	1	0	0	0	1
90000	0	0	0	0	1	0	0	1	0
98000	0	0	0	0	1	0	0	1	1
A0000	0	0	0	0	1	0	1	0	0
A8000	0	0	0	0	1	0	1	0	1
B0000	0	0	0	0	1	0	1	1	0
B8000	0	0	0	0	1	0	1	1	1
C0000	0	0	0	0	1	1	0	0	0
C8000	0	0	0	0	1	1	0	0	1
D0000	0	0	0	0	1	1	0	1	0
D8000	0	0	0	0	1	1	0	1	1
E0000	0	0	0	0	1	1	1	0	0
E8000	0	0	0	0	1	1	1	0	1

Table 9-2 (Cont.)

Memory Base Address	Jumper Setting A23	A22	A21	A20	A19	A18	A17	A16	A15
F0000	0	0	0	0	1	1	1	1	0
F8000	0	0	0	0	1	1	1	1	1
100000	0	0	0	1	0	0	0	0	0
108000	0	0	0	1	0	0	0	0	1
110000	0	0	0	1	0	0	0	1	0
118000	0	0	0	1	0	0	0	1	1
120000	0	0	0	1	0	0	1	0	0
128000	0	0	0	1	0	0	1	0	1
130000	0	0	0	1	0	0	1	1	0
138000	0	0	0	1	0	0	1	1	1
140000	0	0	0	1	0	1	0	0	0
148000	0	0	0	1	0	1	0	0	1
150000	0	0	0	1	0	1	0	1	0
158000	0	0	0	1	0	1	0	1	1
160000	0	0	0	1	0	1	1	0	0
168000	0	0	0	1	0	1	1	0	1
170000	0	0	0	1	0	1	1	1	0
178000	0	0	0	1	0	1	1	1	1
180000	0	0	0	1	1	0	0	0	0
188000	0	0	0	1	1	0	0	0	1
190000	0	0	0	1	1	0	0	1	0
198000	0	0	0	1	1	0	0	1	1
1A0000	0	0	0	1	1	0	1	0	0
1A8000	0	0	0	1	1	0	1	0	1
1B0000	0	0	0	1	1	0	1	1	0
1B8000	0	0	0	1	1	0	1	1	1
1C0000	0	0	0	1	1	1	0	0	0
1C8000	0	0	0	1	1	1	0	0	1
1D0000	0	0	0	1	1	1	0	1	0
1D8000	0	0	0	1	1	1	0	1	1
1E0000	0	0	0	1	1	1	1	0	0
1E8000	0	0	0	1	1	1	1	0	1
1F0000	0	0	0	1	1	1	1	1	0
1F8000	0	0	0	1	1	1	1	1	1
200000	0	0	1	0	0	0	0	0	0
208000	0	0	1	0	0	0	0	0	1
210000	0	0	1	0	0	0	0	1	0
218000	0	0	1	0	0	0	0	1	1
220000	0	0	1	0	0	0	1	0	0
228000	0	0	1	0	0	0	1	0	1
230000	0	0	1	0	0	0	1	1	0
238000	0	0	1	0	0	0	1	1	1
240000	0	0	1	0	0	1	0	0	0
248000	0	0	1	0	0	1	0	0	1

Table 9-2 (Cont.)

Memory Base Address	Jumper Setting A23	A22	A21	A20	A19	A18	A17	A16	A15
250000	0	0	1	0	0	1	0	1	0
258000	0	0	1	0	0	1	0	1	1
260000	0	0	1	0	0	1	1	0	0
268000	0	0	1	0	0	1	1	0	1
270000	0	0	1	0	0	1	1	1	0
278000	0	0	1	0	0	1	1	1	1
280000	0	0	1	0	1	0	0	0	0
288000	0	0	1	0	1	0	0	0	1
290000	0	0	1	0	1	0	0	1	0
298000	0	0	1	0	1	0	0	1	1
2A0000	0	0	1	0	1	0	1	0	0
2A8000	0	0	1	0	1	0	1	0	1
2B0000	0	0	1	0	1	0	1	1	0
2B8000	0	0	1	0	1	0	1	1	1
2C0000	0	0	1	0	1	1	0	0	0
2C8000	0	0	1	0	1	1	0	0	1
2D0000	0	0	1	0	1	1	0	1	0
2D8000	0	0	1	0	1	1	0	1	1
2E0000	0	0	1	0	1	1	1	0	0
2E8000	0	0	1	0	1	1	1	0	1
2F0000	0	0	1	0	1	1	1	1	0
2F8000	0	0	1	0	1	1	1	1	1
300000	0	0	1	1	0	0	0	0	0
308000	0	0	1	1	0	0	0	0	1
310000	0	0	1	1	0	0	0	1	0
318000	0	0	1	1	0	0	0	1	1
320000	0	0	1	1	0	0	1	0	0
328000	0	0	1	1	0	0	1	0	1
330000	0	0	1	1	0	0	1	1	0
338000	0	0	1	1	0	0	1	1	1
340000	0	0	1	1	0	1	0	0	0
348000	0	0	1	1	0	1	0	0	1
350000	0	0	1	1	0	1	0	1	0
358000	0	0	1	1	0	1	0	1	1
360000	0	0	1	1	0	1	1	0	0
368000	0	0	1	1	0	1	1	0	1
370000	0	0	1	1	0	1	1	1	0
378000	0	0	1	1	0	1	1	1	1
380000	0	0	1	1	1	0	0	0	0
388000	0	0	1	1	1	0	0	0	1
390000	0	0	1	1	1	0	0	1	0
398000	0	0	1	1	1	0	0	1	1
3A0000	0	0	1	1	1	0	1	0	0
3A8000	0	0	1	1	1	0	1	0	1
3B0000	0	0	1	1	1	0	1	1	0

Table 9-2 (Cont.)

Memory Base Address	Jumper Setting A23	A22	A21	A20	A19	A18	A17	A16	A15
3B8000	0	0	1	1	1	0	1	1	1
3C0000	0	0	1	1	1	1	0	0	0
3C8000	0	0	1	1	1	1	0	0	1
3D0000	0	0	1	1	1	1	0	1	0
3D8000	0	0	1	1	1	1	0	1	1
3E0000	0	0	1	1	1	1	1	0	0
3E8000	0	0	1	1	1	1	1	0	1
3F0000	0	0	1	1	1	1	1	1	0
3F8000	0	0	1	1	1	1	1	1	1
400000	0	1	0	0	0	0	0	0	0
408000	0	1	0	0	0	0	0	0	1
410000	0	1	0	0	0	0	0	1	0
418000	0	1	0	0	0	0	0	1	1
420000	0	1	0	0	0	0	1	0	0
428000	0	1	0	0	0	0	1	0	1
430000	0	1	0	0	0	0	1	1	0
438000	0	1	0	0	0	0	1	1	1
440000	0	1	0	0	0	1	0	0	0
448000	0	1	0	0	0	1	0	0	1
450000	0	1	0	0	0	1	0	1	0
458000	0	1	0	0	0	1	0	1	1
460000	0	1	0	0	0	1	1	0	0
468000	0	1	0	0	0	1	1	0	1
470000	0	1	0	0	0	1	1	1	0
478000	0	1	0	0	0	1	1	1	1
480000	0	1	0	0	1	0	0	0	0
488000	0	1	0	0	1	0	0	0	1
490000	0	1	0	0	1	0	0	1	0
498000	0	1	0	0	1	0	0	1	1
4A0000	0	1	0	0	1	0	1	0	0
4A8000	0	1	0	0	1	0	1	0	1
4B0000	0	1	0	0	1	0	1	1	0
4B8000	0	1	0	0	1	0	1	1	1
4C0000	0	1	0	0	1	1	0	0	0
4C8000	0	1	0	0	1	1	0	0	1
4D0000	0	1	0	0	1	1	0	1	0
4D8000	0	1	0	0	1	1	0	1	1
4E0000	0	1	0	0	1	1	1	0	0
4E8000	0	1	0	0	1	1	1	0	1
4F0000	0	1	0	0	1	1	1	1	0
4F8000	0	1	0	0	1	1	1	1	1
500000	0	1	0	1	0	0	0	0	0
508000	0	1	0	1	0	0	0	0	1
510000	0	1	0	1	0	0	0	1	0

Table 9-2 (Cont.)

Memory Base Address	Jumper Setting A23	A22	A21	A20	A19	A18	A17	A16	A15
518000	0	1	0	1	0	0	0	1	1
520000	0	1	0	1	0	0	1	0	0
528000	0	1	0	1	0	0	1	0	1
530000	0	1	0	1	0	0	1	1	0
538000	0	1	0	1	0	0	1	1	1
540000	0	1	0	1	0	1	0	0	0
548000	0	1	0	1	0	1	0	0	1
550000	0	1	0	1	0	1	0	1	0
558000	0	1	0	1	0	1	0	1	1
560000	0	1	0	1	0	1	1	0	0
568000	0	1	0	1	0	1	1	0	1
570000	0	1	0	1	0	1	1	1	0
578000	0	1	0	1	0	1	1	1	1
580000	0	1	0	1	1	0	0	0	0
588000	0	1	0	1	1	0	0	0	1
590000	0	1	0	1	1	0	0	1	0
598000	0	1	0	1	1	0	0	1	1
5A0000	0	1	0	1	1	0	1	0	0
5A8000	0	1	0	1	1	0	1	0	1
5B0000	0	1	0	1	1	0	1	1	0
5B8000	0	1	0	1	1	0	1	1	1
5C0000	0	1	0	1	1	1	0	0	0
5C8000	0	1	0	1	1	1	0	0	1
5D0000	0	1	0	1	1	1	0	1	0
5D8000	0	1	0	1	1	1	0	1	1
5E0000	0	1	0	1	1	1	1	0	0
5E8000	0	1	0	1	1	1	1	0	1
5F0000	0	1	0	1	1	1	1	1	0
5F8000	0	1	0	1	1	1	1	1	1
600000	0	1	1	0	0	0	0	0	0
608000	0	1	1	0	0	0	0	0	1
610000	0	1	1	0	0	0	0	1	0
618000	0	1	1	0	0	0	0	1	1
620000	0	1	1	0	0	0	1	0	0
628000	0	1	1	0	0	0	1	0	1
630000	0	1	1	0	0	0	1	1	0
638000	0	1	1	0	0	0	1	1	1
640000	0	1	1	0	0	1	0	0	0
648000	0	1	1	0	0	1	0	0	1
650000	0	1	1	0	0	1	0	1	0
658000	0	1	1	0	0	1	0	1	1
660000	0	1	1	0	0	1	1	0	0
668000	0	1	1	0	0	1	1	0	1
670000	0	1	1	0	0	1	1	1	0

Table 9-2 (Cont.)

Memory Base Address	Jumper Setting A23	A22	A21	A20	A19	A18	A17	A16	A15
678000	0	1	1	0	0	1	1	1	1
680000	0	1	1	0	1	0	0	0	0
688000	0	1	1	0	1	0	0	0	1
690000	0	1	1	0	1	0	0	1	0
698000	0	1	1	0	1	0	0	1	1
6A0000	0	1	1	0	1	0	1	0	0
6A8000	0	1	1	0	1	0	1	0	1
6B0000	0	1	1	0	1	0	1	1	0
6B8000	0	1	1	0	1	0	1	1	1
6C0000	0	1	1	0	1	1	0	0	0
6C8000	0	1	1	0	1	1	0	0	1
6D0000	0	1	1	0	1	1	0	1	0
6D8000	0	1	1	0	1	1	0	1	1
6E0000	0	1	1	0	1	1	1	0	0
6E8000	0	1	1	0	1	1	1	0	1
6F0000	0	1	1	0	1	1	1	1	0
6F8000	0	1	1	0	1	1	1	1	1
700000	0	1	1	1	0	0	0	0	0
708000	0	1	1	1	0	0	0	0	1
710000	0	1	1	1	0	0	0	1	0
718000	0	1	1	1	0	0	0	1	1
720000	0	1	1	1	0	0	1	0	0
728000	0	1	1	1	0	0	1	0	1
730000	0	1	1	1	0	0	1	1	0
738000	0	1	1	1	0	0	1	1	1
740000	0	1	1	1	0	1	0	0	0
748000	0	1	1	1	0	1	0	0	1
750000	0	1	1	1	0	1	0	1	0
758000	0	1	1	1	0	1	0	1	1
760000	0	1	1	1	0	1	1	0	0
768000	0	1	1	1	0	1	1	0	1
770000	0	1	1	1	0	1	1	1	0
778000	0	1	1	1	0	1	1	1	1
780000	0	1	1	1	1	0	0	0	0
788000	0	1	1	1	1	0	0	0	1
790000	0	1	1	1	1	0	0	1	0
798000	0	1	1	1	1	0	0	1	1
7A0000	0	1	1	1	1	0	1	0	0
7A8000	0	1	1	1	1	0	1	0	1
7B0000	0	1	1	1	1	0	1	1	0
7B8000	0	1	1	1	1	0	1	1	1
7C0000	0	1	1	1	1	1	0	0	0
7C8000	0	1	1	1	1	1	0	0	1
7D0000	0	1	1	1	1	1	0	1	0

Table 9-2 (Cont.)

Memory Base Address	Jumper Setting A23	A22	A21	A20	A19	A18	A17	A16	A15
7D8000	0	1	1	1	1	1	0	1	1
7E0000	0	1	1	1	1	1	1	0	0
7E8000	0	1	1	1	1	1	1	0	1
7F0000	0	1	1	1	1	1	1	1	0
7F8000	0	1	1	1	1	1	1	1	1
800000	1	0	0	0	0	0	0	0	0
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
FF8000	1	1	1	1	1	1	1	1	1

SECTION 10

REPLACEABLE ELECTRICAL PARTS

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

LIST OF ASSEMBLIES

A list of assemblies can be found at the beginning of the Electrical Parts List. The assemblies are listed in numerical order. When the complete component number of a part is known, this list will identify the assembly in which the part is located.

CROSS INDEX-MFR. CODE NUMBER TO MANUFACTURER

The Mfr. Code Number to Manufacturer index for the Electrical Parts List is located immediately after this page. The Cross Index provides codes, names and addresses of manufacturers of components listed in the Electrical Parts List.

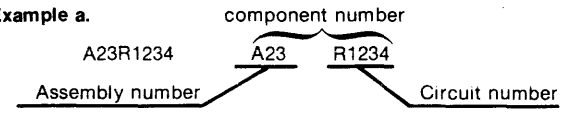
ABBREVIATIONS

Abbreviations conform to American National Standard Y1.1.

COMPONENT NUMBER (column one of the Electrical Parts List)

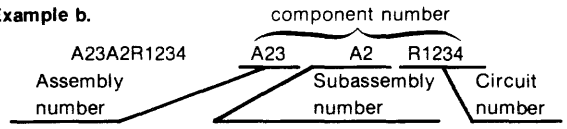
A numbering method has been used to identify assemblies, subassemblies and parts. Examples of this numbering method and typical expansions are illustrated by the following:

Example a.



Read: Resistor 1234 of Assembly 23

Example b.



Read: Resistor 1234 of Subassembly 2 of Assembly 23

Only the circuit number will appear on the diagrams and circuit board illustrations. Each diagram and circuit board illustration is clearly marked with the assembly number. Assembly numbers are also marked on the mechanical exploded views located in the Mechanical Parts List. The component number is obtained by adding the assembly number prefix to the circuit number.

The Electrical Parts List is divided and arranged by assemblies in numerical sequence (e.g., assembly A1 with its subassemblies and parts, precedes assembly A2 with its subassemblies and parts).

Chassis-mounted parts have no assembly number prefix and are located at the end of the Electrical Parts List.

TEKTRONIX PART NO. (column two of the Electrical Parts List)

Indicates part number to be used when ordering replacement part from Tektronix.

SERIAL/MODEL NO. (columns three and four of the Electrical Parts List)

Column three (3) indicates the serial number at which the part was first used. Column four (4) indicates the serial number at which the part was removed. No serial number entered indicates part is good for all serial numbers.

NAME & DESCRIPTION (column five of the Electrical Parts List)

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

MFR. CODE (column six of the Electrical Parts List)

Indicates the code number of the actual manufacturer of the part. (Code to name and address cross reference can be found immediately after this page.)

MFR. PART NUMBER (column seven of the Electrical Parts List)

Indicates actual manufacturers part number.

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
000JV	INMOS TO	BOX 16000	COLORADO SPRINGS, CO 80935
01121	ALLEN-BRADLEY COMPANY	1201 2ND STREET SOUTH	MILWAUKEE, WI 53204
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P O BOX 5012, 13500 N CENTRAL EXPRESSWAY	DALLAS, TX 75222
04222	AVX CERAMICS, DIVISION OF AVX CORP.	P O BOX 867, 19TH AVE. SOUTH	MYRTLE BEACH, SC 29577
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS STREET	MOUNTAIN VIEW, CA 94042
32440	ENGINEERED COMPONENTS CO.	3580 SACRAMENTO DR.	SAN LUIS OBISPO, CA 93406
32997	BOURNS, INC., TRIMPOT PRODUCTS DIV.	1200 COLUMBIA AVE.	RIVERSIDE, CA 92507
56289	SPRAGUE ELECTRIC CO.	87 MARSHALL ST.	NORTH ADAMS, MA 01247
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A10	670-7383-00			CKT BOARD ASSY:LARGE ADDRESS 64K MEMORY	80009	670-7383-00
	----- -----			(8550 OPTION 04 ONLY)		
A10	670-7384-00			CKT BOARD ASSY:LARGE ADDRESS 128K MEMORY	80009	670-7384-00
	----- -----			(8550 OPTION 05 ONLY)		
A10	----- -----			CKT BOARD ASSY:LARGE ADDRESS MEMORY		
A10C1010	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C1015	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C1020	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C1030	290-0743-00			CAP.,FXD,ELCTLT:100UF,+50-10%,16V	56289	500D146
A10C1035	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C1040	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C1050	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C1060	290-0743-00			CAP.,FXD,ELCTLT:100UF,+50-10%,16V	56289	500D146
A10C1065	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C1080	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C1085	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C1090	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C1100	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C1110	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C1130	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C1131	290-0743-00			CAP.,FXD,ELCTLT:100UF,+50-10%,16V	56289	500D146
A10C1135	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C1155	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C1160	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C1170	290-0743-00			CAP.,FXD,ELCTLT:100UF,+50-10%,16V	56289	500D146
A10C1185	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C1190	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C1191	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C1192	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C2010	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C2015	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C2030	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C2035	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C2060	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C2065	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C2080	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C2085	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C2130	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C2135	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C2150	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C2155	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C2180	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C2185	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A10C2190	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C2195	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C3010	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C3030	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C3035	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C3060	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C3065	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C3080	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C3085	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C3095	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C3100	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C3130	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C3135	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C3150	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C3155	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C3180	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C3185	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C3190	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C3195	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C4010	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C4015	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C4030	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C4035	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C4060	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C4065	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C4080	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C4085	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C4130	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C4135	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C4150	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C4155	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C4180	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C4185	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C4190	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C4195	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C5015	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C6010	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C6030	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C6050	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C6080	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C6130	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C6150	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A10C6180	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C6190	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C7010	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C7120	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C7130	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C7140	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C7150	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C7160	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C7190	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C8011	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C8020	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C8030	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C8040	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C8050	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C8060	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C8070	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C8080	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C8085	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C8090	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C8100	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C8110	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C8120	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C8130	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C8150	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
A10C8170	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C8190	283-0423-00			CAP.,FXD,CER DI:0.22UF,+80-20%,50V	04222	DG015E224Z
	----- -----			(8550 OPTION 05 ONLY)		
A10C9010	290-0743-00			CAP.,FXD,ELCTLT:100UF,+50-10%,16V	56289	500D146
A10C9180	290-0743-00			CAP.,FXD,ELCTLT:100UF,+50-10%,16V	56289	500D146
A10DL7100	119-1407-00			DELAY LINE,ELEC:100NS,TAPPED,14 PIN	32440	TTLDM100
A10R7090	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
A10R7091	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
A10R7092	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
A10R7093	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
A10R7160	315-0241-00			RES.,FXD,CMPSN:240 OHM,5%,0.25W	01121	CB2415
A10RP1090	307-0828-00			RES NTWK,FXD,FI:4,33 OHM,2%,0.30W	01121	208B330
A10RP2090	307-0828-00			RES NTWK,FXD,FI:4,33 OHM,2%,0.30W	01121	208B330
A10RP2100	307-0650-00			RES NTWK,FXD,FI:9,2.7K OHM,5%,0.150W	32997	4310R-101-272
A10RP3095	307-0828-00			RES NTWK,FXD,FI:4,33 OHM,2%,0.30W	01121	208B330
A10RP4015	307-0828-00			RES NTWK,FXD,FI:4,33 OHM,2%,0.30W	01121	208B330
A10RP4035	307-0828-00			RES NTWK,FXD,FI:4,33 OHM,2%,0.30W	01121	208B330
A10RP4065	307-0828-00			RES NTWK,FXD,FI:4,33 OHM,2%,0.30W	01121	208B330
	----- -----			(8550 OPTION 05 ONLY)		
A10RP4085	307-0828-00			RES NTWK,FXD,FI:4,33 OHM,2%,0.30W	01121	208B330
	----- -----			(8550 OPTION 05 ONLY)		
A10RP4100	307-0650-00			RES NTWK,FXD,FI:9,2.7K OHM,5%,0.150W	32997	4310R-101-272
A10RP4115	307-0828-00			RES NTWK,FXD,FI:4,33 OHM,2%,0.30W	01121	208B330
A10RP4135	307-0828-00			RES NTWK,FXD,FI:4,33 OHM,2%,0.30W	01121	208B330
A10RP4165	307-0828-00			RES NTWK,FXD,FI:4,33 OHM,2%,0.30W	01121	208B330
	----- -----			(8550 OPTION 05 ONLY)		
A10RP4185	307-0828-00			RES NTWK,FXD,FI:4,33 OHM,2%,0.30W	01121	208B330
	----- -----			(8550 OPTION 05 ONLY)		

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A10RP5010	307-0828-00			RES NTWK,FXD,FI:4,33 OHM,2%,0.30W	01121	208B330
A10RP5030	307-0828-00			RES NTWK,FXD,FI:4,33 OHM,2%,0.30W	01121	208B330
A10RP5060	307-0828-00			RES NTWK,FXD,FI:4,33 OHM,2%,0.30W	01121	208B330
	----- -----			(8550 OPTION 05 ONLY)		
A10RP5080	307-0828-00			RES NTWK,FXD,FI:4,33 OHM,2%,0.30W	01121	208B330
	----- -----			(8550 OPTION 05 ONLY)		
A10RP5110	307-0828-00			RES NTWK,FXD,FI:4,33 OHM,2%,0.30W	01121	208B330
A10RP5130	307-0828-00			RES NTWK,FXD,FI:4,33 OHM,2%,0.30W	01121	208B330
A10RP5160	307-0828-00			RES NTWK,FXD,FI:4,33 OHM,2%,0.30W	01121	208B330
	----- -----			(8550 OPTION 05 ONLY)		
A10RP5180	307-0828-00			RES NTWK,FXD,FI:4,33 OHM,2%,0.30W	01121	208B330
	----- -----			(8550 OPTION 05 ONLY)		
A10RP6030	307-0828-00			RES NTWK,FXD,FI:4,33 OHM,2%,0.30W	01121	208B330
A10RP6160	307-0828-00			RES NTWK,FXD,FI:4,33 OHM,2%,0.30W	01121	208B330
A10RP7180	307-0650-00			RES NTWK,FXD,FI:9,2.7K OHM,5%,0.150W	32997	4310R-101-272
A10RP8130	307-0650-00			RES NTWK,FXD,FI:9,2.7K OHM,5%,0.150W	32997	4310R-101-272
A10RP8150	307-0650-00			RES NTWK,FXD,FI:9,2.7K OHM,5%,0.150W	32997	4310R-101-272
A10RP8170	307-0650-00			RES NTWK,FXD,FI:9,2.7K OHM,5%,0.150W	32997	4310R-101-272
	----- -----			(8550 OPTION 05 ONLY)		
A10RP8190	307-0650-00			RES NTWK,FXD,FI:9,2.7K OHM,5%,0.150W	32997	4310R-101-272
	----- -----			(8550 OPTION 05 ONLY)		
A10U1010	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U1015	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U1030	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U1035	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U1060	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U1065	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U1080	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U1085	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U1090	156-1058-01			MICROCIRCUIT,DI:OCTAL ST BFR W/3 STATE OUT	01295	SN74S240J4
A10U1100	156-1058-01			MICROCIRCUIT,DI:OCTAL ST BFR W/3 STATE OUT	01295	SN74S240J4
A10U1110	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U1115	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U1130	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U1135	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U1160	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U1165	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U1180	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U1185	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U2010	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U2015	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U2030	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U2035	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U2060	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U2065	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U2080	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A10U2085	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U2090	156-1058-01			MICROCIRCUIT,DI:OCTAL ST BFR W/3 STATE OUT	01295	SN74S240J4
A10U2100	156-1058-01			MICROCIRCUIT,DI:OCTAL ST BFR W/3 STATE OUT	01295	SN74S240J4
A10U2110	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U2115	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U2130	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U2135	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U2160	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U2165	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U2180	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U2185	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U3010	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U3015	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U3030	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U3035	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U3060	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U3065	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U3080	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U3085	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U3095	156-1058-01			MICROCIRCUIT,DI:OCTAL ST BFR W/3 STATE OUT	01295	SN74S240J4
A10U3100	156-1058-01			MICROCIRCUIT,DI:OCTAL ST BFR W/3 STATE OUT	01295	SN74S240J4
A10U3110	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U3115	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U3130	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U3135	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U3160	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U3165	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U3180	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U3185	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U4010	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U4015	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U4030	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U4035	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U4060	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U4065	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U4080	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U4085	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U4110	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U4115	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U4130	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A10U4135	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
A10U4160	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U4165	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U4180	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U4185	156-1615-00			MICROCIRCUIT,DI:SRAM,16384 X 1	000JV	1MS1400-55
	----- -----			(8550 OPTION 05 ONLY)		
A10U5090	156-1058-01			MICROCIRCUIT,DI:OCTAL ST BFR W/3 STATE OUT	01295	SN74S240J4
A10U5100	156-1058-01			MICROCIRCUIT,DI:OCTAL ST BFR W/3 STATE OUT	01295	SN74S240J4
A10U6010	156-0914-02			MICROCIRCUIT,DI:OCT ST BFR W/3 STATE OUT	01295	SN74LS240
A10U6030	156-0914-02			MICROCIRCUIT,DI:OCT ST BFR W/3 STATE OUT	01295	SN74LS240
A10U6060	156-0914-02			MICROCIRCUIT,DI:OCT ST BFR W/3 STATE OUT	01295	SN74LS240
	----- -----			(8550 OPTION 05 ONLY)		
A10U6080	156-0914-02			MICROCIRCUIT,DI:OCT ST BFR W/3 STATE OUT	01295	SN74LS240
	----- -----			(8550 OPTION 05 ONLY)		
A10U6110	156-0914-02			MICROCIRCUIT,DI:OCT ST BFR W/3 STATE OUT	01295	SN74LS240
A10U6130	156-0914-02			MICROCIRCUIT,DI:OCT ST BFR W/3 STATE OUT	01295	SN74LS240
A10U6160	156-0914-02			MICROCIRCUIT,DI:OCT ST BFR W/3 STATE OUT	01295	SN74LS240
	----- -----			(8550 OPTION 05 ONLY)		
A10U6180	156-0914-02			MICROCIRCUIT,DI:OCT ST BFR W/3 STATE OUT	01295	SN74LS240
	----- -----			(8550 OPTION 05 ONLY)		
A10U7010	156-0703-02			MICROCIRCUIT,DI:4-2-3-2 INPUT& OR GATE	07263	74S64
A10U7020	156-0703-02			MICROCIRCUIT,DI:4-2-3-2 INPUT& OR GATE	07263	74S64
A10U7030	156-0703-02			MICROCIRCUIT,DI:4-2-3-2 INPUT& OR GATE	07263	74S64
A10U7040	156-0703-02			MICROCIRCUIT,DI:4-2-3-2 INPUT& OR GATE	07263	74S64
A10U7050	156-0703-02			MICROCIRCUIT,DI:4-2-3-2 INPUT& OR GATE	07263	74S64
A10U7060	156-0703-02			MICROCIRCUIT,DI:4-2-3-2 INPUT& OR GATE	07263	74S64
A10U7070	156-0703-02			MICROCIRCUIT,DI:4-2-3-2 INPUT& OR GATE	07263	74S64
A10U7080	156-0703-02			MICROCIRCUIT,DI:4-2-3-2 INPUT& OR GATE	07263	74S64
A10U7110	156-0180-04			MICROCIRCUIT,DI:QUAD 2 INP NAND GATE	01295	SN74S00NP3
A10U7120	156-0418-01			MICROCIRCUIT,DI:8 INPUT NAND GATE,SCRN	01295	SN74S30NPS
A10U7130	156-0418-01			MICROCIRCUIT,DI:8 INPUT NAND GATE,SCRN	01295	SN74S30NPS
	----- -----			(8550 OPTION 05 ONLY)		
A10U7140	156-0418-01			MICROCIRCUIT,DI:8 INPUT NAND GATE,SCRN	01295	SN74S30NPS
	----- -----			(8550 OPTION 05 ONLY)		
A10U7150	156-0418-01			MICROCIRCUIT,DI:8 INPUT NAND GATE,SCRN	01295	SN74S30NPS
A10U7160	156-1286-00			MICROCIRCUIT,DI:QUAD 2 INP & GATES W/OC OUT	01295	SN74S09N3
A10U7190	156-0381-02			MICROCIRCUIT,DI:QUAD 2-INP EXCL OR GATE	01295	SN74LS86
A10U8010	156-0966-01			MICROCIRCUIT,DI:DUAL 5 INP NOR GATES	80009	156-0966-01
A10U8085	156-1058-01			MICROCIRCUIT,DI:OCTAL ST BFR W/3 STATE OUT	01295	SN74S240J4
A10U8090	156-1179-01			MICROCIRCUIT,DI:OCTAL BFR,W/3STATE OUT	01295	SN74S241 JP3
A10U8100	156-1179-01			MICROCIRCUIT,DI:OCTAL BFR,W/3STATE OUT	01295	SN74S241 JP3
A10U8110	156-1058-01			MICROCIRCUIT,DI:OCTAL ST BFR W/3 STATE OUT	01295	SN74S240J4
A10U8130	156-0472-03			MICROCIRCUIT,DI:13 INPUT NAND GATE,SCRN	01295	SN74S133
A10U8150	156-0472-03			MICROCIRCUIT,DI:13 INPUT NAND GATE,SCRN	01295	SN74S133
A10U8170	156-0472-03			MICROCIRCUIT,DI:13 INPUT NAND GATE,SCRN	01295	SN74S133
	----- -----			(8550 OPTION 05 ONLY)		
A10U8190	156-0472-03			MICROCIRCUIT,DI:13 INPUT NAND GATE,SCRN	01295	SN74S133
	----- -----			(8550 OPTION 05 ONLY)		

Section 11
DIAGRAMS

Standards

The following American National Standard Institute standards are used in the preparation of Tektronix, Inc. diagrams.

Graphic Symbols	ANSI Y32.2–1975
Logic Symbols	ANSI Y32.14–1973 (Positive logic. Logic symbols depict the logical function performed and may differ from the manufacturer's data.)
Abbreviations	ANSI Y1.1–1972
Drafting Practices	ANSI Y14.15–1966
Line Conventions And Lettering	ANSI Y14.2–1973
Letter Symbols	ANSI Y10.5–1968

Component Values

Electrical components shown on the diagrams are in the following units unless noted otherwise:

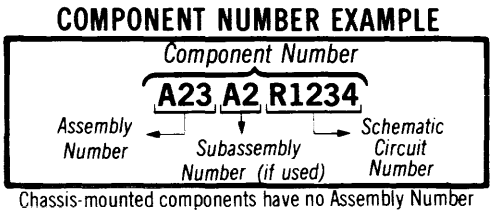
Capacitors = Values one or greater are in picofarads (pF). Values less than one are in microfarads (μF).

Resistors = Ohms (Ω)

The following special symbols may appear on the diagrams:

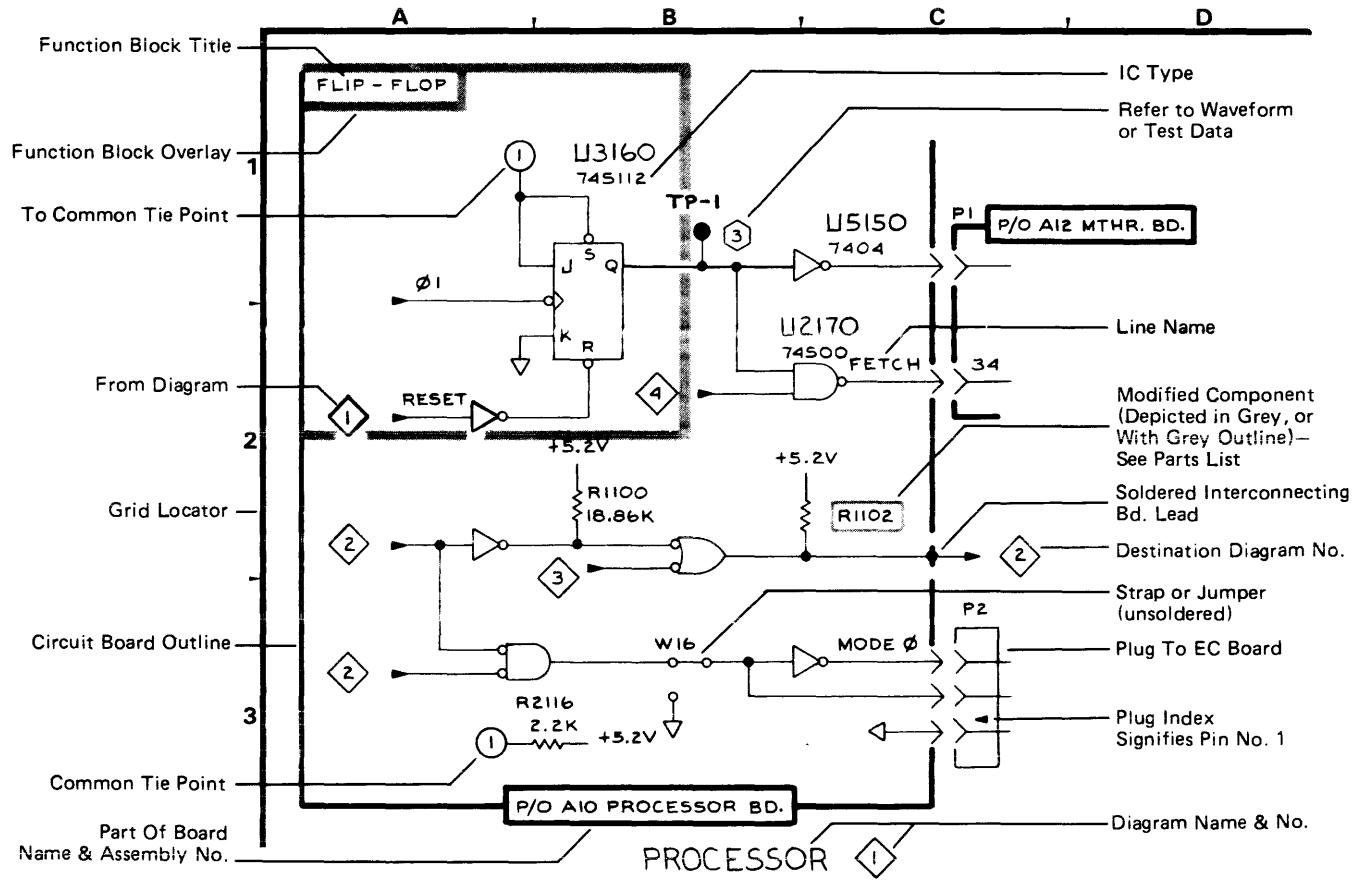
Assembly Numbers and Grid Coordinates

Each circuit board in the instrument is assigned an assembly number (e.g. A20). This number appears on the component location illustration, the schematics, and the component lookup table. The Replaceable Electrical Parts list also uses the number to list components by assembly. The following illustration shows an example of a component number in the Electrical Parts list.



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

Both the schematics and the component locator illustration have locating grids. A lookup table is assigned to each schematic. The lookup table gives the component location in both the associated schematic, and on the component locator illustration.



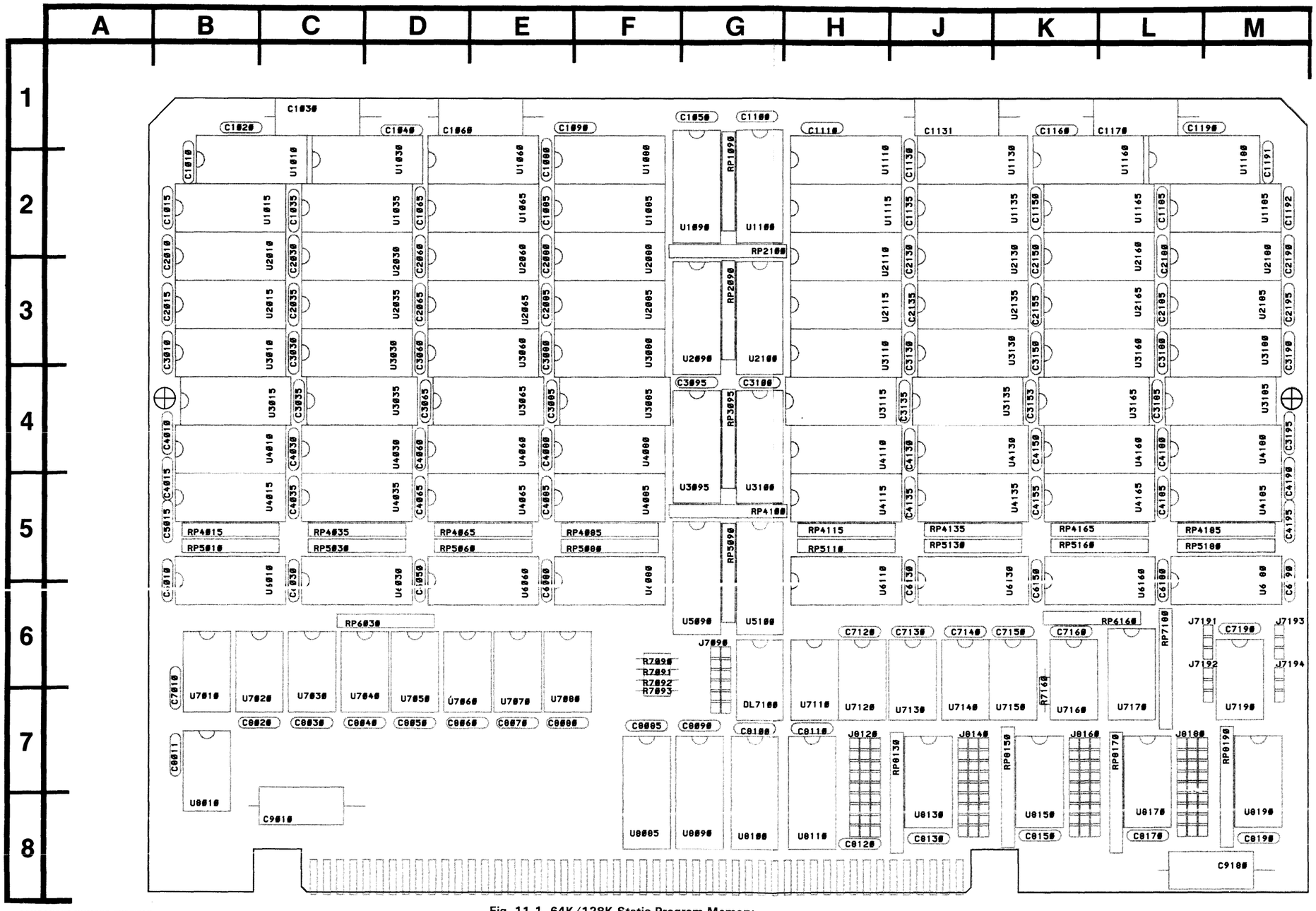
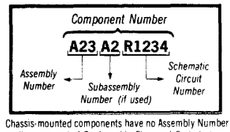


Fig. 11-1. 64K/128K Static Program Memory

COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

Static Sensitive Devices
See Maintenance Section

@

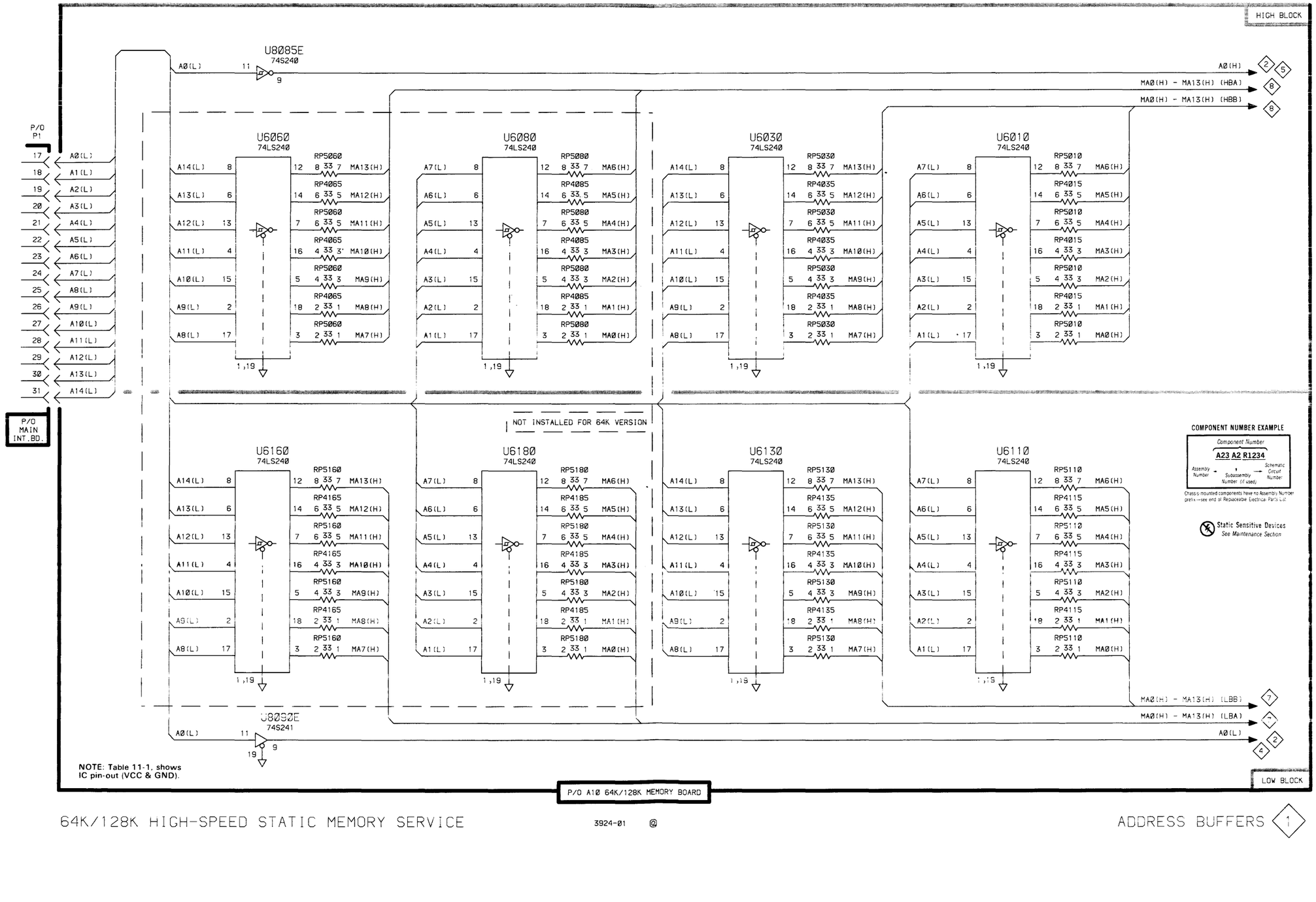
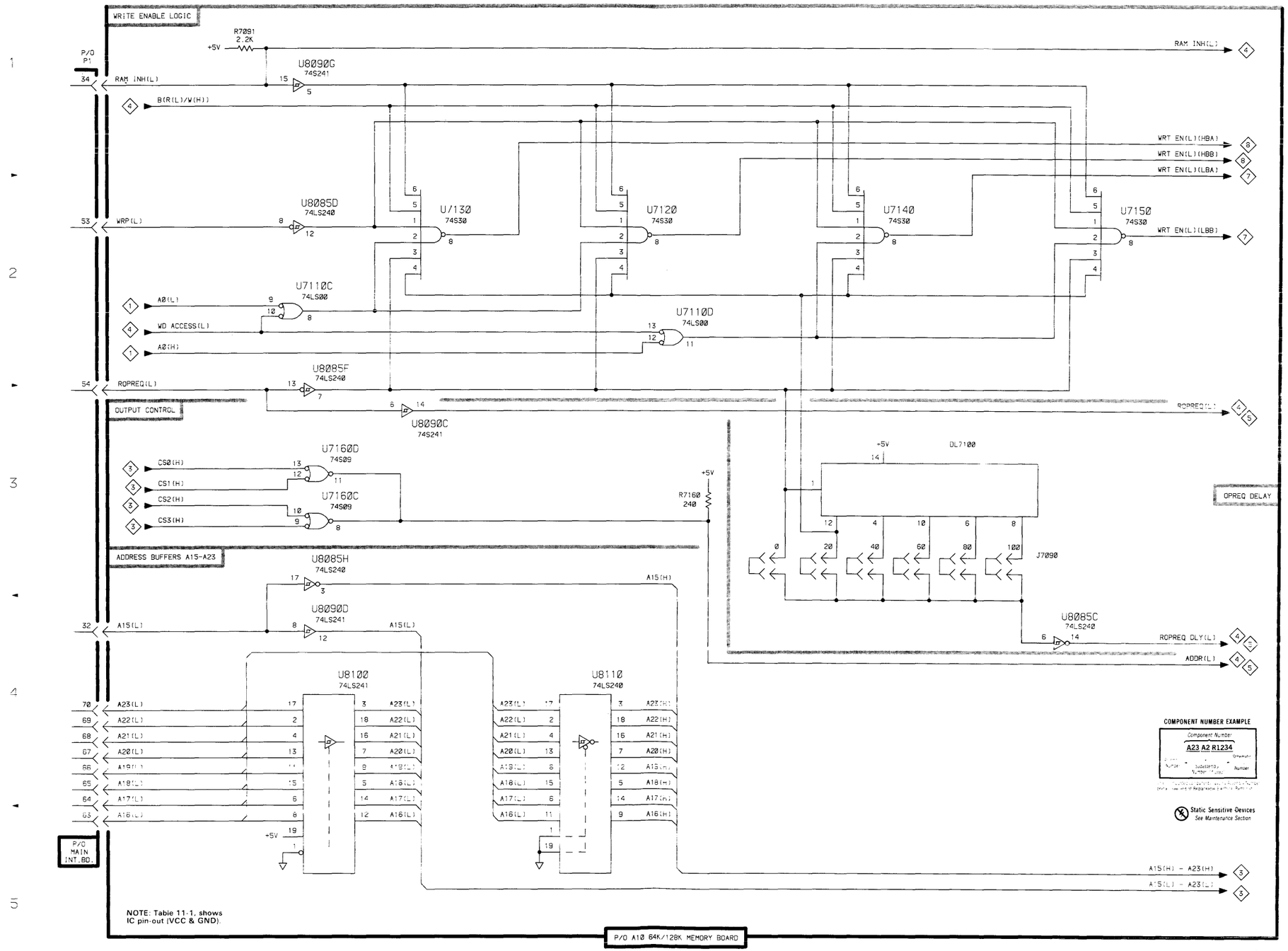
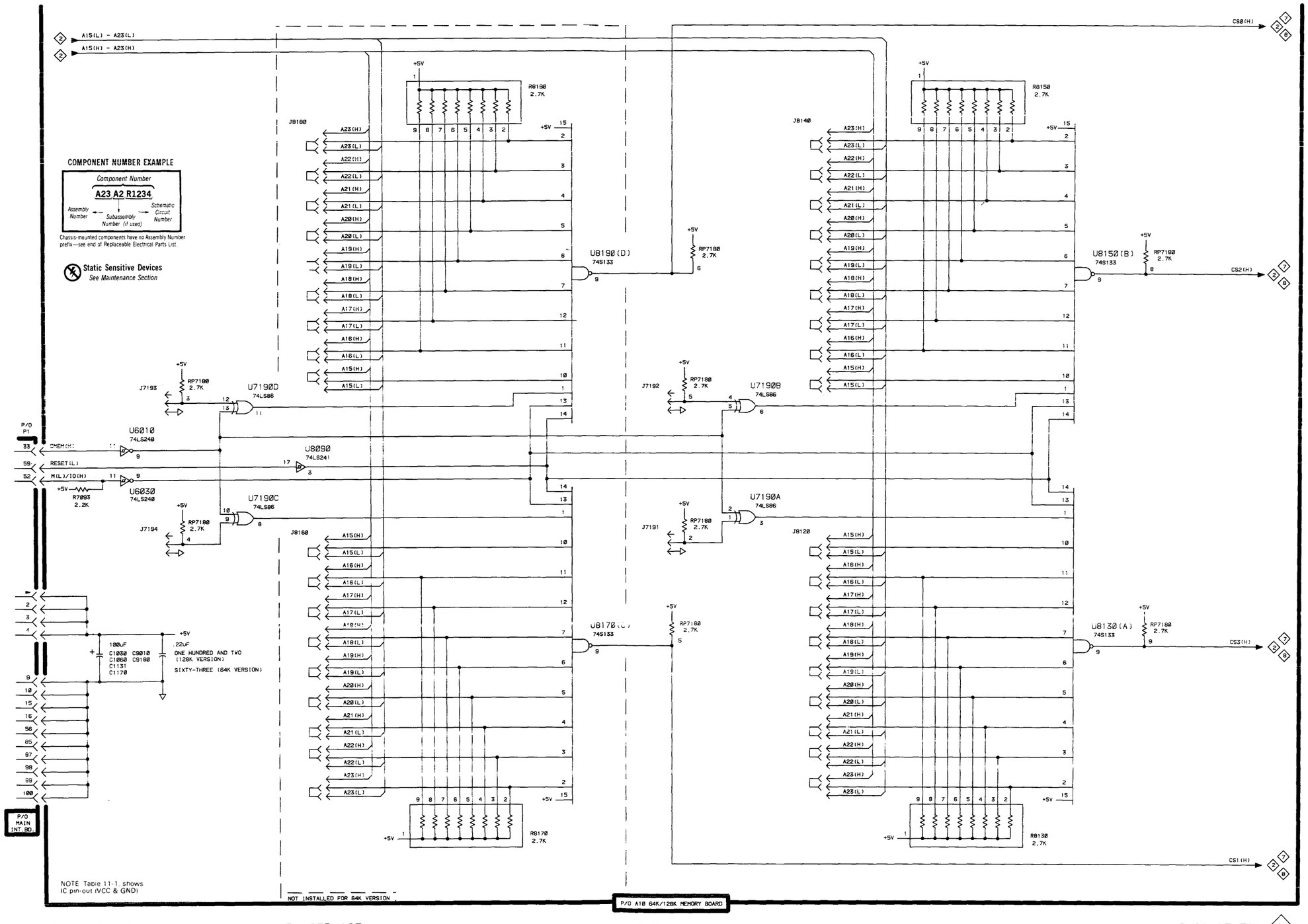

HIGH BLOCK
U8085E
74S240
A0(L)
A0(H)
MA0(H) - MA13(H) (HBA)
MA0(H) - MA13(H) (HBB)
P/O P1
P/O MAIN INT. BD.
U6060
U6080
U6030
U6010
U6160
U6180
U6130
U6110
74LS240
NOT INSTALLED FOR 64K VERSION
U8090E
74S241
MA0(H) - MA13(H) (LBB)
MA0(H) - MA13(H) (LBA)
A0(L)
NOTE: Table 11-1, shows IC pin-out (VCC & GND).
COMPONENT NUMBER EXAMPLE
Component Number
A23 A2 R1234
Assembly Number
Subassembly Number (if used)
Schematic Circuit Number
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.
Static Sensitive Devices
See Maintenance Section
P/O A10 64K/128K MEMORY BOARD
LOW BLOCK

Table 11-2
Decoupling Capacitors
For 64K Memory

C1010	C3030	C6150
C1015	C3035	C7010
C1020	C3060	C7120
C1035	C3065	C7150
C1040	C3095	C7160
C1050	C3100	C7190
C1065	C3130	C8011
C1100	C3135	C8020
C1110	C3150	C8030
C1130	C3155	C8040
C1135	C4030	C8050
C1155	C4035	C8060
C1160	C4060	C8070
C2030	C4065	C8080
C2035	C4130	C8085
C2060	C4135	C8090
C2065	C4150	C8100
C2130	C4155	C8110
C2135	C6030	C8120
C2150	C6050	C8130
C2155	C6130	C8150

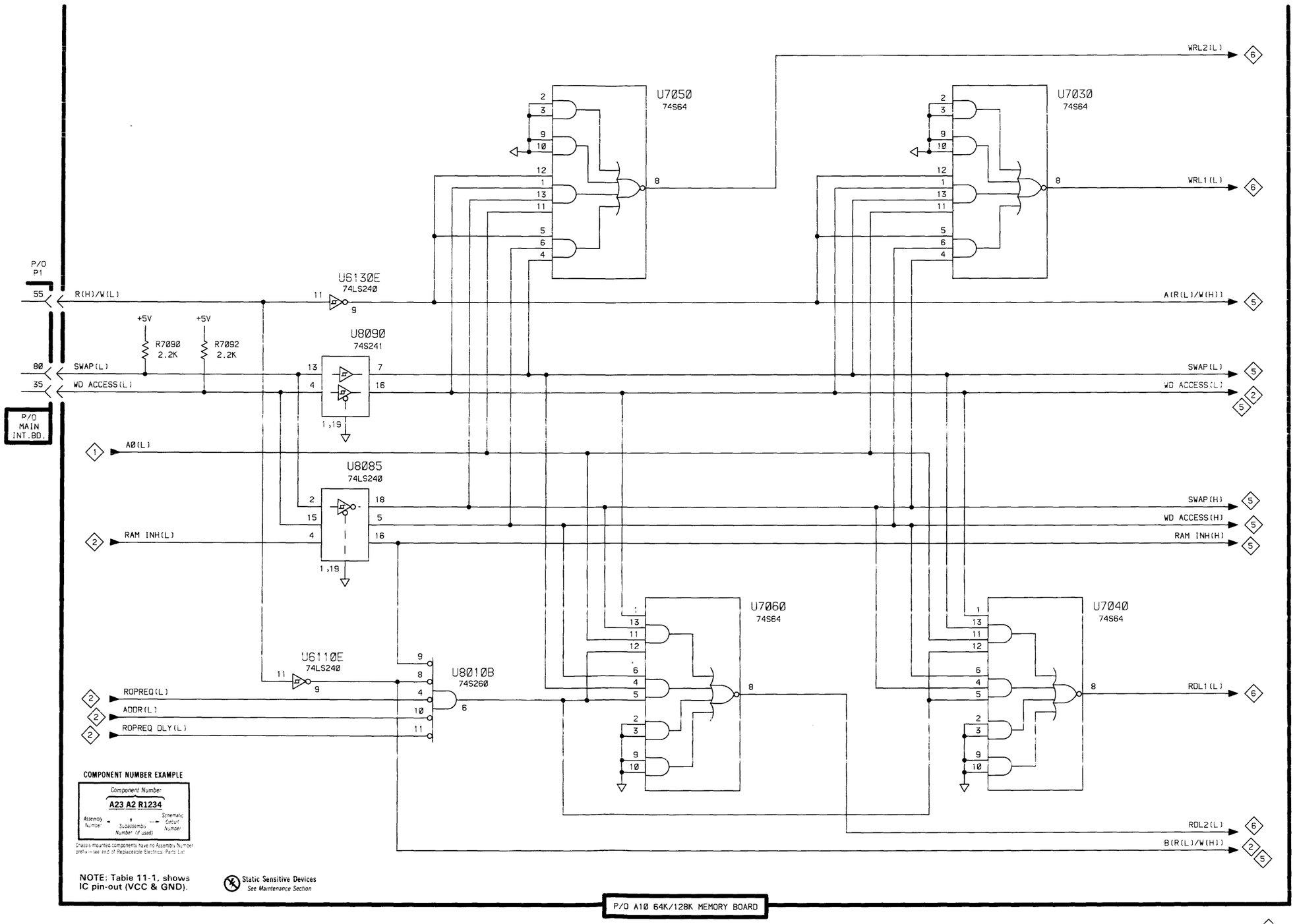

WRITE ENABLE LOGIC
R7091
2.2K
+5V
U8090C
74S241
P/O
P1
RAM INH(L)
B(R(L)/W(H))
WRT EN(L)(HBA)
WRT EN(L)(HBB)
WRT EN(L)(LBA)
WRT EN(L)(LBB)
U8085D
74LS240
WRP(L)
U7130
74S30
U7120
74S30
U7140
74S30
U7150
74S30
U7110C
74LS00
A0(L)
WD ACCESS(L)
A0(H)
U7110D
74LS00
U8085F
74LS240
ROPREQ(L)
OUTPUT CONTROL
U8090C
74S241
U7160D
74S09
U7160C
74S09
CS0(H)
CS1(H)
CS2(H)
CS3(H)
R7160
240
DL7100
OPREQ DELAY
J7090
ADDRESS BUFFERS A15-A23
U8085H
74LS240
U8090D
74LS241
A15(L)
A15(H)
U8085C
74LS240
ROPREQ DLY(L)
ADDR(L)
U8100
74LS241
U8110
74LS240
A23(L)
A22(L)
A21(L)
A20(L)
A18(L)
A17(L)
A16(L)
A23(H)
A22(H)
A21(H)
A20(H)
A18(H)
A17(H)
A16(H)
P/O
MAIN
INT.BD.
A15(H) - A23(H)
A15(L) - A23(L)
COMPONENT NUMBER EXAMPLE
Component Number
A23 A2 R1234
Static Sensitive Devices
See Maintenance Section
NOTE: Table 11-1, shows
IC pin-out (VCC & GND).
P/O A10 64K/128K MEMORY BOARD

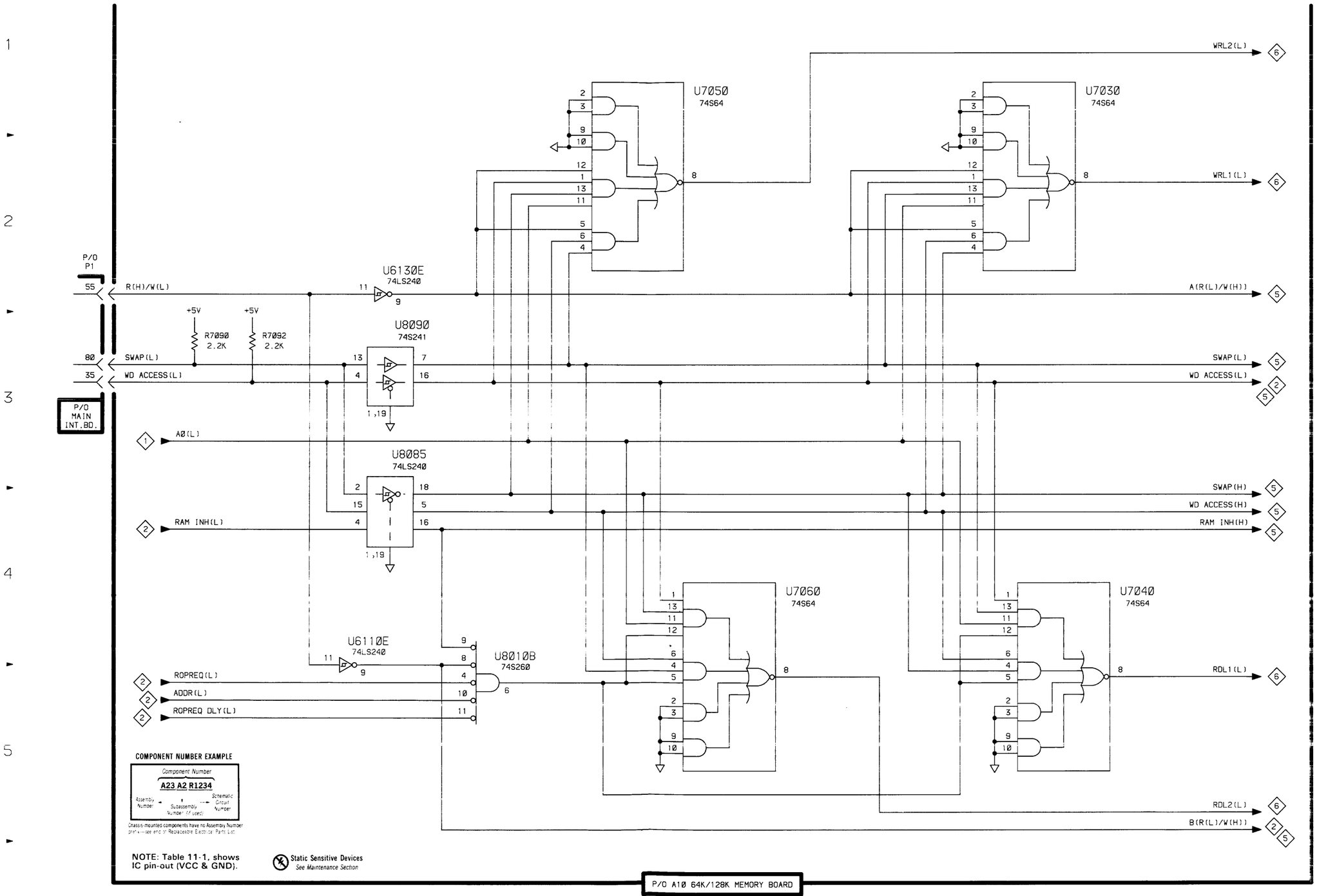


64K/128K HIGH-SPEED STATIC MEMORY SERVICE

3924-03

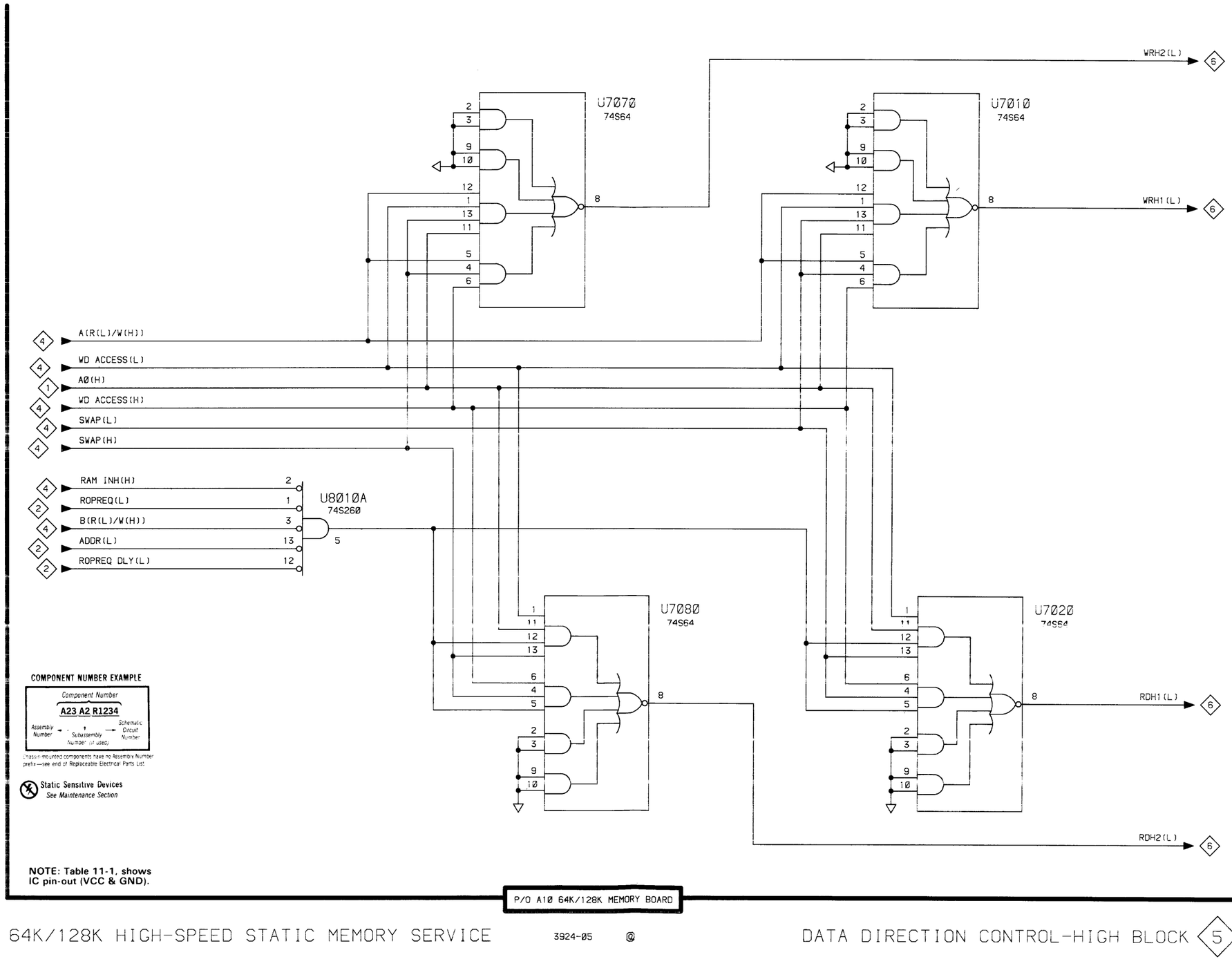
CHIP SELECT 3


P/O P1
55
R(H)/W(L)
80
SWAP(L)
35
WD ACCESS(L)
P/O MAIN INT.BD.
+5V
R7090 2.2K
+5V
R7092 2.2K
U6130E 74LS240
U8090 74S241
U8085 74LS240
U6110E 74LS240
U8010B 74S260
U7050 74S64
U7030 74S64
U7060 74S64
U7040 74S64
A0(L)
RAM INH(L)
ROPREQ(L)
ADDR(L)
ROPREQ DLY(L)
WRL2(L)
WRL1(L)
A(R(L)/W(H))
SWAP(L)
WD ACCESS(L)
SWAP(H)
WD ACCESS(H)
RAM INH(H)
RDL1(L)
RDL2(L)
B(R(L)/W(H))
COMPONENT NUMBER EXAMPLE
Component Number
A23 A2 R1234
Assembly Number
Subassembly Number (if used)
Schematic Circuit Number
Chassis mounted components have no Assembly Number prefix – see end of Replaceable Electrical Parts List
NOTE: Table 11-1, shows IC pin-out (VCC & GND).
Static Sensitive Devices
See Maintenance Section
P/O A10 64K/128K MEMORY BOARD


P/O P1
55
R(H)/W(L)
U6130E
74LS240
11
9
+5V
+5V
R7090
2.2K
R7092
2.2K
U8090
74S241
80
SWAP(L)
35
WD ACCESS(L)
13
4
7
16
1,19
P/O MAIN INT.BD.
A0(L)
U8085
74LS240
2
15
4
18
5
16
1,19
RAM INH(L)
U6110E
74LS240
11
9
9
8
4
10
11
6
U8010B
74S260
ROPREQ(L)
ADDR(L)
ROPREQ DLY(L)
U7050
74S64
2
3
9
10
12
1
13
11
5
6
4
8
U7030
74S64
U7060
74S64
U7040
74S64
WRL2(L)
WRL1(L)
A(R(L)/W(H))
SWAP(L)
WD ACCESS(L)
SWAP(H)
WD ACCESS(H)
RAM INH(H)
RDL1(L)
RDL2(L)
B(R(L)/W(H))
COMPONENT NUMBER EXAMPLE
Component Number
A23 A2 R1234
Assembly Number
Subassembly Number (if used)
Schematic Circuit Number
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List
NOTE: Table 11-1, shows IC pin-out (VCC & GND).
Static Sensitive Devices
See Maintenance Section
P/O A10 64K/128K MEMORY BOARD

A B C D E F

1 2 3 4



COMPONENT NUMBER EXAMPLE

Component Number: A23 A2 R1234
(Assembly Number — Subassembly Number (if used) — Schematic Circuit Number)

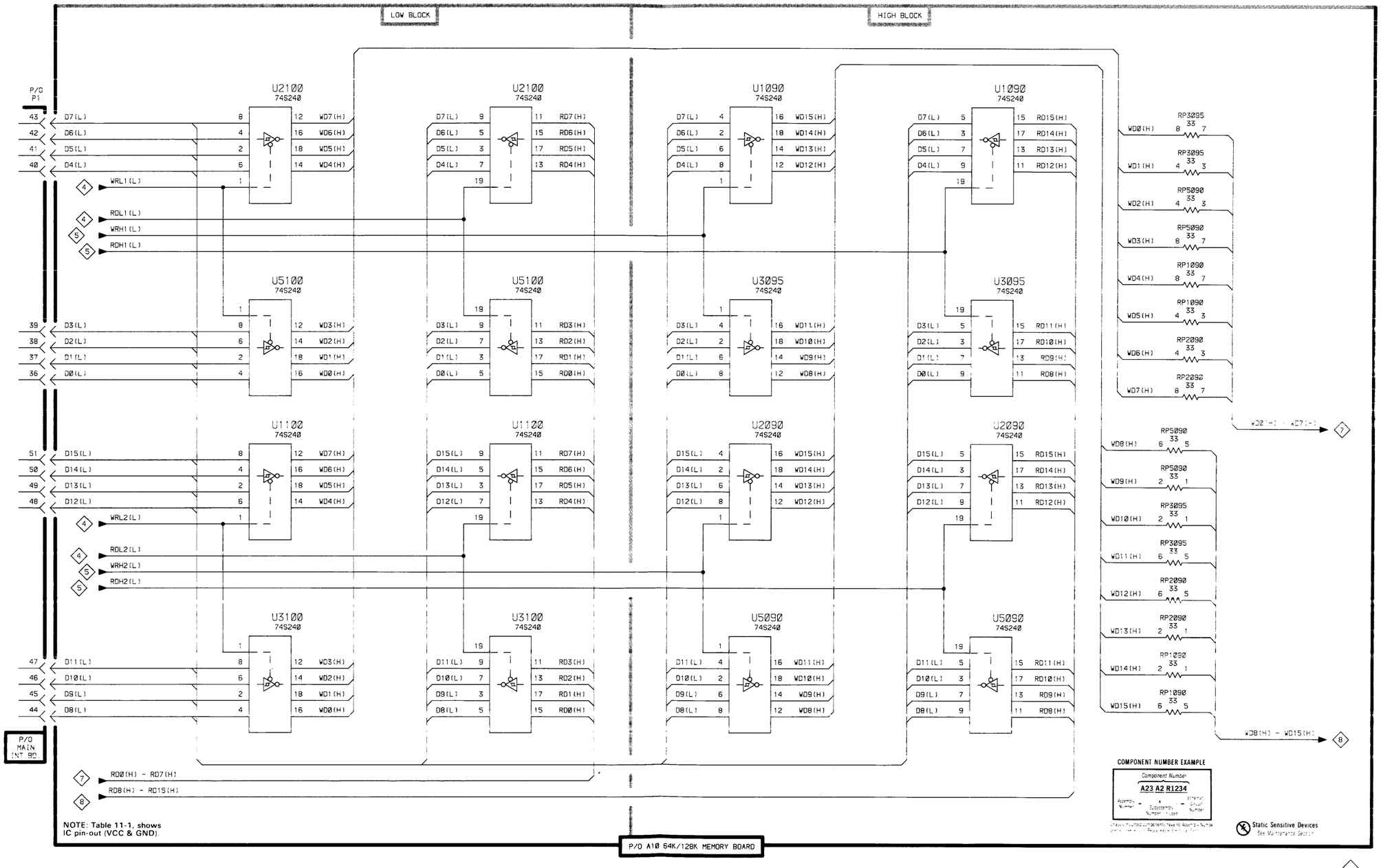
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

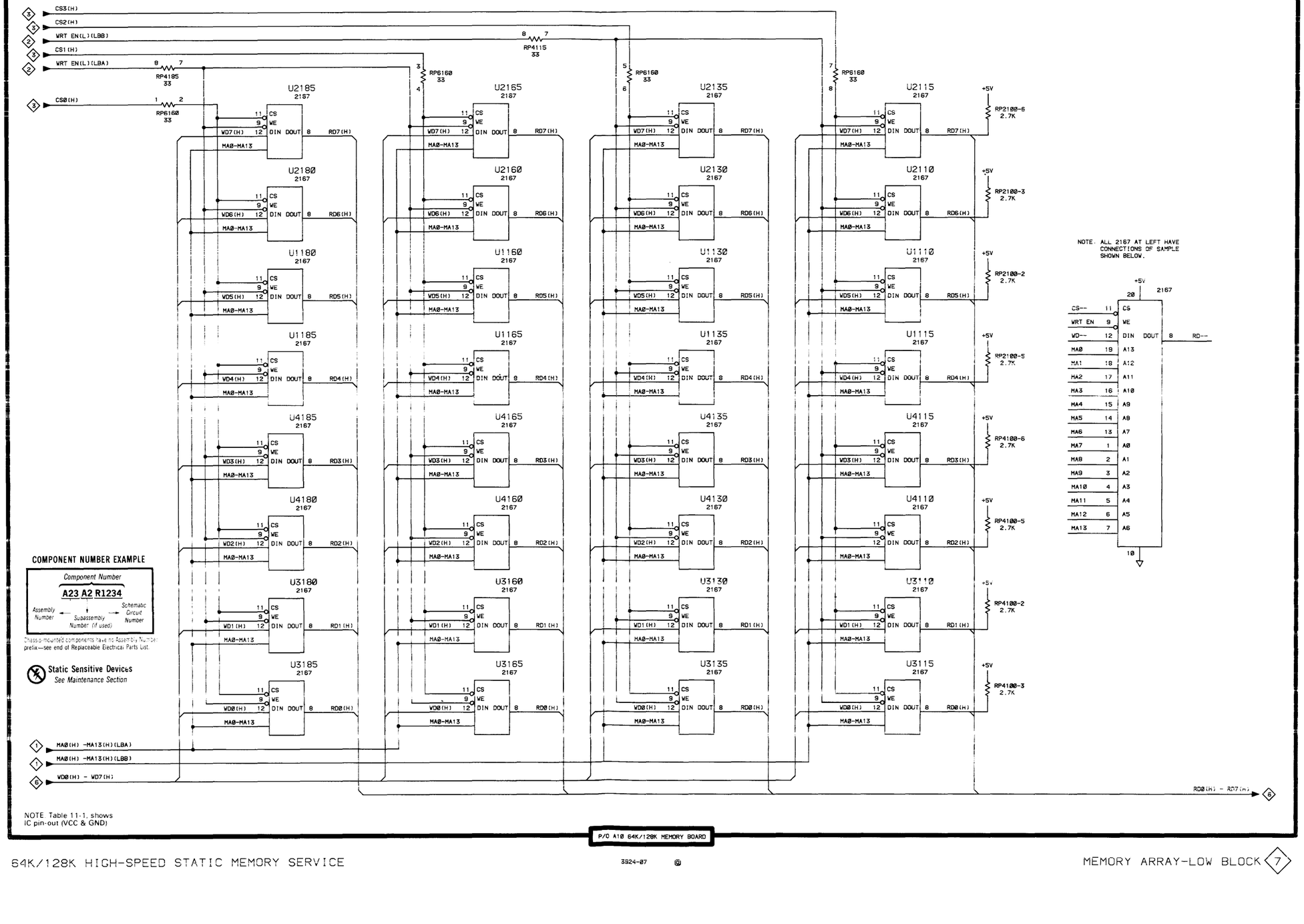
Static Sensitive Devices
See Maintenance Section

NOTE: Table 11-1, shows IC pin-out (VCC & GND).

P/O A10 64K/128K MEMORY BOARD

64K/128K HIGH-SPEED STATIC MEMORY SERVICE 3924-05 @ DATA DIRECTION CONTROL-HIGH BLOCK 5


LOW BLOCK
HIGH BLOCK
P/O P1
U2100 74S240
U5100 74S240
U1100 74S240
U3100 74S240
U1090 74S240
U3095 74S240
U2090 74S240
U5090 74S240
D7(L) D6(L) D5(L) D4(L) D3(L) D2(L) D1(L) D0(L) D15(L) D14(L) D13(L) D12(L) D11(L) D10(L) D9(L) D8(L)
WD7(H) WD6(H) WD5(H) WD4(H) WD3(H) WD2(H) WD1(H) WD0(H) WD15(H) WD14(H) WD13(H) WD12(H) WD11(H) WD10(H) WD9(H) WD8(H)
RD7(H) RD6(H) RD5(H) RD4(H) RD3(H) RD2(H) RD1(H) RD0(H) RD15(H) RD14(H) RD13(H) RD12(H) RD11(H) RD10(H) RD9(H) RD8(H)
WRL1(L)
RDL1(L)
WRH1(L)
RDH1(L)
WRL2(L)
RDL2(L)
WRH2(L)
RDH2(L)
RP3095 33
RP5090 33
RP1090 33
RP2090 33
WD0(H) WD1(H) WD2(H) WD3(H) WD4(H) WD5(H) WD6(H) WD7(H)
WD8(H) WD9(H) WD10(H) WD11(H) WD12(H) WD13(H) WD14(H) WD15(H)
WD0(H) - WD7(H)
WD8(H) - WD15(H)
P/O MAIN INT BD
RD0(H) - RD7(H)
RD8(H) - RD15(H)
NOTE: Table 11-1, shows IC pin-out (VCC & GND).
P/O A10 64K/128K MEMORY BOARD
COMPONENT NUMBER EXAMPLE
Component Number
A23 A2 R1234
Assembly Number
Subassembly Number
Identical Circuit Number
Static Sensitive Devices
See Maintenance Section



P/O A10 64K/128K MEMORY BOARD

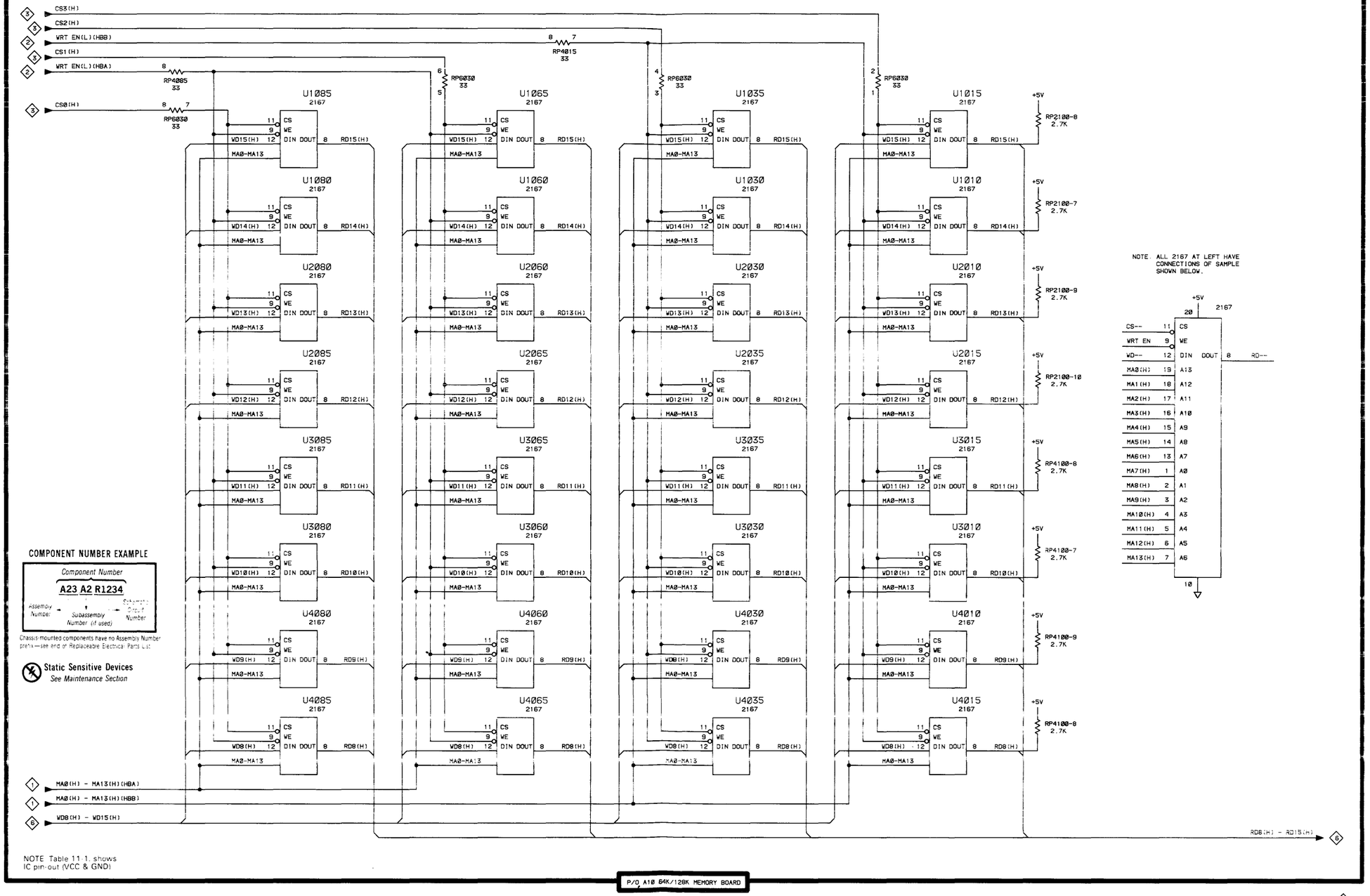

CS3(H)
CS2(H)
WRT EN(L)(HBB)
CS1(H)
WRT EN(L)(HBA)
CS0(H)
RP4085 33
RP4015 33
RP6030 33
U1085 2167
U1065 2167
U1035 2167
U1015 2167
U1080 2167
U1060 2167
U1030 2167
U1010 2167
U2080 2167
U2060 2167
U2030 2167
U2010 2167
U2085 2167
U2065 2167
U2035 2167
U2015 2167
U3085 2167
U3065 2167
U3035 2167
U3015 2167
U3080 2167
U3060 2167
U3030 2167
U3010 2167
U4080 2167
U4060 2167
U4030 2167
U4010 2167
U4085 2167
U4065 2167
U4035 2167
U4015 2167
CS WE DIN DOUT
WD15(H) WD14(H) WD13(H) WD12(H) WD11(H) WD10(H) WD9(H) WD8(H)
RD15(H) RD14(H) RD13(H) RD12(H) RD11(H) RD10(H) RD9(H) RD8(H)
MA0-MA13
+5V
RP2100-8 2.7K
RP2100-7 2.7K
RP2100-9 2.7K
RP2100-10 2.7K
RP4100-8 2.7K
RP4100-7 2.7K
RP4100-9 2.7K
RP4100-8 2.7K
NOTE. ALL 2167 AT LEFT HAVE CONNECTIONS OF SAMPLE SHOWN BELOW.
2167
CS-- WRT EN WD-- MA0(H) MA1(H) MA2(H) MA3(H) MA4(H) MA5(H) MA6(H) MA7(H) MA8(H) MA9(H) MA10(H) MA11(H) MA12(H) MA13(H)
CS WE DIN DOUT RD-- A13 A12 A11 A10 A9 A8 A7 A0 A1 A2 A3 A4 A5 A6
COMPONENT NUMBER EXAMPLE
Component Number
A23 A2 R1234
Assembly Number
Subassembly Number (if used)
Schematic Circuit Number
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List
Static Sensitive Devices
See Maintenance Section
MA0(H) - MA13(H)(HBA)
MA0(H) - MA13(H)(HBB)
WD8(H) - WD15(H)
RD8(H) - RD15(H)
NOTE Table 11-1. shows IC pin-out (VCC & GND)
P/O A10 64K/128K MEMORY BOARD

Table 11-1
IC Pin Information

DEVICE	VCC	GND
2167	20	10
74LS00	14	7
74S30	14	7
74S64	14	7
74LS86	14	7
74S133	16	8
74S240(LS)	20	10
74S241(LS)	20	10
74S260	14	7

NOTE

The following devices are not installed in the 64K Static Program Memory Board.

U1060	U3065
U1065	U3080
U1080	U3085
U1085	U3160
U1160	U3165
U1165	U3180
U1180	U3185
U1185	U4060
U2060	U4065
U2065	U4080
U2080	U4085
U2085	U4160
U2160	U4165
U2165	U4180
U2180	U4185
U2185	U8170
U3060	U8190

Table 11-3
Decoupling Capacitors
For 128K Memory

C1010	C2190	C4195
C1015	C2195	C5015
C1020	C3010	C6010
C1035	C3030	C6030
C1040	C3035	C6050
C1050	C3060	C6080
C1065	C3065	C6130
C1080	C3080	C6150
C1085	C3085	C6180
C1090	C3095	C6190
C1100	C3100	C7010
C1110	C3130	C7120
C1130	C3135	C7130
C1135	C3150	C7140
C1155	C3155	C7150
C1160	C3180	C7160
C1185	C3185	C7190
C1190	C3190	C8011
C1191	C3195	C8020
C1192	C4010	C8030
C2010	C4015	C8040
C2015	C4030	C8050
C2030	C4035	C8060
C2035	C4060	C8070
C2060	C4065	C8080
C2065	C4080	C8085
C2080	C4085	C8090
C2085	C4130	C8100
C2130	C4135	C8110
C2135	C4150	C8120
C2150	C4155	C8130
C2155	C4180	C8150
C2180	C4185	C8170
C2185	C4190	C8190

SECTION 12

REPLACEABLE MECHANICAL PARTS

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

SPECIAL NOTES AND SYMBOLS

X000	Part first added at this serial number
00X	Part removed after this serial number

FIGURE AND INDEX NUMBERS

Items in this section are referenced by figure and index numbers to the illustrations.

INDENTATION SYSTEM

This mechanical parts list is indented to indicate item relationships. Following is an example of the indentation system used in the description column.

1 2 3 4 5 Name & Description

Assembly and/or Component
Attaching parts for Assembly and/or Component
- - - * - - -
Detail Part of Assembly and/or Component
Attaching parts for Detail Part
- - - * - - -
Parts of Detail Part
Attaching parts for Parts of Detail Part
- - - * - - -

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. The separation symbol - - - * - - - indicates the end of attaching parts.

Attaching parts must be purchased separately, unless otherwise specified.

ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

ABBREVIATIONS

"	INCH
#	NUMBER SIZE
ACTR	ACTUATOR
ADPTR	ADAPTER
ALIGN	ALIGNMENT
AL	ALUMINUM
ASSEM	ASSEMBLED
ASSY	ASSEMBLY
ATTEN	ATTENUATOR
AWG	AMERICAN WIRE GAGE
BD	BOARD
BRKT	BRACKET
BRS	BRASS
BRZ	BRONZE
BSHG	BUSHING
CAB	CABINET
CAP	CAPACITOR
CER	CERAMIC
CHAS	CHASSIS
CKT	CIRCUIT
COMP	COMPOSITION
CONN	CONNECTOR
COV	COVER
CPLG	COUPLING
CRT	CATHODE RAY TUBE
DEG	DEGREE
DWR	DRAWER
ELCTRN	ELECTRON
ELEC	ELECTRICAL
ELCTLT	ELECTROLYTIC
ELEM	ELEMENT
EPL	ELECTRICAL PARTS LIST
EQPT	EQUIPMENT
EXT	EXTERNAL
FIL	FILLISTER HEAD
FLEX	FLEXIBLE
FLH	FLAT HEAD
FLTR	FILTER
FR	FRAME or FRONT
FSTNR	FASTENER
FT	FOOT
FXD	FIXED
GSKT	GASKET
HDL	HANDLE
HEX	HEXAGON
HEX HD	HEXAGONAL HEAD
HEX SOC	HEXAGONAL SOCKET
HLCPS	HELICAL COMPRESSION
HLEXT	HELICAL EXTENSION
HV	HIGH VOLTAGE
IC	INTEGRATED CIRCUIT
ID	INSIDE DIAMETER
IDENT	IDENTIFICATION
IMPLR	IMPELLER
IN	INCH
INCAND	INCANDESCENT
INSUL	INSULATOR
INTL	INTERNAL
LPHLDR	LAMPHOLDER
MACH	MACHINE
MECH	MECHANICAL
MTG	MOUNTING
NIP	NIPPLE
NON WIRE	NOT WIRE WOUND
OBD	ORDER BY DESCRIPTION
OD	OUTSIDE DIAMETER
OVH	OVAL HEAD
PH BRZ	PHOSPHOR BRONZE
PL	PLAIN or PLATE
PLSTC	PLASTIC
PN	PART NUMBER
PNH	PAN HEAD
PWR	POWER
RCPT	RECEPTACLE
RES	RESISTOR
RGD	RIGID
RLF	RELIEF
RTNR	RETAINER
SCH	SOCKET HEAD
SCOPE	OSCILLOSCOPE
SCR	SCREW
SE	SINGLE END
SECT	SECTION
SEMICOND	SEMICONDUCTOR
SHLD	SHIELD
SHLDR	SHOULDERED
SKT	SOCKET
SL	SLIDE
SLFLKG	SELF-LOCKING
SLVG	SLEEVING
SPR	SPRING
SQ	SQUARE
SST	STAINLESS STEEL
STL	STEEL
SW	SWITCH
T	TUBE
TERM	TERMINAL
THD	THREAD
THK	THICK
TNSN	TENSION
TPG	TAPPING
TRH	TRUSS HEAD
V	VOLTAGE
VAR	VARIABLE
W/	WITH
WSHR	WASHER
XFMR	TRANSFORMER
XSTR	TRANSISTOR

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
00779	AMP, INC.	P O BOX 3608	HARRISBURG, PA 17105
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077

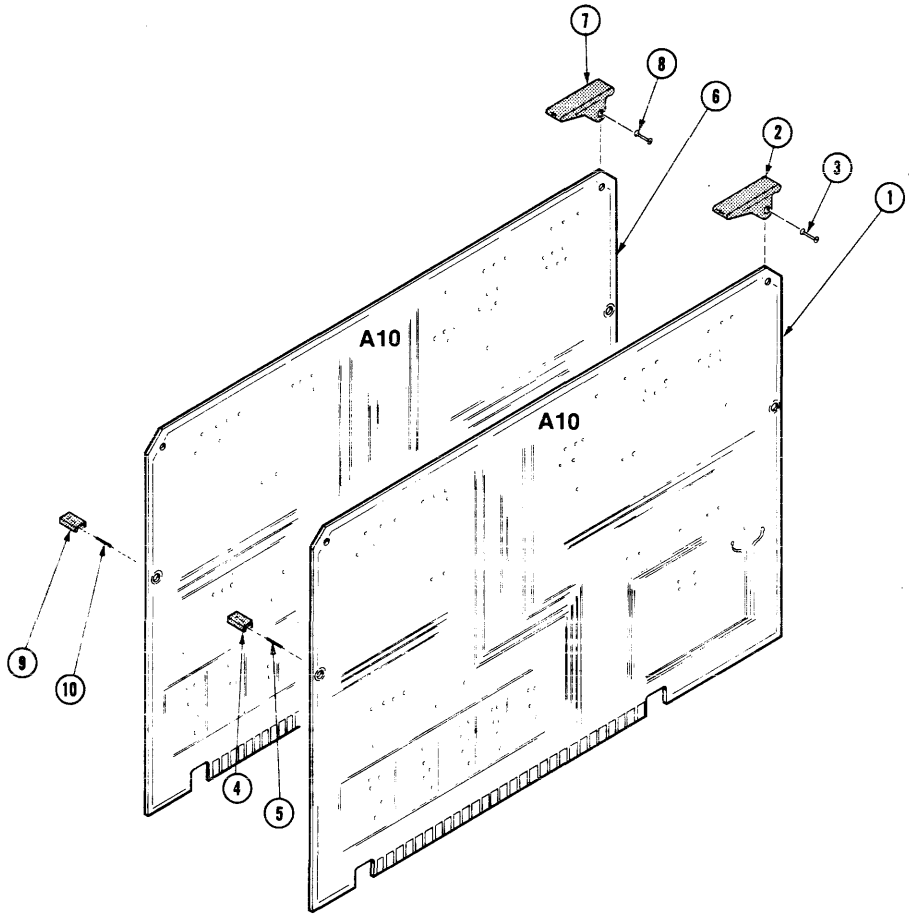


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-1	----- -----			1		CKT BOARD ASSY:LAS 64K MEMORY(SEE A10 REPL)		
-2	105-0792-00			2		. EJECTOR,CKT BD:PLASTIC	80009	105-0792-00
-3	214-1337-00			2		. . PIN,SPRING:0.10 OD X 0.25 INCH L,STL	80009	214-1337-00
-4	131-0608-00			66		. TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-5	131-0993-00			19		. BUS,CONDUCTOR:2 WIRE BLACK	00779	530153-2
-6	----- -----			1		CKT BOARD ASSY:LAS 128K MEMORY(SEE A10 REPL)		
-7	105-0792-00			2		. EJECTOR,CKT BD:PLASTIC	80009	105-0792-00
-8	214-1337-00			2		. . PIN,SPRING:0.10 OD X 0.25 INCH L,STL	80009	214-1337-00
-9	131-0608-00			122		. TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-10	131-0993-00			35		. BUS,CONDUCTOR:2 WIRE BLACK	00779	530153-2
						STANDARD ACCESSORIES		
	070-3923-00			1		MANUAL,TECH:INSTALLATION	80009	070-3923-00
	070-3924-00			1		MANUAL,TECH:SERVICE	80009	070-3924-00

Tektronix®
COMMITTED TO EXCELLENCE

MANUAL CHANGE INFORMATION

Date: 1-28-82 Change Reference: C1/182

Product: 64K/128K Static Prog. Memory Service Manual Part No.: 070-3924-00

DESCRIPTION

TEXT CORRECTIONS

SECTION 3 - OPERATING INFORMATION

Page 3-5, Read Delay Jumper Heading, the references to 20 ns (three) in the last line of paragraph one and in the second paragraph

CHANGE TO:

60 ns