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MR 8

EPROM/RAM MODULE

Micro Design PROM
2708 Reset and Go Board
$99.50

MICRODESIGN

microcomputer products

MR 8

EPROM/RAM MODULE



8187 HAVASU CIRCLE BUENA PARK CA 90621 (714) 523-8080

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1.1 INTRODUCTION

The MICRODESIGN MR 8 is an EPROM/RAM board for the S-100 BUSS. The MR 8 accepts the popular types of 2704/2708 EPROMS and 2102 type RAMS.

1.2 GENERAL DESCRIPTION

The MR 8 will accept up to eight 2704/2708 type EPROMS, each of which is individually addressable in any one Kbyte segment from zero to sixty four. In addition, space has been provided for one Kbyte of scratch pad RAM. An options jumper socket has been provided for the user to program special functions such as SHADOW which allows ROM and RAM to occupy the same addresses. PHANTOM AND $\overline{\text{PHANTOM}}$ functions allow the MR 8 to be de-selected from an external source. One wait state may be programmed, if desired, to utilize slower EPROMS.

1.3 ELECTRICAL SPECIFICATIONS

POWER REQUIREMENTS

+8 VOLTS: 350 MA (ALL ROMS AND RAMS INSTALLED)
+16 VOLTS: 400 MA (ALL ROMS INSTALLED)
-16 VOLTS: 240 MA (ALL ROMS INSTALLED)

MEMORY CAPACITY

Eight Kbytes of read only memory or seven Kbytes of ROM plus one Kbyte of random access memory.

BUSS STANDARD

Compatable with all computer systems employing the S-100 BUSS system.

1.4 PHYSICAL SPECIFICATIONS

Conforms to S-100 standard card size and connector configuration.

2.1 UNPACKING

Inspect the container upon arrival for external damage. If there is any damage, report it immediatly to your carrier. Carefully open the package and remove all the components. Inspect each part and check it with the parts list contained in this manual. If there are any shortages, notify your dealer or MICRODESIGN

2.2 ASSEMBLY PROCEEDURES

TOOLS

We recommend that a low power soldering iron with a pointed tip be used. It should be no more than about forty watts. Only a good quality rosin core solder (supplied with your kit) should be used. Acid core solder will void the warranty. Otherwise, no special tools are required.

PRE-ASSEMBLY

Remove the printed circuit board from the package and inspect it carefully for flaws or defects such as shorts or bad plated through holes. If in doubt, use an ohm meter.

I.C. SOCKETS

Install the eight 24 pin dip sockets across the top of the board as indicated on the component layout. Note that all I.C. sockets have a notch denoting pin one. This notch is oriented towards the upper left corner of the board. On the circuit board, pin one is the square pad. Next, install the eight 16 pin dip sockets supplied in their proper positions. Two will be the address and one will be the options socket. Now install the five 14 pin dip sockets in their proper positions.

2.2 ASSEMBLY PROCEEDURES CONT'D

REGULATORS

Locate the -5 volt regulator (LM 320T-5 or 7905) and bend its leads to conform to the three hole pattern on the board. Mount it, with a heat sink, on the upper left pad. Use some thermal compound (not supplied) for better heat conductivity. Next, locate the +12 volt regulator (LM 340T -12 or 7812) and mount it, as above, on the center pad. Now locate the +5 volt regulator (LM 340T -5 or 7805) and proceed as above.

INTEGRATED CIRCUITS

Using the board layout and parts list locate the ten I.C.s and install them in their proper positions. Note that pin one will be towards the upper left and is a square pad.

RESISTORS

Using the parts list and board layout, locate the six resistors and install them in their proper locations,

CAPACITORS

Using the parts list and the board layout, locate the six 10 uf capacitors (may have brown, black and blue bands) and install them in their proper locations. NOTE: POSITIVE MAY BE EITHER A PLUS SIGN OR A VERTICAL PAINT STRIPE. PROPER POLARITY MUST BE OBSERVED OR SERIOUS DAMAGE MAY RESULT.

Next locate the twelve 2.2 uf capacitors and install them as above. (these may have two red bands and a green band)

3.1 FINAL INSPECTION

Carefully inspect the board. Note that all components are in their proper positions and all polarities have been observed. Check that all solder connections have been made and no shorts exist. Remove solder flux with a stiff brush and some Isopropyl alcohol.

3.2 TESTING

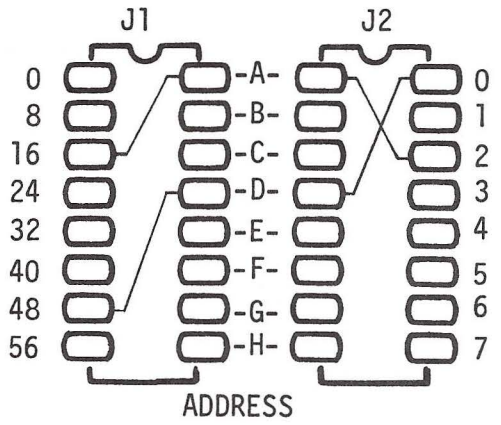
After inspection, insert the board into the computer. Do not insert any ROMS yet. Using a D.C. voltmeter, check for proper power supply voltages. +5 volts will be on the square pad of C-5. -5 volts will be on the round pad of C-6. +12 volts will be on the square pad of C-10. After all voltages have been varified. Insert ROMS and address them using the instructions contained in this manual. Note, the new EPROM sockets are tight and most PROM leads are fragile. we recommend that the sockets be loosened using an old I.C.

4.1 ADDRESSING

JUMPER SELECTION

Using the illustration below, note the two columns of figures, zero to seven and zero to fifty six. 0 to 7 are the one Kbyte segments and 0 to 56 are the eight Kbyte segments. 'A' through 'H' are the ROM chip select lines. Each of the ROM chip selects has to be connected to a location on their respective sides. Example: for the 18th Kbyte segment and the 'A' ROM, 'A' left connects to 16 and 'A' right connects to 2. Using the table in this section, find the desired HEX or OCTAL address and convert it to the decimal equivalent. Then add up the left and right columns to match and install the jumpers. The example below shows ROM 'D' addressed for $C000_h$ or 300_o. On the table that is the 48th segment. Therefore, 'D' left is connected to 48 and 'D' right is connected to 0.

Two dip headers and some small wire have been supplied. Draw a diagram for all jumpers before proceeding to prevent confusion.



4.2 TABLE OF EQUIVALENTS

HEX	OCTAL	DECIMAL
0000	000	0K
0400	004	1K
0800	010	2K
0C00	014	3K
1000	020	4K
1400	024	5K
1800	030	6K
1C00	034	7K
2000	040	8K
2400	044	9K
2800	050	10K
2C00	054	11K
3000	060	12K
3400	064	13K
3800	070	14K
3C00	074	15K
4000	100	16K
4400	104	17K
4800	110	18K
4C00	114	19K
5000	120	20K
5400	124	21K
5800	130	22K
5C00	134	23K
6000	140	24K
6400	144	25K
6800	150	26K
6C00	154	27K
7000	160	28K
7400	164	29K
7800	170	30K
7C00	174	31K

4.2 TABLE OF EQUIVALENTS CONT'D

HEX	OCTAL	DECIMAL
8000	200	32K
8400	204	33K
8800	210	34K
8C00	214	35K
9000	220	36K
9400	224	37K
9800	230	38K
9C00	234	39K
A000	240	40K
A400	244	41K
A800	250	42K
AC00	254	43K
B000	260	44K
B400	264	45K
B800	270	46K
BC00	274	47K
C000	300	48K
C400	304	49K
C800	310	50K
CC00	314	51K
D000	320	52K
D400	324	53K
D800	330	54K
DC00	334	55K
E000	340	56K
E400	344	57K
E800	350	58K
EC00	354	59K
F000	360	60K
F400	364	61K
F800	370	62K
FC00	374	63K

5.1 OPTIONS

SHADOW

When utilized, the shadow function allows alternate operation of ROM and RAM at the same addresses. Upon receiving the Power On Clear ($\overline{POC}$) from the computer BUSS, either from start-up or activation of the reset switch, The ROM at position 'H' is set up to operate. Automatic substitution of RAM occurs when a byte is written into any address within the one Kbyte segment occupied by the 'H' position. The RAM may be either the on board scratch pad or an external RAM board supplied by the user. If an external RAM board is used, it must have the $\overline{PHANTOM}$ de-select option. If the $\overline{POC}$ signal is placed on the BUSS, the MR 8 will place a logical low on BUSS line number 67 ($\overline{PHANTOM}$), de-selecting the RAM and enabling the ROM at position 'H'.

PH AND $\overline{PH}$

PHANTOM and $\overline{PHANTOM}$ allow the MR 8 to be de-selected from an external source. If a jumper is installed in PH, a high on line 67 will de-select the MR 8 and if $\overline{PH}$ is used, a low on line 67 will de-select the MR 8.

RAM ONLY

When installed, this jumper activates the on board one Kbyte of scratch pad RAM. It is addressed as the 'H' position.

EXT RAM

The external RAM jumpers are used with the shadow function to control RAM boards via the $\overline{PHANTOM}$ line. Note that there are two positions marked 'EX'. Both jumpers must be installed for proper EXT RAM operation. Both must be removed for on board RAM operation.

5.1 OPTIONS CONT'D

WAIT

One wait state may be programmed by installing this jumper. This is only necessary if ROMS slower than 500 ns are used. Otherwise do not install this jumper.

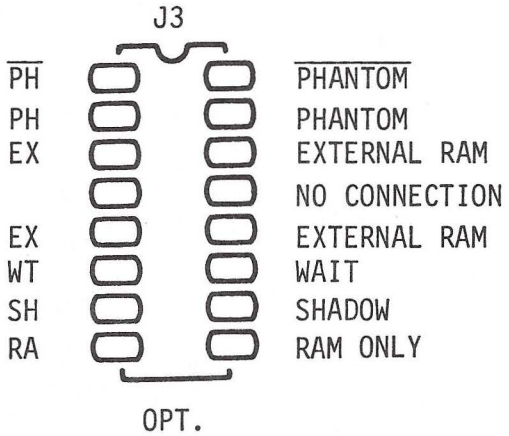
5.2 TYPICAL APPLICATIONS

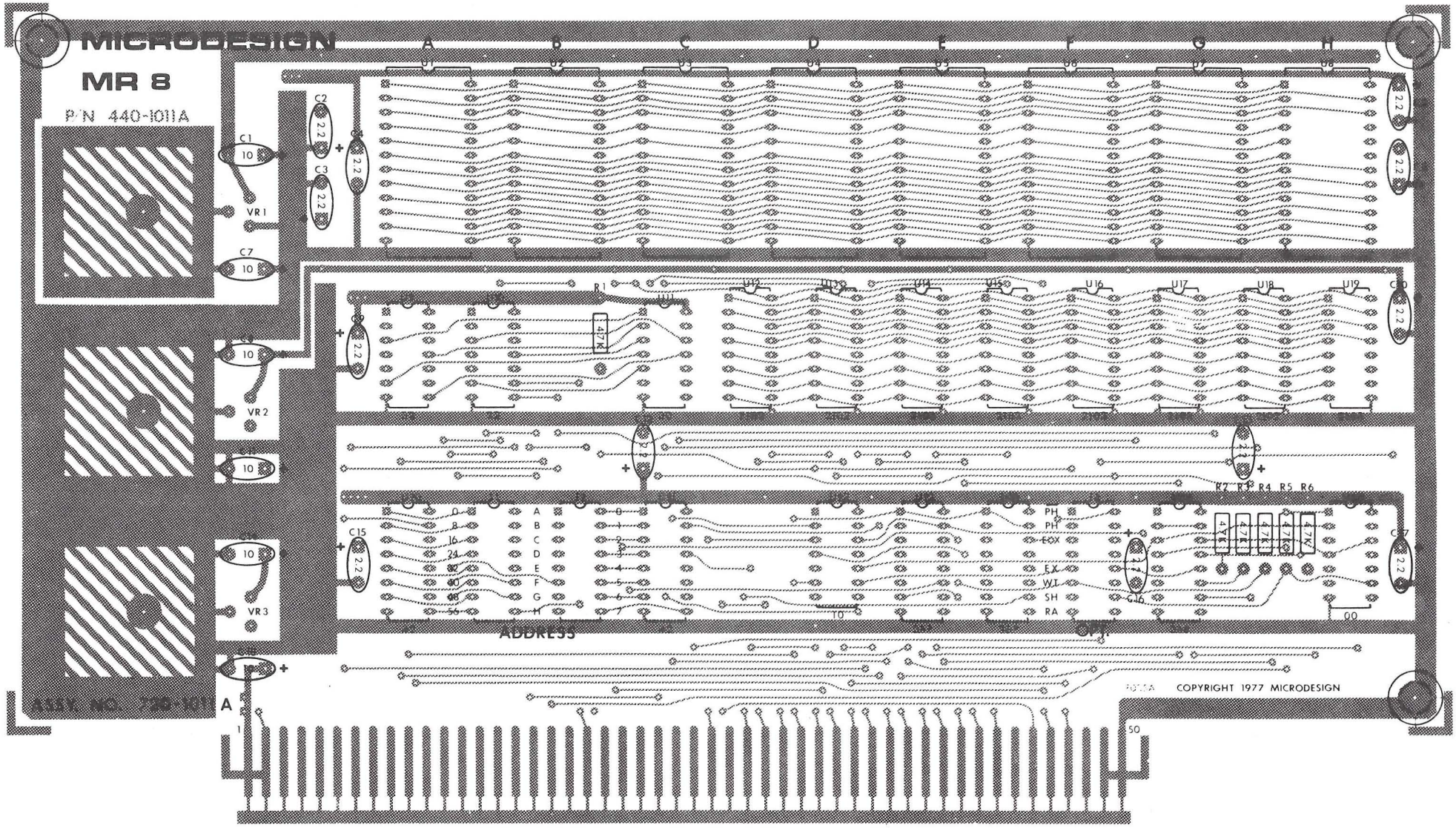
1K to 8K of ROM only: No jumpers in options area.

Up to 7K of ROM plus on board scratchpad RAM: Jumper 'RAM ONLY' (J3-8 to 9) and position 'H' addresses as RAM

Up to 8K of ROM, with SHADOW controlling external RAM: Jumper 'SHADOW' (J3-7 to 10);'EXTERNAL RAM' (J3-3 to 14) and (J3-5 to 12); Enable $\overline{\text{PHANTOM}}$ option on appropriate RAM board.

NOTE: All jumpers are straight across the socket and a dip switch may be substituted for the dip header.



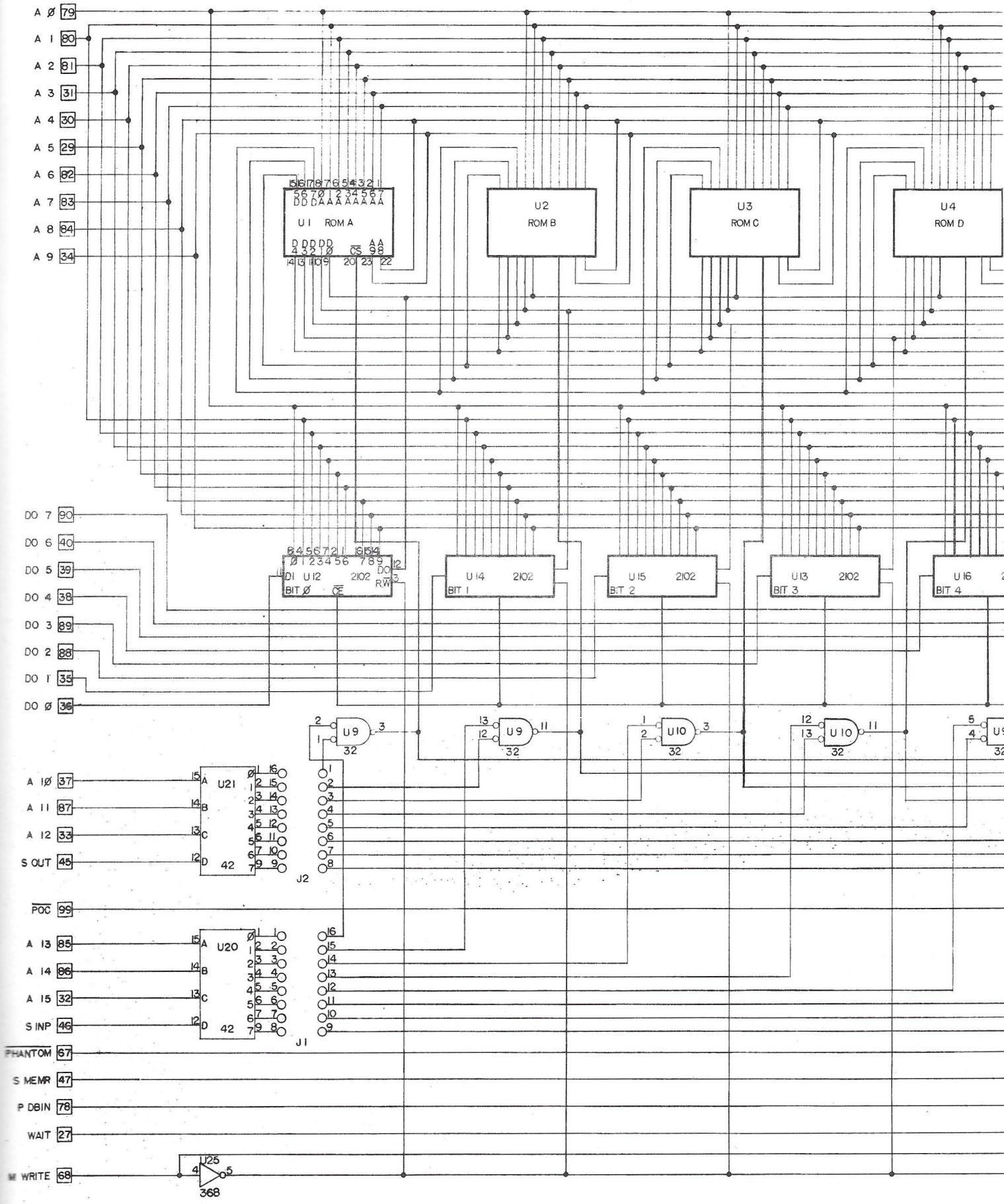

MICRODESIGN
MR 8
P/N 440-1011A
A
B
C
D
E
F
G
H
U1
U2
U3
U4
U5
U6
U7
U8
U9
U10
U11
U12
U13
U14
U15
U16
U17
U18
U19
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
C16
C17
C18
10
22
VR1
VR2
VR3
R1
R2
R3
R4
R5
R6
R7
R8
47
47K
ADDRESS
PH
PH
EOX
EX
WI
SH
RA
ASSY. NO. 720-1011
COPYRIGHT 1977 MICRODESIGN
50

MR 8 PARTS LIST

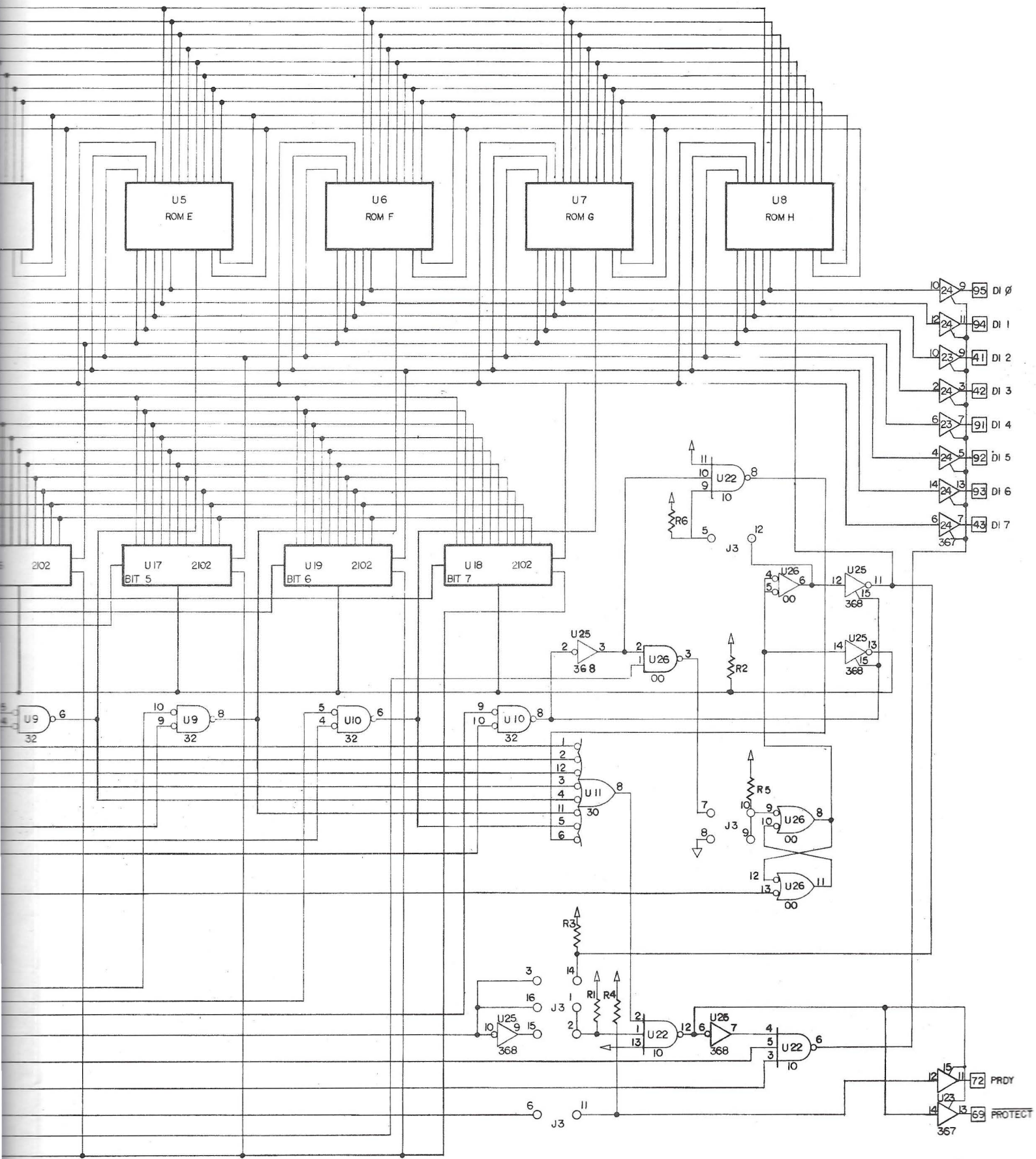
QTY USED	PART NUMBER	DESCRIPTION
1	440-1011	PRINTED CIRCUIT BOARD
1	500-2000	I.C. 74LS00
1	500-2010	I.C. 74LS10
1	500-2030	I.C. 74LS30
2	500-2032	I.C. 74LS32
2	500-2042	I.C. 74LS42
2	500-1367	I.C. 74367
1	500-2368	I.C. 74LS368
1	503-1805	REGULATOR 7805(LM340T-5)
1	503-1812	REGULATOR 7812(LM340T-12)
1	503-1905	REGULATOR 7905(LM320T-5)
6	522-1472	RESISTOR 4.7K 1/4W
6	534-1106	CAPACITOR 10uf 25V
12	534-1225	CAPACITOR 2.2uf 25V
5	563-1214	I.C. SOCKET 14 PIN
8	563-1216	I.C. SOCKET 16 PIN
8	563-1224	I.C. SOCKET 24 PIN
3	564-1016	DIP HEADER 16 PIN
3	565-1004	HEAT SINK
3	210-1620	BOLT 6-32X3/8
3	220-1618	NUT 6-32x1/4
3	231-1628	WASHER, LOCK #6
1	401-1101	MANUAL

MR 8-RA ADDITIONAL PARTS

8	563-1216	I.C. SOCKET 16 PIN
8	504-2102	I.C. 2102-1



NOTE: 1. ALL RESISTORS 4700 OHM 5% 1/4W 2. SYMBOL (4) IND. CONNECTION TO +5V



REV A © 1977 MICRODESIGN MR 8

APPENDICES

SPECIAL APPLICATIONS

If desired, the on board RAM may be used for stack area etc, at the same time as the shadow and external RAM functions are used. This may be accomplished by cutting the trace at U-25 pin 13 (component side) and running a short piece of wire from U-11 pin 5 to U-12 pin 13. This removes the RAM chip select from the 'H' position and places it on the 'G' position. Do not install a ROM in the 'G' position. Address the 'G' position as desired for the stack area.

AUTOMATIC DE-SELECT OF SHADOW ROM

If SHADOW is being used, and a jump is executed to another ROM on the MR 8, such as a monitor at a higher memory location, Automatic de-select of the SHADOW ROM and re-enabling of RAM may be accomplished by removing the SHADOW jumper (J3-7 to 10), and installing a wire from (J3-10) to the chip select ($\overline{CS}$) of the ROM that is the jump destination.

EXAMPLE: A monitor residing at $F000_h$ is installed at ROM position 'A'. The SHADOW ROM, at position 'H', contains a jump to that address. Run a jumper from (J3-10) to (U1-20). Remove SHADOW jumper from OPTIONS SOCKET.

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