IMSAI

PROM-4

THEORY OF OPERATION

The PROM-4 board provides up to 4K of addressable Read-Only-Memory, utilizing the Intel 8702-1702 PROM devices. The board contains 256 bytes of memory for each 8702-1702 chip installed.

Address lines A0 through A7 are run directly to all PROM positions to select one of the 256 internal byte positions, while address lines A8 through A11 are used to select and enable one particular PROM position through 8205 decoders. Address lines A12 through A15 are jumper-selected to determine the board's enabling address.

The board is enabled when the 74LS30 NAND (C1) inputs are all high, namely when the selected address appears on the address bus, and the Status line SMEMR is high. The Processor Ready line is controlled by a 74195 shift register via an 8T97. The 74195 provides a user-selected memory read delay, selectable with jumpers in the delay select socket. The 74195 shift register is reset on the rising edge of the inverted Board Enable (BDENA) signal.

When addressed and enabled, an 8702-170Z PROM puts out its data on the D0 through D7 lines. The data output lines of all PROMS are tied to these lines, and these lines are buffered via 8T97 sections to the DI0 through DI7 back plane bus lines.

Power for the card logic is provided by a +5 volt regulator and a -5 volt regulator-4 volt zener combination to yield +5 and -9 volts. Tantalum and disc ceramic by-pass capacitors eliminate noise from the power distribution busses.

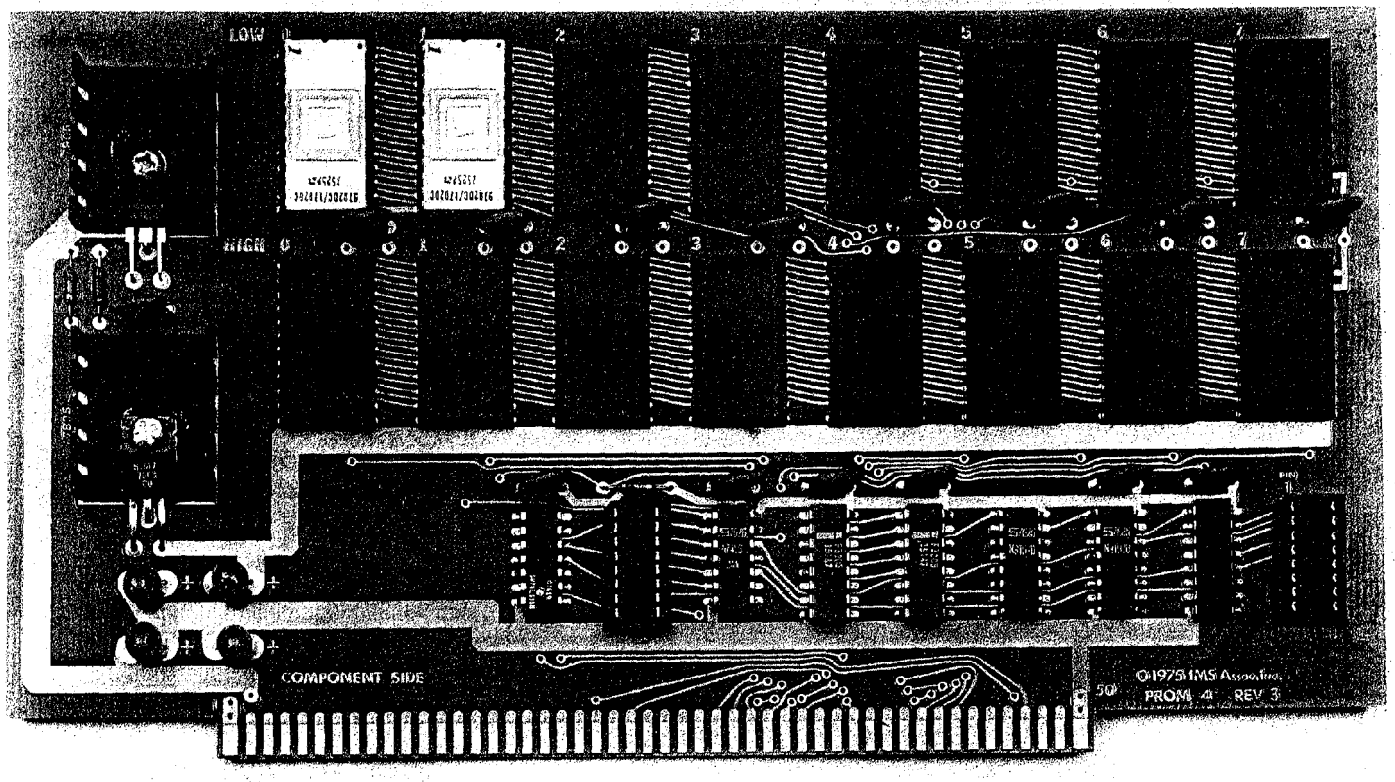
FUNCTIONAL DESCRIPTION

The IMSAI PROM-4 Board supports up to 4K bytes on non-volatile, read-only memory. Designed to utilize the Intel 1702 or 8702 read-only memory devices, the PROM-4 board may be flexibly configured to contain up to 4K bytes in 256 byte increments. The board address can be switch or jumper-selected to any 4K block of the computer's 64K memory space. Tri-state bus drivers and fully-de-coupled on-card voltage regulators provide reliable plug-in compatibility with the IMSAI 8080 (S100).

The PROM-4 board provides sockets for 16 1702 or 8702 PROMs. The socket locations are marked for easy selection of PROM addresses. A user-selectable memory read delay allows efficient use of fast or slow PROM devices. (Please consult the User's Guide for additional information about this feature.) Two on-card regulators provide the +5 and -9 volts required by the 1702-8702 chips.

The PROM 4-4 board contains a full 4K block of PROM (8702 or 1702). PROM 4-512 contains 512 bytes of PROM (two 8702's or 1702's) which may be expanded through the use of an expansion module MM702-5. Each expansion module provides an additional 512 bytes of PROM capability. .

Physically, the PROM-4 board is G-10 equivalent, 1/16" thick glass fiber reinforced laminate. Plated through-holes eliminate jumpers, and the edge connector contact fingers are gold plate over nickel for reliable contact and long life. The board measures 5" x 10" and uses the standard 100 pin edge connections to the back plane. Discrete components are of the highest quality with tantalum by-pass and ceramic de-coupling capacitors. Both on-card voltage regulators are fully protected against short circuits and thermal overloads.



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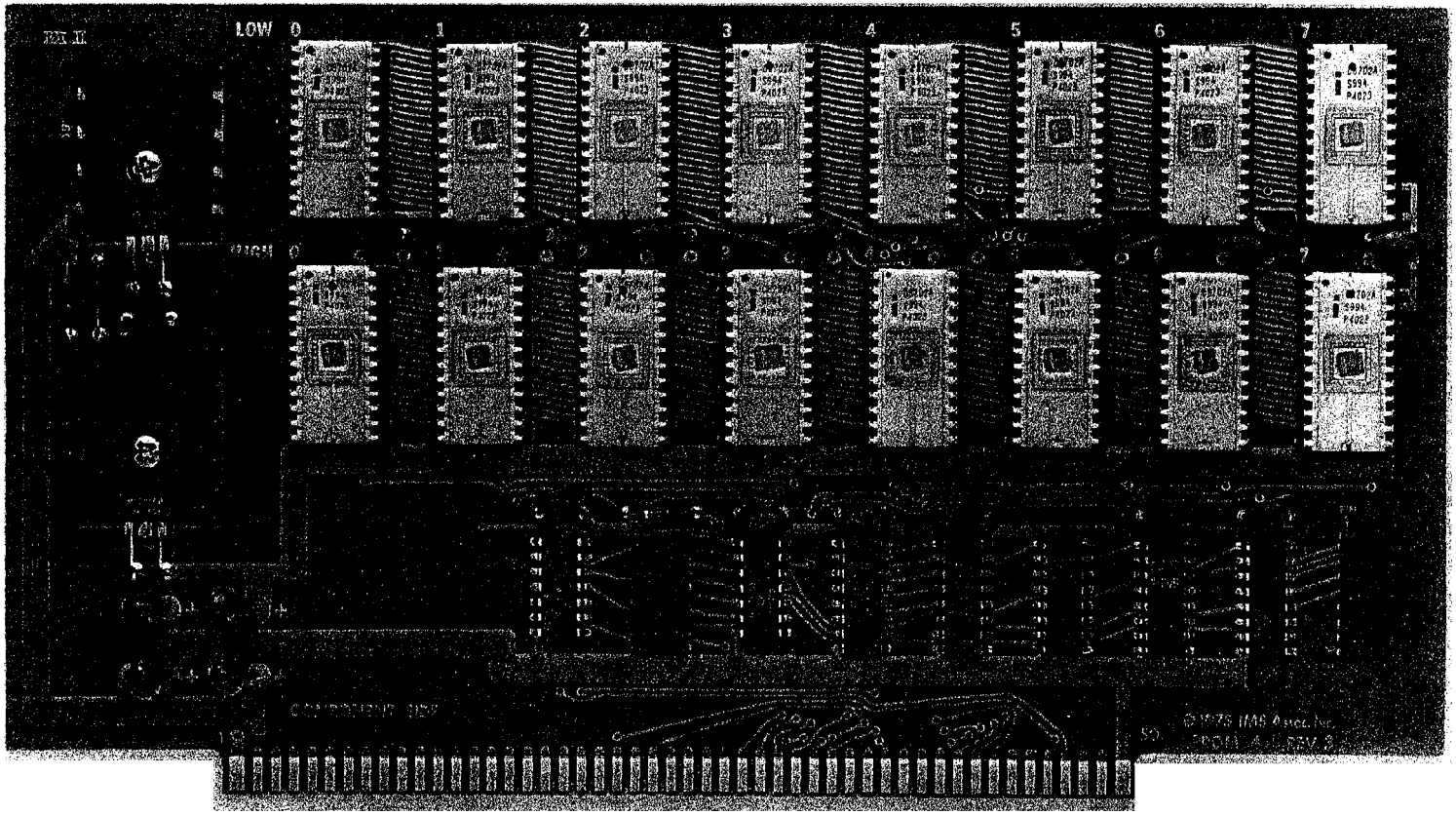

LOW
0
1
2
3
4
5
6
7

BOARD: PROM 4

ITEM	IMSAI PART #		QUANTITY	DESCRIPTION/IDENTIFYING MARKS
Solder	15-0000001		10'	
Heat Sink	16-0100002		2	Thermalloy Heat Sink/6106B-14
Screw	20-3402001		2	6-32x3/8" Phillips Pan Head Machine Screw
Nut	21-3120001		2	6-32 Hex Nut
Lockwasher	21-3350001		2	#6 Internal Star Lockwasher
Header	23-0400001		2	16 Pin IC Header
Socket	23-0800001		2	16 Pin Solder Tail Socket
Socket	23-0800002		16	24 Pin Solder Tail Socket
Resistor	30-4100362		2	1K Ohm, ¼Watt Resistor/brown, black, red
Capacitor	32-2010010		15	.1uf Disk Capacitor
Capacitor	32-2233070		4	33-25 Tantalum Capacitor (or 22-25)
Diode	35-1000004		1	Zener Diode (brown, violet)/1N748
8T97	36-0089701		2	Hex Tri-State Buffer/N8T97B
74LS04	36-0740402		1	Hex Inverter (Low Power Schottky)/SN74LS04N
74LS30	36-0743002		1	8 Input NAND (Low Power Schottky)/SN74LS30N
7805	36-0780501		1	5 V. Positive Voltage Regulator/MC7805CP
7905	36-0790501		1	5 V. Negative Voltage Regulator/MC7905CP
8205	36-0820501		2	Binary Decoder/8205
1702a	36-0870201	(for 4-4) (for 4-512)	16 2	Programmable Read Only Memory (256x8)/White and Gold Chip /C8702A
74195	36-7419501		1	4-Bit Parallel I/O Shift Register/SN74195N
PC Board	92-0000014		1	Printed Circuit Board/PROM 4

ASSEMBLY INSTRUCTIONS

( ) 1. Unpack your board and check all parts against the parts list enclosed in the package.

( ) 2. If gold contacts on the edge connector appear to be corroded, use pencil eraser to remove any oxidation. NOTE: Do not use Scotchbright or any abrasive material as it will remove the gold plating.

RESISTOR INSTALLATION

( ) 3. Insert and solder each of the two 1K ohm, ¼ watt resistors (brown, black, red) at locations R1 and R2 as shown on the Assembly Diagram.

( ) 4. Insert and solder the 3.9 volt zener diode (brown/violet) at location Z1 as shown on the Assembly Diagram.

DISCRETE COMPONENT INSTALLATION

( ) 5. Insert and solder each of the two 16 pin IC sockets at locations C2 and C9 as shown on the Assembly Diagram. Plug in the jumper headers. See User Guide section for jumper wire connections(s).

( ) 6. Insert and solder each of the fifteen .1uF capacitors at locations C1 and C6 through C19 as shown on the Assembly Diagram.

( ) 7. Insert and solder each of the three 33uF capacitors at locations C2 through C5 as shown on the Assembly Diagram.
NOTE: Observe polarity (+ to +) as shown on the board.

IC INSTALLATION

NOTE: All IC Pin 1's point toward the upper left hand corner as noted on the board.

( ) 8. Insert and solder the one 74LS04 at location C3.

( ) 9. Insert and solder the one 74LS30 at location C1.

( ) 10. Insert and solder the one 74195 at location C8.

( ) 11. Insert and solder the two 8205's at locations C4 and C5.

( ) 12. Insert and solder the two 8T97's at locations C6 and C7 as shown on the Assembly Diagram.

( ) 13. PROM 4-4:
Insert and solder the 16 24-pin sockets at locations A1 through A8 and B1 through B8. Insert the 1702A's (or 8702A's) into their appropriate locations. See the User Guide section, Table 1 for these locations.

PROM 4-512:
Determine the appropriate locations for the 512 bytes of PROM by consulting the User Guide (Table 1). Then insert and solder the two 24-pin sockets into the selected locations. Finally, insert the two 1702A's (or 8702A's) into their respective sockets.

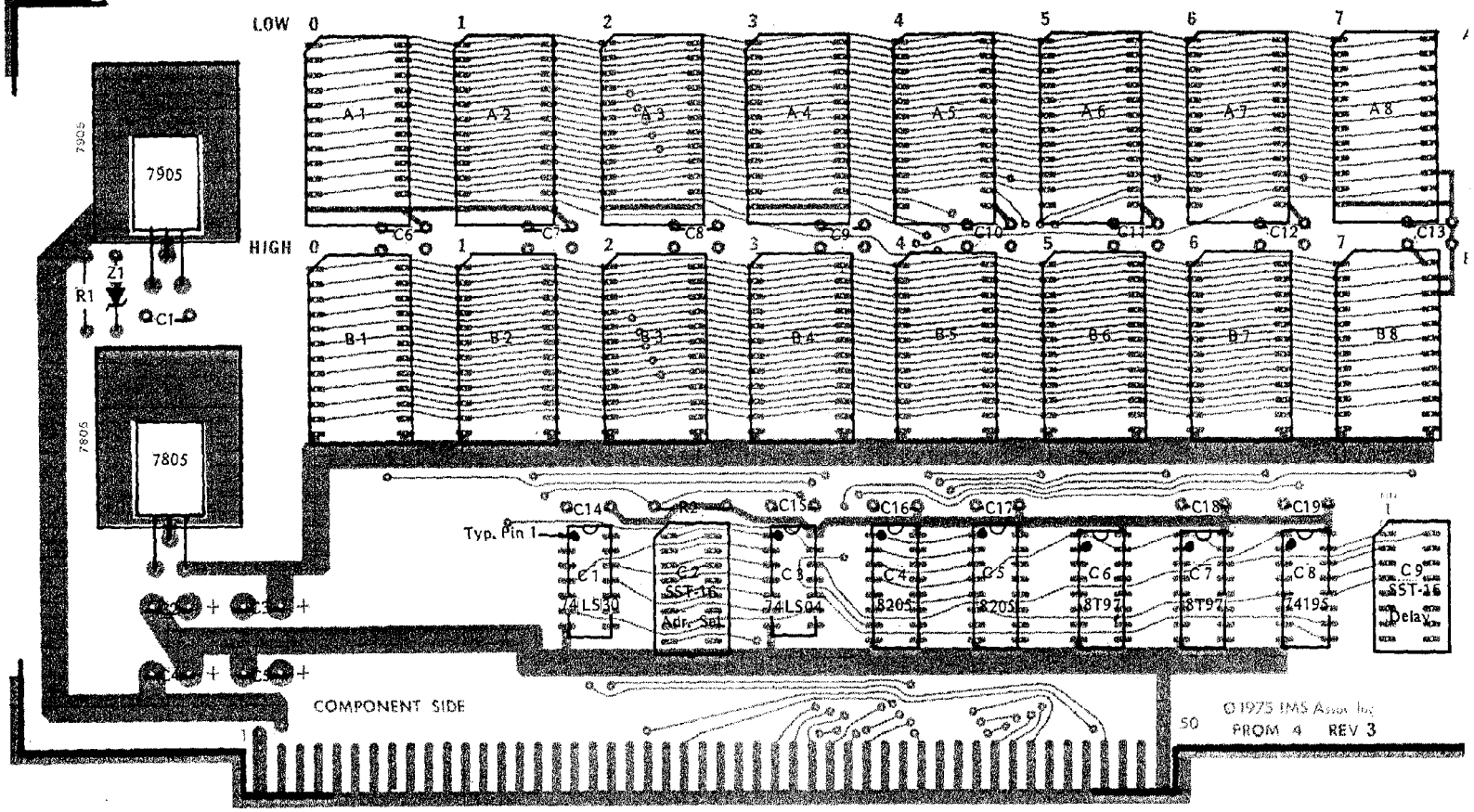
REGULATOR AND HEAT SINK INSTALLATION

CAUTION NOTE: The 7805 and 7905 regulators are physically similar. The identifying number is located immediately below the center hole. Be certain you are using the correct device in each location!

( ) 14. Before installing the heat sink and regulator, bend the 7805 regulator leads at 90 degree angles to facilitate mounting on the heat sink.

( ) 15. Insert the #6 screw through the 7805 regulator and heat sink on the component side of the board and attach through the lockwasher and nut on the circuit side of the board. Tighten the screw carefully to insure proper alignment of the heat sink to prevent shorting to adjacent traces. Solder in the 7805 leads.

( ) 16. In a similar manner install the 7905 regulator and its heat sink, following instructions 14 and 15 above.



IMS Associates Inc.

ASSEMBLY DIAGRAM

PROM 4 REV 3 2/76

2/27/76

USER GUIDE

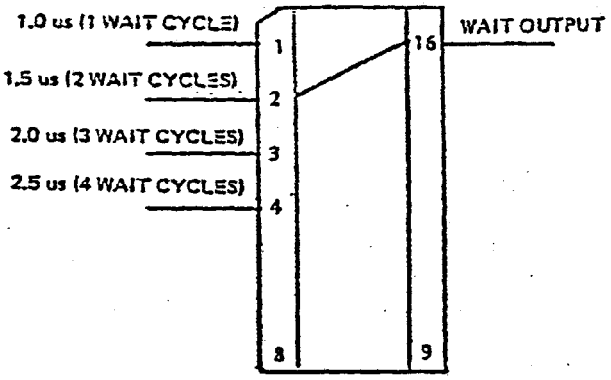
The PROM-4 board uses Intel 8702 or 1702 ROM chips which are structured 256 x 8 bits so that the minimum increment possible in memory space is 256 bytes or 1 8702-1702 chip. The board is designed to contain up to 16 8702-1702 devices, which is the full 4K of PROM. Each of the 16 PROM sockets has its own unique address, and each PROM operates independently of any other PROM. Thus, the user may structure his/her memory space in any way desired merely by placing his/her PROM(s) in the desired location(s).

The PROM-4 board is structured so that the memory address corresponds to a physical location on the board. The PROM sockets are arranged in a 2 x 8 rectangular array, and a particular PROM socket is addressed by address bits A8, A9, A10 and A11. A particular byte in the selected PROM is addressed by address bits A0 through A7. The sockets are labelled LOW 0 through 7 and HIGH 0 through 7. Table 1 should clarify the relationship between address and selected socket.

TABLE 1

ADDRESS				SOCKET
A11	A10	A9	A8	ADDRESSING
0	0	0	0	L0
0	0	0	1	L1
0	0	1	0	L2
0	0	1	1	L3
0	1	0	0	L4
0	1	0	1	L5
0	1	1	0	L6
0	1	1	1	L7
1	0	0	0	H0
1	0	0	1	H1
1	0	1	0	H2
1	0	1	1	H3
1	1	0	0	H4
1	1	0	1	H5
1	1	1	0	H6
1	1	1	1	H7

DELAY SELECTION SOCKET



The delay jumper socket (C9) of the PROM-4 board allows the selection of one of four possible memory read cycle delays. The available delay times are 1, 2, 3, or 4 machine cycles, which translates to 1000, 1500, 2000 and 2500 nanoseconds. This read cycle delay is necessary to insure the data from PROM is correct before transmission to the data bus. Most 1702-8702 chips available are either 1000 or 1500 nanosecond access time chips. The chips provided by IMSAI with the PROM-4 board are 1000 ns access time devices. After determining the access time of the slowest PROM on the board, the user should jumper the delay socket to produce that necessary delay.

Table 2 lists jumper pin numbers for the possible delays. In all cases, jumper the selected pin to pin 16.

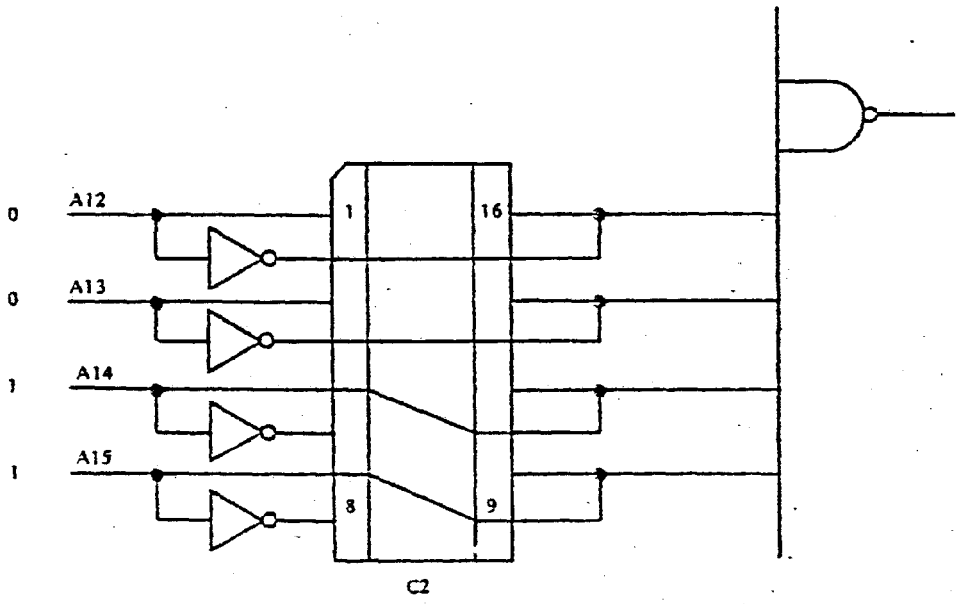
TABLE 2

Delay (ns)	Pin #
1000	1
1500	2
2000	3
2500	4

The example at the top of the page is jumpered for a 1500 ns delay.

Board Addressing

An example jumper for the Address Block beginning with the Address C hex:



The board address select jumper location is C2. It permits any one of the 16 possible 4K blocks of memory space to be jumpered to form the board enable.

The jumper location accepts a standard 16 pin IC socket and the jumpers can be soldered on to a header which can be plugged into the socket and changed easily without any resoldering from the board.

After selecting a board address, the user must properly jumper the socket. Very simply, to enable the board, all address inputs to the NAND gate must be high. Therefore, any address bit not a 1 at the selected address should be inverted before connection to the NAND input.

Address bits 12, 13, 14 and 15 are available on pins 1, 3, 5 and 7 and their respective complements on pins 2, 4, 6 and 8. These signals should be jumpered to the input of the board select circuitry which appears on pins 9 through 16. An 8 position DIP switch similar to that

used for write enable may be inserted into this location should very frequent changes of address be desired. For a board whose address is expected to remain the same, jumpers may be inserted directly on the board.

It is suggested that pins 9, 11, 13 and 15 be used to input as desired either a 0 or a 1 from the address bits so that for any address bits desired to be 0, the jumper will extend directly across the header and for any address bits desired to be 1, the jumper will extend diagonally across the header. For instance, if A16 were to be 1, the jumper would extend from pin 7 to pin 9. This makes it easy to visually tell what address the board is jumpered for.