SUPER EXPANSION

FOR THE

SUPER ELF

If you have any questions
or problems with your SUPER EXPANSION

Write to:

SUPER EXPANSION QUEST ELECTRONICS
P.O. Box 4430 Santa Clara, CA 95054

LIMITED WARRANTY

QUEST ELECTRONICS INC. warrants this product as follows.

All components are first quality and are procured from reputable distributors and/or factories and their representatives, and any part which fails because of defects in manufacturing or material will be replaced at no charge for a period of 90 days from the date of purchase for kits and one year for assembled products as shown on customers invoice.

Should the product fail to perform satisfactorily, return it prepaid to QUEST and it will, at our option, be repaired or replaced free of charge, providing the unit is received during the warranty period. This warranty is invalid if the product has been misused, damaged, or modified. Warranty is limited to replacement of defective parts and no responsibility is assumed for damage to other equipment.

This warranty is made in lieu of all other warranties expressed or implied.

REPAIR POLICY

All units returned to QUEST not covered by our warranty will be repaired under the following policy.

A minimum service charge of $15.00 will be required on all non-warranty repairs. Repair costs will be calculated on parts cost plus labor at $25.00 per hour.

Quest will contact the customer for approval if the total charges will exceed $30.00. The repaired unit will be returned COD for shipping and repair charges. Allow 3 to 4 weeks for processing.

CONTENTS PAGE

CONTENTS PAGE

FIGURES

CONTENTS PAGE

*Appendices B thru H Supplied with their associated option kit.

I. INTRODUCTION

1. MANUAL CONTENTS

This manual consists of two major sections and eight appendices. The two sections cover; a) A description of the external connections required and, b) Operational considerations. The eight appendicies cover the basic SUPER EXPANSION and its seven options. Appendix A covers the assembly and checkout of the basic SUPER EXPANSION. Appendicies B thru H each cover the assembly and checkout of their associated option kit.

II. INTERFACING

+5R +8U -16U +12U -5R +12R +16U

1. EXTERNAL CONNECTIONS

The power supply connections are located along the left edge near the bottom of the board. Starting in the lower left hand corner, and working up towards the middle of the board, there are eight (8) pads for power. The first is (1) =5 Volts(4),-16 Volts (5),-12 Volts(6)-5 Volts(7) + 12 Volts(8) +16 Volts. The trace around the outside edge of the board on the component side is +5 Volts. The trace around the outside edge of the board on the solder side is ground (just like the SUPER ELF).

2708 ROM +12V ±5% -5V

The basic board requires only +5 Volts for operation. The other voltages are required in differing combinations depending upon the options installed. Along the bottom edge on the left are connections for the 20MA Current Loop, Cassett Tape Recorder and, RS232 Serial Interface. On the left side at the bottom are the 16 Pin Dip sockets for the Parallel Input and Output Ports (refer to figure 1). These pads (power and (I/O) are designed to fit the standard MOLEX type single row pin connectors and these connectors are strongly recommended. Proper connectors are available from QUEST or from your local MOLEX dealer.

2. SUPER ELF CONNECTIONS

The SUPER EXPANSION is connected to the SUPER ELF using the 50 pin expansion bus. There are two sets of 50 pin bus connections on the SUPER EXPANSION and several ways to connect the two boards together.

A. Using a 50 pin male connector on the solder side of the SUPER ELF and a 50 pin femal connector on the solder side of the SUPER EXPANSION (using the connections FARTHEST from the edge) the two boards can be connected back to back and slid into the proper slots in the SUPER ELF case. All options except the S100 board option (with the S100 boards installed in) will fit in the case.

B. Using a 50 pin male connector on the solder side of the SUPER ELF and a 50 pin male connector on the component side of the SUPER EXPANSION (using the connectors NEAREST the edge) the two boards can be connected together using a 50 pin ribbon cable no longer than 6 inches. This approach will also fit in the SUPER ELF case (early cases may require slight modification to provide clearance for the ribbon cable).

C. The connections may be made by soldering wires no longer than 6 inches between the two boards. If you use this approach be very careful to make the connections correctly and look out for shorts. If you choose this method and IN or OUT of warranty work is required both the SUPER EXPANSION and the SUPER ELF must be returned as a unit.

NOTE: Option C (hard wiring) is NOT RECOMMENDED and is only included for those hardy people who INSIST on a kludge full of potential problems. The connectors and ribbon cable are STANDARD AP PRODUCTS parts and available from QUEST or any AP PRODUCTS Dealer. Refer to Figure - 2 for connector placement and cable routing.

3. SUPER ELF MODIFICATIONS

The following modifications must be made to your SUPER ELF when you connect the SUPER EXPANSION.

A. Modifications for Version 3

1) Cut J2

2) Connect a jumper from the anode of D10 to the cathode of D16 (by passes D10, D12, D14 and D16).

3) Connect a jumper from the anode of D11 to the cathode of D17 (by passes D11, D13, D15, and D17).

4. Disconnect the plug in transformer.

B. Modifications for Version 2.

1) Connect a jumper wire from the 50 pin bus PIN36 to U10P1.

2) Connect a jumper wire from the 50 pin bus PIN 37 to U10P4.

3) Also make all Versions 3 modifications.

C. Modifications for Version 1

1) Make the expansion bus revisions on page 89 of the SUPER ELF manual.

20 Make all Version 2 modifications.

IMPORTANT NOTE: If the HIGH ADDRESS Option is not installed you MUST (as a minimum) install U17,U18,&U22.

III OPERATION

1. POWER SUPPLY REQUIREMENTS

The +8 - 16 and +16 Volt supplies may be unregulated. The +8 Volt supply should be between 7.5 Volts and 10 Volts under load. The ± 16 Volt supplies should be between 15 Volts and 20 Volts under load. The unloaded voltages should not exceed 12 Volts and 22 Volts respectifully. The ± 5 and ± 12 Volt supplys must be within 5% at ALL times. Faliure to meet the above requirements automatically voids the warranty and can damage both the SUPER EXPANSION and the connected SUPER ELF. There are two ways to power the basic SUPER EXPANSION/ SUPER ELF.

A. Supply +7.5 to +10 Volts at 3 Amps unregulated to the SUPER EXPANSION and install the +5 Volt regulator option.

B. Supply +7.5 to +10 Volts at 2 amps unregulated and supply +5 volts at 1 1/2 Amps. NOTE: Be sure that the 5 Volt supply measures 5.0 ±0.25 Volts AT THE SUPER EXPANSION. This is CRITICAL to proper operation.

NOTE: All power supplied to the SUPER EXPANSION and SUPER ELF MUST be switched at the SAME TIME i.e. ONE common ON/OFF switch. Failure to follow this instruction may damage components and automatically voids the warranty.

Some options require additional supply voltages. A basis unregulated supply capable of +8 Volts at 5 Amps and ±16 volts at 1/2 amp is an adequate unregulated supply and by adding 5 and 12 Volt regulators is capable of providing power for all options (including up to 16k of static s-100 ram). An inexpensive general purpose small computer supply is available from QUEST which meets the above requirements.

Care must be taken to insure that operating voltages are within specification. Improper operation and/or component damage can occur if supply voltages are incorrect. This constraint is not always stated but is common to all MOS/TTL integrated circuits.

2. HARDWARE ASSIGNMENTS

The SUPER ELF and SUPER EXPANSION combination has been designed using the following hardware assignments. The SUPER ELF assignments are included here for your convenience.

A.	Video Display ON	OUT 1
B.	Video Display OFF	OUT 2
C.	HEX Key Board	INP 4
D.	HEX Display	OUT 4
E.	Parallel INPUT Port	INP 5
F.	Parrallel OUTPUT Port	OUT 3
G.	Parallel IN Data Ready	INCP10 (EF2)
H.	Parallel IN Data Received	INCP 15
I.	Parallel OUT Data Received	OUTCP10 (EF3)
J.	Parallel OUT Data Ready	OUTCP15
K.	Video Display Status	EF1
L.	Input Switch Status	EF4
M.	Cassett Output	Q
N.	Cassett Input	EF3
O.	RS232 Output	Q
P.	RS232 Input	EF2
Q.	20MA Loop Output	Q
R.	20MA Loop Input	EF2

This hardware design causes some limitations on the combinations of external devices which may be used at the same time. Refer to the corresponding option appendix for details.

A. The RS232 and 20MA Loop cannot be used at the same time, although they may both be installed on the board at the same time. The unused input

must be PROPERLY terminated.

B. The Parallel INPUT Port Data Ready handshake cannot be used at the same time as either the RS232 or 20MA loop is being used. The quiescent condition of the serial interfaces is active, pulling down the sense line EF2 which is shared with the input port. However, it is possible to output a serial device while using the Parallel Input Port. For example, use of a TTY as 4 printer with an ASCII keyboard as input.

3. SOFTWARE CONSIDERATIONS

An entire volume could be written on software considerations. However, there are some common pitfalls which cause problems with inexperienced programmers (and even, on occasion, experienced programmers). ALMOST ALL 1802 software published to date makes one or more undocumented assumptions which can cause problems with the unsuspecting user. Some more common problems are included in the following list.

A. You are not using the same register for program counter that the author did but since it was not specified it is up to you to decode the program to find out which one to use.

B. The program only works when loaded into page zero and started from reset, but this requirement is not stated. (Most programs starting with a 90 instruction fall into this category).

C. The program only works with a one page system because the program counter high register was not preset.

D. The program was written for a different hardware configuration. I.E. EF2 VS EF3 ETC.

E. Use of Register 3 for anything other than the program counter (RCA standard convention uses R3 as the PC).

F. Use of the #1 register byte for data storage and the LO register bite for the program counter.

Now that you have a multipage SUPER ELF you must be much more cautious when attempting to use someone elses program.

4. GENERAL NOTES

A. Addressing the 4K block of RAM.

Figure A6 shows the jumpers required to configure the 4K RAM to a specific 8 K block of memory. Figure A6 shows the jumpers required to locate the individual 1K RAM segments to any 4 of the 8 segments within the 8K block previously selected. The standard configuration is to locate the 4 K RAM in the first 8K block and the first 4 1K RAM segments. The 4 K RAM is then addressed from 0000 of OFFF.

B. Addressing the EPROM

Figure B1 shows the jumpers for selecting either 1K byte or 2K byte EPROM'S with the first of the 3 EPROMS starting at address 8000. The EPROM'S are relocatable to other starting addresses for unique non standard configurations. However, the SUPER ELF 1/4 K RAM will always appear in the address space that would be used if a 4th EPROM was provided for.

C. Addressing the SUPER ELF 1/4 K RAM

Figure A6 shows the jumper connection setting the address starting at 9800. This RAM address will be decoded either as a 1K or 2K RAM depending upon the EPROM 1K/2K jumpers.

D. Spare gates and Pads.

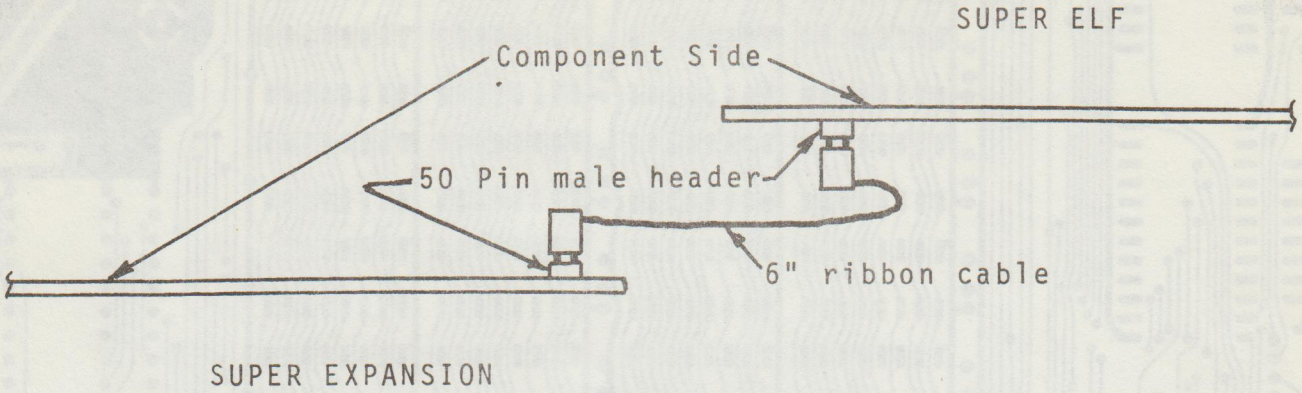
There are provisions for two 16 pin IC's and two 14 pin IC's just below the EPROM area. In addition there is a spare inverter on U12. One half of U4 is spare also. This capability may be used for circuits of your choice. Figure A8 shows how a simple LOGIC PROBE can be added. (Be sure and cut the trace grounding the inverter input if you use it).

E. Memory Protect

The EXPANDED SUPER ELF retains the Memory Protect feature and the 4K RAM is protected along with the original 1/4 K RAM. S100 memory may or may not protect depending upon the type of protect circuits used on the S100 board.

The following SUPER ELF modification will disable the memory protect on the 1/4 K RAM ONLY and allow you to use the 1/4 K RAM for the stack and still protect your programs loaded in the 4 K RAM. The modification required is to cut the connection between U10P1 and U11P1 and add a jumper between U11P1 and U11P2 the Version 3.0 board makes this easy by cutting J 4 and adding a jumper across the pads provided. Study the board wiring patterns carefully before starting. Note that the 1/4 K RAM must not be protected when using the SUPER MONITOR.

If you intend to use memory protect while running programs this modification is required.



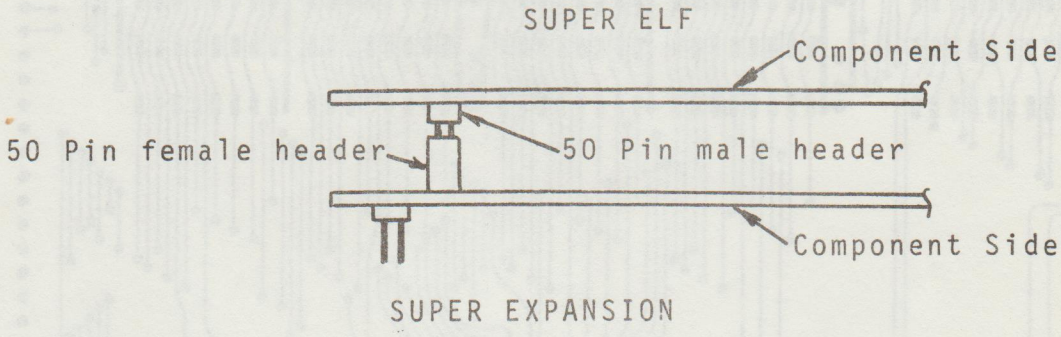


Figure 1. SUPER ELF Expansion Connection

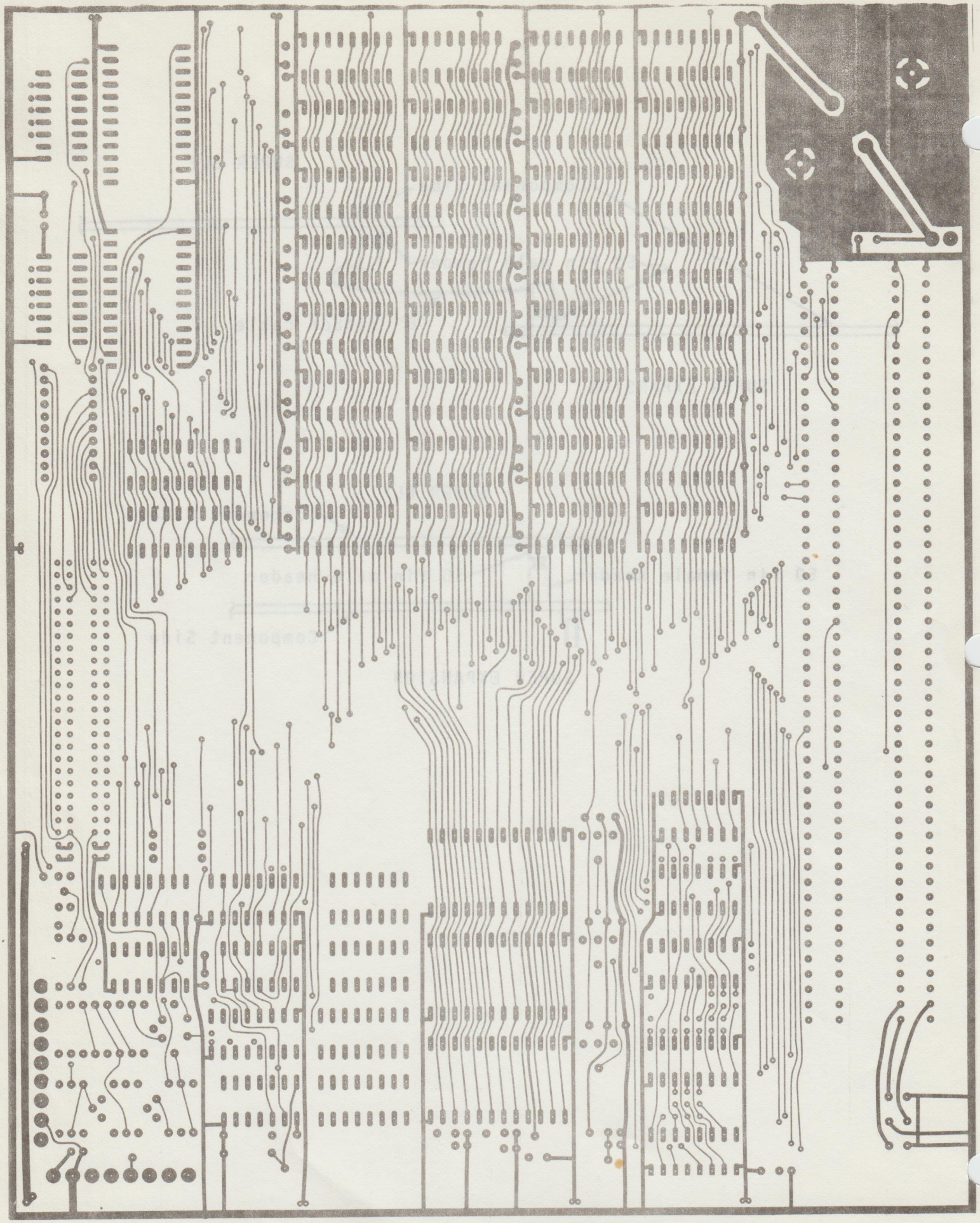


Figure 2. Board Wiring Pattern V2.0 Back

APPENDIX A. BASIC SUPER EXPANSION

1. PARTS LIST

TYPE	NUMBER	QTY	DESCRIPTION
INTEGRATED CIRCUITS			
U1*	4049	1	HEX Inverting Buffer
U2*-U3*	74LS138	2	Decoder
U4*	74C20	1	Dual 4-Input NAND Gate
U5*	74C32	1	Quad 2-Input OR Gate
U12*	4049	1	HEX Inverting Buffer
U14*	4049	1	HEX Inverting Buffer
U16*-U47*	21L02	32	1024X1 MOS RAM
U48*-U49*	81LS95	2	Octal Buffer
RESISTORS			
R8-R10	22K OHM	3	1/4 Watt Carbon Film
R11	1 K OHM	1	1/4 Watt Carbon Film
R12-R13	47K OHM	2	1/4 Watt Carbon Film
R14-R21	22k OHM	8	1/4 Watt Carbon Film
CAPACITORS			
C12	10.0 MFD 10V	1	Tantalum
C4	0.1 MFD 50V	1	Ceramic
C13-C15	0.1 MFD 50V	3	Ceramic
C17-C32	0.1 MFD 50V	16	Ceramic
DIODES			
D4-D7	1N914	4	Switching Diode
D9-D10	1N914	2	Switching Diode
TRANSISTOR			
Q3	2N2222	1	Switching Transistor

TYPE	NUMBER	QTY	DESCRIPTION
MISCELLANEOUS			
——	14 pin socket	2	Low Profile
——	16	37 .	Low Profile
——	20	2	Low Profile
——	EP1 Board	1	Super Expansion
——	Manual	1	Basic Manual
——	Apndx A	1	Appendix A

2. ASSEMBLY INSTRUCTIONS

Prior to starting assembly, please carefully read this manual and inspect the printed circuit board to observe the soldering skills and kit building experience required. If you have any doubts about your ability to assemble this ket or do not have the required tools we suggest that you exchange the kit for an assembled SUPER EXPANSION.

You will need the following tools and supplies.

A. A 25 watt soldering iron with a small dia (.063 in. maximum) tip. A higher wattage iron usually has a tip temperature too high for safe printed circuit work. A lower wattage iron may take too long to heat the joint and result in poor solder joints. A larger tip diameter is likely to cause bridges.

B. A radio type rosin core solder of .032 in. dia MAXIMUM with an alloy of 60 to 65 percent tin. Do NOT use 50-50 solder as its melting point is much higher.

C. Small diagonal cutters.

D. Needlenose pliers.

E. Magnifying glass (to check for shorts).

F. Multimeter (sensitivity at least 20000 OHMS/volt).

NOTE: Failure to use good soldering techniques and the proper solder can void the warranty.

The following tools are not required but will be helpful if available.

A. An IC insertion tool.

B. A component lead bender.

Check the parts in the kit against the parts list to insure that the kit is complete and to familiarize yourself with the parts. CAUTION: DO NOT remove the integrated circuits from the antistatic (black) foam they were shipped in until told to do so.

The printed circuit board is double-sided epoxy glass with plated through holes. The front of the board has component designations on it. All components are installed from the front and all soldering is on the back.

Carefully inspect both sides of the printed circuit board for shorts and defects. The top of the board is more critical since the sockets, etc., cover up the traces, and defects are harder to detect and correct. NOTE: Every board is carefully inspected, under magnification, prior to shipment and the above suggestion is a double check to minimize any inconvenience to you from undetected defects. Any defects found are of course covered by our warranty.

Referring to the component identification on the board; start assembly using the following steps. NOTE: If you purchased options with your SUPER EXPANSION, they can be added now or later. We recommend adding them now by doing all corresponding steps at one time. For example, install both the basic and optional sockets at the same time. CAUTION: in each of the following steps, be sure that you have installed the parts in the correct locations prior to soldering. This is particularly important if you did not buy all the options since some locations will be empty.

( ) A. Install low profile sockets for ICs listed. Slightly bend two leads on diagonally opposite corners to hold the socket in place while you turn the board over. Solder these two pins while the socket is snug

against the board. Before soldering the remaining pins, check to be sure the socket is seated on the board properly. SOLDER all the remaining pins.

( ) B. Install all the resistors. SOLDER. Trim off excess leads.

Note: Pre-bending resistors to a lead spacing of 0.4 inch with a lead bender will simplify this job.

( ) C. Install all the diodes. SOLDER. Trim off excess leads.

Note: Pre-bending diodes to a lead spacing of 0.4 inch is helpful. Note: The cathode (band) end of all diodes should be next to the hole with a dot or + sign.

( ) D. Install the capacitors. SOLDER. Note: Observe polarity on the tantalum. Note: Some tantalums may not be marked with A+. These will have a colored dot on one side. With the leads down and the dot facing you, the right lead is +. Be sure the .1 Caps are in the correct holes!

( ) E. Install the transistor Q3. It should stand approximately 1/8 inch off the board. SOLDER. See Figure A7 for lead identification.

( ) F. Install jumper in area J1 as shown in Figure A 6. SOLDER.

( ) G. Install jumpers in area J2 as shown in Figure A 6. SOLDER.

( ) H. Install jumpers in area J3 as shown in Figure A 6. SOLDER.

( ) I. Install jumpers in area J4 as shown in Figure A 6. SOLDER.

( ) J. Only if the parallel port option is NOT installed, install jumpers in area J9 as shown in Figure A 7. SOLDER.

( ) K. Only if the RS232 option is NOT installed, install jumper in area J10 as shown in Figure A7. SOLDER.

( ) L. Install jumpers in area J11 as shown in Figure A 7. SOLDER.

( ) M. Make connections to the 50 pin bus as discussed in Section II,2. SUPER ELF connections. SOLDER. NOTE: All 50 pins MUST be connected.

( ) N. Install the integrated circuits. The use of an insertion tool is recommended. Most IC leads are spread at the tip and must be bent

inward to provide the right row spacing to fit the socket. MOS and CMOS types require EXTRA care in handling to prevent static damage. Static charges too small for you to detect can destroy these parts. All parts have been factory tested prior to shipment and static damaged parts or other mishandled parts cannot be replaced under warranty. Be sure you, the board and, the IC's are ALL grounded TOGETHER during ALL handling during, and after, installation on the board. This precaution is necessary at ALL TIMES the SUPER EXPANSION is disconnected from the SUPER ELF (the 50 pin bus on the SUPER EXPANSION is connected to CMOS inputs on the board).

( ) 0. Make required connections to your power supply and external devices. SOLDER.

This completes the assembly and now go back over all soldered joints for shorts etc. with a magnifing glass.

3. INITIAL CHECKOUT

Turn power on and verify all required voltages are correct. All controls and operations should be the same as the SUPER ELF without the SUPER EXPANSION with two exceptions. 1. The 'M' button will not enable the 32 byte monitor, but is now used as a 'RUN' with monitor button. If the SUPER MONITOR is not installed, pushing 'M' will cause the CPU to try to run with what ever it can find at locations 8000 and 0000. 2. The 1861 check out procedure of loading a 69 to obtain a row of vertical bars will no longer result in a fixed pattern; since all 64 K of memory addresses cannot be loaded with a 69. The display usually shows a bunch of moving white dashes.

The cassette interface design takes advantage of the automatic level control (ALC) built into most MIKE inputs of cassette tape recorders. This feature automatically sets the proper record level. The EAR output is used for play back. This signal is clipped into a zero crossing square wave and input to

EF3. The jumpers shown on Figure A7 are correct for most tape recorders which do not invert the signal. If yours does not work try patching for an inverted playback. (J11 connect 3-4).

The best tape recorder for this use is not always the most expensive.

We have tried many brands and both lo and high prices models and recommend, as a best buy the J.C. PENNEY'S Model 6566 (usually available for under $40.00).

Use C30 tapes for best results and avoid the lowest priced ones. Any medium priced tape should be OK. C60 and C90 tape is thinner and can cause problems. If you are using the SUPER MONITOR with its 1200 baud read/write and multi file capability, a large number of programs can be stored on one C30 cassette.

NOTE: Always playback with the volume and tone controls at MAXIMUM.

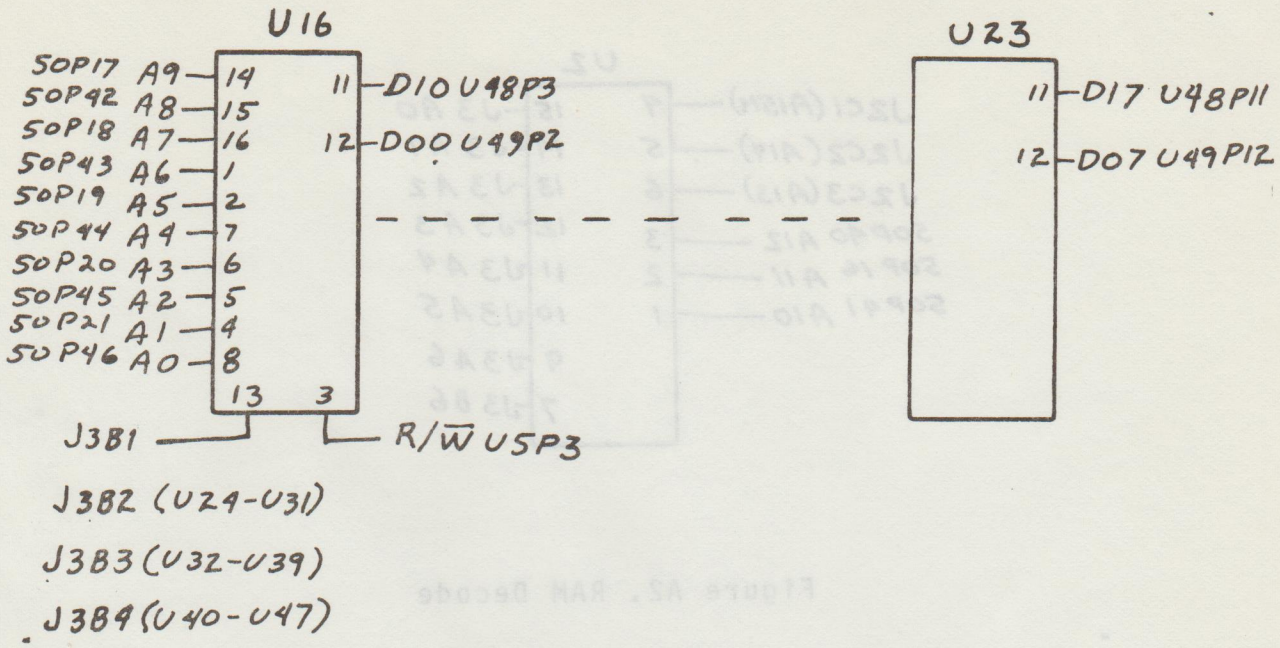


Figure A1. 4K RAM

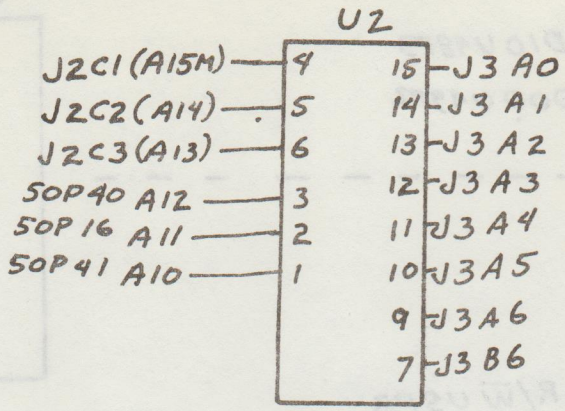


Figure A2. RAM Decode

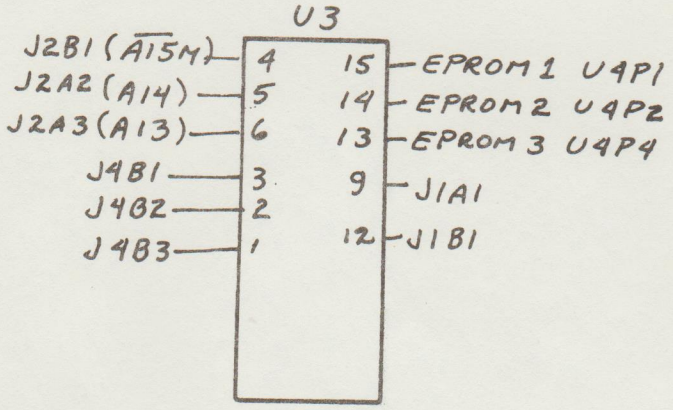


Figure A3. EPROM Decode

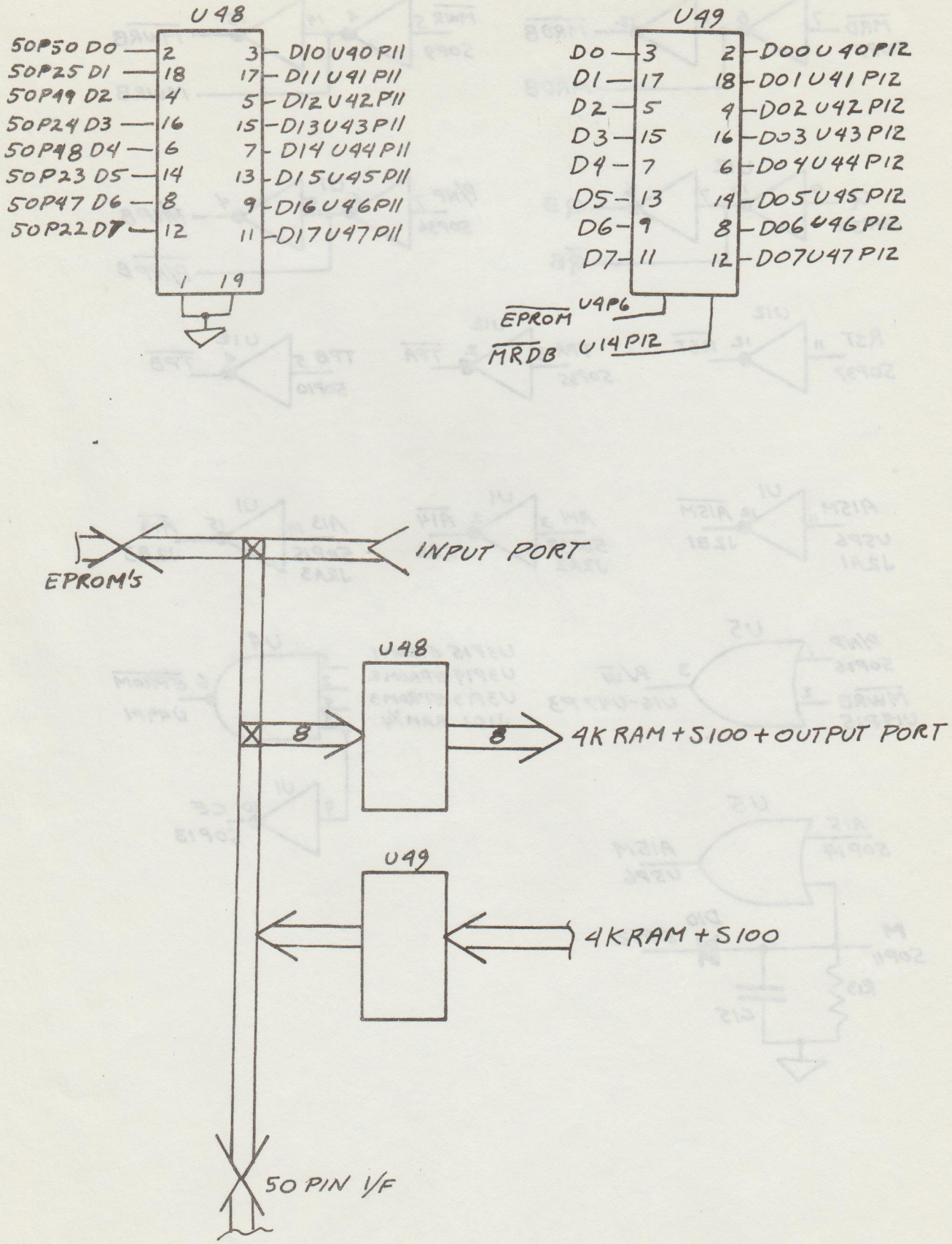


Figure A4. DATA Bus

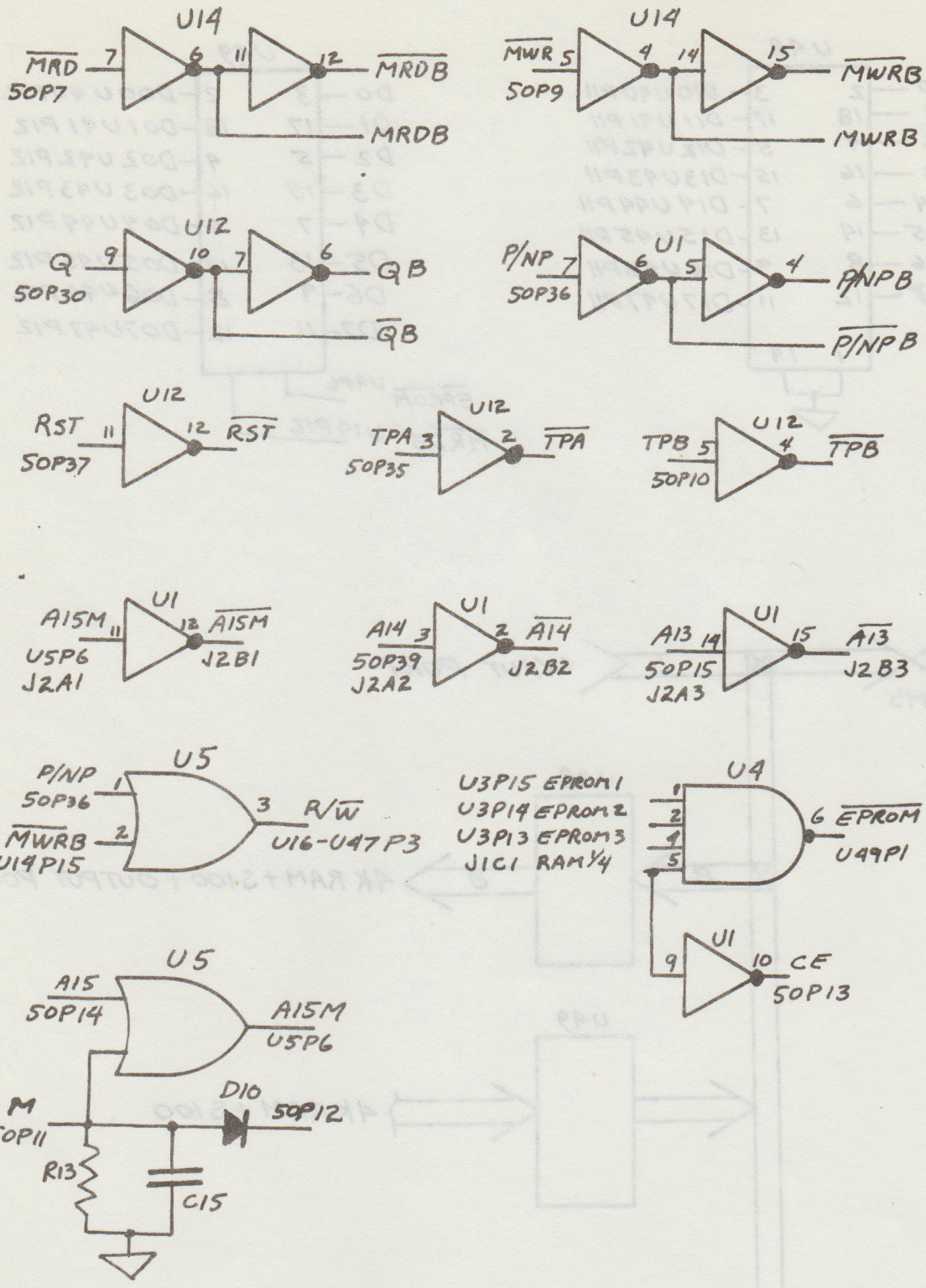
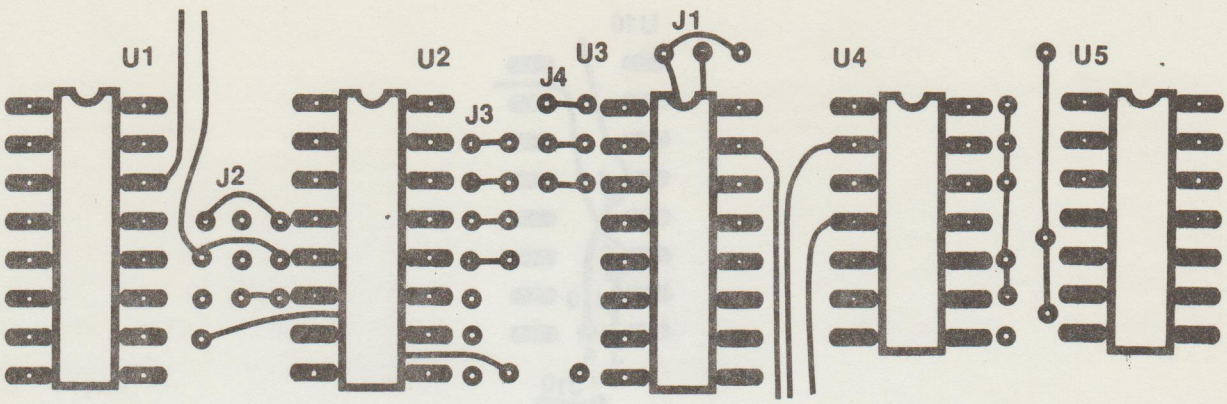
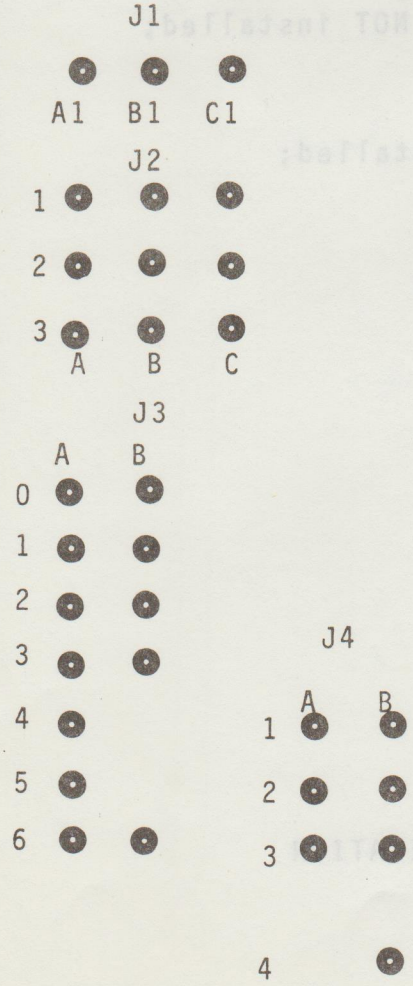


Figure A5. Buffers / Inverters



Jumper Areas 1,2,3,&4 shown with jumpers installed for:
J1 SUPER ELF RAM at Address 9800
J2 RAM block at Address 0000
J3 RAM located at Address 0000
J4 1K EPROM located at Address 8000

NOTE: This is the STANDARD jumper configuration.



J1 TRUTH TABLE

FOR	CONNECT
1K EPROM	A1-C1
2K EPROM	B1-C1

J2 TRUTH TABLE

FOR	CONNECT ROW		
8K Block	1	2	3
0000-1FFF	A-C	A-C	B-C
2000-3FFF	B-C	A-C	B-C
4000-5FFF	A-C	B-C	B-C
6000-7FFF	B-C	B-C	B-C
8000-9FFF	A-C	A-C	A-C
A000-BFFF	B-C	A-C	A-C
C000-DFFF	A-C	B-C	A-C
E000-FFFF	B-C	B-C	A-C

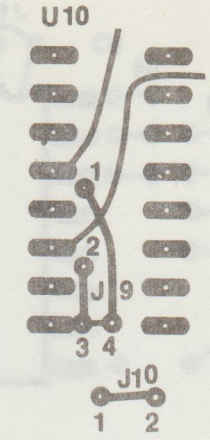
J3 TRUTH TABLE

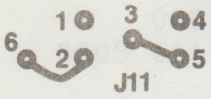
4K Block	Connect
1st	A0-B0,A1-B1,A2-B2,A3-B3
2nd	A4-B0,A5-B1,A6-B2,B6-B3

J4 TRUTH TABLE

EPROM	Connect
1K	A1-B1,A2-B2,A3-B3
2K	A2-B1,A3-B2,B4-B3

FIGURE A6



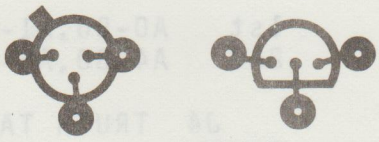


J9 If Parallel Port is NOT installed;
Connect 1-4,2-3

J10 If RS232 is NOT installed;
Connect 1-2

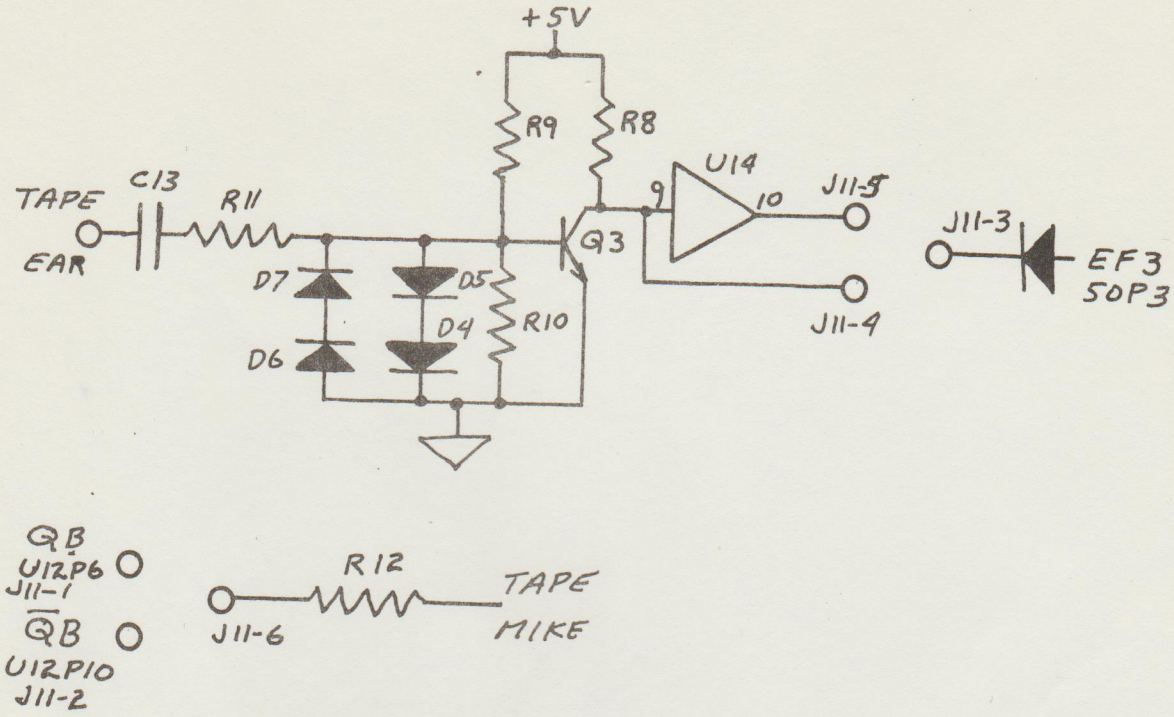
J11 Normal connections;
Connect 3-5,2-6

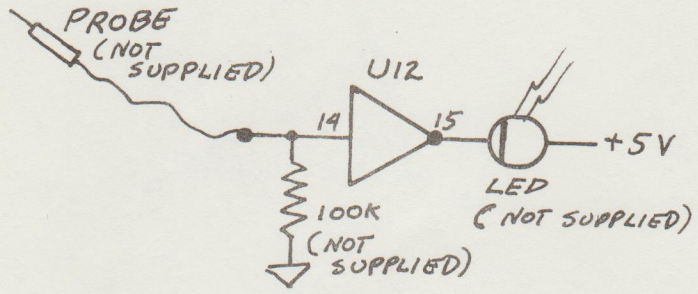
Pad Identification
1 Record Normal
2 Record Inverted
3 Playback Input
4 Playback Inverted
5 Playback Normal
6 Record Output



TRANSISTER LEAD IDENTIFICATION
TOP VIEW
COMPONENT SIDE

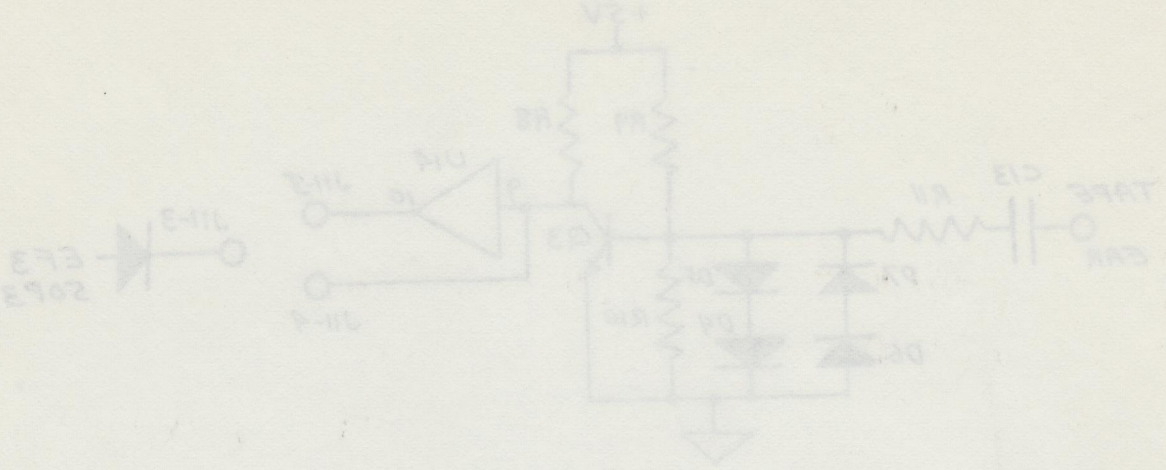
FIGURE A7

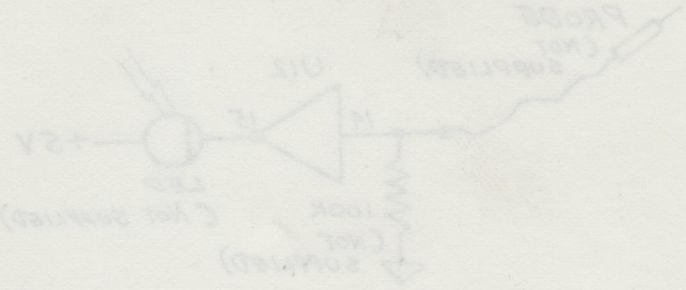




Optional LOGIC PROBE

Figure A8. Cassette and Optional LOGIC PROBE





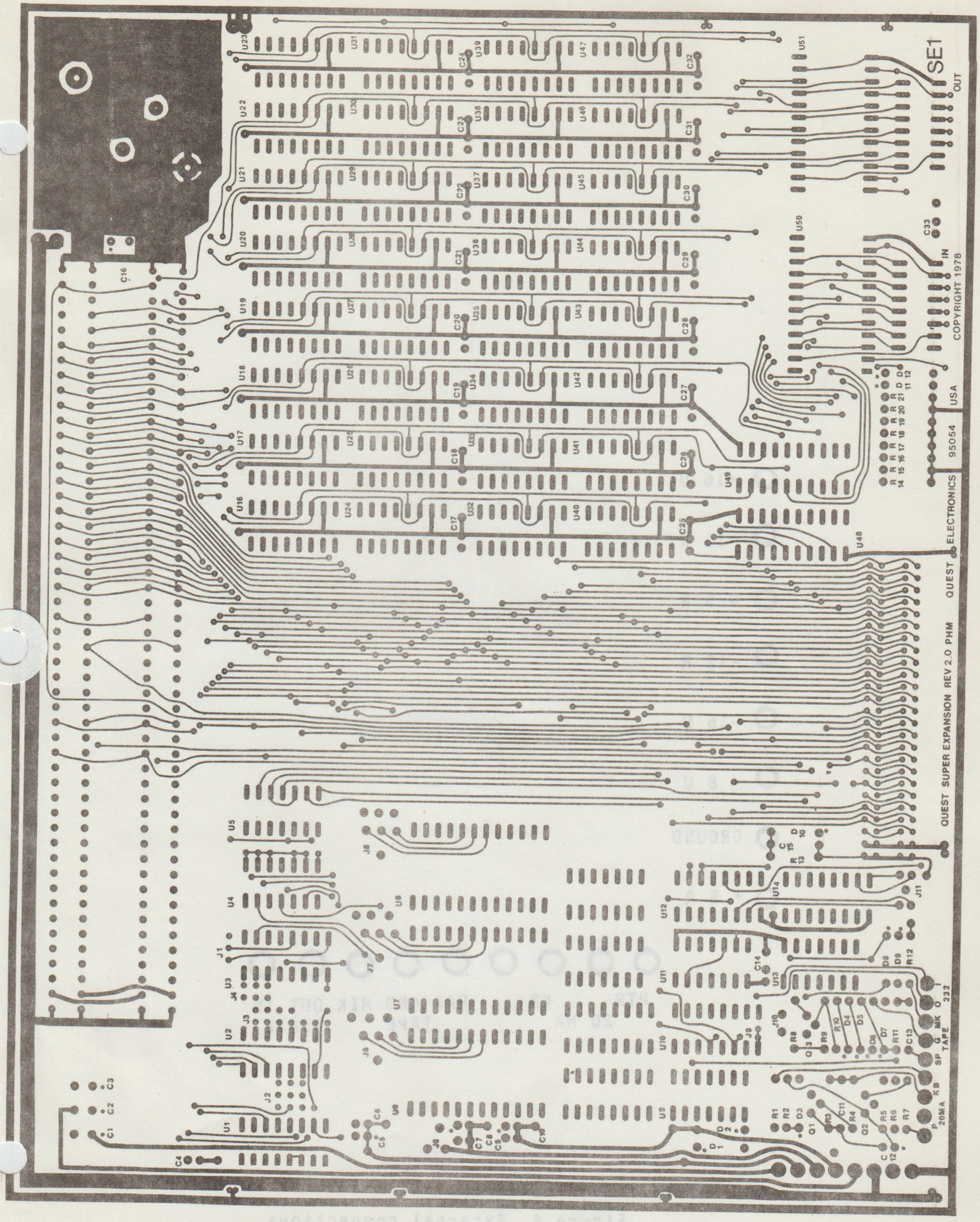


Figure 3. Board Wiring Pattern V2.0 Front

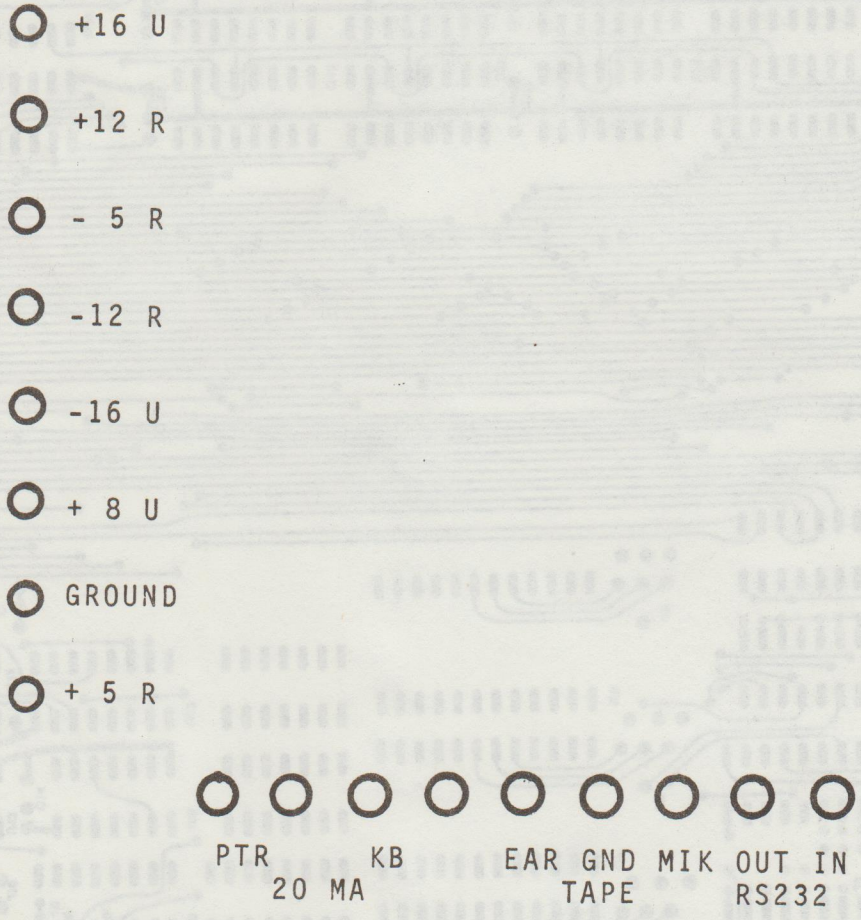


Figure 4. External connections

APPENDIX C PARALLEL PORT

1. PARTS LIST

2-16 pin Sockets installed for I/O ports

TYPE	NUMBER	QTY	DESCRIPTION
INTEGRATED CIRCUITS			
U50-U51	8212	2	I/O Port
U10	74C42	1	BCD to decimal decoder
U11	4013	1	Dual D Flip-Flop
CAPACITORS			
C33	0.1 MFD 50V	1	Ceramic
DIODES			
D11-D12	1N914	1	Switching Diode
MISCELLANEOUS			
---	24 Pin Socket	2	Low Profile
---	14 Pin Socket	1	Low Profile
---	16 Pin Socket	1	Low Profile
---	16 Pin Socket	2	STD or WW

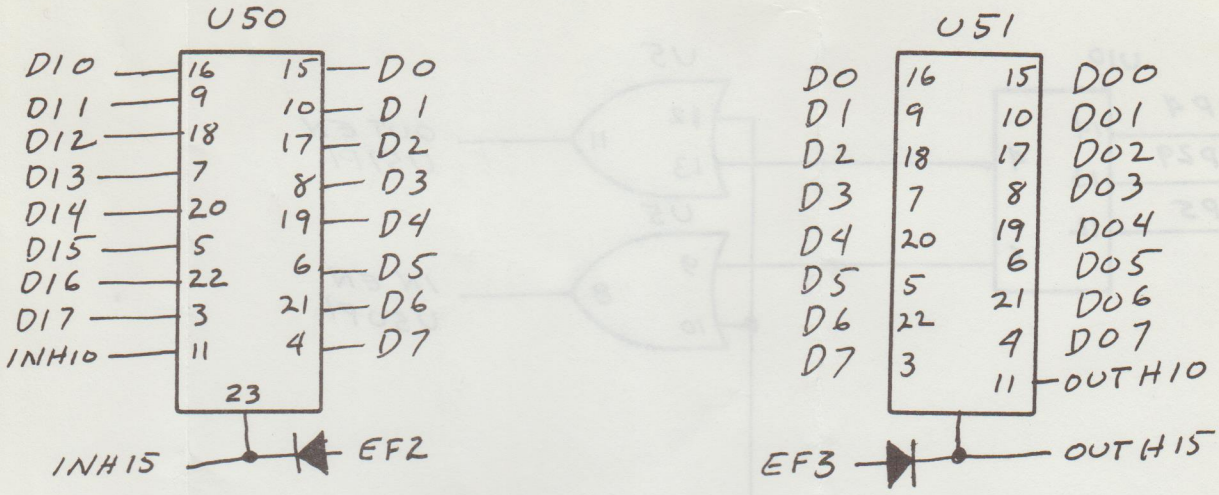
2. ASSEMBLY INSTRUCTIONS

Review the assembly instructions in Appendix A and install the components using the method described. NOTE that the I/O ports U50 and U51 are on their side with pin one toward the right side of the board. The STD or WW sockets mount just below U50 and U51 and also are side mounted. They are the sockets for external connections which should be made with DIP headers (not supplies). NOTE be sure and REMOVE jumpers in area J9 if they were previously installed.

3. INITIAL CHECKOUT

Figure C1 provides the DIP header pin assignments. On the Input Port Pin 10 Data Available is used to latch the incoming data and also pulls EF2 LOW, telling the CPU that data is ready to be read. Pin 15 Data Accepted is also pulled LOW at this time. When the data is read by an Input Instruction EF2 goes HIGH and Pin 15 also goes HIGH telling the external device that the port is ready for another input byte. Pin 10 should always be tied LOW when not in use to prevent its pulling EF 2 LOW and preventing its shared use with other I/O functions.

On the Output Port Pin 10 Data Accepted is used by the receiving device to tell the CPU that it has received the data and to output another byte. EF3 going LOW with the Data Accepted signal is the CPU flag to output another data byte. Pin 15 goes LOW with data accepted and goes HIGH when the next data byte is ready. As with the Input Port Pin 10 must be held LOW when not in use to prevent its pulling EF3 LOW and preventing its shared use with other I/O functions.



INPUT HEADER (INH)

PIN	FUNCTION
1	Di7
2	Di6
3	Di5
4	Di4
5	Di3
6	Di2
7	Di1
8	Di0
9	Gnd
10	Data Avail
11	N/C
12	N/C
13	N/C
14	N/C
15	Data Accepted
16	+5

OUTPUT HEADER (OUTH)

PIN	FUNCTION
1	Do7
2	Do6
3	Do5
4	Do4
5	Do3
6	Do2
7	Do1
8	Do0
9	Gnd
10	Data Accepted
11	N/C
12	N/C
13	N/C
14	N/C
15	Data Ready
16	+5

Figure C1 Parallel Port

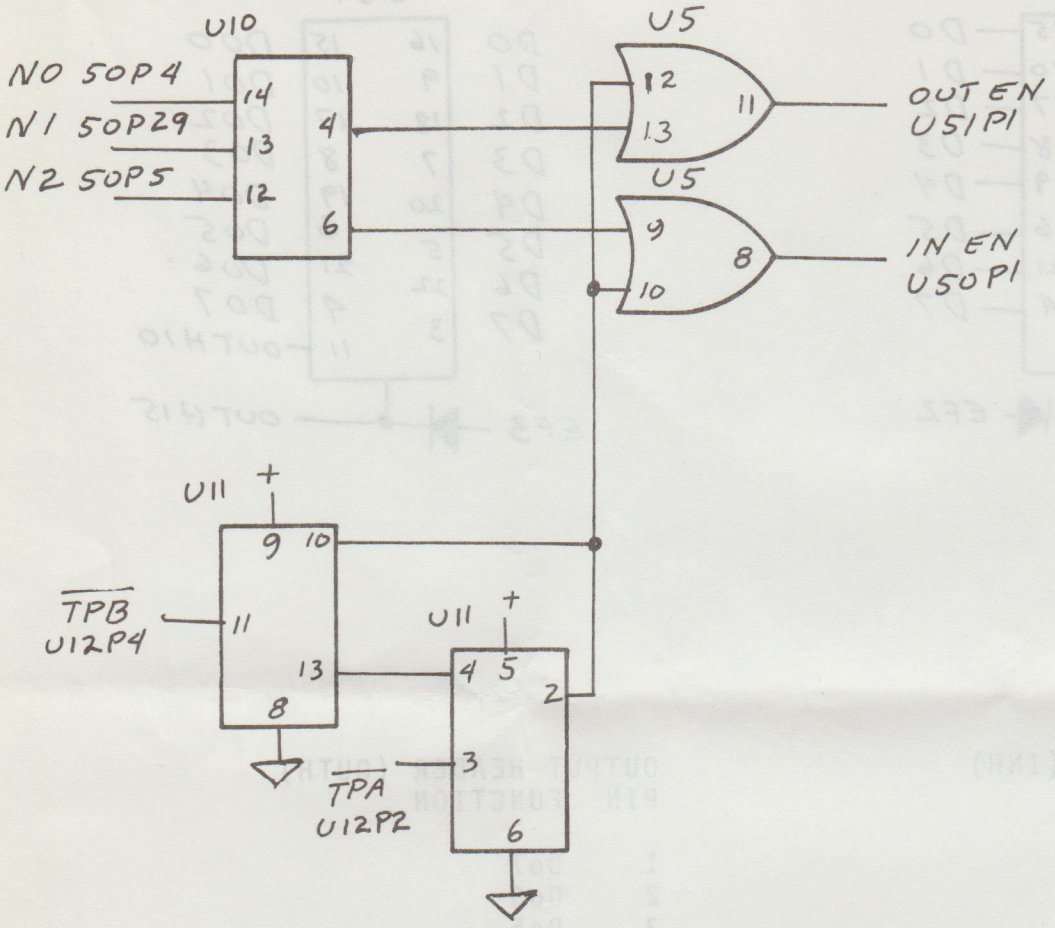


Figure C2 N Decode

APPENDIX F S100 MEMORY

1. PARTS LIST

TYPE	NUMBER	QTY	DESCRIPTION
CAPACITORS			
C1-C3	10.0 MFD 25V	3	Tantalum
MISCELLANEOUS			
---	100 Pin Socket		S-100 Card Socket

2. ASSEMBLY INSTRUCTIONS

Review the assembly instructions in Appendix A and install the components using the method described.

3. INITIAL CHECKOUT

This S-100 interface is designed to work with most S-100 boards which are or act as a block of memory (like most video boards) with the following contraints.

A. The memory must be static.

B. ALL data and address lines must present no more than one LS TTL load to the bus.

C. Only two boards may be installed at the same time.

D. The memory protect circuits may or may not work depending upon their design.

The above constraints are necessary because there is no S-100 standard as yet and also there are many S-100 memory boards with one or more pour design features.

The power supply requirements depend upon the board installed.

NOTE: It may be necessary to terminate properly some S-100 pins in addition to those already supplies. This due to the lack of standardization of the S-100 bus.

Pin Assignments

1	+8	51	+8
2	+16	52	-16
		68	MWR
20	NP	70	P
		77	PWR
29	A5	79	A0
30	A4	80	A1
31	A3	81	A2
32	A15	82	A6
33	A12	83	A7
34	A9	84	A8
35	Do1	85	A13
36	Do0	86	A14
37	A10	87	A11
38	Do4	88	Do2
39	Do5	89	Do3
40	Do6	90	Do7
41	Di2	91	Di4
42	Di3	92	Di5
43	Di7	93	Di6
		94	Di1
45	Gnd	95	Di0
46	Gnd	96	
47	MRD		
		99	Reset
50	Gnd	100	Gnd

Figure F1 S100 Memory

PARALLEL INPUT PORT KEYBOARD CONNECTIONS

16 PIN DIP	FUNCTION
1	GND(B8)
2	B7
3	B6
4	B5
5	B4
6	B3
7	B2
8	B1
9	GND
10	STB PULSE
11	NC
12	NC
13	NC
14*	-12V 1F REQ
15	NC
16	+5V

*Jumper TO -12V supply
NOTE: Jumper keyboard for positive logic

PARALLEL INPUT PORT KEYBOARD CONNECTIONS

16 PIN DIP	FUNCTION
1	GND(B8)
2	B7
3	B6
4	B5
5	B4
6	B3
7	B2
8	B1
9	GND
10	STB PULSE
11	NC
12	NC
13	NC
14*	-12V IF REQ
15	NC
16	+5V

*Jumper TO +12V Supply

NOTE: Jumper keyboard for positive logic

APPENDIX B SUPER MONITOR

1. PARTS LIST

TYPE	NUMBER	QTY	DESCRIPTION
INTEGRATED CURCUITS			
U6*	*	1	EPROM SUPER MONITOR 2708
CAPACITORS			
C5, C7	10.0 MFD 15V	2	Tantalum
C6, C8	0.1 MFD 50V	2	Ceramic
MISCELLANEOUS			
---	24 Pin Socket	1	Low Profile
---	Apndx B	1	Appendix B

* May be one of following depending upon order
  1K x 8 EPROM 2708, 2758
  2K x 8 EPROM 2716, TMS 2716, TMS 2516

2. ASSEMBLY INSTRUCTIONS

Review the assembly instructions in Appendix A and install the components using the method described. Refer to Figure B1 for the jumper configuration required for the EPROM supplies. Also verify the correct jumpers are installed in areas J1 and J4. Refer to Figure A6.

If you have either the 2708 EPROM or the TMS 2716 EPROM you must supply +12 VDC and -5 VDC ± 5% (measured AT the SUPER EXPANSION board).

Before installing the EPROM, apply power and verify proper voltages. Then remove power, install the EPROM, apply power and recheck the voltages.

3. INITIAL CHECKOUT

Cutting J2 on the SUPER ELF (Refer to Page 7 SUPER ELF connections) disabled the 32 byte monitor (which will not work with an expanded system) and allows the 'M' button to become a 'RUN' with monitor button. By pushing the

'M' button (ALWAYS from a reset state) the SUPER MONITOR starts running and will display 'AA' in the output displays to indicate that it is ready for mode selection. Now you are ready to learn how to use the SUPER MONITOR.

4. Learning To Use the SUPER MONITOR

SUPER MONITOR Step-by-Step Instructions

To aid in the learning and understanding of the capabilities of the SUPER MONITOR, a complete set of step-by-step instructions is provided here. Please make every effort to follow these steps closely and observe the results very carefully.

Here are some notes on some symbols and abbreviations used in the instructions:

1. In the hex display boxes, every effort was made to provide the data value that you should see after you perform the step. Sometimes the value is either unpredictable or meaningless. In this case an X or Y was inserted in the appropriate box.

2. The term "enter" means push and release the indicated key(s). For example: Enter "A" means push and release the A key. Enter "AB" means push and release the A key, then push and release the "B" key, in that order.

3. N/C means "No Change From Before".