S. D. SALES

4K LOW POWER RAM BOARD

Introduction:

The S. D. Sales 4K Memory Board kit is a fast, low power
static memory that is plug compatable with the Altair, and
IMSAI 8080 systems. It includes 4096 memory words of 8 bits
with buffered outputs and onboard regulation. 21L02 memory chips
are used, and each has a capacity of one bit at each of 1024
addresses. The chips are arranged so that the top two horizontal
rows are the first "K" of memory, the second two rows, the second
"K", and so forth. Since the 21L02 is a semiconductor memory,
loss of power results in a loss of memory. The memory will
power back up in a random bit configuration. A minimum of +2
volts must be maintained in order to retain the stored bits.

PLEASE NOTE:

Assembly of this board requires experience in the soldering
of very fine connections. If you do not feel that this precision
is within your capabilities, do us both a favor and return the
unused kit for a refund.

PLEASE READ BEFORE ATTEMPTING ASSEMBLY!

The 4K memory board is assembled on a double-sided, plated
through hole board. There are pc paths on both sides. Many of
the holes are plated through to make connection with pc paths
on both sides. BE CAREFUL TO KEEP COMPONENTS OUT OF THESE HOLES.
They do not need to be soldered or "filled" with a wire.

The 21L02 memories are MOS devices and care should be taken in handling the units. Do not remove the devices from the protective foil until they are to be plugged into the board. Do not use a soldering "gun" of any type. Use a low wattage small tipped iron, and small diameter solder. There are many conductors on both sides of the board that are very close together. Be especially careful to avoid solder bridges between conductors. Clean the tip of your iron each 5 to 7 connections. Use a wet sponge or rag and keep the tip tinned but void of excess solder.

The kit is packed in several "pre-packs". Locate the packs and inventory the parts using the list below:

Pak #1	37	16 pin IC sockets
	6	14 pin IC sockets
	4	6-32 x ½" machine screws
	4	6-32 nuts
Pak #2	43	.01mfd disc ceramic caps
	1	50mfd @25V electrolytic cap
	4	7805 5V volt regulators
	4	Heatsinks
Pak #3	32	21L02 MOS memories
	5	8T97B buffers
	1	74LS00 IC (For IC #36)
	2	74S00 IC
	1	74LS04 IC (For IC #37)
	1	74S04 IC
	1	74S20 IC

NOTE: Do not confuse the 4 digit date code on the IC's with the part #.

For construction refer to Fig. #1. The top of the board will be considered the end opposite the gold plated fingers. Hold the board with the "S. D. Sales Co." down and to your right.

1.   Remove 8, 16 pin sockets from the Pak #1. Carefully straighten any bent pins and insert 1 socket into the 16 matching holes of the PC board into position #1. The component side of the board has been silk screened with the parts locations for ease of construction. Turn the board over. Hold the socket firmly against the PC Board and solder the top right-hand pin and the bottom left-hand pin. Do not solder any more of the pins at this time.

2.   Insert a socket in position #2 soldering the two pins as before. Repeat the same procedure with the remaining 6 sockets   for positions 3 to 8.

3.   Turn the board over and check to make sure each socket is firmly against the PC Board. If any of the sockets are not flush, heat the top solder joint and push with a finger. Do the same with bottom solder joint until the socket is in place.

4.   Once all the sockets are in place in the first two rows, carefully check each one on the back side of the board (side opposite the sockets) to make sure each of the 16 holes in each location are filled with a pin. It is easy to miss a hole and bend the pins under the socket, so do this step carefully!

5.   After you are sure all of the pins on all 8 sockets are in place, lay the board front side (socket side) down on a

flat surface. Very carefully solder the remaining 112
pins. Check for solder shorts or cold solder joints.
(A magnifying glass is helpful at this stage).

6. Sockets 1 through 8 are now complete. Using the same
procedures as outlined in steps 2 through 5, install sockets
9 through 16; sockets 17 through 24; sockets 25 through 32.

7. Sockets 33, 34, 35, 36, 37 and 39 are 14 pin. Install and
solder all connections of these sockets.

8. Install 16 pin sockets 38, 40, 41, 42 and 43 in their proper
positions and solder all pins.

9. Locate the 43 .01mfd disc capacitors from pre-pak #2. There
are two holes about 1/16th" above each socket. Insert
a disc in position #1 Row 1. SLIDE the cap through the
holes until the ceramic material touches the PC Board.
The ceramic continues down the leads. If the leads are
spread or closed often the ceramic on the leads will crack.
This does not affect operation of the caps. These caps
do not have a polarity.

10. Insert and solder each of the 42 remaining .01 disc. One
above each IC socket (solder on back side only). Clip
off all the excess leads.

11. Locate the 50mfd 25V electrolytic capacitor. Refer to
Figure #1. Note that there is a polarity marked on the cap.
Be sure to mount the cap with the "+" end up as shown. Clip
off the excess lead.

12. Locate the four 7805 regulators and the four finned heat-
    sinks. Line up the large hole in the board with hole in
    the metal tab of the 7805. Using a small pair of needle-
    nose pliers, bend the three leads 90°. Fit the proper hole
    spacing. Note the center lead is bent about 1/8" closer to
    the body than the other two. Preform all four regulators
    in this manner. Do not insert or solder at this time.

13. The heatsinks should be mounted between the PC Board and the
    7805 regulators. The three tabs on the heatsinks should point
    to the left (away from the IC's). Mount the 7805 and
    heatsink by sliding a 6-32 machine screw through the tab on
    the 7805, through the slot on the heatsink, through the top
    side of the PC Board. Secure the entire assembly to the PC
    Board with a 6-32 nut. A small amount of silicon grease
    (heatsink compound) can be used on the back of each 7805.
    Make sure the three terminals on each regulator fit into
    the proper holes before the screws are tightened down.
    Solder the three terminals on each 7805 on both sides of the
    PC Board. DO NOT OVER TIGHTEN THE SCREWS.

The 4K Board is now ready for the IC's to be inserted. The IC's
will NOT fit the sockets as they are shipped. The pins must be
bent slightly inward. Use the following procedure to bend the
pins. Work with one IC at a time and insert it into the proper
socket immediately after bending.

    1. Hold the IC on each end with both hands (like a cob of
       corn).

2. Use the front edge of a table or workbench and place all
   of the pins on one side of the IC against the edge.

3. Push gently against the table so all the pins on one side
   bend together. Bend until they are almost perpendicular.

4. Turn the IC around and bend the other pins on the opposite
   side in the same manner.

5. Try the IC in the socket. Both sides must be pushed in
   at the same time to avoid bending pins.

NOTE: When inserting the IC's into the sockets. Be extremely
careful that all the pins fit into the socket properly.
It is easy for a pin to fold under and not make contact.
A folded pin is almost impossible to detect after the IC
is seated against the socket!

1. Using the Fig. #1 provided, insert the proper IC's into
   the sockets, working one row at a time. Note that each
   IC has a notch on one end. Be sure to position all the
   notches as shown in Fig. #1. Failure to do this could result
   in the failure of components. Do not confuse the round
   mold marks on the top of the IC's with the notch. The first
   32 IC's are all 21L02's.

2. Check the Board against the layout (Fig. #1).

3. Check all connections for bridges or cold joints.

There are 12 holes located between IC's 34 and 37. These will be
used to provide a board select code to the computer. Since a com-
puter may have more than 1 4K memory board, there must be a method
to select which of the memory boards we are working with. Using

the diagram and chart below, solder a short jumper wire between the points to develop the proper code. Use insulated wire. These wires must be connected before the unit will operate. The edge connector is numbered on the PC Board.

INSTALLATION

1. Check to see that a power source of approximately 8V is furnished through the circuit using pins 1 and 51 and ground through pins 50 and 100 BEFORE plugging the board into the computer. These power input connections should be standard in ALTAIR or IMSAI systems.

2. After plugging in the board check the voltage on the output pins of each 7805 (pin 3) to make sure each bus is 5 volts.

For the functions of the pins on the edge connectors see the schematic.
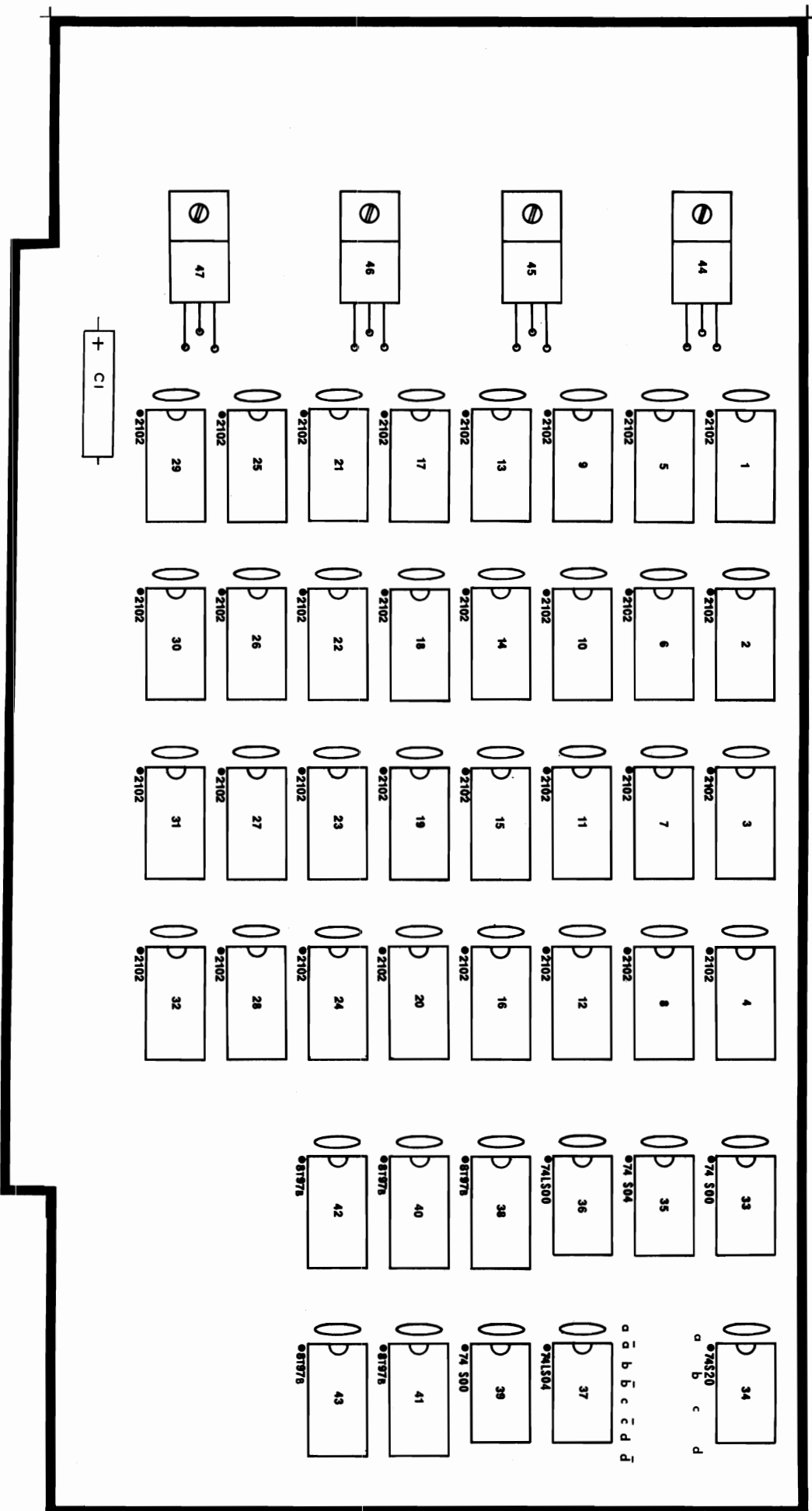
FIG. #2   TOP VIEW
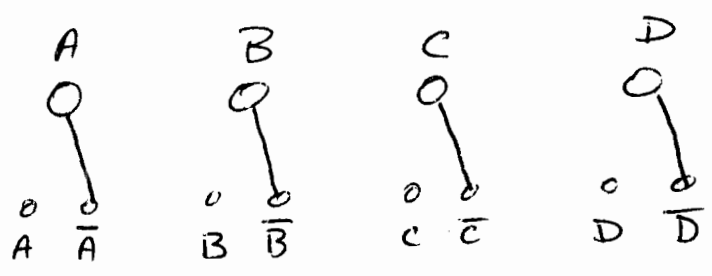
A   B   C   D
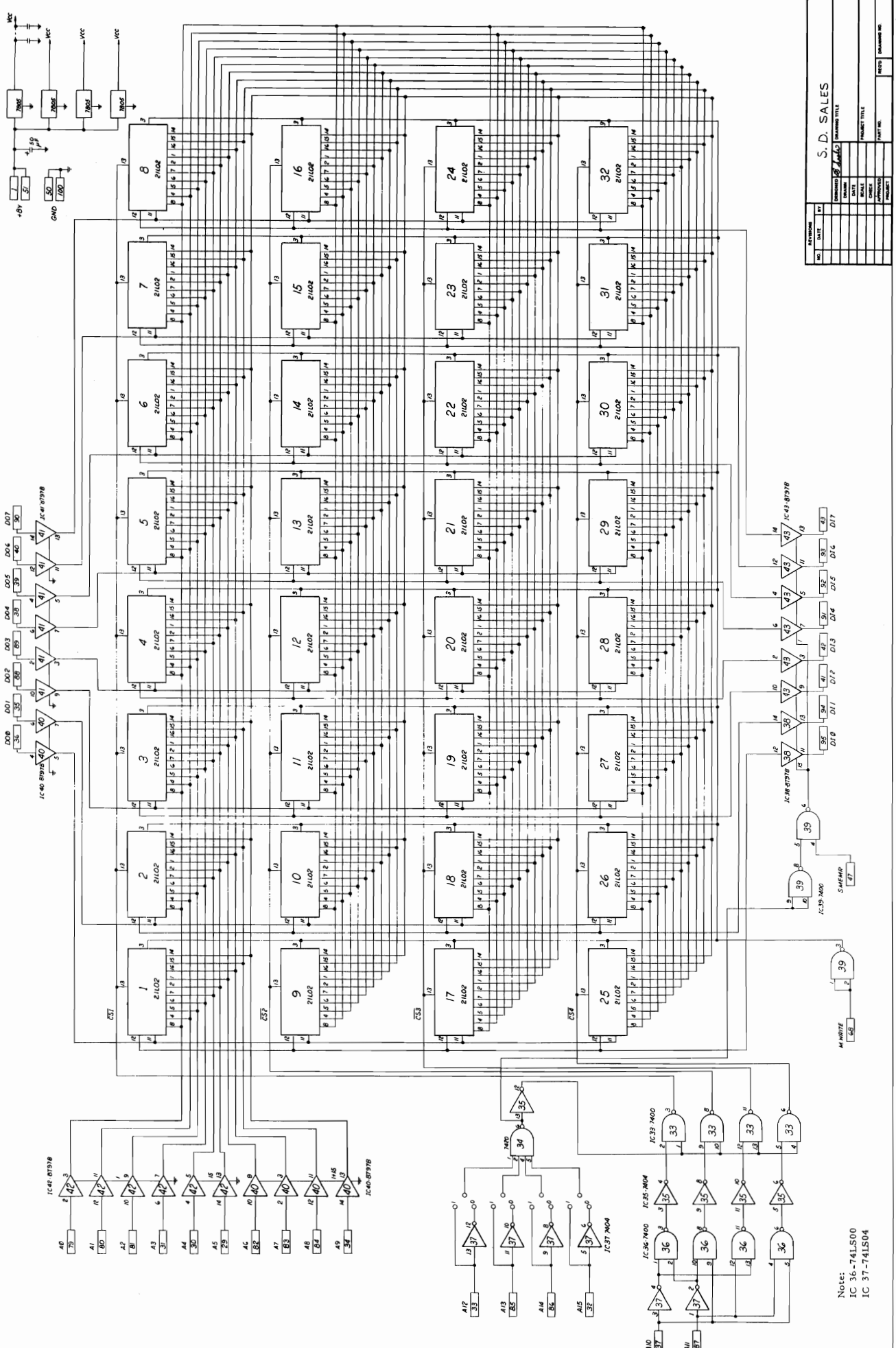

← EXAMPLE:
SET FOR 1ST.
4K BLOCK.

0 o̅   0 o̅   0 o̅   0 o̅
A A̅   B B̅   C C̅   D D̅

JUMPER CODES FOR MEM. SELECT   H

1ST 4K BLOCK	$\overline{A}$	–	$\overline{B}$	–	$\overline{C}$	– $\overline{D}$	0
2	A	–	$\overline{B}$	–	$\overline{C}$	– $\overline{D}$	1
3	$\overline{A}$	–	B	–	$\overline{C}$	– $\overline{D}$	2
4	A	–	B	–	$\overline{C}$	– $\overline{D}$	3
5	$\overline{A}$	–	$\overline{B}$	–	C	– $\overline{D}$	4
6	A	–	$\overline{B}$	–	C	– $\overline{D}$	5
7	$\overline{A}$	–	B	–	C	– $\overline{D}$	6
8	A	–	B	–	C	– $\overline{D}$	7
9	$\overline{A}$	–	$\overline{B}$	–	$\overline{C}$	– D	8
10	A	–	$\overline{B}$	–	$\overline{C}$	– D	9
11	$\overline{A}$	–	B	–	$\overline{C}$	– D	A
12	A	–	B	–	$\overline{C}$	– D	B
13	$\overline{A}$	–	$\overline{B}$	–	C	– D	C
14	A	–	$\overline{B}$	–	C	– D	D
15	$\overline{A}$	–	B	–	C	– D	E
16	A	–	B	–	C	– D	F

MEMORY SELECT CODES

C1 +

47 46 45 44

2102 29 2102 25 2102 21 2102 17 2102 13 2102 9 2102 5 2102 1

2102 30 2102 26 2102 22 2102 18 2102 14 2102 10 2102 6 2102 2

2102 31 2102 27 2102 23 2102 19 2102 15 2102 11 2102 7 2102 3

2102 32 2102 28 2102 24 2102 20 2102 16 2102 12 2102 8 2102 4

74197 42 74197 40 74197 38 74LS00 36 74 S04 35 74 S00 33

74197 43 74197 41 74 S00 39 74LS04 37 74S20 34

a b c d

Note:
IC 36-74LS00
IC 37-74LS04

S. D. 4K RAM KIT ERRATA

It has come to our attention that there is a potential noise
problem in some 8080 based microcomputers that our RAM boards
may be used in. If you feel this is a problem in your system,
then we have included 4 tantalum capacitors which should be
soldered on the bottom of the P. C. Board at each of the four
voltage regulators. The capacitor is soldered from the unregulated
input pin (input 1) to the ground terminal (GND 3). On the bottom
of the P. C. Board the unregulated power line comes from pin #51.
The pad where the trace from pin 51 connects to the input pin of
the regulator is where the + lead of the tantalum is soldered. The
other lead of the tantalum is soldered to the ground terminal of the
voltage regulator.

ON CAPACITOR
RED DOT OR
LONG LEAD IS
+

OUTPUT (2)
GND (3)
INPUT (1)

BOTTOM
SIDE

51