altair™ 680b

ASSEMBLY MANUAL

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altair 680b
ASSEMBLY MANUAL

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ALTAIR 680B
MAIN BOARD
APRIL, 1976

BAG 1

1	74LS00	101069
2	74LS01	101101
2	74LS02	101136
7	74LS04	101042
1	74LS10	101133
3	74LS20	101134
4	74LS30	101135
1	74LS73	101119
1	74LS74	101088
4	4050 (4010)	101105
1	4449 (4009)	101104
4	74367 (8T97)	101040
1	34702	101099

BAG 2

7	470 Ohm	101927
1	100 Ohm	101924
3	47 Ohm	101922
1	33K Ohm	102053
5	10K Ohm	101932
5	3.3K Ohm	102085
4	1K Ohm	101928
1	15 Ohm 2W	101961
2	330 Ohm	101926
1	10M Ohm	102079
2	220 Ohm	101925
1	180 Ohm	101998
1	22K Ohm	101933

BAG 3

8	2102	101107
1	P-ACIA (1702A w/Monitor)	P-ACIA
1	6800	101096
1	6850	101098
1	7805	101074

BAG 4

4	4.7K Ohm RP	101999
11	4.7K Ohm	101930
2	#26 White Wires	103060
2	#6 Solder Lugs	101801

BAG 5

4	IN4004	100718
5	IN914	100705
1	10.0V Zener	100717
1	VJ-048	100711
1	2.4576MHz Crystal	101741
1	2.0000MHz Crystal	101855

BAG 6

2	CCS-4410	102806
4	2N2907	102804
1	TIP-30	102821
2	Heat Sink (Large)	101870
1	Heat Sink (Small)	101870
3	6-32 x 1/4" Screw	100917
3	6-32 Nut	100933
3	#6 Lock Washer	100942

BAG 7

36	.1uf 12V	100348

BAG 8

1	.001uf	100328
1	.01uf	100321
2	1.0uf (Tantalum)	100325
2	100uf	100313
1	50pf	100331
2	56pf	100317
2	430pf	100322
3	35uf 15V	100326
1	3000 or 3300uf	100315

BAG 9

1	40 Pin Socket	102106
5	24 Pin Socket	102105
9	16 Pin Socket	102103
2	Small Rubber Feet	101751
2	4-40 x 1/2 Screw	100903
2	4-40 hex nuts	100932

MISC.

1	Main PC Board	100199

ALTAIR 680B
DISPLAY BOARD
PARTS LIST
APRIL, 1976

BAG 1

5	SN74LS05	101102
4	4009 _ 4449	101104
1	SN74L00	101080
2	SN74L123	101078

BAG 2

| 27 | RL-21 | 100702 |

BAG 3

| 4 | .2uF 10v | 100355 |
| 5 | .1uF 10v | 100348 |

BAG 4

| 24 | 1.5K 1/2W 5% | 101946 |

BAG 5

1	10 Ohm ½W 5%	101950
3	22K 1/2W 5%	101933
4	4.7K 1/2W 5%	101930
2	47K 1/2W 5%	101934
3	1K 1/2W 5%	101928
2	100K 1/2W 5%	101936
2	10K 1/2W 5%	101932

BAG 6

25	SPDT switches	102366
2	MOM switches	102367
1	100-pin connector	101864

MISCELLANEOUS

| 1 | PC board | 100182 |

ALTAIR 680B
CASE ASSEMBLY
APRIL, 1976

BAG 1

1	HBK Fuse Holder	101813
2	.01uf/1kv	100305
1	1/2SB Fuse	101771
1	Switch ST1-7C	102366
1	Terminal Strip	101713
1	Strain Rel.	101719
1	5 Pin-Male Conn.	101872
1	5 Pin-Female Conn.	101873
4	Small Rubber Feet	101751
5	Terminal Pins (Large)	101769
1	5 Pin-Miniature Male Conn.	101671
1	5 Pin-Miniature Female Conn.	101672
5	Terminal Pins (Miniature)	101723

BAG 2

2	6-32 x 1 1/8" Screws	100936
9	6-32 x 1/2" Screws	100918
2	6-32 x 3/8" Screws	100925
1	6-32 x 1/4" Screw	100917
4	4-40 x 3/8" Screws	100908
2	4-40 x 1/2" Screws	100903
18	#6-32 Nuts	100933
6	#4-40 Nuts	100932
	#6 Lock Washers	100942
4	#4 Lock Washers	100941
4	Spacer 1/4 Long	101826
1	Back Panel Label	101875
1	Connector Cover	101874
	1 oz. of Heat Sink Grease	
4	Lengths of 44-66 Solder	
1	DB-25S Pin Connector	102112

MISC.

1	Binder	101532
1	Transformer	102609
1	Cord (Power)	101742
1	Case	100519
1	680B Theory	101580
1	680B Assembly	101584
1	680B Operators	101581
1	680B Monitor	101582

ALTAIR 680b

ASSEMBLY MANUAL

Table of Contents

SECTION I
ALTAIR 680b
ASSEMBLY HINTS

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PRINTED CIRCUIT BOARD VISUAL INSPECTION

It is recommended that a visual inspec-
tion of the PC Board(s) in your kit be
made before beginning the assembly pro-
cedures.

Look for etching "bridges" or etching
"opens" in the printed circuit lands,
as shown in the drawings below:

Example of an
Etching "Bridge"

Example of an
Etching "Open"
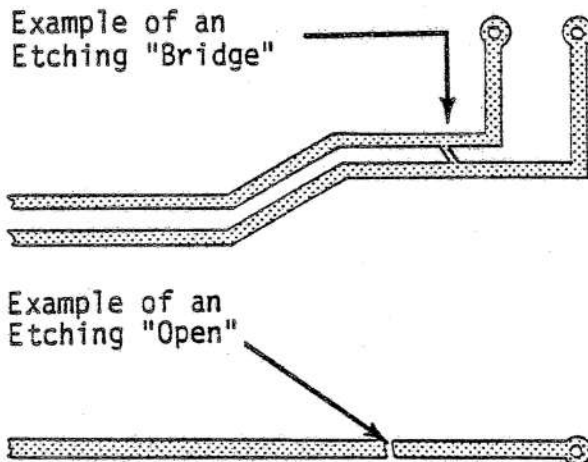
This could also appear as a
"hairline" cut.

A thorough visual inspection will elim-
inate one possibility for errors, should
the board not operate properly after it
is assembled. Troubleshooting efforts
may then be concentrated elsewhere.

ASSEMBLY HINTS

Before beginning the construction of your unit, it is important that you read the "MITS Kits Assembly Hints" booklet included with your kit. Pay particular attention to the section on soldering, because most problems in the Altair occur as the result of poor soldering. It is essential that you use the correct type of soldering iron. A 25-30 watt iron with a chisel tip (such as an Ungar 776 with a 7155 tip) is recommended in the assembly hints booklet.

Some important warnings are also included in the hints booklet. Read them carefully before you begin work on your unit -- failure to heed these warnings could cause you to void your warranty.

Check the contents of your kit against the enclosed parts list to make sure you have all the required components, hardware and parts. The components are in plastic envelopes; do not open them until you need the components for an assembly step. You will need the tools called for in the "Kits Assembly Hints" booklet.

As you construct your kit, follow the instructions in the order that they are presented in the assembly manual. Always complete each section before going on to the next. Two organizational aids are provided throughout the manual to assist you: 1) Boxed-off parts identification lists, with spaces provided to check off the components as they are installed; 2) Reproductions of the silk screens showing a) previously installed components, b) components being installed and c) components yet to be installed. (see below)
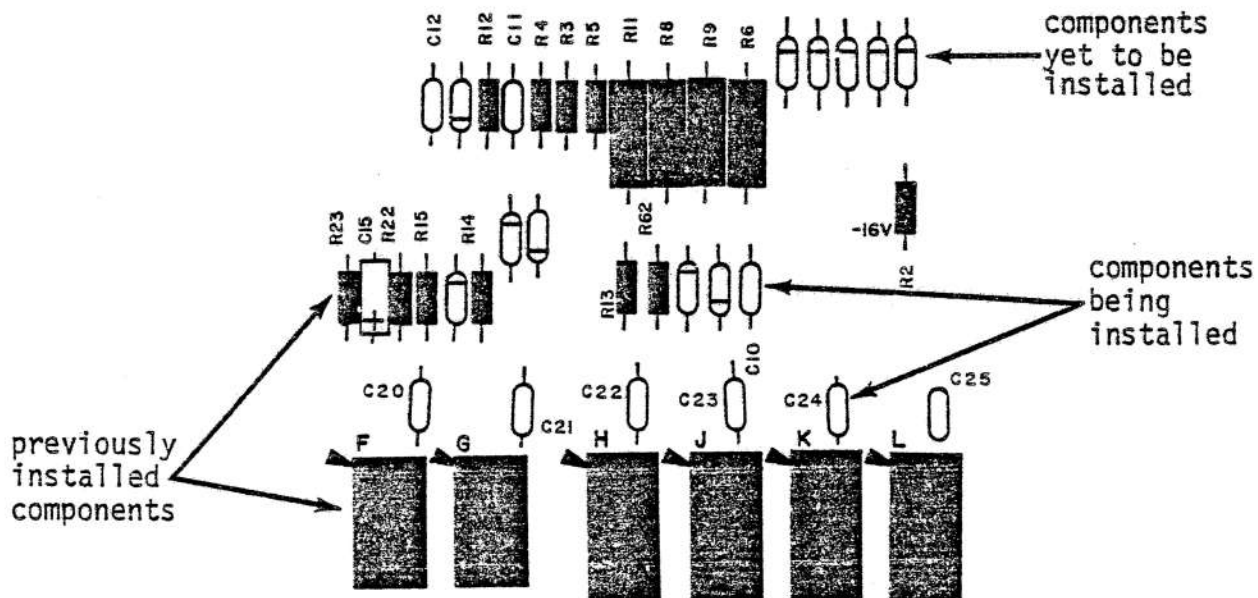
COMPONENT INSTALLATION METHODS

Pages 5 through 11 of the Assembly Manual describe the
proper procedures for installing the various types of
components in your kit.

Read these instructions over very carefully and refer
back to them whenever necessary. Failure to properly
install components may cause permanent damage to the
component or the rest of the unit; it will definitely
void your warranty.

More specific instructions, or procedures of a less
general nature, will be included within the assembly
text itself.

Under no circumstances should you proceed with an
assembly step without fully understanding the proce-
cures involved. A little patience at this stage will
save a great deal of time and potential "headaches"
later.

IC IDENTIFICATION CHART
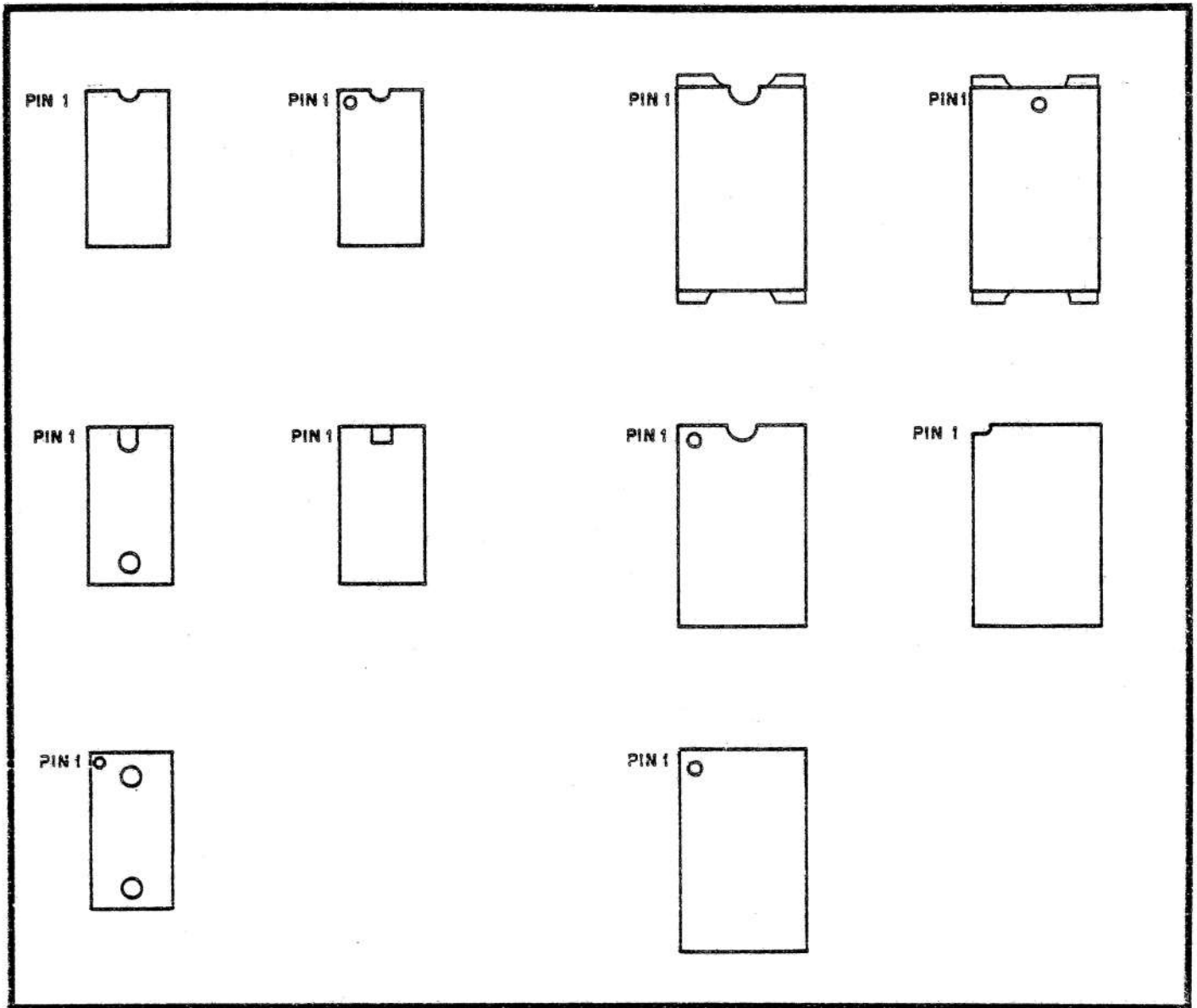
INTEGRATED CIRCUITS (IC's) CAN COME WITH ANY ONE OF, OR A COMBINATION OF, SEVERAL DIFFERENT MARKINGS. THESE MARKINGS ARE VERY IMPORTANT IN DETERMINING THE CORRECT ORIENTATION FOR THE IC's WHEN THEY ARE PLACED ON THE PRINTED CIRCUIT BOARDS. REFER TO THE ABOVE DRAWING TO LOCATE PIN 1 OF THE IC's, THEN USE THIS INFORMATION IN CONJUNCTION WITH THE INFORMATION BELOW TO PROPERLY ORIENT EACH IC FOR INSTALLATION.

WARNING: INCORRECTLY ORIENTED IC's MAY CAUSE PERMANENT DAMAGE!
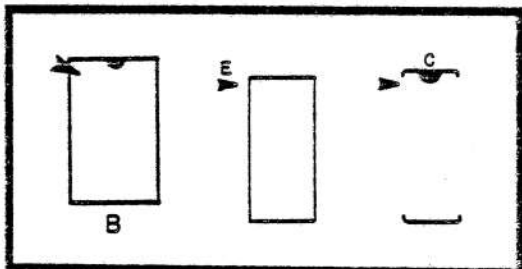
THE DRAWING ON THE LEFT INDICATES VARIOUS METHODS USED TO SHOW THE POSITION OF IC's ON THE PRINTED CIRCUIT BOARDS. THESE ARE SILK-SCREENED DIRECTLY ON THE BOARD. THE ARROWHEAD INDICATES THE POSITION FOR PIN 1 WHEN THE IC IS INSTALLED.

MOS IC SPECIAL HANDLING PRECAUTIONS

There are several MOS integrated circuits contained in this kit. These IC's are very sensitive to static electricity and transient voltages. In order to prevent damaging these components, read over the following precautions and adhere to them as closely as possible. FAILURE TO DO SO MAY RESULT IN PERMANENT DAMAGE TO THE IC.

1) All equipment (soldering iron, tools, solder, etc.) should be at the same potential as the PC board, the assembler, the work surface and the IC itself along with its container. This can be accomplished by continuous physical contact with the work surface, the components, and everything else involved in the operation.

2) When handling the IC, develop the habit of first touching the conductive container in which it is stored before touching the IC itself.

3) If the IC has to be moved from one container to another, touch both containers before doing so.

4) Do not wear clothing which will build up static charges. Preferably wear clothing made of cotton rather than wool or synthetic fibers.

5) Always touch the PC board before touching the IC to the board. Try to maintain this contact as much as possible while installing the IC.

6) Handle the IC by the edges. Avoid touching the pins themselves as much as possible.

7) Dry air moving over plastic can result in the development of a significant static charge. Avoid placing the IC near any such area or object.

8) In general, never touch anything to the IC that you have not touched first while touching both it and the IC itself.

IC Installation

All ICs must be oriented so that the notched end is toward the end with the arrowhead printed on the PC board. Pin 1 of the IC should correspond with the pad marked with the arrowhead. If the IC does not have a notch on one end, refer to the IC Identification Chart to identify Pin 1.

To prepare ICs for installation:
All ICs are damaged easily and should be handled carefully -- especially static-sensitive MOS ICs. Always try to hold the IC by the ends, touching the pins as little as possible. When you remove the IC from its holder, CAREFULLY straighten any bent pins using needle-nose pliers. All pins should be evenly spaced and should be aligned in a straight line, perpendicular to the body of the IC itself.

A. Installing ICs without sockets:

1. Orient the IC so that Pin 1 coincides with the arrowhead on the PC board.

2. Align the pins on one side of the IC so that just the tips are inserted into the proper holes on the board.

3. Lower the other side of the IC into place. If the pins don't go into their holes right away, rock the IC back, exerting a little inward pressure, and try again. Be patient. The tip of a small screwdriver may be used to help guide the pins into place. When the tips of all the pins have been started into their holes, push the IC into the board the rest of the way. Tape the IC to the board with a piece of masking tape.

4. Turn the board over and solder each pin to the foil pattern on the back side of the board. Be sure to solder each pin and be careful not to leave any solder bridges. Remove the masking tape.

WARNING:
Make sure none of the pins have been pushed underneath the IC during insertion.

B. Installing ICs with sockets:

1. Referring to the drawing below, set the IC socket into the designated holes on the board and secure it with a piece of masking tape.
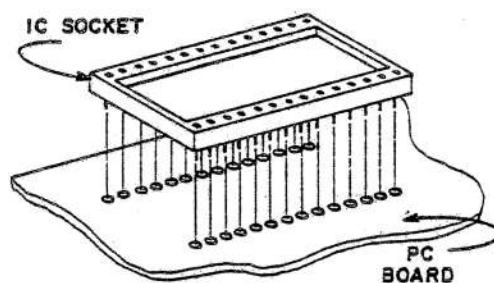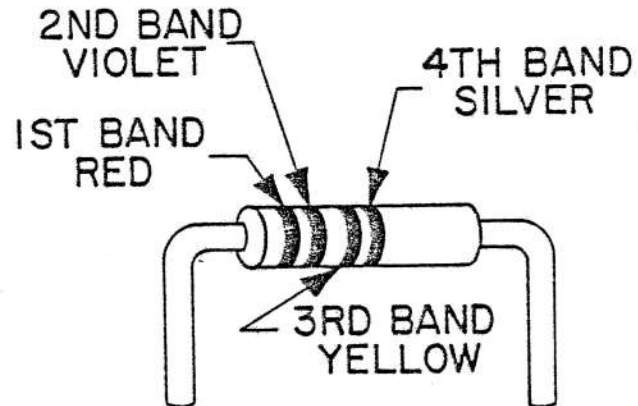

2. Turn the board over and solder each pin to the foil pattern on the back side of the board. Be sure to solder each pin and be careful not to leave any solder bridges. Remove the masking tape.

3. Orient the IC over the socket so that Pin 1 coincides with the arrowhead on the PC board.

4. Align the pins on one side of the socket so that just the tips are inserted into the holes.

5. Lower the other side of the IC into place. If the pins don't go into their holes right away, rock the IC back, exerting a little inward pressure, and try again. Be patient. When the tips of all the pins have been started into their holes, push the IC into the socket the rest of the way.

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Resistor Installation

Resistors have four (or possibly five) color-coded bands as represented in the chart below. The fourth band is gold or silver and indicates the tolerance. NOTE: In assembling a MITS kit, you need only be concerned with the three bands of color to the one side of the gold or silver (tolerance) band. These three bands denote the resistor's value in ohms. The first two bands correspond to the first two digits of the resistor's value and the third band represents a multiplier.

For example: a resistor with red, violet, yellow and silver bands has a value of 270,000 ohms and a tolerance of 10%. By looking at the chart below, you see that red is 2 and violet 7. By multiplying 27 by the yellow multiplier band (10,000), you find you have a 270,000 ohm (270K) resistor. The silver band denotes the 10% tolerance. Use this process to choose the correct resistor called for in the manual.

RESISTOR COLOR CODES		
COLOR	BANDS 1&2	3rd BAND (Multiplier)
Black	0	1
Brown	1	10
Red	2	10^2
Orange	3	10^3
Yellow	4	10^4
Green	5	10^5
Blue	6	10^6
Violet	7	10^7
Gray	8	10^8
White	9	10^9

Use the following procedure to install the resistors onto the boards. Make sure the colored bands on each resistor match the colors called for in the list of Resistor Values and Color Codes given in the assembly instructions.

1. Using needle-nose pliers, bend the leads of the resistor at right angles to match their respective holes on the PC board.

2. Install the resistor into the correct holes on the silk-screened side of the PC board.

3. Holding the resistor in place with one hand, turn the board over and bend the two leads slightly outward.

4. Solder the leads to the foil pattern on the back side of the board; the clip off any excess lead lengths.

Capacitor Installation

A. Electrolytic and Tantalum Capacitors

<u>Polarity must be noted on electrolytic capacitors and tantalum capacitors before they are installed.</u>

The electrolytic capacitors contained in your kit may have one or possibly two of three types of polarity markings. To determine the correct orientation, look for the following.

ELECTROLYTIC CAPACITOR
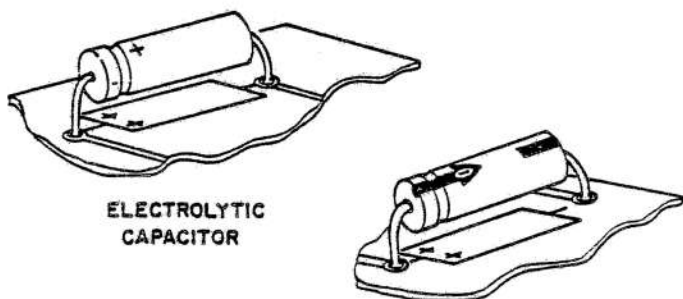
One type will have plus (+) signs on the positive end; another will have a band or a groove around the positive side in addition to the plus signs. The third type will have an arrow on it; in the tip of the arrow there is a negative (-) sign and the capacitor must be oriented so the arrow points to the negative polarity side.

The tantalum capacitor is metallic in appearance and smaller than the electrolytic capacitors. Its positive end has a plus sign on it or a red dot.

Install the electrolytic capacitors and tantalum capacitors using the following procedure. Make sure you have the correct capacitor value each time.

1. Bend the two leads of the capacitor at right angles to match their respective holes on the board. Insert the capacitor into the holes on the silk-screened side of the board. Be sure to align the positive polarity side with the "+" signs printed on the board.

2. Holding the capacitor in place, turn the board over and bend the two leads slightly outward. Solder the leads to the foil pattern and clip off any excess lead lengths.

B. Ceramic Disk Capacitors

Install the ceramic disk capacitors using the following procedure. Make sure you have the correct capacitor value each time.

1. Straighten the two capacitor leads as necessary to fit their respective holes on the PC board.

2. Insert the capacitor into the correct holes from the silk-screened side of the board. Push the capacitor down until the ceramic insulation almost touches the foil pattern.

3. Holding the capacitor in place, turn the board over and bend the two leads slightly outward.

4. Solder the two leads to the foil pattern on the back side of the board; then clip off any excess lead lengths.
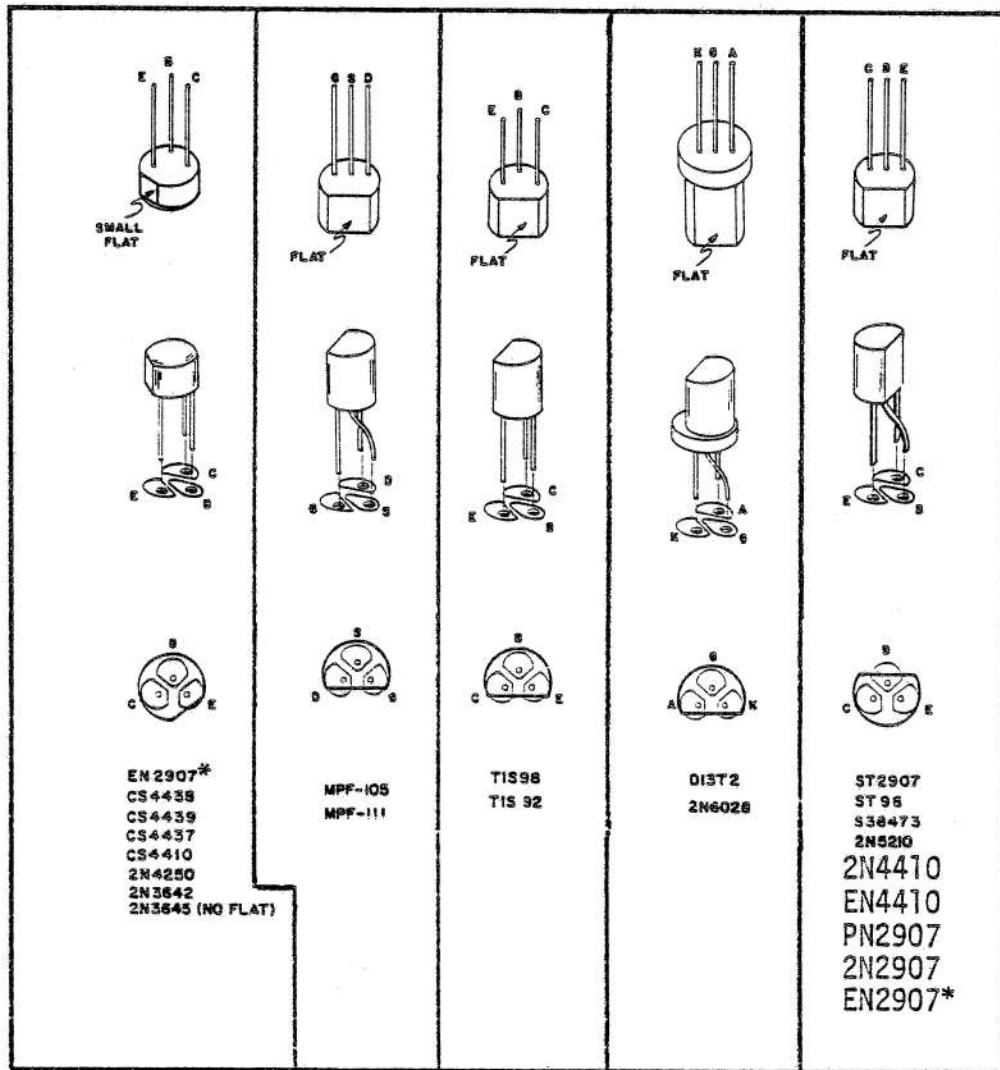
Diode Installation

NOTE: Diodes are marked with a band on one end indicating the cathode end. Each diode must be installed so that the end with the band is oriented towards the band printed on the PC board. Failure to orient the diodes correctly may result in permanent damage to your unit.
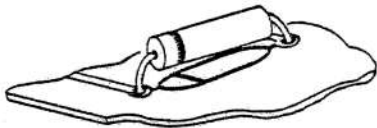
DIODE

Use the following procedure to install diodes onto the board. Refer to the list of Diode Part Numbers included for each board to make sure you install the correct diode each time.

1. Bend the leads of the diode at right angles to match their respective holes on the board.

2. Insert the diode into the correct holes on the silk screen, making sure the cathode end is properly oriented. Turn the board over and bend the leads slightly outward.

3. Solder the two leads to the foil pattern on the back side of the board; then clip off any excess lead lengths.

Transistor Installation

To install transistors, use the following instructions.

NOTE: Always check the part number of each transistor before you install it. (See listing of Transistor Part Numbers for each board.) Some transistors look identical but differ in electrical characteristics, according to part number. If you have received substitute part numbers for the transistors in your kit, check the Transistor Identification Chart which follows these instructions to be sure you make the correct substitutions.

NOTE: Always make sure the transistor is oriented so that the emitter lead is installed in the hole on the PC board labeled with an "E". To determine which lead is the emitter lead, refer to the Transistor Identification Chart.

1. After the correct transistor has been selected and the leads have been properly oriented, insert the transistor into the holes on the silk-screened side of the board.

2. Holding the transistor in place, turn the board over and bend the three leads slightly outward.

3. Solder the leads to the foil pattern on the back side of the board; then clip off any excess lead lenghts.

TRANSISTOR IDENTIFICATION CHART

EN2907*	MPF-105	TIS98	013T2	ST2907
CS4438	MPF-111	TIS 92	2N6028	ST 98
CS4439				S38473
CS4437				2N5210
CS4410				2N4410
2N4250				EN4410
2N3642				PN2907
2N3645 (NO FLAT)				2N2907
				EN2907*

IN THE ILLUSTRATION ABOVE THE OUTLINE OF EACH TYPE OF TRANSISTOR IS SHOWN ABOVE THE PADS ON THE CIRCUIT BOARD WITH THE CORRECT DESIGNATION FOR EACH OF THE THREE LEADS. USE THIS INFORMATION TOGETHER WITH THE INFORMATION IN THE ASSEMBLY MANUAL FOR THE CORRECT ORIENTATION OF THE TRANSISTORS AS YOU INSTALL THEM.

THE FOLLOWING IS A LIST OF POSSIBLE SUBSTITUTIONS: IF ANY OTHERS ARE USED YOU WILL RISK DAMAGING YOUR UNIT:
    2N4410 = EN4410 = CS4410 = CS4437, CS4438, TIS98, ST98, S38473 (NPN)
    EN2907 = 2N2907 = PN2907 = ST2907, CS4439 (PNP)
WHEN MAKING SUBSTITUTIONS, REFER TO THE ILLUSTRATION TO DETERMINE THE CORRECT ORIENTATION FOR THE THREE LEADS.

*Configuration of the leads on EN2907 may vary.

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SECTION II
ALTAIR 680b
MAIN PC BOARD ASSEMBLY

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IC Socket Installation

There are 15 IC sockets to be installed on the 680b Main PC Board.

Install the IC sockets according to the instructions given on page 7, section B. The size for each socket is listed below.

IC Designation	Socket Size
( ) C, D, E, F, G, H, J, K, and Z	16 pin
( ) T, U, V, W, and JJ	24 pin
( ) NN	40 pin

The ICs that are to be installed into these sockets are all static-sensitive MOS ICs. (see page 6)

Install only the sockets at this time. DO NOT install the ICs in the sockets until the Main PC Board has been completely assembled.

IC Installation

There are 31 ICs to be installed (without sockets) onto the 680b Main PC Board.

Install these ICs according to the instructions on page 7, section A. The correct part numbers for the ICs are listed below.

IC Designation	Part Number
( ) A, B, X, HH, MM, VV, and ZZ	74LS04
( ) L (Baudot only)*	74LS74
( ) M	74LS10
( ) N and P	74LS01
( ) R, S, CC, and PP	4050**
( ) Y	74LS00
( ) AA, KK, LL, and UU	74LS30
( ) BB	4449**
( ) DD, EE, and FF	74LS20
( ) GG and SS	74LS02
( ) TT	74LS73
( ) RR, WW, XX, and YY	74367 (or 8T97)

*NOTE: Install IC L ONLY if a
        Baudot terminal is to be
        interfaced to the 680b.

**Static-Sensitive MOS ICs.
  See page 6 before installing.
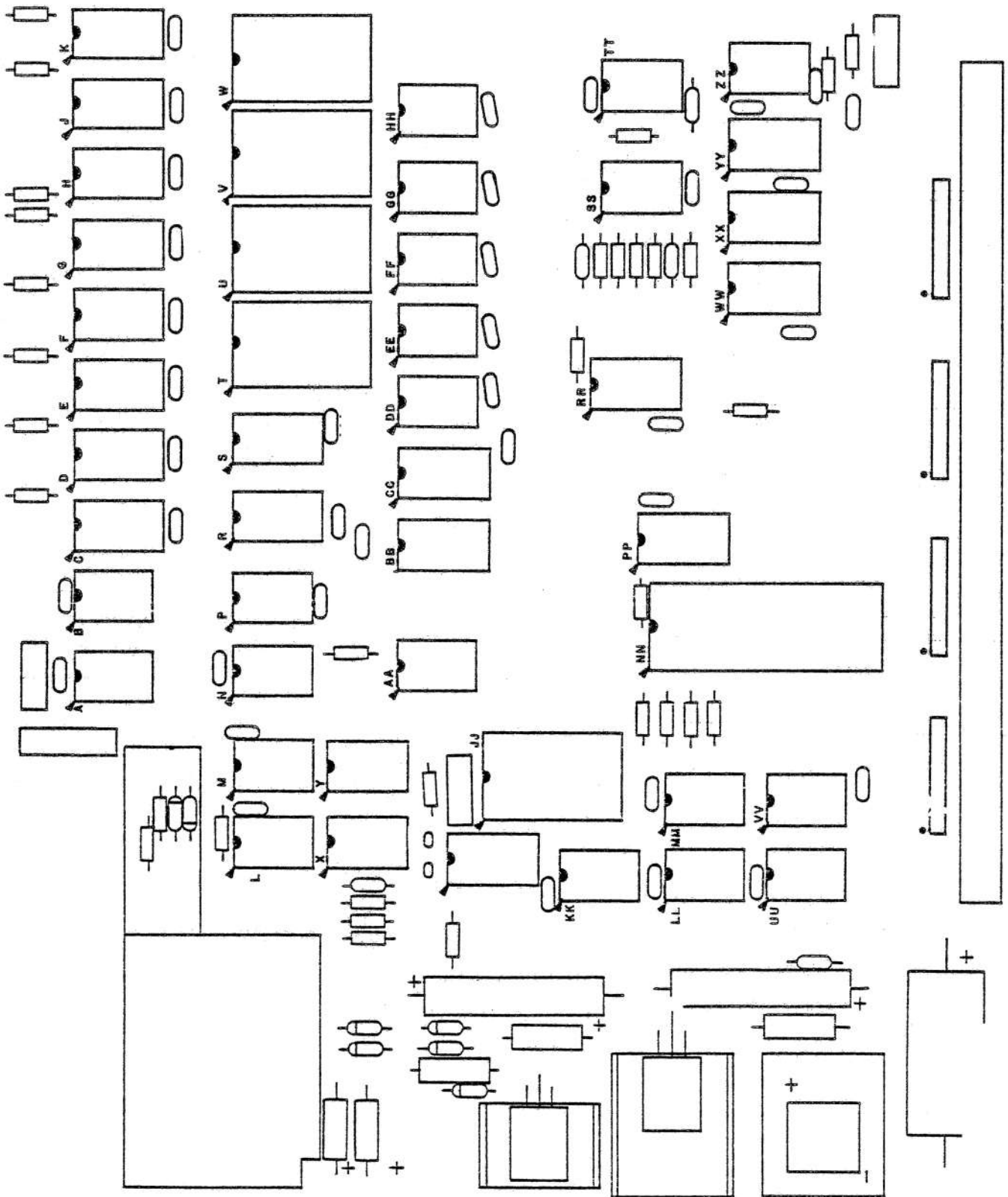
IC and IC Socket Installation

Capacitor Installation

There are 6 electrolytic capacitors
(C1, C2, C3, C4, C5, and C15), 1
tantalum capacitor (C6), and 43 cer-
amic disk capacitors (C7 through C14
and C50 through C84) to be installed
on the Main PC Board. Install the
electrolytic capacitors and the tan-
talum capacitor according to the
instructions given on page 9, Sec-
tion A. Install the ceramic disk
capacitors according to the instruc-
tions on page 9, Section B.

The values for all 50 capacitors are
listed below.

Capacitor Values	
( ) C1, C2, C3	35 uf
( ) C4, C5	100 uf
( ) C6	1 uf
( ) C7, C8	56 pf
( ) C9, C10	430 pf
( ) C11	.001 uf
( ) C12	50 pf
( ) C13	.01 uf
*( ) C14, C50 through C84	.1 uf
( ) C15	3300 uf

*NOTE: Save the extra capacitor
leads clipped from C50
through C84 for later use.

Capacitor Installation

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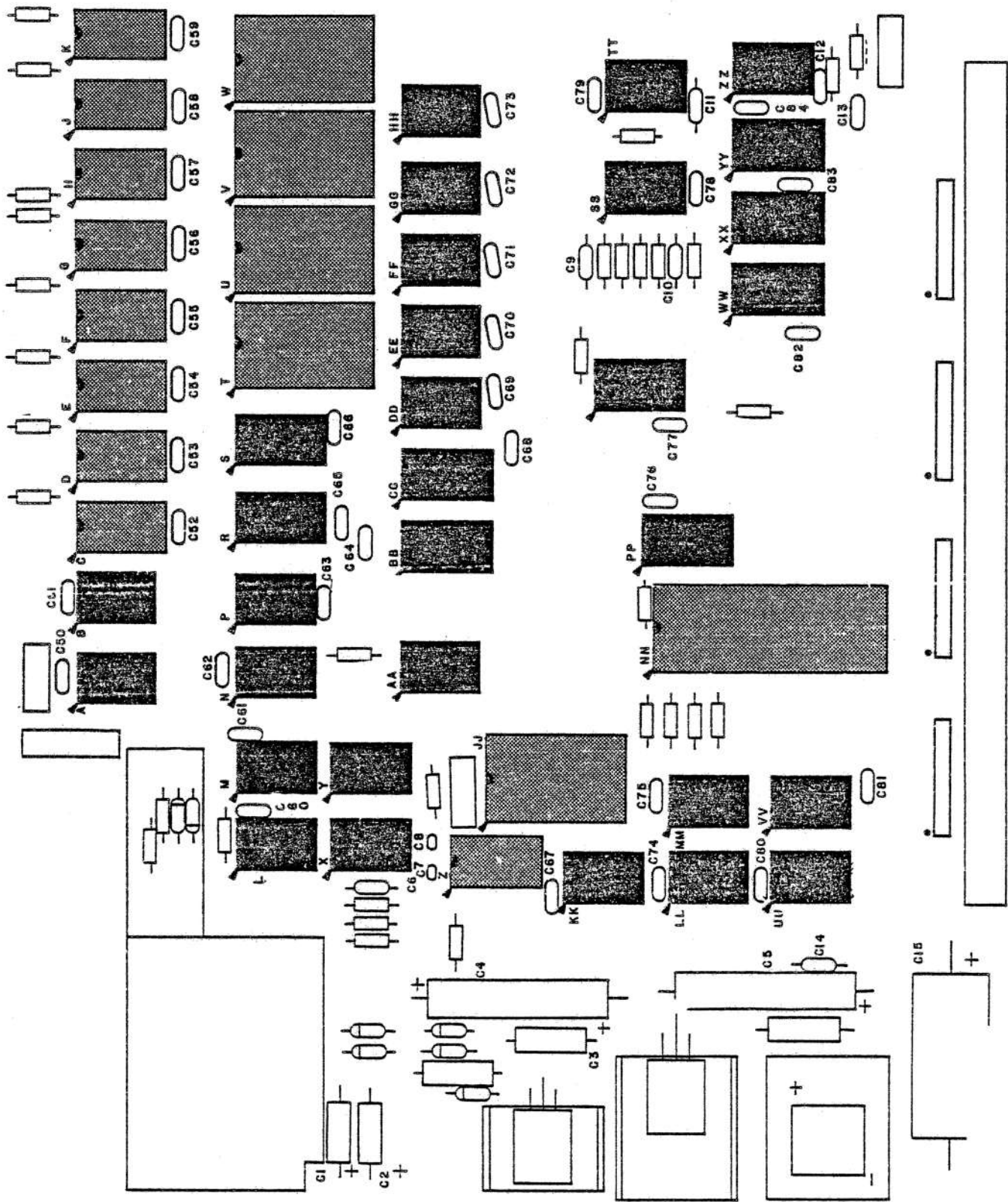
Resistor Installation

Install the following 37 resistors on the Main PC Board. Use the instructions listed on page 8.

NOTE: All of the resistors on the Main PC Board are either 1/4 watt or 1/2 watt, except R21, which is a 2-watt resistor.

Resistor Values and Color Codes	
( ) R1 through R9, R15, R30	4.7K ohm, yellow, violet, red
( ) R10, R11, R13, R17, R18	10K ohm, brown, black, orange
( ) R12	33K ohm, orange, orange, orange
( ) R14	330 ohm, orange, orange, brown
( ) R16	10M ohm, brown, black, blue
( ) R19, R20	3.3K ohm, orange, orange, red
( ) R21	15 ohm (2 watt), brown, green, black
( ) R22	1K ohm, brown, black, red
( ) R23, R28	47 ohm, yellow, violet, black
( ) R24, R25, R26, R27, R31, R32	470 ohm, yellow, violet, brown
( ) R29	100 ohm, brown, black, brown

Resistor Pack Installation

After installing all 37 resistors, the 4 resistor packs (RP1 through RP4) must be installed. The resistors within these packs each have a value of 4.7K ohms. Each pack has a small dot printed at one end. This dot must correspond with the dot printed on the PC Board. Use the following instructions to install each resistor pack.

1. Install the resistor pack at a perpendicular angle to the silk-screened side of the board. Make sure the dot on the resistor pack is aligned with the dot printed on the PC Board.

2. Tape the resistor pack in place and turn the board over. Before soldering, check that the resistor pack is still perpendicular to the board. Carefully solder each pin of the resistor pack to the foil pattern on the back of the board.*

3. Turn the board over again and remove the tape.

( ) RP1 through RP4 are 4.7K ohm resistor packs

*NOTE: The foil pattern on the back of the board is partially covered by a solder mask. The solder masks helps prevent solder bridges across lands.

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Altair 680b

Main PC Board, Assembly Procedure

Addendum, Page 20, Resistor Pack Installation

Due to supply shortages, your 680b kit may have been shipped to you without the four 4.7K ohm Resistor Packs (RP1-RP4) called for on page 20 of the Assembly Manual. Nine 4.7K ohm, 1/4 watt resistors have been substituted for each pack. These substitute resistors must be installed according to the directions outlined below.

Substitute Resistors, RP1-RP4
Installation Procedure

1. Note that each resistor pack designation on the silk screen has 10 holes. The left-most hole is marked on the silk screen with a dot.

2. Beginning with the box labeled RP1, insert one 4.7K ohm, 1/4 watt (yellow-violet-red) resistor vertically into the right-most hole in the box. Bend the top lead at two right angles, as shown in the diagram, so that the end of the free lead may be inserted into the hole marked with a dot. Solder the two inserted leads to the foil pattern on the back of the board.

3. Insert the remaining eight 4.7K ohm, 1/4 watt resistors vertically into the remaining eight holes. Solder each of the top leads to the common horizontal lead of the first resistor. It may be helpful to bend the top leads against the horizontal lead for better contact before soldering.

4. Solder the inserted leads of the eight resistors to the foil pattern on the back of the board. Clip all excess leads from the top and bottom of the resistors.

5. Repeat this procedure for RP2, RP3 and RP4.
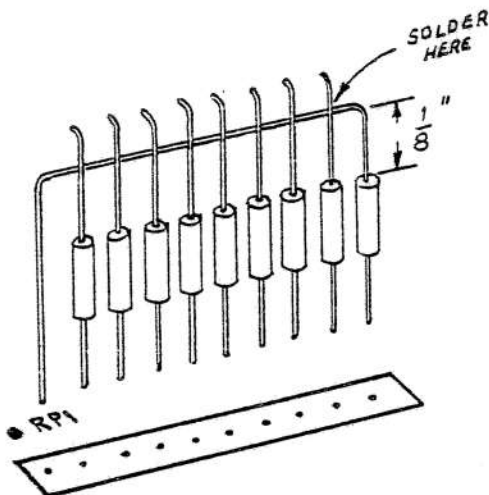
Resistor Installation
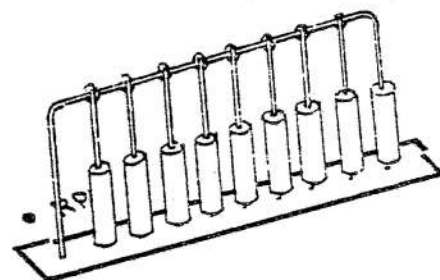
Completed Resistor Assembly

Resistor Installation

21
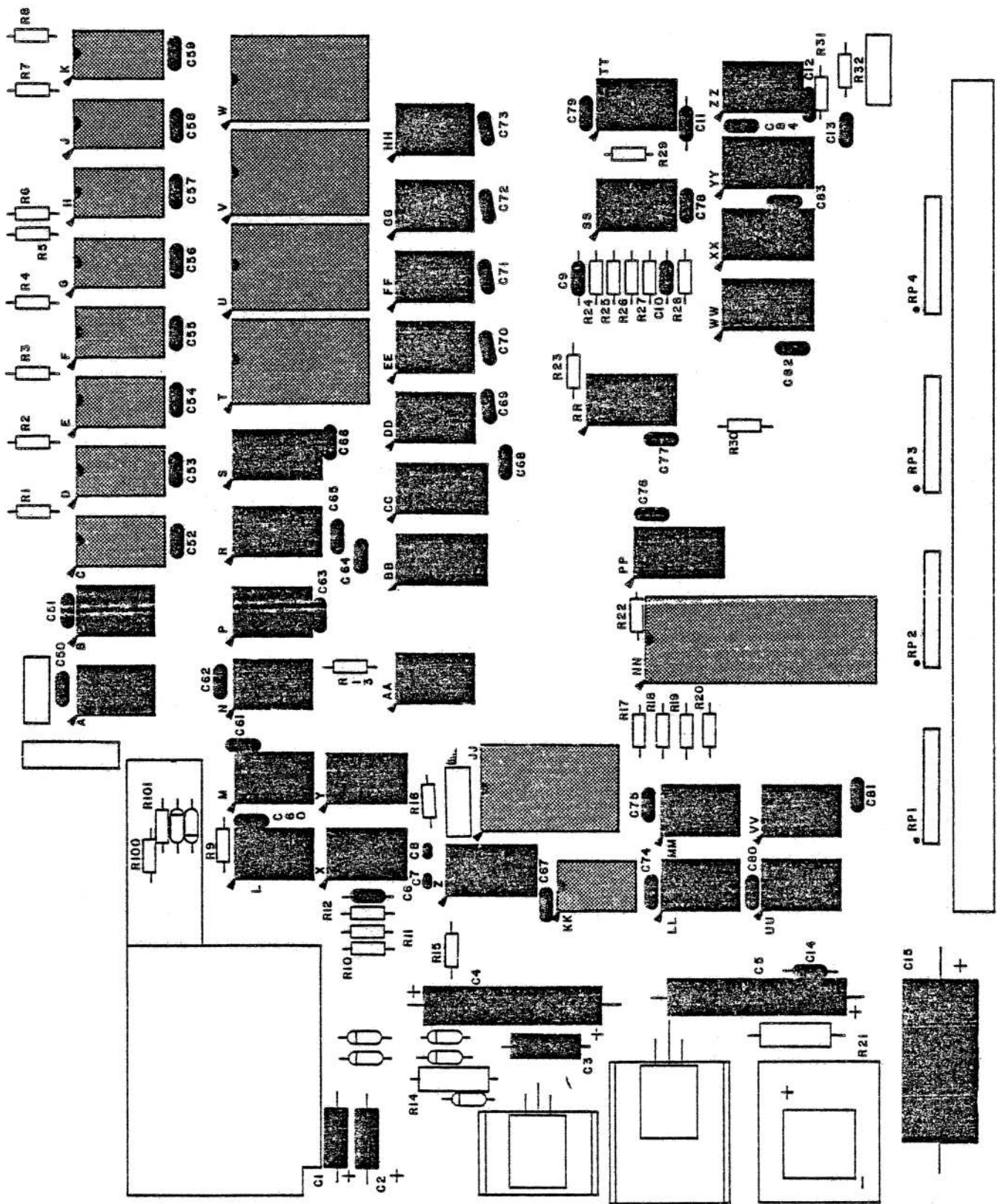
Transistor Installation

There are five transistors to be installed on the Main PC Board. Q2, Q3, Q4, and Q5 should be installed first. To install these 4 transistors, follow the instructions given on page 10. MAKE SURE YOU INSTALL THE EMITTER LEAD INTO THE HOLE LABELLED "E" ON THE BOARD. See the Transistor Identification Chart on page 11 for identification of the emitter lead.

Install transistor Q1 next. Q1 is a TIP-30 power transistor that will be installed with a small heat sink. Use the instructions and diagram below to install Q1.

WARNING: The TIP-30 is very similar in appearance to the MC7805 voltage regulator (VR1). When installing Q1, make sure you have selected the part labeled TIP-30.

1. Set the TIP-30 in place on the board and align the mounting holes. Use a pencil to mark the point on each of the three leads where they line up with their respective holes on the board.

2. Use needle-nose pliers to bend each of the three leads at a right angle on the points where you made the pencil marks.

NOTE: Use heat-sink grease when installing this component. Apply the grease to all surfaces which come in contact with each other.

3. Referring to the drawing, set the transistor and heat sink in place on the silk-screened side of the board. Secure them to the board using a #6-32 nut. Hold the transistor in place as you tighten the nut to keep from twisting the leads.

4. Turn the board over and solder the three leads to the foil pattern on the back side of the board. Be sure not to leave any solder bridges.

5. Clip off any excess lead lengths.

Part numbers for the five transistors are given below.

Transistor Part Numbers	
( ) Q1	TIP-30
( ) Q2, Q3	CCS-4438
( ) Q4, Q5	2N-2907

22

Transistor Installation

23
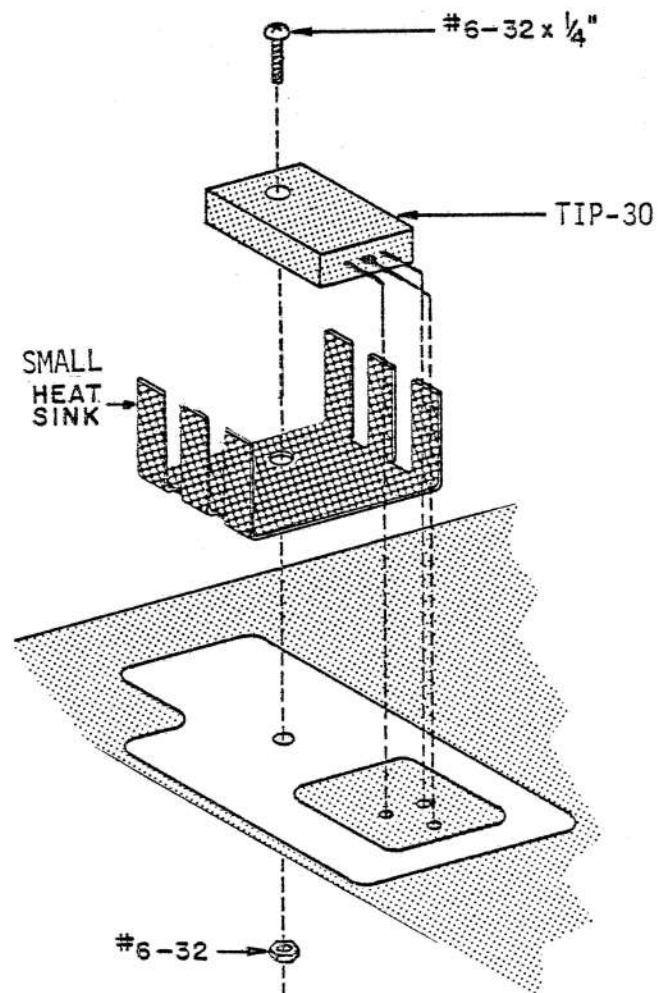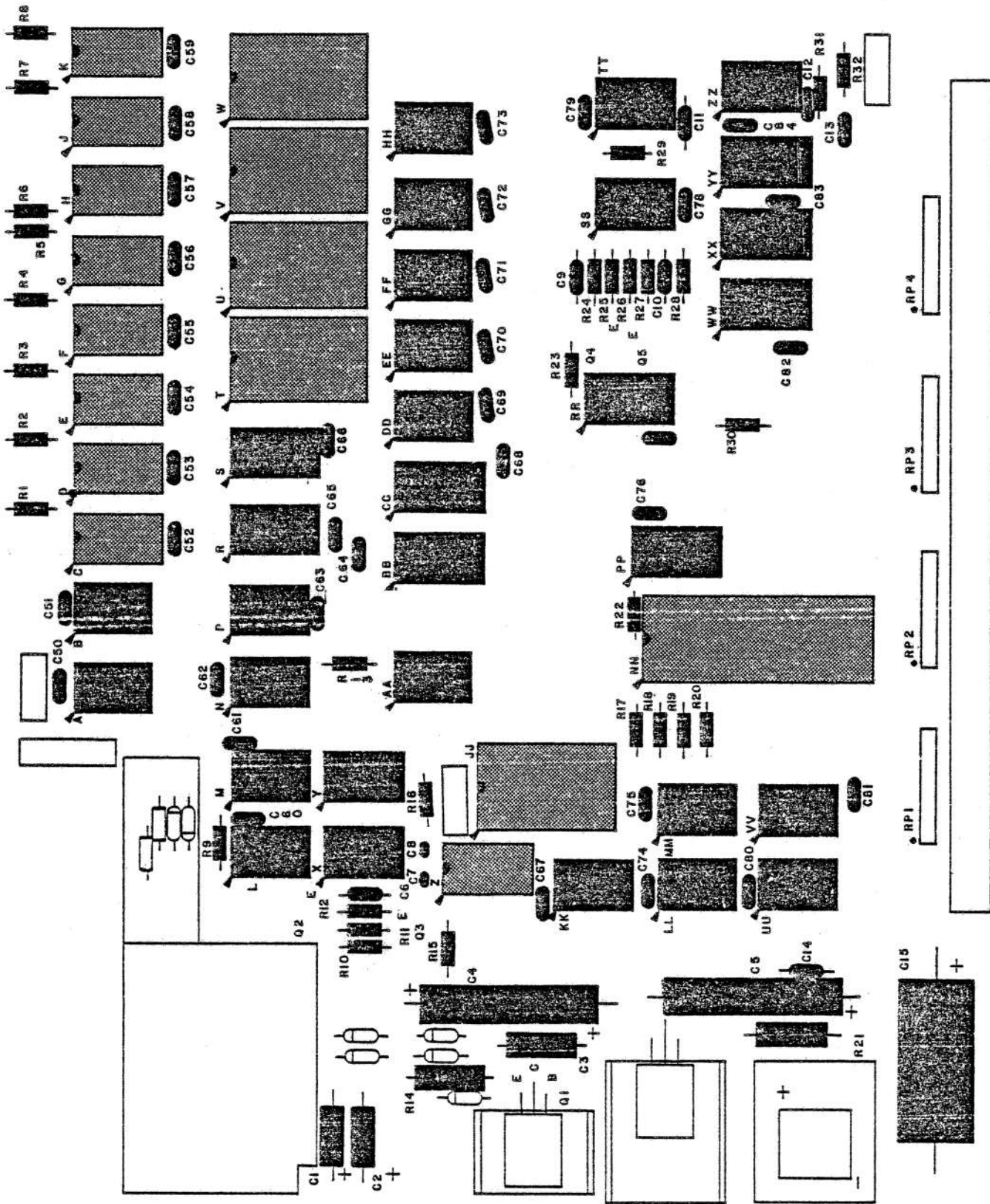
Diode Installation

There are five diodes (D1, D2, D3, D4, and D5) to be installed on the Main PC Board. To install these diodes, follow the instructions given on page 10.

Part numbers for the five diodes are listed below.

| Diode Part Numbers	
( ) D1, D2, D3, D5	IN4004
( ) D4	10.0 volt zener

Crystal Installation

There are two crystals to be installed on the 680 Main PC Board. XTAL 1 is a 2.4576 MHz crystal and XTAL 2 is a 2.000 MHz crystal.

Follow the instructions below for installation of each crystal.

1. Use needle nose pliers to straighten the leads on the crystal.

2. Insert the leads into the correct holes until the crystal case stands 1/8" off the surface of the board. (Do not allow the metal crystal case to come into contact with any of the lands on the board.)

3. Holding the crystal in place, turn the board over and bend the leads slightly outward.

4. Solder the leads to the foil pattern and clip off any excess lead lengths.

( ) XTAL 1	2.4576 MHz
( ) XTAL 2	2.000 MHz
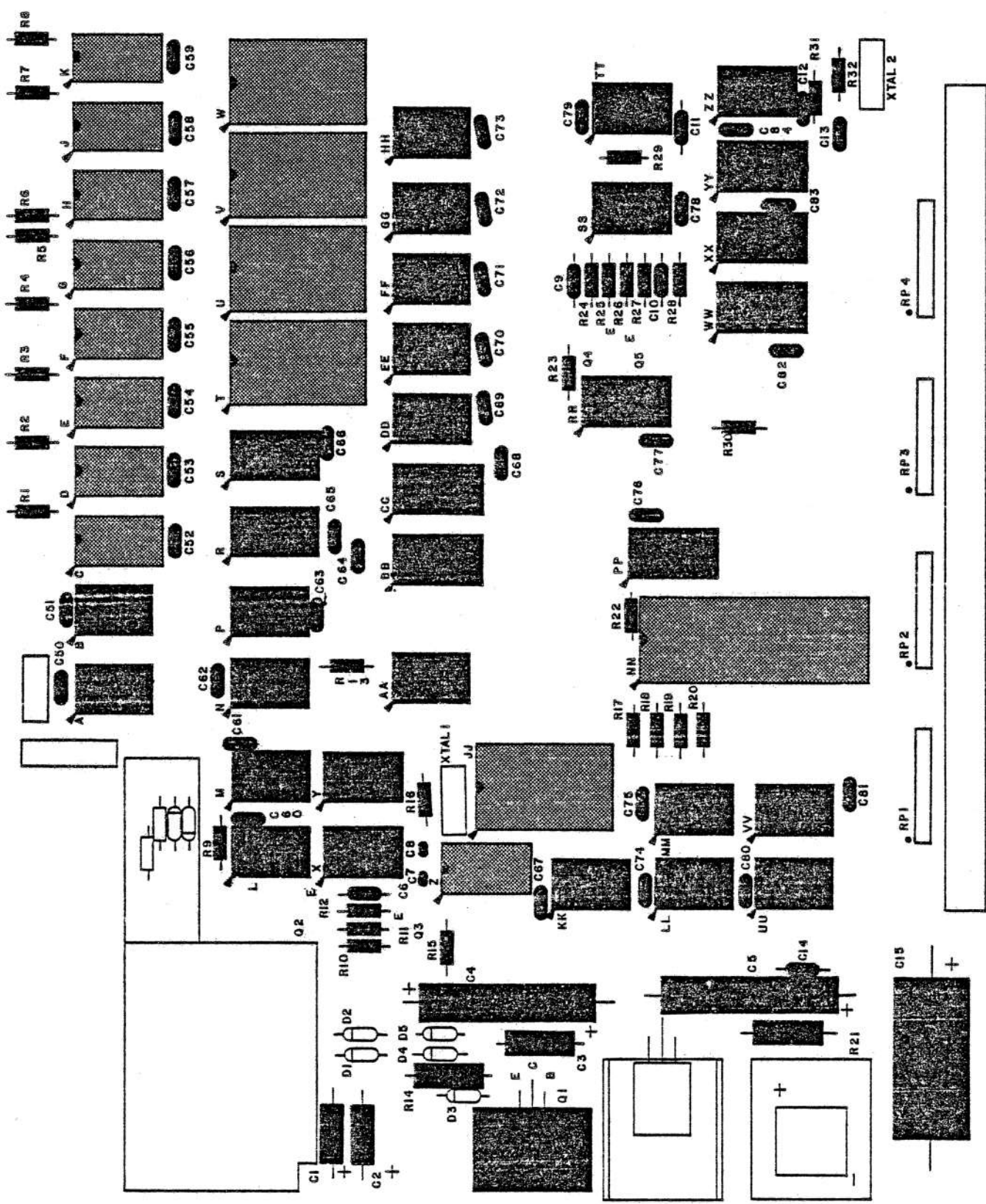
Diode and Crystal Installation

Voltage Regulator Installation

There is one 7805 5-volt regulator (VR1) to be installed on the 680b Main PC Board.

Use the following instructions and the diagram below to install the voltage regulator.

1. Set the 7805 in place on the board and align the mounting holes. Use a pencil to mark the point on each of the three leads where they line up with their respective holes on the board.

2. Use needle-nose pliers to bend each of the three leads at a right angle on the points where you made the pencil marks.

NOTE: Use heat-sink grease when instal-ling this component. Apply the grease to all surfaces which come in contact with each other.

3. Referring to the drawing, set the regulator and heat sink in place on the silk-screened side of the board. Secure them to the board using a #6-32 nut. Hold the regulator in place as you tighten the nut to keep from twisting the leads.

4. Turn the board over and solder the three leads to the foil pattern on the back side of the board. Be sure not to leave any solder bridges.

5. Clip off any excess lead lengths.

( ) VR1 is part number 7805.

#6-32 x ¼"

MC 7805

HEAT SINK

#6-32
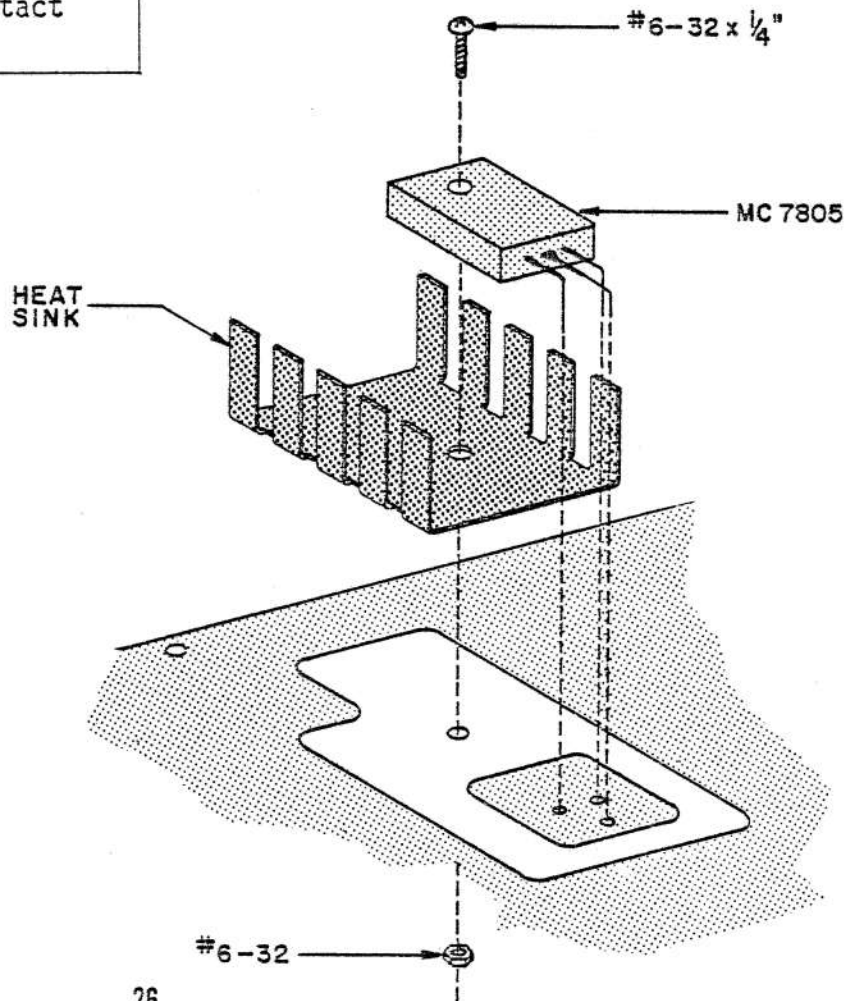
Bridge Rectifier Installation

There is one VJ048 bridge rectifier (BR1) to be installed on the 680 Main PC Board. It will be installed with one of the large heat sinks over it.

WARNING! It is absolutely essential that the bridge rectifier be oriented correctly, so that the "+" lead corresponds with the "+" hole on the PC board. Failure to orient the bridge rectifier properly will result in permanent damage to your unit.


Examine the diagrams shown below and use the following instructions to install BR1.

NOTE: Use heat sink grease when installing this component. Apply the grease to the bridge rectifier and the heat sink where they are in contact with each other.

1. Orient the bridge rectifier and the heat sink as shown in the illustration below. Note that the mounting hole in the heat sink is not centered but is closer to one end. Make sure you orient the "+" lead of the rectifier under the wider end of the heat sink, as shown.

2. Attach the heat sink to the bridge rectifier, using a #6-32 x 1/2 inch screw and a #6 hex nut.
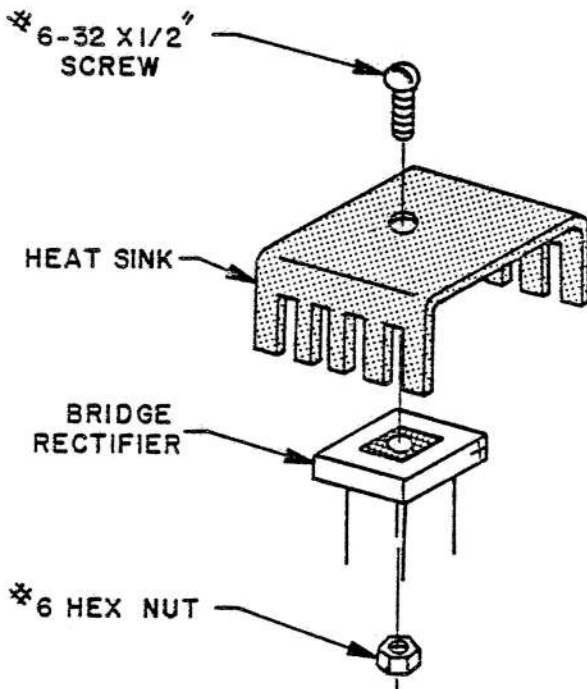
3. Orient the heat sink and rectifier assembly correctly over the board, as shown in the next illustration. When you have the proper alignment, the wider end of the heat sink will be pointing towards the right side of the PC board, and the "+" lead will be going into the "+" hole.

4. Put the four leads from the bridge rectifier through the proper holes on the PC board until the prongs of the heat sink rest on the board. If necessary, bend the prongs of the heat sink outward slightly so that they do not contact any lands when mounted to the board.

5. Holding the heat sink in place, turn the board over and bend the four leads slightly outward. Solder the leads to the foil pattern on the back of the board and clip off any excess lead lengths.
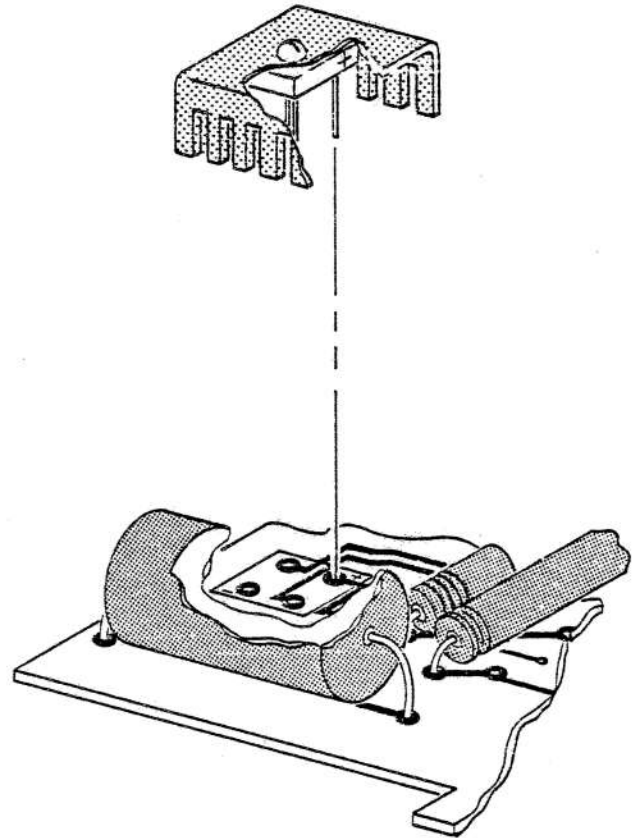
( ) BR1 is part number VJ048

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Connector Installation

There are three silk-screen designations for connectors on the 680b Main PC Board: J1, J2 and J3.

J1

J1 is not included with your kit and is not to be installed at this time. The designation J1 is for a 100-pin edge connector that will be used for future memory and I/O expansion. The connector itself is included with the purchase of an expander card.

J2

J2 is a 5-pin male molex connector. Install J2 onto the Main PC Board according to the following instructions.

1. Cut the bent pins off 1/8" from the body of the connector, as shown. This modification is necessary before the connector will fit properly on the PC board. NOTE: Disregard this step if the bent pins have been pre-cut at the factory.
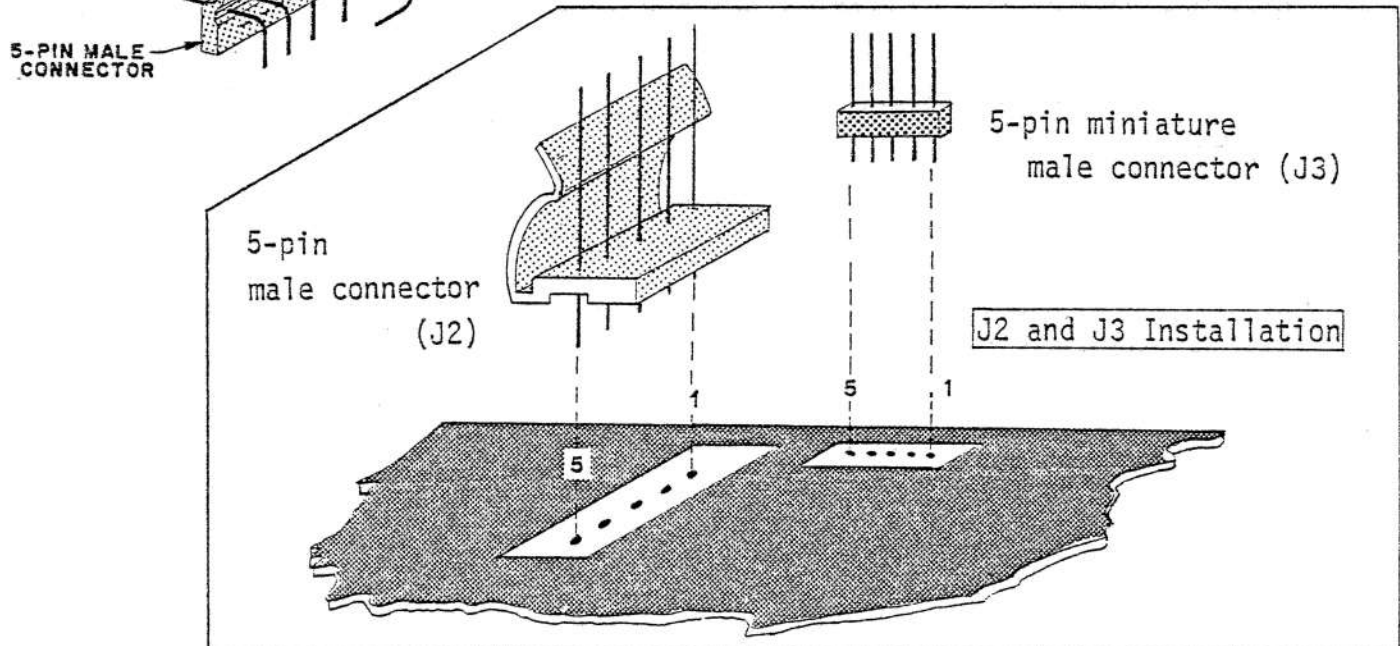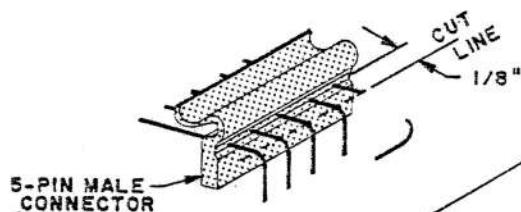
2. Orient the connector J2 as shown below, with the closed side facing the left hand side of the board. Insert the 1/8" pins into the five holes on the silk screened side of the board.

3. Holding the connector in place, turn the board over and solder the five pins to the foil pattern on the back side of the board.

J3

J3 is a 5-pin miniature male molex connector. Install J3 onto the Main PC Board according to the following instructions.

1. Insert the short pins into the five holes on the silk screened side of the Main PC Board, as shown below.

2. Holding the connector in place, turn the board over and solder the five pins to the foil pattern on the back side of the board.

CUT LINE
1/8"

5-PIN MALE CONNECTOR

5-pin male connector (J2)

5-pin miniature male connector (J3)

J2 and J3 Installation

28

Input/Output Configurations

        In the upper left-hand corner of the Main PC Board, a portion of
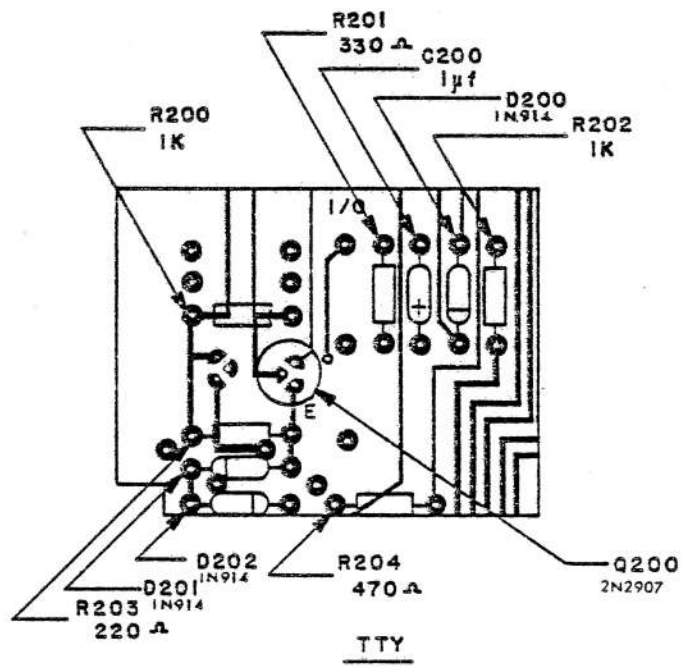the foil pattern has been boxed off and labeled "I/O."

        The components in this box may be configured in one of three
different ways, depending on the interface level desired.

        A.   ASR33/KSR33 Teletype Interface (20 ma current loop)

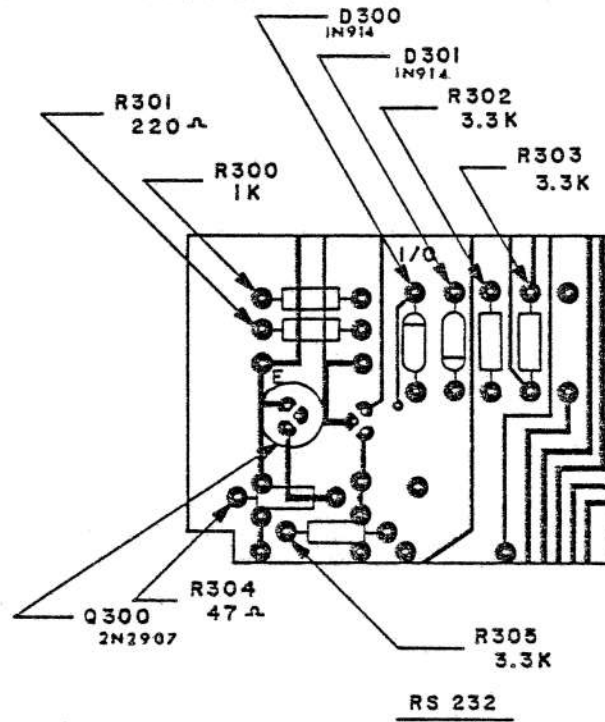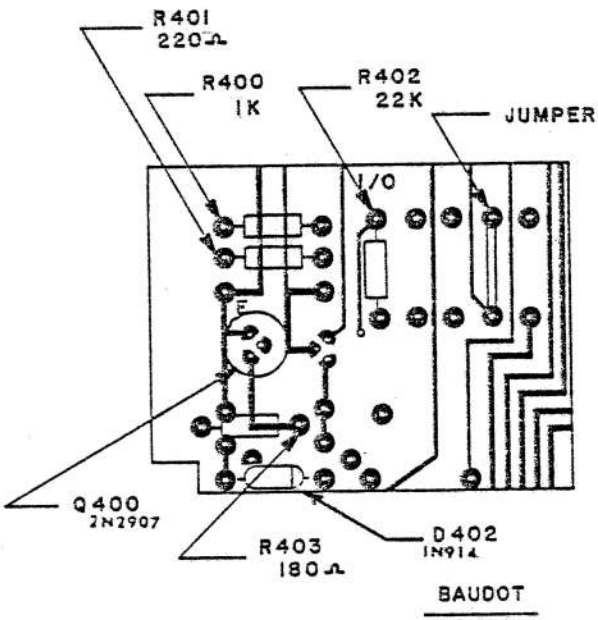   B.   Standard RS-232 Interface

        C.   Baudot Interface

        The component configuration for each of the three interface levels
is diagrammed below. The correct part numbers and values appear on the
diagrams.

        Install these components onto the "I/O" section of the Main PC
Board according to the interface level you are planning to use.

A.   ASR33/KSR33 Teletype Interface

        (20 ma current loop)

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B. Standard RS-232 Interface

R301
220 Ω

R300
1 K

D300
1N914

D301
1N914

R302
3.3 K

R303
3.3 K

I/O

E

Q300
2N2907

R304
47 Ω

R305
3.3 K

RS 232

C. Baudot Interface*

R401
220 Ω

R400
1 K

R402
22 K

JUMPER

I/O

E

Q400
2N2907

R403
180 Ω

D402
1N914

BAUDOT

*This component configuration alone does not provide a Baudot level interface for the 680b. It is also necessary to include a level converting and isolation circuit (either a read relay or an optical isolation circuit will suffice). A suggested isolation circuit is shown in the Altair 680b Operator's Manual.

Jumper Wire Connections

On the 680b Main PC Board, the following three areas require jumper wire connections:

    A.   Baud Rate Generator (pads 0-3, to the left of IC Z)

    B.   RAM Starting Address (pads 1-6 and 10-$\overline{15}$, between ICs AA & BB)

    C.   Hardware Programmable Bits (pads 1-5, to the left of IC WW)

Use the capacitor leads saved earlier to make the jumper connections. Cut the leads to size and insert the ends into the proper holes from the silk screened side of the board. Solder the ends to the foil pattern. Make sure the wire is raised 1/4" or so above the board so that none of the lands underneath are shorted.

A.   BAUD RATE GENERATOR

Moving to the left from IC Z there is: 1) a column of four holes labeled 0 through 3; 2) a column of four holes (not labeled) representing the ground (LOW) plane; 3) a column of four holes (not labeled) representing the +5 volt (HIGH) plane.

The baud rate for the 680b computer is user selectable according to the jumper connections placed across these holes. The configurations of the jumper wires for the various baud rates are listed in the chart on the next page.

0	1	2	3	OUTPUT RATE Z(pin 10)
L	H	L	L	50 Baud
H	H	L	L	75 Baud
L	L	H	L	134.5 Baud
H	L	H	L	200 Baud
L	H	H	L	600 Baud
H	H	H	L	2400 Baud
L	L	L	H	9600 Baud
H	L	L	H	4800 Baud
L	H	L	H	1800 Baud
H	H	L	H	1200 Baud
L	L	H	H	2400 Baud
H	L	H	H	300 Baud
L	H	H	H	150 Baud
H	H	H	H	110 Baud

TRUTH TABLE FOR
RATE SELECT INPUTS

Examples are shown below of the jumper wire configurations
for 110 baud, 4800 baud and 1200 baud.
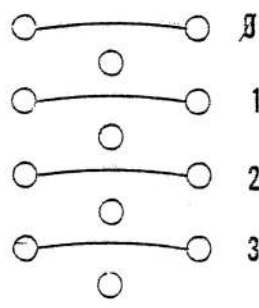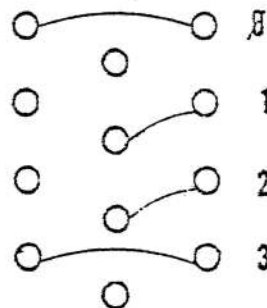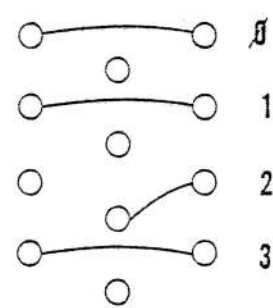
110 Baud   4800 Baud   1200 Baud

B.   RAM STARTING ADDRESS

The Altair 680b comes equipped with 1K of Random Access Memory (RAM). The starting address for this block of memory is determined by the configuration of the jumper wires across pads 1 through 6 and 10 through $\overline{15}$ (between ICs AA and BB).

As long as the unit is equipped only with the original 1K of RAM, you will probably want to configure the jumper wires for starting address 0000. This is accomplished by jumpering the following locations:

```
                                         O  15
         6  O                            O  15
                                         O  14
         5  O                            O  14
                                         O  13
         4  O                            O  13
                                         O  12
         3  O                            O  12
                                         O  11
         2  O                            O  11
                                         O  10
         1  O                            O  10
```
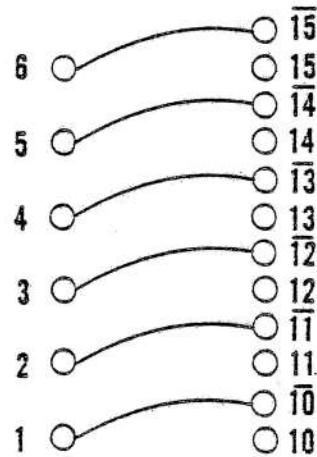
As more memory is added to the unit, you may wish to change the RAM starting address. Details on how to wire the board for various starting addresses are given in the 680b Operator's Manual.

C. HARDWARE PROGRAMMABLE BITS

Moving to the left from IC WW there is: 1) a column of five holes labeled 1 through 5; 2) a column of five holes (not labeled) representing the ground (LOW) plane; 3) a column of five holes (not labeled) representing the +5 volt (HIGH) plane.

The following three conditions are to be hardware programmed by placing jumper connections across these holes:

1. Baudot Interface Bit

   Jumper hole #1 HIGH if a Baudot interface is to be used.
   Jumper hole #1 LOW if no Baudot interface is to be used.

2. Number of Stop Bits Bit

   Jumper hole #2 HIGH for 1 stop bit.
   Jumper hole #2 LOW for 2 stop bits.

3. Terminal/No Terminal Bit

   Jumper hole #5 HIGH if no terminal is to be interfaced (i.e. programming to be done via the front panel).
   Jumper hole #5 LOW if a terminal is to be interfaced (i.e. programming to be done via Teletype, CRT terminal, etc.).

The remaining two holes (#3 and #4) are reserved for future system expansion and are not used at this time. They should be jumpered to the LOW plane to insure noise immunity on the bus.
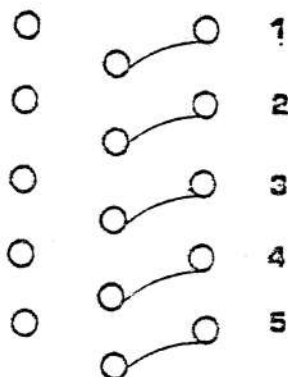
Programmed for:
1. no Baudot
2. 2 stop bits
3. terminal
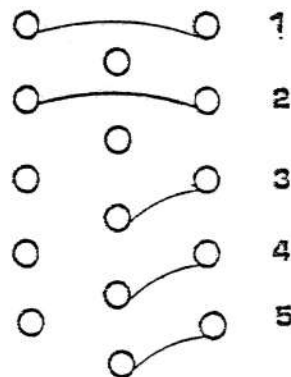
Programmed for:
1. Baudot
2. 1 stop bit
3. terminal

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Paper Tape Reader Control

In the upper left-hand corner of the Main PC Board there is a block of components labeled "PTRC" (Paper Tape Reader Control).

These components are to be installed only if the Altair 680b is to be interfaced to a Teletype equipped with a Call/Control Unit (controllable reader).

The part numbers for the components are listed in the chart below.

Silk Screen Designation	Part Number
R100	1K ohm brown-black-red
R101	220 ohm red-red-brown
D100 & D101	IN914
Q100	2N2907
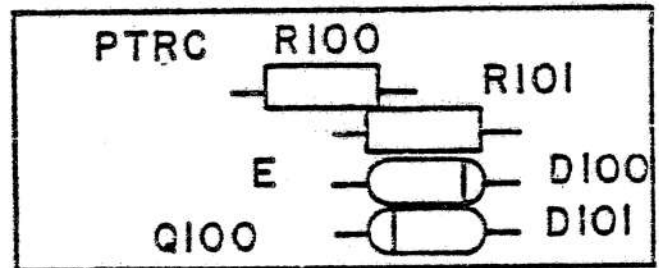
If you are not using a controllable reader, it is not necessary to mount these components onto the board.

MOS IC Installation

The assembly of the Main PC Board is now complete except for the installation of the Static-Sensitive MOS ICs into their respective sockets.

Before installing these ICs, review the "MOS IC Special Handling Precautions" given on page 6.

Install the ICs according to the instructions given on page 7, section B.

The correct part numbers are listed in the chart below.

ACIA PROM Monitor

Insert the 1702-A chip (labeled "A" or "680A") into the the IC socket labeled T. This IC contains the PROM monitor for use with any of the ACIA interfaces (TTY or RS-232).

Baudot PROM Monitor

The Baudot PROM monitor is contained within two ICs labeled "680B1" and "680B2." Insert 680B1 into IC socket U and 680B2 into IC socket T. These two ICs are supplied only to customers who specified the Baudot option when ordering their kits.

Silk Screen Designation	IC Part Number
( ) C, D, E, F, G, H, J, and K	2102
( ) Z	34702
( ) JJ*	6850
( ) NN	6800

*NOTE: DO NOT INSTALL IC JJ if a Baudot terminal is to be interfaced to the 680b.

SECTION III
ALTAIR 680b
DISPLAY/CONTROL BOARD ASSEMBLY

39 (blank)

IC Installation

There are 12 integrated circuits, or ICs, to be installed on the 680b Display/Control Board. These ICs should be installed according to the instructions given on page 7, Section A.

Part numbers for all 12 ICs are listed below.

IC Part Numbers	
Silk Screen Designation	IC Part Number
( ) A, B, C, D, I	SN74LS05
( ) E, F, G, H	4009+
( ) J	SN74L00
( ) K, L	SN74L123

+Static-sensitive MOS IC
(Read "MOS IC Special Handling Precautions" before inserting these ICs.)

IC Installation

41
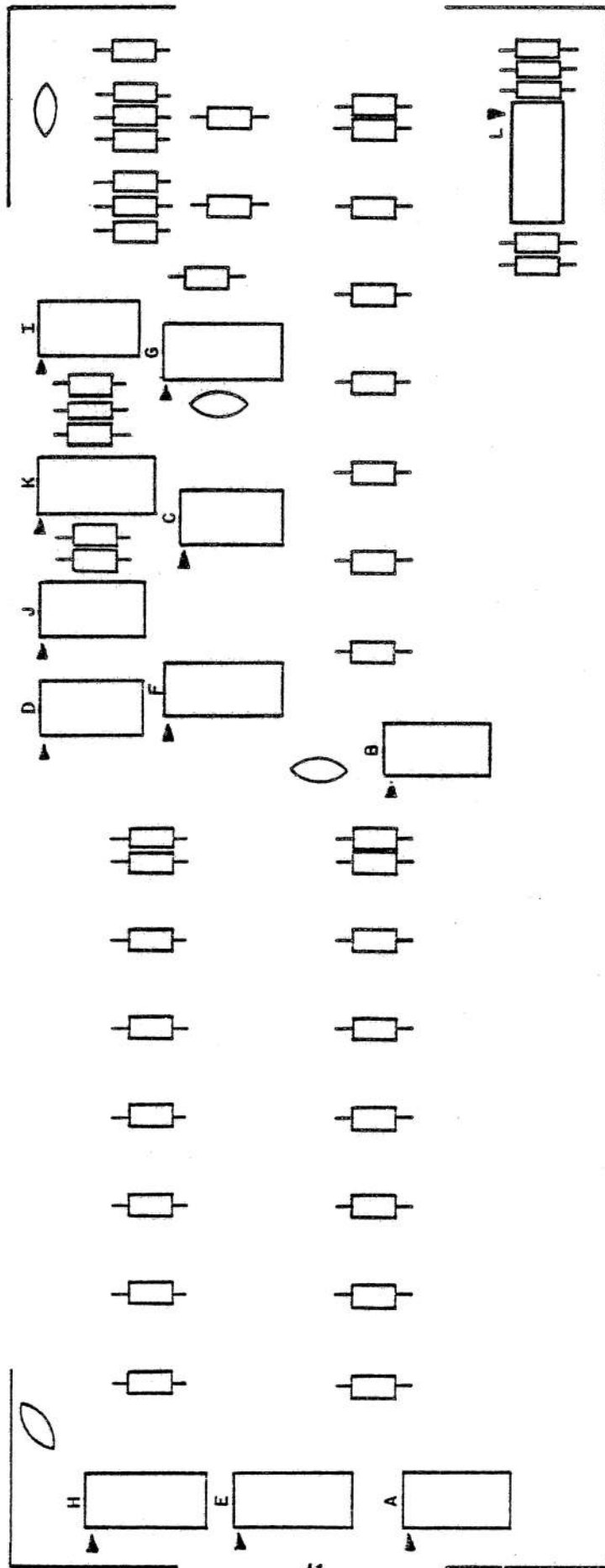
Resistor Installation

There are 40 resistors to be installed on the 680b Display/
Control Board. Install these resistors according to the
instructions given on page 8.

The resistor values and color codes are listed in the chart
below.

Resistor Values and Color Codes

( ) R1-R16 and R20-R27 are 1.5K ohm (brown-green-red)

( ) R17-R19 are 22K ohm (red-red-orange)

( ) R28, R30, R33 and R35 are 4.7K ohm (yellow-violet-red)

( ) R29 and R37 are 47K ohm (yellow-violet-orange)

( ) R31, R32, and R38 are 1K ohm (brown-black-red)

( ) R34 and R36 are 100K ohm (brown-black-yellow)

( ) R39 and R40 are 10K ohm (brown-black-orange)

Resistor Installation

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A
E
H

R1   R20
R2   R21
R3   R22
R4   R23
R5   R24
R6   R25
R7   R26
R8   R27

B

F
D
M
J
R9
R34
R10   C   K
R11
R29
R39
R12   G   I
R13   R19
R37
R31
R14   R18   R33
R17
L   R32
R15   R35   R28
R16   R30
R36
R40   R38
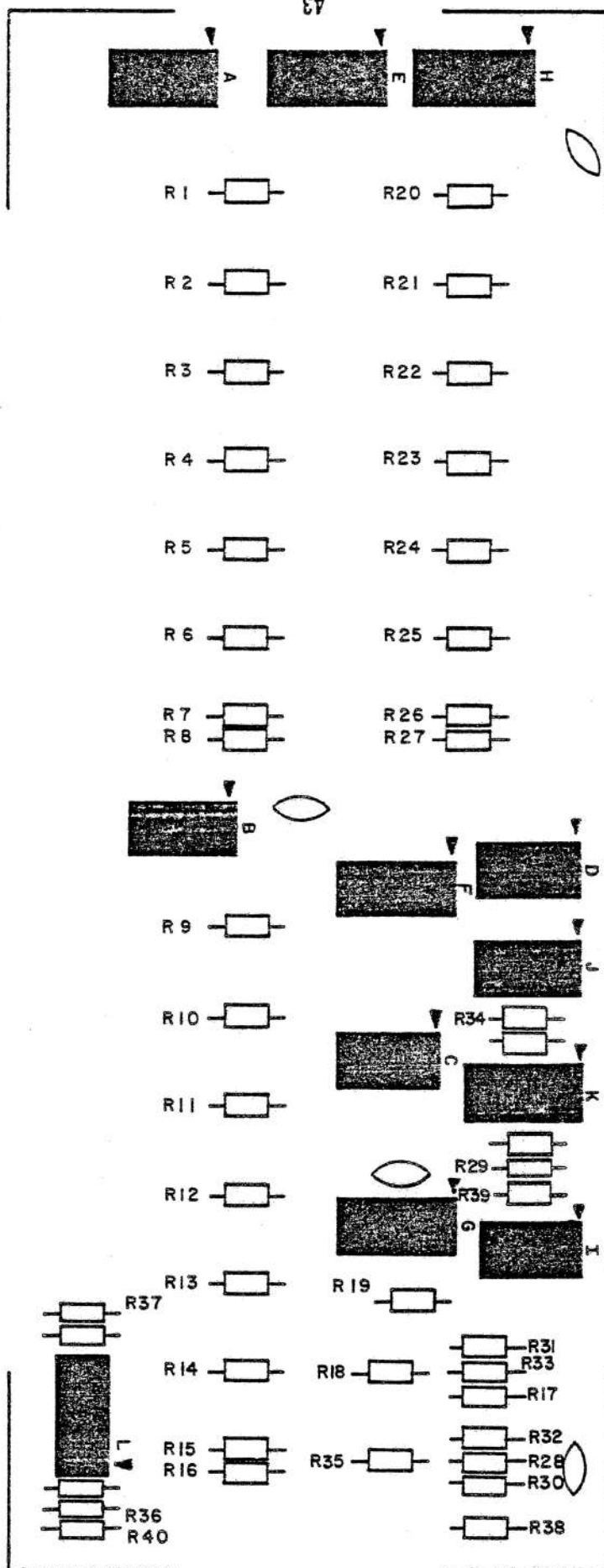
Capacitor Installation

There are 8 ceramic disk capacitors to be installed on the 680b Display/Control Board. To install the capacitors, follow the instructions given on page 9, Section B.

The capacitors values are shown in the chart below.

Capacitor Values

(Different voltages may be substituted in some cases.)

( ) C1-C4 = .2uF, 10v

( ) C5-C8 = .1uF, 16v

Capacitor Installation

45
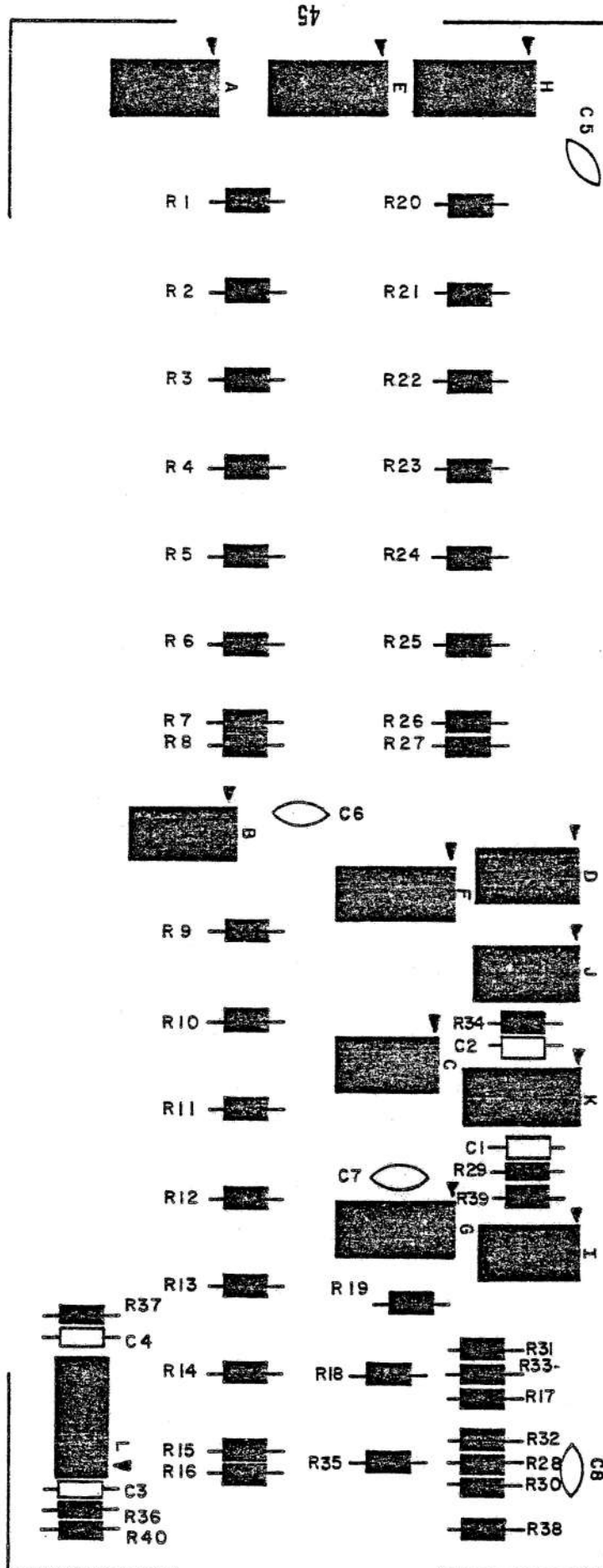
Jumper Connection

One jumper wire must be added to the display/control board so that the Halt switch is configured correctly. The jumper wire must be placed across the two pads labeled "HLT" and "A" on the upper, right-hand corner of the board.

1. Cut a piece of wire to length and trim 1/8 inch of insulation off the ends. Tin the ends by applying a thin coat of solder.

2. Insert the ends into the holes labeled "HLT" and "A" on the silk screened side of the PC board. Be sure not to insert any of the insulated portion of the wires.

3. Solder the ends of the wire to the foil pattern on the back side of the board.

Ground Lug Installation

1. Turn the board over so that the silk-screened side is down.

2. Put the number 6 solder lug over the hole at the top left corner of the board.

3. Solder the narrow end of the lug to the top land (ground) directly to the right of the hole.

100-Pin Edge Connector

Install the 100-pin edge connector onto the D/C board using the instructions and diagram given below.

1. Orient the connector over the two rows of holes at the bottom of the D/C board silkscreen.

2. Insert the connector pins into their respective holes. It may be necessary to guide some of the pins with the tip of a small screwdriver. Be sure that the connector is tight against the board and that all 100 pins are in their respective holes.
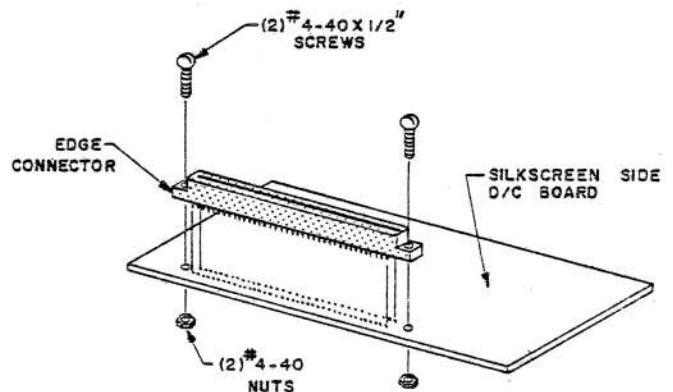
3. Secure the connector to the board with a #4-40 x 1/2" screw and a #4-40 nut at each end, as shown in the illustration.

4. Turn the board over and solder each pin to the foil pattern on the back side. Be careful not to leave any solder bridges.

SECTION IV
ALTAIR 680b
BACK PANEL ASSEMBLY

Addenda

January, 1977

The transformer supplied with your kit (part number 102620) is equipped with dual primaries so that it can be used for either 110v or 220v operation. The diagram below shows the proper wiring for both operations.

For a 220 volt supply, be sure to wire the 110v fan as shown, with one fan wire connected to the brown/white transformer wire, and the other fan wire connected to the junction of the brown and black/white transformer wires.
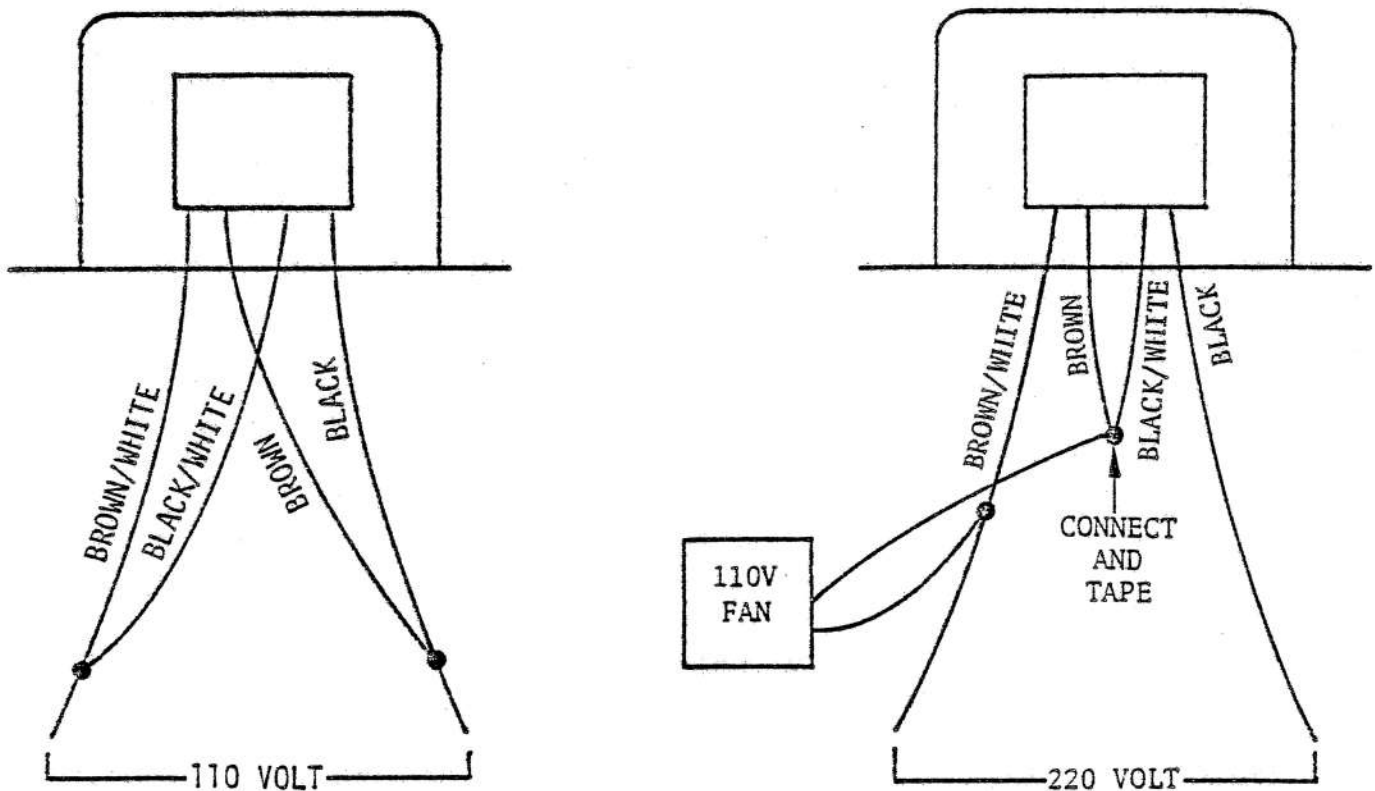
NOTE: ON UNITS WITH FANS, USE THESE CONNECTIONS FOR 110 VOLT FAN

49A

TRANSFORMER

A. Attach Connector Pins

A connector pin must be attached to each of the following transformer wires: white, white, orange, red, red. In addition, the pin with the orange wire will also be used to connect a grounding wire to the back panel. The connector pins are supplied in a strip, as illustrated below. DO NOT SEPARATE THE PINS UNTIL INSTRUCTED TO DO SO.

The blue wires will not be used in wiring the transformer. They should be clipped off at the point where they enter the transformer. (Set the blue wires aside for use later on.)

Use the following instructions to attach a connector pin to each of the colored transformer wires.

1. Trim 1/8" of insulation off the ends of the colored wires. Cut an 8" length from the wire supplied with your kit, and trim 1/8" of insulation off each end.

2. Insert the wires into the pins as shown below. When you insert the orange wire, insert one end of the 8" wire into the same pin.
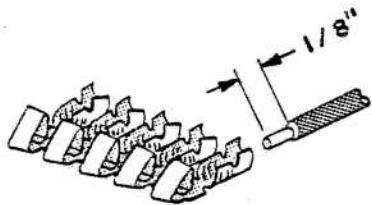
3. Crimp the portion of the pins which holds the insulation. Use needle nose pliers or a crimping tool.

4. Solder the exposed portions of the wires to the pins. Make sure no solder flows up under the lock tabs, and be careful not to melt any of the insulation.


SOLDER & CRIMP
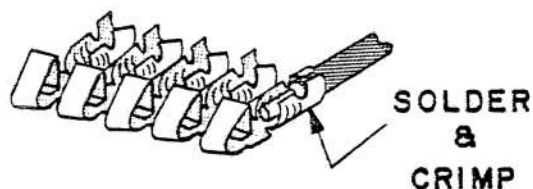
5. Separate the pins from each other by cutting the tabs off as close to the pins as possible.


CUT TABS OFF AS CLOSE AS POSSIBLE
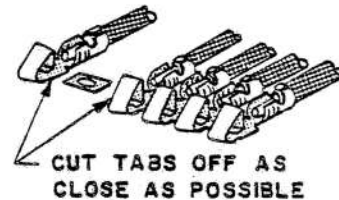
B. Attach Female Connector

Use the following instructions for inserting the colored transformer wires into the 5-pin female connector.

1. Beginning with one of the white wires, orient the pin and the 5-pin female connector as shown in the illustration.
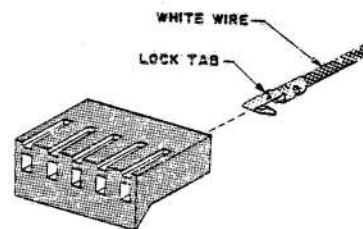

WHITE WIRE
LOCK TAB

2. Push the pin into its slot until it locks into place.

3. Make sure you put the remaining wires into the connector in the correct order (white, white, orange and ground wire, red, red), as shown below.

RED
RED
ORANGE
WHITE
WHITE

5-PIN FEMALE CONNECTOR

8" GROUND WIRE

49
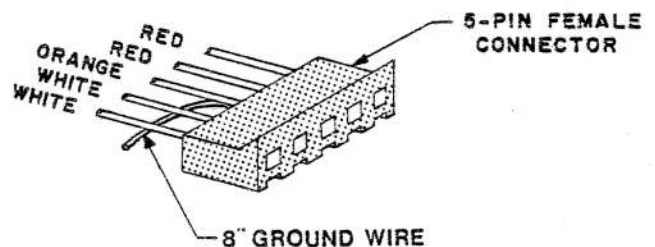
C. Mount Transformer to Back Panel

1. Refer to the illustration below for correct positioning of the transformer on the back panel.

2. Mount the transformer to the back panel using two #6-32 x 1/2 inch screws, two #6-32 nuts and two #6 lockwashers.


(2) #6-32 X 1/2" SCREWS

TRANSFORMER

(2) #6 LOCKWASHERS

(2) #6-32 NUTS
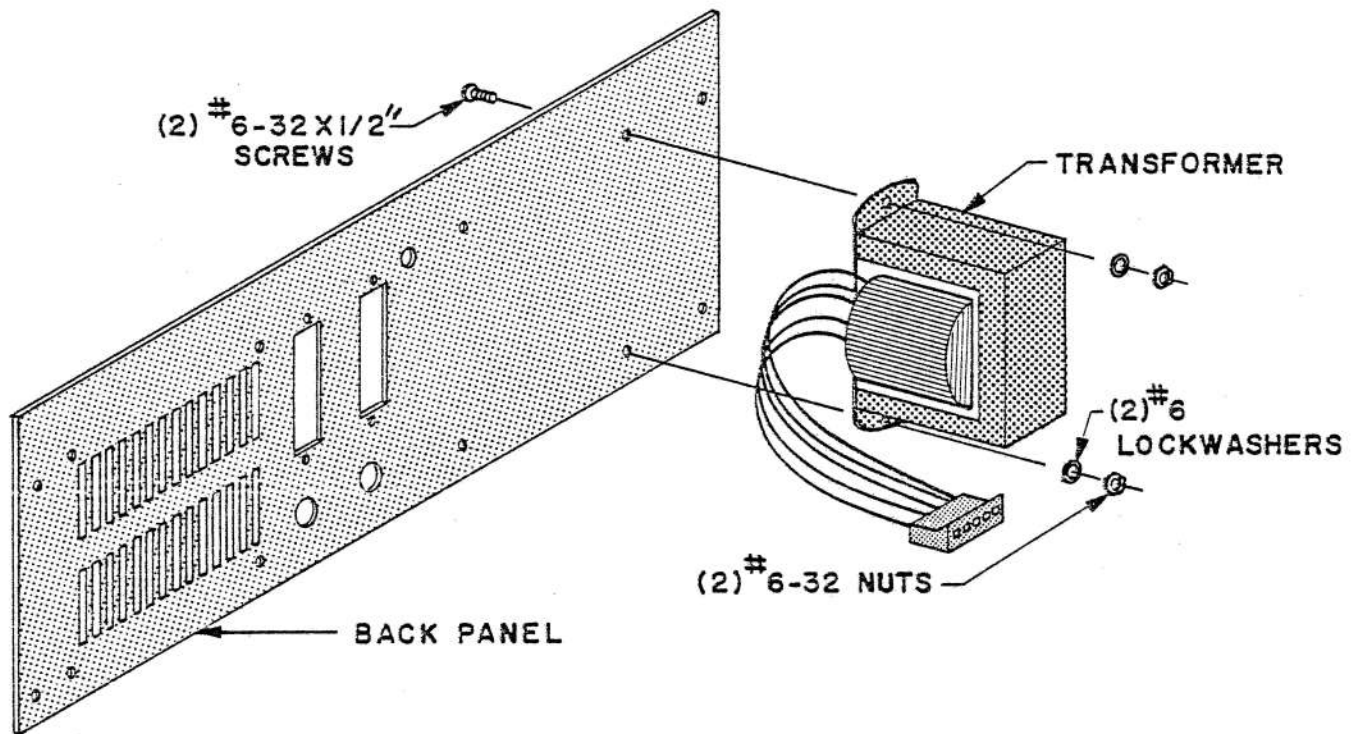
BACK PANEL

TERMINAL STRIP

In order to establish a ground connection with the back panel, it is necessary to remove the paint from around the mounting holes for the terminal strip and the AC switch. (see illustration below)

1. Use a screwdriver or some abrasive paper to chip the paint away from these two areas.

Next, mount the terminal strip to the back panel as follows:

2. Orient the terminal strip as shown in the drawing below. <u>Remove the left-most terminal</u> by cutting off 3/8" of the fiberglass strip.

3. Mount the strip to the back panel using a #6-32 x 3/8 inch screw, #6-32 nut and #6 lockwasher.

REMOVE PAINT FROM THESE AREAS

#6-32" X 3/8" SCREW

TERMINAL STRIP

3/8"

#6 LOCKWASHER
#6-32 NUT
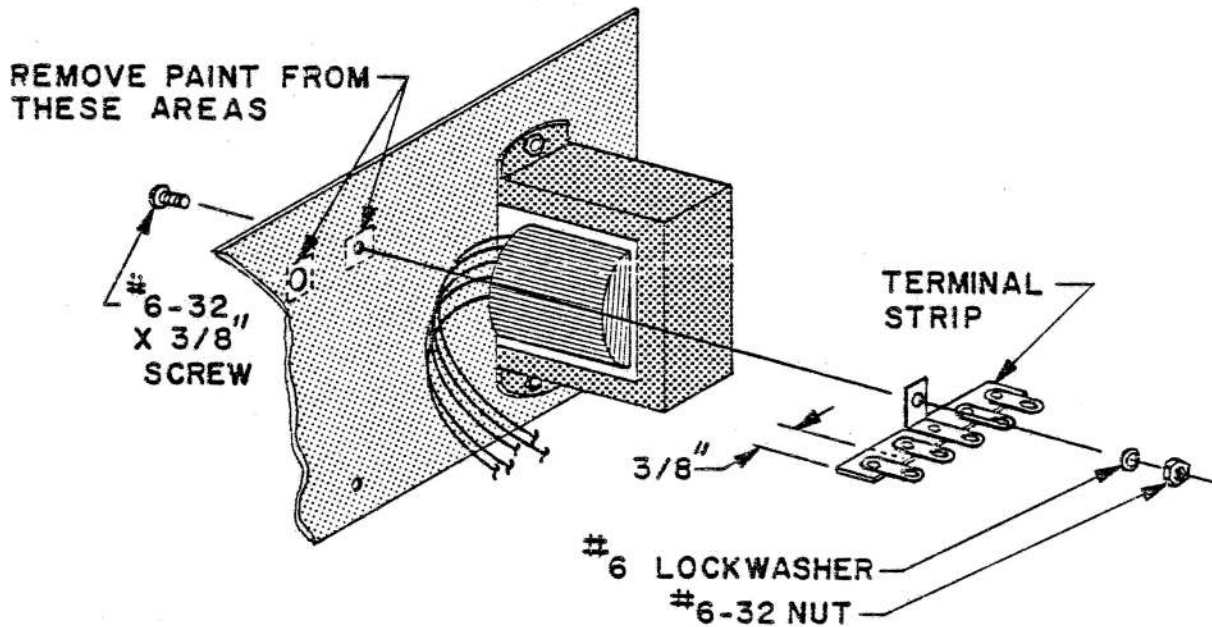
AC SWITCH

1. If you have not already removed the paint from around the AC switch mounting hole, do so at this time.

2. Refer to the drawing below for proper orientation and placement of the switch.

3. Mount the switch to the back panel using the nut and washer provided.
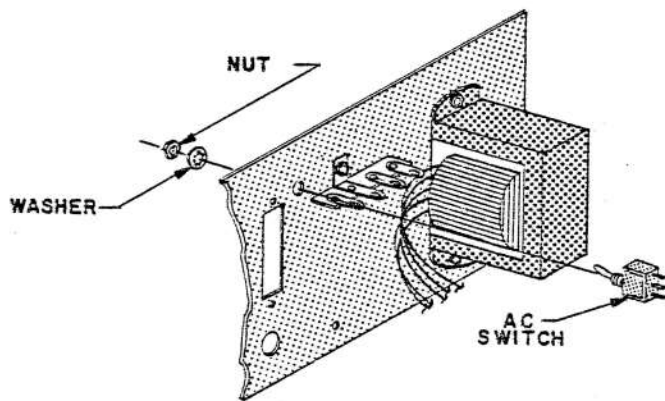
FUSE HOLDER & FUSE

1. Refer to the drawing below for proper orientation and placement of the fuse holder. Insulate each terminal on the fuse holder with a 1/2" piece of heat shrink. If heat shrink is not available, use electrical tape.

2. Mount the fuse holder to the back panel, as shown, using the nut and washer provided.

3. Put the fuse into the fuse holder.
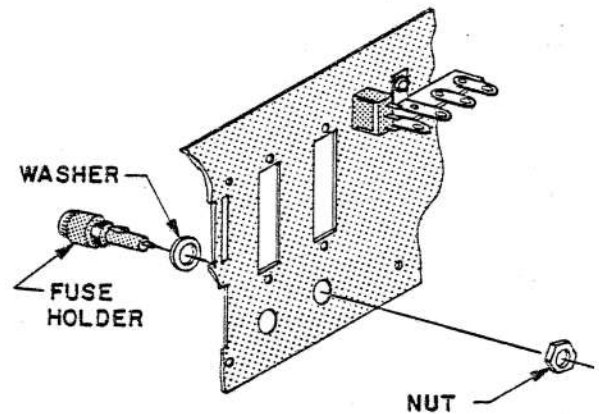
POWER CORD

1. Put the strain relief on the power cord.

2. Strip 4 inches of casing from the cord by cutting a circle four inches from the end and pulling the black insulation off. Be careful not to cut into any of the three wires inside the casing.

3. Put the free ends of the wires through the power cord opening on the back panel, and pull through until 1/4" of casing is on the inside of the panel.

4. Snap the strain relief in place.

POWER CORD

STRAIN RELIEF
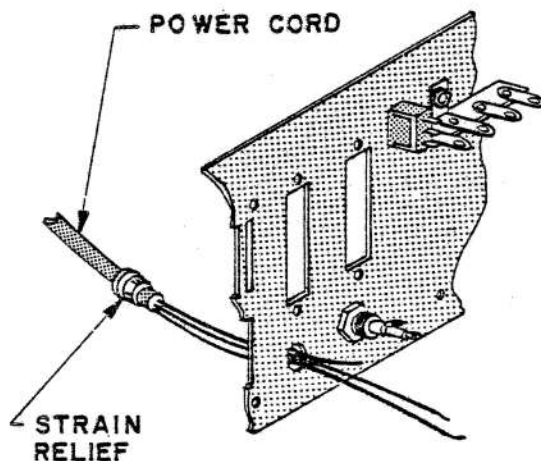
WIRING

Preparation

1. Cut the black wire from the AC power cord off about 1 inch from the cord casing.

2. You will need two additional wires-- one about 4 inches in length and the other 1 inch. Pieces of the blue transformer wires are suitable for this purpose.

3. Before any wire is connected, it should have at least 1/8" of insulation removed from the end and the exposed portion should be tinned with a thin coat of solder.

How to

Make the wire connections by hooking or folding the exposed portion of the wires onto their respective terminals and then soldering them in place. Be careful not to melt any of the insulation.

When wiring the terminal strip, it is usually easier to get all the wires in place before applying any solder. Then, to ensure a good connection, apply enough solder to completely fill the center hole of the terminal. (To simplify the instructions, the terminals on the strip will be called T1, T2 and T3, beginning with the left-most terminal.)

Make the wire connections as they are listed and diagrammed on the next page.

Wire Connections

( ) Two black transformer wires. One to T1 and the other to T3.

( ) Green wire from power cord to T2.

( ) White wire from power cord to T3.

( ) Black wire from power cord (cut to one inch) to the side terminal of the fuse holder.

( ) 8-inch ground wire from transformer connector to T2.

( ) Noise reduction capacitors. Both are .01uF, 1Kv. C1 goes across T1 and T2. C2 goes across T2 and T3.

( ) Connect the bottom terminal on the switch to T1 with the 1-inch piece of wire.

( ) Connect the terminal on the end of the fuse holder to the center terminal on the switch with the 4-inch piece of wire.

( ) Optional Fan. Attach one wire to each of the two terminals on the fan: one of them goes to T1 and the other goes to T3.

GREEN WIRE

TO FAN (OPTIONAL)

BLACK WIRES

C1 C2

BLACK WIRE

WHITE WIRE

GROUND WIRE

54
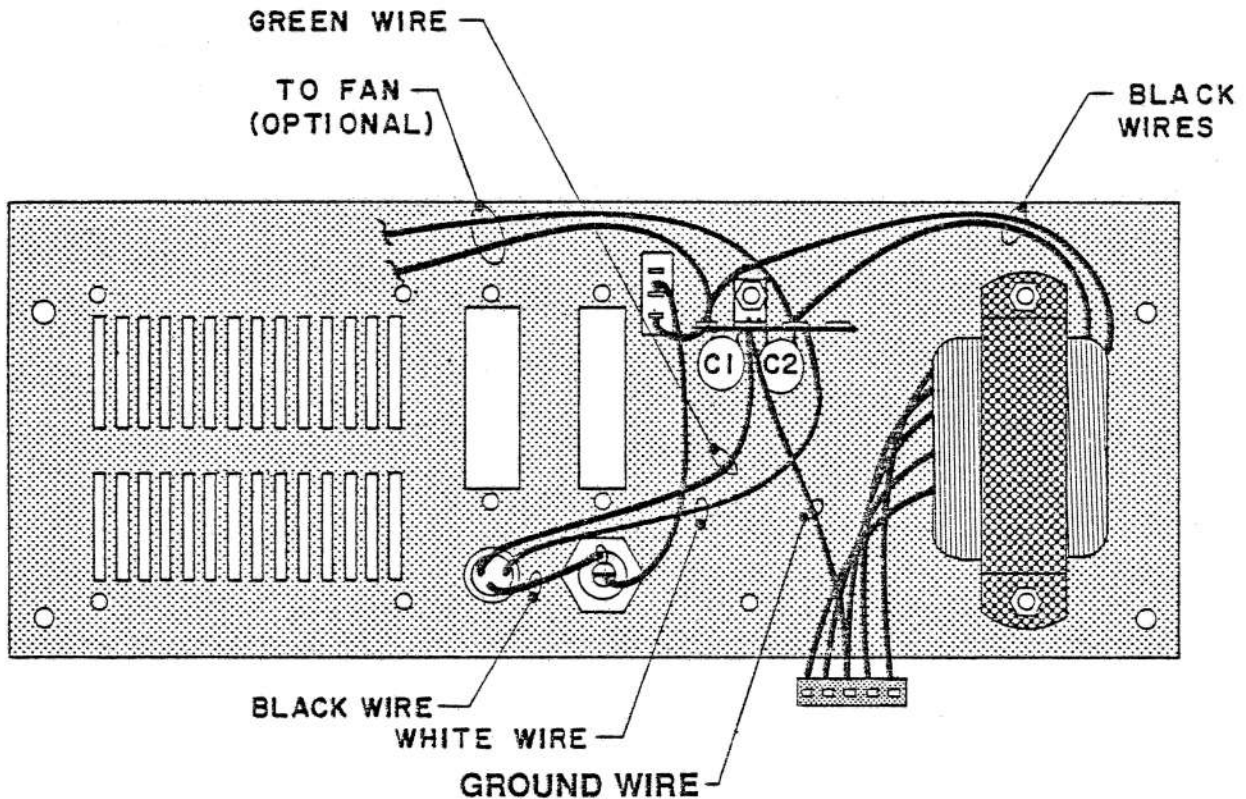
25-PIN I/O CONNECTOR INSTALLATION

The two rectangular openings in the back panel are spaces for 25-pin I/O connectors. One 25-pin female I/O connector is supplied with your kit and should be installed according to the diagram (left) below. Install the connector so that the hollow pins are toward the inside of the back panel and Pin 1 is on top.

The wiring of this connector for TTY, RS-232 or Baudot level I/O is explained on the next page.
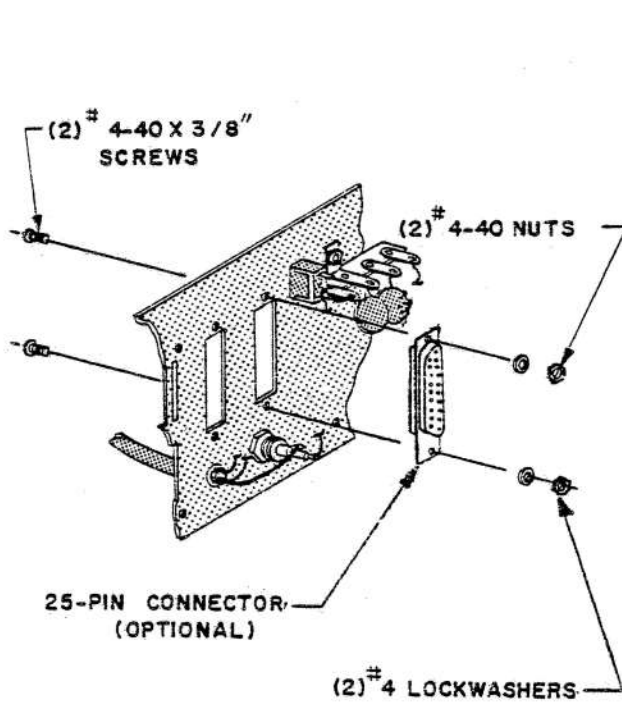
While not in use, the other opening should be covered with a blank panel. Install the blank panel as shown in the diagram (right) below.

Connector Installation
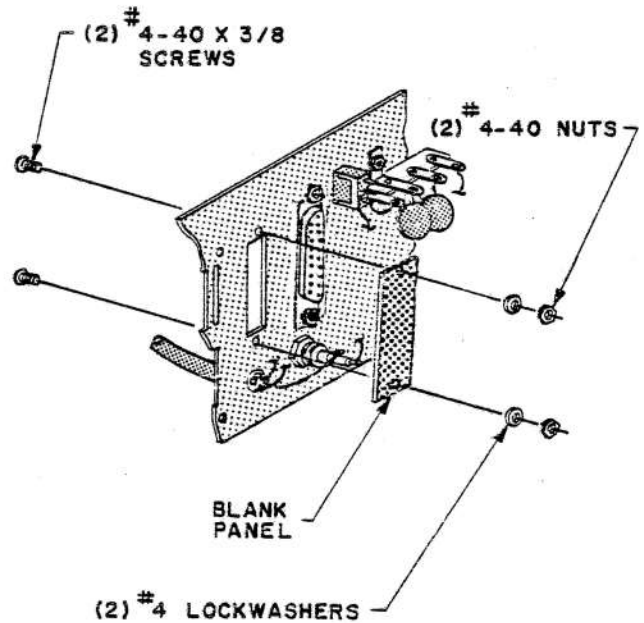
Blank Panel Installation

I/O CONNECTOR WIRING

The 25-pin I/O connector on the back panel may be wired for TTY, RS-232 or Baudot
level I/O using one of two different wiring configurations. The wires that are to
be attached to the 25-pin connector will be connected to a 5-pin miniature female
molex connector. The miniature female connector will be installed onto the Main PC
Board during the final case assembly.

Wiring for Teletype (TTY) Interface

1. Using a soldering iron, heat pins
   2, 3, 4, 5 and 6 on the 25-pin con-
   nector one at a time and fill the
   hollow space in the pin with solder.

2. Cut five 8-inch wires and strip and
   tin both ends of each wire.

3. Crimp and solder a miniature connec-
   tor pin onto one end of each wire
   (see instructions under "Transformer,"
   Section A).

4. Connect the other end of each wire
   to one of the prepared pins on the
   25-pin connector. To do this:
   a) Remelt the solder in the pin.
   b) Insert the wire up to the insu-
      lation.
   c) Remove the heat and hold the wire
      in place until the solder cools.

5. Note that one of the slots on the
   5-pin miniature female connector is
   labeled with a "1." Insert the
   wires from the 25-pin connector into
   the slots on the miniature female
   connector in the following order:

Miniature Female Connector	25-pin I/O Connector
Slot 1	Pin 3
Slot 2	Pin 5
Slot 3	Pin 4
Slot 4	Pin 2
Slot 5	Pin 6
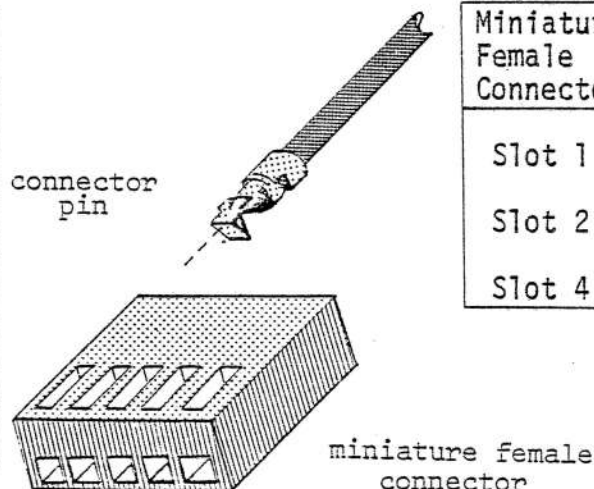
Wiring for RS-232 or Baudot Interface

1. Using a soldering iron, heat pins
   2, 3 and 7 on the 25-pin connector
   one at a time and fill the hollow
   space in the pin with solder.

2. Cut three 8-inch wires. Strip and
   tin both ends of each wire.

3. Crimp and solder a miniature connec-
   tor pin onto one end of each wire
   (see instructions under "Transformer,"
   Section A).

4. Connect the other end of each wire
   to one of the prepared pins on the
   25-pin connector. To do this:
   a) Remelt the solder in the pin.
   b) Insert the wire up to the insu-
      lation.
   c) Remove the heat and hold the wire
      in place until the solder cools.

5. Note that one of the slots on the
   5-pin miniature female connector is
   labeled with a "1." Insert the
   wires from the 25-pin connector into
   the slots on the miniature female
   connector in the following order:

Miniature Female Connector	25-pin I/O Connector
Slot 1	Pin 3
Slot 2	Pin 2
Slot 4	Pin 7

connector pin

miniature female connector

COOLING FAN (optional)

When one or more additional PC boards
are added to the Altair 680, it is neces-
sary to install a cooling fan on the
back panel.

Orient the fan so that the two solder
terminals are in the upper, right-hand
corner.

Install the fan as shown in the diagram
below. Connect the fan to the power
supply as shown in the Wiring diagram.

58 (blank)
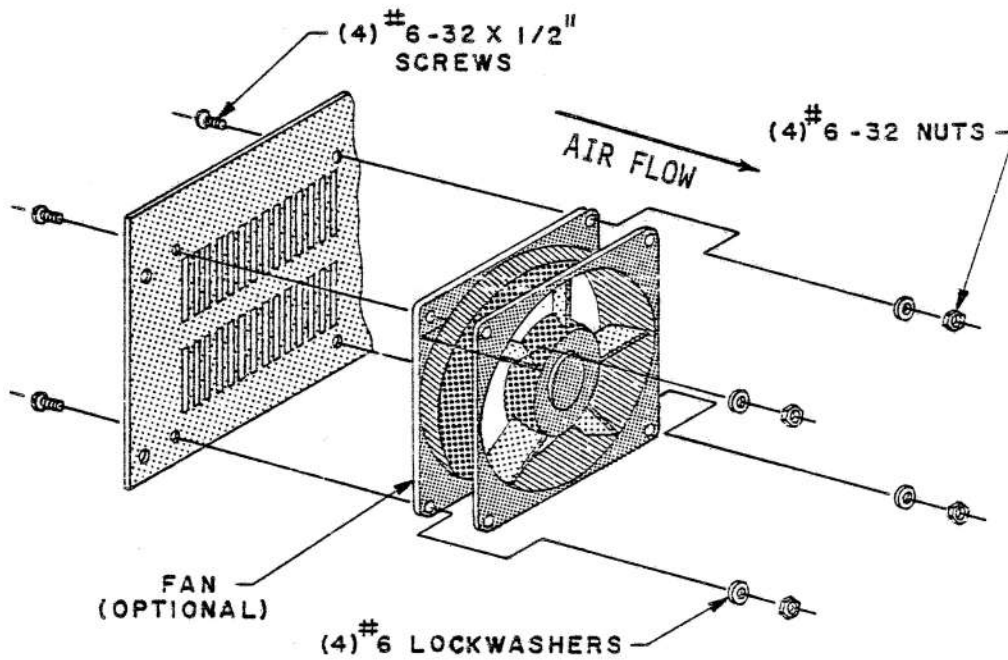
SECTION V
ALTAIR 680b
FRONT PANEL AND
FINAL CASE ASSEMBLY

ALTAIR 680b FRONT PANEL ASSEMBLY

The switches and LEDs that make up the front panel display will be mounted on-to the non-silk-screened side of the display/control board, as outlined in the instructions below.

BE SURE TO READ THE INSTRUCTIONS BEFORE YOU BEGIN THE WORK. THE COMPACT DESIGN OF THE ALTAIR 680 MAKES IT ESSENTIAL THAT THE ASSEMBLY STEPS BE FOLLOWED IN ORDER.

The copies of the foil pattern shown on pages 64 and 65 will aid in the correct placement of the switches and LEDs.

There are 27 switches to be mounted to the board. Two of these are momentary contact SPDT switches and 25 are latching type SPDT switches. The momentary contact switches can be distinguished from the latching type switches by their spring action. The momentary contact type will return to the center position automatically when pressure is released.

There are 27 LEDs (RL-21) to be mounted on the board. All LEDs must be inserted with the cathode lead towards the top edge of the board. (For all but two of the LEDs, the hole for the cathode lead is indicated on the non-silk-screened side of the board with a "K.") The diagram below shows you how to determine which lead is the cathode. Hold the LED up to the light. The larger of the two elements inside is the cathode.

RL-21

CATHODE

CATHODE   ANODE

61
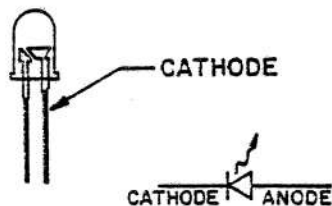
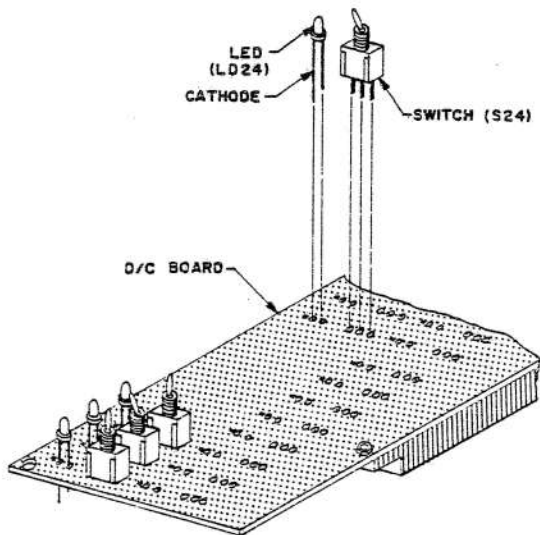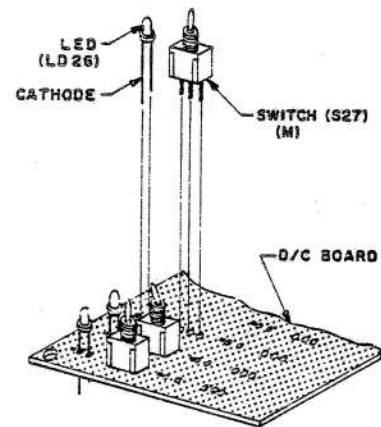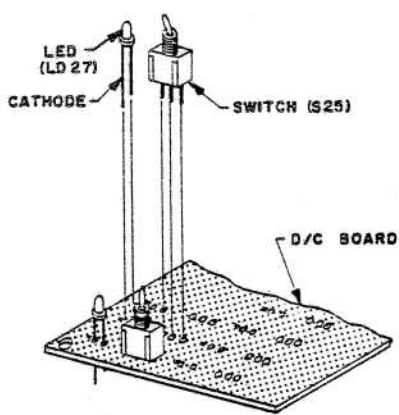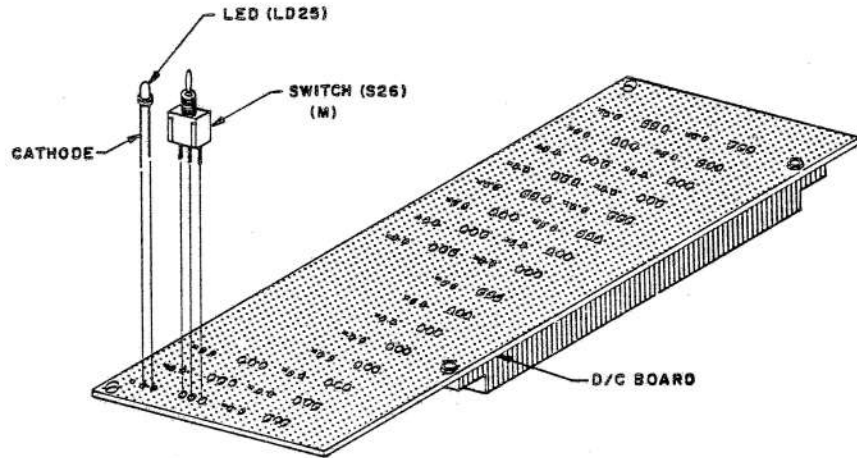## Front Panel Assembly Instructions

1. Set the display/control board in an
   elevated position so there is enough
   room underneath for the leads of the
   switches and LEDs to clear when they
   are inserted. Orient the board as
   shown in the diagrams (next page),
   so that the edge with the 100-pin
   connector is closest to you and the
   non-silk-screened side is facing up.

2. Begin inserting the switches and
   LEDs into their proper holes on the
   board.

   DO NOT SOLDER ANY OF THEM UNTIL
   INSTRUCTED TO DO SO.

   The series of drawings on the next
   page shows the placement of switches
   S26, S25, S27, S24 and LEDs LD25,
   LD27, LD26, LD24.

NOTE THAT S26 AND S27 ARE MOMENTARY CONTACT SWITCHES.
NOTE THAT THE CATHODE LEAD OF THE LEDs IS ALWAYS INSERTED TOWARDS THE TOP EDGE OF THE BOARD.

LED (LD25)

SWITCH (S26)
(M)

CATHODE

D/C BOARD

LED
(LD 27)

CATHODE

SWITCH (S25)

D/C BOARD

LED
(LD 26)

CATHODE

SWITCH (S27)
(M)

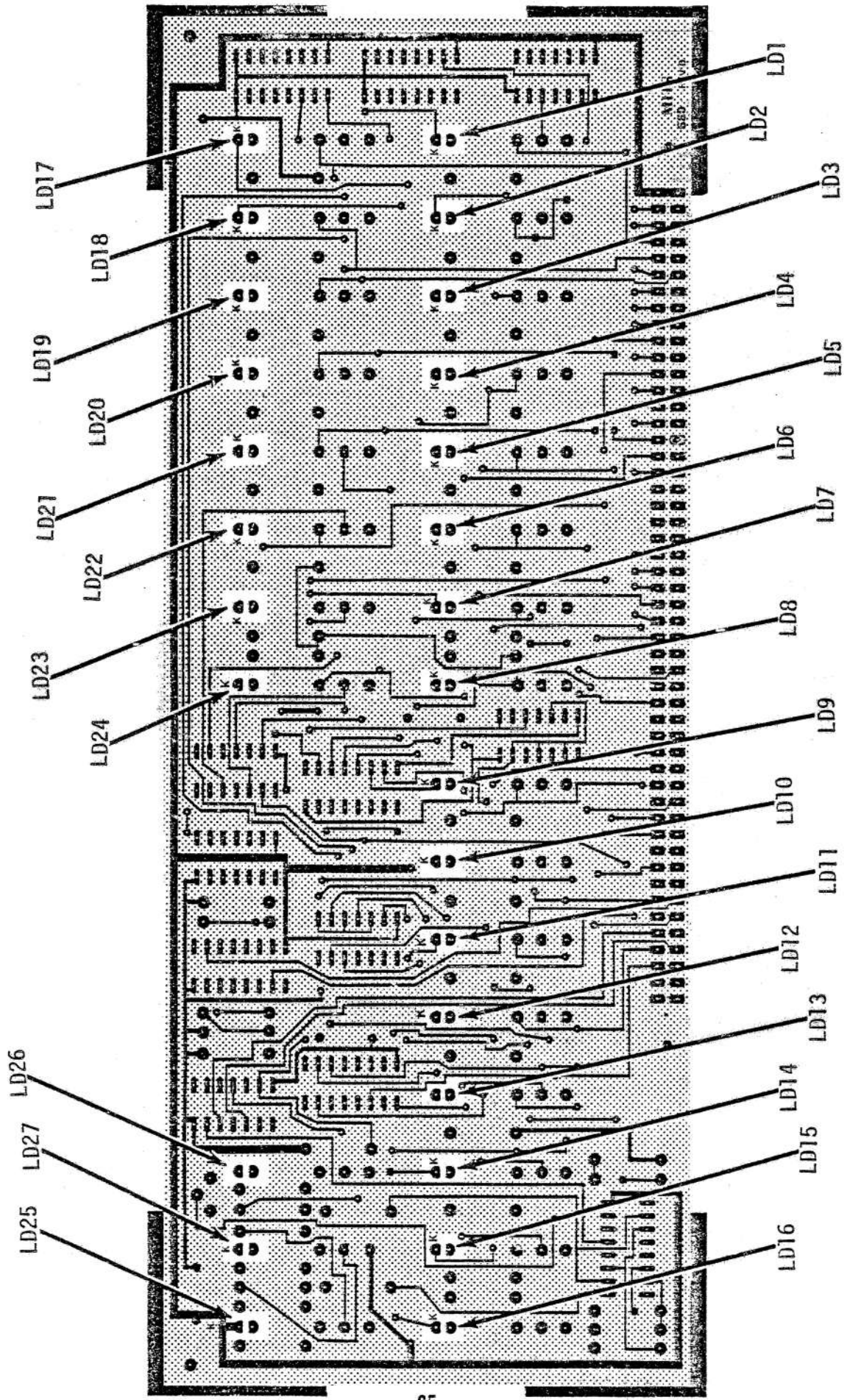D/C BOARD

LED
(LD24)

CATHODE

SWITCH (S24)

D/C BOARD

3. Insert all of the remaining switches and LEDs onto the board in this same manner. Use the copies of the foil pattern shown on the next two pages for proper placement of these components.
(Note: Set aside twelve of the nuts provided with the switches for use in Step 11 of this procedure. The rest of the hardware associated with the switches will not be used.)
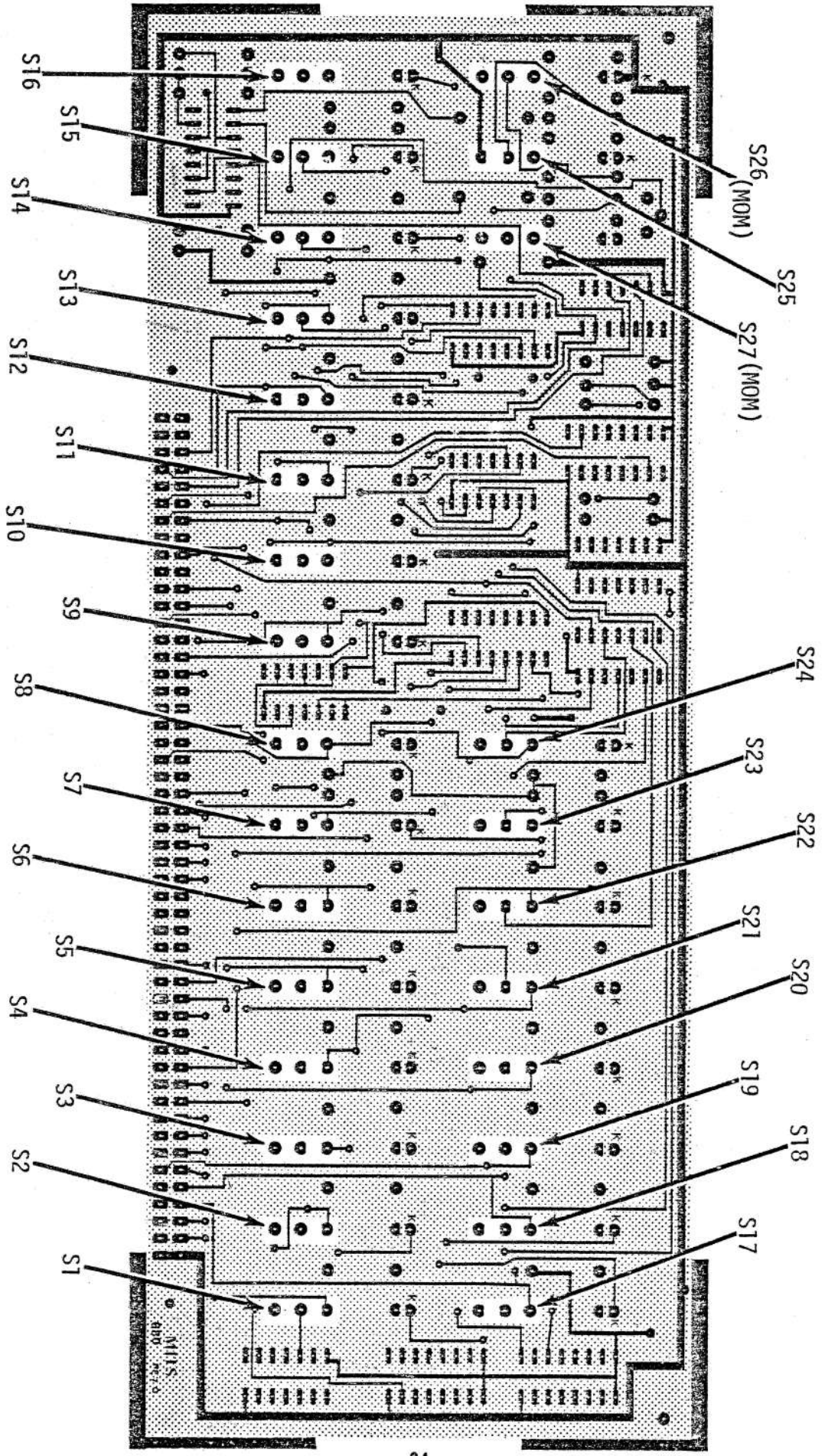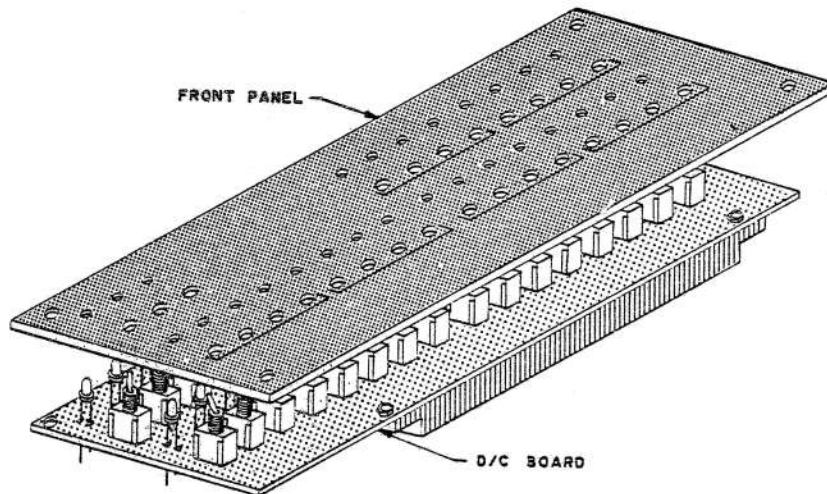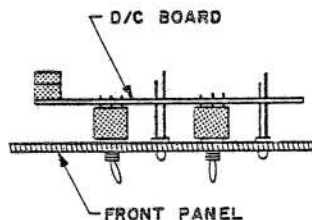
SWITCHES

Altair 680
Front Panel Assembly

64

Altair 680
Front Panel Assembly

LEDS

65

When all the switches and LEDs have been
placed on the board, you are ready to
place the front panel over them as shown
in the diagram below. The purpose of put-
ting the front panel over the D/C board
at this time is to hold the switches and
LEDs in place while they are being soldered.


FRONT PANEL

D/C BOARD

4. Remove the front panel from the case
    by removing the four corner screws.
    Set the screws aside, as two of them
    are to be used again later.

5. Place the front panel over the
    switches and LEDs on the D/C board
    as shown in the diagram above.

6. Hold the D/C board and the front panel
    together and turn them upside down. At
    this point, a side view of the entire
    assembly should look like this:

D/C BOARD

FRONT PANEL

Once again, set the assembly in an
elevated position so that the switches
and lights are not in contact with the
work surface. Make sure all the
switches are pushed flush against the
inside of the front panel.

7. Now you are ready to begin soldering. Soldering will be done on the <u>silk-screened side</u> of the board. <u>Solder all the switches first.</u> Make sure you solder all three leads of each switch.

8. When all the switches have been soldered, make sure all the LEDs are pushed flush against the inside of the front panel.
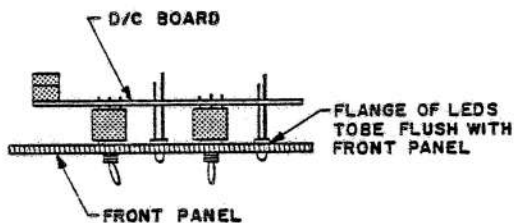

WARNING: LEDs are heat-sensitive. Use a minimum amount of heat for a minimum length of time when soldering them.

9. Solder the LEDs into place. Make sure each LED is pushed all the way down before you solder it. THIS IS IMPORTANT, AS IT ENSURES AN EVEN ALIGNMENT OF THE LIGHTS FOR THE FRONT PANEL DISPLAY.

10. When all the LEDs have been soldered, turn the entire assembly right side up again and remove the front panel.

11. Using the twelve nuts you set aside in Step 3, attach two nuts to each of the following switches: S1, S17, S7, S25, S16, S26 (corresponding to A0, D0, A7, D7, A15, RESET respectively). These nuts help provide the proper spacing between the front panel and the D/C board, so that the LEDs will be at the correct height for the display.

ALTAIR 680b FINAL CASE ASSEMBLY

A. <u>Replace Front Panel</u>

   1. Return the front panel to its place on the case bottom as shown below. Use two of the original screws for the bottom holes, but use #6-32 x 1 1/8" screws for the top holes. Longer screws must be used at the top to provide adequate spacing between the front panel and the D/C board.

(2) #6-32 X 1-1/8" SCREWS

Case Bottom
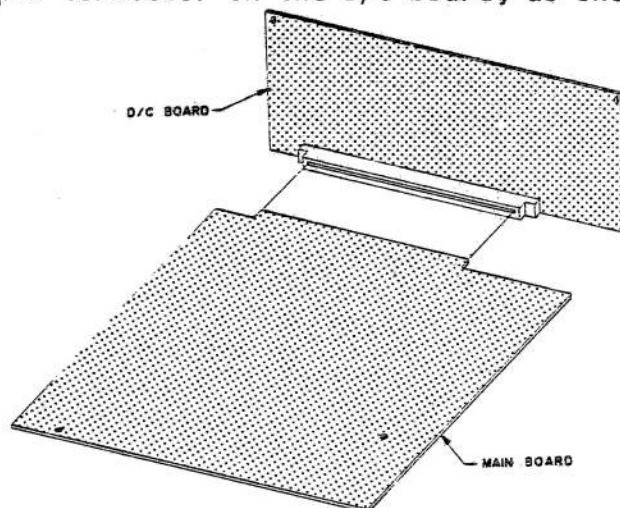
FRONT PANEL

(2) EXISTING SCREWS
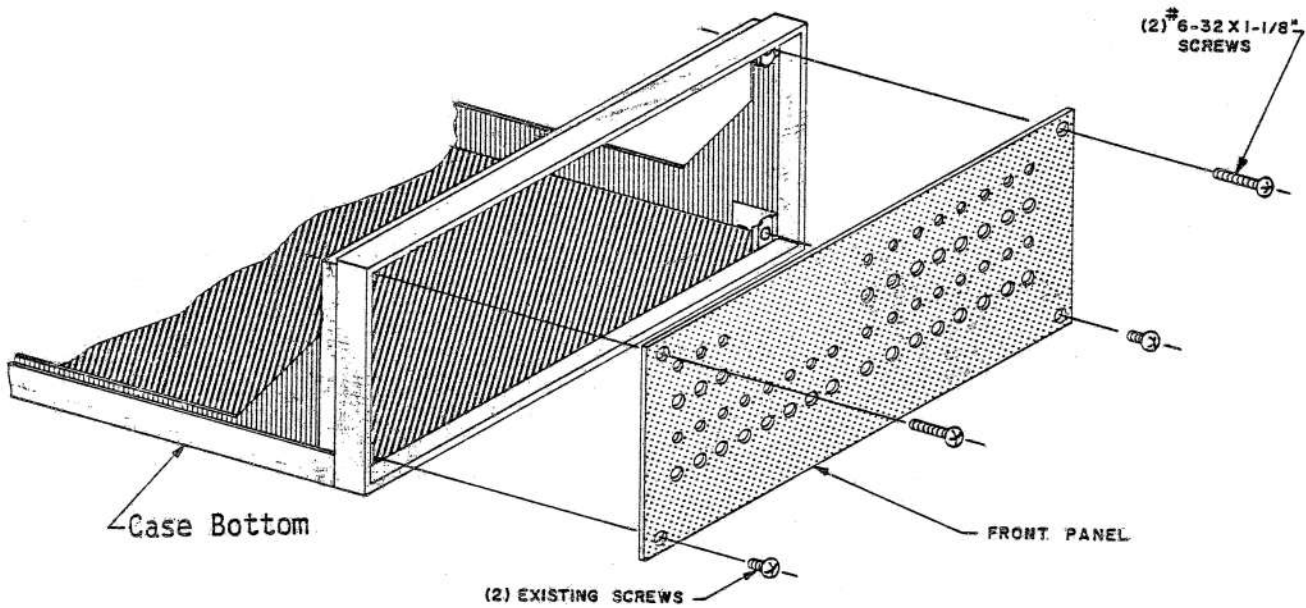
B. Prepare Case Bottom

1. Remove the paint from around the rear-most mounting hole in the case bottom (to establish a ground connection with the main PC board).

2. Insert a #6-32 x 1/2" screw with two #6-32 nuts into each of the two mounting holes in the case bottom.

3. Attach six rubber feet: One to each corner of the outside case bottom, and two on the inside center line, as shown. The rubber feet are self-adhesive and need only to be peeled from their backing and applied to the case.

Case Bottom

(6) RUBBER FEET

(4) #6-32 NUTS

REMOVE PAINT FROM AROUND HOLE

(2) #6-32 X 1/2" SCREWS
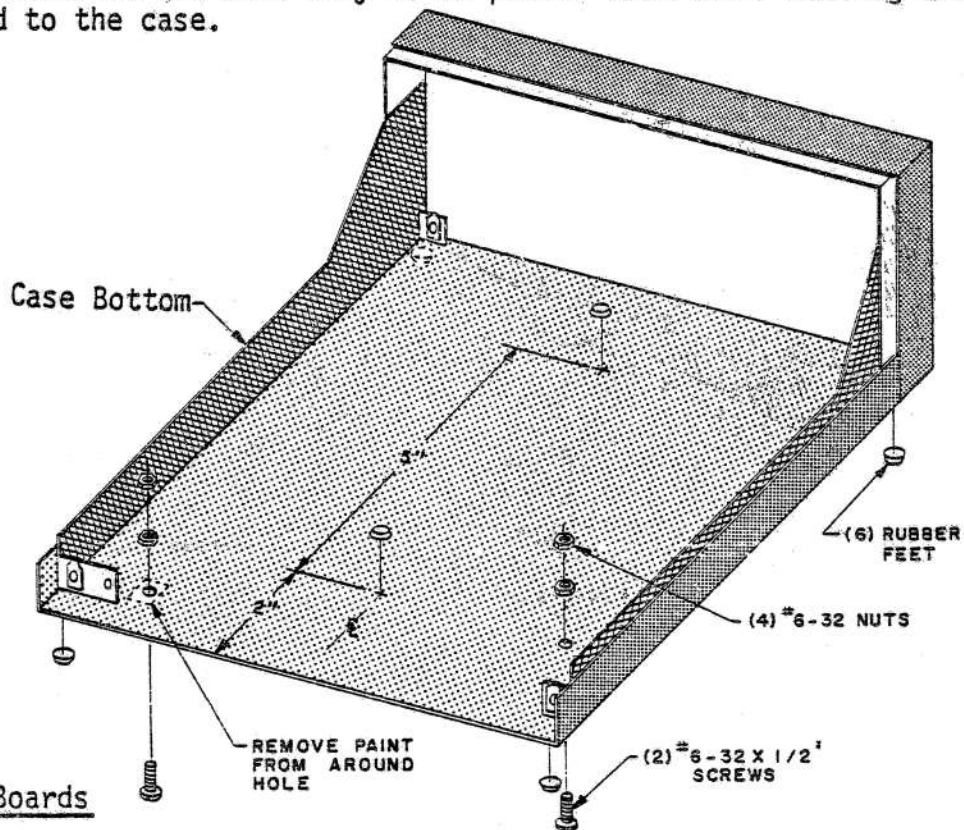
C. Mate PC Boards

1. Connect the two PC boards by inserting the top edge of the main board into the 100-pin connector on the D/C board, as shown below.

D/C BOARD

MAIN BOARD

D. Install PC Boards

1. Make sure all latching switches on the D/C board are in the "UP" position.

2. Put a 1/2" spacer on each of the two top front panel screws. (Two 1/4" spacers may be substituted for a 1/2" spacer.)

3. Insert the boards into the case bottom at a slight angle so that the switches and LEDs go into their respective holes first, and then the main board settles into place.

4. Secure the boards with four #6-32 nuts as shown in the illustration.
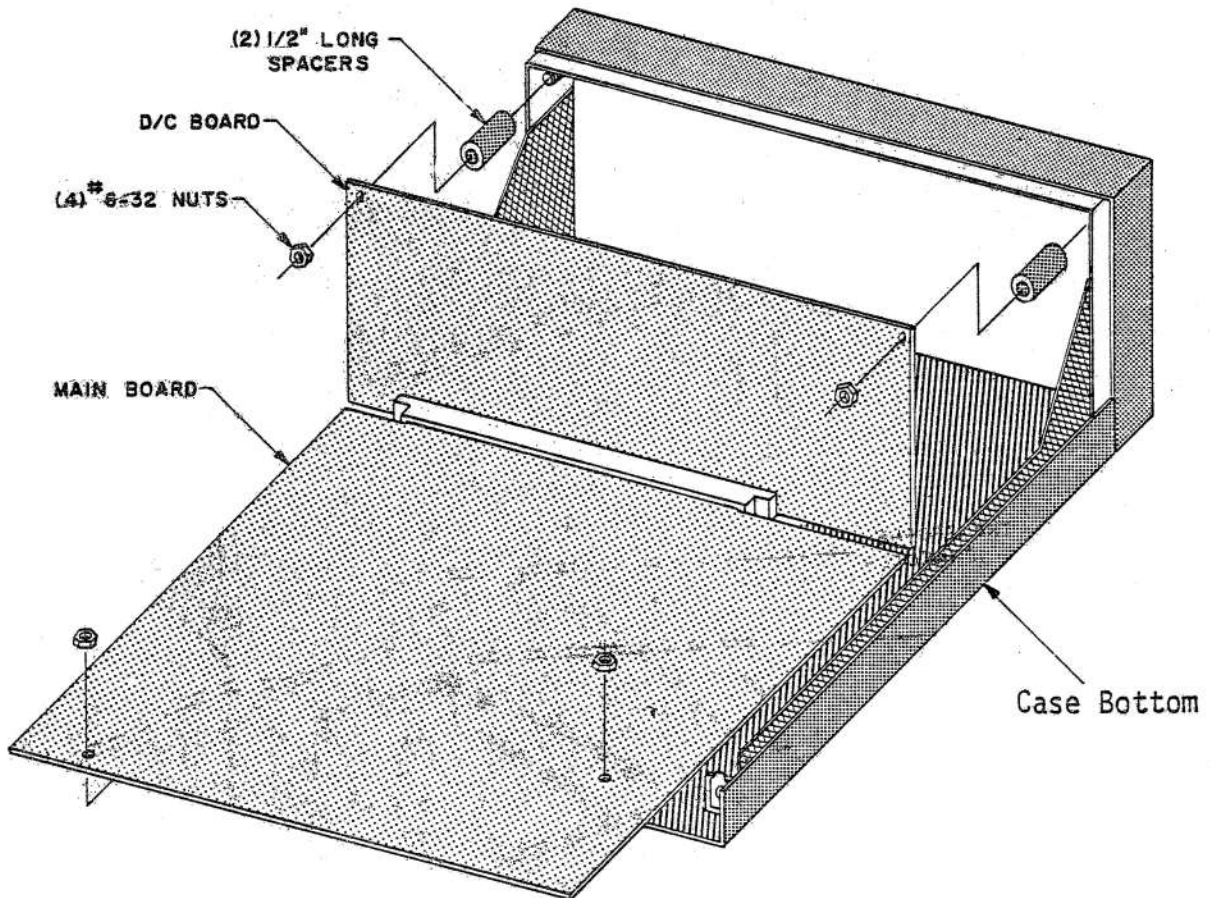
E. Case Top and Back Panel

1. Install the case top in its place on the case bottom, as shown in the illustration below.

2. Install the 5-pin female connector from the transformer onto the 5-pin male connector on the Main PC Board. Install the 5-pin miniature female connector from the I/O plug onto the 5-pin miniature male connector.

3. Put the back panel on the case, securing it with the same screws that you set aside earlier.

CASE TOP

TRANSFORMER CONNECTOR

I/O CONNECTOR

LOWER CASE
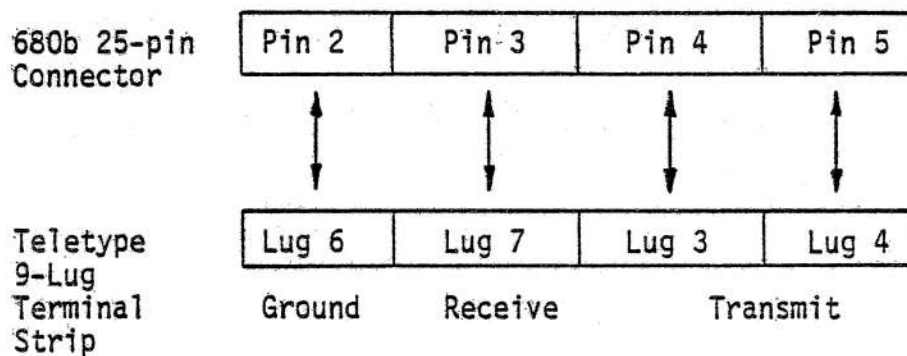
(4)EXISTING SCREWS

BACK PANEL

71
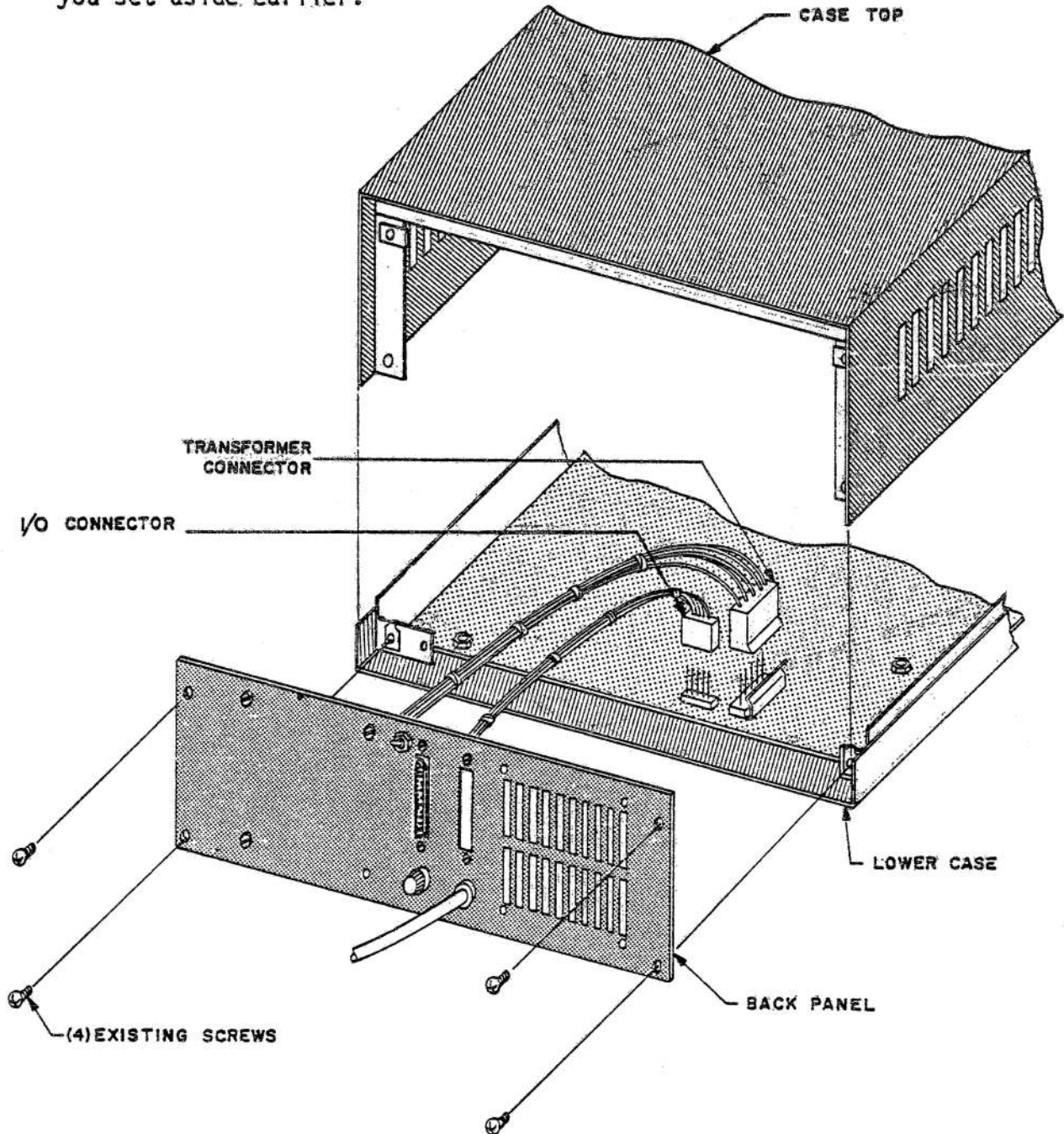
TELETYPE CONNECTIONS

The diagram below shows the connections that are necessary to hook up a Teletype to the 680b. The connections are between the 25-pin connector on the 680b back panel and the 9-lug terminal strip inside the Teletype.

```
┌────────────────────────────────────────────────────────────┐
│                            NOTE                              │
│                                                              │
│  The Teletype must be wired for 20 ma current loop and full  │
│  duplex operation.                                           │
└────────────────────────────────────────────────────────────┘
```

680b 25-pin Connector

Pin 2	Pin 3	Pin 4	Pin 5

↕   ↕   ↕   ↕

Teletype 9-Lug Terminal Strip

Lug 6	Lug 7	Lug 3	Lug 4

Ground   Receive   Transmit

72

ALTAIR 680b

680-MB Expander Card Installation

1. Carefully remove the 680b Main Board from the case.

2. Orient the 100-pin edge connector (enclosed with the expander card) over the two rows of holes labelled "J1" on the silkscreened (top) side of the main board.

3. Insert the connector pins into their respective holes. It may be necessary to guide some of the pins with the tip of a small screwdriver.

4. Secure the connector to the board with two #4-40 x 1/2" screws and two #4-40 nuts.

5. Solder each pin to the foil (bottom) side of the board.

```
CAUTION

Insure that solder bridges
are not formed.
```

6. Insert the card stab connector of the expander card into the 100-pin socket.

```
NOTE

Before replacing the 680b Main Board into
its case, refer to pages 3-21 through 3-23
in the 680-BSM Documentation for installation
of the 16K Static Memory Board onto the
680-MB Expander Card.
```

mits

2450 Alamo SE
Albuquerque, NM 87106