ALTAIR 8800

ASSEMBLY MANUAL

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ASSEMBLY HINTS

Before beginning the construction of your unit, it is important that you read the "Kit Assembly Hints" booklet. Pay particular attention to the section on soldering because most problems in the ALTAIR occur as the result of poor soldering. Failure to heed the warnings in the "Kit Assembly Hints" booklet may cause you to void your warranty.
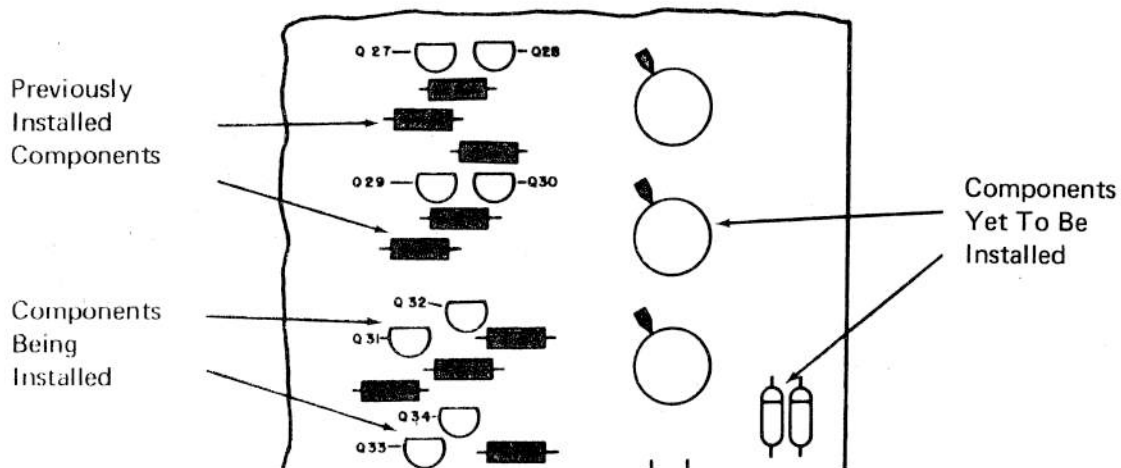
The type of soldering iron used is critical. Use a 30-40 watt iron with a chisel tip, such as an Ungar 776 with a 7155 tip. The delicate soldering necessary for this unit precludes using a blunt-tipped iron.

Each component should be installed in the order presented in the assembly instructions. Each component must be placed in its correct position on the board. There are drawings throughout the assembly instructions which will aid you in installing the components correctly. Some components (diodes, integrated circuits, some capacitors, and transistors) have special orientations on the board. These special orientations are called out in the assembly instructions; it is important that you note them carefully before installing the components.

After a component has been soldered to the board, check it off in the space provided on the page. Before going on to a new page, check to make sure all the components on that page have been installed.

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 "Kit Assembly Hints" booklet.

To assist you in assembling your unit, a coding system is used to identify the components already installed, components being installed, and components to be installed later. Compare each page with your circuit board to ensure that all components are installed before going on to a new page.

TRANSISTOR IDENTIFICATION CHART

| EN2907*
CS4438
CS4439
CS4437
CS4410
2N4250
2N3642
2N3645 (NO FLAT) | MPF-105
MPF-111 | TIS98
TIS 92 | DI3T2
2N6028 | ST2907
ST98
S38473
2N5210
2N4410
EN4410
PN2907
2N2907
EN2907* |
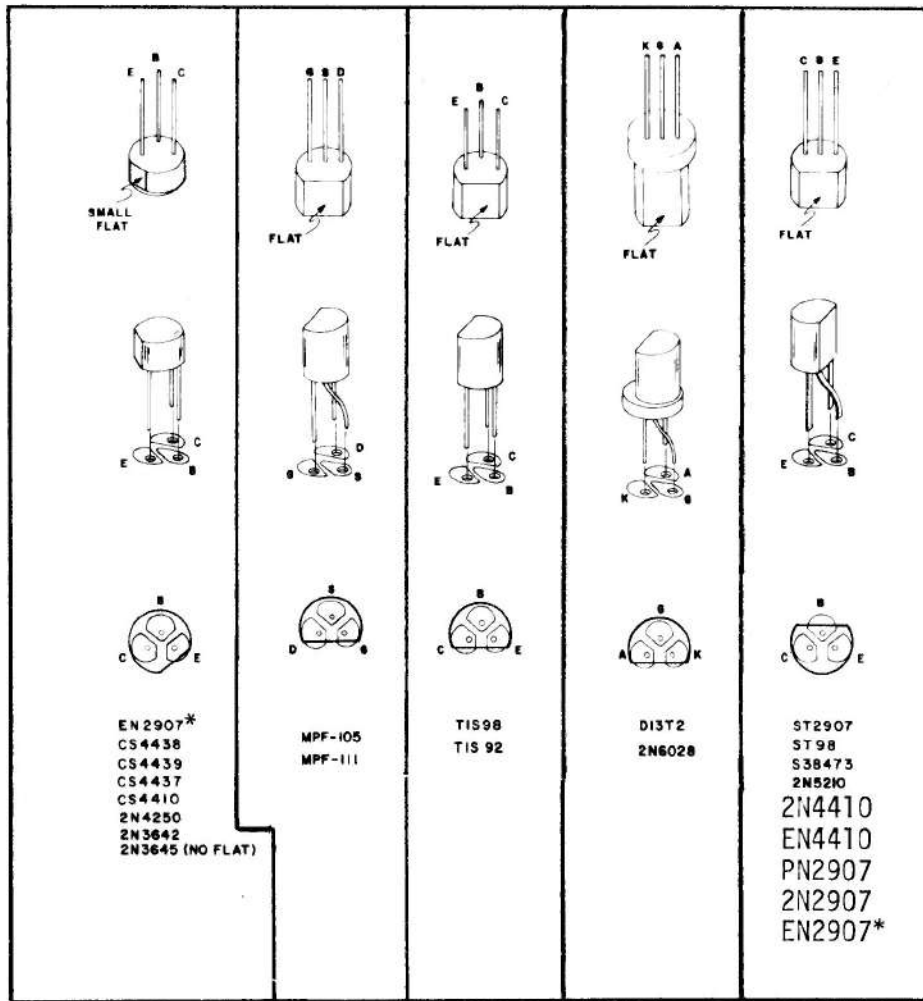
IN THE ILLUSTRATION ABOVE THE OUTLINE OF EACH TYPE OF TRANSISTOR IS
SHOWN OVER THE PADS ON THE CIRCUIT BOARD WITH THE CORRECT DESIGNATION
FOR EACH OF THE THREE LEADS. USE THIS INFORMATION TOGETHER WITH THE
INFORMATION IN THE ASSEMBLY MANUAL FOR THE CORRECT ORIENTATION OF THE
TRANSISTORS AS YOU INSTALL THEM.

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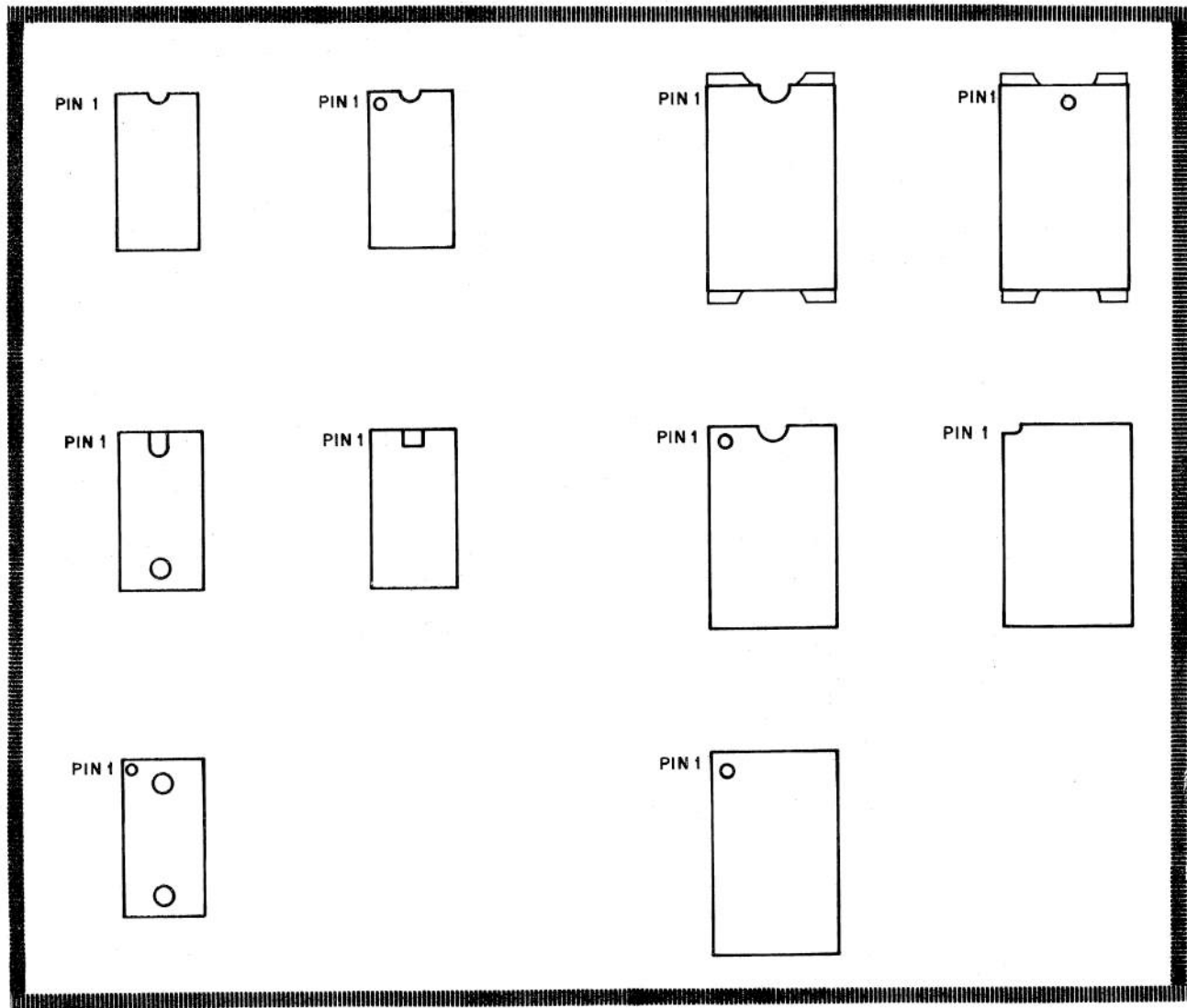USED YOU WILL RISK DAMAGING YOUR UNIT:
     2N4410 = EN4410 = CS4410 = CS4437, CS4438, TIS98, ST98, S38473 (NPN)
     EN2907 = 2N2907 = PN2907 = ST2907, CS4439 (PNP)
WHEN MAKING SUBSTITUTIONS, REFER TO THE ILLUSTRATION TO DETERMINE THE
CORRECT ORIENTATION FOR THE THREE LEADS.

*Configuration of the leads on EN2907 may vary.

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 INSTALLATION. REFER TO THE ABOVE DRAWING TO DETERMINE THE POSITION OF PIN 1 OF THE IC AND USE THIS INFORMATION TO ORIENT IT AS DESCRIBED IN THE ASSEMBLY MANUAL.

WARNING: IF THE IC's ARE NOT PROPERLY ORIENTED DURING INSTALLATION, IT MAY RESULT IN PERMANENT DAMAGE TO YOUR UNIT.

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 build up considerable static charges. 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.

Integrated Circuit Installation

There are 25 integrated circuits (IC's) to be installed on the 8800 Display/ Control Board.

( ) Referring to the component layout, remove the IC with the correct part number from its holder. If there are any bent pins, straighten these using needle-nose pliers. Ensure that you choose the IC with the correct part number as you install each one.

( ) Orient the IC so that its notched end corresponds with the notch printed on the PC Board, and pin 1 of the IC corresponds with the pad marked with an arrowhead on the board.

NOTE: If the IC does not have a notch on one end, refer to the IC Orientation Chart included with your manual for the identification of pin 1.

( ) When you have the correct orientation, start the pins on one side of the IC into their respective holes on the silk-screened side of the PC board. DO NOT PUSH THE PINS IN ALL THE WAY. If you have difficulty getting the pins into the holes, use the tip of a small screwdriver to guide them.

( ) Start the pins on the other side of the IC into their holes in the same manner. When all of the pins have been started, set the IC in place by gently rocking it back and forth until it rests as close as possible to the board. Make sure that the IC is perfectly straight and as close as possible to the board; then tape it in place with a piece of masking tape.

( ) 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.

( ) Turn the board over again and remove the piece of masking tape.

Use the same procedure to install each of the IC's. Be sure that you have the correct part number and the correct orientation as you install each one.

( ) AA & BB are 74LS04's

( ) Y is a 74L30

( ) U is a 7400

( ) W is a 7404

( ) E is a 7405

( ) B is a 7405

( ) A is a 7405

( ) X is an 8T97

( ) C is a 7405

( ) S & T are 74L10's   ( ) Z is a 74L04

( ) D is a 7405

( ) H is a 7400

( ) V is a 7404

( ) R is a 74L02

( ) O is a 7430

( ) J is a 7473

( ) K, M, L, F and G are 74123's

( ) N is a 7400

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REV 0

Resistor Installation

There are 59 resistors to be installed
on the 8800 Display/Control Board.

NOTE: Resistors are color-coded accord-
ing to their value. The resistors in
your kit will have four or possibly five
bands of color. The fourth band in both
cases will be gold or silver, indicating
the tolerance. In the following instruc-
tions we will be concerned only with the
three bands of color to one side of the
gold or silver band. Be sure to match
these three bands of color with those
called for in the instructions as you
install each resistor.

Using needle-nose pliers, bend the leads
of the following resistors at right an-
gles to match their respective holes on
the PC board. (see component layout)

NOTE: All resistors on the 8800 Display/
Control Board are either 1/4 or 1/2 Watt.

( ) Install resistor R1 (1K-ohm, 1/2W,
    brown-black-red) into the correct
    holes on the silk-screened side of
    the PC board.

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

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

Referring to the component layout, in-
stall the remaining resistors in the
same manner. Be sure you have the cor-
rect color-coding for each one as you
install them.

( ) R1, R2, R13, R14, R15, R16, R17, R18, R19, R22 and R34 are all 1K-ohm, 1/2W, brown-black-red.

( ) R3, R5 and R11 are all 47K-ohm, 1/2W, yellow-violet-orange.

( ) R6, R8 and R12 are 7.5-K-ohm, 1/2W, violet-green-red.

( ) R7, R9 and R10 are all 30K-ohm, 1/2W, orange-black-orange.

( ) R20 is 270K-ohm, 1/2W, red-violet-yellow.

( ) R23 is 100-ohm, 1/2W, brown-black-brown.

( ) R24 to R33, R35 to R41, and R44 to R62 are all 220-ohm, 1/2W, red-red-brown.

( ) R4 is 1/2W, either 20K-ohm (red-black-orange) or 22K-ohm (red-red-orange).

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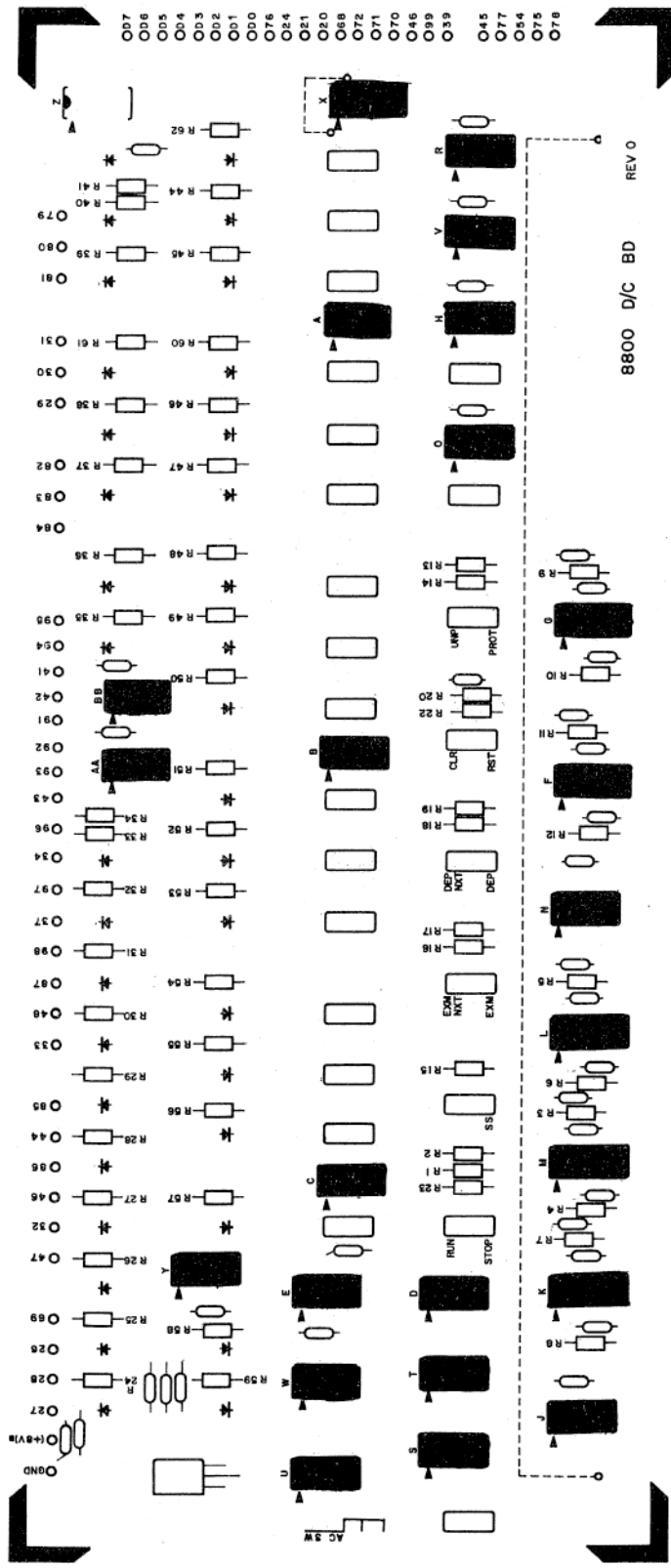
Capacitor Installation

There are 33 ceramic disk capacitors to
be installed on the 8800 Display/Control
Board.

Refer to the component layout and install
the capacitors according to the follow-
ing procedure.

( ) Choose the capacitor with the cor-
    rect value as called for in the in-
    structions. Straighten the two
    leads and bend them as necessary to
    fit their respective holes on the
    PC board.

( ) Insert the capacitor into the cor-
    rect holes from the silk-screened
    side of the board. Push the capaci-
    tor down until the ceramic insula-
    tion almost touches the foil pattern.

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

( ) Solder the two leads to the foil pat-
    tern on the back side of the board;
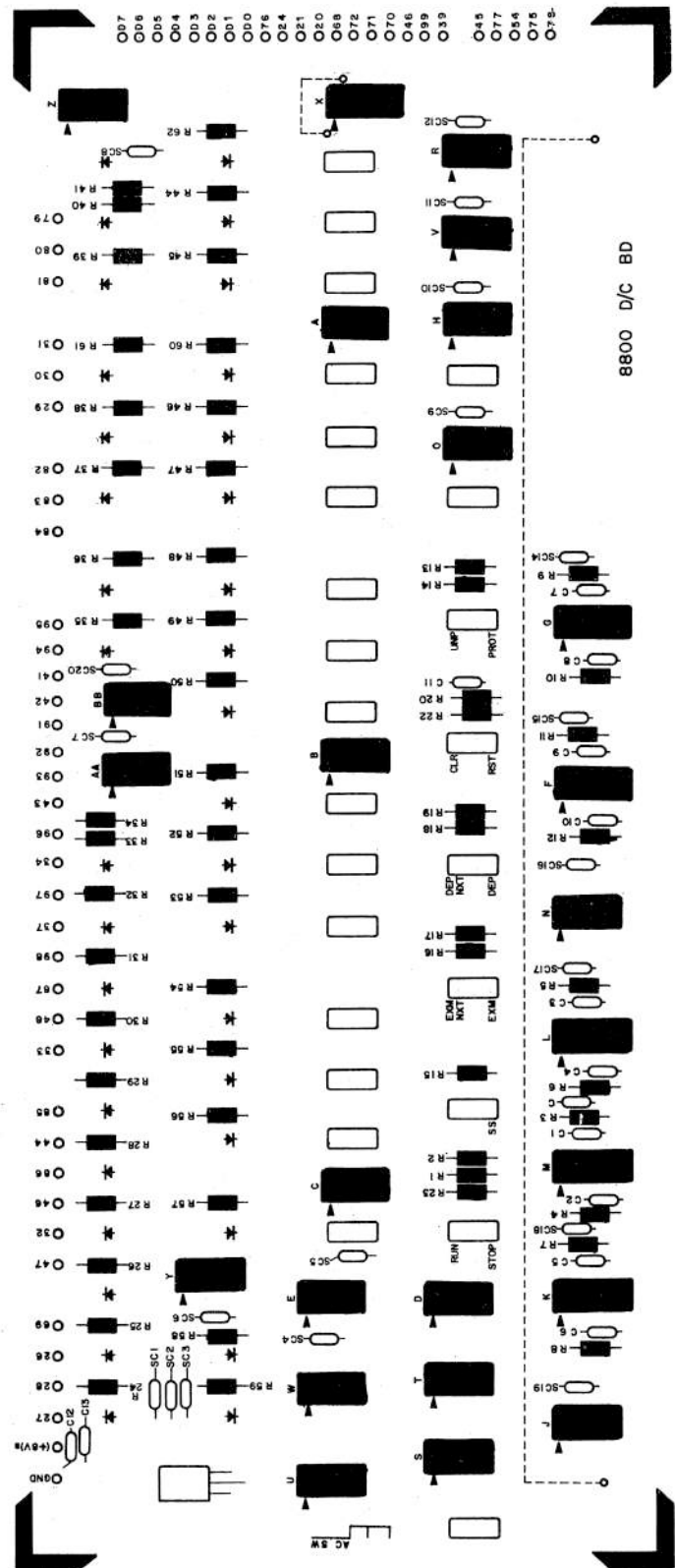   then clip off any excess lead lengths.

Install all of the capacitors in this
manner. Be sure you have the correct
value capacitor as you install each one.

( ) C1, C3, C5, C9, C11, C12, C13, and
SC1 through SC20 are all .1uf.
NOTE: SC13 is incorrectly marked on
the silk-screen; it is the capacitor
labeled "c" between R3 & R6.

( ) C2, C4, C6 and C10 are 20pf.
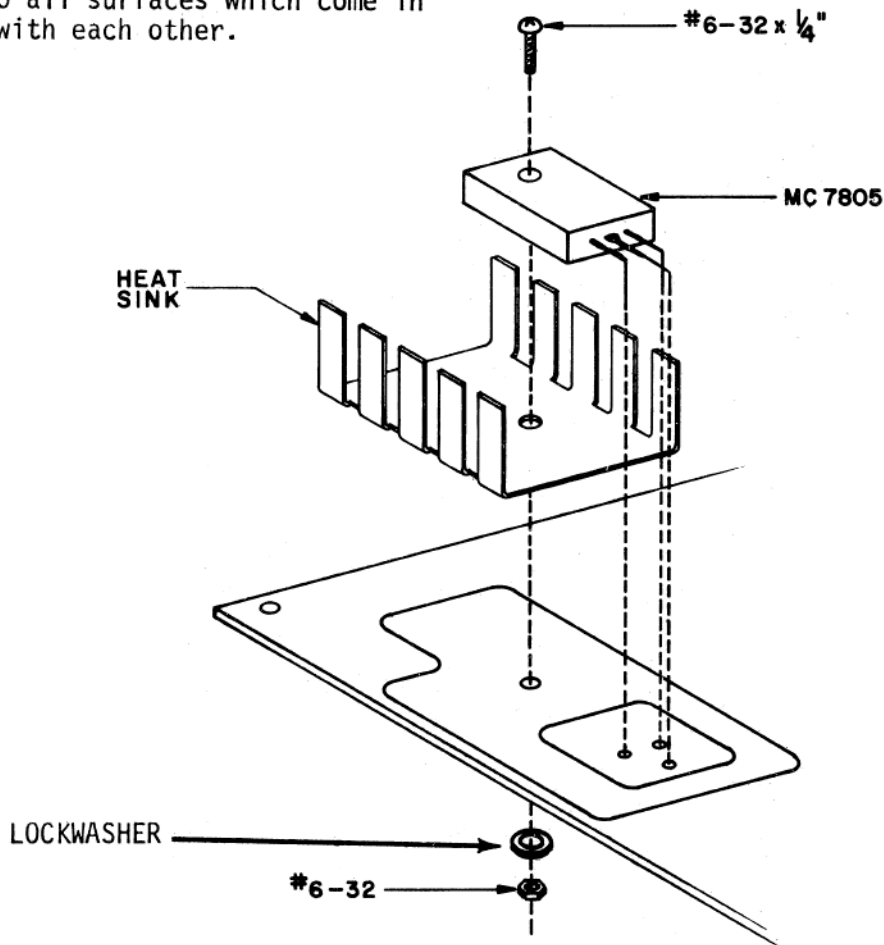
( ) C7 is 0.01uf

( ) C8 is 0.1uf.

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Voltage Regulator Installation

There is one MC7805 5-volt regulator to be installed on the 8800 Disply/Control Board.

( ) Set the MC7805 in place on the board and align the mounting holes. (see drawing)

( ) Use a pencil to mark the point on each of the three leads where they line up with their respective holes on the board.

( ) 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.

( ) 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.

( ) 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.

( ) Clip off any excess lead lengths.

#6-32 x ¼"

MC 7805

HEAT SINK

LOCKWASHER

#6-32

Component Additions

There is one bypass capacitor and three resistors to be mounted on the back (non silk-screened) side of the Display/Control Board.

( ) Referring to the drawing below, connect the capacitor and resistors to the back side of the board as shown.

NOTE: These components are soldered directly to the lands; so be very careful not to leave any solder bridges or shorts between lands. A piece of tape should be placed between the resistors and the board as an additional precaution.

( ) The capacitor can be any value from 20 to 35uf. Observe the polarity orientation indicated in the drawing.

( ) The resistors can be any value from 62 to 68 ohm. These three resistors are to be connected together in parallel as shown before being connected to the board.

( ) Install P (uA7805)

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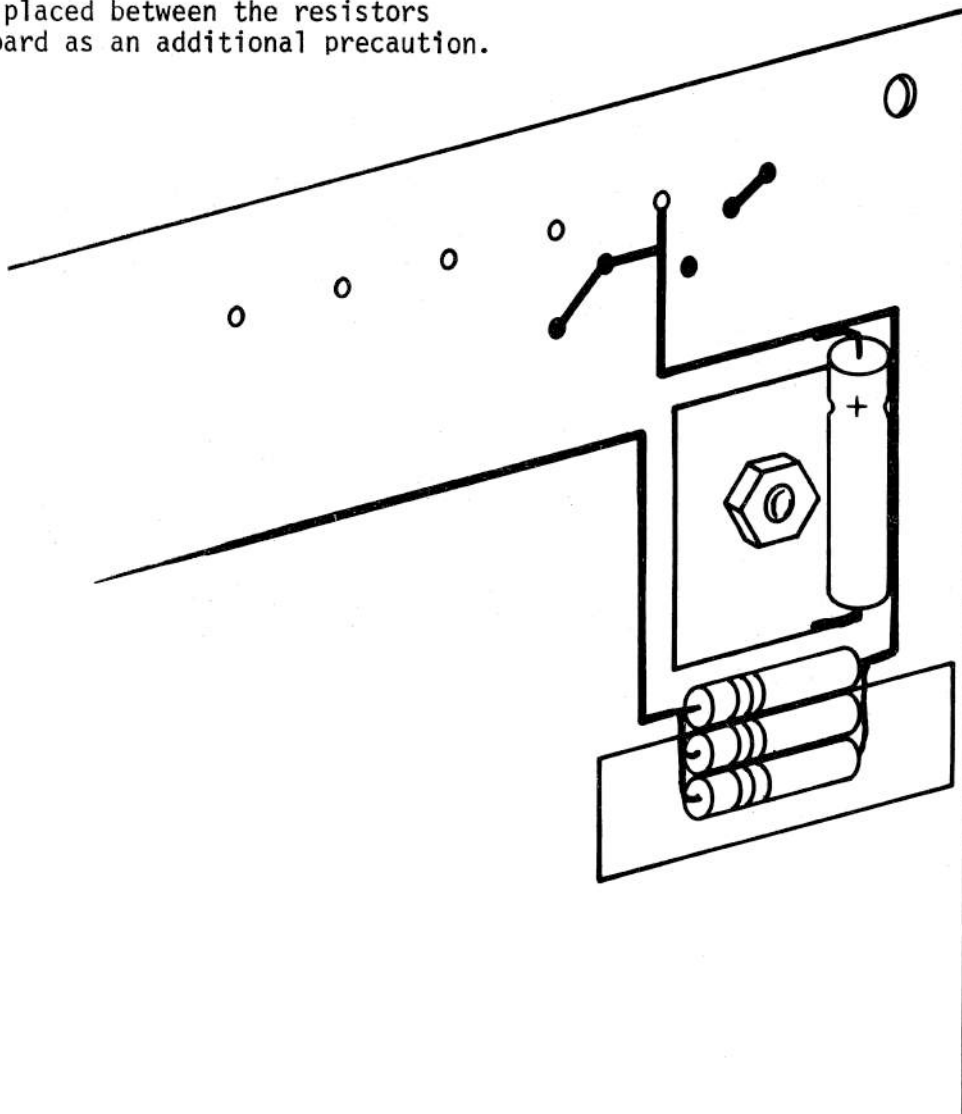
There are 62 loose wire connections and 2 jumper wire connections to be made on the 8800 Display/Control Board.

The two jumper connections are to be made by inserting the wires from the silk-screened side of the board and soldering them on the back side. Be sure to clip off any excess lead lengths as you make each connection.

( ) Connect one end of an 18 inch wire to one of the pads labeled "J1".

( ) Cut the wire as necessary so that it is just long enough to reach the other pad labeled "J1" and then solder it to the pad.

( ) Use the length of wire that was cut from the 18 inch wire above to connect both pads labeled "J2". Make this connection in the same manner as that used above.

There are 63 three foot lengths of wire to be connected to the 8800 Display/ Control Board.

Make all of these connections by inserting the wires from the back side of the board and soldering them on the silk-screened side. Be sure to clip off any excess lead lengths as you make each connection.

As you install each wire, label the end opposite the connection with a piece of masking tape marked with the same designation as the pad to which it is connected.

NOTE: There are two pads with the designation "46", one on the top edge and one on the side. Only one of these pads need be connected to a wire.

( ) Connect 3 foot wires to the row of 37 pads along the top edge of the board. Start with the pad labeled "GND" and end with the pad labeled "79".

( ) Connect 3 foot wires to the row of 24 pads along the right edge of the board. Start with the pad labeled "D7" and end with the pad labeled "78".

( ) Connect 3 foot wires to the two pads on the left edge of the board labeled "AC SW".

NOTE: There are four heavier guage wires provided for four of the wire connections. Use the heavier #18 wire for the connections to "AC SW", "GND" and "(+8V)B". Use the lighter #26 wire for the other connections.

8800 D/C Board Revision 1

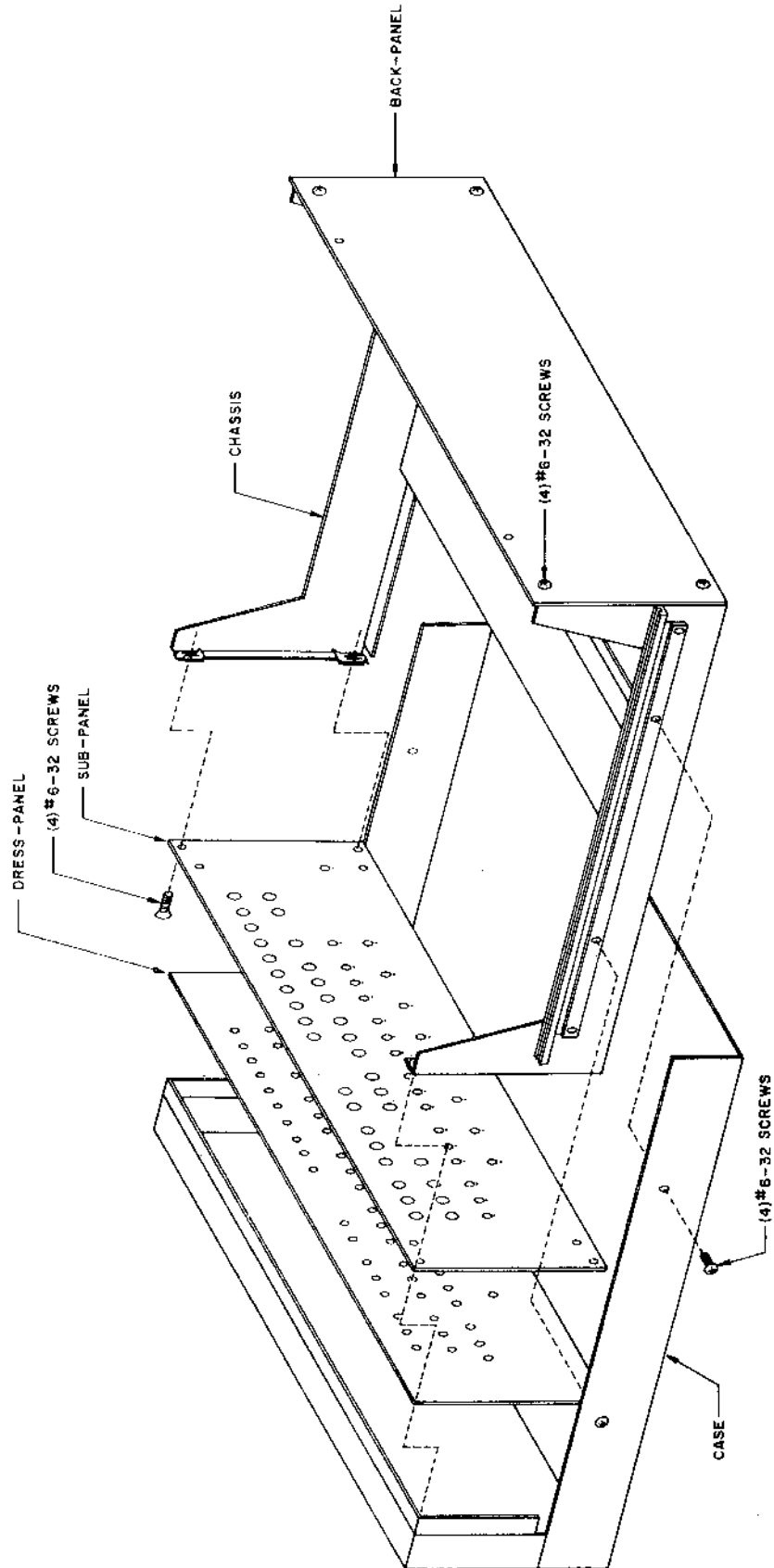If you have a Rev 1 D/C board, please note the following changes:

1. Jumper J1 and the jumper between the hole just below IC T and the pad just to the left of the unmarked pad between pads 39 and 45 are no longer needed. Omit them. Jumper J2 should still be installed per the manual. The 3 foot wire to be labelled 53 should still be connected to the unmarked pad per the manual.

2. The holes for the AC switch wires have been moved closer to the AC switch.

( ) Install jumpers J1 & J2

( ) Connect 3-foot wires to pads
as instructed on page 14

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CHASSIS AND SUB-PANEL REMOVAL

In order to correctly install the LED
displays and the switches on the 8800
Display/Control Board, the Sub-Panel
must first be removed from the case.
The Sub-Panel and Dress-Panel will be
used for alignment purposes while in-
stalling the remaining components.

( ) There are four screws securing the
    chassis to the case bottom, two on
    each side. Remove these four screws
    and set them asside. It would be
    adviseable to place the screws in
    a small envelope and label it "Chas-
    sis Mounting Screws". (see drawing)

( ) Remove the chassis from the case
    bottom by sliding it towards the
    back of the case. It will be nec-
    essary to lift up on the back of
    the chassis in order to completely
    remove it from the case. The Dress-
    Panel should fall free when the
    chassis is removed.

( ) There are four screws securing the
    Sub-Panel to the chassis. Remove
    these four screws and set them as-
    side.

The chassis and case should now be set
out of the way.

BACK-PANEL

CHASSIS

(4)#6-32 SCREWS

DRESS-PANEL

(4)#6-32 SCREWS

SUB-PANEL

(4)#6-32 SCREWS

CASE

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Switch Installation

There are 25 toggle switches to be
mounted on the 8800 Display/Control
Board. Eight of these are momentary
contact SPDT switches and seventeen
are latching type SPDT switches.

For alignment purposes, the switches
must first be mounted to the Sub-Panel
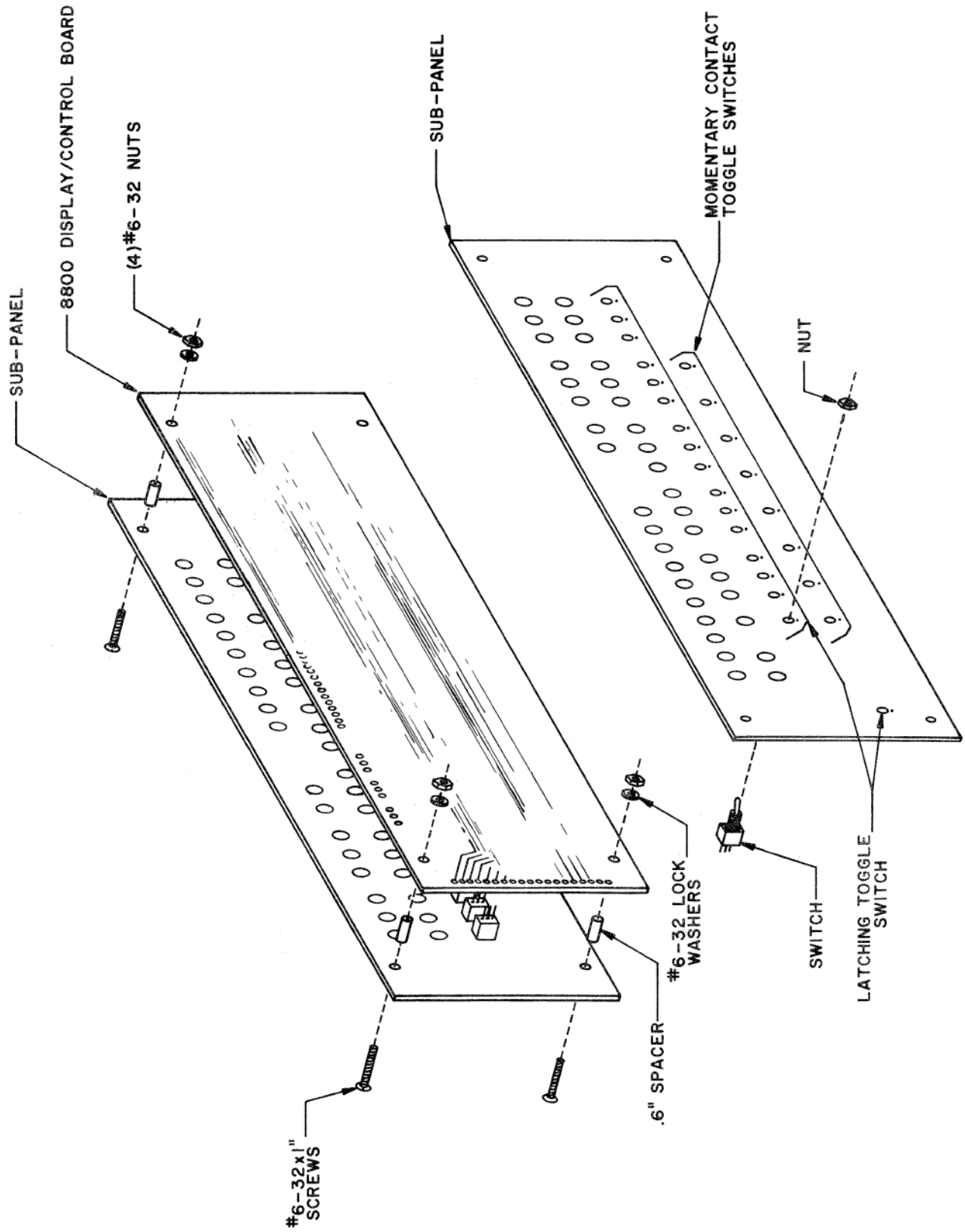before connecting them to the Display/
Control Board itself.

( ) Referring to the drawing, install
all 25 switches into the proper
holes on the Sub-Panel. Tighten
the nuts on the switches just
enough to keep the switch from
falling off the panel.

NOTE: 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 preassure is removed.

( ) The Display/Control Board should
now be mounted to the Sub-Panel.
Refer to the drawing and mount the
board to the panel using #6-32 X 1
inch screws and .6 inch spacers.

NOTE: As the Display/Control Board is
set into place with the Sub-Panel it
may be necessary to guide the switches
into the holes on the board with a
screwdriver. The switch leads should
protrude approximately 1/8 inch through
the PC board.

( ) Once the switches are all in place
tighten the nuts on all of them so
that they are fastened as securely
as possible onto the Sub-Panel.

( ) Place the entire assembly in front
of you with the PC board facing up.

( ) Solder the leads on each of the 25
switches to the foil pattern on the
back side of the board. Be careful
not to leave any solder bridges.

SUB-PANEL

8800 DISPLAY/CONTROL BOARD

(4)#6-32 NUTS

SUB-PANEL

SUB-PANEL

MOMENTARY CONTACT
TOGGLE SWITCHES

NUT

#6-32 LOCK
WASHERS

SWITCH

LATCHING TOGGLE
SWITCH

.6" SPACER

#6-32x1"
SCREWS

AC SW

GND
(+8V)a

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(√) Install latching toggle switches SA0 through SA15 and S8.

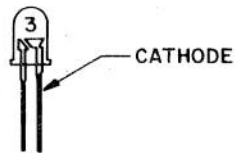(Y) Install momentary contact toggle switches S0 through S7.

LED Installation

There are 36 RL-21 LED's to be installed
on the 8800 Display/Control Board. Care
must be taken during this procedure to
ensure correct physical alignment and
polarity orientation.

Refer to the drawing below for the cor-
rect polarity orientation of the LED's.

RL-21

CATHODE

CATHODE   ANODE

( ) Insert the top row of 18 LED's with
the cathode lead towards the top
edge of the board. Insert the LED's
through the holes on the Sub-Panel
into the correct holes on the Display/
Control Board. Bend the two leads
protruding through the board slightly
outward just enough to keep each LED
from falling back out. (see drawing)

( ) Insert the second row of 18 LED's in
the same manner, but with the cath-
ode lead towards the switches on the
bottom. (see drawing)

( ) Referring to the drawing, set the
Dress-Panel in place over the Sub-
Panel. Secure the two panels to-
gether using rubber bands.

( ) Set the entire assembly in front of
you so that you have easy access to
both sides.

( ) One at a time, align each LED with
the correct hole on the Dress-Panel
and solder the two leads to the foil
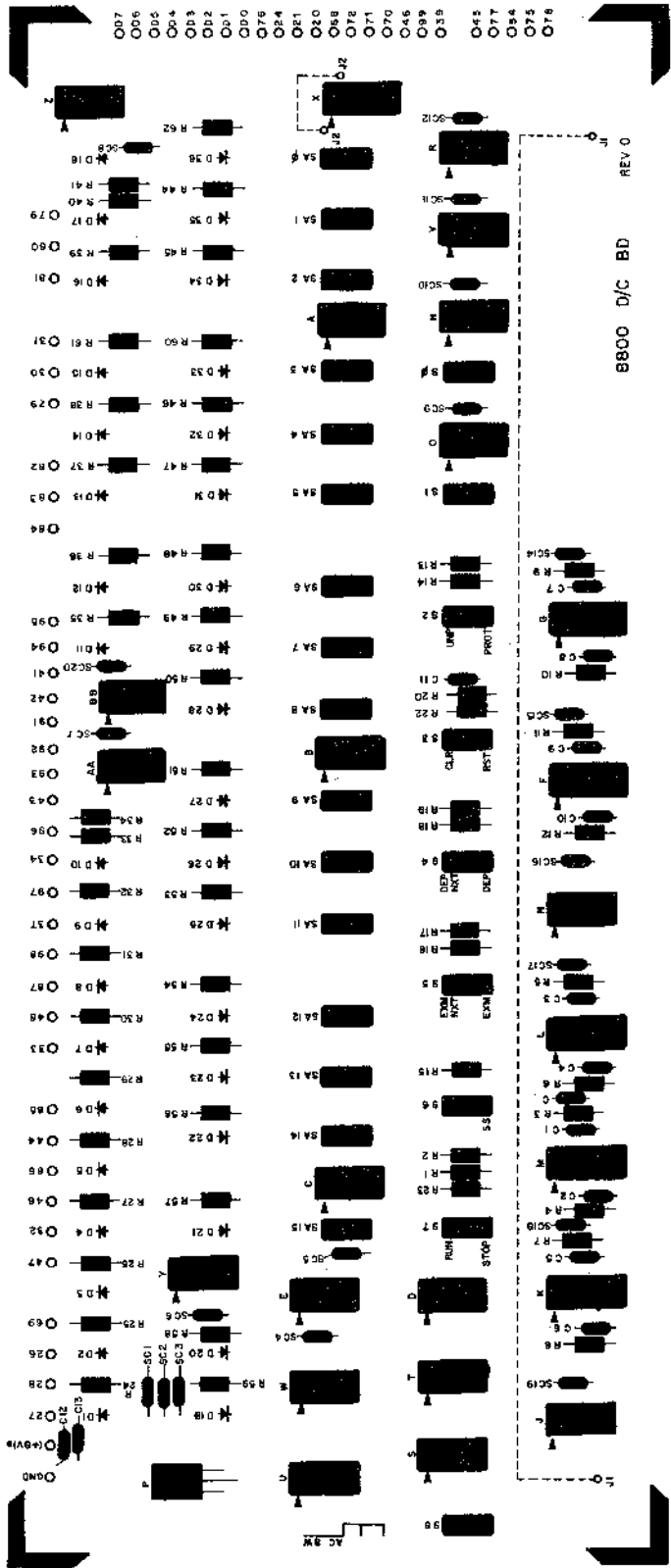pattern on the back side of the
Display/Control Board.

NOTE: Due to supply variations, the
LED's in your kit may or may not fit
all the way through the holes in the
Dress-Panel. If they don't, set them
as close as possible to the panel. If
they do fit through, set them as desired.

WARNING: These LED's are heat sensitive.
Use a minimum amount of heat for a mini-
mum length of time when soldering them.

( ) Clip off any excess lead lengths
from each LED after it is soldered
into place.

SUB-PANEL

DRESS PANEL

D/C BOARD

RUBBER BAND

CATHODE

CATHODE

SUB-PANEL

D/C BOARD

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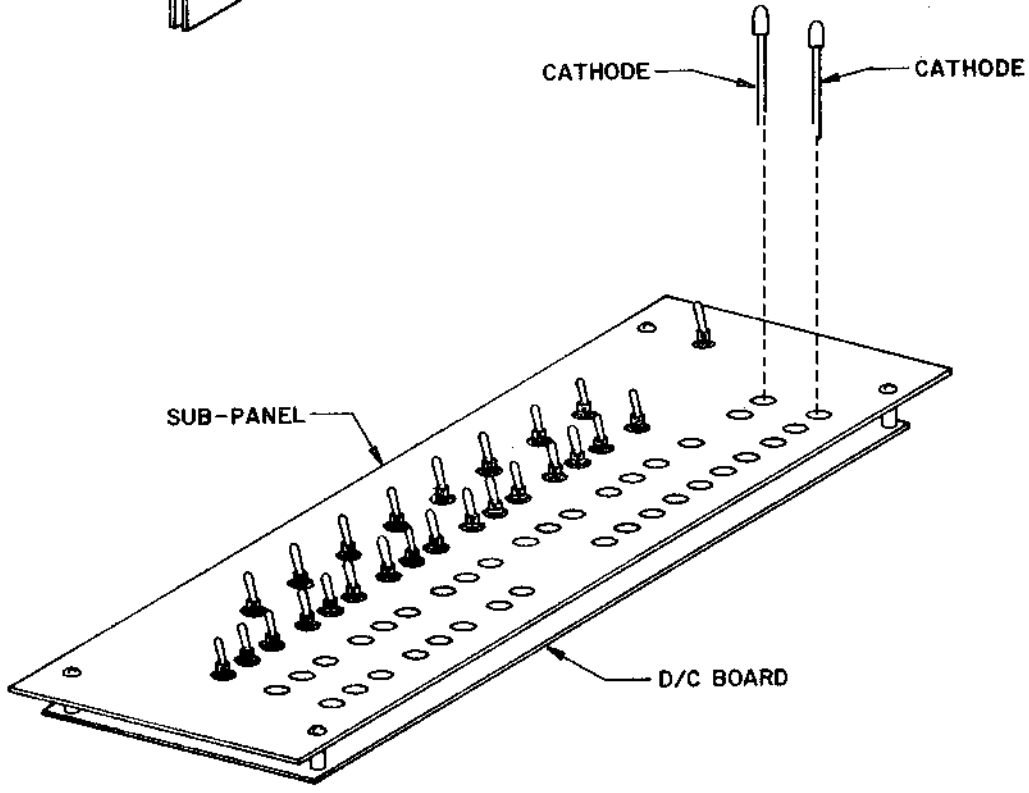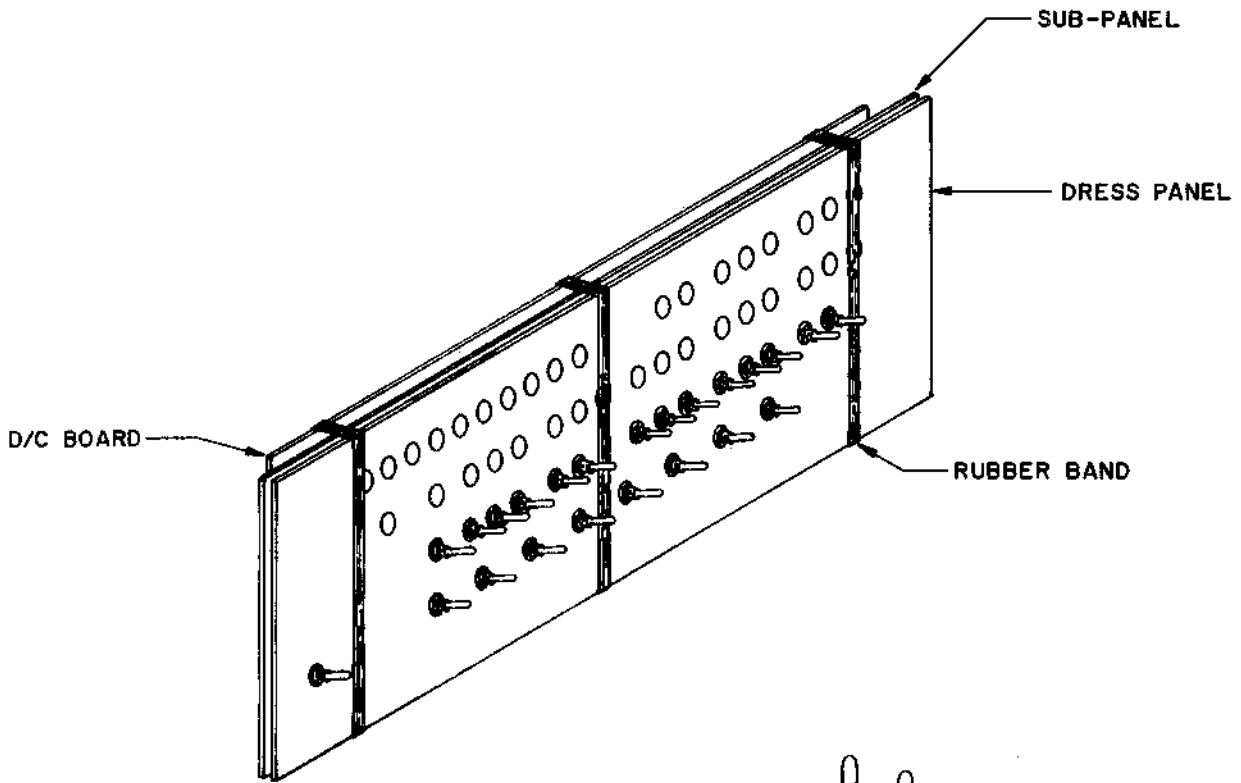
( ) Install RL-21 LED's D1 through D36.

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Connector Plug Installation

There is one 10-pin female connector to be installed onto 8 of the wires from the 8800 Display/Control Board.

( ) There are 8 wires coming from the row of wires on the shorter edge of the Display/Control board labeled "D0" through "D7". Move the labels on these wires to within 10 inches of the board itself; then cut each of the wires to approximately 16 inches in length.

( ) Strip 1/8 inch of insulation from the ends of each of the wires and tin the exposed ends by applying a thin coat of solder.

( ) Install one of the connector pins onto the end of each of the wires. Do this by crimping the wire into place; then soldering the end to the pin itself. (see drawing)

( ) Insert the 8 pins into the 10-pin connector as shown in the drawing below. Be sure that you install them in the order indicated in the drawing.


D3
D2
D1
D0
D4
D5
D6
D7
DISPLAY/CONTROL BOARD

CONNECTOR PLUG
10-PIN FEMALE CONNECTOR
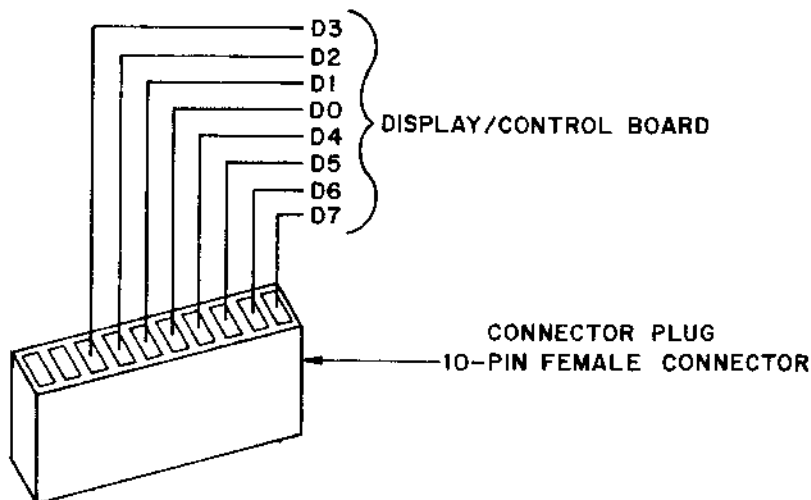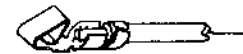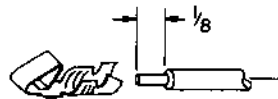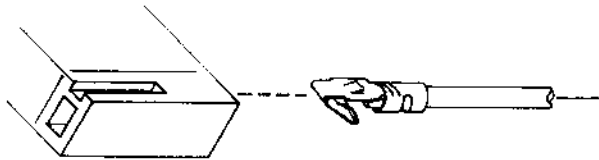
Integrated Circuit Installation

There are 18 integrated circuits (IC's) to be installed on the 8800 CPU Board. One of these, the 8080 CPU IC, will be provided with a 40-pin IC socket. The 8080 IC itself should not be installed into the socket until the entire board is ready to be installed in the 8800.

( ) Referring to the component layout, set the 40-pin IC socket included in your kit into place, and secure it with a piece of masking tape. (see drawing below)
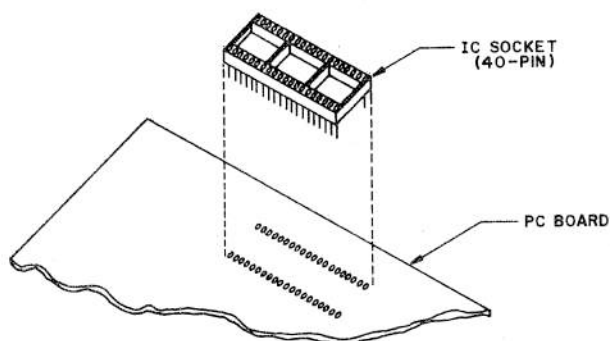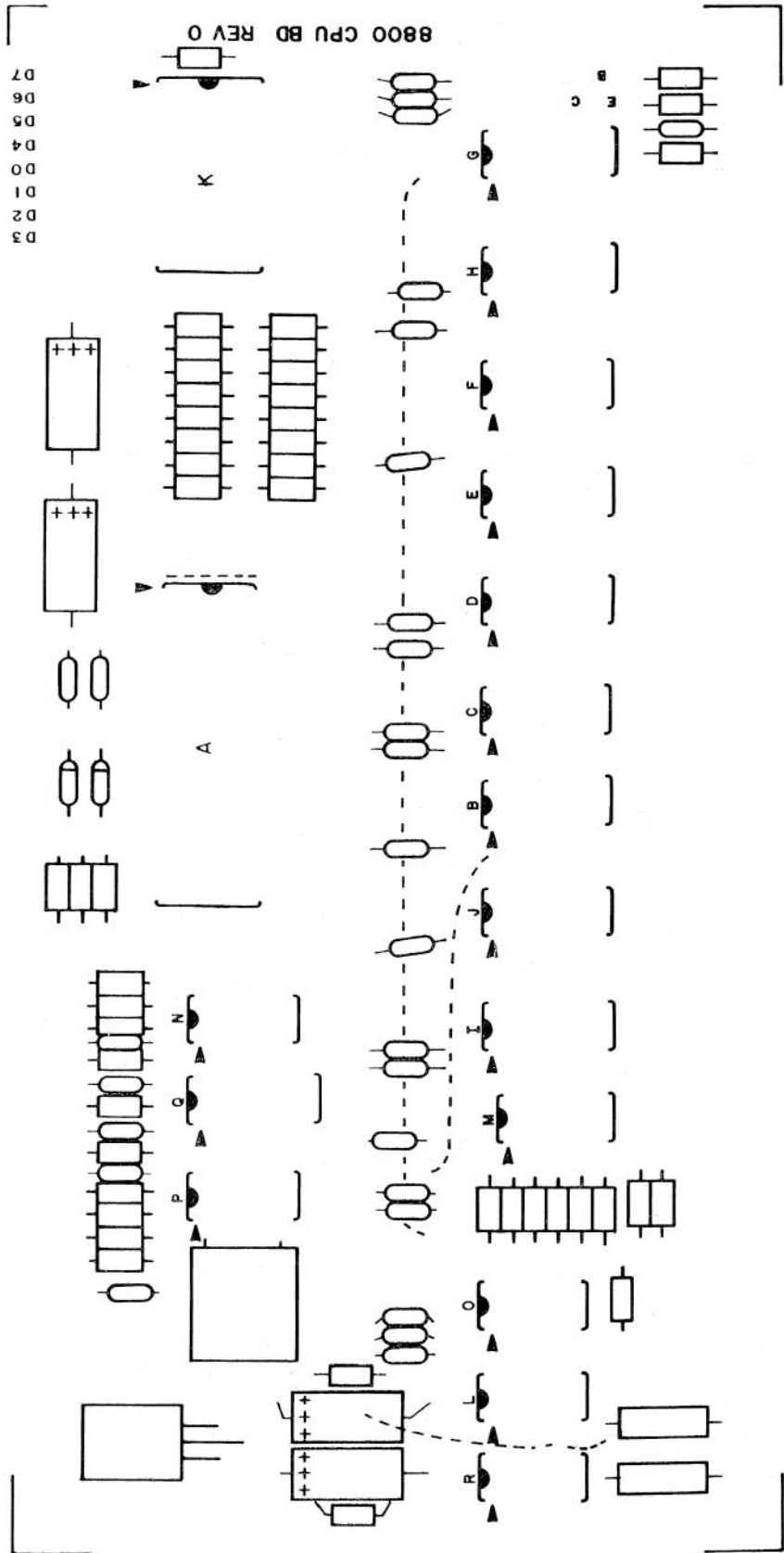

( ) Turn the board over and solder each pin to the foil pattern on the back side of the board. Be sure to solder each pin and be careful not to leave any solder bridges.

( ) Turn the board over again and remove the masking tape.

( ) Referring to the component layout, remove the IC with the correct part number from its holder. If there are any bent pins, straighten these using needle-nose pliers. Ensure that you choose the IC with the correct part number as you install each one.

( ) Orient the IC so that its notched end corresponds with the notch printed on the PC board, and pin 1 of the IC corresponds with the pad marked with an arrowhead on the board.

NOTE: If the IC does not have a notch on one end, refer to the IC Orientation Chart included with your manual for the identification of pin 1.

( ) When you have the correct orientation, start the pins on one side of the IC into their respective holes on the silk-screened side of the PC board. DO NOT PUSH THE PINS IN ALL THE WAY. If you have difficulty getting the pins into the holes, use the tip of a small screwdriver to guide them.

( ) Start the pins on the other side of the IC into their holes in the same manner. When all of the pins have been started, set the IC in place by gently rocking it back and forth until it rests as close as possible to the board. Make sure that the IC is perfectly straight and as close as possible to the board; then tape it in place with a piece of masking tape.

( ) 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.

( ) Turn the board over again and remove the piece of masking tape.

Use the same procedure to install each of the IC's. Be sure that you have the correct part number and the correct orientation as you install each one.

D7
D6
D5
D4
D0
D1
D2
D3

K

A

B
E
C

G
H
F
E
D
C
B
J
I
M
O
R
N
Q
P

( ) Install a 40-pin socket in IC A position.

( ) K is an 8212

( ) P is a 7404

( ) Q is a 74123

( ) N is a 7406

( ) R is a 74L00

( ) L is a 74LS74 or a 74L74

( ) O is a 74L02

( ) M is a 74LS04

( ) I, J, B, C, D, E, F, H, and G are 8T97's

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Hardwire Jumper Connections

There are 5 jumper connections to be
made on the 8800 CPU Board.

All of the jumper connections on this
board are to be made in the same manner.
These connections are indicated on the
board by two pads marked with the same
designation and connected by a broken
line. (i.e., J1-------------J1)

Use the wire provided in your kit for
jumper connections and cut each one to
length as needed.

( ) Connect pad J1 to pad J1 by insert-
      ing the wire ends from the silk-
      screened side of the board and sol-
      dering them to the foil pattern on
      the back side. Clip off any excess
      lead lengths.

( ) Connect J2 to J2 and J3 to J3, etc.,
      in the same manner. Be sure you
      connect the pads with the same de-
      signation each time.

( ) Install jumpers J1 through J5

8800 CPU BD REV 0

D7
D6
D5
D4
D0
D1
D2
D3
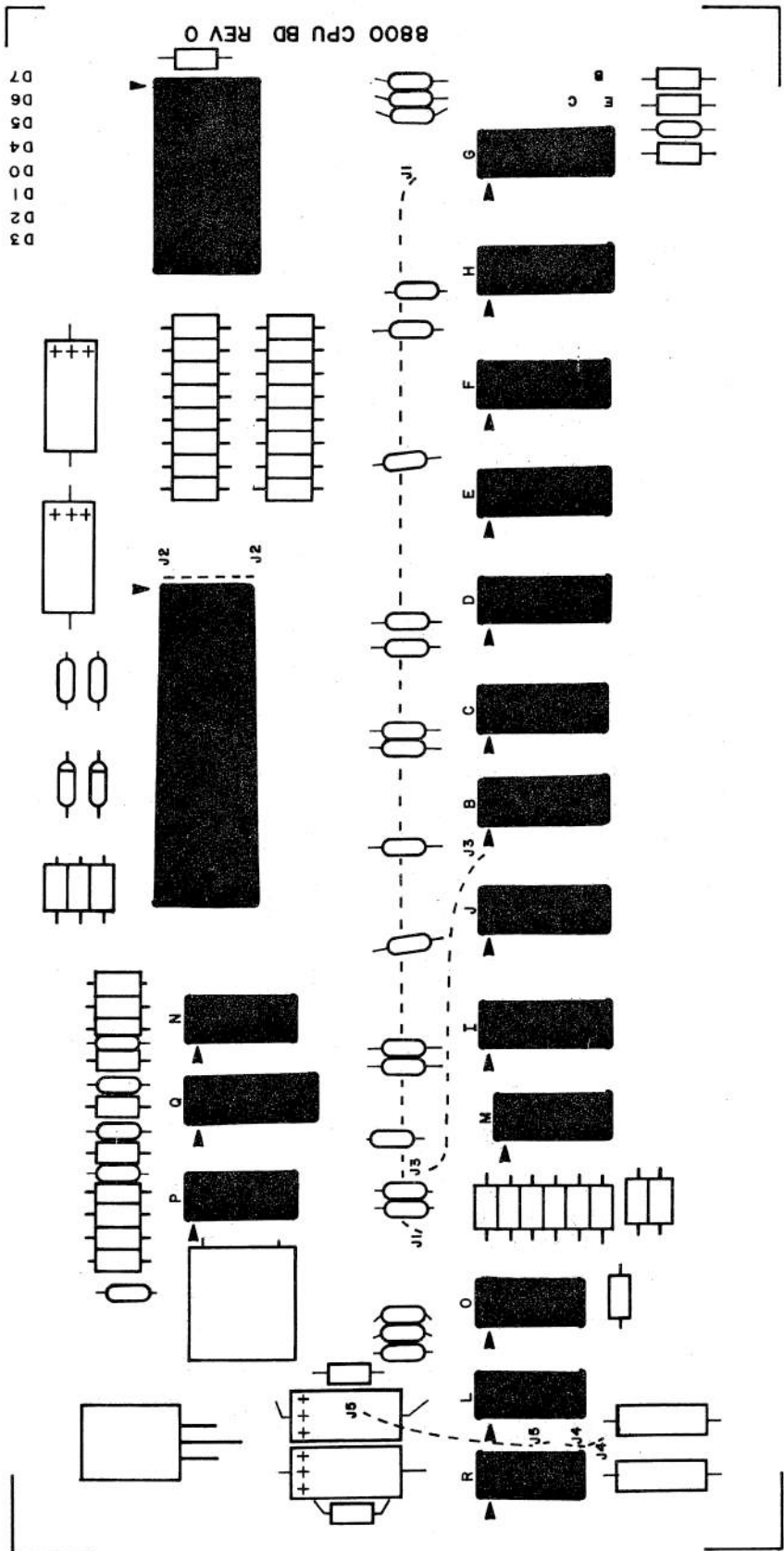
Resistor Installation

There are 44 resistors to be installed
on the 8800 CPU Board.

NOTE: Resistors are color-coded accord-
ing to their value. The resistors in
your kit will have four or possibly five
bands of color. The fourth band in both
cases will be gold or silver, indicating
the tolerance. In the following instruc-
tions we will be concerned only with the
three bands of color to one side of the
gold or silver band. Be sure to match
these three bands of color with those
called for in the instructions as you
install each resistor.

Using needle-nose pliers, bend the leads
of the following resistors at right an-
gles to match their respective holes on
the PC board. (see component layout)

( ) Install resistor R1 (1K-ohm, 1/2 or
    1/4W, brown-black-red) into the cor-
    rect holes on the silk-screened side
    of the PC board.

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

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

Referring to the component layout, in-
stall the remaining resistors in the
same manner. Be sure you have the cor-
rect color-coding for each one as you
install them.

( ) R1 to R8, R17 to R25, R35 to R37, R39, and R44 are all 1K-ohm, 1/2W, brown-black-red.

( ) R9 to R16 are 4.7K-ohm, 1/2W, yellow-violet-red.

( ) R26 & R27 are 47K-ohm, 1/2W, yellow-violet-orange.

( ) R28 is 20K-ohm, 1/2W, red-black-orange.

( ) R29, R30, R32 and R33 are 470-ohm, 1/2W, yellow-violet-brown.

( ) R38 & R40 are 330-ohm, 1/2W, orange-orange-brown.

( ) R41 is 13K-ohm, 1/2W, brown-orange-orange.

( ) R42 is 6.2K-ohm, 1/2W, blue-red-red.

( ) R43 is 680-ohms, 1/2W, blue-gray-brown.

NOTE: R31 and R34 are to be omitted.

( ) R45 is 220-ohms, 2W, red-red-brown.

( ) R46 is 33-ohms, 2W, orange-orange-black.

8800 CPU BD REV 0
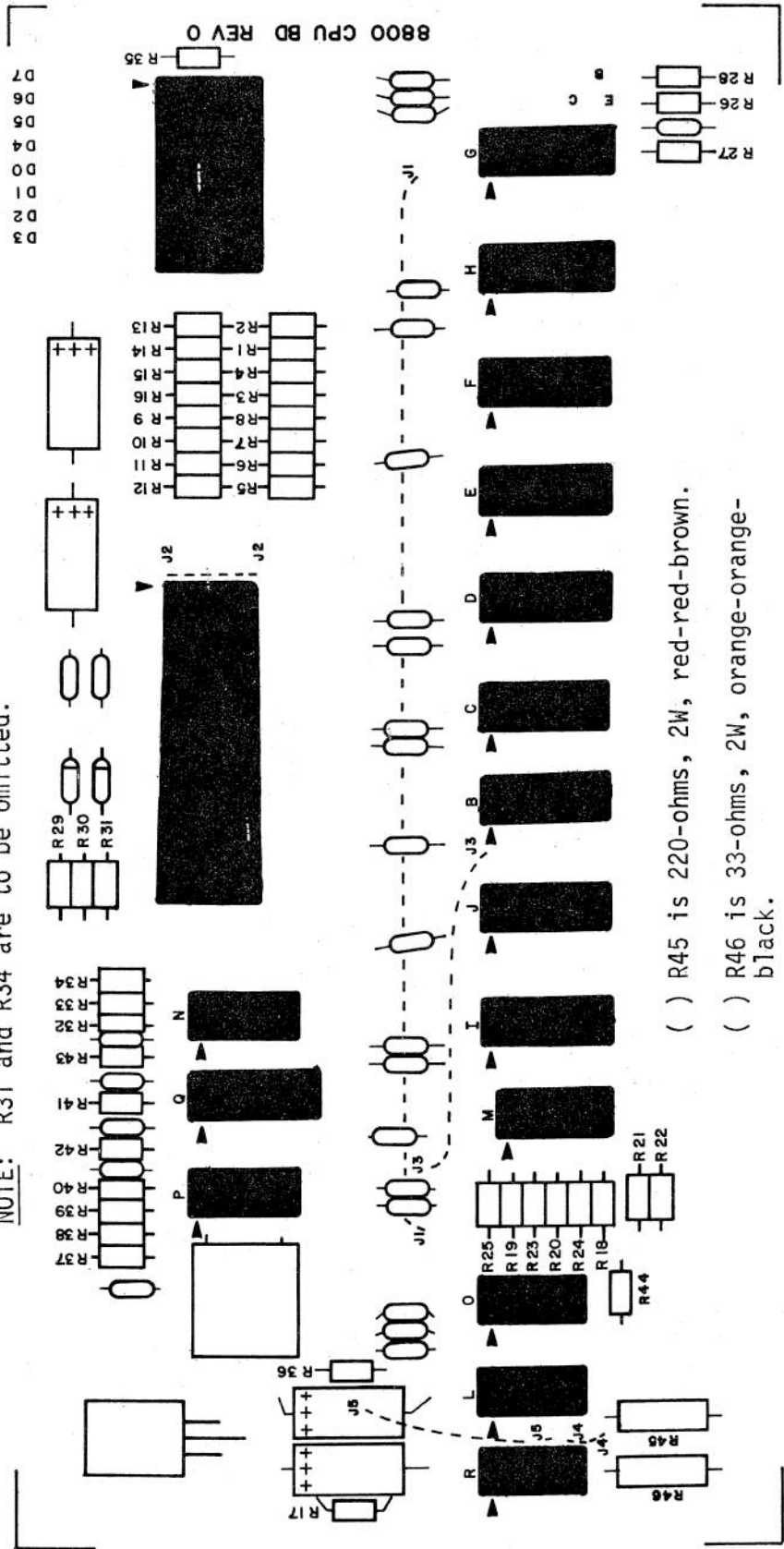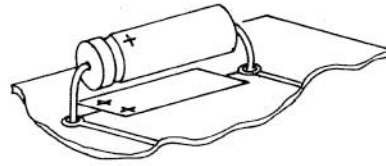
Capacitor Installation

There are 28 ceramic disk and 4 electro-
lytic capacitors to be installed on the
8800 CPU Board.

Refer to the component layout and in-
stall the ceramic disk capacitors ac-
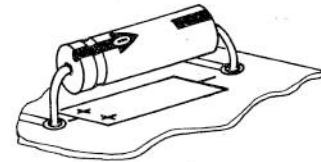cording to the following procedure.

( ) Choose the capacitor with the cor-
rect value as called for in the in-
structions. Straighten the two
leads and bend them as necessary to
fit their respective holes on the
PC board.

( ) Insert the capacitor into the cor-
rect holes from the silk-screened
side of the board. Push the capaci-
tor down until the ceramic insula-
tion almost touches the foil pattern.

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

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

Install all of the ceramic disk capaci-
tors in this manner. Be sure that you
have the correct value capacitor as you
install each one.

The four electrolytic capacitors for the
CPU Board have polarity requirements
which must be noted before installation.
Those contained in your kit may have one
or possibly two of three types of polar-
ity markings. To determine the correct
orientation, look for the following:
(see drawing above right)

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.

Referring to the component layout, in-
stall the electrolytic capacitors on the
board.

( ) Bend the two leads of the capacitor
with the correct value at right an-
gles 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.

( ) 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.

( ) Install the other electrolytic ca-
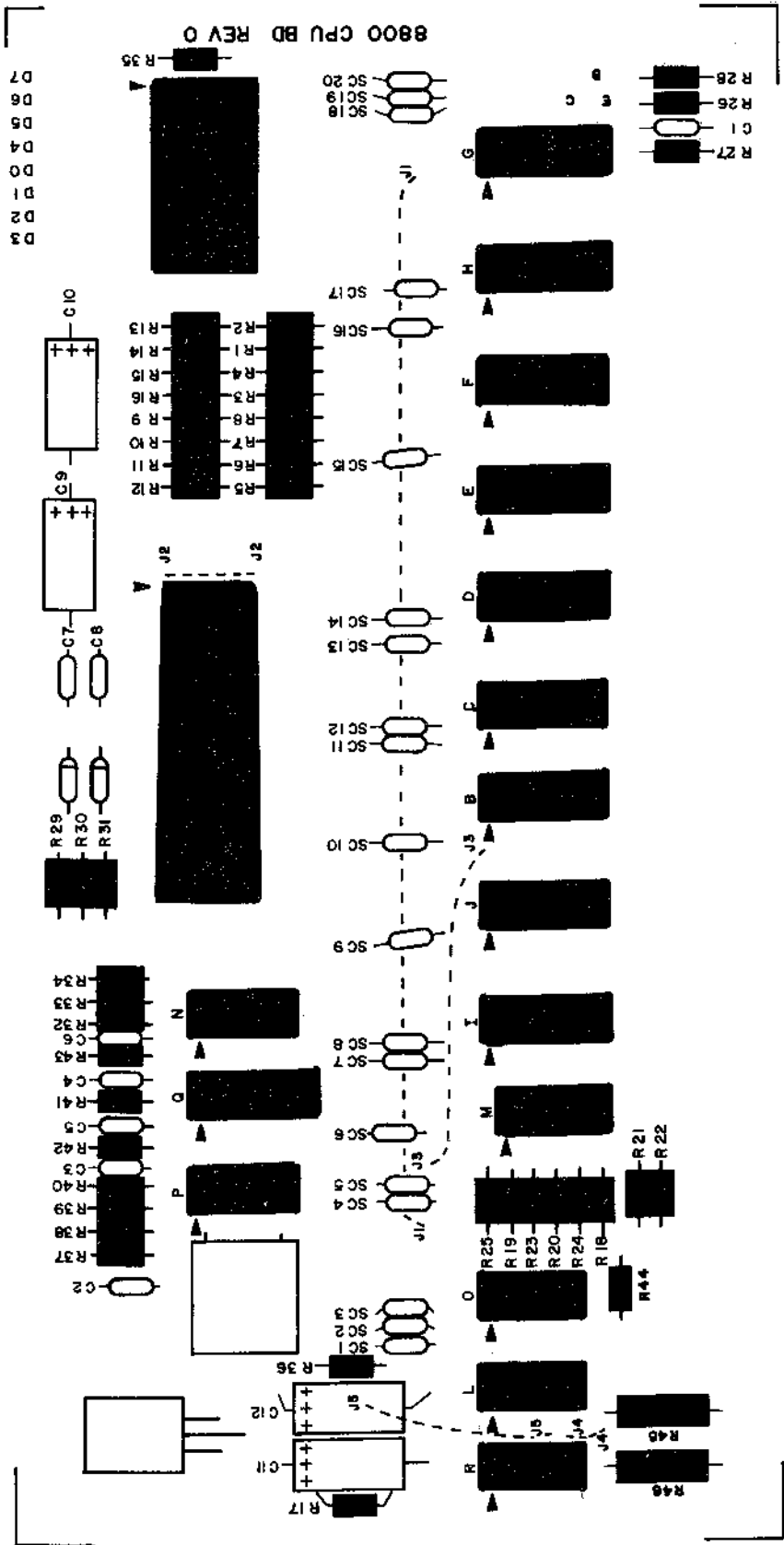pacitors in the same manner.

( ) C9 through C12 are all 20uf to 35uf.

( ) C1, C2, C7, C8 and SC1 through SC20 are all .1uf.

( ) C3 is .01uf.

( ) C4 is 10pf.

( ) C5 is 100pf.

( ) C6 is 20pf.

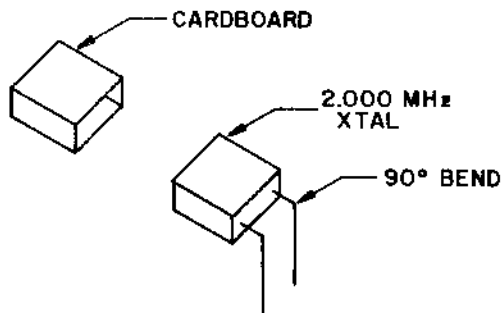8800 CPU BD REV 0

Crystal Installation

There is one 2.000MHz crystal to be installed on the 8800 CPU Board.

( ) Referring to the drawing below, cut a piece of the cardboard container that the crystal is packaged in to the same length as the crystal case itself.

( ) Using needle-nose pliers, bend the two leads of the crystal at right angles as in the drawing above.

( ) Insert the crystal into the correct holes from the silk-screened side of the board. (see component layout)

( ) Holding the crystal in place, turn the board over and bend the two leads slightly outward.

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

( ) Place the piece of cardboard over the crystal case as indicated in the drawing.
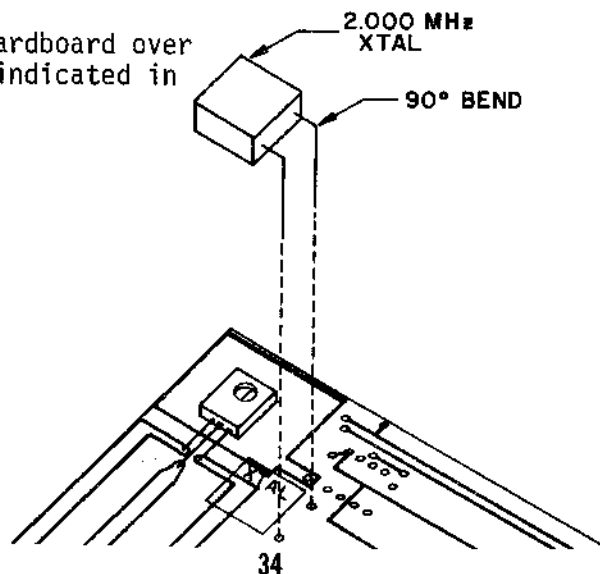
Zener Diode Installation

There is one 5.1 volt and one 12 volt zener diode to be installed on the 8800 CPU Board.

NOTE: Diodes are marked with a band on one end indicating the cathode end. The diode must be oriented so that the end with the band is towards the band printed on the board when being installed.

( ) Referring to the component layout, bend the leads on the 12 volt zener at right angles to match the correct holes on the board.

( ) Insert the diode into the correct holes from the silk-screened side of the board. Turn the board over and bend the two leads slightly outward.

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

( ) Install the 5.1 volt zener diode in the same manner.

Be sure that you have the band on the diode aligned with the band printed on the board for both diodes before proceeding. Failure to orient these two diodes correctly may result in permanent damage to your unit.

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8800 CPU BD REV O

( ) XTAL is a 2.000MHz crystal.

( ) D1 is a 12v zener diode.

( ) D2 is a 5.1v zener diode.

The 5v zener will be marked "5v", "5.1v" or 1N4733.

The 12v zener will be marked "12v" or 1N4742.
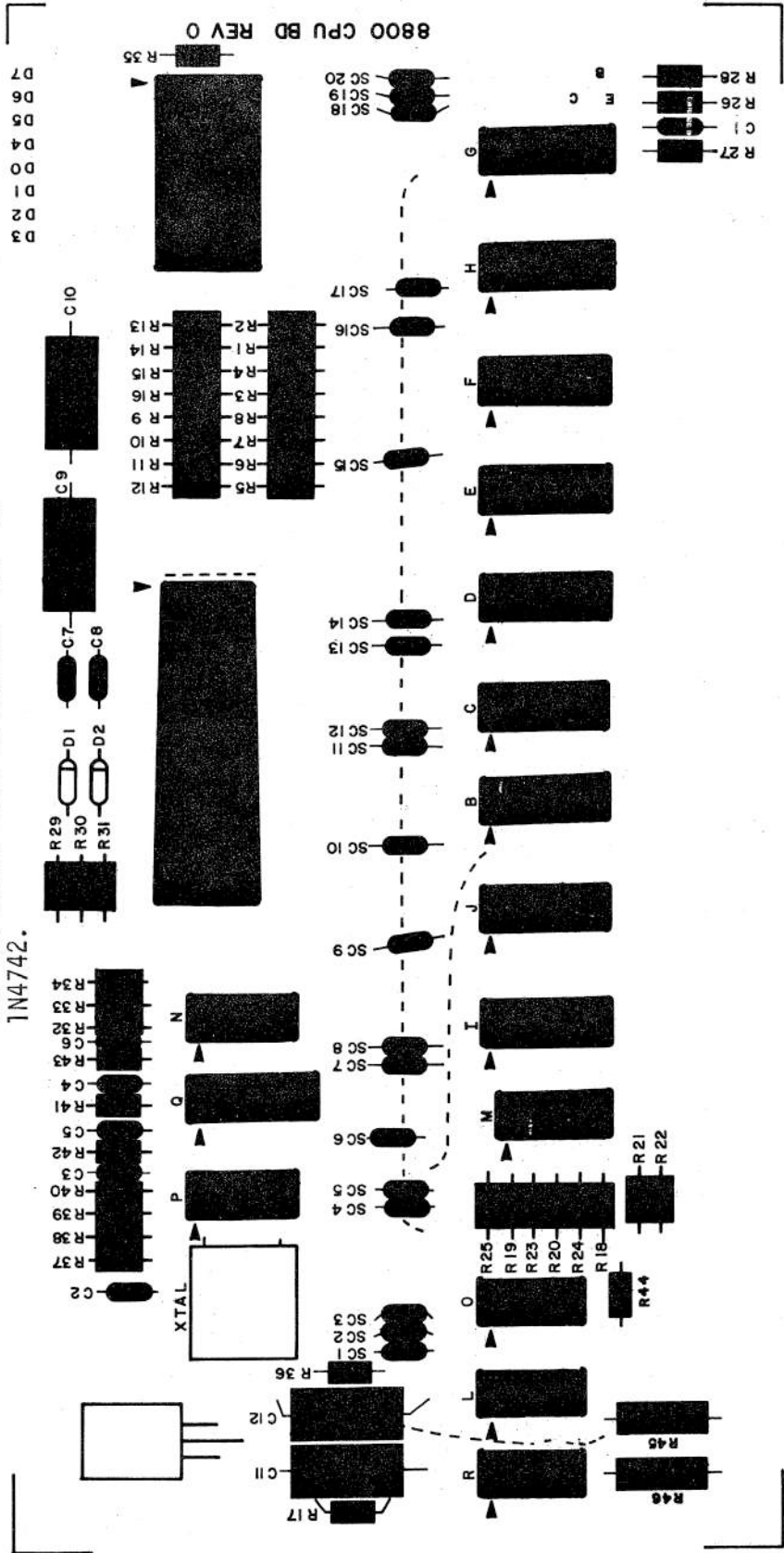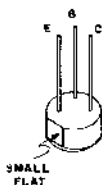
Transistor Installation

There is one CS4410 NPN transistor to be installed on the 8800 CPU Board.

NOTE: When installing this transistor, ensure that you check the part number on it before soldering it into place. Some transistors are identical in physical appearance but differ in electrical characteristics. If the part numbers of your transistors do not match the numbers called for in the instructions, it may be that you have substitutions. In this case, refer to the Transistor Identification Chart included with your manual.

( ) This transistor is rounded and has a flat edge near one of the leads. The lead nearest this flat edge is called the emitter. The hole for the emitter is marked with an "E" on the board. If the emitter lead is placed into this hole, the other two leads should fit into their holes with little or no bending and should not cross over each other. (see drawing below)

( ) Orient transistor Q1 (CS4410) so that the lead nearest the flat edge aligns with the hole marked "E" on the board. Insert the transistor into the holes from the silk-screened side of the board.

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

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

SMALL
FLAT

Voltage Regulator Installation

There is one MC7805 5-volt regulator to be installed on the 8800 CPU Board.

( ) Set the MC7805 in place on the board and align the mounting holes. (see drawing)

( ) Use a pencil to mark the point on each of the three leads where they line up with their respective holes on the board.

( ) 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.

( ) 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.

( ) 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.

( ) Clip off any excess lead lengths.

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( ) Q1 is a CS4410, NPN transistor.

( ) S is a uA7805

8800 CPU BD REV 0

CPU BOARD REVISION

A .00luf capacitor must be added to the 8800 CPU Board between ground and the Protect line (Ref. P. 72 Bus Structure).

( ) Referring to the drawings below, install the capacitor and solder the lead going through the large land to both sides of the board.

( ) On the back side of the board, connect a jumper wire between the free end of the capacitor and the pad for bus line #70, PROTECT. Make the connection to the pad as small as possible and be sure it does not short to any other lands.

.001uf CAPACITOR

MITS

CPU BD REV O

R27 C1 R26 R28
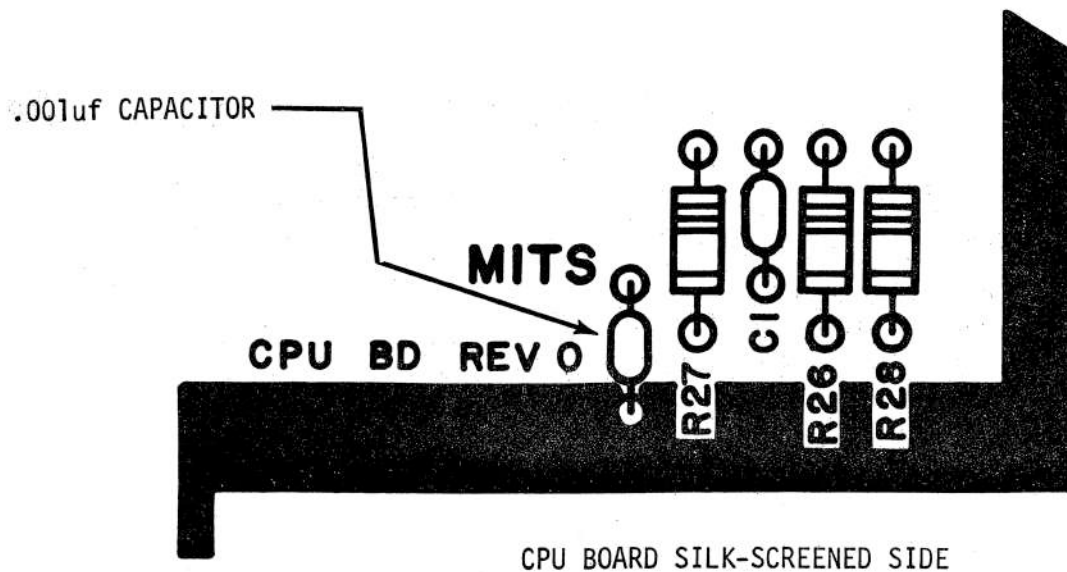
CPU BOARD SILK-SCREENED SIDE

NOTE: Keep the jumper connection to the pad as close to the top as possible.

JUMPER

CPU BOARD BACK SIDE

38A
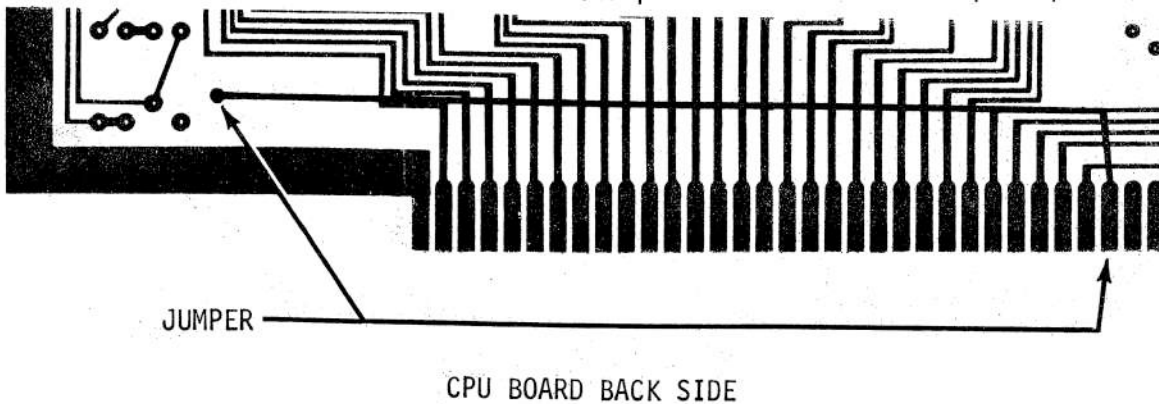
Wafer Connector Installation

There is one 8-pin male connector to be installed on the 8800 CPU Board.

( ) Referring to the drawing below, insert the 8-pin wafer connector into the correct holes on the board from the silk-screened side. Be sure to insert the side with the shorter pins.

( ) Holding the connector in place, turn the board over and solder the 8 pins to the foil pattern on the back side of the board.

WAFER CONNECTOR
8-PIN MALE CONNECTOR

CPU BOARD
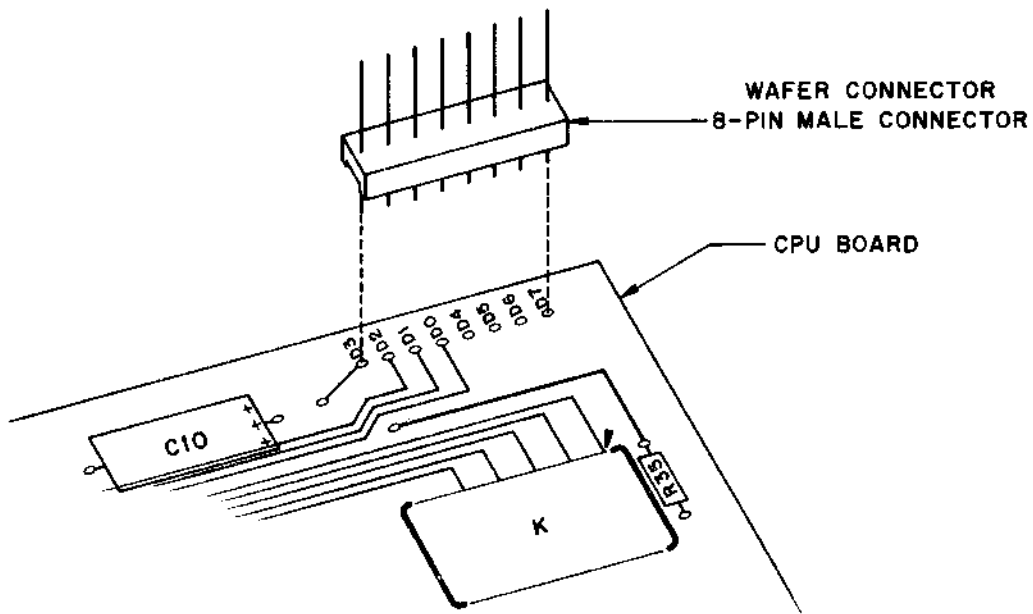
1K STATIC MEMORY BOARD ASSEMBLY

Integrated Circuit Installation

There are 20 integrated circuits (IC's) to be installed on the 8800 1K Static Memory Board. Some of these are MOS IC's and are very sensitive to static electricity and transient voltages. Read the MOS IC Special Handling Precautions sheet included with your manual before proceeding.*

( ) Referring to the component layout, remove the IC with the correct part number from its holder. If there are any bent pins, straighten these using needle-nose pliers. Ensure that you choose the IC with the correct part number as you install each one.

( ) Orient the IC so that its notched end corresponds with the notch printed on the PC board, and pin 1 of the IC corresponds with the pad marked with an arrowhead on the board.

NOTE: If the IC does not have a notch on one end, refer to the IC Orientation Chart included with your manual for the identification of pin 1.

( ) When you have the correct orientation, start the pins on one side of the IC into their respective holes on the silk-screened side of the PC board. DO NOT PUSH THE PINS IN ALL THE WAY. If you have difficulty getting the pins into the holes, use the tip of a small screwdriver to guide them.

*****NOTE*****
THIS BOARD MAY OR MAY NOT BE INCLUDED WITH YOUR KIT, DEPENDING ON IF IT WAS ORDERED. IF IT IS NOT INCLUDED, SKIP THIS SECTION.

( ) Start the pins on the other side of the IC into their holes in the same manner. When all of the pins have been started, set the IC in place by gently rocking it back and forth until it rests as close as possible to the board. Make sure that the IC is perfectly straight and as close as possible to the board; then tape it in place with a piece of masking tape.

( ) 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.

( ) Turn the board over again and remove the piece of masking tape.

Use the same procedure to install each of the IC's. Be sure that you have the correct part number and the correct orientation as you install each one.

*The basic memory block includes 256 words of memory. This means that only two 8101 IC's are used. Install these two in positions MA1 & MA2. Each additional 256 word block of memory is installed in the same manner; i.e. MB1 & MB2, MC1 & MC2, MD1 & MD2.

( ) MA1 & MA2 through MD1 & MD2 are 8101 static RAM's.

( ) J & H are 8T97's

( ) D & N & L are 74L00's

( ) F is a 7400 or a 74L00

( ) C & A are 74L04's

( ) E is a 7404

( ) K is a 74L73

( ) B is a 74L30

( ) G is a 7432

8800 1K STATIC MEM BOARD
REV 0
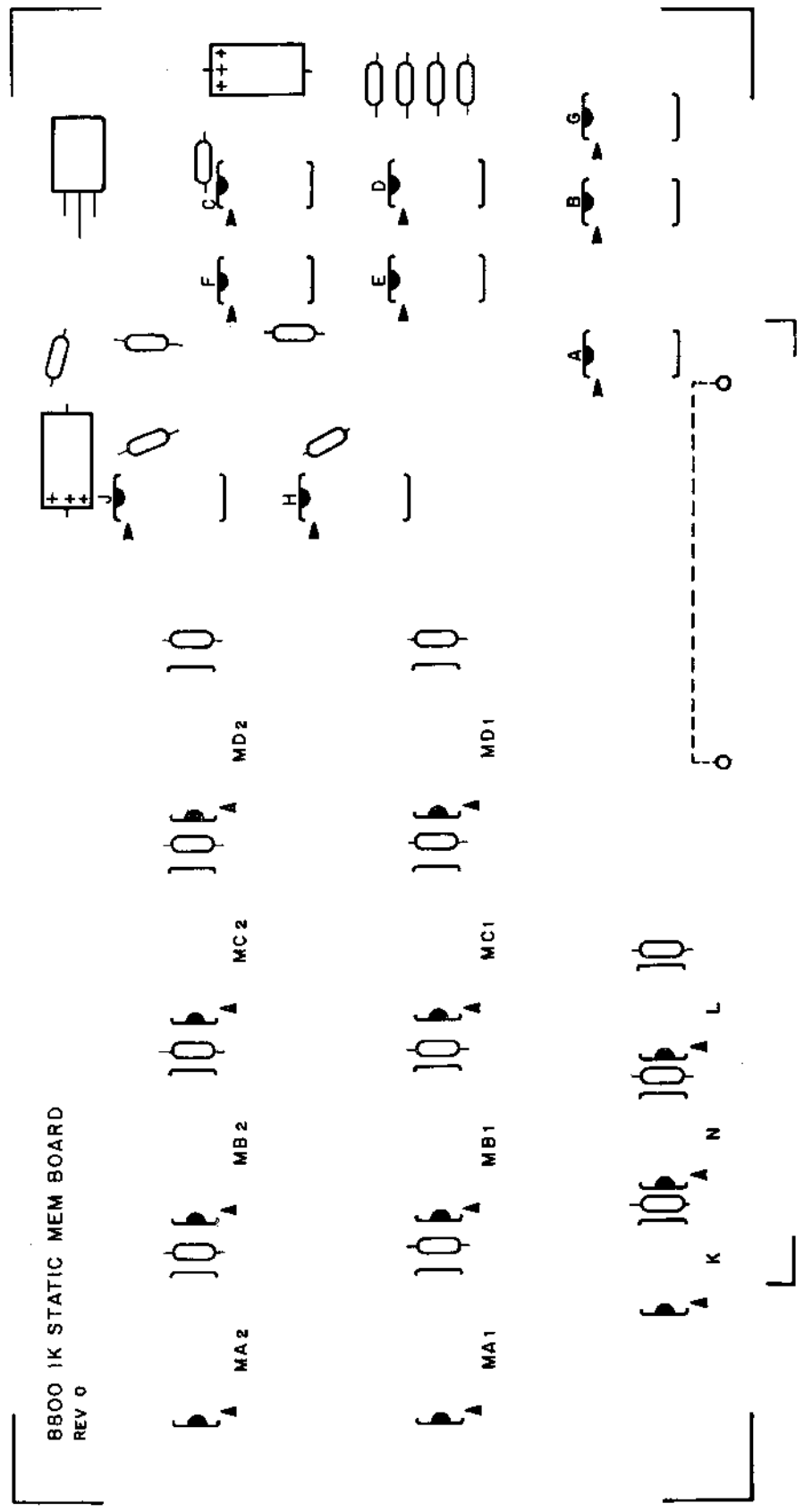
Capacitor Installation

There are 21 ceramic disk and 2 electrolytic capacitors to be mounted on the 8800 1K Static Memory Board.

Refer to the component layout and install the ceramic disk capacitors according to the following procedure.

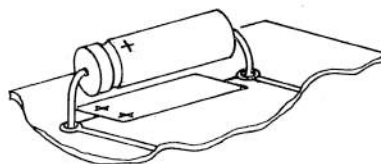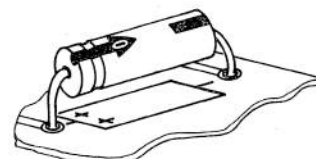( ) Choose the capacitor with the correct value as called for in the instructions. Straighten the two leads and bend them as necessary to fit their respective holes on the PC board.

( ) 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.

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

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

Install all of the ceramic disk capacitors in this manner. Be sure that you have the correct value capacitor as you install each one.

The two electrolytic capacitors for the memory board have polarity requirements which must be noted before installation. Those 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: (see drawing above right)

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.

Referring to the component layout, install the electrolytic capacitors on the board.

( ) Bend the two leads of the capacitor with the correct value 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.

( ) 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.

( ) Install the second electrolytic capacitor in the same manner.
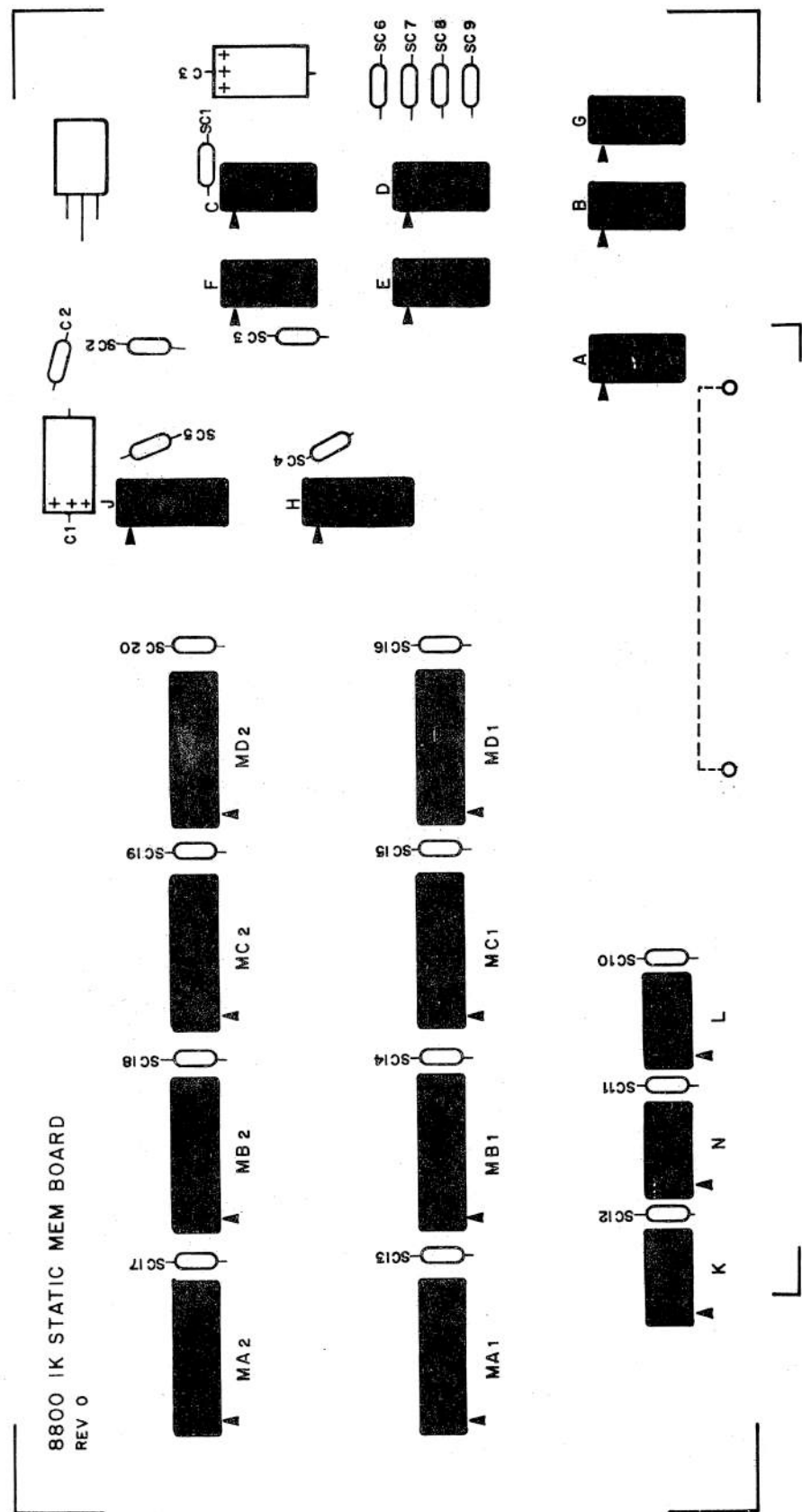
( ) C1 & C3 are 20uf to 35uf

( ) SC1 through SC20 are .1uf

( ) C2 is .1uf

8800 1K STATIC MEM BOARD
REV 0

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Voltage Regulator Installation

There is one MC7805 5-volt regulator to be installed on the 8800 1K Static Memory Board.

( ) Set the MC7805 in place on the board and align the mounting holes. (see drawing)

( ) Use a pencil to mark the point on each of the three leads where they line up with their respective holes on the board.

( ) 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.

( ) 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.

( ) 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.

( ) Clip off any excess lead lengths.

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Hardwire Jumper Connections

There are seven jumper connections to be made on the 8800 1K Static Memory Board.

( ) One jumper is indicated on the board by two pads marked "J1" connected with a broken line.

( ) Insert the two ends of the jumper wire from the silk-screened side of the board into the correct holes.

( ) Solder the wire ends to the foil pattern on the back side of the board; then clip off any excess lead lengths.

The remaining six jumpers can be made using uninsulated wire or the leftover leads clipped off of previously installed components.

( ) These six jumpers are located in the bottom right corner of the board, between IC's A and B.

( ) There is a row of 12 pads next to IC A, and a row of 6 pads directly opposite next to IC B. Each of the pads in the row of 6 is to be connected to one of the pads in the row of 12.

( ) Start with the bottom pad in the row of 6 pads and connect it in the same manner as above to the bottom pad in the row of 12.

( ) In the same manner, connect each of the remaining pads in the row of 6 to every other one of the pads in the row of 12. Start at the bottom and work up. This should leave the top pad in the row of 12 empty.
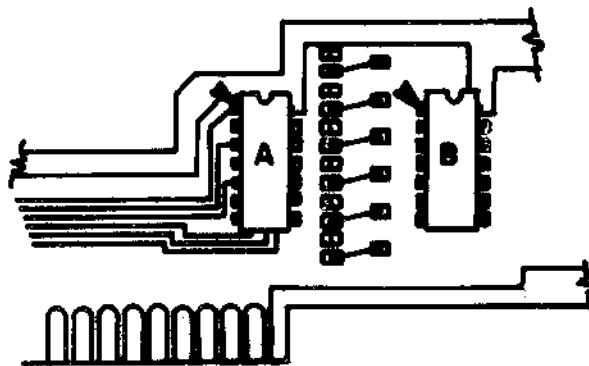
NOTE: Further information on the function of these six jumpers will be recieved as necessary for future memory expansion.

8800 1K STATIC MEM BOARD
REV 0
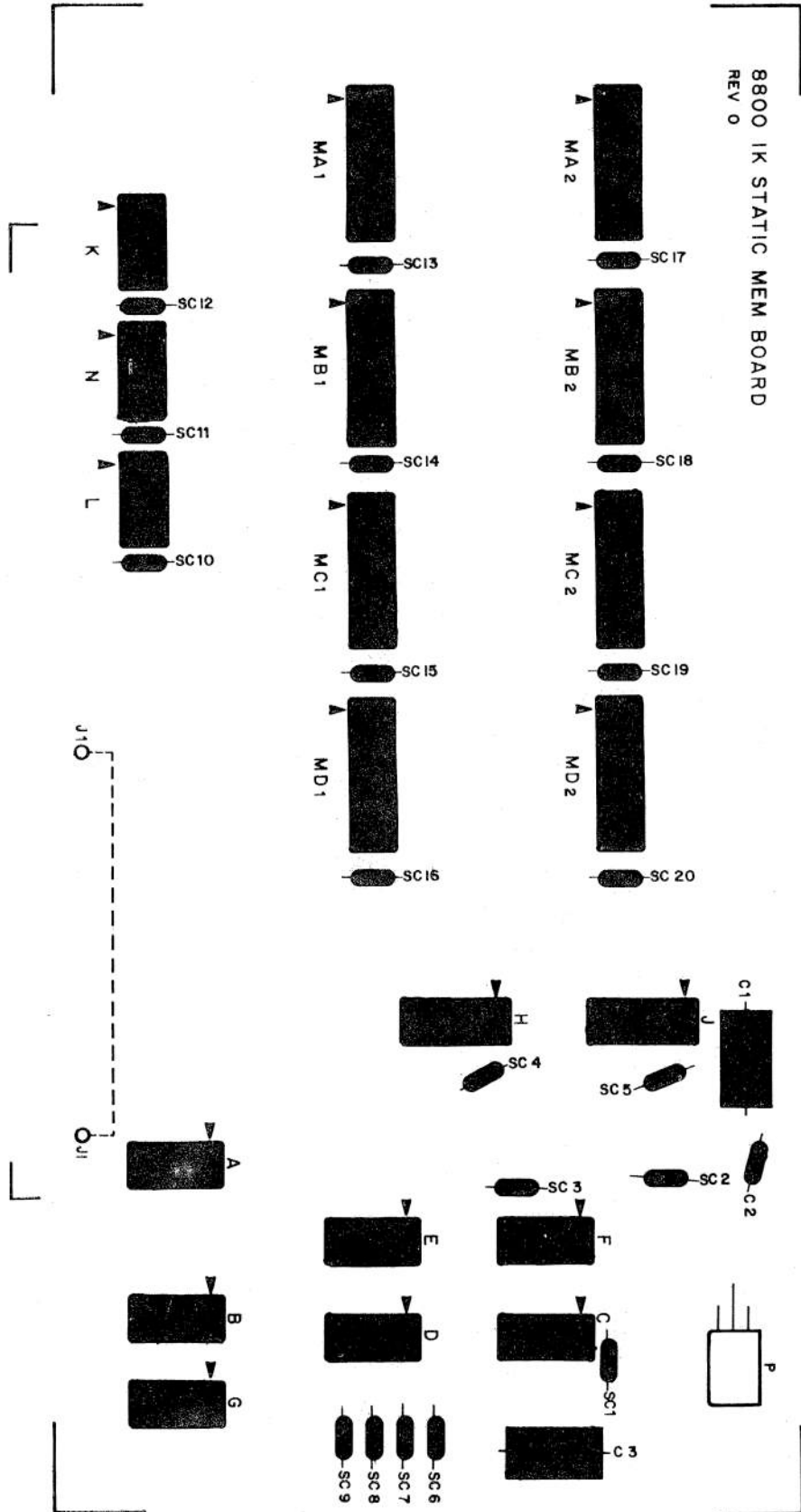
MA1 —SC13
MA2 —SC17
MB1 —SC14
MB2 —SC18
MC1 —SC15
MC2 —SC19
MD1 —SC16
MD2 —SC20

K —SC12
N —SC11
L —SC10

J10
J11

H —SC4
J —SC5
C1
SC2
C2
SC3
E
F
D
C —SC1
C3
SC9 SC8 SC7 SC6

P

( ) P is a uA7805

( ) Install J1

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Resistor Installation

There are 4 resistors to be installed on the 8800 Power Supply Board.

NOTE: Resistors are color-coded according to their value. The resistors in your kit will have four or possibly five bands of color. The fourth band in both cases will be gold or silver, indicating the tolerance. In the following instructions we will be concerned only with the three bands of color to one side of the gold or silver band. Be sure to match these three bands of color with those called for in the insturctions as you install each resistor.

Using needle-nose pliers, bend the leads of the following resistors at right angles to match their respective holes on the PC board. (see component layout)

( ) R1 (470-ohm, 1/2W, yellow-violet brown)

( ) R2 (1K-ohm, 1/2W, brown-black-red)

NOTE: All resistors on the 8800 Power Supply Board are 1/2 Watt.

( ) Install resistor R1 (470-ohm, yellow-violet-brown) into the correct holes on the silk-screened side of the PC board.

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

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

Referring to the component layout, install the remaining resistors in the same manner. Be sure you have the correct color-coding for each one as you install them.

( ) R3 (4.7K-ohm, 1/2W, yellow-violet red)

( ) R4 (4.7K-ohm, 1/2W, yellow-violet red)
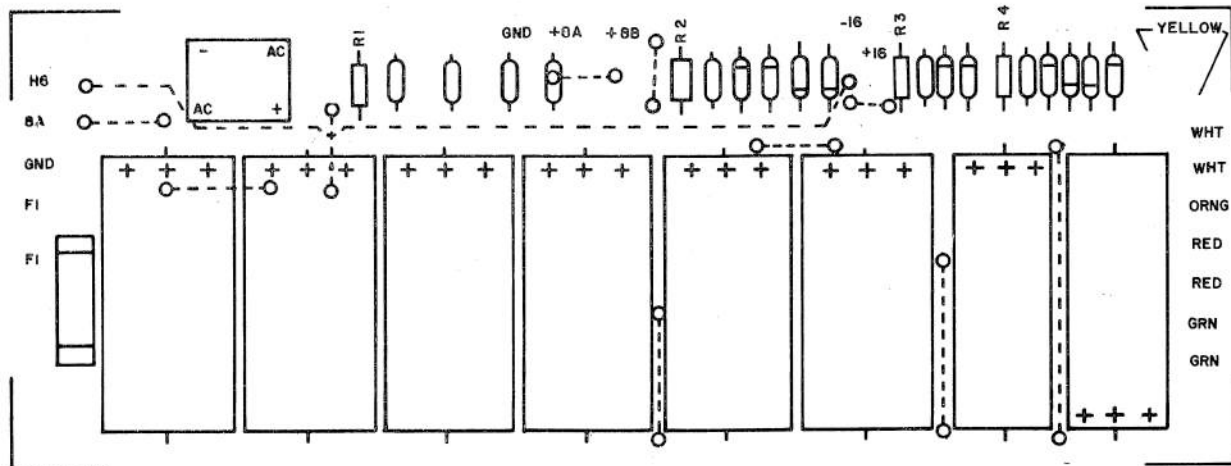
Diode Installation

There are 10 diodes (1N4004's) to be installed on the 8800 Power Supply Board.

NOTE: Diodes are marked with a band on one end indicating the cathode end. The diode must be oriented so that the end with the band is towards the band printed on the board when being installed.

( ) Referring to the component layout, bend the leads of diode D1 (1N4004) at right angles to match the correct holes on the board.

( ) Insert the diode into the correct holes from the silk-screened side of the board. Turn the board over and bend the two leads slightly outward.

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

Install the remaining 9 diodes in the same manner. Be sure that you have the band on the diode aligned with the band printed on the board as you install each one. Failure to orient these diodes correctly may result in permanent damage to your unit.

D1 through D10 are all 1N4004 diodes.

( ) D1   ( ) D2   ( ) D3   ( ) D4

( ) D5   ( ) D6   ( ) D7   ( ) D8

( ) D9   ( ) D10
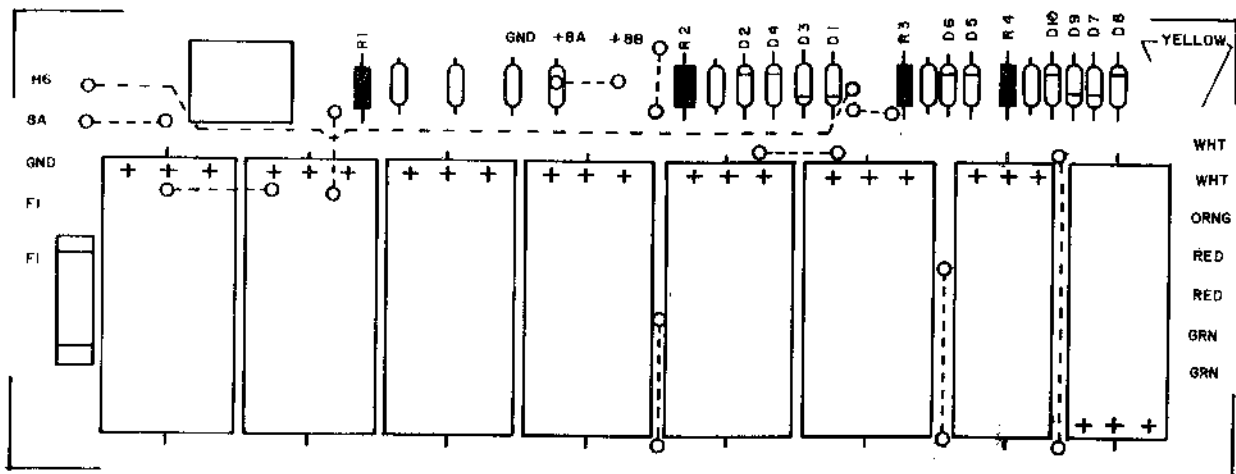
Ceramic Disk Capacitor Installation

There are 7 ceramic disk capacitors to be installed on the 8800 Power Supply Board.

Refer to the component layout and install the capacitors according to the following procedure.

( ) Choose the capacitor with the correct value as called for in the instructions. Straighten the two leads and bend them as necessary to fit their respective holes on the PC board.

( ) 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.

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

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

Install all of the ceramic disk capacitors in this manner. Be sure you have the correct value capacitor as you install each one.

All ceramic disk capacitors are .1uf.

( ) C5   ( ) C6   ( ) C7   ( ) C8

( ) C11   ( ) C13   ( ) C15

NOTE: Capacitors C13 and C15 must be rated at 50V. The voltage rating on the other capacitors may vary with the stock supply.
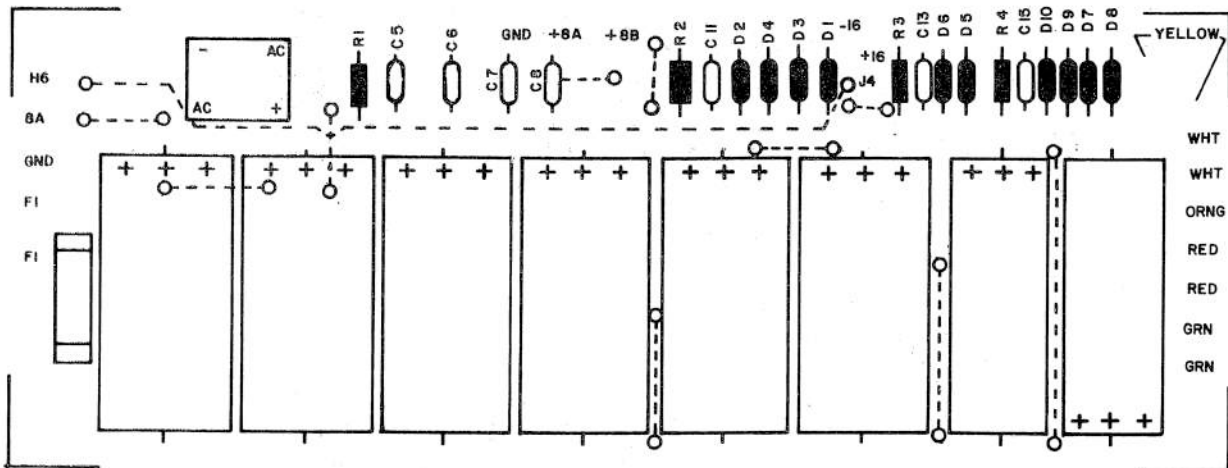
Rectifier Installation

There is one 10 amp bridge rectifier (VJ048) to be installed on the 8800 Power Supply Board.

WARNING: It is very important that this component be properly oriented before it is soldered into place. If it is not in the correct orientation it may cause major damage to the rest of your unit.

There is a "+" and a "-" sign on opposite sides of the VJ048 rectifier. The four leads of this component should be aligned so that the "+" and "-" signs printed on the board correspond with the signs marked on the rectifier itself.

( ) Referring to the drawing on the opposite page, physically mount the rectifier to the foil pattern side of the board as shown. It is very important that the spacing be precisely as indicated in the drawing.

( ) Check to make sure that the "+" and "-" signs on the board and the VJ048 correspond.

( ) Very carefully solder the four leads to the foil pattern. You will be soldering between the board and the body of the rectifier, so take extra care not to leave any solder bridges.

( ) Clip the excess lead lengths from the top of the board; then remove the nut and other hardware so that only the solder connections are holding the rectifier in place.

Hardwire Jumper Connections

There are 11 jumper connections to be made on the 8800 Power Supply Board.

The jumper connections are indicated on the board by two pads with the same designation and connected by a broken line. (see component layout)

Care must be taken when installing these jumpers to be sure that you do not short them to any other components on the top of the board. All of the jumpers except the one marked "J4" can be made with uninsulated bus wire if desired.

( ) Connect J1 to J1, J2 to J2, etc. by inserting the jumper wires from the silk-screened side of the board and soldering them to the foil pattern on the back side.

Be sure to install all 11 jumpers and be careful not to create any shorts between components.

( ) Clip off any excess lead lengths.

( ) Install rectifier VJ048

#6-32 x 5/8" SCREW

SILK-SCREENED
SIDE OF
P.S. BOARD

#6 FLATWASHER

RECTIFIER
INSTALLATION

.125" SPACER

#6 FLATWASHER

VJ048

#6-32 NUT

( ) Install jumpers J1 through J11
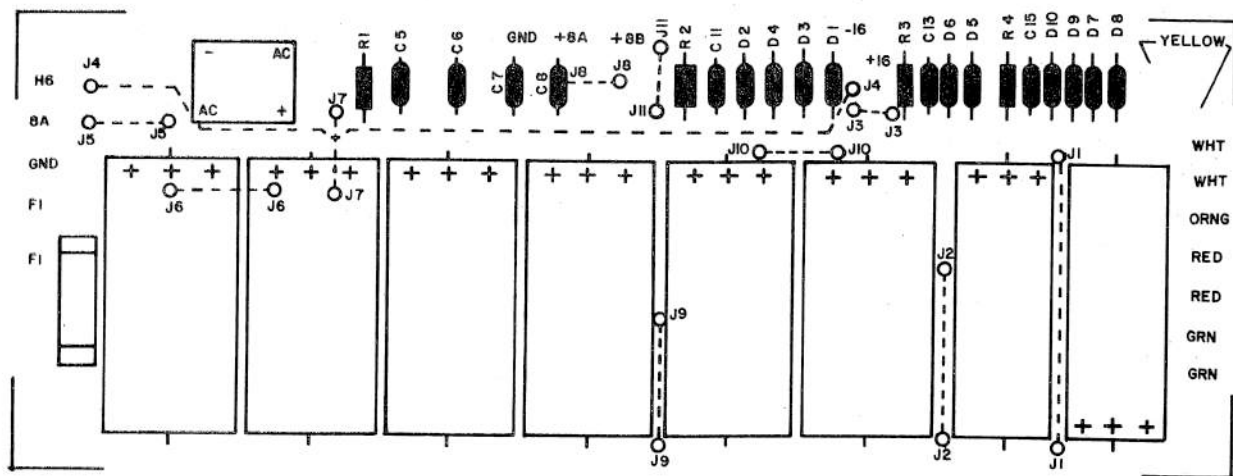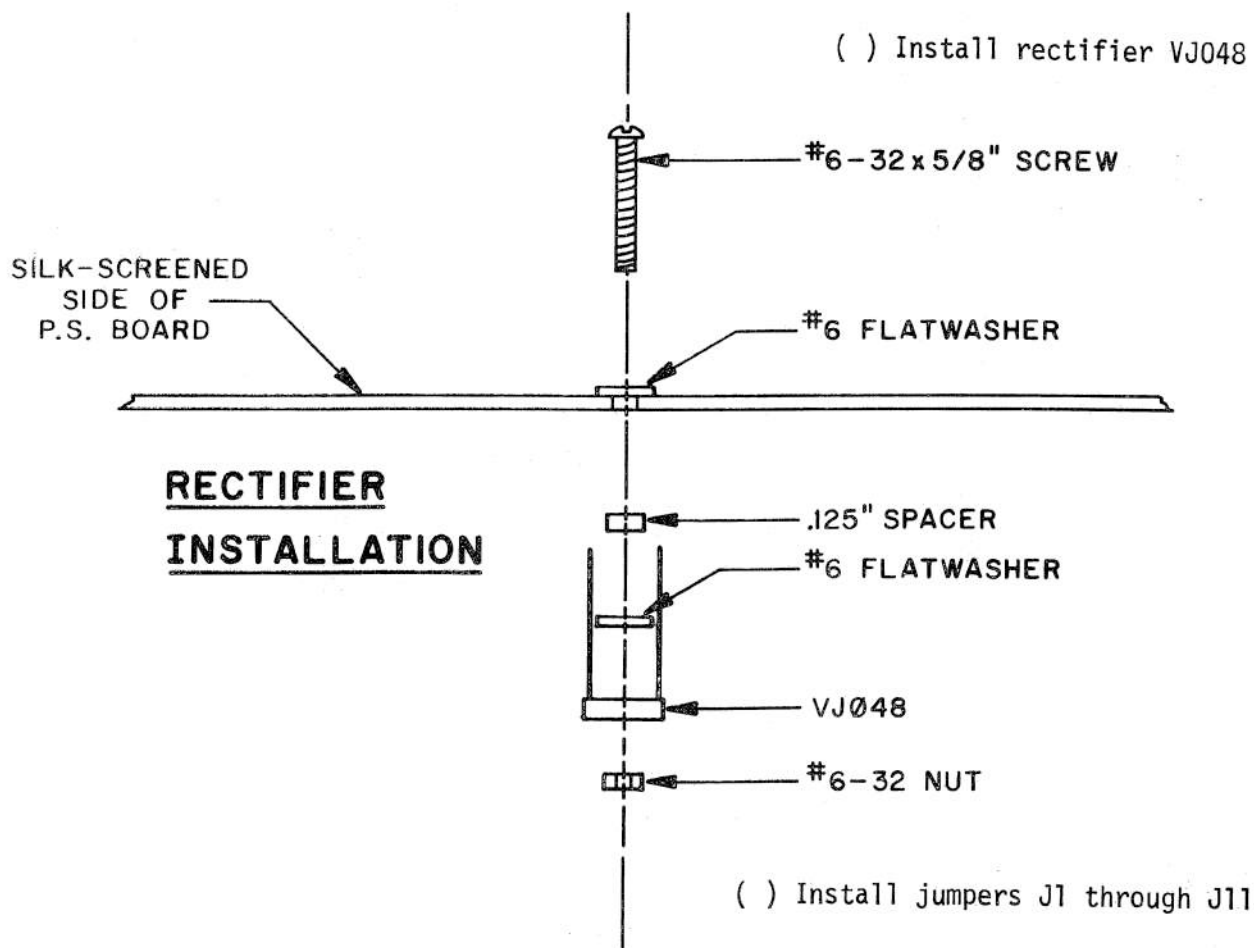
Electrolytic Capacitor Installation

There are eight electrolytic capacitors to be installed on the 8800 Power Supply Board. These capacitors have polarity requirements which must be noted before installation. Those 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: (see drawing below)

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.

Referring to the component layout, install the electrolytic capacitors on the board.

( ) Bend the two leads of the capacitor with the correct value 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.

( ) 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.

( ) Install all of the capacitors in the same manner.

( ) C1, C2, C3, C4, C9, and C10 are all 3300uf capacitors.

( ) C12 is any value from 1000 to 2200uf.

( ) C14 is 500uf.

52
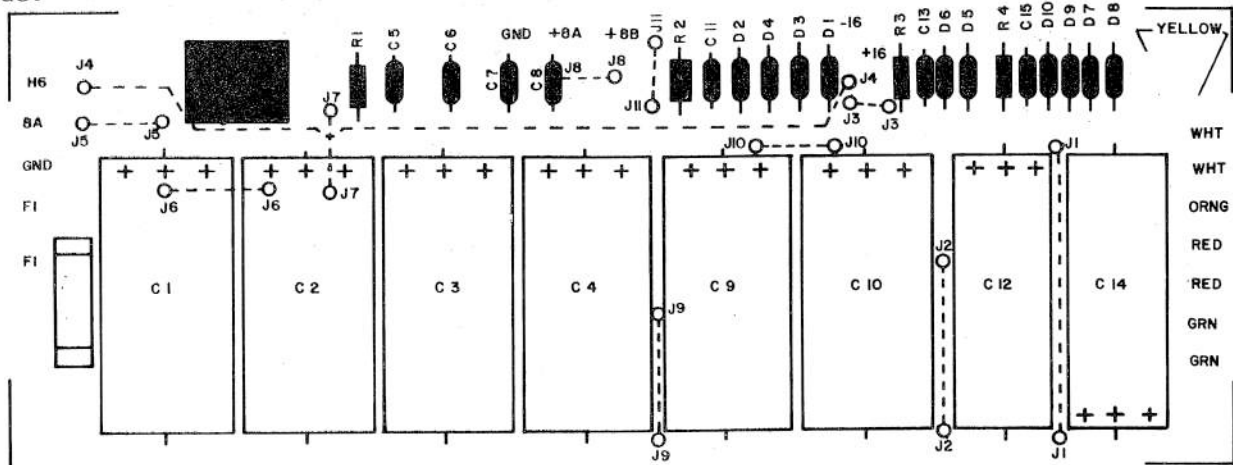
Resistor and Zener Diode Installation

There is a 47 ohm resistor and a 9.1 volt zener diode to be vertically installed on the Power Supply Board.

( ) Align one end of the resistor to the 8A hole on the Power Supply Board and insert it. (See drawing.)

( ) Solder the resistor lead to the foil (bottom) side of the Power Supply Board, and clip off any excess resistor lead.

( ) Align the non banded end of the 9.1 volt zener to the GND hole on the Power Supply Board **and** insert it. (See drawing.)

```
┌─────────────────────────┐
│           NOTE          │
│                         │
│ Insure the zener is     │
│ installed               │
│ with the band end up.   │
└─────────────────────────┘
```

( ) Solder the zener lead to the foil (bottom) side of the Power Supply Board, and clip off any excess zener lead.

( ) Bend the top lead of the zener so it can be soldered to the top end of the resistor lead.

( ) Solder the zener lead to the resistor lead, and clip off any excess zener lead.

```
┌─────────────────────────┐
│           NOTE          │
│                         │
│ Do not clip off the top │
│ resistor lead.  It will │
│ be needed later.        │
└─────────────────────────┘
```
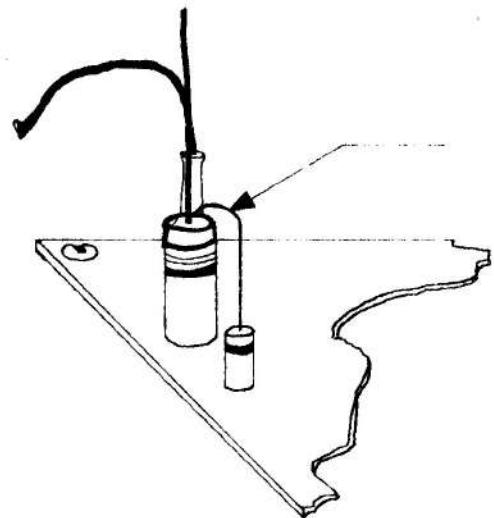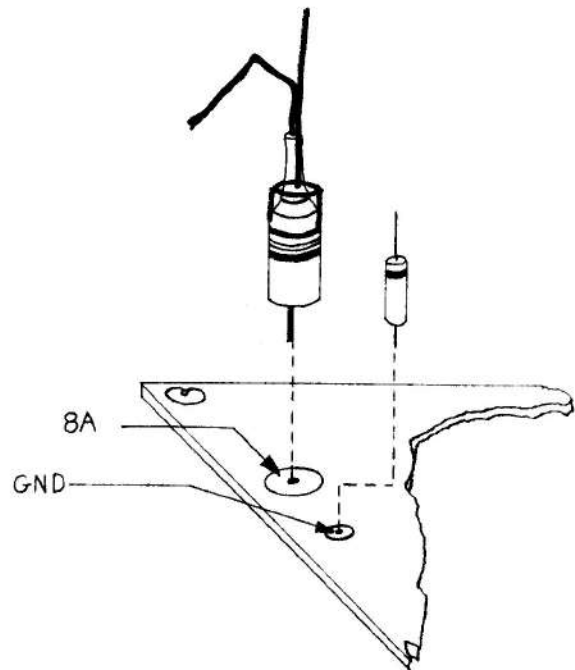
Fuse and Fuse Clip Installation

There are two fuse clips and a fuse to be installed on the 8800 Power Supply Board.

( ) Spread one of the fuse clips apart slightly and insert a #4-40 X 1/4 inch screw. (see drawing)

( ) Align the clip and screw over the correct hole on the silk-screened side of the board and insert the screw into the hole.

( ) Holding the clip and screw in place with a screwdriver, place a #4-40 lockwasher and nut onto the screw on the foil side of the board and tighten them securely.

( ) Install the second clip in the same manner; then push the clips back together so they will hold the fuse.

( ) Carefully insert the fuse into the clips. Be sure that the clips hold the fuse securely in place.
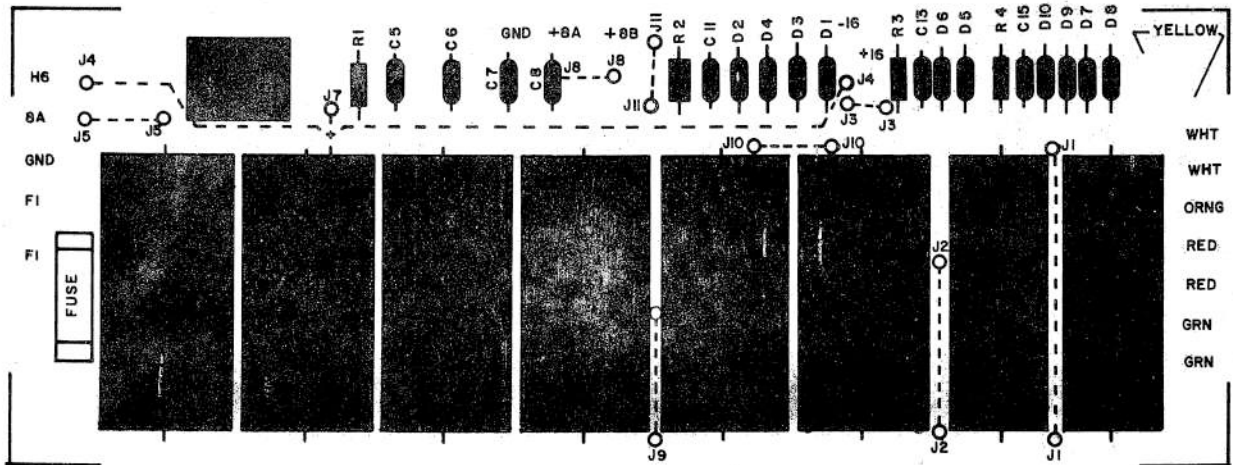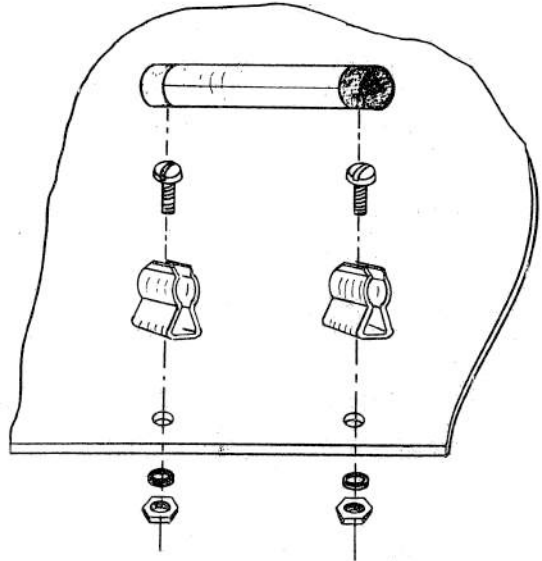
TRANSFORMER MOUNTING

There are three power supply transformers to be mounted on the 8800 back panel.

Transformer T1 is mounted using four #8-32 X 3/8 inch screws with a flat-washer, lockwasher and nut on each of them. (see drawing)

( ) Referring to the drawing, set T1 in place and install the four mounting screws with washers and nuts. DO NOT TIGHTEN THE NUTS DOWN AT THIS TIME.

( ) You will observe that the mounting holes on T1 are oval rather than round.

( ) Set the cross member in place directly beneath T1 and allow the transformer to slide down until it rests on the cross member. Now tighten the two top mounting screws on T1 as securely as possible.

( ) Remove the cross member and tighten the two bottom mounting screws on T1 as securely as possible.

Transformer T2 is mounted using two #6-32 X 3/8' inch screws with a lock-washer and nut on each of them. (see drawing)

( ) Referring to the drawing, set T2 in place and install the two mounting screws with lockwashers and nuts.

( ) Tighten the screws down as securely as possible.

Transformer T3 is mounted using two #6-32 X 3/8 inch screws with a lock-washer and nut on each of them. (see drawing)

( ) Referring to the drawing, set T3 in place and install the two mounting screws with lockwashers and nuts.

( ) Tighten the two screws down as securely as possible.
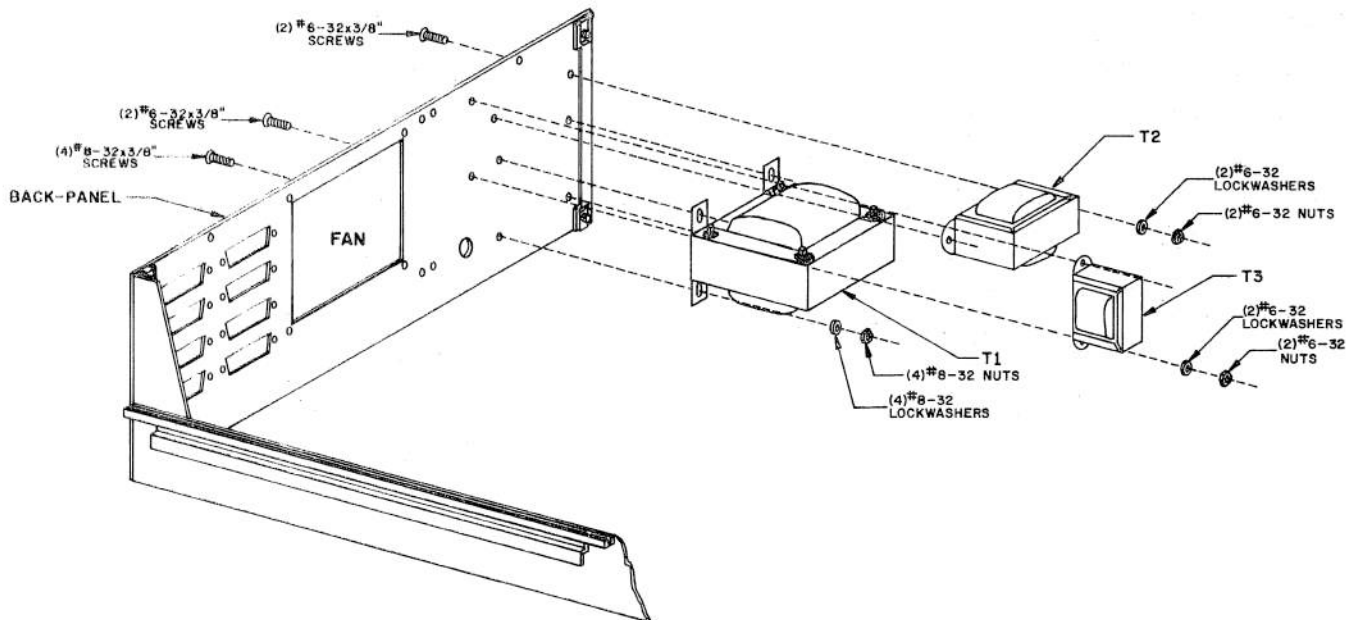
Rail Installation

( ) Insure the rails are installed
according to the drawing on this
page. They have been modified
to insure the holes line up
with the motherboard.

```
+--------------------------------+
|              NOTE              |
|                                |
| The rails are not identical and|
| must be installed as shown.    |
| If they are not installed cor- |
| rectly, the 18 slot motherboard|
| cannot be installed later.     |
+--------------------------------+
```

Disregard rail installation proce-
dure on page 56 of the assembly
manual.
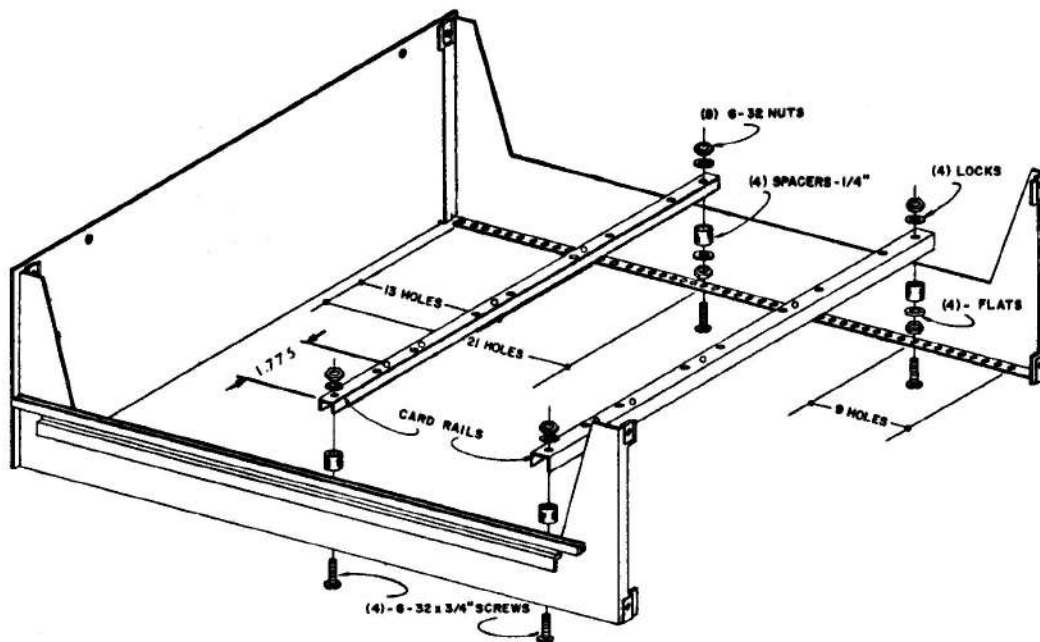
TERMINAL BLOCK MOUNTING

There is one terminal block with a double row of ten terminals to be installed on the 8800 back panel.

( ) Strip approximately 8 inches of casing from the power supply cord by cutting a circle 8 inches from the end of the case and pulling the black insulation off. Be careful not to cut into any of the three wires inside the cord.

( ) Referring to the drawing below, mount the terminal block as shown using four #6-32 X 5/8 inch screws with lock-washers and nuts. Tighten them securely into place.

( ) Refer to the drawing again and set the AC power cord in place at this time.
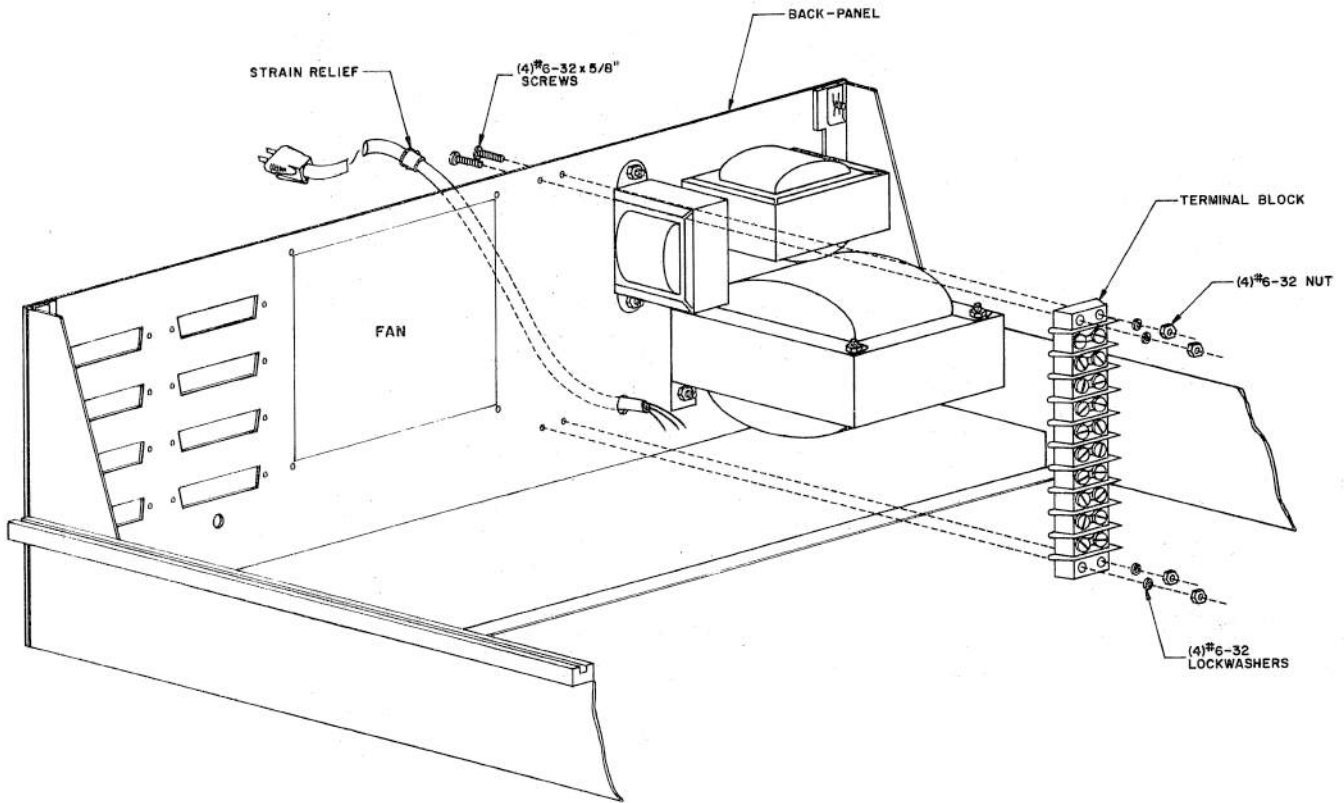
CHASSIS ASSEMBLY

There is one cross member and two card rails to be installed on the 8800 chassis.

( ) Refer to the drawing below and set the cross member in place beneath the transformers. Tighten it down securely.

( ) Referring to the drawing, set the two card rails in place and tighten them down securely. Be sure that you connect them to the holes as indicated in the drawing.

Addition of Hole on Cross Member

A transistor is to be installed on
the cross member board. In order
to mount it a hole has to be drilled
through the cross member for mount-
ing purposes.

( ) Using a #32 (.116 in) drill bit,
    drill a hole through the cross
    member as shown in the drawing.

(4) LOCKS

(4) - FLATS

9 HOLES

(4) SPACERS - 1/4"

(8) 6 - 32 NUTS

CROSS MEMBER

21 HOLES

13 HOLES

CARD RAILS

(4) - 6 - 32 x 3/4" SCREWS

(4) 6 - 32 SCREWS
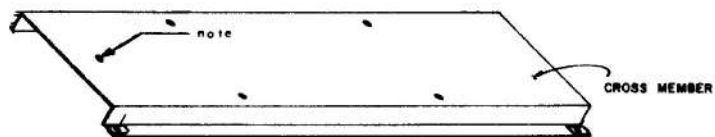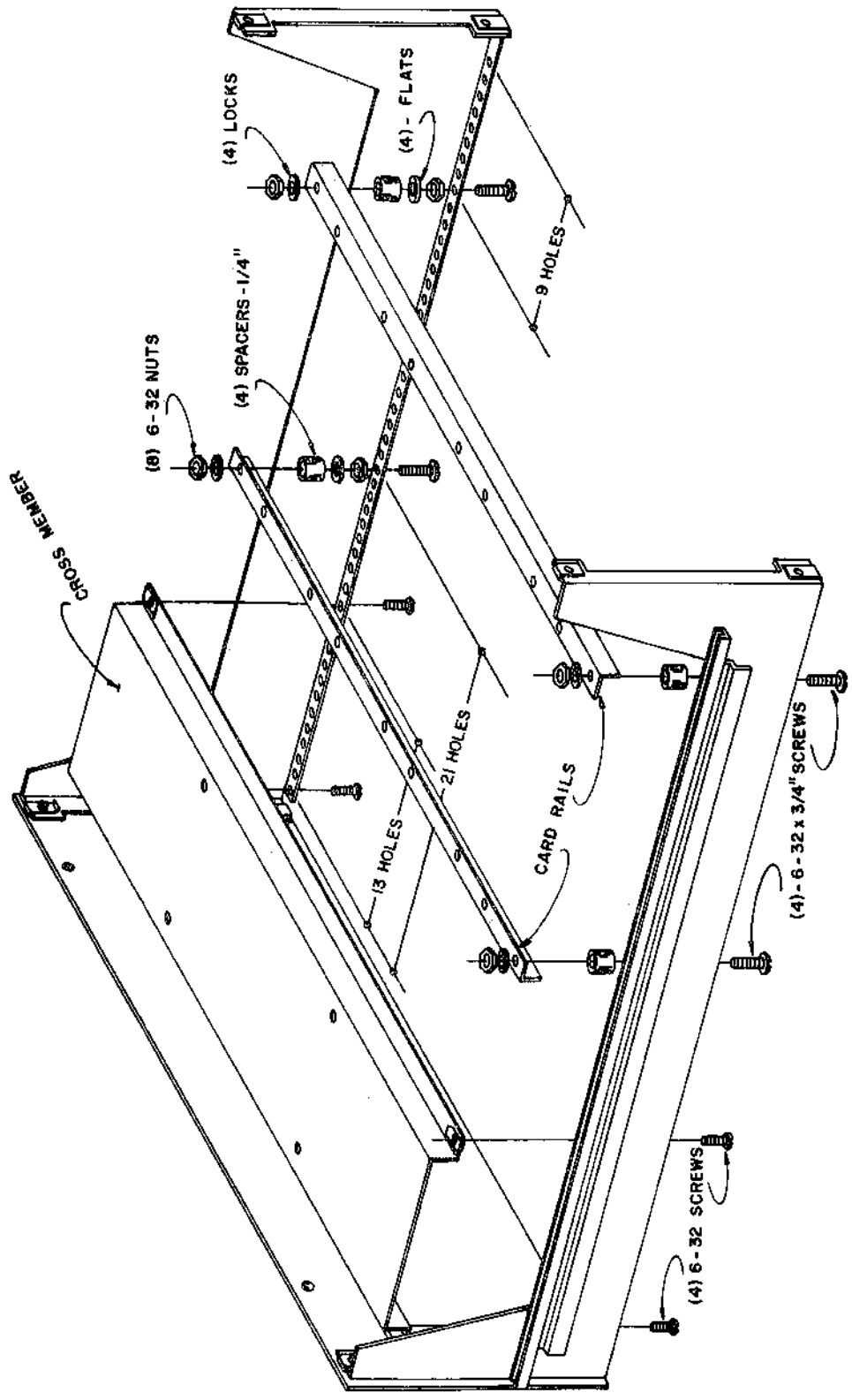
TERMINAL LUG INSTALLATION

There are 24 terminal lugs to be install-
ed onto wires at this time for later
connection to the terminal block.

Make all of the connections between the
terminal lugs and the wires as shown in
the drawing below. Try to make the con-
nection so that the insulated portion of
the wire runs right up to the lug itself;
this will help prevent any accidental
shorting.

TERMINAL LUG

( ) Connect terminal lugs to the two
black primary wires on each of the
three transformers.

( ) Connect terminal lugs to each of the
three wires in the AC power cord.

( ) Connect terminal lugs to the two
wires from the Display/Control Board
that you labeled "AC SW".

( ) Connect terminal lugs to the two
wires from the Display/Control Board
that you labeled "GND" and "+8vB".

NOTE: There is a roll of #20 insulated
wire included in your kit for making the
following connections. Add an inch to
each of the lengths called for in the in-
structions and cut the wires from this
roll. Strip 1/2 inch of insulation from
the ends of the wires and tin them by
applying a thin coat of solder.

( ) Connect a terminal lug to each of
five 8-inch lengths of wire. Con-
nect only one lug on one of the ends
of each wire.

( ) In the same manner, connect a ter-
minal lug to one end of two 12-inch
lengths of wire.

( ) In the same manner, connect a ter-
minal lug to one end of four 24-inch
lengths of wire.

Chassis Ground Connection

There is one wire connection to be made
between the Power Supply Board and the
8800 chassis.

( ) Referring to the procedure on page
58, connect a terminal lug to an
insulated wire approximately 14 inches
long.

( ) In the same manner as the connections
on page 59, connect the wire to the
Power Supply board. Connect the end
opposite the terminal lug to the
hole on the board located between
the bottom hole of jumper "J1" and
the positive end of C14.

( ) The terminal lug end of the wire
should be routed around the trans-
formers and mounted to the chassis
with the same connection as the
power cord ground wire as described
on page 61.

Transistor (TIP 140 or 142) and
Wiring Installation

After the Power Supply Board is
mounted the transistor (TIP 140 or
142) is to be installed to the cross
member. However, before it is in-
stalled, wires must be prepared
and soldered to the transistor. The
transistor is then mounted and wired
to the terminal block and Power Sup-
ply Board.

Wiring

( ) Using the 20 gauge wire, cut two
    lengths at 15 inches and one at
    5 inches, and strip both ends of
    the wire (approximately 1/8 inch).

( ) Solder one 15 inch wire to the
    emitter (E) of the TIP 140.
    Solder the other 15 inch wire to
    the collector (C) of the TIP 140
    (see drawing).

( ) Solder the 5 inch wire to the
    base (B) of the TIP 140. (See
    drawing.)

( ) Insulate these solder connec-
    tions using the Heat Shrink Tu-
    bing or tape. (See drawing.)

( ) Connect terminal lugs to the
    free ends of the 15 inch pieces
    of wire.
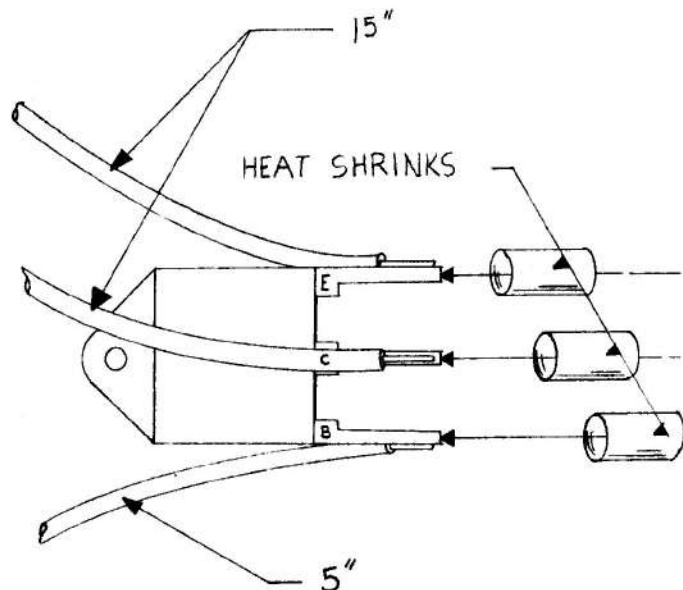
TIP Installation

( ) Using a 4-40 x 3/8 inch screw,
a fiber shoulder washer, mica
insulator, 4-40 lockwasher, and
4-40 nut install the TIP 140 to
the cross member as shown in the
drawing.

```
CAUTION

Insure the case of the TIP
140 is insulated from the
cross member.  Check with
an ohmmeter if possible.
```

(1) 4-40 x 3/8" SCREW

FIBER
WASHER

TIP-140

MICA
INSULATOR

(1) 4-40 LOCK

(1) 4-40 NUT

60 B
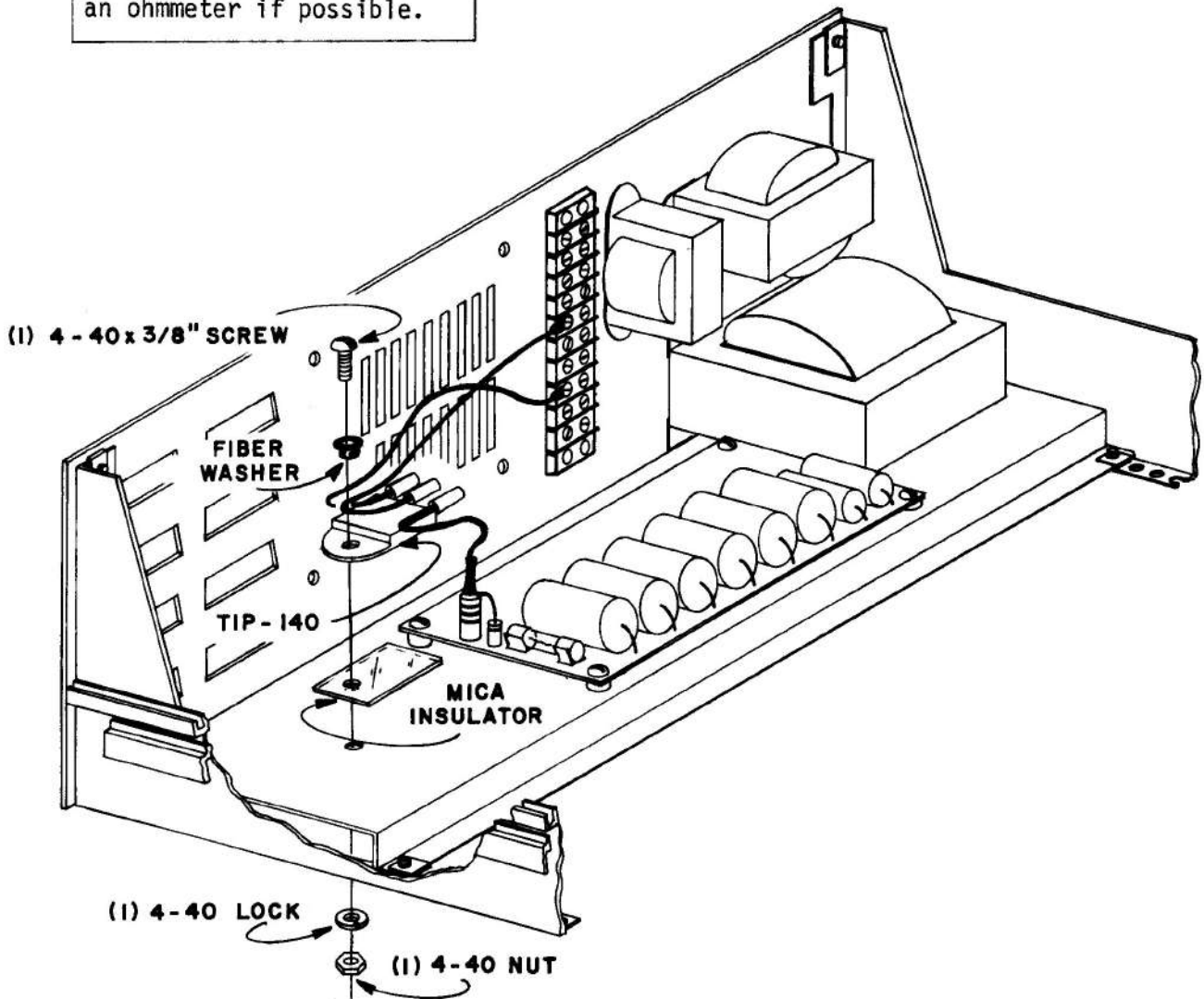
( ) Solder the 5 inch wire from B of the TIP 140 to the 47 ohm resistor and 9.1 volt zener connection. (See drawing)

CAUTION

Insure the top leads of the zener and resistor are insulated in order to prevent damage.

( ) Attach the wire from E of TIP 140 to terminal block #8. (See drawing)

( ) Attach the wire from C of TIP 140 to terminal block #5. (See drawing)

Refer to the "POWER SUPPLY WIRING DIAGRAM" on the following page and connect all of the wires shown to the terminal block, except "AC SW". Refer to Page 61 in the Assembly Manual for "AC SW" connection.

Terminal Block

47 Ω

+8A
GND
9.1 v Zener
Fuse
P/S Board

Pass Transistor
TIP 140

Terminal Block #8
Terminal Block #5
Resistor & Zener Diode

A/C PWR CORD

GREEN

WHITE

BLACK

T3   P   S

T2   P   S

T1   S   P

A
C
S
W

TIP-140
E
C
B

(47Ω)
(9.1 v.z)

F1

F1

POWER SUPPLY BOARD

G +8 +8
N A B
D

-16
+16

Y
Y
WO
WO
OO
R
R
GO
GO

60 D
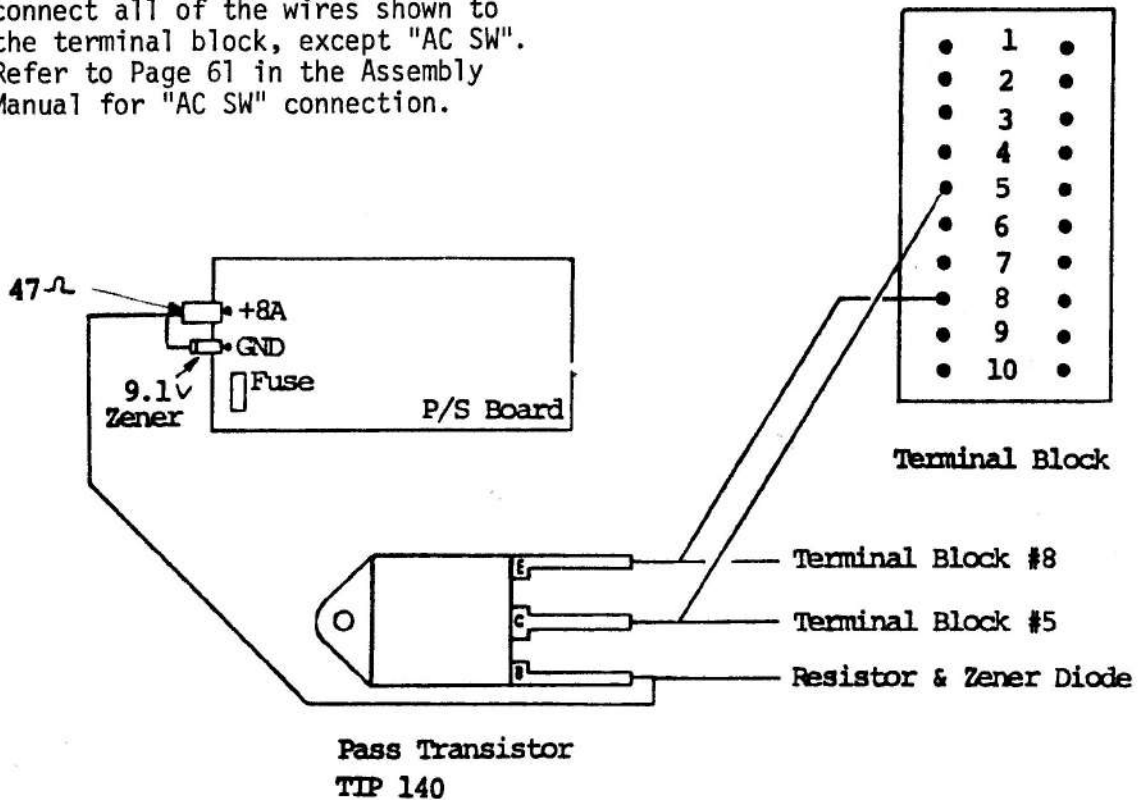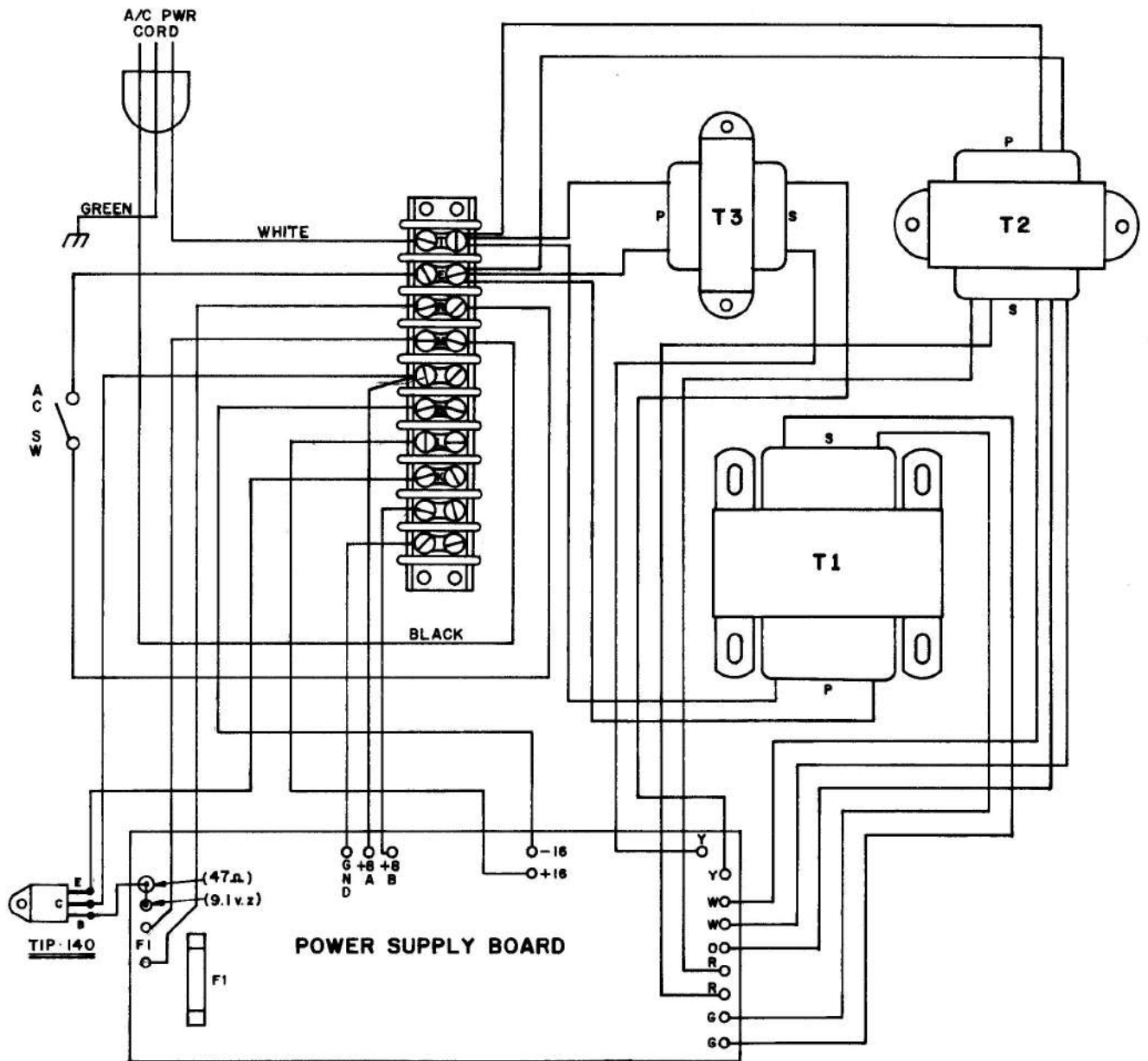
POWER SUPPLY BOARD WIRE CONNECTIONS

There are 16 wire connections to be made to the 8800 Power Supply Board. Nine of these are from the transformers and the other seven will be connected to the terminal block. (see wiring diagram)

Transformer Connections

( ) Connect one of the green secondary wires from transformer T1 to one of the pads on the power supply board labeled "GRN". Make the connection by inserting the wire from the silk-screened side of the board and soldering it to the foil pattern on the back side. Clip off any excess lead length.

Make the following connections in the same manner.

( ) Connect the second green wire from T1 to the other pad labeled "GRN".

( ) Connect the two red wires from T2 to the two pads on the board labeled "RED".

( ) Connect the orange wire from T2 to the pad labeled "ORANG".

( ) Connect the two white wires from T2 to the two pads labeled "WHT".

( ) Connect the two yellow wires from T3 to the two pads labeled "YELLOW".

Terminal Block Wire Connections

( ) Using the same type connection as with the transformer wires, connect the bare end of one of the 8-inch wires with a terminal lug on it to the pad on the power supply board labeled "+16".

In the same manner, connect 8-inch wires with terminal lugs attached to the following pads on the board:

( ) -16   ( ) +8B   ( ) +8A

( ) GND pad near C7

In the same manner, connect 12-inch wires with terminal lugs attached to the following pads on the board:

( ) F1 (top)   ( ) F1 (bottom)

NOTE: The three pads "H6", "8A" and "GND" on the left are for future expansion.

59
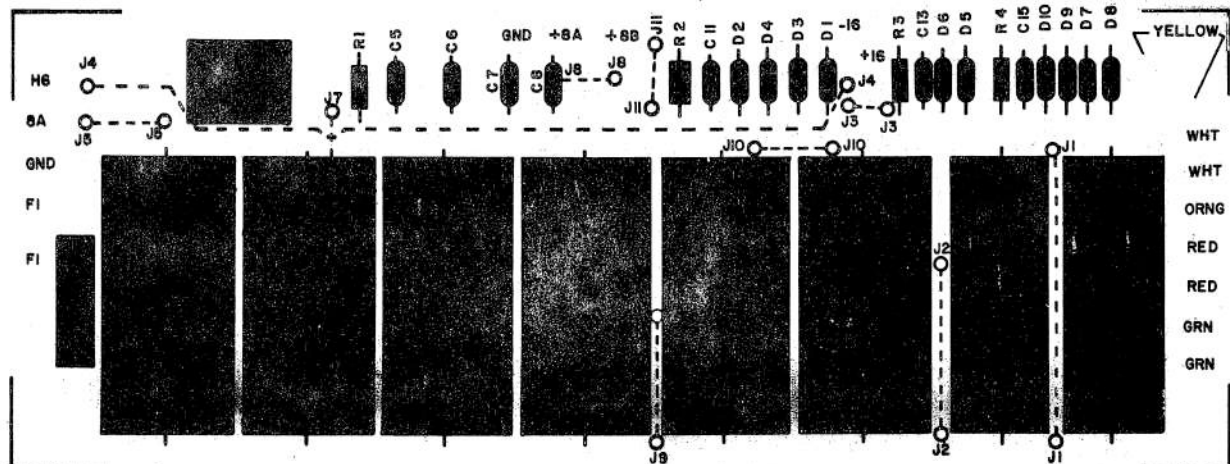
POWER SUPPLY BOARD MOUNTING

The 8800 Power Supply Board is mounted directly to the chassis cross member.

( ) Referring to the drawing, remove the backing from one of the small flat rubber feet included in your kit and place it in the center of the four mounting holes for the power supply board on the cross member.

( ) Remove the backing from another of the rubber feet and place it directly over top of the first one.

( ) Referring to the drawing, mount the screen on the inside of the back panel.

( ) Refer to the drawing and mount the power supply board to the cross member as shown. Be careful not to catch any of the wires underneath the board as you mount it. Tighten it securely into place.

(4) 6-32 x 5/8" SCREWS

6-32 x 1/2" SCREW

POWER SUPPLY BOARD

(4) 6-32 x 3/8 SCREWS

(2) 4-40 x 3/8" SCREWS

FLAT

(4)-6-32 NUTS

(2) RUBBER FEET

(4) .375 METAL SPACERS

(2) FLATS
(2) 4-40 NUTS

(4) LOCKS

(4) 6-32 NUTS
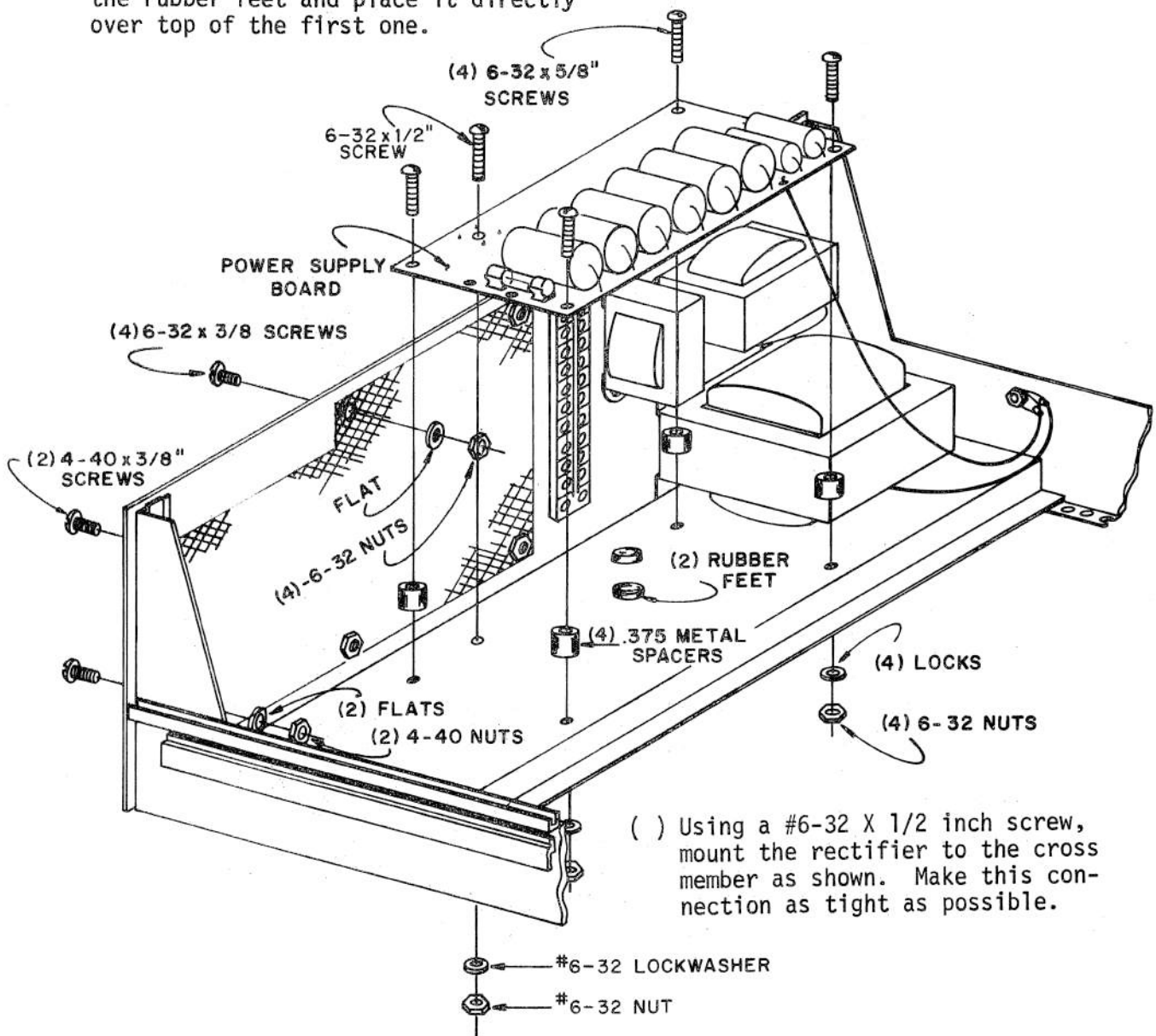
( ) Using a #6-32 X 1/2 inch screw, mount the rectifier to the cross member as shown. Make this connection as tight as possible.

#6-32 LOCKWASHER

#6-32 NUT

FAN INSTALLATION

There is a 110 vac cooling fan which is to be mounted on the 8800 Back Panel.

( ) Cut two 3 inch lengths of wire and strip 1/4 inch of insulation from both ends of each wire. Tin the ends by applying a thin coat of solder.

( ) Attach a terminal lug to one end of each of the wires and solder it in place.

( ) Orient the fan so that the arrow with the word "AIRFLOW" is facing upwards. There are two terminals on one side of the arrow. Attach the end of one of the wires opposite the terminal lug to one of the terminals on the fan and solder it in place. Attach the other wire to the other terminal in the same manner. (See drawing on following page.)

( ) There are four clip nuts included with the fan hardware. These should be pressed into place over the four screw holes in the corners of the fan on the side towards which the arrow is pointing. Place them on the inside portion of the fan body which is generally shaped the same as the clip nut itself.

( ) Before mounting the fan, insulate the two terminals on the fan with plastic tape or tubing.

( ) Mount the fan to the 8800 back panel using the four screws supplied with the hardware. Orient the fan with the arrow on top pointing towards the back panel. Insert the screws from the outside of the panel and tighten them into place.

( ) The two terminal lugs on the three inch wires should now be connected to the terminal block. The terminals should be connected to the two top connectors on the left side of the block as shown in the circuit diagram below. Be careful not to short any of the lugs together when making these connections.

62 A

(4) 6-32 x 3/4" SCREWS

FAN

62 B
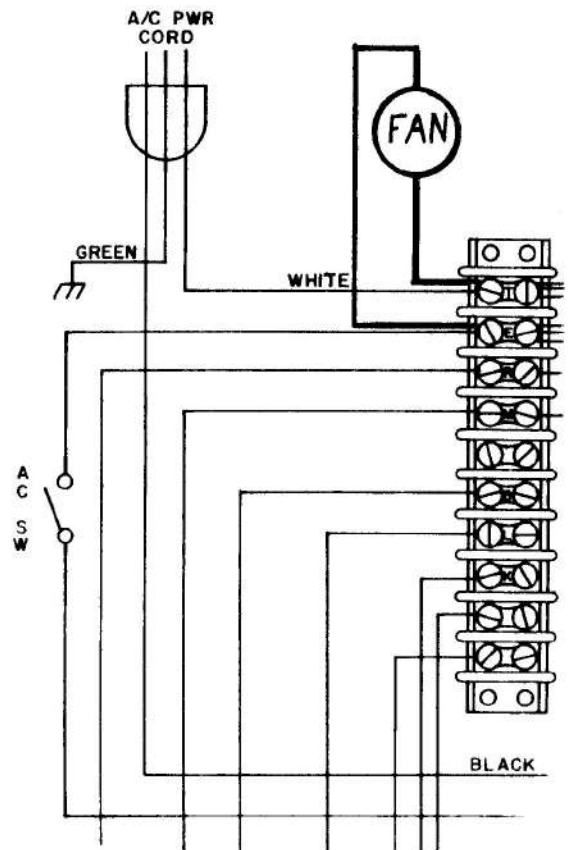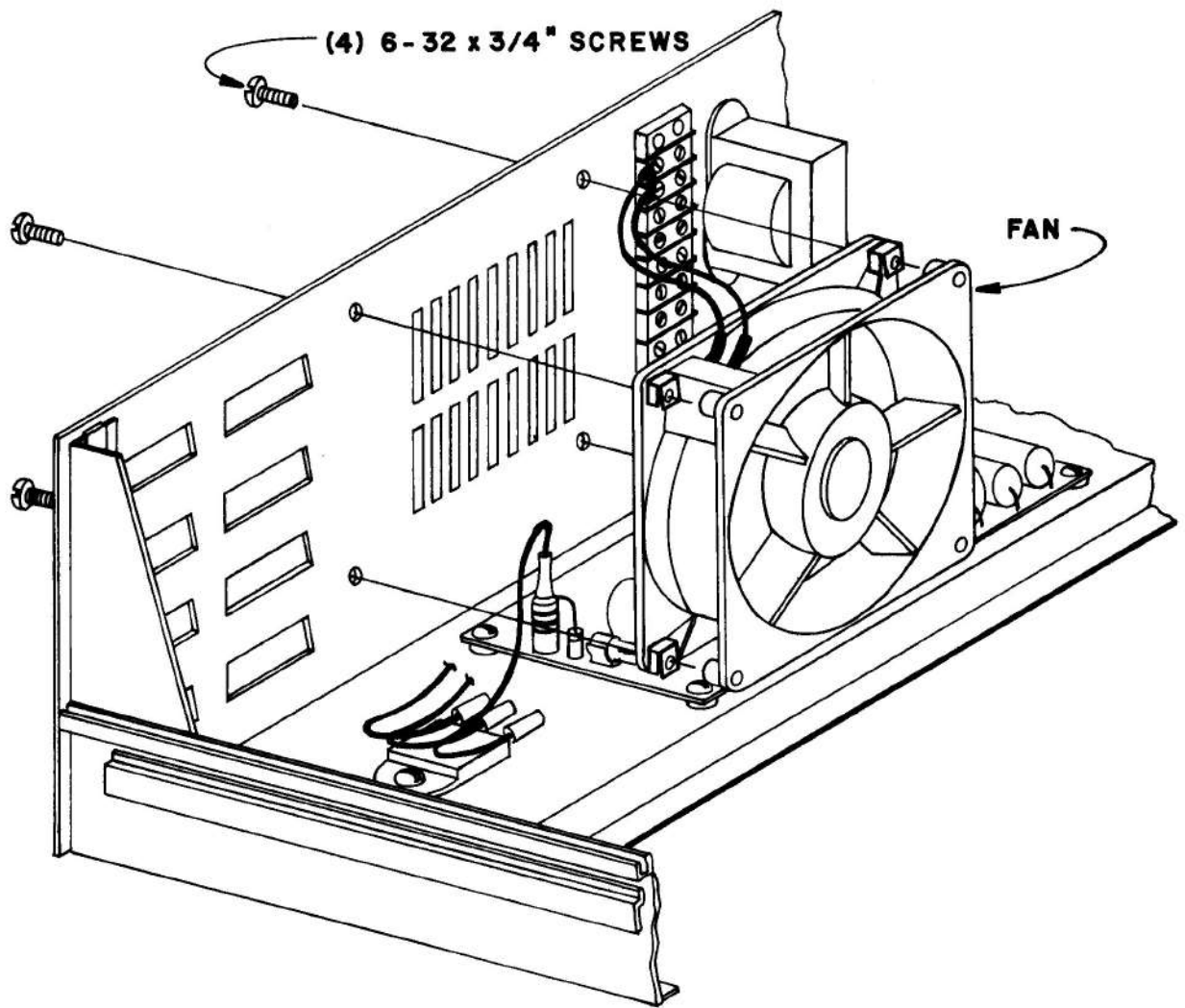
POWER SUPPLY CONNECTIONS

There are 15 connections to be made to
the terminal block on the 8800 back panel.

( ) Refer to the "POWER SUPPLY WIRING
    DIAGRAM" on the following page and
    connect all of the wires shown to
    the terminal block, except "AC SW".

NOTE: These are all wires to which you
have attached terminal lugs earlier. Be
sure to connect the lugs to the exact
locations indicated in the wiring diagram.
Use a screwdriver to make the connections,
and be sure they are as tight as possible.

( ) The green ground wire on the AC Power
    Cord should be routed around behind
    the transformers and connected to the
    side of the chassis itself. The wire
    should reach to approximately the 14th
    hole from the back and should be at-
    tached to the top row of holes.

NOTE: The chassis is anodized, so use a
pieces of sandpaper or steel wool to
scratch the finish around the hole for
the wire. Use a #6-32 X 1/4 inch screw
and a #6-32 nut to mount the lug. The
screw head should be on the outside of
the chassis.

POWER SUPPLY WIRING DIAGRAM

A/C PWR
CORD

GREEN

WHITE

BLACK

A
C
S
W

P   T3   S

P

T2

S

S

T1

P

Y

GND +8   +8   −16   Y
      A   B
           +16   W

POWER SUPPLY BOARD

F1

F1

Y

W

O
R

R

G

G
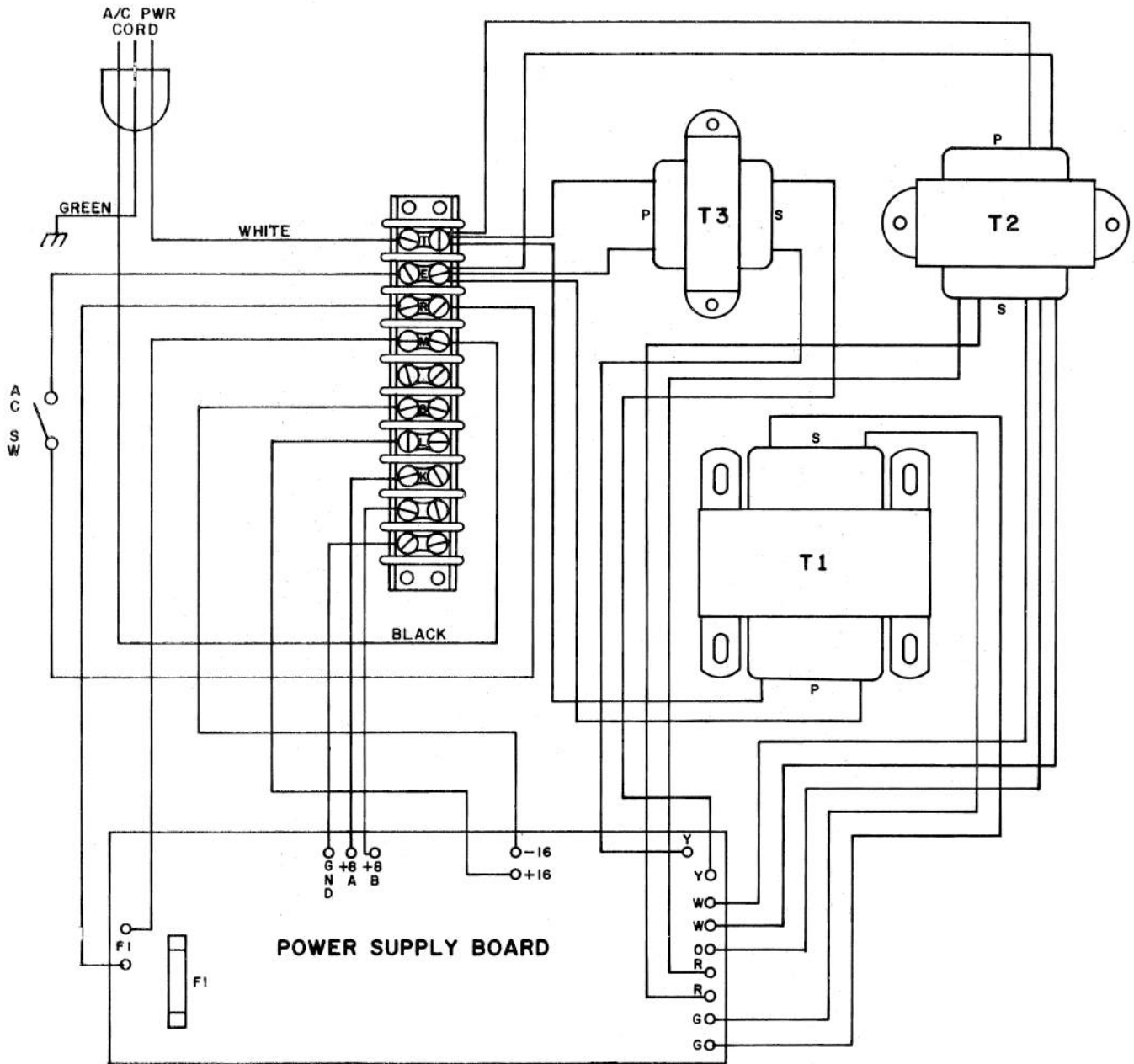
EXPANDER BOARD 8800 M/BD ASSEMBLY

There are up to four edge connectors to be mounted on each 8800 M/BD expander board. These connectors are all to be mounted in the same manner.

Observe that the edge connectors each have a double row of pins; one side is numbered 1 through 50 and the other side is lettered A through AF. These markings are indicated on both the top and the bottom of the connectors.

Observe that the expander board has a foil pattern only on one side. The connectors will be mounted on the <u>blank</u> side of the board.

( ) Orient the expander board in front of you with the foil pattern on the bottom. The board designation markings (MITS 8800 M/BD, etc.) should be underneath, in the <u>right</u> corner towards you. Looking at the blank side of the board, this will place pin 1 on the left and pin 50 on the right.

( ) Orient one of the edge connectors so that the numbered pins are towards you and the lettered pins towards the back, with the pins themselves pointing downward. This should place pins 1 and 50 with the same orientation as the 1 and 50 on the bottom (foil side) of the board.

( ) The edge of the board towards you has four rows of holes close together. The first two rows are staggered from each other and will be used later for wiring. The second two rows are in line and match the pins on the connector. Insert the connector into the 2nd two rows of holes keeping the same orientation as above. It may be necessary to use the tip of a scribe or a screwdriver to help guide the pins into the holes.

( ) Be sure that the connector is tight against the board and that all 100 pins are in their holes; then turn the board over and solder the pins to the foil pattern. Be careful not to leave any solder bridges between the pins or the lands.

( ) Mount all of the edge connectors to the expander board in the same manner.

BOTTOM OF BOARD
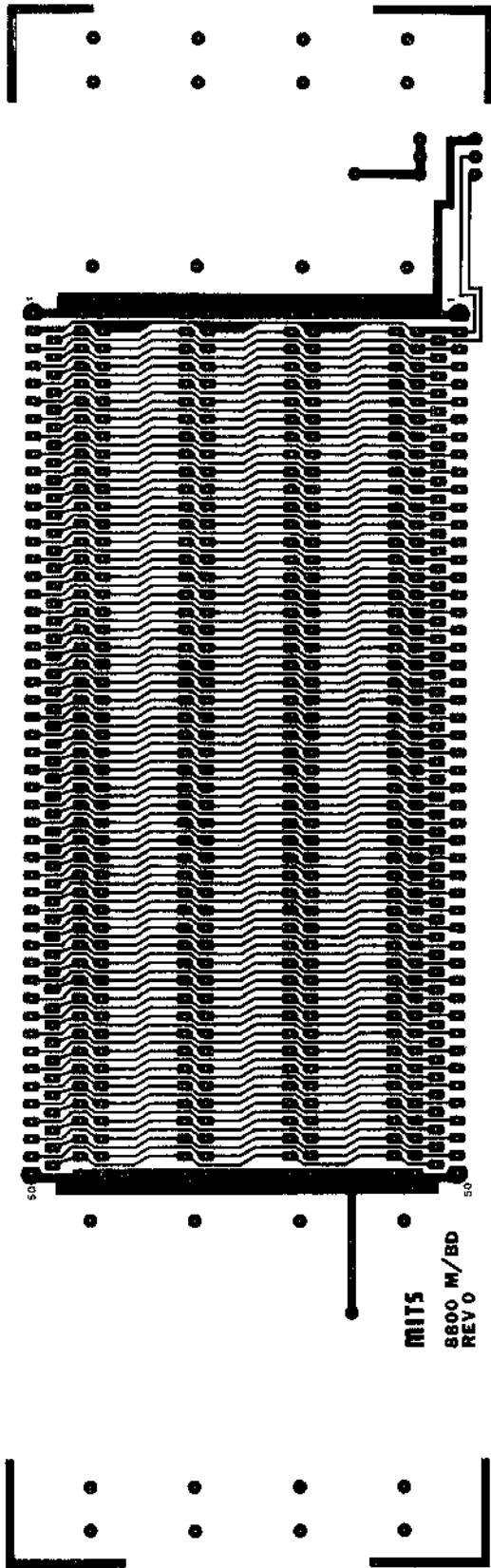
MITS
8800 M/BD
REV 0

EDGE CONNECTOR

PIN 1

TOP OF BOARD

65
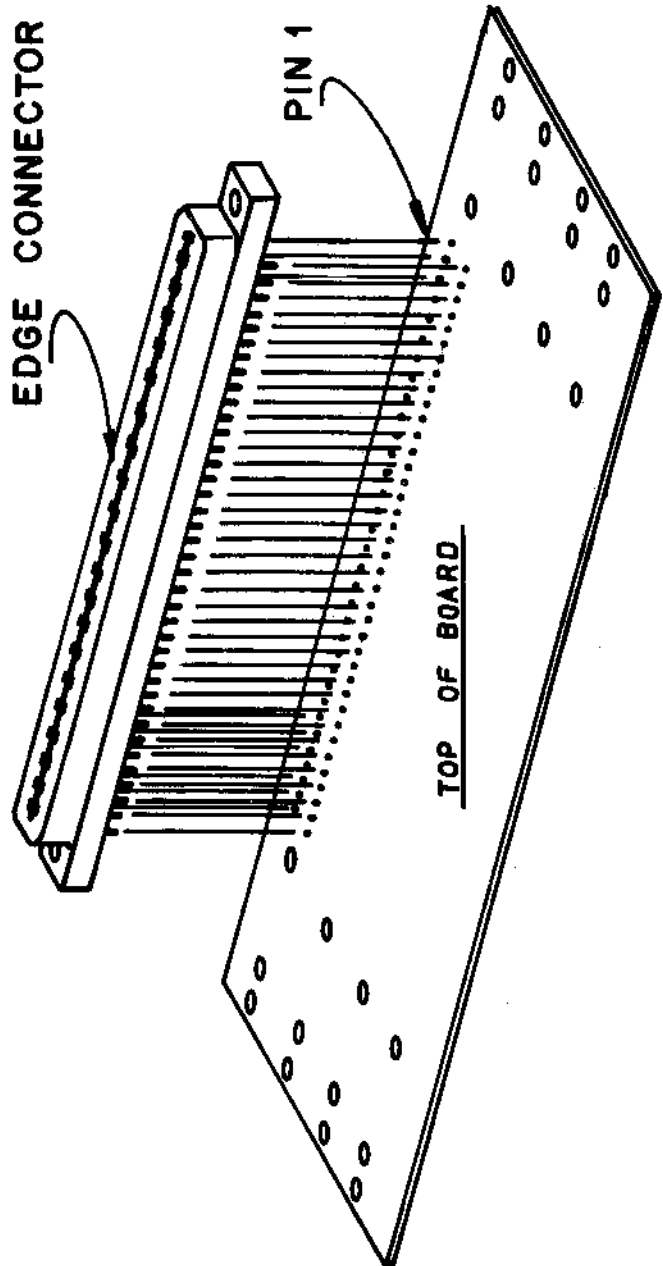
EXPANDER BOARD WIRING

Place the expander board in front of you with the same orientation as at the beginning of the previous step. Observe the two staggered rows of holes towards the front edge of the board. These holes correspond with the pins on the connector. The row of holes closest to the edge of the board corresponds to pins 1 through 50 consecutively from left to right. The second row corresponds to pins 52 through 99 consecutively from left to right. (52 = B, 99 = AE) (see drawing and bus chart)

NOTE: Pins 51 and 100 are electrically common with pins 1 and 50 and thus are not used for wiring the bus.

( ) Orient the Display/Control Board in front of you with the sub-panel and switches facing down and the row of wire connections along the longer edge of the board towards you.

( ) Orient the expander board so that it is approximately 4 inches away from the back edge of the Display/Control Board. It should be setting so that the two rows of holes described above are to the right and the shorter edge of the board towards you. (see drawing)

( ) Referring to the drawing, remove the nut and lockwasher from the front right corner of the Display/Control Board. Place all of the wires, except "GND", "(+8V)B", and "AC SW", through the cable clamp and remount the clamp to the corner with the same nut and lockwasher.*

( ) Connect the wires from the Display/Control Board labeled with numbers to the expander board according to the following procedure.

( ) One at a time, take one of the wires and stretch it out to the hole on the expander board corresponding to the same number as the label on the wire.

( ) Cut the wire 1/2 inch longer that the length necessary to reach its hole; then strip 3/8 inch of insulation from the cut end. Tin the exposed portion of the wire by applying a thin coat of solder.

( ) Insert the end of the wire into its hole from the blank side of the board, being careful not to push any of the insulated portion of the wire into the hole.

( ) Turn the board over and solder the wire to the foil pattern on the bottom side. Clip off any excess lead length.

( ) Follow this same procedure for each of the wires.

MAKE SURE THAT THE NUMBER ON THE WIRE LABEL CORRESPONDS WITH THE NUMBER OF THE HOLE ON THE EXPANDER BOARD AS YOU CONNECT EACH ONE.

( ) In the same manner as the connections above, connect the free end of the 4 24-inch wires with terminal lugs attached to holes number 1, 2, 50 and 52.

( )*In the same manner, install cable clamps on the two screws on the left side of the board and route the other four wires through these.

18-Slot Motherboard Installation

The motherboard and the display/control board can now be mounted onto the chassis.

( ) Before mounting the motherboard, refer to the drawing on the following page and set the board in place on the card rails. Observe where the board comes in contact with the rails themselves. Place a length of tape along the bottom (foil patterned) side of the motherboard covering all of the lands where the board comes in contact with the front rail (closest to the display/control board). Be sure that this is done for the front rail, and that no lands come in contact with the rail before continuing.

( ) Refer to the drawing and mount the motherboard and the sub-panel with the display/control board attached to the chassis.

( ) Re-mount the sub panel using the four screws you removed earlier. Be careful not to catch any of the wires beneath the boards or between the metal parts when making the installation. Disregard the Board Installation instructions on page 68 of the manual, but install the card guides as explained.

(2) 4-40 x 5/16 SCREWS

(2) 4-40 x 5/8" SCREWS

MOTHER BD.

SUB-PANEL

(4) 4-40 LOCKS

(4) 4-40 NUTS

8800 DISPLAY/CONTROL BOARD

67 A

52 53 54 55

1 2 3 4 5

95 96 97 98 99

46 47 48 49 50

8800 M/BD

8800 M/BD
EXPANDER
BOARD
WIRING

PIN 50

PIN 1

4"

DISPLAY/CONTROL BOARD

WIRES

WIRES

TO CPU
BD
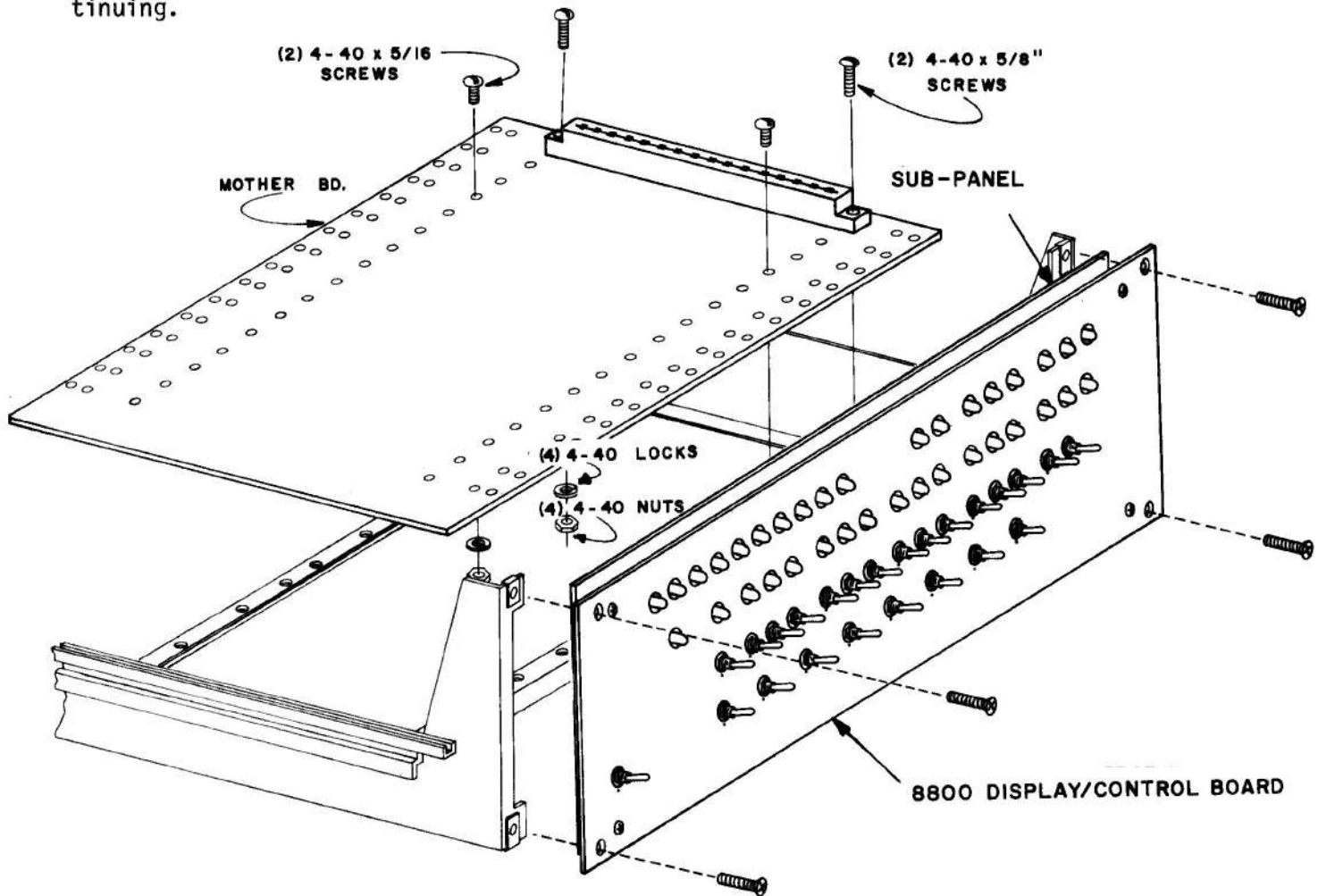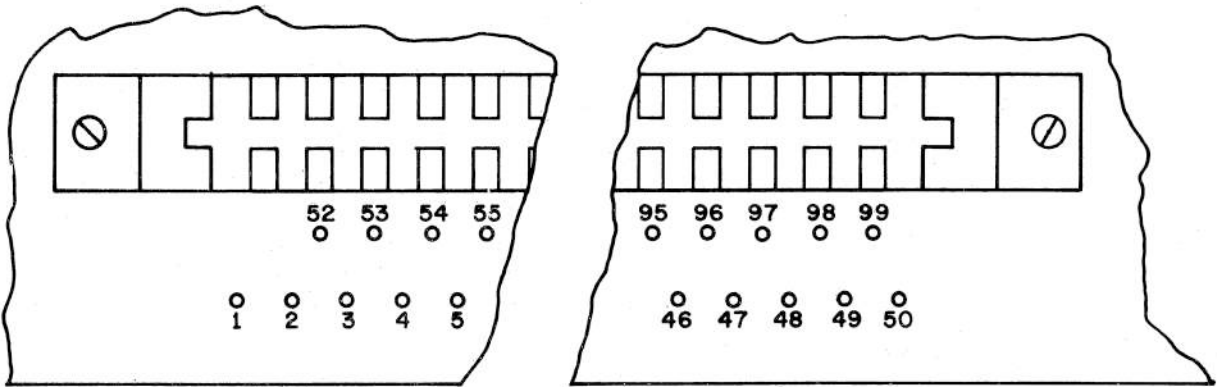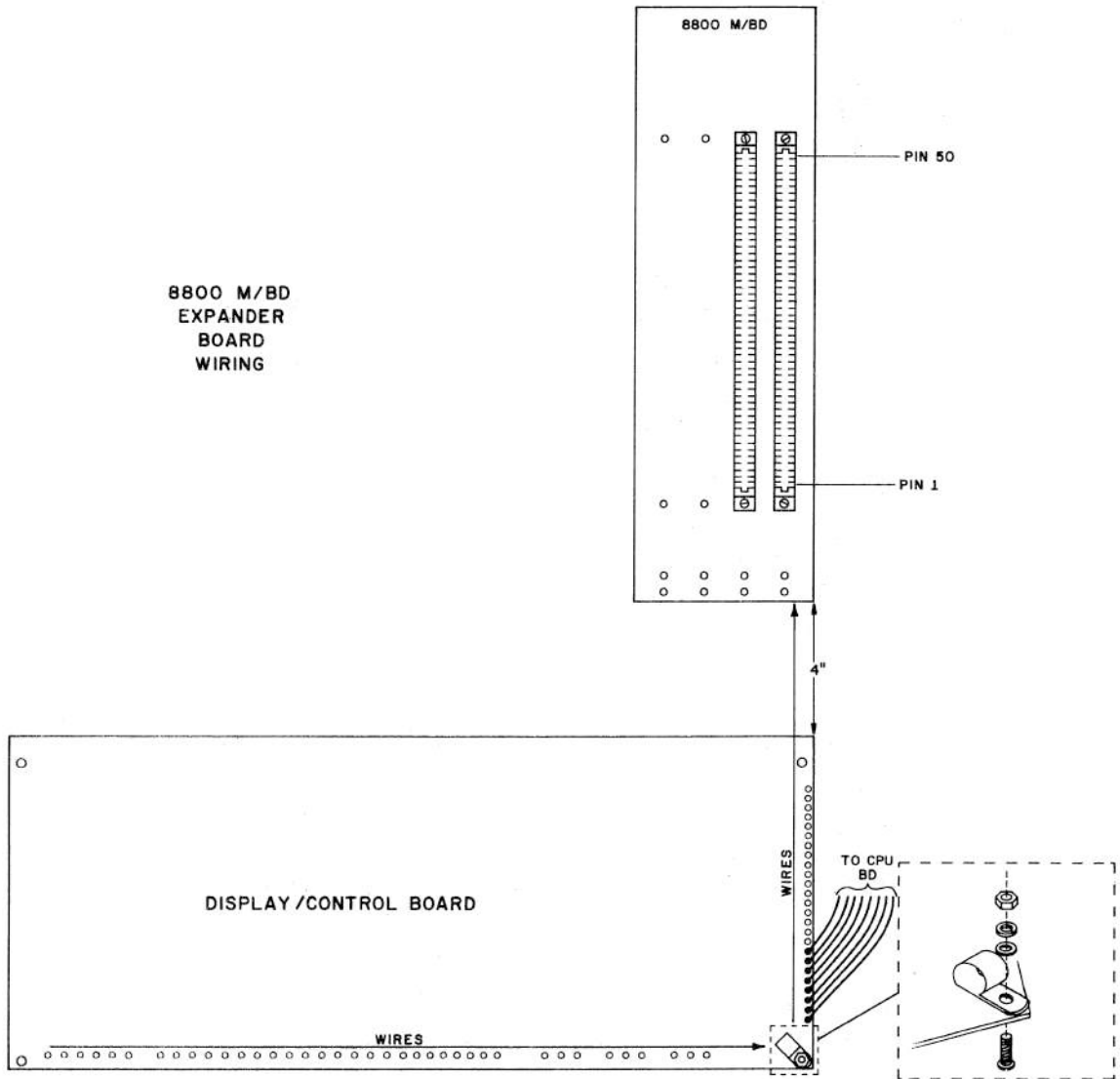
BOARD INSTALLATION

The expander board and the display/control board can now be mounted onto the chassis.

( ) Before mounting the expander board, refer to the drawing on the opposite page and set the board in place on the card rails. Observe where the board comes in contact with the rails themselves. Place a length of tape along the bottom (foil patterned) side of the expander board covering all of the lands where the board comes in contact with the two card rails. Be sure that this is done for both rails, and that no lands come in contact with the rail before continuing.

( ) Referring to the drawing on the opposite page, mount the expander board and the sub-panel with the display/control board attached to the chassis.

NOTE: Use the four screws that you removed when disconnecting the sub-panel earlier to re-mount it. Be careful not to catch any of the wires beneath the boards or between the metal parts when making the installation.

( ) Install card guides into the pairs of holes along the outside edges of the expander board as shown below. Install them in the holes corresponding to each of the edge connectors you have previously installed.

CARD GUIDE ────▶

EXPANDER BOARD ──────▶

6-32 X 3/8" SCREWS ────▶

(4) 4-40 LOCKS

(4) 4-40 NUTS

(2) 4-40 x 5/8" SCREWS

(2)-4-40 x 5/16" SCREWS

MOTHER BD.

69
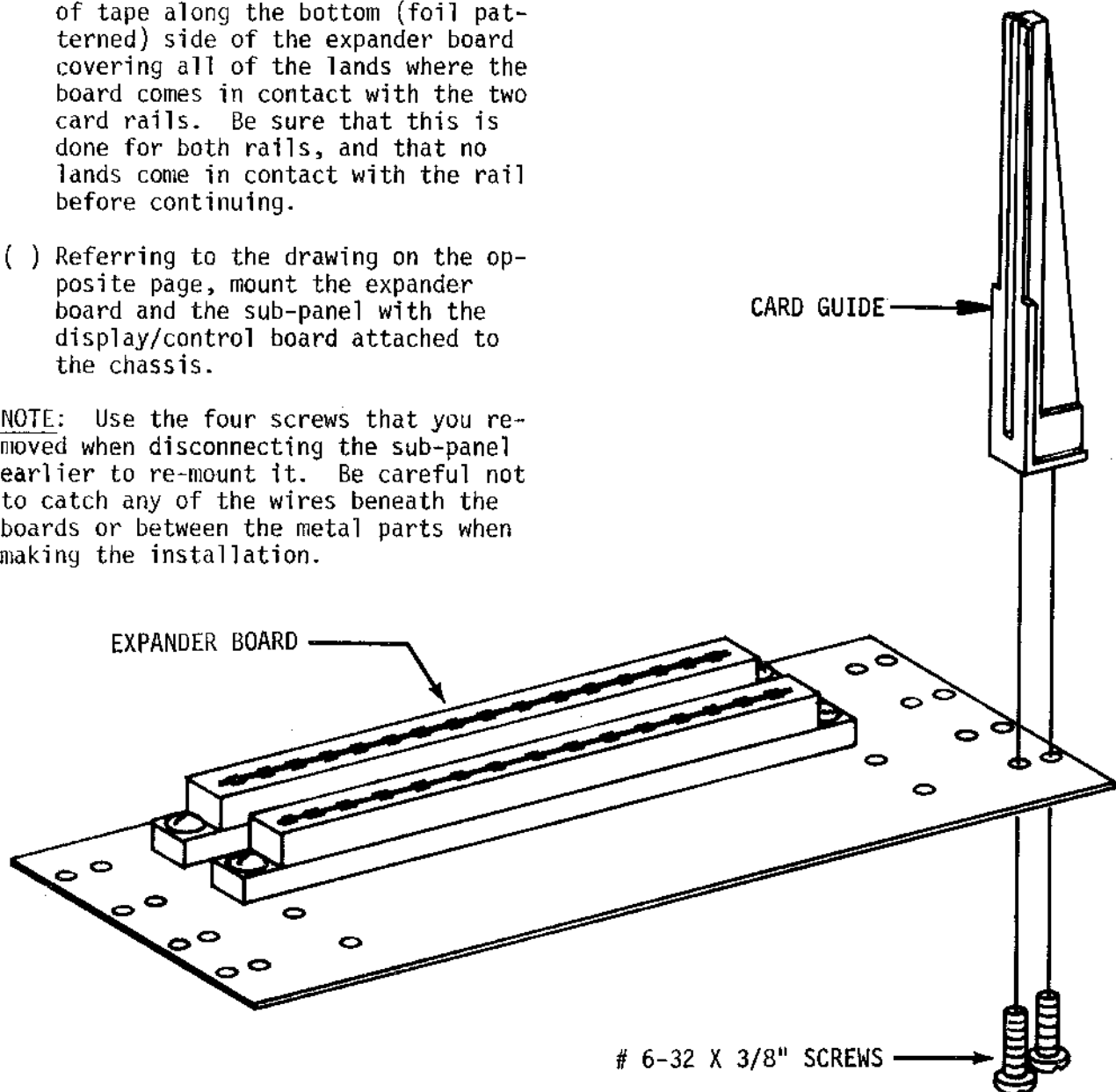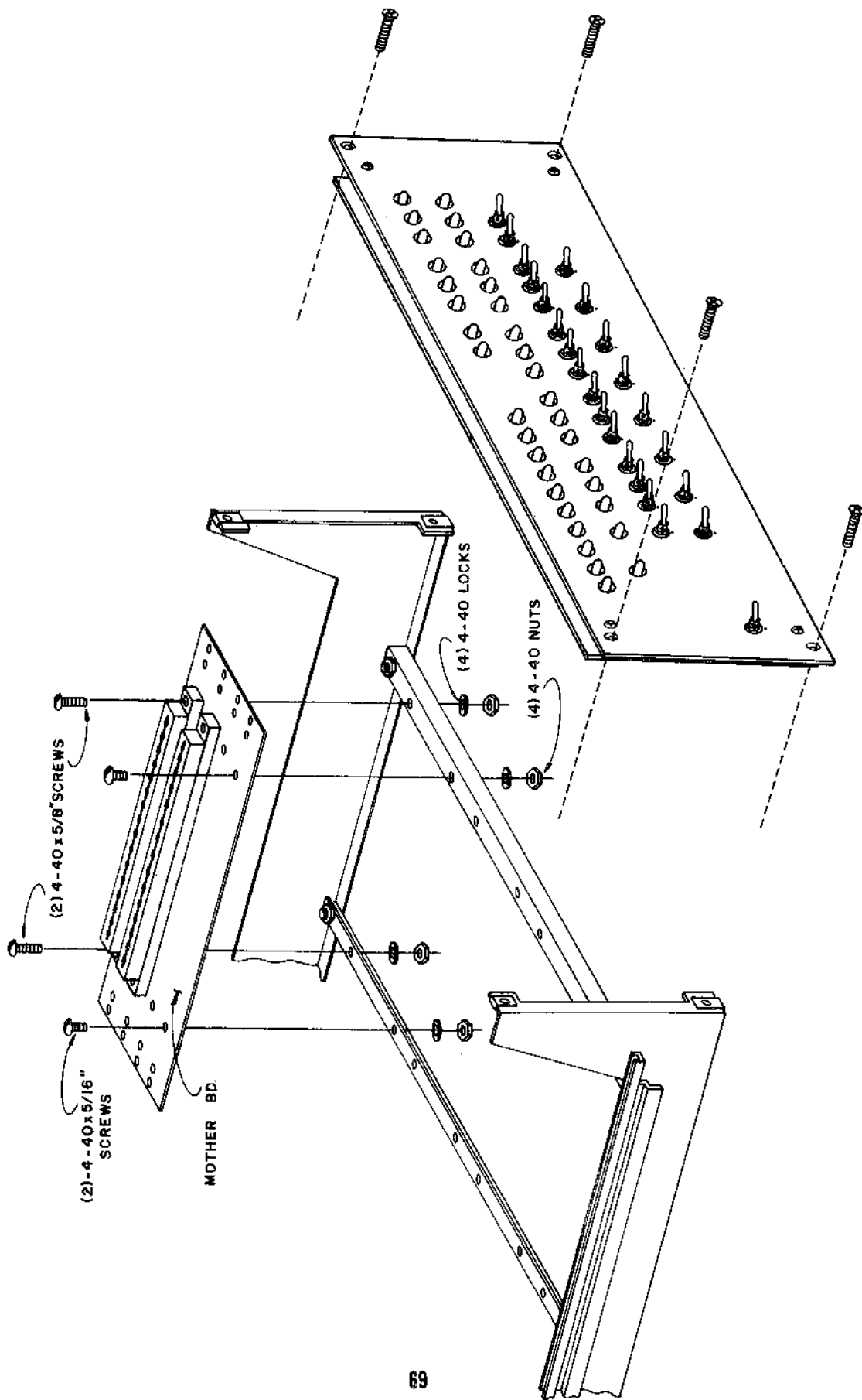
BUS POWER CONNECTIONS

There are 7 wires with terminal lugs attached to be connected to the terminal block.

( ) Referring to the drawing on the opposite page, connect the four 24 inch wires from holes 1, 2, 50 and 52 on the expander board to the terminal block as shown. Be sure to place them in the exact location indicated.

( ) Refer to the drawing again and connect the two "AC SW" wires and the "GND" and "(+8V)B" wires from the display/control board to the terminal block as shown.

NOTE: It is very important that all of these wires be in the exact locations indicated by the instructions as they provide all of the power to the boards in the unit. Refer to the bus structure chart on page 72 for a complete description of all of the signals and their location on the bus.

NOTE: The 4 wires from the expander board should be routed around the right side of the case. The 4 wires from the Display/Control board should be routed around the left side of the case.

Some additional cable clamps are included with your kit to aid in routing these wires. These may be attached to the card rail mounting screws and the top row of holes along the sides of the chassis as necessary.

A/C PWR
CORD

GREEN

WHITE

Hole #52 (-15v on Bus)

Hole #2 (+15v on Bus)

A
C
S
W

Hole #1 (+5v on Bus)

(+8V)B wire from D/C Board

BLACK

Hole #50 (GND on Bus) &
"GND" wire from D/C Board

G +8 +8   O—16
N A   B   O+16
D

Y

YO

WO
WO
OO
RO
RO
GO
GO

F1

F1

POWER SUPPLY BOARD

1	+ 5 V		51	+ 5 V	A
2	+15 V		52	− 15 V	B
3	XRDY		53	SSW DSB	C
4	VI ϕ		54	EXT CLR	D
5	VI 1		55		E
6	VI 2		56		F
7	VI 3		57		H
8	VI 4		58		J
9	VI 5		59		K
10	VI 6		60		L
11	VI 7		61		M
12			62		N
13			63		P
14			64		R
15			65		S
16			66		T
17			67		U
18	STAT DISABLE		68	MWRITE	V
19	C/C DISABLE		69	PS	W
20	UNPROTECT		70	PROTECT	X
21	SS		71	RUN	Y
22	ADDR DSBL		72	PRDY	Z
23	DO DSBL		73	PINT	a
24	ϕ 2		74	PHOLD	b
25	ϕ 1		75	PRESET	c
26	PHLDA		76	PSYNC	d
27	PWAIT		77	PWR	e
28	PINTE		78	PDBIN	f
29	A5		79	A ϕ	h
30	A4		80	A 1	j
31	A3		81	A 2	k
32	A15		82	A 6	l
33	A12		83	A 7	m
34	A9		84	A 8	n
35	DO1		85	A 13	p
36	DOϕ		86	A 14	r
37	A10		87	A 11	s
38	DO4		88	DO 2	t
39	DO5		89	DO 3	u
40	DO6		90	DO 7	v
41	DI2		91	DI 4	w
42	DI3		92	DI 5	x
43	DI7		93	DI 6	y
44	SM1		94	DI 1	z
45	SOUT		95	DI ϕ	AA
46	SINP		96	SINTA	AB
47	SMEMR		97	SW O	AC
48	SHLTA		98	SSTACK	AD
49	CLOCK (2 MHz)		99	POC	AE
50	GND		100	GND	AF

INTERCONNECTIONS AND BOARD INSTALLATIONS

The CPU and Memory boards can now be installed into the unit.

( ) The 8080 CPU integrated circuit can now be placed into its socket on the CPU Board. Before proceding, go back and review the "MOS IC Special Handling Precautions" in the front of this manual.

( ) Insert the 8080 IC into its socket. Be very careful in handling it and use as little pressure as possible when inserting it.

( ) Press the 8800 CPU Board into the first edge connector, with the silk-screened side of the board facing towards the chassis. This should place the wafer connector on the CPU Board towards the back of the unit.

( ) Referring to the drawing on the opposite page, connect the Connector Plug from the display/control board to the Wafer Connector on the CPU board as indicated. Be sure that the signals match as indicated.

( ) Insert the Memory board into the second edge connector in the same manner as the CPU Board. It should be oriented so that the silk-screened side of the board is towards the CPU Board.

INTEGRATED CIRCUIT
(IC)

IC SOCKET
(40-PIN)

PC BOARD

D3
D2
D1
D0
D4
D5
D6
D7

DISPLAY/CONTROL BOARD

CONNECTOR PLUG
10-PIN FEMALE CONNECTOR

WAFER CONNECTOR
8-PIN MALE CONNECTOR

CPU BOARD

C10

K

R35
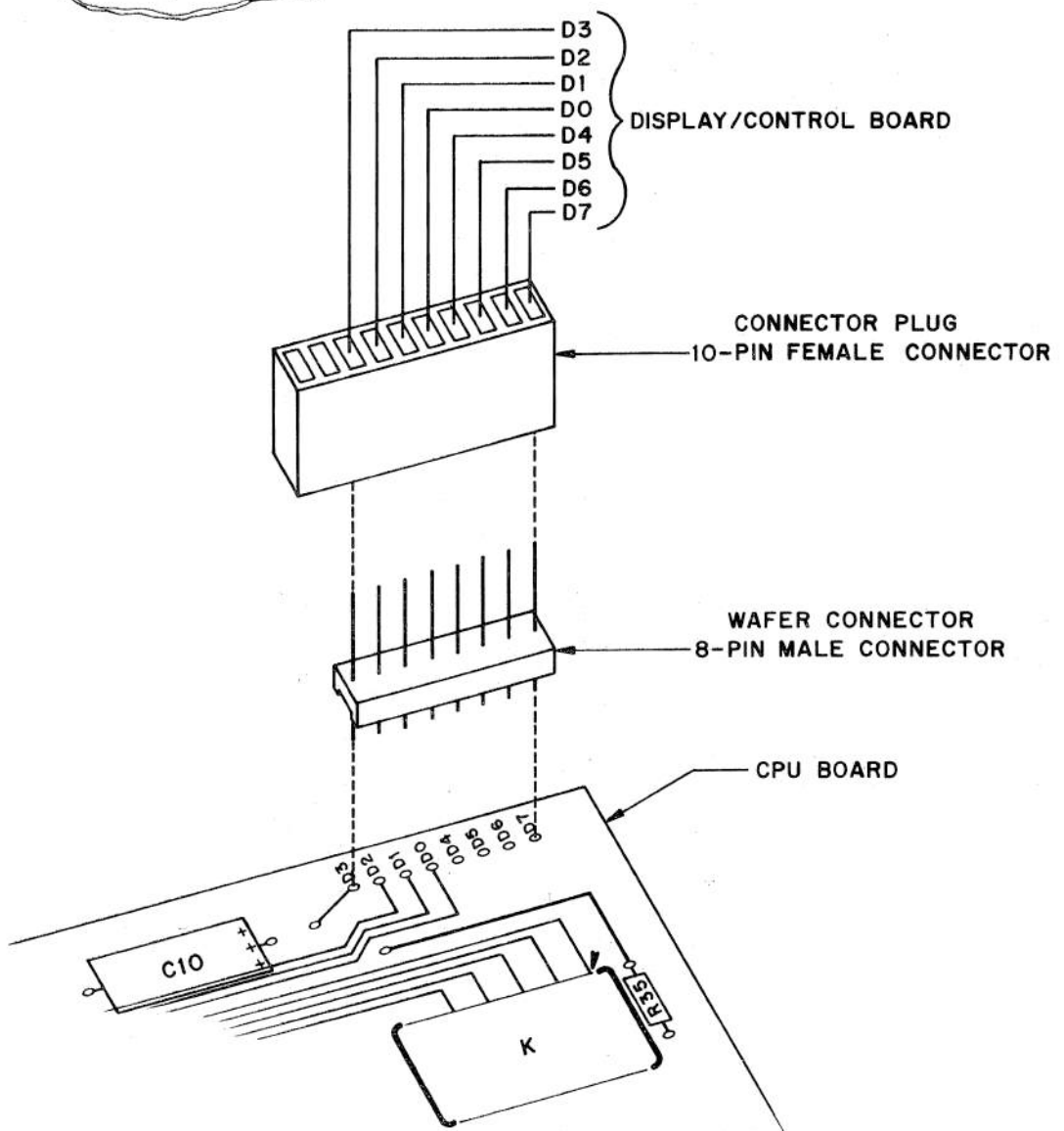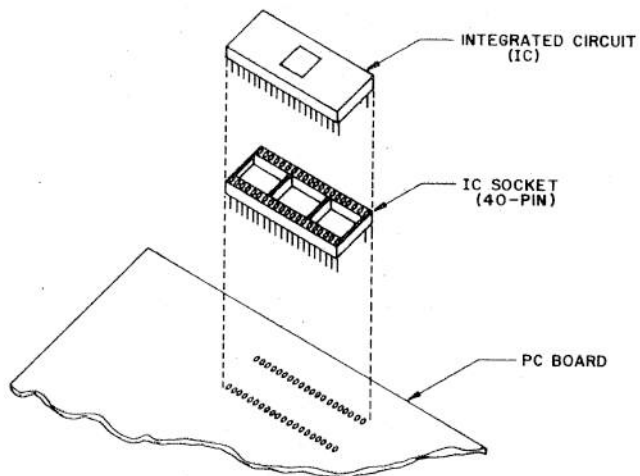
CASE TOP INSTALLATION

The chassis and the case top should
be re-installed into the case bottom
in the same manner as they were re-
moved. Use the same hardware which
you removed earlier to re-assemble
the unit.

CASE-TOP

CASE-BOTTOM

(2)#6-32 SCREWS

BACK-PANEL
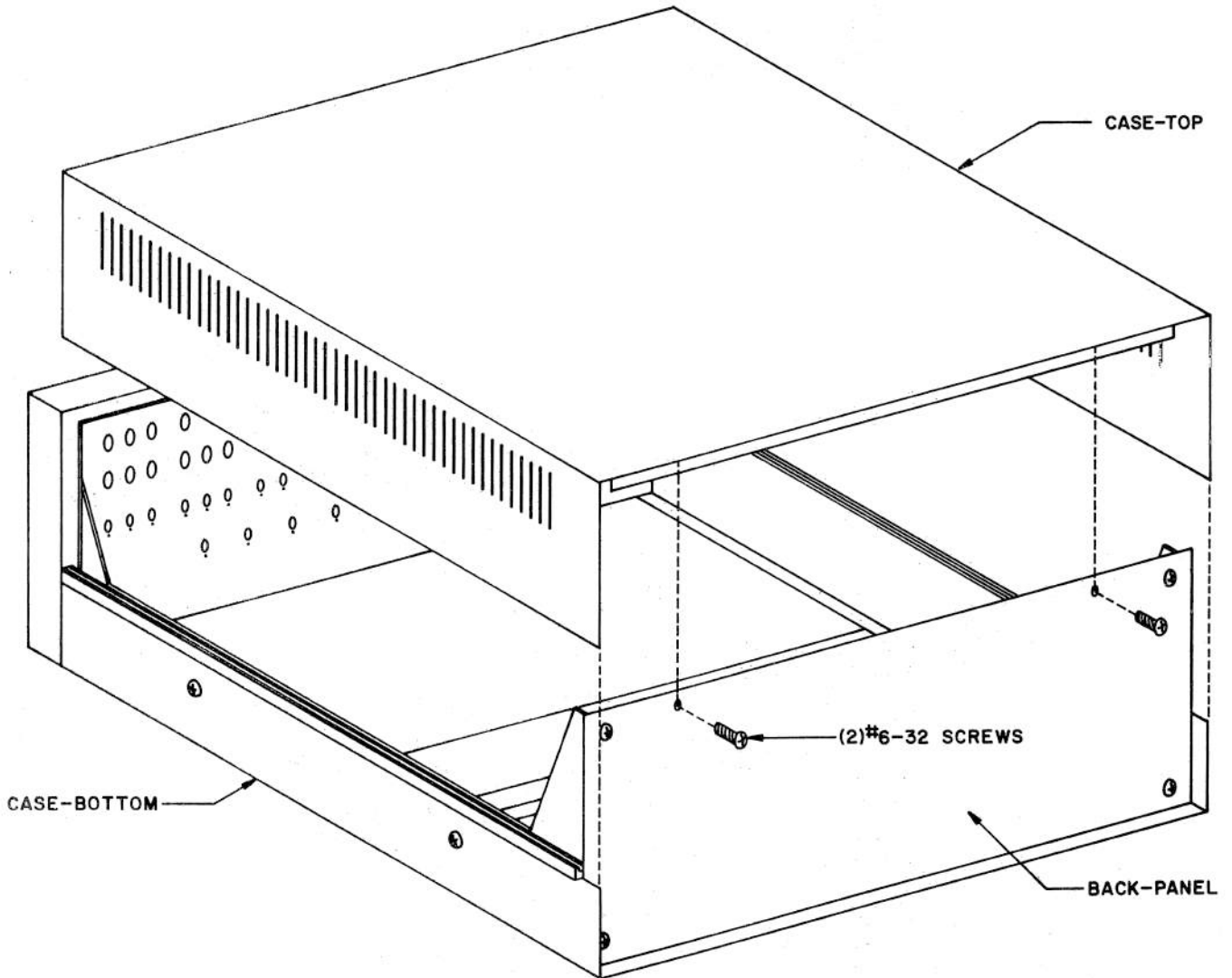
NAME PLATE INSTALLATION

The MITS ALTAIR 8800 COMPUTER name plate is to be installed <u>after</u> the entire case has been re-assembled.

WARNING: The adhesive backing on the Altair name plate is extremely strong. Take extra precaution when installing it to be sure that you place it in the correct position the first time.

( ) Remove the paper covering from the back of the name plate. Be careful not to touch anything to the adhesive while you have the paper removed.

( ) Attach the plate to the dress panel on the very bottom, beneath the switches. Be sure that the dress panel is tight against the case bottom before doing this, as the plate will not fit between the panel and the case.

( ) Remove the protective covering from the front of the name plate. This may be tinted pink. The name plate should be silver.

MEMORY ADDRESS SELECTION

There are several hardwire connections to be made on the 8800 memory boards for selecting the starting address for each board.

The starting address for each individual board is entirely optional within a few limitations. With only a single memory board in your system there is no problem, as long as the starting address selected is noted and taken into account when programming.

When more than one memory board is in the system, the sequence of starting addresses becomes critical. This is especially true when combining 1K and 4K boards in the same system. The important aspect in this case is to be sure that the individual blocks of memory on each board follow each other sequentially. There should be no gaps between the last address of one board and the starting address of the next.

The best example of this situation would be a system containing a 1K board with only 256 words of static memory together with a full 4K dynamic memory board. As may be noted from the "MEMORY ADDRESS SELECTION CHART", the starting address of the 1K boards may be selected with minimum increments of 1024 words. For the 4K board the minimum increment is 4096 words.

NOTE: Those addresses marked with an asterisk (*) in the chart are the possible address selections for the 4K boards, I1 & I0 being dropped for this board. Any address listed may be selected for the 1K boards.

As may be seen from studying the chart, in the example above if the 1K board is placed at an address "before" the 4K board there will be a gap of 3840 words of memory between the boards. Even with the 1K board expanded to its full 1024 words, there would still be a gap of 3072 words of memory.

In this example the 4K board address must be placed "before" the 1K board address in order to keep all possible addresses sequential. (i.e.--place the 4K board at octal address 0 and the 1K board at octal address 10 000)

The same would hold true for two 1K boards, one fully expanded and the other with only 256 words of memory. The full board must be placed first and the second board must be placed so that it follows immediately in sequence.

The chart below illustrates the address selection pads for both the 1K and the 4K memory boards. The "I" prefixed pads correspond to the "I" prefixed headings on the "MEMORY ADDRESS SELECTION CHART". The "A" prefixed pads correspond to the 1's and 0's on the "MEMORY ADDRESS SELECTION CHART" as indicated at the bottom of the chart below. The last number of the pad should always correspond in each connection. (i.e.--pad I5 must go to either A15 or $\overline{A15}$, pad I1 must go to either A11 or $\overline{A11}$)

PROM MEMORY CARD (88-PMC) The 2K PROM Board uses exactly the same addressing format as the 1K and 4K memory boards. The only differ-ence is that five jumpers are used (I1 through I5), and the memory increments in 2K blocks. All of the information in this section applies to the PROM board just as with the other memory boards. The possible addresses for the PROM board are marked " † " on the MEMORY ADDRESS SELECTION CHART.
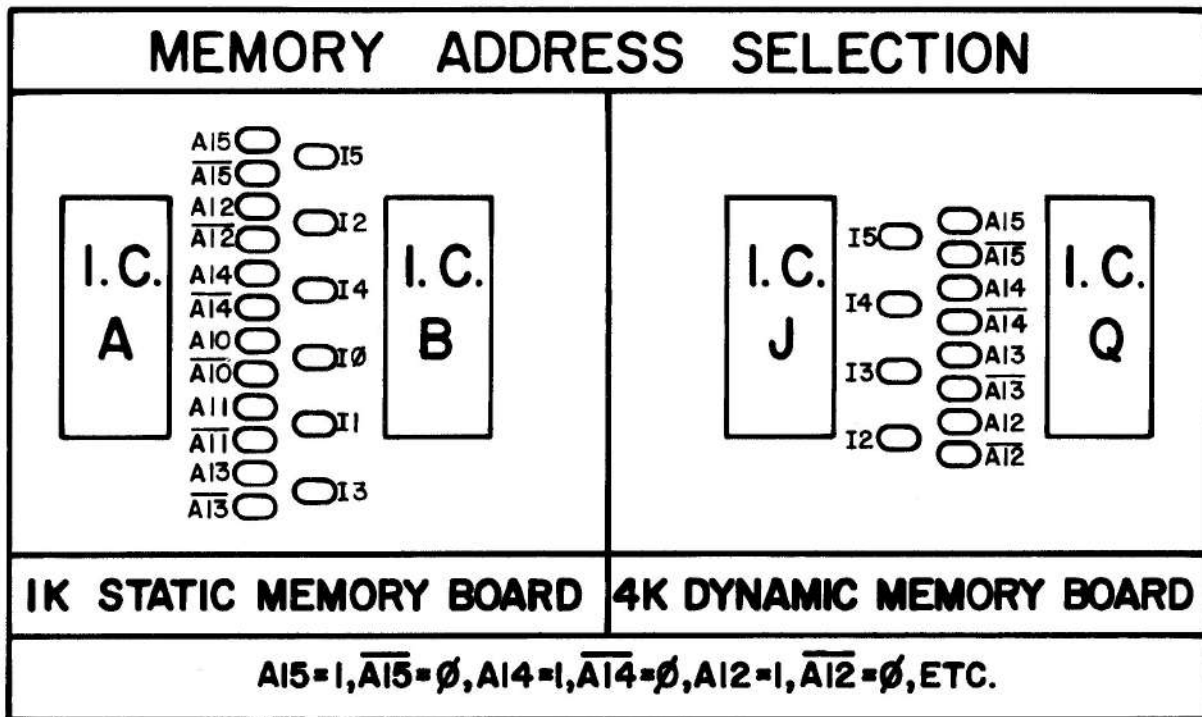
MEMORY ADDRESS SELECTION CHART

ADDRESS LINES						ADDRESS SELECTED	
I5	I4	I3	I2	I1	I0	DECIMAL ADDRESS	OCTAL ADDRESS
0	0	0	0	0	0	0	0 * †
0	0	0	0	0	1	1,024	2 000
0	0	0	0	1	0	2,048	4 000 †
0	0	0	0	1	1	3,072	6 000
0	0	0	1	0	0	4,096	10 000 * †
0	0	0	1	0	1	5,120	12 000
0	0	0	1	1	0	6,144	14 000 †
0	0	0	1	1	1	7,168	16 000
0	0	1	0	0	0	8,192	20 000 * †
0	0	1	0	0	1	9,216	22 000
0	0	1	0	1	0	10,240	24 000 †
0	0	1	0	1	1	11,264	26 000
0	0	1	1	0	0	12,288	30 000 * †
0	0	1	1	0	1	13,312	32 000
0	0	1	1	1	0	14,336	34 000 †
0	0	1	1	1	1	15,360	36 000
0	1	0	0	0	0	16,384	40 000 * †
0	1	0	0	0	1	17,408	42 000
0	1	0	0	1	0	18,432	44 000 †
0	1	0	0	1	1	19,456	46 000
0	1	0	1	0	0	20,480	50 000 * †
0	1	0	1	0	1	21,504	52 000

ADDRESS LINES						ADDRESS SELECTED	
15	14	13	12	11	10	DECIMAL ADDRESS	OCTAL ADDRESS
0	1	0	1	1	0	22,528	54 000 †
0	1	0	1	1	1	23,552	56 000
0	1	1	0	0	0	24,576	60 000 * †
0	1	1	0	0	1	25,600	62 000
0	1	1	0	1	0	26,624	64 000 †
0	1	1	0	1	1	27,648	66 000
0	1	1	1	0	0	28,672	70 000 * †
0	1	1	1	0	1	29,696	72 000
0	1	1	1	1	0	30,720	74 000 †
0	1	1	1	1	1	31,744	76 000
1	0	0	0	0	0	32,768	100 000 * †
1	0	0	0	0	1	33,792	102 000
1	0	0	0	1	0	34,816	104 000 †
1	0	0	0	1	1	35,840	106 000
1	0	0	1	0	0	36,864	110 000 * †
1	0	0	1	0	1	37,888	112 000
1	0	0	1	1	0	38,912	114 000 †
1	0	0	1	1	1	39,936	116 000
1	0	1	0	0	0	40,960	120 000 * †
1	0	1	0	0	1	41,984	122 000
1	0	1	0	1	0	43,008	124 000 †
1	0	1	0	1	1	44,032	126 000
1	0	1	1	0	0	45,056	130 000 * †
1	0	1	1	0	1	46,080	132 000

ADDRESS LINES						ADDRESS SELECTED	
I5	I4	I3	I2	I1	I0	DECIMAL ADDRESS	OCTAL ADDRESS
1	0	1	1	1	0	47,104	134 000 †
1	0	1	1	1	1	48,128	136 000
1	1	0	0	0	0	49,152	140 000 * †
1	1	0	0	0	1	50,176	142 000
1	1	0	0	1	0	51,200	144 000 †
1	1	0	0	1	1	52,224	146 000
1	1	0	1	0	0	53,248	150 000 * †
1	1	0	1	0	1	54,272	152 000
1	1	0	1	1	0	55,296	154 000 †
1	1	0	1	1	1	56,320	156 000
1	1	1	0	0	0	57,344	160 000 * †
1	1	1	0	0	1	58,368	162 000
1	1	1	0	1	0	59,392	164 000 †
1	1	1	0	1	1	60,416	166 000
1	1	1	1	0	0	61,440	170 000 * †
1	1	1	1	0	1	62,464	172 000
1	1	1	1	1	0	63,488	174 000 †
1	1	1	1	1	1	64,512	176 000

Highest Directly Addressable ⟶ 65,535   177 777
Memory Location

*4K Dynamic Memory Board Selections

† PROM MEMORY CARD SELECTIONS

CHECKOUT PROCEDURE FOR ALTAIR 8800

1. Before applying power (with the aid of a magnifying glass
   if available) check all boards and components for solder
   bridges, cold solder joints, broken PC lands or wires, and
   correct component orientation.

   Careful attention to this step will eliminate most of the
   common machine failure causes.

2. With all boards removed from the mother board, apply power
   to the machine and check both the terminal block and the
   bus pins for the proper unregulated voltages.

   Without the boards loading the supply, these voltages
   should read as follows:

Bus Pins	Approximate voltages referenced to power supply GND
Pins 1 & 51	+10VDC
Pin 2	+20VDC
Pin 52	-17VDC
Pins 50 & 100	0VDC

3. Now check to see that none of the above voltages are pre-
   sent on any of the bus pins adjacent to those listed.

   NOTE: Pin 49 will be open without the CPU board
           in place, and thus will read the same as
           pin 50.

W A R N I N G

UNDER NO CONDITIONS REMOVE OR INSTALL

BOARDS TO THE UNIT WITH THE POWER ON.

4. Power the machine down and insert the boards into the mother
   board. Apply power to the machine again and check the
   output of the voltage regulators for +5vdc. Also check
   to see that the 12v zener diode on the CPU board is regulating
   at +12vdc.

   Be sure the regulated supplies are correct on all of your
   boards.

CHECKOUT PROCEDURE, cont.

5. Power the machine down again and install the plug connecting
    the Display/Control Board to the CPU Board.

    Re-apply power to the machine. The machine comes up in an
    undetermined state so what you do is hold the STOP switch
    in the stop position and give it a RESET. Then check to see
    if the PROTECT light is on; if it is, push the PROTECT-
    UNPROTECT switch in the unprotect position.

6. Now you can check out the different switches and indicators.
    All address switches should be in the down (0) position.
    Hold the RESET on -- you should have all the status lights
    off and all data address lights on. When you release the
    RESET switch, all the address lights should go off. The
    MEMR, M1, WO, WAIT lights should be on and whatever data
    there is in location 0 will be displayed in the data lights.

    Now to check the lights and switches for proper operation,
    turn each address switch on one at a time and make sure
    that the corresponding address light comes on when the
    EXAMINE switch is operated. What you are doing here is
    checking for obvious shorts in the address bus area so only
    one switch should be on at a time.

    The data lights should be checked in the same fashion.
    Only use the lower 8 switches and the DEPOSIT switch to
    check these.

    Checking the EXAMINE NEXT and DEPOSIT NEXT is fairly simple.
    Just keep pressing them and observe that the address lights
    count up in sequential binary order.

    Make sure that PROTECT switch turns on the Protect Status
    light and that UNPROTECT turns if off. With the PROTECT on
    you shouldn't be able to change the contents of memory with
    DEPOSIT or DEPOSIT NEXT (or instructions either).

    Now you're ready to try a program. Use the one in the
    Operator's Manual on pages 33-38. After you load everything
    in be sure to RESET so that you start from LOC 0. SINGLE
    STEP through it first to check out the SINGLE STEP switch
    and then run it. Every time you stop it to examine the re-
    sults be sure to RESET prior to restarting.

mits

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Albuquerque, NM 87106