

PROCESSOR TECHNOLOGY COMPANY

PARTS LIST: MB-1 MOTHER BOARD

ITEM	QUANTITY
<u>RESISTORS</u>	
330 ohm $\frac{1}{4}$ W 5% carbon film	47
470 ohm $\frac{1}{4}$ W 5% carbon film	26
<u>CAPACITORS</u>	
15 mfd 25V dipped tantalum	1
1 mfd 25V dipped tantalum	1
<u>IC's</u>	
LM340T - 5.0 regulator IC	1
<u>HARDWARE</u>	
4-40 hex nut, screw & lockwasher	6 sets
24 ga tinned wire	7 ft.
16 ga copper bus wire	4.5 ft.
16 ga stranded hookup wire	6 ft.
20 conductor ribbon cable	8 ft.
spaghetti 22 ga	6 ft.
spaghetti 14 ga	4 ft.
spaghetti 10 ga	3 in.

PRELIMINARY

ASSEMBLY INSTRUCTIONS - MB-1 MOTHER BOARD w/BUS TERMINATION

You must decide whether to use the existing Display Control Board wiring or install the ribbon cable supplied with your Mother Board Kit. If you haven't finished assembling your Altair we recommend the cable. The neatly arranged color coded ribbon cable is much easier to trace than a bundle of identically colored wires.

When wiring the ribbon cable, you follow roughly the same procedure as in wiring the Altair according to the assembly instructions with the following exceptions.

1. Cut one (1) length of three (3) feet and start installing the colored wires from pad #27, near the five (5) volt regulator, sequentially along the top of the Display Control Board in order off the ribbon cable. e.g. #27=brown, #28=red, #26=orange, #69=yellow, etc.
2. Note which color corresponds to which number on the Display Control Board on the cable.
(per above)
3. The next length of cable will start at the next sequential pad on the top of the Display Control Board. This should be #92. The length of this piece of ribbon cable should be cut such that it begins at #92 and ends at the same point as the first piece. On this piece only 15 connections are made to the top of the Display Control Board. The remaining five (5) we suggest connecting to 76, 24, 21, 20, and 68 on the side of the Display Control Board.
4. Separate eight (8) conductors from the remaining length of ribbon cable approximately 18 inches long, and connect them to the D₀ to D₇ pads on the Display Control Board. These will terminate on the connector on the Central Processor Unit Board per Altair instructions.
5. Use the remainder of the cable that has the conductors removed from it or wire the remaining pads. Noting #46 is already wired on the top of the Display Control Board. Also since there are only 58 wires from the Display Control Board and a total of 60 from the three (3) ribbon cables

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you can

- (a) strip off the extra two (2) wires for the neatest finish,
- (b) wire them to one of the auxiliary switches to connect, e.g. the Pint. and P-hold lines,
NOTE: This requires providing ground to the switch used to activate those lines.

or (c) disregard them.

If you wish to use your existing wiring, you should label and remove the wires from your 88-EC Board, install your MB-1 and re-install the wires in the appropriate Bus lines.

The Mother Board is secured to the two rails the original 88 - EC was mounted to. There are six (6) holes that align for this purpose. Refer to the location diagram for correct orientation of MB-1 and location of mounting holes. To preclude confusion, the foil side mounts down and the large land (ground) with Processor Technology on it is toward the rear of the computer.

The bus strips labeled +V, +8, and -V are for the +16v, and +8v, and -16v power supplies respectively. A duplicate wire 18" long should be run from the same tab on the Power Distribution Block to the other side of the Mother Board from all three (+V, +8, & -V) to their appropriate bus strips. These can share the same path as the Display Control Board wires.

It is necessary to jumper the +V, +8, and -V bus strips to each card slot. Refer to the overlay diagram for placement of these 16 gage wires correctly.

The land labeled +VT is the terminator supply land. A five (5) volt regulator (LM340) mounts on the underside of the Mother Board support rail using one of the screws that fastens the MB-1 to the rail. Refer to Drawing A.
NOTE: Lead #1 is jumpered to +8 volts and lead #3 is jumpered to the +VT land. Lead #2 is grounded on the rail through its mounting tab, which is electrically connected internally.

1. Mount the regulator (per Drawing A)
2. Cut two (2) six (6) inch jumper wires and connect one each to the +8 and +VT lands through appropriate

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- holes close to the ends where the +VT regulator is located. These will wrap around the end of the Mother Board on the Bus side of the mounting rail and be connected to their respective leads on the regulator.
3. Cut a short length of spaghetti tubing for both +8 and +VT leads to the LM340 regulator (about 3/4")
 4. Slip the tubing onto the lead from the +8 land, strip 1/4" off the end of the wire and insert the + lead of the 15 Mf Electrolytic through the spaghetti tubing along with the +8V wire. Solder both the wires to Terminal #1 on the LM340 regulator (refer to Drawing A) and slide the tubing over the Terminal.
 5. Solder the other lead of the 15 Mf capacitor to lead #2 of the regulator.
 6. Slip the other piece of tubing onto the +VT jumper. Strip it and solder the lead to Terminal #3 on the LM340, then slide the insulating tubing down to insulate Terminal #3.
 7. Install the 1 Mf Electrolytic capacitor at the end of the +VT bus. Connect the + lead to the +VT bus and the other lead to the ground land adjacent to the end of the VT bus.

Several of the bus lines have resistor pull down to ground in addition to the +VT pull up. On these lines it is necessary to provide a ground bus. Refer to Drawing B, which illustrates the proper method of installing these resistors and their ground bus wire.

TERMINATING RESISTOR INSTALLATION

1. Install the 330 ohm (orange, orange, brown, gold) resistors as shown on the component location diagram (figure 1). Solder ONLY the end of each resistor going to the +VT trace.
2. Cut and install a 12" piece of 16 gage bare solid wire above the inner row of 330 ohm resistors (as shown in figure B).
3. Bend one lead on each 470 ohm (yellow, violet, brown, gold) resistors (as shown in figure 3). With the foil side down install the 470 ohm resistors through the holes shared by the 330 ohm

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resistors (unsoldered) leads. Only the 330 ohm resistors with diagonal shading (as shown in figure 1) have associated 470 ohm pull down resistors.

4. Solder the 470 ohm resistors to the 16 gage bare bus wire. Tin the bus wire first with solder.
5. Turn the Board over and solder the other lead of both the 330 ohm and 470 ohm resistors.

FIGURE A
REGULATOR IC WIRING

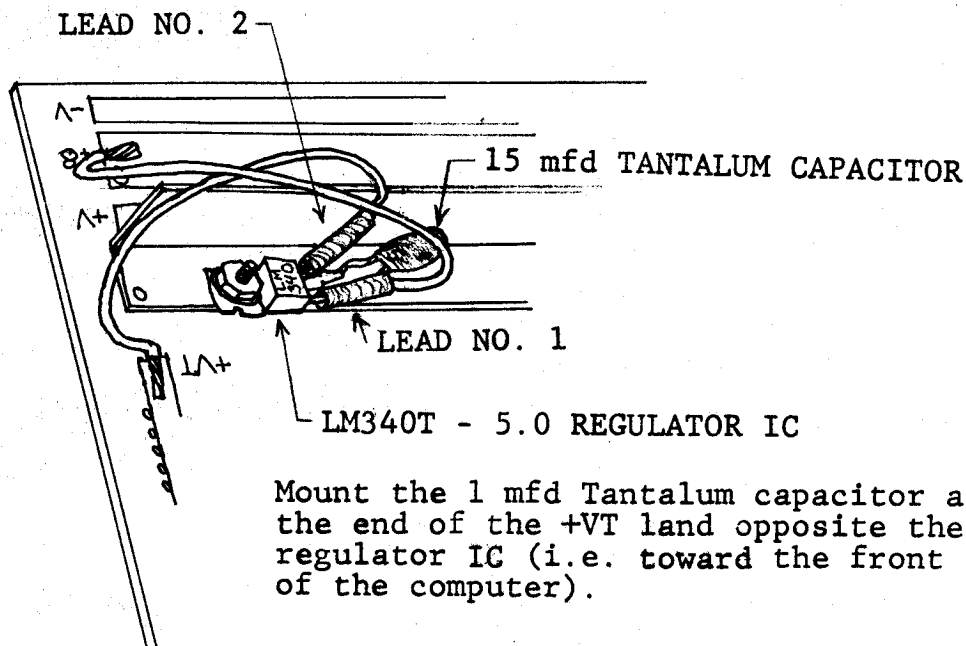
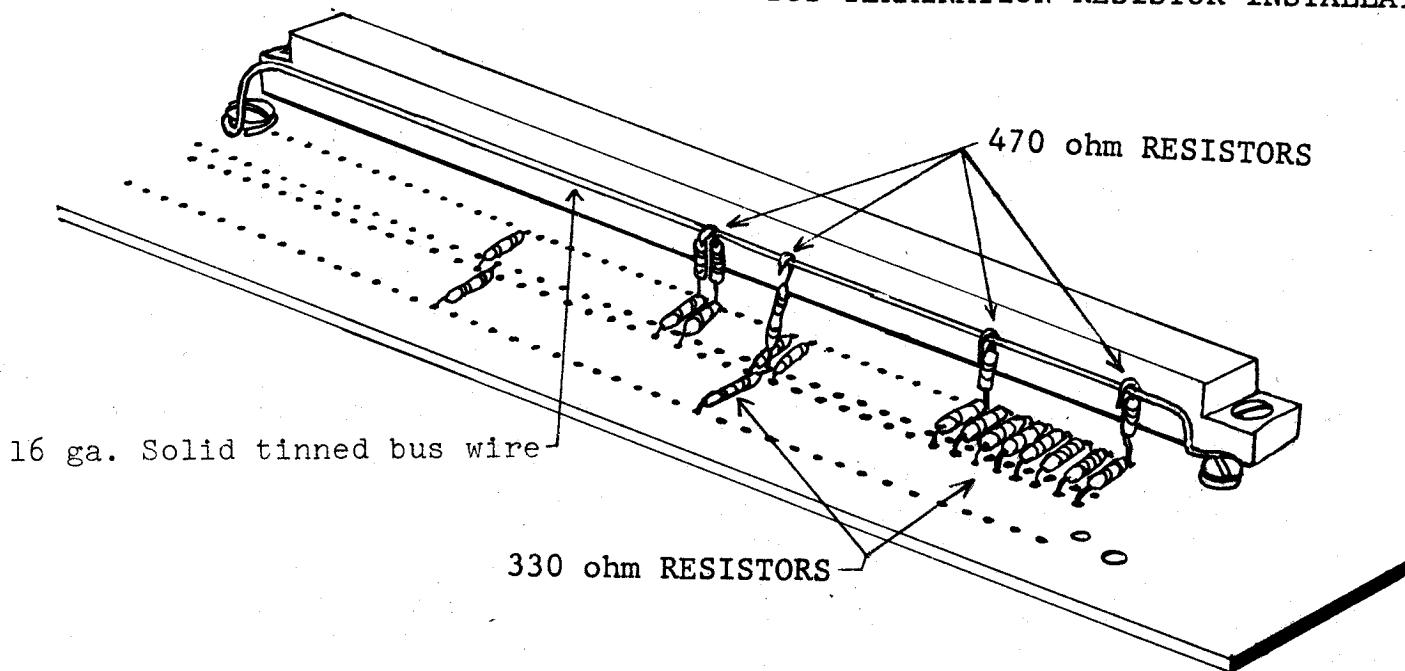


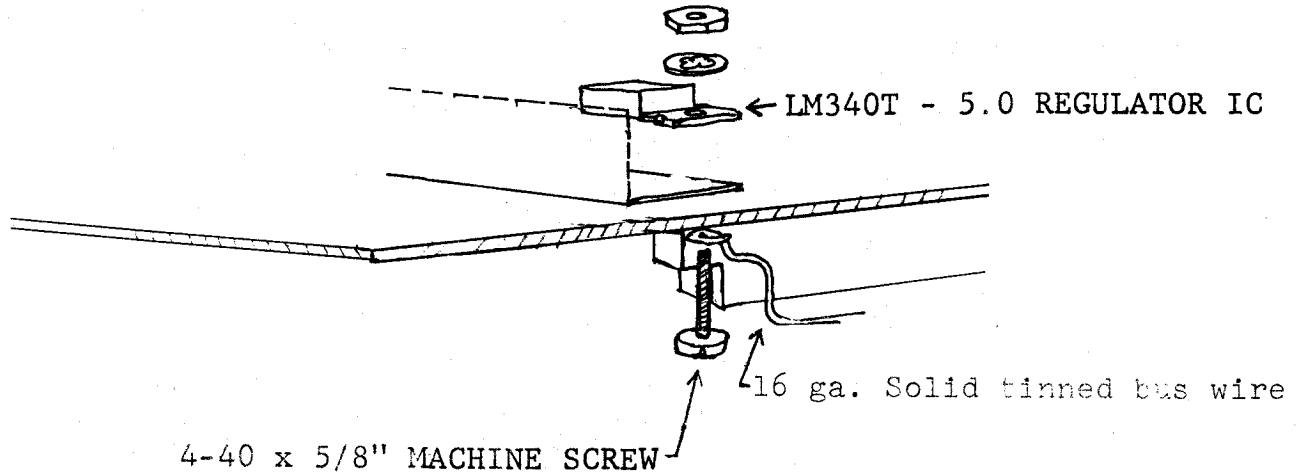
FIGURE B
BUS TERMINATION RESISTOR INSTALLATION



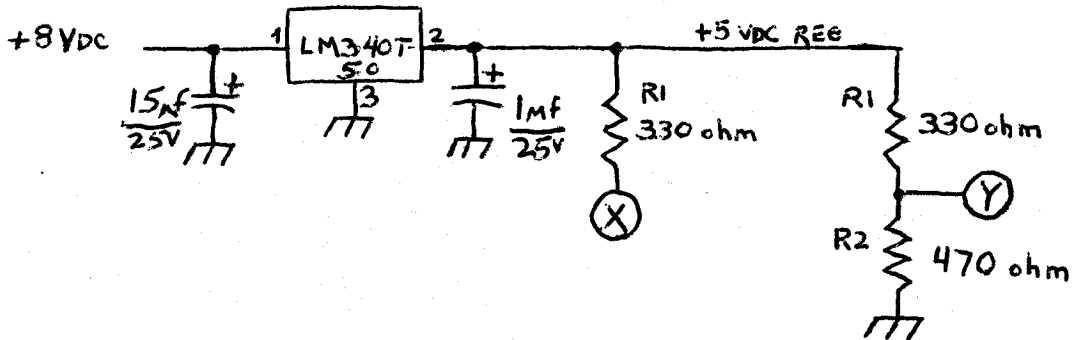
NOTE: The 470 ohm resistors mounted vertically may short to the wire leads of adjacent 330 ohm horizontally mounted ones. To avoid this problem, mount the 330 ohm resistors so that the lead to +VT is as short as possible.

FIGURE C

EXPLODED VIEW, REGULATOR IC MOUNTING



SCHEMATIC: BUS TERMINATION



X= bus pins 4-11, 18-23, 26, 53, 54, 70, 71, 73, & 75

Y= bus pins 3, 24, 25, 35-36, 38-43, 49, 68, 72, 74, 76-8, & 88-95

LOADING DIP (DUAL IN-LINE PACKAGE) DEVICES

Most DIP devices have their leads spread so that they can not be dropped straight into the board. They must be "walked in" using the following procedure:

- (1) Orient the device properly. Pin 1 is indicated by a small embossed dot on the top surface of the device at one corner. Pins are numbered counterclockwise from pin 1.
- (2) Insert the pins on one side of the device into their holes on the printed circuit card. Do not press the pins all the way in, but stop when they are just starting to emerge from the opposite side of the card.
- (3) Exert a sideways pressure on the pins at the other side of the device by pressing against them where they are still wide below the bend. Bring this row of pins into alignment with its holes in the printed circuit card and insert them an equal distance, until they begin to emerge.
- (4) Press the device straight down until it seats on the points where the pins widen.
- (5) Turn the card over and select two pins at opposite corners of the device. Using a fingernail or a pair of long-nose pliers, push these pins outwards until they are bent at a 45 degree angle to the surface of the card. This will secure the device until it is soldered.

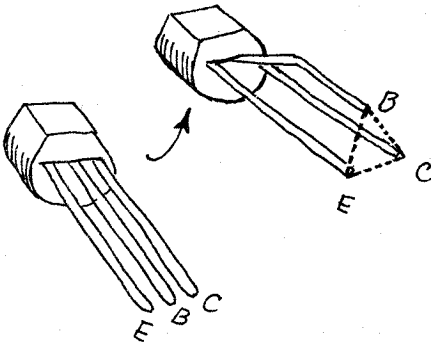
SOLDERING TIPS

- (1) Use a low-wattage iron — 25 watts is good. Larger irons run the risk of burning the printed-circuit board. Don't try to use a soldering gun, they are too hot.
- (2) Use a small pointed tip and keep it clean. Keep a damp piece of sponge by the iron and wipe the tip on it after each use.
- (3) Use 60-40 rosin-core solder ONLY. DO NOT use acid-core solder or externally applied fluxes. Use the smallest diameter solder you can get.

NOTE: DO NOT press the top of the iron on the pad or trace. This will cause the trace to "lift" off of the board which will result in permanent damage.

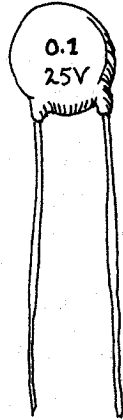
- (4) In soldering, wipe the tip, apply a light coating of new solder to it, and apply the tip to both parts of the joint, that is, both the component lead and the printed-circuit pad. Apply the solder against the lead and pad being heated, but not directly to the tip of the iron. Thus, when the solder melts the rest of the joint will be hot enough for the solder to "take," (i.e., form a capillary film).
- (5) Apply solder for a second or two, then remove the solder and keep the iron tip on the joint. The rosin will bubble out. Allow about three or four bubbles, but don't keep the tip applied for more than ten seconds.
- (6) Solder should follow the contours of the original joint. A blob or lump may well be a solder bridge, where enough solder has been built upon one conductor to overflow and "take" on the adjacent conductor. Due to capillary action, these solder bridges look very neat, but they are a constant source of trouble when boards of a high trace density are being soldered. Inspect each integrated circuit and component after soldering for bridges.
- (7) To remove solder bridges, it is best to use a vacuum "solder puller" if one is available. If not, the bridge can be reheated with the iron and the excess solder "pulled" with the tip along the printed circuit traces until the lump of solder becomes thin enough to break the bridge. Braid-type solder remover, which causes the solder to "wick up" away from the joint when applied to melted solder, may also be used.

IDENTIFICATION OF COMPONENTS

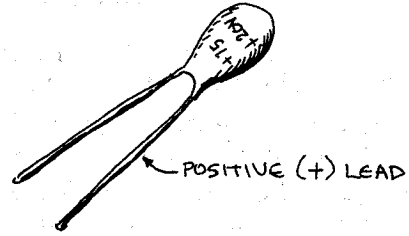


transistor - TO-92 package (plastic)

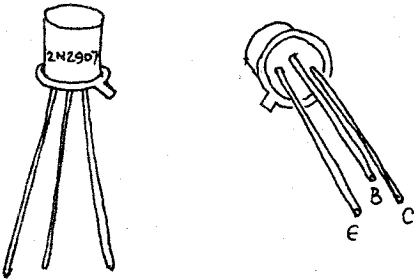
transistor - TO-18 package (metal can)



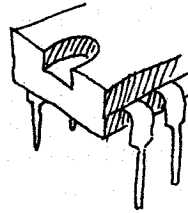
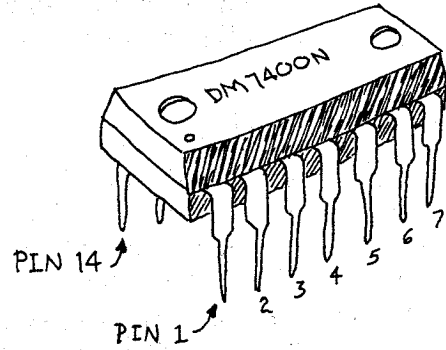
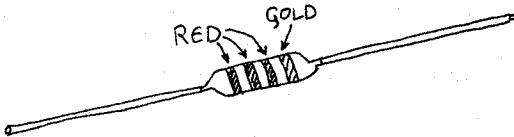
ceramic disc capacitor



dipped tantalum electrolytic capacitor



carbon film resistor 5% (gold) or 10% (silver)

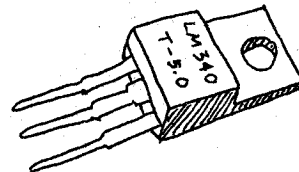


NOTE: PIN 1 MAY BE INDICATED BY CORNER DOT OR CUT-OUT.

dual-inline-package (DIP) integrated circuit
8,14,16,24 or 40 pins (14 pin shown)



metal film 1% precision resistor



regulator IC or power transistor (TO-220)