

MODEL

AJ-1510A Digital FM

Stereo Tuner

HEATHKIT[®]

ASSEMBLY MANUAL



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Price \$2.00

595-1673-02

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Prices and specifications subject to change without notice.

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INTRODUCTION

The Heathkit Model AJ-1510A Digital FM Stereo Tuner has put the "computer revolution" into your tuner. Unlike conventional tuners, it has no tuning dial and no mechanical tuning capacitor. In fact, there are no moving components at all. Instead, the desired stations are selected directly on a computer-type, pushbutton keyboard, or are tuned in semiautomatically as described below. The frequency of each station you select is indicated numerically on soft, green lights on the front panel.

Three tuning modes are provided: Keyboard, Sweep, and Preprogram.

- In the Keyboard mode, you receive a station by selecting its frequency on the pushbutton keyboard; and by pressing the Reset button you can clear one station so you can select another one.
- In the Sweep mode, the Tuner sweeps across the fm band from 107.9 MHz to 88.1 MHz, with the frequency countdown displayed numerically on the front panel. The Tuner will stop at and automatically lock in on any fm station that has more than the minimum-signal-strength-level that you set with the AGC Squelch control. Pressing the Bypass button will cause the Tuner to move on to the next station.
- The Preprogram mode uses plug-in, "Channel Selector" cards which, when preprogrammed, give you instant pushbutton selection of three fm stations. Three Channel Selector cards can be plugged into the Tuner at any one time. Ten blank cards are provided that you can preprogram to your favorite fm stations.

The front panel "Signal" meter can be used to indicate the relative strength of a received signal, or to reduce the effects of multipath reception. It can also be used, by means of the Meter switch on the master circuit board, as a built-in test meter. This test meter function is used in the "Tests and Adjustments" section to make sure your Tuner is working correctly before you put it in operation. The test meter function can also be used as a servicing aid in case a trouble develops later.

A preassembled varactor fm tuning unit provides high sensitivity, low cross modulation, and no overload on strong signals. Exceptional frequency stability is maintained, as well as a frequency accuracy of better than $\pm 0.005\%$. An inductorless digital frequency discriminator of the pulse counting (averaging) type follows two fixed-tuned five-pole LC i-f filters. This eliminates all i-f and discriminator adjustments while achieving distortion levels of 0.1%. AGC Squelch and Noise Squelch controls keep the Tuner from "locking in" on any station with a noise level above the level you prefer for easy listening.

Extremely stable tuner voltages are regulated in the built-in power supply. An unswitched, 350-watt auxiliary power outlet is mounted on the rear panel, as well as two "Scope Output" connectors that can be used with oscilloscope tuning indicators. And on the front panel, the black lighting adds a final touch of distinction. This unsurpassed Digital FM Stereo Tuner is sure to impress both you and all who see it as an outstanding example of excellent engineering, impressive styling, and dynamic performance.

Refer to the "Kit Builders Guide" for complete information on unpacking, parts identification, tools, wiring, soldering, and step-by-step assembly procedures.

Federal Communications Commission requirements prescribe maximum RF radiation from receivers operating above 30 MHz. This tuner will meet these requirements when constructed in strict accordance with the instructions in this Manual, using only components and materials supplied with the kit or the exact equivalent thereof. You will be instructed to sign and affix a label to the tuner certifying that you have constructed this tuner in accordance with the above mentioned instructions. In order to meet legal requirements, be certain to follow the instructions exactly as they are stated in this Manual.



UNPACKING

Your Digital Tuner kit is packed in a large shipping carton, which contains smaller cartons, packages, and loose parts. Some of the smaller cartons and packages have the numbers 1 through 12 stamped on them. After these numbered cartons and packages have been removed from the large carton, the remaining parts will be considered to be package #13. This "final pack" (#13) consists of items too large to fit into the small cartons and packages, and those items used in a number of assembly sections, such as metal parts.

Parts for packs 1 through 8 are in compartments in the carton stamped "PKS #1-8." Parts for packs 9, 10, and 12 are in compartments in the carton stamped "PKS #9-10 & 12." As soon as you open each carton, you will see a "Pack Index Sheet." This sheet shows which compartment contains the parts for each pack. Pack 11 is a separate package and does not have a "Pack Index Sheet."

Each assembly section of the Manual contains a Parts List and Step-by-Step instructions. At the beginning of each Parts List, you will be instructed which numbered carton or package to open. You will also be directed to remove any parts from package #13 that are required to complete that assembly section. Disregard any numbers that are not on the Parts List when more than one number is on any package or part in this kit.

NOTE: To avoid intermixing parts, do not open any of the packages until instructed to do so at the beginning of a parts list. Any part that is packaged in an individual envelope with a part number on it should be placed back in the envelope, after it is identified, until it is called for in a step.



ASSEMBLY INFORMATION

Before you start to assemble this Kit, be sure to read the "Kit Builders Guide" for complete information on wiring and soldering, and step-by-step assembly procedures.

Components will be installed on the circuit boards in the circuit board pictorials. Position all parts as shown. Follow the instructions carefully and read the entire step before performing each operation.

Use 1/2 watt resistors unless directed otherwise in a step. All resistors will be called out by their resistance value (in Ω , or $k\Omega$). The color code will also be given for color-coded resistors. Capacitors will be called out by their type and capacitance value (in pF, or μF).

Due to the small foil area around the circuit board holes and the small areas between foils, it will be necessary to use the utmost care to prevent solder bridges between adjacent foil areas. Use only a minimum amount of solder and do not heat components excessively with the soldering iron. Use no larger than a 40-watt soldering iron with a small tip. Allow it to reach operating temperature, and then apply it only long enough to make a good solder connection.

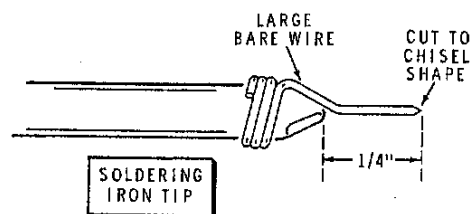
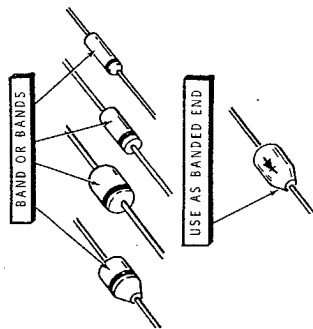


Figure A

If a small wattage, small-tip soldering iron is not available, proceed as follows: Be sure your soldering iron is cool. Wrap the large bare wire (supplied) tightly around the soldering iron tip as shown in Figure A. Allow approximately 1/4" of wire to extend beyond the end of the soldering iron. Cut the wire end to a chisel shape as shown. Occasionally apply solder to the turns of large bare wire to achieve a good heat transfer.



NOTE: DIODES MAY BE SUPPLIED IN ANY OF THE FOLLOWING SHAPES. ALWAYS POSITION THE BANDED END AS SHOWN IN THE PICTORIAL WHERE IT IS INSTALLED.

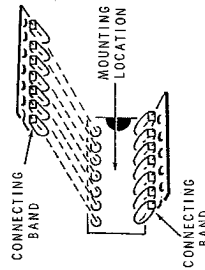


DIODE MOUNTING DETAIL

1 THE CIRCUIT BOARD YOU ARE ASSEMBLING MAY HAVE FOURTEEN AND/OR SIXTEEN LEAD IC'S. SEPARATE THE FOURTEEN LEAD IC'S FROM THE SIXTEEN LEAD IC'S. USE LONG-NOSE PLIERS TO STRAIGHTEN ANY BENT IC LEAD.

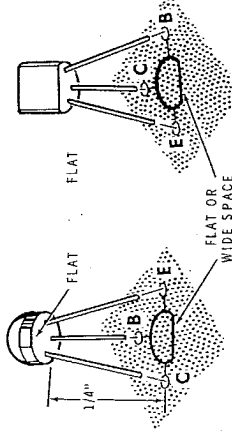
2 BEFORE YOU INSTALL CONNECTORS IN THE FOLLOWING STEPS, BE SURE NONE OF THE CIRCUIT BOARD HOLES ARE FILLED WITH SOLDER. IF NECESSARY, HEAT THE FOIL AND USE A LENGTH OF BARE WIRE (OR A COMPONENT LEAD) TO CLEAR THE HOLE.

3 POSITION A STRIP OF SEVEN OR EIGHT CONNECTORS ALONG THE CIRCUIT BOARD IC HOLES AS SHOWN. BE SURE THE CONNECTING BAND IS TOWARD THE OUTSIDE. INSERT THE CONNECTOR STRIP INTO THE CIRCUIT BOARD IC HOLES.



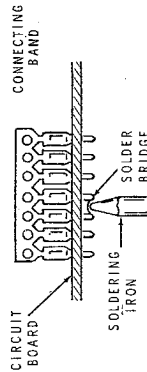
4 BE SURE EACH STRIP OF CONNECTORS IS PERPENDICULAR TO THE CIRCUIT BOARD. THEN TURN THE CIRCUIT BOARD OVER AND SOLDER THE CONNECTORS TO THE HOLES. THE CONNECTORS TO THE HOLES MUST BE SOLDERED TO THE HOLES. IF YOU USE SMALL-TIP SOLDERING IRON, IF ONE IS NOT AVAILABLE, REFER TO THE ASSEMBLY INFORMATION ON PAGE 9.

NOTE: INSTALL TRANSISTORS BY LINING UP THE FLAT SIDE OR WIDE SPACE OF EACH TRANSISTOR WITH THE CORRESPONDING OUTLINE ON THE CIRCUIT BOARD. THEN INSERT THE TRANSISTOR LEADS INTO THEIR CIRCUIT BOARD HOLES, WHICH ARE INDICATED BY E, C, AND B. POSITION THE TRANSISTOR 1/4" ABOVE THE CIRCUIT BOARD. SOLDER EACH LEAD TO THE FOIL AND CUT OFF THE EXCESS LEAD LENGTHS.

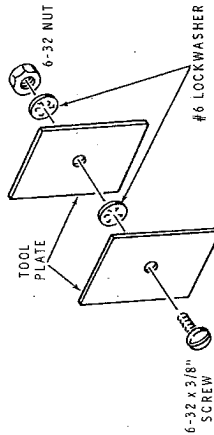


TRANSISTOR MOUNTING DETAIL

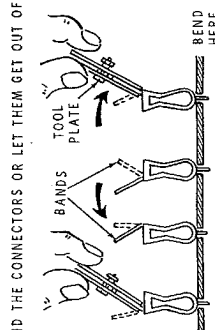
5 IF A SOLDER BRIDGE OCCURS, CLEAN THE SOLDERING IRON TIP AND PLACE IT BETWEEN THE TWO POINTS THAT ARE BRIDGED UNTIL THE EXCESS SOLDER FLOWS DOWN THE TIP.



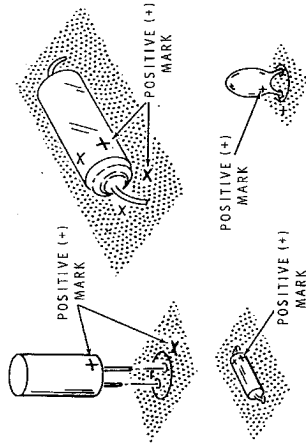
6 ASSEMBLE THE TWO TOOL PLATES TOGETHER AS SHOWN. USE A 6-32 X 3/8" SCREW, TWO #6 LOCKWASHERS, AND A 6-32 NUT.



7 USE THE ASSEMBLED TOOL PLATES TO REMOVE THE CONNECTORS OR LET THEM GET OUT OF LINE.

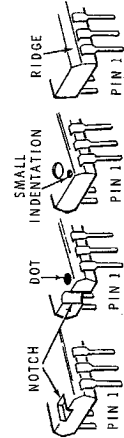


NOTE: WHEN MOUNTING ELECTROLYTIC AND TANTALUM CAPACITORS IN THE FOLLOWING STEPS, ALWAYS MATCH THE POSITIVE (+) END ON THE CAPACITOR WITH THE POSITIVE (+) MARK ON THE CIRCUIT BOARD.

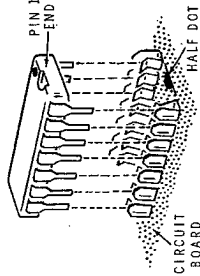


CAPACITOR MOUNTING DETAIL

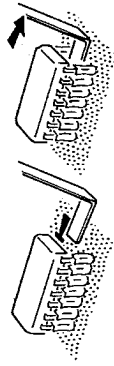
8 BEFORE YOU INSTALL EACH IC, LOOK AT THE DRAWING BELOW AND IDENTIFY THE PIN 1 END.



9 INSTALL THE INDICATED IC IN ITS CONNECTOR STRIPS. POSITION THE PIN 1 END OF THE IC OVER THE HALF DOT CALLED OUT IN THE STEP.



10 SHOULD IT EVER BECOME NECESSARY TO REMOVE AN IC FROM ITS CONNECTORS, USE THE IC PULLER SUPPLIED WITH YOUR KIT, TO USE THE PULLER, INSERT ITS FOOT BENEATH THE IC, THEN GENTLY ROCK THE TOOL BACK AND FORTH TO LIFT THE IC.



INTEGRATED CIRCUIT PREPARATION AND INSTALLATION DETAIL

POWER SUPPLY CIRCUIT BOARD

PARTS LIST

Refer to the "Pack Index Sheet" and remove the pack 1 parts from the carton stamped "PKS #1-8." Then check each part against the following Parts List. The key numbers correspond to the numbers on the "Power Supply Circuit Board Parts Pictorial" (fold-out from Page 13). NOTE: Any part that is packaged in an individual envelope with a part number on it should be placed back in its envelope, after it is identified, until it is called for in a step.

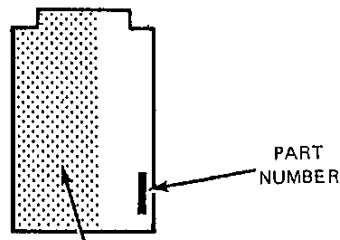
KEY PART No.	PARTS No.	PARTS Per Kit	DESCRIPTION	PRICE Each	KEY PART No.	PARTS No.	PARTS Per Kit	DESCRIPTION	PRICE Each
RESISTORS, 1/2-WATT					Film, 5%				
Composition, 5%					A1	4-53	1	270 Ω (red-violet-brown-gold)	.15
A1	1-95	1	560 Ω (green-blue-brown-gold)	.15	A1	4-63	1	2700 Ω (red-violet-red-gold)	.15
A1	1-80	1	1200 Ω (brown-red-red-gold)	.15	A1	4-18	2	3300 Ω (orange-orange-red-gold)	.15
A1	1-81	1	1500 Ω (brown-green-red-gold)	.15	A1	4-19	1	3900 Ω (orange-white-red-gold)	.15
A1	1-90	1	2000 Ω (red-black-red-gold)	.15	A1	4-26	1	33 k Ω (orange-orange-orange-gold)	.15
A1	1-57	1	2200 Ω (red-red-red-gold)	.15					
A1	1-43	3	4700 Ω (yellow-violet-red-gold)	.15					
A1	1-113	1	5600 Ω (green-blue-red-gold)	.15					
A1	1-105	1	10 k Ω (brown-black-orange-gold)	.15	Composition, 10%				
A1	1-58	2	22 k Ω (red-red-orange-gold)	.15	A1	1-9	1	1000 Ω (brown-black-red)	.15
A1	1-115	1	47 k Ω (yellow-violet-orange-gold)	.15	A1	1-69	2	18 k Ω (brown-gray-orange)	.15
					A1	1-67	1	39 k Ω (orange-white-orange)	.15



KEY PART No.	PARTS No.	DESCRIPTION	PRICE Each	KEY PART No.	PARTS No.	DESCRIPTION	PRICE Each
CAPACITORS				HARDWARE			
Electrolytic				E1	250-170	5 #6 x 1/4" sheet metal screw	.05
B1	25-257	2 10 μ F vertical	.40	E2	250-89	4 6-32 x 3/8" screw	.05
B2	25-116	1 50 μ F vertical	.75	E3	252-3	4 6-32 nut	.05
B3	25-172	2 100 μ F tubular	1.20	E4	253-2	4 #6 fiber shoulder washer	.05
B3	25-121	1 500 μ F, 50-volt, tubular	1.95	E5	254-1	4 #6 lockwasher	.05
B3	25-173	1 500 μ F, 75-volt, tubular	2.55				
B3	25-208	1 1500 μ F tubular	2.25				
B3	25-230	1 2000 μ F tubular	2.85				
Other Capacitors				MISCELLANEOUS			
C1	21-108	1 180 pF disc	.15	F1	75-704	4 Transistor insulator (packaged between two pieces of cardboard)	.15
C1	21-143	1 .05 μ F disc	.30	F2	215-59	1 Small heat sink	.55
C2	27-60	1 .22 μ F Mylar*	.40	F3	204-1268	2 Large heat sink	.60
C3	25-180	1 2.2 μ F tantalum	1.60	F4	352-13	1 Silicone grease pod	.25
*Registered Trademark, DuPont Corporation					490-5	1 Nut starter	.15
DIODES-TRANSISTORS						Solder (Additional 6' rolls of solder, #331-3, can be ordered for 40 cents each.)	
D1	56-26	1 1N191 diode (brown-white-brown)	.40	PARTS FROM PACK #13 (Final Pack)			
D1	56-47	1 MZ1000-23 zener diode	1.65	85-1643-1	1	Power supply circuit board	5.85
D1	56-74	1 MZ2362 diode	1.00	597-260	1	Parts Order Form	
D1	57-27	4 1N2071 diode	.75	597-308	1	Kit Builders Guide	
					1	Manual (See front cover for part number.)	2.00
NOTE: Transistors are marked for identification in one of the following four ways.				NOTE: See Page 192 for "Replacement Parts and Price Information."			
	1.	Part number.					
	2.	Type number.					
	3.	Part number and type number.					
	4.	Part number with a type number other than the one listed.					
D2	417-110	1 S2090 transistor	.75				
D3	417-118	7 2N3393 transistor	.50				
D4	417-175	4 2N5294 transistor	1.45				

STEP-BY-STEP ASSEMBLY

- () Position the power supply circuit board as shown in the identification drawing. Then complete each step on the Pictorials.

 IDENTIFICATION
DRAWING


The steps performed in this Pictorial are in this area of the circuit board.

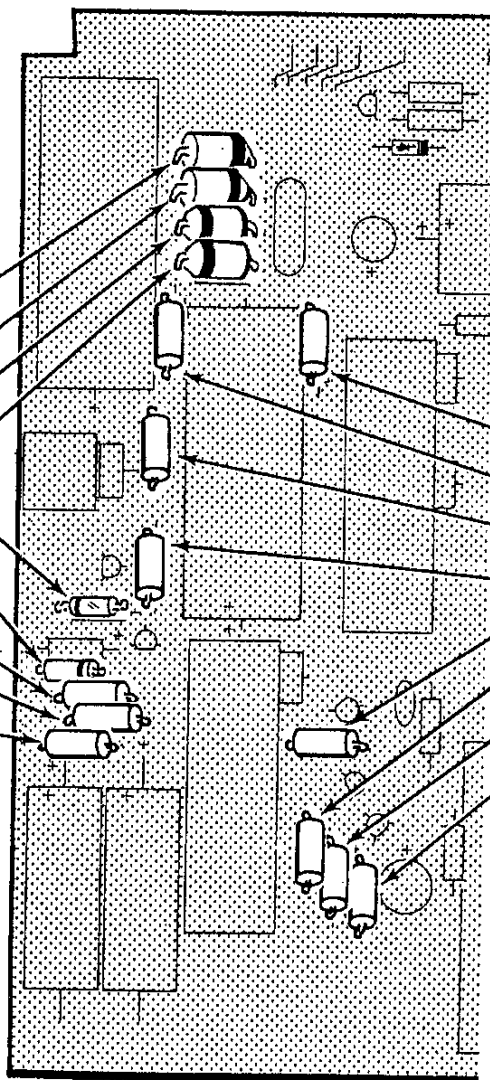
START

NOTE: When installing diodes, note the position of the banded end. See the "Diode Mounting" Detail (fold-out from Page 10).

- 1N2071 diode (#57-27) at D101.
- 1N2071 diode (#57-27) at D102.
- 1N2071 diode (#57-27) at D103.
- 1N2071 diode (#57-27) at D104.
- MZ2362 diode (#56-74) at D105.
- MZ1000-23 diode (#56-47) at ZD101.
- () 1500 Ω , 5% (brown-green-red-gold).
- () 4700 Ω , 5% (yellow-violet-red-gold).
- () 33 k Ω , 5%, film (orange-orange-orange-gold).

SAFETY WARNING: Avoid eye injury when you clip off excess leads. We suggest that you wear glasses, or at least clip the leads so the ends will not fly toward your eyes.

- () Solder all leads to the foil and cut off the excess lead lengths.

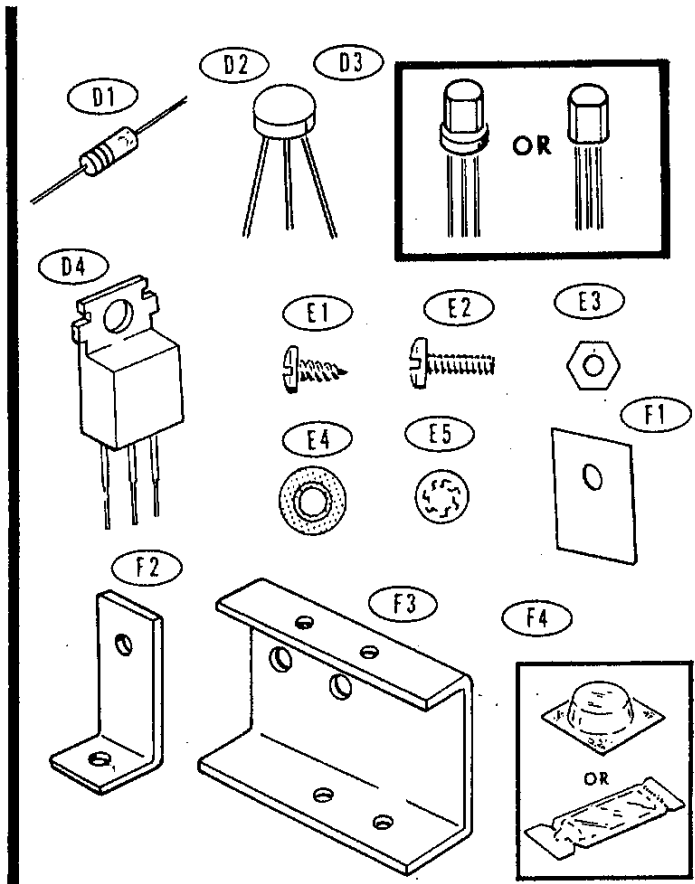
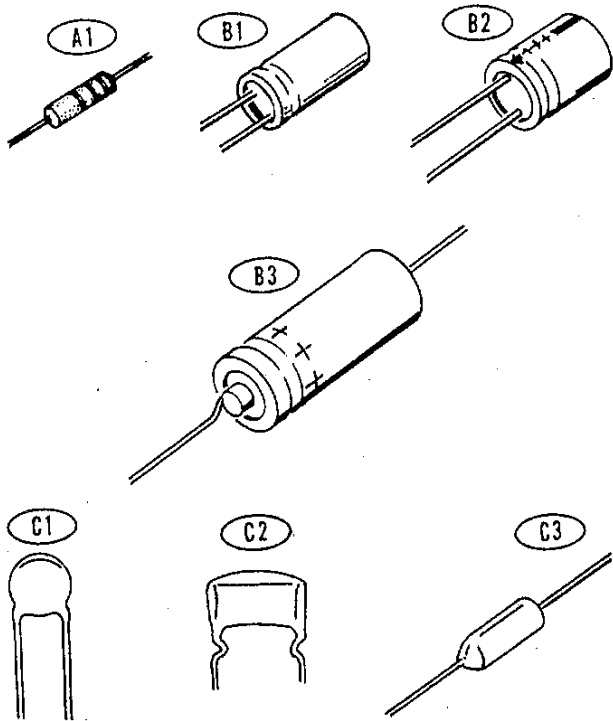


CONTINUE

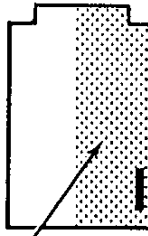
- () 39 k Ω (orange-white-orange).
- () 2000 Ω , 5% (red-black-red-gold).
- () 4700 Ω , 5% (yellow-violet-red-gold).
- () 4700 Ω , 5% (yellow-violet-red-gold).
- () 1000 Ω (brown-black-red).
- () 18 k Ω (brown-gray-orange).
- () 2200 Ω , 5% (red-red-red-gold).
- () 1200 Ω , 5% (brown-red-red-gold).
- () Solder all leads to the foil and cut off the excess lead lengths.

PICTORIAL 1-1

POWER SUPPLY CIRCUIT BOARD PARTS PICTORIAL



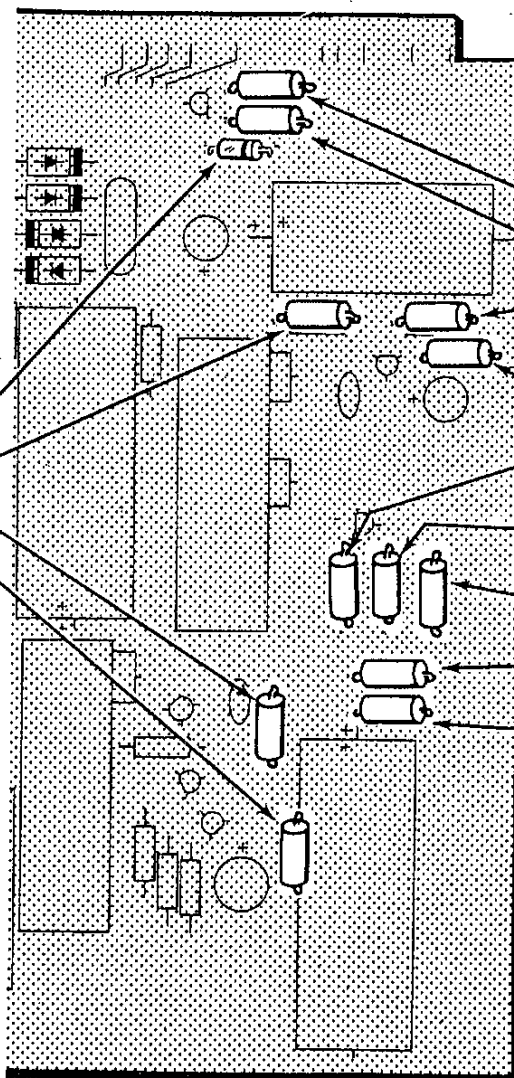
IDENTIFICATION
DRAWING



The steps performed in this Pictorial are in this area of the circuit board.

START

- () 1N191 diode (#56-26, brown-white-brown) at D106.
- () 2700 Ω , 5%, film (red-violet-red-gold).
- () 5600 Ω , 5% (green-blue-red-gold).
- () 22 k Ω , 5% (red-red-orange-gold).
- () Solder all leads to the foil and cut off the excess lead lengths.



CONTINUE

- () 22 k Ω , 5% (red-red-orange-gold).
- () 560 Ω , 5% (green-blue-brown-gold).
- () 3300 Ω , 5%, film (orange-orange-red-gold).
- () 270 Ω , 5%, film (red-violet-brown-gold).
- () 47 k Ω , 5% (yellow-violet-orange-gold).
- () 3300 Ω , 5%, film (orange-orange-red-gold).
- () 3900 Ω , 5%, film (orange-white-red-gold).
- () 18 k Ω (brown-gray-orange).
- () 10 k Ω , 5% (brown-black-orange-gold).
- () Solder all leads to the foil and cut off the excess lead lengths.

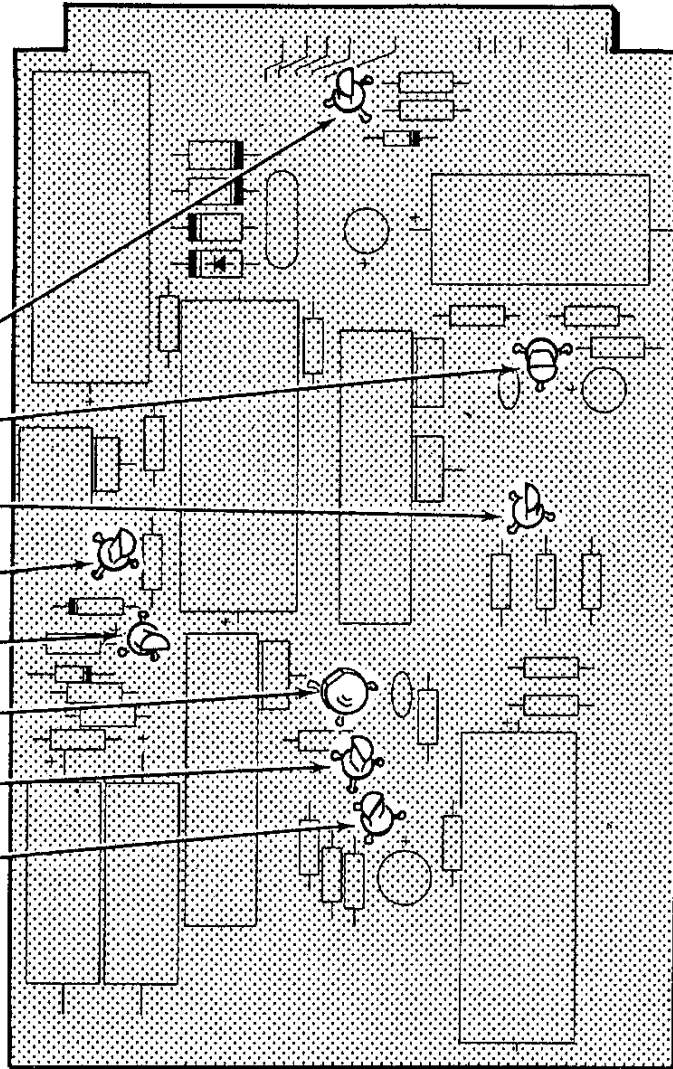
PICTORIAL 1-2

START



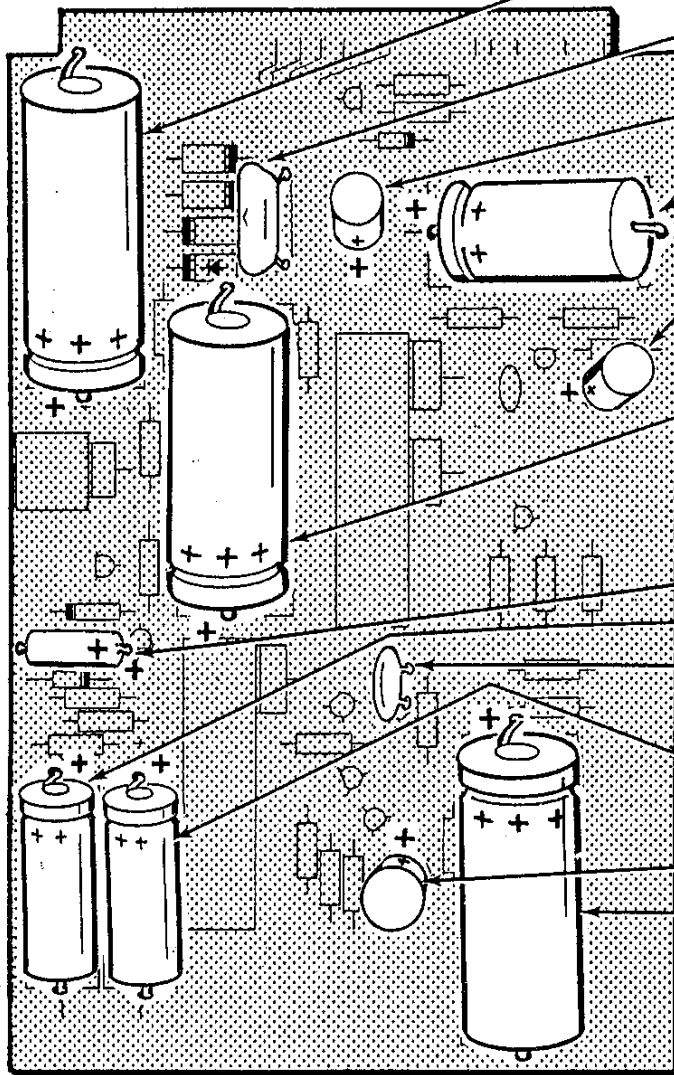
NOTE: When installing transistors, see the "Transistor Mounting" Detail (fold-out from Page 10).

- () 2N3393 transistor (#417-118) at Q113.
- () 2N3393 transistor (#417-118) at Q112.
- () 2N3393 transistor (#417-118) at Q111.
- () 2N3393 transistor (#417-118) at Q102.
- () 2N3393 transistor (#417-118) at Q103.
- () S2090 transistor (#417-110) at Q105.
- () 2N3393 transistor (#417-118) at Q106.
- () 2N3393 transistor (#417-118) at Q107.
- () Be sure all leads are soldered and all excess lead lengths are cut off.



PICTORIAL 1-3

START



NOTE: When installing electrolytic and tantalum capacitors, note the position of the positive (+) lead. See the "Electrolytic Capacitor Mounting" Detail (fold-out from Page 10).

- () 500 μ F, 75 volt tubular electrolytic (#25-173).
- () .22 μ F Mylar. NOTE: Some Mylar capacitors have a clear coating on their leads. Scrape off this coating to insure a good solder connection.
- () 10 μ F vertical electrolytic.
- () 2000 μ F tubular electrolytic.
- () 10 μ F vertical electrolytic.
- () 1500 μ F tubular electrolytic. Bend the positive lead straight down as shown.
- () Solder all leads to the foil and cut off the excess lead lengths.
- () .22 μ F tantalum electrolytic.
- () 100 μ F tubular electrolytic.
- () .05 μ F disc.

REMOVE INSULATION ON LEADS
- () 100 μ F tubular electrolytic.
- () 50 μ F vertical electrolytic.
- () 500 μ F, 50 volt tubular electrolytic.
- () Solder all leads to the foil and cut off the excess lead lengths.

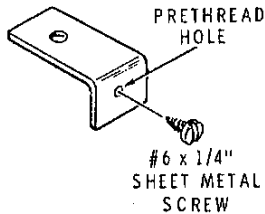
PICTORIAL 1-4

START



() Mount a 2N5294 transistor (#417-175) on the small heat sink as follows:

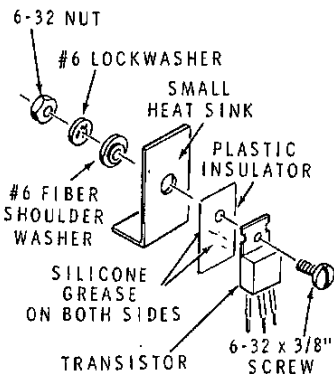
1. Prethread the indicated hole in the small heat sink with a #6 x 1/4" sheet metal screw. Then remove the screw.



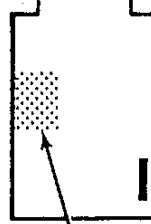
2. Completely cover both sides of a plastic insulator with silicone grease. Use 1/8 pod of silicone grease per side.
3. Position the plastic insulator on the indicated side of the small heat sink.

NOTE: Use the nut starter to pick up and start 6-32 and 4-40 nuts on screws.

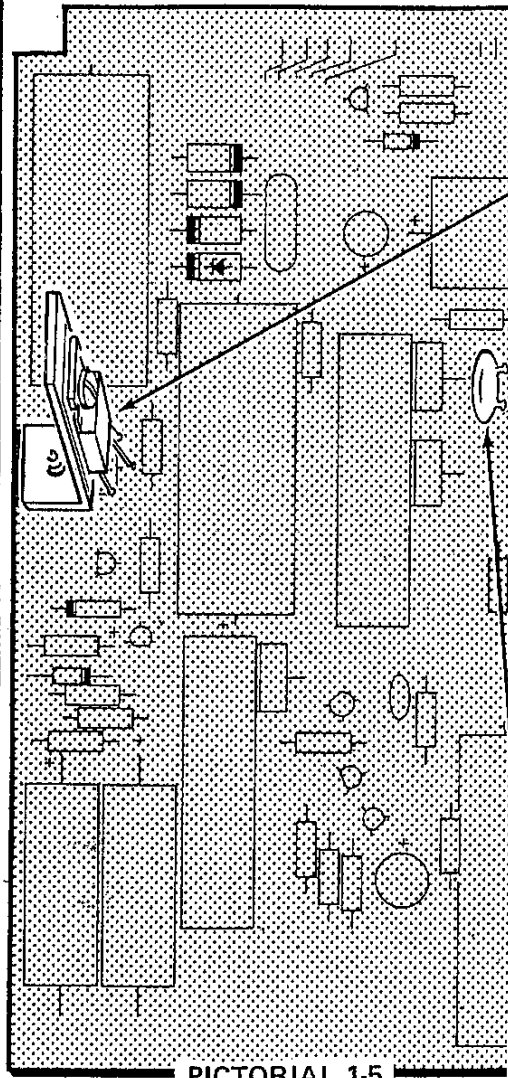
4. Center the transistor on the plastic insulator. Then secure the transistor to the heat sink with a 6-32 x 3/8" screw, a #6 fiber shoulder washer, a #6 lockwasher, and a 6-32 nut. Be sure the shoulder portion of the shoulder washer is in the hole in the heat sink.



IDENTIFICATION DRAWING



The steps performed in this Pictorial are in this area of the circuit board.

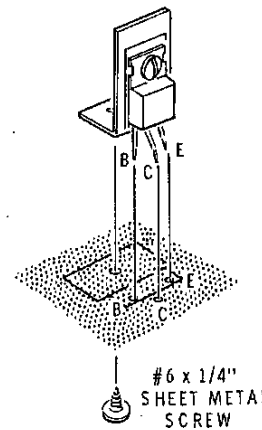


PICTORIAL 1-5

CONTINUE



() Mount the heat sink assembly at Q101 with a #6 x 1/4" sheet metal screw. Position the E, C, and B leads of the transistor into the corresponding E, C, and B marked holes in the circuit board. Bend the C (center) lead as required to fit into its hole in the circuit board. Solder all three leads of the transistor to the foil. Cut off the excess lead lengths.

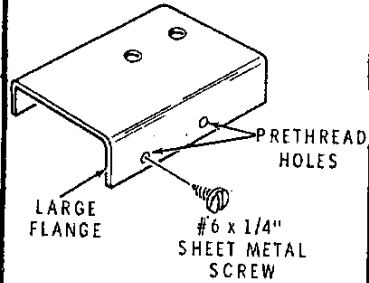


() 180 pF disc. Solder the leads to the foil and cut off the excess lead lengths.

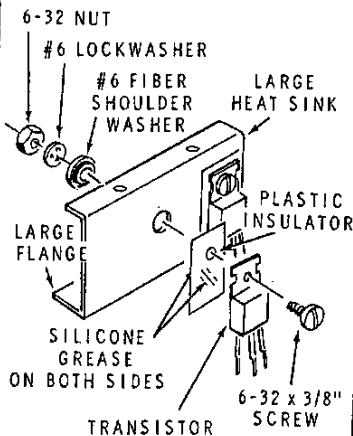
START

() Mount two 2N5294 transistors (#417-175) on a large heat sink as follows:

1. Prethread the indicated holes in the large heat sink with a #6 x 1/4" sheet metal screw. Then remove the screw.



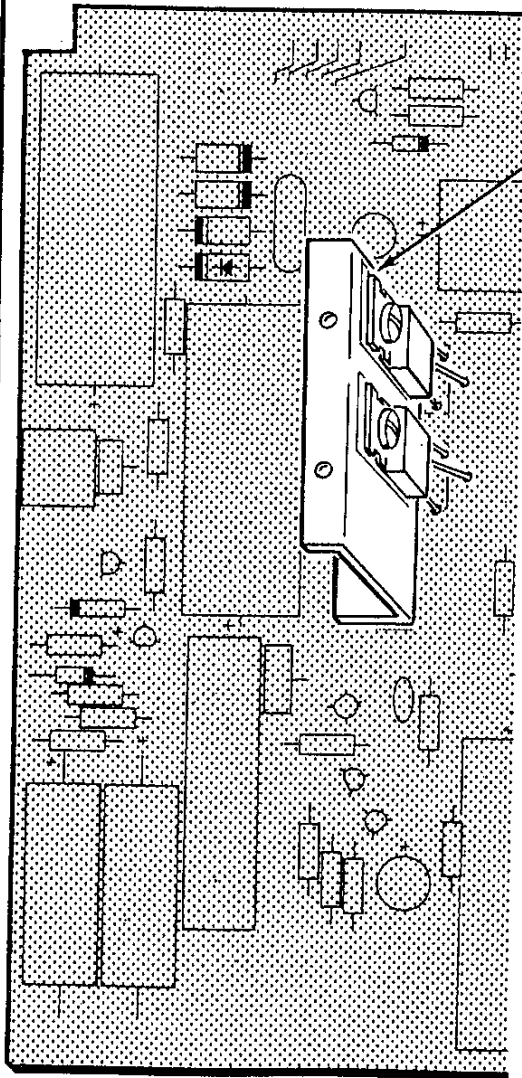
2. Completely cover both sides of two plastic insulators with silicone grease. Use 1/8 cup of silicone grease per side.
3. Position the plastic insulators on the indicated side of the large heat sink. Note the position of the large flange.
4. Center a transistor on each plastic insulator. Secure each transistor with a 6-32 x 3/8" screw, a #6 fiber shoulder washer, a #6 lockwasher, and a 6-32 nut. Be sure the shoulder portion of the shoulder washers are in the holes in the heat sink.



IDENTIFICATION DRAWING

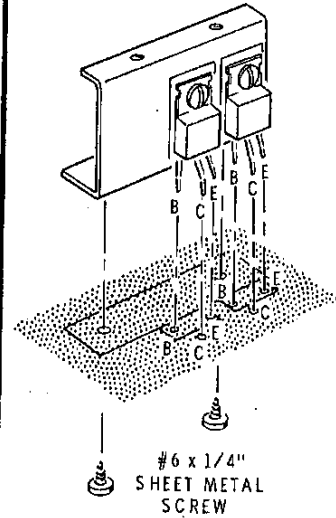


The steps performed in this Pictorial are in this area of the circuit board.



CONTINUE

() Mount the large heat sink assembly at Q108 and Q109 with two #6 x 1/4" sheet metal screws. Position the E, C, and B leads of each transistor into the corresponding E, C, and B marked holes of the circuit board. Bend the C (center) lead of each transistor as required to fit into its circuit board hole. Solder all leads to the foil and cut off excess lead lengths.

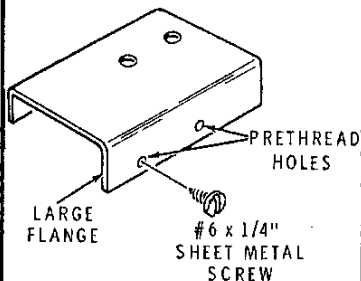


PICTORIAL 1-6

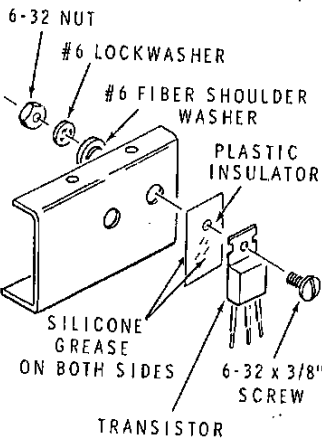
START

() Mount a 2N5294 transistor (#417-175) at the indicated hole of a large heat sink as follows:

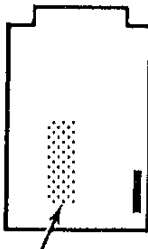
1. Prethread the indicated holes in the large heat sink with a #6 x 1/4" sheet metal screw. Then remove the screw.



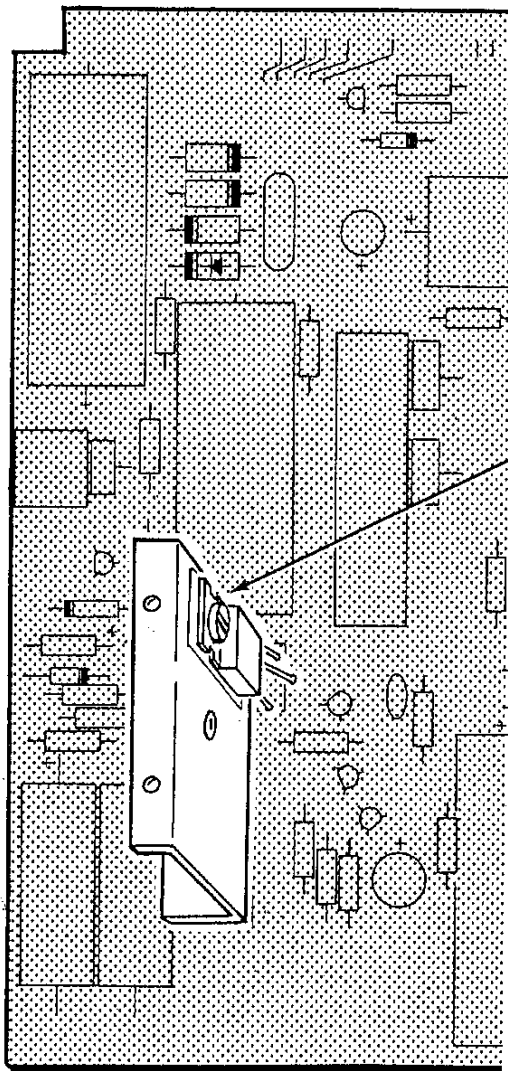
2. Completely cover both sides of a plastic insulator with silicone grease. Use 1/8 cup of silicone grease per side.
3. Position the plastic insulator at the indicated location on the large heat sink. Note the position of the large flange.
4. Center the transistor on the plastic insulator. Secure it to the heat sink with a 6-32 x 3/8" screw, a #6 fiber shoulder washer, a #6 lockwasher, and a 6-32 nut. Be sure the shoulder portion of the shoulder washer is in hole in the heat sink.



IDENTIFICATION DRAWING



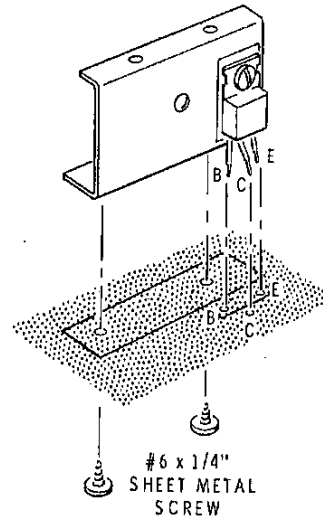
The steps performed in this Pictorial are in this area of the circuit board.



PICTORIAL 1-7

CONTINUE

() Mount the large heat sink assembly at Q104 with two #6 x 1/4" sheet metal screws. Position the B, C, and E leads of the transistor into the corresponding B, C, and E marked holes of the circuit board. Bend the C (center) lead as required to fit into its hole in the circuit board. Solder all three leads to the foil and cut off the excess lead lengths.

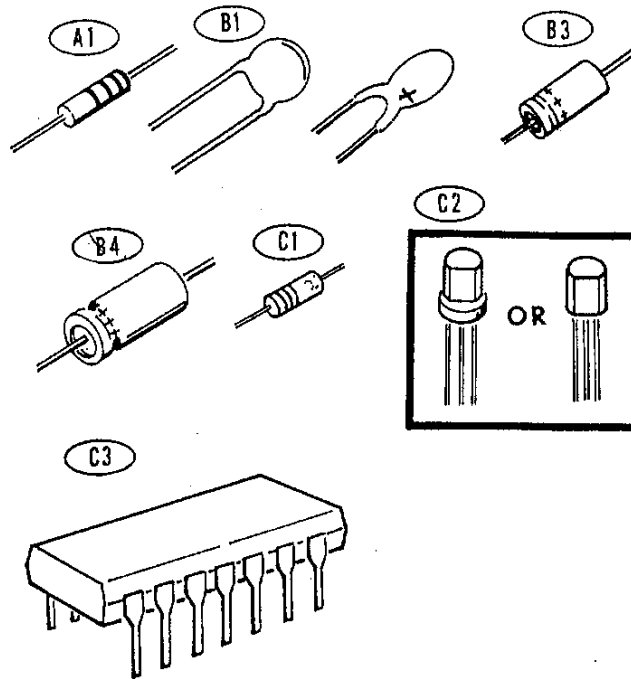


NOTE: Be careful that the positive (+) lead of the 1500 μ F tubular electrolytic is not touching the heat sink assembly.

This completes the assembly of the circuit board. Check all connections to be sure they are soldered and that there are no solder bridges between foils. Set the circuit board aside temporarily.

FINISH

PARTS PICTORIAL



PROGRAMMER CIRCUIT BOARD

PARTS LIST

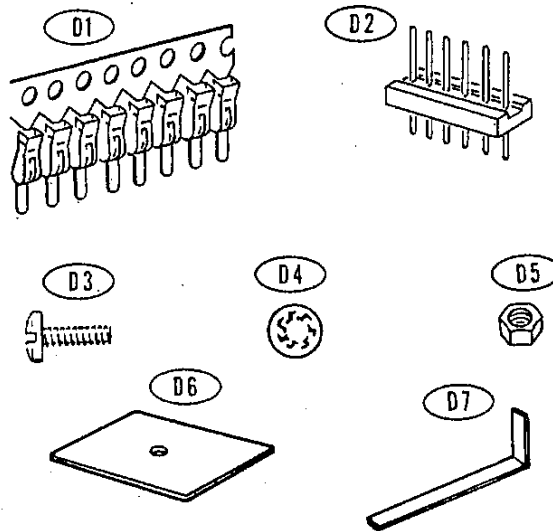
Refer to the "Pack Index Sheet" and remove the pack 2 parts from the carton stamped "PKS#1-8." Then check each part against the following Parts List. The key numbers correspond to the numbers on the "Parts Pictorial."

KEY PART No.	PARTS No.	Per Kit	DESCRIPTION	PRICE Each	KEY PART No.	PARTS No.	Per Kit	DESCRIPTION	PRICE Each
RESISTORS, 1/2-WATT, 5%					DIODE-TRANSISTOR-IC's				
A1	1-111	1	150 Ω (brown-green-brown-gold)	.15	C1	56-26	7	1N191 diode (brown-white-brown)	.40
A1	1-147	1	220 Ω (red-red-brown-gold)	.15	NOTE: Transistors and IC's are marked for identification in one of the following four ways.				
A1	1-157	2	470 Ω (yellow-violet-brown-gold)	.15					
A1	1-95	6	560 Ω (green-blue-brown-gold)	.15					
A1	1-79	1	820 Ω (gray-red-brown-gold)	.15					
A1	1-57	1	2200 Ω (red-red-red-gold)	.15	1.	Part number.			
10%					2.	Type number. (In IC's this refers only to the numbers; the letters may be different.)			
A1	1-9	5	1000 Ω (brown-black-red)	.15	3.	Part number and type number.			
CAPACITORS					4.	Part number with a type number other than the one listed.			
B1	21-95	6	.1 μ F disc	.25	C2	417-118	2	2N3393 transistor	.40
B2	25-200	4	.68 μ F tantalum	.75	C3	443-1	1	SN7400N IC (integrated circuit)	.70
B3	25-123	1	2 μ F electrolytic	.60	C3	443-45	1	SN7408N IC	1.00
B4	25-54	2	10 μ F electrolytic	.30	C3	443-46	2	SN7402N IC	.85
					C3	443-57	1	MC3003P IC	.95
					C3	443-60	1	MC4012P IC	4.65
					C3	443-61	4	MC4016P IC	5.25



KEY PART No.	PARTS No.	PARTS Per Kit	DESCRIPTION	PRICE Each	KEY PART No.	PARTS No.	PARTS Per Kit	DESCRIPTION	PRICE Each
MISCELLANEOUS					PARTS FROM PACK #13 (Final Pack)				
D1	432-144	180	IC connector strip (extra included)	.01	340-1	1	1	Large bare wire (used only for soldering iron tip)	.05
D2	432-168	2	6-pin plug	.20	85-586-1	1	1	Programmer circuit board	10.85
D3	250-89	1	6-32 x 3/8" screw	.05					
D4	254-1	2	#6 lockwasher	.05					
D5	252-3	1	6-32 nut	.05					
D6	205-141	2	Plate	.15	NOTE: See Page 192 for "Replacement Parts and Price Information."				
D7	490-111	1	IC puller	.15					

PARTS PICTORIAL (Cont'd.)



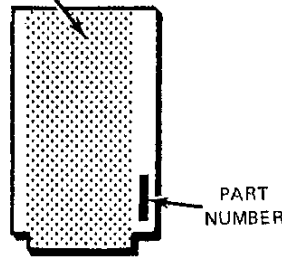
STEP-BY-STEP ASSEMBLY

- () Position the programmer circuit board as shown in the identification drawing. Then complete each step on the Pictorials.

The steps performed in this Pictorial are in the area of the circuit board.

START

IDENTIFICATION DRAWING



- (/) 220 Ω, 5% (red-red-brown-gold).
- (/) 1000 Ω (brown-black-red).

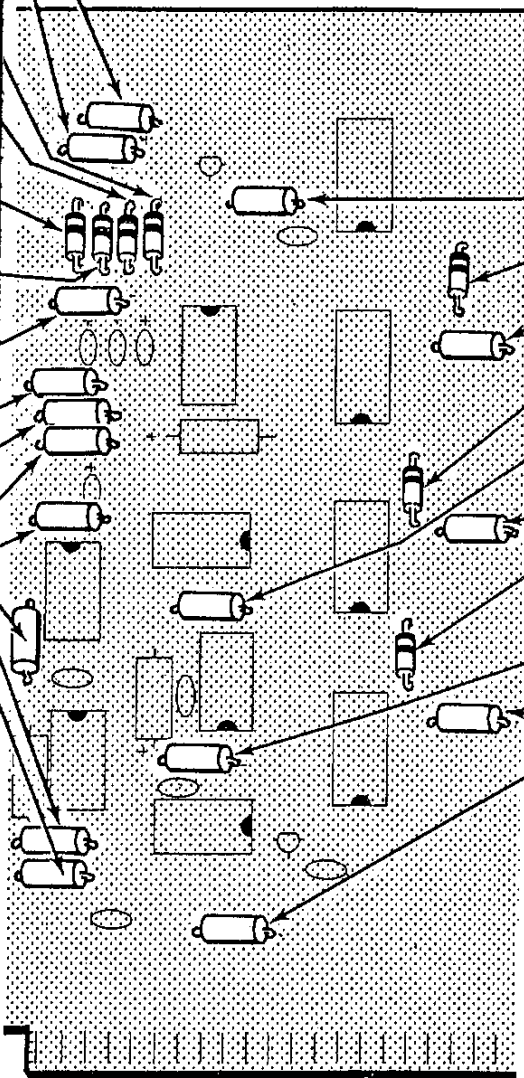
NOTE: When you install diodes, note the position of the banded end. See the "Diode Mounting" Detail (fold-out from Page 10).

- (/) 1N191 diode (#56-26, brown-white-brown) at D201.
- (/) 1N191 diode (#56-26, brown-white-brown) at D204.
- (/) 1N191 diode (#56-26, brown-white-brown) at D202.
- (/) 1N191 diode (#56-26, brown-white-brown) at D203.
- (/) 470 Ω, 5% (yellow-violet-brown-gold).
- (/) 560 Ω, 5% (green-blue-brown-gold).
- (/) 560 Ω, 5% (green-blue-brown-gold).
- (/) 560 Ω, 5% (green-blue-brown-gold).
- (/) 560 Ω, 5% (green-blue-brown-gold).
- (/) 560 Ω, 5% (green-blue-brown-gold).
- (/) 560 Ω, 5% (green-blue-brown-gold).
- (/) 560 Ω, 5% (green-blue-brown-gold).
- (/) 820 Ω, 5% (gray-red-brown-gold).

FOR GOOD SOLDERED CONNECTIONS, YOU MUST KEEP THE SOLDERING IRON TIP CLEAN... WIPE IT OFTEN WITH A DAMP SPONGE OR CLOTH.

Several circuit board holes will not be used. These are special "plated through" (lined with foil) holes that are used only to connect a foil on one side of the circuit board to the foil on the other side. When you solder component leads to the foil, be especially careful that solder does not flow into unused holes.

() Solder all leads to the foil and cut off the excess lead lengths.



CONTINUE

- (/) 1000 Ω (brown-black-red).
- (/) 1N191 diode (#56-26, brown-white-brown) at D207.
- (/) 1000 Ω (brown-black-red).
- (/) 1N191 diode (#56-26, brown-white-brown) at D206.
- (/) 470 Ω, 5% (yellow-violet-brown-gold).
- (/) 1000 Ω (brown-black-red).
- (/) 1N191 diode (#56-26, brown-white-brown) at D205.
- (/) 150 Ω, 5% (brown-green-brown-gold).
- (/) 1000 Ω (brown-black-red).
- (/) 2200 Ω, 5% (red-red-red-gold).
- () Solder all leads to the foil and cut off the excess lead lengths.

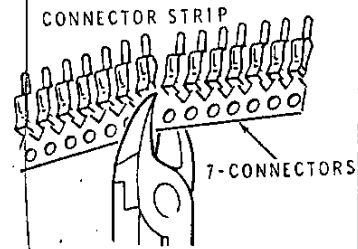
PICTORIAL 2-1

START



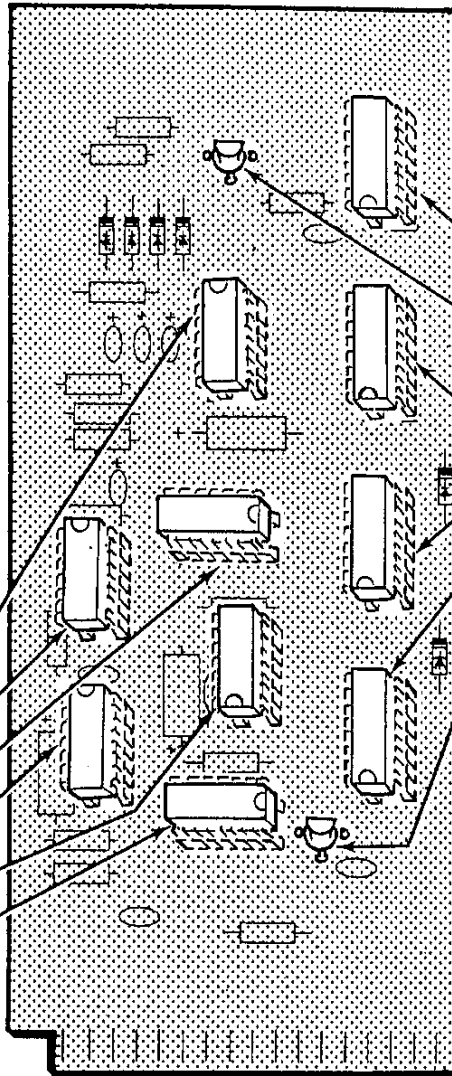
NOTE: In the following steps you will prepare and install the integrated circuits (IC's). Read and follow the instructions very closely to avoid improper installation.

- () Cut off twelve strips of seven IC connectors and set them aside.



NOTE: Refer to "IC Preparation and Installation" Detail (fold-out from Page 10), for information on installing IC's.

- () MC4012P IC (#443-60) at IC201.
- () SN7408N IC (#443-45) at IC208.
- () SN7402N IC (#443-46) at IC206.
- () SN7402N IC (#443-46) at IC209.
- () MC3003P IC (#443-57) at IC207.
- () SN7400N IC (#443-1) at IC210.



CONTINUE



- () Cut off eight strips of eight IC connectors.
- () MC4016P IC (#443-61) at IC205.
- () 2N3393 transistor (#417-118) at Q201. NOTE: When you install transistors, see the "Transistor Mounting" Detail (fold-out from Page 10).
- () MC4016P IC (#443-61) at IC204.
- () MC4016P IC (#443-61) at IC203.
- () MC4016P IC (#443-61) at IC202.
- () 2N3393 transistor (#417-118) at Q202.

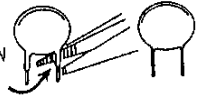
PICTORIAL 2-2

START



(/) .1 μ F disc.

REMOVE INSULATION ON LEADS



NOTE: When you install tantalum and electrolytic capacitors, note the position of the positive (+) lead. See the "Capacitor Mounting" Detail (fold-out from Page 10).

(/) .68 μ F tantalum.

(/) .68 μ F tantalum.

(/) .68 μ F tantalum.

(/) .68 μ F tantalum.

(/) 2 μ F electrolytic.

(/) .1 μ F disc.

(/) 10 μ F electrolytic.

(/) .1 μ F disc.

(/) .1 μ F disc.

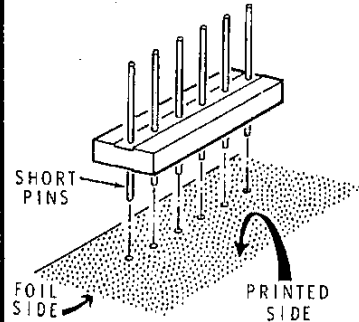
(/) 10 μ F electrolytic.

(/) .1 μ F disc.

(/) .1 μ F disc.

(/) Solder all leads to the foil and cut off the excess lead lengths.

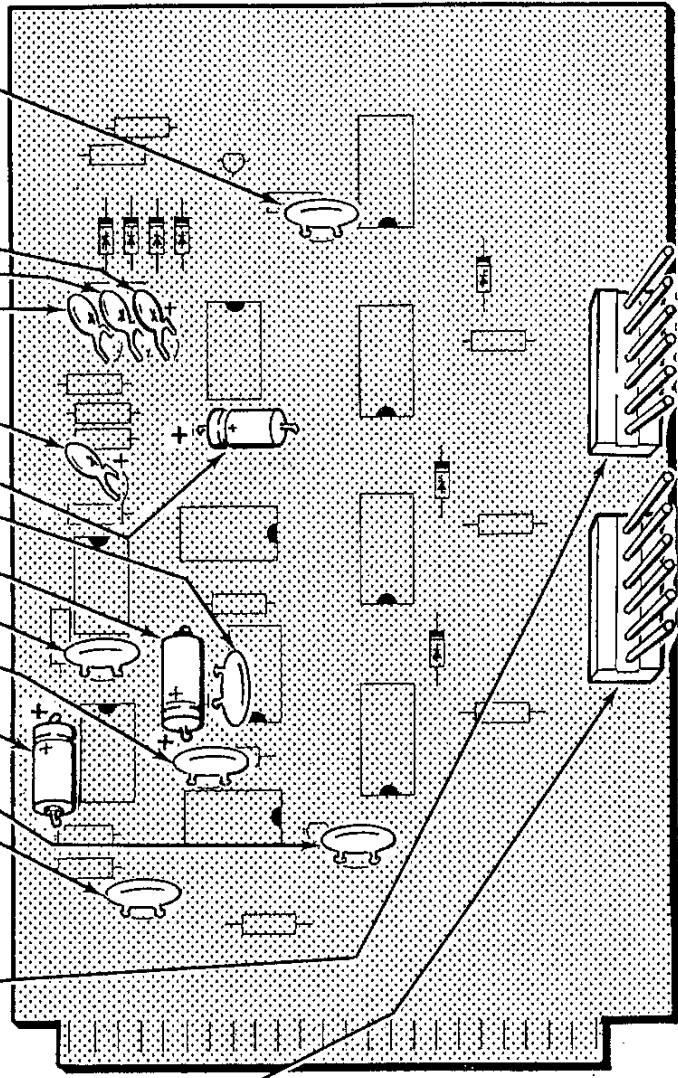
() 6-pin plug. Solder all six pins to the foil.



() 6-pin plug. Solder all six pins to the foil.

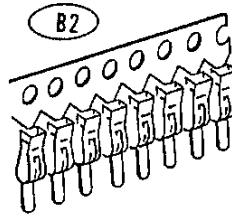
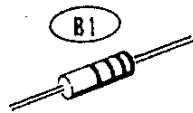
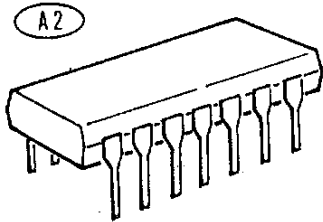
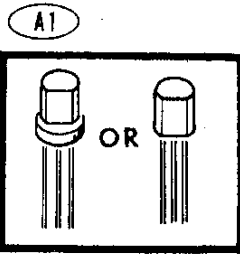
This completes the assembly of the circuit board. Check all connections to be sure they are soldered and that no solder bridges exist between foils. Set the circuit board aside temporarily.

FINISH



PICTORIAL 2-3

PARTS PICTORIAL

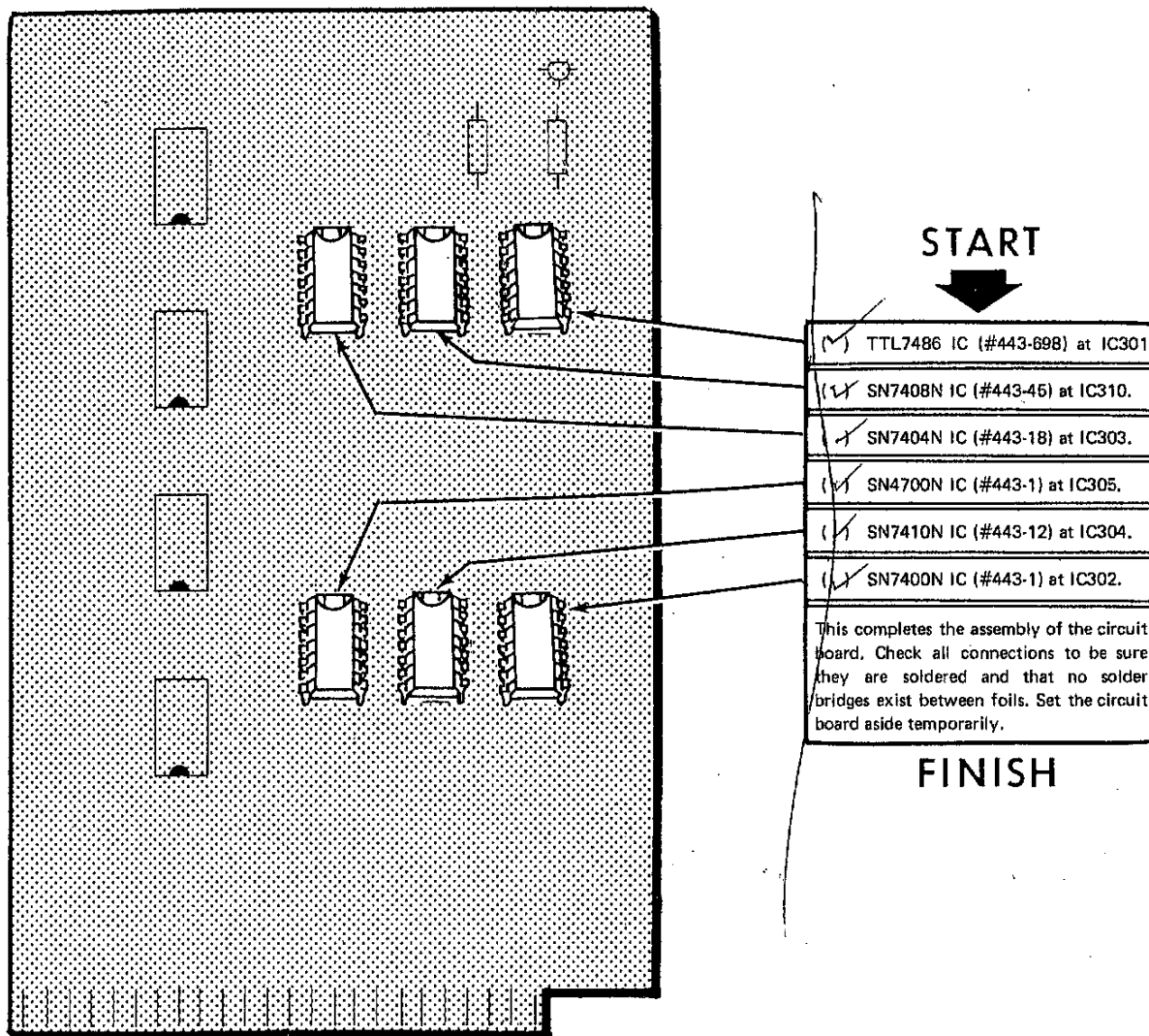


PRELOAD DECODER CIRCUIT BOARD

PARTS LIST

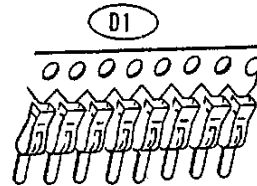
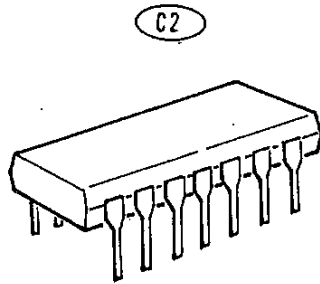
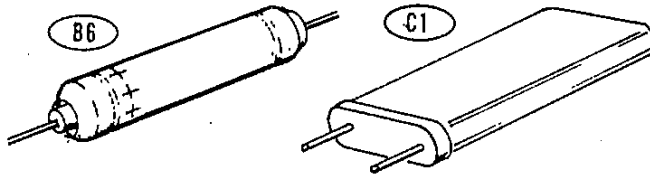
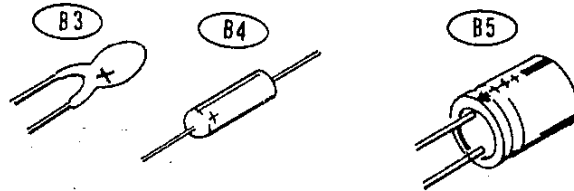
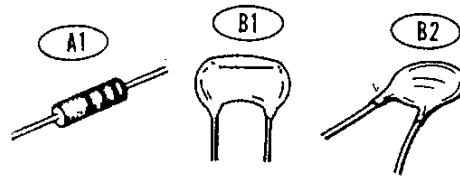
Refer to the "Pack Index Sheet" and remove the pack 3 parts from the carton stamped "PKS #1-8." Then check each part against the following Parts List. The key numbers correspond to the numbers on the "Preload Decoder Circuit Board Parts Pictorial."

KEY PART No.	PARTS No.	PARTS Per Kit	DESCRIPTION	PRICE Each	KEY PART No.	PARTS No.	PARTS Per Kit	DESCRIPTION	PRICE Each
TRANSISTOR-IC's					Transistor-IC's (cont'd.)				
NOTE: Transistors and IC's are marked for identification in one of the following four ways.					A2	443-45	1	SN7408N IC	1.00
1. Part number.					A2	443-698	2	TTL7486 IC	1.60
2. Type number. (In IC's this refers only to the numbers; the letters may be different.)					MISCELLANEOUS				
3. Part number and type number.					B1	1-9	2	1000 Ω resistor (brown-black-red)	.15
4. Part number with a type number other than the one listed.					B2	432-144	154	IC connector strip (extra included)	.01
A1	417-118	1	2N3393 transistor	.40	PART FROM PACK #13 (Final Pack)				
A2	443-1	3	SN7400N IC	.70	85-587-1	1	Preload decoder circuit board	10.45	
A2	443-12	2	SN7410N IC	.70	NOTE: See Page 192 for "Replacement Parts and Price Information."				
A2	443-18	2	SN7404N IC	.75					



PICTORIAL 3-2

PARTS PICTORIAL



GENERATOR-DIVIDER- OSCILLATOR CIRCUIT BOARD

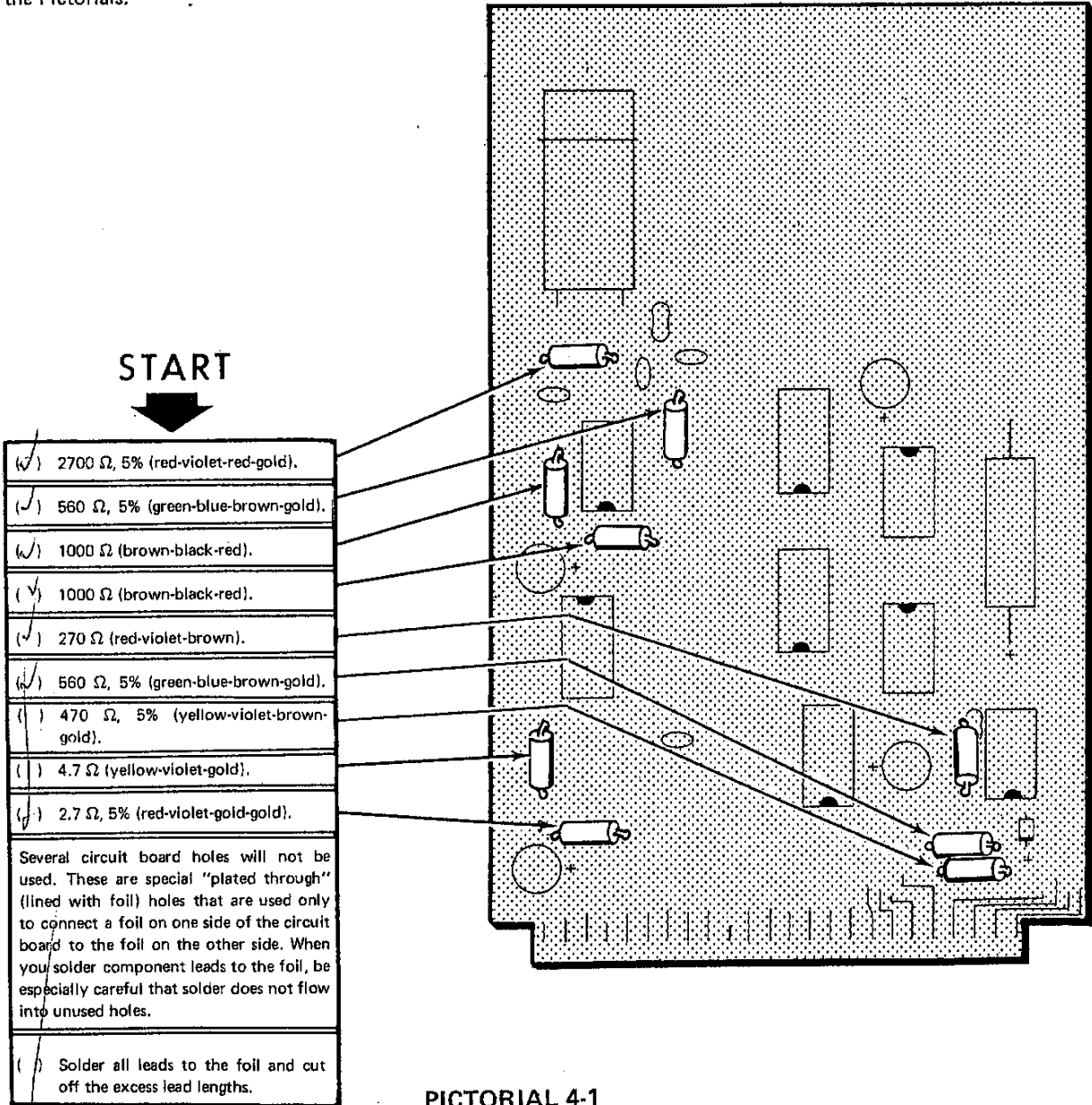
PARTS LIST

Refer to the "Pack Index Sheet" and remove the pack 4 parts from the carton stamped "PKS#1-B." Then check each part against the following Parts List. The key numbers correspond to the numbers on the "Parts Pictorial."

KEY PART No.	PARTS No.	PER KIT	DESCRIPTION	PRICE Each	KEY PART No.	PARTS No.	PER KIT	DESCRIPTION	PRICE Each
RESISTORS, 1/2-WATT					CRYSTAL-IC's				
5%					C1	404-43	1	100 kHz crystal	6.75
A1	1-143	1	2.7 Ω (red-violet-gold-gold)	.15	NOTE: IC's are marked for identification in one of the following four ways.				
A1	1-157	1	470 Ω (yellow-violet-brown-gold)	.15	1. Part number.				
A1	1-95	2	560 Ω (green-blue-brown-gold)	.15	2. Type number. (In IC's this refers only to the numbers; the letters may be different.)				
A1	1-158	1	2700 Ω (red-violet-red-gold)	.15	3. Part number and type number.				
10%					4. Part number with a type number other than the one listed.				
A1	1-129	1	4.7 Ω (yellow-violet-gold)	.15	C2	443-16	1	SN7476N	1.35
A1	1-42	1	270 Ω (red-violet-brown)	.15		443-1	2	SN7400N	.70
A1	1-9	2	1000 Ω (brown-black-red)	.15		443-65	1	SN7427	1.20
CAPACITORS						443-66	3	SN74192	5.00
B1	20-100	1	30 pF mica	.25		443-68	1	SN74H10N	.90
B2	21-108	3	180 pF disc	.15	MISCELLANEOUS				
B2	21-95	1	.1 μ F disc	.25	D1	432-144	142	IC connector strip (extra included)	.01
B3	25-221	1	2.2 μ F tantalum	.60		340-2	1	Bare wire	.05/ft
B4	25-210	1	.22 μ F tantalum	1.15	PART FROM PACK #13 (final Pack)				
B5	25-116	4	50 μ F vertical electrolytic	.75		85-588-1	1	Generator-divider-oscillator circuit board	10.20
B6	25-99	1	150 μ F tubular electrolytic	.70	NOTE: See Page 192 for "Replacement Parts and Price Information."				

STEP-BY-STEP ASSEMBLY

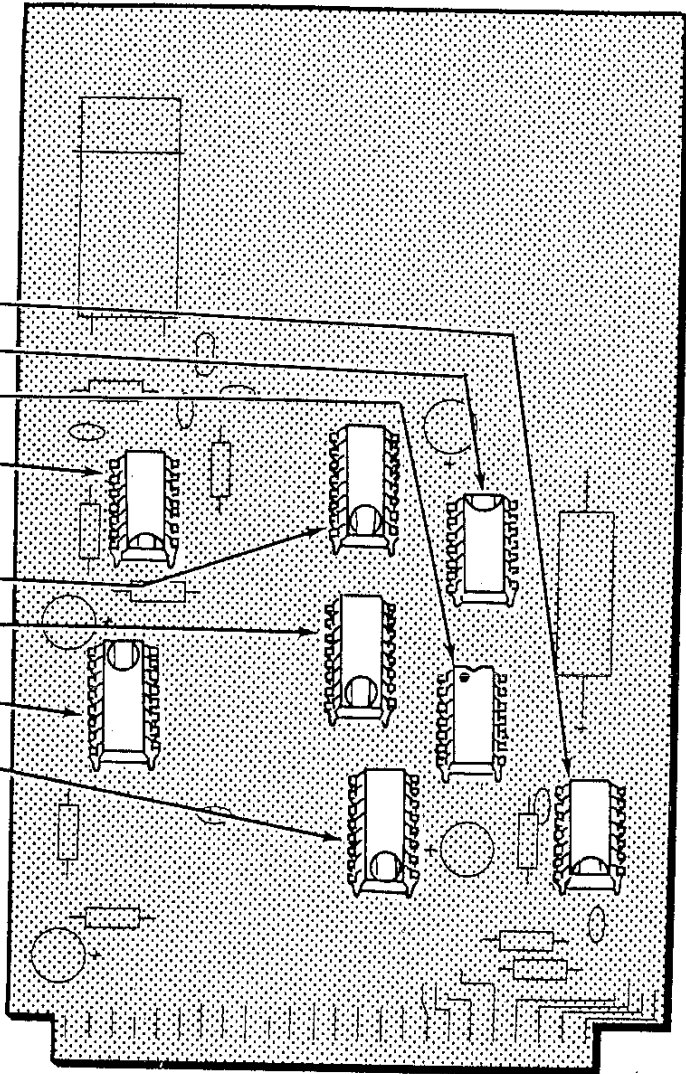
() Position the generator-divider-oscillator circuit board as shown in Pictorial 4-1. Then complete each step on the Pictorials.



START



- () Cut off eight strips of seven IC connectors and set them aside.
- NOTE: Refer to "IC Preparation and Installation" Detail (fold-out from Page 10), for information on installing IC's.
- () SN7400N IC (#443-1) at IC408.
- () SN7427 IC (#443-65) at IC406.
- () SN74H10N IC (#443-68) at IC407.
- () SN7400N IC (#443-1) at IC401.
- () Cut off eight strips of eight IC connectors and set them aside.
- () SN74192 IC (#443-66) at IC403.
- () SN74192 IC (#443-66) at IC404.
- () SN7476N IC (#443-16) at IC402.
- () SN74192 IC (#443-66) at IC405.

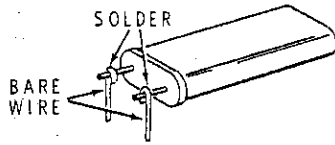


PICTORIAL 4-2

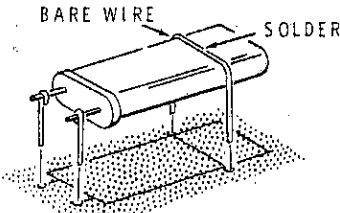
START



- () Bend and solder a 3/4" length of bare wire to each pin of the 100 kHz crystal (#404-43).



- () Crystal with 1-3/4" bare wire. Solder the ends of the bare wires to the foil and cut off the excess lead lengths. Then solder the bare wire to the metal case of the crystal only at the indicated location. This assures a good electrical ground.



- (✓) 30 pF mica.

- () 180 pF disc.



- () 180 pF disc.

- (✓) 180 pF disc.

NOTE: When you install electrolytic capacitors, note the position of the positive (+) lead. See the "Capacitor Mounting" Detail (fold-out from Page 10).

- (✓) 50 μ F electrolytic.

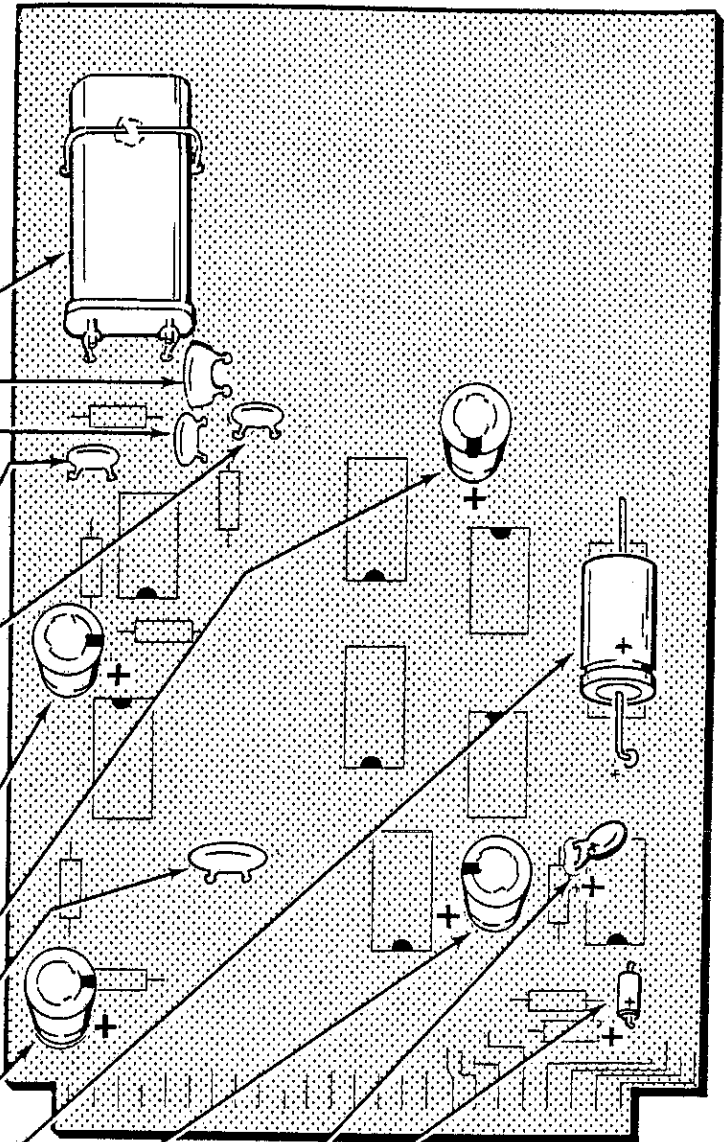
- (✓) 50 μ F electrolytic.

- (✓) .1 μ F disc.

- (✓) 50 μ F electrolytic.

- (✓) 150 μ F electrolytic.

- (✓) 50 μ F electrolytic.



CONTINUE

- (✓) .22 μ F tantalum.

- (✓) 2.2 μ F tantalum.

- () Solder all leads to the foil and cut off the excess lead lengths.

This completes the assembly of the circuit board. Check all connections to be sure they are soldered and that no solder bridges exist between foils. Set the circuit board aside temporarily.

PICTORIAL 4-3

FINISH



TUNER/PHASE-LOCK-LOOP CIRCUIT BOARD

PARTS LIST

Refer to the "Pack Index Sheet" and remove the pack 5 parts from the carton stamped "PKS #1-8." Then check each part against the following Parts List. The key numbers correspond to the numbers on the "Tuner/Phase-Lock-Loop Circuit Board Parts Pictorial" (fold-out from Page 37).

KEY PART No.	KEY PART No.	PARTS Per Kit	DESCRIPTION	PRICE Each	KEY PART No.	KEY PART No.	PARTS Per Kit	DESCRIPTION	PRICE Each
RESISTORS, 1/2-WATT,					10% (cont'd.)				
5%					A1	1-9	4	1000 Ω (brown-black-red)	.15
A1	1-147	2	220 Ω (red-red-brown-gold)	.15	A1	1-69	1	18 k Ω (brown-gray-orange)	.15
A1	1-157	2	470 Ω (yellow-violet-brown-gold)	.15	CAPACITORS				
A1	1-79	1	820 Ω (gray-red-brown-gold)	.15	B1	21-23	1	420 pF disc	.15
A1	1-81	1	1500 Ω (brown-green-red-gold)	.15	B1	21-46	4	.005 μ F disc	.15
A1	1-144	1	1800 Ω (brown-gray-red-gold)	.15	B1	21-143	4	.05 μ F disc	.30
A1	1-57	1	2200 Ω (red-red-red-gold)	.15	B2	25-123	1	2 μ F tubular electrolytic	.60
A1	1-122	1	3300 Ω (orange-orange-red-gold)	.15	B3	27-85	2	.22 μ F Mylar	.30
A1	1-43	2	4700 Ω (yellow-violet-red-gold)	.15	DIODE-TRANSISTORS-IC's				
A1	1-113	1	5600 Ω (green-blue-red-gold)	.15	C1	56-26	2	1N191 diode (brown-white-brown)	.40
A1	1-133	1	15 k Ω (brown-green-orange-gold)	.15	NOTE: Transistors and IC's are marked for identification in one of the following four ways:				
A1	1-124	1	27 k Ω (red-violet-orange-gold)	.15	1. Part number.				
10%					2. Type number. (In IC's this refers only to the numbers; the letters may be different.)				
A1	1-42	1	270 Ω (red-violet-brown)	.15	3. Part number and type number.				
					4. Part number with a type number other than the one listed.				
					C2	417-94	1	2N3416 transistor	1.00
					C2	417-118	3	2N3393 transistor	.40
					C2	417-201	1	X29A829 transistor	.50

KEY PART No.	PARTS No.	DESCRIPTION	PRICE Each	KEY PART No.	PARTS No.	DESCRIPTION	PRICE Each
Diode-Transistors-IC's (cont'd.)				MISCELLANEOUS			
C3	443-1	1 SN7400N IC	.70				
C3	443-38	1 MC1023P IC	5.25	343-12	1	Small shielded cable	.10/ft
C3	443-39	1 MC1034P IC	6.75	343-9	1	Large shielded cable	.15/ft
C3	443-56	1 MC1032 IC	6.00	344-59	1	White wire	.05/ft
C3	443-62	1 MC4044P IC	4.60				
PLUG-SOCKET-CONNECTORS				PART FROM PACK #13 (Final Pack)			
D1	438-4	2 Phono plug	.15	85-589-1	1	Tuner/phase-lock-loop circuit board	5.85
D2	434-186	1 Phono socket	.15	E1	110-61	*FM tuner	45.40
D3	432-144	80 IC connector strip (extra included)	.01				
D4	432-66	2 Push-on connector	.15				

NOTE: See Page 192 for "Replacement Parts and Price Information."

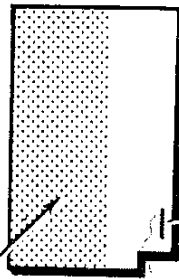
*If your old tuner is repairable, you can return it to the Heath Company for a credit or rebate against the cost of the replacement tuner (after you get the replacement tuner if you prefer). You can also return it to a Heathkit Electronic Center.

STEP-BY-STEP ASSEMBLY

- () Position the tuner/phase-lock-loop circuit board as shown in the identification drawing. Then complete each step on the Pictorials.



IDENTIFICATION
DRAWING

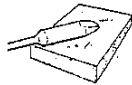


PART
NUMBER

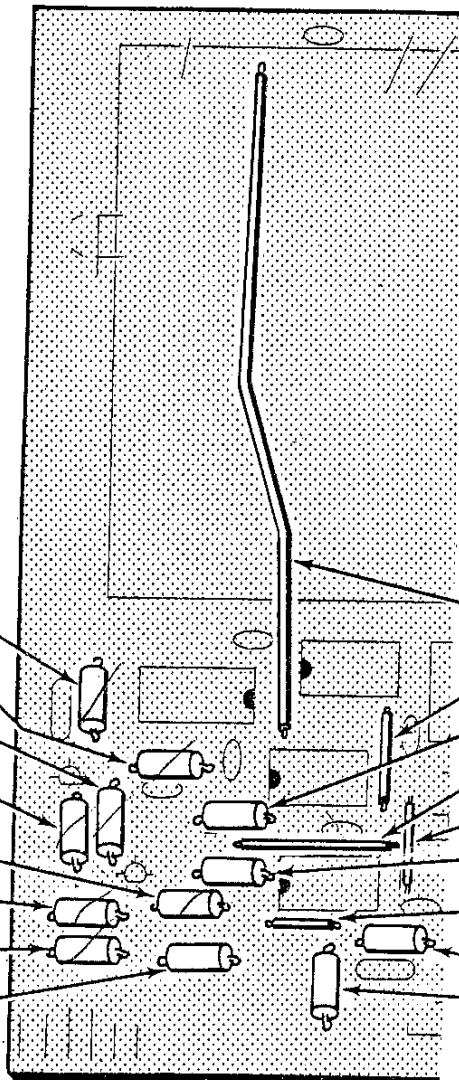
The steps performed in this Pictorial are in
this area of the circuit board.

START

FOR GOOD SOLDERED CONNECTIONS, YOU MUST KEEP THE SOLDERING IRON TIP CLEAN... WIPE IT OFTEN WITH A DAMP SPONGE OR CLOTH.



<input type="checkbox"/>	18 k Ω (brown-gray-orange).
<input type="checkbox"/>	1800 Ω , 5% (brown-gray-red-gold).
<input type="checkbox"/>	1000 Ω (brown-black-red).
<input checked="" type="checkbox"/>	15 k Ω , 5% (brown-green-orange-gold).
<input checked="" type="checkbox"/>	1000 Ω (brown-black-red).
<input checked="" type="checkbox"/>	1000 Ω (brown-black-red).
<input checked="" type="checkbox"/>	270 Ω (red-violet-brown).
<input checked="" type="checkbox"/>	3300, 5% (orange-orange-red-gold).
<input type="checkbox"/>	Solder all leads to the foil and cut off the excess lead lengths.



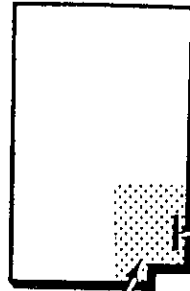
CONTINUE

NOTE: When you are instructed to install a jumper, cut the white hookup wire to the length specified in the step and remove 1/4" of insulation from both ends of the wire.

<input checked="" type="checkbox"/>	5" jumper.
<input checked="" type="checkbox"/>	1-1/8" jumper.
<input checked="" type="checkbox"/>	820 Ω , 5% (gray-red-brown-gold).
<input checked="" type="checkbox"/>	1-1/2" jumper.
<input checked="" type="checkbox"/>	1" jumper.
<input checked="" type="checkbox"/>	1000 Ω (brown-black-red).
<input checked="" type="checkbox"/>	1" jumper.
<input checked="" type="checkbox"/>	4700 Ω , 5% (yellow-violet-red-gold).
<input checked="" type="checkbox"/>	220 Ω , 5% (red-red-brown-gold).
<input checked="" type="checkbox"/>	Solder all leads to the foil and cut off the excess lead lengths.

PICTORIAL 5-1

IDENTIFICATION
DRAWING



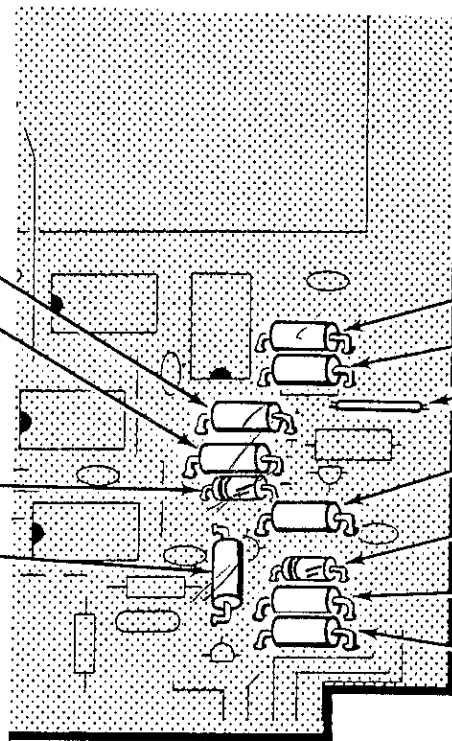
PART
NUMBER

The steps performed in this Pictorial are in
this area of the circuit board.

START



(✓) 1500 Ω, 5% (brown-green-red-gold).
() 27 kΩ, 5% (red-violet-orange-gold).
NOTE: When you install diodes, note the position of the banded end. See the "Diode Mounting" Detail (fold-out from Page 10).
(✓) 1N191 diode (#56-26, brown-white-brown) at D501.
(✓) 4700 Ω, 5% (yellow-violet-red-gold).
() Solder all leads to the foil and cut off the excess lead lengths.

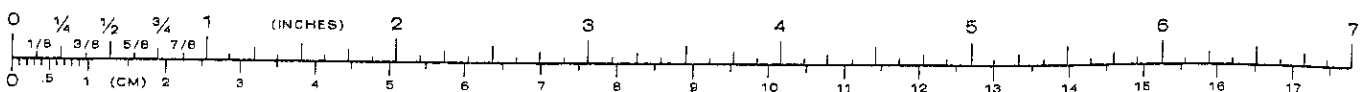


CONTINUE

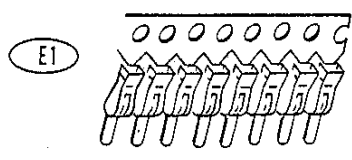
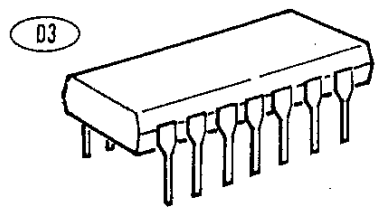
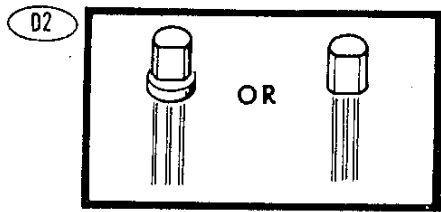
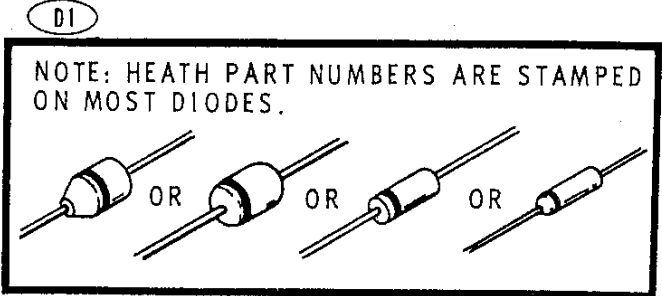
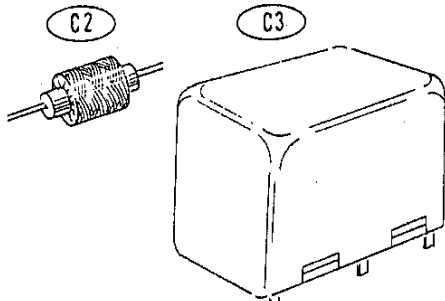
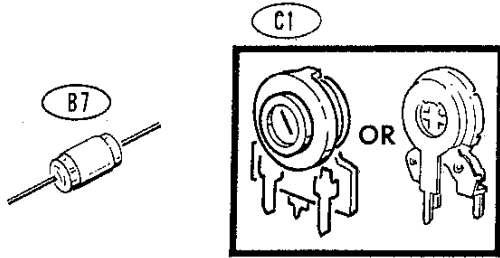
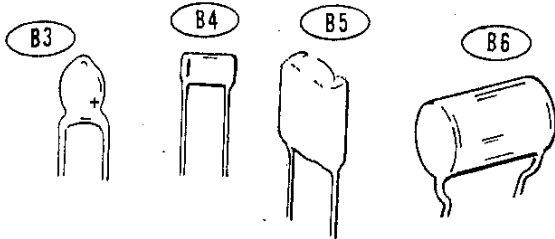
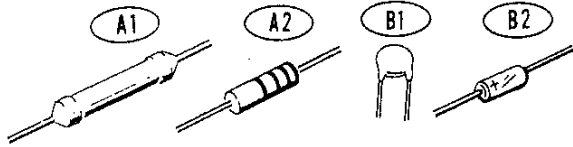


(✓) 220 Ω, 5% (red-red-brown-gold).
(✓) 5600 Ω, 5% (green-blue-red-gold).
(✓) 7/8" jumper.
(✓) 470 Ω, 5% (yellow-violet-brown-gold).
(✓) 1N191 diode (#56-26, brown-white-brown) at D502.
() 470 Ω, 5% (yellow-violet-brown-gold).
() 2200 Ω, 5% (red-red-red-gold).
() Solder all leads to the foil and cut off the excess lead lengths.

PICTORIAL 5-2



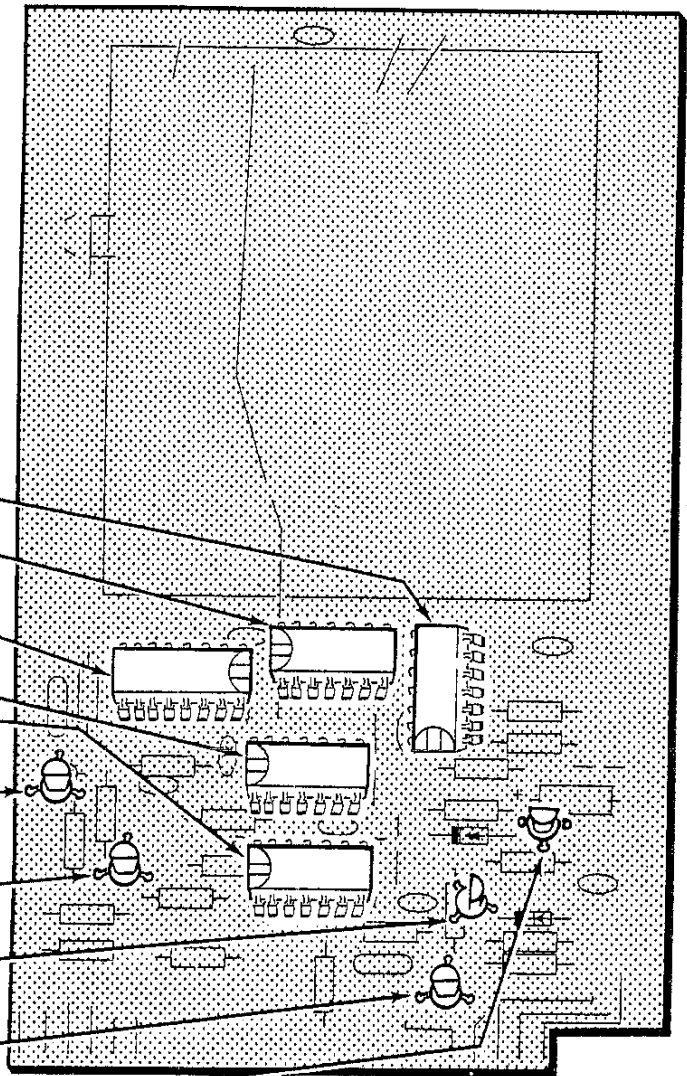
PLL MULTIPLEX CIRCUIT BOARD PARTS PICTORIAL



START



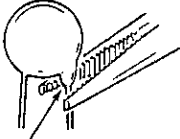
- () Cut off eight strips of seven IC connectors and set them aside.
- () Cut off two strips of eight IC connectors and set them aside.
- NOTE: Refer to "IC Preparation and Installation" Detail (fold-out from Page 10) for information on installing IC's.
- (✓) MC1023P IC (#443-38) at IC501.
- (✓) MC1034P IC (#443-39) at IC502.
- () MC1032 IC (#443-56) at IC503. Use the two strips of eight IC connectors.
- (✓) SN7400N IC (#443-1) at IC504.
- (✓) MC4044P IC (#443-62) at IC505.
- () X29A829 transistor (#417-201) at Q503. NOTE: When you install transistors, see the "Transistor Mounting," Detail (fold-out from Page 10).
- (✓) 2N3393 transistor (#417-118) at Q502.
- (✓) 2N3393 transistor (#417-118) at Q501.
- () 2N3416 transistor (#417-94) at Q505.
- (✓) 2N3393 transistor (#417-118) at Q504.

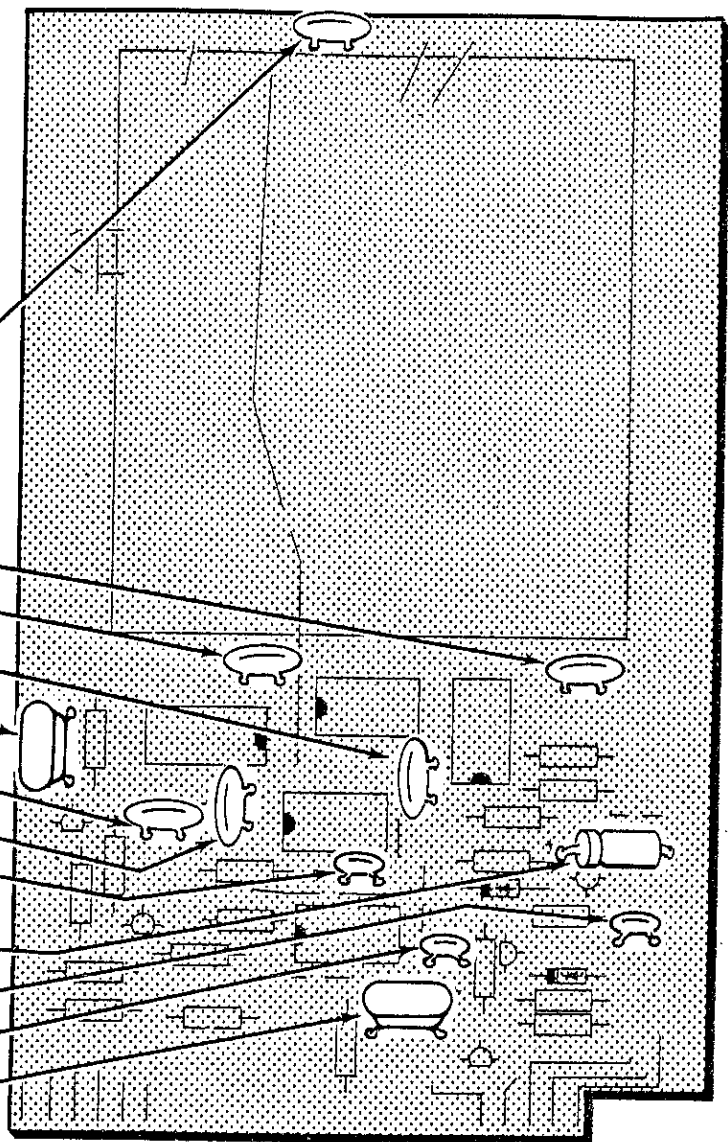


PICTORIAL 5-3

START



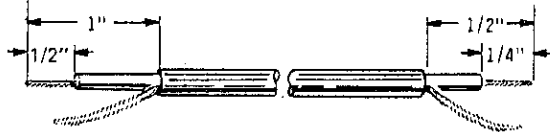
- (/) .05 μ F disc.

 REMOVE INSULATION FROM BOTH LEADS
- (✓) .005 μ F disc.
- (✓) .05 μ F disc.
- (✓) .05 μ F disc.
- (✓) .22 μ F Mylar.
- (✓) .05 μ F disc.
- (/) .005 μ F disc.
- (✓) 420 pF disc.
- (✓) 2 μ F electrolytic. Note the position of the positive (+) lead. See the "Capacitor Mounting" Detail (fold-out from Page 10).
- (✓) .005 μ F disc.
- (/) .005 μ F disc.
- (/) .22 μ F Mylar.
- (/) Solder all leads to the foil and cut off the excess lead lengths.



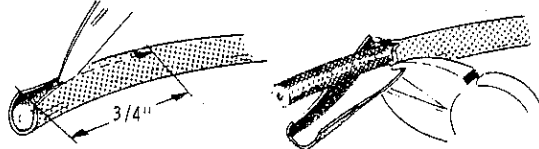
PICTORIAL 5-4

PROCEED TO NEXT PAGE.

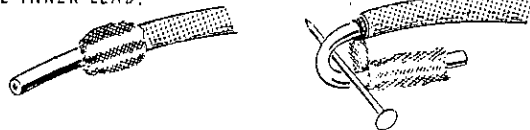
CUT THE CABLE ACCORDING TO THE DIMENSIONS BELOW. PREPARE EACH END AS SHOWN.



TAKING CARE NOT TO CUT THE OUTER SHIELD OF VERY THIN WIRES, REMOVE THE OUTER INSULATION.



PUSH BACK THE SHIELD. THEN MAKE AN OPENING IN THE SHIELD AND BEND OVER AS SHOWN. PICK OUT THE INNER LEAD.



HOLD THE CABLE WITH A PAIR OF PLIERS TO PREVENT PULLING THE INNER LEAD OUT OF THE CABLE, AND REMOVE THE INNER INSULATION AND TWIST THE SMALL WIRES OF THE SHIELD. APPLY SMALL AMOUNTS OF SOLDER TO THE END OF THE SHIELD AND THE INNER LEAD.



Detail 5-5A

TWIST AND SOLDER

The steps performed in this Pictorial are in this area of the circuit board.



IDENTIFICATION DRAWING

PART NUMBER

CONTINUE

INSERT THE INNER LEAD OF THE CABLE THROUGH THE PLUG AND WRAP THE SHIELD AROUND THE PLUG.

SOLDER

APPLY HEAT TO THE TIP OF THE PIN ONLY LONG ENOUGH FOR THE SOLDER TO BE DRAWN UP INTO THE PIN BY CAPILLARY ACTION. CUT OFF EXCESS WIRE FROM THE TIP OF THE PIN. SOLDER THE SHIELD TO THE PLUG.

Detail 5-5B

EXTENDER CABLE

() Prepare the ends of an 8" length of small shielded cable as shown in Detail 5-5A.

() Install a phono plug on the end of the cable, with the longest shield, as shown in Detail 5-5B.

() Install a phono socket on the free end of this cable as follows:

SOLDER INNER LEAD TO CENTER LUG

SOLDER SHIELD LEAD TO SIDE

() Plug the phono plug coming from the circuit board into the socket of the "extender cable."

START

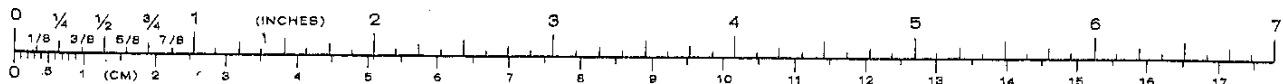
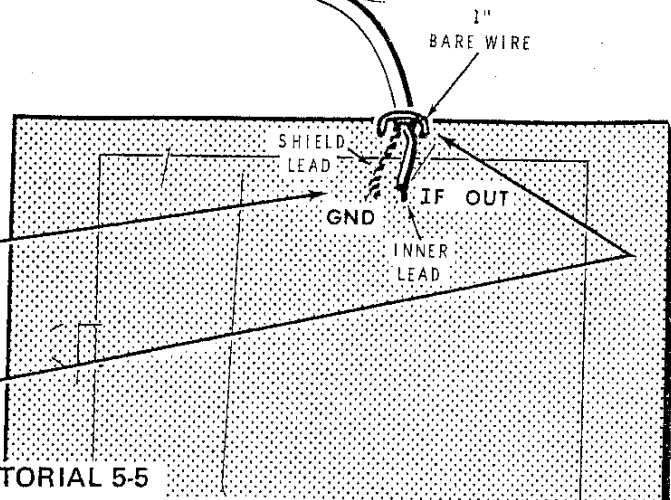
() Prepare the ends of a 6" length of small shielded cable as shown in Detail 5-5A.

() Install a phono plug on the end of the cable, with the longest shield, as shown in Detail 5-5B.

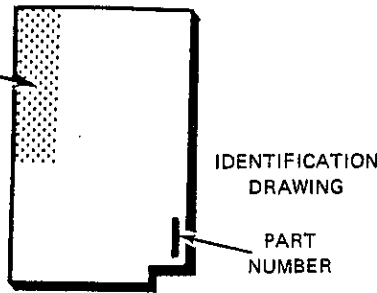
() Solder the inner lead and shield lead at the free end of this cable into the indicated holes in the circuit board. Cut off any excess lead lengths.

() 1" bare wire over cable. Solder both ends to the foil and cut off the excess lengths. Prepare the bare wire by removing 1" of insulation from the hookup wire. Then cut off the bare wire.

PICTORIAL 5-5



The steps performed in this Pictorial are in this area of the circuit board.



CONTINUE

(✓) Install a push-on connector on the inner lead at the free end of each shielded cable as shown.

CONNECTOR
INNER LEAD
CRIMP ON INSULATION
INSERT WIRE AND SOLDER

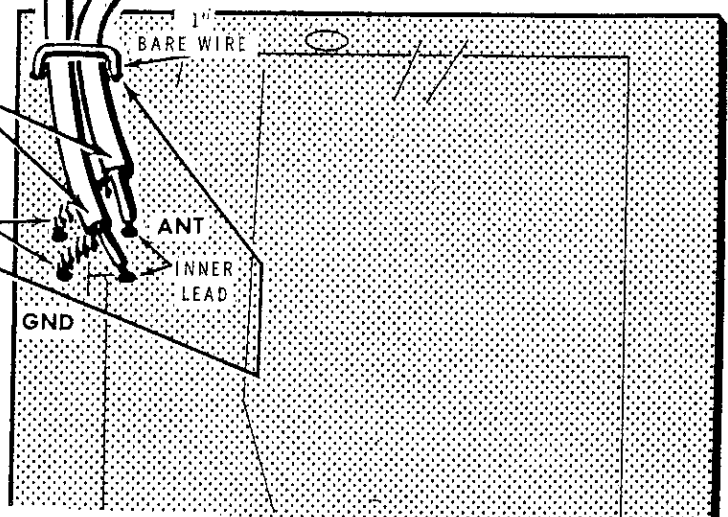
(✓) Solder the shield lead of both cables together spacing the cables as shown. Cut off any excess shield lead.

SOLDER SHIELD LEADS TOGETHER

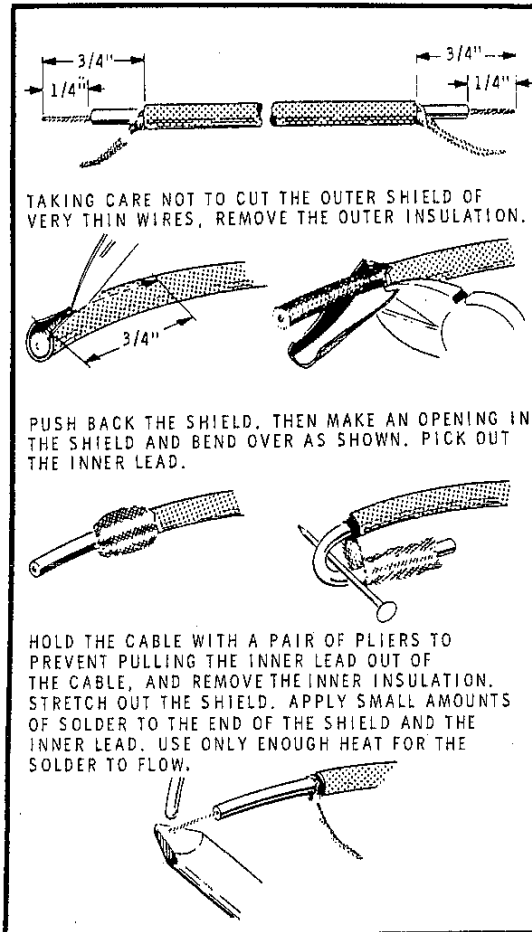
3/8"

START

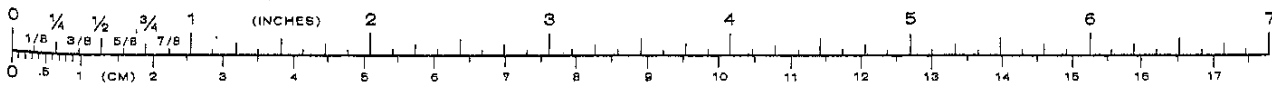
- (✓) Prepare the ends of two 6-1/2" lengths of large shielded cable as shown in Detail 5-6A.
- (✓) Solder the inner lead and shield lead of either end of both cables into the indicated holes of the circuit board. Cut off any excess lead lengths.
- (✓) 1" bare wire over both cables. Solder both ends to the foil and cut off the excess lengths.



PICTORIAL 5-6



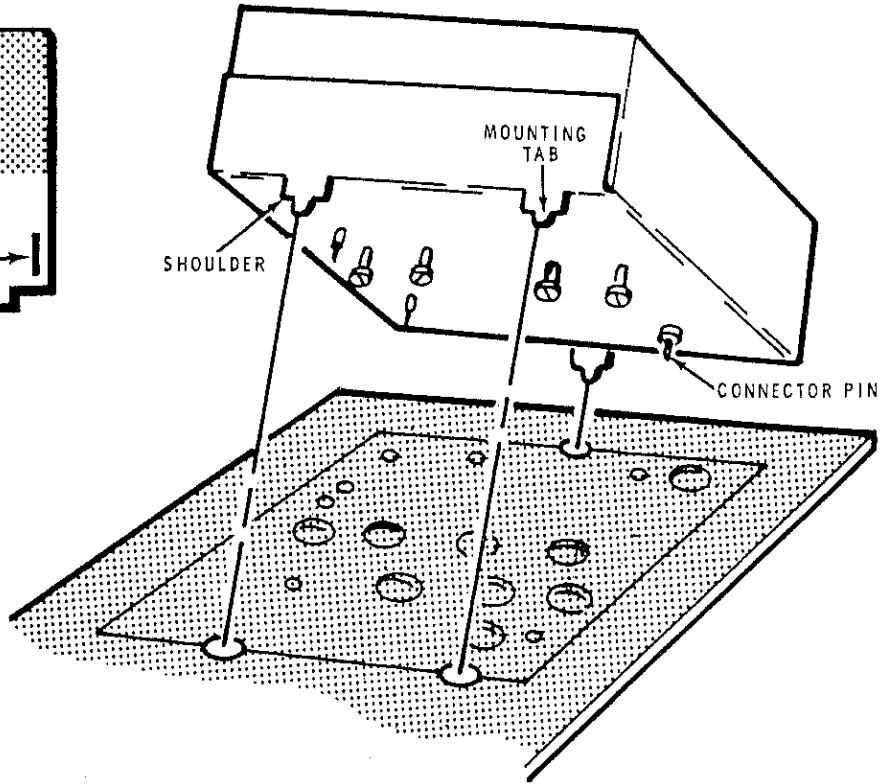
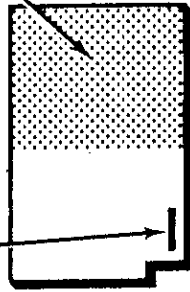
Detail 5-6A



The steps performed in this Pictorial are in this area of the circuit board.

IDENTIFICATION DRAWING

PART NUMBER



START

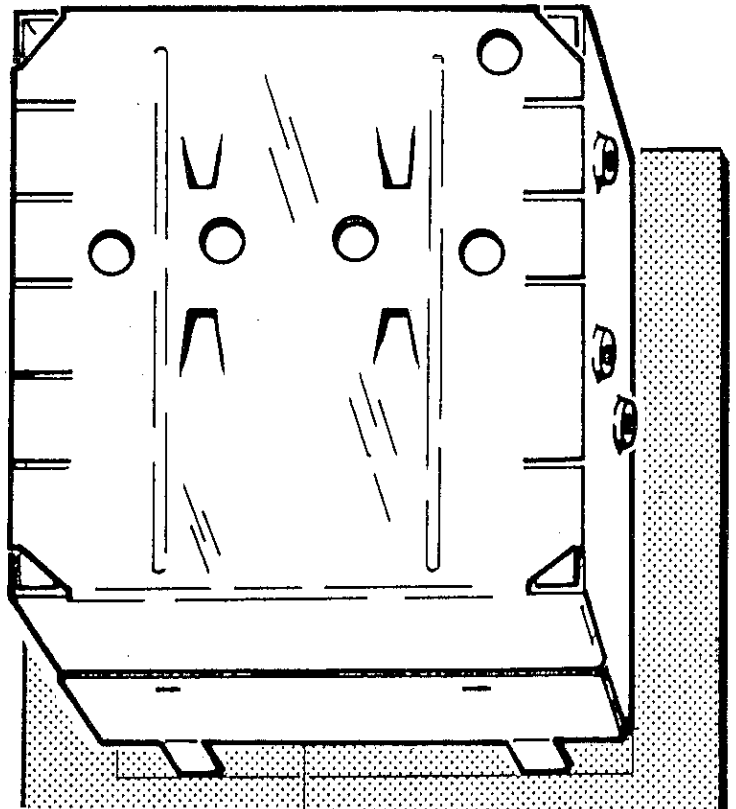


1 FM tuner (#110-61). Position the tuner over its outline on the circuit board with the three mounting tabs of the tuner aligned with their holes in the circuit board. Install the tuner by pushing the mounting tabs into their holes in the circuit board. The shoulder portion of the mounting tabs should be down against the circuit board. Carefully straighten any bent mounting tab or connector pin that prevents easy installation.

2 Carefully turn the circuit board over and solder all mounting tabs and connector pins to the foil.

This completes the assembly of the circuit board. Check all connections to be sure they are soldered and that no solder bridges exist. Set the circuit board aside temporarily.

FINISH



PICTORIAL 5-7

I-F CIRCUIT BOARD

PARTS LIST

Refer to the "Pack Index Sheet" and remove the pack 6 parts from the carton stamped "PKS #1-8." Then check each part against the following Parts List. The key numbers correspond to the numbers on the "I-F Circuit Board Parts Pictorial" (fold-out from Page 38).

KEY PART		PARTS	DESCRIPTION	PRICE	KEY PART		PARTS	DESCRIPTION	PRICE
No.	No.	Per Kit		Each	No.	No.	Per Kit		Each
FILM RESISTORS, 1/2-WATT, 5%					Film Resistors, 1/2-Watt, 5% (cont'd.)				
A1	4-57	5	100 Ω (brown-black-brown-gold)	.15	A1	4-37	3	6800 Ω (blue-gray-red-gold)	.15
A1	4-53	1	270 Ω (red-violet-brown)	.15	A1	4-22	6	10 k Ω (brown-black-orange-gold)	.15
A1	4-73	1	330 Ω (orange-orange-brown-gold)	.15	A1	4-23	1	22 k Ω (red-red-orange-gold)	.15
A1	4-12	1	390 Ω (orange-white-brown-gold)	.15	A1	4-26	1	33 k Ω (orange-orange-orange-gold)	.15
A1	4-13	6	510 Ω (green-brown-brown-gold)	.15	A1	4-79	1	36 k Ω (orange-blue-orange-gold)	.15
A1	4-14	1	620 Ω (blue-red-brown-gold)	.15	A1	4-27	1	47 k Ω (yellow-violet-orange-gold)	.15
A1	4-15	4	1000 Ω (brown-black-red-gold)	.15	A1	4-64	1	68 k Ω (blue-gray-orange-gold)	.15
A1	4-41	1	1500 Ω (brown-green-red-gold)	.15	A1	4-34	1	100 k Ω (brown-black-yellow-gold)	.15
A1	4-17	4	2200 Ω (red-red-red-gold)	.15	A1	4-6	1	1 M Ω (brown-black-green-gold)	.15
A1	4-65	2	2400 Ω (red-yellow-red-gold)	.15	CAPACITORS				
A1	4-20	2	4700 Ω (yellow-violet-red-gold)	.15	Mica				
A1	4-36	1	5100 Ω (green-brown-red-gold)	.15	B1	20-161	1	68 pF	.45
A1	4-54	1	5600 Ω (green-blue-red-gold)	.15	B1	20-131	1	360 pF	.45
					B1	20-128	1	470 pF	.55



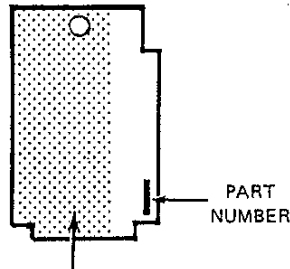
KEY PART		PARTS	DESCRIPTION	PRICE	KEY PART		PARTS	DESCRIPTION	PRICE
No.	No.				No.	No.			
Disc					Diode-Transistors-IC's (cont'd.)				
B2	21-33	1	3.3 pF	.15	D1	56-74	1	MZ2362	.65
B2	21-3	1	10 pF	.15	D1	56-56	2	1N4149 diode	.30
B2	21-60	1	18 pF	.15	D1	56-26	10	1N191 diode (brown-white-brown)	.40
B2	21-5	2	20 pF	.15	D1	56-59	1	1N750A zener diode (violet-green-black-brown)	1.00
B2	21-25	1	.0013 μF (1300)	.15	D2	417-118	3	2N3393 transistor	.40
B2	21-140	6	.001 μF	.15	D2	417-91	2	2N3391 transistor	.85
B2	21-143	22	.05 μF	.30	D2	417-201	1	X29A829 transistor	.50
B2	21-95	6	.1 μF	.25	D2	417-222	1	2N5308 transistor	1.00
Tantalum					D3	442-2	1	SN72709 IC	1.75
B3	25-221	1	2.2 μF	.60	D3	442-28	2	MC1357P IC	3.15
B3	25-220	4	10 μF	.70	D3	443-67	1	MC8601P IC	4.30
B3	25-212	2	22 μF	1.05	D4	442-18	2	MC1350P IC	2.50
B3	25-223	1	47 μF	2.25	D5	442-20	1	UA703 IC	2.05
COIL-CHOKE-TRANSFORMERS					MISCELLANEOUS				
C1	40-961	3	Toroid coil	1.00	E1	434-186	1	Phono socket	.15
C2	45-57	2	10 μH choke	1.00		344-59	1	White wire	.05/ft
C3	52-153	2	LC filter	16.35	PART FROM PACK #13 (Final Pack)				
C4	52-154	1	i-f coil	1.05	85-1644-1	1	i-f circuit board	5.00	
DIODES-TRANSISTOR-IC'S					NOTE: See Page 192 for "Replacement Parts and Price Information."				
NOTE: Transistors and IC's are marked for identification in one of the following four ways.									
<ol style="list-style-type: none"> 1. Part number. 2. Type number. (In IC's this refers only to the numbers, the letters may be different.) 3. Part number and type number. 4. Part number with a type number other than the one listed. 									

STEP-BY-STEP ASSEMBLY

() Position the i-f circuit board as shown in the identification drawing. Then complete each step on the Pictorials.



IDENTIFICATION
DRAWING

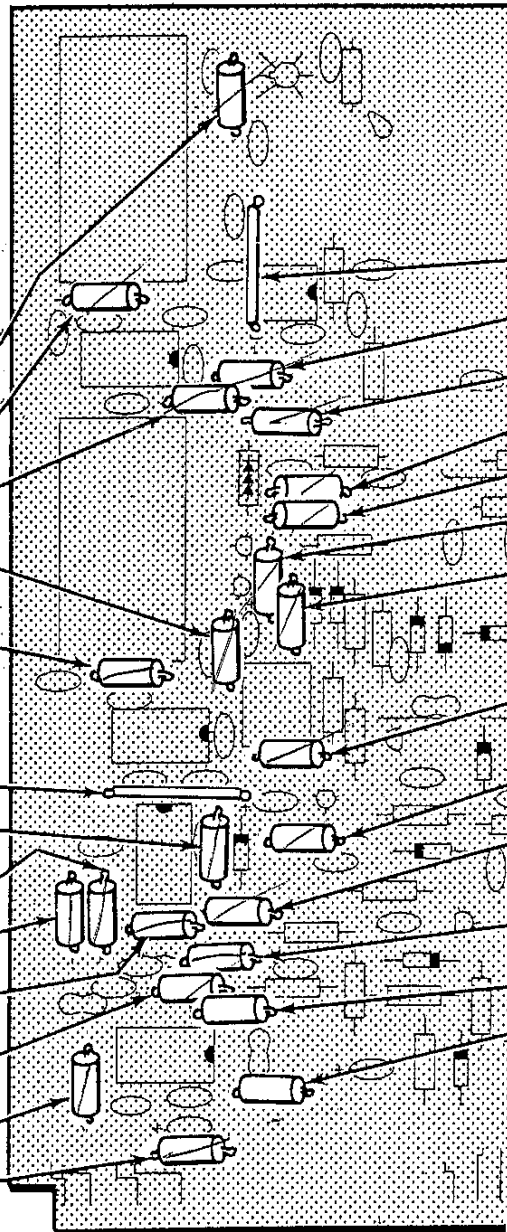


The steps performed in this Pictorial are in this area of the circuit board.

START



- FOR GOOD SOLDERED CONNECTIONS, YOU MUST KEEP THE SOLDERING IRON TIP CLEAN... WIPE IT OFTEN WITH A DAMP SPONGE OR CLOTH.
- 510 Ω, 5% (green-brown-brown-gold).
 - 510 Ω, 5% (green-brown-brown-gold).
 - 510 Ω, 5% (green-brown-brown-gold).
 - 100 kΩ, 5% (brown-black-yellow-gold).
 - 510 Ω, 5% (green-brown-brown-gold).
 - Solder the leads to the foil and cut off the excess lead lengths.
 - 1-1/2" jumper.
 - 5100 Ω, 5% (green-brown-red-gold).
 - 2200 Ω, 5% (red-red-red-gold).
 - 510 Ω, 5% (green-brown-brown-gold).
 - 2200 Ω, 5% (red-red-red-gold).
 - 10 kΩ, 5% (brown-black-orange-gold).
 - 68 kΩ, 5% (blue-gray-orange-gold).
 - 100 Ω, 5% (brown-black-brown-gold).
 - Solder the leads to the foil and cut off the excess lead lengths.



CONTINUE

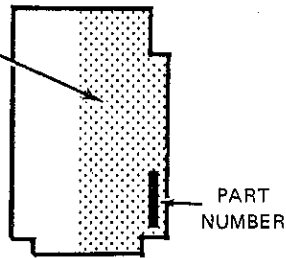


- 1-1/2" jumper.
- 100 Ω, 5% (brown-black-brown-gold).
- 270 Ω, 5% (red-violet-brown-gold).
- 1000 Ω, 5% (brown-black-red-gold).
- 620 Ω, 5% (blue-red-brown-gold).
- 2200 Ω, 5% (red-red-red-gold).
- 4700 Ω, 5% (yellow-violet-red-gold).
- Solder the leads to the foil and cut off the excess lead lengths.
- 100 Ω, 5% (brown-black-brown-gold).
- 390 Ω, 5% (orange-white-brown-gold).
- 510 Ω, 5% (green-brown-brown-gold).
- 10 kΩ, 5% (brown-black-orange-gold).
- 1 MΩ, 5% (brown-black-green-gold).
- 1500 Ω, 5% (brown-green-red-gold).
- Discard the 510 Ω (green-brown-brown) resistor in your kit.
- Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 6-1

IDENTIFICATION
DRAWING

The steps performed in this Pictorial are in this area of the circuit board.



START



() MZ2362 diode (#56-74) at D614. Position the banded end in the direction the arrow points on the circuit board.

NOTE: When you install each of the following diodes, always position the banded end as shown on the circuit board.

(✓) 1N4149 diode (#56-56) at D613.

() 1N4149 diode (#56-56) at D612.

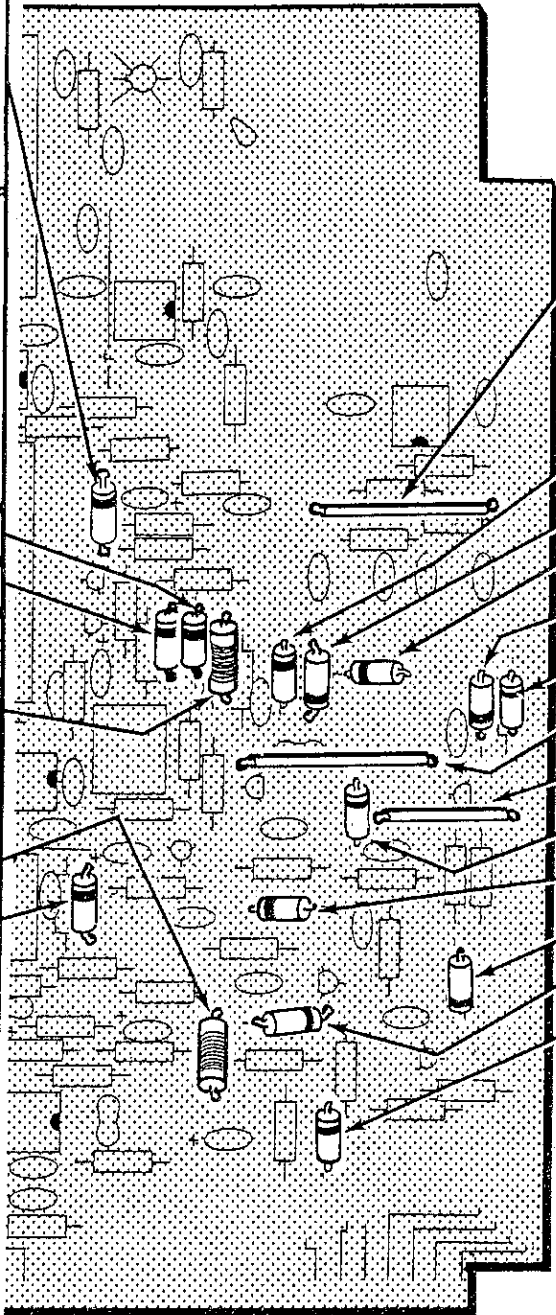
(✓) 10 μ H choke (#45-57). Bend the choke leads toward the slots in the ends of the choke body.

(✓) 10 μ H choke (#45-57).

(✓) 1N750A zener diode (#56-59 violet-green-black) at ZD601.

(/) Solder the leads to the foil and cut off the excess lead lengths.

CONTINUE



() 1-3/4" jumper.

NOTE: In the following steps, install 1N191 diodes (#56-26, brown-white-brown). Be sure to position the banded end as shown on the circuit board.

() 1N191 diode at D601.

() 1N191 diode at D602.

() 1N191 diode at D603.

() 1N191 diode at D605.

() 1N191 diode at D606.

() 1-3/4" jumper.

() 1-1/4" jumper.

() 1N191 diode at D604.

() 1N191 diode at D607.

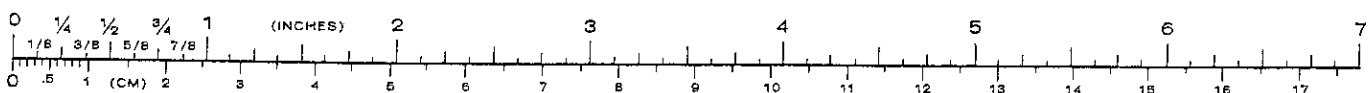
() 1N191 diode at D609.

() 1N191 diode at D608.

() 1N191 diode at D611.

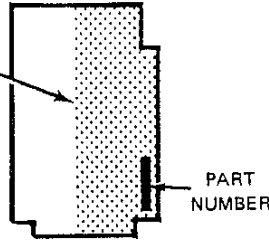
() Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 6-2



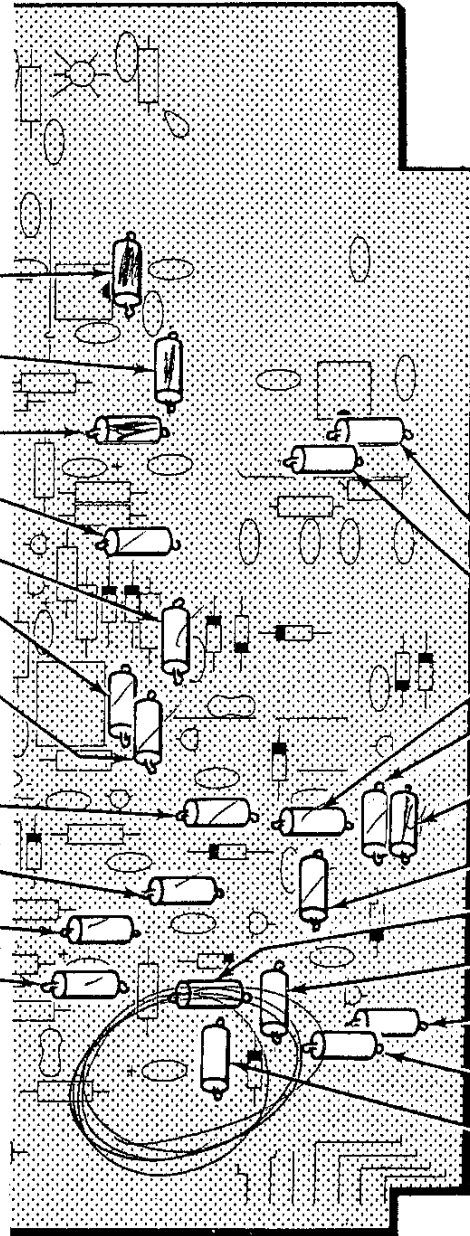
IDENTIFICATION
DRAWING

The steps performed in this Pictorial are in this area of the circuit board.



START

- () ~~39~~ ³⁹ Ω, 5% (orange-orange-brown-gold). Or. wh. Bk. gold.
- () ~~100~~ ⁵⁶⁰ Ω, 5% (brown-black-brown-gold). Gr. Bl. Br. gold.
- () ~~100~~ ⁴⁷⁰ Ω, 5% (brown-black-brown-gold). yel. Vio. Br. gld.
- () 1000 Ω, 5% (brown-black-red-gold).
- () 1000 Ω, 5% (brown-black-red-gold).
- () 33 kΩ, 5% (orange-orange-orange-gold).
- () 47 kΩ, 5% (yellow-violet-orange-gold).
- () Solder the leads to the foil and cut off the excess lead lengths.
- () 22 kΩ, 5% (red-red-orange-gold).
- () 10 kΩ, 5% (brown-black-orange-gold).
- () 6800 Ω, 5% (blue-gray-red-gold).
- () 6800 Ω, 5% (blue-gray-red-gold).
- () Solder the leads to the foil and cut off the excess lead lengths.



CONTINUE

- () 2400 Ω, 5% (red-yellow-red-gold).
- () 2400 Ω, 5% (red-yellow-red-gold).
- () 1000 Ω, 5% (brown-black-red-gold).
- () 2200 Ω, 5% (red-red-red-gold).
- () ~~12k~~ ^{12k} kΩ, 5% (orange-blue-orange-gold). red, red, or. gld.
- () 10 kΩ, 5% (brown-black-orange-gold).
- () 5600 Ω, 5% (green-blue-red-gold).
- () 6800 Ω, 5% (blue-gray-red-gold).
- () 10 kΩ, 5% (brown-black-orange-gold).
- () 4700 Ω, 5% (yellow-violet-red-gold).
- () 10 kΩ, 5% (brown-black-orange-gold).
- () Solder the leads to the foil and cut off the excess lead lengths.

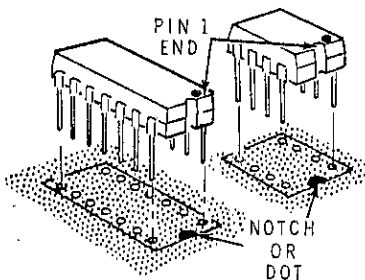
PICTORIAL 6-3

START



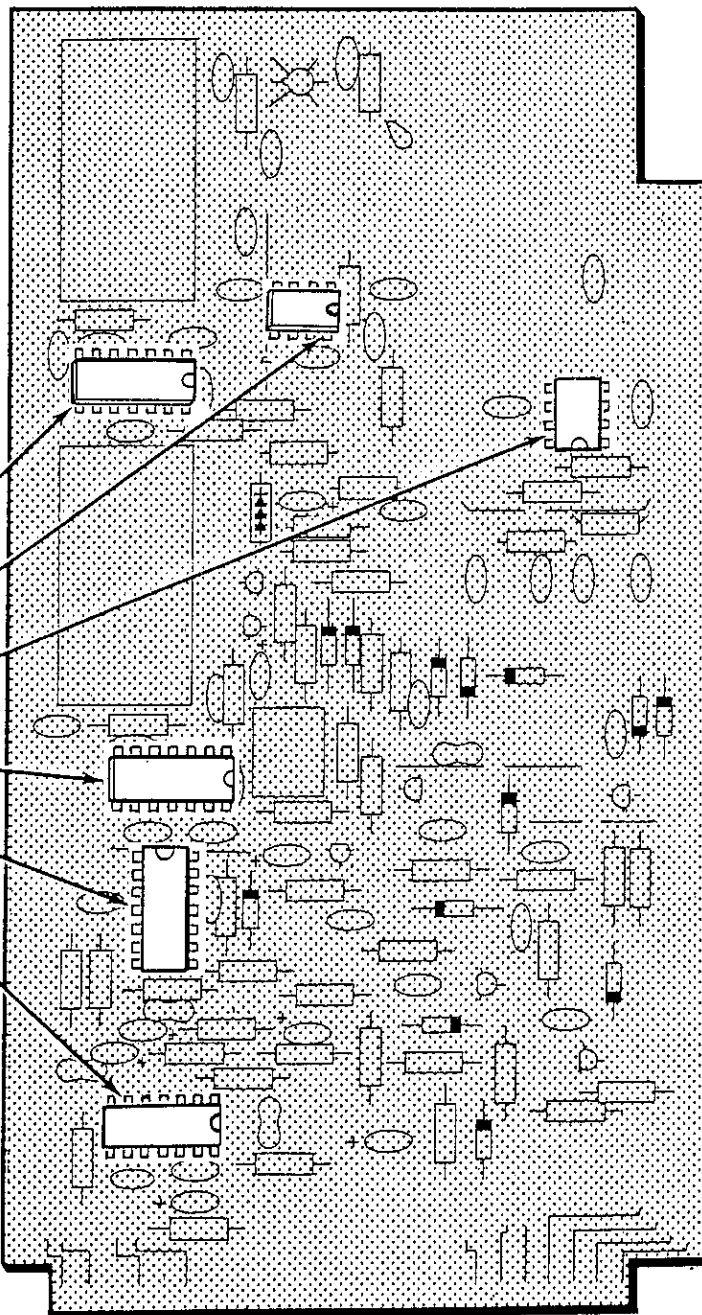
In the following steps you will be instructed to install IC's on the circuit board. IC CONNECTOR STRIPS ARE NOT USED ON THIS CIRCUIT BOARD. INSTALL EACH IC AS FOLLOWS:

Position the pin 1 end (refer to the fold-out from Page 10) of the IC over the dot screened on the circuit board. Then insert the IC leads into their corresponding holes and press the IC down tight against the circuit board. Turn the circuit board over and solder each lead to the foil.



CAUTION: Double check to make sure the correct IC is installed and that all its pins are in their holes. The only way these IC's can be removed is to cut their leads and then unsolder and remove each lead one at a time, thus destroying the IC.

- (✓) MC1357P IC (#442-28) at IC602.
- (✓) MC1350P IC (#442-18) at IC607.
- (✓) MC1350P IC (#442-18) at IC608.
- (✓) MC1357P IC (#442-28) at IC603.
- () MC8601P IC (#443-67) at IC604.
- () SN72709 IC (#442-2) at IC605.

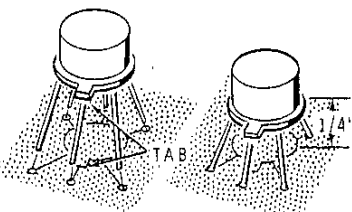


PICTORIAL 6-4

START



(✓) UA703 IC (#442-20) at IC601.
 Position the IC over its outline on the circuit board. Align the tab of the IC as shown and bend the IC leads as necessary to fit into their holes in the circuit board. Solder each lead to the foil and cut off the excess lead lengths. NOTE: The IC may have to be removed from a protective holder before installation.



NOTE: When you install transistors, see the "Transistor Mounting" Detail (fold-out from Page 10).

(✓) 2N3391 transistor (#417-91) at Q606.

(✓) 2N3391 transistor (#417-91) at Q605.

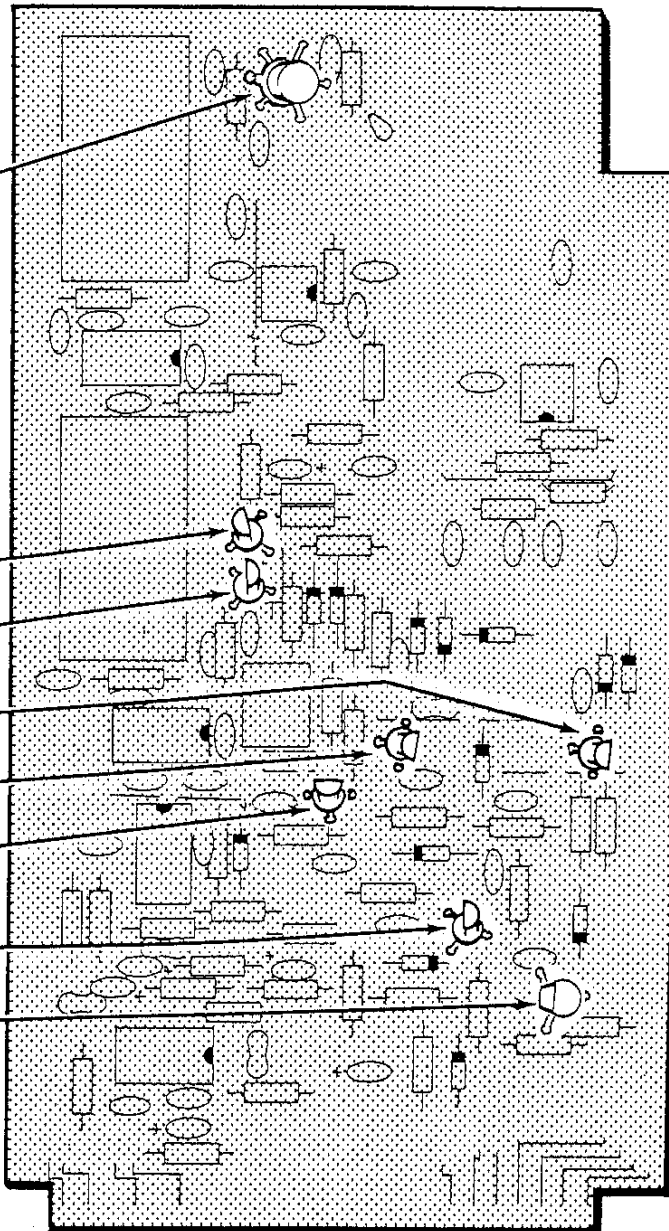
(✓) 2N3393 transistor (#417-118) at Q604.

(✓) 2N3393 transistor (#417-118) at Q602.

(✓) X29A829 transistor (#417-201) at Q607.

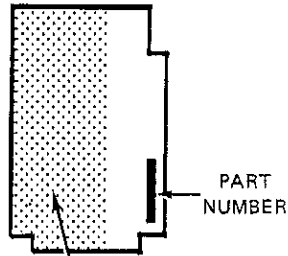
(✓) 2N3393 transistor (#417-118) at Q603.

(✓) 2N5308 transistor (#417-222) at Q601.



PICTORIAL 6-5

IDENTIFICATION
DRAWING



The steps performed in this Pictorial are in this area of the circuit board.

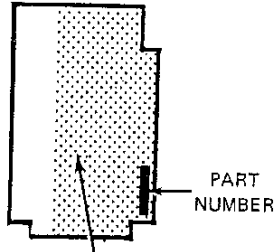
START



<input checked="" type="checkbox"/> .001 μ F disc.		<input type="checkbox"/> .05 μ F disc.
<input checked="" type="checkbox"/> .05 μ F disc.		<input checked="" type="checkbox"/> .001 μ F disc.
<input checked="" type="checkbox"/> .10 pF disc.		<input checked="" type="checkbox"/> .05 μ F disc.
<input checked="" type="checkbox"/> .05 μ F disc.		<input checked="" type="checkbox"/> .05 μ F disc.
<input checked="" type="checkbox"/> .1 μ F disc.		<input checked="" type="checkbox"/> 10 μ F tantalum. Be sure to position the plus (+) mark as shown on the circuit board. See the capacitor Mounting Detail (fold-out from Page 10).
<input checked="" type="checkbox"/> .1 μ F disc.		<input checked="" type="checkbox"/> .05 μ F disc.
<input checked="" type="checkbox"/> .05 μ F disc.		<input checked="" type="checkbox"/> .05 μ F disc.
<input checked="" type="checkbox"/> .001 μ F disc.		<input type="checkbox"/> .05 μ F disc.
<input checked="" type="checkbox"/> .05 μ F disc.		<input checked="" type="checkbox"/> 2.2 μ F tantalum. Note the plus (+) marked lead.
<input checked="" type="checkbox"/> Solder the leads to the foil and cut off the excess lead lengths.		<input type="checkbox"/> Solder the leads to the foil and cut off the excess lead lengths.
<input checked="" type="checkbox"/> .1 μ F disc.		<input checked="" type="checkbox"/> 10 μ F tantalum. Note the plus (+) marked lead.
<input checked="" type="checkbox"/> .1 μ F disc.		<input checked="" type="checkbox"/> 22 μ F tantalum. Note the plus (+) marked lead.
<input checked="" type="checkbox"/> .05 μ F disc.		<input checked="" type="checkbox"/> 22 μ F tantalum. Note the plus (+) marked lead.
<input checked="" type="checkbox"/> 20 pF disc.		<input checked="" type="checkbox"/> 10 μ F tantalum. Note the plus (+) marked lead.
<input checked="" type="checkbox"/> .05 μ F disc.		<input checked="" type="checkbox"/> 10 μ F tantalum. Note the plus (+) marked lead.
<input checked="" type="checkbox"/> .05 μ F disc.		<input checked="" type="checkbox"/> 47 μ F tantalum. Note the plus (+) marked lead.
<input checked="" type="checkbox"/> 18 pF disc.		<input checked="" type="checkbox"/> Solder the leads to the foil and cut off the excess lead lengths.
<input checked="" type="checkbox"/> 1300 pF (.0013) disc.		
<input checked="" type="checkbox"/> 470 pF mica.		
<input checked="" type="checkbox"/> 360 pF mica.		
<input checked="" type="checkbox"/> .05 μ F disc.		
<input type="checkbox"/> 3.3 pF disc.		
<input type="checkbox"/> Solder the leads to the foil and cut off the excess lead lengths.		

PICTORIAL 6-6

IDENTIFICATION
DRAWING

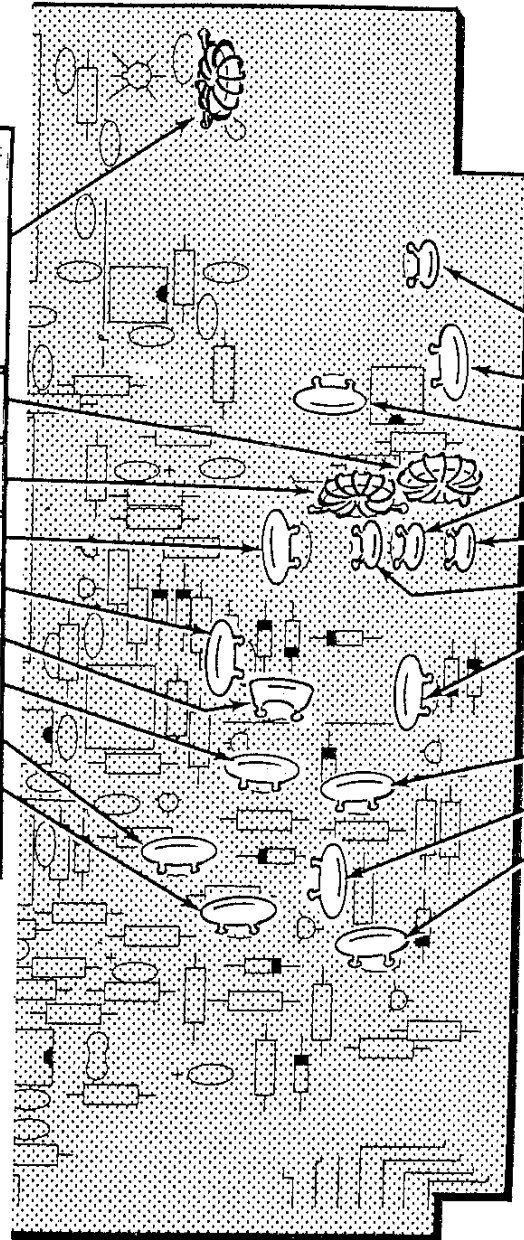


The steps performed in this Pictorial are in this area of the circuit board.

START



- (✓) 100 μ H toroid coil (#40-961) at L601. Solder the leads to the foil.
- (✓) 100 μ H toroid coil (#40-961) at L603. Solder the leads to the foil.
- (✓) 100 μ H toroid coil. (#40-961) at L604. Solder the leads to the foil.
- (✓) .05 μ F disc.
- (✓) .05 μ F disc.
- (✓) 68 pF mica.
- (✓) .1 μ F disc.
- (✓) .05 μ F disc.
- (✓) .1 μ F disc.
- (✗) Solder the leads to the foil and cut off the excess lead length.



CONTINUE



- (✓) 20 pF disc.
- (✓) .05 μ F disc.
- (✓) .05 μ F disc.
- (✓) .001 μ F disc.
- (✓) .001 μ F disc.
- (✓) .001 μ F disc.
- (✓) .05 μ F disc.
- (✓) Solder the leads to the foil and cut off the excess lead lengths.
- (✓) .05 μ F disc.
- (✓) .05 μ F disc.
- (✓) .05 μ F disc.
- () Solder the leads to the foil and cut off the excess lead lengths.

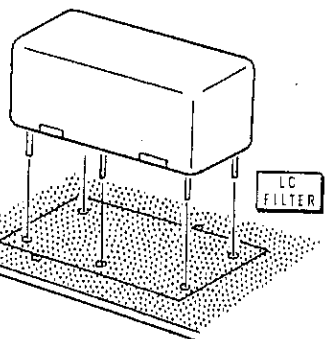
PICTORIAL 6-7



CONTINUE

START

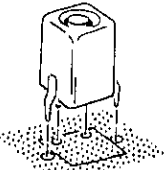
(✓) LC filter (#52-153) at F601. Solder all pins to the foil.



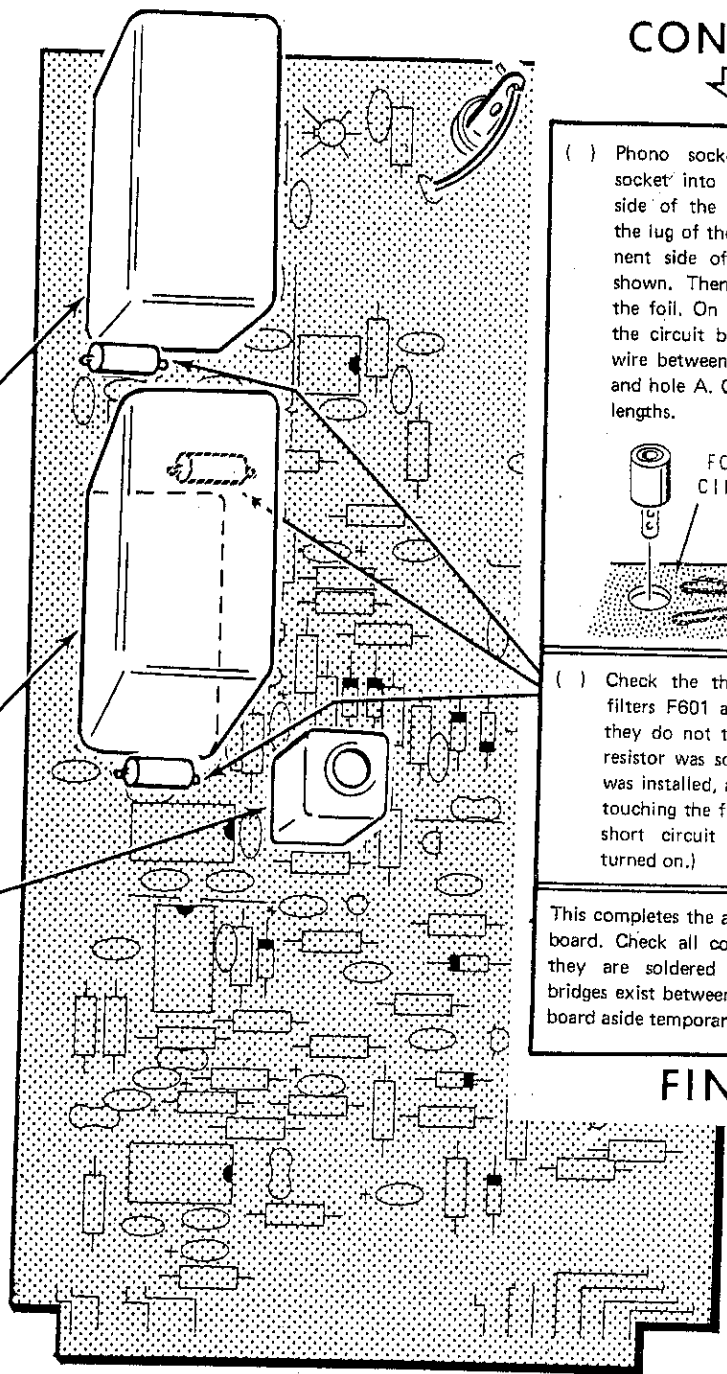
LC FILTER

(✓) LC filter (#52-153) at F602.

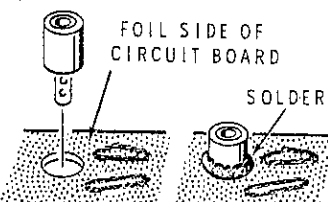
(✓) I-F coil (#52-154) at L602. Solder all four pins to the foil.



I-F COIL



() Phono socket. Insert the phono socket into its hole from the foil side of the circuit board. Position the lug of the socket on the component side of the circuit board as shown. Then solder the socket to the foil. On the component side of the circuit board, solder a 1" bare wire between the lug of the socket and hole A. Cut off any excess lead lengths.



FOIL SIDE OF CIRCUIT BOARD

SOLDER

() Check the three resistors near LC filters F601 and F602, and be sure they do not touch the filters. (If a resistor was scratched when a filter was installed, and the resistor is now touching the filter, it may produce a short circuit when the Tuner is turned on.)

This completes the assembly of the circuit board. Check all connections to be sure they are soldered and that no solder bridges exist between foils. Set the circuit board aside temporarily.

FINISH

PICTORIAL 6-8

PLL MULTIPLEX CIRCUIT BOARD

PARTS LIST

Refer to the "Pack Index Sheet" and remove the pack 7 parts from the carton stamped "PKS #1-8." Then check each part against the following Parts List. The key numbers correspond to the numbers on the "PLL Multiplex Circuit Board Parts Pictorial" (fold-out from Page 57).

KEY PART No.	PARTS No.	PARTS Per Kit	DESCRIPTION	PRICE Each	KEY PART No.	PARTS No.	PARTS Per Kit	DESCRIPTION	PRICE Each
RESISTORS					Film, 1/2-watt, 5% (cont'd.)				
Precision, 1/2-Watt					A2	4-20	4	4700 Ω (yellow-violet-red-gold)	.15
A1	2-271	2	2.5 M Ω , 1%	1.00	A2	4-36	1	5100 Ω (green-brown-red-gold)	.15
A1	2-129	1	3.3 M Ω , 5%	1.00	A2	4-37	4	6800 Ω (blue-gray-red-gold)	.15
Film, 1/2-Watt, 5%					A2	4-21	2	8200 Ω (gray-red-red-gold)	.15
A2	4-56	1	47 Ω (yellow-violet-black-gold)	.15	A2	4-22	7	10 k Ω (brown-black-orange-gold)	.15
A2	4-53	1	270 Ω (red-violet-brown-gold)	.15	A2	4-67	1	15 k Ω (brown-green-orange-gold)	.15
A2	4-60	2	470 Ω (yellow-violet-brown-gold)	.15	A2	4-25	2	27 k Ω (red-violet-orange-gold)	.15
A2	4-61	1	560 Ω (green-blue-brown-gold)	.15	A2	4-27	4	47 k Ω (yellow-violet-orange-gold)	.15
A2	4-74	3	680 Ω (blue-gray-brown-gold)	.15	A2	4-64	1	68 k Ω (blue-gray-orange-gold)	.15
A2	4-15	6	1000 Ω (brown-black-red-gold)	.15	A2	4-45	1	82 k Ω (gray-red-orange-gold)	.15
A2	4-16	2	1800 Ω (brown-gray-red-gold)	.15	A2	4-35	2	180 k Ω (brown-gray-yellow-gold)	.15
A2	4-75	1	2000 Ω (red-black-red-gold)	.15	A2	4-32	2	390 k Ω (orange-white-yellow-gold)	.15
A2	4-17	1	2200 Ω (red-red-red-gold)	.15	A2	4-33	2	470 k Ω (yellow-violet-yellow-gold)	.15
A2	4-63	2	2700 Ω (red-violet-red-gold)	.15	A2	4-6	1	1 M Ω (brown-black-green-gold)	.15
A2	4-18	1	3300 Ω (orange-orange-red-gold)	.15					



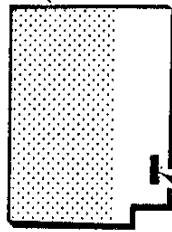
KEY PART		PARTS Per Kit	DESCRIPTION	PRICE Each	KEY PART		PARTS Per Kit	DESCRIPTION	PRICE Each
No.	No.				No.	No.			
CAPACITORS					DIODES-TRANSISTORS-IC's				
Disc					D1	56-26	7	1N191 diode (brown-white-brown)	.40
B1	21-7	1	33 pF	.15	D1	56-89	1	GD-510 diode	.30
B1	21-9	1	100 pF	.15	D2	56-614	3	Dual diode	.85
B1	21-56	1	470 pF	.15	NOTE: Transistors and IC's are marked for identification in one of the following four ways:				
B1	21-159	1	510 pF	.25	1. Part number.				
B1	21-143	4	.05 μ F	.30	2. Type number. (In IC's this refers only to the numbers; the letters may vary.)				
Tantalum					3. Part number and type number.				
B2	25-195	2	2.2 μ F	.90	4. Part number with a type number other than the one listed.				
B3	25-220	6	10 μ F	.70	D2	417-118	8	2N3393 transistor	.40
Mylar					D2	417-201	5	X29A829 transistor	.50
B4	27-69	2	.0091 μ F	.60	D2	417-218	2	TZ1160 transistor	.50
B5	27-85	4	.22 μ F	.30	D3	442-46	1	MC1310 IC	6.75
B6	27-60	2	.22 μ F (200 V minimum)	.40	D3	443-2	1	SN7420N IC	.70
B6	27-61	1	.47 μ F	.60	MISCELLANEOUS				
Polystyrene					E1	432-144	30	IC connector strip	.01
B7	29-6	1	.0012 μ F (1200 pF)	.15		344-59	1	White wire	.05/ft
CONTROL-COILS-CHOKE-FILTER					PART FROM PACK #13 (Final Pack)				
C1	10-286	1	5000 Ω control (5K)	1.00	85-1204-2	1	PLL multiplex circuit board	5.00	
C2	45-47	1	2 mH choke	1.00	NOTE: See Page 192 for "Replacement Parts and Price Information."				
C3	52-155	2	Multiplex filter	6.45					

15

STEP-BY-STEP ASSEMBLY

- () Position the PLL multiplex circuit board as shown in the identification drawing. Then complete each step on the Pictorials.

The steps performed in this Pictorial are in this area of the circuit board.



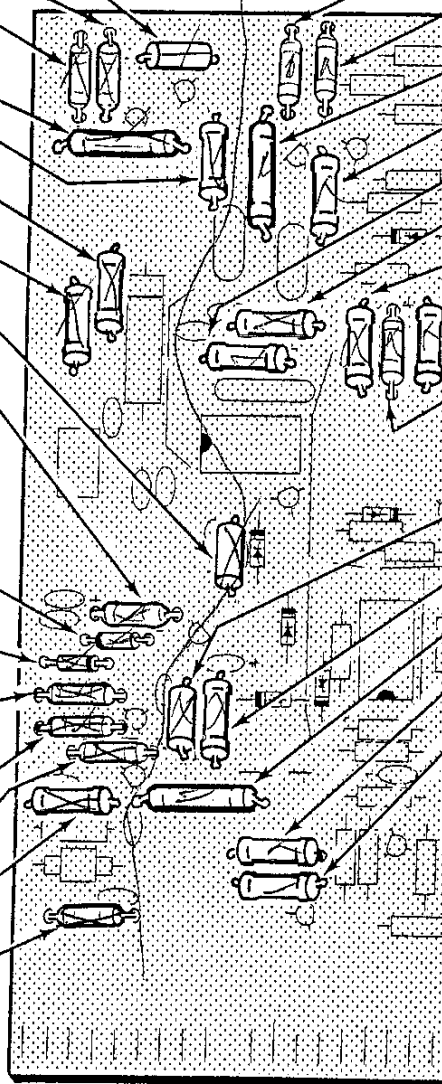
IDENTIFICATION DRAWING

PART NUMBER

START

CONTINUE

- (✓) 1800 Ω, 5% (brown-gray-red-gold).
- (✓) 470 Ω, 5% (yellow-violet-brown-gold).
- (✓) 470 kΩ, 5% (yellow-violet-yellow-gold).
- (✓) 2.5 MΩ, precision.
- (✓) 6800 Ω, 5% (blue-gray-red-gold).
- () 1000 Ω, 5% (brown-black-red-gold).
- () 15 kΩ, 5% (brown-green-orange-gold).
- (✓) 1000 Ω, 5% (brown-black-red-gold).
- (✓) 10 kΩ, 5% (brown-black-orange-gold).
- NOTE: When you install diodes, note the position of the banded end. See the "Diode Mounting Detail" (fold-out from Page 10).
- (✓) 1N191 diode (#56-26, brown-white-brown) at D712.
- () 1N191 diode (#56-26, brown-white-brown) at D711.
- (✓) 47 Ω, 5% (yellow-violet-black-gold).
- (✓) 10 kΩ, 5% (brown-black-orange-gold).
- (✓) 10 kΩ, 5% (brown-black-orange-gold).
- (✓) 1 MΩ, 5% (brown-black-green-gold).
- (✓) 10 kΩ, 5% (brown-black-orange-gold).
- FOR GOOD SOLDERED CONNECTIONS, YOU MUST KEEP THE SOLDERING IRON TIP CLEAN... Wipe it often with a damp sponge or cloth.
- () Solder all leads to the foil and cut off the excess lead lengths.



- (✓) 470 kΩ, 5% (yellow-violet-yellow-gold).
- (✓) 470 Ω, 5% (yellow-violet-brown-gold).
- (✓) 2.5 MΩ, precision.
- (✓) 6800 Ω, 5% (blue-gray-red-gold).
- (✓) 8200 Ω, 5% (gray-red-red-gold).
- (✓) 8200 Ω, 5% (gray-red-red-gold).
- (✓) 2200 Ω, 5% (red-red-red-gold).
- () 680 Ω, 5% (blue-gray-brown-gold).
- (✓) 10 kΩ, 5% (brown-black-orange-gold).
- () Solder all leads to the foil and cut off the excess lead lengths.
- (✓) 1000 Ω, 5% (brown-black-red-gold).
- (✓) 5100 Ω, 5% (green-brown-red-gold).
- (✓) 3.3 MΩ, precision.
- (✓) 560 Ω, 5% (green-blue-brown-gold).
- (✓) 2000 Ω, 5% (red-black-red-gold).
- (✓) Solder all leads to the foil and cut off the excess lead lengths.

PICTORIAL 7-1

The steps performed in this Pictorial are in this area of the circuit board.

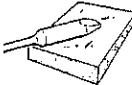
START

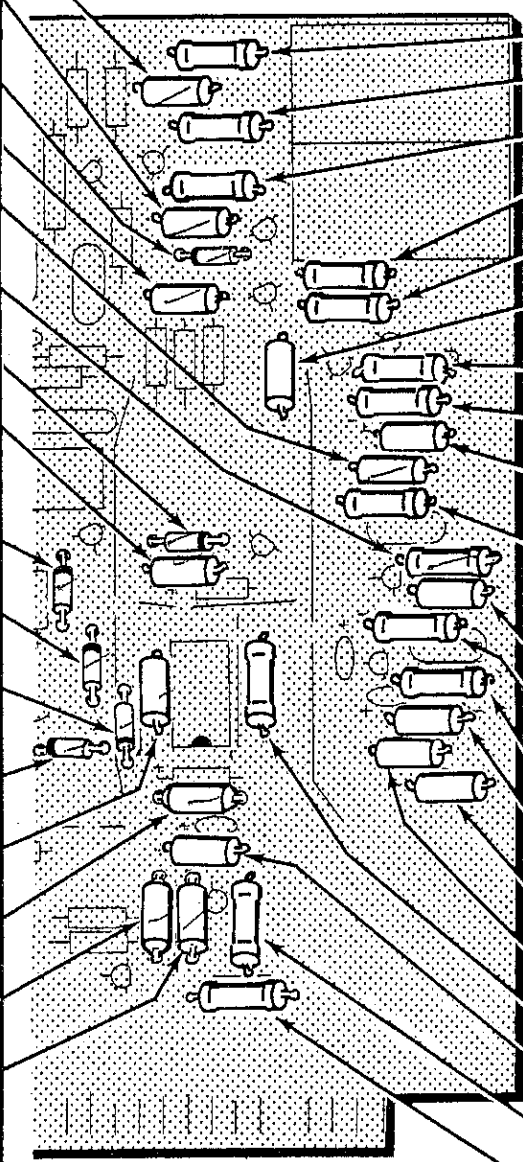
IDENTIFICATION DRAWING

PART NUMBER

CONTINUE

- 1800 Ω, 5% (brown-gray-red-gold).
 - 47 kΩ, 5% (yellow-violet-orange-gold).
 - 1N191 diode (#56-26, brown-white-brown) at D708.
 - 1000 Ω, 5% (brown-black-red-gold).
 - 47 kΩ, 5% (yellow-violet-orange-gold).
 - 390 kΩ, 5% (orange-white-yellow-gold).
 - 1N191 diode (#56-26, brown-white-brown) at D715.
 - 82 kΩ, 5% (gray-red-orange-gold).
 - Solder all leads to the foil and cut off the excess lead lengths.
 - GD-510 diode (#56-89) at D717.
 - 1N191 diode (#56-26, brown-white-brown) at D716.
 - 1N191 diode (#56-26, brown-white-brown) at D714.
 - 1N191 diode (#56-26, brown-white-brown) at D713.
 - 3300 Ω, 5% (orange-orange-red-gold).
 - 10 kΩ, 5% (brown-black-orange-gold).
 - 10 kΩ, 5% (brown-black-orange-gold).
 - 1000 Ω, 5% (brown-black-red-gold).
- FOR GOOD SOLDERED CONNECTIONS, YOU MUST KEEP THE SOLDERING IRON TIP CLEAN... WIPE IT OFTEN WITH A DAMP SPONGE OR CLOTH.


- Solder all leads to the foil and cut off the excess lead lengths.



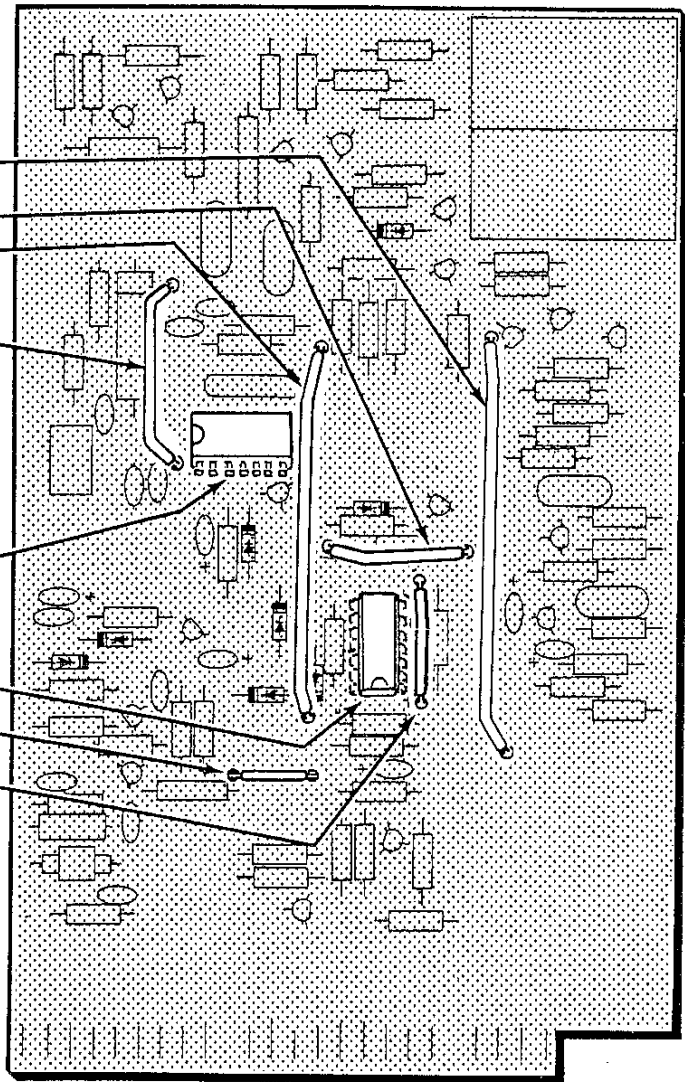
- 2700 Ω, 5% (red-violet-red-gold).
 - 2700 Ω, 5% (red-violet-red-gold).
 - 68 kΩ, 5% (blue-gray-orange-gold).
 - 6800 Ω, 5% (blue-gray-red-gold).
 - 6800 Ω, 5% (blue-gray-red-gold).
 - 47 kΩ, 5% (yellow-violet-orange-gold).
 - 27 kΩ, 5% (red-violet-orange-gold).
 - 27 kΩ, 5% (red-violet-orange-gold).
 - 47 kΩ, 5% (yellow-violet-orange-gold).
 - 180 kΩ, 5% (brown-gray-yellow-gold).
 - Solder all leads to the foil and cut off the excess lead lengths.
 - 4700 Ω, 5% (yellow-violet-red-gold).
 - 180 kΩ, 5% (brown-gray-yellow-gold).
 - 390 kΩ, 5% (orange-white-yellow-gold).
 - 4700 Ω, 5% (yellow-violet-red-gold).
 - 4700 Ω, 5% (yellow-violet-red-gold).
 - 4700 Ω, 5% (yellow-violet-red-gold).
 - 680 Ω, 5% (blue-gray-brown-gold).
 - 1000 Ω, 5% (brown-black-red-gold).
 - 680 Ω, 5% (blue-gray-brown-gold).
 - 270 Ω, 5% (red-violet-brown-gold).
- Solder all leads to the foil and cut off the excess lead lengths.

PICTORIAL 7-2

START



- NOTE: When you install a jumper, as in the next step, cut the white hookup wire to the length specified in the step. Then remove 1/4" of insulation from both ends of the wire.
- (/) 3-1/2" jumper.
 - (/) 1-1/2" jumper.
 - (/) 3-1/4" jumper.
 - (/) 1-3/4" jumper.
 - (/) Solder all leads to the foil and cut off the excess lead lengths.
 - (/) Cut off four strips of seven IC connectors and set them aside.
- NOTE: Refer to "IC Preparation and Installation," Detail (fold-out from Page 10), for information on installing IC's.
- (\) MC1310P IC (#442-46) at IC701.
 - (/) SN7420N IC (#443-2) at IC702.
 - (/) 1" jumper.
 - (/) 1-1/4" jumper.
 - () Solder all leads to the foil and cut off the excess lead lengths.



PICTORIAL 7-3

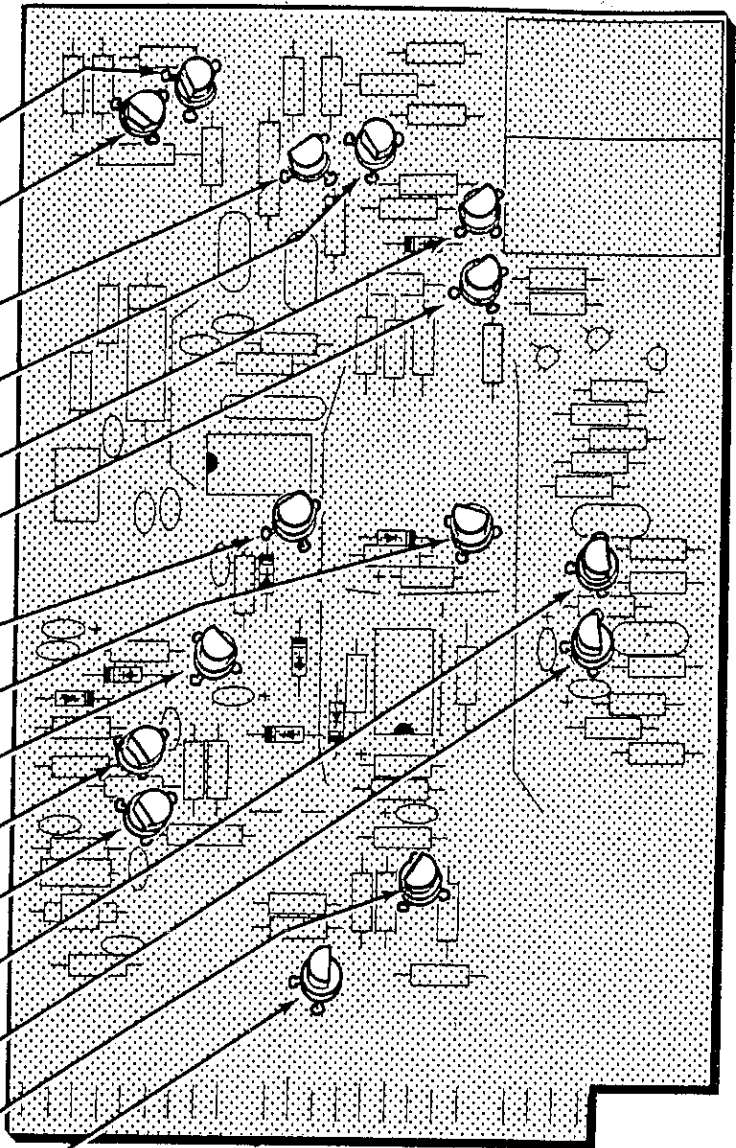


START



NOTE: When you install transistors, see the "Transistor Mounting" Detail (fold-out from Page 10).

- X29A829 transistor (#417-201) at Q704.
 - TZ1160 transistor (#417-218) at Q702.
 - TZ1160 transistor (#417-218) at Q701.
 - X29A829 transistor (#417-201) at Q703.
 - 2N3393 transistor (#417-118) at Q711.
 - 2N3393 transistor (#417-118) at Q709.
 - X29A829 transistor (#417-201) at Q718.
 - 2N3393 transistor (#417-118) at Q715.
 - 2N3393 transistor (#417-118) at Q714.
 - 2N3393 transistor (#417-118) at Q713.
 - X29A829 transistor (#417-201) at Q712.
 - 2N3393 transistor (#417-118) at Q708.
 - 2N3393 transistor (#417-118) at Q707.
 - X29A829 transistor (#417-201) at Q716.
 - 2N3393 transistor (#417-118) at Q717.
- Be sure all leads are soldered and all excess lead lengths are cut off.

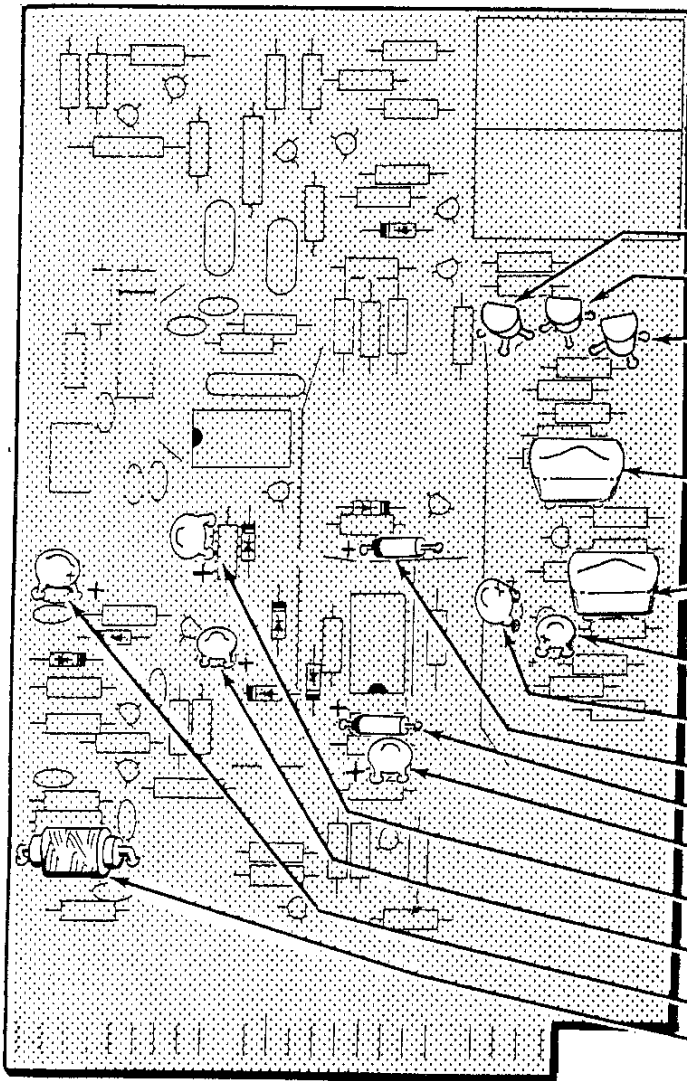
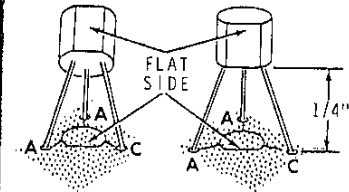


PICTORIAL 7-4

START



NOTE: Install the dual diodes in the following manner, as shown: First line up the flat on the diode with the outline of the flat on the circuit board. Insert the diode leads into their correct holes, which are indicated by A, A, and C. Then solder each lead to the foil and cut off the excess lead lengths.



(✓) Dual-diode (#56-614) at D703.

(✓) Dual-diode (#56-614) at D702.

(✓) Dual-diode (#56-614) at D701.

NOTE: When you install the next two capacitors, note that there are two different kinds of .22 μ F Mylars. Use the kind pictured.

(✓) .22 μ F Mylar.

(✓) .22 μ F Mylar.

NOTE: When you install electrolytic and tantalum capacitors, see the "Capacitor Mounting" Detail (fold-out from Page 10).

(✓) 10 μ F tantalum.

(✓) 10 μ F tantalum.

(✓) 2.2 μ F tantalum.

(✓) 2.2 μ F tantalum.

(✓) 10 μ F tantalum.

(✓) 10 μ F tantalum.

(✓) 10 μ F tantalum.

(✓) 10 μ F tantalum.

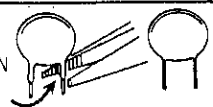
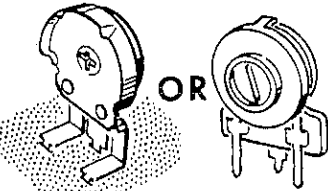
(✓) 2 mH choke (#45-47).

(✓) Solder all leads to the foil and cut off the excess lead lengths.

PICTORIAL 7-5

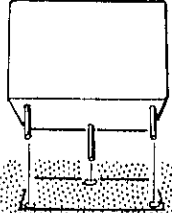
START



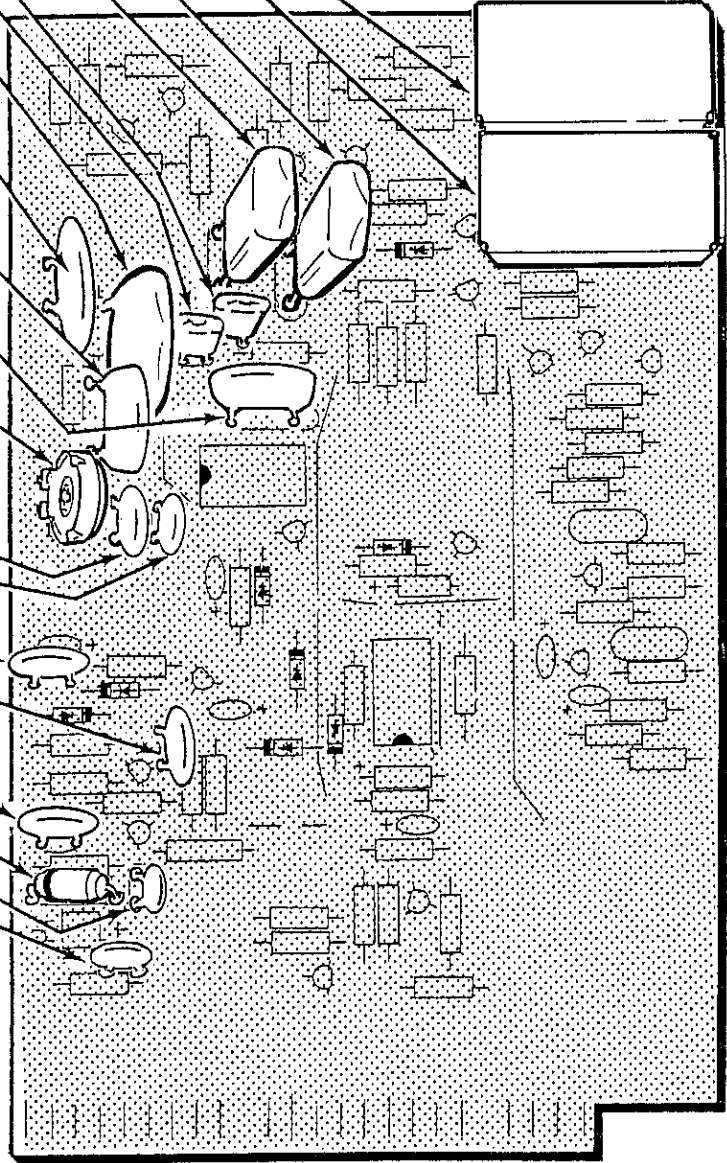
- NOTE: In the next two steps, be sure to use the correct .22 μ F Mylar capacitors.
- (✓) .22 μ F Mylar.
 - (✓) .22 μ F Mylar.
 - (✓) .0091 μ F Mylar (9100 pF).
 - (✓) .0091 μ F Mylar (9100 pF).
 - (✓) .47 μ F Mylar.
 - (✓) 510 pF disc.
- REMOVE INSULATION ON LEADS 
- (✓) .22 μ F Mylar (200 V minimum).
 - (✓) .22 μ F Mylar (200 V minimum).
 - (✓) 5000 Ω control. Solder all three pins to the foil. 
 - (✓) .05 μ F disc.
 - (✓) 470 pF disc.
 - (✓) .05 μ F disc.
 - (✓) .05 μ F disc.
 - (✓) .05 μ F disc.
 - (✓) 1200 pF polystyrene.
 - (✓) 33 pF disc.
 - (✓) 100 pF disc.
 - (✓) Solder all leads to the foil and cut off the excess lead lengths.

CONTINUE



- (✓) Multiplex filter (#52-155). Solder all pins to the foil. 
 - (✓) Multiplex filter (#52-155). Solder all pins to the foil.
- This completes the assembly of the circuit board. Check all connections to be sure they are soldered and that no solder bridges exist between foils. Set the circuit board aside temporarily.

FINISH



PICTORIAL 7-6

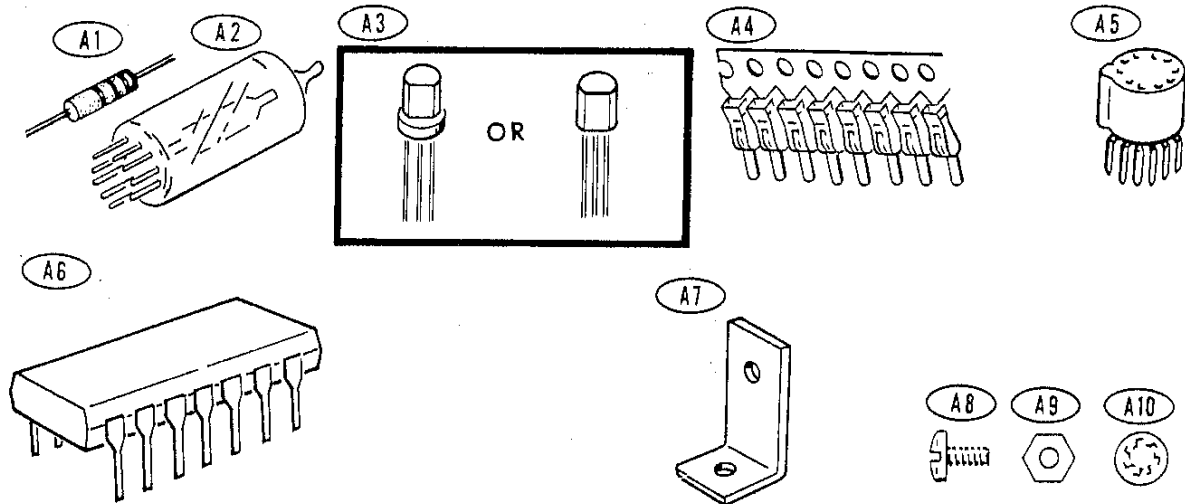
READOUT CIRCUIT BOARD

PARTS LIST

Refer to the "Pack Index Sheet" and remove the pack 8 parts from the carton stamped PKS #1-8." Then check each part against the following Parts List. The key numbers correspond to the numbers on the "Readout Circuit Board Parts Pictorial."

KEY PART No.	No.	PARTS Per Kit	DESCRIPTION	PRICE Each	KEY PART No.	No.	PARTS Per Kit	DESCRIPTION	PRICE Each
A1	1-151	1	330 Ω , 1/2-watt, 5% resistor (orange-orange-brown-gold)	.15	A7	204-102	2	Angle bracket	.30
A2	411-268	2	DR2100 tube	9.70	A8	250-56	2	6-32 x 1/4" screw	.05
A2	411-269	1	DR2110 tube	10.00	A9	252-3	2	6-32 nut	.05
A2	411-270	1	DR2120 tube	6.10	A10	254-1	2	#6 lockwasher	.05
A3	417-94	1	2N3416 transistor	1.00		344-59	1	White wire	.05/ft
A4	432-144	56	IC connector (extra included)	.01	PART FROM PACK #13 (Final Pack)				
A5	434-215	4	Tube socket	1.50	85-594-2		1	Readout circuit board	3.60
A6	443-64	3	CD2500E IC	8.40	NOTE: See Page 192 for "Replacement Parts and Price Information."				

PARTS PICTORIAL



STEP-BY-STEP ASSEMBLY

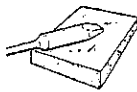
() Position the readout circuit board as shown in Pictorial 8-1. Then complete each step on the Pictorials.

START

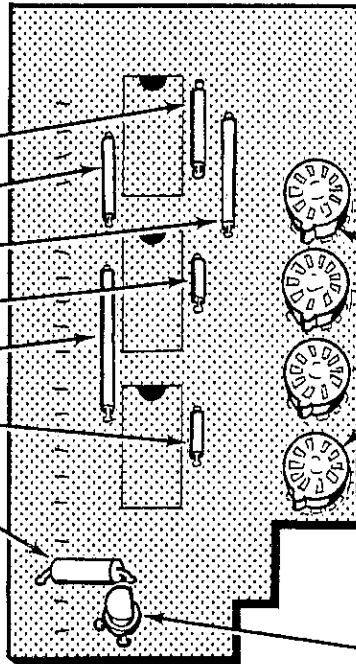
NOTE: When you install jumpers, cut the white wire to the specified length. Then remove 1/4" of insulation from both ends. Be careful solder does not flow into the IC circuit board holes when installing jumpers.

- () 1" jumper.
- () 1" jumper.
- () 1-1/4" jumper.
- () 7/8" jumper.
- () 1-1/2" jumper.
- () 7/8" jumper.
- () 330 Ω, 5% (orange-orange-brown-gold).

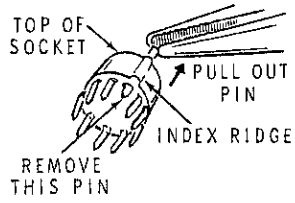
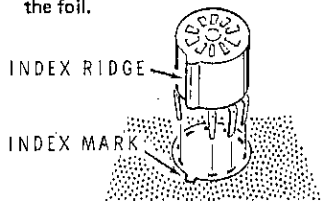
FOR GOOD SOLDERED CONNECTIONS, YOU MUST KEEP THE SOLDERING IRON TIP CLEAN... WIPE IT OFTEN WITH A DAMP SPONGE OR CLOTH.



- () Solder all leads to the foil and cut off the excess lead lengths.



CONTINUE

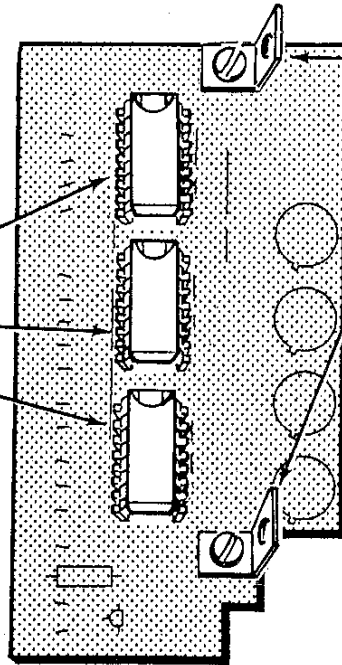
- (✓) Remove and discard the pin that is in line with the index ridge of each of the four tube sockets. Push the pin up with pliers until it can be pulled out the top of the socket.
 
- (✓) Tube sockets at V901, V902, V903, and V904. Align the index ridge of the socket with the index mark on the circuit board. Solder all pins to the foil.
 
- (✓) 2N3416 transistor (#417-94). See the "Transistor Mounting" Detail (fold-out from Page 10).

PICTORIAL 8-1



START

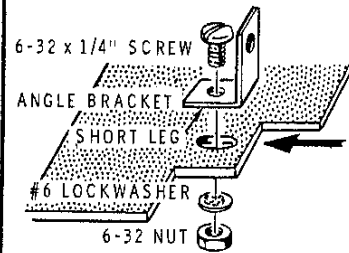
- () Cut off six strips of eight IC connectors and set them aside.
- NOTE: Refer to "IC Preparation and Installation" Detail (fold-out from Page 10) for information on installing IC's.
- () CD2500E IC (#443-64) at IC903.
- () CD2500E IC (#443-64) at IC902.
- () CD2500E IC (#443-64) at IC901.



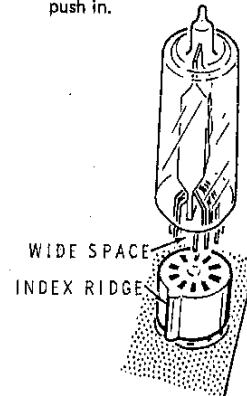
PICTORIAL 8-2

CONTINUE

- () Two angle brackets. Use two 6-32 x 1/4" screws, two #6 lockwashers, and two 6-32 nuts. Position the short leg of each bracket so it is back as far as possible, in the direction of the arrow below, in the slotted holes in the circuit board.



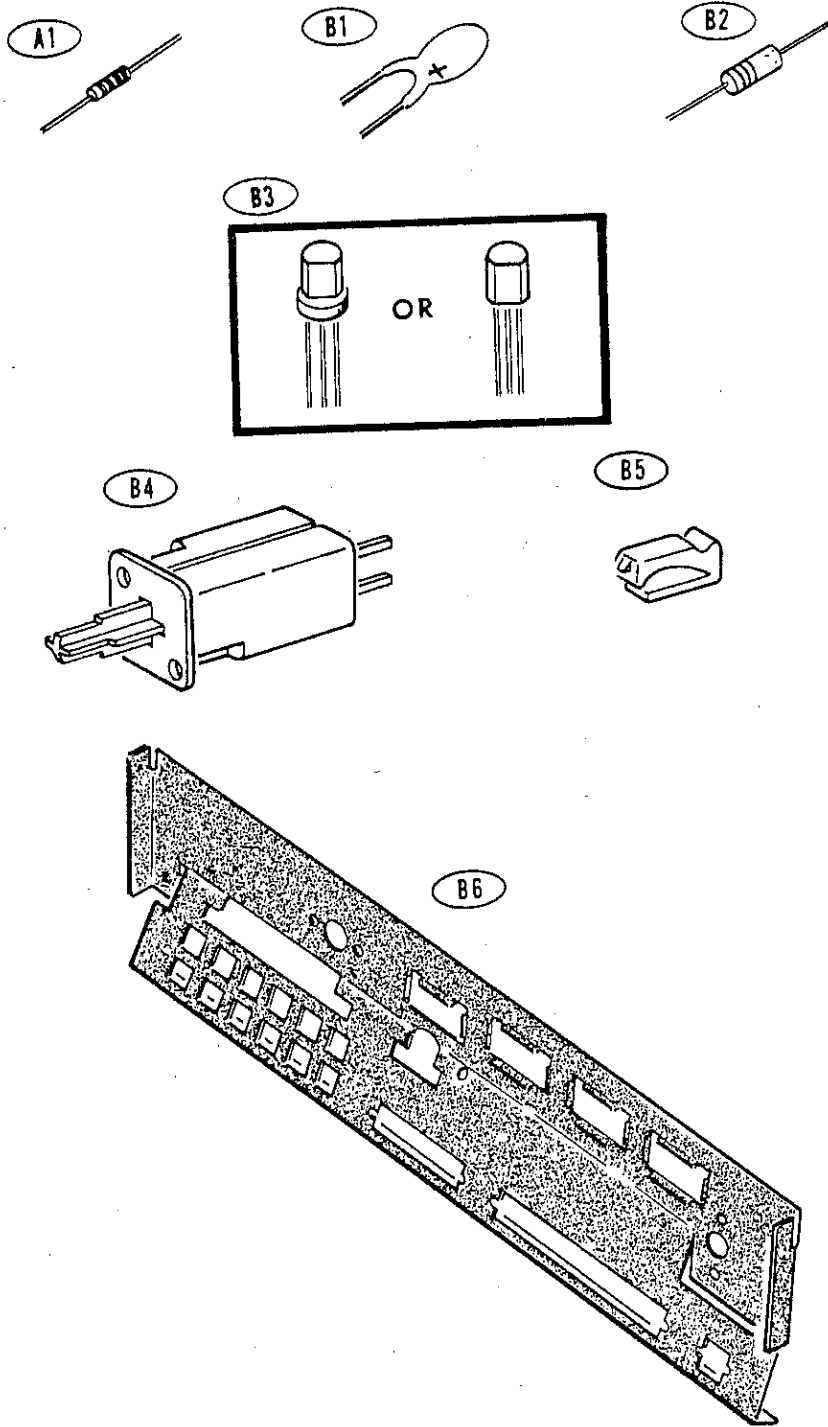
- () Install one of the tubes in each tube socket. At this time, the tube locations are not important. Be sure the wide space lines up with the index ridge. The tubes are easier to install if you rock them slightly while you push in.



This completes the assembly of the circuit board. Check all connections to be sure they are soldered and that no solder bridges exist between foils. Set the circuit board aside temporarily.

FINISH

PARTS PICTORIAL



KEYBOARD CIRCUIT BOARD

PARTS LIST

Refer to the "Pack Index Sheet" and remove the pack 9 parts from the carton stamped "PKS 9-10 & 12." Then check each part against the following Parts List. The key numbers correspond to the numbers on the "Parts Pictorial."

KEY PART No.	PARTS No.	PARTS Per Kit	DESCRIPTION	PRICE Each	KEY PART No.	PARTS No.	PARTS Per Kit	DESCRIPTION	PRICE Each
RESISTORS, 1/4-WATT,					MISCELLANEOUS				
5%					B1	25-200	1	.68 μ F tantalum capacitor	.75
A1	1-60-12	1	100 Ω (brown-black-brown-gold)	.15	B1	25-212	1	22 μ F tantalum capacitor	1.05
A1	1-64-12	1	390 Ω (orange-white-brown-gold)	.15	B2	56-26	16	1N191 diode (brown-white-brown)	.40
A1	1-69-12	2	1000 Ω (brown-black-red-gold)	.15	B3	417-118	1	2N3393 transistor	.40
A1	1-76-12	1	4700 Ω (yellow-violet-red-gold)	.15	B4	65-45	12	Keyboard switch	3.85
A1	1-80-12	1	10 k Ω (brown-black-orange-gold)	.15	B5	208-36	24	Retaining clip	.15
10%					PARTS FROM PACK #13 (Final Pack)				
A1	1-29-12	5	39 k Ω (orange-white-orange)	.15		85-593-1	1	Keyboard circuit board	4.05
					B6	206-543-1	1	Front subpanel	1.60

NOTE: See Page 192 for "Replacement Parts and Price Information."

STEP-BY-STEP ASSEMBLY

() Position the keyboard circuit board as shown in Pictorial 9-1. Then complete each step on the Pictorials.

CONTINUE

START



NOTE: This circuit board has the foil and lettering on the same side. You will install and solder the components on the foil side of the circuit board.

NOTE: When you install resistors and diodes, hold each lead with long-nose pliers as shown. Then bend the lead.

(✓) 1000 Ω, 5% (brown-black-red-gold).

(✓) 10 kΩ, 5% (brown-black-orange-gold).

(✓) 100 Ω, 5% (brown-black-brown-gold).

(✓) 390 Ω, 5% (orange-white-brown-gold).

(✓) 39 kΩ (orange-white-orange).

(✓) 1000 Ω, 5% (brown-black-red-gold).

(✓) 4700 Ω, 5% (yellow-violet-red-gold).

(✓) 39 kΩ (orange-white-orange).

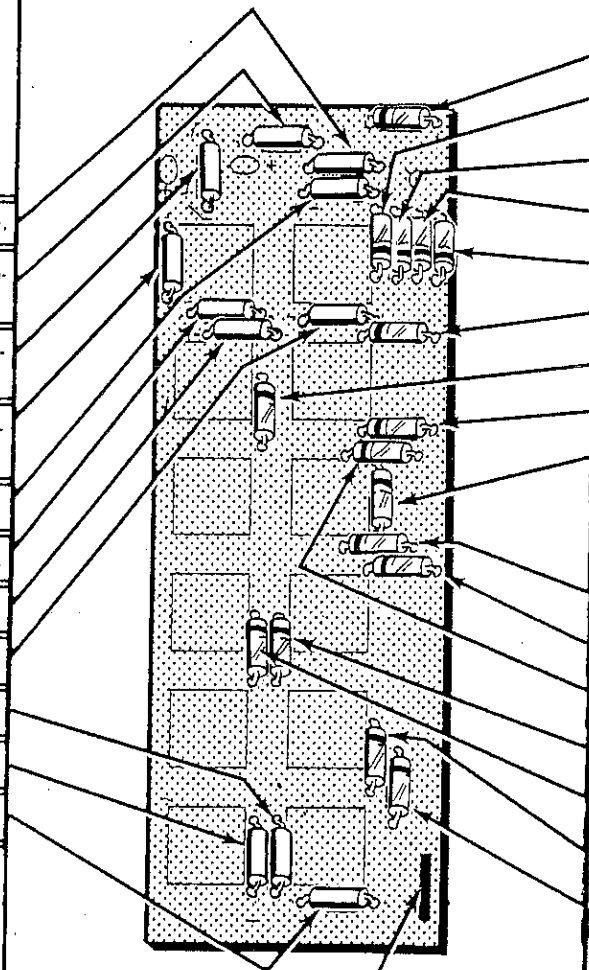
() 39 kΩ (orange-white-orange).

(✓) 39 kΩ (orange-white-orange).

() 39 kΩ (orange-white-orange).

FOR GOOD SOLDERED CONNECTIONS, YOU MUST KEEP THE SOLDERING IRON TIP CLEAN... Wipe it often with a damp sponge or cloth.

() Solder all leads to the foil and cut off the excess lead lengths. Be sure the cutoff component leads are not close enough together to touch each other. The resulting short circuit could damage many components.



PART NUMBER

PICTORIAL 9-1

1. When you install diodes, note the position of the banded end. See the "Diode Mounting" Detail (fold-out from Page 10).
 2. The following 16 diodes are (#56-26) 1N191 (brown-white-brown) diodes.
 3. CAUTION: The diodes must be installed exactly in the sequence shown. This is to insure they will not be damaged by the soldering iron heat when they are soldered. Be sure to follow the arrows and install each diode exactly where indicated.
- () Diode.
 - () Diode.
 - () Diode.
 - () Diode.
 - () Diode.
 - () Diode.
 - () Diode.
 - () Solder all leads to the foil and cut off the excess lead lengths.
 - () Diode.
 - () Diode.
 - () Diode.
 - () Diode.
 - () Diode.
 - () Diode.
 - () Diode.
 - () Solder all leads to the foil and cut off the excess lead lengths. Be sure the cutoff component leads are not close enough together to touch each other. The resulting short circuit could damage many components.

START



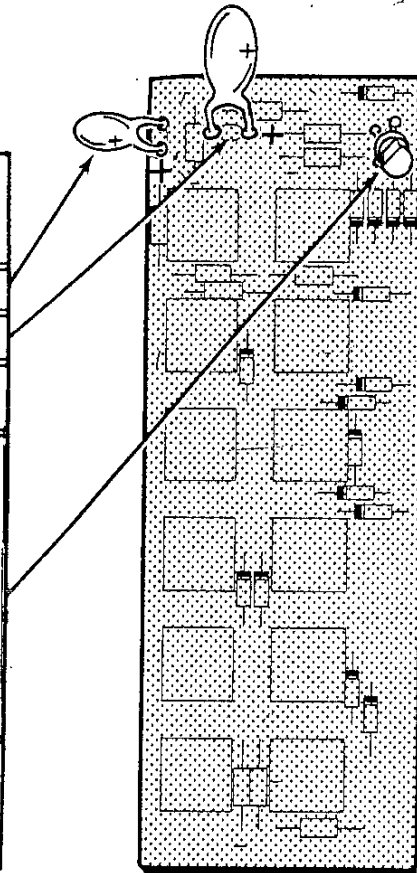
NOTE: When you install the following capacitors, note the position of the positive (+) lead. See the "Capacitor Mounting" Detail (fold-out from Page 10).

()	.68 μ F tantalum.
()	22 μ F tantalum.
()	Solder all leads to the foil and cut off the excess lead lengths.
()	2N3393 transistor (#417-118). Note that the collector lead is bent toward the flat of the transistor as shown.

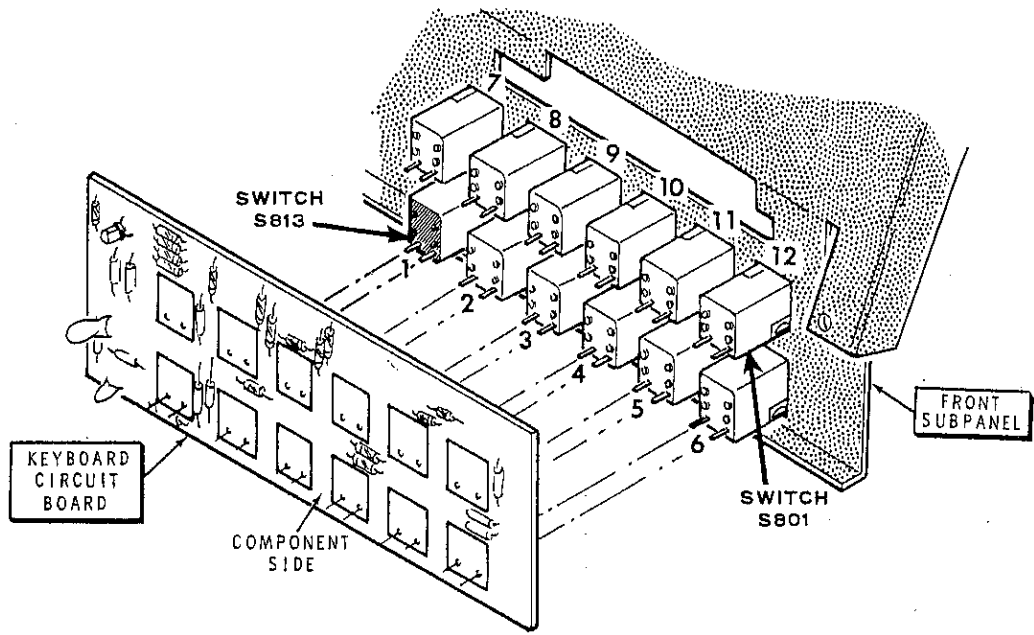
FLAT SIDE

1/4"

Be sure the cutoff component leads are not close enough together to touch each other. The resulting short circuit could damage many components.

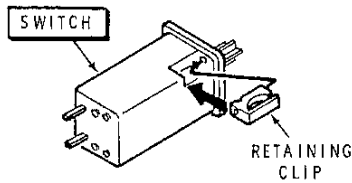


PICTORIAL 9-2



PICTORIAL 9-3

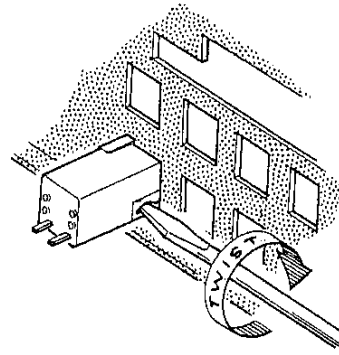
Refer to Pictorial 9-3 for the following steps. Handle the switches carefully, as they are very fragile.



Detail 9-3A

NOTE: If your switches already have retaining clips in them, ignore the next three steps.

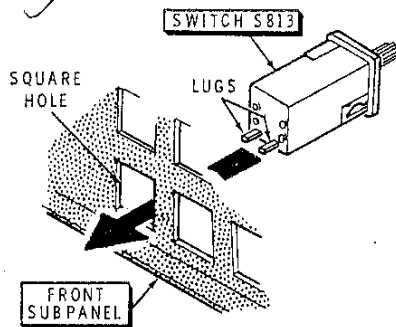
- () Refer to Detail 9-3A and install a retaining clip in one corner of a keyboard switch as shown.
- () Similarly install a retaining clip in the opposite corner of the keyboard switch.
- () Install two retaining clips in each of the remaining eleven keyboard switches.



Detail 9-3C

- () Refer to Detail 9-3C and use a small screwdriver to snap the retaining clips into place.

- () Similarly install the remaining eleven keyboard switches, ONE AT A TIME, in the numbered sequence shown in the Pictorial.



Detail 9-3B

- () Set the keyboard circuit board component side up onto the lugs of the twelve switches.

- () Press the circuit board down against switch S801. Then solder the two lugs of the switch to the circuit board.

- () Press the other end of the circuit board down against switch S813. Then solder the two lugs of the switch to the circuit board.

- () Refer to Detail 9-3B and install keyboard switch number 1 in the indicated square hole in the front subpanel. Be sure the switch lugs are positioned as shown. Push the switch down flat against the subpanel.

- () Solder the lugs of the remaining ten switches to the circuit board.

- () Set the front subpanel aside until it is called for.

MASTER CIRCUIT BOARD

PARTS LIST

Refer to the "Pack Index Sheet" and remove the pack 10 parts from the carton stamped "PKS 9-10 & 12." Then check each part against the following Parts List. The key numbers correspond to the numbers on the "Master Circuit Board Parts Pictorial" (fold-out from Page 75).

KEY PART No.	PARTS No.	PER KIT	DESCRIPTION	PRICE Each	KEY PART No.	PARTS No.	PER KIT	DESCRIPTION	PRICE Each
RESISTORS, 1/2-Watt,					HARDWARE				
5%									
A1	1-63	1	510 Ω (green-brown-brown-gold)	.15	D1	250-52	24	4-40 x 1/4" screw	.05
A1	1-116	1	6200 Ω (blue-red-red-gold)	.15	D2	252-15	24	4-40 nut	.05
A1	1-114	1	8200 Ω (gray-red-red-gold)	.15	D3	254-9	24	#4 lockwasher	.05
A1	1-105	6	10 k Ω (brown-black-orange-gold)	.15	TRANSISTOR-IC's				
A1	1-104	1	100 k Ω (brown-black-yellow-gold)	.15	NOTE: Transistors and IC's are marked for identification in one of the following four ways.				
10%					1. Part number.				
A1	1-9	6	1000 Ω (brown-black-red)	.15	2. Type number. (In IC's this refers only to the numbers; the letters may be different).				
A1	1-33	1	470 k Ω (yellow-violet-yellow)	.15	3. Part number and type number.				
CAPACITORS					4. Part number with a type number other than the one listed.				
B1	21-95	5	.1 μ F disc	.25	E1	417-94	2	2N3416 transistor	1.00
B2	25-200	1	.68 μ F tantalum	.75	E1	417-118	3	2N3393 transistor	.40
B3	25-250	1	50 μ F tubular electrolytic	.45	E2	443-1	1	SN7400N IC	.70
SWITCHES-CONNECTORS					E2	443-12	3	SN7410N IC	.70
C1	60-21	1	2-position slide switch	.40	E2	443-57	1	MC3003P IC	.95
C2	60-67	1	3-position slide switch	.75	E2	443-58	4	MC3006P IC	.90
C3	432-144	130	IC connector (extra included)	.01	MISCELLANEOUS				
C4	432-715	7	Circuit board connector	2.65	F1	73-1	2	3/8" rubber grommet	.10
					F2	73-34	2	Alligator clip insulator	.10
					F3	260-16	2	Alligator clip	.10
						343-12	1	Shielded cable	.10/ft
						344-15	1	Black stranded wire	.05/ft
						344-16	1	Red stranded wire	.05/ft
						344-56	1	Blue wire	.05/ft
						344-57	1	Violet wire	.05/ft



KEY PART No.	PARTS No.	DESCRIPTION	PRICE Each
PARTS FROM PACK #13 (Final Pack)			
	85-592-2	1 Master circuit board	22.60
F4	204-1265	2 Support rail	1.05
F5	134-282	1 Programmer wire harness	3.15

KEY PART No.	PARTS No.	DESCRIPTION	PRICE Each
Parts From Pack #13 (Final Pack) cont'd.			
	134-281	1 Master wire harness	8.85

NOTE: See Page 192 for "Replacement Parts and Price Information."

STEP-BY-STEP ASSEMBLY

() Position the master circuit board as shown in the identification drawing. Then complete each step on the Pictorial. Note that there is lettering on both sides

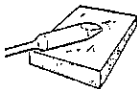
of the circuit board. Be sure the circuit board is positioned so the part number and holes are in the locations shown in the identification drawing.

START

() Cut off eighteen strips of seven IC connectors and set them aside.

NOTE: Refer to "IC Preparation and Installation" Detail (fold-out from Page 10), for information on installing IC's.

FOR GOOD SOLDERED CONNECTIONS, YOU MUST KEEP THE SOLDERING IRON TIP CLEAN... WIPE IT OFTEN WITH A DAMP SPONGE OR CLOTH.



Several circuit board holes will not be used. These are special "plated through" (lined with foil) holes that are used only to connect a foil on one side of the circuit board to the foil on the other side. When you solder component leads to the foil, be especially careful that solder does not flow into unused holes.

(✓) SN7410N IC (#443-12) at IC1.

(✓) SN7400N IC (#443-1) at IC2.

(✓) SN7410N IC (#443-12) at IC3.

(✓) SN7410N IC (#443-12) at IC4.

(✓) MC3006P IC (#443-58) at IC8.

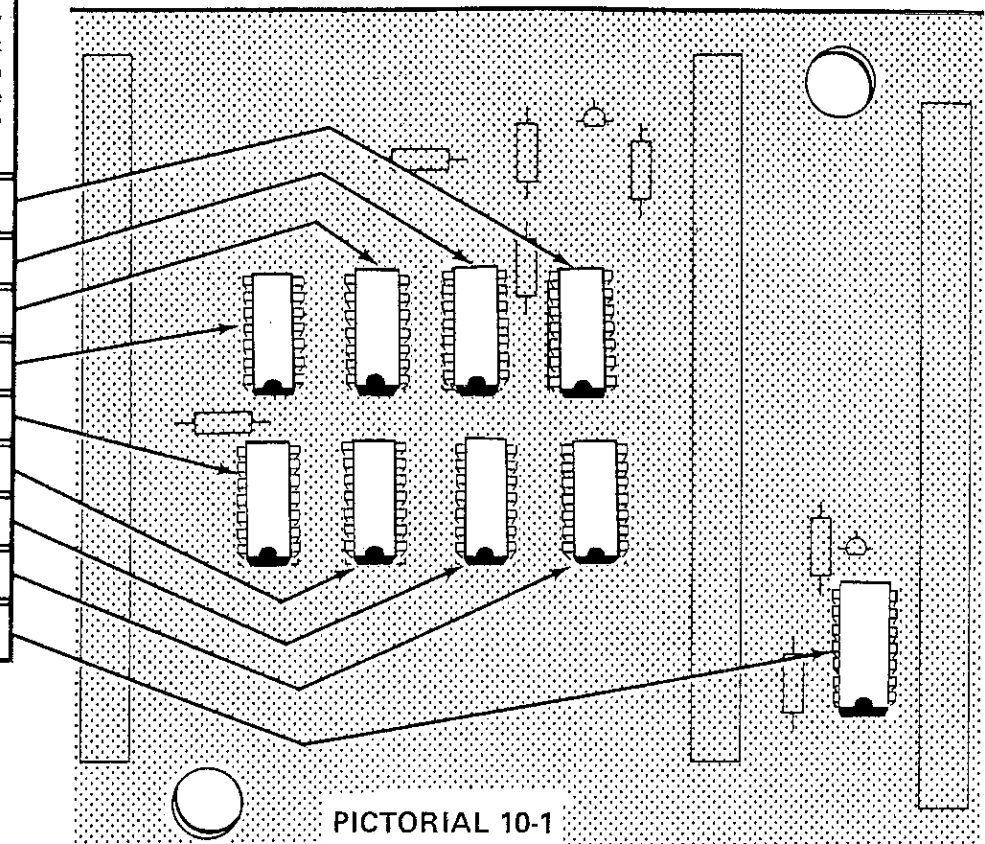
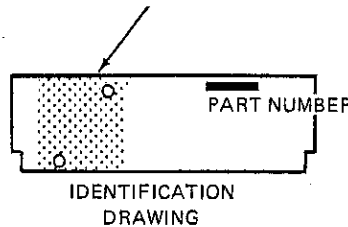
(✓) MC3006P IC (#443-58) at IC7.

() MC3006P IC (#443-58) at IC6.

(✓) MC3006P IC (#443-58) at IC5.

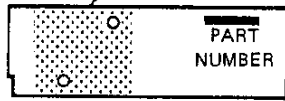
(✓) MC3003P IC (#443-57) at IC9.

The steps performed in this Pictorial are in this area of the circuit board.



PICTORIAL 10-1

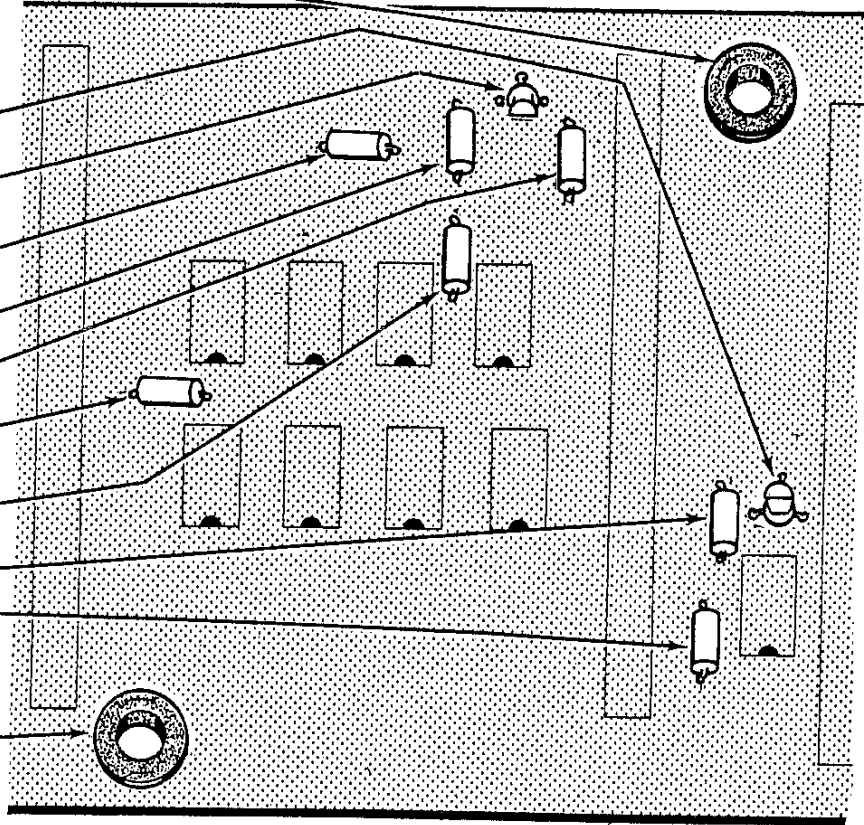
The steps performed in this Pictorial are in this area of the circuit board.



IDENTIFICATION DRAWING

START

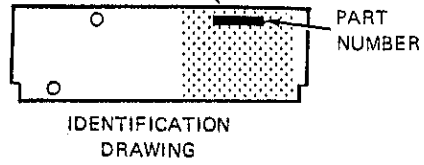
- (✓) 3/8" rubber grommet.
- NOTE: When you install transistors, see "Transistor Mounting" Detail (fold-out from Page 10).
- (✓) 2N3393 transistor (#417-118) at Q2.
- (✓) 2N3393 transistor (#417-118) at Q1.
- (✓) 10 k Ω , 5% (brown-black-orange-gold).
- () 1000 Ω (brown-black-red).
- (✓) 1000 Ω (brown-black-red).
- (✓) 10 k Ω , 5% (brown-black-orange-gold).
- (✓) 10 k Ω , 5% (brown-black-orange-gold).
- (✓) 1000 Ω (brown-black-red).
- (✓) 1000 Ω (brown-black-red).
- () Solder all leads to the foil and cut off the excess lead lengths.
- (✓) 3/8" rubber grommet.



PICTORIAL 10-2

10 k

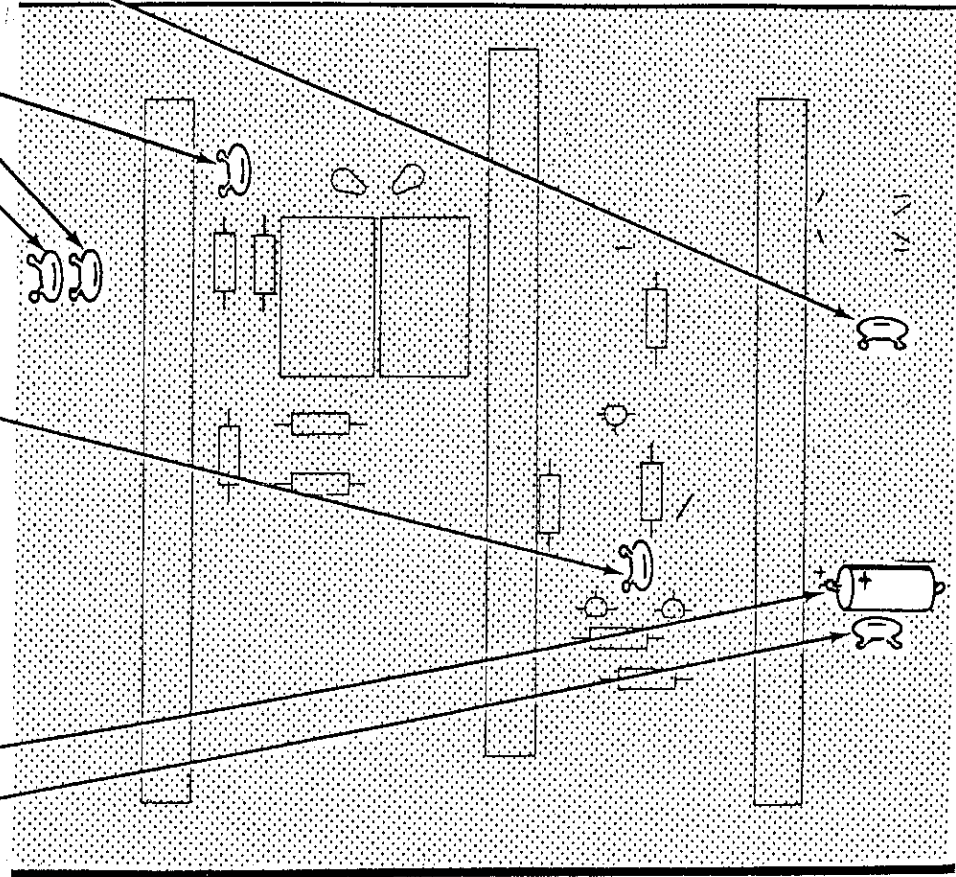
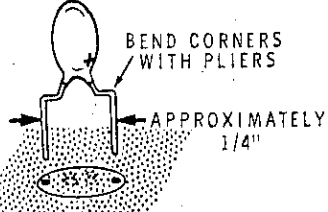
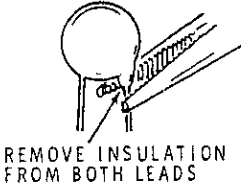
The steps performed in this Pictorial are in this area of the circuit board.



START

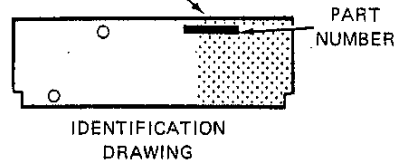


- () .1 μ F disc.
- (✓) .1 μ F disc.
- (✓) .1 μ F disc.
- (✓) .1 μ F disc.
- NOTE: When you install electrolytic and tantalum capacitors, note the position of the positive (+) lead. See "Electrolytic Capacitor Mounting" Detail (fold-out from Page 10).
- (✓) .68 μ F tantalum. Carefully bend the leads as shown to avoid damaging the capacitor.
- (✓) 50 μ F tubular electrolytic.
- (✓) .1 μ F disc.
- () Solder all leads to the foil and cut off the excess lead lengths.



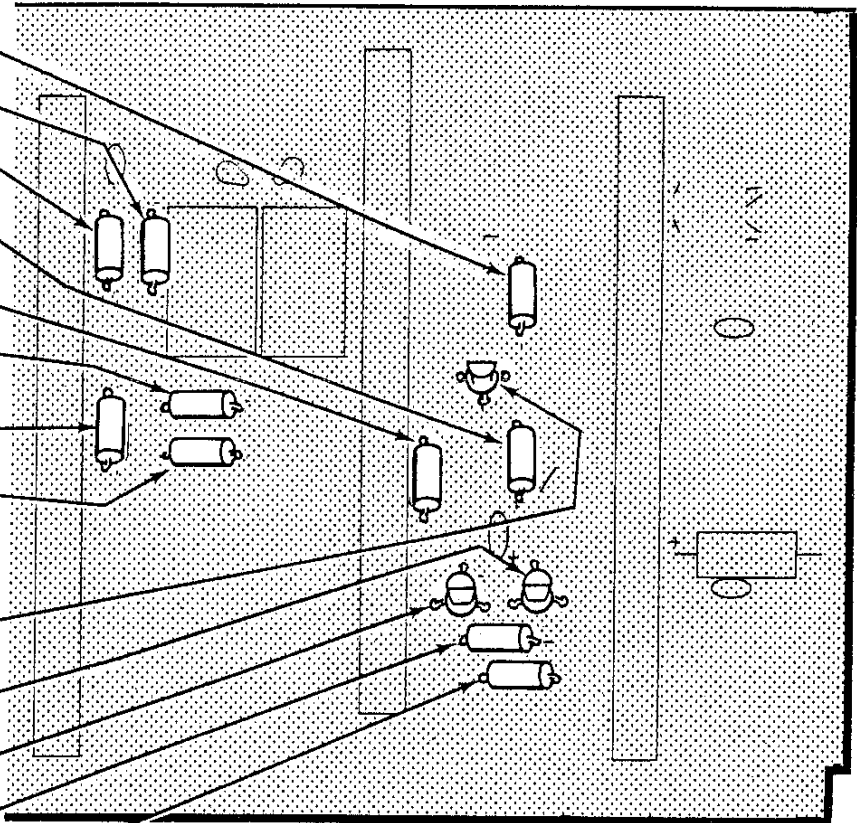
PICTORIAL 10-3

The steps performed in this Pictorial are in this area of the circuit board.



START

- 1000 Ω (brown-black-red).
- 6200 Ω , 5% (blue-red-red-gold).
- 1000 Ω (brown-black-red).
- 10 k Ω , 5% (brown-black-orange-gold).
- 510 Ω , 5% (green-brown-brown-gold).
- 100 k Ω , 5% (brown-black-yellow-gold).
- 10 k Ω , 5% (brown-black-orange-gold).
- 470 k Ω (yellow-violet-yellow).
- Solder all leads to the foil and cut off the excess lead lengths.
- 2N3416 transistor (#417-94) at Q4.
- 2N3393 transistor (#417-118) at Q3.
- 2N3416 transistor (#417-94) at Q5.
- 8200 Ω , 5% (gray-red-red-gold).
- 10 k Ω , 5% (brown-black-orange-gold).
- Solder all leads to the foil and cut off the excess lead lengths.



PICTORIAL 10-4

START

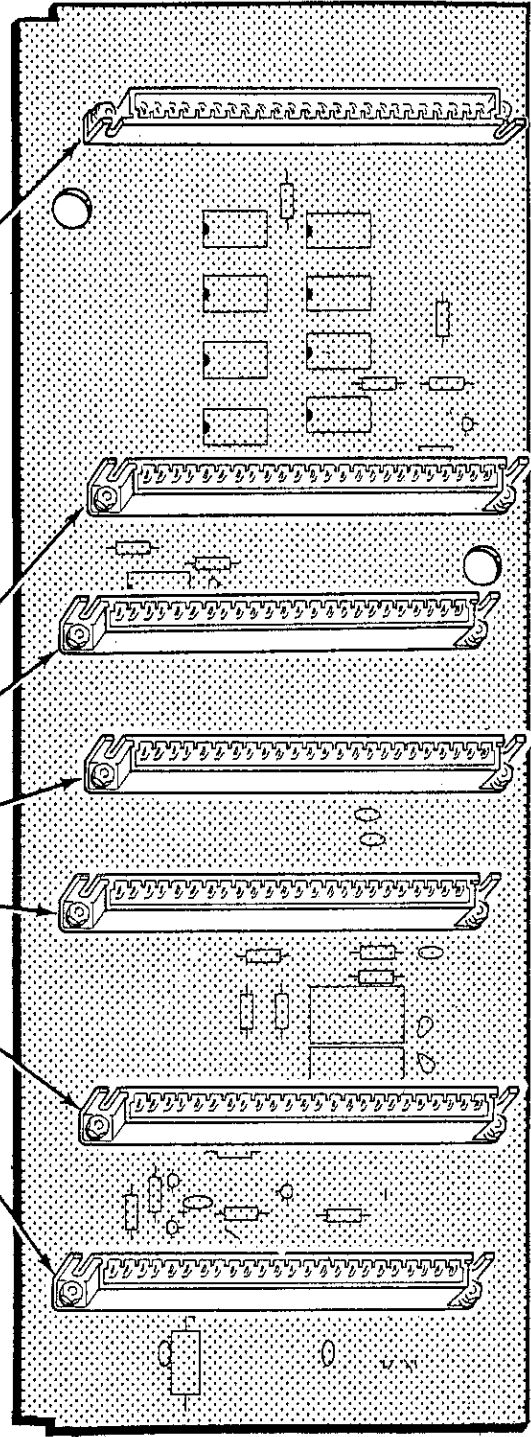


(✓) 24-pin connector. Use 4-40 x 1/4" screws, #4 lockwashers, and 4-40 nuts. Then turn the circuit board over and solder all 24 pins to the foil.

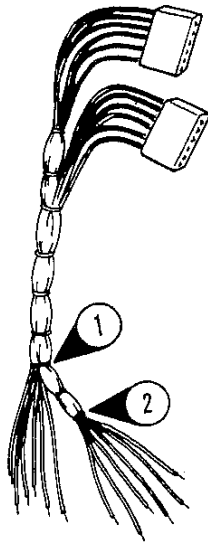
Labels in diagram:
 4-40 NUT
 #4 LOCKWASHER
 24-PIN CONNECTOR
 4-40 x 1/4" SCREW

(✓) In like manner, install 24-pin connectors at the remaining six locations on the circuit board. Note that these six connectors are turned 180° from that shown in the above illustration.

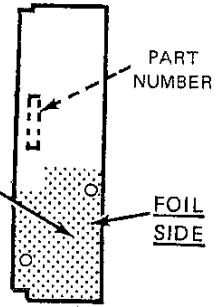
(✓) Check all 24 pins of each 24-pin connector to be sure they are soldered.



PICTORIAL 10-5



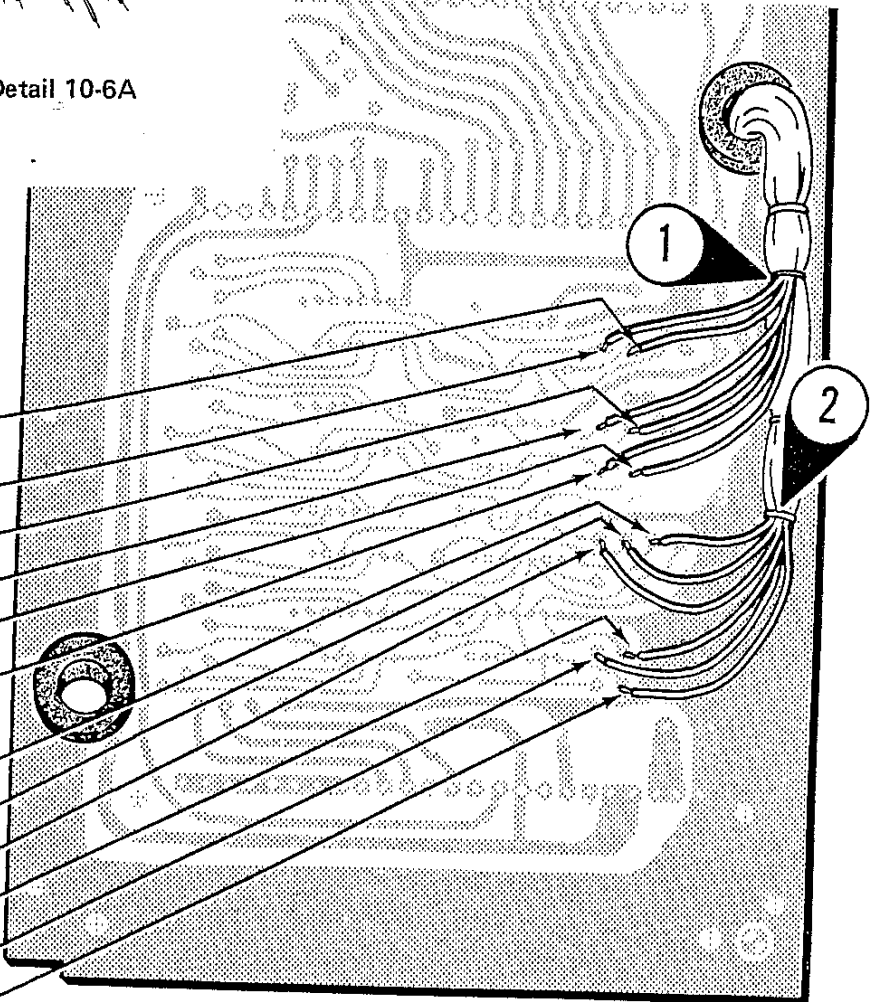
The steps performed in this Pictorial are in this area of the circuit board.



START

- Locate the programmer wire harness (#134-282) and straighten it out as shown in Detail 10-6A.
 - Insert the breakout end of the wire harness through the indicated grommet from the component (IC) side of the circuit board.
- NOTE: In the following steps you will connect the wire harness to the circuit board. Solder each wire to the component (IC) side of the circuit board as it is installed. Then cut off the excess wire length. CAUTION: Be sure no solder splashes or drips, or cut off wire lengths fall into the IC's.
- Connect the wires from BO#1 as follows:
- White wire to B8.
 - Brown wire to A1.
 - Black wire to B2.
 - Red wire to B4.
 - Green wire to C8.
 - Violet wire to B1.
- Connect the wires from BO#2 as follows:
- Orange wire to C1.
 - Yellow wire to C2.
 - Blue wire to C4.
 - Black wire to D8.
 - Red wire to D4.
 - Brown wire to D2.

Detail 10-6A

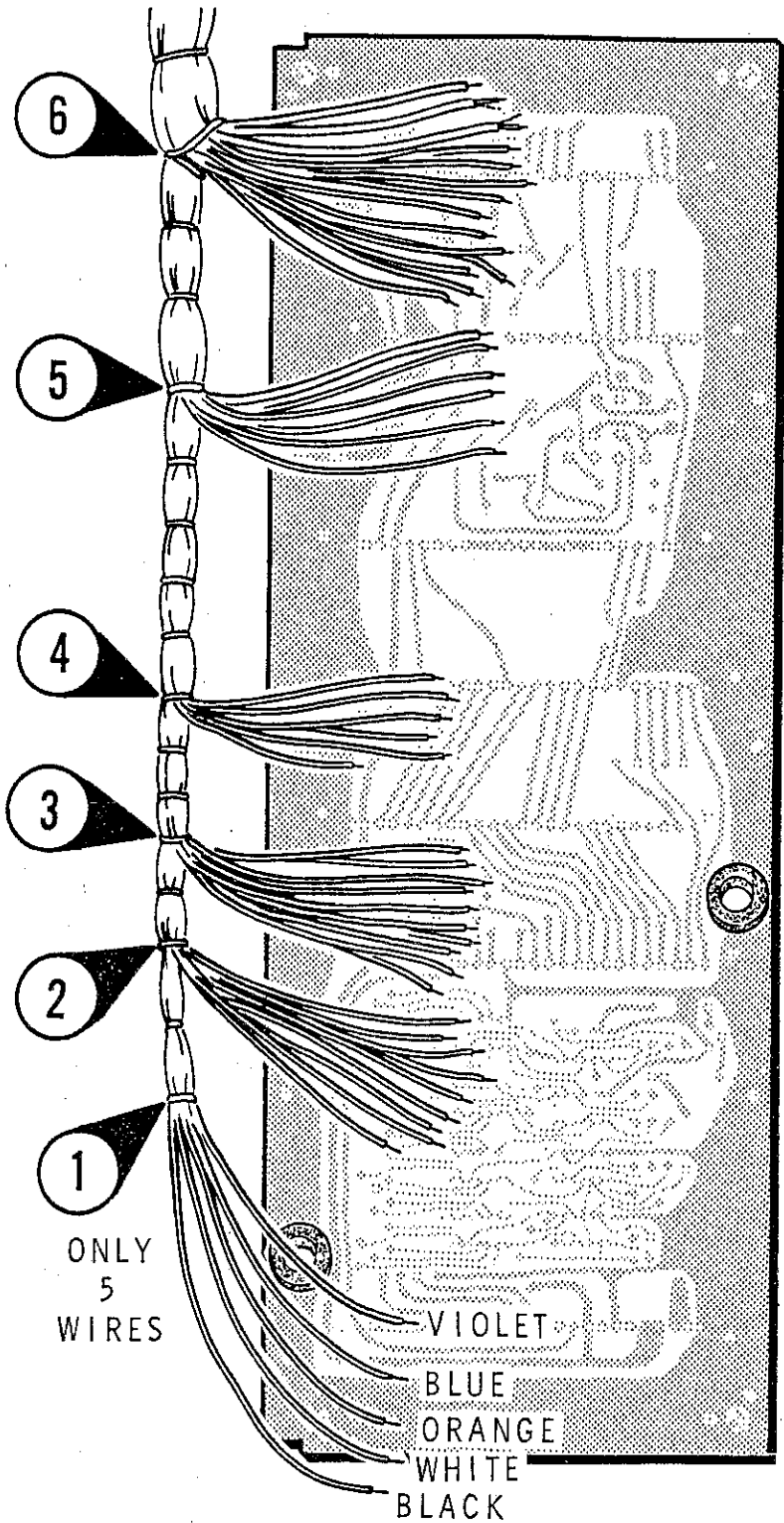


PICTORIAL 10-6

START

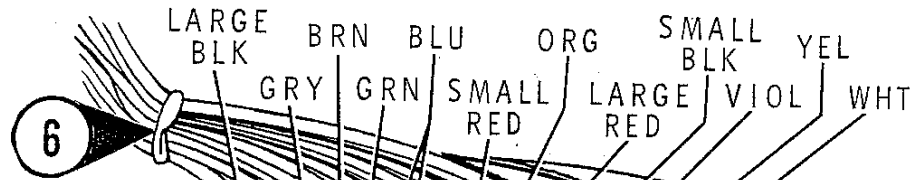
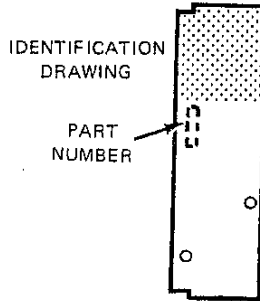


- () Turn the circuit board component side down and position it as shown.
- () Locate the master wire harness (#134-281) and straighten it out as shown.
- () Position the wire harness along the circuit board with the wires from breakouts (BO) 1 through 6 as shown. Position the remaining harness wires past the end of the circuit board.



PICTORIAL 10-7

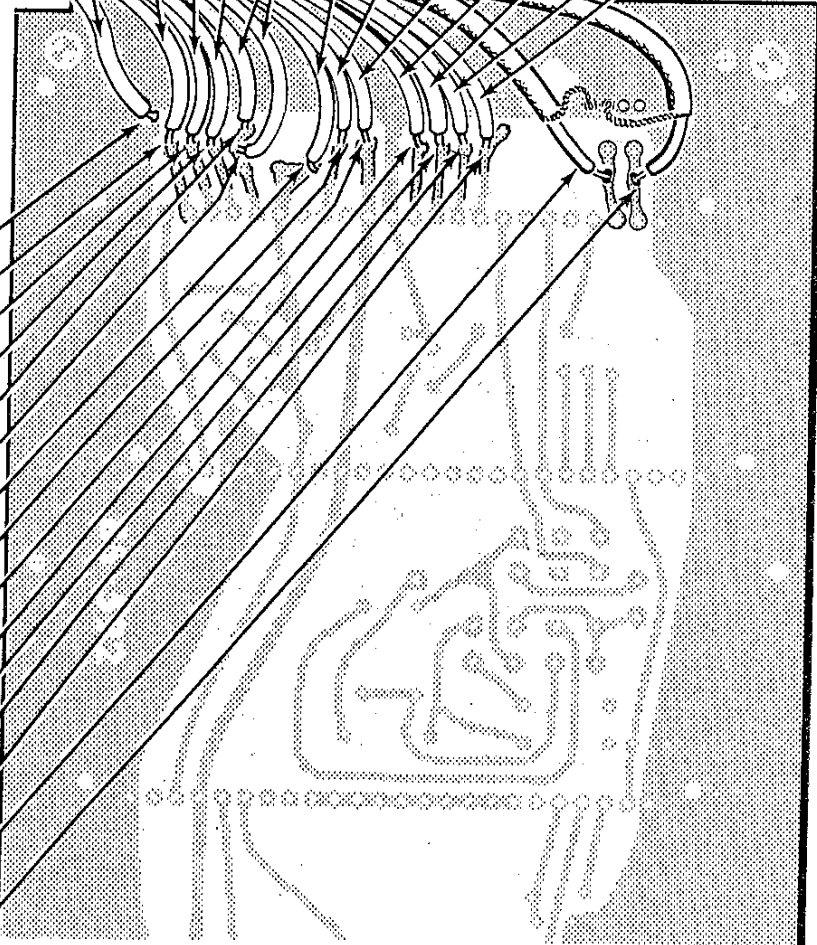
The steps performed in this Pictorial are in this area of the circuit board.



START

NOTE: In the following steps you will solder the wire harness to the component side of the circuit board. Solder each wire as it is installed and cut off the excess wire ends.

- (/) Large black to GND.
- (✓) Gray to NOISE.
- (✓) Brown to ST ONLY 1.
- (✓) Green to STEREO LT 1.
- (✓) Either blue to RE-PRGM SQ.
- (✓) Other blue to RE-PRGM SQ.
- (✓) Small red to +15V.
- (✓) Orange to AGC LEVEL.
- (✓) Large red to +5V.
- (✓) Small black to SQ OVRID.
- (/) Violet to STOP SWP.
- (/) Yellow to STEREO ONLY 2.
- (✓) White to SQ DEFEAT.
- (✓) Either shielded cable: Inner lead to RIGHT CHAN, shield lead to GND.
- (✓) Other shielded cable: Inner lead to LEFT CHAN, shield lead to GND.



PICTORIAL 10-8

The steps performed in this Pictorial are in this area of the circuit board.

IDENTIFICATION DRAWING

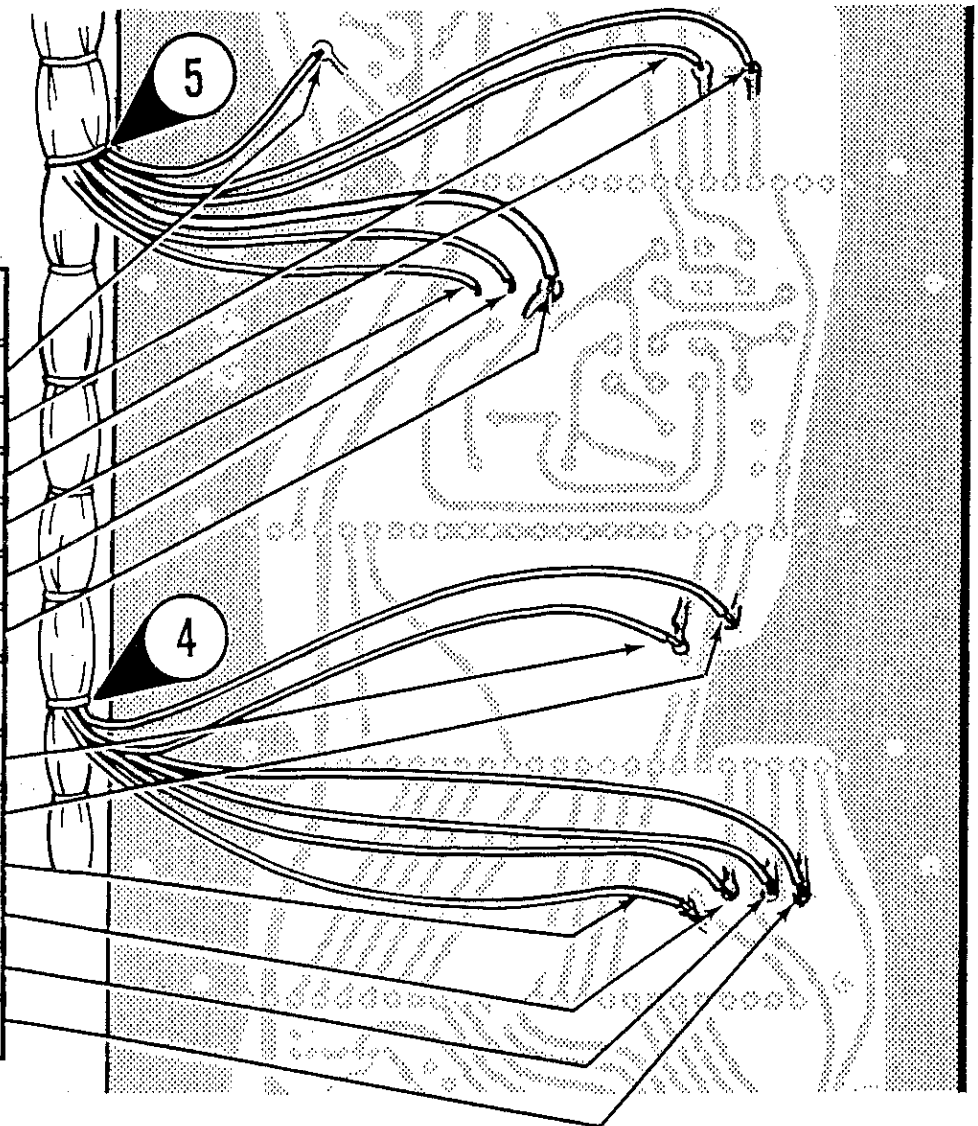
PART NUMBER



START



Connect the wires from BO#5 to the circuit board as follows:
(/) Yellow to ST LT 2.
(/) Blue to +0V SWP.
(/) White to MULTIPATH.
(/) Violet to METER SW (-).
(/) Small brown to METER SW (+).
(/) Large brown to +8V.
Connect the wires from BO#4 to the circuit board as follows:
(/) Gray to UNLOCK LIGHT.
(/) Violet to SQUELCH.
(/) Blue to RE-PGM.
(/) Green to SPEED 2.
(/) Yellow to SPEED 1.
(/) Red to +5V (SW).

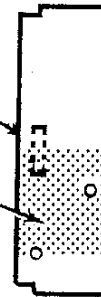


PICTORIAL 10-9

The steps performed in this Pictorial are in this area of the circuit board.

IDENTIFICATION DRAWING

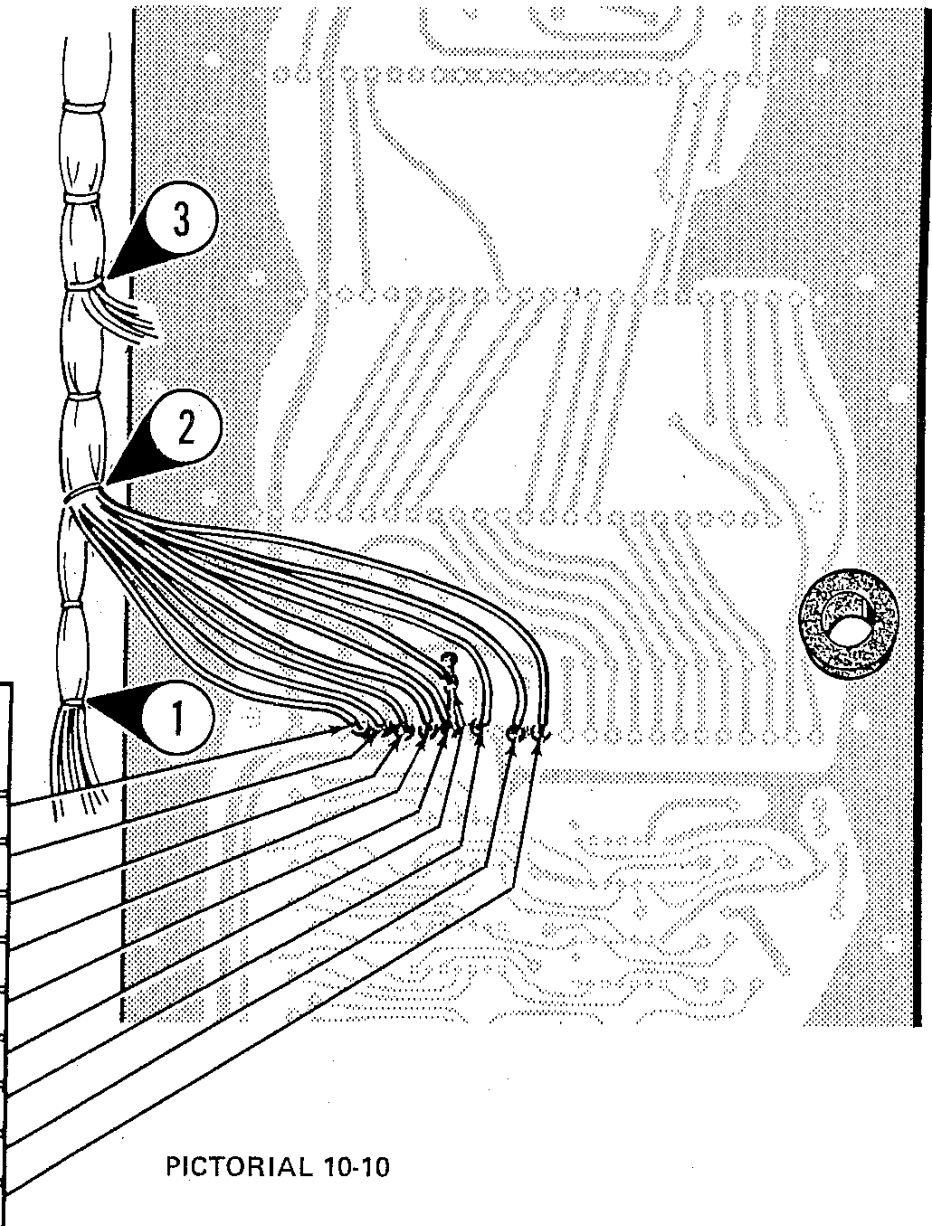
PART NUMBER



START

Connect the wires from BO#2 as follows. The wires from BO#3 will be connected later.

- (/) Blue to SHFT.
- (✓) Orange to SQ.
- (✓) Gray to RST.
- (✓) White to B+S.
- (✓) Either green to BYPS.
- (✓) Other green to BYPS.
- (✓) Violet to STOP.
- (✓) Yellow to A1.
- (✓) Brown to BB.



PICTORIAL 10-10

PART NUMBER

The steps performed in this pictorial are in this area of the circuit board.

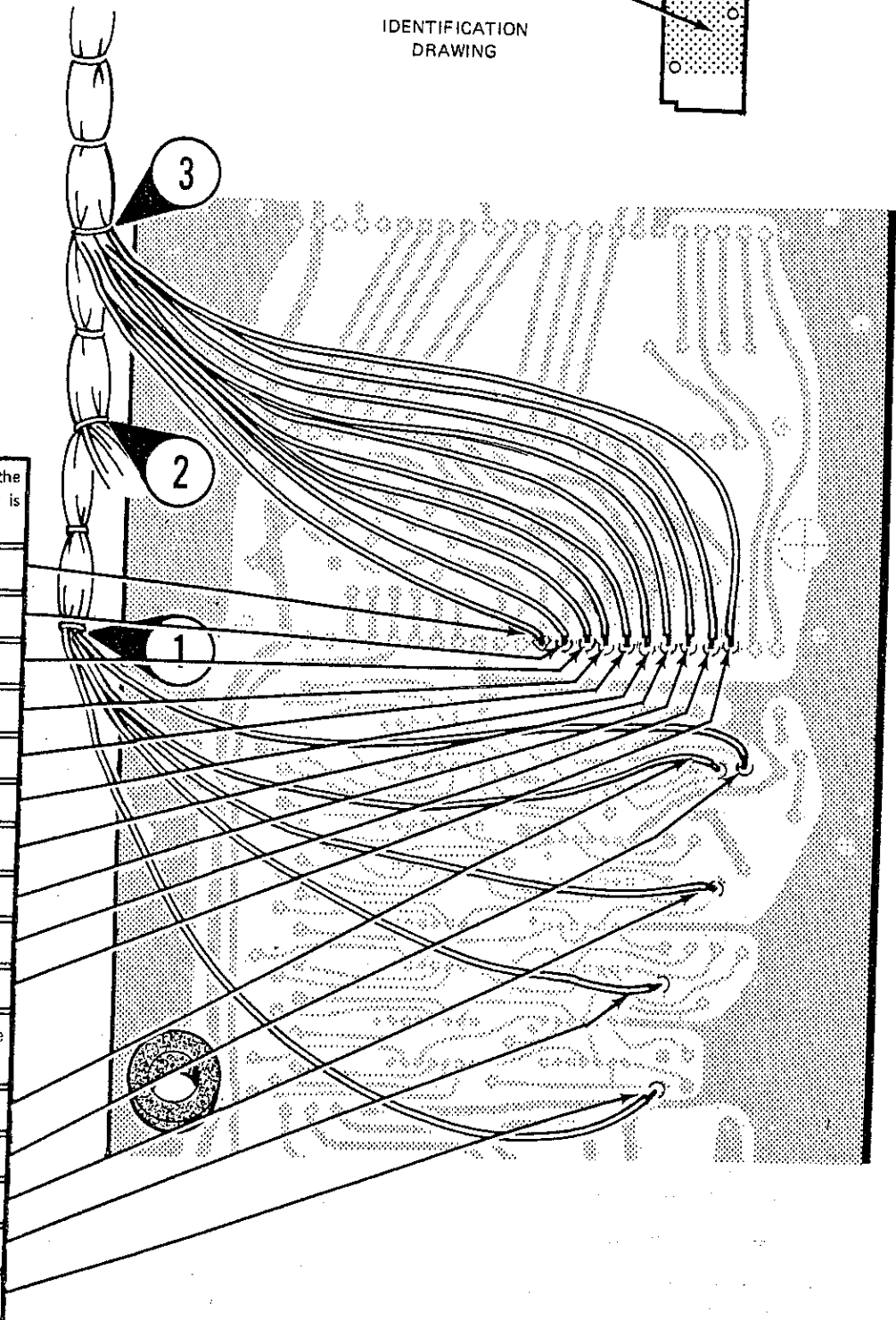
IDENTIFICATION DRAWING



START



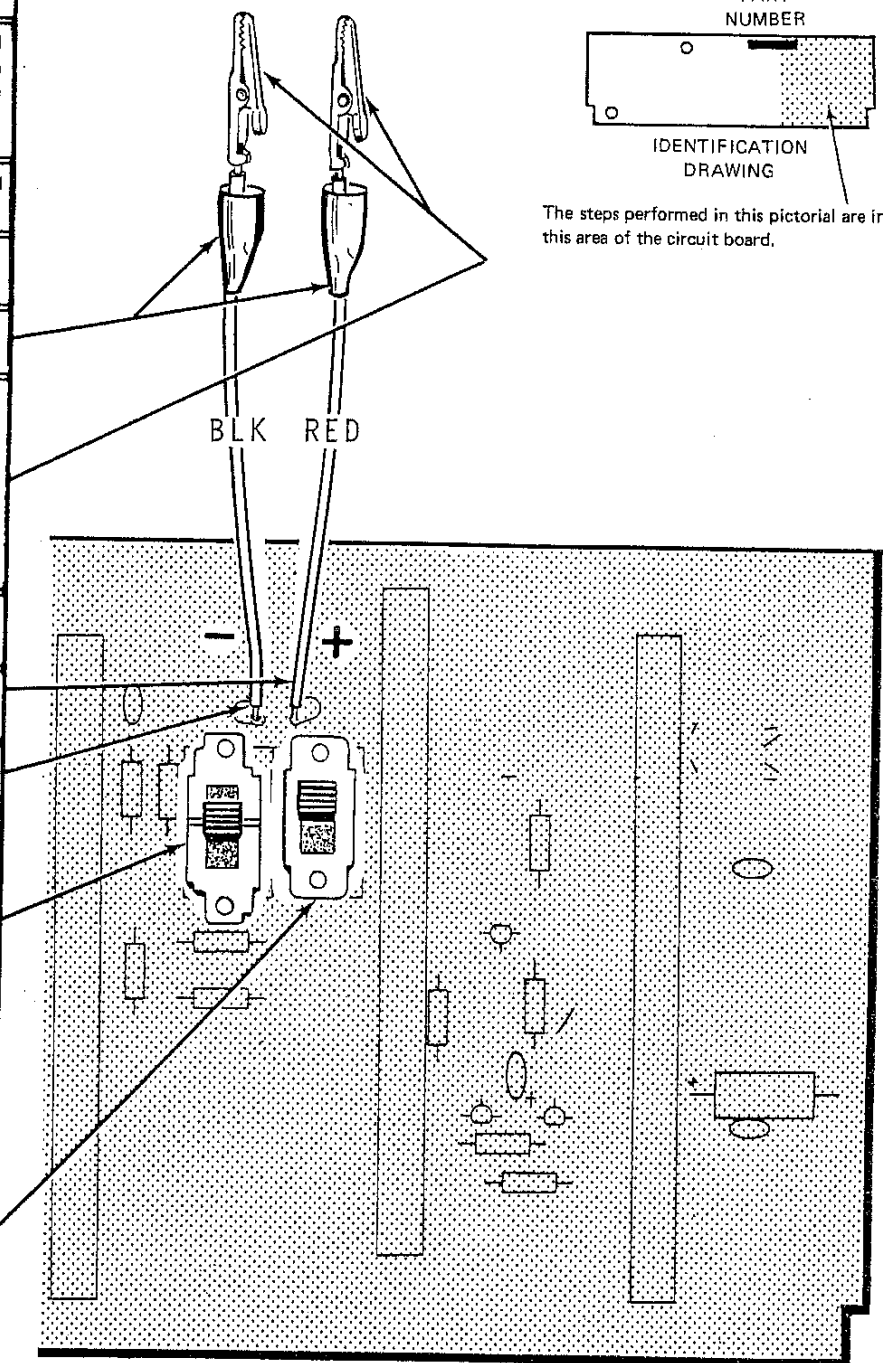
Connect the wires from BO#3 in the following steps. Solder each wire as it is installed.
<input checked="" type="checkbox"/> White to B4.
<input checked="" type="checkbox"/> Orange to B2.
<input checked="" type="checkbox"/> Gray to B1.
<input checked="" type="checkbox"/> Violet to C8.
<input checked="" type="checkbox"/> Blue to C4.
<input checked="" type="checkbox"/> Green to C2.
<input checked="" type="checkbox"/> Yellow to C1.
<input checked="" type="checkbox"/> Brown to D8.
<input checked="" type="checkbox"/> Black to D4.
<input checked="" type="checkbox"/> Red to D2.
Connect the wires from BO#1 to the circuit board as follows:
<input checked="" type="checkbox"/> Orange to L8.
<input checked="" type="checkbox"/> Blue to SWEEP.
<input checked="" type="checkbox"/> White to L4.
<input checked="" type="checkbox"/> Violet to L1.
<input checked="" type="checkbox"/> Black to L2.



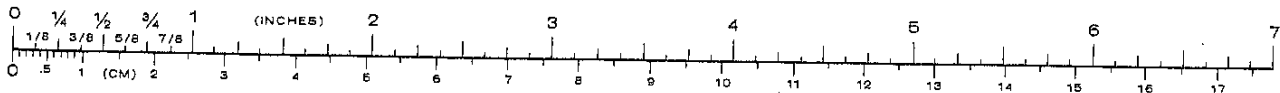
PICTORIAL 10-11

START

- (✓) Position the circuit board component side up as shown.
- NOTE: When you prepare stranded hookup wire, remove 1/4" of insulation from each end of the wire. Use wire of the color specified and cut it to the indicated length. Solder each wire as it is installed.
- (✓) Prepare an 18" length of red stranded wire.
- (✓) Prepare an 18" length of black stranded wire.
- (✓) Install red alligator clip insulators on one end of each wire.
- (✓) Install an alligator clip on one end of each wire.
- CRIMP AND SOLDER**
- (✓) Now push the alligator clip insulators over the alligator clips.
- (✓) 18" length of red stranded wire in the hole marked (+).
- (✓) 18" length of black stranded wire in the hole marked (-).
- (✓) 3-position slide switch (#60-67) at S2. Solder all eight pins to the foil.
- (✓) 2-position slide switch (#60-21) at S1. Solder all six pins to the foil.

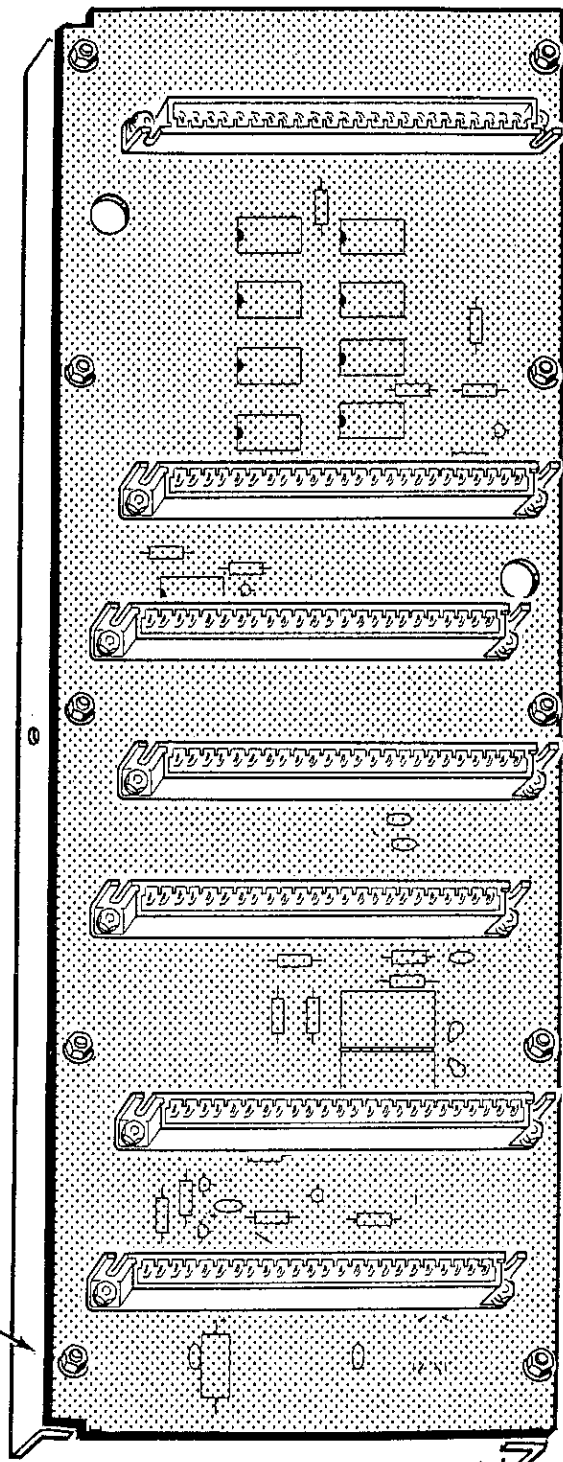
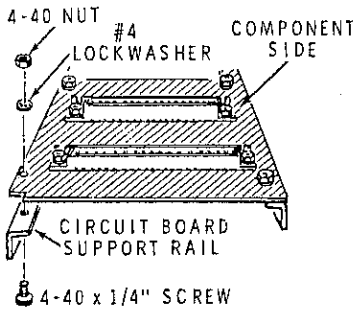


PICTORIAL 10-12



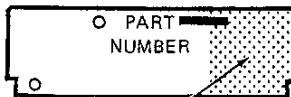
START

Circuit board support rail along each long edge of the circuit board. Mount the rail to the side of the circuit board opposite the components. Use 4-40 x 1/4" screws, #4 lockwashers, and 4-40 nuts at each of the five holes in each rail. Be careful not to pinch any wires.



PICTORIAL 10-13

IDENTIFICATION
DRAWING

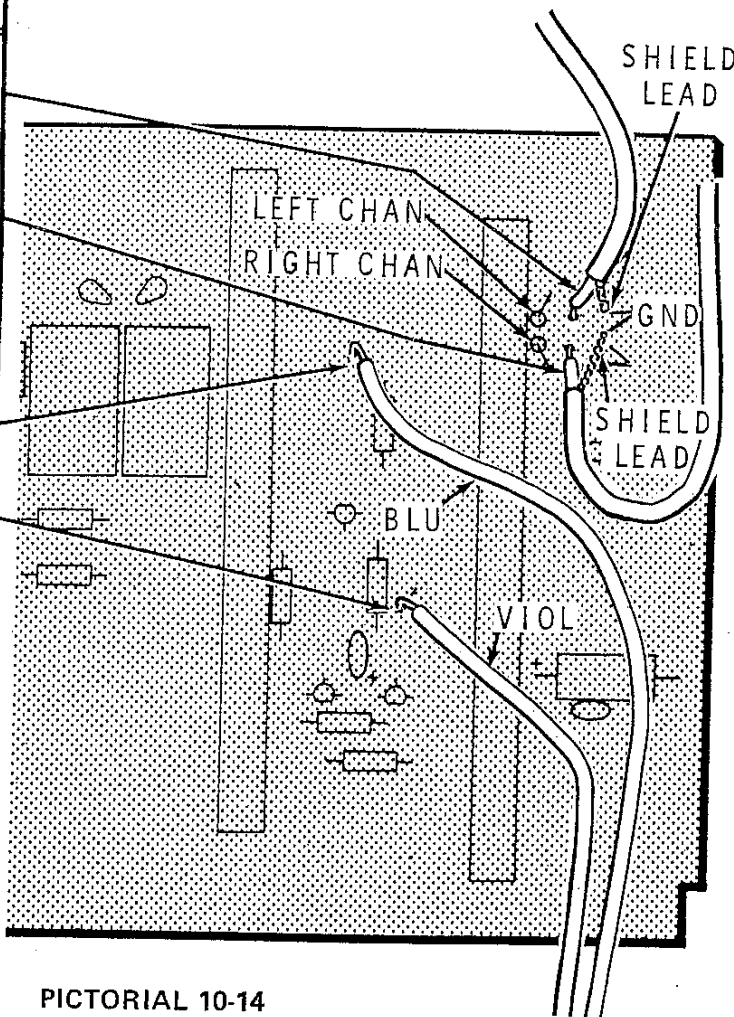
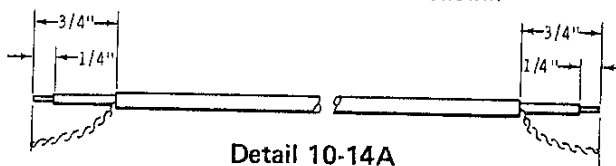


The steps performed in this Pictorial are in this area of the circuit board.

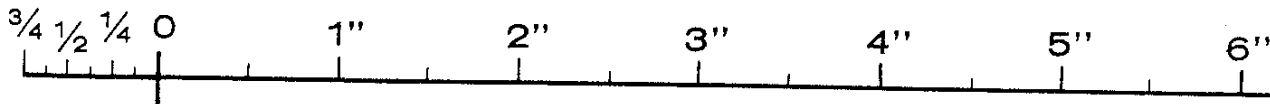
START

- () Position the circuit board component side up as shown.
 - () Prepare two 16" lengths of small shielded cable as shown in Detail 10-14A.
 - NOTE: Solder the following cables and wires as they are installed.
 - () Either shielded cable: Inner lead to LEFT CHAN, shield lead to GND. The other end of this cable will be connected later.
 - () Other shielded cable: Inner lead to RIGHT CHAN, shield lead to GND. The other end of this cable will be connected later.
 - NOTE: When you prepare hookup wire, remove 1/4" of insulation from each end of the wire.
 - () 18" blue wire at SCOPE VERT. The other end of this wire will be connected later.
 - () 18" violet wire at SCOPE HORIZ. The other end of this wire will be connected later.
- This completes the assembly of the master circuit board. Check all connections to be sure they are soldered and that no solder bridges exist between foils. Set the master circuit board aside until it is called for.

CUT THE CABLE ACCORDING TO THE DIMENSIONS BELOW. PREPARE EACH END AS SHOWN.



PICTORIAL 10-14



CHASSIS

PARTS LIST

Unpack the package marked 11 and check each part against the following Parts List. The key numbers correspond to the numbers on the Chassis Parts Pictorial (fold-out from Page 88). NOTE: Any part that is packaged in an individual envelope with a part number on it should be placed back in its envelope, after it is identified, until it is called for in a step.

KEY PART No.	PARTS No.	PARTS Per Kit	DESCRIPTION	PRICE Each	KEY PART No.	PARTS No.	PARTS Per Kit	DESCRIPTION	PRICE Each
CAPACITORS					HARDWARE				
A1	21-70	1	.01 μ F 1.4 kV ceramic	.25	#6 Hardware				
A2	27-60	1	.22 μ F Mylar	.40	D1	250-170	14	#6 x 1/4" sheet metal screw	.05
METAL PARTS					D2	250-56	1	6-32 x 1/4" screw	.05
B1	208-6	1	Capacitor bracket	.25	D3	250-89	7	6-32 x 3/8" screw	.05
B2	208-30	6	Circuit board retainer	.15	D4	252-3	8	6-32 nut	.05
FUSEHOLDER-TERMINAL STRIPS-SOCKETS					D5	254-1	10	#6 lockwasher	.05
C1	423-2	1	Fuseholder	.95	D6	259-1	1	#6 solder lug	.05
C2	431-8	1	Screw-type terminal strip	.15	#8 Hardware				
C3	431-27	1	3-lug terminal strip	.15	E1	250-362	4	8-32 x 5/16" screw	.05
C4	431-51	1	2-lug terminal strip	.15	E2	252-4	4	8-32 nut	.05
C5	434-107	4	Phono socket	.60	E3	254-2	4	#8 lockwasher	.05
C6	434-147	1	AC socket	.25					



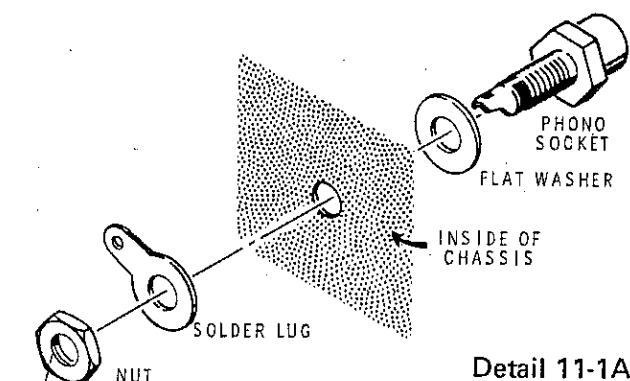
KEY PART No.	PARTS No.	DESCRIPTION	PRICE Each	KEY PART No.	PARTS No.	DESCRIPTION	PRICE Each		
MISCELLANEOUS				Parts From Pack #13 (cont'd.)					
F1	57-42	2	3A1 diode	1.75	G3	204-1263	1	Support bracket	3.60
F2	75-71	1	Strain relief	.15	G4	206-545	1	AC shield	2.15
	207-22	1	Cable clamp	.15	G5	206-544-1	1	RF shield	1.65
F3	261-44	4	Foot	.20	G6	54-291	1	Power transformer	12.65
F4	421-20	1	.5 ampere slow-blow fuse	.50		89-37	1	Line cord	1.00
F5	485-14	2	Hole plug	.15	G7	73-78	1	Grommet strip	.85
PARTS FROM PACK #13 (Final Pack)						344-15	1	Large black wire	.05/ft
G1	201-52-2	1	Chassis	3.10		344-16	1	Large red wire	.05/ft
G2	202-602	1	Left side	2.20		390-926	1	Line cord label	.25
					G8	25-261	1	6000 μ F electrolytic	2.10

NOTE: See Page 192 for "Replacement Parts and Price Information."

STEP-BY-STEP ASSEMBLY

Refer to Pictorial 11-1 (fold-out from Page 93) for the following steps.

- (✓) Locate the chassis and position it as shown on your work surface.

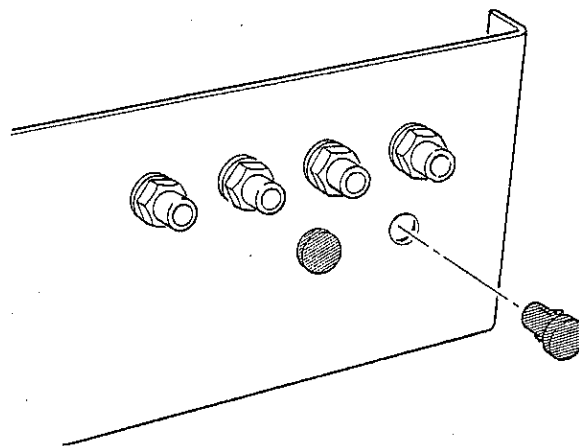


Detail 11-1A

- (✓) Mount a foot at AA, AB, AC, and AD on the chassis bottom. Peel away the protective paper on each foot and stick it into place as shown.

- (✓) Refer to Detail 11-1A and mount phono sockets on the chassis at AG, AH, AJ, and AK. Use the hardware supplied with the sockets. Be sure the solder lug is positioned as shown. NOTE: Do not overtighten the sockets as they can be broken.

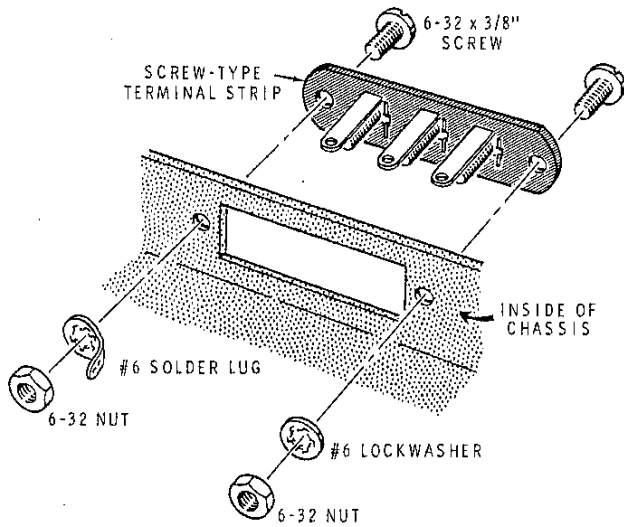
- (✓) Bend up the solder lug on each socket as shown in the Pictorial.



Detail 11-1B

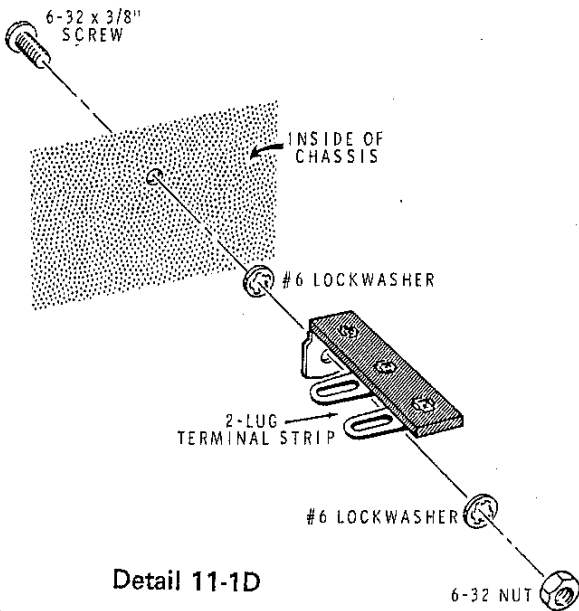
- (✓) Refer to Detail 11-1B and install hole plugs in the chassis at AE and AF. Push them into the holes until they snap into place.

NOTE: When hardware is called for in a step, only the screw size will be given. For instance, if "6-32 x 3/8" hardware" is called for, it means that a 6-32 x 3/8" screw, one or more #6 lockwashers, and a 6-32 nut should be used. The Detail referred to in the step will show the proper number of lockwashers to use.

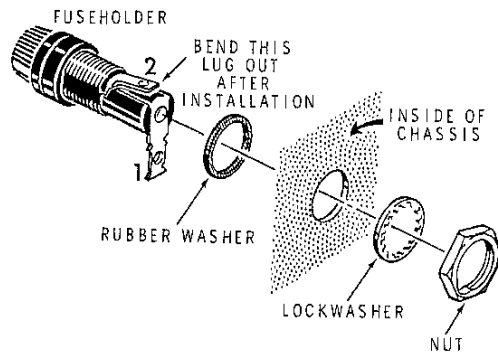


Detail 11-1C

- (✓) Mount the screw-type terminal strip on the outside on the chassis as shown in Detail 11-1C. Position the lugs as shown and use a 6-32 x 3/8" screw, a #6 solder lug, and a 6-32 nut at AL. Be sure to position the solder lug against the terminal strip lug as indicated in the Pictorial. Use 6-32 x 3/8" hardware in the remaining hole.
- (✓) Refer to Detail 11-1D and mount the 2-lug terminal strip at AN with 6-32 x 3/8" hardware. Position the lugs as indicated in the Pictorial.

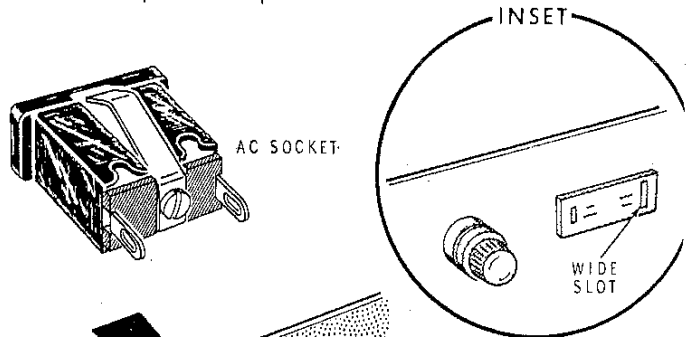


Detail 11-1D



Detail 11-1E

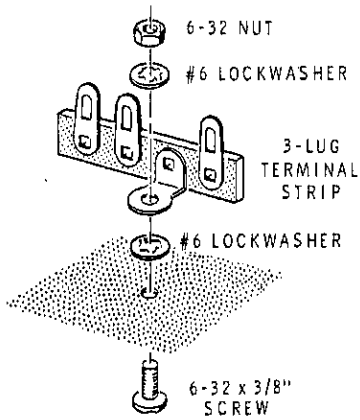
- (✓) Refer to Detail 11-1E and mount the fuseholder at AR with the hardware supplied with the fuseholder. Be sure to position the lugs as shown.
- (✓) Bend lug 2 of the fuseholder away from the fuseholder body as shown.
- (✓) Remove the fuseholder cap by twisting it counterclockwise. Then install the .5A slow-blow fuse and replace the cap.



Detail 11-1F

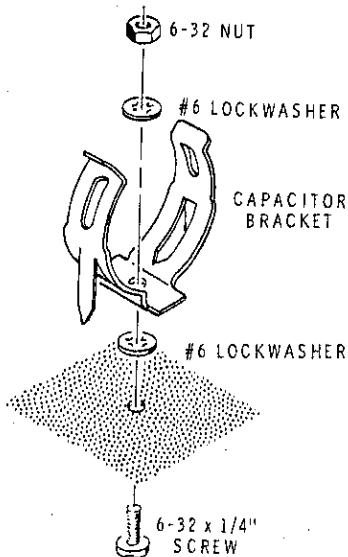
NOTE: When you install the ac socket in the following steps, be sure to position the socket with the wide slot as shown in the inset drawing.

- (✓) Install the ac socket into the chassis by pressing it into position at AP as shown in Detail 11-1F.



Detail 11-1H

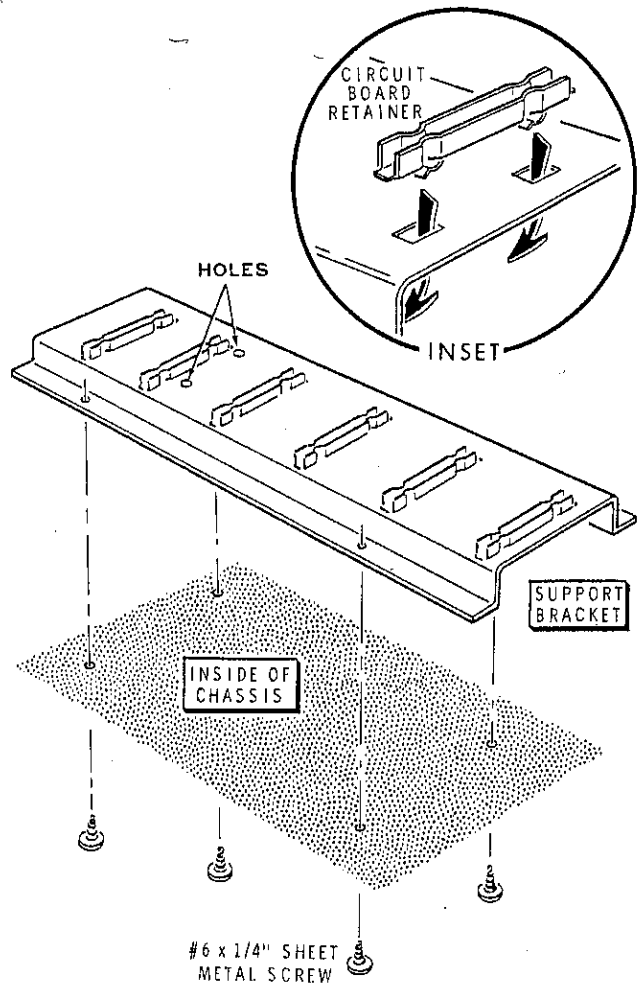
Mount the 3-lug terminal strip at AS with 6-32 x 3/8" hardware as shown in Detail 11-1H.



Detail 11-1J

Refer to Detail 11-1J and mount the capacitor bracket at AT with 6-32 x 1/4" hardware.

Install the six circuit board retainers on the support bracket as shown in Detail 11-1K. Make sure the retainers and the support bracket are positioned properly.

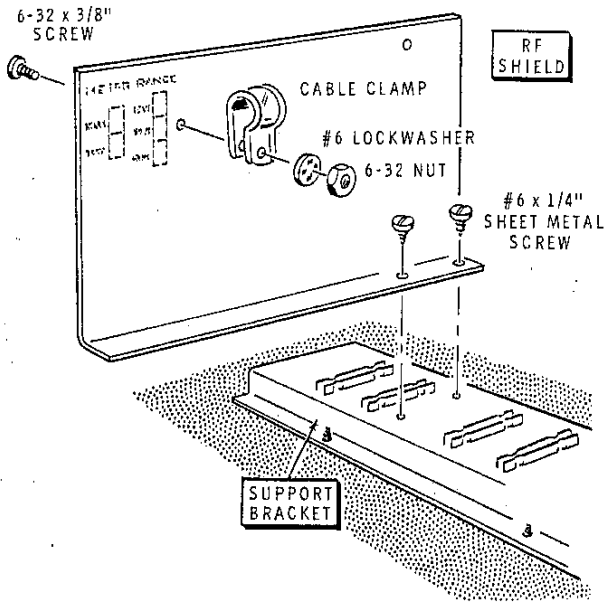


Detail 11-1K

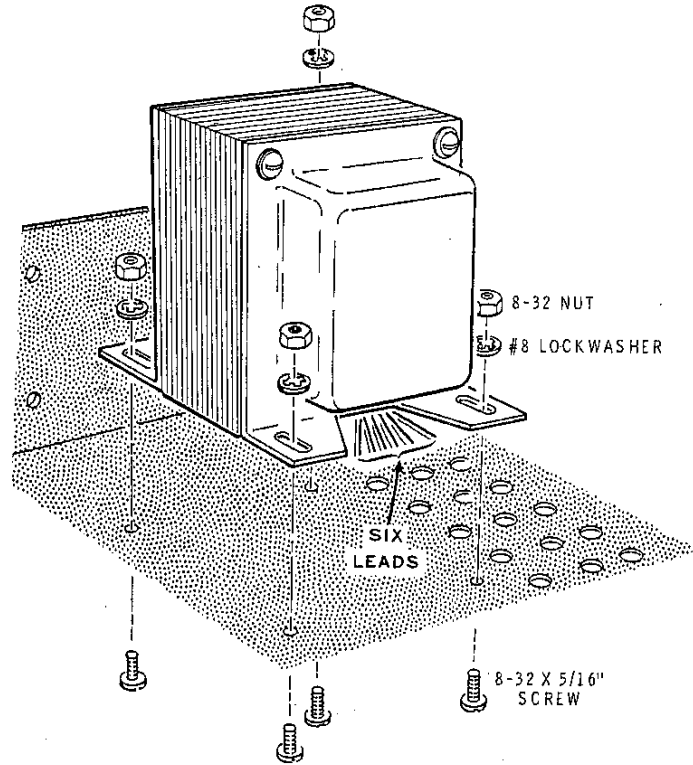
Mount the support bracket on the chassis with #6 x 1/4" sheet metal screws at AU, AX, AY, and AZ as shown in Detail 11-1K. NOTE: Do not overtighten the screws. You might strip out the threads so they will not hold properly.

Refer to Detail 11-1L and mount the rf shield to the support bracket with #6 x 1/4" sheet metal screws at BA.

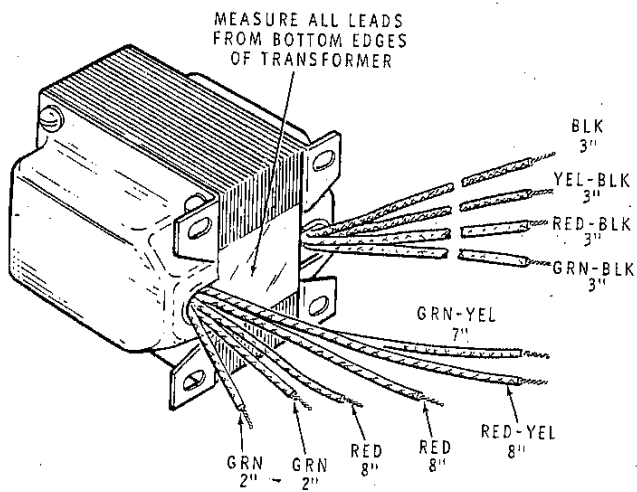
Mount the cable clamp at BB on the rf shield as shown in the Detail with 6-32 x 3/8" hardware. Position the cable clamp as shown.



Detail 11-1L



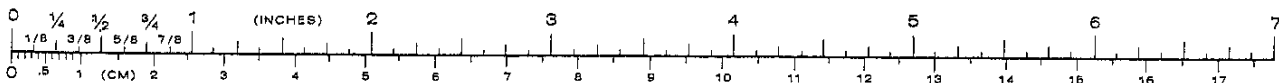
Detail 11-1N



Detail 11-1M

✓ Cut the leads of the power transformer (#54-291) to the lengths shown in Detail 11-1M. After the leads are cut to length, remove 1/4" of insulation from the end of each lead. Then, if necessary, melt a small amount of solder on the exposed end of each lead to hold the small wire strands together.

✓ Mount the power transformer to the chassis as shown in Detail 11-1N with 8-32 x 5/16" hardware. Be sure to position the transformer with its leads as shown in the Pictorial. Slide the transformer forward away from the ac socket, as far as possible before you tighten the hardware.

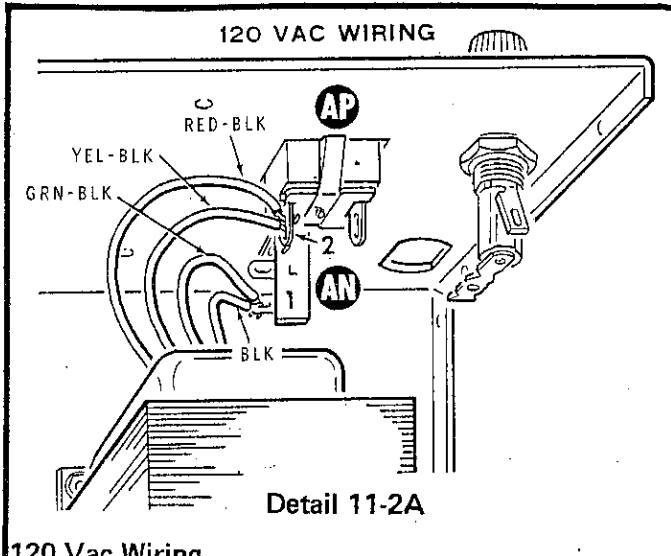


ALTERNATE LINE VOLTAGE WIRING

Two sets of line voltage wiring instructions are given below, one for 120 Vac line voltage and the other for 240 Vac line voltage. In the U.S.A., 120 Vac is most often used, while in many other countries 240 Vac is more common. USE ONLY THE INSTRUCTIONS THAT AGREE WITH THE LINE VOLTAGE IN YOUR AREA.

NOTES:

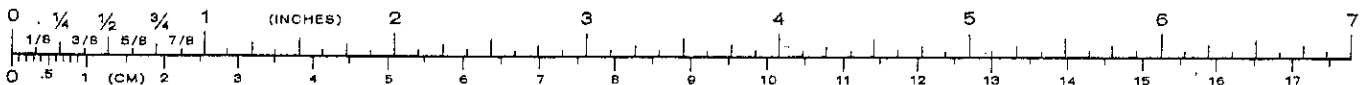
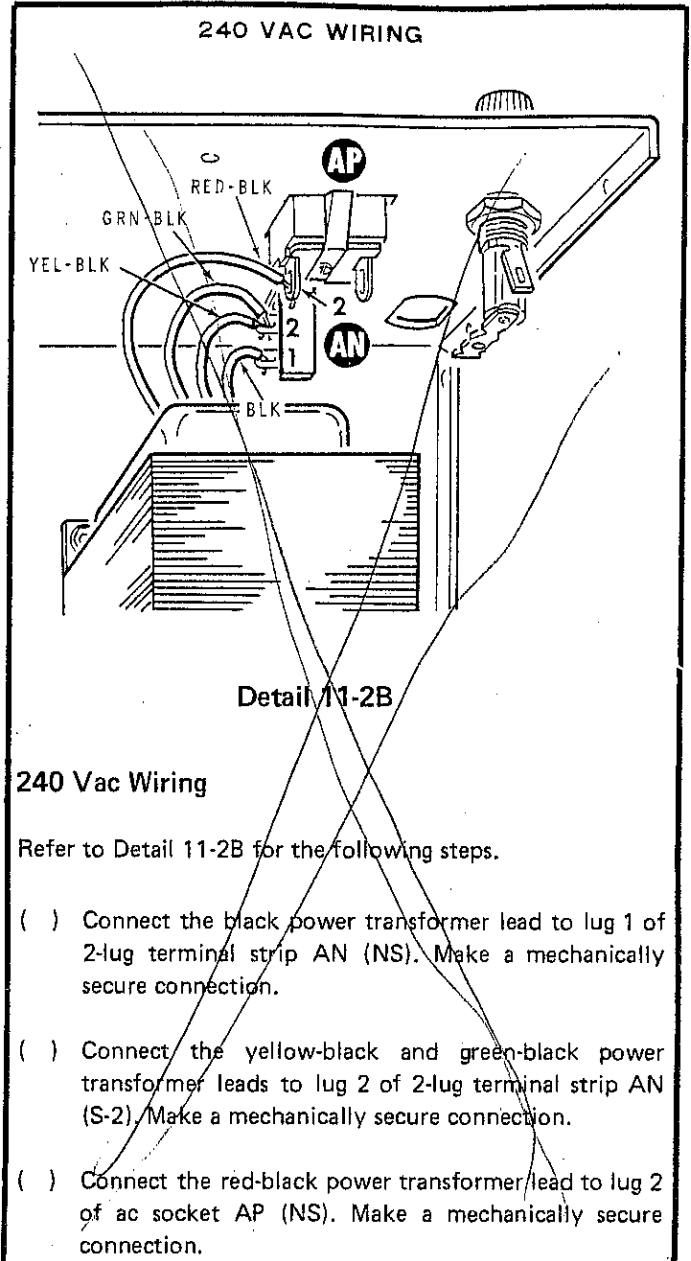
1. In some of the following steps, you will be directed to "make a mechanically secure connection." Do this by inserting the wire through and/or wrapping it around the lug before soldering. See the inset drawing on Pictorial 11-2.
2. In the following steps, (NS) means not to solder because other wires will be added later. "S—" with a number, such as (S-3), means to solder the connection. The number following the "S" tells how many wires are at the connection.



120 Vac Wiring

Refer to Detail 11-2A for the following steps.

- (✓) Connect the black and green-black power transformer leads to lug 1 of 2-lug terminal strip AN (NS). Make a mechanically secure connection.
- (✓) Connect the red-black and yellow-black power transformer leads to lug 2 of ac socket AP (NS). Make a mechanically secure connection.



CHASSIS WIRING AND ASSEMBLY

Refer to Pictorial 11-2 for the following steps.

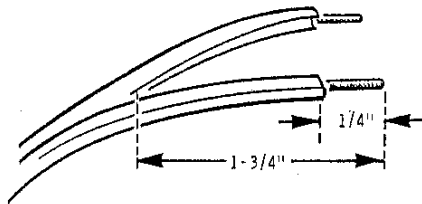
() Prepare the following lengths of large black wire:

2-1/2"
24"
24"

NOTE: Make mechanically secure connections in each of the next four steps.

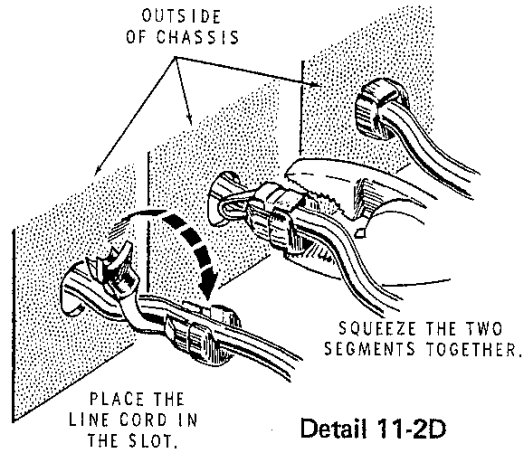
- (✓) Connect the 2-1/2" large black wire from lug 2 of fuseholder AR (S-1) to lug 1 of ac socket AP (NS).
- (✓) Connect one end of a 24" large black wire to lug 1 of fuseholder AR (S-1). The other end will be connected later.
- (✓) Connect one end of a 24" large black wire to lug 1 of 2-lug terminal strip AN (NS). The other end will be connected later.
- (✓) Connect a .01 μ F 1.6 kV ceramic capacitor between lug 1 of terminal strip AN (S-4 for 120 VAC or S-3 for 240 VAC) and lug 2 of socket AP (NS).

NOTE: The flat 2-wire cord supplied with this kit is approved for use in the U.S.A. and in some other countries. If this cord is not approved for your locality, obtain an approved cord locally and proceed with the following steps, making changes as necessary.



Detail 11-2C

- (✓) Refer to Detail 11-2C and prepare the end of the 2-wire line cord.
- (✓) Pass the line cord through hole BC in the chassis.
- (✓) Connect the ribbed side of the line cord to lug 2 of socket AP (S-4, 120 Vac; S-3, 240 Vac). Make a mechanically secure connection.
- (✓) Connect the other side of the line cord to lug 1 of ac socket AP (S-2). Make a mechanically secure connection.



Detail 11-2D

- (✓) Install the line cord strain relief at BC as shown in Detail 11-2D. It may be necessary to squeeze the strain relief with pliers when installing it.

Refer to Pictorial 11-2 for the following steps.

- (✓) Connect one of the 2" green power transformer leads to lug 1 of terminal strip AS (NS).
- (✓) Connect the other 2" green power transformer lead to lug 2 of terminal strip AS (NS).
- (✓) Connect the .22 μ F Mylar capacitor between lugs 1 (NS) and 2 (NS) of terminal strip AS.

NOTE: When installing diodes, refer to the "Diode Mounting" Detail on the fold-out from Page 10.

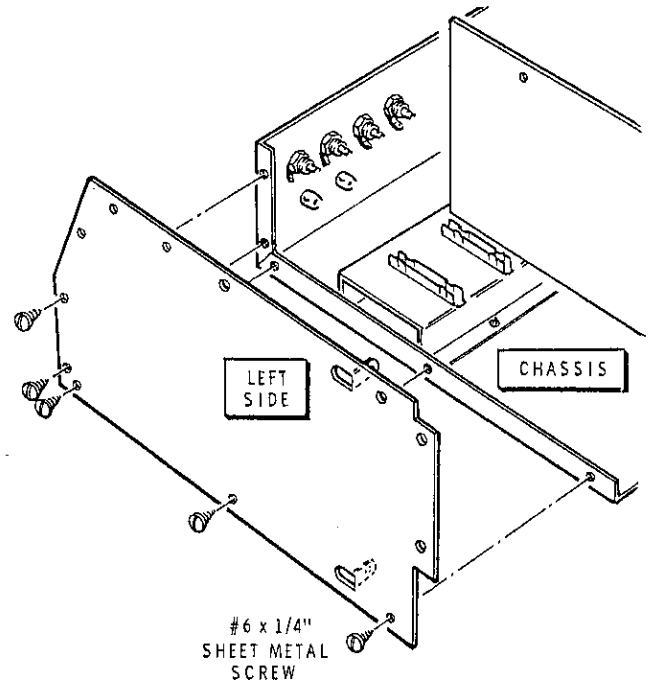
- (✓) Connect the lead from the banded end of a 3A1 diode (#57-42) to lug 3 of terminal strip AS (NS). Connect the other lead to lug 1 of 3-lug terminal strip AS (S-3).
- (✓) Connect the lead from the banded end of a 3A1 diode to lug 3 of terminal strip AS (NS). Connect the other lead to lug 2 of terminal strip AS (S-3).
- (✓) Locate the previously assembled master circuit board and position it next to the chassis as shown.
- (✓) Connect either of the red power transformer leads to one of the 30 Vac holes in the master circuit board (S-1).
- (✓) Connect the other red power transformer lead to the remaining 30 Vac hole in the master circuit board (S-1).
- (✓) Connect the red-yellow power transformer lead to the +18 V hole in the master circuit board (S-1).



NOTE: The green-yellow power transformer lead will be connected later.

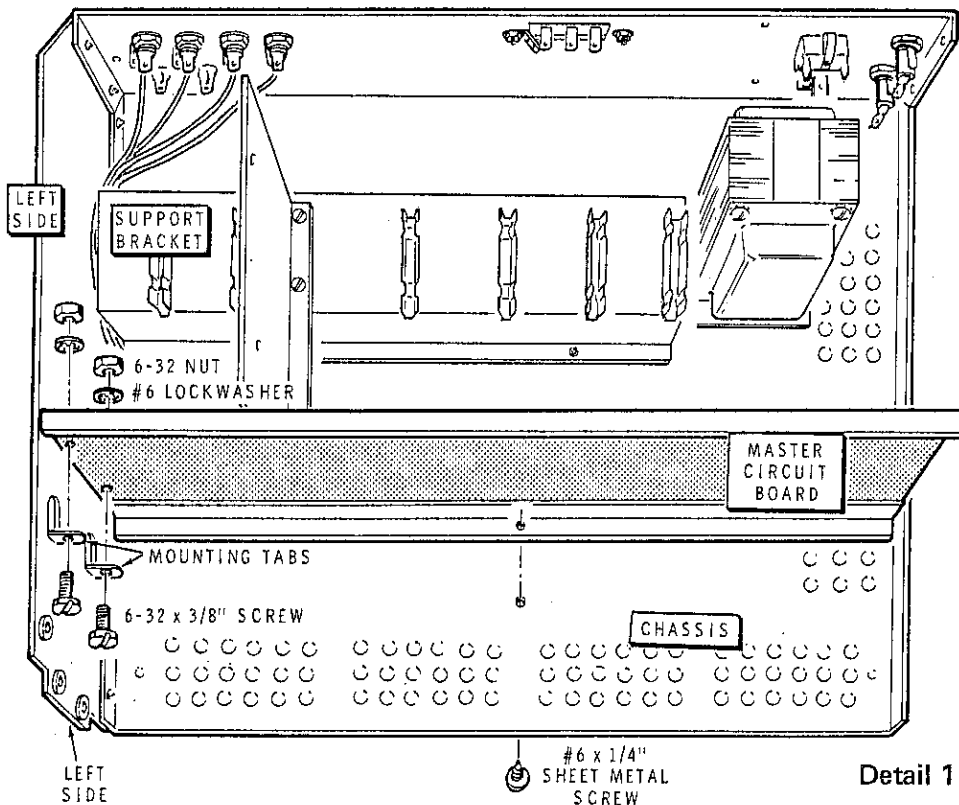
- (✓) Locate the two 24" large black wires (from the fuseholder and terminal strip) and twist them together to form a twisted pair. Then insert them through grommet BD in the master circuit board. The other end of the twisted pair will be connected later.
- (✓) Connect the violet wire coming from the "Scope Horiz" hole in the master circuit board to lug 1 of phono socket AK (S-1).
- (✓) Connect the blue wire coming from the "Scope Vert" hole in the master circuit board to lug 1 of phono socket AJ (S-1).
- (✓) Connect the inner lead of the coaxial cable coming from the "Left Chan" hole in the master circuit board to lug 1 of phono socket AG (S-1). Connect the shield lead to lug 2 (S-1).
- (✓) Connect the inner lead of the coaxial cable coming from the "Right Chan" hole in the master circuit board to lug 1 of phono socket AH (S-1). Connect the shield lead to lug 2 (S-1).

Refer to Pictorial 11-3 (fold-out from Page 99) for the following steps.



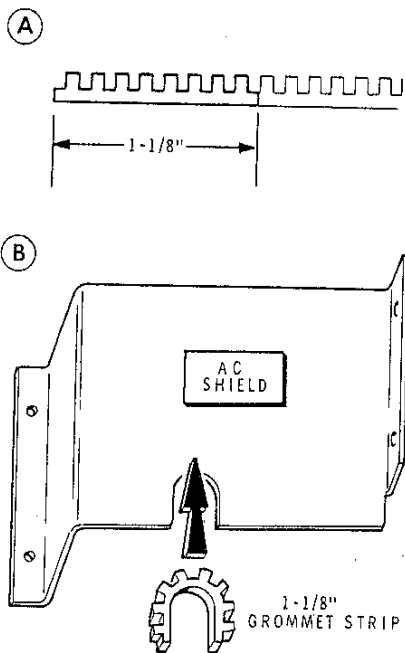
Detail 11-3A

- (✓) Refer to Detail 11-3A and mount the left side to the chassis with five #6 x 1/4" sheet metal screws. NOTE: Be careful not to pinch any wires between the left side and the chassis.



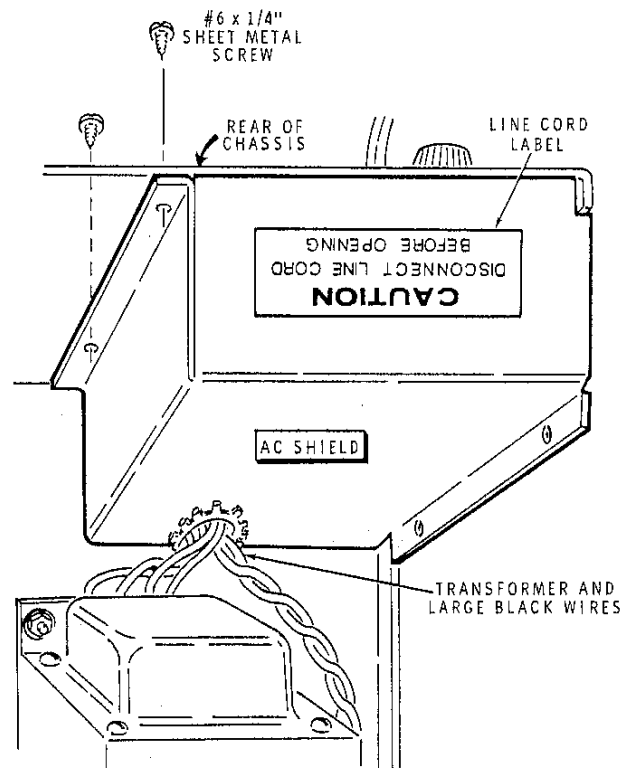
Detail 11-3B

- (✓) Carefully fold up the master circuit board and position it behind the mounting tabs on the left side as shown in Detail 11-3B. Then mount the master circuit board to the left side with 6-32 x 3/8" hardware.
- (✓) Again refer to the Detail and position the two wires and two coaxial cables from the rear panel phono sockets as shown. Tuck them neatly between the left side and the support bracket.
- (✓) Install a #6 x 1/4" sheet metal screw through the chassis into the master circuit board support rail.
- (✓) Insert the large black and the large red test lead wires with clips into cable clamp BB on the rf shield. Fold the wires neatly back and forth and insert them into the cable clamp.



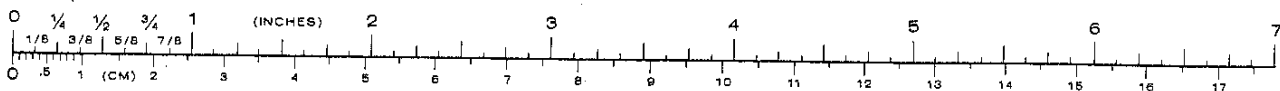
Detail 11-3C

- (✓) Refer to Detail 11-3C and cut off a 1-1/8" length of the grommet strip.
- (✓) Locate the ac shield and install the grommet strip into it as shown. Make sure the ends of the grommet strip are even with the edges of the ac shield.



Detail 11-3D

- (✓) Carefully position the ac shield over the ac power wiring as shown in Detail 11-3D. The power transformer wires and the two large black wires should go through the grommet and not be pinched between the chassis and the ac shield.
- (✓) Mount the ac shield to the chassis with #6 x 1/4" sheet metal screws.
- (✓) Inspect the wiring inside the ac shield by looking into the open end. There should be no bare wires near or touching any of the sheet metal.
- (✓) Locate the line cord label and remove the protective backing paper. Then stick the label into position on the ac shield as shown in Detail 11-3D.





Refer to Pictorial 11-3 for the following steps.

- (✓) Press the solder lug against the indicated lug of screw-type terminal strip AL. Then solder the two lugs together.
 - () Press the 6000 μ F electrolytic capacitor into capacitor bracket AT. Refer to the Pictorial and rotate the capacitor until the positive (+) or dot marked lug is positioned as shown.
 - () Slide capacitor AT backward toward the transformer so the lug end is near the capacitor bracket. The wires and lead in following steps will be easier to connect with more working room.
 - () Connect the green-yellow power transformer lead to the negative (unmarked) lug of capacitor AT (NS).
 - () Prepare the following lengths of large wire:
 - 6" large black
 - 6" large red
 - 4" large red
 - () Connect the 6" large black wire between the negative (unmarked) lug of capacitor AT (S-2) and the hole marked GND (printed on the foil side) on the master circuit board (S-1).
 - () Connect the 6" large red wire between the positive (+) lug of capacitor AT (NS) and the hole marked +8V (printed on the foil side) on the master circuit board (S-1).
 - () Connect the 4" large red wire between the positive (+) lug of capacitor AT (S-2) and lug 3 of terminal strip AS (S-3).
 - () Slide capacitor AT forward away from the transformer until it is centered in the capacitor bracket as shown in the Pictorial.
- Temporarily set the chassis aside until it is called for later.



FRONT PANEL

PARTS LIST

Refer to the "Pack Index Sheet" and remove the pack 12 parts from the carton stamped "PKS #9-10 & 12." Then check each part against the following Parts List. The key numbers correspond to the numbers on the Front Panel Parts Pictorial on the fold-out from this page and from Page 101.

KEY PART No.	No.	PARTS Per Kit	DESCRIPTION	PRICE Each	KEY PART No.	No.	PARTS Per Kit	DESCRIPTION	PRICE Each
SWITCHES					#4 Hardware (cont'd.)				
A1	60-13	1	2-position slide switch	.40	C3	252-15	15	4-40 nut	.05
A2	60-22	1	3-position slide switch	.70	C4	254-9	20	#4 lockwasher	.05
A3	64-31	1	Round pushbutton switch	2.20	C5	250-156	3	4-40 x 1/8" setscrew	.05
A4	64-86	1	5-switch assembly	5.70	#6 Hardware				
A5	64-87	1	3-switch assembly	4.30	D1	250-56	6	6-32 x 1/4" screw	.05
A6	64-88	1	Power switch	3.00	D2	250-170	19	#6 x 1/4" sheet metal screw	.05
A7	266-258	1	Pushbutton switch	2.25	D3	250-8	2	#6 x 3/8" sheet metal screw	.05
CONTROLS-METER					D4	250-89	2	6-32 x 3/8" screw	.05
B1	10-901	2	1000 Ω control (1k)	2.95	D5	250-270	5	6-32 x 3/8" black screw	.05
B1	10-902	1	10 k Ω control	3.30	D6	250-276	10	6-32 x 3/8" black flat head screw	.05
B2	407-167	1	Meter	5.65	D7	254-1	8	#6 lockwasher	.05
HARDWARE					D8	259-1	4	#6 solder lug	.05
#4 Hardware					D9	252-3	9	6-32 nut	.05
C1	250-52	8	4-40 x 1/4" screw	.05	Other Hardware				
C2	250-1114	6	4-40 x 1-1/4" black screw	.05	E1	252-39	3	Control nut	.05
					E2	254-14	3	Control lockwasher	.05
					E3	259-12	1	Control solder lug	.05
					E4	253-30	1	Large flat washer	.05
					E5	253-9	2	#8 flat washer	.05



KEY PART No.	PARTS No.	DESCRIPTION	PRICE Each
MISCELLANEOUS PLASTIC			
F1	261-43	1 Foot	.15
F2	266-257	6 Card guide	.25
F3	432-713	3 Card socket	3.15
F4	462-352	1 12-pushbutton set (numerals 0-9, By-Pass, and Reset)	4.10
	462-353	9 Black pushbutton	.25
F5	354-6	1 Wire tie	.15
F6	432-715	1 Circuit board connector	2.65

MISCELLANEOUS MECHANICAL

G1	204-1808-1	1 Meter bracket	1.10
G2	206-331-1	3 Light shield	.30
G3	206-564-1	1 Meter light shield	1.75
G4	462-345	3 Round knob	1.20

WIRE-SLEEVING

	340-2	1 Bare wire	.05/ft
	344-50	1 Black wire	.05/ft
	344-52	1 Red wire	.05/ft
	344-90	1 Black stranded wire	.05/ft
	344-96	1 Blue stranded wire	.05/ft
	344-93	1 Orange stranded wire	.05/ft
	346-3	4 2" sleeving	.05/ft
	346-6	2 1-1/4" sleeving	.05/ft
	346-1	1 Small sleeving	.10/ft

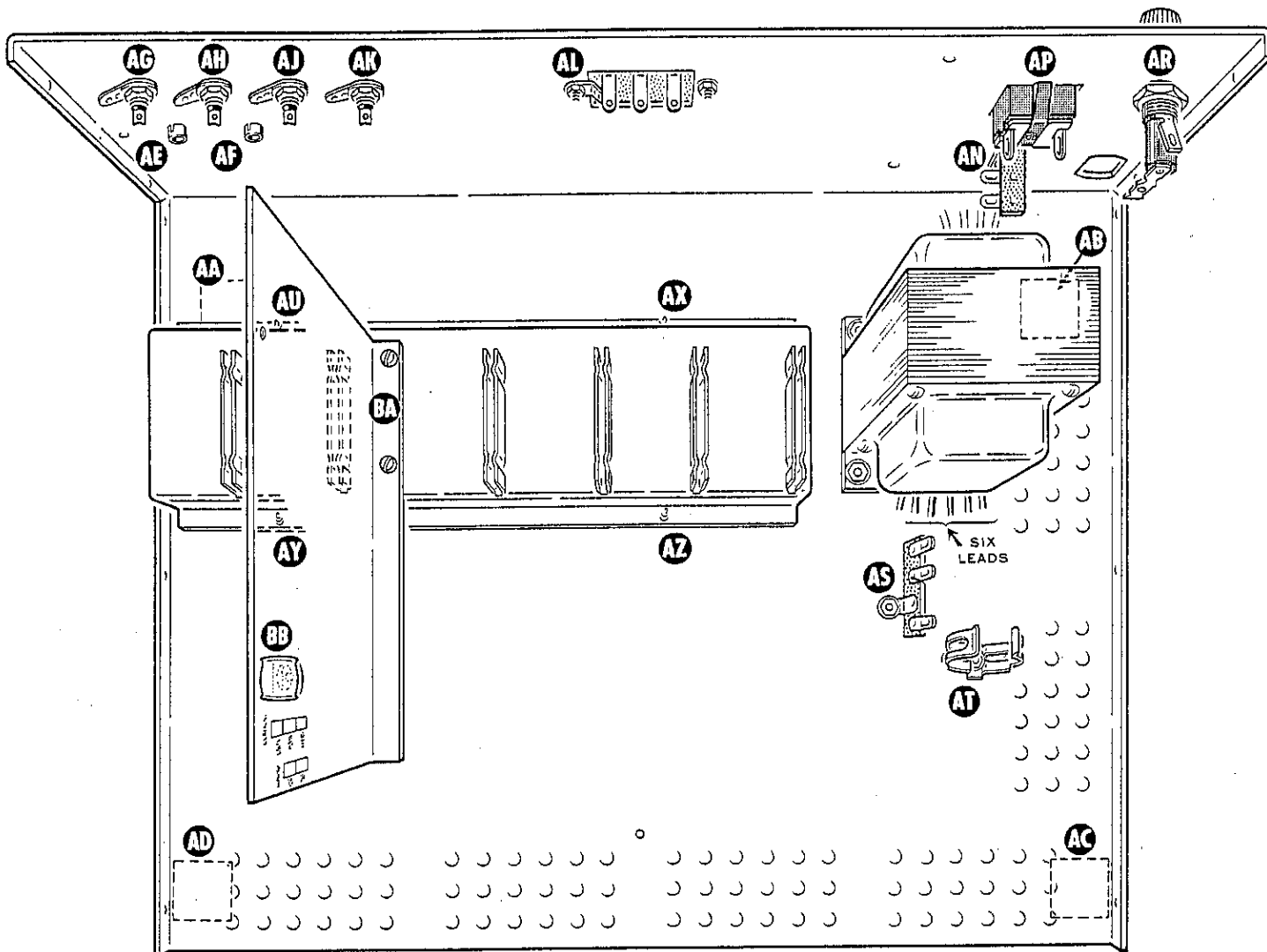
KEY PART No.	PARTS No.	DESCRIPTION	PRICE Each
GENERAL			
H1	1-80	1 1200 Ω, 5% resistor (brown-red-red-gold)	.15
H1	1-144	1 1800 Ω, 5% resistor (brown-gray-red-gold)	.15
H2	21-27	1 .005 μF ceramic	.15
H3	73-12	1 Black insulator	.15
H4	412-55	3 #1815 lamp	.30
H4	412-58	3 #1813 lamp	.55
H5	434-220	6 Lamp socket	.15
H6	431-12	1 4-lug terminal strip	.15
H7	490-23	1 Small allen wrench	.15

PARTS FROM PACK #13 (Final Pack)

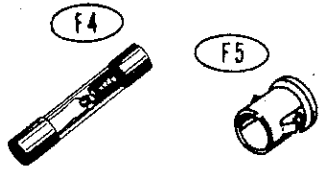
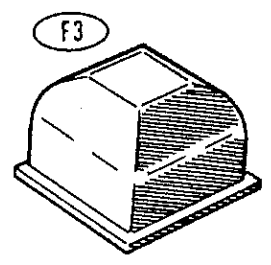
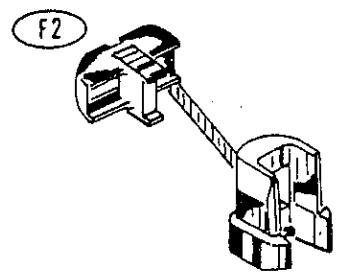
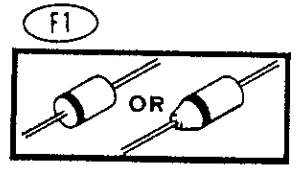
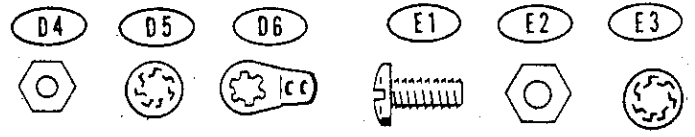
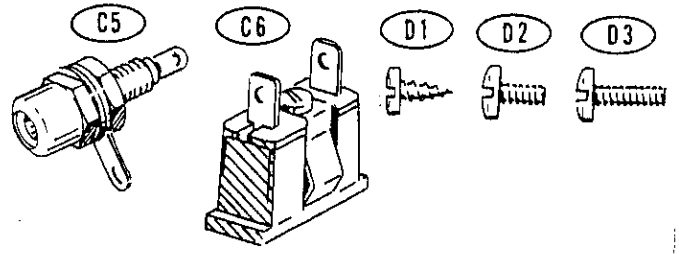
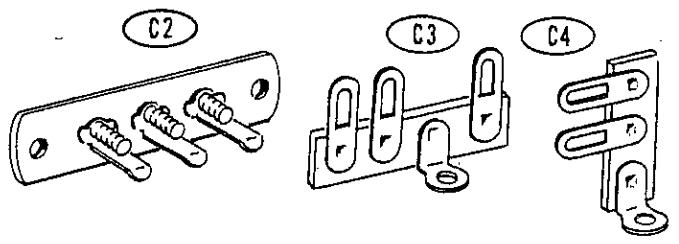
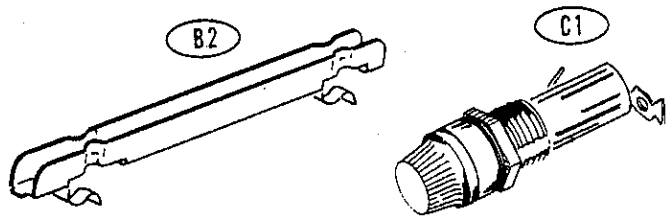
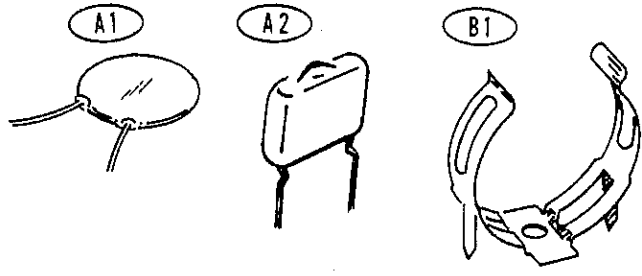
J1	203-1622	1 Front panel assembly	30.95
	390-921	1 Top rail label	.40
J2	446-92	1 Trim panel	5.20
J3	202-601	1 Right side	2.20
	85-595	1 Extender board	5.85
J4	90-545	1 Top shield	3.90
J5	204-1264	1 Top rail	4.35
J6	490-71	1 Trimmer alignment tool	1.35
J7	490-109	1 Coil alignment tool	.15
	134-36	2 Audio cable	1.15
J8	73-39	1 Foam gasket material	.15/ft
	345-1	1 Flat braid	.10/ft
J9	266-244	1 Channel Selector card (set of 10)	5.00
	390-1163	1 Certification label	
	391-34	1 Blue and white label	

NOTE: See Page 192 for "Replacement Parts and Price Information."

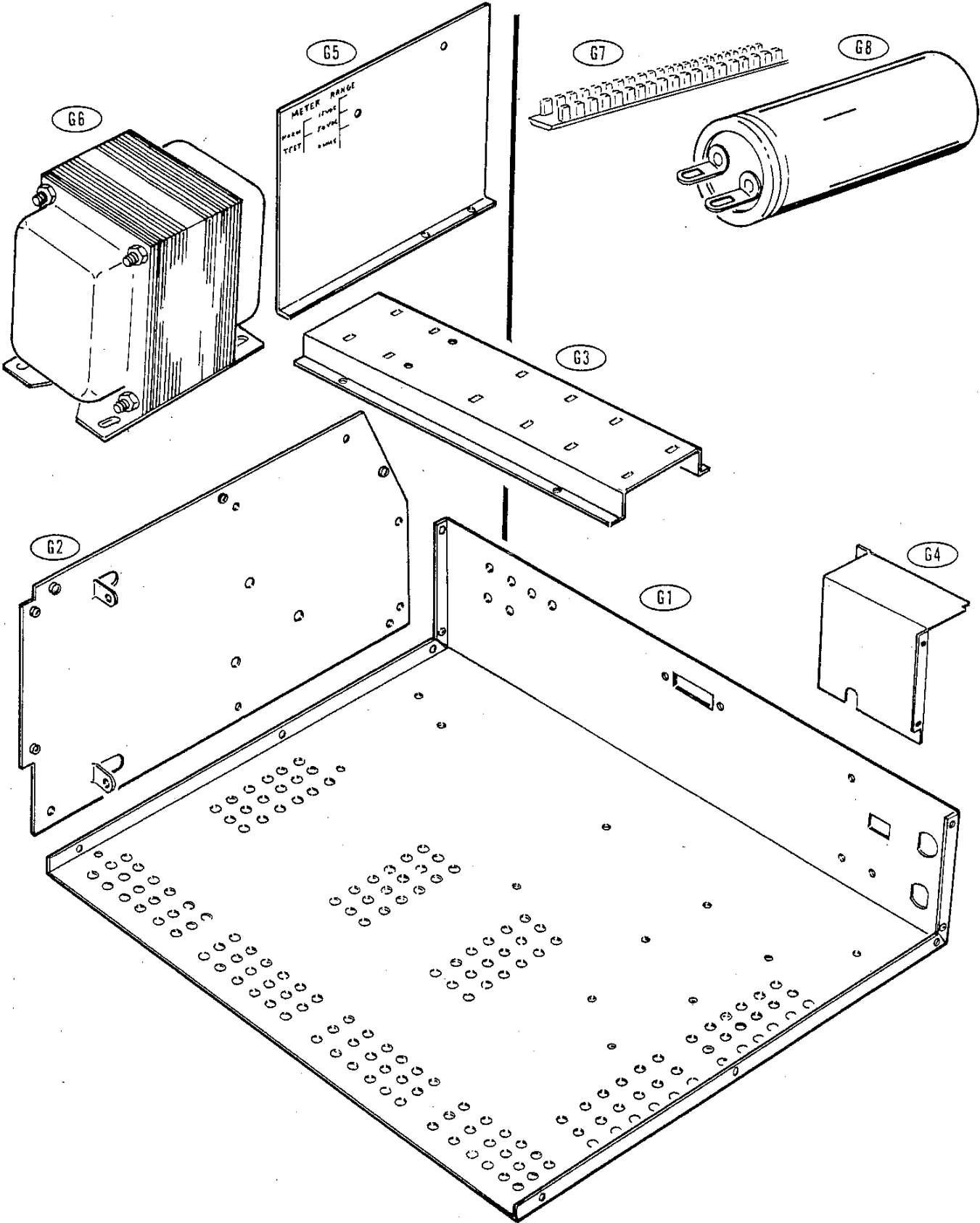
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3.6

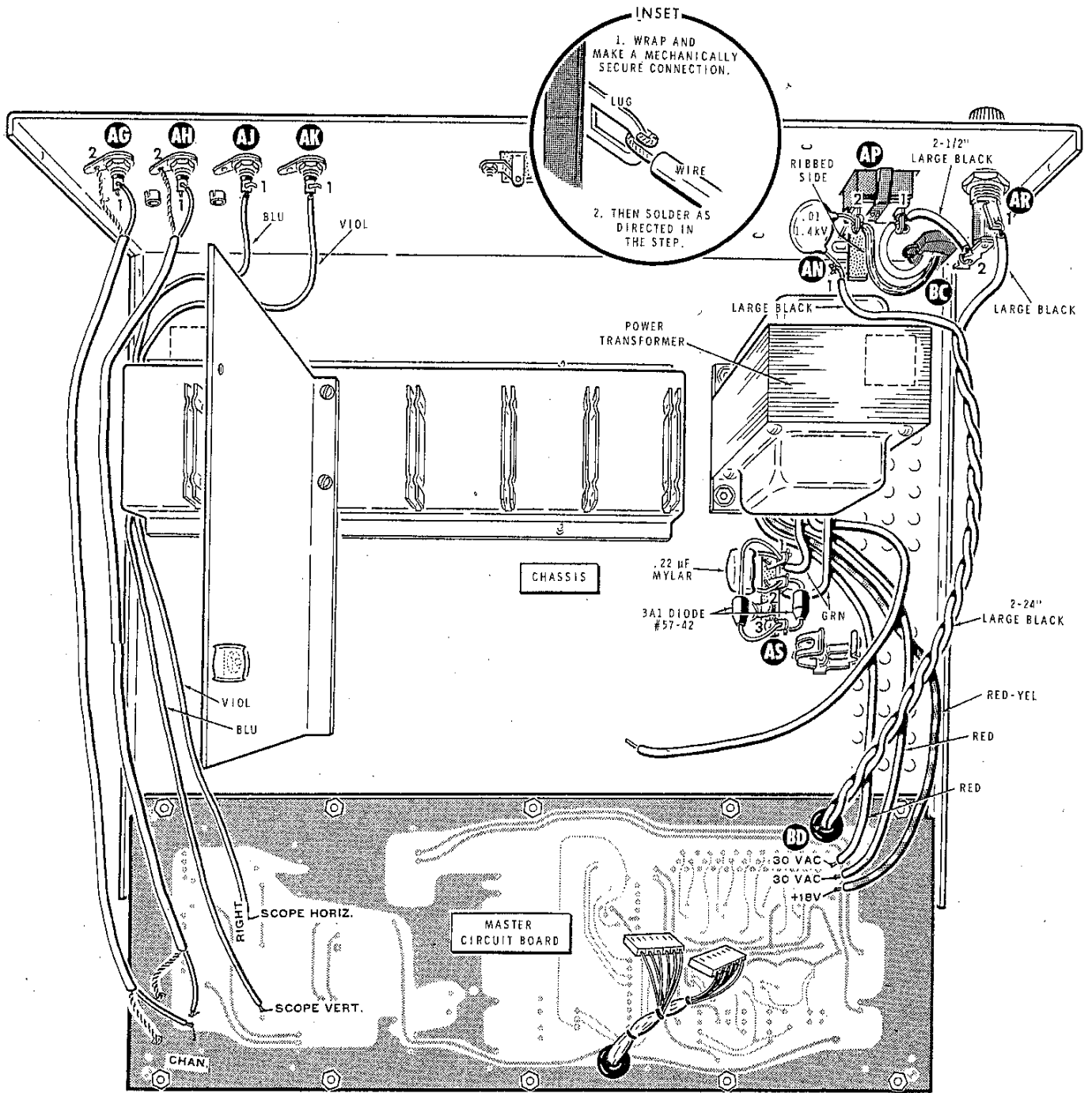


PICTORIAL 11-1



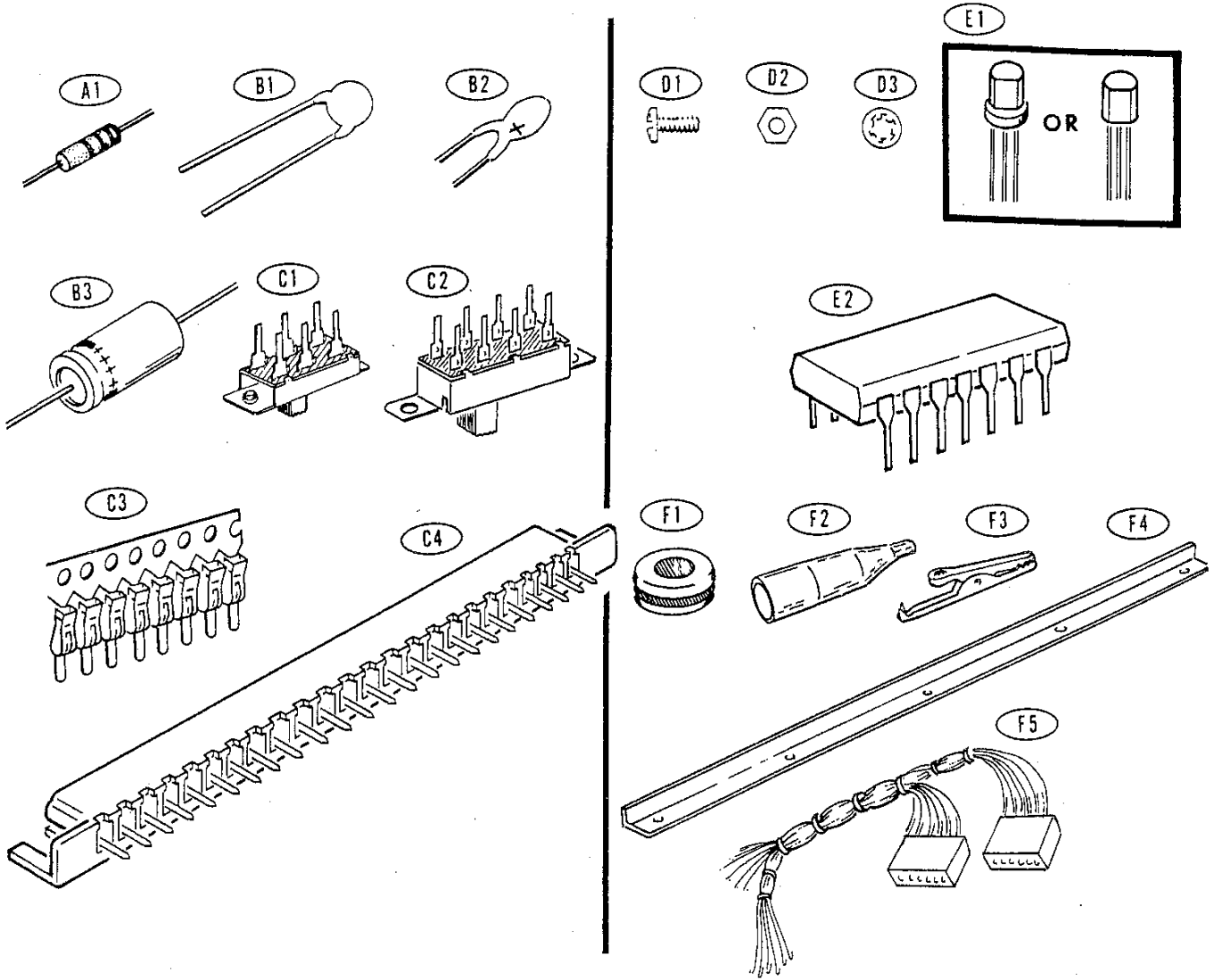
CHASSIS PARTS PICTORIAL



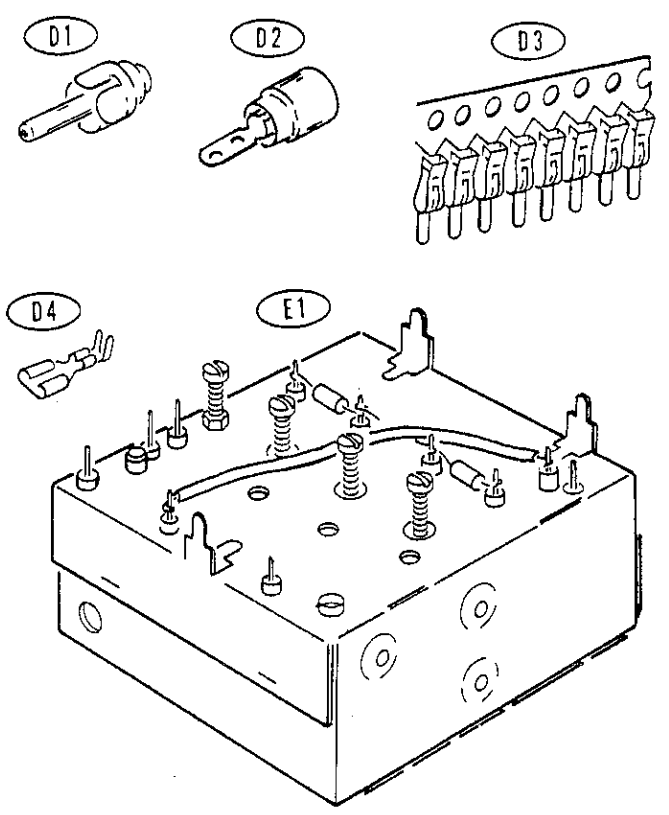
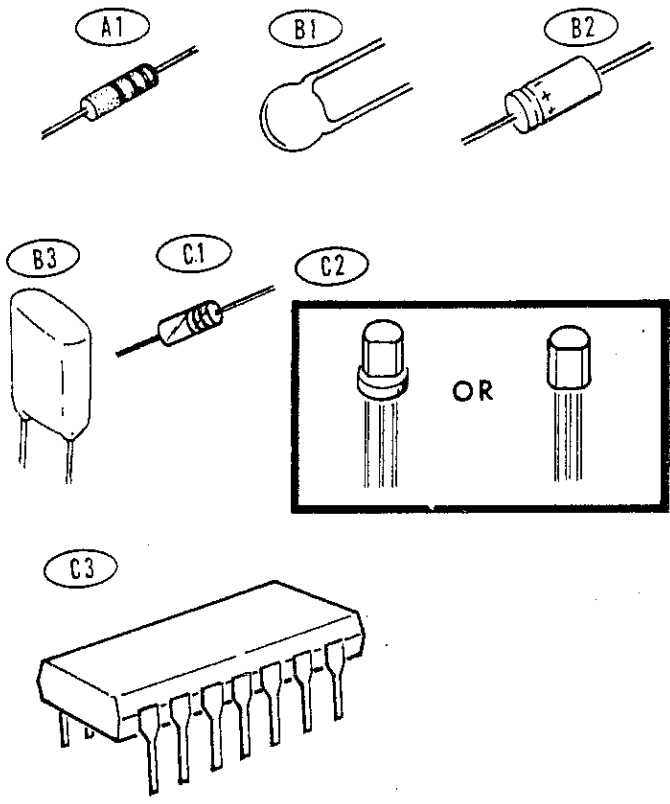


PICTORIAL 11-2

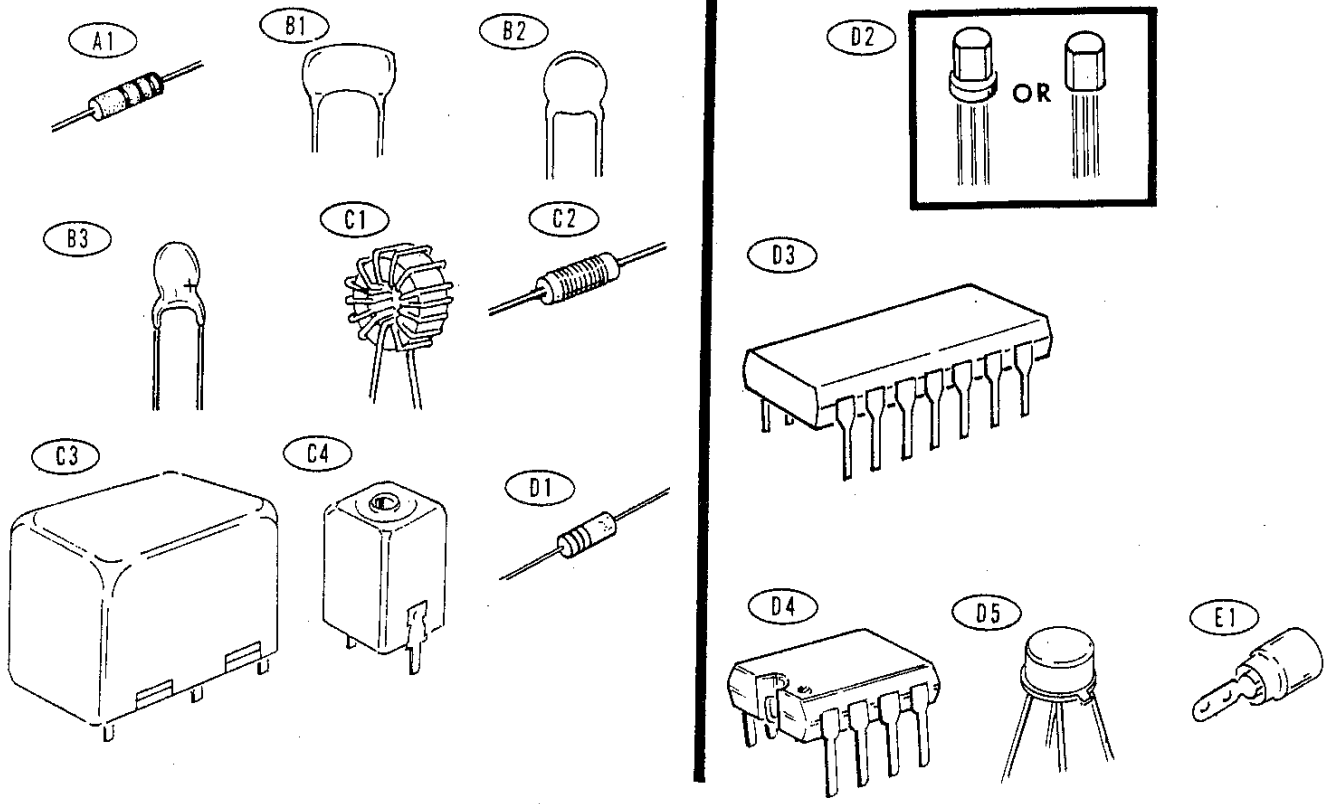
MASTER CIRCUIT BOARD PARTS PICTORIAL

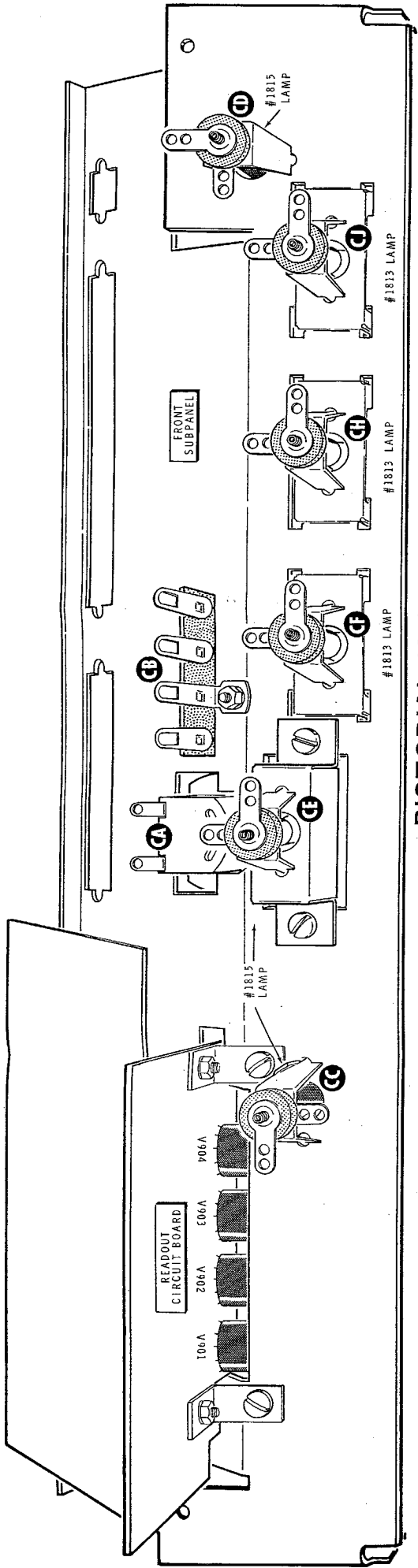


TUNER/PHASE-LOCK-LOOP CIRCUIT BOARD PARTS PICTORIAL

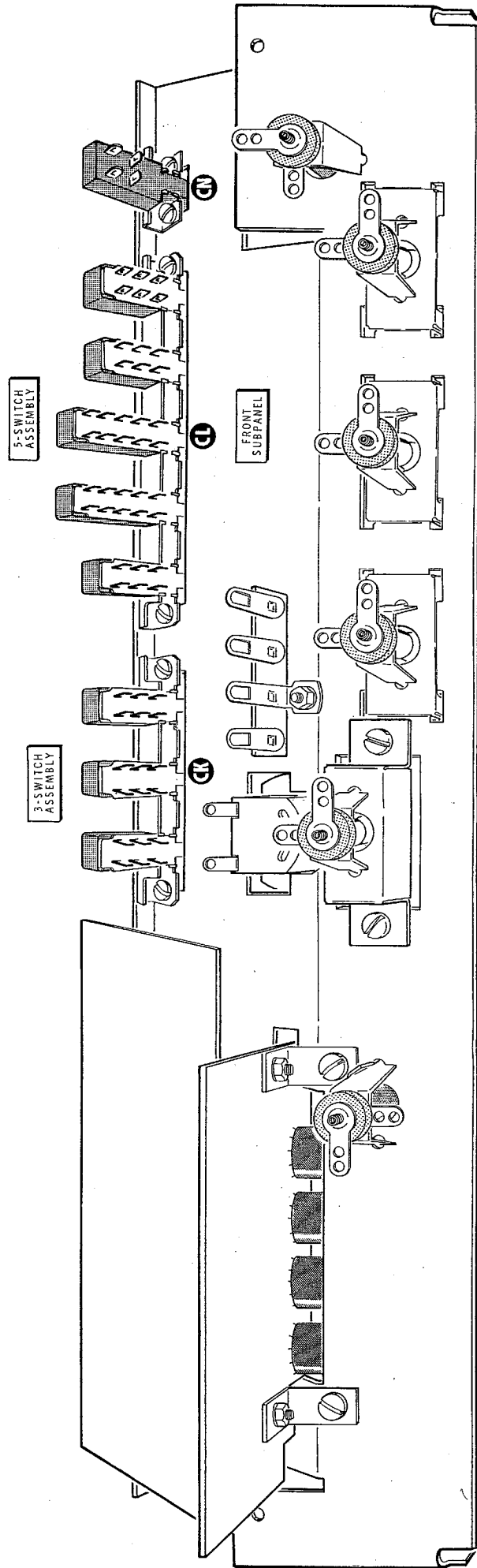


I-F CIRCUIT BOARD PARTS PICTORIAL





PICTORIAL 12-1



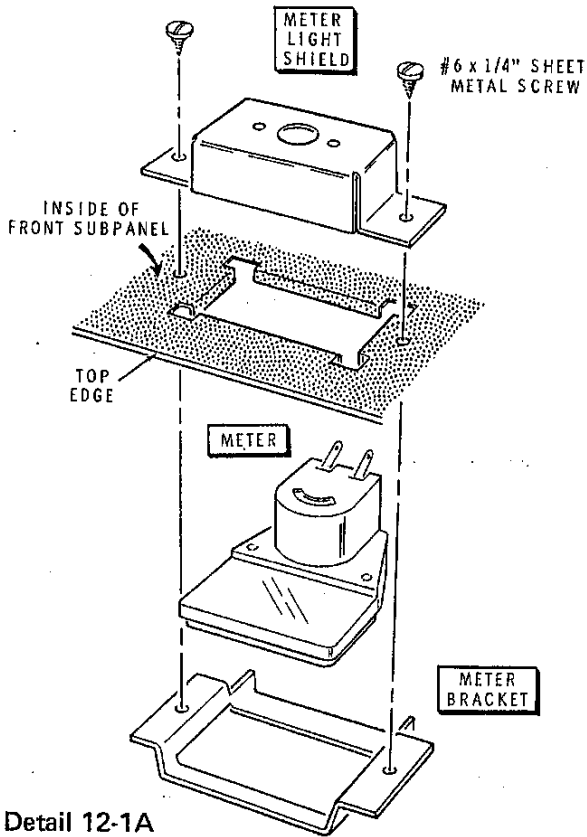
PICTORIAL 12-2

STEP-BY-STEP ASSEMBLY

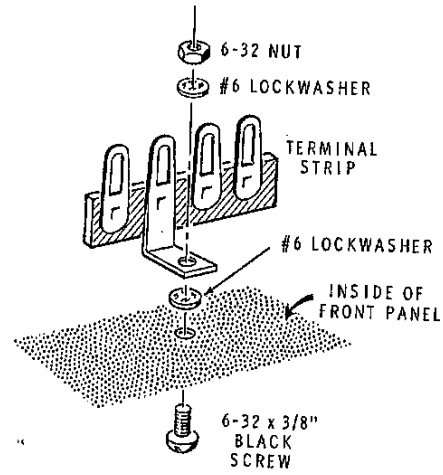
FRONT SUBPANEL

Refer to Pictorial 12-1 (fold-out from Page 100) for the following steps.

- (✓) Locate the front subpanel (with keyboard circuit board) and position it as shown on your work surface.



- (✓) Refer to Detail 12-1A and mount the meter to the front subpanel at CA with the meter light shield, meter bracket, and #6 x 1/4" sheet metal screws. Be sure the meter is seated properly in the meter bracket.

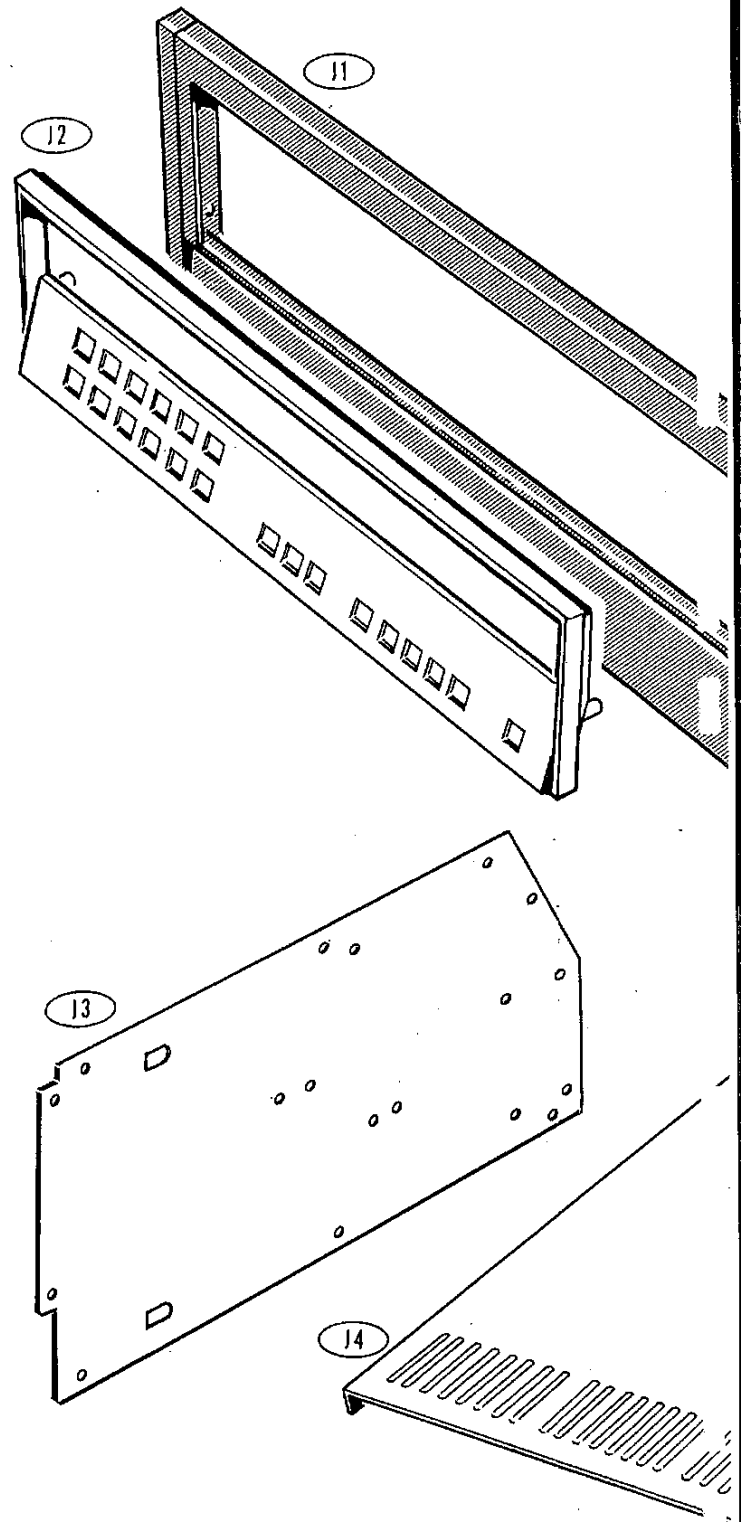
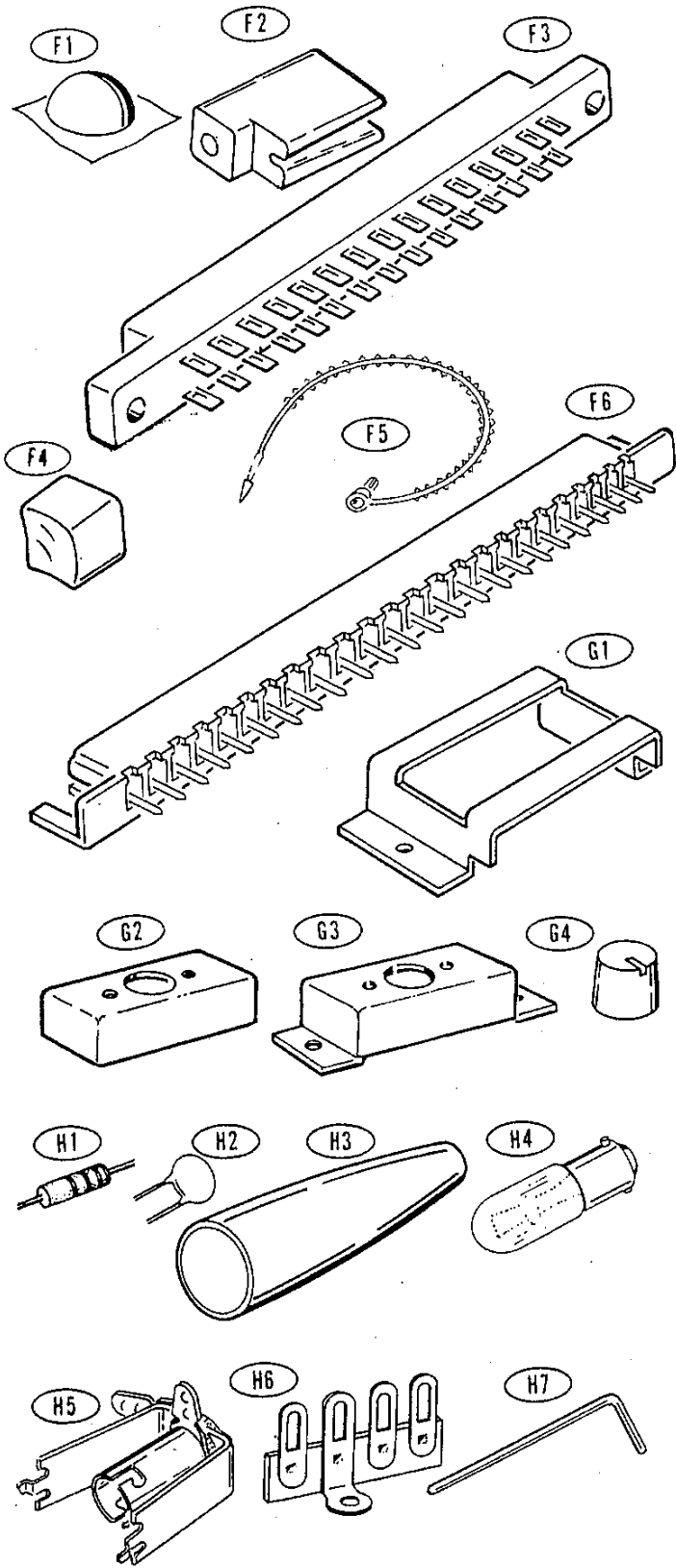


Detail 12-1B

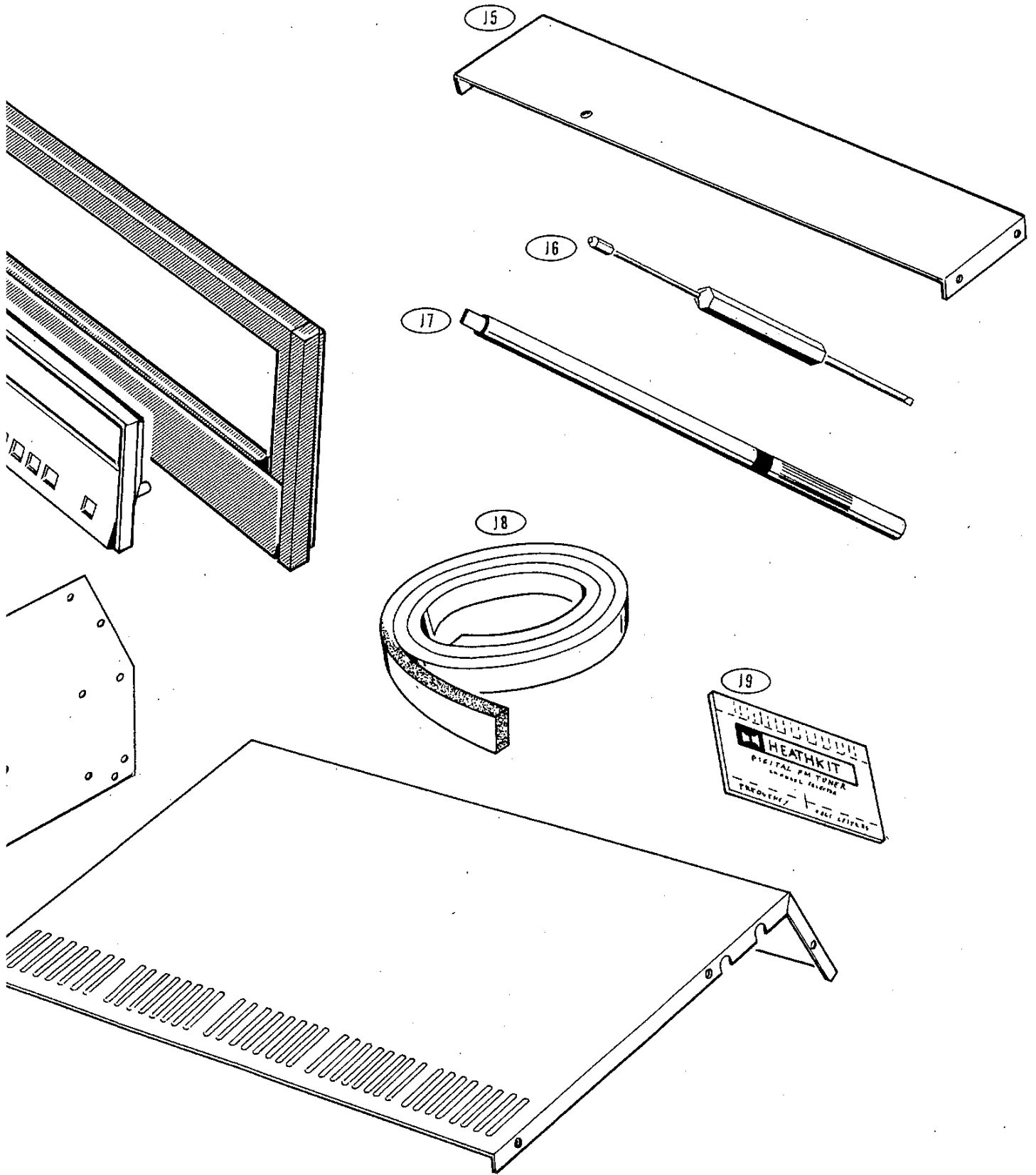
NOTE: When black hardware is called for in a step, only the screw will be black.

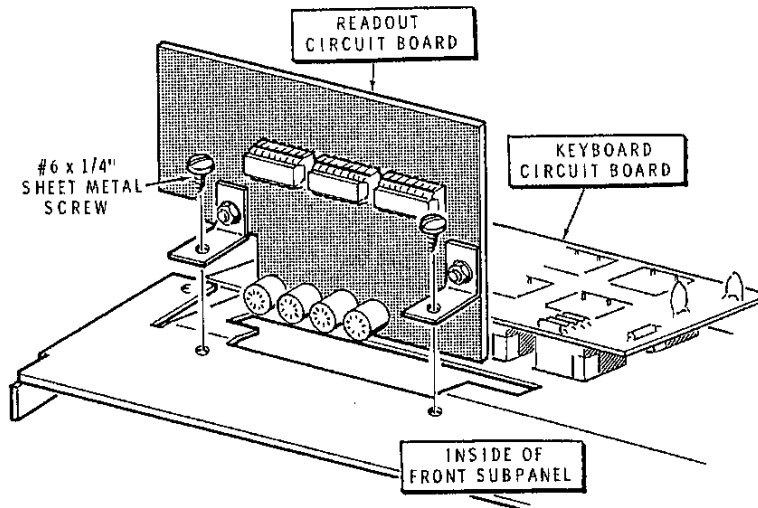
- (✓) Mount the 4-lug terminal strip at CB as shown in Detail 12-1B with 6-32 x 3/8" black hardware.

FRONT PANEL PARTS PICTORIAL (Cont'd.)



Cont'd.)

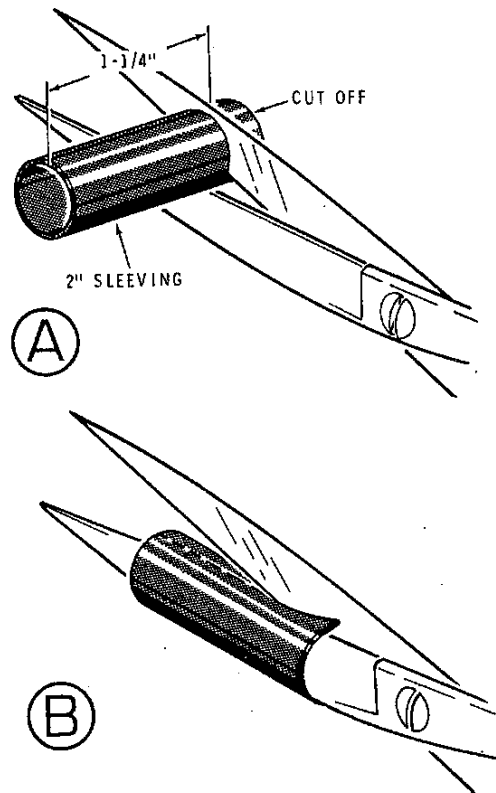




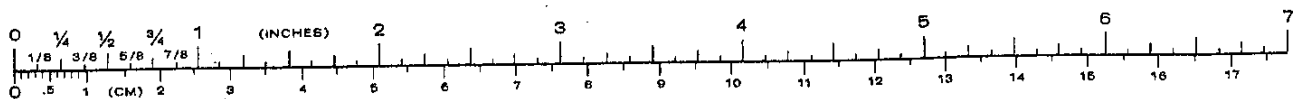
Detail 12-1C

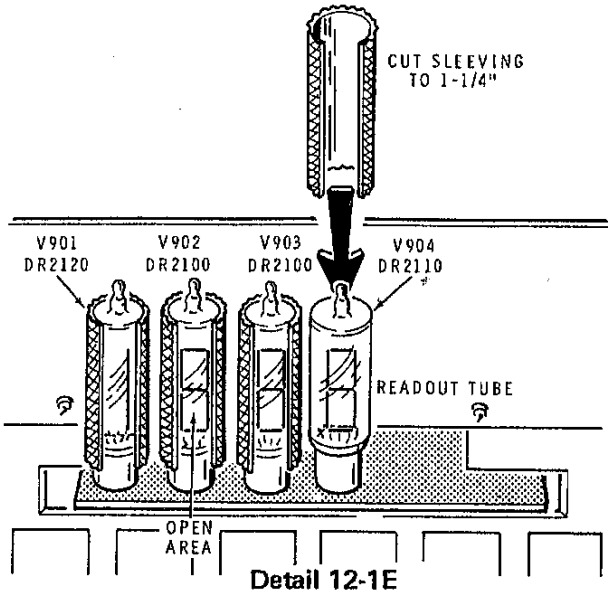
- (✓) Locate the previously assembled readout circuit board and temporarily remove the readout tubes. Set the readout tubes aside where they will not be damaged.
- () Refer to Detail 12-1C and position the readout circuit board against the front subpanel. Then use #6 x 1/4" sheet metal screws to mount the circuit board to the subpanel.
- (✓) Refer to Detail 12-1D and cut each length of 2" sleeving to 1-1/4", as shown in Part A of the Detail. (NOTE: Do not use the 1-1/4" sleeving here.)
- (✓) Refer to Part B of the Detail and very carefully cut each of the four lengths of sleeving lengthwise as shown. Make the cuts as straight as possible. Try not to have ragged edges on the sleeving after it is cut. The lengths of sleeving will be used in a later step.
- (✓) Reinstall the readout tubes on the readout circuit board in the following positions as shown in Detail 12-1E.

- DR2120 tube at V901.
- DR2100 tube at V902.
- DR2100 tube at V903.
- DR2110 tube at V904.



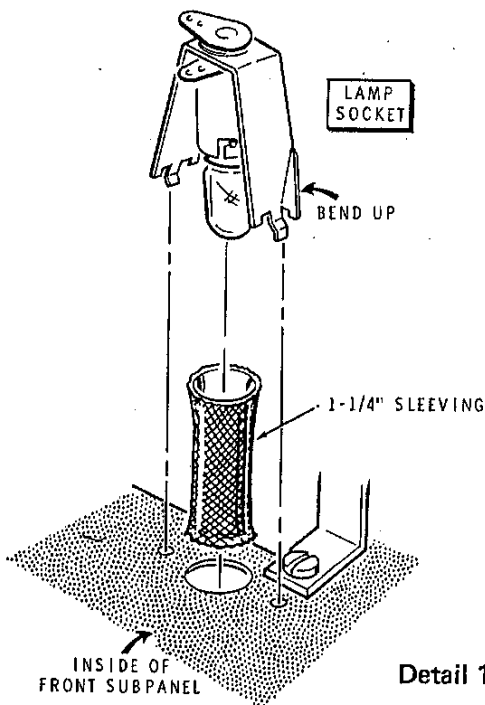
Detail 12-1D





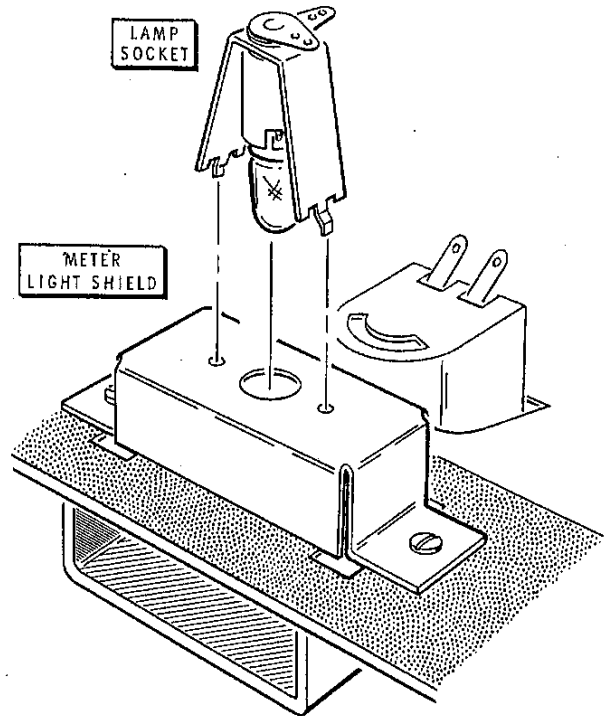
Detail 12-1E

- (✓) Install one of the previously cut lengths of sleeving on each of the readout tubes as shown in Detail 12-1E. Be sure the open area of the readout tube is straight ahead as shown.
- (✓) Locate the three #1815 lamps, and three lamp sockets. Install a lamp in each lamp socket.

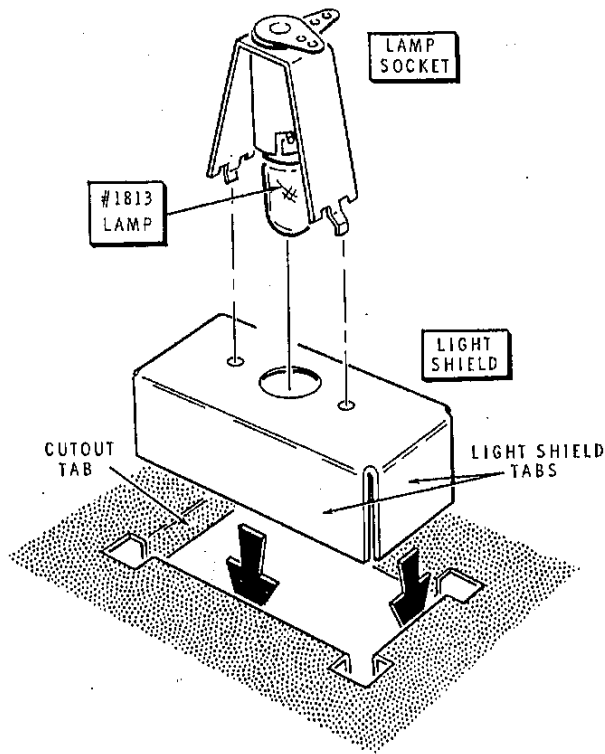


Detail 12-1F

- (✓) Position a lamp socket as shown in Detail 12-1F. Then bend up the indicated corner of the lamp socket leg as shown.
- (✓) Again refer to the detail and insert one end of a 1-1/4" length of sleeving into hole CC. Then clip the prepared lamp socket into position at CC. Be sure the lamp socket lugs are positioned as shown. Adjust the sleeving so the front edge is about even with the front surface of the readout tubes.
- (✓) Similarly insert one end of a 1-1/4" length of sleeving into hole CD. Then clip a lamp socket into position at CD. Be sure the lamp socket lugs are positioned as shown.
- (✓) Clip a lamp socket into the meter light shield at CE as shown in Detail 12-1G.



Detail 12-1G



Detail 12-1H

NOTE: If necessary, spread the light shield tabs slightly in the following step so the shields will fit firmly when installed.

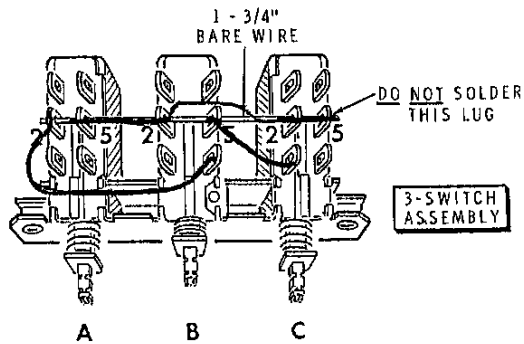
- (✓) Locate the remaining three lamp sockets and install a #1813 lamp in each of them. Then clip these lamp sockets into the three light shields, as shown in Detail 12-1H.
- (✓) Press the light shields into the front subpanel cutouts at CF, CH, and CJ. The front edges of the light shields should be even with the front edges of the cutout tabs.

Refer to Pictorial 12-2 (fold-out from Page 100) for the following steps.

- () Cut off the following lengths of bare wire:

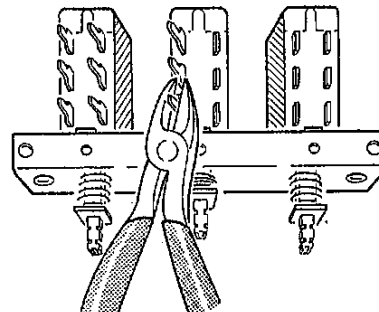
1-3/4"	1-1/4"
2"	1"
5/8"	1"
5/8"	1"

NOTE: When a wire passes through a connection and then goes to another point, as in the next step, it will count as two wires in the soldering instructions (S-2), one entering and one leaving the connection.



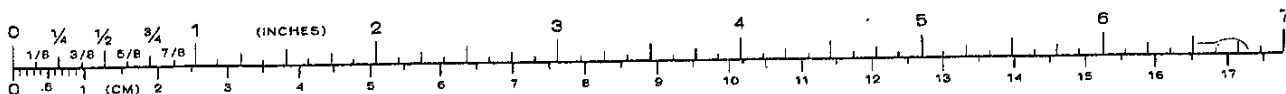
Detail 12-2A

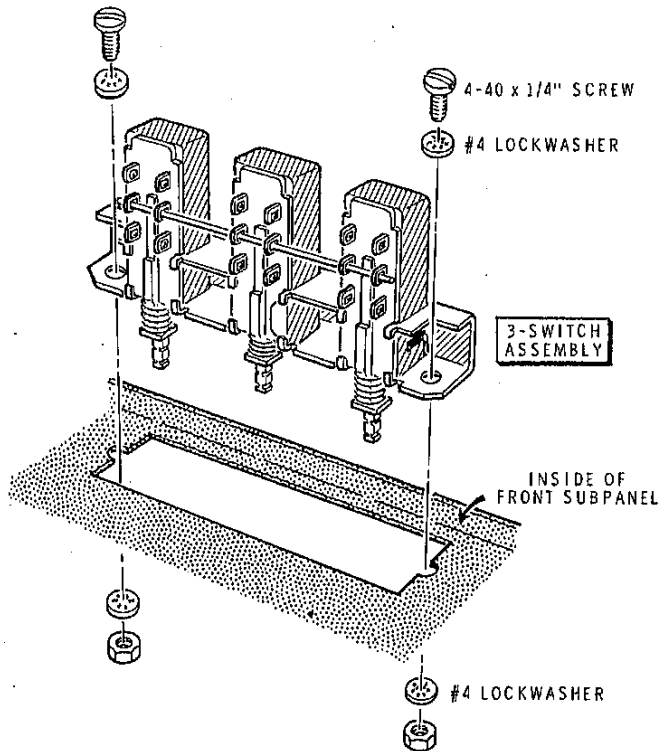
- (1) Position the 3-switch assembly as shown in Detail 12-2A. Then insert the 1-3/4" bare wire from lug 2 of switch A (S-1), through lug 5 of switch A (S-2), lug 2 (S-2) and lug 5 (S-2) of switch B, and lug 2 of switch C (S-2), to lug 5 of switch C (NS).



Detail 12-2B

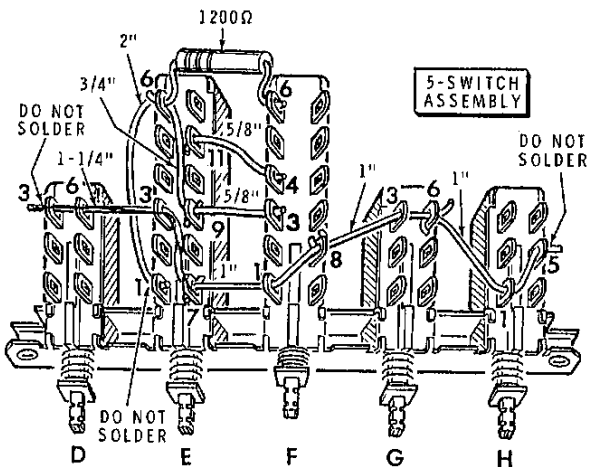
- (✓) Refer to Detail 12-2B and cut off all the straight pins (pins without holes), as shown on the side of the 3-switch assembly opposite the bare wire.





Detail 12-2C

- (✓) Refer to Detail 12-2C and mount the 3-switch assembly to the front subpanel at CK as shown with 4-40 x 1/4" hardware.



Detail 12-2D

Refer to Detail 12-2D for the following steps.

- (✓) Position the 5-switch assembly as shown.
- (✓) Connect a 1200 Ω, 5% resistor (brown-red-red-gold) from lug 6 of switch F (S-1) to lug 6 of switch E (NS).
- (✓) Connect a 2" bare wire from lug 1 (NS) through lug 6 (S-3) to lug 9 (NS) of switch E. The wire between lugs 1 and 6 should be positioned down along side the switch.
- (✓) Connect a 5/8" bare wire from lug 9 (S-2) of switch E to lug 3 (S-1) of switch F.
- (✓) Connect a 5/8" bare wire from lug 4 of switch F (S-1) to lug 11 of switch E (S-1).
- (✓) Connect a 1-1/4" bare wire from lug 3 (NS) through lug 6 (S-2) of switch D, and through lug 3 (S-2) to lug 7 (NS) of switch E. Be sure this wire does not touch the bare wire it crosses.
- (✓) Connect a 1" bare wire from lug 7 of switch E (S-2) through lug 1 (S-2) to lug 8 (NS) of switch F.
- (✓) Connect a 1" bare wire from lug 8 of switch F (S-2) through lug 3 (S-2) to lug 6 (NS) of switch G.
- (✓) Connect a 1" bare wire from lug 6 of switch G (S-2) through lug 1 (S-2) to lug 5 (NS) of switch H.

Refer to Pictorial 12-2 (fold-out from Page 100) for the following steps.

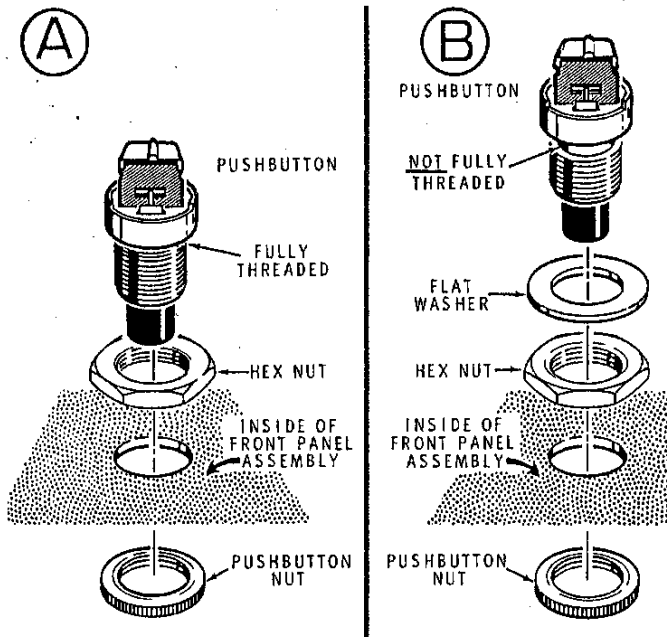
- (✓) Cut off all the straight pins on the side of the 5-switch assembly opposite the bare wires.
- (✓) Mount the 5-switch assembly to the front subpanel at CL in the same way that you mounted the 3-switch assembly. Use 4-40 x 1/4" hardware.
- (✓) Cut off any straight pins on the side of the power switch opposite the lugs with holes.
- (✓) Mount the Power switch at CN with 4-40 x 1/4" hardware.

Temporarily set the front subpanel aside until it is called for.

FRONT PANEL

Refer to Pictorial 12-3 (fold-out from this page) for the following steps.

- (✓) Refer to Detail 12-3A and open the door on the front panel assembly by pushing the nut starter through hole DG.
- (✓) Peel the foot from the backing paper and install it in the circle on the door label as shown in Detail 12-3A.
- (✓) Place the front panel assembly face down on a soft cloth on your work surface.



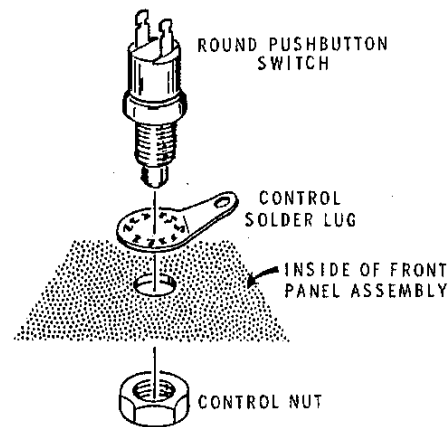
Detail 12-3B

- (✓) The pushbutton supplied with your kit will be one of the types shown in Detail 12-3B. If the pushbutton is fully threaded as shown in Part A, proceed to the next step. If the pushbutton is not fully threaded as shown in Part B, install the flat washer as shown; then proceed with the next step.

- (✓) Install the hex nut (supplied with the pushbutton) on the pushbutton and tighten it finger tight.
- (✓) Mount the pushbutton at DG as shown in Detail 12-3B with the pushbutton nut supplied with the pushbutton.

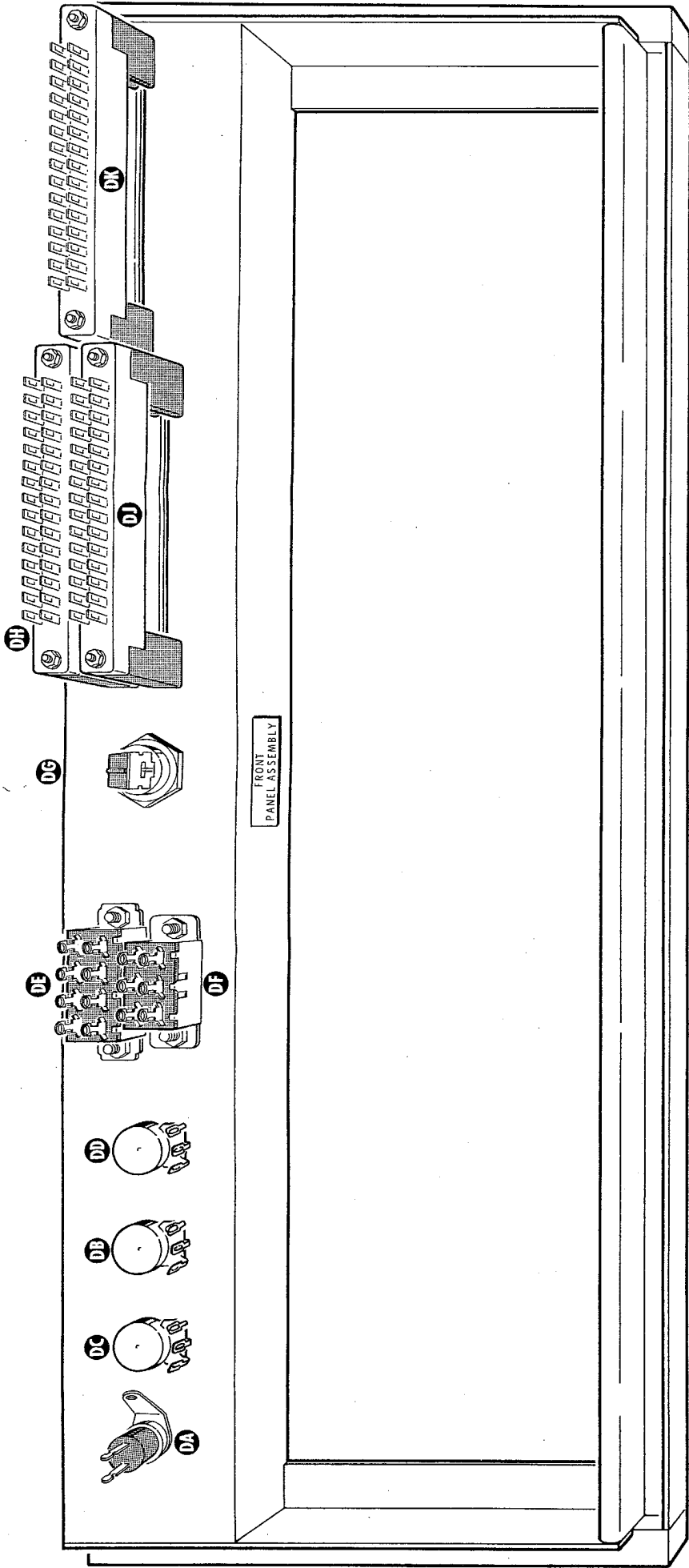
NOTE: The door can be opened and closed by lightly pressing along the top edge. In one position the door is flush with the front panel, and in the other position the door is open slightly so it can be grasped for opening.

- (✓) If the door is not within 1/16" of being flush with the front panel, proceed as follows: Loosen the pushbutton nut and then loosen the hex nut slightly. Now retighten the pushbutton nut. The door should now be more flush with the front panel.



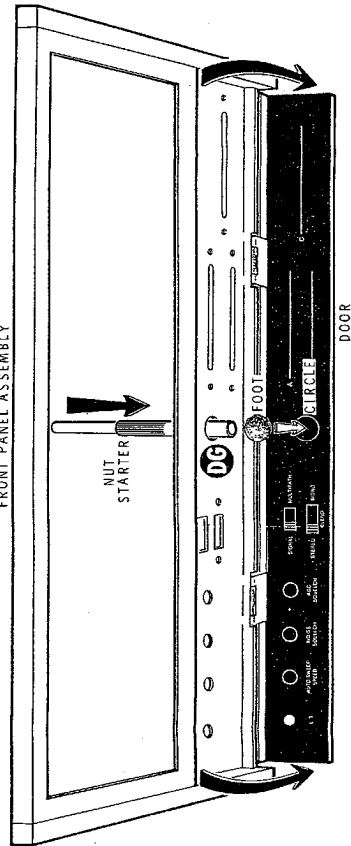
Detail 12-3C

- (✓) Refer to Detail 12-3C and mount the round pushbutton switch at DA with a control solder lug and the nut supplied with the switch. Be sure to position the switch lugs and the solder lug as shown in the Pictorial.

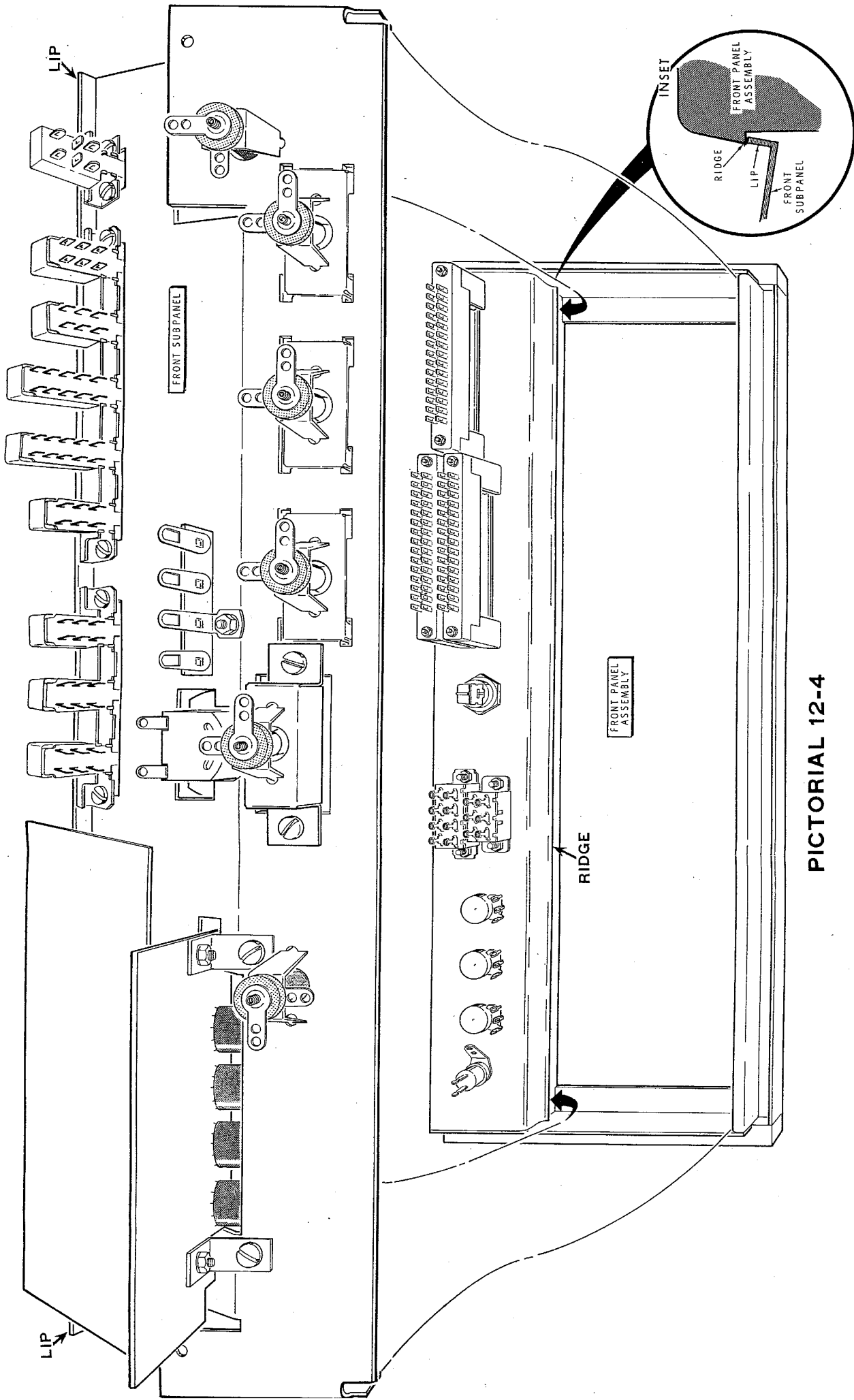


PICTORIAL 12-3

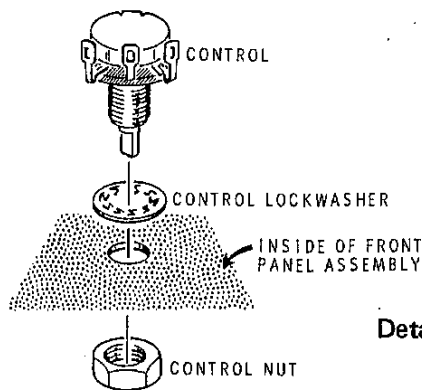
FRONT PANEL ASSEMBLY



Detail 12-3A

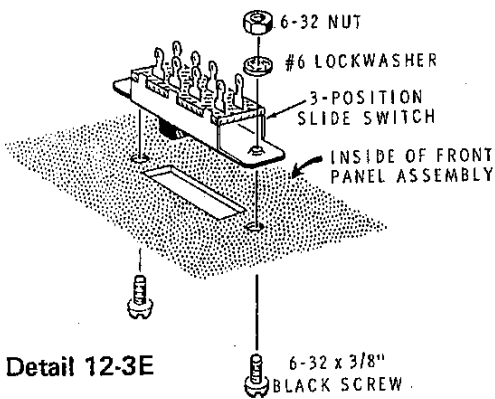


PICTORIAL 12-4



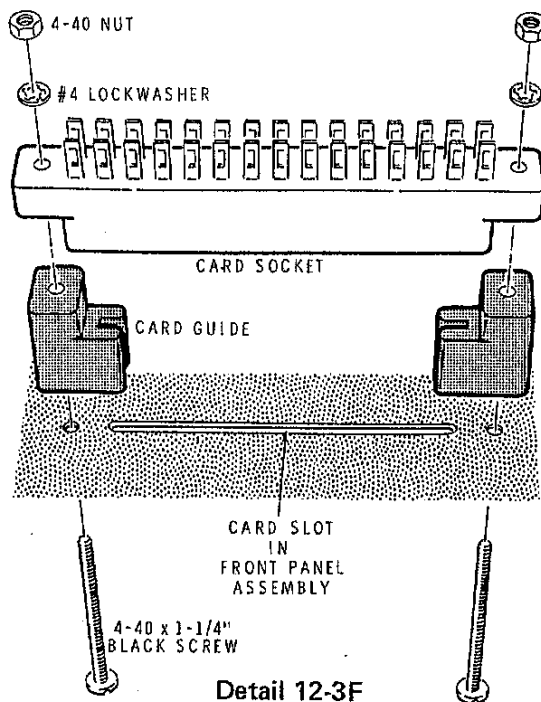
Detail 12-3D

- (✓) Mount the 10 kΩ control (#10-902) at DB as shown in Detail 12-3D with a control lockwasher, and a control nut.
- (✓) Similarly mount a 1000 Ω control (#10-901) at DC with a control lockwasher, and a control nut.
- (✓) Mount the remaining 1000 Ω control (#10-901) at DD with a control lockwasher, and a control nut.



Detail 12-3E

- (✓) Refer to Detail 12-3E and mount the 3-position slide switch at DE with 6-32 x 3/8" black screws, #6 lockwashers, and 6-32 nuts.
- (✓) Similarly mount a 2-position slide switch at DF with 6-32 x 3/8" black screws, #6 lockwashers, and 6-32 nuts.
- (✓) Unpack the set of ten channel selector cards. One of these cards will be used in the following step.
- (✓) Refer to Detail 12-3F and loosely mount a card socket at DH with two card guides and 4-40 x 1-1/4" black hardware. NOTE: Disregard any numbers or letters stamped near the lugs.



Detail 12-3F

- (✓) Carefully insert a channel selector card through the front panel assembly slot and into the card socket you are mounting. Be sure the card guides are positioned as shown in Detail 12-3F.
- (✓) Tighten the card socket mounting hardware and then remove the channel selector card.
- (✓) In a similar manner, mount the two remaining card sockets at DJ and DK with card guides and 4-40 x 1-1/4" black hardware.
- (✓) Set aside the ten channel selector cards until they are called for.

Refer to Pictorial 12-4 (fold-out from this page) for the following step.

- (✓) Position the front subpanel and the front panel assembly as shown. Then lay the front subpanel into the front panel assembly.
- (✓) Refer to inset drawing on the Pictorial and position the lip of the front subpanel under the ridge on the front panel assembly.

FRONT PANEL WIRING

Refer to Pictorial 13-1 (fold-out from this page) for the following steps.

- (✓) Connect a 1" bare wire from lug 2 (S-1) to lug 3 (S-1) of switch DA.
- (✓) Prepare the following lengths of solid wire:
 - 2-3/4" black
 - 2" black
 - 3-1/2" black
 - 3-1/2" red

NOTE: When you perform the following wiring steps, position the wires down against the front panel assembly. This will provide a neater looking wiring job.

- (✓) Connect the 2-3/4" black solid wire from the 1" bare wire on switch DA (S-1) to lug 3 of control DB (NS).
- (✓) Connect a 2" black solid wire from lug 3 of control DB (S-2) to lug 3 of control DD (S-1).
- (✓) Cut two 1" lengths of small sleeving. Place a length over each lead of an 1800 Ω , 5% resistor (brown-gray-red-gold).
- (✓) Connect this 1800 Ω resistor between lug 1 of control DD (S-1) and lug 6 of switch DF (NS).
- (✓) Remove the shorting wire from the meter terminals.
- (✓) Connect a 3-1/2" black solid wire between lug 2 of switch DF (S-1) and lug 1 of meter CA (S-1).
- (✓) Connect a 3-1/2" red solid wire between lug 5 of switch DF (S-1) and lug 2 of meter CA (S-1).
- (✓) Connect a .005 μ F ceramic capacitor between lugs 2 (S-1) and lug 6 (S-1) of switch DE.
- (✓) Connect a 1/2" bare wire from lug 4 (S-1) to lug 8 (S-1) of switch DE.
- (✓) Remove 3/4" of insulation from a piece of black stranded wire. Tightly twist the small strands together and apply a small amount of solder to the wire to hold the strands together. Cut this 3/4" length of wire from the longer piece.

- (✓) In the same manner, prepare another 3/4" length of bare stranded wire.
- (✓) Form one of the 3/4" bare stranded wires to fit into the eyelets of lugs 1 (S-1) and 2 (S-1) of terminal strip CB.
- (✓) In the same manner, form the other 3/4" bare stranded wire to fit into the eyelets of lugs 3 (S-1) and 4 (S-1) of terminal strip CB.
- () Prepare the following lengths of black solid wire:

4-1/4"	3"
6"	4"
3-1/2"	3-1/4"

NOTE: When you connect wires to the foil side of a circuit board, do not push the insulation tight against the foil. Leave it 1/8" away from the foil to insure a good solder connection between the foil and wire.

- (✓) Connect a 4-1/4" black solid wire from the GND hole in the keyboard circuit board (S-1) to lug 1 of terminal strip CB (NS).
- (✓) Connect a 6" black solid wire from lug 1 of terminal strip CB (NS) to lug 1 of lamp socket CC (S-1).
- (✓) Connect a 3-1/2" black solid wire from lug 2 of terminal strip CB (NS) to lug 2 of lamp socket CE (S-1).
- (✓) Connect a 3" black solid wire from lug 2 of terminal strip CB (NS) to lug 3 of switch CL-D (S-2).
- (✓) Connect a 4" black solid wire from lug 5 of switch CK-C (S-2) to lug 9 of switch CL-F (S-1).
- (✓) Connect a 3-1/4" black solid wire from lug 5 of switch CL-H (S-2) to lug 2 of lamp socket CD (S-1).
- () Prepare the following lengths of red solid wire:
 - 4-1/2"
 - 8"
 - 4-1/4"
 - 2"
- (✓) Connect a 4-1/2" red solid wire from lug 2 of lamp socket CC (S-1) to lug 1 of lamp socket CE (NS).



- (✓) Connect an 8" red solid wire from lug 1 of lamp socket CE (NS) to lug 1 of lamp socket CD (S-1).
- (✓) Connect a 4-1/4" red solid wire from lug 1 of lamp socket CH (S-1) to lug 1 of lamp socket CJ (NS).
- (✓) Connect a 2" red solid wire from lug 4 of terminal strip CB (NS) to lug 1 of switch CL-E (S-2).

NOTE: When wiring to the card sockets in the following steps, disregard any numbers or letters stamped near the lugs.

- (✓) Twist lugs 16 through 30 of card socket DH 45 degrees as shown in the Pictorial.
- (✓) In a similar manner, twist lugs 16 through 30 of card sockets DJ and DK 45 degrees.
- (✓) Insert a 2-3/8" bare wire through lugs 16 through 30 of card socket DH. Solder the bare wire to each lug except lug 30.
- (✓) Insert a 2-3/8" bare wire through lugs 16 through 30 of card socket DJ. Solder the bare wire to each lug except lug 30.
- (✓) Insert a 2-3/8" bare wire through lugs 16 through 30 of card socket DK. Solder the bare wire to each lug except lug 16.

Wire Harness

Refer to Pictorial 13-2 (fold-out from this page) for the following steps.

- (✓) Position the front panel assembly near the chassis as shown.

NOTE: Be very careful in the following steps not to burn or melt any insulation while wiring the wire harness.

- (✓) Carefully lay the wire harness along the readout circuit board with breakouts BO#7, BO#8, and BO#9 separated as shown. Position the breakouts in their approximate positions as shown.

Connect the wires from BO#7 as follows:

- (✓) Both large black stranded wires to the bare wire between lugs 2 and 3 of round pushbutton switch DA (S-2).
- (✓) White to lug 1 of switch DA (S-1).
- (✓) Green to lug 1 of control DC (S-1).
- (✓) Yellow to lug 2 of control DC (S-1).

- (✓) Gray to lug 2 of control DB (S-1).

- (✓) Orange to lug 2 of control DD (S-1).

NOTE: When you connect a wire to the foil side of a circuit board, as in the next step, leave the insulation 1/8" away from the foil to insure a good solder connection between the foil and wire.

- (✓) Red to the +5V hole in the keyboard circuit board (S-1).

Connect the wires from BO#8 to the keyboard circuit board as follows:

- () Green to "INV Out" (S-1).
- (✓) Blue to INV IN (S-1).
- () Red to +5V (S-1).
- (✓) Gray to B₁ (S-1).
- (✓) Brown to B₈ (S-1).
- (✓) Yellow to A₁ (S-1).
- (✓) White to B₄ (S-1).
- (✓) Orange to B₂ (S-1).
- (✓) Black to GND (S-1).
- (✓) Carefully clip off the excess bare wire ends so they do not fall down into the front panel wiring. They could cause a short circuit.

Connect the wires from BO#9 to the readout circuit board as follows:

- (✓) Yellow to C₁ (S-1).
- (✓) Violet to C₈ (S-1).
- (✓) Blue to C₄ (S-1).
- (✓) Green to C₂ (S-1).
- (✓) Brown to D₈ (S-1).
- (✓) White to L/T (S-1).
- (✓) Black to D₄ (S-1).
- (✓) Red to D₂ (S-1).
- (✓) Clip off the excess bare wire ends.

Refer to Pictorial 13-3 (fold-out from this page) for the following steps. Connect the wires from BO#10 to the keyboard circuit board as follows:

- (✓) Violet to L1 (S-1).
- (✓) Black to L2 (S-1).
- (✓) White to L4 (S-1).
- (✓) Orange to L8 (S-1).
- (✓) Brown to Key BD SW (S-1).
- (✓) Green to BPS (S-1).
- (✓) Yellow to +5 SW (S-1).
- (✓) Red to +5V (S-1).
- (✓) Gray to RST (S-1).
- (✓) Blue to SHT (S-1).

Refer to Pictorial 13-4 for the following steps. Connect the wires and shielded cables from BO#11 as follows:

- (✓) Red to lug 6 of switch DF (S-2).
- (✓) White to lug 3 of switch DF (S-1).
- (✓) Small brown to lug 4 of switch DF (S-1).
- (✓) Violet to lug 1 of switch DF (S-1).
- (✓) Either shielded cable to lug 7 of switch DE (S-1).
- (✓) Remaining shielded cable to lug 3 of switch DE (S-1).
- (✓) Small black to lug 1 of terminal strip CB (S-3).

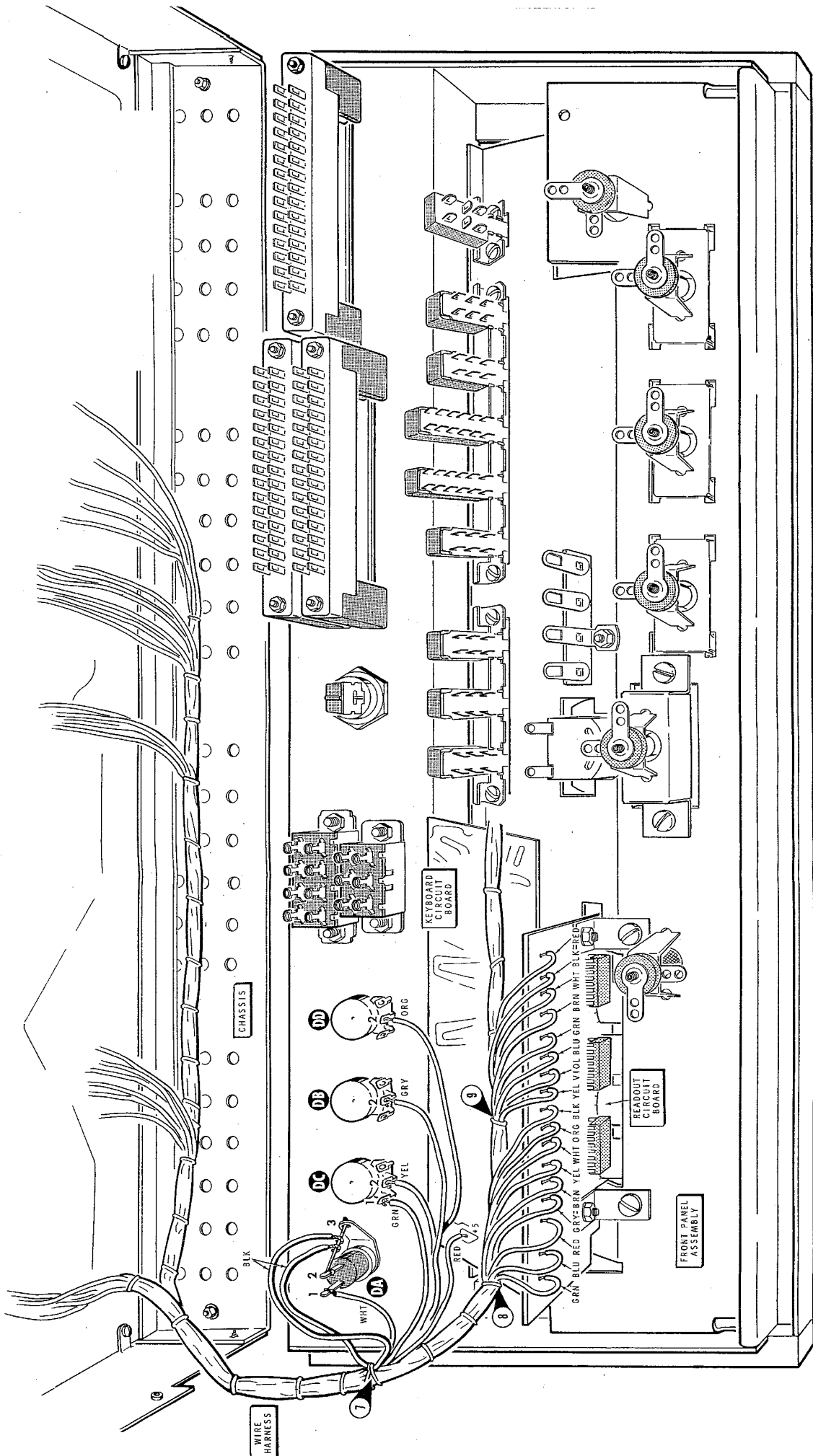
- (✓) Large black stranded to lug 2 of terminal strip CB (S-3).
- (✓) Large brown stranded to lug 1 of lamp socket CE (S-3).

Connect the wires from BO#12 as follows:

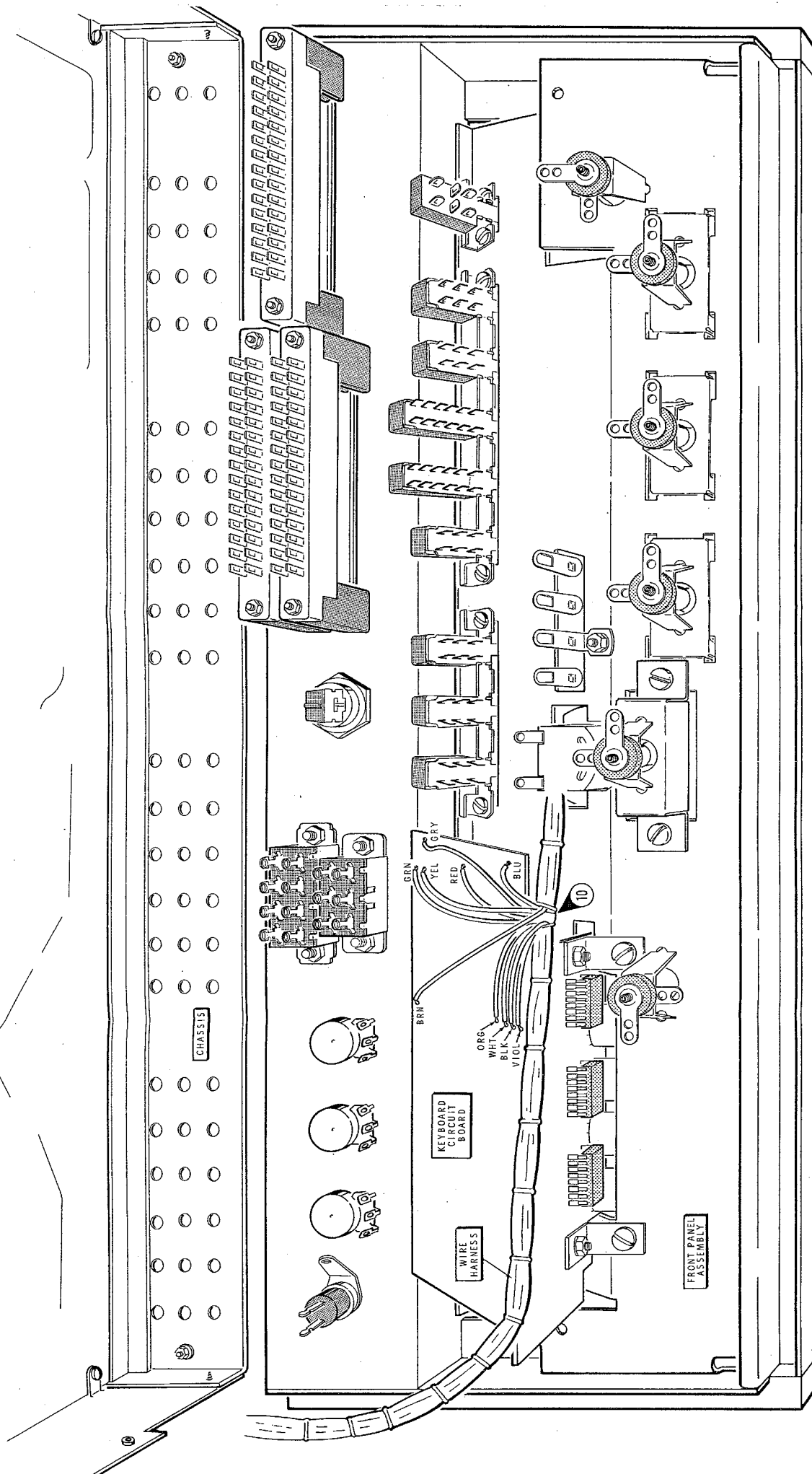
- (✓) Blue to lug 6 of switch CK-A (S-1).
- (✓) Orange to lug 6 of switch CK-B (S-1).
- (✓) Black to lug 6 of switch CK-C (S-1).
- (✓) Large red stranded to lug 3 of terminal strip CB (NS).
- (✓) Any two of the small red wires to lug 3 of terminal strip CB (S-3).
- (✓) Remaining two small red wires to lug 4 of terminal strip CB (S-3).
- (✓) Yellow to lug 1 of lamp socket CF (S-1).
- (✓) Green to lug 2 of lamp socket CF (S-1).

Connect the wires from BO#13 to 5-switch assembly CL as follows:

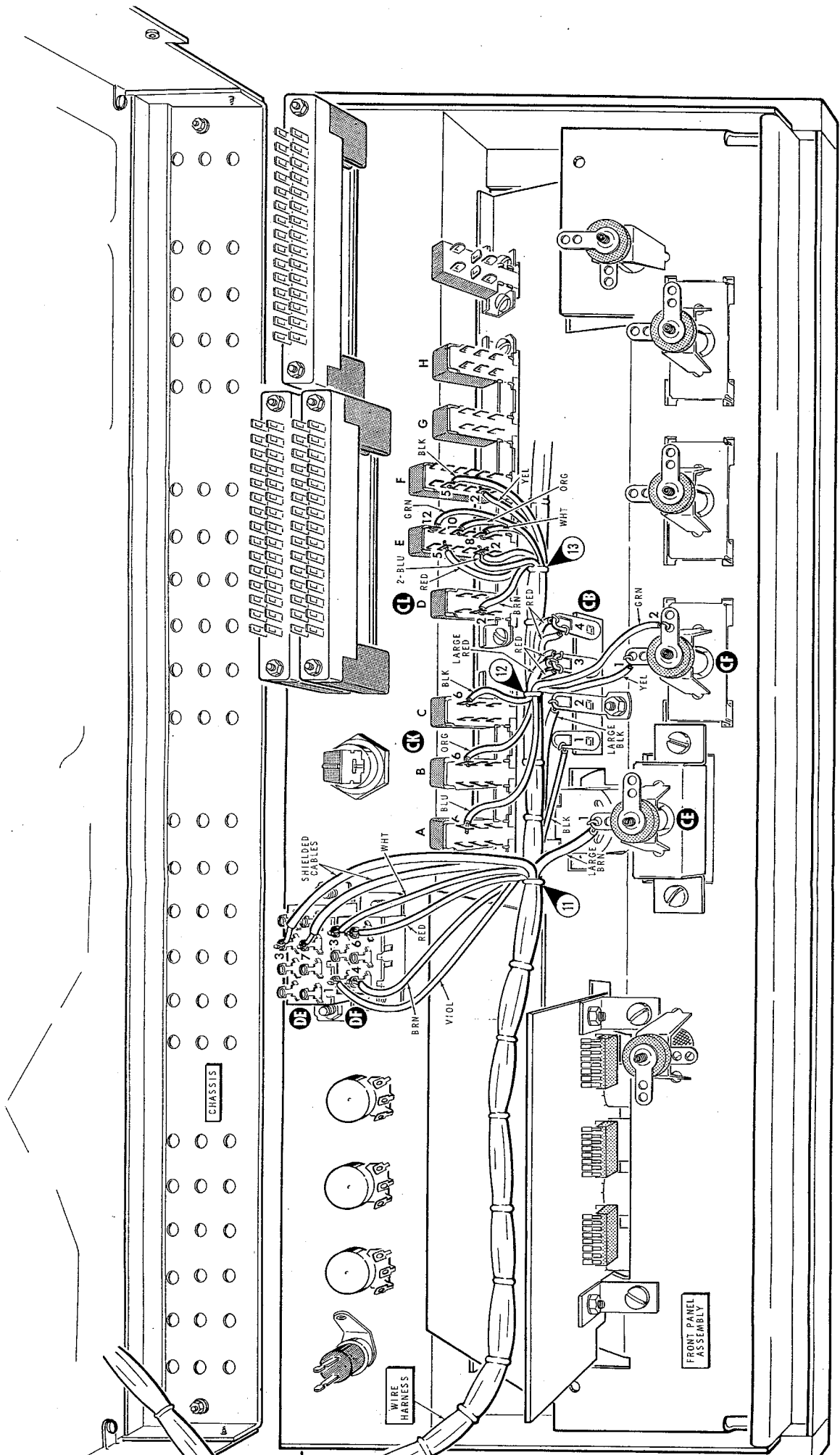
- (✓) Brown to lug 2 of switch D (S-1).
- (✓) Both blue wires to lug 2 of switch E (S-2).
- (✓) Red to lug 5 of switch E (S-1).
- (✓) White to lug 8 of switch E (S-1).
- (✓) Orange to lug 10 of switch E (S-1).
- (✓) Green to lug 12 of switch E (S-1).
- (✓) Yellow to lug 2 of switch F (S-1).
- (✓) Black to lug 5 of switch F (S-1).



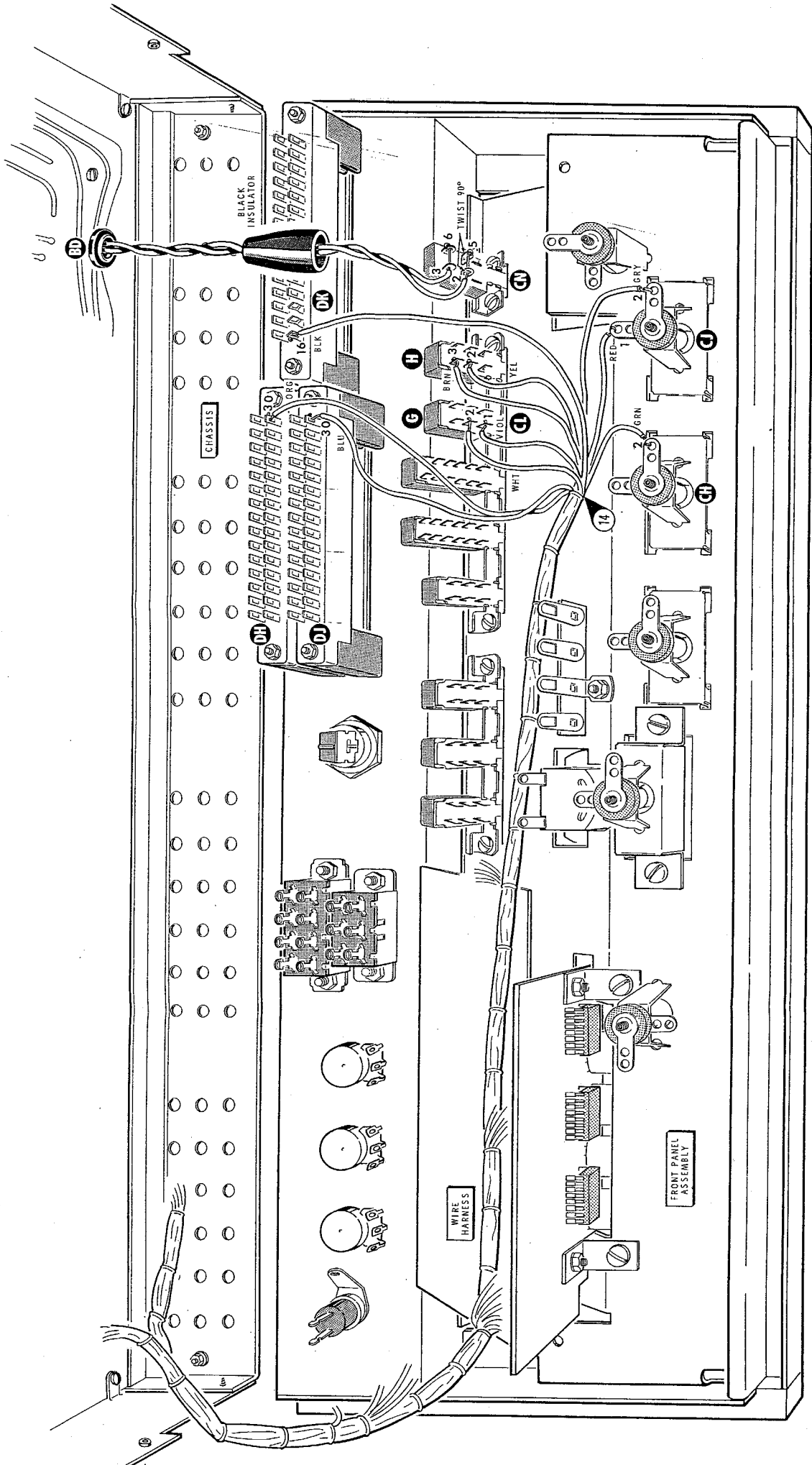
PICTORIAL 13-2



PICTORIAL 13-3



PICTORIAL 13-4



PICTORIAL 13-5

Refer to Pictorial 13-5 for the following steps.

Connect the wires from BO#14 as follows:

- (✓) Violet to lug 1 of switch CL-G (S-1).
- (✓) White to lug 2 of switch CL-G (S-1).
- (✓) Yellow to lug 2 of switch CL-H (S-1).
- (✓) Brown to lug 3 of switch CL-H (S-1).
- (✓) Green to lug 2 of lamp socket CH (S-1).
- (✓) Red to lug 1 of lamp socket CJ (S-2).
- (✓) Gray to lug 2 of lamp socket CJ (S-1).
- (✓) Blue to lug 30 of card socket DJ (S-2).
- (✓) Orange to lug 30 of card socket DH (S-2).
- (✓) Black to lug 16 of card socket DK (S-2).
- (✓) Refer to Part A of Detail 13-5A and cut 1/4" from the wide end of the black insulator as shown. Discard the 1/4" piece.
- (✓) Again refer to Part A of the Detail and cut 1/2" from the small end of the black insulator as shown. Discard the 1/2" piece.
- (✓) Locate the twisted pair of large black stranded wires coming from grommet BD in the master circuit board. Then remove an additional 1/4" of insulation from the end of each wire.
- (✓) Refer to Pictorial 13-5 and slide the black insulator onto the large black wires from grommet BD as shown. Be sure the large end of the insulator is toward the ends of the wires.