HEATHKIT® MANUAL

for the

STATION CONSOLE

Model SB-634

595-1667-05

HEATH COMPANY • BENTON HARBOR, MICHIGAN

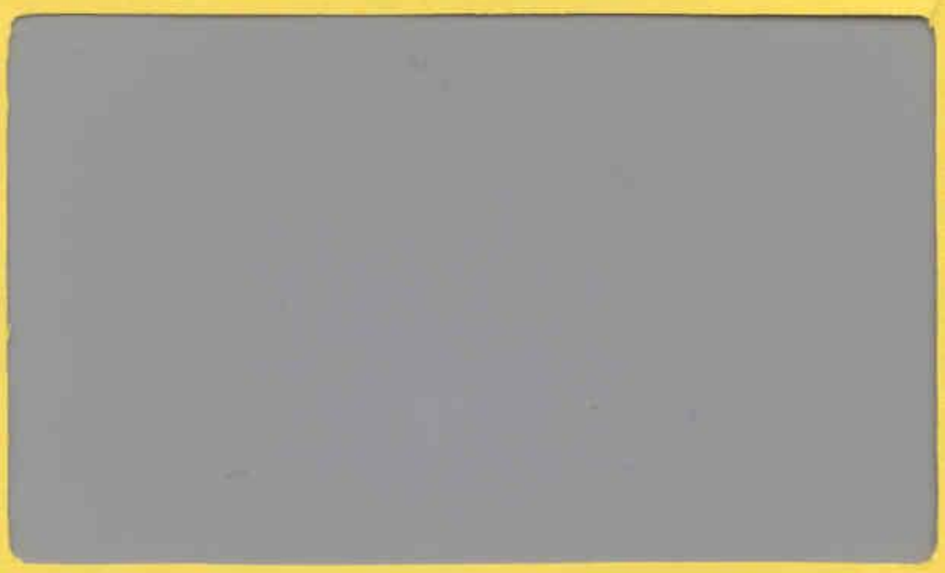
HEATH COMPANY PHONE DIRECTORY

The following telephone numbers are direct lines to the departments listed:

Kit orders and delivery information	(616) 982-3411
Credit	(616) 982-3561
Replacement Parts	(616) 982-3571

Technical Assistance Phone Numbers
8:00 A.M. to 12 P.M. and 1:00 P.M. to 4:30 P.M., EST, Weekdays Only

R/C, Audio, and Electronic Organs	(616) 982-3310
Amateur Radio	(616) 982-3296
Test Equipment, Weather Instruments and Home Clocks	(616) 982-3315
Television	(616) 982-3307
Aircraft, Marine, Security, Scanners, Automotive, Appliances and General Products	(616) 982-3496
Computers — Hardware	(616) 982-3309
Computers — Software:	
Operating Systems, Languages, Utilities	(616) 982-3860
Application Programs	(616) 982-3884
Heath Craft Wood Works	(616) 982-3423



YOUR HEATHKIT 90-DAY LIMITED WARRANTY

Consumer Protection Plan for Heathkit Consumer Products

Welcome to the Heath family. We believe you will enjoy assembling your kit and will be pleased with its performance. Please read this Consumer Protection Plan carefully. It is a "LIMITED WARRANTY" as defined in the U.S. Consumer Product Warranty and Federal Trade Commission Improvement Act. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Heath's Responsibility

PARTS — Replacements for factory defective parts will be supplied free for 90 days from date of purchase. Replacement parts are warranted for the remaining portion of the original warranty period. You can obtain warranty parts direct from Heath Company by writing or telephoning us at (616) 982-3571. And we will pay shipping charges to get those parts to you . . . anywhere in the world.

SERVICE LABOR — For a period of 90 days from the date of purchase, any malfunction caused by defective parts or error in design will be corrected at no charge to you. You must deliver the unit at your expense to the Heath factory, any Heathkit Electronic Center (units of Veritechnology Electronics Corporation), or any of our authorized overseas distributors.

TECHNICAL CONSULTATION — You will receive free consultation on any problem you might encounter in the assembly or use of your Heathkit product. Just drop us a line or give us a call. Sorry, we cannot accept collect calls.

NOT COVERED — The correction of assembly errors, adjustments, calibration, and damage due to misuse, abuse, or negligence are not covered by the warranty. Use of corrosive solder and/or the unauthorized modification of the product or of any furnished componen, will void this warranty in its entirety. This warranty does not include reimbursement for inconvenience, loss of use, customer assembly, set-up time, or unauthorized service.

This warranty covers only Heath products and is not extended to other equipment or components that a customer uses in conjunction with our products.

SUCH REPAIR AND REPLACEMENT SHALL BE THE SOLE REMEDY OF THE CUSTOMER AND THERE SHALL BE NO LIABILITY ON THE PART OF HEATH FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO ANY LOSS OF BUSINESS OR PROFITS, WHETHER OR NOT FORSEEABLE.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

Owner's Responsibility

EFFECTIVE WARRANTY DATE — Warranty begins on the date of first consumer purchase. You must supply a copy of your proof of purchase when you request warranty service or parts.

ASSEMBLY — Before seeking warranty service, you should complete the assembly by carefully following the manual instructions. Heathkit service agencies cannot complete assembly and adjustments that are customer's responsibility.

ACCESSORY EQUIPMENT — Performance malfunctions involving other non-Heath accessory equipment, (antennas, audio components, computer peripherals and software, etc.) are not covered by this warranty and are the owner's responsibility.

SHIPPING UNITS — Follow the packing instructions published in the assembly manuals. Damage due to inadequate packing cannot be repaired under warranty.

If you are not satisfied with our service (warranty or otherwise) or our products, write directly to our Director of Customer Service, Heath Company, Benton Harbor MI 49022. He will make certain your problems receive immediate, personal attention.

Heathkit® Manual

for the

STATION CONSOLE

Model SB-634

595-1667-05

HEATH COMPANY
BENTON HARBOR, MICHIGAN 49022

TABLE OF CONTENTS

INTRODUCTION

The Heathkit Model SB-634 Station Console is a multi-purpose instrument that includes an RF Power/SWR (standing wave ratio) Meter, a hybrid phone patch, a 10-minute electronic timer, and a 24-hour electronic clock. The Console was designed for use with an amateur radio station or other types of transmitters or transceivers that use a 50-ohm transmission line.

The RF Power/SWR Meter section of the Console indicates the power transfer efficiency between a transmitter and antenna. If the meter is used with a transceiver, it will not affect receiver operation. The combination of negligible insertion loss and high power rating permits the meter to be permanently inserted in a transmission line. This permits constant monitoring of RF power output or reflected power (SWR) to determine proper transmitter tuning, transmission-line-to-antenna impedance matching, loading, and relative power output.

The RF Power/SWR Meter section can also be used for other applications, such as testing antenna coupling networks, checking other transmission systems, etc.

The hybrid phone patch section of the Console is used to transfer audio signals between telephone lines and two-way radio equipment. It can be used either manually or with voice-controlled (VOX) transmitters, without changing any connections.

When the phone patch section of the Console is used, the meter will indicate the VU level of the phone patch output so you can adjust the proper volume level to the telephone line to prevent crosstalk. The meter also permits you to make a convenient null adjustment check. (Maximum null depth produces maximum isolation between the telephone line and station equipment, which results in the best operating conditions for voice-control circuits.) Proper match to the telephone line, with minimum hum, is provided by a specially designed hybrid transformer.

The 10-minute electronic timer in the Console reminds you to give your call letters and identify your station at 10-minute intervals to comply with FCC (Federal Communications Commission) regulations. You can select either a visual reminder, or both visual and aural reminders by a front panel switch. You can also reset the timer at any time to start a new 10-minute interval.

The 24-hour electronic clock shows the hours, minutes, and seconds. It is independent of all other circuits in the Console, and runs whenever the power cord is connected to the AC line.

The RF Power/SWR Meter and the hybrid phone patch require no AC power for operation. They can be used with the timer switch turned off or with the line cord disconnected. AC power is required to operate the timer and the electronic clock.

The styling of the Model SB-634 Station Console conforms with that of other Heathkit SB-series equipment, and its versatility makes it a useful instrument for any radio station.

NOTE: You may be required by your local Telephone Company to install a Network Control Signaling unit "QKT" between your telephone and the telephone line. Check with your local Telephone Company to see if this is required in your area.

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

UNPACKING INSTRUCTIONS

You Station Console is packed in four packs; #1, #2, #3, and #4. Inside the shipping carton, you will find another carton marked Packs #1 through #3. The loose parts in the shipping carton are Pack #4. Do not open packs #1, #2, or #3 until you are directed to do so.

There is a Parts List in this Manual for each pack. At the beginning of each Parts List you will be instructed to open a pack and check each part.

ASSEMBLY NOTES

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

2. Resistors are identified by the resistance value, in ohms (Ω, kΩ, or MΩ), and color code.

3. Capacitors are identified by the capacitance value (in pF or μF) and type (disc, mica, electrolytic, etc.).

4. 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 a minimum amount of solder and use no larger than a 25-watt soldering iron with a small tip. Allow it to reach operating temperature, and then apply it long enough to make a good solder connection.

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

5. Each circuit part in this kit has its own "Circuit Component Number" (R2, C4, SW1, etc.). This is a specific number for only that one part. The purpose of these numbers is to help you easily identify the same part in each section of the Manual. These numbers will appear:

   — In the Parts List,

   — At the beginning of each step where a component is installed,

   — In some illustrations,

   — In the sections at the rear of the Manual.

POWER METER CIRCUIT BOARD

PARTS LIST

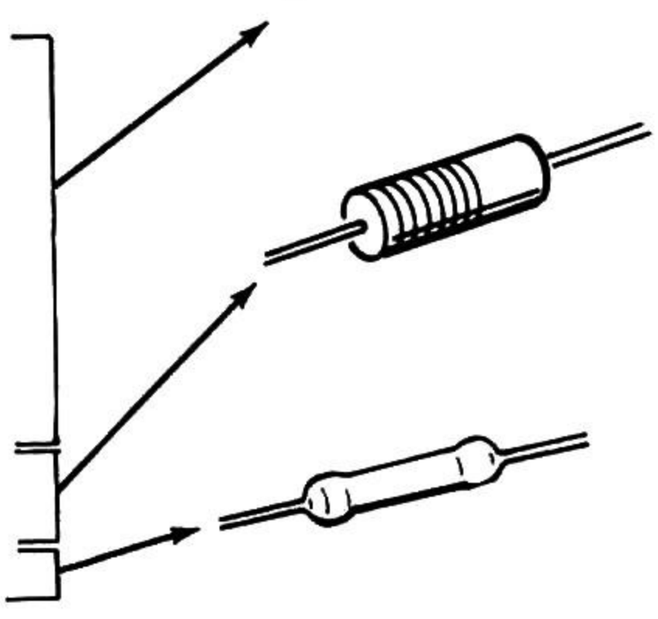
Unpack the package marked 1 and check each part against the following list. Make a check (√) in the space provided as you identify each part. Any part that is packed in an individual envelope with a part number on it should be placed back in the envelope after you identify it until it is called for in a step. Do not throw away any packing material until all of the parts are accounted for.

Refer to the inside back cover of the Manual for "Replacement Parts" information.

QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.

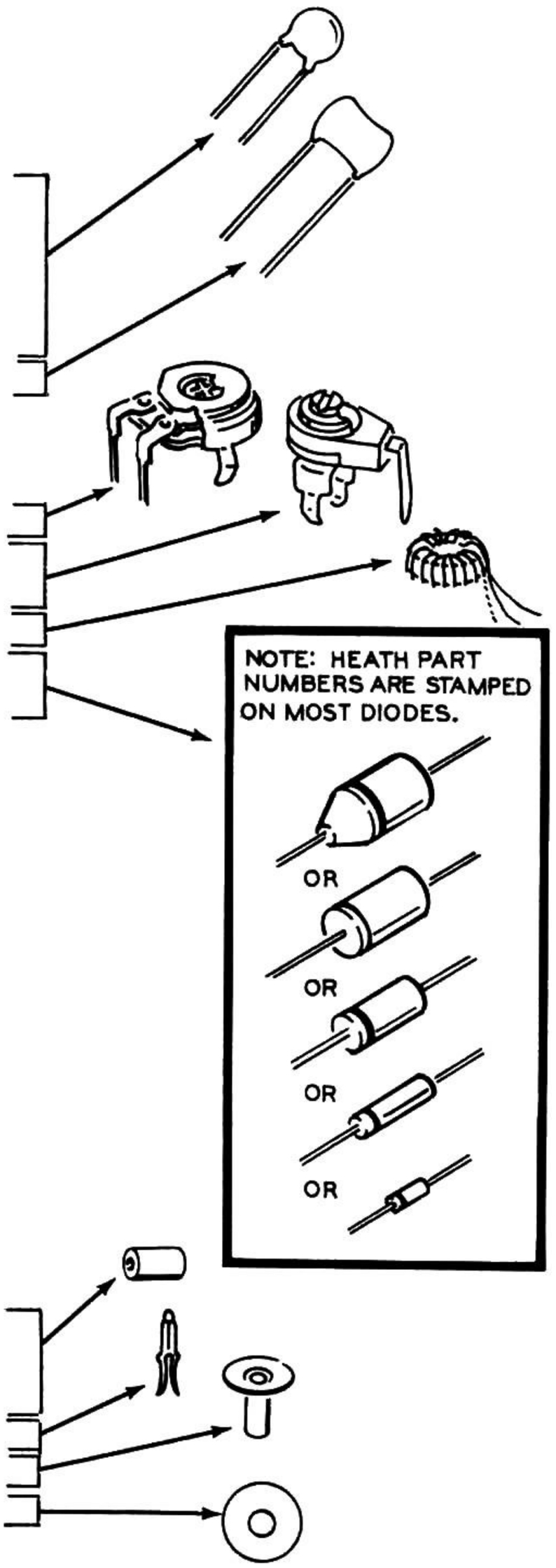
RESISTORS, 1/2-Watt

NOTE: The following resistors have a 5% tolerance unless otherwise noted. 5% is indicated by a fourth color band of gold; 10% is indicated by a silver band.



( )	2	470 Ω (yellow-violet-brown)	1-157	R304,R305
( )	1	3300 Ω (orange-orange-red)	1-122	R302
( )	1	22 kΩ (red-red-orange)	1-58	R308
( )	1	82 kΩ (gray-red-orange)	1-159	R309
( )	1	100 kΩ (brown-black-yellow)	1-104	R306
( )	1	68 Ω, 1-watt, 10% (blue-gray-black)	1-16-1	R301
( )	1	90 kΩ. 1%, precision	2-41	R303

QTY.		DESCRIPTION	PART No.	CIRCUIT Component No.
CAPACITORS				
( )	2	150 pF disc	21-11	C301,C305
( )	6	.001 μF disc	21-163	C307,C308, C309,C311, C313, C314
( )	1	.005 μF disc	21-27	C312
( )	1	100 pF mica	20-148	C306
MISCELLANEOUS				
( )	1	50 kΩ control	10-325	R307
( )	1	2.0 – 18.5 pF trimmer capacitor	31-57	C304
( )	1	Toroid coil	40-1011	L301
( )	3	1N295 diode (red-white-green)	56-20	D301,D302, D303
( )	5	Ferrite bead	475-10	FB301,FB302, FB303,FB304, FB305
( )	2	Circuit board pin	432-121	
( )	1	Eyelet	257-12	
( )	1	Fiber washer	253-1	
( )	1	Power meter circuit board	85-1443-4	
( )		Solder (Additional 3' rolls of solder can be ordered under part number 331-6 for $.25 each.)	331-8	



QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.

PARTS FROM PACK No. 4

( )	6"	Small bare wire	340-3
( )	12'	Yellow wire	344-54
( )	3'	5-wire cable	347-39
( )	3"	Teflon* sleeving	364-21
( )	1	Kit Builders Guide	597-308
( )	1	Parts Order Form	597-260
( )	1	Manual (See front cover for part number.)	

NOTE : The prices shown on the separate "Heath Parts Price List" apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Add 10% (minimum 25 cents) to the price when ordering (Michigan residents add 4% sales tax) to cover insurance, postage, and handling. Outside the U.S.A., parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties, and rates of exchange.

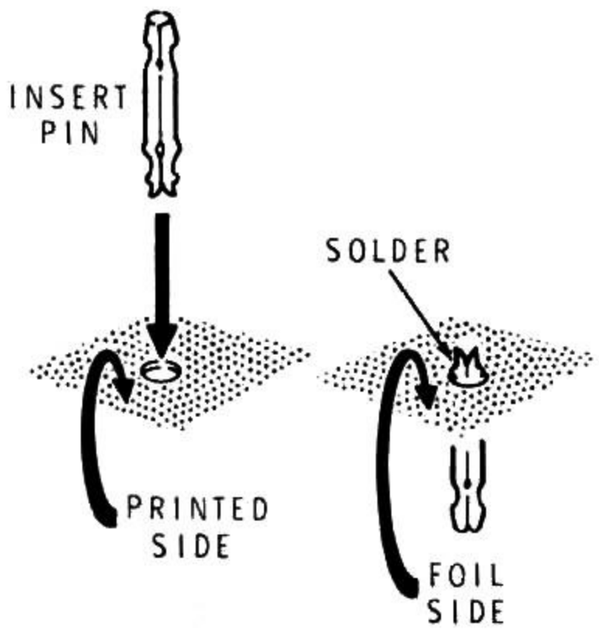
*DuPont Registered Trademark.

STEP-BY-STEP ASSEMBLY

START

Position the meter circuit board as shown. Then perform the steps in the order listed.

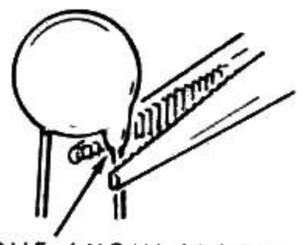
( ) Install circuit board pins (#432-121) at locations marked CAL and NORM. Be sure the pins are straight; then solder them to the foil. CAUTION: Do not allow the pins to fill with solder.



( ) R303: 90 kΩ, 1%, precision resistor.

( ) C306: 100 pF mica.

NOTE: Before you install disc capacitors, remove any insulation on the leads near the body of the capacitors as shown below.



( ) C312: .005 μF disc.

( ) C301: .001 μF disc.

( ) C305: 150 pF disc.

( ) C301: 150 pF disc.

( ) R303: 3300 Ω (orange-orange-red).

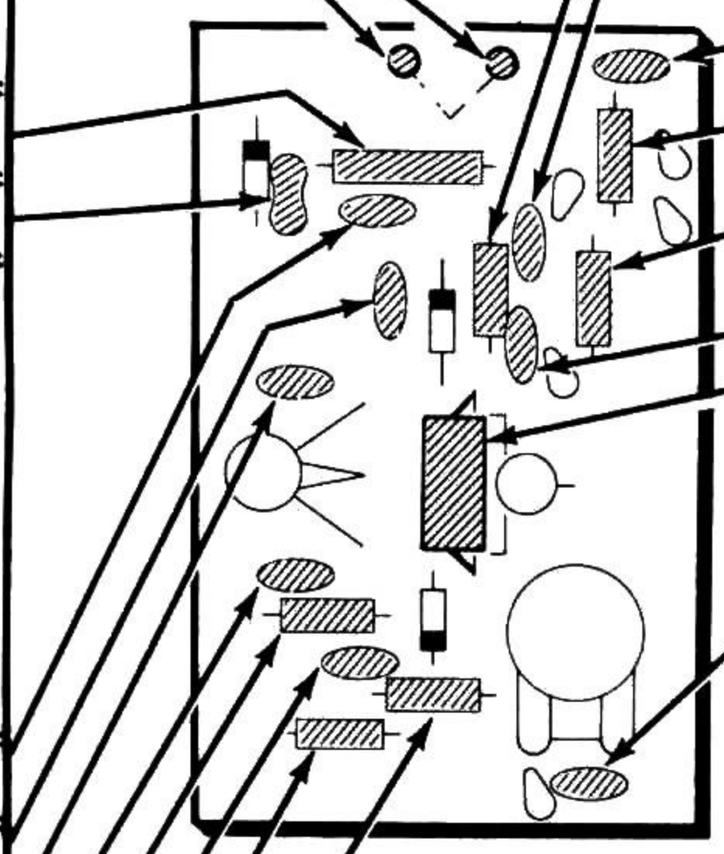
( ) C308: .001 μF disc.

( ) R306: 100 kΩ (brown-black-yellow).

( ) R305: 470 Ω (yellow-violet-brown).

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

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



CONTINUE

( ) R304: 470 Ω (yellow-violet-brown).

( ) C313: .001 μF disc.

( ) C314: .001 μF disc.

( ) R309: 82 kΩ (gray-red-orange).

( ) R308: 22 kΩ (red-red-orange).

( ) C309: .001 μF disc.

( ) R301: 68 Ω, 1-watt (blue-gray-black). NOTE: Position this resistor toward the left as shown.

( ) C311: .001 μF disc.

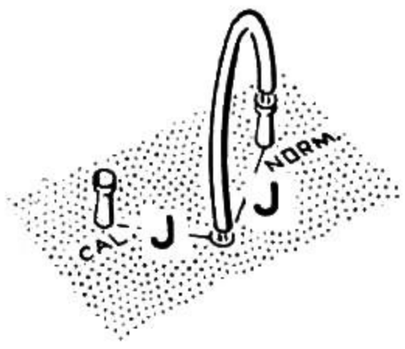
( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 1-1

START

NOTE: To prepare a wire, cut it to the proper length and remove 1/4" of insulation from each end.

( ) 1-1/4" yellow wire. Solder one end to the foil. Then temporarily solder the other end of the wire to the circuit board pin at NORM.



( ) L301: Install the toroid coil (#40-1011) as follows:

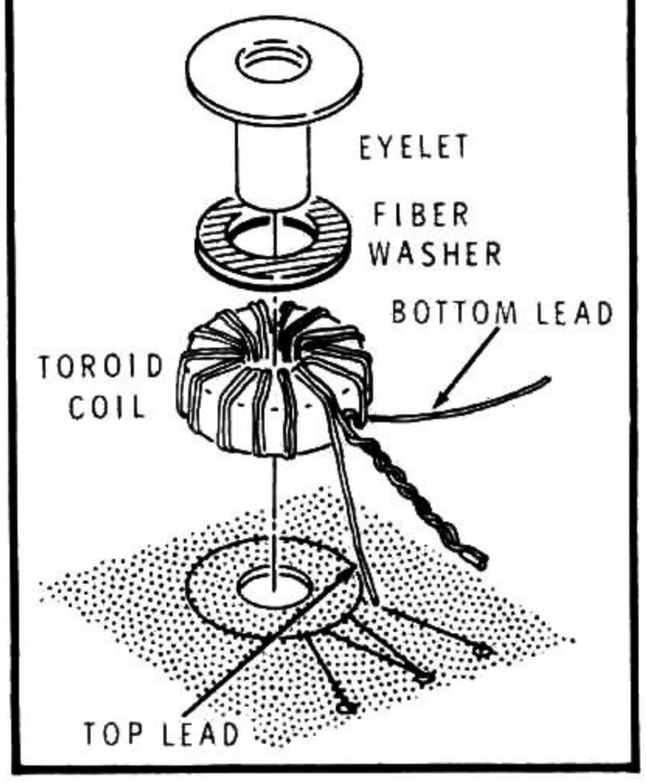
1. Refer to the drawing below and press the eyelet into the fiber washer. (It is a tight fit.)

2. Position the toroid coil so the top and bottom leads are as shown. Then carefully press the eyelet into the coil.

3. Insert the end of the eyelet through the hole in the circuit board. Then solder the eyelet to the foil.

4. Position the coil leads as shown and insert the leads into the circuit board holes. CAUTION: Be sure you insert the twisted pair into the center hole. Also, the top lead must go in the hole nearest C301, and the bottom lead in the hole nearest C305. Solder only the solder covered ends of the leads.

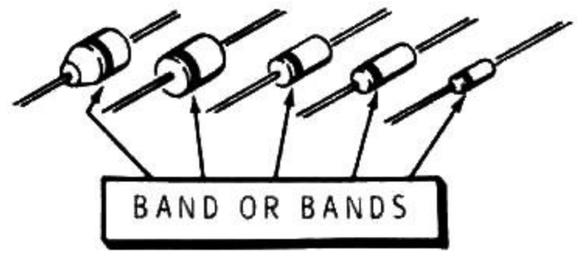
5. Solder the three leads to the foil and cut off the excess lead lengths.



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

CONTINUE

NOTE: DIODES MAY BE SUPPLIED IN ANY OF THE FOLLOWING SHAPES. ALWAYS POSITION THE BANDED END AS SHOWN ON THE CIRCUIT BOARD.



Install three 1N295 diodes (#56-20 red-white-green) at:

( ) D303.

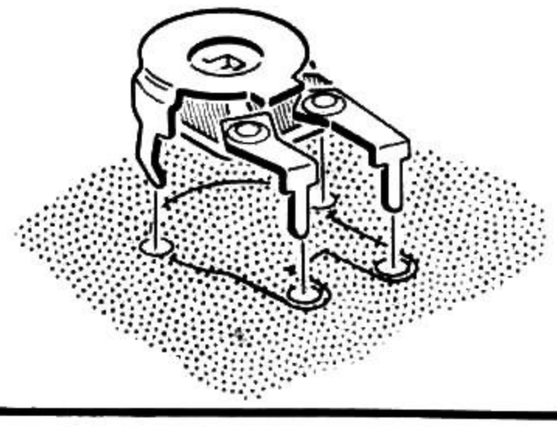
( ) D301.

( ) D302.

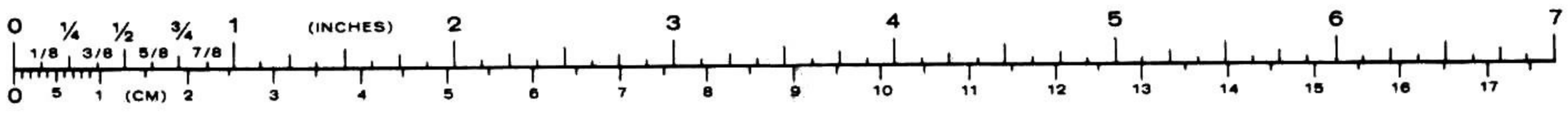
( ) Solder the leads to the foil and cut off the excess lead lengths.

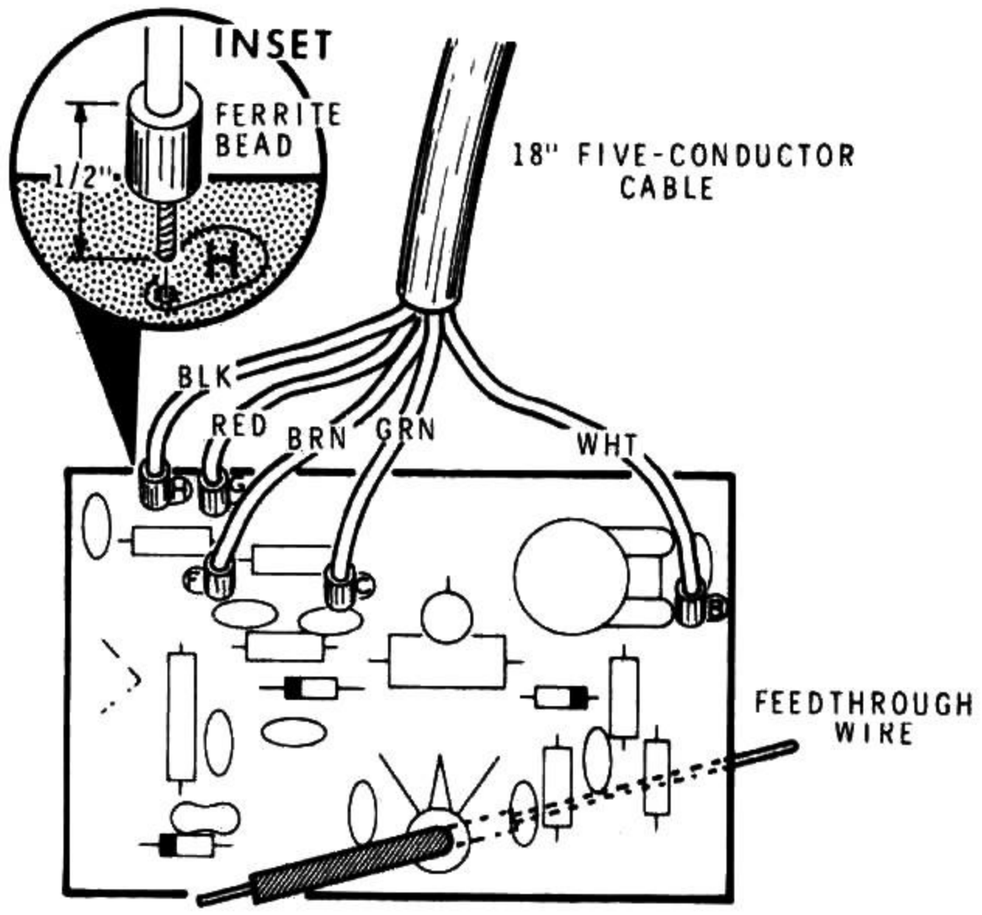
( ) C304: 2.7 to 20 pF trimmer (#31-57). Solder the lugs to the foil.

( ) R307: 50 kΩ control (#10-325). Solder the lugs to the foil.

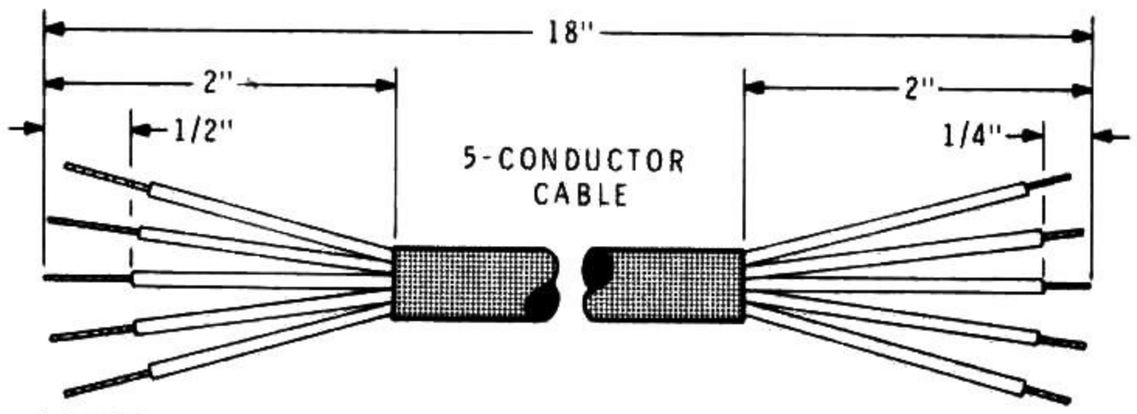


PICTORIAL 1-2





PICTORIAL 1-3



AT BOTH ENDS OF THE CABLE, TWIST THE STRANDS OF EACH WIRE. THEN APPLY A SMALL AMOUNT OF SOLDER TO HOLD THE STRANDS TOGETHER.

Detail 1-3A

Refer to Pictorial 1-3 for the following steps.

( ) Cut an 18" length of 5-wire cable. Then refer to Detail 1-3A and prepare each end of the cable as shown.

NOTE: In the following steps, when you connect the 5-wire cable to the power meter circuit board, place a ferrite bead on each wire. Use the wires with the longer bare ends, solder each wire to the foil as it is connected, and then cut off the excess wire lengths.

Connect the 5-wire cable wires with the longer bare ends as follows:

( ) White wire with ferrite bead to hole B.

( ) Green wire with ferrite bead to hole C.

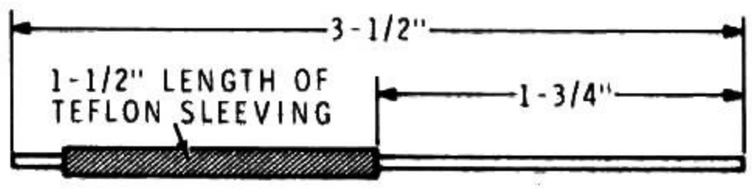
( ) Brown wire with ferrite bead to hole F.

( ) Red wire with ferrite bead to hole G.

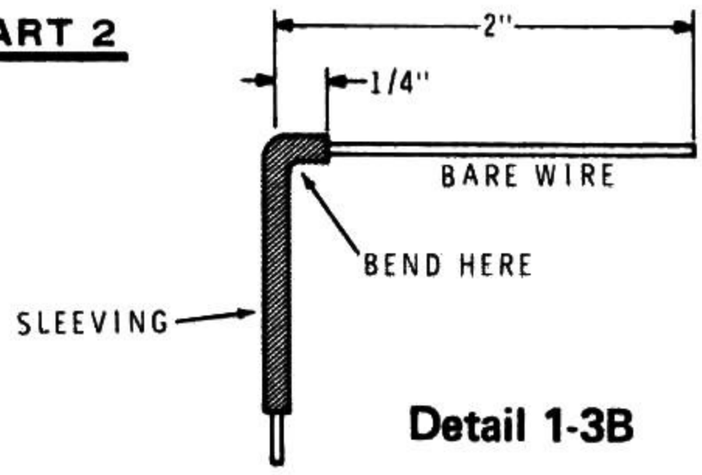
( ) Black wire with ferrite bead to hole H.

The free end of the 5-wire cable will be connected later.

PART 1



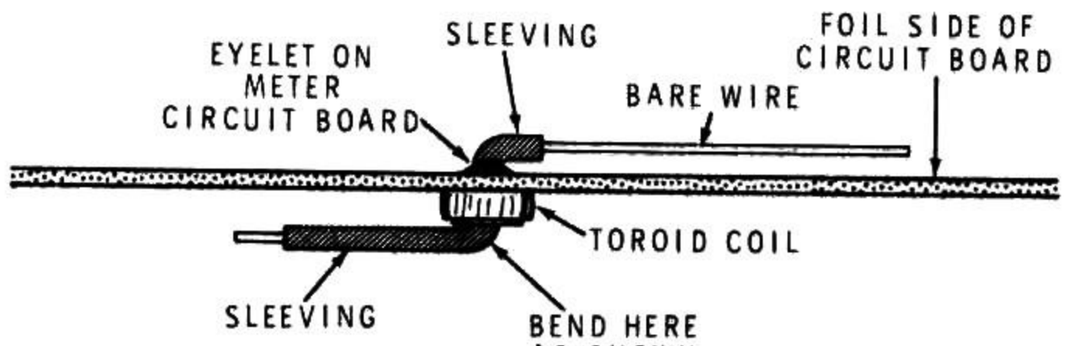
PART 2



Detail 1-3B

( ) Refer to Part 1 of Detail 1-3B and place a 1-1/2" length of teflon sleeving on a 3-1/2" length of the small bare wire as shown.

( ) Refer to Part 2 of the Detail and bend the wire and sleeving straight down. Be sure the sleeving is positioned as shown.

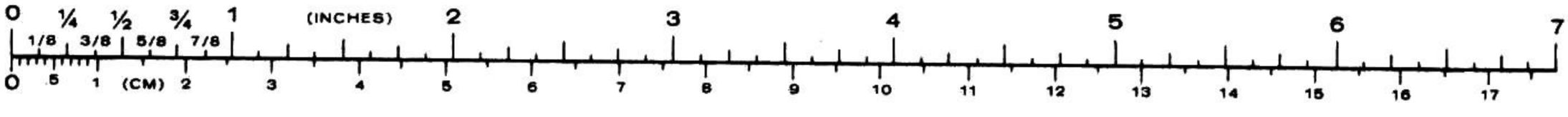


Detail 1-3C

( ) Refer to Detail 1-3C and, from the foil side of the power meter circuit board, insert the sleeve covered end of the bent wire down through the eyelet on the power meter circuit board.

( ) Bend the protruding end of the sleeve covered wire toward the left as shown. The wire should appear as shown in the Detail and should move freely in the eyelet. The free ends of the bare wire will be connected later.

Set the power meter circuit board aside until it is called for.



MAIN CIRCUIT BOARD

PARTS LIST

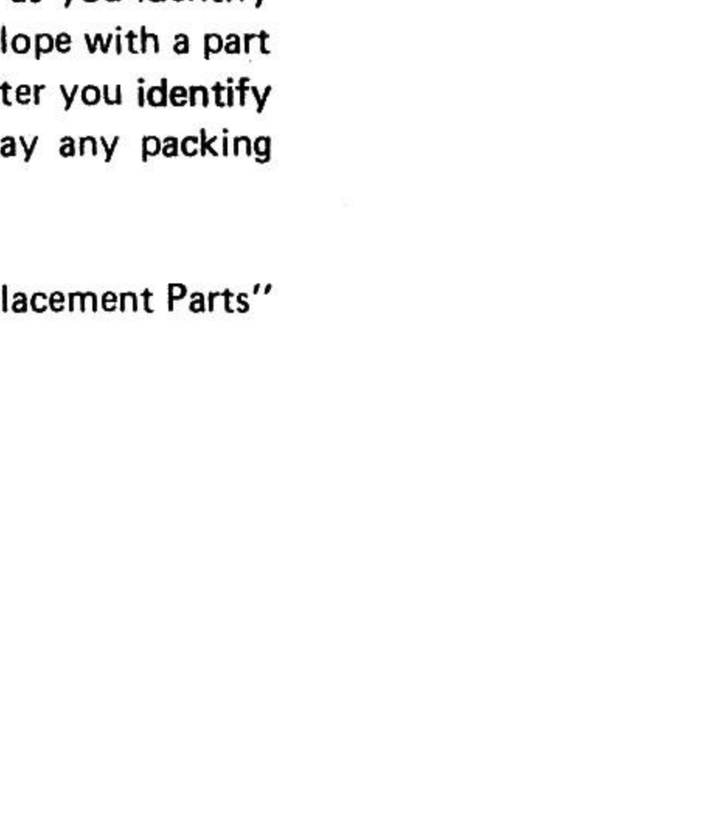
Unpack the package marked 2 and check each part against the following list. Make a check (√) in the space provided as you identify each part. Any part that is packed in an individual envelope with a part number on it should be placed back in the envelope after you identify it until it is called for in a step. Do not throw away any packing material until all of the parts are accounted for.

Refer to the inside back cover of the Manual for "Replacement Parts" information.

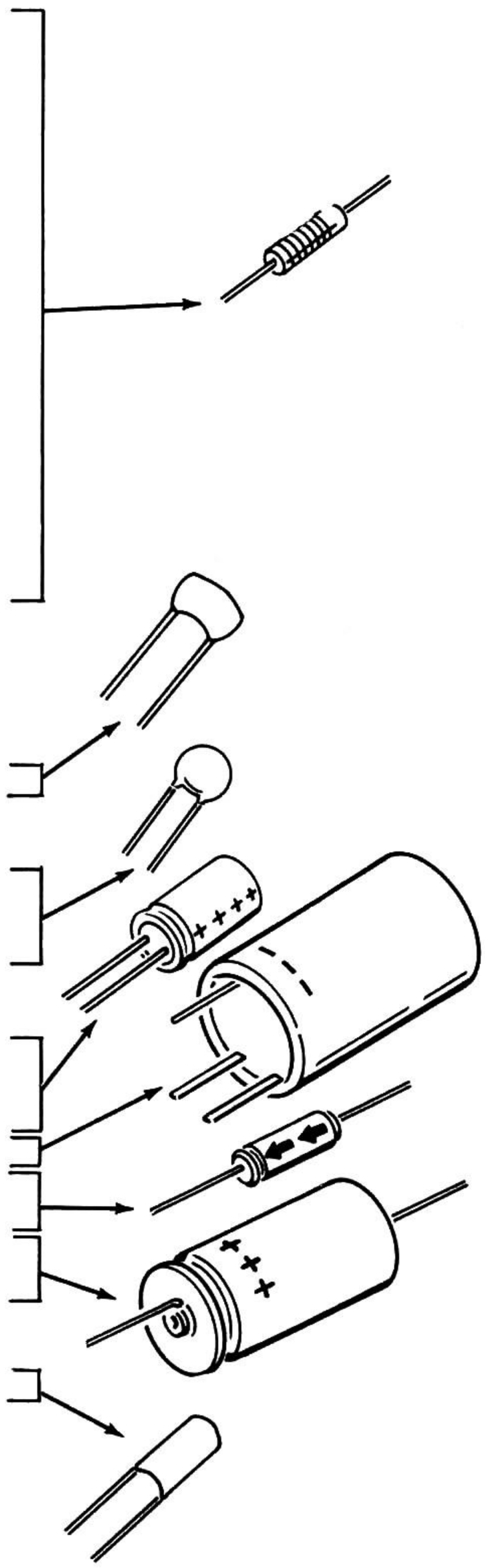
QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.
	RESISTORS, 1/2-Watt		

NOTE: The following resistor tolerances are 10% unless otherwise noted. 10% is indicated by a fourth color band of silver; 5% is indicated by a gold band.

( )	1	100 Ω (brown-black-brown)	1-3	R246
( )	1	220 Ω (red-red-brown)	1-45	R241
( )	2	270 Ω (red-violet-brown)	1-42	R247, R251
( )	1	680 Ω (blue-gray-brown)	1-7	R243
( )	2	1000 Ω (brown-black-red)	1-9	R244, R248
( )	1	2700 Ω (red-violet-red)	1-13	R242
( )	1	3300 Ω, 5% (orange-orange-red)	1-122	R245
( )	1	6800 Ω (blue-gray-red)	1-19	R207
( )	1	8200 Ω, 5% (gray-red-red)	1-114	R238
( )	1	12 kΩ, 5% (brown-red-orange)	1-109	R239
( )	1	18 kΩ (brown-gray-orange)	1-162	R237



QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.
Resistors (cont'd.)			
( ) 1	22 kΩ (red-red-orange)	1-22	R208
( ) 6	27 kΩ (red-violet-orange)	1-23	R201,R202, R203,R204, R205,R206
( ) 2	56 kΩ (green-blue-orange)	1-47	R209,R249
( ) 12	120 kΩ (brown-red-yellow)	1-121	R213,R214, R217,R218, R222,R223, R226,R227, R231,R232, R235,R236
( ) 6	270 kΩ (red-violet-yellow)	1-30	R212,R216, R221,R225, R229,R234
( ) 6	1 MΩ (brown-black-green)	1-35	R211,R215, R219,R224, R228,R233
CAPACITORS			
Mica			
( ) 1	51 pF	20-190	C201
Disc			
( ) 6	.001 μF	21-163	C202,C203 C204,C205, C206,C207
Electrolytic			
( ) 2	100 μF	25-117	C214,C218,
( ) 1	1000 μF	25-164	C213
( ) 1	20-20 μF	25-270	C211A/B
( ) 2	2 μF	25-123	C215,C221
( ) 2	10 μF	25-54	C216,C217
( ) 1	1200 μF	25-241	C209
( ) 1	6000 μF	25-272	C212
Mylar*			
( ) 1	.022 μF (.022K)	27-63	C208



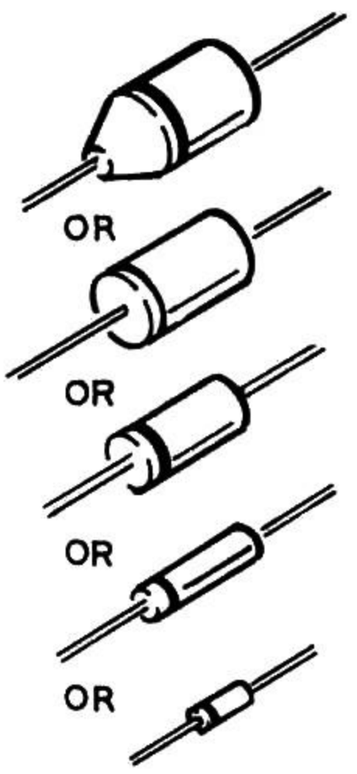
*Dupont Registered Trademark

QTY.		DESCRIPTION	PART No.	CIRCUIT Component No.

DIODES-TRANSISTORS-INTEGRATED CIRCUITS

( )	9	1N4149 diode	56-56	D201,D202, D203,D204* D205,D214, D215,D216, D217,D218
( )	1	1N2071 diode	57-27	D208
( )	6	1N4002 diode	57-65	D206,D207, D209,D211, D212,D213
( )	1	1N4166A zener diode	56-25	ZD201
( )	1	1N709A zener diode	56-58	ZD202

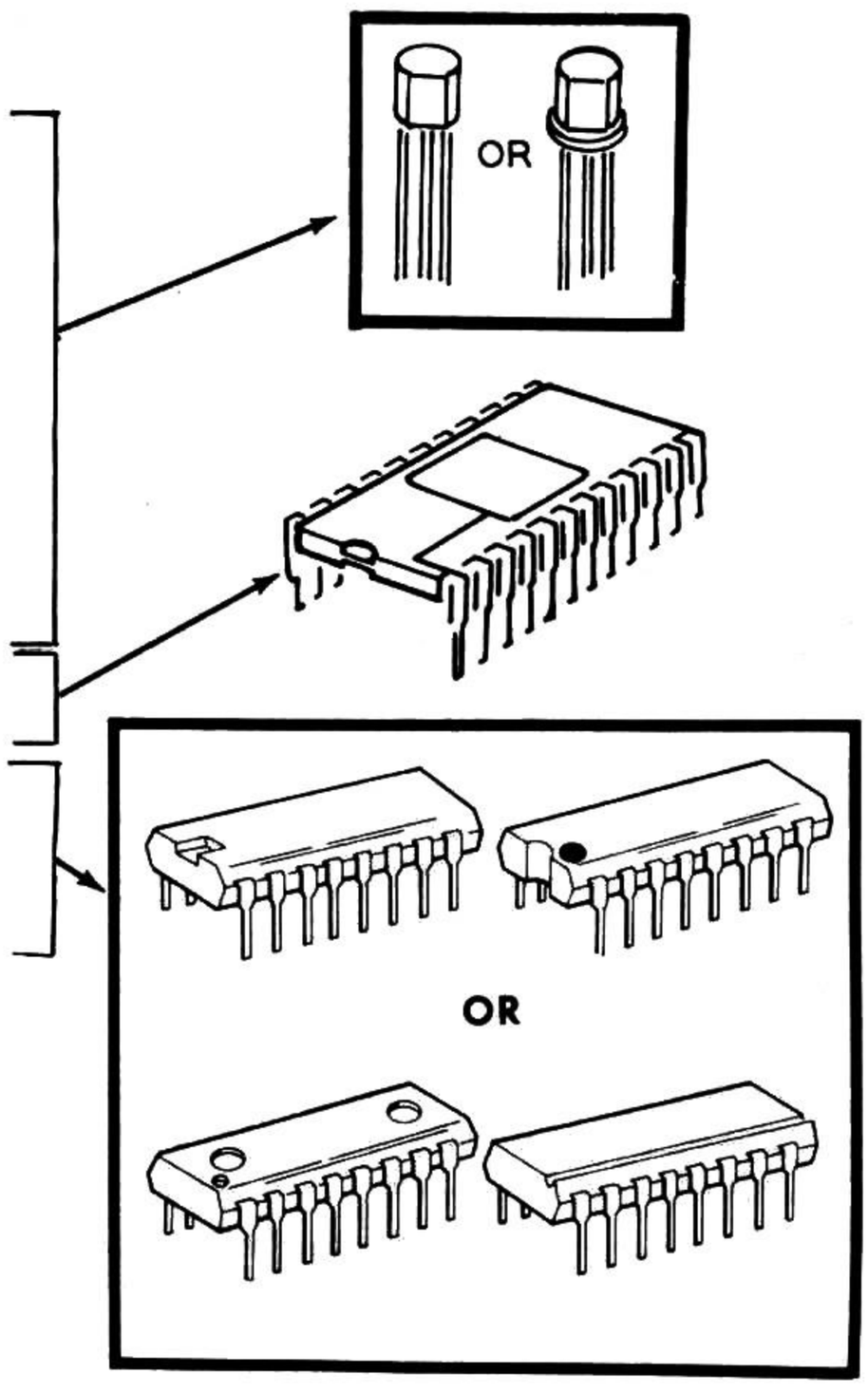
NOTE: HEATH PART NUMBERS ARE STAMPED ON MOST DIODES.



NOTE: Transistors and integrated circuits are marked for identification in one of the following four ways:

1. Part number.
2. Type number. (On integrated circuits this refers only to the numbers; the letters may be different or missing.)
3. Part number and type number.
4. Part number with a type number other than the one listed.

( )	1	MPS-U05 transistor	417-224	Q214
( )	7	MPS-L51 transistor	417-295	Q201,Q203, Q205,Q207, Q209,Q212, Q218
( )	11	MPS-A20 transistor	417-801	Q202,Q204, Q206,Q208, Q211,Q213, Q215,Q216, Q217,Q219, Q221
( )	1	MK5017AA integrated circuit	443-687	IC201
( )	3	SN7490N integrated circuit	443-7	IC202,IC203, IC204
( )	1	SN7413N integrated circuit	443-44	IC205

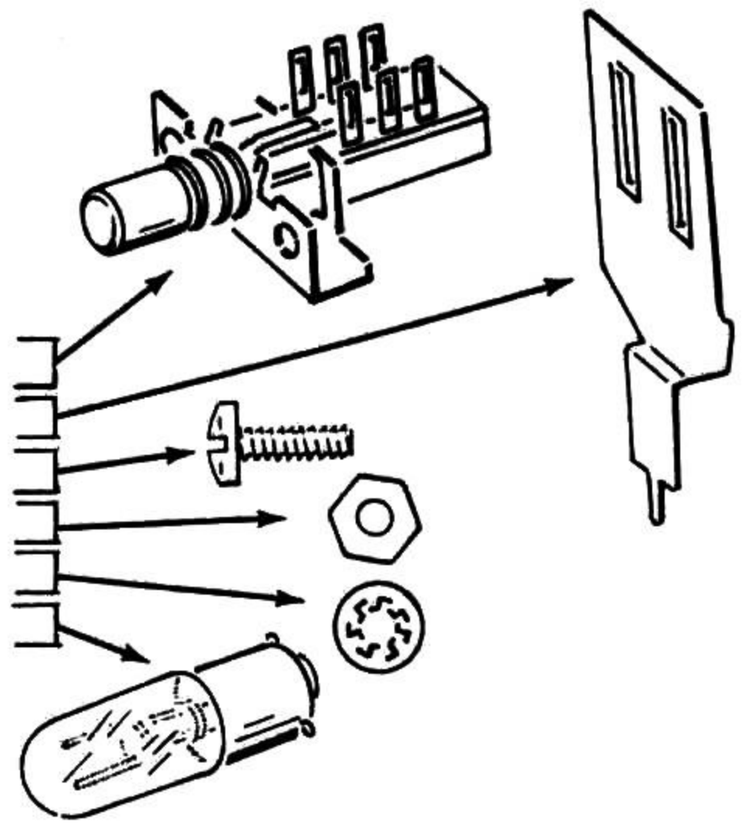


* D204 is optional; not supplied.

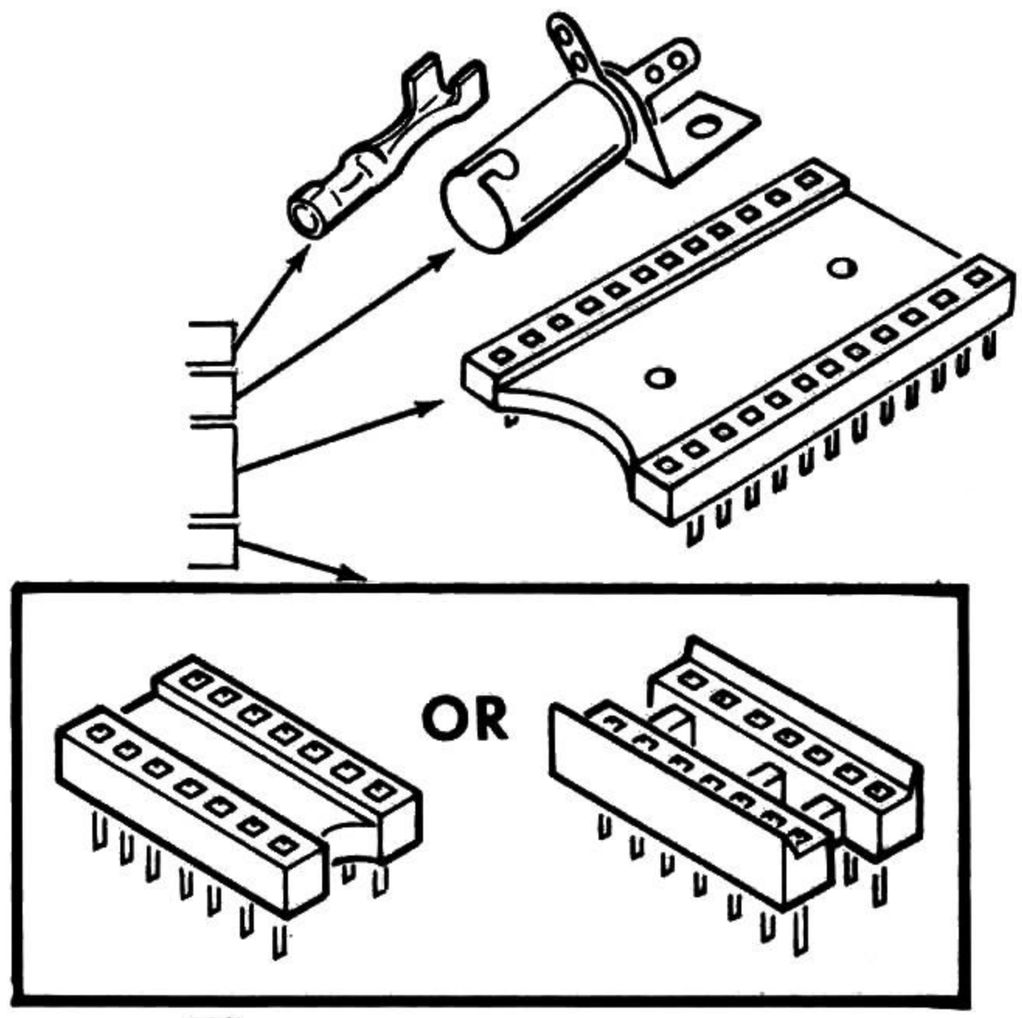
QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.

MISCELLANEOUS

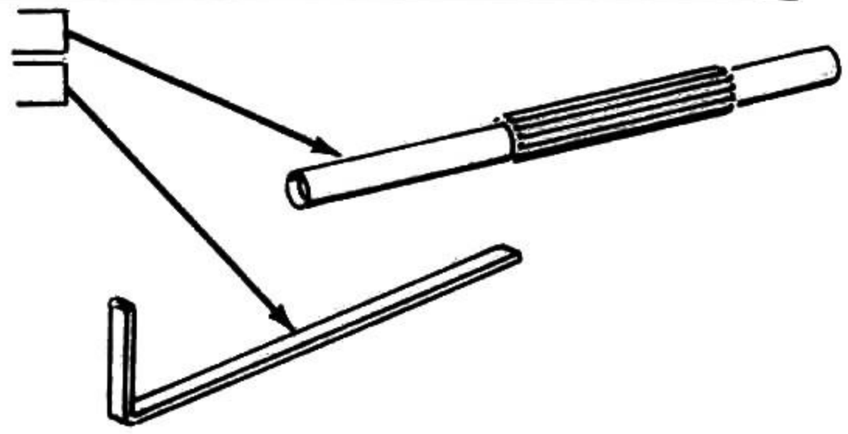
( )	1	Pushbutton switch	64-680	SW201
( )	1	Heat sink	215-86	
( )	1	6-32 x 3/8" screw	250-89	
( )	1	6-32 nut	252-3	
( )	1	#6 lockwasher	254-1	
( )	1	Lamp	412-16	PL201



( )	29	Connector	432-120	
( )	1	Lamp socket	434-88	
( )	1	24-pin IC (integrated circuit) socket	434-221	
( )	4	14-pin IC socket	434-298	



( )	1	Plastic nut starter	490-5	
( )	1	IC lifter	490-111	

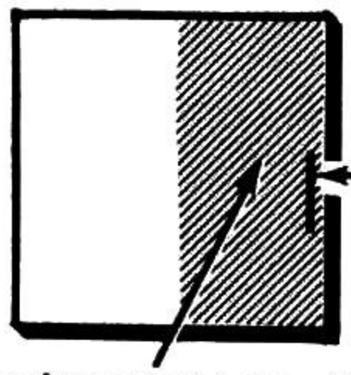


PARTS FROM PACK #4

( )	1	Main circuit board	85-1671-2
( )	1	8-wire flat cable	347-55
( )	12"	Black sleeving	346-4

NOTE: The prices shown on the separate "Heath Parts Price List" apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Add 10% (minimum 25 cents) to the price when ordering (Michigan residents add 4% sales tax) to cover insurance, postage, and handling. Outside the U.S.A., parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties, and rates of exchange.

IDENTIFICATION DRAWING



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

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

START

Position the main circuit board as shown. Then perform each step in the order listed.

( ) R248: 1000 Ω (brown-black-red).

( ) R234: 270 kΩ (red-violet-yellow).

( ) R233: 1 MΩ (brown-black-green).

( ) R251: 270 Ω (red-violet-brown).

( ) R229: 270 kΩ (red-violet-yellow).

( ) R228: 1 MΩ (brown-black-green).

( ) R225: 270 kΩ (red-violet-yellow)

( ) R249: 56 kΩ (green-blue-orange).

( ) R224: 1 MΩ (brown-black-green).

( ) R237: 18 kΩ (brown-gray-orange).

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

( ) R221: 270 kΩ (red-violet-yellow).

( ) R219: 1 MΩ (brown-black-green).

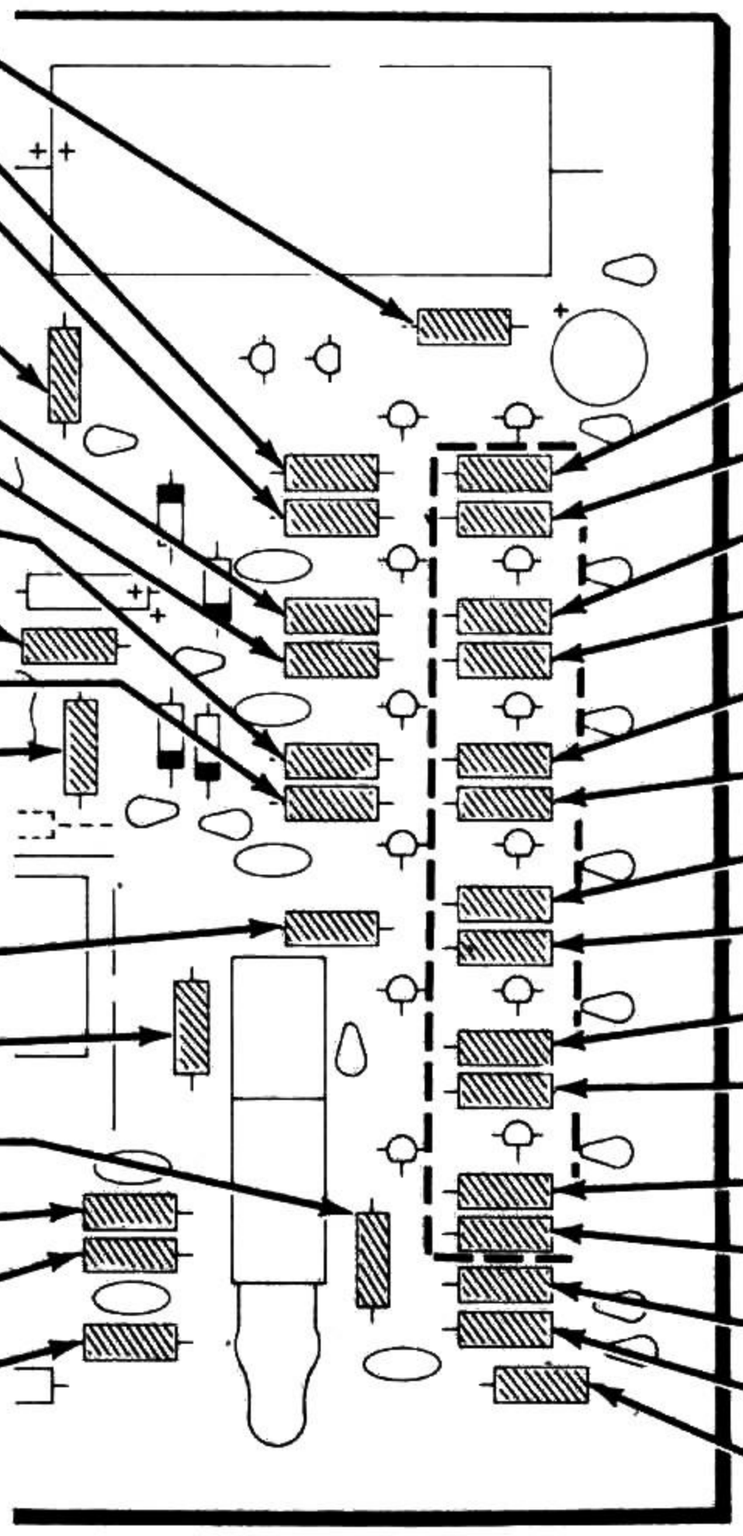
( ) R211: 1 MΩ (brown-black-green).

( ) R216: 270 kΩ (red-violet-yellow).

( ) R215: 1 MΩ (brown-black-green).

( ) R212: 270 kΩ (red-violet-yellow).

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



CONTINUE

Install twelve 120 kΩ (brown-red-yellow) resistors at:

( ) R235.

( ) R236.

( ) R232.

( ) R231.

( ) R227.

( ) R226.

( ) R223.

( ) R222.

( ) R217.

( ) R218.

( ) R213.

( ) R214.

( ) R207: 6800 Ω (blue-gray-red).

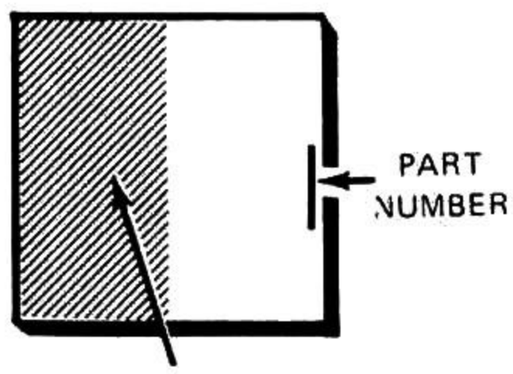
( ) R208: 22 kΩ (red-red-orange).

( ) R209: 56 kΩ (green-blue-orange).

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

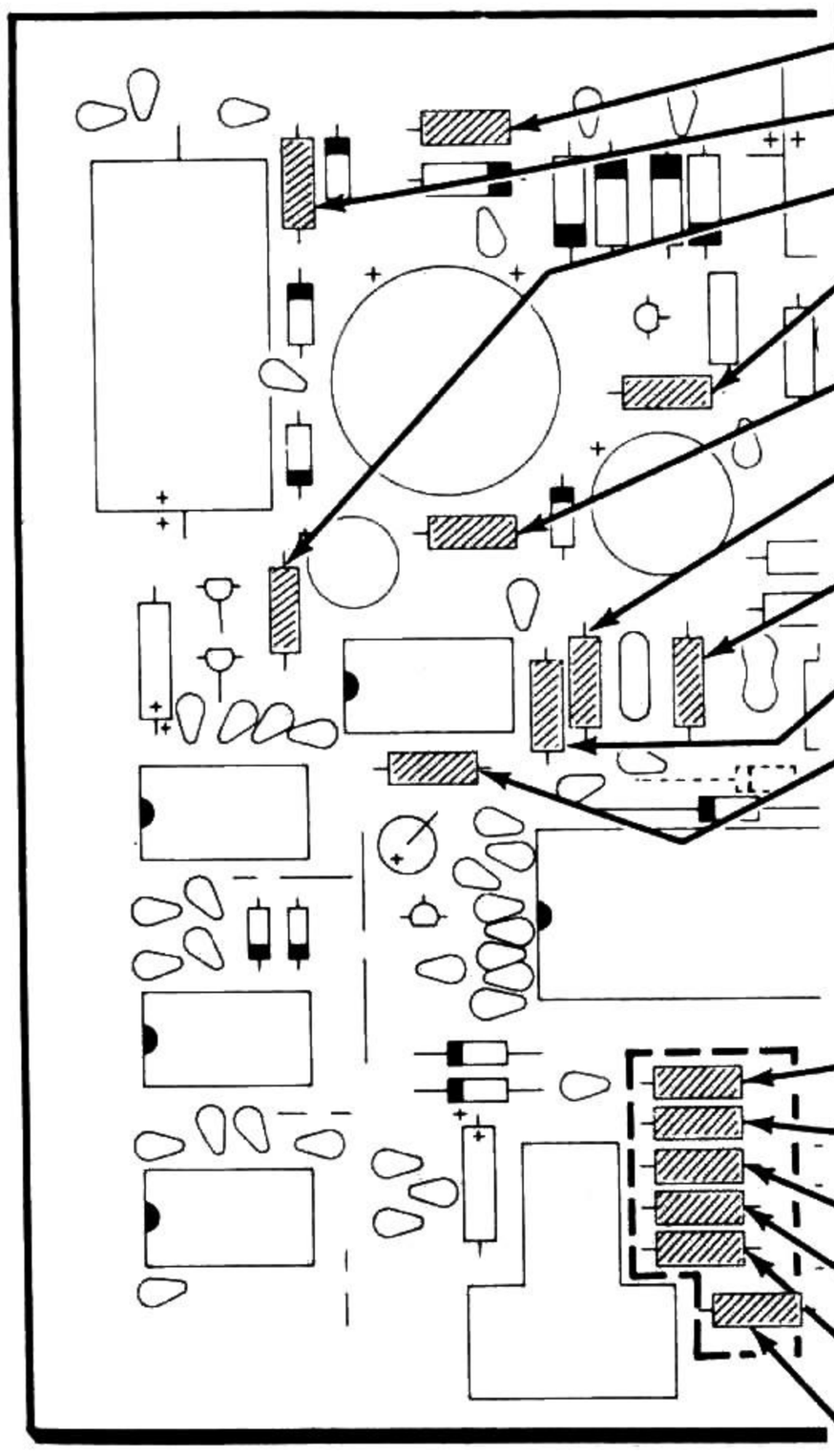
PICTORIAL 2-1

IDENTIFICATION DRAWING



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

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



START

( ) R242: 2700 Ω (red-violet-red).

( ) R241: 220 Ω (red-red-brown).

( ) R244: 1000 Ω (brown-black-red).

( ) R243: 680 Ω (blue-gray-brown).

( ) R245: 3300 Ω, 5% (orange-orange-red).

( ) R238: 8200 Ω, 5% (gray-red-red).

( ) R239: 12 kΩ, 5% (brown-red-orange).

( ) R247: 270 Ω (red-violet-brown).

( ) R246: 100 Ω (brown-black-brown).

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

Install six 27 kΩ (red-violet-orange) resistors at:

( ) R201.

( ) R202.

( ) R203.

( ) R204.

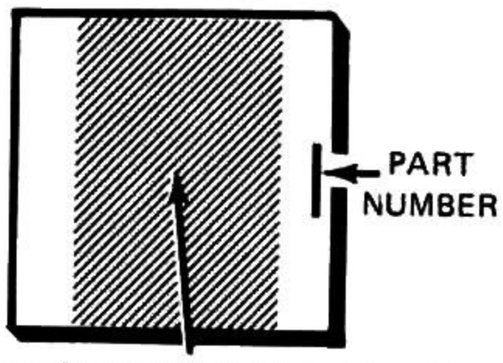
( ) R205.

( ) R206.

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

PICTORIAL 2-2

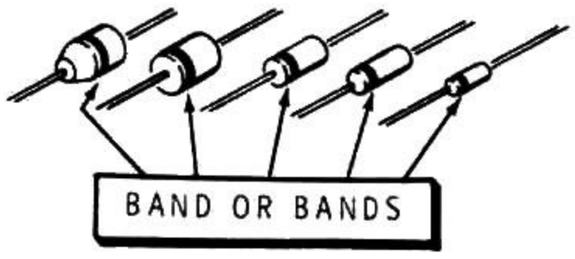
IDENTIFICATION DRAWING



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

START

NOTE: DIODES MAY BE SUPPLIED IN ANY OF THE FOLLOWING SHAPES. ALWAYS POSITION THE BANDED END AS SHOWN ON THE CIRCUIT BOARD.



( ) D208: 1N2071 diode (#57-27).

( ) ZD201: 1N4166A zener diode (#56-25).

( ) D206: 1N4002 diode (#57-65).

( ) D207: 1N4002 diode (#57-65).

( ) ZD202: 1N709A zener diode (#56-58).

( ) D205: 1N4149 diode (#56-56).

Install four 1N4149 diodes (#56-56) at:

( ) D215. . . . . .

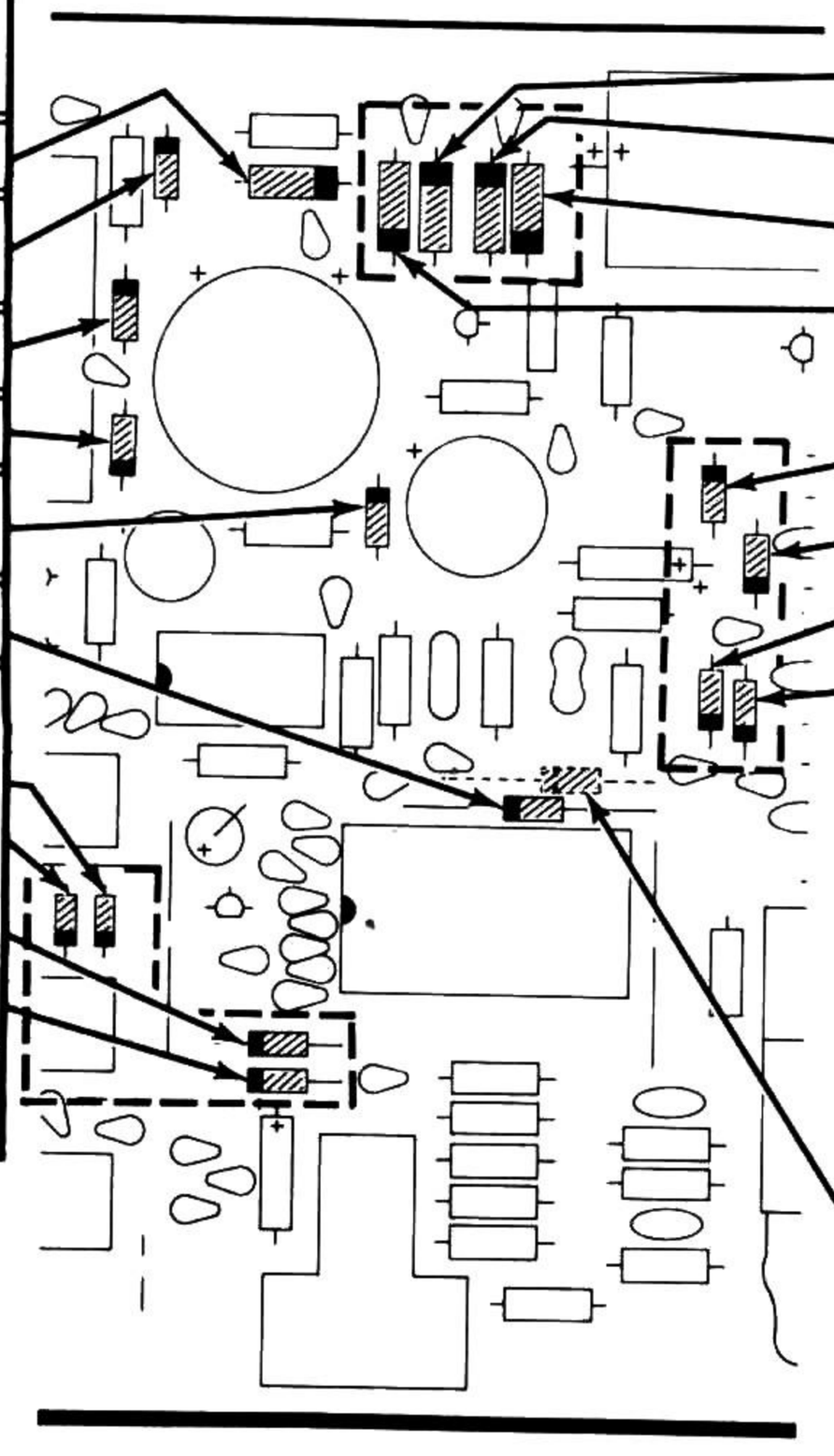
( ) D214. . . . . .

( ) D216. . . . . .

( ) D217. . . . . .

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

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



CONTINUE

Install four 1N4002 diodes (#57-65) at:

( ) D209.

( ) D211.

( ) D213.

( ) D212.

Install four 1N4149 diodes (#56-56) at:

( ) D218.

( ) D201.

( ) D202.

( ) D203.

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

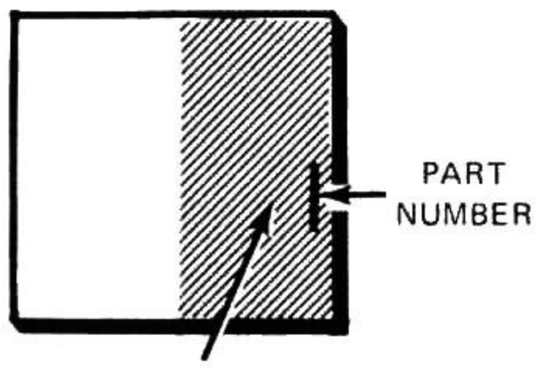
NOTE: Perform the next step ONLY IF YOUR SB-634 STATION CONSOLE WILL BE OPERATED FROM A 50 Hz POWER SOURCE. If it will be operated from a 60 Hz power source disregard the next step. This diode is not supplied with your kit; if necessary, you will have to purchase an extra diode, 1N4149 or its equivalent.

( ) D204: 1N4149 diode (#56-56).

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

PICTORIAL 2-3

IDENTIFICATION DRAWING

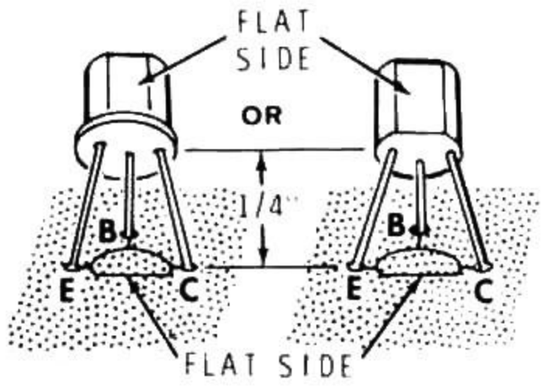


The steps performed in this Pictorial are in this area of the circuit board.

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

START

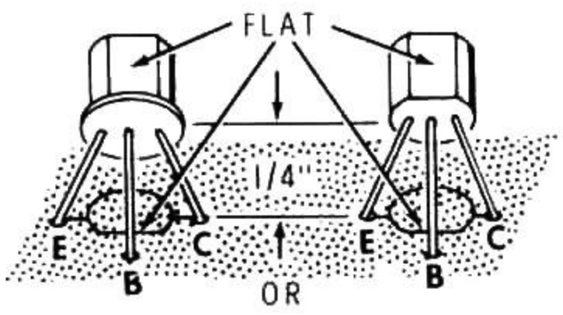
NOTE: When you install the following transistors, line up the flat on the transistor with the outline of the flat on the circuit board. Then insert the E, B, and C leads of the transistor into the corresponding E, B, and C holes in the circuit board. Position the transistor 1/4" above the circuit board. Solder the leads to the foil and cut off the excess lead lengths.



( ) Q221: MPS-A20 transistor (#417-801).

( ) Q219: MPS-A20 transistor (#417-801).

Install six MPS-A20 transistors (#417-801) at:



( ) Q213. . . . . .

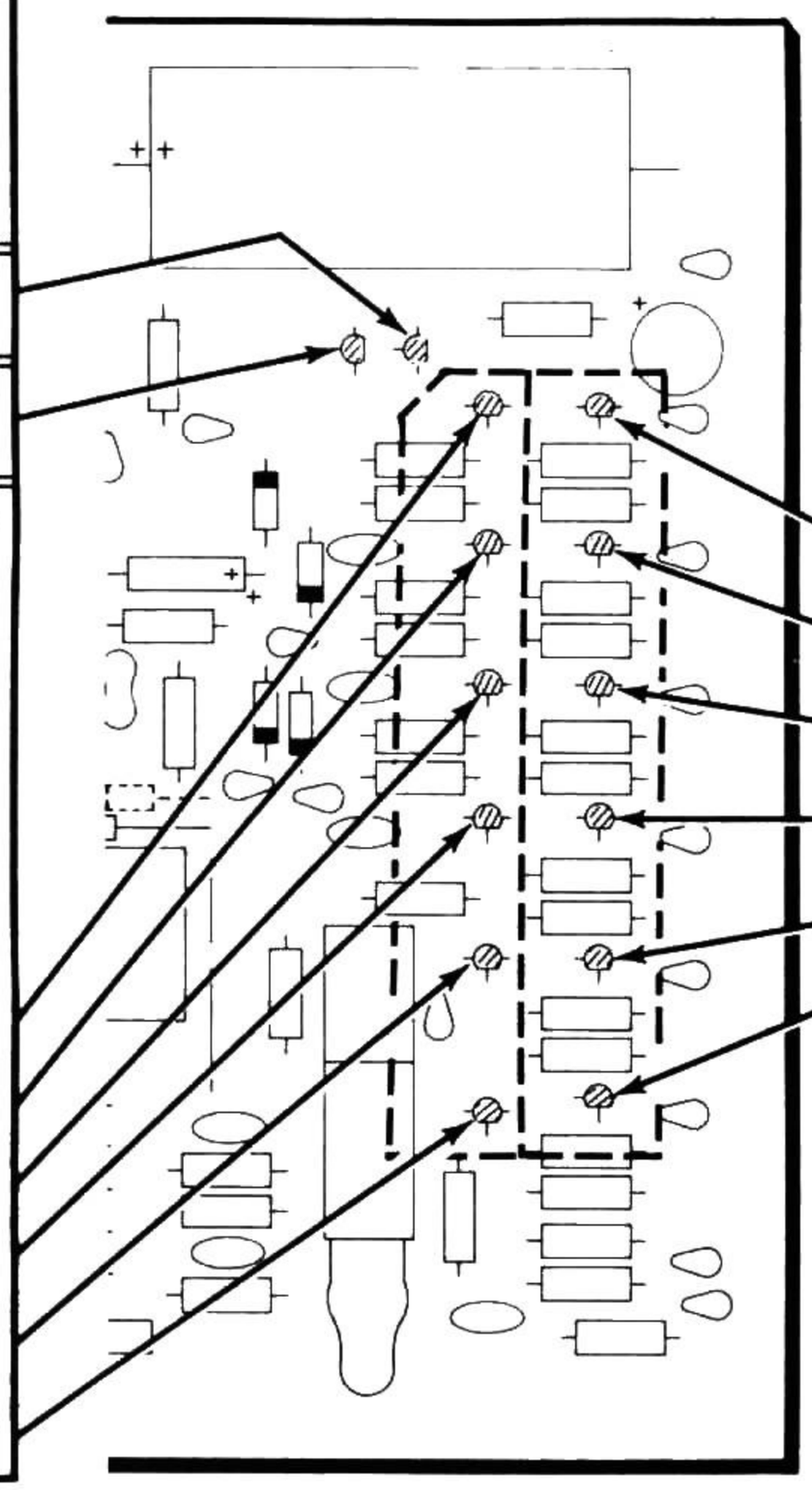
( ) Q211. . . . . .

( ) Q208. . . . . .

( ) Q206. . . . . .

( ) Q204. . . . . .

( ) Q202. . . . . .



CONTINUE

Install six MPS-L51 transistors (#417-295) at:

( ) Q212.

( ) Q209.

( ) Q207.

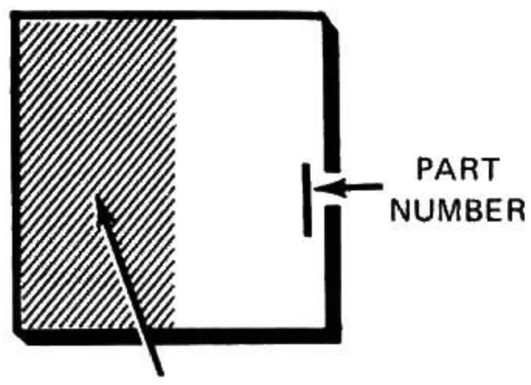
( ) Q205.

( ) Q203.

( ) Q201.

PICTORIAL 2-4

IDENTIFICATION DRAWING



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

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

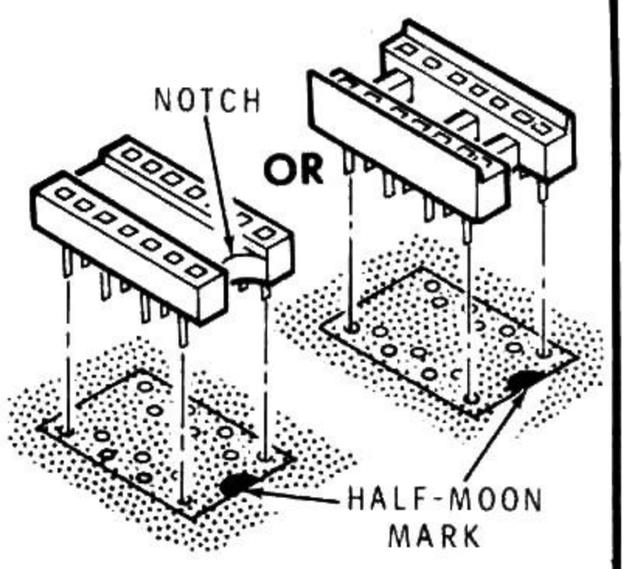
START

( ) Q215: MPS-A20 transistor (#417-801).

( ) Q217: MPS-A20 transistor (#417-801).

( ) Q216: MPS-A20 transistor (#417-801).

NOTE: You will install four 14-pin IC sockets in the following steps. To mount each socket, insert the socket pins into the holes. The half-moon mark on the circuit board should still be visible after it is installed. Solder the pins to the foil.



Install four 14-pin IC sockets at:

( ) IC202. . . . . .

( ) IC205. . . . . .

( ) IC203. . . . . .

( ) IC204. . . . . .

CONTINUE

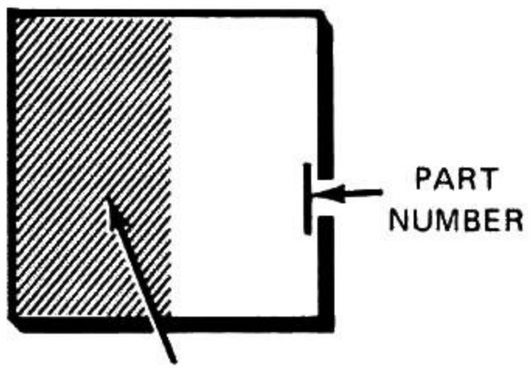
( ) Q18: MPS-L51 transistor (#417-295).

NOTE: In the following step, mount the 24-pin IC socket so the indexed end is at the half-dot end of the socket outline on the circuit board.

( ) IC201: Install a 24-pin IC socket. Then solder the pins to the foil.

PICTORIAL 2-5

IDENTIFICATION DRAWING



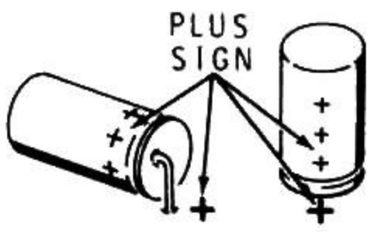
The steps performed in this Pictorial are in this area of the circuit board.

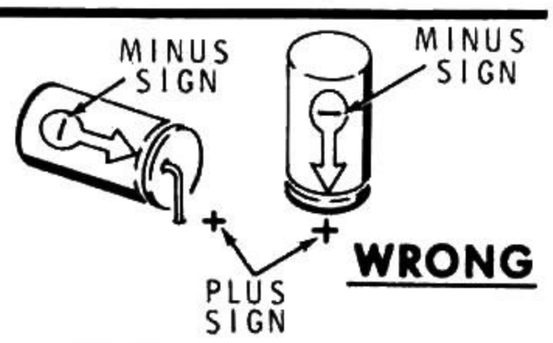
FOR GOOD SOLDER CONNECTIONS, YOU MUST **KEEP THE SOLDERING IRON TIP CLEAN.** WIPE IT OFTEN WITH A DAMP SPONGE OR CLOTH.

START

NOTE: When you install an electrolytic capacitor, always connect the lead at the positive (+) end of the capacitor to the positive (+) marked point on the circuit board.

RIGHT





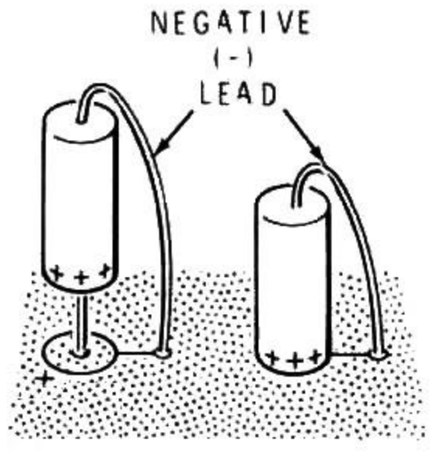
( ) C209: 1200 μF electrolytic.

( ) C211: 20/20 μF vertical mount electrolytic.

( ) C214: 100 μF vertical mount electrolytic.

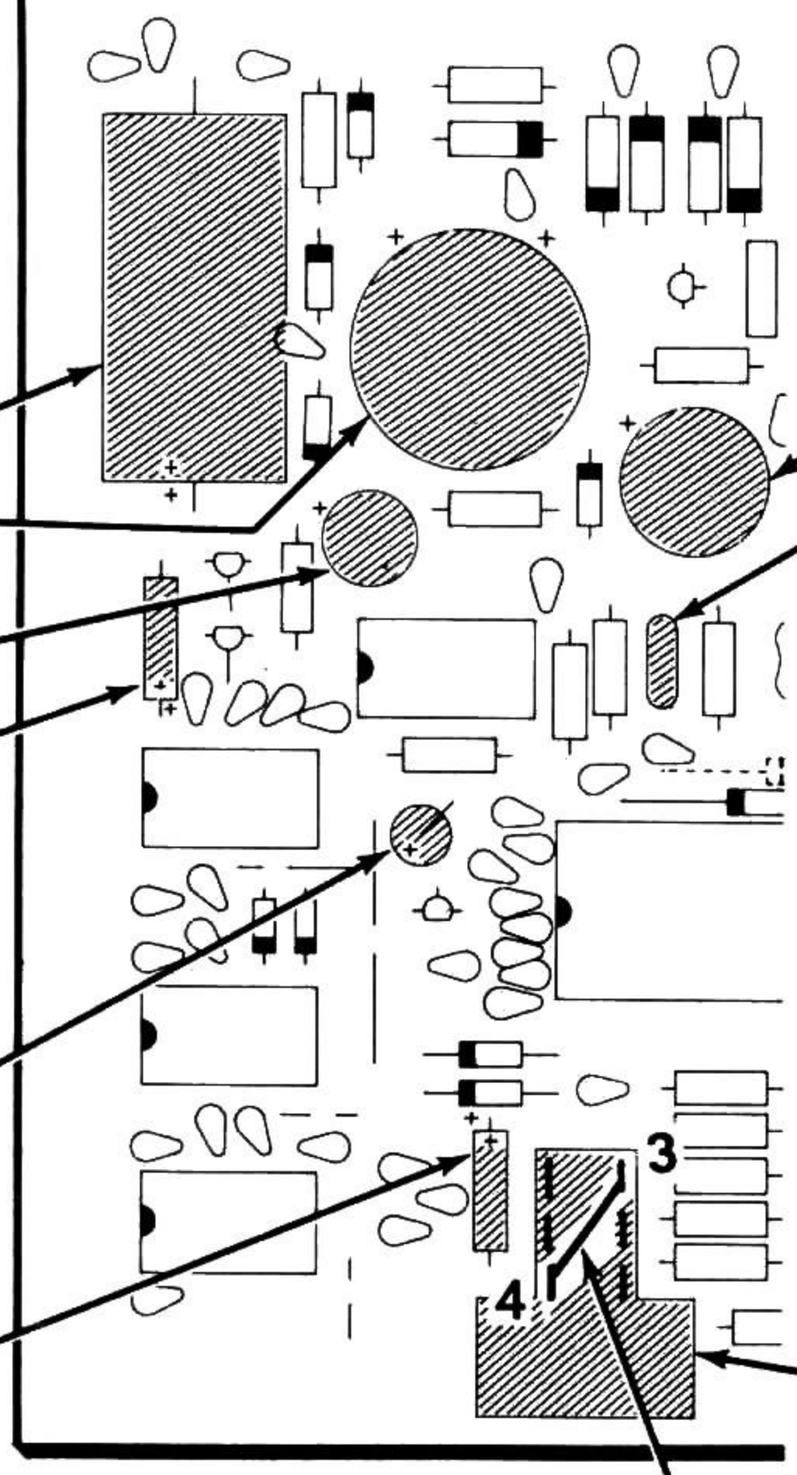
( ) C215: 2 μF electrolytic.

( ) C216: 10 μF electrolytic.



( ) C217: 10 μF electrolytic.

( ) Solder the leads to the foil and cut off the excess lead lengths. NOTE: Save several of the cut off leads.



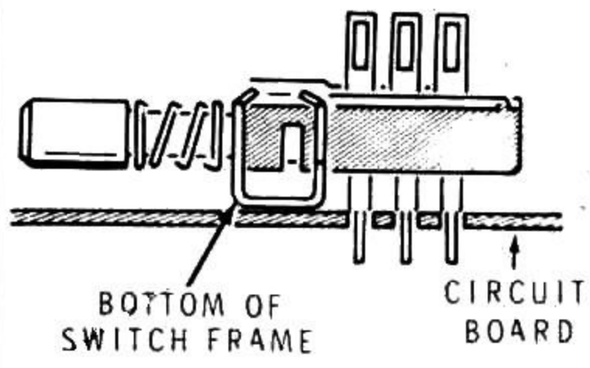
CONTINUE

( ) C213: 1000 μF vertical mount electrolytic.

( ) C208: .022 μF (.022 k) Mylar.

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

NOTE: In the following step, you will be instructed to mount the pushbutton switch assembly. Be sure to position the bottom of the switch frame against the circuit board as shown. Then solder the leads to the foil.

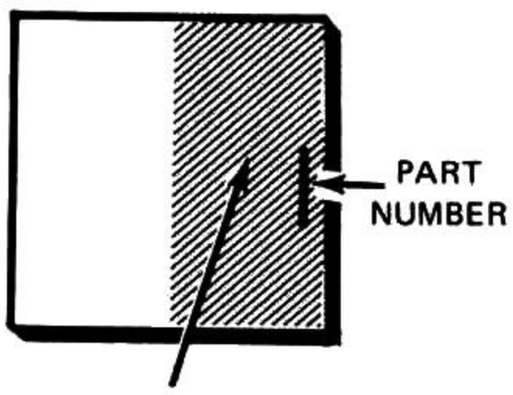


( ) SW201: Pushbutton switch assembly.

( ) Use a cutoff resistor lead and connect it between switch SW201 lugs 4 and 3. Solder the connections and cut off the excess lead lengths.

PICTORIAL 2-6

IDENTIFICATION DRAWING



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

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

START

( ) C218: 100 µF vertical mount electrolytic.

( ) C221: 2 µF electrolytic.

( ) C201: 51 pF mica.

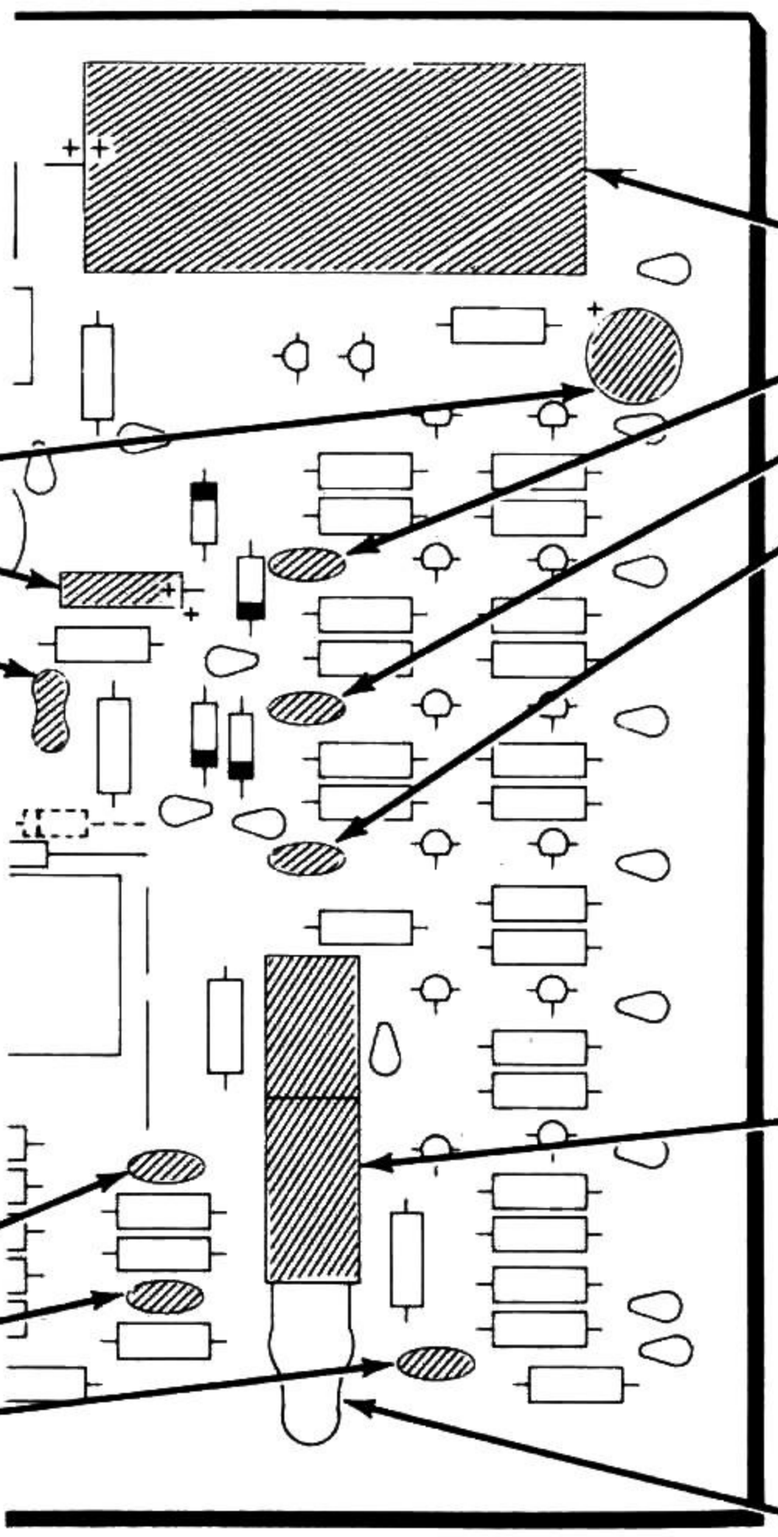
NOTE: When you install disc capacitors, do not push the insulated portion of the leads into the circuit board holes. This could make it difficult to solder the leads to the foil.

( ) C204: .001 µF disc.

( ) C203: .001 µF disc.

( ) C202: .001 µF disc.

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



CONTINUE

( ) C212: 6000 µF electrolytic.

( ) C207: .001 µF disc.

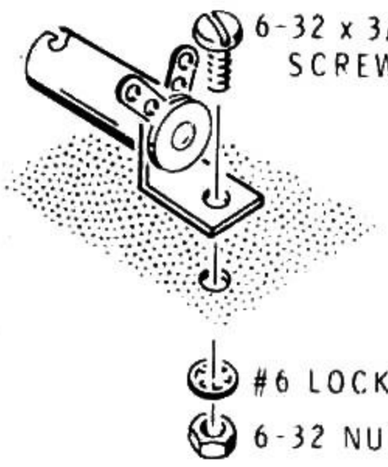
( ) C206: .001 µF disc.

( ) C205: .001 µF disc.

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

NOTE: Use the plastic nut starter supplied with this kit to hold and start 6-32 and 4-40 nuts on screws.

( ) PL-201: Mount the panel lamp socket as shown. Position the socket on the outline in the circuit board.



( ) Install the lamp (#412-16) in the panel lamp socket.

PICTORIAL 2-7

START

NOTES:

1. To prepare a wire, cut it to the proper length and remove 1/4" of insulation from each end.
2. Solder each wire as it is installed. Then position the wire as shown on the Pictorial.
3. When a bare wire is called for, cut the proper length of yellow wire; then remove its insulation.

( ) 5" yellow wire between circuit board holes 27 and 26.

( ) 1-1/2" yellow wire.

( ) 1" small bare wire.

( ) 1-1/2" small bare wire.

( ) 1" small bare wire.

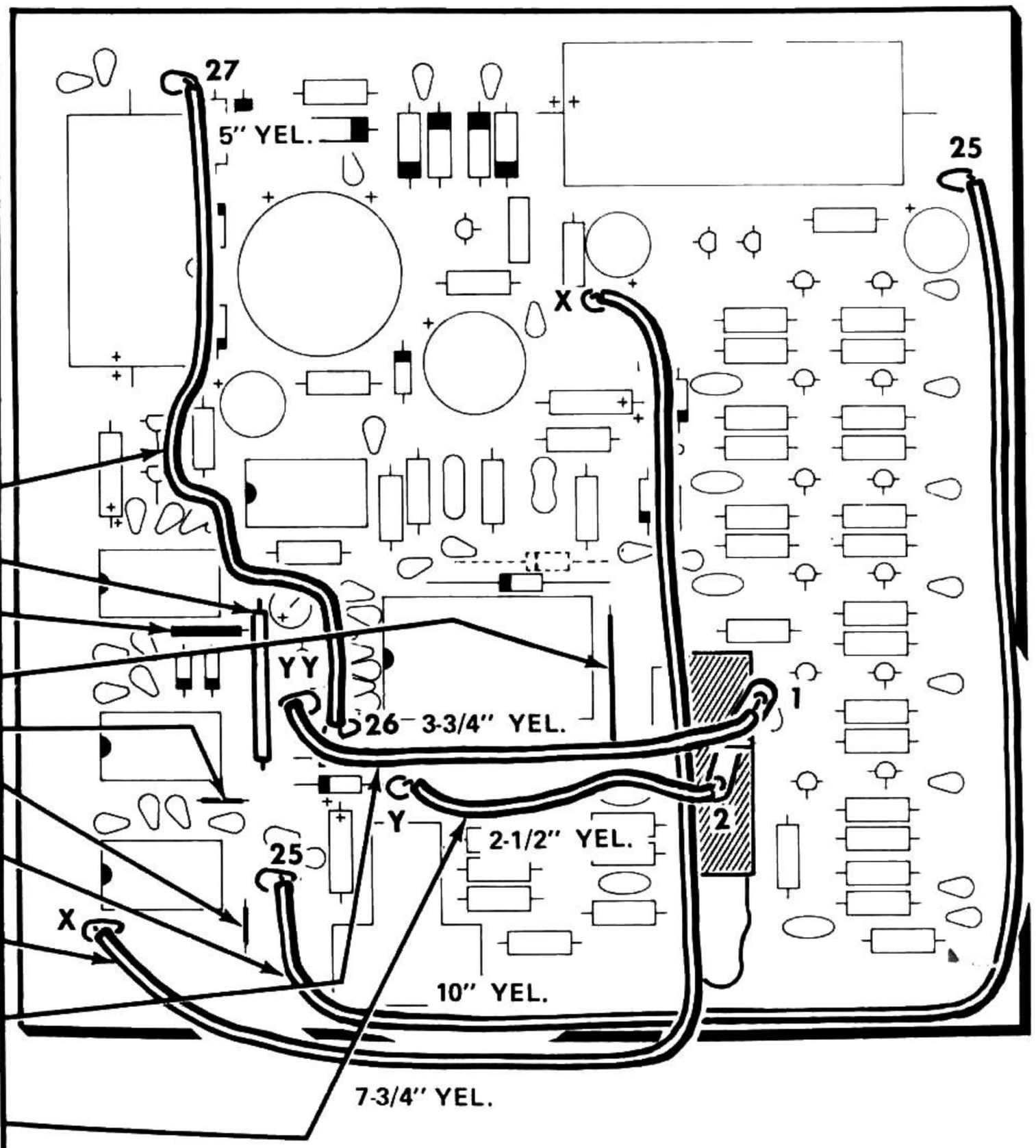
( ) 1" small bare wire.

( ) 10" yellow wire between circuit board holes 25 and 25.

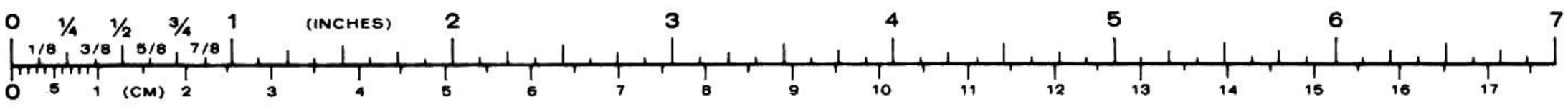
( ) 7-3/4" yellow wire between circuit board holes X and X.

( ) 3-3/4" yellow wire from circuit board hole YY to PL201, lug 1.

( ) 2-1/2" yellow wire from circuit board hole Y to PL201, lug 2. NOTE: DO NOT solder lug 2.



PICTORIAL 2-8



NOTES:

1. The following Cable Details are drawn full length only. Use them to cut each main circuit board cable to the proper length. Then from the component side, connect each cable to the main circuit board as it is prepared.

2. Mark across each cable with a pencil or felt pen to show you how far to separate each cable wire.

( ) Cut a 4-1/2" length of flat 8-wire cable. Then make it into two 4-wire cables by separating the cable between the green and the yellow wires.

( ) Refer to Detail 2-9A and prepare both 4-wire cables as shown.

Refer to Pictorial 2-9 (fold-out from Page 29) for the following steps.

Insert the free ends of the gray, violet, blue, and green 4-wire cable in the following circuit board holes. Solder the wires to the foil and cut off the excess wire lengths.

( ) Gray in hole 16.

( ) Violet in hole 17.

( ) Blue in hole 19.

( ) Green in hole 18.

Connect the free ends of the yellow, orange, red, and brown 4-wire cable in the following main circuit board holes.

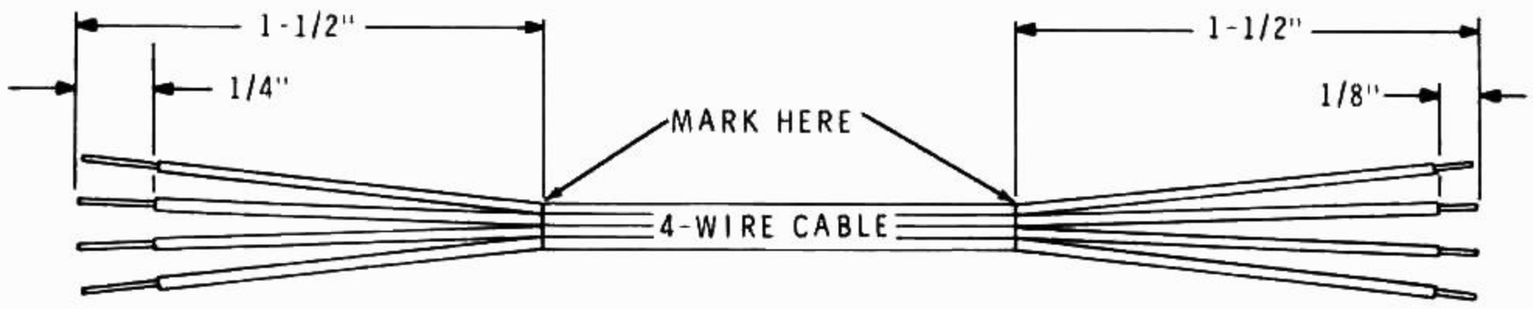
( ) Yellow in hole 12.

( ) Orange in hole 14.

( ) Red in hole 15.

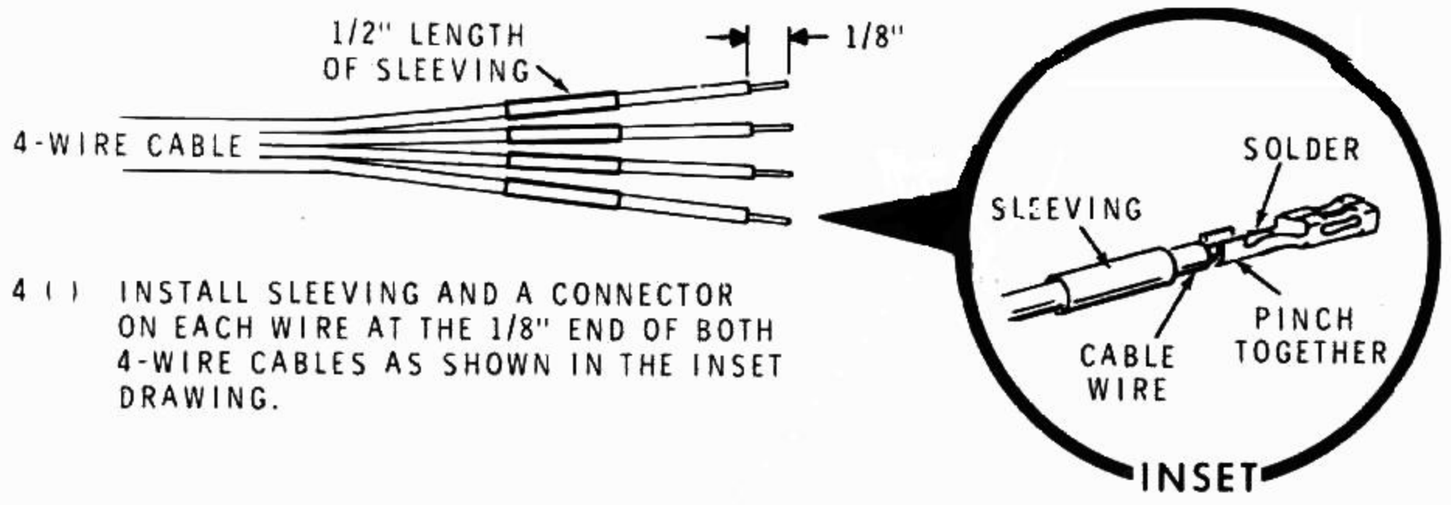
( ) Brown in hole 13.

1 ( ) SEPARATE THE WIRES AT THE ENDS OF BOTH 4-WIRE CABLES AS SHOWN.



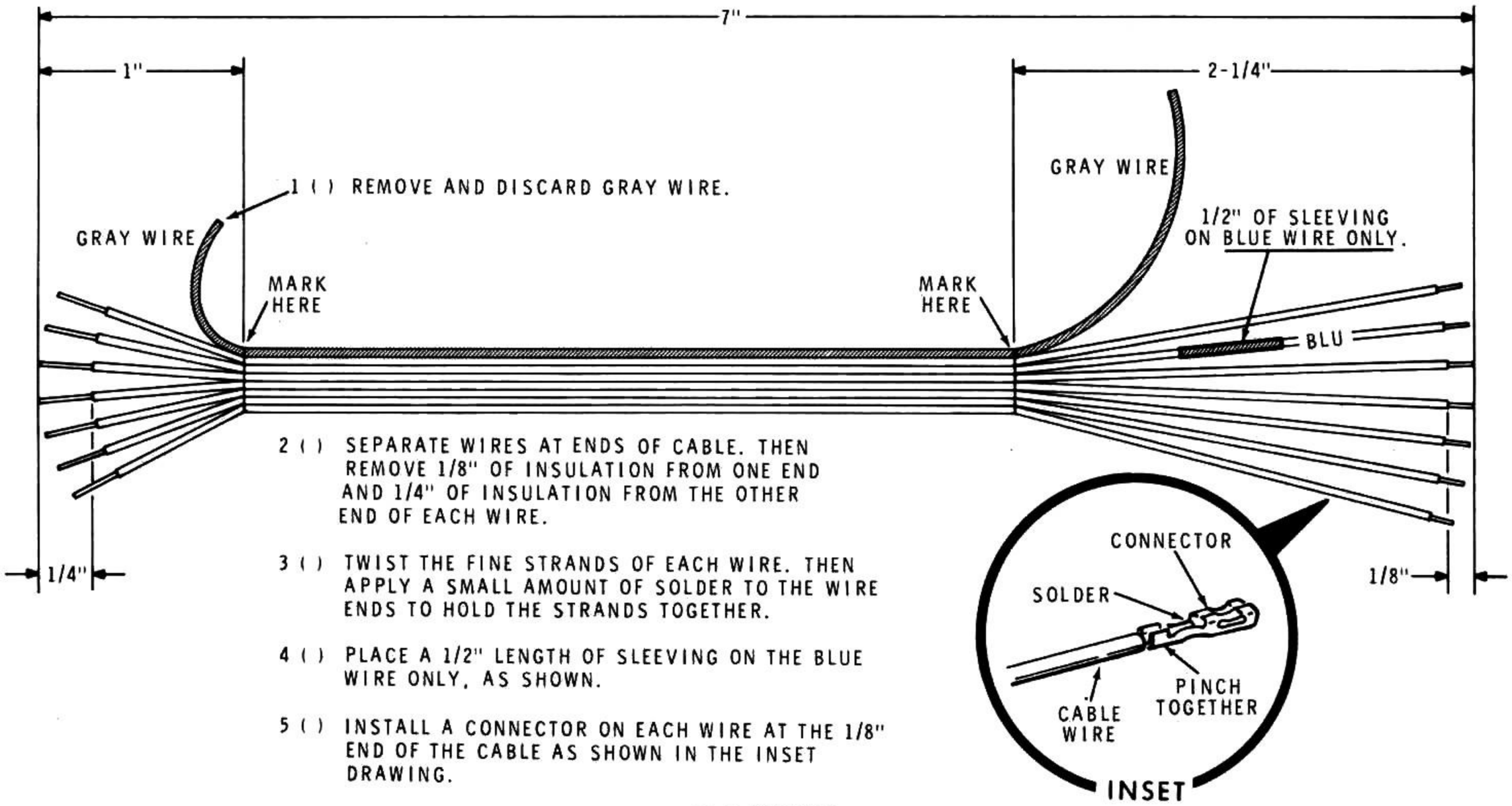
2 ( ) REMOVE 1/4" OF INSULATION FROM THE WIRES AT ONE END AND 1/8" OF INSULATION FROM THE WIRES AT THE OTHER END OF BOTH 4-WIRE CABLES.

3 ( ) AT BOTH ENDS OF THE CABLES, TWIST TOGETHER THE FINE STRANDS OF EACH WIRE. THEN APPLY A SMALL AMOUNT OF SOLDER TO HOLD THE STRANDS TOGETHER.



4 ( ) INSTALL SLEEVING AND A CONNECTOR ON EACH WIRE AT THE 1/8" END OF BOTH 4-WIRE CABLES AS SHOWN IN THE INSET DRAWING.

Detail 2-9A



Detail 2-9B

( ) Refer to Detail 2-9B and cut a 7" length of flat 8-wire cable. Remove and discard the gray wire; then prepare the 7-wire cable as shown in the Detail.

Insert the free ends of the 7-wire cable in the following circuit board holes. Solder the wires to the foil and cut off the excess wire lengths.

( ) Violet in hole A.

( ) Blue in hole B.

( ) Green in hole C.

( ) Yellow in hole D.

( ) Orange in hole E.

( ) Red in hole F.

( ) Brown in hole G.

( ) Refer to Detail 2-10A and cut a 6-3/4" length of flat 8-wire cable. Then prepare the cable as shown in the Detail.

Refer to Pictorial 2-10 (fold-out from Page 29) for the following steps.

Insert the free ends of the 8-wire cable in the following circuit board holes. Then solder the wires to the foil and cut off the excess wire lengths.

( ) Brown in hole R.

( ) Red in hole P.

( ) Orange in hole N.

( ) Yellow in hole M.

( ) Green in hole L.

( ) Blue in hole K.

( ) Violet in hole J.

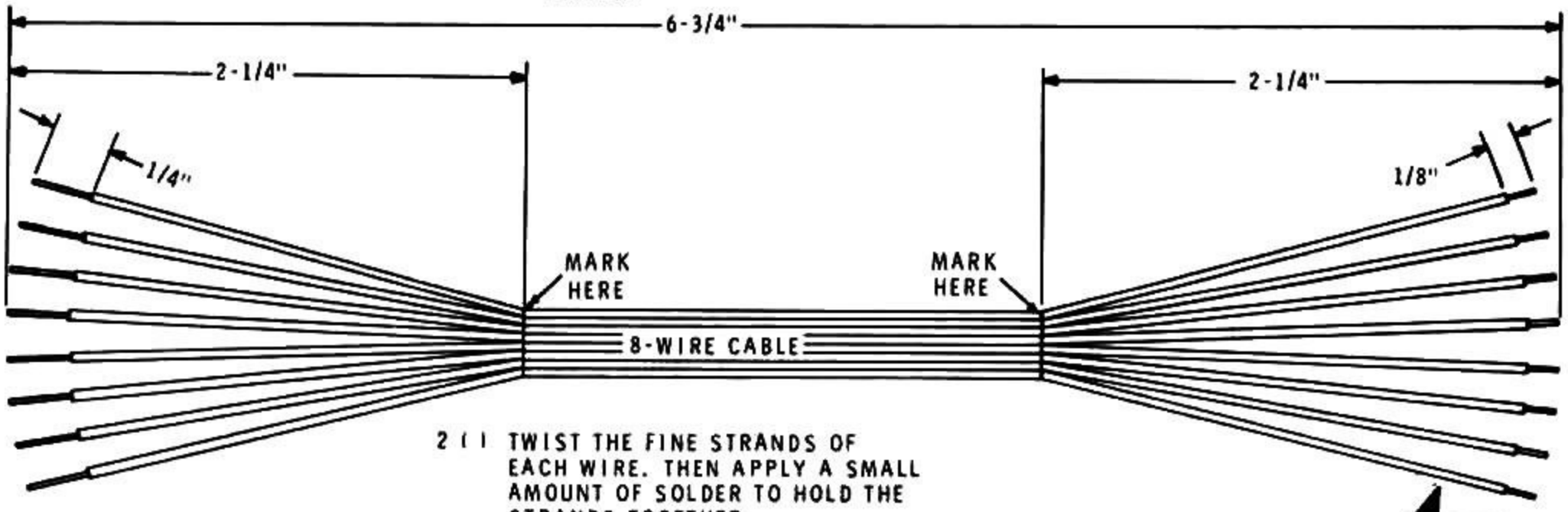
( ) Gray in hole H.

( ) Cut a 7" length of flat 8-wire cable. Then remove and discard the gray and the violet wires.

( ) Refer to Detail 2-10B and prepare the cable as shown.

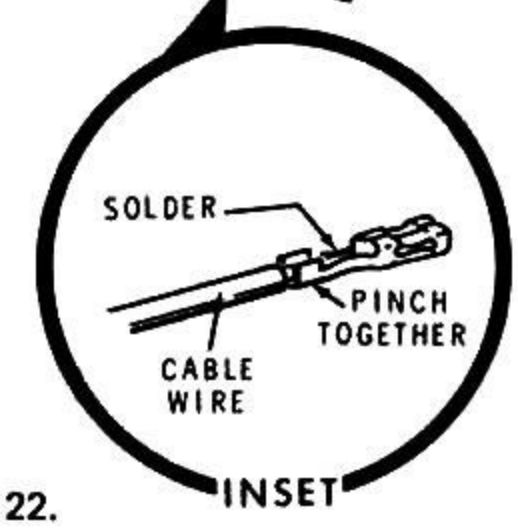
Insert the free ends of the orange, yellow, green, and blue wires of the 4-wire cable, and the free ends of the brown and

1 ( ) SEPARATE WIRES AT ENDS OF CABLE AS SHOWN. THEN REMOVE 1/8" OF INSULATION FROM ONE END AND 1/4" OF INSULATION FROM THE OTHER END OF EACH WIRE AS SHOWN.



2 ( ) TWIST THE FINE STRANDS OF EACH WIRE. THEN APPLY A SMALL AMOUNT OF SOLDER TO HOLD THE STRANDS TOGETHER.

3 ( ) INSTALL A CONNECTOR ON EACH WIRE AT THE 1/8" END OF THE CABLE AS SHOWN IN THE INSET DRAWING.



Detail 2-10A

red wires you previously removed from the cable, in the following circuit board holes. Then solder the wires to the foil and cut off the excess wire lengths.

( ) Blue in hole 7.

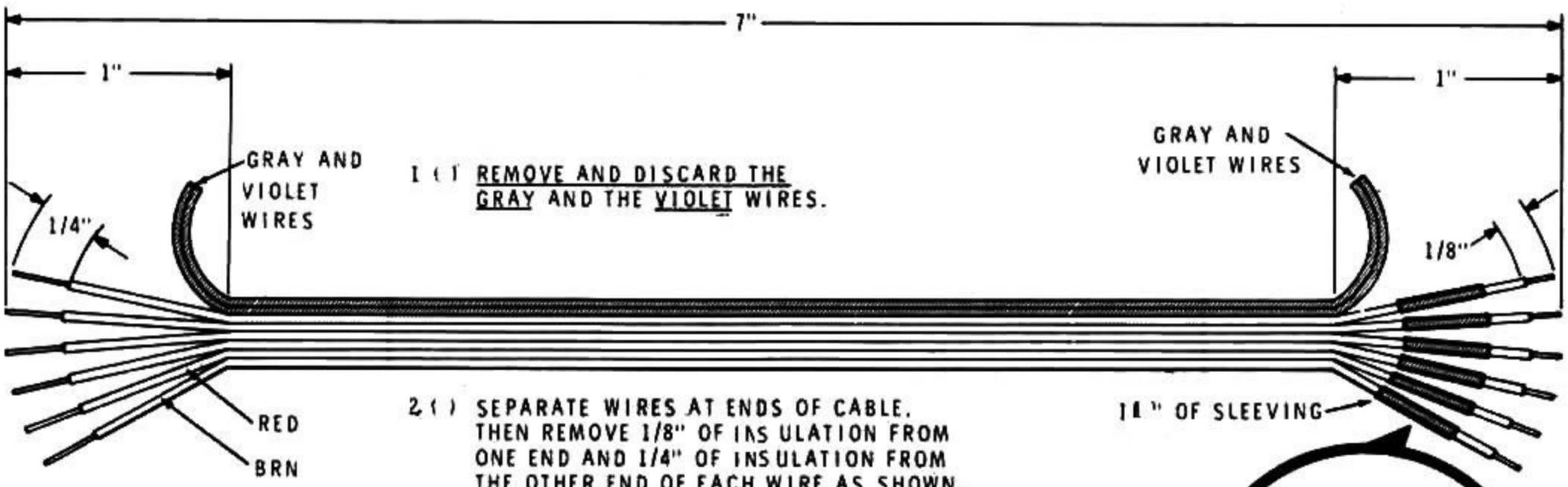
( ) Green in hole 8.

( ) Yellow in hole 10.

( ) Orange in hole 9.

( ) Separate brown wire in hole 22.

( ) Separate red wire in hole Z.



1 ( ) REMOVE AND DISCARD THE GRAY AND THE VIOLET WIRES.

2 ( ) SEPARATE WIRES AT ENDS OF CABLE. THEN REMOVE 1/8" OF INSULATION FROM ONE END AND 1/4" OF INSULATION FROM THE OTHER END OF EACH WIRE AS SHOWN.

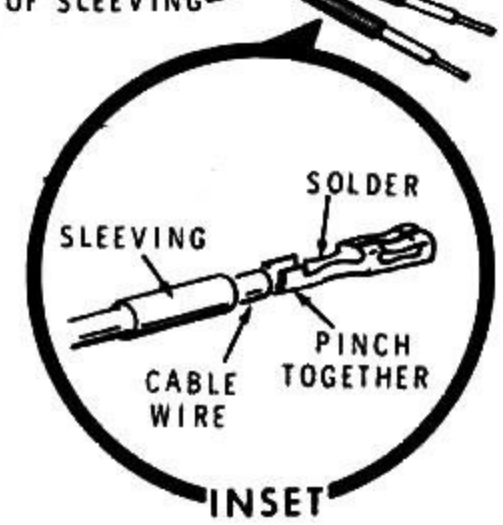
3 ( ) TWIST THE FINE STRANDS OF EACH WIRE. THEN APPLY A SMALL AMOUNT OF SOLDER TO HOLD THE STRANDS TOGETHER.

4 ( ) INSTALL SLEEVING AND A CONNECTON ON EACH WIRE AT THE END OF THE CABLE AS SHOWN IN THE INSET DRAWING.

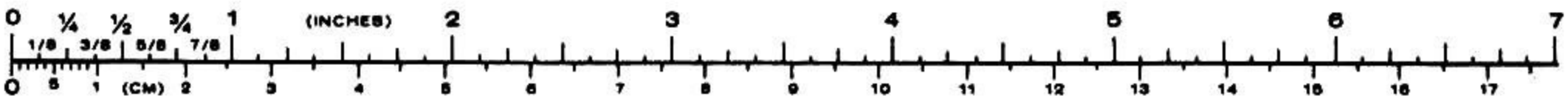
5 ( ) PUSH THE SLEEVING ONTO THE CONNECTOR.

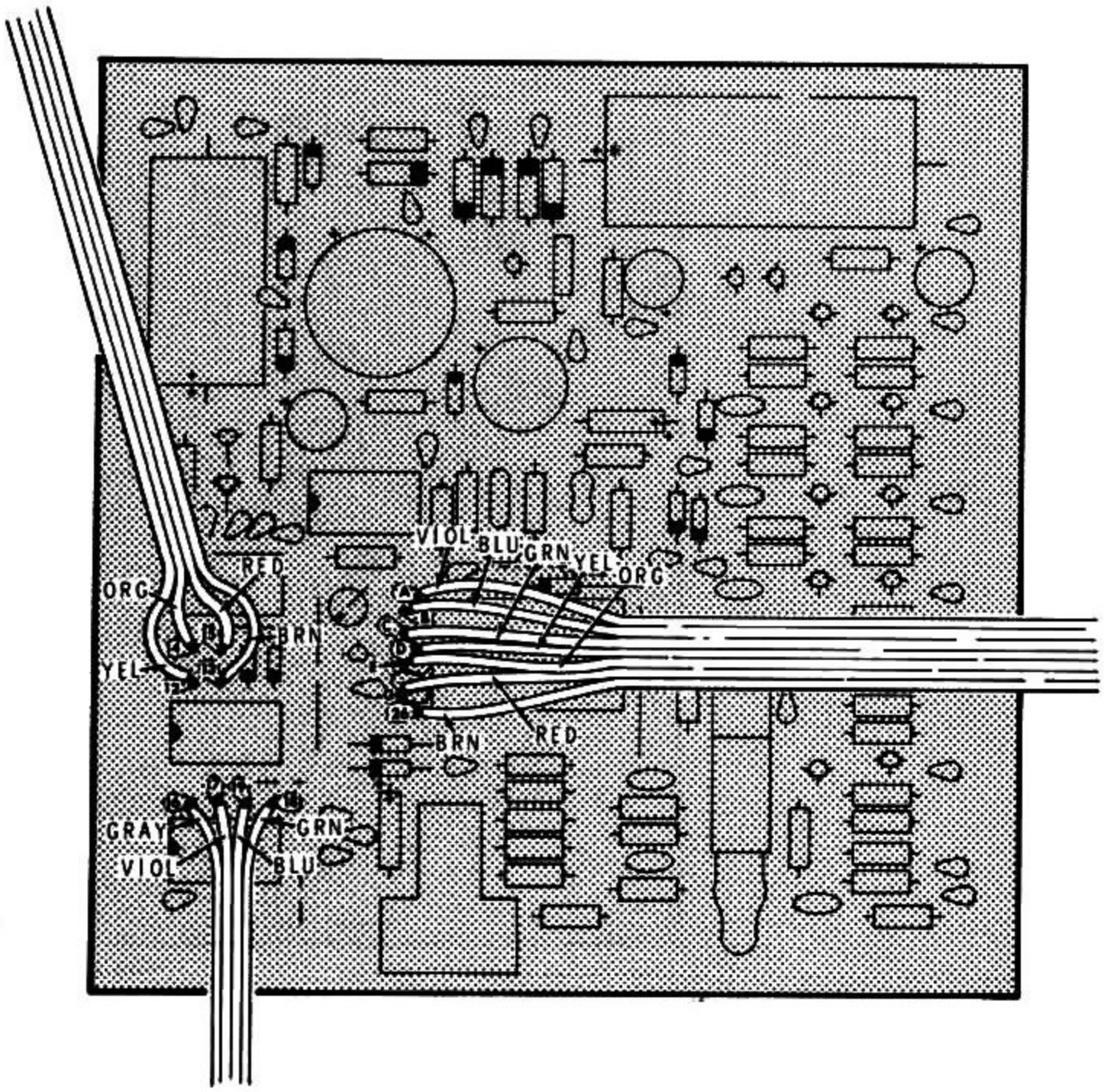
6 ( ) REMOVE AND SAVE THE BROWN WIRE.

7 ( ) THEN REMOVE AND SAVE THE RED WIRE.

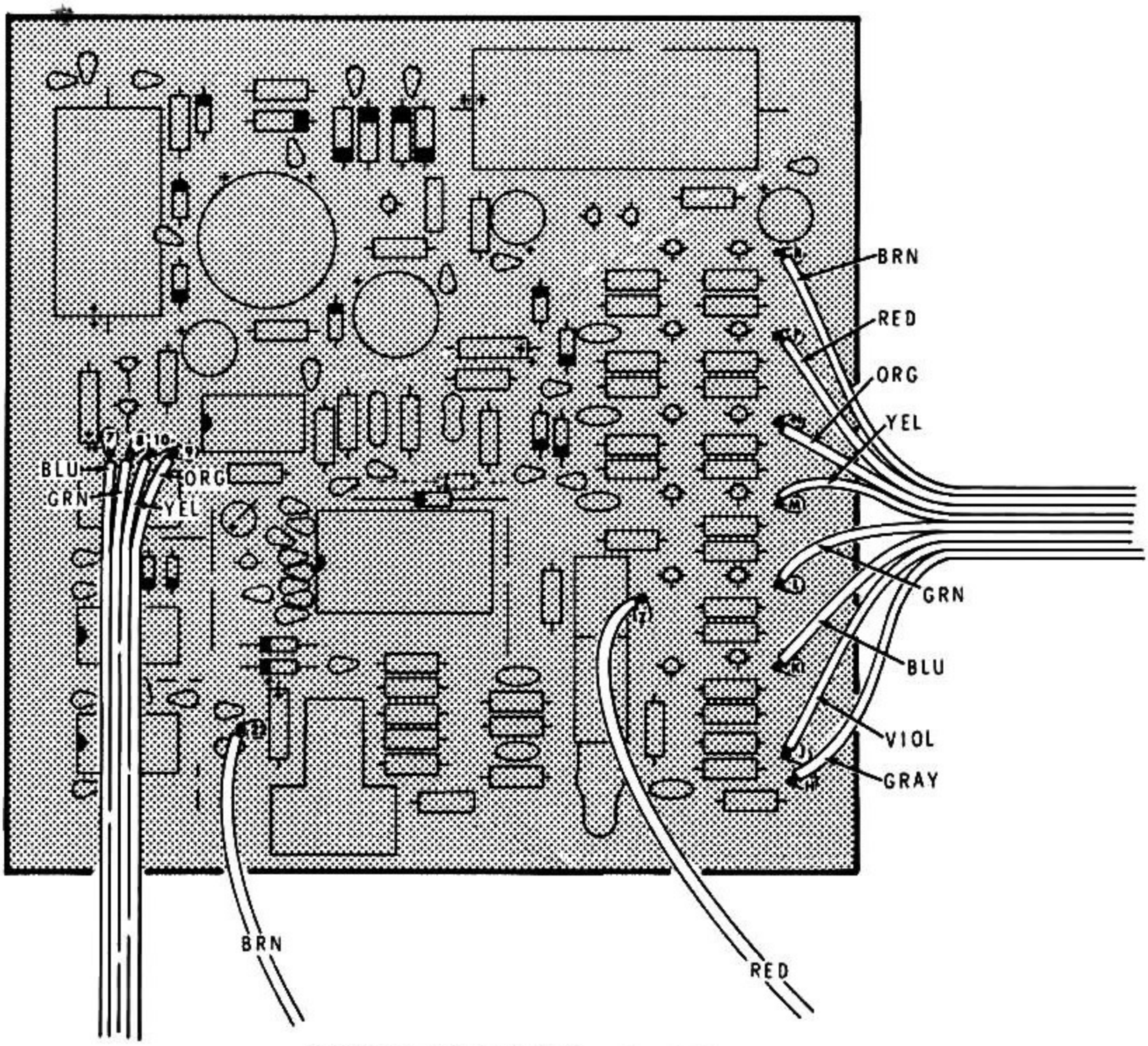


Detail 2-10B





PICTORIAL 2-9



PICTORIAL 2-10

Refer to Pictorial 2-11 for the following steps.

To prepare a wire, cut it to the proper length and remove 1/4" of insulation from each end.

NOTE: In the following four steps, you will connect only one end of four wires to the main circuit board. The other ends will be connected later.

( ) 4" yellow wire in hole 20.

( ) 5-3/4" yellow wire in hole 2.

( ) 2-1/2" yellow wire in hole 21.

( ) Cut a 17" length of 5-conductor cable. Then refer to Detail 2-11A and prepare the cable as shown.

At the longer prepared end of the 5-wire cable, insert the wire ends in the following circuit board holes. Then solder the wires to the foil and cut off the excess wire lengths.

( ) Black in hole V.

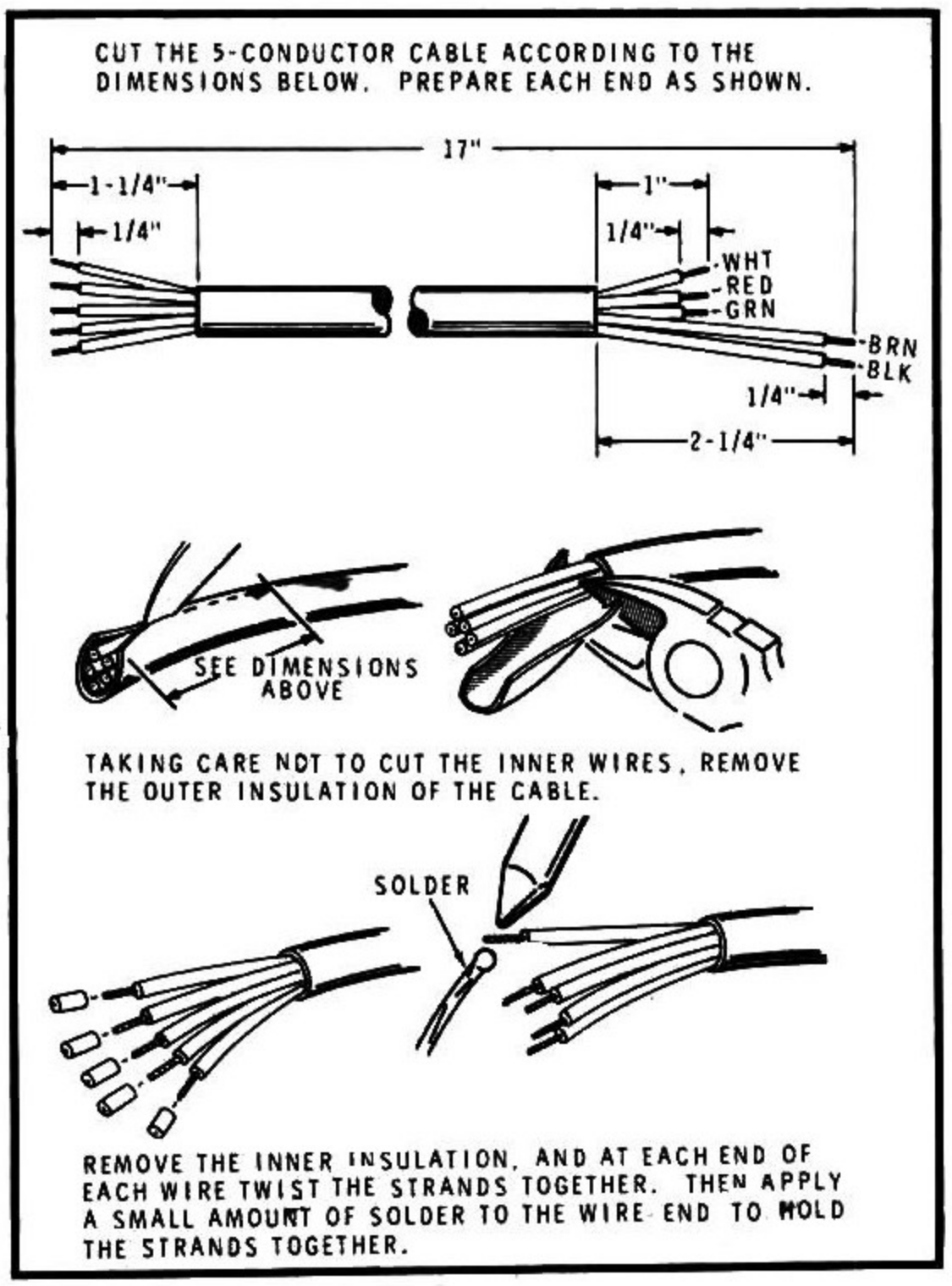
( ) Brown in hole W.

( ) Red in hole T.

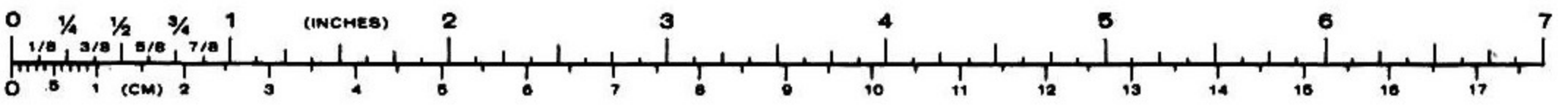
( ) Green in hole U.

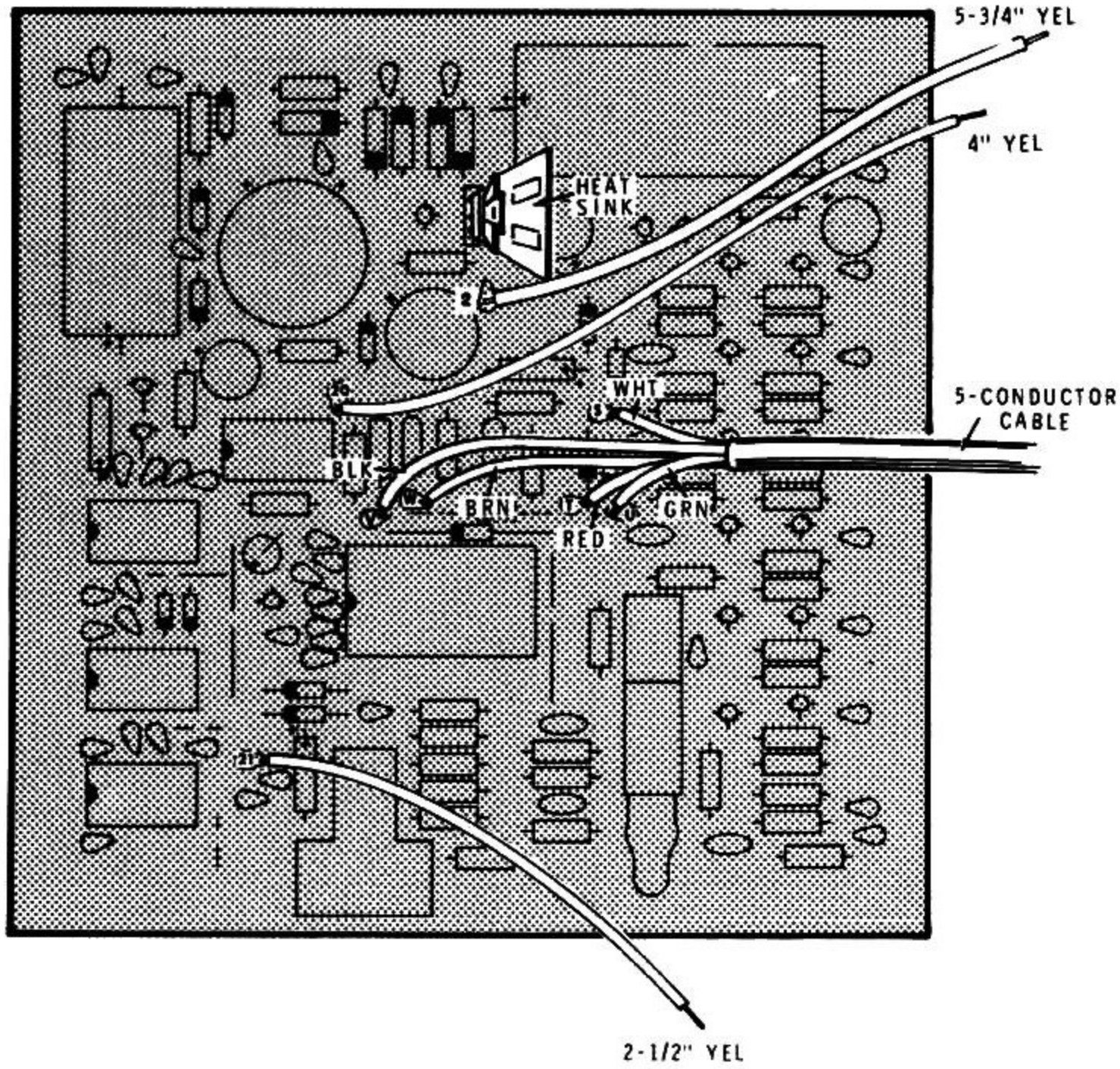
( ) White in hole S.

The free ends of all of the cables will be connected later.



Detail 2-11A

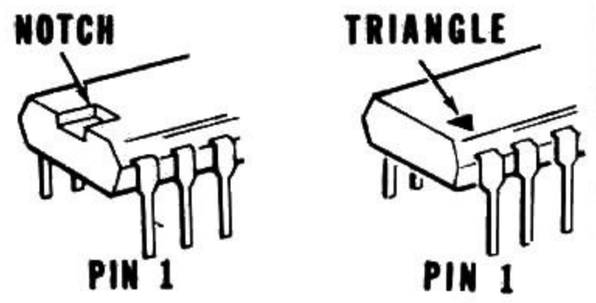




PICTORIAL 2-11

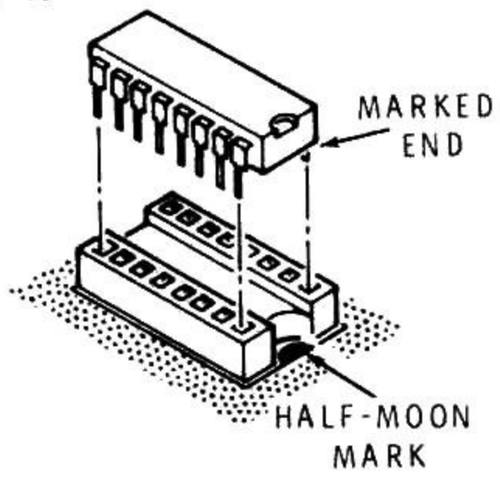
START

NOTE: The indexed (pin 1) end of inline integrated circuits may be marked in a number of ways such as a notch, triangle, dot, the numeral 1, etc.



Be sure you install each IC so its indexed end is toward the index mark at the end of its socket.

When you install each integrated circuit, position the pin 1 end toward the half-moon mark on the circuit board. Then carefully install the integrated circuit. Make sure all the pins are in their respective holes.



( ) IC205: SN7413N integrated circuit (#443-44).

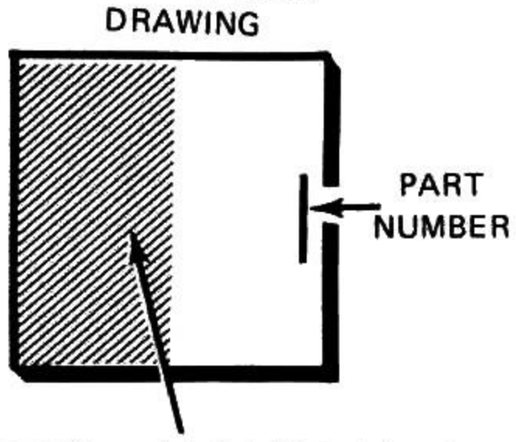
( ) IC202: SN7490A integrated circuit (#443-7).

( ) IC203: SN7490N integrated circuit (#443-7).

( ) IC204: SN7490N integrated circuit (#443-7).

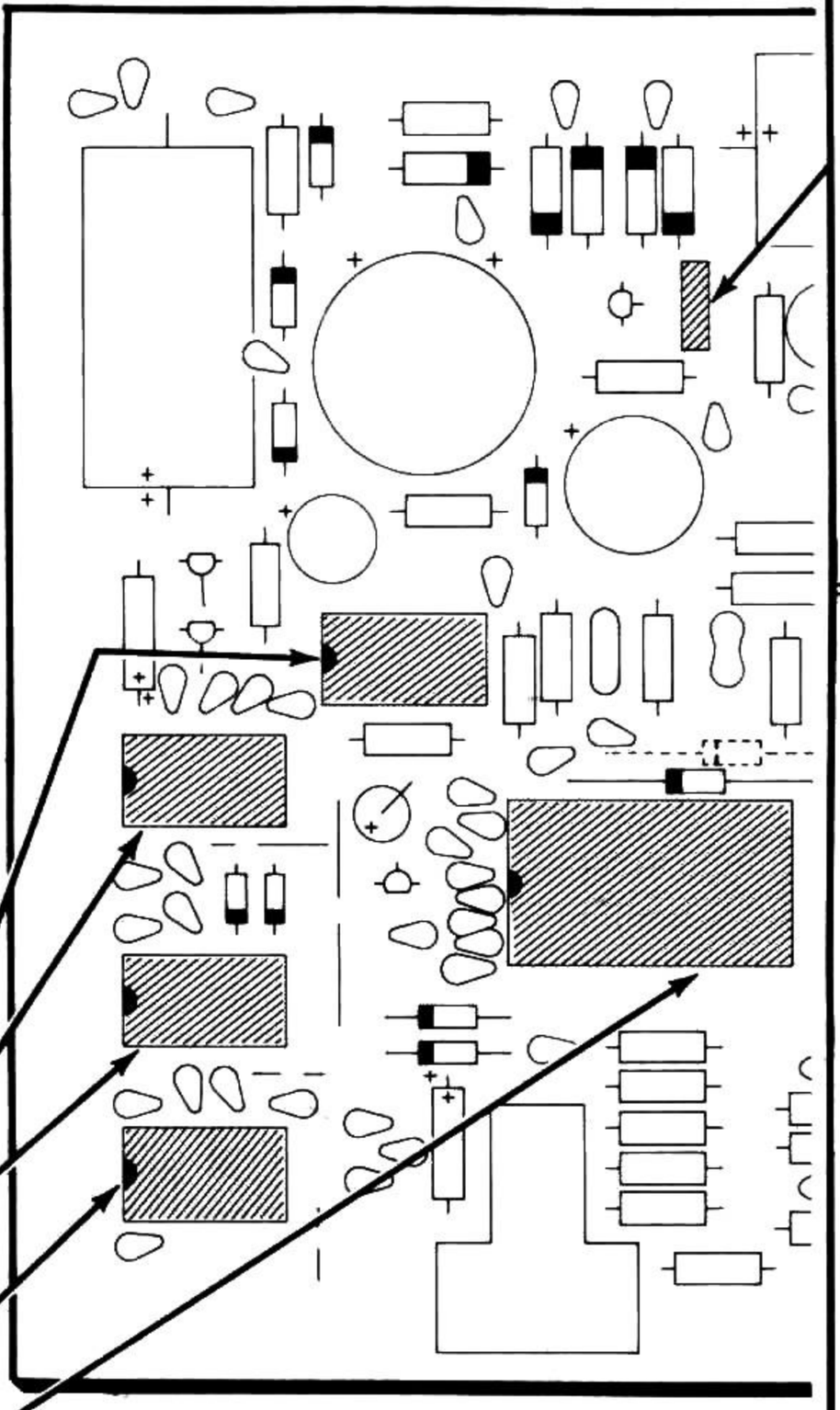
( ) IC201: 24-pin inline MK5017 AA integrated circuit (#443-687).

IDENTIFICATION DRAWING



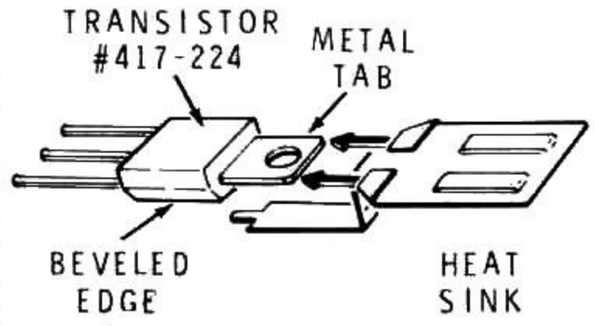
The steps performed in this Pictorial are in this area of the circuit board.

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

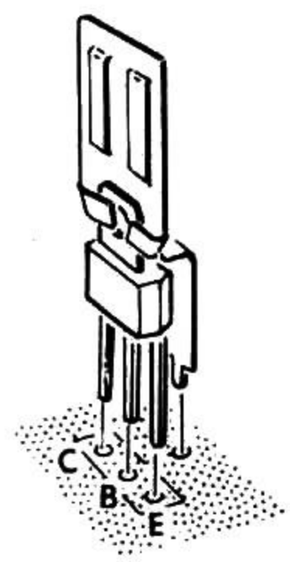


CONTINUE

( ) Place a heat sink (#215-86) on the metal tab on the top of MPS-U05 transistor (#417-224) as shown. Press the heat sink as far as it will go onto the transistor.



( ) Q214: Mount the transistor assembly on the circuit board at Q214. NOTE: Be sure all four pins are in their circuit board holes.



( ) Position the assembly straight up on the circuit board; then solder the pins to the foil.

CIRCUIT BOARD CHECKOUT

Carefully inspect the circuit board for the following conditions.

( ) Unsoldered connections.

( ) "Cold" solder connections.

( ) Solder bridges between foil patterns.

( ) Protruding leads which could touch together.

( ) Transistors for the proper type and installation.

( ) IC's for proper positioning and installation.

( ) Electrolytic capacitors for the correct position of the positive (+) end.

( ) Diodes for the correct position of the banded end.

This completes the assembly of the circuit board. Set it aside until it is called for in a step.

FINISH

PICTORIAL 2-12

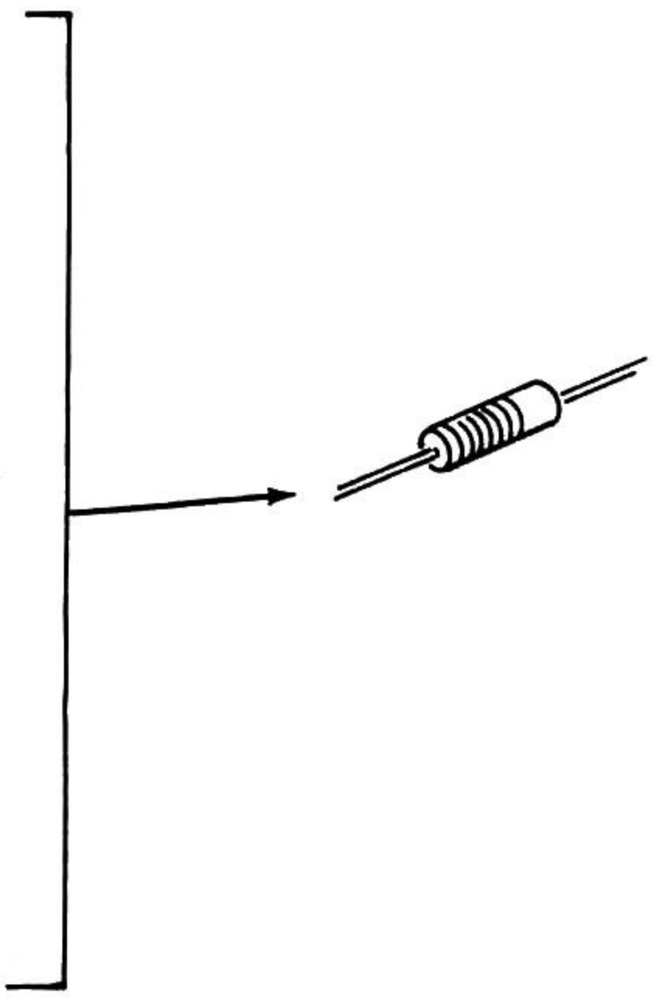
DISPLAY CIRCUIT BOARD

PARTS LIST

Unpack the package marked 3 and check each part against the following list. Make a check (√) in the space provided as you identify each part. Any part that is packed in an individual envelope with a part number on it should be placed back in the envelope after you identify it until it is called for in a step. Do not throw away any packing material until all of the parts are accounted for.

Refer to the inside back cover of the Manual for "Replacement Parts" information.

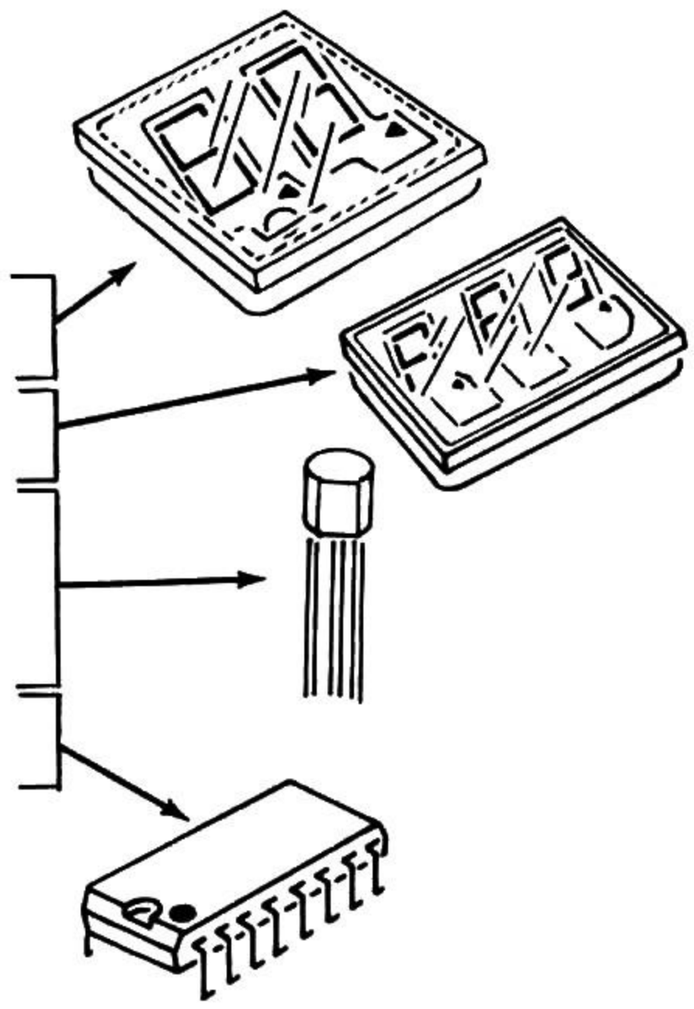
	QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.
RESISTORS, 1/4-Watt, 10%				
( )	3	4700 Ω (yellow-violet-red)	1-8-12	R101,R102, R103
( )	3	22 kΩ (red-red-orange)	1-45-12	R111,R112, R113
( )	7	27 kΩ (red-violet-orange)	1-46-12	R116,R118, R122,R125, R128,R132, R136
( )	7	100 kΩ (brown-black-yellow)	1-32-12	R115,R119, R123,R126, R129,R133, R135
( )	7	180 kΩ (brown-gray-yellow)	1-16-12	R114,R117, R121,R124, R127,R131, R134
( )	6	470 kΩ (yellow-violet-yellow)	1-18-12	R104,R105, R106,R107, R108,R109



	QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.

DISPLAY TUBES-TRANSISTORS-INTEGRATED CIRCUITS

( )	3	Large display tube	411-295	V101,V102, V103
( )	1	Small display tube	411-804	V104
( )	7	MPS-L01 transistor	417-811	Q101,Q102, Q103,Q104, Q105,Q106, Q107
( )	3	DD700 (DM8880) integrated circuit	443-602	IC101, IC102, IC103

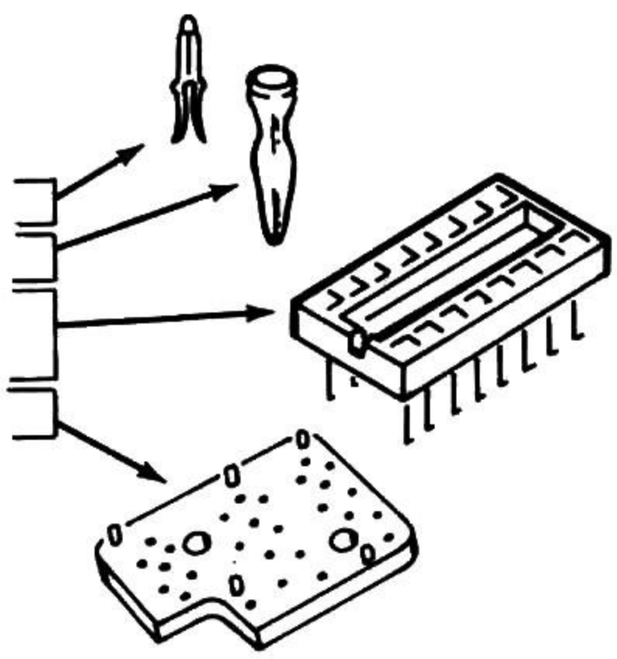


NOTE: Transistors and integrated circuits are marked for identification in one of the following ways:

1. Part number.
2. Type number. (On integrated circuits this refers only to the numbers; the letters may be different or missing.)
3. Part number and type number.
4. Part number with a type number other than the one listed.

MISCELLANEOUS

( )	29	Circuit board pin	432-121
( )	48	Display tube pin	432-134
( )	3	16-pin IC (integrated circuit) socket	434-242
( )	1	Display tube socket	434-252



PARTS NEEDED FROM PACK #4

( )	1	Display circuit board	85-1657-1

NOTE: The prices shown on the separate "Heath Parts Price List" apply only on purchases from Heath Company where shipment is to a U.S.A. destination. Add 10 percent (minimum 25 cents) to the price when ordering (Michigan residents add 4 percent sales tax) to cover insurance, postage, and handling. Outside the U.S.A., parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties, and rates of exchange.

STEP-BY-STEP ASSEMBLY

START

NOTE: On one side of this circuit board there are only foils, while on the other side there are printed component outlines in addition to the foils. In the following pages, the side of the circuit board with the printed outlines will be referred to as the "component side." the other side will be referred to as the "foil" side.

Position the display circuit board component side up as shown. NOTE: The resistors used on this circuit board are all 1/4-watt resistors.

( ) R131: 180 kΩ (brown-gray-yellow).

( ) R104: 470 kΩ (yellow-violet-yellow).

( ) R128: 27 kΩ (red-violet-orange).

( ) R105: 470 kΩ (yellow-violet-yellow).

( ) R115: 100 kΩ (brown-black-yellow).

( ) R106: 470 kΩ (yellow-violet-yellow).

( ) R135: 100 kΩ (brown-black-yellow).

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

( ) R107: 470 kΩ (yellow-violet-yellow).

( ) R108: 470 kΩ (yellow-violet-yellow).

( ) R119: 100 kΩ (brown-black-yellow)

( ) R109: 470 kΩ (yellow-violet-yellow).

( ) R123: 100 kΩ (brown-black-yellow).

( ) R113: 22 kΩ (red-red-orange).

( ) R112: 22 kΩ (red-red-orange).

( ) R126: 100 kΩ (brown-black-yellow).

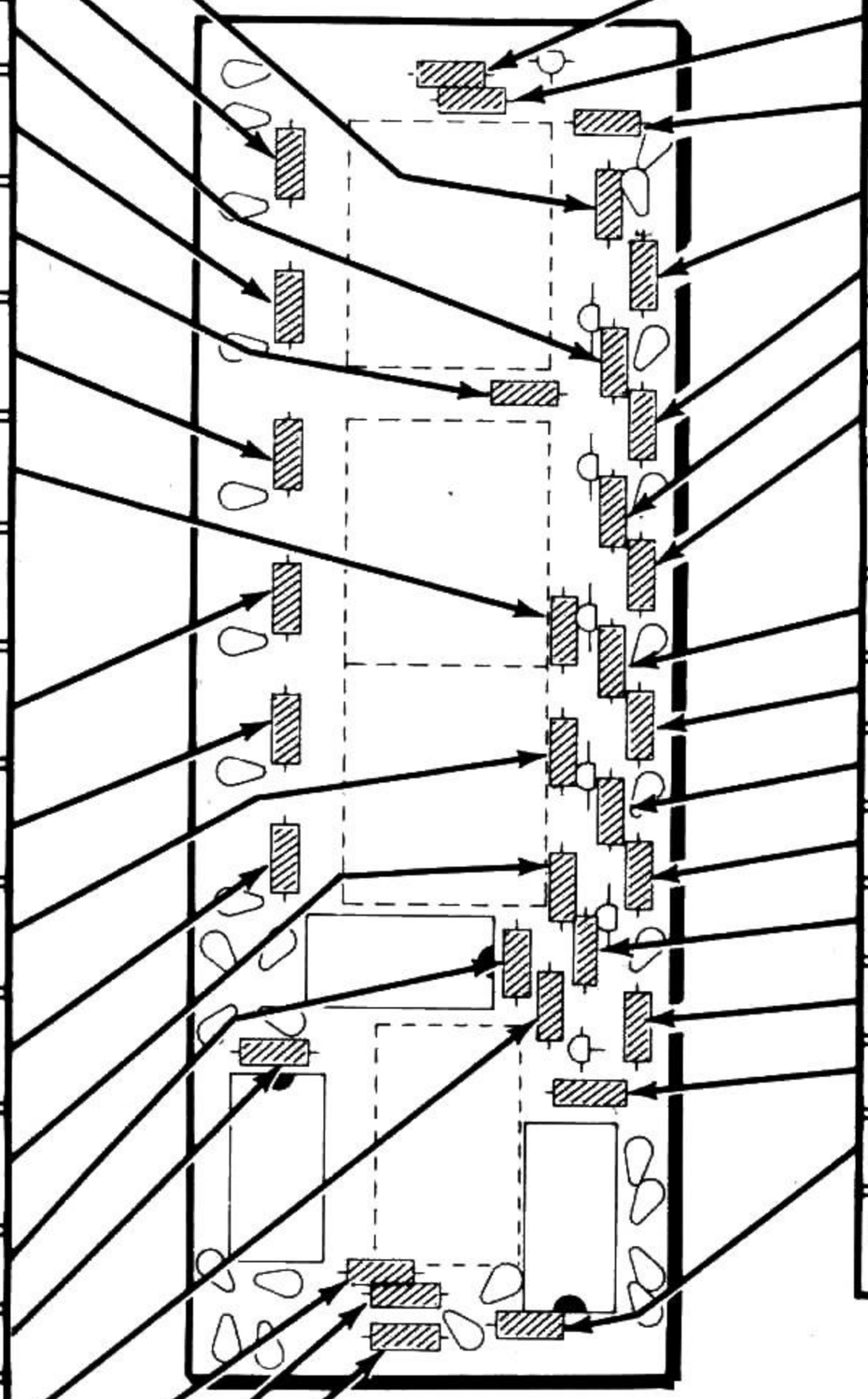
( ) R103: 4700 Ω (yellow-violet-red).

( ) R102: 4700 Ω (yellow-violet-red).

( ) R101: 4700 Ω (yellow-violet-red).

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

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



CONTINUE

( ) R133: 100 kΩ (brown-black-yellow).

( ) R129: 100 kΩ (brown-black-yellow).

( ) R132: 27 kΩ (red-violet-orange).

( ) R127: 180 kΩ (brown-gray-yellow).

( ) R114: 180 kΩ (brown-gray-yellow).

( ) R116: 27 kΩ (red-violet-orange).

( ) R134: 180 kΩ (brown-gray-yellow).

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

( ) R136: 27 kΩ (red-violet-orange).

( ) R117: 180 kΩ (brown-gray-yellow).

( ) R118: 27 kΩ (red-violet-orange).

( ) R121: 180 kΩ (brown-gray-yellow).

( ) R122: 27 kΩ (red-violet-orange).

( ) R124: 180 kΩ (brown-gray-yellow).

( ) R125: 27 kΩ (red-violet-orange).

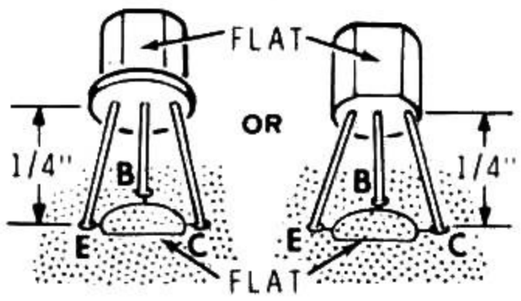
( ) R111: 22 kΩ (red-red-orange).

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

PICTORIAL 3-1

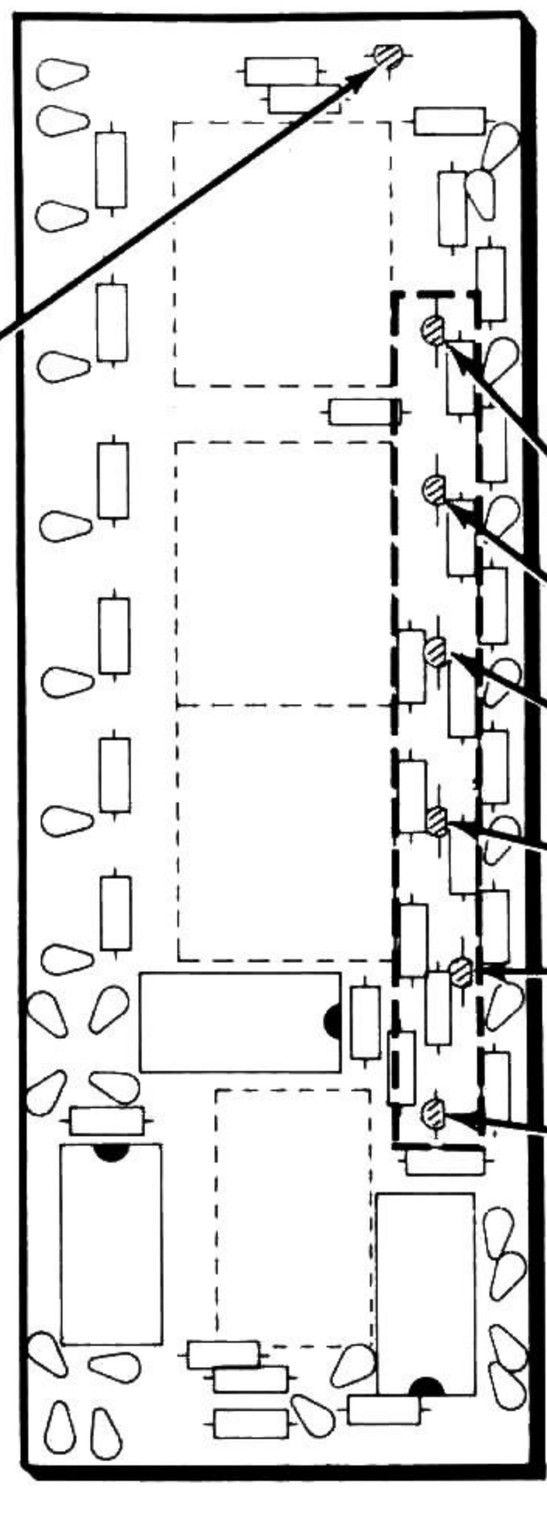
START

NOTE: When you install the following transistor, line up the flat on the transistor with the outline of the flat on the circuit board. Then insert the E, B, and C leads of the transistor into the corresponding E, B, and C holes in the circuit board. Position the transistor 1/4" above the circuit board, solder the leads to the foil, and cut off the excess lead lengths.



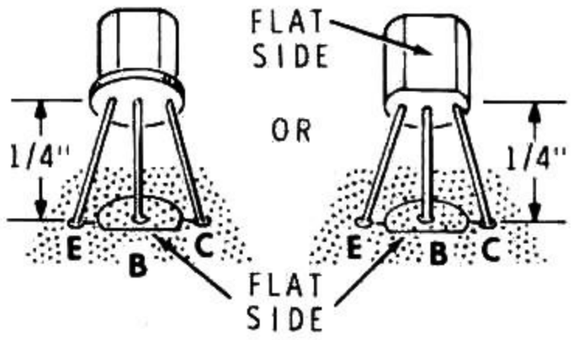
( ) Q105: MPS-L01 transistor (#417-811).

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



CONTINUE

Install five MPS-L01 transistors (#417-811) at:



( ) Q107.

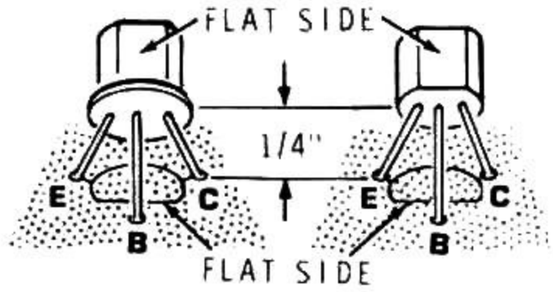
( ) Q106.

( ) Q104.

( ) Q101.

( ) Q102.

( ) Q103: MPS-L01 transistor (#417-811). Note the different position of the B (base) lead.

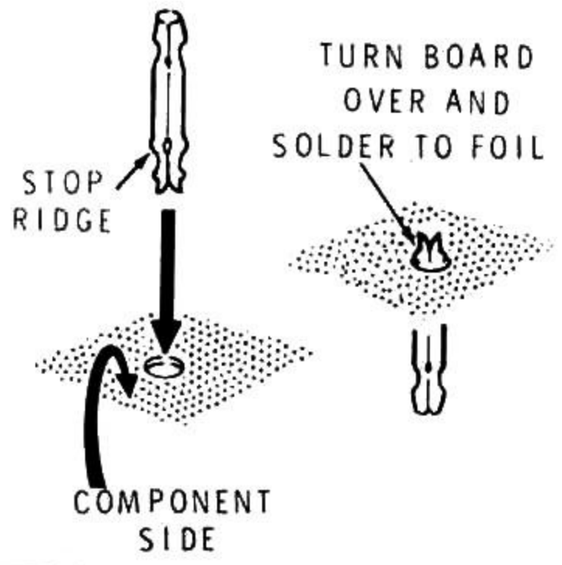


PICTORIAL 3-2

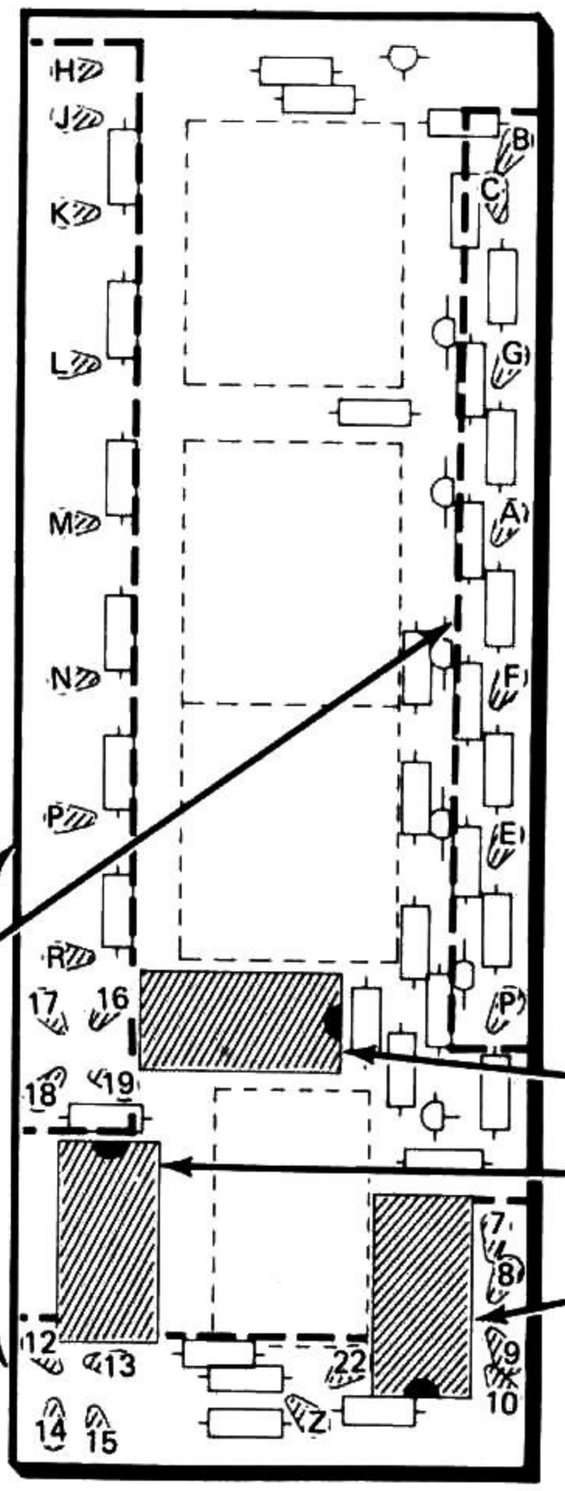
START

CAUTION: Plated-through holes are used to connect the foils on this circuit board together. Therefore, it is very important that you solder the connection on BOTH SIDES of the circuit board even though there may not be any foil leading away from the connection.

NOTE: Refer to the following drawing when you install #432-121 circuit board connector pins. Mount the pins on the component side of the circuit board. Press each pin as far as it will go into its mounting hole. Then turn the circuit board over and solder the pins to the foil on the other side of the board.

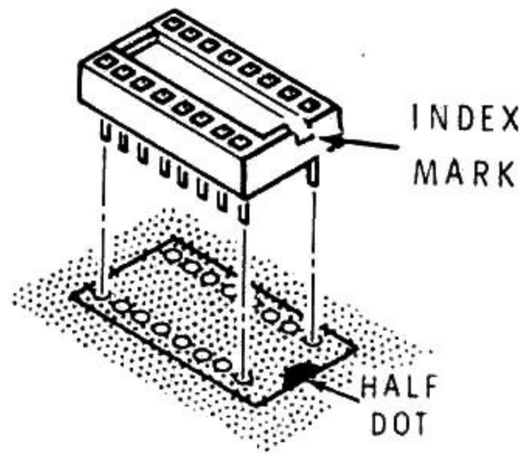


( ) Install #432-121 connector pins at the thirteen numbered and sixteen lettered locations shown.



CONTINUE

NOTE: Mount each of the following sockets so the indexing mark (notch, cutout, arrow, etc.) at one end is at the half-dot end of the socket outline on the circuit board. Be sure all socket pins are in their holes. Solder the pins to the foil as you install each socket.



Install three 16-pin IC sockets at:

( ) IC103.

( ) IC102.

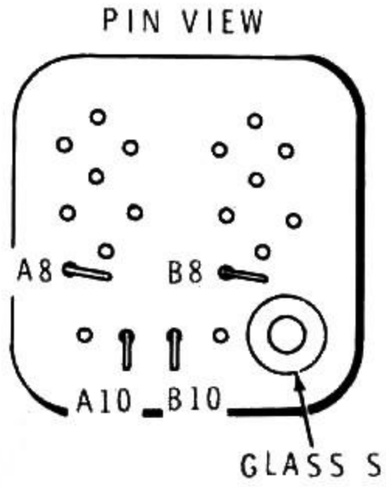
( ) IC101. NOTE: After you solder the pins of this socket to the foil, cut off the excess lengths from the inner row of socket pins.

PICTORIAL 3-3

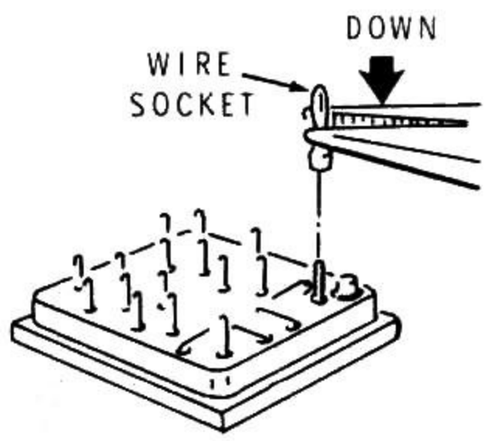
START

Prepare the three large display tubes as follows:

( ) Position the three display tubes with their pins up and with the glass seal positioned as shown below. Carefully locate pins A8, A10, B8, and B10, and bend these pins over against the tube base. Be sure the bent over pins do not touch any other pin.



( ) Use thin-nose pliers to hold the narrow part of a wire socket. Then with its open end down, push the wire socket onto a tube pin until it touches the back of the tube. As the tube pins are easily bent, you must very carefully push straight down with just enough force to cause the pin to enter the wire socket. If the tube pin bends, straighten it and try again.

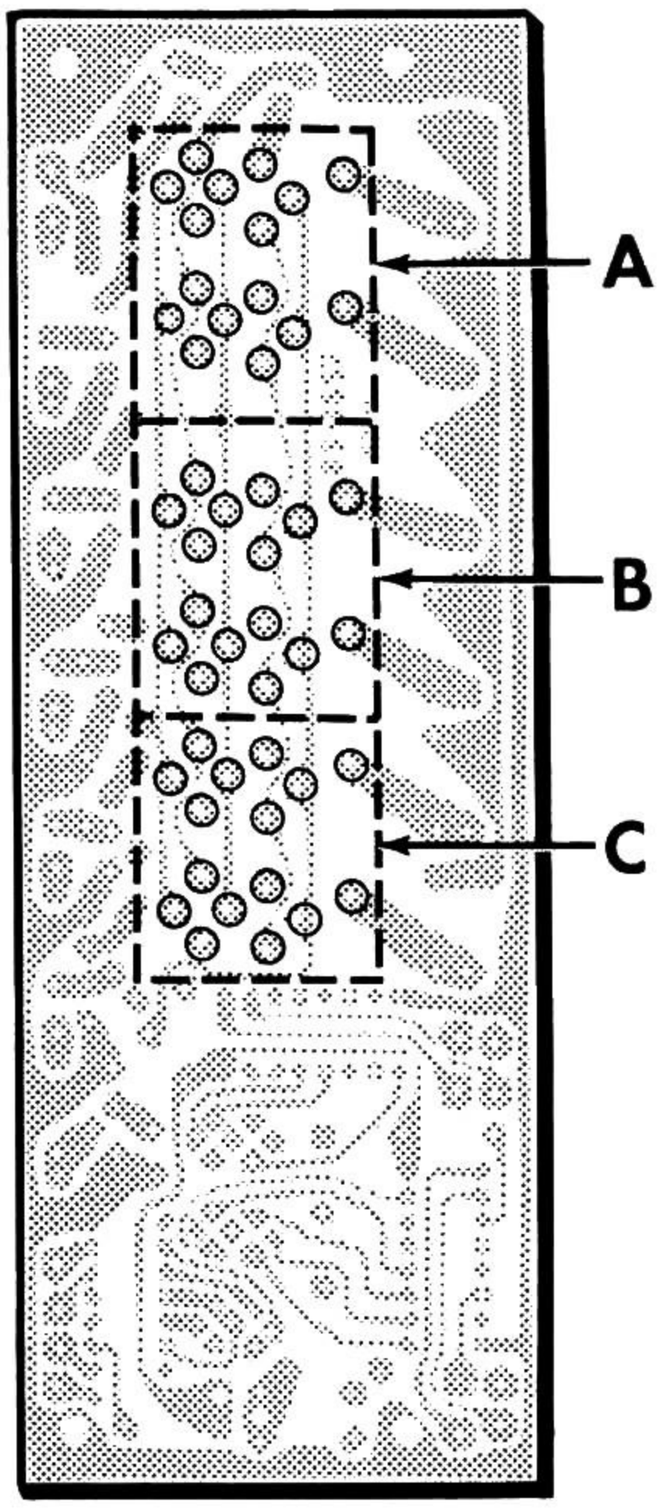


( ) Install wire sockets on all of the unbent pins of the three display tubes.

( ) Look at the wire sockets on each tube from two adjacent sides. Then adjust them so they are perpendicular to the tube base.

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

FOIL SIDE OF CIRCUIT BOARD



PICTORIAL 3-4

CONTINUE

( ) Turn the circuit board foil-side-up as shown in the Pictorial.

( ) V103: Position the glass seal of a display tube toward the FOIL side of the circuit board and fit the sixteen wire sockets on the display tube into the sixteen circuit board holes at location A. Solder the pins on the COMPONENT side of the circuit board. CAUTION: Use a MINIMUM amount of heat and solder at each wire socket, but be sure you have a good connection. If you hold the soldering iron on the connection too long, or use too much solder, the solder may "wick" up inside the wire socket and solder the tube pin to the socket. This would make it difficult to remove the tube.

( ) V102: In the same manner, install a prepared display tube at location B.

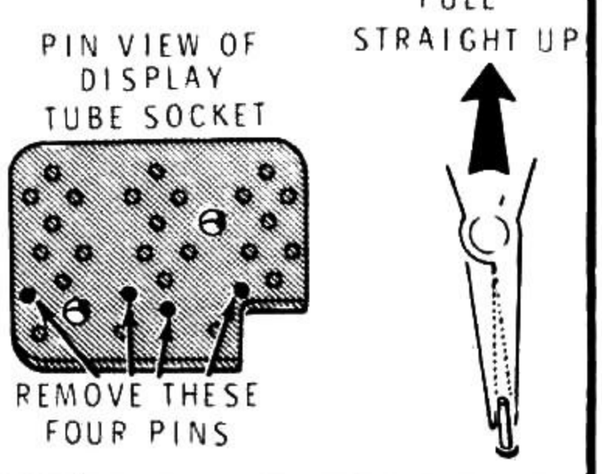
( ) V101: In the same manner, install a prepared display tube at location C.

START

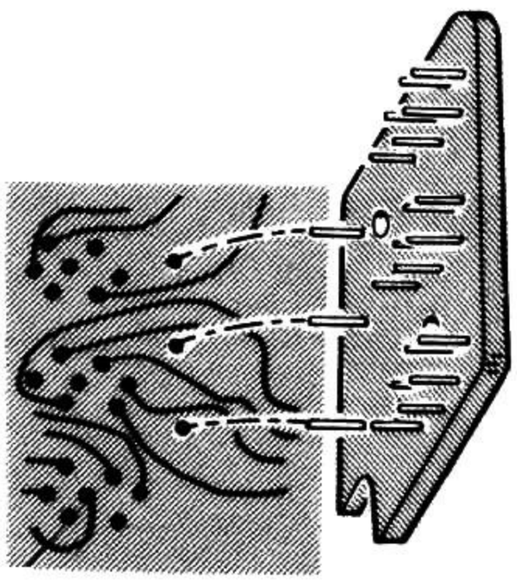
( ) Locate the 28-pin display tube socket and position it pin side up on your work bench.

CAUTION: BE VERY CAREFUL WHEN YOU PERFORM THE NEXT STEP SO YOU ONLY REMOVE THE INDICATED PINS. Save the removed pins in case you should accidentally damage one of the pins still in the socket.

( ) Refer to the following drawing. Then use small long-nose pliers and pull straight up on the four indicated pins and remove each of them from the socket.

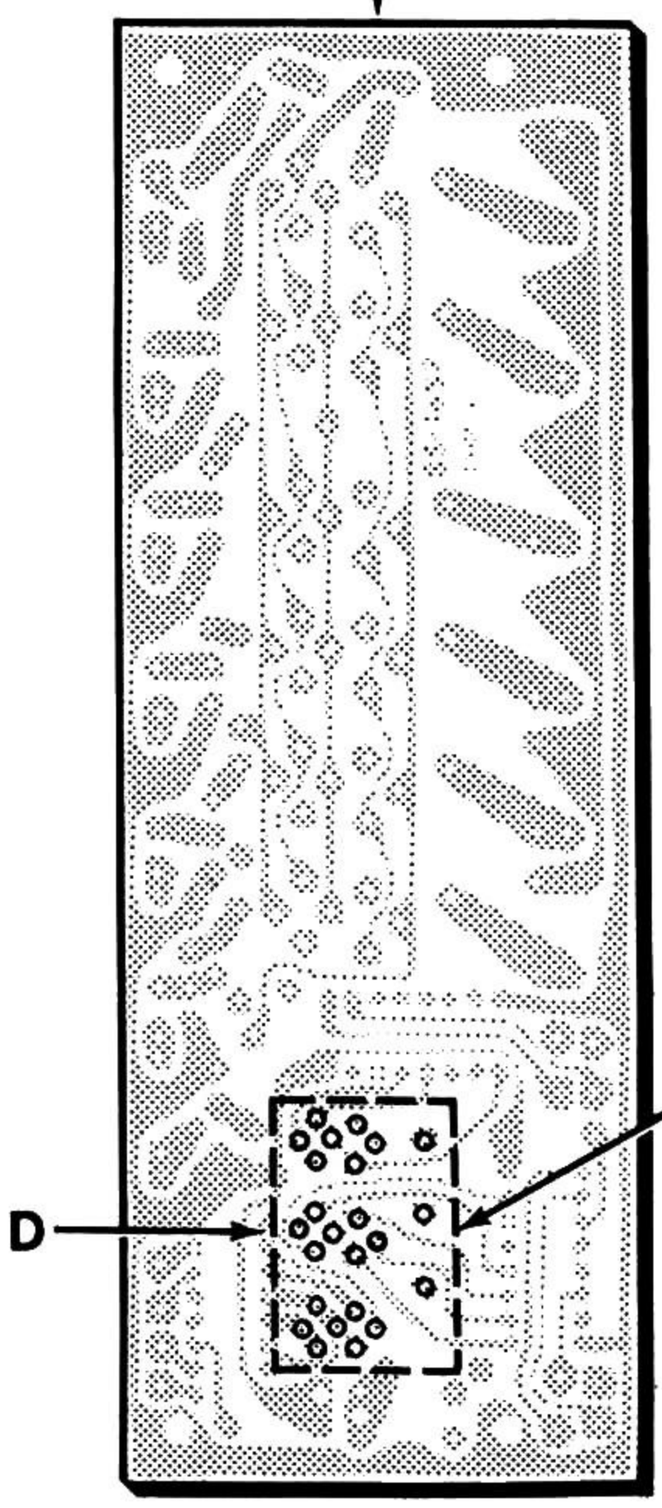


( ) V104: Mount the prepared display tube socket at location D as shown. Carefully start the pins of the socket into the matching circuit board holes. Then press the socket as far into the circuit board as it will go.



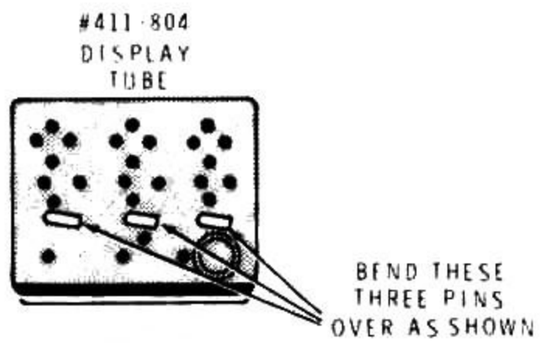
( ) Turn the circuit board over. Then solder the pins to the foil on the component side of the circuit board.

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

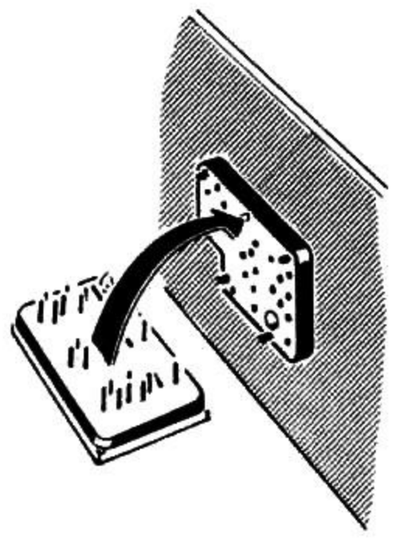


CONTINUE

( ) Prepare the small display tube as shown below. CAUTION: Be sure the bent over pins do not touch any other tube pins.



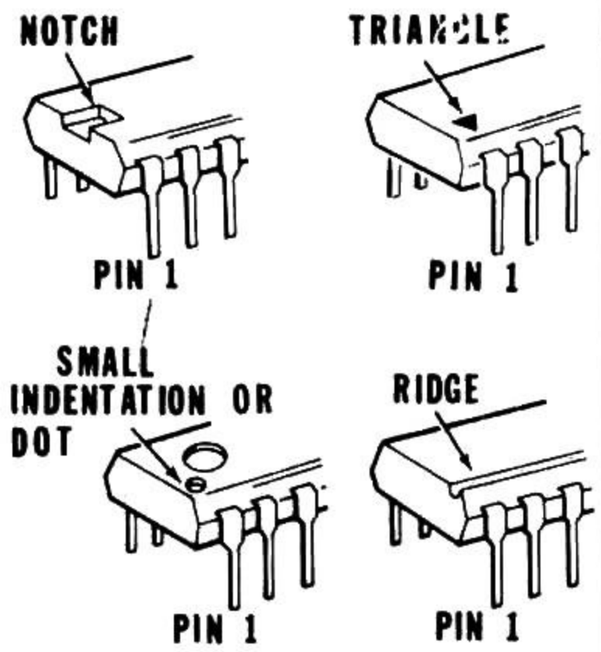
( ) Install the prepared display tube in the socket at location D. Be sure all the tube pins are started into the proper socket holes; then press evenly on the tube until it is seated against the socket.



PICTORIAL 3-5

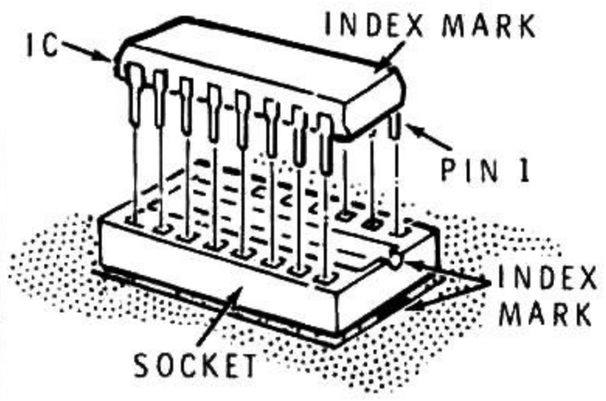
START

NOTE: The indexed (pin 1) end of inline integrated circuits may be marked in a number of ways such as a notch, triangle, dot, the numeral 1, etc.



Be sure you install each IC so its indexed end is toward the index mark at the end of its socket.

Before you apply downward pressure to an IC, make sure each IC pin is centered in its proper socket hole. Handle IC's with care as their pins are very easily bent.



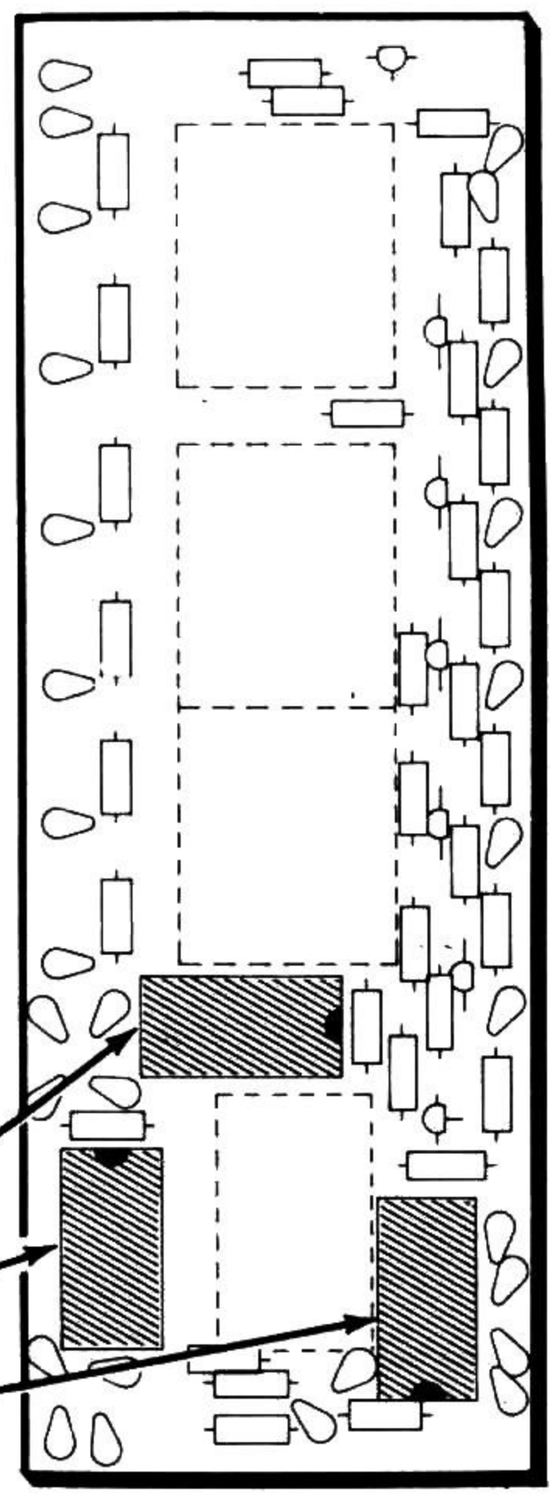
Install three DD700 (DM8880) (#443-602) integrated circuits at :

( ) IC103. . . . . .

( ) IC102. . . . . .

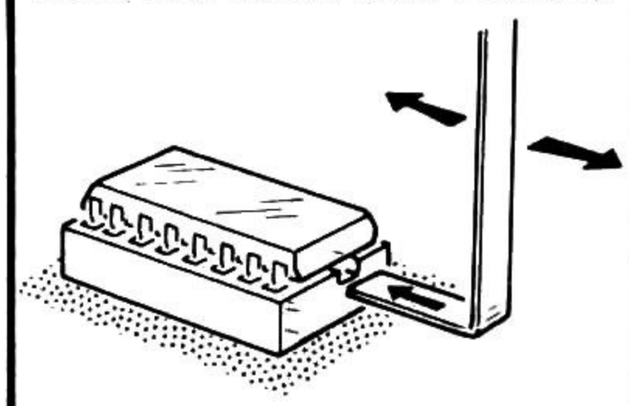
( ) IC101. . . . . .

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



CONTINUE

NOTE: An IC lifter has been furnished to remove an IC from its socket if necessary.



To remove an IC, push the shorter end of the lifter in between the IC and the socket, and carefully rock the longer portion back and forth.

CIRCUIT BOARD CHECKOUT

Carefully inspect the circuit board for the following conditions.

( ) Unsoldered connections.

( ) "Cold" solder connections.

( ) Solder bridges between foil patterns.

( ) Protruding leads which could touch together.

( ) Transistors for the proper type and installation.

( ) Integrated circuits for proper type and installation.

( ) Make sure all display tubes are properly installed.

This completes the assembly of the display circuit board. Set it aside until it is called for in a step.

PICTORIAL 3-6

CHASSIS

PARTS LIST

Check the **remaining** parts against the following list. Make a check (√) in the space provided as you identify each part. Any part that is packed in an individual envelope with a part number on it should be placed back in the envelope after you identify it until it is called for in a step. Do not throw away any packing material until all of the parts are accounted for.

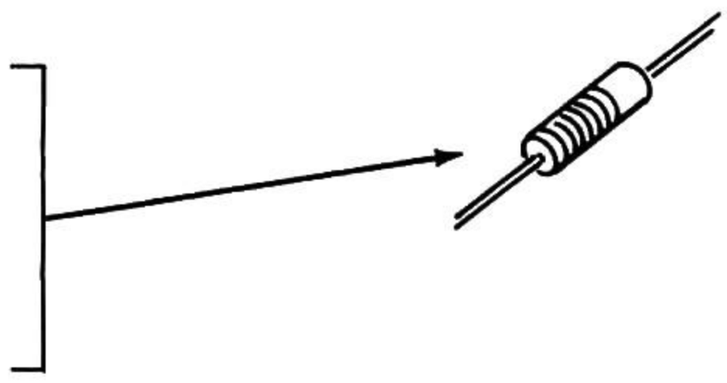
Refer to the inside back cover of the Manual for "Replacement Parts" information.

QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.

RESISTORS 1/2-Watt

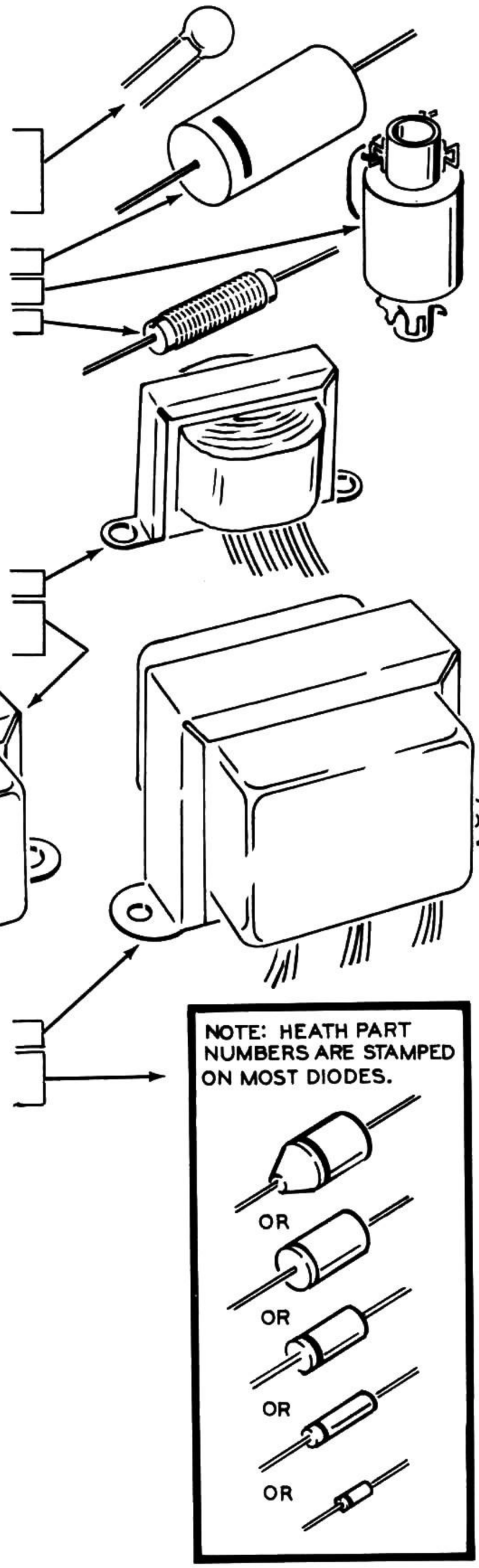
NOTE: The following resistor tolerances are 10% unless otherwise noted. 10% is indicated by a fourth color band of silver; 5% is indicated by a gold band.

( )	4	82 Ω (gray-red-black)	1-118	R6,R7,R9, R11
( )	1	1000 Ω (brown-black-red)	1-9	R8
( )	1	3600 Ω, 5% (orange-blue-red)	1-82	R13



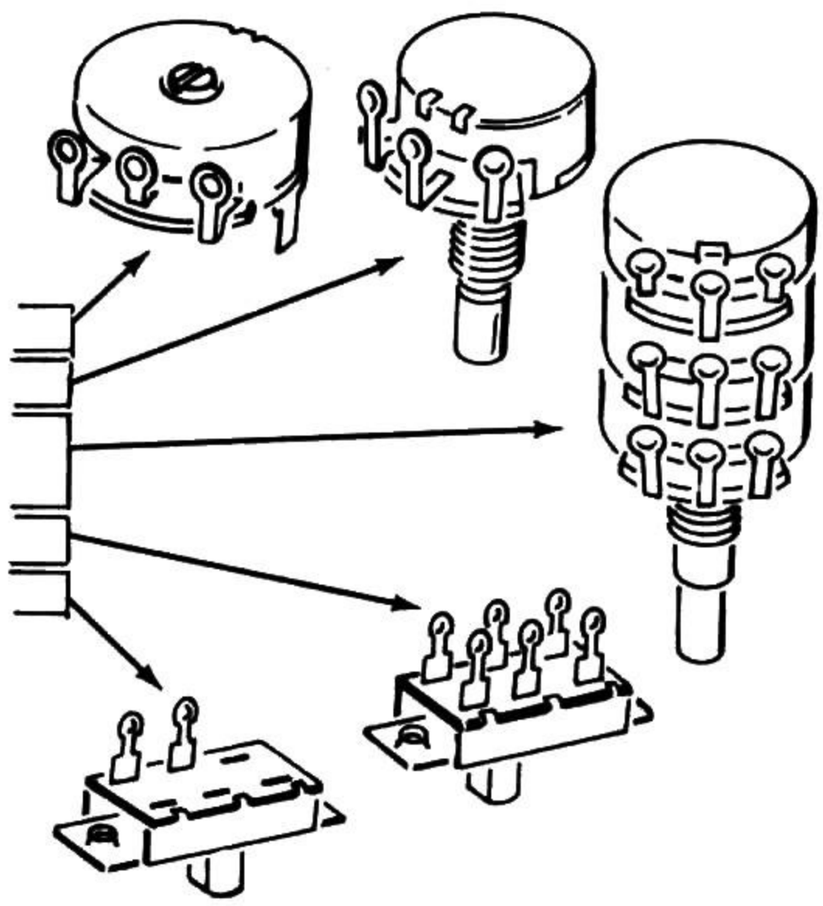
CAPACITORS-INDUCTORS-DIODE

	QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.
( )	1	7.7 pF disc capacitor	21-181	C302
( )	3	.001 μF disc capacitor	21-163	C1,C2,C3
( )	4	.002 μF disc capacitor	21-36	C5,C6,C7,C8
( )	1	.005 μF disc capacitor	21-27	C4
( )	1	100 pF mica capacitor	21-148	C303
( )	1	2 μF Mylar* capacitor	27-21	C11
( )	1	2600 Hz trap	40-1699	L3
( )	2	Choke	45-2	L1, L2
( )	1	Input transformer	51-129	T3
( )	1	Hybrid line transformer	51-130	T2
( )	1	Power transformer	54-870	T1
( )	1	1N295 diode (red-white-green)	56-20	D1

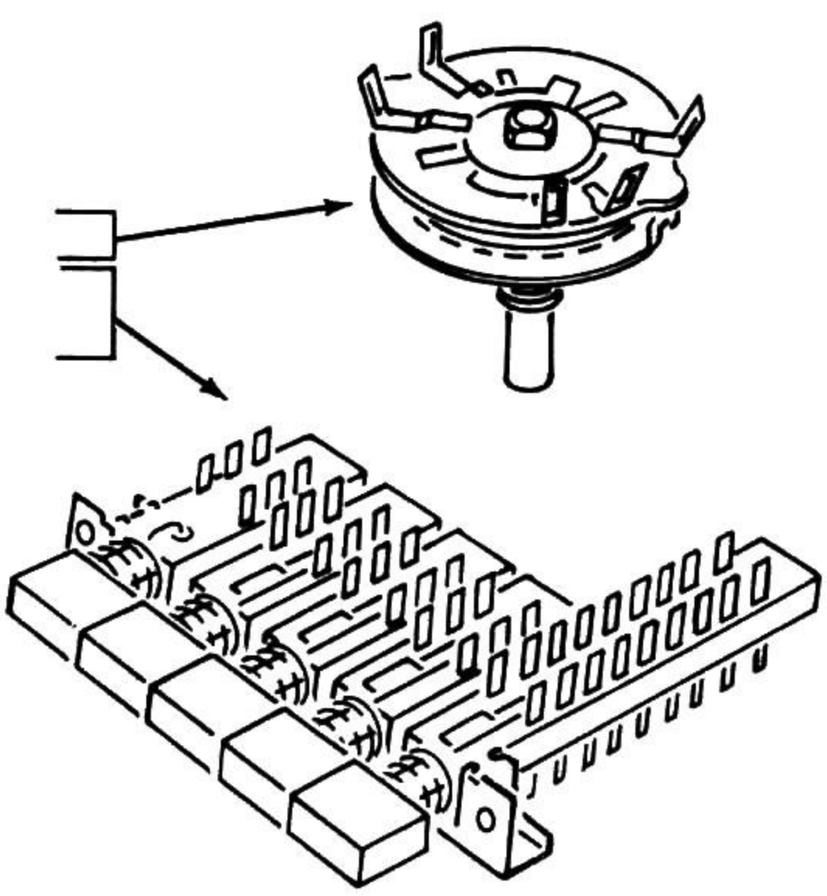


*DuPont Registered Trademark

QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.
CONTROLS-SWITCHES			
( ) 1	2000 Ω control	10-52	R2
( ) 1	250 kΩ control	10-14	R1
( ) 1	200 kΩ/1500 Ω/10 Ω tandem control	13-16	R4,R3,R5
( ) 1	6-lug switch	60-2	SW5
( ) 3	2-lug switch	60-6	SW1,SW2,SW3



( )	1	Rotary switch	63-725	SW6
( )	1	Pushbutton switch assembly	64-773	SW4A/B/C/D/E



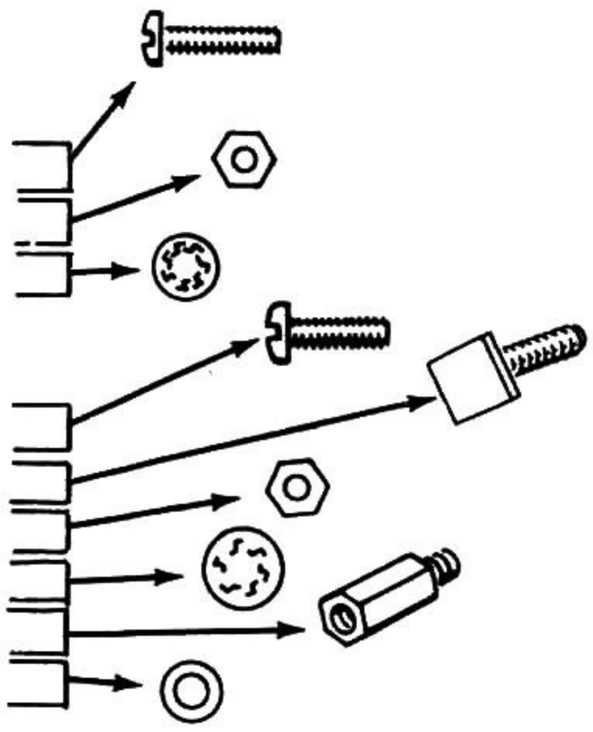
HARDWARE

#3 Hardware

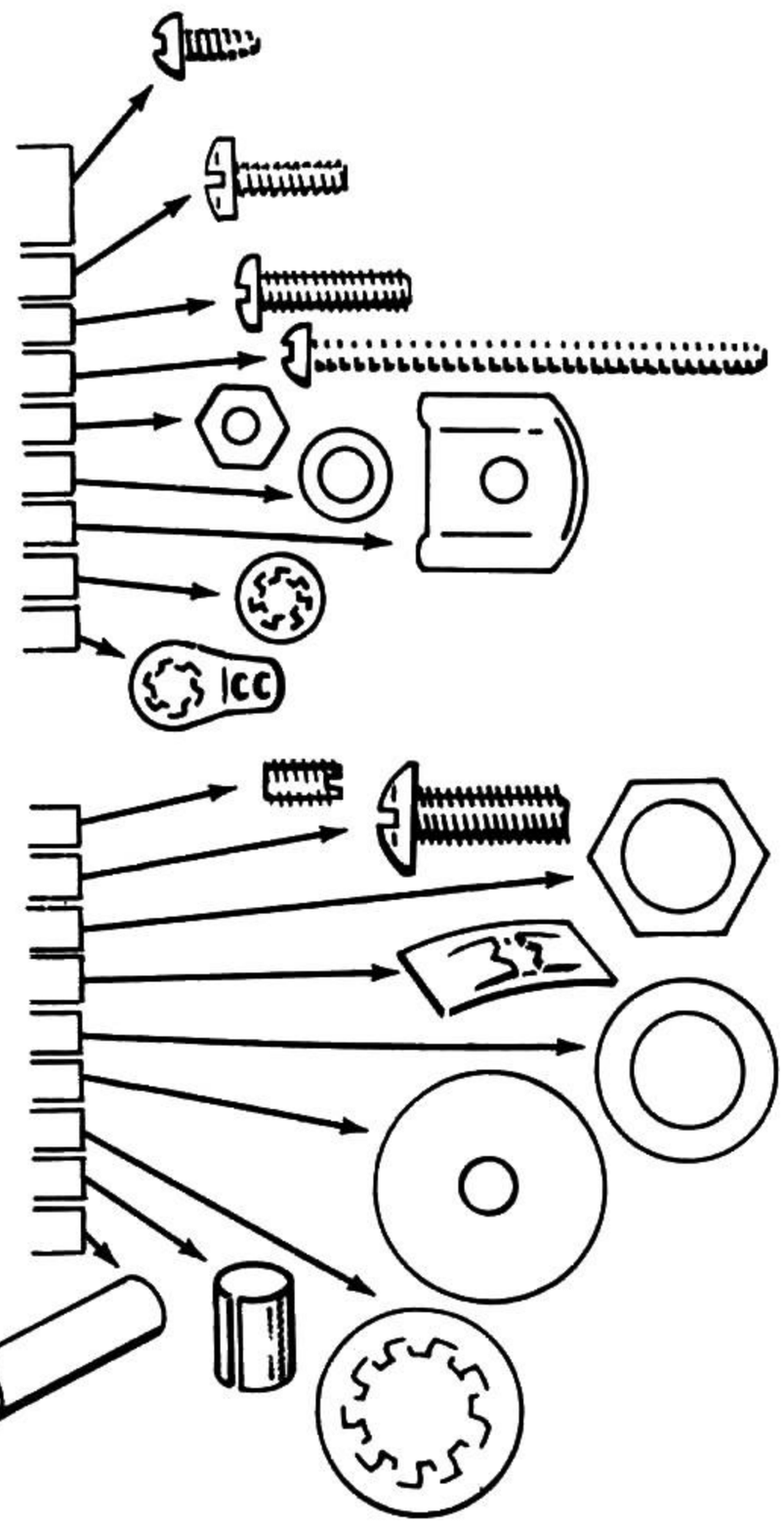
( )	2	3-48 x 3/8" screw	250-172
( )	4	3-48 nut	252-1
( )	2	#3 lockwasher	254-7

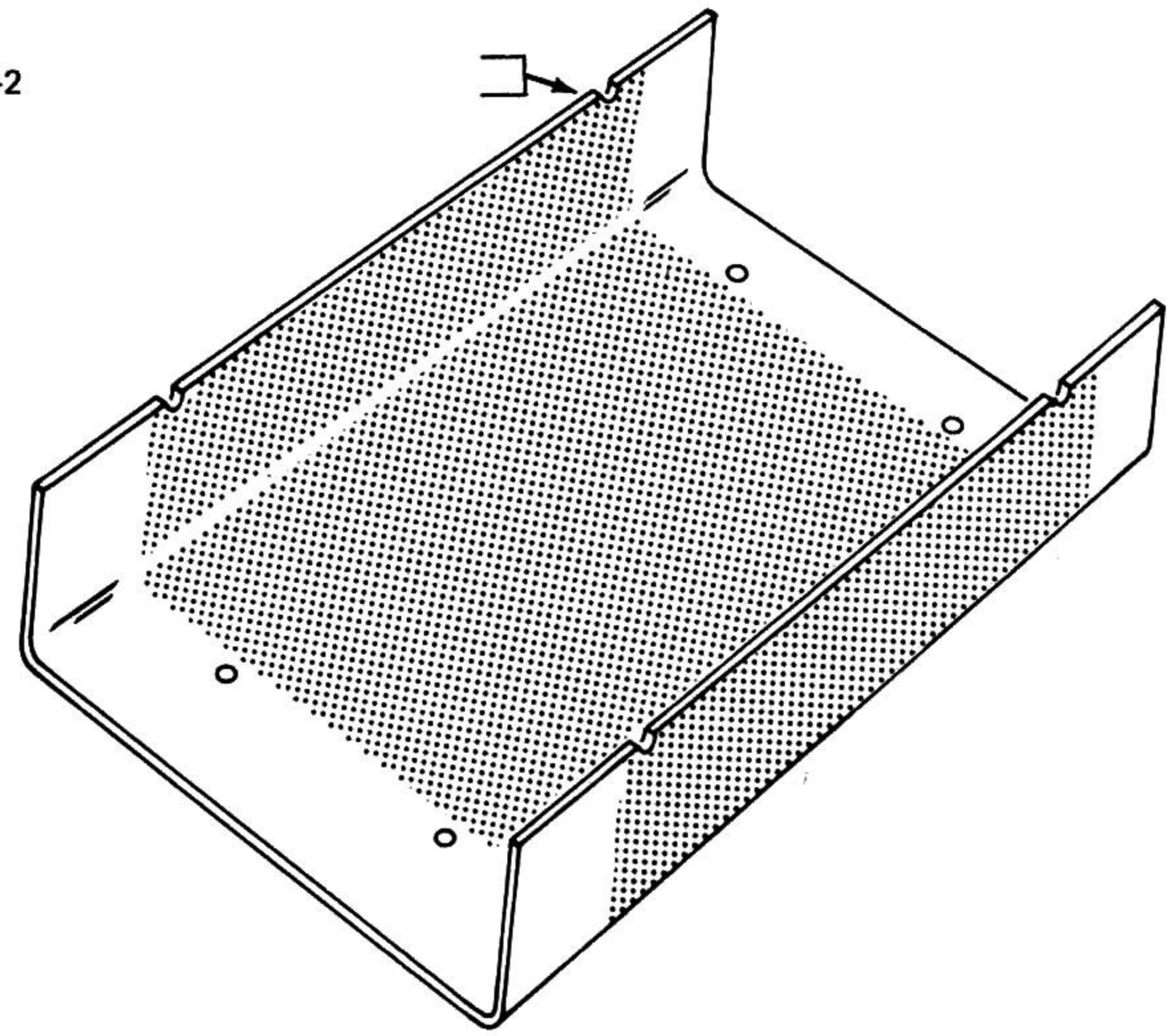
#4 Hardware

( )	8	4-40 x 5/16" screw	250-213
( )	8	4-40 x 1/2" T screw	250-1194
( )	16	4-40 nut	252-15
( )	12	#4 lockwasher	254-9
( )	4	4-40 x 3/8" spacer	255-195
( )	4	#4 fiber washer	253-103



	QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.
#6 Hardware				
( )	21	#6 x 1/4" self-tapping screw	250-170	
( )	48	6-32 x 3/8" screw	250-89	
( )	9	6-32 x 1/2" screw	250-162	
( )	2	6-32 x 1-1/2" screw	250-40	
( )	39	6-32 nut	252-3	
( )	2	#6 flat washer	253-27	
( )	3	#6 D washer	253-89	
( )	41	#6 lockwasher	254-1	
( )	3	#6 solder lug	259-1	
Other Hardware				
( )	3	8-32 x 1/4" set screw	250-43	
( )	4	10-32 x 1/2" screw	250-456	
( )	3	Control nut	252-7	
( )	3	Speed Nut**	252-10	
( )	3	Control flat washer	253-10	
( )	8	#10 flat washer	253-19	
( )	3	Control lockwasher	254-4	
( )	1	Brass bushing	455-11	
( )	3	3/4" spacer	255-71	
METAL PARTS				
( )	1	Bottom cabinet shell	90-1127-2	

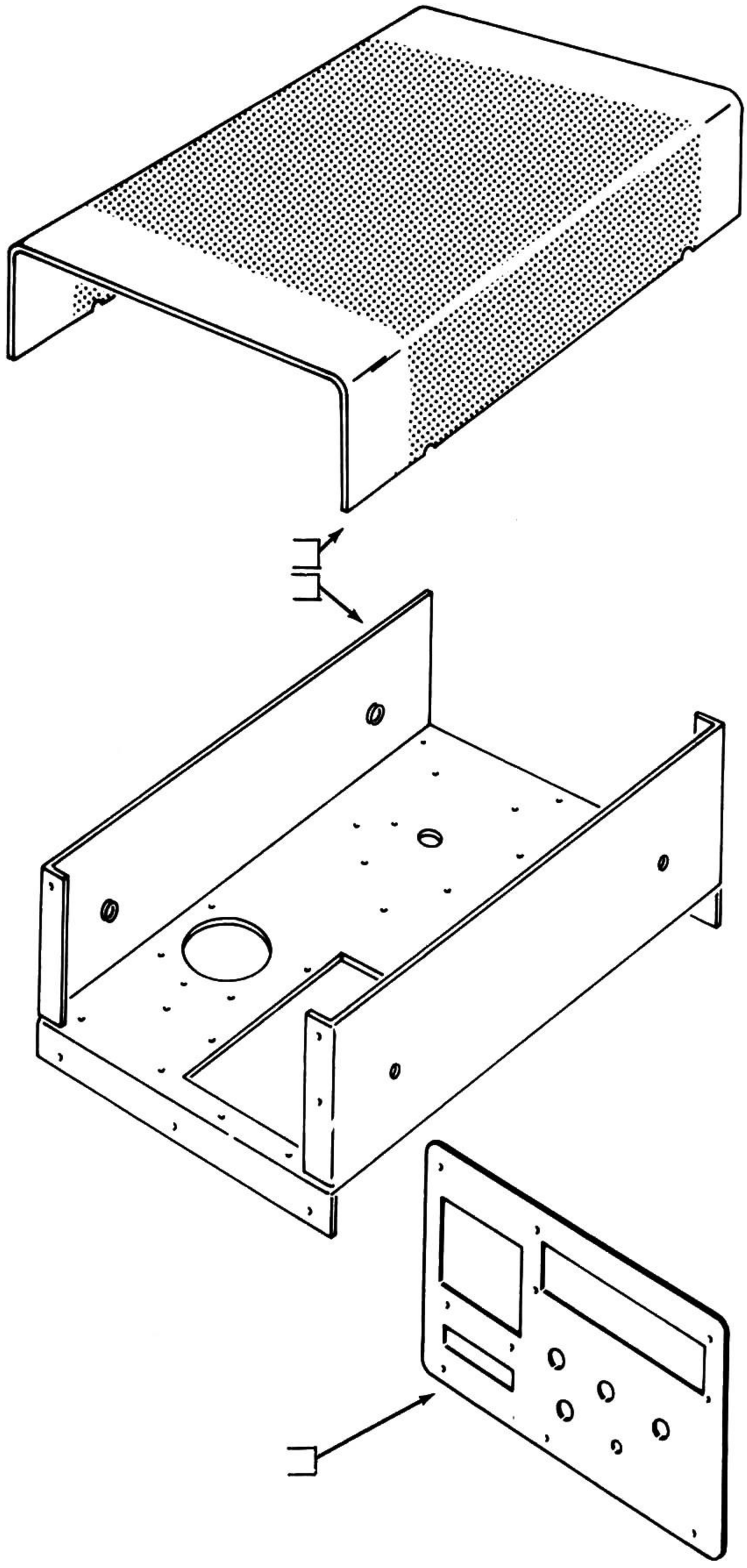




**Registered Trademark, Tinnerman Co.

QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.

Metal Parts (cont'd.)

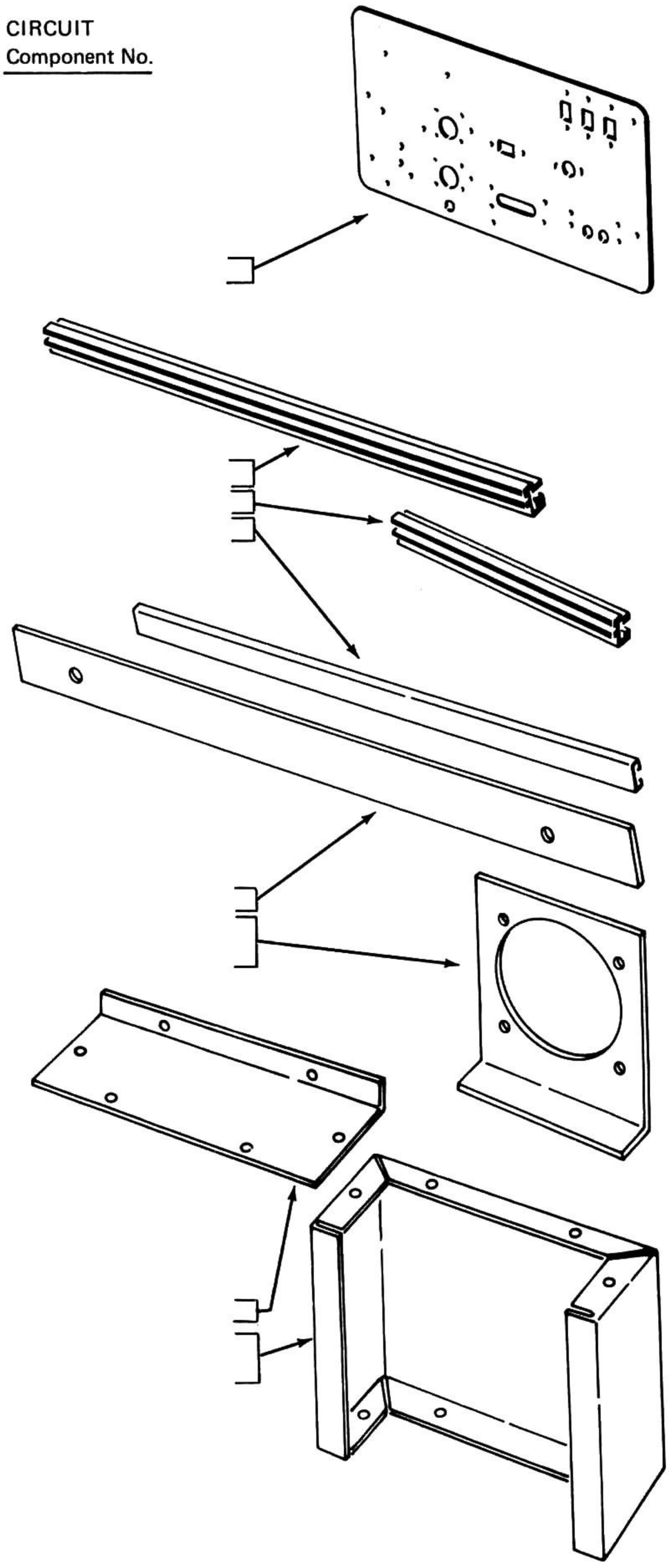


( )	1	Top cabinet shell	90-1103-2
( )	1	Chassis	200-1240
( )	1	Front panel	203-1615-1

QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.

Metal Parts (cont'd.)

( )	1	Rear panel	203-1616-1
( )	1	Long window bracket	204-1937
( )	1	Short window bracket	204-1986
( )	1	Trim strip	205-1448-2
( )	2	Trim rails	205-1576
( )	1	Meter mounting bracket	204-1984
( )	1	Shield cover	204-1985
( )	1	Power meter circuit board shield	206-1111



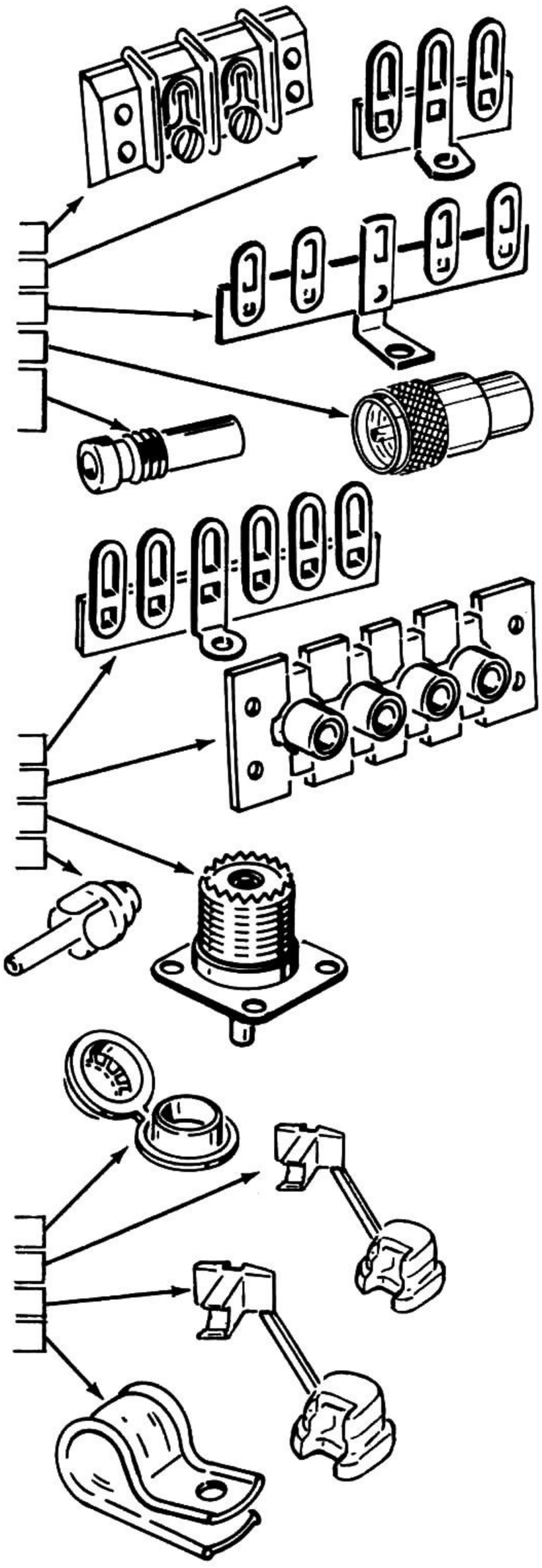
QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.

TERMINAL STRIPS-SOCKET-CONNECTORS-PLUG

( )	1	2-lug terminal block	431-70
( )	3	3-lug terminal strip	431-10
( )	1	5-lug terminal strip	431-42
( )	2	Coaxial connector	438-9
( )	2	Coaxial connector insert	438-12
( )	2	6-lug terminal strip	431-55
( )	1	Phono socket	434-113
( )	2	Coaxial connector	436-5
( )	4	Phono plug	438-4

PLASTIC PARTS

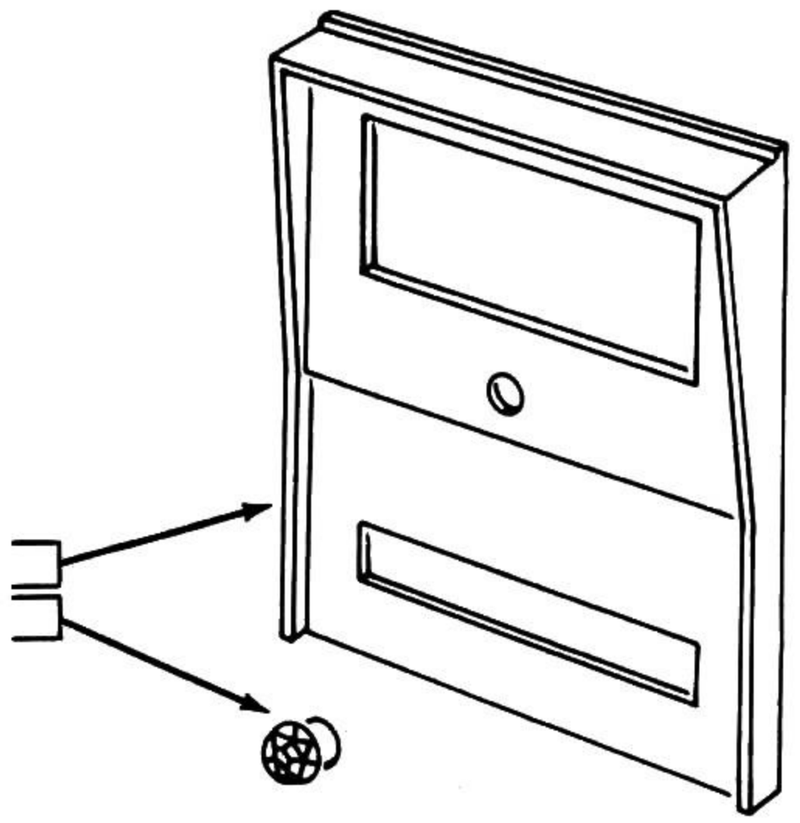
( )	1	Grommet	73-43
( )	1	Small strain relief	75-24
( )	1	Large strain relief	75-30
( )	3	Cable clamp	207-18

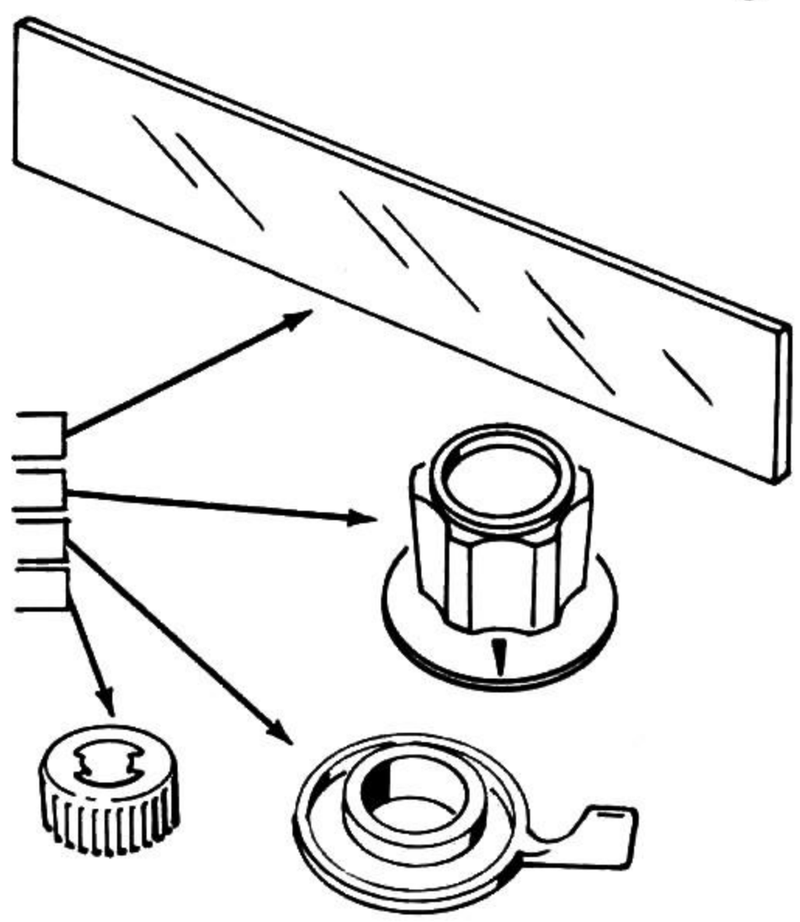


QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.

Plastic Parts (cont'd.)

( )	1	Bezel	210-73
( )	1	Green lens	413-18
( )	1	Window	446-637
( )	3	Skirted knob	462-933
( )	1	Thumb knob	462-935
( )	1	Knob insert	455-52





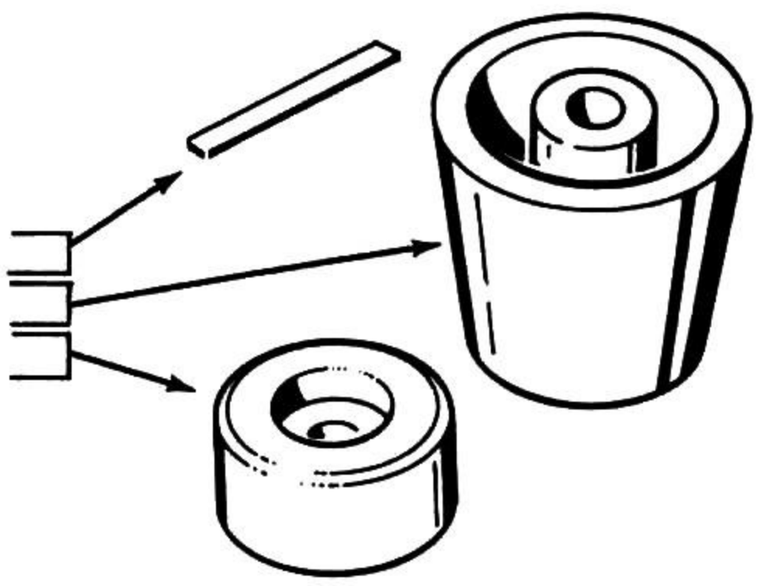
WIRE-CABLE-SLEEVING

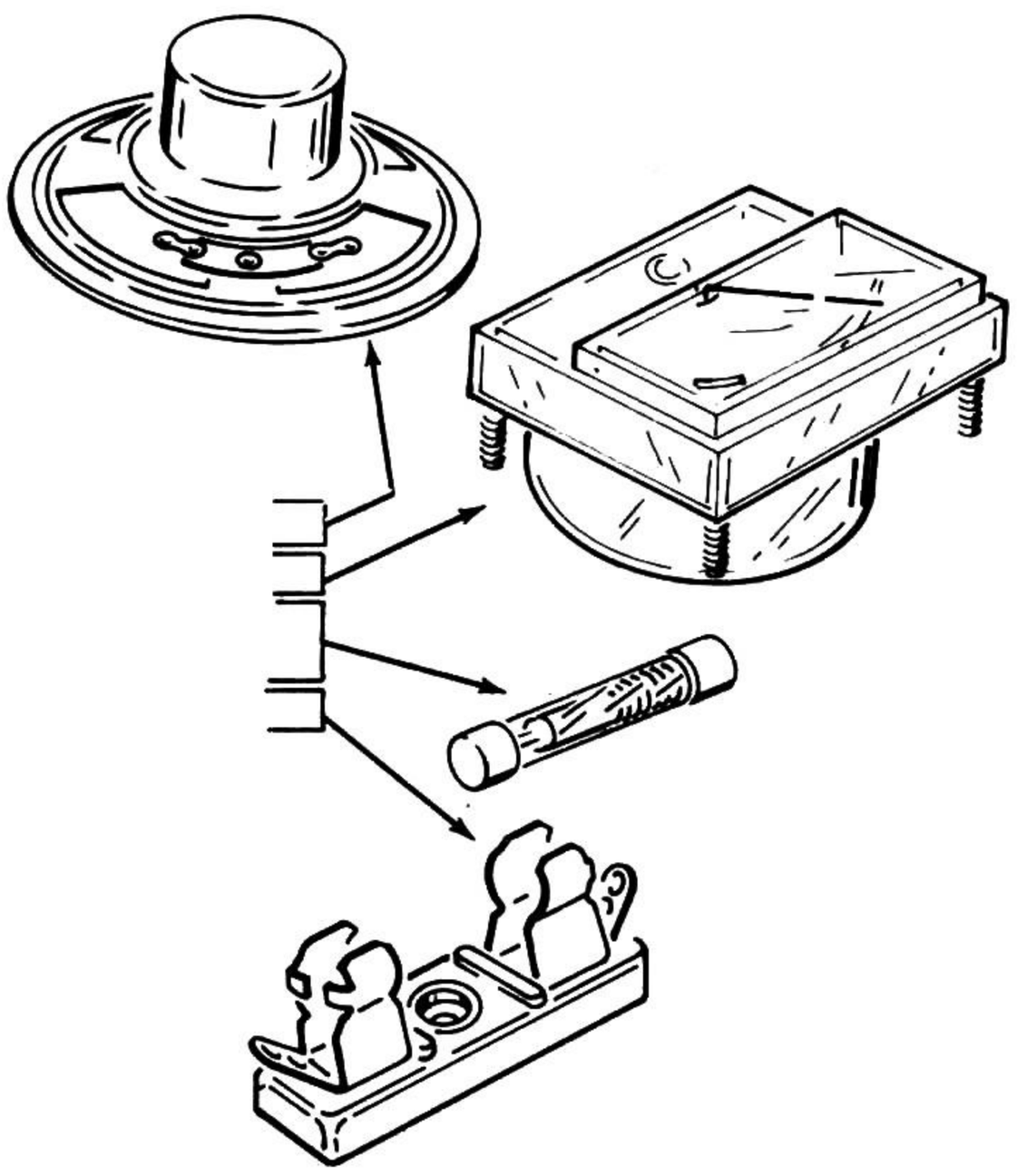
( )	1	Line cord	89-1
( )	2′	Brown wire	344-51
( )	2′	Orange wire	344-53
( )	2′	Green wire	344-55
( )	2′	Blue wire	344-56
( )	15′	Coaxial cable	343-15
( )	5′	Shielded cable	343-11

QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.

MISCELLANEOUS

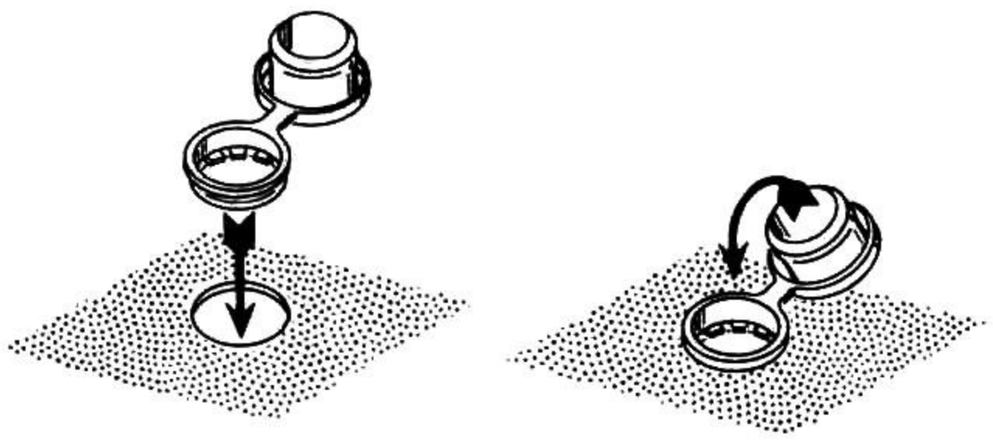
( )	1	Insulating paper	75-90	
( )	1	Alignment tool blade	205-778	
( )	2	Tapered foot	255-59	
( )	4	Rubber foot	261-9	
( )	1	Speaker	401-163	SP1
( )	1	Meter	407-193	M1
( )	1	1/4-ampere,slow-blow fuse	421-33	F1
( )	1	Fuse block	422-1	
( )	1	Blue and white label	391-34	





NOTE : The prices shown on the separate "Heath Parts Price List" apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Add 10% (minimum 25 cents) to the price when ordering (Michigan residents add 4% sales tax) to cover insurance, postage, and handling. Outside the U.S.A., parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties, and rates of exchange.

STEP-BY-STEP ASSEMBLY



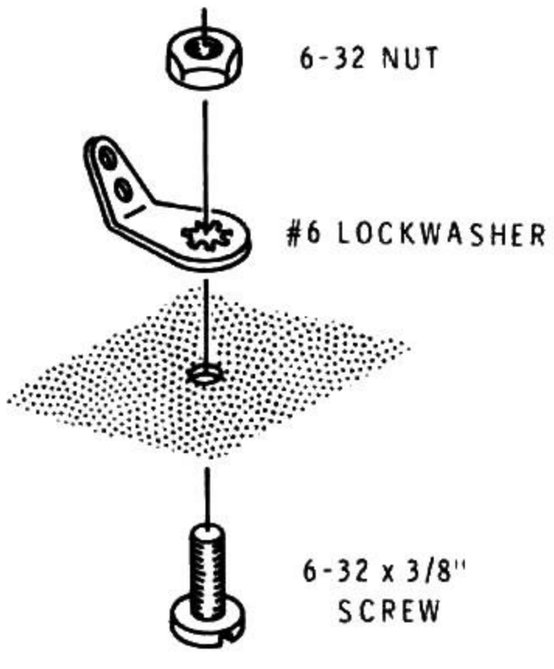
Detail 4-1A

PARTS MOUNTING

Refer to Pictorial 4-1 (fold-out from Page 55) for the following steps.

( ) Refer to Detail 4-1A and install a grommet in hole AR. Be sure the grommet is properly seated in the hole.

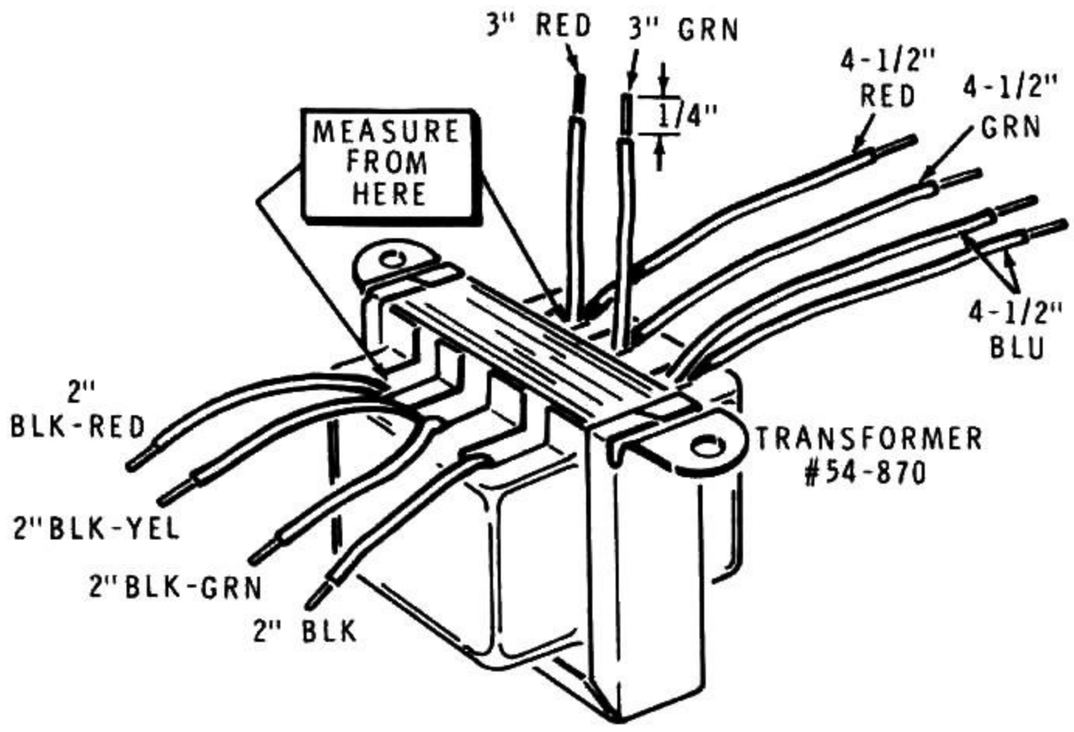
NOTE: When hardware is called for in a step, only the screw size will be given. For instance, if "6-32 x 3/8" hardware" is called for, it means to use a 6-32 x 3/8" screw, one or more #6 lockwashers, and a 6-32 nut. The Detail (or Pictorial) referred to in the step will show the proper number of lockwashers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



Detail 4-1B

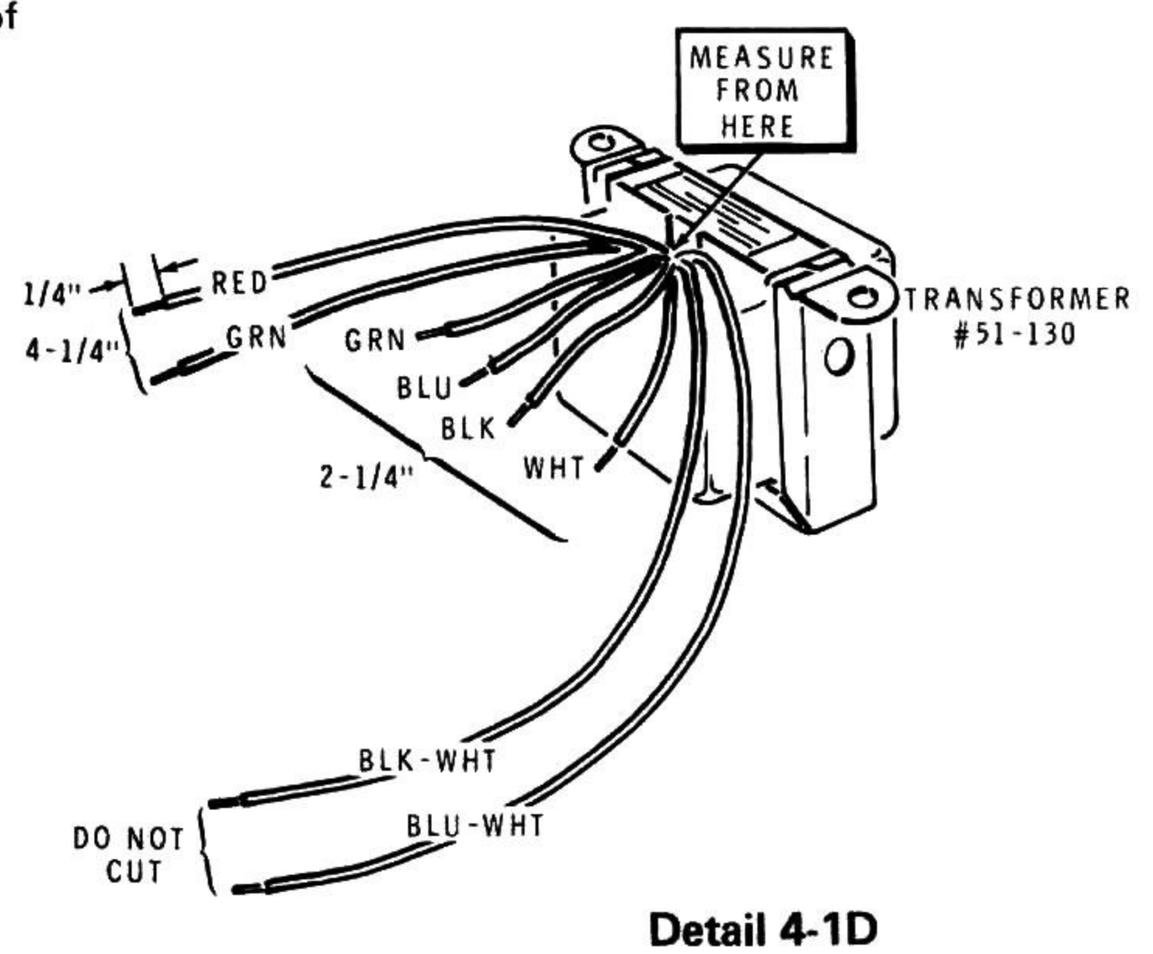
( ) Refer to Detail 4-1B and mount #6 solder lugs with 6-32 x 3/8" hardware at AD and AE. Position the solder lugs as shown in the Pictorial.

NOTE: Three transformers will be prepared in the following steps. Set each transformer aside after it has been prepared until it is called for in a step.

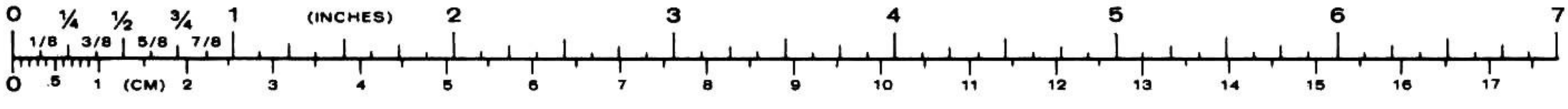


Detail 4-1C

( ) Refer to Detail 4-1C and prepare the leads of the power transformer (#54-870) as shown. Save the cut off lead lengths for use later.

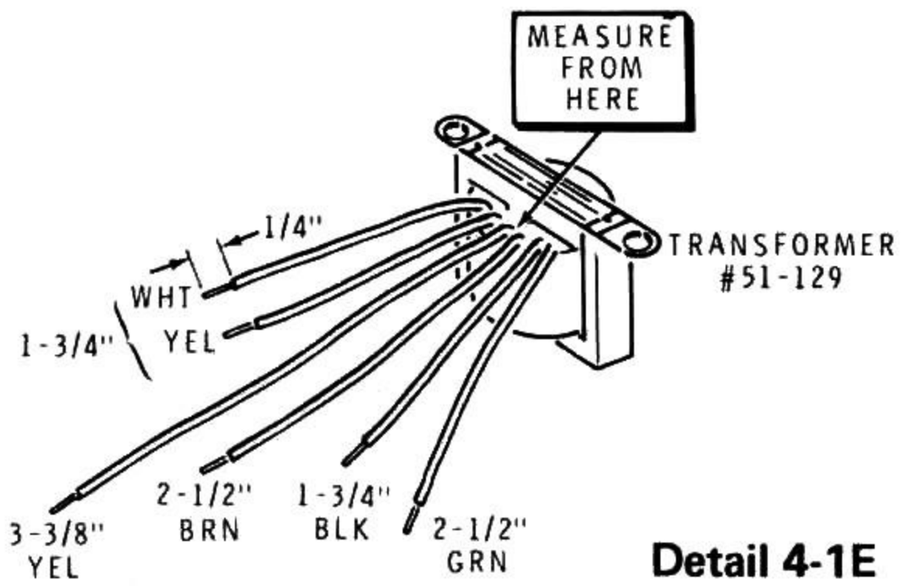


Detail 4-1D



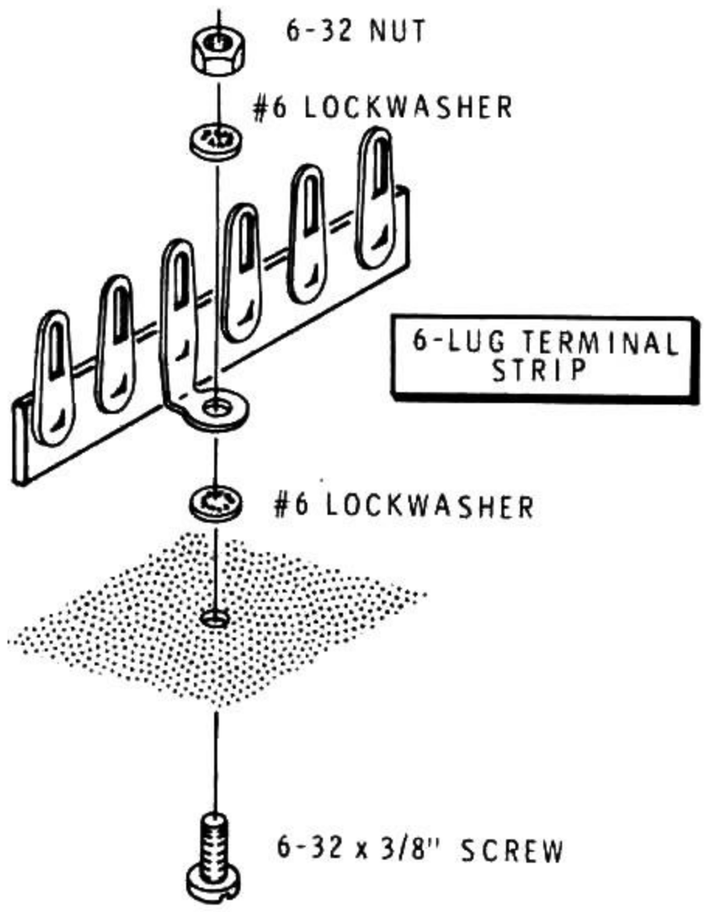
( ) Refer to Detail 4-1D and prepare the leads of the hybrid line transformer (#51-130) as shown.

CAUTION: Be very careful when you perform the next step as the transformer leads are quite small and can be easily damaged.



Detail 4-1E

( ) Refer to Detail 4-1E and prepare the leads of input transformer T3 (#51-129) as shown.

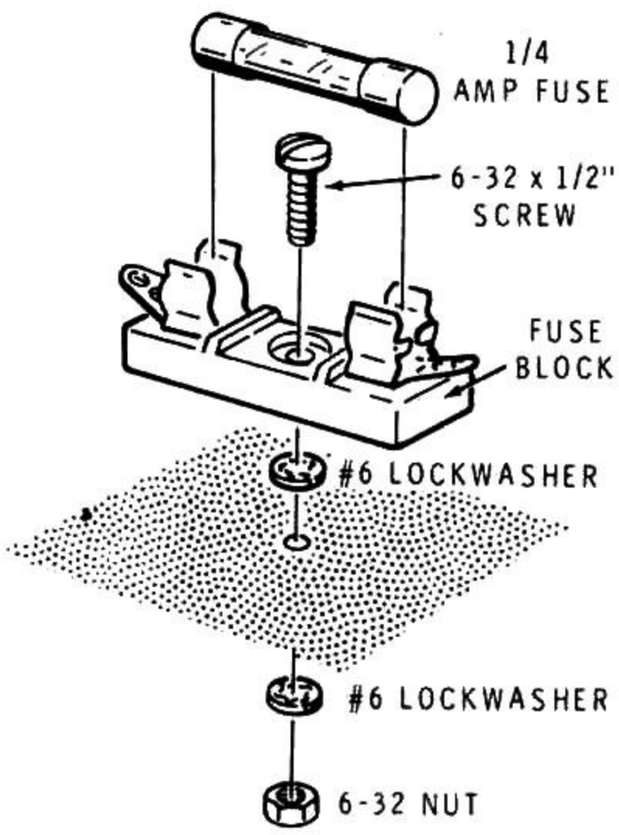


Detail 4-1F

( ) Refer to Detail 4-1F and, using 6-32 x 3/8" hardward, mount 6-lug terminal strips at AN and AP. Position the terminal strips as shown in the Pictorial.

( ) In a like manner, mount a 3-lug terminal strip at AU. Position the terminal strip as shown in the Pictorial.

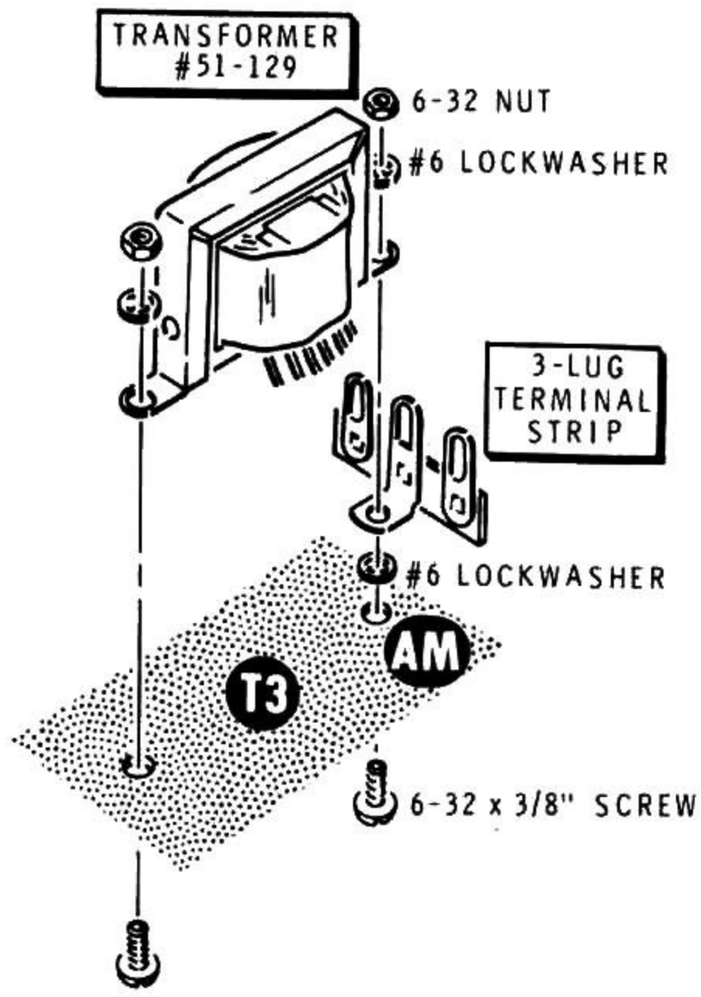
( ) In a similar manner, mount a 5-lug terminal strip at AL. Position the terminal strip as shown in the Pictorial.



Detail 4-1G

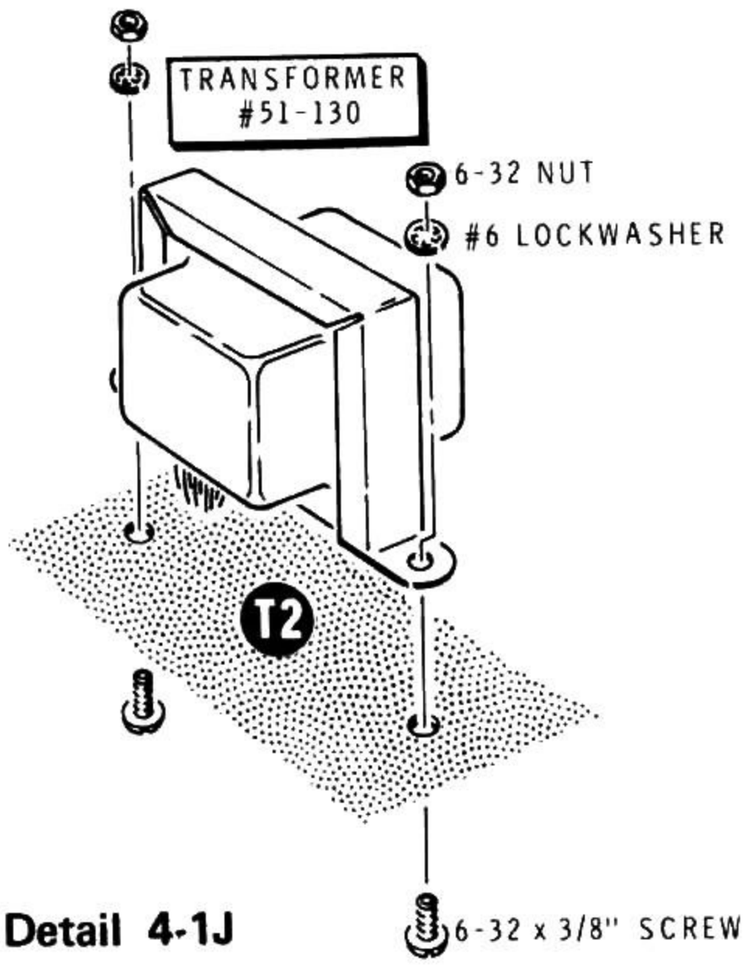
( ) Refer to Detail 4-1G and, using 6-32 x 1/2" hardware, mount the fuse block at AS. Position the fuse block as shown in the Pictorial.

( ) Push the 1/4-ampere fuse into the fuse block.



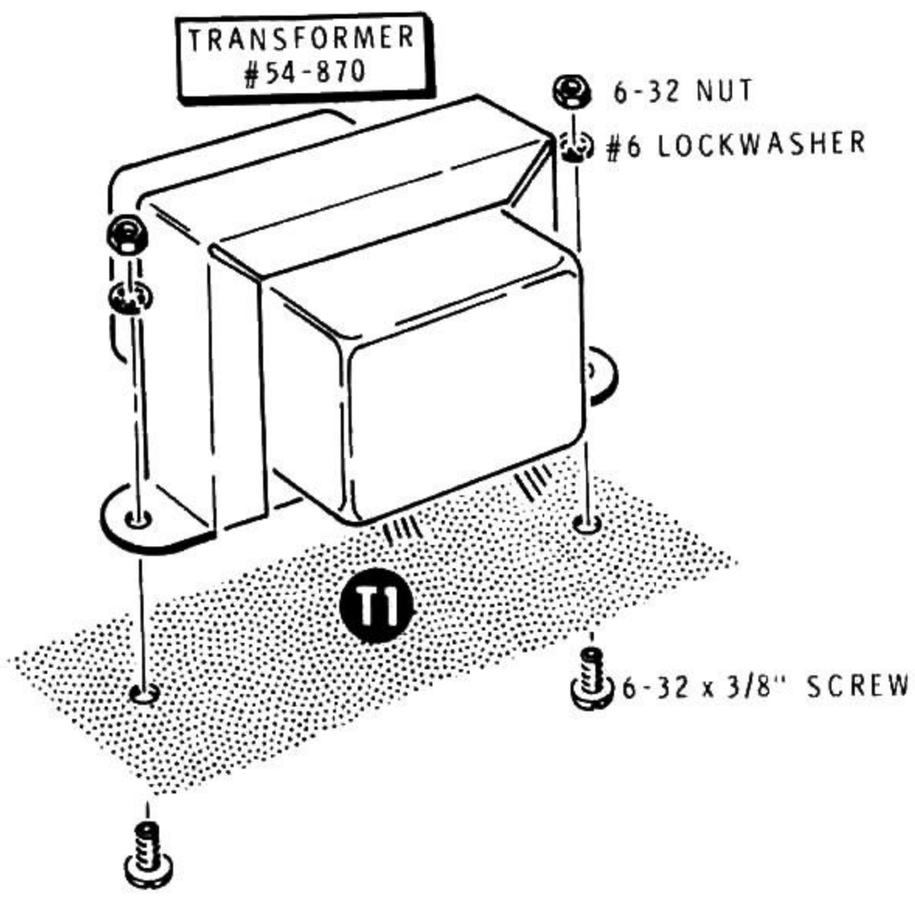
Detail 4-1H

( ) Refer to Detail 4-1H and mount prepared input transformer #51-129 at T3 with 6-32 x 3/8" hardware, and with a 3-lug terminal strip at AM. Position the transformer and terminal strip as shown in the Pictorial.



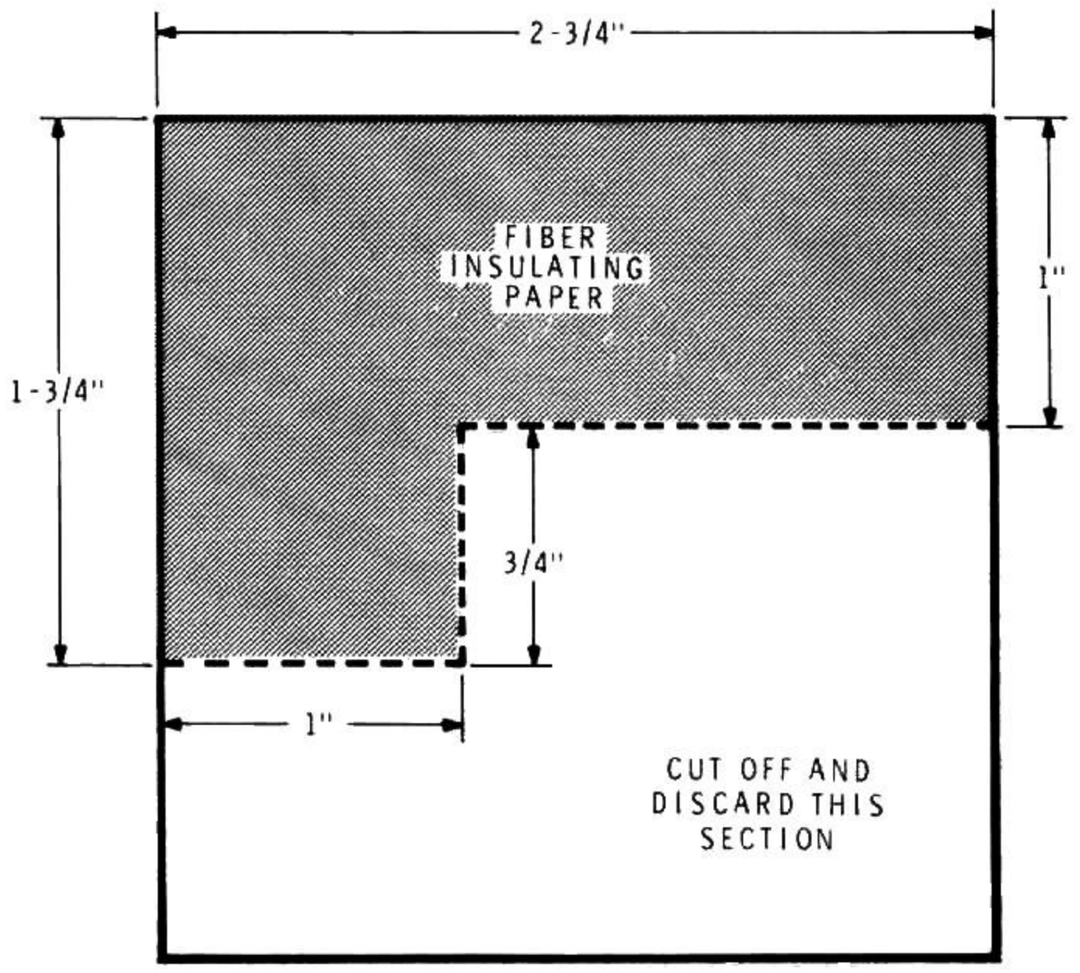
Detail 4-1J

( ) Refer to Detail 4-1J and mount the prepared hybrid line transformer #51-130 at T2 with 6-32 x 3/8" hardware. Position the transformer as shown in the Pictorial.



Detail 4-1K

( ) Refer to Detail 4-1K and mount the power transformer (#54-870) at T1 with 6-32 x 3/8" hardware. Position the transformer so the red leads are as shown in the Pictorial.



Detail 4-1L

( ) Refer to Detail 4-1L and prepare the insulating paper as shown. Mark the paper as indicated by the dashed lines. Then cut along the dashed lines and discard the indicated section.

( ) **Refer to the Pictorial and place the insulating paper on the chassis at the location shown by the shaded area on the Pictorial. Position it as shown by the indicated dimensions; then mark the chassis around the insulating paper.**

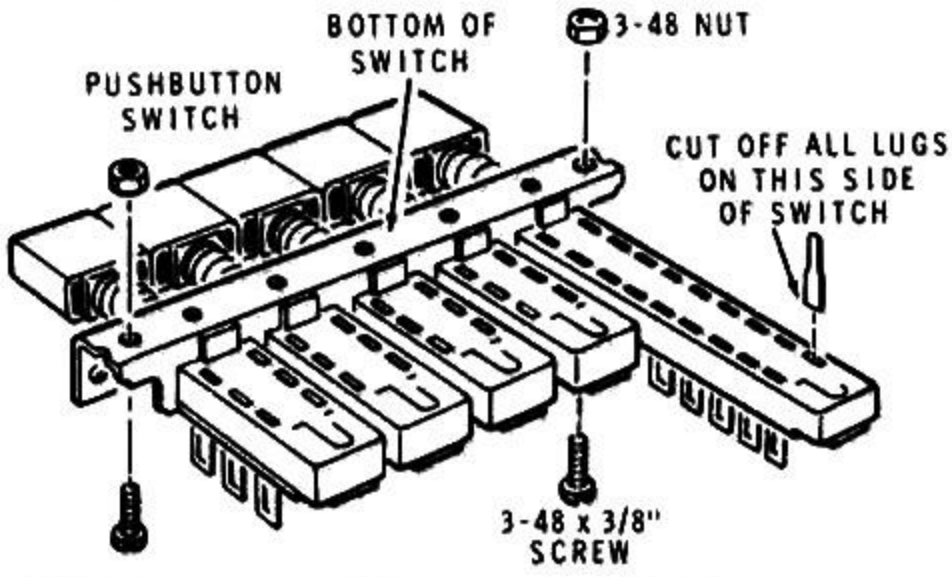
( ) Remove the backing paper from the insulating paper. Then press it in position within the marked area on the chassis.

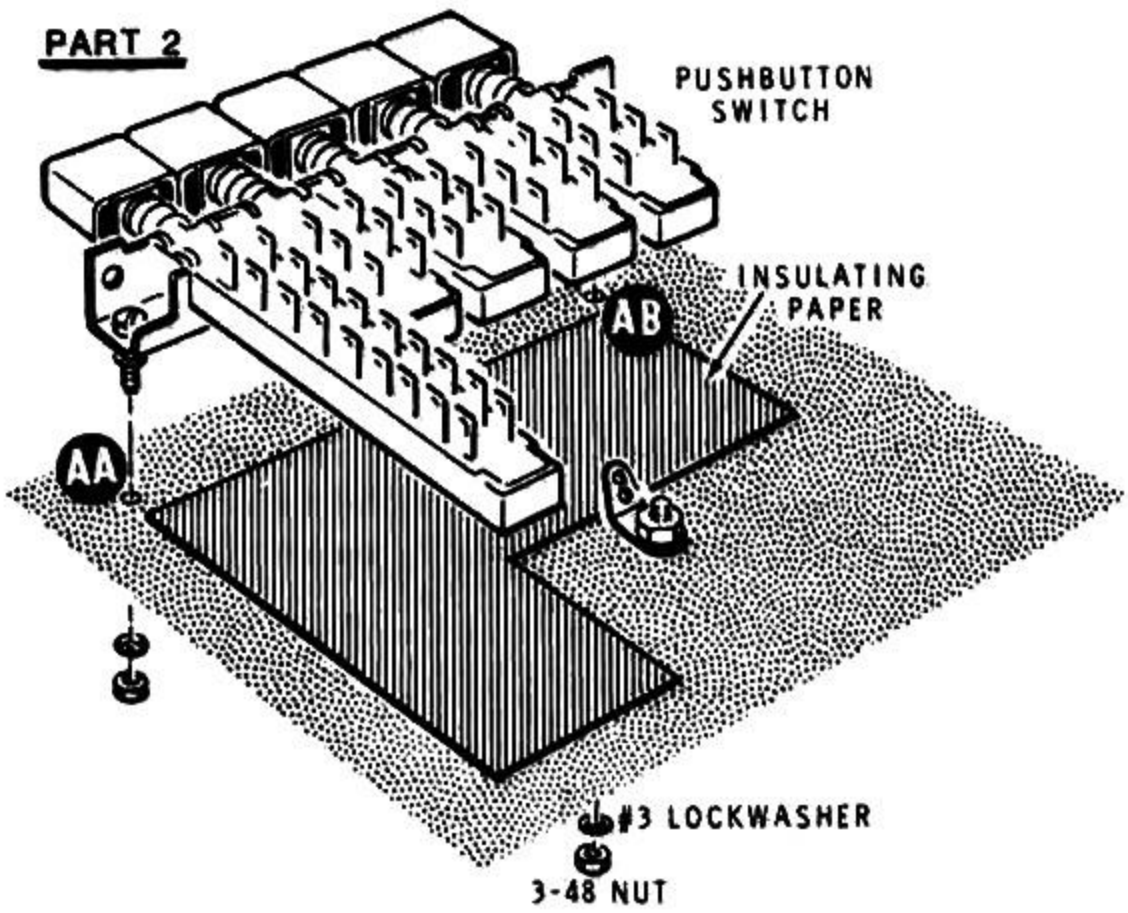
Refer to Part 1 of Detail 4-1M for the following steps.

( ) **Install 3-48 x 3/8" screws and 3-48 nuts at the two indicated locations in the pushbutton switch assembly, and securely tighten the hardware. NOTE: You may have to turn the screws into the holes in the bottom of the switch assembly.**

( ) Use a pair of diagonal cutters and cut off all of the lugs on the bottom of the pushbutton switch assembly. NOTE: Be sure none of the cut off lugs get inside of the switch assembly.

( ) Refer to Part 2 of Detail 4-1M and mount the pushbutton switch assembly on the chassis over the insulating paper. Insert the screws through holes AA and AB. Then secure the assembly to the chassis with two #3 lockwashers and 3-48 nuts.



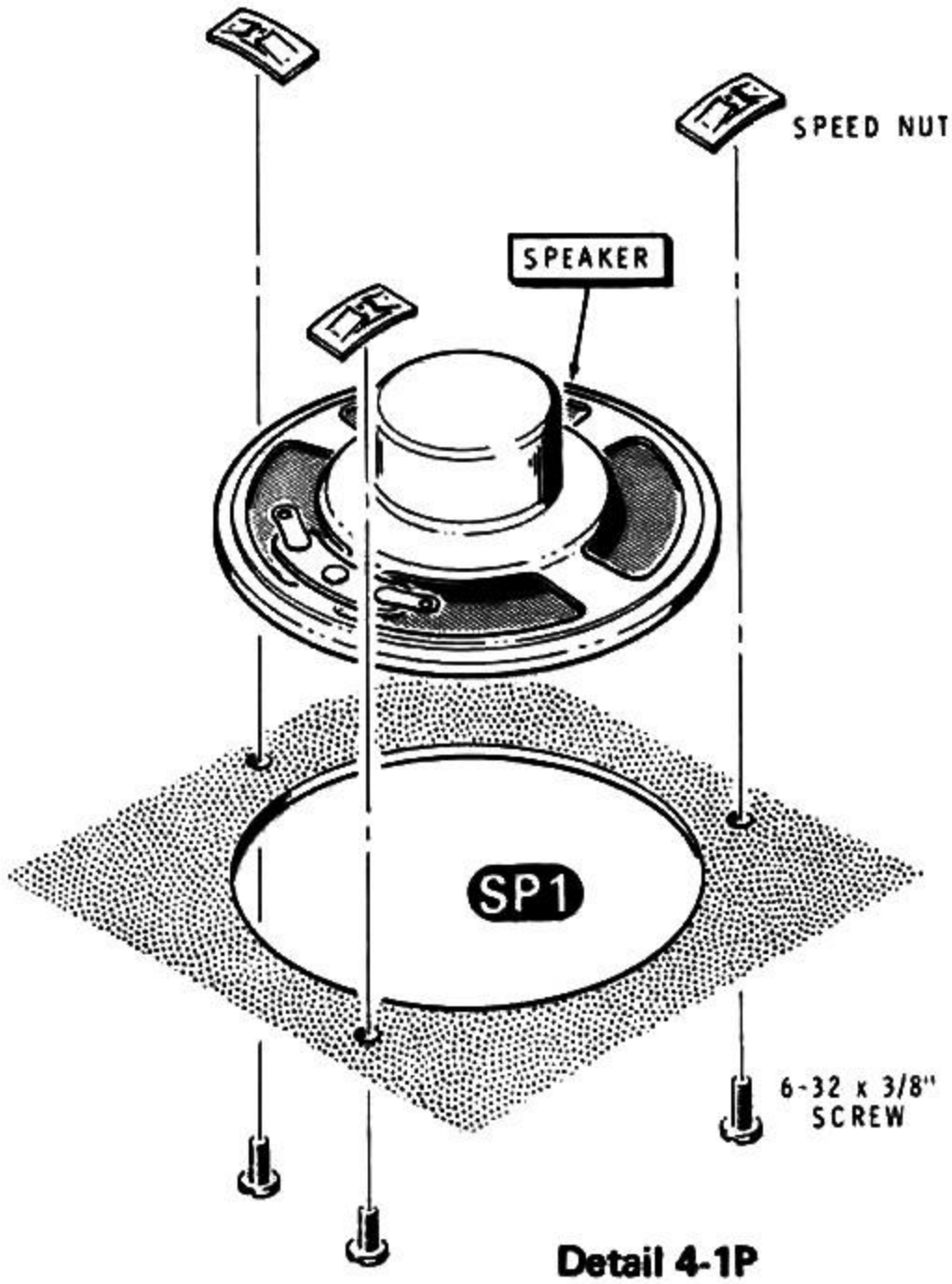


Detail 4-1M

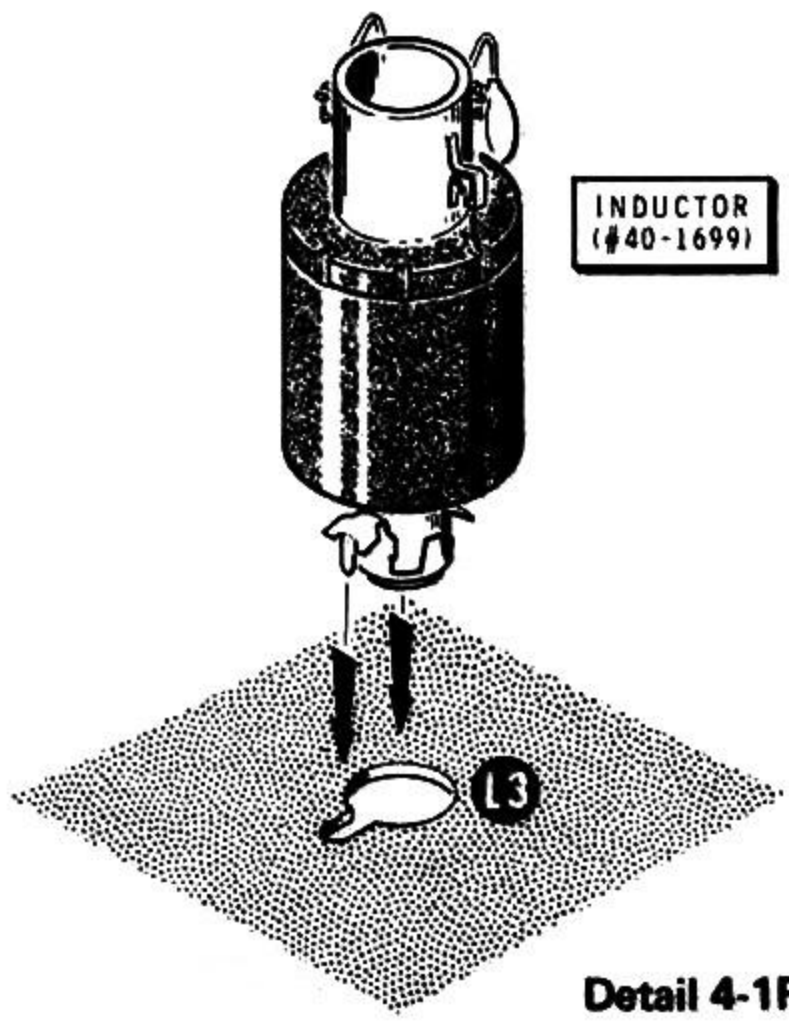
( ) Refer to Detail 4-1P and mount the speaker at SP1 with 6-32 x 3/8" hardware. Position the speaker as shown in the Pictorial.

( ) Cut a 3" square piece of cardboard and, from the bottom of the chassis, tape the cardboard over the exposed speaker. This will prevent damaging the speaker during assembly.

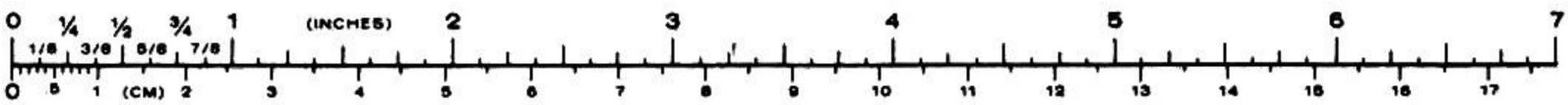
( ) Refer to Detail 4-1R and mount the inductor (#40-1699) at L3. Position the inductor as shown in the Pictorial.

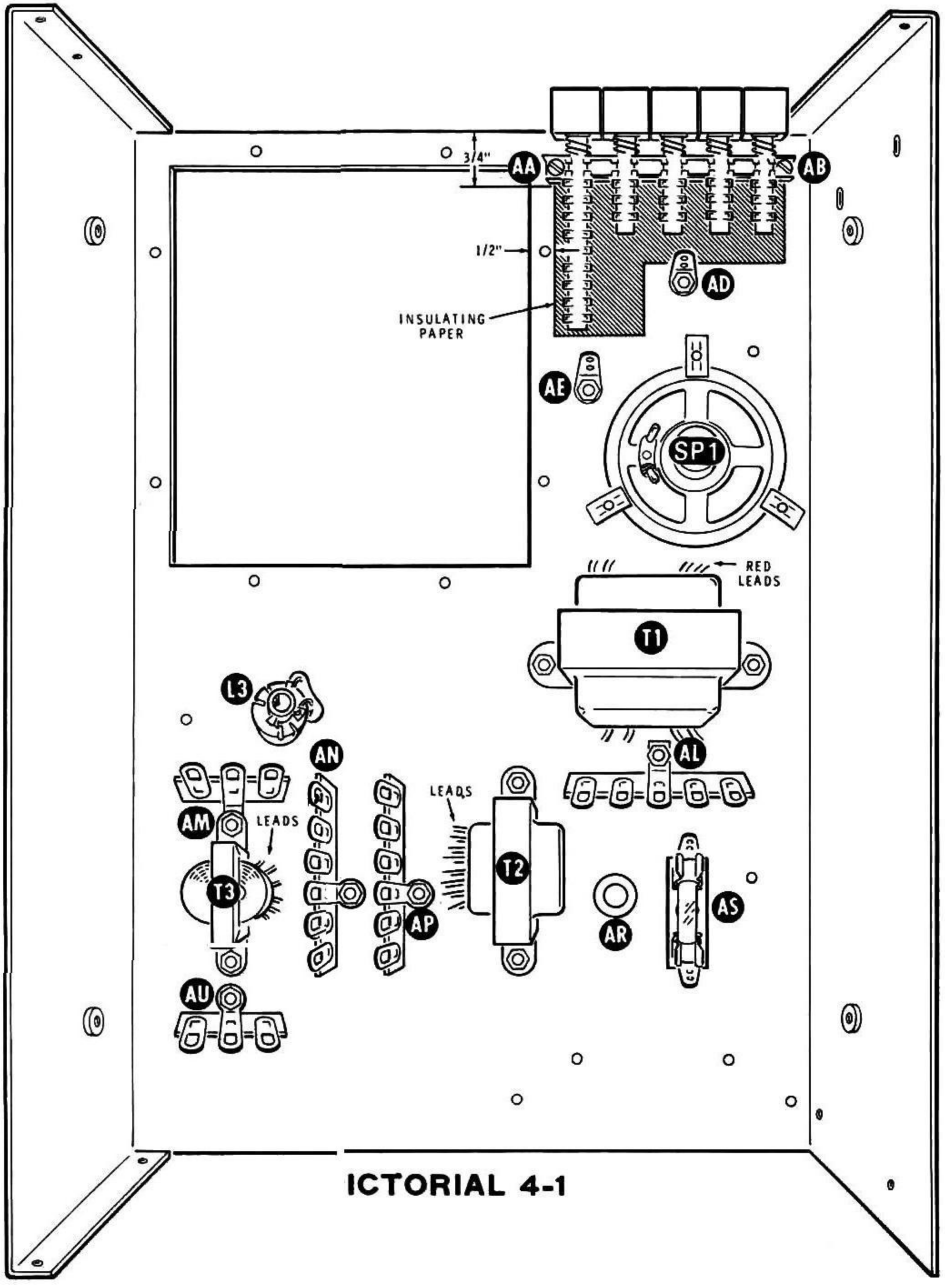


Detail 4-1P

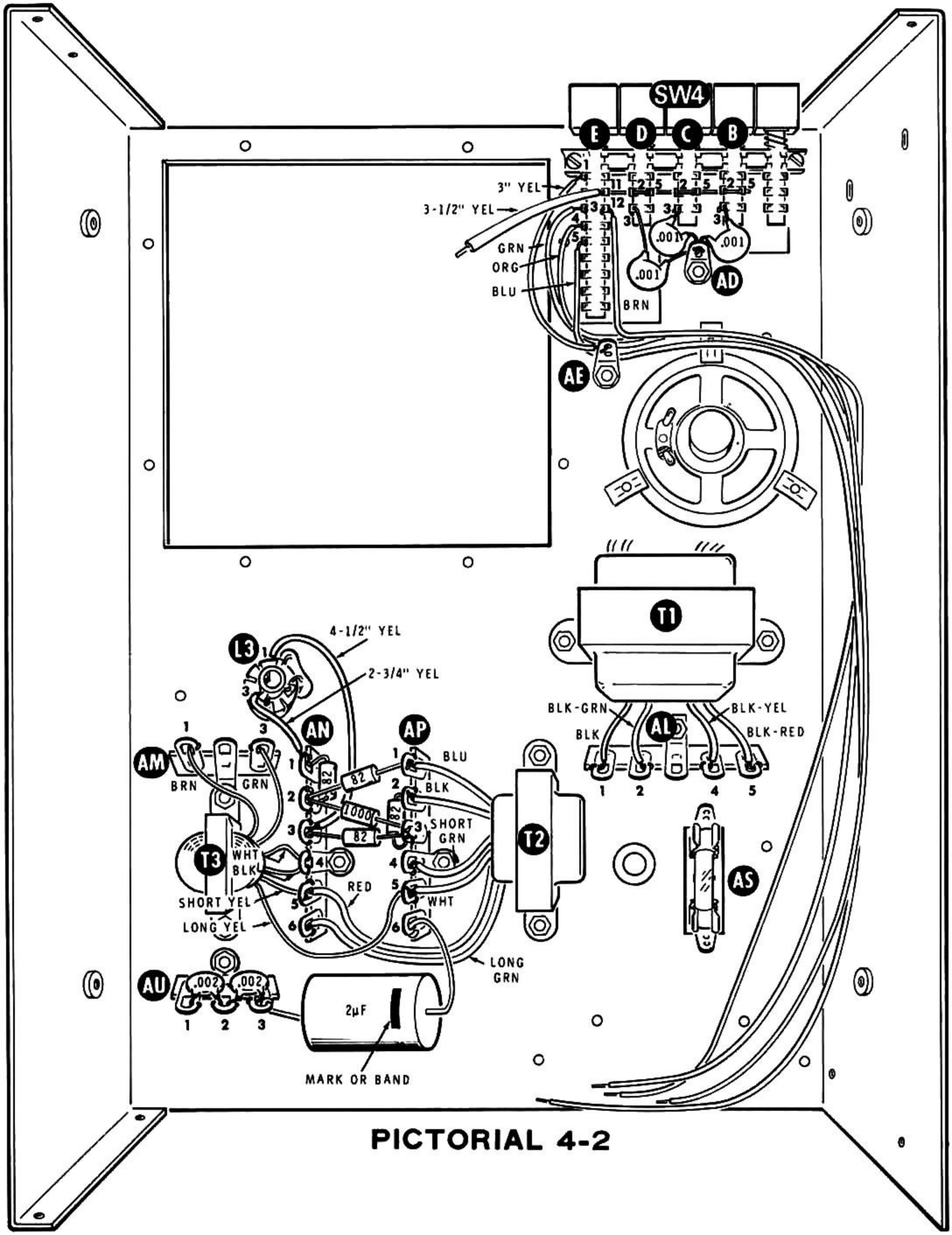


Detail 4-1R

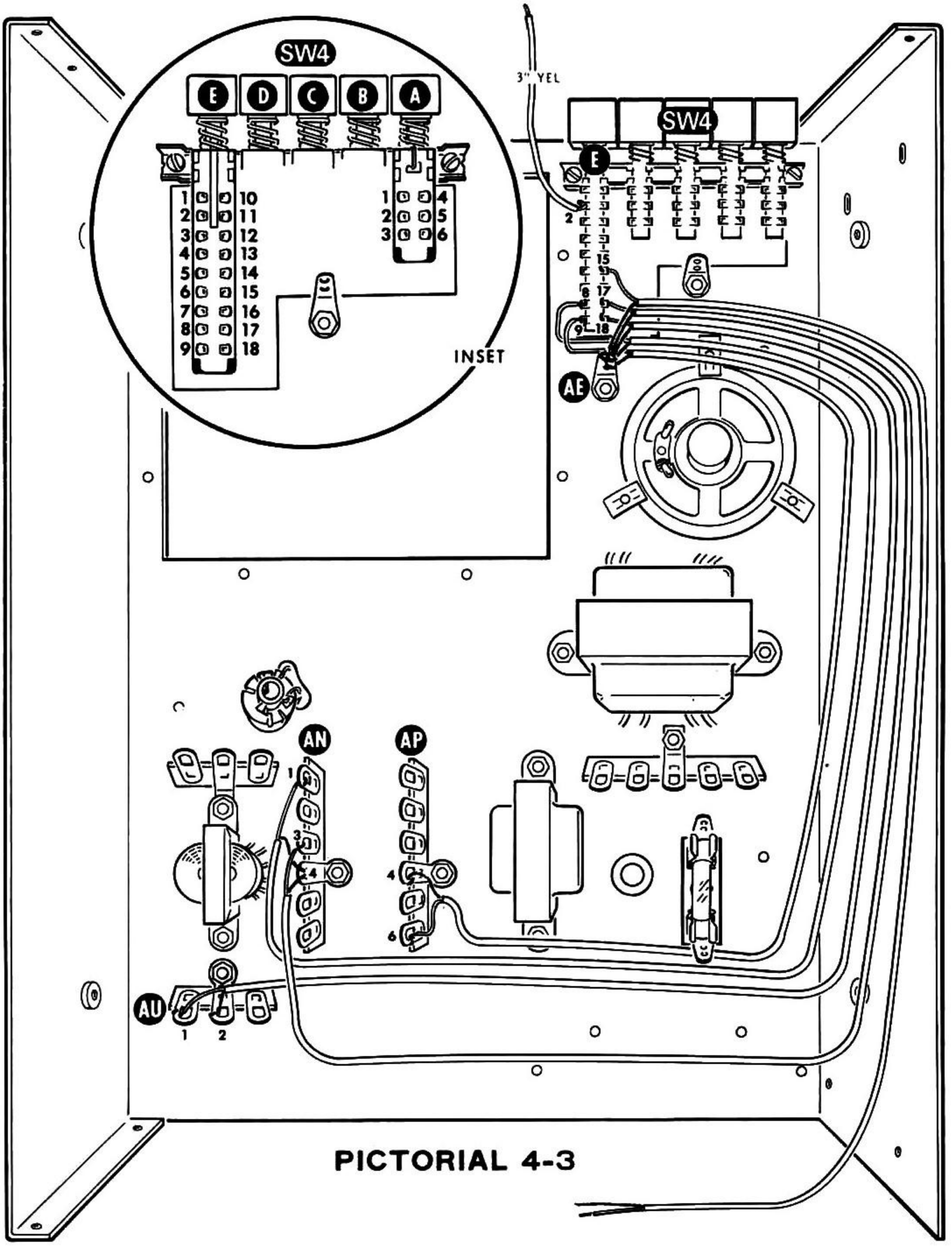



3/4"
1/2"
AA
AB
AD
INSULATING PAPER
AE
SP1
RED LEADS
T1
L3
AN
AM
LEADS
T3
AP
AU
LEADS
T2
AR
AS
AL

ICTORIAL 4-1



PICTORIAL 4-2



PICTORIAL 4-3

PRELIMINARY WIRING

NOTE: In the following steps, (NS) means not to solder because another wire (or wires) will be added later. The letter S with a number, such as (S-3), means to solder the connection. The number that follows the letter S tells the number of wires at the connection.

Refer to Pictorial 4-2 (fold-out from this page) for the following steps. NOTE: Refer to the inset drawing on Pictorial 4-3 for switch SW4 lug numbers.

( ) C1: Connect a .001 µF disc capacitor from switch SW4B lug 3 (NS) to solder lug AD (NS).

( ) C2: Connect a .001 µF disc capacitor from switch SW4C lug 3 (NS) to solder lug AD (NS).

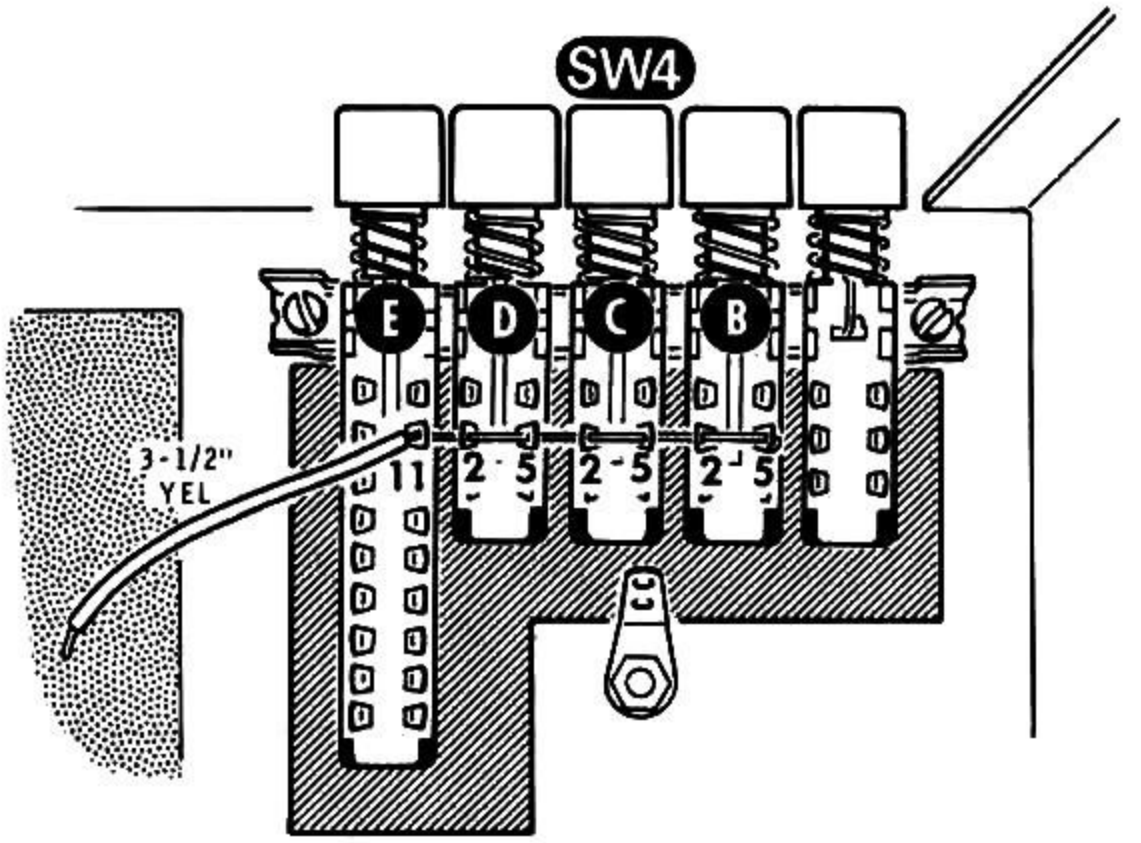
( ) C3: Connect a .001 µF disc capacitor from switch SW4D lug 3 (NS) to solder lug AD (NS).

NOTE: When wire is called for in a step, cut the wire to the proper length and remove 1/4" of insulation from each end unless directed otherwise in the step.

( ) Remove 1/4" of insulation from one end and 1-5/8" of insulation from the other end of a 3-1/2" yellow wire.

NOTE: When a wire passes through a connection and goes to another point, as in the next step, it will count as two wires in the solder instructions (S-2), one entering and one leaving the connection. When you solder these connections, be sure you use enough solder and heat to properly solder these "through wires."

( ) Refer to Detail 4-2A and insert the longer bare end of the 3-1/2" yellow wire through lug 11 of switch SW4E; then on through lugs 2 and 5 of switches SW4D, SW4C, and SW4B. Now solder the wire to the seven switch lugs. The free end of the wire will be connected later.



Detail 4-2A

( ) Connect a 3" yellow wire from SW4E lug 1 (S-1) to solder lug AE (NS).

T1: Connect the black, black-green, black-yellow, and black-red power transformer leads to terminal strip AL as follows. NOTE: Make mechanically secure connections before soldering.

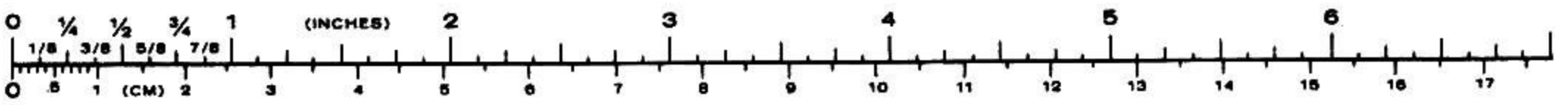
( ) Black to lug 1 (NS).

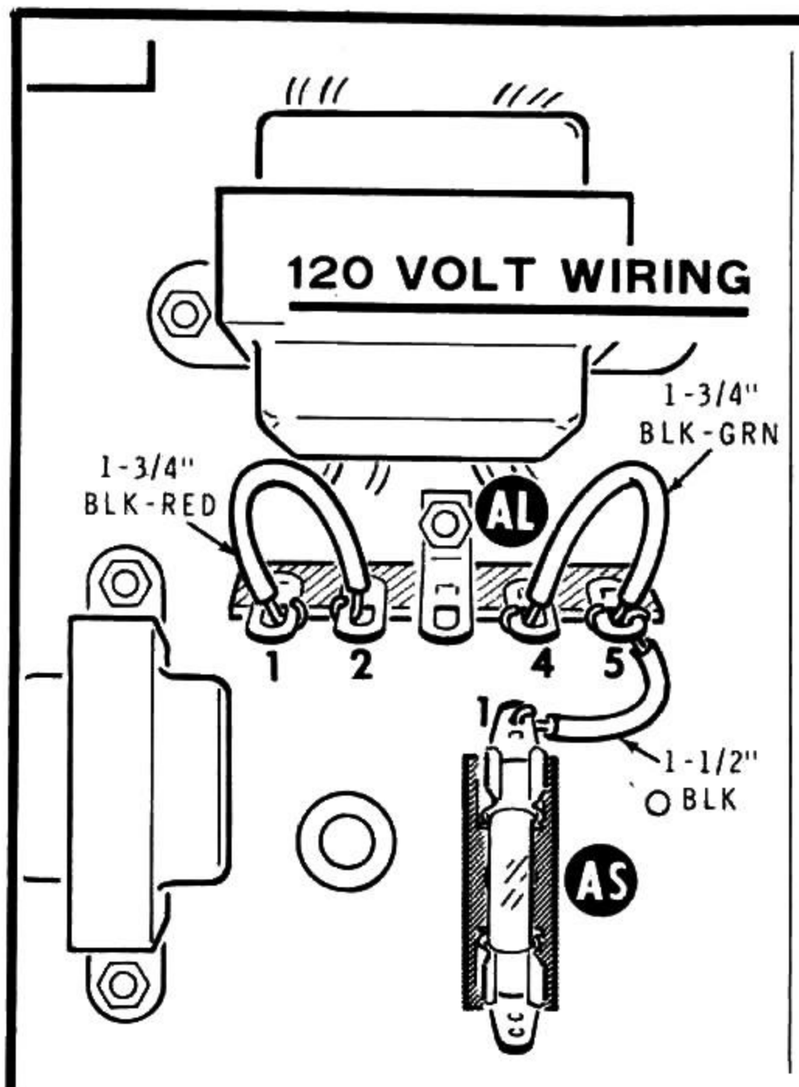
( ) Black-green to lug 2 (NS).

( ) Black-yellow to lug 4 (NS).

( ) Black-red to lug 5 (NS).

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





Detail 4-2B

120 VAC Wiring

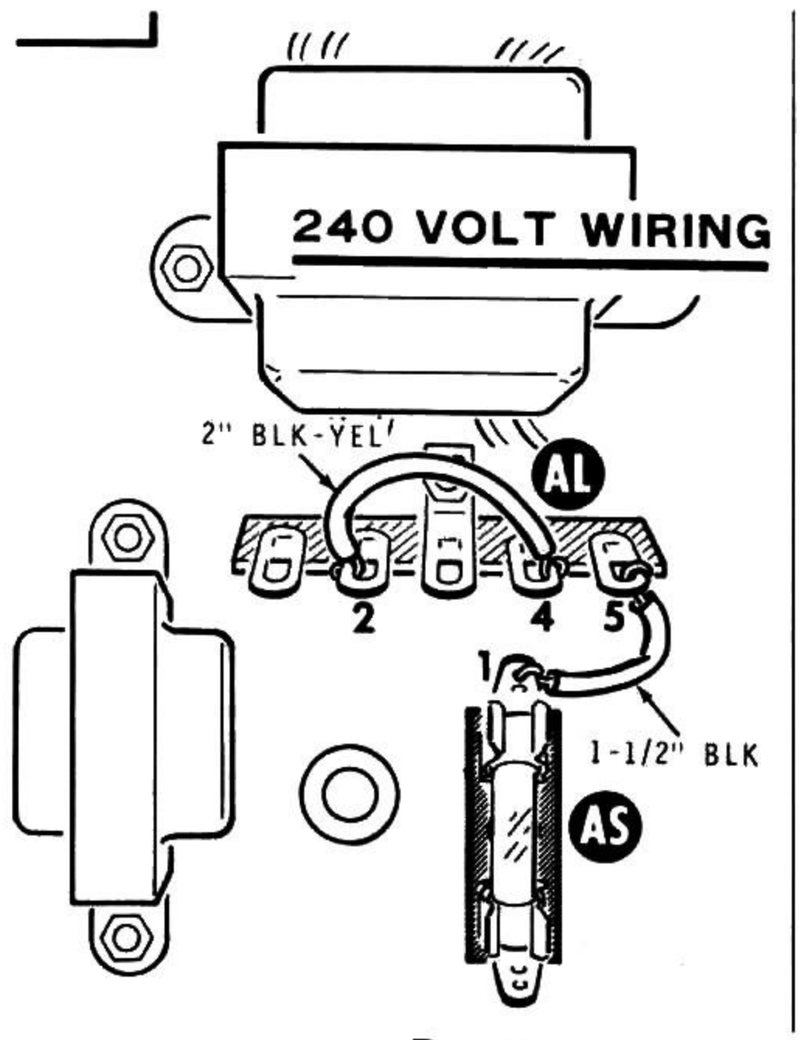
NOTE: Make mechanically secure connections before you solder.

( ) Locate the lengths of wire saved when you prepared the power transformer leads. Then prepare a 1-1/2" length of the black wire.

( ) Connect the black wire from fuse block AS lug 1 (S-1) to terminal strip AL lug 5 (NS).

( ) Prepare a 1-3/4" length of black-green wire. Then connect this wire between terminal strip AL lugs 4 (S-2) and 5 (S-3).

( ) Prepare a 1-3/4" length of black-red wire. Then connect this wire between terminal strip AL lug 1 (NS) and lug 2 (S-2).



Detail 4-2C

240 VAC Wiring

NOTE: Make mechanically secure connections before you solder.

( ) Locate the lengths of wire saved when you prepared the power transformer leads. Then prepare a 1-1/2" length of the black wire.

( ) Connect the black wire from fuse block AS lug 1 (S-1) to terminal strip AL lug 5 (S-2).

( ) Prepare a 2" length of black-yellow wire.

( ) Connect the black-yellow wire between terminal strip AL lug 2 (S-2) and lug 4 (S-2).

T2: Connect the leads of the hybrid line transformer to terminal strip AP as follows. Position all leads down against the chassis.

( ) Blue to lug 1 (NS).

( ) Black to lug 2 (NS).

( ) Shorter green to lug 4 (NS).

( ) White to lug 5 (NS).

( ) Other green to terminal strip AN lug 6 (NS).

( ) Red to terminal strip AN lug 5 (NS).

NOTE: The blue-white and the black-white leads will be connected later.

T3: Connect the leads of the input transformer as follows. Position all leads down against the chassis.

( ) Brown to terminal strip AM lug 1 (NS).

( ) Green to terminal strip AM lug 3 (NS).

( ) White to terminal strip AN lug 4 (NS).

( ) Black to terminal strip AN lug 4 (NS).

( ) Shorter yellow to terminal strip AN lug 5 (S-2).

( ) Other yellow to terminal strip AP lug 5 (S-2).

( ) Connect a 2-3/4" yellow wire from L3 lug 3 (S-1) to terminal strip AN lug 1 (NS). Position the wire as shown in the Pictorial.

( ) Connect a 4-1/2" yellow wire from L3 lug 1 (S-1) to terminal strip AN lug 3 (NS). Position the wire as shown in the Pictorial.

( ) R6: Connect an 82 Ω (gray-red-black) resistor between terminal strip AN lugs 1 (NS) and 2 (NS).

( ) R7: Connect an 82 Ω (gray-red-black) resistor from terminal strip AP lug 1 (S-2) to terminal strip AN lug 2 (NS).

( ) R11: Connect an 82 Ω (gray-red-black) resistor between terminal strip AP lugs 3 (NS) and 2 (S-2).

( ) R8: Connect a 1000 Ω (brown-black-red) resistor from terminal strip AN lug 2 (S-3) to terminal strip AP lug 3 (NS).

( ) R9: Connect an 82 Ω (gray-red-black) resistor from terminal strip AP lug 3 (S-3) to terminal strip AN lug 3 (NS).

NOTE: In the next two steps, position the capacitors flat against the terminal strip as shown in the Pictorial.

( ) C8: Connect a .002 μF disc capacitor between terminal strip AU lugs 1 (NS) and 2 (NS).

( ) C7: Connect a .002 μF disc capacitor between terminal strip AU lugs 2 (NS) and 3 (NS).

( ) C11: Connect the lead at the marked or banded end of a 2 μF Mylar capacitor to terminal strip AP lug 6 (NS). Connect the other lead to terminal strip AU lug 3 (NS).

( ) Prepare the following lengths of wire:

20" brown
21" blue
21" orange
21" green

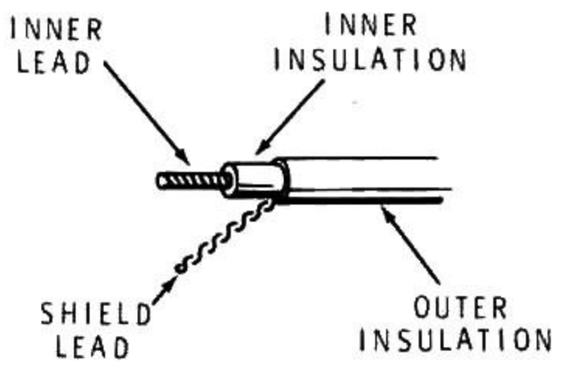
Connect one end of the brown, blue, orange, and green wires to switch SW4E as follows:

( ) Brown to lug 12 (S-1).

( ) Blue to lug 5 (S-1).

( ) Orange to lug 4 (S-1).

( ) Green to lug 3 (S-1).

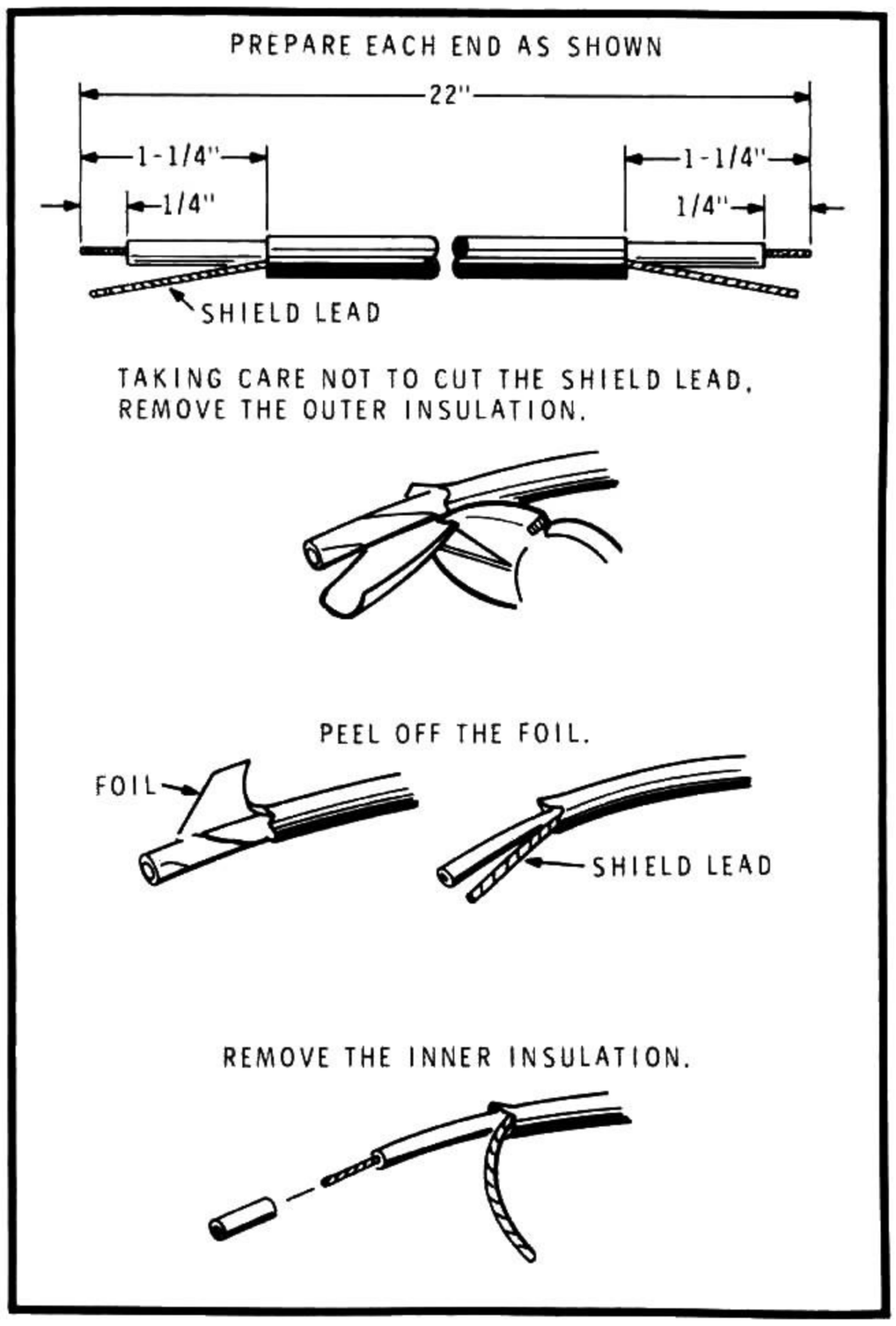


Detail 4-3A

Refer to Pictorial 4-3 (fold-out from Page 56) for the following steps.

( ) Connect one end of a 3" yellow wire to switch SW4E lug 2 (S-1). The other end of the wire will be connected later.

NOTE: Refer to Detail 4-3A to identify the leads of shielded cables.



Detail 4-3B

( ) Refer to Detail 4-3B and prepare three 22" shielded cables as shown.

( ) Connect the inner lead at one end of one of the shielded cables to switch SW4E lug 8 (S-1) and the shield lead to solder lug AE (NS).

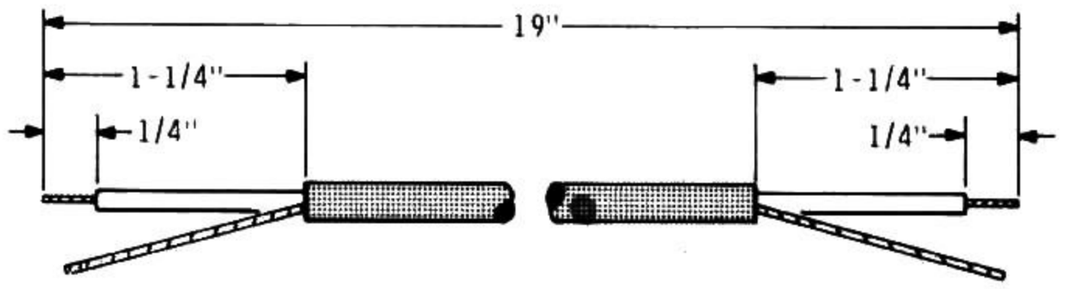
( ) At the other end of the cable, connect the inner lead to lug 1 (NS) and the shield lead to lug 4 (NS) of terminal strip AN.

( ) Use another prepared shielded cable and connect the inner lead at one end to switch SW4E lug 18 (S-1) and the shield lead to solder lug AE (NS).

( ) At the other end of the cable, connect the inner lead to lug 1 (NS) and the shield lead to lug 2 (NS) of terminal strip AU.

( ) Use the remaining prepared shielded cable and connect the inner lead at one end to switch SW4E lug 17 (S-1) and the shield lead to solder lug AE (NS)

( ) At the other end of the cable, connect the inner lead to lug 3 (NS) and the shield lead to lug 4 (S-4) of terminal strip AN.



Detail 4-3C

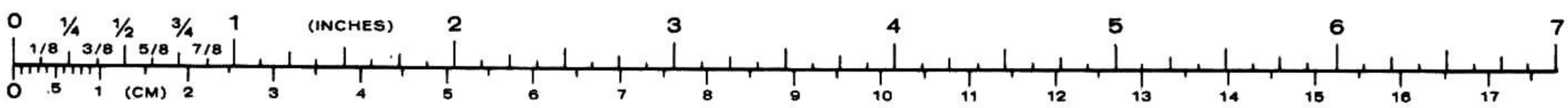
( ) Refer to Detail 4-3C and prepare two 19" shielded cables as shown.

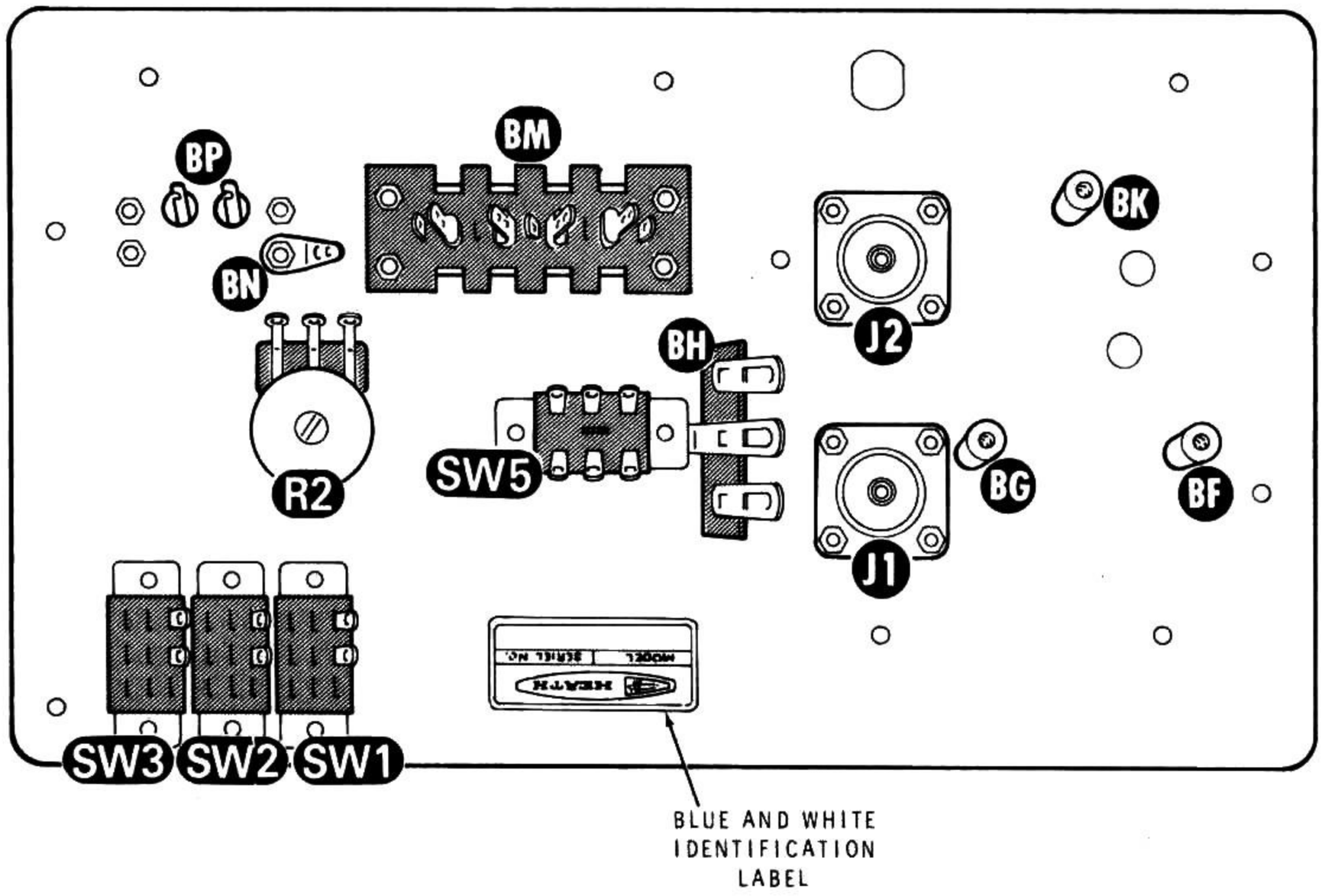
( ) Connect the inner lead at one end of one of the shielded cables to switch SW4E lug 9 (S-1) and the shield lead to solder lug AE (NS).

( ) At the other end of the cable, connect the inner lead to lug 6 (S-2) and the shield lead to lug 4 (S-2) of terminal strip AP.

( ) Use the remaining prepared shielded cable and connect the inner lead at one end to switch SW4E lug 15 (S-1), and the shield lead to solder lug AE (S-6). The other end of the cable will be connected later.

( ) Position the four wires and five shielded cables down and out of the way in the corner of the chassis. The free ends of the four wires and one shielded cable will be connected later.

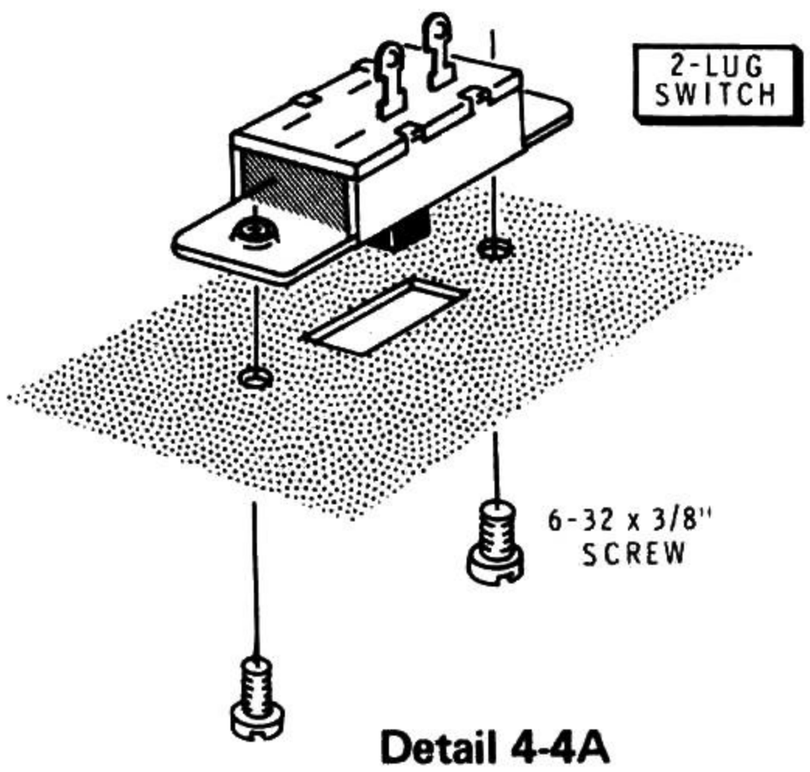




PICTORIAL 4-4

REAR PANEL PARTS

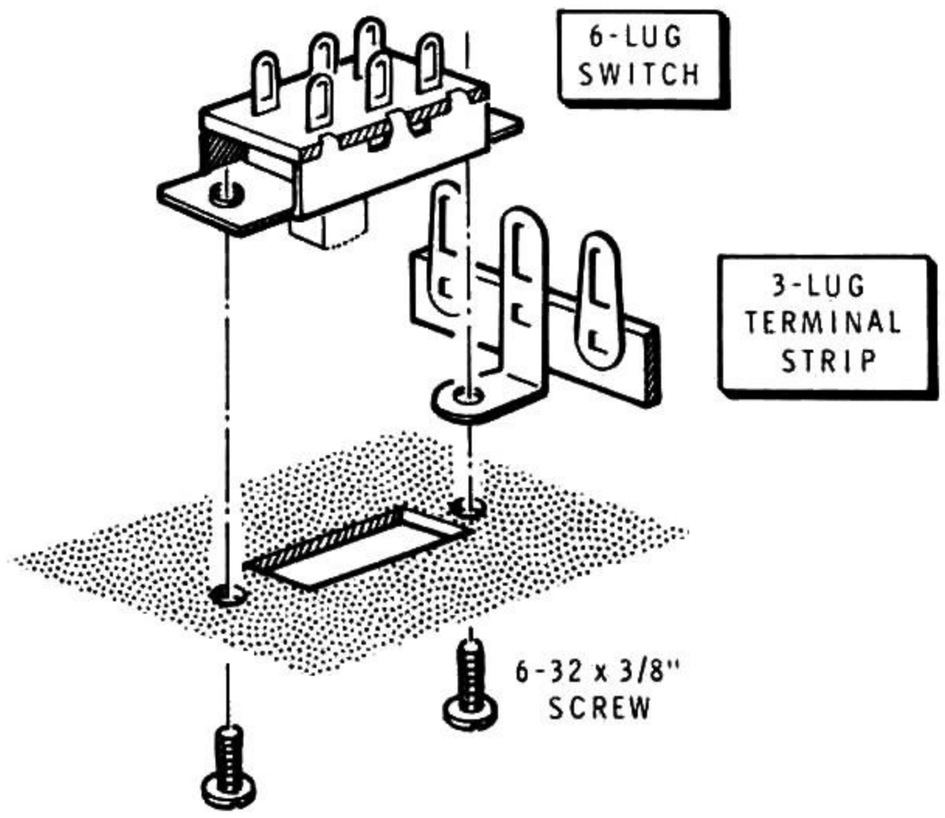
Refer to Pictorial 4-4 for the following steps.



Detail 4-4A

( ) SW1: Refer to Detail 4-4A and mount a 2-lug switch (#60-6) at SW1 with 6-32 x 3/8" hardware. Position the switch as shown in the Pictorial.

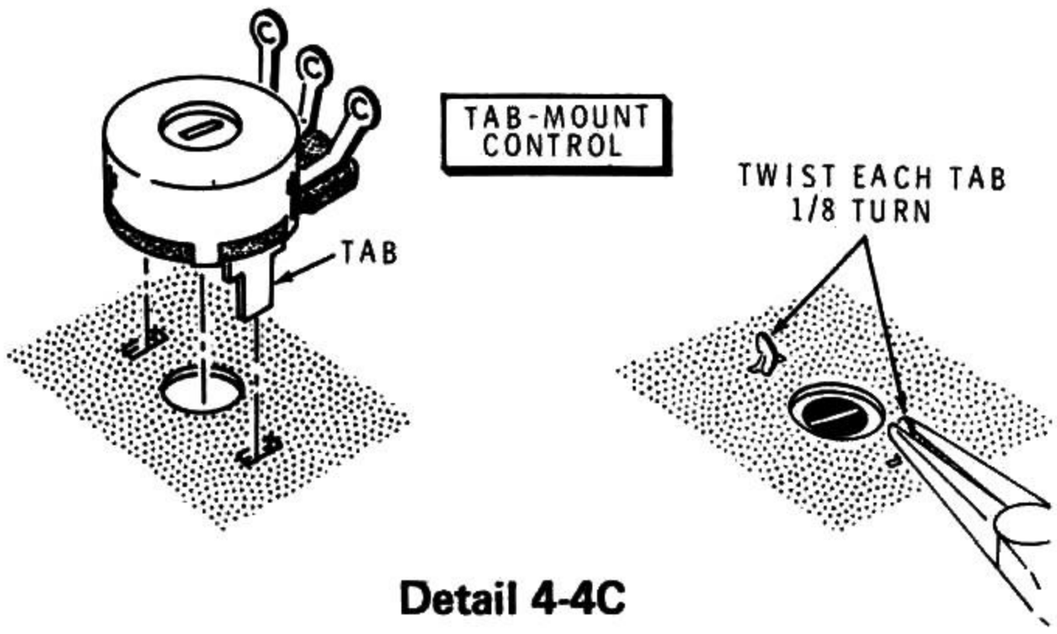
( ) SW2 and SW3: In like manner, mount 2-lug switches at SW2 and SW3.



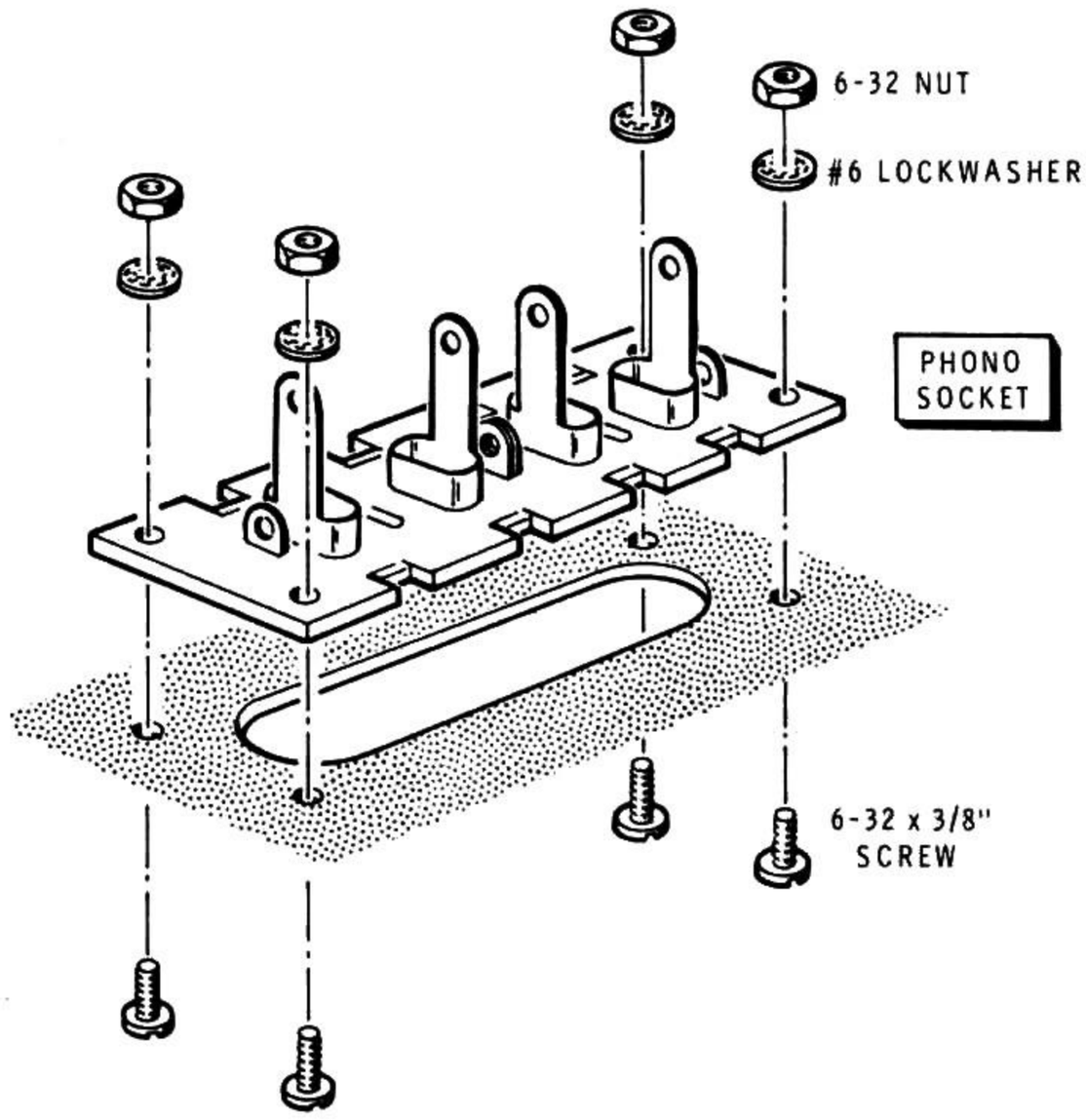
Detail 4-4B

( ) SW5: Refer to Detail 4-4B and, using 6-32 x 3/8" hardware, mount a 6-lug switch at SW5, with a 3-lug terminal strip at BH. Position the terminal strip as shown in the Pictorial.

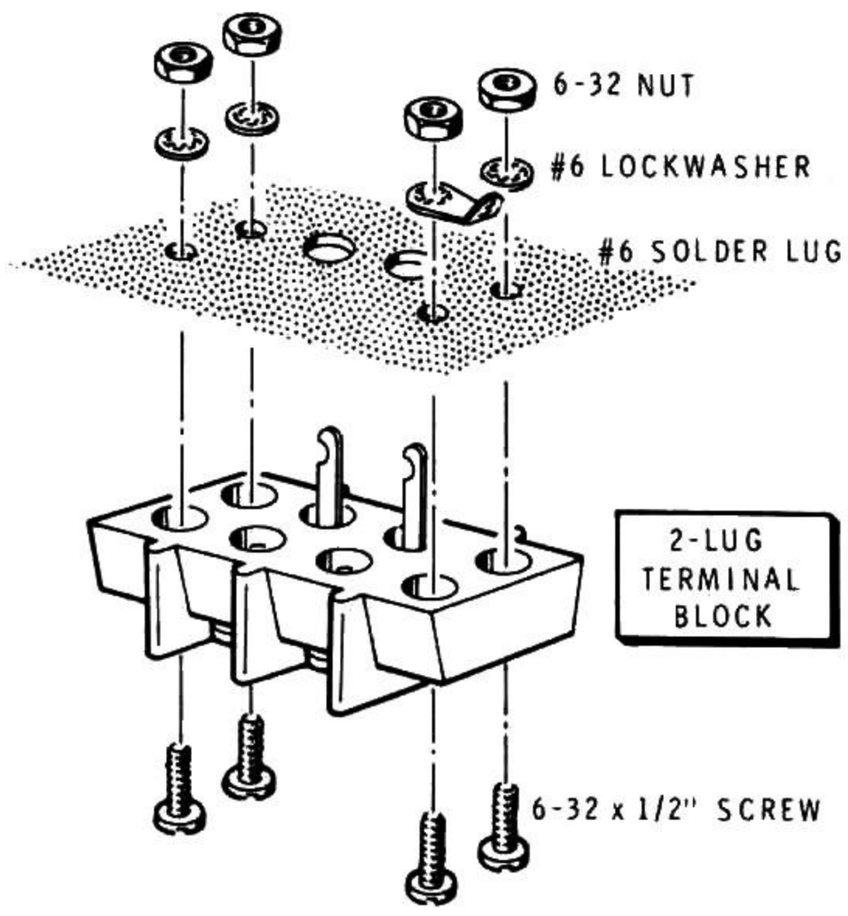
( ) R2: Refer to Detail 4-4C and mount a 2000 Ω tab-mount control at R2. Position the control as shown in the Pictorial. Twist each tab 1/8 turn.



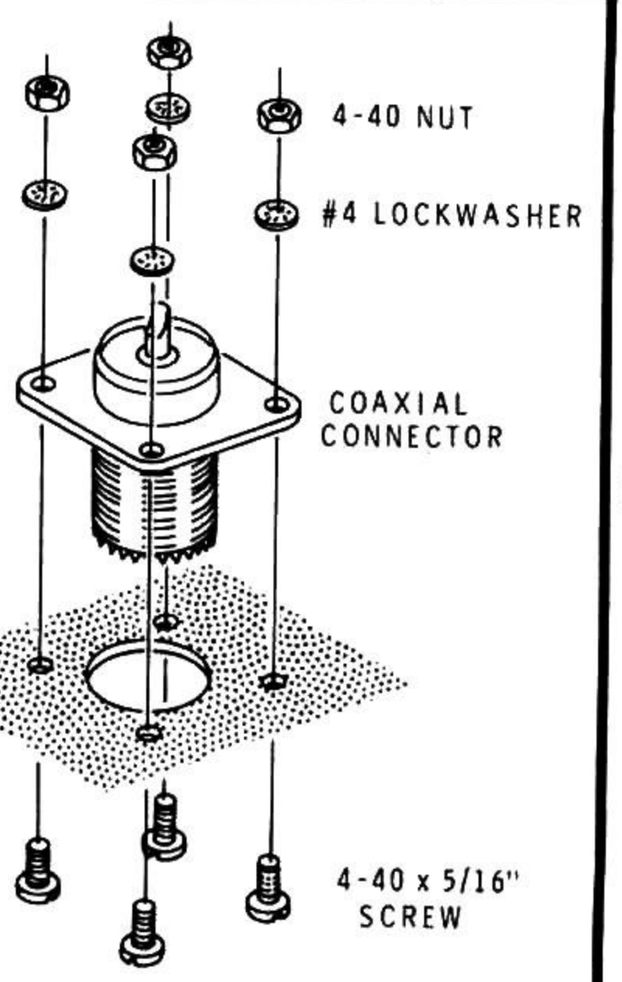
Detail 4-4C



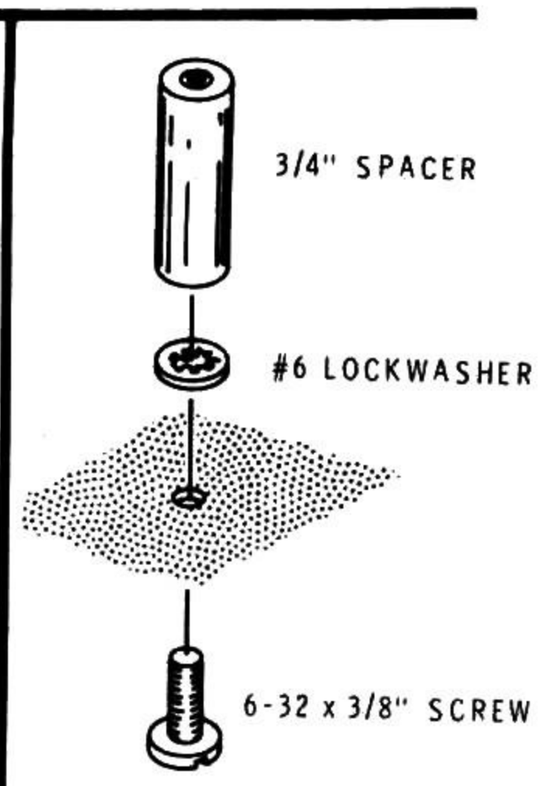
Detail 4-4E



Detail 4-4D



Detail 4-4F



Detail 4-4G

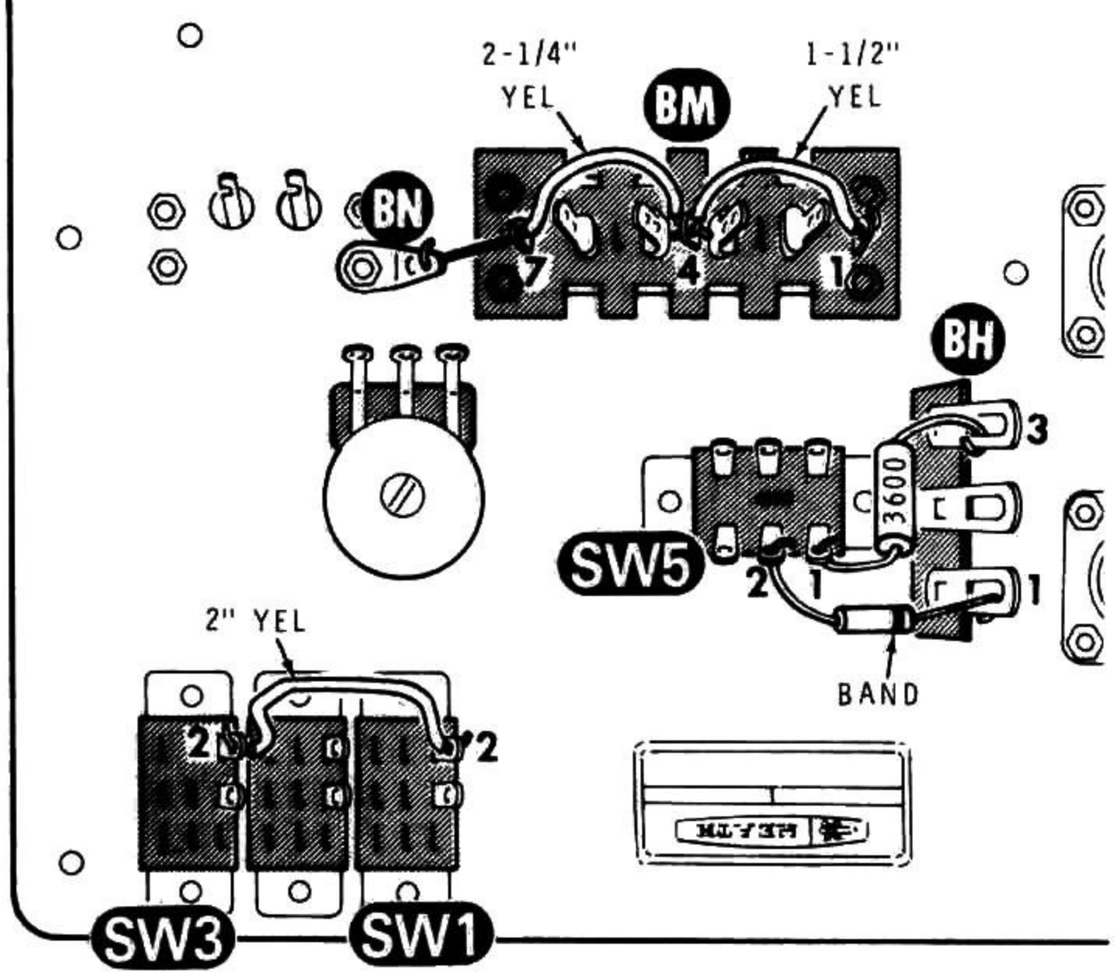
( ) Refer to 4-4D and mount a 2-lug terminal block on the outside of the panel at BP with 6-32 x 1/2" hardware. Use a #6 solder lug on the inside of the panel at BN. Position the terminal block and solder lug as shown in the Pictorial.

( ) Refer to Detail 4-4E and mount the phono socket at BM with 6-32 x 3/8" hardware. NOTE: Temporarily insert phono plugs in the two end sockets before you tighten the hardware. This will insure proper positioning of the phono socket.

( ) Refer to Detail 4-4F and, using 4-40 x 5/16" hardware, mount coaxial connectors at J1 and J2.

( ) Refer to Detail 4-4G and mount 3/4" spacers at BF, BG, and BK with 6-32 x 3/8" hardware.

( ) Carefully remove the backing paper from the blue and white identification label. Then press the label on the inside of the rear panel as shown in the Pictorial. Be sure you refer to the numbers on this label in any communications you have with the Heath Company about this kit.



PICTORIAL 4-5

REAR PANEL PRELIMINARY WIRING

Refer to Pictorial 4-5 for the following steps.

( ) Connect a 1-1/2" yellow wire from phono socket BM lug 1 (NS) to double-lug 4 (NS).

( ) Prepare a 2-1/4" yellow wire by removing 1/4" of insulation from one end and 3/4" of insulation from the other end.

( ) Insert the longer bare end through phono socket BM lug 7 (S-2) to solder lug BN (S-1).

( ) Connect the other end of the wire to phono socket BM double-lug 4 (NS).

NOTE: In the next step, position the red banded end of the diode as shown in the Pictorial.

( ) D1: Connect the lead at the red banded end of a 1N295 diode (#56-20) to terminal strip BH lug 1 (NS). Connect the other lead to switch SW5 lug 2 (S-1).

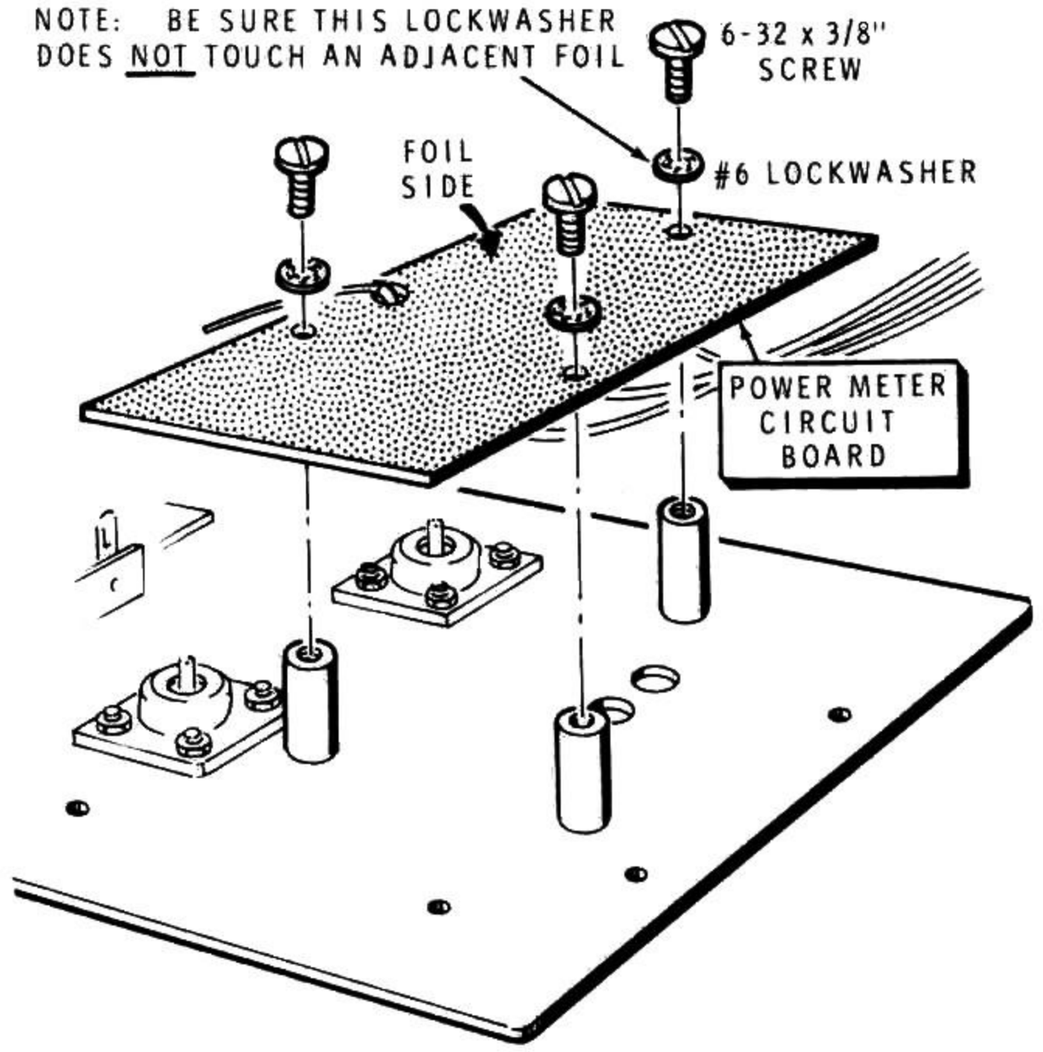
( ) R13: Connect a 3600 Ω (orange-blue-red) resistor from switch SW5 lug 1 (S-1) to terminal strip BH lug 3 (NS).

( ) Connect a 2" yellow wire from switch SW1 lug 2 (S-1) to switch SW3 lug 2 (NS).

POWER METER CIRCUIT BOARD MOUNTING

Refer to Pictorial 4-6 (fold-out from Page 63) for the following steps.

( ) Refer to Detail 4-6A and mount the power meter circuit board on the spacers on the rear panel with 6-32 x 3/8" hardware at the three indicated locations. Position the circuit board and cable as shown in the Pictorial.



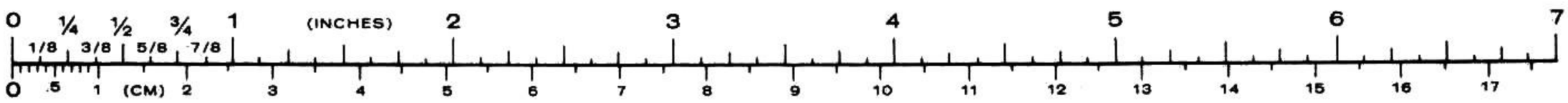
Detail 4-6A

NOTE: In the next two steps, you will connect the ends of the feed-through wire to the two coaxial connectors on the rear panel.

( ) Carefully bend the end of the sleeved portion of the feed-through wire toward the rear panel and insert it into the center lug of coaxial connector J2. Then solder the wire to the lug.

( ) Carefully bend the other portion of the feed-through wire as needed in order to insert its end into the center lug of coaxial connector J1. Then solder the wire to the lug.

Cut both leads of a 100 pF mica capacitor to 1". Then place a 3/4" length of teflon sleeving on one lead.



( ) C303: Insert the sleeved lead of the 100 pF mica capacitor into the hole in the circuit board marked X in Pictorial 4-6. Then solder the lead to the foil.

( ) Place a 5/8" length of teflon sleeving on the other lead of the capacitor. Wrap this lead around the feed-through wire close to the end of the sleeving on the feed-through wire.

( ) Solder the lead to the feed-through wire and cut off the excess lead length.

( ) Cut one lead of a 7.7 pF disc capacitor to 1/4".

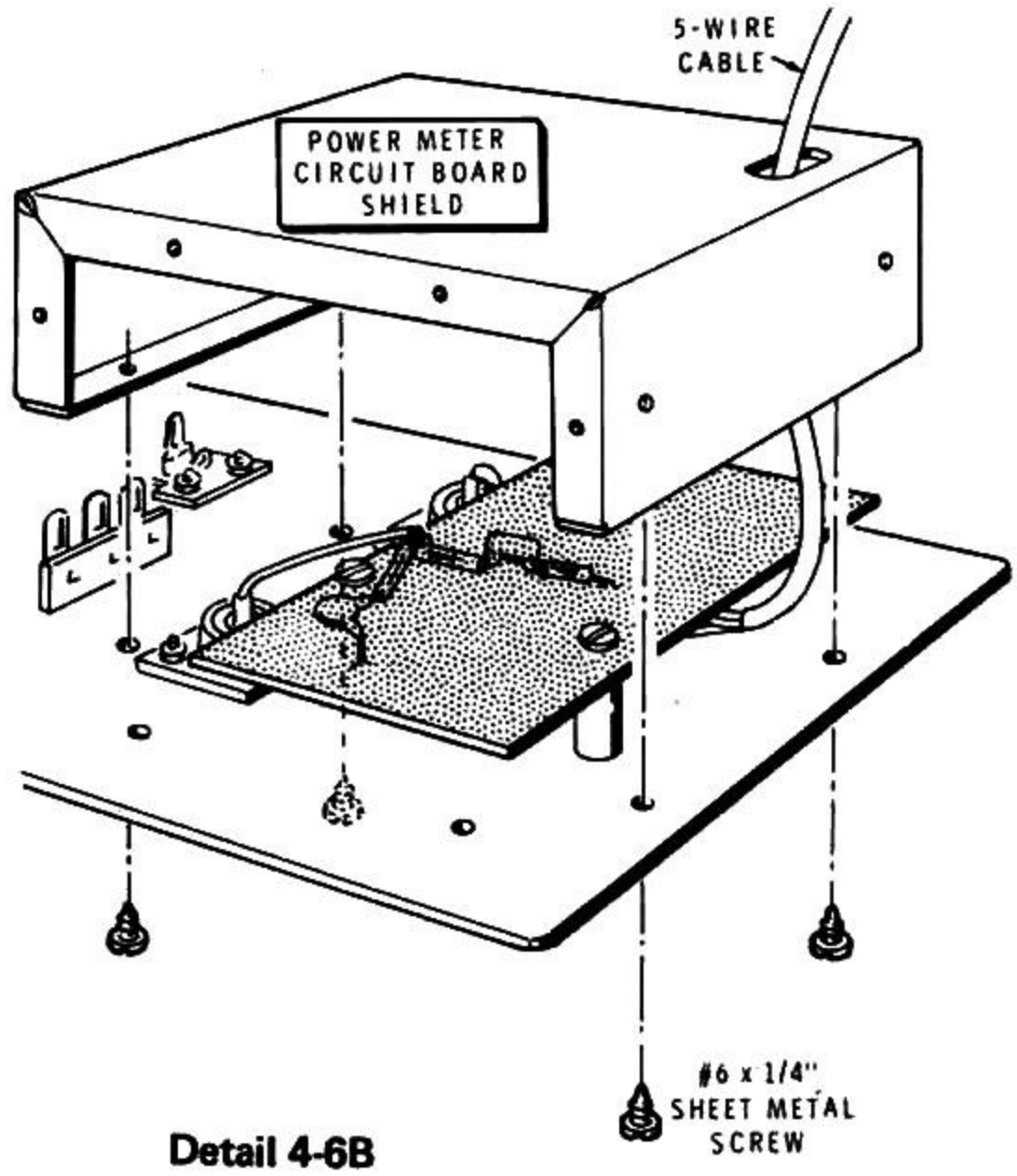
( ) C302: Insert the 1/4" lead of the 7.7 pF disc capacitor into the hole in the circuit board marked Y in Pictorial 4-6. Then solder the lead to the foil.

( ) Place a 3/4" length of teflon sleeving on the other lead of the 7.7 pF disc capacitor and wrap this lead around the feed-through wire close to the lead of the 100 pF mica capacitor. Then solder the lead to the feed-through wire (S-1) and cut off the excess lead length.

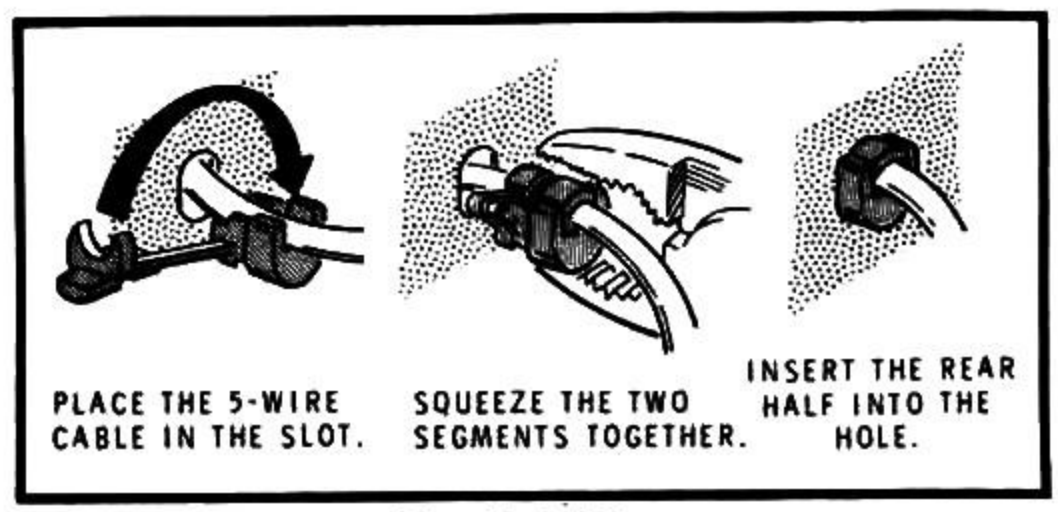
( ) Position both the 7.7 pF disc capacitor and the 100 pF mica capacitor so their leads do not touch the circuit board foils.

( ) Insert the free end of the 5-wire cable attached to the circuit board through the hole in the power meter circuit board shield.

( ) Refer to Detail 4-6B and secure the shield to the rear panel with #6 x 1/4" sheet metal screws at the four locations shown in the Pictorial.



Detail 4-6B



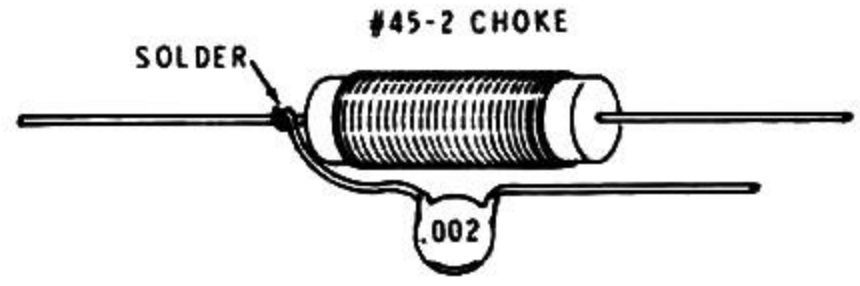
Detail 4-6C

( ) Refer to Detail 4-6C and install a large strain relief around the 5-wire cable where it comes out of the power meter circuit board shield. NOTE: Leave just enough slack in the cable so there is no pull on the wire inside the shield.

( ) Refer to Detail 4-6D and prepare two choke-capacitor combinations. Use a #45-2 choke and a .002 μF disc capacitor for each combination.

( ) Tighten the two screws in the PHONE LINE terminal block on the rear panel.

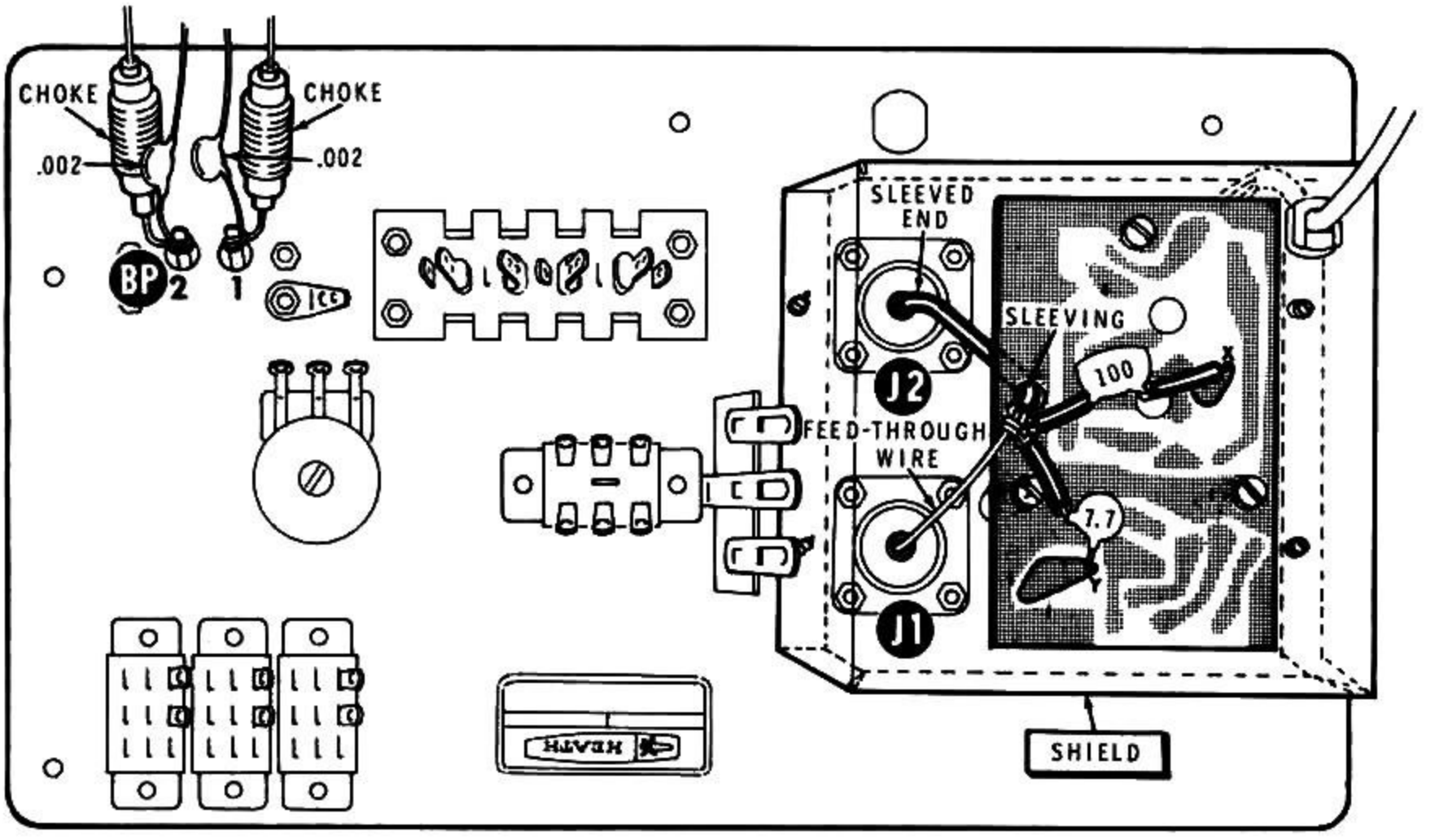
( ) L1 and C5: Connect the prepared end of one of the choke-capacitor combinations to BP lug 2 (S-1).



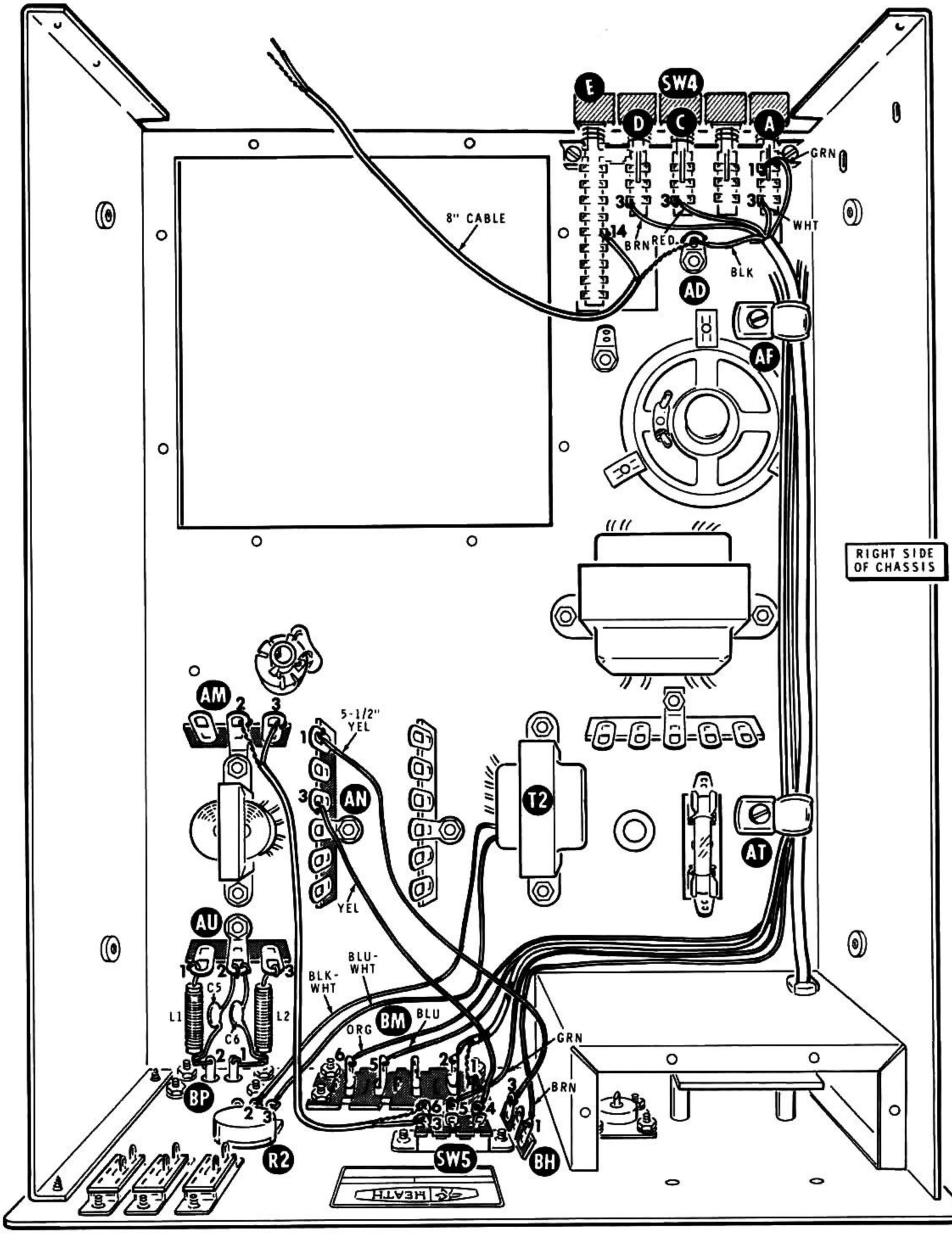
Detail 4-6D

( ) L2 and C6: In a like manner, connect the prepared end of the other choke-capacitor combination to BP lug 1 (S-1).

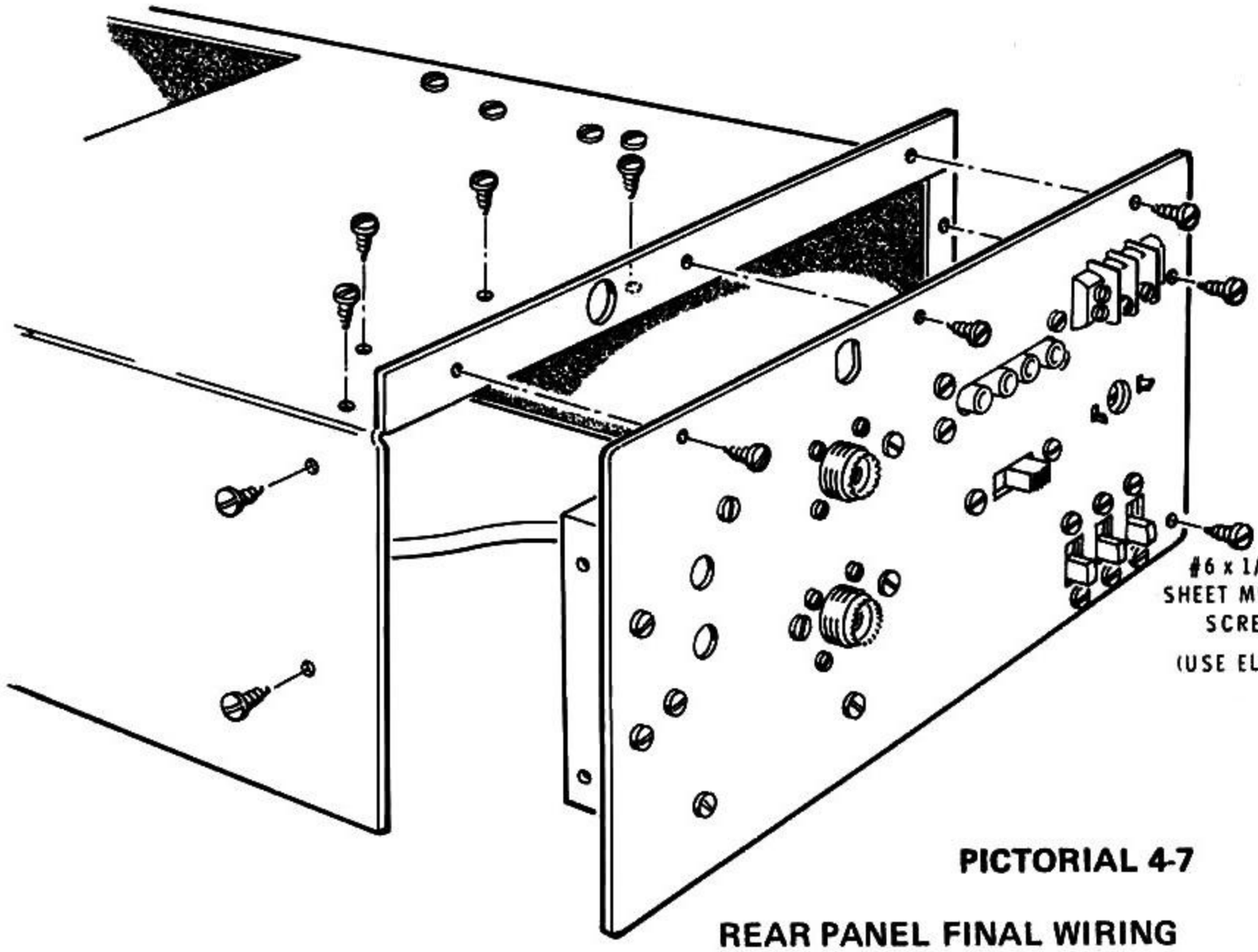
( ) Position both choke-capacitor combinations straight out from the rear panel. They will be connected later.



PICTORIAL 4-6



PICTORIAL 4-8



PICTORIAL 4-7

REAR PANEL MOUNTING

Refer to Pictorial 4-7 for the following steps.

( ) Position the shielded cables and the free ends of the brown, blue, orange, and green wires away from the rear of the chassis.

( ) Be sure the two chokes connected to the 2-lug terminal block on the rear panel are positioned straight out from the panel.

( ) Position the rear panel assembly near the rear of the chassis and line up the free leads of chokes L2 and L1 with terminal strip AU lugs 1 and 3.

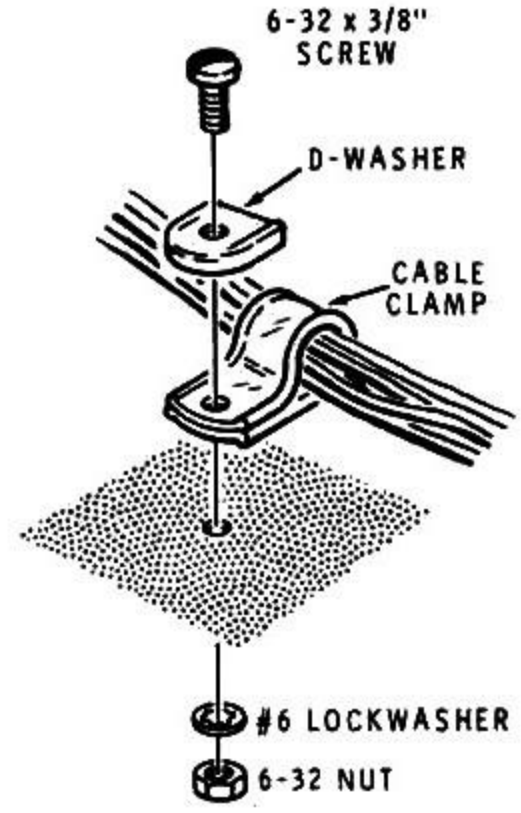
( ) Carefully guide the free leads of choke L2 and choke L1 into terminal strip AU lug 1 and lug 3 respectively.

( ) Be sure there are no wires or cables between the power meter circuit board shield on the rear panel and the chassis. Then secure the rear panel to the chassis with #6 x 1/4" sheet metal screws at the eleven locations shown in the Pictorial.

REAR PANEL FINAL WIRING

Refer to Pictorial 4-8 (fold-out from Page 64) for the following steps.

( ) Place a cable clamp around all the wires and cables that pass along the right side of the chassis. Then refer to Detail 4-8A and secure the cable clamp at AF with 6-32 x 3/8" hardware. Position the cable clamp as shown in the Pictorial.



Detail 4-8A

( ) **In the same manner, secure the wires and cables at AT with a cable clamp and 6-32 x 3/8" hardware.**

Connect the wires at the free end of the 5-wire cable coming from cable clamp AF as follows:

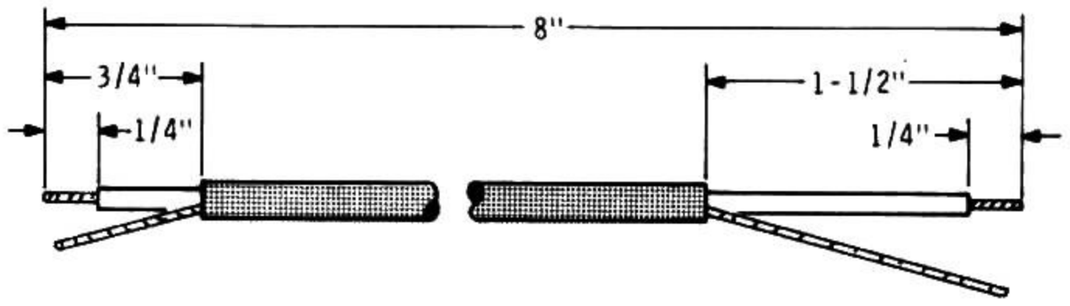
( ) Black wire to solder lug AD (NS).

( ) Green wire to switch SW4A lug 1 (S-1).

( ) White wire to switch SW4A lug 3 (S-1).

( ) Red wire to switch SW4C lug 3 (S-2).

( ) Brown wire to switch SW4D lug 3 (S-2).



Detail 4-8B

Refer to Detail 4-8B and prepare an 8" length of shielded cable.

( ) At the 1-1/2" end, connect the shield lead to solder lug AD (S-5) and the inner lead to switch SW4E lug 14 (S-1). The other end of the cable will be connected later.

Connect the free ends of the wires and shielded cable coming from cable clamp AT as follows:

( ) **Connect the free end of the shielded cable to phono socket BM. Shield lead to lug 1 (S-2) and inner lead to lug 2 (S-1).**

( ) **Connect the brown wire to terminal strip BH lug 1 (S-2)**

( ) **Connect the green wire to switch SW5 lug 5 (S-1).**

( ) **Connect the blue wire to phono socket BM lug 5 (S-1).**

( ) **Connect the orange wire to phono socket BM lug 6 (S-1).**

Connect the free ends of the leads coming from transformer T2 as follows:

( ) **Black-white to control R2 lug 2 (S-1).**

( ) **Blue-white to control R2 lug 3 (S-1).**

( ) **Position the wires and cables down and out of the way against the chassis and rear panel.**

( ) **Solder the lead of choke L1 to terminal strip AU lug 1 (S-3), and cut off the excess lead length.**

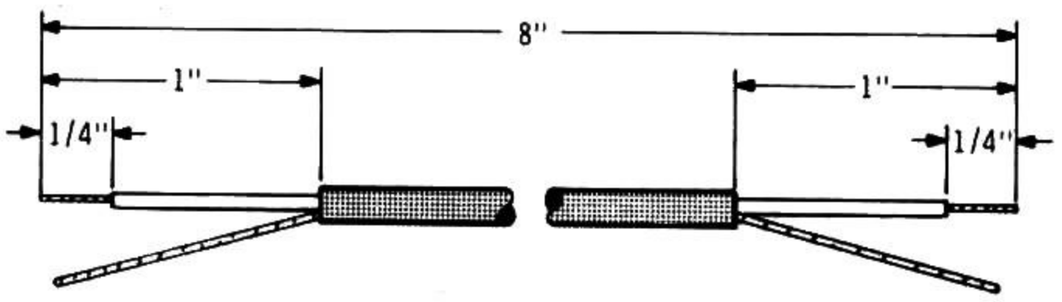
( ) **Solder the lead of choke L2 to terminal strip AU lug 3 (S-3), and cut off the excess lead length.**

( ) **Connect the free lead of the .002 μF disc capacitor (C5) coming from terminal block BP lug 1 to terminal strip AU lug 2 (NS).**

( ) **Connect the free lead of the .002 μF disc capacitor (C6) coming from terminal block BP lug 2 to terminal strip AU lug 2 (S-5).**

( ) **Connect a 5-1/2" yellow wire from terminal strip AN lug 1 (S-4) to terminal strip BH lug 3 (S-2).**

( ) **Connect a 4-3/4" yellow wire from terminal strip AN lug 3 (S-4) to switch SW5 lug 4 (S-1).**

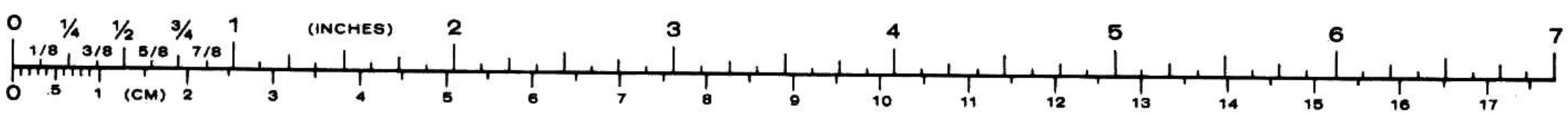


Detail 4-8C

( ) **Refer to Detail 4-8C and prepare an 8" shielded cable.**

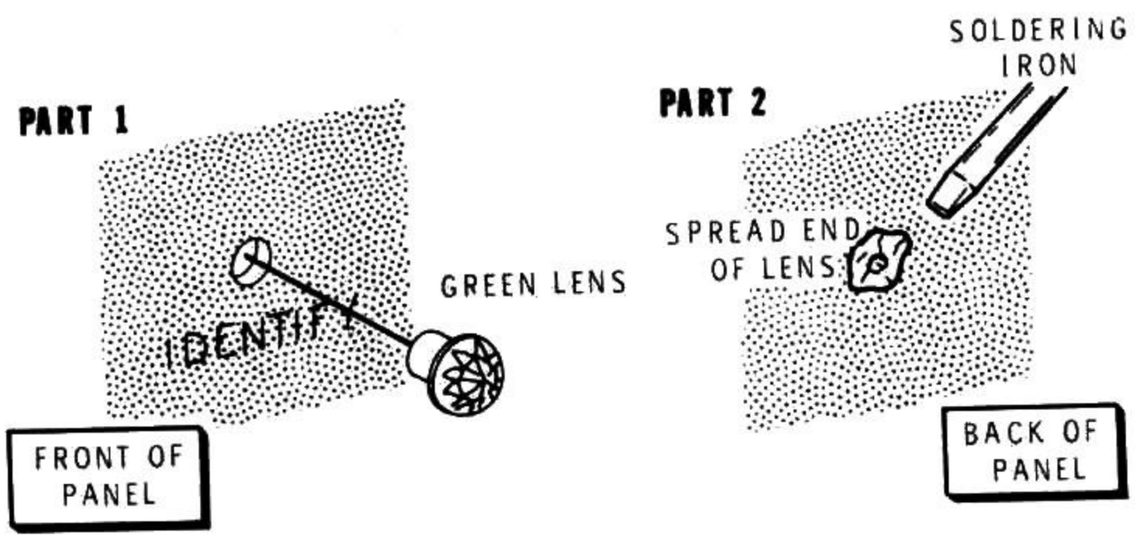
( ) **At one end of the cable, connect the inner lead to switch SW5 lug 3 (S-1) and the shield lead to lug 6 (S-1).**

( ) At the other end of the cable, connect the shield lead to lug 2 (NS) and the inner lead to lug 3 (NS) of terminal strip AM.



FRONT PANEL PARTS MOUNTING

Refer to Pictorial 5-1 (fold-out from Page 67) for the following steps.

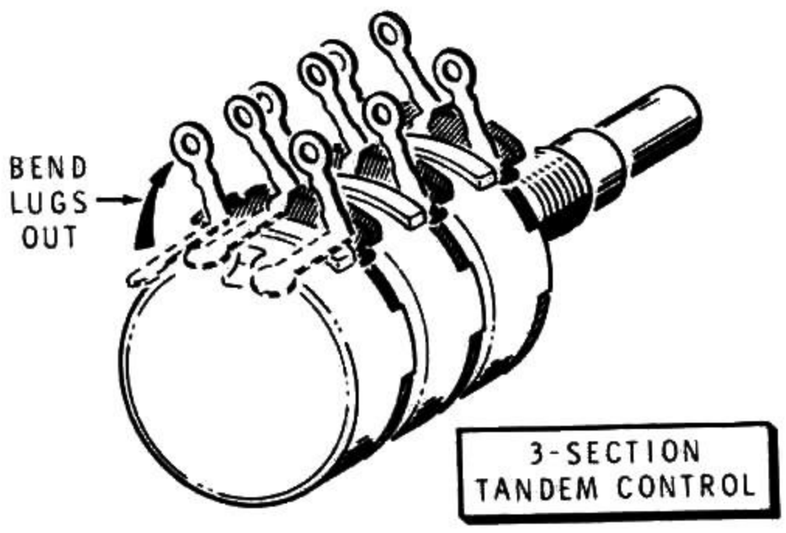


Detail 5-1A

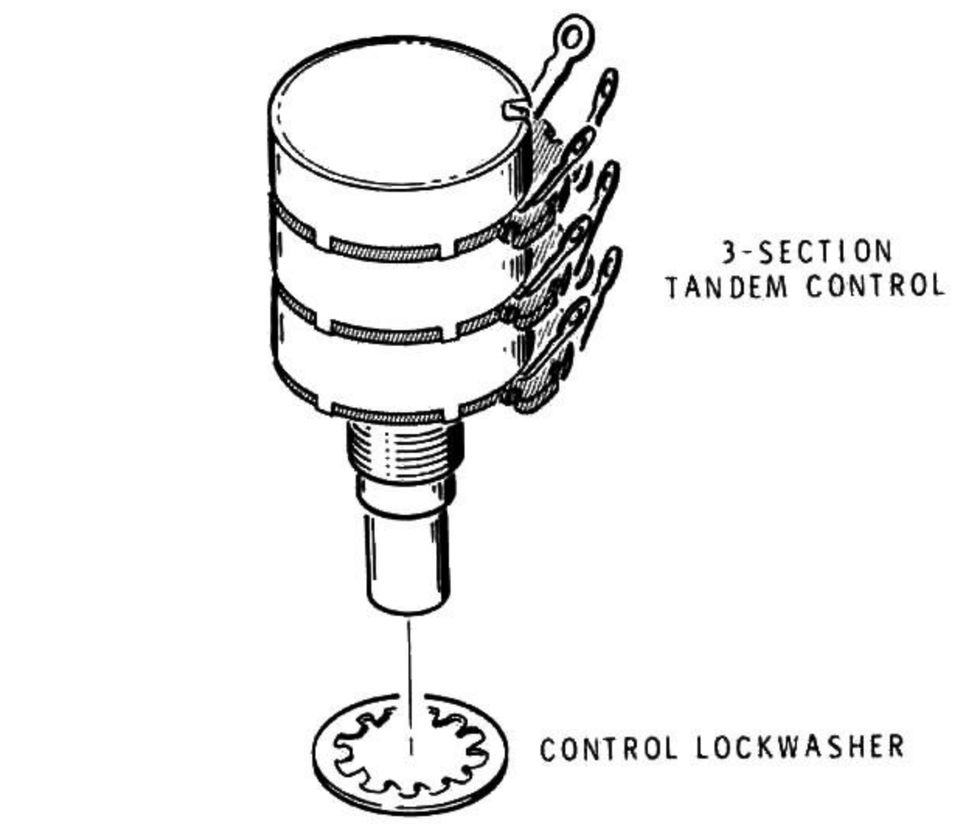
( ) Refer to Part 1 of Detail 5-1A and, from the front of the panel, place a green lens in hole CL. Then place the panel face down on your work surface.

( ) Clean the end of your soldering iron. Then from the back of the panel, wipe the soldering iron against the protruding end of the green lens. This will soften and spread the end of the lens so it will stay in the hole.

( ) Refer to Detail 5-1B and carefully bend out all nine lugs of the 3-section tandem control (#13-13) as shown.



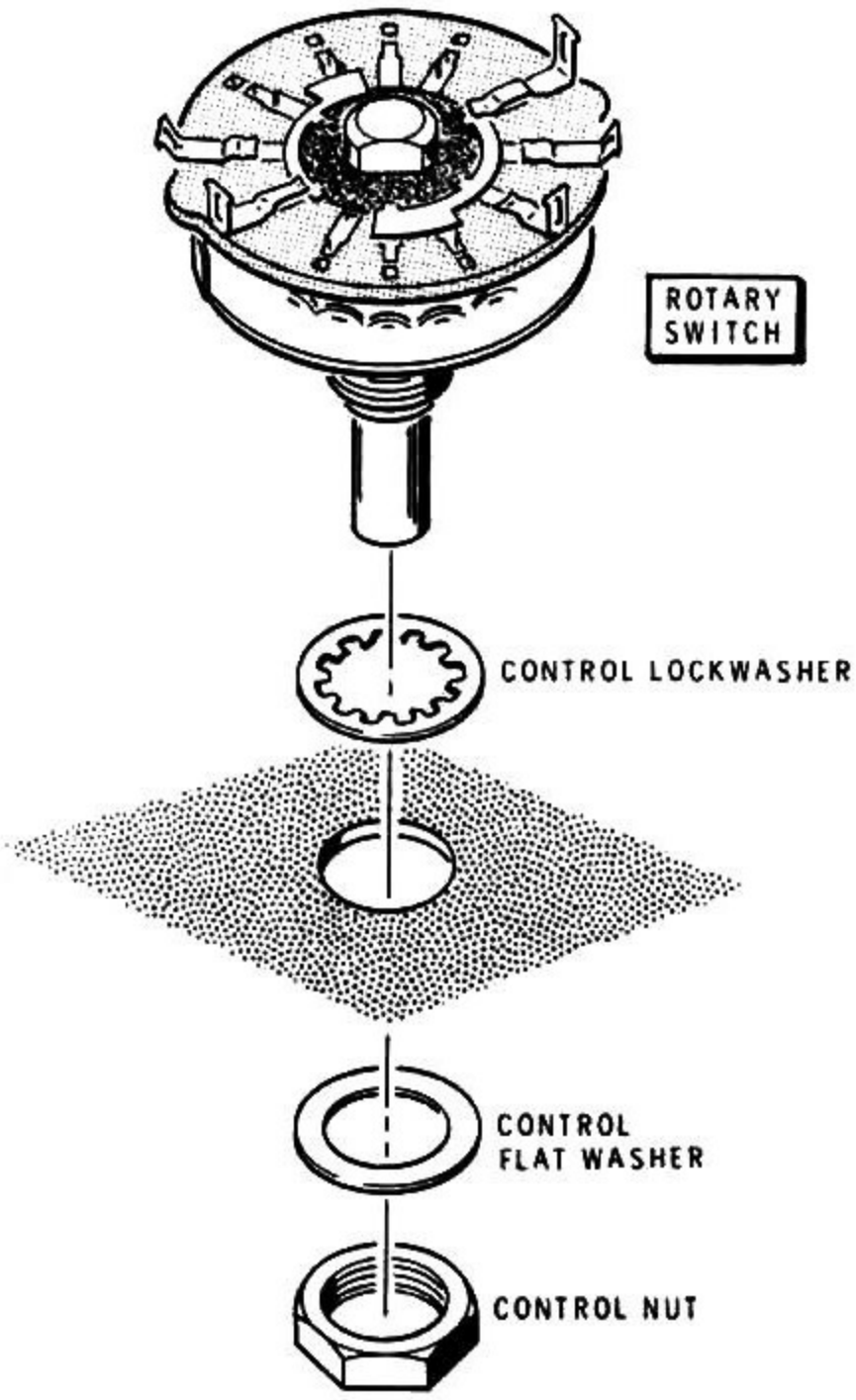
Detail 5-1B



Detail 5-1C

( ) R3, R4, and R5: Refer to Detail 5-1C and mount the 3-section tandem control (#13-16) at CG. Position the control as shown in the Pictorial.

( ) R1: In a like manner, mount a 250 kΩ control (#10-14) at CF. Position the control as shown in the Pictorial.



Detail 5-1D

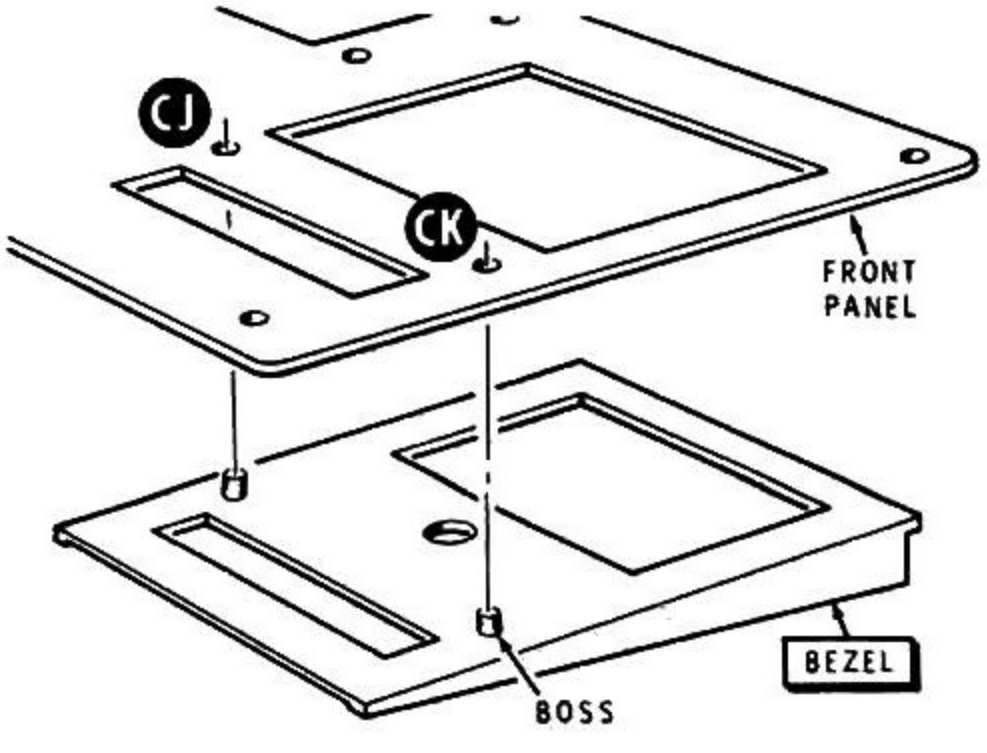
( ) SW6: Refer to Detail 5-1D and mount a rotary switch (#63-725) at CH. Position the switch as shown in the Pictorial.

( ) Refer to Detail 5-1E and mount the bezel on the front of the panel. Be sure the two bosses that protrude from the bezel are in holes CJ and CK.

( ) Hold the bezel firmly against the panel. Then, using a hot soldering iron, wipe the soldering iron against the bosses until they flatten down over the holes and hold the bezel on the panel.

Refer to Detail 5-1F (fold-out from this page) for the following steps.

( ) Slide three 4-40 x 3/8" T screws into the slots of the longer window bracket. Then, from the front of the panel and with the rabbet (see inset drawing #1) of the bracket toward the bottom of the panel, insert the three screws into holes CA, CB, and CC. NOTE: Be sure the flange on the top of the bezel is in the rabbet of the window bracket. See inset drawing #2 on the Detail.



Detail 5-1E

( ) Secure the window bracket to the panel with a #6 flat washer and a 4-40 x 3/8" spacer at CB. Use only 4-40 x 3/8" spacers at CA and CC. Tighten the spacers only finger tight.

( ) Carefully remove the backing paper from both sides of the plastic window. CAUTION: Be careful so you do not scratch either surface of the window.

( ) Wipe (DO NOT SOAK) the plastic window with water and detergent to remove all fingerprints. After drying, grasp the window only by the edges.

( ) If necessary, slightly loosen the spacers at CA and CB, and place one edge of the window into the rabbet of the window bracket. Then tighten the spacers finger tight.

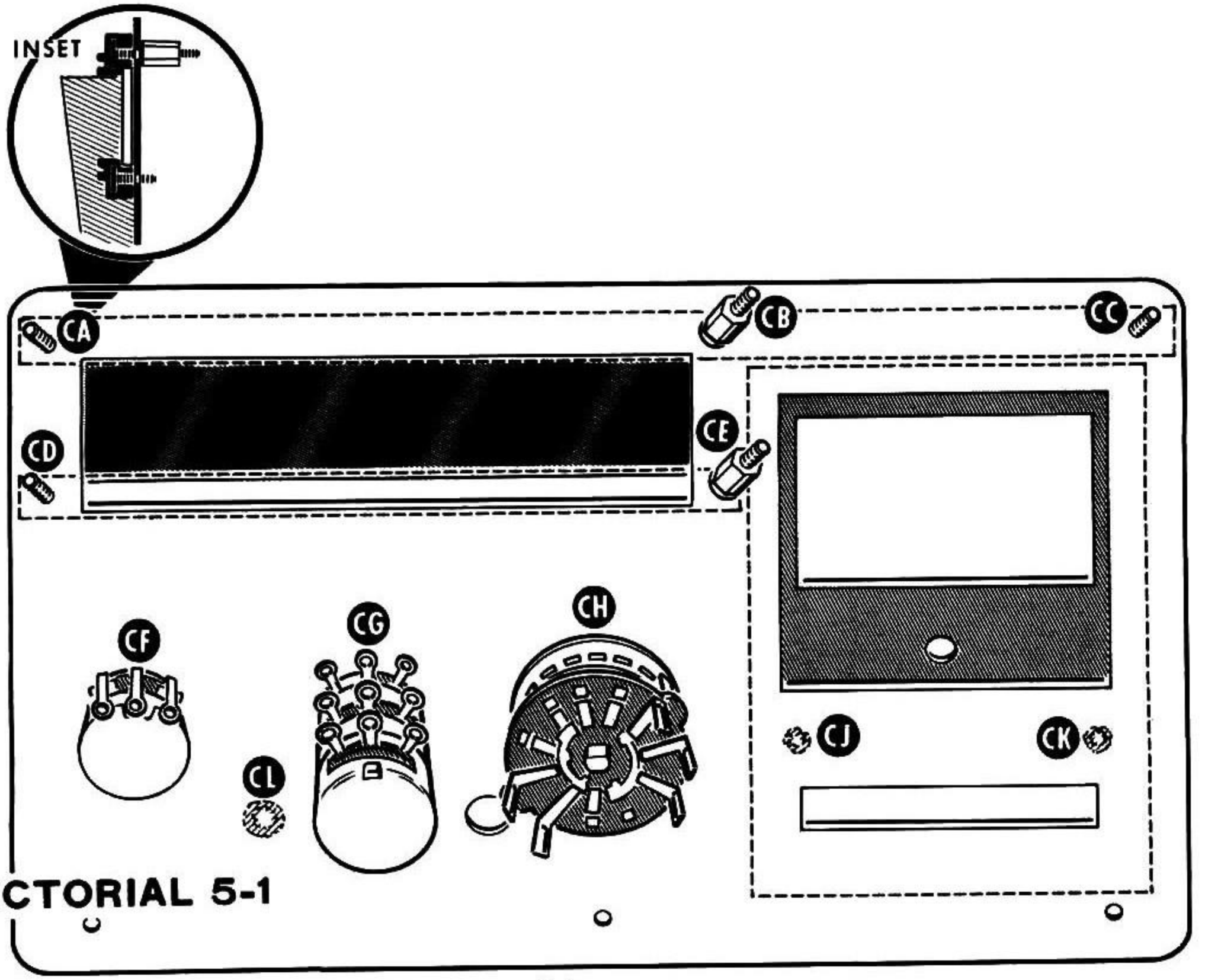
( ) Slide two 4-40 x 1/2" T screws into the slots of the shorter window bracket. Then from the front of the panel and with the rabbet of the bracket toward the *top* of the panel, insert the two screws into holes CD and CE.

( ) Lightly secure the window bracket with a #6 flat washer and a 4-40 x 3/8" spacer at CE. Use only a 4-40 x 3/8" spacer at CD.

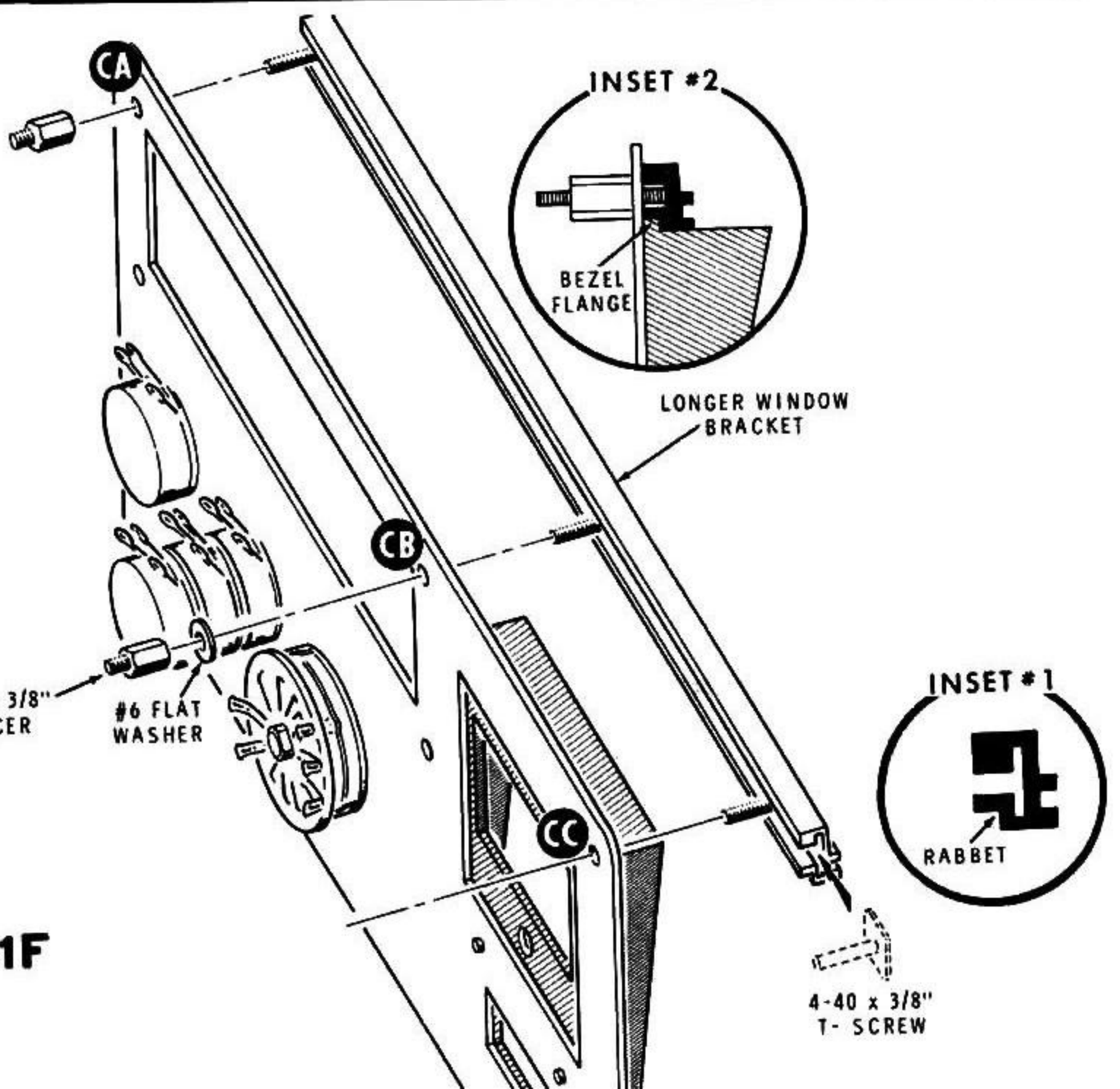
( ) While you hold the panel assembly in one hand, slightly loosen all the spacers.

( ) Be sure the top and bottom edges of the window are in the rabbets in the window brackets and that the brackets are properly positioned and the inner end of the window is against the bezel. Then tighten the spacers at CB and CE.

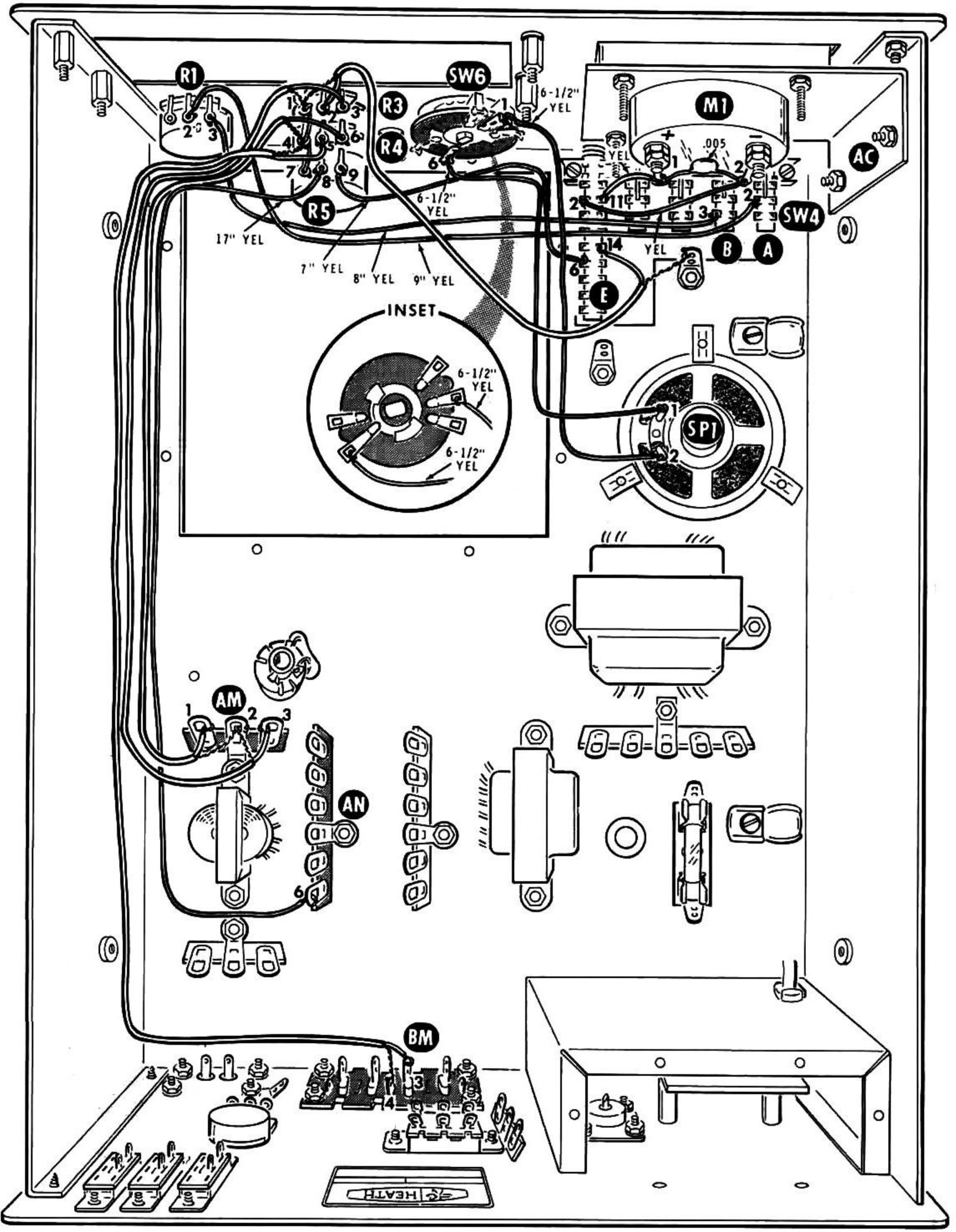
( ) Remove the 4-40 x 3/8" spacers from the screws at CA, CC and CD.



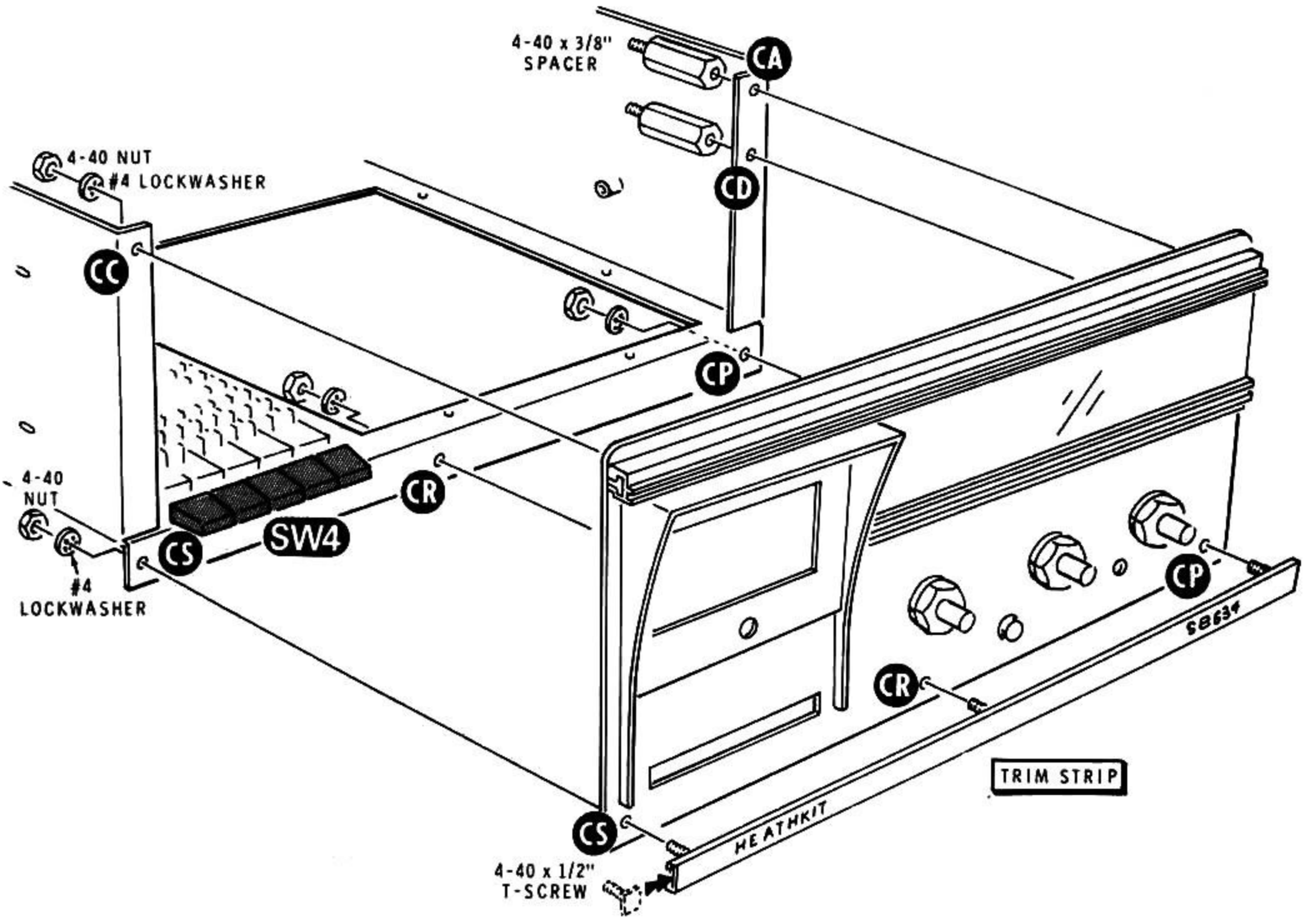
PICTORIAL 5-1



Detail 5-1F



PICTORIAL 5-3



PICTORIAL 5-2

FRONT PANEL MOUNTING

Refer to Pictorial 5-2 for the following steps.

( ) Position the front panel assembly as shown in the Pictorial. Then guide the screws at CA, CC, and CD into the corresponding holes in the front of the chassis. At the same time, guide the pushbuttons of switch SW4 through the corresponding opening in the panel.

( ) Secure the front panel assembly to the chassis with 4-40 x 3/8" spacers at CA and CD. Use a #4 lockwasher and 4-40 nut at CC.

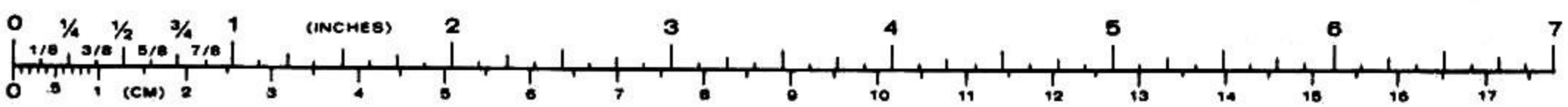
NOTE: In the next step, be sure you install the trim strip so the lettering on the strip is right side up.

( ) Slide three 4-40 x 1/2" T screws into the slot in the trim strip. Then guide the three screws through holes CP, CR, and CS in the panel.

( ) Secure the trim panel with #4 lockwashers and 4-40 nuts at the three indicated locations.

FRONT PANEL WIRING

Refer to Pictorial 5-3 (fold-out from Page 68) for the following steps. NOTE: Position the wires and cables as shown in the Pictorial.



( ) Connect an 8" yellow wire from switch SW4B lug 3 (S-2) to control R1 lug 3(S-1).

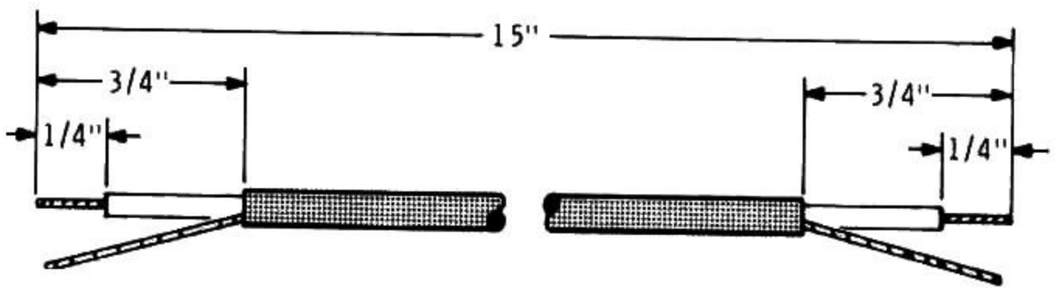
( ) Connect a 9" yellow wire from switch SW4A lug 2 (S-1) to control R1 lug 2 (S-1).

( ) Remove the insulation from a 1-1/4" length of yellow wire. NOTE : In the next step, you wil Connect this bare wire to three lugs of the 3-section tandem control R3, R4, and R5.

( ) the 1-1/4" bare wire from R5 lug 7 (NS), through R4 lug 4 (NS), to R3 lug 1 (NS).

( ) Connect a 7" yellow wire from control R5 lug 9 (S-1) to switch SW4E lug 6 (S-1).

( ) Connect a 17" yellow wire from control R5 lug 8 (S-1) to terminal strip AN lug 6 (S-2).



Detail 5-3A

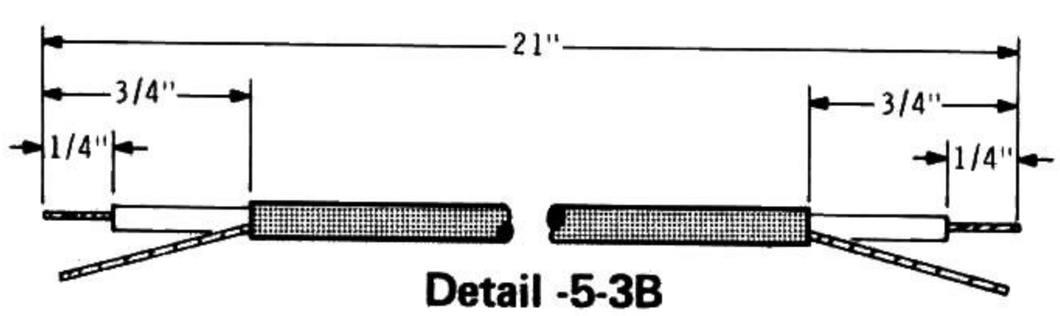
( ) Refer to Detail 5-3A and prepare two 15" shielded cables as shown.

( ) Connect one end of one shielded cable to control R4: inner lead to lug 6 (S-1) and shield lead to lug 4 (NS).

( ) Connect the other end of the cable to terminal strip AM: inner lead to lug 1 (S-2) and shield lead to lug 2 (NS).

( ) Connect one end of the other shielded cable to control R3: inner lead to lug 3 (S-1) and shield lead to lug 1 (NS).

( ) Connect the other end of the cable to terminal strip AM: inner lead to lug 3 (S-3) and shield lead to lug 2 (S-3).



Detail -5-3B

( ) Refer to Detail 5-3B and prepare a 21" length of shielded cable as shown.

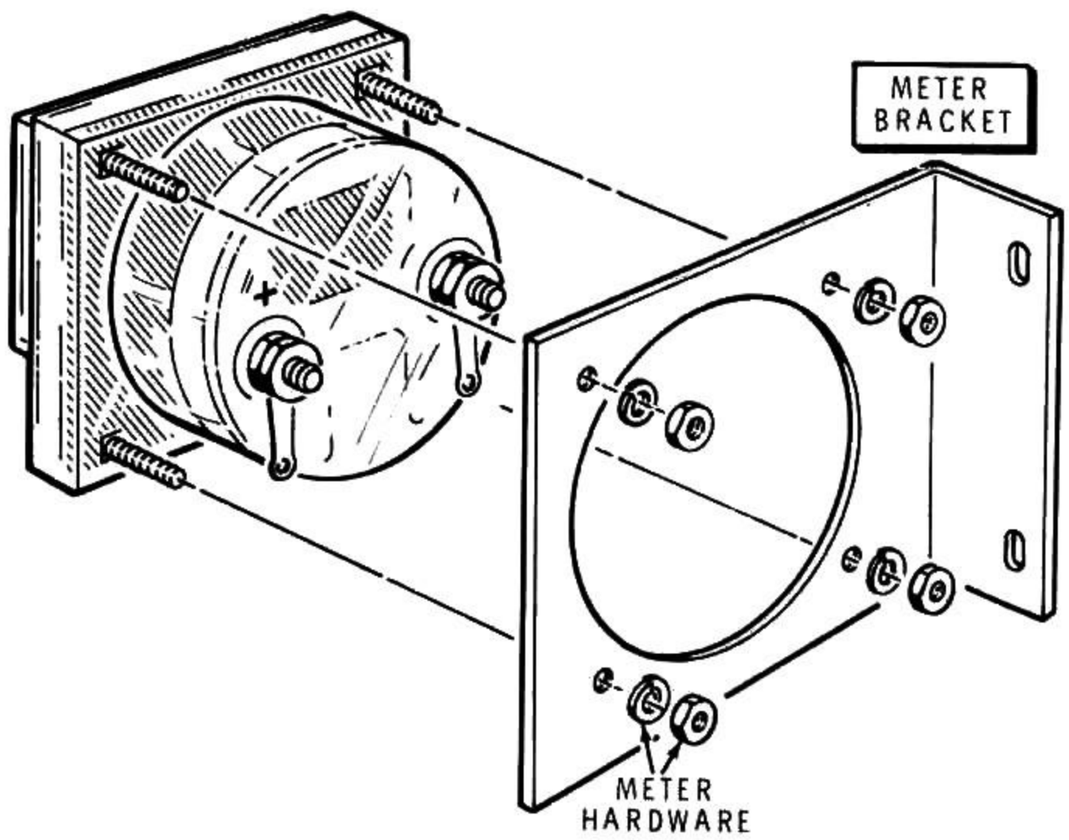
( ) Connect one end of the cable to control R4: inner lead to lug 5 (S-1) and shield to lug 4 (S-4).

( ) Connect the other end of the cable to phono socket BM: shield lead to double-lug 4 (S-3) and inner lead to lug 3 (S-1).

( ) Connect a 6-1/2" yellow wire from switch SW6 lug 1 (S-1) to speaker SP1 lug 2 (S-1).

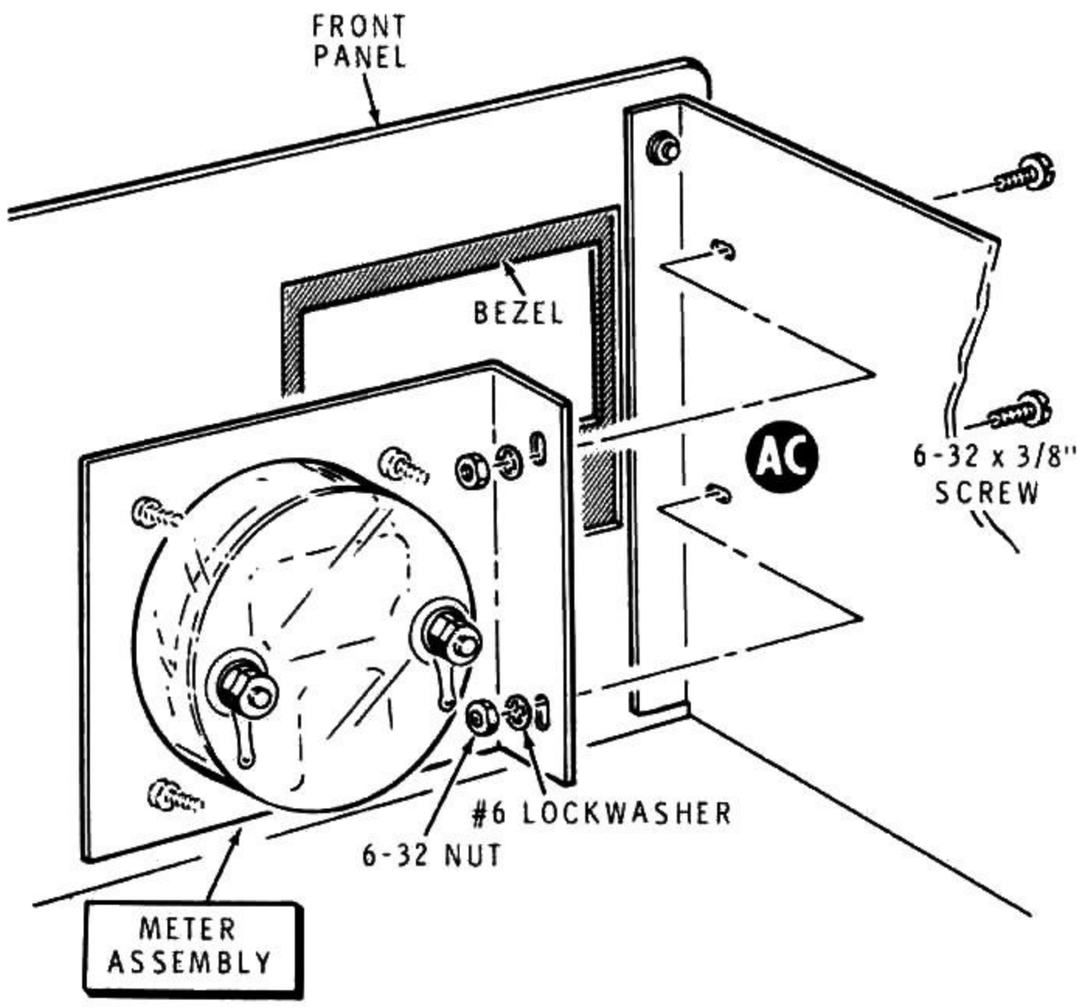
( ) Connect a 6-1/2" yellow wire from switch SW6 lug 6 (S-1) to speaker SP1 lug 1 (S-1).

( ) Connect the free end of the shielded cable coming from switch SW4 to control R3: inner lead to lug 2 (S-1) and shield lead to lug 1 (S-4).



Detail 5-3C

( ) Remove the shorting wire or clip between the meter terminals. Then refer to Detail 5-3C and, using the hardware supplied with the meter, mount the meter in the bracket. Be sure you position the bracket as shown.



Detail 5-3D

( ) Refer to Detail 5-3D and mount the meter assembly on the side of the chassis at AC with 6-32 x 3/8" hardware. Adjust the bracket so the face of the meter just touches the bezel on the front panel.

( ) Connect a .005 μF disc capacitor between M1 lugs 1 (NS) and 2 (NS).

( ) Connect the free end of the yellow wire coming from switch SW4E lug 11 to meter M1 lug 1 (S-2).

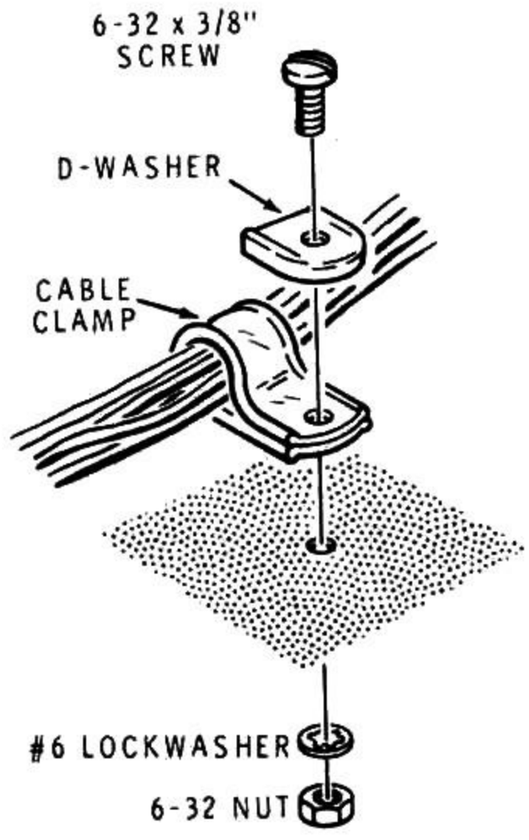
( ) Connect the free end of the yellow wire coming from switch SW4E lug 2 to meter M1 lug 2 (S-2).

( ) Temporarily remove the TIMER switch (SW6) from the front panel. Position the switch behind the meter.

( ) Install the main circuit board assembly on the chassis. Use 6-32 x 3/8" hardware as shown in the inset drawing at the eight indicated locations. CAUTION: Remove any mounds of solder that will prevent the circuit board from lying flat on the chassis.

( ) After you secure the circuit board, position the wires and cables down neatly around the chassis.

( ) Mount the TIMER switch back on the front panel. Be sure it is properly positioned.

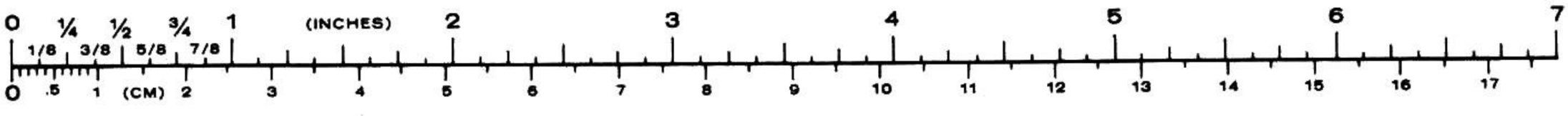


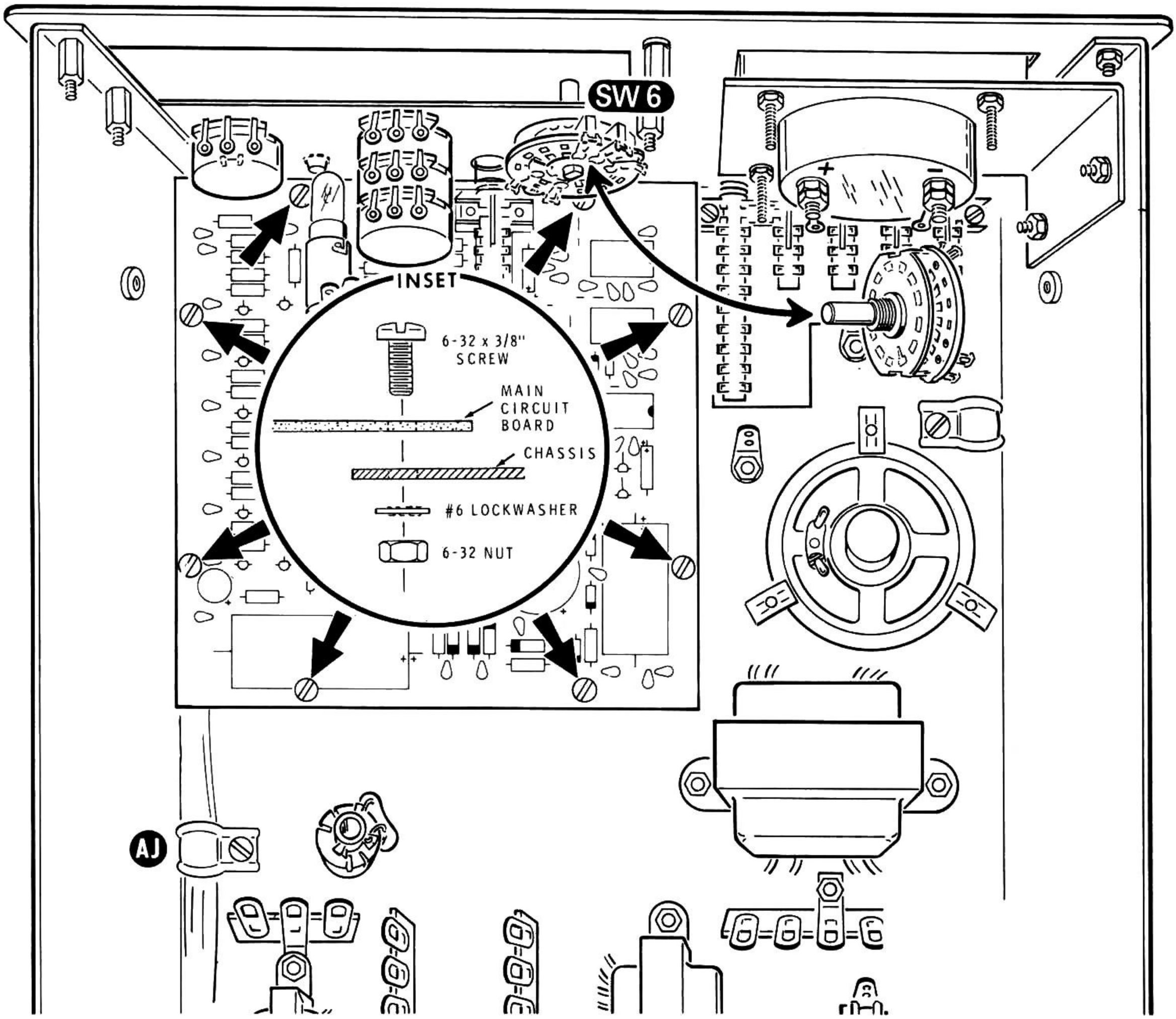
Detail 5-4A

Refer to Pictorial 5-4 for the following steps.

NOTE: Be sure none of the wires or cables are between the circuit board and the chassis when you perform the following steps.

( ) **Place a cable clamp around the 5-wire circuit board cable, and the shielded cables and wires along the right side of the chassis. Then refer to Detail 5-4A and secure the cables and wires at AJ with 6-32 x 3/8" hardware. Position the cable clamp as shown in the Pictorial.**





PICTORIAL 5-4

Refer to Pictorial 5-5 (fold-out from Page 73) for the following steps.

Connect the wires at the free end of the 5-wire cable coming from cable clamp AJ as follows:

( ) Black to switch SW3 lug 2 (S-2).

( ) White to switch SW3 lug 1 (S-1).

( ) Brown to switch SW2 lug 2 (S-1).

( ) Green to switch SW2 lug 1 (S-1).

( ) Red to switch SW1 lug 1 (S-1).

Connect the leads of transformer T1 to the following circuit board holes:

( ) One blue to hole 4 (S-1).

( ) Other blue to hole 5 (S-1).

( ) Shorter green to hole 23 (S-1).

( ) Shorter red to hole 24 (S-1).

( ) Other red to hole 6 (S-1).

( ) Other green to hole 3 (S-1).

( ) Connect a 2-1/4" yellow wire from control R5 lug 7 (S-2) to panel lamp PL201 lug 2 (S-2).

( ) Connect the free end of the yellow wire coming from circuit board hole 20 to switch SW6 lug 7 (S-1).

( ) Connect the free end of the yellow wire coming from circuit board hole 21 to switch SW6 lug 2

( ) Connect the free end of the yellow wire coming from circuit board hole 2 to switch SW6 lug 12 (S-1).

Refer to Pictorial 5-6 for the following steps.

( ) Mount the display circuit board on the spacers on the front panel with #4 fiber washers and 4-40 hardware at the four indicated locations.

Refer to Pictorial 5-7 for the following steps.

NOTE: In the following steps, you will connect the free ends of the main circuit board cables and wires to pins on the display circuit board.

Connect the wires of the 8-wire cable as follows:

( ) Gray to pin H.

( ) Violet to pin J.

( ) Blue to pin K.

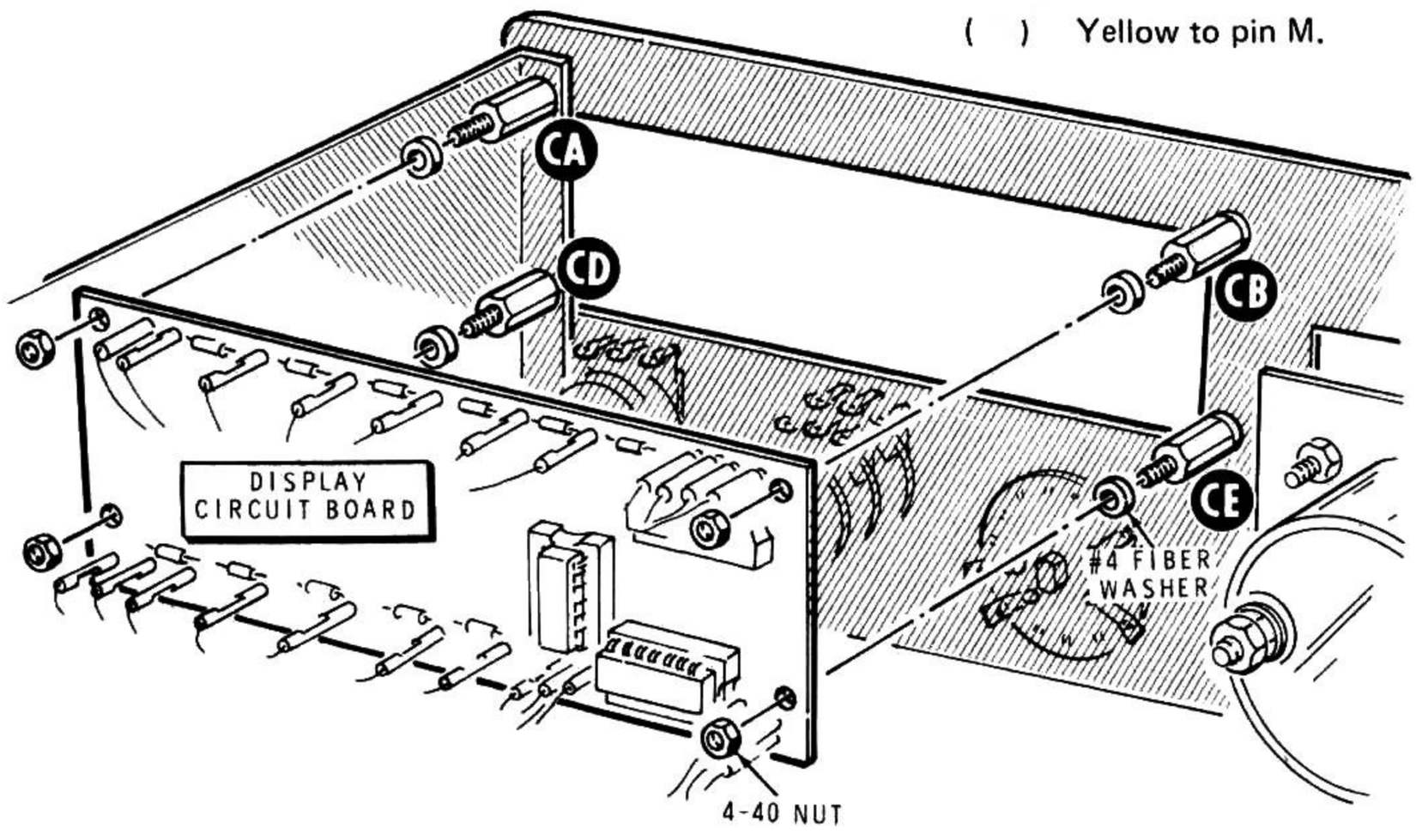
( ) Green to pin L.

( ) Yellow to pin M.

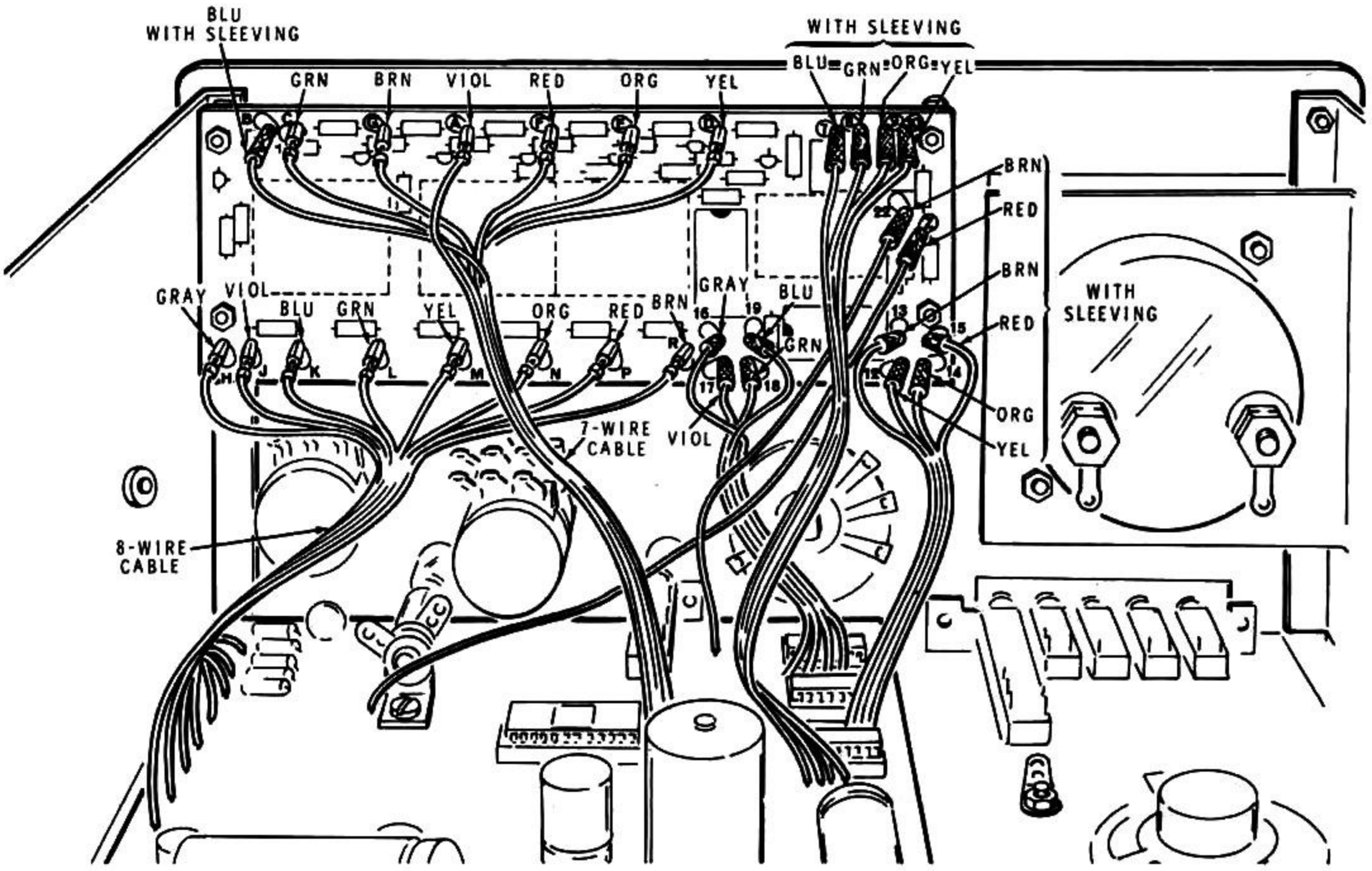
( ) Orange to pin N.

( ) Red to pin P.

( ) Brown to pin R.



PICTORIAL 5-6



PICTORIAL 5-7

Connect the wires of the 7-wire cable as follows:

( ) Blue (with sleeving) to pin B.

( ) Green to pin C.

( ) Brown to pin G.

( ) Violet to pin A.

( ) Red to pin F.

( ) Orange to pin E.

( ) Yellow to pin D.

Connect the gray, violet, blue, and green 4-wire cable as follows:

( ) Green to pin 18.

( ) Violet to pin 17.

( ) Gray to pin 16.

( ) Blue to pin 19.

Connect the yellow, orange, red, and brown 4-wire cable as follows:

( ) Orange to pin 14.

( ) Yellow to pin 12.

( ) Brown to pin 13.

( ) Red to pin 15.

( ) Connect the separate red wire to Z.

( ) Connect the separate brown wire to 22.

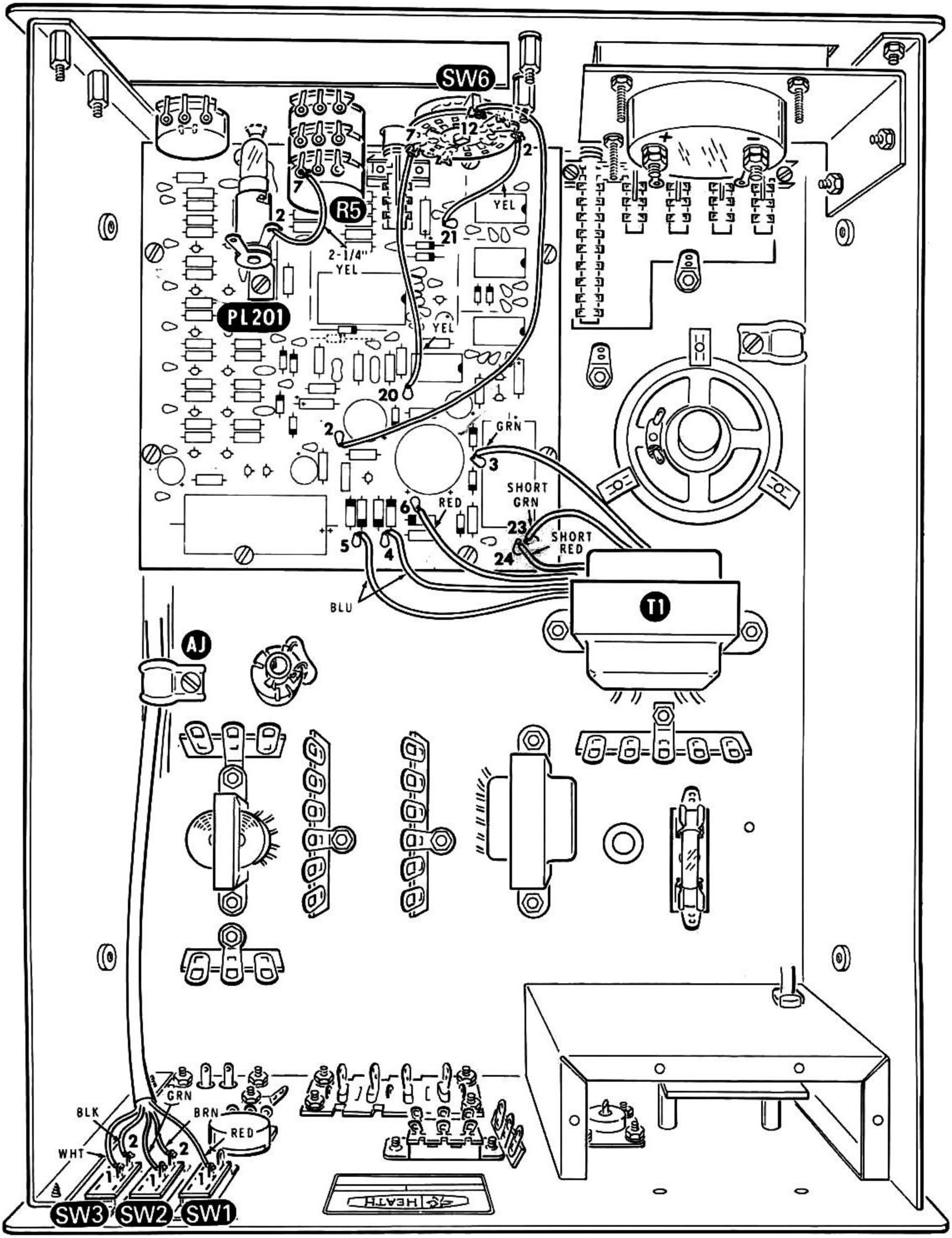
Connect the blue, green, yellow, and orange 4-wire cable as follows:

( ) Yellow to pin 10.

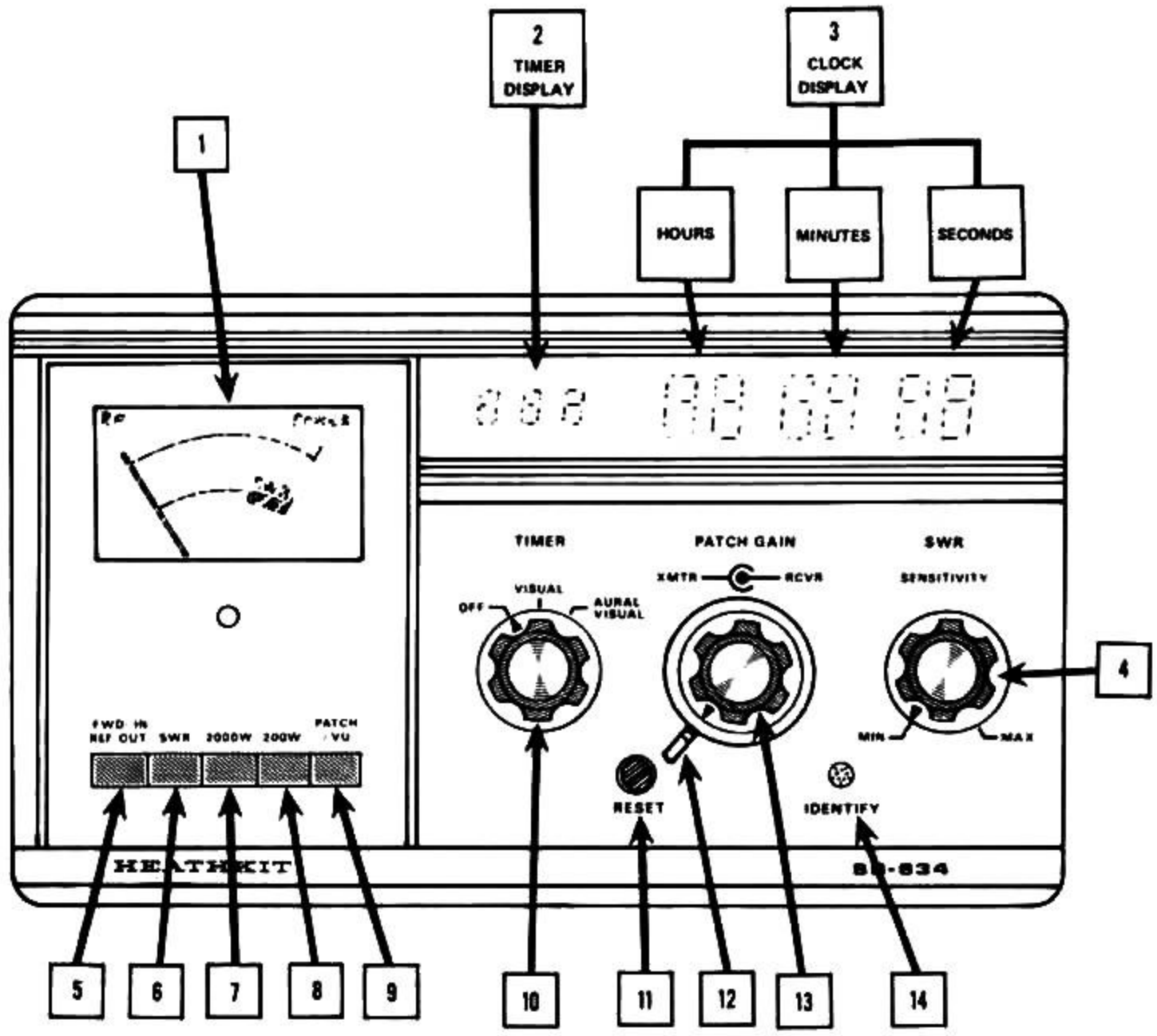
( ) Orange to pin 9.

( ) Green to pin 8.

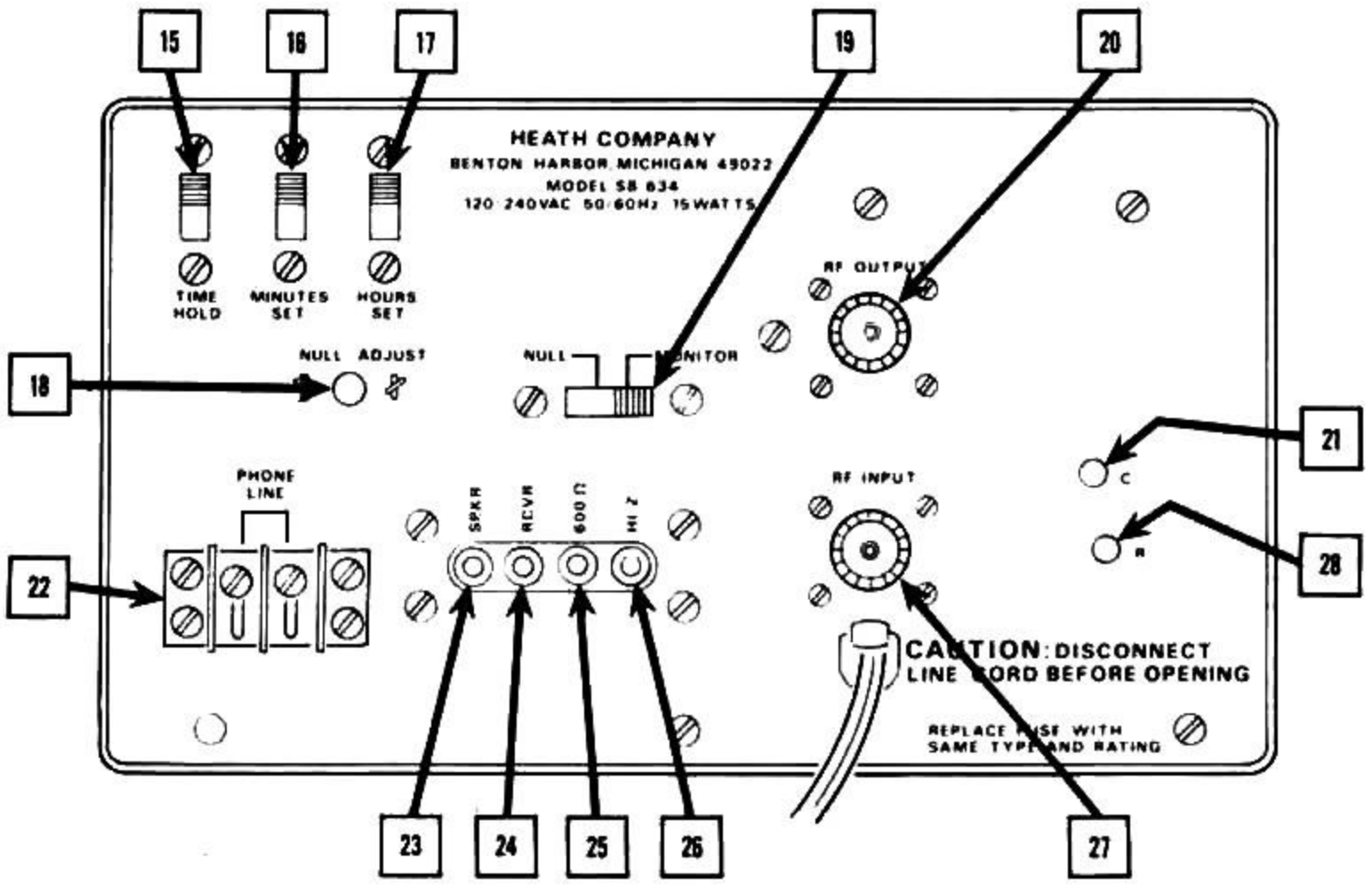
( ) Blue to pin 7.



PICTORIAL 5-5

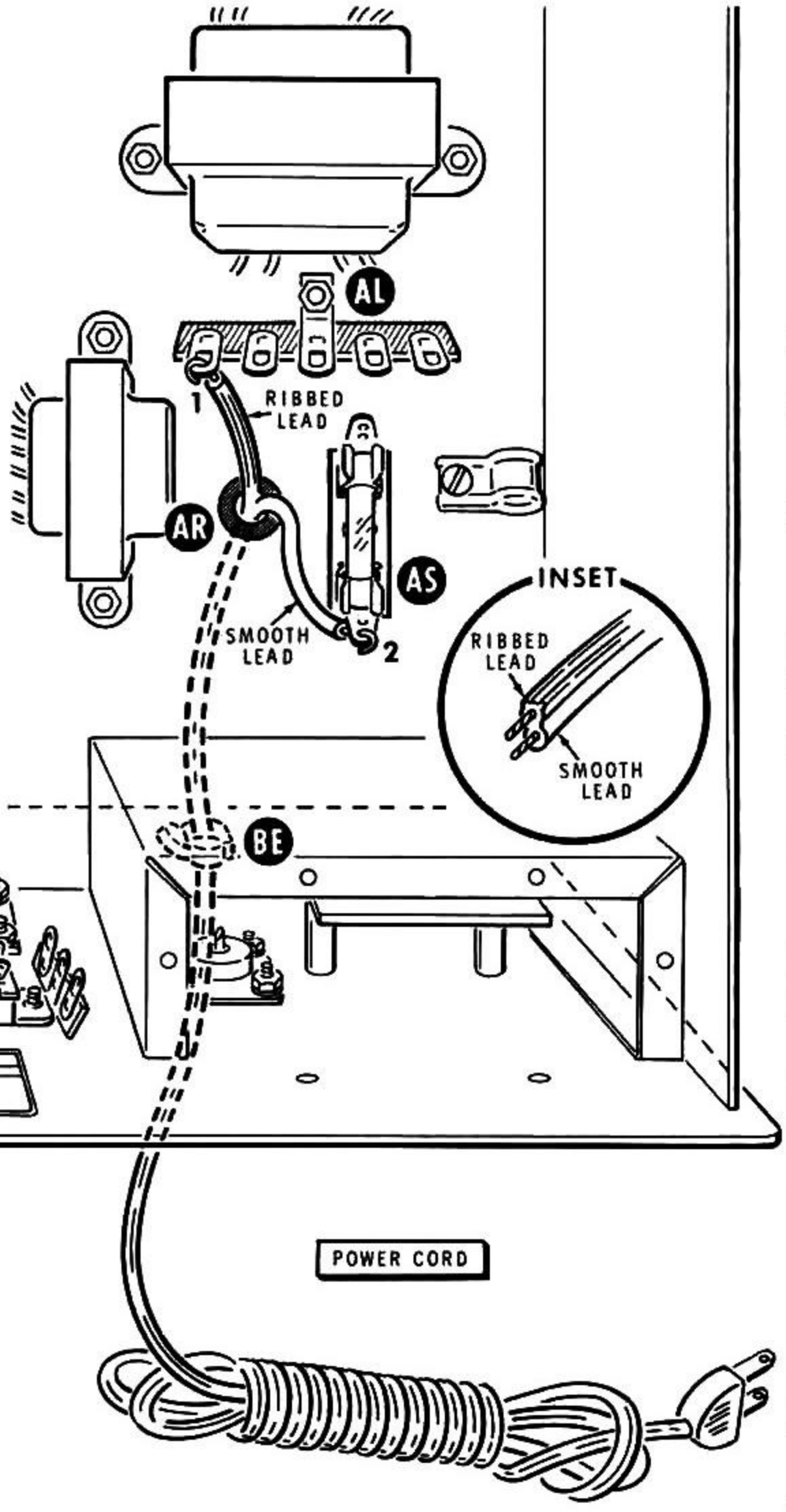


PART A

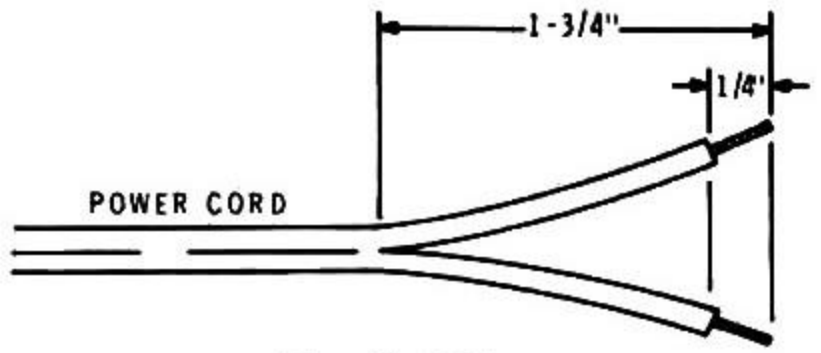


PART B

Figure 1



PICTORIAL 5-8



Detail 5-8A

Refer to Pictorial 5-8 for the following steps.

( ) Refer to Detail 5-8A and prepare the end of the power cord as shown.

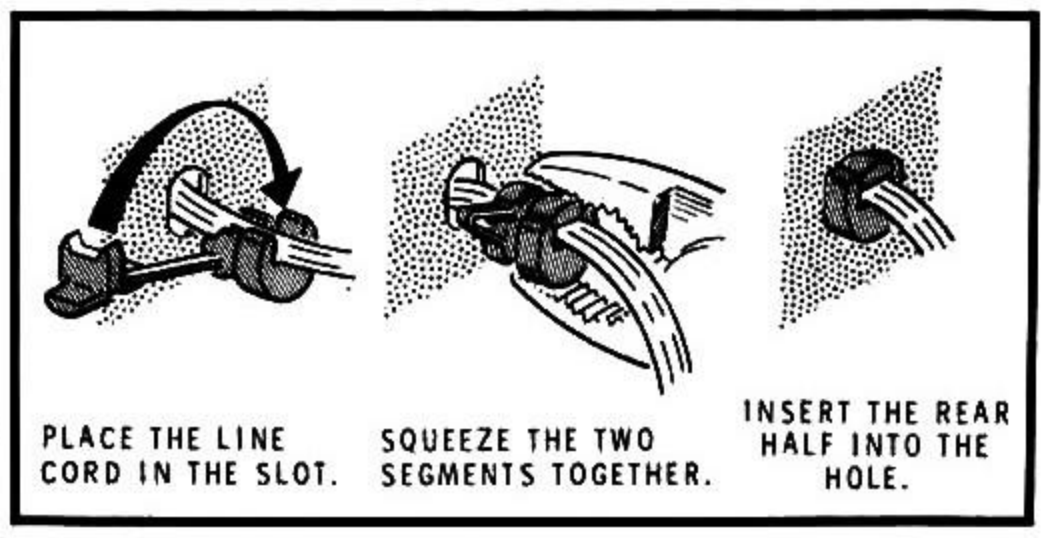
( ) Insert the end of the power cord through rear panel hole BE and then up through gromment AR in the chassis bottom.

NOTE: Make mechanically secure connections before you solder in the following steps.

( ) Connect the ribbed lead of the power cord to terminal strip AL lug 1 (S-3).

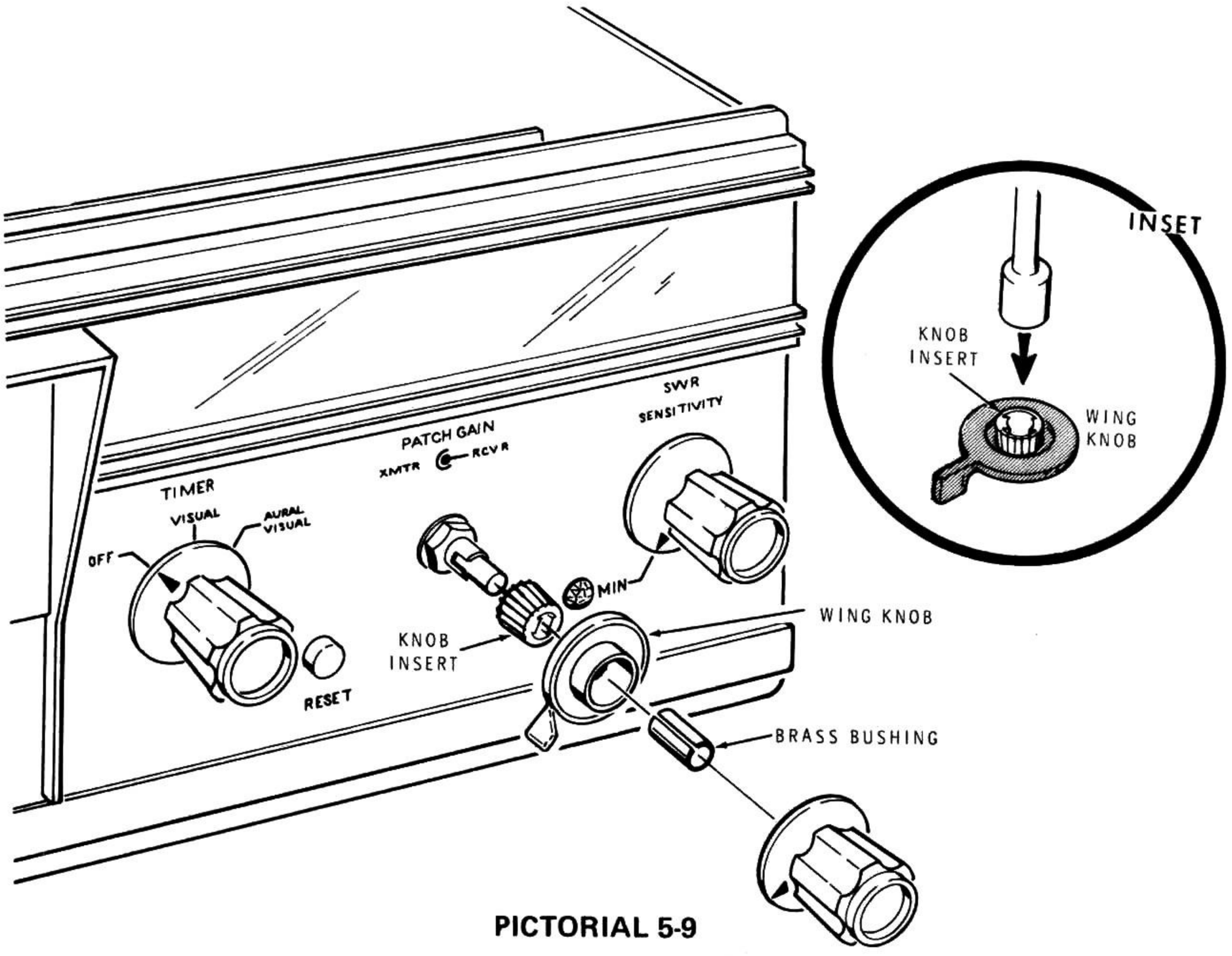
( ) Connect the other power cord lead to fuse block AS lug 2 (S-1).

CAUTION: When you perform the next step, be sure you leave enough slack in the power cord so there is no strain on terminal strip AL.



Detail 5-8B

( ) Refer to Detail 5-8B and, using the remaining strain relief, secure the power cord in hole BE in the rear panel.



PICTORIAL 5-9

KNOB INSTALLATION

Refer to Pictorial 5-9 for the following steps.

( ) Turn the front panel switch and controls to their fully counterclockwise positions.

( ) Place a knob insert (#455-52) on the outer shaft of the PATCH GAIN control; then turn the insert fully counterclockwise.

( ) Position the lever portion of the wing knob as shown in the Pictorial and press it part way onto the knob insert. Now turn the knob through its full rotation to be sure it is properly positioned in the insert.

( ) With the knob still on the insert, carefully remove the insert from the control shaft.

( ) Refer to the inset drawing on the Pictorial, and using a suitable tool, drive the insert into the wing knob. Then place the wing knob on the outer shaft of the PATCH GAIN control.

( ) Install 8-32 x 1/4" setscrews into each round knob.

( ) Press the brass bushing onto the small inner shaft of the PATCH GAIN control.

( ) Place a round knob on the brass bushing on the PATCH GAIN control. Position the knob pointer in line with the lever portion of the wing knob and tighten the knob setscrew. NOTE: Be sure the wing knob and the round knob turn freely and independent of each other.

( ) Install round knobs on the TIMER switch and the SWR SENSITIVITY control. Position the knob pointers as shown in the Pictorial.

TESTS AND ADJUSTMENTS

NOTE: Do not plug the line cord into an AC outlet until you are told to do so.

This part of the Manual is divided into various sections. Each section deals with a particular circuit of the Station Console. In the first section, "Clock-Timer Test," you will make sure the 24-hour clock and the 10-minute timer work. In the second section,"Adjustments," you will make adjustments so that the meter reads correctly for each function. In the third section, "Null Adjustment," you will adjust the phone patch circuit for proper operation.

NOTE: If you do not obtain the proper results in any of the following steps, unplug the line cord and proceed to the "In Case of Difficulty" section on Page 93.

CLOCK-TIMER TEST

Refer to Figure 1 (fold-out from Page 74) for the following steps.

( ) Make sure the TIMER switch (SW6) is in the OFF position.

CLOCK

( ) Plug the line cord into an AC outlet. The six clock display digits should come on and each indicate an eight.

( ) **Push down and hold the TIME HOLD switch. The display should indicate 00:00:00.**

( ) **Release the TIME HOLD switch. The seconds display should advance one digit each second. This display should advance to 59, return to 00, and start over.**

( ) **Push down and hold the MINUTES SET switch. The right-hand digit of the minutes display should advance one digit each half second.**

( ) **Release the MINUTES SET switch. The right-hand digit of the minutes display should advance one digit each time the seconds display returns to 00.**

( ) **Simultaneously push down and hold both the MINUTES SET switch and the HOURS SET switch. The left-hand digit of the minutes display should advance one digit each half second. This digit should advance to 5, return to 0, and start over.**

( ) Release the MINUTES SET and HOURS SET switches. The left-hand digit should advance one digit each time the right-hand digit goes to 0.

( ) **Push down and hold the HOURS SET switch (SW3). The hours display should advance one digit each half second. This display should advance to 23, return to 00, and start over.**

( ) Release the HOURS SET switch. The hours display should advance one digit each time the minutes display goes to 00.

TIMER

( ) Turn the TIMER switch to the VISUAL position. The timer display should indicate a random number with three digits displayed and the IDENTIFY lamp should light for one second.

( ) Push in and release the RESET switch. The timer display should go to 0:00 and start counting.

( ) Turn the TIMER switch to the OFF position. Then quickly turn the TIMER switch through the VISUAL position to the AURAL-VISUAL position. The timer display should again indicate a random number and the IDENTIFY lamp should again come on. Also, a momentary tone should be heard from the speaker. NOTE: If the momentary tone is too loud, you can decrease its volume as follows:

1. Procure a 100 ohm 1/4-watt composition resistor.

2. Connect the resistor in series with one of the leads to speaker SP1.

( ) Again push in and release the RESET switch. The timer display should again go to 0:00 and start counting.

( ) Turn the TIMER switch to the OFF position.

( ) Unplug the line cord from the AC outlet.

ADJUSTMENTS

Locate the nut starter and the alignment tool blade. Prepare an alignment tool in the following manner:

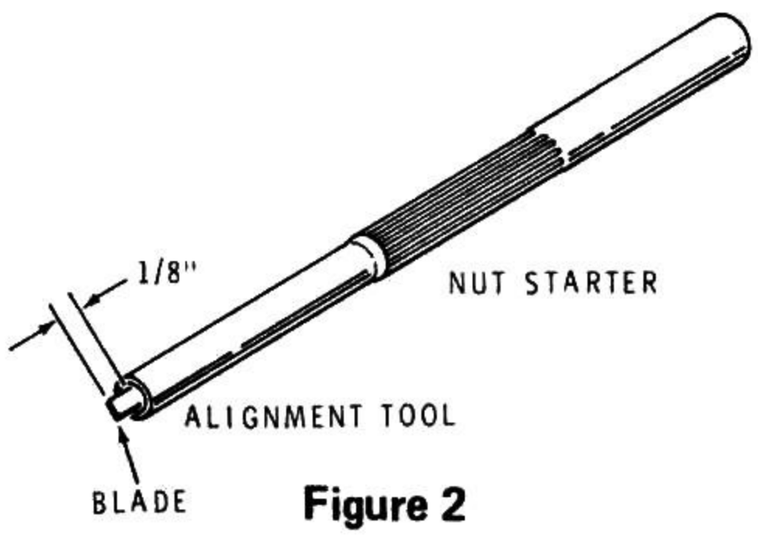


Figure 2

Refer to Figure 2 and insert the alignment tool blade into the small end of the nut starter as shown. Leave 1/8" of the blade protruding from the end of the nut starter. You will use this alignment tool in some of the following steps.

SWR BALANCE ADJUSTMENT

NOTE: Perform steps 1 through 5 to make sure you have a normal output from your transmitter, through the power meter, to your dummy load. You *must* obtain a power meter reading before you continue with steps 6 through 13.

Refer to Figure 1 while you perform the following steps.

1. ( ) Connect a 50-ohm noninductive load, such as the Heathkit Cantenna, to the RF OUTPUT connector on the rear panel.

2. ( ) Connect the transmitter output to the RF INPUT connector on the rear panel.

3. ( ) Push the 200W switch to the on (in) position.

4. ( ) Turn the SWR SENSITIVITY control to MIN (fully counterclockwise).

5. ( ) Turn on your transmitter and set it to the CW mode in the 40-meter band. Then tune the transmitter. The power meter needle should move up-scale.

6. ( ) Decrease the Transmitter output level.

7. ( ) Set the FWD/REF switch to the REF (out) position.

8. ( ) Push the SWR switch to the on (in) position.

9. ( ) Increase the transmitter output level to obtain a power meter reading of approximately 25 on the 200 scale. Even if the meter does not read this high, proceed with the following steps.

10. ( ) Adjust the SWR SENSITIVITY control for a full-scale meter reading.

11. ( ) Use the alignment tool and adjust C (SWR null trimmer C304) for the best null (greatest dip of the meter pointer). This reading should be at or near zero. NOTE: Do not use any metal tool other than the alignment tool blade to make this adjustment.

12. ( ) Increase the transmitter output to full power and readjust C (SWR null trimmer C304) for the best null. Make this adjustment carefully and precisely. The accuracy of the power meter depends on a well-balanced bridge circuit.

13. ( ) Repeat steps 11 and 12.

Do not disconnect the transmitter transceiver, or the load; they will be used in the following section.

POWER METER

This section of the Manual contains three calibration procedures: one for calibrating the power meter on the 40-meter band, one for calibrating the meter on any one of the other bands, and one for calibration using an accurate external wattmeter.

Calibrate the power meter on the 40-meter band, even if it is going to be used on the other bands. If your transmitter will tune to the 40-meter band, use the "Normal Calibration" procedure. However, if your transmitter will not tune to the 40-meter band, use the "Calibration on Other Bands" procedure. NOTE: Readings are more accurate in the upper half of the meter scale. Therefore, if possible, use a transmitter that has an output of at least 100 watts when you perform the following calibration procedures.

( ) Check to see that the meter pointer is directly over the zero on the scale. If it is not, adjust the "zero adjust screw" on the front of the meter until the needle is positioned over the zero.

CAUTION: DO NOT USE AN ANTENNA OR A LIGHT BULB FOR THE FOLLOWING CALIBRATION PROCEDURE. USE ONLY A 50 OHM NONINDUCTIVE DUMMY LOAD SUCH AS THE HEATHKIT "CANTENNA."

Normal Calibration

( ) Push the 200W switch to the on (in) position.

( ) Adjust the transmitter output to approximately 100 watts.

( ) Complete the calibration as follows:

1. Turn off your transmitter.

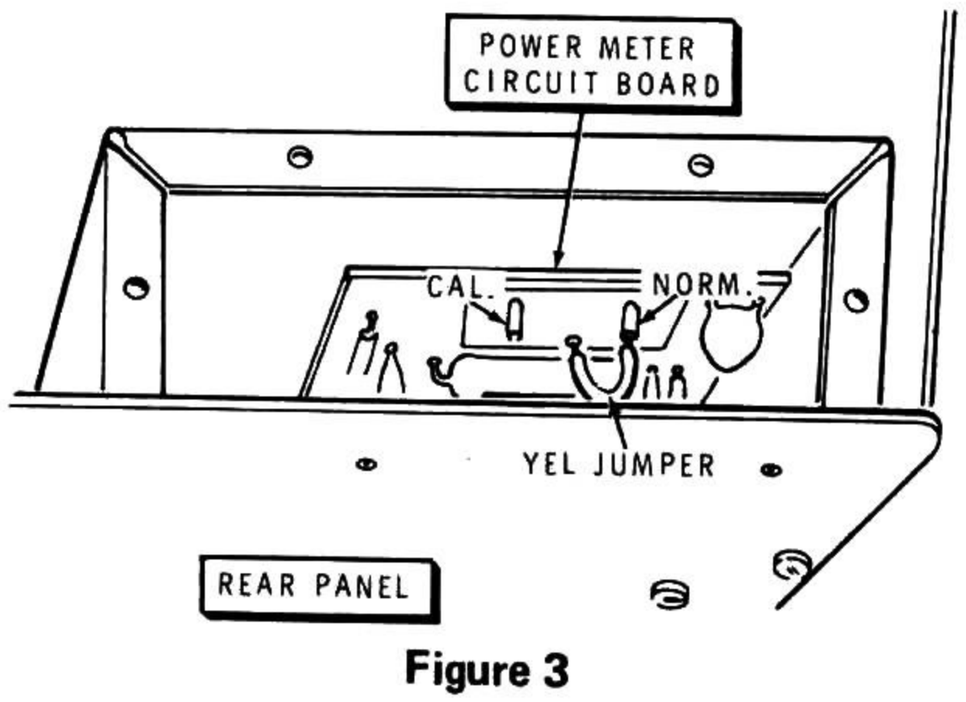


Figure 3

2. Refer to Figure 3 and note the yellow jumper wire on the power meter circuit board. Unsolder the end of this wire that is connected to the pin marked NORM. Then temporarily solder it to the circuit board pin marked CAL.

3. Turn on your transmitter. Note the meter reading and record it here. _____W

4. Again turn off your transmitter.

5. Unsolder the yellow jumper wire from the CAL, circuit board pin and solder it to the NORM circuit board pin.

6. With the alignment tool, adjust R (power calibrate control R307) for the same meter reading you recorded in step 3.

7. Repeat steps 1 through 6 until the meter readings for NORM and CAL are the same.

8. Permanently solder the yellow jumper wire to the NORM circuit board pin.

This completes the "Normal Calibration" of the power meter.

Calibration on Other Bands

NOTE: During the following steps you will need a VTVM with a high impedance input and an RF probe, or an RF voltmeter, to measure the RF output of your transmitting system.

If you cannot tune your transmitter to the 40-meter band, acceptable calibration accuracy can be obtained on another band by using the following formula:

$$P = \frac{E^2}{R}$$

Where P = watts output
E = RF voltage across the load
R = load resistance

To determine E, select a transmitter output value and substitute it for P in the formula. Then, using 50 Ω for R, calculate the value of E. With this method, you will adjust the transmitter for an RF voltmeter reading of that determined by the formula. The power meter is then adjusted to read the same as that of the transmitter output.

To calibrate the power meter using this method, and the desired transmitter output of 100 watts:

1. ( ) Push the 200W switch to the on (in) position.

2. ( ) Connect your RF Voltmeter across the resistive load. NOTE: Do not exceed the voltage rating of your RF probe.

3. ( ) Adjust the transmitter output to obtain an RF Voltmeter reading of approximately 71 volts. NOTE: This value was obtained using the power formula, where P = 100 watts and R = 50 Ω.

4. ( ) Use the alignment tool and adjust control R (power calibrate control R307) on the rear panel until the power meter reads 100 on the appropriate meter scale.

Any other figure for watts between 10 and 2000 may be substituted in the formula and in the following example.

EXAMPLE: If you wish to use the 25-watt figure on the meter scale for calibration and you are using a 50-ohm resistive load, set your transmitter output so the RF voltmeter across the load reads 35 volts RF.

25 watts (P) X 50 ohms (R) = 1250 (E^2)

$E = \sqrt{1250} = 35$ volts (approximately)

When the RF voltmeter indicates 35 volts, you know the transmitter is putting out 25 watts. Therefore, you can adjust the power meter to indicate 25 watts.

To do this, proceed as follows:

1. ( ) Select the power you wish to obtain from your transmitter.

2. ( ) Use the power formula to calculate the RF voltage that should appear across the resistive load when the transmitter is putting out the selected power (refer to the example).

3. ( ) Push either the 200W switch (SW4D) or the 2000W switch (SW4C) to the on (in) position, depending upon the output power of your transmitting system.

4. ( ) Connect the RF voltmeter across the resistive load. NOTE: Do not exceed the voltage rating of your RF probe.

5. ( ) Adjust the transmitter output so the RF voltage across the resistive load is the same as the calculated RF voltage.

6. ( ) Using the assembled alignment tool, adjust R (power calibrate control R307) until the power meter indicates the power you selected to obtain from your transmitter.

Calibration Using External Wattmeter

( ) Check and make sure the yellow jumper wire on the power meter circuit board is soldered to the circuit board pin marked NORM.

Refer to the following block diagram and to Part A of Figure 1 (fold-out from Page 74) for the following steps.

( ) Connect the input of a known-to-be-accurate external RF Wattmeter to the RF OUTPUT connector on the SB-634. Then connect the output of the RF Wattmeter to a 50-ohm dummy load, such as the Heathkit Cantenna.

( ) Push the 200W pushbutton of the SB-634 Selector switch to the on (in) position.

( ) Set your transmitter (or transceiver) to the 40-meter band, and adjust its output for a reference reading on the external RF Wattmeter. Make a note of the external wattmeter reading.

( ) Use the alignment tool and adjust control R (power calibrate control R307) on the rear panel of the SB-634 until the reading on the 0 to 200 scale of the SB-634 is the same as the reading shown by the external wattmeter.

( ) Turn off the transmitting equipment and disconnect the external wattmeter.

This completes the power meter calibration using an external RF Wattmeter.

PHONE PATCH

Refer to the "Phone Patch Connections" of the "Installation" section on Page 86 and make the proper connections. Then return to this part of the Manual and complete the following steps.

( ) Place the NULL-MONITOR switch (SW5) in the NULL position. (See Figure 1.)

( ) Turn the NULL-ADJUST control (R2) to the full counterclockwise position.

( ) Turn the PATCH GAIN-XMTR control (R3/R4) fully counterclockwise. (See Figure 1.)

( ) Turn the PATCH GAIN-RCVR control (R3) fully clockwise; then counterclockwise 1/4 turn.

( ) Make sure the PATCH/VU switch (SW4E) is in the OFF (out) position.

( ) Tune in a strong heterodyne note of about 800 Hz on the receiver. This can be done by beating a crystal calibrator against the receiver BFO.

( ) Call a friend on the phone. Someone on a different line is best. Explain to your friend that there will be a strong tone in the telephone receiver, that he should keep the phone away from his ear, and that he can hang up when the tone stops.

( ) Leave your telephone handset off the cradle, and push the Patch/VU switch to the ON (in) position.

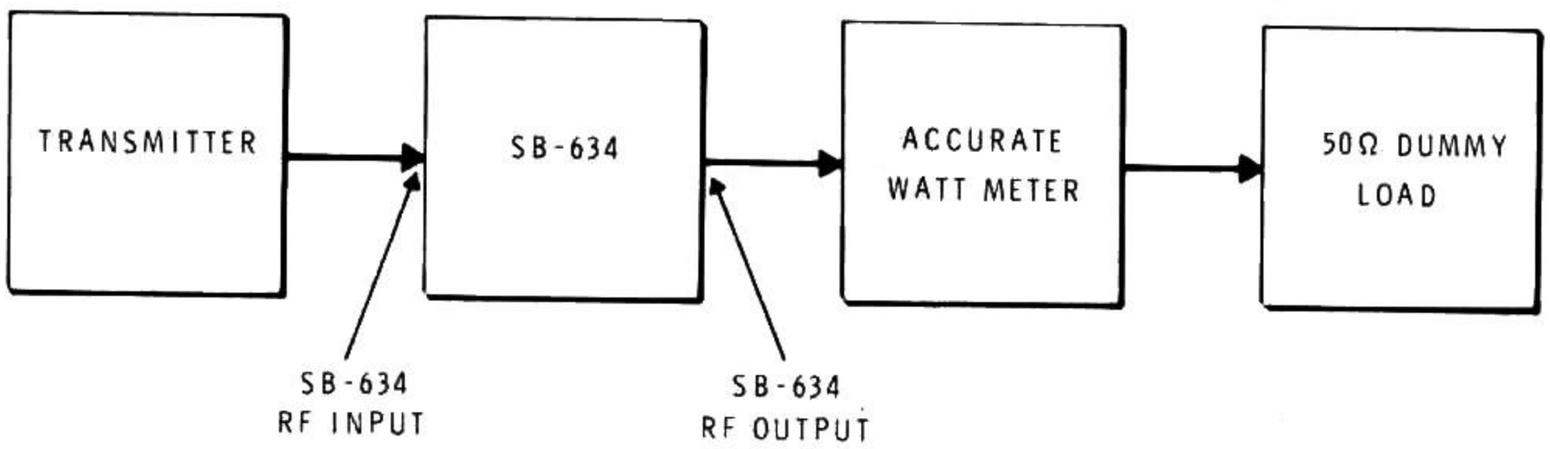
( ) Advance the receiver AF Gain control until the VU meter on the Station Console indicates zero VU, or 100%.

( ) Adjust the NULL-ADJUST control for minimum VU meter indication, (-20 or less). This dip should occur with about one-half rotation of the NULL-ADJUST control.

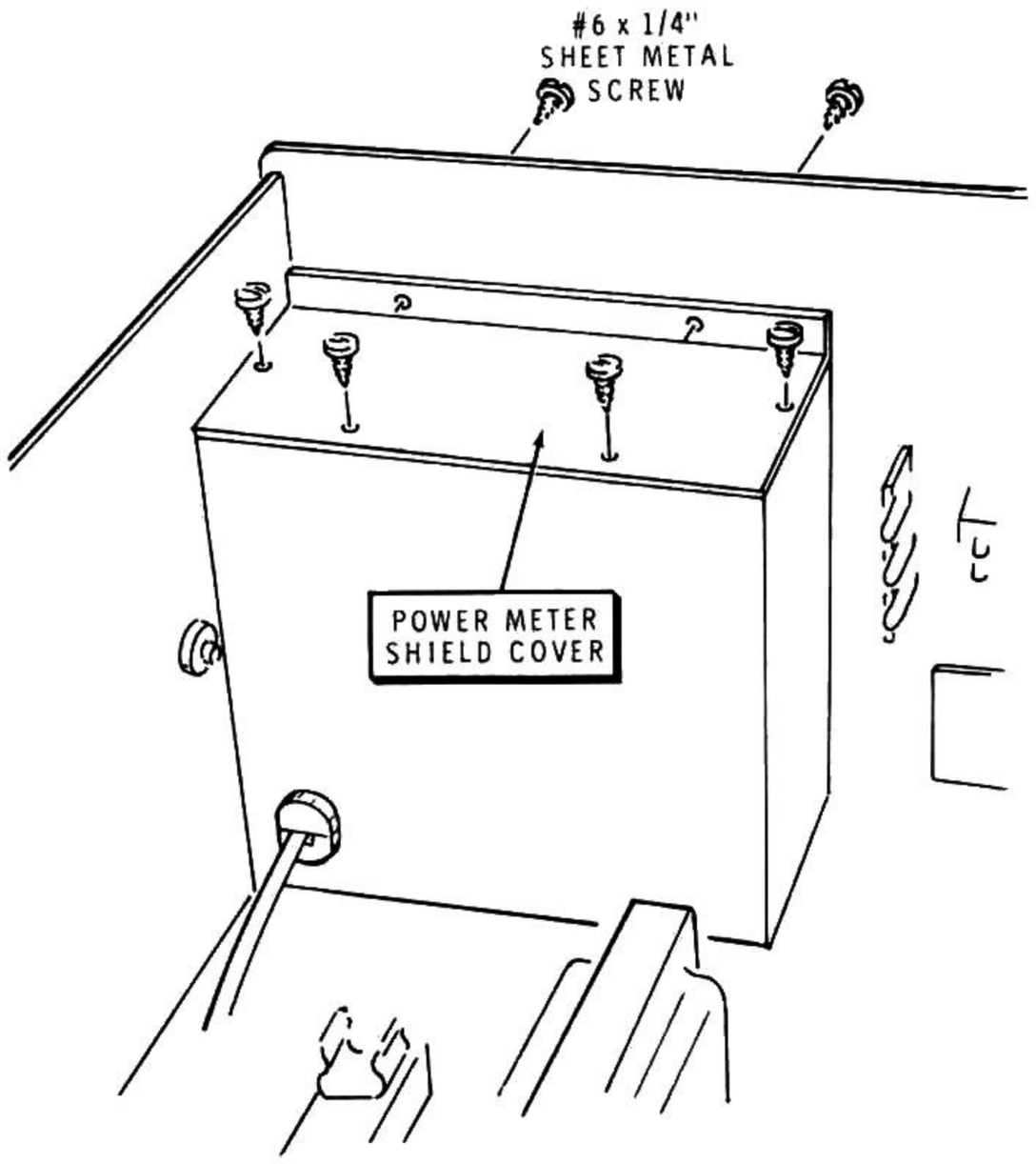
( ) Push the Patch/VU switch to the OFF (out) position and hang up the telephone handset.

( ) Place the NULL-MONITOR switch in the MONITOR position.

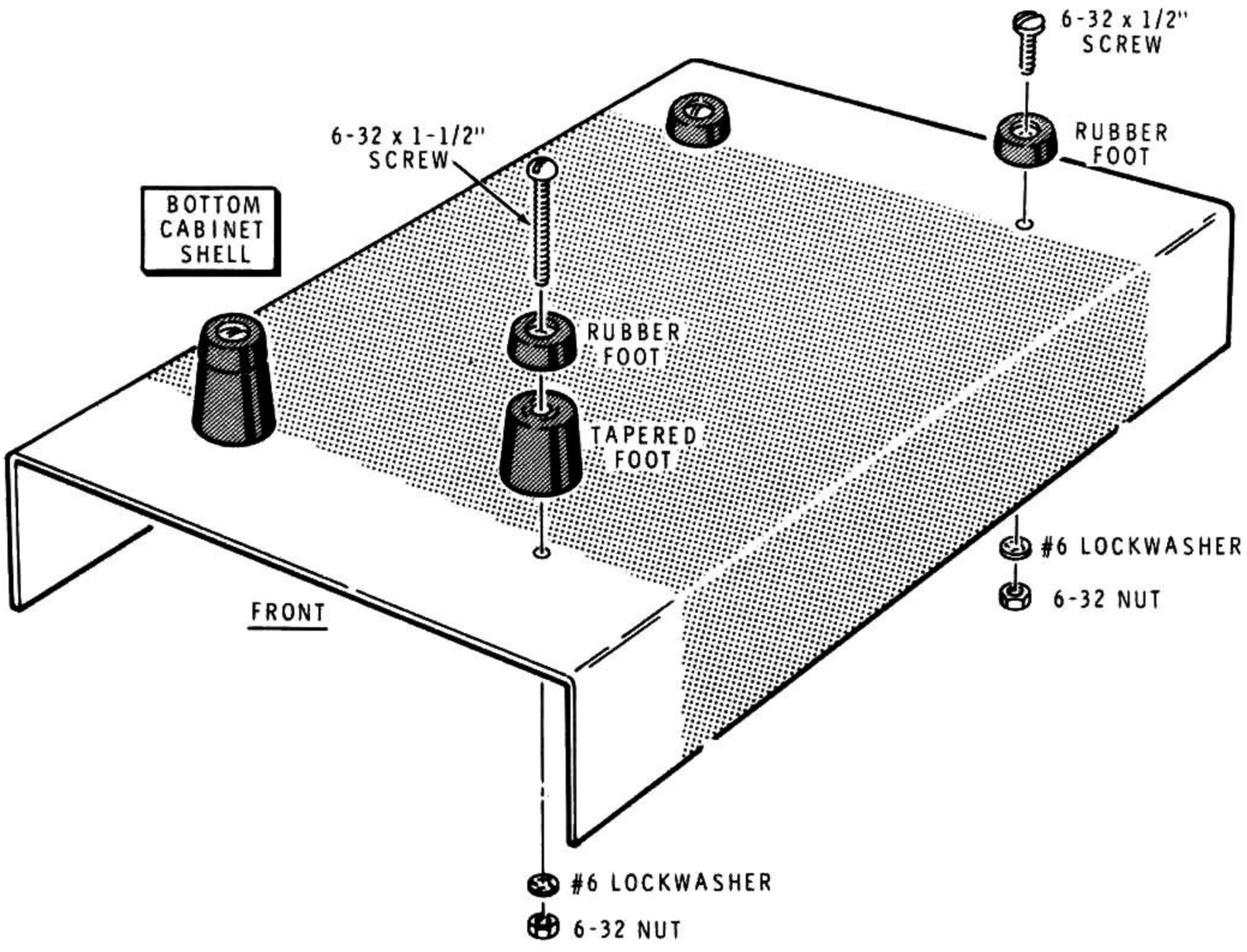
This completes the "Tests and Adjustments."



BLOCK DIAGRAM



Detail 6-1A



Detail 6-1B

FINAL ASSEMBLY

Refer to Pictorial 6-1 (fold-out from Page 83) for the following steps.

( ) Refer to Detail 6-1A and mount the power meter shield cover on the power meter shield and the rear panel with #6 x 1/4" sheet metal screws at the six indicated locations.

( ) Loosely mount a trim rail on each side of the chassis. Use a 10-32 x 1/2" screw and two #10 flat washers at each of the four indicated locations. NOTE: Turn the screws in just enough to prevent the rails from coming off the chassis.

( ) Refer to Detail 6-1B and mount two tapered feet and four rubber feet on the bottom cabinet shell at the four indicated locations. Use two 6-32 x 1/2" screws and two 6-32 x 1-1/2" screws as shown.

( ) Position the chassis up-side-down and remove the protective cardboard covering the speaker.

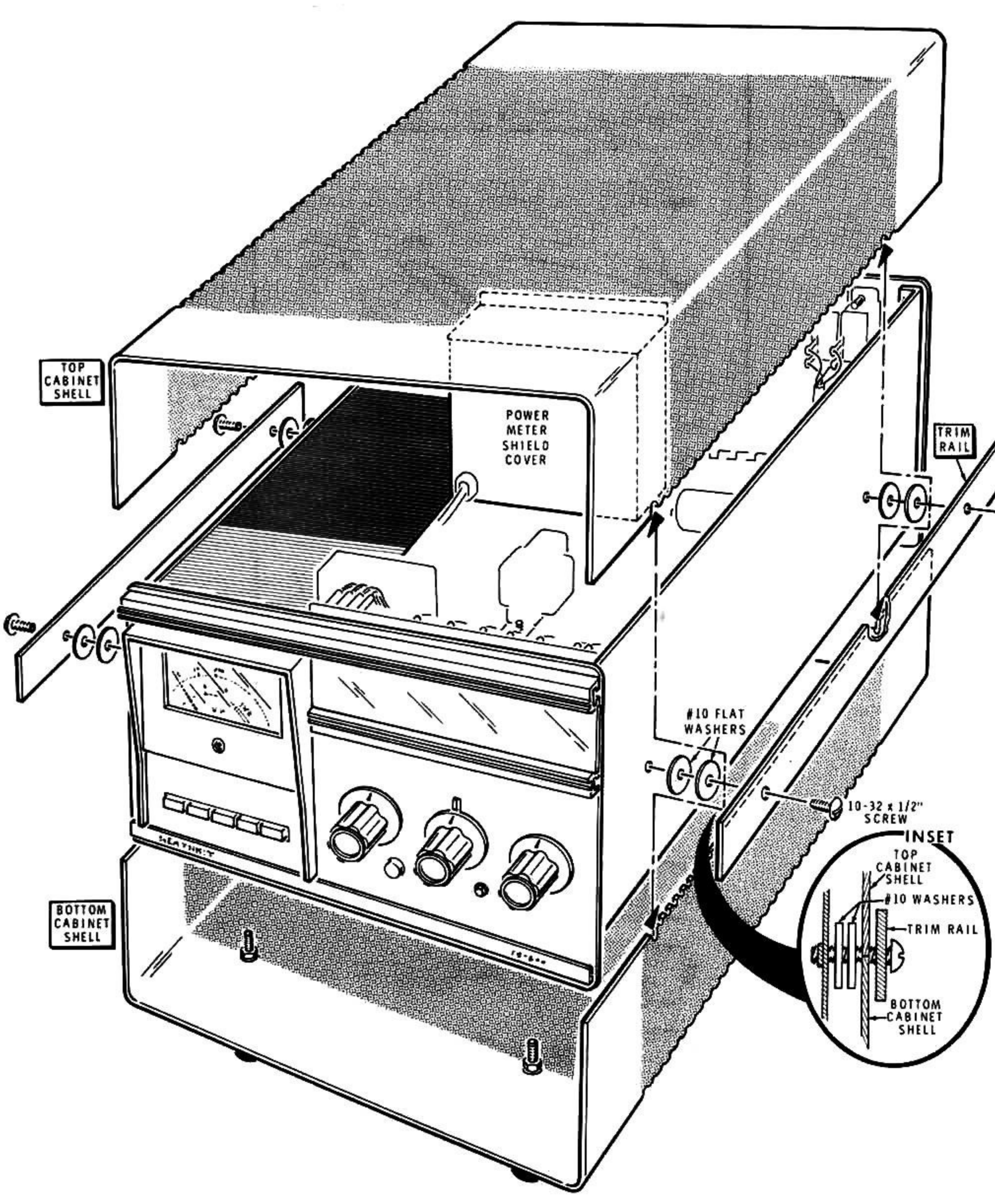
( ) With the longer feet toward the front, place the bottom cabinet shell on the chassis. Be sure the flat washers at all four locations are between the chassis and the shell and that the four notches in the shell are seated over the screws in the chassis.

( ) Tighten all four screws just enough to hold the bottom shell in place; then position the chassis right-side-up.

( ) Loosen the four screws in the trim rails and place the top cabinet shell on the chassis. See the inset drawing on Pictorial 6-1.

( ) Be sure the top shell is properly seated on the trim rail screws and tighten the trim rail screws.

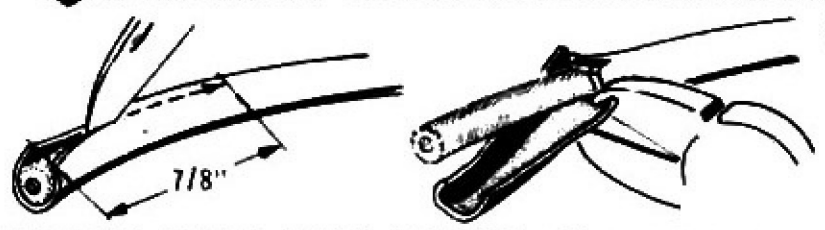
This completes the assembly of your Station Console.



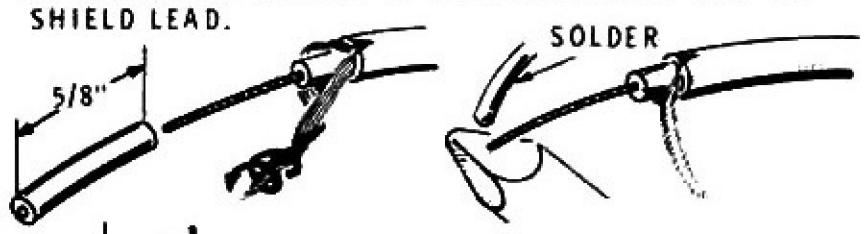
PICTORIAL 6-1

PREPARE EACH END OF THE CABLE AS SHOWN BELOW.

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



TWIST THE SHIELD WIRES INTO ONE LEAD. REMOVE THE INNER INSULATION. THEN APPLY A SMALL AMOUNT OF SOLDER TO THE END OF THE INNER LEAD AND THE SHIELD LEAD.



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

APPLY HEAT TO THE TIP OF THE PIN ONLY LONG ENOUGH FOR THE SOLDER TO BE DRAWN UP INTO THE PIN BY CAPILLARY ACTION.

SOLDER THE SHIELD LEAD ONTO THE PLUG.

CUT OFF EXCESS WIRE FROM THE TIP OF THE PIN.

Figure 4

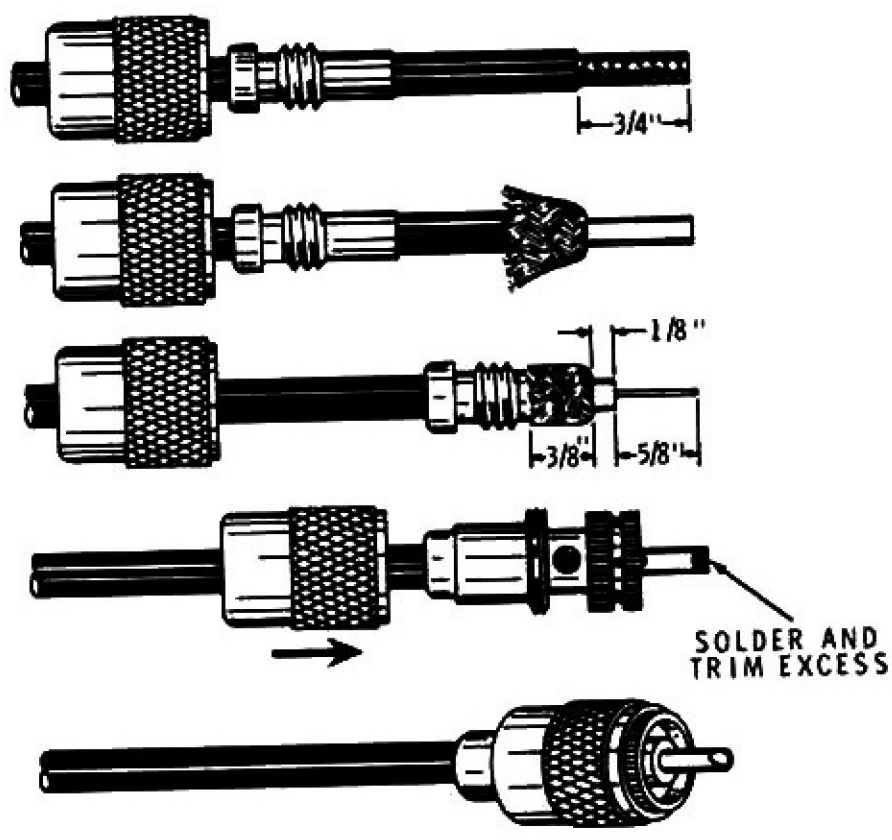


Figure 5

INSTALLATION

The 24-hour clock, the ten-minute timer, the power meter, and the phone patch are independent circuits within the Station Console. The connection procedure for each circuit will be presented separately. Part A of Figure 1 shows the location of the front panel controls and switches. Part B of the Figure shows the locations of the jacks, controls, switches, and connectors on the rear panel.

24-HOUR CLOCK

No special clock connection is required since the clock runs whenever the line cord is connected to an AC power line.

10-MINUTE TIMER

The 10-minute timer requires no special installation procedure since it operates from the 24-hour clock circuitry whenever the TIMER switch is not in the OFF position.

POWER METER

The power meter section of the Console connects between the transmitter output and the antenna transmission line by means of two coaxial connectors. The meter will not perform properly in a transmission line with an impedance other than 50 ohms, or with lines that are used as tuned feeders. No AC power is needed to operate the power meter.

( ) Cut the coaxial transmission line at a place that will allow the Console to be at a convenient location. Install male coaxial connectors on the cable ends.

( ) Connect the transmitter output cable to the RF Input connector, and the antenna cable to the RF Output connector on the rear of the Station Console. See Figure 1.

NOTE: If an antenna coupler is used, connect the power meter between the transmitter and the antenna coupler with coaxial cable of the proper impedance. Then you can adjust the coupler for maximum output and a minimum standing wave ratio.

Physical Placement and Losses

The meter readings may vary if the power meter is placed at different locations in the transmission line, or if the length of the transmission line is changed. For this reason, assume that the highest SWR reading is most correct. Keep in mind that the closer the SWR approaches 1:1 the more accurate the meter becomes.

Misleading meter readings may be obtained with long transmission lines since the losses in the cable tend to "smooth out" the standing waves. This condition may give you a much better indication at the transmitter than actually exists at the antenna. Therefore, if you are using a transmission line long enough to have appreciable losses, connect the meter into your system near the antenna, especially when you adjust beams or tuning traps. You can better understand the extent of this effect when you realize that a line with a 3 dB loss will show a SWR of 3 when it is terminated in a dead short. A line with a loss of over 10 dB will show a SWR of practically 1:1, on this or any other SWR meter regardless of what load or termination is connected at the far end.

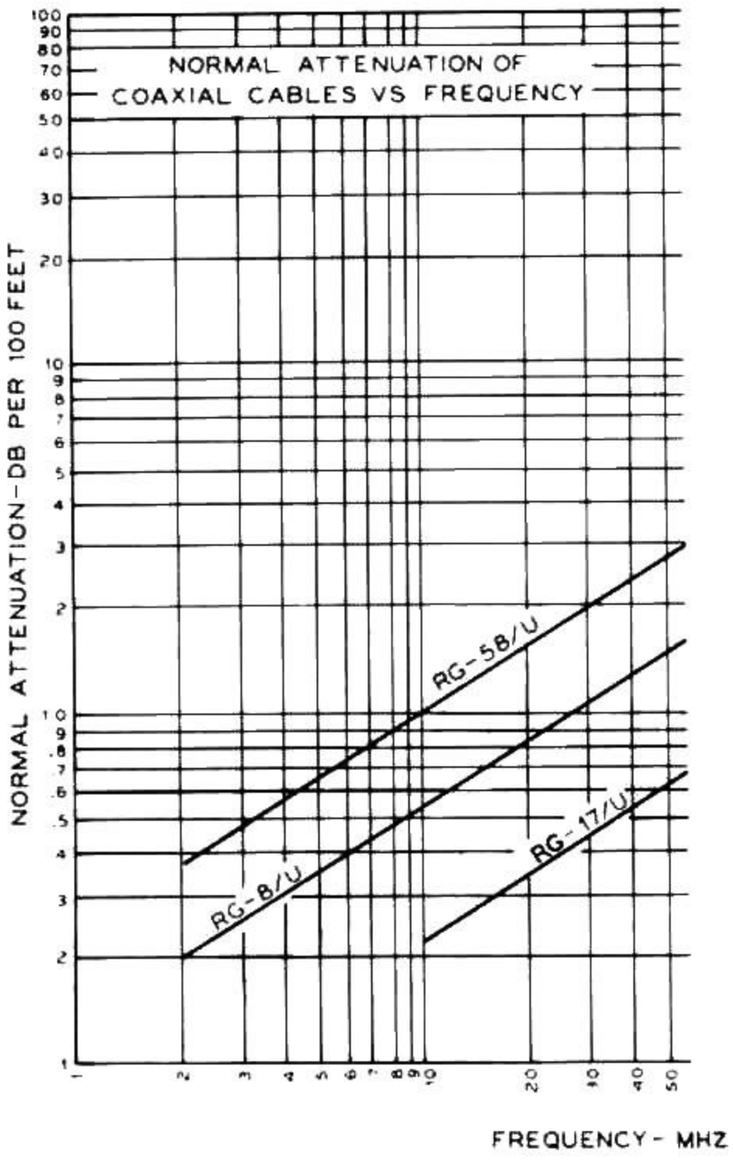


Figure 8

The power losses in these cases occur in the cable, but the meter reading will not indicate that anything is wrong. When in doubt, make measurements at the antenna and at the transmitter, so future changes in the readings will be meaningful. The values of cable losses at various frequencies can be obtained from Figure 8. These losses become worse as time and moisture affect the cable.

With a high SWR, the transmission line losses may become so great that the radiated power is appreciably reduced. With high-power transmitters the cable ratings may be exceeded. Figure 9 shows the effect of cable losses caused by various values of SWR. When these looses occur, the RF power is turned into heat in the cable instead of being radiated from the antenna.

To figure the total losses in a given length of coaxial cable, determine the dB loss per foot of the cable from Figure 8. This is done by finding your operating frequency on the bottom line of the chart, and moving up to find the type of cable used. By looking at this same level on the left-hand side of the chart, you can read the dB loss per 100 feet of the cable at that frequency.

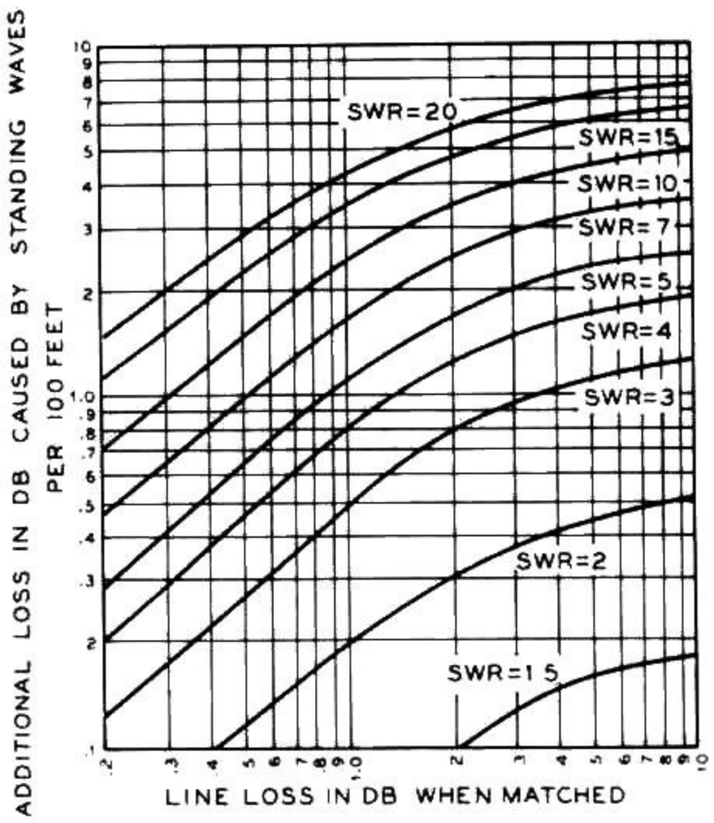


Figure 9

Now determine the additional loss caused by the SWR from Figure 9 as follows: Use the amount of loss determined from Figure 8 and find this value on the bottom line of Figure 9. Now move up the graph until you come to the SWR of your antenna system. Move over the the left-hand side of the graph and determine the amount of loss caused by the SWR. To obtain the total loss of your system, add the value from Figure 8 to the value from Figure 9.

Loading

The load presented to the transmitter output circuit may create conditions that make the transmitter "touchy" or impossible to load. With a low SWR, the load that the transmitter "sees" is practically purely resistive. However, at a high SWR, the apparent load may change from a very low to a very high resistance, accompanied by either capacitive or inductive reactance. These resistance and reactance values change when the transmission line length or frequency is changed.

Remember, when you are using 50 ohm unbalanced feed lines, the SWR ***cannot*** be changed by changing the transmission line length. However, the loading to the transmitter may be changed considerably, and thus make it appear that "pruning" the cable length offers improvement when it actually does not affect the SWR.

The SWR can only be changed by changing the load or termination at the end of the cable. If the transmission line length is changed, for example, with 50 ohm cable and an SWR of 3, the apparent load to the transmitter may vary from 16-2/3 ohm to 150 ohm resistive, with reactance varying from 66-2/3 ohm capacitive, to zero, to 66-2/3 ohm inductive. If the transmitter output tuning adjustments will not accommodate this impedance range, the transmitter will be difficult to load until the load is properly matched to the line. When the load is matched, the SWR will be lower.

PHONE PATCH WITH HEATHKIT SB SERIES EQUIPMENT

An SB-104 Transceiver, an SB-303/SB-401 receiver-transmitter combination, and a speaker from the Heathkit SB series of amateur equipment have been selected to illustrate phone patch connections.

Use the shielded cable, phono plugs, and coaxial connectors supplied with the kit to interconnect equipment as shown in Figures 6 and 7 (fold-out from this page).

Figures 4 and 5 (fold-out from Page 84) show you how to attach phono plugs or coaxial connectors to a shielded cable. The shielded cables will provide the essential ground connections between the various pieces of equipment.

SB-104 Connection Procedure

Refer to Figure 6 (fold-out from Page 87) for the following steps.

( ) Plug the cable from your speaker into the SPKR socket on the rear of the SB-634 Station Console.

( ) Connect the SPKR socket of the SB-104 Transceiver to the RCVR socket on the rear of the SB-634 Station Console.

( ) Connect the HI Z socket on the rear of the SB-634 Station Console to the PATCH IN socket of the SB-104 Transceiver.

SB-401/SB-303 Connection Procedure

Refer to Figure 7 (fold-out from Page 87) for the following steps.

( ) Plug the cable from your speaker into the SPKR socket on the rear of the SB-634 Station Console.

( ) Connect the SPKR socket of the SB-401 Transmitter to the RCVR socket on the rear of the SB-634 Station Console.

( ) Connect the HI Z socket on the rear of the SB-634 Station Console to the PHONE PATCH socket of the SB-401 Transmitter.

Telephone Connection Procedure

CAUTION: To prevent the telephone ringing voltage from damaging the VU meter, be sure the PATCH/VU pushbutton switch is in the off (out) position before you connect any leads to the telephone line.

NOTE: You may be required by your local Telephone Company to install a Network Control Signaling unit "QKT" between your telephone and the telephone line. Check with your local Telephone Company to see if this is required in your area.

( ) Connect the LINE terminals on the rear of the SB-634 Station Console to the red and green wires on the telephone terminal block or to the "QKT" (Network Control Signaling) unit, if one is being used. Polarity is not important. Also, disregard the yellow wire on the telephone terminal block.

( ) Readjust the Vox and Anti-Vox controls on your transmitting equipment after you make the Phone Patch connections.

NOTE: Under some circumstances it may be desirable to connect a separate ground wire between the Station Console, and the ground terminals on the transmitting and receiving equipment. Make this connection only if you experience instability or difficulty with RF feedback.

TO ANT.

TO RED AND GREEN WIRES OF TELEPHONE TERMINAL BLOCK, OR "QKT" NETWORK CONTROL SIGNALING UNIT, IF REQUIRED BY YOUR LOCAL TELEPHONE COMPANY.

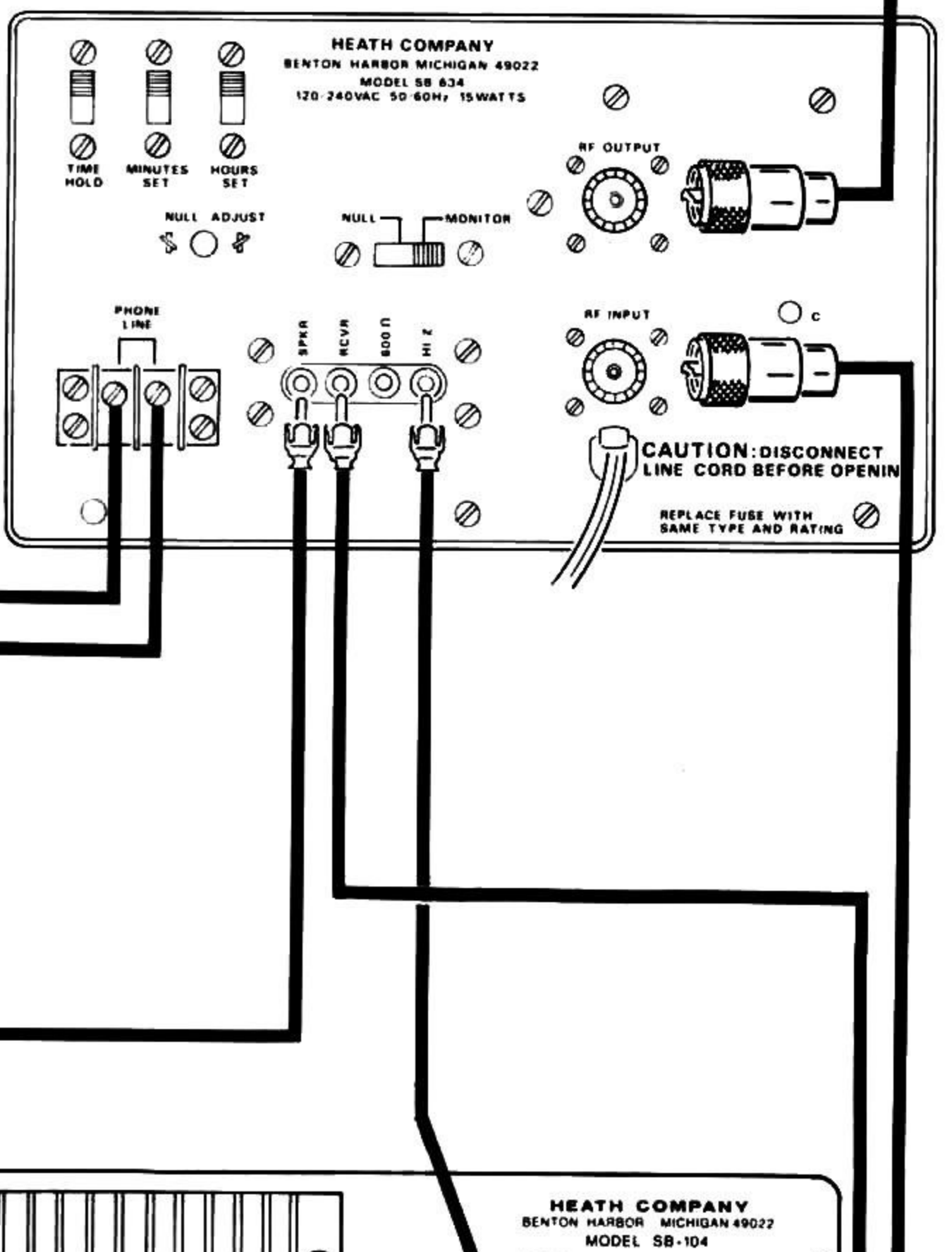


Figure 6

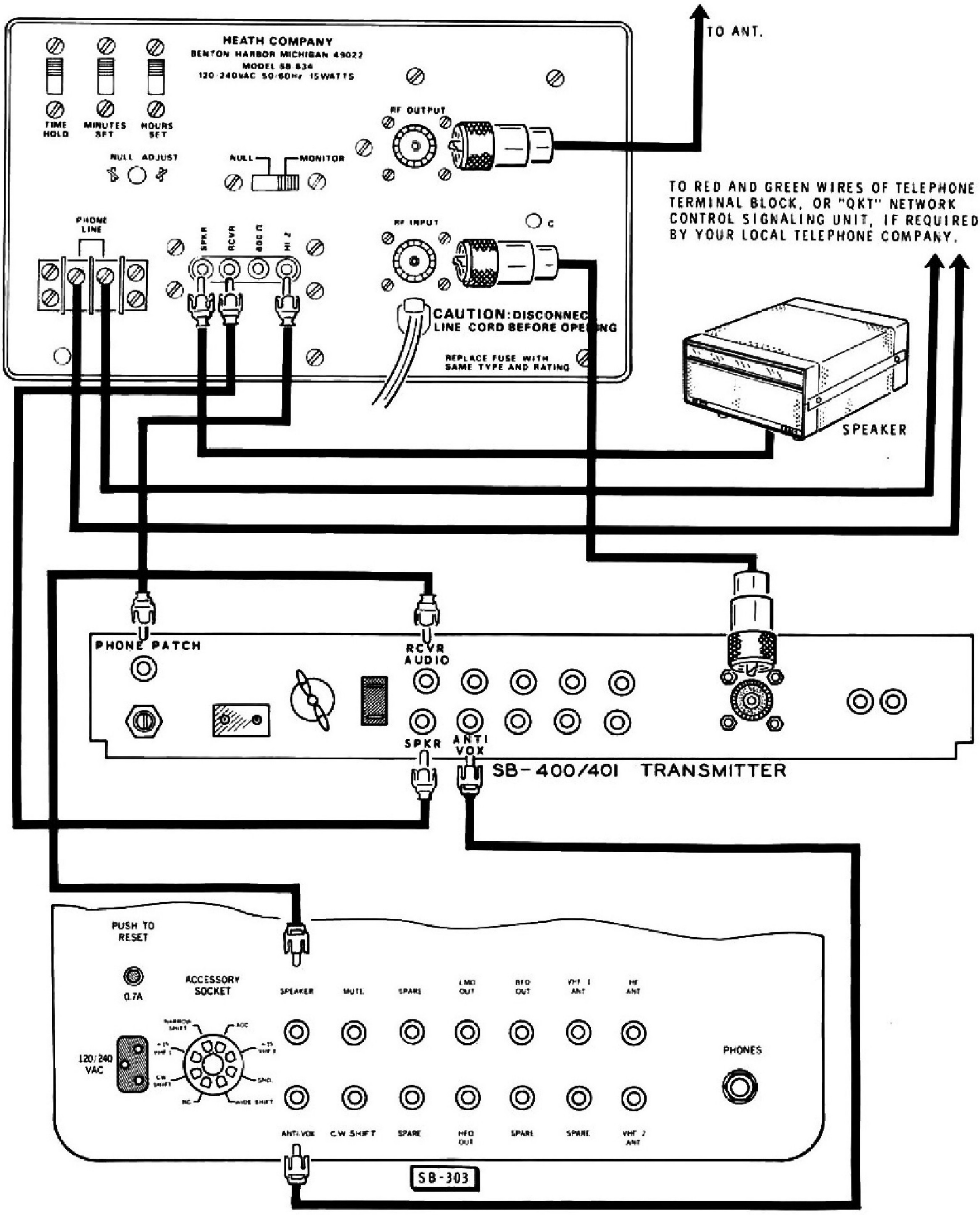

HEATH COMPANY
BENTON HARBOR MICHIGAN 49022
MODEL SB 634
120-240VAC 50-60Hz 15WATTS
TIME HOLD
MINUTES SET
HOURS SET
NULL ADJUST
NULL
MONITOR
RF OUTPUT
TO ANT.
PHONE LINE
SPKR
RCVR
600 Ω
HI Z
RF INPUT
CAUTION: DISCONNECT LINE CORD BEFORE OPENING
REPLACE FUSE WITH SAME TYPE AND RATING
TO RED AND GREEN WIRES OF TELEPHONE TERMINAL BLOCK, OR "QKT" NETWORK CONTROL SIGNALING UNIT, IF REQUIRED BY YOUR LOCAL TELEPHONE COMPANY.
SPEAKER
PHONE PATCH
RCVR AUDIO
SPKR
ANTI VOX
SB-400/401 TRANSMITTER
PUSH TO RESET
0.7A
ACCESSORY SOCKET
120/240 VAC
SPEAKER
MUTE
SPARE
LMO OUT
BFO OUT
VHF 1 ANT
HF ANT
PHONES
ANTI VOX
CW SHIFT
SPARE
HFO OUT
SPARE
SPARE
VHF 2 ANT
SB-303

Figure 7

PHONE PATCH WITH OTHER EQUIPMENT

NOTE: Refer to the "Connection Procedure" in the equipment Manual.

Connections to other makes of equipment will vary in details, but the same basic principles will apply. Some notes and suggestions are:

1. Use shielded wire for all audio interconnecting lines as an aid in suppressing RF feedback. It is usually unnecessary to use shielded wire between the telephone terminal block and the Phone Patch.

2. If not already provided, arrangements should be made to mute your receiver and to open the SPKR lead when transmitting.

3. If you want to use voice control but no anti-vox output is provided on your receiver, use shielded wire to connect the Anti-Vox transmitter input to the SPKR socket on the rear panel.

4. Usually the HI-Z Phone Patch socket will be associated with transmitter high impedance input circuits, and the 600 ohm socket (J6) will be associated with low impedance input circuits. Try both for suitability.

5. Make sure that shielded cables are properly grounded at both ends, and that, if necessary, a separate ground wire interconnects all equipment.

OPERATION

The numbered squares of Figure 1 (fold-out from Page 74) refer to the correspondingly numbered paragraphs on the following pages. These paragraphs describe the readout devices and the function of each switch and connection on the front and rear panels of your Station Console.

1. Meter: Four scales indicate RF Power Output of 0 to 2 kW, or 0 to 200 watts; an SWR (standing wave ratio) scale; and a VU (volume units) scale from -20 to +3.

2. Timer Readout: Displays minutes and seconds.

3. Clock: Displays hours, minutes, and seconds. The clock operates whenever the power cord is plugged in.

4. SWR SENSITIVITY: Adjusts the sensitivity of the meter circuit when the Function switch SWR pushbutton is pressed in.

5. FWD-IN/REF-OUT: This switch selects either the Foreward or Reflected power measurement function. The strength of the selected signal will be indicated by the meter. NOTE: The SWR switch must be pressed at the same time for the power measurement function circuitry to operate.

6. SWR: This switch must be pressed in while FWD-IN/REF-OUT power measurements are being made.

7. 2000W: This switch provides circuitry to indicate a maximum RF output of 2 kW for a full-scale meter deflection.

8. 200W: This switch provides circuitry for indicating a maximum RF output of 200 watts for a full-scale meter deflection.

9. PATCH/VU: This switch activates the phone patch circuitry and provides VU (volume unit) readings.

10. TIMER: This switch turns the timer circuitry on or off, allows a visual signal only, or allows both an aural and a visual signal to be produced every ten minutes.

11. RESET: This switch allows the timer display to be reset to zero at any time.

12 and 13. PATCH GAIN: These independent controls determine the level of the receiver and transmitter audio signals applied by the phone patch circuitry to the telephone line.

14. IDENTIFY: With the TIMER switch in the VISUAL or the AURAL VISUAL position, this lamp will produce a visual signal every ten minutes.

15. TIME HOLD: Pressing this switch down will clear the clock readout when the power cord is first plugged in, and will also start the clock counting. When the clock is running, pressing this switch will also "hold" the clock at the hours and minutes being displayed at that time, but the seconds display will return to "00."

16. MINUTES SET: Pressing this switch will advance only the right hand digit of the minutes display one minute each second as long as the switch is held down. To advance the left hand digit of the minutes display, refer to the following paragraph.

16 and 17. MINUTES SET/HOURS SET: Simultaneously pressing these switches will advance the minutes display ten minutes each half second, as long as the switches are held down.

17. HOURS SET ONLY: Pressing only this switch will advance the hours display one hour each half second as long as the switch is held down.

18. NULL ADJUST: Adjustment of this control provides the best possible balance between the telephone line and the transmitter-receiver system when you use the VOX (voice operated transmission) mode of operation.

19. NULL/MONITOR: The normal operating position is the MONITOR position. The NULL position is only used while you adjust the Null Adjust control.

20. RF OUTPUT: This is a coaxial socket that connects a shielded cable transmission line to a transmitting antenna or antenna coupler.

21. C: This is a variable capacitor null adjustment to calibrate the circuitry for proper SWR meter readings.

22. PHONE LINE: For connecting a telephone line to the phone patch circuitry.

23. SPKR: For connecting a receiver speaker.

24. RCVR: For connecting the PATCH IN terminal or jack on a receiver or transceiver.

25. 600 Ω : This is a low impedance input that is to be used with transmitters or transceivers that have a low impedance phone patch output.

26. HI-Z: For connecting the PATCH OUT jack or terminals of transmitters or transceivers that have a high impedance phone patch output.

27. RF INPUT: This is a coaxial socket that connects a shielded cable transmission line coming from a transmitter or transceiver antenna connector.

28. R: This control is used to calibrate the power meter circuit in the Station Console.

SWR METER

NOTE: Proper SWR and RF Power readings can only be obtained when the Station Console is used with coaxial transmission lines having a nominal impedance of 50 ohms (RG-8/U or RG-58/U cable).

1. Connect a 50 Ω dummy load or antenna to the RF Output connector. Then press in the SWR and the FWD/REF pushbuttons.

2. Turn the SWR SENSITIVITY control to the MIN (fully CCW) position.

3. Apply power to the transmitter and tune it for maximum RF output. Disregard the station console meter reading at this time.

4. Adjust the SWR SENSITIVITY control for a midscale reading of the station console meter. A minor "touch-up" tuning of the transmitter may result in an increased meter reading that indicates a closer match between the transmitter and the transmission line.

5. Adjust the SWR SENSITIVITY control to obtain a full-scale meter reading.

6. Push and release the FWD/REF pushbutton to its out (REF) position. Then read the SWR ratio directly on the lower scale of the meter dial.

Normal Operating Characteristics

The peaks of controlled-carrier modulation will "kick" the meter pointer upward. SSB and DSB signals will produce a bouncing meter reading during transmission. Therefore, SWR measurements cannot be made using these signals. Use a single-tone or CW carrier with sideband transmitters when you make SWR measurements. When operating SSB, any meter indication with no modulation indicates spurious or parasitic emission, or poor carrier suppression.

SWR meter readings may change if the Station Console is placed at a different location in the transmission line, or if the length of the transmission line is changed. For this reason, assume that the higher SWR reading is most correct. Keep in mind that the closer the SWR approaches 1:1, the more accurate the Station Console readings become.

POWER METER

The operation of the power meter function is quite simple. Press either the 200W or 2000W pushbutton and read the output power of the transmitter on the appropriate scale of the meter dial. CAUTION: A load *must* be connected to the OUTPUT connector of the Station Console.

Low Power Measurements (1 to 20 Watts)

1. Press the 200W pushbutton.

2. Adjust the transmitter output until the station console meter reads 10 on the 0 to 200 RF POWER scale.

3. Press in the FWD-IN/REF-OUT pushbutton and the SWR pushbutton.

4. Adjust the SWR SENSITIVITY control to obtain a meter reading of 100 on the 0 to 200 scale. NOTE: Be sure you do not move the sensitivity control after making this adjustment.

5. Read the power output (0 to 20 watts) on the 0 to 200 scale. For example, a meter reading of 75 would indicate an output power of approximately 7.5 watts.

IN CASE OF DIFFICULTY

This part of the Manual is intended to provide you with information that will help you locate and correct difficulties which might occur in your Station Console. This information is divided in various sections. The first section, "General," contains suggestions of a general nature in the following areas:

Visual checks and inspection.

Precautions to observe when bench testing.

Locating and correcting both the cause and effect of a trouble (Repairing the Station Console).

The second section, "Troubleshooting Charts," contains troubleshooting charts to help you determine the cause of a difficulty in certain areas. These areas are:

24-Hour Clock

10-Minute Timer

Power Meter

Phone Patch

NOTE: If you prefer to have your Station Console repaired at the factory, one of the Heathkit Electronic Centers, or if you need additional information before you proceed, refer to the "Customer Service" information inside the rear cover of this Manual. Your Warranty is located inside the front cover.

GENERAL

VISUAL CHECKS

1. About 90% of the kits that are returned for repair do not function properly due to poor soldering. Therefore, many troubles can be eliminated by a careful inspection of connections to make sure they are soldered as described in the Soldering section of the "Kit Builders Guide." Reheat any doubtful connections and be sure all the wires are soldered at places where several wires are connected. Check carefully for solder bridges between circuit board foils.

2. Check to be sure that all transistors are in their proper locations, and are installed correctly.

3. Check the value of each part. Be sure that the proper part has been wired into the circuit, as shown in the Pictorial diagrams and as called out in the wiring instructions. It would be easy, for example, to install a 2200 Ω (red-red-red) resistor in a step that calls for a 220 Ω (red-red-brown) resistor.

4. Recheck the wiring. Trace each lead in colored pencil on the Pictorial as it is checked. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something you have consistently overlooked.

5. Check all component leads connected to the circuit boards. Make sure the leads do not extend too far through the circuit board and make contact with other connections or parts, such as shields or the chassis.

6. Check all of the wires that are connected to the circuit boards to be sure the wires do not touch the chassis or other lugs. Make sure all wires are properly soldered.

7. A review of the "Circuit Description" may help to determine the problem.

8. If the difficulty still is not cured, read the "Precautions for Bench Testing" section, and the section titled "Troubleshooting Charts."

PRECAUTIONS FOR BENCH TESTING

NOTE: Use a high input impedance voltmeter for voltage measurements.

1. Be cautious when testing transistor circuits. Although transistors have almost unlimited life when used properly, they are much more vulnerable to damage from excessive voltage or current than other circuit components.

2. Be sure you do not short any terminals to ground when you make voltage measurements. If the probe should slip, for example, and short out a bias or voltage supply point, it is almost certain to cause damage to one or more transistors or diodes.

3. Do not remove any components while the Station Console is operating; this could cause considerable damage.

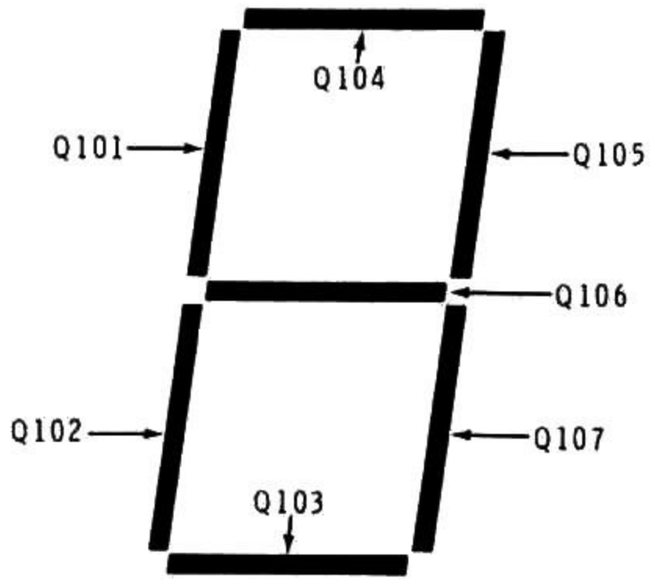
CAUTION: The full AC line voltage is present at several points in the Station Console. Be careful to avoid personal shock. See the Chassis Photo on Page 105 for the location of this hazardous voltage.

REPAIRING THE STATION CONSOLE

When you make repairs to the Station Console, make sure you eliminate the cause as well as the effect of the trouble. If, for example, you should find a damaged resistor, be sure to find out what (wiring error, etc.) caused the resistor to become damaged. If the cause is not eliminated, the replacement resistor may also become damaged when the Station Console is put back into operation.

TROUBLESHOOTING CHARTS

The following charts list the condition and possible cause of several malfunctions. If a particular part is mentioned (Q107 for example) as a possible cause, check that part to see that it was installed and/or wired correctly. It is also possible, on rare occasions, for a part to be faulty and require replacement.



24-Hour Clock

CONDITION	POSSIBLE CAUSE
A digit or digit segment does not light.	1. Check pins of that display tube.
The same segment of all six digits remains lit or does not turn on.	1. Associated transistor (Q101 through Q107). See above.
One digit does not light.	1. Associated transistors (Q201 through Q212) as follows: V101B – Q202, Q201. V101A – Q204, Q203. V102B – Q206, Q205. V102A – Q208, Q207. V103B – Q211, Q209. V103A – Q213, Q212.
None of the digits light.	1. Diode D208. 2. Fuse F1. 3. No high voltage.
One digit lights up much brighter than others.	1. Associated transistor (Q201 through Q212).
Only one digit is turned on.	1. IC201.
Time cannot be set.	1. Diodes D201 through D203. 2. Switch SW1, SW2, SW3.
Time does not advance.	1. Diode D206. 2. IC201.

10-MINUTE TIMER

CONDITION	POSSIBLE CAUSE
One or more digits do not light.	1. Associated integrated circuit (IC101 through IC203 and IC202 through IC204).
None of the digits light.	1. Q213 or Q214. 2. D209, D211, D212, D213.
Light does not light at every 10-minute interval.	1. Q218. 2. PL201. 3. IC202. 4. IC205.
No Identify tone.	1. IC205.
Random count sequence.	1. IC101. 2. IC103.

POWER METER

CONDITION	POSSIBLE CAUSE
Meter reads down-scale on SWR or wattmeter.	1. Meter leads reversed. 2. Diode D301 or D302 reversed.
Higher meter reading for SWR Set than for SWR.	1. Input and output plugs reversed. 2. Diode D303 reversed. 3. Capacitor C302, C306, C312, C311. 4. Resistor R303.
SWR reading while transmitter is off.	1. Nearby transmitter in operation.

PHONE PATCH

CONDITION	POSSIBLE CAUSE
No meter reading when receiving.	1. RCVR GAIN control (R5) improperly adjusted. 2. Null-Monitor switch (SW5) in Null position. 3. Diode DI faulty. 4. RCVR and SPKR plugs transposed.
Poor transmitter gain.	1. Null-Monitor switch in Null position. 2. Trans Gain control (R3/R4) improperly adjusted. 3. Wrong output impedance used.
Deep null not obtained.	1. Phone dialing not completed. 2. Null Adjust control (R2) improperly set.
No transfer of audio between telephone lines and station equipment.	1. SWR switch in ON (in) position. 2. RCVR and TRANS gain controls improperly adjusted. 3. Resistor R6, R7, R9, or R10 open. 4. Transformers T2 and T3 incorrectly wired.

SPECIFICATIONS

CLOCK

Display	Six full digits.
Time Base	24 hours.
Accuracy	Determined by accuracy of power line frequency.

TIMER

Display	Three full digits.
Time Interval	10 minutes with automatic reset. Manual reset at any portion of 10-minute period.
Accuracy	Determined by accuracy of power line frequency.
Signal	Visual only or both visual and aural; switch selected.

RF POWER/SWR METER

Frequency Range	1.8 to 30 MHz.
Wattmeter Accuracy	±10% of full-scale reading.
Power Handling Capability	2000 watts (maximum).
SWR Sensitivity	Less than 10 watts.
Impedance	50 Ω nominal.
Connectors	Uhf type SO-239.

PHONE PATCH

Circuit	Telephone hybrid circuit. Allows voice control or manual operation.

TELEPHONE LINES

Input Impedance	Approximately 600 Ω.
Null Depth	At least 30 dB isolation between transmit and receive circuits.
Receiver Impedance	Effective match from 3 to 16 Ω.
Transmitter Impedance	600 Ω or higher impedance output.

GENERAL

Meter	100 μA movement. VU readings for phone patch monitoring. Null depth indication. RF power output, relative power, and SWR readings.
Front Panel Controls	Timer: Off, Visual, Aural Visual. Reset: Pushbutton switch. Patch Gain: Transmitter, Reciver. SWR: Sensitivity. Mode: SWR, Forward and Reflected. RF Power, 2000 W and 200 W. Phone Patch.
Rear Panel Controls	Clock: Time hold, minutes set, seconds set. Null Adjust control Null-Monitor switch C adjust control R adjust control
Dimensions	7-1/4" H x 10-1/4" W x 15-1/4" D.
Net Weight	8 lbs.
Power Requirements	120/240 VAC, 50/60 Hz, 15 watts.

CIRCUIT DESCRIPTION

Refer to the Schematic (fold-out from Page 111) while you read this "Circuit Description."

Your Station Console contains four independent circuits: the 24-hour clock, the 10-minute timer, the power meter, and the phone patch. Each circuit will be explained separately.

24-HOUR CLOCK

All of the digital logic for the 24-hour clock is performed by integrated circuit IC201. The remaining circuitry supplies DC power and responds to commands from IC201 to turn the display tubes on and off.

Resistor R237 and capacitor C201 are the timing components for an oscillator inside IC201. This oscillator scans outputs D201 through D205 (applies a positive pulse to first D1, then D2, then D3, etc.) in rapid succession. Outputs D1 through D6 are pins 3 through 8. These outputs turn on and turn off the anode driver transistors that control the high voltage to the anodes of the display tubes. At the correct time, the oscillator also applies positive pulses to one of, or any combination of, pins 9 through 15 of IC201. These pulses turn on and turn off the segment driver transistors that control the segments of the display tubes.

Example: Consider the time 08:56:21.

When a positive pulse is applied to output D1, anode driver transistors Q213 and Q212 turn on, and 230 volts is applied to the anode of display V103, part A. At the same time positive pulses are also applied to pins 13 and 14 of IC201. These pulses turn on segment driver transistors Q105 and Q107 which turns on segments b and c of the display tubes. However, these segments in display tubes V101, V102, and V103, part B, do not light up because there is not a high enough voltage at their anodes. Therefore, only the b and c segments of V103, part A, light up and a 1 is displayed.

The positive pulse is then applied to output D2. This turns on anode driver transistors Q211 and Q209, and applies 230 volts to the anode of display tube V101, part B. At the same time, positive pulses are also applied to pins 9, 11, 12, 14, and 15 of IC201. This turns on segment driver transistors Q106, Q102, Q103, Q105, and Q104. These transistors turn on segments a, b, g, e, and d, and a 2 is displayed on V103 part B.

Next, the positive pulse is applied to output D3 which turns on anode driver transistors Q208 and Q207. At the same time positive pulses are also applied to pins 9, 10, 11, 12, and 13 of IC201 which turn on segment driver transistors Q106, Q101, Q102, Q103, and Q107. When this happens, a six is displayed on display tube V102, part A. The scanning continues through output D6 and then starts over. This happens so fast that all six digits appear to be on at the same time.

Diodes D201 through D205 are a diode matrix to keep the DC voltages on their own D outputs.

Dual-primary transformer T1 can be wired to operate from either 120 VAC or 240 VAC. Two of the three secondary windings of T1 supply voltages for the Clock. (The third secondary winding supplies voltage to the 10-minute timer.)

Diode D208 forms a half-wave rectifier which supplies DC voltage for the anodes of the display tubes. Capacitor C211 and resistor R242 filter this voltage. Diode D206, capacitor C209, and resistor R241 form another rectifier and filter circuit. Zener diode ZD201 maintains the voltage from this circuit at a proper operating level for IC201. Diode D207 is another rectifier and, along with resistors R238 and R239, provides the proper 50 or 60 Hz signal to act as a reference frequency for IC201. Capacitor C208 is the filter for this circuit.

10-MINUTE TIMER

A pulse is fed from pin 19 of integrated circuit IC201 to pulse shaping transistors Q219 and Q221 each second. The pulse is shaped and amplified by Q219 and Q221 and coupled to pin 14 of integrated circuit IC204.

Integrated circuits IC204 (seconds), IC203 (tens of seconds), and IC202 (minutes) are individual decade counters. These counters count 0 through 9, reset to 0, and start over. This count output is in the form of a 4-line binary code.

Pin 14 of IC204 normally has a positive voltage applied to it through resistor R248. When the positive pulse from IC201 is applied to transistor Q219, it turns on the transistor which turns on Q221. This grounds pin 14 of IC204 and removes the positive voltage. This transition from high (positive voltage) to low (ground) makes IC204 count up one. When the count reaches eight, pin 11 of IC204 goes high. Since pin 11 of IC204 is connected to pin 14 of IC203, pin 14 also goes high. These two pins stay high until IC204 resets. When IC204 resets there is a transition from high to low on pin 11 of IC204 and pin 14 of IC203. This transition on the input (pin 14) makes IC203 count up one. IC203 works similar to IC204 except it only counts up 0 through 5; then it is forced to reset to zero. When IC203 reaches a count of four, pin 8 goes high. Pin 8 is connected to pin 3 (the reset), so pin 3 also goes high at count five. Then, when the count goes to 6, pin 2 also goes high. At this instant both pins 3 and 2 are high and immediately cause the counter to reset, before the number 6 can be displayed. Since pin 14 of IC202 is also connected to pin 8 of IC203, the transition also occurs at it. This makes IC202 count up one. IC202 works exactly like IC204.

The three decade counters can be reset manually by Reset switch SW201. When SW201 is in the normal position, pins 3 of IC204 and IC202 are held low (grounded) and capacitor C217 is held in a charged state. When SW201 is depressed, pins 3 of IC204 and IC202 are forced to go high. This resets IC204 and IC202 to zero. Also, when SW201 is depressed, capacitor C217 is allowed to discharge through diodes D216 and D217 to pins 2 and 3 of IC203. This forces these pins high which makes IC203 reset to zero.

The four outputs from each decoder counter are coupled to one of three decoder-driver integrated circuits. The outputs from IC204 go to IC203, the outputs from IC203 go to IC102, and the outputs from IC202 go to IC101. These decoder-drivers convert the 4-line binary code inputs to 7-line outputs and control the segments of display tube V104. IC103 controls the segments of V104, part A (seconds); IC102 controls the segments of V104, part B (tens of minutes); and IC101 controls the segments of V104, part C (minutes).

When pin 11 of IC202 goes high, transistor Q216 is turned on. This turns on Q217 which grounds capacitor C214 and discharges it. When pin 11 of IC202 goes low Q216 is turned off. This turns off Q217 and C214 starts charging again. During the time that C214 is charging, a voltage is applied to pin 10 of tone oscillator integrated circuit IC205. This causes IC205 to oscillate and produce an output at pin 8. This output is coupled to transistor Q218 through resistor R247, which turns on Q218 and allows Identify lamp PL201 to turn on. When C214 is fully charged, there is no voltage applied to pin 10 and IC205 stops oscillating. When IC205 is not oscillating, Q218 is turned off, which turns off PL201. When TIMER switch SW6 is in the AURAL-VISUAL position, the output on pin 8 of IC205 is applied to speaker SP1 and a tone is heard.

Power is supplied through SW6 by a full-wave rectifier circuit made up of diodes D209, D211, D212, and D213; and is regulated by transistors Q214, Q215, and zener diode ZD202.

POWER METER

In this section, two functions of the power meter are described; the SWR circuit and the power meter circuit.

SWR Circuit

The SWR circuit operates only when SWR switch SW4B is in the On (in) position. Toroid coil L301 is a current pickup element for forward and reflected power. A bus wire is connected from Input connector J2, through L301, to Output connector J1. A transmitted signal through this wire induces a current in L301. This develops a voltage across L301. When FWD-REF switch SW4A is in the FWD (out) position, this voltage is rectified by diode D301 and decoupled by capacitor C307 and resistor R304. Resistor R304 is the load for the forward power reading. When FWD-REF switch is in the REF (in) position, the voltage is rectified by diode D302 and decoupled by capacitor C308 and resistor R305. Resistor R305 is the load for the reflected power reading.

Forward and reflected voltages are connected to the meter through switches SW4A, SW4B, and SWR Sensitivity control R1.

Resistor R302 is a ground-return path of diodes D301 and D302. Capacitors C301, C303, C304, and C305 form a voltage divider circuit to balance the capacitive effects of the double windings in L301, which provides correct SWR readings.

POWER METER CIRCUIT

The power meter circuit works only when either the 200W switch (SW4D) or the 2000W switch (SW4C) is in the On (in) position. Current is induced in L301 in the same manner as for the SWR circuit. Resistor R301 forms a load across L301 to reduce the Q of the coil circuit. This prevents the transmitted frequency from affecting the meter.

The meter is calibrated by adjusting control R307, which determines the voltage applied to the meter. Resistors R308 and R309 are voltage dividers for the two power ranges, 200 watts and 2000 watts.

Capacitors C302 and C306, diode D303, and voltage divider resistor R303 (through either SW4C or SW4D) complete a voltmeter circuit for the meter.

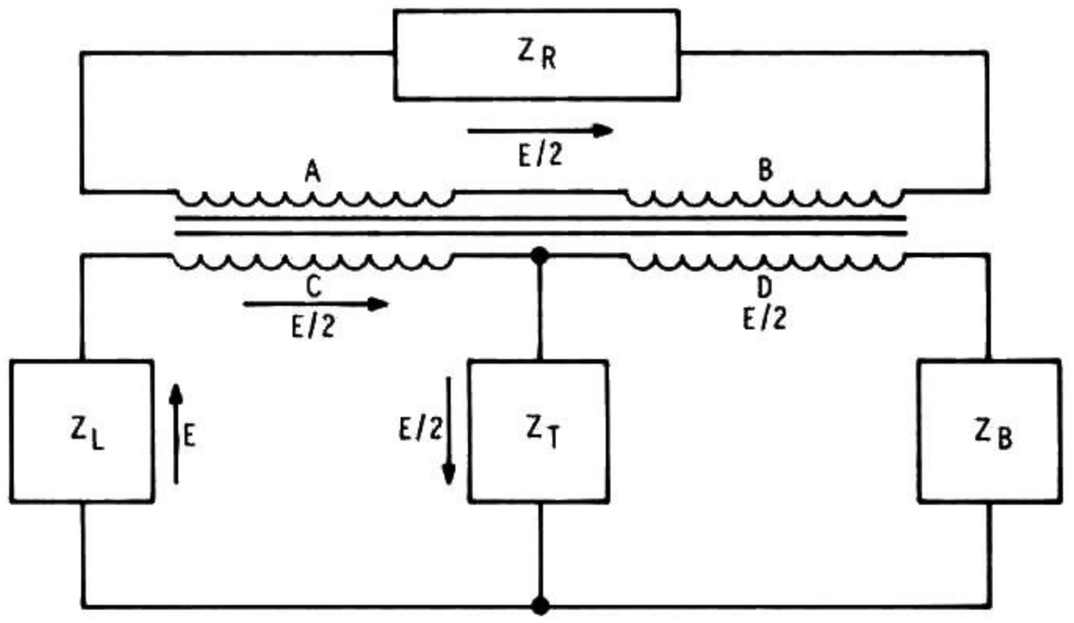
Ferrite beads FB301 through FB305 prevent RF from being applied through the 5-wire cable to the meter.

PHONE PATCH

The phone patch circuit is based on the use of special hybrid transformer T2. The hybrid transformer, with proper adjustment of Null Adjust control R2, provides a high degree of isolation between the receiving and transmitting circuits. This feature is required for stable voice-control operation.

The operation of a hybrid transformer is shown in Figures 10 and 11.

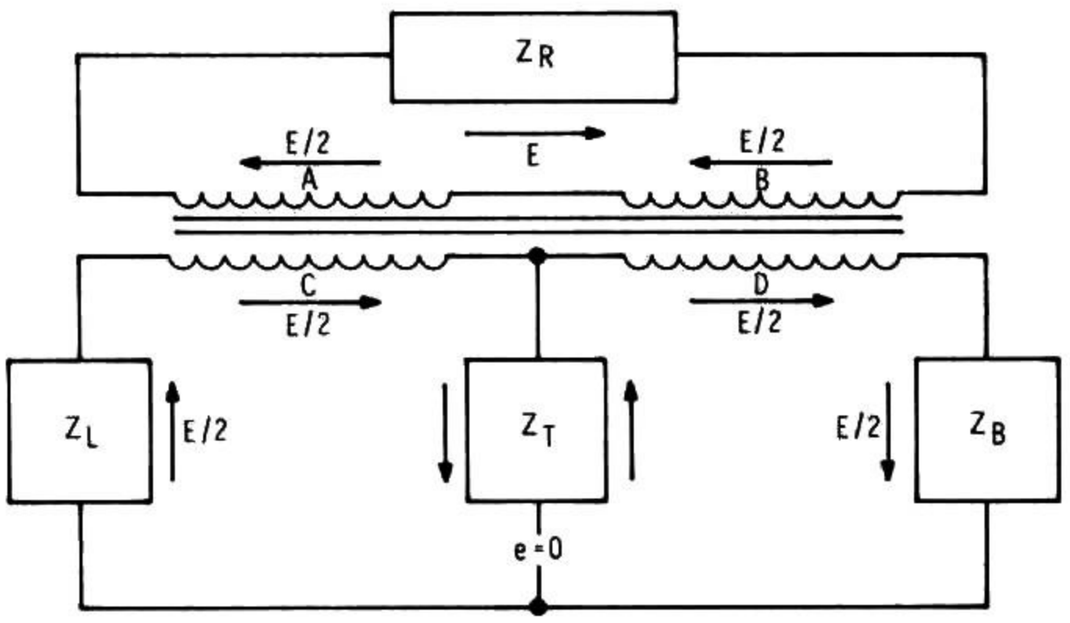
Figure 10 shows the phone patch in the Transmit mode; that is, energy from the telephone line is being routed to the transmitter. The turns ratio of the hybrid transformer is such that the impedance of windings C, D, and Z_T are equal. If an incoming voltage from the telephone line is impressed on the transformer, it will at a given instant, cause current to flow as shown by the arrows. The opposing voltage drop across winding C will equal that across winding Z_T. Identical winding D is linked by the same flux as winding C; therefore it will have an induced (opposing) voltage of equal magnitude and in the same direction as winding C. The induced voltage in winding D is equal to the voltage across winding Z_T, and since their like polarities are connected together, no current flow will occur through Z_B. The result is that half of the incoming energy is available at the transmitter input and the other half is dissipated across Z_R.



Z_L = TELEPHONE LINE IMPEDANCE
Z_B = BALANCE NETWORK
Z_L = ZB

WINDINGS A = B AND C = D
Z_R = RECEIVER OUTPUT IMPEDANCE
Z_T = TRANSMITTER INPUT IMPEDANCE

Figure 10



Z_L = TELEPHONE LINE IMPEDANCE
Z_B = BALANCE NETWORK
Z_L = ZB

WINDINGS A=B AND C=D
Z_R = RECEIVER OUTPUT IMPEDANCE
Z_T = TRANSMITTER INPUT IMPEDANCE

Figure 11

In Figure 11, the phone patch is shown in the receive mode, with the signal from the receiver routed to the telephone line. If voltage E (representing a voltage from the receiver) is impressed on the transformer, it will, at a given instant, cause current to flow as shown by the arrows. Windings A and B are connected in series aiding.

Equal voltages are induced in each winding, since winding C equals winding D. The balance network is adjusted so that Z_B equals Z_L; therefore, the voltage drops across Z_B and Z_L are equal. This will cause equal and opposite currents through Z_T, so there is no voltage across Z_T and no energy is fed to the transmitter input.

The turns ratio of the transformer windings (T1 and T2) match the speaker and transmitter input impedances to the hybrid windings of transformer T1.

The phone patch circuit, and the meter, are coupled to the telephone line when the PATCH/VU (SW4E) is in the On (in) position. The meter signal is coupled through resistors R4, R5, and diode D3. Therefore, the meter readings closely approximate standard VU readings. A zero VU reading represents 4 dB above 1 milliwatt in 600 Ω , and is the maximum voltage allowed on the telephone lines to avoid crosstalk between channels.

A Null-Monitor switch (SW5) on the rear panel is provided so the VU meter can be used as a null indicator when the balance network is adjusted. In the Null position of SW5, resistor R12 is switched out of the circuit to increase the sensitivity of the meter.

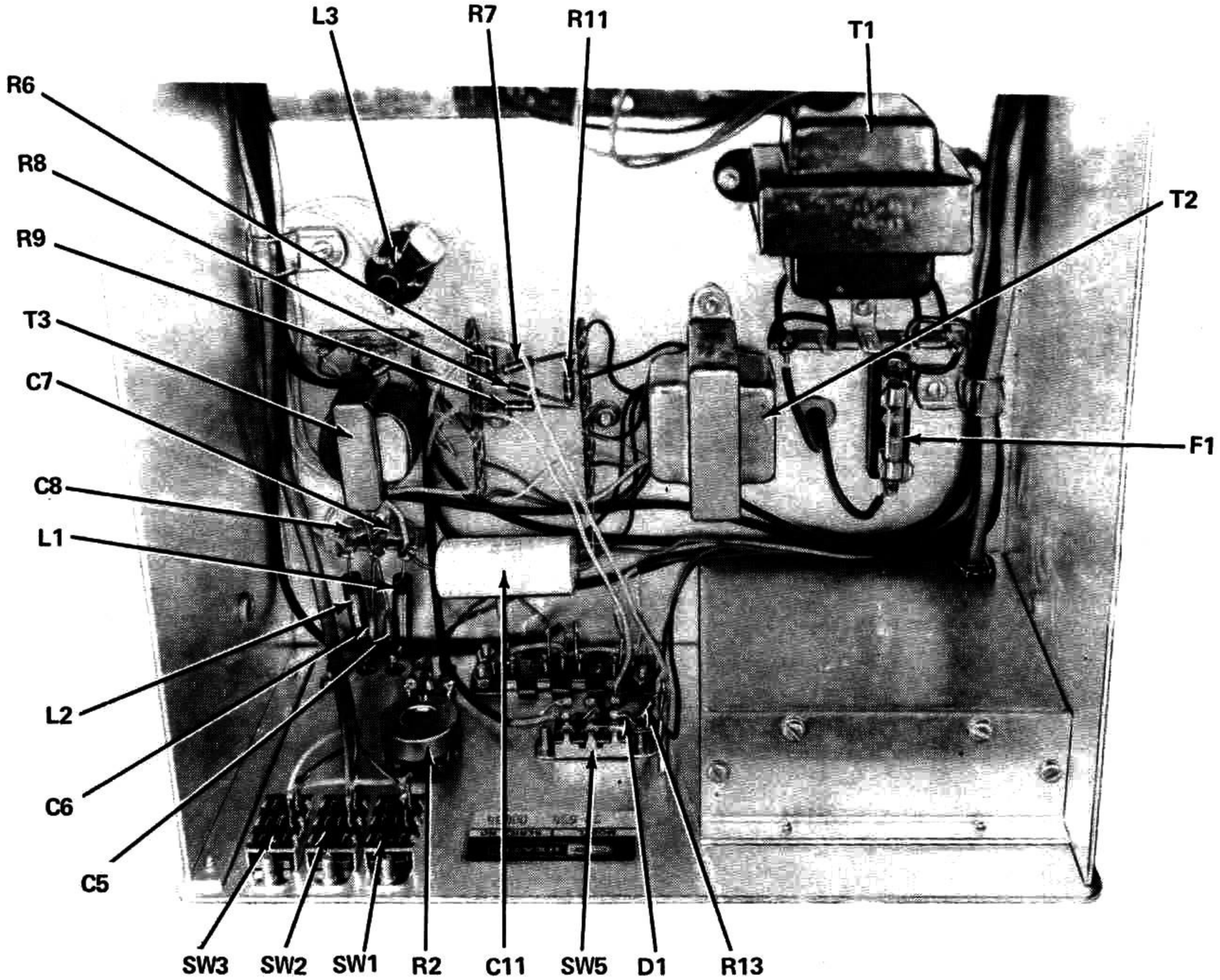
The telephone line connections to the phone patch are filtered by a balanced pi network to prevent RF from entering the phone lines and/or the transmitter audio circuits.

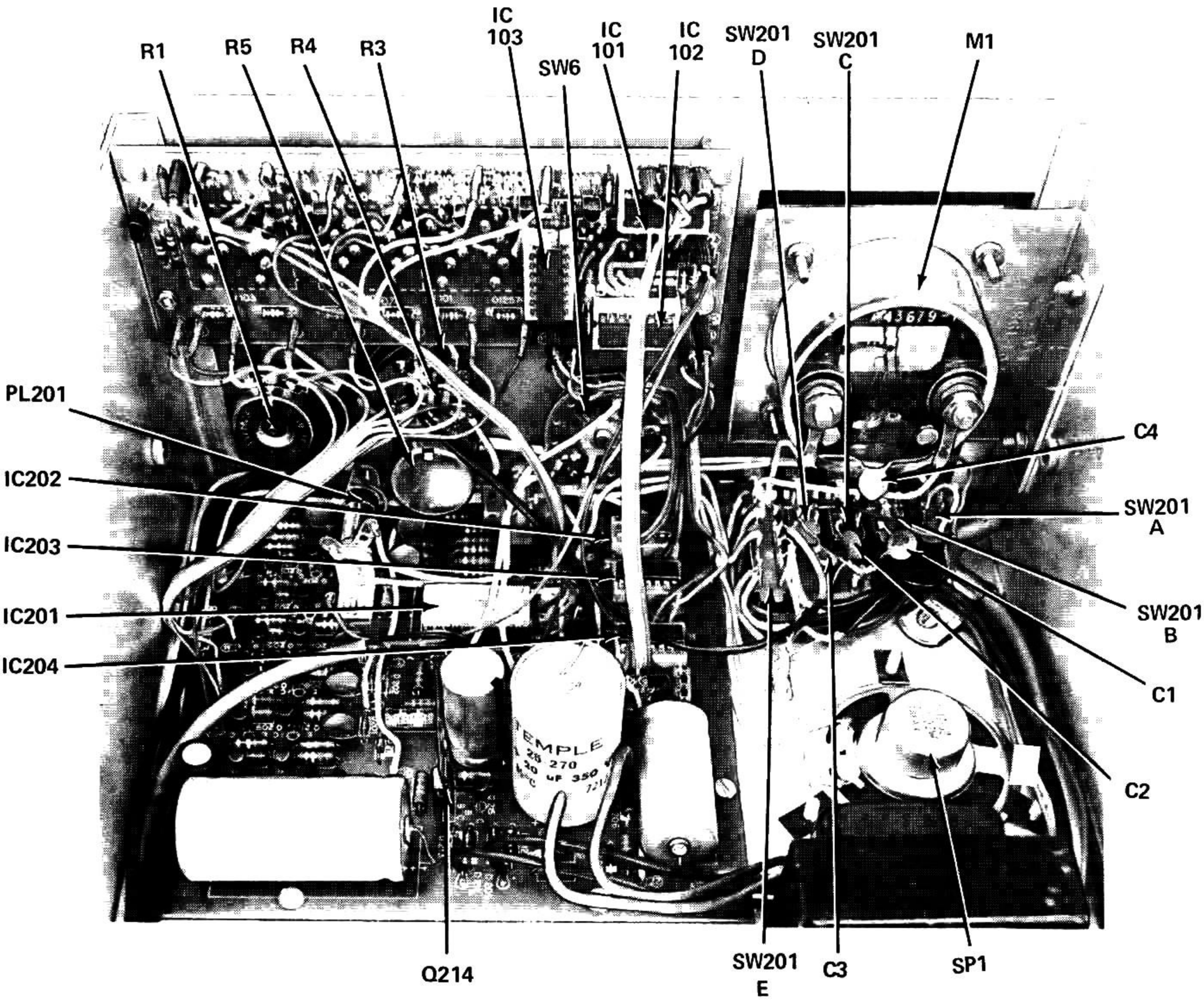
Since the impedance of a telephone line varies greatly from installation to installation, it is necessary to isolate the line impedance so a simple balance network will provide a sufficient null at every installation. This is done by connecting the telephone line to the phone patch through an H pad. This H pad, which is formed by resistors R6, R7, R8, R9, and R10, has an impedance of 600 Ω . The pad forces the line impedance to appear as approximately a 600 Ω resistance. This allows the impedance of Null Adjust control R2 with resistor R11 to equal the line impedance and provide a deep null.

In order to provide a balanced load to the telephone line, an important feature in minimizing hum, the hybrid transformer incorporates additional windings, and the resistive pad is made in the "H" form.

The telephone line is also connected to the phone patch through capacitor C10. This capacitor blocks the DC voltage of the telephone line but allows the audio frequencies to pass. The large value of capacitance has very little reactance at audio frequencies, thus allowing the phone patch to maintain good audio quality.

CHASSIS PHOTOGRAPHS




R1
R5
R4
R3
IC 103
SW6
IC 101
IC 102
SW201 D
SW201 C
M1
PL201
IC202
IC203
IC201
IC204
C4
SW201 A
SW201 B
C1
C2
Q214
SW201 E
C3
SP1

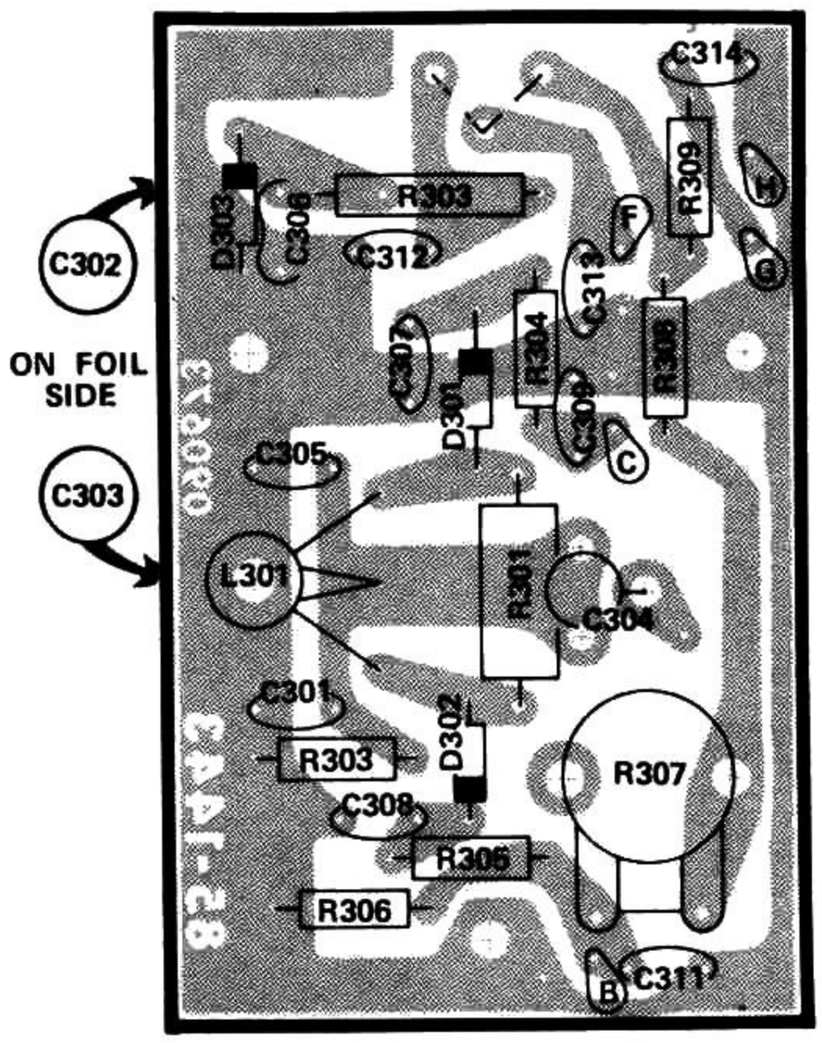
CIRCUIT BOARD X-RAY VIEWS

NOTE: To find the PART NUMBER of a component for the purpose of ordering a replacement part:

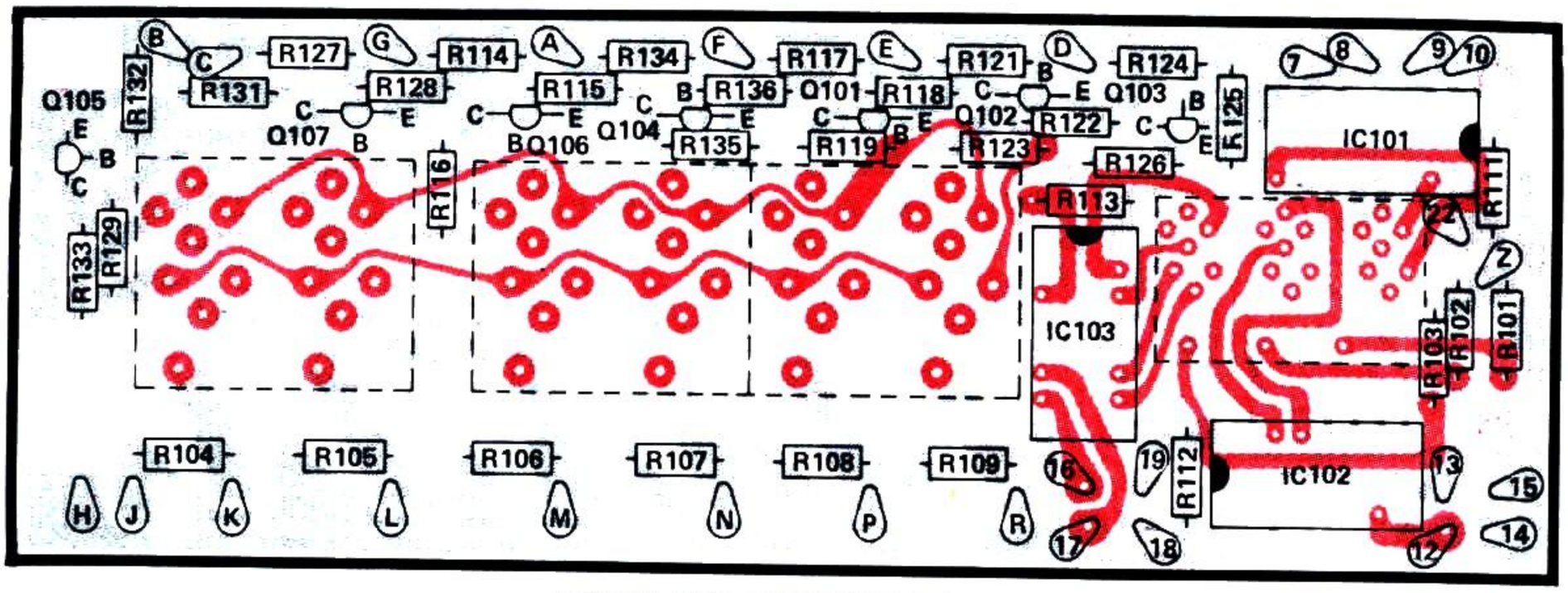
A. Find the circuit component number (R5, C3, etc.) on the "X-Ray View" or "Chassis Photograph."

B. Locate this same number in the "Circuit Component Number" column of the "Parts List" in the front of this Manual.

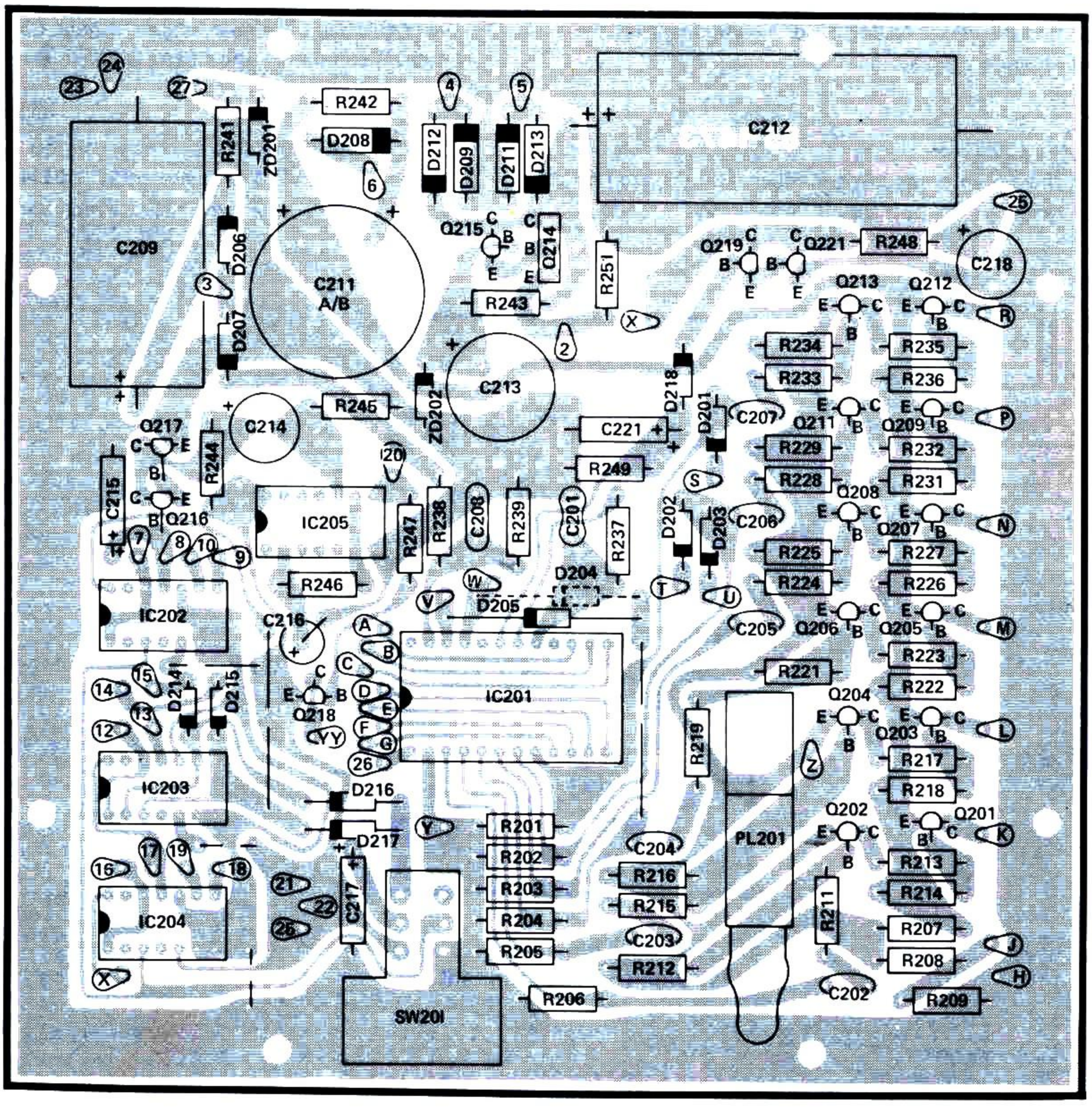
C. Adjacent to the circuit component number, you will find the PART NUMBER and DESCRIPTION which must be supplied when you order a replacement part.



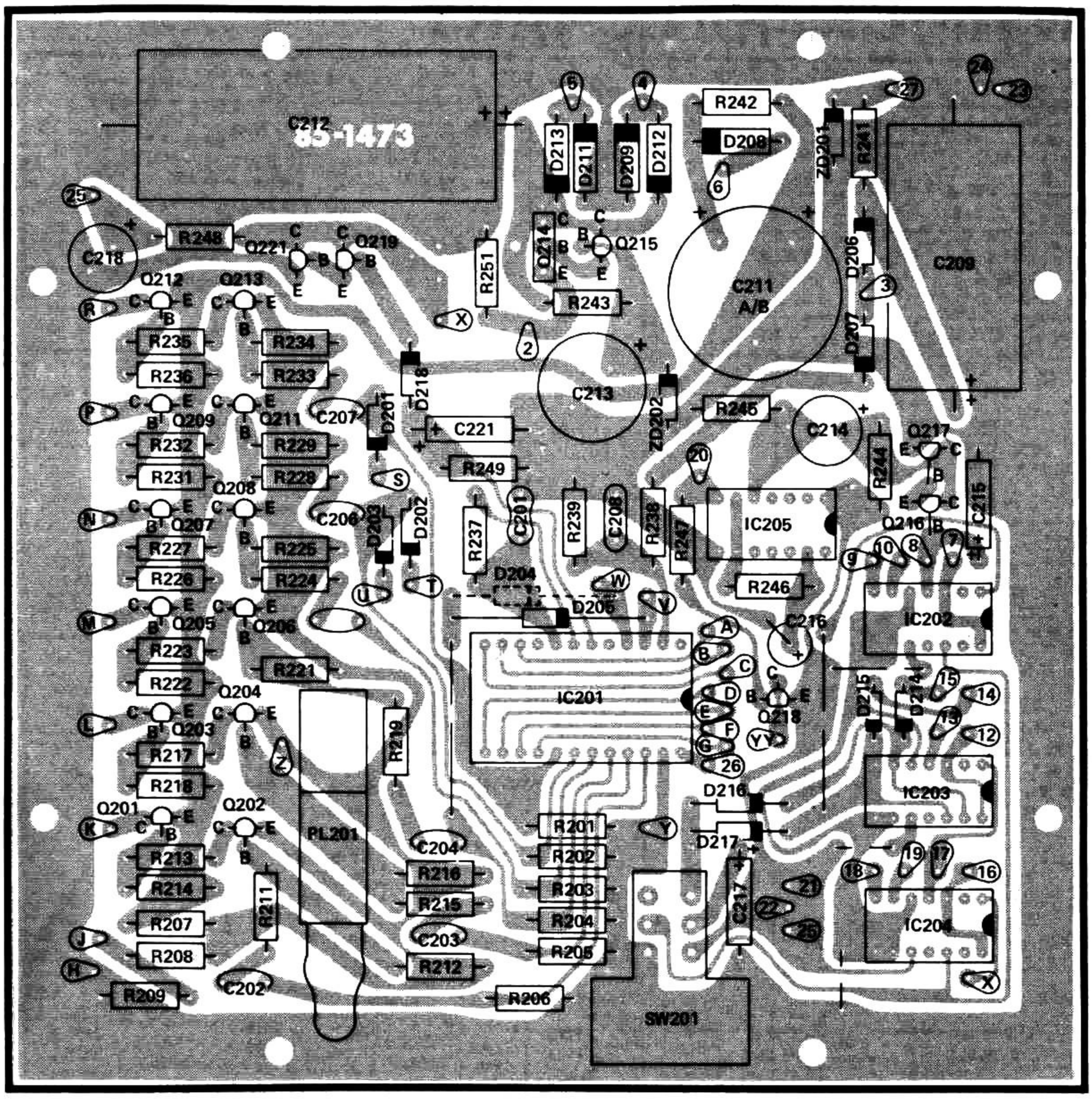
POWER METER CIRCUIT BOARD
(viewed from component side)



DISPLAY CIRCUIT BOARD
(viewed from component side)

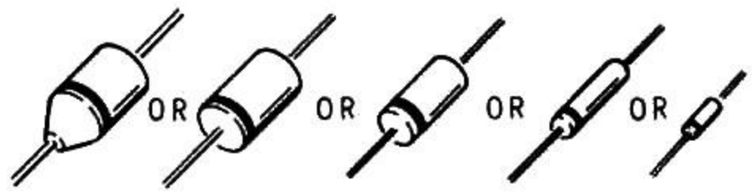
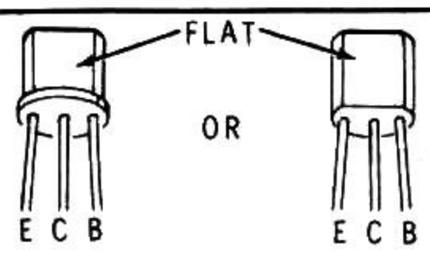
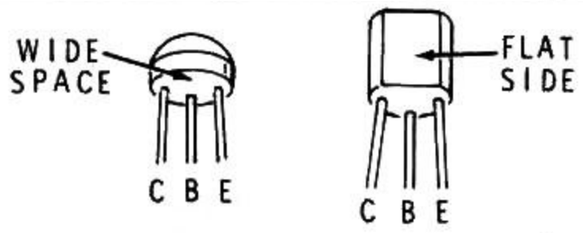
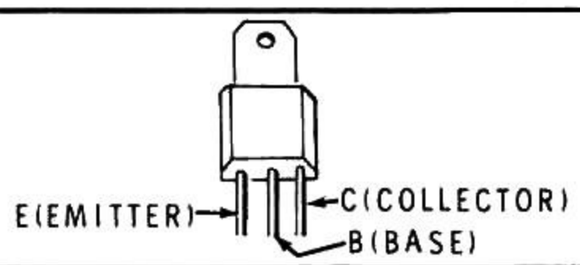
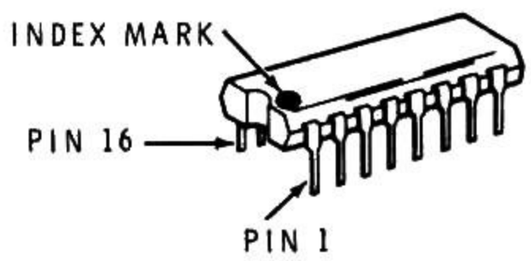
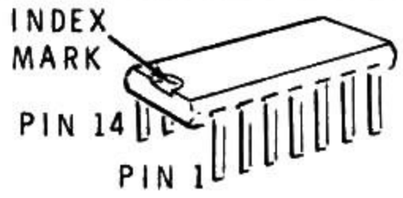
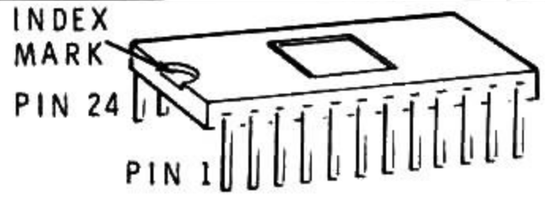
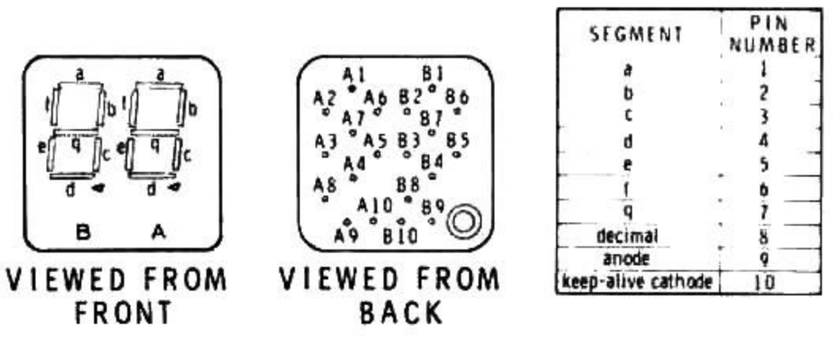
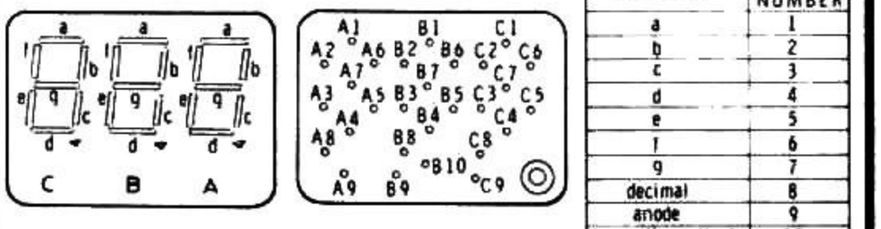


MAIN CIRCUIT BOARD
(viewed from component side)



MAIN CIRCUIT BOARD
(viewed from foil side)

IDENTIFICATION CHART

COMPONENT	HEATH PART NUMBER	TYPE NUMBER	IDENTIFICATION
D1, D301, D302, D303	56-20	1N295	NOTE: HEATH PART NUMBERS ARE STAMPED ON MOST DIODES. 
D201, D202, D203, D204, D205, D214, D215, D216, D217, D218	56-56	1N4149	
D208	57-27	1N2071	
D206, D207, D209, D211, D212, D213	57-65	1N4002	
ZD201	56-25	1N4166A	
ZD202	56-58	1N709A	
Q101, Q102, Q103, Q104, Q105, Q106, Q107	417-811	MPS-L01	
Q201, Q203, Q205, Q207, Q209, Q212; Q218	417-295	MPS-L61	
Q202, Q204, Q206, Q208, Q211, Q213, Q215, Q216, Q217, Q219, Q221	417-801	MPS-A20	
Q214	417-224	MPS-U05	
IC101, IC102, IC103	443-602	DD700 (DM8880)	
IC205	443-44	SN7413N	
IC202, IC203, IC204	443-7	SN7490N	
IC201	443-687	MK5017AA	
V101, V102, V103	411-286	SP352	 SEGMENT / PIN NUMBER: a 1; b 2; c 3; d 4; e 5; f 6; g 7; decimal 8; anode 9; keep-alive cathode 10
V104	411-804	SP333	 SEGMENT / PIN NUMBER: a 1; b 2; c 3; d 4; e 5; f 6; g 7; decimal 8; anode 9; keep-alive cathode 10

CUSTOMER SERVICE

REPLACEMENT PARTS

Please provide complete information when you request replacements from either the factory or Heath Electronic Centers. Be certain to include the **HEATH** part number exactly as it appears in the parts list.

ORDERING FROM THE FACTORY

Print all of the information requested on the parts order form furnished with this product and mail it to Heath. For telephone orders (parts only) dial 616 982-3571. If you are unable to locate an order form, write us a letter or card including:

- Heath part number.
- Model number.
- Date of purchase.
- Location purchased or invoice number.
- Nature of the defect.
- Your payment or authorization for COD shipment of parts not covered by warranty.

Mail letters to: Heath Company
Benton Harbor
MI 49022
Attn: Parts Replacement

Retain original parts until you receive replacements. Parts that should be returned to the factory will be listed on your packing slip.

OBTAINING REPLACEMENTS FROM HEATH ELECTRONIC CENTERS

For your convenience, "over the counter" replacement parts are available from the Heath Electronic Centers listed in your catalog. Be sure to bring in the original part and purchase invoice when you request a warranty replacement from a Heath Electronic Center.

TECHNICAL CONSULTATION

Need help with your kit? — Self-Service? — Construction? — Operation? — Call or write for assistance. you'll find our Technical Consultants eager to help with just about any technical problem except "customizing" for unique applications.

The effectiveness of our consultation service depends on the information you furnish. Be sure to tell us:

- The Model number and Series number from the blue and white label.
- The date of purchase.
- An exact description of the difficulty.
- Everything you have done in attempting to correct the problem.

Also include switch positions, connections to other units, operating procedures, voltage readings, and any other information you think might be helpful.

Please do not send parts for testing, unless this is specifically requested by our Consultants.

Hints: Telephone traffic is lightest at midweek — please be sure your Manual and notes are on hand when you call.

Heathkit Electronic Center facilities are also available for telephone or "walk-in" personal assistance.

REPAIR SERVICE

Service facilities are available, if they are needed, to repair your completed kit. (Kits that have been modified, soldered with paste flux or acid core solder, cannot be accepted for repair.)

If it is convenient, personally deliver your kit to a Heathkit Electronic Center. For warranty parts replacement, supply a copy of the invoice or sales slip.

If you prefer to ship your kit to the factory, attach a letter containing the following information directly to the unit:

- Your name and address.
- Date of purchase and invoice number.
- Copies of all correspondence relevant to the service of the kit.
- A brief description of the difficulty.
- Authorization to return your kit COD for the service and shipping charges. (This will reduce the possibility of delay.)

Check the equipment to see that all screws and parts are secured. (Do not include any wooden cabinets or color television picture tubes, as these are easily damaged in shipment. Do not include the kit Manual.) Place the equipment in a strong carton with at least THREE INCHES of *resilient* packing material (shredded paper, excelsior, etc.) on all sides. Use additional packing material where there are protrusions (control sticks, large knobs, etc.). If the unit weighs over 15 lbs., place this carton in another one with 3/4" of packing material between the two.

Seal the carton with reinforced gummed tape, tie it with a strong cord, and mark it "Fragile" on at least two sides. Remember, the carrier will not accept liability for shipping damage if the unit is insufficiently packed. Ship by prepaid express, United Parcel Service, or insured Parcel Post to:

Heath Company
Service Department
Benton Harbor, Michigan 49022

HEATH

ZENITH

HEATH COMPANY • BENTON HARBOR, MICHIGAN

THE WORLD'S FINEST ELECTRONIC EQUIPMENT IN KIT FORM

LITHO IN U.S.A.