PRICE $2.00

HEATH COMPANY • BENTON HARBOR, MICHIGAN

HEATHKIT®
ASSEMBLY MANUAL

HEATHKIT

SHORTWAVE RECEIVER
MODEL GR-64

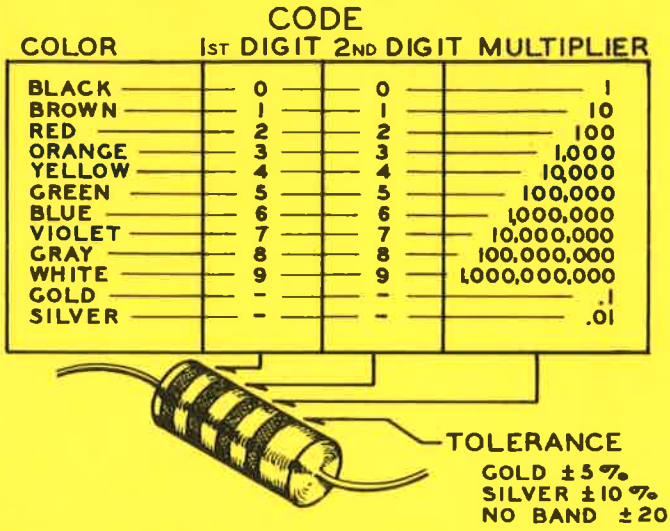
RESISTOR AND CAPACITOR COLOR CODES

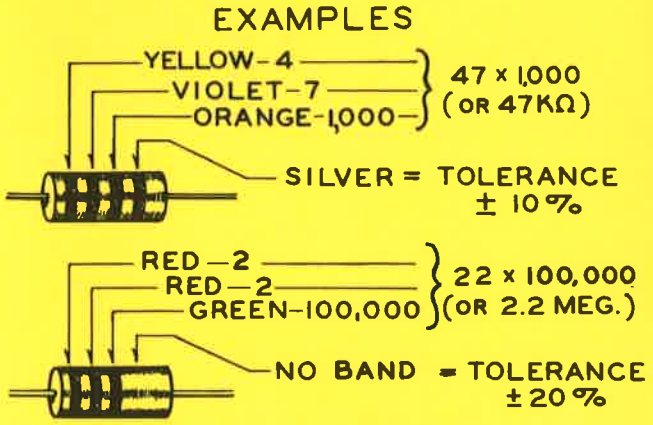
RESISTORS

The colored bands around the body of a color coded resistor represent its value in ohms. These colored bands are grouped toward one end of the resistor body. Starting with this end of the resistor, the first band represents the first digit of the resistance value; the second band represents the second digit; the third band represents the number by which the first two digits are multiplied. A fourth band of gold or silver represents a tolerance of ±5% or ±10% respectively. The absence of a fourth band indicates a tolerance of ±20%.

The physical size of a composition resistor is related to its wattage rating. Size increases progressively as the wattage rating is increased. The diameters of 1/2 watt, 1 watt and 2 watt resistors are approximately 1/8", 1/4" and 5/16", respectively.

The color code chart and examples which follow provide the information required to identify color coded resistors.

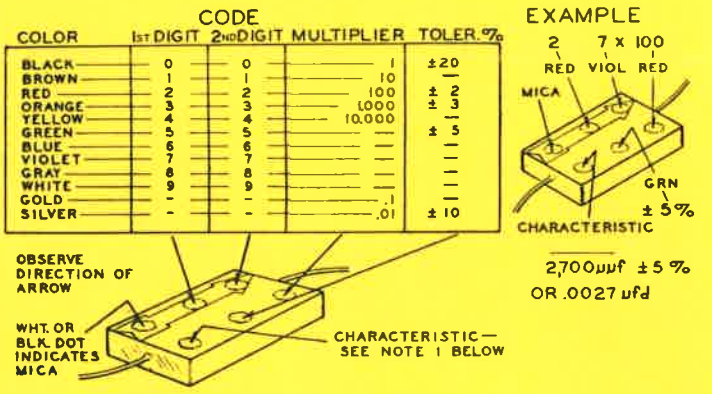




CAPACITORS

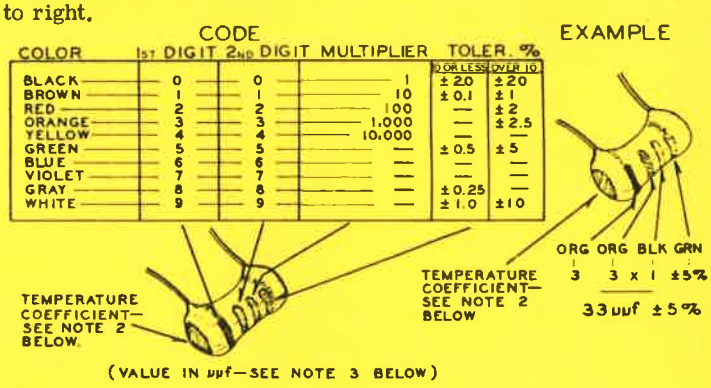
Generally, only mica and tubular ceramic capacitors, used in modern equipment, are color coded. The color codes differ somewhat among capacitor manufacturers, however the codes shown below apply to practically all of the mica and tubular ceramic capacitors that are in common use. These codes comply with EIA (Electronics Industries Association) Standards.

MICA



TUBULAR CERAMIC

Place the group of rings or dots to the left and read from left to right.



NOTES:

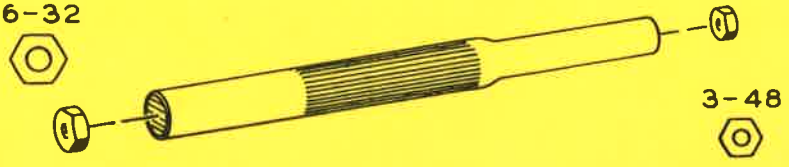
1. The characteristic of a mica capacitor is the temperature coefficient, drift capacitance and insulation resistance. This information is not usually needed to identify a capacitor but, if desired, it can be obtained by referring to EIA Standard, RS-153 (a Standard of Electronic Industries Association.)

2. The temperature coefficient of a capacitor is the predictable change in capacitance with temperature change and is expressed in parts per million per degree centigrade. Refer to EIA Standard, RS-198 (a Standard of Electronic Industries Association.)

3. The farad is the basic unit of capacitance, however capacitor values are generally expressed in terms of μfd (microfarad, .000001 farad) and μμf (micro-micro-farad, .000001 μfd); therefore, 1,000 μμf = .001 μfd, 1,000,000 μμf = 1μfd.

USING A PLASTIC NUT STARTER

A plastic nut starter offers a convenient method of starting the most used sizes: 3/16" and 1/4" (3-48 and 6-32). When the correct end is pushed down over a nut, the pliable tool conforms to the shape of the nut and the nut is gently held while it is being picked up and started on the screw. The tool should only be used to start the nut.



Assembly and Operation of the HEATHKIT SHORTWAVE RECEIVER

MODEL GR-64

HEATH COMPANY,
BENTON HARBOR,
MICHIGAN

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SPECIFICATIONS

Frequency Coverage	
Band A.	550 kc to 1500 kc.
Band B.	1.5 mc to 4 mc.
Band C.	4 mc to 10.5 mc.
Band D.	9.5 mc to 30 mc.
Meter.	Indicates relative signal strength.
Headphone Jack.	For most commercial headphones (headphone resistance may be from 50 Ω to 10 KΩ).
Controls.	VOLUME with OFF-ON switch. BFO (Beat Frequency Oscillator) BAND. BANDSPREAD. MAIN TUNING. ANL (Automatic Noise Limiter) ON-OFF. Function with AM, STBY, and CW positions.
Tube Complement.	12BE6 oscillator and mixer. 12BA6 IF amplifier and BFO. 12AV6 detector and audio amplifier. 12AQ5 audio output.
Power Supply.	Transformer-operated, voltage-doubler circuit with two silicon diodes.
Power Requirements.	120 volts 50/60 cps AC, 30 watts.
Dimensions.	13-1/2" wide x 6" high x 9" deep.
Net Weight.	11-1/2 lbs.

All prices are subject to change without notice. The Heath Company reserves the right to discontinue instruments and to change specifications at any time without incurring any obligation to incorporate new features in instruments previously sold.

INTRODUCTION

The Heathkit Model GR-64 Shortwave Receiver is designed to provide shortwave and standard broadcast band reception. The Receiver tunes from 550 kc to 30 mc in four overlapping bands. Amateur, foreign, marine, and broadcast frequencies are indicated on the dial.

The Receiver features a relative signal strength meter, electrical bandspread for all four bands, a BFO control, an automatic noise limiter circuit and a headphone jack. A large printed circuit board is used for circuit stability and ease of assembly. The transformer-operated power supply uses two silicon diodes in a voltage-doubler circuit for low heat and high efficiency.

The low-silhouette styling and attractive front panel will prove an attractive addition to any surroundings.

INTRODUCTION TO RADIO

Radio is a system of sending and receiving signals, messages, speech, music, and other information by the use of electromagnetic waves, without any connecting wires.

When an announcer speaks into a microphone in a radio broadcast station, the sound waves created by his voice are picked up by the microphone and changed into electrical impulses. See Figure 1. The weak electrical impulses from the microphone are then fed into a transmitter. The transmitter amplifies the weak signals from the microphone and transforms them into electrical waves that can be fed to a transmitting antenna and radiated through space. Similarly, when the amateur radio operator talks into a microphone, the weak electrical impulses from the microphone are fed into a transmitter. The signal from the transmitter is then fed into an antenna and radiated through space.

When these electrical signals leave the transmitting antenna, they are called electrical waves. They spread out in all directions, or they may be beamed in one direction, depending on the type of transmitting antenna used.

A receiver antenna picks up a small part of these electrical waves and feeds it into the receiver in the form of an electrical signal. Before this signal can enter the receiver, the receiver must be tuned to the frequency of the transmitted signal.

A receiver must separate one station from another. This is accomplished with tuned circuits which select one station and reject all others. After tuning to the desired radio signal, the radio reduces the frequency of the incoming signal to a constant, intermediate frequency signal.

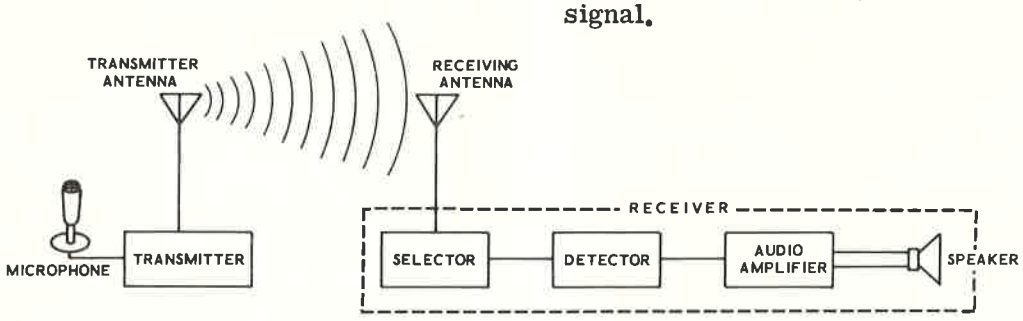


Figure 1

The process of obtaining this intermediate frequency signal requires three functions; oscillation, mixing, and detection. An oscillator circuit, generally called a local oscillator, sets up a signal that differs in frequency from the signal frequency. A mixer is required to obtain a new intermediate frequency by combining the signal frequency with that of the local oscillator through heterodyne or mixing action.

When the incoming electrical signal and the oscillator signals are combined, the output of the mixer contains many frequencies. The output of the mixer is fed directly to a highly selective amplifier, called an intermediate frequency or IF amplifier. This IF amplifier accepts only one frequency, amplifies it, and rejects all other frequencies. From the IF amplifier, the signal is fed to the audio detector.

The audio detector separates the audio frequency signal from the IF signal. Therefore, the output of the audio detector is an audio signal. This is where the announcer's voice, or the orchestra is restored to its original form. This signal is very weak.

From the audio detector the audio signal is fed to an audio amplifier which amplifies the signal so it can drive headphones or a loudspeaker. The loudspeaker converts the electrical audio signal into sound waves that can be heard.

CIRCUIT DESCRIPTION

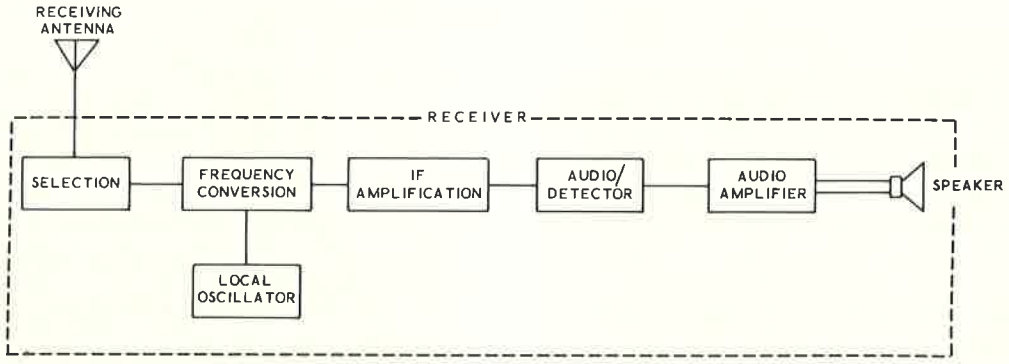
Refer to the Schematic (fold-out from Page 43) and Block Diagrams while reading the following description for a more thorough understanding of the circuit. The signal path will be described with the switches in their fully counter-clockwise position. This is the position in which the switches are shown on the Schematic Diagram.

When the Band switch is in position A, the radio station signal is received by the band A rod antenna coil, rear half of wafer A on the Band Switch, and then coupled through capacitor C14 and resistor R1 to the grid of the mixer-oscillator tube V1. Tube V1 combines the received radio signal and the oscillator signal. This produces a difference frequency of 455 kc. The 455 kc frequency is called the Intermediate Frequency (IF). The oscillator signal is varied along with the radio signal so that the difference between these signals is always 455 kc. The oscillator frequency is varied by one-half of Main Tuning capacitor C7 and the proper oscillator coil selected by Band switch wafer B.

The 455 kc IF signal from the plate of V1 is coupled through IF transformer IF-1 to the grid of the IF amplifier tube V2. IF transformer IF-1 is tuned so that it will pass only the 455 kc IF signal and reject all others. The IF signal is amplified by IF amplifier stage V2 and coupled through IF transformer IF-2 to the detector tube V3. Tube V2 also acts as a Beat Frequency Oscillator (BFO). The output signal of the BFO is used for Carrier Wave (CW) and Single Side Band (SSB) reception.

Tube V3 is a combination detector, audio amplifier, and an automatic noise limiter (ANL). The audio portion of the 455 kc IF signal is removed by the detector action of V3. This audio signal is amplified by the audio amplifier section of V3 and coupled through capacitor C26 to the grid of the audio output tube V4. The amount of amplification in tube V3 is controlled by the setting of Volume control R13 which is in the detector circuit of V3.

In audio output stage V4, the audio signal is greatly amplified and applied through audio output transformer T2 to the speaker.



BLOCK DIAGRAM

Figure 2

The power supply consists of diodes D1 and D2, capacitors C27C, C29, and C30, and power transformer T1 connected in a voltage-doubler circuit.

The B+ voltage is filtered by resistor R20 and capacitor C27B. The tube filaments are operated from a 12 volt winding on power transformer T1.

CONSTRUCTION NOTES

This manual is supplied to assist you in every way to complete your kit with the least possible chance for error. The arrangement shown is the result of extensive experimentation and trial. If followed carefully, the result will be highly stable and dependable performance. We suggest that you retain the manual in your files for future reference, both in the use of the equipment and for its maintenance.

UNPACK THE KIT CAREFULLY AND CHECK EACH PART AGAINST THE PARTS LIST. In so doing, you will become acquainted with the parts. Refer to the information on the inside covers of the manual to help you identify the components. If some shortage or parts damage is found in checking the Parts List, please read the Replacements section and supply the information called for therein.

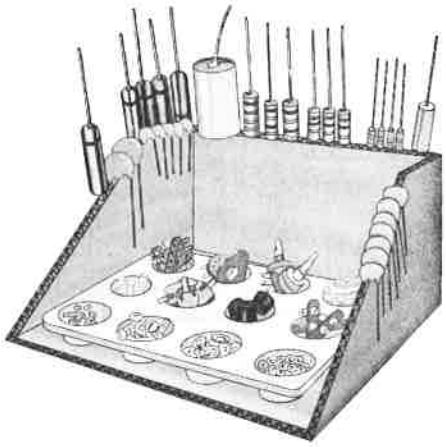
Resistors generally have a tolerance rating of 10% unless otherwise stated in the Parts List. Tolerances on capacitors are generally even greater. Limits of +100% and -20% are common for electrolytic capacitors.

We suggest that you do the following before work is started:

1. Lay out all parts so that they are readily available.

2. Provide yourself with good quality tools. Basic tool requirements consist of a screwdriver with a 1/4" blade; a small screwdriver with a 1/8" blade; long-nose pliers; wire cutters, preferably separate diagonal cutters; a penknife or a tool for stripping insulation from wires, and a soldering iron (or gun). A set of nut drivers, while not necessary, will aid extensively in construction of the kit.

Most kit builders find it helpful to separate the various parts into convenient categories. Muffin tins or molded egg cartons make convenient trays for small parts. Resistors and capacitors may be placed with their lead ends inserted in the edge of a piece of corrugated cardboard until they are needed. Values can be written on the cardboard next to each component. The illustration shows one method that may be used.



PARTS LIST

NOTE: The numbers in parentheses in the Parts List are keyed to the numbers on the Parts Pictorial (fold-out from Page 13) to aid in parts identification.

PART No.	PARTS Per Kit	DESCRIPTION
RESISTORS (1/2 Watt)		
(1) 1-2	1	68 Ω (blue-gray-black)
1-3	5	100 Ω (brown-black-brown)
1-66	1	150 Ω (brown-green-brown)
1-9	1	1000 Ω (brown-black-red)
1-109	1	12 KΩ (brown-red-orange)
1-22	1	22 KΩ (red-red-orange)
1-25	2	47 KΩ (yellow-violet-orange)
1-60	2	68 KΩ (blue-gray-orange)
1-29	1	220 KΩ (red-red-yellow)
1-33	3	470 KΩ (yellow-violet-yellow)
1-37	1	2.2 megohm (red-red-green)
1-38	1	3.3 megohm (orange-orange-green)
1-40	1	10 megohm (brown-black-blue)
RESISTORS (1 Watt - 2 Watt)		
(2) 1A-20	1	330 Ω 1 watt (orange-orange-brown)
1A-2	1	1000 Ω 1 watt (brown-black-red)
(3) 1B-16	1	330 Ω 2 watt (orange-orange-brown)
CAPACITORS (Resin-Mica)		
(4) 20-52	1	7.5 μμf resin
(5) 20-34	1	350 μμf mica
20-35	1	910 μμf mica (.00091)
20-57	1	2000 μμf mica (.002)

PART No.	PARTS Per Kit	DESCRIPTION
CAPACITORS (Disc)		
(6) 21-86	1	75 μμf
21-9	1	100 μμf
21-22	1	220 μμf
21-13	1	500 μμf
21-27	4	.005 μfd
21-16	8	.01 μfd
21-31	2	.02 μfd
21-78	1	5 μμf
CAPACITORS (Other)		
(7) 25-119	1	60-20-20-10 μfd at 350, 250, and 150 V electrolytic
(8) 25-43	1	70 μfd at 350 V electrolytic
(9) 26-81	1	355 μμf variable
26-88	1	5.9 μμf variable
(10) 31-8	3	1-10 μμf trimmer
(11) 31-23	1	2-60 μμf dual section trimmer
CONTROLS-SWITCHES		
(12) 10-27	1	3000 Ω control
19-26	1	1 megohm control with SPST switch
(13) 60-1	1	SPST switch
(14) 63-53	1	3-position switch (Function)
63-286	1	4-position, 2-section switch (Band)

PART No.	PARTS Per Kit	DESCRIPTION
COILS-CHOKE-TRANSFORMERS		
(15) 40-397	1	Band A oscillator coil
40-398	1	Band B oscillator coil
40-399	1	Band C oscillator coil
40-400	1	Band D oscillator coil
40-615	1	Band B antenna coil
40-616	1	Band C antenna coil
40-617	1	Band D antenna coil
(16) 40-618	1	Band A rod antenna coil
(17) 45-27	1	30 mh RF choke
(18) 51-55	1	Audio output transformer
(19) 52-84	2	IF transformer
54-155	1	Power transformer
DIODES-TUBES-LAMPS		
(20) 57-27	2	Silicon diode
411-50	1	12BE6 tube
411-51	1	12BA6 tube
411-52	1	12AV6 tube
411-203	1	12AQ5 tube
(21) 412-20	2	#47 pilot lamp
TERMINAL STRIPS-SOCKETS-JACK		
(22) 431-8	1	3-lug screw type terminal strip
(23) 431-10	1	3-lug terminal strip
(24) 431-11	1	5-lug terminal strip
(25) 434-80	2	7-pin tube socket with center pin
(26) 434-112	2	7-pin tube socket without center pin
434-88	2	Pilot lamp socket
(27) 436-4	1	Phone jack
INSULATORS-WIRES-CABLE		
73-1	2	3/8" rubber grommet
73-4	1	5/16" rubber grommet
(28) 75-24	1	Line cord strain relief
89-1	1	Line cord
340-2	1	Bare wire
344-50	1	Black hookup wire
344-59	1	White hookup wire
347-9	1	3-wire shielded cable
HARDWARE		
(29) 250-26	3	6-32 x 5/8" screw
(30) 250-89	10	6-32 x 3/8" screw
(31) 250-32	2	6-32 x 3/8" flat head screw
(32) 250-56	14	6-32 x 1/4" screw
(33) 250-116	4	6-32 x 1/4" truss head screw (black)
(34) 250-49	16	3-48 x 1/4" screw
(35) 250-8	17	#6 x 3/8" sheet metal screw
(36) 250-16	2	8-32 x 3/16" setscrew

PART No.	PARTS Per Kit	DESCRIPTION
HARDWARE (cont'd.)		
(37) 250-100	2	6-32 x 5/16" setscrew
(38) 252-7	6	Control nut
(39) 252-3	20	6-32 nut
(40) 252-1	16	3-48 nut
(41) 252-22	4	6-32 speednut
(42) 253-10	5	Control flat washer
(43) 253-27	4	#6 flat steel washer
(44) 253-36	1	Formed spring washer
(45) 254-5	3	Control lockwasher
(46) 254-1	23	#6 lockwasher
(47) 254-7	16	#3 lockwasher
(48) 259-10	2	Control solder lug
(49) 259-1	4	#6 solder lug
(50) 253-11	1	E ring
(51) 255-3	3	#6 spacer
(52) 258-1	2	Dial cord spring
(53) 453-110	1	Dial drive shaft
(54) 454-12	1	Flywheel
(55) 455-9	1	1/4" brass bushing
METAL PARTS		
90-M288F	1	Cabinet
200-M411	1	Chassis
(56) 204-M628	1	Switch mounting bracket
(57) 204-M636	1	Dial drive mounting bracket
100-M510F	1	Dial back plate
205-M453	1	Bottom plate
MISCELLANEOUS		
85-95P69	1	Circuit board
94-406	1	Cabinet back panel
(58) 100-M19	1	Bandspread dial pulley
100-M70	1	Main dial pulley
100-M356	1	Dial cord assembly
349-1	1	Dial cord
205-463	1	Plastic decorative panel
206-77	2	Tube shield
(59) 207-4	1	1/4" cable clamp
207-18	2	3/8" cable clamp
(60) 261-16	2	Short plastic feet
261-17	2	Long plastic feet
(61) 259-20	22	Terminal pins
401-24	1	Speaker
407-68	1	Meter
(62) 462-140	2	Large knob
462-159	4	Small knob
(63) 463-22	1	Vernier dial pointer
463-30	1	Main dial pointer
464-35	1	Dial window
(64) 481-1	1	Capacitor mounting wafer
(65) 490-1	1	Alignment tool
490-5	1	Nut starter
336-1		Solder
595-702	1	Manual

PROPER SOLDERING TECHNIQUES

Only a small percentage of customers find it necessary to return equipment for factory service. By far the largest portion of malfunctions in this equipment are due to poor or improper soldering.

If terminals are bright and clean and free of wax, frayed insulation and other foreign substances, no difficulty will be experienced in soldering. Correctly soldered connections are essential if the performance engineered into a kit is to be fully realized. If you are a beginner with no experience in soldering, a half hour's practice with some odd lengths of wire may be a worthwhile investment.

For most wiring, a 25 to 100 watt iron or its equivalent in a soldering gun is very satisfactory. A lower wattage iron than this may not heat the connection enough to flow the solder smoothly. Keep the iron tip clean by wiping it from time to time with a cloth.

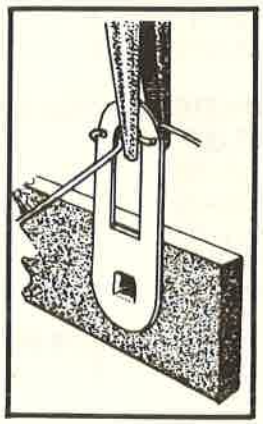
CHASSIS WIRING AND SOLDERING

1. Unless otherwise indicated, all wire used is the type with colored insulation (hookup wire). In preparing a length of hookup wire, 1/4" of insulation should be removed from each end unless directed otherwise in the assembly step.

2. To avoid breaking internal connections when stripping insulation from the leads of transformers or similar components, care should be taken not to pull directly on the lead. Instead, hold the lead with pliers while it is being stripped.

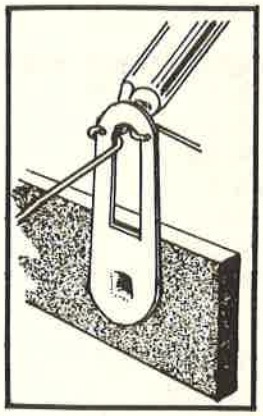
3. Leads on resistors, capacitors, and similar components are generally much longer than need be to make the required connections. In these cases, the leads should be cut to proper length before the part is installed. In general, the leads should be just long enough to reach their terminating points.

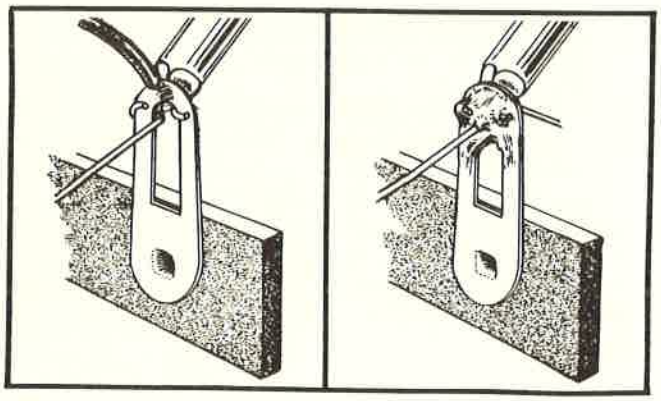
4. Crimp or bend the lead (or leads) around the terminal to form a good joint without relying on solder for physical strength. If the lead is too large to allow bending or if the step states that it is not to be crimped, position it so that a good solder connection can still be made.



5. Position the work, if possible, so that gravity will help to keep the solder where you want it.

6. Place a flat side of the soldering iron tip against the joint to be soldered until it is heated sufficiently to melt the solder.





7. Then place the solder and it will immediately flow over the joint; use only enough solder to thoroughly wet the junction. It is usually not necessary to fill the entire hole in the terminal with solder.

8. Remove the solder and then the iron from the completed joint. Use care not to move the leads until the solder is solidified.

A poor or cold solder joint will usually look crystalline and have a grainy texture, or the solder will stand up in a blob and will not have adhered to the joint. Such joints should be reheated until the solder flows smoothly. In some cases, it may be necessary to add a little more solder to achieve a smooth, bright appearance.

ROSIN CORE SOLDER HAS BEEN SUPPLIED WITH THIS KIT. THIS TYPE OF SOLDER MUST BE USED FOR ALL SOLDERING IN THIS KIT. ALL GUARANTEES ARE VOIDED AND WE WILL NOT REPAIR OR SERVICE EQUIPMENT IN WHICH ACID CORE SOLDER OR PASTE FLUXES HAVE BEEN USED. IF ADDITIONAL SOLDER IS NEEDED, BE SURE TO PURCHASE ROSIN CORE (60:40 or 50:50 TIN-LEAD CONTENT) RADIO TYPE SOLDER.

CIRCUIT BOARD WIRING AND SOLDERING

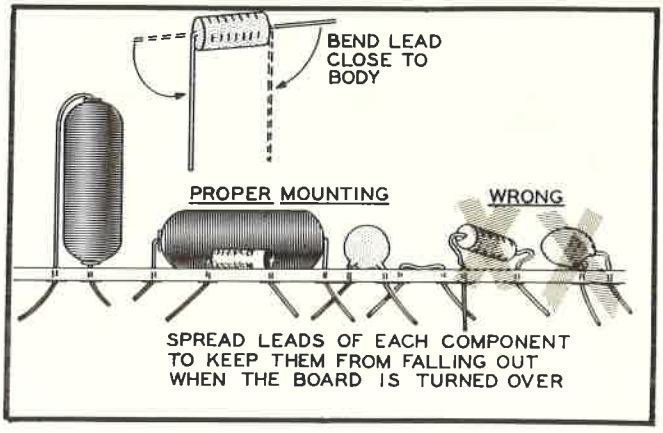
Before attempting any work on the circuit board, read the following instructions carefully and study the Figures. It is only necessary to observe the following basic precautions to insure proper operation of the unit the first time it is turned on.

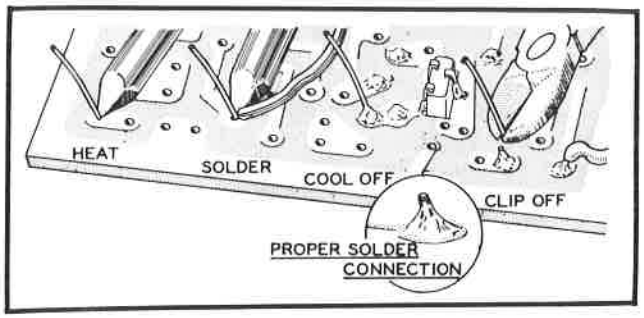
Proper mounting of components on the board is essential for good performance. A good general rule to follow is that all components on the board should be mounted tightly to the board, unless instructions state otherwise. All leads should be kept as short as possible to minimize the effects of stray capacity in the wiring. Proper and improper methods of mounting are illustrated in the accompanying Figures.

NOTE: Exercise care not to damage resistors or capacitors when bending the leads as shown.

Tubular capacitors and resistors will fit properly if the leads are bent as shown. Disc capacitors will generally fit in place with no lead preparation other than determining that the leads are straight. Components with lugs normally require no preparation unless the lugs appear to be bent, in which case they can be straightened with pliers.

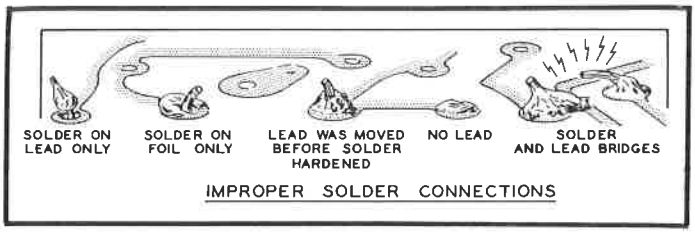
Parts should be inserted as instructed, and the leads bent outward, as illustrated, to lock them in place. When a group of parts have been installed on a circuit board, solder each lead to the foil pattern and clip off the excess wire.





The actual technique of soldering leads to a circuit board is quite simple. Position the tip of the soldering iron so that it firmly contacts both the circuit board foil and the wire or lug to be soldered, as shown. The iron should be held so that solder is not likely to flow to adjacent foil conductors or connections. The solder should immediately be placed between the iron and the joint to be soldered. Remove the length of solder as soon as its end begins to melt and flow onto the lead and foil. Hold the tip of the iron in place only until the solder begins to flow outward over the foil; then remove the iron quickly.

Avoid overheating the connection. A soldering pencil or small iron (approximately 25 watts) is ideal for use in circuit board work. If only a high wattage iron or soldering gun is available, precautions must be taken to avoid circuit board damage due to overheating and excess solder.



IMPROPER SOLDER CONNECTIONS

The use of excessive amounts of solder will increase the possibility of bridging between foil conductors or plugging holes which are to be left open for wires which may be added later on. If solder is accidentally bridged across insulating areas between conductors, it can be cleaned off by heating the connection carefully and quickly wiping or brushing the solder away with a soft cloth or clean brush. Holes which become plugged can be cleared by heating the area immediately over the hole while gently pushing the lead of a resistor through the hole from the opposite side, and withdrawing the lead before the solder rehardens. Do not force the lead through; too much pressure before the solder has time to soften may separate the foil from the board.

STEP-BY-STEP PROCEDURE

The following instructions are presented in a logical step-by-step sequence to enable you to complete your kit with the least possible confusion. Be sure to read each step all the way through before beginning the specified operation. Also read several steps ahead of the actual step being performed. This will familiarize you with the relationship of the subsequent operations. When the step is completed, check it off in the space provided. This is particularly important as it may prevent errors or omissions, especially if your work is interrupted. Some kit builders have also found it helpful to mark each wire and part in colored pencil on the Pictorial as it is added.

ILLUSTRATIONS

The fold-out diagrams in this manual may be removed and attached to the wall above your working area; but because they are an integral part of the instructions, they should be returned to the manual after the kit is completed.

In general, the illustrations in this manual correspond to the actual configuration of the kit; however, in some instances the illustrations may be slightly distorted to facilitate clearly showing all of the parts.

SOLDERING

The abbreviation "NS" indicates that a connection should not be soldered yet as other wires will be added. When the last wire is installed, the terminal should be soldered and the abbreviation "S" is used to indicate this. Note that a number will appear after each solder instruction. This number indicates the number of leads that are supposed to be connected to the terminal in point before it is soldered. For example, if the instruction reads, "Connect a wire to lug 1 (S-2)," it will be understood that there will be two wires connected to the terminal at the time it is soldered. (In cases where a wire passes through a terminal or lug and then connects to another point, it will count as two wires, one entering and one leaving the terminal.)

STEP-BY-STEP ASSEMBLY

NOTE: All resistors are 1/2 watt unless specified otherwise.

CIRCUIT BOARD WIRING

Before starting, be sure you read the Circuit Board Wiring and Soldering on Page 9.

( ) Locate the circuit board and position it with the lettered side up as shown in Pictorial 1, then install resistors and capacitors as shown. Notice that the circuit board has been divided into two halves for ease of construction. The shaded area in the small drawing at the top of the Pictorial shows the area in which you are working.

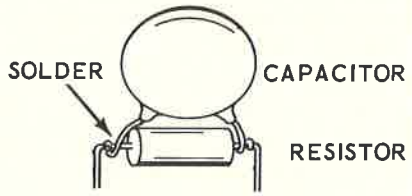
NOTE: Resistors and capacitors will be called out by value in the circuit board wiring steps. The color code for resistors will also be given.

START

NOTE: All resistors used in the following steps are 1/2 watt unless specified otherwise.

(✓) .01 μfd disc.

(✓) .02 μfd disc and 68 Ω (blue-gray-black) combination.



Bend capacitor leads around resistor leads. Solder and cut off excess capacitor leads.

(✓) .01 μfd disc.

(✓) 68 KΩ (blue-gray-orange).

(✓) 100 Ω (brown-black-brown).

(✓) 100 μμf disc.

(✓) 100 Ω (brown-black-brown).

(✓) .01 μfd disc.

(✓) 1000 Ω (brown-black-red).

(✓) 220 KΩ (red-red-yellow).

(✓) 100 Ω (brown-black-brown).

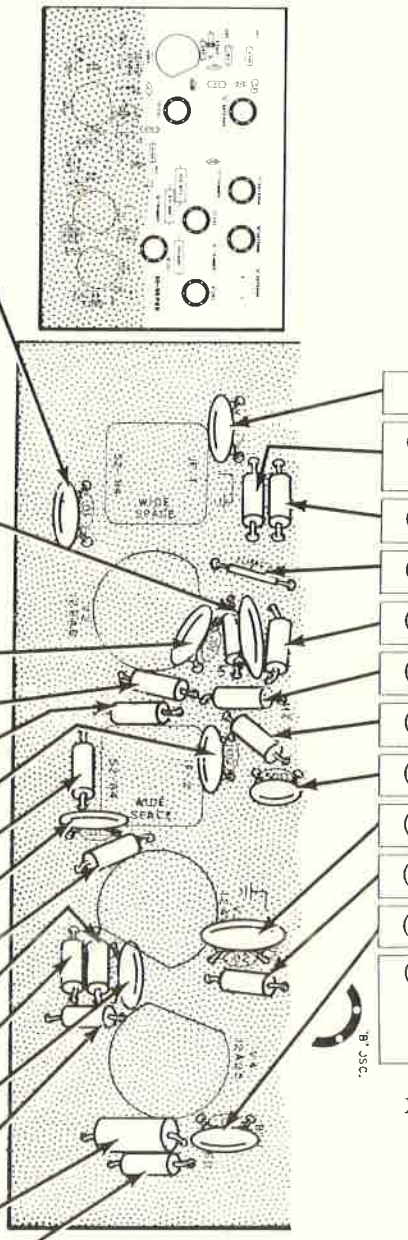
(✓) .01 μfd disc.

(✓) 470 KΩ (yellow-violet-yellow).

(✓) 330 Ω 1 watt (orange-orange-brown).

(✓) 100 Ω (brown-black-brown).

(✓) Turn the board over and solder all the leads. Then cut off the excess lead lengths close to the board.



CONTINUE

(✓) .01 μfd disc.

(✓) 3.3 megohm (orange-orange-green).

(✓) 2.2 megohm (red-red-green).

(✓) 1" white wire.

(✓) 12 KΩ (brown-red-orange).

( ) 47 KΩ (yellow-violet-orange).

(✓) 47 KΩ (yellow-violet-orange).

(✓) 500 μμf disc.

(✓) .02 μfd disc.

(✓) 10 megohm (brown-black-blue).

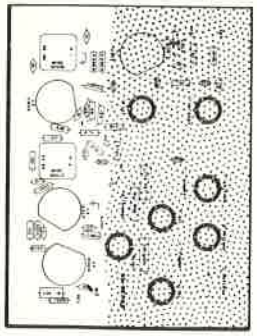
(✓) .01 μfd disc.

(✓) Turn the board over and solder all the leads. Then cut off the excess lead lengths close to the board.

PROCEED TO PICTORIAL 2.

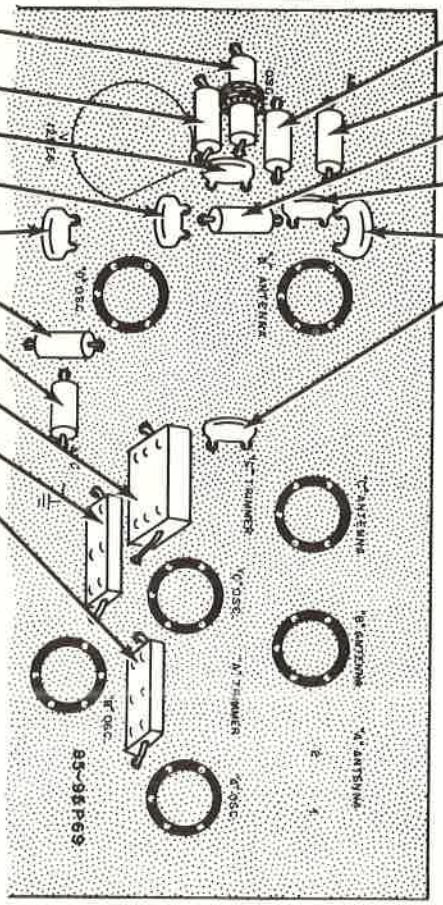
FINISH

PICTORIAL 1



START

- (✓) 30 μh choke (#45-27).
- (✓) 22 KΩ (red-red-orange).
- (✓) 75 μμf disc.
- (✓) .005 μfd disc.
- (✓) .01 μfd disc.
- (✓) 68 KΩ (blue-gray-orange).
- (✓) 470 KΩ (yellow-violet-yellow).
- (✓) .002 μfd molded.
- (✓) 910 μμf (.00091) molded.
- (✓) 350 μμf molded.
- (✓) Turn the board over and solder all the leads. Then cut off the excess lead lengths close to the board.



CONTINUE

- (✓) 150 Ω (brown-green-brown).
- (✓) 470 KΩ (yellow-violet-yellow).
- (✓) 100 Ω (brown-black-brown).
- (✓) 220 μμf disc.
- (✓) 7.5 μμf mica.
- (✓) .005 μfd disc.
- (✓) Turn the board over and solder all the leads. Then cut off the excess lead lengths close to the board.

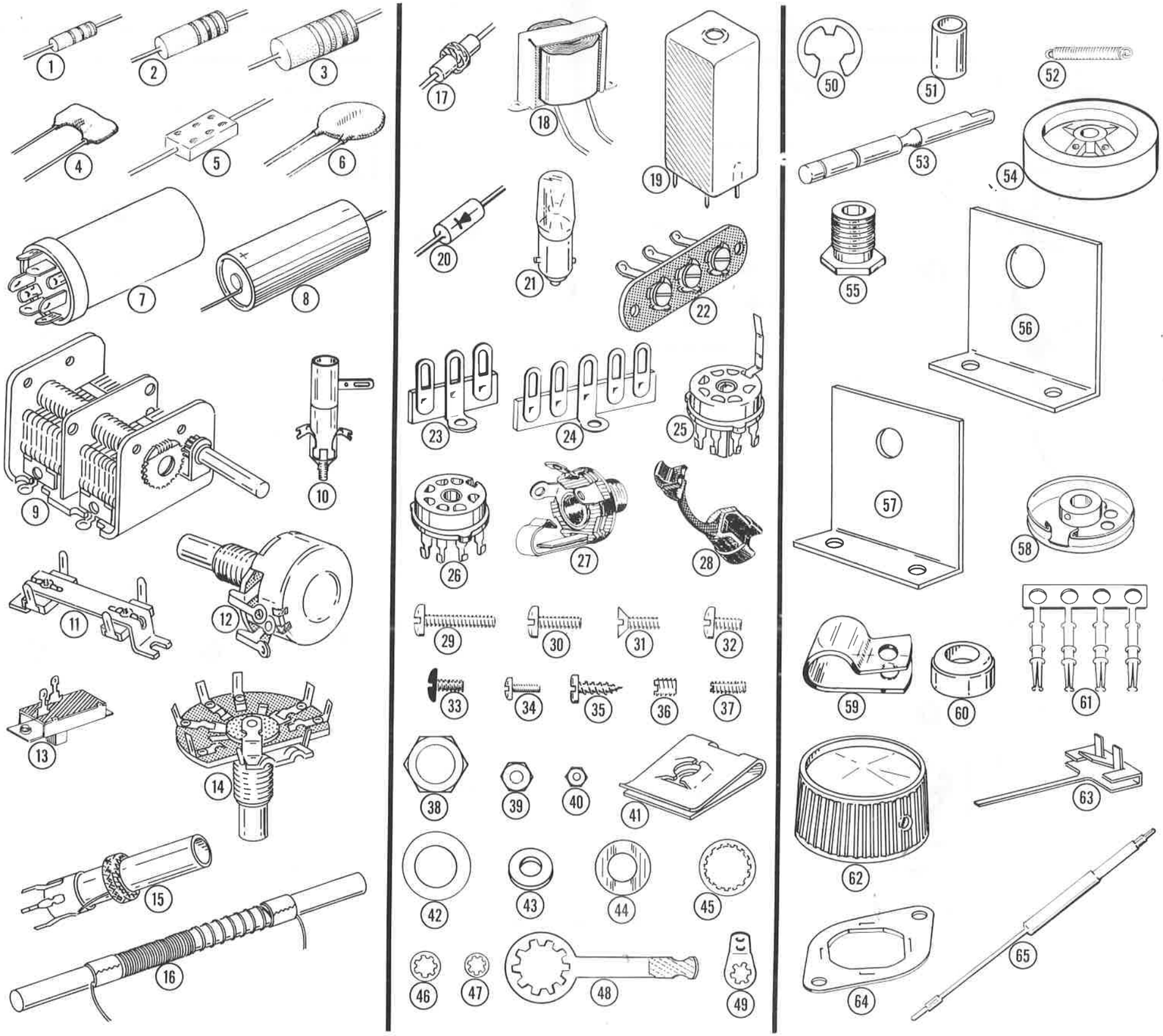
FINISH

PROCEED TO PICTORIAL 3.

PICTORIAL 2

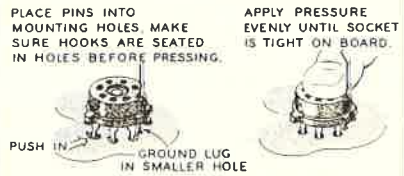
P2

PARTS PICTORIAL



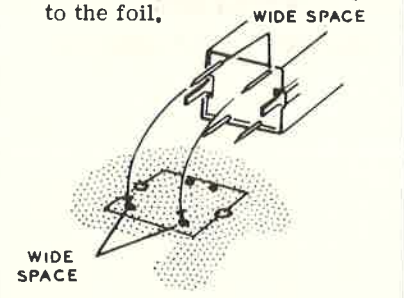
START

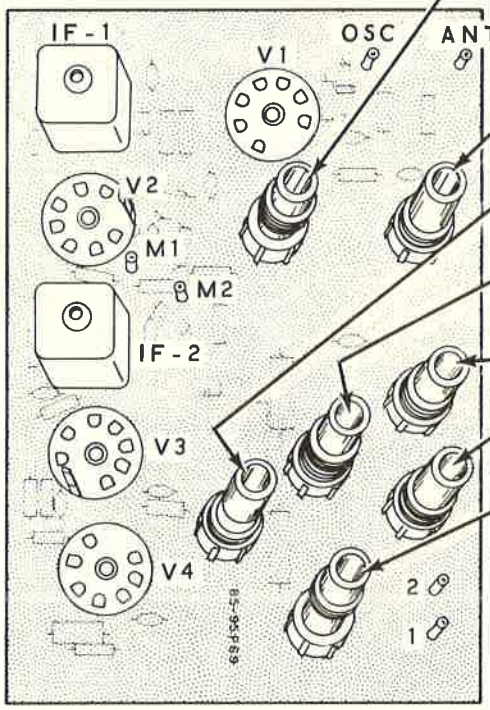
( ) Mount 7-pin tube sockets with center post at V2 and V3. Solder all pins and the center post of each socket.



( ) Mount 7-pin tube sockets without center post at V1 and V4. Solder all pins to the foil.

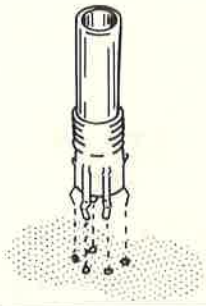
( ) Mount IF transformers (#52-84) at IF-1 and IF-2. Solder all pins to the foil.





CONTINUE

( ) Mount the "D" oscillator coil (#40-400). Solder all pins.



( ) Mount the "D" antenna coil (#40-617). Solder all pins.

( ) Mount the "B" oscillator coil (#40-398). Solder all pins.

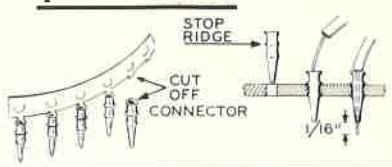
( ) Mount the "C" oscillator coil (#40-399). Solder all pins.

( ) Mount the "C" antenna coil (#40-616). Solder all pins.

( ) Mount the "B" antenna coil (#40-615). Solder all pins.

( ) Mount the "A" oscillator coil (#40-397). Solder all pins.

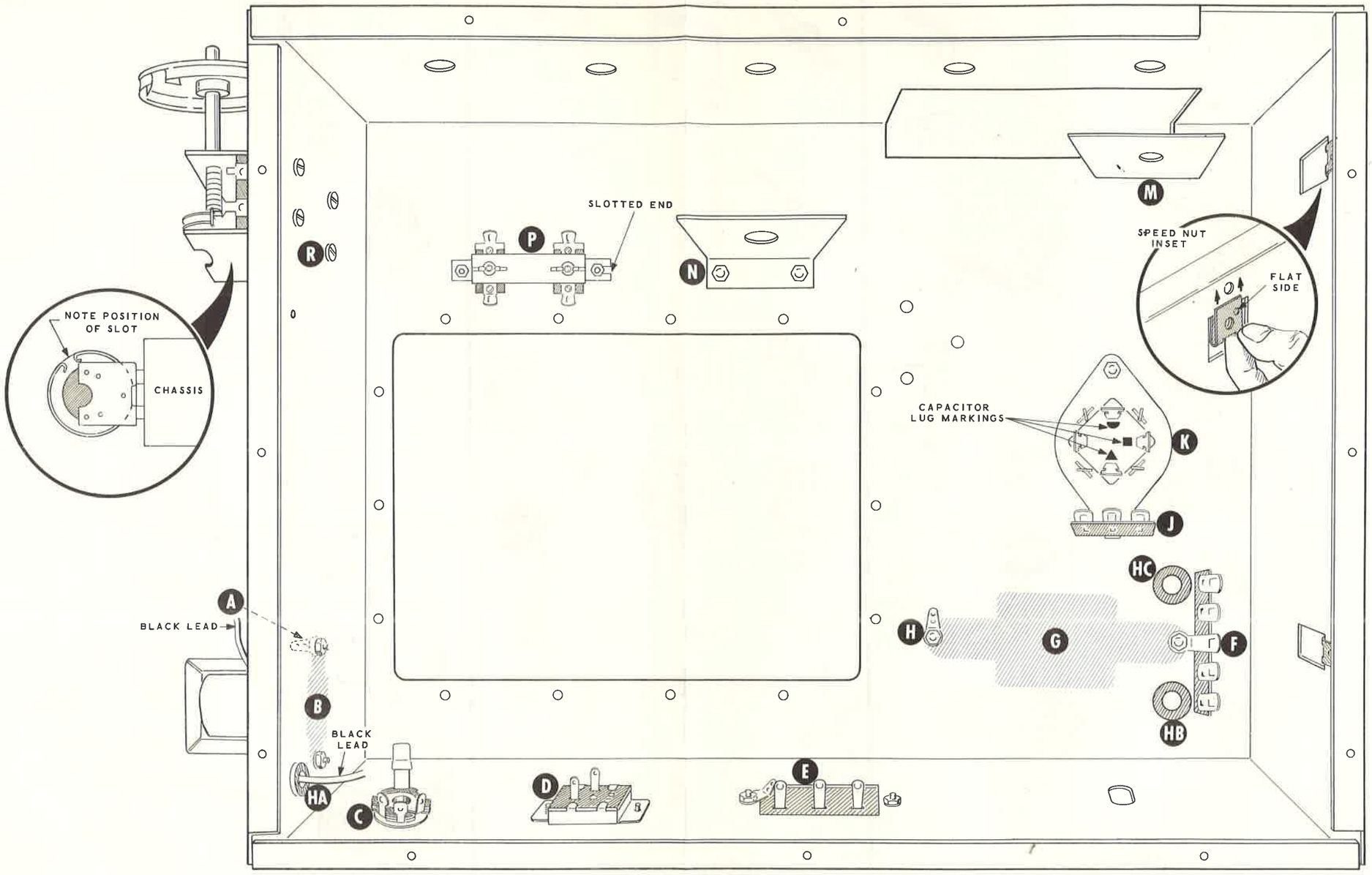
( ) Install terminal pins at locations OSC, ANT, M1, M2, 2, and 1 on the circuit board. Install all the pins from the lettered side of the circuit board. Do not solder the pins at this time.



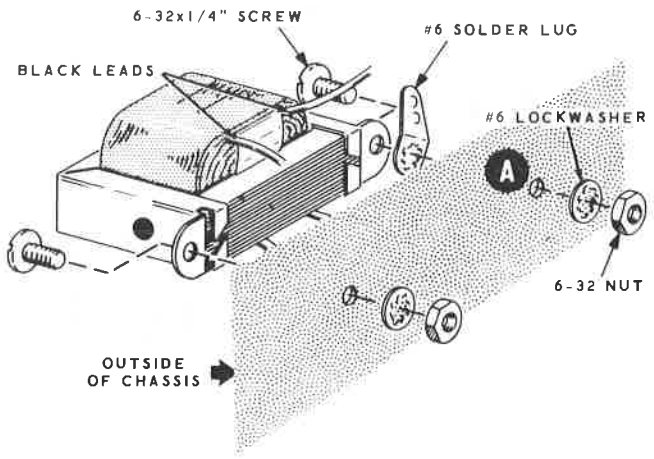
( ) Inspect the foil side of the circuit board to be sure there are no unsoldered connections except for the terminal pins extending through the board. Be sure there are no solder bridges between foils.

PICTORIAL 3

FINISH


NOTE POSITION OF SLOT
CHASSIS
SLOTTED END
P
N
M
SPEED NUT INSET
FLAT SIDE
CAPACITOR LUG MARKINGS
K
J
HC
H
G
F
HB
A
BLACK LEAD
B
BLACK LEAD
HA
C
D
E
R

PICTORIAL 4



Detail 4A

CHASSIS PARTS MOUNTING

Refer to Pictorial 4 for the following steps.

( ) Locate the chassis and position it as shown in the Pictorial.

( ) Install a 6-32 speednut in the two cutouts in the side of the chassis. Place the flat side of each speednut outward.

( ) Install a 5/16" rubber grommet at HA and 3/8" rubber grommets at HB and HC.

( ) Locate the audio output transformer (#51-55) and cut the leads as follows. Measure the leads from the bottom edge of the transformer frame.

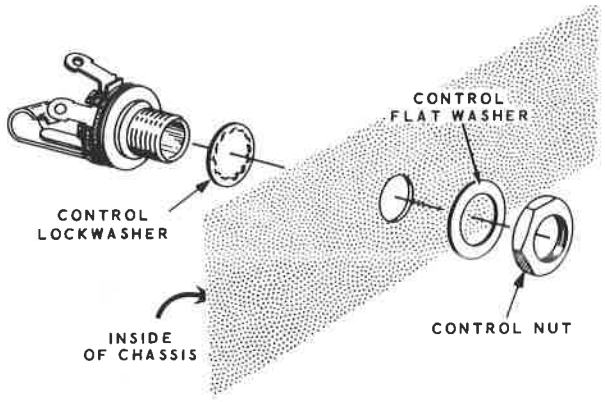
LEAD COLOR	CUT TO LENGTH
Red	2-1/2"
Blue	2"
Both black	1-1/2"

( ) Remove 1/4" of insulation from the end of each lead and melt a small amount of solder on the exposed lead end. This will hold the small strands together.

NOTE: Lockwashers and nuts will be used with all screws when mounting parts, unless stated otherwise in the assembly steps. The following steps will call out the size and type of hardware to be used. For example, the phrase, "Use 6-32 x 1/4" hardware" means to use 6-32 x 1/4" screws, #6 lockwashers, and 6-32 nuts.

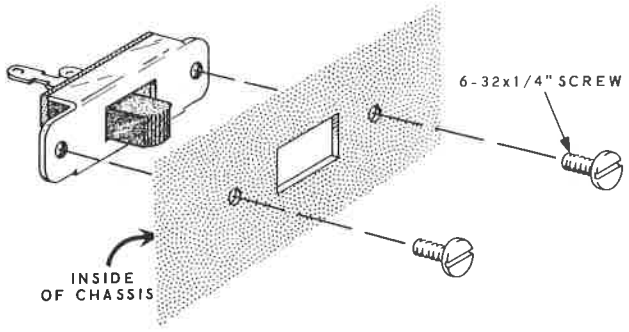
( ) Referring to Detail 4A, mount the audio output transformer at B and a #6 solder lug on the mounting screw at A. Use 6-32 x 1/4" hardware. Position the transformer with the black leads toward the chassis bottom. Place the black lead nearest grommet HA through HA to be connected later.

( ) Refer to Detail 4B and mount the phone jack at C on the rear apron. Use a control lockwasher, control flat washer, and a control nut. Position the jack lugs as shown in Pictorial 4.

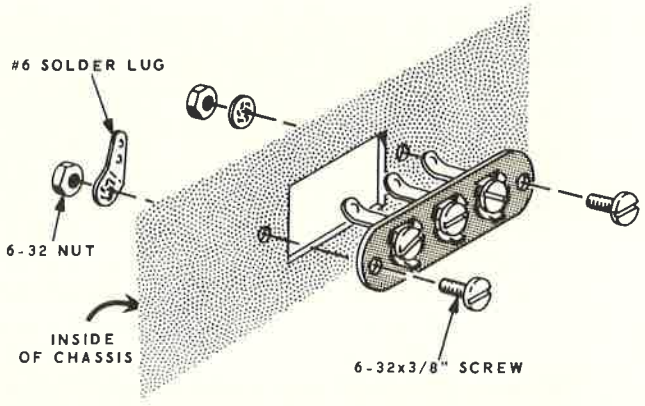


Detail 4B

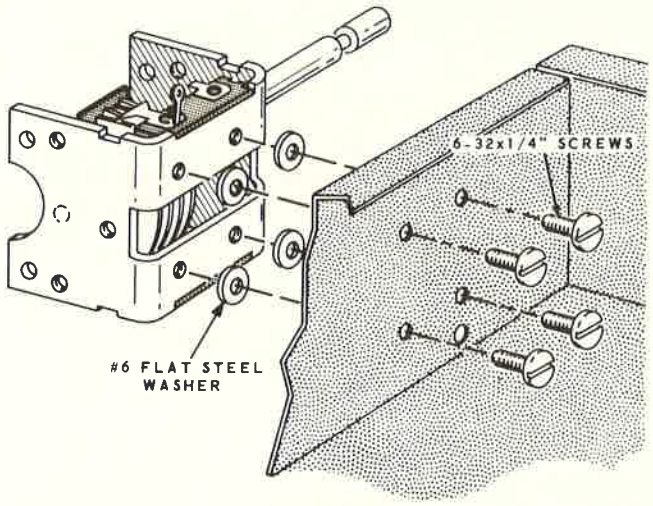
( ) Mount the SPST slide switch at D with 6-32 x 1/4" screws as shown in Detail 4C. Position the switch lugs as shown in Pictorial 4.



Detail 4C



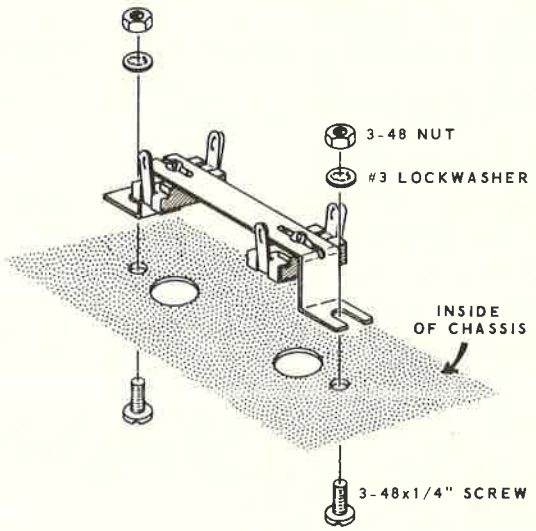
Detail 4D



Detail 4E

(✓) Referring to Detail 4D, mount the 3-lug screw type terminal at E and a #6 solder lug on the indicated mounting screw. Use 6-32 x 3/8" hardware. Be sure to place the terminal strip on the outside of the rear apron and position the solder lug as shown in Pictorial 4.

(✓) Referring to Detail 4E, mount the Band Spread variable capacitor (#26-88) at R. Use 6-32 x 1/4" screws and #6 flat steel washers. Keep the plates fully closed during installation to prevent their being damaged.

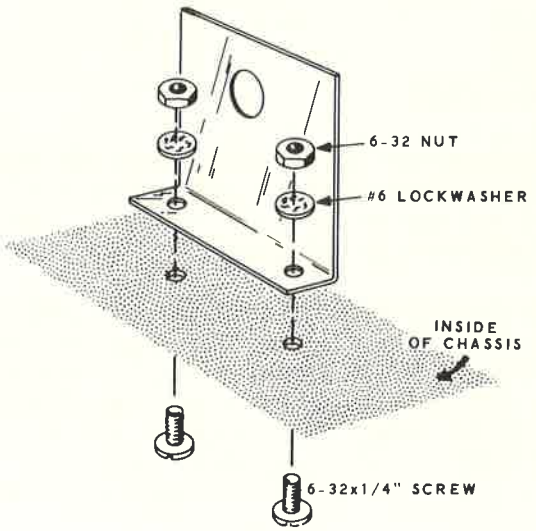


Detail 4F

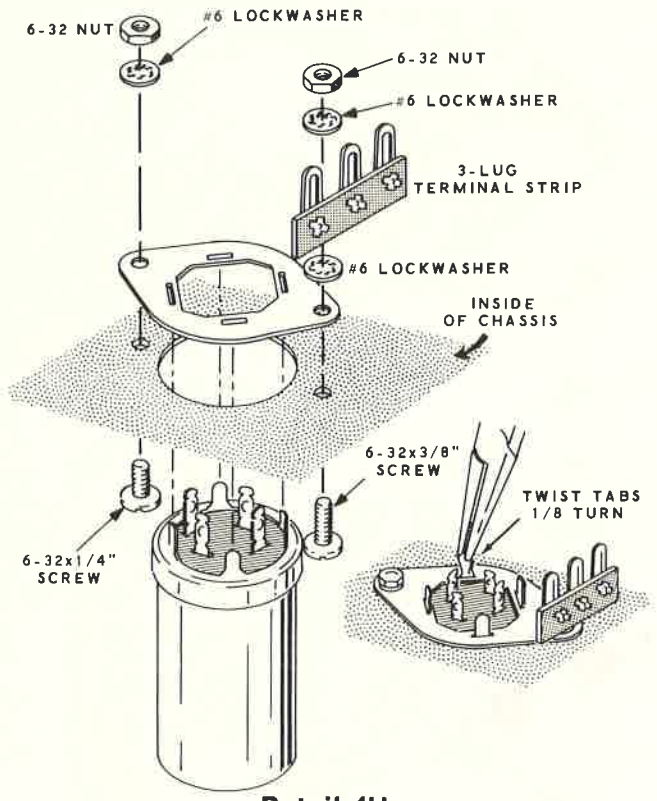
(✓) Refer to Detail 4F and mount the dual trimmer capacitor at P. Use 3-48 x 1/4" hardware.

(✓) Referring to Detail 4G, mount the switch mounting bracket (#204-M628 has larger hole) at N. Use 6-32 x 1/4" hardware.

(✓) Mount the dial drive shaft support bracket (#204-636) at M. Use 6-32 x 1/4" hardware.



Detail 4G



Detail 4H

( ) Referring to Detail 4H, mount the capacitor mounting wafer at K with a 3-lug terminal strip at mounting screw J. Use 6-32 x 3/8" hardware at the terminal strip mounting hole and 6-32 x 1/4" hardware at the other mounting hole. Mount the wafer on the bottom of the chassis.

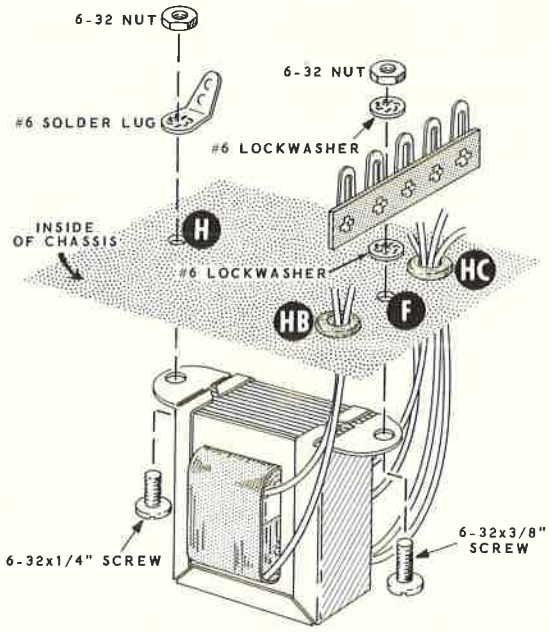
( ) Again refer to Detail 4H and mount the 60-20-20-10 μfd electrolytic capacitor at K. Position the capacitor lug markings as shown in Pictorial 4. Secure the capacitor by twisting each mounting tab 1/8 turn.

Cut the power transformer leads to the following lengths. Measure the leads from the side of the transformer frame.

LEAD COLOR	LEAD LENGTH
( ) Either green	7"
( ) Other green	5-1/2"
( ) Either red	5"
( ) Other red	3"
( ) Either black	3-1/2"
( ) Other black	3"

( ) Remove 1/4" of insulation from the end of each power transformer lead and melt a small amount of solder on the exposed lead end. This will hold the small strands together.

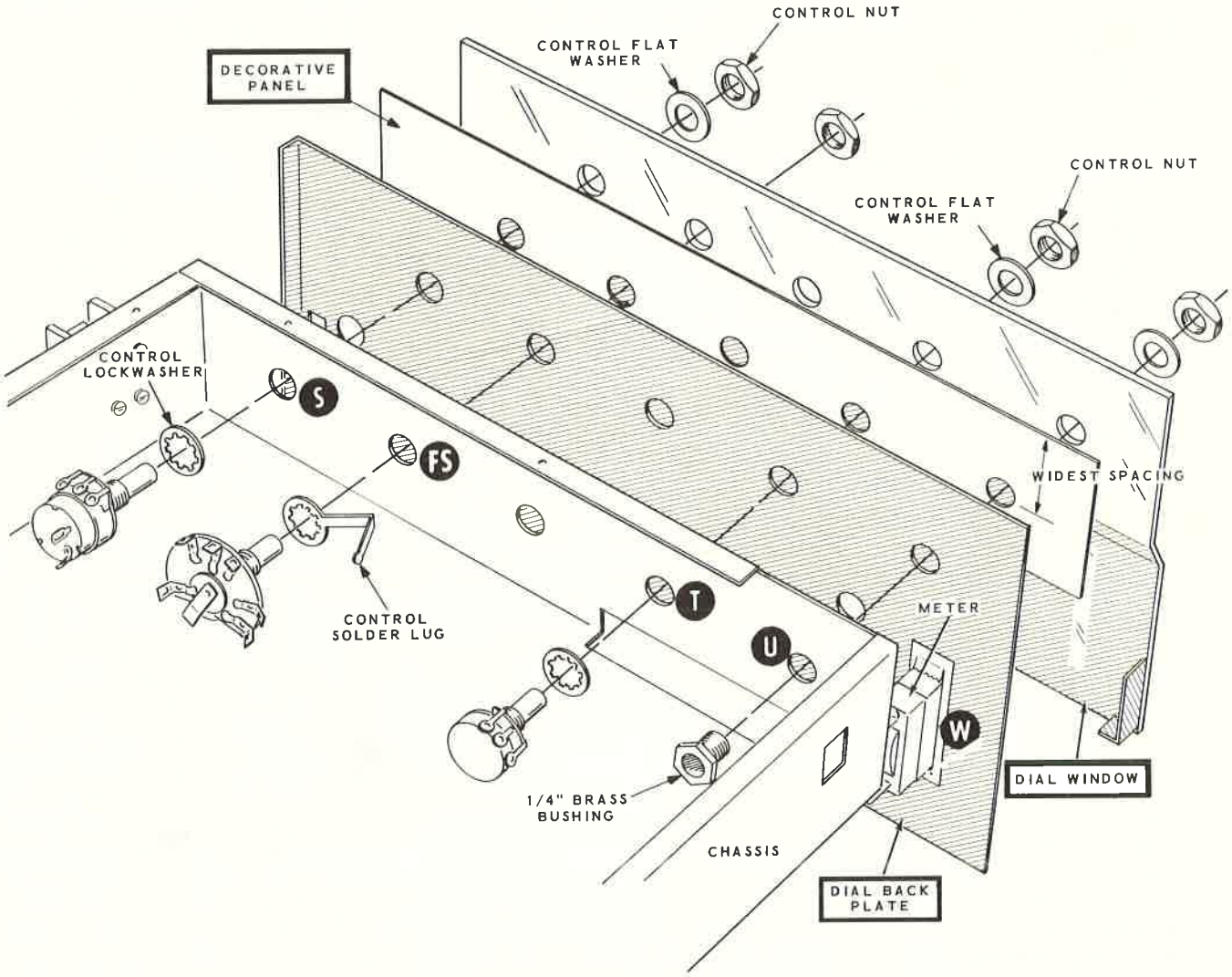
( ) Referring to Detail 4J, mount the power transformer at G with a #6 solder lug at mounting screw H and a 5-lug terminal strip at mounting screw F. Position the transformer so the two black leads go through grommet HB and the two green and two red leads go through grommet HC. Use 6-32 x 3/8" hardware for the terminal strip mounting and 6-32 x 1/4" hardware for the solder lug mounting.



Detail 4J

( ) Start an 8-32 x 3/16" setscrew in the Band Spread dial pulley (smaller pulley).

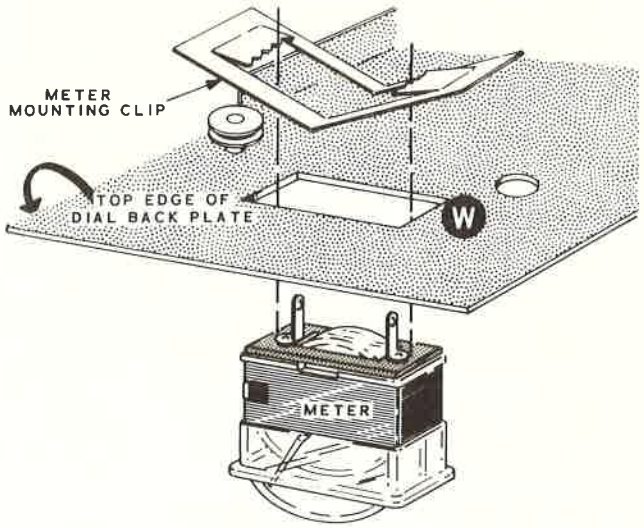
( ) Turn the shaft of variable capacitor R until the plates are fully open. Place the small dial pulley on the shaft of capacitor R. Position the pulley so it is flush with the front of the chassis and the slot is as shown on the capacitor inset drawing in Pictorial 4, then tighten the setscrew. Now return the capacitor plates to their fully closed position.



PICTORIAL 5

Refer to Pictorial 5 for the following steps.

( ) Mount the meter on the dial back plate at W. Hold the meter against the plate, and slip the clamp over the rear of the meter. With a screwdriver, push both sides of the clamp tightly against the dial back plate as shown in Detail 5A. Be sure the meter lettering is rightside up when viewing the dial plate from the front in the upright position.



Detail 5A

(✓) Mount the dial back plate, the decorative panel, and the dial window to the chassis front apron. Secure these parts to the chassis with a 1 megohm control with SPST switch (#19-26) at S. Use a control lockwasher, a control flat washer and a control nut. Do not tighten the nut at this time. Position the decorative panel so the widest space between the control mounting holes and the bottom edge is toward the chassis bottom.

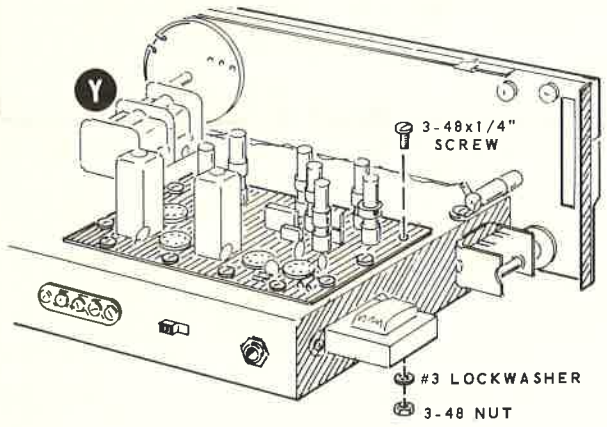
(✓) Install the 3-position Function switch (#63-53) at FS with a control solder lug and a control nut. Position the solder lug as shown in Pictorial 5. Do not tighten the nut at this time.

(✓) Install a 3000 Ω control (#10-27) at T with a control lockwasher, control flat washer, and a control nut. Do not tighten the nut at this time.

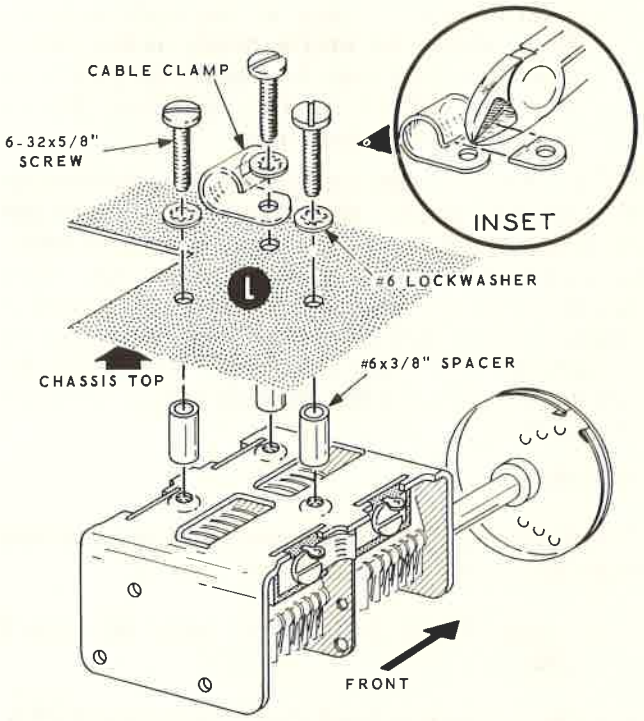
(✓) Install a 1/4" brass bushing at U with a control flat washer and a control nut. Now position all switch and control lugs as shown in Pictorial 5 and tighten the nuts on S, FS, T, and U. Do not overtighten these nuts as the plastic dial window may crack. Before tightening the nuts, be sure the bottom edge of the dial window is flush with the chassis bottom.

Refer to Pictorial 6 (fold-out from Page 25) for the following steps.

(✓) Mount the circuit board on the top side of the chassis, using 3-48 x 1/4" hardware as shown in Detail 6A. Be sure to position the circuit board as shown in Pictorial 6.



Detail 6A



Detail 6B

(✓) Locate the 1/4" (small) cable clamp and cut off the indicated mounting lip as shown in Detail 6B.

(✓) Start an 8-32 x 3/16" setscrew in the large dial pulley.

(✓) Locate the Main tuning capacitor (#26-81) and place the large pulley on the shaft. Temporarily tighten the setscrew.

(✓) Referring to Detail 6B, mount the main tuning capacitor (#26-81) on the top side of the chassis at Y and the 1/4" cable clamp on the bottom side of the chassis at L. Use 6-32 x 5/8" screws, #6 lockwashers, and #6 x 3/8" spacers. Position the cable clamp L as shown in Pictorial 6. Be sure that the plates of the variable capacitor are fully closed to prevent damage during assembly.

( ) Install terminal pins at the sixteen locations shown by arrow heads on the circuit board in Pictorial 6. Install the pins from the foil side of the circuit board. Do not solder them at this time.

NOTE: When a step calls for a terminal pin to be soldered, solder the wire to the pin and the pin to the foil side of the circuit board. At some locations there will be more than one wire connected to a terminal pin. Also, at some locations, wires will be connected to both ends of a terminal pin. When a wire is connected to the bottom (small end) the wire should be wrapped around the pin.

WIRING

Connect the power transformer leads extending from grommet HB as follows:

( ) Longer black to lug 2 of terminal strip F (NS).

( ) Other black to lug 5 of terminal strip F (NS).

Connect the power transformer leads extending from grommet HC as follows:

( ) Short red to lug 3 of terminal strip J (NS).

( ) Long red to lug 1 of electrolytic capacitor K (NS).

( ) Twist the two green leads together and connect the short green to solder lug H (S-1) and the long green to terminal pin F1 on the circuit board (NS).

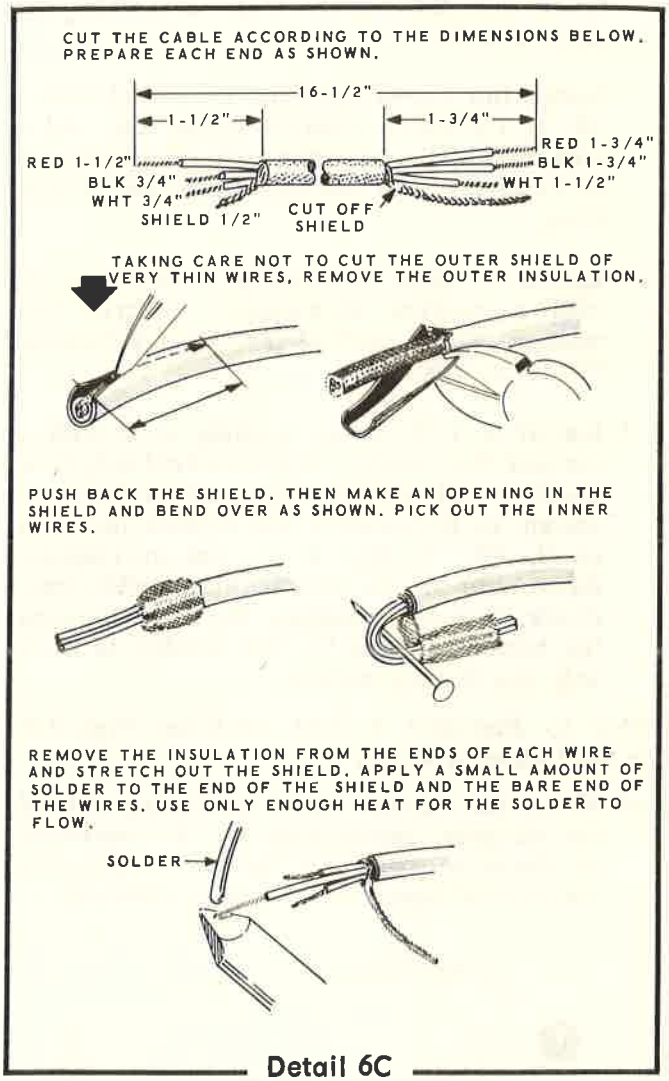
NOTE: When preparing a specified length of hookup wire, remove 1/4" of insulation from each end.

( ) Connect a 5-1/4" white wire from terminal pin F-1 (S-2) to terminal pin F-2 (NS).

( ) Connect a 4-3/4" white wire from terminal pin F-2 (S-2) to terminal pin F-3 (NS).

( ) Connect a 4-1/2" white wire from terminal pin F-3 (S-2) to terminal pin F-4 (S-1).

( ) Referring to Detail 6C, prepare a 16-1/2" length of 3-wire shielded cable.



Detail 6C

At the end of the prepared cable with the shield lead cut off, connect the wires as follows:

( ) Black wire to terminal pin K (S-1).

( ) White wire to terminal pin S (S-1).

( ) Red wire to terminal pin B+ (S-1).

Connect the wires at the other end of the prepared cable to electrolytic capacitor K as follows:

( ) Shield to lug 5 (S-1). Apply enough heat and solder to securely solder lug 5 to the mounting wafer.

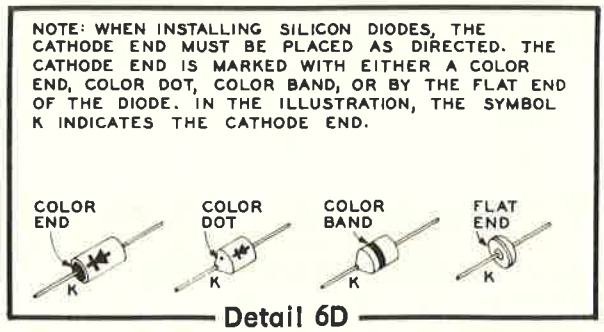
( ) White to lug 3 (NS).

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

( ) Red to lug 2 (NS).

( ) Connect a 1000 Ω (brown-black-red) 1 watt resistor between lugs 2 (NS) and 3 (S-2) of electrolytic capacitor K.

( ) Connect a .005 µfd disc capacitor between lugs 3 (NS) and 2 (NS) of terminal strip J.



Detail 6D

NOTE: Refer to Detail 6D in the following steps to determine the proper polarity of the silicon diodes. Be sure the diodes are installed as specified to prevent damage to them and related components.

( ) Connect the cathode (K) lead of a silicon diode to lug 3 (NS) and the other lead to lug 2 (S-2) of terminal strip J.

( ) Connect the cathode (K) lead of a silicon diode to lug 1 (NS) and the other lead to lug 3 (S-4) of terminal strip J.

( ) Connect a 330 Ω (orange-orange-brown) 2 watt resistor from lug 1 of terminal strip J (NS) to lug 2 of electrolytic capacitor K (S-3).

( ) Connect the positive (+) lead of a 70 µfd electrolytic capacitor to lug 1 of terminal strip J (S-3) and the other lead to lug 1 of electrolytic capacitor K (S-2).

( ) Connect a .01 µfd disc capacitor from lug 3 of terminal strip E (S-1) to hole QM on the circuit board (S-1). Cut off the excess lead length going through hole QM. This lead should be cut off flush with the top surface of the circuit board.

( ) Bend the solder lug mounted near lug 1 of terminal strip E so it touches lug 1 of E (S-1).

( ) Connect a 1-1/2" bare wire from lug 2 of switch D (S-1) to hole NL (near tube socket V-3) on the circuit board (S-1).

( ) Connect a 2-1/4" bare wire from lug 1 of switch D (S-1) to hole NL (near tube socket V-4) on the circuit board (S-1).

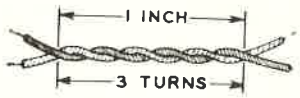
( ) Connect the black output transformer lead extending through grommet HA to lug 1 of phone jack C (S-1).

( ) Connect a 1-1/4" bare wire from lug 3 of dual trimmer capacitor P (S-1) to hole BS on the circuit board (S-1).

( ) Connect a 1-1/4" bare wire from lug 4 of dual trimmer capacitor P (S-1) to hole CS on the circuit board (S-1).

NOTE: The purpose of using twisted pairs of hookup wire is to provide shielding for signal carrying leads and the cancellation of hum in the filament and AC leads. Best results will be obtained in the following steps if the wires are twisted approximately 3 complete turns per inch. See Detail 6E. The wires may be twisted by hand or with a drill. If a drill is used, be careful not to twist the wires too tightly.

( ) Using the black hookup wire as a guide, cut the white hookup wire to the same length as the black hookup wire. Now twist these two lengths together as shown in Detail 6E.



Detail 6E

NOTE: When making a connection with hookup wire, 1/4" of insulation should be removed unless directed otherwise in the step.

In the following steps you may wish to cut the lengths of wire ahead of time. The lengths of hookup wire needed for the wiring steps are listed at the beginning of each section. Use the white insulated hookup wire unless bare or twisted wire is specified. Arrange the wires in the sequence listed. This will save time in performing the wiring steps.

( ) Cut the following lengths of twisted wires:

10" twisted pair	9" twisted pair
11" twisted pair	9" twisted pair
15" twisted pair	8" twisted pair
12" twisted pair	

( ) At either end of a 10" twisted pair, connect the white wire to terminal pin AUD 2 (S-1) and the black wire to terminal pin AUD 2 GND (S-1).

( ) At the other end of this twisted pair, connect the black wire to lug 3 (S-1) and the white wire to lug 2 (S-1) of control S.

NOTE: In the following steps the black wire may not be connected at one end of the twisted pair. If the black wire is not connected, it serves as a shield for the white wire and should be wrapped around the end of the white wire, as shown in Pictorial 6.

( ) At either end of an 11" twisted pair, connect the white wire to terminal pin AUD 1 (S-1) and the black wire to terminal pin AUD 1 GND (S-1).

( ) At the other end of this twisted pair, connect the white wire to lug 1 of control S (S-1). The black wire is not connected at this end.

( ) At either end of a 15" twisted pair, connect the white wire to lug 4 (S-1) and the black wire to lug 5 (S-1) of control S. Route the free end of the twisted pair through cable clamp L.

( ) At the other end of this twisted pair, connect the white wire to lug 2 (S-2) and the black wire to lug 1 (NS) of terminal strip F.

( ) At either end of a 12" twisted pair, connect the white wire to lug 1 of switch FS (S-1). The black wire is not connected at this end. Route the free end of this twisted pair through cable clamp L.

( ) At the other end of this twisted pair connect the white wire to terminal pin S3 (S-1) and the black wire to terminal pin S3 GND (S-1).

( ) At either end of a 9" twisted pair, connect the white wire to lug 6 of switch FS (S-1). The black wire is not connected at this end. Route the free end of this twisted pair through cable clamp L.

( ) At the other end of this twisted pair, connect the white wire to terminal pin S-2 (S-1) and the black wire to terminal S-2 GND (S-1).

( ) Place one end of a 3-1/4" bare wire through lug 2 (S-2) to lug 1 (S-1) of dual trimmer capacitor P. Connect the other end of this wire to lug 5 of switch FS (NS).

( ) Connect a 3-1/4" bare wire from lug 3 (S-1) through lug 4 (S-2) of switch FS and around the solder lug mounted on FS (S-2) to lug 5 of FS (S-2).

( ) At either end of a 9" twisted pair, connect the white wire to lug 2 (S-1) and the black wire to lug 3 (S-1) of control T. Route the free end of this twisted pair through cable clamp L.

( ) At the other end of this twisted pair, connect the white wire to terminal S-1 (S-1) and the black wire to the center post of tube socket V2 (S-1).

( ) At either end of an 8" twisted pair, place the white wire through grommet HA and connect it to lug 2 of phone jack C (S-1). Connect the black wire of this twisted pair to solder lug A (NS). The other end of the twisted pair will be connected later.

( ) Connect the remaining black output transformer lead to solder lug A (S-2).

Refer to Pictorial 7 for the following steps.

(✓) Locate the Band switch (#63-286) and mount it in the band switch mounting bracket at N. Place the shaft of the switch through hole BS in the front panel. Position the switch lugs as shown in Pictorial 7 and secure it with a control solder lug, control flat washer, and a control nut as shown in Detail 7A.

The lengths of bare wire needed for the following steps are:

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

The lugs on the front side of wafer A of Band switch BS will be wired in the following steps.

(✓) Connect a 5/8" bare wire from lug 2 (S-1) to hole DA-2 on the circuit board (S-1).

(✓) Connect a 4" bare wire from lug 4 (S-1) around the control solder lug on Band switch BS (S-2) to lug 12 (NS). Lug 12 is on the rear side of wafer A.

(✓) Connect a 2-1/2" bare wire from lug 6 (S-1) to hole CS on the circuit board (S-1).

(✓) Connect a 3-3/4" bare wire from lug 8 (S-1) to hole BS on the circuit board (S-1).

(✓) Connect a 4-3/4" bare wire from lug 10 (S-1) to hole AS on the circuit board (S-1).

(✓) Connect a .005 μfd disc capacitor between lugs 11 (S-1) and 12 (S-2) of wafer A. Lug 12 is on the rear of wafer A.

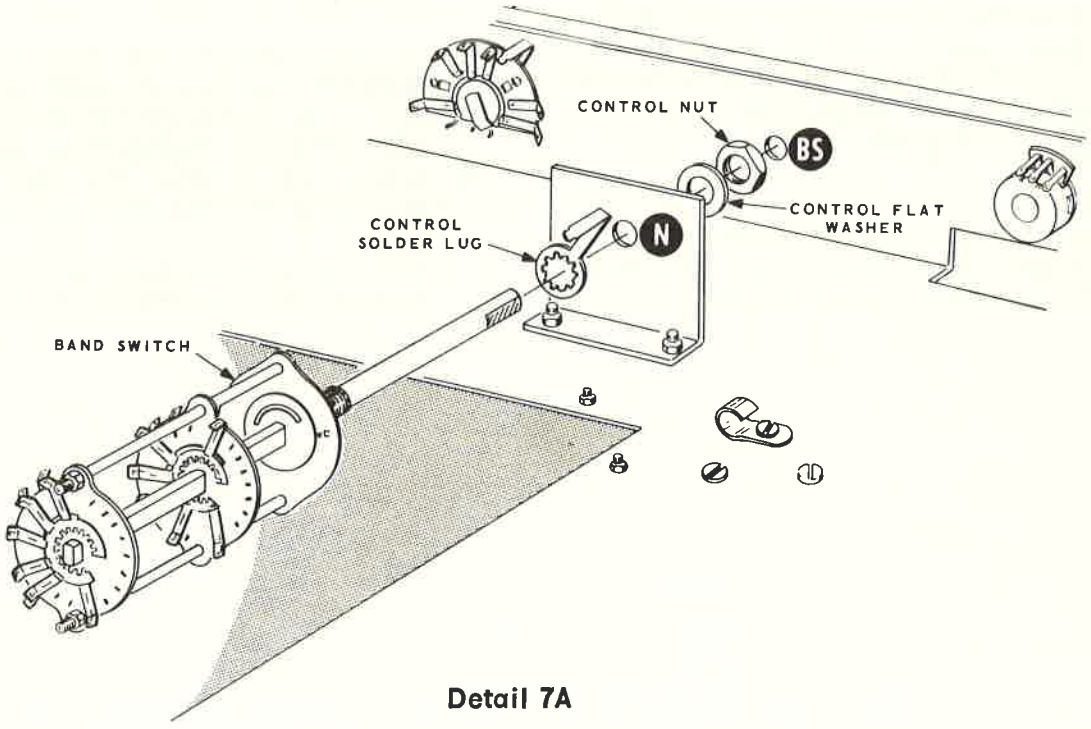
The lugs on the front side of wafer B of Band switch BS will be wired in the following steps.

(✓) Connect a 1-1/2" bare wire from lug 2 (S-1) to hole DO-2 on the circuit board (S-1).

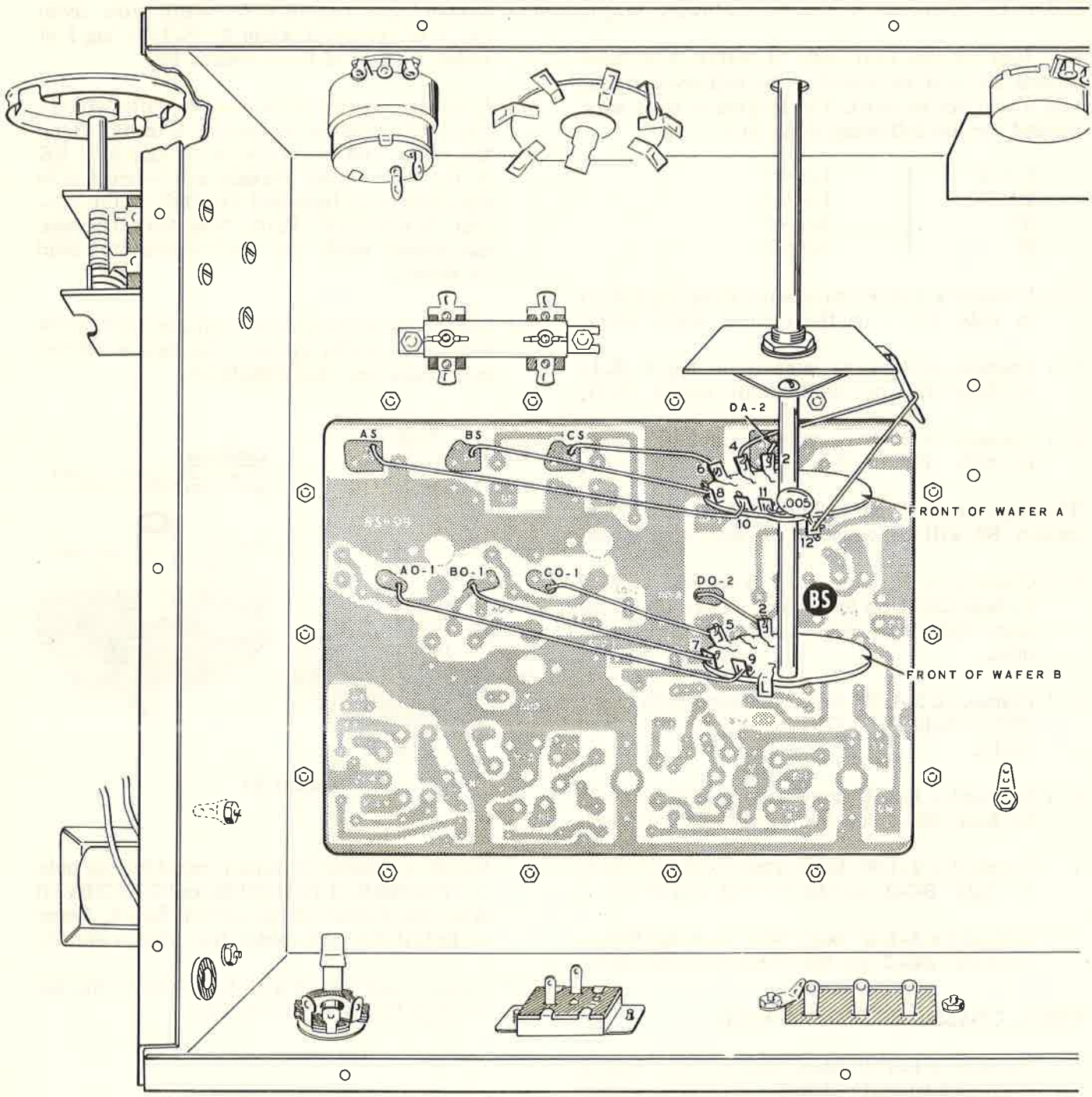
(✓) Connect a 2-1/2" bare wire from lug 5 (S-1) to hole CO-1 on the circuit board (S-1).

(✓) Connect a 3-1/2" bare wire from lug 7 (S-1) to hole BO-1 on the circuit board (S-1).

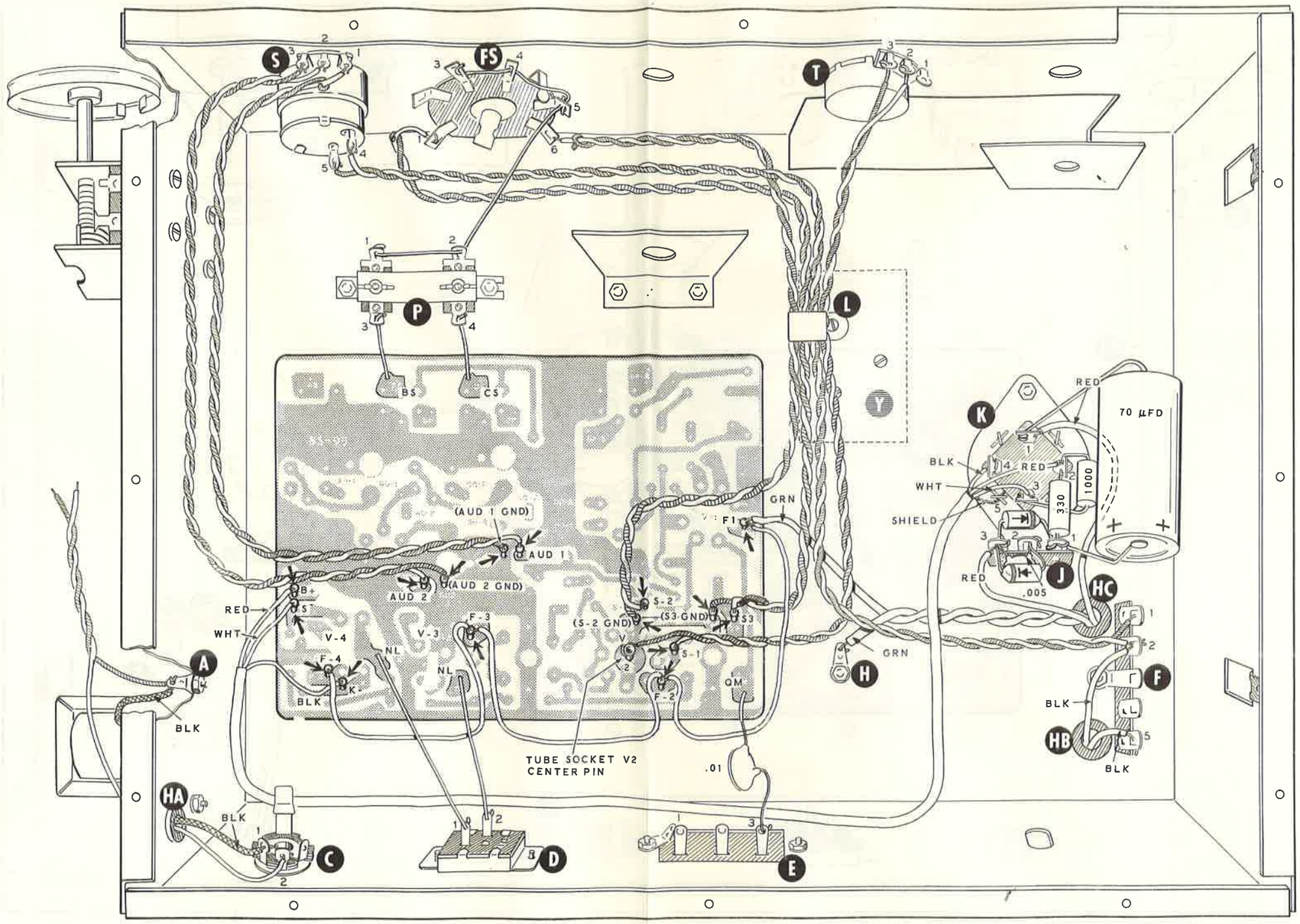
(✓) Connect a 4-1/2" bare wire from lug 9 (S-1) to hole AO-1 on the circuit board (S-1).



Detail 7A


DA-2
AS
BS
CS
AO-1
BO-1
CO-1
DO-2
.005
FRONT OF WAFER A
FRONT OF WAFER B

PICTORIAL 7



PICTORIAL 6

—P6

Refer to Pictorial 8 for the following steps.

The lugs on the rear side of wafer A of Band switch BS will be wired in the following steps. Lug 9 will not be used. The lengths of bare wire needed for the following steps are:

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

( ) Connect a 1-3/8" bare wire from lug 3 (S-1) to hole DA-3 on the circuit board (S-1).

( ) Connect a 2" bare wire from lug 5 (S-1) to hole CP on the circuit board (S-1).

( ) Connect a 3" bare wire from lug 7 (S-1) to hole BP on the circuit board (S-1).

The lugs on the rear side of wafer B of Band switch BS will be wired in the following steps.

( ) Connect a 2" bare wire from lug 1 (S-1) to hole DO-1 on the circuit board (S-1). Be sure this lead does not touch the switch stud.

( ) Connect a 1-1/2" bare wire from both lugs 3 (NS) to hole DO-1 GND on the circuit board (S-1).

( ) Connect a 1-3/4" bare wire from lug 4 (S-1) to hole CO-2 on the circuit board (S-1).

( ) Connect a 2-1/4" bare wire from lug 6 (S-1) to hole BO-2 on the circuit board (S-1).

( ) Connect a 3-1/2" bare wire from lug 8 (S-1) to hole AO-2 on the circuit board (S-1).

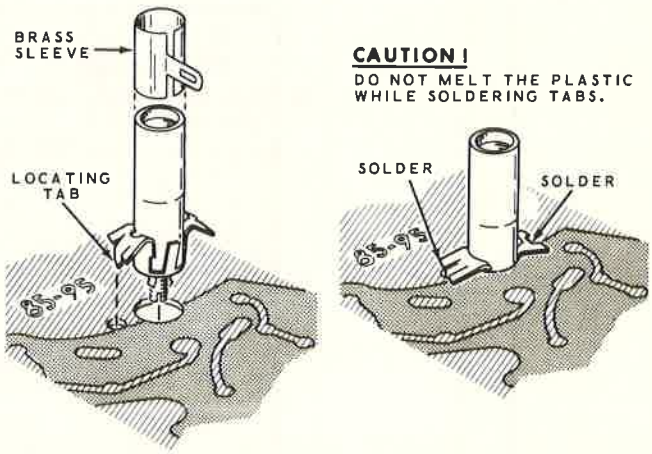
FINAL CHASSIS BOTTOM WIRING

( ) Connect a 1-3/4" bare wire between lugs 3 (S-2) and 10 (S-1) of wafer B of Band switch BS. Be sure to solder both lugs at each location.

( ) Connect one end of a 5" white wire from lug 2 of terminal strip E (S-1) to lug 1 of wafer A (S-1) of Band switch BS.

( ) Connect one end of an 8-5/8" white wire to lug 1 of variable capacitor R (S-1). Place the other end of this wire through hole HE in the side of the chassis and connect it to the bottom of terminal pin OSC on the circuit board (NS). Route this wire between the switch shaft and the lower switch stud as shown.

( ) Locate the three plastic trimmer capacitors and temporarily remove the brass sleeve from each one. See Detail 8A.

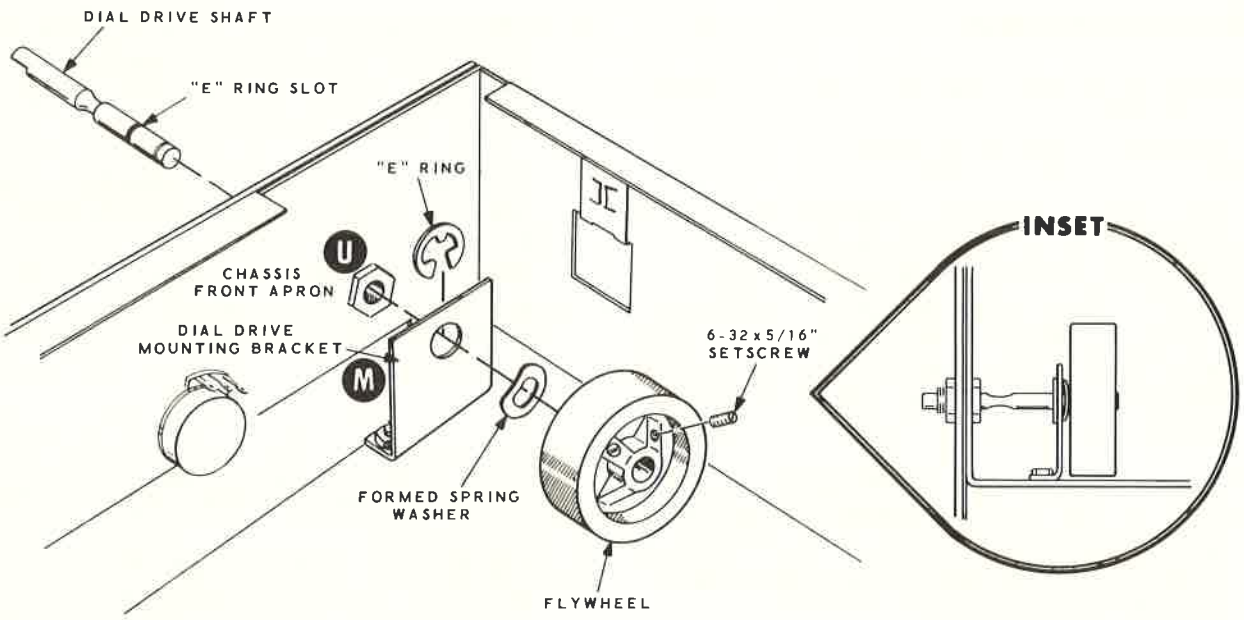


Detail 8A

( ) Insert a plastic trimmer capacitor in hole A TRIMMER, B TRIMMER, and C TRIMMER from the bottom of the circuit board. Refer to Detail 8A and solder the tabs as shown.

( ) Connect one end of a 1" bare wire to the lug on each brass sleeve (S-1).

NOTE: In the following steps, be sure to place the brass sleeves all the way on the trimmers.



Detail 8B

( ) Slip a brass sleeve over A TRIMMER and connect the wire to hole AA on the circuit board (S-1).

( ) Slip a brass sleeve over B TRIMMER and connect the wire to hole BB on the circuit board (S-1).

( ) Slip a brass sleeve over C TRIMMER and connect the wire to hole CC on the circuit board (S-1).

( ) Start two 6-32 x 5/16" setscrews in the flywheel. Place the dial drive shaft through hole U in the front panel and install an E ring on the shaft as shown in Detail 8B. Place the end of the dial drive shaft through the hole in bracket M until the E ring touches the bracket.

( ) Place a spring washer and the flywheel on the end of the shaft extending from the bracket. Push the flywheel against the bracket until the formed spring washer is slightly compressed. Tighten the setscrews in the flywheel.

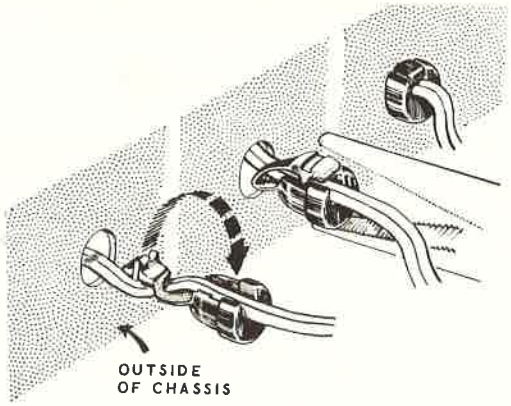
( ) Locate the line cord and melt a small amount of solder on the exposed wire ends. This will hold the small wire strands together.

( ) Place this end of the line cord through hole HD in the rear apron of the chassis and connect either line cord wire to lug 1 (S-2) and the other wire to lug 5 (S-2) of terminal strip F.

( ) Referring to Detail 8C, install the line cord strain relief in hole HD.

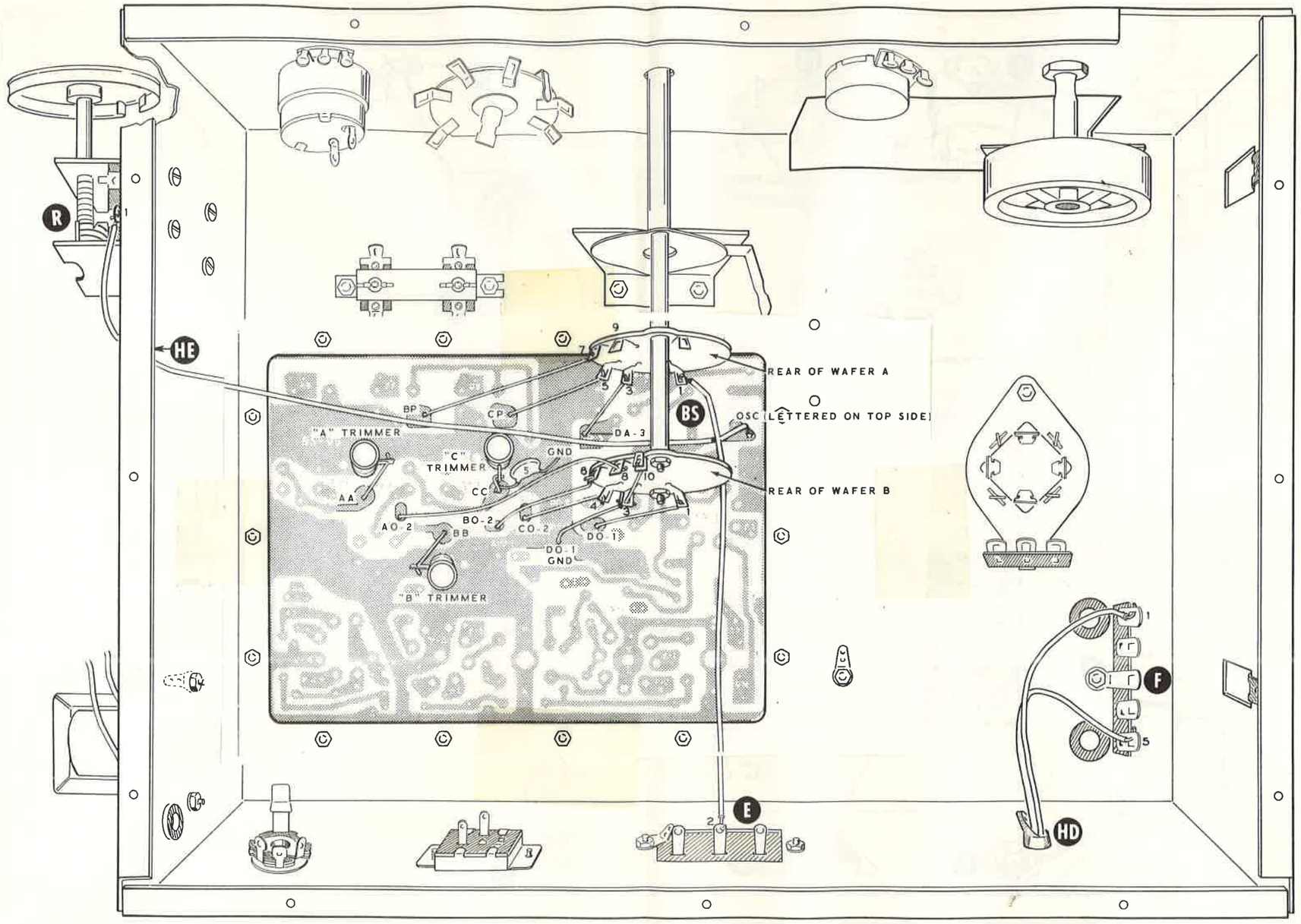
( ) Check the top of the circuit board for protruding wire ends. Cut off these wire ends flush with the top surface of the circuit board.

This completes the wiring on the bottom of the chassis. Some terminal pins are still not soldered. These will be used later.



Detail 8C

( ) Connect a 5 $\mu\mu$f disc capacitor from the foil near hole CC (S-1) to the GND foil (S-1) as shown in Pictorial 8.


R
HE
BS
F
E
HD
REAR OF WAFER A
REAR OF WAFER B
"A" TRIMMER
"B" TRIMMER
"C" TRIMMER
BP
CP
DA-3
GND
CC
AA
AO-2
BO-2
BB
CO-2
DO-1
DO-1
GND

PICTORIAL 8

DIAL CORD STRINGING

Refer to Pictorial 9 for the following steps.

( ) Position the chassis as shown.

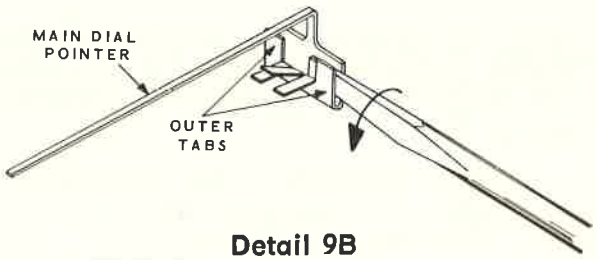
( ) Loosen the setscrew in the dial pulley on tuning capacitor Y. Turn the shaft of tuning capacitor Y until the capacitor plates are fully meshed. Set the dial pulley so that the opening in the rim is at the 10 o'clock position. Tighten the setscrew. The dial pulley should be even with the end of the tuning capacitor shaft.

( ) Locate the dial cord (#100-M356) and dial cord spring. Attach the dial cord spring to one end of the dial cord. At the other end of the dial cord spring form a small hook. Refer to Detail 9A.

Detail 9A

( ) Referring to Pictorial 9, string the dial cord starting at 1.

( ) Locate the main dial pointer (larger) and slightly spread the two outer tabs as shown in Detail 9B.



Detail 9B

( ) Place the main dial pointer on the dial back plate with the pointer between the plastic and back plate and slide the dial pointer onto the lip of the dial back plate.

( ) With the Main Tuning capacitor fully meshed, position the dial pointer directly behind the C of KC on band A at the left end of the dial. Crimp the tabs of the dial pointer on the dial cord. Do not use too much pressure or the tabs may cut the cord. See Detail 9C.

( ) Locate the length of dial cord and tie a loop in one end. See Detail 9D.

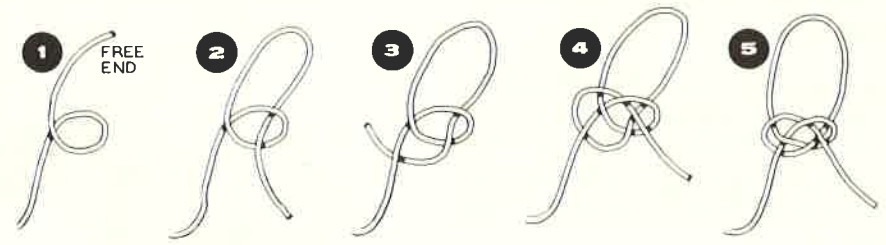
( ) Measure the dial cord and tie a dial cord spring to the other end of the dial cord, 11-3/4" from the loop. Cut off any excess cord.

( ) Referring to Pictorial 9 string the Bandspread dial cord starting at 1 with the capacitor plates fully meshed.

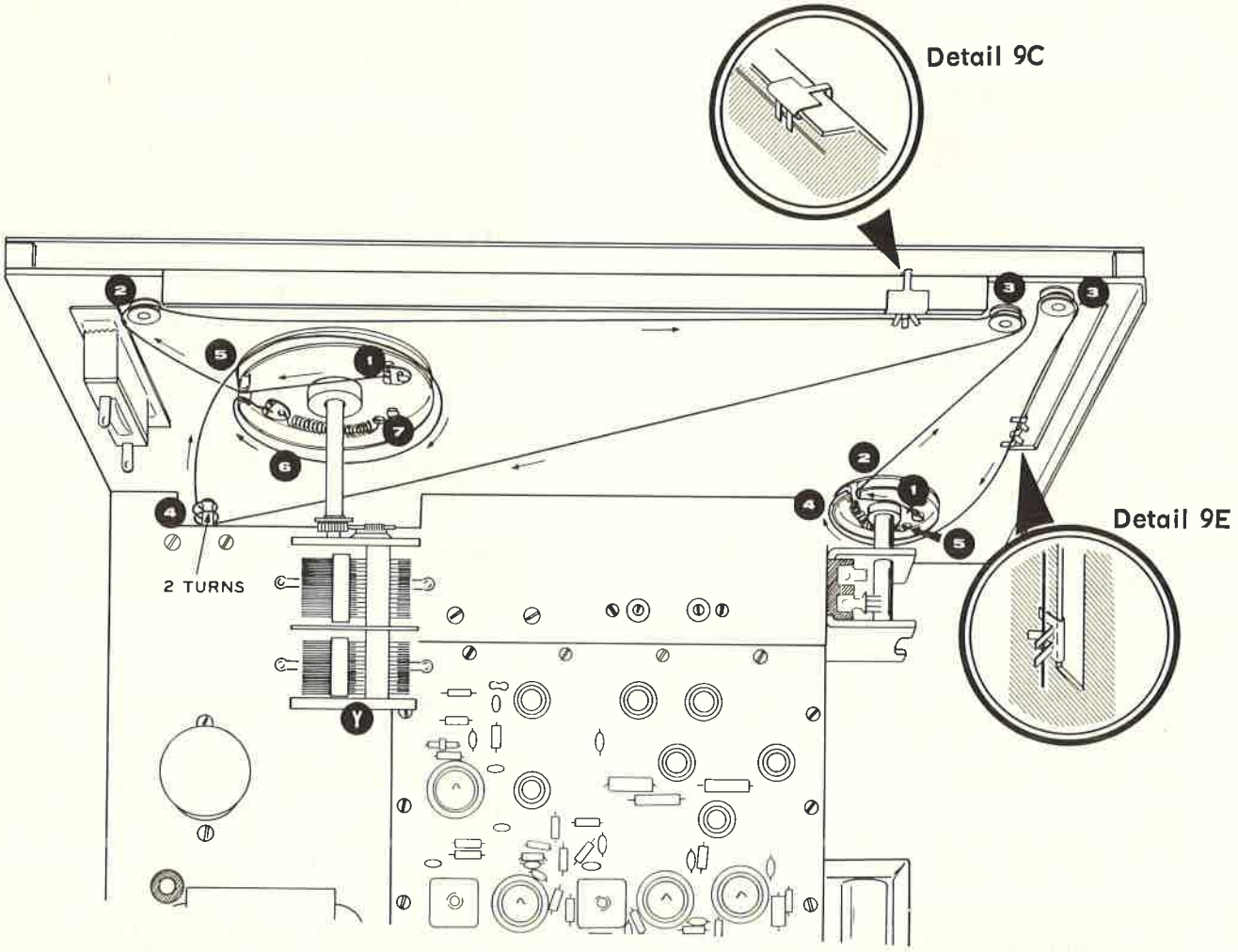
( ) Locate the Bandspread dial pointer and spread the tabs.

( ) Slide the dial pointer on the dial backplate. Place the dial cord between the tabs on the dial pointer. See Detail 9E.

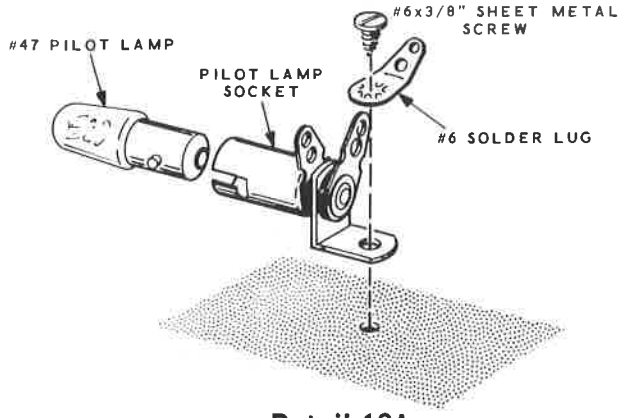
( ) With the Bandspread capacitor plates fully open, position the dial pointer directly behind the 10 on the dial window. Crimp the dial pointer tabs on the dial cord.



Detail 9D



PICTORIAL 9



Detail 10A

CHASSIS TOP WIRING

Refer to Pictorial 10 for the following steps.

( ) Install #47 pilot lamps in the two pilot lamp sockets.

( ) Referring to Detail 10A, mount a pilot lamp socket at Z with a #6 x 3/8" screw and #6 solder lug. Position the solder lug so that it touches lug 2 of socket Z (S-1). Be sure the screw does not short any wires on the bottom of the chassis.

( ) Mount a pilot lamp socket at X with a #6 x 3/8" sheet metal screw.

( ) Connect an 8-1/2" white wire from lug 1 of pilot lamp socket Z (S-1) to lug 2 of pilot lamp socket X (S-1).

( ) Connect a 5-3/4" white wire from lug 1 of pilot lamp socket X (S-1) to the bottom of terminal pin F1 on the circuit board (S-1). This pin protrudes up from the bottom of the board.

( ) At either end of a 12" twisted pair, connect the white wire to lug 2 (S-1) and the black wire to lug 1 (S-1) of meter W. Route this wire as shown.

( ) At the other end of this twisted pair, connect the white wire to terminal pin M2 (S-1). and the black wire to terminal pin M1 (S-1) on the circuit board. Be sure the pins are soldered to the foil of the circuit board.

( ) Connect a 1" bare wire from lug 1 of Main Tuning capacitor Y (S-1) to terminal pin ANT on the circuit board (S-1). Be sure to solder the terminal pin to the foil.

( ) Connect a 1" bare wire from lug 2 of Main Tuning capacitor Y (S-1) to terminal pin OSC on the circuit board (S-1). Be sure to solder the terminal pin to the foil.

( ) Connect the free end of the blue output transformer lead to hole BLU in the circuit board (S-1).

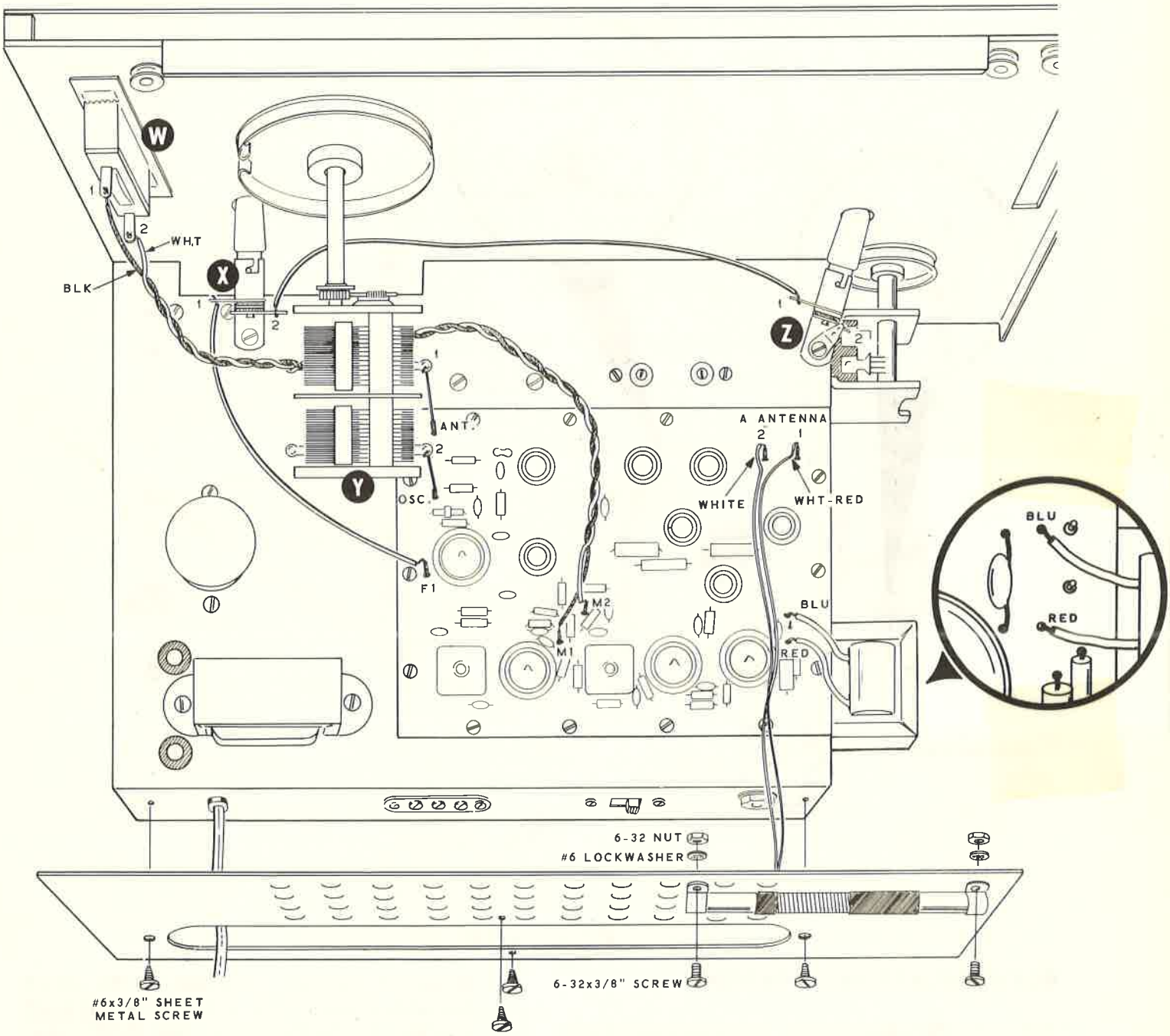
( ) Connect the free end of the red output transformer lead to hole RED in the circuit board (S-1).

( ) Install the Band A Antenna rod on the outside of the back panel with two 3/8" plastic cable clamps. Use 6-32 x 3/8" hardware. Position the antenna rod so that the winding with the white-red lead is to your right. Pass the two antenna leads through a hole in the back panel.

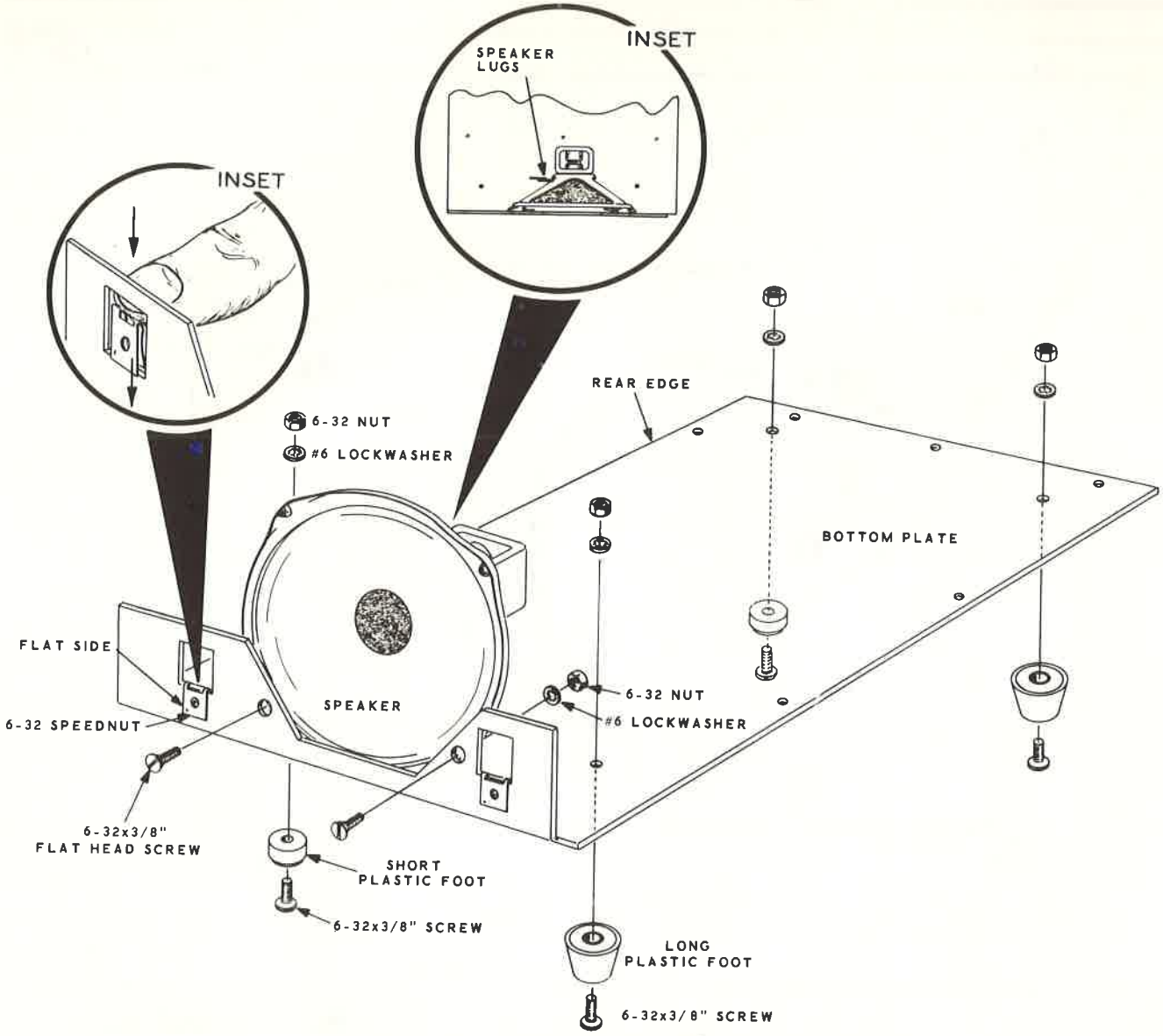
( ) Secure the back panel to the rear apron of the chassis with four #6 x 3/8" sheet metal screws.

The Band A antenna rod leads will be connected in the following step.

( ) Connect the white-red lead to terminal pin A ANTENNA 1 (S-1) and the white lead to A ANTENNA 2 (S-1) on the circuit board. Be sure to solder the terminal pins to the foil.



PICTORIAL 10



PICTORIAL 11

BOTTOM PLATE PREPARATION

Refer to Pictorial 11 for the following steps.

(✓) Install two 6-32 speednuts on the flange at the end of the bottom plate. Place the flat side outward as shown.

(✓) Install a long plastic foot in the two front corners of the bottom plate as shown. Use 6-32 x 3/8" hardware.

(✓) Install a short plastic foot on the two rear corners of the bottom plate as shown. Use 6-32 x 3/8" hardware.

(✓) Mount the speaker on the flange at the end of the bottom plate. Use 6-32 x 3/8" flat head screws, #6 lockwashers, and 6-32 nuts. Position the speaker lugs toward the rear edge of the bottom plate.

This completes the wiring of your GR-64 Shortwave Receiver. (The speaker will be wired later.) Carefully inspect the bottom of the Receiver to make sure all the connections are soldered and that none of the foils on the circuit board are shorted together with excess solder or wire clippings.

RESISTANCE MEASUREMENTS AND INITIAL TEST

RESISTANCE MEASUREMENTS

Refer to Pictorial 6 (fold-out from Page 25) for the following steps.

If an ohmmeter is available, it would be well to make the following resistance checks before turning on the Receiver for the first time.

If any of the following resistance measurements are not correct, refer to the In Case Of Difficulty section of the manual.

( ) Measure the resistance from lug 1 and from lug 5 of terminal strip F to the chassis. Both of these measurements should be at least 15 megohms.

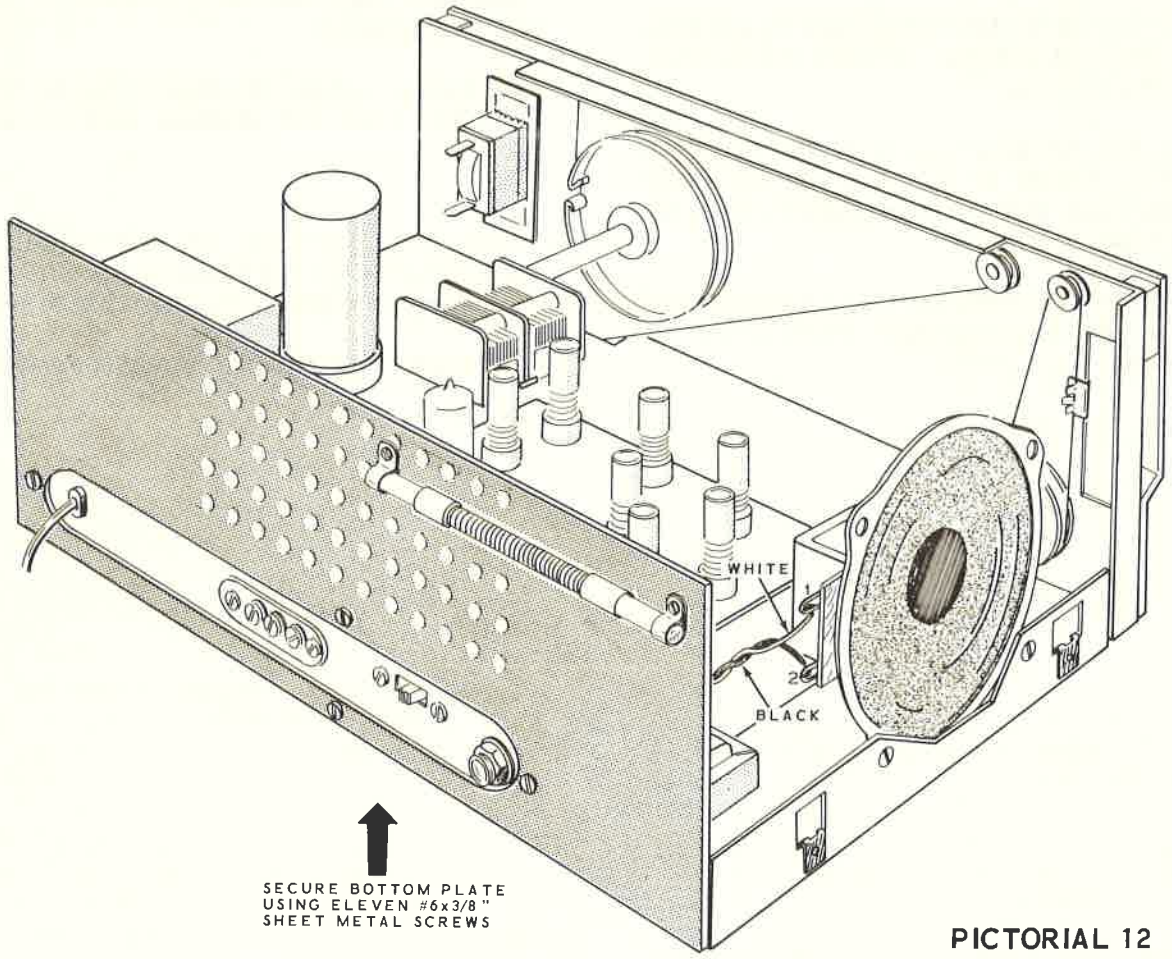
( ) Measure the resistance between lugs 1 and 5 of terminal strip F. This resistance should be approximately 8 Ω with the VOLUME control switch ON.

( ) Measure the resistance between lug 3 of electrolytic capacitor K and the chassis. This measurement should be over 25 KΩ.

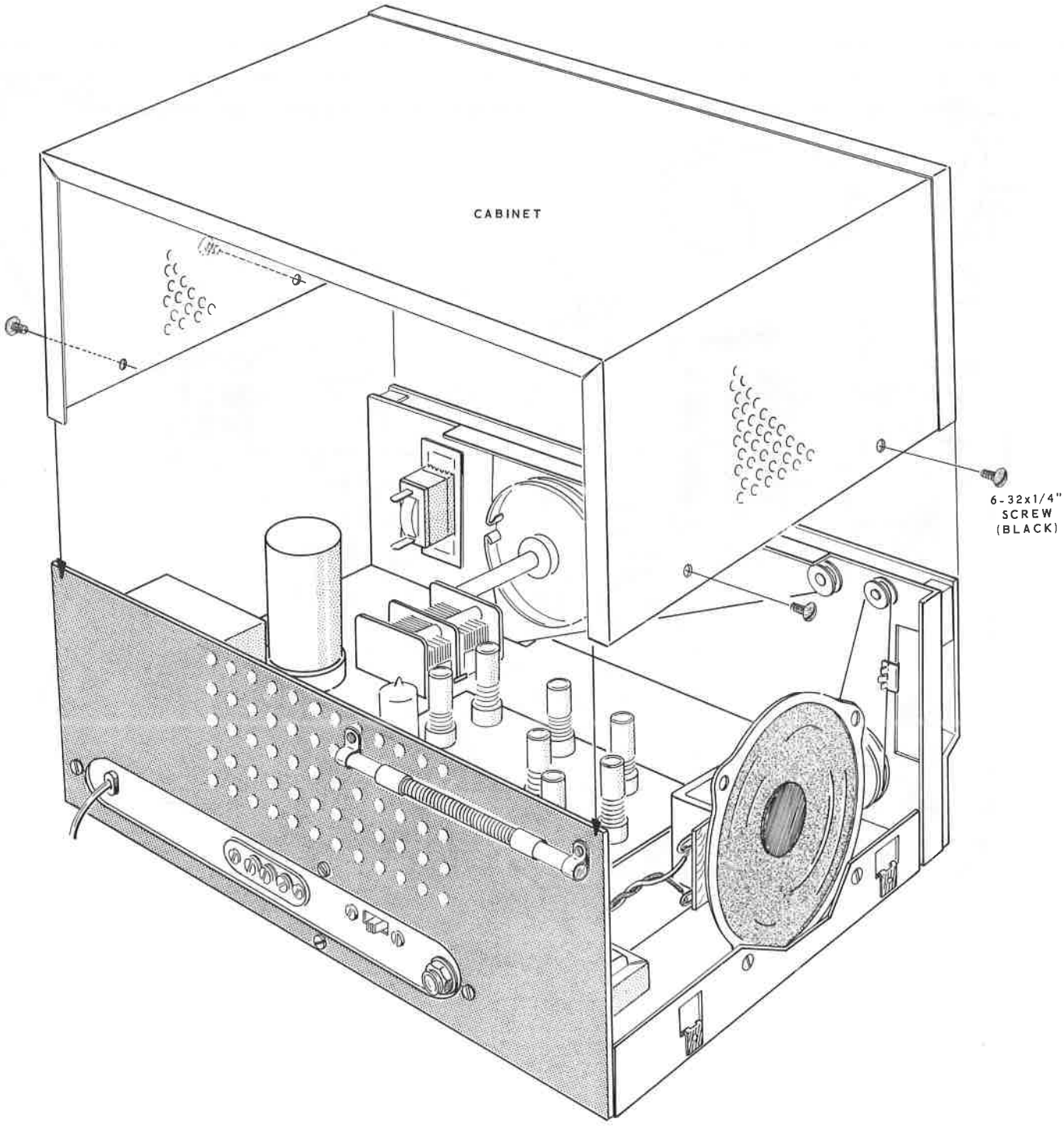
Refer to Pictorial 12 for the following steps.

(✓) Install the bottom panel on the chassis, using eleven #6 x 3/8" sheet metal screws.

(✓) Connect the white wire of the twisted pair extending from the chassis to lug 1 (S-1) and the black wire to lug 2 (S-1) of the speaker.



PICTORIAL 12



PICTORIAL 13

( ) Insert all tubes in their proper sockets on the circuit board. The tube type number appears near each tube socket on the circuit board.

( ) Turn all the front panel control shafts fully counterclockwise.

( ) Install the two large knobs, one on the MAIN TUNING capacitor shaft and the other knob on the BANDSPREAD capacitor shaft.

( ) Install the four small knobs on the shafts. Position the pointers to the counterclockwise front panel marking for each shaft.

INITIAL TEST

( ) Plug the line cord plug into an electrical outlet, 105-125 volts, 50/60 cps AC only.

NOTE: If any of the following tests do not produce the desired results refer to the In Case Of Difficulty section.

( ) Turn the Receiver on with the VOLUME control. Check to see that the two pilot lamps light and the tube filaments in the four tubes glow.

( ) Turn the VOLUME control clockwise and listen for a background noise from the speaker.

( ) Set the BAND switch to BAND A.

( ) Place your finger on or connect a short length of wire to the ANT terminal on the rear of the Receiver.

( ) Some broadcast stations should be heard by tuning across the dial.

( ) Similarly, switch the BAND switch through the remaining three bands, checking for any stations that you may pick up.

( ) Turn the Function switch to the STBY position. The pilot lamps and filaments should still be on but no stations or background noise should be heard from the speaker.

( ) Turn the Function switch to the CW position and turn the BFO control to its 12 o'clock position.

( ) By tuning across the higher bands (B, C, and D), some CW stations may be heard.

( ) Turn the Receiver off and install tube shields over V2 and V3. Make sure the shield slips over the shield clip on each tube socket.

( ) Disconnect the antenna wire if one was used.

ALIGNMENT

Before attempting alignment, operate the Receiver for a minimum of 15 minutes to allow the tubes and components to stabilize. For best results, alignment should be done with test instruments. However, if the following instruments are not available, refer to Alignment Without Instruments on Page 37. A plastic alignment tool is provided to align the coils.

The following test instruments will be needed for the following steps.

Signal Generator
VTVM

ALIGNMENT WITH INSTRUMENTS

Refer to Figure 3 (fold-out from Page 37) for the following steps.

( ) Preset the adjusting screws in the A, B, and C TRIMMERS as shown in Figure 3.

( ) Preset the B and C antenna trimmers, located on the chassis, by turning the screws clockwise until they are snug. Then turn the B and C antenna trimmer screws counterclockwise 1-2/3 turns.

( ) Remove the screw from the oscillator trimmer located on the MAIN TUNING capacitor. Carefully bend the brass strap out 90 degrees from the capacitor, as shown.

( ) Set the front panel controls as follows:

BANDSPREAD - 10.
VOLUME - 12 o'clock.
(Adjust as necessary during alignment)
Function - AM.
BAND - B.
BFO - OFF.
MAIN TUNING - 1.5 MC.
ANL (on rear apron) - OFF.

( ) Connect the common VTVM lead to the chassis and the DC test lead to the AVC terminal pin on the topside of the circuit board. Set the VTVM to read -DC volts on the 15 volt scale.

( ) Connect the common lead of the signal generator to the chassis and the signal lead to the ANT terminal on the rear of the chassis. Set the signal generator for a 455 kc unmodulated signal.

( ) Adjust the generator output until an increase in the voltage reading is indicated on the VTVM. Set the generator output to the lowest level that still provides a usable voltage reading on the lowest VTVM range.

( ) During alignment, reduce the signal generator output as the VTVM readings become higher. Always use the lowest signal generator output possible and still have a readable voltage on the lowest VTVM range.

Proceed with alignment, using the Alignment Chart.

ALIGNMENT CHART

	TUNE SIGNAL GENERATOR TO:	SET BAND SWITCH TO:	SET RECEIVER DIAL TO:	ADJUST FOR MAXIMUM VTVM READING:
1.	455 kc	B	1.5 mc	IF-1 top and bottom.
2.	455 kc	B	1.5 mc	IF-2 top and bottom.
3.	Repeat steps 1 and 2.			
	NOTE: It may be necessary to use a high signal output from the generator for steps 4 - 6.			
4.	550 kc	A	550 kc	A OSC coil.
5.	1.5 mc	A	1.5 mc	A TRIMMER and the Antenna trimmer on the MAIN TUNING capacitor.
6.	550 kc	A	1.5 mc	A OSC coil.
7.	Repeat steps 4 through 6 until no improvement is noticed.			
8.	10 mc	D	10 mc	D OSC and D ANTENNA coils. NOTE: It should not be necessary to turn this coil more than 1/2 turn in either direction.
9.	Tune the Receiver to 9.090 mc and check for the image frequency. If the image frequency does not appear at this point, repeat steps 5 through 9, being careful to align to the correct frequency. The image frequency is 910 kc below the signal frequency on Bands A, B, and C.			
10.	4 mc	C	4 mc	C OSC and C ANTENNA coils.
11.	10 mc	C	10 mc	C BAND trimmer and Ant trimmer on chassis.
12.	4 mc	C	4 mc	C OSC and C ANTENNA coils.
13.	Repeat steps 10 through 12 until no further improvement is noticed.			
14.	1.5 mc	B	1.5 mc	B OSC and B ANTENNA coils.
15.	4 mc	B	4 mc	B BAND trimmer and Ant trimmer on chassis.
16.	1.5 mc	B	1.5 mc	B OSC and B ANTENNA coils.
17.	Repeat steps 14 through 16 until no further improvement is noticed.			

This completes the alignment with instruments.
Proceed to Cabinet Installation.

ALIGNMENT WITHOUT INSTRUMENTS

Refer to Figure 3 for the following steps.

(✓) Preset the adjusting screws in the A, B, and C TRIMMERS as shown in Figure 3.

(✓) Preset the B and C Antenna trimmers located on the chassis by turning the screws clockwise until they are snug. Then turn the B and C Antenna trimmer screws counter-clockwise 1-2/3 turns.

(✓) Remove the screw from the oscillator trimmer located on the MAIN TUNING capacitor. Carefully bend the brass strap out 90 degrees from the capacitor, as shown. Discard the mica insulator and screw as they are not needed.

( ) Set the front panel controls as follows:

BANDSPREAD - 10
VOLUME - 12 o'clock (adjust as necessary during alignment).
Function - AM.
BAND - A.
BFO - OFF.
MAIN TUNING - Radio station of known frequency near 550 kc.
ANL (on rear apron) - OFF.

( ) With a radio station of known frequency near 550 kc tuned in, adjust A OSC coil and retune the Receiver until the station is received when the dial pointer indicates the frequency of the radio station.

( ) With a radio station near 550 kc tuned in, adjust the top and bottom slugs of IF-1 and IF-2 transformers for a maximum meter reading.

The coils for the other bands are preset at the factory and should not be readjusted without test instruments. The preset coil settings will provide adequate reception.

F3 —

CABINET INSTALLATION

( ) Refer to Pictorial 13 and install the cabinet over the Receiver chassis. Secure the cabinet with two 6-32 x 1/4" black screws on each side with the back panel inside the cabinet.

NOTE: The blue and white identification label shows the Model Number and Production Series Number of your kit. Refer to these numbers in any communications with the Heath Company; this assures you that you will receive the most complete and up-to-date information in return.

( ) Install the identification label in the following manner:

1. Select a location for the label where it can easily be seen when needed, but will not show when the unit is in operation. This location might be on the rear panel or the top of the chassis, or on the rear or bottom of the cabinet.

2. Carefully peel away the backing paper. Then press the label into position.

OPERATION

Before attempting to use the Receiver, carefully read the explanation of each control and learn its function.

CONTROLS

VOLUME - Turns the Receiver on or off and varies the loudness of the sound from the speaker or headphone.

BFO - Turn the BFO on or off and varies the tone of the CW signal when the FUNCTION switch is in the CW position. This control is also useful when tuning weak AM stations.

FUNCTION - Selects AM, STBY, or CW modes of reception. In the AM position the AVC voltage is on; in the CW position the AVC voltage is off. In the STBY position the Receiver is kept warmed up and ready for instant use but it is kept muted.

BAND - Selects one of four bands: A, B, C, or D.

MAIN TUNING - Provides a means of tuning the Receiver, to the desired station.

BANDSPREAD - Provides a fine tuning to the MAIN TUNING capacitor to help separate the incoming signals from each other when they are near the same frequency. This capacitor is normally left in the SET position as it affects the main dial calibration.

AM OPERATION

The BFO control should be in the OFF position. Turn the Function switch to AM and advance the VOLUME control for sufficient volume. Set the BAND switch to the desired band and tune in a station with the MAIN TUNING control.

Turn the BANDSPREAD control until the desired station is centered (that is, for the clearest reception).

When listening to weak stations, turn the BFO ON and slowly adjust this control for the loudest and clearest reception.

CW-SSB OPERATION

Turn the BFO control 3/4 turn clockwise. Turn the Function switch to CW and set the BAND switch to one of the shortwave bands, B, C, or D.

With the MAIN TUNING control, tune in a CW station. Adjust the BFO control as follows: Turn the control fully clockwise and then slowly counterclockwise until the clearest tone is produced. The frequency of this tone may be varied either with the MAIN TUNING or the BANDSPREAD capacitor. Some experimentation will be necessary to find the best position for the BFO control.

When tuning SSB (single side band) signals, tune to the SSB station and then alternate between the BANDSPREAD and BFO controls for the clearest reception.

ANTENNA INSTALLATION

The Receiver must have an antenna for proper shortwave reception. The built-in antenna is for broadcast reception only.

For general broadcast and shortwave listening, a long-wire outside antenna is suggested. A typical long-wire antenna installation is shown in Figure 4. The length of the antenna wire may be from 50 to 100 feet long. The lead-in wire should be attached and soldered to one end of the antenna. The other end of the lead-in wire is connected to the ANT terminal on the rear of the Receiver.

Generally, the higher the antenna the better the reception. A tree or pole may be used as one support and your house as the other support. Insulators must be used at each end of the antenna to separate the antenna wire from the support wire.

The GND terminal on the rear of the Receiver should be grounded to a water pipe or to a 6 or 8 foot long ground rod driven into the earth.

A dipole antenna may be used for optimum reception on the shortwave band. This type of antenna is directional and is designed to receive a narrow band of the shortwave frequencies. It

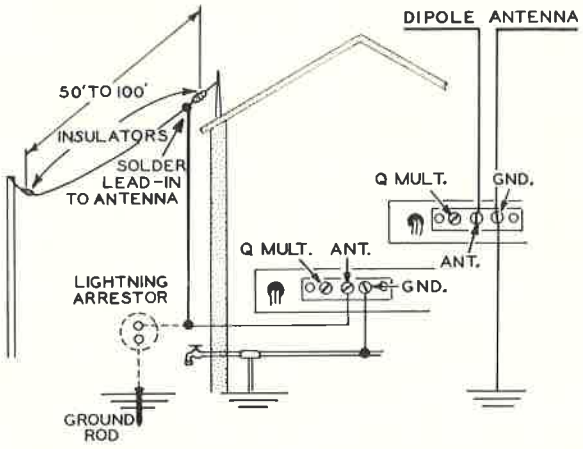


Figure 4

is suggested you check an ARRL Handbook or an Antenna Handbook for the proper dipole antenna length needed for the shortwave frequencies you intend to listen to.

To connect a dipole antenna to the Receiver, connect the two lead-in wires from the dipole antenna between terminals ANT and GND on the rear of the Receiver. See Figure 4.

RECEPTION GUIDE

BAND	FREQUENCY	TIME	ZONE
80 M	3.5 mc	Morning	Local (Amateur)
49 M	6 mc	Evening	Latin America and Europe
41 M	7 mc	Evening	Europe
40 M	7 mc	Late afternoon, Evening	Europe
40 M	7 mc	Morning	United States (Amateur)
31 M	9 mc	Morning	Asia and Australia
31 M	9 mc	Afternoon	Europe and Africa
31 M	9 mc	Evening	Europe and Latin America
25 M	11 mc	Morning	Asia and Australia
25 M	11 mc	Evening	Latin America
20 M	14 mc	Late morning, Afternoon	United States, Foreign, (Amateur)
19 M	15 mc	Late morning, Afternoon	Europe and North America
19 M	15 mc	Evening	North and Latin America
16 M	17 mc	Afternoon	Europe
	17 mc	All day	United States
	17 mc	Evening	South America
13 M	20 mc	Afternoon	Europe
	20 mc	All day	United States
	20 mc	Evening	South America
11 M	27 mc	All day	Local (Citizen's Band)
10 M	28 mc	Morning	Europe
	28 mc	All day Evening	Central America, United States (Amateur), Asia

These reception conditions prevail in the spring and fall of the year. They are also subject to varying atmospheric conditions, sun spot activities, and to some extent, weather conditions. In the winter, reception generally will be best on the lower frequency bands. In summer, reception will be better on higher frequency bands.

IN CASE OF DIFFICULTY

1. 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 consistently overlooked by the constructor.

2. It is interesting to note that about 90% of the kits that are returned for repair, do not function properly due to poor connections and soldering. Therefore, many troubles can be eliminated by reheating all connections to make sure that they are soldered as described in the Proper Soldering Techniques section of this manual.

3. Check to be sure that all tubes are in their proper locations. Make sure that all tubes light up properly.

4. Check the tubes with a tube tester or by substitution of tubes of the same types and known to be good.

5. Check the values of the parts. 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.

6. Check for bits of solder, wire ends or other foreign matter which may be lodged in the wiring.

7. If, after careful checks, the trouble is still not located and a voltmeter is available, check voltage readings against those shown on the Schematic Diagram. NOTE: All voltage readings were taken with an 11 megohm input vacuum tube voltmeter. Voltages may vary as much as 10%.

8. A review of the Circuit Description will prove helpful in indicating where to look for trouble.

SPECIFIC PROBLEMS

PROBLEM	CHECK
Filaments do not light.	1. Check filament wiring on bottom of the circuit board against Pictorial 6. 2. Open tube filament - with an ohmmeter, check for continuity between pins 3 and 4 on all four tubes. 3. Check power transformer wiring against Pictorial 6.
Filaments light, but no sound with VOLUME control turned fully clockwise.	1. Make sure the Function switch is not in STBY position. 2. Check wiring between the VOLUME control and the circuit board against Pictorial 6. CAUTION: When making the following checks, do not touch the chassis with your other hand. 3. Turn the Receiver on and place a small screwdriver on lug 7 of tube socket V4, then touch your finger to the metal portion of the screwdriver; a low pitched hum should be audible. 4. Now place the screwdriver on lug 1 of tube socket V3. Again touch your finger to the metal portion, this time the hum should be louder. If no hum is present check the circuit board components of tubes V3 and V4 and the wiring to the speaker.
Audio present - no signals can be heard.	CAUTION: When making the following tests, do not touch the chassis with your other hand. 1. Place a small screwdriver on lug 1 of tube socket V2 and with your finger, touch the metal portion of the screwdriver. A low pitched hum should be heard. If no hum is present, check the circuit board components around tube socket V2. 2. Similarly, make the screwdriver test on lug 7 of tube socket V1. The hum should be louder. If no hum is present or if the hum level does not increase, check the components on the circuit around tube socket V1. 3. With an ohmmeter, check for continuity from the ANT terminal to ground. The following resistance reading should be obtained for the BAND switch positions. Band A - 40 Ω Band B - 1 Ω Band C - 1 Ω Band D - .4 Ω

SERVICE INFORMATION

SERVICE

If, after applying the information in this manual and your best efforts, you are still unable to obtain proper performance, it is suggested that you take advantage of the technical facilities which the Heath Company makes available to its customers.

The Technical Consultation Department is maintained for your benefit. This service is available to you at no charge. Its primary purpose is to provide assistance for those who encounter difficulty in the construction, operation or maintenance of HEATHKIT equipment. It is not intended, and is not equipped to function as a general source of technical information involving kit modifications nor anything other than the normal and specified performance of HEATHKIT equipment.

Although the Technical Consultants are familiar with all details of this kit, the effectiveness of their advice will depend entirely upon the amount and the accuracy of the information furnished by you. In a sense, YOU MUST QUALIFY for GOOD technical advice by helping the consultants to help you. Please use this outline:

1. Before writing, fully investigate each of the hints and suggestions listed in this manual under In Case Of Difficulty. Possibly it will not be necessary to write.

2. When writing, clearly describe the nature of the trouble and mention all associated equipment. Specifically report operating procedures, switch positions, connections to other units, and anything else that might help to isolate the cause of trouble.

3. Report fully on the results obtained when testing the unit initially and when following the suggestions under In Case Of Difficulty. Be as specific as possible and include voltage readings if test equipment is available.

4. Identify the kit Model Number and Series Number, and date of purchase, if available. Also mention the date of the kit assembly manual. (Date at bottom of Page 1.)

5. Print or type your name and address, preferably in two places on the letter.

With the preceding information, the consultant will know exactly what kit you have, what you would like it to do for you and the difficulty you wish to correct. The date of purchase tells him whether or not engineering changes have been made since it was shipped to you. He will know what you have done in an effort to locate the cause of trouble and, thereby, avoid repetitious suggestions. In short, he will devote full time to the problem at hand, and through his familiarity with the kit, plus your accurate report, he will be able to give you a complete and helpful answer. If replacement parts are required, they will be shipped to you, subject to the terms of the Warranty.

The Factory Service facilities are also available to you, in case you are not familiar enough with electronics to provide our consultants with sufficient information on which to base a diagnosis of your difficulty, or in the event that you prefer to have the difficulty corrected in this manner. You may return the completed equipment to the Heath Company for inspection and necessary repairs and adjustments. You will be charged a minimal service fee, plus the price of any additional parts or material required. However, if the completed kit is returned within the Warranty period, parts charges will be governed by the terms of the Warranty. State the date of purchase, if possible.

Local Service by Authorized HEATHKIT Service Centers is also available in some areas and often will be your fastest, most efficient method of obtaining service. HEATHKIT Service Centers will honor the regular 90 day HEATHKIT Parts Warranty on all kits, whether purchased through a dealer or directly from the Heath Company; however, it will be necessary that you verify the purchase date of your kit.

Under the conditions specified in the Warranty, replacement parts are supplied without charge; however, if the Service Center assists you in locating a defective part (or parts) in your kit, or installs a replacement part for you, you may be charged for this service.

HEATHKIT equipment purchased locally and returned to Heath Company for service must be accompanied by your copy of the dated sales receipt from your authorized HEATHKIT dealer in order to be eligible for parts replacement under the terms of the Warranty.

THIS SERVICE POLICY APPLIES ONLY TO COMPLETED EQUIPMENT CONSTRUCTED IN ACCORDANCE WITH THE INSTRUCTIONS AS STATED IN THE MANUAL. Equipment that has been modified in design will not be accepted for repair. If there is evidence of acid core solder or paste fluxes, the equipment will be returned NOT repaired.

For information regarding modification of HEATHKIT equipment for special applications, it is suggested that you refer to any one or more of the many publications that are available on all phases of electronics. They can be obtained at or through your local library, as well as at most electronic equipment stores. Although the Heath Company sincerely welcomes all comments and suggestions, it would be impossible to design, test, evaluate and assume responsibility for proposed circuit changes for special purposes. Therefore, such modifications must be made at the discretion of the kit builder, using information available from sources other than the Heath Company.

REPLACEMENTS

Material supplied with HEATHKIT products has been carefully selected to meet design requirements and ordinarily will fulfill its function without difficulty. Occasionally, improper operation can be traced to a faulty component. Should inspection reveal the necessity for replacement, write to the Heath Company and supply all of the following information.

A. Thoroughly identify the part in question by using the part number and description found in the manual Parts List.

B. Identify the kit Model Number and Series Number.

C. Mention date of purchase.

D. Describe the nature of defect or reason for requesting replacement.

The Heath Company will promptly supply the necessary replacement. PLEASE DO NOT RETURN THE ORIGINAL COMPONENT UNTIL SPECIFICALLY REQUESTED TO DO SO. Do not dismantle the component in question as this will void the guarantee. This replacement policy does not cover the free replacement of parts that may have been broken or damaged through carelessness on the part of the kit builder.

SHIPPING INSTRUCTIONS

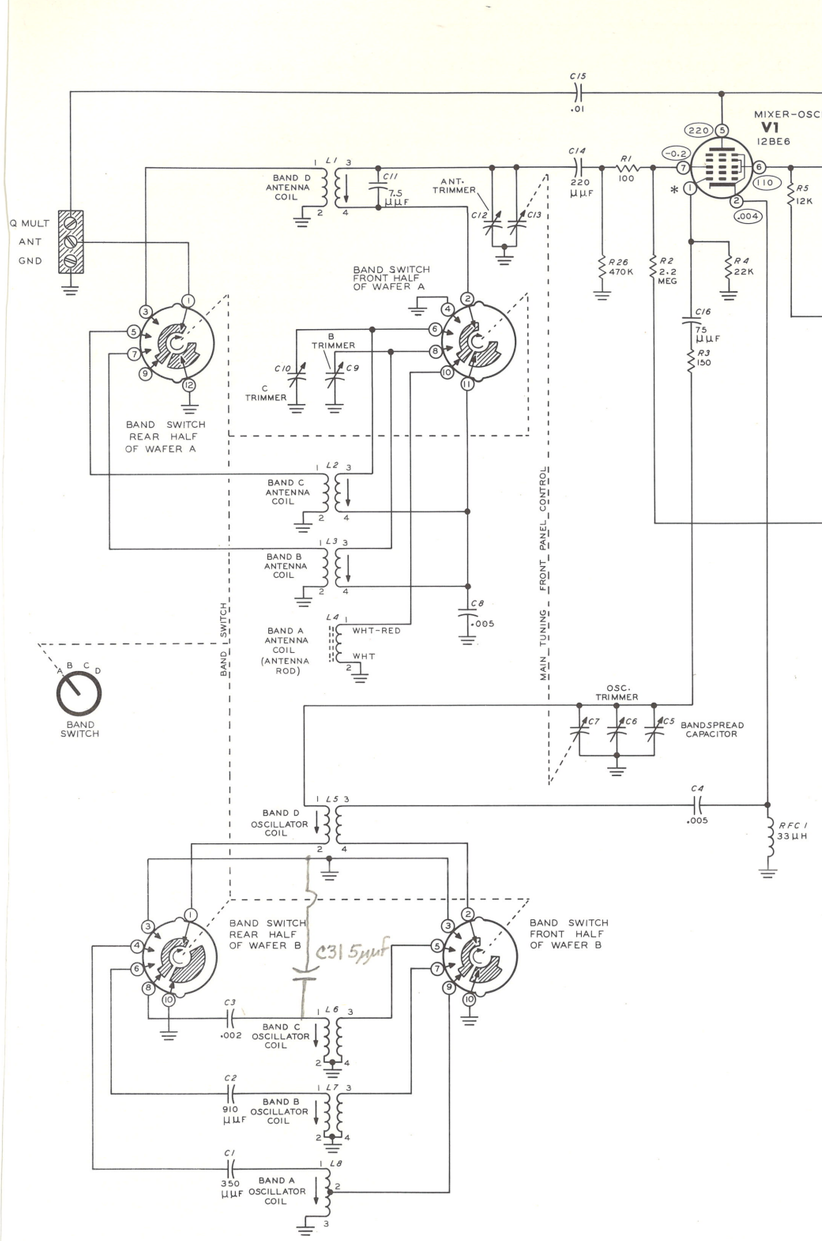
In the event that your instrument must be returned for service, these instructions should be carefully followed.

Wrap the equipment in heavy paper, exercising care to prevent damage. Place the wrapped equipment in a stout carton of such size that at least three inches of shredded paper, excelsior, or other resilient packing material can be placed between all sides of the wrapped equipment and the carton. Close and seal the carton with gummed paper tape, or alternately, tie securely with stout cord. Clearly print the address on the carton as follows:

To: HEATH COMPANY
Benton Harbor, Michigan 49023

ATTACH A LETTER TO THE OUTSIDE OF THE CARTON BEARING YOUR NAME, COMPLETE ADDRESS, DATE OF PURCHASE, AND A BRIEF DESCRIPTION OF THE DIFFICULTY ENCOUNTERED. Also, include your name and return address on the outside of the carton. Preferably affix one or more "Fragile" or "Handle With Care" labels to the carton, or otherwise so mark with a crayon of bright color. Ship by insured parcel post or prepaid express; note that a carrier cannot be held responsible for damage in transit if, in HIS OPINION, the article is inadequately packed for shipment.

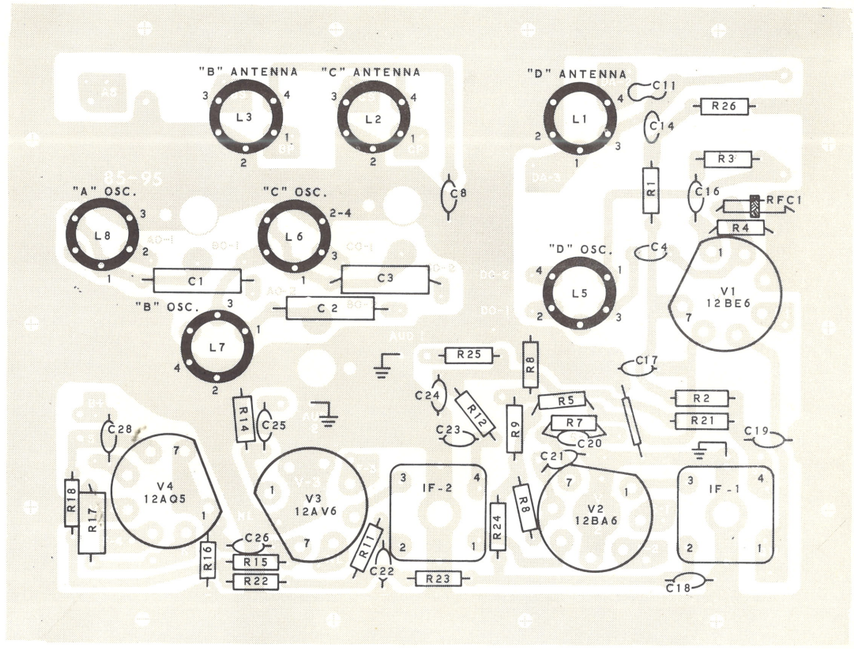
SCH —



SCHEMATIC OF THE
HEATHKIT®
SHORTWAVE RECEIVER
MODEL GR-64

NOTES:

ALL RESISTORS ARE 1/2 WATT UNLESS MARKED OTHERWISE.
ALL RESISTOR VALUES ARE IN OHMS (K = 1000, MEG = 1,000,000).
ALL CAPACITOR VALUES ARE IN μfd UNLESS OTHERWISE MARKED.
(oval) INDICATES VOLTAGE READING.
ALL VOLTAGES ARE DC POSITIVE UNLESS MARKED OTHERWISE.
ALL VOLTAGES ARE MEASURED FROM POINT INDICATED TO CHASSIS GROUND, EXCEPT AC VOLTAGES ON POWER TRANSFORMER WINDINGS.
VOLTAGE READINGS TAKEN WITH AN 11 MEGOHM INPUT VTVM.
VOLTAGES MAY VARY ±10%.
VOLTAGES MEASURED WITH THE CONTROLS SET AS FOLLOWS:
BAND SPREAD - 10 (SET)
VOLUME - 1/4 CLOCKWISE
FUNCTION SWITCH-AM
BAND - BAND A EXCEPT WHERE SHOWN
BFO - OFF
MAIN TUNING - 550
ANL - OFF
REFER TO THE X-RAY VIEW FOR THE PHYSICAL LOCATION OF PARTS ON THE CIRCUIT BOARD.
ALL SWITCHES VIEWED FROM THE FRONT, AT FULL COUNTERCLOCKWISE ROTATION.
* BAND A - -10
BAND B - -6.5
BAND C - -5.8
BAND D - -5.2



Page 43 - Locate the Band C Oscillator Coil, L6, on the fold-out schematic diagram. Draw a capacitor from lug 1 of L6 to ground. Letter this capacitor C31 5 μμf.

— SCH

W A R R A N T Y

Heath Company warrants that all Heathkit parts shall be free of all defects in materials and workmanship under normal use and service, and in fulfillment of such warranty Heath Company will, for a period of three months from the date of shipment, replace any part upon verification that it is defective.

The foregoing warranty shall apply only to the original buyer, and is and shall be in lieu of all other warranties, whether express or implied and of all other obligations or liabilities on the part of Heath Company and in no event shall Heath Company be liable for any anticipated profits, consequential damages, loss of time or other losses incurred by the buyer in connection with the purchase, assembly or operation of Heathkits or components thereof. No replacement shall be made of parts damaged by the buyer in the course of handling or assembling Heathkit equipment.

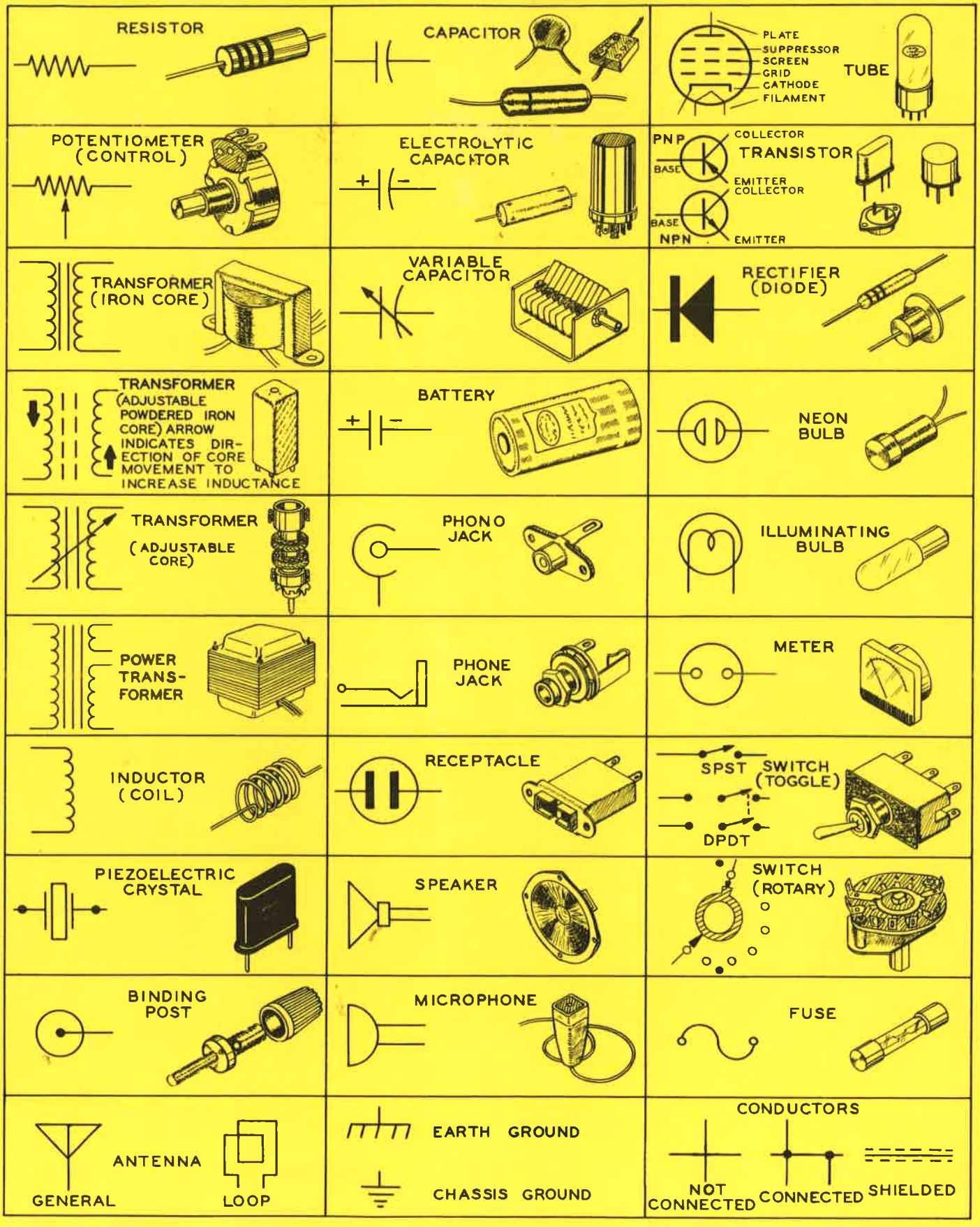
The foregoing warranty is completely void if corrosive solder or fluxes have been used in wiring the equipment. Heath Company will not replace or repair any equipment in which corrosive solder or fluxes have been used.

This warranty applies only to Heath equipment sold and shipped within the continental United States including APO and FPO shipments. Warranty replacement for Heathkit equipment outside the United States is on an f.o.b. factory basis. Contact the Heathkit authorized distributor in your country or write: Heath Company, International Division, Benton Harbor, Michigan, U.S.A.

HEATH COMPANY

TYPICAL COMPONENT TYPES

This chart is a guide to commonly used types of electronic components. The symbols and related illustrations should prove helpful in identifying most parts and reading the schematic diagrams.



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BENTON HARBOR, MICHIGAN

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