

PRICE \$2.00

HEATHKIT® ASSEMBLY MANUAL




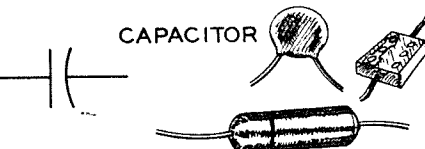
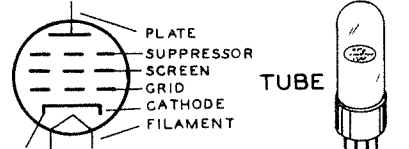
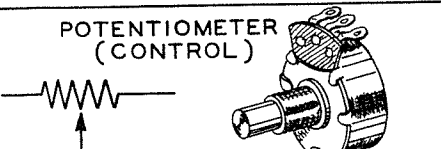
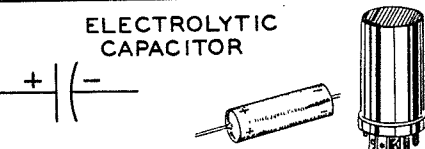


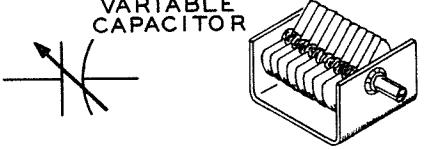
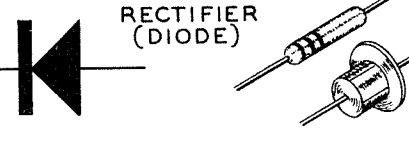
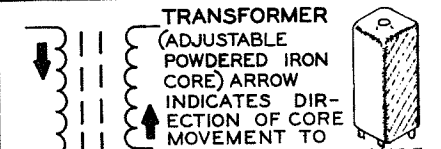
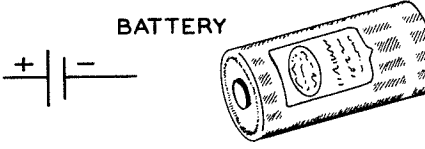
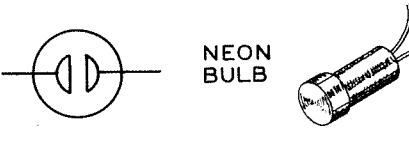
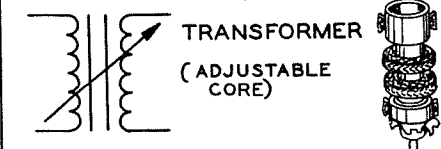
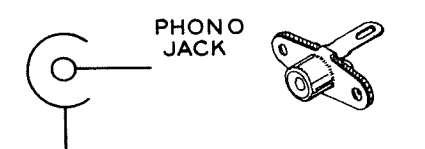
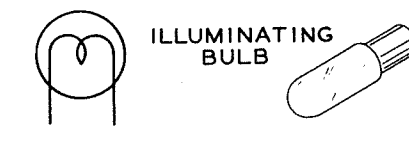
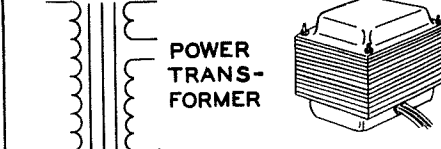

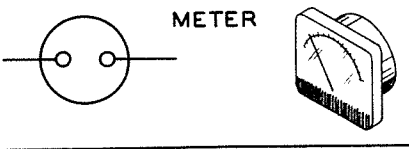

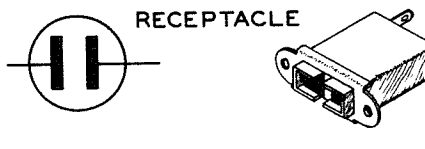
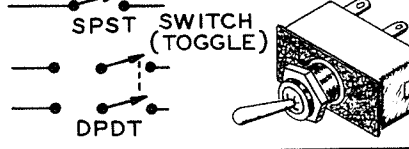
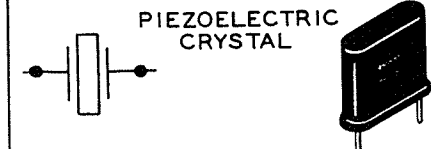

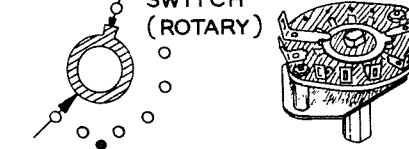
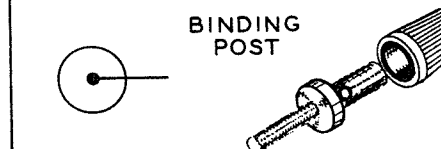

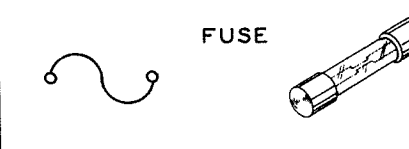
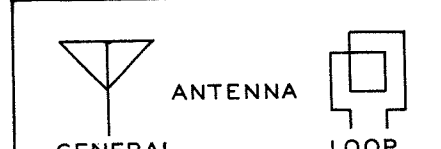
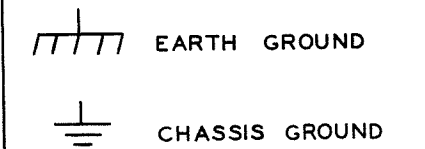

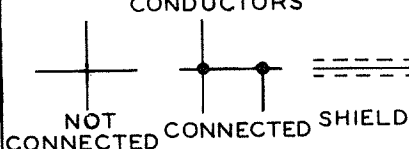
RF SIGNAL GENERATOR

MODEL IG-102

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.

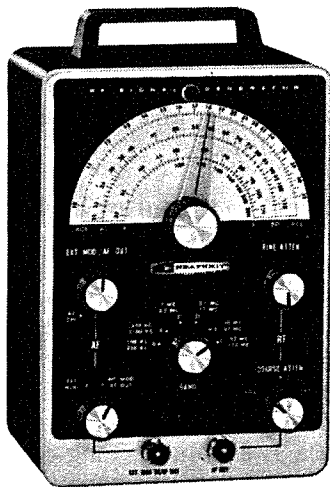
| | | |
|--|---|--|
| <p style="text-align: center;">RESISTOR</p>  | <p style="text-align: center;">CAPACITOR</p>  | <p style="text-align: center;">TUBE</p>  |
| <p style="text-align: center;">POTENTIOMETER (CONTROL)</p>  | <p style="text-align: center;">ELECTROLYTIC CAPACITOR</p>  | <p style="text-align: center;">TRANSISTOR</p>  |
| <p style="text-align: center;">TRANSFORMER (IRON CORE)</p>  | <p style="text-align: center;">VARIABLE CAPACITOR</p>  | <p style="text-align: center;">RECTIFIER (DIODE)</p>  |
| <p style="text-align: center;">TRANSFORMER (ADJUSTABLE POWDERED IRON CORE) ARROW INDICATES DIRECTION OF CORE MOVEMENT TO INCREASE INDUCTANCE</p>  | <p style="text-align: center;">BATTERY</p>  | <p style="text-align: center;">NEON BULB</p>  |
| <p style="text-align: center;">TRANSFORMER (ADJUSTABLE CORE)</p>  | <p style="text-align: center;">PHONO JACK</p>  | <p style="text-align: center;">ILLUMINATING BULB</p>  |
| <p style="text-align: center;">POWER TRANSFORMER</p>  | <p style="text-align: center;">PHONE JACK</p>  | <p style="text-align: center;">METER</p>  |
| <p style="text-align: center;">INDUCTOR (COIL)</p>  | <p style="text-align: center;">RECEPTACLE</p>  | <p style="text-align: center;">SWITCH (TOGGLE)</p>  |
| <p style="text-align: center;">PIEZOELECTRIC CRYSTAL</p>  | <p style="text-align: center;">SPEAKER</p>  | <p style="text-align: center;">SWITCH (ROTARY)</p>  |
| <p style="text-align: center;">BINDING POST</p>  | <p style="text-align: center;">MICROPHONE</p>  | <p style="text-align: center;">FUSE</p>  |
| <p style="text-align: center;">ANTENNA</p>  | <p style="text-align: center;">EARTH GROUND</p>  <p style="text-align: center;">CHASSIS GROUND</p>  | <p style="text-align: center;">CONDUCTORS</p>  |

Assembly
and
Operation
of the



RF SIGNAL GENERATOR

MODEL IG-102



HEATH COMPANY,
BENTON HARBOR,
MICHIGAN

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INTRODUCTION

The Heathkit Model IG-102 RF Signal Generator is an accurate and stable source of modulated or unmodulated RF (radio frequency) signals. Six over-lapping bands provide a wide range of frequencies for use in the AM, FM, TV, LW, and SW broadcast bands.

The RF frequency is indicated on a large dial scale that is accurate and easy to read. Switch-type and continuously variable attenuators are used to obtain output signal levels that are suitable for most applications.

A built-in audio oscillator provides modulation for the RF signal, and serves as a convenient source of audio signal. The RF may also be modulated by an external audio signal.

To insure greater accuracy of the RF frequencies, the bandswitch and coil assembly has been assembled and adjusted to precision standards at the factory. The completed Signal Generator can be calibrated without the need of expensive calibration equipment.

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.

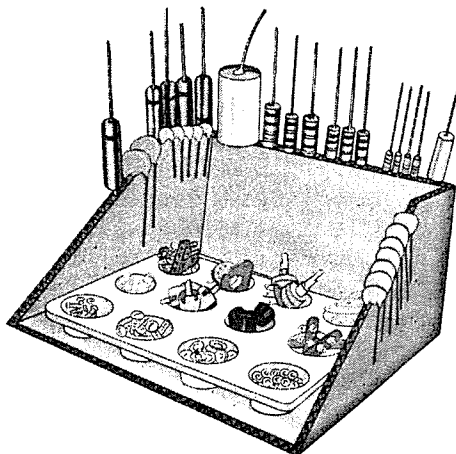
Resistors generally have a tolerance rating of 10% unless otherwise stated in the Parts List. Tolerances on capacitors are generally even greater. Limits of +100% and -20% are common for electrolytic capacitors.

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

The numbers in parentheses in the Parts List are keyed to the numbers on the Parts Pictorial (fold-out from Page 5) to aid in parts identification.

| <u>PART No.</u> | <u>PARTS Per Kit</u> | <u>DESCRIPTION</u> | <u>PART No.</u> | <u>PARTS Per Kit</u> | <u>DESCRIPTION</u> |
|---------------------|----------------------|--------------------------------------|---------------------------------------|----------------------|---|
| RESISTORS | | | Tubular | | |
| | | | (4)23-39 | 1 | .0047 μ f |
| | | | 23-50 | 1 | .022 μ f |
| (1) 1-1 | 2 ✓ | 47 Ω (yellow-violet-black) | 23-59 | 1 | .05 μ f |
| 1-48 | 1 ✓ | 390 Ω (orange-white-brown) | 23-28 | 1 | .1 μ f |
| 1-7 | 3 ✓ | 680 Ω (blue-gray-brown) | | | |
| 1-20 | 1 ✓ | 10 K Ω (brown-black-orange) | Other | | |
| 1-24 | 3 ✓ | 33 K Ω (orange-orange-orange) | (5)28-1 | 1 | 2.2 μ f molded phenolic (red-red-white) |
| 1-47 | 1 ✓ | 56 K Ω (green-blue-orange) | (6)21-29 | 1 | 4.7 μ f N750 tubular ceramic |
| 1-26 | 3 ✓ | 100 K Ω (brown-black-yellow) | (7)20-99 | 1 | 22 μ f mica |
| | | | 20-101 | 1 | 47 μ f mica |
| | | | (8)25-7 | 1 | 20-20 μ f electrolytic |
| 1 Watt | | | (9)31-8 | 1 | 1-10 μ f trimmer |
| (2) 1A-23 | 1 ✓ | 2200 Ω (red-red-red) | (10)26-57 | 1 | Dual tuning |
| CAPACITORS | | | CONTROLS-TRANSFORMERS-SWITCHES | | |
| Disc Ceramic | | | (11)10-27 | 1 | 3000 Ω control |
| (3) 21-32 | 1 ✓ | 47 μ f | 19-11 | 1 | 100 K Ω control with SPST switch |
| 21-14 | 2 ✓ | .001 μ f | 51-44 | 1 | Oscillator transformer |
| 21-27 | 1 ✓ | .005 μ f | 54-92 | 1 | Power transformer |
| 21-16 | 4 ✓ | .01 μ f | (12)63-70 | 1 | 3-position rotary switch |
| 21-31 | 5 ✓ | .02 μ f | 63-211 | 1 | 2-position rotary switch |
| | | | 163-2 | 1 | Band switch and coil assembly |



| <u>PART No.</u> | <u>PARTS Per Kit</u> | <u>DESCRIPTION</u> | <u>PART No.</u> | <u>PARTS Per Kit</u> | <u>DESCRIPTION</u> |
|-----------------------------|----------------------|-----------------------|----------------------------|----------------------|-------------------------|
| RECTIFIER-TUBES-LAMP | | | WIRE-CABLE-SLEEVING | | |
| (13)57-27 | 1 | Silicon diode | ✓89-1 | 1 | Line cord |
| ✓411-24 | 1 | 12AT7 tube | ✓340-2 | 1 | Bare wire |
| ✓411-68 | 1 | 6AN8 tube | ✓344-59 | 1 | Hookup wire |
| ✓412-1 | 1 | #47 lamp | ✓343-2 | 1 | Coaxial cable RG-58A/U |
| TERMINAL STRIPS | | | ✓347-3 | 1 | 2-lead shielded cable |
| (14)431-10 | 2 | 3-lug terminal strip | ✓346-1 | 1 | Sleeving |
| ✓431-40 | 2 | 4-lug terminal strip | METAL PARTS | | |
| ✓431-11 | 1 | 5-lug terminal strip | ✓90-253 | 1 | Cabinet |
| CONNECTORS-SOCKETS | | | ✓200-M442 | 1 | Chassis |
| (15)432-1 | ✓1 | Cable connector | ✓203-180F764-765-766 | 1 | Front panel |
| (16)432-3 | ✓2 | Chassis connector | | | |
| (17)434-77 | ✓2 | 9-pin tube socket | | | |
| 434-87 | ✓1 | Pilot lamp socket | | | |
| HARDWARE | | | MISCELLANEOUS | | |
| (18)250-49 | 4 | 3-48 x 1/4" screw | (34)40-193 | 1 | Band F oscillator coil |
| (19)250-7 | 5 | 6-32 x 3/16" screw | (35)73-1 | 5 | Rubber grommet |
| (20)250-56 | 13 | 6-32 x 1/4" screw | (36)75-71 | 1 | Line cord strain relief |
| (21)250-89 | 4 | 6-32 x 3/8" screw | (37)100-M10 | 1 | Dial pointer assembly |
| (22)250-83 | 2 | #10 sheet metal screw | (38)205-254 | 1 | Alignment tool blade |
| (23)250-16 | 1 | 8-32 setscrew | (39)207-4 | 2 | Cable clamp |
| (24)252-1 | 4 | 3-48 nut | ✓211-15 | 1 | Handle |
| (25)252-3 | 15 | 6-32 nut | ✓260-1 | 2 | Alligator clip |
| (26)252-37 | 1 | 9/32-32 x 3/8" nut | ✓(40)413-4 | 1 | Pilot lamp jewel |
| (27)252-7 | 5 | Control nut | ✓462-187 | 5 | Pointer knob |
| (28)252-22 | 2 | Speednut | ✓462-140 | 1 | Large knob |
| (29)254-1 | 18 | #6 lockwasher | ✓(41)490-1 | 1 | Coil alignment tool |
| (30)254-4 | 7 | Control lockwasher | ✓(42)490-5 | 1 | Plastic nut starter |
| (31)253-10 | 5 | Control flat washer | ✓331-6 | | Solder |
| (32)259-1 | 7 | #6 solder lug | ✓595-565 | 1 | Manual |
| (33)259-10 | 2 | Control solder lug | | | |

PROPER SOLDERING TECHNIQUES

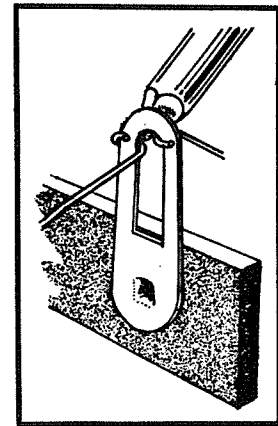
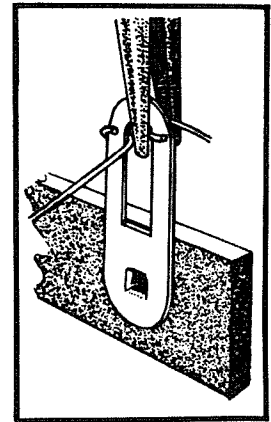
Only a small percentage of customers find it necessary to return equipment for factory service. By far the largest portion of malfunctions in this equipment are due to poor or improper soldering.

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.

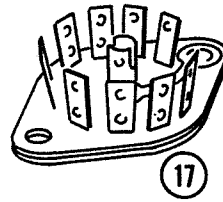
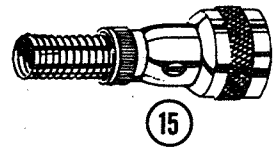
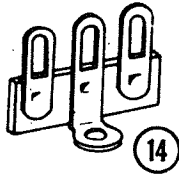
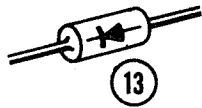
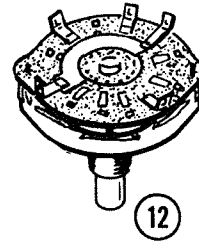
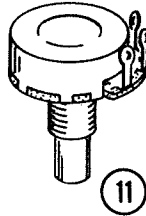
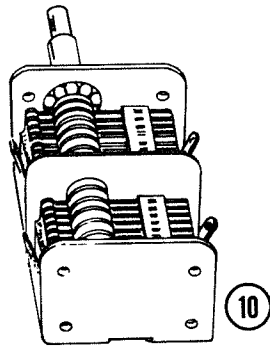
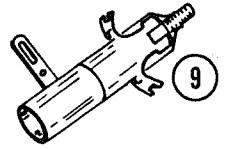
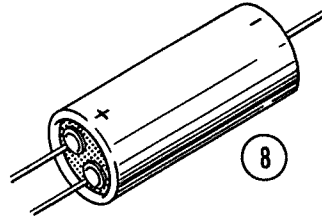
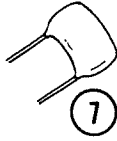
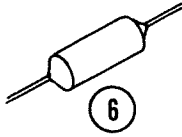
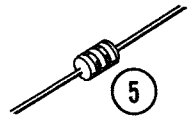
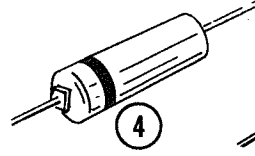
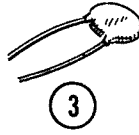
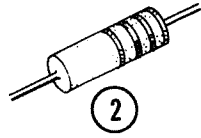
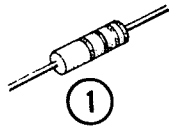
For most wiring, a 25 to 100 watt iron or its equivalent in a soldering gun is very satisfactory. A lower wattage iron than this may not heat the connection enough to flow the solder smoothly. Keep the iron tip clean by wiping it from time to time with a cloth.

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. Wherever there is a possibility of bare leads shorting to other parts or to the chassis, the leads should be covered with insulating sleeving. Where the use of sleeving is specifically intended, the phrase "use sleeving" is included in the associated assembly step. In any case where there is the possibility of an unintentional short circuit, sleeving should be used. Extra sleeving is provided for this purpose.
5. Crimp or bend the lead (or leads) around the terminal 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.
6. Position the work, if possible, so that gravity will help to keep the solder where you want it.
7. Place a flat side of the soldering iron tip against the joint to be soldered until it is heated sufficiently to melt the solder.



PARTS PIC1





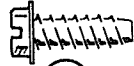
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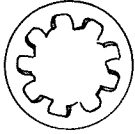
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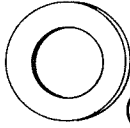
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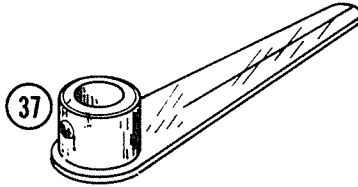
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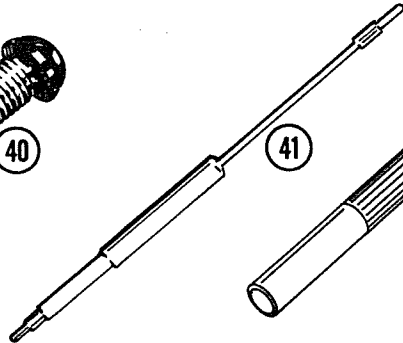
37



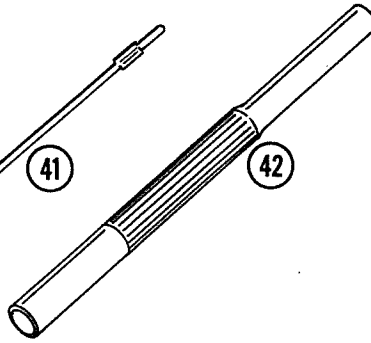
39



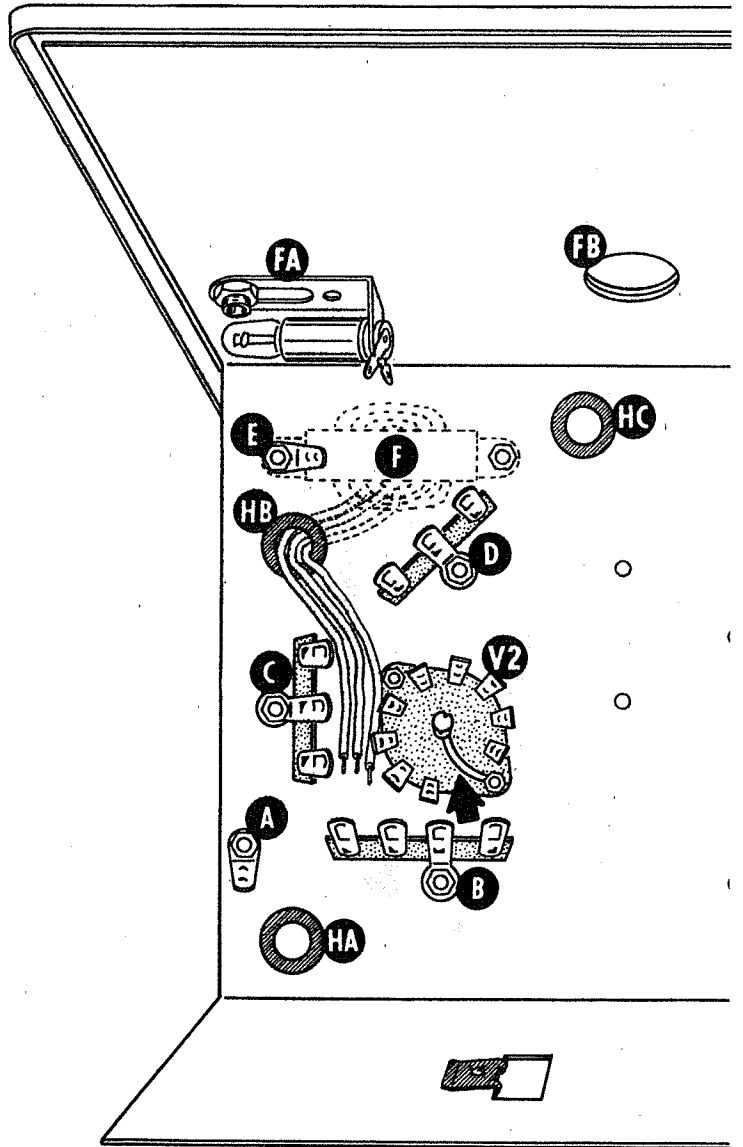
40

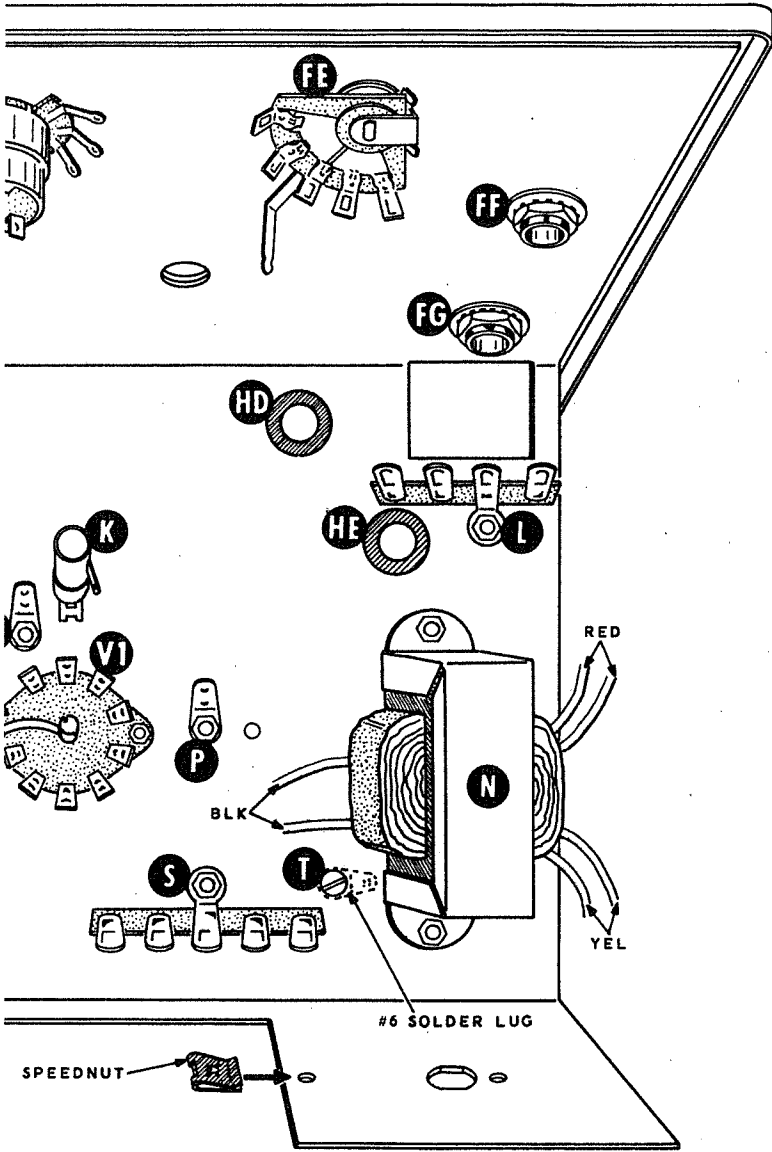


41

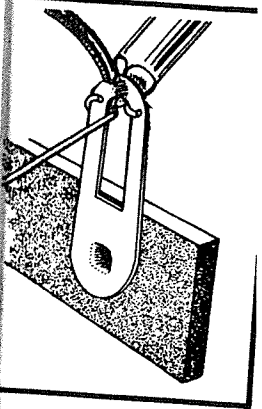


42





IAL 1

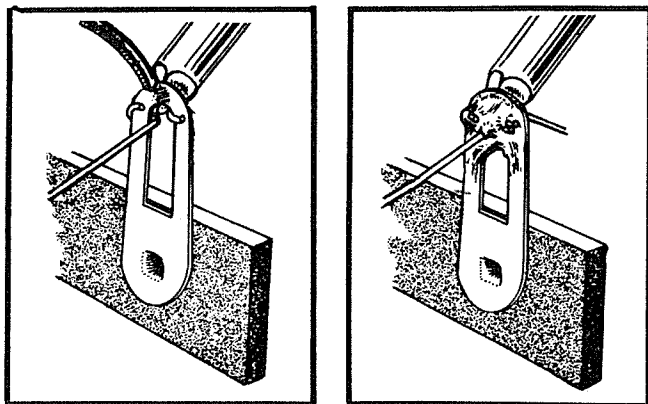


Then place the sold and it will immedia use only enough sol junction. It is usua the entire hole in th Remove the solder the completed joint. the leads until the

following instruction al step-by-step sequ complete your kit with th n. Be sure to read e gh before beginning th read several steps ah performed. This will relationship of the sul the step is complete provided. This is pa may prevent errors if your work is im rs have also found it h and part in colored per s added.

TRATIONS

ld-out diagrams in thi ed and attached to the g area; but because th the instructions, they s manual after the k



8. Then place the solder against the connection 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.
9. 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.

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

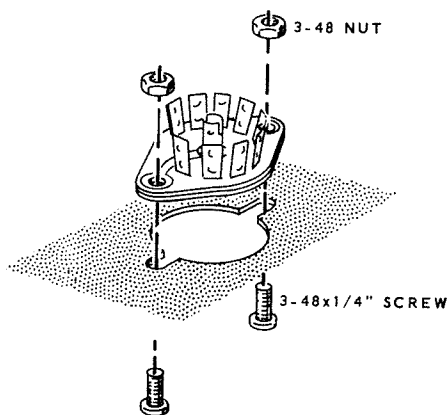
CHASSIS PARTS MOUNTING

Refer to Pictorial 1 for the following steps.

- (✓) Locate the chassis and position it as shown.
- (✓) Install the five rubber grommets at HA, HB, HC, HD, and HE.
- (✓) Install the two speednuts on the rear flange of the chassis. Be sure the flat side of each speednut is on the outside of the chassis as shown.

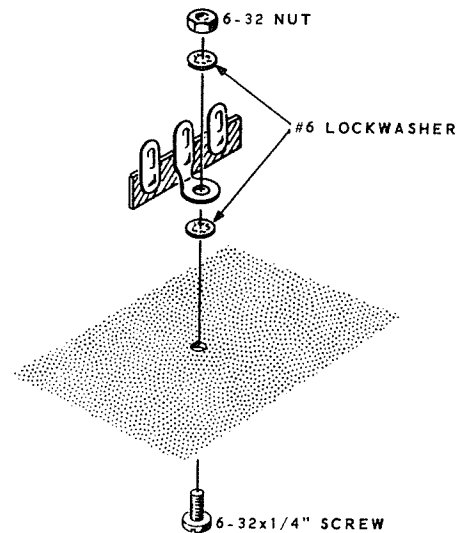
NOTE: A plastic nut starter is provided for your convenience. Refer to the inside front cover of this Manual for information on its use.

- (✓) Refer to Detail 1A and mount the two 9-pin tube sockets at V1 and V2. Use 3-48 x 1/4" screws and 3-48 nuts. Position the blank space of the tube sockets as shown by the arrows on Pictorial 1.



Detail 1A

Terminal strips will be mounted in the next five steps. Refer to Detail 1B and use a 6-32 x 1/4" screw, two #6 lockwashers, and a 6-32 nut to mount each terminal strip. Also, position the terminal strips as shown in the Pictorial.

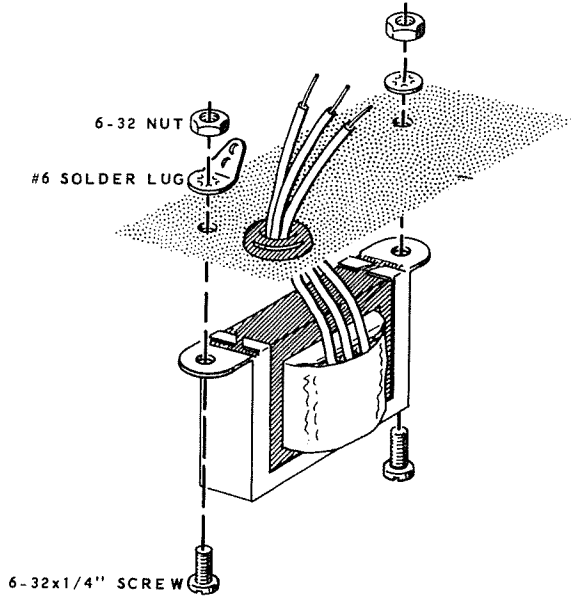


Detail 1B

- (✓) 3-lug terminal strip at C.
- (✓) 3-lug terminal strip at D.
- (✓) 4-lug terminal strip at B.
- (✓) 4-lug terminal strip at L.
- (✓) 5-lug terminal strip at S.

In the following steps, when the instructions call for using 6-32 hardware, use a 6-32 x 1/4" screw, #6 lockwasher, and 6-32 nut. When a #6 solder lug is used, the #6 lockwasher will not be used.

- (✓) Install a #6 solder lug on the bottom side of the chassis at A. Use 6-32 hardware.
- (✓) Similarly, install #6 solder lugs at J and P using 6-32 hardware.
- (✓) Install a #6 solder lug on the top side of the chassis at T. Use 6-32 hardware and position it as shown in Pictorial 1.

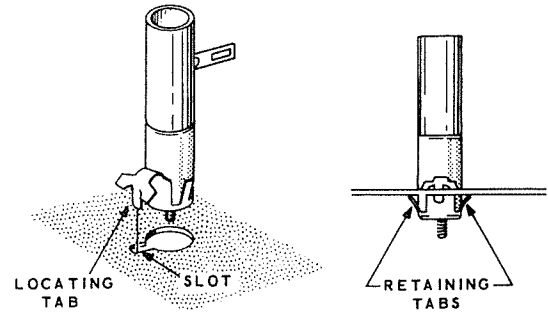


Detail 1C

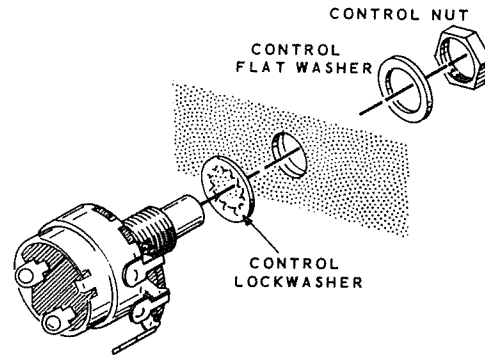
- (✓) Refer to Detail 1C and mount the oscillator transformer (#51-44) on the top side of the chassis at F. Use 6-32 hardware and install a #6 solder lug at E on the bottom side of the chassis. Position the transformer as shown and insert the three leads through grommet HB.
- (✓) Refer to Detail 1D and mount the 1-10 μ f trimmer capacitor at K. Place the locating tab in the slot, as shown, and press down until both retaining tabs snap into place.

FRONT PANEL MOUNTING

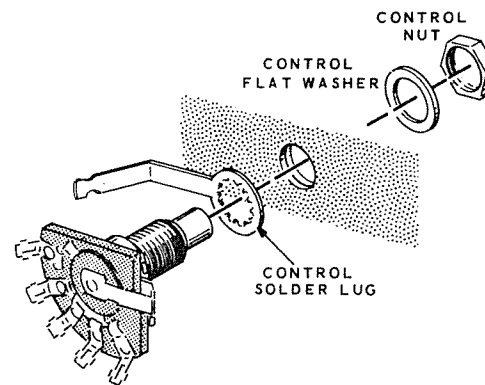
- (✓) Locate the front panel. Position the panel so that the largest hole in the panel is in line with the hole at FB on the front flange of the chassis.
- (✓) Mount the front panel on the chassis by mounting the 100 K Ω control with SPST switch (#19-11) at FC. Refer to Detail 1E and use a control lockwasher, control flat washer, and control nut. Position the control as shown and do not tighten the control nut.
- (✓) Refer to Detail 1F and mount the 2-position rotary switch (#63-211) at FE. Use a control solder lug, control flat washer, and control nut. Position the control solder lug and the switch as shown. Do not tighten the control nut.



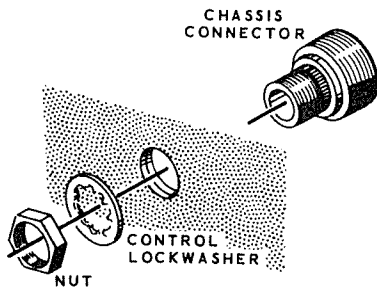
Detail 1D



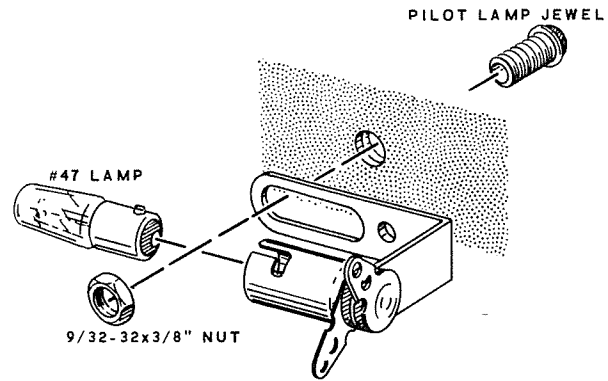
Detail 1E



Detail 1F



Detail 1G



Detail 1H

(✓) Refer to Detail 1G and mount a chassis connector at FF. Use a control lockwasher and the nut supplied with the connector. Discard the solder lug supplied with the connector.

(✓) Similarly, mount the remaining chassis connector at FG.

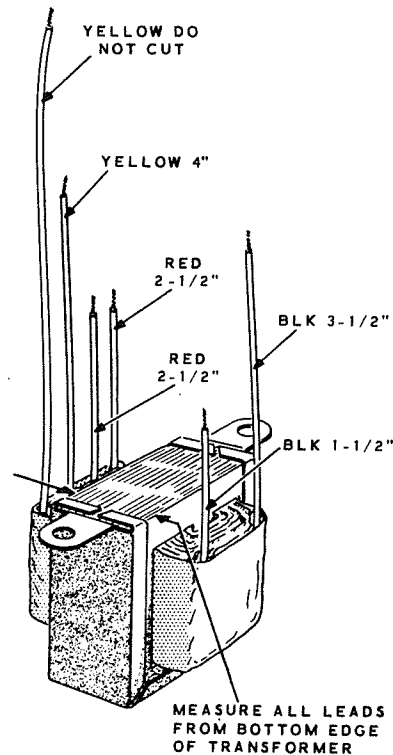
(✓) Now tighten the control nuts on the control at FC and the switch at FE.

(✓) Refer to Detail 1H and mount the pilot lamp socket at FA. Position the socket as shown and use the pilot lamp jewel and a 9/32-32 x 3/8" nut.

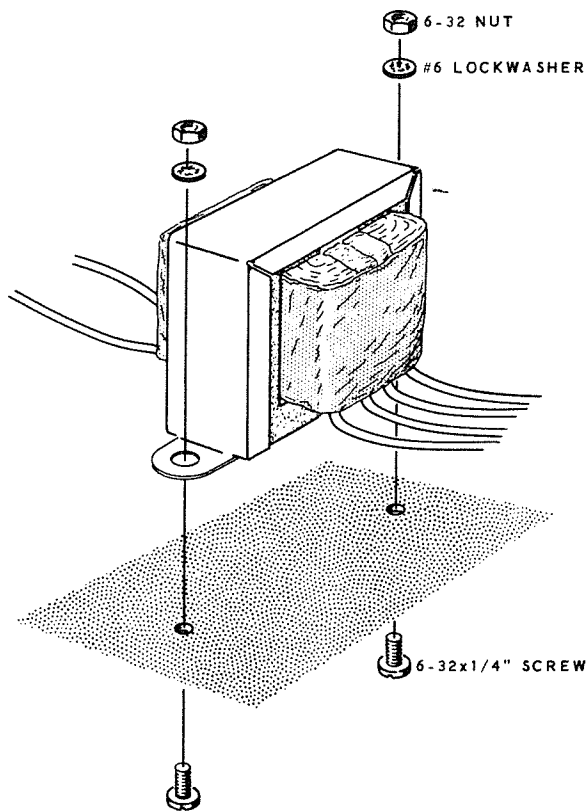
(✓) Install the #47 lamp in the pilot lamp socket.

(✓) Refer to Detail 1J and cut the power transformer (#54-92) leads to the lengths as shown. Do not shorten one of the yellow leads. Measure the leads from the bottom edge of the transformer as shown.

(✓) Remove 1/4" of insulation from the end of each transformer lead. Then melt a small amount of solder on the end of each exposed lead to hold the wire strands together.



Detail 1J



Detail 1K

- (✓) Refer to Detail 1K and mount the power transformer at N. Position the transformer with the two black leads toward terminal strip S. Use 6-32 hardware.

FRONT PANEL PARTS MOUNTING AND WIRING

Refer to Pictorial 2 for the following steps.

- (✓) Turn the chassis and front panel assembly over and position it as shown in the Pictorial.
- (✓) Refer to Detail 2A and mount the 3-position rotary switch (#63-70) at FH. Use a control lockwasher, control solder lug, control flat washer, and a control nut. Position the switch and control solder lug as shown in the Pictorial.

- (✓) Mount the 3000 Ω control (#10-27) at FJ using two control lockwashers, a control flat washer, and a control nut. Position the control as shown.

Precut the following lengths of hookup and bare wire. Remove 1/4" of insulation from the ends of each length of hookup wire. Do not use the shielded or coaxial cable unless it is specifically called for. The wires are listed in the sequence that they will be used.

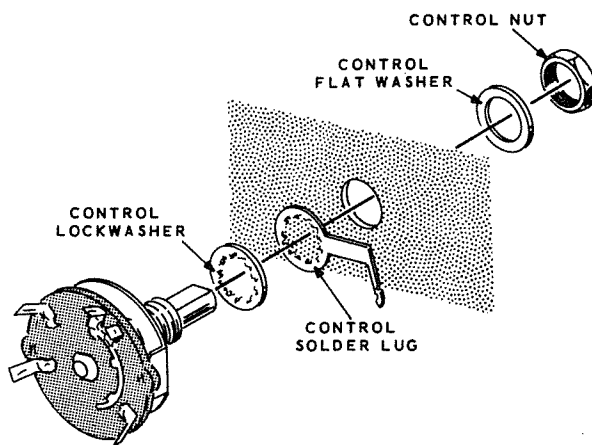
- (✓) Prepare the following lengths of wire.

- 2-1/2" hookup wire
- 5-1/2" hookup wire
- 2-3/4" bare wire

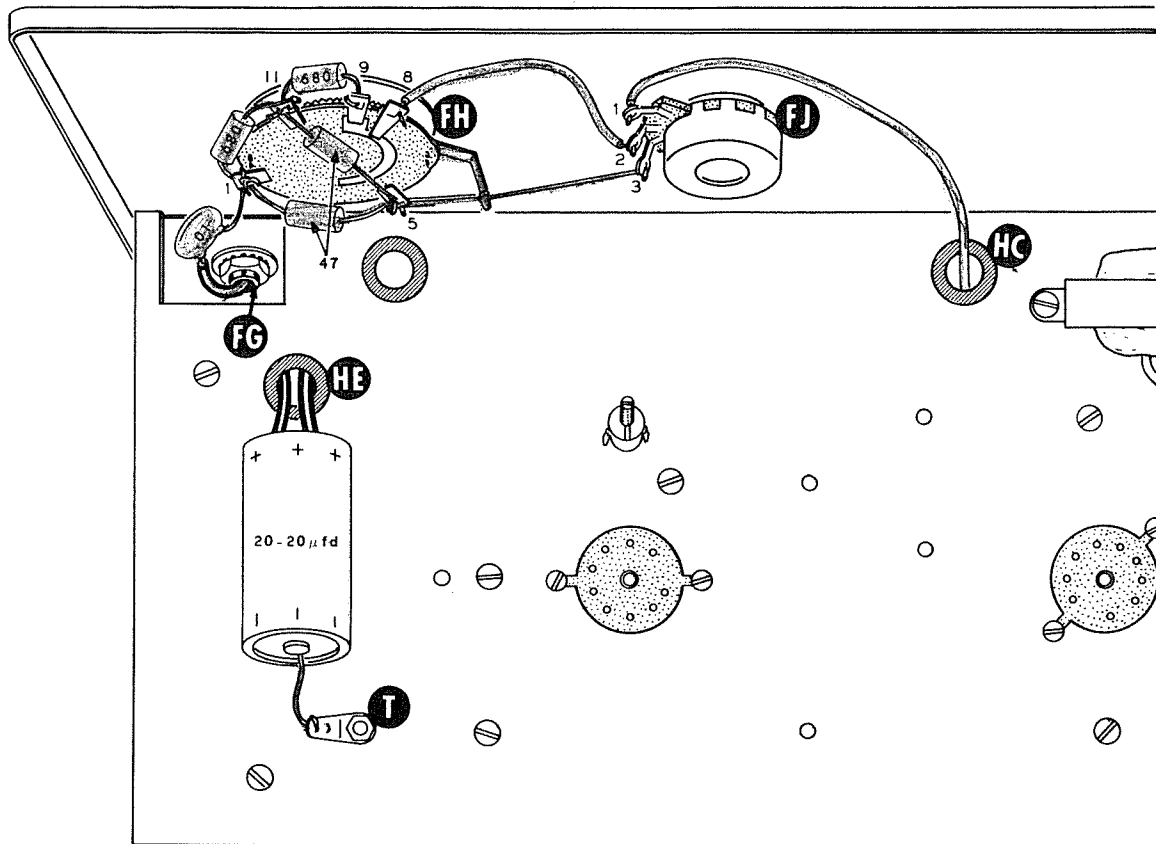
- (✓) Connect a 2-1/2" wire from lug 8 of switch FH (S-1) to lug 2 of control FJ (S-1).

- (✓) Connect one end of a 5-1/2" wire to lug 1 of control FJ (S-1). Insert the other end of the wire through grommet HC to be connected later.

- (✓) Connect a 2-3/4" bare wire from lug 3 of control FJ (S-1), around the control solder lug at switch FH (S-2), to lug 5 of switch FH (NS).



Detail 2A



PICTORIAL 2

- (✓) Place a 3/4" length of sleeving on one lead of a .01 μ fd disc ceramic capacitor, and connect this lead to the eyelet in chassis connector FG (S-1). After soldering, cut off any excess lead at the eyelet and position the capacitor in the chassis cutout as shown.
- (✓) Connect the other lead of this capacitor to lug 1 of switch FH (NS). This lead should be as short and direct as possible.

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

- (✓) Connect a 47 Ω (yellow-violet-black) resistor between lugs 1 (NS) and 5 (NS) of switch FH.
- (✓) Connect a 47 Ω (yellow-violet-black) resistor between lugs 11 (NS) and 5 (S-3) of switch FH.

- (✓) Connect a 680 Ω (blue-gray-brown) resistor between lugs 1 (S-3) and 11 (NS) of switch FH.
- (✓) Connect a 680 Ω (blue-gray-brown) resistor between lugs 11 (S-3) and 9 (S-1) of switch FH.
- (✓) Place a 1" length of sleeving on one positive (+) lead of the 20-20 μ fd electrolytic capacitor.
- (✓) Place a 2" length of sleeving on the other positive (+) lead of this capacitor.
- (✓) Insert both positive leads of the 20-20 μ fd electrolytic capacitor through grommet HE to be connected later. Connect the negative (-) lead of the capacitor to solder lug T (S-1).

CHASSIS WIRING

Refer to Pictorial 3 (fold-out from Page 13) for the following steps.

- (✓) Position the chassis as shown in the Pictorial.

The oscillator transformer leads coming through grommet HB will be connected in the next three steps.

- (✓) Yellow to lug 3 of tube socket V2 (NS).
- (✓) Black to lug 2 of terminal strip C (NS).
- (✓) Red to lug 1 of terminal strip C (NS).

The leads coming from power transformer N will be connected in the next six steps.

- (✓) Short black to lug 5 of terminal strip S (NS).
- (✓) Other black to lug 2 of terminal strip S (NS).
- (✓) Longer yellow to lug 5 of tube socket V1 (NS).
- (✓) Other yellow to lug 3 of terminal strip S (NS).
- (✓) Either red to lug 2 of terminal strip L (NS).
- (✓) Other red to lug 3 of terminal strip L (S-1).

The free leads of the 20-20 μ fd electrolytic capacitor coming through grommet HE, will be connected in the next two steps.

- (✓) Lead with the longer length of sleeving to lug 4 of terminal strip L (NS).
- (✓) The other lead to lug 1 of terminal strip L (NS).
- (✓) Prepare the following lengths of hookup wire:

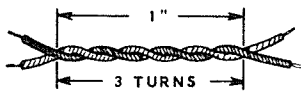
| | |
|--------|--------|
| 3-1/2" | 9-1/2" |
| 13" | 2-3/4" |
| 9" | 2-1/2" |
| 2" | |

- (✓) Connect a 3-1/2" wire from lug 1 of terminal strip B (NS) to lug 1 of terminal strip D (NS).
- (✓) Connect a 13" wire from lug 1 of tube socket V2 (NS) to lug 2 of switch FE (S-1).
- (✓) Connect a 9" wire from lug 4 of tube socket V2 (NS) to lug 5 of tube socket V1 (NS). Position the wire as shown.
- (✓) Connect a 2" wire from lug 7 of tube socket V2 (S-1) to lug 1 of terminal strip D (NS).
- (✓) Connect a 9-1/2" wire from lug 1 of terminal strip D (NS) to lug 1 of terminal strip L (NS).
- (✓) Connect a 2-3/4" wire from lug 1 of pilot lamp socket FA (S-1) to lug 4 of the tube socket V2 (S-2).
- (✓) Connect a 2-1/2" wire from lug 3 of control FC (S-1) to lug 3 of switch FE (S-1).
- (✓) Connect the free end of the wire coming through grommet HC to lug 3 of terminal strip D (NS).
- (✓) Precut the following lengths of bare wire:

| | |
|--------|--------|
| 1-1/2" | 2-1/2" |
| 2" | 3" |
| 1" | |
- (✓) Connect a 1-1/2" bare wire from solder lug E (NS) to lug 2 of pilot lamp socket FA (S-1).
- (✓) Place one end of a 2" bare wire through the center post (NS) to lug 5 (S-1) of tube socket V2. Place a 3/4" length of sleeving on the other end of this wire and connect it to lug 3 of terminal strip B (NS).
- (✓) Connect a 1" bare wire from trimmer capacitor K (S-1) to lug 2 of tube socket V1 (NS).
- (✓) Place one end of a 2-1/2" bare wire through lug 9 (S-2) to the center post (NS) of tube socket V1. Connect the other end of this bare wire to solder lug J (NS).

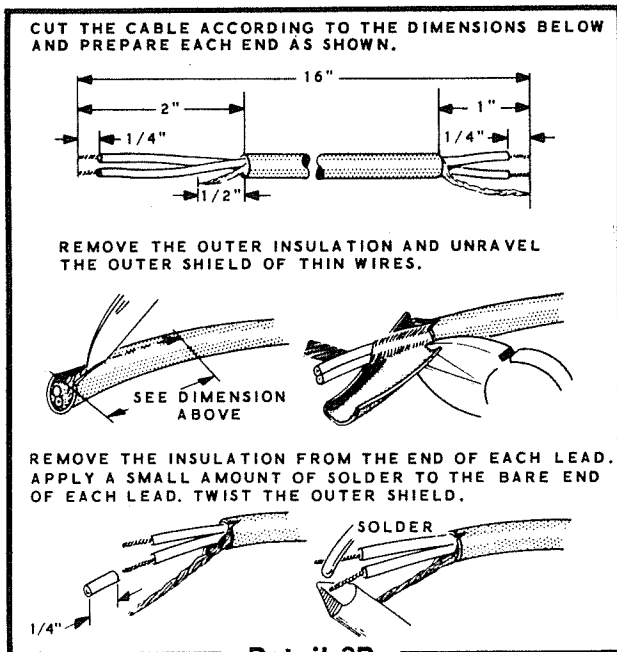


- (✓) Connect a 3" bare wire from lug 1 of control FC (NS) to the control solder lug at switch FE (NS).
- (✓) Refer to Detail 3A and twist two 12" wires together to form a twisted pair. Remove 1/4" of insulation from each end of both wires.



Detail 3A

- (✓) At one end of this twisted pair, connect either wire to lug 4 (S-1) and the other wire to lug 5 (S-1) of control FC.
- (✓) At the other end of the twisted pair, connect either wire to lug 4 (NS) and the other wire to lug 5 (S-2) of terminal strip S. Route the twisted pair as shown in Pictorial 3 and position it down against the chassis.
- (✓) Refer to Detail 3B and prepare a 16" length of 2-lead shielded cable.



- (✓) Insert the end of the cable with the longest inner leads through grommet HA from the top side of the chassis.

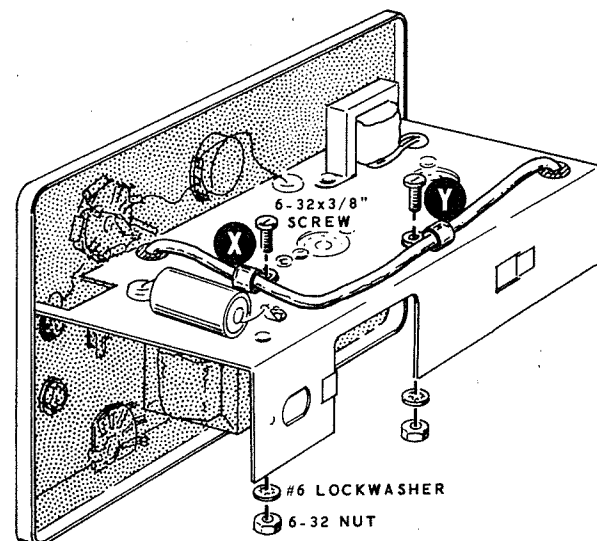
Connect the leads at this end of the 2-lead shielded cable as follows.

- (✓) Shield to solder lug A (S-1).
- (✓) Yellow to lug 2 of tube socket V2 (NS).
- (✓) Green to lug 3 of terminal strip C (NS).

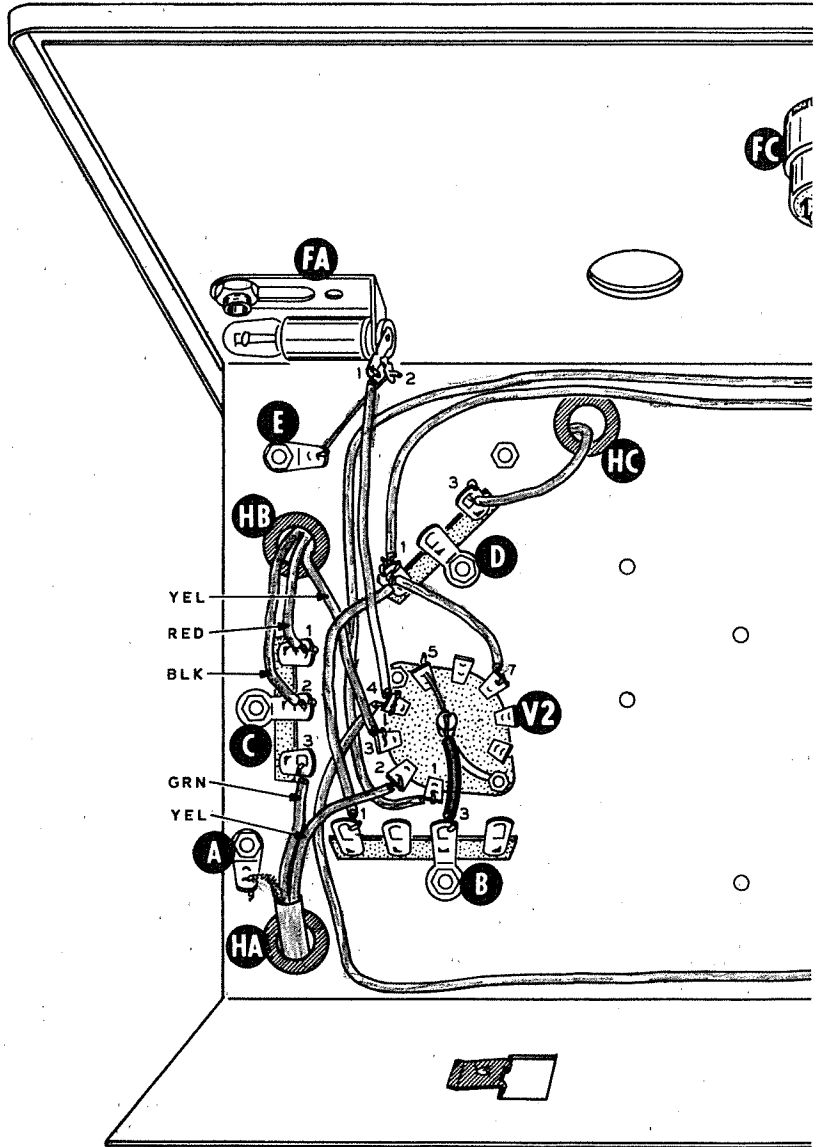
- (✓) Insert the other end of the 2-lead shielded cable through grommet HD from the top side of the chassis.

Connect the leads at this end of the 2-lead shielded cable as follows.

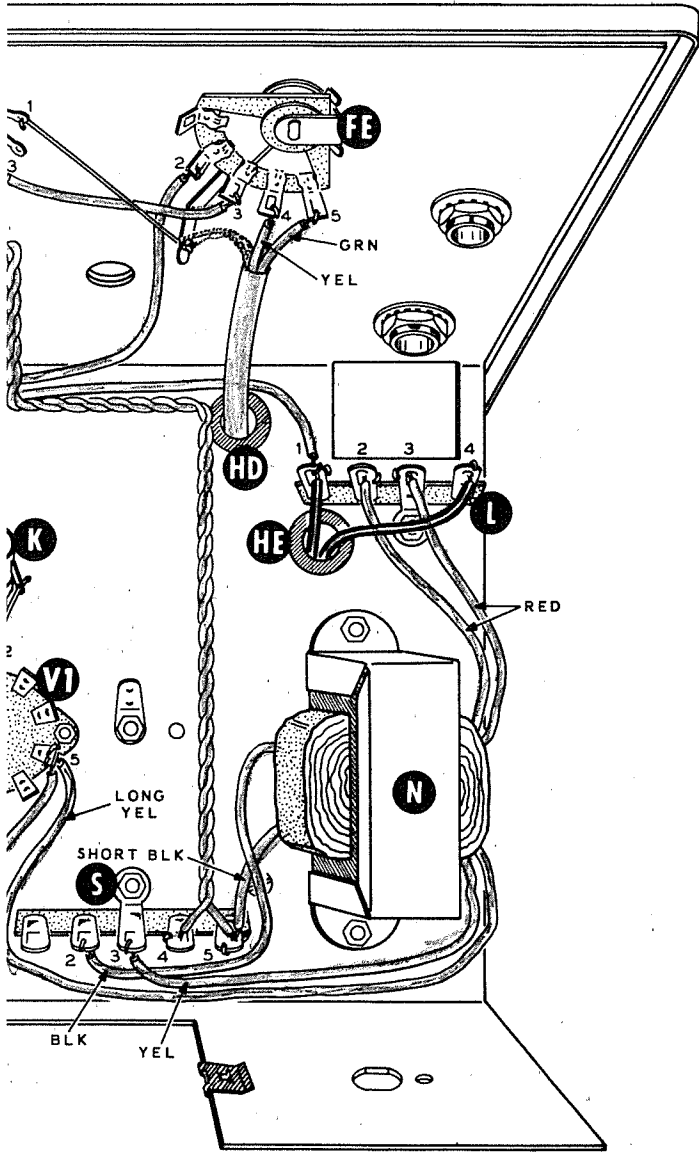
- (✓) Shield to the control solder lug at switch FE (S-2).
- (✓) Yellow to lug 4 of switch FE (S-1).
- (✓) Green to lug 5 of switch FE (S-1).
- (✓) Place two cable clamps over the 2-lead shielded cable and secure them at X and Y on the top of the chassis. Refer to Detail 3C and use 6-32 x 3/8" screws, #6 lockwashers, and 6-32 nuts.

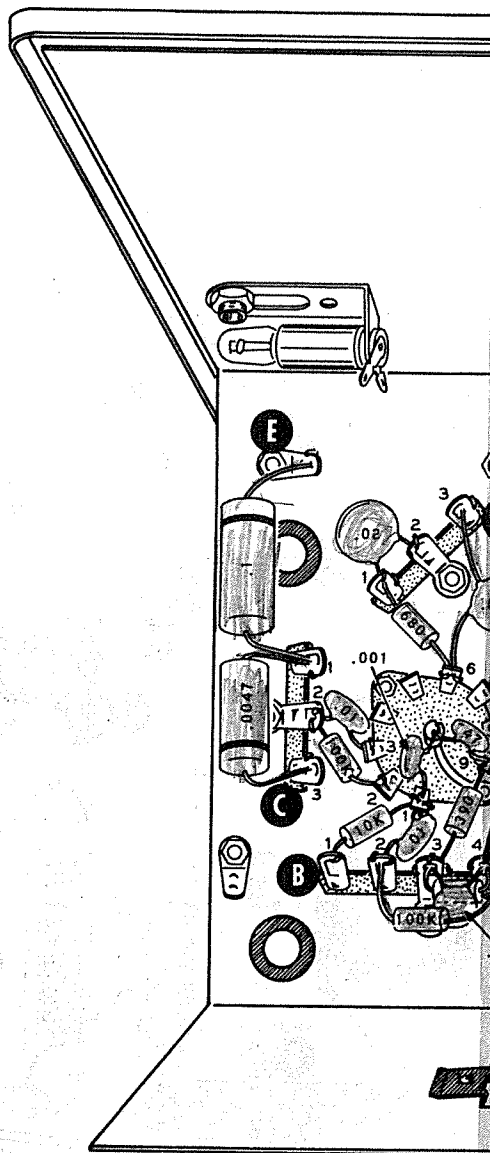


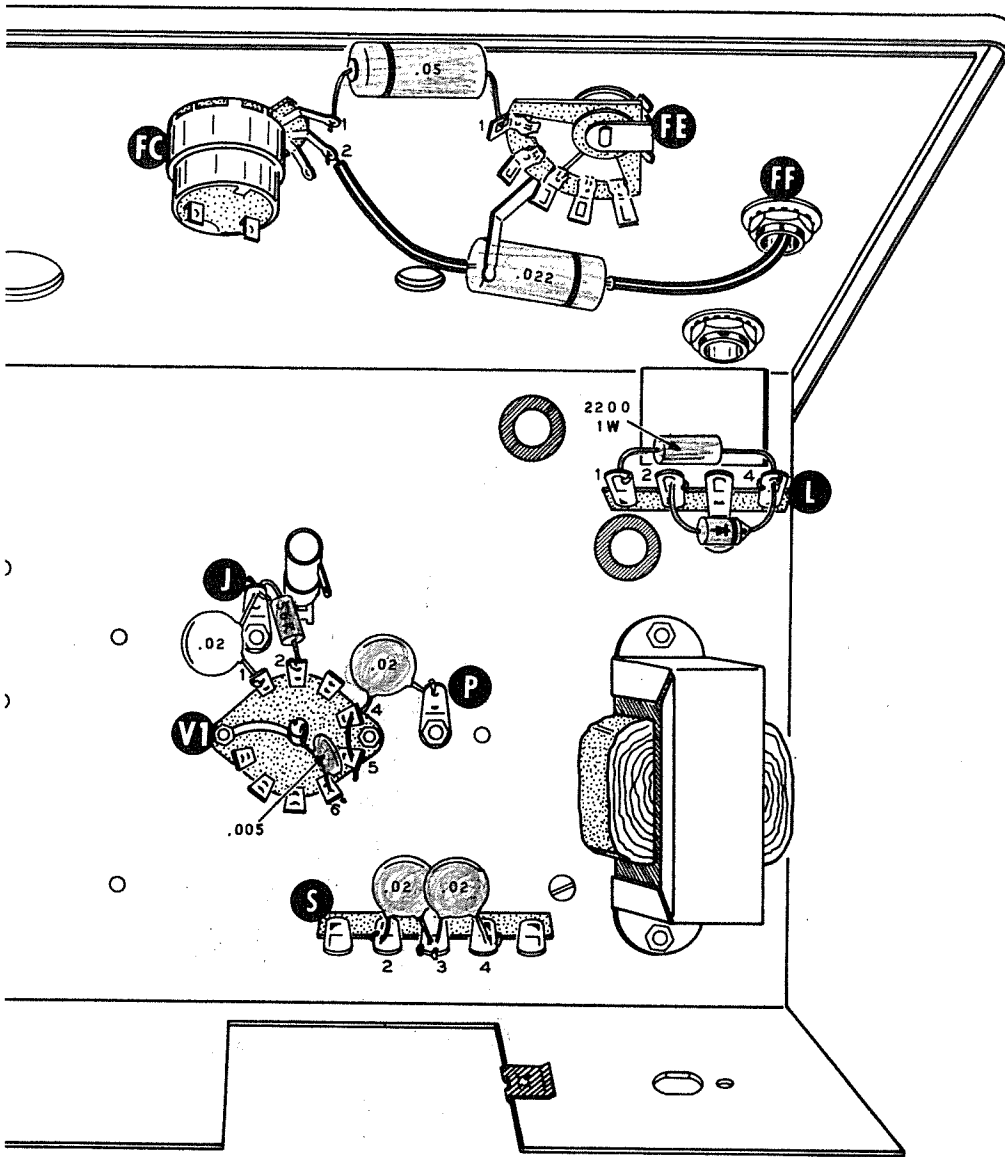
Detail 3C



PICTO







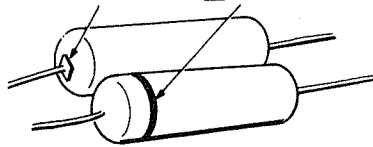
PICTORIAL 4

COMPONENT INSTALLATION

Refer to Pictorial 4 for the following steps.

NOTE: Before installing the tubular capacitors, identify the marked end of each one. Refer to Detail 4A. Each capacitor should be connected with the marked end as shown in the Pictorial.

NOTE MARKING ON TUBULAR CAPACITOR
EITHER SHOULDER OR BAND



MARKED END MUST BE PLACED
AS SHOWN IN THE PICTORIAL

Detail 4A

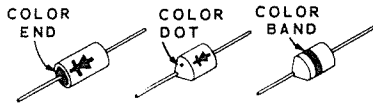
- (✓) Connect a .1 μfd tubular capacitor from solder lug E (S-2) to lug 1 of terminal strip C (NS).
- (✓) Connect a .0047 μfd tubular capacitor between lugs 1 (S-3) and 3 (S-2) of terminal strip C.

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

- (✓) Connect a 33 $\text{K}\Omega$ (orange-orange-orange) resistor between lugs 3 (NS) and 4 (NS) of terminal strip B.
- (✓) Connect a .001 μfd disc ceramic capacitor between lugs 3 (NS) and 4 (NS) of terminal strip B.
- (✓) Connect a 100 $\text{K}\Omega$ (brown-black-yellow) resistor between lugs 2 (NS) and 4 (NS) of terminal strip B.
- (✓) Connect a 390 Ω (orange-white-brown) resistor from lug 9 of tube socket V2 (NS) to lug 3 of terminal strip B (S-4).
- (✓) Connect a 47 μfd disc ceramic capacitor between the center post (NS) and lug 9 (S-2) of tube socket V2.
- (✓) Connect a 100 $\text{K}\Omega$ (brown-black-yellow) resistor from lug 8 of tube socket V2 (NS) to lug 4 of terminal strip B (S-4).
- (✓) Connect a 10 $\text{K}\Omega$ (brown-black-orange) resistor from lug 1 of tube socket V2 (NS) to lug 1 of terminal strip B (S-2).

- (✓) Connect a .01 μfd disc ceramic capacitor from lug 1 of tube socket V2 (NS) to lug 1 of terminal strip B (S-2).
- (✓) Connect a .001 μfd disc ceramic capacitor between the center post (S-4) and lug 1 (S-4) of tube socket V2.
- (✓) Connect a 100 $\text{K}\Omega$ (brown-black-yellow) resistor from lug 2 of tube socket V2 (NS) to lug 2 of terminal strip C (NS).
- (✓) Connect a .01 μfd disc ceramic capacitor from lug 3 of tube socket V2 (S-2) to lug 1 of terminal strip C (S-3).
- (✓) Connect a 680 Ω (blue-gray-brown) resistor from lug 6 of tube socket V2 (NS) to lug 1 of terminal strip D (NS).
- (✓) Connect a .01 μfd disc ceramic capacitor from lug 6 of tube socket V2 (S-2) to lug 1 of terminal strip D (S-2).
- (✓) Connect a .02 μfd disc ceramic capacitor between lugs 1 (S-5) and 2 (S-1) of terminal strip D.
- (✓) Connect a .02 μfd disc ceramic capacitor between lugs 2 (NS) and 3 (NS) of terminal strip S.
- (✓) Connect a .02 μfd disc ceramic capacitor between lugs 3 (S-2) and 4 (NS) of terminal strip S.
- (✓) Connect a 56 $\text{K}\Omega$ (green-blue-orange) resistor from lug 2 of tube socket V1 (NS) to solder lug J (NS).
- (✓) Connect a .02 μfd disc ceramic capacitor from lug 1 of tube socket V1 (NS) to solder lug J (S-3).
- (✓) Insert one lead of a .02 μfd disc ceramic capacitor through lug 4 (S-2) to lug 5 (S-2) of tube socket V1. Position the capacitor against the chassis as shown, and connect the other lead of this capacitor to solder lug P (S-1).
- (✓) Connect a .005 μfd disc ceramic capacitor between lug 6 (NS) and the center post (S-4) of tube socket V1.
- (✓) Connect a 2200 Ω (red-red-red) 1/2 watt resistor between lugs 1 (NS) and 4 (NS) of terminal strip L.

NOTE: WHEN INSTALLING DIODES THE CATHODE END MUST BE PLACED AS DIRECTED. THE CATHODE END IS MARKED WITH EITHER A COLOR END, COLOR DOT, OR COLOR BAND.



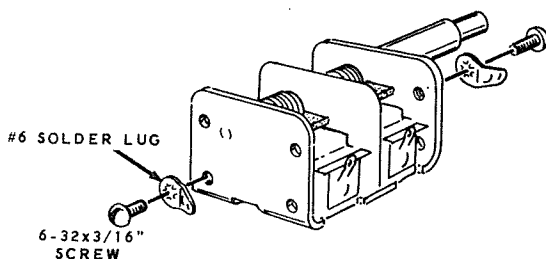
Detail 4B

- (✓) Refer to Detail 4B and identify the cathode lead of a silicon diode.
- (✓) Connect the cathode lead of a silicon diode to lug 4 of terminal strip L (S-3). Connect the other lead of this diode to lug 2 of terminal strip L (S-2).
- (✓) Connect a .05 μ fd tubular capacitor from lug 1 of control FC (S-2) to lug 1 of switch FE (S-1).
- (✓) Place a 1-1/2" length of sleeving on each lead of a .022 μ fd tubular capacitor. Connect this capacitor from lug 2 of control FC (S-1) to chassis connector FF (S-1).

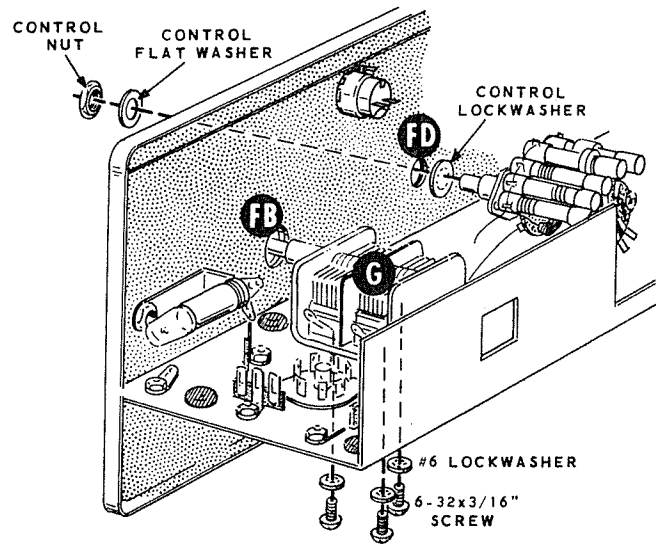
Refer to Pictorial 5 (fold-out from Page 21) for the following steps.

NOTE: Keep the plates of the dual tuning capacitor fully meshed during the remaining assembly of the kit except when instructed otherwise.

- (✓) Locate the dual tuning capacitor (#26-57). Refer to Detail 5A and install a 6-32 x 3/16" screw and a #6 solder lug on each end of the capacitor.



Detail 5A



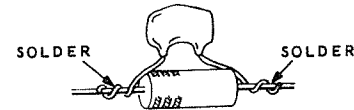
Detail 5B

- (✓) Refer to Detail 5B and mount the tuning capacitor at G. Use 6-32 x 3/16" screws and #6 lockwashers. Center the capacitor shaft in hole FB before tightening the screws.
- (✓) Mount the band switch and coil assembly (#163-2) at FD. Refer to Detail 5B and use a control lockwasher, control flat washer, and control nut. Position the free leads so they may be connected as shown in Pictorial 5.
- (✓) Turn the band switch shaft fully counter-clockwise. The flat portion of the shaft should be opposite panel marking A. If necessary, reposition the switch and re-tighten the control nut.
- (✓) Bend lugs 1, 2, and 4 of the tuning capacitor down so that the lugs are at right angles to the capacitor.
- (✓) Connect the long heavy lead of band F oscillator coil to lug 2 (NS) and the short heavy lead to solder lug 6 of tuning capacitor G (S-1). Position the coil with approximately 1/2" of space between the coil and the chassis.
- (✓) Connect a 4.7 μ fd N750 tubular ceramic capacitor from lug 8 of tube socket V2 (NS) to the tap on coil F (S-1). Position the body of the capacitor against the tuning capacitor frame.

- (✓) Connect a 2.2 $\mu\mu\text{f}$ (red-red-white) molded phenolic capacitor from lug 4 of tuning capacitor G (S-1) to lug 8 of tube socket V2 (S-3).
- (✓) Place a 2-1/4" length of sleeving on the bare wire connected to the tap on coil F. Connect the free end of this wire to lug 8 of tube socket V1 (S-1). Position the wire above coil F and away from the tuning capacitor.
- (✓) Locate the free end of the ground wire which is connected to all five coils on switch FD.
- (✓) Connect this ground wire to solder lug 5 on tuning capacitor G (S-1).
- (✓) Place a 1" length of sleeving over the remaining free wire coming from the front wafer (lug 1) of switch FD. Connect this wire to lug 1 of tuning capacitor G (NS).
- (✓) Connect a 47 $\mu\mu\text{f}$ mica capacitor from lug 1 of tuning capacitor G (S-2) to lug 2 of tube socket V1 (S-3).

NOTE: The lugs on the rear wafer of switch FD will be wired in the following four steps.

- (✓) Connect the free end of the bare wire coming from lug 1 of switch FD to lug 3 of tube socket V1 (S-1).
- (✓) Connect a 2" wire from lug 1 of tube socket V1 (S-2) to lug 3 of switch FD (S-1).
- (✓) Place a 1/2" length of sleeving on one lead of a 33 K Ω (orange-orange-orange) resistor. Connect this lead to lug 4 of switch FD (S-1), and connect the other lead to lug 1 of terminal strip L (S-4).
- (✓) Connect a 2-1/2" wire from lug 6 of tube socket V1 (S-2) to lug 5 of switch FD (S-1).

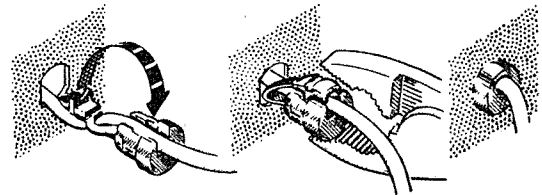


Detail 5C

- (✓) Prepare a 22 $\mu\mu\text{f}$ mica capacitor and 33 K Ω (orange-orange-orange) resistor combination. See Detail 5C.
- (✓) Connect this capacitor-resistor combination from lug 2 of tuning capacitor G (S-2) to lug 7 of tube socket V1 (S-1).
- (✓) Insert the free end of the line cord through hole U in the rear flange of the chassis.

The line cord wires will be connected to terminal strip S in the following two steps.

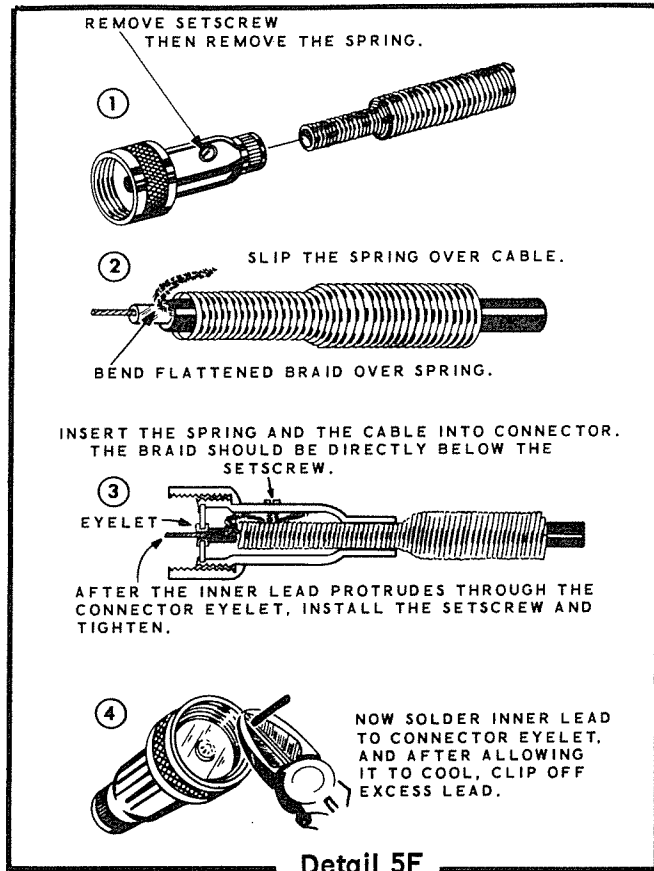
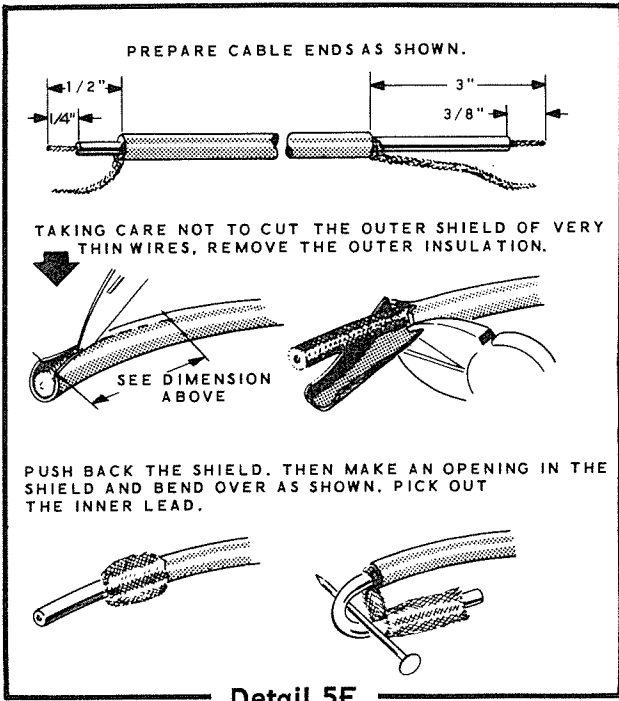
- (✓) Either wire to lug 2 (S-3).
- (✓) Other wire to lug 4 (S-3).



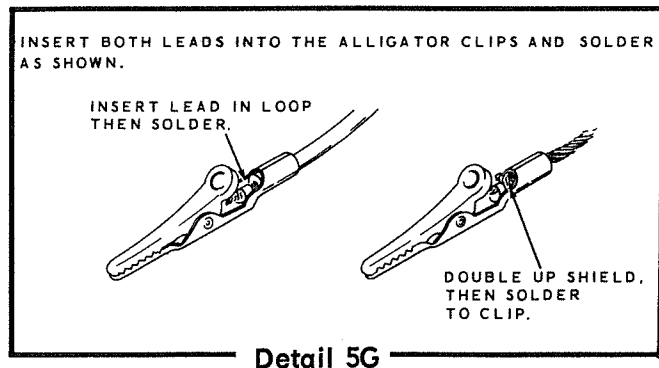
Detail 5D

- (✓) Refer to Detail 5D and install the line cord strain relief at U.

This completes the wiring on the chassis. Carefully check to be sure there are no unsoldered connections, loose or broken leads, or shorted lugs of tube sockets. Turn the chassis over and shake out any bits of solder or wire clippings. Note that one lug on terminal strip S is not used. This extra lug is provided for special wiring in Signal Generators that are shipped abroad.



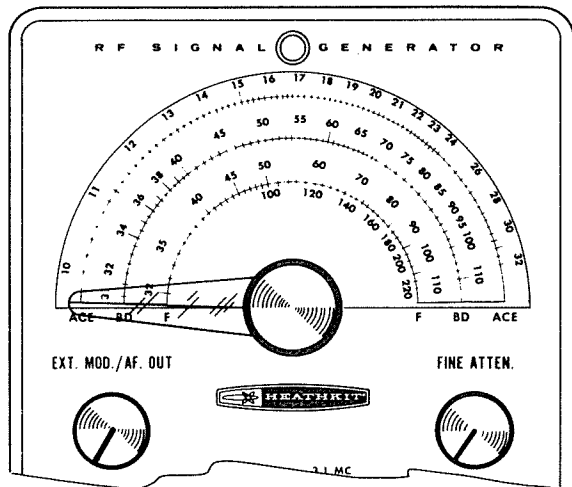
- (✓) Refer to Detail 5E and prepare the length of RG-58A/U coaxial cable.
- (✓) Install a cable connector on the end of this cable that has 1/2" of outer insulation removed. See Detail 5F.
- (✓) Refer to Detail 5G and install two alligator clips on the other end of the cable.



KNOB AND TUBE INSTALLATION

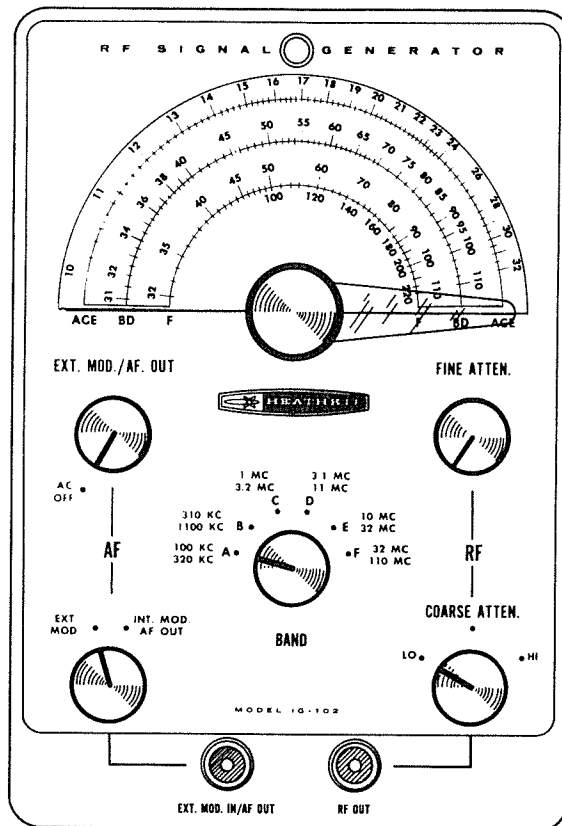
Refer to Pictorial 6 for the following steps.

- (✓) Turn the shaft of the tuning capacitor fully clockwise.
- (✓) Install the dial pointer assembly on the large shaft of the tuning capacitor. Use an 8-32 setscrew.
- (✓) Turn the shaft of the tuning capacitor fully counterclockwise and be sure the dial pointer lines up with the end marking at the low end of the dial. See Detail 6A. If necessary, reposition the dial pointer assembly and tighten the setscrew securely. Also, be sure the dial pointer does not rub against the front panel as the tuning shaft is turned.

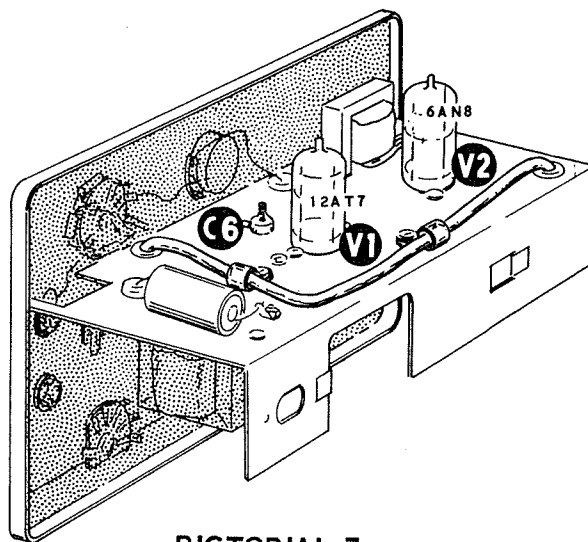


Detail 6A

- (✓) Install the large knob on the small shaft of the tuning capacitor.
- (✓) Install the pointer knobs on the remaining control shafts. Position the knobs so the index markers are as shown in the Pictorial, with all control shafts turned fully counterclockwise.
- (✓) Refer to Pictorial 7 and install a 12AT7 tube in tube socket V1.
- (✓) Install a 6AN8 tube in tube socket V2.



PICTORIAL 6



PICTORIAL 7

INITIAL TEST

If an ohmmeter is available, check for possible short circuits in the power supply before applying power to the Signal Generator for the first time. If an ohmmeter is not available, proceed to the Note which follows the next three steps.

Refer to Pictorial 4 (fold-out from Page 14) for the next three steps.

- () Place the ohmmeter range switch in the RX1000 position.
- () Connect the test leads of the ohmmeter across the leads of the silicon diode connected between lugs 2 and 4 of terminal strip L. Then note the resistance reading. The initial kick of the meter pointer indicates that the filter capacitors are charging. Reverse the ohmmeter leads to the diode and note the reading. The ratio of the two resistance readings should be 10 to 1 or greater.
- () To check the B+ supply circuit, connect the common test lead of the ohmmeter to the chassis and the ohms (or "hot") test lead to lug 1 of terminal strip L. The meter pointer should kick down to a fairly low reading,

indicating charging of the filter capacitors, and then rise slowly to a reading of at least 50,000 Ω . If a reading of less than 50,000 Ω is obtained, first check the installation of the silicon diode and be sure the cathode lead is connected to lug 4 of terminal strip L. Refer to Detail 4B on Page 15 to identify the cathode lead of the diode. If you are still unable to obtain a resistance reading of 50,000 Ω , refer to the In Case Of Difficulty section of the manual.

NOTE: If the proper results are not obtained in the following steps, turn the Generator off and refer to the In Case Of Difficulty section of the Manual.

- () Plug the line cord into a standard (105 to 125 volts, 50/60 cps) AC outlet.
- () Turn the EXT MOD/AF OUT control clockwise to turn the Generator on. The tube filaments and pilot lamp should light.
- () Visually check all parts for any signs of overheating.
- () Proceed to the Calibration section.

CALIBRATION

Before starting the Generator calibration, carefully study the operation of each control and switch as described in Figure 2 on Page 23.

An AM radio is needed to calibrate bands A, B, C, D, and E. The tuned circuit and component parts for band F have been preadjusted at the factory. If additional accuracy is desired, an FM radio must be used to calibrate band F.

BANDS A THROUGH E

- (✓) Turn the BAND switch to band B.
- (✓) Turn the Modulation switch to EXT MOD.
- (✓) Turn the FINE ATTEN control fully clockwise.
- (✓) Set the COARSE ATTEN switch at HI.
- () Connect the shielded output cable to the Generator RF OUT connector. Place the free end of this cable near the loop or antenna lead of the AM radio, but do not connect it directly to the radio.
- (✓) Turn the Generator and AM radio on. Allow the Generator and radio to warm up for 15 minutes so all components will reach normal operating temperature.

The following procedure will be used to calibrate the Generator.

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First, a signal of known frequency is tuned in on the AM radio. Then the dial pointer of the Generator is set to the exact frequency of the station the radio is tuned to. The RF oscillator is then tuned to the same frequency as the radio station by adjusting it until a zero beat is heard in the radio.

This zero beat is the signal that is created by the beating together of the oscillator signal and the station signal in the radio. When the beat is heard, it starts out as a high pitched tone, which gradually changes as the beat frequency becomes lower until the tone becomes very low pitched. Once the zero beat point is passed, the tone gradually increases in pitch until it can no longer be heard.

At these frequencies it is often hard to get a complete zero beat (no sound at all) between the signals. Often, a low pitched tone or a slow popping sound will be as close as you will be able to come to a complete zero beat. The output level of the Generator should be just high enough to give a clear beat sound; do not set the Generator output level higher than necessary.

- (✓) Locate the alignment tool blade supplied with this kit. Refer to Figure 1 and use a pair of long-nose pliers. Insert the blade into the smaller hole of the nut starter until the blade end is flush with the end of the nut starter. This now can be used as a trimmer alignment tool.

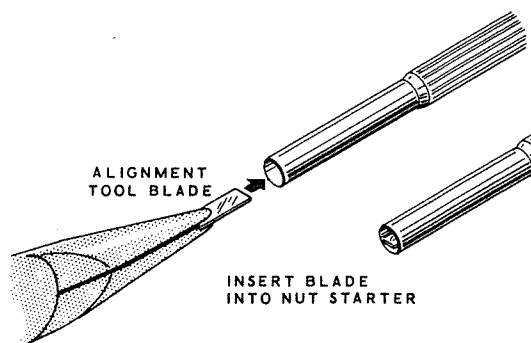


Figure 1



(✓) Referring to Pictorial 7 (Page 18) and using the trimmer alignment tool, preset trimmer capacitor C6 until the top of the adjustment screw is 1/2" above the chassis.

() Tune the AM radio to a station of known frequency between 800 and 1000 kc. The frequency of this station should preferably be one whose frequency falls directly on one of the calibration points on the dial, such as 800 kc, 850 kc, 900 kc, or 1000 kc.

() Turn the dial pointer on the Generator to the place on the dial that indicates the exact frequency of the station the radio is tuned to.

() Adjust trimmer capacitor C6 for a zero beat in the radio. Use the FINE ATTEN and COARSE ATTEN controls to set the output level of the Generator just high enough to give a clear zero beat in the radio.

This completes the calibration of bands A through E. Turn off the AM radio.

The frequencies, for bands A through E, were adjusted with trimmer capacitor C6. This was possible because the adjustment slug, for each coil on these bands, was accurately adjusted at the factory. A slight improvement in accuracy could be obtained if the slug in each coil was adjusted by zero beating the Generator signal with an accurate frequency standard. An accurate frequency standard could be obtained by tuning a communications receiver to a WWV frequency such as 2.5 mc, 5 mc, 10 mc, etc., (National Bureau of Standards). Standard frequencies can also be obtained from a precision laboratory generator (with an accuracy of at least 1%), in conjunction with an oscilloscope to indicate the zero beat. If the coil slugs are adjusted, each band should be adjusted near the low end of the dial. A coil alignment tool, for adjusting the coil slugs, is supplied with the kit.

BAND F

To calibrate band F to obtain additional accuracy, you must use an FM radio.

() Turn on the FM radio and tune it to a station between 88 mc and 100 mc.

() Set the BAND switch to band F, and turn the dial pointer to the frequency of the FM station.

() Turn the Modulation switch to INT MOD/AF OUT.

() Connect the output cable of the Generator to the antenna terminals of the FM radio.

() Turn the Generator dial pointer back and forth and listen for the 400 cps tone modulation in the FM radio. This 400 cps tone will be weakest at the correct frequency, and it will be louder on both sides of this frequency.

() Turn the Generator dial pointer to the place where the 400 cps tone is weakest. If the dial indicator points to a frequency lower than the station frequency, gently squeeze together the turns of coil F. Then retune the dial pointer to the weakest 400 cps tone. Repeat this procedure until the correct frequency is indicated on the Generator dial. See Pictorial 5 to identify coil F. If the dial pointer indicates a higher frequency than the station frequency, the turns of coil F should be spread apart slightly.

This completes the calibration of band F.

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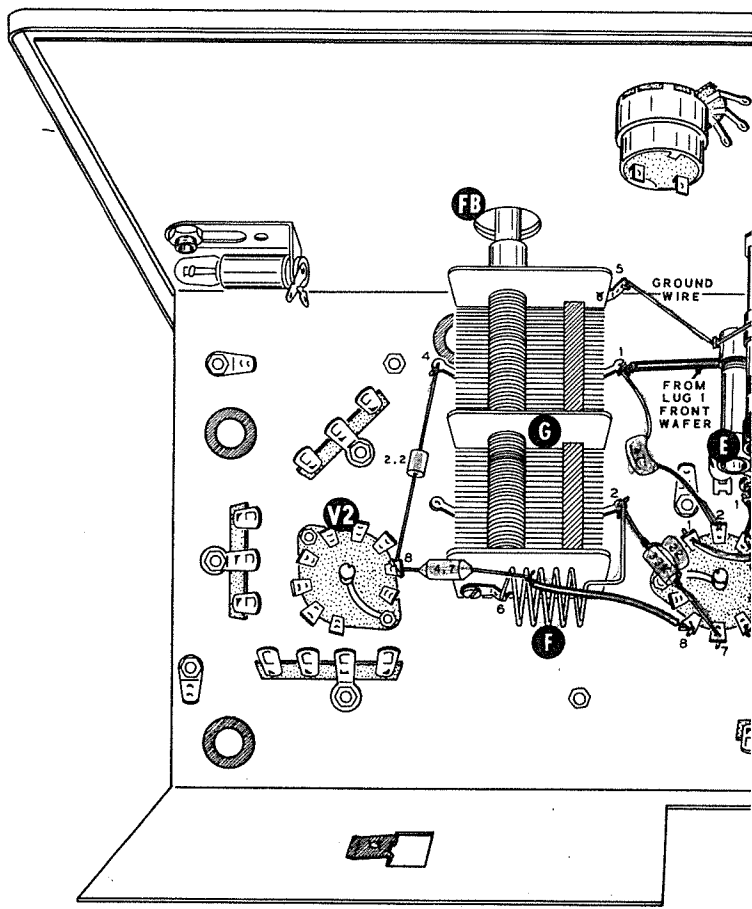
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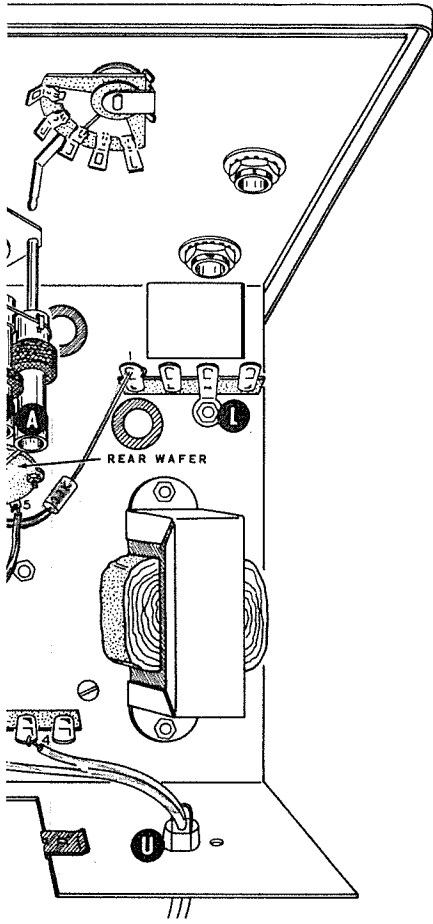
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PICTORIAL 5



FINAL ASSEMBLY

Refer to Pictorial 8 for the following steps.

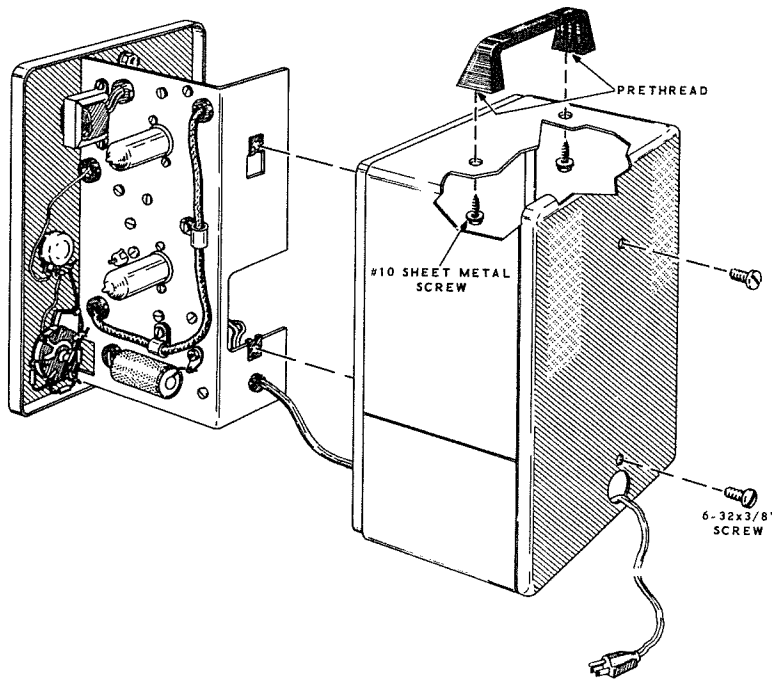
- () Prethread both holes in the handle using a #10 sheet metal screw.
- () Mount the handle on the top of the cabinet. Use #10 sheet metal screws.
- () Insert the line cord through the large hole in the back of the cabinet, then install the Generator in the cabinet with two #6 x 3/8" screws.

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.



PICTORIAL 8

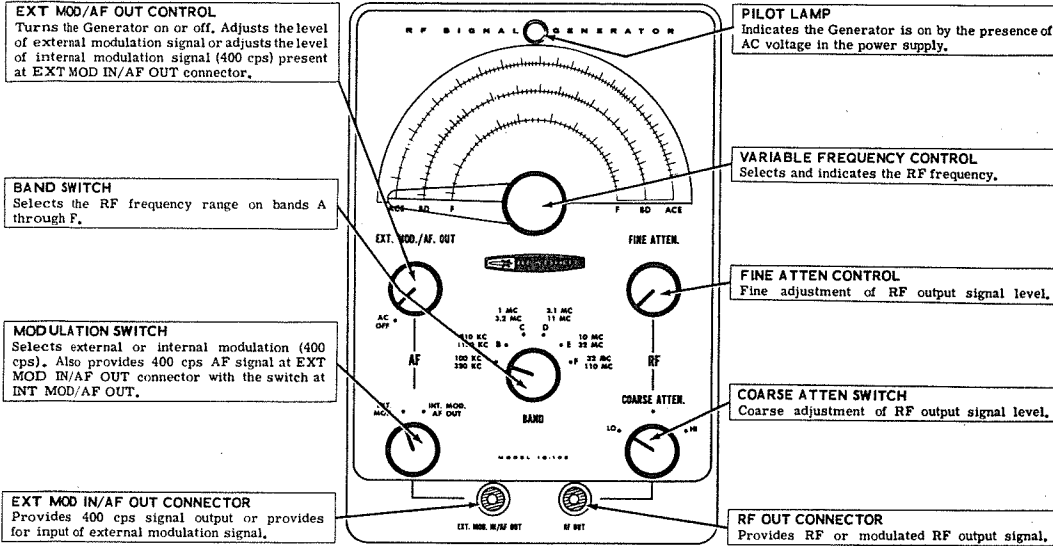


Figure 2

OPERATION

Figure 2 explains the basic functions of the front panel controls. A detailed explanation of how to read the dial scale, and the use of some front panel controls, is given in the following paragraphs.

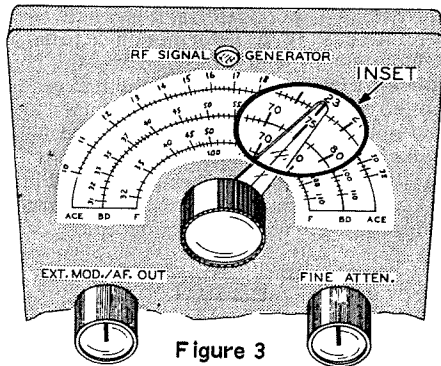
DIAL SCALE

The RF output frequency of the Generator depends on the number the dial pointer is set to, and the position of the BAND switch. Bands A, C, and E are read on the outside dial scale, bands B and D are read on the center dial scale, and band F is read on the inside dial scale. See Figure 3.

Proceed as follows to read the dial scales. On bands A and B, multiply the number indicated on the dial by 10 to obtain the frequency in kc. On bands C and D, divide the number indicated on the dial by 10 to obtain the frequency in mc. On bands E and F, the dial is read directly in mc. Refer to the inset drawing on Figure 3 and the following table for examples of how to read the dial scale.

| BAND | DIAL READING | FREQUENCY |
|------|---------------------|-----------|
| A | 23 (multiply by 10) | 230 kc |
| B | 75 (multiply by 10) | 750 kc |
| C | 23 (divide by 10) | 2.3 mc |
| D | 75 (divide by 10) | 7.5 mc |
| E | 23 (read direct) | 23 mc |
| F | 77 (read direct) | 77 mc |

The numbers from 100 to 220 on the inside of scale F are calibrated harmonic frequencies of band F. This dial scale, which should be read directly, adds another range of frequencies from 100 mc to 220 mc. The most commonly used IF frequencies for AM and FM radio receivers are indicated with a special mark on the dial; 455 kc (AM) is marked on band B and 10.7 mc (FM) is marked on band E.





GENERAL

When the Modulation switch is turned to INT MOD/AF OUT, a 400 cps audio signal is available at the connector marked EXT MOD IN/AF OUT. With this switch turned to EXT MOD, the

internal 400 cps oscillator is turned off, and the RF signal may be modulated by connecting an external audio signal to the EXT MOD IN/AF OUT connector. An audio signal with a level of about 3 volts is needed for 30% modulation of the RF frequency.

APPLICATIONS

The RF Signal Generator may be used as an RF signal source for the peak alignment of tuned circuits in some FM radios and tuners. More often, though, the sweep alignment method is used to align high quality FM radios and tuners. For sweep alignment, an RF sweep generator is needed and your RF Signal Generator may be used as a marker generator. Whenever possible it is best to follow the detailed instructions from the manufacturer of the FM radio or tuner.

There are many other applications for this Generator which are too numerous to outline in this Manual. However, two basic applications are outlined here under AM Radio Alignment and Signal Injection.

AM RADIO ALIGNMENT

Figure 4 shows a block diagram of a typical AM radio. This diagram includes all of the circuits that must be aligned. The radio speaker or a suitable voltmeter may be used as the output indicator. However, a voltmeter will indicate smaller changes in the output signal and is more desirable.

If a DC voltmeter is used, set it to measure negative DC volts, and connect it to the output of the AVC filter circuit as shown. If an AC voltmeter is used, it may be connected between the two outside lugs of the volume control or across the speaker terminals.

Be sure to use the proper frequency for alignment of the IF transformers. An IF frequency of 455 kc will be used in the following procedure, since it is used in most AM radios. But your

radio may use another IF frequency such as 262 kc or 460 kc. Follow the detailed instructions from the manufacturer of the radio whenever possible.

1. Turn on the radio, RF Signal Generator, and voltmeter if one is used. Allow the equipment to warm up for 15 minutes so that all components will reach normal operating temperature.
2. Turn the AM radio dial to the high frequency end of the dial.
3. Connect the output cable to the connector labeled RF OUT on the Signal Generator.
4. If the radio uses a loop or rod antenna, place the inner or "hot" lead of the output cable near the antenna. If there is no loop or rod antenna, connect the hot lead of the output cable to the antenna terminal and the shield lead to the chassis of the radio.
5. Set the Signal Generator to 455 kc (Band B) and the Modulation switch to the INT MOD/AF OUT position.
6. Use an insulated alignment tool to adjust the IF transformers which are shown in the shaded portions of Figure 4. Start with the last IF transformer (next to the detector stage) and work toward the first; adjust each one for a maximum reading on the voltmeter or the loudest signal from the speaker. At the same time, reduce the Signal Generator output to keep the output of the radio at minimum but still large enough to give an indication on the voltmeter.

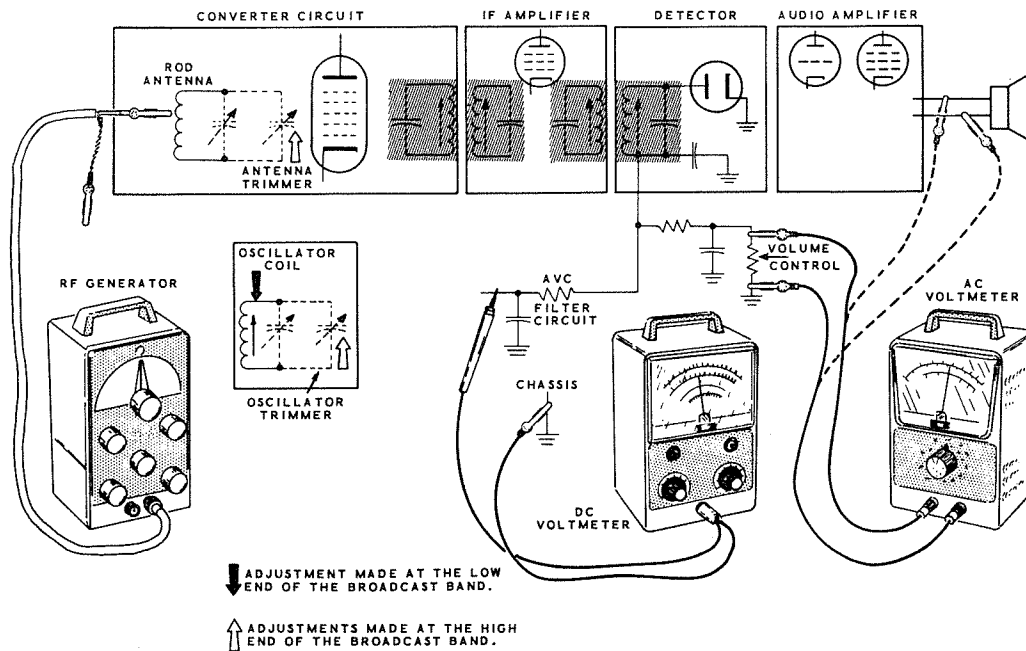


Figure 4

7. Since the IF adjustments affect each other, repeat the adjustments at least once for best results.
8. Set the Signal Generator and radio to 1600 kc. Adjust the oscillator trimmer capacitor (shown by light arrow in Figure 4) for maximum voltage reading.
9. Set the Signal Generator and radio to 1400 kc. Adjust the antenna trimmer capacitor (also shown by light arrow) for maximum voltage reading.
10. Set the Signal Generator to 600 kc and tune the AM radio to 600 kc.
11. Adjust the slug of the oscillator coil (shown by the dark arrow) for maximum reading on the voltmeter. Now tune the radio a slight

amount in either direction so the signal sounds faint or the voltage reading decreases slightly. Again adjust the oscillator coil for maximum voltage, then note whether the voltage is larger or smaller than it was before. Retune the radio a slight amount again, in the same direction if the voltage increased, and in the other direction if the voltage decreased, and adjust the oscillator coil for maximum voltage. Repeat this re-tuning and coil adjustment process until you locate the oscillator coil adjustment that produces the largest reading on the voltmeter.

12. Repeat steps 8 through 11 again because there will be some interaction between the adjustments.

This completes the alignment of the AM radio.

SIGNAL INJECTION

Signal injection is a technique used to troubleshoot weak or dead electronic devices (radio and TV receivers, hi-fi amplifiers, etc.), to find the circuit that is not operating properly. In this method, a signal is coupled into the stages of the defective equipment, one stage at a time, until the defective stage is located.

A coupling capacitor (.05 μ fd) should always be used with the hot lead to keep DC voltages from being connected to the Signal Generator. Also, care should be used so the test signal does not overdrive the stage it is connected to.

For example, this method might be used to find an open coupling capacitor between two amplifier stages. In this case, the signal would be heard when the 400 cps audio signal from the Signal Generator is connected to the control grid of the second tube. This is shown as point G in Figure 5. The signal will not be heard when the Signal Generator is connected to the plate of the first tube (point P).

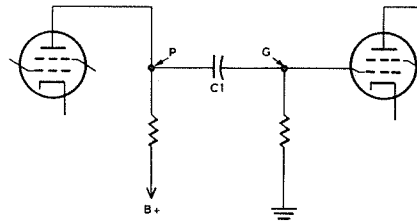


Figure 5

Figure 6 shows how signal injection can be used to find the faulty stage of an AM radio receiver. First the 400 cps audio signal from the Signal Generator is connected to the grid of the output tube, then the hot lead of the Signal Generator is moved back to the audio amplifier tube. If a normal sound is heard from the speaker in both cases, a modulated RF signal would be used to check the remaining stages of the radio. The modulated RF frequencies shown in Figure 6 would be used.

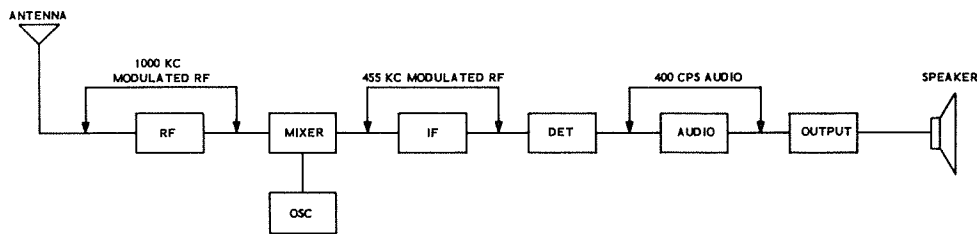


Figure 6

IN CASE OF DIFFICULTY

If your RF Signal Generator does not operate properly after assembly, use the following information to help locate and correct the difficulty. The Troubleshooting Chart on Page 28 will also help you locate the problem.

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 builder.
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 that are known to be good.
5. Check the values of the parts. Be sure 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 suitable meter is available, check voltage readings against those shown on the Schematic (fold-out from Page 35). NOTE: All voltage readings were taken with an 11 megohm input vacuum tube voltmeter. Voltages and resistances may vary as much as 10%.
8. A review of the Circuit Description will prove helpful in indicating where to look for trouble.



TROUBLESHOOTING CHART

| DIFFICULTY | POSSIBLE CAUSE |
|--|---|
| Pilot lamp and tubes do not light. | <ol style="list-style-type: none">1. Open on-off switch.2. Faulty power transformer. |
| No RF output signal. | <ol style="list-style-type: none">1. Check tubes V1 and V2.2. Shorted or open output cable. |
| No modulation present on RF output signal. | <ol style="list-style-type: none">1. Check tube V2.2. Check wiring of tube socket V2.3. Check wiring of modulation switch S3. |
| No B+ voltage. | <ol style="list-style-type: none">1. Check diode D1.2. Check resistor R17, capacitor C25A, and capacitor C25B. |

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.

The tubes should be installed in their respective sockets and the output cable should also be returned with the completed instrument. Be sure that the instrument is properly mounted in the cabinet for additional protection during shipment.

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.

WARRANTY

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



When switch S3 is in the External Modulation position, tube V2A is used to amplify the external modulation signal that is connected to the External Modulation In connector. This signal is coupled through capacitor C11 to control R4, and then to the grid of tube V2A. The signal is then amplified by tube V2A and coupled through capacitor C17 and resistors R7 and R8 to the grid of tube V2B.

AMPLIFIER AND MODULATOR

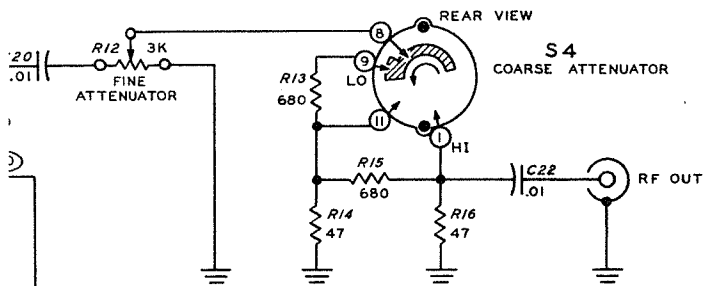
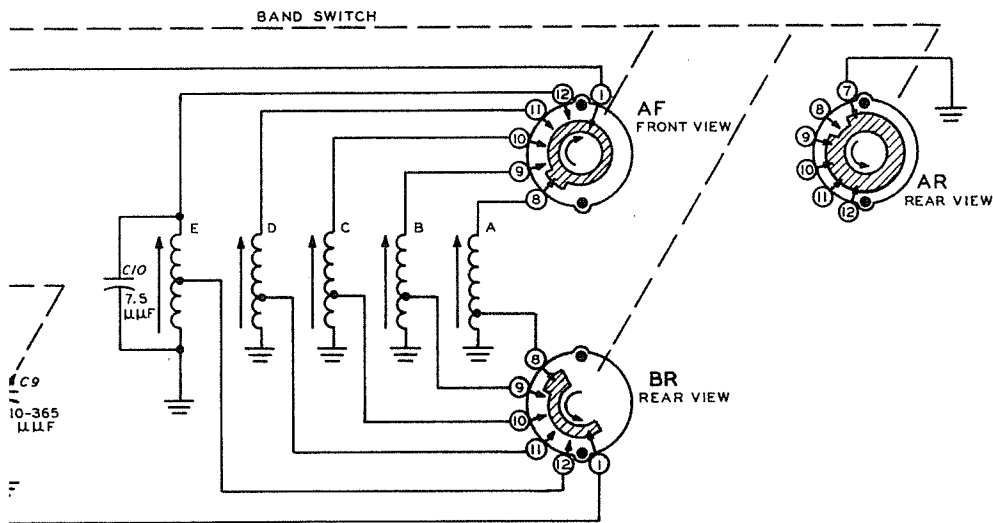
The RF and AF signals are coupled to the grid of tube V2B. Resistors R7 and R9 keep the AF signal from overdriving the grid of tube V2B and also determine the modulation level. From the plate of tube V2B, the modulated

RF signal is coupled through capacitor C20, Fine Attenuator control R12, Coarse Attenuator switch S4, and capacitor C22 to the RF Output connector.

POWER SUPPLY

B+ voltage is supplied to all stages of the Generator by a half-wave rectifier circuit consisting of diode D1. Resistor R17 with capacitors C25A and C25B provide filtering of the B+ voltage.

Filament voltage is supplied to the filaments of all tubes and the #47 lamp by a 6.3 volt AC winding on power transformer T1.



**SCHEMATIC OF THE
HEATHKIT®
RF SIGNAL GENERATOR
MODEL IG-102**

NOTES:

- ALL RESISTORS ARE 1/2 WATT UNLESS MARKED OTHERWISE.
- ALL RESISTOR VALUES ARE IN OHMS (K = 1000).
- ALL CAPACITOR VALUES ARE IN μfd UNLESS MARKED OTHERWISE.
- 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 $\pm 10\%$.
- ALL SWITCHES SHOWN AT FULL COUNTERCLOCKWISE ROTATION, EXCEPT SWITCH S3 WHICH IS AT FULL CLOCKWISE ROTATION.
- TUNING CAPACITOR CLOSED.
- SWITCH LUGS WITH THE SAME NUMBERS ON DECKS AR AND AF ARE CONNECTED TOGETHER (12 TO 12, 11 TO 11, ETC.).
- * VOLTAGE MEASURED WITH BAND SWITCH S2 AT BAND F.
- ** ALL SECTIONS SHOWN HERE ARE VIEWED FROM THE FRONT PANEL: SWITCH SHOWN IN BAND A POSITION.

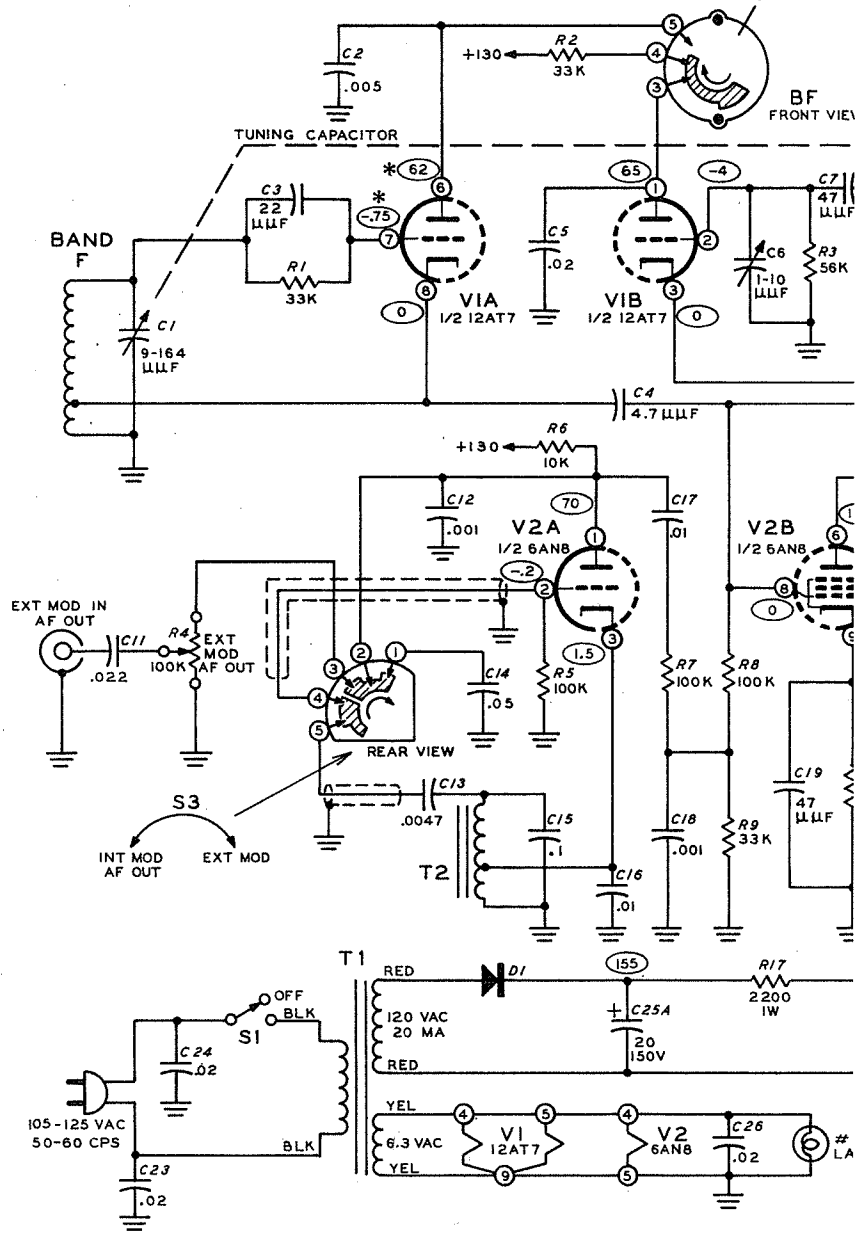
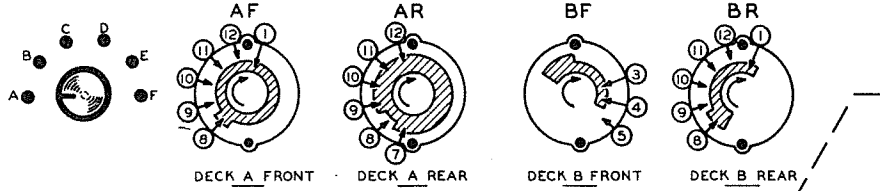
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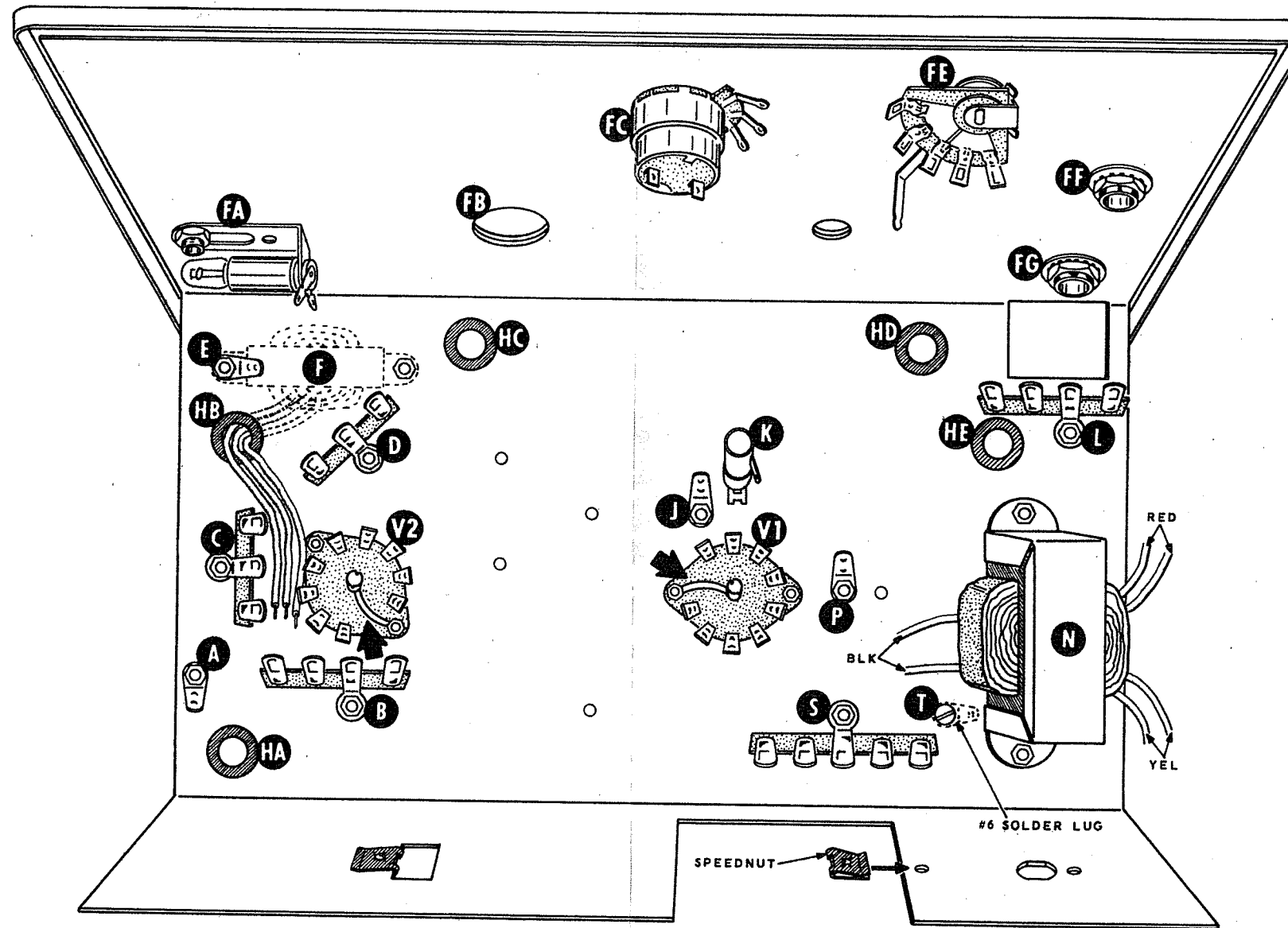
+130

B

V

**** BAND SWITCH S2**





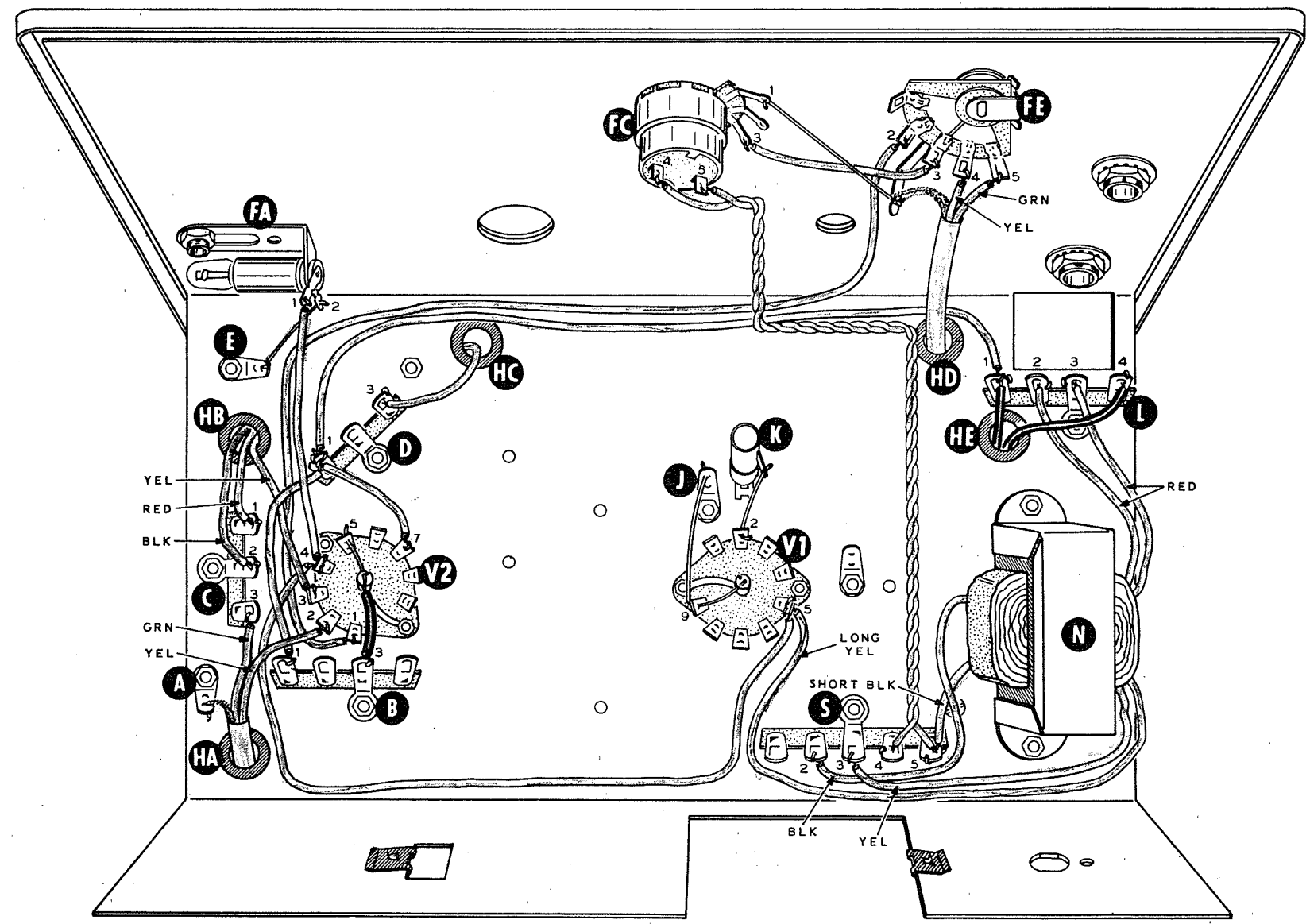
PICTORIAL 1

PRICE \$2.00

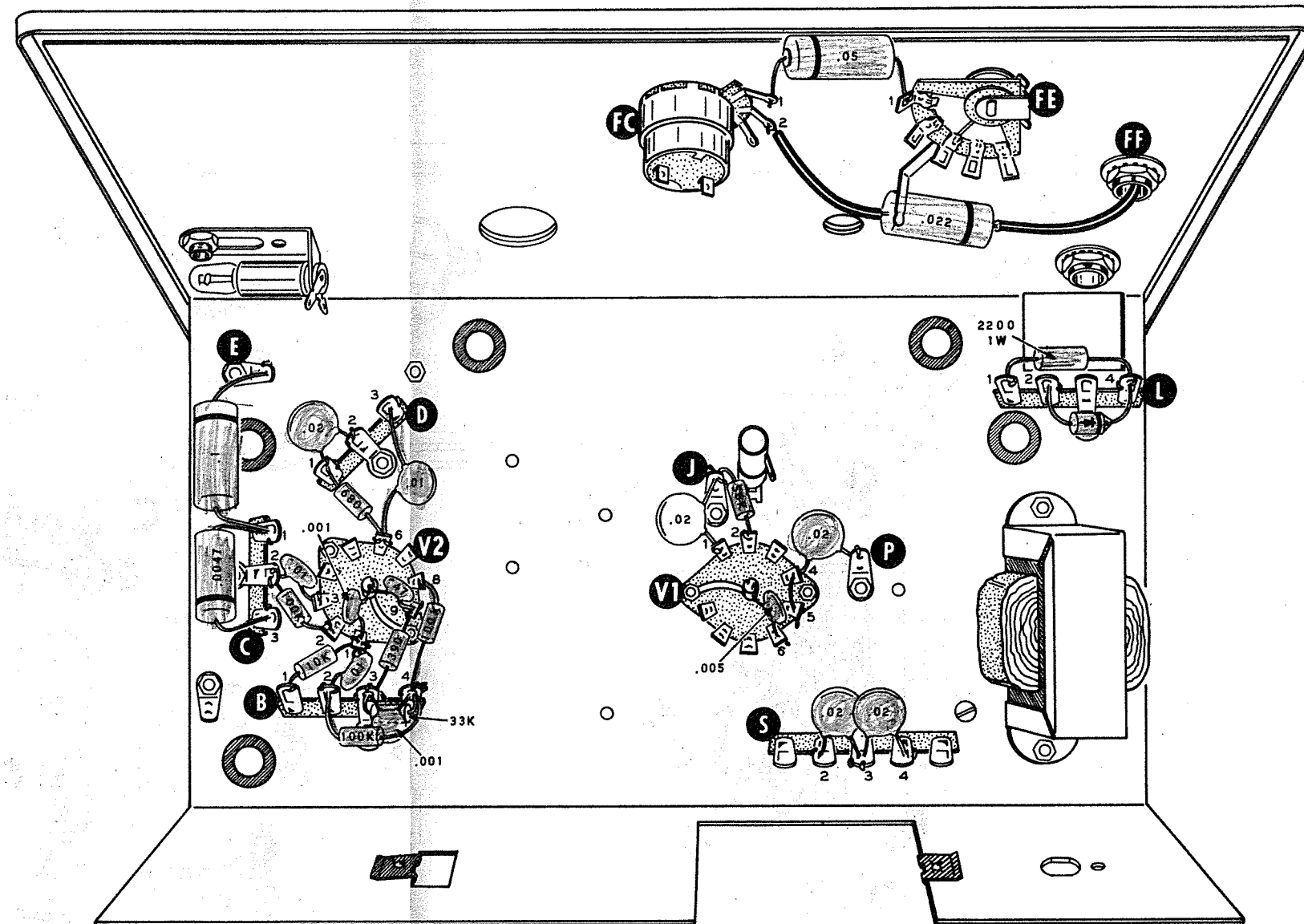
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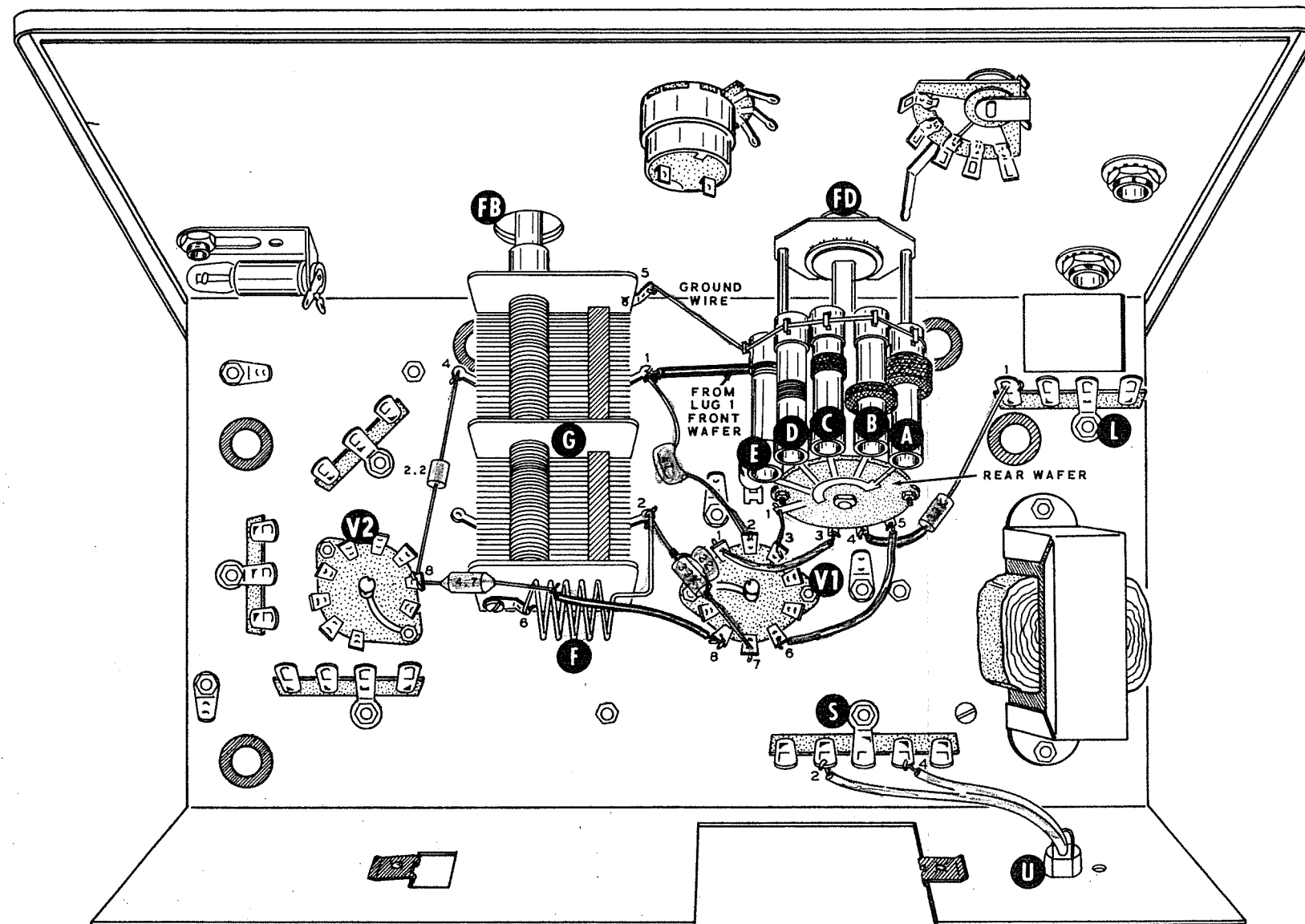
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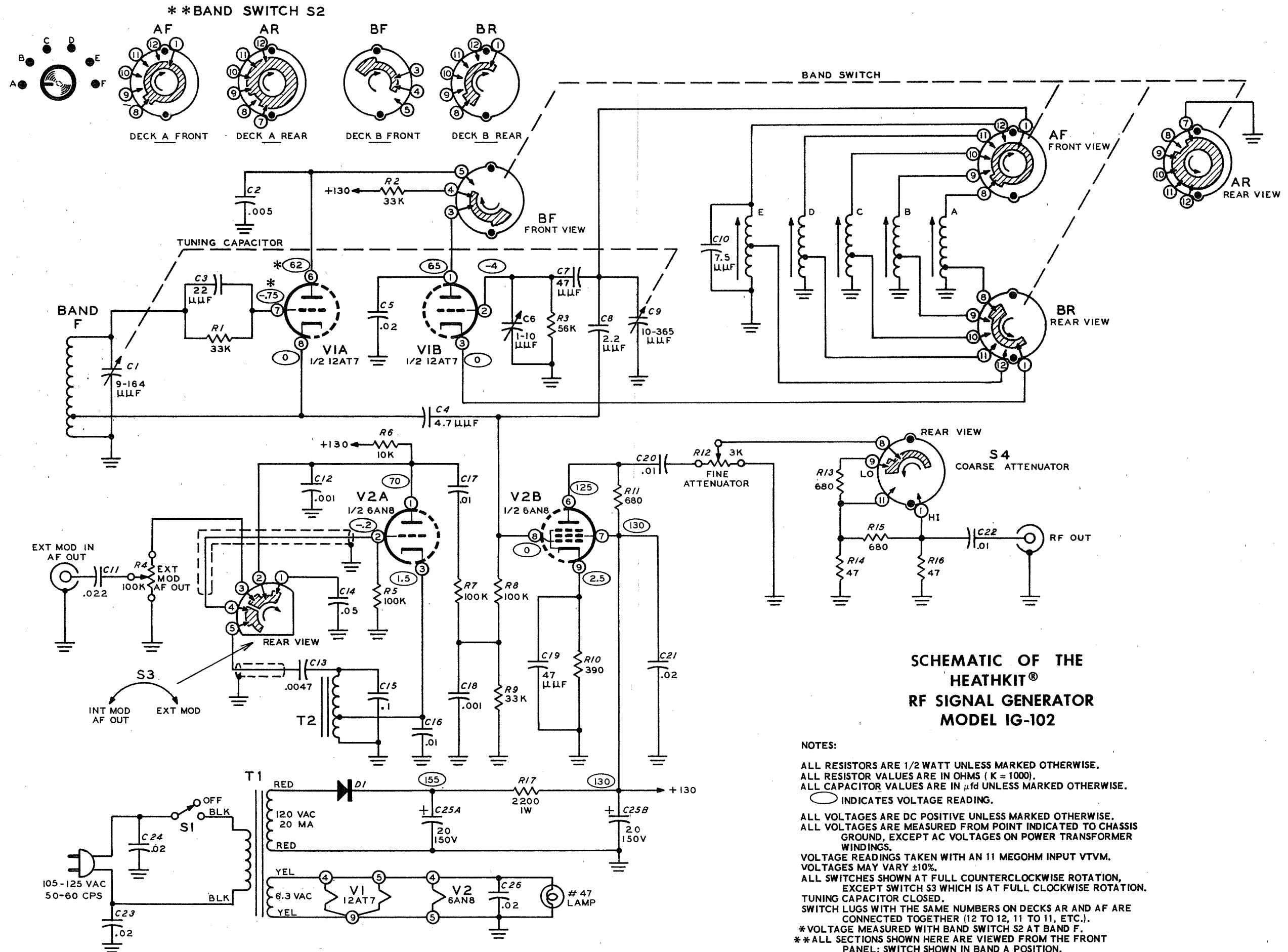
PICTORIAL 3



PICTORIAL 4



PICTORIAL 5



**SCHEMATIC OF THE
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- NOTES:**
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 - ALL VOLTAGES ARE DC POSITIVE UNLESS MARKED OTHERWISE.
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