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Heathkit RF1 Manual

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ASSEMBLY AND OPERATION OF THE HEATHKIT RF SIGNAL GENERATOR MODEL RF-1



SPECIFICATIONS

Frequency Range:

Band A:.....	100 kc to 320 kc.
Band B:.....	310 kc to 1100 kc.
Band C:.....	1 mc to 3.2 mc.
Band D:.....	3.1 mc to 11 mc.
Band E:.....	10 mc to 32 mc.
Band F:.....	32 mc to 110 mc.
Calibrated Harmonics:.....	100 mc to 220 mc.

Accuracy:..... 2%.

Output:

Impedance:.....	50 Ω .
Voltage:.....	In excess of 100,000 μ v on all bands.

Modulation:

Internal:.....	400 cycle, approximately 30% depth.
External:.....	Approximately 3 volts across 50 K Ω for 30%.

400 Cycle Audio Output:..... Approximately 10 volts open circuit.

Tube Complement:..... V1 - 12AT7 - RF oscillator.
V2 - 6AN8 - modulator and RF output.

Power Requirements:..... 105-125 volts 50/60 cycle AC 15 watts.

Aluminum Cabinet Dimensions:..... 6 1/2" wide x 9 1/2" high x 5" deep.

Net Weight:..... 4 1/2 lbs.

Shipping Weight:..... 7 lbs.

INTRODUCTION

The Heathkit RF (radio frequency) Signal Generator Model RF-1 has been designed to provide the service technician, ham and experimenter, with an accurate and stable source of RF signals. A preassembled band switch and coil assembly, aligned to factory precision standards, eliminates the necessity of having costly equipment to calibrate the finished kit. To insure that the maximum performance that is available in this kit be realized, it is suggested that the builder take a few minutes now to read the CIRCUIT DESCRIPTION and CONSTRUCTION NOTES.

CIRCUIT DESCRIPTION

The RF oscillator for Bands A, B, C, D and E consists of one-half of a 12AT7 tube (V1B), the tuning capacitor C12 and the five adjustable Hartley oscillator coils. These coils are supplied as a pre-aligned band switch assembly (SW2). The cathode of the tube is connected to the tap of the coils through switch SW2-BR. Because one end of each coil is grounded, the current from the cathode will excite the coil at resonance. The feedback necessary to maintain oscillation is coupled from the "hot" end of the coil through switch SW2-AF and then through capacitor C8 to the tube grid. Switch SW2-AR shorts out the unused coils to prevent any undesirable suckouts.

The coil for Band F is mounted directly on the tuning capacitor and is permanently connected to the other half of the 12AT7 oscillator tube (V1A). This arrangement eliminates the stray capacities that would be involved in switching and thus provides a more desirable LC ratio. Band switching is accomplished by switching the B+ to Band F through switch SW2-BF.

The triode of a 6AN8 (V2A) is used for the 400 cycle oscillator. A Hartley Oscillator is also used in this circuit but, of course, the coil or reactor is of the iron core type because of the frequency involved. The modulation in-out switch SW3 connects either the plate or the grid through control R6 to the modulation jack. This arrangement enables the 400 cycle output to be amplitude controlled, and also controls the level of external modulation applied to the grid of V2A.

RF signals are coupled to the grid of the 6AN8 output tube (V2B) through capacitors C4 and C11. Modulation is coupled to the grid through capacitor C5, resistors R8 and R9. These components, along with resistor R10, establish the modulation level. The modulated RF signal is then coupled from the plate of V2B through capacitor C25, fine attenuator R13 and the step attenuator switch SW4 to the RF output jack.

The power for the RF-1 is supplied through transformer T1. A conservatively rated silicon diode (D1) is used in a half-wave rectifier circuit to supply the B+ for the generator.

CONSTRUCTION NOTES

This manual is supplied to assist you in every way to complete your kit with the least possible chance for error. While the arrangement shown is probably not the only satisfactory arrangement, nevertheless it is the result of extensive experimentation and trial. If followed carefully, it will result in a stable instrument, operating at a high degree of accuracy and dependability. We suggest that you retain the manual in your files for future reference, both in the use of the instrument 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 charts and other information on the inside covers of your manual to help you identify the components. If some shortage or parts damage is found in checking the Parts List, please read the REPLACEMENT section and supply the information called for therein, and include all inspection slips in your letter to us. Hardware items are counted by weight and there may be a few more or less than the quantity specified. If a few are missing, please obtain them locally if at all possible.

CAUTION: The tuning capacitor supplied with this kit has been specially calibrated. Care must be taken that the plates are not bent or damaged in any way. Always keep the plates fully meshed while constructing the kit.

In order to expedite delivery to you, we are occasionally forced to make minor substitution of parts. Such substitutions are carefully checked before they are approved and parts supplied will work satisfactorily. In checking the Parts List for resistors, for example, you may find that a resistor with a 5% tolerance has been substituted for a resistor with a 10% tolerance, as shown on the Parts List. These changes are self-evident and are mentioned here only to prevent confusion in checking the contents of your kit.

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 -50% are common for electrolytic capacitors.

PROPER SOLDERING TECHNIQUES

Only a small percentage of Heathkit purchasers find it necessary to return an instrument for factory service. Of these instruments, by far the largest proportion of malfunctions are due to poor or improper soldering.

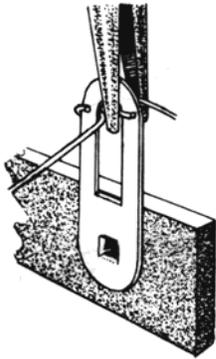
If terminals are bright and clean and free of wax, frayed insulation and other foreign substances, no difficulty will be experienced in soldering. Correctly soldered connections are essential if the performance engineered into a kit is to be fully realized. If you are a beginner with no experience in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

For most wiring, a 30 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 over the joint. Keep the iron tip clean and bright by wiping it from time to time with a cloth.

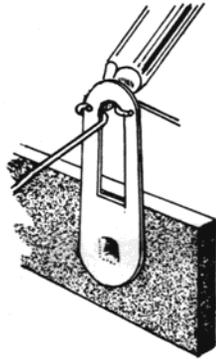
CHASSIS WIRING AND SOLDERING

1. Unless otherwise indicated, all wire used is the type with the colored insulation (hookup wire); the size of the conductor is the same for all colors of hookup wires furnished with your kit. In the case that bare wire is to be covered with insulating sleeving, the phrase "use sleeving" will be used.

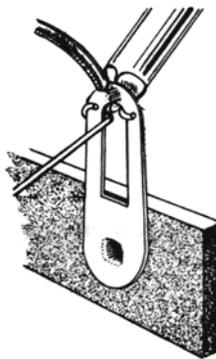
2. Leads on resistors, capacitors and transformers are generally much longer than they need to be to make the indicated connections. In these cases, the excess leads should be cut off before the part is added to the chassis. In general, the leads should be just long enough to reach their terminating points. Wherever there is a possibility of bare leads shorting to other parts or to the chassis, the leads should be covered with insulating sleeving.
3. Crimp or bend the lead (or leads) around the terminal to form a good joint without relying on solder for physical strength. If the wire is too large to allow bending, position the wire so that a good solder connection can still be made.
4. Position the work, if possible, so that gravity will help to keep the solder where you want it.
5. Place a flat side of the soldering iron tip against the joint to be soldered until it is heated sufficiently to melt the solder.
6. Then place the solder against the heated terminal 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.
7. Remove the solder and then the iron from the completed junction. Use care not to move the leads until the solder is solidified.



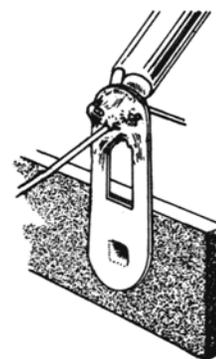
CRIMP WIRES



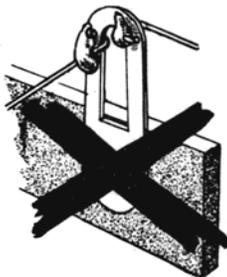
HEAT CONNECTION



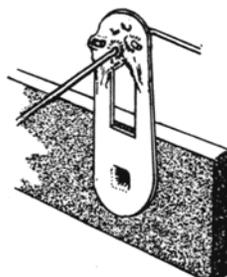
APPLY SOLDER



ALLOW SOLDER TO FLOW



COLD SOLDER JOINT CONNECTION INSUFFICIENTLY HEATED



PROPER SOLDER CONNECTION



COLD SOLDER JOINT CONNECTION MOVED WHILE COOLING

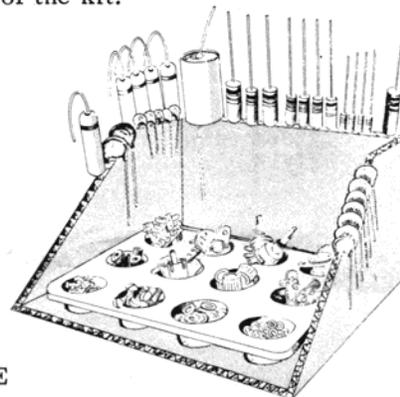
A poor or cold solder joint will usually look crystalline and have a grainy texture, or the solder will stand up in a blob and will not have adhered to the joint. Such joints should be reheated until the solder flows smoothly over the entire junction. In some cases, it may be necessary to add a little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

NOTE: ALL GUARANTEES ARE VOIDED AND WE WILL NOT REPAIR OR SERVICE INSTRUMENTS IN WHICH ACID CORE SOLDER OR PASTE FLUXES HAVE BEEN USED. WHEN IN DOUBT ABOUT SOLDER, IT IS RECOMMENDED THAT A NEW ROLL PLAINLY MARKED "ROSIN CORE RADIO SOLDER" BE PURCHASED.

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

1. Attach the large folded pictorials to the wall above your work bench.
2. Read several steps ahead of the actual step being performed. This will familiarize you with the relationship of the subsequent operations.
3. Lay out all parts so that they are readily available.
4. 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 pen knife or a tool for stripping insulation from wires; a soldering iron (or gun) and rosin core solder. A set of nut drivers and a nut starter, 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.

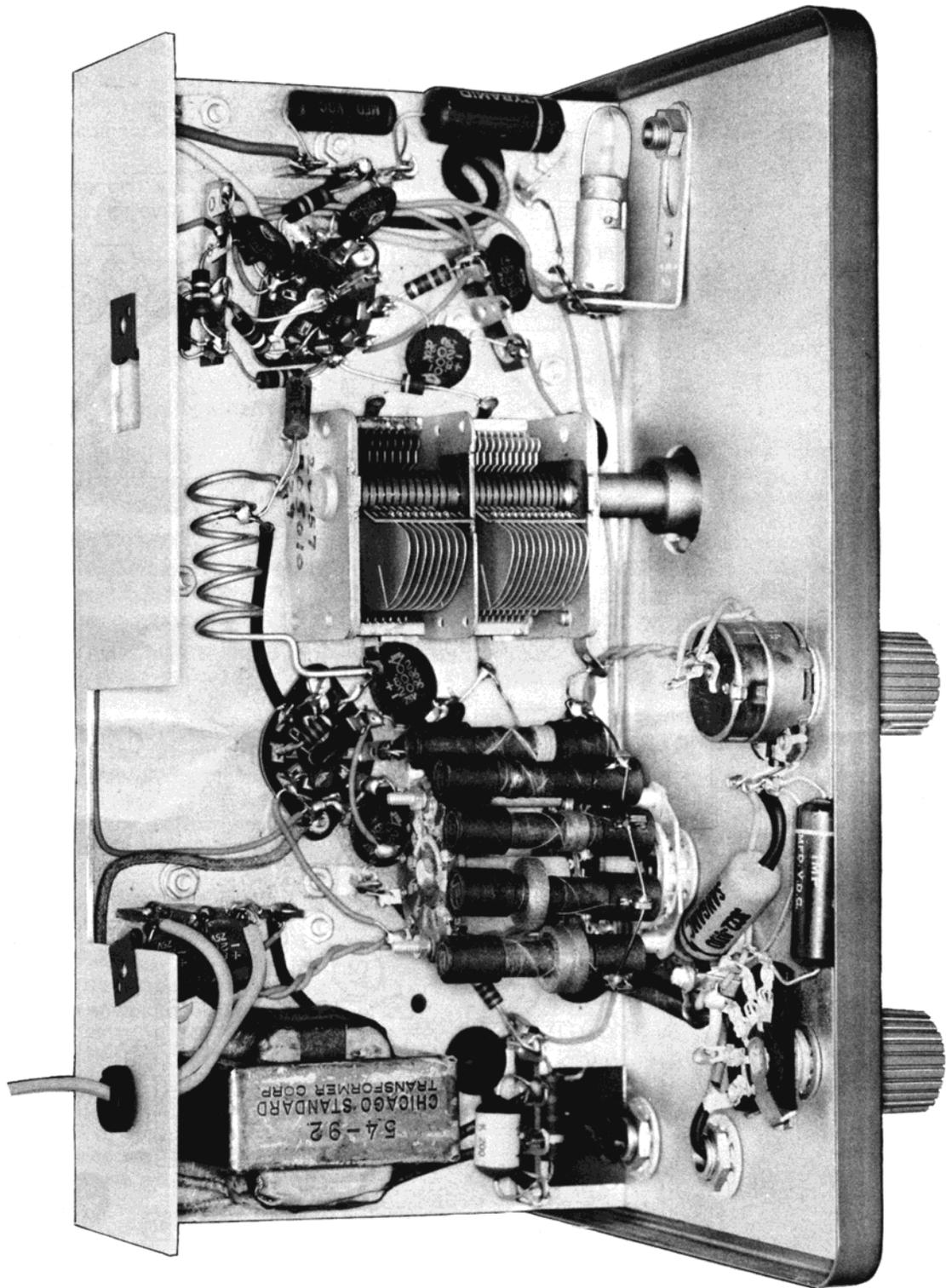


STEP-BY-STEP PROCEDURE

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. 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 lead in colored pencil on the pictorial as it is added.

The abbreviation "NS" indicates that a connection should not be soldered as yet for other wires may need to 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 question before it is soldered. For example, if the instruction reads, "Connect one lead of a 47 K Ω resistor to lug 1 (S-2)," it will be understood that there will be two leads connected to the terminal at the time it is soldered. This additional check will help avoid errors.

NOTE: Because of the RF frequency involved in this instrument it is imperative that all mounting hardware be tightened securely. A loose ground lug, for example, could cause an intermittent frequency change that would be extremely difficult to locate.



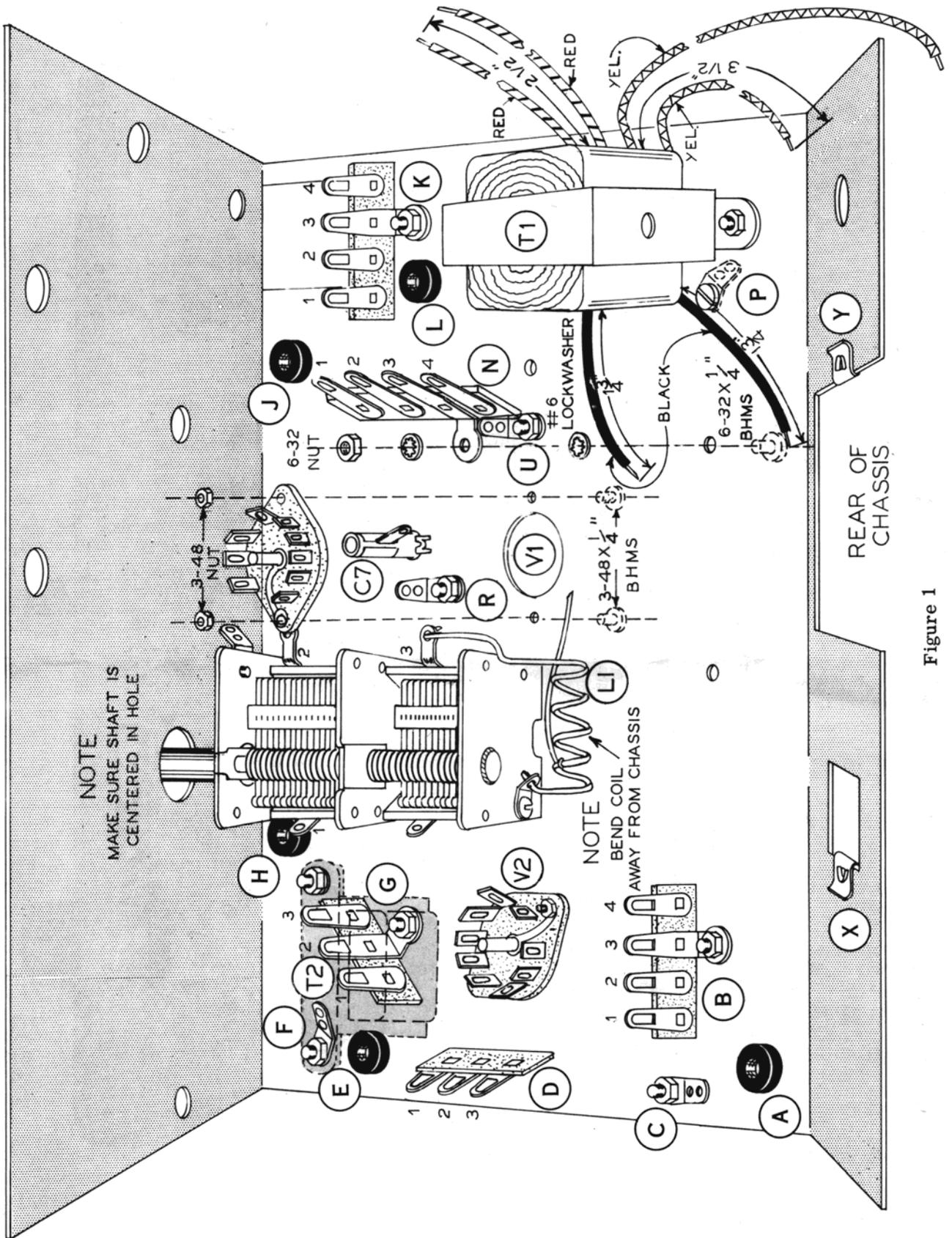


Figure 1

- () Orient the chassis as shown in Figure 1. Install the five rubber grommets A, E, H, J and L.
- () Mount the tube socket V1 as shown in Figures 1 and 2, using 3-48 hardware.
- () In like manner, mount tube socket V2.
- () Install the two speednuts X and Y. The flat side must be toward the outside of the chassis.
- () Mount the 4-lug terminal strip N. Use a 6-32 x 1/4" BHMS, a #6 lockwasher under the mounting foot and another #6 lockwasher under the 6-32 nut.
- () In a similar manner, mount the 4-lug terminal strip B.
- () Mount the 3-lug terminal strip D.
- () Mount the 3-lug terminal strip G.
- () Mount the 4-lug terminal strip K.
- () Using a 6-32 x 1/4" BHMS and nut, mount the ground lug C.
- () Mount transformer (#51-44) T2 on the opposite side of the chassis. At the same time, install ground lug F. Use 6-32 x 1/4" BHMS. The transformer leads should be toward the rear of the chassis. See Figure 9 on Page 18.
- () Install ground lugs R and U.
- () Install ground lug P on the opposite side of the chassis.
- () Push the trimmer capacitor C7 through its mounting hole until the spring snaps open on the opposite side of the chassis.
- () Cut one of the yellow leads of the power transformer (#54-92) to a length of 3 1/2", the two red leads to 2 1/2" and the two black leads to 1 3/4".
- () Strip approximately 1/4" of the insulation from the ends of the leads and tin. Mount the transformer, using 6-32 hardware.



Start SPEEDNUT over edge of metal.



Push into position with thumb, snapping extrusion on lower leg of SPEEDNUT into screw hole.

NOTE: Keep the plates of the tuning gang fully meshed during construction.

- () Prepare the tuning gang as shown in Figure 2 and mount the assembly on the chassis using three short 6-32 RHMS with lockwashers under the heads.

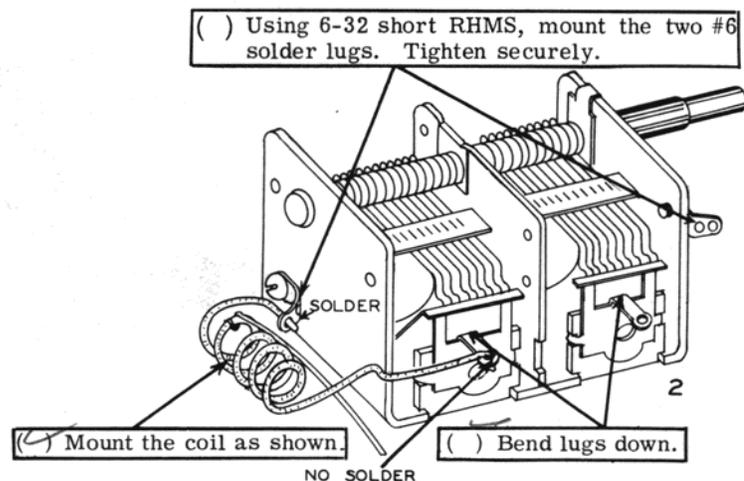


Figure 2

