PRICE $1.00

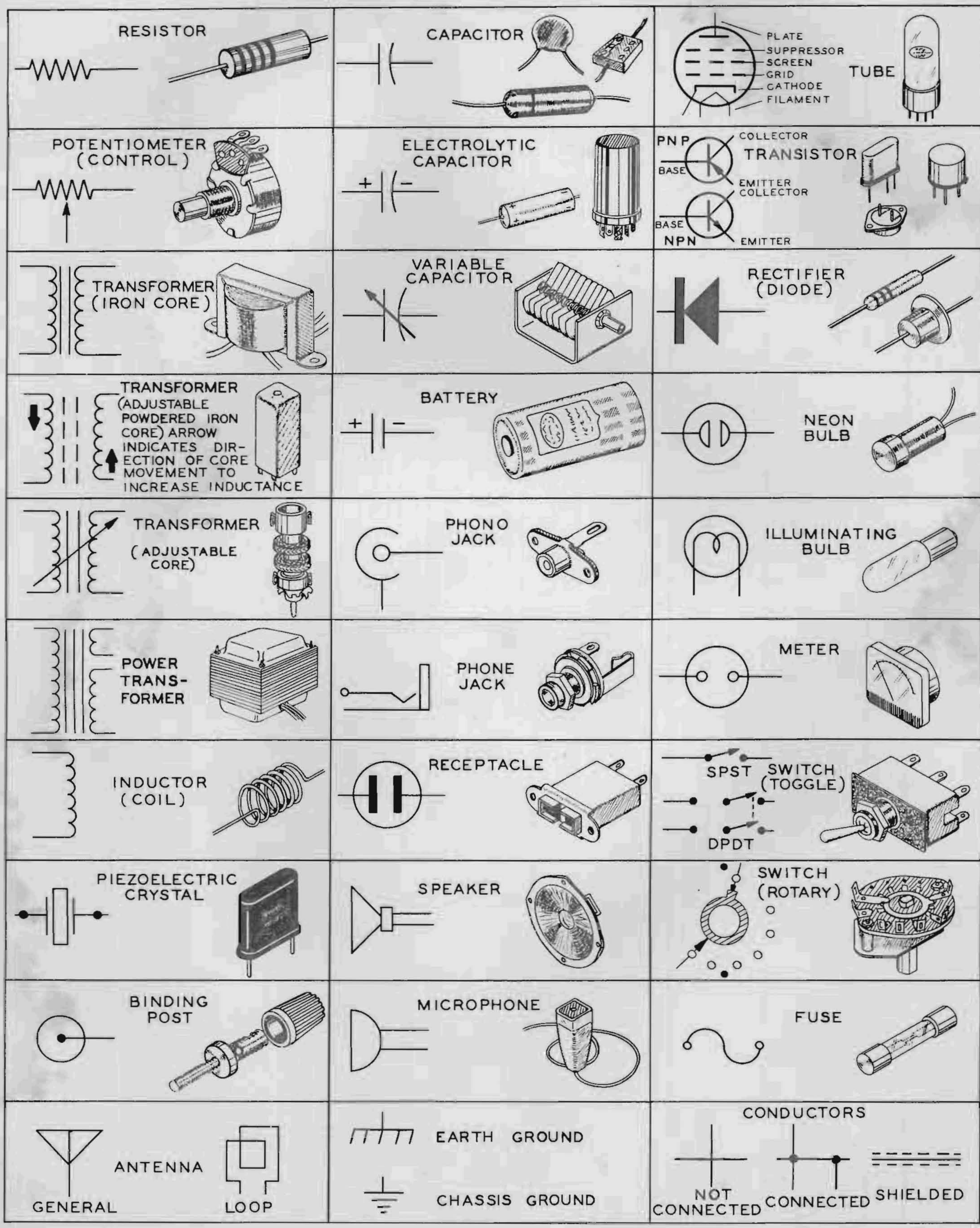
# HEATHKIT®
# ASSEMBLY MANUAL

HEATHKIT

## Q MULTIPLIER
MODEL GD-125

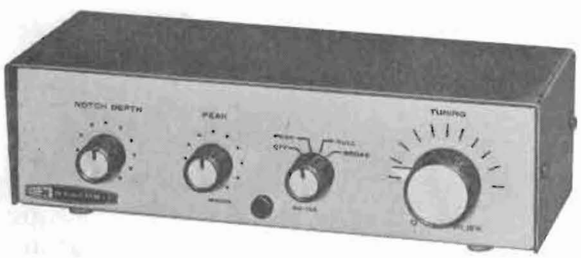
## TYPICAL COMPONENT TYPES

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.



# Assembly and Operation of the HEATHKIT Q MULTIPLIER

## MODEL GD-125




HEATH COMPANY,
BENTON HARBOR,
MICHIGAN

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# INTRODUCTION

The Heathkit Model GD-125 Q Multiplier is used with communications receivers to provide additional selectivity and signal rejection. Because its peak or null effect can be tuned across the receiver IF bandpass, the operation of the Q Multiplier is more flexible than that of a fixed frequency IF filter.

The Q Multiplier may also be used with a receiver which already has an IF filter, to obtain two simultaneous functions. For example, the IF filter could be set to peak the desired signal and the Q Multiplier used to null an adjacent signal.

When properly connected and adjusted, the Q Multiplier will not decrease receiver sensitivity.

In the peak function, an audible gain will be noted on CW signals, and a carrier gain will be noted on the S meter for phone signals. However, the audio will be attenuated slightly due to narrowing of the received sidebands.

The reduced sideband reception will tend to attenuate the higher audio frequencies. This is more than compensated for by the increased readability against the surrounding QRM.

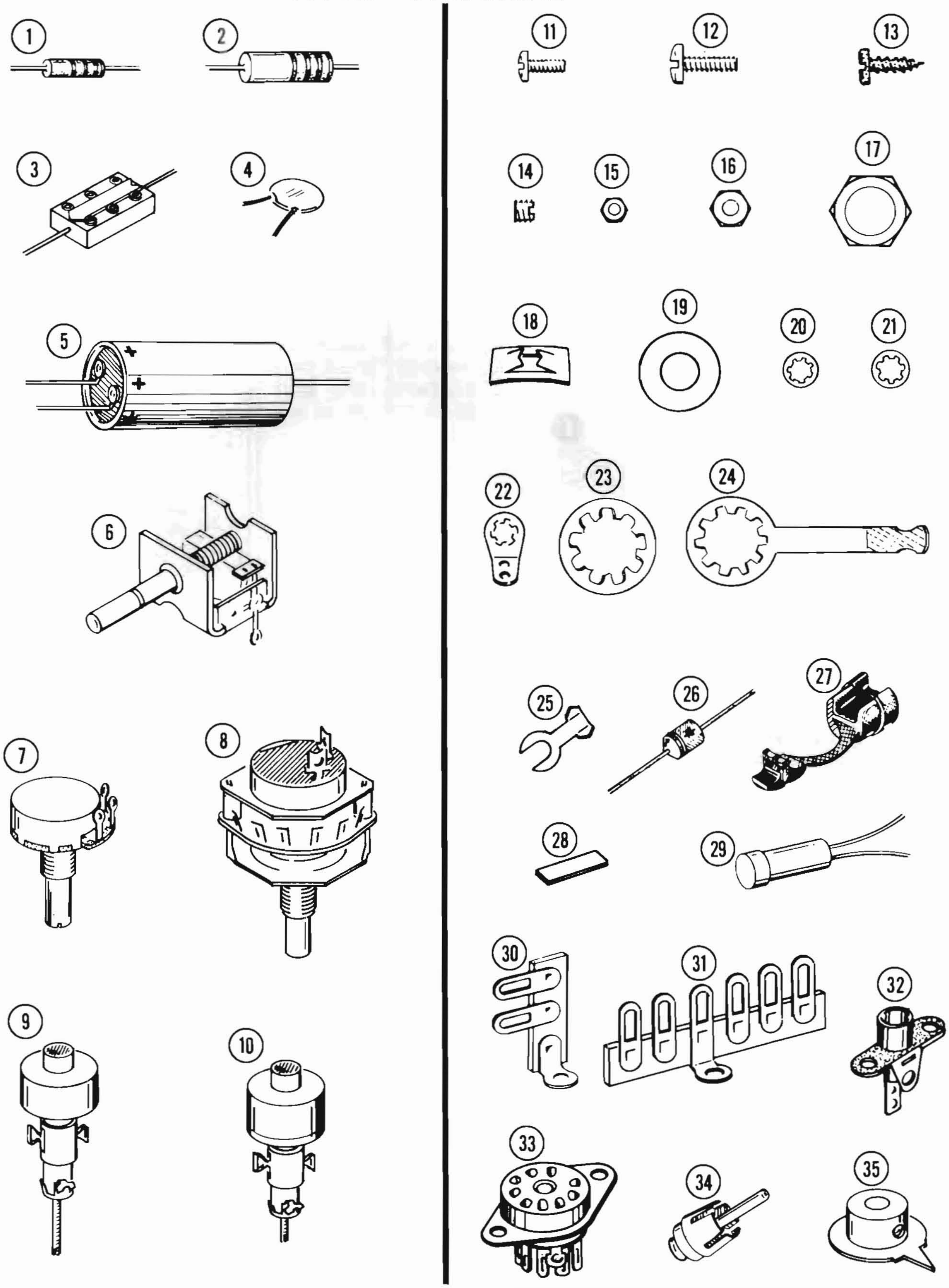
NOTE: Refer to the "Kit Builders Guide" for complete information on unpacking, parts identification, tools, wiring, soldering, and step-by-step assembly procedures.

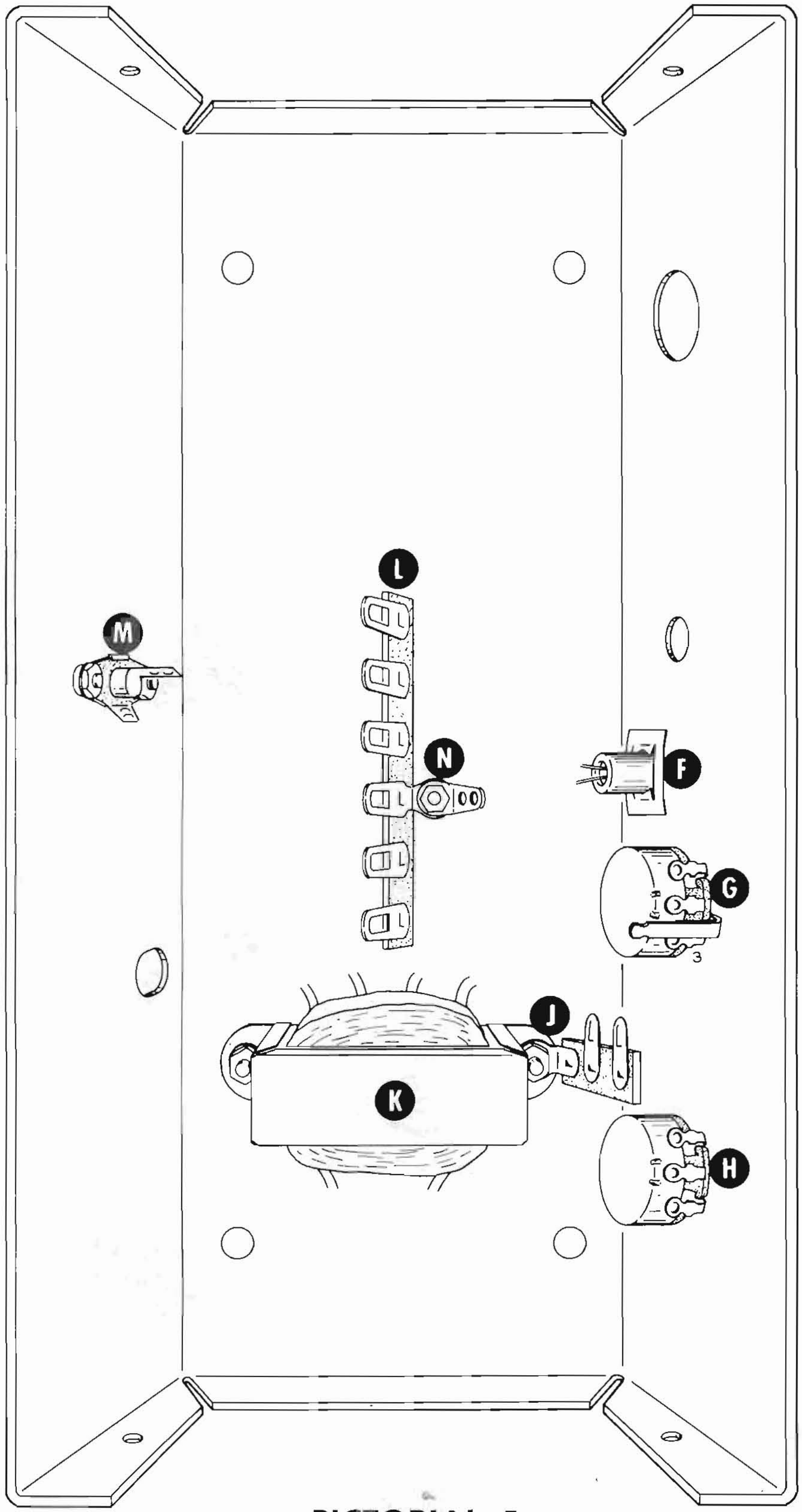
# PARTS LIST

The numbers in parentheses are keyed to the numbers on the Parts Pictorial (fold-out from Page 3). The instructions in the Kit Builders Guide show you how to identify resistors and capacitors.

| PART No. | PARTS Per Kit | DESCRIPTION |
|---|---|---|
| **RESISTORS** | | |
| **1/2 Watt** | | |
| (1) 1-9 | 1 | 1000 Ω (brown-black-red) |
| 1-11 | 1 | 1500 Ω (brown-green-red) |
| 1-13 | 2 | 2700 Ω (red-violet-red) |
| 1-19 | 1 | 5600 Ω (green-blue-red) |
| 1-23 | 1 | 27 KΩ (red-violet-orange) |
| 1-25 | 1 | 47 KΩ (yellow-violet-orange) |
| 1-26 | 1 | 100 KΩ (brown-black-yellow) |
| 1-29 | 1 | 220 KΩ (red-red-yellow) |
| 1-37 | 2 | 2.2 megohm (red-red-green) |
| **1 Watt** | | |
| (2) 1A-7 | 1 | 47 KΩ (yellow-violet-orange) |
| **CAPACITORS** | | |
| (3) 20-42 | 1 | 510 μμf mica |
| 20-53 | 1 | .0011 μfd mica (1100 μμf) |
| 20-54 | 1 | .0033 μfd mica (3300 μμf) |
| (4) 21-27 | 4 | .005 μfd disc |
| (5) 25-80 | 1 | 20-20 μfd electrolytic |
| (6) 26-28 | 1 | 100 μμf variable |
| **CONTROLS-SWITCH-TRANSFORMER-COILS** | | |
| (7) 10-7 | 2 | 5000 Ω control |
| (8) 63-288 | 1 | 4-position rotary switch |
| 54-2 | 1 | Power transformer |
| (9) 40-67 | 1 | 1.5 - 3.0 mh coil |
| (10) 40-68 | 1 | 120-150 μh coil |
| **HARDWARE** | | |
| (11) 250-52 | 6 | 4-40 x 1/4" screw |
| (12) 250-89 | 5 | 6-32 x 3/8" screw |
| (13) 250-155 | 4 | #6 sheet metal screw |
| (14) 250-15 | 1 | 8-32 setscrew |
| **Hardware (cont'd.)** | | |
| (15) 252-15 | 2 | 4-40 nut |
| (16) 252-3 | 5 | 6-32 nut |
| (17) 252-7 | 3 | Control nut |
| (18) 252-9 | 1 | Push-on speednut |
| (19) 253-10 | 3 | Control flat washer |
| (20) 254-9 | 6 | #4 lockwasher |
| (21) 254-1 | 7 | #6 lockwasher |
| (22) 259-1 | 1 | #6 solder lug |
| (23) 254-4 | 2 | Control lockwasher |
| (24) 259-10 | 1 | Control solder lug |
| (25) 259-11 | 2 | Spade lug |
| **WIRE-SLEEVING** | | |
| 89-1 | 1 | Line cord |
| 343-2 | 1 | Coaxial cable |
| 344-59 | 1 | Hookup wire |
| 346-1 | 1 | Sleeving |
| **MISCELLANEOUS** | | |
| (26) 57-27 | 1 | Silicon diode, 750 ma, 500 PIV |
| (27) 75-24 | 1 | Line cord strain relief |
| (28) 205-254 | 1 | Alignment tool blade |
| 261-4 | 4 | Rubber feet |
| 411-26 | 1 | 12AX7 tube |
| (29) 412-13 | 1 | Neon lamp |
| (30) 431-51 | 1 | 2-lug terminal strip |
| (31) 431-55 | 1 | 6-lug terminal strip |
| (32) 434-42 | 1 | Phono socket |
| (33) 434-56 | 1 | 9-pin tube socket |
| (34) 438-4 | 2 | Phono plug |
| 462-140 | 1 | Knob (large) |
| 462-159 | 3 | Knob (small) |
| (35) 100-M357 | 1 | Pointer assembly |
| 90-M331F | 1 | Cabinet top shell |
| 90-M330P262 | 1 | Cabinet base |
| 200-M453 | 1 | Chassis |
| 490-5 | 1 | Nut starter |
| 331-6 | | Solder |
| 597-308 | 1 | Kit Builders Guide |
| 595-775 | 1 | Manual |
| | 1 | Identification label |

# PARTS PICTORIAL






PICTORIAL 5

# STEP-BY-STEP ASSEMBLY

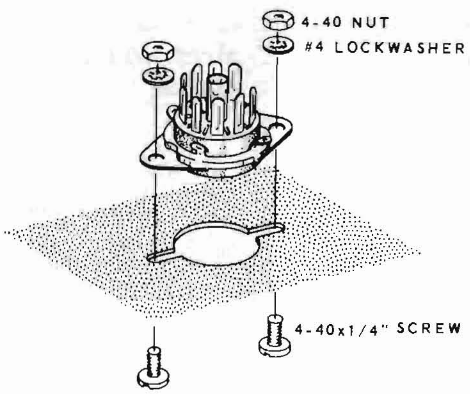
Before starting to assemble this kit, read the Kit Builders Guide for complete information on wiring, soldering, and Step-By-Step Assembly procedures.

## CHASSIS ASSEMBLY

Refer to Pictorial 1 for the following steps.

(✓) Locate the chassis and position it as shown.

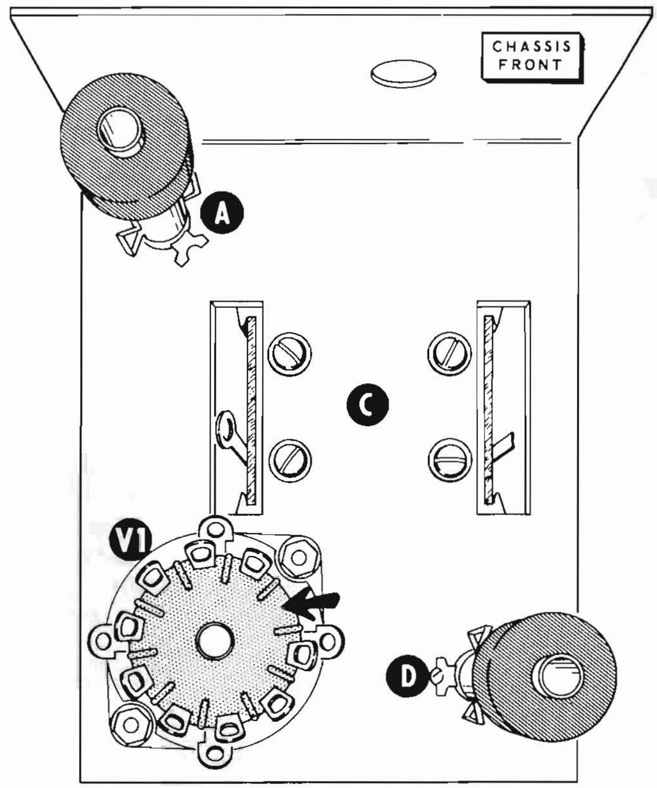
(✓) Refer to Detail 1A and mount the 9-pin tube socket at V1 with 4-40 x 1/4" screws, #4 lockwashers, and 4-40 nuts. Position the blank space as shown by the arrow on Pictorial 1.



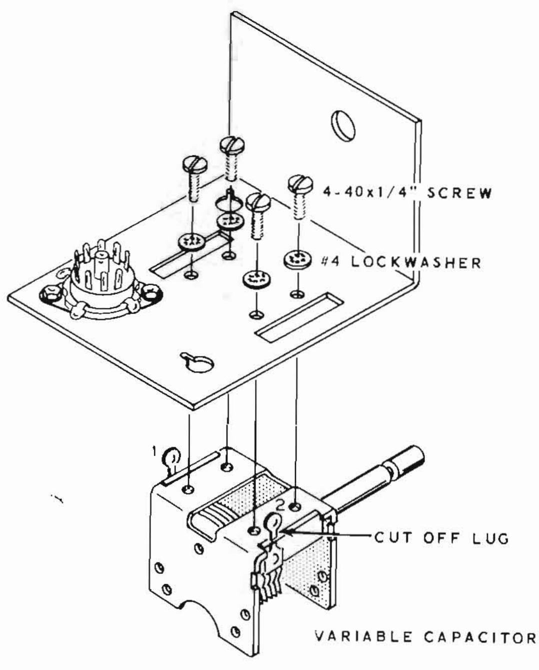

Detail 1A

(✓) Locate the 100 $\mu\mu f$ variable capacitor and clip off lug 2 as shown in Detail 1B.

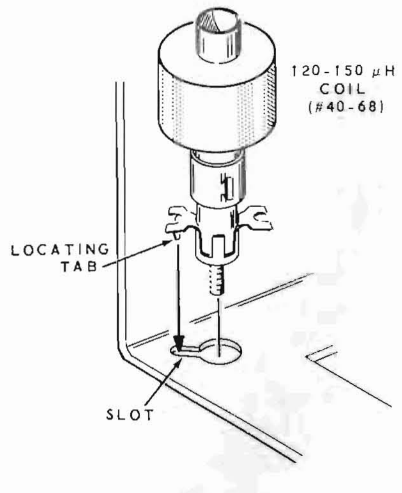
(✓) Refer to Detail 1B and mount the 100 $\mu\mu f$ variable capacitor at C with four 4-40 x 1/4" screws and #4 lockwashers.




PICTORIAL 1




Detail 1B




**Detail 1C**

( ✓) Refer to Detail 1C and mount the 120-150 μh coil (#40-68) at A. Place the locating tab on the coil mounting clip into the slot in the mounting hole.

( ✓) Mount the 1.5-3.0 mh coil (#40-67) at D.

Refer to Pictorial 2 for the following steps.

( ✓) Connect a .0011 μfd (1100 μμf) mica capacitor from lug 1 of coil A (NS) to ground lug B on tube socket V1 (NS).

( ✓) Connect a .005 μfd disc capacitor from lug 1 of coil D (S-1) to ground lug C on tube socket V1 (NS).

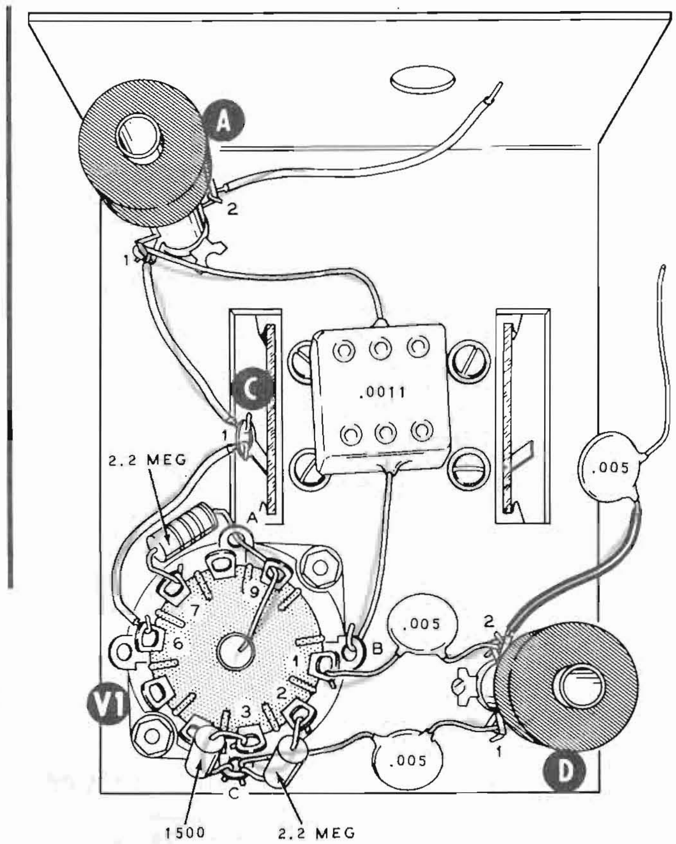
( ✓) Connect a 1500 Ω (brown-green-red) resistor from lug 3 (S-1) to ground lug C (NS) of tube socket V1.

( ✓) Connect a 2.2 megohm (red-red-green) resistor from lug 2 (NS) to ground lug C (S-3) of tube socket V1.

( ✓) Connect a .005 μfd from lug 2 of coil D (NS) to lug 1 of tube socket V1 (NS).

( ✓) Place a 1-1/4" length of sleeving over one lead of a .005 μfd capacitor. Connect this lead to lug 2 of coil D (NS). Leave the other lead free. It will be connected later.

( ✓) Connect a 1-1/2" wire from lug 6 of tube socket V1 (S-1) to lug 1 of variable capacitor C (NS).




**PICTORIAL 2**

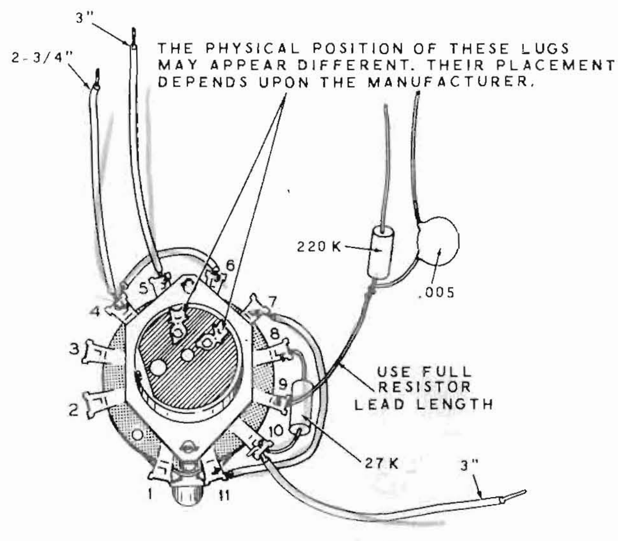
( ✓) Connect a 1-1/2" wire from lug 1 of variable capacitor C (S-2) to lug 1 of coil A (S-2).

( ✓) Connect one end of a 2-1/4" wire to lug 2 of coil A (S-1). Leave the other end free. It will be connected later.

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

( ✓) Place one lead of a 2.2 megohm (red-red-green) resistor through ground lug A (S-2), through lug 9 (S-2), to the center post (S-1) of tube socket V1. Connect the other lead to lug 7 of V1 (NS).

( ) Set the chassis aside temporarily.




PICTORIAL 3

## FUNCTION SWITCH WIRING

Refer to Pictorial 3 for the following steps.

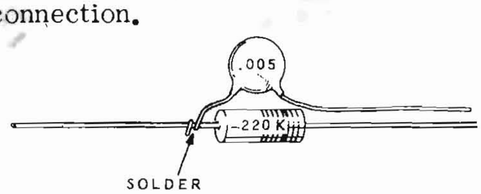
( ) Position the 4-position rotary switch as shown in Pictorial 3.

(✓) Connect a 27 KΩ (red-violet-orange) resistor between lugs 8 (S-1) and 10 (NS) of the switch.

(✓) Connect one end of a 3" wire to lug 10 of the switch (S-2). Leave the other end free. It will be connected later.

(✓) Connect a 2" wire between lugs 11 (NS) and 7 (NS) of the switch.

(✓) Refer to Detail 3A and prepare a 220 KΩ (red-red-yellow) resistor and .005 μfd disc capacitor combination. Do not cut either resistor lead. The soldered capacitor lead should be cut off even with the solder connection.




Detail 3A

(✓) Connect the lead extending from the prepared end of the combination to lug 9 of the switch (S-1). Leave the other leads free. They will be connected later.

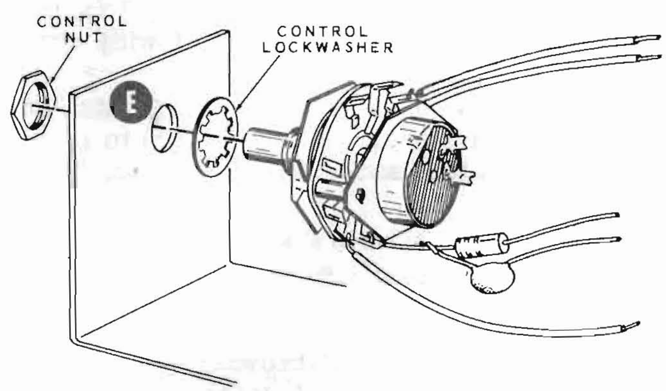
(✓) Connect a 1-1/4" wire between lugs 6 (S-1) and 4 (NS) of the switch.

(✓) Connect one end of a 2-3/4" wire to lug 4 of the switch (S-2). Leave the other end free. It will be connected later.

(✓) Connect one end of a 3" wire to lug 5 of the switch (S-1). Leave the other end free. It will be connected later.

Refer to Pictorial 4 for the following steps.

(✓) Refer to Detail 4A and install the Function switch at E on the chassis with a control lockwasher and a control nut. Position the lugs as shown in Pictorial 4. Tighten the nut only enough to hold the switch in place. The nut will have to be removed later.

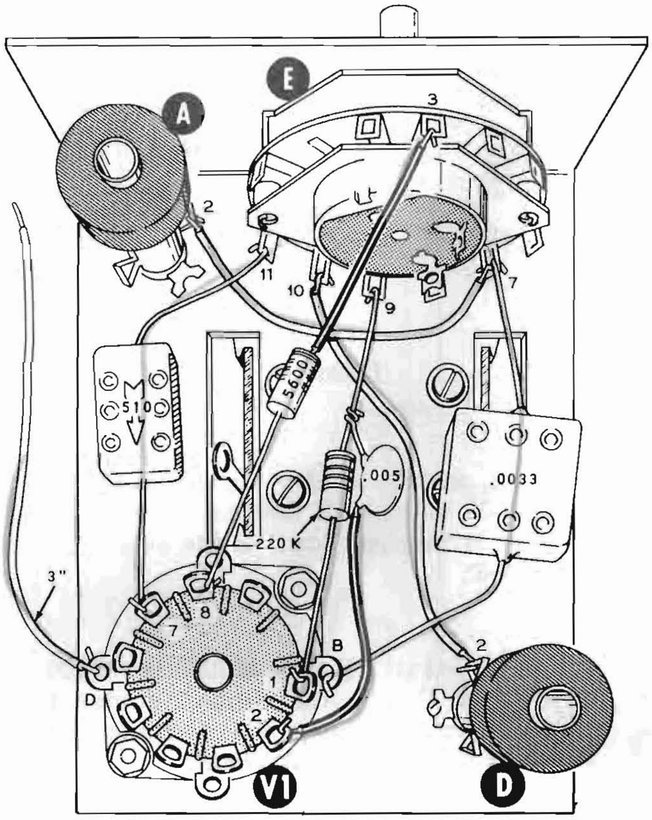



Detail 4A

(✓) Connect the free end of the wire extending from lug 10 of switch E to lug 2 of coil D (S-3).

(✓) Connect a 510 μμf mica capacitor from lug 11 of switch E (NS) to lug 7 of tube socket V1 (S-2).

(✓) Connect the free end of the wire extending from lug 2 of coil A to lug 7 of switch E (NS).




PICTORIAL 4

(✓) Connect a .0033 μfd (3300 μμf) mica capacitor from lug 7 of switch E (S-3) to ground lug B on tube socket V1 (S-2).

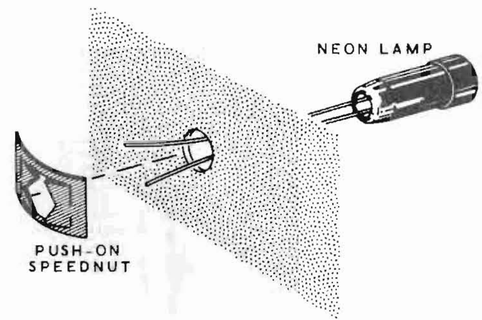
(✓) Place a 1" length of sleeving on one lead of a 5600 Ω (green-blue-red) resistor. Connect this lead to lug 3 of switch E (S-1), and connect the other lead to lug 8 of tube socket V1 (S-1).

(✓) Connect the free resistor lead of the resistor-capacitor combination extending from lug 9 of switch E to lug 1 of tube socket V1 (S-2).

(✓) Connect the free capacitor lead of this combination to lug 2 of tube socket V1 (S-2). Use sleeving on the capacitor lead.

( ) Connect one end of a 3" wire to ground lug D on tube socket V1 (S-1). Leave the other end free. It will be connected later.

( ) Set the chassis aside temporarily.



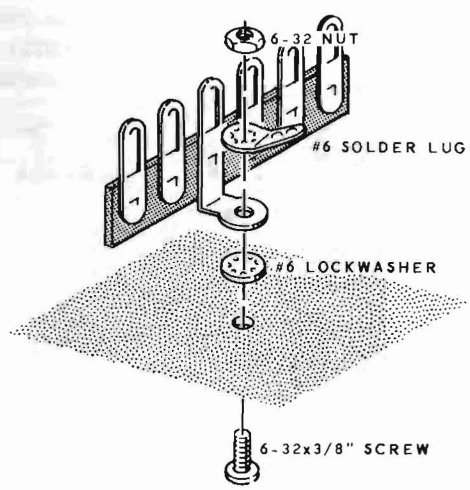

Detail 5A

Refer to Pictorial 5 for the following steps.

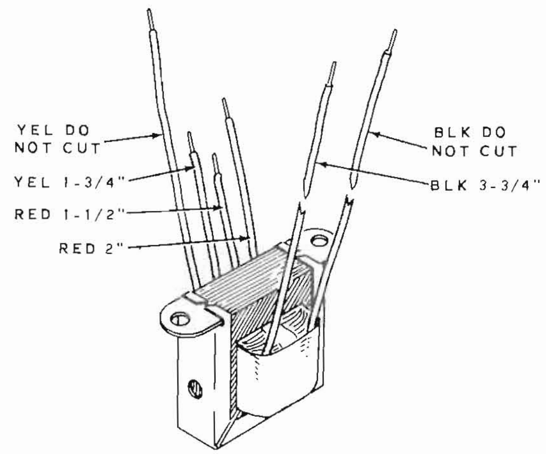
(✓) Position the cabinet base as shown in Pictorial 5.

(✓) Refer to Detail 5A and install the neon lamp at F. Use a push-on speednut.

( ) Refer to Detail 5B and mount the 6-lug terminal strip at L with a 6-32 x 3/8" screw, a #6 lockwasher, a #6 solder lug, and a 6-32 nut.




Detail 5B

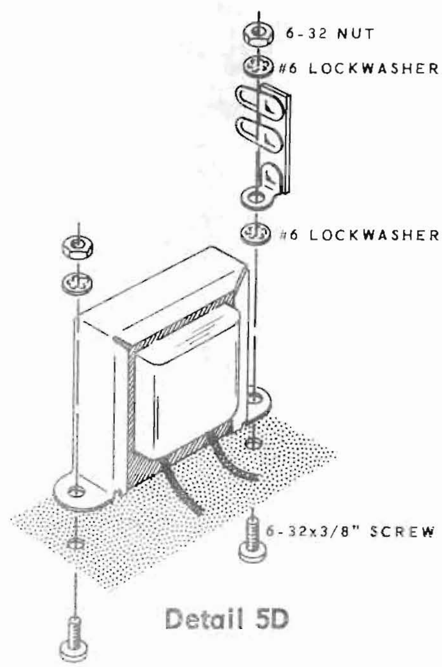



Detail 5C

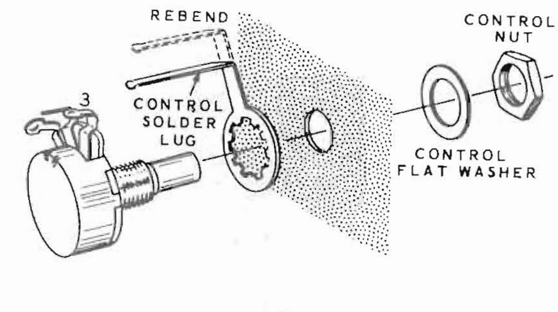
( ✓) Cut the power transformer leads to the length shown in Detail 5C. Measure each lead from the point where it leaves the transformer.

( ✓) Remove 1/4" of insulation from the end of each power transformer lead. If the wires are not presoldered, melt a small amount of solder on each bared lead end to hold the wire strands together.

( ✓) Mount the power transformer at K, with the 2-lug vertical terminal strip on the mounting screw at J. Use 6-32 x 3/8" screws, #6 lockwashers, and 6-32 nuts as shown in Detail 5D. Position the power transformer so the leads are as shown in Pictorial 5.




Detail 5D



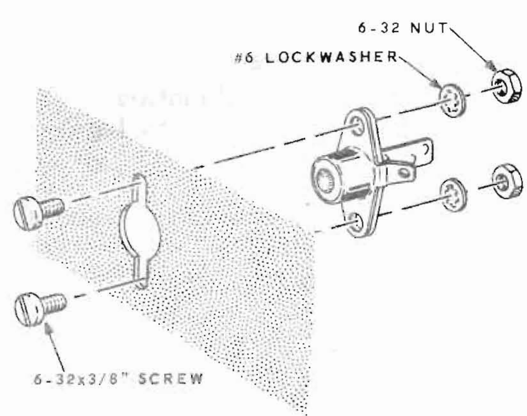

Detail 5E

( ✓) Place a control solder lug on the bushing of a 5000 Ω control. Rebend the solder lug so that it touches lug 3 of the control. See Detail 5E.

( ✓) Refer to Detail 5E and mount the 5000 Ω control at G with the control solder lug, control flat washer, and a control nut. Position the solder lug and control lugs as shown in Pictorial 5.

( ✓) Mount a 5000 Ω control at H with a control lockwasher, control flat washer, and a control nut. Position the control lugs as shown.

( ✓) Refer to Detail 5F and mount the phono socket at M with 6-32 x 3/8" screws, #6 lockwashers, and 6-32 nuts.




Detail 5F

Refer to Pictorial 6 for the following steps.

(✓) Connect the short red power transformer lead to solder lug N (NS).

(✓) Connect the short yellow power transformer lead to solder lug N (NS).

(✓) Connect the short black power transformer lead to lug 6 of terminal strip L (NS).

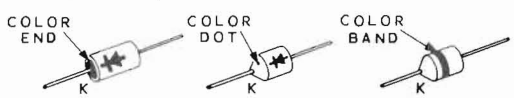
(✓) Connect the remaining red power transformer lead to lug 3 of terminal strip L (NS).

(✓) Connect a 47 KΩ (yellow-violet-orange) 1 watt resistor from lug 1 of terminal strip L (NS) to solder lug N (NS).

(✓) Connect a 1000 Ω (brown-black-red) resistor between lugs 1 (NS) and 2 (NS) of terminal strip L.

(✓) Refer to Detail 6A and identify the cathode (K) lead of the silicon diode. Connect the cathode (K) lead of the diode to lug 2 (NS) and the other lead to lug 3 (S-2) of terminal strip L.

NOTE: WHEN INSTALLING SILICON DIODES, THE CATHODE END SHOULD BE PLACED AS DIRECTED. THE CATHODE END IS MARKED WITH EITHER A COLOR END, COLOR DOT, OR COLOR BAND. IN THE ILLUSTRATION, THE SYMBOL K INDICATES THE CATHODE END.




Detail 6A

(✓) Position the 20-20 $\mu$fd electrolytic capacitor so it does not extend past lug 2 of terminal strip L, as shown in Pictorial 6. Place a 1/2" length of sleeving on one positive (+) lead and a 1" length of sleeving on the other positive (+) lead. Connect the (+) lead with 1/2" of sleeving to lug 2 (S-3), and the other (+) lead to lug 1 (NS) of terminal strip L.

(✓) Connect the negative (-) lead of this capacitor to lug 4 of terminal strip L (NS).

(✓) Connect either neon lamp lead to solder lug N (S-4). Be sure all four leads are soldered.

(✓) Place a 1-1/2" length of sleeving over the other neon lamp lead and connect this lead to lug 5 of terminal strip L (NS).

(✓) Place a 3/4" length of sleeving over each lead of a 100 KΩ (brown-black-yellow) resistor. Connect this resistor between lugs 1 (NS) and 5 (S-2) of terminal strip L.

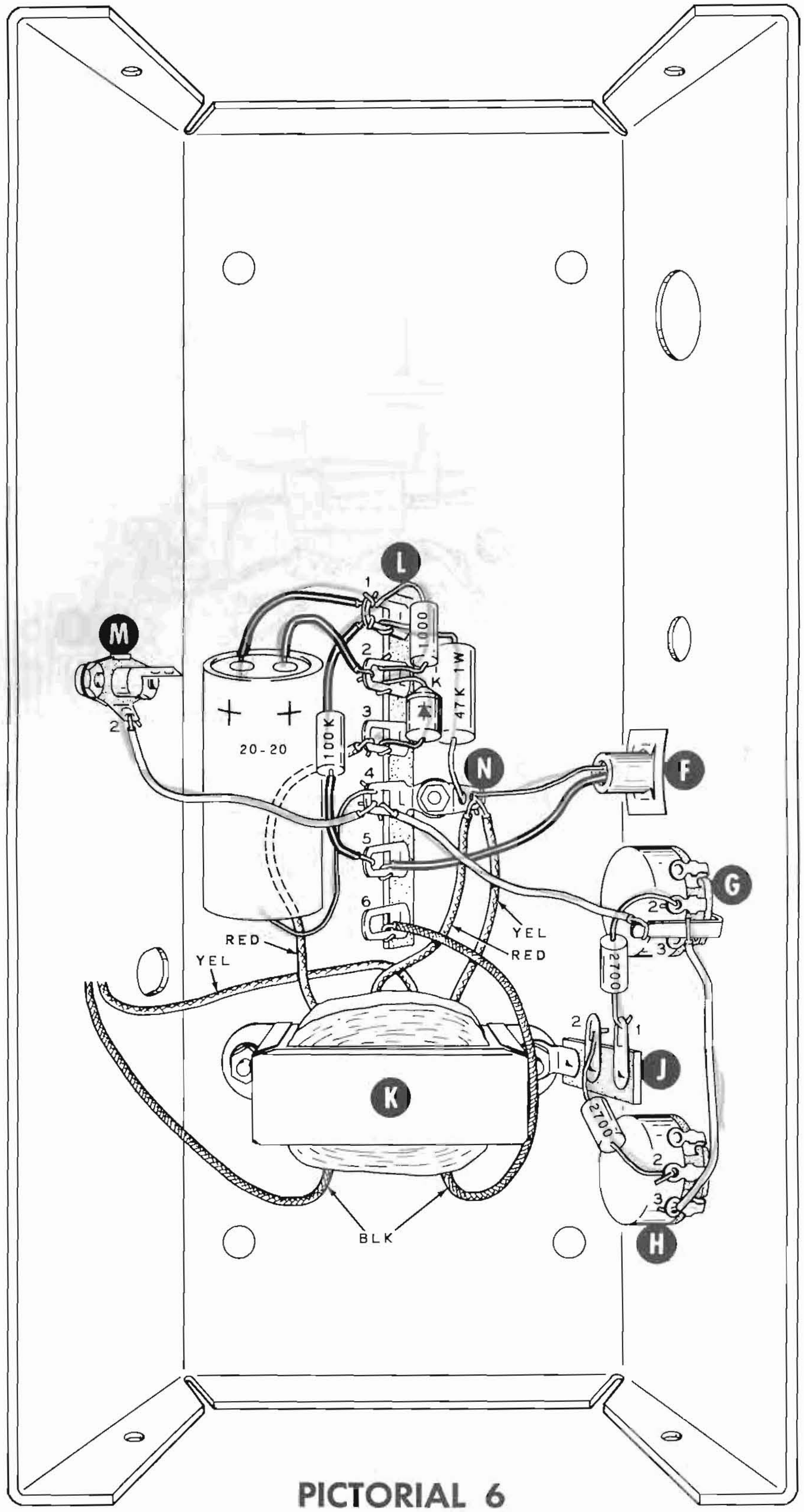
(✓) Connect a 2-3/4" wire from lug 4 of terminal strip L (NS) to the solder lug on control G (NS).

(✓) Connect a 1-1/2" wire from lug 4 of terminal strip L (S-3) to lug 2 of phono socket M (NS).

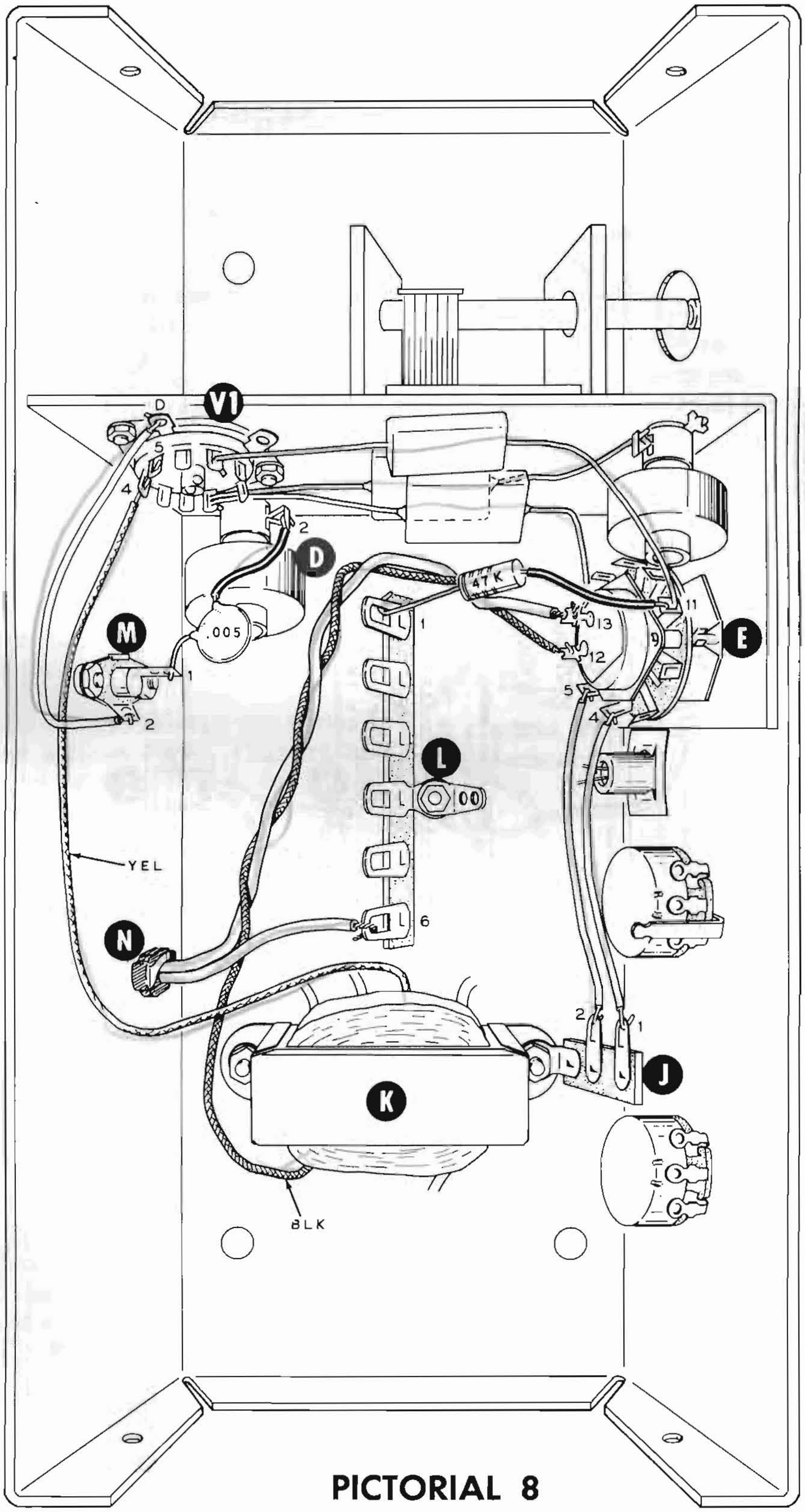
(✓) Connect a 2-3/4" wire from the solder lug on control G (S-3) to lug 3 of control H (S-1). Be sure to solder the solder lug to lug 3 of control G.

(✓) Connect a 2700 Ω (red-violet-red) resistor from lug 2 of control G (S-1) to lug 1 of terminal strip J (NS).

(✓) Connect a 2700 Ω (red-violet-red) resistor from lug 2 of control H (S-1) to lug 2 of terminal strip J (NS).




PICTORIAL 6




**PICTORIAL 8**

Refer to Pictorial 7 for the following steps.

( ✓) Check the chassis and switch to be sure all lugs except lug 11 of switch E are soldered.

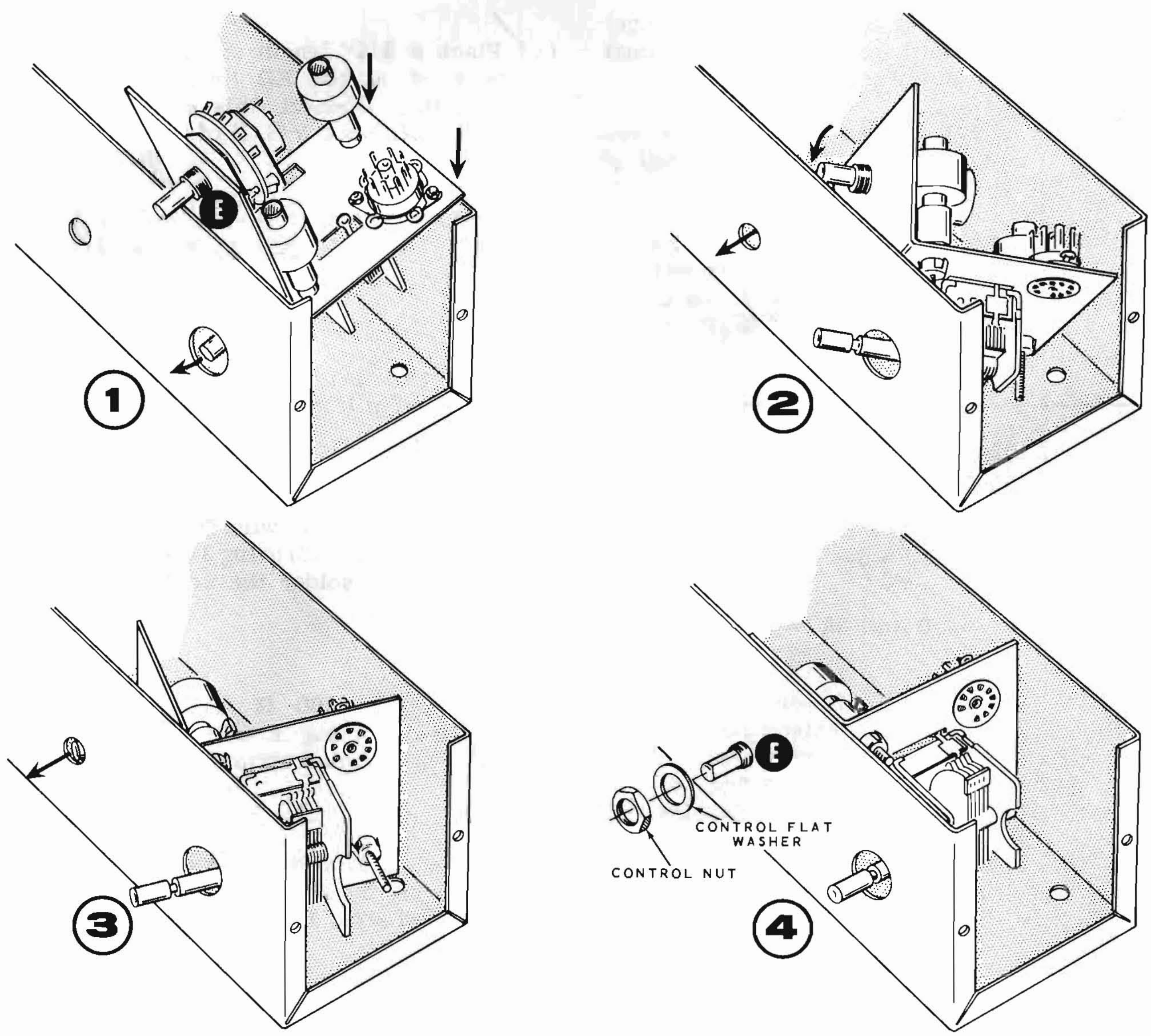
( ✓) Remove the control nut from switch E on the chassis.

( ✓) Refer to the sequence drawings of Pictorial 7 and install the chassis in the cabinet base. Secure switch E with a control flat washer and a control nut.

Refer to Pictorial 8 for the following steps.

( ✓) Connect the free end of the wire extending from lug 4 of switch E, to lug 1 of terminal strip J (S-2).

( ✓) Connect the free end of the wire extending from lug 5 of switch E, to lug 2 of terminal strip J (S-2).




PICTORIAL 7

( ) Place the remaining yellow power transformer lead through lug 4 (S-2) to lug 5 (S-1) of tube socket V1.

( ) Place a 1-1/4" length of sleeving over one lead of a 47 KΩ (yellow-violet-orange) resistor. Connect this lead to lug 11 of switch E (S-3).

( ) Connect the other lead of this resistor to lug 1 of terminal strip L (S-5).

( ) Connect the free lead of the .005 μfd disc capacitor extending from lug 2 of coil D, to lug 1 of phono socket M (S-1).

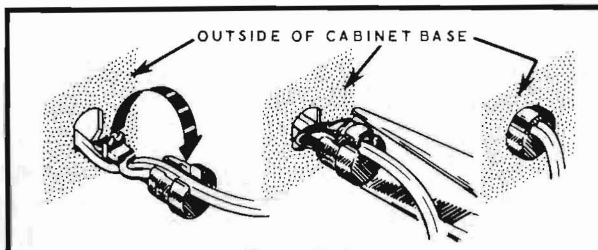
( ) Connect the free end of the wire extending from ground lug D on tube socket V1, to lug 2 of phono socket M (S-2).

( ) Locate the line cord and clip 2-1/2" from one of the leads. Remove 1/4" of insulation from the clipped lead.

( ) Twist together the wire strands on each of the line cord leads. Then melt a small amount of solder on the bared ends to hold the wire strands together.

( ) Place the line cord through hole N, and connect the short line cord wire to lug 6 of terminal strip L (S-2).

( ) Wrap the long line cord lead and the remaining black transformer lead together. Connect the line cord lead to lug 12 (S-1) and the black transformer lead to lug 13 (S-1) of switch E.




Detail 8A

( ) Refer to Detail 8A and install the line cord strain relief at N.

( ) Install the 12AX7 tube in tube socket V1.

Refer to Pictorial 9 for the following steps.

( ) Turn the variable capacitor shaft until the plates of the capacitor are half open.

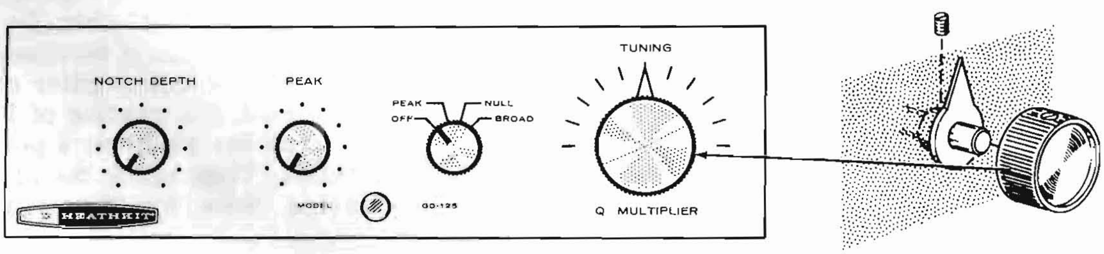
( ) Locate the pointer assembly and slide the pointer assembly onto the capacitor shaft.

( ) Start an 8-32 setscrew in the pointer assembly bushing. Position the pointer at the 12 o'clock position and tighten the setscrew.

( ) Install the large knob on the capacitor shaft and tighten the setscrew.

( ) Install the remaining knobs so that the pointers are as shown in Pictorial 9 when the Function switch and control shafts are maximum counterclockwise.

This completes the wiring of your kit. Shake out all wire clippings and solder splashes. Be sure that all connections are properly soldered. Then continue with the Installation section.




PICTORIAL 9

# INSTALLATION

## CONNECTION TO THE RECEIVER

To put the Q Multiplier in operation, connect a coaxial cable between your communications receiver and the phono socket on the rear of the Q Multiplier. Figure 1A shows how to install the phono plug on the coaxial cable. Connect the shield of this cable to chassis ground in the receiver. Connect the inner lead to the plate circuit of the mixer stage. See Figure 1, which shows the Q Multiplier connected in a typical mixer stage. A phono socket may be installed on the rear of your receiver or you may wish to use the two spade lugs supplied with this kit.

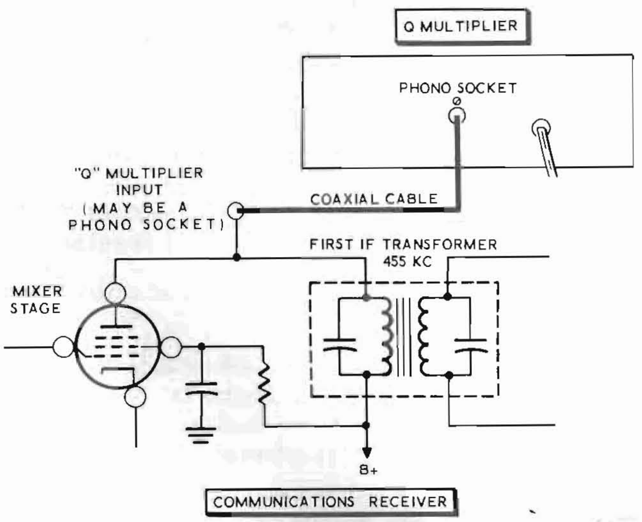



Figure 1

The connection from the mixer plate to the inner lead of the coaxial cable should be as short as possible, and isolated from other receiver circuits. If shielded wire is used for the connection between the coaxial cable and the mixer plate, the primary winding of the first IF transformer should be retuned. (Retune the transformer before attaching the Q Multiplier to the receiver.)

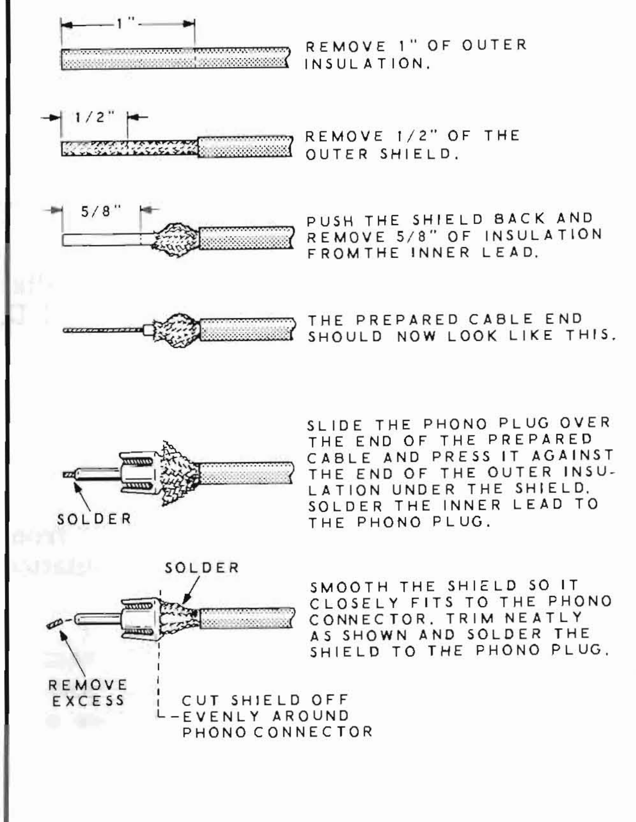



Figure 1A

This will compensate for the additional capacitance the shielded wire places across the transformer.

WARNING: Connecting the Q Multiplier to an AC-DC type of receiver, particularly the "hot chassis" type, may make the chassis and cabinet of the Q Multiplier "hot" also. To avoid this lethal shock hazard, connect the leads of an AC voltmeter between the Q Multiplier chassis and a good earth ground. If a reading of 117 volts is obtained, reverse the receiver's power plug in the power outlet. Then mark the plug and outlet to polarize them for future reference.

# ALIGNMENT

( ) A small rectangular steel blade is supplied with this kit. Refer to Figure 2. Then use long-nose pliers to insert this blade into the smaller hole in the plastic nut starter. When installed, the blade end should be flush with the end of the nut starter. This can now be used as an alignment tool.

( ) For best results, the receiver IF strip should be in good alignment at the IF frequency. It would be well to check receiver alignment before proceeding.

( ) If the receiver does not have an S meter, it is recommended that a voltmeter be connected between its AVC line and ground. This meter should be set to a negative DC range. It will then act as an S meter. For best results, this meter should have a negative DC range low enough to permit a center scale deflection of the meter when the receiver is tuned to a station.

( ) Connect the Q Multiplier to the receiver. Then, with the Function switch in the OFF position, tune in a steady phone signal, or possibly a broadcast station. Be sure that the signal is centered in the IF bandpass. This can be noted by the greatest S meter reading, maximum audio signal, or by a maximum reading on the voltmeter (AVC voltage in the receiver).

Refer to Figure 3 for the location of the alignment points.

( ) Place the cabinet top shell upside down on the top of the cabinet base. This will compensate for the capacitance added when the cabinet is installed later.

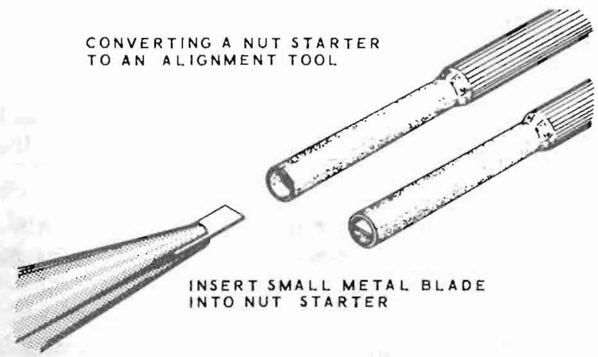



Figure 2

( ) Tune coil L1 for the highest S meter reading or loudest signal (or maximum negative DC reading on the voltmeter). When adjusting this coil, you will notice two different points at which a peak can be obtained. Use the peak obtained with the coil slug midway in the coil, not the one where the slug protrudes from the bottom of the coil. This adjustment tunes out the reactance of the coaxial cable; it will not have to be changed later.

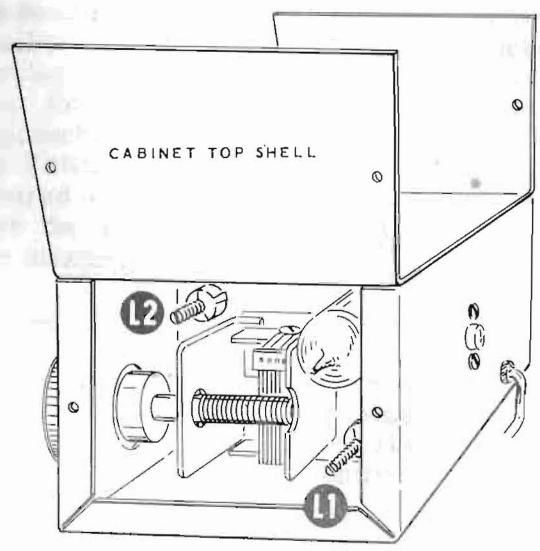



Figure 3

( ) Rotate the NOTCH DEPTH and PEAK controls to their mid-point, and set the TUNING knob so the plates of the tuning capacitor are 50% meshed. Then, rotate the Function switch to the NULL position and allow the Q Multiplier to warm up. Be sure there are no components overheating before continuing.

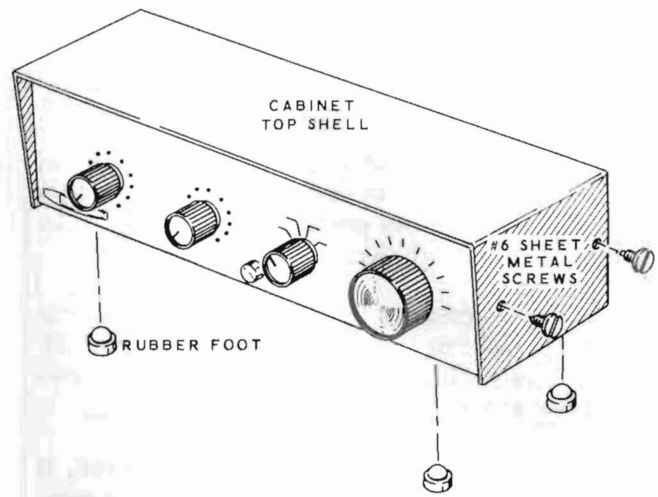
NOTE: The next adjustment is critical; therefore, it is recommended that the procedure be followed carefully.

( ) Now adjust coil L2 for a null on the S meter or minimum signal (or for the smallest amount of negative DC voltage on the voltmeter). This null will be extremely sharp. With a 455 kc IF, it will occur when the coil screw is between 1/8" and 1/4" above the coil mounting frame. Rock the adjustment back and forth over this point several times to make sure that the best null reading is obtained.

This completes the Alignment.

Refer to Pictorial 10 for the following steps.

( ) Install a rubber foot in each corner of the cabinet base.




PICTORIAL 10

( ) Install the cabinet top shell on the cabinet base with four #6 sheet metal screws.

( ) Carefully peel away the backing paper from the blue and white identification label. Then press the label onto the rear of the cabinet base. Be sure to refer to the numbers on this label in any communications you have with the Heath Company about this kit.

# OPERATION

## OPERATING NOTES

The Q Multiplier is essentially a high Q resonant circuit that is tuned to the IF of your communications receiver. The Q Multiplier is aligned so that signals slightly removed from the IF bandpass will be bypassed to ground. Misalignment of the Q Multiplier will give the effect of deadening the receiver. Actually, due to its regenerative characteristic, the desired signal will be amplified and adjacent unwanted signals will be deadened (for Peak operation).

The Q Multiplier is extremely sensitive to tune, therefore the operator may have to practice for a while before he becomes proficient in its operation. Proper tuning is of the utmost importance. The Q Multiplier will appear to greatly amplify the sensitivity of the receiver when it is tuned and operated correctly.

## CONTROL FUNCTIONS

The following paragraphs describe operation of the Q Multiplier in each position of the Function switch.

### Off

In this position, the Q Multiplier has no effect and the receiver will operate in the usual manner.

### Peak

By varying the PEAK control, the receiver selectivity can be changed from broad to extremely sharp. With the control counterclockwise, the bandpass will be quite broad and the receiver gain somewhat decreased. As the control is turned clockwise, the peak becomes narrower and the gain higher until the sharpest point is reached just below the point of oscillation. Phone signals may lose some volume due to the loss of high frequency audio response.

With the Q Multiplier peaked, the TUNING setting can be changed to accentuate any signal within the receiver IF bandpass and attenuate all others. This is the main advantage that the Q Multiplier has over a filter. As the receiver does not have to be tuned to peak any particular signal within its bandpass, there is little danger in losing the desired signal.

### Null

The NULL position is particularly good for removing heterodynes on phone signals or adjacent CW signals. It is extremely sharp and, as such, is very critical to tune. Besides nulling the interfering signal, it is equally easy to remove the desired signal. It probably will require some practice before this function of the Q Multiplier can be used to advantage.

It may help to remember that the Q Multiplier tunes toward the high end of the IF bandpass in a clockwise direction, providing the receiver local oscillator is higher in frequency than the incoming signal. A heterodyne higher in frequency than the desired signal would be removed by approaching it by counterclockwise rotation of the TUNING knob, and vice versa. When the undesired signal has been placed in the notch, adjust both the TUNING and NOTCH DEPTH controls for maximum null.

### Broad

This position allows a higher gain than the PEAK position when a wider bandpass is desired. It also allows the Q Multiplier to be used as a BFO by advancing the PEAK control to just past the oscillation point.

# IN CASE OF DIFFICULTY

NOTE: Refer to the Kit Builders Guide for Service and Warranty information.

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

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

3. Make sure that the tube lights up properly.

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

5. Check the values of the component parts. Be sure that the proper part has been wired into the circuit, as shown in the pictorial diagrams and as called out in the wiring instructions.

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

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

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

9. Make sure the receiver that is being used with the Q Multiplier has an IF between 450 and 500 kc.

# SPECIFICATIONS

| | |
|---|---|
| Operating Frequency | 450 - 500 kc. |
| Switch Functions | OFF, PEAK, NULL, BROAD. |
| Tube-Diode Complement | 1 - 12AX7 tube, multiplier.<br>1 - Silicon diode, rectifier. |
| Power Requirements | 105-125 volts AC, 50/60 cps, 4-1/2 watts. |
| Cabinet Size | 9-1/32" wide x 2-9/16" high x 3-5/8" deep. |
| Net Weight | 2-1/2 lbs. |

# CIRCUIT DESCRIPTION

Refer to the Schematic (fold-out from Page 19) while reading the following description.

## CIRCUIT THEORY

The Q Multiplier, which is connected across the input IF transformer of your communications receiver, acts like a very high Q tuned circuit. And since all high Q circuits have a very sharp resonance point, the Q Multiplier can be used for either of the following purposes:

1. It can be used to peak a desired signal by performing like a very high Q parallel resonant circuit. See Figure 4. As the Q is increased, the side slopes of the resonant peak become steeper and steeper. Therefore, at the resonant frequency of the Q Multiplier, the desired signal "sees" a very high impedance and passes on to the IF amplifier. All other frequencies "see" a relatively low impedance and are shunted to ground. The Tuning control on the Q Multiplier adjusts the resonant peak to any point in the IF bandpass.

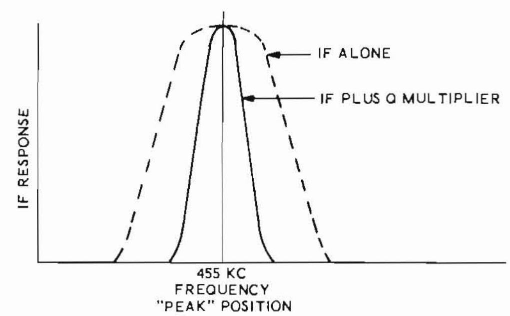



Figure 4

2. It can be used to null out an unwanted signal by performing like a very high Q series resonant circuit. See Figure 5. Here, the unwanted signal "sees" a very low impedance and is shunted to ground by the Q Multiplier. All other signals see the normal high impedance and pass on through the receiver. The null point can be adjusted to any point in the IF bandpass, therefore a heterodyne adjacent to the desired signal can be dropped into the notch (null point) and eliminated.

## CIRCUIT OPERATION

The Q Multiplier circuit is centered around coil L2 (in the plate circuit of tube V1B), which has a Q of 200 or more. The Q of this coil is amplified to approximately 4000 by the positive feedback that is coupled back to the grid of tube V1B through capacitor C9. The resonant frequency of the circuit is adjusted by capacitor C7.

The output signal, for Peak or Broad operation, is coupled through the Function switch, capacitor C1, and the coaxial cable to the communications receiver. The high Q that this circuit introduces into the receiver compares favorably with the Q of the quartz crystal in a crystal filter.

For Null operation, the output signal is coupled through lugs 7 and 9 of the Function switch, and through capacitor C4 to the grid of tube V1A. Tube V1A inverts the signal, making it 180 degrees out of phase with the IF response of the receiver. The inverted signal is then coupled through capacitors C3 and C1, and the coaxial cable, to the receiver where it causes a sharp null in the IF response.

Coil L1 is used to tune out the capacitance of the coaxial cable.

## POWER SUPPLY

The line voltage is transformer coupled to half-wave rectifier diode D1. The rectified voltage is then filtered by a pi-network consisting of capacitors C10A and C10B, and resistor R9. Resistor R10 and the neon lamp make up the pilot lamp circuit. The pilot lamp indicates the presence of B+.

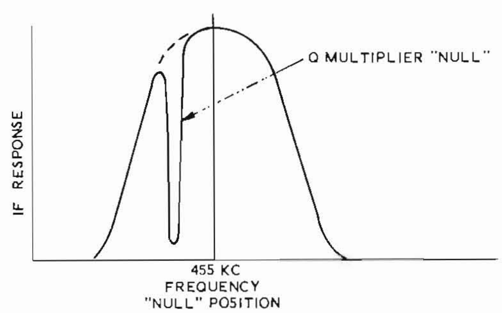
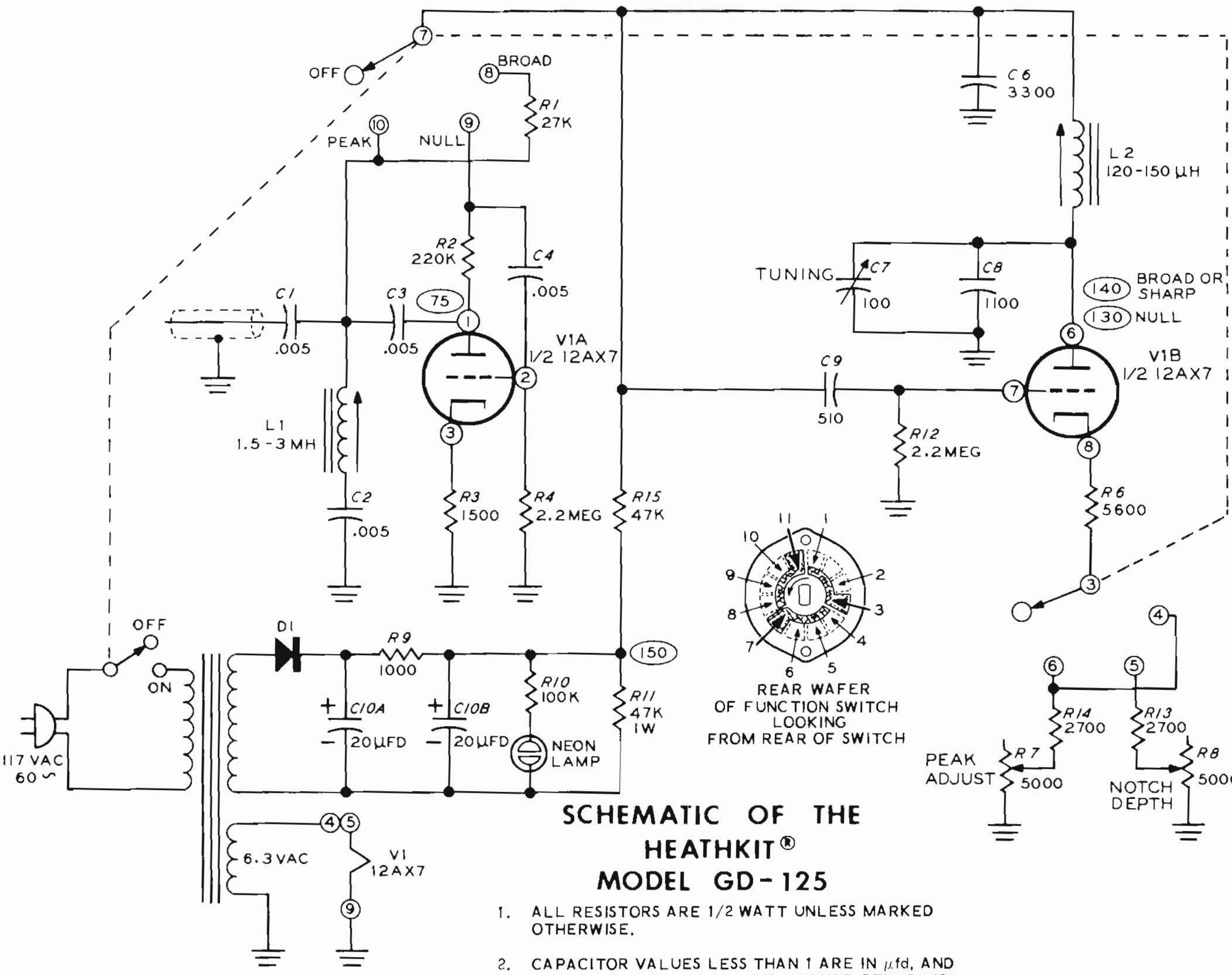



Figure 5




## SCHEMATIC OF THE HEATHKIT® MODEL GD-125

1. ALL RESISTORS ARE 1/2 WATT UNLESS MARKED OTHERWISE.
2. CAPACITOR VALUES LESS THAN 1 ARE IN µfd, AND ABOVE 1 ARE IN µµf, UNLESS MARKED OTHERWISE.
3. FUNCTION SWITCH SHOWN IN OFF POSITION.
4. VOLTAGE READINGS MAY VARY ±10 %.
5. ALL DC VOLTAGES ARE INDICATED IN ELLIPSES.

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