

communications



**OPERATING and SERVICE
INSTRUCTIONS**



HT-40

the hallicrafters co.

MANUFACTURERS OF ELECTRONIC EQUIPMENT, CHICAGO 24, U. S. A

Ser. # 105093

FEATURES AND SPECIFICATIONS

TYPES OF EMISSION	
AM.	Amplitude modulation
CW.	Continuous wave
FREQUENCY SELECTION. Crystal controlled or external VFO	
FREQUENCY COVERAGE. 80, 40, 20, 15, 10, and 6 meter bands	
POWER INPUT	
AM.75 watts peak power
CW.75 watts maximum
AUDIO INPUT.004 V minimum at input to microphone jack	
DISTORTION.8% at 75% modulation	
HUM AND NOISE OUTPUT.40 db or more below maximum output	
TUBES. Four, plus two silicon rectifiers	
POWER SOURCE.105-125 volts, 60 CPS, AC	
OUTPUT COUPLING. Pi network	
POWER CONSUMPTION.175 watts	
RF OUTPUT IMPEDANCE.50 to 75 ohm coaxial, connector accepts Amphenol 83-1SP connector	
CW KEYING. Panel mounted key jack accepts standard 2-connector 1/4" plug	
MICROPHONE INPUT. Rear chassis mounted microphone receptacle Amphenol 75-MCIF connector	
DIMENSIONS.7-3/16" high, 13-3/8" wide, 8-1/4" deep	
NET WEIGHT.17 pounds	
SHIPPING WEIGHT.19 pounds	

FREQUENCY COVERAGE

Band	Transmitter Frequency Range	Crystal or VFO Frequency Range
80	3.5 MC to 4 MC	3500 KC to 4000 KC
40	7 MC to 7.3 MC	3500 KC to 3650 KC 7000 KC to 7300 KC
20	14 MC to 14.35 MC	7000 KC to 7175 KC
15	21 MC to 21.45 MC	7000 KC to 7150 KC
10	28 MC to 29.7 MC	7000 KC to 7425 KC
6	50 MC to 54 MC	8333 KC to 9000 KC

Note: 1000 KC = 1 MC

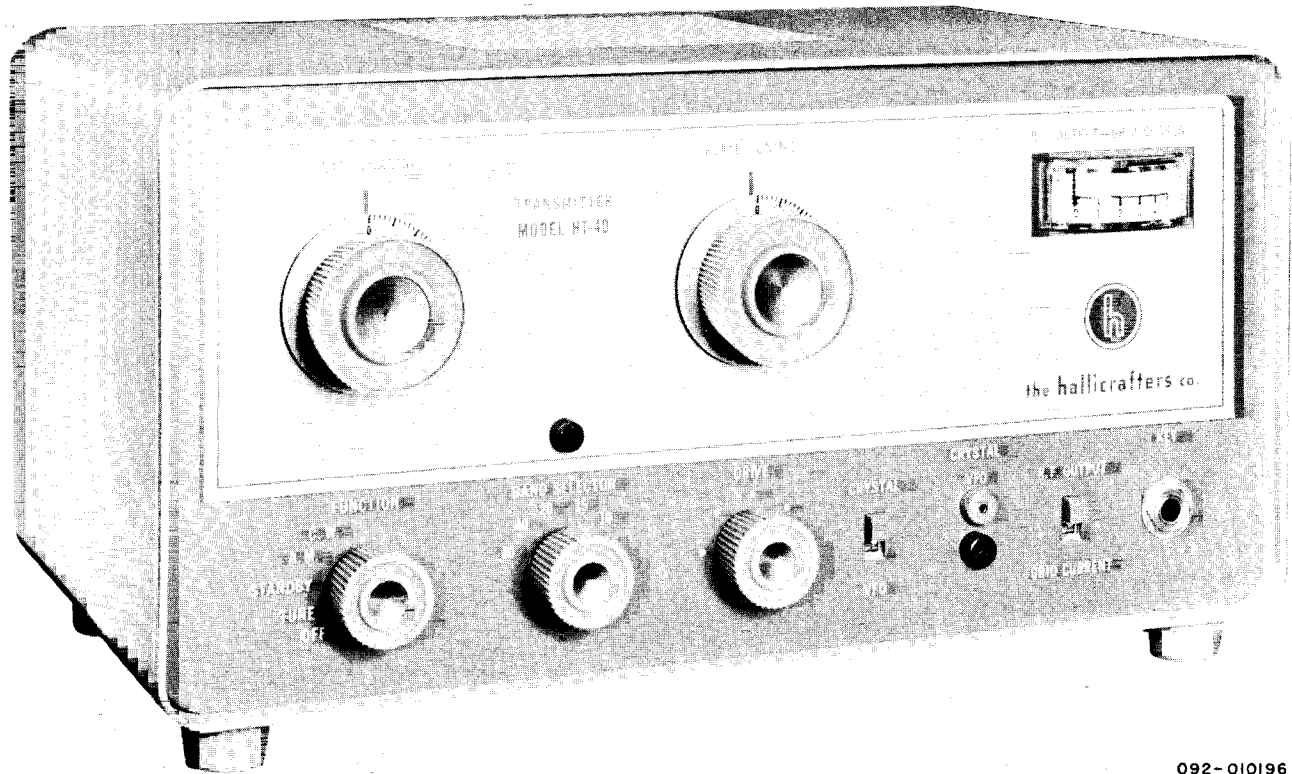


Figure 1. Model HT-40K Transmitter.

INTRODUCTION

GENERAL

The Hallicrafters Model HT-40K Transmitter Kit is designed to operate on the 80, 40, 20, 15, 10, and 6 meter bands.

A few of the features of the HT-40K include: 75 watts input with high efficiency output capability, either crystal or external VFO control, full carrier-controlled amplitude modulation (AM) and Continuous Wave (CW) transmission. Internal switching connected to a terminal board on the rear of the HT-40K permits the Transmitter to control or be controlled by accessory equipment such as the SX-140 or the SX-140K Receiver. Special attention was given in the selection of the components and the internal circuit arrangement to reduce Television Interference (T.V.I.) to a minimum.

It is assumed for all practical purposes that many kits will be constructed by people new to the radio and electronic field or who pursue other fields and construct kit items for a diversion. Because of this, extreme care has been exercised in the preparation of the manual in the step-by-step procedure for mounting the parts, soldering, and final testing of the kit so that questionable meanings of the steps do not exist. IT IS TO BE EMPHASIZED THAT THE BUILDER CAREFULLY READ THE MANUAL BEFORE ATTEMPTING TO BUILD THE KIT SO THAT MISTAKES DIFFICULT TO CORRECT WILL NOT OCCUR.

A kit which is wired and soldered neatly and correctly will afford the builder complete satisfaction in operation. To achieve this result, we suggest that a particular space be used for the building of the kit and the arrangement of parts and tools. Parts which are easily scratched or marred should be placed on a soft cloth away from the construction area. By setting up the construction space in this order, you minimize the possibilities of using incorrect parts and insure successful construction of the kit.

CIRCUIT DESCRIPTION

GENERAL. - The HT-40K Transmitter utilizes a built-in oscillator circuit or external VFO for generating the desired fundamental signal that is to be amplified straight through, or operated as a harmonic generator to produce the desired output frequency on each band. Circuits are employed in the Transmitter to permit operation at any desired frequency in the 80, 40, 20, 15, 10, and 6 meter bands on CW (continuous wave) or AM (amplitude modulation). Screen injection or carrier control modulation is employed for phone transmission.

CRYSTAL OSCILLATOR. - The triode section of V1 (6CX8) is used in a modified Pierce Type of crystal oscillator circuit. In this circuit, feedback energy is fed from the plate to the grid by means of a 4700 mmf capacitor in series with the crystal. The grid circuit elements consist of a 47K ohm grid return resistor shunted by a 22 mmf capacitor loading capacity. The plate circuit utilizes a 2.5 MH choke as a common fixed plate load for all frequencies of operation. Coupling from the oscillator plate to buffer grid is accomplished with a 1000 mmf capacitor.

When operating the Transmitter with external VFO, the crystal is removed from the pin jacks and the VFO output terminals are connected to the pin jacks. The high side of the VFO output is connected through the red jack to the grid of V1 (6CX8) and the ground side of the VFO output is connected through the black jack and switch S1 in the VFO position, to ground. When S1 is in the VFO position the 4700 mmf feedback capacitor is disconnected from the circuit.

During CW operation the cathode of this tube is switched to and from ground with the operation of the key.

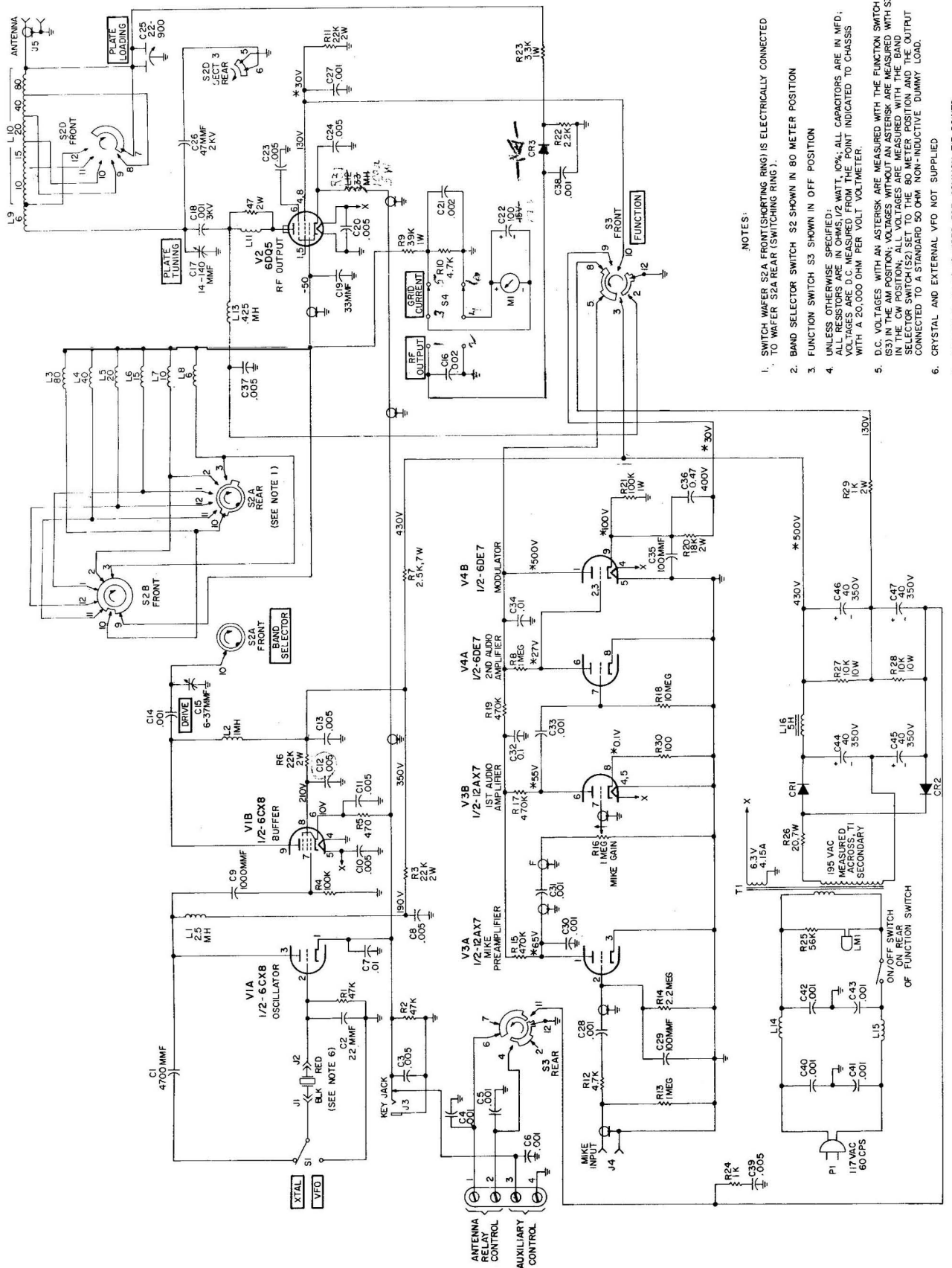
BUFFER-MULTIPLIER. - The pentode section of V1 (6CX8) is operated as a buffer multiplier. The signals are fed from the oscillator circuit to the grid of the buffer and amplified or multiplied by this stage operating in class C. The buffer plate load consists of a shunt fed 1 MH choke coupled to the grid of the final amplifier tube V2(6DQ5) by means of a pi network with separate inductances for each band. The network input is tuned with the DRIVE capacitor and the network output is terminated with a 33 mmf capacitor connected to the 6DQ5 grid circuit. Because of the proper selection of coils in each band, it is impossible to tune to a harmonic of the output frequency with the DRIVE capacitor. This reduces the possibility of undesirable signals being fed to the antenna and keeping television interference to a minimum.

FINAL AMPLIFIER STAGE. - The final amplifier stage utilizing a 6DQ5 beam powered pentode tube operates as a "straight through" amplifier on the 80 through 10 meter bands and as a frequency doubler on the 6 meter band. The final amplifier plate load consists of a shunt fed RF choke capacitively coupled to the pi section network. The input of the network is tuned with the PLATE TUNING capacitor, and is terminated with the PLATE LOADING capacitor for matching the plate impedance to the impedance of the antenna. A tapped coil (L10) is used for the 80 through 10 meter bands, the 6 meter band uses a separate coil (L9) connected at right angles to L10 so that a minimum of mutual inductance exists between them. A sensitive meter (M1) is used in this circuit to measure grid current and output power.

RF OUTPUT-GRID CURRENT METER. - The RF OUTPUT-GRID CURRENT meter, a basic 5 mil movement graduated in 5 units (0-5), and its circuitry perform two important functions:

1. With the switch S4 in the GRID CURRENT position the final amplifier grid current can be measured, each division indicates approximately 1 milliampere.
2. With switch S4 in the RF OUTPUT position the output power delivered to the antenna can be measured. Each division on the meter represents approximately 10 watts, therefore if a deflection of three and a half divisions is indicated, 35 watts are being delivered to the antenna ($3.5 \times 10 = 35$).

SPEECH AMPLIFIER AND MODULATOR. - The speech amplifier section of the audio system consists of the two triode sections of V3 (12AX7) and one triode section of V4 (6DE7) RC coupled and operated in cascade to develop an adequate signal input to the modulator (second triode section of V4). The modulator has a low plate resistance and acts as a high level cathode follower. The screen impedance of the 6DQ5 (the modulated element) becomes an appreciable portion of the cathode follower impedance. The audio frequency component of the cathode follower is applied in full to the screen of the final ampli-



- NOTES:
1. SWITCH WAFER S2A FRONT (SHORTING RING) IS ELECTRICALLY CONNECTED TO WAFER S2A REAR (SWITCHING RING).
 2. BAND SELECTOR SWITCH S2 SHOWN IN OFF POSITION
 3. FUNCTION SWITCH S3 SHOWN IN OFF POSITION
 4. UNLESS OTHERWISE SPECIFIED: ALL RESISTORS ARE IN OHMS, 1/2 WATT, 10%; ALL CAPACITORS ARE IN MFD; VOLTAGES ARE D.C. MEASURED FROM THE POINT INDICATED TO CHASSIS WITH A 20,000 OHM PER VOLT VOLTMETER.
 5. D.C. VOLTAGES WITH AN ASTERISK ARE MEASURED WITH THE FUNCTION SWITCH (S3) IN THE AM POSITION; VOLTAGES WITHOUT AN ASTERISK ARE MEASURED WITH S3 IN THE CW POSITION; ALL VOLTAGES ARE MEASURED WITH THE BAND SELECTOR SWITCH (S2) SET TO THE 80 METER POSITION AND THE OUTPUT CONNECTED TO A STANDARD 50 OHM NON-INDUCTIVE DUMMY LOAD.
 6. CRYSTAL AND EXTERNAL VFO NOT SUPPLIED
 7. SECTION C OF S2 IS USED FOR COMMON TIE POINTS.

Figure 2. Model HT-40K Schematic Diagram.

47 MFD 450V CAPACITOR

fier (6DQ5) tube through a $\frac{1}{2}$ mfd capacitor to permit modulation of the screen. An RF filter between the microphone jack and the grid of the MIKE preamplifier (V1A) eliminates distortion in the system which could be caused by RF across the microphone jack.

POWER SUPPLY. - The DC voltage to operate the Transmitter is obtained by rectifying the AC voltage across the secondary of the power transformer T1 with a full wave voltage doubler circuit using two silicon diode rectifiers. Adequate filtering of the power supply is accomplished by the voltage doubler circuit, together with the choke and output filter capacitors.

Another secondary winding of the power transformer furnishes filament voltage for all of the tubes in the transmitter.

To prevent television interference from being conducted back through the power cord to the power line an LC filter is connected across the power transformer primary.

OPERATOR CONTROLS

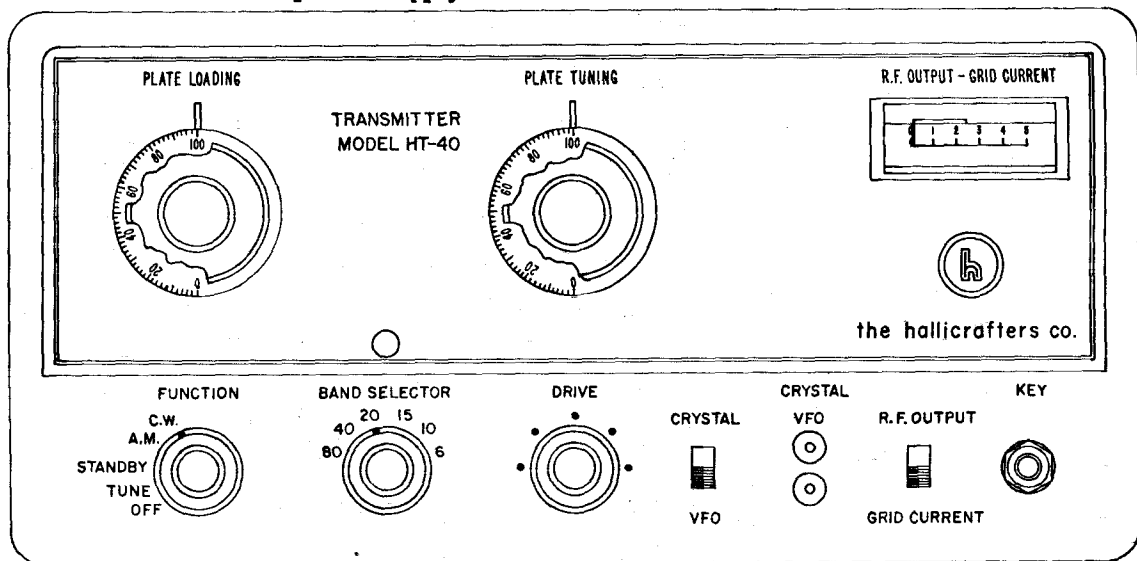
FUNCTION CONTROL. - The FUNCTION control, a five-position rotary switch is used to select the Transmitter mode of operation as indicated.

1. OFF position; AC power is disconnected from the power transformer primary.
2. TUNE position; power is applied to the oscillator and buffer stages but not to the modulator and final amplifier stages. Grid current is adjusted with the DRIVE control for maximum indication on the RF OUTPUT - GRID CURRENT meter.
3. STANDBY position; the negative side of the DC power supply is disconnected from the internal circuitry. Provision is made for remote control switching.

NOTE

A unique feature of the power supply allows current to be constantly fed through the bleeder when in the STANDBY position, thus providing better voltage regulation when switching from STANDBY to AM or CW.

4. AM position; power is applied to the oscillator, buffer, speech amplifier, final amplifier and modulator stages.
5. CW position; power is applied to the oscillator, buffer and final amplifier stages but is removed from the modulator stage. Screen voltage for the 6DQ5 is obtained from the tap on the bleeder connected across the power supply.



092-01041

Figure 3. Model HT-40K Front Panel Controls and Indicators.

Scanned for BAMA

by

Lynn Bisha W2BSN

BAND SELECTOR CONTROL. - The BAND SELECTOR is a six-position multi-section rotary switch used to select the proper inductance in the driver and final amplifier pi network for each band.

DRIVE CONTROL. - The DRIVE control is a variable capacitor used to tune the plate circuit of the buffer stage. This control also functions as the input tuning capacitor of the pi network between the output of the buffer stage and the input to the final amplifier stage. Operation of this control is such that it is impossible to tune to a harmonic of the desired output frequency.

CRYSTAL-VFO SWITCH. - The CRYSTAL-VFO switch is a SPDT slide switch which permits the HT-40K to operate either crystal controlled or to operate from an external VFO.

RF OUTPUT-GRID CURRENT SWITCH. - The RF OUTPUT-GRID CURRENT switch is a DPDT slide switch which permits the operator to switch the meter either into the grid circuit of the final amplifier (6DQ5) or across the RF output load.

PLATE LOADING CONTROL. - The PLATE LOADING control is a variable capacitor in the output of the pi network section which adjusts the plate load impedance thus matching the Transmitter to the antenna.

PLATE TUNING CONTROL. - The PLATE TUNING control is a variable capacitor which tunes the plate circuit of the final amplifier (6DQ5) to the desired operating frequency.

MIKE GAIN CONTROL. - The MIKE GAIN control, a 1 megohm potentiometer located on the chassis rear, controls the audio signal applied to the grid of the audio amplifier tube V3B.

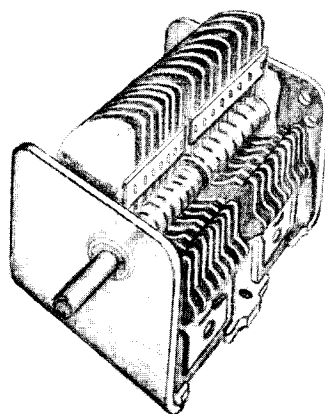
UNPACKING

After carefully reading the manual unpack the items of the Model HT-40K Transmitter Kit. Check the quantity and value of each component against the parts list and accompanying illustrations. It is suggested that each package of parts be checked as they are removed from the carton. Should missing, incorrect, or broken parts be discovered, notify the dealer from whom the kit was purchased or The Hallicrafters Company for proper authorization for returning broken parts or obtaining missing parts.

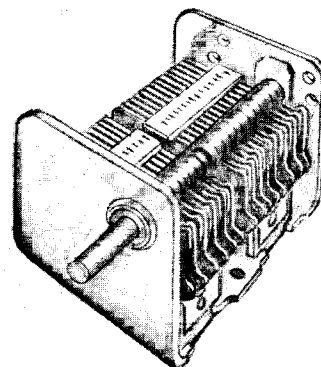
NOTE

The variable capacitors are packed with their plates fully meshed (see figure 4). To prevent damage or bending of the plates it is important that they be fully meshed at all times during construction of the kit. If the plates are accidentally bent they will rub or short against the stationary plates when the capacitor is tuned.

In the design of the Hallicrafters HT-40K Transmitter Kit only the highest quality components were used throughout. To ensure neat wiring and eliminate obscure electrical problems, a prefabricated cable harness has been prepared for easy wiring. Critical lead placement is automatically taken care of with the use of this pre-fabricated cable.



CAPACITOR HALF OPEN
(HALF MESHED)



CAPACITOR CLOSED
(FULLY MESHED)

Figure 4. Variable Capacitor, Open and Closed.

INSTALLATION

LOCATION.- The unit should be placed in a location that provides adequate space around it, to permit free circulation of air through the cabinet openings. Avoid excessively warm locations such as those on or near radiators and heating vents.

POWER SOURCE.- The HT-40K Transmitter is designed to operate on 105 to 125 volt, 60 cycle AC current. Power consumption is 175 watts.

IMPORTANT: If in doubt about the power source, contact your local power company prior to inserting the power plug into an AC power outlet. Plugging the power cord into the wrong power source can cause extensive damage to the unit, requiring costly repairs.

CRYSTAL - VFO RECEPTACLE.- The CRYSTAL-VFO receptacle consists of two pin jacks, mounted on the front panel, to accommodate .093" diameter pins with 1/2" center separation (similar to type FT-243 crystal holder). When an external VFO is used connect the high or "hot" side of the VFO output to the red pin jack and the ground side to the black pin jack.

KEY RECEPTACLE.- The KEY jack, a standard two conductor closed circuit type jack located on the front panel, provides for the connection of a hand keyer, a "bug" or an automatic keyer (T.O. Keyer). In addition to the KEY jack the keying instrument may be connected to terminals 3 and 4 of the four terminal strip located on the rear of the chassis. These contacts are connected in parallel with the KEY jack when the plug is removed from the jack.

MICROPHONE CONNECTOR.- The microphone connector, located on the rear of the chassis, is an Amphenol type 75-PC1M bulkhead receptacle and will accept an Amphenol type 75-MC1F microphone plug.

ANTENNAS.- It is suggested that a half-wave dipole antenna fed with a 50-ohm coaxial cable be used to radiate maximum power from the HT-40K (see figure 25). Refer to the ARRL ANTENNA HANDBOOK or similar publications for detailed information concerning transmitting antennas.

ACCESSORY TERMINAL STRIP.- A four-terminal strip on the rear of the chassis permits connecting the HT-40K to auxiliary equipments. The FUNCTION switch in the AM or CW position electrically connects terminals 1 and 2. When the FUNCTION switch is in either the OFF, TUNE or STANDBY position these terminals are not electrically connected. When terminals 1 and 2 are connected to auxiliary equipment such as an antenna change-over relay the FUNCTION switch controls the operation of the relay (see figure 26).

Terminals 3 and 4 connected across (in parallel with) the key jack terminals, when the plug is removed from the KEY jack, permits the HT-40K to be connected to a remote control switching device such as the SX-140 Receiver, SX-140K Receiver, a remote control switch or separate leads from the push-to-talk switch on the microphone (see figure 27). The HT-40K may be keyed by connecting a key to terminals 3 and 4. For remote control operation or keying from these terminals the key plug must be removed from the KEY jack and the shorting wire removed from terminals 3 and 4.

OPERATION

GENERAL.- The tuning procedure for the Model HT-40K Transmitter has been simplified by design to permit rapid adjustment of the Transmitter to the desired frequency. However, this does not mean that the transmitter may be operated successfully when only rough tuning adjustments are made. A clean signal from any transmitter requires good operating technique.

TUNING PROCEDURE FOR CW OPERATION.- The following tuning procedure must be performed prior to operating the transmitter in the CW mode.

EQUIPMENT REQUIRED:

1. 50 ohm non-inductive dummy load or a 40 watt light bulb (see figure 28). *SEE SPECIAL NOTE #1*
2. Crystal with its fundamental or harmonic frequency corresponding to the desired transmitting frequency or an external VFO.

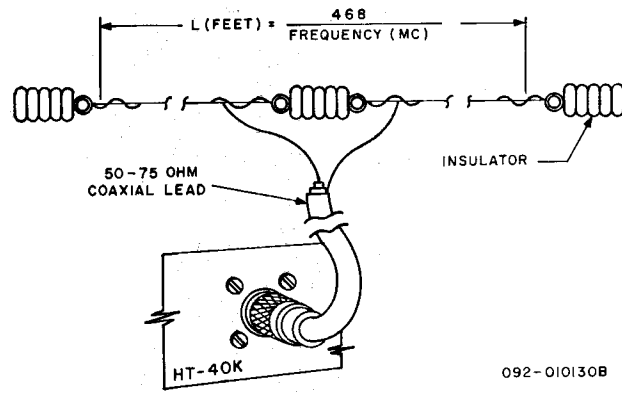


Figure 25. Coaxial Fed Half-Wave Dipole Antenna.

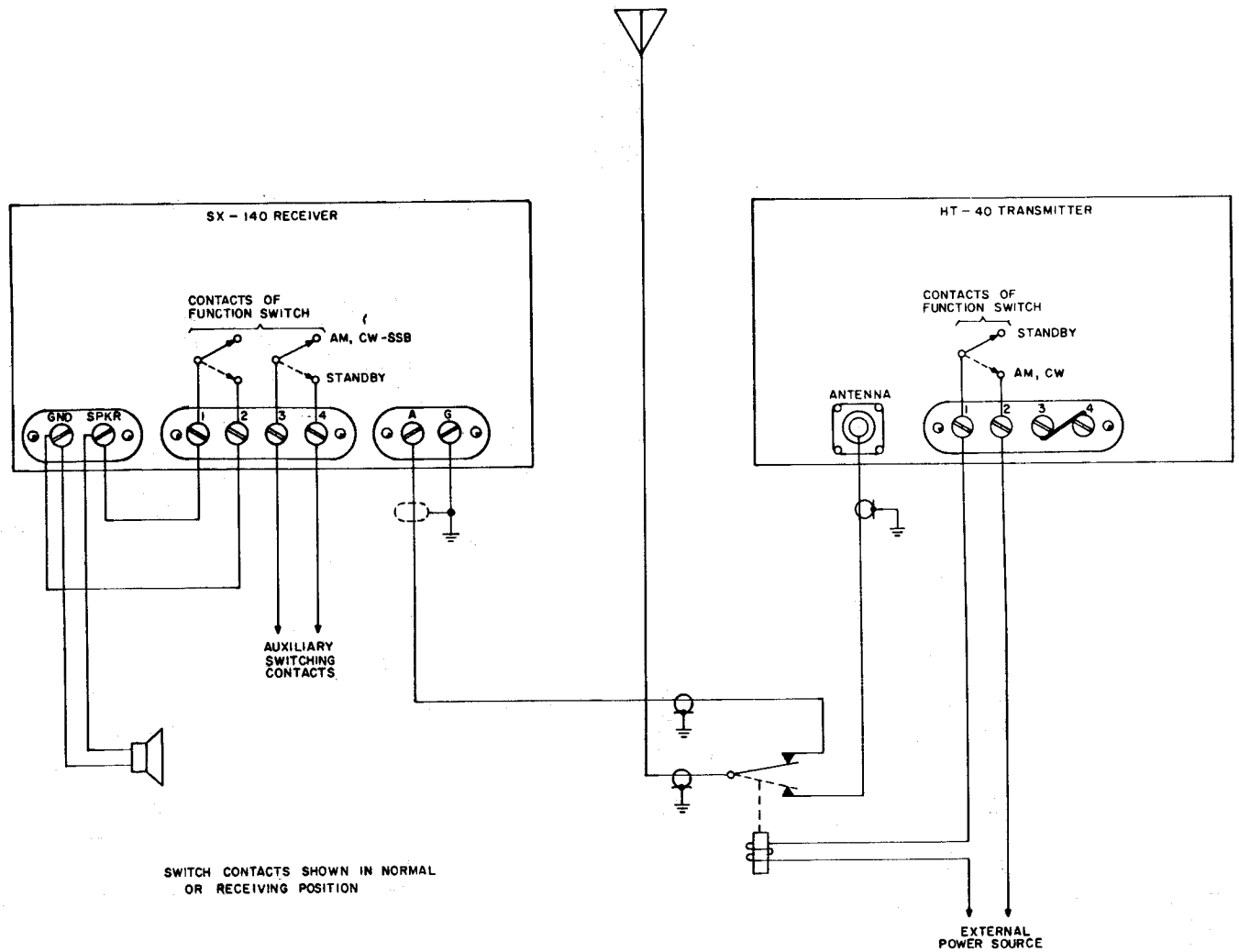


Figure 26. Model HT-40K Controlling Antenna Relay.

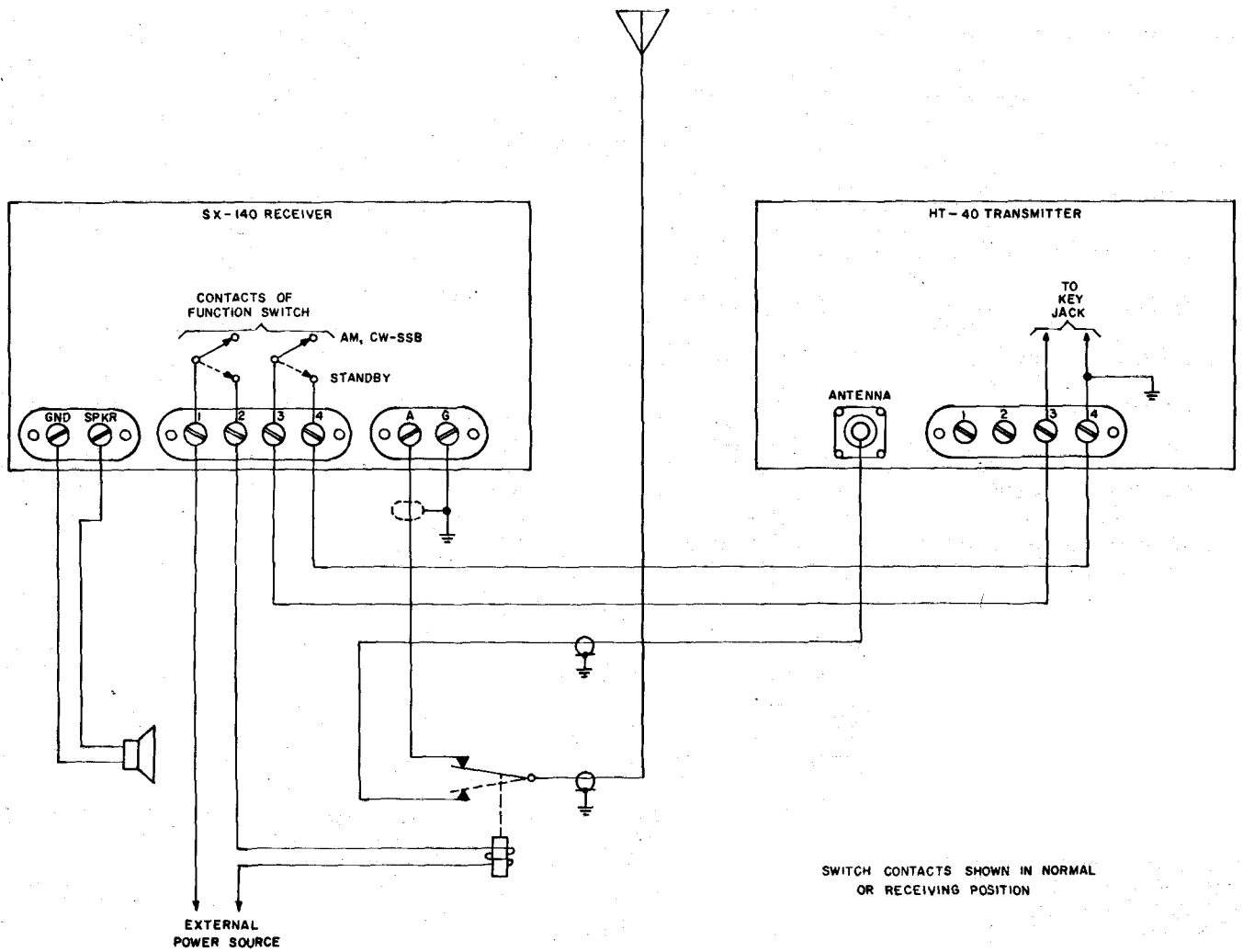


Figure 27. Model HT-40K Controlled by Station Receiver.

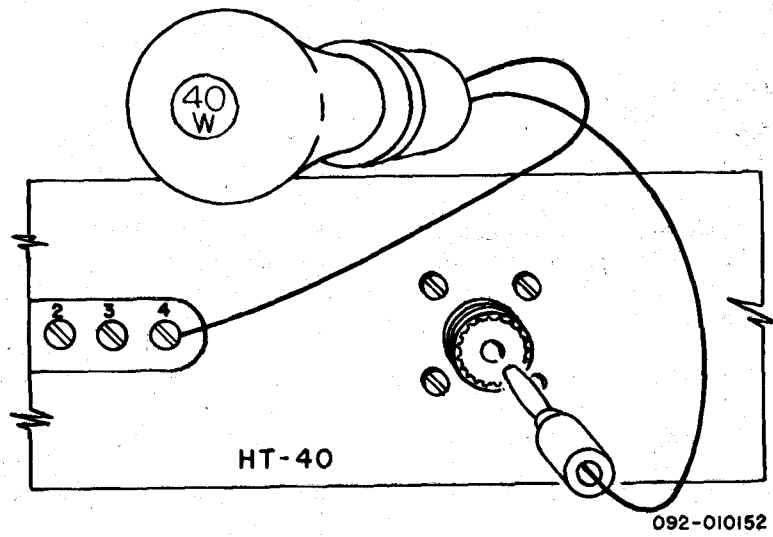


Figure 28. Light Bulb Used as Dummy Load.

50 - 2 load
68 - 73

PROCEDURE

1. Set the controls as indicated:

MIKE GAIN Maximum counterclockwise

FUNCTION OFF

BAND SELECTOR Desired band

DRIVE Center of range

CRYSTAL-VFO CRYSTAL

RF OUTPUT-GRID
CURRENT GRID CURRENT

PLATE LOADING

80 to 10 meter bands Near 100

6 meter band Near 0

PLATE TUNING

80 to 10 meter bands Near 100

6 meter band Near 0

2. Insert crystal of desired frequency into the CRYSTAL-VFO socket.
3. It may be desirable to insert the key plug into the KEY jack and close the key at this time to allow the operator to tune the transmitter, however, this is not necessary since the jack is a normal closed circuit type when the key plug is removed.
4. Connect the dummy load to the antenna connector on the rear chassis panel and plug the line cord into a 117 volt AC utility outlet.
5. Set FUNCTION control to STANDBY, allow approximately 5 minutes to warm up and then set FUNCTION control to TUNE.
6. Adjust DRIVE control for maximum deflection on the RF OUTPUT-GRID CURRENT meter.
7. Set RF OUTPUT-GRID CURRENT switch to the RF OUTPUT position.
8. Rotate FUNCTION control to CW.

NOTE

In steps 9,10 and 11 the final setting of the PLATE LOADING and PLATE TUNING controls will be near 100 on the 80 meter band and progressively lower on the 40 to 6 meter bands. On the 6 meter band two maximum output indications can be obtained. The correct setting will be between 0 and 20.

9. Adjust PLATE TUNING control for maximum output indication on the meter.
10. Adjust PLATE LOADING control for maximum output indication on the meter.
11. Repeat steps 9 and 10 until maximum output is obtained; note the approximate meter reading.
12. Turn Transmitter off with the FUNCTION control, disconnect the dummy load and connect the transmitting antenna.

13. Rotate the FUNCTION control to CW and note output indication. If the antenna impedance is approximately the same as that of the dummy load the meter indication will be approximately the same as that noted in step 11. If the antenna line is open a higher indication will be noted; if the antenna line is shorted approximately zero indication will be noted.
14. If the proper indication is obtained on the meter the HT-40K is ready for CW operation.

TUNING PROCEDURE FOR AM OPERATION. - The procedure for tuning the Transmitter for AM operation is identical to the tuning procedure for CW operation, step 1 through step 12 except that the CW key need not be plugged in. The following procedure will complete the tuning of the transmitter for AM operation:

1. Connect the microphone to the MIKE connector on the rear of the chassis.
2. Rotate the FUNCTION control to AM; note the meter indication, it should be approximately one fourth the indication noted in step 11.
3. While talking in a normal voice level two or three inches from the microphone and observing the meter, advance the MIKE control clockwise until a peak indication is observed during "talk" periods which is slightly below the indication noted in step 11. This provides 75% to 90% AM modulation as shown in figure 29, if it is desired to use a scope.

SERVICE

SERVICE POLICY

Facilities of the Hallicrafters Service Department are available for repair, service, and technical consultation by mail. If continued operational difficulties result with completed kit, a letter to Hallicrafters may help solve the problem.

REPAIR PROCEDURE

Hallicrafters Model HT-40K Transmitter Kit may be returned for inspection and repair at a special service charge of \$12.50 during the first year after purchase. This special price applies only to kits that have been completed and wired according to the instructions contained within this material. Any kits that are not completed or that have been modified will not be accepted for repair. Charges for replacement parts will be determined by the warranty status of the equipment when it is received for service. The builder is to be reminded that the registration card furnished with each Hallicrafters Kit must be completed and returned to The Hallicrafters Company immediately after purchase. The warranty is applicable only to equipment that is registered with Hallicrafters factory.

After the first year, service charges will be based on the labor time required to make repairs and the cost of any parts or material needed to complete the repairs.

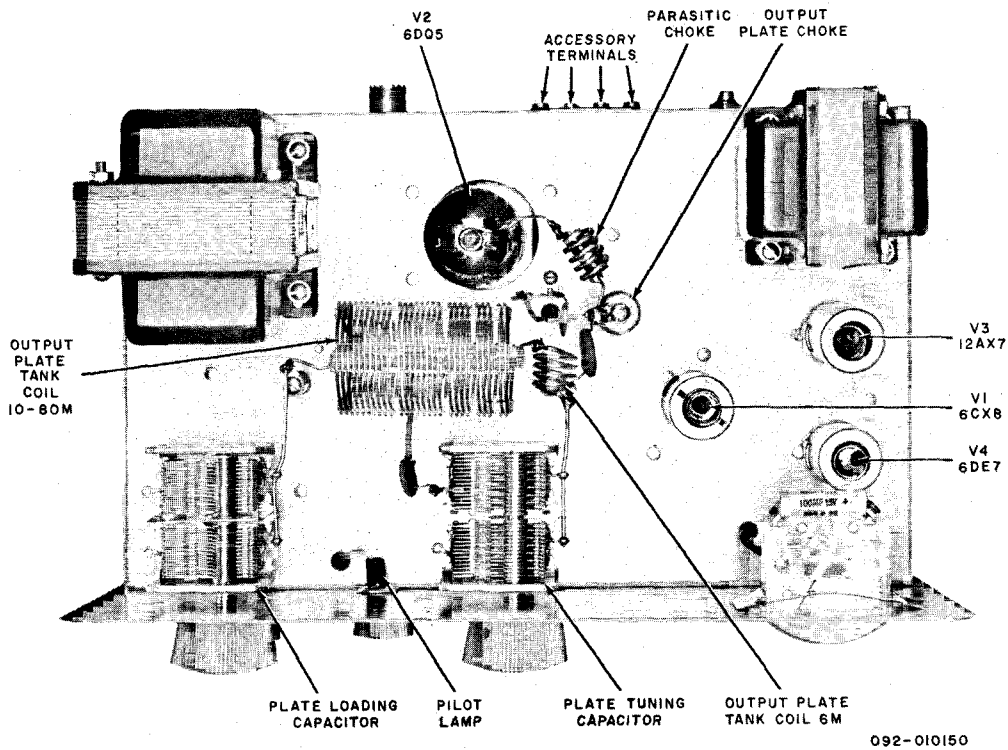
NOTE

KITS SHOWING EVIDENCE OF WIRING WITH ACID CORE SOLDER
OR PASTE FLUXES WILL NOT BE ACCEPTED FOR REPAIR OR
SERVICE AND WILL BE RETURNED UNREPAIRED.

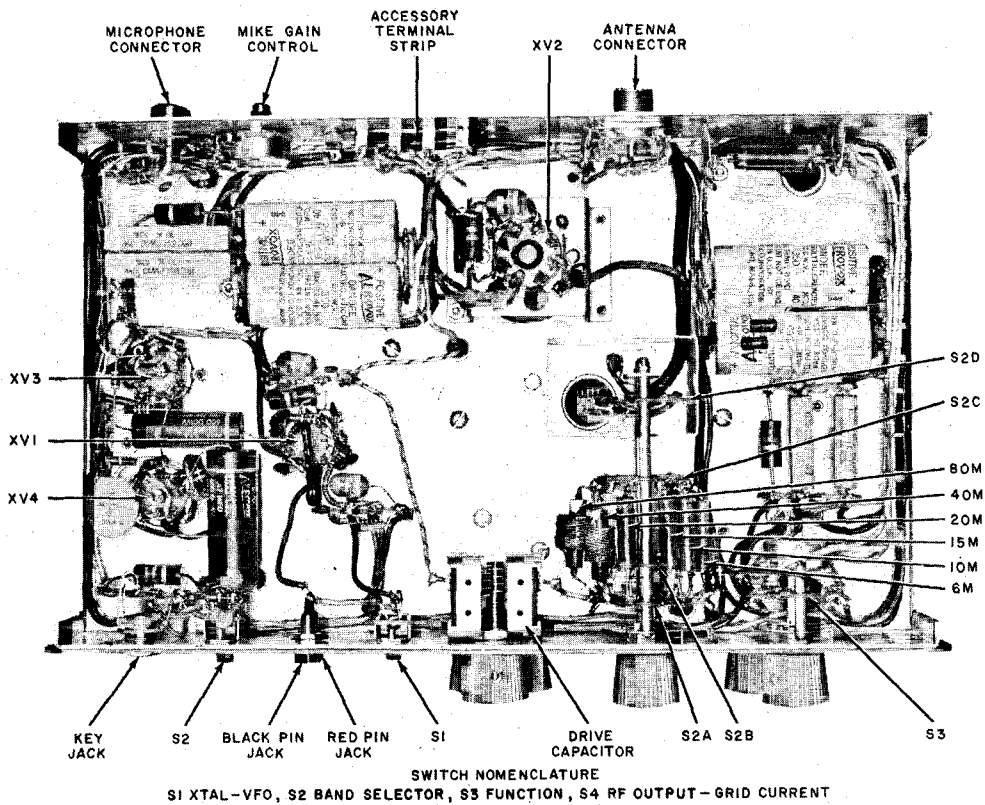
Before returning a kit for service or repair, please notify The Hallicrafters Company and a shipping label and a return authorization will be mailed to the requester.

When writing, include the following information:

1. Model number of kit.
2. Serial number.
3. Date of purchase
4. Description of trouble.



Top View



Bottom View

COMPLETED TRANSMITTER CHASSIS