

# INSTRUCTION MANUAL

for the

# W R L

*"Globe Chief"*

**TRANSMITTER MODEL 90**

Manufactured by WRL ELECTRONICS, INC.

Council Bluffs, Iowa

For

**WORLD RADIO LABORATORIES, INC.**

COUNCIL BLUFFS, IOWA

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## SPECIFICATIONS

R.F. AMPLIFIER POWER INPUT: 90 watts maximum, all bands. 75 watts for Novice use.

OUTPUT: Unbalanced, 50 to 600 ohms, non-reactive.

BAND COVERAGE: 160 through 10 meters with generous overlap between amateur bands.

POWER REQUIREMENTS: 115 volts A.C., 50/60 cycles, 1-1/2 amperes.

FREQUENCY CONTROL: Crystal control, with provision for external VFO.

EMISSION: CW, with provisions for either screen or plate modulation.

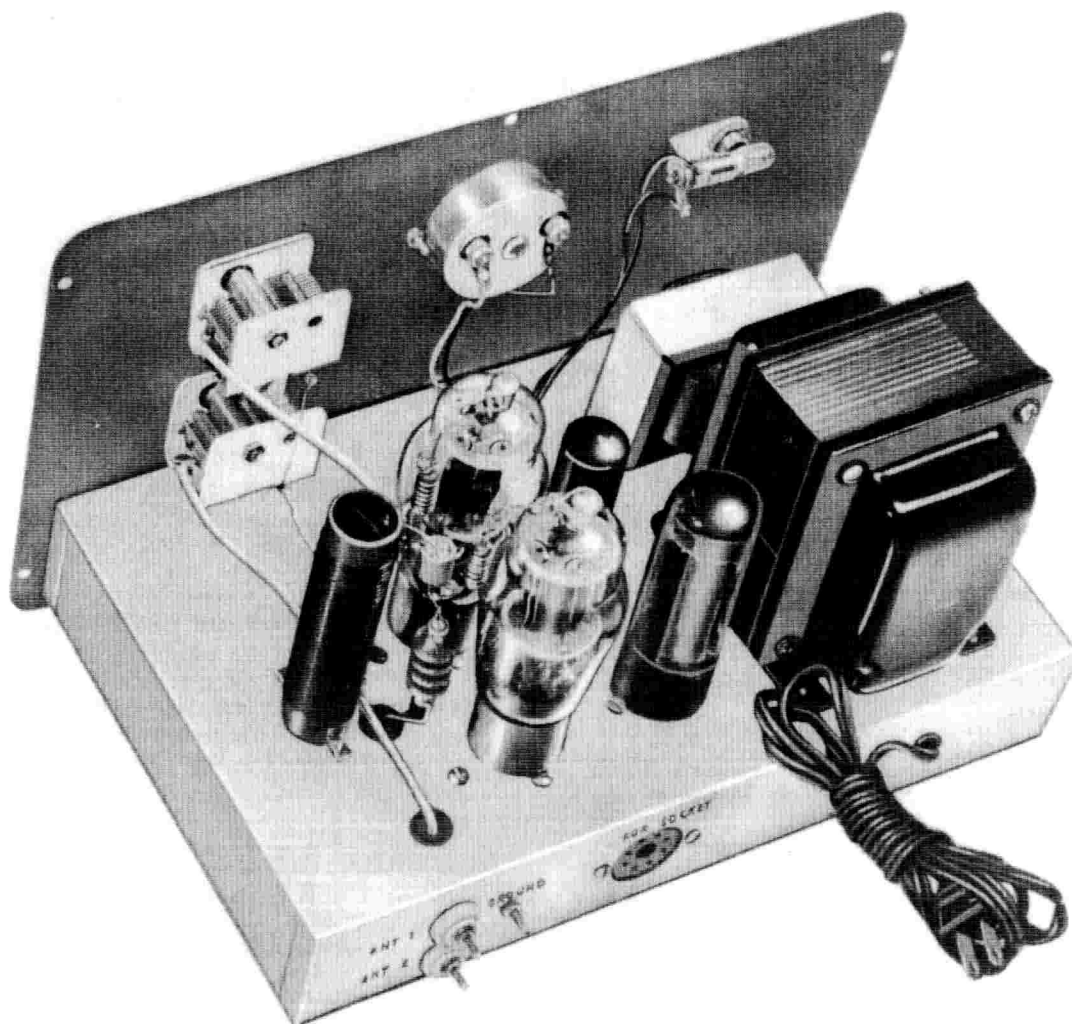
KEYING: Safe keying through the use of a modified blocked-grid system. Voltage across the key limited to less than 75 volts.

DIMENSIONS: 8 inches high, 8 inches deep, 14-1/4 inches wide.

SHIPPING WEIGHT: 27 pounds.



Globe Chief Transmitter Model 90



Top And Rear View of Chassis

## SECTION I

### GENERAL DESCRIPTION

#### 1-1. GENERAL.

1-2. The WRL Globe Chief Transmitter, Model 90, is made by WRL Electronics, Inc., of Council Bluffs, Iowa for World Radio Laboratories, Inc., of Council Bluffs, Iowa. The transmitter is rated at 75 watts input power for operation by the holder of a Novice Class amateur radio license, or may be operated at 90 watts input by the holder of a General Class, or higher class license. The WRL Globe Chief has been designed to provide the amateur radio operator with a complete CW transmitter of adequate power for world wide contacts. Complete bandswitching is included for maximum convenience. A wide variety of antenna types may be used with the transmitter due to the pi-network output circuit. Modified blocked-grid keying has been incorporated for increased safety; the voltage appearing across the key is held to less than 75 volts. The transmitter has been designed to allow the addition of a plate modulator; or, if radiotelephone operation is desired at minimum cost, a screen modulator may be employed. Provision for use with an external VFO has been incorporated. Voltage for operating an antenna changeover relay is available at the auxiliary socket on the rear of the transmitter.

#### 1-3. DESCRIPTION.

1-4. The model 90 transmitter is completely self-contained in a metal cabinet. Dimensions are 8 inches high, 8 inches deep, and 14-1/4 inches wide. Net weight is approximately 22-1/2 pounds. Ventilating grilles are provided in the cabinet to assure adequate ventilation and heat dissipation. The meter and cabinet are fully shielded for TVI reduction. The unit may be removed from the cabinet for inspection and servicing. Power requirements are 115 volts A.C., 50/60 cycles, single phase. Power consumption is approximately 160 watts for 75 watts plate input, or 175 watts for 90 watts plate input. Tube complement is shown in Table I.

TABLE I. TUBE COMPLEMENT.

Quantity	Type	Function
2	807	R.F. Amplifier (parallel)
1	6AG7	Oscillator
1	5U4GA	Rectifier

#### 1-5. THEORY OF OPERATION.

1-6. The oscillator uses a type 6AG7 tube in a controlled regeneration circuit which supplies adequate drive to the R.F. amplifier on all bands. Regeneration is removed by short-circuiting the cathode R.F. choke when a VFO is used in place of crystal control. Bandswitching is incorporated in this stage. Blocked grid keying is used, with the blocking bias supplied by a resistor common to the B- return of the oscillator and amplifier stages. The oscillator stage is capacity-coupled to the R.F. amplifier.

1-7. The R.F. amplifier uses two type 807 tubes operated in parallel as a Class C amplifier. A pi-network tank circuit in the plate circuit of this stage provides wide range matching to various antenna loads, good harmonic attenuation, and bandswitching. Under key-up conditions, a large bias voltage is applied to this stage, limiting plate current to between 20 and 30 milliamperes. This current is enough to greatly improve the regulation of the power supply, and yet small enough to be handled easily by the 807's. This current flowing through the common B- resistor provides the blocking bias for the oscillator stage. The R.F. amplifier stage operates as a "straight-through" amplifier on all bands except 10 meters, where it doubles. On 160 meters, and for use with lower impedance loads on 80 and 40 meters, an "L" network coil is available at a terminal on the rear of the chassis.

1-8. The power supply uses a full-wave center-tapped circuit. The rectifier tube is a 5U4GA, feeding a single section choke input filter. Power supply output is 475 volts at 235 milliamperes.

SECTION I  
GENERAL DESCRIPTION

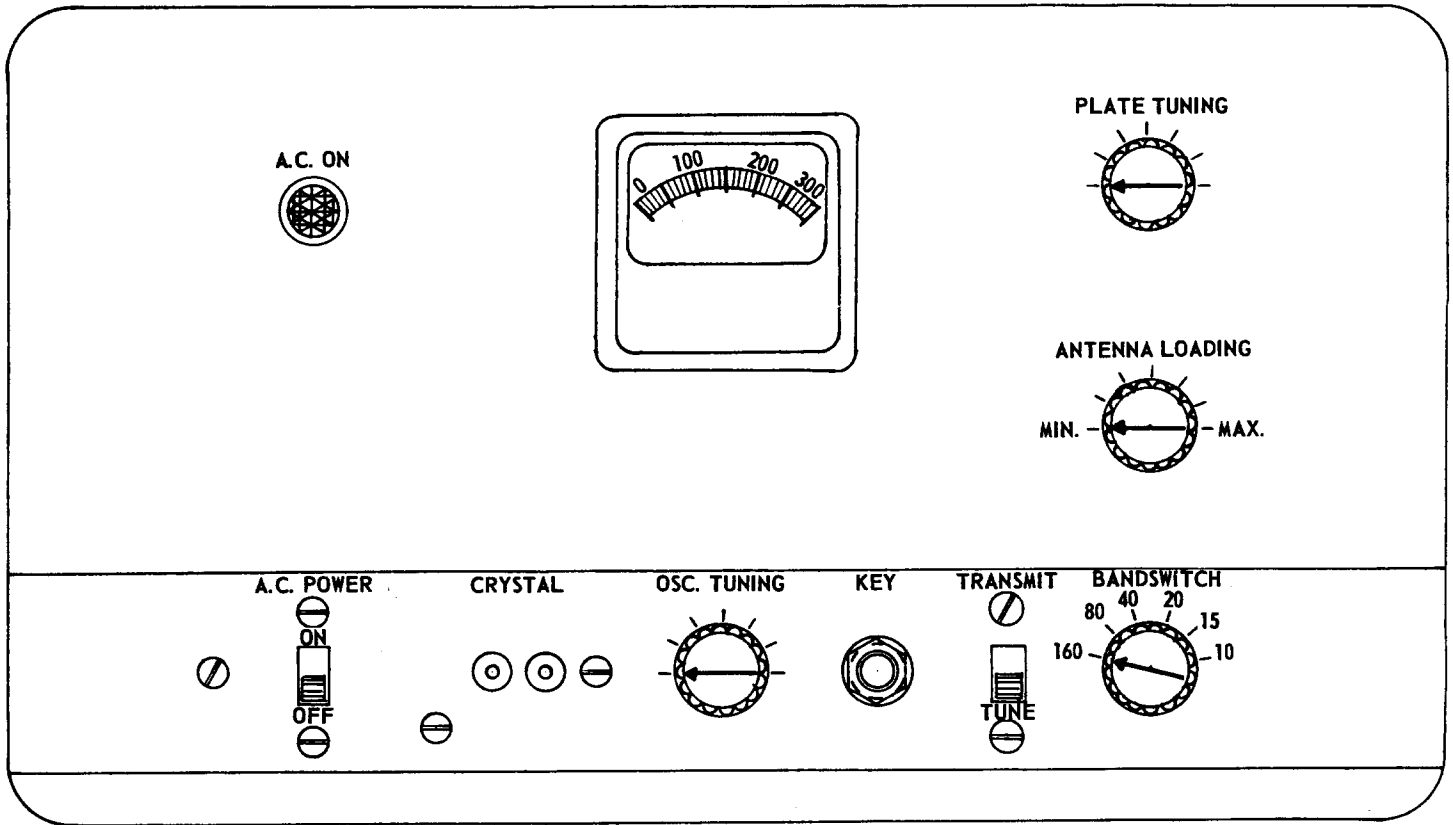


Figure 1. Front Panel View.

## SECTION II

### OPERATING PROCEDURES

#### 2-1. GENERAL.

2-2. The following paragraphs describe the various controls of the Globe Chief transmitter, Model 90. Tune up and operating procedures are outlined following the description of the controls. It is recommended that this section be studied thoroughly before any attempt is made to place the transmitter in operation.

#### 2-3. DESCRIPTION OF CONTROLS.

2-4. A.C. POWER. This switch applies A.C. power to the power transformer when in the ON position. This is the master power switch.

2-5. OSC. TUNING. This variable capacitor tunes the oscillator plate circuit to the fundamental, second, or third harmonic of the crystal frequency.

2-6. TUNE-TRANSMIT. When placed in the TUNE position, this switch applies a blocking bias to the final amplifier and at the same time permits the oscillator to operate normally for oscillator tune-up. When placed in the TRANSMIT position, the switch removes the blocking bias from the R.F. amplifier to permit it to operate, and also applies 115 volts A.C. to pins 6 and 7 of the AUX. socket for operation of an external antenna changeover relay. (Relay is optional equipment and is not supplied with the transmitter).

2-7. PLATE TUNING. This variable capacitor tunes the R.F. amplifier plate circuit to resonance at the desired operating frequency.

2-8. ANTENNA LOADING. This variable capacitor matches the antenna or feedline impedance to the R.F. amplifier plate circuit impedance for proper loading and maximum R.F. output to the antenna.

2-9. BANDSWITCH. This two-section rotary switch permits instant choice of bands through the entire range of amateur frequencies from 160 to 10 meters by selecting the proper taps on the oscillator and R.F. amplifier coils.

#### 2-10. EXTERNAL CONNECTIONS.

##### WARNING

Before making any external connections to the transmitter remove the A.C. power cord plug from the A.C. source receptacle. Also place the A.C. POWER switch in the OFF position. The first external connection should be a good ground to the GROUND connection on the rear of the transmitter. See paragraphs 2-15 and 2-19 (c).

2-11. CRYSTAL SOCKET. Located on front panel

of the transmitter. Plug frequency controlling crystal, or VFO, into this socket.

2-12. KEY JACK. Located on front panel of the transmitter. Plug transmitting key into this jack for C.W. operation.

2-13. AUXILIARY SOCKET. Located on the rear of the transmitter. 115 volts AC is available at this socket for the operation of an antenna changeover relay. This socket may also be used to provide connections for a plug-in modulator for radio telephone operation (see paragraphs 4-5 through 4-14).

2-14. ANT 1 and ANT 2. Located on the rear of the transmitter. Two insulated terminals for antenna connection; see paragraph 2-19 (d) for proper use.

2-15. GROUND. Located on the rear of the transmitter. Attach a good electrical ground to this terminal.

##### CAUTION

Read paragraph 2-10 before making any external connections.

A No. 12 copper wire connected to a cold water pipe, or to a 6 or 8 foot rod driven into the ground is usually satisfactory. Should difficulty be encountered in achieving a good ground on the higher frequency bands, it may be that the length of the grounding wire is such that it acts like an antenna. The cure is to shorten or lengthen the wire a few feet.

2-16. POWER CORD AND PLUG. Extends out from the rear of the transmitter. Supplies A.C. power to the transmitter when plugged into a 115 volt 50/60 cycle, single phase alternating source. Most home wall receptacles provide this type of power.

2-17. Proper tune-up is necessary for optimum performance of the Globe Chief transmitter. Attempted operation of the transmitter without proper tune-up may result in damage to the equipment or spurious radiations outside the assigned amateur bands.

##### WARNING

Operation of this equipment involves the use of high voltages which are dangerous to life. Observe all safety precautions! Do not attempt to make adjustments inside the equipment or change any tubes with the power on. Disconnect-UNPLUG-the power cord before touching any high voltage points or the antenna terminals. Do not do any work on the inside of the transmitter without first unplugging the power cord. It is advisable to short the B plus to ground using an insulated

SECTION II

OPERATING PROCEDURES

screwdriver as a shorting stick, before touching any exposed wiring.

2-18. TUNE-UP PROCEDURE.

2-19. The following paragraphs describe the tune-up procedure for the WRL Globe Chief transmitter, Model 90. Prior to the initial tune-up the following preliminary precautions and procedures should be observed:

- (a) Make certain AC power cord plug is removed from the AC power source receptacle.
- (b) Make certain the AC POWER switch is in the OFF position.
- (c) Attach a good electrical ground as per paragraph 2-15.
- (d) Connect the antenna, or antenna feedline, to the transmitter as follows: for a single-wire direct fed antenna, or a single wire feedline, connect to ANT-1. If proper loading cannot be obtained, as described later in this section, change connection to ANT-2. For co-axial cable feedline, connect the outer conductor (the shield) to GROUND. Connect the inner conductor to ANT-1. If proper loading cannot be obtained, change the connection to ANT-2. For two-wire feedline, such as twin-lead, connect one wire to GROUND. Connect the other wire to ANT-1. If proper loading cannot be obtained, change the connection to ANT-2. If the ANTENNA LOADING control must be advanced to the extreme clockwise position (MAX), improper loading is indicated. Adjustment of this control is described later in this section. If proper loading cannot be obtained at either ANT-1 or ANT-2 it is recommended that the antenna itself be inspected, and altered if necessary. Terminal ANT-2 is used to match lower impedance loads and will seldom be needed on 20, 15, or 10 meters.
- (e) Insert the power cord plug into a 115 volt AC wall receptacle.
- (f) Place A.C. POWER switch in ON position and let the transmitter warm up for at least one minute.
- (g) Set bandswitch to the desired band of operation.
- (h) Insert a suitable crystal into the crystal socket. See Table II.

TABLE II. CRYSTAL CHART.

Band	Crystal Frequency General Class	Crystal Frequency Novice Class
160*	1800 to 2000 Kc.	no Novice
80	3500 to 4000 Kc.	3700 to 3750 Kc.
40	7000 to 7300 Kc.	7150 to 7200 Kc.
20	7000 to 7175 Kc.	no Novice
15	7000 to 7150 Kc.	7034 to 7083 Kc.
11	6740 to 6807 Kc.	no Novice
10	7000 to 7425 Kc.	no Novice

\*See the Federal Communications Commission

regulations for the 160 meter frequencies and powers available in your area.

- (i) Insert the key plug into the keyjack and close the key contacts.
- (j) Rotate the OSC. TUNING control for maximum reading of the meter. On several bands there will be two positions of the control where a maximum meter reading will be obtained; on 15 METERS ONLY use the one where the arrow on the OSC. TUNING control is to the right of center. On all other bands, use the one with the arrow to the left of center.
- (k) When the proper maximum reading has been obtained, open the key contacts. With the key open, the meter should not drop all the way to zero, but should read about 20 milliamperes, or 1 dial division.
- (l) Place ANTENNA LOADING control to MIN position.
- (m) Place PLATE TUNING control so arrow points in the same direction as the arrow on the ANTENNA LOADING control.
- (n) Place the TUNE-TRANSMIT switch in the TRANSMIT position.

- (o) Close the key contacts. The meter reading should rise to between 220 and 260 milliamperes.
- (p) Rotate the PLATE TUNING control until the meter pointer dips to a minimum reading.
- (q) Rotate ANTENNA LOADING control until the meter reading rises to approximately 190 milliamperes.
- (r) Rotate PLATE TUNING control for minimum meter reading again. The minimum should now be higher than it was in step (p).
- (s) Repeat steps (p), (q), and (r) until the minimum meter reading is 180 milliamperes (Heavy line extending below scale). This is 75 watts input, the maximum allowed to a novice operator. If the licensee and operator of the station holds a general, or higher class license, loading may be increased until the meter reads 210 milliamperes, which represents just over 90 watts input.
- (t) The transmitter is now ready for CW operation. If separate antennae are used for transmitting and receiving, it is merely necessary to close the key to begin transmitting, and open the key to listen. If it is desired to use the same antenna for transmitting and receiving, a 115 volt A.C. antenna relay may be used. 115 volts A.C. to operate this relay is available at pins 6 and 7 of the AUX. socket on the rear of the transmitter. Placing the TUNE-TRANSMIT switch in the TRANSMIT position will apply this voltage to pins 6 and 7 of the AUX. socket; placing the TUNE-TRANSMIT switch in the TUNE position will remove the voltage. See paragraph 2-24 for details.

2-20. OPERATING HINTS.

2-21. Included here are some hints applicable to the operation of this transmitter, and

## OPERATING PROCEDURES

some helpful information on the successful setting up and operation of any amateur radio station. Attention paid to details will result in consistently satisfactory operation; a careless job will give not only erratic results, but also may cause equipment failure and possibly dangerous electrical shock.

2-22. GROUNDING. It is recommended that all metal chassis in use at the station, including this transmitter, be connected to a common ground wire. This will eliminate possible electrical shocks which may otherwise be received from some ungrounded equipment. A fairly short lead of heavy (No. 12 or No. 14) copper wire securely fastened to a COLD water pipe is usually a satisfactory ground. Do not just wrap the wire around the pipe; it must make a good electrical connection. Ground clamps suitable for making this connection are available for only a few cents. A six or eight-foot grounding rod driven into the moist earth will also provide a suitable point to which a grounding wire for the station can be attached.

2-23. ANTENNAE. The one item which can perhaps be said to be the most important in determining if an amateur station will "get out" is the antenna. With a poor antenna, even a 1000 watt station will experience great difficulty in making many satisfactory contacts, while with a good antenna a 75 to 90 watt station may make excellent contacts with all continents of the world. In general, the higher up an antenna is, the better it will radiate. A half-wave dipole or folded dipole is quite satisfactory for 40 and 80 meters, and many long distance contacts can be made on the 10, 15, and 20 meter bands with such an antenna. A quarter-wave vertical or ground-plane antenna will often provide superior performance on 10 or 15 meters. On 20, 15, and 10, a rotary beam antenna will provide excellent performance. For the best compromise between performance and cost, we recommend the half-wave dipole or folded dipole for each band (See Table III and Figures 2 and 3). For minimum cost, a simple 75 to 85 foot end-fed wire may be strung up from the transmit-

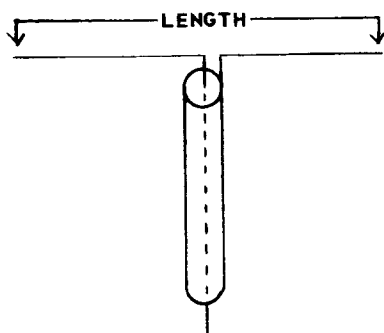


Figure 2. Half-Wave Dipole (RG-58/U or RG-59/U).

ter to the nearest high point; this antenna will load up on all bands and get out surprisingly well if the far end is high and in the clear and not too much of the antenna is inside the building which houses the transmitter.

TABLE III. ANTENNA CHART.

Band	Length, $\frac{1}{2}$ Wave Dipole	Length, Folded Dipole
10	15'-9" to 16'-6"	15'-8" to 16'-5"
11	17'-2"	17'-1"
15	21'-11" to 22'-3"	21'-9" to 22'-1"
20	32'-10" to 33'-3"	32'-4" to 33'-0"
40	64'-3" to 66'-6"	63'-6" to 66'-0"
80	118' to 133'	116' to 132'
80*	126'	124'-6"
160	235' to 260'	. . . . .

\* Novice Band.

Note: in Table III, two lengths are given for each type of antenna for most bands. The shorter one is correct for the high frequency end of the band, and the longer for the low frequency end of the band. If operation over the entire band is desired, cut the antenna to a length in between the lengths given for the band edges. For instance, a 65 foot  $\frac{1}{2}$  wave dipole or folded dipole would work well over the entire forty meter band.

2-24. ANTENNA RELAY. When a good transmitting antenna has been installed, it is advantageous to be able to use the same antenna for receiving. This can be done with an inexpensive DPDT ceramic insulated knife switch, as shown in Figure 4. For greater convenience, a DPDT 115 volt A.C. antenna relay can be used, as shown in Figure 5. When using this relay, it is only necessary to set The TUNE-TRANSMIT switch to TUNE when it is desired to listen, and to TRANSMIT when it is desired to transmit. In the TRANSMIT position, 115 volts A.C. is applied to the coil of the relay, closing the relay and connecting the transmitter to the antenna while disconnecting the receiver.

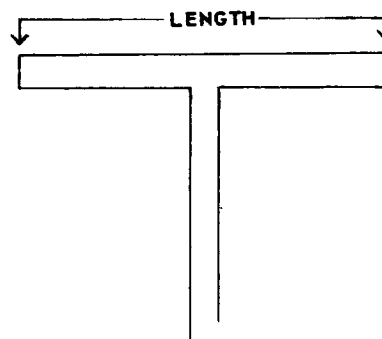


Figure 3. Folded Dipole (300 Ohm Twinlead).



SECTION II

OPERATING PROCEDURES

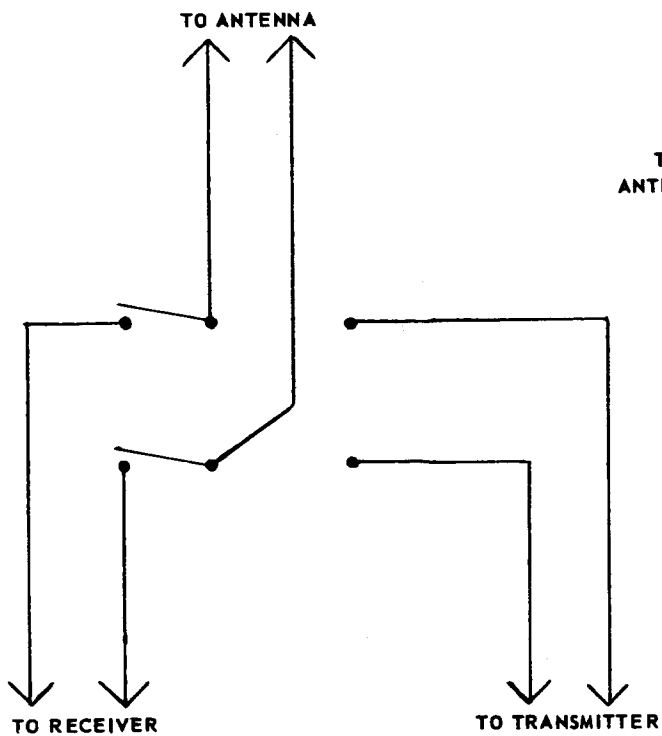


Figure 4. Antenna Switch (DPDT Knife Switch).

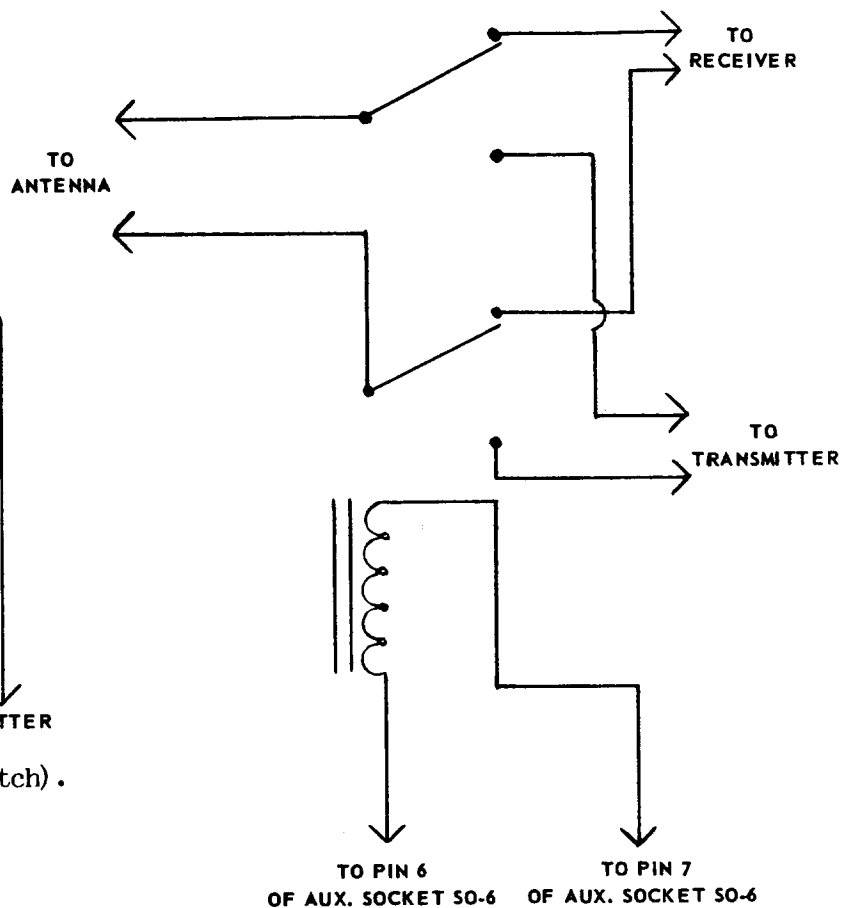


Figure 5. Antenna Relay. (DPDT Relay, Ceramic Insulation, 115 V. A.C. Coil).

This knife switch or relay may be used for radiotelephone transmission as well as for

CW. To convert the transmitter for phone operation, see paragraphs 4-5 through 4-14.

operation, proceed to Section V, Test Procedure.

#### 4-5. MODIFICATIONS FOR PLATE MODULATION.

4-6. The holder of a General Class License may desire to add modulation to the WRL Globe Chief Model 90 Transmitter for radio-telephone operation. An external modulator supplying 25 to 45 watts of audio at an impedance of approximately 2500 to 3000 ohms may easily be employed as a high-level plate modulator by making the following modifications in the transmitter wiring.

1. Disconnect the long red wire from lug 1 of tie-lug strip TS-5. Connect it instead to pin 2 of SO-6 (S).
2. Connect a 5 inch piece of wire from pin 3 of SO-6 (S) to lug 1 of TS-5 (S).
3. Connect a 5-1/2 inch piece of wire from lug 5 of TS-5 (S) to pin 4 of SO-6 (S).
4. Use an octal plug to make external connections to SO-6. Connect the output of a modulator to pins 2 and 3 of this plug. Connect a .1 MFD 400 or 600 volt capacitor from pin 3 to pin 4 of this plug.

4-7. These are all the modifications necessary to operate at full power on phone. For tune-up procedure, leave the modulator turned off and tune up the same as on C.W. To operate, turn on the transmitter as for C.W., then turn on the modulator. At the end of the transmission, turn off the modulator before turning off the transmitter. To change back to C.W. operation, turn off the modulator and short pin 2 to pin 3 of SO-6. If additional operating conveniences are desired, the following steps can be added.

1. Connect a 2-1/2 inch piece of bare wire from pin 5 of SO-6 (S) to the nearest solder lug (S).
2. Connect a 11-1/2 inch piece of wire from lug 2 of the keyjack J-1 (S) to pin 1 of SO-6 (S).
3. Use a DPDT switch to turn the modulator on, leaving one section of the switch unused. Connect the unused section of the switch to pins 1 and 5 of the plug that is inserted into SO-6. This will short the keyjack and turn the transmitter on when the modulator is turned on, eliminating the necessity for closing the key and also turning on the modulator every time transmission is desired.

4-8. Greater operating convenience may be obtained by the use of a 115 volt A.C. DPDT

relay as follows:

1. Complete the modifications detailed in paragraph 4-6. Complete the modifications detailed in steps 1 and 2 of paragraph 4-7.
2. Connect the two wires from the coil of the 115 VAC DPDT relay to pins 6 and 7 of the plug that goes to SO-6.
3. Connect a pair of the normally open contacts of the relay to pins 1 and 5 of this plug.
4. Use the other pair of normally open contacts to operate (turn on) the modulator.
5. The entire transmitter can now be controlled on phone operation by use of the TUNE-TRANSMIT switch on the front panel. For tuning up the transmitter, follow the tune up procedure for C.W. Once tuned up, "STANDBY" condition can be achieved by opening the key or unplugging it and placing the TUNE-TRANSMIT switch in the TUNE position. To transmit, simply place the TUNE-TRANSMIT switch in the TRANSMIT position. The relay will close, shorting the keyjack and also turning on the modulator, thus placing the entire transmitter on the air.

#### 4-9. MODIFICATIONS FOR SCREEN MODULATION.

4-10. Screen grid modulation may be employed with the WRL Model 90 transmitter for radio-telephone operation, if desired. The efficiency of the R.F. amplifier is not as great with screen modulation as with plate modulation; however, the cost is also not as great. An external modulator for screen modulation may be employed by making the following modifications in the transmitter wiring.

1. Do NOT make the modifications detailed in the paragraphs on plate modulation, 4-5 and 4-6. These screen-grid modulation changes refer to the transmitter as originally wired for C.W. operation.
2. Connect a 5 inch piece of wire from lug 1 of tie-lug strip TS-5 (S) to pin 3 of SO-6 (S).
3. Remove the following two orange/white wires: from pin 2 of SO-4 to lug 5 of TS-5, and from pin 2 of SO-3 to lug 5 of TS-5.
4. Connect a 3 inch piece of wire from pin 2 of SO-4 (S) to lug 2 of TS-5 (NS).
5. Connect a 3 inch piece of wire from pin 2 of SO-3 (S) to lug 2 of TS-5 (NS).

## SECTION IV

### WIRING INSTRUCTIONS

6. Connect a 6 inch piece of wire from lug  2 of TS-5 (S) to pin 2 of SO-6 (S).
7. Connect a 6 inch piece of wire from lug  5 of TS-5 (S) to pin 4 of SO-6 (S).
8. Connect a 2-1/2 inch piece of bare solid  wire from pin 5 of SO-6 (S) to the nearest solder lug (S).
9. Connect a 5-1/2 inch piece of wire from  pin 8 of SO-6 (S) to pin 1 of SO-3 (S).

4-11. This completes the internal modifications of the WRL Model 90 transmitter for use with an external screen modulator. It is essential that the screen modulator be of the cathode-follower type if these modifications are to be satisfactory. The clamp-tube type of screen modulator requires slightly different connections and does not give quite as good performance. Use an octal plug to connect the screen modulator to SO-6. Connect the ground lead of the modulator to pin 5 of the plug; the filament lead to pin 8; the B plus lead to pin 3; and the output lead to pin 2. To change back to C.W. operation, unplug the modulator and insert a plug which has pins 2 and 4 connected together into SO-6.

#### 4-12. TUNE UP PROCEDURE WHEN USING THE SCREEN MODULATOR.

4-13. Tuning up with the screen modulator is slightly different from the tune up procedures for C.W. or plate modulation operation. In general, the pattern is the same as for C.W. operation except for lower meter readings. Detailed procedure is as follows:

1. Place transmitter controls as follows: A.C. POWER to ON. TUNE-TRANSMIT to TUNE. Bandswitch to desired band of operation. OSC. TUNING, PLATE TUNING, and ANTENNA LOADING all pointing to the left side of the transmitter.
2. Plug in a suitable crystal for the desired band. See Table II.
3. Plug key into keyjack J-1.
4. Close key and adjust OSC. TUNING for maximum meter reading. This will be less than for C.W. operation, and may even be less than one dial division. Be certain that the arrow on the OSC. TUNING control is to the left of center on all bands except 15 meters. On 15 meters it must be to the right of center.
5. Open the key. Connect antenna to the proper antenna terminal. See the C.W. tune up procedure for details.

6. Place the TUNE-TRANSMIT switch in TRANSMIT position. Close key. The meter should rise to between 110 and 150 Ma.
7. Rotate PLATE TUNING control for minimum reading. Advance the ANTENNA LOADING control toward maximum until the meter returns to its original reading. Retune the PLATE TUNING for minimum reading, which will now be higher than it was at first. Repeat the process until there is very little difference between the minimum reading and the maximum, i.e., the meter reading at the "dip" point should be within 10 milliamperes of the reading with the PLATE TUNING tuned away from the "dip" point. With any form of screen grid or control grid modulation, very heavy loading is essential if good audio quality is to be obtained.
8. Connect a crystal or hi-impedance dynamic microphone to the connector on the modulator. Speak into the microphone. A slight movement of the meter indicates full modulation. The meter should not move more than 10, or at the most, 20 milliamperes.
9. To standby, simply open the key. To transmit, close the key. If an antenna relay is being used, it will also be necessary to operate the TUNE-TRANSMIT switch in order to operate the antenna relay, just the same as in C.W. operation.

4-14. If the antenna relay is being used and it is desired to have truly "one-switch" operation, this can be obtained by adding a SPST 115 volt A.C. relay as follows:

1. Connect a 11-1/2 inch piece of wire from  lug 2 of keyjack J-1 (S) to pin 1 of SO-6 (S).
2. Connect the leads from the coil of the  SPST 115 V.A.C. relay to pins 6 and 7 of the plug that plugs into SO-6.
3. Connect the leads from the normally open  contacts of the relay to pins 1 and 5 of this plug.
4. After tuning up the transmitter as detailed in paragraph 4-13, the key may be left open or may be removed entirely. Setting the TUNE-TRANSMIT switch to TRANSMIT will cause the SPST relay to close, shorting the keyjack and turning on the transmitter. Setting the TUNE-TRANSMIT switch to TUNE will open the relay and turn the transmitter off, thus allowing complete control of the transmitter with one switch.

#### 4-15. MODIFICATIONS FOR USE WITH EXTERNAL V.F.O.

4-16. The holder of a General Class License may desire to operate the Globe Chief, Model 90, with an external V.F.O. for variable-frequency operation. It is necessary to make a slight modification in the crystal oscillator for V.F.O. operation, as follows:

1. Remove condenser C-3, the 33 MMF ceramic capacitor connected from pin 4 of SO-2 to pin 5 of SO-2.
2. Connect a 500 MMF capacitor from pin 5 of SO-2 (S) to pin 2 of SO-2 (S).

3. Connect the output of the external V.F.O. to the crystal socket. Be sure the grounded side of the V.F.O. output cable connects to the grounded side of the crystal socket. This is the left side, as viewed from the front panel; pin 7 of SO-5.
4. If single switch operation is desired, a relay to turn on the V.F.O. may be activated by connecting its coil to pins 6 and 7 of SO-6. The TUNE-TRANSMIT switch will then activate the relay when the switch is in the TRANSMIT position. A 115 volt A.C. relay must be used. Contact arrangement depends on the particular V.F.O. used.

## SECTION V

### PRELIMINARY TESTS AFTER KIT ASSEMBLY

#### 5-1. GENERAL.

5-2. Upon completion of parts assembly and wiring, the transmitter is ready for preliminary testing. The purpose of these tests is to determine that all circuits and components are functioning properly before placing the transmitter into actual on-the-air operation.

#### WARNING

Operation of this equipment involves the use of high voltages which are dangerous to life. Observe all safety precautions! Do not attempt to make any adjustments inside the equipment or change tubes when the A.C. power is on. Disconnect-UNPLUG-the A.C. power cord before touching any high voltage components.

5-3. Insert each tube into its proper socket, as marked on the chassis. Insert the pilot light into its socket in the pilot light assembly.

5-4. It is recommended that a dummy antenna be used for the preliminary tests, as this will prevent radiation of a signal on the air while testing, and will also provide information regarding satisfactory R.F. output. A suitable dummy antenna is an ordinary 60 watt light bulb. Connect one wire to the center terminal on the base of the bulb, and another wire to the threaded part of the base. The base of some light bulbs is made of a metal to which solder will not stick; if this is the case with the bulbs on hand, use any available light bulb socket to make connections to the bulb. Connect the wires from the bulb to the transmitter just as though they were the wires from an antenna (see 2-19, d) i.e., one wire to GROUND and the other to ANT-1 or ANT-2, whichever loads up best. With a 60 watt light bulb, ANT-1 can be used on 10, 15, 20, and 40 meters. The ANT-2 connection will be needed on 80 meters and 160 meters. It may be found that it is difficult to load to full power on 160 with a 60 watt bulb, as this bulb presents an "in-between" value of impedance to the transmitter on that band. If no dummy antenna is available, the antenna to be used for regular operation may be used instead.

5-5. With the tubes in their sockets and the dummy or real antenna connected to the transmitter, turn on and tune up the transmitter as detailed in 2-19 (a) through 2-19 (s). If difficulty is encountered in any of the steps, consult the "trouble-shooting" steps which follow.

(a) Fuse blows as soon as A.C. power cord is plugged in, even with A.C. POWER switch

in OFF position. Look for an error in the wiring of the power cord, switch SW-1, or the fuseholder. Watch especially for a stray strand of the stranded wire touching some unwanted point.

- (b) Fuse blows as soon as the A.C. POWER switch is turned to ON. Look for an error in the wiring of the leads from power transformer PT-1. It is possible that PT-1 may be defective, although this happens very seldom.
- (c) Fuse blows after the A.C. POWER switch has been on for about three to ten seconds. Look for an error in the wiring to the 5U4GA tube (SO-1) and to the filter capacitor C-2 and filter choke CH-1 and the other wires connected to those parts. The filter capacitor C-2 may be connected backwards. If an ohm-meter is available, check for shorts from B plus to ground. BE SURE POWER IS OFF AND A.C. POWER PLUG UNPLUGGED. The ohm-meter should show approximately 35,000 ohms from B plus to ground. It is possible that the filter capacitor or choke may be defective, although this seldom happens.
- (d) Fuse blows after 10 to 30 seconds warm-up. This indicates trouble in the oscillator or final amplifier stages. Recheck wiring carefully. It is possible that the 6AG7 or one of the 807 tubes may be defective.
- (e) No meter rise when tuning OSC. TUNING control. Check to make certain key is plugged in and key contacts closed. Check to see that the bandswitch setting corresponds to the crystal which is plugged into the crystal socket (see Table II). Check wiring of the oscillator (SO-2), the front section of the bandswitch (SW-3A), the TUNE-TRANSMIT switch, the key-jack, and the blocking bias resistor R-2. It is possible that R.F. choke RFC-1, the 6AG7 tube, or the 807 tubes are defective. Check the wiring of the 807 tube sockets and tie-lug strip TS-5, also.
- (f) Meter reads below 200 milliamperes when TUNE-TRANSMIT switch is first placed in TRANSMIT position. Check to see that key is plugged in to key jack and key contacts are closed. Check to make certain PLATE TUNING and ANTENNA LOADING controls are all the way counter-clockwise, i.e., with the arrow on the ANTENNA LOADING pointing toward MIN., and the arrow on PLATE TUNING pointing the same way. Check all above-the-chassis wiring associated with the final plate tuning

SECTION V

PRELIMINARY TESTS AFTER KIT ASSEMBLY

and antenna loading capacitors and the 807 tubes. Check the orange/white wires associated with pin 2 of SO-3 and SO-4. Check resistor R-8, the 9000 ohm 7 watt resistor. Check the red wires associated with tie-lug strips TS-1 and TS-5 and RFC-2. It is possible that the 807 tubes may be defective. Check wiring of the TUNE-TRANSMIT switch.

- (g) There is no meter dip as PLATE TUNING control is turned. Check connections to bandswitch SW-3B, and to all the above-chassis components associated with the 807 tubes, coil L-3, and the F. PLATE TUNING and ANTENNA LOADING capacitors. Also check coil L-4 for shorted turns.
- (h) Meter reading does not increase as ANTENNA LOADING control is turned toward MAX. Check connections to ANTENNA LOADING capacitor, coils L-3, and L-4, and ANT-1 and ANT-2.
- (i) Erratic meter readings while adjusting PLATE TUNING or ANTENNA LOADING controls. Check to see if there are any sparks between the plates of these variable capacitors (C-8 and C-9). If there are, note whether it is due to excessive dust and dirt between the plates, or whether the plates are bent out of alignment and are touching or nearly touching. If dirty, blow or brush out the dirt. If out of alignment, carefully bend the plates until they are aligned, or replace the faulty capacitor.

CAUTION

Do not touch anything inside the transmitter unless the A.C. POWER CORD is first removed from the wall receptacle.

5-6. When the transmitter is properly tuned up, the dummy antenna (light bulb) should show a near normal brilliancy, indicating nearly 60 watts of actual R.F. output power. On 10 meters, the bulb will be somewhat dimmer, as the final amplifier is used as a doubler on this band; however, there is still adequate power output for world wide contacts on 10 meters when used with an efficient antenna.

5-7. When the transmitter, with the dummy

antenna connected, has been tuned up satisfactorily on all bands, it is ready for on-the-air operation. Remove the A.C. power cord from the wall receptacle and mount the transmitter in the cabinet. Refer to 2-18 through 2-24 for installation and operation information.

TABLE IV. VOLTAGE CHART-KEY UP.

TUNE-TRANSMIT switch in TUNE position. Position of other controls immaterial. All voltage readings from specified pin to ground unless indicated otherwise.

PinNo.	SO-1, 5U4GA	SO-2, 6AG7	SO-3, 807	SO-4, 807
1	0	0	6.3 AC	6.3 AC
2	+ 520 V DC*	0	+ 510 V DC	+ 510 V DC
3	0	0	-65 VDC	-65 V DC
4	520 AC	-65 V DC	0	0
5	0	0	0	0
6	520 AC	+ 340 V DC	.....	.....
7	0	6.3 AC	.....	.....
8	+ 520 V DC*	+520 VDC	.....	.....
Top Cap	.....	.....	+ 520 VDC	+ 520 VDC

\*5.0 volts AC from pin 2 of the 5U4GA to pin 8 of the 5U4GA.

TABLE V. VOLTAGE CHART-KEY DOWN.

Tune-up procedure completed. Plate current 180 MA. Bandswitch at 40 meter position. TUNE-TRANSMIT switch in TRANSMIT position. All voltages measured from specified pin to ground unless indicated otherwise.

PinNo.	SO-1, 5U4GA	SO-2, 6AG7	SO-3, 807	SO-4, 807
1	0	0	6.3 AC	6.3 AC
2	+ 510 VDC*	0	+ 280 VDC	+ 280 VDC
3	0	0	**	**
4	560 AC	**	0	0
5	0	0	0	0
6	560 AC	+ 210 VDC	.....	.....
7	0	6.3 AC	.....	.....
8	+ 510 VDC*	**	.....	.....
Top Cap	.....	.....	**	**

\*5.0 volts AC from pin 2 of 5U4GA to pin 8 of 5U4GA. \*\*Do not measure as R.F. is present at this point.

## SECTION VIII

## PARTS LIST

Quan.	Description	Circuit Designation	WRL Part No.	Quan.	Description	Circuit Designation	WRL Part No.
1	Capacitor, .05 Mfd, 200 volt	C-1	1101-006	1	Insulator, 2-1/2 inch bakelite standoff	I-1	2200-007
1	Capacitor, filter, 12 Mfd, 700, volt	C-2	1106-007	1	Insulator, ceramic feed-through	I-2	2200-004
1	Capacitor, 33 Mmfd, tubular ceramic	C-3	1101-004	1	Insulator, ceramic feed-through	I-3	2200-004
1	Capacitor, 33 Mmfd, tubular ceramic	C-6	1101-004	1	Jack, key, open circuit	J-1	2004-002
1	Capacitor, 250 Mmfd, tubular ceramic	C-4	1101-007	1	Meter, 0-300 milliamperes	Meter	2500-010
1	Capacitor, variable, 75 Mmfd.	C-5	1105-006	1	Parasitic choke	PC-1	1301-009
1	Capacitor, special, .001 Mfd, 1.5 Kv	C-7	1101-011	1	Parasitic choke	PC-2	1301-009
1	Capacitor, variable, 365 Mmfd.	C-8	1105-009	1	Parasitic choke	PC-3	1301-009
1	Capacitor, variable, 365 Mmfd.	C-9	1105-009	1	Pilot light bulb, No. 47	PL-1	16A008
1	Capacitor, special disc, .0047 Mfd, 1Kv.	C-10	1101-023	1	Resistor, 100 K, 1/2 watt	R-1	1000-009
1	Capacitor, .005 Mfd, disc ceramic	C-11	1101-003	1	Resistor, 2000 ohms, 7 watt	R-2	1003-008
1	Capacitor, .005 Mfd, disc ceramic	C-12	1101-003	1	Resistor, 12,500 ohms, 10 watt	R-3	1003-007
1	Capacitor, .005 Mfd, disc ceramic	C-13	1101-003	1	Resistor, 25,000 ohms, 10 watt	R-4	1003-001
1	Capacitor, .005 Mfd, disc ceramic	C-14	1101-003	1	Resistor, 10,000 ohms, 1 watt	R-5	1001-008
1	Capacitor, .005 Mfd, disc ceramic	C-15	1101-003	1	Resistor, 47K, 1/2 watt	R-6	1000-002
1	Capacitor, .002 Mfd, disc ceramic	C-16	1101-009	1	Resistor, 6000 ohms, 10 watt	R-7	1003-010
1	Capacitor, .002 Mfd, disc ceramic	C-17	1101-009	1	Resistor, 9000 ohms, 7 watt	R-8	1003-011
1	Choke, Filter, 7 Hy, 200 Ma.	CH-1	1300-008	1	Socket, octal, wafer	SO-1	1600-008
1	Choke, R.F., 750 uHy., 33 Ma.	RFC-1	1301-006	1	Socket, octal, wafer	SO-2	1600-008
1	Choke, R.F., 2.5 Mhy., 200 Ma.	RFC-2	1301-002	1	Socket, octal, wafer	SO-5	1600-008
1	Coil, Osc. Plate, 160, 80 and 40 meters	L-1	1400-007A	1	Socket, octal, wafer	SO-6	1600-008
1	Coil, Osc. Plate, 20, 15 and 10 meters	L-2	1400-006	1	Socket, 5-pin	SO-3	1600-009
1	Coil, Final plate, all bands	L-3	1400-004	1	Socket, 5-pin	SO-4	1600-009
1	Coil, L-network	L-4	1400-005	1	Switch, SPST slide	SW-1	2102-001
1	Fuse, 3 ampere	F-1	1500-002	1	Switch, DPDT slide	SW-2	2102-002
1	Fuseholder	FS-1	1500-001	1	Switch, 2-section rotary	SW-3	2100-002
1	Grommet, 3/8 inch OD	GR-1	3200-001	1	Tie-lug strip, one lug	TS-1	2002-006
1	Grommet, 3/8 inch OD	GR-2	3200-001	1	Tie-lug strip, one lug	TS-2	2002-006
1	Grommet, 3/8 inch OD	GR-3	3200-001	1	Tie-lug strip, two lugs	TS-3	2002-002
1	Grommet, 1/2 inch OD	GR-4	3200-002	1	Tie-lug strip, two lugs	TS-4	2002-002
1	Grommet, 1/2 inch OD	GR-5	3200-002	1	Tie-lug strip, two lugs	TS-6	2002-002
1	Grommet, 1/2 inch OD	GR-6	3200-002	1	Tie-lug strip, five lugs	TS-5	2002-004
				1	Transformer, power	PT-1	1200-002

SECTION VIII

PARTS LIST

Quan.	Description	WRL Part No.
1	Cabinet with panel & screws	1700-009
1	Chassis, punched	1900-004
4	Knobs	2600-005
4	Lockwashers, No. 4	3101-001
19	Lockwashers, No. 6	3101-002
6	Lockwashers, No. 8	3101-003
1	Lockwasher, 3/8	3101-005
4	Nuts, 4-40	2901-001
30	Nuts, 6-32	2901-003
8	Nuts, 8-32	2901-004
2	Nuts, 3/8	2901-006
1	Pilot Light Assembly	2400-001
2	Plate Caps	2005-003
1	Power Cord, AC, with plug	2700-042
4	Rubber mounting feet	3300-010
6	Screws, 4-40 x 3/8	2900-001
6	Screws, 6-32 x 3/16	2900-018
24	Screws, 6-32 x 5/16	2900-004
1	Screw, 6-32 x 1/2	2900-005
5	Screws, 8-32 x 1/2	2900-008
4	Screws, self-tapping, #6 x 1/2	2900-013
11	Solder Lugs, No. 6 bent	2006-004
2	Solder Lugs, No. 6 teardrop	2006-008
1	Solder Lug, No. 6 double	2006-006
1	Solder Lug, No. 10 bent	2006-003
2	Sleeving, insulated, largest size, 1-1/2" lengths	2800-005
3	Sleeving, insulated, large yellow, 1-1/2 inch lengths	2800-006
1	Sleeving, insulated, small yellow, 1 inch length	2800-002
1	Sleeving, insulated, small yellow, 3 inch length	2800-002
2	Sleeving, insulated, small yellow, 3-3/4 inch length	2800-002
1	Tube, 5U4GA or 5U4GB	
1	Tube, 6AG7	
2	Tubes, 807	

Following is a complete list of all the wire used in the WRL Globe Chief transmitter, model 90.

No. Of Pieces	Description	Length, each piece, in inches	WRL Part No.
3	#20 stranded, green	6-1/2, 6-1/2, 9	2700-011
2	#20 stranded, red	4, 12-1/2	2700-014
3	#20 stranded, gray	19, 3-1/2, 1-1/2	2700-033
2	#20 stranded, black	6-1/2, 7-1/2	2700-015
2	#20 stranded, green/white	4-1/2, 6	2700-021
1	#20 stranded, red/white	5	2700-023
4	#20 stranded, orange/white	1-1/2, 3-3/4, 4, 8	2700-019
4	#20 stranded, yellow/white	3, 6-1/2, 9, 9-1/2	2700-020
3	#20 stranded, blue/white	3-1/2, 8-3/4, 12	2700-017
5	#20 stranded, black/white	3-1/2, 3, 2-3/4, 2-3/4, 2-3/4	2700-024
5	#18 stranded, hi-voltage	5-1/2, 5-1/2, 5, 4-1/4, 3-1/2	2700-002
10	#20 bare-solid wire	1-1/2, 1-1/2, 2, 2, 2, 2, 4, 4-1/4, 4-3/4, 4-3/4	2700-005

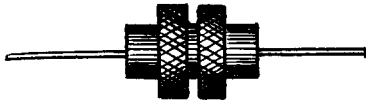
HELPFUL TOOLS AND SUPPLIES

Cat. No.	Item	Cash Price
6A044	Long Nose Pliers	2.55
6A019	Side Cutting Pliers (Diagonals)	2.64
6A320	Solder Gun Kit, Weller 8100K	5.83
6A266	Rosin Core Solder, 3oz.	.17

ACCESSORIES YOU MAY DESIRE

Catalog No.	Item	Cash Price
50B025	Key, Johnson 114-300	1.96
53A008	Microphone and Stand, JT-30	9.97
67B002	80 Meter Crystals	2.88
67B007	40 Meter Crystals	2.88
1000A050K	WRL VFO Kit	49.95
1000A050W	WRL VFO Wired	59.95
54A131	Antenna Change-over Relay	3.75





750 UHY R.F. CHOKE  
1301-006



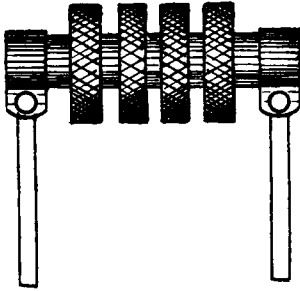
CERAMIC TUBULAR CAPACITOR



1/2 WATT RESISTOR



1 WATT RESISTOR  
1001-008



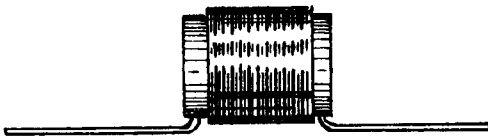
2.5 MHY R.F. CHOKE  
1301-002



CERAMIC DISC CAPACITOR



PARASITIC CHOKE  
1301-009



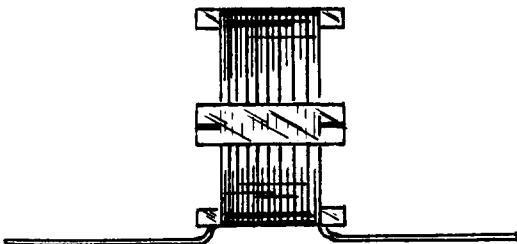
10-15-20 METER OSC. COIL  
1400-006



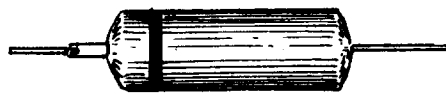
.001 MFD, 1.5 KV CERAMIC CAPACITOR  
1101-011



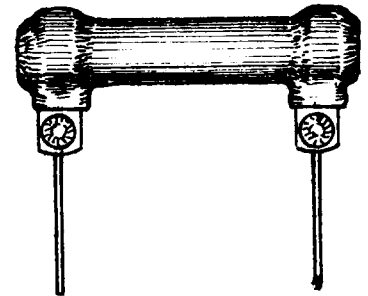
7 WATT RESISTOR PW-7



"L" SECTION COIL L-4  
1400-008



.05 MFD 200 VOLT CAPACITOR  
1101-006



10 WATT RESISTOR



NO. 6 SOLDER LUG  
2006-001



NO. 8 SOLDER LUG  
2006-002



10 WATT RESISTOR PW-10

Figure 18. Parts Identification.

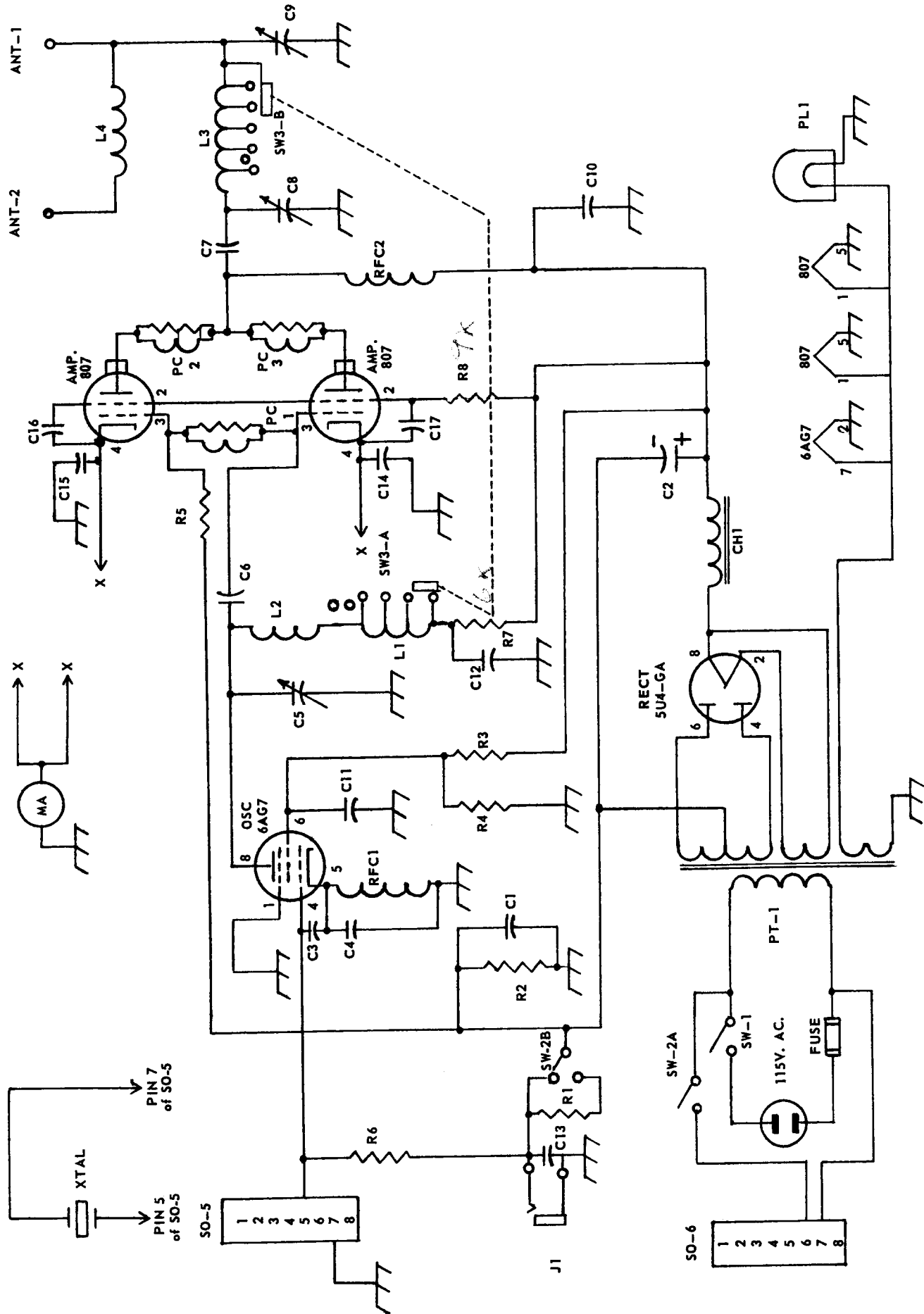


Figure 17. Schematic Diagram.

# **K4XL's** **BAMA**

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