Aristrol . . . .

MOPA

Transmitter

CLASS 'C'

CRYSTAL CONTROLLED

27.255 Mc

INSTRUCTION MANUAL

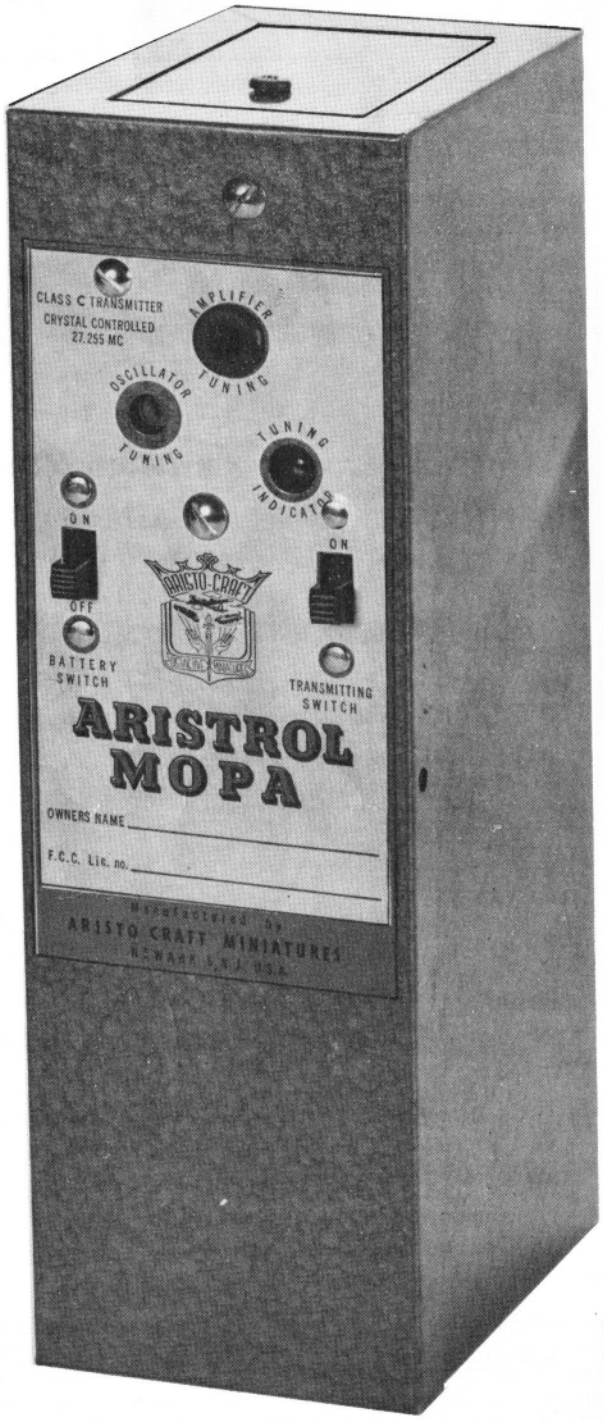

Fig. 1

Instruction Manual for the Aristrol MOPA Transmitter

INTRODUCTION:

The Aristrol MOPA hand held transmitter which you are about to build, has been designed to give you reliable performance with a minimum of battery drain and freedom from unnecessary tuning and adjustments. Figure 1 shows this hand held transmitter with all points of importance indicated. It operates on one 1-1/2 volt filament battery and two 67-1/2 volt batteries, in series, to give a plate supply (B+) of 135 volts. The tuning inductor assures you correct adjustment at all times and, due to the overall design, there is no need to use an antenna for bench testing. The crystal oscillator is "loaded" by the amplifier stage and therefore, unlike the conventional single tube oscillator transmitter, the crystal will not draw excessive current when the tank circuit is not "loaded" by an antenna. The actual signal output of this transmitter is much more stable and unaffected by varying battery voltages and body capacity effects because of its specialized circuitry.

The Aristrol MOPA transmitter uses an etched wiring chassis for ease of assembly and reliable operation. In addition, this transmitter may be converted into a tone unit for more advanced R/C work. Either a single tone or up to three tones for reed receiver use may be attached to the standard carrier unit.

The Aristrol MOPA transmitter kit is complete with all necessary components, with the exception of the batteries and the antenna. (a 3/32"

diameter piece of piano wire is used). The tools required are:

Small soldering iron (Ungar type)	Screw driver
Wire cutters	Long nose pliers

PRE-ASSEMBLY INFORMATION AND SOLDERING INSTRUCTIONS

Etched circuit boards, one of the latest developments in electronics, in addition to making a neater appearance provides fast, simple, error-proof assembly in a minimum of time, with the highest degree of consistent performance.

Certain precautions are necessary to insure proper assembly and final successful operation of your Aristrol MOPA transmitter:-

1. Read the instructions and study all assembly drawings carefully before beginning actual construction.
2. Identify all components and their relative positions on the etched circuit chassis.
3. Use a soldering iron of about 25 but no more than 35 watts.
4. USE ONLY RADIO ROSIN CORE SOLDER, NEVER ACID CORE. If you are not sure of the solder you may now have, purchase a new package plainly marked radio rosin core solder.

Aristo-Craft will not repair, service or guarantee any instrument that shows evidence of acid core or similar corrosive solder fluxes.

When soldering care must be taken to prevent the copper foil from lifting from the board due to excess heat. The iron should be left on the foil only long enough for a small amount of solder to flow onto the foil and around the lead. The best procedure is to apply the tip of the iron to the component lead first, allowing it to heat up, before applying the solder.

Prior to mounting the components, the copper pattern should be cleaned with steel wool or very fine sandpaper, in order to facilitate good soldering.

ASSEMBLY PROCEDURE

The actual assembly of the Aristrol MOPA transmitter is practically self explanatory, due to the nomenclature of parts which has been silk-screened on the reverse side of the chassis. Figure 2 should be followed to show the placement of components on the copper foil side of the chassis. Figure 3 shows the placement of parts on the reverse side of the chassis. For actual assembly follow the listed steps.

1. Solder all the eyelets to the copper pattern. Failure to do so can render the unit inoperative. Be careful not to get a bridging of solder between the turns of the coil when sol-

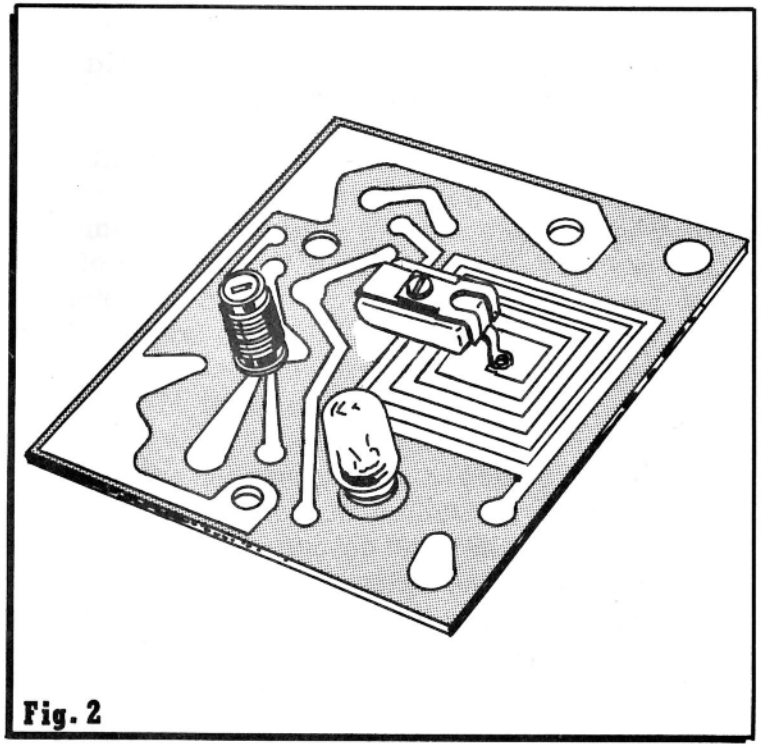

Fig. 2

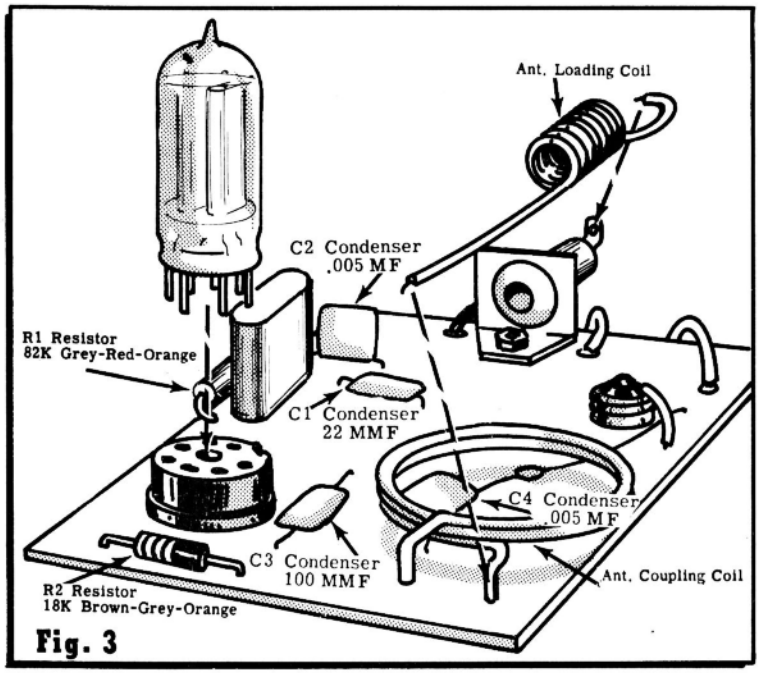

Fig. 3

dering those two eyelets.

2. Insert the tube socket as shown in the illustrations and bend the tabs slightly on the copper foil side to mechanically hold the socket in place while soldering.

3. Insert the wound coil form in place, at point "L", from the copper pattern side. The holes may have to be enlarged slightly to accomodate the coil form tabs. Use the 1/16" strip of balsa wood (supplied) to hold the coil form off the surface of the chassis. While holding down the top of the coil form (firm against the piece on the chassis) bend the tabs carefully to mechanically hold the coil in place. Solder tabs from the pattern side of the chassis, applying the soldering iron and the solder to the coil tabs first. After the two solder connections are made remove the balsa wood spacer.

4. Before mounting the crystal, scrape the pins to assure a clean surface for fast soldering. Insert the crystal at point X from the reverse side of the chassis and solder in place while holding the crystal tight against the chassis. DO NOT clip off excess leads.

5. Mount the variable tuning capacitor to the copper pattern side of the chassis, following the detailed instructions as shown in Figure 4. Solder directly to the eyelets, making sure the capacitor is properly placed, otherwise the adjusting screw will not line up with the hole provided on the front of the case.

6. All other components are mounted by bending the leads to the proper spacing and inserting them from the reverse side of the chassis. Bend the projecting leads firmly against the pattern and snip off the excess

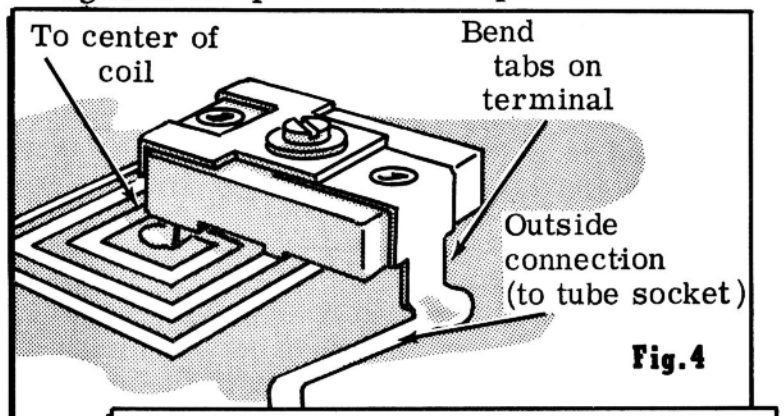

Fig.4

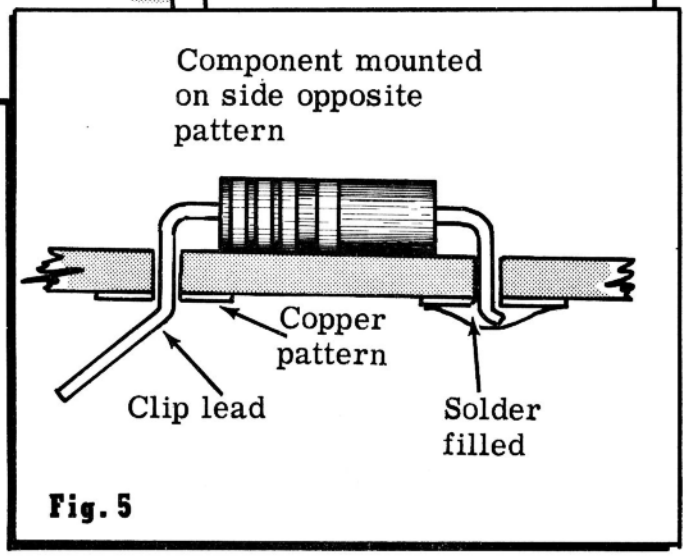

Fig. 5

length prior to soldering. See Figure 5 for the proper mounting of components. NOTE: That one wire lead of Capacitor C4 is soldered to the copper pattern (refer to Fig. 6 for proper position) the other wire lead is spot soldered to the eyelet, then this same wire lead is continued and finally soldered at point J. (hole nearest IND. Bulb). In this way you have mounted capacitor C4 and also made the jumper wire connection with the one piece of wire.

7. The bulb indicator is now inserted in the 3/8" diameter hole, with the bulb part protruding on the pattern side. Soldering will be made easier if the brass shell of the bulb is tinned with solder before soldering it to the copper pattern. Be sure the bulb is straight and perpendicular with the chassis, otherwise it will not line up with the INDICATOR hole on the front of the case. After the bulb is soldered in place, solder a short jumper wire from the center terminal of the bulb to the other indicating mounting hole, at point J. (hole farthest from Bulb.)

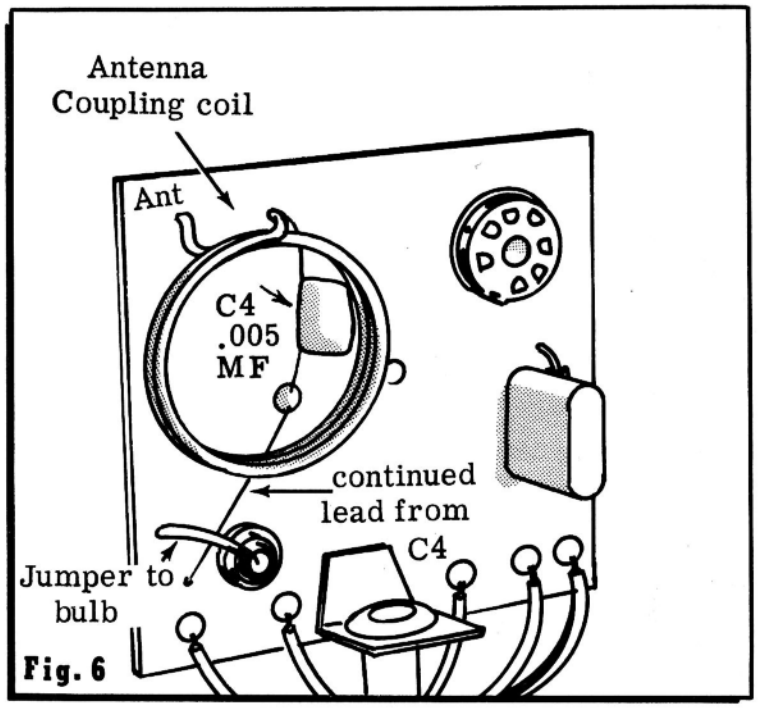

Fig. 6

8. The antenna coupling coil is now soldered in place as shown in Figure 6. One end is connected to the eyelet and the other end to the copper pattern. Position the loop over the dotted lines screened on the reverse side of the chassis, keeping this coil off the chassis by approx. 1/8".

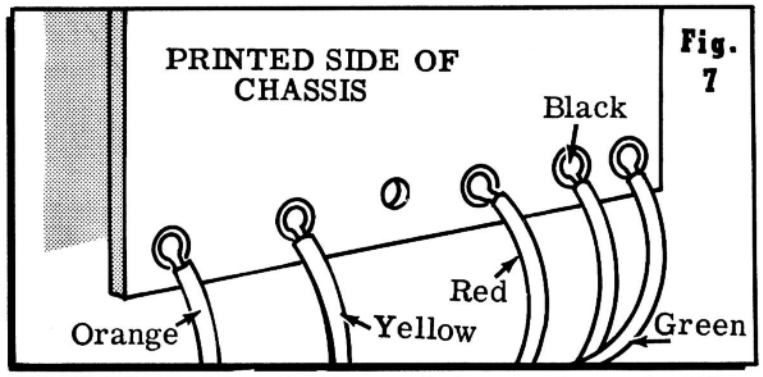

Fig. 7

9. Solder wires to the eyelets as shown in Figure 7. They may be inserted from either side of the eyelet. Be sure the wire is actually joined to the copper pattern and to the eyelet. As mentioned before, a bad connection will result if the wire or component lead is soldered only to the eyelet, which in turn may not be properly joined to the copper pattern.

This completes the assembly of the etched wiring chassis.

Connect the wires from the chassis, as shown in Figure 8, to the switches. Solder a wire to each switch as shown in Figure 8. No plug is furnished for the 1-1/2 volt A battery since you may prefer to use either the plug-in or screw terminal type. A 1-1/2 volt battery plug may be obtained from your local hobby shop.

After the wires have been soldered in place, the antenna loading coil is soldered between the antenna socket tab and the point on the chassis marked 'ANT'. This completes the assembly of the transmitter.

FINAL ASSEMBLY

The ON-OFF switch and the transmitting switch are already mounted on the front panel. Mount the grommet on the front panel as shown in Figure 1. Also, mount the smaller grommet in the hole on the top of the case, as shown in Figure 1.

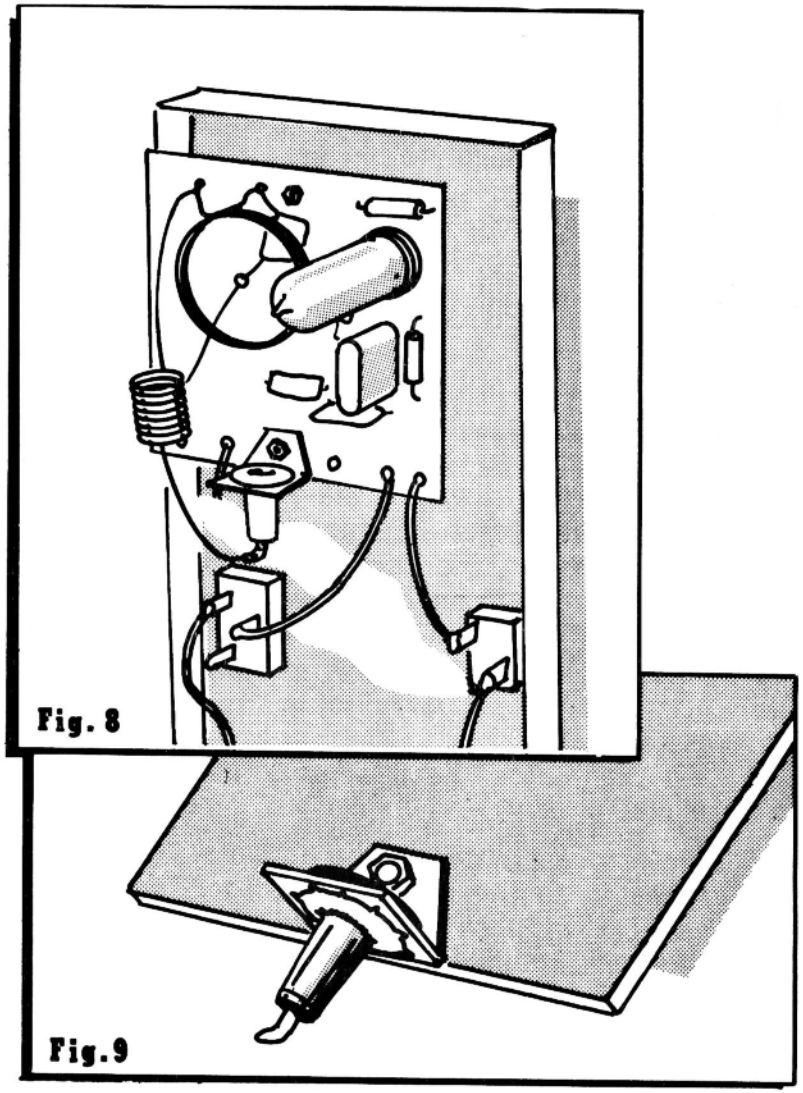

Fig. 8

Fig. 9

The chassis is mounted on the front panel with three screws, using the three spacers to obtain the proper standoff spacing. The one metal spacer may be placed at either of the mounting holes connected by the ground strip. DO NOT place this metal spacer under the tube socket. Two short screws and one long one are provided for the chassis mount. Use the long one for the mounting hole which is in the center of the tube socket. NOTE: The tube socket mounting hole does not use a nut since the center of the tube socket is tapped to accept the screw. Do not tighten this too tightly. Mount the chassis as shown in Figure 8, with the wire leads towards the bottom of the panel. Mount the antenna socket onto the antenna socket bracket as shown in Figure 9 and then mount this assembly under the head of the nut on the bottom chassis mount. This is shown in Figure 8. Place the serrated washer BETWEEN the chassis and the antenna bracket.

Round the end of a piece of 3/32" diameter piano wire, 36" long, and insert in antenna socket, through the grommet on the top of the case.

Please Note: Further loading may be accomplished by attaching a 12" length of brass tubing to the end of the piano wire. If desired, a 12" length of 3/32" brass tubing may be used as the base of the antenna and a 36" length of 1/16" piano wire inserted in the other end of the brass tubing. See Figure 11 for details.

★ License your transmitter; a convenient form has been supplied with your unit. Fill this form out at once and send to your local Federal Communication Commission Field Office.

TUNING AND OPERATION

9 Before tuning or operating your Aristrol MOPA Transmitter, recheck your assembly steps and all solder connections. When you are satisfied that your assembly is correct, that all components are in their proper position and that all solder connections are neat and making proper electrical contact then continue to the tuning procedure.

Your Aristrol MOPA transmitter, once properly tuned, will need little or no further readjusting. Connect your battery supply as shown in Fig. 10. The Aristrol case was designed for a Burgess 4F 1 1/2 Volt filament battery and two XX45, 67 1/2 Volt batteries or equal. All tuning is accomplished from the panel side (front) of your transmitter, with antenna NOT attached.

For your convenience we will consider two tuning procedures, one with a meter and one without.

Tuning procedure of Aristro MOPA Transmitter with 0-50 MA meter.

To test and tune the oscillator section of the 3A5 duo-triode tube insert an 0-50 MA meter between B-1 (red lead) and the +135 volt battery supply. Turn on the battery switch on the case cover and while pressing the transmitting switch, slowly rotate the oscillator slug until a dip in current is noted. This reading should drop to about 6 to 8 MA. Further rotating the slug into the coil form will cause a further drop until a point is reached where the current will suddenly shoot up again. At this point, back off (on the steady current side) until the capacity is reduced enough to obtain a reading of 8-10 MA. If a drop cannot be had, check the wiring and possibly the tube and crystal.

To check the amplifier section of the 3A5 duo-triode tube, insert the 0-50 MA DC meter between the (orange) B-2 lead and the lead coming from the +135 volt battery. The red lead, B-1, is connected directly to the +135 volt of the battery. In this way you will only be reading amplifier current. Turn on the battery switch on the case cover and while pressing the keying switch the current reading on the amplifier will be about 20-25 MA. Rotate the

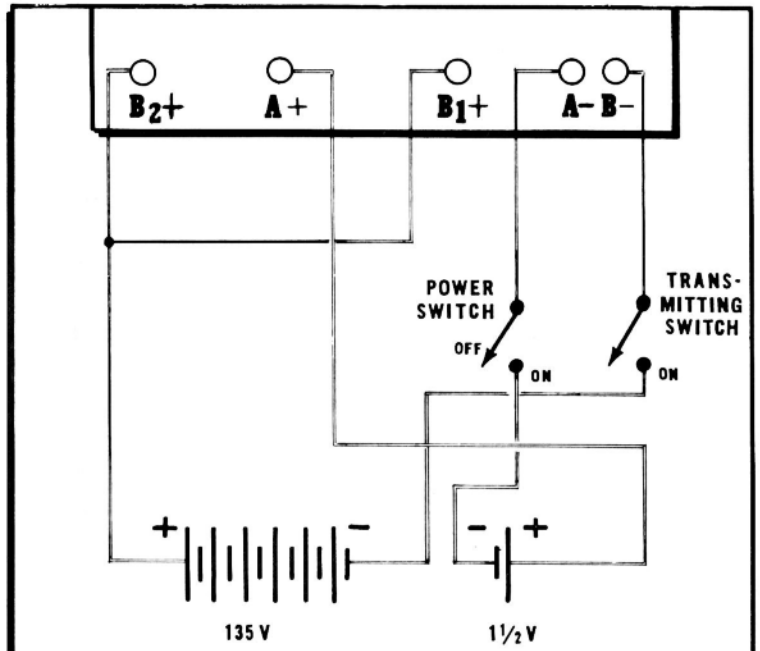

Fig.10

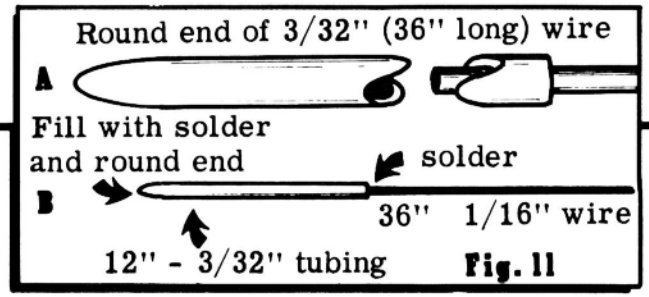

Fig. 11

tuning capacitor until a dip is obtained. This dip indicates that the oscillator is feeding a signal to the amplifier and that the amplifier is then tuned to resonance. The indicator bulb will show R. F. power now whenever the transmitting switch is depressed.

If a dip does not occur turn the oscillator slug out of the coil slightly and retune the amplifier. When the minimum dip is obtained, the oscillator setting should be increased further to increase the amplifier dip.

Tuning procedure of the Aristro MOPA Transmitter by indicator Bulb.

Connect the power cable leads to the batteries as per diagram. Turn on the battery switch and while pressing the transmitting switch, rotate the oscillator slug so that it is about 1/32 of an inch from the top of the coil form. The oscillator tuning slug is almost pretuned. In this tuning procedure it is best to use an insulated screw driver, plastic tuning wand or tapered wood dowel.

Rotate the tuning capacitor (amplifier) either way until the indicator bulb shows a glow. If by turning the amplifier tuning capacitor no glow appears, slightly turn the oscillator slug out of the coil form and retune the amplifier.

When maximum glow is had by tuning the amplifier to resonance, go back to the oscillator slug and turn it either way to increase the glow in the indicator bulb.

It is best to tune the amplifier and oscillator a little at a time until maximum R F output is obtained.

The indicator bulb is only for tuning purposes and when the antenna is inserted into its socket, the glow of the indicator bulb will either decrease or disappear, since all R.F. output is being radiated out of the antenna.

OPERATION and SUGGESTIONS

The battery complement, as mentioned previously, for your Aristrol MOPA transmitter consists of 2 Burgess XX45 Batteries ($67\frac{1}{2}$ V.) and a Burgess 4F or 4FH, or equal ($1\frac{1}{2}$ V.).

Position the $1\frac{1}{2}$ v. bat. on the bottom of the case, then the 2-$67\frac{1}{2}$ v. batteries are placed on top of the $1\frac{1}{2}$ v. battery. Fabricate a jumper with 2" of stranded, insulated wire and the snap connectors supplied; then attach jumper assembly to the + of one $67\frac{1}{2}$ v. battery to — of other $67\frac{1}{2}$ v. battery. Now attach proper leads from transmitter to battery supply.

It is suggested that a piece of insulating material (cardboard, etc.) be placed between batteries and case sides to prevent battery movement and a piece of this same material be placed in cover to prevent shorting of batteries. A wooden insert may be installed to prevent upward battery movement. Now position cover on case and secure with 2 sheet metal screws, supplied.

Insert antenna, carefully, through rubber grommet on top of the transmitter case and with a twisting motion push into antenna socket.

Operate your transmitter by pushing "BATTERY SWITCH" to ON position. You may now transmit by pushing the "TRANSMITTING SWITCH" each time a signal is desired.

TROUBLE SHOOTING

1:- No R.F. output when "TRANSMITTING SWITCH" is pushed.

POSSIBLE CAUSES:	REMEDY:
A:- Transmitter "Battery Switch" NOT in - ON position.	PUSH TO ON.
B:- Transmitter not properly tuned.	See tuning instructions.

C:-	Switches not properly wired to batteries.	See DIAGRAM.
D:-	Batteries not connected properly.	See DIAGRAM.
E:-	Faulty tube.	Replace TUBE.
F:-	Damaged crystal.	Replace crystal.
G:-	OSCILLATOR COIL is not soldered.	Just Resolder.
H:-	Amplifier Trimmer is not soldered.	Just Resolder.
I:-	Solder bridging P/C-coil winding.	Clean off Solder.
J:-	Indicator Bulb burned out.	Replace BULB.
K:-	Indicator Bulb jumper not soldered.	Just Resolder.

2:- Indicator Bulb decreases in brilliance when keeping Transmitting Switch depressed.

A:-	Faulty 3A5 Tube.	Replace TUBE.
B:-	Weak Crystal.	Replace crystal.

For maximum operation, replace batteries that read, UNDER LOAD, below 129 volts "B" supply and 1.2 volts "A" supply.

WARRANTY and GUARANTEE

Your factory assembled and tested Aristocraft MOPA transmitter is warranted for a period of 30 days from the date of purchase, by the manufacturer. Any factory assembled and tested transmitter that fails to operate within this period will be repaired or replaced on a NO CHARGE basis upon being returned directly to the FACTORY. This warranty is void if the transmitter has been tampered with or has been abused beyond that encountered in normal use.

The above warranty <u>DOES NOT</u> apply to the Aristocraft MOPA transmitter KIT. All components have been tested prior to packaging and are free from defects when shipped; the successful assembly and efficient operation is the RESPONSIBILITY OF THE BUILDER. A minimum charge of $3.00 plus parts will be charged for any set returned for service or for the purpose of being put in operating condition.