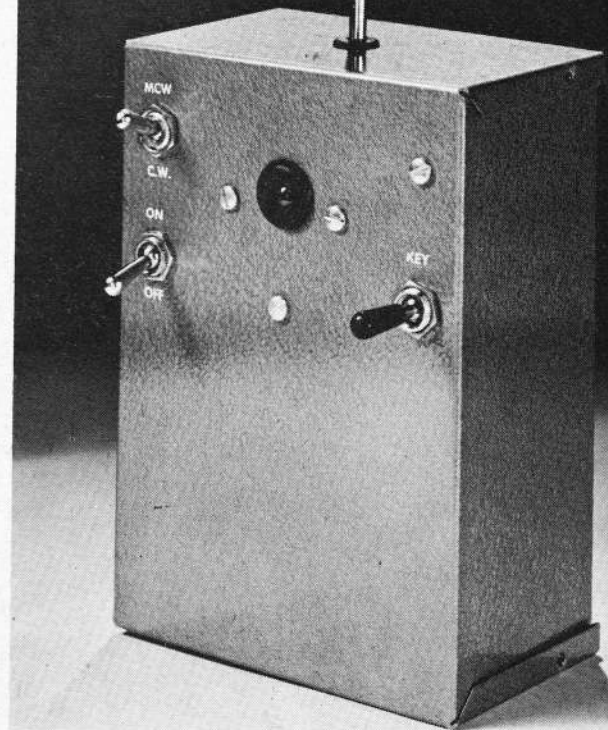


Compact, but still accessible is good description of innards. All parts are commercially available including printed circuit board.



Tuning indicator lamp extends through large grommet in center of case. Antenna is also mounted through grommet to prevent shorting case.

CW/TONE TRANSMITTER

FOR THOSE WHO MUST BUILD THEIR OWN WE HAVE A RELIABLE HAND HELD TRANSMITTER WITH GOOD RANGE AND HIGH MODULATION LEVEL.

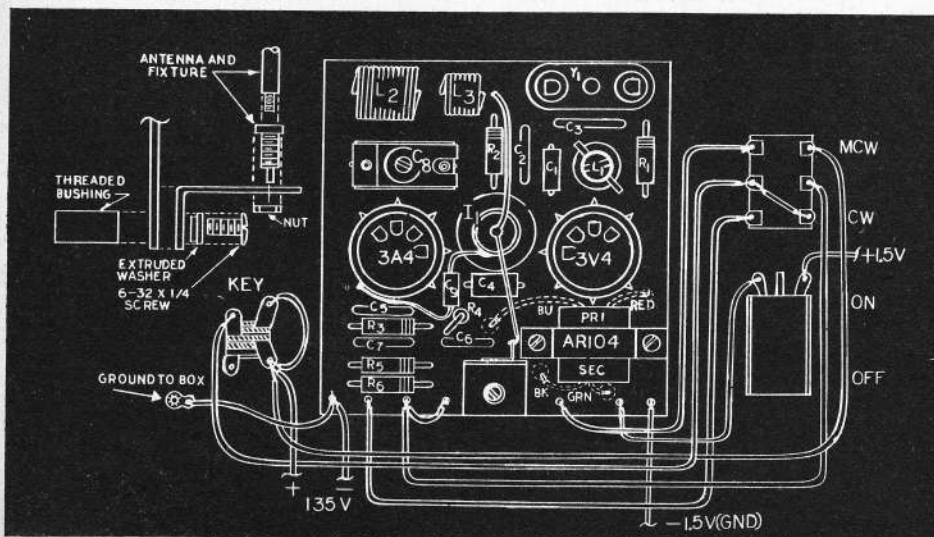
by E. B. CHAPMAN

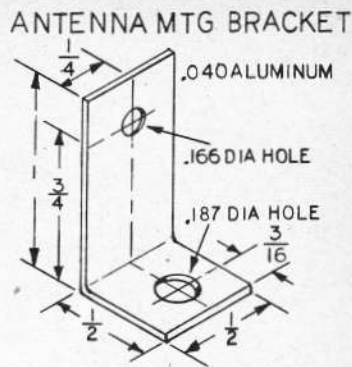
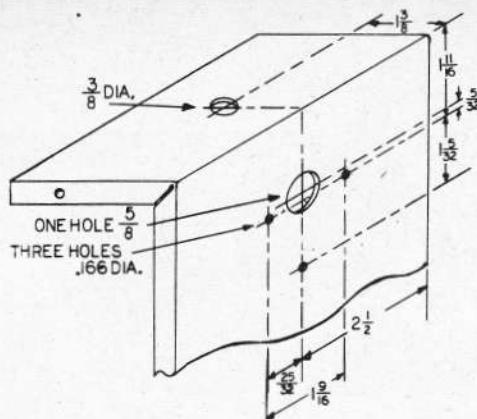
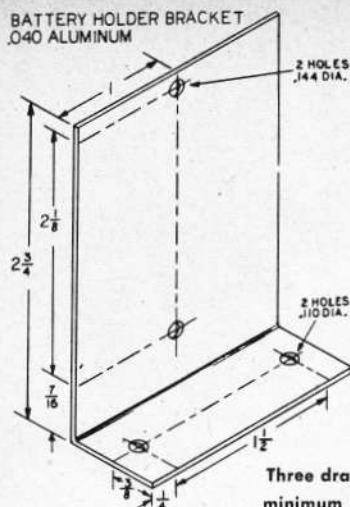
► The design of this transmitter was motivated by the need for one basic requirement, reliability in a hand held transmitter. The chief factors constituting reliability are; adequate range; a consistent high modulation level and; an antenna system not easily detuned by body capacity. Other features include. small size; low battery drain; a collapsible antenna and a tone/carrier switch making for a dual purpose transmitter.

The component chassis is an etched circuit board so that duplication of transmitters is assured. The frequency stability is within the requirements of the FCC regulations.

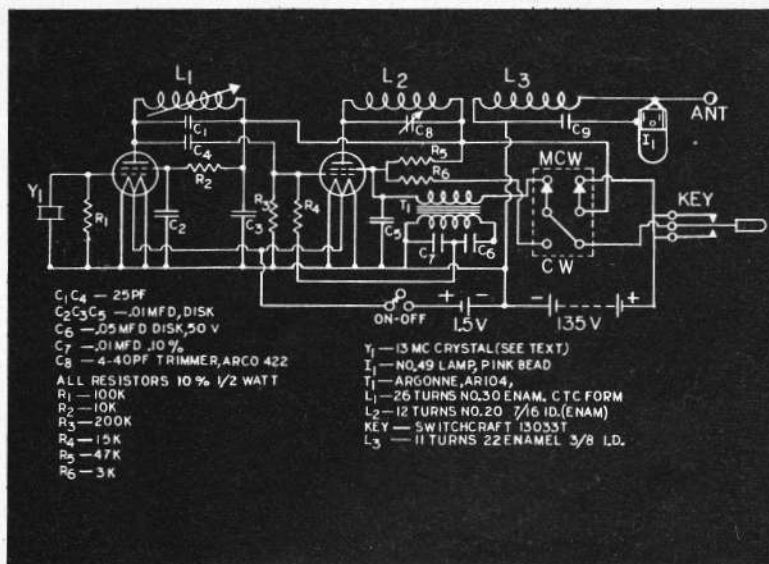
Circuit Description

The RF circuitry is a conventional MOPA (Master Oscillator Power Amplifier) system with a crystal oscillator capable of meeting the FCC requirements on frequency stability. Both tubes used are pentodes, with high power gain. The crystal oscillator (3V4) requires a relatively small amount of driving power therefore the crystal drive level will be low and hence better frequency stability. The output amplifier doubler stage (3A4) is conventional except for the self modulating circuit. The





Three drawings above are for the metal parts and drilling of the case. Metal sizes are indicated. Be certain to maintain minimum bend radii of 3/32".



Printed circuit board available ABC Battery Co., Richland, Wash.

Transmitter schematic with parts keyed and indexed for easy reference.

screen grid acts as the anode of an audio oscillator with the control grid serving a dual purpose. Basically this stage is grid modulated but differs from conventional grid modulation in that the resulting power output remains constant or higher than the average carrier power level. If the proper components are used it will always be 100% modulated.

The screen grid normally receives its voltage through the 47K resistor but when the key is closed, this voltage is increased resulting in an increase in peak power during modulation. The resulting audio tone is very stable with changes in drive level and supply voltages. The capacitor C₇ determines the audio frequency and with the values given the frequency is about 500 CPS. With a .005 MFD the audio frequency will be about 700 CPS. A different frequency may be desirable since some receivers require higher audio tones.

The loading coil and antenna circuit will resonate with the antenna fully extended, however, for close range work the antenna may remain collapsed. This coil must be carefully wound and if a different length antenna is used, it will affect the number of turns of the loading coil. A shorter antenna may require one

or two additional turns. The ground end of the 10 PF capacitor may be soldered in the same hole as pin #1 of the 3A4 tube socket. The other end solders to the shell of the indicator lamp.

The indicator lamp, although simple, is an excellent output and tuning indicator. It will also indicate the condition of the batteries.

When operating the transmitter in carrier mode, a smaller value of screen resistor is switched in and the B+ is keyed. This will increase the RF power output.

Crystals required are in the 13 MC range and are of the fundamental type. Any of the six frequencies, 13,497.5 to 13,627.5 KC may be used.

The power supply consists of two 67½ volt batteries and two type "D" flashlight cells.

All of the components are readily available with nothing tricky or difficult to make.

Construction

The construction and assembly should pose little difficulty since the drawings and photos are self-explanatory.

A small 30 watt soldering iron with a 1/8 diameter tip should be used along with good quality 60/40 rosin core

solder. We have found an Unger iron to be satisfactory. The lead wires should be preformed to correspond to the mounting holes. The lead wires are bent over and cut close to avoid bridging of solder.

The etched circuit board may be used as a hole locating template. Center the board (before mounting components) on the inside of the box and mark the hole locations to be drilled. Allow about 1/16 inch clearance at the top. Drill a small pilot hole then drill to size from the front. The switches are located midway in the area on the sides. Keep the switches high enough so they do not interfere with the batteries.

The antenna indicator lamp is mounted in a rubber grommet on the etched circuit board, and wired to the antenna and loading coil. Mount the two spacers before the tube sockets. Leave Pin #1 of the 3A4 unsoldered to allow insertion of a capacitor lead C₈.

The components recommended should be used to avoid spacing problems. The battery bracket should be used to assure good contact with the battery terminals. One cell will be satisfactory but two cells will give much longer periods of operation.

Close wind (Continued on page 45)

CW/Tone Transmitter

(Continued from page 29)

the coils carefully. They may be coated with model cement if desired. Form and scrape the enamel off the ends to permit good soldered connections. The winding of the oscillator coil should start at the terminal end and the turns kept tight.

Before drilling the hole for the antenna grommet, check the alignment of the hole in the antenna bracket to be sure the antenna will be straight. This bracket will be hot so be sure it does not short to frame of the transformer or other components.

There is sufficient space provided for a variety of switches. A push button key may be used but we prefer a lever switch with the lock-on feature.

A good ground connection between the hole in the lower left hand corner of the board and the box must be made. A bolt and solder lug was used in the model, located just above the key.

Tuning

The tuning is very simple but must be done carefully. When properly tuned, it should require no further attention.

Set the tone-carrier (MCW-CW) switch to carrier position. Always use the CW position when tuning. Adjust the oscillator tuning slug to allow about three threads to show above the form. The oscillator should work in this position. Make a test lamp with a single 1/2" dia. turn attached to a pink bead lamp. Hold this loop close to the output tank coil. Depress the key switch and adjust the trimmer in the output circuit for maximum output. The oscillator will require a finer adjustment. Depress the key again and adjust the oscillator slug for maximum output then unscrew the slug until a slight drop in

(Continued on page 48)

CW/Tone Transmitter

(Continued from page 45)

output is apparent on the indicator lamp. The antenna must be fully extended when making all tuning adjustments. Once these adjustments are made further tuning will not be necessary.

The total battery drain is about 18 MA on tone and 22-25 MA on CW.

PARTS LIST

- 1 Etched circuit board (ABC Battery Co., Richland, Wash. \$250)
- 3 1/2 inch #6 tapped bushings
- 6 #6-32 x 1/4 binder head screws
- 1 1/2 inch mtg hole rubber grommets
- 2 #8 solder lugs
- 24 inches #22 stranded wire, plastic insulation
- 1 #6 extruded fiber washer
- 1 Battery holder double "D" cell
- 1 3/8 inch mtg hole, rubber grommet
- 1 5/8 inch mtg hole, rubber grommet
- 2 #6 x 1/4 self tapping screws
- 1 Minibox 7 x 5 x 3, Bud CU-2108 (Hammertone)
- 2 Battery strap snaps, EBY 67-2
- 1 SPST Toggle switch
- 1 DPDT Toggle switch
Available Lafayette Radio, N.Y.C.
- 1 Coil form, SPC2-B-2L (L_1)
- 1 Antenna, F343
- 1 Transformer, TR-110 (T_1)
- 1 Trimmer capacitor, ARCO 422 (C_s)
Available, ACE
- 2 Printed circuit sockets, 7 PIN
- 1 Crystal socket
- 1 13 MC Crystal (Y_1)
- 1 Pilot lamp No. 49, pink bead (I_1)
- 1 Keying Switch—Switchcraft SPDT #13033L—Radio Ham Shack Catalog, 730 Commonwealth Ave., Boston 7, Mass.