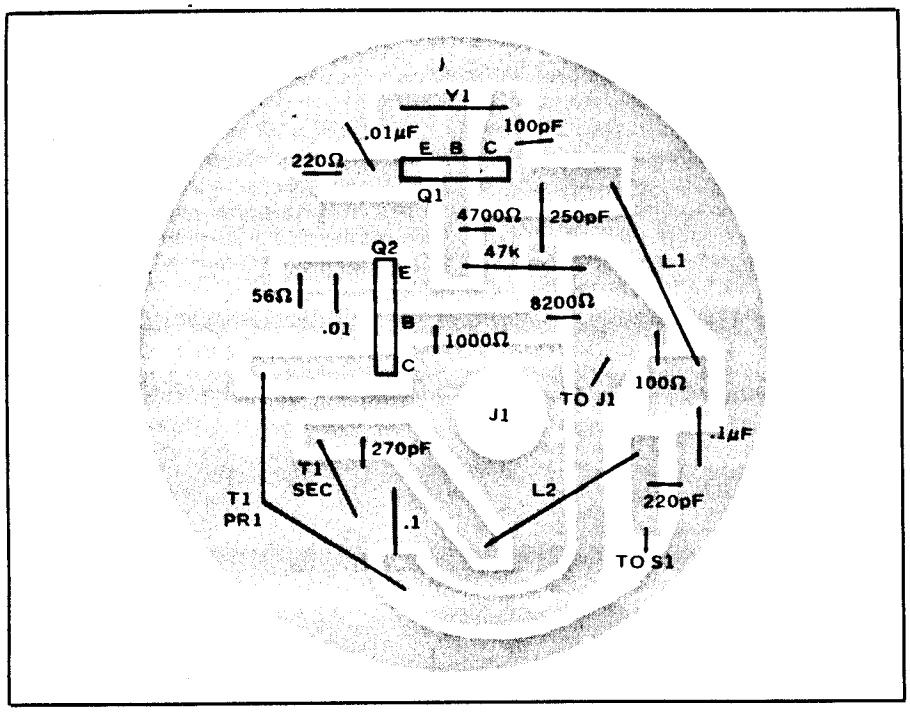

Fig. 4 — Scale layout of the pc board. Copper is etched away where J1 is mounted to prevent shorting the terminals to ground and other parts of the board. Size is for 6-1/2-ounce food can. Square format may be used if different chassis is desired. The 25-μF capacitor mounts between J4 and the pc-board ground foil.

can be mounted on a metal plate if the builder wishes. A base plate will help keep the transmitter in one spot on the operating table, especially if adhesive-backed plastic feet are used on the bottom of the plate.

Those with art in their souls may choose to paint the tuna can some favorite color. Alternatively, decorative contact paper may be used to hide the ugliness of the bare metal.

Comments

Keying quality with this rig was good with several kinds of crystals tried. There was no sign of chirp. Without shaping, the keying is fairly hard (good for weak-signal work), but there were no objectionable clicks heard in the station receiver.

The voltages shown in Fig. 3 will be helpful in troubleshooting this rig. All dc measurements were made with a VTVM. The rf voltages were measured with an rf probe and a VTVM. The values may vary somewhat, depending on the exact characteristics of the transistors chosen. The point marked 1 and 2 (in circles) can be opened to permit insertion of a dc milliammeter. This will be useful in determining the dc input power level for each stage. Power output can be checked by means of an rf probe from J2 to ground. Measurements should be made with a 51- or 56-ohm resistor as a dummy load. For 350 mW of output, there should be 4.4 rms volts across the 56-ohm resistor.

Operating voltage for the transmitter can be obtained from nine Penlite cells connected in series (13.5 volts). For greater power reserve one can use size C or D cells wired in series. A small ac-operated 12- or 13-volt regulated dc supply is suitable also, especially for home-station work.

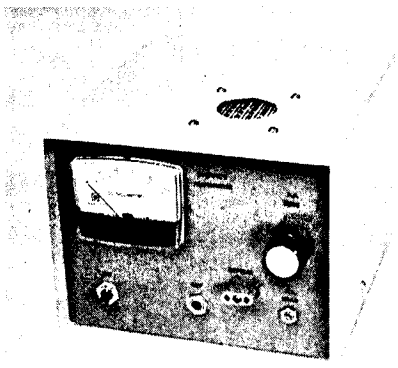

Fig. 5 — Low-power Novice transmitter for 80 and 40 meters. The amplifier tuning capacitor, C1, is operated by the knob at the right through an extension shaft and coupling. Just below the knob is the compression-trimmer loading control, screwdriver-adjusted.

A One-Tube Transmitter for the Novice

The 80- and 40-meter bands are good ones for the Novice to start out on, and the transmitter shown in Figs. 5 to 8, inclusive, is not only simple to build but will provide many satisfying contacts on those two bands — even though the power input is a bit less than 10 watts. It uses a single tube — a 6T9 — which, however, is equivalent to two, as it has a triode and a pentode power amplifier in the same bulb. The triode section is used as a Pierce crystal oscillator, with untuned coupling to the pentode amplifier.

The complete circuit diagram is given in Fig. 7. The Pierce oscillator, as you learned in chapter 3 requires no tuning. The pentode amplifier, since its grid circuit is untuned, does not require neutralizing to be stable. It has a pi-network tank circuit, with C1 the tuning capacitor and C2 the loading capacitor. Plug-in coils are used to shift bands. The screen voltage for the amplifier is obtained through a 15,000-ohm dropping resistor from the plate supply.

A milliammeter is included for reading the amplifier plate current as an aid to tuning and to determine when the amplifier is properly loaded.

Since the value of capacitance needed at C2 for proper loading on 80 meters is greater than can be supplied by C2 alone, an additional capacitor, C6, is connected into the circuit automatically when the 80-meter coil is plugged in. C2 by itself is sufficient on 40 meters.

These circuits will be familiar to you from your study of chapter 3, including Z1, the amplifier vhf-parasitic suppressor, and the 22-ohm resistor in series with the triode grid, which is also a

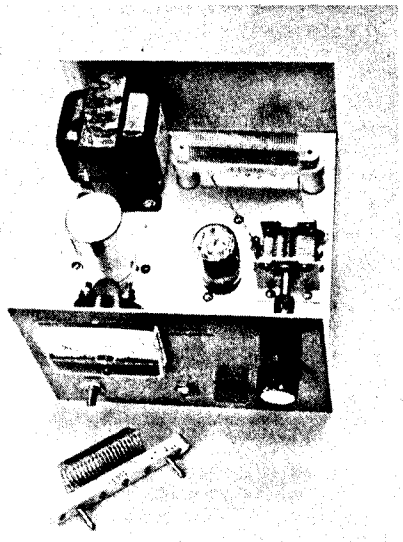

Fig. 6 — Top view of the Novice transmitter. The power transformer and amplifier tank coil are along the rear edge of the chassis. In front of the transformer is the 100-μF filter capacitor, C3. The 6T9 oscillator-amplifier tube is to its right, with the tank tuning capacitor, C1, alongside.

parasitic suppressor. The cathodes of both tube sections are keyed, and key clicks are reduced by C4 and R1 connected in series across the keying line.

The power supply uses a full-wave center-tap rectifier with silicon diodes. The power-supply filter is simple – just a 100-μF electrolytic capacitor connected across the rectifier output. A 35,000-ohm bleeder resistor discharges the capacitor when power is shut off, and also helps to improve the voltage regulation. The rectifiers are shunted by 0.01-μF capacitors to protect them from transients (see chapter 12).

Construction

A standard 7 X 7 X 2-inch aluminum chassis forms the base of the transmitter. The panel and cabinet are homemade, both for the purpose of providing an enclosure that is no larger than is really needed, and – more important – to provide good shielding and thus reduce chances of causing interference in nearby television receivers. You should have no trouble with TVI if you make a similar enclosure. The panel, seven inches wide by 5-1/4 inches high, is made of 1/16-inch aluminum. A similar piece 3-3/4 inches high is mounted on the rear edge so it comes to the same height as the top of the panel. The smaller height of this piece allows clearing the connections on the back wall of the chassis while still providing metallic contact at the back to the U-shaped piece which forms the top and sides of the box. A 1-1/2-inch hole in the top, directly over the tube when the cover is in place, is covered by a piece of Reynolds do-it-yourself perforated aluminum held in place by machine screws. This hole lets the heat from the tube escape to the surrounding air without making a gap in the shielding. A rectangular piece of the same type of perforated aluminum covers the bottom of the chassis, held in place by sheet-metal screws, although it is not visible in the photographs.

The parts layout is shown in Figs. 6 and 8, top and bottom. A 12-prong socket is needed for the 6T9, and it is

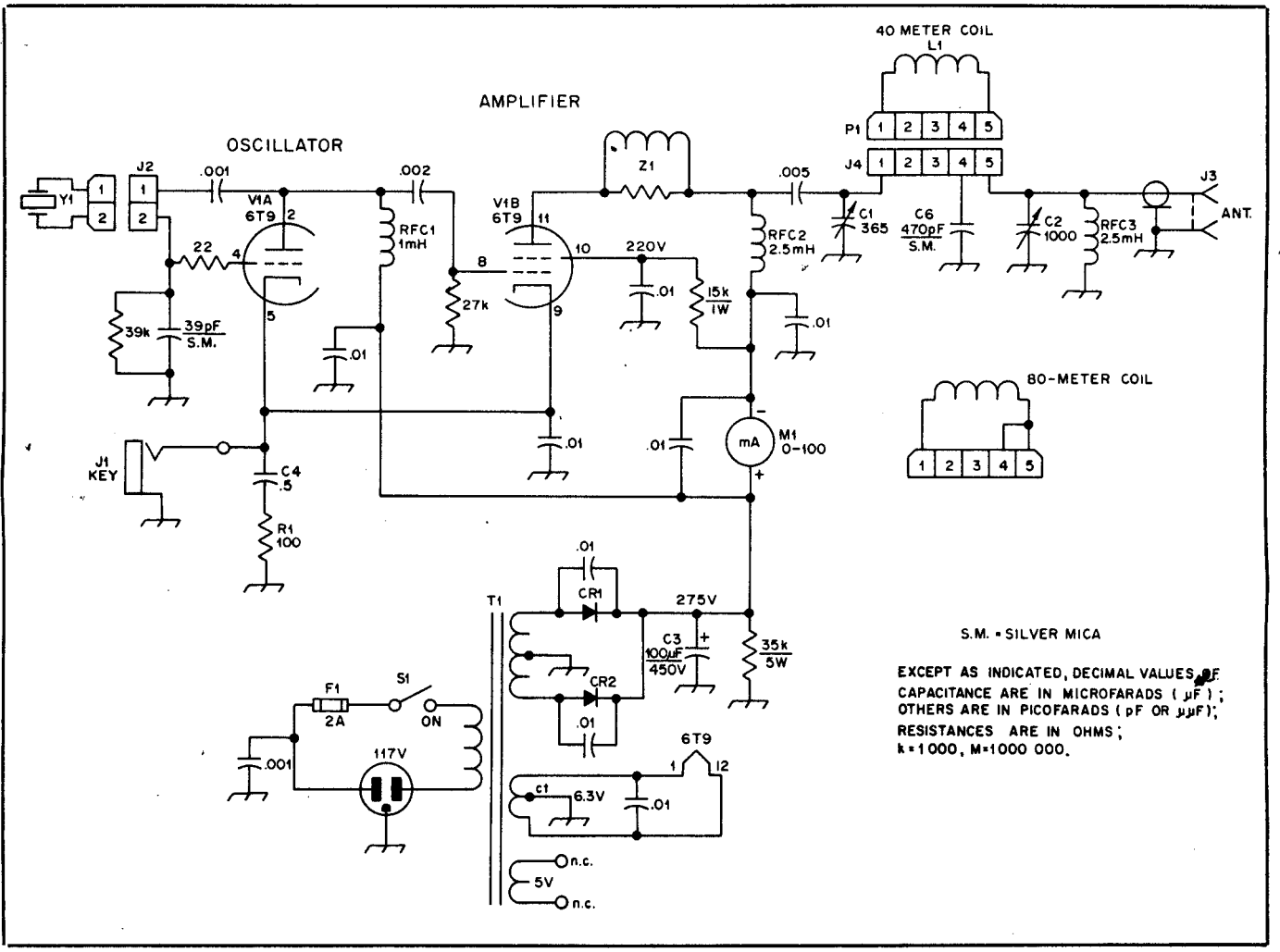

Fig. 7 – Circuit diagram of the 80-40 Novice low-power transmitter. Resistors are 1/2 watt unless otherwise specified. Capacitors with polarity marked are electrolytic; others not specified below are disk ceramic, 1000-volt rating.

C1 – 365-pF air variable.
C2 – 360 to 1000-pF padder.
C3 – 100-μF, 450-volt electrolytic.
C4 – 0.5-μF paper.
C6 – 470-pF silver mica.
C7, C8 – 200-μF, 250-volt electrolytic.
CR1, CR2 – 100-volt PRV, 750-mA silicon rectifier.
F1 – 2-amp., 3AG fuse.
J1 – Open-circuit key jack.
J2 – Crystal socket.
J3 – Coaxial chassis fitting, type SO-239 or phono jack.
J4 – Coil jack bar (Millen 41305).
L1 – 80 meters, 43 turns no. 20, 16 turns-per-inch, 3/4 inch dia. (B&W Miniductor 3011). 40 meters, 30 turns no. 20, 16 turns-per-inch, 3/4 turns dia. (B&W Miniductor 3011).
M1 – 100-mA meter.
P1 – Coil plug (Millen 40305).
P2 – Line plug, with cord.
RFC1 – 1-mH rf choke (Miller 4652-E or similar).
RFC2, RFC3 – 2.5-mH rf choke (Miller 4666-E or similar.
R1 – For text reference.
S1 – Spst toggle.
T1 – Power transformer, 470 volts, center-tapped, 40 mA; 6.3 volt, 2A; 5 volt, 2A (not used); Stancor PC8401 or equivalent.
Y1 – 80- or 40-meter crystal, FT243 type, as required; see text.
Z1 – 7 turns no. 16 wire, space-wound on a 100-ohm, 1-watt carbon resistor.

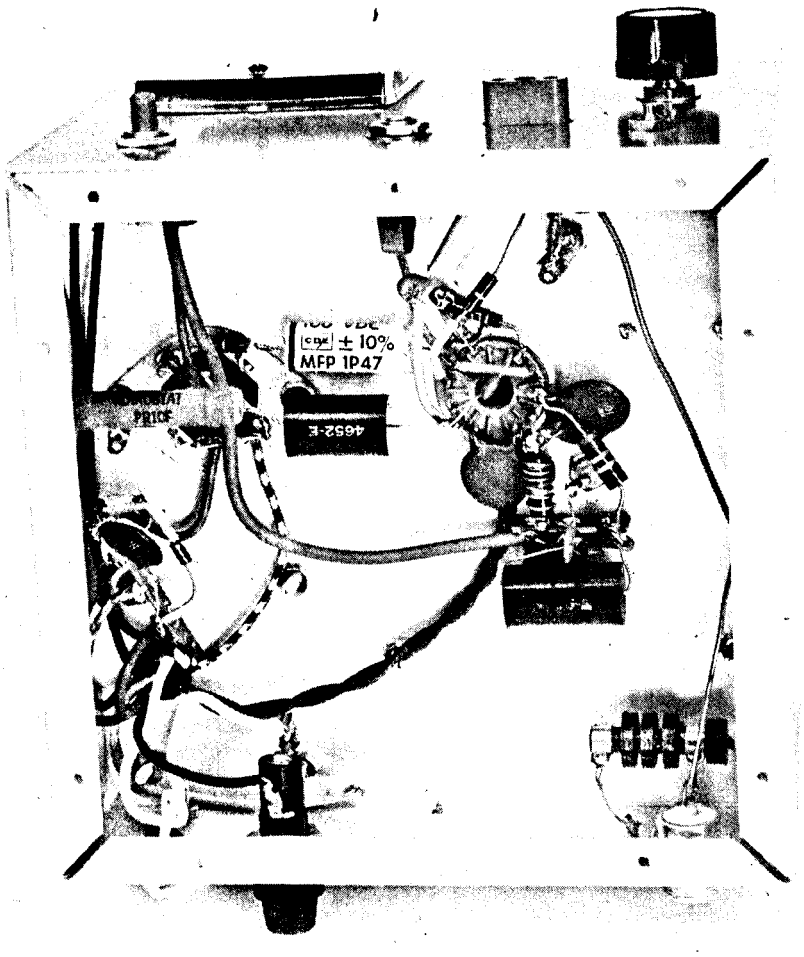

Fig. 8 — Underneath the Novice transmitter chassis. The resistor above the tube socket with its lead extending under the lip of the chassis is the 22-ohm unit in series with the grid of the 6T9 triode; the 39,000-ohm grid leak for the tube connects to it on one of the crystal-socket prongs. The resistor mounted horizontally above the socket is the 27,000-ohm grid leak for the pentode-tube section. The pentode screen resistor and Z1 are below the socket to the right. Black cylinders are encapsulated rf chokes; the one in the lower right-hand corner (RFC3) is not "potted," but an encapsulated type can be used. C4 and R1 extend to the left from the tube socket. Power-supply rectifiers are mounted on a terminal strip near the left-hand edge.

mounted so that the index (open space between pins 12 and 1) faces directly toward the rear of the chassis. J3 and the fuse holder are mounted on the rear chassis wall. The line cord runs through a rubber grommet in the same wall.

The "hot" rf connections between the top and underside of the chassis (from C1 to C2) run through feed-through bushings. Rubber grommets can be substituted; use stiff wire (no. 16 or larger) and keep it spaced from the grommets.

The coils, cut from Miniductor coil material, are mounted on five-prong plug bars, Millen type 40305, which fit into a bar socket, type 41305, mounted on the chassis. The unused pins in the plug bars have been removed from the coils shown; this makes it easier to insert them in the jack bar. They can be cut off with a hacksaw or clipped off with heavy diagonal cutters.

Any inexpensive 0-100 milliammeter can be used for measuring the plate current.

Adjustment

The amplifier tank circuit is designed for working into a load of approximately 50 ohms. For a preliminary test, connect a 10-watt, 115-volt lamp to J3, with the shell of the lamp base to ground and the center connection to the center of J3. The lamp can be mounted in a socket as shown in chapter 11.

Turn on the power and allow the tube to warm up thoroughly. Connect a key to J1 and plug a crystal into J2. Install the coil for the same band as the crystal (3.5-MHz coil for 3.5-MHz crystals, 7-MHz coil for 7-MHz crystals). Start out with the capacitance of C2 at maximum (trimmer screwed up tight). Close the key and turn the knob on C1, watching for a sharp dip in the plate current. Tune to the dip and then decrease the capacitance of C2, watching the lamp dummy antenna as you do. It should brighten, reach a maximum brightness, and then taper off as you continue to decrease the capacitance. Set C2 for maximum brightness and retune C1 to see if any further improvement can be made. The plate current should be between 30 and 40 mA at this point.

If there is no output the crystal isn't oscillating — assuming, of course, that you've checked all the wiring and found it to be in order. If the crystal won't oscillate the plate current will rise to 50 mA or more on closing the key, but if there is *no* plate current the key isn't closing the cathode circuits. The only thing to do when the crystal won't oscillate is to try another one.

With everything working right, you're ready to go on the air. The transmitter can be used with any antenna system that will show it a 50-ohm load on the band in use. A transmatch may be needed to make the actual antenna/feeder combination look like 50 ohms to the transmitter. Chapter 6 suggests a number of antenna systems that will be suitable.

For best keying, the crystal frequency and the output frequency should be the same. It is possible to use the amplifier as a doubler to get output on 40 from an 80-meter crystal, but since the keying characteristics aren't as good that way, we don't recommend it.

A 75- to 120-Watt CW Transmitter

The transmitter shown in Fig. 9 is designed to satisfy the cw requirements of either a Novice or higher class licensee. The PA stage will operate at 120-watts dc input. The rig provides

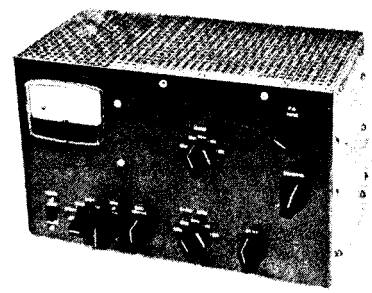

Fig. 9 — This 120-watt cw transmitter can be operated at 75-watt dc input for Novice-band use. The slide switch puts the meter in the grid or cathode circuit of the 6146B amplifier. Directly to the right of the slide switch is the FUNCTION switch and crystal socket. Continuing at this level, farther to the right is the GRID TUNING, grid BAND SWITCH, and the DRIVE level control. The controls to the upper right are the final BAND SWITCH, FINAL TUNING, and FINAL LOADING.