A 35-W, Two-Band CW Transmitter

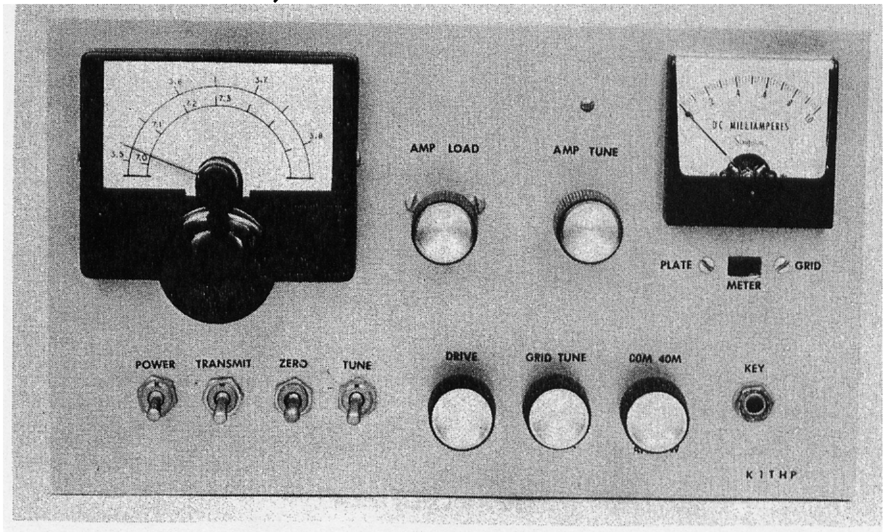


Fig. 60 — Front panel of the two-band transmitter.

A traditional source of components for amateur projects is the junked television set. Modern television sets are solid state, and many are pressed into service as video monitors for the home computer when they are retired from service. The older tube units, conversely, are often thrown into the garbage and hauled to the dump. The enterprising amateur can intercede and acquire enough parts for many projects.

The transmitter described here (Fig. 60) is built around used television components. While the design is far from state of the art, the performance is comparable to today's standards. Financial outlay should be minimal for anyone who is willing to invest a little time in searching for the bargains. Bands covered are 80 and 40 meters with a CW input of 35 watts. The circuit is one adapted by K1THP from an April 1965 **QST** article by W1ICP.

The Circuit

The oscillator is a classic Colpitts circuit (Fig. 61). The grid circuit of the 6DC6 is tuned to the 1.75 MHz range while the plate circuit is tuned to 3.5 MHz. V2 is an untuned buffer amplifier. This promotes stable VFO operation and chirp-free keying. Both VI and V2 are run from a regulated power source, further enhancing transmitter stability.

The driver stage, V3, is also used as a frequency doubler for the 3.5-MHz signal during 7-MHz operation. The plate circuit, L3-C3, tunes to either 80 or 40 meters, depending on the position of S2. The cathode bias is adjustable by varying R1, allowing the proper amount of drive for the final amplifier tube.

The final amplifier of Fig. 61 is a 6DQ6 sweep tube. The high plate impedance of the tube is transformed to 50 ohms by means of a pi-network. The matching network provides harmonic attenuation. The screen of V4 can be grounded through S3 to allow tune-up at reduced power.

The cathodes of VI, V3 and V4 are all keyed. For spotting purposes the cathode of V1 can be grounded separately through S1. This turns on the oscillator without radiating a signal over the air.

The power supply uses a surplus TV-type transformer. Two silicon diodes in a full-wave circuit rectify the ac. After filtering, the unregulated power-supply output is 400V. Metering of the plate current is accomplished by use of a 0-1 mA meter connected as a volt-meter across a shunt in the B+ line. Grid current is measured in a similar manner.

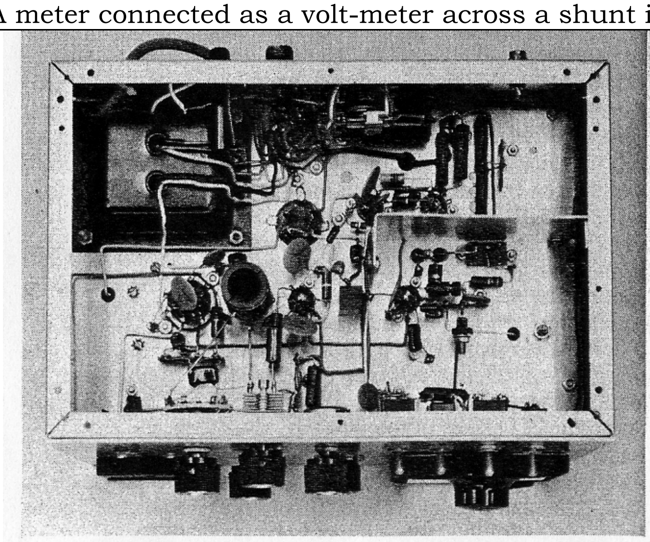


Fig. 63 — The underside of the transmitter. Layout is not especially critical. However, a clean layout will make trouble shooting much simpler, should that be necessary.

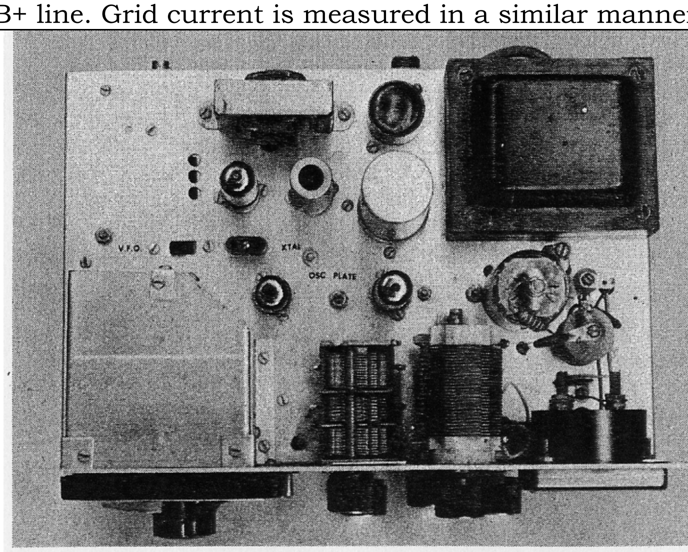


Fig. 62 — The layout on the top side of the chassis. The VFO is enclosed in an aluminum case at the left and the final stage is at the right.

Construction Details

VFO components LI, Cl and C2 should be mounted firmly to the chassis top to prevent wobble in the VFO. The leads brought down to below the chassis from the VFO components should be similarly stiff, using no. 14 solid wire. The turns of LI are closely spaced. The wire should be wound tightly on the coil form and sprayed with a clear acrylic lacquer or coil dope to enhance mechanical stability.

The pi-network coil, L4, should be mounted on stand-off insulators at a distance from the chassis. The neutralizing arrangement requires that the shaft of C3 be insulated from the chassis. Neutralizing capacitor C4 must also be insulated from ground.

Tune-up and Operation

Upon warm-up, the oscillator should be tested and aligned. A receiver tuned to the operating frequency is an ideal indicator. To adjust the VFO, first fully mesh C1, the front panel control. The slug in L1 should be fully disengaged (screwed to the stop on the coil form). Slowly tune C2 through its range until the signal is heard at 3500 kHz in the receiver.

For optimum bandspread, 300 kHz of range should be available at 80 meters. Tune C1 through 180 degrees and check the frequency coverage. If it is less than 300 kHz, move the slug in L1. Reset C2 so that the fully meshed condition of C1 gives an oscillator output at 3500 kHz. Again check the range of C1. Repeat the process until the 300-kHz bandspread is reached. The dial can then be calibrated using the receiver as a standard.

After the VFO tuning range is adjusted, switch Ml to read final amplifier grid current. Leave the amplifier screen grounded and tune C3 for maximum grid current. Set the VFO to 3600 kHz and adjust the slug in L2 for maximum amplifier grid current. As much as 5 mA of grid current should be available at the maximum setting of R1.

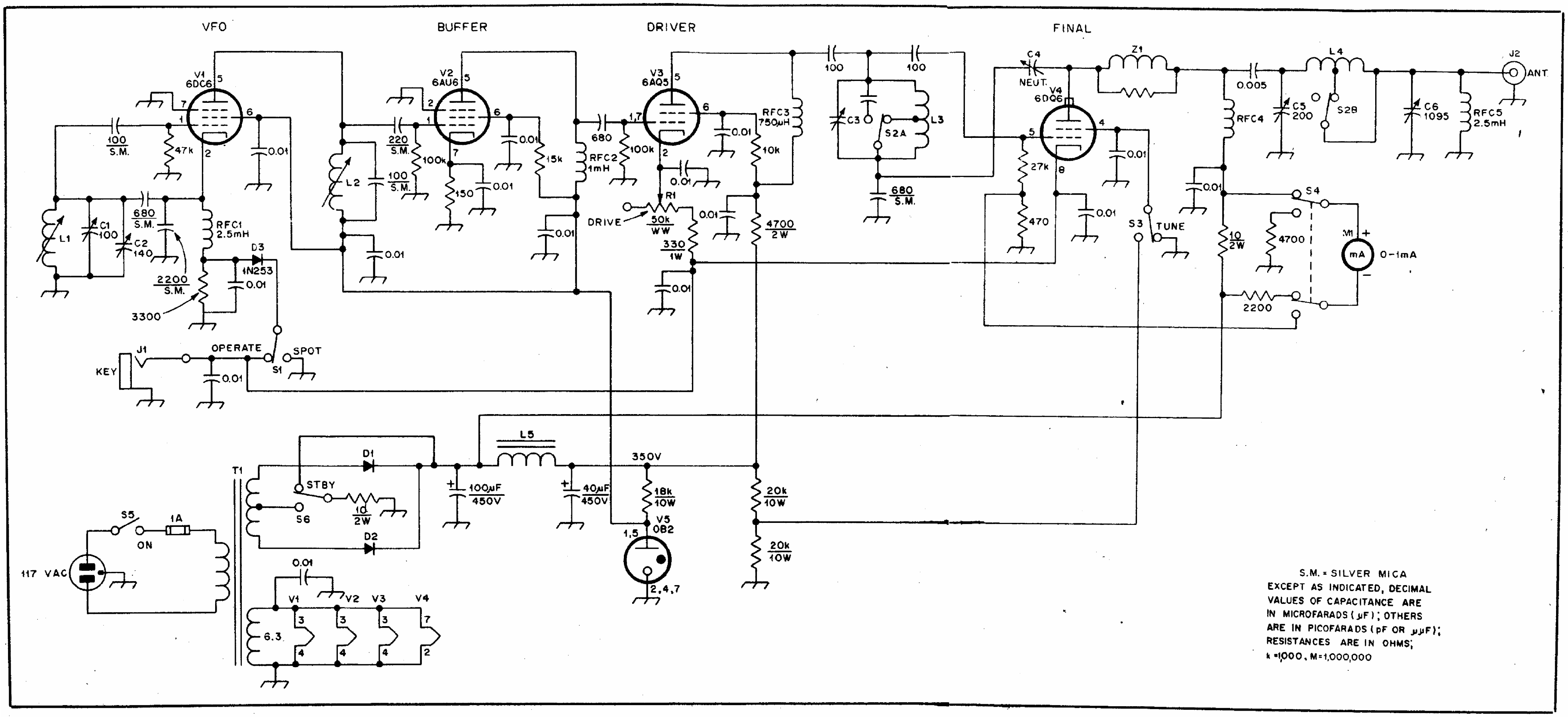
Neutralizing the amplifier requires a means to sample output power. This could be in the form of an SWR indicator, a wattmeter or a dip meter set to the diode mode. Connect a dummy load to the output terminal through the SWR meter or wattmeter, if used. If neither is available, couple the grid-meter probe near to L4. *(Remember: High voltage is present in this rig. Turn off the power and allow the filter capacitors to bleed before working near any high-voltage point.* ***Be careful!****)* Adjust C3, and the plate-tuning capacitor for maximum deflection on the output indicator when the rig is keyed. Next, adjust C4 for minimum indication. It will be a sharp dip when adjusted properly.

Adjust the drive control for a key-down amplifier grid current of 2 mA. Switch the meter to read plate current. Set C6 to maximum and switch S4 so that screen voltage is applied to V4.

Tune-up procedure with a pi network consists of gradually reducing the loading capacitance (turning C6 towards minimum) while constantly retuning the plate tuning capacitor for a dip. This process is continued until a plate current of about 100 mA is attained. If an output-indicating device is in the feed line, maximum power should be observed at minimum plate current. Connecting the antenna in place of the dummy load should only require a small amount of retuning. Under operating conditions, 1.5 mA of grid current is optimum.

Fig. 61 — Schematic diagram of the 80- and 40-meter transmitter. Resistors are 1/2-watt carbon types unless specified otherwise, capacitors are disk ceramic unless otherwise noted.

C1 — l00-pF midget variable, Hammarlund MC-100.
C2 — l40-pF midget variable. Hammarlund APC-l40-B.
C3— 100-pf midget variable. Hammarlund APC-l00-B.
C4 — 15-pF midget variable. Hammarlund APC-15.
C5 — 365-pF midget variable, Miller type 2111.
C6 — 365-pF per section three-section midget variable, three stators connected in parallel. Miller type 2113.
Dl, D2 — Silicon diode, 1000 PRV, 2.5 A. Mallory M2.5 A or equiv,
JI — Phone jack, open-circuit type.
J2 — Coaxial chassis connector, type S0-239.
L1 — 40 turns of no.26. enameled. close-wound on 1/2-Inch (12.7-mm) diameter ceramic slug-tuned form. Form is Millen 69046.
L2— Slug-tuned coil. 14.8 to 31.0 μH, Miller 4407.
L3— 36 turns of no. 22 enameled, close wound on 1-inch (25.4-mm) diameter form. 40-meter tap is 12 turns from the hot end of the coil. Millen coil form, no- 45000.
L4— 30 turns no. 20, 16 turns per inch. 1-inch (25.4-mm) diameter, 40-meter tap 16 turns from C5 end of coil, B & W Miniductor 3016.
L5 - 2.5 H. 25 mA,
M1 - 0-1 mA meter.
R1 - 50 Ω potentiometer, 1/2-watt, wire wound.
RFC1 - 2.5-mH rf choke, Millen 34300-2500.
RFC2 - 1-mH rf choke, Millen 34300-1000.
RFC3, RFC4 - 750-μH rf choke,
Millen 34300-750,
RFC5 - 2.5-mH rf choke, Millen 34300-2500.
S1, S3, S6 — Spdt toggle switch.
S2 — 2p, 2-position rotary switch.
S4 — Dpdt toggle switch.
S5 — Spst toggle Switch.
T1 — Power transformer. Primary: 117V. Secondaries: 540 volts. 120 mA; 6.3 volts, 3.5 A: 5 volts, 3 A
(5-volt winding not used).
Z1 — 7 turns, no. 20 enameled, close-wound on 2200-ohm, 1-watt resistor.



S.M. = SILVER MICA
EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (μF); OTHERS ARE IN PICOFARADS (pF OR μμF); RESISTANCES ARE IN OHMS; k=1000, M=1,000,000