The QRP 80/40 CW Sender

QRP power and QRP cost.

by Richard Q. Marris G2BZQ

My original plan was to home-brew a simple CW transmitter for a daily, early morning, point-to-point QSO with a friend in Germany, using 3665 kHz. This was a distance of 400 miles or so. I figured that around 5 watts CW would suffice, and decided to use semi-conductors. A look at some recently published designs indicated that this would involve a printed circuit, several semi-conductors, maybe 50 or more components, plus all the components for an AC power supply.

I went back to the happy days when I, and many others, used a single 6L6 or 6V6 transmitter and worked the world. With these happy recollections in mind, things really got out of hand—one thing led to another, and the QRP 80/40 was born.

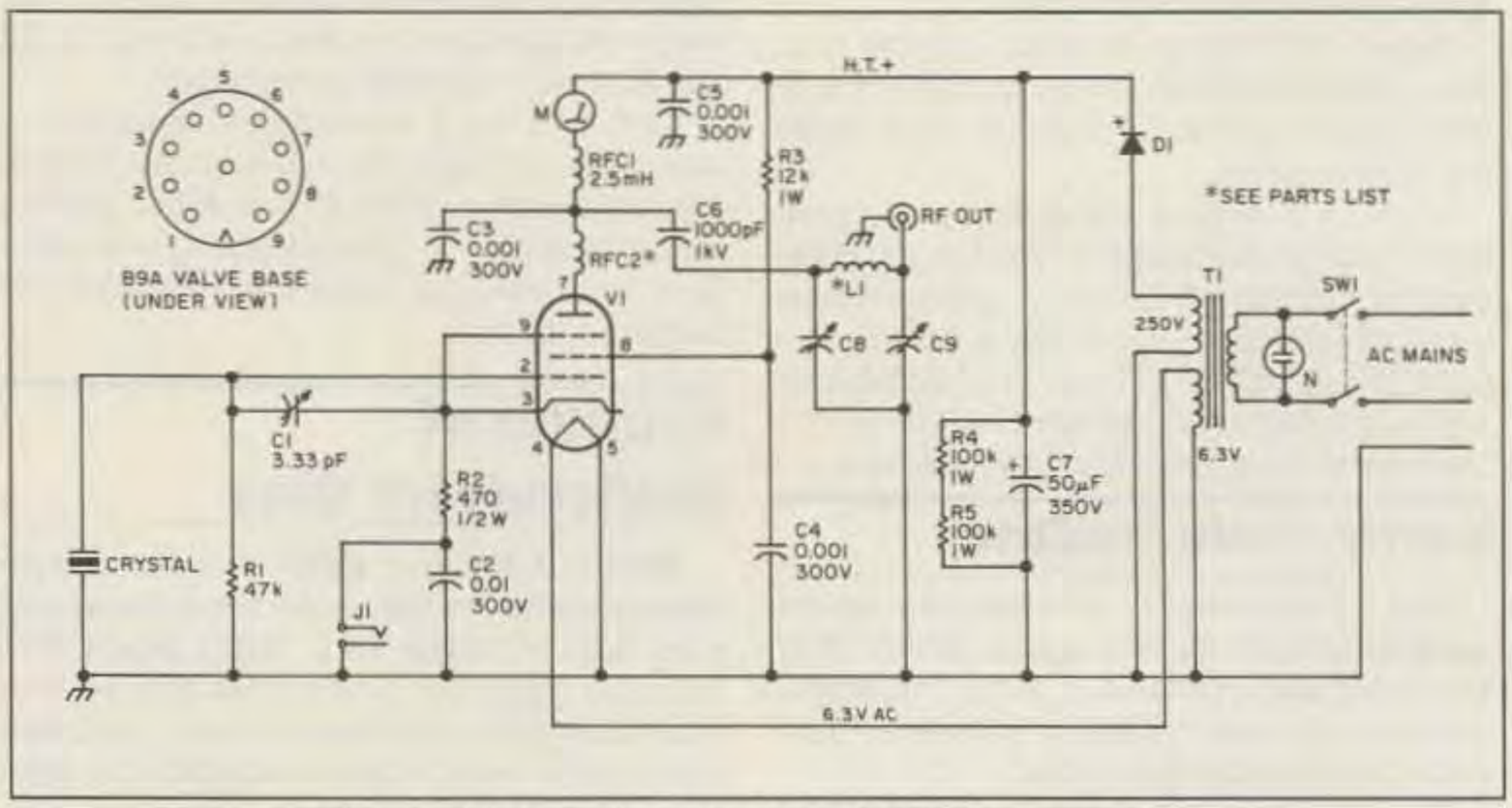

Figure 1. Schematic of the QRP 80/40 CW transmitter.

This transmitter is a personification of simplicity in circuitry, simplicity in construction, QRP in power, and QRP in cost. It covers both the 80 and 40 meter bands, and is built into an existing metal cabinet measuring about 8.6" wide x 4" high x 4.1" deep (that includes the built-in AC power supply). It uses just one tube and can be loaded to 5 watts or so. In fact, the result is less complex than so-called "simple" semi-conductor jobs. The reliable, robust 6BW6 tube can be quickly changed and the design does not require a printed circuit—all major components have solder tag connections and the smaller components can be slung between them. By all means, toil away on a printed circuit board if it will make you happy, but I have always believed that "the simplest is the bestest." In addition, 85% of the bits and pieces were in my junk box.

The circuit in Figure 1 shows a relatively conventional circuit using a 6BW6 tube (V1), crystal-controlled with a pi-output circuit which is tunable over both 80 and 40, by simply plugging in an FT-243 crystal (either 80 or 40 meter band) for the selected band. Do not try to double an 80 meter crystal to the 40 meter band. The purpose of C1 (3–33 pF trimmer) is to pre-set adjust for a clean CW note, which can be a problem with a single tube TX. The power of the TX could be increased by decreasing the value of R3, at the risk of a T7/T8 note.

C8 is a single-gang 365 pF air-spaced good quality receiving type variable capacitor. C9 is a similar 2-gang 365 + 365 pF variable capacitor with both sections wired in parallel to give 730 pF total capacity. Both an external LC and "T" type ATU have been used with success and no detectable harmonics.

The built-in AC power supply half-wave rectifier used was an old Westinghouse 18RA which was in the junk box, but Radio Shack/Tandy and others stock suitable low cost alternatives.

The whole TX + AC power supply is enclosed in an existing metal cabinet 8.6" wide x 4" high x 4.1" deep, onto which a new front panel was fitted. A simple ⌐¬ shape chassis was made and fitted to the panel as shown in Figure 2, which also shows the assembled layout of the main components on the front panel and chassis. The size of the cabinet/chassis is not critical and the positioning of the major components can be adjusted slightly to accommodate the actual component sizes used by individual constructors. The HT DC plate voltage with "key down" was 115 volts DC.

L1 is wound on a length of 1" diameter PVC or plastic tube using 35 turns of 24-gauge enamel copper wire spaced one turn. The L1/C8 + C9 circuit should tune to the 40 meter band near minimum capacity. However, individual coils and layouts may differ slightly. If necessary, a small number of turns can be removed from L1 to achieve 40 meters with the C8 plates about 15% enmeshed, and then the 80 meter band should resonate with C8 plates about 65% enmeshed.

To test the TX, adjust C1 and C9 to maximum capacity and plug in a 50-ohm dummy load. Next, insert an 80 meter band crystal, press the key, and tune C8 for minimum current on the meter; then increase the current by detuning to give a

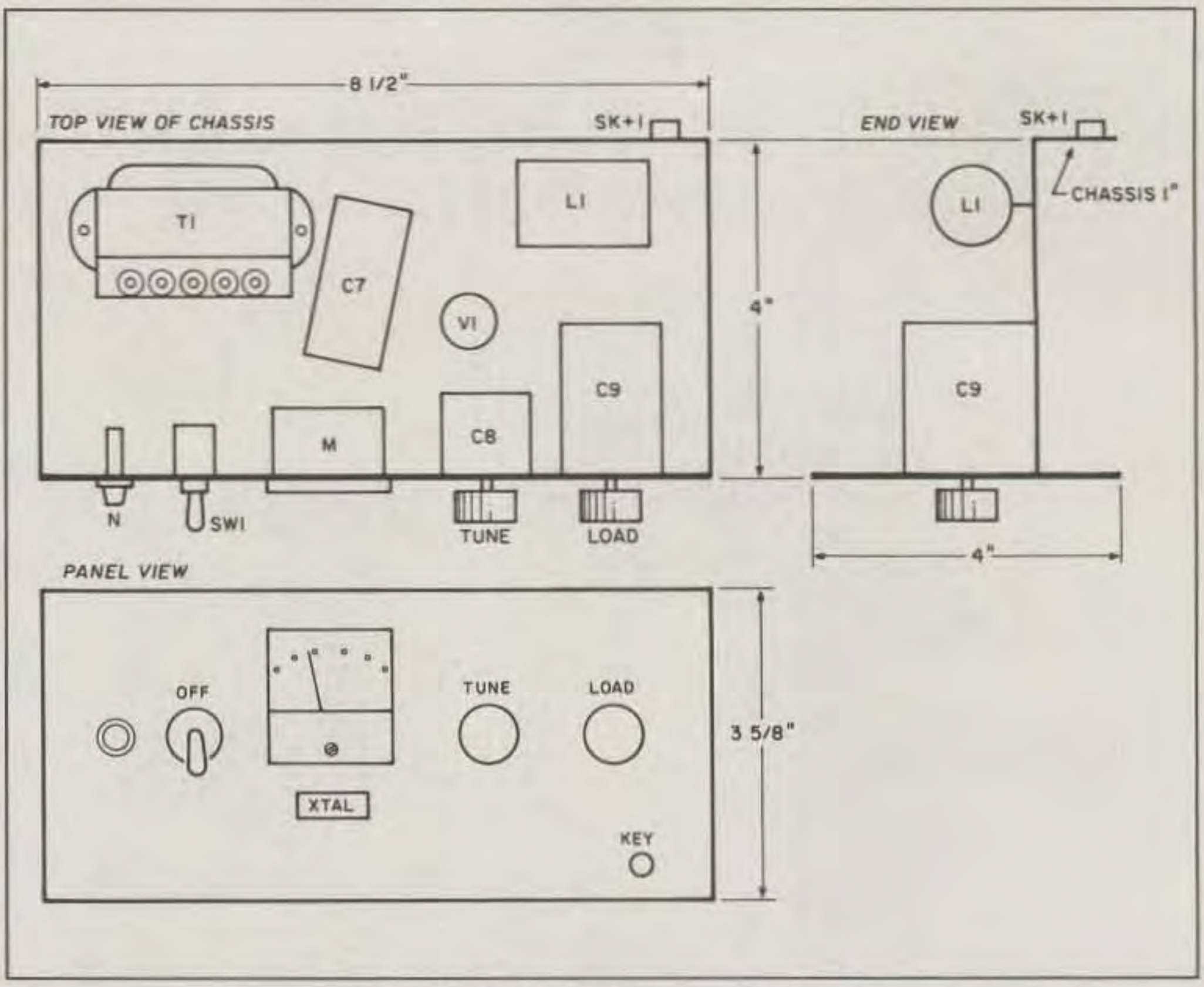

Figure 2. Panel/chassis assembly layout.

2 mA increase in current so that the crystal is oscillating smoothly. Increase the antenna load by tuning C9 for maximum current. Now listen on an RX and adjust C1 for the best keying note. Repeat all the above with an ATU and antenna in place of the dummy load. Readjust C1 for the best note. It should not be necessary to readjust C1 again unless the 6BW6 tube is replaced.

Repeat all the above with a 40 meter band crystal—*but* without any further adjustment of C1. Do not use an 80 meter crystal on 40 meters.

Remember—higher voltages are used in tube transmitters than with semi-conductors, so TAKE CARE!

With this little QRP one-tube transmitter I have been able to maintain the regular early morning QSO into Germany, and have met little difficulty in working all over Europe with an indoor antenna, providing a useful standby transmitter.

Have fun with "The QRP 80/40 Sender." 73

Parts List

R1	47k, 1/4 watt
R2	470 ohms, 1/2 watt
R3	12k, 1 watt
R4	100k, 1 watt
R5	100k, 1 watt
C1	3-33 pF trimmer
C2	0.01 µF/300V working minimum
C3,C4,C5	0.001 µF/300V
C6	1000 pF @ 1kV
C7	50 µF/350 volts electrolytic
C8	365 pF single gang airspaced variable capacitor
C9	365 + 365 pF two gang airspaced variable in parallel—730 pF
Crystal	3.5 & 7 MHz band crystals—FT243 with panel mounting socket
V1	6BW6 tube + B9A ceramic chassis mounting socket
D1	(Westinghouse 18RA used) any suitable type available
RFC1	2.5 mH RF choke
RFC2	9 turns close-wound PVC hook-up wire wound on 3/16" diameter rod, and removed
J1	Jack socket for Morse key plug
L1	35 turns 24 gauge enamel copper wire, spaced 1 turn and wound on 1" diameter PVC or plastic (paxolin in the U.K.) tube
N	Neon panel light
SW1	2-pole on/off switch
T1	Transformer—secondaries 1.) 250 VAC @ 60 mA (minimum) 2.) 6.3 VAC @ 1 amp (minimum)