Number 25 on your Feedback card

QRP

Low Power Operation

Michael Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

Build Your Own QRP Transmitter

What's been your excuse for not trying QRP? Don't have the time to build a small transmitter? Can't find the parts for your project? Perhaps you've never built a QRP transmitter and don't have the test equipment to trouble-shoot the transmitter if it fails to operate.

Well, have I got a project for you this month! It's a small crystal-controlled transmitter, already built and ready to go. Add a crystal, key and power supply and you're on the air with up to 2.5 watts of RF. The power output is determined by the operating voltage of the unit. The transmitter will provide a nominal 1.75 watts at 14 volts or 1.25 watts at 12 volts.

The transmitter is the SW-1 medium/shortwave CW exciter/transmitter produced by Rayan Communications in Harmony, PA. The SW-1 is sold by Fair Radio Sales, 1016 East Eureka Street, Lima, OH 45802, a company whose 44 years in business has been largely with war surplus electronics. When someone mentions Fair Radio Sales, visions of ARC-5s and RT-77/GRC-9 transceivers come to mind. Of course, Fair Radio Sales also sells other electronic surplus aside from RT-77s.

Depending on the band, the price of the SW-1 ranges from $29.95 to $32.94. Fair Radio has a special for an order of four SW-1 exciters on four different bands. The frequency range of the SW-1 exciter ranges from 1.8–2.0 MHz, 3.5–4 MHz, 7.0–7.3 MHz, 10.1–10.5 MHz, 14.0–14.35 MHz, 18.068–18.168 MHz, 21.0–21.45 MHz and 24.89–24.99 MHz. A different SW-1 exciter is required for each different band because of the filter network used on the board. I ordered an SW-1 for the 30 meter (10.1–10.15 MHz) band.

There are three active devices in the SW-1. A single 2N3019 makes up the power amplifier. There is no high SWR protection diode in the PA circuit, so an SWR of under 2:1 would be a good idea to ensure a long life of the PA transistor. A single 2N4124 for the crystal oscillator and a 2N5089 for the buffer driver share the 4" x 2" commercial grade G-10 PC board. The entire PC board, less the crystal, weighs two ounces.

The SW-1 on 30 meters produced 1.5 watts at 13.8 volts, according to my MFJ QRP wattmeter. Hey, it's no Bird Thruline™, but it has been right on the money—most of the time. The power of the SW-1 is rated in ICAS, or Intermittent Commercial and Amateur Service. At 12 volts the SW-1 will produce 1.75 watts ICAS or 1.25 watts CCS (Continuous Commercial Service.) Key down and the SW-1 PA gets right hot to the touch. I'd keep the supply voltage down under 14 volts so the PA won't go out to lunch—permanently.

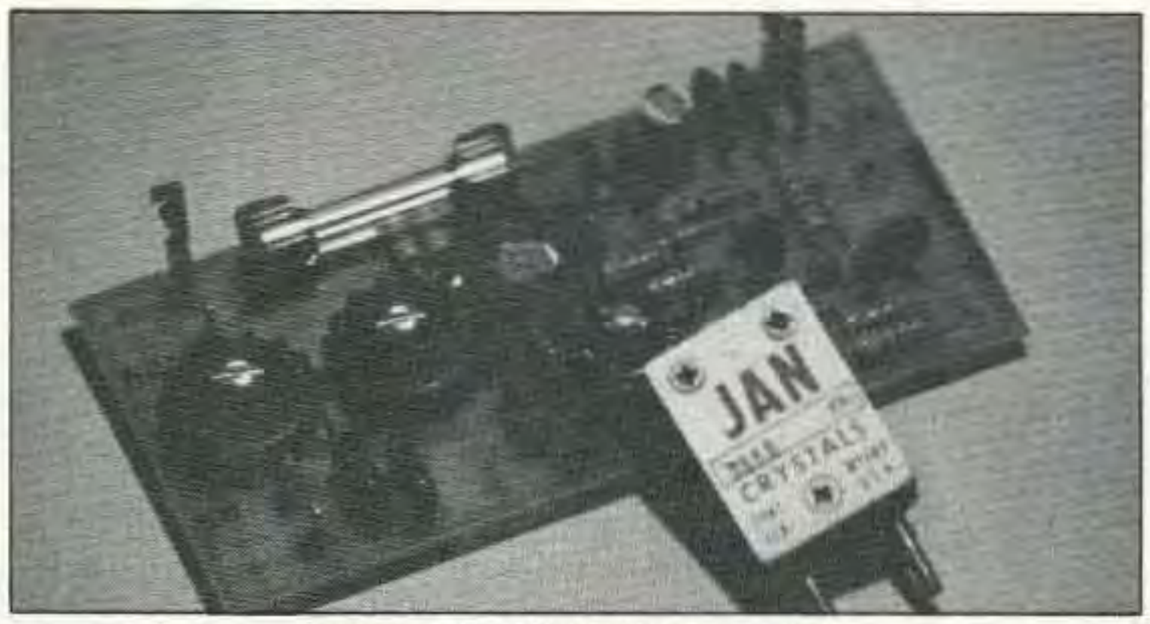

Photo A. The SW-1 QRP transmitter.

Features

Kinda strange to me, and I'm sure to a lot of other QRP builders, is the onboard fast-acting fuse. It's a 3/4 amp fuse to protect the entire SW-1. A diode on the board will conduct, blowing the fuse, if you connect the SW-1 up to the power supply backwards. It's a nice touch, especially for those shorts between the headphones when we hook something up backwards. Personally, I've never done that—really!

Frequency control for the SW-1 has provisions for fundamental mode HC6/U or HC33/U quartz crystals for non-oven, direct circuit board mounting. I have not used the popular FT-243 crystals on the SW-1. I see no trouble in using FT-243 crystals in the SW-1 as the oscillator is quite simple. Just about anything should oscillate in that circuit. It might prove interesting to rework this oscillator into a buffer/amplifier stage and add an external VXO or VFO for frequency control of the SW-1.

When I opened the box from Fair Radio containing the SW-1, I was immediately taken back by the apparent "mil spec" construction of the SW-1. Most of the resistors on the board are 1/2 watt, instead of the usual 1/4 watt resistors used by most of us. The PA transistor has a finned heat sink already attached to it. A big glob of heat-sink transfer compound can be clearly seen on the PA transistor and its heat sink. All the tuned circuits are wound on toroids and the toroids are in turn mounted to the PC board with 6-32 screws and fiber washers. Flip the PC board over, and there between the crystal's socket is a surface-mount resistor.

The circuit of the SW-1 is a bit out of the ordinary, compared to many QRP transmitters you might have seen before. The oscillator's supply voltage is regulated via a 10 volt zener diode. To key the SW-1, you ground the emitter of the 2N4124. You don't see this too often. Not that it's bad, it's just different. You might have some trouble with the keying if you use a keying device utilizing a transistor. These transistor switches don't pull the key line all the way to ground because of the 0.7 volt junction of the transistor. Because the key line can carry some low-level RF, keep the wires short from the SW-1 to the keying device. For the SW-1, use a reed relay (driven by your keyer) or dig out your straight key or bug! If you built the universal T/R controller last year, that unit provides solid ground keying via its built-in reed relay.

The PA transistor has two resistors in the emitter lead. Two resistors are used to reduce the current flowing through each resistor and to reduce the overall resistance. This is different, as most QRP transmitters have the emitter lead connected directly to ground. Again, like I said before, this is different, but not necessarily bad.

So, how does it work? Great! Plug in the crystal, power and key, add an antenna, and you're off and running. I find the keying just a bit soft, but it might be my crystal. In the SW-1, you're keying the oscillator on and off. Many contacts were produced on 30 meters with the SW-1.

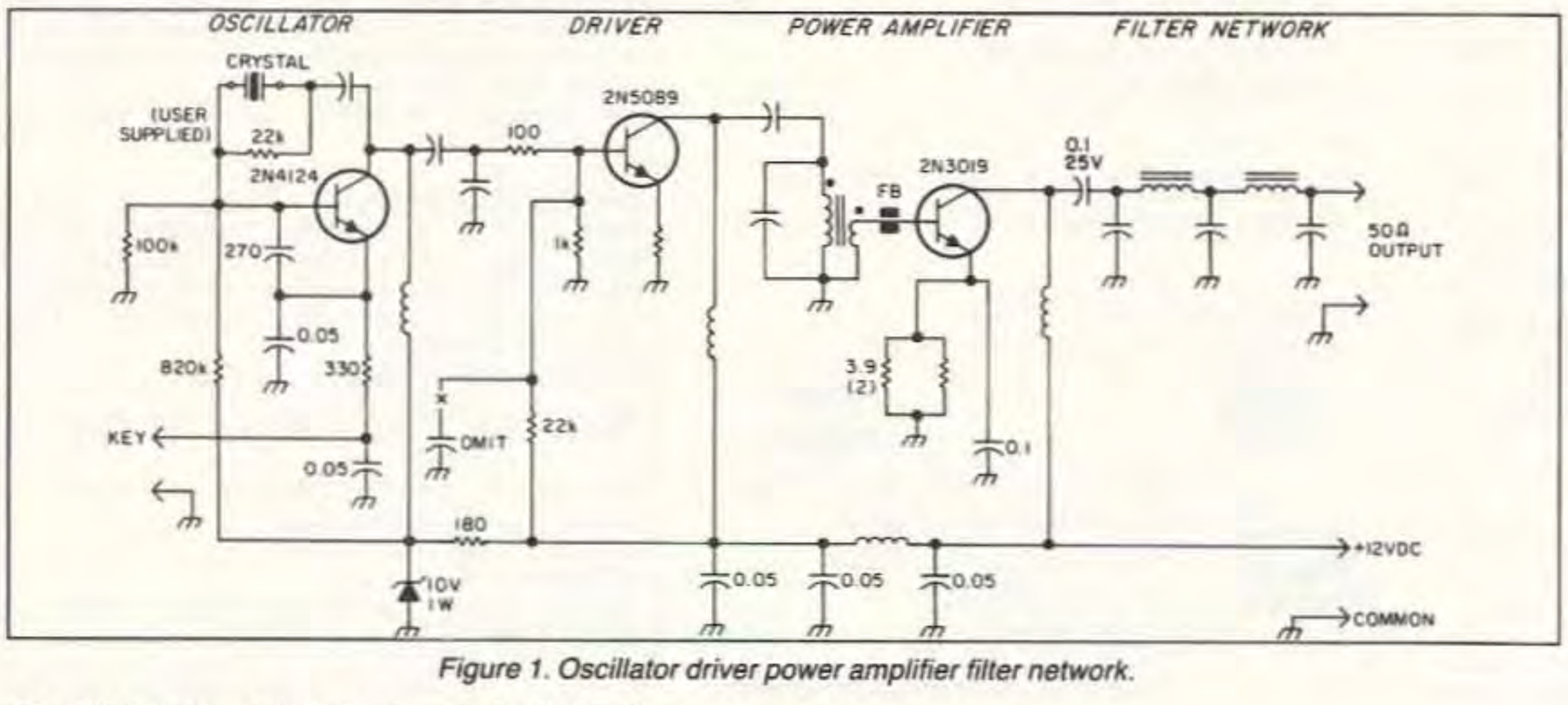

Figure 1. Oscillator driver power amplifier filter network.

The Instructions

The instructions that come with the SW-1, and there are three double-sided pages, caution you not to solder any conductors to the terminal post or to the circuit board conductor traces. Doing this will void all warranties associated with the product. Trouble is, there is no mention of the warranty. I tried to call Rayan Communications, but was told the number has been disconnected.

A small plastic bag of connectors for the PC board quick-disconnect terminals are supplied so you don't need to do any soldering on the board.

If you've never done much building, the instructions may give you a fright! They read like a military manual. For example, the following caution: "Under no circumstances should an external voltage potential be applied to the exciter/transmitter keying terminals. Connections to the keying circuit originating from input/output (I/O) modules of computer devices and/or process controllers should be checked for this condition." Whoa!!

So, what's it mean? Well, just don't apply any voltage to the key line.

My favorite from the manual: "The user must supply static discharge and/or lightning protection apparatus if an antenna system is connected to the exciter/transmitter module." Simply don't hook up the SW-1 to an antenna during an electrical storm.

Besides the obvious benefits of using the SW-1 for a transmitter, you could use it as a low level driver for a transverter. How about a BFO? A beacon transmitter for 10 meters (some changes would have to be made). A plasma generator for thin film solar cell production? The list is endless.

So, now you have no excuse for not trying out QRP. The SW-1 is a fast and inexpensive way to get your feet wet in the fun of QRP. Give it a try, the results will amaze you! 73