

# WA3RNC 40-Meter CW Transceiver

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The WA3RNC 40-Meter CW Transceiver Quick Kit is a 5 W, CW-only radio that covers approximately 7017 to 7047 kHz. The kit includes a PC board with most of the components mounted, an assembled digital dial PC board, all remaining components, and a drilled and painted die-cast enclosure. ARRL Lab volunteer Pete Turbide, W1PT, built the kit, and he shares his observations in the “Construction Notes” sidebar. Figures 7 and 8 show the finished unit.

The enclosure is available in several colors in addition to the green shown in the photos. WA3RNC also offers a lower-cost version with the digital dial and with an acrylic chassis instead of



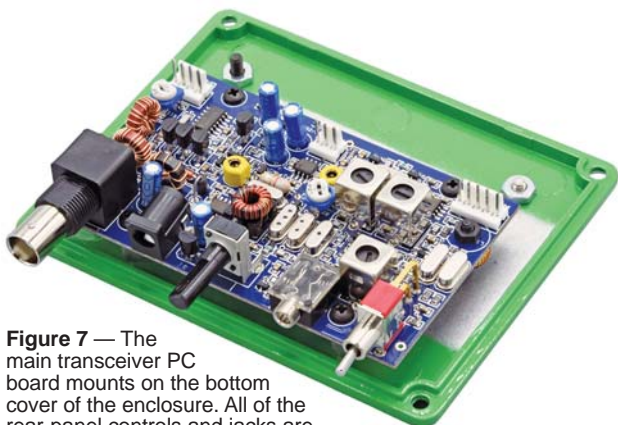
## Bottom Line

The WA3RNC 40-Meter CW Transceiver Quick Kit goes together quickly and results in a very nice looking finished product. Performance is surprisingly good for an inexpensive kit.

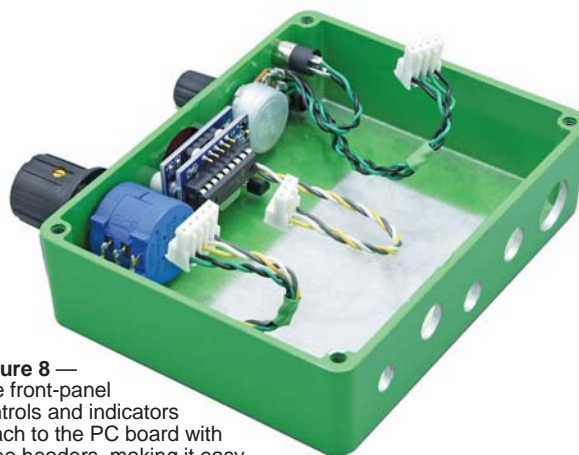
the die-cast enclosure. That version is also available as a “no-solder” kit.

## Lab Testing

The transceiver is rated for operation from 12 to 14 V dc and is battery-friendly for portable operation. Our radio put out 6.2 W maximum at



**Figure 7** — The main transceiver PC board mounts on the bottom cover of the enclosure. All of the rear-panel controls and jacks are mounted on the board.



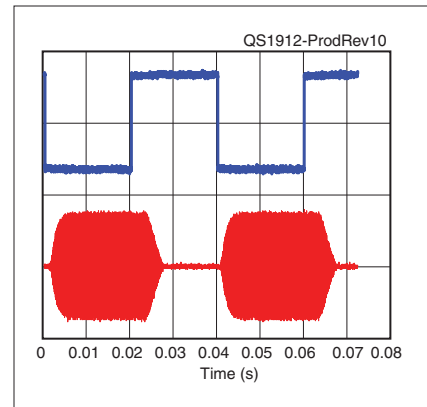
**Figure 8** — The front-panel controls and indicators attach to the PC board with three headers, making it easy to assemble and disassemble the case.

**Table 2**  
**WA3RNC 40 Meter CW Transceiver Quick Kit, rev B3**

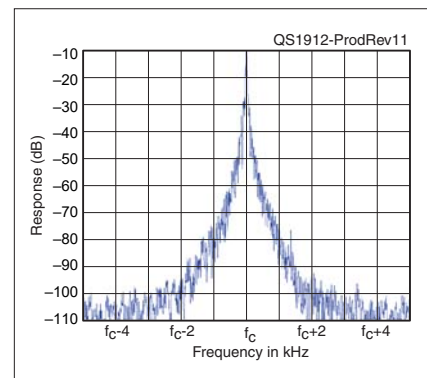
Manufacturer's Specifications		Measured in the ARRL Lab		
Frequency coverage: 7.017 to 7.047 MHz.		7.013 to 7.047 MHz.		
Power consumption: 12 V dc.		At 13.8 V dc: Receive, 48 mA; transmit 760 mA (max).		
Mode of operation: CW.		As specified.		
Receiver		Receiver Dynamic Testing		
Sensitivity: Not specified.		Noise floor (MDS): -135 dBm at 7 MHz.		
Noise figure: Not specified.		7 MHz, 12 dB.		
Blocking gain compression dynamic range: Not specified.		Blocking gain compression dynamic range: 20 kHz offset, 103 dB; 5 kHz offset, 103 dB.*		
Reciprocal mixing dynamic range: Not specified.		Not measured. Low-noise 7 MHz oscillator not available.		
ARRL Lab Two-Tone IMD Testing*				
<i>Band</i>	<i>Spacing</i>	<i>Measured IMD Level</i>	<i>Measured Input Level</i>	<i>IMD DR</i>
7 MHz	20 kHz	-135 dBm -97 dBm -10 dBm	-57 dBm -45 dBm 0 dBm	78 dB
7 MHz	5 kHz	-135 dBm -97 dBm -9 dBm	-57 dBm -45 dBm 0 dBm	78 dB
Second-order intercept point: Not specified.		+47 dBm.		
IF/audio response: Not specified.		Range at -6 dB points: 312 – 1182 Hz (870 Hz).		
Transmitter		Transmitter Dynamic Testing		
Power output: 0 to 5 W.		0 to 6.2 W at 13.8 V dc. 0 to 3.9 W at 9 V dc.		
Spurious-signal and harmonic suppression: >50 dB.		62 dB. Meets FCC emission standards.		
CW keying characteristics: Not specified.		See Figures 10 and 11.		
Transmitted phase noise: Not specified.		-140 dBc at 10 kHz from carrier; -145 dBc at 50 kHz.		
Transmit-receive turn-around time: Not specified.		S-9 signal, 30 ms.		
Size (height, width, depth, incl.): 1.8 × 4.6 × 5.2 inches. Weight, 13 oz.				
Second-order intercept point was determined using S-5 reference.				
*2 kHz dynamic range tests not performed due to filter bleed through.				



**Figure 9** — The WA3RNC transceiver's rear panel.



**Figure 10** — CW keying waveform for the WA3RNC 40-Meter CW Transceiver showing the first two dits using external keying. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first key closure starts at the left edge of the figure.) Horizontal divisions are 10 ms. The transceiver was being operated at 5 W output on the 7 MHz band.



**Figure 11** — Spectral display of the WA3RNC 40-Meter CW Transceiver during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 5 W PEP output on the 7 MHz band, and this plot shows the transmitter output  $\pm 5$  kHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

13.8 V dc, and operated well at 9 V dc with 3.9 W output. At 13.8 V dc, our radio drew 760 mA on transmit at full output, and just 48 mA on receive.

Receive sensitivity is excellent, and dynamic range is good for a small kit. If too many strong signals are a problem, engage the 12 dB attenuator. Frequency accuracy with the digital dial is specified at  $\pm 1$  kHz, and the review radio was just 500 Hz low.

## Construction Notes

Pete Turbide, W1PT

This is a very well-made kit, with quality components and circuit board. The surface-mount parts and many other components all pre-installed, leaving 24 parts for the builder to install and solder. The parts to be installed all have leads and include transistors, three-terminal regulators, capacitors, inductors, jacks, and controls. The kit comes in eight small plastic bags of components. This worked out well for me as a good stopping point after assembling each bag of components.

The pre-wound toroids and excellent, well-illustrated, step-by-step instructions made construction a joy. Anyone with a little building and soldering experience should be successful with this kit.

The only problem I encountered during assembly was an interference fit between the front rubber foot screw and the 10-turn potentiometer used for tuning. When the case is fully assembled, the screw put pressure on the outside potentiometer casing and caused the shaft to bind. A simple solution was to replace the screw provided with a shorter screw.

The kit arrives factory aligned, and no further adjustment is needed or encouraged. As a result, we had the transceiver on the air and making a contact before the solder had a chance to cool. We monitored the contact from our remote listening station (about 20 miles west of ARRL Headquarters). The signal from our transceiver was very stable with a pleasant, clean CW note.

Overall, it was a fun kit to build with no surprises. My only recommendation would be the addition of an on-off switch.

The CW waveform is clean, with good keying sidebands. On air, the signal sounds great with no sign of key clicks. The transmitter easily meets FCC spectral purity requirements.

### Using the Transceiver

The digital dial is at the center of the front panel and shows the last two digits of the tuned frequency. For example, 27 indicates 7.027 MHz. To the left of the display is a 10-turn potentiometer for tuning, and the volume control is on the right. The LED in the upper left indicates that the 12 dB attenuator is engaged, while the LED at the upper right is a received signal strength indicator (the stronger the signal, the brighter the LED). The 1/8-inch jack in the lower right corner is for stereo headphones. Note that using a monaural plug for the audio output will short the audio output and may damage the radio.

The BNC antenna jack is on the left side of the rear panel (see Figure 9), and the dc power connector is next to

that. The knob in the center is the RF power output control. To the right of that are the 1/8-inch key jack and a switch to turn the attenuator on and off. There is no power switch, and the panels are not labeled.

I plugged in my 40-meter dipole, headphones, and keyer, powered up the radio, and immediately heard signals on the band. With the 10-turn potentiometer, the tuning rate is slow enough to casually scroll through signals on the band. The receiver has a three-pole crystal filter, and although the skirts are not terribly sharp, it's usually possible to tune in one signal at a time unless the band is packed with strong signals. The receiver had plenty of clean audio for my 8  $\Omega$  headphones and was quite pleasant to listen to.

I adjusted the transmitter output to 5 W and had no trouble working a number of stations. Transmit-receive switchover is smooth and silent, and I had no trouble hearing band activity

between Morse characters at 30 WPM. The manual indicates that the built-in sidetone is actually the transmitted signal as heard in the receiver, rather than a separately generated tone.

In addition to the caution about plugging in monaural headphones, the manual also cautions against transmitting continuously for more than a few seconds at higher power out levels. It recommends turning down the power when adjusting an external antenna tuner, and that's easy enough to do with the rear-panel control.

The transceiver worked so well that I decided to try it in one of the short CWOps CWT contests one Wednesday afternoon. I worked a couple dozen stations, and for the most part, I had no trouble picking out stations to call, even though they are usually CQing just a few hundred hertz apart. On the air, the transceiver works so well that it's easy to forget that this is just a simple kit.

*Manufacturer:* John Dillon, WA3RNC, [www.wa3rnc.com](http://www.wa3rnc.com). Price: \$149.