

LNR Precision FX-2 40/30 Meter QRP CW Transceiver

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It was a pleasant surprise to learn about another low power (QRP) radio being made available to radio amateurs — the FX-2 offered by LNR Precision in Asheboro, North Carolina. LNR specializes in Par EndFedz antennas and formerly offered classic custom made telegraph keys. Larry Draughn, AE4LD, the owner of LNR, coordinated with a firm in China to design and fabricate this radio to his specifications.

As a result the FX-2 was announced in April 2012 and was ready for introduction and showing at Dayton. Since that time, LNR has implemented a firmware upgrade that adds and improves some features and fixes a few bugs. This review describes the radio with firmware version 2.1 (version 2.2 now shipping). Steve Weber, KD1JV, was instrumental in the design and upgrade of the firmware. Owners of the introductory model purchased prior to June 10, 2012 may contact LNR regarding the firmware upgrade.

Overview

The LNR website describes the FX-2 as an introductory level radio ideal for those who need portability or the convenience of a small lightweight CW transceiver. Weighing a little over 10 ounces and measuring 1.9 × 5.2 × 2.3 inches, it certainly fits the description of a trail friendly transceiver that is ideal for backpacking or slipping into a carry-on bag for portable operation almost anywhere.

The transceiver includes full frequency coverage of 7 to 7.3 MHz and 10 to 10.150 MHz, CW only. The power supply requirement is 9 to 13.8 V dc. Power output is approximately 5 W on 40 meters and 2.4 W on 30 meters with a nominal 13.8 V supply. In the Lab we found that the FX-2 will operate at reduced power with as little as 6 V dc — useful for portable operation with limited battery capacity.

In addition to the two band coverage, the radio features receiver incremental tuning (RIT, ±9.9 kHz); a switchable bandwidth IF (five settings, about 350 to 1200 Hz);



TUNE mode with SWR indicator; an iambic keyer with two programmable CW message memories of up to 120 characters each; and 20 user programmable frequency memories, 10 per band.

The physical layout of this radio is a bit different from other recently introduced QRP radios in that the ON/OFF/VOLUME control and TUNING knob are on the right hand side of the unit, and the dc POWER INPUT and BNC ANTENNA connector are on the left hand side. Since it has a small footprint, this configuration allows more room on the top of the unit for the display and four pushbuttons. The KEY and HEADPHONE jacks are on the front, along with a SIDETONE LEVEL control that is a screwdriver adjustment (turning it clockwise lowers the volume). The steel case feels hefty and should prove to be durable.

An Informative Display

The bright blue display provides easy to read contrast for the frequency and other features. The frequency display is in the format 00.000.000, and a cursor below the digits lets you easily select the tuning rate by means of arrow buttons.

At initial power up, the 40 meter band is selected, the tuning rate is 100 Hz, keyer

Bottom Line

The LNR Precision is a tiny 40 and 30 meter QRP CW transceiver with features such as full band coverage, a digital display and a built-in memory keyer that make this radio a worthy travel companion.

speed is set for 20 WPM and IF bandwidth is set to BW 1 (the narrowest setting). The S meter bar graph is active on the display. On transmit, the S meter changes to indicate T, with the bar graph scale beginning at 1 W output and increasing in approximately 0.5 W increments to a full scale of 4.5 W or greater.

As a battery saving feature, the LCD backlight turns off after 2.5 minutes of inactivity. The display can still be viewed under strong light with the backlight off and any activity — pushing a button, tuning the frequency or tapping a key or paddle — will turn the light back on.

Hooking it Up

The quick setup description in the manual instructs the user to connect an antenna before proceeding. It suggests that RG-174 miniature coax has proven satisfactory for runs up to 25 feet as part of a compact, portable wire antenna system. The FX-2 features protection for an SWR of up to 3:1. The manual cautions to use an antenna analyzer and antenna tuner to bring the antenna within range if you anticipate a higher mismatch.

Plug in your favorite key or keyer paddle using a 1/8 inch stereo plug. A menu choice selects either straight key or paddle. The unit provides sufficient audio output to drive earphones. A power supply cord with the matching plug is supplied, and the positive side of the cord is marked by a stripe or line. Although LNR says that the external power jack has reverse polarity protection, the manual carries the following caution: "Make sure this is wired to your power supply correctly or damage will occur to FX-2!"

Tuning Around

Tuning is accomplished with the rotary detent knob labeled TUNED, and the frequency changes with every other click. The tuning rate can be changed by the left and right arrow buttons and the rate is indicated by the cursor under the corresponding digit (10 Hz, 100 Hz, 1 kHz or 10 kHz). The CALL/IF button is used to toggle between the 40 and 30 meter bands. Push and hold the CALL/IF button for about two seconds, release the switch when you hear a beep tone and the band in meters is shown in the menu window. The operating frequency displays

Table 2
LNR Precision FX-2, Rev 2.1, serial number N/A

Manufacturer's Specifications	Measured in the ARRL Lab																																																
Frequency coverage: Receive & transmit: 7-7.3, 9.999-10.150 MHz.	Receive & transmit: 7-7.3001, 9.999-10.1501 MHz.																																																
Power requirements: 9-13.8 V dc.	13.8 V dc external power, receive, max audio, no signal, backlight on, 89 mA, backlight off, 74 mA; transmit, 850 mA (7 MHz), 530 mA (10 MHz). Minimum operating voltage, 6 V dc at 900 mW RF output. Receive sensitivity reduced below specified voltage range.																																																
Mode: CW.	As specified.																																																
Receiver	Receiver Dynamic Testing																																																
Sensitivity: 0.7 μ V (-110 dBm).	Noise floor (MDS), 500 Hz filter (BW setting = 3): 7 MHz, -116 dBm*; 10 MHz, -115 dBm.																																																
Noise figure: Not specified.	31 dB (7 MHz), 32 dB (10 MHz).																																																
ARRL Lab Two-Tone IMD Testing (500 Hz filter, BW setting = 3)**																																																	
	<table border="1"> <thead> <tr> <th>Band</th> <th>Spacing</th> <th>Input Level</th> <th>Measured IMD Level</th> <th>Measured IMD DR</th> <th>Calculated IP3</th> </tr> </thead> <tbody> <tr> <td rowspan="3">7 MHz</td> <td rowspan="3">20 kHz</td> <td>-43 dBm</td> <td>-116 dBm</td> <td>73 dB</td> <td>-6 dBm</td> </tr> <tr> <td>-36 dBm</td> <td>-97 dBm</td> <td></td> <td>-5 dBm</td> </tr> <tr> <td>0 dBm</td> <td>-20 dBm</td> <td></td> <td>-10 dBm</td> </tr> <tr> <td rowspan="3">7 MHz</td> <td rowspan="3">5 kHz</td> <td>-44 dBm</td> <td>-116 dBm</td> <td>72 dB</td> <td>-8 dBm</td> </tr> <tr> <td>-37 dBm</td> <td>-97 dBm</td> <td></td> <td>-7 dBm</td> </tr> <tr> <td>0 dBm</td> <td>-18 dBm</td> <td></td> <td>-9 dBm</td> </tr> <tr> <td rowspan="3">7 MHz</td> <td rowspan="3">2 kHz</td> <td>-44 dBm</td> <td>-116 dBm</td> <td>72 dB</td> <td>-8 dBm</td> </tr> <tr> <td>-37 dBm</td> <td>-97 dBm</td> <td></td> <td>-7 dBm</td> </tr> <tr> <td>0 dBm</td> <td>-16 dBm</td> <td></td> <td>-8 dBm</td> </tr> </tbody> </table>	Band	Spacing	Input Level	Measured IMD Level	Measured IMD DR	Calculated IP3	7 MHz	20 kHz	-43 dBm	-116 dBm	73 dB	-6 dBm	-36 dBm	-97 dBm		-5 dBm	0 dBm	-20 dBm		-10 dBm	7 MHz	5 kHz	-44 dBm	-116 dBm	72 dB	-8 dBm	-37 dBm	-97 dBm		-7 dBm	0 dBm	-18 dBm		-9 dBm	7 MHz	2 kHz	-44 dBm	-116 dBm	72 dB	-8 dBm	-37 dBm	-97 dBm		-7 dBm	0 dBm	-16 dBm		-8 dBm
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Second-order intercept point: Not specified.	7 MHz, +5 dBm.																																																
S meter sensitivity: Not specified.	S9 signal at 7 MHz: 69.2 μ V (four dots on display).																																																
IF/audio response: Not specified.	Range at -6 dB points, (bandwidth): CW, 500 Hz filter (BW setting = 3), 640-1137 Hz (497 Hz). Equivalent Rectangular BW: 512 Hz.																																																
Spurious and image rejection: Not specified.	First IF rejection: 76 dB; image rejection: >125 dB.																																																
Transmitter	Transmitter Dynamic Testing																																																
Power output: 4 W (7 MHz), 2.5 W (10 MHz) with 13.8 V dc external power input.	13.8 V dc external supply, 7 MHz, 5.4 W, 10 MHz, 2.4 W.																																																
Spurious signal and harmonic suppression: Not specified.	43 dB (7 MHz), 54 dB (10 MHz). Meets FCC requirements.																																																
CW keyer speed range: 5-40 WPM.	5-41 WPM; iambic Mode B.																																																
CW keying characteristics: Not specified.	See Figures 1 and 2.																																																
Receive-transmit turn-around time (tx delay): Not specified.	325 ms.																																																
Size (height, width, depth): 1.9 x 5.2 x 2.3 inches, including protrusions. Weight: 10.3 oz.																																																	
Price: \$185.																																																	
*Measured level, but usable audio level is -110 dBm or greater.																																																	
**ARRL Product Review testing now includes Two-Tone IMD results at several signal levels. Two-Tone, 3rd-Order Dynamic Range figures comparable to previous reviews are shown on the first line in each group. The "IP3" column is the calculated Third-Order Intercept Point. Second-order intercept points were determined using -97 dBm reference.																																																	

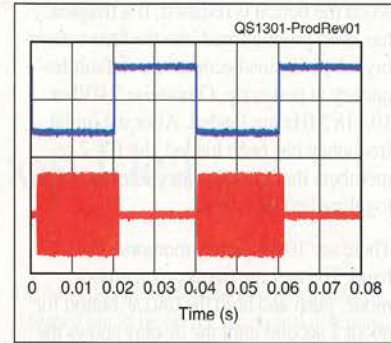


Figure 1 — CW keying waveform for the FX-2 showing the first two dits in full-break-in (QSK) mode using external keying. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first key closure starts at the left edge of the figure.) Horizontal divisions are 10 ms. The transceiver was being operated at 5 W output on the 7 MHz band.

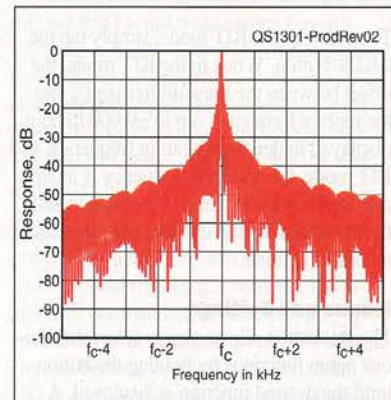


Figure 2 — Spectral display of the FX-2 transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 5 W PEP output on the 7 MHz band, and this plot shows the transmitter output \pm 5 kHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

when the button is released. If a frequency has been programmed into the MEM 0 memory location, this becomes the default frequency at power up. Otherwise 7.030 or 10.118 MHz are loaded. After the initial frequency has been loaded, the FX-2 remembers the last frequency selected when toggling between bands.

There are 10 frequency memories for each band. To enter the frequency memory mode, push and hold the CALL/IF button for about 1 second until the display shows the memory mode. The display changes to MEMx ???.???.??? where x is a memory number 0 to 9 and the ? symbols are replaced by a frequency unless the location is empty. Select a memory location with the left and right arrow buttons. To store the current displayed operating frequency, tap the MV button. Once stored, the display returns to normal operation. To recall a frequency, press and hold the CALL/IF button for about 1 second.

To enter into the RIT mode, simply tap the CALL/IF button. When in the RIT mode, the offset between the transmit frequency and the receive frequency (up to ± 9.900 kHz) is displayed under the operating frequency. In RIT mode, the transmit frequency is locked and the receive frequency is adjusted using the TUNED knob. Tap the CALL/IF button again to exit RIT mode.

Menus and Settings

The MV button allows you to select the various menu functions by holding the button until the desired function is displayed. A beep sounds as you scroll through menus for TUNE mode, bandwidth adjustment, and keyer speed, memory and paddle selections. Code speed is changed by tapping the MV button briefly and using the dot and dash paddles to increase or decrease the speed. When the TUNE mode is selected, the rig can be placed in transmit by using the dot paddle. In this mode, relative forward and reflected power levels are displayed. The reflected power scale is most responsive when the SWR is below 2 to 1 to help with adjustment of an antenna tuner. A full scale of 6 dots indicates a SWR above 3 to 1. Exit the TUNE mode by tapping the MV button.

To select the various IF bandwidths, push the MV button and hold it until you see BW 1 through BW 5 on the display. BW 1 is the narrowest. Select the desired bandwidth with the left or right arrow buttons and exit this mode by pushing MV again.

The last menu selection deals with the keyer memory. Press and hold the MV button until you see KMEM in the display; when it's released the keyer memory function becomes

active. The top line displaying KMEM clears and the bottom line shows ESC, BS, IS and RM, each label above a button to remind you of its function. To exit without storing a message, simply push the MV button.

Two messages of up to 120 characters each can be stored by using your paddle to key in the message. As you key it in, the letters, numbers and common punctuation characters are decoded and shown on the display. When the memory is full, the sidetone sends MF and you can decide to store the message as is or delete some characters with the backspace button. When the message is okay, store it in one of the two memories. Memories can be edited later. To send the stored memory, tap the MV button, then within 1 second, tap either the dot paddle for message 1 or the dash paddle for message 2.

Lab Tests

Although the FX-2's performance is generally good for a CW QRP radio in this price class, the Lab found a few issues to be aware of. Receiver sensitivity measured -116 dBm, but that signal level is barely audible in a normal pair of headphones. The receiver needs a signal of about -110 dBm (the specified sensitivity) or greater for it to be usable. This would be considered low sensitivity for a desktop 100 W transceiver (typically -120 dBm or better without preamp).

The transmitter passes FCC requirements, although it just barely passes on 40 meters. The keying waveform (Figure 1) is hard and the keying sidebands are relatively wide (Figure 2), but at the 5 W power level, key clicks are not evident on the air. Used by itself, it's okay, but the Lab wouldn't recommend using an external RF amplifier with this radio.

The Lab was unable to perform a composite noise test, which requires the transmitter to remain stable, key down, for several minutes. We found that when the transmit key is held down, current consumption increases over time; the power goes up a couple of hundred mW and the current draw increases. With the key down for 30 seconds or so, the final PA heats up and the current rapidly increases to 1.4 to 1.5 A, while the power then drops. Take care to avoid prolonged key down operation.

Final Thoughts

I found this radio fun to use and made many enjoyable contacts during the review, mostly on 40 meters, using my low dipole antenna to work stations up and down the East Coast. I received good signal reports with no reports of key clicks or chirps. As with other recent QRP radios we've tested, the display is a pleasure to behold. Its digital frequency readout eliminates the need for calibrating a tuning dial.

The radio comes with a two position flip stand so you can tip up the front for easier viewing of the display — something I particularly liked. The tuning detent control has a nice solid feel, and ample audio output was available for earbud headphones.

This small radio should prove to be popular with QRP enthusiasts or anyone looking for a transceiver to stow away for a trip in a minimal amount of space. The FX-2 offers some modern features at a low price and is ready to go right out of the box. Just add power supply, earphones, antenna and paddle and you'll be on the air in no time.

US distributor: LNR Precision, Randleman, NC 27317, tel 336-495-7714; www.lnrprecision.com.

See the Digital Edition for a video overview of the LNR Precision FX-2 transceiver.

