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Product Review

QRP Labs QDX 5-Band HF QRP Digital Transceiver

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The QRP Labs QDX Digital Transceiver is a low-power, low-cost radio for digital operations. The reviewed unit covers five HF bands — 80, 60, 40, 30, and 20 meters — and the maximum power output is 5 W, with support for digital modes only. It comes in a kit to be built, and you can buy a fully assembled unit for an extra $45. See Figure 1 for the kit parts packaging. The printed circuit board (PCB) comes with pre-installed surface-mount device (SMD) components (Figures 2 and 3 show each side of the PCB). It includes an embedded software-defined receiver (SDR), 24-bit 48 kilo samples per second (kS/s), a USB sound card, CAT control, and a synthesized VFO with TCXO reference. The QDX transmits a single, clean output signal, as it is not an SSB modulator with associated unwanted sideband and residual carrier, or intermodulation due to amplifier non-linearity (more on this later).

The QDX is suitable for single-tone operations. It is reported on the QDX forum that successful RTTY operation has been accomplished. It is not suitable for CW operation using *fldigi* or similar programs. It is my understanding that there is no waveform shaping that would prevent key clicks. Modes that require multiple simultaneous tones, such as Winlink, are not possible with the QDX. Also, the QDX is not capable of phase-shift keying, such as PSK31. Per the product description,

> QDX is suitable only for single tone FSK modes, which covers the majority of digital modes in use today. This includes everything in WSJT-X, JS8Call, some fldigi modes e.g. RTTY, Olivia and more. QDX is not suitable for on/off keyed modes such as CW because it does not have click-reducing RF envelope shaping; furthermore, it is not suitable for phase shift keyed modes such as PSK31 or modes involving multiple concurrent tones such as WinLink.

Description and Kit Assembly

While it does require a computer, the unit has only four connections on the rear panel: an antenna BNC port, a power connection, a 3.5-millimeter PTT, and a single USB type B port that handles both CAT control and audio (see Figure 4). When all the necessary physical connections are made, the unit becomes a "black box" that requires no other user intervention.

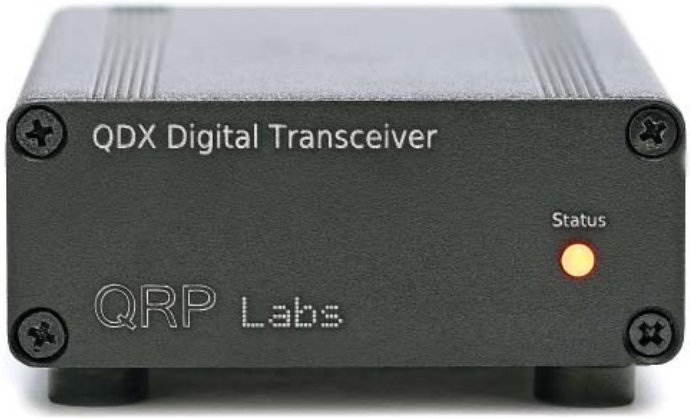

Figure 1 — The QDX kit with parts packaging.

Since Revision 3 (Rev3, now Rev4), QRP Labs added a standard 3.5-millimeter plug for an external PTT connection that can be used without modification between the QDX and the QRP Labs 50 W PA. The PTT output can also be configured for use with any other amplifier.

Bottom Line

The QRP Labs QDX is a low-cost digital transceiver with a clean RF output signal for the supported digital modes. Setting it up is fast and easy, perfect for portable and permanent installations.

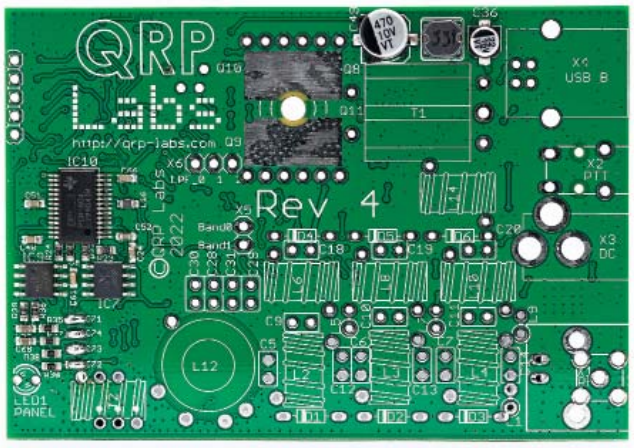

Figure 2 — The front view of the QDX's PCB.

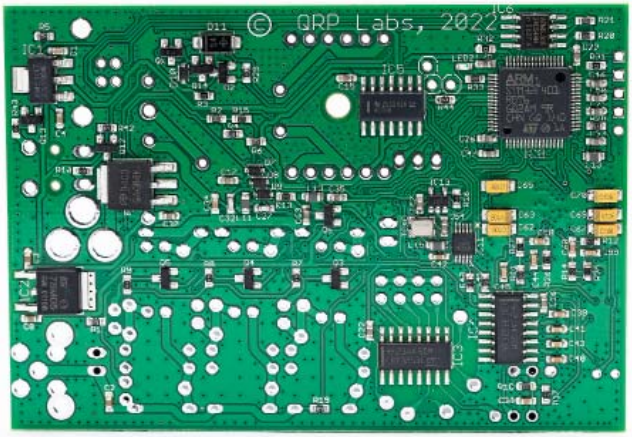

Figure 3 — The rear view of the QDX's PCB.

I have considerable experience with QRP Labs products. I assembled at least eight original QCX models, repaired several more, and built a QCX+. The QRP Labs instruction manuals are clear, they contain concise technical descriptions, and they are generally easy to follow. The QDX documentation is no exception. It is, perhaps, among the easiest of the QRP Labs kits to assemble. My assembly time was no more than a few hours.

Assembly is straightforward, and the parts count is low. Most of the board is pre-populated with the SMD components, so the user doesn't need special tools to complete the kit. There are 16 through-hole capacitors, six diodes, four transistors for the final amplifier, an LED, a transformer, and a series of toroids to wind and install. Finally, a few connectors complete the build. Depending on your level of experience, the kit can be assembled in a few hours. There is only one construction option, and that is whether to build the device to operate on 9 or 12 V dc. To quote the operating manual, "No test equipment is required to build, align, and operate this digi modes transceiver. There are no alignment tasks."

Figure 4 — The rear panel of the QDX.

For more details, you can download the manual from the manufacturer's website (**www.qrp-labs.com/qdx.html**).

Linux (Xubuntu 22.04) is my operating system of choice. But as stated on the manufacturer's website, the drivers for these types of audio devices should be already present on your computer if you are using macOS, Linux, or Microsoft Windows 10 or 11. If you are using older versions of Windows, then you need to install a driver for the virtual COM port (audio and USB flash drivers are already present, even on older versions of Windows). The details can be found in the QDX manual. I made the connection between the QDX and my laptop via a USB A/USB C cable. Linux immediately recognized the built-in sound card, and it was easy to select the correct sound settings in *WSJT-X*. The serial device followed the typical naming scheme for Unix-like systems. The serial port test confirmed operation immediately, and after a brief check I was on the air. I selected the **KENWOOD TS-440S** configuration for CAT settings in *WSJT-X*. The sound card appears as **ALSA_INPUT.USB-QRP-LABS_QDX_TRANSCEIVER-02.ANALOG-STEREO** and **ALSA_OUTPUT.USB-QRP-LABS_QDX_TRANSCEIVER-02.ANALOG-STEREO**, respectively, for audio input and output. With the QDX designation in the sound card description, there is little possibility of making a mistake in selecting the device. The serial port appears as **/DEV/TTYACM1** on my laptop. I have not connected the radio to a Windows or Mac computer to date. Most importantly, the radio was not designed around a single operating system.

On the Air

With many hours of operation behind me, I can say with certainty that this transceiver is unparalleled in ease of operation within the scope of my experience. The radio's front panel has no controls and only a single

Table 1
QRP Labs QDX HF Digital Transceiver (Rev4)

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: 80, 60, 40, 30, and 20 meters.	As specified.
Power requirement: 9 V or 12 – 13 V dc with modification.	At 12 V dc: transmit, 0.9 A; receive, 166 mA.
Receive	
Modes of operation: Digital only.	As specified.
Transmitter	**Transmitter Dynamic Testing**
Power output: Up to 5 W.	At 12 V dc: 3.5 MHz, 4.5 W; 5.3 MHz, 4.8 W; 7 MHz, 4.2 W; 10.1 MHz, 5.4 W; 14 MHz, 5.5 W.*
Spurious-signal and harmonic suppression: Not specified.	Typically >52 dB; worst case, 44 dB (60 meters). Complies with FCC emission standards.

Size (height, width, depth, including protrusions): 1 × 2.48 × 3.49 inches. Weight: 0.30 pounds/(135 grams).

*RF power output was 3.0 W on 14 MHz with 9 V dc input voltage.

I use the transceiver primarily for portable operations, as I am an avid activator for both World Wide Flora and Fauna and Parks on the Air® programs. Rapid deployment is a distinct advantage for field operations, and the QDX greatly facilitates this. Previous field setups included multiple peripherals, careful adjustment of sound and drive levels, and many extra wires that were easily misconfigured. The setup of the QDX is nearly foolproof. Due to the nature of propagation, portable operations, and the parks programs, the majority of my operating has been on 20 meters. I'm sure other bands would work well, but I typically do not spend a lot of time away from 14074 kHz. I have, however, tested the transceiver and made a few contacts on other bands.

USB cable, power, and antenna connection on the back of the radio. While no adjustment or alignment is needed, it's possible to access configuration and test menus. To access these features, you will need to use terminal software like *PuTTY* or *Minicom*, which will give you access to several menus within the radio. The firmware is upgradable. The radio seems exceptionally stable, likely due to the TCXO that controls the reference oscillator.

There are no relays within the radio. All switching is done with PIN diodes. I have used the radio only for FT4, FT8, and JS8Call, but operations with these modes have been nearly trouble-free. Modes that will work shift frequencies one at a time. The QDX cannot be used for phase-shift keying, multi-tone modes, or CW. It is reported to work with RTTY (with some compromises), DominoEX, and Olivia.

There was one instance of a brief failure, but it was really a computer operating system problem, and it had nothing to do with the QDX. The USB port designation changed from **/DEV/TTYACM1** to **/DEV/TTYACM0**, but this was easily remedied in the field. This can happen with any operating system. With Linux-based systems it is possible to make a permanent port assignment to avoid this problem. While I have had some experience with Mac OS X, it has been quite a while, and I am unfamiliar with recent changes within the OS. I also have very little recent experience with Microsoft Windows.

Operating voltage and power output are supposed to be determined by the number of turns on the secondary winding of transformer T1. I chose the 12 V operation voltage, although I find that my transmitter is a bit more optimistic than one might like. The maximum recommended output is 6 W, and my transceiver puts out nearly this much and more on several bands. So far, I haven't encountered any difficulties, but there could be a replacement for the BS170s transistor in the future. My battery of choice is LiFePO4, and the voltage is a very steady 13.2 V under normal operating conditions. The power output of the QDX is strictly a function of input voltage and not related to audio drive. Manipulation of the input voltage in the field does present certain problems. The recommended input of 12 V can be obtained by placing a diode inline with the power source (see Table 1). I may try a LiPO4 pack (about 11.1 V) to see if that drops the power output to a more acceptable level.

There is a jack for operations with an external power amplifier, but I have not found it necessary to move to QRO operations. I have made thousands of contacts with plenty of DX using low power and a good antenna.

An LED indicator shows that the radio is powered up. In transmit, the LED has a medium blink rate. It shows a fast blink rate on boot-up, or very slow and steady blink rate if it is in the firmware upgrade mode. Boot time is less than 1 second, but the fast LED will blink for 5 seconds. For portable operations, setup takes a little longer than setting up the antenna. There are no settings to fiddle with. The transmit level in *WSJT-X* does not affect

power output, and it is recommended to simply leave the transmit power at the maximum setting. I reduced the computer's audio input drive to keep the receive level indicator out of the red, but that was the only adjustment needed in my configuration.

My portable operations have taken me very far afield, at least through a swath of the central United States. My favorite portable operating position is from a picnic table, although the small size of the QDX makes it easy to set up nearly anywhere. I have a portable aluminum table that also works well. It is rare that I operate exclusively in digital modes, so I need enough room for a CW transceiver. I may be something of a heretic, but I rarely operate QRP when I am activating a park unless there is a considerable hike involved. Then the station is as light as possible. My "tailgate" and picnic table operations are usually accompanied by a Yaesu FT-991A for CW. There is always plenty of room for the QDX. Keep in mind that the QDX requires some sort of computer, although there are many configurations that can be used for this purpose. A Raspberry Pi, which is about the same size as the QDX, could be linked wirelessly to a tablet or iPad, making for a compact and versatile setup.

Hans Summers, GØUPL, founder of QRP Labs and the designer of the QDX, provides a better technical description of the operation of the radio, but here's my take. As a musician, I understand the term "transposition." To transmit, the radio uses an analog-to-digital conversion of the audio input signal, which is sampled. The sample of each audio frequency is then "transposed," or transformed, directly to appropriate RF frequencies. These are not sideband signals injected to produce a suppressed carrier SSB transmission. The transmitter produces pure frequency shift keying without any spurious mixing products.

The receiver is an SDR that uses an intermediate frequency for the final extraction of the tones — first in digital form, then fed as audio to a built-in sound card, and finally sent via USB to a computer. Anecdotally, the receiver passband is nearly devoid of noise. In very unscientific terms, the radio doesn't seem to "hear" much of anything aside from the intended signals. This may, in part, have to do with portable operations, but even still I find that, compared to other QRP FT4/FT8 setups I have used, the signal-to-noise ratio appears to be much better with the QDX. Compared to other QRP setups, my experience is that the QDX hears well enough that there is bigger spread in SNR readings, and because the QDX hears so well, a reply with the other station being unable to hear it seems to be more frequent than with other radios I have used.

The QDX does an excellent job of leveraging the modes available in *WSJT-X* and several other popular modes.

Conclusion

Overall, the QDX is an excellent transceiver. It is compact, easy to use, and nearly foolproof. I highly recommend purchasing the case unless you are highly skilled at fabricating your own enclosures, or if you have a 3D printer, as some templates are available online. The radio is a worthwhile addition to my go-box for portable operations, but it would function equally well as a dedicated radio in the shack.

Manufacturer: QRP Labs, **www.qrp-labs.com**. Available in two versions at the same price: 80, 60, 40, 30, and 20 meters (the reviewed unit), and the new 20, 17, 15, 12, and 10 meters. Price: $69 for the kit version, and $20 for the optional enclosure; an extra $45 for the assembled version.