

QST



ARRL The National Association for
Amateur Radio®

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Yaesu FTdx101MP MF, HF, and 6-Meter SDR Transceiver

Product Review

Yaesu FTDX101MP MF, HF, and 6-Meter Transceiver



Reviewed by Joel R. Hallas, W1ZR
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In the November 2019 issue of *QST*, we reviewed Yaesu's FTDX101D, a 100 W, SSB, CW, AM, FM, and digital-mode transceiver for 160 through 6 meters. In that review, we mentioned that there was also a 200 W version available, the FTDX101MP, which we review this month. You may wish to look at the earlier review to follow along in our discussion of the differences. For those interested in naming conventions, the "MP" of the product name is in honor of the founder of Yaesu, the late Sako Hasegawa, JA1MP.

A Full-Size HF Transceiver

While many manufacturers strive to offer a compact, travel-friendly transceiver, the FTDX101MP configuration is based on different design objectives. This transceiver is designed to sit in the center of your operating position with a full-size front panel that includes dedicated concentric controls for most functions.

This radio will be an easy-to-access focal point of a full-featured fixed-station layout. Controls are well marked and identified, but most are not illuminated, so your station should be well-lighted to see the control

labels, at least until your muscle memory is well-programmed.

Changes Between the Models

A look at the front panels of the two transceivers confirms that, other than the model numbers on the upper right, the two panels are identical, with the same controls and indicators in all the same places. There are, however, some important differences that are apparent upon a deeper inspection.

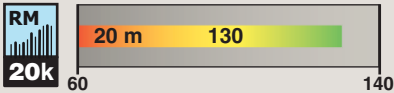
Of course, the most significant difference is that the maximum RF output power of the 'MP is 200 W versus 100 W for the 'D model. This difference, 3 dB, or half an S-unit, doesn't sound like a big improvement, but may be important to some users. For example:

Bottom Line

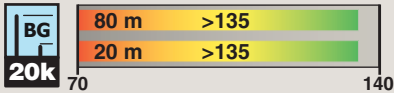
The Yaesu FTDX101MP is a very effective, full-size, full-featured, 200 W PEP transceiver that would work well in most stations, especially those involved in serious contesting or DX chasing where strong close-in signals abound.

Yaesu FTdx101MP Key Measurements Summary

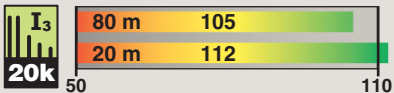
20 kHz Reciprocal Mixing Dynamic Range (dB)



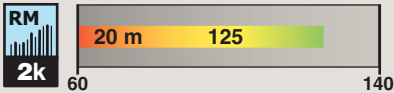
20 kHz Blocking Gain Compression (dB)



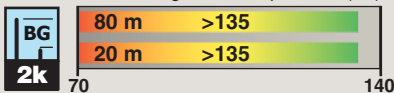
20 kHz Third-Order IMD Dynamic Range (dB)



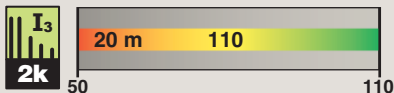
2 kHz Reciprocal Mixing Dynamic Range (dB)



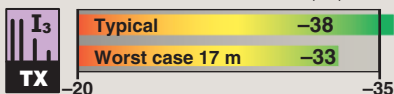
2 kHz Blocking Gain Compression (dB)



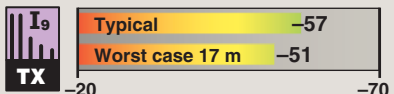
2 kHz Third-Order IMD Dynamic Range (dB)



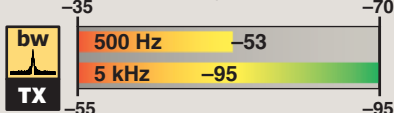
Transmit Third-Order IMD (dB)



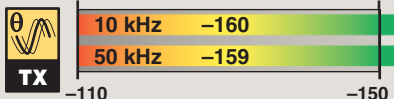
Transmit Ninth-Order IMD (dB)



Transmit Keying Sidebands (dB)



-90 Transmit Phase Noise (dB) -150



KEY: QS2012-PR147
Measurements are for main receiver with preamp off.
Bars off the graph indicate values over scale.

Table 1

Yaesu FTdx101MP, serial number 9M060545

Manufacturer's Specifications

Frequency coverage: Receive, 0.03 – 75 MHz; transmit, 160 – 6 meter amateur bands only.

Power requirement: Transmit, 720 VA, Receive (with signal), 120 VA.

Modes of operation: SSB, CW, AM, FM, FSK, PSK, SSB data modes.

Main Receiver

SSB/CW sensitivity (preamp 2 on):

0.16 μ V (1.8 – 30 MHz)
0.125 μ V (50 – 54 MHz)
0.16 μ V (70 – 70.5 MHz).

ADC overload level: Not specified.

Noise figure: Not specified.

AM sensitivity: 6 kHz BW, 10 dB (S+N/N), preamp 2 on:

6.3 μ V (0.5 – 1.8 MHz)
2.0 μ V (1.8 – 30 MHz)
1.0 μ V (50 – 54 MHz)
2.0 μ V (70 – 70.5 MHz).

FM sensitivity: 12 kHz BW, 12 dB SINAD, preamp 2 on:

0.25 μ V (28 – 30 MHz)
0.20 μ V (50 – 54 MHz)
0.25 μ V (70 – 70.5 MHz).

Spectral sensitivity: Not specified.

Blocking gain compression dynamic range: Not specified.

Reciprocal mixing dynamic range: Not specified.

ARRL Lab Two-Tone IMD Testing (600 Hz roofing filter, 500 Hz bandwidth)

Band/Preamp	Spacing	Measured IMD Level	Measured Input Level	IMD DR
3.5 MHz/Off	20 kHz	-125 dBm -97 dBm	-20 dBm -5 dBm	105 dB
14 MHz/Off	20 kHz	-125 dBm -97 dBm	-13 dBm -5 dBm	112 dB
14 MHz/P1	20 kHz	-134 dBm -97 dBm	-22 dBm -10 dBm	112 dB
14 MHz/P2	20 kHz	-138 dBm -97 dBm	-30 dBm -17 dBm	108 dB
14 MHz/Off	5 kHz	-125 dBm -97 dBm	-13 dBm -5 dBm	112 dB
14 MHz/Off	2 kHz	-125 dBm -97 dBm	-15 dBm -5 dBm	110 dB

Measured in the ARRL Lab

Receive and transmit, as specified, including 60 meters on 5.332, 5.348, 5.3585, 5.373, and 5.405 MHz (preset channels).

Transmit, typically 560 VA, 642 VA max. at maximum RF power output.

Receive, 54 VA (max brightness). Power off, <1 mA.

As specified.

Main Receiver Dynamic Testing*

Noise floor (MDS), 500 Hz bandwidth, 600 Hz roofing filter:

Preamp	Off	P1	P2
0.137 MHz	-121	-131	-118 dBm
0.475 MHz	-124	-133	-136 dBm
1.0 MHz	-125	-134	-138 dBm
3.5 MHz	-125	-133	-138 dBm
14 MHz	-125	-134	-138 dBm
50, 70 MHz	-127	-136	-138 dBm

>+10 dBm.

Preamp off/1/2, 14 MHz: 22/13/9 dB; 50 MHz, 20/11/9 dB.

10 dB (S+N)/N, 1 kHz tone, 30% modulation, 9 kHz BW:

Preamp	Off	P1	P2
1.0 MHz	3.39	1.15	0.79 μ V
3.88 MHz	4.12	1.43	0.94 μ V
29.0 MHz	2.98	1.02	0.87 μ V
50.4 MHz	2.82	1.08	0.94 μ V
70.4 MHz	3.63	1.30	1.23 μ V

For 12 dB SINAD, 3 kHz deviation, 16 kHz BW:

Preamp	Off	P1	P2
29 MHz	1.17	0.41	0.35 μ V
52 MHz	1.06	0.39	0.35 μ V
70 MHz	1.03	0.35	0.33 μ V

Panadapter and waterfall, preamp Off/1/2

14 MHz, -120/-129/-138 dBm
50 MHz, -125/-133/-141 dBm

3DSS, preamp Off/1/2

14 MHz, -121/-130/-137 dBm
50 MHz, -125/-133/-141 dBm

Blocking gain compression dynamic

range, 500 Hz BW, 600 Hz roofing filter:**

Preamp	Off/P1/P2	Preamp off
3.5 MHz	>135/>143/145	>135/135 dB
14 MHz	>135/>144/147	>135/>135 dB
50 MHz	>137/139/133	>137/>137 dB

14 MHz, 20/5/2 kHz offset: 130/128/125 dB, for 600 and 300 Hz roofing filter.

Manufacturer's Specifications

Band/Preamp	Spacing
50 MHz/Off	20 kHz
50 MHz/P2	20 kHz

Second-order intercept point:
Not specified.

IF and image rejection: IF, ≥ 60 dB (1.8 – 28 MHz, VC on), ≥ 60 dB (50 MHz); image, ≥ 70 dB (1.8 – 28 MHz), ≥ 60 dB (50 MHz).

Noise reduction: Not specified.

FM two-tone third-order IMD dynamic range: Not specified.

Squelch sensitivity: (preamp 2 on) FM, 28 – 30 MHz, 0.25 μ V, 50 – 54 MHz, 0.2 μ V, SSB, CW AM, 2 μ V.

S-meter sensitivity: Not specified.

Notch filter depth: Not specified.

IF/audio response: Not specified.

Audio output: 2.5 W at 10% THD at 4 Ω .

Receive processing delay time: Not specified.

Transmitter

Power output: 5 – 200 W (SSB, CW, FM), 5 – 50 W (AM).

Spurious-signal and harmonic suppression: ≥ 50 dB (HF); ≥ 66 dB (50 MHz).

Third-order intermodulation distortion (IMD) products: Not specified.

CW keyer speed range: Not specified.

CW keying characteristics: Not specified.

Transmit-receive turnaround time (PTT release to 50% audio output: Not specified.

Receive-transmit turnaround time (TX delay): Not specified.

Transmit phase noise: Not specified.

Amplifier key line closure to RF output: 15 – 30 ms (adjustable).

Size (height, width, depth, with protrusions): 5.9 \times 16.5 \times 15 inches; weight, 31.3 pounds.

Second-order intercept points were determined using S-5 reference.

*Sub receiver test results were very similar to the main receiver test results. See

www.arrl.org/qst-in-depth for additional measurements.

**Blocking dynamic range exceeds these values. No blocking was observed with up to +10 dBm signal at the antenna jack, the maximum level used in ARRL Lab testing.

†Measurement is noise limited at the value indicated.

‡Default values; bandwidth is adjustable.

Measured in the ARRL Lab

Measured IMD Level	Measured Input Level	IMD DR
-127 dBm -97 dBm	-22 dBm -13 dBm	105 dB
-138 dBm -97 dBm	-36 dBm -24 dBm	102 dB

Preamp Off/P1/P2

14 MHz, +67/+67/+67 dBm

21 MHz, +63/+61/+61 dBm

50 MHz, +59/+57/+57 dBm

IF rejection, VC off/on: 7 MHz, 72/105 dB;

10.1 MHz, 70/100 dB; 14 MHz,

102/105 dB, 50 MHz, 105/105 dB.

Image rejection, VC off/on:

7 MHz, 88/95 dB; 10.1 MHz, 78/105 dB;

14 MHz, 70/89 dB; 50 MHz, 69/69 dB.

Up to 20 dB.

20 kHz offset, P2 on: 29 MHz, 86 dB;†

52 MHz, 86 dB. 10 MHz offset, P2 on:

29 MHz, 119 dB; 52 MHz, 110 dB.

FM, P2 on: 29 MHz, 0.27 – 0.58 μ V;

52 MHz, 0.27 – 0.57 μ V.

HF squelch: 1.19 – 13.3 μ V.

S-9 signal, preamp Off/P1/P2:

14 MHz, 132/46.7/17.6 μ V;

50 MHz, 99/38/14.6 μ V;

Scaling: 3 dB per S-unit.

Tunable notch filter, >70 dB; auto notch > 70 dB, attack time 2 ms for one or two tones.

Range at -6 dB points:‡

CW (500 Hz BW): 453 – 945 Hz;

Equivalent Rectangular BW: 489 Hz;

SSB (2.4 kHz BW): 289 – 2,406 Hz;

AM (9 kHz BW): 98 – 1,668 Hz.

As specified. THD 0.3% at 1 V_{RMS}.

25 ms.

Transmitter Dynamic Testing

SSB, CW, FM (typical): 1.8 – 30 MHz,

5.0 – 196 W; 50 – 54 MHz; 4.9 – 185 W;

AM (typical): 1.8 – 30 MHz, 5.0 – 48 W;

50.4 MHz, 5.1 – 46 W.

HF, 69 dB typical; worst case, 58 dB (80 m);

50 MHz, 71 dB. Complies with FCC

emission standards.

3rd/5th/7th/9th order, 200 W PEP:

-38/-46/-51/-57 dB (HF typical)

-33/-40/-45/-51 dB (worst case, 17 m)

-37/-44/-47/-54 dB (14 MHz)

-40/-44/-51/-58 dB (50 MHz)

At 50 W PEP RF output:

-35/-44/-54/-63 dB (14 MHz)

-40/-47/-58/-72 dB (50 MHz)

4 to 56 WPM. Iambic mode A, B, Y, ACS, semi-automatic.

See Figures 1 and 2.

S-9 signal, AGC fast, SSB: 54 ms;

AGC fast, CW, full break-in: 30 ms.

SSB, 24 ms; FM, 18 ms (29 and 52 MHz).

See Figure 3.

As specified.

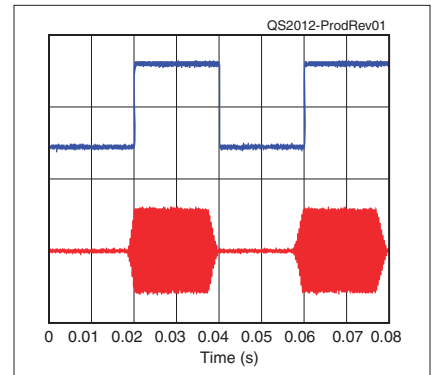


Figure 1 — CW keying waveform for the Yaesu FTdx101MP showing the first two dits in full-break-in (QSK) mode using external keying and the default rise time setting. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first key closure starts at the left edge of the figure.) Horizontal divisions are 10 ms. The transceiver was being operated at 200 W output on the 14 MHz band.

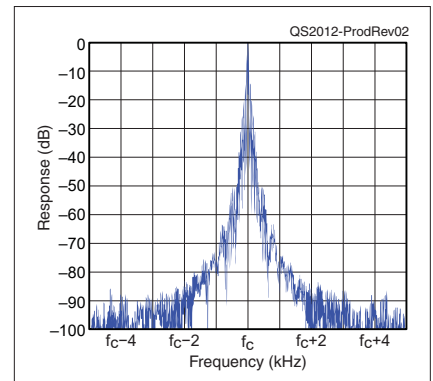


Figure 2 — Spectral display of the Yaesu FTdx101MP transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying and the default rise time setting. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 200 W PEP output on the 14 MHz band, and this plot shows the transmitter output ± 5 kHz from the carrier. The reference level is 0 dBc, and the vertical scale is in decibels.

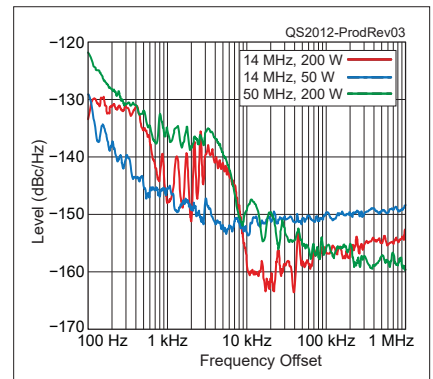


Figure 3 — Spectral display of the Yaesu FTdx101MP transmitter output during phase-noise testing. Power output is 200 W on the 14 MHz band (red trace), 50 W on the 14 MHz band (blue trace), and 200 W on the 50 MHz band (green trace). The carrier, off the left edge of the plot, is not shown. This plot shows phase noise 100 Hz to 1 MHz from the carrier. The reference level is -120 dBc/Hz, and the vertical scale is 5 dB per division.

- Amateurs who frequent 30 meters can operate up to the 200 W legal limit, without need for an additional amplifier.
- While 3 dB will not make a noticeable difference during casual contacts when signals are strong, it can easily make the difference between completing a contact and frustration while trying to break through a pileup or when signals are barely out of the noise.
- Some older linear amplifiers need a bit more than 100 W drive to yield full-rated output. In addition, those amplifiers needing close to 100 W drive will generally see a more linear signal from a transceiver operated well below its full-power output.
- Both FTDX101 models operate from external power supplies. The 'MP comes with an included dedicated power supply to provide the 50 V required by the 200 W power amplifier stage. If you were to buy a dedicated 13.8 V, 23 A supply for the 100 W 'D model, it might come out about the same in terms of required space. If you already have a 13.8 V dc distribution system in your station with sufficient capacity, the 'MP model will add an additional box to your station's equipment inventory (and space requirements).
- The 'MP model includes two features that are offered as options on the 'D model (and both must be speci-

fied on initial order). These are the 300 Hz bandwidth CW/data roofing filter (\$260), and the VCT101 motor-driven RF preselector for the second receiver (\$330). Note that both models include a 600 Hz roofing filter as standard equipment, along with selectable DSP filtering down to a bandwidth of 50 Hz, and both models include the preselector in the primary receiver. In addition to providing additional protection from strong close-in signals in CW mode, the 300 Hz filter also provides a small improvement in the already excellent receiver close-in dynamic performance for CW or data mode operation. The 'MP model also brings with it multiple subtle improvements to the display system, presented on a 7-inch TFT (thin-film transistor) color touch-panel display.

If you were to buy an FTDX101D with the optional 300 Hz filter, the optional preselector for the second receiver, and a typical 13.8 V, 23 A power supply, you would add about 60% of the \$1,300 (list) price difference between the two radios, perhaps making it easier to decide to purchase the more-powerful 'MP version that includes those functions in its base price.

How It Works

Both FTDX101 models make use of traditional down-converting superhet architectures in both of the dual

Lab Notes: Yaesu FTDX101MP

Bob Allison, WB1GCM

Receiver testing for FTDX101MP indicates both main and sub receiver offer performance virtually identical to that of the FTDX101D reviewed in the November 2019 issue of *QST*. Two-tone, third-order IMD dynamic range on 20 meters is the highest we have measured, and the receiver exhibits excellent reciprocal mixing dynamic range (RMDR) and blocking gain compression dynamic range as well (see the FTDX101D review for more information).

Transmit intermodulation distortion (IMD) in the FTDX101MP is reasonably low. We generally look for third/fifth/seventh/ninth-order IMD products to be no higher than -30/-40/-50/-60 dB relative to full PEP output. The seventh- and ninth-order products must be kept as low as possible, as they will cause the most interference on adjacent frequencies. The FTDX101MP transmit IMD

products are close to or exceed this performance at full PEP power output. Other operators on the band hearing the FTDX101MP will enjoy a respectably clean transmitted signal. At the 50 W PEP output level, typically the power level needed to drive an RF power amplifier, the distortion products are even lower. As always, monitor the automatic level control (ALC) and keep the ALC in the specified range when speaking, and keep the ALC level at zero when transmitting digital modes, such as FT8.

Transmit phase noise is very low, as shown in Figure 3. At 100 Hz away from the carrier, the transmit phase noise is about the lowest we've observed in the ARRL Lab. This means considerably less potential interference to other operators listening very close to the transmitted frequency. Farther away from the carrier, the phase noise is even

lower, approaching the noise floor of the test instrument. Excellent keying waveform shaping, with no shortening of the first transmitted dit, and a correspondingly narrow CW bandwidth, makes for a clean transmitter, a complement to this model's top performing receiver.

My only critique of the test data is the S-meter scaling. The widely adopted convention for S-meters is a 50 μ V signal level for S-9, and scaling of 6 dB per S-unit. With Preamp 1 engaged, the FTDX101MP's S-meter reads close to S-9 with a 50 μ V (-73 dBm) signal level input at the antenna jack, but the scaling is 3 dB per S-unit. This scaling means S-0 is equal to a signal level of -100 dBm, typical of other Yaesu transceivers measured in the ARRL Lab. If the S-meter used 6 dB per S-unit scaling, S-0 would equal -127 dBm.

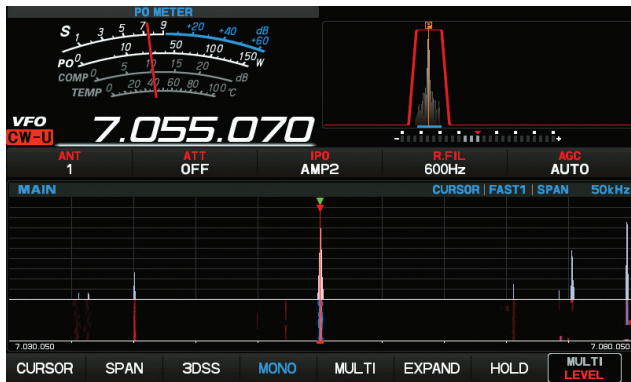


Figure 4 — Screenshot of the Yaesu FTdx101MP display, showing a single panadapter display, with panadapter below, including the frequency tuned by VFO A. The upper right display shows the received bandwidth with the received signal within. The spectrum span can be adjusted from a width of 1 kHz to 1,000 kHz (50 kHz shown) in 10 steps.

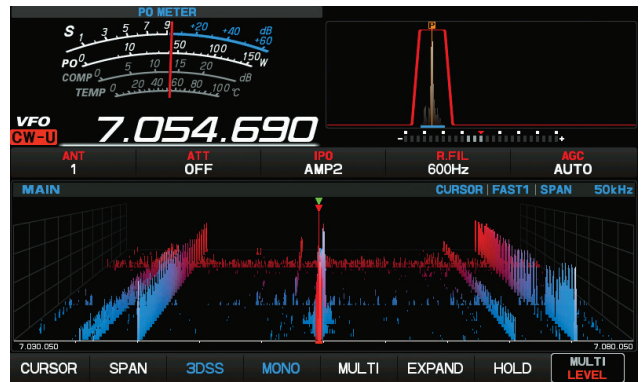


Figure 5 — Same as Figure 4, except we have tapped the 3DSS on-screen button, and now have a 3D view with time marching out the back of the screen, instead of the waterfall. This way, you can see what happened before, as well as what's happening now.

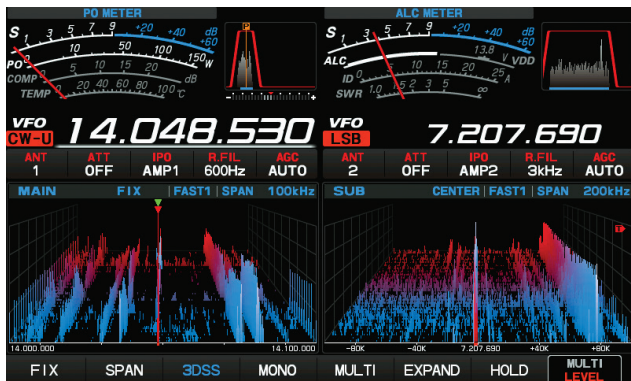


Figure 6 — Same as Figure 5, except a second spectrum view of the sub-receiver display has been added to the right of the first. Note that the second is on a different band, bandwidth, mode, and antenna. Either can be anywhere within the FTdx101MP's tuning range. The two displays can also be one above the other, if you prefer — lots of flexibility available.



Figure 7 — Pressing the **FUNC** button below the screen opens up the top menu display. The **MULTI** button is used to select the desired function, and pressing the desired function button brings up the adjustable parameter, or an additional layer of menu items.

receivers, with the result that the very highest close-in receiver dynamic range is achieved. This has been a major competitive marker for some years, and this transceiver, as well as the FTdx101D, puts Yaesu at the top of list, as seen in the ARRL Lab measurements in Table 1 and independently tested and listed in the Sherwood Engineering tabulated summary of receiver performance (www.sherweng.com/table.html).

The FTdx101MP controls, in my opinion, are well thought out and well positioned, providing a large measure of flexibility and control. For example, touch the MHz or kHz area of the frequency display to select the tuning knob steps — quite intuitive.

If you are operating using just the primary receiver (press the **MONO** key to select a single receiver), the display for that receiver fills the entire screen (see

Figure 4). This can be helpful whether you just look closely at a narrow range, or open up the display width to cover a large segment or even the full band. While the operating frequency is nicely presented in a large, bright font, the frequency scale of the panadapter display is in a very tiny font.

In addition to the typical panadapter presentation, the FTdx101MP offers a three-dimensional view, with the history shown going out the rear, as shown in Figure 5. The spectrum of both receivers can be observed simultaneously, as shown in Figure 6. Additional display and operating options can be selected by pressing the **FUNC** key, with the selection options shown in Figure 7.

Yaesu offers the optional FH-2 Remote Control Keypad for use with the FTdx101MP, as well as other

Yaesu transceivers. While all functions on the remote can be performed from the transceiver's front panel, the FH-2 makes it easier to perform some functions, particularly operating the voice memories and CW keyer memories. Yaesu also recently introduced the SCU-LAN10 unit for remote control of the FTDX101D and FTDX101MP transceivers.

While many manufacturers have chosen to use a simpler direct-sampling SDR architecture, with potential benefits in terms of reduced spurious responses, Yaesu's use of the traditional superhet approach allows a receiver with higher dynamic range than that limited by the closer-to-antenna analog-to-digital conversion stage required in direct sampling receivers. Some day that will likely no longer be a limit, but for now, superhets seem to have the receiver performance edge in amateur transceivers.

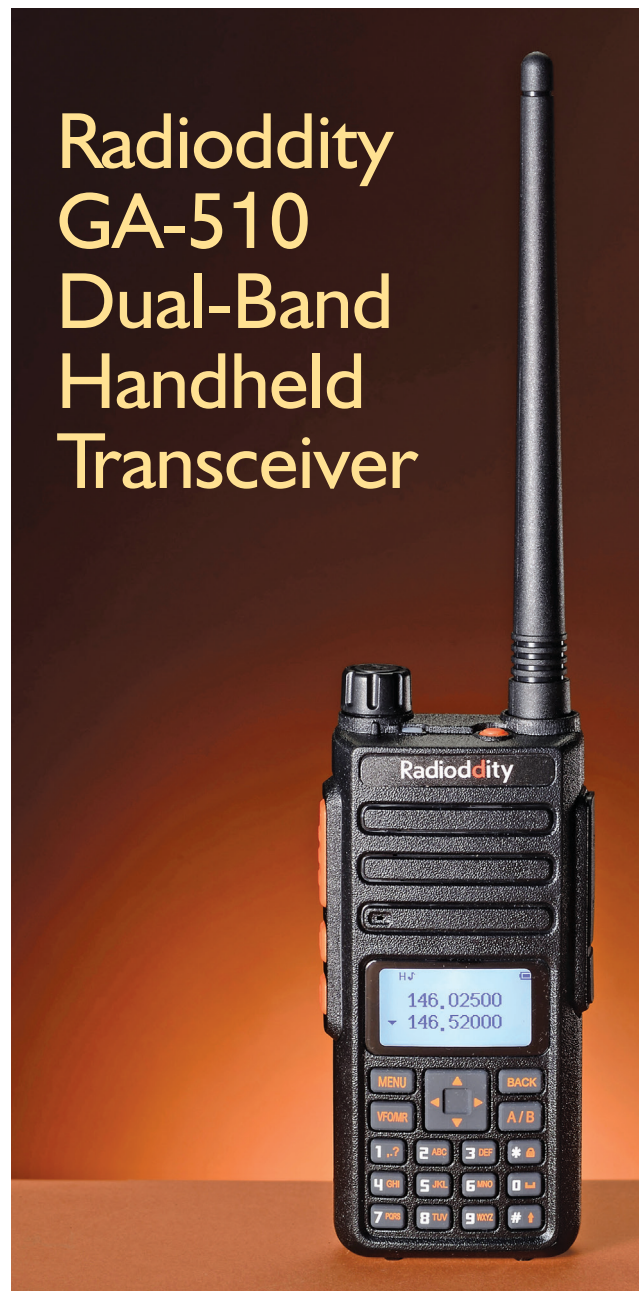
On the Air with the FTDX101MP

The FTDX101MP worked well as the primary transceiver at W1ZR over a number of weeks. I made contacts on both CW and SSB, all with reports of good signal quality. In addition to being easy for me to operate with a minimum learning curve, the operators on the other end also had an easy time copying me on both modes, with me using the Yaesu SSM-75G hand mic for SSB. The operating experience is essentially identical to the FTDX101D — refer to the November 2019 review for more information.

Documentation

The FTDX101MP comes with a 122-page *Operation Manual*. A complete schematic package is provided on eight double-sided 16 × 12 inch sheets and a 21-page *CAT Operation Reference Manual* is available for download from the Yaesu website. The *Operation Manual* does a reasonably good job at getting you started with the radio. The *CAT Operation Reference* provides a detailed description of the command set needed to communicate from PC to radio — perfect if you want to write your own CAT software, but not so useful in helping you set up a connection from the radio to the CAT PC software that most of us will elect to run on our PCs.

Manufacturer: Yaesu USA, 6125 Phyllis Dr., Cypress, CA 90630; www.yaesu.com. *Price:* Yaesu FTDX101MP, \$4,400; FH-2 Remote Control Keypad; \$99.

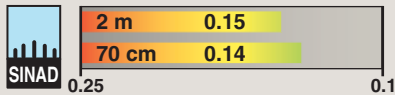


Reviewed by Dan Wall, W1ZFG
w1zfg@arrl.net

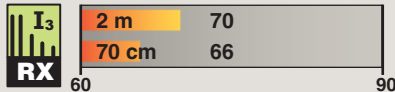
Another new entry into the field of low-cost handhelds is the Radioddity GA-510. It is a dual-band radio with frequency ranges of 136 to 174 MHz and 400 to 520 MHz. This radio does transmit outside of the 2-meter and 70-centimeter amateur bands, so users should be careful when selecting the operating frequency. Transmit power output is selectable at three levels, and it also receives the FM broadcast band. The start-up screen indicates that this model is sourced from Baofeng.

Radioddity GA-510 Key Measurements Summary

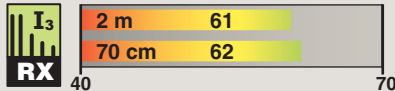
Receiver Sensitivity (12dB SINAD, μV)



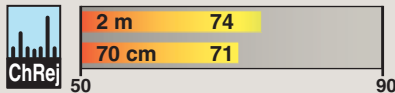
Receiver Third-Order Dynamic Range (dB)
(10 MHz offset)



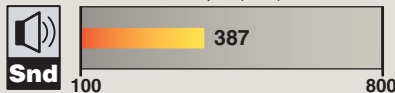
Receiver Third-Order Dynamic Range (dB)
(20 kHz offset)



Adjacent Channel Rejection (dB)



Audio Output (mW)



KEY: QS2012-PR148

*Measured at the external speaker jack.
Measurements shown for FM mode.
See Table 1 and expanded test results at
www.arrl.org/qst-in-depth for additional
measurements.
Bars off the graph indicate values over scale.

Table 2

Radioddity GA-510, serial number 19GA51000001

Additional ARRL Lab measurements are available at www.arrl.org/qst-in-depth.

Manufacturer's Specifications

Frequency coverage: Receive and transmit, VHF and UHF.

Modes: Analog FM.

Power requirements: 7.4 V dc (internal battery pack only). Battery capacity: 2,200 mAh.

Receiver

Sensitivity: For 12 dB SINAD, 0.25 μV .

Adjacent-channel rejection: ≥ 70 dB (wide), ≥ 60 dB (narrow).

Squelch sensitivity: Not specified.

S-meter sensitivity: Not specified.

Audio output: 1,000 mW.

Transmitter

Power output: < 5.0 W (high), < 1 W (low).

Spurious signal and harmonic suppression: ≥ 57 dB.

Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.

Receive-transmit turnaround time (TX delay): Not specified.

Size (height, width, depth): 5.3 \times 2.3 \times 1.3 inches (with protrusions). Belt clip, add 0.5 inch. Antenna length: 5.7 inches. Weight: 8.8 ounces with battery and antenna.

*Squelch range is narrow, only slightly more than 6 dB of range.

**Operator must wait a half-second to speak after pressing the PTT button, due to turnaround time. Transmit-receive turnaround is a bit slow compared to other radios.

Measured in ARRL Lab

Transmit and receive: 136 – 173.995, 400 – 519.995 MHz, 76 – 108 MHz (receive only).

FM, FM-N (FM narrow), WFM (receive only).

At 8.3 V dc (full charge): Receive, 390 mA (max volume, max lights); 96 mA (standby, lights off). Power save on, 20 mA.

Transmit (high/medium/low):
146 MHz, 2.35/1.76/1.12 A
440 MHz, 2.34/1.74/0.95 A
Power off, < 1 mA.

Receiver Dynamic Testing

For 12 dB SINAD, FM/FM-N: 146 MHz, 0.15/0.14 μV . 440 MHz: 0.14/0.14 μV .

20 kHz offset, FM/FM-N: 146 MHz, 74/76 dB; 440 MHz, 71/72 dB.

At threshold, 146 MHz, 0.1 μV – 0.16 μV ; 440 MHz, 0.09 μV – 0.18 μV .*

For four bars, 146 MHz, 1.17 μV ; 440 MHz, 1.23 μV .

At the external speaker jack, 387 mW at 10% THD into 8 Ω . THD at 1 V_{RMS} , 3.4%.

Transmitter Dynamic Testing

At 8.3 V dc (full charge), high/med/low:
146 MHz, 8.0/4.0/1.1 W
440 MHz, 5.1/4.0/1.1 W

146 MHz, 63 dB; 440 MHz, > 70 dB.
Meets FCC requirements.

Squelch on, S-9 signal: 146 and 440 MHz, 622 ms.**

146 MHz, 470 ms; 440 MHz, 494 ms.**

Out of the Box

The radio comes with an impressive list of supplied accessories. There is a dual-band flexible antenna with a reverse SMA connector, a programming cable with USB and dual audio connectors, a desktop charging base with ac adapter, a belt clip, and a wrist strap. There is an item that is listed as an earpiece, but it functions as a microphone as well. There is a push-to-talk switch in the middle of the earpiece/microphone wire. The *User Manual* is printed in both English and German.

The radio comes supplied with two 7.4 V, 2,200 mAh Li-ion battery packs. Because there are two battery packs supplied with this radio, the website is able to boast of a 96-hour battery life.

The manual does not list any optional accessories available, but not much else is needed. There are additional accessories displayed on the Radioddity website, but they are grouped by accessory type across all the different radios available, which made it difficult for me to find accessories for a specific model.

Features

The radio itself is slim and lightweight, which fits the hand nicely. On the top of the radio is the **ON/OFF/VOLUME** knob, the antenna connector, and an **RX/TX** status light, which turns green when receiving a signal, red when transmitting, and off when in standby. There is also an orange **SOS** button. When pressed and held, this button puts the radio into the alarm

mode. In this mode, the radio can be set to sound an alarm through the radio speaker, to transmit a cycling tone over the air, or to transmit "119" (which could be 911 in reverse, but I'm not sure) over the air. Pressing the orange **SOS** button again returns the radio to normal operation.

On the left side of the radio, there is an ample PTT button and two smaller orange buttons, described as **SIDE KEY 1** and **SIDE KEY 2**. Pressing **SIDE KEY 1** momentarily will switch the radio to FM broadcast reception mode. Signals received on the amateur bands will interrupt the FM broadcast until the amateur band signal goes away. Pressing **SIDE KEY 1** again will exit the FM broadcast mode and return the radio to regular operation. Pressing and holding **SIDE KEY 2** will open the squelch to allow listening to a weak signal. Pressing **SIDE KEY 2** momentarily will change the power level for the selected channel or frequency.

On the right side of the radio is the accessory jack. This is where you plug in the supplied earphone/microphone or the supplied programming cable. The external speaker jack accepts a stereo 2.5-millimeter plug, and the external microphone jack accepts a stereo 3.5-millimeter plug, which is compatible with a typical Kenwood headset configuration.

The good-sized LCD is easy to read with the backlight on. I found it difficult to read the display in low-light conditions when the backlight is off. The backlight turns on automatically with the press of any button, and it automatically turns off after 1 to 10 seconds (user programmable). The backlight can also be set to be always on.

There is a good-sized front-mounted speaker which provides plenty of receive audio. The internal microphone is below the speaker.

The keypad below the LCD has a standard 12-key numeric keypad, along with four dedicated function buttons and four-way arrows buttons. Press and hold the # key for about 2 seconds to enable the scan mode. A momentary press of the * key will enable the reverse function for repeaters. Press and hold the

Bottom Line

The Radioddity GA-510 offers good performance for the 2-meter/70-centimeter FM operator. Programming is best done using the supplied cable and free downloadable software.

* key for about 2 seconds to enable or disable the keypad lock.

The **BACK** button is used to exit menus and cancel menu options. The **VFO/MR** button switches between the frequency (VFO) mode and the memory or channel (**MR**) mode. The **A/B** button switches between the upper and the lower display. The frequency or channel on the selected display becomes the active frequency or channel.

The up/down arrow button is used to navigate through the menu options, as well as to select channels and step up or down in frequency, depending on operating mode. The *User Manual* does not make any reference to the left/right arrow buttons and they didn't appear to do anything.

The **MENU** button is used to enter the menu and confirm menu options. There are 38 menus with various user selectable options that control all the settings of the radio. Several of the more notable features that can be set up are: squelch, frequency step (2.5 to 50 kHz), transmit power, power saver, or transmit sub-audible tone frequencies. There is also a voice feature that speaks when function or numeric buttons are pressed. The voice function can be disabled by a menu setting.

The radio also has dual-watch capability. It can scan between two frequencies and lock the transmit frequency to one of the two channels it monitors.

Scanning

The radio has three different modes of operation in the scan function: time, carrier, or search.

In the time operation mode, the scanner stops when it detects a signal and resumes scanning after a factory pre-set time. (This time does not appear to be adjustable.)

In the carrier operation mode, the scanner stops when it detects a signal and resumes scanning after a factory pre-set time when no signal is present. (This time does not appear to be adjustable.)

In the search operation mode, the scanner stops when it detects a signal. To resume scanning, you must press and hold the # key again.

The radio will also scan for CTCSS and DCS tones.

Programming

The transceiver has 128 memory channels that each can hold receive and transmit frequencies, transmit

power level, group signaling information, bandwidth, and a six-character alphanumeric identifier or channel name.

Regarding manually programming this radio, the *User Manual* states, "Manual programming is somewhat difficult until you get used to it, especially when programming in duplex channels." There is no automatic repeater shift function as found on more expensive radios, so you must program a receive frequency, an offset frequency, and an offset direction (plus, minus, or none) for each channel. You can only save memory channels from the upper VFO display. You cannot overwrite existing memory channels, but must first delete a memory channel before updating or replacing its contents. The alphanumeric labels cannot be entered manually, so you must use computer software to upload them.

Free programming software is available for download from the Radioddity website, and the popular CHIRP software is also supported. The programming software is a basic, no-frills program that was easy to install and use. It does make programming the radio much easier.

To use the software, connect the supplied programming cable between the GA-510 and a USB port on your computer. Turn on the radio, and if you have previously loaded a compatible driver from a different radio, it may be recognized. If not, there is a driver available for download from the Radioddity website. There is also a file on the website with step-by-step

instructions on how to download and install the driver and how to use the programming software.

As mentioned earlier, there are many parameters that can only be set using the programming software. For example, the channels that I entered manually would not scan. After I entered repeaters using the software and setting the **SCAN ADD** column to **YES**, all programmed channels scanned normally.

Final Thoughts

The GA-510 from Radioddity has quite a few features found on higher-priced units. On-the-air testing showed that the receiver had good sensitivity on the 2-meter and 70-centimeter amateur bands and the FM broadcast band. The audio quality was good, even at higher volumes. The slim, lightweight design made it comfortable to hold and operate. The manual programming is somewhat tedious, but with a programming cable supplied and free software available for download, I had no need to program it manually.

This radio is more than adequate for newer operators to use to determine what features they would like in their next radio. Experienced operators may find that this radio may not have all the features they want in their main radio, but would find it to be a good choice for a backup radio in a go-kit. Given all of the supplied accessories and a price of \$65, you can't go wrong.

Manufacturer: Radioddity, 36 Berkley Dr., Newark, DE 19702; www.radioddity.com. Price: \$65.

Workshop Vises

Reviewed by Paul Danzer, N1II
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The first vise I ever used was in high school woodworking shop. It had a jaw that was almost 2 feet long and a threaded shaft about 2 inches in diameter. The next one I used mounted to a table top with screws, weighed less than a pound, and could only open its jaws about 1 inch.

Surprisingly, when I looked online to see what was available today, not much had changed. Monster units are still available, and sizes range down to a few inches and a few ounces. There are a few different mounting options — screw down, clamp to the table edge, free standing, and vacuum base.

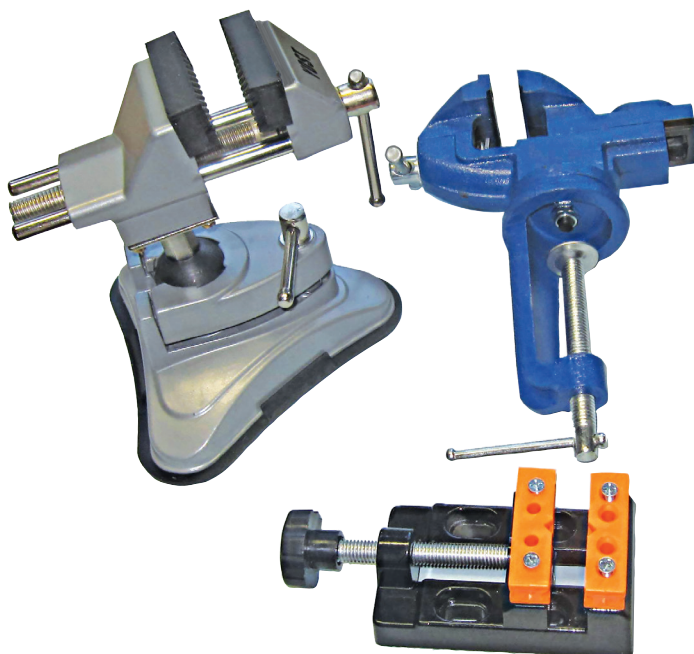


Table 3
Vise Parameters

	Yost	MYTEC	Z-COLOR
Weight	3.25 pounds	3.79 pounds	9.5 ounces
Mounting	Vacuum clamp	Table edge clamp	Screws or sits on table
Jaw width/height (inches)	2.5 × 0.5	2 × 0.5	2.187 × 0.5
Jaw opening (inches)	2.5	3.125	2.125

In my workshop, the vise is a multi-purpose tool. You might think that it's only used to hold a box or piece of metal for drilling, but over the years, I have used it for a number of other purposes.

If you need a length of six-conductor cable, it's easy and quick to accomplish. Lay out six pieces of wire, put one end in the vise and the other in a manual drill. Turn the handle on the drill and you now have a length of twisted six-conductor (or whatever number you want) cable. If one of the pieces of wire is solid, the twisted group will probably stay together. If it's stranded wire, a few cable ties will hold it.

Working with those pesky connectors where you have to solder several connecting wires is also just as easy. Put the connector in a small vise, feed the wire, and solder from above.

I also use my vise for bending sheet metal and for making a rolled edge. If I am using very thin metal — imagine a salvaged piece of tin can — it is difficult to get an edge that will not cut your hand. I make a crude 180-degree bend with a set of gas pliers and then put the edge into the vise jaws to flatten the fold and make a safe edge.

For this review, I tried three of the many inexpensive vises available from **amazon.com** and other online sources. Although these specific models were available when this review was prepared, the selection or prices may have changed by the time you read this.

Yost Tools V-275 Portable Vacuum Base Vise

With a lever control to seal the vacuum base to a smooth surface, this solid 3¼-pound unit, shown in Figure 8, can handle good-sized projects. The jaws ride on two smooth cylinders with a center screw that allows the jaws to open to a maximum of 2½ inches. The cast metal parts are finished in a grey/silver coat.

The jaws have a V-shaped groove running their length and three vertical grooves to hold cylindrical parts.



Figure 8 — The Yost vise is vacuum mounted and includes two soft jaw covers. The center lever locks or loosens the ball mount.

Soft covers prevent scratching objects held in the jaws. Without the covers, the jaws are 2½ inches wide and ½ inch high.

A friction ball couples the jaw assembly to the base. When loosened, the jaws can rotate 360 degrees, tilt approximately 45 degrees to each side, and 90 degrees to the front (away from the friction lever). When the jaws are open fully, an internal mechanism keeps the jaws from riding off their mount.

Experience with other devices shows that, over time, you may experience problems with the vacuum seal that holds the vise in place. This 3¼-pound unit is mounted on a large enough base that vacuum hold may not be needed for many tasks.

Price: about \$25 on **amazon.com**. Search for Yost V-275.

MYTEC Home Clamp-On Vise, 2.5 Inch

The MYTEC vise, shown in Figure 9, is designed for home use, although picking up the unit at close to 4 pounds suggests it is fairly heavy duty. The jaws are made of steel screwed onto the cast base. The jaw surface is 2 inches wide by ½ inch high, and the bottom of each jaw surface has a rectangular notch. Soft jaw covers are included to prevent scratching.

The jaws ride on two sliding side surfaces and a single center screw. The distance from the bottom of the jaws to the screw is ⅞ inch. The top assembly can be rotated 360 degrees and locked into position with a



Figure 9 — Made of cast metal, the MYTEC vise includes soft jaw covers and soft inserts to prevent scratching the mounting surface or work. Without the soft inserts, the clamp mount can fit a benchtop as wide as 3½ inches.

lever on the side. The unit as delivered needed a bit of force to turn the locking lever for the first time. A screw with a jam nut under the jaw head can be adjusted to increase or decrease the rotation tension. The manufacturer also suggests applying a few drops of oil to the jaw screw.

Holding the unit on my lap, I turned the jaw opening adjustment screw to see if the movable section remained locked to the adjusting screw at maximum jaw opening. The answer is — it hurt when the back section fell off the screw and onto my knee.

Price: about \$29 on [amazon.com](https://www.amazon.com). Search for MYTEC Home Vise.

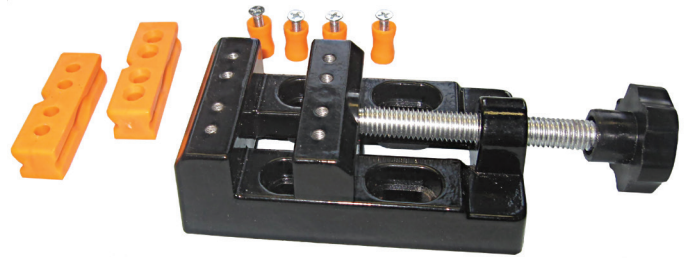


Figure 10 — The small and light Z-COLOR vise can only take items as deep as the jaw height — approximately ½ inch.

Z-COLOR Mini Flat Clamp Vise

For less than \$10 plus shipping, you get a lightweight (9.5-ounce), very basic vise. The jaws are approximately 2¾ inches wide and ½ inch deep. The package includes the vise, two jaw extensions made of hard plastic, and four screws with hard plastic sleeves that match holes in the jaw (see Figure 10).

The bottom of the jaws rest on the mounting surfaces, so items up to only ½ inch deep will fit. The jaws will open 2½ inches and the movable jaw will not fall off. The vise can be mounted to a workbench with four screws through slotted holes or just rested on the work surface.

The tops of the jaws each have four holes, and the spacing of these holes matches the holes in the orange plastic jaw extensions. Although it looks like you can screw on the jaw extensions with the supplied metric screws, the outer four holes are not threaded far enough to tighten the supplied screws completely, and the inner holes have just a tiny bit of threading. The result is that you can mount the jaw extensions, very loosely, using the outer holes. Shorter screws might yield a tighter fit.

You can also use the screws to mount the four orange cylindrical sleeves in the outer holes, again, loosely. It wasn't apparent to me what you might use these for.

Even with the loose screws, I was able to use this vise to hold a PC board as wide as the jaw opening — a bit over 2 inches — at a price comparable to, or less than, a single-purpose PC board holder. This rugged little vise is easily picked up and stored.

Price: about \$10 on [amazon.com](https://www.amazon.com). Search for Z-COLOR Mini Flat.

Four State QRP Group Cric-Key Kit

Reviewed by Steve Ford, WB8IMY
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Don't let the appearance of the Four State QRP Group Cric-Key fool you — this is a real CW keyer and key. The speed is adjustable between 5 and 50 WPM, and the keying output uses a MOSFET capable of switching up to 1 A, so it will safely key any radio. The key paddles are adjustable for both spacing and tension.

The Cric-Key is powered by a 9 V battery and draws less than a microamp when the keyer is not in use. Rather than an audible sidetone, the Cric-Key uses a red LED to indicate keying (most transceivers include a sidetone).

This key was designed by Dave Cripe, NM0S, for use with the Four State Cricket series of minimalist QRP radios, but you can use it with any transceiver you like. The Cric-Key is a useful keyer, but it is also educational and fun to build. This is one of those kits that's so straightforward, it's difficult to make a mistake if you follow the instructions. Best of all, you have instant gratification the moment you're finished.

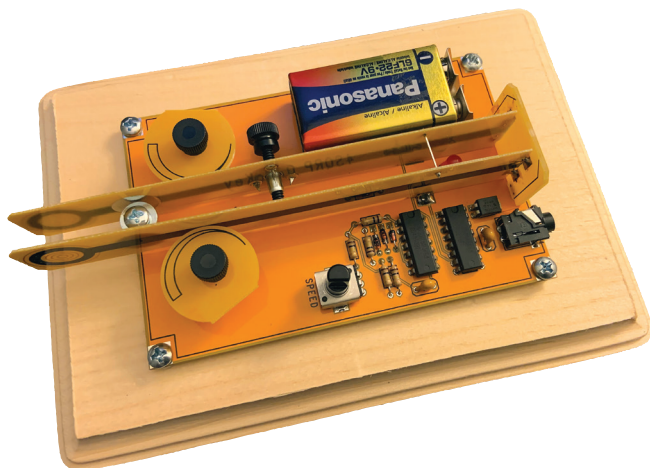
Building the Cric-Key

The kit has only 19 components, consisting of a couple of integrated circuits (ICs) and an assortment of resistors, diodes, capacitors, and the optoisolator. The circuit board is well designed, with all parts placed in a logical arrangement that offers ample space even for my thick fingers.

In the 90 minutes I spent building, it seemed that the lion's share was spent with the mechanical portions of the key. This involves separating a few circuit board sections and carefully mounting them onto the main board. The paddles, for example, consist of two long pieces that must be aligned and soldered. There are also two discs that are used in clever fashion to adjust the paddle spacing. It may not be apparent how the discs function when looking at the photo, but it becomes obvious once you've installed them.

Bottom Line

The Cric-Key is a cleverly designed keyer kit with an integrated paddle that goes together in an evening and results in a useful piece of station gear.



The kit comes with spacers and bolts for mounting within an enclosure if you prefer. It also provides a set of screws, and I used these to secure my Cric-Key to the included pine board for stability.

Enjoying the Cric-Key

Despite their unusual construction, the Cric-Key paddles felt surprisingly good once I adjusted them to my liking. I like my paddles sensitive, so I used the discs to put the paddle contacts right where I need them. Light finger taps were more than enough to operate the Cric-Key in this configuration.

Ergonomically, the Cric-Key is a pleasure to use. For example, the speed potentiometer has an extended shaft, which makes it easy to tweak while you're operating.

I should point out that the Cric-Key lacks an on/off power switch. Instead, plugging in the cable for your transceiver completes the path to ground through the 3.5-millimeter jack for the negative terminal of the battery, which then activates the Cric-Key. I didn't realize this when I finished the kit, and at first, I thought it wasn't working. A quick glance at the schematic diagram confirmed my suspicion, and with the cable in place, I was under way.

This is a simple kit that even a beginner should be able to tackle. Considering its economical price, a batch of Cric-Keys would make an entertaining club project.

Manufacturer: Four State QRP Group,
www.4sqrp.com. Price: \$25, plus shipping.