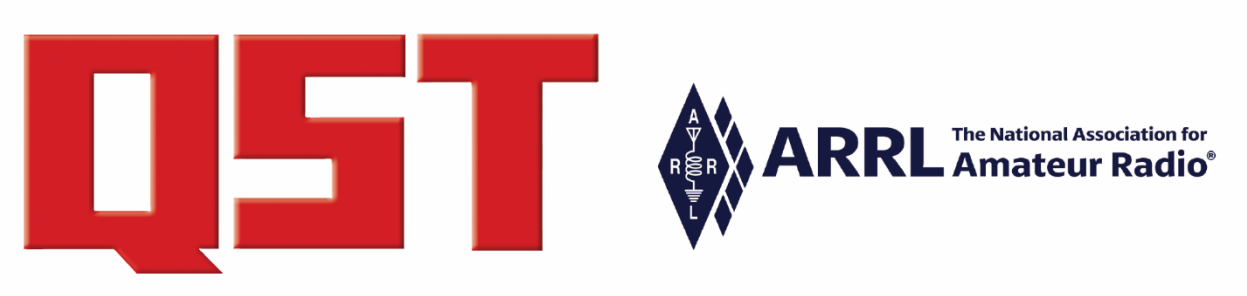

April 2021

Yaesu FTM-300DR Dual Band FM/Digital Mobile Transceiver

Eton Elite 750 Portable Receiver

Product Review

Yaesu FTM-300DR Dual-Band FM/Digital Mobile Transceiver

Reviewed by Steve Ford, WB8IMY
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The latest entry in the Yaesu System Fusion lineup boasts two completely independent receivers. With the FTM-300DR, you can monitor two separate VHF frequencies, two UHF frequencies, or whatever combination you like. This includes the ability to monitor two C4FM digital signals simultaneously, or listen to an analog FM signal with one receiver and a C4FM signal with the other. Extended receive coverage is split among several bands from 108 MHz to 999.99 MHz.

Yaesu packs all this functionality into a compact package. The control head is detachable so that you can install the body of the transceiver out of sight. In fact, the radio includes a 20-foot cable to connect the two units. The transceiver body houses the top-firing speaker, so if you place it in a location where you can't hear it, you'll need to attach an external speaker that you can mount near your operating position. Unless you are using a wireless headset, you will also need to attach an extension cable, such as the 10-foot Yaesu MEK-2, between the microphone and the transceiver body. The rear panel sports a single antenna jack with an SO-239 connector, two external speaker jacks (one for each receiver), a data jack for remote operation or connection to other devices, and an extremely quiet fan.

Bottom Line

Packed with features for analog FM and C4FM System Fusion operation, the FTM-300DR offers two completely independent receivers that can monitor two separate VHF or UHF frequencies simultaneously. A GPS receiver, APRS capability, and colorful display are standard.

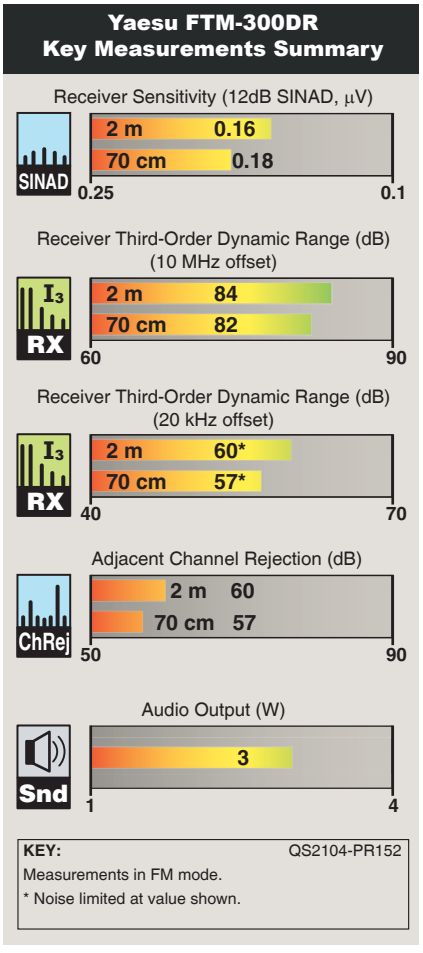
Table 1
Yaesu FTM-300DR, serial number 0G020476

Manufacturer's Specifications	Measured in ARRL Lab
Frequency coverage: Receive, 108 – 999.999 MHz (cellular blocked); transmit, 144 – 148, 430 – 450 MHz.	Receive: 108 – 823.995, 849.1 – 868.995, 894.1 – 938.295, 965.2 – 983.295 MHz. Transmit: as specified.
Modes: FM, FM-N (FM-Narrow), C4FM digital voice, data, AM (receive only).	As specified.
Power requirements: transmit, 11 A at 50 W RF output; receive, 0.5 A at 13.8 V dc.	At 13.8 V dc: Receive, no signal, max. audio and backlights, 500 mA; standby, 275 mA. Power off, 3 mA. Transmit (hi/med/low): 146 MHz, 8.25/5.17/2.67 A; 440 MHz, 10/6.2/3.03 A.
Receiver	**Receiver Dynamic Testing***
Sensitivity: FM 12 dB SINAD: 137 – 150 MHz, 0.2 µV; 150 – 174 MHz, 0.25 µV; 174 – 222 MHz, 0.3 µV; 222 – 300 and 336 – 420 MHz, 0.25 µV; 420 – 520 MHz, 0.2 µV; 800 – 900 MHz, 0.4 µV; 900 – 999.99 MHz, 0.8 µV. AM: 10 dB S/N, 108 – 137, 300 – 336 MHz, 0.8 µV.	FM, 12 dB SINAD, 146 MHz, 0.16 µV; 223 MHz, 0.18 µV; 440 MHz, 0.18 µV; 902 MHz, 0.22 µV. AM, as specified.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset: 146 MHz, 60 dB,† 440 MHz, 57 dB;† 10 MHz offset: 146 MHz, 84 dB, 440 MHz, 82 dB.
FM two-tone, second-order IMD dynamic range: Not specified.	146 MHz, 92 dB; 440 MHz, 108 dB.
Adjacent-channel rejection: Not specified.	20 kHz offset: 146 MHz, 60 dB; 440 MHz, 57 dB.
Squelch sensitivity: Not specified.	At threshold: 146 MHz and 440 MHz, 0.11 µV. Maximum, 0.28 µV.
S-meter sensitivity: Not specified.	For S-9 signal, 2.24 µV.
Audio output power: 3 W into 8 Ω at 10% THD.	As specified. THD at 1 V_{RMS}, 2.4%.
Transmitter	**Transmitter Dynamic Testing**
Power output: High/medium/low power, 50/25/5 W.	At 13.8 V dc, high/medium/low power: 146 MHz, 50/25/4.9 W 440 MHz, 52/26/4.8 W.
Power output at minimum specified operating voltage: Not specified.	At 11.7 V dc, high power: 146 MHz, 48 W; 440 MHz, 49 W.
Spurious signal and harmonic suppression: ≥60 dB.	146 MHz and 440 MHz, >70 dB. Meets FCC requirements.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch on, S-9 signal: 146 MHz, 278 ms; 440 MHz, 268 ms.
Receive-transmit turnaround time (TX delay): Not specified.	146 MHz, 50 ms; 440 MHz, 42 ms.

Size (height, width, depth): Control head: 2.6 × 5.6 × 0.7 inches, including protrusions. Radio body: 1.7 × 5.6 × 5.2 inches, without fan.

Weight 3.9 pounds (radio body and control head with microphone and power cord).

*Receivers A and B tested identically. Test results shown are for standard FM mode. Sensitivity and adjacent channel selectivity increased by 1 dB in FM narrow mode.
†Measurement was noise limited at the value indicated.



The control head offers a 2-inch color TFT display that can be read even in bright daylight (see Figure 1). At either side of the screen are separate audio and frequency controls for each receiver.

There isn't a dedicated squelch knob, but this adjustment is easy. You simply tap the **SQL** button and the two right-hand knobs become squelch controls for the individual receivers. Within a couple of seconds after you've made your adjustments, they revert to being frequency controls again.

With a maximum 50 W output power, the FTM-300DR is ideal for either mobile or fixed station applications. And like all Yaesu System Fusion radios, the FTM-300DR will automatically switch from analog FM to digital C4FM according to the nature of the received signal thanks to its automatic mode selection (AMS) function. You can also elect to operate analog or C4FM exclusively with a push of a button.

An Abundance of Standard Features

The FTM-300DR comes with so many standard features, several of which are optional on other pieces of equipment, that it isn't practical to

Figure 1 — The FTM-300DR's colorful display is readable even in bright daylight.

discuss them all in a single review. Instead, I'll touch upon the ones I found particularly intriguing.

Bluetooth

In many transceivers, the ability to use a Bluetooth wireless headset is an option you must purchase separately, but not with the FTM-300DR. It can be paired with nearly any Bluetooth audio device for hands-free operating. The Bluetooth function includes a VOX (voice-operated switch) in case your chosen headset lacks a transmit/receive switch.

I didn't have a Bluetooth headset to fully test this feature, but I do own Bluetooth headphones. Following the instructions in the manual, I paired the headphones with the FTM-300DR without difficulty. Once the device successfully pairs, the FTM-300DR's speaker goes silent, and all audio is directed to the headphones. You need only go through the pairing steps once for each device.

It was fun to walk around the house with my headphones while listening to activity on the bands. I set up the FTM-300DR's scanning function and busied myself with other things while monitoring the local fire dispatch channel and the UNICOM frequency of a nearby airport. I even managed to pair the FTM-300DR with my Apple Air Pods.

Memory Channel Grouping

All transceivers these days have frequency memories, and the FTM-300DR is no exception, with more than 1,000 memories available. What's interesting about the way the transceiver handles memories is in its memory channel grouping function.

I found that I needed to experiment with this feature to fully understand and appreciate it. The short explanation is that it allows you to assign memory channels to specific groups of your choosing and then recall them for operating or scanning as the need arises. It is somewhat analogous to memory blocks familiar to scanner owners. For instance, you can place all the repeaters you normally use for your local area into one group, but then create another group for, say, the city where you work. The FTM-300DR makes it easy to switch from one group to another as you travel from place to place.

You can also segregate memory groups according to function. If you have several repeaters in your area dedicated to ARRL Amateur Radio Emergency Service (ARES®) activities, you can place all those repeaters into one memory group for easy access during deployments. The function is highly flexible for memory monitoring when necessary.

GPS and APRS

A sensitive Global Positioning System (GPS) receiver is standard in the FTM-300DR. Thanks to the FTM-300DR's crisp display, you can use the GPS receiver directly for real-time navigating. It even includes a backtrack feature to help you retrace your route back to a given location.

The GPS receiver is quite sensitive. From within my car, it had no trouble locking onto several satellites and determining a position fix within seconds after I powered up the radio. Even when I operated the transceiver indoors — inside my aluminum-sided home — the receiver still managed to acquire the needed satellites.

Of course, GPS and the Automatic Packet Reporting System (APRS) go hand in hand, which is why the FTM-300DR also includes a 1,200/9,600-baud packet modem as standard equipment. When operating APRS, the FTM-300DR will use its own screen to display information, but it also makes the AX.25 packet data available at the rear-panel data port. This means you can attach a computer and use your own APRS software or grab the modem data for other applications.

To activate the APRS function, you must first go into the menu system and turn on the modem. You also must input your APRS call sign, beacon message, and other parameters. Fortunately, the FTM-300DR's menu system is well designed, and I found it easy to navigate from the front-panel screen. Unlike some transceivers, menu choices are displayed in plain English rather than cryptic abbreviations. It is a matter of using a VFO knob to select what you want (the screen highlights your selections with red backgrounds) and then giving the knob a brief push.

With the APRS properly configured, I selected 144.39 MHz and the FTM-300DR began displaying decoded APRS data. The information is easy to read and includes a compass heading to the station in question (see Figure 2).

If you are new to APRS, it is best to download the FTM-300DR's dedicated APRS manual. Despite not having done this at first, I found it straightforward to pick my way through the menus and set up all the necessary parameters.

Snapshot

One clever feature that I didn't have an opportunity to try was the Snapshot function. This allows you to send and receive images using the optional MH-85A11U camera microphone. This ability has been present in Yaesu System Fusion radios for years, but not all transceiver models can support it. The FTM-300DR's high-resolution display is ideal for this, albeit with small images. Still, it is a cool function to have available, especially when you're doing public service work with other System Fusion users with compatible displays.

Band Scope

When the band scope is active, it sweeps above and below the midpoint of the signal frequencies being received by the receiver and displays the results as a sea of flickering pixel blocks. I found the band scope to be most useful when the receiver was in memory mode rather than free-tuning VFO mode. In VFO mode, there was simply too much to see, and the result was somewhat incoherent.

However, in memory mode, the band scope shows activity on programmed channels rather than a range of frequencies. This gives you a convenient visual sense of the activity. Twisting the upper VFO knob slides the pixel display right or left until you position a signal spike beneath the downward-pointing arrow at the top center of the band scope.

MicroSD Storage

The FTM-300DR offers a slot on the control head for inserting a microSD memory card (not included). The card has several applications in this transceiver. You can record received and transmitted audio, which can be useful in several situations. You can also back up the FTM-300DR's memory information to the card.

Naturally, you'll need to purchase a microSD card, but these are inexpensive. You'll also need a memory card reader to access the card with your PC or laptop.

Figure 2 — Monitoring APRS activity with the FTM-300DR.

These are also inexpensive and simply plug into an available USB port.

Memory Programming with External Software

Yaesu offers free software for Windows that you can use to conveniently manage the contents of the FTM-300DR's many memory channels. This is my preferred method of management just because it is so much easier to do from my desktop or laptop.

To access the FTM-300DR memories directly you must purchase an SCU-20 data cable. Yaesu used to sell this cable separately, but now it is only available as part of the SCU-40 kit that allows the FTM-300DR to be connected to external WIRES-X node hardware. Selling at about $70, this is a pricey way to obtain a single cable.

The cost-saving alternative is to use the microSD card instead. You can write the transceiver's memories to the card, move the card to your computer, and then read its contents into the software. When you're finished, write the data back to the card, place the card into the transceiver, and then load the information to transceiver's memory.

I happened to have an SCU-20 on hand, so I used it instead. The software worked perfectly, making it a pleasure to input new memory information, or delete and modify existing information. I simply used the **READ** function to grab the data from the FTM-300DR and then wrote it back to the radio when I was finished.

On the Air

The FTM-300DR's 50 W output is ideal for solid mobile coverage. You can set it to lower output levels, but I enjoy operating simplex, and with my little mag-mount antenna on the car, I needed all the help I could get.

Speaking of simplex, the ARRL Lab was made aware of a quirk concerning 70-centimeter operation. In the

Figure 3 — Connecting to a System Fusion repeater, and then connecting to the America Link group on the Yaesu WIRES-X network.

US, 446.0 MHz is the national simplex calling frequency. However, when the FTM-300DR's automatic +/– frequency shift function is enabled, it insists on regarding this frequency as a repeater channel and shifts the transmit frequency accordingly. I verified that it will indeed recognize 445.0 MHz as a simplex frequency, but not 446.0 MHz. The workaround is to temporarily deactivate the auto-shift feature if you need to operate simplex on 446.0 MHz. Yaesu indicates that they will correct this issue in a future FTM-300DR firmware update. I checked my Yaesu FTM-7250DR transceiver and discovered the same behavior.

I'm fortunate to have Yaesu System Fusion activity in my vicinity, and most of it is connected via the internet to the Yaesu WIRES-X network. If you haven't tried operating through a linked network, it can be a blast. Thanks to a couple of local repeaters and nodes, I chatted with hams in Europe and Japan while driving around town with the radio. The FTM-300DR's screen displayed the other station's call signs and link/reflector information (see Figure 3). If you want to get the most out of WIRES-X, download the FTM-300DR WIRES-X manual from the Yaesu website.

The cost of the FTM-300DR may make some amateurs a bit hesitant, but it is important to consider what you're receiving for your investment. Yaesu has packed a remarkable number of features and performance into the FTM-300DR — so many that it may not be an exaggeration to call it the ultimate C4FM radio. If you have System Fusion activity in your area and want the ability to enjoy digital and analog operating to the fullest, the FTM-300DR is a serious contender.

Manufacturer: Yaesu USA, 6125 Phyllis Dr., Cypress, CA 90630; **www.yaesu.com**. Price: $450.

SharkRF openSPOT3 Multimode Digital Hotspot

Reviewed by Pascal Villeneuve, VA2PV
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In the past few years, the digital voice modes have rapidly grown to be popular on the VHF/UHF bands. It would be nice if radio manufacturers had all chosen the same digital voice mode, but that is not the case. On the other hand, for many hams, this is part of the fun because it gives them the opportunity to experiment with different approaches, and to meet the challenge of bridging together certain modes with virtual repeaters (called *reflectors*) that are accessed via the internet. This brought the introduction of multimode digital hotpots, and the openSPOT3 is one of the latest models. Basically, the openSPOT3 is a digital radio internet gateway with a low-power (20 mW) 70-centimeter transceiver to communicate with an amateur radio digital-mode transceiver.

There are several general concepts that are important to understanding the key differences between the

Bottom Line

Building on the previous model, the openSPOT3 multimode digital hotspot offers improved transcode performance for seamlessly allowing operators using different digital modes to talk with each other.

openSPOT3 and other hotspots. When choosing a digital mode to invest in, there are three simple things to consider:

1) Who do you want to talk with? (In other words, which mode is used by your friends?)
2) What types of digital repeaters are available in your region?
3) What is your budget? Can you afford a radio and a hotspot, or many radios plus a hotspot?

For new hams, the available choices can be overwhelming because this represents the unknown. It's a critical choice, as their experience with the new radio and new mode may impact their first impressions of the hobby. Many hams choose DMR as their first digital radio because these radios are usually less expensive. DMR can be the most complicated mode to program and operate, but fortunately setting up a DMR radio for a hotspot is easy.

I often suggest buying three radios, one DMR, one D-STAR, and one C4FM (Yaesu System Fusion, YSF), but the cost adds up very quickly. The openSPOT3 from SharkRF may help hams in their decision making and save some money at the same time.

There are two previous hotspot versions from SharkRF, the openSPOT and the openSPOT2. I reviewed the original openSPOT in the October 2017 issue of *QST*, and the openSPOT2 in the June 2019 issue. SharkRF has added features and improvements with each version, and in the openSPOT3, they achieved a serious milestone: the newest SharkRF hotspot has the ability to do hardware *transcode* between all digital modes without losing any quality. (For example, the hotspot hardware allows a ham using a DMR radio to talk to one using D-STAR.) See the sidebar, "Supported Digital Modes."

Overview

The first thing I noticed is the quality of the packaging and the hardware. The openSPOT3 still has no ethernet RJ-45 jack and no external antenna port — features that were on the first version but were removed in version 2. Physically, the new version looks like the openSPOT2, but it's bigger and heavier because of new hardware additions. The power connector is a USB-C which, in my opinion, is the best solution.

There are now two buttons on top. One is for Wi-Fi, and when you hold it for more than 3 seconds, the openSPOT3 switches into Wi-Fi AP (access point) mode. If you hold the Wi-Fi button for more than 30 seconds, it will do a full factory reset of all the settings and configuration profiles.

The second button turns the power on and off, because this version has an internal rechargeable Li-ion battery. The glowing LED indicator near the power button shows the battery and power status with different colors and blinking speed indications, fully described in the manual. As an example, when the power cable is connected, a green light means the battery is fully charged and red mean it's charging. If you hold the power button more than 7 seconds, the device reboots.

Like the openSPOT2, there are five profiles you can save with mode and reflector preferences. If you press the power button three times quickly, it will transmit Morse code for the letter P, followed by the current active profile number and name.

Just like the previous version, you won't see any obvious operating status LED indicators, as they are hidden inside the white plastic enclosure. When you

Supported Digital Modes

The openSPOT3 supports multiple digital modes and reflectors (a reflector is the equivalent of a digital voice mode repeater and is accessed via the internet).

DMR (digital mobile radio) — Originally a commercial protocol, adapted for ham radio. The popular DMRplus, DMR-MARC, and BrandMeister reflector networks are all supported by the openSPOT3, along with Phoenix, XLX, and TGIF.

Yaesu System Fusion (YSF, C4FM) — Developed for ham radio by Yaesu, there are three different reflectors/networks. YSFReflector and FCS are both supported by the openSPOT3. Yaesu's Wires-X network is not supported by hotspots like the openSPOT.

D-STAR — Developed by the Japan Amateur Radio League and supported by Icom and Kenwood transceivers. There are many networks, including DCS, REF/DPlus, XRF/DExtra, and XLX, all supported by the openSPOT3.

NXDN — Kenwood's commercial digital mode. Only one ham network exists, NXDNReflector, which is supported by the openSPOT3.

P25 — Another commercial digital mode. Only one ham network exists, P25Reflector, supported by the openSPOT3.

POCSAG (DAPNET) — An amateur radio paging system used in Europe and supported by the openSPOT3.

APRS (Amateur Packet Reporting System) — APRS messaging and location data forwarding (APRS-IS) are supported.

turn on the unit, the status LED glows through the case. Many colors are used to indicate the current status, and it's very intuitive. For example, when the openSPOT3 receives a signal, the LED turns green. When it transmits, the LED turns red. Other status indications are described in the well-illustrated, online manual.

Setting Up the Device

To set up the openSPOT3, you can use any PC, tablet, smartphone, or other device with an internet browser and Wi-Fi capability. When you first receive the openSPOT3, by default it will be in Wi-Fi AP mode. Turn on the hotspot and scan for a new Wi-Fi network called **openSPOT3 AP** with your device, just like you would when you want to connect to any new Wi-Fi network. Once connected to the openSPOT3, you can do the initial setup via its web interface and then connect the device to your home Wi-Fi network and the internet. (Remember, without internet access, the openSPOT3 is useless.)

After the initial setup, if you move out of range of your initial Wi-Fi network, simply press the Wi-Fi button for more than 3 seconds to switch the openSPOT3 back into its AP mode. Then again, connect into the web interface directly, and select a new Wi-Fi network. Doing this does not affect your hotspot configurations, and you won't lose the other Wi-Fi setup as long as you do not hold the button more than 30 seconds and trigger a factory reset.

Once the Wi-Fi setup is complete, use the very intuitive web interface to enter your call sign, IDs, digital ham radio mode, and reflector you want to operate.

Web Interface

The web interface is almost identical to the one used with the previous openSPOT model. We have the same top tabs: **STATUS**, **CONNECTORS**, **MODEM**, **SETTINGS,** and **NETWORK** (see Figure 4). The left menu is for **QUICK SETUP**, a link to the online manual, and for **SHARKRF LINK** setup. On the right menu, you have **POCSAG/DAPNET** setup, the DMR ID database lookup, and the **UPGRADE** button. Upgrading this device is easy — just click **UPGRADE** and the rest is automatic.

There is an **ADVANCED MODE** option that you can select to add advanced settings in almost every tab. This device can be amazingly easy to operate, but you can still do complex configurations if you're an advanced user, an important advantage that SharkRF implemented in all their devices. At the upper left, they added a battery indicator.

The center of the screen shows the reflector in use, the modem mode, and other information. In Figure 4, you can see that the **MODEM MODE** is D-STAR, but the **ACTIVE CONNECTOR** is System Fusion/FCS. With the openSPOT3, you can communicate with a System Fusion reflector using a D-STAR radio, and the other way around is also possible.

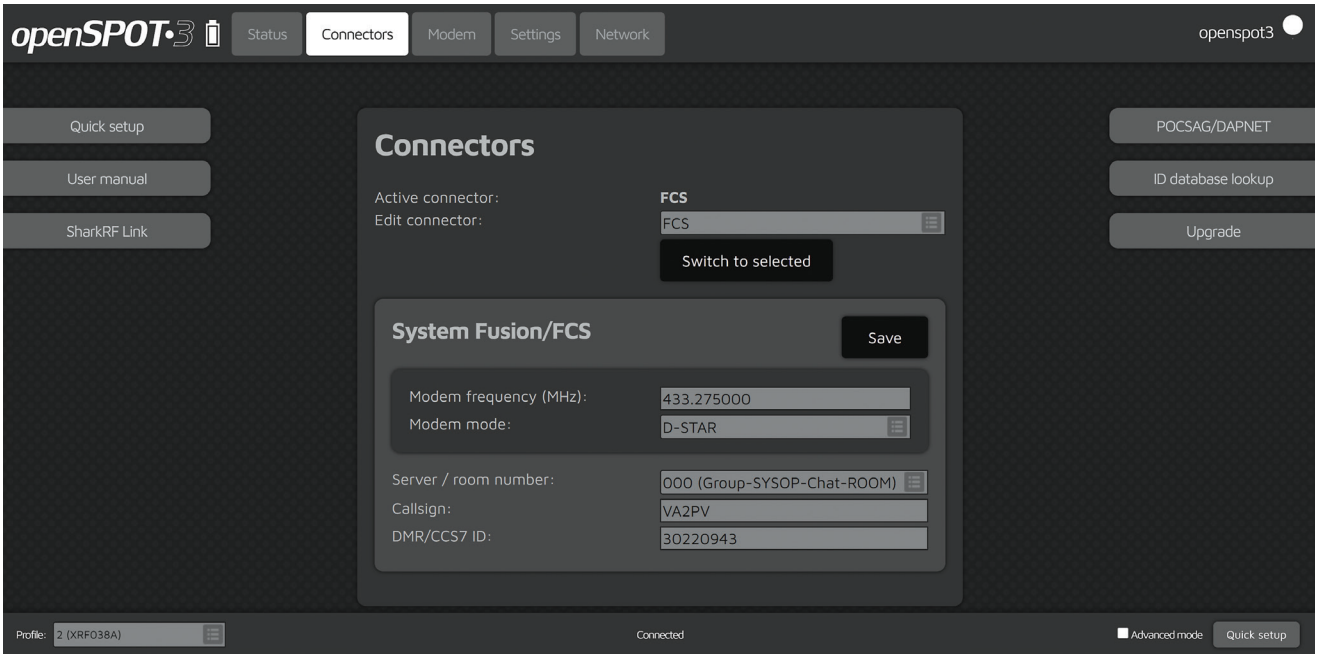

Figure 4 — The openSPOT3's web interface, with the **CONNECTORS** tab selected.

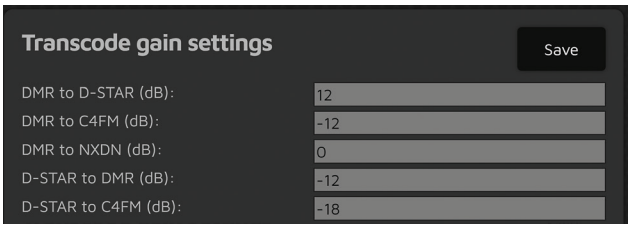

Figure 5 — A portion of the transcode gain settings screen, which is an Advanced Option in the web interface.

New Hardware

The openSPOT3 offers a good solution for those wondering which mode to choose. This new third generation of the openSPOT hotspot benefits from all the improvements made in the previous devices. To that, they have added new hardware components, such as an AMBE vocoder, which is the same chip that digital radio manufacturers use to encode digital communications.

The AMBE vocoder allows the openSPOT3 to transcode perfectly (no glitches) between modes. This means that you only need one digital radio to access most of the digital mode reflectors. In **ADVANCED MODE**, you can adjust the gain used during transcoding to correct the volume difference between systems (see Figure 5). This ensures top-quality audio in every mode.

With the previous model, it was possible to transcode between certain modes, but this was achieved with software, and it was not perfect. Cross mode with D-STAR was not possible, as it uses a different protocol that needs to be re-encoded. Now you can operate cross mode with all modes, including D-STAR because the openSPOT3 can decode and re-encode into another mode using the AMBE chip. This is a major improvement. Note that to operate cross mode with C4FM, you need to be in DN (digital narrow, 6.25 kHz), as it will not work when you used VW (voice wide, 12.5 kHz).

Just like the openSPOT2, the new model boots very quickly, and it's ready for operation in less than 10 seconds. You can also program multiple Wi-Fi networks, and it will connect automatically to the first one available. I programmed my home network and my iPhone Wi-Fi hotspot (tethering). If I ever want to take the unit mobile, I just have to share my cellular connection, and I'm ready to go.

They also added a 1,200 mAh Li-ion battery, allowing the hotspot to be autonomous up to 10 hours without any external power. The new version also has a built-in beeper for audio status tone and CW profile announcement.

Operation on the Air

The openSPOT3 operates exactly like the openSPOT2. It is easy to configure, and it's very stable.

The big improvement in the openSPOT3 is the hardware transcoding capability. Figure 6 shows simultaneous reception on two radios from the same C4FM reflector (FCS003/90), but from two different hotspots. The Yaesu radio on the left is set to the openSPOT2 frequency in C4FM. On the right, the Kenwood D-STAR radio is set to the frequency of the openSPOT3, which is connected to the same C4FM reflector, but with the modem in D-STAR mode for transcoding. The call sign of the received station (2EØSEI) is shown on both radios.

In this simultaneous receive test, I noticed that the signal from the openSPOT3 was slightly delayed before reception in the D-STAR receiver. This is due to the manipulation of the data in the transcode process, because the source is a C4FM signal. On a busy reflector where people come back very quickly, you may have to call a few times before you can be heard in between transmissions. This is also true if you are far away (in the IP world) as the number of internet hops can also add some delay. This phenomenon is not new in digital modes and is the reason operators are asked to leave a pause after each transmission.

Conclusion

The openSPOT3 is an excellent portable/mobile hotspot. It is more expensive than some other hotspots, but you can use it to operate the most popular digital modes with just one transceiver. The

Visit https://youtu.be/GJaftUiMGc0 to see our review of the SharkRF openSPOT3 Multimode Digital Hotspot on YouTube.

Figure 6 — The simultaneous reception of the same C4FM reflector using two different digital radios with two hotspots. On the left is a Yaesu System Fusion radio connected through an openSPOT2, and on the right is a Kenwood radio in D-STAR mode using the openSPOT3. The received signal from the reflector is transcoded from C4FM to D-STAR by the openSPOT3, and the received signal sounds the same on both radios.

openSPOT3 software and hardware is robust and very stable. It's also very easy to use, it boots up very quickly, and it's completely standalone.

The SharkRF website offers extensive documentation for setting up and using this device with the various digital modes and reflectors. Additional support is available from the online SharkRF Community Forum, accessed via their website. Check out my companion video overview to hear the openSPOT3 in operation. For more information about digital modes and hotspots, see my YouTube channel, **Laboenligne.ca** (or search YouTube for "VA2PV").

Manufacturer: SharkRF, Tallinn, Estonia; **www.sharkrf.com**. Available from **shop.sharkrf.com**. Price: about $300 depending on exchange rate.

Etón Elite 750 Portable Receiver

Reviewed by Steve Ford, WB8IMY
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Those familiar with shortwave receivers may notice something familiar in the Etón Elite 750. In its previous life it was the Grundig Satellit 750, manufactured by the Chinese company Tecsun. It underwent a bit of a metamorphosis and emerged in China as the Tecsun S-2000 and was known elsewhere as the Etón Satellit 750.

The Satellit 750 was discontinued and the shortwave listening community assumed that was the end of the line, but this was not the case. In 2020, the Tecsun S-2000 returned in China, and for the rest of the world, it reappeared as the Etón Elite 750.

A Hefty Portable

At a little more than 14 × 7 × 5 inches and weighing more than 5 pounds, the Elite 750 is one of the larger receivers in its class that can still be called portable. Like its Grundig predecessor, the Elite 750 sports the side-mounted rack handles, which gives the Elite 750 an industrial profile. While you can certainly carry the 750 by the rack handles, there is a more conventional handle that folds out of the top of the case.

Bottom Line

The Etón Elite 750 portable receiver covers all of the popular longwave, mediumwave, and shortwave bands, as well as the FM broadcast band and air band. It works well with the built-in antennas and the audio quality is good. Its SSB and CW capability is fine for casual listening in the ham bands.

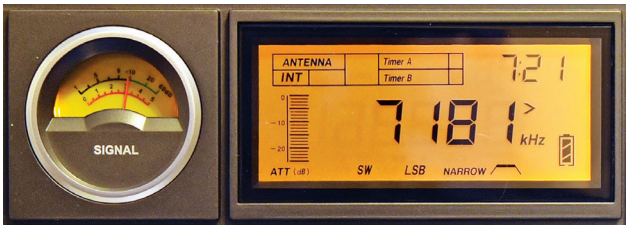

Figure 7 — The Elite 750 S-meter and display.

The sizeable tuning knob has a smooth, competent feel, as do all the knobs and buttons. The illuminated LCD is large enough to be easily readable, yet small enough to avoid stealing ergonomic space from the other controls (see Figure 7). To help conserve battery power, the display backlighting automatically comes on when you turn the tuning knob or adjust some of the controls, and then turns off after about 5 seconds. You can keep the illumination on continuously by pressing and holding the **LIGHT/SNOOZE** button.

I am so accustomed to seeing graphical signal-strength indicators that I was pleasantly surprised to find a real meter in the Etón Elite 750. The circular meter is recessed and illuminated by a single, amber LED. However, as useful as the meter is, I often found it difficult to read in less than optimal lighting. Improved illumination would be a welcome addition.

Beneath the sizeable speaker, and adjacent to the separate bass and treble controls, you'll find an earphone/headphone jack and a **LINE IN** jack. The **LINE IN** jack is intended for those times when you might want

Table 2
Etón Elite 750, serial number n/a

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Receive only, 0.1 – 0.519, 0.52 – 1.710, 1.711 – 29.999 MHz (SSB, AM), 88 – 108 MHz (FM broadcast), 117 – 137 MHz (AM).	As specified.
Power requirement: External 6 V dc supply or four D cells. 80 mAh w/o backlight, 90 mAh with backlight.	At maximum volume, battery power: backlights on, 462 mA; backlights off, 450 mA. With external 6.3 V dc supply: at max volume, backlight on, 540 mA.
Modes of operation: SSB, AM, wideband FM (FM broadcast band only, stereo reception).	As specified.
Receiver	**Receiver Dynamic Testing**
Sensitivity: Not specified.	Noise floor (MDS), narrow filter, attenuator off: 475 kHz, –129 dBm; 3.5 MHz, –127 dBm; 7 MHz, –130 dBm; 14 MHz, –127 dBm; 28 MHz, –122 dBm.
AM sensitivity: Not specified.	10 dB (S+N)/N, 1 kHz tone, 30% modulation, narrow filter: 0.198 MHz, 1.0 µV; 1.020 MHz, 0.94 µV; 3.885 MHz, 0.90 µV; 6.160 MHz, 0.90 µV; 7.490 MHz, 1.0 µV; 15.1 MHz, 0.75 µV; 120.0 MHz, 1.46 µV.
FM sensitivity: Not specified.	For 12 dB SINAD, 15 kHz deviation: 100 MHz, 1.57 µV.
S-meter sensitivity: Not specified.	For S-9 (50 µV) signal at 14.2 MHz: Narrow, 3.93 µV; Wide, 1.74 µV.
Blocking gain compression dynamic range: Not specified.	At 14 MHz, 20 kHz spacing: 97 dB.
Reciprocal mixing dynamic range: Not specified.	At 14 MHz, 20 kHz spacing: 79 dB.
Two-tone, third-order intermodulation distortion dynamic range: Not specified.	At 14 MHz, 20 kHz spacing: 82 dB.
Two-tone, second-order intermodulation distortion intercept point: Not specified.	At 14 MHz: +29 dBm.
Squelch sensitivity: Not specified.	At threshold: 7.42 µV.
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth)* SSB Narrow: 290 – 2390 Hz (2100 Hz) SSB Wide: 290 – 2340 Hz (2050 Hz) AM Narrow: 290 – 3560 Hz (3270 Hz) AM Wide: 330 – 2910 Hz (5160 Hz).

Size (height, width, depth, including protrusions): 4.4 × 7.6 × 1.3 inches; with handle lifted add 2.7 inches.

Antenna length, 38.8 inches. Loop length, 8.2 inches. Weight 6.25 pounds with batteries (4 D cells); 5.55 pounds without.

Second-order intercept point was determined at the S-5 signal level.

*Bass and treble control adjusted for flattest response — bass midway, treble, maximum.

Figure 8 — The Elite 750's built-in ferrite bar antenna works well for AM broadcast band reception.

to connect another audio device and play it through the Elite 750.

You'll find **LINE OUT** ports on the back, and they are a nice feature for those times when you want to make recordings of your listening adventures. The engineers thoughtfully included two line-level ports, one for each audio channel when recording FM stereo broadcasts. Of course, you can also use these ports to connect the Elite 750 to a much larger audio system.

The profile of the Elite 750 is dominated by its rotatable, directional ferrite-bar antenna (see Figure 8). It's one of the reasons the 750 is prized among those who enjoy AM broadcast DXing. Of course, there is also a long telescoping antenna for higher frequencies. The right side of the radio has BNC and terminal jacks for any other external antenna system you might wish to attach (see Figure 9).

You can power the Elite from its 6 V dc power supply, or take it traveling if you install four D cell batteries. (It seems like ages since I've used a radio that accommodated D cells.) If you choose to use an external 6 V dc supply provided by another manufacturer, or perhaps one of your own design, beware. The 750's dc power jack has an unconventional arrangement with negative polarity at the center/tip rather than positive.

The Elite 750 offers wide frequency coverage. It starts in the longwave basement from 100 to 519 kHz and extends all the way to 29.99 MHz. The receiver adds FM stereo broadcast band coverage from 88 to 108 MHz and then continues into the aeronautical band at 117 to 137 MHz.

Mediumwave, Shortwave, and Longwave

My introduction to the Etón Elite 750 occurred right after I pulled it out of the box and deployed the telescoping antenna. I took a cruise through the popular shortwave broadcast hangouts and was fortunate to run into Radio Romania's transmission in English. The signal strength was excellent, despite using the

Figure 9 — The Etón Elite 750's external antenna connectors.

receiver indoors. I wanted to catch a later broadcast using my outdoor antenna, so I added the frequency to one of the radio's 1,000 memory slots. This is easy to do and requires only a few button presses. Recalling memories is even easier.

Frequency memories are grouped into numbered pages for convenience, and the Elite 750 allows you to sort them in various ways. The receiver also includes the ability to scan through the longwave, AM, and FM broadcast bands, automatically storing the strongest signals into Page 0 memories.

Audio quality was excellent with the Elite 750's built-in speaker. The sound is rich and full, especially at lower frequencies. The radio provides separate bass and treble controls, and they make a substantial difference in fidelity, unlike controls on other receivers that only add or subtract muddiness.

The Elite 750 comes equipped with an RF gain control and a switchable two-step attenuator. Both are useful if you encounter strong signals, especially when using an external antenna. For example, I found that the Elite 750 seemed somewhat prone to front-end overload on the HF bands when I connected it to my wire dipole antenna. A quick tap of the **ANT.ATT** button would bring the attenuator into play and the level of attenuation is indicated in the LCD as a vertical bar graph. The bar graph is somewhat counterintuitive until you get used to it. The highest (tallest) bar indicates that the *least* amount of attenuation is being applied.

Another tool is the Elite 750's selectable wide and narrow bandwidth options. The manual does not specify the bandwidths, but the wide selection seemed a bit too wide, and it was problematic in crowded conditions. I found myself using the **NARROW** setting much of the time.

After hunting through the HF bands for a while, I was eager to give the rotatable ferrite antenna a try on medium and longwave signals.

I remember hunting distant AM stations with a portable receiver many years ago and having to endure the hassle of turning the entire radio this way and that, trying to aim its ferrite rod antenna for maximum signal strength. This is not the case with the Elite 750. Its bar antenna turns smoothly with a slight clicking sound, as if it were moving through mechanical detents. Not only could I peak desired signals, I was also able to use the antenna to null interference from stations on adjacent frequencies.

My first test was on 700 kHz. That's the home of the mighty WLW in Cincinnati, Ohio. At first there was little to hear but noise, but as I gently turned the bar the static fell away, and WLW emerged. Reception was surprisingly good considering that the Elite 750 was sitting inside an aluminum-sided house at the time.

Longwave broadcasters are a vanishing breed, but their signals can still be heard when conditions are optimal. Try as I may, I was unable to receive longwave broadcasts during this review, but I was able to spin the bar and isolate some interesting signals from other services, such as aeronautical beacons.

SSB and CW

The Elite 750 is not a replacement for a high-performance ham radio receiver, but it does offer SSB and CW reception. It achieves this with an adjustable beat-frequency oscillator (BFO). The knob is labeled **SSB BFO**, but of course, its use isn't strictly limited to SSB. Tuning is in 1 kHz steps, and the SSB BFO control does an admirable job of tuning in separate CW signals above and below the tuned frequency, as long as the band is not too crowded.

I've often been disappointed with how BFOs are implemented in consumer shortwave radios. Either the BFO control is way too sensitive, or the BFO introduces annoying distortion that can make listening almost painful. I was pleasantly surprised to see that the worst failings of consumer BFOs were avoided in the Elite 750. Yes, the control requires a light touch to tune signals perfectly, but once I had it tuned to my liking, the BFO remained stable and the resulting audio was clean and undistorted.

Even while using just the telescoping whip antenna, I was able to monitor a number of amateur SSB and CW conversations. The radio lacks the ability to create the kind of narrow filtering that is critical when listening to a crowded band, but again, the Elite 750 is a consumer product, not a ham receiver.

With the radio still in the SSB mode, I couldn't resist punching 14.074 MHz into the keypad. That's the 20-meter FT8 watering hole. As the musical cacophony of what sounded like a million FT8 signals erupted from the speaker, I grabbed a microphone headset, plugged it into my computer, and then held the mic close to the radio. I started the *WSJT-X* software and configured the program to select the computer's headset input as its audio source. Within seconds, I was greeted with a waterfall display full of successfully decoded signals. Later I tried again, but this time, I tapped the audio from the Elite 750's **LINE OUT** jacks and, as one would expect, it worked even

Lab Notes: Etón Elite 750 Receiver

Bob Allison, WB1GCM

In testing the Elite 750, I found that the sensitivity is not quite uniform throughout the HF spectrum, like we are used to with amateur transceivers. It's good below 20 MHz and fair at higher frequencies. The aircraft band could use more sensitivity. At less than 4 µV needed for an S-9 reading (normally 50 µV), the signal strength meter is not very accurate.

There are wide and narrow filter settings. In the SSB mode, you will notice that the audio frequency response measured slightly greater with the narrow filter than the wide filter. Audibly, it's hard to tell much difference, but the narrow filter setting eliminates hiss in the audio.

Dynamic range performance looks good at first glance for a portable, consumer-grade receiver, although I could not perform 5 or 2 kHz spacing measurements, as we do with amateur transceivers because there was considerable bleed-through from the adjacent signals. I hooked up an external antenna for the AM broadcast but found that the increased signal levels overloaded the receiver such that I heard a lot of intermodulation distortion. As noted in the review, the ferrite bar antenna does a good job on its own.

better. I have a feeling the designers didn't have HF digital reception in mind for the Elite 750, but this is what happens when you turn a product over to a ham.

FM and Aeronautical Bands

The Etón Elite 750 turned in excellent FM broadcast performance. You can listen in stereo only through headphones or earbuds, but even monaural listening with the internal speaker was impressive. Stereo decoding is selectable, so you can also choose to listen in monoaural, which is useful for weak signals.

It is worth noting that the bandwidth, RF gain, and attenuator controls appear to be disabled when the Elite 750 is used in the FM broadcast band. In addition, the signal strength meter indicates maximum strength regardless of what you may be listening to.

Exploring the aeronautical band, I was relieved to see the bandwidth, RF gain, attenuation, and metering return to normal functioning. I live in an area with a lot of air traffic, but I found that I had to use an outdoor antenna to receive an adequate number of signals. The sensitivity on the air band could be better.

The good news is that the Elite 750 includes a squelch control that works on all frequencies, and it was put to good use on the aeronautical band. It's a well-designed squelch with a sharp, fast cutoff.

I'd be remiss if I didn't mention the Elite 750's clock and timing features. There are two independent alarms that you can set to activate the radio whenever you wish. The Etón manual emphasizes their usefulness as alarms to awaken you from sleep, which is fine, but nothing would prevent you from tuning to a particular frequency — a shortwave broadcast frequency, for example — and using the alarm to switch on the radio at the beginning of a specific broadcast. A voice-operated (VOX) recorder attached to the **LINE OUT** jacks could then record the broadcast while you are away. I tried this using my station computer and the VOX function in my *Audacity* audio-editing software, and it worked perfectly.

Conclusion

The Etón Elite 750 appeals primarily to the consumer market, and it does an outstanding job in that application. With its rotatable ferrite bar antenna, I think it may also be a formidable contender among radios used for AM broadcast DXing.

Amateurs would find it most useful for casual listening, but there are times when it can do double duty as a test receiver. During this review, I needed to compare the transmit audio quality of two microphone/headsets I was using with my HF transceiver. I reduced the transceiver output to just a few watts, turned on the Elite 750, stowed its telescoping antenna, and then kicked in considerable attenuation. Using headphones plugged into the Elite 750, I was able to listen closely and compare the characteristics of the two microphones.

Of course, you wouldn't invest in an Elite 750 just to use it as a test receiver, but it is an extra benefit to consider for those times when you're not hunting longwave, AM broadcast, or shortwave signals, or enjoying your favorite FM stations.

Manufacturer: Etón Corporation, 1015 Corporation Way, Palo Alto, CA 94303, **etoncorp.com**. Price: $449. Available directly from Etón's website or select dealers.