BridgeCom Systems D-500 70-Centimeter DMR and Analog Handheld Transceiver

This solid radio offers an easy entry point to DMR.

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In the past few years, VHF/UHF digital voice communication has been one of the fastest growing segments of Amateur Radio. D-STAR and System Fusion (C4FM) were specifically designed for Amateur Radio, but this is not the case with DMR — Digital Mobile Radio. It is an open standard, developed by the European Telecommunications Standards Institute (ETSI). As such, this technology is available to any company willing to build a digital radio, such as the BridgeCom Systems D-500 (by Tekk) reviewed this month.

Introduction to DMR

There are three types of DMR — Tier I, Tier II, and Tier III. To learn more about DMR, I strongly suggest that you read "Introduction to Digital Mobile Radio (DMR)" by John S. Burningham, W2XAB, in the October 2015 issue of *QST*.

In this review, we will concentrate on the widespread Tier II DMR network. You will need to understand a bit about this technology to program

your DMR radio. As DMR was not developed specifically for Amateur Radio, the terms are different from what we are used to. Tier II DMR uses TDMA (Time Division Multiple Access), which is a frequency-sharing protocol. You can have two conversations on the same frequency without them interfering with each other. This is very efficient, as Tier II TDMA uses a 12.5 kHz bandwidth with two time slots. The switching is very fast, thus allowing for two simultaneous contacts on the same frequency, using this time-sharing method.

Most DMR radios do not have direct access for frequency configuration, and this is the case with the D-500. You will need a "code plug," which is simply a configuration file that you transfer to your radio from a computer. The fastest way to get started in DMR is to ask a friend who is already active to share their code plug and then modify it for your use. Note that the code plug needs to be compatible with

your radio. Otherwise, you can create a code plug using the programming software.

Radio Overview

The BridgeCom Systems D-500 comes in two versions — VHF (144 – 147.99 MHz) or UHF (420 – 450 MHz). Both versions are compatible with DMR Tier I and Tier II, as well as analog FM. It's a 5 W transceiver with 1,000 memory channels, full DTMF keypad, IP-54 water-resistant rating, and a 1-year warranty. The first time you hold that radio in your hand, you will appreciate the quality feel for the price. It's very sturdy, well built, and has very good receive audio. This radio is similar to the popular Tytera MD-380 (and can use an MD-380 code plug), but it offers a more powerful battery pack and a more rugged case. In addition, BridgeCom Systems sells the Tekk products for the Amateur Radio market and offers support and documentation specifically for hams.

The box includes the radio; a flexible antenna (SMA female); a 7.4 V dc, 2,200 mAh battery; a belt clip; a desktop charger, and a hand strap. Our package also included the optional programming

Bottom Line

BridgeCom's D-500 70-centimeter DMR/analog handheld transceiver offers an affordable way to get acquainted with DMR digital voice communications on the 440 MHz band. The ruggedly built radio and its companion software are easy to use.

Table 1
BridgeCom Systems D-500 (by Tekk), serial number 14300010

Manufacturer's Specifications	Measured in ARRL Lab
Receiver	
Frequency coverage: Receive, 400 – 520 MHz; transmit, 400 – 470 MHz.	As specified.
Modes: FM, DMR.	As specified.
Power requirements: 2,200 mAh Li-ion battery (included), 7.4 V dc nominal.	Receive: 440 mA (max volume, backlight on); standby, ~30 mA. Transmit: high, 1.55 A; low, 0.94 A; off, <1 mA.
Receiver	**Receiver Dynamic Testing**
Sensitivity: 12 dB SINAD, –116 dBm (0.35 µV).	For 12 dB SINAD: FM, 0.35 µV.
Adjacent-channel rejection: 65 dB.	20 kHz offset, 65 dB.*
FM two-tone, third-order IMD dynamic range: 65 dB.	20 kHz offset, 65 dB; 10 MHz offset, 65 dB.*
FM two-tone, second-order IMD dynamic range: Not specified.	65 dB.*
Squelch sensitivity: Not specified.	At threshold, 0.35 µV.
Audio power output: 1 W (impedance not specified).	For 10% THD, 640 mW at 8 Ω. THD at 1 V_{RMS}, 2.4%.
Transmitter	**Transmitter Dynamic Testing**
Power output: 5 W (high), 1 W (low).	5.0 W (high), 3.5 W (low).
Spurious signal and harmonic suppression: Not specified.	>70 dB; meets FCC requirements.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	S-9 signal, 150 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	4 ms.
Size (height, width, depth): 5.5 × 2.3 × 1.5 inches (including protrusions); weight: 10.4 oz. including battery and antenna. Antenna length: 5.2 inches.	
Price: $145. With programming cable, $160.	

*Squelch could not be disabled; opens at 0.35 µV (–116 dBm). IMD measurements are noise limited at the value indicated.

Figure 1 — The D-500 programming software, "General Settings" screen.

the only two mandatory fields to be configured in this section. You must have a Radio ID (DMR ID) before you can use this radio on DMR repeaters and reflectors (hotspots). If you don't have a DMR ID, you must obtain one from the DMR-MARC group (digital IDs are coordinated worldwide). This registration process is free, and the DMR-MARC team responds quickly. For details, see **www.dmr-marc.net**.

4) To set up a talk group (TG), go into the "Digital Contacts" section. By default, you will have one contact (CONTACT1). To add a digital hotspot, just add a contact by clicking on ADD, then change the contact name — in the example, I named it "HotSpot." Leave Call Type set to Group Call and set the Call ID to 9 (for TG9) (see Figure 2).

5) The next step is setting up the channel in the "Channel Information" screen (see Figure 3). By default, there is one available channel (CHANNEL1). Click on it and change the name to one you choose. In the example, I again used "HotSpot." Then set up the frequency. My hotspot uses a simplex frequency, so I used 433.275 MHz for both RX and TX.

In the "Contact Name" section, select the contact created in Step 4, called HotSpot. Then set the Repeater Slot to 2 (usually all hotspots use TS2 — time slot 2 — for local). I strongly suggest changing the timeout timer (TOT[s]), which is set by default to 60 seconds. I usually use 180 seconds. Because my
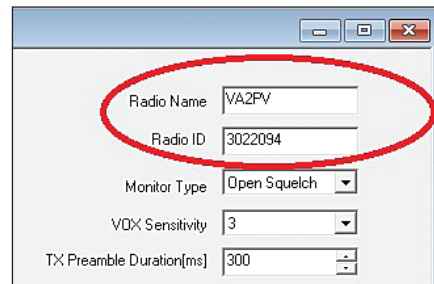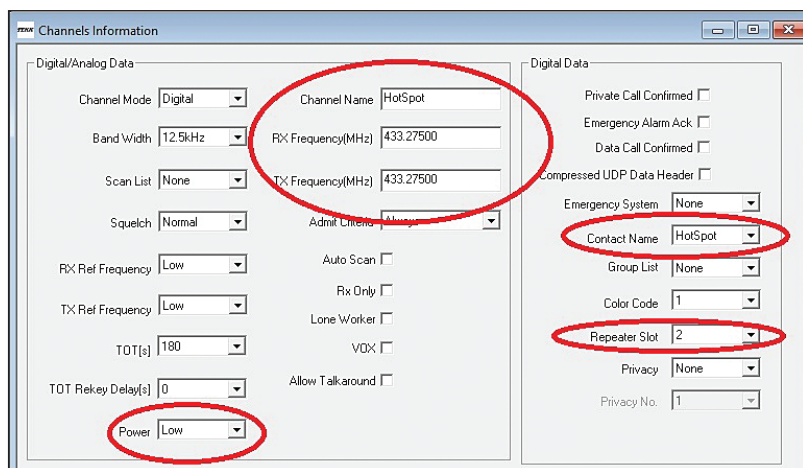
cable, which must be selected unless you already have one — it is necessary to program the radio.

Programming the Radio
DMR has a different approach from what we are used to with "classic" Amateur Radio. Don't be confused by the terminology used by the software and the radio interface. Just keep in mind that, to configure a memory channel for DMR, you need to set up a "contact," a "channel," and assign it to a "zone." For analog repeaters and simplex frequencies, you need to program a channel and assign it to a zone, but the contact is not necessary. Using the radio keypad, the user can switch directly to MR (memory) mode instead of CH (channel) mode. The frequency can always be seen on the radio display.

After programming, the radio is very easy to use to make contacts, so taking the time to learn the basics is worth the effort. A PDF file, with more detailed screen captures that illustrate the following programming steps, is available online from **www.arrl.org/qst-in-depth**. Here's a quick look at how programming works:

1) Download the programming software and instruction manual from the BridgeCom website.

2) Running the software for the first time, select the correct version of your radio from the "Basic Information" section — in this case, the 400 – 480 MHz Frequency Range.

3) In the "General Settings" section, enter your Radio Name (call sign) and Radio ID (see Figure 1). Those are

Figure 2 — The D-500 programming software, "Digital Contacts" (Talk Group) screen.

Figure 3 — The D-500 programming software, "Channel Information" screen for a digital hotspot.
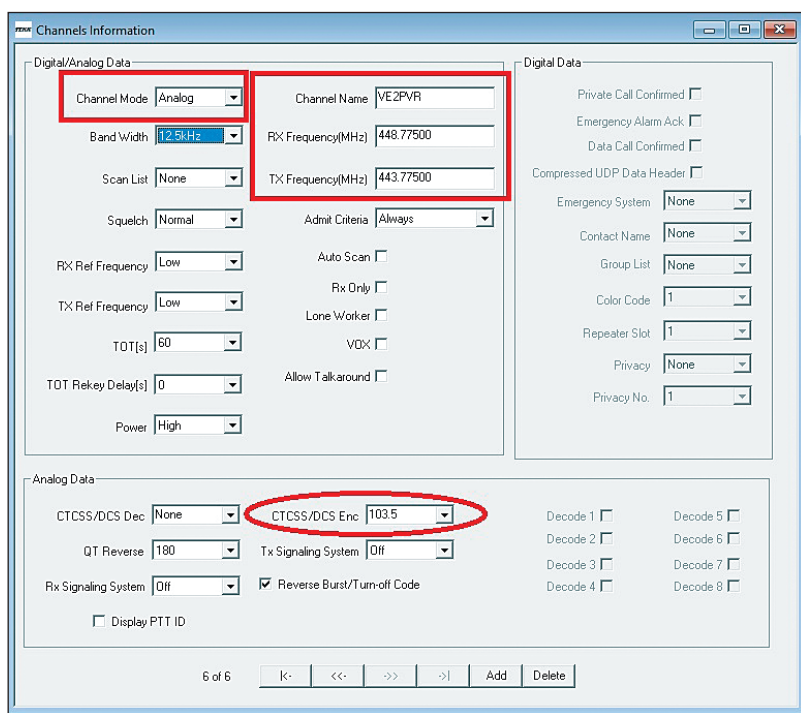
Figure 4 — The D-500 programming software, "Channel Information" for an analog (FM) repeater with tone squelch

hotspot is local, I selected low power. Then click ADD to add the channel.

6) Now we need to set up a zone in the "Zone Information" section. Click on the default zone (ZONE1) and change the name to whatever you like. Once again, I used "HotSpot." Add the channel just created in Step 5 into the "Channel Member" section by clicking on it and then ADD (in the center of the screen). The channel is now a member of that zone. The ADD button at the bottom is for adding a new zone.

7) To add an analog channel, go back to "Channel Information" and click ADD. Select ANALOG in "Channel Mode," name the channel, and add the RX and TX frequencies (taking into account the repeater offset, or making them the same for simplex). If there's a required tone for access, you need to set it in the "CTCSS/DCS Enc" (encode) section. In the example, it's 103.5. Then you need to add the channel to a zone. You can use the "HotSpot" zone, created in Step 6, and add up to 16 channels, which will be selectable by using the radio's channel knob. See Figure 4.

8) Don't forget to save your configuration file. And now it's time to transfer the code plug to the radio. Connect the programming cable between the radio's speaker/mic connector and the USB port on the computer where you have the D-500 software installed. Then turn on the radio. On my computer, *Windows 10* automatically found the correct driver. On the programming software screen, click the icon that shows a radio with a red arrow to transfer the code plug to the radio. You can also download a code plug from the radio to the programming software using the radio icon with the yellow arrow.

Click OK and the transfer will start. When a successful transfer has been confirmed by the software, turn off the radio, unplug the programming cable, and turn the radio back on. It's now configured.

DMR Repeaters and Talk Groups (TG)

In DMR, there are three popular types of networks linking stations and repeaters via the Internet — DMR+, DMR BrandMeister (BM), and DMR-MARC. The DMR-MARC network is the most widespread throughout the

Figure 5 — Example of Talk Groups (TG) set up in the contact list.

No.	Contact Name	Call Type	Call ID	Call Receive Tone
1	ALL CALL	All Call	16777215	Yes
2	Worldwide	Group Call	1	Yes
3	Local	Group Call	2	Yes
4	North America	Group Call	3	Yes
5	Canada Wide	Group Call	302	Yes
6	MIT	Group Call	3125	Yes
7	DCI	Group Call	3100	Yes

Figure 6 — The D-500 screen and menu navigation keys.

US and Canada. DMR+ and BM are accessible via most hotspots, as well as some DMR-MARC talk groups. For more details, see **www.dmr-marc.net/dmrplus-america.html**.

In this review, we did not cover programming the radio to transmit via a digital DMR repeater. Before setting up a repeater memory channel, you need to contact the repeater operator to find out what Talk Groups (TG) / Time Slots (TS) are available.

Here are some common TG on TS1: World Wide (TG1, PTT), North America (TG3), and World Wide English (TG13). TS2 is for local (including hotspots on TG9), state, and regional Talk Groups. See Figure 5 for some TG examples set into the contact list.

Before creating a memory channel for a repeater, you will need to know the available TG for each Time Slot (TS1 and TS2). Then create a contact for each TG, create a channel for each TG with associated contact, and assign all channels to a zone. Usually, you will have one dedicated zone for each repeater, and the channel knob will be used to switch between Trunk Groups and Time Slots.

If you want to see the call sign of the receiving station on the radio screen instead of the DMR ID, you will have to create a contact for each call sign associated with its DMR ID. This is done in the same way as creating a TG.

Ask your local club or local repeater owner where you can find an already-built code plug for your radio. Code plugs for the TYT (Tytera) MD-380 and MD-390 are compatible with the D-500.

Getting on the Air

Navigating between memories is a completely new experience for DMR newcomers, but you will get used to it quickly. There are 16 channels in one zone, and the channel is selected with the top middle knob (channel knob). If you need to change zones (another channel bank), you must go into the menu. In Figure 6, the highlighted keys are for menu navigation.

Push the button under the MENU label on the screen to enter the menu. Use the arrows to navigate. The left button is to confirm the selection, and the right button is to go back.

Within the selected zone, you can select the desired channel using the channel knob. Once you are familiar with this radio, changing frequency is easy and straightforward. Once the channel is selected, operation is similar to traditional handheld radios.

While making a DMR contact, I received positive feedback about the transmitted audio — a little bit high pitched, but very clean and natural. In analog, the results are similar. On the receiving end, it sounds very good and there is more bass.

I noticed, during my first transmitting test, that my audio was not very loud. Later, I found out that I was talking in front of the keypad at the bottom of the radio. The microphone is located near the speaker above the display, and talking right in front of the speaker made a big difference.

This radio can scan, but you will need to add the desired channels into the scan list via the programming software. Please note that all the channels created for each TG need to be on the scan list, otherwise they won't be scanned.

Some very limited configuration can be done with the keypad. Here are a few examples: time and date, adding a contact, changing the power, backlight, and a few minor options. This radio has more configuration options available via the programming software.

Conclusion

BridgeCom's D-500 was fun to play with because it offers so much to discover. I used it for 13 hours without losing a single bar on the battery indicator. It seems to have power forever. This is a good thing if you plan to bring this radio out in the field for event communications.

If you travel with this radio, you will need to plan in advance if you want to use repeaters while on the move. Probably the main TG will be available on most repeaters, but the channels should be preprogrammed unless you carry a computer and the program-

ming cable. Because there are 1,000 memories available, all the common simplex frequencies should be programmed in advance, so when you are operating in the field, you can change channels easily.

The BridgeCom Systems D-500 (by Tekk) is a nice digital radio, with very good quality and a low price tag. During the review, I had several questions for BridgeCom, and their customer service was quick and helpful via e-mail. Bottom line — you get a lot for the price. If you've been thinking about getting into digital (DMR) communications, this unit is a good way to start without breaking the bank. For more about DMR and digital voice communication, check out my YouTube channel, **Laboenligne.ca** (or search for VA2PV).

Manufacturer: BridgeCom Systems, 102 N.E. State Route 92 Hwy., Suite C, Smithville, MO 64089; **www.bridgecomsystems.com**; tel. 816-532-8451.

Visit https://youtu.be/kEK-9V2z4W8 to see our review of the BridgeCom Systems D-500 70-Centimeter DMR and Analog Handheld on YouTube.