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Product Review

RFinder B1 Dual-Band DMR/FM Transceiver with Android Smartphone

Bottom Line

The RFinder B1 combines a dual-band DMR and FM handheld and Android smartphone into one highly capable package. The RFinder application eliminates the need for a DMR code plug, making operation easier.

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The RFinder B1 is a modern Android smartphone, and it's also a DMR/FM dual-band handheld transceiver. I'm not sure which category this radio falls into, because it does so many things. This review will focus on the ham radio features, but the basic cellular phone features will be covered as well.

The RFinder B1 combines a smart cell phone and a radio into one piece of equipment that's about the size of a typical smartphone, but thicker. The unit requires the RFinder application, which allows the radio to be configured very easily using the integrated GPS location feature with the RFinder repeater database. For DMR, this capability removes the need to keep a code plug up to date, as you only need to select the talk group (TG), the color code (CC), and you are good to go.

Overview

The RFinder B1 supports DMR and FM modes on 2 meters and 70 centimeters, one band at the time, with a maximum transmit power of 4 W on both bands. It has a 4-inch touchscreen and is resistant to dust and moisture (the radio complies with the IP67 standard). Unlike most smartphones, this unit has a large removable battery on which you can attach a belt clip or optional swivel belt loop. The 7.2 V, 2,500 mAh battery can last a long time (more than a day) as a standby phone, and a little bit less when monitoring the bands with the radio application on. With two batteries, you should never run out of power, as they can charge without the radio in the desktop charger.

The package includes the B1 transceiver, a screen protector, a battery, a standard belt clip, a hand strap, a USB-C cable, and a desktop charger with the ac adapter. You can buy optional accessories, such as spare batteries, a speaker-microphone, a swivel belt loop, and a 13.8 V cigarette lighter power cable. (This cable needs to be used with the desktop charging cradle, not directly with the radio.)

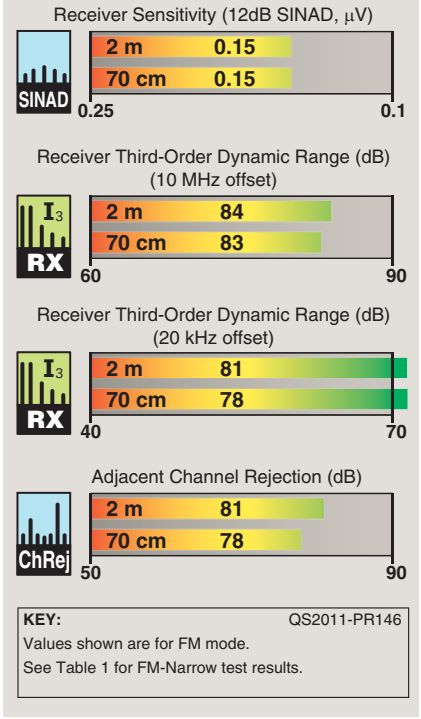
The documentation does not say how much the radio supports in terms of memory channels, DMR talk groups (TG), digital contacts, and radio IDs, but with the RFinder app, it's irrelevant because it uses the phone's memory. The device has 4 GB of RAM and 64 GB of internal storage, plus you can add two microSD cards up to 128 GB each. You won't run out of memory with the B1.

Table 1
RFinder B1, serial number S202001130395

Manufacturer's Specifications	Measured in ARRL Lab
Frequency coverage: 136 – 174, 400 – 470 MHz.	Receive and transmit: 136 – 174, 400 – 500 MHz.
Modes: FM, FM-N (FM narrow), DMR Tier II.	As specified.
Power requirements: 7.4 V dc, 2,500 mAh removable battery.	As specified.
Receiver	**Receiver Dynamic Testing**
FM sensitivity: Not specified.	For 12 dB SINAD:
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset (FM/FM-N): 146 MHz, 81/83 dB 440 MHz, 78/80 dB. 10 MHz offset (FM/FM-N): 146 MHz, 84/85 dB; 440 MHz, 83/84 dB.
FM two-tone, second-order IMD dynamic range: Not specified.	146 MHz, 73 dB; 440 MHz, 83 dB.
Adjacent-channel rejection: Not specified.	20 kHz offset (FM/FM-N): 146 MHz, 81/83 dB; 440 MHz, 78/80 dB.
Squelch sensitivity: Not specified.	At threshold: 0.05 µV (min), 0.18 µV (max). Squelch range is very limited.
Transmitter	**Transmitter Dynamic Testing**
Power output: 4 W.	High/Low power at full charge: 146 MHz, 3.6/1.2 W; 440 MHz, 4.0/1.7 W.
Spurious signal and harmonic suppression: Not specified.	(High/Low power): 146 MHz, 65/51 dB; 440 MHz, >70/>70 dB. Meets FCC requirements.

	FM	*FM-N*
146 MHz	0.15 µV	0.13 µV
162 MHz	0.15 µV	0.13 µV
440 MHz	0.16 µV	0.14 µV

Size (height, width, depth): 6.3 × 2.2 × 1.3 inches (including protrusions). Belt clip, add 0.5 inches to depth. Antenna, 6.5 inches. Weight: 15.6 ounces with belt clip and antenna.



Physical Description

This radio doesn't look exactly like a typical smartphone or handheld transceiver. Excluding the external antenna, the B1 is smaller than my iPhone XS Max, but is almost four times thicker. It's heavy — almost 1 pound with the antenna, battery, and belt clip — but I was able to use the B1 for a long time without feeling too much fatigue in my hand and arm.

This radio is very solid. I used it for a few months, and I dropped it several times by accident. Once, it fell 5 feet, right onto the outside metal doorstep of my shed with the display facing down, and there wasn't any damage or scratches. With the antenna, the B1 is about 12 inches long, so when it is standing vertically it does not take much force to make it fall over.

Figure 1 shows several views of the B1.

Front: The 4-inch IPS color touchscreen dominates the front, with the three typical Android buttons below. On the top left corner of the screen, there is a five-megapixel front camera.

Rear: At the top right, there's a 13-megapixel camera

Figure 1 — Two views of the RFinder B1.

that can record full HD video (1,920 × 1,080 pixels, 30 frames per second) and an integrated flash that is also a flashlight.

Left side: The top two buttons are for push-to-talk (PTT). The top button is for the radio, and you can use the other to operate half-duplex communication applications, such as Zello, which lets you use your phone as a walkie-talkie. Below there's a fingerprint sensor to unlock the phone. The sensor works okay, but it is not always responsive.

Right side: The connector for the optional external speaker-mic has no cover, so the pins are exposed, but the manufacturer said it's still IP67 weather resistant. There are up and down volume buttons and a USB-C port under a rubber cap. The USB port can only be used to connect the unit to a computer — it does not charge the battery.

Top: The dual-function step knob toggles between volume control or channel selection in the RFinder radio application, and on the other side, there is an inside-thread SMA male connector for the radio antenna. The GPS antenna is also on top, in between the knob and the radio antenna, under a cover with a satellite image engraved into the case.

Bottom: There is a latch to remove or secure the battery.

Under the battery: There is a rubber door that flips up to expose four slots, two for cellular service SIM cards and two for microSD memory cards.

Operation on the Air

The B1 is different from other DMR radios because it doesn't require CPS programming software for configuration. Instead, it uses its own RFinder application database from the internet. You can use it on a Wi-Fi network or on your cellular connection if you have a data plan. You can download and store your regional repeater database into the B1, if you need to use it offline. Another nice feature is that you can store your memories in the cloud, and you can restore them from the internet later. You can transfer any repeater found in the database to the B1's memory or create your own repeater listing. Unfortunately, there's no scanning feature in the RFinder application.

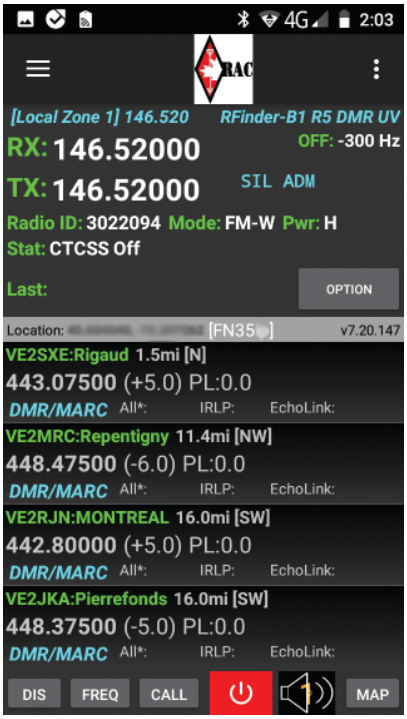


Figure 2 — The RFinder B1 application's main window.

Because the B1 relies on an Android application for operation, you will need a Google account to update the RFinder app. Just like all the other DMR radios, a DMR ID is required for operation in this digital mode (no charge for an ID; see **www.radioid.net**). You will also need a subscription to the RFinder application to use the radio. The software is preinstalled, and you can upgrade to the latest version using the Google Play Store.

The RFinder app comes with a free 30-day trial, but after that, you will need a subscription that costs $12.99 per year. It's a good value, considering that you always have access to the latest repeater and DMR ID databases. The first time you open the app, you will have to register before operating the radio. The app will ask for your DMR ID the first time you set the radio in the DMR mode.

The RFinder application main window is split into two sections — VFO settings on top and a list of nearby repeaters from the database at the bottom (see Figure 2). When in DMR mode, you can toggle to promiscuous (PROM) mode in the top section if you want to monitor all the TGs available on the repeater. There's also an **OPTION** button to activate minor settings.

The repeater database includes listings for repeaters on 10 meters through the UHF bands, and all modes including FM, DMR, D-STAR, and YSF. It's possible to filter the data for only the bands and modes supported by the B1, and that's what I did. Note that the screen is only showing DMR and FM repeaters on 2 meters and 70 centimeters.

At the bottom of the screen shown in Figure 2, three are different ways to sort the repeaters — by distance (**DIS**), frequency (**FREQ**), or repeater call sign (**CALL**). Next to **CALL** is a button to turn the radio on and off; it's grayed out when off and red when on. Next to that is a volume level indicator, adjusted using the knob on the top of the B1. You can toggle the knob between volume and memory channel by touching the indicator on the screen. If you touch **MAP**, it will show the repeaters on a map.

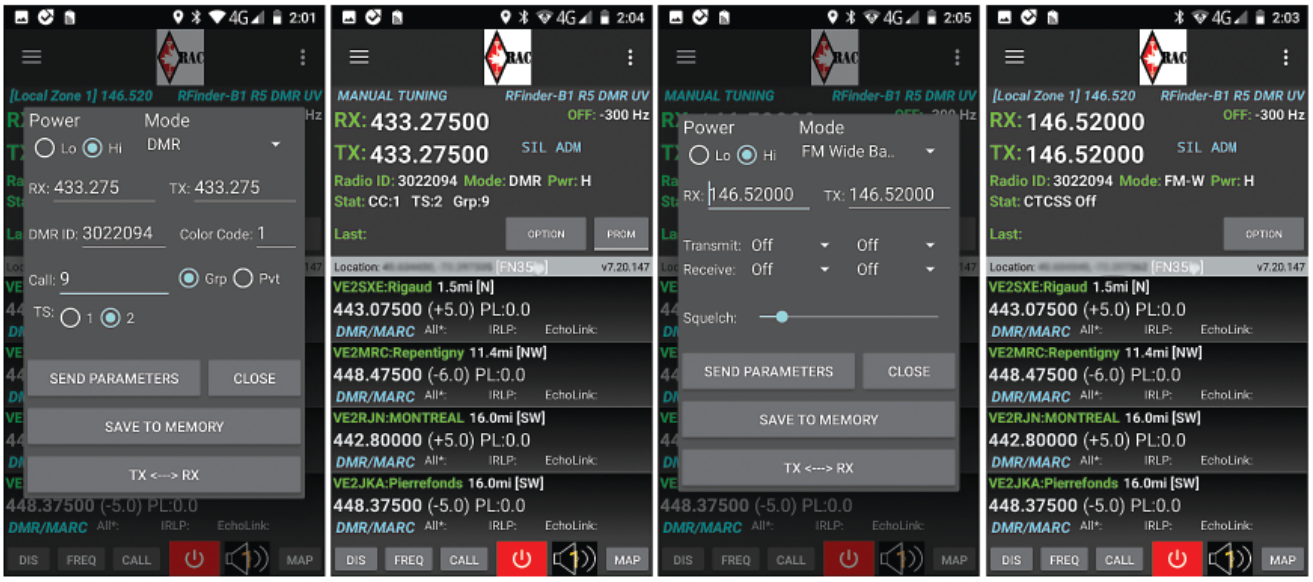


Figure 3 — Left to right, the DMR VFO setup screen, the applied DMR configuration from the setup screen, the FM VFO setup screen, and the applied FM configuration from the setup screen.

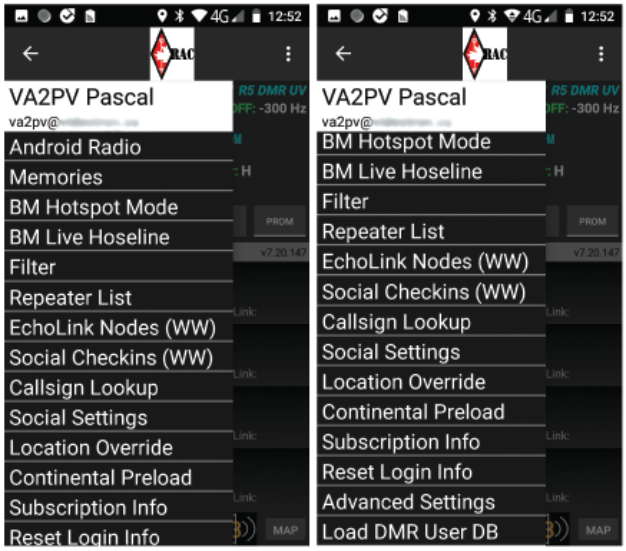


Figure 4 — The RFinder B1 menus.

Changing frequencies is easy and intuitive. Touch the top part of the screen (VFO), and it will pop up a window for manual settings. The fields will change depending on the mode, as shown in Figure 3. You must send the configuration to the radio before it's effective, and you can save the configuration in a memory. When finished, close the window manually.

When you touch the three lines on the top left corner of the screen, it will pop up the app menu (see Figure 4). Here's the description from top to bottom.

Call Sign, Name, and Email — your subscription information.

Android Radio — pops up the VFO window, same as touching the top of the screen.

Memories — to access your saved memories.

BM Hostpot Mode — call channel for your DMR hotspots to use with the Brandmeister network.

BM Live Hoseline — to listen to the latest activities on the Brandmeister network via the internet.

Filter — to filter bands and modes from the database.

Repeater List — update the repeater list on the bottom half of the screen.

EchoLink Nodes (WW) — repeater list with an EchoLink node.

Social Check-ins (WW) — If you log into Facebook from the app, your repeater check-in will be posted to your timeline. Your friends who follow you will now see your check-in on their newsfeed. If you choose to post to APRS, you will show up on APRS, and if you connect to an EchoLink node using the integration with the EchoLink app, your posting on APRS will be both local to you and local to the remote repeater. I did not test this feature.

Call Sign Lookup — search for the name and address for a call sign.

Social Settings — choose how to share your repeater check-in with APRS.

Location Override — Many app features require a GPS location, but if you're operating from an area with no GPS signals (such as from a basement), you can enter your location manually.

Continental Preload — to download your region's database into the B1 memory (for example, North America).

Subscription Info — your RFinder app subscription details, including the expiration date.

Reset Login Info — to restart the registration process. It will recognize your subscription with your email if you've already subscribed.

Advanced Settings — such as the offset for DMR (–300 Hz recommended). You will also find the OS version running on your device in this menu tab.

Load DMR User DB — to download the latest DMR ID database into the radio.

Figure 5 — The RFinder B1 Android 8.1 interface.

I tested the radio in both analog and digital modes, on both bands, using simplex, and on repeaters. It performed well in all situations and the receiver sensitivity is on par with the best amateur radio handheld I own. At first, I noticed some kind of digital DMR interference in my audio during a contact on a local repeater. This was solved by adding an offset of –300 Hz in the Advanced Settings menu.

I found one compromise compared to a standard handheld. The B1 uses an app to operate the radio, which makes changes slower to apply — even adjusting the squelch. However, with the app, you don't have to maintain a code plug, so I think the advantages outweigh the disadvantages.

The RFinder B1 application did crash on me several times, always when applying new configurations and never when operating. In the past 6 months, there were several software updates, and I'm hopeful that the future software versions will bring more stability and probably new features.

RFinder B1 as a Smartphone

The RFinder B1 runs on the common Android operating system (Android OS, see Figure 5). If you're familiar with this platform, setting it up will be easy — it's all the same, except for the dual-band radio, which has its own application.

I use an iPhone XS Max as my personal and professional cell phone, and it's the only smartphone I had on hand to compare with the B1. At first glance, I noticed that the B1 is bigger and heavier than the iPhone XS Max, and the B1's display is smaller and offers lower resolution. The iPhone weighs about 7 ounces while the B1 weighs about 15 ounces. The iPhone screen is 6.5 inches, 1,242 × 2,688 pixels versus 4.0 inches and 640 × 1,136 pixels for the B1.

The RFinder B1 uses the Mediatek 2 GHz version of the MTK6763 processor (the MTK6763V) that has eight cores. The MTK6763 was launched in 2017, so this processor is a little bit behind technologically, but is still a good choice. The B1 includes an LTE modem that supports dual-SIM (two SIM cards that can be used for separate networks). When using the B1, I noticed that it was sometimes slower to respond compared to my iPhone (which uses a newer processor) when running the same application (game), but the difference was not a showstopper.

The bottom line is the RFinder B1 is a very capable smartphone, but if you're planning on getting one to replace your current cell phone, you need to be certain that it's compatible with your network provider. Although the B1 is a global version that supports many cellular frequencies, it may not be compatible with all the cellular bands used by your provider, which may affect coverage. If you're not sure, check with your cell phone company and RFinder before buying.

These are the supported bands for the B1:

- 2G: GSM 850/900/1800/1900
- 3G: WCDMA 850/900/1900/2100
- LTE-FDD: B1/B2/B3/B4/B5/B7/B8/B17/B20
- LTE-TDD: B38/B39/B40/B41

For those not familiar with cellular terminology, 2G is the second generation network, 3G is the third generation, 4G is the fourth generation (also called LTE for Long-Term Evolution), and 5G is the newest generation.

The B1 requires a micro-SIM card, but my iPhone uses a smaller nano-SIM. In order to test the B1, I needed an adapter, which I found online for a few dollars. (Both SIM slots on the B1 are the same size.)

Technical Support

I consider myself an advanced user when it comes to digital modes, such as DMR, but the RFinder B1 confused me a bit. Before upgrading any of the software or firmware, make sure you understand the types of upgrades that are possible with this device. You can upgrade the Android OS version. You can upgrade the custom-build version with the FOTA (firmware over the air) upgrade, but this could be blocked by your internet or 4G provider, and it may be necessary to download the file manually.

RFinder recommends using their Facebook page to exchange information, ask questions, obtain the latest upgrade files, and request technical support. You will find the official Facebook group by searching for "RFinder Android Radio" or following this link: **www.facebook.com/groups/328426600855938**. You can also communicate with the company by phone or email.

Conclusion

The RFinder B1 is in a class of its own. Once you get used to using the application, it's extremely easy to operate. For DMR, it's the easiest and fastest way to get on the air, because there is no need to create or locate a code plug.

I could use the B1 as a daily cell phone, but I don't think that I would like to carry it on the job, as it's too large to fit into a pocket. On the other hand, if I were traveling and I needed a waterproof, rugged phone that can be used in the field for 16 hours without a recharge, the B1 with two spare batteries would be a very good choice. Plus, I could operate ham radio during my breaks. For travel, the B1 and RFinder app make it easy to quickly find and program nearby DMR and analog FM repeaters.

Larger versions of the illustrations in this review may be found at **www.arrl.org/qst-in-depth**.

Manufacturer: RFinder, 455 Sunrise Hwy., W. Islip, NY 11795; **www.rfinder.net** and **androiddmr.com**. Available in the US only at **gigaparts.com** and in the UK/EU only at **moonraker.eu**. Price: $999.

Visit https://youtu.be/meygFdrP_aw to see our review of the RFinder B1 Dual-Band DMR/FM Transceiver with Android Smartphone on YouTube.