Product Reviews

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Eagle One Vertical HF Antenna

Product Review

AnyTone BT-01 Bluetooth Speaker Microphone

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The AnyTone BT-01 Bluetooth Speaker Microphone accessory for the AnyTone 578 mobile radio is AnyTone's answer to mobile radios with removable faceplates so that the radios can be located anywhere in the car. The new BT-01 speaker microphone uses a Bluetooth connection to connect to the AnyTone AT-D578UVIII mobile radio. This is unique. No wiring is needed to connect to the radio.

Description

The BT-01 is about the same size as the standard AnyTone microphone, but it is about an inch longer and slightly thinner. Figure 1 shows the size comparison between an AnyTone AT-D878UVII Plus portable radio and the BT-01 microphone. Unlike the standard speaker microphone, it has a large 2.2-inch screen that contains complete information from the radio. This screen is significantly larger than the one on the AnyTone 578, which it replaces. The letters, numbers, and icons are larger and much easier to read. The screen can also be held at eye level for ease of reading at a desk or in a car. The unit has a full keypad, three user-programmable buttons with nine possible options, and all of the usual controls needed to make routine changes to the radio's operation. In addition, ports on the right side (see Figure 2) can be used to connect an external microphone and earphone along with a USB-C port for battery charging (yes, it does have a long-lasting integrated battery). The RJ-45 jack on the bottom of the BT-01 can also be used with the 4-meter Ethernet cable that comes with the unit for a wired connection; it also charges the unit. So, if you run out of battery, you can still use the mic with the Ethernet cable to the radio microphone connection, and it will charge it at the same time.

This product has been a long time coming and has been referred to by many hams as "vaporware." When BridgeCom Systems announced the availability of the BT-01, I immediately placed my order, only to be disappointed by a 3-month wait. I was excited when

Figure 1 — The AnyTone AT-D878UVII Plus (left) and the AnyTone BT-01 (right).

Bottom Line

The AnyTone BT-01 Speaker Microphone uses Bluetooth to wirelessly connect to the AnyTone 578 mobile radio. It's an alternative to mobile radios with removable faceplates. While it's practical in the station, it also makes a clean mobile setup. It's a very good solution for an RV installation.

Figure 2 — The AnyTone BT-01 right-side view with the possible connections.

I finally received the BT-01 Bluetooth Speaker Microphone. I unpacked it, plugged the provided USB-C cable into a 5 V dc power supply to charge it, and read the manual. Once it was fully charged, I tried pairing it with the radio. Like many of my experiences with new technology, my initial efforts ended in failure (more on this shortly).

Please double-check with your vendor before buying the BT-01 to ensure that your 578 model is compatible with the Bluetooth microphone.

Needed Software Updates

Unfortunately, in my haste when reading the manual, I missed the point about needing to update the Bluetooth module and other firmware in the AnyTone 578 mobile radio before using the BT-01. My failure was not too big of a problem because I like being a new adopter of cutting-edge technology. I enjoy the challenge of working the bugs out and getting things to work like they are supposed to.

My AnyTone distributor (and Google) provided some valuable videos, guidance, and instruction on what I needed to do to get the speaker microphone up and running. After spending about an hour researching the BT-01 online and watching YouTube videos, I discovered and executed the following:

1 I had to update the Bluetooth module on the radio. This could have been simpler. I downloaded a Bluetooth update file from BridgeCom Systems to my Windows computer. The downloaded zip file contained an Android Bluetooth app for that purpose, the Bluetooth update, the AnyTone 578 firmware update, the latest computer programming system (CPS) version 1.17, and instructions for all of the updates needed for the BT-01 to function. However, I discovered that it is not possible to update the Bluetooth module on the AnyTone 578 radio from Windows — it has to be done from an Android device only.

2 I transferred the Bluetooth app and the Bluetooth module update to my Samsung smartphone using a USB cable. To do this, I had to learn a little bit more about the Android operating system, the associated file structure, and my Samsung phone.

3 Once I transferred the files to the phone's download folder, I executed the AnyTone Bluetooth installation app on the phone. Initially the phone's security system would not allow the app to run. I had to click through several security-overriding screens to finally get the app running. I put the AnyTone 578 radio into pairing mode, and the connection was quickly established between the phone and the radio. The Bluetooth software on the radio was updated by the phone using the Android Bluetooth connection. It took a couple of minutes to complete, and I received a report on my phone that the update was successful.

4 Selecting the correct files to use for the updates was a little confusing, because there are two versions of the AnyTone 578 radio, along with two versions of the Android software updates that depend on the version of Android you are using. I also might have been able to download the files directly to my phone, but the interface screens on the phone are small, difficult to see, and much harder for me to use. This Bluetooth upgrade was the hardest part of the process, probably because I'm not as familiar with the Android operating system and the associated file structure as I am with Windows.

5 The next step was to export my existing code plug from the old CPS version to a folder on my Windows computer. (When the firmware in the radio is updated, the existing code plug disappears completely.) I have executed this export process a few times in the past, and it has always gone smoothly. At this point, I was ready to update the firmware in the radio.

6 The latest firmware version is needed in the radio so that it will work with the new CPS version needed by the BT-01 speaker microphone. I have done this before, so using Windows and the firmware update went smoothly. Now I had an operational radio, but without my code plug installed. The online documentation indicated that the firmware could be installed using my Android phone and the new Bluetooth connection. But, because I was more familiar with Windows, I used the Windows update process.

7 I imported the code plug that I had exported from my original CPS into the new version (1.17) of the CPS software. While that import was slow, it was successful. However, when I tried to write the imported code

plug to the radio, I got a "band error." I needed to do further research. I found a work-around, which was to load the old RDT code plug file directly into the new CPS version 1.17, then export it as I had done before from the old CPS, and then import that exported file back into the new CPS version 1.17. I believe that the export/import process resolves the file structure and associated compatibility problems. In any case, it worked, and the file was successfully written to the radio.

8 After rebooting, my AnyTone 578 radio was running fine using my old code plug. Next, I turned on Bluetooth in the radio, set it to pairing mode, and then turned on the speaker microphone and let it pair with the radio. That part was quick and easy — it worked perfectly. The speaker microphone displayed the same information that had been displayed on the 578 radio, and it seemed to be working. The radio screen now displayed **EXTERNAL BT MODE**.

9 I made a call for radio check, and my updated mobile radio transmitted okay, but I couldn't hear a response on the BT-01. I increased the volume level on the BT-01, and then audio came out loud and clear, as proven by a short QSO with Daniel, KO4JPR, and my continued use thereafter.

Using the BT-01

When the BT-01 is powered, the speaker microphone's start screen shows two choices: Bluetooth mode and cable mode. I selected Bluetooth mode and hit the green confirm button. Next, the screen displayed **INITIALIZING BLUETOOTH** and then **NO DEVICE CONNECTED**, followed quickly by **ALL DATA CHECKING...**. About 4 seconds later, the standard screen of my AnyTone 578 radio appeared on the BT-01. The unit was then ready to use. (Later, I discovered that if no selection is made, the BT-01 automatically connects by Bluetooth if no cable is present.) When I powered down the BT-01, control was returned to my radio after a couple of seconds. It is also possible to disconnect the speaker microphone from the radio by pressing the exit button on the radio.

When the BT-01 is operating in Bluetooth mode, there is a short delay when you press the push-to-talk (PTT) button before the radio actually transmits. If you don't pause before speaking, the first part of your transmission will be lost. I moved around the house to check the Bluetooth range and found it to be about 10 meters, as indicated in the specifications. The range could be less, depending on your environment. For example, if your radio station is in the basement and you bring your microphone upstairs, your range may be shorter.

Figure 3 — The AnyTone BT-01 accessories.

Next, I decided to check how the unit functions when it is connected to the AnyTone 578 radio with the provided 4-meter Ethernet cable (see Figure 3). I turned on the BT-01 with the cable connected and selected **WIRED CONNECTION**, and my AnyTone 578 radio's screen quickly displayed on the speaker microphone. The screen also showed that the speaker microphone was in charging mode. So, if you use a cable connection, you will not have to worry about keeping the BT-01 charged. The functioning was the same as with the Bluetooth connection.

The BT-01 Controls

The power button is located on the top in the center of the unit (see Figure 4). Once the unit is turned on, this button can also be used with a short press to toggle between VFO/channel mode and volume control mode. Buttons on each side of the power button are used to change the channel/frequencies and adjust the volume of the unit. The up (**UP**) control is on the right side, and the down (**DN**) control is on the left side of the power button. Directly below the 2.2-inch color screen are four control buttons. The green pushbutton on the left side takes you to the radio's menu, where you can make changes to the radio's options. The red pushbutton on the right side lets you move backwards in the menu and can take you to the various lists that may have been loaded into the radio. The function for both buttons is shown on the bottom of the speaker microphone's screen. Between the green and red

Figure 4 — The AnyTone BT-01 top view.

controls are up and down arrow buttons. They are used to move through the menus and to change the programmed zones in the radio. Below those buttons is a standard numeric keypad.

The PTT is located on the top left-hand side of the BT-01. Three user-programmable function buttons (FP1, FP2, and FP3) are located directly below the PTT button. Each can be set to respond to a short press, a long press, and an even longer 3-second press. This provides the user with the possibility of a total of nine different programmable functions.

Configuring the three programmable buttons is easy using the AnyTone 578 CPS. It is accomplished by selecting "BT Tab" from the optional settings area. Just click on the key to program (with a short, long, or 3-second press), and pick the desired function from the drop-down menu that appears. Click "OK" after making all of your selections. Be sure to save the file to your computer, and then write it to your AnyTone 578 radio. It's easy to configure the buttons directly on the BT-01. Go to **MENU**, **SETTINGS**, **RADIO SET**, and **KEY FUNC**. Then, select FP1, FP2, or FP3 with a short, long, or 3-second press, and assign a function (such as reverse to switch to the repeater receive frequency, voltage display, and TX power).

A cover on the right side of the speaker microphone allows access to a USB-C charging port and a Kenwood-style microphone/earphone jack. A small slot is used to ventilate the speaker microphone. The Ethernet port for a wired connection is located on the bottom of the unit.

There doesn't appear to be a way to select VFO/channel A or VFO/channel B from the face of the unit. To resolve this shortcoming, I programmed one of the buttons on the left-hand side of the speaker microphone to toggle this selection with a short press, as that feature is used often.

The BT-01 uses an internal lithium-ion 1800 mAh 3.7 V battery that doesn't appear to be designed for user replacement. I found that the BT- 01 operated on a full charge for about 11 hours from this internal battery. Your experience may vary depending on the amount of traffic that the microphone handles while it is powered. The battery indicator does a good job of showing the amount of charge that remains available in the battery.

The BT-01 comes with a standard AnyTone-style belt clip that is mounted on the speaker microphone with two screws. I am surprised that it didn't come with a standard microphone hanger or button, as it is unlikely that most hams will ever wear the unit on a belt like a handheld transceiver. I ordered a replacement microphone button from Amazon and mounted it on the belt clip to make hanging my speaker microphone easier when I am not using it.

The AnyTone 578 cannot be placed in its cross-band repeater mode when the BT-01 is being used to control the radio. This is because the audio circuits in the radio are being used by the BT-01. This loss of functionality should not be a problem, as this is not a common use for most amateur radio operators. When using the 578 mobile radio in cross-band mode, the user will probably use a handheld transceiver instead of the BT-01.

There appears to be an intermittent problem with the Bluetooth connection to the AnyTone 578. Occasionally the Bluetooth connection is successful, and the screen is correctly populated on the BT-01, but there is no audio output even with the volume set to maximum. This problem has occurred a couple times after closing the Bluetooth connection by pressing the exit button on the radio, and another time after using the BT-01 with the Ethernet cable connection. In both cases I had to reboot the radio and restart the BT-01 to get the Bluetooth connection to work properly again. This will probably be fixed with a future firmware release, if not already done by the time this review is published.

I have used the BT-01 exclusively for more than a month before writing this review and have discovered that the unit's screen is easily damaged. It is soft plastic, which is not as scratch resistant as it should be, but it's not a touchscreen, so you may want to add some sort of a screen protector.

Conclusion

This is an excellent product that, unfortunately, has a convoluted update process that will be difficult for

some individuals to complete. To help resolve this issue, you could contact your vendor, as they may offer to do the upgrade for you for a fee.

Now that I have the BT-01 running, I am pleased with it. However, I would like to see the implementation improved by including all of the update files on the BT-01 and then using the provided Ethernet cable between the BT-01 and the radio to apply the needed updates. I would prefer it to be a plug-and-play device with automatic updates.

In spite of its minor shortcomings, the AnyTone BT-01 Speaker Microphone is a wonderful and useful accessory for the AnyTone 578 mobile radio. I am pleased with my purchase and have found it to be well worth my long wait for delivery. Now I can sit at my computer and have easy access to my 2-meter radio, and when I am in the car, I can easily see the screen, change frequencies, and make other adjustments to the radio.

Manufacturer: AnyTone, Qixiang Building, Tangxi Industrial Zone, Luojiang District, Quanzhou City, Fujian Province, China, **www.anytone.net**. Available from various US distributors. Price: $150.

Eagle One Vertical HF Antenna

Reviewed by Mark Wilson, K1RO
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Over the years, I've used a number of different portable and mobile antennas to activate Parks on the Air® (POTA) and World Wide Flora and Fauna (WWFF) locations. I've come to appreciate antennas that work on more than one band, are easy to transport, and allow for quick setup and teardown. In the more developed and popular state parks, it's generally not okay to hang wires in trees, drive stakes into the ground, or spread out wires and guy lines that interfere with other visitors. These situations call for antennas that are self-supporting or that can work with a vehicle.

A Versatile Antenna

The Eagle One vertical antenna checks many of the boxes. The antenna uses a collapsible, lightweight fiberglass mast with a stranded-wire radiating element running up inside. The mast extends to 31 feet and is about 4 feet long when collapsed (see Figure 5). The mast assembly weighs just under 6 pounds, and the antenna is rated for 1500 W.

The antenna wire enters the mast through a hole in the bottom and is permanently attached to the inside of the tip section. When the antenna is not in use and the mast is collapsed, the excess antenna wire exits the hole in the bottom. For storage and transport, the wire is wound on hooks attached to the outside of the mast and secured with a couple of short elastic cords. To extend the antenna, unwind the wire from the hooks and feed it through the bottom hole as you extend and lock the sections. When you're finished using the antenna, lower the sections, feed the wire back out through the hole in the bottom, and wind it on the hooks.

At the bottom of the mast is an SO-239 connector for the feed-line connection and a place to attach a suitable counterpoise, such as radials, ground rods, or a strap, to a vehicle frame/body. A rubber cap at the top keeps the collapsed mast contained inside the bottom section and keeps out moisture and debris.

With the addition of a suitable counterpoise, the antenna functions as a resonant ¼-wavelength vertical antenna for 40 meters. According to the Eagle One website, it will operate on the 80- through 6-meter bands with an antenna tuner. The website also notes that a 9:1 unun (impedance transformer) at the feed point will make the antenna easier to tune.

Figure 5 — The Eagle One antenna collapses to a 4-foot-long package for transport. It takes just a few minutes to install on the optional trailer hitch mount.

Support Options

Eagle One offers several options for deploying the antenna. For the purpose of this review, I tried the trailer hitch mount package for use with a vehicle and the tripod for ground mounting. Eagle One also offers a 24-inch extended hitch mount with clearance for pickup truck tailgates and a set of clamps for mounting the antenna to an RV ladder. Various individual mounts and combination packages are available from the Eagle One website.

The trailer hitch package includes the antenna; a 2-inch diameter, 48-inch-long aluminum mounting pole; a mount designed to fit in a standard 2-inch vehicle trailer hitch receiver; a grounding clamp to attach to the vehicle, and associated hardware. Two clamps secure the lower section of the mast to the aluminum mounting pole, and the mounting pole slides into the hitch mount. The assembled antenna and mounting pole weigh about 8 pounds.

Figure 6 — The optional tripod mount uses the aluminum mounting pole that works with the hitch mount. I could not drive in the supplied 4-foot ground rods, so I secured the tripod with cement blocks. The antenna is lightweight, and it doesn't take much to keep it upright on a calm day.

The hitch mount is made from aluminum square stock and is designed to fit a standard 2-inch trailer hitch receiver. Initially the mount didn't slide into my receiver far enough to secure the hitch pin. Everything fit as expected after wire brushing some corrosion from the inside of my receiver and sanding down the corners of the Eagle One hitch mount a bit.

I used the tripod as well as the hitch mount for this review. The tripod includes three 4-foot-long ground rods that are driven through holes in the tripod feet to keep the tripod from tipping over. The supplied ground rods were too big to fit through the 5/16-inch holes in the tripod feet, so I drilled out the holes with a ⅜-inch bit. The tripod also uses the aluminum mounting pole that came with the hitch mount.

I live in New Hampshire, aka the Granite State, and it's difficult to find a spot where you can drive in three 4-foot ground rods without running into rocks. I struggled to pound one of the ground rods halfway in before giving up and using cement blocks to secure the tripod with the antenna extended (see Figure 6). Of course, your soil may be easier to work with. Another consideration for portable/park operations is rules against driv-

Bottom Line

The Eagle One vertical HF antenna is a good choice for portable operations or home stations. It's easy to transport, lightweight, and quick to set up using one of the available mounting options. Although it's a resonant quarter-wave vertical for 40 meters, you can add an antenna tuner or other matching device to use it as an end-fed wire on other bands.

ing stakes into the ground. In that case, small sandbags on the tripod feet might be a good solution. The Eagle One is so light that on a calm day, you may not need to secure the tripod at all.

Using the Antenna

The Eagle One assembly instructions and photos aren't the best, but the hardware is easy to navigate. Extending the antenna mast involves unwinding the antenna wire and pulling up the fiberglass mast one section at a time. As each section is extended to full length, twist the upper section to lock it in place. The manual warns to not pull and twist the sections too tightly, or it might be hard to get the mast to collapse. The manual also shows how to drill a small hole in the upper section at each joint and use a bit of #14 AWG solid wire to keep the sections from sliding down if they fail to lock in place.

I set up the antenna with the hitch mount and attached the ground clamp to a clean spot on the frame of my SUV (similar to using a mobile antenna; see Figure 7). Then I attached 25 feet of RG-58 feed line and checked it with my antenna analyzer. As expected, the 31-foot vertical was resonant just above the 40-meter band where it is ¼ wavelength, with an SWR of 2:1 or less across the band. There was a second resonance just above the 15-meter band (¾ wavelength), with an SWR of 2.5:1 in the band. SWR on the other bands ranged from 4:1 to 10:1, greater than the 3:1 limit of the internal tuner in the Icom IC-7300 I use for portable operations.

▼**Figure 7** — The feed point at the base of the Eagle One connector has an SO-239 connector for the feed line and a bolt for attaching a counterpoise. The large clamp resting on the trailer hitch is for connection to the vehicle frame/body, but you can also attach radials.

▶**Figure 8** — A wide-range remote antenna tuner, such as the Icom AH-730, allows the Eagle One antenna to operate on many bands with a good match for the transceiver.

In the Field

After a test run in the driveway, I headed to Mount Sunapee State Park for an activation. When I arrived, it took just a few minutes to install the trailer hitch mount, unwind the antenna wire, and extend the Eagle One mast. I clipped the ground clamp to my SUV frame, ran a feed line to my radio, and was ready to operate. I was glad that setting up this antenna went quickly on a cold winter day.

I started on 40 meters and worked 20 stations on CW. Signals were loud, and I received good reports. Next, I attached an LDG 9:1 unun at the feed point, making a 31-foot end-fed random wire antenna. This brought the SWR within range of my radio's internal antenna tuner on several bands. I was greeted with a small pileup on 20 meters and went on to make another 86 contacts.

Eagle One indicates that the antenna can operate on 80 through 6 meters with an antenna tuner, and this approach is used by several successful POTA operators. I mounted an Icom AH-730 remote tuner on the aluminum support pole and ran wires to the antenna's SO-239 center conductor and ground clamp attached to my SUV (see Figure 8). Icom specifies the tuner for operation from 1.8 to 50 MHz with a 23-foot or longer radiating element. It quickly found a match on all bands from 160 through 6 meters with the Eagle One's 31-foot wire.

A return trip to Mount Sunapee State Park with the Eagle One on the hitch mount and remote tuner netted 111 contacts on 10 bands from 160 through 10 meters. I even worked some European stations using FT8 on 80 and 60 meters around sunset. A couple of days later, I used the Eagle One and AH-730 to activate a local state forest and made 54 contacts using eight different bands. It was great being able to operate on a wide range of frequencies without changing antennas or manually adjusting coils or capacitors.

While waiting for the AH-730 tuner to arrive, I set up the Eagle One on its tripod in my yard. This time I cut

a couple of 33-foot radials for a counterpoise. Fed directly, the Eagle One tuned very much like it did on the hitch mount, except it resonated at 7.260 MHz instead of just above the band. With the 9:1 unun installed, the SWR measured 6:1 on 80 meters and 5:1 or less on all bands from 60 through 10 meters. The internal tuner in my Kenwood TS-590S was able to match the antenna on all of these bands, and I spent the afternoon making contacts with US and DX stations.

Final Thoughts

The Eagle One vertical antenna is well made using quality hardware. Thanks to the various mounting and feeding options, it's easy to tailor it to your needs.

Manufacturer: Eagle One Antenna, LLC, **www.eagleoneantenna.com**. Price: Eagle One Antenna only, $190; hitch mount, $75; hitch package (antenna plus trailer hitch mount), $235; tripod with ground rods, $65; RV ladder mounting kit, $45; motorhome package (antenna with RV ladder kit), $220.

Dr.Duino Inventor Edition (Pro Version)

Reviewed by Glen Popiel, KW5GP
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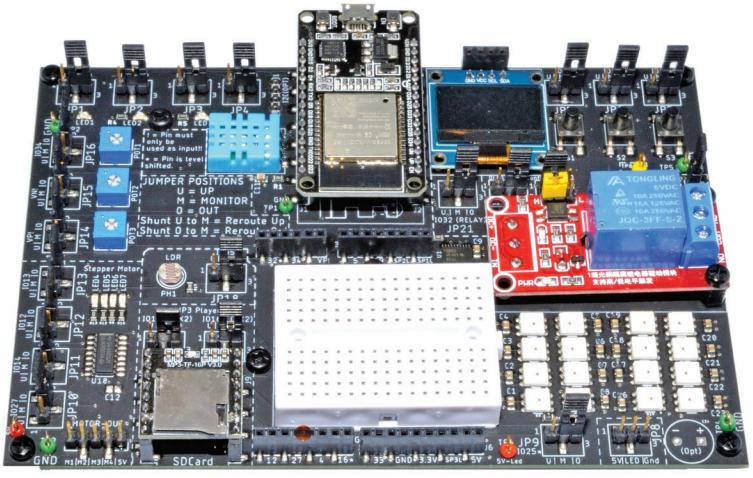

As my projects for the Arduino get more powerful and complex, the basic Arduino Uno and Nano that I primarily use are being replaced by more powerful microcontrollers, such as the STMicroelectronics STM32, Teensy, and Espressif ESP32, to name a few. In fact, there are so many new, more powerful Arduino-compatible microcontrollers that it's often difficult to choose which one to use for my Arduino projects.

Adding to this difficult decision is the lack of versatile pre-existing development platforms that allow you to design, create, and test your higher-end Arduino projects. Early on, as I began to develop Arduino projects, I quickly learned the value of a stable development platform to breadboard and test my projects. With the Uno and Nano, there are the Dr.Duino Pioneer and Explorer that I previously reviewed for the November 2020 and January 2021 issues of *QST*, respectively, but until recently, there really wasn't anything for the higher-end Arduino-compatible microcontrollers.

Description

The Dr.Duino Inventor Edition Pro is an Arduino code-compatible development system based on the Espressif ESP32 microcontroller. The ESP32-DevKit V1 module used in the Inventor consists of a dual-core 32-bit 240 MHz processor with 448 KB of flash memory, 520 KB of RAM with built-in Wi-Fi, Bluetooth, BLE, and other features that make it ideal for the Internet of Things (IoT) and other higher-end Arduino projects.

In addition to the ESP32, the Inventor Edition features an MP3 player module and speaker to play audio files from an SD memory card, a DHT11 Humidity and Temperature Sensor, a 128 × 64 organic LED display, a light-dependent resistor, a stepper motor, three potentiometers, three pushbutton switches, 16 addressable RGB LEDs arranged in a 4 × 4 matrix, a relay, and a breadboard area (see the included parts in Figure 9). A level shifter is incorporated on the board to support the Inventor's hardware, as well as provide a few extra pins for your own use.

The Inventor also has sockets on the board that allow the mounting of a standard Arduino shield. Using Dr.Duino's unique Re-Route It Technology®, you can select whether a signal is routed to the on-board hard-

Bottom Line

The Dr.Duino Inventor Edition is an ideal platform to design, create, and test your next-level ESP32-based Arduino projects.

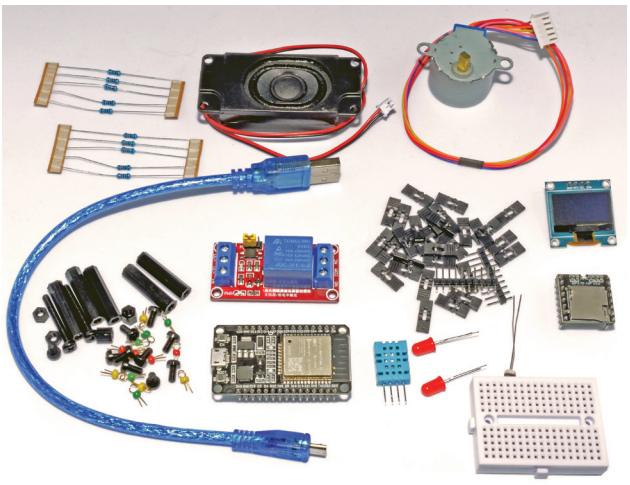

Figure 9 — The Dr.Duino Inventor Edition parts included with the kit.

ware or up to the shield connectors. This allows you to use the Inventor to initially create a project, then move it to a more permanent solution, such as a prototyping shield, when you're ready. The Inventor board is also uniquely laid out. The component for a Re-Route It jumper is mounted directly below the jumper itself, making the jumper easy to find. There is also a connector on the board that allows you to attach an external addressable RGB LED strip.

The Inventor ships as what I refer to as a "semi-kit" — the major components are already pre-soldered to the board for you. All you have to do to complete the assembly is decide if you want to mount the three optional components on the board itself or attach them using the Inventor's breadboard area. Because things tend to get lost in my workshop, I generally prefer to keep everything together, so I soldered all of the optional components to the board. The Inventor also comes with standoffs to lift the board off the surface of your work area, to prevent short circuits and damage to the Inventor board.

The manual for assembling and testing the Inventor board is completely online. This is done so that the instructions can be updated as needed. The manual incorporates an in-depth and easy-to-follow step-by-step process, with detailed color pictures. It walks you through every step of the driver, IDE and library installation, and setup process to get the Inventor up and running. A schematic of the Inventor board is also included.

One very nice feature of the Inventor board is the **AUTOMATED TEST PROGRAM** that is included as part of the Inventor's Arduino IDE library. This sketch tests every feature of the Inventor board, as well as verifies that the drivers, IDE, and library are correctly installed, allowing you to quickly verify that your Inventor board is fully functional. You could also use pieces of this sketch to create your own sketches without having to learn all there is to know about how to use a particular feature of the Inventor board. There are also a number of other in-depth example sketches included in the Inventor's library that also provide ideal starting points for developing sketches using the Inventor's hardware.

From start to finish, it took me about an hour to solder the optional components to the Inventor board, and another hour to complete the software driver and library installation and run the **AUTOMATED TEST PROGRAM** to verify that everything worked as it should. While I didn't need it for the review unit, if all else fails, Dr.Duino provides excellent support online through their help desk ticket system. All you have to do is click the help link in the manual or on their website to open a support ticket.

Conclusion

The Dr.Duino Inventor Edition is available in two versions: Basic and Pro. The Pro version (as reviewed) includes 6 months of Pro technical support, additional code samples, projects, and demos, along with 1.5 hours of step-by-step video walk-throughs of the Inventor's foundation code set. The videos are well put together and worth watching, especially if you're somewhat new to the Arduino or the hardware devices on the Inventor board.

I was really impressed by the Dr.Duino Inventor board and look forward to using it to help develop and test my future Arduino projects.

Manufacturer: Dr.Duino, P.O. Box 875, Holbrook, NY 11741, **www.DoctorDuino.com**. Price: Basic version, $349; Pro version, $499.

Yaesu M-1 Reference Microphone

Reviewed by Pascal Villeneuve, VA2PV
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The Yaesu M-1 is a lot more than just a microphone. It's not only a good-looking unit, but it's also functional, versatile, and well thought out. It's the first time I have had to read a manual to use a microphone.

Description

The Yaesu M-1 comes with two small screwdrivers (called the "dedicated alignment tool") for the microphone equalizer (EQ) adjustment, which is very clever, as it uses recessed potentiometers, and you won't change your setting just by touching the base.

Included with the M-1 is a reversible cable for the transceiver connection. On one side you have the standard eight-pin round plug, and on the other side is an RJ-45 eight-pin modular connector. On the microphone you have both connectors, so depending on your radio microphone input, you can connect the cable to the side that matches your radio. The printed manual is complete with everything you need to know about your new microphone. It comes with a cowling cap that can be attached to the microphone for a treble boost (see Figure 10). Also included is an AC adapter (SAD-22) with a micro-USB cable to power the microphone. The use of the adapter is optional if you have a recent Yaesu radio, like the FT**DX**101D, as it can provide power through the microphone connector. To use the power provided by the radio, you need to open the base of the microphone and flip a switch inside (see Figure 11). There's a **DCIN** switch with two selections, **TRX** or **DCIN**, to power from your radio — obviously, you switch to **TRX**. That's what I did, and no other cable, other than the microphone connection, is needed.

The input power is 5 V with a typical current consumption of 160 mA. The impedance is 600 Ω, and the frequency response is between 30 and 17000 Hz. The M-1 size is 5.5 inches wide with a maximum height of 11 inches (adjustable from 8.5 to 11 inches) and depth of 6 inches. The weight is 2.11 pounds without the cable attached.

The M-1 is a dual-element microphone. One is a condenser, and the other is dynamic. You can also use both at the same time to create a unique sound. Both elements can be adjusted independently, including the graphic equalizer and the mic gain directly on the microphone.

Figure 10 — The Yaesu M-1 with the treble boost cowling cap installed.

Bottom Line

The Yaesu M-1 is a high-quality microphone that provides endless possibilities to fine-tune your audio.

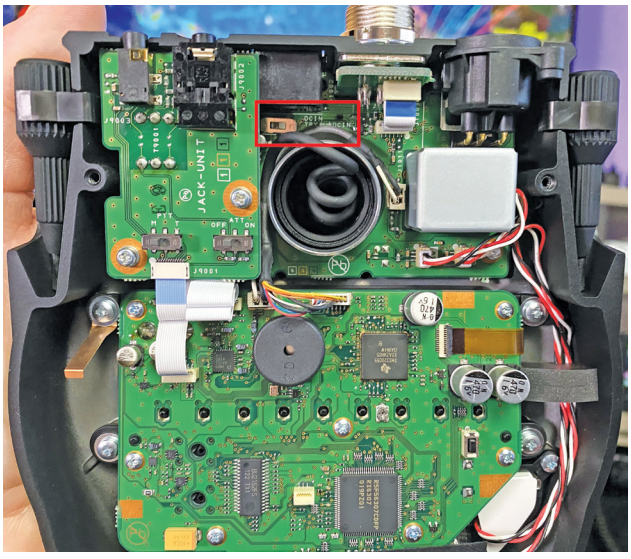

Figure 11 — The Yaesu M-1 internal **DCIN** switch to select an external power source from the transceiver.

Figure 12 — The Yaesu M-1 microphone base rear panel.

On the microphone base you have a nine-band graphic EQ with two memory settings for each element. You also have a pass-through (THR) option if you prefer using your radio's internal EQ settings. On both sides of the microphone, you have a rubber/plastic mini screwdriver to adjust the EQ and the mic gain on the microphone. This type of knob prevents the user from changing any settings unintentionally.

This is the most expensive microphone I have ever bought, but this unit screams quality, and you can feel it. It seems to be made exclusively of aluminum. I have never experienced a smooth PTT like the one on the M-1. It feels like it's sitting on a cushion of air. The manual states that the PTT key used a "contactless triple air cylinder magnetic construction [for] smooth fingertip-sensitive operations."

On the rear panel of the M-1 base, you will find many ports (see Figure 12). On the left is a **POWER** switch with **AUTO** and **ON**. In the **AUTO** position, the microphone turns on and off together with the power of the radio. In the **ON** position, it stays on when the radio is

Figure 13 — The Yaesu M-1 microphone top view of the EQ and other adjustments.

turned off (with external power). Under the **POWER** switch you have a **PHONE** 3.5-millimeter jack to use with a pair of headphones to monitor yourself and to listen to the recorded memories. If you connect the **RX AUDIO IN** to your radio, you will also be able to listen to the received audio from the transceiver. You can connect the included power sources to the micro-USB **DC IN 5V** input. I would have preferred the use of a USB-C connection instead of a micro-USB. In the middle, you will find the modular and round microphone ports to the radio, to use with the reversible cable. You will also find a balance **XLR OUT** to connect to a mixing console. If you used the XLR output, ensure that there's no phantom power on the connection, and if you keep your radio connected, you may have a ground loop with a hum. If you use the microphone with only the **XLR OUT** connection, you will need the external power source.

The Microphone Base Controls

On top of the M-1 base is where you perform all of the adjustments (see Figure 13). You can use either the condenser (**C**) element or the dynamic (**D**) element, or both (**DUAL**) at the same time. When any of these three options are active, an amber LED turns on above each of these buttons. You can deactivate the dual elements by pressing **DUAL**, and then you can select between **C** and **D** just by pressing it. There's a nine-band EQ with two memories for each element (**1** and **2**), so setting up this microphone can be a complex operation because there are so many adjustments. As an example, you can use both microphone elements at the same time in **DUAL** mode, and each element has its own EQ and mic gain control, so you can do a mix and

match of both at the same time. Also, for each element there's a THR button. When pressed, a white LED beside the button will turn on and the graphic EQ function will be bypassed. It's also usable in dual mode. You can activate any EQ on any element while one of the elements is in bypass mode (imagine all of the creative possibilities with this mic!). The low cut (**LC**) button will cut off the 200 Hz frequency by –6 dB. A blue LED will turn on when activated. Keep in mind that this function is independent of the EQ.

To prevent scratching your fancy microphone, always use the included screwdriver located on each side of the base to adjust the EQ and the mic gain. Yaesu paid great attention to detail by including two adjustment tools, so it's easily accessible for left- or right-handed operators.

There are two memories that you can use to record your audio. With a long press, the red LED will turn on in the middle of the button, meaning it's recording. A short press will stop the recording. To recall any recording, just do a short press on the button, and when it plays back your recorded audio, the middle LED will be blue.

On the microphone base is an LCD display showing the EQ adjustment. Upon pressing the **SCOPE** button (an amber LED will turn on when active), you will see a live scope of your audio output. The LCD is not directly lit, but on top of the Yaesu logo there's a gap with a white/blue LED that lights the display (helpful when it's dark in the shack). On top of the **SCOPE** button you will find a volume knob for the monitor. The **PTT** and **LOCK** buttons are self-explanatory.

Under the mic base are two switches. In the **NORM** position, the PTT needs to be held to transmit, and the transceiver will return to receive when relieved. In the **HOLD** position, the PTT will hold when pressed, and if you press again, the transceiver will return to reception. When the **RX ATT** switch is in the **ON** position, the audio signal input from the **RX AUDIO IN** jack will be attenuated by 20 dB.

On the Air

I must admit that after several months, I still need to experiment with the mic, as I don't think that my audio is as good as it can be. I received very good reports making a first adjustment by listening to myself, but one evening I got a friend to help me make the adjustment directly on the air. I didn't completely understand the dual elements, as I tuned only one EQ, but the audio improved considerably. Having two EQs per element — one setting for ragchew and one for DX — is great.

Here's my recommendation for fine-tuning the microphone's EQ: First, make sure the EQ in the radio is turned off. It's easier to do it on the mic. You may want to try mixing both EQs in the future, but this will complicate the tuning process — probably with very little improvement. Then, adjust one element at a time. Start by resetting the nine EQ bands (memory 1) to **0 dB**, and proceed with the adjustment. Then change elements, and repeat the process. When both elements are independently adjusted to your desired audio, copy your EQ settings for both elements into the EQ memory 2 (you will need to adjust the bands manually). Start from there to fine-tune the **DUAL** mode.

I also have an Expert Electronics MB1 transceiver that uses the same mic connection as a Yaesu FT-991, and the mic also works well with this radio. It is also able to power the mic directly.

Conclusion

The Yaesu M-1 is an awesome microphone that gives you endless possibilities to fine-tune your audio. Although it's an expensive unit, it is worth the price if you consider all of the included features. If you own a Yaesu radio, you have everything you need to fine-tune your audio without any other EQ. Plus, you can easily recall presets depending on your operation needs (DX or ragchew) just by touching one button on the microphone base. For me, this one is a keeper.

Manufacturer: Yaesu USA, 6125 Phyllis Dr., Cypress, CA 90630, **www.yaesu.com**. Price: $672.