QST

Product Reviews

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AF6SA Portable WI-FI Rotator Controller (PWRC)

Icom IC-905 VHF/UHF/SHF Multi-mode Transceiver System

Product Review

Icom IC-905 VHF/UHF/SHF Multi-Mode Transceiver System

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The Icom IC-905 is an all-mode transceiver system covering 2 meters, 70, 23, 13, and 6 centimeters, and with the optional CX-10G transverter module, 3 centimeters. This is, as far as I know, the first commercial product of its kind covering well into the upper microwave amateur bands in two boxes (three with the 10 GHz module).

Based on software-defined radio technology and using down conversion on the bands above 70 centimeters, it is capable of operating all modes on all bands: SSB, CW, AM, FM, D-STAR digital voice and digital data, and amateur TV (ATV, FM only).

Figure 1 — The bottom unit is the RF for 2 meters and 70, 23, 13, and 6 centimeters. The upper unit is the 3-centimeter transverter. The antenna shown is the optional AH-109PB parabolic antenna for 10 GHz (Note: the tripod and mast are not included).

The RF sections are designed to be operated remotely from the shack, putting them as close as possible to the antennas to minimize feed-line losses. The only cable between the remotely placed RF equipment (see Figure 1) and the controller is the control cable, which carries dc power and control signals to and from the in-shack controller. As anyone who has experimented with the microwave amateur bands will tell you, cable losses can seriously reduce the performance of an otherwise great set of RF equipment. Icom has very effectively minimized the amount of coax required to connect the RF equipment to the antenna by fully weatherproofing the outdoor equipment. When I recently set up the equipment for a trip to the field, I needed no more than 3 feet of coax for any band. Some hams might want to use the IC-905 in a fixed station application, and Icom has accounted for this. They supply a 20-foot-long control cable, but both 65 feet (20 meters) and 164 feet (50 meters) are available options. I used the 20-foot length for my testing. Note that Icom

Bottom Line

The IC-905 offers a great way to become operational on the popular microwave bands. The equipment is high performance and weatherproof, allowing great microwave DX opportunities without the need for expensive, low-loss transmission lines.

Figure 2 — The right side of the IC-905 main unit.

does not specify a maximum length for the control cable in the specifications for the IC-905, so it is unknown whether the user could make their own longer cable for runs longer than the 50-meter maximum sold by Icom.

As can be seen in the lead photo, Icom has styled the IC-905 after the immensely popular IC-705 HF/VHF/UHF QRP transceiver. The controller looks very much the same as the IC-705, with the same 4.3-inch touch-screen display and knobs and buttons in the same positions as on the IC-705. Most of the button and knob functions are the same as well, so becoming familiar with the operation of the radio was easy. Unlike the IC-705, the IC-905 does not use Wi-Fi; it has an RJ45 LAN connection instead to connect to the internet for remote operation.

Description

The form factor of the IC-905 main unit is the same as the IC-705, but there are way more possible connections.

On the right side of the IC-905 main unit, you have an SD card slot, an RJ45 Ethernet LAN port, a USB (type C), and the RF unit RJ45 connector for the remote RF module (see Figure 2).

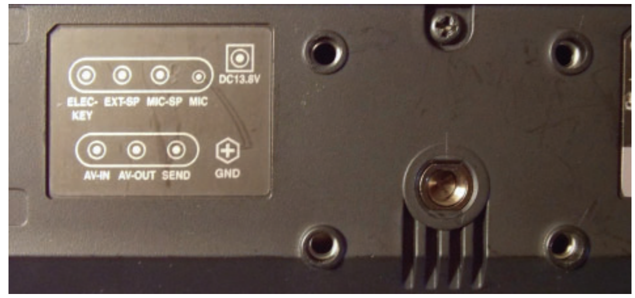

Figure 4 — The bottom view of the IC-905 main unit.

On the left side of the IC-905 main unit, you have six 3.5-millimeter (⅛-inch) female stereo-type connectors: the audio-video input (**AV-IN**), the audio-video output (**AV-OUT**), a transmit jack (**SEND**), a CW key jack (**ELEC-KEY**), and the external speaker (**EXT-SP**). The last 3.5-millimeter female connector is for the speaker connection to the supplied speaker/mic (**MIC-SP**). There's also a 2.5-millimeter female connector (four conductors) for its microphone (**MIC**). You will also find a ground terminal and the dc power connector (see Figure 3).

Under the main unit you have a few screw holes; the ¼"-20 located in the middle can be used for mounting the radio to a common camera mount like a tripod. You also have four holes in a rectangular pattern spaced at 1.181 × 1.496 inches (30 × 38 millimeters); this is for mounting solutions using the automated mounting positioning system (AMPS) standard (see Figure 4).

There is no connector on the main-unit rear panel; you will find only the heatsink (see Figure 5). There are reports that it can get pretty hot, but in my testing (which included long key-down periods in FM at full power) that was not the case.

For the description of the included RF module and the optional 10 GHz transverter, see Figures 6 and 7.

Figure 3 — The left side of the IC-905 main unit.

Figure 5 — The IC-905 main-unit rear-panel heatsink.

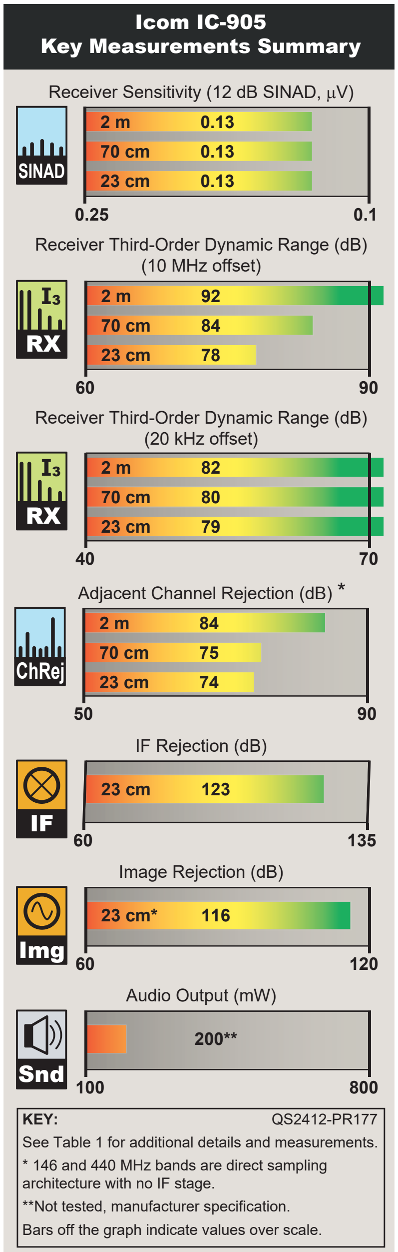

Table 1
Icom IC-905, serial number 12001065, Firmware V1.03

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Receive/transmit 144 – 148, 430 – 450, 1240 – 1300, 2300 – 2309.999999, 2390.000001 – 2450, 5650 – 5925 MHz.	As specified.
Power requirements: 13.8 V ±15%. Receive, 2 A standby, < 3 A max. audio. Transmit, < 5.5 A at max. RF output.	At 13.8 V dc: Receive, max. brightness, max. volume, no signal, 2.13 A (2.427 GHz). Transmit, 3.8 A (440 MHz) at max. RF output; no change in RF output at min. specified supply voltage.
Modes of operation: SSB, CW, AM, FM, DV, DD, ATV.	As specified.
Receiver	**Receiver Dynamic Testing**
SSB/CW sensitivity, 10 dB (S+N)/N, SOFT filter, 144/430/1200/2400 MHz bands: < –19 dBµV (0.11 µV), 5600 MHz band: < –16 dBµV (0.15 µV). Preamp on for 144/430/1200 MHz bands.	Noise floor (MDS), SOFT filter: 146.02 MHz –132 dBm (0.05 µV)* 440.02 MHz –133 dBm (0.05 µV)* 1260 MHz –142 dBm (0.02 µV)* 2400 MHz –144 dBm (0.01 µV) 5750 MHz –143 dBm (0.02 µV)
AM sensitivity: 10 dB (S+N/N), 144/1200/2400 MHz bands: < 0 dBµV (1.0 µV), 5600 MHz band: < +3 dBµV (1.4 µV). Preamp on for 144/430/1200 MHz bands.	10 dB (S+N)/N, 1 kHz tone, 30% modulation, 6 kHz BW: 146.02 MHz –115 dBm (0.41 µV)* 440.02 MHz –115 dBm (0.41 µV)* 1260 MHz –115 dBm (0.41 µV)* 2400 MHz –115 dBm (0.41 µV) 5750 MHz –111 dBm (0.63 µV)
FM sensitivity: 12 dB SINAD, 15 kHz BW, 144/430/1200/2400 MHz bands; < –15 dBµV (0.17 µV), 5600 MHz band; < –12 dBµV (0.25 µV). Preamp on for 144/430/1200 MHz bands.	For 12 dB SINAD, 3 kHz deviation, 1k kHz BW: 146.02 MHz –125 dBm (0.13 µV)* 440.02 MHz –124 dBm (0.13 µV)* 1260 MHz –124 dBm (0.13 µV)* 2400 MHz –123 dBm (0.16 µV) 5750 MHz –120 dBm (0.23 µV)

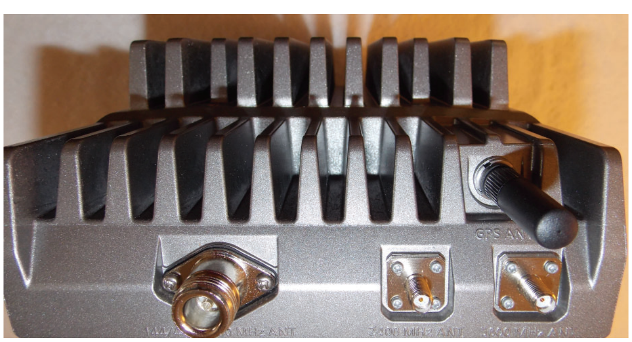

Figure 6 — Connections to the included RF module. Left to right: N-female for 2 meters, 70 centimeters, and 23 centimeters; SMA female for 13 centimeters, and SMA female for 6 centimeters. Also shown is the GPS antenna.

Overview

The package performs well on all bands. The basic system consists of two boxes: the controller (main unit) and the RF unit. In this configuration, the radio operates on the full US authorizations of the 2-meter (144 – 148 MHz), 70-centimeter (430 – 450 MHz), 23-centimeter (1.240 – 1.300 GHz), 13-centimeter (2.300 – 2.309999999 and 2.39000001 – 2.450 GHz), and 6-centimeter (5.650 – 5.925 GHz) bands. RF output is 10 W on 2 meters, 70 centimeters, and 23 centimeters, and 2 W on 13 and 6 centimeters (see Table 1 for the full specifications).

The addition of the CX-10G 10 GHz module allows operations over the full 3-centimeter (10.000 – 10.500 GHz) band at a power output of 0.5 W. Note that most hams are running between 3 and 10 W on 10 GHz, so 500 mW is a significant step down from that. Also note that Icom has made no provisions for adding a power amplifier or preamplifier to the IC-905 for any of its bands.

FM adjacent channel rejection: Not specified.	146.02 MHz, 84 dB[†]; 440.02 MHz, 75 dB[†]; 1260 MHz, 74 dB[†].
FM two-tone third-order IMD dynamic range: Not specified.	20 kHz offset, 146 MHz, 82 dB; 440 MHz, 80 dB; 1260 MHz, 79 dB, 10 MHz offset, 146 MHz, 92 dB; 440 MHz, 84 dB; 1260 MHz, 78 dB.
FM two-tone second-order IMD dynamic range: Not specified.	146 MHz, 109 dB, 440 MHz, 104 dB.
IF rejection: Not specified.	IF rejection[‡]: 1260 MHz, 123 dB; 2400 MHz, 129 dB; 5600 MHz, 140 dB.
Image rejection FM: 144/430 MHz > 60 dB, 1200/2400/5600 MHz > 50 dB.	Image rejection[‡]: 1260 MHz, > 116 dB; 2400 MHz, 122 dB; 5600 MHz, 121 dB.
S-meter sensitivity: Not specified.	S-9 signal (–93 dBm): 146 MHz, –97 dBm (3.23 µV); 440 MHz, –98 dBm (2.85 µV); 1260 MHz, –98 dBm (2.85 µV); 2400 MHz, –97 dBm (3.23 µV); 5600 MHz, –97 dBm (3.23 µV).
Squelch sensitivity: Not specified.	At threshold/maximum level, FM: 146 MHz, 0.09/4.5 µV; 440 MHz, 0.09/3.7 µV; 1260 MHz, 0.10/4.0 µV.
Audio output: > 0.2 W into 8 Ω at 10% THD.	As specified. THD 0.45% at 1 V_{RMS}.
Transmitter	**Transmitter Dynamic Testing**
Power output: 144/440/1200 MHz, 10 W (all modes except AM), 2.5 W AM; 2400/5600, 2 W (all modes except AM), 0.5 W AM	As specified.
Spurious-signal and harmonic suppression: 144/440 MHz; > 60 dB, 1200 MHz, > 53 dB, 2400/5600 MHz; > 46 dB.	144/440 MHz; > 70 dB. All others as specified. Complies with FCC emission standards.

Size (height, width, depth, excluding protrusions): 3.3.× 7.9 × 3.2 inches (control head); 3.4.× 6.8 × 8.3 inches (RF unit).
Weight: 2.1 pounds (control head); 7.1 pounds (RF unit).

All tests performed with unit GPS locked.
*Testing performed with preamp on.
†Measurement was noise limited at the value indicated.
‡146 and 440 MHz bands are direct sampling architecture with no IF stage.

The system operates on 13.8 V dc. As mentioned earlier, the multi-conductor control cable carries all power and signaling between the controller and the RF equipment. The review unit includes the optional 10 GHz module, and it connects to the lower-band RF unit with another short multi-conductor control cable (supplied), a short BNC-to-BNC coaxial cable (supplied) to feed the 10 MHz reference to the optional 10 GHz module, and a short IF coaxial cable with SMA male connectors on each end (not supplied). Each piece of RF equipment has the appropriate RF connectors for the antenna connections. The 2-meter, 70-centimeter, and 23-centimeter bands are all connected through a common Type-N female connector, while the 13- and 6-centimeter bands are connected to the antennas via separate SMA female connectors (see Figure 6). The 3-centimeter optional module also uses an SMA female connector for its antenna connection (see Figure 7). The setup of the equipment is simple. Icom supplies solid stainless-steel mounting brackets and hardware for each antenna and for the 10 GHz transverter module. Once the brackets for the RF modules have been mounted, the RF modules' mounting screws slip into notches in the brackets and are tightened, securing the pieces. The control cables connect only one way, so there is no chance to make a mistake, and the RF cable connectors are clearly marked.

Figure 7 — Connections to the optional CX-10G 3-centimeter (10 GHz) module: power and control (far left); 10 GHz (SMA female) antenna (left center), and **REF IN** 10 MHz reference from the lower-frequency unit (BNC), 13-centimeter IF, and 13-centimeter antenna (both SMA female; right).

The radio does not have a "bandswitch" per se. In keeping with the similarity to IC-705 and IC-9700 functionality, to change bands you use the touchscreen and touch the "MHz" portion of the displayed frequency. This brings up a menu of the six available bands (the band stacking register), and you just touch the desired band and the radio goes either to the default (if no previously used frequency has been entered for that band) or to the

Figure 8 — Band stacking register ("bandswitch"). You can also manually enter a frequency in the radio's operating range using the **F-INP** button.

last used frequency on that band (see Figure 8).

The touchscreen display is the same as the one used in the IC-7300, IC-9700, and IC-705. It includes a waterfall spectrum display (a very useful feature on the microwave bands where the frequency error of stations you're trying to work can be significant). The waterfall spectrum display allows you to select the amount of the band you want to view, and you can see when there's a station off your frequency. You can also select an audio scope function to view your own TX audio, as well as a full-function meter to monitor the radio's operation.

The review unit was first supplied with three optional antennas from Icom. They are the AH-24, AH-56, and AH-100 for 2.3, 5.6, and 10 GHz, respectively. They are compact, omnidirectional antennas with low gain. Icom claims their gain to be 4 dBi, 5 dBi, and 5 dBi, respectively. I attempted to make contacts using them on each of the three upper microwave bands, unsuccessfully.

Figure 9 — The three omnidirectional antennas offered by Icom for 2.4, 5.6, and 10 GHz (Note: these are low-gain antennas and are vertically polarized).

Table 2 — Icom IC-905 VHF/UHF/SHF Multi-Mode Transceiver System

Current Drain for Each Band, in Receive and Full Power Transmit (not tested in the ARRL Lab)

Band (MHz)	RX (A)	TX (A)
144	1.9	3.8
432	1.9	4.3
1296	2.0	4.7
2304	2.3	2.9
5760	2.4	3.1
10368	2.6	3.5

These antennas are omnidirectional and vertically polarized, and in the US pretty much all weak-signal microwave ham work is done using horizontal polarization. For temporary or portable installation, it is possible to rotate the antennas 90 degrees to accomplish the vertical to horizontal polarization, but this may compromise the waterproof integrity of the antenna. Operators running short point-to-point links (ATV, perhaps?) might be able to use these compact antennas, but they aren't suitable for DX work. Note: If you decide these antennas are for you, I suggest you mark each with its band of operations; the only frequency marking on them is on the bottom, and if you use the supplied mounting brackets, you cannot tell them apart — they look identical! I also received the Icom AH-109PB parabolic antenna for 10 GHz and used it with much better results. Figure 9 shows the three omnidirectional antennas available from Icom. Figure 10 shows the parabolic antenna. Icom does not offer high-gain, horizontally polarized antennas for the bands below 10 GHz. To have a useful signal on the other bands, I used a short loop Yagi on 1296 MHz and a 24-inch homebrew parabolic dish on 2.3 and 5.7 GHz. On 2 meters and 70 centimeters, I used an old dual-band Yagi with four or five elements on each band.

On the Air

I enjoyed operating the IC-905. I have many years of experience building and operating my microwave ham station at home. I operate on all the ham bands from 1.8 MHz to 122 GHz. I have built most of my microwave equipment. But to me, this was a nice change, not having to concern myself with packaging and weatherproofing the outdoor equipment, wondering if it would survive. The gear is well made and should last a long time outdoors without significant maintenance. It has built-in GPS, so all bands are locked to that reference and spot-on in frequency. It was fun to change bands. At my home station, I have to throw switches to select the band, make sure the correct IF radio is switched on, and ensure I have a CW key plugged into the correct IF radio. The IC-905 does it all in one control unit — very convenient! Just touch the band screen and it's ready to go. I ran my tests using battery power, and Table 2 shows the measured current drain for each band, running full RF output power for each.

A newcomer to VHF/UHF and microwave operation will find this radio to have a couple of advantages over other low-powered VHF/UHF units such as the Icom IC-705. While the specifications for both are similar on the 2-meter and 70-centimeter bands in terms of output power and sensitivity, one advantage the IC-905 has is that it is designed to be operated outside as close as possible to the antennas, thereby minimizing the losses associated with long feed lines. Plus, the IC-905 runs a full 10 W output on the 23-centimeter band, a ham band that the IC-705 and other QRP HF/VHF/UHF radios don't cover.

From my portable test site in FN02xu (western New York between Rochester and Buffalo), I was able to easily work a number of stations at various distances on both SSB and CW on all the bands. But the highlight on 10 GHz was a contact on CW with N8IUP when he was in EN81rj in Ohio; this is a distance of 403 kilometers between us! Figure 11 shows my operation from FN02xu in western New York.

For my testing, I manually moved the cable from the Type-N connector on the controller to the appropriate antenna for 2 meters and 70 or 23 centimeters. I recommend use of either a multi-position coaxial switch or a high-quality triplexer to make band changing simpler.

With the short coax connecting the radio to my 2-meter and 70-centimeter antenna, I found the performance to be excellent. I got (and gave out) great signal reports from everyone I worked, and they also commented on the excellent audio quality.

Figure 11 — The system set up for six-band operations in FN02, showing the short RF cables needed between the antennas and radio. The dual-band Yagi, short loop Yagi, and dish in the center of the tripod are not supplied by Icom. The setup of the equipment was simple and took no more than a few minutes to be fully operational.

Figure 10 — The AH-109PB parabolic dish antenna available from Icom. This antenna would be a good choice for 10 GHz DX work.

Conclusion

The amateur radio market is pretty small. That said, the amateur radio microwave market is tiny! It's surprising to me that a major manufacturer of equipment for hams would spend the time and money to develop equipment that will appeal to a very small group of people. But Icom did, and this product is a fine example of the great equipment Icom produces. It can do just about anything a ham experimenting with the microwave bands would want to do, including weak-signal work, FM/repeaters, amateur TV, and digital voice/data on the most popular microwave ham bands. Comparing it to the "classic" approach to the microwaves (building and testing transmit and receive converters, preamps, power amplifiers, etc.), the IC-905 stacks up very well in terms of price and performance. I think this is another winner for Icom and the amateur radio community!

Manufacturer: Icom America, 12421 Willows Rd. NE, Kirkland, WA 98034, **www.icomamerica.com**. Price: main unit, $2,995.95; CX-10G 10 GHz transverter, $999.95; AH-24 2.4 GHz collinear antenna, $349.95; AH-56 5.6 GHz collinear antenna, $349.95; AH-100 10 GHz collinear antenna, $349.95; AH-109PB parabolic 10 GHz antenna, $999.95.

AF6SA Portable Wi-Fi Rotator Controller (PWRC)

Reviewed by John Leonardelli, VE3IPS
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Amateur radio operators who operate in the field or portable may eventually need to rotate a VHF/UHF Yagi antenna, a Buddipole, a tri-band dipole, or any small HF Yagi. Rovers in the ARRL Sprint contests also need to be able to rotate their Yagi antennas — usually with an antenna array mounted on their vehicle. Radio clubs that participate in ARRL Field Day also require an antenna rotator solution to improve their signal strength and maximize scores. Most hams who operate from home use large antennas requiring larger rotators, but if you use a low-noise loop or a Yagi like the Arrow or Elk antenna for satellite use, these can also benefit from the use of a rotator. I looked at various TV rotators (Channel Master, RCA, RadioShack, and Digiwave brands), but I realized I would need to use a power inverter to supply the required 120 V ac in the field, as well as connect the control box with a three-wire rotator cable.

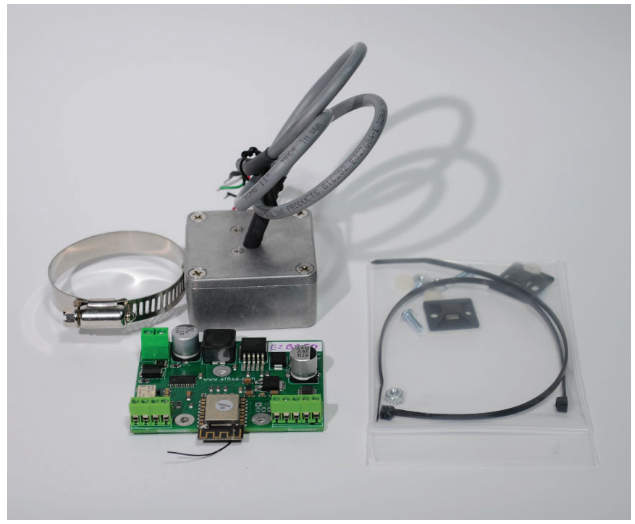
I wanted to be able to use my solar-powered 12 V dc power system, rotate various antennas, and be able to know where the antennas are pointed. I found a solution that solves my needs and more: the Portable Wi-Fi Rotator Controller (PWRC) manufactured by Stefan Nicov, AF6SA.

Description

The PWRC is a pre-built kit with an optional electronic compass module. It is powered by 12 V dc allowing battery-powered portable operation. The PWRC interface board mounts inside the rotator housing. It uses the electronic compass module (it is Wi-Fi enabled) that also allows the direction information to appear on a web-based application. The web-based applications do not require any software downloads, and they use your internet browser to access the device. The web interface is also used to provide setup menus and rotator direction controls. It will, once calibrated, show the antenna direction (see Figure 12).

Bottom Line

The PWRC is a great choice for operators needing a 12 V dc-powered antenna rotation solution. The ability to use the web-based application on any smartphone will simplify operations and ultimately improve contest scores and DX contacts.



The only connection to the PWRC is the 12 V dc cable; the three-wire rotator cable is not needed, as the start/stop buttons are all done on the web interface. The power source must supply 2.5 A, which is drawn only during rotation.

The TV rotators are usually able to rotate the smaller lightweight HF Yagis and can easily manage VHF/UHF Yagi antennas. These lightweight TV rotators could manage wind loads of 1.5 square feet if mast mounted, and 3 square feet if mounted in the tower on a rotator plate.

The PWRC uses the Wi-Fi (802.11n) network interface and can be set up as its own access point or can connect to an existing network. The web interface is useful, as it provides direction information and allows point-and-click control of the antenna heading or uses a grid locator for azimuth and distance information.

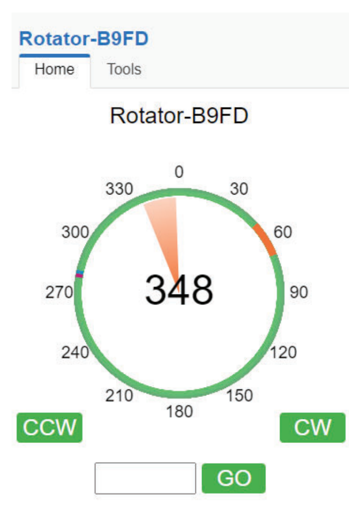


Figure 12 — The PWRC web-based application main menu.

The PWRC configuration menu offers the ability to change the variable motor drive speed (30 to 80 Hz) and acceleration and deceleration velocity profiles. For those using automation applications, the PWRC also supports a Telnet interface that allows compatibility with *PstRotator*, or you can use the UDP packet listener to integrate with *N1MM Logger* or *DXLab Suite*. The software built into the rotator module is powerful and has a wealth of features not available on the basic TV rotator control box. Contesters will find the integration to be very desirable.

The PWRC provides what I wanted: 12 V dc operation; fast deployment; antenna rotation with direction information; the ability to connect to the PWRC with a laptop, smartphone, or tablet using the internet browser, and a Wi-Fi connection that makes this device even better than I initially realized.

PWRC Interface Board Installation

The kit came packed nicely with mounting hardware, the interface board, and the electronic compass module. The interface board will mount inside the TV rotator housing and requires the drilling of three holes. A drilling template is provided in the comprehensive user manual available for download from the web store (see **http://af6sa.com/projects/Kits.html**).

Once the holes are drilled into the rotator housing base plate, the board can be mounted accordingly. The board is connected to the rotator motor, and a 12 V dc cable is connected to a power source at the radio location. The optional electronic compass module in its sealed metal box comes with a mounting strap and is mounted to the antenna mast and then connected to the PWRC board. Installation took about 30 minutes. I used the Channel Master 9521 host rotator. My use cases are for portable operations with a 20-foot mast and 30 feet to the radio equipment. I used the suggested #14-gauge wire for the power cable for a 50-foot length (see Figure 13).

Web Interface Configuration

After the hardware installation, it's time to connect to the controller using the web application. Using Wi-Fi, the PWRC can be set up and operated in two modes: Access Point (**AP**) and Station (**STA**). Access Point provides access to the Wi-Fi network with a Dynamic Host Configuration Protocol (DHCP) for up to five devices. This means that five users can rotate the antenna. This mode is ideal for connecting your laptop/tablet/smartphone while portable. Once credentials are entered, the blue LED blinks once per second.

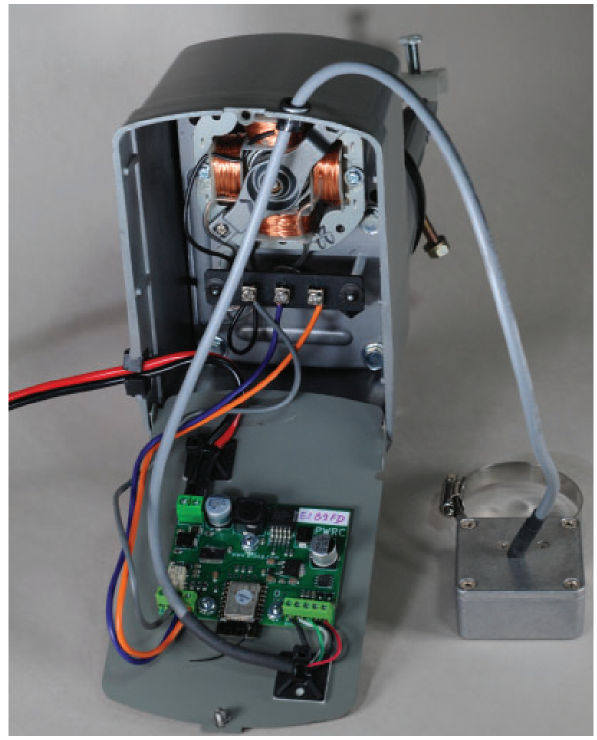


Figure 13 — The PWRC wiring.

The Station mode allows you to connect to an existing 2.4 GHz Wi-Fi network using a dynamic IP address (via DHCP) or with an assigned fixed IP address. Your credentials will include the service set identifier (SSID) of the network you are connecting to. The blue LED blinks twice per second. I suggest you set up everything indoors and have the rotator plate hanging down so you can see the blue LED.

When starting for the first time, the PWRC is in Access Point mode, which is the mode I want to use. Connect your device (smartphone, tablet, or PC) to the controller Wi-Fi network that will appear with the name "Rotator-xxxx," open a web browser, and enter the following link: **192.168.4/setup**. I was able to connect to the SSID named "Rotator-B9FD" using the supplied password. A new page is presented with the new DHCP-assigned IP address.

Now using the web browser, connect to the new assigned IP address. In the main configuration page, you can rename your host whatever you like — "VE3IPS-Rotator," for example — and add a new web admin name and password. You can leave it blank for access by anyone. Next, you can change the network SSID and password from the default settings. I did not use the static IP settings, so I left this blank.

The **TOOLS** tab allows you to make any changes to the system. The **ROTATOR** section allows you to change the braking, speed, acceleration/deceleration, and even your Maidenhead grid coordinates. Calibration is also done on this screen. For logger integration, you can change the UDP control port to what is required in your scenario (see Figures 14 and 15).

I ended up doing a calibration routine with my initial antenna set up in my backyard. You can calibrate the PWRC with or without a compass. It's very simple, as the rotator will operate counterclockwise to a hard stop, then rotate clockwise to calibrate the compass. It is recommended to do this every time you move the rotator to a new location. This is a quick process.

Web Interface Operating

The application is accessed by using the **HOME** tab in the application or pointing your browser to **http://192.168.4.1/setup**. The **MENU** tab will not be available, and it is protected by your web admin password. I left it blank so other users can access the rotator.

With a 360-degree circle showing degradations and the current antenna heading, I can enter the Maidenhead grid and it will rotate to that direction. You can also click/tap around the green circle to point and shoot, or click/tap and hold the arrow until it points in the direction you want, then release to stop (see Figure 12).

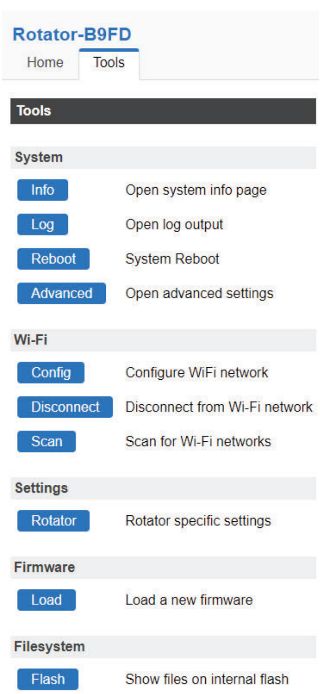


Figure 14 — The PWRC application **TOOLS** menu.

All details are stored in the internal flash memory, and you can modify the web interface to meet your needs. AF6SA has done a great job with the application, and I saw no need to customize anything. I tried this with my Google Pixel smartphone and HP Stream Netbook. The *N1MM Logger* and *PstRotator* integration are just as easy to configure.

Use Case 1

My first deployment

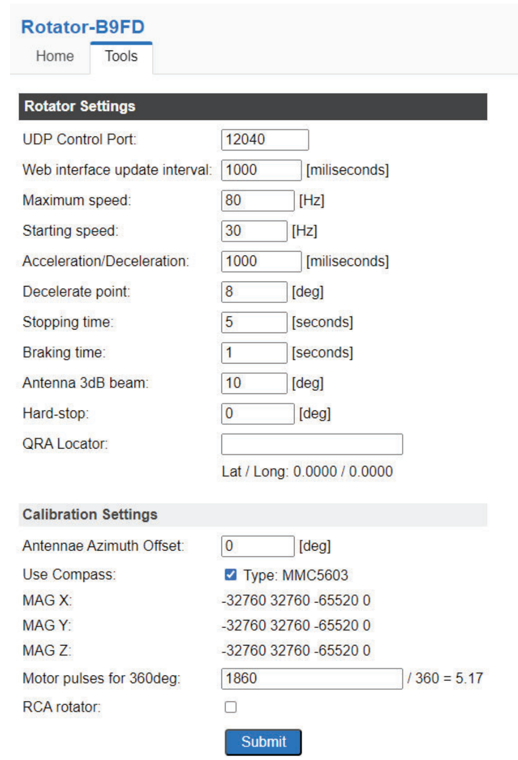


Figure 15 — The PWRC application **ROTATOR SETTINGS** menu.

was to use my DX Engineering RF-PRO-1B or the MFJ-1888 low-noise amplifier loops that I purchased at Hamvention last year. I had initially mounted the loop on a rugged video tripod and deployed it in my backyard, as needed, while I figured out where I would install it for its final location. These low-noise loops are awesome for low-band listening, and with two of them there is an opportunity for loop phasing. I was planning to have one at home and to use the other for portable operations. I brought one to ARRL Field Day last year to be used with the DX Engineering RTR-2 but found that I was a bit annoyed to have to leave my operating position to rotate the loop manually many times to peak signals.

The PWRC allows me to rotate the loop antenna easily, and everything is powered from a 12 V dc source, allowing easy connections to my RIGrunner distribution block back to my battery system. I have also found the loops to be fantastic for listening below the ham bands for medium-wave DXing or non-directional beacon hunting, and the ability to rotate the antenna is a must (see Figure 16).

Use Case 2

I am active in experimenting with signals above 30 MHz, and find the ARRL contests and sprints a great way to make contacts and try different antennas. My home location isn't great for this type of activity, so I take my

Figure 16 — The PWRC setup with a low-noise loop.

setup out to a local park that has a nice elevated area. I use a rugged video tripod for deploying 6-meter to 23-centimeter (1.2 GHz) small Yagis. For roving I use a 20-foot aluminum mast mounted on my car hitch mount. All of these are rotated using the "armstrong" method. I usually will call CQ, manually rotate the antenna, call CQ, and rotate the antenna again. Depending on the weather, I may jump in and out of my car too many times to count, searching for elusive grid squares.

The PWRC solves this problem nicely with the ability to power the rotator with a 12 V dc source and rotate it remotely from inside my car.

Use Case 3

For HF operations, several antennas that I deploy would benefit from rotation. I use the Buddipole system as a dipole or as a 10-meter two-element Yagi. A tri-band dipole (actually the driven element of a Hy-Gain tri-band) is also used, and I use that with ICE band-pass filters and a triplexer for 10-, 15-, and 20-meter operations. These filters allow three bands to be used simultaneously with an operator on each band for Field Day or POTA operation. I have a Hy-Gain TH-3JR that has a wind load of 3.4 square feet, which is too much load for the TV rotator, but if I remove the director, then it's doable. I look forward to trying that for Field Day. If the wind is too high for a three-band dipole, using the driven element of a Yagi will be ideal.

Use Case 4

For satellites, rotation is needed to be continuously aligned with the satellite as it passes overhead. Rotators that offer azimuth and elevation adjustments are the foundation of a satellite station. However, good results have been achieved with having just the azimuth rotated and leaving the elevation at a fixed angle. This makes it easier to work the satellites, as I can concentrate on adjusting the Doppler shift on the radio and logging contacts and periodically nudging the rotator direction using the web application on my smartphone. It's a trade-off, but there is an opportunity to adjust the elevation manually. The Arrow and Elk brands offer satellite antennas that are an ideal fit for the PWRC system.

Use Case 5

Computers have brought automation into our radio shacks. The integration with the popular *PstRotator* is a useful feature. *PstRotator* is a versatile software application designed for controlling antenna rotators. Whether you're a ham radio operator, satellite enthusiast, or DX chaser, *PstRotator* offers a range of features to enhance your antenna tracking experience. The PWRC also supports *N1MM Logger* for rotator integration. I look forward to experimenting further with these integrations and software applications.

Conclusion

I am now able to operate the rotator from a 12 V dc solar/battery system and rotate my VHF/UHF antenna stack or a small HF antenna. I can connect my laptop/tablet/smartphone directly to the rotator web interface using the Wi-Fi network for rotation control. My contest scores and DX contacts will now improve with the ability to use directional gain antennas or turn low-noise loops away from interference to improve readability. The simplicity of a pre-built kit, no soldering, and a great software application make portable rotation very easy to use.

Manufacturer: AF6SA, **www.af6sa.com**. Price: PWRC controller without the compass, $119; PWRC controller with the compass (reviewed unit), $199.

HAMRS Logging Software

Reviewed by Harold Kramer, WJ1B
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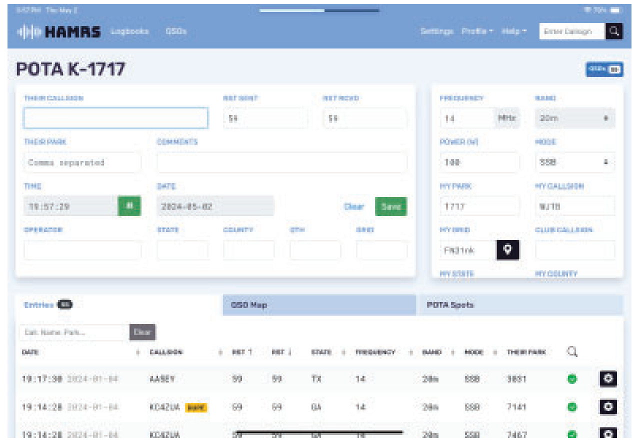
HAMRS is a fast, easy-to-use logging program specifically built for portable operations such as POTA, SOTA, or ARRL Field Day. *HAMRS* is similar to other logging programs but is optimized to run on small screens and multiple platforms, and it provides specific log fields and functions for portable operating activities. It was created by Jarrett Green, KBØICT, who has deliberately kept it straightforward and easy to use.



HAMRS runs on macOS, iOS, Windows, Ubuntu Linux, and Raspbian. It runs fine on my iPhone, iPad, HP Windows 10 shack computer, and Dell Windows 11 laptop. I had my friend Martin Ewing, AA6E, install the program on his Android phone, and it also ran fine on that operating system.

While the macOS, Windows PC, Ubuntu, and Raspbian versions are free for download from the manufacturer's website (**www.hamrs.app**), the *HAMRS* mobile version needs to be purchased and downloaded from the Apple App Store (for an iOS device, it's the same app for iPhone and iPad) or from the Google Play Store for Android users. The price is reasonable — a cup of coffee at my local coffee shop costs more!

Installation and Setup

In this review, I will discuss running *HAMRS* on my iPad, which is the device that I use for logging during POTA activations.

After downloading *HAMRS*, you create a profile including your call sign and name. You then go to the **SETTINGS** menu and select your choice of QRZ, HamDB, or HamQTH as your call sign lookup provider. I chose QRZ because I am a member. While *HAMRS* operates fine without internet connectivity, it does require the internet to look up call signs in real time. My iPad does not have a SIM card with an internet data plan, so during POTA activations, I use my iPhone as a Wi-Fi hotspot for the iPad to provide internet access for call sign lookups. Once an internet connection is established, whenever a call sign is entered in the **THEIR CALLSIGN** field, that station's information appears in a blue box in the upper right-hand corner for about 10 seconds. If the call sign is not in the QRZ database, a red box appears with the message **CALL NOT FOUND**. This feature has minimized the number of mistakes that I make entering call signs during my POTA activations. Another useful feature is that a green box appears in the same screen location when you are spotted on the POTA app.

Setting up a new logbook is easy. Tap the **NEW LOGBOOK** button, and a pop-up box will appear where the name of the log, such as "20M POTA US-1776," is entered. The user is then offered a choice of five custom templates: Generic, Parks on the Air, Summits on the Air, Field Day, or Winter Field Day. Each template has specific fields for particular operating events (see Figure 17). For example, the POTA log template has fields where you enter **MY PARK** and **THEIR PARK**, and similarly the Summits on the Air template has fields for **MY SUMMIT** and **THEIR SUMMIT**.

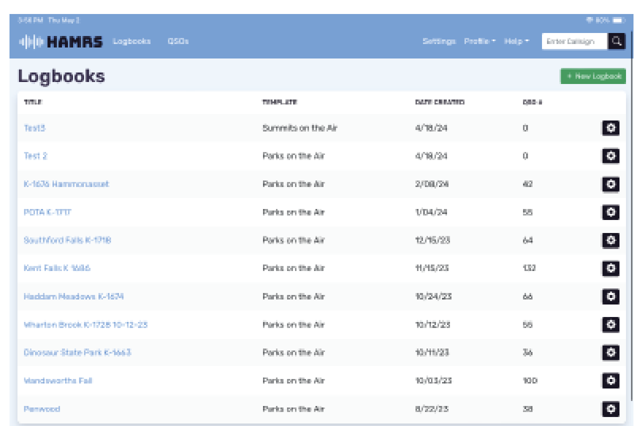


Figure 17 — The iPad *HAMRS* application logbook screen.

Bottom Line

The *HAMRS* logging software is easy to use, light, and fast. It's free to download for macOS, Windows PC, and Linux. The iOS and Android versions offer a great solution for portable operations at a very low cost.

Operation

HAMRS has an intelligently laid-out, well-organized user interface. On the iPad version, the left side of the screen is organized by contact information including the call sign signal report, date, time, and location. The right side is organized by your station's operating information including band, mode, park, grid, etc. This information is displayed vertically rather than horizontally on the iPhone version (see Figure 18). Another nice touch is that when characters are entered in a field, they are all upper case. There is no need to switch between upper- and lower-case letters.

Before you begin logging contacts, you need to set the date and UTC time. These are set automatically on iOS devices. You then enter your station's band, mode, power, park number, grid, and country. These fields remain the same from QSO to QSO unless you change them. Once everything is set up, to log a contact, you enter the contact's call sign and hit **SAVE**, and the data goes into the log automatically. This makes contact entry very fast.

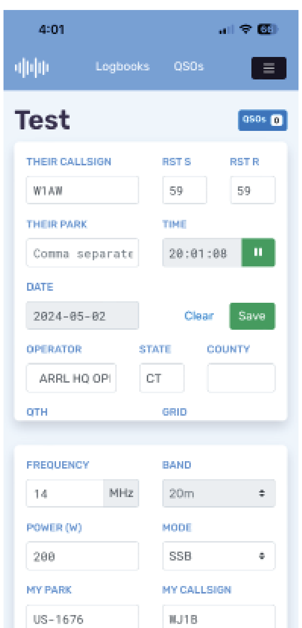


Figure 18 — The *HAMRS* application showing the **IPHONE CONTACT ENTRY** screen.

On the iPad or iPhone, completed QSOs are displayed on the first tab in a table below the operating fields. The Windows version can also display QSOs in either table format or boxes similar to the POTA web app. In table format, fields can be sorted in ascending or descending order. A specific call sign can also be queried from the database.

Two additional tabs are adjacent to the log table in the POTA template. The second tab displays a QSO map of all the QSOs in the log either with or without their call signs, and the map can be zoomed in and out. However, there is no way to download the map. When *HAMRS* is connected to the web, the third tab displays POTA spots in real time. These can be filtered similarly to the filters on the POTA web app. An individual spot on the display can be entered into the log by pushing the **COPY** button on the displayed spot.

When a log is closed, you can edit, duplicate, export, or delete a log. I use the **EXPORT.ADI** function to upload the iPad .adi file into my Dropbox account while I am at the park. When I return to my home station, I use a Windows ADIF utility program (ADIF Master) to create an upload file for the POTA app. I use the same .adi file to import the log to my home station's logging program.

HAMRS lacks some of the features of more advanced logging programs, but many of these are purposely excluded to keep the program easy to use, light, and fast. There is no facility to import QSOs from another log. Queries beyond call signs are limited, and there is no direct upload provision to other platforms. There is no rig control yet, but that may be available in the future according to the *HAMRS* support group.

Support

HAMRS is supported by question-and-answer support on the app, the *HAMRS* website, and Discord. There is limited individual user support by the developer. I created a login and signed up to receive email information from the *HAMRS* support group. Like other web-based support groups, this service posts lots of useful information about the program.

Besides paying the mobile device app fee, you can also support *HAMRS* by donating to "Help KB0ICT keep working on HAMRS!" on the *HAMRS* website. Three optional monthly membership support choices provide additional benefits such as "early access to Beta and Preview Builds on all devices."

Conclusion

I use *HAMRS* for portable operations, and I have been pleased with its operation. It's hard to beat for its modest price.

Like most software-based logging software, *HAMRS* revises its software with new features and improvements. So, be sure to check their website for the latest updates. Also, there is now a completely new web version available at **https://logger.hamrs.app** — this is serving as a test for the rewrite that will soon make its way to desktop and mobile.

Manufacturer: Cabin Interactive, LLC, **www.hamrs.app**. Price: iOS version (Apple App Store), $4.99; Android version (Google Play Store), $4.99; the macOS, Windows PC, Ubuntu (Linux), and Raspbian versions are free to download.