AF6SA Portable Wi-Fi Rotator Controller (PWRC)

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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.

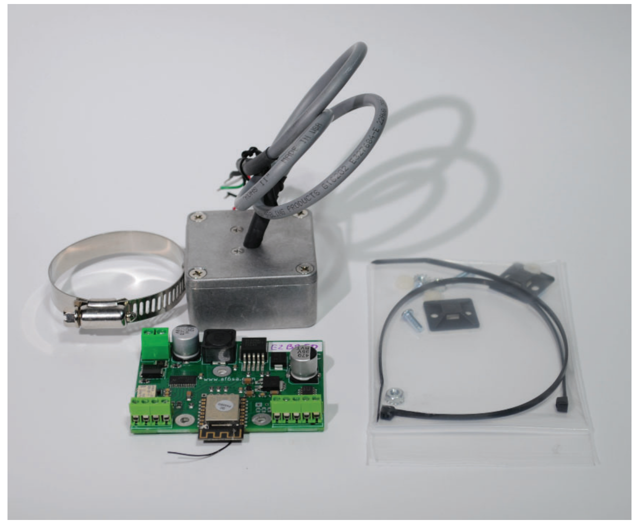
I wanted to be able to use my solar-powered 12 V dc power system, rotate various antennas, and be able to know where the antennas are pointed. I found a solution that solves my needs and more: the Portable Wi-Fi Rotator Controller (PWRC) manufactured by Stefan Nicov, AF6SA.

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.

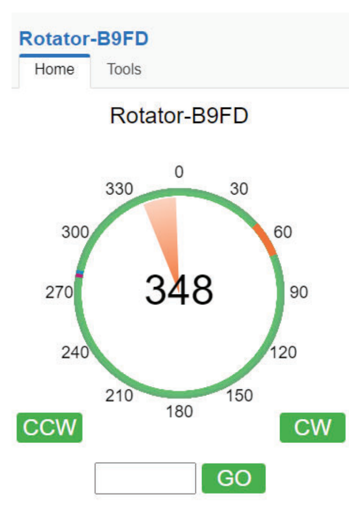


Figure 12 — The PWRC web-based application main menu.

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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.

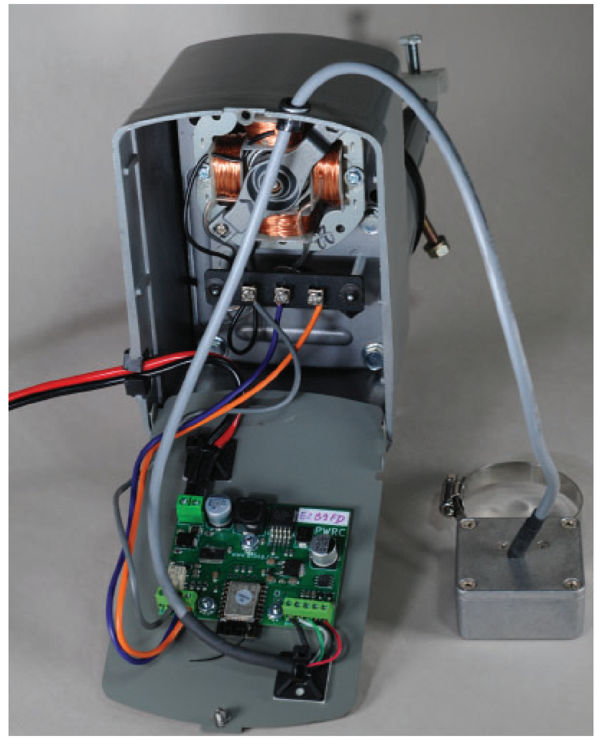

Figure 13 — The PWRC wiring.

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.

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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).

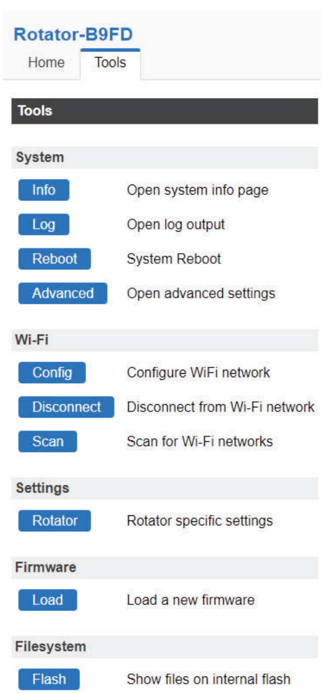

Figure 14 — The PWRC application **TOOLS** menu.

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 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.

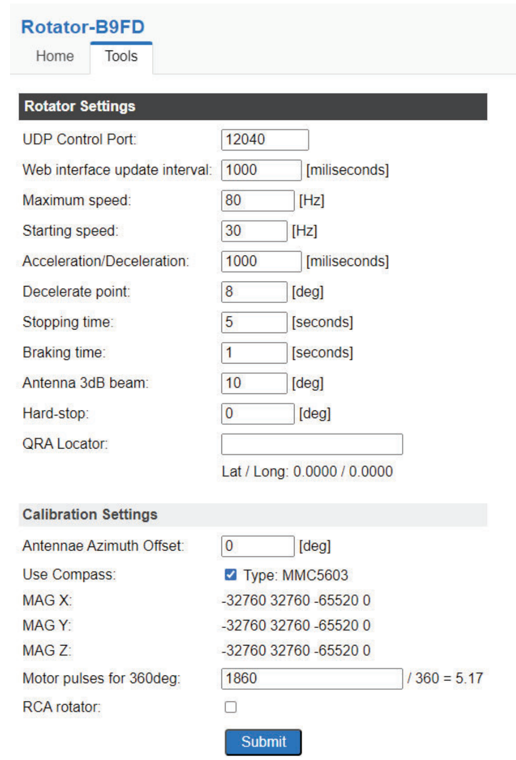

Figure 15 — The PWRC application **ROTATOR SETTINGS** menu.

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

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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.

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