Antenna Rotator Control Software

Version 1.1 or later, December 2023
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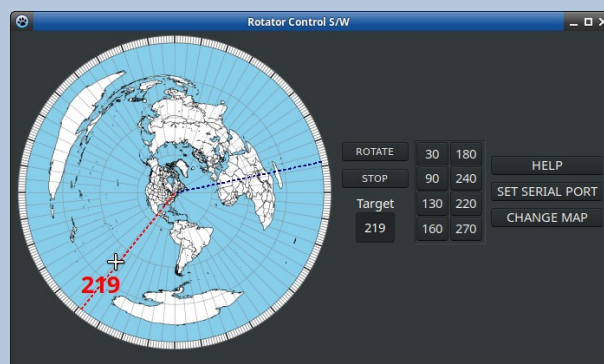https://ve2zaz.net
https://github.com/VE2ZAZ
https://www.qrz.com/db/VE2ZAZ

Table of Contents

1   Overview

This Antenna Rotator Control Software offers a simple, practical way of remote operating antenna rotator (aka "rotor") control boxes compatible with the Rotor-EZ protocol, in particular the VE2ZAZ Smart Rotator Controller, which was designed as an add-on to HyGain Tailtwister, Ham-III and Ham-IV controller boxes. The software main features are:

- It offers a PC interface to the VE2ZAZ Smart Rotator Controller,

- It can also control any antenna rotator control box compatible with the Rotor-EZ protocol. It may also work with DCU-1 protocol boxes, since DCU-1 is a subset of the Rotor-EZ protocol. Presumably, the DCU-1 box will reject the un-recongnized Rotor-EZ commands, such as reading the current heading.

- It offers a re-sizeable window to accommodate various screen needs,

- It displays the current heading on a station-centered azimuthal map,

- The azimuthal map is mouse-clickable to quickly pick a target heading,

- The Azimuthal map can be customized for the station location,

- The window offers 8 memory buttons for frequently used headings,

- It has a Stop button to interrupt the ongoing rotation,

- The program can receive N1MM+ logger "Rotate" and "Stop Rotate" commands via UDP socket,

- User settings such as window size and location, serial port and azimuthal map file name are saved at program exit, and restored at program launch. The settings file resides in the same directory as the program directory.

- Software executables are available for Ubuntu-Linux and Windows 10. The software may be compiled for other OS releases, such as MacOS using the Lazarus IDE (Free Pascal) suite, however it has not been tested by the author.

2   Operation
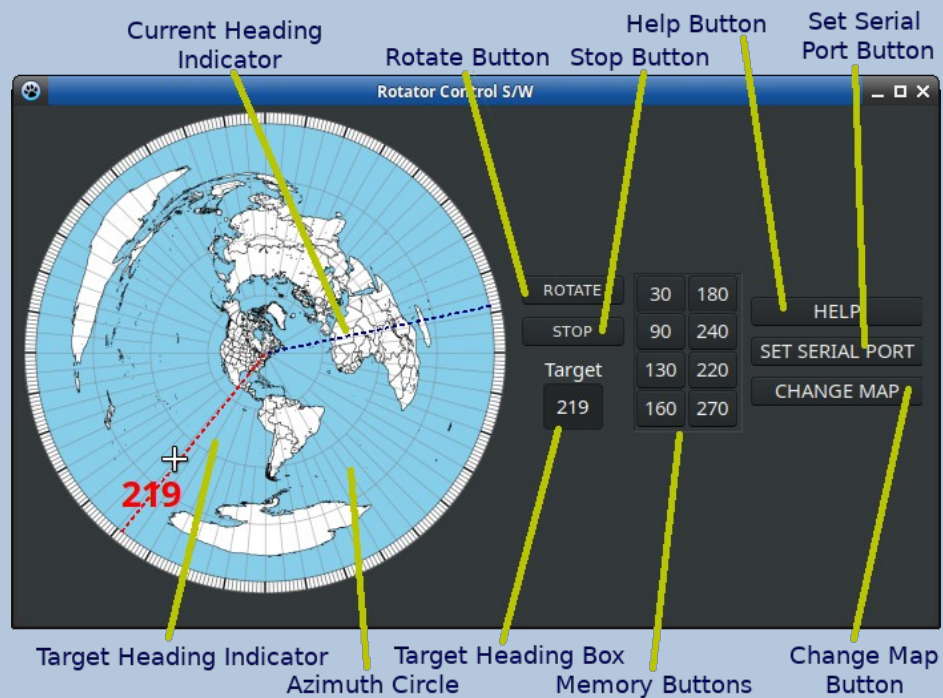
2.1   Configure the link to the rotator control box

The serial link between the computer and the antenna controller box must be properly configured for the remote control to operate. With the VE2ZAZ Smart Antenna Rotator Controller box, a USB link is established. Other brands of controller boxes may require a RS-232 connection. Link configuration in the latter applications is beyond the scope of this help document. Some experimenting will be required.

To reconfigure the serial link, click on the "SET SERIAL PORT" button. This opens the following setup window:
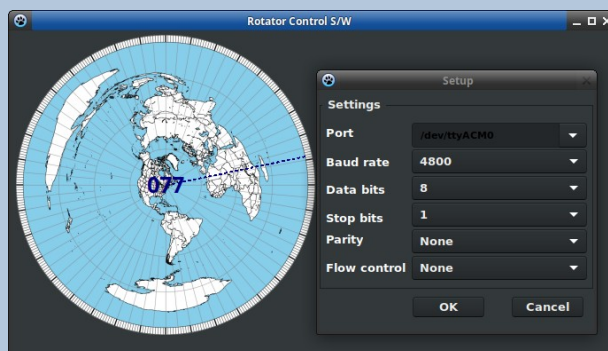
On linux computers, the virtual serial port created by a valid USB connection to the VE2ZAZ controller will show up as "/dev/ttyACM*x*", likely "/dev/ttyACM0". This port must be selected to establish a connection. On Windows computers, it will show up as COM*xx*. The COM port

number *xx* corresponding to the rotator controller can be found by consulting the Windows Device Manager. The COM port to look for will be identified in the Ports section of the Device Manager as "USB Serial Device (COM*xx*)".

Since the link to the VE2ZAZ Smart Antenna Rotator Controller is a virtual serial port, other settings, including the Baud Rate, can be left untouched.

To confirm the port settings, click on the OK button.

Note that the serial port will show up as a valid port on the computer only when the controller is connected and is powered up.

2.2 Initiate a rotation

There are five ways of initiating a rotation of the antenna:

1. Typing the target heading value between 0 and 359 into the Target heading box, and then pressing the <RETURN> key.

2. Typing the target heading value between 0 and 359 into the Target heading box, and then clicking on the Rotate button,

3. Hovering the mouse pointer over the azimuth circle to the desired azimuth, and then left-clicking,

4. Clicking on one of the azimuth memory buttons. The indicated heading will be the target heading.

5. Sending a new heading command via the N1MM+ Logger QSO entry window (<ALT-J> keystroke in N1MM+).

2.3 Interrupt a rotation

There are two ways of interrupting (stopping) an ongoing rotation of the antenna:

1. Clicking on one of the Stop button.

2. Sending a Stop command via the N1MM+ Logger QSO entry window (<CTRL-ALT-J> keystroke in N1MM+).

2.4 Use the memory buttons

The memory buttons allow to quickly "recall" headings you use more frequently. There are 8 memory buttons that can be individually programmed. The programmed headings are saved in the configuration file, and are recalled at program launch.

A mouse click on the chosen memory button will initiate an antenna rotation to the indicated heading.

2.5 Resize window

The main program window can be resized by dragging the window edges or corners. When resizing the window, the azimuthal map also resizes, yet it retains its full control functionality. This allows to create a minimalist window with varying content that suits the user. A horizontal

scroll bar shows up when content is hidden due the window size. Examples of resized windows are:
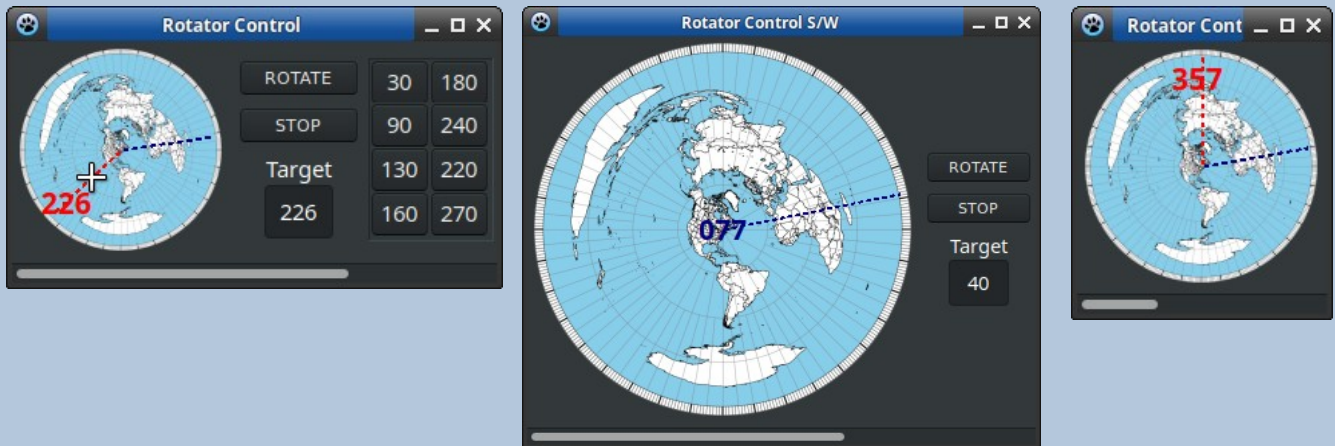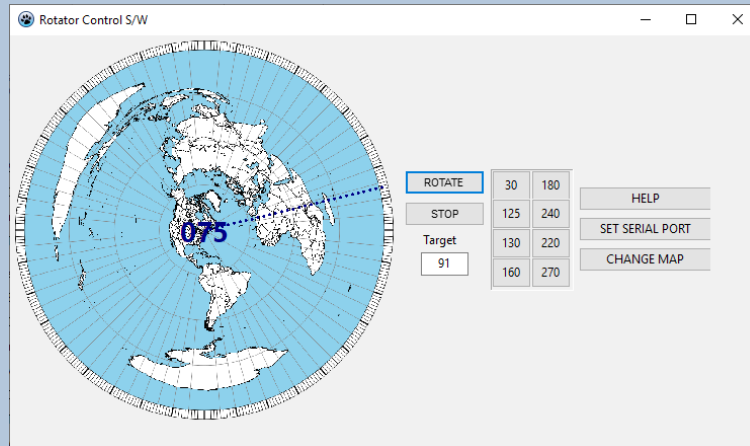

2.6   Invoke Help

This help document being an PDF-formatted file, it can be read in the computer's default PDF viewer by simply clicking on the Help button.

3 Program Setup

3.1 Running software under Windows

The appearance of the program's main window is slightly different when run in Windows. The following image shows the appearance in Windows 10.

Windows has its way of dealing with unavailable resources, such as the COM port and the Azimuthal map file. The software tries to deal with that. For example, when the selected COM port is not available, the software shows an error message popup window. But Windows may decide to terminate program execution altogether despite the program trying to intercept the error, something Linux does not do.

If the program tries to launch but crashes right away, suspect a wrong COM port or a wrong azimuthal map file being selected at launch time. The easiest way to correct this is to manually edit the program's config.xml file, which is located in the same directory as the main program (.exe) file. Any ASCII (plain text) editor is suitable for the task. The entries to modify may be:

```
SerialPort="COMxx"
```

or

```
ImageFilename="xxxxx.png"
```

(x marks may vary). The values to change are those between the double-quote marks. They should match an existing COM port and azimuthal map file name.

3.2 Setting up for N1MM+ Logger software

The program automatically connects and listens to broadcast UDP port 12040. As is, it receives and processes the N1MM+ originating antenna rotation command. Consequently, there is no setup required.

3.3   Programming memory buttons

The programming of a memory button is performed by right-clicking on the button. A memory edit box shows up. Enter a new heading between 0 and 359. Press the <RETURN> key to save the new value, or press the <ESCAPE> key to cancel the memory edit action. The programmed headings are saved in the configuration file, and are recalled at program launch.

3.4   Changing the Azimuth Circle map,

As supplied, the program displays an azimuth circle map centered on VE2ZAZ's station location. The user will want to replace that map with a map centered on his/her station location. Such map can be generated online. With some subsequent image editing, the result shown can be obtained.

The author uses N6ST's Azimuthal Map Generator web page, which produces nice colored maps. There are other sites that can be used to obtain azimuthal circle maps, with varying degrees of resolution and color.

The following settings are used on N6ST's Azimuthal Map Generator to produce the required azimuth map file:

The output produced by the web page is a PDF file. Subsequent to obtaining the map file, some image editing of that file is required. The following tasks should be performed:

1. Load the PDF file into an image editing program, such as GIMP. A 200 pixels-per-inch resolution is appropriate.

2. Remove the white background and the heading indications

   1. "Ellipse Select" the map, excluding the white background and the heading indications,

   2. Invert the selection,

   3. Clear the selection.

3. Crop Image to Content (this removes the unused area around the circle)
4. Export result as a PNG file with transparent background. Save the file into the program directory (saving in that location is a requirement).

The newly generated PNG image can be loaded to the program by clicking on the "CHANGE MAP" button, selecting the PNG map file and clicking Open. The new map gets displayed. If, instead of clicking Open, the Cancel button is clicked, the map will default to a plain blue circle.

4   Software Recompilation

This software was written in Free Pascal and compiled in the Lazarus IDE environment. The user can modify and recompile the software in Lazarus IDE. In addition to all components installed by default in the IDE, two additional components are required, namely "LazSerial" and "Synapse". They can be installed using the Online Package Manager tool in Lazarus IDE.

One action must be performed before compiling for Windows. The following line must be deleted from the main_unit.lfm file using a plain text editor:

"SynSer.NonBlock = False"

Failing to remove this line will cause the compilation to fail.

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6   References

The Idiom Press Rotor-EZ protocol:
(https://www.hamsupply.com/wp-content/uploads/2015/11/Rotor-EZ-Protocol.pdf).

The N6ST's Azimuthal Map Generator web page:
https://ns6t.net/azimuth/azimuth.html

The N1MM+ Logging software - Rotator Control:
https://n1mmwp.hamdocs.com/setup/interfacing/#n1mm-rotator-control

GIMP – the GNU Image Manipulation Program:
https://www.gimp.org/

Lazarus IDE - The professional Free Pascal RAD IDE:
https://www.lazarus-ide.org/