Rotary antenna rotator controller GNI-r9

User manual

Introduction

The GNI-r9 controller supports one dual rotator with DC motors for azimuth and elevation rotation. The rotator has to have pulse outputs (pulser or reed switch). Antenna rotation is possible with a resolution of **1 degree**. The rotation for azimuth is in the range of 0 to 360 degrees with a certain reserve in each direction (the default value of the reserve is 180 degrees - half a turn, in this case the rotation is from -180 to +540 degrees - two full revolutions). The rotation for the elevation is in the range of -15 to 195 degrees. Lower and upper limits can be changed via the Menu. The GNI-r9 controller is suitable e.g. for RAS, SPX AZ/EL, BIG-RAS rotors.

The GNI-r9 controller is equipped with a high-quality OLED display with excellent readability. It displays the current azimuth and elevation values. These values are entered into the controller's EEPROM non-volatile memory only at the moment of power supply loss (as a result of shutdown or uncontrolled decay). This ensures continuous and correct storage of information about the current position of the antenna.

The current value of the antenna position is written into the EEPROM non-volatile memory when the final value (sent by the computer program) is reached, or when the "Stop" button is pressed.

External dimensions (W x H x D): 109 x 58 x 125 mm.

Installation

The controller GNI-r9 is powered from the computer's USB connector via the cable and the USB-mini connector on the back panel. The current drawn from the USB output is typically 45 mA, up to 130 mA. For manual operation without a computer, you can use a typical charger or power bank with an USB socket.

The rotator motor power supply given to the 2.1/5.5 socket (plus in the centre!) on the rear panel can range from 12V to 25V. You can use any DC power supply with a current output at least 5 A, for example a typical 13.8V power supply used to power your transceiver. Equally good is the use of a 19 V power supply from a laptop, and at such the voltage the antenna rotation is 50% faster than for 13.8V. Current consumption for **one** motor active is approx. 1 A, maximum 3 A.

The motor power ground has galvanic separation from the controller and computer ground.

To connect the rotator, use two NC/4p (Model 25-724-0) type connectors, and plug them into the appropriate sockets on the back plate with the connection to the pins as follows:

- Pin 1 (M1) – motor control (connector 1 in the RAS rotator junction box)
- Pin 2 (M2) – motor control (connector 2 in the RAS rotator junction box)
- Pin 3 (K2) – pulse sensor (connector 3 in RAS rotator junction box)
- Pin 4 (K1) – pulse sensor (connector 4 in RAS rotator junction box).

After installing and checking the connections, perform the calibration as described further.

Front panel

Display:

- The upper line indicates the current antenna **azimuth** value in the range of 0-359 degrees.
- The bottom line displays antenna **elevation** value within the range selected in the Menu.
- If the "**>**" sign is present in front of the azimuth value, the actual antenna position value is greater than the 359 degree angle.
- If the "**<**" sign is in front of the azimuth value, the actual antenna position value is lower than the 0 degree angle.
- The first field on the left on both lines of the display is reserved for the marker, which indicates that the **buttons** on the front panel **can control** the azimuth or the elevation of the antenna, respectively

Buttons:

- "**>**" - start rotation clockwise
- "**<**" - start rotation counter-clockwise

Note - press the button and **keep it pressed** for about 1 second until the relay operates and the motor starts (the green diode starts blinking).

- "Stop" (red) - immediate stop of the rotator
- "Menu" – **holding down for 1-2 seconds** - moving the marker up/down and the corresponding change of the influence of the buttons on the front panel on azimuth or elevation.
- "Menu" – **holding down for more than 3 seconds** - enter the settings Menu.

The LED1 (green) flashes with every single degree of rotation. It lights continuously after each use of the "Stop" button, as well as: after a successful calibration of the antenna setting, after switching off the display backlight (only for LCD), and when the lower or upper rotation limit is reached. The LED2 (red) indicates the 12-25 V DC power supply connection.

Manual operation

To manually control the rotator, three front panel buttons are used. If the **marker** is in the top line of the display, you can rotate the antenna in azimuth: "**>**" (start of rotation clockwise, azimuth value increases), "**<**" (start of rotation in the opposite direction). Note: Azimuth readings are always "modulo 360", i.e. after exceeding 359 degrees from below, the displays are shown from 0 degrees (up), and when exceeding 0 degrees from above, displays are from 359 degrees (down).

If the **marker** is in the bottom line of the display, you can rotate the antenna in the elevation: "**>**" (start of rotation clockwise, i.e. the value of the elevation increases), "**<**" (start of rotation in the opposite direction). Note: if the rotation range is limited to 90 degrees from above, "**>**" means **antenna up** and "**<**" - **down**.

Pressing "Stop" red button (after reaching the desired position or for another reason) immediate stops the rotator. The rotation of the rotator will **always** stop after pressing the "Stop" button, also when controlling from a computer. If during rotation you want to change its direction, it is recommended to first stop the movement by using the "Stop" key, and then press the "**>**" or "**<**" button.

Calibration

The red button "Stop" also has the function of calibration, i.e. setting the initial positions (zeroing) in appropriate physical positions of the antenna, both in azimuth and in the elevation. Before saving the calibration results to the non-volatile EEPROM memory, the antenna must be set to the appropriate position.

In the case of azimuth, first set the antenna using the "**>**" or "**<**" buttons as accurately as possible **north** or **south**. Note: RAS and similar rotors normally do not have limit switches for azimuth.

For elevation, the RAS rotor and the like are equipped with limit switches. The rotor position must be calibrated both electronically and **mechanically**. Keeping the "<" button pressed, first rotate the rotor until the limit switch trips and the rotation stops. Note: below a certain value (-5 degrees by default) the rotor goes into intermittent operation - do not release the button until rotation is stopped by the limit switch. Remember the elevation value indicated by the bottom line of the display. Then, using the "**>**", "**<**" and "Stop" buttons, set the rotor 21 degrees (reserve) larger, which completes the mechanical calibration of the elevation to 0 degrees. Fasten the antenna on the boom and position it horizontally as accurately as possible.

To perform **electronic calibration**, keep the "Stop" button pressed while turning the power on (USB cable) and wait for the message "Cal. Azimuth".

If you want the azimuth values of the antenna and the actual position of the antenna to be set in the non-volatile EEPROM memory to 0 degrees (direction to the **north**), select the "**<**" button. If you want the azimuth values of the antenna and its position in the EEPROM memory to be set to 180 degrees (direction to the **south**), then select the "**>**" button. If you want to cancel the azimuth calibration, press the "Menu" key.

The message "Cal. Elevation" appears. After mechanical calibration to the 0 degrees described above, select the "**<**" button. Check experimentally whether the upper range of rotation in the elevation is 180 degrees or more. If not, repeat mechanical calibration for a reserve value less than 21 degrees.

If later during operation you find that the indication of the GNI-r9 controller deviates from the actual position of the antenna, then use the "**<**" and "**>**" buttons to move antenna north or south and horizontally, and then perform the electronic calibration.

Automatic operation

Controlling from a computer is possible using any program compatible with the AlfaSpid communication protocol. The GNI-r9 controller has been checked with Orbitron, SatPc32, N1MM Rotor and SatPc32.

When configuring external software, select the SPID RAS 1deg controller or AlfaSpid protocol in the appropriate place of this program and select:

- Communication or Serial Port - appropriate COM number (after connecting the USB cable it will be reported automatically - you can check its number in the Windows Device Manager)
- Set: speed 600 baud, word length 8 bits, 1 stop bit, no parity
- Choose the option Resolution 1deg, 1.0, AlfaSpid ROT2 or Rot2prog

You can use the "Stop" button during rotation. In this case, the rotation will be stopped immediately.

GNI-r9 controller programming

Press and hold the Menu button. "Entering setup.." will appear, followed by the first option:

1. „LOW AZ. limit:" (lower limit of azimuth antenna rotation). The number in brackets is the current value. If you want to change it, use the ">" and "<" buttons. The value can be set in the range -180 to 0 degrees. After setting the desired value, press the Menu button again.
2. „HIGH AZ. limit:" (higher limit of azimuth antenna rotation). The number in brackets is the current value. If you want to change it, use the ">" and "<" buttons. The value can be set in the range 360 to 540 degrees. After setting the desired value, press the Menu button again.
3. „LOW EL. limit:" (lower limit of elevation antenna rotation). The number in brackets is the current value. If you want to change it, use the ">" and "<" buttons. The value can be set in the range -15 to 15 degrees. After setting the desired value, press the Menu button again.
4. „HIGH EL. limit:" (higher limit of elevation antenna rotation). The number in brackets is the current value. If you want to change it, use the ">" and "<" buttons. The value can be set in the range 75 to 195 degrees. After setting the desired value, press the Menu button again.
5. „BL ON (minutes)". **Note:** This does not apply to the standard OLED display, but only to the LCD! This is the time after which the display backlight turns off automatically. The number in brackets is the current value. If you want to change it, use the ">" or "< buttons. The value can be set in the range of 1 to 30 minutes. After setting the desired time, press the Menu button again. Press the "Stop" button if the backlight has turned off.

Notes

1. After connecting USB cable (supply 5V) the controller starts up and makes reset. After 10 seconds it is ready for operation. The best if the motor supply is connected already before the reset (red LED on).

2. When you start rotation the controller switches-on one of the relays, and you should hear a "click". If all is OK the rotator should start rotation. The controller waits for pulses from rotator. Each pulse should arrive every single degree and is confirmed by green LED on the front panel - short blink. If the controller do not receive any pulse, it assumes that there is a fault and stops rotation. After that, for the safety reasons GNI-r9 controller **blocks rotation orders**, form buttons and form PC. It means that you can't activate any relay and you won't hear the "click" during about 5 seconds. In that case you must check what is wrong on hardware side. One of the reason can be very simple - motor supply (red LED off) was not present when you tried to activate the rotation. The second reason is it's a mechanical jam or lack of a connection of one of eight wires from the controller to the rotator. After removing the cause of disability, it is recommended to

disconnect/connect USB supply of GNI-r9 controller.

3. Turning off the power supply of the GNI-r9 controller while the antenna is in motion causes the rotor to stop and the current values of the antenna position are written to the non-volatile EEPROM memory. This prevents the loss of information about the real position of the antenna. Nevertheless, avoid the following actions **when the antenna is turning**:

- disconnecting the USB cable from the GNI-r9 controller or computer
- turning off or restarting the computer
- changing the configuration of serial ports
- starting or closing the rotator PC controlling program.

4. Take care of an adequate length of coaxial cable (not to over-wind), especially when using the maximum -180 +540 degrees rotation range.

5. Motor control cables should have a diameter of **at least 1.5 mm** (AWG 14). If their length exceeds 30 m, it is recommended to use 2 mm wires (AWG 12). Cables from impulse sensor like 0.5 mm diameter (AWG 22) are sufficient.

6. It is advisable that each cable connected to the controller has a ferrite core.

7. Limit values are **superior** to the parameters from computer control programs and cannot be changed via the AlfaSpid protocol. An external program may have its own rotating limits, but the attempt to rotate out of the controller's limit will fail. The internal program in each case will determine the shortest route to the target within the permissible range of rotation. If the upper rotation limit in the elevation is greater than 90 degrees, the antenna can work in the "flip mode" (reverse track). Make sure that it is acceptable due to the tightness of connections, etc. Remember that in this case finding any point in the sky is possible in two ways, and some computer programs use this fact when controlling the antenna (e.g. Az = 0 and El = 120 is the same position as Az = 180 and El = 60).

8. The set with the GNI-r9 controller includes a USB A/B cable, a plug for DC power, and 2 NC plugs for rotor cables.

Questions: sp5gni@gmail.com