



Rotator Genius Manual

During the time of writing the firmware and app versions are 1.4.3
rev 3.

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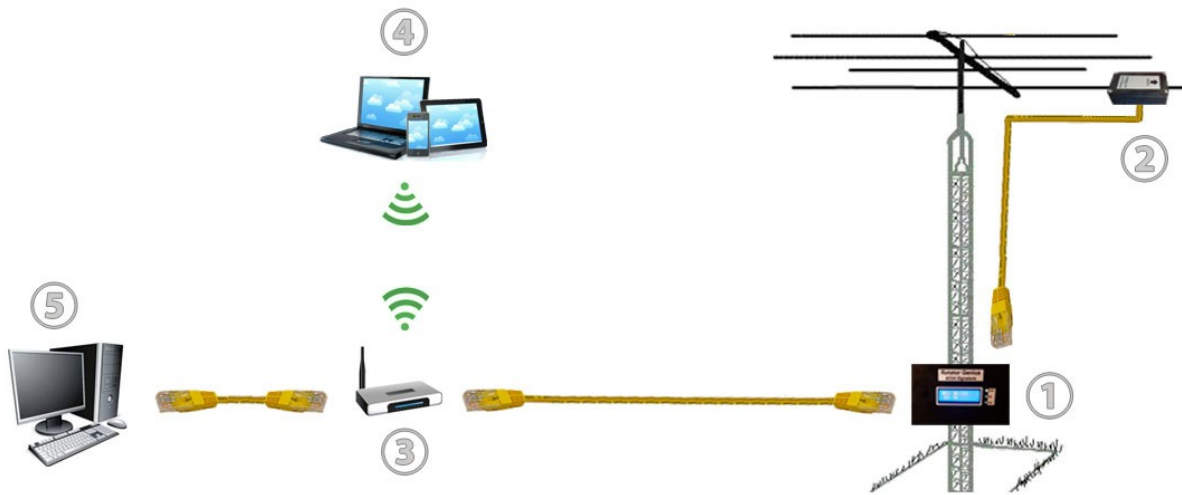
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Abbreviations:

RG	Rotator Genius
PSU	Power Supply Unit
IPv4	Internet Protocol version 4

1. Introduction and Overview

A typical diagram of the Rotator Genius system using one sensor, controlling one rotator:



Device connection overview

① Rotator Genius Control Unit is connected to the rotor motor. It can be mounted on the base of the tower in a waterproof housing. Alternatively it can be hung on a wall in the shack, with cables connected to the rotor motor.

② Rotator Genius Sensor is an electromagnetic sensor. It is encased in a waterproof housing, mounted on a boom. It is connected to the Control Unit by a standard Cat5 Ethernet cable.

③ You can use a typical Small Office / Home Router found in homes worldwide to connect RG to your network. A “dumb” switch will also work. RG uses IPv4 and is compatible with most switches and routers out there.

④ You can control and interact with RG using a wireless Android or Windows device.

⑤ Most users will use the same shack Windows PC running various other control and logging software.

Remote control over the internet is also possible. Setting this up requires some understanding of your networking equipment and technology. You must use a VPN connection since there is no security implemented on the device.

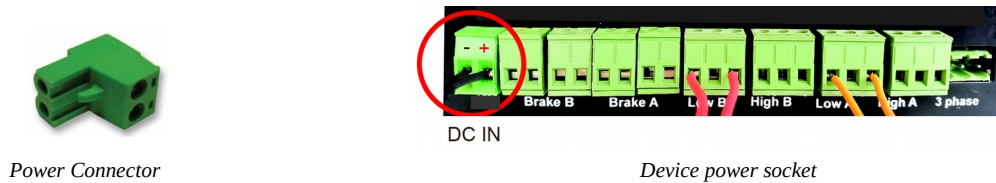
2. Powering Up!

RG will work with any power supply between 13.8V and 48V DC. Choose a power supply with at least the same voltage as the rotor you intend to control.

It is possible, as well as recommended to have overhead in power. You can still control a 12V rotor using a 16V, 24V or 48V power supply.

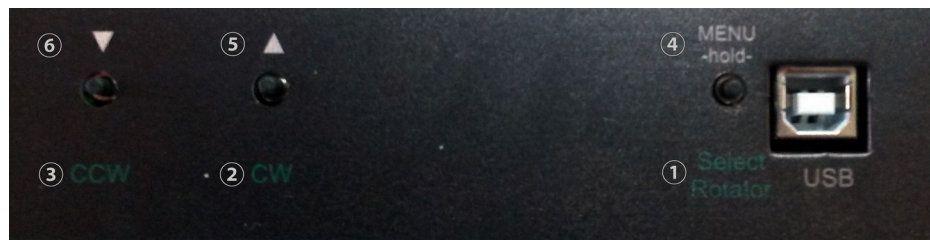
RG can supply 100%, 75%, 50% or 25% of your power supply voltage to the rotor motors. This will be covered in more detail in this in the [3. Connecting Rotators](#) and [3.8 Rotator Connection Examples](#) sections.

Connect the power supply wires to the DC IN connector. + and - are marked on the picture below.



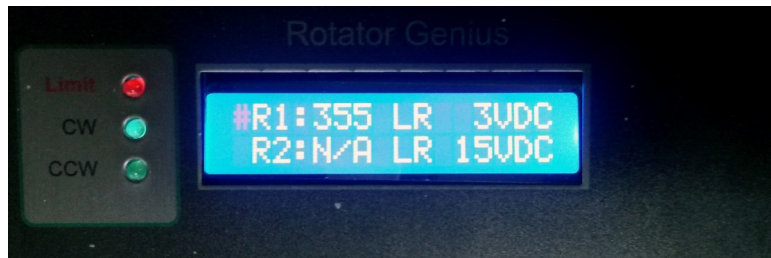
When you power the device, the LED display will show azimuth values for the connected sensors. If the sensors are not connected, azimuth values will be shown as N/A (not available).

2.1 Buttons and Controls



On the bottom of the device there are three buttons. These are used for manual control of the rotor and basic network and other settings.

① Pressing this button to select the other rotor. If R1 is selected, it will select R2 and vice versa. On the front LCD display you will see the ➡ symbol next to the selected rotor. For example, on the picture below R1 is selected.



Front LCD Display

② Pressing this button will move the selected rotor in the clockwise direction. The green CW led will light up, and the arrow next to the selected rotor will start moving, indicating the rotation is under way.

③ Pressing this button will move the selected rotor in the counter clockwise direction. The green CCW led will light up, and the arrow next to the selected rotor will start moving, indicating the rotation is under way.

④ Hold this button for two seconds to enter the settings menu. The front display will change and the device will be offline while in this menu.

⑤ This button will now be used to navigate the menu to the right, or increment the selected value.

⑥ This button will now be used to navigate the menu to the left, or decrement the selected value.

2.2 Network Setup

Configuring the IP address and other network parameters is done using the on device menu, using the device buttons and LCD display.

After entering the menu use the CW and CCW buttons to navigate between items. Bold items in the description indicate buttons from the bottom of the device.

- LOCAL IP** Sets the IP address of the device. Default IP address is 192.168.1.250.
When you select this item, press the **MENU** button to edit the address.
The first octet will start blinking. That is 192 in the default address case. Use **CW** and **CCW** buttons to increase or decrease this value.
When done, press the **MENU** button to move to the next octet. 168 in the default case. Again use the **CW** and **CCW** buttons to change it, then press **MENU** to move to the next octet.
The selected octet will always blink.
When done with all 4, the address will not be blinking any more.
Use **CCW** button to navigate to next item.
- LOCAL IP** Sets the netmask of the device. Default netmask is 255.255.255.0.
When you select this item, press the **MENU** button to edit the netmask.
The first octet will start blinking. That is 255 in the default case. Use **CW** and **CCW** buttons to increase or decrease this value.
When done, press the **MENU** button to move to the next octet. 255 in the default case. Again use the **CW** and **CCW** buttons to change it, then press **MENU** to move to the next octet.
The selected octet will always blink.
When done with all 4, the netmask will not be blinking any more.
Use **CCW** button to navigate to next item.
- GATEWAY** Sets the gateway address of the device. Default gateway address is 192.168.1.1.
This is necessary only if you intend to use the device over the internet. It needs to be the address of your router.
When you select this item, press the **MENU** button to edit the gateway.
The first octet will start blinking. That is 192 in the default case. Use **CW** and **CCW** buttons to increase or decrease this value.
When done, press the **MENU** button to move to the next octet. 168 in the default case. Again use the **CW** and **CCW** buttons to change it, then press **MENU** to move to the next octet.
The selected octet will always blink.
When done with all 4, the gateway will not be blinking any more.
Use **CCW** button to navigate to next item.
- PORT** The TCP port for the control app. Default port is 9006.
It is strongly recommended to keep it default.
You can change it in case you have a service on your network that uses the same port. If so, change it to whatever you like, and make sure to change it in the application as well.
Again, use **CW** and **CCW** to increase and decrease the value.
While in editing mode, the item will blink.
Press the **MENU** button when done.
Use **CCW** button to navigate to next item.
- OFFSET R1** This is where you set the magnetic declination for Rotator 1. It is a value that varies depending on where you live. You can calculate it online using a service such as this one: <http://www.ngdc.noaa.gov/geomag-web/>
It is a value to be subtracted or added to the azimuth value.
It will be subtracted if the value is negative.
It will be added if the value is positive.

Use the **MENU** button to edit the item.
Use **CW** and **CCW** buttons to increase or decrease the value.
Press the **MENU** button when done.
Use **CCW** button to navigate to next item.

OFFSET R2 This is where you set the magnetic declination for Rotator 2. It is a value that varies depending on where you live. You can calculate it online using a service such as this one: <http://www.ngdc.noaa.gov/geomag-web/>
It is a value to be subtracted or added to the azimuth value.
It will be subtracted if the value is negative.
It will be added if the value is positive.
Use the **MENU** button to edit the item.
Use **CW** and **CCW** buttons to increase or decrease the value.
Press the **MENU** button when done.
Use **CCW** button to navigate to next item.

SAVE&EXIT When you select this item, press the **MENU** button to save all the changes.
The device will return to the normal operating state.

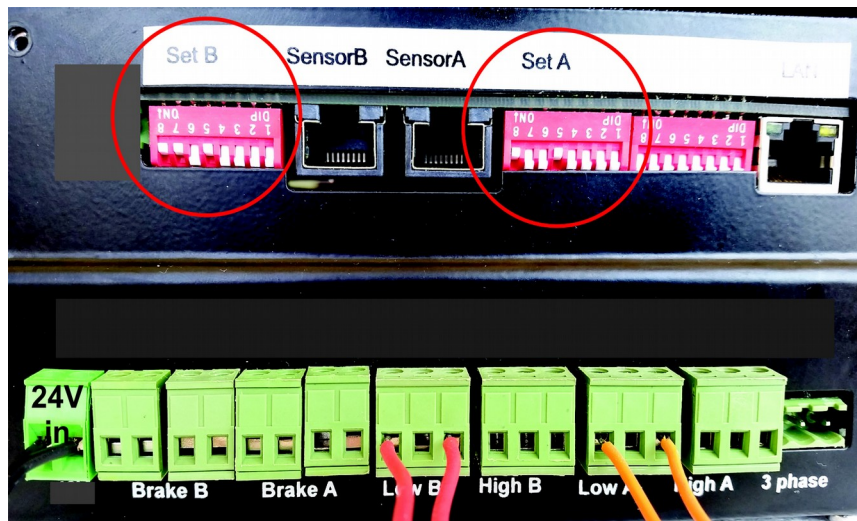
If you don't want to apply changes you made, reset the power to the device.

3. Connecting and Wiring The Rotors

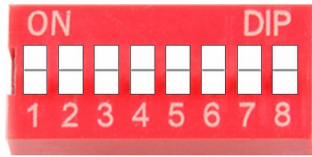
RG can be used to power:

1. Low Range motors from 12V to 48V with up to 15A of current.
2. High Range motors single phase from 110V to 220V AC.
3. High Range three phase motors from 110V to 380V AC.

DIP Switches on the back of RG are used to configure the device to drive your specific rotor.



DIP switches on the back



The table below briefly sums up each DIP switch function. More info in next chapters.

DIP1: Low Range or High Range?
DIP2: Reverse CW and CCW
DIP3: No Function
DIP4: Using Breaks?
DIP5: Using Soft Start?
DIP6: AC or DC motor?

OFF
 Low Range Motor
 CW and CCW normal
 Not using Prop Pitch
 Not using breaks
 Soft Start Disabled
 DC Motor

ON
 High Range Motor
 CW and CCW reversed
 Using Prop Pitch
 Using breaks
 Soft Start Enabled
 AC Motor

DIP7 and **DIP8:** What percentage of the power supply voltage do you want to supply to the rotator motor?

DIP7 DIP8

OFF	OFF	25% of power supply voltage to the rotator motor
OFF	ON	50% of power supply voltage to the rotator motor
ON	OFF	75% of power supply voltage to the rotator motor
ON	ON	100% of power supply voltage to the rotator motor

3.1 DIP1: Low Range or High Range?

High Range should be selected if your motor is 110VAC, 220VAC or 3 phase.

Low range motors are AC or DC from 6V to 48V. They must not exceed 15A of current.

3.2 DIP2: Reversing CW and CCW

DIP2 switch reverses the CW and CCW.

3.3 DIP3: Prop Pitch

Turn **DIP3** switch **ON** if you are using a **Prop Pitch** motor.

3.4 DIP4: Rotor Brakes?

On Low Range motors, you can use your rotor breaks.

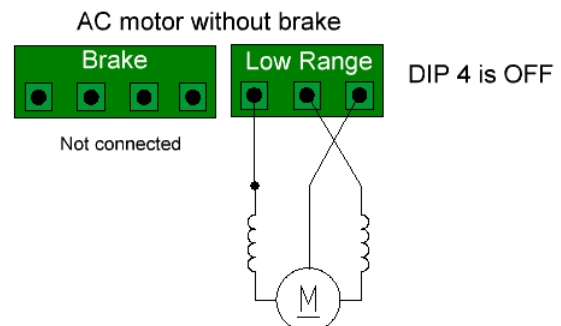
Voltage on the break must be the same as voltage on the rotor motor.

Set **DIP4** to **ON** to enable using this feature in software.
 Set **DIP5** to **OFF** to disable soft start.

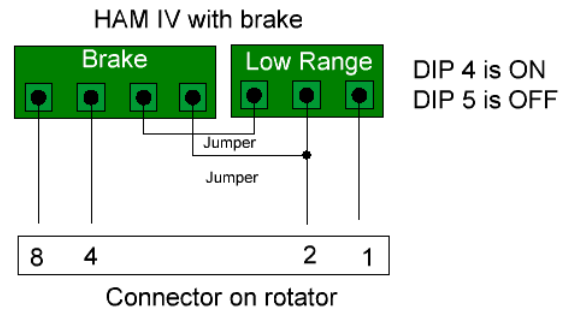
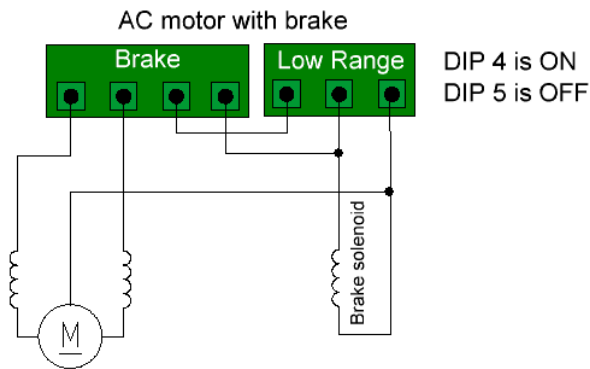
Soft start is not possible when using brakes.

Rewire your rotator to match the diagram below.

Common wire of AC motor is connected to the center pin.



Motor ends are connected over the brake relays as on the diagram below.



When you execute the CW or CCW command the brake solenoid will be powered first about half a second before the motor. When you release the command, the motor will stop being powered and the brake will be powered for half a second more. This enables the release of activation of the brake, by properly sequencing it.

3.5 DIP5: Soft Start

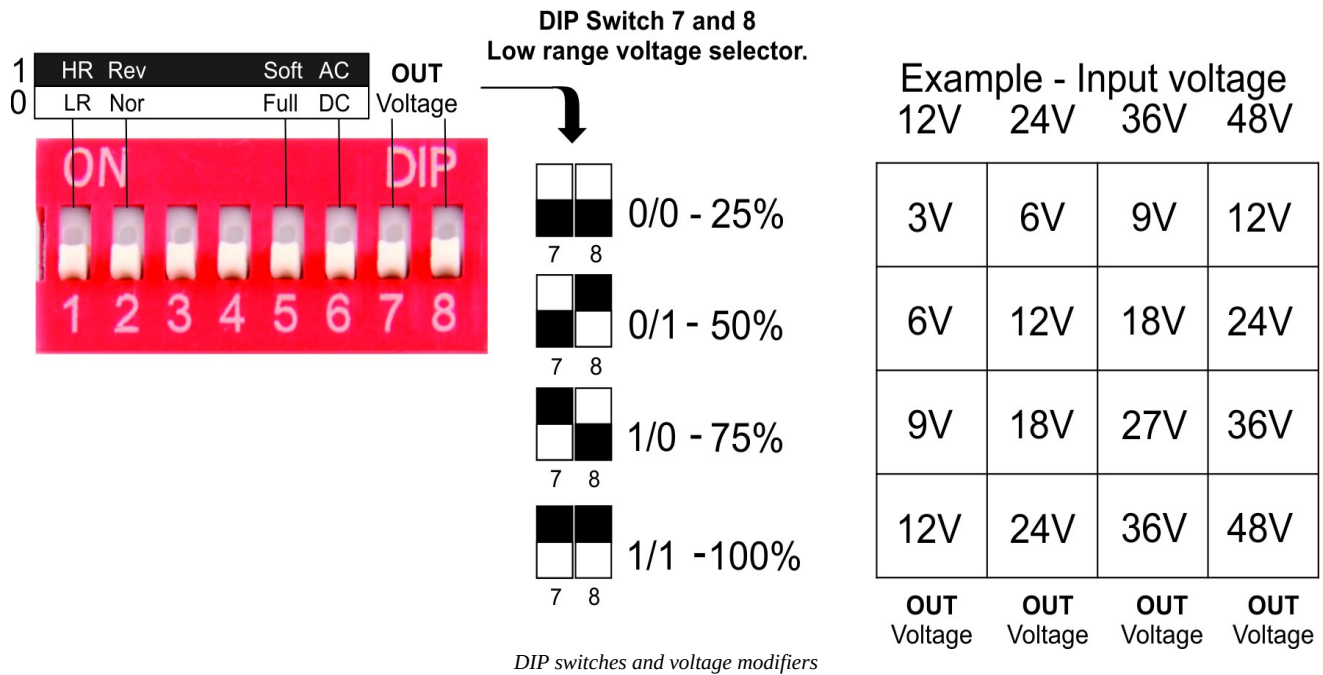
Soft start will slowly speed up and slow down your rotor.

3.6 DIP6: AC or DC?

DIP6 switch is used for to configure the rotor to be powered by AC or DC power.

3.7 DIP7 and DIP8: Voltage Configuration

Take a look at the table with examples of 12V, 24V, 36V and 48V power for a Low Range rotor:



If the 25% increments are not accurate enough, you can use a small potentiometer inside the device on the PCB for fine tuning.

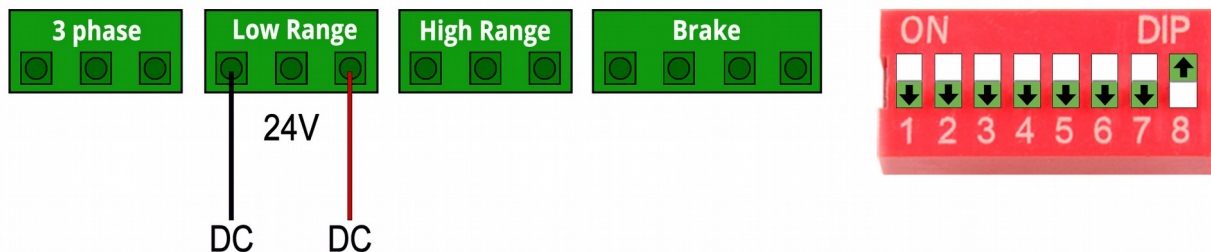
3.8 Rotor Connection Examples

The examples below are designed to provide you with a clear idea of how to connect your rotor to the RG. Models may vary over time, so make sure you double check your rotors documentation before connecting anything.

3.8.1 Low Range DC Rotors

AlfaSpid (Spid in Europe) motors are mostly 12V DC electric motors. This includes: [BIG-RAK](#), [BIG-RAS](#), [RAEL](#), [RAK](#), [RAS](#), [RAU](#), [SPID RING - 01](#) and [SPID RING - 02](#) models.

Using a **24V PSU**, the DIP Switch configuration and wiring look like this:



DIP1: Low Range or High Range?
DIP2: Reverse CW and CCW
DIP3: No Function
DIP4: Using Breaks?
DIP5: Using Soft Start?
DIP6: AC or DC motor?

OFF
Low Range Motor
CW and CCW normal
none
Not using breaks
Soft Start Disabled
DC Motor

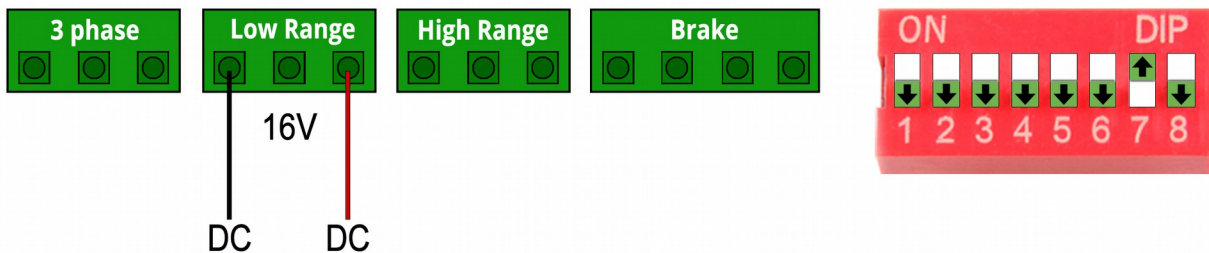
ON
High Range Motor
CW and CCW reversed
none
Using breaks
Soft Start Enabled
AC Motor

DIP7 DIP8

OFF OFF
 OFF **ON**
ON OFF
ON **ON**

25% of power supply voltage to the rotator motor
 50% of power supply voltage to the rotator motor
 75% of power supply voltage to the rotator motor
 100% of power supply voltage to the rotator motor

A **16V PSU** would have the same wiring and settings except the DIP7 and DIP8 would be set to 75% voltage:

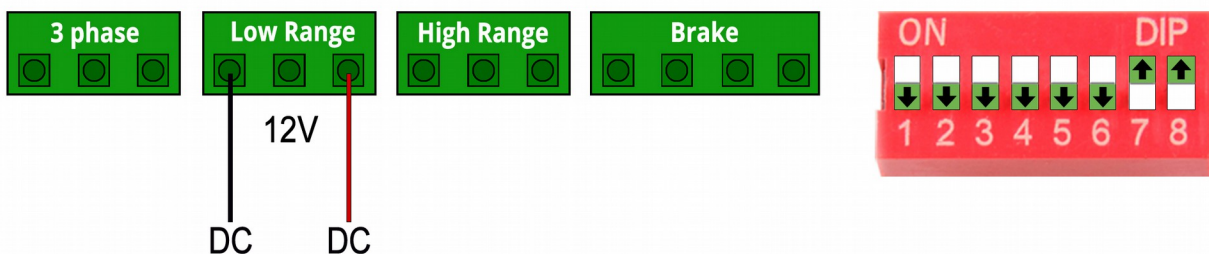


DIP7 DIP8

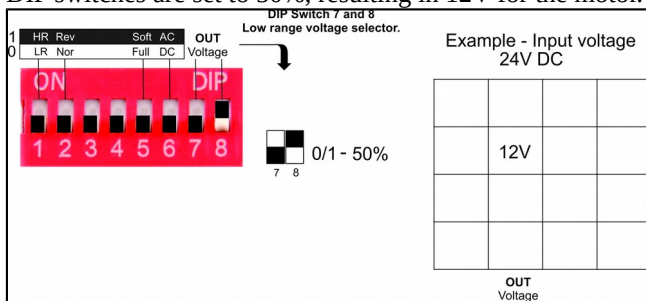
OFF OFF
 OFF **ON**
ON OFF
ON **ON**

25% of power supply voltage to the rotator motor
 50% of power supply voltage to the rotator motor
 75% of power supply voltage to the rotator motor
 100% of power supply voltage to the rotator motor

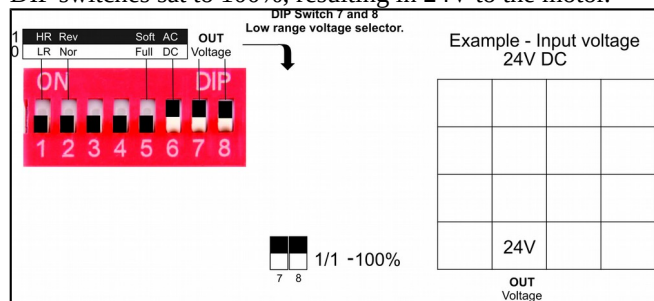
Lastly, a **12V PSU** configuration would look like. DIP7 and DIP8 set power with 100% voltage:



Example 1: 12VDC (Alpha spid). RG power – 24V DC.
DIP switches are set to 50%, resulting in 12V for the motor.



Example 2: 24VAC motor. RG power – 24V DC
DIP switches sat to 100%, resulting in 24V to the motor.

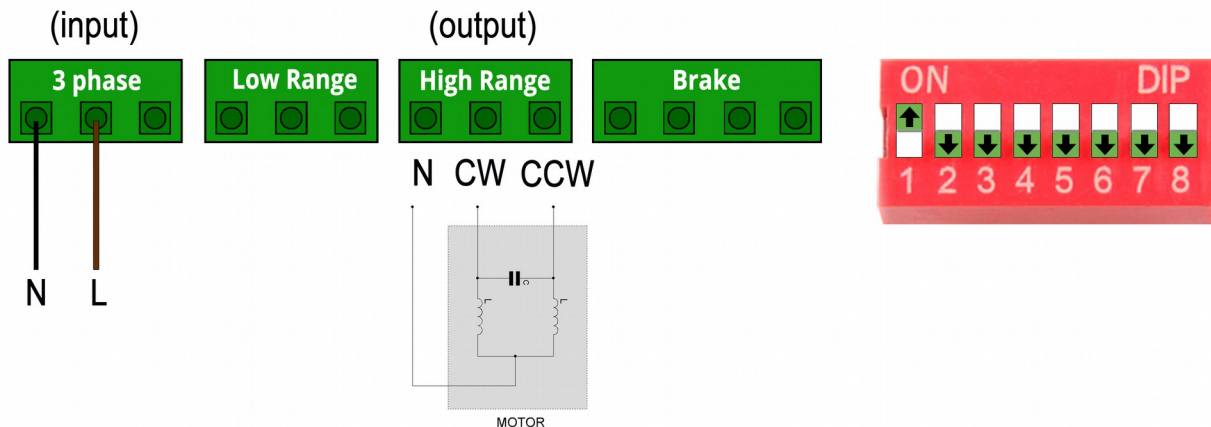


In order to verify you connected the rotors correctly, use the CW and CCW buttons on the device control your rotor manually. Use Select to switch between the selected rotators.

3.8.2 Single Phase High Range AC Motors

Set DIP switch 1 for your corresponding rotor (A or B) to ON. This configures the rotor to high range.

Supply the AC power for driving the rotor on to the dedicated **3 phase port**. This power will be outputted over the **High Range port**. Connect your rotor on to the **High Range output port** as shown on the diagram below.



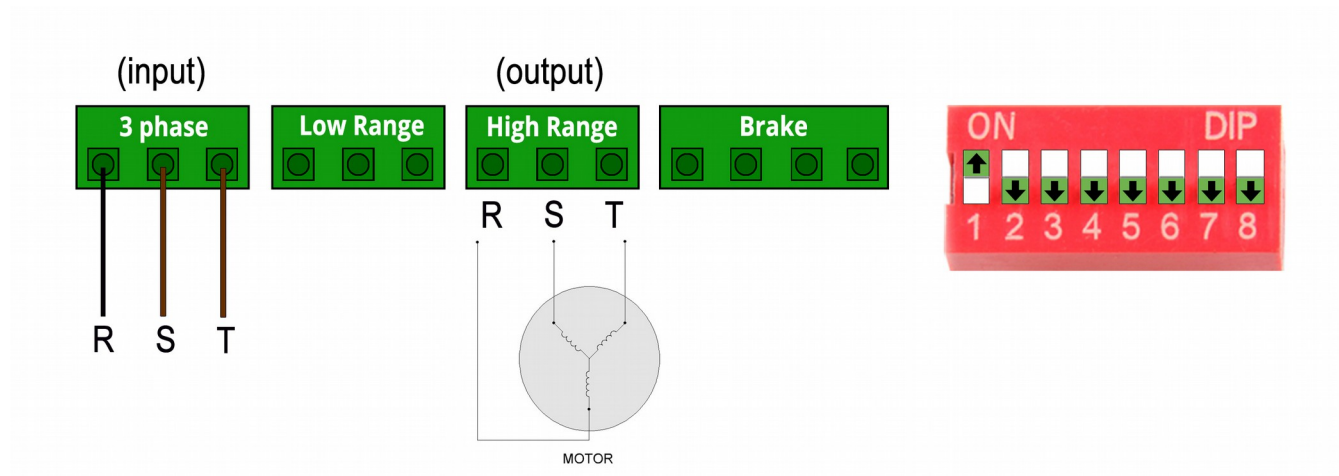
At least 13.8VDC (up to 48VDC) of additional is needed to power the RG logic and sensors regardless of the AC power.

Important: Make sure to connect the N (neutral) wire properly to avoid damaging your rotor.

3.8.3 Three Phase High Range AC Motors

Set DIP switch 1 for your corresponding rotor (A or B) to ON. This configures the rotor to high range.

Supply the AC power for driving the rotor on to the dedicated **3 Phase port**. This power will be outputted over the **High Range port**. Connect your rotor on to the High Range output port as shown on the diagram below.



Motor shown on the diagram is in a triangle configuration as an example. RG supports both triangle and star configurations.

At least 13.8VDC (up to 48VDC) of additional is needed to power the RG logic and sensors regardless of the AC power.

3.9 Testing and Verifying

Use <CCW> and <CW> buttons to move your rotors manually. This ensures proper connections and configuration is made. Use the <Select Rotator> button to switch between the rotors you control.

The arrow on the left side on the LCD screen is the indication of the selected motor.

4. The Electromagnetic Sensor

Sensors read the magnetic azimuth and send the position to the RG. Sensors are carefully calibrated in the factory and you can use them out of the box.

The arrow on the sticker shows the direction it is pointing. Designed to be installed parallel to the ground, not tilted at all.

You need to place the Sensor at least 80cm away from metal materials such as iron and ferromagnetics. You can mount it to the aluminum antenna boom.

The sensor is placed in a plastic waterproof housing, making it very light, so you can use plastic cable strips for mounting.



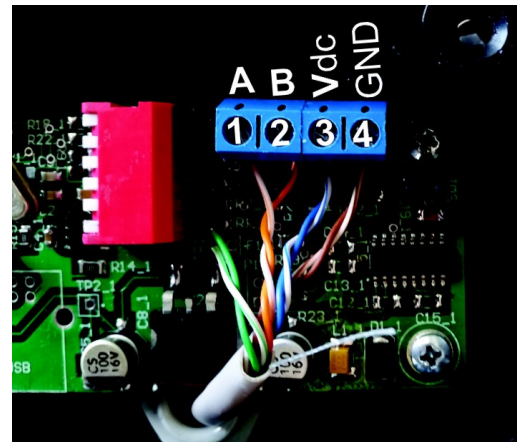
Magnetic Sensor

To connect the sensor, open it by unwinding the four screws on the box. It sends data over UTP network cable, using the RS485 protocol. Use two wires for VDC, two wires for GND, and two A and B wires for data.

Sensor wiring:

1. **ORANGE/WHITE** to **A**
2. **ORANGE** to **B**
3. **BLUE** and **BLUE/WHITE** to **VDC**
4. **BROWN** and **BROWN/WHITE** to **GND**

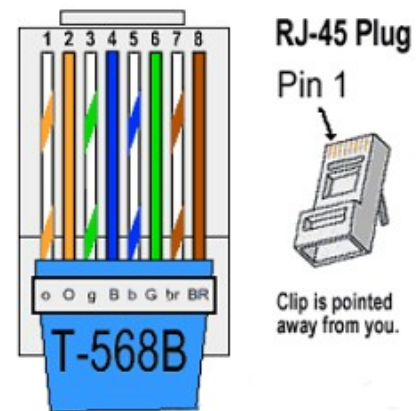
Green is unused, it is recommended to cut it off completely on this end.



Internal sensor wiring

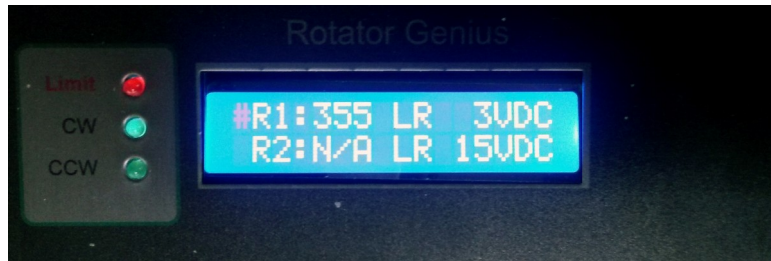
Device side wiring is using the T-568B standard, as described below:

1. **ORANGE/WHITE**
2. **ORANGE**
3. **GREEN/WHITE**
4. **BLUE**
5. **BLUE/WHITE**
6. **GREEN**
7. **BROWN/WHITE**
8. **BROWN**



RJ-45 pinout on the device side

Once connected, the azimuth should be displayed on the Rotator Genius LCD screen. Move it around and verify it works before installing it on your antenna. It should be parallel to the floor and moved only in X and Y axis, so place it on a flat surface such as a table.



LCD display on the front

On the front display you can see the azimuth value of connected sensors, as well as the set output voltage to motor. LEDs indicate if a rotator is out of configured limits, and if it's being controlled CW or CCW at the moment.

4.1 Sensor Correction

In case of sensor inaccuracies sometimes caused by disturbances in the EM field, we can recalculate the azimuth mathematically.

You can choose to do correction with four or eight points.

Four point algorithm has a maximum deviation of ± 45 degrees.

Eight point algorithm has a maximum deviation of ± 22 degrees.

You will need to experiment and see what works best for you.

Before proceeding:

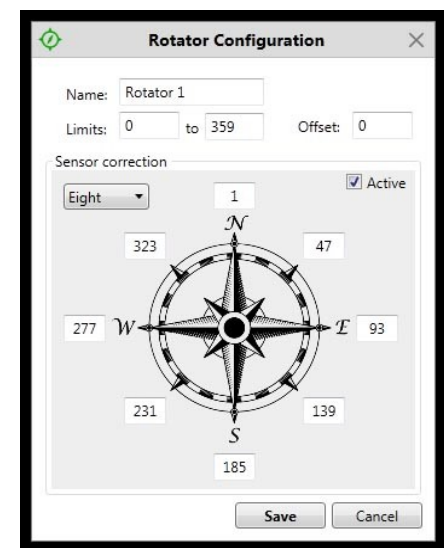
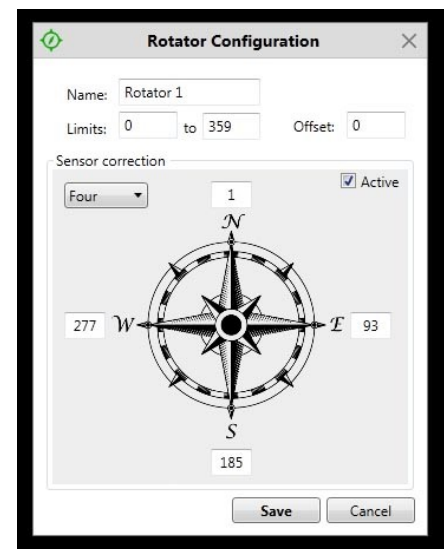
You will not be able to rotate by double clicking while in this menu, only by pressing the CW and CCW buttons on the device.

Alternatively, you can use a piece of paper to write the values down, and then enter them in.

Use a regular compass or your own reference points to determine actual sides of the world.

Four Point Sensor Correction:

1. Point the sensor to actual North. Write down the value the sensor reads in this position.
2. Point the sensor to actual East. Write down the value the sensor reads in this position.
3. Point the sensor to actual South. Write down the value the sensor reads in this position.
4. Point the sensor to actual West. Write down the value the sensor reads in this position.
5. Open the Sensor Correction menu, tick Active box and write the values in their corresponding boxes.
6. Press Save



Eight Point Sensor Correction works exactly the same, but with addition of NE, SE, SW, NW.

4.2 Recalibrating the sensor

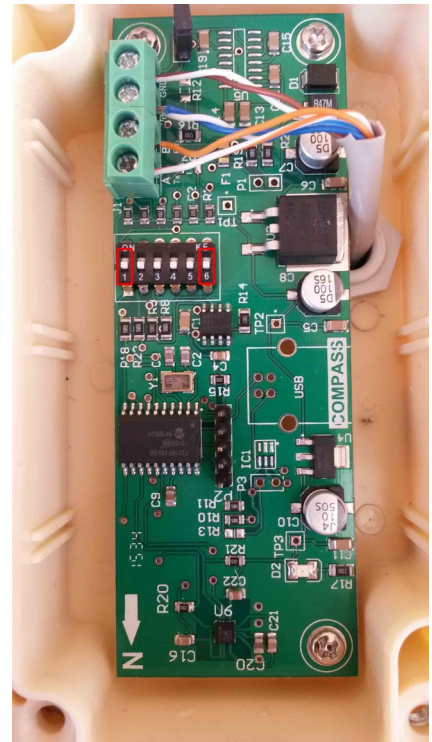
Sensors come precalibrated from the factory. Do not attempt to do this unless you are absolutely sure it is necessary.

Calibration requirements and tips:

- The sensor should be attached to the boom in the same way it is going to be used.
- Your boom must be able to make full 360 degree turns with your boom.
- The more full circles you make, the higher the precision will be. Around five is optimal. You can rotate in any direction, CW, CCW or mixed.
- The slower you rotate it while calibrating, the higher the precision will be.

Calibration process:

- In order to start the calibration process you need to disconnect the sensor from the device, and open the casing.
- Set **PIN 1** and **PIN 6** to **ON**, as shown on the picture. Do NOT use a metal screwdriver for this, or it will mess up the readings.
- Connect the sensor back to the RG.
- There will be no reading on the LCD display or Panel Application during the calibration mode.
- When done, set **PIN 1** and **PIN 6** to **OFF**.
- The sensor should now be calibrated. You should get a reading on your LCD display or Panel Application.
- Repeat the process if not satisfied with the results.
- When done, seal back the box.



Calibration pins

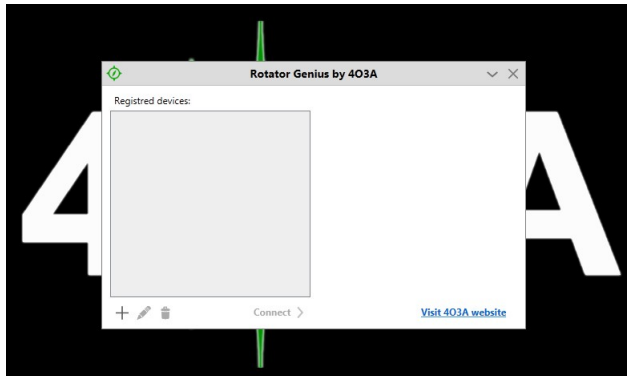
5. Control software

5.1 Windows App

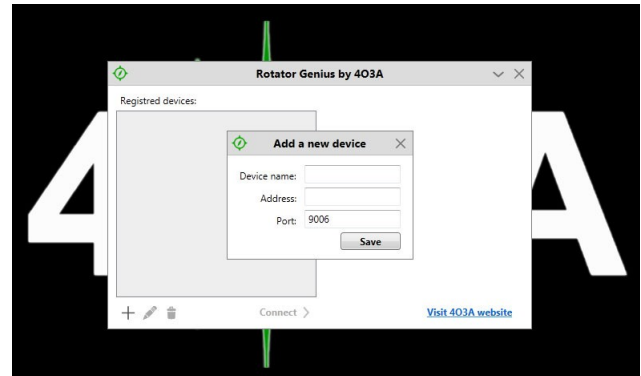
Download and install the latest Panel and firmware software from <http://4o3a.com/index.php/downloads>

The app is designed Windows 7, Windows 8 and Windows 10. It can be used on a Windows tablet and phone as well.

Follow the setup. Rotator Genius icon will appear on your desktop.



Device selection



Add device

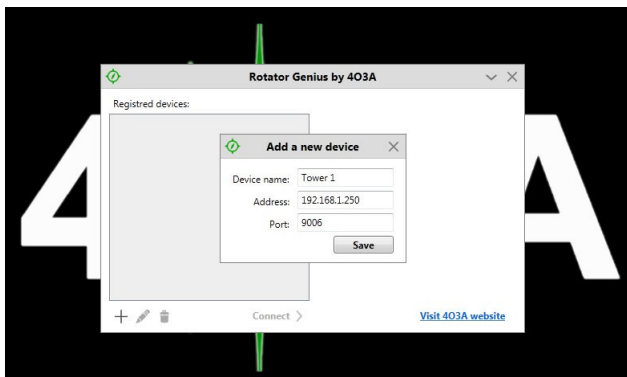
This is how your window looks like when you first open the application. You first need to add your device to the list.

Press the + button to add.

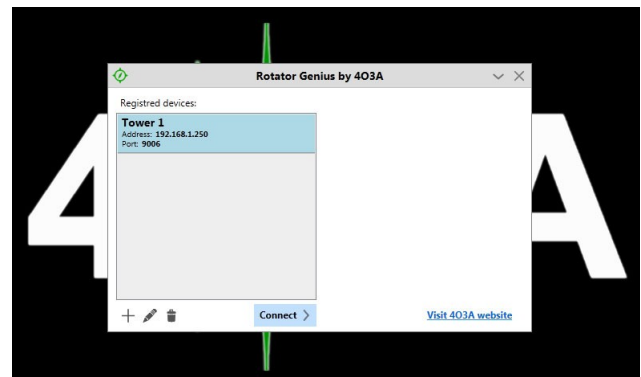
The button to its right is the edit button, and finally delete.

Name your device and enter its IP address and port number.

Check how to set your IP address and port number in the NETWORK SETTINGS section above.



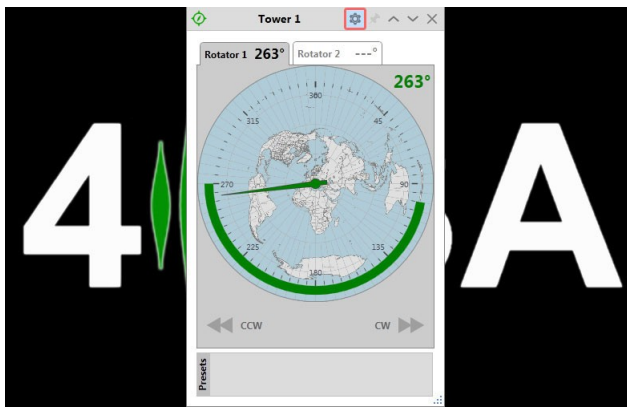
Adding the device



Connect

Press Save when done.

Select your rotator from the list, and click Connect.

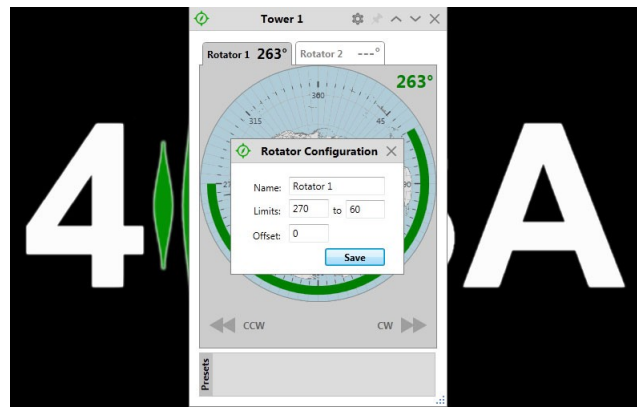


RG Control Panel

This is the RG Control Panel. You can see your status and send commands from here.

It is recommended configure your rotators before attempting to move them.

Click the settings icon on the top of the window.



Rotator configuration

Name your rotator, and set the limits if you do not want your rotator to go beyond a certain point.

You will not be able to give it a target beyond the limits.

However, if external factors move the antenna out of bounds, you will be able to use the CW and CCW buttons to move it back to the allowed area.

In case your rotator has some inertia when stopping, you can compensate by adding the offset. This will stop the rotator the amount of set degrees before its final location. Click Save when done.



Setting the target

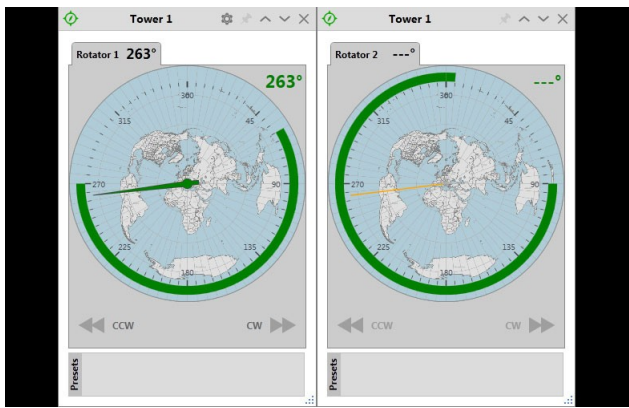
You can double click anywhere within limits to easily move your antenna to the desired azimuth. The green area will start to flash, and the stop button will appear below the gadget. You can use it to stop at any time. You can use the CW and CCW buttons to manually move if needed.



Tabs

There is a tab for each rotator. At the moment, Rotator 2 does not have a sensor connected.

The other rotator azimuth is represented as the orange line at all times.



Separating tabs

You can right click the tab with your mouse to separate the windows.

If you close a tab they will merge back.



Add preset

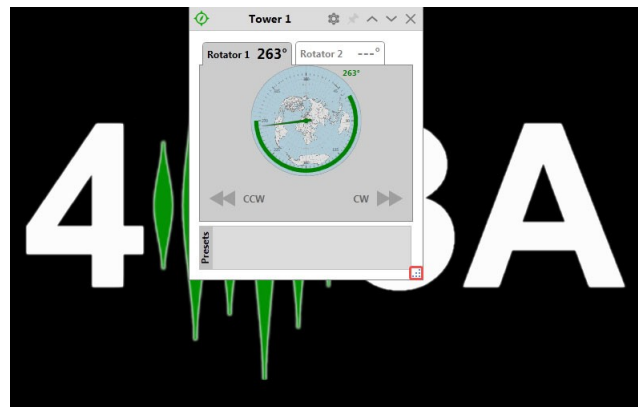
After finding your optimum antenna positions you should save them as presets.

Click on the Add button.



Preset examples

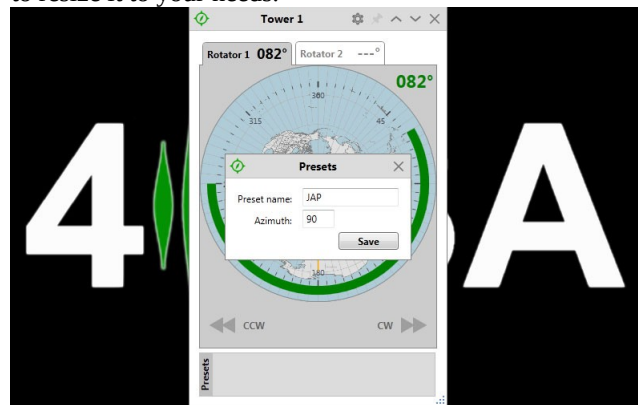
We recommend naming your presets with the maximum of three letters, though it is not a technical limitation.



Resizing

In the bottom right corner you will find the re-size icon.

Left click it with your mouse, hold, and move your mouse to resize it to your needs.



Adding the preset

Enter your preset name, and the corresponding azimuth. Click Save when done.

1.3.0 NEW FEATURES



Move by clicking the GO button

As well as double clicking you can now click on the azimuth you want to move once to and click the GO button below the gauge.



Rotate Manually

You can click on the Azimuth in the top right corner and enter a value manually, then click Rotate.



New Preset Features

The presets now show the saved value on the label. When you mouse over them, they will let you know if they are within limits. Blue color indicates it is within limits.



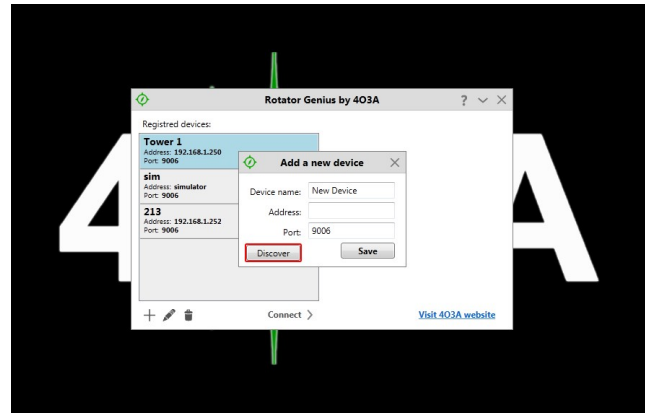
Invalid Preset Value

Presets marked in red are indicating your preset value is out of bounds of limits. Clicking it will not issue a go command.



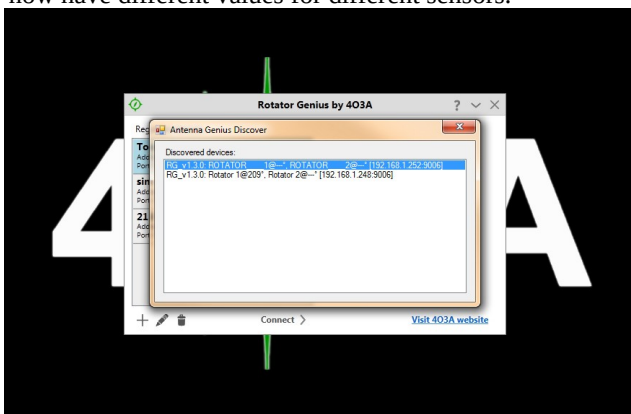
Offset

Declination is replaced by offset, both on the device and the panel. Instead of having one declination setting you now have different values for different sensors.



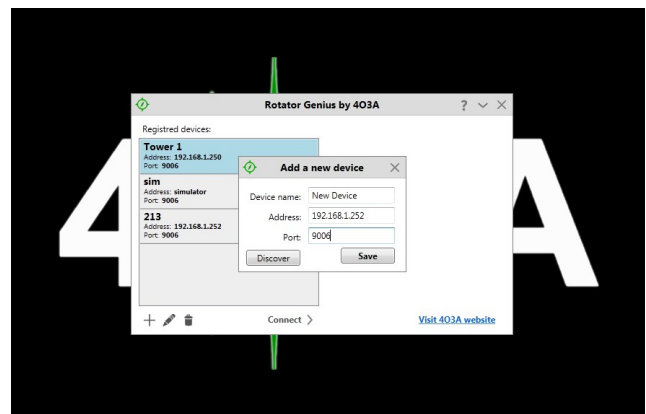
Discovery Protocol

The discovery protocol was implemented, allowing you to find your devices on the network easily.



Discovering Devices

Double click the discovered device to add it to your registered device list.



Adding a discovered device

Change the name if you wish and click save.

5.2 Android App

You can use the Android App to control your rotors, but not configure them. Download the app from the Google App Store directly.