SATRAN MK2 USER MANUAL

"**SA**tellite **TR**acking **AN**tenna"
Experimental azimuth/elevation antenna rotator
www.satran.io

Within Europe only legal for use by
authorities or licensed radio amateurs.

Always read and understand this manual before use

Safety Precautions and Instructions

Before use, read all parts of this manual to prevent injury or malfunction

1) Inspect the product after unboxing and do not continue with the installation in case there are parts missing or the product has any visible damage.

2) The control unit needs a stable DC 12V 1A power supply to function properly, you are advised to only use the supplied power adapter or it may result in damage to the unit.

3) Ensure that the operating environment meets the specifications stated in this data sheet.

4) Do not store or mount any electrical parts of the product in such manner that they can be exposed to water or other chemicals. The rotator housing is splash-proof but prolonged exposure to liquids might damage it.

5) Protect the product from sources of high voltage, lightning or electromagnetic interference. The unit has some protection for EMI, but high antenna transmitting powers might affect the functionality or even damage the control unit.

6) When installing or using the product, make sure that the rotator and any externally mounted antenna have enough space to move freely without hitting something or someone before you connect any power cables.

7) Never use the product if it is damaged in any way or operating unexpectedly.

8) Never use the product if you do not have sufficient knowledge or licenses. It is the responsibility of the operator to follow local laws and regulations, and to maintain the proper permissions.

9) Disassembly or modifications to the product will void any warranty.

10) Should any abnormal odour, noise, smoke, temperature rise or vibration be detected; stop using the product immediately, remove power and any connected communication cables.

11) Strong winds can cause antennas, rotator or parts of it to get damaged or come loose and hurt people or property. In strong winds, it is advised to manually fixate the rotator mechanically or temporarily take it down.

Getting started

The default mount supplied with the rotator is intended for a 35mm pipe, preferably a PA speaker stand with any plastic center plugs removed for the cables to run through the center.

Warning! Before connecting power to the device, make sure it has enough room to move freely without hitting something. When power is applied, the rotator will initiate by moving both axis and turning azimuth to 0 degrees north.

1) Mount the Satran on top of a pipe with control cables and any coaxial cables running inside down through the pipe, without fastening it completely.

2) Mount the control unit below the rotator, approx 1 meter away from the device or any other sources of electromagnetic interference. Cables coming in or out of the plastic housing should do so in the bottom to prevent any rainwater entering. Connect the control cable from the Satran to the RJ45 port on the controller, and the 12V power connector to the JST-plug on the controller.

3) Connect the power cable to a recommended power adapter and wait a few seconds for the rotator to initialize. If all is well, it should move both the azimuth and the elevation for some distance.

4) After initialization, the rotator points to what should be 0 degrees north. Take a compass and place it on top of the antenna. Turn the rotator by the pipe mount until the antenna is facing geographic north and fasten it by tightening the bolt on the pipe mount.

5) Start your computer or smartphone and connect it to the wireless hotspot with a hostname starting with "SATRAN_"

6) Now you can control the rotator. No more steps are needed if you only want to control the rotator directly. Enter http://192.168.4.1 in a web browser to access the manual control interface or enter the IP in the settings of your desired software like "Satran Control" android app or Gpredict on PC.

Continue if you want to control the Satran via your wireless network (recommended)...

7) Open a web browser and enter http://192.168.4.1/setup

8) Choose your desired wireless network from the list and enter the required password, press to save. Satran now restarts.

9) Now you can connect the computer or smartphone back to your own WLAN and the Satran can be accessed by replacing the IP-address with the one assigned to it by your wireless router. If you do not know this, you need to login to your wireless router and check what IP-address it has been assigned by the DHCP service. If the Satran is unable to connect, you might need to reset it to factory defaults and try again.

Success! Now it is ready to be controlled by the app or any other compatible software.

Mounting the device and antenna

It is important that both the Satran and its antenna is mounted properly to minimize the risk of damage to the unit or its surroundings.

The rotator should always be mounted facing upwards to prevent rain or dust entering it.

Satran MK2 is intended for all cables running through the center of it down the mounting pipe. On the side of the rotator there is a rubber gasket for the antennas coaxial cable. If the pipe your Satran is mounted to is taller than the control cable, you need to drill a hole in the pipe approx 1 meter below the top where the cable can exit for connection with the control box.

The DC power jack on the power cable is not waterproof and should be protected or sealed from the elements if it is mounted outdoors.

The control box should be securely mounted with the cables coming out from the bottom, using a rubber gasket for the cables and the silicone-sealed lid completely fastened.

A maximum antenna weight of 700 grams including any counterweight is recommended. It should be balanced with a small offset of approx 1/5 of the antennas weight in the front of the rotator to prevent unnecessary stress to the motors and gears.

Satran does not know what is north or south. When you mount the rotator, connect power to it and let it finish initialization. Then put a compass along the top bracket or antenna and manually turn the entire rotator until the "front" is facing 0 degrees north. Now tightly fasten the screws on the rotator mount. Remove and reconnect power again and make sure that sensors has been read correctly and that it is still facing north, otherwise redo the procedure and adjust.

Use plastic wire straps to fasten any cables to prevent strain on the connectors and other damage that could be caused by strong gusts of wind or that bloody thing called gravity.

Reset to factory defaults

If you need to reset the wifi settings and start the default Access Point again, you need to reset the controller to factory defaults. Do this by pressing and holding the small "RESET"-button on the top left of the controller board for a minimum of 3 seconds until a second blue LED-light turns on. Release the button and wait 10 seconds for the Satran to reset and reinitialize.

Powering up or down

To turn off the Satran; you just disconnect the power. There are not any manual boot sequences or commands. When you reconnect power again it will boot up in a clean state, but remembering any saved wifi credentials and calibrations.

It is recommended to always disconnect power when the device is not in active use.

Calibration of sensors

The sensors have been pre-calibrated and unless you make changes to the mechanics or the gears have missed a step due to excessive force, a re-calibration is not necessary.

The Satran MK2 uses two linear 1K potentiometers as sensors to read its current position. The max/min values of these need to be calibrated in order to give a high accuracy. The rotator accepts potentiometer range of 25 - 999. A reading lower than 25 probably indicates that the control board has lost the connection to the sensor, in that case check your cables.

1) Mount the rotator correctly and power it up. Wait a few seconds for the device to initialize.

2) If the device has not yet been setup and connected to you WLAN, connect your computer or smartphone directly to the Satran Access Point (hostname starting with "SATRAN_").

3) When connected, open a web browser window and enter http://192.168.4.1/calibration into the URL field if accessing it directly on the access point, or replace the IP-address with the one assigned to it by your wireless router.

4) Click to turn the azimuth counter-clockwise until it reads approx 100-150. This number will be the north end position (0 degrees). Enter this value in the corresponding field and press save button.

5) Take a pen or piece of tape and make a marking on both the bottom fixed turntable and the top rotator housing that should line up with each other.

6) Press the "Azimuth CW" button repeatedly to turn the azimuth a full 360-degree turn until the markings you made lines up again. Enter this new azimuth reading into the corresponding "azimuth max"-field and press save. Remove the markings/tape on the rotator if you like.

7) Continue by repeatedly pressing "Elevation down" button until the top antenna bracket is perfectly horizontal. Enter the elevation reading into the corresponding "Elevation min"-field and save.

8) Press "Elevation up" until the antenna bracket is perfectly vertical and enter the reading as the "elevation maximum", press to save settings.

Now calibration is finished and you can continue with the regular setup.

Controlling manually via browser interface

When installing or testing the Satran, it is good to have a way of controlling it without needing any additional software. That's why it has a manual control that you can access directly from any standard internet browser.

If setup has been performed and Satran is connected to your WLAN, enter:

http://192.168.x.x (change IP-address to the one it has been assigned by your WLAN)

If you are accessing the Satran directly, via the built-in access point (SSID: SATRAN_***):

http://192.168.4.1

Control with the Android app

The easiest way to use the Satran is with the free android app "Satran Control" available for download from Google Play.

After installation, start the app and go to the settings tab. Enter your GPS location and the correct IP-address to the Satran. If setup has been performed, use the IP that it has been assigned to it dynamically by your wireless router. If you are accessing the Satran access-point directly, the given IP-address is always 192.168.4.1

Now click the tab for the satellite list and choose any by clicking on it. If the list is empty, you need to connect your android device to a WLAN with internet access and restart the app to fetch a new satellite list from the CelesTrak data server.

When a satellite has been chosen, you can go to the first tab that should show you its relative position and the time for its next overhead pass. If you want the Satran to track the satellite when it passes you, you need to click the toggle button on the prediction tab to activate the rotator.

Please mind that the app will keep sending commands to the Satran even when minimized in the background. For the Satran to stop you need to deactivate it by pressing the toggle button in the app, or completely terminate the app.

Control with HTTP GET request

The app uses very simple GET requests to control the Satran, which are sent as a readable URL over HTTP on port 80 that you can test manually with any web browser:
Http://192.168.x.x/tracker?az=123&el=123

The IP-address above (192.168.x.x) should be replaced with the one it has been assigned by your wireless router. Replace "123" with the direction you want in degrees 0-360 for azimuth and 0-90 for elevation. Wait a second and the rotator should move and the browser sends back the string "success".

Control with Gpredict (hamlib/rotctld)

The Satran has a simulated hamlib rotctl daemon or "rotctld" that acts as a TCP server and can take standard rotctl commands from compatible software, like the popular Gpredict program.

When power is connected and the rotator has initialized without errors the Satran is always listening for rotctl commands, which makes setup very easy.

1) Power up the Satran and connect the computer with Gpredict either directly to the access point or the wireless network that the Satran is connected to.

2) In Gpredict, click "edit" and "preferences" in the top bar
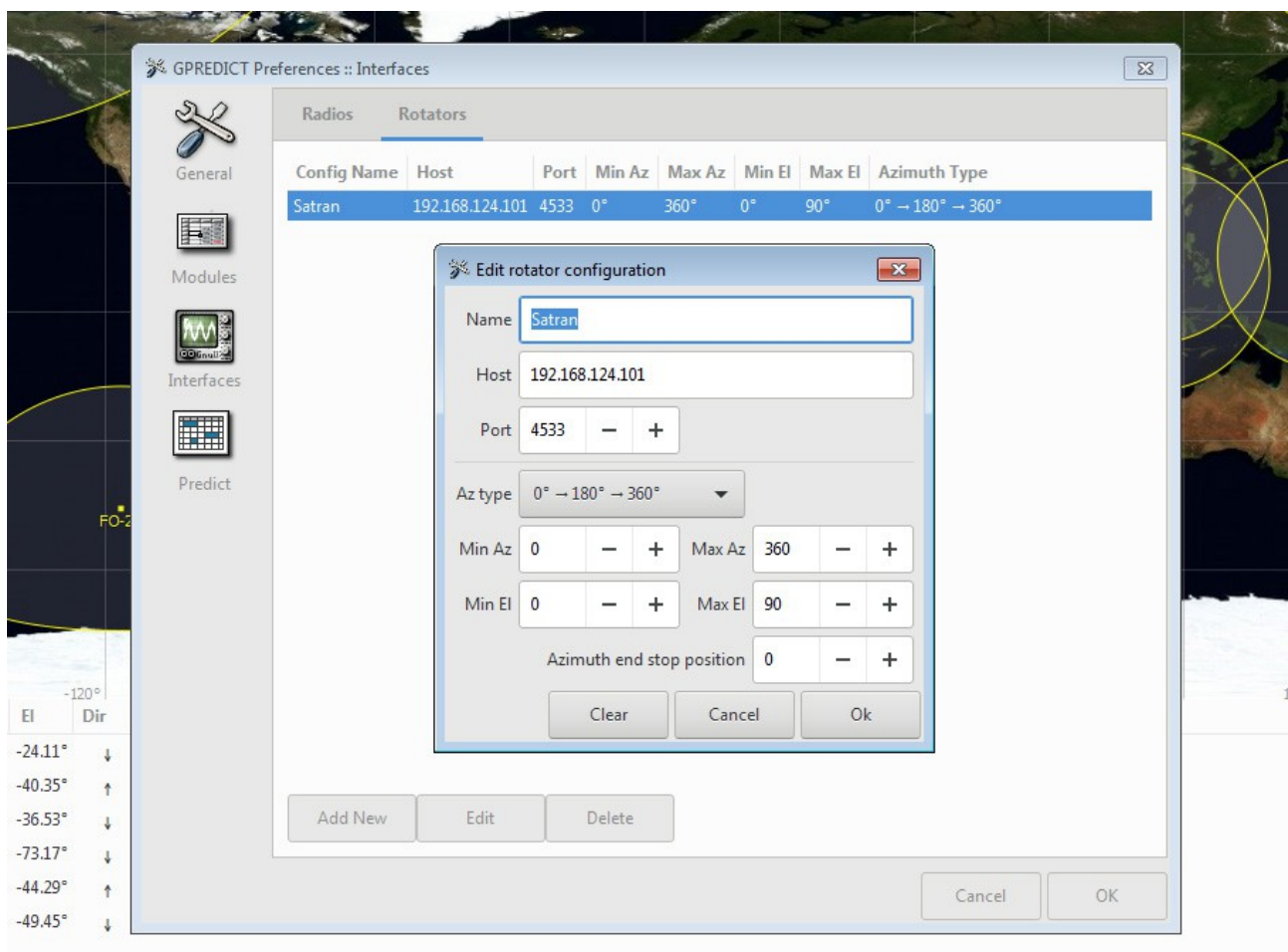
3) Press "interfaces" in the left column and choose the tab "rotators". Press "Add New". Enter the IP-address to the Satran and the other settings as pictured above. Press OK to close all.

4) In the main Gpredict window, now click on the small arrow icon in the top right corner to bring up the menu containing "Antenna Control". Click on it.
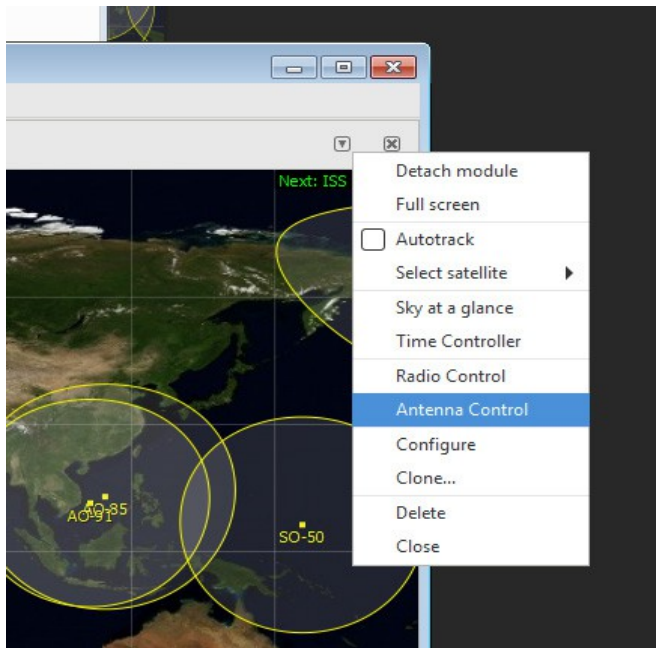
5) First press the "engage"-button to connect with the rotator. Next choose the desired satellite from the dropdown under "Target" and click the button "Track" to automatically follow the satellite when it reaches AOS (enters over the horizon). You can also manually change the large numbers for azimuth or elevation and the rotator will turn accordingly.
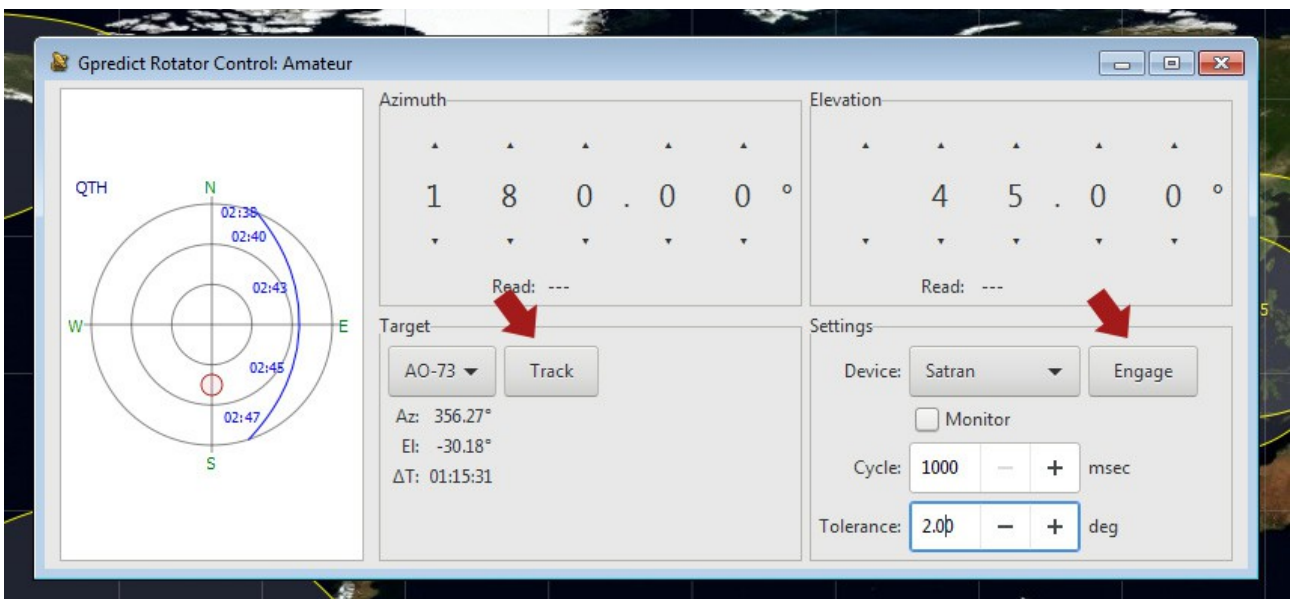
Satran MK2 has not yet been tested with other hamlib/rotctl-compatible software like satnogs. If you get it to work with such other software, please be kind to the community and share your findings in the forum at www.satran.io or by mail to satran@danaco.se

Specifications MK2 standard

Control unit processor:	ESP8266 v2 NodeMCU
Recommended PSU:	DC12V 1A
Control unit power cable:	JST-XH 2pin to 5x2.5mm DC-plug
Voltage requirements:	DC 11-15 volt
Recommended fuse:	5x20mm 630mA
Motor rated voltage:	DC12V 60RPM
Wifi network compatibility:	802.11 b/g/n (max 20 character pass/ssid)
Azimuth movement:	0-360 degrees
Elevation movement:	0-90 degrees
Tolerance:	approx 5 degrees
Operating temperature:	-10 to +35° Celsius
Max antenna weight:	700 gram
Housing material:	Cast aluminum, IP54
Color:	Grey satin RAL7040 as standard
Gears material:	Acrylonitrile styrene acrylate
Weight, rotator unit:	1.05 kg
Dimensions rotator:	200x120x120mm
Dimensions control box:	110x110x70mm
Country of origin:	Sweden

Happy satellite hunting!

73 de SM7YSA Daniel Nikolajsen
www.satran.io