NTRIP-X Quick guide

INTRODUCTION

NTRIP-X is a multi-band, multi-constellation GNSS RTK base-station with built-in NTRIP Client and Wi-Fi connectivity. The base station supports GPS L1/2/5, GLONASS L1/2, Galileo E1/5a/5b and BDS B1I/2I/3I simultaneously.

NTRIP-X GNSS RTK Base-Station

This quick guide provides a brief overview of the user interface and helps setting up the device for the first time.

NTRIP-X Features

- Ultra high precision GNSS RTK engine
- GPS L1 + L2 + L5
- GLONASS L1 + L2
- Galileo E1 + E5a + E5b
- BeiDou (BDS) B1I + B2I + B3I
- All constellations and all bands simultaneously
- NTRIP client using NTRIP protocol v1 & v2 (auto select)
- RTCM protocol v3
- Wi-Fi Station and Access Point 2.4 GHz with WPS

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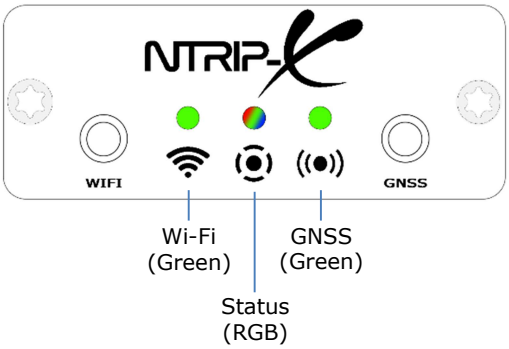
1 LED DESCRIPTION



1.1 Wi-Fi LED (green)

The Wi-Fi LED lights up whenever the NTRIP-X device is connected to an access point. Its intensity varies with the reception quality and can be used to find the optimum position for the Wi-Fi antenna, just place it where the LED shines brightest.
Please note that the NTRIP-X can also work as an access point for initial configuration. Connections where the NTRIP-X acts as access point are not reflected by the Wi-Fi LED.

1.2 GNSS LED (green)

The GNSS LED is active while the GNSS receiver has a position fix.

1.3 Status LED (RGB)

The status LED is full color and displays the status of several internal modules as a succession of blink-codes in different colors. Each sequence starts with "white" and continues with colors according to modules currently active. Colors and blink-codes are detailed in the table below, here are some typical ones:

white – white - …
All modules but the Wi-Fi access point (AP) disabled. This is the state after factory reset, you can connect to the internal AP and configure the device.

white – blue (double) - white – blue (double) - …
The device is successfully connected to a Wi-Fi network. No other modules active.

white – blue (double) – green (double) - white – blue (double) – green (double) - …
The device is successfully connected to a Wi-Fi network and to an NTRIP-Server.

Color	Module	Blink-Code	Meaning
White	System	Single	Begin of sequence
Blue	Wi-Fi Station	Single	Wi-Fi network configured but not connected
		Double	Wi-Fi network configured and connected
Green	NTRIP Client	Single	NTRIP-Server configured but not connected
		Double	NTRIP-Server configured and connected

The status LED is also used for the display of several special device states:

- **Button pressed > 1 s.**: Fast yellow flashing (-> Start WPS)
- **WPS currently activated:** Continuous yellow blinking
- **Button pressed > 15 s.**: Fast pink flashing (-> Factory reset)
- **Transient errors:** Fast red flashing for 2 s.
- **System is booting:** Several blink codes white/red

2 Setting up the device

The delivery includes the NTRIP-X device, a 2.4 GHz Wi-Fi antenna, and a multi-band GNSS antenna with 5m antenna cable. An additional USB-C power supply with at least 2 A current rating is needed.

To set-up the device, connect the Wi-Fi antenna to the left (WIFI) antenna port and the GNSS antenna to the right (GNSS) antenna port using the supplied antenna cable. Make sure that the GNSS antenna is mounted with a good 360° view to the sky and in such a way that it will not move while active. Plug-in the USB-C power supply (not included) to start operation.
Under no circumstances should the GNSS antenna be re-positioned while the device is powered. If you need to change the antenna location, unplug the NTRIP-X power, change the antenna position and then, with the antenna tightly fixed, power on the device again.

2.1 Using alternative antennas

Any 2.4 GHz antenna with SMA connector may be used as an alternative Wi-Fi antenna.
However, special care should be taken when selecting an alternative GNSS antenna to avoid degrading the system performance. The supplied GNSS antenna is a high quality active multi-band and multi-constellation antenna, and it should only be replaced by an active antenna suited for a phantom supply of 3.3 V and 100 mA maximum current. It should support all of the following constellations and bands: GPS L1/2/5, GLONASS L1/2, Galileo E1/5a/5b and BDS B1I/2I/3I.

3 Configuration

The device can be configured via a web interface. In order to access the web interface, it is necessary to connect the device to a Wi-Fi access point (AP) or router.

3.1 Factory Reset

When the NTRIP-X has never been configured, the Status LED will blink white every 2 seconds. If any other colors are displayed in the blink cycle, the device should be factory reset before connecting it to a new network.
To execute a factory reset, press the WPS button located at the rear of the device for 15 seconds until the status LED flashes pink, then release the button and wait until the status LED returns to blinking slowly white. ***This will clear <u>all</u> setting!***

3.2 Connecting the NTRIP-X to a Wi-Fi network

The connection to an existing Wi-Fi network may be established either by using WPS if this is supported by your AP/router or by accessing the NTRIP-X via its built-in AP.

3.2.1 Using WPS to connect to a Wi-Fi network

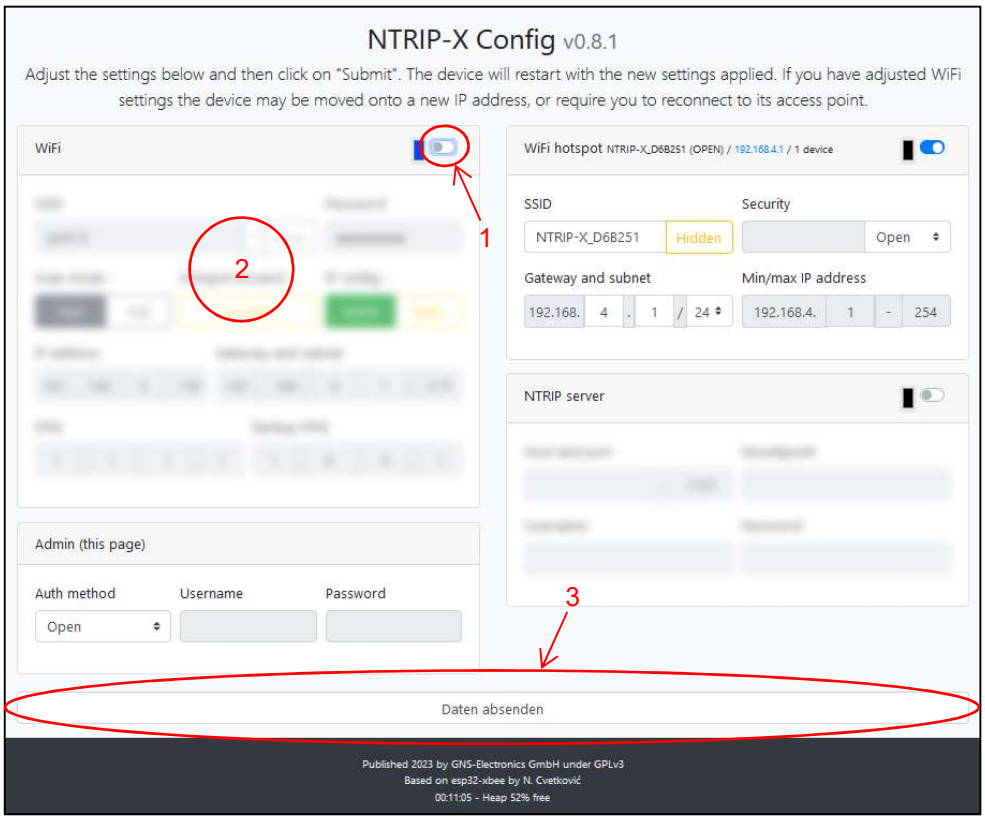
Make sure that the NTRIP-X is not yet configured (status LED blinks slowly only white). Otherwise execute a factory reset as described in §3.1.
During the WPS pairing process the GNSS antenna may be left unconnected.

Place the NTRIP-X nearby the Wi-Fi access point (AP) or router and put the AP/router into WPS mode (see AP/router documentation on how to do this). Press the WPS button until the status LED starts flashing yellow, then release the button and the WPS pairing process will start. During this process the LED will blink yellow. If a pairing error occurs, the status LED will flash red for two seconds and then return to the normal state. Pairing errors are not uncommon with WPS and it normally just works if you try again. Upon successful pairing, the device will reboot and the status LED will eventually indicate the Wi-Fi connection (blue double blink). The built-in AP will be automatically disabled.

3.2.2 Using the internal Wi-Fi Access Point to connect to a Wi-Fi network

Make sure that the NTRIP-X is not yet configured (status LED blinks slowly only white). Otherwise execute a factory reset as described in §2.1.

Using a smartphone, tablet or notebook, scan for available Wi-Fi networks and connect to the one named NTRIP-*XXXX* (where *XXXX* is a unique number). Open a browser and navigate to http://192.168.4.1 (***not*** *http**s**://*) where you should be greeted by the configuration page:



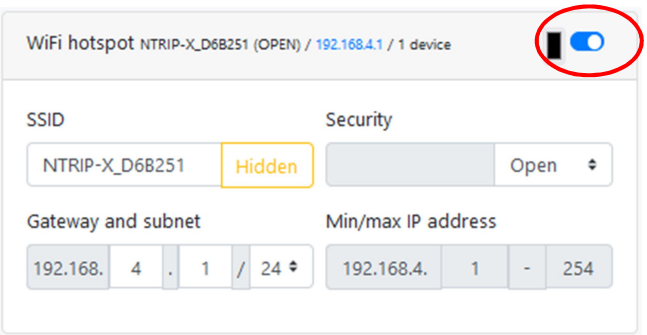
On a smartphone you might be presented with a one-column view of the same configuration page. In this case you will need to scroll down to locate the settings for specific modules and the 'Submit' Button.

Now enable the Wi-Fi module by clicking on the switch marked '1' in the screenshot above. This will un-blur the Wi-Fi configuration under '2'. Fill-in SSID and Password in the now visible fields and press the 'Submit' button marked '3'.
The device will reboot, and the status LED will eventually indicate the Wi-Fi connection (blue double blink). Please note that **the internal AP will not be disabled automatically**, so continue with *Securing the device*.

3.3 Securing the device

3.3.1 Securing the Access Point

It is highly advisable to disable the built-in Access Point (AP) after the device has been successfully connected to a Wi-Fi network. Configuring via WPS will do this automatically but if Wi-Fi has been configured manually via the web interface, the AP will remain active to allow re-configuration in case the supplied SSID/password is wrong.
To disable the AP, log into the NTRIP-X under its new IP address and disable the module by clicking on the switch located in the upper right corner of the *WiFi hotspot* configuration:

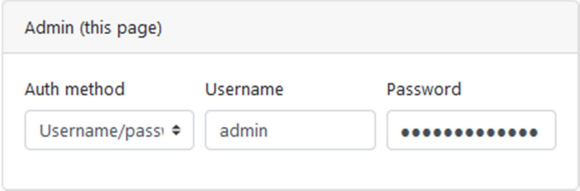


The 'Submit' Button needs to be pressed to activate the changes.

If for some reason the AP should remain active, the security should be adjusted to WPA/2-PSK and a sufficiently complex password should be supplied. The 'Submit' Button needs to be pressed to activate the changes.

3.3.2 Securing the web interface

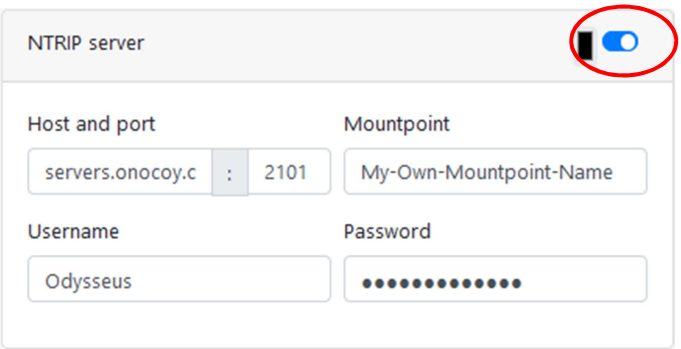
Depending on the nature of the network, it may be sensible to secure access to the configuration web interface. This is accomplished by changing the *Admin* module's *Auth Method* to *Username/Password* and entering a username and sufficiently complex password.



The 'Submit' Button needs to be pressed to activate the changes.
If the password gets lost, the only way to recover the device is to execute a factory reset!

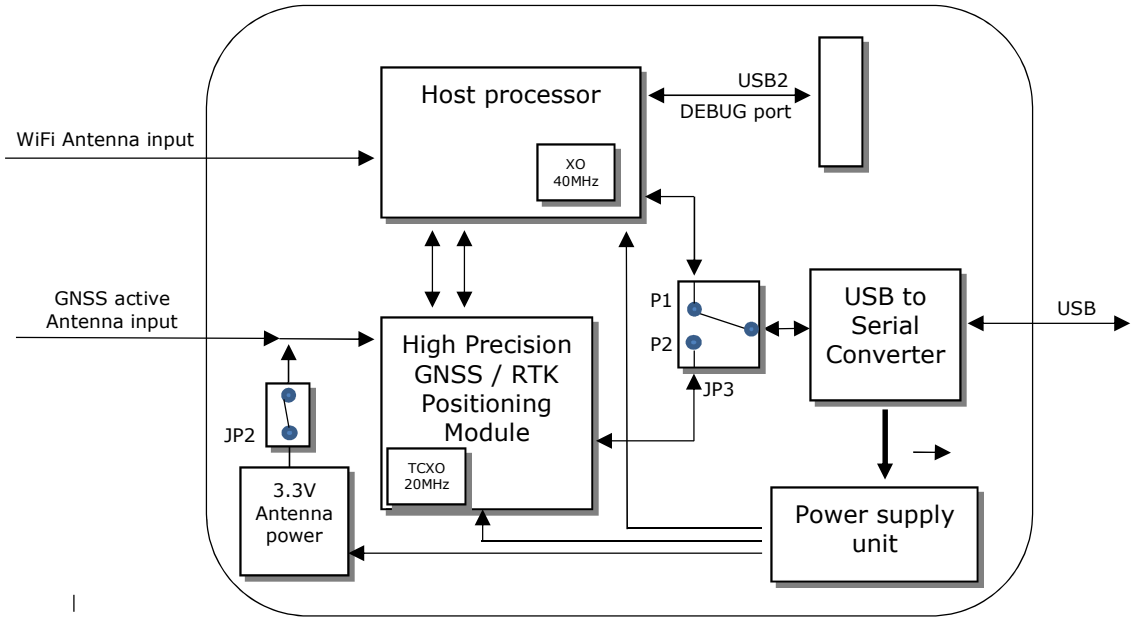
3.4 Configuring the NTRIP Client

After connecting the Wi-Fi network and securing the device, the NTRIP client needs to be configured to connect to an NTRIP server of your choice.
Enable the NTRIP client module by clicking on the switch in the upper right corner of the NTRIP client pane which will unblur the configuration area:

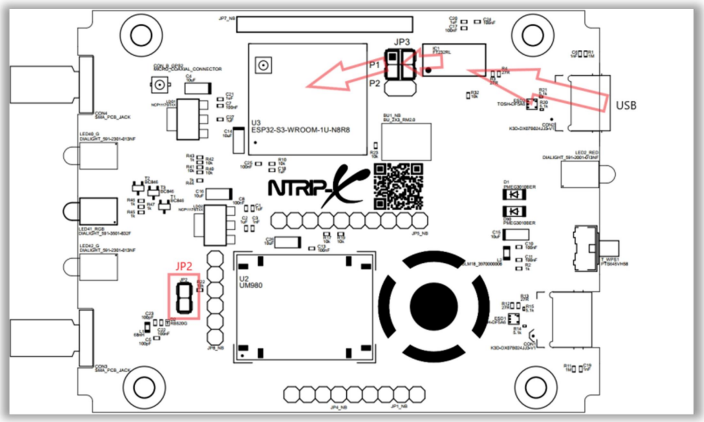


Enter the host name or IP address of the NTRIP server of your choice and change the port number if necessary, the standard port 2101 is pre-selected. Enter the *Mountpoint, Username and Password* as supplied by the NTRIP server administrator and click the 'Submit' Button to activate the changes.
The device re-configures and should be showing a blue double-blink (Wi-Fi) and a green double-blink (NTRIP client) to indicate success.

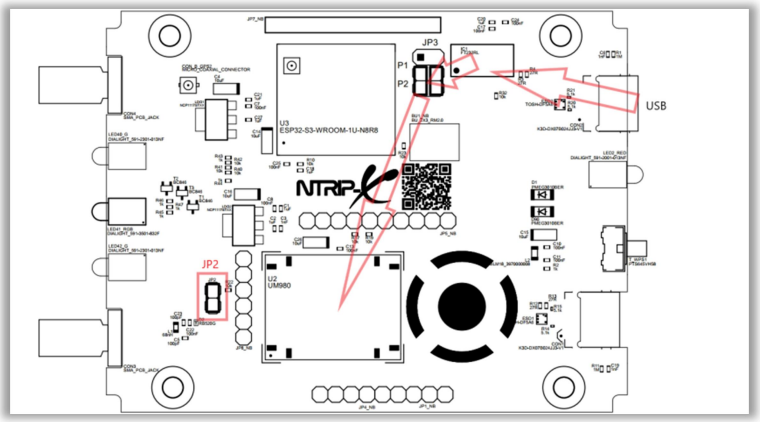
4 Block diagram



4.1 Jumper Configuration



JP3 in Pos. P1



JP3 in Pos. P2

5 FCC STATEMENT

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules.
Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

FCC RF Exposure Warning Statements:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment shall be installed and operated with minimum distance 20cm between the radiator & body.

6 DOCUMENT REVISION HISTORY

V0.9	2023-03-20	C. Diehl	Initial creation
V1.0	2023-03-21	C. Diehl	Release
V1.1	2023-06-15	M. Heinzel	Block diagram & Jumper setting added
V1.11	2023-06-16	M. Heinzel	XO & TCXO frequencies added
V1.2	2023-07-18	M. Heinzel	FCC STATEMENT added, US representative added

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