



# X5R

## Documentation

Download manual as PDF

Base station and Rover for PPK, RTK and NTRIP fixed solution. With just a few minutes of setup, the X5R is one of the fastest ways to take centimeter-grade measurements. It works with common GIS software including SW Maps, SurvPC, Field Genius, and many others.

**Version:** 7.0

**This device can be used in the following modes:**

- GNSS Standalone module
- GNSS Positioning Rover and Base for post-processing
- GNSS Positioning with RTK LoRa (10 mm accuracy) with 10 km reach at line of sight
- GNSS Positioning with NTRIP (10 mm accuracy) receives streaming correction data from a NTRIP caster to apply as real-time corrections to a GNSS receiver.

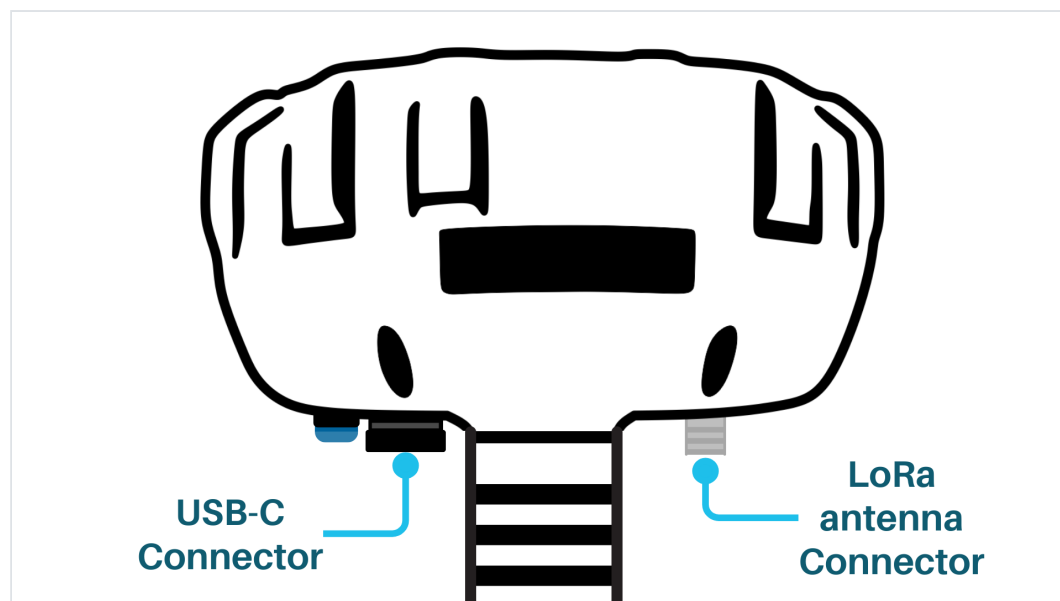
If you have any questions that are beyond the scope of this documentation, Please feel free to contact our [Mettatec X5 Support contact](#).

# Technical specifications

<b>Mechanical</b>	<ul style="list-style-type: none"><li>• Dimensions: 138 × 138 × 85 mm</li><li>• Weight: 650 g</li><li>• Operation temperature: -40 to 85 °C</li><li>• Enclosed Design</li><li>• IP67 Enclosure – Able to protect against powerful water jets.</li><li>• Water projected in powerful jets (12.5 mm nozzle) against the enclosure from any direction shall have no harmful effects.</li><li>• Test duration: at least 3 minutes; Water volume: 100 liters per minute; Pressure: 100 kPa at distance of 3 m.</li></ul>
<b>Electrical</b>	<ul style="list-style-type: none"><li>• Input voltage: 4.75 – 5.5 V</li><li>• Internal antenna DC bias: 3.3 V</li><li>• Peak current consumption: 2500 mA</li><li>• Average current consumption: 500 mA</li><li>• Current limit on USB OTG: 2000 mA</li><li>• LiPo 6Ah with fast 1.5A charging</li><li>• More than 15h autonomous work in base mode</li><li>• More than 20h autonomous work in rover mode</li></ul>
<b>Connectivity</b>	<ul style="list-style-type: none"><li>• Wi-Fi 2.4 GHz 802.11b/g/n</li><li>• Bluetooth V4.2 BR/EDR</li></ul>
<b>Data</b>	<ul style="list-style-type: none"><li>• Position output NMEA, RXM (for RINEX 3.0)</li><li>• Data logging UBX file with events</li><li>• Internal storage of 32 GB</li></ul>
<b>GNSS</b>	<ul style="list-style-type: none"><li>• Concurrent reception of GPS, SBAS, Galileo, BeiDou and GLONASS</li><li>• Receives both L1C/A and L2C bands</li><li>• Signal tracked GPS/QZSS L1 C/A, L2 GLONASS L1OF, L2 BeiDou B1I, B2I Galileo E1-B/C, E5b</li><li>• Number of channels 184</li><li>• Update rate up to 10 Hz GNSS</li><li>• Time to First Fix: 25s (cold), 2s (hot)</li><li>• Max Altitude: 50 km (31 miles)</li><li>• Max Velocity: 500 m/s (1118 mph)</li><li>• Horizontal Position Accuracy:<ul style="list-style-type: none"><li>• 25 cm without RTK</li><li>• 10 mm with RTK</li><li>• 10 mm with NTRIP</li></ul></li></ul>

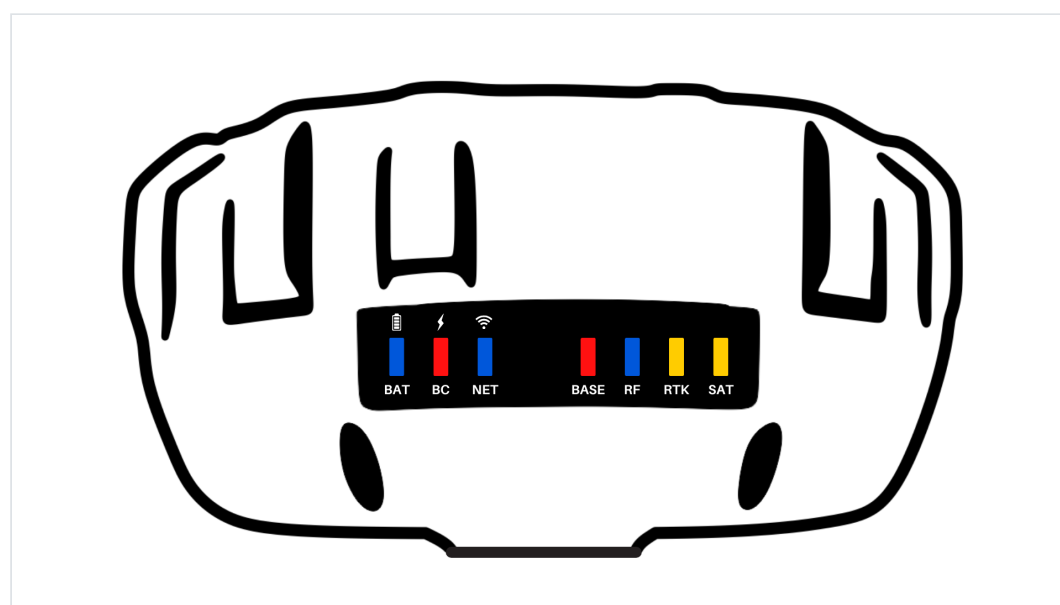
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Antenna	Constellations	GPS, SBAS, Galileo, BeiDou, GLONASS
	Nominal frequency	<ul style="list-style-type: none"><li>• GPS: L1C/A, L1C, L2P, L2C, L5</li><li>• BDS-2: B1I, B2I, B3I</li><li>• BDS-3: B1I, B3I, B1C, B2a, B2b</li><li>• GLONASS: G1, G2, G3</li><li>• Galileo: E1, E5b, E5a, E5 AltBoC, E6c</li><li>• QZSS: L1C/A, L2C, L5, L1C</li><li>• SBAS: L1C/A</li><li>• IRNSS: L5</li></ul>
	Frecuency range	1165-1278/1559-1612 MHz
	V.S.W.R.	≤2
	Phase center (mm)	<2 mm
	Impedance	50 Ω
	Polarization	RHCP
Antenna LNA	LNA gain	38±2dB
	V.S.W.R	<2
	Noise Figure	<1.0
	DC Voltage	3.3~18 V
	Current	25~40 mA
Antenna Environmental conditions	Working Temp	-40°C~+85°C, 10%~95% RH
	Storage Temp	-55°C~+100°C, 10%~95% RH
	Vibrations	Sine sweep @1.5mmAM 10~55Hz Each Axis
Radio configuration	<ul style="list-style-type: none"><li>• Global license-free ISM 433MHz or 915MHz band</li><li>• Antenna gain: 5 dBi</li><li>• Max distance: 10 km, in clear open area and line of sight</li></ul>	

## Ports description



- **USB-C connector:**
  - Charging battery
  - Flashing and programming firmware
  - Debugging
  - Accessing files
- **Antenna connector:**
  - SMA connector for 433/915MHz LoRa antenna

## LEDs description



- **BAT: Battery level indicator**
  - Blue: 80 - 100%
  - Green: 50 - 80%
  - Yellow: 10 - 50%
  - Red: 0 - 10%
- **BC: Battery charge indicator**
  - Red: when the X5 Receiver is charging
  - Blue: charge completed
- **NET: Wi-Fi & Bluetooth**
  - Blinking: Bluetooth waiting for connection
  - Solid: Bluetooth connected
  - Fading: Wi-Fi Enabled

- **BASE:**
  - Blinking: Device is set to Base Mode and a survey is being conducted
  - Solid: survey is complete, and the unit begins broadcasting RTCM correction data
- **RF: LoRa Radio Rx/Tx**
  - Blinking: Transmitting or receiving data
- **RTK: RTCM data Reception**
  - Off: no RTCM correction data is received.
  - Blinking: RTK Float is achieved.
  - Solid: RTK Fix is achieved.
- **SAT: Pulse per second (PPS)**
  - Blinking at 1Hz: GNSS fix is achieved. The receiver has detected enough satellites to obtain a rough location.

## Functionalities

### Push button

According to the pulse duration, it makes different changes in the device operation:

- **Turning on**
  - Pressing 3 seconds until the BAT LED turns on.
- **Mode selector**
  - Pressing 2 seconds, until it beeps twice, enters configuration mode.
  - If you entered configuration mode, push the button once to return to operating mode without restarting the device from the app.
- **Turning off**
  - Pressing 5 seconds, until all lights turn off.

### Sound alerts

The device includes a buzzer that emits sound alerts for certain events:

- Turning on: Three beeps
- Mode selector: Two beeps
- Recording files: One beep every 30 seconds
- Base mode position: Continuous beeps until it gets its position
- RTK Fix: Three beeps every 15 seconds if RTK Fix is reached
- Turning off: Ten beeps

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## Utilization

### Charging and energization

When fully charged, the X5 GNSS Receiver can run for 20 hours straight. However, if a longer time without interruption is required or if you want to charge the unit, it must be connected to a power source with the provided cable and AC adapter.

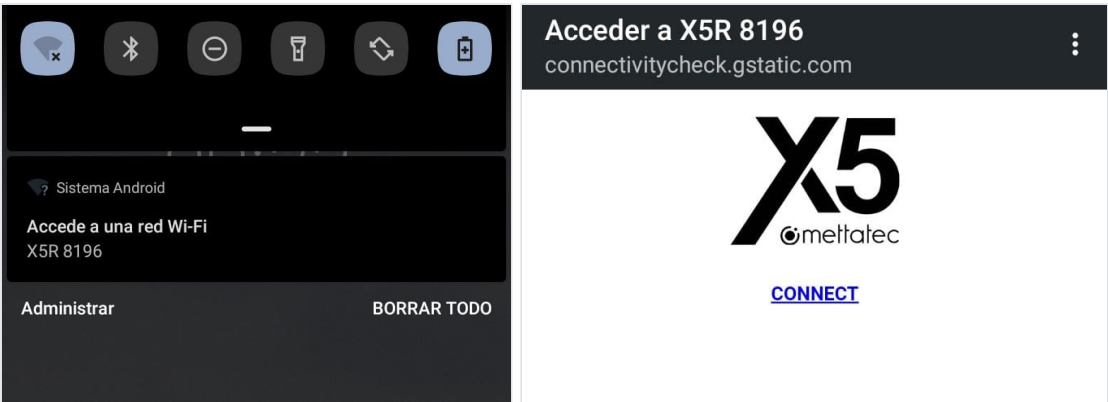
# Configuration

Enter **configuration mode** by pressing the button until you hear two beeps. During this mode, datalogging to the SD card is paused; in order to resume datalogging, push the button to return to the operating modes. Wi-Fi is available under the following parameters:

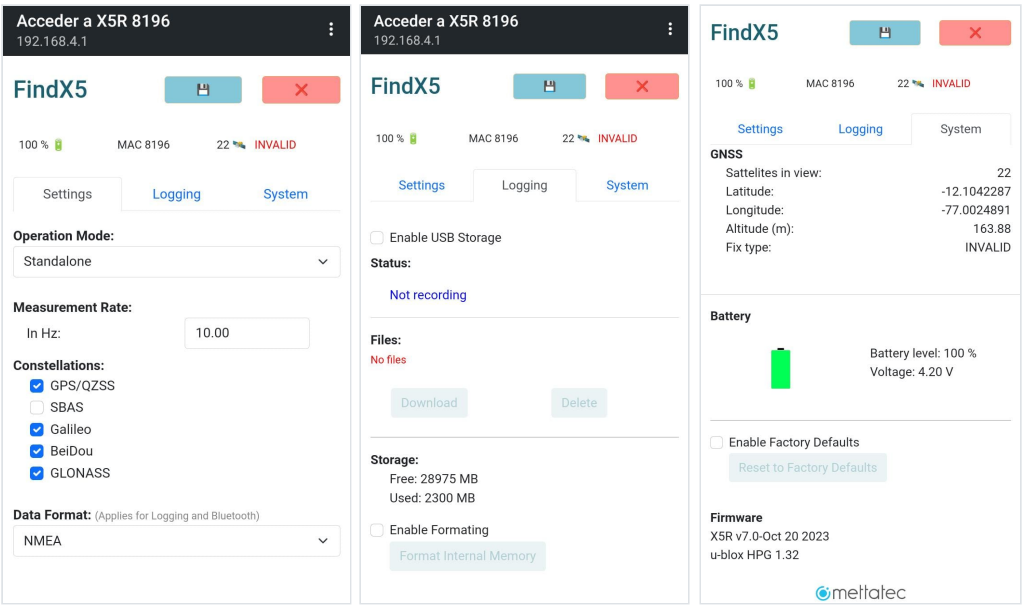
- SSID: X5 Receiver XXXX, where “XXXX” represents the device's MAC address
- Password: 123456789

Can be used with the FindX5 App (only Android supported) or using a web browser with the IP address <http://192.168.4.1>.

- The app will display an alert message in your mobile device to access to the graphic interface.
- Make sure your phone is connected just to the device Wi-Fi, not mobile data activated.



- There are three sections: **Settings** (parameters and operation modes), **Datalogging** (accessing files from internal storage) and **System** (current device GNSS, battery and version information).



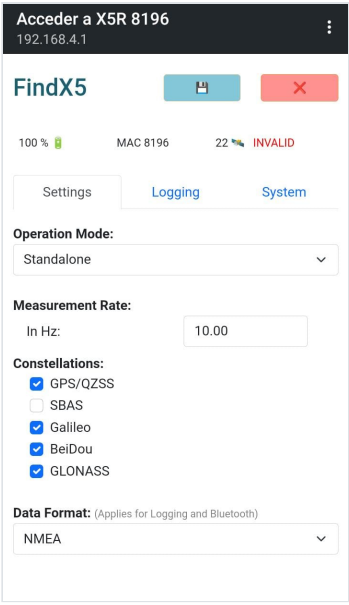
- Click the Save button in order to save all the modifications. Click the Exit button to return to the operating mode after saving the configuration.

# Modes of operation

The X5 GNSS Receiver can operate in different modes, including the Configuration Mode and operating modes like a Standalone module or in RTK LoRa, PPK and RTK NTRIP, each of them in Base or Rover mode.

## Standalone module

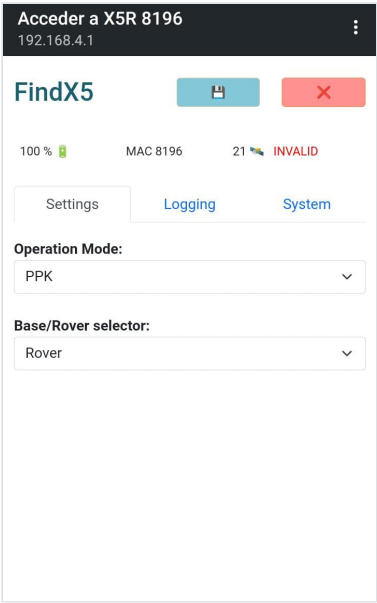
In this mode, the X5 Receiver works as an independent device without receiving corrections from an external source. This mode is suitable for applications where the required accuracy is relatively low. At the end of the job, you will have .ubx files that can be further processed.



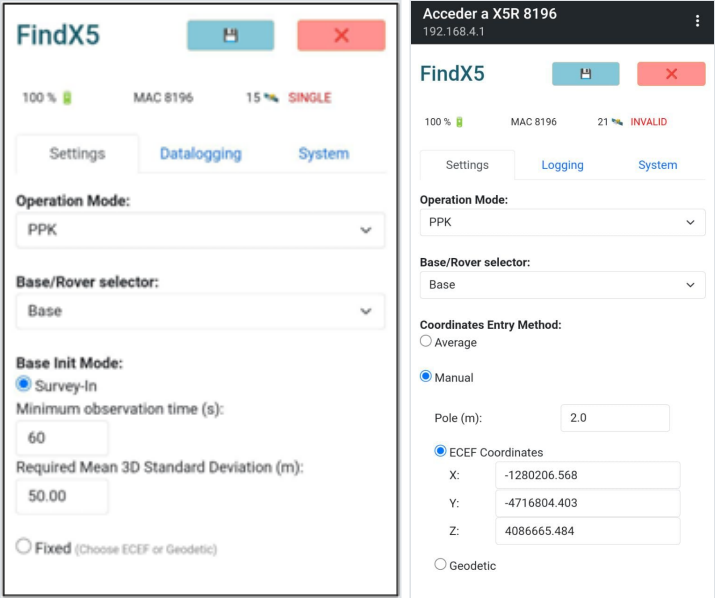
- Data format: If you need to view the information from a GIS software by connecting via Bluetooth, choose the Combined data; otherwise, select NMEA data.
- Recommended measurement rate: 10 Hz

PPK Mode

In this mode, data collected from the receiver is later processed to improve the position accuracy. The use of a GNSS data processing software is required. At the end of the job, you will have .ubx files that can be further processed.



- For Base mode, the way the module defines its position can be configured as:
  - Survey-in: Set a time limit for achieving the minimum deviation; if it is not reached within that time, the search for the minimum deviation will persist.
  - Fixed: Define specific coordinates in ECEF or geodetic system, introduce the pole length in meters.

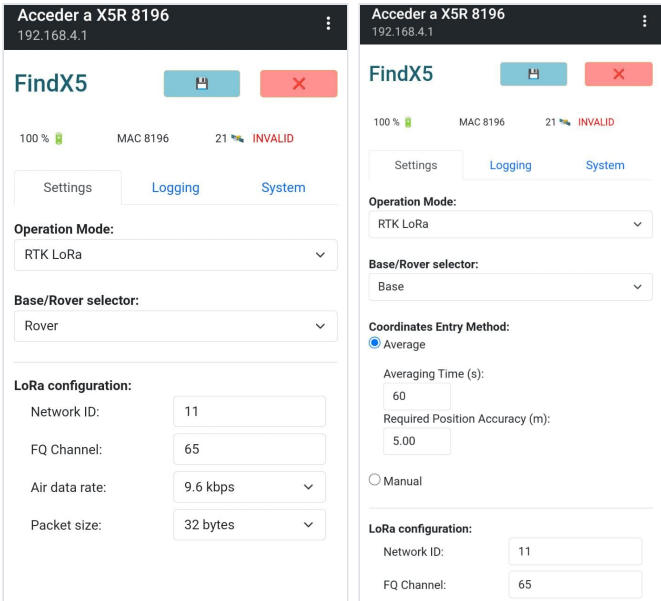


RTK with LoRa radio

In this mode, the base station transmits correction data in real-time to the receiver through a LoRa connection with a range of up to 10 km (at sight line) in the respective frequency band.



For Base mode, the way the module defines its position can be configured either as “Survey-in” or “Fixed”. Due to the high current consumption, the Bluetooth is deactivated when receiving corrections. If it is required to see the status of the base, connect with the included cable with USB Serial mode in the GIS software.



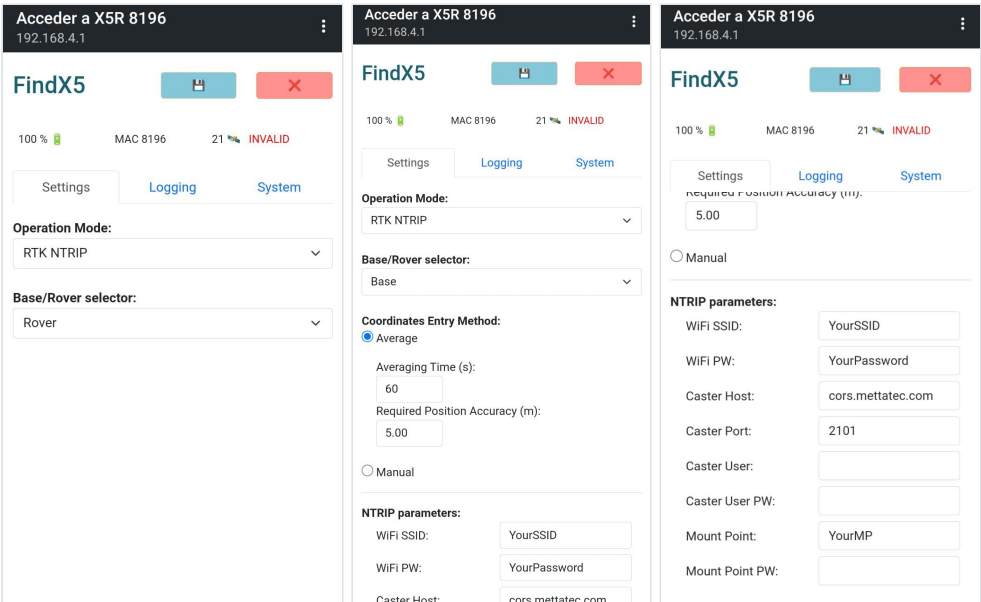
Your GNSS Base Station and X5 Receiver must have the same configuration in the RTK LoRa mode for the following parameters:

- NET ID: Unique identifier used to distinguish the LoRa network, default 0, it can be an integer from 0 to 255.
- Channel: Determines the frequency band used for communication, it can be an integer from 0 to 80 where:  $Frequency\ (MHz) = 850.125\ or\ 410.125 + CH \cdot 1M$ , according to the baseband and channel (CH) selected.
- Air rate: Refers to the data rate at which information is transmitted over the air, from 0.3 to 62.5 kbps with a default of 2.4 kbps.
- Other parameters are set by default and can not be modified: Baud rate (57600 bps), Packet size (32 bytes), Transmission power (30 dBm).

### NTRIP Mode

In this mode, the base station transmits correction data in real-time to the receiver through an Internet connection with much greater range.

- Your mobile device must have Internet connection to receive NTRIP corrections. Also, a caster connection is required to use this device (find free casters at rtk2go or Emlid).
- In case Rover does not receive corrections from the server, the module will retry connection during 30 seconds. This happens in case the base is disconnected, there is no Internet connection or there is a long distance with the router.
- For the Rover mode, the NTRIP credentials must be defined in a GIS software. Make sure you use the same mount point and caster information for the Base NTRIP.

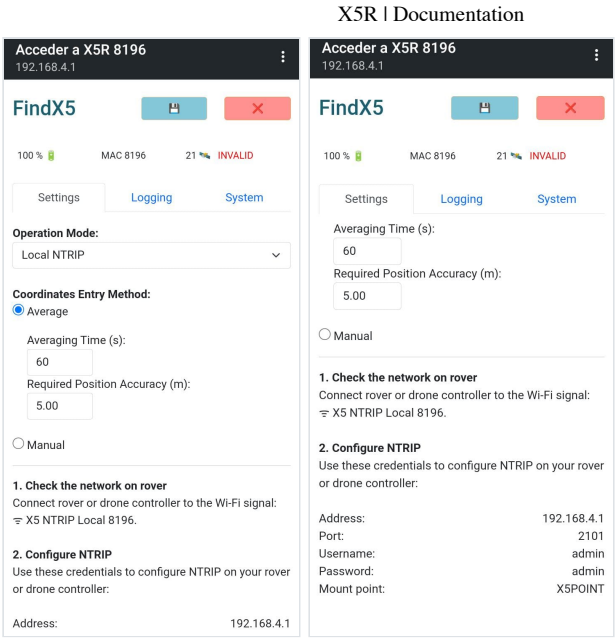


### Local NTRIP Mode

In this mode, the X5 Receiver works like a base station (the way the module defines its position can be configured either as “Survey-in” or “Fixed”) transmitting correction data in real-time to the receiver through a generated local Wi-Fi signal.

This can be used with the remote controls of UAV devices with credentials from the X5 Receiver; then, it is not necessary to have an Internet connection to receive correction data.



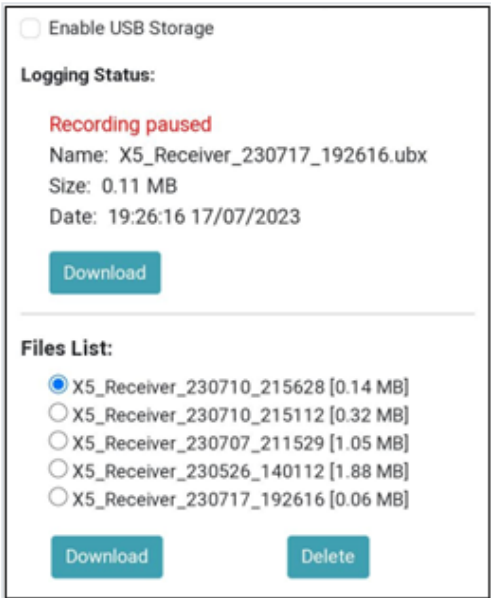


## Downloading data

The X5 Receiver module generates UBX files that are saved in the SD card included. Therefore, you have two ways to access these files:

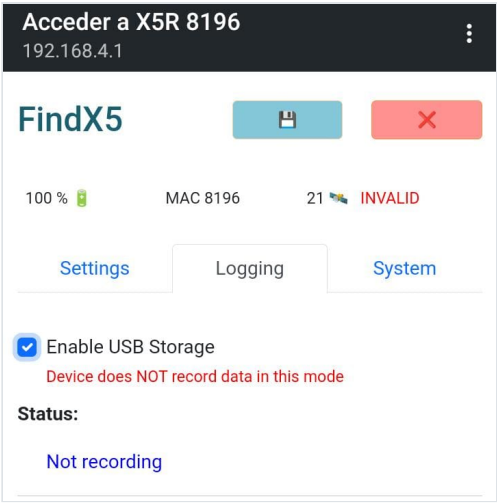
### 1. FindX5 app:

- a. Enter the configuration mode of the X5 Receiver. Connect your phone/tablet through Wi-Fi using the device's SSID and password.
- b. Open the “FindX5” app (only Android supported).
- c. Go to the “Datalogging” section in the SD Files List.
- d. Here you can find the generated UBX files and download them if needed.



### 2. USB storage connection:

- a. Select the “Enable USB Storage” option in the Datalogging section.
- b. Save the configuration and click the exit button. Remember, the device will not record data in this mode.
- c. Turn on again your X5 Receiver device. Connect it with the cable provided to your laptop (make sure you have installed the drivers from [here](#)).
- d. Now you should be able to access the internal files through your File Explorer.
- e. If you want to resume the regular operation modes, open the configuration mode in the FindX5 app and disable the USB Storage. Save the configuration, exit and restart your X5 Receiver device.



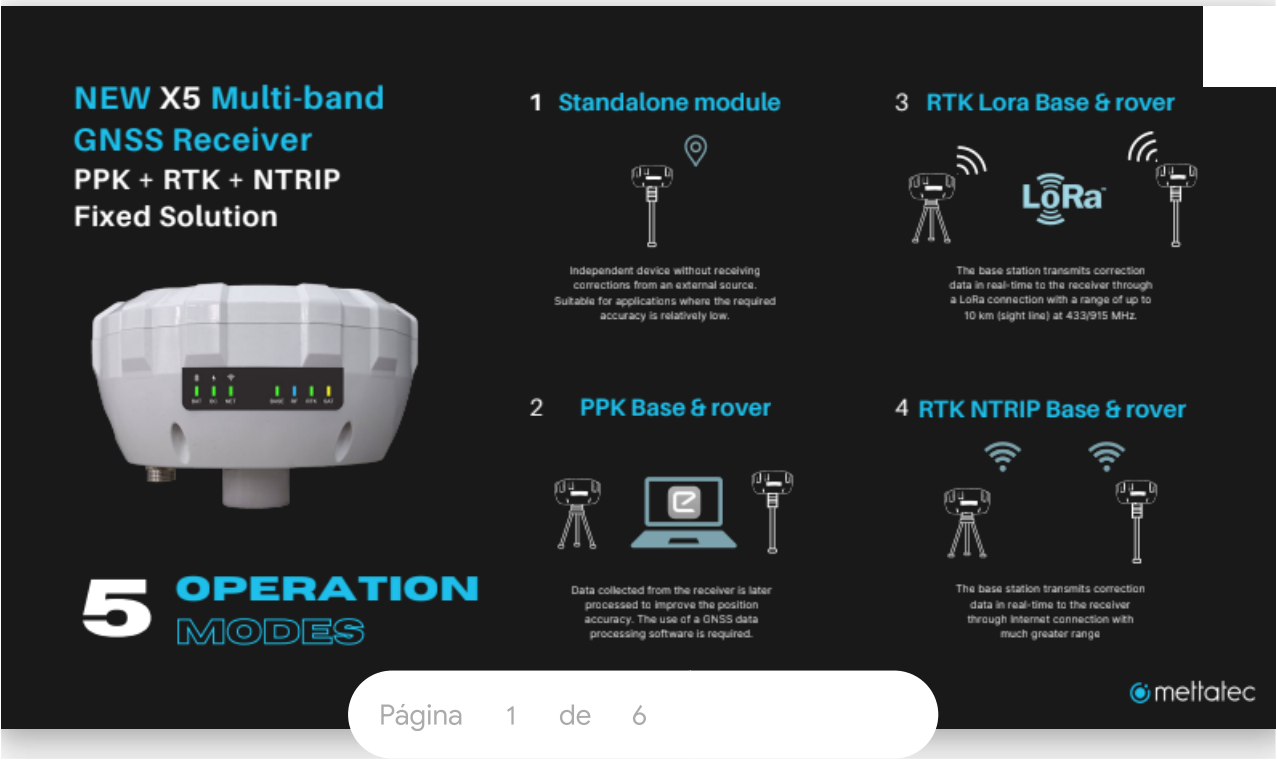
## Firmware update

Our devices are in continuous improvement and updates. Follow the next steps:

**NOTE:** If it is the first time you connect the X5 Receiver to your computer, it is required to install the X5 drivers [here](#).

- a. Connect the X5 Receiver to your computer.
- b. Open the “X5 Updater” application.
- c. Browse the firmware file (\*.bin) provided by Mettatec.
- d. Select the COM Port where the X5 Module is connected (USB-SERIAL CH340).
- e. Press the “Upload Firmware” button.
- f. The X5 Receiver will start the firmware updating process.
- g. When the updating is finished, the X5 Receiver will restart.

## Graphic manuals



# Video tutorials


@mettatec X5 Receiver & ...



X5 Receiver & X5 PPK | Fir...



X5R | Prueba de NTRIP Local con DJI Enter...



# Downloads

Download the necessary firmware updates and executable applications for your device.

- [X5 drivers](#)
- [X5 Updater](#)
- [Firmware version 7.0](#)

# Release notes

See what's new added, changed, fixed, improved or updated in the latest versions.

## Version 7.0 (20 Oct, 2023)

- ADDED

Local NTRIP for RTK Drones, receive corrections via Wi-Fi without Internet access.
- UPDATED

Improved accessibility to the configuration interface with an automatic pop-up window

UPDATED

Additional auditory feedback with the buzzer in Fix Mode (beeps indicate that Rover RTK solution is stable and accurate) and Base Mode (when the coordinates are set)

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## Version 6.4 (13 Sep, 2023)

ADDED

RAW data logging now available in every Base mode.

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## Version 6.3

ADDED

Now you can introduce the pole length for the Base mode (fixed position) into the configuration web.

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## Version 6.2

UPDATED

Improved configuration web: Now it is easier to configure your X5 Receiver, just choose the operation mode required.

UPDATED

Minor bugs on configuration web fixed.

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