Hemisphere®

875-0441-10

R632
GNSS Receiver

User Guide
Revision: A2
January 14, 2021

Table of Contents

Device Compliance, License and Patents

Device Compliance

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.

This product complies with the essential requirements and other relevant provisions of Directive 2014/53/EU. The declaration of conformity may be consulted at HTTPS://HEMISPHEREGNSS.COM/ABOUT-US/QUALITY-COMMITMENT.

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Hemisphere GNSS products may be covered by one or more of the following patents:

Patents			
6111549	6876920	7400956	8000381
6397147	7142956	7429952	8018376
6469663	7162348	7437230	8085196
6501346	7277792	7460942	8102325
6539303	7292185	7689354	8138970
6549091	7292186	7808428	8140223
6711501	7373231	7835832	8174437
6744404	7388539	7885745	8184050
6865465	7400294	7948769	8190337
8214111	8217833	8265826	8271194
8307535	8311696	8334804	RE41358

Australia Patents	
2002244539	2002325645
2004320401	

Continued on next page

Device Compliance, License and Patents, Continued

Notice to Customers

Contact your local dealer for technical assistance. To find the authorized dealer near you:

Hemisphere GNSS, Inc
8515 East Anderson Drive
Scottsdale, AZ 85255 USA
Phone: (480) 348-6380
Fax: (480) 270-5070
PRECISION@HGNSS.COM
WWW.HGNSS.COM

Technical Support

If you need to contact Hemisphere GNSS Technical Support:

Hemisphere GNSS, Inc.
8515 East Anderson Drive
Scottsdale, AZ 85255 USA
Phone: (480) 348-6380
Fax: (480) 270-5070
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Terms and Definitions

Introduction

The following table lists the terms and definitions used in this document.

R632 Terms & definitions

Term	Definition
Activation	Activation refers to a feature added through a one-time purchase. For features that require recurring fees, see **Subscription**.
Atlas	Atlas is a subscription-based service provided by Hemisphere GNSS.
Base Station	The Base Station is a receiver placed over a familiar point to provide real-time observations and send those observations to nearby RTK rovers via UHF radio or the internet.
BeiDou	BeiDou is a global navigation satellite system deployed and maintained by China.
BIN message	Binary message
Cold Start	Position moved more than 100km during power-off, or power-off is longer than 3 days.
CSEP	The distance in meters that the receiver has calculated between the primary and secondary antenna. This value should always be accurate to within 2 cm.
dB	Decibel. The unit of measurement used to express signal-to-noise ratio (SNR).
DGPS	Differential GPS refers to a receiver using differential corrections.

Continued on next page

R632 Terms & definitions, continued

Term	Definition
Firmware	Firmware is the software loaded into the receiver that controls the functionality of the receiver and runs the GNSS engine.
Galileo	Galileo is a global navigation satellite system deployed and maintained by the European Union and European Space Agency.
GLONASS	Global Orbiting Navigation Satellite System (GLONASS) is a Global Navigation Satellite System deployed and maintained by Russia.
GNSS	Global Navigation Satellite System (GNSS) is a system that provides autonomous 3D position (latitude, longitude, and altitude) and accurate timing globally by using satellites. Current GNSS providers are GPS, GLONASS, Galileo, BeiDou, NavIC (IRNSS), and QZSS.
GPS	Global Positioning System (GPS) is a global navigation satellite system deployed and maintained by the United States.
Heading	Heading is the angle between true north and the vector calculated from the primary to secondary antenna.
Heading Bias	Heading Bias is an offset applied to the heading value calculated by the receiver.
Hot Start	RF signal loss when power is on.
I/O	Input/Output
LED	Light Emitting Diode

Continued on next page

R632 Terms & definitions, continued

Term	Definition
Mountpoint	Mountpoints are the specified data streams in NTRIP. Multiple base stations may send data to an NTRIP caster.
MSEP	This is the distance in meters between the primary and secondary antenna. This differs from CSEP in that the user measures this value and inputs it into the receiver.
Multipath	Multipath occurs when the GNSS signal reaches the antenna by two or more paths. This causes incorrect pseudo-range measurements and leads to less precise GNSS solutions.
NavIC (IRNSS)	Navigation with Indian Constellation and Indian Regional Navigational Satellite System (IRNSS) is a regional navigation satellite system deployed and maintained by India.
NMEA	National Marine Electronics Association (NMEA) is a marine electronics organization that sets standards for communication between marine electronics.
NTRIP	Networked Transport of RTCM via Internet Protocol – a protocol for transmitting differential GNSS or RTK over the internet.
NTRIP Server	The NTRIP server sends data from the NTRIP source (base station) to the NTRIP caster.
PPS	Pulse-per-second is a pulse output by the receiver precisely aligned to the GNSS time. Default output is every one second.
QZSS	Quasi-Zenith Satellite System (QZSS) is a regional satellite navigation system deployed and maintained by Japan.
RF	Radio Frequency
RMS	Root Mean Square

Continued on next page

Terms and Definitions, Continued

R632 Terms & definitions, continued

Term	Definition
ROX	ROX is a Hemisphere GNSS propriety RTK message format that can be used as an alternative to RTCM3 when both the base and rover are Hemisphere branded.
RTCM	Radio Technical Commission for Maritime Services (RTCM) is a standard used to define RTK message formats so that receivers from any manufacturer can be used together.
RTK	Real-Time-Kinematic (RTK) is a real-time GNSS differential method that provides better accuracy compared to other differential corrections.
SBAS	Satellite Based Augmentation System (SBAS) is a system that provides differential corrections over satellite throughout a wide area or region.
SNR	Signal-to-Noise Ratio
Subscription	A subscription is a feature that is enabled for a limited time. Once the end-date of the subscription has been reached, the feature will turn off until the subscription is renewed.
UHF	Ultra-high frequency is the ITU designation for radio frequencies in the range between 300 megahertz (MHz) and 3 gigahertz (GHz), also known as the decimeter band as the wavelengths range from one meter to one tenth of a meter (one decimeter).
Warm Start	Power loss is less than the cold start time or distance.

Chapter 1: Introduction

Overview

Introduction

This chapter contains the information you need to get started using your R632 receiver. You can download this manual from the Hemisphere GNSS website at WWW.HGNSS.COM.

Contents

Product Overview

Product overview

The R632 GNSS receiver is a full-solution product that provides robust performance and high precision in a compact package. The R632 uses Hemisphere's new Lyra, Cygnus and Aquila core technologies, and features new interference rejection and multipath mitigation.

The R632's standard configuration offers multiple methods of connectivity and wireless communications. R632 uses Hemisphere's Atlas® correction network to achieve a stand-alone positioning to 4 cm.

R632 is a high-accuracy GNSS receiver for Survey, GIS, Marine Navigation, and other applications. The product is suitable for base stations and light vehicle applications.

Figure 1-1: R632 GNSS Receiver

Note: Throughout the rest of this manual the R632 GNSS receiver is referred to simply as the R632.

Continued on next page

Athena™ RTK

The R632 supports the use of Athena RTK (Real Time Kinematic) technology. Athena RTK requires the use of two separate receivers: a stationary base station (primary receiver) that broadcasts corrections over a wireless link to the rover (secondary receiver). The localized corrections are processed on the rover to achieve superior accuracy and repeatability. Performance testing has shown positioning accuracy at the centimeter level.

Alternatively, RTK corrections can be brought in over a GNSS network (NTRIP) if one is available in your area.

Athena RTK has the following benefits:

- Improved Initialization time - Performing initializations in less than 15 seconds at better than 99.9% of the time.
- Robustness in difficult operating environments - Extremely high productivity under the most aggressive of geographic environments.

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Atlas® L-band

Atlas L-band corrections are available worldwide. With Atlas, the positioning accuracy does not degrade as a function of distance to a base station, as the data content is not composed of a single base station's information, but an entire network's information.

The R632 provides accurate and reliable heading and position information at high update rates. To accomplish this task, the R632 uses a high performance GNSS receiver and two antennas for GNSS signal processing.

One antenna is designated as the primary GNSS antenna and the other is the secondary GNSS antenna.

Positions computed by the R632 are referenced to the phase center of the primary GNSS antenna. Heading data references the vector formed from the primary GNSS antenna phase center to the secondary GNSS antenna phase center.

Atlas L-band has the following benefits:

- Positioning accuracy - Competitive positioning accuracies down to 2cm RMS in certain applications.
- Positioning sustainability - Cutting edge position quality maintenance in the absence of correction signals, using patented technology.
- Scalable service levels - Capable of providing virtually any accuracy, precision, and repeatability level in the 4 to 50 RMS range.
- Convergence time - Industry-leading convergence times of 10-40 minutes.

Key Features

R632 key features

Key features of the R632 include:

- Multi-frequency GPS, GLONASS, BeiDou (including Phase 3), Galileo, NavIC (IRNSS)*, QZSS, and Atlas L-band
- Long-range RTK baselines up to 50 km with fast acquisition times
- Worldwide Atlas L-band corrections to 4 cm
- UHF (400 MHz & 900 MHz), cellular (GSM, 3G & 4G), Bluetooth, and Wi-Fi wireless communication
- Athena GNSS engine providing best-in-class RTK performance
- Status LEDs and powerful WebUI, making the R632 easy to monitor and configure
- Ethernet, Serial, and USB
- NTRIP Server, NTRIP Caster, and NTRIP Client
- Rugged housing
- Easy configuration from WebUI and remote server
- Adapt to power supply requirements in various environments
- IP67 Rated

*NavIC (IRNSS) will be available as a future firmware update.

What's Included in Your Kit

Kit contents

Table 1-1 provides the description and part number of each part in your kit. Table 1-2 lists the optional cables and accessory parts that are available for use with the R632.

Review the parts shipped with your kit. If any parts are damaged, contact your freight carrier. If any parts are missing, contact your dealer.

Table 1-1: Parts list

Part Name	Part Number	Qty
R632 Receiver	752-0053-10	1
Power Cable	054-0226-10	1

Table 1-2: Optional Cables and Accessory Parts

Part Name	Part Number	Qty
Cable, DB26 F - 2X DB9 M, 40"L	051-0451-10	1
Cable, DB26 F - DB9 M, 40"L	051-0452-10	1
Cable, DB26 F - RJ45 F, 40"L	051-0453-10	1
Cable, DB26 F - USB M, 40"L	051-0454-10	1
Cable, PWR, 2PIN Conn - SAE, 20"L	054-0225-10	1
Cable, PSAA30R-150-2P	054-0171-0	1

Chapter 2: Operating the R632

Overview

Introduction

Chapter 2 provides the information you need to power and operate your R632 receiver.

Contents

Powering the Receiver On/Off

Powering the receiver on/off

To power on the R632 you must connect to an external power supply. The R632 will power on automatically after it connects to the 2-pin power cable and has a power supply.

After powering on, the LED indicators will show the device status. For example, the Wi-Fi power indicator will illuminate green if the power is on.

To power off the R632 disconnect the external power supply.

Figure 2-1: R632 LED Indicators

Continued on next page

Powering the receiver on/off, continued

Table 2-1 lists the R632 indicators by color and function.

Table 2-1: LED Indicators

LED	Color	Function
Power	Red	Solid red when connected to power OFF when it is not connected power **Note:** The R632 cannot be powered on when voltage is less than 9V and will be powered on automatically when power is higher than 9V.
Satellite	Yellow	1. Flashing yellow is single solution 2. Solid yellow is float/fixed solution 3. OFF is Invalid solution/or tracked less than 4 satellites
Bluetooth	Blue	ON, Bluetooth has connected OFF, No connection
Cellular	Green	ON, Cellular is enabled OFF, cellular is disabled
Wi-Fi	Green	Solid green, Client/AP is enabled
UHF	Green	ON, UHF is enabled Flashing green, data transmitting via UHF OFF, UHF is disabled
Heading	Green	ON, Heading is enabled OFF, heading is disabled

Ports

R632 ports

Figure 2-2 below shows the R632 communication ports and port name labels.

Figure 2-2: R632 communication ports

Table 2-2 lists the communication ports and a description of each function.

Table 2-2: R632 communication ports

	Port Name	Description
1	GNSS2	TNC, external GNSS slave antenna connector
2	PWR	2-pin LEMO connector, power supply
3	DB-26	Two RS-485 serial ports One RS-232 serial port One USB 2.0 interface (supports OTG) One PPS output interface One EVENT interface One 100M Ethernet port
4	GNSS1	TNC, external GNSS master antenna connector
5	LTE	SMA, 4G antenna interface
6	UHF	External UHF antenna

SIM and MicroSD Cards

Insert cards

If you need to use the SIM card or a MicroSD card, you should insert the card before you power on the R632.

Refer to Figure 2-3 below. Open the card cover first, then insert the SIM card and MicroSD card and close the card cover.

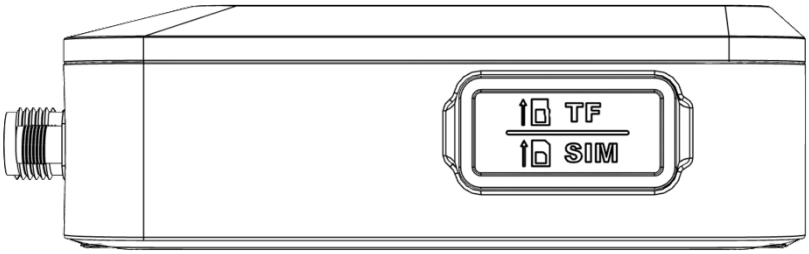


Figure 2-3: Card cover

Continued on next page

Insert cards, continued

Table 2-3 lists the R632 card slot ports and descriptions.

Table 2-3: R632 card slots

	Port Name	Description
1	TF card slot	MicroSD card slot
2	SIM card slot	Standard size SIM card interface

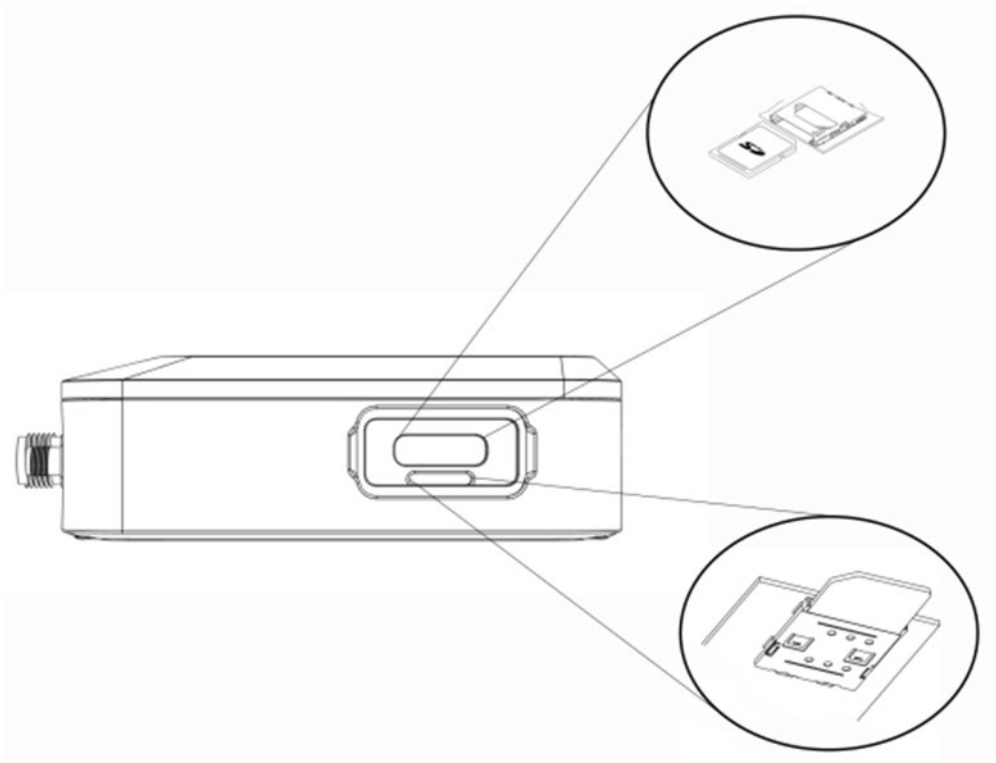


Figure 2-4: R632 card slots

Continued on next page

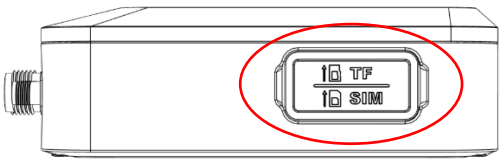
SIM and MicroSD Cards, Continued

Connect LTE modem

The R632 features an LTE modem that can be used to connect the receiver to the internet. R632 can also be used as an NTRIP client, NTRIP caster, and NTRIP server.

You can also upload raw data files to and FTP site or send emails and SMS messages when receiver conditions or criteria have been met (i.e., the receiver has moved, overheated, etc.). To connect to the LTE modem, use the following steps. Table 2-4 lists the steps to connect the LTE modem.

Table 2-4: Connect LTE modem

Step	Action
1	Locate the SIM card slot. 
2	Insert the SIM card using the below orientation.
3	Carefully push the SIM card until you hear the card click.
4	Install the LTE antenna.
5	The receiver will automatically power on. The power port is a 2-pin LEMO connector shown in the photo in Step 1. Optional power adapters include an AC and a DC option (8-36V).

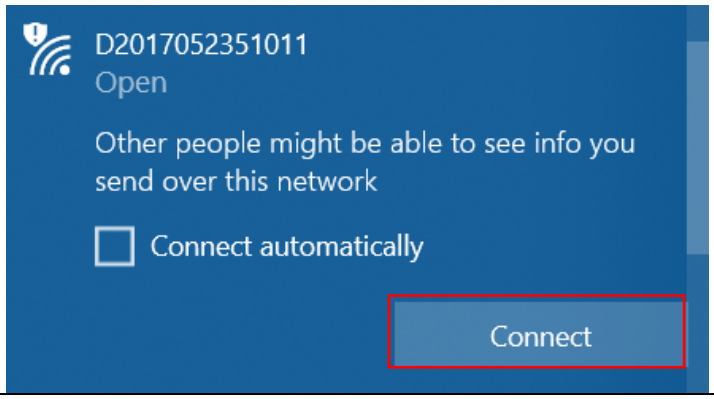
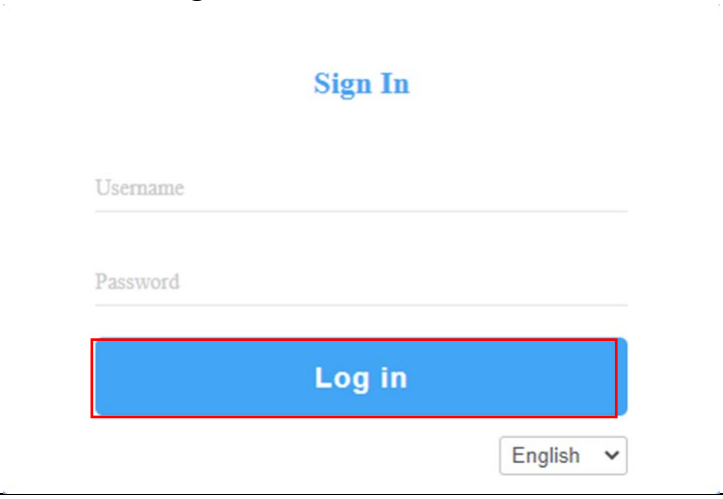
Connecting to the WebUI

Connect to the WebUI

Use the following steps in Table 2-5 to login to the WebUI.

Note: When completing subsequent portions of the R632 setup and installation (discussed later in this manual) return to this section for the steps you need to use the WebUI.

Table 2-5: Connect to the WebUI

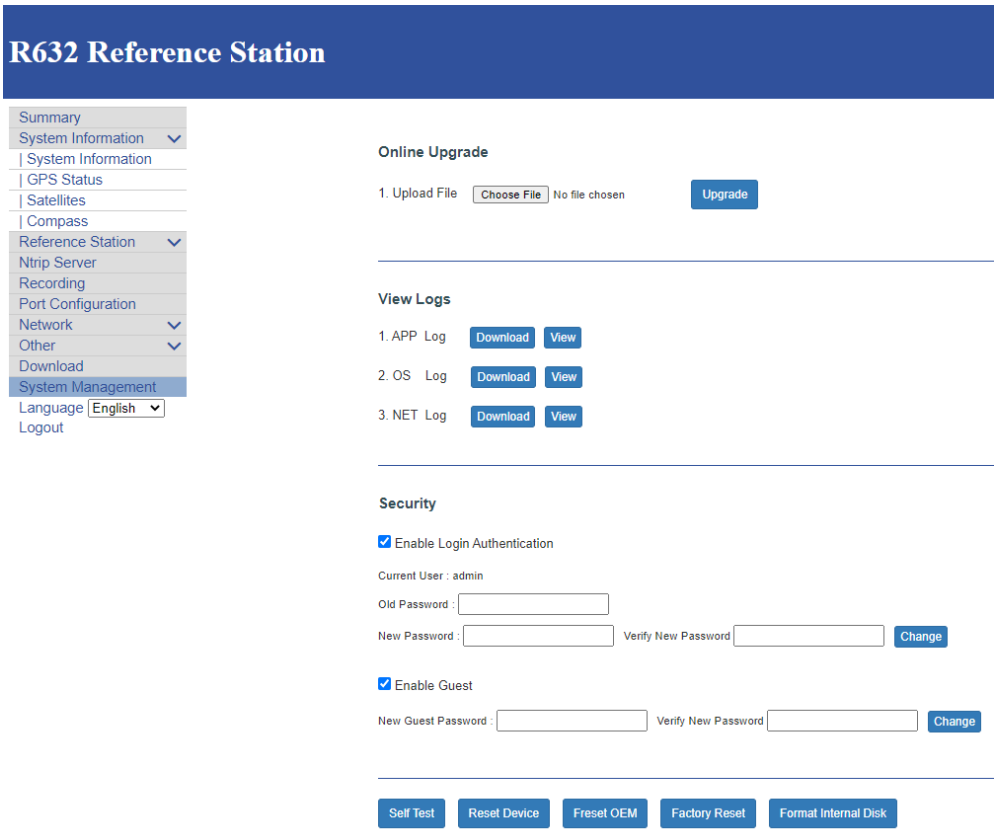
Step	Action
1	Click to connect to the SSID. The SSID is the serial number of the receiver. 
2	Type 192.168.10.1 in the browser address bar to log into WebUI.
3	Type the username: **admin** and type the default password: **password.** Click **Log in.** 

Upgrading Firmware

Upgrade firmware

The R632 has two firmware files: the carrier board firmware, and the GNSS firmware. The carrier board firmware and the GNSS firmware can be upgraded via the WebUI.

To upgrade firmware with the WebUI, log into the WebUI (see Connecting to the WebUI), and click **System Management**.



Locate the **Online Upgrade** option and click **Choose File**. Select the applicable file. Click **Upgrade**.

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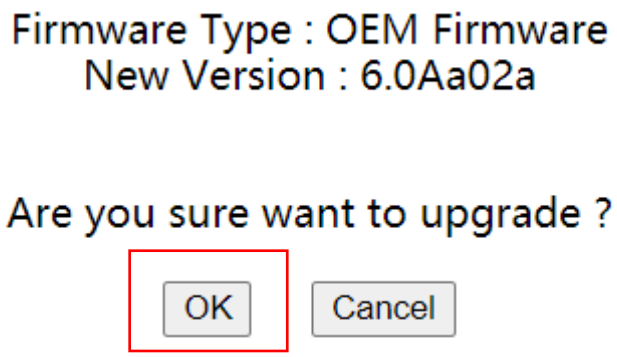
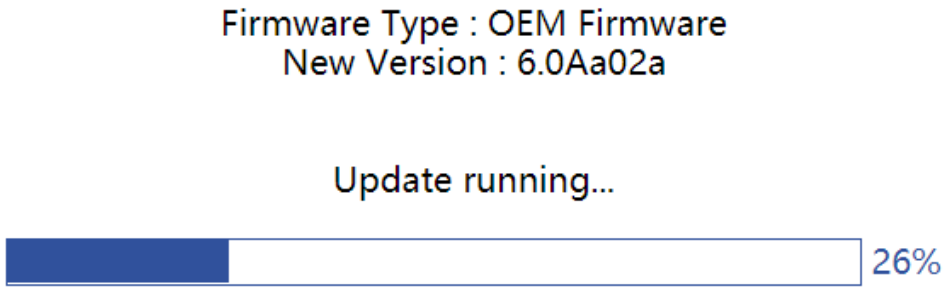
Upgrading Firmware, Continued

Upgrade firmware, continued

The WebUI will indicate either **OEM Firmware** (GNSS board) or **WebUI firmware**. Click **OK** to confirm that you wish to upgrade firmware.



The status bar displays the upgrade status.



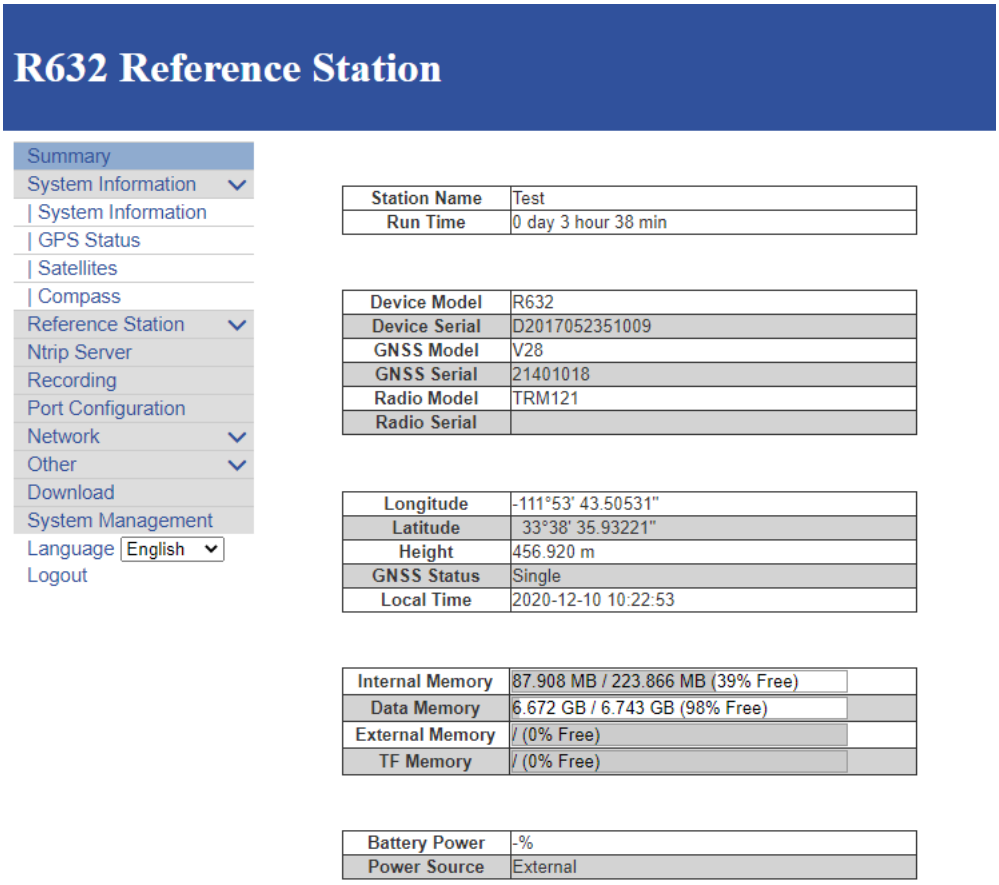
Using the WebUI

Overview

The R632 WebUI is used for configuration, logging, and data output via the communication ports (RS-232, RS-485, Bluetooth, and Ethernet (TCP/IP). Additional configuration related to the **Reference Station**, **NTRIP**, **Ports**, and **Network** options are available.

Summary

The **Summary** page contains information about the **Device Model**, **Device Serial**, **GNSS Model**, and **GNSS Serial Number** with a brief overview of the **Longitude**, **Latitude**, **Height**, and **GNSS Status**. The **Internal** and **External Memory** indicates the available internal and external storage in real-time.



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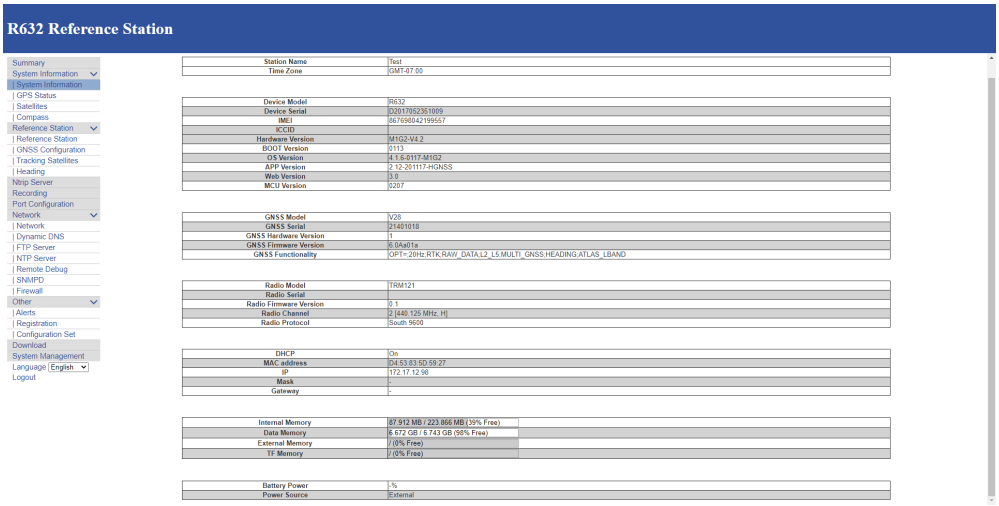
System Information

The **System Information** page contains an in-depth view of the GNSS receiver's technology. You can see the **GNSS Model**, **GNSS Serial Number**, **Firmware/Software** versions, **IMEI (Internal Modem)**, and **Radio** version and model.



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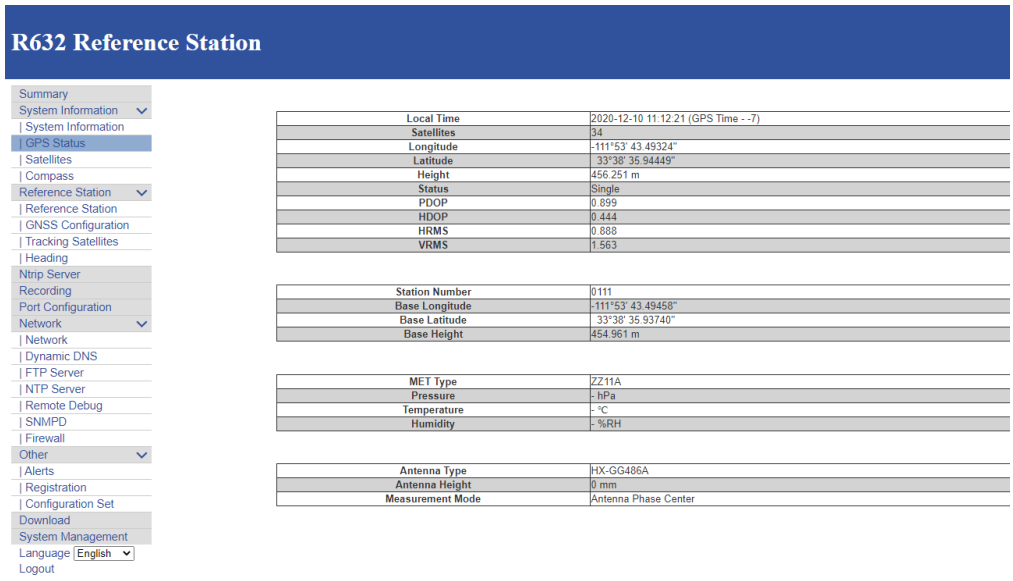
GPS Status

The **GPS Status** page shows the **Local Time**, the **Satellites** currently used in the solution, with **Longitude**, **Latitude**, **Height**, and **PDOP**, **HDOP**, **Horizontal RMS**, and **Vertical RMS**. The **Station Number** and **Base** (**Latitude**, **Longitude**, and **Height**) identify the current solution. Other items include the environmental information and selected antenna type visible at the bottom of the page.



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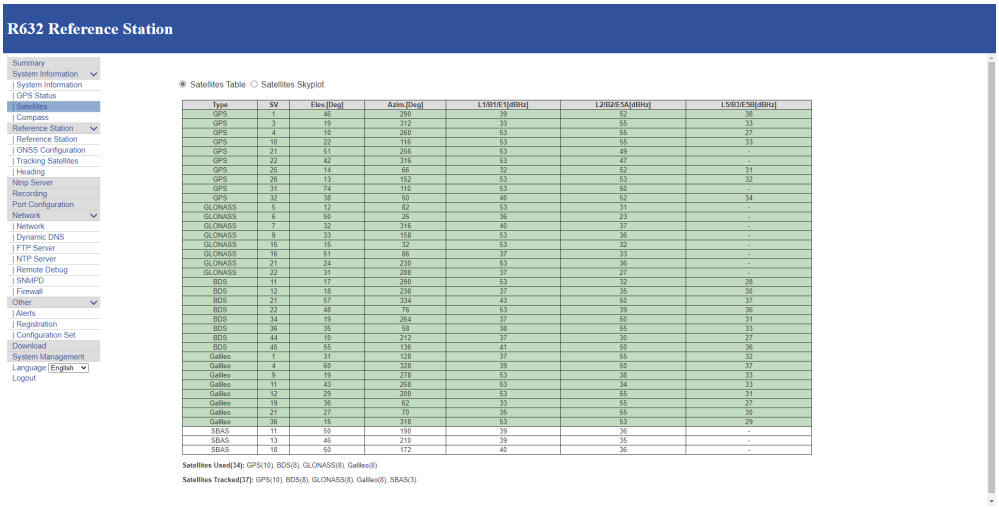
Satellites

The **Satellites** page displays the **Satellites** currently being used in the GNSS solution. All of the lines in **GREEN** are being **Tracked** and **Used** in the solution. Items in **WHITE** are being **Tracked** but **Not Used** in the solution. There is also a convenient summary line at the bottom of the page showing the total counts of satellites and constellation being used and/or tracked.

Sky Plot

The **Sky Plot** provides a graphical representation of available satellites being tracked and used in the solution along with the ability to see the **Satellite Vehicle** orientation compared to the R632 GNSS receiver. The bubbles on the **Sky Plot** identify the constellation of each satellite vehicle.



Type	SV	Elev.[Deg]	Azim.[Deg]	L1/B1/E1[dBHz]	L2/B2/E5A[dBHz]	L5/B3/E5B[dBHz]
GPS	1	46	290	39	52	38
GPS	3	19	312	33	55	33
GPS	4	10	260	53	55	27
GPS	10	22	116	53	55	33
GPS	21	51	256	53	49	-
GPS	22	42	316	53	47	-
GPS	25	14	66	32	52	31
GPS	26	13	152	53	53	32
GPS	31	74	110	53	50	-
GPS	32	36	50	40	52	34
GLONASS	5	12	82	53	31	-
GLONASS	6	50	26	36	23	-
GLONASS	7	32	316	40	37	-
GLONASS	9	33	158	53	36	-
GLONASS	15	15	32	53	32	-
GLONASS	16	51	86	37	33	-
GLONASS	21	24	230	53	36	-
GLONASS	22	31	288	37	27	-
BDS	11	17	290	53	32	28
BDS	12	18	238	37	35	30
BDS	21	57	334	43	50	37
BDS	22	48	76	53	39	36
BDS	34	19	264	37	50	31
BDS	36	35	58	38	55	33
BDS	44	10	212	37	30	27
BDS	45	55	136	41	50	36
Galileo	1	31	128	37	55	32
Galileo	4	60	328	39	50	37
Galileo	9	19	278	53	38	33
Galileo	11	43	268	53	34	33
Galileo	12	29	200	53	55	31
Galileo	19	36	62	33	55	27
Galileo	21	27	70	35	55	30
Galileo	36	15	318	53	53	29
SBAS	11	50	190	39	36	-
SBAS	13	46	210	39	35	-
SBAS	18	50	172	40	36	-

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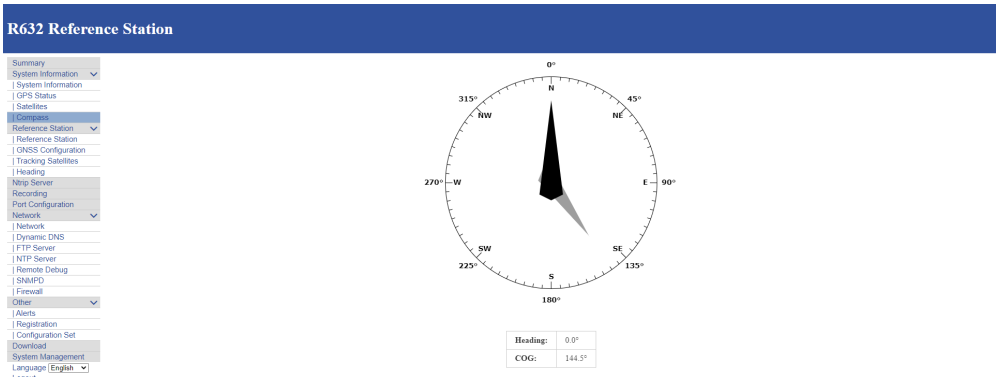
Compass

On the **Compass** page you can find a graphical real-time view of the **Heading** and the **Course over Ground** data.



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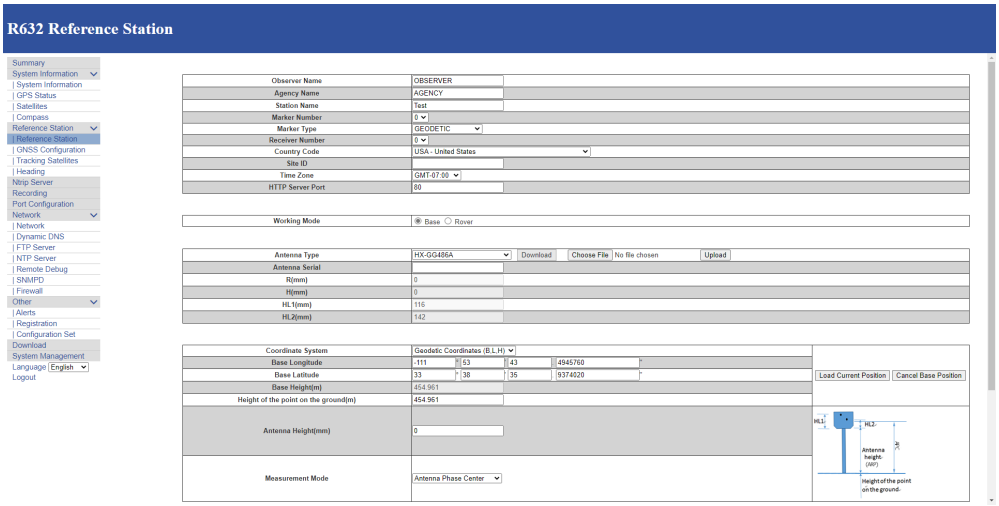
Reference Station

Use the **Reference Station** page to setup and configure your Reference Station. You can name the station, set the markers, local time, working mode, and antenna height. Additionally, the **Antenna** portion of this page provides a drop-down list of existing **Antenna Manufacturers** and configurations. For manufacturer antennas that are not on the list, a "Custom" option allows you to input the necessary information.



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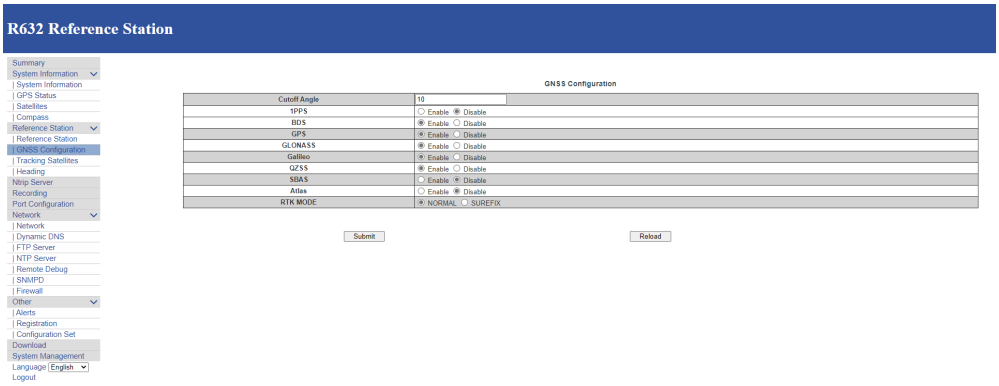
GNSS Configuration

GNSS Configuration allows enabling and disabling of **PPS**, **BeiDou**, **GPS**, **GLONASS**, **Galileo**, **QZSS**, **SBAS**, **Atlas**, and **RTK Mode**. **Cutoff Angle** can be adjusted in a situation if the standard 10° cutoff isn't sufficient for your application.



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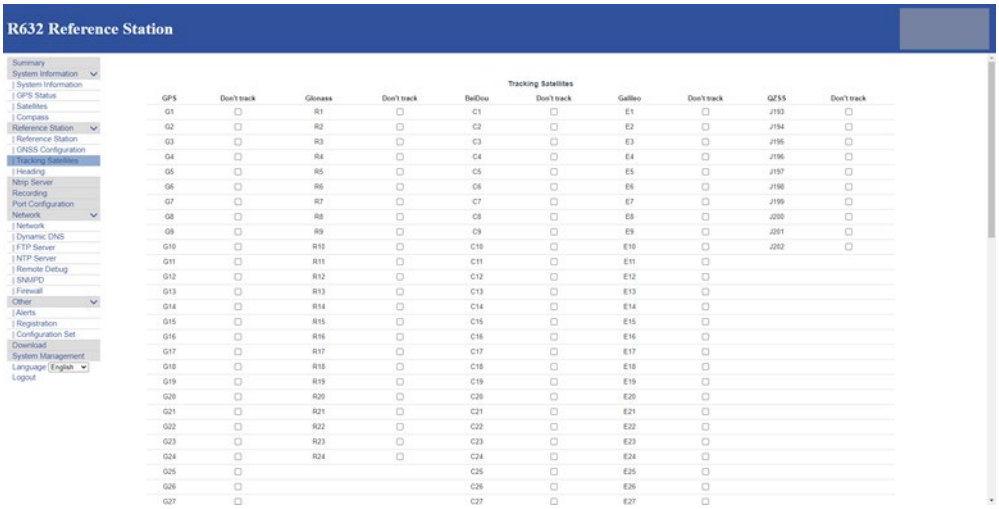
Tracking Satellites

The **Tracking Satellites** page shows every satellite that is capable of being tracked by the R632. If you have a specific satellite that causes issues or has been known to cause interference in your application, you can shut off that specific satellite form being used.

Note: Only advanced should make changes to the **Tracking Satellites** page.



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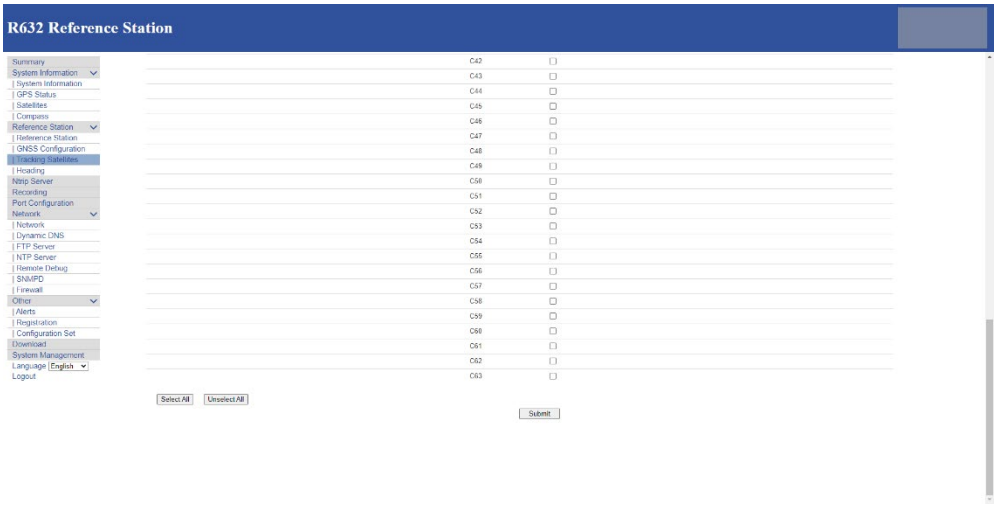
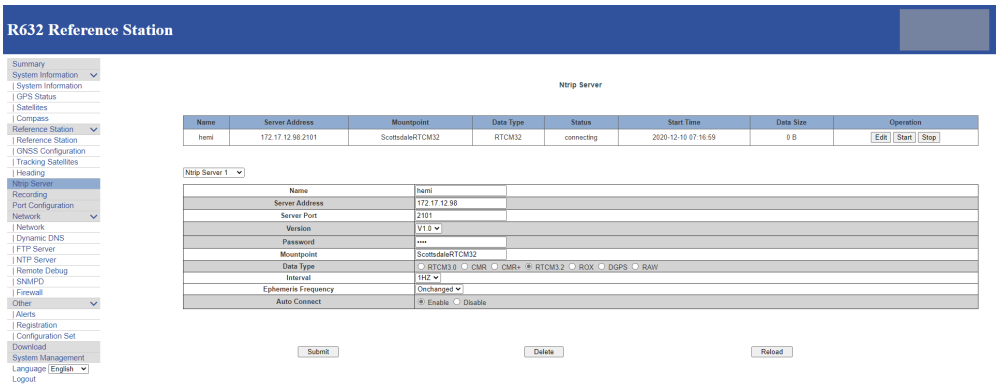
Tracking Satellites, continued



Continued on next page

Ntrip Server

The **NTRIP Server** page allows the implementation of up to three servers. Each server can have unique **IP addresses**, **ports**, **mount points**, and can output a variety of data protocols (**RTCM**, **CMR**, **ROX**, **DGPS**, and **Raw**).

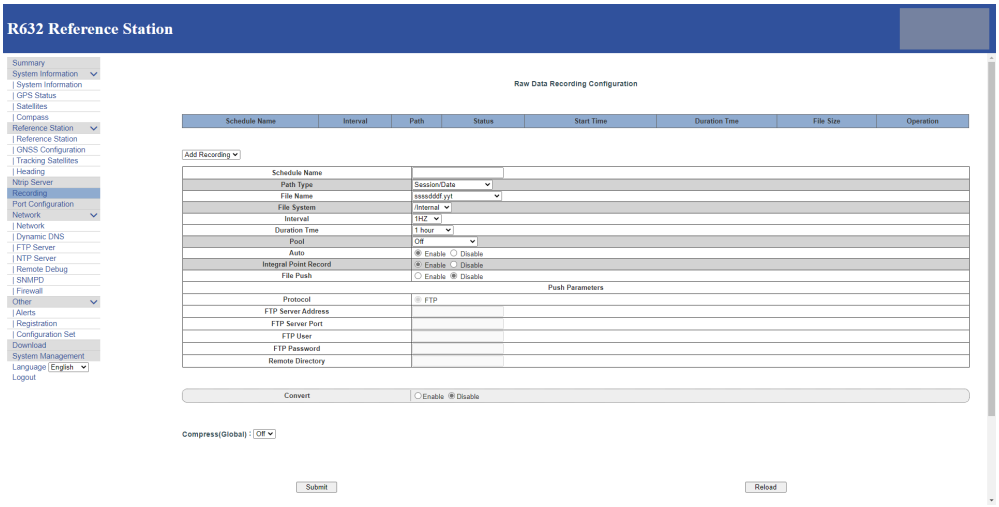


Continued on next page

Recording

Use the **Recording** page to enable the data logging on the R632. Specifically, this works for **Raw Data** that will be used for **Post Processing**. Customized fields for **Name**, **Path Type**, **Interval**, **Duration**, and **File Push** are available. **File Push** allows the data to be sent to an external FTP site.

The **Recording** page has a built in Rinex converter that can convert raw data into a usable file for post processing.



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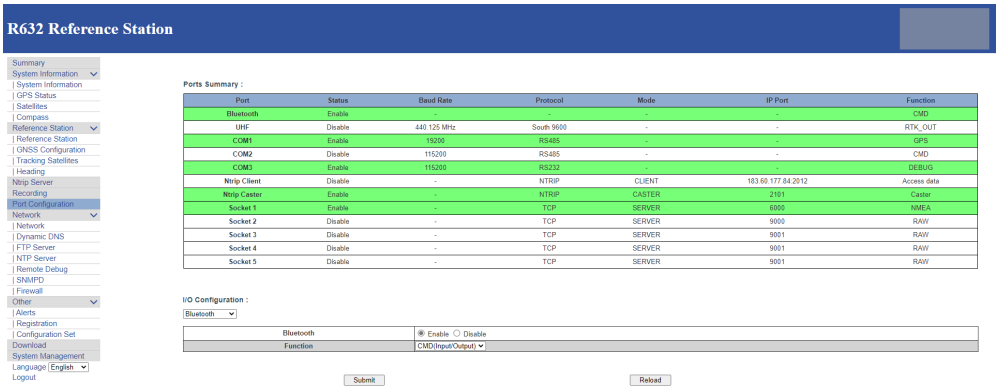
Port Configuration

The **Port Configuration** page is used to configure **Bluetooth**, **UHF**, **COM1-3**, **NTRIP Client**, **NTRIP Caster**, and five **TCP/IP Sockets**. All of these ports can be configured for **Baud Rate**, **Protocol**, **Mode**, **IP Port** (**TCP/IP**, and **NTRIP**), and **Function**.



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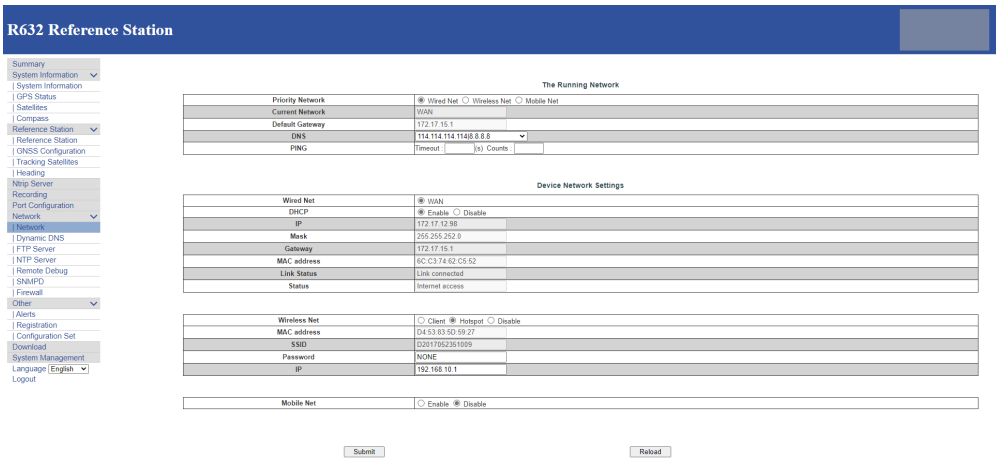
Network

The **Network** page contains options to connect to the R632 via a **Wired** connection, **Wireless** connection, or a **mobile** connection.

Network Connection	Requirements
Wired Connection	Network, Gateway, DNS, and PING
Wireless Connection	DHCP or Static IP address, Mask, Gateway, and MAC Address



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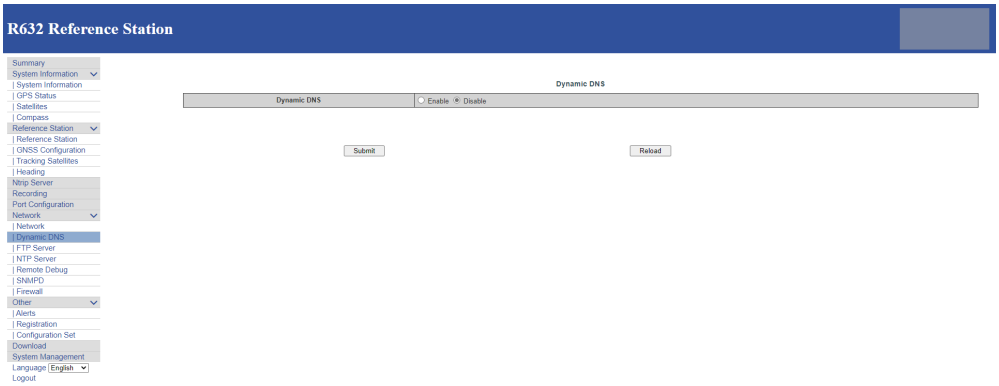
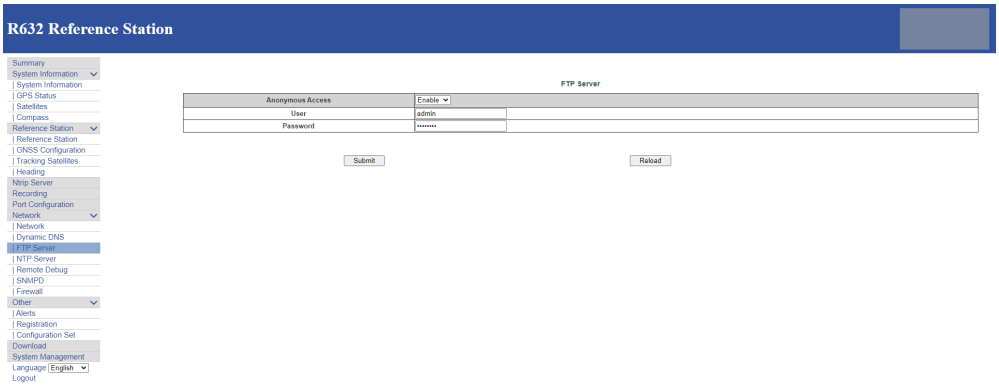
Dynamic DNS

The **Dynamic DNS** provides the option to use common DNS sites, and an option to input a custom DNS.



FTP Server

You can select to allow the R632 to output data directly to an **FTP server**.



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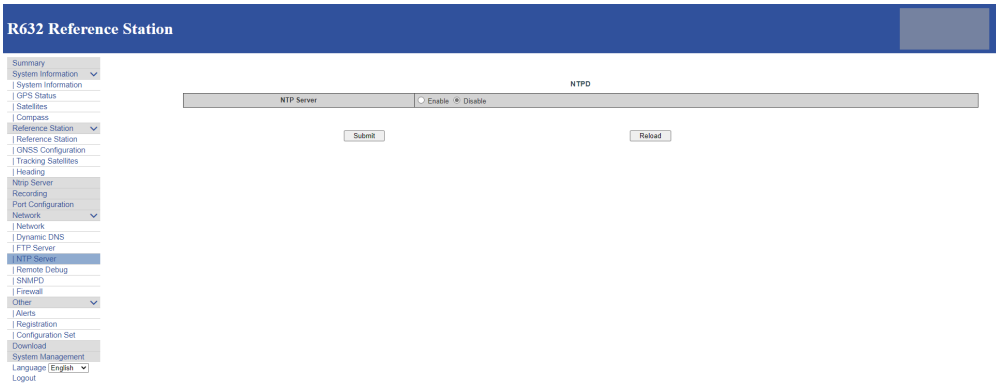
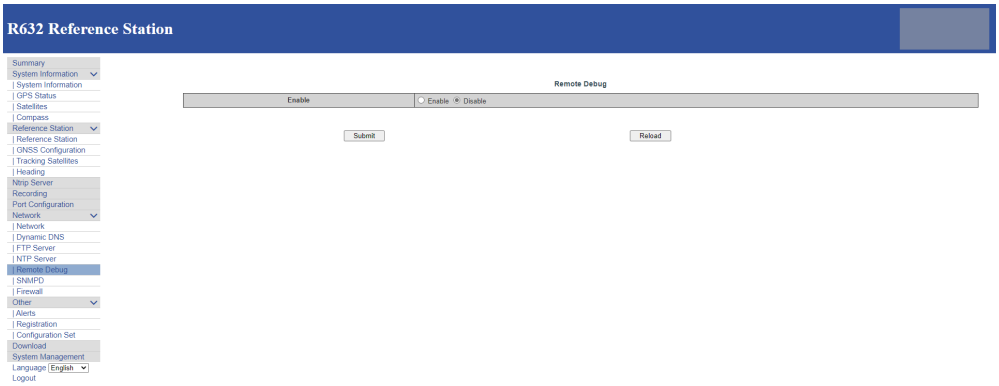
NTP Server

This allows the R632 to output to a specific **NTP Server**.



Remote Debug

Remote Debug is typically used by HGNSS Technical Support. If you have an issue with the R632, HGNSS Technical Support may require you to turn this feature on and provide a specific log for better troubleshooting.



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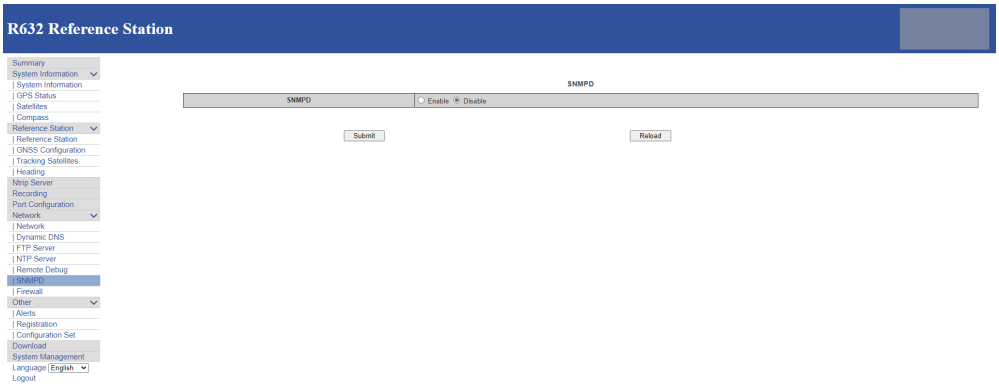
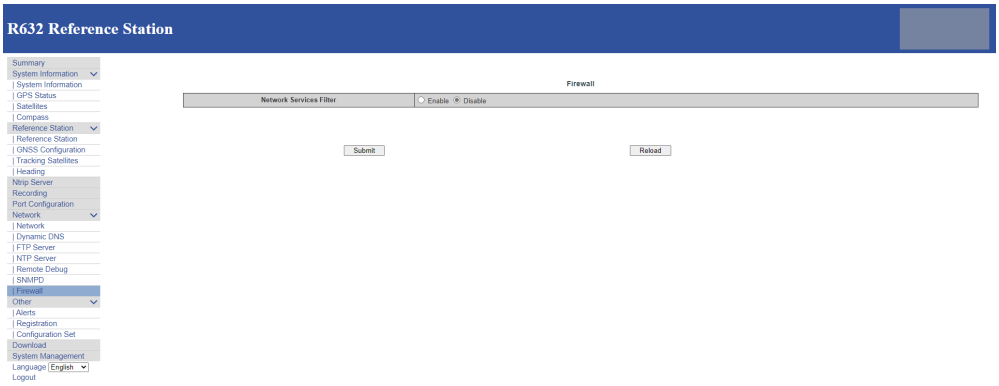
SNMPD

SNMPD can be selected to add the R632 to existing Network Management software updates and alerts.



Firewall

The firewall feature enables a user to “White List” specific IP addresses that are authorized to access the R632. Or the user can “Blacklist” certain IP addressed that they would prefer to deny access to the R632.



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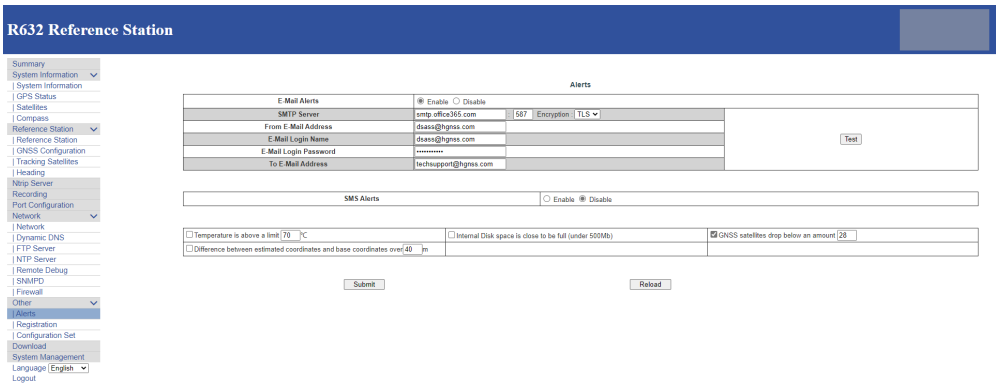
Alerts

Use the **Alerts** page to send alerts in reference to **Temperature**, **Internal Disk Space**, **Estimated Coordinates**, and **Satellite Counts**. If any of these items fall outside their set parameters, and alert will be sent via SMS or email.

Note: Alerts require a cellular data plan to work properly.



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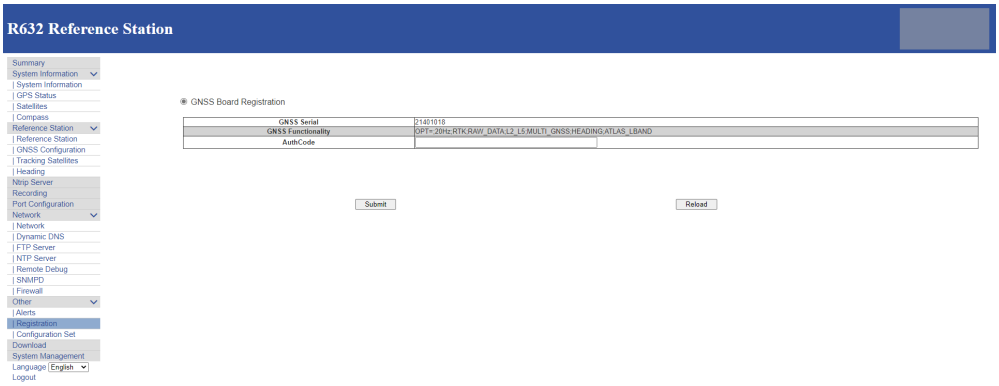
Registration

The **Registration** page updates the R632 with **Activations** and **Subscriptions**. The fields below show the **GNSS Serial Number**, **GNSS Functionality**, and AuthCode input.

Note: When an activation or subscription is input, the user is required to power cycle the device and wait 10 seconds and refresh the page to see the GNSS Functionality change.



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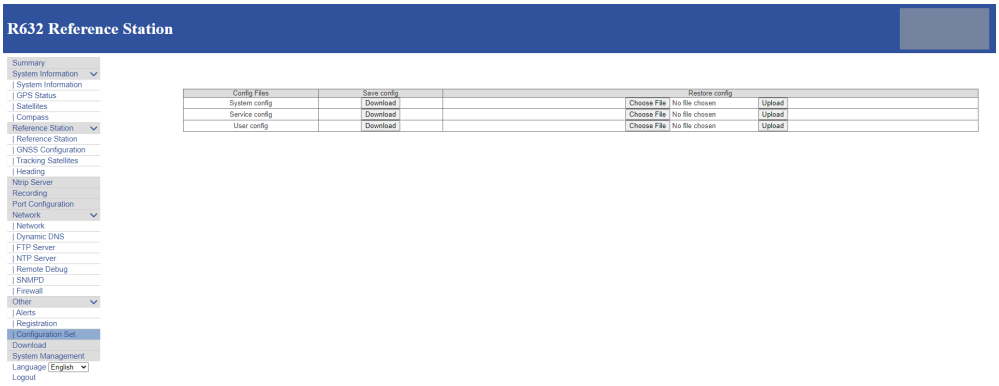
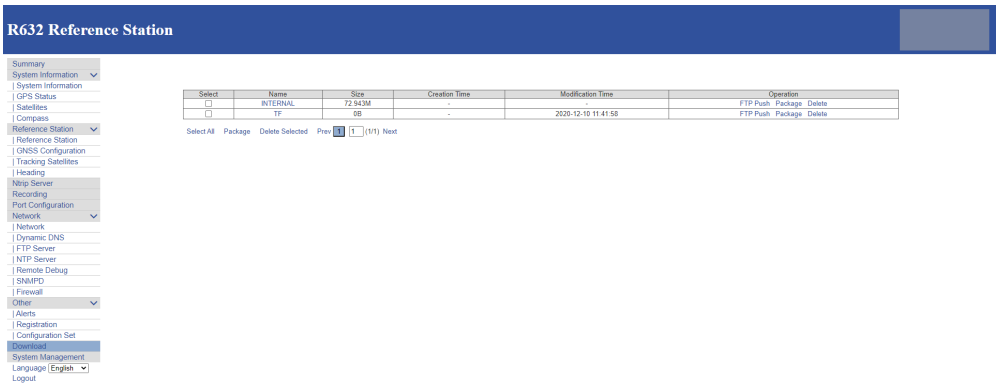
Configuration Set

The **Configuration** page allows the user to create a current profile of the R632 configuration. This will be packaged as a file that can be saved on a local drive. In the event an R632 needs to be restored, the file can be uploaded and restore all the previous configuration settings.



Download

The **Download** page provides access to the internal and external storage of the R632 with the option to export these files to an FTP or download and save to a local drive. You can also delete any unwanted files.



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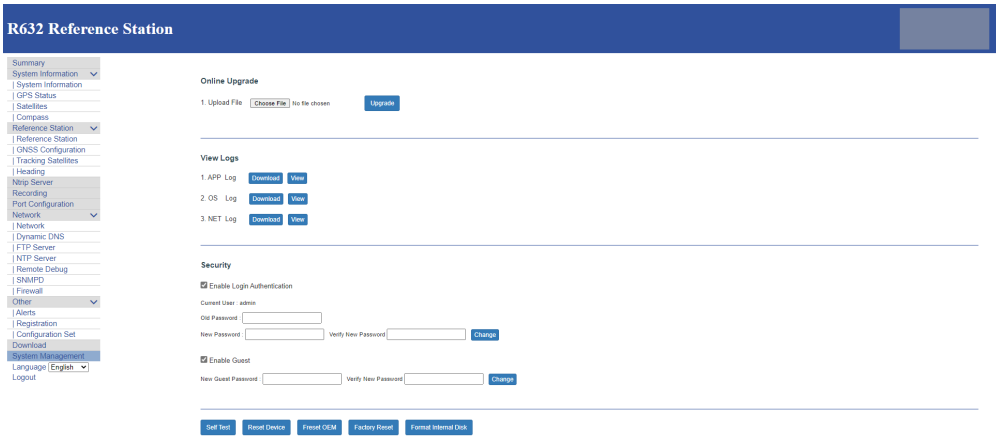
System Management

Use the **System Management** page to update **Application Software** and **GNSS Firmware** via the “Online Upgrade” feature.

Additionally, the R632 can output logs for **APP**, **OS**, and **Net**. For security purposes, this page allows the user to reset or update the password for the R632 or create a guest password. The R632 can run a **Self-Test**, **Reset**, and **Format Internal Disk** options.



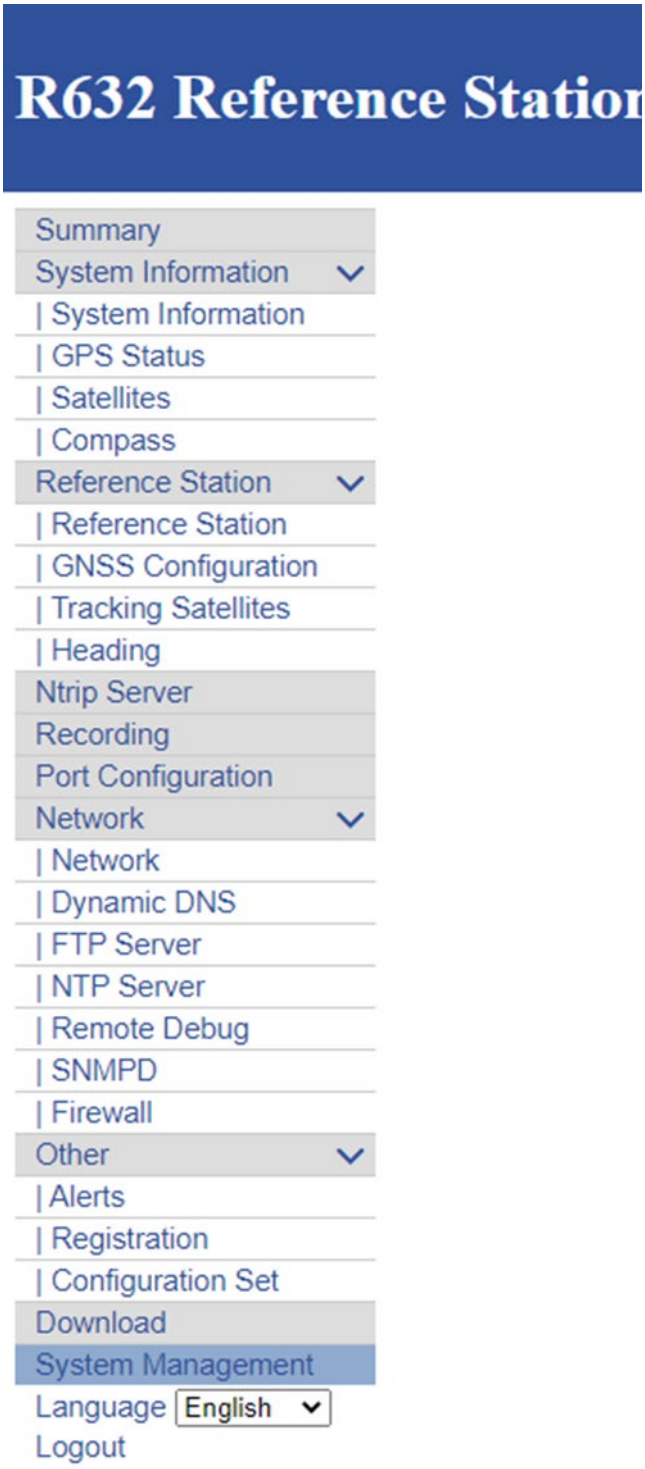
Language

Supported languages for the R632 include English, Russian, and Chinese.

Continued on next page

Logout

Click **Logout** to logout of the R632 system.



Mounting R632 as a Base Station

Roof mount

To use the R632 as a base station, you can either mount the antenna using a roof mount, or mount the antenna using a tripod.

To roof mount an antenna is to permanently mount an antenna at the highest possible point, clear of multipath. Permanent base stations are often mounted on the top of buildings. You can mount the A45 antenna onto a 5/8” thread. The example below shows an A45 antenna mounted on a retaining wall on top of the roof of a Hemisphere GNSS office.

To roof mount the antenna, run an Rf cable to the R632. The R632 can be placed on a rack or mounted permanently to the wall of an office. Carefully run the cable down, keeping in mind attenuation (see Routing and Securing the Antenna Cable).

Figure 2-5: Roof mounted antenna

Continued on next page

Mounting R632 as a Base Station, Continued

Tripod mount

Another option to mount the R632 as a base station is to place the antenna on a tripod and place it over a known point. This is a less typical setup for the R632. Figure 2-6 shows the R632 receiver mounted on a tripod.

Figure 2-6: R632 Mounted on a Tripod

Configuring R632 as a Base Station

Base station configuration

After mounting the R632 as a base station, you must configure the R632 as a reference station.

In the R632 WebUI, click **Reference Station** on the left panel.

Note: The configurations before **Working Mode** are used if collecting raw data and converting to Rinex and are used to populate the header file.

To configure the R632 as a base station, set **Working Mode** to **Base**. Use the **Antenna Type** drop-down menu to select an antenna from the list or choose **Custom** for **Antenna Type**.

If choosing custom, type in the antenna phase center offsets and the base station coordinate.

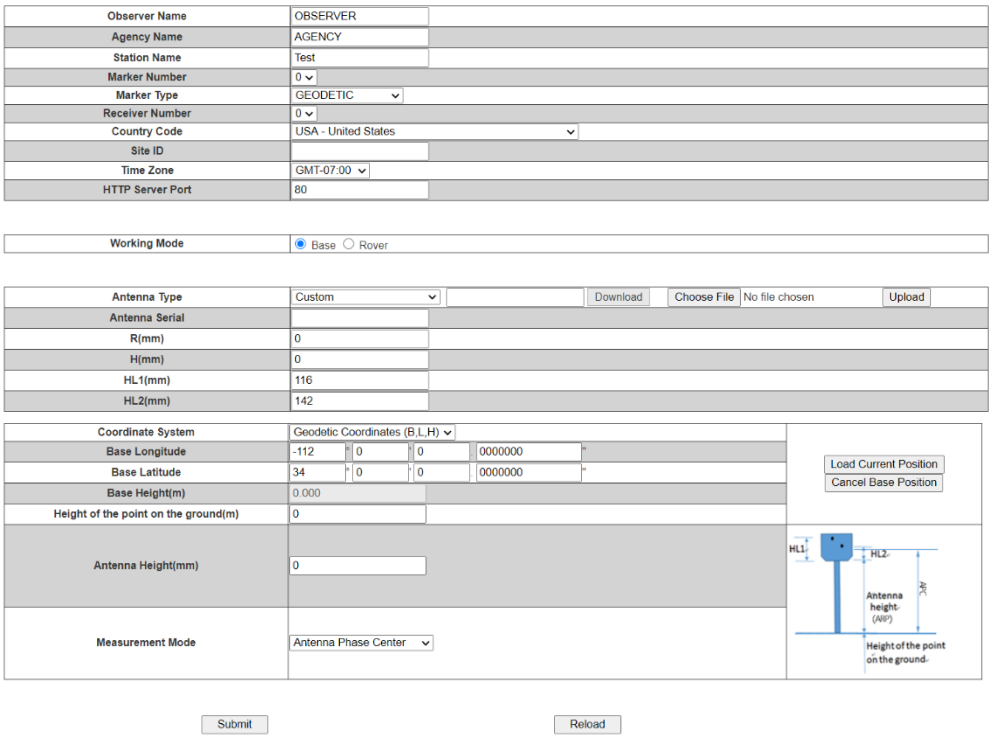
To set the **Coordinate System**, you can select **Geodetic Coordinates** (latitude, longitude, and height) or **Cartesian** (ECEF reference frame). Type in a **Base Height**.

Continued on next page

Configuring R632 as a Base Station, Continued

Base station configuration, continued

Type in an **Antenna Height** and **Measurement Mode**. For **Measurement Mode**, you can specify that the base coordinate is to the APC or to the antenna base. Click **Submit**.



After setting up the base station, you will need to output RTK. Refer to the next section, Setting Up R632 RTK Output.

Setting up R632 RTK Output

NTRIP Server/Caster

To setup as an NTRIP server, select **NTRIP server** from the dropdown menu on the left panel.

Name	HGNSS
Server Address	
Server Port	2101
Version	V1.0
Password	•••••
Mountpoint	ScottsdaleOffice
Data Type	RTCM3.0 CMR RTCM3.2 ROX DGPS RAW
Interval	1HZ
Ephemeris Frequency	Onchanged
Auto Connect	Enable Disable

Type the credentials for the NTRIP caster (Name, Server Address, Server Port, Password, Mountpoint, etc.). Select **Data Type**. Use RTCM3.2 or ROX for best performance. RTCM 3.0 is GPS+GLONASS only.

Setting up R632 RTK Output, Continued

External UHF Radio

To output RTK over serial, click **Port Configuration**. Click on the COM port you wish to use to output RTK (COM3 is RS-232 and the COM1 and COM2 are RS-485). Check your cable to see the COM port to which you have access.

Set the COM port to **Enable**. Set the baud rate. For the function of the COM port, set to RTK(Output). Configure the RTK message type. We suggest using RTCM3.2 or ROX for output observations for all constellations / signals.

Next, connect this serial port to an external radio. Most radios will require a null modem connection. (Contact HGNSS for the DB26 to null modem DB9.)

Port	Status	Baud Rate	Protocol	Mode	IP Port	Function
Bluetooth	Enable	-	-	-	-	CMD
UHF	Enable	451.8 MHz	Satel	-	-	RTK_IN
COM1	Enable	19200	RS485	-	-	NMEA
COM2	Disable	115200	RS485	-	-	NMEA
COM3	Enable	19200	RS232	-	-	DEBUG(RTCM3)
Ntrip Client	Disable	-	NTRIP	CLIENT	183.60.177.84:2012	Access data
Ntrip Caster	Disable	-	NTRIP	CASTER	6070	Caster
Socket 1	Disable	-	TCP	SERVER	6060	RAW
Socket 2	Disable	-	TCP	SERVER	9000	RAW
Socket 3	Disable	-	TCP	SERVER	9001	RAW
Socket 4	Disable	-	TCP	SERVER	9001	RAW
Socket 5	Disable	-	TCP	SERVER	9001	RAW

I/O Configuration :

COM3

COM3	Enable / Disable
Baud Rate	19200
Function	RTK(Output)
Data Type	RTCM3.2
Interval	1HZ
Ephemeris Frequency	Off

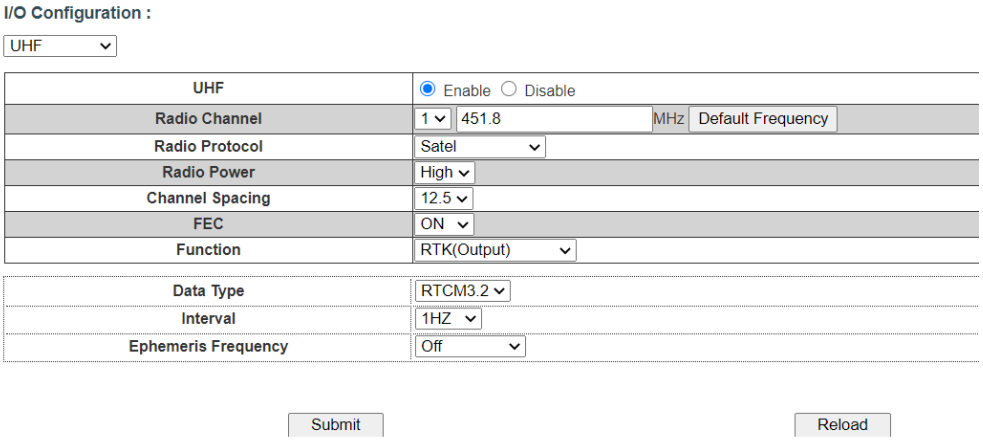
Continued on next page

Setting up R632 RTK Output, Continued

Internal UHF Radio

To output RTK over UHF, select the UHF radio. Set **Function** to **RTK(Output)**.

Select options to configure radio settings. Set the frequency, protocol. Channel spacing, FEC, and transmit power. Select the **RTK(Output)** format.



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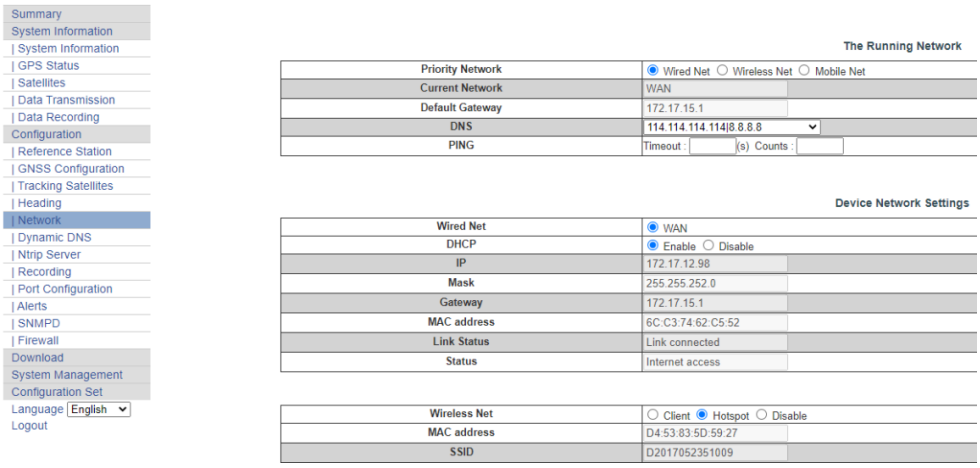
Setting up R632 RTK Output, Continued

NTRIP Caster

The R632 has a built-in NTRIP caster. You can configure the built-in NTRIP server to send data to the built-in NTRIP caster.

Click **Network** on the left menu. If you are connected via Ethernet, select the **Enable** radio button next to **DHCP** and allow the network switch to determine an IP address, or disable DHCP and type in a static IP address.

If you are using a SIM card (that provides a public IP address), refer to SIM and MicroSD cards in this manual.



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Setting up R632 RTK Output, Continued

NTRIP Caster, continued

Go to **Port Configuration** and click **NTRIP Caster**. Select **Enable** to set a port. If the R632's NTRIP server(s) is pointing to this IP address, you can use the R632 as an NTRIP caster.

Ports Summary :

Port	Status	Baud Rate	Pr
Bluetooth	Disable	-	
UHF	Disable	440.125 MHz	Sou
COM1	Disable	115200	F
COM2	Disable	115200	F
COM3	Disable	115200	F
Ntrip Client	Disable	-	N
Ntrip Caster	Enable	-	N
Socket 1	Enable	-	
Socket 2	Disable	-	
Socket 3	Disable	-	
Socket 4	Disable	-	
Socket 5	Disable	-	

I/O Configuration :

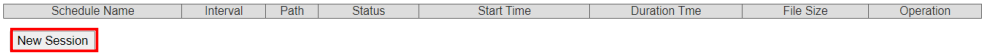
Ntrip Caster

Ntrip Caster	(•) Enable ( ) Disable
Port	2101

Logging Raw Data

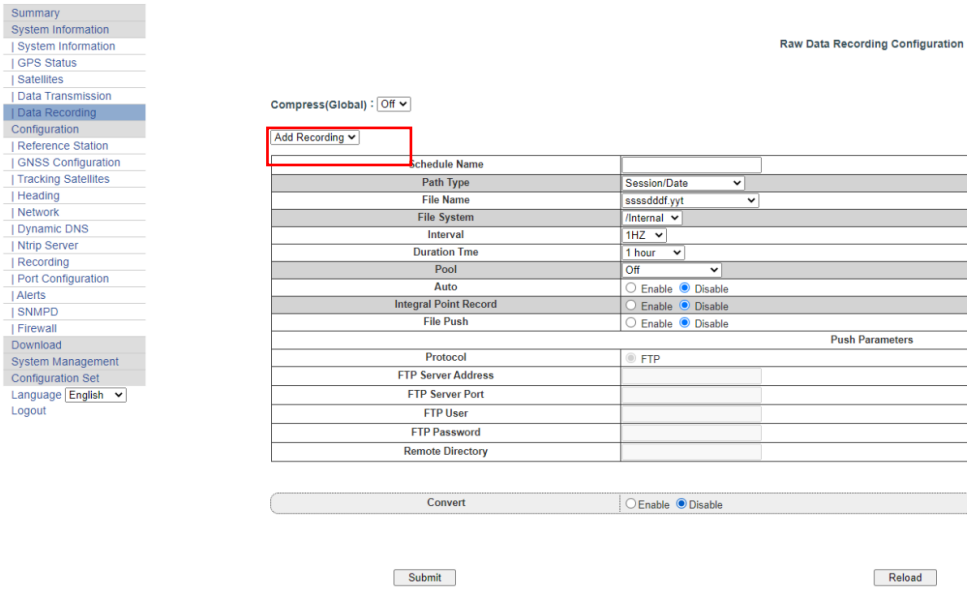
Logging Raw Data

To record data for converting to Rinex, go to the **Data Recording** tab. The current data logs are displayed. To create a new file, click **New Session**.



Click the **Add Recording** dropdown menu to select and append an existing record, or type a **Schedule Name**, then select a **Path Type** and **File Name**. Click the arrow to select the **File System** (i.e., storage location).

Complete the remaining fields to set the other options. Click **Enable** to automatically convert this data file to your preferred version of Rinex.



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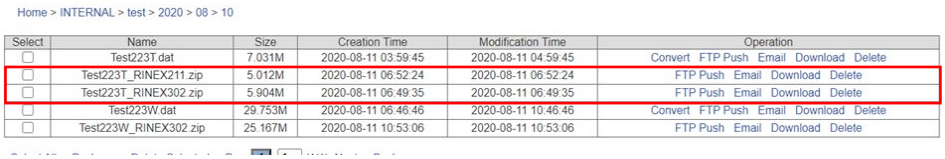
Logging Raw Data, Continued

Logging Raw Data, continued

If you click on a data file (see previous screenshot), the following screen displays:



Home > INTERNAL > test > 2020 > 08 > 10

Select	Name	Size	Creation Time	Modification Time	Operation
☐	Test223T.dat	7.031M	2020-08-11 03:59:45	2020-08-11 04:59:45	Convert FTP Push Email Download Delete
☐	Test223T_RINEX211.zip	5.012M	2020-08-11 06:52:24	2020-08-11 06:52:24	FTP Push Email Download Delete
☐	Test223T_RINEX302.zip	5.904M	2020-08-11 06:49:35	2020-08-11 06:49:35	FTP Push Email Download Delete
☐	Test223W.dat	29.753M	2020-08-11 06:46:46	2020-08-11 10:46:46	Convert FTP Push Email Download Delete
☐	Test223W_RINEX302.zip	25.167M	2020-08-11 10:53:06	2020-08-11 10:53:06	FTP Push Email Download Delete

You can convert the raw files (.dat file extension) to Rinex. In the example above, a file has been converted to Rinex version 2.11 and 3.02.

Chapter 3: Installing the R632

Overview

Introduction

This chapter describes the steps to install and the equipment you need to install the R632.

Contents

Routing and Securing the Antenna Cable

Routing and securing the antenna cable

To route and secure the antenna cables, review the following guidelines.

Prior to selecting a cable, consider the attenuation of the cable. Attenuation of a cable is often specified at dB/100m and is related to the frequency of the signal being transmitted. GNSS signals are in the L-band frequency- which ranges from 1GHz –2GHz.

The R632 is designed to work with active GNSS antennas with an LNA gain range of 10 to 40 dB. The purpose of the range is to accommodate for losses in the cable system.

There is a maximum cable loss budget of 30 dB for a 40 dB gain antenna. The A45 antenna gain is 30 dB and has an antenna loss budget of 20 dB.

Measuring Antenna Dimensions

Antenna dimensions

Hemisphere offers two antennas available for purchase with your R632: the A45 (dual-frequency) antenna and the A25 (single-frequency) antenna.

The phase center measurements are important when using an RTK positioning solution with a dual frequency antenna (A45).

The phase center measurements for the A45 antenna are:
L1=45.8
L2=40.5

Figure 3-1 shows the antenna dimensions.

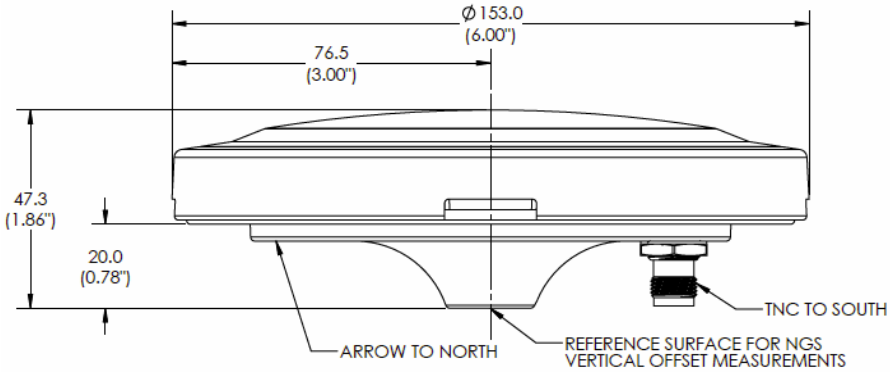


Figure 3-1: Antenna dimensions

Continued on next page

Measuring Antenna Dimensions, Continued

Antenna alignment

An arrow on the bottom of the antenna indicates the forward-facing direction for heading, and the marks on the side of the antenna allow you a “zero” point for measuring the height of the antennas for the surface on which it is mounted. The height is relative to the accuracy of the RTK solution. Figure 3-2 shows the antenna arrow and alignment marks.

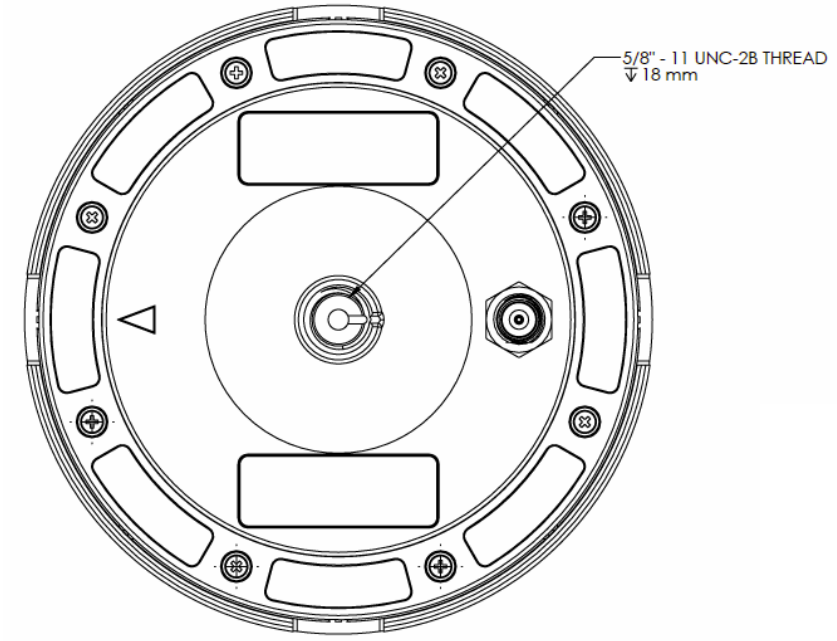


Figure 3-2: Antenna arrow and alignment marks

Mounting the Antennas

Default configuration

The default configuration is a single antenna position solution. The R632 can be upgraded to a dual antenna heading solution with the addition of an activation purchased from HGNSS or an HGNSS authorized dealer.

Parallel antennas orientation

The most common installation is to orient the antennas parallel to, and along the centerline of, the axis of the vessel with the primary antenna near the stern and the secondary antenna near the bow. This provides a true heading, since heading is calculated from the primary to secondary antenna. If the primary antenna is near the bow and secondary antenna near the stern, you will need a heading bias of approximately 180°.

In this orientation, you may need to enter a small heading bias in the RS632 to calibrate the physical heading to the true heading of the vessel.

Perpendicular antenna orientation

You can also install the antennas so they are oriented perpendicular to the centerline of the vessel's axis.

In this orientation, you will need to enter a heading bias of +90° if the primary antenna is on the star side of the vessel, and -90° if the primary antenna is on the port side of the vessel.

Planning the optimal antenna placement

Proper antenna placement is critical to positioning accuracy. For the best results, orient the antennas so the antennas' connectors face the same direction. Place the antennas with a clear view of the horizon, away from other electronics and antennas, and along the vessel's centerline. When mounting the primary and secondary antennas, consider the following:

- The recommended minimum separation is 0.5m.
- The maximum separation is 10.0m if the receiver has a multi-frequency activation. If the receiver is only activated for single frequency, the maximum separation is 5.0m.
- The position is calculated from the primary antenna.
- Maintain at least 25cm distance from transmitting radios/antennas, as they may interfere with GNSS.
- Maintain a clear view of the sky, avoiding metal obstructions at a higher elevation than the antenna (when possible).

Heading Configuration

Heading configuration

If using the R632 as a dual antenna GNSS position + heading solution, you can configure several heading parameters.

Click **Heading** on the left side of the screen.

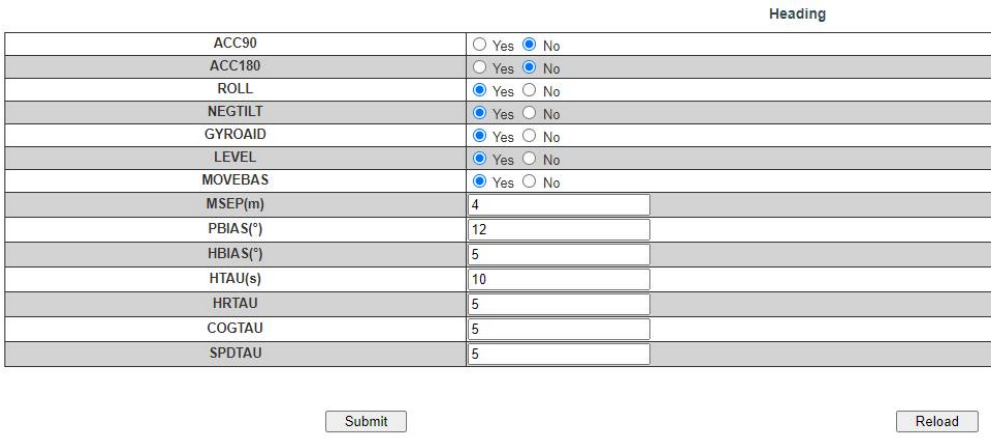
Note: Heading requires an activation.

Continued on next page

Heading Configuration, Continued

Heading configuration, continued

The following options display:



The ACC90 and ACC180 values are dependent on the orientation of the R632 with respect to the antennas. The R632 provides heading, pitch, and roll. An internal gyro allows for the receiver to provide heading for up to 3 minutes during a GNSS outage. For pitch and roll, one axis is calculated from the antenna array and the other axis is calculated from an internal sensor. The ACC90 and ACC180 values are critical for using the gyro during a GNSS outage and for calculating either pitch or roll (whichever is coming from the internal sensor).

When you configure the ACC90/ACC180 values, the internal sensor value will calibrate to zero. It is important that the vehicle/vessel is level.

Continued on next page

Heading configuration, continued

The **Heading** page contains the **ACC90** and **ACC180** values. To determine which values to use for ACC90 and ACC180, refer to Mounting the Antennas.

Please note that any changes to the ACC90 and ACC180 values will automatically perform a tilt calibration of the R632's internal gyro. These should not be changed unless the R632 is properly oriented and in a static environment.

Additional items covered in this page:

Roll – If set to YES, the roll value that outputs from the receiver will be based on the antenna array and the pitch value will calculated from the sensor. If set to NO, the pitch value that outputs form the receiver will be based on the antenna array and the roll value will be calculated from the sensor.

Neg Tilt – If set to YES, the sign of the pitch (or roll) value calculated from the antenna array will be reversed.

GyroAid – If enabled, the internal gyro will be used to maintain heading for up to 3 minutes during a GNSS outage. **If gyroaid is used, the ACC90/ACC180 values must be properly configured.**

Level – You can use level if the vector is always operated within +/- 10 degrees of level. This will improve heading acquisition time at startup.

MoveBase – This can only be set to YES if you have a multi-frequency activation. Setting MOVEBAS to YES will enable the receiver to automatically calculate the antenna separation.

CSEP – The calculated separation between the primary and secondary antennas.

Continued on next page

Heading configuration, continued

MSEP – If MOVEBAS is set to NO, the slope distance (measured in meters) between the primary and secondary antenna must be entered.

PBIAS – This adds an offset to the pitch (or roll) value calculated by the antenna array. **WARNING:** Adding a PBIAS does not account for the roll of the vessel or vehicle.

HBIAS – This adds an offset to the heading value calculated by the antenna array. **WARNING:** Heading is the angle that the projection of the vector onto the horizontal plane makes with respect to north. HBIAS simply adds a constant value to heading.

HTAU – This value adjusts the responsiveness of the heading measurement provided. The higher the value, the more smoothing is in place. If you are not sure what to set the value to, you can use the following formula:

Gyro On
htau (in seconds) = 40 / maximum rate of turn (in deg/sec)
Gyro Off
htau (in seconds) = 10 / maximum rate of turn (in deg/sec)

HRTAU – This value adjusts the responsiveness of the rate of turn measurement. The higher the value the more smoothing. If you aren't sure what to set this to, you can use the following formula:

HRTAU (in seconds) = 10 / maximum rate of turn (in deg / sec^2)

COGTAU – This value adjusts the responsiveness of the course over ground measurement. If you are not sure what to set it to, use the following formula:

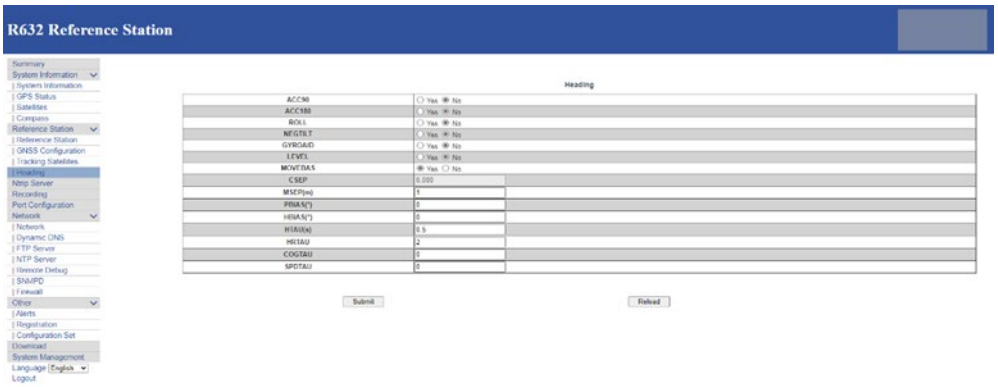
COGTAU (in seconds) = 10 / maximum change of course (in deg / sec)

Continued on next page

Heading configuration, continued, continued

SPDTAU – This value adjusts the responsiveness of the speed measurement (such as velocity in $GPVTG). If you are unsure what to set it to, use the following formula:

SPDTAU (in seconds) = 10 / maximum acceleration (in m/s^2)



Measuring R632 Dimensions

R632 dimensions

Figures 3-3 through 3-6 show the dimensions of the R632 receiver.

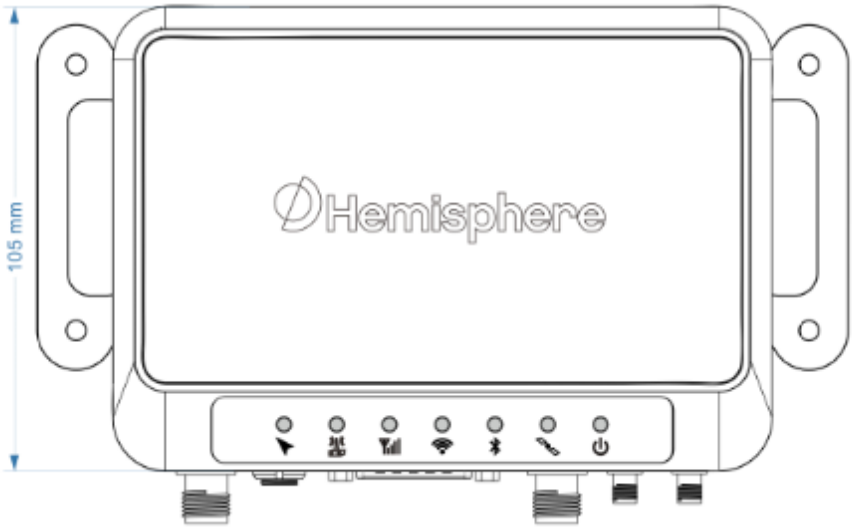


Figure 3-3: R632 receiver length

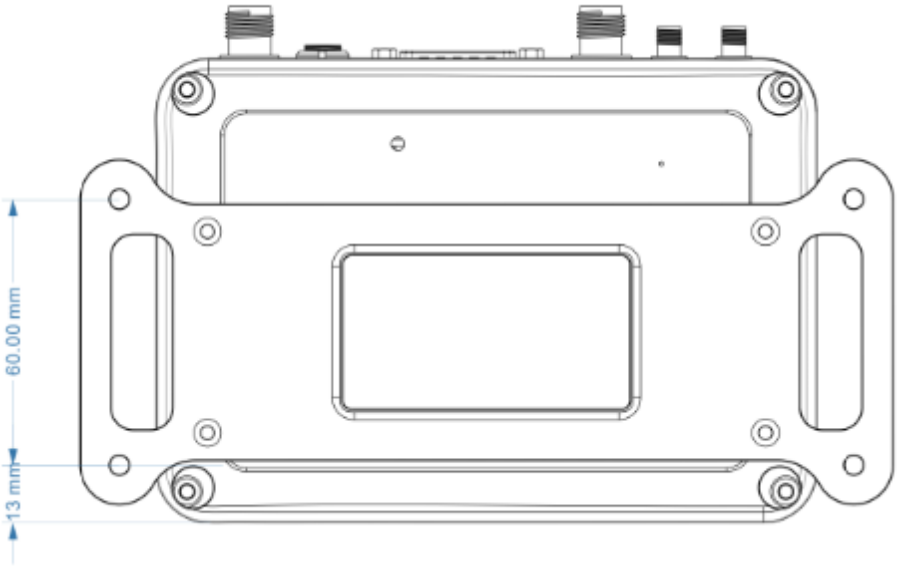


Figure 3-4: R632 bracket

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Measuring R632 Dimensions, Continued

R632 dimensions, continued

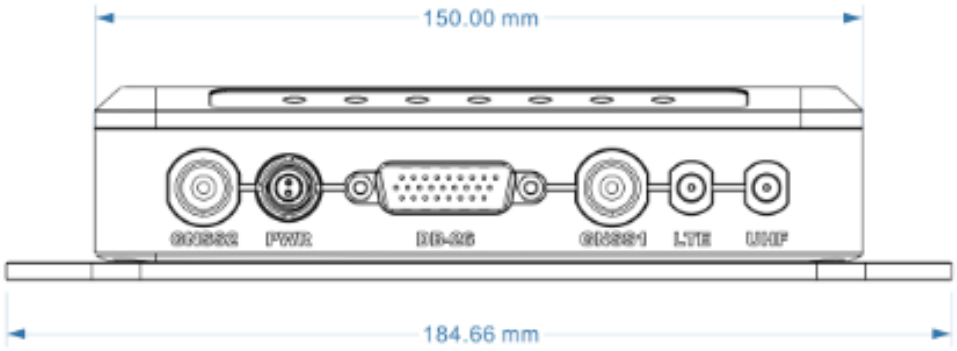


Figure 3-5: R632 width

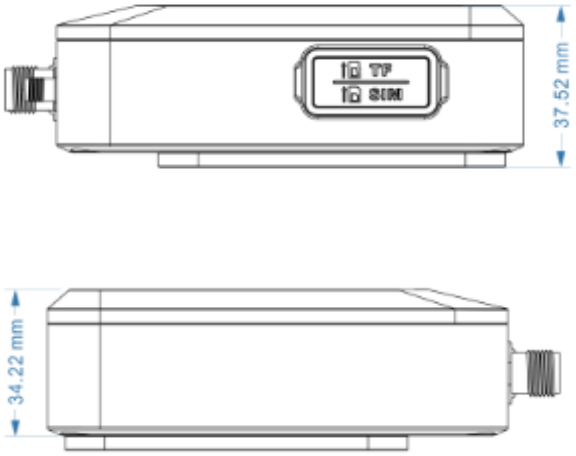


Figure 3-6: R632 height

Mounting the R632

Introduction

This section provides information on mounting the R632 in the optimal location, orientation considerations, environmental considerations, and other mounting options.

GNSS satellite reception

When considering where to mount the R632, consider the following satellite reception recommendations:

- Ensure cable length is adequate to route into the machine to reach a breakout box or terminal strip.
- Do not mount the receiver where environmental conditions exceed those specified in the technical specifications of this document.
- Route cables away from any potential source of mechanical damage. Do not locate the antenna where environmental conditions exceed those specified in Appendix B, Technical Specifications of this document.

Environmental considerations

Hemisphere GNSS Receivers are designed to withstand harsh environmental conditions; however, adhere to the following limits when storing and using the R632:

- Operating temperature: -40°C to +70°C (-40°F to +158°F)
- Storage temperature: -40°C to +85°C (-40°F to +185°F)
- Humidity: IEC 16750-4:2010 Section 5.6 Humid heat, cyclic test

Mounting options

The R632 allows for two different mounting options: mount with bolts, or mount with magnets.

Continued on next page

Mounting the R632, Continued

Power/Data cable considerations

Before mounting the R632, consider the following regarding power/data cable routing:

Do	Do not
Ensure cable reaches appropriate power source.	Run cables in areas of excessive heat.
Keep cable away from corrosive chemicals.	Run cables through a door or window jams.
Connect to a data storage device, computer, or other device that accepts GNSS data.	Crimp or excessively bend the cable.
Keep cable away from rotating machinery.	Place tension on the cable.
Remove unwanted slack from the cable at the R632 end.	
Secure along the cable route using plastic tie wraps.	

⚠WARNING:
Improperly installed cable near machinery can be dangerous.

Connecting the serial and power cable

To connect the serial and power cable:

- Align the cable connector key-way with the R632 connector key.
- Push the connector in until it locks. The locking action is firm; you will feel a positive “click” when it has locked.

⚠WARNING:
Do not apply a voltage higher than 36 VDC. This will damage the receiver and void the warranty. Also, do not attempt to operate the R632 with the fuse bypassed, as this will void the warranty.

Continued on next page

Mounting the R632, Continued

Mounting orientation

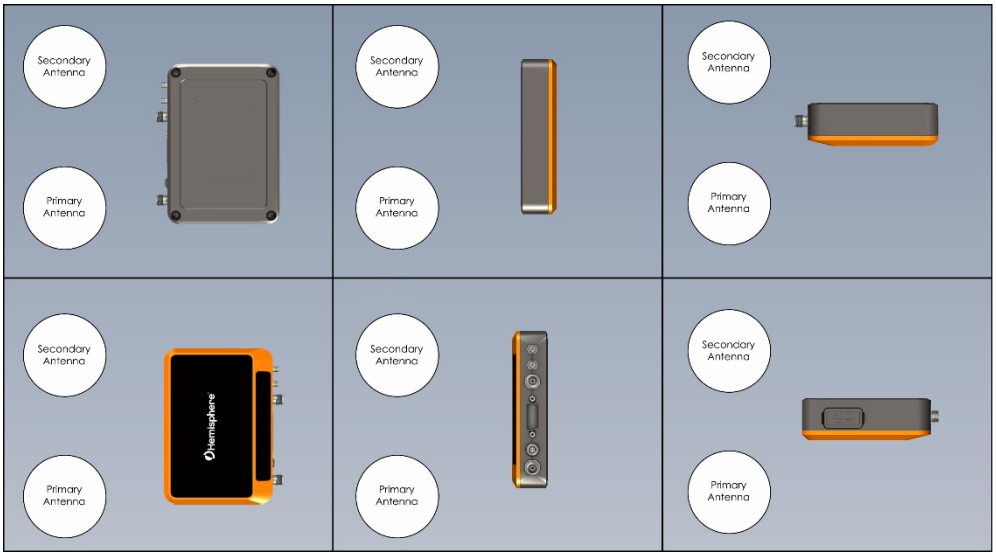
Use the WebUI to configure the orientation of the receiver with respect to the antennas.

When you send, the pitch and roll values from the internal sensor will zero, meaning that this should only be sent when the receiver is parallel to the mounting surface.

If you are not configuring the ACC90 and ACC180 values, then ignore pitch and roll from the receiver and turn off the GYROAID and TILTAID.

Group A

The R632 must be installed parallel or perpendicular to the plane of the antennas as shown in the images below.



$JATT,ACC90,NO
$JATT,ACC180,NO

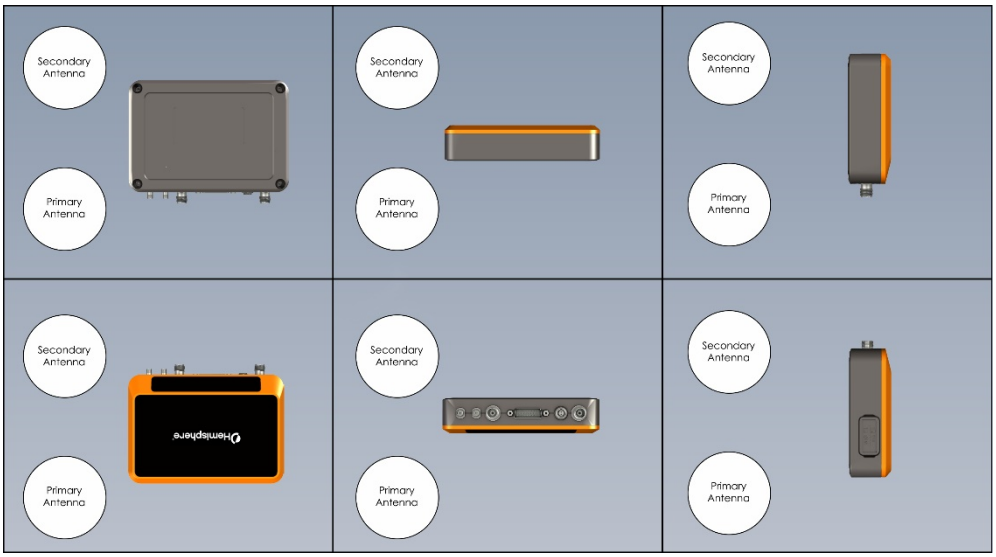
Figure 3-7: Group A

Continued on next page

Mounting orientation, continued

Group B

The R632 must be installed parallel or perpendicular to the plane of the antennas as shown in the images below.



$JATT,ACC90,YES
$JATT,ACC180,NO

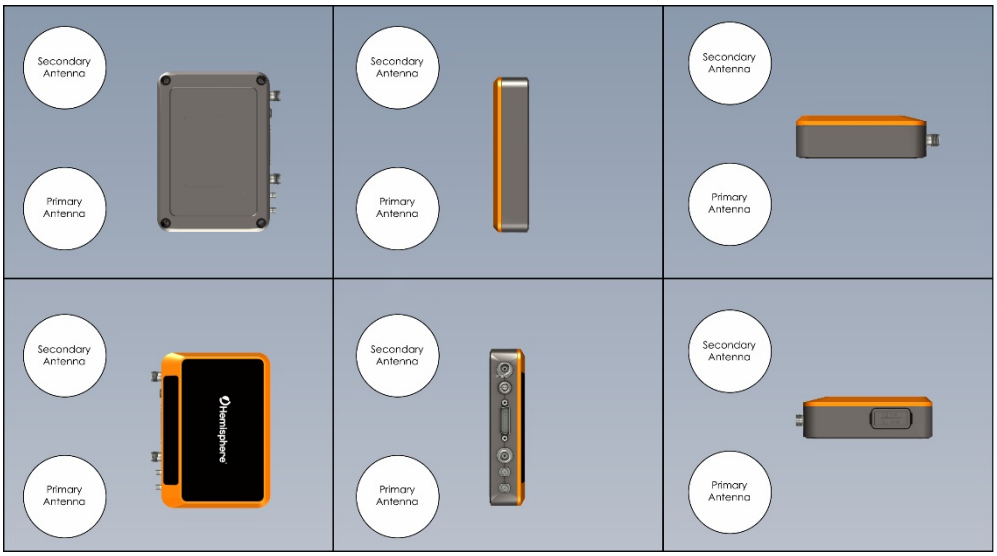
Figure 3-8: Group B

Continued on next page

Mounting orientation, continued

Group C

The R632 must be installed parallel or perpendicular to the plane of the antennas as shown in the images below.



$JATT,ACC90,NO
$JATT,ACC180,YES

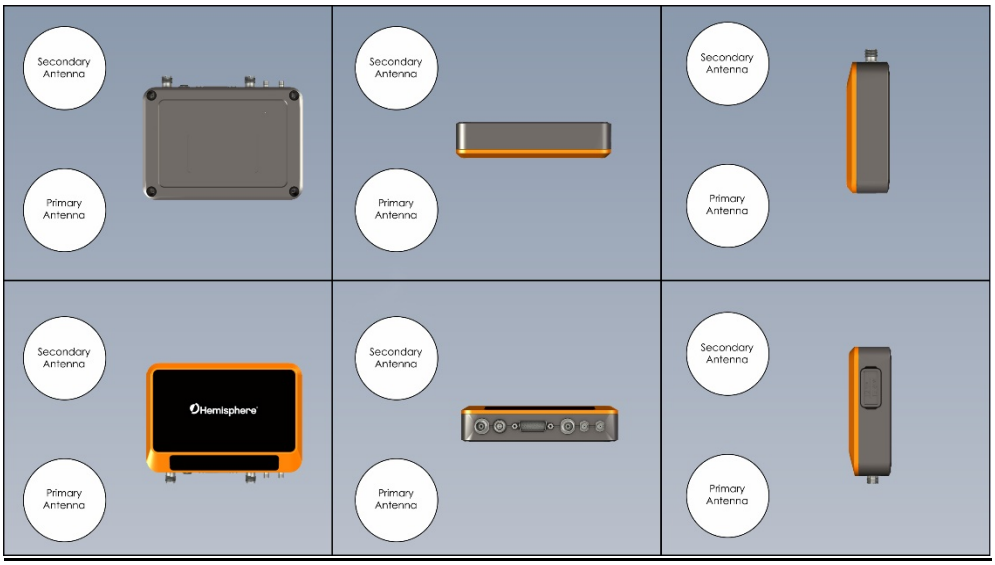
Figure 3-9: Group C

Continued on next page

Mounting orientation, continued

Group D

The R632 must be installed parallel or perpendicular to the plane of the antennas as shown in the images below.



$JATT,ACC90,YES
$JATT,ACC180,YES

Figure 3-10: Group D

Connecting the R632

Connectors

The R632 has a single DB26 connector for COMs. Hemisphere provides multiple cables that go from DB26 to various connectors and a breakout box.

Figure 3-11 shows the 26-pin connector and Table 3-1 lists the pin-out for the DB26 connector.

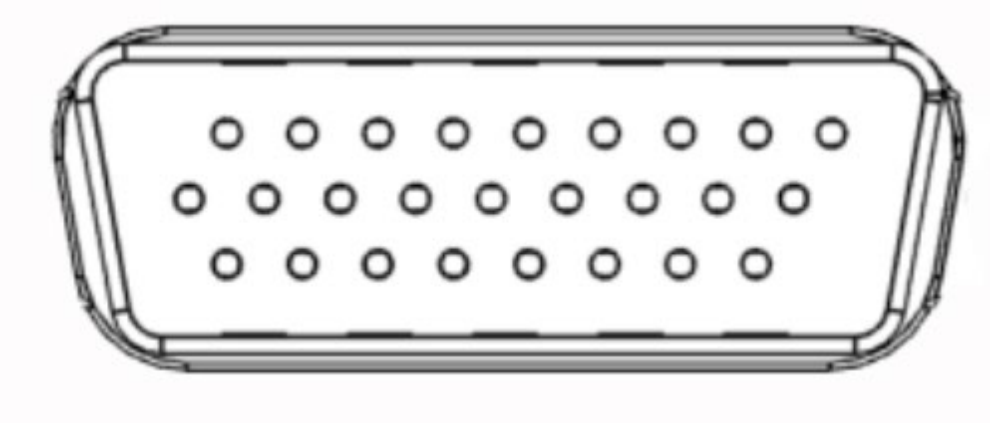


Figure 3-11: R632 pin-out

Continued on next page

Connectors, continued

Table 3-1: R632 pin-out

Connector	Connector (Label)
1	RS-485_A+
2	NC
3	NC
4	Reserved
5	Reserved
6	USB_VBUS
7	USB_P
8	USB_N
9	PPS
10	RS-485_B-
11	RS-232 Rx
12	RS-232 Tx
13	GND
14	RJ45_ACT
15	RJ45_LINK
16	ETH
17	3VCC
18	EVENT
19	USB_ID
20	NC
21	RS-485_A+
22	RS-485_B-
23	RJ45_MX0_P
24	RJ45_MX0_N
25	RJ45_MX1_P
26	RJ45_MX1_N

Connecting the Receiver to External Devices

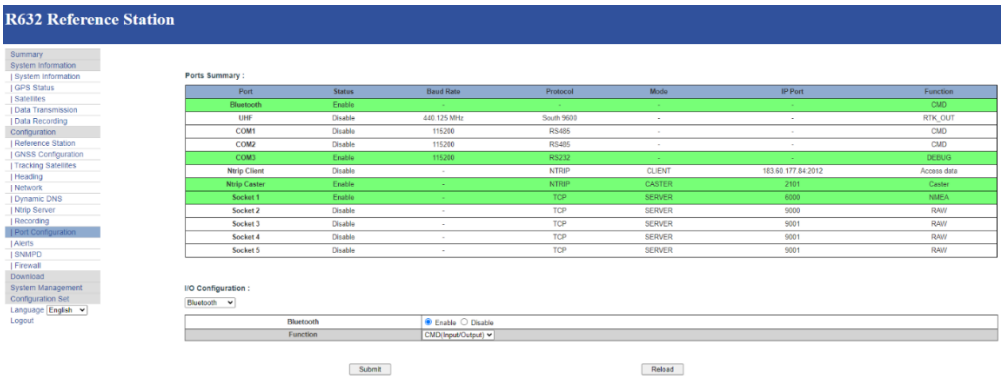
Connect to external devices

Using the built-in WebUI, you can connect the R632 to external devices via the Comm connectors. The R632 supports RTK input/output for an external radio, NMEA, and proprietary (proprietary data messages, ephemeris, and observation messages for converting to Rinex, etc.) message output over RS-232, RS-485, Bluetooth, TCP, and UDP.

In the WebUI, locate the **Port Configuration** tab. (To connect to the WebUI, see section Connecting to the WebUI.)

Note: The fields highlighted in green are enabled.

To enable a port, click on the port (shown in bold). The port will be shown at the bottom of the screen. Click the **Enable** radio button next to the name of that port.



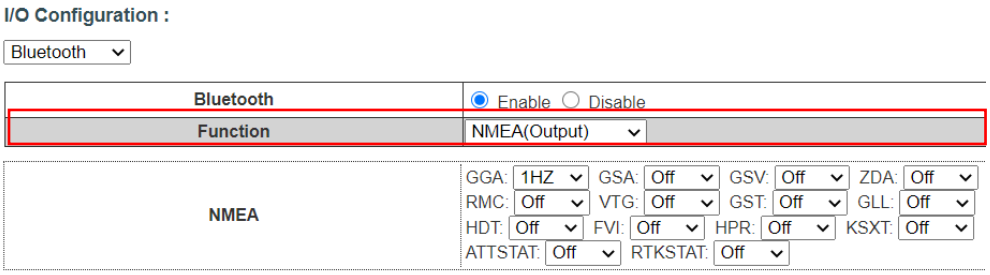
Continued on next page

Connect to external devices, continued

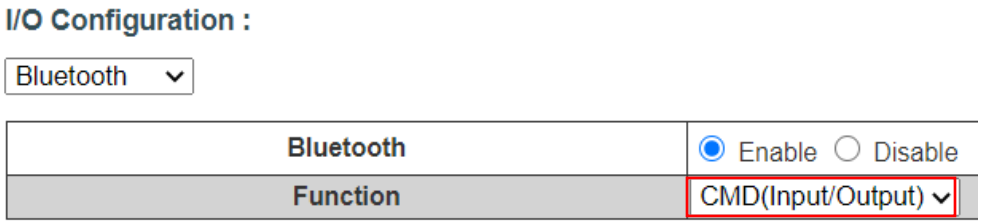
The example below shows the **Bluetooth** port is selected and enabled.

Next, click the drop-down menu next to **Function** to select **NMEA(Output)**. A list of supported NMEA0183 and proprietary messages are displayed.

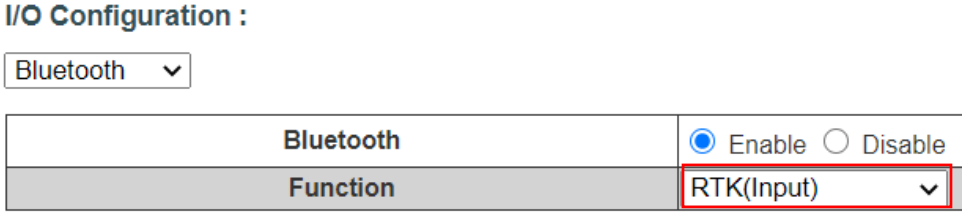
Click each drop-down menu to select the desired message and streaming rate.



This port can also be used for configuration. In this example, use the drop-down menu to select **CMD(Input/Output)**.



Use the drop-down menu to select **RTK(Input)** to input RTK from an external source or select **RTK(Output)** to output RTK.



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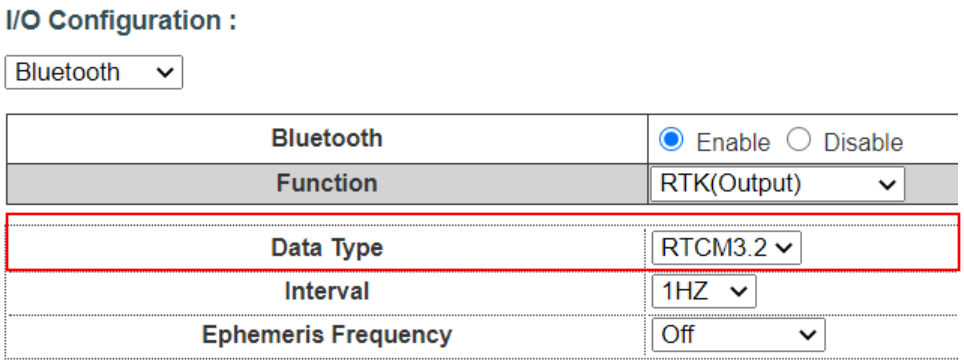
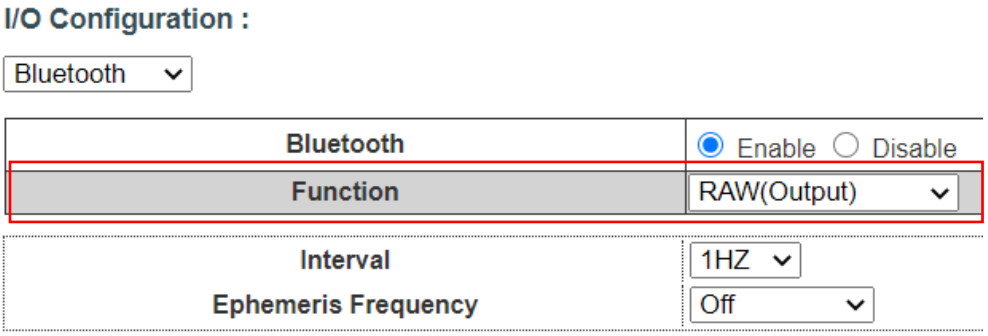
Connect to external devices, continued

If you select **RTK(Output)**, you must also specify an RTK message format (**RTCM3.0**, **RTCM 3.2**, **CMR**, **ROX**, or **DGPS**).

Using the drop-down menu next to **Data Type**, click to highlight and select your desired message format.



Using the **Function** drop-down menu, select **RAW(Output)** for the binary messages necessary to convert to Rinex.



Continued on next page

Connect to external devices, continued

You can use the COM ports to output messages.

Click on a **COM** port (COM1, COM2, or COM3). Note that **COM3** is **RS232** protocol, and **COM1** and **COM2** are **RS485** protocol. If a **COM** port is selected, you must enter a Baud Rate. Supported baud rates are 4800, 9600, 19200, 38400, 57600, and 115200 bps.

Ports Summary :

Port	Status	Baud Rate	Protocol	Mode	IP Port	Function
Bluetooth	Enable	-	-	-	-	CMD
UHF	Enable	451.8 MHz	Satel	-	-	RTK_IN
COM1	Disable	115200	RS485	-	-	CMD(RTCM3)
COM2	Disable	115200	RS485	-	-	CMD
COM3	Enable	19200	RS232	-	-	NMEA
Ntrip Client	Disable	-	NTRIP	CLIENT	183.60.177.84:2012	Access data
Ntrip Caster	Disable	-	NTRIP	CASTER	6070	Caster
Socket 1	Disable	-	TCP	SERVER	6060	RAW
Socket 2	Disable	-	TCP	SERVER	9000	RAW
Socket 3	Disable	-	TCP	SERVER	9001	RAW
Socket 4	Disable	-	TCP	SERVER	9001	RAW
Socket 5	Disable	-	TCP	SERVER	9001	RAW

I/O Configuration :

COM1

COM1	Enable / Disable
Baud Rate	115200
Function	NMEA(Output)
NMEA	GGA: 1HZ GSA: Off GSV: Off ZDA: Off RMC: Off VTG: Off GST: Off GLL: Off HDT: Off

Continued on next page

Connect to external devices, continued

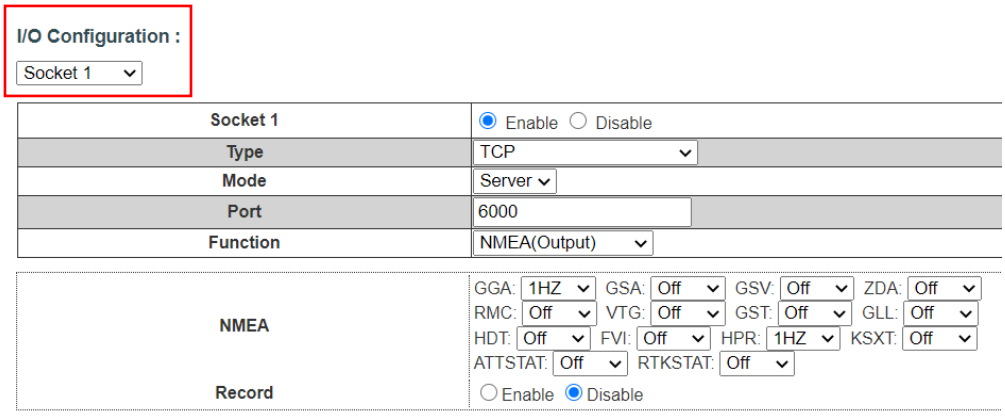
You can also output messages over TCP or UDP.

Under **I/O Configuration:** use the drop-down menu to select **Socket 1**, **Socket 2**, **Socket 3**, **Socket 4**, or **Socket 5**.

Next to **Type**, use the drop-down menu to select between **UDP** or **TCP**.

Click the drop-down menu next to **Mode** to select either **Server** or **Client**.

Next to **Port**, type in a port name.



Connecting the Receiver to External Accessories

Connect external accessories

Using the port connections, you can connect the R632 to an external antenna, external power supply, or an LTE or UHF connector. Figure 3-12 shows the R632 external connections.

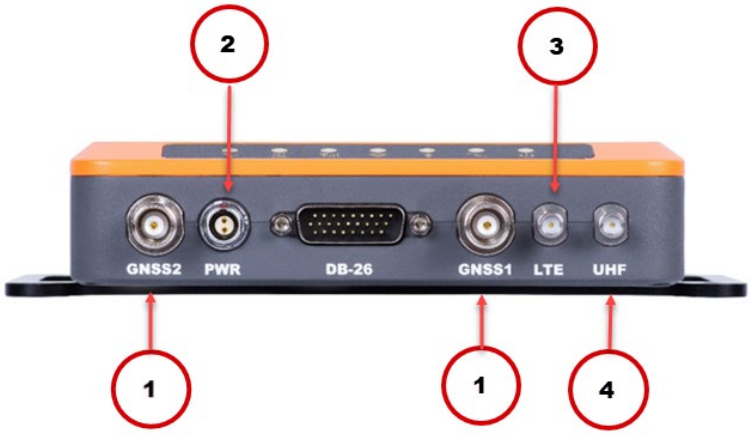


Figure 3-12: R632 External Connections

Refer to the following table a description of the external port connections and functions.

Table 3-2: External connections

	Function	Connection
1	To *reach work status*	Connect to the external antenna to connect to the GNSS1/2.
2	To *power on*	Connect to the 2-pin power supply cable.
3	To *use the SIM card*	Insert the SIM card and connect the 4G antenna to the LTE connector.
4	To *use the radio*	Connect the UHF antenna to the UHF connector.

Appendix A: Troubleshooting

Overview

Introduction

Appendix A provides solutions to common questions when operating the R632 receiver.

Contents

Troubleshooting

Table A-1: R632 Troubleshooting

Symptom	Possible Solution
Receiver fails to power on	• Check to see if the power LED is lit. • Verify polarity of power leads. • Check integrity of power cable connectors. • Check power input voltage (8 to 36 VDC). • Check the voltage from the connector at the end of the cable. • Check current restrictions imposed by power source.
No data from R632	• Check receiver power status to ensure the receiver is powered on. • Use the WebUI to verify desired messages are turned on. • Ensure the baud rate of the R632 matches that of the receiving device. • Check integrity and connectivity of power and data cable connections.
Random data from R632	• Verify that RTCM or binary messages are not being output (use the WebUI to see which messages are enabled). • Ensure the baud rate of the R632 matches that of the remote device.
No GNSS lock	• Verify the R632 has a clear view of the sky. • Use the WebUI to see how many satellites are in view and the SNR values.

Continued on next page

Troubleshooting, continued

Table A-1: R632 Troubleshooting (continued)

Symptom	Possible Solution
No heading or incorrect heading value	• Ensure MSEP value is correct, within 2 cm. • Check CSEP value is constant without varying more than 1 cm (0.39 in)—larger variations may indicate a high multipath environment and require moving the receiver location. • The R632 calculates heading from the primary to secondary GNSS antenna (the secondary antenna has an arrow underneath). Ensure via the WebUI there is not a heading bias added to the heading solution. • Check to make sure the R632 has a heading activation.
R632 will not go RTK fixed	• Check to see if the UHF indicator is blinking. If it is not blinking, check to see if the UHF base radio is transmitting data. • Ensure the frequency and settings (modulation, protocol, channel spacing, forward error corrections, and scrambling) of the base radio match the R632 radio. • Check other R632 receivers in the same area are going RTK Fixed. If they are not, the area may not have UHF coverage. Check if the R632 works closer to the base radio. Installation of a repeater may be necessary.

Continued on next page

Troubleshooting, continued

Table A-1: R632 Troubleshooting (continued)

Symptom	Possible Solution
R632 will not go RTK fixed (continued)	• Check the RTK latency. If the R632 remains in RTK Float, but the latency keeps climbing, this usually indicates the radio settings are correct, but the environment is poor (or lacks adequate UHF coverage). If the RTK latency is consistently 1, but the R632 stays RTK Float, ensure the R632 has an RTK activation.
Constellations	• If the R632 is not using satellites from a specific constellation (such as Galileo or BeiDou), verify the base station supports those constellations. Only satellites used at the base station can be used at the rover. • Check the WebUI for multi-GNSS activation.
Atlas Corrections Are Not Working	• Check your subscription end-date in the WebUI. • Use the L-band tab to check the frequency and bandwidth of the tracked satellite. We suggest pressing **Auto** to use your position to automatically tune to the correct frequency for your region.

Appendix B: Technical Specifications

Overview

Introduction

Appendix B lists the technical specifications of your R632 GNSS receiver.

Contents

R632 Technical specifications

Table B-1: Receiver

Item	Specification
Receiver Type	Multi-Frequency GPS, GLONASS, BeiDou, Galileo, QZSS, NavIC (IRNSS*), and Atlas L-band
Signals Received	GPS L1CA/L1P/L1C/L2P/L2C/L5 GLONASS G1/G2/G3, P1/P2 BeiDou B1i/B2i/B3i/B10C/B2A/B2B/ ACEBOC GALILEO E1BC/E5a/E5b/E6BC/ALTBOC QZSS L1CA/L2C/L5/L1C/LEX NavIC (IRNSS)* L5 Atlas L-band
GPS Sensitivity	-142 dBm
SBAS Tracking	3-channel, parallel tracking
Update Rate	10 Hz standard, 20 Hz optional (with activation)
Timing (PPS) Accuracy	20 ns
Cold Start	60 s typical (no almanac or RTC)
Warm Start	30 s typical (almanac and RTC)
Hot Start	10 s typical (almanac, RTC and position)
Antenna Input Impedance	50 Ω
Maximum Speed	1,850 kph (999 kts)
Maximum Altitude	18,000 m (59,055 ft)

*NavIC (IRNSS) will be available as a future firmware update.

Continued on next page

R632 Technical specifications, continued

Table B-1: Receiver (continued)

Item	Specification
Heading (RMS)	0.2° @ 0.5 m antenna separation 0.1° @ 1.0 m antenna separation 0.05° @ 2.0 m antenna separation
Positioning (RMS)	

	Horizontal	Vertical
Single Point	1.2 m	2.4 m
SBAS[1]	0.3 m	0.6 m
Atlas H10[1]	0.04 m	0.08 m
Atlas H30[1,3]	0.15 m	0.3 m
Atlas Basic [1,3]	0.5 m	1.0 m
RTK[1,2]	8 mm + 1 ppm	15 mm + 1 ppm

Continued on next page

R632 Technical specifications, continued

Table B-2: L-band receiver

Item	Specification
Receiver Type	Single Channel
Frequency Range	1525 to 1560 MHz
Sensitivity	-130 dBm
Channel Spacing	5.0 kHz
Satellite Selection	Manual and Automatic
Reacquisition Time	15 seconds (typical)

Table B-3: Communications

Item	Specification
Bluetooth	Bluetooth 2.1+EDR / 4.0 LE
Wi-Fi	802.11 b/g
Network	LTE FDD: B1/B2/B3/B4/B5/B7/B8/B12/B13/ B18/B19/B20/B25/B26/B28 LTE TDD: B38/B39/B40/B41 UMTS: B1/B2/B4/B5/B6/B8/B19 GSM: B2/B3/B5/B8
Radio	Frequency range: 410MHz ~ 470MHz and 902.4MHz ~ 928MHz Channel Spacing: 12.5 KHz / 25 KHz Protocol: TrimTalk 450S, PCC EOT, TrimMark III(19200)
RTK Formats	RTCM2.1, RTCM2.3, RTCM3.0, RTCM3.1, RTCM3.2 including MSM
Correction I/O Protocol	Hemisphere GNSS proprietary ROX format, RTCM v2.3, RTCM v3.2, CMR, CMR+
Data I/O Protocol	NMEA 0183, Hemisphere GNSS binary
Timing Output	PPS (CMOS, rising edge sync)
Event Marker Output	Open drain, falling edge sync, 10 kΩ, 10 pF load

Continued on next page

R632 Technical specifications, continued

Table B-4: Physical

Item	Specification
Weight	550 g
Dimensions	105 x 150 x 34 mm
Power Connector	2-pin metal ODU
Antenna Connector	TNC female, straight (2x)
Data Connector	D-SUB 26 (2x RS485, 1x RS232, 1x USB2, 1x PPS, 1x Event, 1x 100m Ethernet)
LTE Connector	SMA
UHF Connector	SMA
Other: Storage Type	Micro SIM card slot and Micro SD card slot 8 GB internal, Micro SD card up to 32 GB

Table B-5: Environmental

Item	Specification
Operating temperature	-30°C ~ +65°C
Storage temperature	-40°C ~ +80°C
Protection	IP6x, IPx6, IPx7
Shock Resistance	EP455 Section 5.41.1 Operational
Humidity	95% non-condensing
Vibration	EP455 Section 5.15.1 Random
EMC	CE (IEC 60945 Emissions and Immunity) FCC Part 15, Subpart B, CISPR22
Inflammability	UL recognized, 94HB Flame Class Rating (3) 1.49 mm
Chemical Resistance	Cleaning agents, soapy water, industrial alcohol, water vapor, solar radiation (UV)

Continued on next page

R632 Technical specifications, continued

Table B-6: Electrical

Item	Specification
Input Voltage	8 to 36 V DC
Power Consumption	7.65W nominal (all signals + L-band)
Reverse Polarity Protection	Yes
Antenna Voltage Output	5 V DC maximum
Antenna Short Circuit Protection	Yes
Input Range	10 to 40 dB

Table B-7: User Interface

Item	Specification
LEDs	Power, Satellite, Bluetooth, Cellular, Wi-Fi, UHF, Heading [3]
WebUI	Supports software updates, receiver status and settings and data downloads via smartphones, tablets, or other Wi-Fi capable devices.

[1]Depends on multipath environment, number of satellites in view, satellite geometry, and ionospheric activity.
[2]Depends also on baseline length.
[3]Requires an activation or subscription from Hemisphere GNSS.

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End User License Agreement

End User license agreement

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Warranty notice

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Warranty notice, continued

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