875-0451-10

Outback A631 Smart Antenna

RTK Base Station (910-3115-10)

RTK Rover (910-3116-10)

User Guide
Revision: **A1**
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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.

The product has a Wi-Fi/BT module with the following certifications:

- **FCC ID**: 2AC7Z-ESPWROOM32D
- **IC** : 21098-ESPWROOM32D

Copyright Notice

Trademarks

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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	

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Device Compliance, License and Patents, Continued

Notice to Customers

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

Outback Guidance
A Division of Hemisphere GNSS
2207 Iowa Street
Hiawatha, KS 66434
Phone: (800) 247-3808
WWW.OUTBACKGUIDANCE.COM

Dealer Locator:
https://www.outbackguidance.com/Support/Dealer-Locator

Technical Support

If you need to contact Technical Support:

Outback Guidance
A Division of Hemisphere GNSS
2207 Iowa Street
Hiawatha, KS 66434
Phone: (800) 247-3808
EMAIL: SUPPORT@OUTBACKGUIDANCE.COM

KNOWLEDGEBASE:
HTTPS://OUTBACKGUIDANCE.ZENDESK.COM/HC/EN-US

Terms and Definitions

Introduction

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

A631 terms & definitions

Term	Definition
Activation	Activation refers to a feature added through a one-time purchase.
Atlas	Atlas is a subscription-based service provided by Hemisphere that enables the A631 to achieve sub-decimeter accuracy without a base station or datalink.
BeiDou	BeiDou is the global satellite system deployed and maintained by China.
DGPS/DGNSS	Differential GPS/GNSS refers to a receiver using Differential Corrections.
Elevation Mask	Elevation Mask is the minimum angle between a satellite and the horizon for the receiver to use that satellite in the solution.
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 implemented by the European Union and the European Space Agency.
GLONASS	Global Orbiting Navigation Satellite System (GLONASS) is a Global Navigation Satellite System deployed and maintained by Russia.
GPS	Global Position System (GPS) is a global navigation satellite system implemented by the United States.

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A631 terms & definitions, continued

Term	Definition
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 differential GPS method that provides better accuracy than differential corrections.
SBAS	Satellite Based Augmentation System (SBAS) is a system that provides differential corrections over satellite throughout a wide area or region.
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.
WAAS	Wide Area Augmentation System (WAAS) is a satellite-based augmentation system (SBAS) that provides free differential corrections over satellite in parts of North America.

Chapter 1: Introduction

Overview

Introduction

This User Guide provides information to help you quickly set up, configure, and operate your Outback Guidance A631 RTK Base Station and Rover products.

You can download this manual from the Outback Guidance website at WWW.OUTBACKGUIDANCE.COM

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Product Overview

Product overview

Outback Guidance' all new scalable A631 GNSS Smart Antenna is designed to excel in challenging environments, and is ideal for use with various applications, such as RTK Base Station and Rover for precision agriculture.

The Outback Guidance A631 GNSS Smart Antenna is a scalable multi-GNSS RTK and L-band capable, high-accuracy Smart Antenna that allows you to work quickly and accurately. Built on Hemisphere GNSS' Lyra™ II Digital Asic Technology with Cygnus™ Interference Mitigation Technology and Aquila™ Wideband RF ASIC Technology , the Outback Guidance A631 GNSS Smart Antenna boasts the latest GNSS patented technology and offers quick startup and reacquisition times.

The Outback Guidance A631 GNSS Smart Antenna can be updated by adding multi-frequency and RTK activations and subscriptions for the Hemisphere GNSS Atlas® L-band services. Athena™ RTK is Hemisphere's most advanced RTK processing software that comes with the A631 GNSS Smart Antenna.

Note: Throughout the rest of this manual, the A631 GNSS Smart Antenna is referred to simply as the A631.

Figure 1-1: Outback Guidance A631 GNSS Smart Antenna

Continued on next page

Product Overview, Continued

Product overview, continued

The A631 is a versatile Smart Antenna with numerous first-class features:

- Utilizes Hemisphere's Athena GNSS engine
- Atlas support for L-band corrections
- Environment-proven enclosure for the most aggressive user scenarios

Athena RTK

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 and landscape-oriented environments.
- Performance on long baselines.
- Industry-leading position stability for long baseline applications.
- Performance under scintillation. Sustained accuracy under ionospheric scintillation activities, in high scintillation-affected areas.

Atlas L-band

Atlas L-band is Hemisphere's industry leading correction service, which can be added to the A631 as an activation or subscription. Atlas L-band has the following benefits:

- **Positioning accuracy -** Competitive positioning accuracies down to 4 cm RMS in certain applications.
- **Positioning sustainability -** Cutting edge position quality maintenance in the absence of correction signals, using Hemisphere's patented technology.
- **Scalable service levels** - Capable of providing virtually any accuracy, precision and repeatability level in the 4 to 100 cm range.
- **Convergence time** – Industry leading convergence times of 10-40 minutes.

Continued on next page

Product Overview, Continued

For more information

For more information about Athena RTK, see:
HTTP://HGNSS.COM/TECHNOLOGY

For more information about Atlas L-band, see:
HTTP://HGNSS.COM/ATLAS

Key Features

Outback A631 RTK Base Station & Rover Key Features

Key features of the Outback A631 RTK Base Station and Rover include the following:

Outback A631 Key Features		
A631 RTK Base Station & A631 RTK Rover	**A631 RTK Base Station**	**A631 RTK Rover**
Utilizes A631 all-in-one, triple-frequency, multi-GNSS receiver solution	Mobile use with carrying case and external battery	Utilizes customer owned corrections as GNSS rover for Rebel sub-inch system
Tracks and provides corrections for GPS, GLONASS, BeiDou, Galileo and QZSS constellations	Ideal solution to provide customer owned corrections for Rebel sub-inch system	Acts as standalone GNSS RTK rover to utilize customer owned corrections for tile plows and ditching applications
Fast start up and acquisition times	Can be combined with another A631 as rover for tile plows and ditching applications	
Easy setup and configuration with mobile device (Smartphone or Tablet) using WiFi interface		
900 MHz radio for license free communication		

What's Included in Your A631 RTK Base Station

A631 RTK Base Station

The parts and accessory items listed below are included with your Outback A631 RTK Base Station (P/N: 910-3115-10)

A631 RTK Base Station Parts list

Table 1-1 provides the part name and description, quantity, and part number for each part in your kit.

Table 1-1: Outback Guidance A631 RTK Base Station Parts list/accessory items

Part No.	Description	Qty
Receiver		
804-0167-60	A631, Smart Antenna, Outback	1
Mounting, Cabling and Case		
750-0050-000	TRIPOD,L-DIF BASE,BLACK	1
640-0199-10	BRKT, Base, A631+ROVER	1
051-0469-10	CBL, BASE, A631+ROVER	1
051-0471-10	CBL, POWER, BATTERY TO DT 2 PIN	1
003-3033-10	CASE, MELMAT, INFINITY 27, A631+ROVER BASE	1
Battery & Power Supply		
427-0048-000	BATTERY, POWERSONIC, AGM,12V, 18A-H, A321	1
427-0050-000	CHARGER,BATTERY,12V,4A,2040	1
054-0095-000#	CBL,INPUT,IEC320-C13,6FT,U.S.	1
Radio		
802-0107-01	OUTBACK MAX ROV.MIC-P400	1
150-0010-000	ANTENNA,900MHZ,NO GND PL	1

Product support

If you have questions regarding the setup, configuration, or operation of the A631, contact your local dealer. For additional support information see Technical Support.

Continued on next page

System Components

Figure 1-1 shows the total Outback Guidance A631 RTK Base Station and system components.

Figure 1-1: Outback Guidance A631 RTK Base Station

What's Included in Your A631 RTK Rover

A631 RTK Rover

The following parts and accessory items are included with your Outback A631 RTK Rover (P/N: 910-3116-10).

A631 RTK Rover Parts list

Table 1-2 provides the part name and description, quantity, and part number for each part in your kit.

Table 1-2: Outback Guidance A631 RTK Rover Parts list/accessory items

Part No.	Description	Qty
Receiver		
804-0167-60	A631, Smart Antenna, Outback	1
Mounting and Cabling		
602-1142-0	POLE MOUNT,AtlasLink	1
675-1042-000#	SCR,MACH,8-32,3/8",PPHC,SS	4
678-1052-000#	WSHR,SPLIT-LOCK,#8	4
720-0033-00A	ASSY,A-SERIES.ANTENNA,MNT,AG	1
054-0143-000#	CBL,PWR-X,CIRC(M)7-RING.TERM,FUSE,3.6M	1
051-0236-000#	CBL,DATA-PWR SWITCH,A220	1
051-0438-10	CBL, 12PIN GNSS + 18 PIN ROVER	1
Radio		
802-0107-01	OUTBACK MAX ROV.MIC-P400	1
150-0010-000	ANTENNA,900MHZ,NO GND PL	1

Note: The following extension kit can be purchased as an optional accessory to support specific tile plow and ditching application.

Part No.	Description	Qty
851-1005-000	KIT CABLES A220320 TILE PLOW	1

Product support

If you have questions regarding the setup, configuration, or operation of the A631, contact your local dealer. For additional support information see Technical Support.

Continued on next page

System Components

Figure 1-2 shows the A631 RTK Rover system components.

Figure 1-2: Outback Guidance A631 RTK Rover

Chapter 2: Installing the A631 RTK Base Station

Overview

Introduction

This chapter provides instructions on how to install, setup and power the Outback Guidance A631 RTK Base Station.

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Setting Up the A631 RTK Base Station

A631 Mobile RTK Base Station Installation Bracket

To begin the installation and setup process, the A631 receiver and radio must be mounted to the Mobile RTK Base Station installation bracket.

The mounting is completed at the factory. The A631 RTK Base Station assembly is ready to remove from the carrying case.

Figure 2-1: A631 RTK Base Station in Carrying Case

Continued on next page

Setting Up the A631 RTK Base Station, Continued

A631 RTK Base Station Tripod Mount

The next step is to mount the A631 RTK Base Station assembly with the Mobile RTK Base Station bracket to the tripod mount.

Figure 2-2: A631 RTK Base Station on Tripod

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A631 RTK Base Station Cabling

The A631 RTK Base Station cable (P/N: 051-0469-10) connects the A631 receiver with the radio and external power options as shown within Figure 2-3 and must be installed by the user.

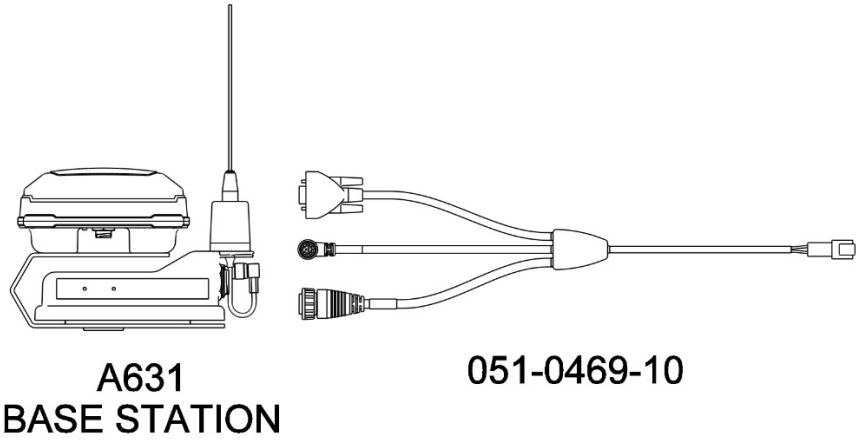

Figure 2-3: A631 RTK Base Station Cabling Diagram

Powering the A631 RTK Base Station

Power considerations

The Outback Guidance A631 RTK Base Station kit comes with two options to power the A631 RTK Base Station.

- External 12V Battery (Included battery or any other 12V battery, i.e., CAR battery that meets power and current consumption needs as shown in Table B-5.)
- External AC Power adapter

Power cables

Figure 2-4 shows the A631 RTK Base Station power cables.

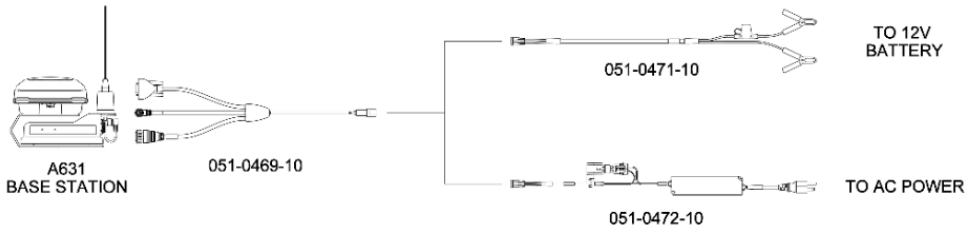

Figure 2-4: A631 RTK Base Station Power Cabling Diagram

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Powering the A631 RTK Base Station, Continued

Connecting to a power source

Choose the desired power source and connect it to the A631 RTK Base Station as shown within Figure 2-4 to power up the system.

Note: Selecting the right power connector will depend on your specific installation requirements. The AC Power connector is not included with the Mobile Base kit and can be purchased as an optional accessory with the P/N: 051-0472-10.

⚠WARNING: Do not apply a voltage higher than 32 VDC. This will damage the receiver and void the warranty.

The A631 features reverse polarity protection to prevent excessive damage if the power leads are accidentally reversed.

LED Indicator

LED Indicator

The A631 uses a single LED that provides system information based on the color of the LED as follows:

Table 2-1: LED Indicators

LED Color	Description
Blinking Red	Power on
Blinking Amber	GNSS position available, including RTK float and Atlas, RTK Base Station is converging
Blinking Green	RTK-fixed or Atlas-converged position available
Blinking Green (Slow)	RTK Base Station converged and outputting corrections
Blinking any color	Receiver operational

⚠WARNING: If at any time the LED turns to a solid color for an extended period of time, the receiver has malfunctioned.

Setup Location

Setup Location

To achieve the best positioning results and radio range, it is important to plan the Base Station location:

- Select an elevated location with an unobstructed view of the sky.
- Ensure there is at least 160 feet (50 meters) from any obstructions.

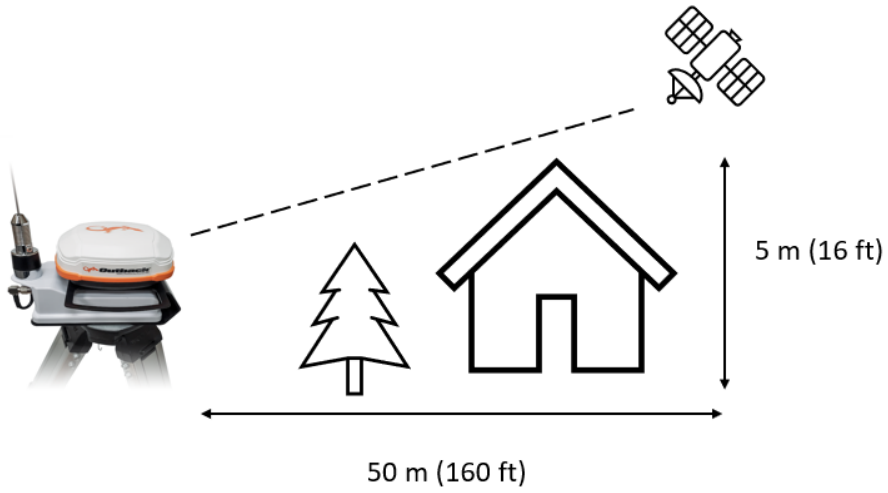

Figure 2-5: A631 RTK Base Station Location

Note: The range of the radio communication increases with the mounting height of the radio antenna.

⚠WARNING: An improper setup location can impact the functionality of your A631 RTK Base Station.

Chapter 3: Operating the A631 RTK Base Station

Overview

Introduction

This chapter explains how to operate the Outback A631 RTK Base Station.

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Using the A631 RTK Base Station

Overview

For your convenience, both the GNSS and differential correction of the A631 RTK Base Station are preconfigured. The receiver and radio will work out-of-the-box with a default radio channel setting, and for most applications, little user setup is necessary.

When powered for the first time, the A631 RTK Base Station will perform a “cold start,” which involves acquiring the available GNSS satellites in view and starting the convergence process.

This chapter provides additional information for user specific settings to the A631 RTK Base Station.

WebUI

Introduction

The WebUI functionality of the Outback A631 RTK Base Station allows the user to configure the receiver and radio with a WiFi capable computer or mobile device.

It allows for easy product status review, configuration and GNSS Firmware updates without the need for a wired cable connection.

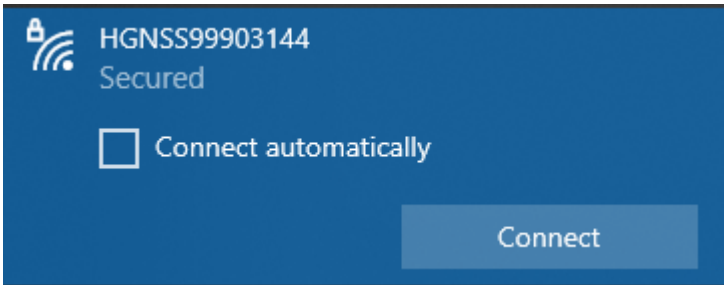
Note: The typical WiFi range is expected to be up to 30 feet (10m). Ideally the user should be in close range to the receiver or within a vehicle (i.e., tractor, truck etc.) directly next to the Outback A631 RTK Base Station.

WiFi Connection

To use the WebUI, a WiFi connection must be established with the Outback A631 receiver.

Connect mobile device to receiver over WiFi:

- Ensure WiFi is enabled on mobile device
- Identify SSID of A631 receiver as [HGNSS+8digit ESN]
- Connect to WiFi network
- The default WiFi password is “hgnss1234”



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WebUI, Continued

Access WebUI

The WebUI utilizes an IP address with a standard internet browser:

- Open internet browser
- Enter http://192.168.100.1/
- Access start page of Outback A631 WebUI

Note: All standard internet browsers can be used to operate the WebUI (i.e., Google Chrome, Firefox, Microsoft Edge).

Continued on next page

WebUI, Continued

WebUI Overview

The Outback A631 RTK Base Station WebUI consists of four main tabs: **Status**, **Tracking**, **Information** and **Settings**.

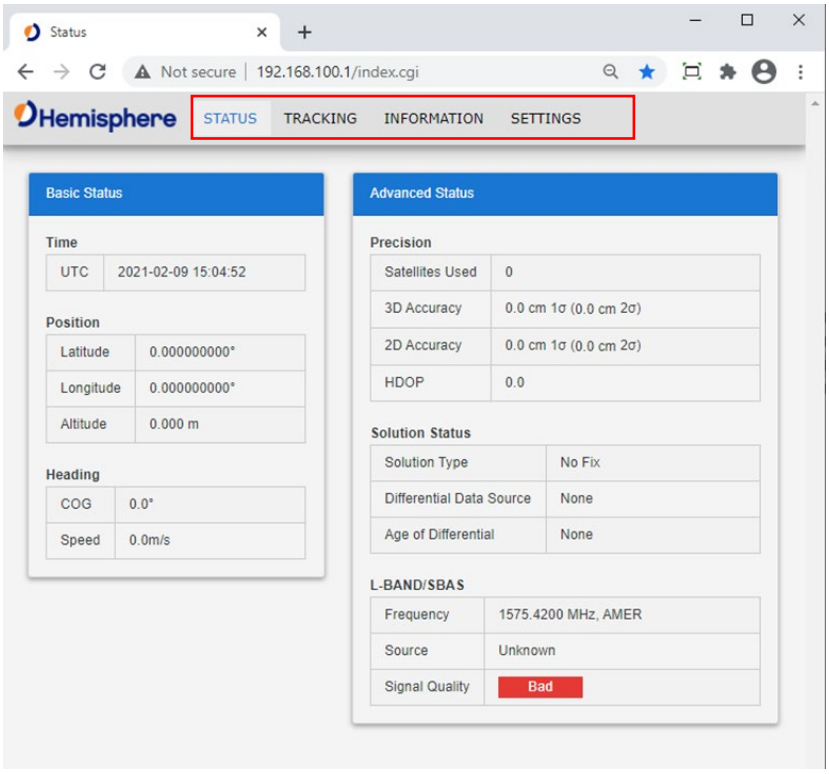


Table 3-1: RTK Base Station WebUI Tabs

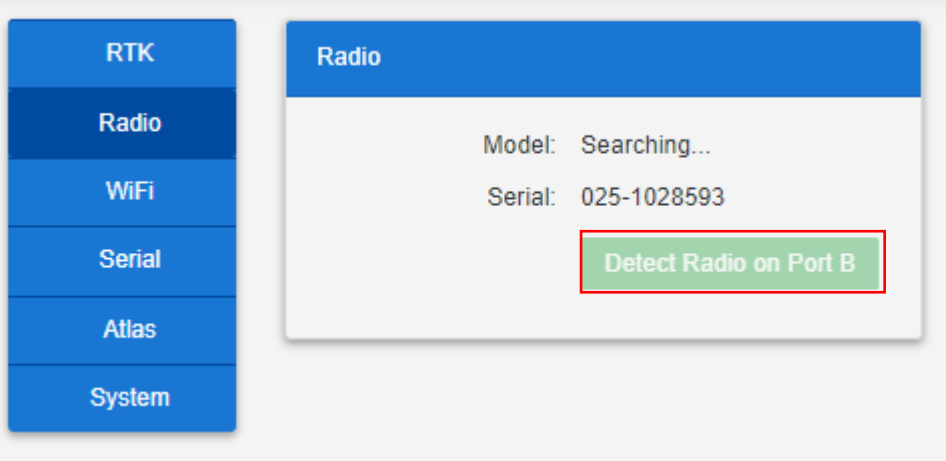
Tab	Content
Status	Time, Position, Heading, Precision, Solution Status, L-BAND/SBAS
Tracking	Sky View and Signal Chart
Information	Receiver details, Activations & Subscriptions
Settings	– System – RTK – Radio – WiFi – Serial – Atlas

Radio Configuration

Detect Radio

To configure the Outback A631 RTK Base Station radio, it must first be detected by the receiver.

To initiate this detection, press the "**Detect Radio on Port B**" button on the **Radio** settings page.



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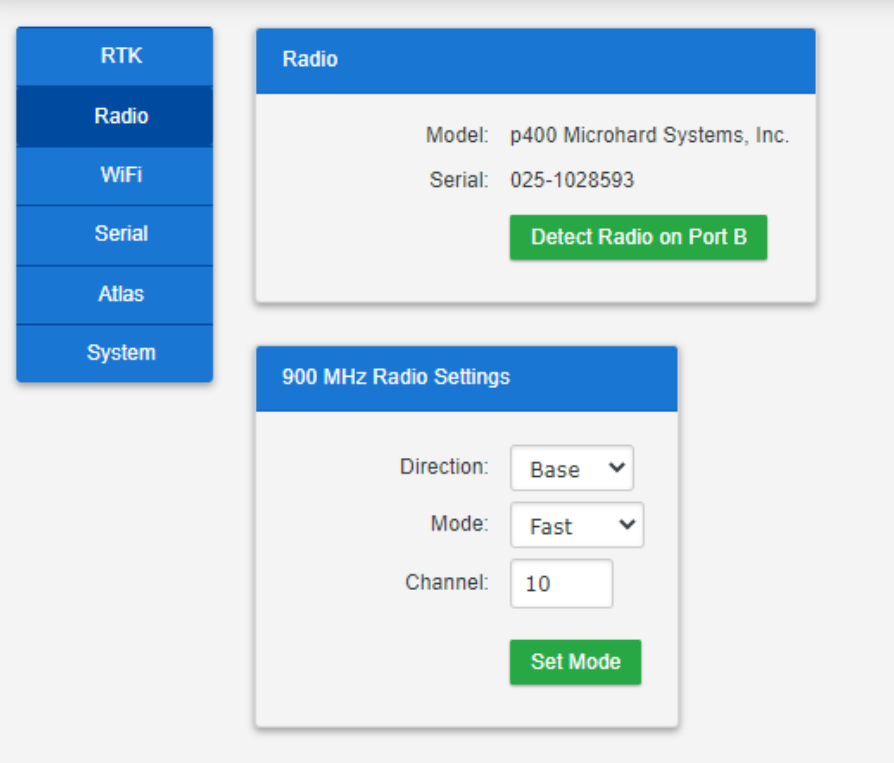
Radio Configuration, Continued

Radio Status

Once the radio has been detected successfully, its status and current setting will be displayed within the WebUI.



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Radio Configuration, Continued

Radio Settings

The Outback A631 RTK Base Station Radio supports the following settings:

Table 3-2: Radio Settings-Base Station

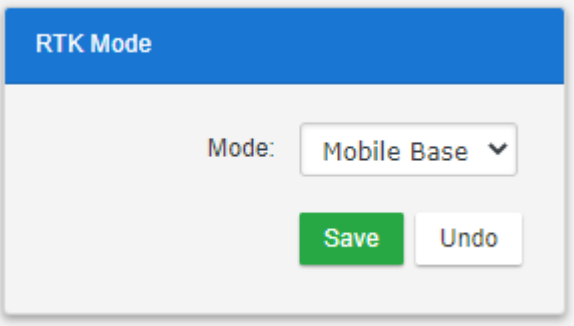
Category	Settings	Description
Direction	Base	The "**Direction**" setting is preconfigured as "**Base**" for the Outback A631 RTK Base Station and should not be changed unless the receiver is intended to be used as an RTK Rover.
Mode	Fast	The "**Mode**" setting is preconfigured as "**Fast**" to provide the best possible RTK performance and compatibility with A631 Rebel Rover systems. The "**Mode**" setting should only be changed to support legacy rover radios. **Note: If the "Mode" setting is changed to "Slow" or "Slow2", this setting automatically limits the support of included GNSS constellations due to the limited throughput of these legacy radios.**
Channel	1-99	The "**Channel**" setting allows the user to choose a different radio channel between "1" and "99" depending upon the rover used and possible interference within the area due to other radios.

RTK Mode Configuration

RTK Mode Overview

The Outback A631 RTK Base Station can be configured to the following RTK Modes:

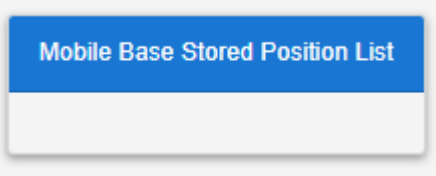
- Mobile Base
- Fixed Base
- Rover



Mobile Base Mode

Mobile Base Mode is the default setting for the Outback A631 RTK Base Station. In this mode the base automatically saves up to 32 base positions and detects proximity during start up for a faster convergence.

The saved RTK Base Station positions are displayed within the “Mobile Base Stored Position List”.



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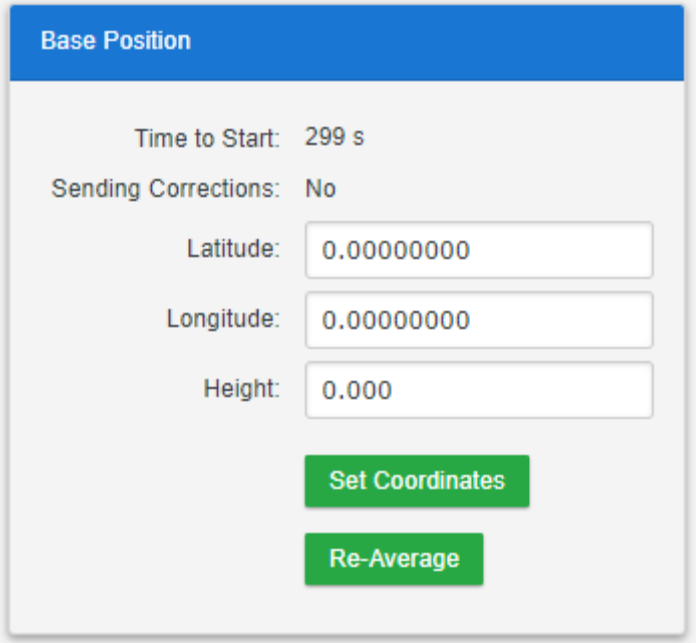
Mobile Base Mode, continued

The user can delete saved positions or enter desired RTK Base Station positions through the Base Position field.



Note: Mobile Base Mode is the recommended RTK Mode for all applications that do not utilize permanent base position. Due to the memory function for previously used base position it allows for faster convergence times if the Outback RTK Base Station is moved in between different fields.

The memory function works if the Outback A631 RTK Base Station is placed within a radius of 10m (30 feet) of a saved RTK Base Station location.

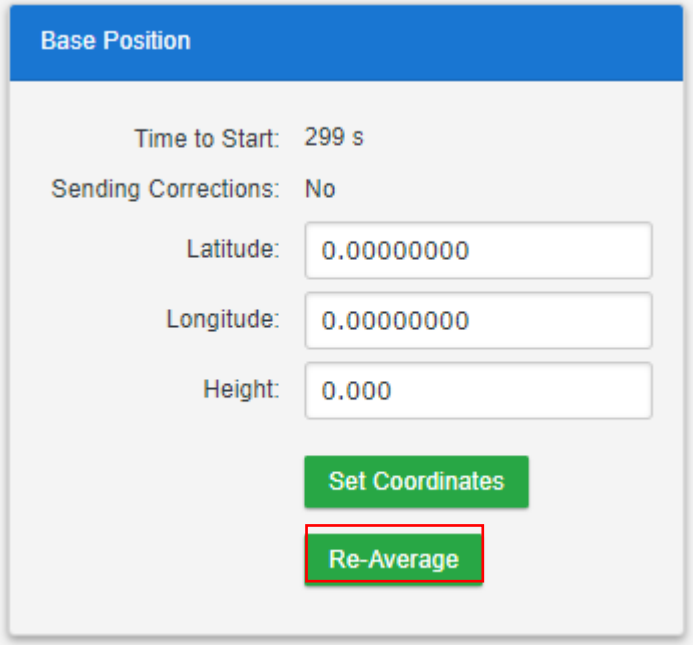
WARNING: If repeatability for guidance lines is required, it is important to ensure that the Outback A631 RTK Base Station is placed exactly within the previously used position.

Continued on next page

Fixed Base Mode

Fixed Base Mode allows the Outback A631 RTK Base Station to operate with a single base position that is used by default every time the receiver is powered on.

The user can manually enter a desired base position or utilize the **Re-Average** function of the receiver to set the fixed base position for the current location of the Outback A631 RTK Base Station.



Note: Fixed Base mode is only recommended for specific applications that always utilize the Outback A631 RTK Base Station within the same location (i.e., mounted to permanent structure).

The memory function and Mobile Base Stored Position List is not in used during the Fixed Base RTK Mode.

Continued on next page

RTK Mode Configuration, Continued

Rover Mode	The RTK Rover Mode should only be used if the Outback A631 is configured as a RTK Rover and does not apply to the Outback A631 RTK Base Station functionality. See Chapter 4: Installing the A631 RTK Rover.

Correction Output Configuration

Supported Settings

The Correction Output for the Outback A631 RTK Base Station does not need to be adjusted by the user during normal operation. Depending on the radio mode configuration, the system automatically chooses the best possible setting.

Table 3-3: Correction Output Configurations

Setting	Options	Default	Legacy
Port A	RTCM 3 RTCM 2 ROC CMR	None	None
Port B	RTCM 3 RTCM 2 ROX CMR	RTCM 3	ROX
RTCM3 Type	RTCM 3.2 MSM4 RTCM 3.2 MSM3 RTCM 3.2 MSM2 RTCM 3.0	RTCM 3.2 MSM2	N/A
Systems	GPS GLONASS Galileo BeiDou QZSS	GPS GLONASS Galileo BeiDou QZSS	GPS

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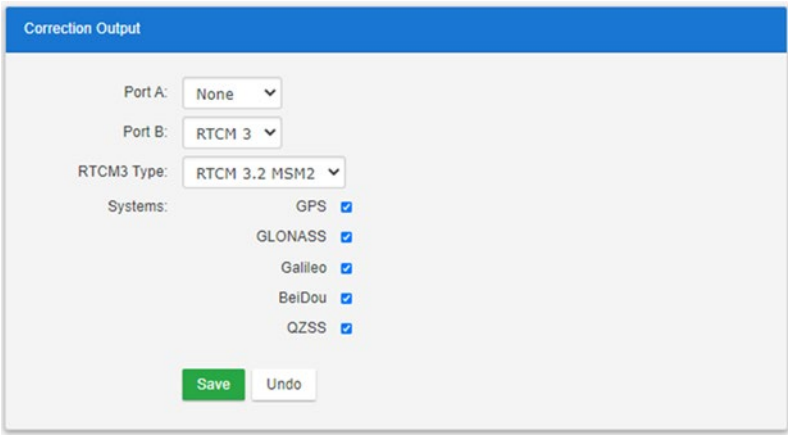
Correction Output Configuration, Continued

Supported Settings, continued



The default setting depends on the chosen radio mode and considers limitations of radio throughput and multi GNSS support with legacy rover products.

It is recommended that the Correction Output Configuration is only adjusted for specific use cases (i.e., third party external radio).

Note: The use of multi GNSS systems like GPS, GLONASS, Galileo, BeiDou and QZSS improve the stability of your RTK positioning solution.

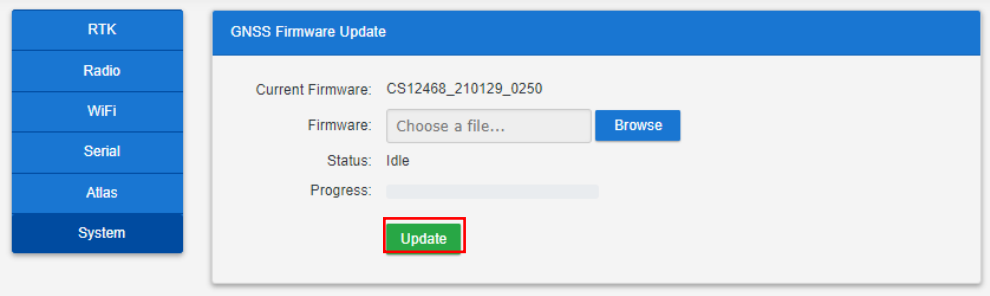
⚠WARNING: Changes to the Correction Output Configuration that are diverting from the systems default settings can impact your RTK positioning performance.

GNSS Firmware Updates

Initiate Update

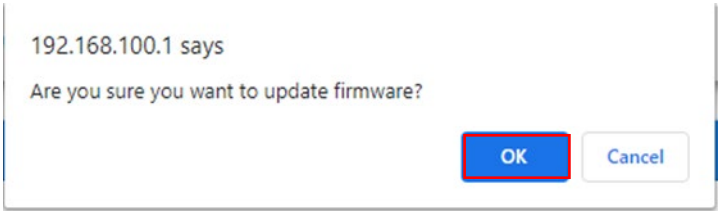
The Outback A631 RTK Base Station product support GNSS Firmware updates over the WebUI.

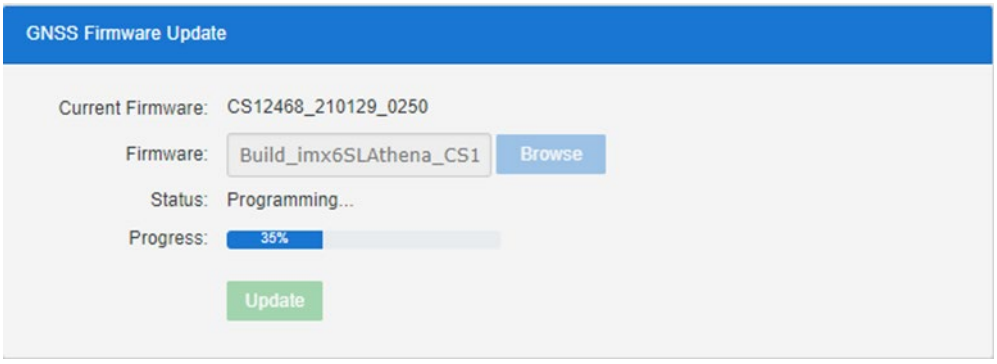
To update the GNSS Firmware, the "**System**" tab includes a "**GNSS Firmware Update**" section. The user can choose the desired file and initiate the update by pressing the "**Update**" button.



Note: Due to current software limitations, GNSS Firmware updates with iOS devices are not supported.

Press **Ok**.





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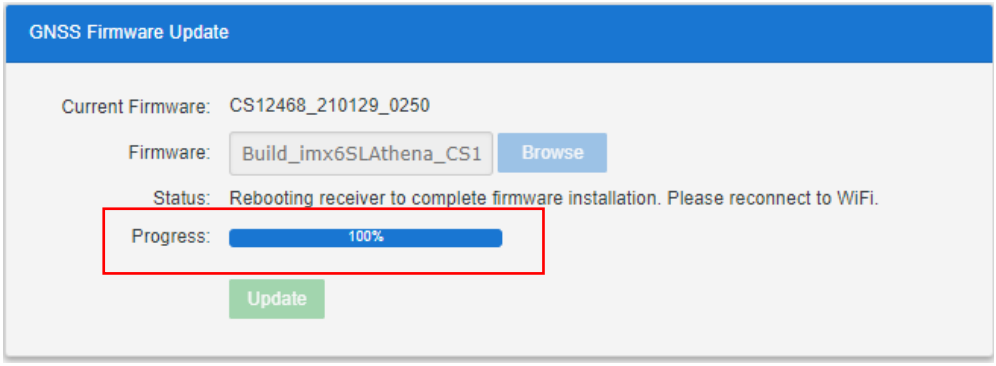
GNSS Firmware Updates, Continued

Completion

The **Progress** bar will show “100%” when the firmware installation is complete.



Note: Once the receiver has rebooted to complete the firmware installation, it is necessary to reconnect the WiFi connection in order to continue to use the WebUI.

Chapter 4: Installing the A631 RTK Rover

Overview

Introduction

This chapter provides instructions on how to install, setup, and power the Outback Guidance A631 RTK Rover.

Contents

Topic	See Page
Setting Up the A631 RTK Rover	42
Powering the A631 RTK Rover	45
LED Indicator	46
Vehicle Setup	47

Setting Up the A631 RTK Rover

A631 RTK Rover Receiver

To begin the installation and setup process, the A631 receiver and radio are required. The Outback A631 Rover should already be mounted to the agricultural pole mount with magnet base.

Figure 4-1: A631 RTK Rover with pole mount

Continued on next page

Setting Up the A631 RTK Rover, Continued

A631 RTK Rover Radio

The A631 Radio Rover includes preinstalled magnet mounts that allow for a surface mount on agricultural equipment.

Figure 4-2: A631 RTK Rover Radio

Continued on next page

Cable Connections

The A631 RTK Rover cable (P/N: 051-0438-10) connects the A631 receiver with the radio to external power and communcation options as shown within Figure 4-3 and must be installed by the user.

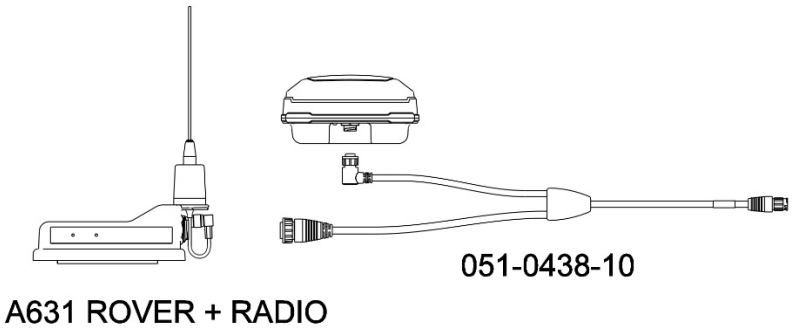


Figure 4-3: A631 RTK Rover Cabling Diagram

Powering the A631 RTK Rover

Power considerations

The Outback Guidance A631 RTK Rover kit is designed to connect to 12V vehicle power per the vehicle installation harness (P/N: 054-0143-000) and includes the following functionalities:

- On/Off Switch
- DB9 Serial Connector for GNSS position output to third party devices

Power Cables

Figure 4-4 shows the power cabling for the A631 RTK Rover.

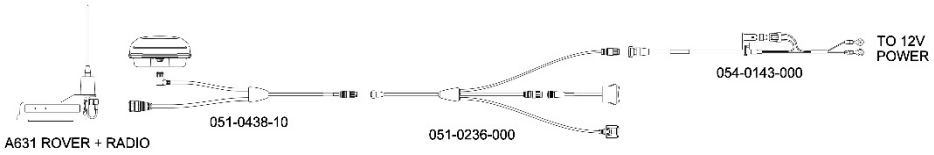


Figure 4-4: A631 RTK Rover Power Cabling Diagram

Connecting to a power source

Install the vehicle installation harness (P/N: 054-0143-000) and connect it to the A631 RTK Rover and Radio assembly as shown within Figure 4-4.

Note: The following extension kit can be purchased as an optional accessory to support specific tile plow and ditching application.

Part No.	Description	Qty
851-1005-000	KIT CABLES A220320 TILE PLOW	1

⚠WARNING: Do not apply a voltage higher than 32 VDC. This will damage the receiver and void the warranty.

The A631 features reverse polarity protection to prevent excessive damage if the power leads are accidentally reversed.

LED Indicator

LED Indicator

The A631 uses a single LED indicator that provides system information based on the color of the LED as follows:

Table 3-4: LED Indicators

LED Color	Description
Blinking Red	Power on
Blinking Amber	GNSS position available, including RTK float and Atlas, RTK Base Station is converging
Blinking Green	RTK-fixed or Atlas-converged position available
Blinking Green (Slow)	RTK Base Station converged and outputting corrections
Blinking any color	Receiver operational

⚠WARNING: If at any time the LED turns to a solid color for an extended period of time, the receiver has malfunctioned.

Vehicle Setup

Setup location

To achieve the best positioning results and radio range, it is important to plan the A631 RTK Rover location on the vehicle. Look for the following conditions:

- An elevated location with an unobstructed view of the sky, and
- away from any obstructions on the vehicle/implement.

Figure 4-5: A631 RTK Rover Location

Note: The A631 RTK Rover Radio does not need to be mounted on the implement for tile plow and ditching application.

WARNING: An improper setup location can impact the functionality of your A631 RTK Rover.

Chapter 5: Operating the A631 RTK Rover

Overview

Introduction

This chapter explains how to operate the Outback A631 RTK Rover.

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WebUI	50
Radio Configuration	53
RTK Mode Configuration	56
Position Output Configuration	57
GNSS Firmware Updates	60

Using the A631 RTK Rover

Overview

For your convenience, both the GNSS and differential correction of the A631 RTK Rover are preconfigured. The receiver and radio will work out-of-the-box with a default radio channel setting, and for most applications, little user setup is necessary.

When powered for the first time, the A631 RTK Rover will perform a “cold start,” which involves acquiring the available GNSS satellites in view.

This chapter provides additional information for user specific settings to the A631 RTK Rover.

WebUI

Introduction

The WebUI functionality of the Outback A631 RTK Rover allows the user to configure the receiver and radio with a WiFi capable computer or mobile device.

It allows for easy product status review, configuration and GNSS Firmware updates without the need for a wired cable connection.

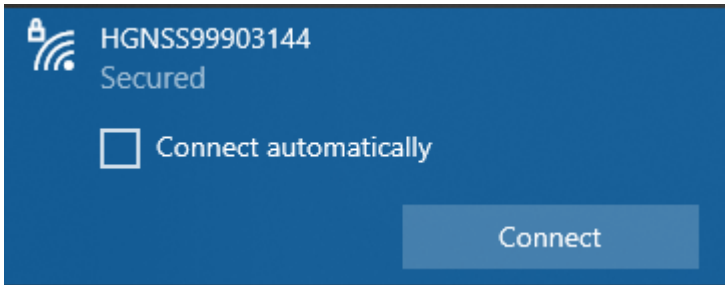
Note: The typical WiFi range is expected to be up to 30 feet (10m). Ideally the user should be in close range to the receiver or within a vehicle (i.e., tractor, truck etc.) directly next to the Outback A631 RTK Base Station.

WiFi Connection

To utilize the WebUI functionality, a WiFi connection must be established with the Outback A631 receiver.

Connect mobile device to receiver over WiFi:

- Ensure WiFi is enabled on mobile device
- Identify SSID of A631 receiver as [HGNSS+8digit ESN]
- Connect to WiFi network
- The default WiFi password is “hgnss1234”



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WebUI, Continued

Access the WebUI

The WebUI utilizes an IP address with a standard internet browser:

- Open internet browser
- Enter http://192.168.100.1/
- Access start page of Outback A631 WebUI

Note: All standard internet browsers can be used to operate the WebUI (i.e., Google Chrome, Firefox, Microsoft Edge).

Continued on next page

WebUI, Continued

WebUI Overview

The Outback A631 RTK Rover WebUI consists of four main tabs: **Status**, **Tracking**, **Information** and **Settings**.

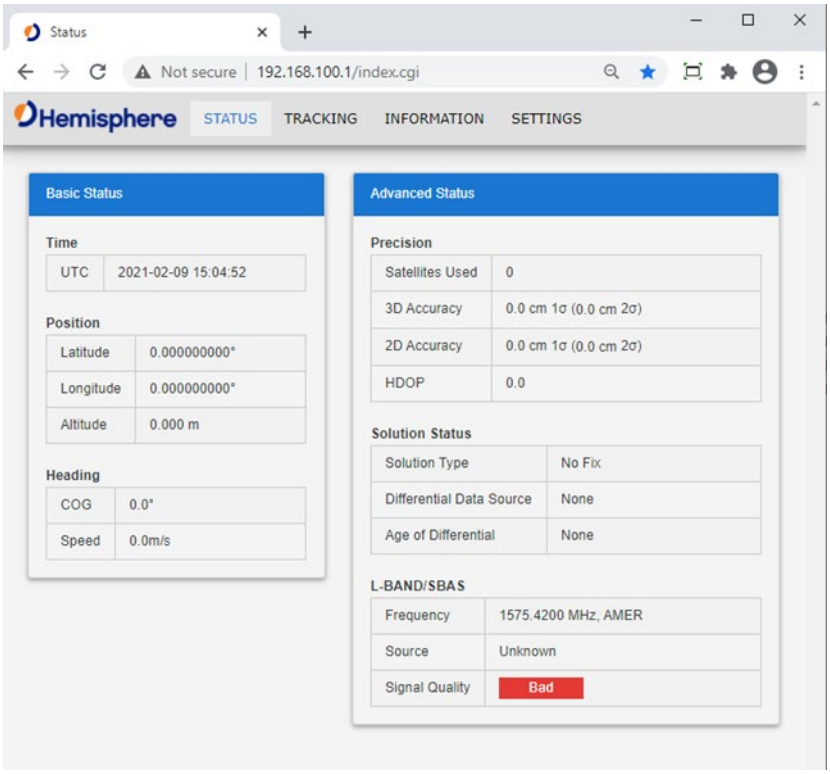


Table 3-5: RTK Rover WebUI Tabs

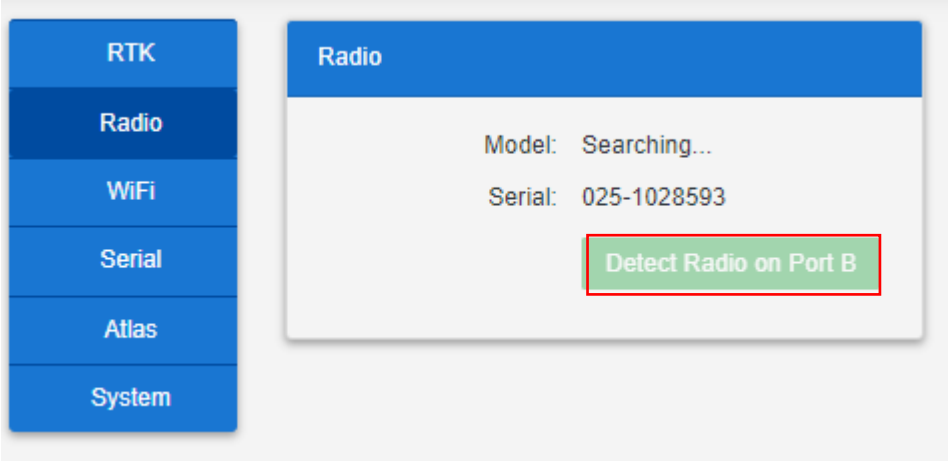
Tab	Content
Status	Time, Position, Heading, Precision, Solution Status, L-BAND/SBAS
Tracking	Sky View and Signal Chart
Information	Receiver details, Activations & Subscriptions
Settings	– System – RTK – Radio – WiFi – Serial – Atlas

Radio Configuration

Detect Radio

To configure the Outback A631 RTK Rover radio, it must first be detected by the receiver.

To initiate this detection, press the "**Detect Radio on Port B**" button within the **Radio** settings page.



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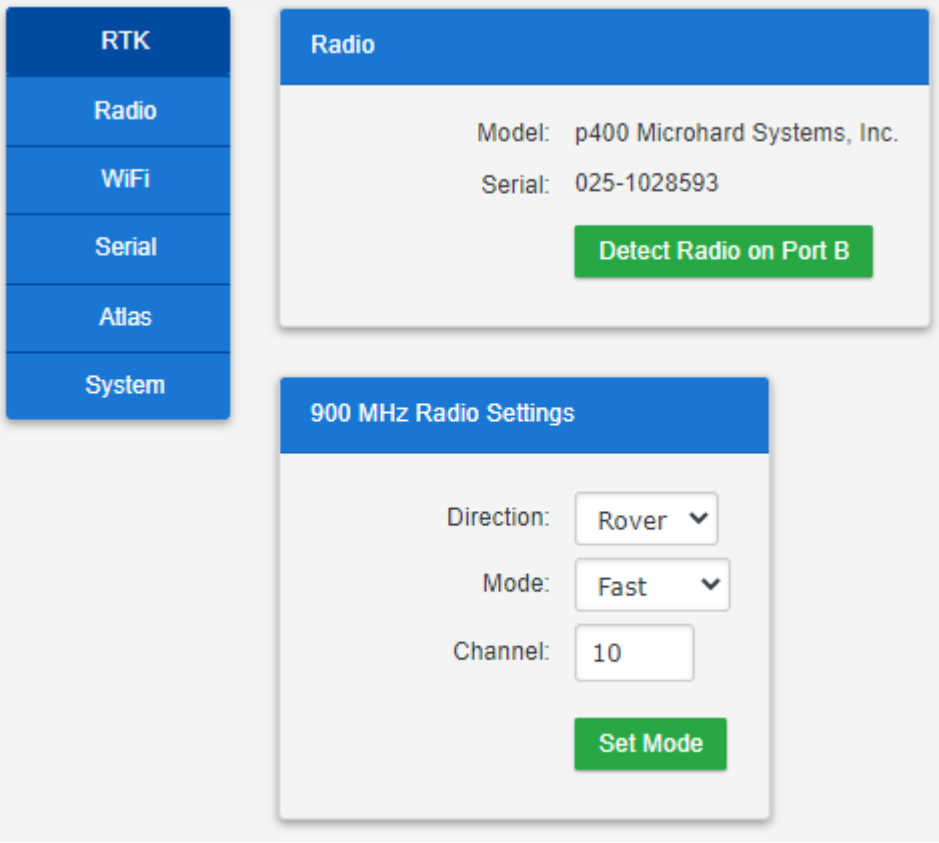
Radio Configuration, Continued

Radio Status

Once the radio has been detected successfully, its status and current setting will be displayed within the WebUI.



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Radio Configuration, Continued

Radio Settings

The Outback A631 RTK Rover Radio supports the following settings:

Table 3-5: Radio Settings-Rover

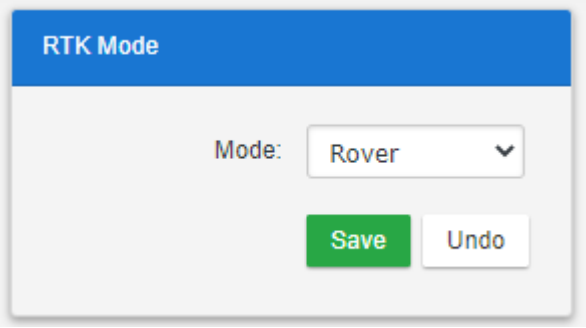
Category	Settings	Description
Direction	Base Rover	The "**Direction**" setting is preconfigured as "**Rover**" for the Outback A631 RTK Rover and should not be changed unless the receiver is intended to be used as an RTK Base Station.
Mode	Fast Slow Slow2	The "**Mode**" setting is preconfigured as "**Fast**" to provide the best possible RTK performance and compatibility with A631 RTK Base Station systems. The "**Mode**" setting should only be changed to support legacy base radios. **Note: If the "Mode" setting is changed to "Slow" or "Slow2", this setting automatically limits the support of included GNSS constellations due to the limited throughput of these legacy radios.**
Channel	1-99	The "**Channel**" setting allows the user to choose a different radio channel in between "1" and "99" depending on the used rover and possible interference within the area due to other radios.

RTK Mode Configuration

RTK Mode Overview

The Outback A631 RTK Rover can be configured to the following RTK Modes:

- Rover
- Mobile Base
- Fixed Base



Rover Mode

Rover Mode is the default setting for the Outback A631 RTK Rover. In this mode the receiver automatically expects RTK corrections from a Base Station and will calculate an RTK position solution based on these corrections.

Mobile Base Mode

The Mobile Base Mode should only be used if the Outback A631 is configured as an RTK Base Station and does not apply to the Outback A631 RTK Rover functionality. See Chapter 3: Operating the A631 RTK Base Station.

Fixed Base Mode

The Fixed Base Mode should only be used if the Outback A631 is configured as an RTK Base Station and does not apply to the Outback A631 RTK Rover functionality. See Chapter 3: Operating the A631 RTK Base Station.

Position Output Configuration

Overview

The position output of the Outback A631 RTK Rover can be configured to meet the requirements of third-party integrations.

Table 3-6: Position Output Configuration Options

Setting	Options	Frequency [Hz]	Default
Baud Rate	1200 2400 4800 9600 19200 38400 57600 115200 230400	N/A	
NMEA Output	GPGSA* GPALM* GPGGA GPGLL GPGNS GPGRS* GPGST* GPGSV* GPRMC GPRRE* GPVTG GPZDA GPGBS	Off 1 2 4 5 10 20**	
BIN Output***	Bin 1, 2*, 3, 16, 19*, 35*, 36, 44*, 45*, 62*, 65*, 66, 69*, 76, 80*, 89*, 93*, 94*, 95*, 96, 97*, 98*, 99*, 100*, 209*	Off 1 2 4 5 10 20**	

* 1Hz only
** Requires additional activation
*** See HGNSS Technical Reference Manual

Continued on next page

Position Output Configuration, Continued

Serial Port Configuration

The position output for Serial Port A can be configured per the WebUI. This setting will adjust the provided message type and frequency for the serial port that is included with the harness (P/N: 051-0236).

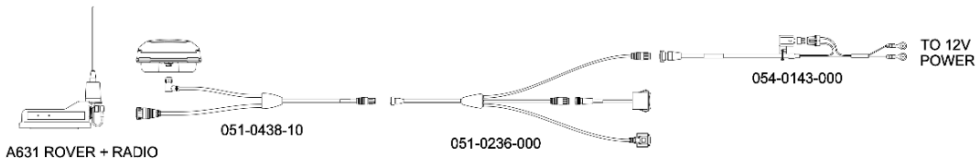
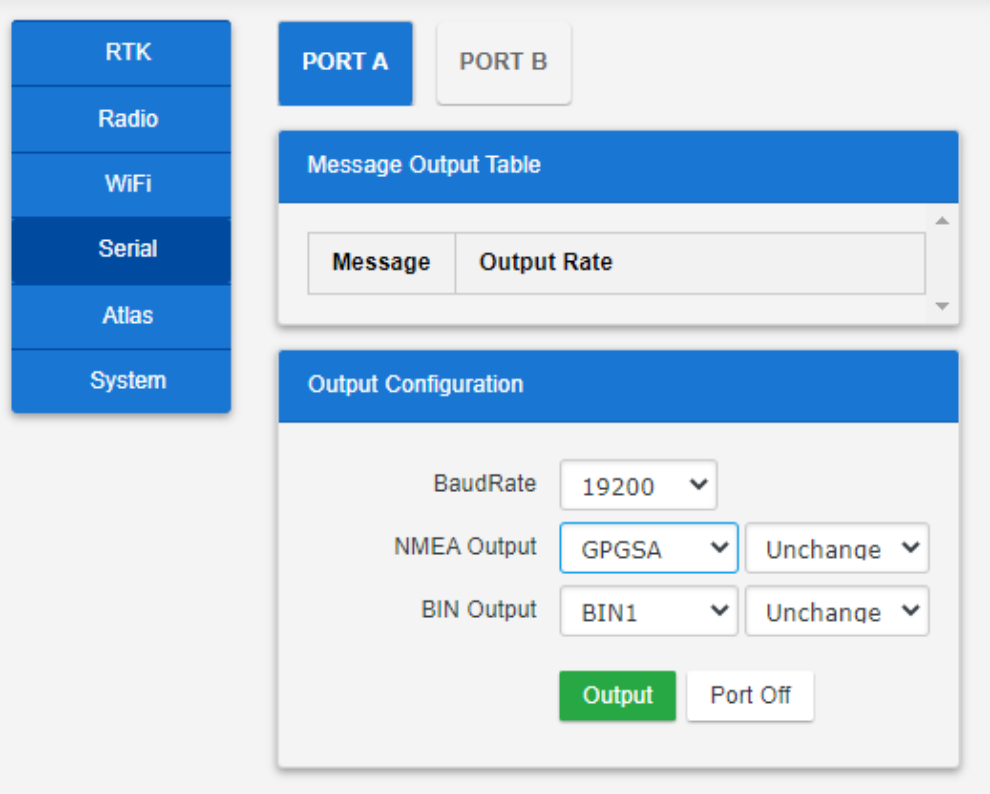


Figure 5-1: Outback A631 Position Output Harness



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Position Output Configuration, Continued

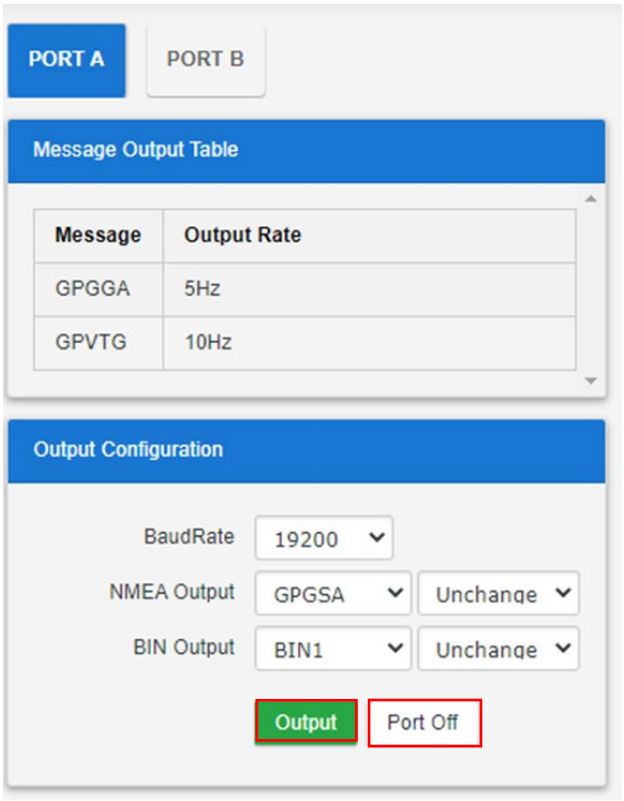
Serial Port Configuration, continued

Configure the serial output with the following steps:

- Choose NMEA (or BIN) Output message
- Choose Frequency
- Press "**Output**" button

The chosen message and output rate will be added to the message output table accordingly and the receiver will begin to output the information.

The same approach applies to disable messages or adjust the output rate. The message output for the serial port can be turned off by pushing the "**Port Off**".



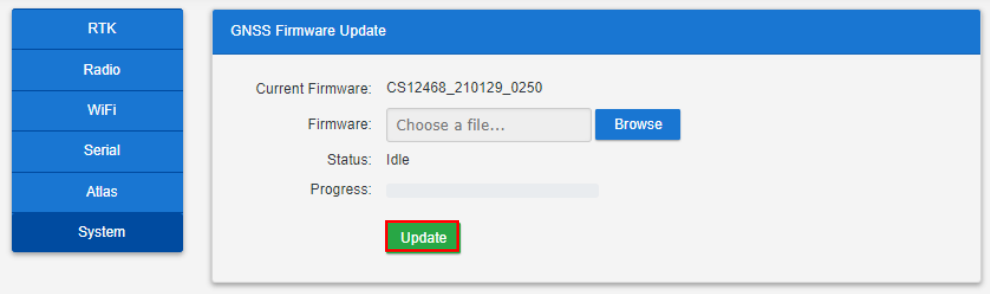
WARNING: No changes should be made to the output configuration of Serial Port B since it will interfere with the radio that is connected to this port.

GNSS Firmware Updates

Initiate Update

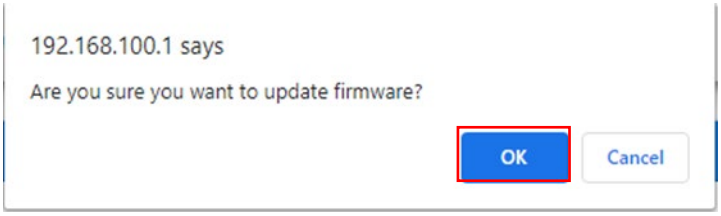
The Outback A631 RTK Rover product supports GNSS Firmware updates over the WebUI.

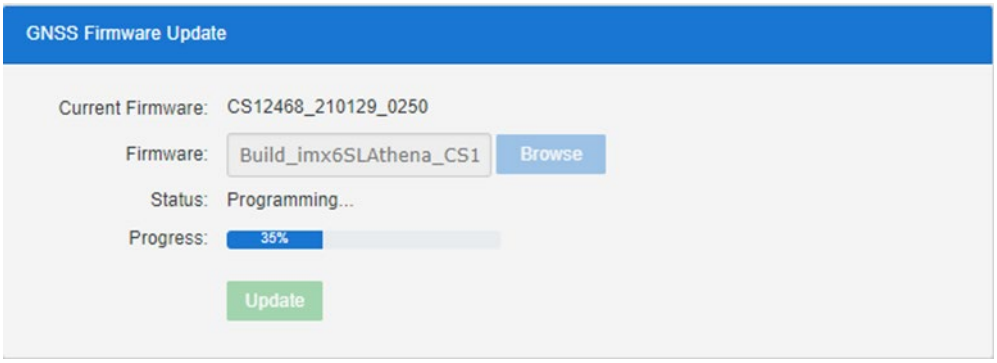
To update the GNSS Firmware, the "**System**" tab includes a "**GNSS Firmware Update**" section. The user can choose the desired file and initiate the update by pressing the "**Update**" button.



Note: Due to current software limitations, GNSS Firmware updates with iOS devices are not supported.

Press **Ok**.





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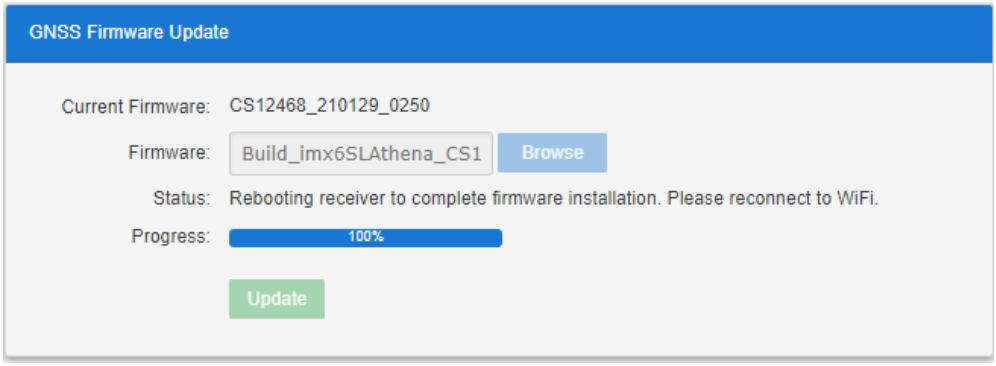
GNSS Firmware Updates, Continued

Completion

The **Progress** bar will show “100%” when the firmware installation is complete.



Appendix A: Troubleshooting

Overview

Introduction

Appendix A contains helpful hints for identifying common issues when using the A631 Smart Antenna.

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Troubleshooting	63

Appendix A troubleshooting

Table A-1: Troubleshooting

Symptom	Possible Solution
Receiver fails to power	• Verify polarity of power leads • Check integrity of power cable connectors • Check power input voltage (8 to 32 VDC) • Check current restrictions imposed by power source (maximum is 300 mA at 12 VDC)
No data from the A631	• Check receiver power status • Check integrity and connectivity of power and data cable connections • Verify the baud rate settings match • Verify receiver responds to valid $J Command ($JI) • Verify it is locked to a valid DGNSS signal • Verify it is locked to 4 or more GNSS satellites
Random binary data from the A631	• Verify the RTCM or the BIN messages are not being accidentally output • Verify the baud rate settings match • Potentially, the volume of data requested to be output could be higher than the current baud rate supports. Try either using a higher baud rate for communications or decreasing the number of messages and/or baud rates
No GNSS lock	• Check the integrity of the antenna's power/data cable • Verify the antenna is outdoors with a clear a view of the sky • Verify the lock status and signal-to-noise ratio (SNR) of GNSS satellites

Continued on next page

Appendix A troubleshooting, continued

Table A-1: Troubleshooting (continued)

Symptom	Possible Solution
No GNSS position	• Verify the antenna is outdoors with a clear view of the sky
The A631 LED not blinking after connection to power	• Verify polarity of power leads • Check integrity of power cable connections • Check power input voltage (8 - 32 VDC)
The A631 LED indicator solid color (not blinking)	• Power-cycle the receiver • Contact Technical Support

Appendix B: Technical Specifications

Overview

Introduction

Appendix B provides the technical specifications for the A631 Smart Antenna.

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A631 Technical Specifications

Overview

Table B-1 through Table B-7 provides the GNSS sensor, horizontal accuracy, L-band sensor, communication, power, environmental, and mechanical specifications for the A631.

A631 technical specifications

Table B-1: A631 sensor

Item	Specification
Receiver type	Multi-Frequency GPS, GLONASS, BeiDou, Galileo, QZSS, NavIC (IRNSS), and Atlas
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**
Channels	800+
GNSS 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)
Maximum speed	1,850 kph (999 kts)
Maximum altitude	18,288 m (60,000 ft)

Continued on next page

A631 Technical Specifications, Continued

A631 technical specifications

Table B-2: Horizontal accuracy

Item	Specification	
	RMS (67%)	**2RDMS (95%)**
RTK[1,2]	8 mm + 1 ppm	15 mm + 2 ppm
Atlas Row-Crop[1,3]	0.04 m	0.08 m
Atlas Broad-Acre[1,3]	0.15 m	0.3 m
Atlas Basic[1,3]	0.50 m	1.0 m
SBAS (WAAS)[1]	0.3 m	0.6 m
Autonomous	1.2 m	2.5 m

Table B-3: L-band sensor specifications

Item	Specification
Receiver type	Single channel
Channels	1530 to 1560 MHz
Sensitivity	-130 dBm
Channel spacing	5.0 kHz
Satellite selection	Manual or automatic
Reacquisition time	15 seconds (typical)

Table B-4: Communication specifications

Item	Specification
Serial ports	2 full-duplex RS-232
CAN port	1 port
Baud rates	4800-460800 (Serial), 250000 (CAN)
Data I/O protocol	NMEA 0183, NMEA 2000, and Hemisphere GNSS binary.
Correction I/O protocol	Hemisphere GNSS proprietary (ROX), RTCM v2.3 (DGNSS), RTCM v3 (RTK), CMR, CMR+
Timing output	PPS CMOS, active low, falling edge sync, 10 kΩ, 10 pF load
Event marker input	CMOS, active low, falling edge sync, 10 kΩ, 10 pF load

Continued on next page

A631 Technical Specifications, Continued

A631 technical specifications, continued

Table B-5: Power specifications

Item	Specification
Input voltage	7- 32 VDC
Power consumption	1.7W nominal GNSS (L1/L2), GLONASS (L1/L2) and L-band
Current consumption	0.120 A nominal GNSS (L1/L2), GLONASS (L1/L2) and L-band
Power isolation	No
Reverse polarity protection	Yes
Antenna voltage	Internal antenna

Table B-6: Environmental specifications

Item	Specification
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	95% non-condensing
Shock and Vibration	**Mechanical Shock**: MIL-STD-810H, Method 516.8 Procedure I, Operational, 50G half sine 11ms Operational **Vibration**: MIL-STD-810H, Method 514.8, Procedure I, General vibration Category 24 E1
EMC	CE (ISO 14982, ISO 13766-1, IEC 60945), FCC Part 15, Subpart B, CISPR 32
Enclosure	IP67

Continued on next page

A631 Technical Specifications, Continued

A631 technical specifications, continued

Table B-7: Mechanical specifications

Item	Specification
Dimensions	15.8 L x 15.8 W x 7.9 H (cm) 6.2 L x 6.2 W x 3.2 H (in)
Weight	<1.05 kg (<2.30 lbs.)
Status indicators (LED)	• Blinking Red - Power on • Blinking Amber - GNSS position available including RTK float and Atlas • Blinking Green - RTK-fixed or Atlas-converged position available • Blinking any color - Receiver operational
Power/data connector	12-pin male (metal)
Antenna mounting	1-14 UNS-2A female adapter, 5/8-11 UNC 2B adapter, flat mount available

References:
[1] Depends on multipath environment, number of satellites in view, satellite geometry and ionospheric activity
[2] Depends also on baseline length
[3]Hemisphere GNSS Proprietary

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Warranty notice

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Warranty notice, continued

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