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BRx6+

User Manual

Ver 1.00





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Environmental

Temperature – operating -30°C to +60°C Temperature – storage -40°C to +80°C Humidity MIL-STD-810F Method 5-7.4 Vibration MIL-STD- 810FG Method. 514.6E-1 Loose cargo MIL-STD- 810F FIG. 514.5C-5

Regulatory Compliance CE Compliance

- IEC 60950-1: 2005
- EN 301 113-1 / EN 301 113-2
- EN 301 489-1 v1.9.2
- EN301 489-3v1.6.1
- EN301 489-7v1.3.1
- EN 301489-17v2.2.1
- EN301 489-24v1.5.1
- EN55022:2010
- EN55024:2010
- EN 300440-1 v1.6.1 / EN 300440-2 v1.4.1
- EN 300 328 V1.9.1
- EN 301 511 v9.0.2
- EN 301 908-1 v6.2.1 / EN 301 908-2 v6.2.1

FCC Compliance

- FCC Part 15, Subpart B
- FCC Part 15, Subpart C :2015
- FCC Part 15, Subpart C:2014
- FCC Part2
- FCC Part22H
- FCC Part24E

IC Compliance

- ICES-003:2012 Issue5
- RSS-247 Issue 1
- RSS-GEN Issue 4
- RSS 132 Issue 3
- RSS 133 Issue 6

Certifications

BRX6+ UHF

- Model: BRX6+UHF
- FCC ID:ZC8BRX6+UHF
- IC:9586A-BRX6+UHF

BRX6+ Non-UHF

- Model: BRX6+Network
- FCC ID:ZC8BRX6+Network
- IC: 9586A-BRX6+Network

⚠ WARNING: If your BRX6+ is equipped with a 400 MHz radio you may be required to obtain a valid radio license for your jurisdiction. Only set the radio to the frequency and power you are licensed to use at your location.



USA- Federal Communication Commission (FCC)

Radio frequency radiation exposure Information:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. GSM Mode

- When using the GSM to receive correction data, this equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.

UHF Radio Mode

- When using the 400 MHz radio, M3-TR4 from Satel™, this equipment should be installed and operated with a minimum distance of 24cm.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Modifications not expressly approved by Hemisphere GNSS could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instructions, it may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by tuning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

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

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

Caution: Exposure to Radio Frequency Radiation.

This device must not be co-located or operating in conjunction with any other antenna or transmitter.

Canada - Industry Canada (IC)

This device complies with RSS 210 of Industry Canada. Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of this device.

L' utilisation de ce dispositif est autorisée seulement aux conditions suivantes: (1) il ne doit pas produire d'interférence et (2) l' utilisateur du dispositif doit être prêt à accepter toute interférence radioélectrique reçue, même si celle-ci est susceptible de compromettre le fonctionnement du dispositif.

Caution: Exposure to Radio Frequency Radiation.

The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada's website <http://www.hc-sc.gc.ca/rpb>.

Europe – Declaration of Conformity

This device is in compliance with the essential requirements of the R&TTE Directive 1999/5/EC.

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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Patents

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

U.S. Patents	Australia Patents
6111549	68769207400956800038182141112002244539
6397147	71429567429952801837682178332002325645
6469663	71623487437230808519682658262004320401
6501346	7277792746094281023258271194
6539303	7292185768935481389708307535
6549091	7292186780842881402238311696
6711501	7373231783583281744378334804
6744404	738853978857458184050RE41358
6865465	740029479487698190337

Other U.S. and foreign patents pending.



1 BRx6+ Overview

Carlson Software's BRx6+ is a multi-GNSS, multi-frequency smart antenna offering robust centimeter-level RTK performance in a variety of applications. The on-board Web user interface (Web UI) allows firmware and features to be configured and managed with any Wi-Fi capable phone or device. With standard Athena RTK technology and optional Atlas functionality, the BRx6+ can operate as a base or rover using the internal radio, modem, or serial out. The BRx6+ supports all constellations, 394 channels, worldwide 4G LTE connectivity, meets IP67 requirements. An internal capacitor allows continuous operation while swapping batteries in the field.



Figure 1: BRx6+

This user guide is intended to introduce the BRx6+ operation to the user along with its many features. We understand there may be questions or comments. If you have a question, we'd like to answer it!

Carlson Technical Support:

- Email: Support@CarlsonSW.com
- Phone: 606-564-5028
- Online: www.CarlsonSW.com/support



1.1 Shipping Case Contents

The BRX6+ is available in two kits, North American (NA) and International (Int'l). Supplementary products sold as “controller/option kits”, “accessory kits” are available as well (listed in the [Appendix](#)). Contents can change without prior notice. Check the official price list to confirm contents.

Note: Charge your Li-on battery upon receipt of shipment. According to regulations and guidelines, batteries must be shipped charged to less than 30%.



Figure 2: Parts Included

BRX6+ Part Lists

Item	Main Kits	Part Number	Quantity
1	BRX6+ (NA) Smart Antenna	8030.020.028	1
2	BRX6+ (INT'L) Smart Antenna	8030.020.038	1
3	Internal Battery	8030.058.006	2
4	Battery Charger	8030.060.046	1
5	Battery Charger Adapter	8030.030.046	1
6	BRX6+ Cigarette Lighter Adapter	8030.060.026	1
7	Power Cable (Alligator Clips)	8030.064.036	1
8	Mini Rotary Table	8030.085.001	1
9	Power Cable (Receiver)	8030.064.027	1
10	BRX6+ Serial Cable	8030.064.028	1
11	Quick Release	8030.085.001	1
12	Cell Antenna	8030.043.006	1
13	UHF Antenna Arm	8030.042.100	1
14	UHF External Antenna (TNC)	8030.042.007	1
15	UHF External Antenna (SMA)	8030.042.006	1
16	Tape Measure 12' (not pictured)	8030.080.096	1
17	Carry Case (not pictured)	8030.080.066	1
18	8Gb SD Card (not pictured)		1



1.2 BRx6+ Appearance



Figure 3: BRx6+, Front and Back View



Figure 4: BRx6+, Bottom View



1.3 BRx6+ Front Panel

LED	ICON	Status
Internal UHF Radio / External Data Link LED		On and blinking: Tx / Rx Data Link Active Off: Tx / Rx Data Link Inactive
Internal GSM Cell Modem / Network LED		On and blinking: Tx / Rx Data Link Active Off: Tx / RX Data Link Inactive
WiFi LED		On and Solid: WiFi Access Point Active Off: WiFi Access Point Inactive
Satellite LED		On and blinking: Satellite Tracking Active (Every 15s, one blink per Sat. used in sol.) Off: Satellite Tracking Inactive
Bluetooth LED		On and Solid: Active Bluetooth Link to device. Off: Inactive Bluetooth Link.
Logging LED		On and Blinking: Data Logging active Off: Data Logging inactive

1.3.1 Function and Power Buttons

The Function button  allows scrolling through the current menu choices while the Power button  acts as selection confirmation.

1.3.2 Home and Information Screens

Upon boot-up, the receiver will show the home screen, pictured below. The user may access the information screens by pressing the 'FN' button. The screens, shown below, can be scrolled through by pressing the 'FN' button. To return to the home screen, press the 'Power' button.



Figure 5: Home Screen

E 0°00' 00.000"	Ant.H.: 0.000 m	DiffType: RTCM32	Mode: Base
N 0°00' 00.000"	Interval: 2S	Datalink: NETWORK	Bat: 99 %
H 0.000 m	Free: 2750.2M	Sta.: No Sats	CSQ: 92 %
LOC RAW RTK STAT	LOC RAW RTK STAT	LOC RAW RTK STAT	LOC RAW RTK STAT

Figure 6: Coordinate Information --> File Information --> Current Data Link Status --> Device Status



1.3.3 Receiver Settings Menu

The user may access the general receiver settings by pressing the power button for 0.5 seconds. Once in the receiver settings menu, the user may scroll through the options by pressing the 'FN' button and select that option by pressing the power button.



Figure 7: Receiver Mode, Set, Shutdown, and Return Options

1.3.4 Receiver Mode Options

Selecting the 'Mode' Icon allows the user to configure the receiver mode. Options are Static, Base, and Rover. The static options allow for the user to select Auto Record or Manual mode; these modes refer to the data logging method while in a GNSS static session.

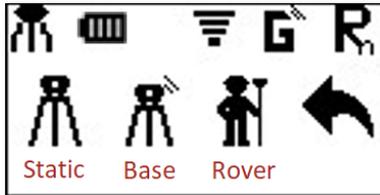


Figure 8: Receiver Mode Options

1.3.5 Receiver RTK Options

Selecting the 'RTK' Icon allows the user to set the RTK wireless device. Options are UHF, GSM, and External UHF.



Figure 9: Receiver RTK Options

1.3.6 Receiver Set Options

Selecting the 'Set' Icon allows the user to configure WiFi, Backlight, and Language settings. The WiFi option allows for the receiver's WiFi to be enabled or disabled. The Backlight option allows for setting the length the display is on before it blacks out; options are 40 seconds, 1 minute, 5 minutes, 30 minutes, or never. The Language option allows the user to select available languages.



Figure 10: Receiver Set Options



1.4 Ports

All ports and connects are located on the bottom of the unit, as shown below.

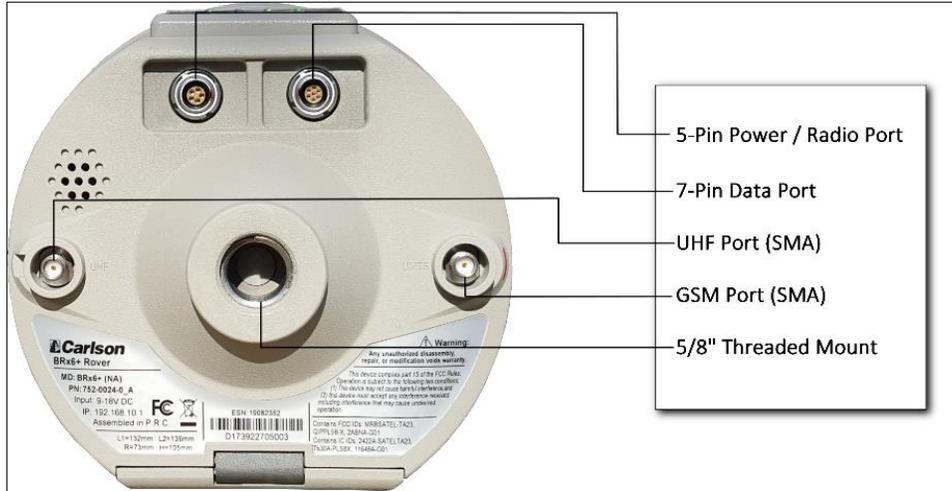


Figure 11: Ports and Connections

Port	Description
7-Pin Data Port (LEMO)	Data cable for serial or USB
5-Pin Power / Radio Port (LEMO)	External Power and Radio devices
GSM Antenna Connector	External GSM Antenna
UHF Antenna Connector	External UHF Antenna
Mounting Hole 5/8"	Pole or Tripod Mount

1.4.1 Power Input Specifications

Item	Description
Battery	Rechargeable 11.1 V -37.74 Wh
Battery Life	6 hours with one battery and UHF radio in Rx mode
Voltage	9-22V DC external power input with over-voltage protection
Charge Time	7 Hours (typical)



1.4.2 SD / SIM Card Slots

The Micro SD Card and the SIM card are located behind the battery door. Once accessible, the SIM card slot is on the left whereas the Micro SD Card slot is on the right.

The receiver comes with an SD card already installed, the user will need to provide a valid SIM card. To install / remove either card, press in until a snap is heard and it will install / eject the card.

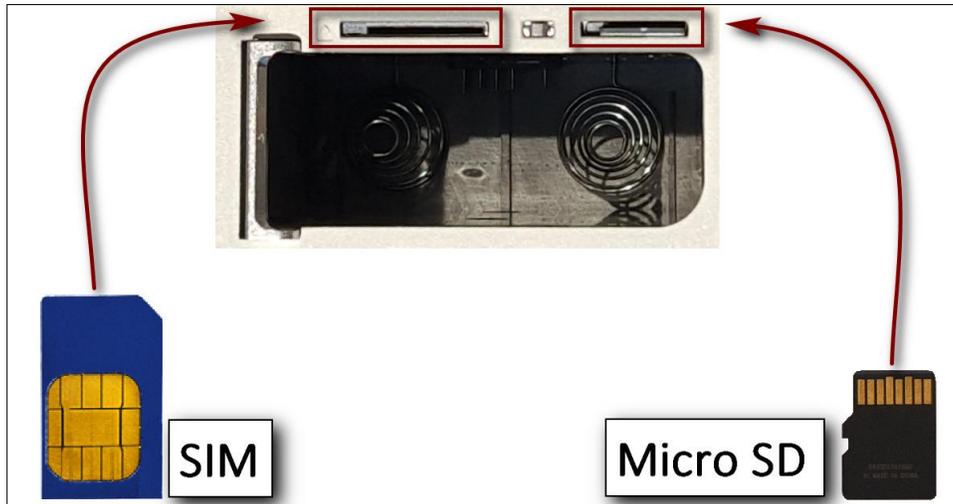


Figure 12: SIM and SD Card Slot Locations



2 BRx6+ Initial Setup

2.1 Install Battery

The BRx6+ allows for one battery (11.1 V – 37.74 Wh) to be installed at a time. When installing the battery, ensure the contact points are facing towards the 'Carlson' logo. Slid the battery into the designated spot until the battery tension bar clicks into place. The projected run time of the battery is 6 hours while operating as a Rover with the internal UHF as the data link.

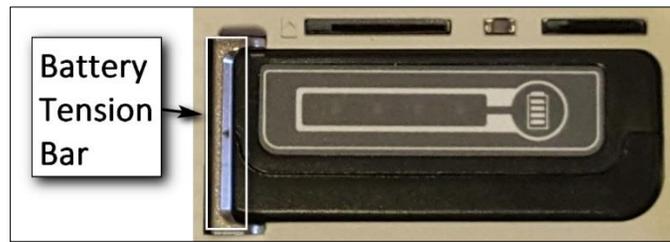


Figure 13: Battery Installation

To remove the battery, push the battery tension bar to the left. The battery should pop-out of the battery compartment. When swapping batteries, the internal capacitor will allow for the BRx6+ to run for ~25 seconds – giving the user ample to time to replace a depleted battery with a charged one.

Each battery has a charge level indicator installed on it. Press the battery icon to see the current charge level of the battery.



2.3 Install on a Tribrach

The BRx6+ mounts flush to the tribrach, by securing the 5/8-11" female metal mounting portion to the standard 5/8-11" male portion of the tribrach. Hand-tighten (35-40 in-lbs. of torque) to secure the BRx6+ onto the mount in a clockwise rotation.



Figure 15: Tribrach Installation Parts

2.4 Quick Release Installation

The quick release attaches to the 5/8" bottom mounting portion of the BRx6+. This adapter then connects to the top of a pole mount or the top of the tribrach mount. This design allows the BRx6+ to be removed from either mounting point at a push of a button.



Figure 16: Quick Release



2.5 Install the Antenna Arm

The antenna arm is typically used when the BRx6+ is configured as a base using the internal UHF radio and mounted on a tripod. The antenna arm moves the UHF antenna away from the BRx6+ and has the UHF antenna point up.



Figure 17: BRx6+ with Tribach on with UHF Antenna Arm

The BRx6+ UHF Antenna arm is found in each BRx6+ receiver kit and consists of two pieces, the antenna arm and the UHF antenna.

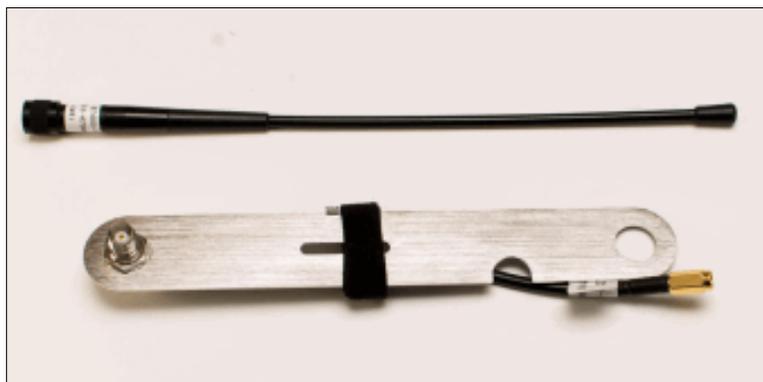


Figure 18: UHF Antenna Arm Kit



2.6 Install on a Range Pole

Using the standard 5/8-11" mount on the bottom of the receiver, the unit can be secured to a field standard 5/8-11" range pole. The receiver should be placed carefully on the range pole, to ensure cross-threading does not occur. Hand tighten (35-40 in-lbs of torque) to secure the unit.



Figure 19: Range Pole Installation

2.7 Connect to an External Power Source

To connect the receiver to an external power source, use the 5-pin Lemo external power cable (054-0171-0). The receiver can be powered from a 9 – 24VDC power supply.



Figure 20: External Power Cable



2.8 Connect to an External Device

The serial cable is available for troubleshooting, debugging, and USB log downloads.



Figure 21: Serial Cable

2.9 Powering On / Off

To power on the receiver, press the 'Power' button for 1 second. The receiver will power up and beep three times when complete. To power off the receiver, press the 'Power' button for 0.5 seconds to activate the Main Menu Screen. From this screen, press the 'FN' key to scroll through the options until the 'Power' Icon is highlighted. Press the 'Power' button to confirm this decision and power off the receiver.

2.10 Reset

The BRx6+ has a reset button located between the Micro SD card and SIM card slots. The reset button will power down the receiver and automatically restart the unit.

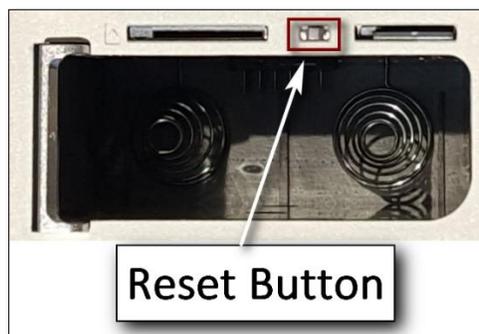


Figure 22: Reset Button Location



3 BRx6+ Key Features

3.1 Navigation Accuracy

Navigation Performance	Horizontal (m)	Vertical (m)
RTK	0.008m + 1ppm	0.015m + 1ppm
Static (long occupation)	0.003m + 0.1ppm	0.0035m + 0.4ppm
Static (rapid occupation)	0.003m + 0.5ppm	0.005m + 0.5ppm
L-Band (Atlas)	0.08m	0.16m
SBAS (WAAS)	0.3m	0.6m
Autonomous, no SA	1.2m	2.4m

3.2 Athena RTK

Athena RTK (ReaTime Kinematic) technology is available on Eclipse-based GNSS receivers. 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.

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

3.3 SureFix RTK Position

In order to provide high fidelity quality indicators to the users, Hemisphere created an additional processor that runs in combination with the RTK engine, called the SureFix processor. The SureFix processor takes several inputs, such as GNSS data, data preprocessing results, and generated RTK solutions. The SureFix processor takes all available information and, by using functional and stochastic analysis methods, determines the quality of the current RTK engine solution. These are shown as “SureFix quality indicators”. The SureFix indicators are then combined with the RTK solution before being provided to the user. At the end of the process, the user has access to high fidelity information about the quality of the RTK solution.

3.4 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. Atlas L-band is Hemisphere’s industry leading correction service, which can be added as a subscription. Atlas L-Band has the following benefits:

- Positioning accuracy - Competitive positioning accuracies down to 2 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 2 to 100 cm range
- Convergence time - Industry-leading convergence times of 10-40 minutes

BRX6+ is supported by our easy-to-use Atlas Portal (www.atlasgnss.com), which empowers you to update firmware and enable functionality, including Atlas subscriptions for accuracies from meter to sub-decimeter levels.

For more information about Athena RTK, see: <https://hemispheregnss.com/Technology> For more information about Atlas L-band, see: <https://hemispheregnss.com/atlas>



3.5 aRTK Position Aiding

aRTK is an innovative feature available in Hemisphere’s BRX6+ smart antenna that greatly mitigates the impact of land-based communication instability. Powered by Hemisphere’s Atlas L-band system service, aRTK provides an additional layer of communication redundancy to RTK users, assuring that productivity is not impacted by intermittent data connectivity. BRX6+ receives the aRTK augmentation correction data over satellite, while also receiving the land-based RTK correction data. With this, the receiver internally operates with two sources of RTK correction, creating one additional layer of correction redundancy as compared to typical RTK systems. Once that process is established (which takes as less than a few seconds), the receiver is able to operate in the absence of either correction source, or in other words, the receiver is able to continue generating RTK positions in case the land-based RTK correction source becomes unavailable for a period of time.

Note: In order to use aRTK, you are required to change the RTK timeout to: 2700 s. This can be accomplished by following the web UI directions outlined in the Setup and Configuration section of this document.



4 BRx6+ General Operation

4.1 Web UI Operation

In order to first connect to the BRx6+ Web UI, a connection needs to be made the BRx6+ WiFi network. In a phone, tablet, PC, or any other WiFi capable device, search for the BRx6+ WiFi network and connect. The name of the BRx6+ WiFi network will be the serial number of the device.

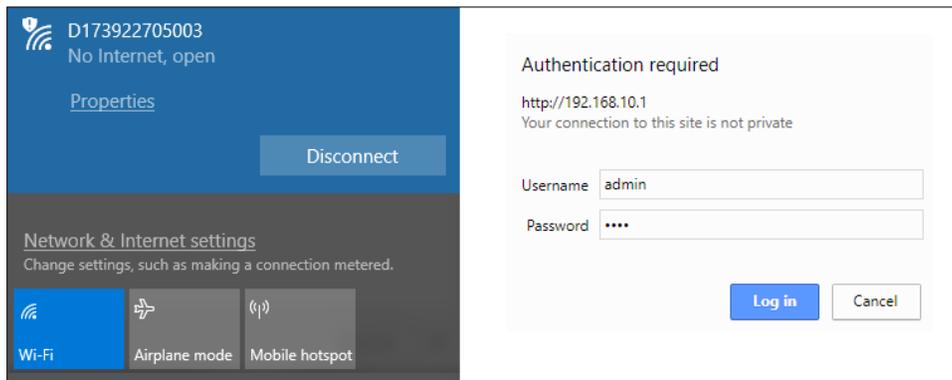


Figure 23: Connection made to BRx6+ WiFi Network and Login

The Web UI is located via browser at 192.168.10.1 and the login details are 'admin' and 's321'. Once the login is completed, the Status page of the Web UI will be presented.

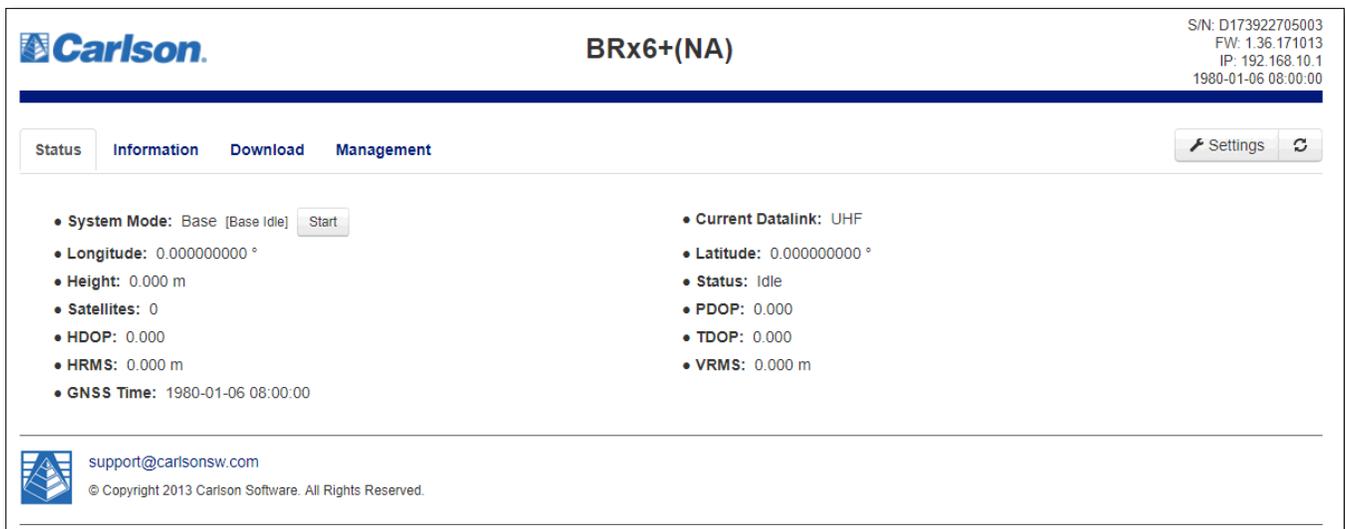


Figure 24: Web UI Status Page

Using Carlson BRx6+ on-board Web UI software, setup for a Base and / or Rover configuration can be made. The general steps will be covered below for Base, Rover, and Static configurations. For more information, please refer to the SurvCE / PC manuals, consult the Carlson Support Website at www.carlsonsw.com/support/support-center or contact the Carlson Support Team at support@carlsonsw.com.



4.1.1 GNSS Base

Start the BRx6+ and connect to the Web UI (This is done by connecting to the WiFi of the receiver and using 'admin' and 'S321' for username and password). Once connected to the Web UI, click on the 'Settings' button. In the Working Mode tab, select 'Base' for System Mode, and the preferred data link (UHF, Network [GSM], External). For each data link selection, fill out the parameters needed to enable the data link device. Note that the user will need to fill in the selected data link parameters to continue. Scroll down the menu options and fill in the appropriate selections or leave as default (Cutoff Angle, Satellite Selections, etc...). The Base Position has three choices; Single, BaseLink, and Repeat Position. Single allows the receiver to set the position automatically. Be aware that using this selection will set the base location at a unique position for each setup. BaseLink allows for the unit to use Atlas PPP corrections (if service is enabled) and set a location when the preferred convergence precision is reached. Repeat Position allows the user to set the base position by typing in Latitude, Longitude, and Elevation in either Degrees / Minutes / Seconds format or Decimal Degrees format. Once the information is properly entered, click the Save button at the bottom to complete the GNSS Base configuration.

Settings	Working Mode	Device Configuration	NMEA Message	Satellites
System Mode	<input type="radio"/> Static	<input type="radio"/> Rover	<input checked="" type="radio"/> Base	
Current Datalink	<input checked="" type="radio"/> UHF	<input type="radio"/> Network	<input type="radio"/> External	
Cutoff Angle	<input type="text" value="10"/>			
GPS	<input checked="" type="radio"/> Enable	<input type="radio"/> Disable		
GLONASS	<input checked="" type="radio"/> Enable	<input type="radio"/> Disable		
Beidou	<input type="radio"/> Enable	<input checked="" type="radio"/> Disable		
Galileo	<input checked="" type="radio"/> Enable	<input type="radio"/> Disable		
SBAS	<input type="radio"/> Enable	<input checked="" type="radio"/> Disable		
L-Band	<input type="radio"/> Enable	<input checked="" type="radio"/> Disable		
aRTK	<input type="radio"/> Enable	<input checked="" type="radio"/> Disable		

Settings	Working Mode	Device Configuration	NMEA Message	Satellites
Automatically Start Base	<input checked="" type="radio"/> NO	<input type="radio"/> YES		
Data Type	<input type="text" value="RTCM3.0"/>			
Site ID	<input type="text"/>			
Pdop Threshold	<input type="text" value="99.0"/> [1-99]			
Base Position	<input type="radio"/> Single	<input type="radio"/> BaseLink	<input checked="" type="radio"/> Repeat Position	
	<input type="button" value="Current Position"/>			
Coordinate	<input type="text" value="Degrees/Minutes/Seconds"/>			
Base Longitude	<input type="text" value="-83"/>	<input type="text" value="45"/>	<input type="text" value="46.89914"/>	
Base Latitude	<input type="text" value="38"/>	<input type="text" value="38"/>	<input type="text" value="51.04001"/>	
Base Height	<input type="text" value="135.272"/> m			

Figure 25: GNSS Base - UHF Datalink Settings



4.1.2 GNSS Rover

Start the BRx6+ and connect to the Web UI (This is done by connecting to the WiFi of the receiver and using 'admin' and 's321' for username and password). Once connected to the Web UI, click on the 'Settings' button. In the Working Mode tab, select 'Rover' for System Mode, and the preferred data link (UHF, Network [GSM], External). For each data link selection, fill out the parameters needed to enable the data link device. Note that the user will need to fill in the selected data link parameters to continue. Once the information is properly entered, click the Save button at the bottom to complete the GNSS Rover configuration.

Settings	Working Mode	Device Configuration	NMEA Message	Satellites
System Mode	<input type="radio"/> Static	<input checked="" type="radio"/> Rover	<input type="radio"/> Base	
Current Datalink	<input checked="" type="radio"/> UHF	<input type="radio"/> Network	<input type="radio"/> External	<input type="radio"/> Bluetooth
Cutoff Angle	<input type="text" value="10"/>			
GPS	<input checked="" type="radio"/> Enable	<input type="radio"/> Disable		
GLONASS	<input checked="" type="radio"/> Enable	<input type="radio"/> Disable		
Beidou	<input type="radio"/> Enable	<input checked="" type="radio"/> Disable		
Galileo	<input checked="" type="radio"/> Enable	<input type="radio"/> Disable		
SBAS	<input type="radio"/> Enable	<input checked="" type="radio"/> Disable		
L-Band	<input type="radio"/> Enable	<input checked="" type="radio"/> Disable		
aRTK	<input type="radio"/> Enable	<input checked="" type="radio"/> Disable		

Settings	Working Mode	Device Configuration	NMEA Message	Satellites
Athena Log	<input type="radio"/> NO	<input checked="" type="radio"/> YES		
Point Name	<input type="text" value="test"/>			
Antenna Height	<input type="text" value="2.000"/>			m
Pdp Threshold	<input type="text" value="99.0"/>			[1-99]
Interval	<input type="text" value="1HZ"/>			
Radio Channel	<input type="text" value="1"/>			464.55MHz, 12.5kHz Spacing, 1000mW TX
Radio Mode	<input type="text" value="Satel"/>			
FEC	<input type="text" value="OFF"/>			
	<input type="button" value="Advanced UHF Settings"/>			
Radio Configuration File	<input type="button" value="Import"/>			

Figure 26: GNSS Rover - UHF Datalink Settings



4.1.3 GNSS Static Session

Start the BRx6+ and connect to the Web UI (This is done by connecting to the WiFi of the receiver and using 'admin' and 's321' for username and password). Once connected to the Web UI, click on the 'Settings' button. In the Working Mode tab, select 'Rover' for System Mode, and the preferred data link (UHF, Network [GSM], External). For each data link selection, fill out the parameters needed to enable the data link device. Note that the user will need to fill in the selected data link parameters to continue. Once the information is properly entered, click the Save button at the bottom to complete the GNSS Rover configuration.

Settings	Working Mode	Device Configuration	NMEA Message	Satellites
System Mode	<input checked="" type="radio"/> Static	<input type="radio"/> Rover	<input type="radio"/> Base	
Cutoff Angle	<input type="text" value="10"/>			
GPS	<input checked="" type="radio"/> Enable	<input type="radio"/> Disable		
GLONASS	<input checked="" type="radio"/> Enable	<input type="radio"/> Disable		
Beidou	<input type="radio"/> Enable	<input checked="" type="radio"/> Disable		
Galileo	<input checked="" type="radio"/> Enable	<input type="radio"/> Disable		
SBAS	<input type="radio"/> Enable	<input checked="" type="radio"/> Disable		
L-Band	<input type="radio"/> Enable	<input checked="" type="radio"/> Disable		
aRTK	<input type="radio"/> Enable	<input checked="" type="radio"/> Disable		

Settings	Working Mode	Device Configuration	NMEA Message	Satellites
aRTK	<input type="radio"/> Enable	<input checked="" type="radio"/> Disable		
RTK Timeout	<input type="text" value="30"/>			s
Point Name	<input type="text" value="Static Session"/>			
Antenna Height	<input type="text" value="2.000"/>			m
Pdop Threshold	<input type="text" value="99.0"/>			[1-99]
Interval	<input type="text" value="1HZ"/>			
Auto Record	<input checked="" type="radio"/> NO	<input type="radio"/> YES		
External Serial Port Baud Rate	<input type="text" value="38400"/>			

Figure 27: GNSS Static Session Settings



4.2 Carlson SurvCE / PC Operation

Using Carlson SurvCE / PC software, setup for a Base and / or Rover configuration can be made. The general steps will be covered below for Base, Rover, and Static configurations. For more information, please refer to the SurvCE / PC manuals, consult the Carlson Support Website at www.carlsonsw.com/support/support-center or contact the Carlson Support Team at support@carlsonsw.com.

4.2.1 GNSS Base

Begin Carlson SurvCE / PC software and create / resume a job. Once the preferred job settings are selected, click on Equip tab and select GPS Base. In the Current tab, select 'Carlson' as the manufacturer and 'BRx6+' as the model.

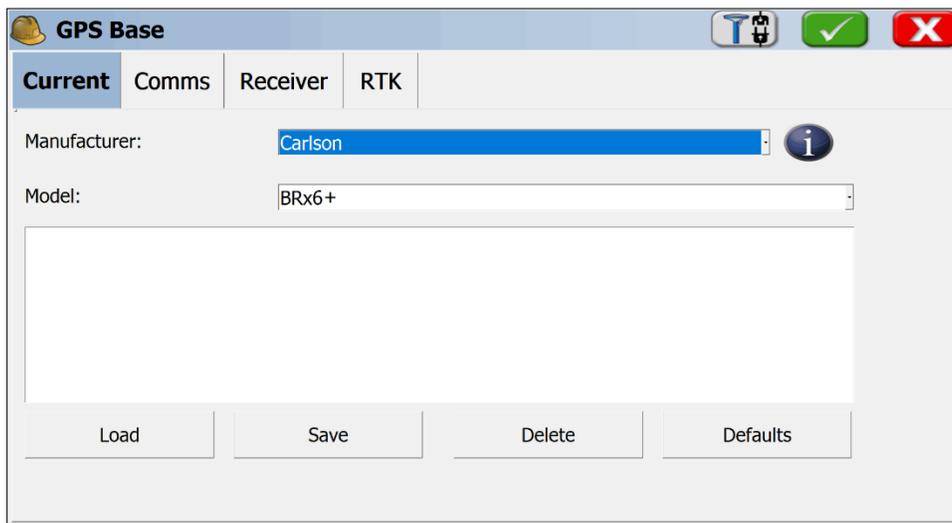


Figure 28: GNSS Base - Current Tab

Click on the Comm tab. Depending on the connection type between the data collector and the receiver, select the appropriate connection type. If the connection type is Bluetooth, search and pair the receiver to the data collector. If the connection type is cable, ensure the port settings match the receiver (defaults for the receiver equal the defaults for SurvCE / PC software).

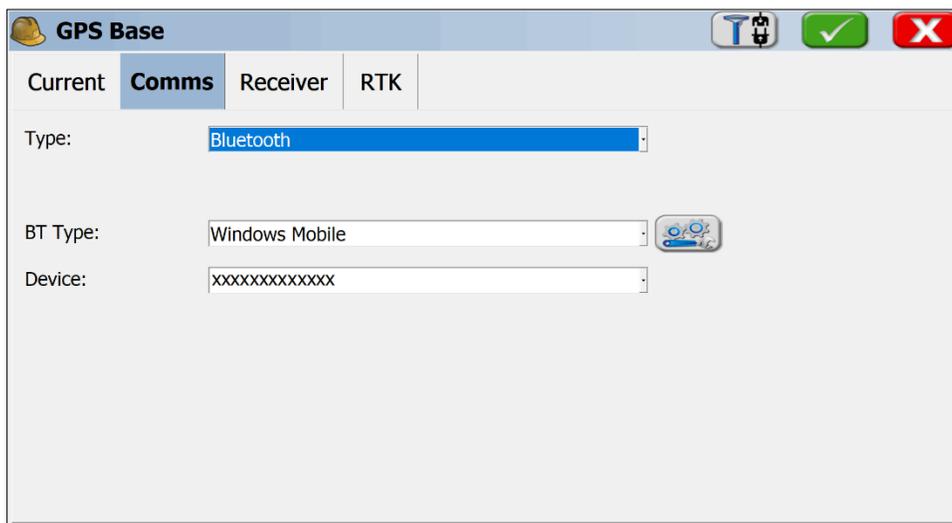


Figure 29: GNSS Base - Comms Tab



Click on the Receiver tab. Select the '[BRX6...]' antenna and enter in the appropriate antenna height.

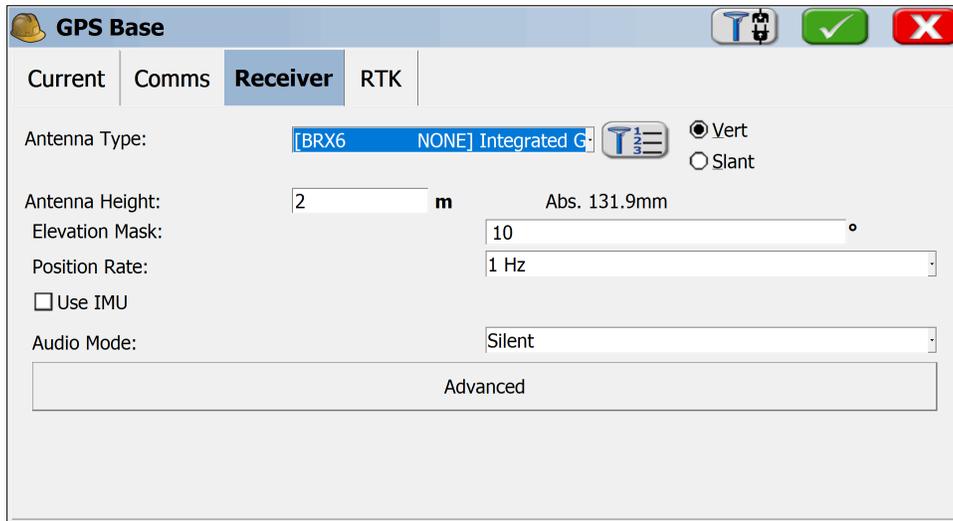


Figure 30: GNSS Base - Receiver Tab

Click on the RTK tab. Select the preferred RTK Device (Internal UHF, Internal GSM, etc...) and configure appropriately.

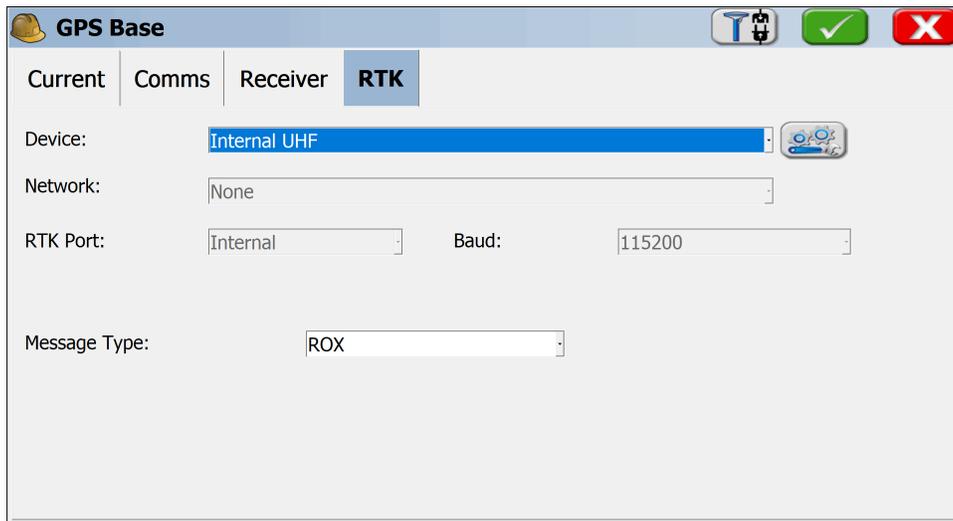


Figure 31: GNSS Base - RTK Tab



Click on the green check. The software will now present the user with selections to set the base location. If 'Read from GPS' is selected, be aware this this will set the location as approximated by Autonomous precision. Thus, each setup using 'Read from GPS' will be a unique location. Once the appropriate selection is made, the GNSS base setup will complete once the green check is clicked.

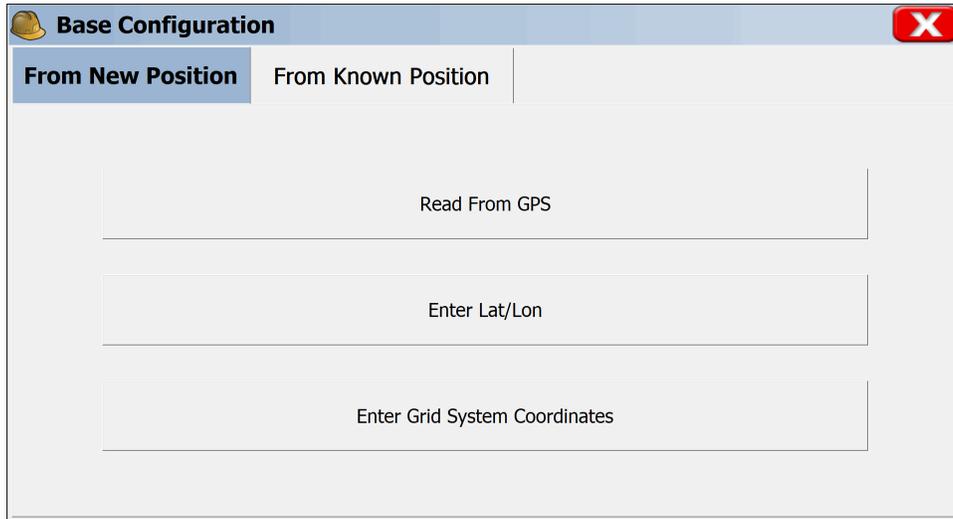


Figure 32: GNSS Base - Base Position



4.2.2 GNSS Rover

Begin Carlson SurvCE / PC software and create / resume a job. Once the preferred job settings are selected, click on Equip tab and select GPS Rover. In the Current tab, select 'Carlson' as the manufacturer and 'BRx6+' as the model.

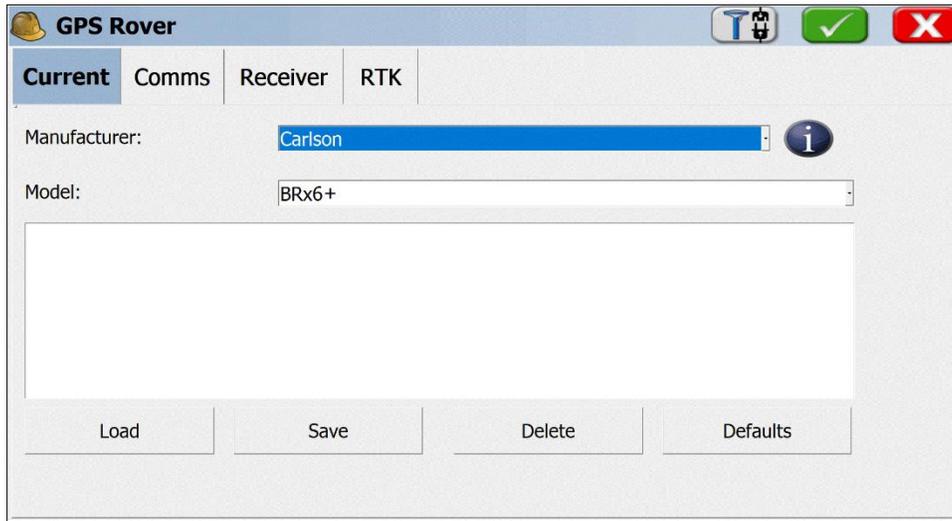


Figure 33: GNSS Rover - Current Tab

Click on the Comm tab. Depending on the connection type between the data collector and the receiver, select the appropriate connection type. If the connection type is Bluetooth, search and pair the receiver to the data collector. If the connection type is cable, ensure the port settings match the receiver (defaults for the receiver equal the defaults for SurvCE / PC software).

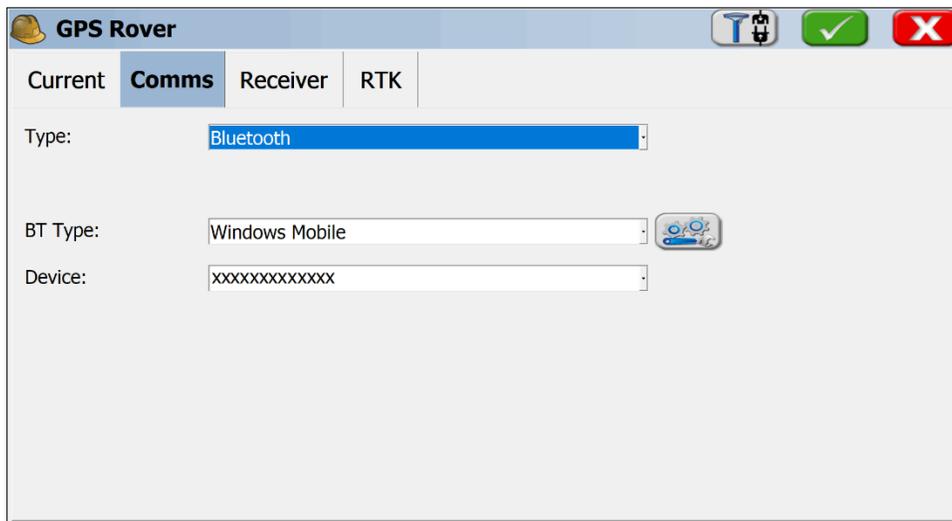


Figure 34: GNSS Rover - Comms Tab



Click on the Receiver tab. Select the 'Hems 321' antenna and enter in the appropriate antenna height.

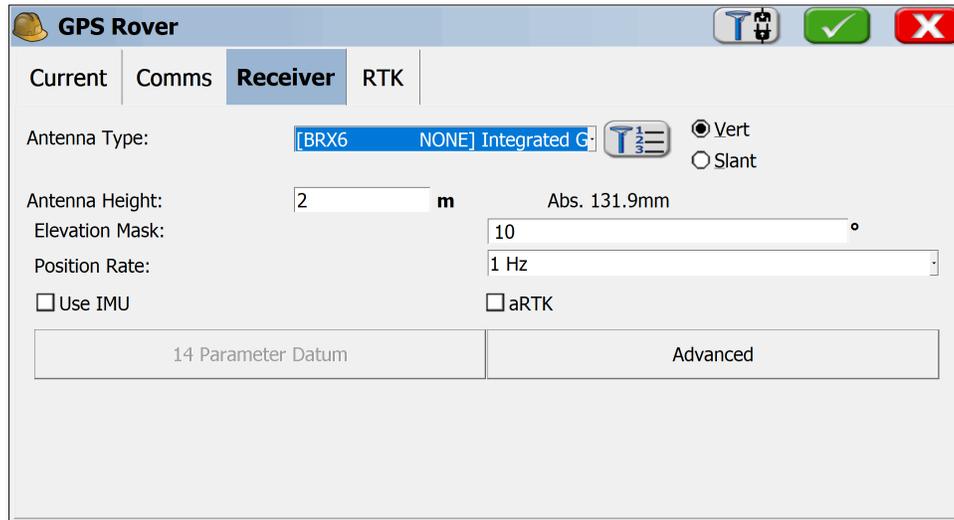


Figure 35: GNSS Rover - Receiver Tab

Click on the RTK tab. Select the preferred RTK Device (Internal UHF, Internal GSM, etc...) and configure appropriately. Click on the green check.



4.2.3 GNSS Static Session

Begin Carlson SurvCE / PC software and create / resume a job. Once the preferred job settings are selected, click on Equip tab and select GPS Rover. In the Current tab, select 'Carlson' as the manufacturer and 'BRx6' as the model.

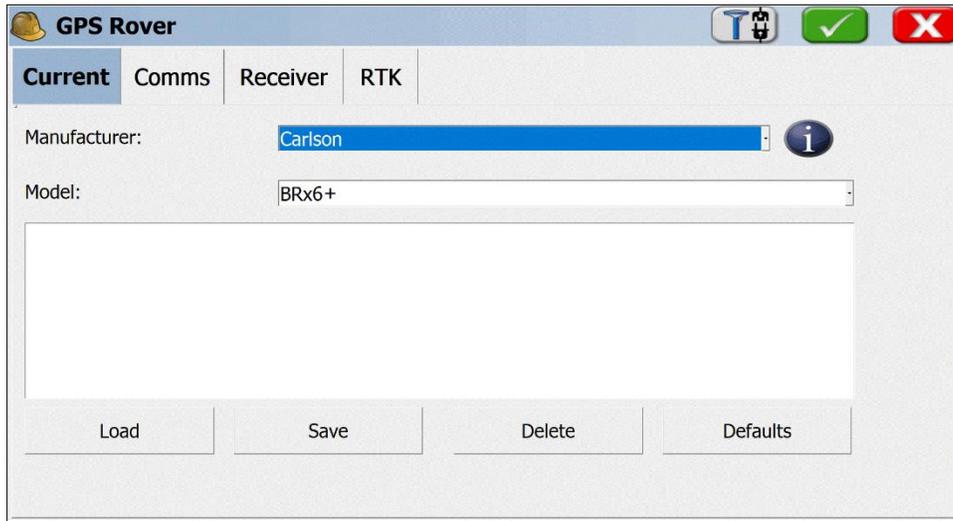


Figure 36: GNSS Static Session - Current Tab

Click on the Comm tab. Depending on the connection type between the data collector and the receiver, select the appropriate connection type. If the connection type is Bluetooth, search and pair the receiver to the data collector. If the connection type is cable, ensure the port settings match the receiver (defaults for the receiver equal the defaults for SurvCE / PC software).

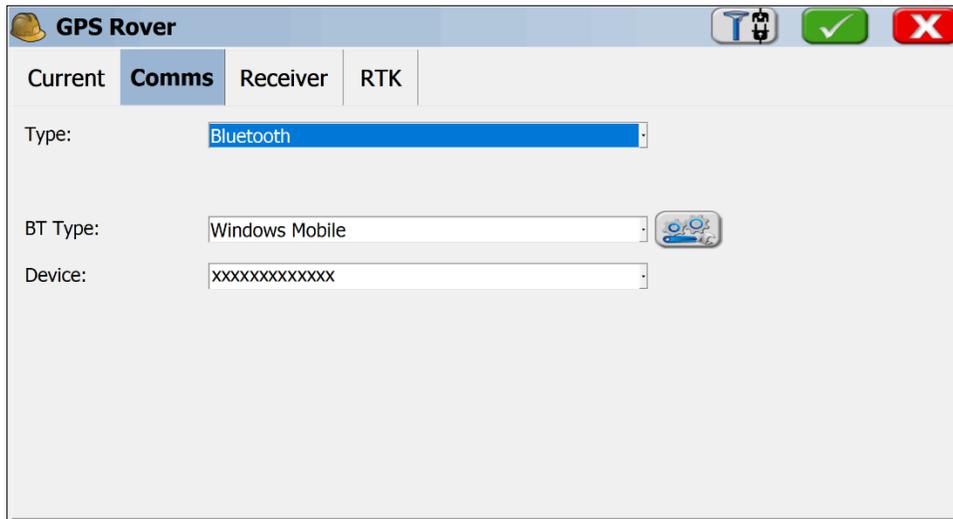


Figure 37: GNSS Static Session - Comms Tab



Click on the Receiver tab. Select the '[BRX6...]' antenna and enter in the appropriate antenna height. The RTK tab is not needed to be configured as the Rover will be logging raw satellite observable data. Click the green check.

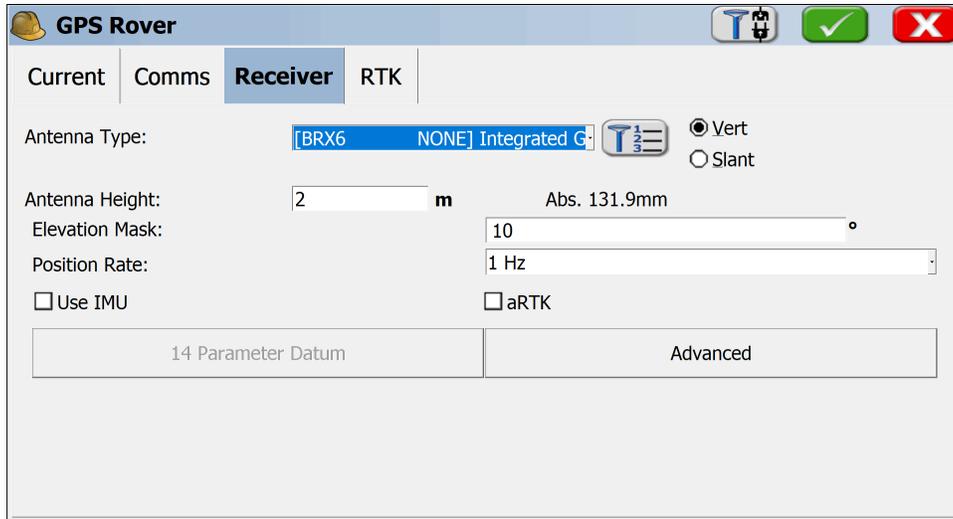


Figure 38: GNSS Static Session - Receiver Tab

Once this is complete, select the 'Log Raw GPS' button within the Survey tab. This will allow for the raw satellite data collection to be configured. Select on the Start/Resume File button and then choose the preferred file attributes and click the green check.

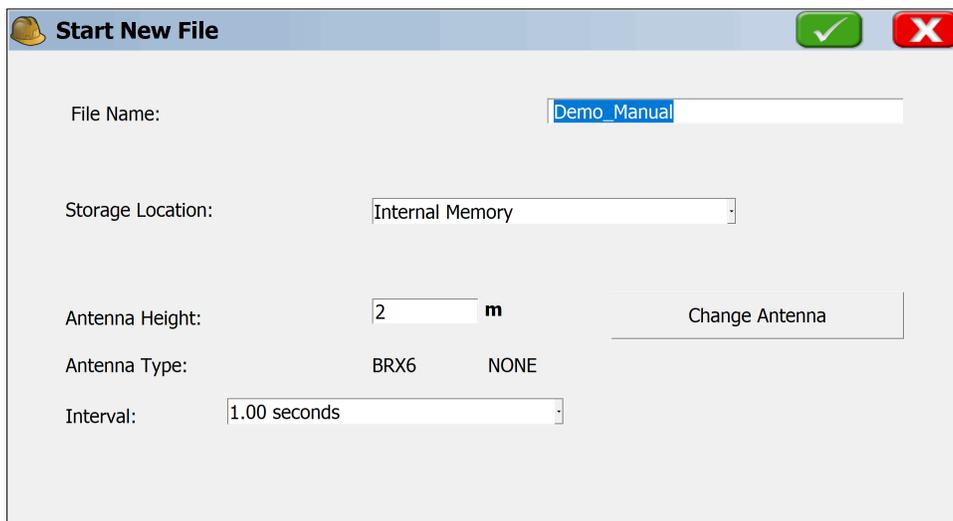


Figure 39: GNSS Static Session - Log Raw Data

The receiver will now be configured to log raw data.



5 BRx6+ Advanced Operation

Carlson **BRx6+(NA)** S/N: D173922705003
FW: 1.39.171116
IP: 192.168.10.1
2017-12-28 16:20:46

Status Information Download **Management** Settings

Install New Firmware

No file chosen

GNSS Registration

GNSS Functionality: 474;0;00/00/2000;0;OPT=;10Hz;RTK;RAW_DATA;L2_L5;MULTI_GNSS;ATLAS_LBAND

Auth Code

Security

Enable Login Authentication

Old Password:

New Password: Confirm Password:

View Logs

1. APP Log

2. OS Log

Format Internal Disk

Self Test

Restore Factory Settings

Reset

support@carlsonsw.com
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Figure 40: GNSS Advanced Operation



5.1 Firmware Updates

Within the Management tab of the BRx6+ Web UI, the user may install new firmware. Once the correct software is selected under the 'choose file' button, the 'Upload' button initiates the firmware update procedure. This will restart the BRx6+ (and thus the user must reconnect to the Web UI). Detailed instructions for upgrading the BRx6+ firmware are included within all firmware download packages provided by the Carlson Knowledge Base.

5.2 GNSS Registration

Within the Management tab of the BRx6+ Web UI, the user may view / update current subscriptions. Enter the new authorization code, tap the 'Submit' button and the device will automatically update. Detailed instructions for new or updated subscription codes are available from Carlson Technical Support.

5.3 Web UI Security

The Security field within the Management tab allows the user to enable or disable login Web UI requirements. The user is able to reset or customize a new password for their device by filling in the required fields. The default Web UI username is 'admin' and the default password is 's321'.

5.4 Formatting / Self-Test / Reset

The Format internal disk button allows the user to reformat the internal BRx6+ hard drive. Self-Test allows the user to run the self-test procedure on the BRx6+ to ensure proper operation (Note that GSM will fail if not the current datalink). Reset allows the user to initiate a complete device shut down. The reset will stop any application activity (logging, Bluetooth connection, etc.).



5.1 Satellite Configuration

Within the Settings of the BRx6+ Web UI, the user may augment the satellite tracking. Click on the 'Settings' button and navigate to the 'Satellites' tab to view / change the current satellite tracking configuration.

Settings					Working Mode	Device Configuration	NMEA Message	Satellites			
G9	<input type="checkbox"/>	R9	<input type="checkbox"/>	C9	<input type="checkbox"/>	E9	<input type="checkbox"/>				
G10	<input type="checkbox"/>	R10	<input type="checkbox"/>	C10	<input type="checkbox"/>	E10	<input type="checkbox"/>				
G11	<input type="checkbox"/>	R11	<input type="checkbox"/>	C11	<input type="checkbox"/>	E11	<input type="checkbox"/>				
G12	<input type="checkbox"/>	R12	<input type="checkbox"/>	C12	<input type="checkbox"/>	E12	<input type="checkbox"/>				
G13	<input type="checkbox"/>	R13	<input type="checkbox"/>	C13	<input type="checkbox"/>	E13	<input type="checkbox"/>				
G14	<input type="checkbox"/>	R14	<input type="checkbox"/>	C14	<input type="checkbox"/>	E14	<input type="checkbox"/>				
G15	<input type="checkbox"/>	R15	<input type="checkbox"/>	C15	<input type="checkbox"/>	E15	<input type="checkbox"/>				
G16	<input type="checkbox"/>	R16	<input type="checkbox"/>	C16	<input type="checkbox"/>	E16	<input type="checkbox"/>				
G17	<input type="checkbox"/>	R17	<input type="checkbox"/>	C17	<input type="checkbox"/>	E17	<input type="checkbox"/>				
G18	<input type="checkbox"/>	R18	<input type="checkbox"/>	C18	<input type="checkbox"/>	E18	<input type="checkbox"/>				
G19	<input type="checkbox"/>	R19	<input type="checkbox"/>	C19	<input type="checkbox"/>	E19	<input type="checkbox"/>				
G20	<input type="checkbox"/>	R20	<input type="checkbox"/>	C20	<input type="checkbox"/>	E20	<input type="checkbox"/>				
G21	<input type="checkbox"/>	R21	<input type="checkbox"/>	C21	<input type="checkbox"/>	E21	<input type="checkbox"/>				
G22	<input type="checkbox"/>	R22	<input type="checkbox"/>	C22	<input type="checkbox"/>	E22	<input type="checkbox"/>				
G23	<input type="checkbox"/>	R23	<input type="checkbox"/>	C23	<input type="checkbox"/>	E23	<input type="checkbox"/>				
				G20	<input type="checkbox"/>	R20	<input type="checkbox"/>	C20	<input type="checkbox"/>	E20	<input type="checkbox"/>
				G21	<input type="checkbox"/>	R21	<input type="checkbox"/>	C21	<input type="checkbox"/>	E21	<input type="checkbox"/>
				G22	<input type="checkbox"/>	R22	<input type="checkbox"/>	C22	<input type="checkbox"/>	E22	<input type="checkbox"/>
				G23	<input type="checkbox"/>	R23	<input type="checkbox"/>	C23	<input type="checkbox"/>	E23	<input type="checkbox"/>
				G24	<input type="checkbox"/>	R24	<input type="checkbox"/>	C24	<input type="checkbox"/>	E24	<input type="checkbox"/>
				G25	<input type="checkbox"/>			C25	<input type="checkbox"/>	E25	<input type="checkbox"/>
				G26	<input type="checkbox"/>			C26	<input type="checkbox"/>	E26	<input type="checkbox"/>
				G27	<input type="checkbox"/>			C27	<input type="checkbox"/>	E27	<input type="checkbox"/>
				G28	<input type="checkbox"/>			C28	<input type="checkbox"/>	E28	<input type="checkbox"/>
				G29	<input type="checkbox"/>			C29	<input type="checkbox"/>	E29	<input type="checkbox"/>
				G30	<input type="checkbox"/>			C30	<input type="checkbox"/>	E30	<input type="checkbox"/>
				G31	<input type="checkbox"/>					E31	<input type="checkbox"/>
				G32	<input type="checkbox"/>					E32	<input type="checkbox"/>
				Select All		Unselect All					
				Save		Cancel					

Figure 41: Satellites Settings



6 BRx6+ Technical Specifications

6.1 GNSS Receiver

Item	Description
Receiver type	Multi Frequency GNSS
Channels	394
Positioning modes	RTK, L-Band, DGNSS, SBAS, Autonomous
RTK formats	RTCM (2.3, 3.0, 3.x), CMR, CMR+, ROX
L-Band formats	Atlas H100, Atlas H30, and Atlas H10
Update rate / recording interval	Selectable from 1, 2, 4, 5, 10 Hz. (20 Hz available as upgrade)

6.2 Performance

Item	Specification	
	Horizontal	Vertical
RTK Performance	8mm + 1ppm	15mm + 1ppm
Static Performance (long occupation)	3mm + 0.1ppm	3.5mm + 0.4ppm
Static Performance (rapid occupation)	3mm + 0.5ppm	5mm + 0.5ppm
L-Band Performance ³	0.08m	0.16m
SBAS Performance ¹	0.3m	0.6m
Autonomous no SA ²	1.2m	2.4m

6.3 Satellite Tracking

Item	Specification
GPS	L1C/A, L1P, L2P, L2C, L5
GLONASS	G1, G2, P1, P2
BeiDou	B1, B2
QZNSS	L1C, L1CA, L2C, L5
Galileo	E1BC, E5a, E5b
SBAS	MSAS, WAAS, EGNOS, GAGAN

6.4 Communication and Port Specifications

Item	Description
Connectors I/O	5-pin Lemo connector for external power supply and external radio devices 7-pin Lemo connector for USB OTG connection and a serial port interface 2 antenna connectors (internal radio and internal modem)
Web UI	To upgrade this software, manage the status and settings, data download. Connection via smart phone, tablet or other electric device.
TTS	Smart voice broadcast system. "Speaking" receiver
Reference Outputs	RTCM 3.0, RTCM 3.2, CMR, CMR+, and ROX (Hemisphere proprietary messaging format)



6.5 Radio Specifications

Item	Description
Frequency Range	410 – 470 MHz
Channel Spacing	12.5 KHz / 25 KHz
Emitting Power	0.5w / 1w

6.6 Wireless Specifications

Item	Description
WiFi	Integrated module with internal WiFi antenna 802.11 (B, G, N)
Bluetooth	Bluetooth 2.1 + EDR Integrated Bluetooth (BT) communication module with internal BT antenna

6.7 Cellular Specifications

Item	Description
Type	PLS8-E (Int'l)
Supported Frequencies	4G – Penta Band LTE – 800/900/1800/2100/2600 Mhz – FDD-Band (20,8,3,7,1) 3G – Tri Band UMTS (WCDMA) – 900/1800/2100 Mhz – FDD-Band (8,3,1) 2G – Dual Band GSM/GPRS/EDGE – 900/1800 Mhz
Type	PLS8-X (North America)
Supported Frequencies	4G – Penta Band LTE – 700/700/850/AWS (1700/2100)/1900 – FDD Band (13,17,5,4,2) 3G – Tri Band UMTS (WCDMA) – 850/AWS (1700/2100)/1900 – FDD Band (5, 4,2) 2G – Quad Band GSM/GPRS/EDGE – 850/900/1800/1900 Mhz

6.8 Power Specifications

Item	Description
Battery	Rechargeable 11.1 V -37.74 Wh
Battery Life	6 hours with one battery and UHF radio in Rx mode
Voltage	9-22V DC external power input with over-voltage protection
Charge Time	7 Hours (typical)

6.9 Memory Specifications

Item	Description
SIM Card	Accessible SIM card slot
Memory	Internal 8GB. Accessible through USB and WiFi External Micro SD card slot. Supports up to 64GB.



6.10 Environmental Specifications

Item	Description
Operating Temperature	-30°C to 60°C (-22°F to 140°F)
Storage Temperature	-40°C to 80°C (-22°F to 176°F)
Water / Dust Proof	IP67
Shock Resistance	MIL-STD-810G, method 516.6
Vibration	MIL-STD-810G, method 514.6E-I
Humidity	Up to 100%

6.11 Mechanical Specifications

Item	Description
Size	14.1 D x 14.0 H (cm) / 5.5 D x 5.5 H (in)
Weight	<1.38kg / 3.05lbs
Mounting	5/8" x 11, 55° thread angle, stainless steel insert
Phase Center Offset	GPS L1 and L2 offset below 2.5mm

1Depends on multipath environment, number of satellites in view, satellite geometry, and ionospheric activity

2Depends also on baseline length

3Requires a subscription

6.12 Radio Modes

Radio Mode	Link Rate	Spacing	Modulation	Scrambling	FEC
Trimtalk 1	4800 bps	12.5 kHz	GMSK	On	Off
Trimtalk 2	9600 bps	25 kHz			On
PC1	9600 bps	25 kHz			On
PC5	4800 bps	12.5kHz			On
PC-4FSK	9600 bps	12.5 kHz	4FSK	On	On
	19200 bps	25 kHz			Off / On
Satel 3AS	9600 bps	12.5 kHz			Off / On
	19200 bps	25 kHz	Off / On		



7 BRx6+ Troubleshooting

The table below provides troubleshooting tips.

Issue	Possible Resolution
Receiver fails to power	<p>External power is low Check charge on external battery and the fuse on the power cable, if applicable.</p> <p>Internal power: Check charge on internal battery. Check all power cables and pins. Try other batteries or cables. Make sure to hold the power button down for a minimum of one full second to turn on. Ensure the battery is installed with contact pointed in the correct direction.</p>
No data logged 1.) No communication 2.) No valid data	<p>Check receiver power status. Verify that it is locked to 4 or more GPS satellites. Check integrity and connectivity of power and data cable connections. Verify that the baud rate settings match in external device mode. If trying to connect over Bluetooth, ensure Bluetooth module is powered ON and device is paired prior to opening the port.</p>
Rando data from Web UI or Direct Link mode	<p>Verify the messages selected in the output messages in the Web UI match intended selections. 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 using a higher baud rate for communications.</p>
Mode will not go RTK Fixed	<p>If in "RTK Float", then it is receiving RTK or Atlas corrections. If the RTK latency is between 10-15 seconds, these are most likely Atlas corrections. If the RTK latency is less than 10-15 seconds, RTK corrections are being received but probably will not Fix due to environment.</p> <p>Check base station operation, ensure correction stream is active. Verify the settings of the UHF radio at the base and at the rover are exact. If using a network, check the Cellular Signal Quality (CSQ) under the information tab for cellular reception. CSQ can also be viewed on the display screen by pressing the 'FN' button.</p>



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10 Appendix

10.1 Accessory Kits

Accessory Kits	Part Number
BRx6+ Serial Cable (5-Pin)	8030.064.028
BRx6+ Power Cable (Alligator Clips)	8030.064.036
BRx6+ Pwr Cbl to Rcvr & DB-9 Serial	8030.064.027
Cell Antenna	8030.043.006
UHF Antenna (SMA)	8030.042.006
400MHz UHF Antenna (TNC)	8030.042.007
Battery (Pair)	8030.058.006
Battery Charger Adapter	8030.060.046
Battery Charger (CH-03)	8030.060.006
Cigarette Lighter Adapter	8030.060.026
Mini Rotary Table	8030.085.001
Quick Release	8030.085.002
BRx6+ External UHF Antenna Bracket Kit	8030.042.100
BRx6+ Carry Case	8030.080.066