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**875-0385-0**

**PocketMax4**

User Guide

**Revision: A1**

December 19, 2017

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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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6501346	7277792	7460942	8102325	8271194	
6539303	7292185	7689354	8138970	8307535	
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6711501	7373231	7835832	8174437	8334804	
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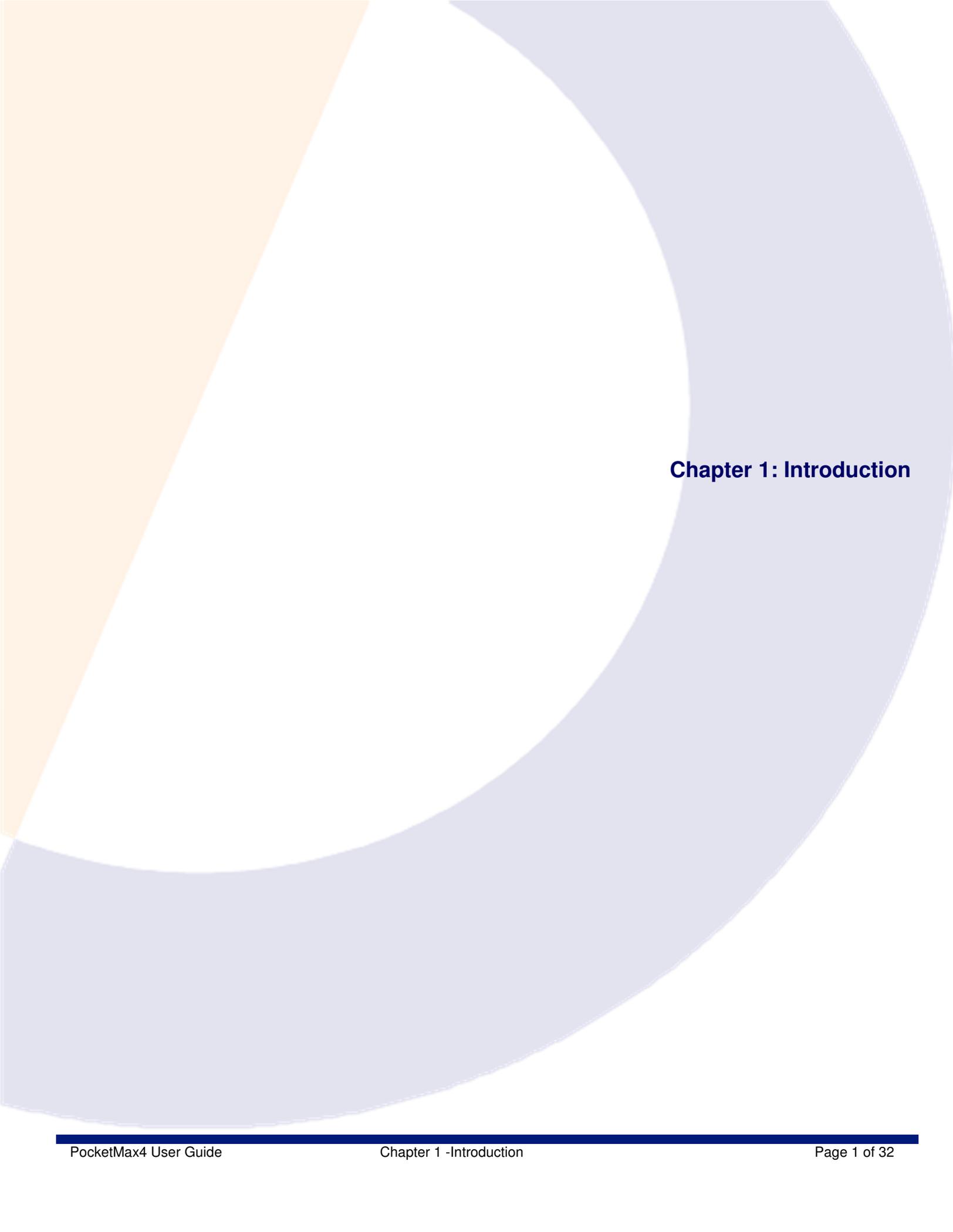
## Terms and Definitions

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

Term	Definition
Activation	Activation refers to a feature added through a one-time purchase. For features that require recurring fees, see <a href="#">Subscription</a> .
Atlas	Atlas is a subscription based service provided by Hemisphere.
Base Station	The Base Station is a receiver placed over a familiar point. The base station then provides real-time observations and sends these to nearby RTK rovers via UHF radio or the internet.
DGPS/DGNSS	Differential GPS/GNSS refers to a receiver using Differential Corrections.
EGNOS	European Geostationary Navigation Overlay Service (EGNOS) is a satellite-based augmentation system (SBAS) that provides free differential corrections over satellite in parts of Europe.
Elevation Mask	Elevation Mask is the minimum angle between a satellite and the horizon for the receiver to use that satellite in the solution. Satellites near the horizon often provide noisy signals and should be avoided.
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 European Space Agency. Global coverage is available and the full constellation is expected by 2020.
GLONASS	Global Orbiting Navigation Satellite System (GLONASS) is a Global Navigation Satellite System (GLONASS) deployed, and maintained, by Russia. It is comparable to the United States' GPS system.
GNSS	Global Navigation Satellite System (GNSS) is a system that provides autonomous 3D position (latitude, longitude, and altitude) along with very accurate timing globally by using satellites. Current GNSS providers are: GPS, GLONASS and Galileo. BeiDou is expected to have global coverage by 2020.
GPS	Global Positioning System (GPS) is a global navigation satellite system implemented by the United States.
Heading	Heading is the angle between true north and the vector calculated from the primary to secondary antenna.
NMEA	National Marine Electronics Association (NMEA) is a marine electronics organization that sets standards for communication between marine electronics.

## Terms and Definitions (continued)

Term	Definition
ROX	ROX is a Hemisphere GNSS propriety RTK message format that can be used as an alternative to RTCM3 when both the base and rover are Hemisphere branded.
RTCM	Radio Technical Commission for Maritime Services (RTCM) is a standard used to define RTK message formats so that receivers from any manufacturer can be used together.
RTK	Real-Time-Kinematic (RTK) is a real-time 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**

## Chapter 1: Introduction

PocketMax4 is a freely available utility designed for use with Hemisphere GNSS products (except the S321 and the C321).

As this utility was not designed specifically for any one product alone, it supports features not offered by every product, however, the interface may be used for all I/O operations.

PocketMax4 runs on the Windows .NET framework, version 3.5 or later, allowing it to operate on several Windows platforms (Windows 2000, ME, XP, Vista, Seven, Mobile, etc).

This software offers you the following flexibility:

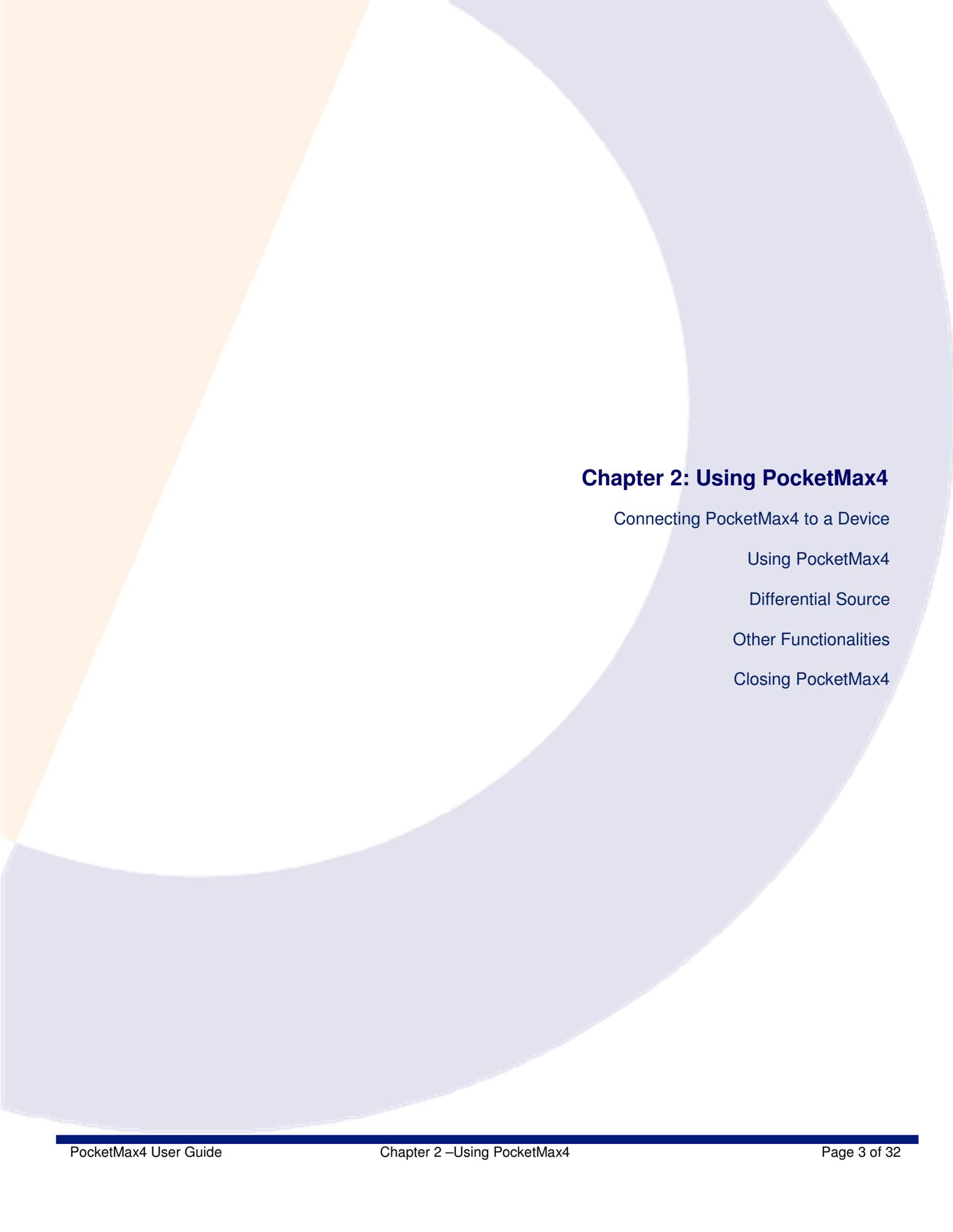
- Tune your beacon, WAAS, and multi-GNSS receivers and monitor reception
- Configure GPS and GNSS message output and port settings
- Configure and monitor an RTK base station
- Configure and monitor Vector related settings
- Record various types of data

The most current version of PocketMax4 PC can be downloaded from the [Hemisphere GNSS website](#), or it can be made available to you by contacting Hemisphere GNSS. Once you have saved the PocketMax4 executable to your computer, the program can be started by clicking on the file name or icon.

You must have the Windows .NET framework installed on your PC or mobile device. Follow the link for a PC install from the same webpage with the PocketMax4 download. Once you have the PocketMax4 executable appropriate for your mobile device's operating system, you can copy it over to your mobile device to whichever folder you wish. To start the program, navigate to the executable on your mobile device and tap the file.

**Caution** – It is important to note that when you are using PocketMax4, the software is doing many operations behind the scenes. This includes modifying the data output from the serial port as the program requires, which is screen dependent. When you close PocketMax4, it will confirm if you want to save any configuration changes.

After the settings are configured properly for your use, it is imperative to let the program close completely on its own before you disconnect or power down the receiver. This may take up to 10 seconds. If this is not performed, the receiver will not be configured properly, and can output a mixture of binary and NMEA data.



## **Chapter 2: Using PocketMax4**

Connecting PocketMax4 to a Device

Using PocketMax4

Differential Source

Other Functionalities

Closing PocketMax4

## Using PocketMax4

### Connecting PocketMax4 to a Device

#### Serial Communication

First, power on and connect the receiver to your computer's com port. A configuration screen appears prompting you to choose the COM port and baud rate of the receiver.

Choose from the following communications settings options:

- Select the Auto-Baud feature to cycle through all baud rates
- Tap the Demo Mode" to view the different screens without connection to a receiver.

**Note:** This mode may be useful to get comfortable with the program, or to demonstrate the software if you don't have a receiver nearby.

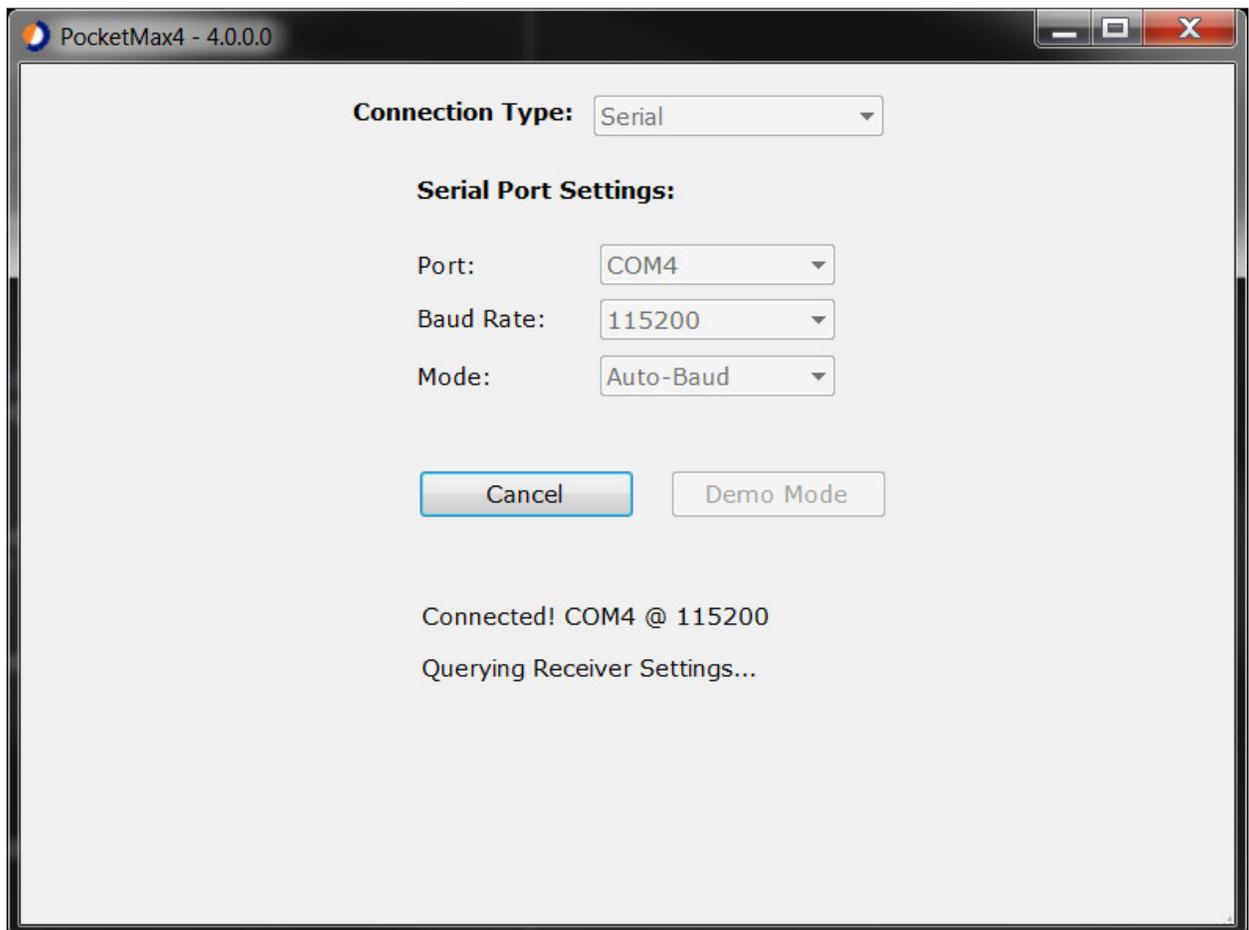


Figure 2-1: Serial Port Settings screen

You can monitor your connection status through the message displayed at the bottom of the screen.

If you receive a message “Receiver not found...” check your connections, your com port and your baud rate and try sending again.

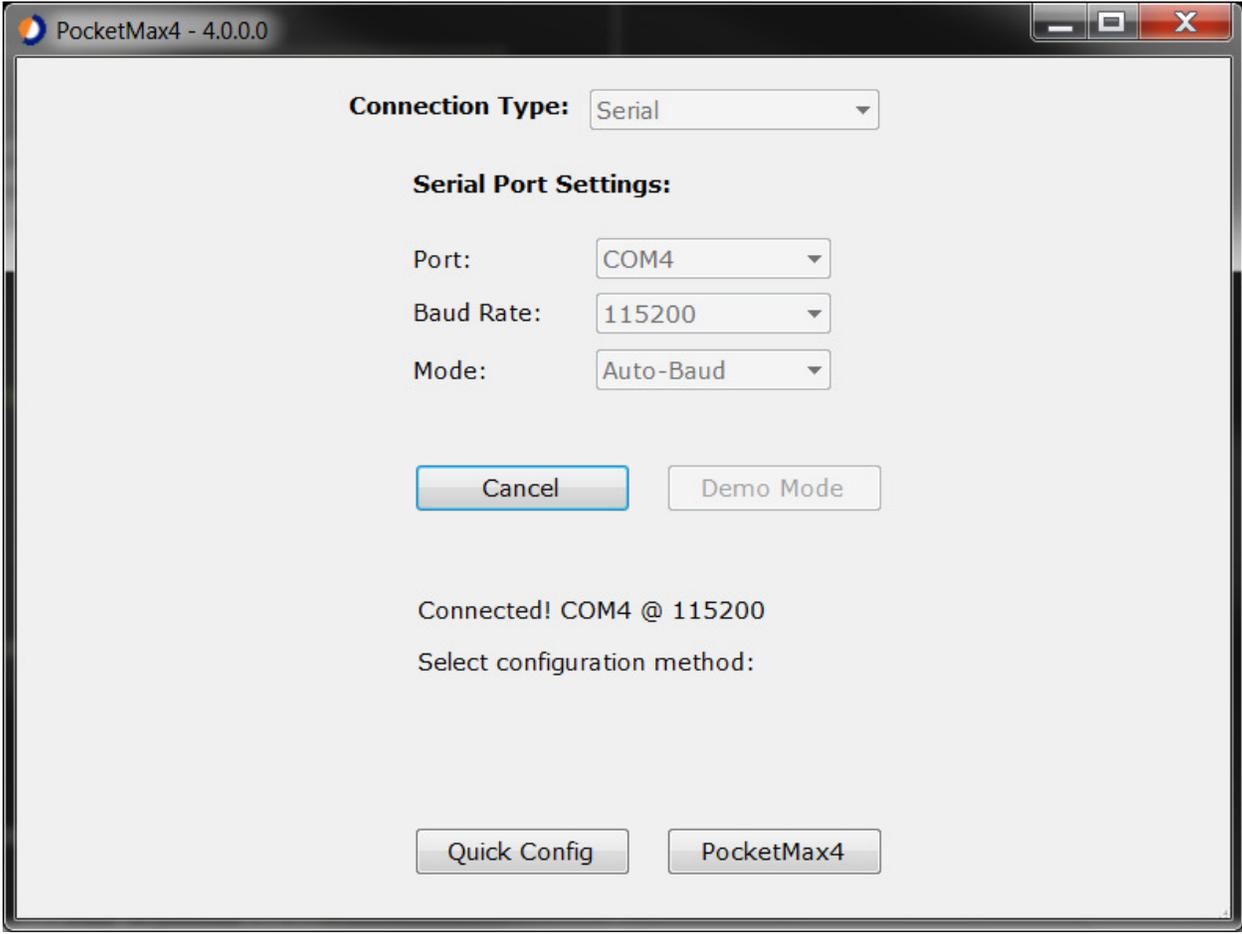


Figure 2-2: Connection Established screen

The Quick Configuration screen allows you to use “PortA”, PortB (Other), PortU, “RX Config”, “Terminal”, “Link”, Log Messages, “NTRIP”“About”.

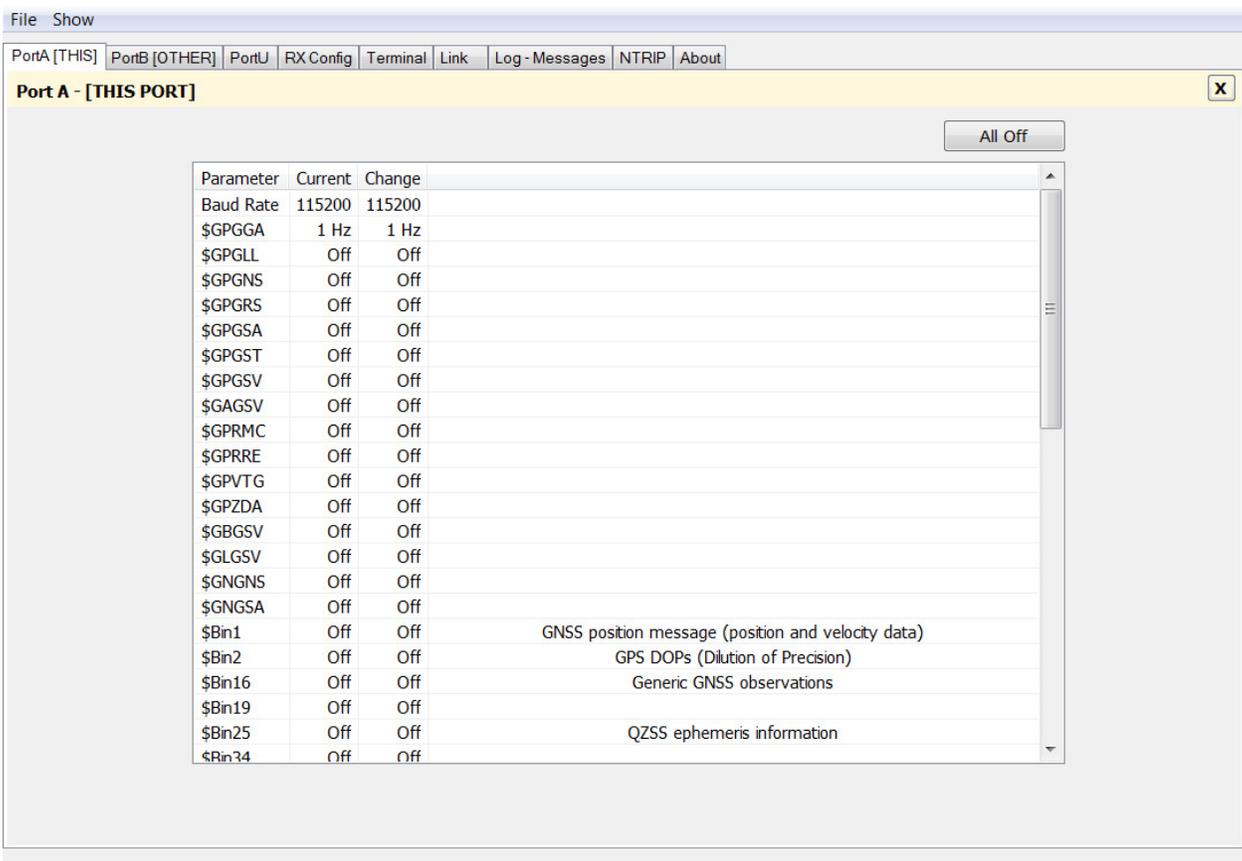


Figure 2-3: Quick Configuration screen

## Using PocketMax4

### Save Settings

To save changes in PocketMax4, go to File > Save Settings.

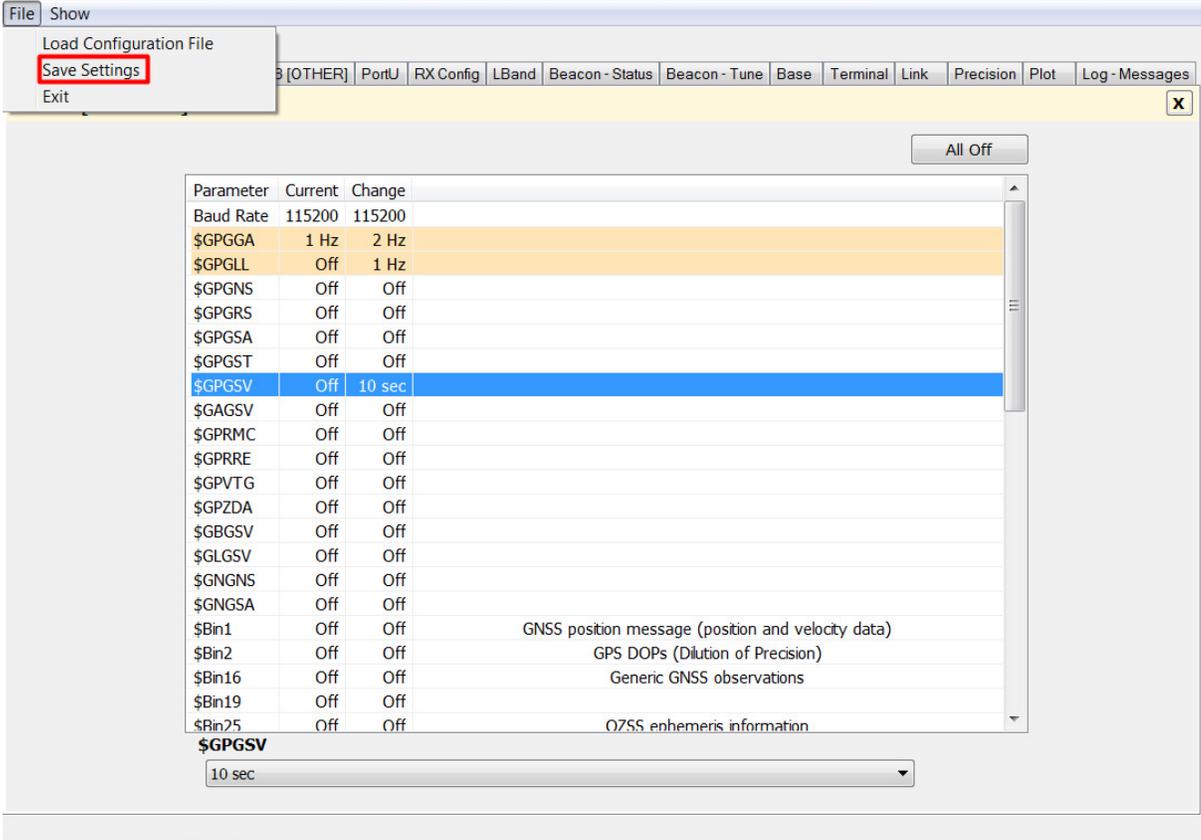
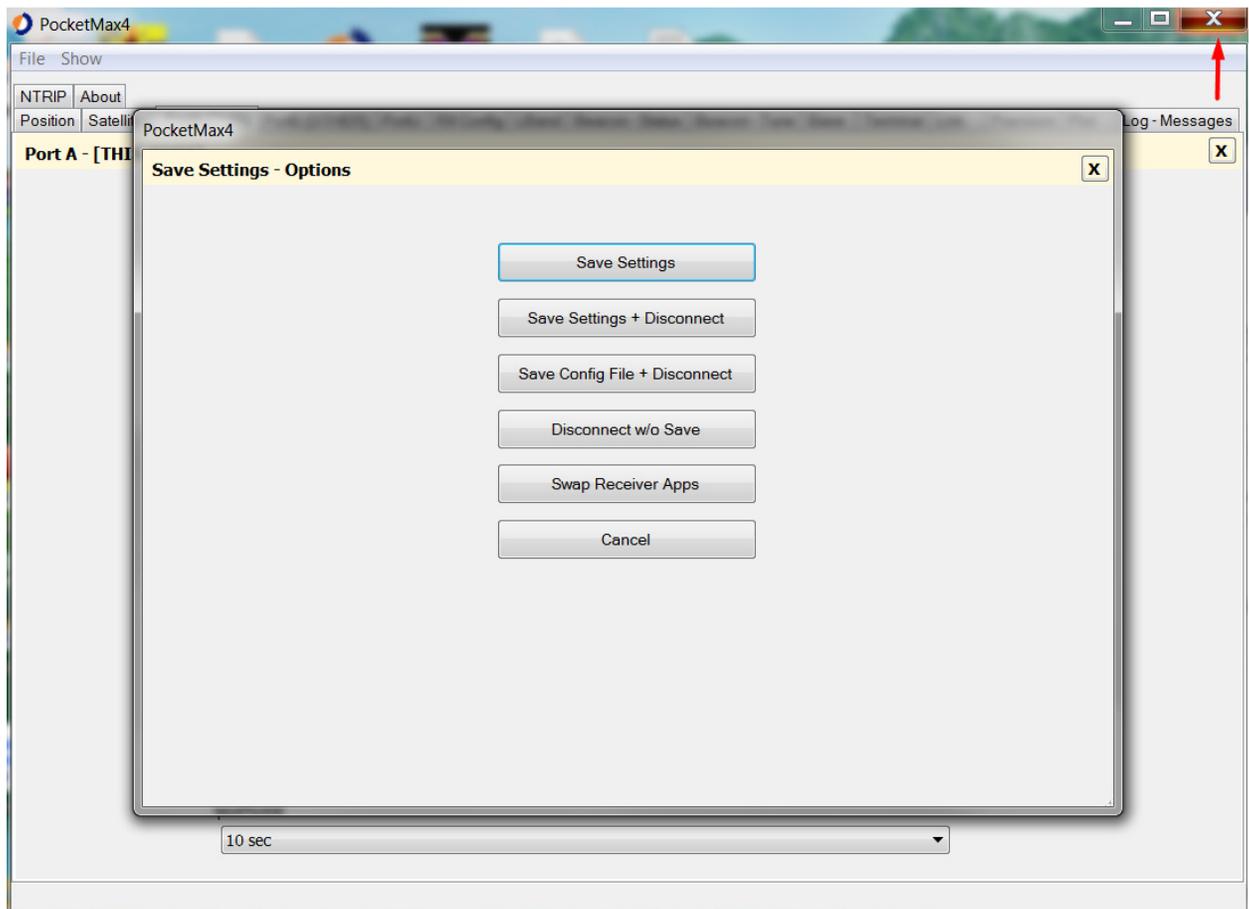


Figure 2-4: Save Settings

You can also save settings when you exit the software. You will receive a prompt to choose from the following:

- Save Settings (saves but does not exit software)
- Save Settings + Disconnect
- Save Config File + Disconnect
- Disconnect w/o Save
- Swap Receiver Apps
- Cancel



**Figure 2-5: Save Settings**

After you have successfully connected PocketMax4 to your receiver, you can use the primary menu buttons to switch screens within PocketMax4 PC. Choose from the following:

- GNSS (Global Navigation Satellite System information and settings),
- Correction mode tab (depends on selected mode):
  - SBAS (Space Based Augmentation System, includes WAAS and EGNOS)
  - BEAC (Beacon)
  - LBAND (Atlas)
  - THIS (port currently connected to PocketMax4)
  - OTHER (other port)
  - PORT (Port C)
  - RTK (L-Dif® rover or RTK rover)
  - AUTO (e-Dif®)
  - NONE (autonomous)
- TERMINAL
- LOGS (logging data to a file)
- Additional functions (depends on the receiver connected):
  - Base (L-Dif® base or RTK base)
  - HDG (Heading; appears when Vector receiver connected)

Within each menu button, there are tabs along the top, as shown in the Figure 2-4. The tabs allow you to navigate within the menu and may vary depending upon the selected menu.

The bottom of the screen displays three (or four for Vector products) indicator lights.

**Table 2-1. Indicator Lights**

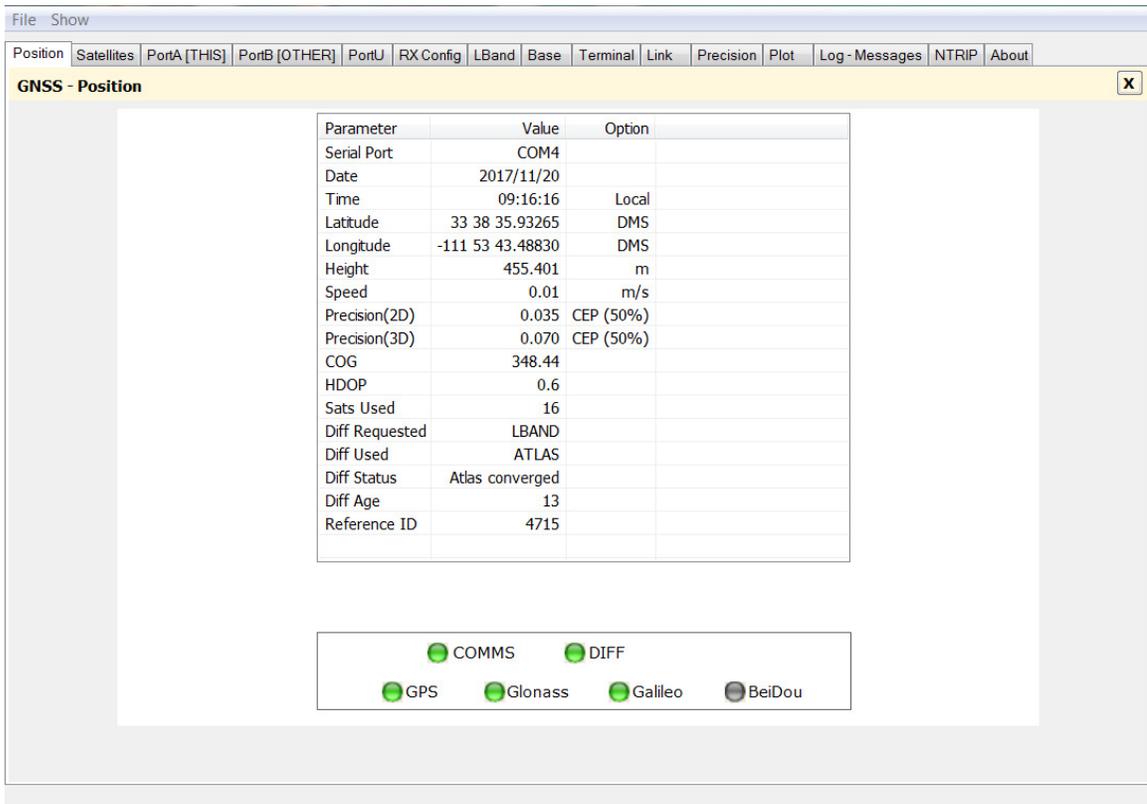
Indicator Light	Position/Color	Function
COMMS	1 <sup>st</sup> / grey or green	Indicates communication or your position fix status
GPS	2 <sup>nd</sup> / grey or green	Indicates if you are tracking GNSS signals
DIFF	3 <sup>rd</sup> / grey or green	Indicates if you are successfully tracking your differential source
	4 <sup>th</sup> / grey or green	Indicates if you are successfully tracking DGPS
	5 <sup>th</sup> / grey or blue	(Vector only) Indicates if you have a valid heading

### GNSS Menu

Within the GNSS menu button, the tabs are: Position, Satellites, PortA (This), PortB (Other), PortU, RXConfig, LBand, Base, Terminal, Link, Precision, Plot, Log-Messages, NTRIP, and About.

### Position tab

The Position tab contains all the main position information, including latitude, longitude, elevated height, speed and precision, all with configurable formats. The differential source is also included in this tab.



**Figure 2-6: GPS Position screen**

**Note:** When the receiver is receiving GNSS information from satellites, the fields Latitude,

Longitude, Date and Time in the GNSS Position screen will all report current information.

If these fields stop updating every few seconds, it is likely a problem with GNSS or the antenna.

**Satellite tab**

The Satellite tab displays a Sky Plot of satellites in view and information on the quantity of satellites tracked, the quantity of satellites used, and SNR values for each tracked signal.

**Note:** The receiver should be tracking at least 4 GPS satellites to compute a position, and for best performance between 5 and 12 (or more) satellites.

The GPS, SBAS, GLONASS, BeiDou, and Galileo Satellite indicator lights show the signal levels and number of satellites being tracked, where applicable.

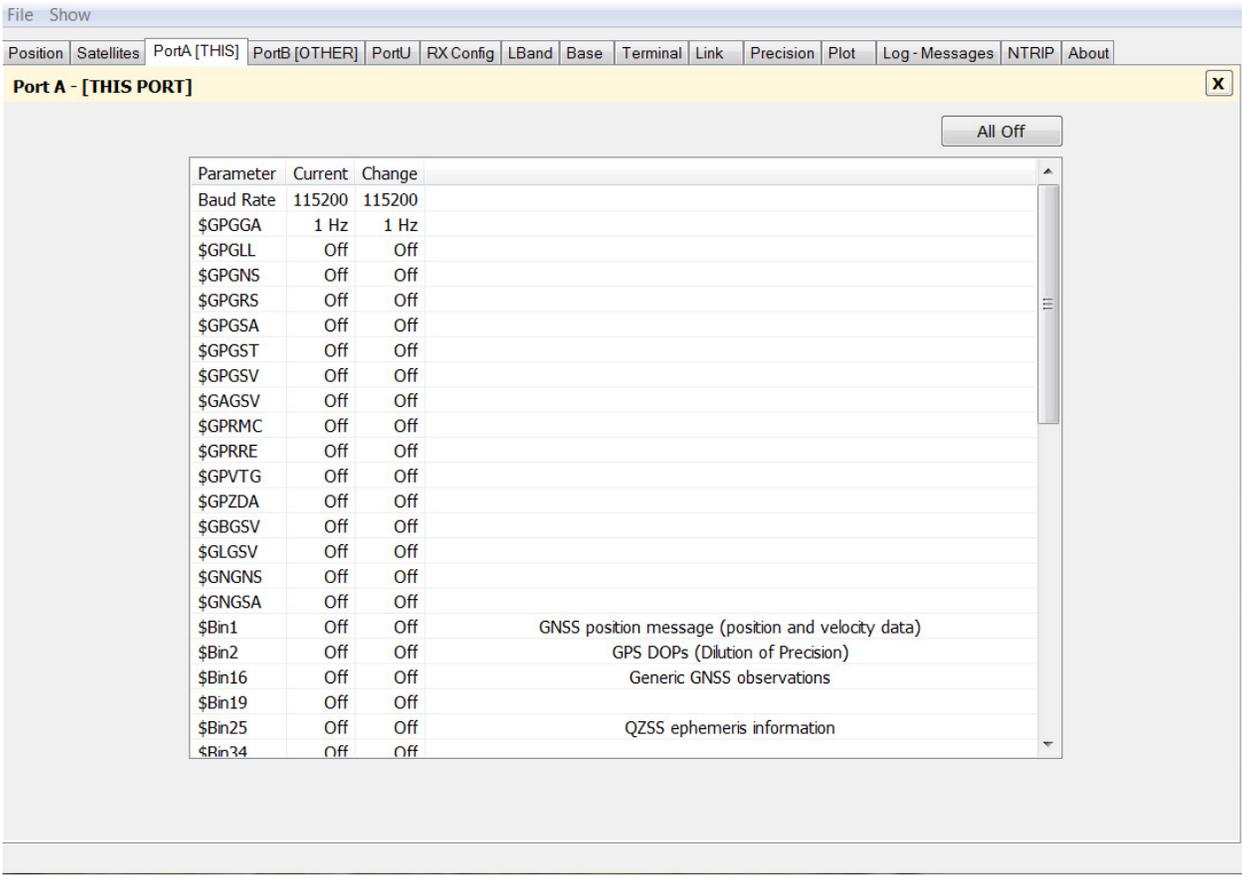
The satellite signal strengths are represented by the bars: the highest bars have the highest signal.

Single frequency signals are represented with single blue bars (for example, all Crescent receivers, and all SBAS signals). Dual frequency signals will have split bars: the left side (blue) shows L1 signal strength, the right side (green) shows L2 signal strength. Receivers capable of L5 have an additional red bar.



Figure 2-7: Satellites screen

### Port tabs



**Figure 2-8: THIS Port**

To configure individual ports, click on the tab with the port’s name, for example, “PortA (This).”

For each individual port, you can configure:

- Message types
- Message rates
- Baud rates

**Note:** In the above example, the tab label reads, “PortA (THIS)”, indicating you are connected to PortA. “PortB (OTHER)” indicates you are not connected to PortB.

### Precision tab

The Precision tab gives a graphical representation of horizontal accuracy in the form of an error ellipse. It also displays numerical precision in northing, easting, and altitude components in configurable formats.

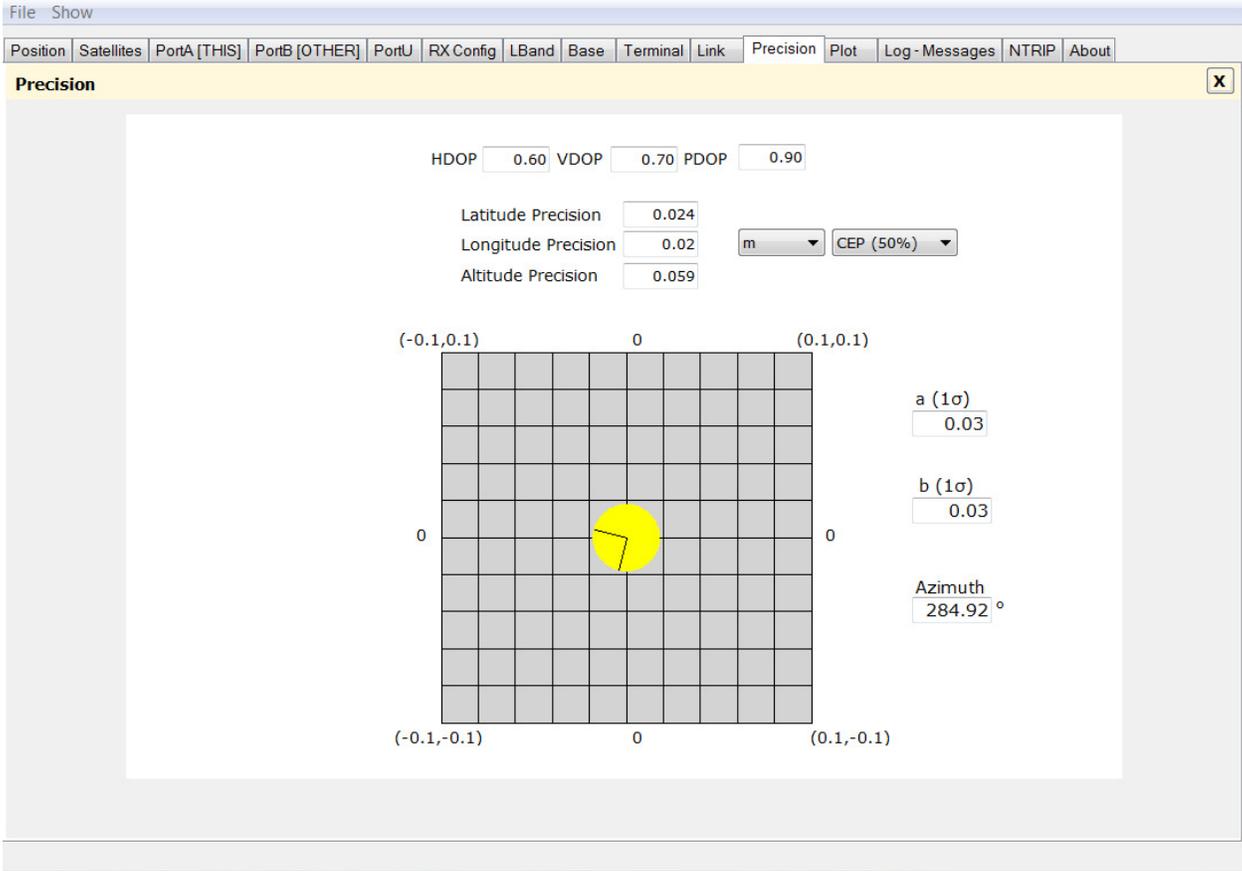


Figure 2-9: Precision screen

**Plot tab**

The Plot tab plots the northing or easting error over time and allows you to adjust your scale and timeline as required. This plot allows you to monitor performance over time with respect to either a known coordinate or an arbitrary one.

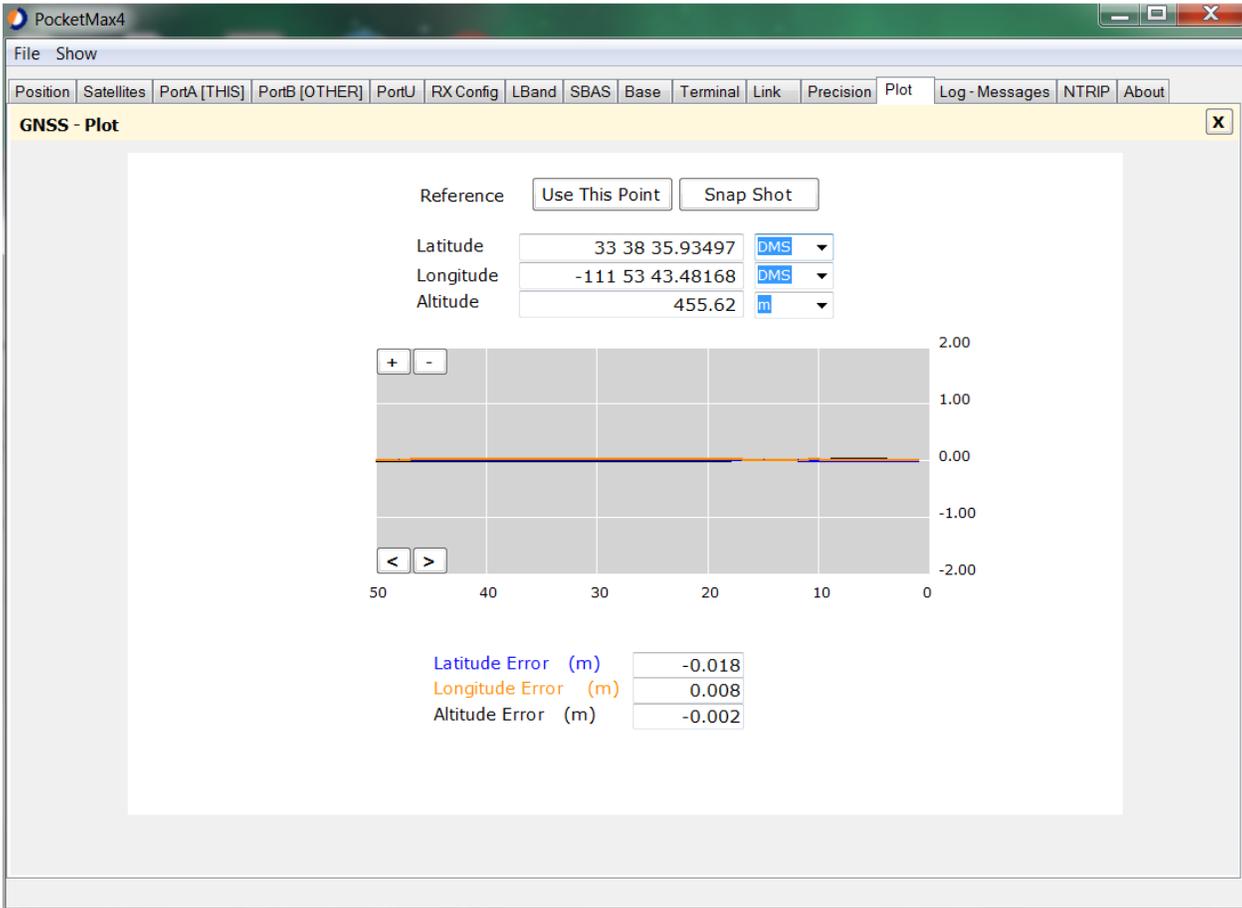


Figure 2-10: Plot tab

**Link tab**

The Link tab allows you to connect a DGPS or RTK correction source to your computer, to set the corrections to go into the GPS receiver via the same cable PocketMax4 is using.

Define which PC communications port your correction source is connected to and the baud rate. PocketMax4 allows you to send commands out of the additional ports, if you wish to, for example, configure the correction device.

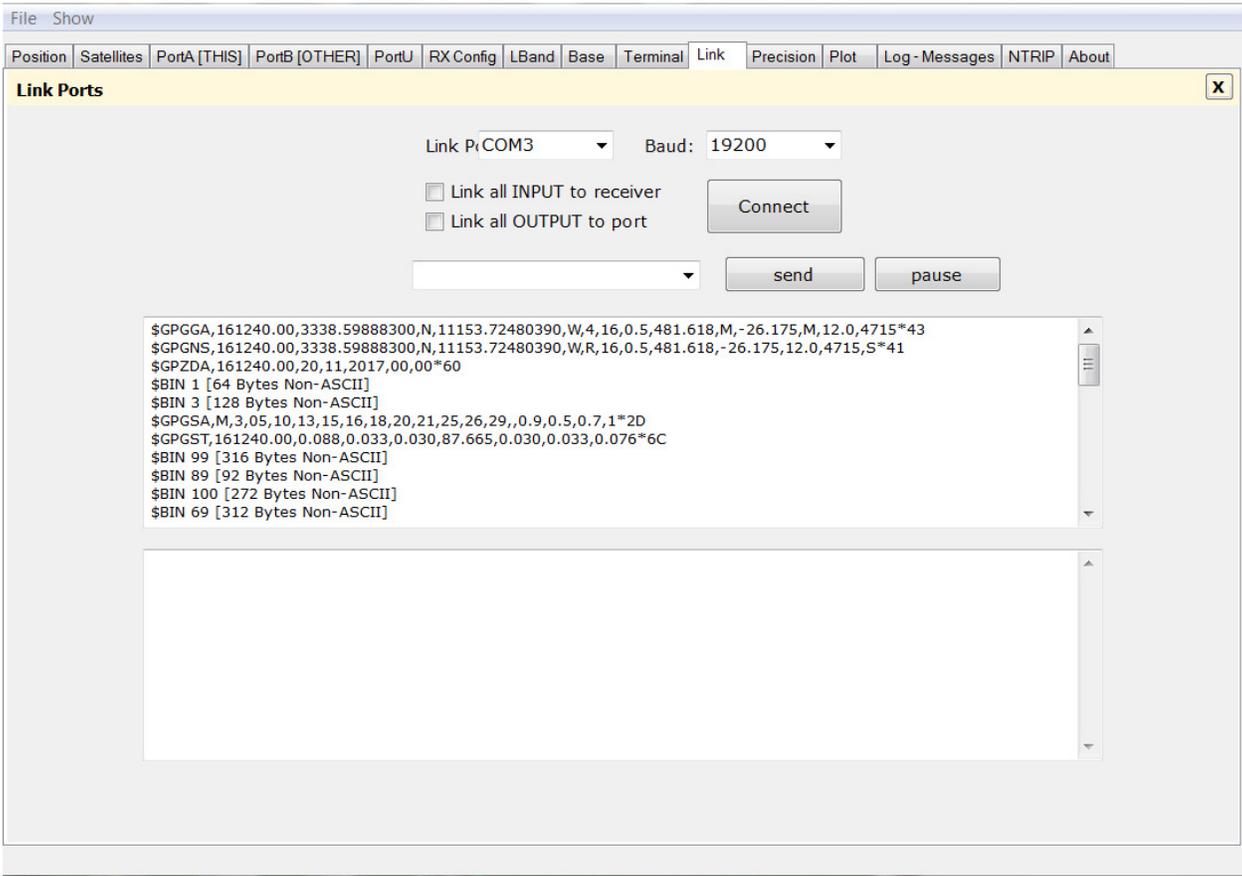


Figure 2-11: Link screen

**About tab**

The About tab displays the current firmware version and installed applications on the receiver.

**Note:** The active application is highlighted in green.

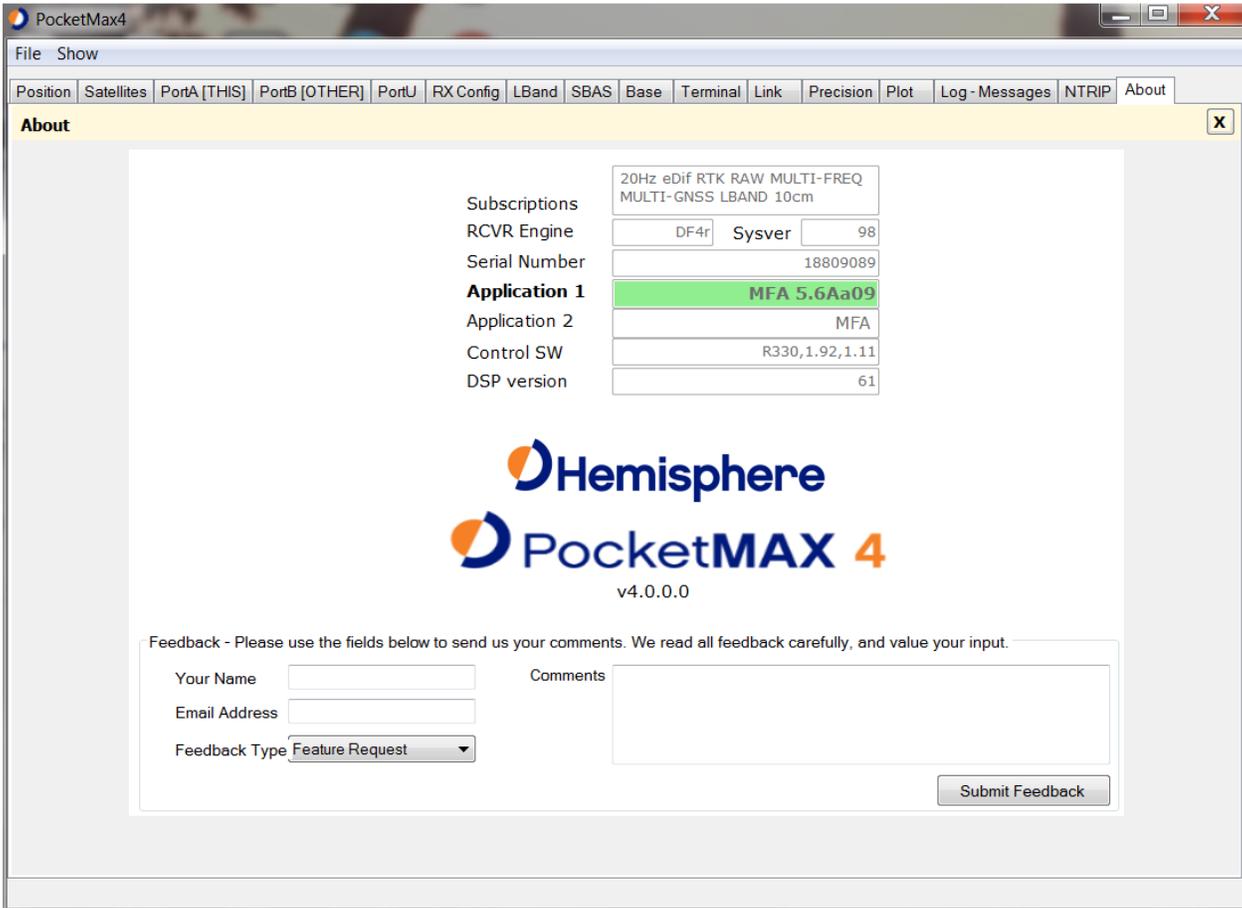


Figure 2-12: About screen

## Differential Source

Current Hemisphere GNSS products automatically use the best available Diff Source (i.e. the one providing the lowest RMS values) included in “Diff Includes.”

### Receiver Configuration tab

The Rx Config tab allows for the configuration of the GNSS receiver. This tab can be used to enable or disable specific GNSS signals, include or exclude differential sources, and edit the various configurations of the receiver.

The “Signal Includes” column displays the signals that the connected GNSS receiver supports.

In the example below, all signals are selected, so the receiver will track, and possibly use, all available signals. Note: In situations where power consumption needs to be reduced, you may choose to uncheck certain signals.

The “Diff Includes ” column tells the receiver which differential sources to look for.

For example, if you de-select SBAS, the receiver will not use SBAS. \*By default, the GNSS receiver will use the best available differential source.

The receiver only chooses the best Diff Source when using MFA firmware. Older receivers may have firmware for one specific application (such as only SBAS, or only e-Dif, etc.)

In the center of Rx Config, you can adjust various settings. Please see the description of those settings below the screenshot.

File Show

Position Satellites PortA [THIS] PortB [OTHER] PortU RX Config LBand Base Terminal Link Precision Plot Log - Messages NTRIP About

**Receiver Configuration** [X]

Signal Includes	Parameter	Current	Change	Diff Includes
<input checked="" type="checkbox"/> L1CA	Diff Source	LBAND	LBAND	<input type="checkbox"/> SBAS
<input checked="" type="checkbox"/> L1P	Diff Age	2700	2700	<input checked="" type="checkbox"/> LBAND
<input checked="" type="checkbox"/> L2P	Elevation Mask	5	5	<input checked="" type="checkbox"/> ATLAS
<input checked="" type="checkbox"/> L2C	Decimal Precision	8	8	<input checked="" type="checkbox"/> RTCM2
<input checked="" type="checkbox"/> G1	Smoothing Time	LONG900	LONG900	<input checked="" type="checkbox"/> RTCM_23
<input checked="" type="checkbox"/> G2	Altitude Aiding Mode	NEVER (3D ONLY)	NEVER (3D ONLY)	<input checked="" type="checkbox"/> RTCM3
<input checked="" type="checkbox"/> E1BC	Altitude Aiding Value			<input checked="" type="checkbox"/> EDIF
<input checked="" type="checkbox"/> E5B	RESID Limit	10.0	10.0	<input checked="" type="checkbox"/> DFX
<input checked="" type="checkbox"/> B1	GPS Only Mode	NO	NO	<input checked="" type="checkbox"/> CMR
<input checked="" type="checkbox"/> B2	Null NMEA Mode	NO	NO	<input checked="" type="checkbox"/> ROX
<input checked="" type="checkbox"/> B3	SBAS Ranging Mode	NO	NO	<input checked="" type="checkbox"/> BEIDOU
	Mixed Mode	NO	NO	
	Timekeep Mode	NO	NO	
	L1 Only Mode	NO	NO	
	Suretrack Mode	YES	YES	
	GGA ALL GNSS Mode	YES	YES	
	Glofix Mode	YES	YES	
	PPS Frequency(Hz)	1	1	
	PPS Width(us)	999.996	999.996	
	BeiDou OFF Mode	NO	NO	
	Galileo OFF Mode	NO	NO	

Factory Reset      Factory Reset Almanac

Figure 2-13: Receiver Configuration tab

The Receiver Configuration tab displays the following information:

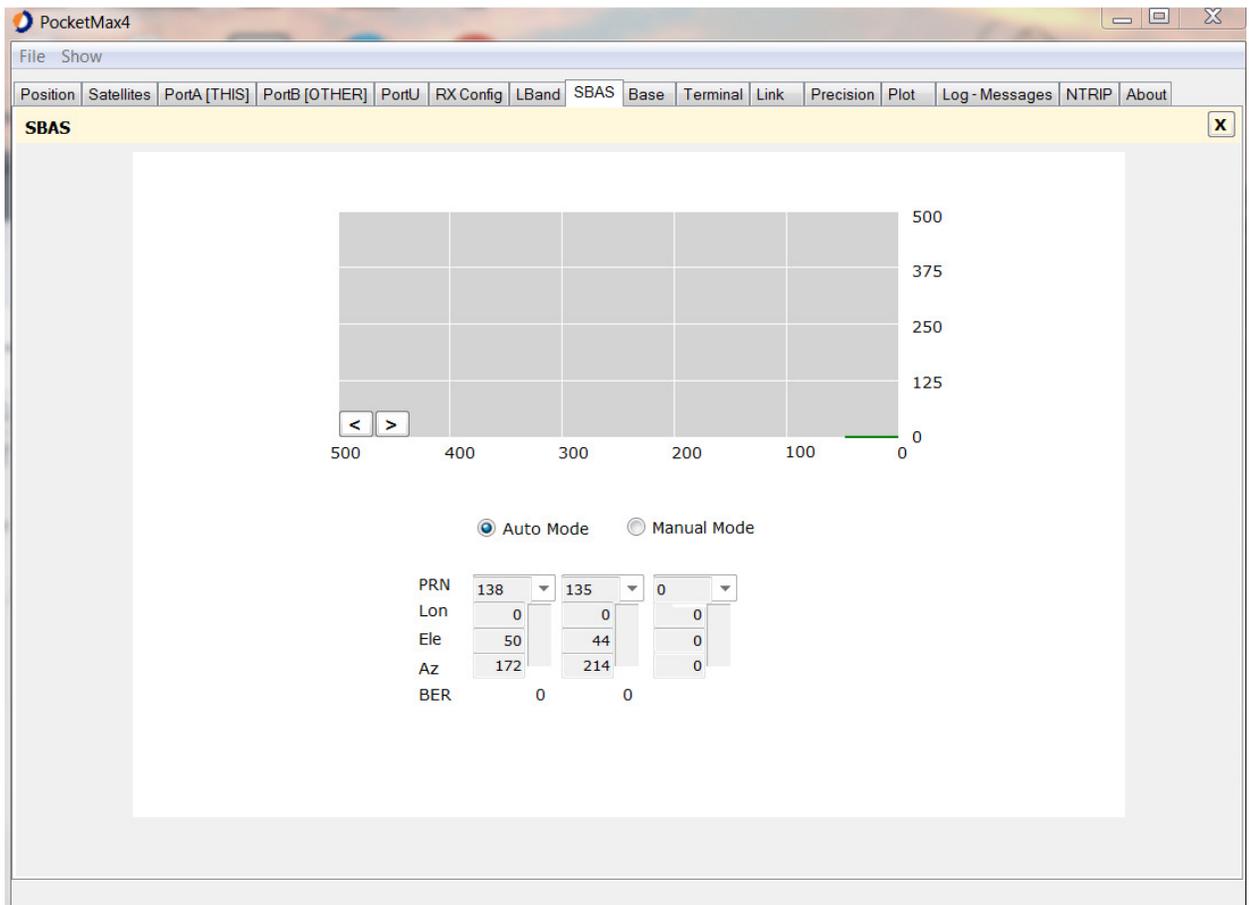
- **Diff Source:** Choose a Diff Source. Save Settings + Disconnect from PocketMax4.
- **Diff Age:** The maximum amount of time that the receiver will continue to use an RTK correction after corrections are lost.
- **Elevation Mask:** Satellites below this elevation (angle between horizon and satellite) will be excluded from the solution.
- **Decimal Precision:** The count of decimal points after latitude/longitude in the NMEA 0183 GGA, GLL, and GNSS.
- **Smoothing Time:** This feature allows you to adjust how long data is smoothed according to the environment. This should usually be left at the default value.
- **Altitude Aiding Mode:** Sets the altitude to a fixed value.
- **GPS Only Mode:** Turns off the use of GLONASS+BEDIOU+GALILEO constellations in the solution.
- **Ranging Mode:** Allows the receiver to use SBAS satellites as part of the usual GNSS solution.
- **Mixed Mode:** The receiver can use satellites without the differential correction data.
- **Timekeep Mode:** Enable or Disable the continuous time updating in NMEA 0183 messages when position is lost.
- **L1 Only Mode:** Enable or Disable the use of all signals other than GPS L1.
- **Suretrack Mode:** Allows a GNSS RTK rover to use GLONASS observations even when the base station is GPS only.
- **Glofix Mode:** Enable/Disable the use of RTCM v3 GLONASS observations
- **PPS Frequency (Hz):** Configure the frequency of 1PPS output (for SX4 and later based boards).
- **PPS Width (us):** The width of the PPS signal can be configured, in microseconds. The available range is 54ns to 900ms.
- **BeiDou OFF Mode:** Turn OFF/On Beidou (if set to YES, BeiDou is off)
- **Galileo OFF Mode:** Turn OFF/On Galileo (if set to YES, Galileo is off)

## SBAS Menu

The main SBAS tabs are Status and Plot.

The Status tab provides details of the satellites used in the SBAS differential system, covering both WAAS and EGNOS.

Also tracked and displayed are the PRNs, longitude, elevation and azimuth, and the satellite bit error rate. The SBAS Bit Error Rate (BER) shows the quality of the SBAS data received from the satellite(s). BER values should stay below 150 to maintain differential lock. Ideally, this value will remain between 0 and 50.



**Figure 2-14: SBAS Status tab**

The line graph displays the BER's for up to three SBAS satellites. However, only one satellite is required to provide corrections.

### Beacon Menu

For beacon, first go to Rx config and enable RTCM\_23 since beacon stations generally send out DGNSS corrections (i.e. RTCM 2.3).

Go to Rx Config page and set "Diff Source" to "Beacon." Click Save Settings and Disconnect. Restart PocketMax4. Two tabs are displayed:

1. Beacon – Status
2. Beacon – Tune

First, go to the Beacon – Tune tab.

To tune to a frequency and MSK rate, there are two options:

1. Manually tune
2. Access the database and select the region, country and beacon.

Press database tune.

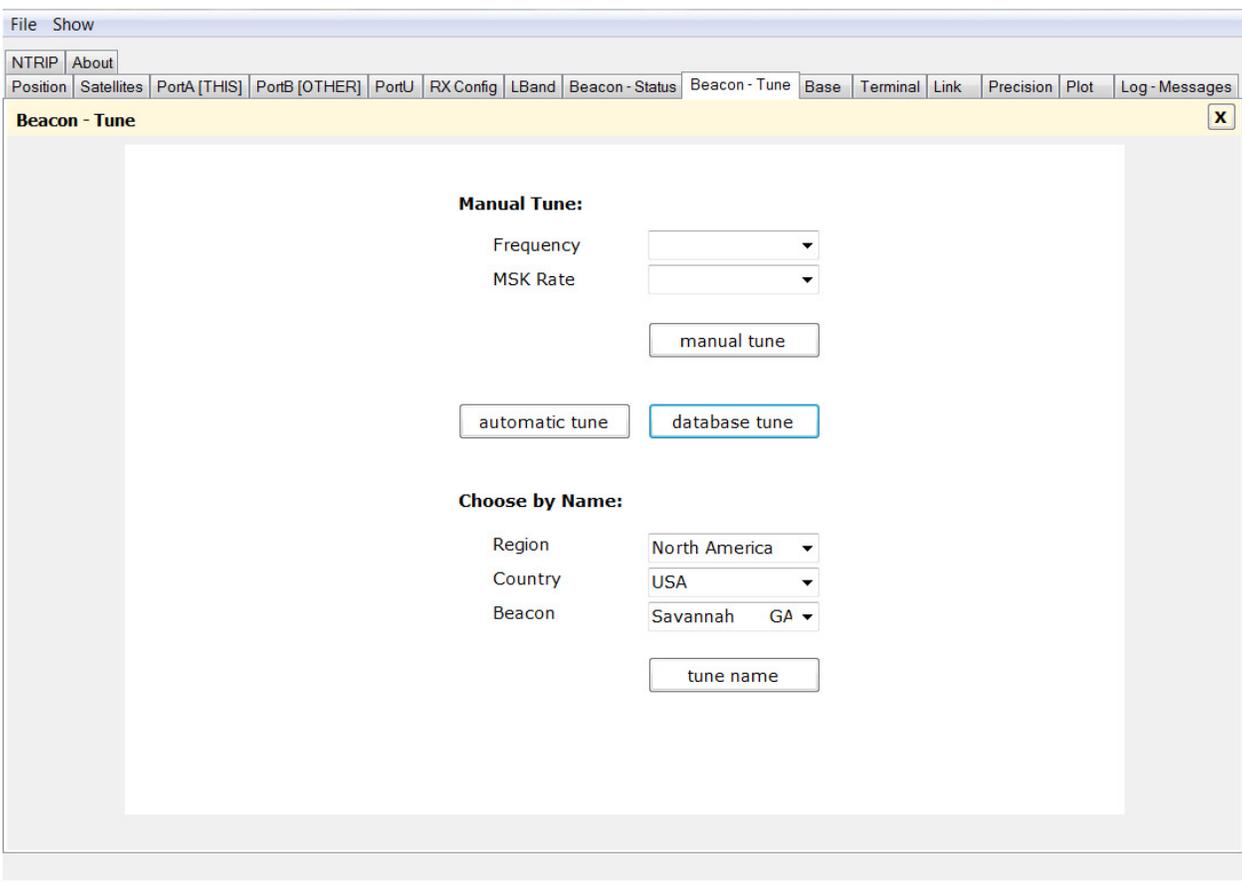


Figure 2-15: Beacon Tune

### L-band\* Menu (Atlas)

**\*Note:** “L-band” refers to Hemisphere’s Atlas L-band subscription service.

Your L-band subscription is displayed in this tab.

In the example below, there is a 10cm subscription. Below that, the frequency of the L-band signal that is tracked is displayed.

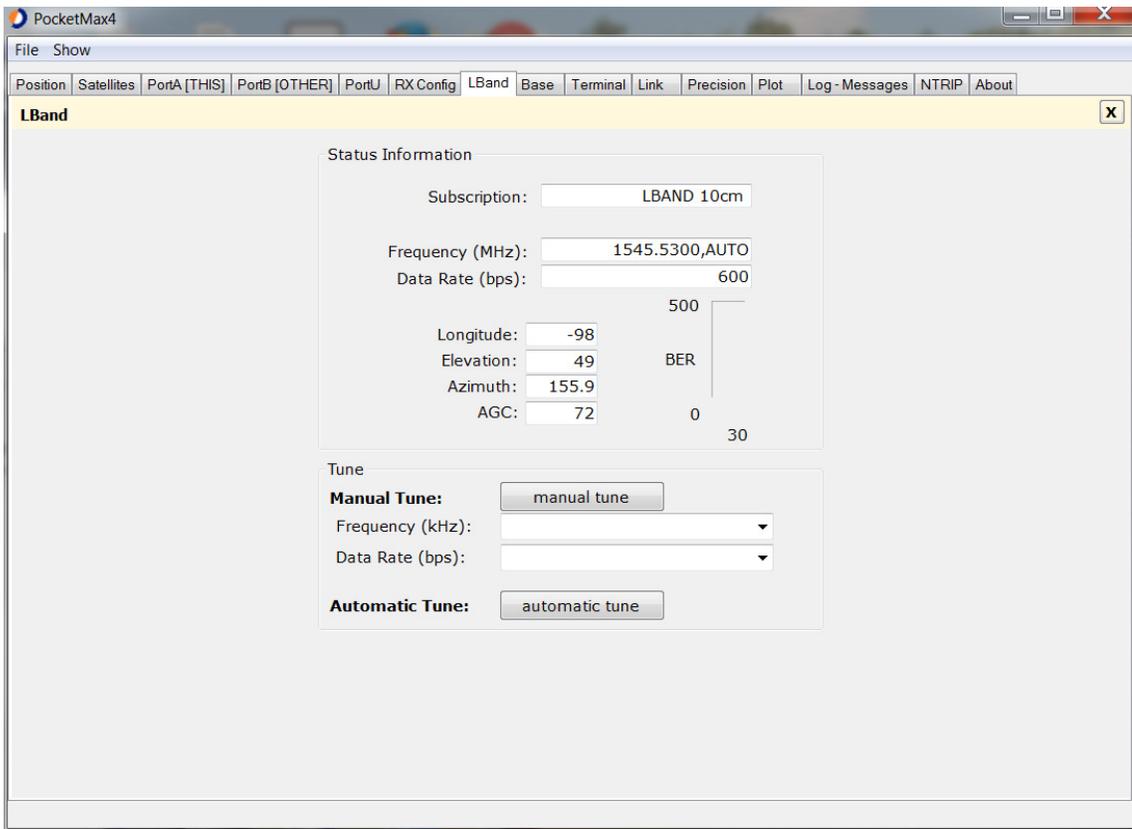
The “Automatic Tune” automatically allows the receiver to decide which signal to track (see the section below with manual and automatic tune). This also shows the Data Rate (all of the Atlas signals use 600 bps).

The longitude, elevation, azimuth, and AGC of the satellite is displayed.

Refer to the “Bit Error Rate” (BER) If the BER is at 500, there is no tracking of the L-band satellite. A low number indicates you are tracking the L-band satellite (ideally between 0 and 50)

From the tuning section, choose a frequency from the dropdown box (there are three options) as well as a baud rate. Then press “manual tune.”

**Note:** Hemisphere GNSS highly recommends simply pressing “automatic tune.”



**Figure 2-16: L-band Status**

### **THIS Port Option**

The differential type selection THIS PORT causes the receiver to look for the differential inputs on THIS port. This option will not display a menu specific to the option, but will instead jump to the GPS/Position menu.

### **OTHER Port**

The differential type selection OTHER PORT causes the receiver to look for the differential inputs on the OTHER port. This option will not display a menu specific to the option, but will instead jump to the GPS/Position menu.

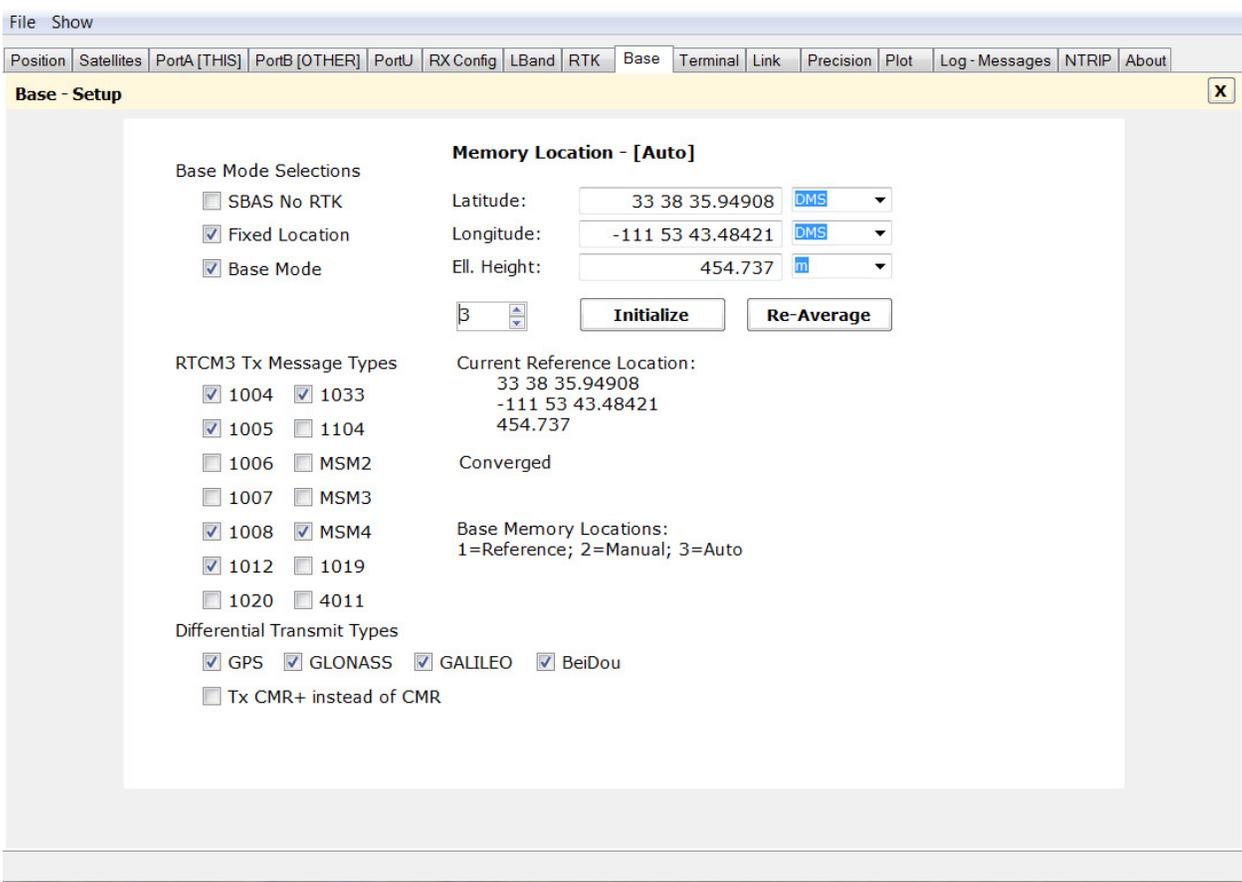
### **PORT C**

The differential type selection PORT C causes the receiver to look for the differential inputs on Port C. This option will not display a menu specific to the option, but will instead jump to the GPS/Position menu.

### **Base Menu**

This single tab menu contains options to set the Latitude, Longitude, and Ell. Height of a reference position and to select the port the receiver uses to connect to a radio that broadcasts local differential correctors.

The reference position must be within five meters of the position estimated of the receiver. The settings may be sent to the receiver with the Initialization button that will highlight when the latitude, longitude, ell. height, and port are set to valid values.



**Figure 2-17: Base Menu**

**RTK Menu**

The RTK tab shows the current distance to the base station. The units are configurable.

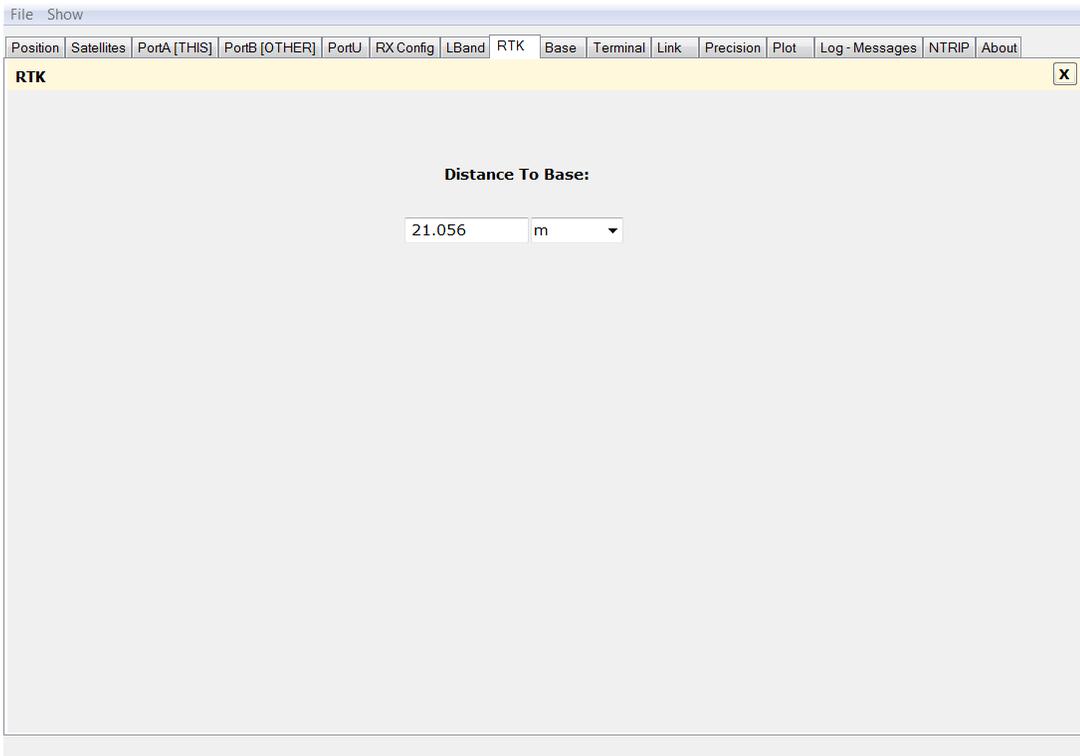


Figure 2-18: RTK Menu

## Other Functionalities

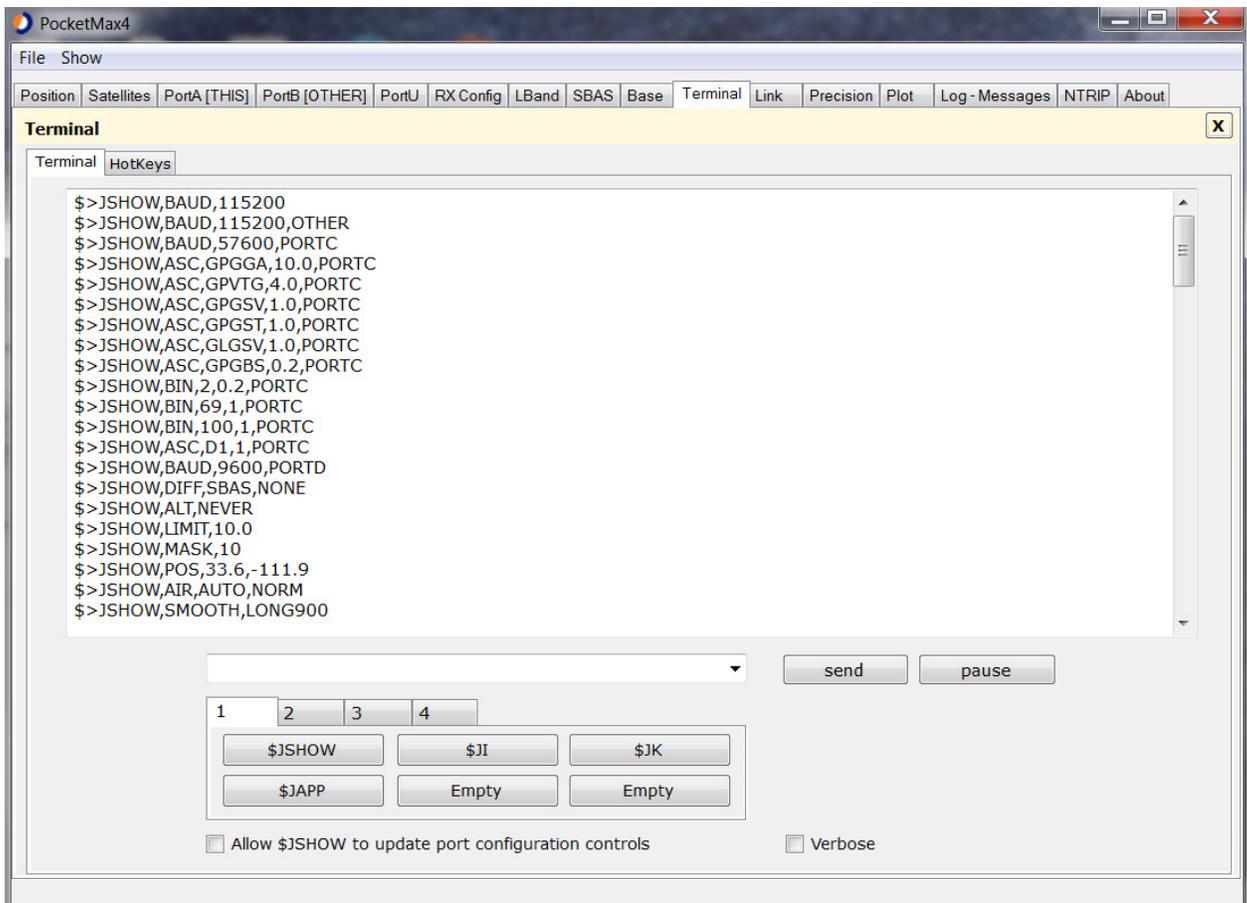
### The TERMINAL Menu Button

The tabs within the terminal menu button are Terminal and Hot Keys.

The Terminal tab provides direct terminal access to the receiver for issuing commands and observing responses.

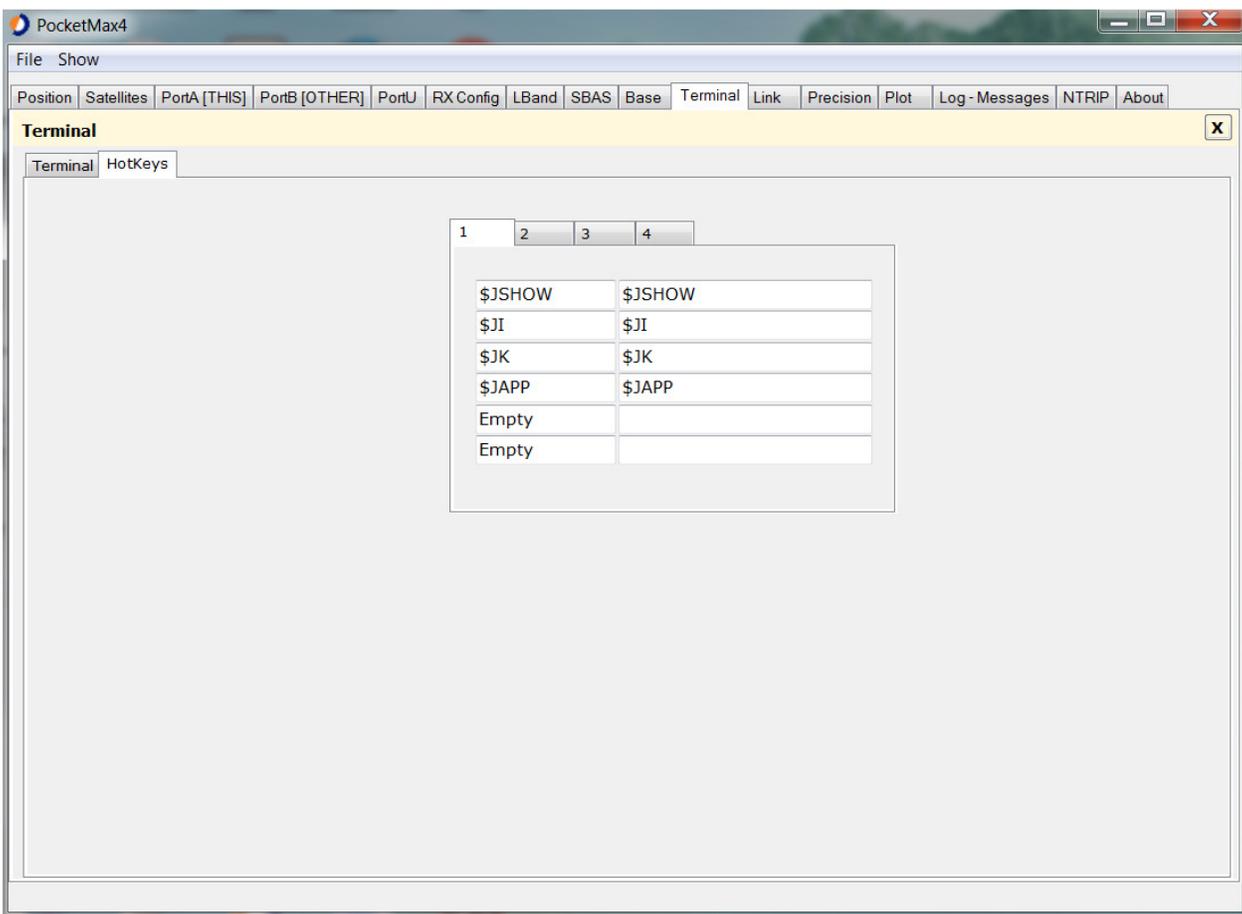
The commands to communicate with the receiver are available in the [Technical Reference Manual](#).

Type the command and the response appears in the window above. If you wish to re-enter a command you have previously entered, you may also select it from the dropdown menu.



**Figure 2-19: Terminal screen**

The Hot Keys tab allows you to set up frequently used commands, and assign them to the buttons displayed in the Terminal tab. The name of the key is entered in the left column, while the command is in the right column. There are 4 levels of hot keys, with 9 buttons each, for a total of 36 available buttons for programming.



**Figure 2-20: Terminal Hot Keys**

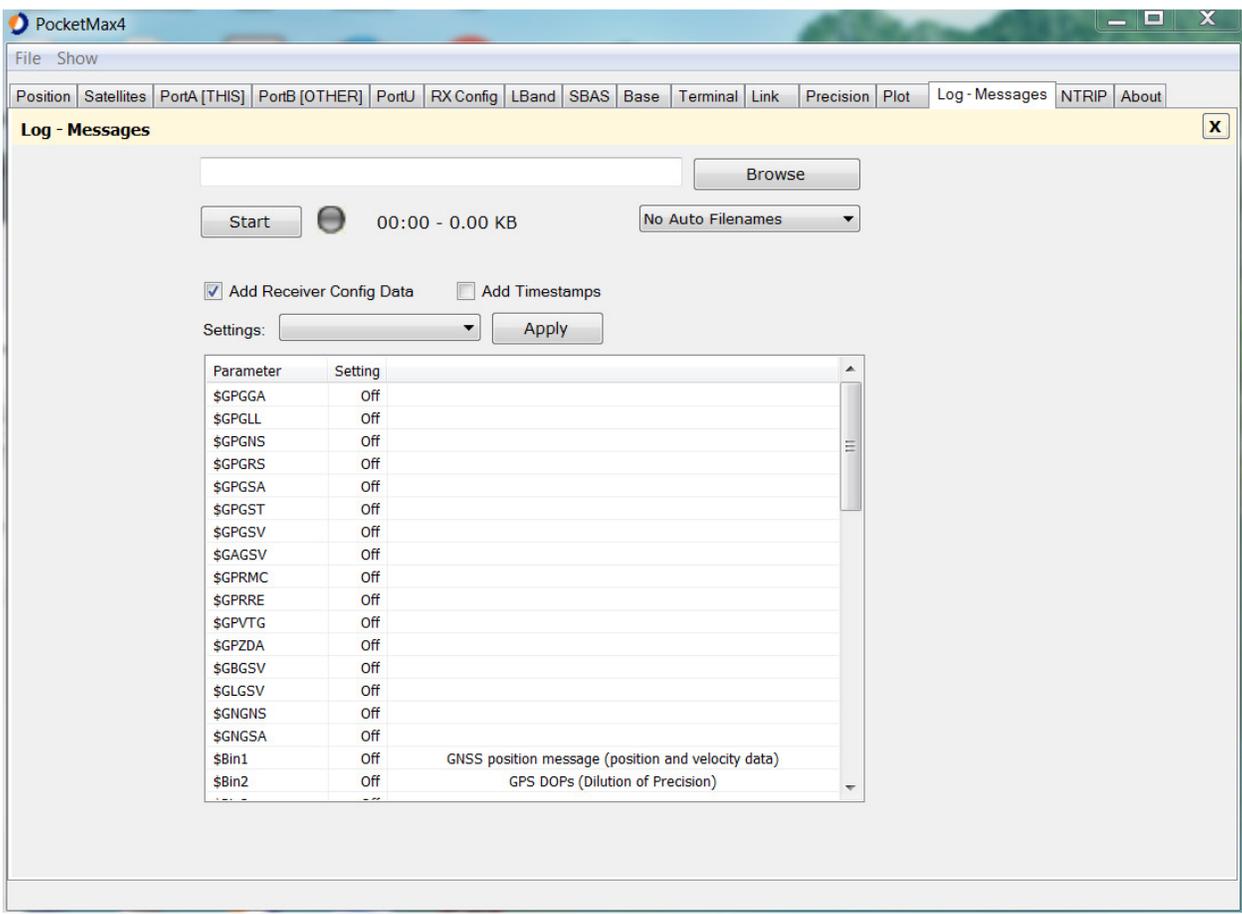
**The LOGS Menu Button**

ASCII and binary data logs can be created through PocketMax4.

First, open a file to log to. Either click on "Browse" and select an existing file to overwrite, or type in the name of a new file (with file extension). You can use the dropdown button underneath "Browse" to automatically create a new file at specified intervals.

Next, select your options. If you select "Add Receiver Config Data," all the configurations of the receiver will be written to the top of the file. If you select "Add Timestamps," the data will have timestamps.

Next, select which messages to log. You can do this manually by turning on specific messages (as shown below):



**Figure 2-21: Logs NMEA**

The Log-Messages tab lists a variety of binary messages. A brief description of several of the binary messages is provided.

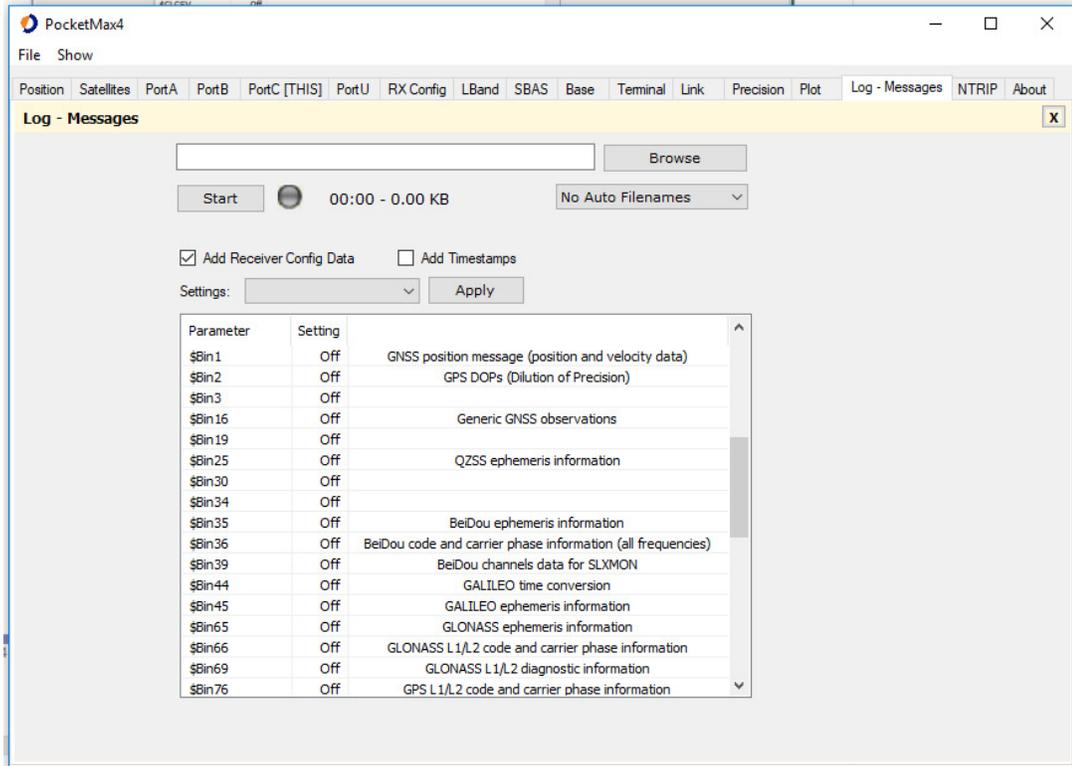


Figure 2-22: Logs Binary

### The HDG Menu Button

The tabs within the HDG (heading) menu button are Heading Status, Heading Setup. The Heading Setup tab displays the current configuration that is unique to the Vector products, and allows you to change the heading configuration.

The Status tab displays a graphical representation and numerical values for heading, rate of turn (ROT), course over ground (COG) and speed.

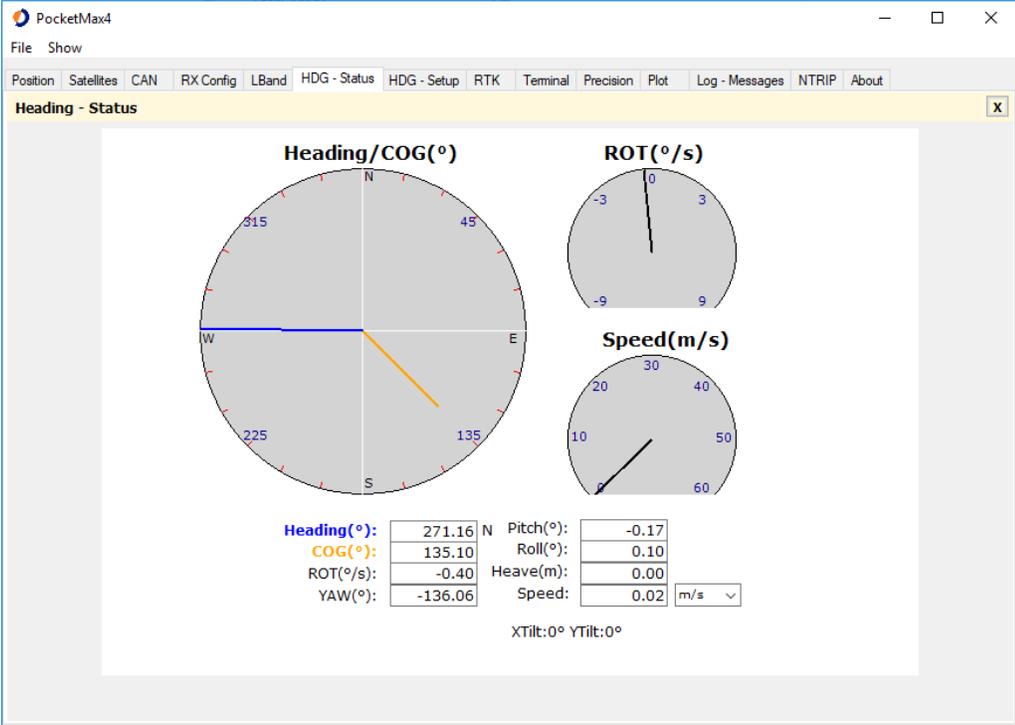


Figure 2-23: Heading Status

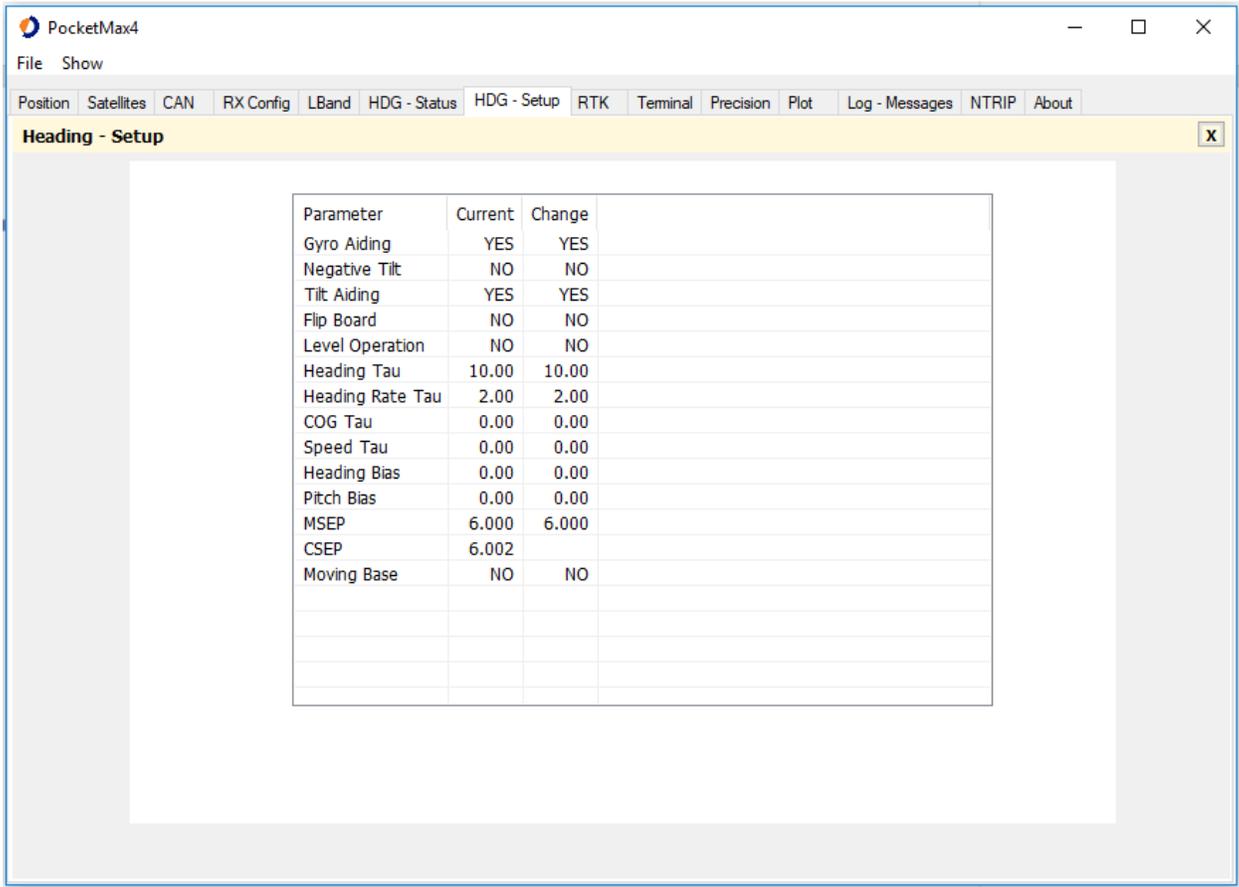


Figure 2-24: Heading Setup

### Closing PocketMax4

The process of closing PocketMax4 is critical in the proper configuration of your receiver. It is very important to let PocketMax4, fully close to ensure proper receiver configuration. When you tap on the 'X' in the upper right-hand corner of the program to exit, the following screen appears.

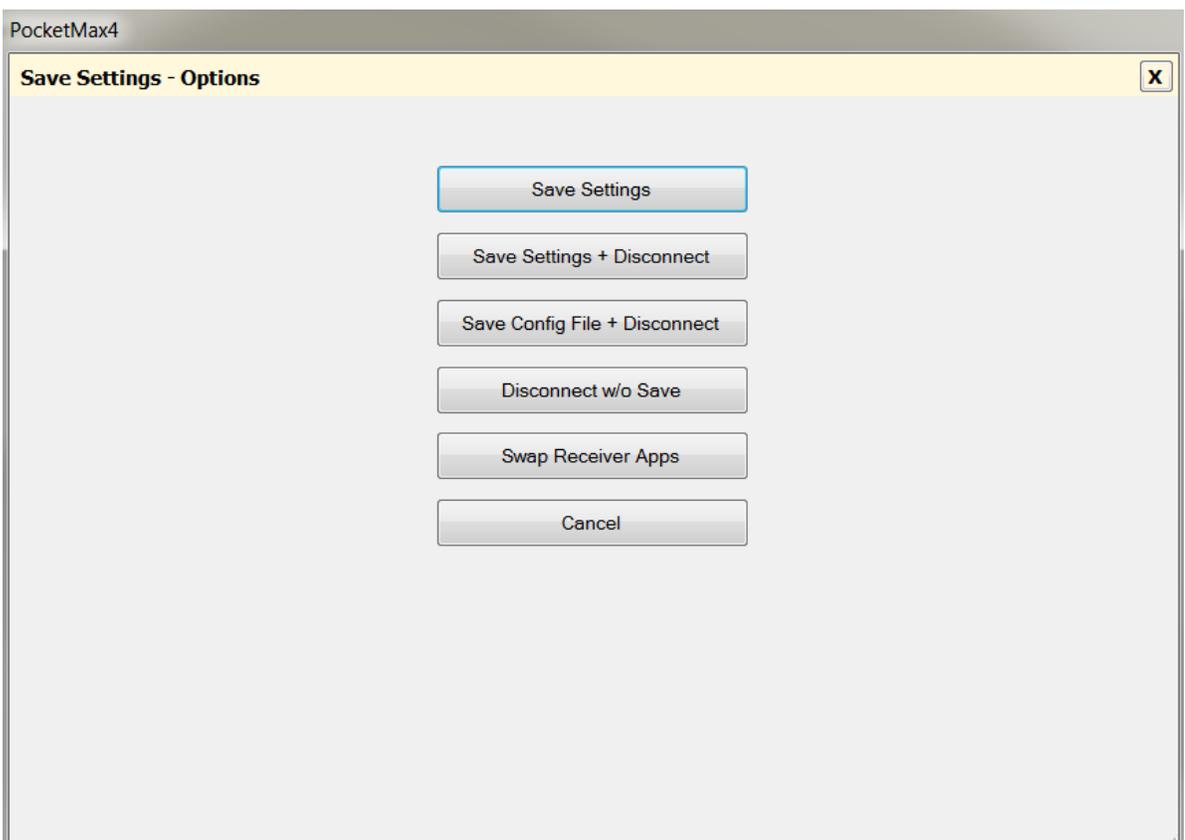
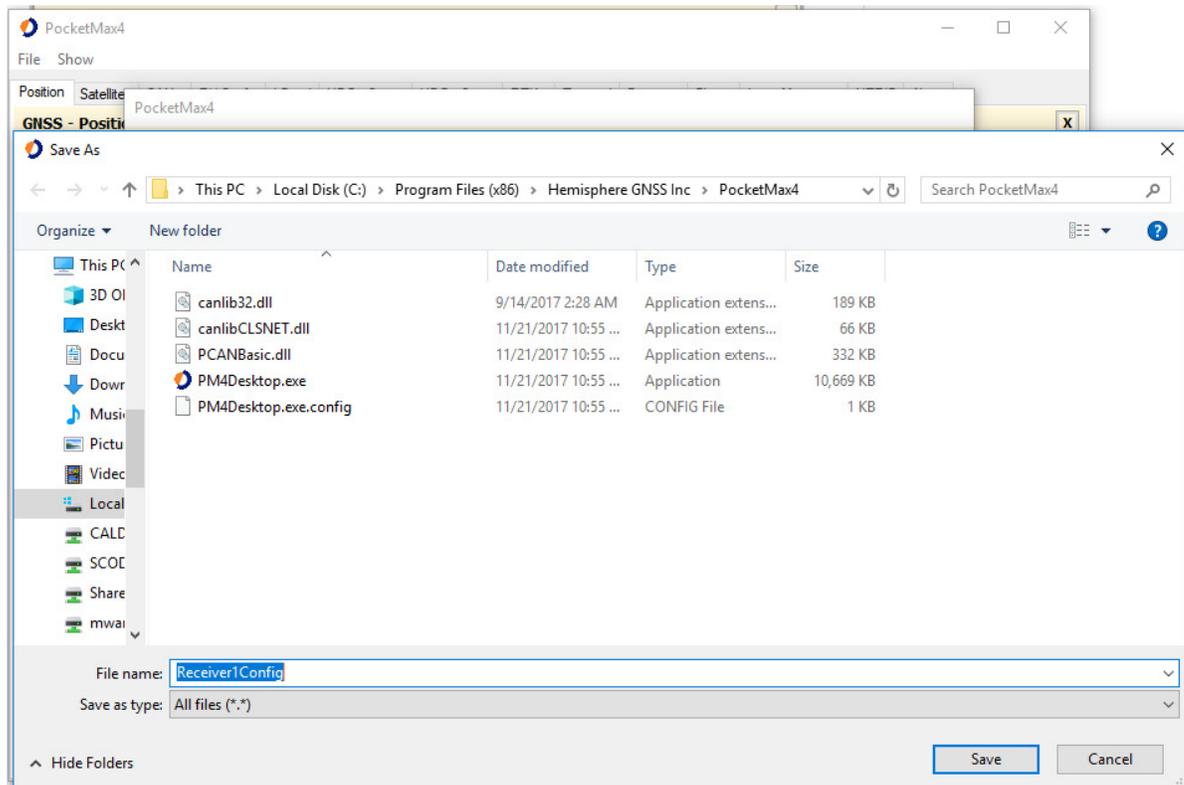


Figure 2-25: Exit screen

**Save Settings**-saves all changes made during your PocketMax4 configuration changes and will keep you connected to the receiver.

**Save Settings and Disconnect**-saves all your PocketMax4 configuration changes, and disconnects PocketMax4 and the session.

**Save Config File & Disconnect**-saves all your PocketMax4 configuration changes, and saves your configuration to a text file.



**Figure 2-26: Calibration text file**

**Disconnect w/o Save**--disconnects your session and does not save any changes.

To return to using PocketMax4, press Cancel.

**Note:** If you have selected to save changes, the screen below displays. It is imperative to allow the program to complete all the steps to close and save the configurations properly.

**Caution** – Settings configured using PocketMax4 may be lost if you disconnect or power down your receiver while PocketMax4 is still running. Be sure to let PocketMax4 close completely.

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