



geode™

GNS3 Receiver

USER'S MANUAL

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Contents

1. Introduction	2
1.1 Geode, Geode GNS2, and Geode GNS3	3
2. Geode Features	6
2.1 Accuracy and Precision	6
2.2 GPS vs. GNSS	7
2.3 GNSS Augmentation	9
2.3.1 SBAS Differential Correction	10
2.3.2 NTRIP Differential Correction	11
2.3.3 Atlas Correction Service	12
2.4 Update Interval Rate	13
2.5 Operating Systems	14
2.6 Geode Connect	14
2.7 Third-Party Applications	15
2.8 Juniper Rugged™	15
2.9 Bluetooth® Wireless Technology	15
2.10 Antennas	16
2.11 LED Status Indicators	16
2.12 Power Supply and Battery	17
2.13 Connector Ports	18
2.14 Carrying Options	18
2.14.1 Camera Tripod Mount	18
2.14.2 Mounting Plate	18
3. Getting Started	20
3.1 Perform Initial Tasks	21
3.1.1 Review Documentation	21
3.1.2 Charge the Battery	21
3.2 Turn on the Geode	22
3.2.1 Reset the Geode	22
3.3 Connect the Geode to a Mobile Device	23

4. Set Up Geode Connect for iPad and iPhone	26
4.1 Download and Install.....	26
4.1.1 The App Store	26
4.2 Connect with the Geode	26
4.2.1 Connect through Geode Connect	26
4.2.2 Connect through OS.....	27
5. Learn Geode Connect for iPad and iPhone	30
5.1 Home Page	30
5.2 Skyplot Page	32
5.3 Points Page.....	33
5.3.1 Capture Waypoints	34
5.3.2 Organize and Edit Waypoints.....	34
5.3.3 Export or Delete Waypoints	35
5.4 Terminal Page.....	36
5.4.1 Capture, Save, or Share NMEA Sentences	37
5.5 Settings (More) Page	39
5.5.1 Preferences	40
5.5.2 Connect Device	41
5.5.3 Receiver Configuration	41
5.5.4 Upgrade Geode.....	57
5.5.5 Request Help and Send Feedback.....	61
5.5.6 About	62
6. Set Up Geode Connect for Android	64
6.1 Download and Install.....	64
6.1.1 Google Play.....	64
6.1.2 Juniper Systems Website	64
6.2 Connect with the Geode.....	65
7. Learn Geode Connect for Android	68
7.1 Home Page	69
7.2 Skyplot Page	70
7.3 Location Page	72
7.3.1 Capture Waypoints	73
7.3.2 Delete Waypoints	74
7.3.3 Share Waypoints	75

7.4 Terminal Page.....	77
7.5 Settings Page.....	79
7.5.1 Preferences.....	80
7.5.2 Connect Device	85
7.5.3 Receiver Configuration	85
7.5.4 Upgrade Geode	101
7.5.5 Request Help and Send Feedback.....	105
7.5.6 About	106

8. Set Up Geode Connect for Windows PC	108
8.1 Download and Install.....	108
8.2 Connect with the Geode	108
9. Learn Geode Connect for Windows PC	116
9.1 Home Page	117
9.2 Skyplot Page	118
9.3 Map Page.....	120
9.3.1 Capture, View, and Compare Waypoints	121
9.4 Terminal Page.....	122
9.4.1 Capture, Save, or Share NMEA Sentences	123
9.5 Settings Menu.....	124
9.5.1 Preferences	125
9.5.2 Connect Device	126
9.5.3 Receiver Configuration	126
9.5.4 Upgrade Geode.....	142
9.5.5 OS Location.....	147
9.5.6 Configure Virtual Port Settings.....	150
9.5.7 Request Help and Send Feedback.....	151
9.5.8 About.....	152
10. Appendix A: Serial Port Configuration	154
11. Appendix B: Warranty and Repair Information	156
11.1 Limited Product Warranty	156
11.1.1 Two Year Warranty	156
11.1.2 Ninety Day Warranty	156
11.1.3 Warranty Exclusions.....	156
11.1.4 Remedy.....	157

- 11.1.5 Limitation of Liability157
- 11.1.6 Governing Law.....158
- 11.1.7 Warranty Repairs158
- 11.2 Repairs, Upgrades, and Evaluations.....159
- 12. Appendix C: Warnings, Licensing, and Regulations 162**
 - 12.1 Product Warnings162
 - 12.1.1 Battery Warnings.....162
 - 12.1.2 Wall Charger Warnings162
 - 12.2 Certifications and Standards.....163
 - 12.2.1 FCC: United States163
 - 12.2.2 Industry Canada.....164
 - 12.2.3 Radio Frequency Safety.....164
 - 12.2.4 CE Marking (European Union).....165
 - 12.2.5 Declaration of Conformity165
- 13. Appendix D: Geode Receiver Specifications 168**
- Index 174**

1

INTRODUCTION



1. Introduction

The Juniper Systems Geode GNS3 GNSS Receiver is a sub-meter, sub-foot, and decimeter capable GNSS receiver. With the Geode, you can collect real-time, sub-meter, sub-foot, or decimeter GNSS data. It works with a wide range of iPhone®, iPad®, Android®, and Windows® devices to fit your needs. Take the Geode with you mounted on a pole, in a pack, or held in your hand to collect real-time GNSS data in harsh environments—including heavy tree canopy and mountainous areas—using almost any handheld device.

Like other Juniper Systems products, the Geode is built ultra-rugged. Rated IP68, it is dustproof as well as waterproof to a depth of 1.4 meters (4.5 ft) for 30 minutes or longer. It can survive multiple drops from 1.2 meters (4 ft) to concrete. It is designed to withstand harsh environments and provide a consistently reliable performance. While stand-alone single-frequency GPS receivers are accurate to only two to five meters or more, the Geode uses NTRIP, SBAS, or Atlas® corrections and combines complex smoothing algorithms and full-wave carrier phase tracking to deliver sub-meter, sub-foot, or decimeter accuracy depending on the configuration.



Note: GNSS accuracy is subject to observation conditions, multipath environment, number of satellites in view, satellite geometry, and ionospheric activity.

The Geode GNS3 is available in two hardware configurations with multiple activations and subscriptions to meet a variety of needs.

1.1 Geode, Geode GNS2, and Geode GNS3

Features that are specific to the Geode GNS3 are identified throughout this manual. For information about the Geode and Geode GNS2, see the [Geode Owner's Manual](#).

Juniper Systems offers two GNS3 models, the GNS3M and the GNS3S.

GNS3M: includes a multi-frequency antenna (L1, L2, L5) and an option to subscribe to receive Atlas corrections.

GNS3S: includes a single frequency antenna (L1). This configuration cannot be updated to a GNS3M multi-frequency.

2

GEODE FEATURES



2. Geode Features

The Geode is a real-time, sub-meter, sub-foot, or decimeter receiver. This means the Geode is able to deliver sub-meter, sub-foot, or decimeter accuracy, depending on the configuration, with 95–98% precision in the very moment the data is being collected. This is the cutting edge of geospatial technology. Historically, this level of precision and accuracy was only available via post-processing software or expensive survey-grade equipment.

2.1 Accuracy and Precision

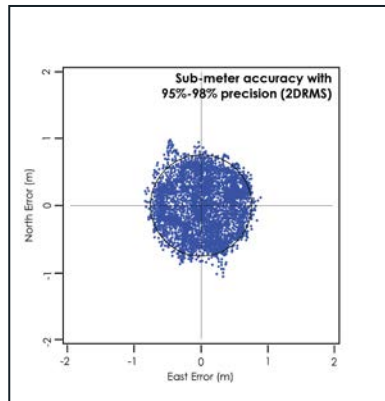
It is important to note that in the context of GPS, accuracy and precision are related, but not the same thing.

Accuracy refers to the radius of the circle of unknown around a true point. The smaller the radius, the higher the accuracy. The Geode has sub-meter, sub-foot, or decimeter accuracy. This means the Geode can plot a position to within a sub-meter (or better) radius of the true point.

Precision refers to repeatability or how frequently a receiver can plot a point inside the circle of accuracy and whether or not that circle is centered over the true point.

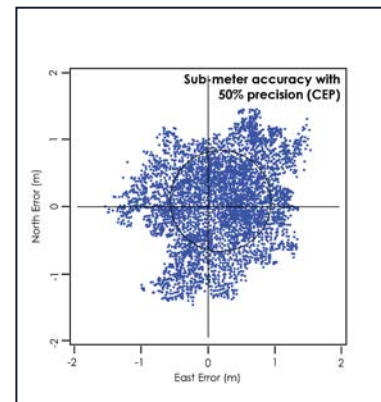
Over time, any stationary GPS receiver will plot multiple positions for a given point. This happens because of errors caused by variables in the satellites, the surrounding physical environment, and the ionosphere. Modern geospatial technology has made huge progress in

correcting for those errors, but a receiver's real-time accuracy is dependent on its ability to process those corrections. The points plotted by the stationary receiver eventually form a scatter plot. Precision is the percentage of points on the scatter plot that fall within the circle of accuracy.



For the Geode in ideal conditions, 95–98% of the points on a scatter plot will fall within a sub-meter radius of the true point.

GPS manufacturers quote their accuracies in different ways. They use different statistical descriptions of probability. A GPS receiver may be sub-meter. That is, it may be able to



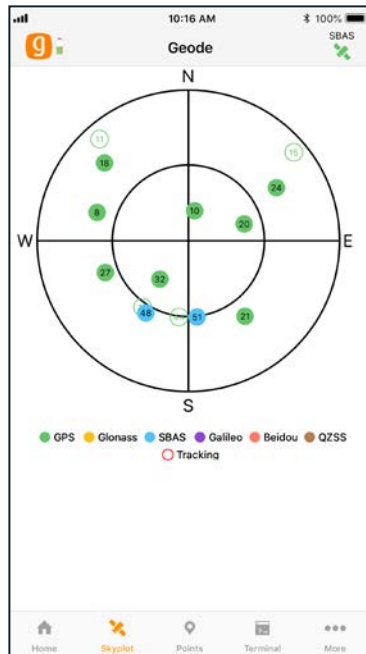
plot points within a meter radius of the true point. However, those points may only fall within that meter radius, 50–60% of the time. The accuracy for those receivers is sub-meter, but the precision is only 50–60%.

These claims largely depend on the statistical method used to calculate accuracy. One manufacturer might use circular error probable (CEP),

a calculation that qualifies the data as sub-meter only 50% of the time. Another could use root mean square (RMS), denoting the data is only truly sub-meter around 65% of the time. The third manufacturer could use twice the distance root mean square (2DRMS), a measure that indicates the data as sub-meter accurate around 95–98% of the time.

2.2 GPS vs. GNSS

A GPS receiver's reliability refers to the consistency with which it is able to secure enough satellite signals to produce accurate, precise positioning. This becomes a challenge when the receiver's immediate surroundings interfere with its line-of-sight to the satellites. For example, tall trees and buildings are common challenges to GPS receivers' reliability.



The Global Positioning System (GPS) is the United States government's navigation satellite constellation. As of June 2021, the GPS constellation consists of 31 operational satellites. You can view six or more GPS satellites from virtually any point on the planet. The US government has stated that it is committed to maintaining the availability of at least 27 GPS satellites 95% of the time.

The standard configuration for the Geode is that of a GPS receiver. This means that it receives positioning data from the US government's GPS constellation of satellites. In

order to calculate an accurate position, the Geode (or any GPS receiver) needs a direct line of sight with at least four satellites. Without that fourth satellite, the receiver has to estimate altitude which can affect horizontal accuracy by hundreds of meters. This is not likely to be a problem if you are collecting data in an open, flat landscape. However, if you are collecting data in the mountains, under heavy canopy, or in a city scape, physical obstructions may make it difficult to view four satellites in the GPS constellation simultaneously.

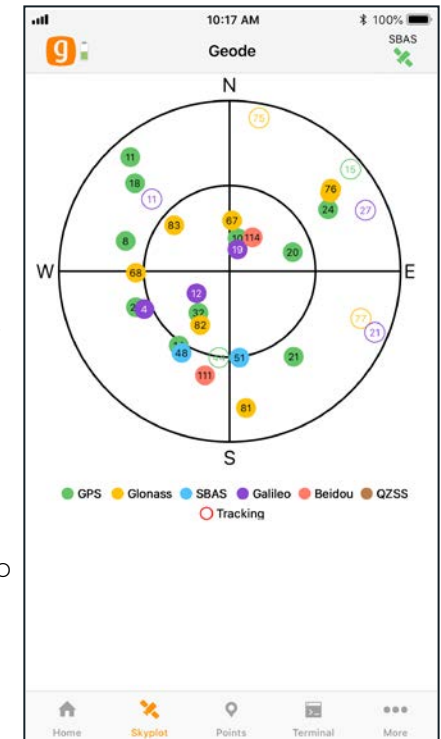
This is why the Geode also comes with GNSS. GNSS stands for Global Navigation Satellite System, and it encompasses all global satellite constellations from various countries and unions. Specifically, the Geode can receive positioning data from the following satellite constellations: GPS (US), GLONASS (Russia), GALILEO (European Union), BeiDou (China).

With the Multi-GNSS configuration, the number of satellites available at any given moment is multiplied. This greatly increases the likelihood that your Geode will be able to get

a fix on multiple satellites simultaneously, even under thick canopy or in the middle of a densely populated city block. With more satellites available to the Geode, total data sets in challenging environments are consistently higher quality.

The Multi-GNSS configuration of the GNS3 makes the Geode's ability to deliver real-time sub-meter, sub-foot, or decimeter accuracy more reliable under what used to be considered "less-than-ideal" circumstances.

Note: GNSS accuracy is subject to observation conditions, multipath environment, number of satellites in view, satellite geometry, and ionospheric activity.



2.3 GNSS Augmentation

GNSS data (including GPS) will unavoidably have errors in it. Sources of GNSS error include:

- Deviations in GNSS satellite orbits
- Inaccurate clocks on the GNSS satellites
- Ionospheric activity that changes daily and hourly
- Interference of satellite signals that creates noise in the multipath environment

When a manufacturer touts a receiver's accuracy, it is usually referencing the receiver's accuracy under ideal conditions. These ideal conditions minimize sources of error.

They include flat, open landscapes with clear skies and no buildings or trees interfering with the receiver's direct line-of-sight to at least four, perfectly positioned satellites. But even these ideal conditions require corrections because the ionosphere is constantly changing and users have no control over satellite orbits or timing.

The Geode is built to be a rugged, go-anywhere GNSS receiver. It is built to perform in all environments, no matter how challenging. This extends even to its receiver capabilities. As with all receivers, it will be more accurate



under ideal conditions, but it also has the ability to access and integrate data from various correction and satellite augmentation services so it can provide real-time high accuracy positions in the rugged, less-than-ideal environments it was built for.

2.3.1 SBAS Differential Correction

The Geode receives Satellite Based Augmentation System (SBAS) data. SBAS includes regional networks of ground and satellite technologies that work together to boost the accuracy and dependability of GPS data. SBAS uses stationary land-based GPS monitors to calculate GPS position errors caused by ionospheric disturbances. This error causes delays in timing, which result in position errors.

To calculate GPS position errors, GPS data from satellites are compared against the precisely documented locations of each land-based station. Any discrepancy is determined to be an error. These errors are sent to the master control station, which create a real-time regional model for correcting ionospheric errors. This correction model, also known as an ionospheric map, is sent to geostationary satellites and broadcast throughout the region. These

SBAS corrections—called deviation corrections—allow GPS receivers to more accurately and reliably determine their position.

GPS is normally accurate to about five meters, but when using SBAS user's can achieve an accuracy of two meters or better. The Geode combines SBAS corrections with complex smoothing algorithms and full-wave carrier phase tracking to deliver accuracies better than 60 cm 2DRMS. In other words, 95–98% of the positions recorded by the Geode will be within 60 cm of the true point.

2.3.2 NTRIP Differential Correction

NTRIP stands for Network Transport of RTCM via Internet Protocol. It is the internet version of Real-Time Kinematic (RTK) Positioning. Where available, RTK and CORS networks stream data corrections over the internet, allowing the Geode to calculate an RTK Float position solution with differential GNSS accuracy.

Conventional RTK includes very precise and highly accurate methods used by land surveyors. Surveyors use a base receiver in a known location that continuously receives positions from GPS satellites. The base sends its position data to the surrounding area via radio. Another receiver, called a rover, uses the signal from the base along with GNSS satellite signals to calculate its position based on the corrections in the signal from the base station.



NTRIP has been the means for significantly improving RTK's applicability. Historically, the RTK model has been limited because it has been dependent on point-to-point radio

communications. Just like GNSS satellites, RTK radio signals must be sent and received via direct line-of-sight. This limits the area around which a base station can be useful. NTRIP changes this by allowing the base to send its positioning and corrections data via the internet, widening the range of application for each base station.

NTRIP has also made it possible to create networks of localized base stations that increase both availability and precision of RTK corrections. Since distance from a base station strongly affects positioning precision and accuracy, NTRIP-enabled RTK networks are able to calculate the user's closest base station or even use algorithms and modeling to create a virtual base station very close to the user's receiver. These are free or paid services that users can subscribe to and use as long as they have a data signal from a cell tower.

The Geode accesses the precision available from NTRIP-enabled RTK services via the cellular data or internet capabilities of the device it is connected to. It uses this data to achieve an RTK Float solution (10–30 cm).



2.3.3 Atlas Correction Service

The Atlas Correction Service is a worldwide L-band satellite based correction that covers almost all of the land 75° north and south of the equator.

The Geode GNS3M includes an option to subscribe monthly or annually to Atlas to receive extra corrections. The three options provided are Atlas Basic, H30, and H10.

Atlas Basic: as good as 50 cm accuracy (similar to SBAS) with 95% precision

H30: as good as 30 cm accuracy with 95% precision

H10: as good as 10 cm accuracy with 95% precision

This correction service varies depending on tree cover, and does not work under a heavy tree canopy.

When using Atlas corrections, the satellites can take time to converge depending on the subscription you have.

Atlas Basic: typically 5 minutes or less

H30: typically 15–30 minutes or less

H10: typically 30 minutes or less

To check the level of subscription of your unit, go to Receiver Configurations > Manage Subscriptions.

When Atlas is enabled, the satellite icon color in the top right corner of Geode connect will indicate the signal quality.

- Blue: Bit Error Rate (BER) between 0 and 20; Excellent signal
- Green: BER between 21 and 150; Good signal
- Orange: BER between 151 and 250; Marginal signal
- Red: BER above 250 to 500; Poor/Unusable signal

These colors can also be seen when using SBAS if the RD1 message is enabled.

2.4 Update Interval Rate

The standard Geode configuration comes with an update interval rate of 1 Hz. This means the Geode updates its position and outputs that data to the connected device once per second.

There is an optional upgrade for update intervals up to 10 Hz or 20 Hz (10 or 20 updates per second) available. These upgrades also allow for update adjustments of 2 Hz, 5 Hz, and 10 Hz. Higher update rates are important for projects in which you are collecting data at faster speeds.

Note: At higher data rates, we recommend turning off messages not required for your application, such as GNS, RRE, and VTG messages.

For more information about how to upgrade the update interval rate, see:

- iPad and iPhone: [5.5.4 Upgrade Geode](#) on page 57
- Android: [7.5.4 Upgrade Geode](#) on page 101
- Windows: [9.5.4 Upgrade Geode](#) on page 142

2.5 Operating Systems

The Geode GPS Receiver is able to communicate with a wide range of computing devices such as an iPhone or iPad as well as other laptops, tablets, and smart phones. These devices may also run a variety of operating systems, including iPhone, iPad, Android, and Windows 10/11.

2.6 Geode Connect

Geode Connect is a simple utility app designed to make the Geode easy to use. Geode Connect provides you with the ability to easily establish a Bluetooth wireless, USB, or serial connection with their handheld device, report position information of the Geode, and customize the most commonly used configuration settings.

Although Geode Connect has limited data-capture features, it is not intended to replace your mapping, navigational, or data-collection app. Juniper Systems offers a full mapping software application called Uinta that can be used with the Geode. Juniper Systems also partners with several software developers who offer mapping applications that can be used with the Geode.

Geode Connect is free for download from the Juniper Systems website and various app stores. For more information about downloading and using Geode Connect with your specific operating system, refer to:

- Chapter 4: [Set Up Geode Connect for iPad and iPhone](#), on page 25
- Chapter 6: [Set Up Geode Connect for Android](#), on page 63

- Chapter 8: [Set Up Geode Connect for Windows PC](#), on page 107

2.7 Third-Party Applications

The Geode streams NMEA 0183, RTCM, and Crescent Raw Binary data protocols, which makes it compatible with most mapping, navigational, and data-collection software. It will usually work seamlessly with the app that you are already using. It will simply improve the precision, accuracy, and reliability of your data.

For a list of professional GPS and GNSS data-collection apps, visit the Juniper Systems blog at blog.junipersys.com and search for data-collection software.

Note: When using the Geode with Android devices, some mapping and data-collection apps do not readily indicate which receiver they are connected to, the highly accurate and reliable Geode GPS Receiver or the device's own internal, consumer-grade GPS receiver. For information about identifying and solving this problem, see [page 81](#).

2.8 Juniper Rugged™

Like other Juniper Systems products, the Geode is built ultra-rugged—waterproof, dustproof, and drop proof. It is designed to withstand harsh environments. It features IP68-rated protection, meets or exceeds MIL-STD 810G (drop, vibration, temperature, ingress protection), and operates in extreme temperatures, providing reliable performance wherever you need to collect data.

2.9 Bluetooth® Wireless Technology

The Geode is equipped with a Class 1 Long Range Bluetooth wireless transmitter. It has a range of approximately 100 meters or 328 feet. However, the device you are pairing with the Geode may or may not have the same range. It may be a good idea to test this range before relying on it heavily.

For instructions on pairing your Geode with your handheld device or laptop, see Chapter 3: *Getting Started*, on page 19.

2.10 Antennas

Juniper Systems offers two GNS3 models, the GNS3M and the GNS3S.

GNS3M: includes a multi-frequency antenna (L1, L2, L5) and an option to subscribe to receive Atlas corrections.

GNS3S: includes a single frequency antenna (L1). This configuration cannot be updated to a GNS3M multi-frequency.

For applications involving dense canopy or other skyline interferences, the Geode includes an external antenna port allowing you to place an external antenna in an area with better sky visibility. Consult Juniper Systems Technical Support before using the Geode with an external antenna.

2.11 LED Status Indicators

There are four LED Status Indicators on the face of the Geode.



Amber LED: Blinks when a 3D GPS fix is made (four or more satellites) and turns solid when a DGPS fix is made (a correction source is being applied to the solution).



Blue LED: Solid when the Geode unit is connected via Bluetooth wireless technology in Geode Connect.



Red LED: 1) Blinks slowly when battery is charging. 2) Solid when battery is fully charged. 3) Blinks rapidly when battery cannot accept a charge (e.g., from a laptop computer that doesn't have enough power to charge the Geode or other faulty power

supply).



Green LED: 1) Solid when the power is turned on. 2) Blinks when the battery needs to be charged.

2.12 Power Supply and Battery

The Geode comes with a 15 W, 100-240 V AC universal USB power supply with adapters for the US, UK, and EU. AU/NZ adapters are supplied separately.

The Geode also comes with two USB cables:

- **USB-C to USB-C:** Recommended for use as a primary charging cable. Use this when the device is powered on and charging at the same time. This cable can also be used for data transfer.
- **USB-A to USB-C:** Legacy cable used for charging when the receiver is powered off.

The supplied US, UK, or EU adapter can be used with either cable.

The Geode has an internal, non-removable battery that can provide 10+ hours (up to 16 hours for the GNS3S) of use. The battery may require as much as six hours to charge before the first use. Subsequent charges should take four hours or less, depending on the remaining power. Before storing the Geode for any amount of time, ensure the battery is fully charged.

To charge the Geode in the field, use the included USB cable and a vehicle USB adapter to plug the Geode into a vehicle's 12 V power port. For best results, use an adapter that is rated at least 10 Watt/2.1 Amp.

Charging the Geode by connecting it to a battery-powered PC or handheld device is not recommended. Most of these devices do not have enough power to charge the Geode. If the Geode detects it is connected to a battery with insufficient power, it will not charge. The red light will flash rapidly indicating that the Geode is not charging. If you connect the Geode to a device via USB for data transfer, the red light may still flash rapidly to let you know that the battery isn't charging. This does not affect the data transfer.

! **CAUTION:** The Geode needs to be charged at least once a month. If the battery drains completely, it may not recover, and your Geode will need to be sent in to Juniper Systems for a battery replacement.

2.13 Connector Ports

The Geode comes standard with a USB-C port for charging the receiver and for connecting it to a PC or handheld device. It also comes with an external antenna port. This port will supply the external antenna with 3.3 volts at up to 45 mA of power. Consult Juniper Systems Technical Support before using the Geode with an external antenna.

The Geode includes a Serial RS-232C 9-pin port. This allows the Geode to be mounted to a piece of equipment while maintaining a constant connection for data and power. Use a straight-through 9-pin cable to communicate with your Geode. For a list of functions for each pin, refer to Appendix A: *Serial Port Configuration*, on page 153.

2.14 Carrying Options

The Geode can be carried in a number of different ways. It can easily be carried in-hand, in a pack, or mounted on a pole, depending on what your individual needs are.

For a complete list of carrying options, visit the Geode page on the Juniper Systems website or go to the blog at blog.junipersys.com and search for Geode.

2.14.1 Camera Tripod Mount

The Geode can be attached to a camera tripod using the 1/4"-20 mounting hole in the case. The screw must be less than 0.3" (7 mm) long to avoid damaging the case. Also included with the Geode is a 5/8"-11 adapter that fits into a camera tripod hole. This will allow the Geode to be mounted to a standard 2 meter survey pole.

2.14.2 Mounting Plate

The Geode can be mounted diagonally on a standard AMPS-style mounting plate. Many other attachments support the AMPS diagonal style mounting interface. Use attachment screws size M4 (less than 0.17" (4.5 mm) long).

3

GETTING STARTED



3. Getting Started

The Geode GPS Receiver is designed to be ready to use right out of the box. Simply charge the battery and pair the Geode with a *Bluetooth*® wireless technology-enabled handheld device. The Geode may be used with most mapping apps that use industry standard NMEA 0183 protocol.

Anatomy of the Geode



- | | |
|-------------------------|-------------------------|
| 1 LED Status Indicators | 3 MCX Antenna Connector |
| 2 Power Switch | 4 USB-C |



- | | |
|----------------------------|---------------------------|
| 5 M4 Amps Port
(1 of 2) | 7 GNS3 Label |
| 6 RS-232C Serial Port | 8 1/4"-20 Attachment Port |

3.1 Perform Initial Tasks

When you receive your Geode, perform the tasks outlined in this section before first use.

3.1.1 Review Documentation

This owner's manual and other documents are available on the Juniper Systems website at www.junipersys.com/products/geode. View, download, and print documents as desired.


3.1.2 Charge the Battery

The Geode has an internal, non-removable battery that can provide more than 10 hours of use. When your Geode arrives, the battery will carry a charge. However, a complete charge is recommended before relying on the Geode for a full day of work. Charge the battery as follows:

1. Insert the USB-C end of the included USB charge cable into the wall charger.
2. Insert the other USB-C end into the Geode.
3. If necessary, attach the appropriate plug adapter for your country onto the AC wall charger.
4. Plug the charger into a wall socket.
5. Charge the battery pack at room temperature (68°F or 20°C) for 4–6 hours (for the first charge). While the battery pack is charging, the red LED blinks. When it is fully charged and external power is applied, the red LED is solid. The LED will turn off when the external power is removed.

Note: For best results, only use the included wall charger and cable to charge the internal battery. Using a third-party USB cable may result in extremely long charge times or an incomplete charge.

3.2 Turn on the Geode

To turn on the Geode, press and release the power key . The green LED Activity Indicator turns on.

3.2.1 Reset the Geode

You can perform a soft or receiver reset for the Geode using the power key by following the instructions below.

Soft Reset

A soft reset will set the Geode back to the default settings. To perform a soft reset,

1. Press and hold the power key for 5 seconds.
2. When the LED Activity Indicator flashes slowly, release the power key.

The Geode will perform a soft reset then turn off when the reset is complete.

Receiver Reset

A receiver reset will set the Geode back to the factory settings. To perform a receiver reset,

1. Press and hold the power key for 15 seconds.
2. When the LED Activity Indicator flashes quickly, release the power key.

The Geode will perform a receiver reset then turn off when the reset is complete.

3.3 Connect the Geode to a Mobile Device

The best way to connect your mobile device to the Geode receiver is via Juniper Systems' Geode Connect app for iPhone, Android, or Windows.

For more information about downloading and using Geode Connect with your specific operating system, refer to:

- Chapter 4: [Set Up Geode Connect for iPad and iPhone](#), on page 26.
- Chapter 6: [Set Up Geode Connect for Android](#), on page 64.
- Chapter 8: [Set Up Geode Connect for Windows PC](#), on page 108.

Geode Connect is intended to serve as a connection and configuration utility for the Geode receiver. Although it has some data capture and mapping demonstration features, it is not intended to replace your mapping, navigational, or data-collection app. Juniper Systems partners with several software developers who offer mapping applications that can be used with the Geode.

Depending on what other mapping or data-collection software you are using, Geode Connect may be required. For example, you may need Geode Connect to serve as an NTRIP client for another app, or you may need it to act as the mock location provider on your Android device. For more information, see [Enable Mock Locations](#) on page 81.

4

SET UP GEODE CONNECT FOR iPad AND iPhone



4. Set Up Geode Connect for iPad and iPhone

As a configuration and communication utility for the Geode GNS3 GPS Receiver, Geode Connect provides you with the ability to establish communications with the Geode; change receiver settings; and view position, altitude, estimated horizontal error, differential status/fix information, speed, heading, satellites in fix, correction signal, and PDOP.

This chapter gives an overview of the features included in Geode Connect for iPad and iPhone. It gives details about specific settings that can optimize the Geode's precision, accuracy, and reliability, depending on the situation and environment. It also gives specific instructions about the nuances of using the Geode with iPad, iPhone, and third-party apps.

4.1 Download and Install

Geode Connect is available for download in the App Store and on the Juniper Systems website.

4.1.1 The App Store

Search for Geode Connect in the App Store. Install according to the device instructions.

4.2 Connect with the Geode

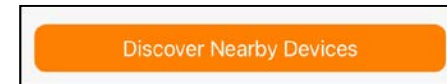
To pair your Geode with an iPhone or iPad via Bluetooth, you can use Geode Connect to connect your devices directly or connect through the OS of your device before connecting it in the Geode Connect app.

4.2.1 Connect through Geode Connect

1. Power on the Geode and open Geode Connect on your device.
2. Click **OK** to pair your device with the Geode.

If the Geode has not been connected to this device before you may need to search for nearby devices.

3. On the Geode Connect Device page, tap **Discover Nearby Devices**.



4. Tap **OK**.
5. In the Select An Accessory dialog box, select the serial number of your Geode.

Note: The serial number can be found on the bottom of the Geode.

When the Geode is paired with your iOS device, a green "Pairing Successful" banner will appear.

6. On the Connect Device page, select your Geode. When your Geode is selected, the Home page will appear.

4.2.2 Connect through OS

1. Power on the Geode.
2. Go to the Settings app on your iPhone.
3. Go to **Bluetooth > Other Devices**.
4. Select the Geode you wish to pair with. It will be listed with its serial number, which can be found on the bottom panel of the Geode.
5. Allow the iPhone to complete the pairing process.
6. Open Geode Connect.
7. Select **Connect Device**.
8. Tap on the Geode you want to connect with.

5

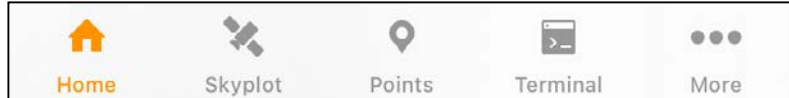
LEARN GEODE CONNECT FOR iPad AND iPhone



5. Learn Geode Connect for iPad and iPhone

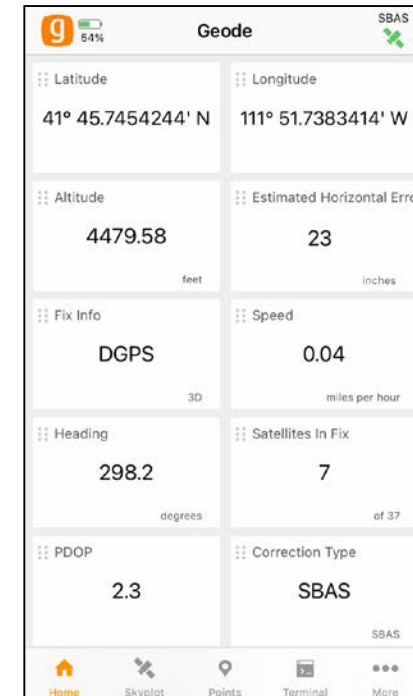
Geode Connect is a utility app that allows you to customize and fine-tune the Geode to your specific project or application. Each page in Geode Connect serves one of three primary functions: configuration of the Geode, validation of Geode accuracy, or changing Geode Connect settings. Though it does have some limited data-capture features, these are included only for demonstration purposes. Geode Connect is not intended to replace your data-collection app.

5.1 Home Page



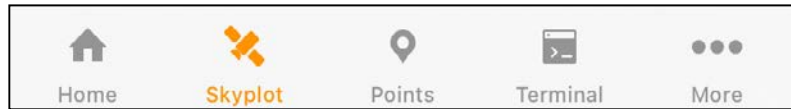
The Home page for Geode Connect serves as a dashboard for the Geode receiver. On this page, you can view connection status, correction mode, and positioning data. It displays latitude, longitude, altitude, estimated horizontal error, fix info (GPS, DGPS, RTK, etc.), speed, heading, number of satellites in fix, PDOP, and correction signal.

You can drag and drop each box to reorganize the screen to your preference.



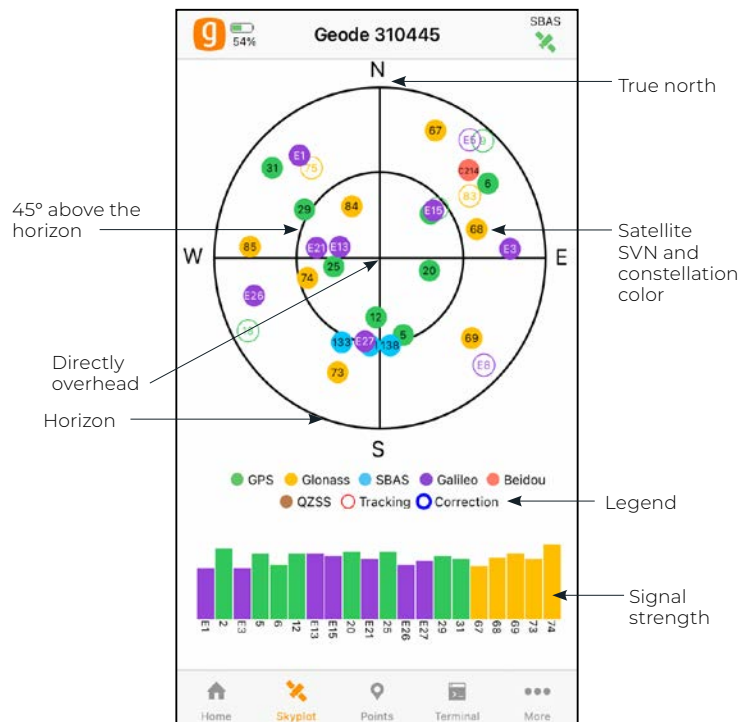
From the toolbar on the bottom of the screen, you can access the Skyplot, Points, Terminal, and Settings pages. Tapping on the More icon in the bottom right corner will allow you to configure the currently connected receiver. Tapping on the orange Geode icon in the top left corner will allow you to disconnect or change your receiver. The satellite icon in the top right corner will tell you which correction service you are using and it will turn green when you are connected. If the RD1 message is enabled, the satellite icon color will change relative to the signal quality. For more information see, [2.3.3 Atlas Correction Service](#) on page 12.

5.2 Skyplot Page



The Skyplot page shows which satellites are being used in the positioning solution and where they are in the sky. It also shows satellites that are being tracked by the Geode.

On the Skyplot page, each satellite is identified by a space vehicle number (SVN) and color for its constellation. The location of each satellite on the skyplot indicates where it resides in the sky overhead relative to true north. The outside ring is 0° elevation (horizon). The inside ring is 45° elevation—halfway above the horizon from the Geode's present location. The intersection of the two lines indicates directly overhead.

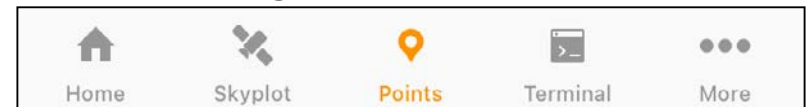


Satellite symbols outlined in red indicate that the satellites are being tracked, but they are not yet a part of the positioning solution. Satellite symbols outlined in blue indicate that a correction is being applied to the signal.

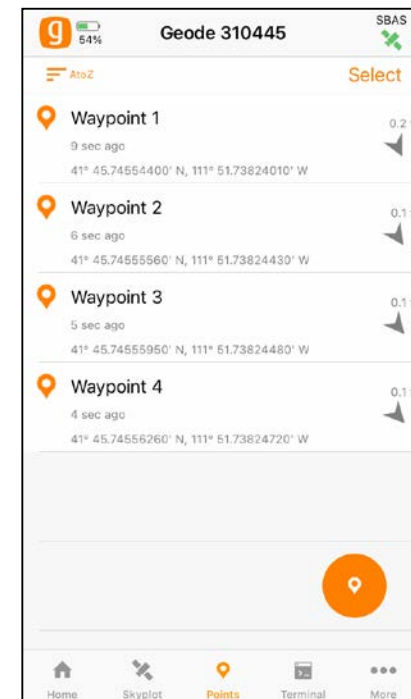
Multi-GNSS Geode models support the Galileo, BeiDou, GPS, QZSS, SBAS, and GLONASS constellations.

The Skyplot page is meant to be used as a guide. It shows the relative visibility of satellites in the sky, but it is not an absolute reference for satellites used in the positioning solution.

5.3 Points Page



The Points page allows you to demonstrate point capture and export captured data as CSV, KML, or KMZ files. This feature allows you to validate the accuracy of the Geode without requiring the use of a third-party app.



5.3.1 Capture Waypoints

1. With the Geode in the position you would like to capture, tap the waypoint icon .

A waypoint with your location will be added to your list.

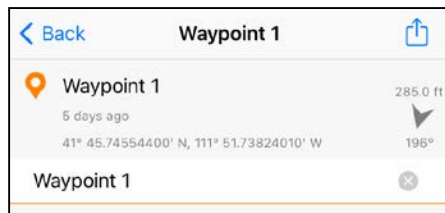
5.3.2 Organize and Edit Waypoints

Organize waypoints by tapping in the upper left corner beneath the Geode symbol. The app will cycle through the following organizing methods: oldest, newest, A to Z, Z to A, and proximity.



To edit the name of a waypoint,



1. Tap on the waypoint you want to rename.
2. Tap on the waypoint name beneath the coordinates.
3. Type the new name.



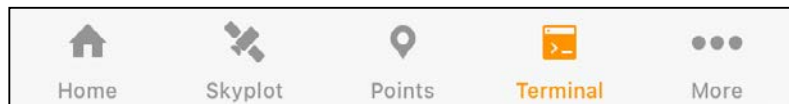
5.3.3 Export or Delete Waypoints

1. Tap **Select** (in the upper right corner).



2. Select the waypoints you want to share or delete.
3. To delete the selected waypoints, tap the trash icon  (in the bottom left corner) and confirm deletion.
4. To export the selected waypoints, tap the share icon  (in the bottom right corner).
5. Name the export file.
6. Choose the file format (CSV, KML, or KMZ).
7. Tap **Export**.
8. Export or share according to the apps and instructions for your iPad or iPhone.

5.4 Terminal Page



The Terminal page displays the NMEA sentences the Geode is receiving. It provides the options to include timestamps (top left) or to pause the data (top right).



At the bottom of the Terminal page, you can send commands to the Geode. This gives you flexibility to configure the Geode and customize data output.

1. Tap **Send Command**.
2. Tap **Show/Hide logging** to show or hide the NMEA strings in the terminal.
3. Tap **Send custom** to enter a custom command.
4. Tap **JSHOW** to show the current receiver configurations.

5. Tap **Clear** to clear the terminal screen.

For a comprehensive list of commands and messages that can be used to configure the Geode, please refer to technical documentation provided by Hemisphere GNSS.

1. Go to <https://hemispheregnss.com/> > **Resources & Support > Technical Documentation**.
2. Under **General**, tap on **Technical Reference Guide** (it may include a version number).

⚠ CAUTION: Use at your own risk. It is possible to cause communication or other errors in the Geode that may require technical assistance to repair.

5.4.1 Capture, Save, or Share NMEA Sentences

To record the NMEA sentences the Geode is receiving,

1. Tap the plus icon in the lower right corner to display the menu.



- Tap the play icon to begin recording your data.



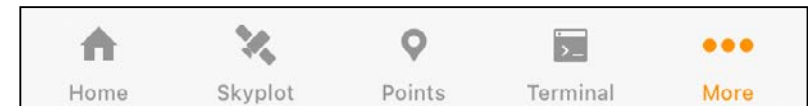
To stop recording,

- Tap the red recording icon. The string of NMEA sentences will be saved.

Tap the folder icon to view the saved recordings. From this screen you can organize, share, or delete the NMEA recordings.



5.5 Settings (More) Page

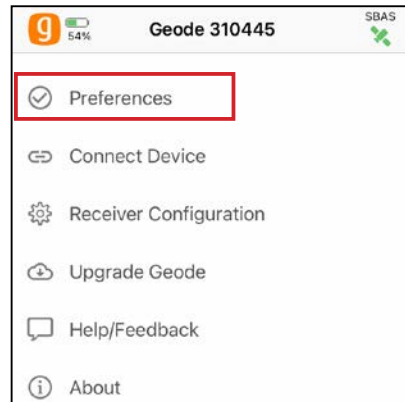


The Settings page provides options for the configuration of the Geode receiver and Geode Connect settings. These options are listed below:

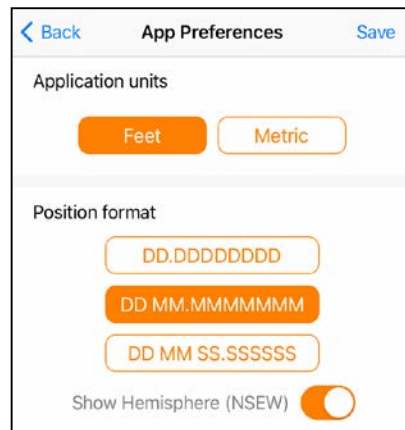
- [Preferences](#) on page 40
- [Connect Device](#) on page 41
- [Receiver Configuration](#) on page 41
 - [Port Connection](#) on page 42
 - [Active GNSS Constellations](#) on page 44
 - [NMEA Sentences](#) on page 44
 - [Update Rate](#) on page 45
 - [Advanced](#) on page 45
 - ▶ [NMEA Precision](#) on page 47
 - ▶ [Mask Angle](#) on page 47
 - ▶ [Correction Source](#) on page 48
 - ▶ [SBAS](#) on page 49
 - ▶ [Receiver Mode](#) on page 51
 - ▶ [Battery Status Sentence](#) on page 52
 - ▶ [Receiver Reset](#) on page 53
 - [Manage Subscriptions](#) on page 54
 - [Configure NTRIP](#) on page 55
- [Upgrade Geode](#) on page 57
- [Request Help and Send Feedback](#) on page 61
- [About](#) on page 62

5.5.1 Preferences

The Preferences screen allows you to customize your preferences for how information is displayed in Geode Connect.



You can specify application units (feet or metric), position format, and whether or not the app will show the hemisphere.



*Note: Changes must be saved in order for them to remain from screen to screen. To save changes, tap **Save** in the upper right corner before you leave this screen.*

5.5.2 Connect Device

The Connect Device screen allows you to connect your iPad or iPhone to the Geode.

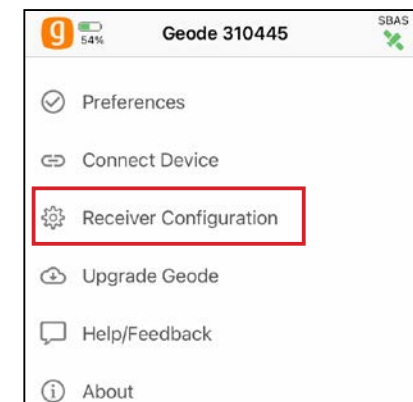
For more information, see [4.2 Connect with the Geode](#) on page 26.



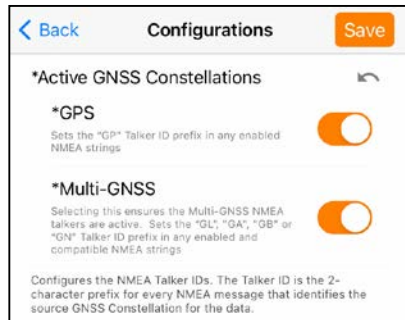
5.5.3 Receiver Configuration

Note: The Receiver Configuration options are only available if you are actively connected to a Geode receiver. Changes saved on these screens are changes made to the Geode receiver, not Geode Connect. This means that these changes crossover and are effective in other navigational and data-collecting apps.

This page allows you to configure the Geode according to the specific needs of your project or application.

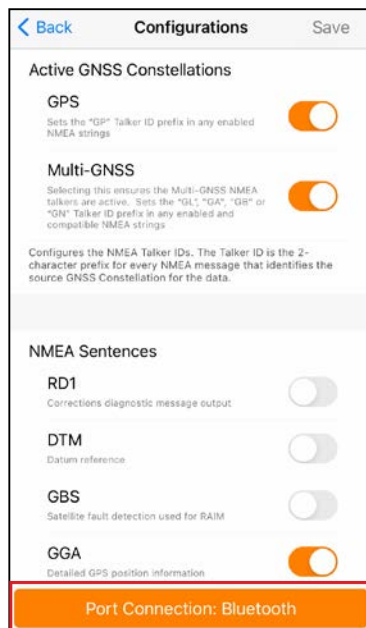


Detailed descriptions of the options are available underneath each specific setting.



Note: Changes must be saved in order for them to remain from screen to screen. To save changes, tap Save in the upper right corner before you leave this screen.

Port Connection



The Geode remembers its settings *per connection type*. You can use the Port Connection option to configure these settings for each connection type, without physically switching the connection for the Geode.

1. Tap **Port Connection** to access the menu with the port options.
2. Select the port you would like to configure.
3. Change the settings as desired and tap **Save**.

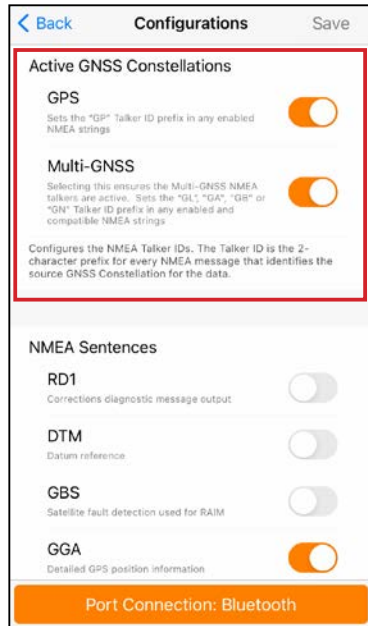
These changes will then be set for each time you connect using that specific port.

This affords you a certain amount of flexibility in the field. If you have multiple uses for the Geode and would prefer not to reconfigure it each time you switch tasks, the Geode can be configured per connection type for specific tasks.

For example, here are three different possible use cases for the same Geode.

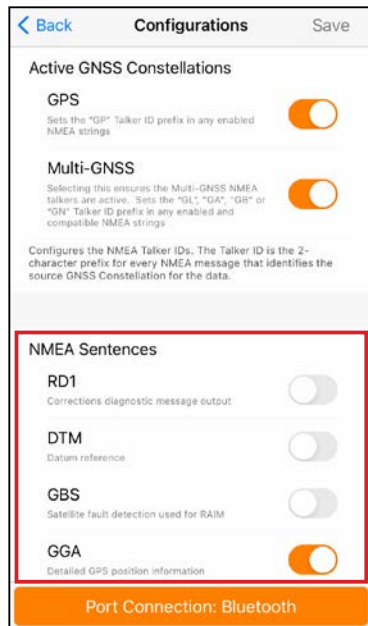
- Use Case 1: Mounted on a pole for data collection on foot in heavy tree canopy.
 - Bluetooth wireless connection settings optimized for slow travel and GNSS (more potential satellites in view through the trees).
- Use Case 2: Mounted in the cab of a truck for carefully locating previously marked research sites.
 - USB connection settings optimized for slower travel and NTRIP correction.
- Use Case 3: Mounted on a fast moving four wheeler on rolling hills with open sky.
 - RS-232C connection settings optimized for speed and unobstructed open sky.

Active GNSS Constellations



You can choose which GNSS constellations to use in your solution: GPS and/or Multi-GNSS.

NMEA Sentences



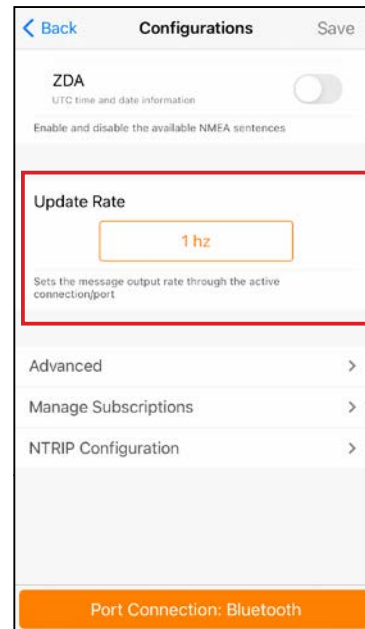
You can choose which NMEA sentences you want the Geode to receive. In most instances, the default NMEA sentences will be sufficient for your project or application.

Note: iPhone and iPad require the GGA and RMC messages to be enabled in order to provide a position to the operating system for other apps to use.

The following list explains the available NMEA sentences:

- RD1: Correction diagnostic message output
- DTM: Datum reference
- GBS: Satellite fault detection used for RAIM
- GGA: Detailed GPS position information
- GLL: Latitude and longitude data
- GNS: Fix data for a single or combined satellite navigation system
- GRS: GNSS range residuals
- GSA: GPS DOP and active satellite information
- GST: GNSS pseudorange error statistics
- GSV: GNSS satellites in view
- RMC: Recommended minimum specific GNSS data
- RRE: Range residual message.
- VTG: Course over ground and ground speed.
- ZDA: UTC time and date information

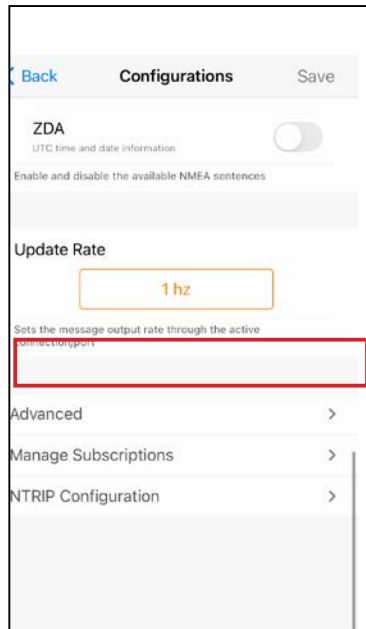
Update Rate



You can specify your preferences for the update rate.

Note: At higher data rates, we recommend turning off messages not required for your application, such as GNS, RRE, and VTG messages.

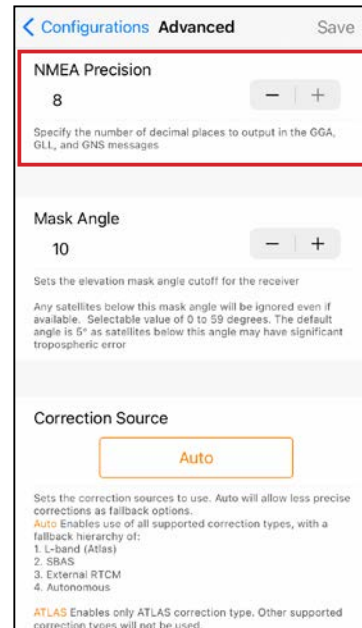
To upgrade the update rate, see [5.5.4 Upgrade Geode](#) on page 57.



The Advanced screen allows you to configure the following advanced settings for the Geode.

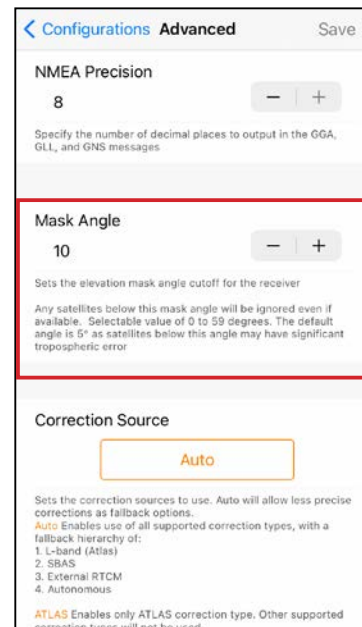
- NMEA Precision
- Mask Angle
- Correction Source
- SBAS
- Receiver Mode
- Battery Status Sentence
- Receiver Reset

NMEA Precision



This specifies the number of decimal places to output in the GGA, GLL, and GNS messages.

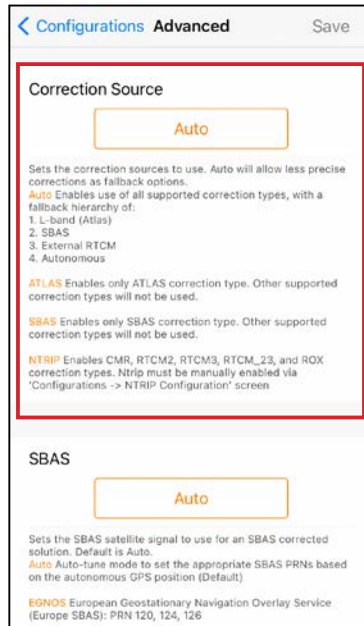
Mask Angle



This specifies the elevation mask angle cutoff for the receiver. Any satellites below this angle will be ignored, even if they are available.

Note: Changes saved on this screen are changes made to the Geode receiver, not Geode Connect. This means that these changes crossover and are effective in other navigational and data-collecting apps.

Correction Source



This specifies whether the Geode should automatically choose its correction source or accept only SBAS, NTRIP, or Atlas corrections. When the correction source is set to Auto, the Geode is programmed to choose a source according to accuracy level in the order of Atlas, SBAS, then NTRIP.

If it fails to reconnect (usually after about two minutes), it will default to an SBAS corrected solution.

Note: If this happens in the middle of collecting data, it may create significant error between positions because different correction sources use different reference datum.

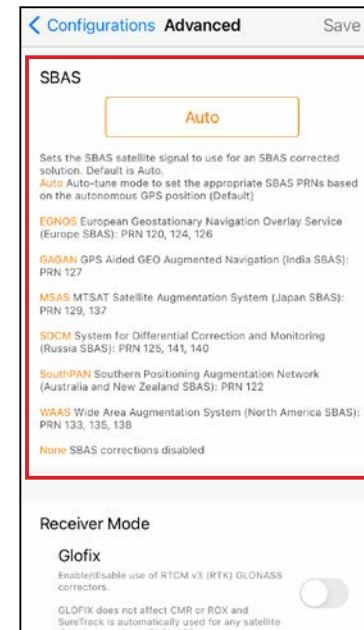
Manually selecting a correction source overrides the Geode's default settings. If NTRIP is selected, the Geode will use NTRIP, but if it loses the NTRIP signal, it will default to an autonomous (uncorrected) solution.

If the Geode is accepting SBAS corrections and it loses its signal, it will always default to an autonomous solution.

If Atlas is selected, the Geode will use Atlas correction and if it loses the signal, it will default to an autonomous solution.

When the Geode is configured to use an NTRIP service, Geode Connect does not automatically select NTRIP as the only correction source. When using NTRIP, the best practice is to manually select NTRIP as the only correction source.

SBAS

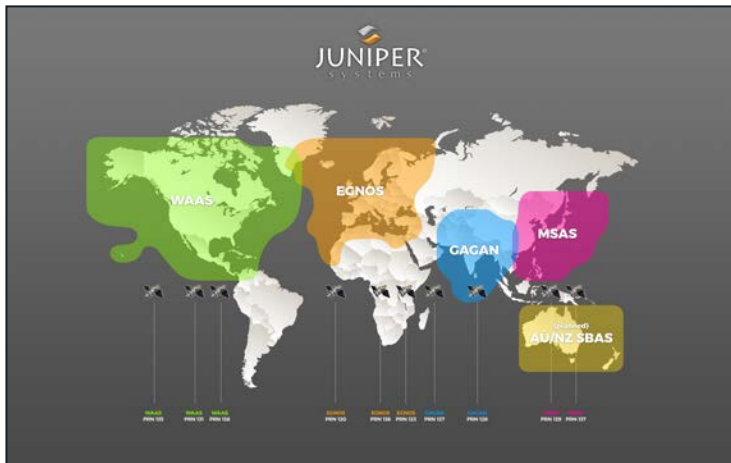


This specifies which SBAS satellites the Geode should use for GPS correction. Usually, selecting Auto is sufficient because the various SBAS services cover different geographical areas. However, there are some areas where these services overlap (see map below).

For example, if you are collecting corrected GPS positions in the Northeastern United States, the Geode may be receiving SBAS corrections from WAAS or EGNOS. If the receiver is set to Auto, it may even jump back and forth between the two.

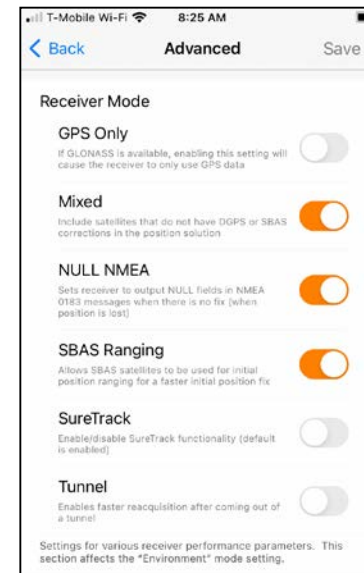
The two services use different reference datum or models. Switching between them can cause significant error between different points of data.

In areas of overlap, the best practice is to select a specific SBAS service the Geode should accept corrections data from.



- Auto: Sets the appropriate SBAS PRNs based on the autonomous GPS position.
- EGNOS: European Geostationary Navigation Overlay Service (Europe SBAS) PRN 120, 124, 126
- GAGAN: GPS Aided GEO Augmented Navigation (India SBAS) PRN 127
- MSAS: MTSAT Satellite Augmentation System (Japan SBAS) PRN 129, 137
- SDCM: System for Differential Correction and Monitoring (Russia SBAS) PRN 125, 141, 140
- SouthPAN: Southern Positioning Augmentation Network (Australia and New Zealand SBAS) PRN 122
- WAAS: Wide Area Augmentation System (North America SBAS) PRN 133, 135, 138
- None: SBAS corrections disabled.

Receiver Mode



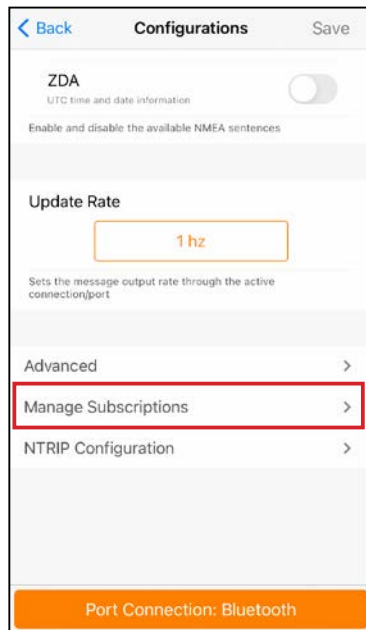
These options affect how the Geode collects and processes positioning information, as well as how it outputs certain types of data.

- **GPS Only:** Enabling this option tells the receiver to only accept signals from GPS satellites. It stops receiving all GNSS signals as long as this box is checked. This may be a useful option in open areas with little interference, particularly if you are trying to preserve battery life.
- **Mixed:** Enabling this option (default) tells the receiver to use all GNSS satellite signals available to calculate the position solution. This includes non-GPS satellites, which do not have DGPS or SBAS corrections. Certain NTRIP services do provide corrections for non-GPS satellites. For most applications, Mixed is the best choice, particularly if there is a lot of interference.
- **NULL NMEA:** This option is available because different navigational apps interpret NULL messages differently. As a default, when the Geode loses its position (cannot get a fix), it sends out a NULL NMEA message. Some apps interpret this NULL message to mean that the Geode's position is (0°, 0°), which is west of Africa in the Atlantic Ocean. If the app you are using starts showing your position as (0°, 0°), deselecting this option will most likely correct the problem.

The two Almanac messages from the GPS satellites alternate every 12.5 minutes. After a receiver reset, the best practice is to turn on the Geode and wait 25 minutes to ensure a complete Almanac has been stored.

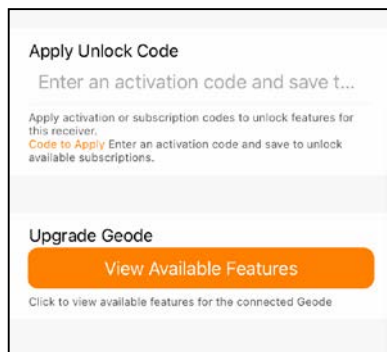
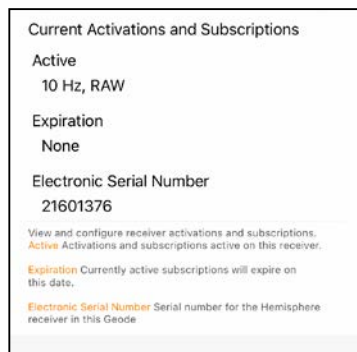
! CAUTION: Resetting the receiver cannot be undone.

Manage Subscriptions

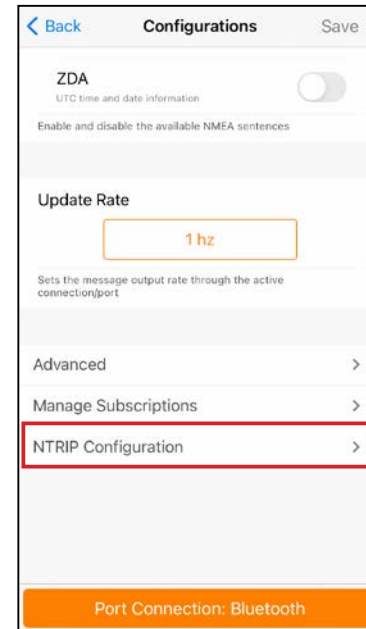


GNS3M devices offer a subscription to Atlas. This screen allows you to view the details of your current subscription, apply unlock codes, and view the subscriptions that are available for activation.

Tap **View Available Features** to apply upgrades to the Geode. For more information, see [5.5.4 Upgrade Geode](#) on page 57.



Configure NTRIP



This page is where you enter the information supplied by your NTRIP service provider, including the caster IP address, port, username, and password.

Note: NTRIP settings are stored in the Geode Connect app, not in the Geode receiver.

As stated in [2.3.2 NTRIP Differential Correction](#) on page 11, NTRIP is a useful protocol for precise correction of real-time positioning solutions.

The Geode is able to calculate an RTK float position with decimeter-level accuracy. NTRIP services do require an internet or cell data connection (via your mobile device) and usually involve either a free or paid subscription to the service.

If you have a subscription to an NTRIP service, Geode Connect will allow you to configure the Geode to use that service.

*Note: Changes must be saved in order for them to remain from screen to screen. To save changes, tap **Save** in the upper right corner before you leave this screen.*

To establish an NTRIP connection:

1. Make sure that the iPhone or iPad you are using to host Geode Connect has a data connection.
2. Enter the identifying information supplied by your NTRIP service provider.

3. Verify “Send GGA to Caster” is checked. This tells the Geode to send its position to the caster so that the caster can locate the mount points closest to the Geode’s position.
4. Tap **Save**.
5. Tap **Download Mount Points**.
6. Tap on the drop-down menu in the Mount Points section.

This will open a list of mount points in the network close to the Geode’s position. The prefix ‘SB’ means ‘single baseline,’ which will connect the Geode with a single baseline caster. All other prefixes indicate networked baselines.

The closer the mount point, the more precise your positioning solution will be.

7. Choose the appropriate mount point.
8. Tap **Save**.
9. Tap **Start NTRIP**.

When NTRIP is connected and working, the word NTRIP and a closed green plug will appear on the right side of the Home page. You can tap on this icon to return to the NTRIP configuration screen at any time.



If NTRIP appears on the home page with an open orange plug, the Geode is still trying to establish a connection to the NTRIP service. The connection might take a while. If the Geode has trouble connecting, try selecting a different mount point.



To turn off NTRIP, tap the NTRIP icon in the upper right corner to go to the NTRIP Configuration screen. Select **Stop NTRIP**.

5.5.4 Upgrade Geode

On the Upgrade Geode screen you can request a quote for upgrades, activate your upgrades, or extend a subscription.



You can apply upgrades via activations or subscriptions.

- **Activations** include a one-time upgrade to apply a new feature to the product. The available activations include increased output rates, multi-frequency, and Atlas basic L-band corrections.
- **Subscriptions** include time-based purchases of an H10 or H30 Atlas L-band correction service.

This screen can also be accessed from under Receiver Configurations > Manage Subscriptions. See [Manage Subscriptions](#) on page 54 for more information.

Request a Quote

To request an activation or subscription quote,

1. Select the check box next to one or more activation or subscription.

2. Select **Next**.

Note: If you have a single-frequency Geode, the only activations available are 10 Hz and 20 Hz.

3. Enter your contact information.

4. Tap **Next**.

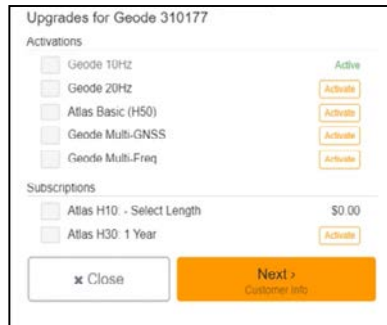
5. On the Quote Summary screen, verify your information is correct and then select **Send Now**.

An email requesting your quote will be sent to Juniper Systems and a representative will contact you.

When the request email is sent, you will receive a Quote Reference Code. This code can be used to reference your request if you encounter any problems and need to contact Juniper Systems.

Activate Upgrade

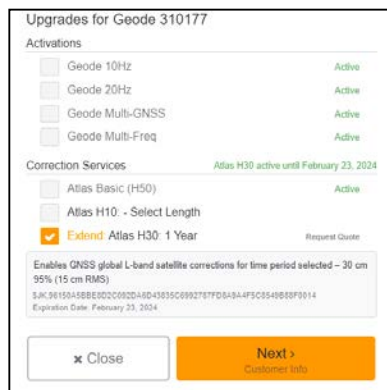
If you have already purchased an activation or subscription you will need to activate it in Geode Connect.



1. Verify your device is connected to the GNS3 and the internet.
2. In the activations list, tap the yellow activate option next to the upgrade you would like to activate.

Extend a Subscription

To extend your current subscription,

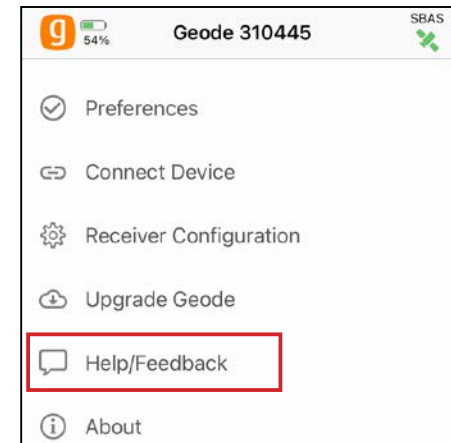


1. Select the check box next to your subscription. It will be marked with a yellow "Extend."
2. Select **Next**.
3. Request a quote for the subscription by following the process listed in the **Request a Quote** section above.

If you purchased the subscription previously, you can activate the subscription for your GNS3 on this screen as well.

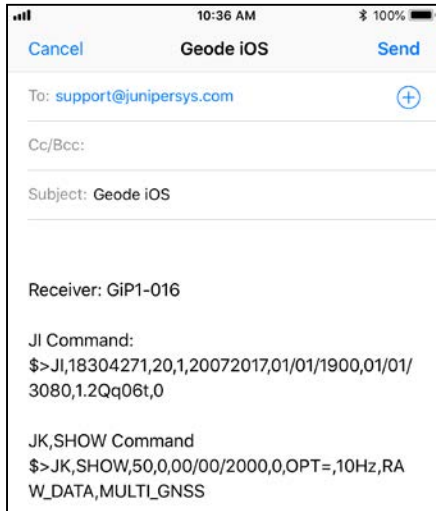
5.5.5 Request Help and Send Feedback

This feature links directly with the email account configured to the iPhone or iPad and opens an email addressed to Juniper Systems Support.



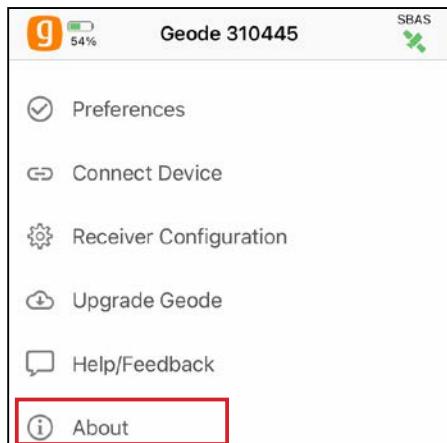
The email includes detailed configuration commands from the Geode. This allows Juniper Systems Support to diagnose and solve the problem more efficiently. This info is also used when purchasing a feature upgrade for the Geode.

You can enter additional information into the email to provide a further explanation about your issue.



5.5.6 About

The About page shows the Geode Connect version currently in use.



6

SET UP GEODE CONNECT FOR ANDROID



6. Set Up Geode Connect for Android

As a configuration and communication utility for the Geode GNS3 GPS Receiver, Geode Connect provides you with the ability to establish communications with the Geode; change receiver settings; and view position, altitude, estimated horizontal error, differential status/fix information, speed, heading, satellites in fix, correction signal, and PDOP.

This chapter gives an overview of the features included in Geode Connect for Android. It gives details about specific settings that can optimize the Geode's precision, accuracy, and reliability, depending on the situation and environment. It also gives specific instructions about the nuances of using the Geode with the Android operating system and third-party apps.

6.1 Download and Install

Geode Connect is available for download on Google Play and the Juniper Systems website.

6.1.1 Google Play

Search for Geode Connect on Google Play. Install according to device instructions.

6.1.2 Juniper Systems Website

If your device cannot access Google Play, the app is also available on the Juniper Systems website.

1. Go to www.junipersys.com/support/geode/downloads.
2. Select Geode Connect for Android.
3. Download the APK file and follow the instructions on your device to install the app.

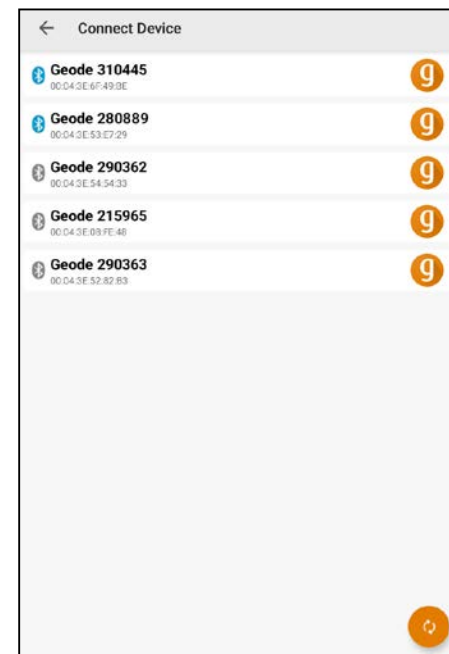
6.2 Connect with the Geode

Android devices can use Bluetooth to pair with the Geode directly in Geode Connect:

1. Power on the Geode.
2. Make sure Bluetooth wireless is enabled on your Android device.
3. Open Geode Connect.
4. Tap the Geode icon with a slash through it in the top left corner. Tapping this icon will allow you to connect, disconnect, or change your device.




If the Android device was paired to the Geode previously, it will connect automatically.



The app will display a list of local Bluetooth wireless devices. Identify your Geode via the serial number printed on its bottom panel.

5. Tap on the name of the Geode you wish to pair with.

Note: If your Geode doesn't show up in the list of devices, check to make sure it is turned on and not paired with another device. Then tap the refresh icon at the bottom of the list of devices .

6. Follow the prompts to finish pairing the Geode with your device.

7

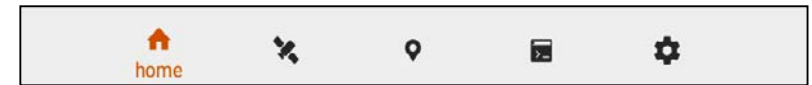
LEARN GEODE CONNECT FOR ANDROID



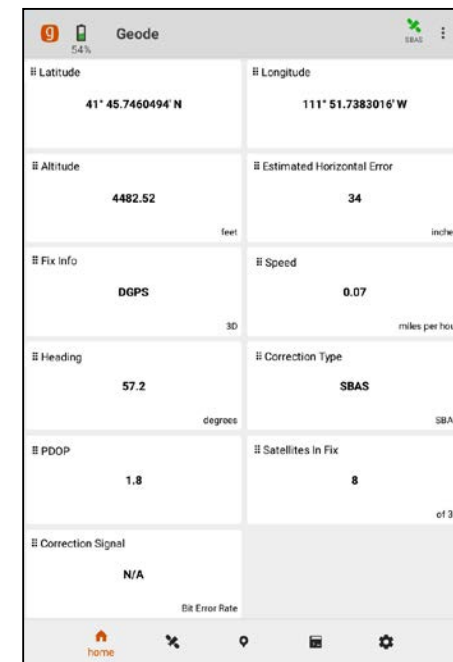
7. Learn Geode Connect for Android

Geode Connect is a utility app that allows you to customize and fine-tune the Geode to your specific project or application. Each page in Geode Connect serves one of three primary functions: configuration of the Geode, validation of Geode accuracy, or changing Geode Connect settings. Though it does have some limited data-capture features, these are included only for demonstration purposes. Geode Connect is not intended to replace your data-collection app.

7.1 Home Page



The Home page for Geode Connect serves as a dashboard for the Geode receiver. On this page, you can view connection status, correction mode, and position data. It displays latitude, longitude, altitude, estimated horizontal error, fix info (GPS, DGPS, RTK, etc.), speed, heading, number of satellites in fix, PDOP, correction type, and correction signal. You can drag and drop each box to reorganize the screen to your preference.



From the toolbar at the bottom of the screen, you can access the Skyplot, Location, Terminal, and Settings pages.

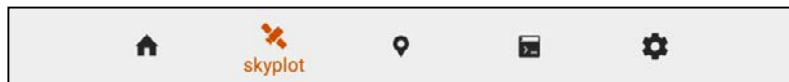
Tapping on the orange Geode icon in the top left corner will allow you to disconnect or change your receiver.



Next to the icon you will see the battery charge indicator, the name of the Geode you are connected to, and the active correction type (SBAS, NTRIP, or Atlas). The satellite icon in the top right corner will tell you which correction service you are using and it will turn green when you are connected. If the RD1 message is enabled, the satellite icon color will change relative to the signal quality. For more information see, [2.3.3 Atlas Correction Service](#) on page 12.

The vertical menu in the upper right corner provides a drop-down menu with the options found on the Settings page: Preferences, Connect Device, Receiver Configuration, Upgrade Geode, Help/Feedback, and About. For more information about these options, see [7.5 Settings Page](#) on page 79.

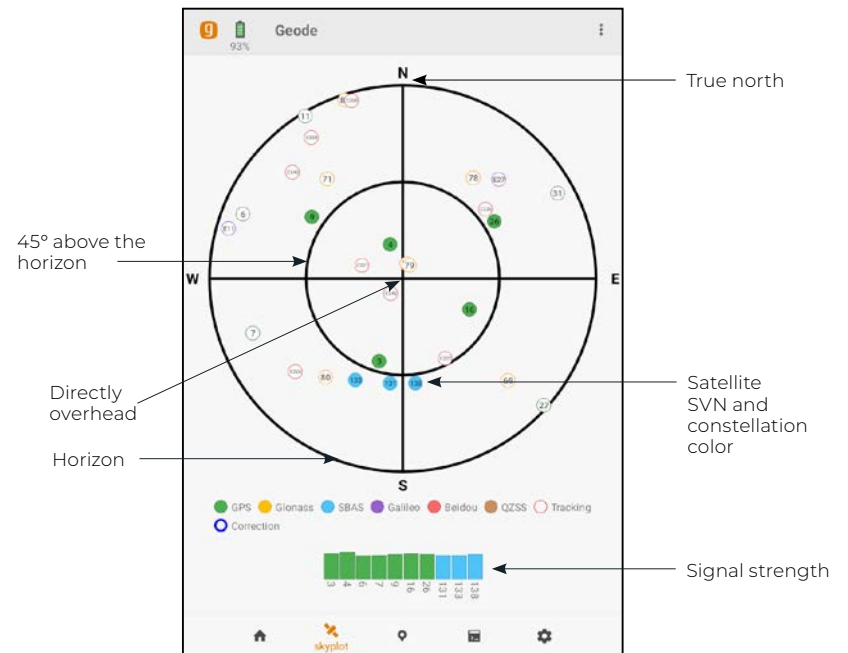
7.2 Skyplot Page



The Skyplot page shows which satellites are being used in the positioning solution and where they are in the sky. It also shows satellites that are being tracked by the Geode.

On the Skyplot page, each satellite is identified by a space vehicle number (SVN) and color for its constellation. The location of each satellite on the skyplot indicates where it resides in the sky overhead relative to true north. The outside ring is 0° elevation (horizon). The inside ring is 45° elevation—halfway above the horizon from the Geode's present location. The intersection of the two lines indicates directly overhead.

Satellite symbols outlined in red indicate the satellites that are being tracked, but they are not yet a part of the positioning solution. Satellite symbols outlined in blue indicate that a correction is being applied to the signal.



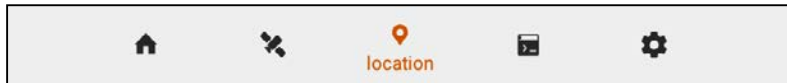
The Skyplot page is meant to be used as a guide. It shows the relative visibility of satellites in the sky, but it is not an absolute reference for satellites used in the positioning solution.

Multi-GNSS Geode models support the Galileo, BeiDou, GPS, QZSS, SBAS, and GLONASS constellations.

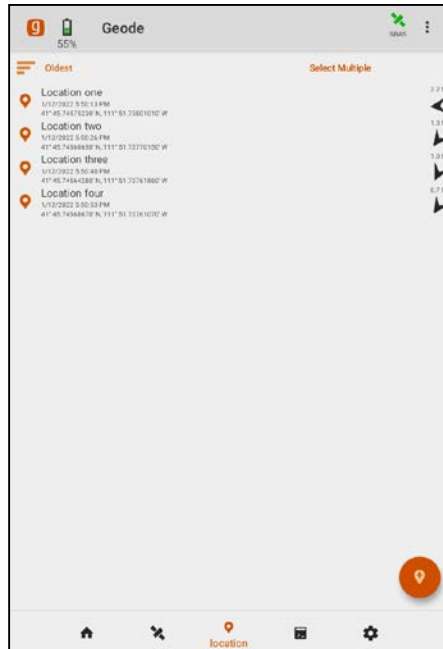
If the Skyplot page is not displaying data:

1. Go to the Settings page by tapping the gear icon in the navigation bar.
2. Under Active GNSS Constellations, select **Multi-GNSS**.
3. Under NMEA Sentences, select **GSV**.
4. Tap the save icon .

7.3 Location Page




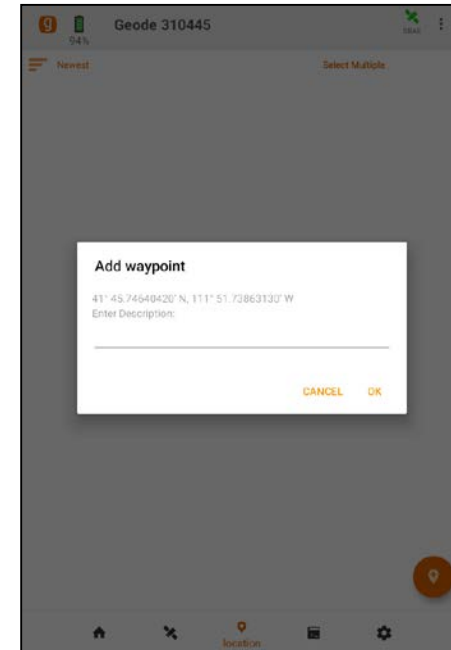
The Location page includes the waypoint capture screen, which allows you to demonstrate point capture and share captured data as CSV, KML, or KMZ files. This feature allows you to validate the accuracy of the Geode without requiring the use of a third-party app.



7.3.1 Capture Waypoints

Note: Geode Connect for Android only records waypoints if the following NMEA sentences are activated: GSA, RRE, and GGA. See [NMEA Sentences](#) on page 88 for instructions on how to enable NMEA sentences.

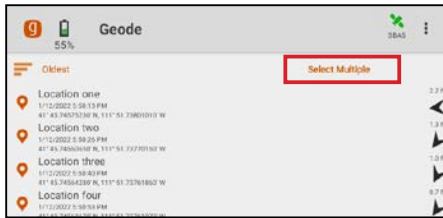
1. With the Geode in the position you would like to capture, tap the plus icon .



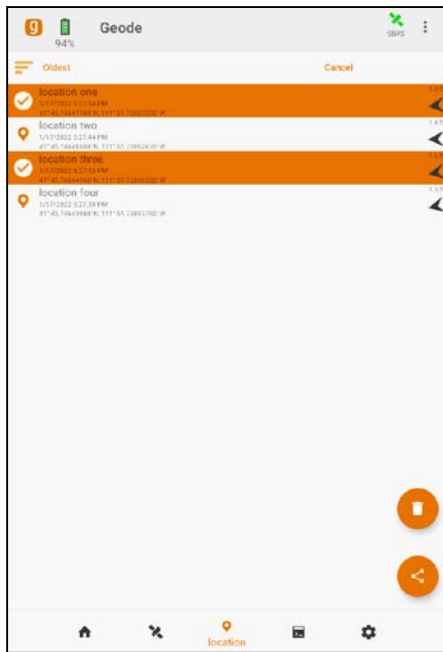
2. Type a description or name for the waypoint (optional).
3. Tap **OK**.


7.3.2 Delete Waypoints

1. In the upper right corner, tap **Select Multiple**.



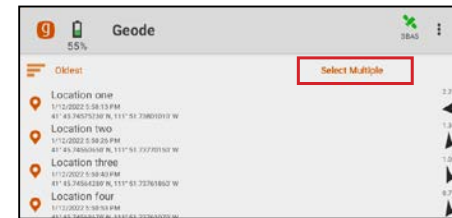
2. Select the waypoint(s) you want to delete.



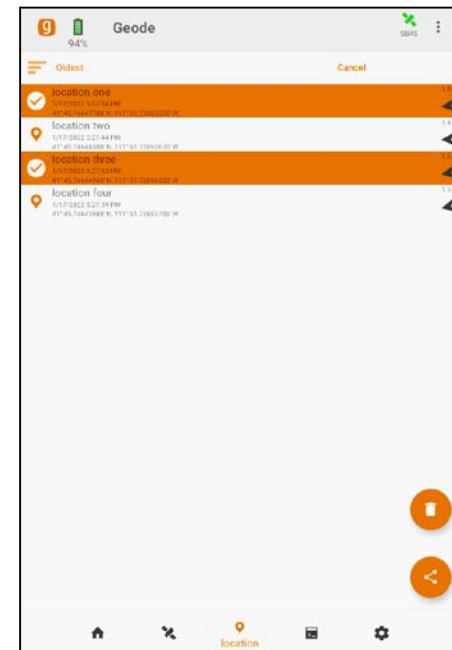
3. Tap the trash icon .
4. Tap **Delete**.

7.3.3 Share Waypoints

1. In the upper right corner, tap **Select Multiple**.

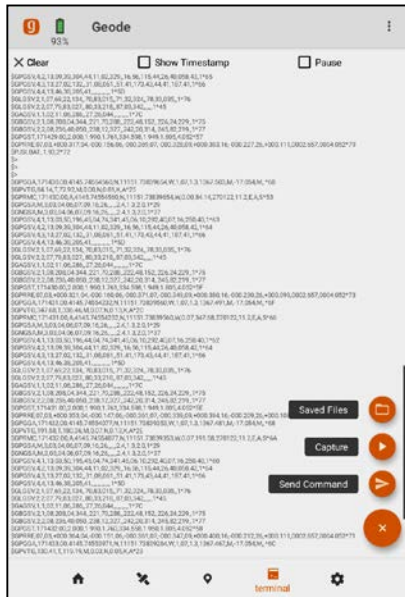





2. Select the Waypoint(s) you want to share.



3. Tap the share icon .


Tap the plus icon  to reveal the following options:



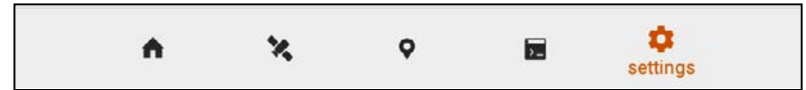
- To capture data received by the Geode, tap the play icon . Tap it again to stop logging data.
- To view saved data logging files, tap the folder icon . Tap the three vertical dots to the left of a log file to delete or share it.
- To send a command to the Geode, tap the command icon . The dialog box will offer Show/Hide Log as the default command.

For a comprehensive list of commands and messages that can be used to configure the Geode, please refer to technical documentation provided by Hemisphere GNSS.

1. Go to <https://hemispheregnss.com/> > **Resources & Support** > **Technical Documentation**.
2. Select the **Technical Reference Manual** (it may include a version number).

 **CAUTION:** Use at your own risk. It is possible to cause communication or other errors in the Geode that may require technical assistance to repair.

7.5 Settings Page

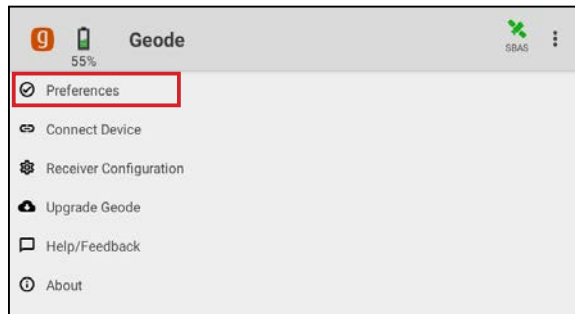


The Settings page provides options for the configuration of the Geode receiver and Geode Connect settings. These options are listed below:

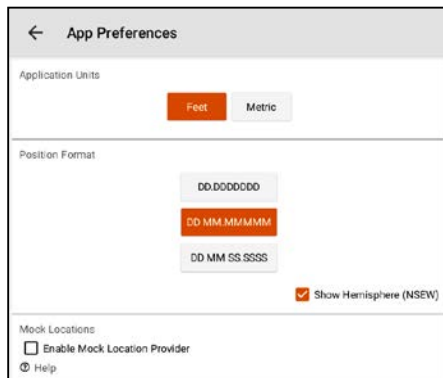
- **Preferences** on page 80
 - *Enable Mock Locations* on page 81
- **Connect Device** on page 85
- **Receiver Configuration** on page 85
 - *Active GNSS Constellations* on page 87
 - *NMEA Sentences* on page 88
 - *Update Rate* on page 89
 - **Advanced** on page 89
 - ▶ *NMEA Precision* on page 90
 - ▶ *Mask Angle* on page 90
 - ▶ *Correction Source* on page 91
 - ▶ *SBAS* on page 92
 - ▶ *Receiver Mode* on page 93
 - ▶ *Battery Status Sentence* on page 95
 - ▶ *Receiver Reset* on page 96
 - *Manage Subscriptions* on page 97
 - *NTRIP Configuration* on page 98
- **Upgrade Geode** on page 101
- **Request Help and Send Feedback** on page 105
- **About** on page 106


7.5.1 Preferences

The Preferences page allows you to customize your preferences for how information is displayed in Geode Connect.



Under Preferences, you can change the application units, position format, specify whether or not the app will show the hemisphere, or enable mock locations.



Note: Changes must be saved in order for them to remain from screen to screen. If the save icon in the lower right corner of the screen is orange, this means there has been a change that needs to be saved. Tap the save icon to save changes .

Enable Mock Locations

When using the Geode with Android devices, some third-party mapping and data-collection apps connect directly with the Geode through the Bluetooth wireless port. Some apps depend on the Android operating system to provide positioning data.

If you are using the Geode, it is because your project demands real-time, sub-meter, sub-foot, or decimeter accuracy. However, if your app is depending on the operating system of your device, it may be collecting data via the consumer-grade receiver in your phone or tablet—not the Geode.

The best way to figure out where your app is getting its positioning data is to take a moment to examine the app. If the app allows you to directly choose an external receiver, you can select the Geode and trust the app will rely on the Geode. If the app provides no option for choosing an external receiver, it is most likely relying on the Android operating system for its data. You will need to activate Geode Connect as a mock location provider in order for the app to collect data via the Geode. To do this, you will need to enable developer options in the Android OS, configure Geode Connect as a mock location provider, and test the mock location provider.

Enable Developer Options in the Android OS

Changing the mock location provider is a developer option. All developer options in Android are disabled and hidden by default. The first thing you have to do is tell Android that you are a developer:

1. From the Android home page, go to **Settings > About phone (or About Tablet)**.
2. Tap **Build Number** seven (yes, seven) times. This will unlock the Developer options.



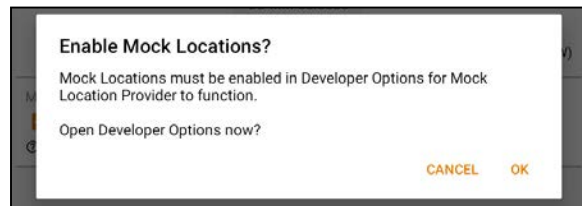
*Note: **Build Number** may not look like you can tap on it. Tap on it anyway. After three taps, Android will prompt you to continue becoming a developer.*

Once you are a developer, close the Android settings and open Geode Connect.

Configure Geode Connect as a Mock Location Provider

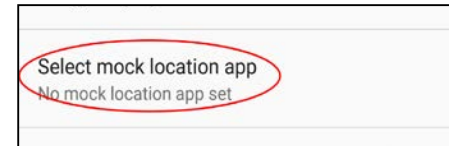
In order for the data received by the Geode to replace the data being received by the device's GPS receiver, you will need to set up Geode Connect as a mock location provider:

1. In Geode Connect, go to **Menu > Preferences**.
2. Select the box for **Enable Mock Location Provider**. Geode Connect will prompt you to open Developer Options.
3. Tap **OK**.

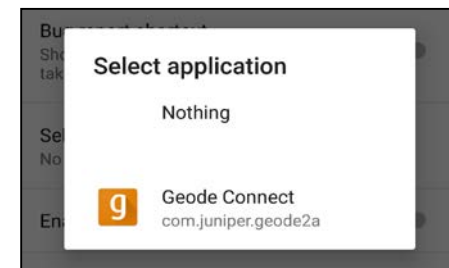


Geode Connect will open Developer Options so that you can set the mock location provider.

4. Tap **Select mock location app**. (In older versions of Android, the option will be **Allow mock locations**, and it will not ask you for a specific app.)



5. Tap **Geode Connect** in the list of possible apps.



6. Tap the Android back button to return to Geode Connect.

Test Mock Location Provider

After configuring Geode Connect as your mock location provider, test to make sure your app is now getting its data from the Geode.

Both of the following tests require that the Geode is on and has had time to build its initial almanac, usually 25 minutes after it has been turned on for the first time outside.

One-Person Test:

1. Connect the Geode to your Android device via Bluetooth wireless technology in Geode Connect.
2. Verify that Geode Connect has been set as the mock location provider.
3. Leave Geode Connect open.

4. Place the Geode in one stationary position. Do not move it.
5. Open your mapping or data-collection app.
6. Holding your phone or tablet, walk five to ten paces out and then walk in a circle around the Geode.

If the position in the data-collection app does not change significantly (remember, the Geode is just sitting there), the app is drawing its data from the Geode. You can continue to use the app and the Geode without any worries.

If the position moves in a circle, the app is drawing its data from your Android device's internal GPS receiver. Return to page 81 and make sure all mock location provider settings have been properly configured.

Two-Person Test:

One person holds the Geode, and the other person holds the Android device.

1. Connect the Geode to your Android device via Bluetooth wireless technology in Geode Connect.
2. Verify that Geode Connect has been set as the mock location provider.
3. Leave Geode Connect open.
4. Open your mapping or data-collection app.
5. The person holding the Android device remains stationary.
6. The person holding the Geode walks five to ten paces out and then walks in a circle around the person holding the Android device.

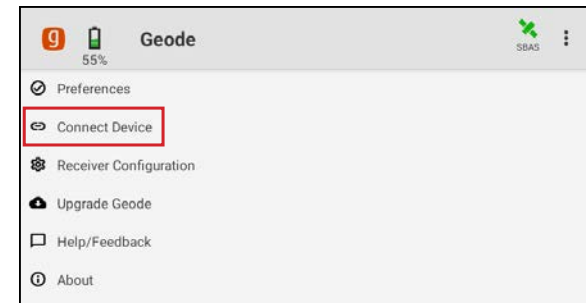
If the position moves in a circle, the app is drawing its data from the Geode and the mock location provider is functioning as it should.

If the position does not change, the app is drawing its data from your Android device's internal GPS receiver. Return to page 82 and make sure all mock location provider settings have been properly configured.

7.5.2 Connect Device

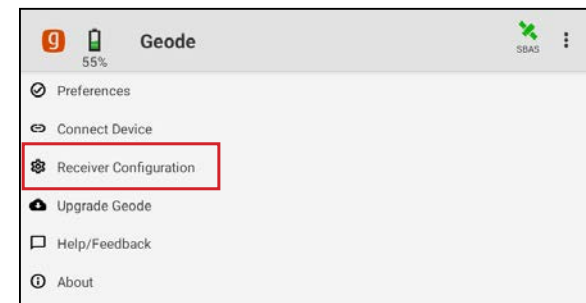
The Connect Device page allows you to connect your Android device to the Geode.

For more information, see [6.2 Connect with the Geode](#) on page 65.



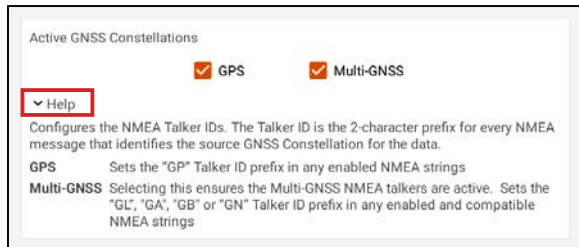
7.5.3 Receiver Configuration

Note: The following pages and options are only available if you are actively connected to a Geode receiver. Changes saved on these screens are changes made to the Geode receiver, not Geode Connect. This means that these changes crossover and are effective in other navigational and data-collecting apps.

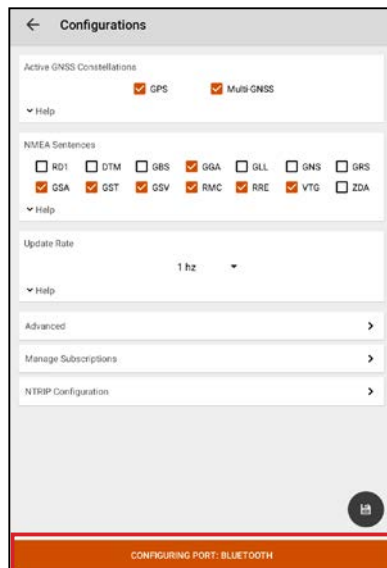


The Receiver Configuration page allows you to configure the Geode according to the specific needs of your project or application.

Tap **Help** to reveal detailed descriptions of the options available with the specific settings.



Port Connection



The Geode remembers its settings *per connection type*. You can use the Port Connection option to configure these settings for each connection type, without physically switching the connection for the Geode.

1. Tap **Port Connection** to access the menu with the port options.
2. Select the port you would like to configure.
3. Change the settings as desired and tap **Save**.

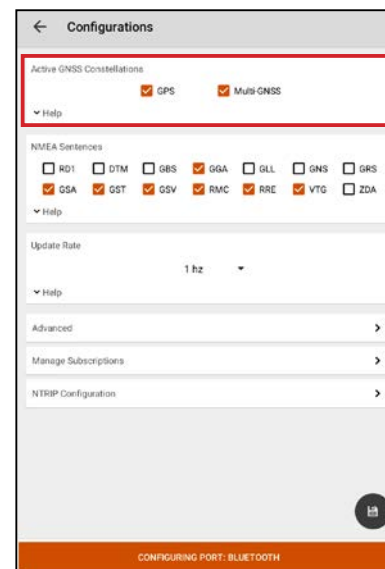
These changes will then be set for each time you connect using that specific port.

This affords you a certain amount of flexibility in the field. If you have multiple uses for the Geode and would prefer not to reconfigure it each time you switch tasks, the Geode can be configured per connection type for specific tasks.

For example, here are three different possible use cases for the same Geode.

- Use Case 1: Mounted on a pole for data collection on foot in heavy tree canopy.
 - Bluetooth wireless connection settings optimized for slow travel and GNSS (more potential satellites in view through the trees).
- Use Case 2: Mounted in the cab of a truck for carefully locating previously marked research sites.
 - USB connection settings optimized for slower travel and NTRIP correction.
- Use Case 3: Mounted on a fast moving four wheeler on rolling hills with open sky.
 - RS-232C connection settings optimized for speed and unobstructed open sky.

Active GNSS Constellations



You can choose which GNSS constellations to use in your solution: GPS and/or Multi-GNSS.

NMEA Sentences



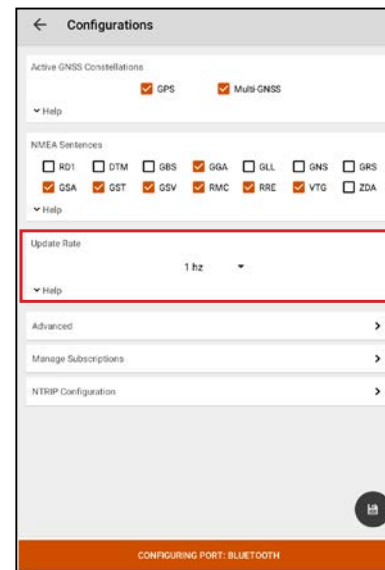
You can choose which NMEA sentences you want the Geode to receive. In most instances, the default NMEA sentences will be sufficient for your project or application.

Note: Changes must be saved in order for them to remain from screen to screen. If the save icon in the lower right corner of the screen is orange, this means there has been a change that needs to be saved. Tap the save icon to save changes.

The following list explains the available NMEA sentences:

- RD1: Correction diagnostic message output
- DTM: Datum reference
- GBS: Satellite fault detection used for RAIM
- GGA: Detailed GPS position information
- GLL: Latitude and longitude data
- GNS: Fix data for a single or combined satellite navigation system
- GRS: GNSS range residuals
- GSA: GPS DOP and active satellite information
- GST: GNSS pseudorange error statistics
- GSV: GNSS satellites in view
- RMC: Recommended minimum specific GNSS data
- RRE: Range residual message
- VTG: Course over ground and ground speed
- ZDA: UTC time and date information

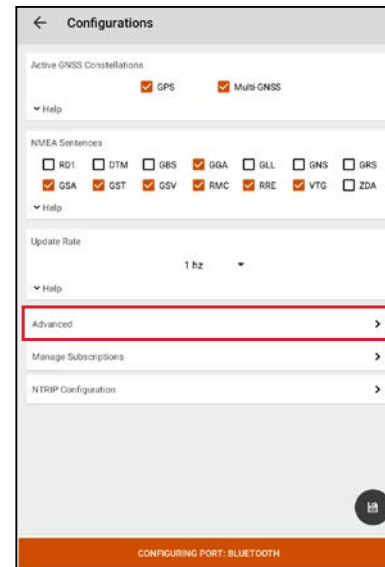
Update Rate



The update rate sets the message output rate through the active port.

To upgrade the update rate, see [7.5.4 Upgrade Geode](#) on page 101.

Advanced

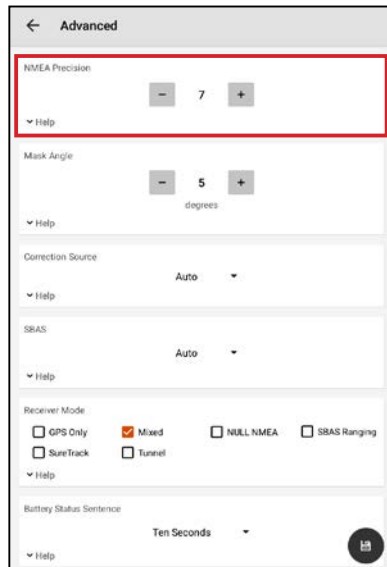


The Advanced screen allows you to configure the following advanced settings for the Geode.

- NMEA Precision
- Mask Angle
- Correction Source
- SBAS
- Receiver Mode
- Battery Status Sentence
- Receiver Reset

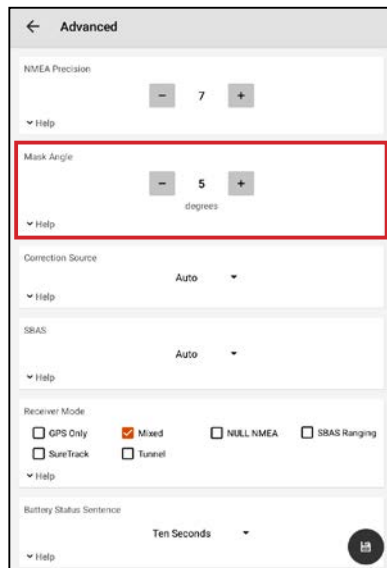
Note: Changes saved on this screen are changes made to the Geode receiver, not Geode Connect. This means that these changes crossover and are effective in other navigational and data-collecting apps.

NMEA Precision



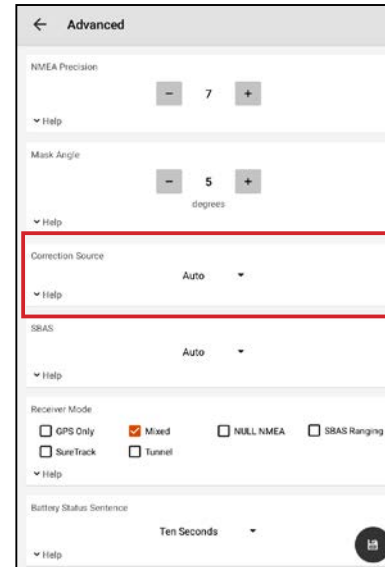
Specify the number of decimal places to output in the GGA, GLL, and GNS messages.

Mask Angle



Specifies the elevation mask angle cutoff for the receiver. Any satellites below this angle will be ignored, even if available.

Correction Source



This specifies whether the Geode should automatically choose its correction source or accept only SBAS, NTRIP, or Atlas corrections. When the correction source is set to Auto, the Geode is programmed to choose a source according to accuracy level in the order of Atlas, SBAS, then NTRIP.

If it fails to reconnect (usually after about two minutes), it will default to the next available correction.

Note: If this happens in the middle of collecting data, it may create significant error between positions because different correction sources use different reference datum.

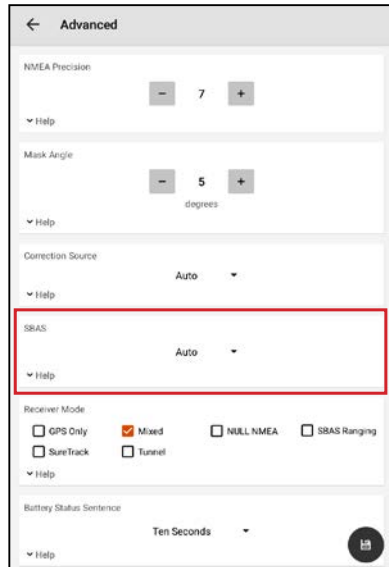
Manually selecting a single correction source overrides the Geode's default settings. If NTRIP is selected, the Geode will use NTRIP, but if it loses the NTRIP signal, it will default to an autonomous (uncorrected) solution.

If the Geode is accepting SBAS corrections, and it loses its signal, it will always default to an autonomous solution.

If Atlas is selected, the Geode will use Atlas correction, and if it loses the signal it will default to an autonomous solution.

When the Geode is configured to use an NTRIP service, Geode Connect does not automatically select NTRIP as the only correction source. When using NTRIP, the best practice is to manually select NTRIP as the only correction source.

SBAS

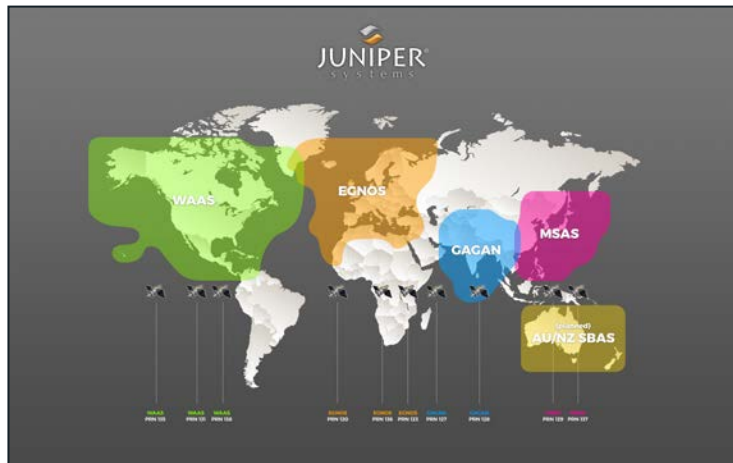


This specifies which SBAS satellites the Geode should use for GPS correction. Usually, selecting Auto is sufficient, since the various SBAS services cover different geographical areas. However, there are some areas where these services overlap (see map below).

For example, if you are collecting corrected GPS positions in the Northeastern United States, the Geode may be receiving SBAS corrections from WAAS or EGNOS.

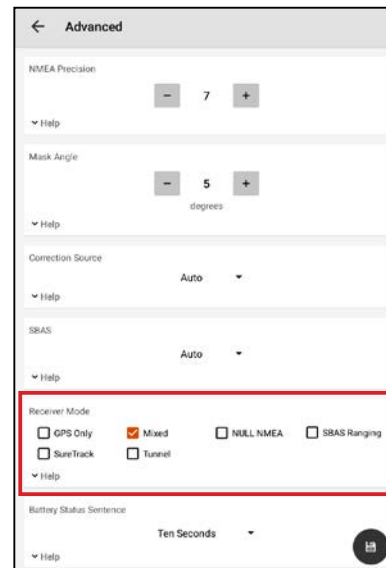
If the receiver is set to Auto, it may even jump back and forth between the two. The two services use different reference datum models. Switching between them can cause significant error between different points of data.

In areas of overlap, the best practice is to select a specific SBAS service the Geode should accept corrections data from.



- Auto: Sets the appropriate SBAS PRNs based on the autonomous GPS position.
- EGNOS: European Geostationary Navigation Overlay Service (Europe SBAS) PRN 120, 124, 126
- GAGAN: GPS Aided GEO Augmented Navigation (India SBAS) PRN 127
- MSAS: MTSAT Satellite Augmentation System (Japan SBAS) PRN 129, 137
- SDCM: System for Differential Correction and Monitoring (Russia SBAS) PRN 125, 141, 140
- SouthPAN: Southern Positioning Augmentation Network (Australia and New Zealand SBAS) PRN 122
- WAAS: Wide Area Augmentation System (North America SBAS) PRN 133, 135, 138
- None: SBAS corrections disabled.

Receiver Mode

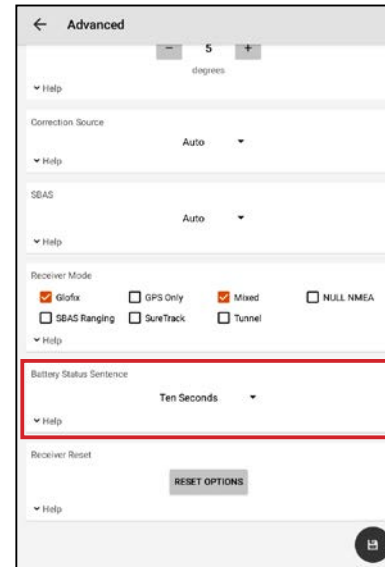


These options affect how the Geode processes positioning information and outputs certain types of data.

- **GPS Only:** Enabling this option tells the receiver to only accept signals from GPS satellites. It stops receiving all GNSS signals as long as this box is checked. This may be a useful option in open areas with little interference, particularly if the user is trying to preserve battery life.
- **Mixed:** Enabling this option (default) tells the receiver to use all GNSS satellite signals available to calculate the position solution. This includes non-GPS satellites, which do not have DGPS or SBAS corrections. Certain NTRIP services do provide corrections for non-GPS satellites. For most applications, Mixed is the best choice, particularly if there is a lot of interference.
- **NULL NMEA:** This option is available because different navigational apps interpret NULL messages differently. As a default, when the Geode loses its position (cannot get a fix), it sends out a NULL NMEA message. Some apps interpret this NULL message to mean that the Geode's position is (0°, 0°), which is west of Africa in the Atlantic Ocean. If the app you are using starts showing your position as (0°, 0°), deselecting this option will most likely correct the problem.
- **SBAS Ranging:** When this option is enabled, it tells the receiver to treat SBAS satellites as GPS satellites. Doing so has the potential to speed up the initial position fix. However, SBAS satellites operate in a time system distinct from that of the GPS satellites, so a position solution that includes SBAS satellites may be less accurate than a GPS-only or GNSS-only solution. The recommendation is to enable this option to speed up the initial position fix and to disable it for improved accuracy.
- **SureTrack:** This is proprietary technology that improves the Geode's sub-meter, sub-foot, or decimeter precision and accuracy. The recommendation is to always leave this option checked.
- **Tunnel:** This option enables faster reacquisition after coming out of a tunnel. Use it as needed.

Note: Changes must be saved in order for them to remain from screen to screen. If the save icon in the lower right corner of the screen is orange, this means there has been a change that needs to be saved. Tap the save icon to save changes

Battery Status Sentence

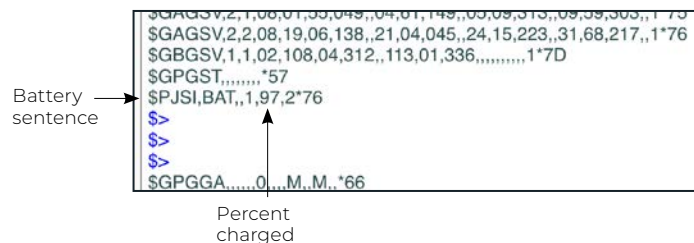


This gives the option to choose how frequently the Geode sends a battery status message.

The message is used by Geode Connect and other applications to display the battery capacity status. The default setting is 10 seconds.

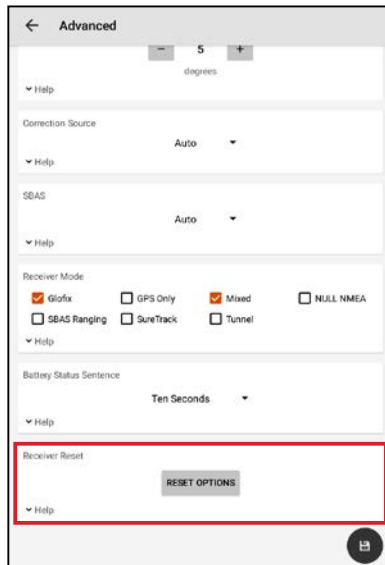
The message is sent out from the Geode as a custom message along with the NMEA strings. The message is visible in the terminal page, as are all other NMEA messages and commands.

In Geode Connect, the battery status sentence looks like this:



This sentence may not be recognized by some navigation or data-collection apps. If it causes problems in an app, disable it.

Receiver Reset



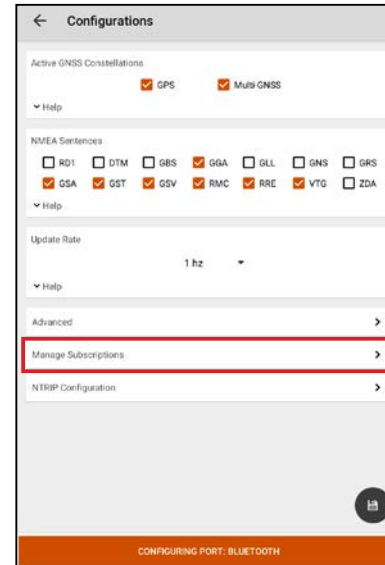
Reset Options allows you to select and perform a soft reset or a receiver reset.

A soft reset reconfigures the Geode to all its default settings. A receiver reset does the same, but it also clears all ephemeris, almanac, and clock data. The Geode will re-download the data the next time it connects with a positioning satellite. This may increase the time to first fix up to 4–6 minutes the first time you turn the Geode on outside after a receiver reset.

The two Almanac messages from GPS satellites alternately repeat every 12.5 minutes. After a receiver reset, the best practice is to turn on the Geode and wait 25 minutes to ensure a complete Almanac has been stored.

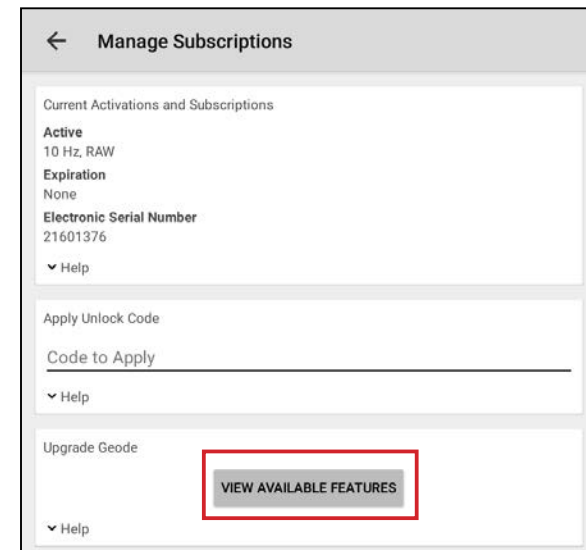
CAUTION: Resetting the receiver cannot be undone.

Manage Subscriptions

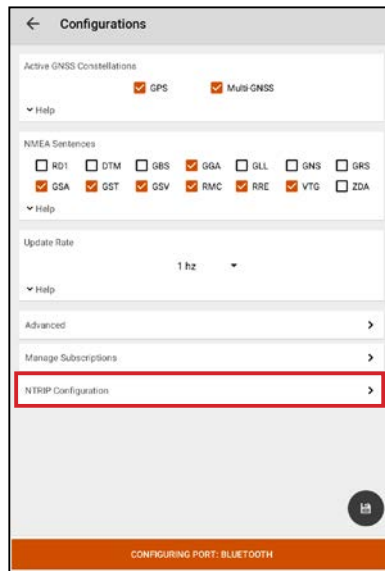


GNS3M devices offer subscriptions for Atlas. This screen allows you to view the details of your current subscription, apply unlock codes, and view the subscriptions that are available for activation.

Tap **View Available Features** to apply upgrades to the Geode. For more information about activating upgrades, see [7.5.4 Upgrade Geode](#) on page 101.



NTRIP Configuration




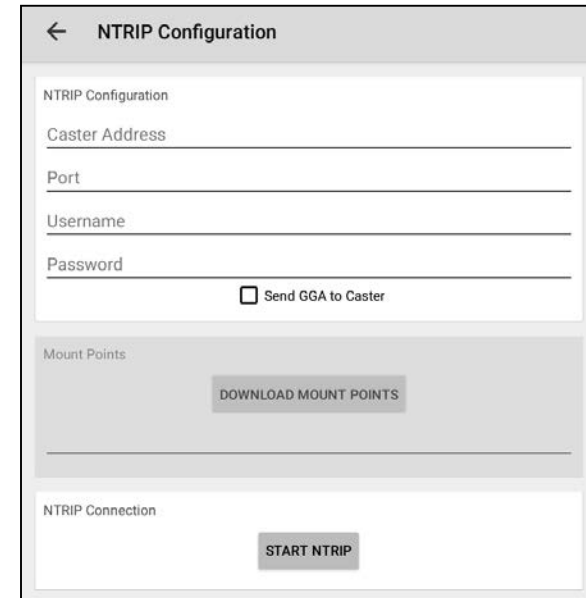
On the NTRIP Configuration screen you can set up NTRIP with your Geode. Enter the information supplied by your NTRIP service provider, including the caster IP address, port, username, and password.

Note: NTRIP settings are stored in the Geode Connect app, not in the Geode receiver.

As stated in [2.3.2 NTRIP Differential Correction](#) on page 11, NTRIP is a useful protocol for precise correction of real-time positioning solutions. The Geode is able to calculate an RTK float position. NTRIP services do require an internet or cell data connection (via your mobile device) and usually involve either a free or paid subscription to the service.

If you have a subscription to an NTRIP service, Geode Connect will allow you to configure the Geode to use that service.

Note: Changes must be saved in order for them to remain from screen to screen. If the save icon in the lower right corner of the screen is orange, this means there has been a change that needs to be saved. Tap the save icon to save changes .




To establish an NTRIP connection:

1. Ensure the handheld device you are using to host Geode Connect has a data connection.
2. Enter the identifying information supplied by your NTRIP service provider.
3. Verify “Send GGA to Caster” is checked. This tells the Geode to send its position to the caster so that the caster can locate the mount points closest to the Geode’s position.
4. Tap **Save** to enable the Download Mount Points option.
5. Tap **Download Mount Points**.
6. Tap the line underneath the Download Mount Points button.

This will open a list of mount points in the network close to the Geode’s position. The prefix ‘SB’ means ‘single baseline,’ which will connect the Geode with a single baseline caster. All other prefixes indicate networked baselines.

The closer the mount point, the more precise your positioning solution will be.

7. Choose the appropriate mount point.
8. Tap the save icon in the bottom right corner to save the changes .
9. Tap **Start NTRIP**.

When NTRIP is connected and working, the word NTRIP and a closed green plug will appear in the top right corner of the Home page. Tap the icon to return to the NTRIP Configuration screen at any time.



If NTRIP appears on the home page next to an open orange plug, the Geode is still trying to establish a connection to the NTRIP service. The connection might take a while. If the Geode has trouble connecting, try selecting a different mount point.



To turn off NTRIP, tap the NTRIP icon to go to the NTRIP Configuration page. Select **Stop NTRIP**.

7.5.4 Upgrade Geode

On the Upgrade Geode screen you can request a quote for upgrades, activate your upgrades, or extend a subscription.



You can apply upgrades via activations or subscriptions.

- **Activations** include a one-time upgrade to apply a new feature to the product. The available activations include increased output rates, multi-frequency, and Atlas basic L-band corrections.
- **Subscriptions** include time-based purchases of an H10 or H30 Atlas L-band correction service.

This screen can also be accessed from under Receiver Configurations > Manage Subscriptions. See [Manage Subscriptions](#) on page 97 for more information.

Request a Quote

To request an activation or subscription quote,

1. Select the check box next to one or more activation or subscription.
2. Select **Next**.
Note: If you have a single-frequency Geode, the only activations available are 10 Hz and 20 Hz.

3. Enter your contact information.
4. Tap **Next**.

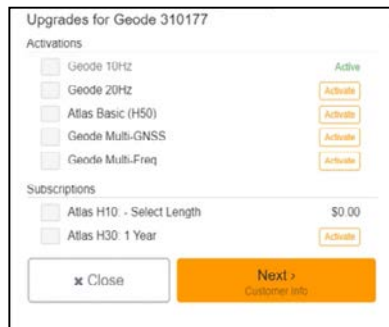
5. On the Quote Summary screen, verify your information is correct and then select **Send Now**.

An email requesting your quote will be sent to Juniper Systems and a representative will contact you.

When the request email is sent, you will receive a Quote Reference Code. This code can be used to reference your request if you encounter any problems and need to contact Juniper Systems.

Activate Upgrade

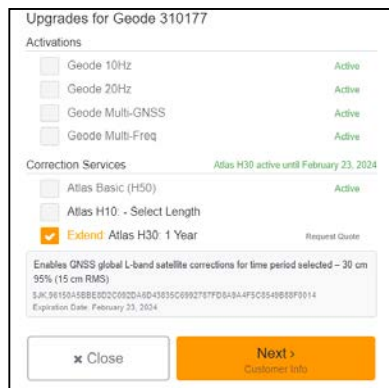
If you have already purchased an activation or subscription, you can activate it in Geode Connect.



1. Verify your device is connected to the GNS3 and the internet.
2. In the activations list, tap the yellow activate option next to the upgrade you would like to activate.

Extend a Subscription

To extend your current subscription,



1. Select the check box next to your subscription. It will be marked with a yellow "Extend."
2. Select **Next**.
3. Request a quote for the subscription by following the process listed in the **Request a Quote** section above.

If you purchased the subscription previously, you can activate the subscription for your GNS3 on this screen as well.

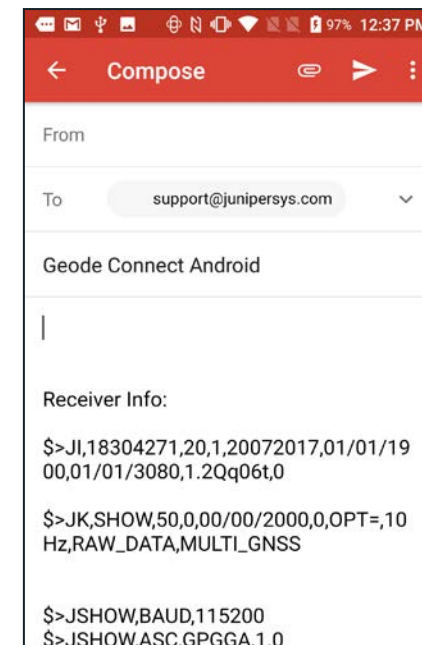
7.5.5 Request Help and Send Feedback

On the Settings page, tap **Help/Feedback**.



This feature links directly with the email account configured to the device and opens an email addressed to Juniper Systems Support. The email includes detailed configuration commands from the Geode. This allows Juniper Systems Support to diagnose and solve the problem more efficiently. This info is also used when purchasing a feature upgrade for the Geode.

You can enter additional information into the email to provide further explanation about your issue.



7.5.6 About

The About page shows the Geode Connect version currently in use.



8. Set Up Geode Connect for Windows PC

As a configuration and communication utility for the Geode GNS3 GPS Receiver, Geode Connect provides you with the ability to establish communications with the Geode; change receiver settings; and view position, altitude, estimated horizontal error, differential status/fix information, speed, heading, satellites in fix, correction signal, and PDOP.

This chapter gives an overview of the features included in Geode Connect for Windows PC. It gives details about specific settings that can optimize the Geode's precision, accuracy, and reliability, depending on the situation and environment. It also gives specific instructions about the nuances of using the Geode with the Windows operating system and third-party apps.

8.1 Download and Install

Geode Connect is available for download on the Juniper Systems web page.

1. Go to www.junipersys.com/support/geode/downloads
2. Select Geode Connect for Microsoft Windows PC.
3. Download the .exe file and follow the instructions on your device to install the app.

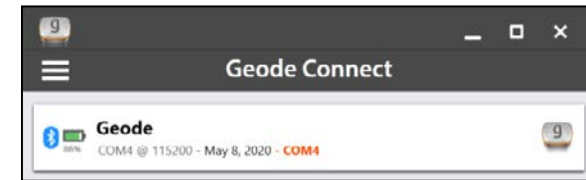
8.2 Connect with the Geode

The Geode connects with Windows PC devices via Bluetooth wireless technology, USB, and RS-232C cable.

Pair via Bluetooth

1. Power on the Geode.
2. Make sure Bluetooth wireless technology is enabled on your Windows device.
3. Pair the Geode to your Windows device.
4. Open Geode Connect.

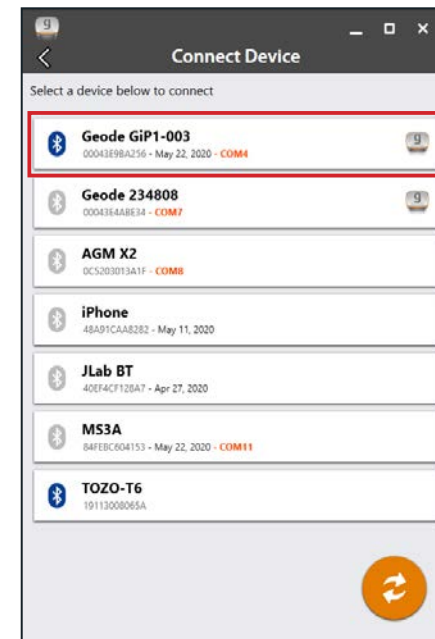
5. If the device has connected to a Geode previously, tap the Geode name at the top of the screen.




The app will ask you what you would like to do.

Note: If the device has not previously connected to a Geode, the app will immediately open the Device Setup page when you open it.

6. Tap **Change Device**. This opens the Device Setup page. The app will display a list of local wireless devices. Identify your Geode via the serial number printed on its bottom panel. Select the name of the Geode you want to pair with.



Note: If your Geode doesn't show up in the list of devices, check to make sure it is turned on and not paired with another device. Then tap the refresh icon at the bottom of the list of devices .

- Follow the prompts to finish pairing the Geode with your device.
- If prompted by your device, enter the Pair code: 0000.

The Geode should now be connected to your Windows device.

Troubleshooting a Windows PC Bluetooth Connection

Sometimes when a Geode has been paired with a Windows PC device and then is paired with several other devices, the Geode may have trouble re-pairing with the original Windows PC device.

If this happens, Geode Connect will display the following prompt:



- Select **Retry**.

This may fix the connection. If not, Geode Connect will display the following:



- Select **Repair**.

Geode Connect will attempt to repair the connection.

If Geode Connect is unable to repair the connection, you may need to turn the Geode off and on again and/or go to Windows Settings and select **Forget Device** for the Geode you are trying to pair. After doing so, return to Geode Connect and begin the pair sequence for a Bluetooth connection again.

Connect via USB

The Geode can connect with a Windows PC or handheld tablet—such as the Juniper Systems Mesa 3 Windows—using the supplied USB cable.

- Ensure your Windows PC or tablet is in Desktop mode, not Tablet mode.
- Power on the Geode before you plug it into your device.
- Plug the USB cable into your device and the Geode.

Note: This may cause the red LED Status Indicator to flash rapidly on the Geode because there is not enough power in the PC or handheld device to charge the Geode. This does not affect the data transfer between the Geode and the device.


- Open Geode Connect.

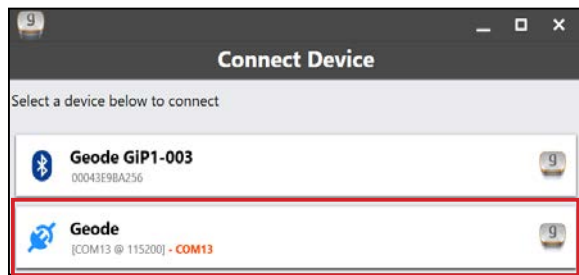
If the device has connected to a Geode previously, tap the Geode name at the top of the screen.




The app will ask you what you would like to do.

Note: If the device has not previously connected to a Geode, the app will immediately open the Device Setup page when you open the app.

5. Tap **Change Device**. This opens the Device Setup page.
6. The app will display a list of local wireless and connected devices. It may list the same Geode twice, once as a Bluetooth wireless device and once as a physically connected device. The Geode connected via USB will have a plug icon  next to it. Select this Geode.



Note: If your Geode doesn't show up in the list of devices, check to make sure it is turned on and not paired with another device. Then tap the refresh icon at the bottom of the list of devices .

For subsequent connections, the Geode may connect to the same device using a different COM port. This is normal.

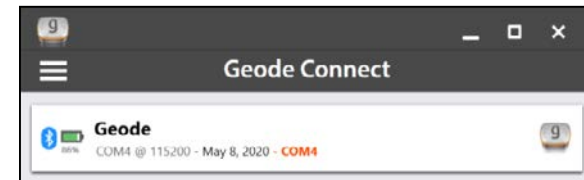
Connect via Serial Port

The Geode has a 9-pin RS-232C serial port. This allows the Geode to be mounted to a piece of equipment while maintaining a constant connection for data and power. Use a straight-through 9-pin cable to communicate with the Geode. For a list of functions for each pin, refer to Appendix A: [Serial Port Configuration](#), on page 153.

To communicate between a PC and a Geode over a straight-through serial cable:


1. Open Geode Connect.

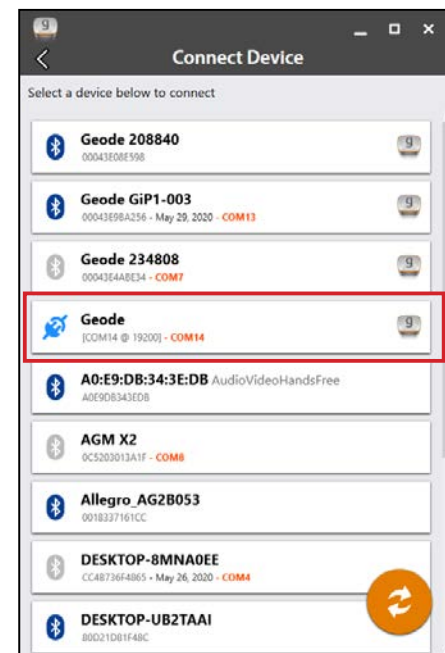
If the device has connected to a Geode previously, tap the Geode name at the top of the screen.




The app will ask you what you would like to do.

Note: If the device has not previously connected to a Geode, the app will immediately open the Device Setup page when you open the app.

2. Tap **Change Device**. This opens the Device Setup page.
3. The app will display a list of local wireless and connected devices. It may list the same Geode twice, once as a Bluetooth wireless device and once as a physically connected device. The Geode connected via serial cable will have a plug icon  next to it. Select this Geode.



Note: The name displayed for a serial connection in this list will not include the serial number of your Geode.

Note: If your Geode doesn't show up in the list of devices, check to make sure it is turned on and connected to your device. Then tap the refresh icon at the bottom of the list of devices .

The Geode will then connect to the host device.

9

LEARN GEODE CONNECT FOR WINDOWS PC



9. Learn Geode Connect for Windows PC

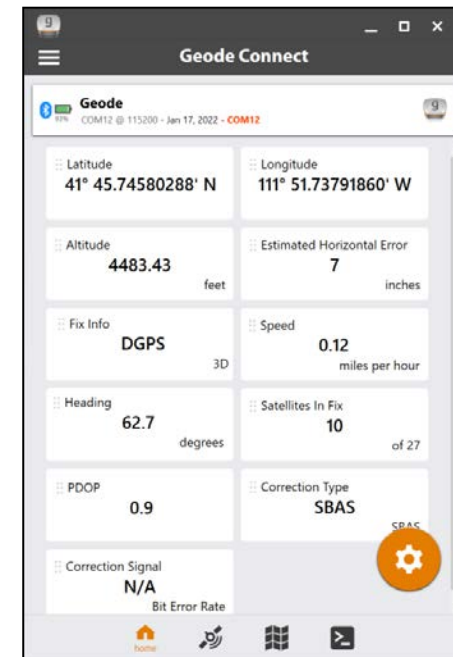
Geode Connect is a utility app that allows you to customize and fine-tune the Geode to your specific project or application. Each page in Geode Connect serves one of three primary functions: configuration of the Geode, validation of Geode accuracy, or changing Geode Connect settings. Though it does have some limited data-capture features, these are included only for demonstration purposes. Geode Connect is not intended to replace your data-collection app.



9.1 Home Page

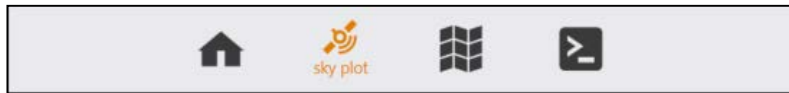


The Home page for Geode Connect serves as a dashboard for the Geode receiver. On this page, you can view connection status, correction mode, and positioning data. It displays latitude, longitude, altitude, estimated horizontal error, fix info (GPS, DGPS, RTK, etc.), speed, heading, number of satellites in fix, PDOP, and correction signal. You can drag and drop each box to reorganize the screen to your preference.



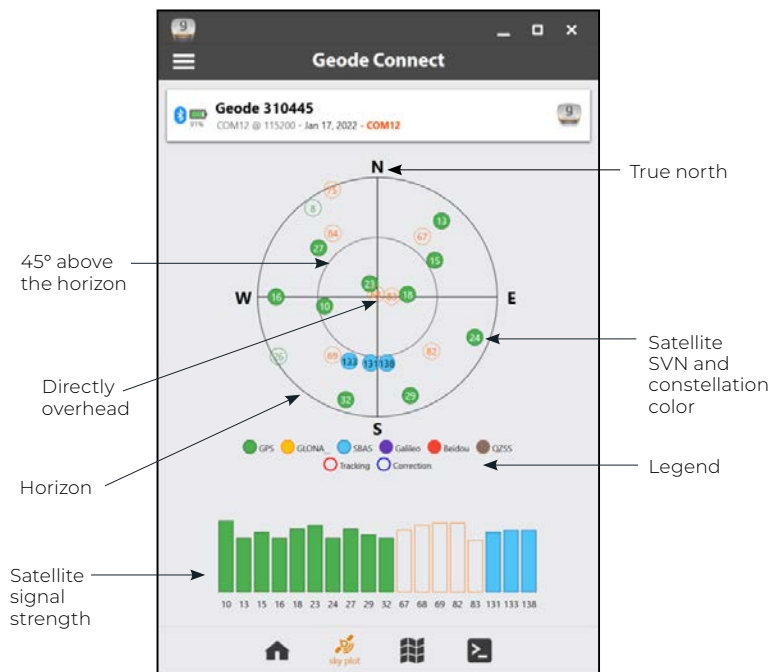
From the toolbar on the bottom of the page, you can access the Skyplot, Map, and Terminal pages. Tap on the receiver name at the top to change receivers. Tap on the Settings menu in the upper left corner to configure the currently connected receiver.

9.2 Skyplot Page



The Skyplot page shows which satellites are being used in the positioning solution and where they are in the sky. It also shows satellites that are being tracked by the Geode.

On the Skyplot page, each satellite is identified by a space vehicle number (SVN) and color for its constellation. The location of each satellite on the skyplot indicates where it resides in the sky overhead relative to true north. The outside ring is 0° elevation (horizon). The inside ring is 45° elevation—halfway above the horizon from the Geode's present location. The intersection of the two lines indicates directly overhead.



Satellite symbols outlined in red indicate that the satellites are being tracked, but they are not yet a part of the positioning solution. Satellite symbols outlined in blue indicate that a correction is being applied to the signal.

The Skyplot page is meant to be used as a guide. It shows the relative visibility of satellites in the sky, but it is not an absolute reference for satellites used in the positioning solution.

Multi-GNSS Geode models support the Galileo, BeiDou, GPS, QZSS, SBAS, and GLONASS constellations.

If the Skyplot page is not displaying data:

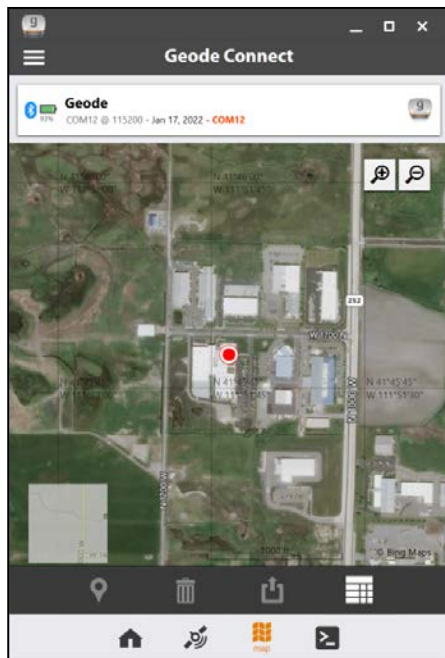
1. Go to the Configure Geode page by tapping the menu icon in the navigation bar.
2. Tap **Receiver Configuration**.
3. Under Active GNSS Constellations, select **Multi-GNSS**.
4. Under NMEA Sentences, select **GSV**.
5. Tap the save icon .

9.3 Map Page



The Map page allows you to see their position in relation to public roads and other landmarks.

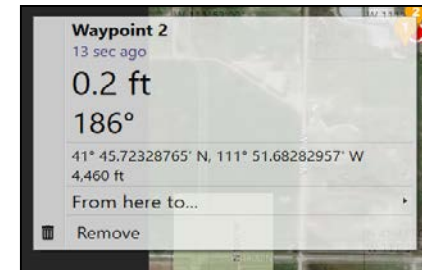
On the Map page, you can capture, compare, and navigate to waypoints.



9.3.1 Capture, View, and Compare Waypoints

To capture waypoints, place the Geode in the position you would like to capture, and tap the waypoint icon .

View waypoint information by selecting a specific waypoint on the map.

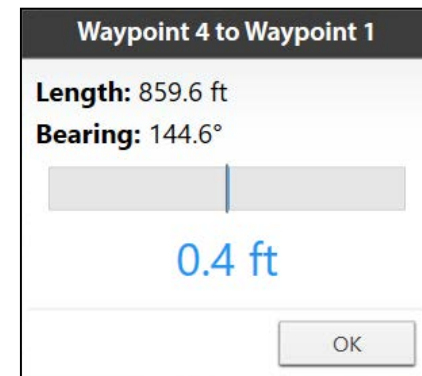


Geode Connect will show you the waypoint's distance and bearing compared to your current position. It will also display the latitude, longitude, and altitude of the waypoint.

To delete the waypoint, tap **Remove**.

To compare the waypoint to another waypoint,

1. Tap **From here to...**
2. Select the waypoint you want to compare your current position to.

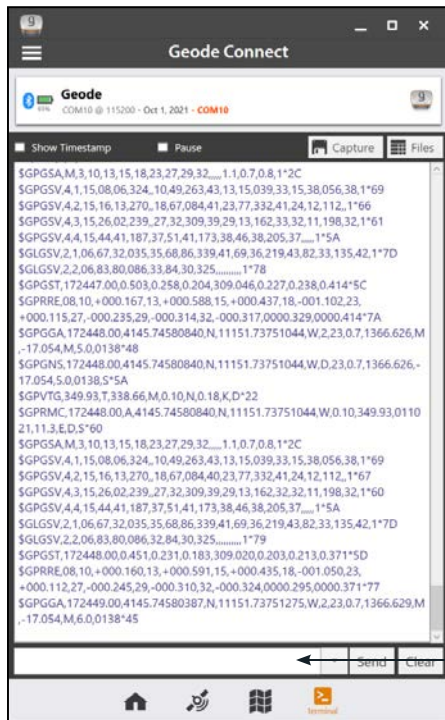


The blue shaded area represents the cross track error between where you are now and what you need to do to get back on the direct path between the two waypoints.

9.4 Terminal Page



The Terminal page displays the NMEA sentences the Geode is receiving. You can include timestamps (top left), pause (middle), capture the information (top right), or view the captured data files (top right).



Command Line

At the bottom of the Terminal page, there is a command line. This gives you flexibility to configure the Geode and customize the data output.

Tapping the down arrow next to the command line will reveal the Show Log and Hide Log commands.

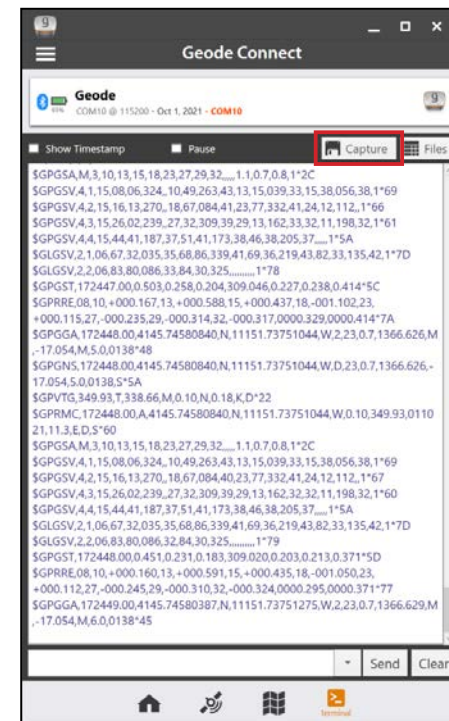
For a comprehensive list of commands and messages that can be used to configure the Geode, please refer to technical documentation provided by Hemisphere GNSS.

1. Go to <https://hemispheregnss.com/> > **Resources & Support > Technical Documentation.**
2. Select the **Technical Reference Manual** (it may include a version number).

CAUTION: Use at your own risk. It is possible to cause communication or other errors in the Geode that may require technical assistance to repair.

9.4.1 Capture, Save, or Share NMEA Sentences

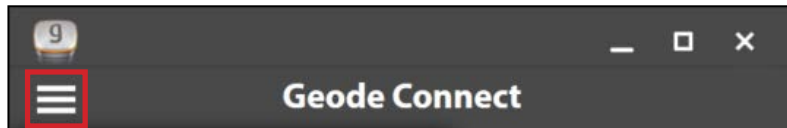
To record the NMEA sentences, tap **Capture**. Geode Connect will begin to record your data.



To stop recording, tap the timer that replaced the Capture button. The string of NMEA sentences will be saved.

Tap **Files** to view the saved recordings. From this screen you can organize, share, or delete the NMEA recordings.

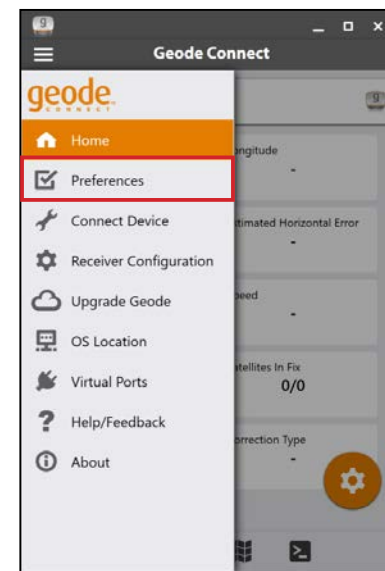
9.5 Settings Menu



The Settings menu provides options for the configuration of the Geode receiver and Geode Connect settings. These options are listed below:

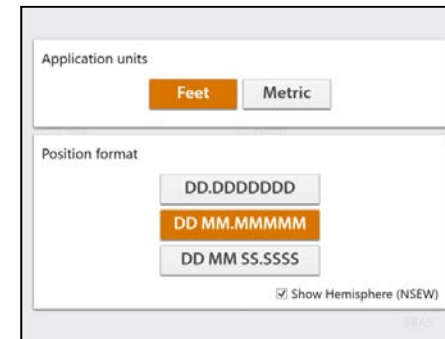
- [Preferences](#) on page 125
- [Connect Device](#) on page 126
- [Receiver Configuration](#) on page 126
 - [Port Connection](#) on page 127
 - [Active GNSS Constellations](#) on page 129
 - [NMEA Sentences](#) on page 130
 - [Update Rate](#) on page 131
 - [Advanced](#) on page 131
 - ▶ [NMEA Precision](#) on page 132
 - ▶ [Mask Angle](#) on page 132
 - ▶ [Correction Source](#) on page 133
 - ▶ [SBAS](#) on page 134
 - ▶ [Receiver Mode](#) on page 135
 - ▶ [Battery Status Sentence](#) on page 137
 - ▶ [Receiver Reset](#) on page 138
 - [Manage Subscriptions](#) on page 139
 - [Configure NTRIP](#) on page 139
- [Upgrade Geode](#) on page 142
- [OS Location](#) on page 147
- [Configure Virtual Port Settings](#) on page 150
- [Request Help and Send Feedback](#) on page 151
- [About](#) on page 152


9.5.1 Preferences



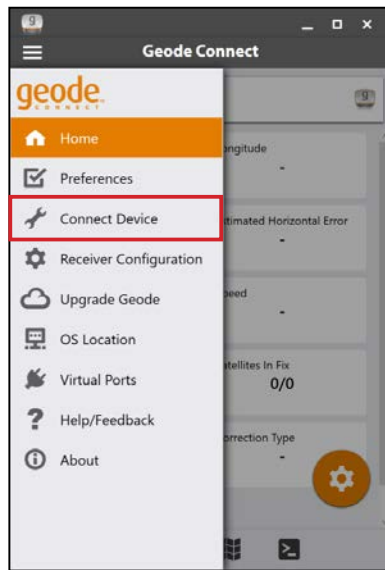
The Preferences page allows you to customize your preferences for how information is displayed in Geode Connect.

You can specify application units (feet or metric), position format, and whether or not the app will show the hemisphere.



Note: Changes must be saved in order for them to remain from screen to screen. If the save icon in the lower right corner of the screen is orange, this means there has been a change that needs to be saved. Tap the save icon to save changes .

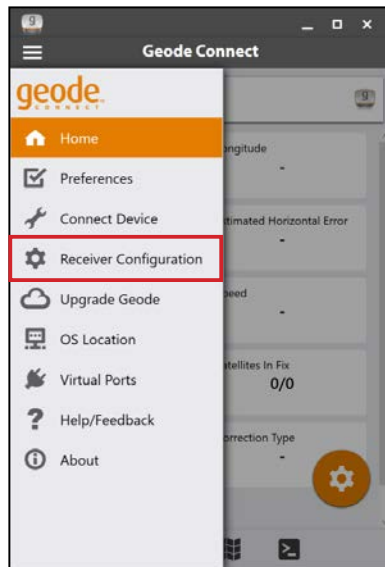
9.5.2 Connect Device



The Connect Device screen allows you to connect your Windows device to the Geode.


For more information, see [8.2 Connect with the Geode](#) on page 108.

9.5.3 Receiver Configuration



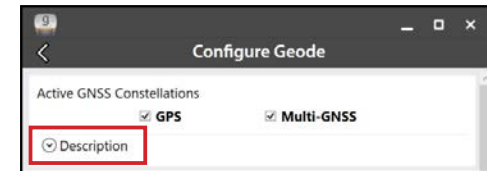
This page allows you to configure the Geode according to the specific needs of your project or application.

Note: The following screens and options are only available if you are actively connected to a Geode receiver. Changes saved on these screens are changes made to the Geode receiver, not Geode Connect. This means that these changes crossover and are effective in other navigational and data-collecting apps.

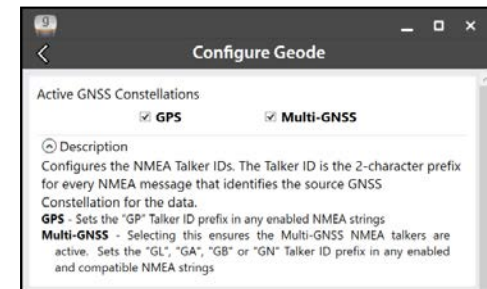
You can also reach this page by tapping the orange gear in the bottom right corner of the home screen .

This page allows you to configure the Geode according to the specific needs of your project or application.

Most of the settings in Geode Connect include a Description toggle below the options available.



Tapping on **Description** will reveal detailed descriptions of the options available for that specific feature.

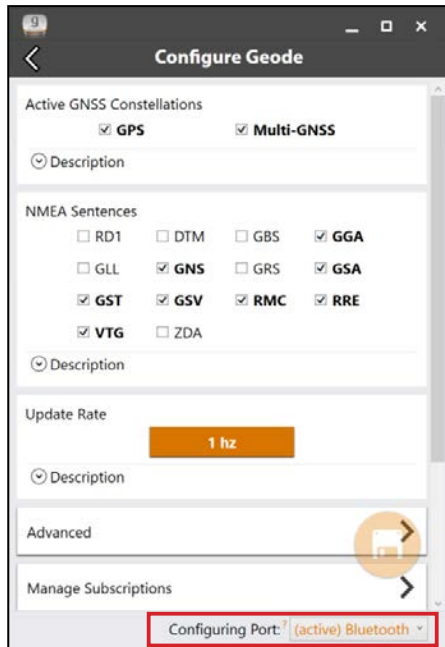


Port Connection

The Geode remembers its settings *per connection type*. You can use the Port Connection option to configure these settings for each connection type, without physically switching the connection for the Geode.

1. Tap the three lines in the top left corner to open the menu.
2. Select **Receiver Configuration**.

On the configuration page, you can use the drop-down menu in the bottom right corner to configure ports you are not physically connected to. Select the port to configure and then save the changes. These configurations will then be set for when you physically connect with that specific port.



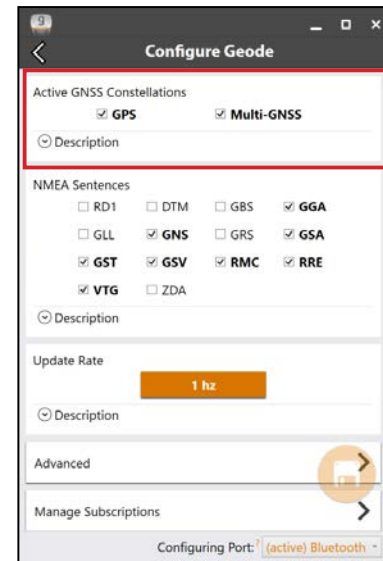
This affords you a certain amount of flexibility in the field. If you have multiple uses for the Geode and would prefer not to reconfigure it each time you switch tasks, the Geode can be configured per connection type for each specific task.

For example, here are three different possible use cases for the same Geode:

- **Use Case 1:** Mounted on a pole for data collection on foot in heavy tree canopy.
 - Bluetooth wireless connection settings optimized for slow travel and GNSS (more potential satellites in view through the trees)

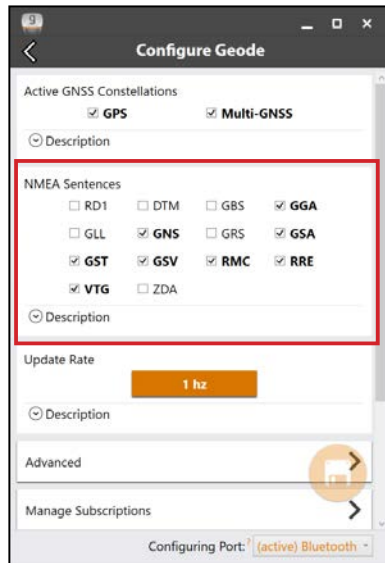
- **Use Case 2:** Mounted in the cab of a truck for carefully locating previously marked research sites.
 - USB connection settings optimized for slower travel and NTRIP correction
- **Use Case 3:** Mounted on a fast moving four wheeler on rolling hills with open sky.
 - RS-232C connection settings optimized for speed and unobstructed open sky

Active GNSS Constellations



You can choose which GNSS constellations to use in your solution, GPS and Multi-GNSS.

NMEA Sentences

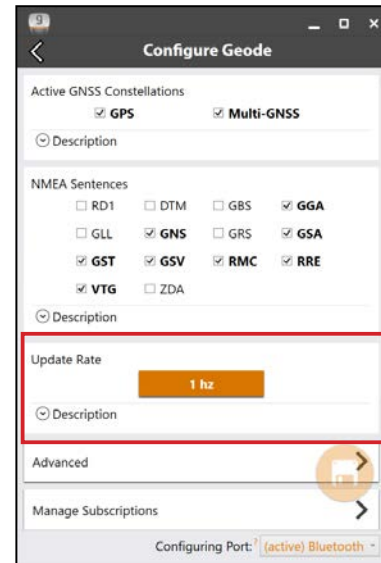


You can choose which NMEA sentences you want the Geode to receive. In most instances, the default NMEA sentences will be sufficient for your project or application.

The following list explains the available NMEA sentences:

- RD1: Correction diagnostic message output
- DTM: Datum reference
- GBS: Satellite fault detection used for RAIM
- GGA: Detailed GPS position information
- GLL: Latitude and longitude data
- GNS: Fix data for a single or combined satellite navigation system
- GRS: GNSS range residuals
- GSA: GPS DOP and active satellite information
- GST: GNSS pseudorange error statistics
- GSV: GNSS satellites in view
- RMC: Recommended minimum specific GNSS data
- RRE: Range residual message
- VTG: Course over ground and ground speed
- ZDA: UTC time and date information

Update Rate

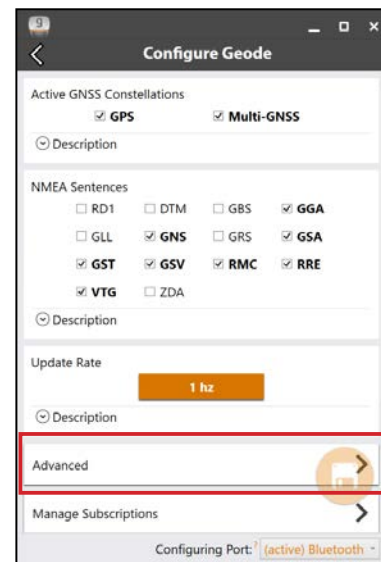


The update rate sets the message output rate through the active port.

Note: Changes must be saved in order for them to remain from screen to screen. If the save icon in the lower right corner of the screen is orange, this means there has been a change that needs to be saved. Tap the save icon to save your changes.

To upgrade the update rate, see [9.5.4 Upgrade Geode](#) on page 142.

Advanced



The Advanced screen allows you to configure the following advanced settings for the Geode.

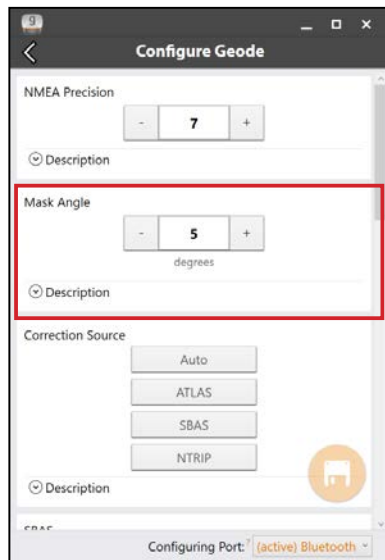
- NMEA Precision
- Mask Angle
- Correction Source
- SBAS
- Receiver Mode
- Battery Status Sentence
- Receiver Reset

NMEA Precision



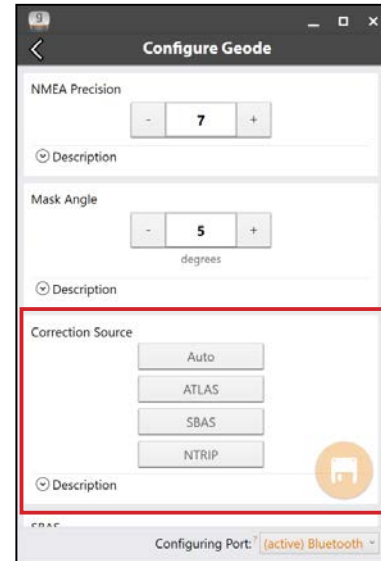
Specify the number of decimal places to output in the GGA, GLL, and GNS messages.

Mask Angle



Specifies the elevation mask angle cutoff for the receiver. Any satellites below this angle will be ignored, even if available.

Correction Source



This specifies whether the Geode should automatically choose its correction source or accept only SBAS, NTRIP, or Atlas corrections. When the correction source is set to Auto, the Geode is programmed to choose a source according to accuracy level in the order of Atlas, SBAS, then NTRIP.

If it fails to reconnect (usually after about two minutes), it will default to an SBAS corrected solution.

Note: If this happens in the middle of collecting data, it may create significant error between positions because different correction sources use different reference datum.

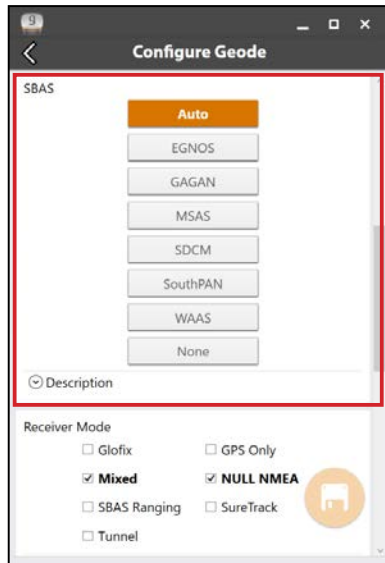
Manually selecting a correction source overrides the Geode's default settings. If NTRIP is selected, the Geode will use NTRIP, but if it loses the NTRIP signal, it will default to an autonomous (uncorrected) solution.

If the Geode is accepting SBAS corrections, and it loses its signal, it will always default to an autonomous solution.

If Atlas is selected, the Geode will use Atlas correction, and if it loses the signal it will default to an autonomous solution.

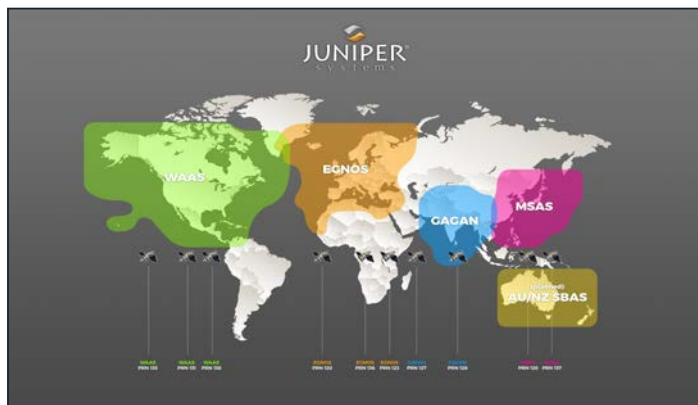
When the Geode is configured to use an NTRIP service, Geode Connect does not automatically select NTRIP as the only correction source. When using NTRIP, the best practice is to manually select NTRIP as the only correction source.

SBAS



This specifies which SBAS satellites the Geode should use for GPS correction. Usually, selecting Auto is sufficient, since the various SBAS services cover very different geographical areas. However, there are some areas where these services overlap (see map below).

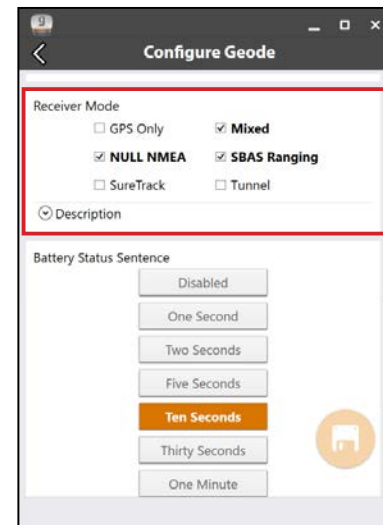
For example, if you are collecting corrected GPS positions in the Northeastern United States, the Geode may be receiving SBAS corrections from WAAS or EGNOS. If the receiver is set to Auto, it may even jump back and forth between the two. The two services use different reference datum or models. Switching between them can cause significant error between different points of data.



In areas of overlap, the best practice is to select a specific SBAS service from which the Geode should accept corrections data.

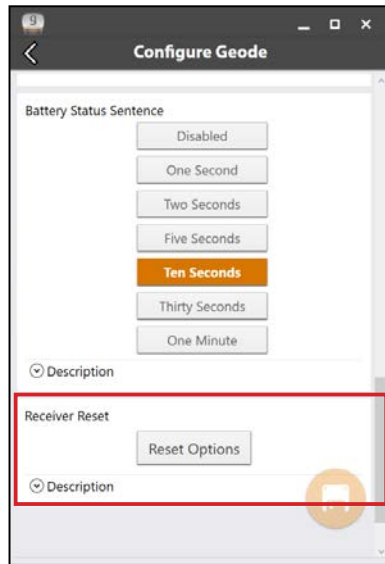
- Auto: Sets the appropriate SBAS PRNs based on the autonomous GPS position.
- EGNOS: European Geostationary Navigation Overlay Service (Europe SBAS) PRN 120, 124, 126
- GAGAN: GPS Aided GEO Augmented Navigation (India SBAS) PRN 127
- MSAS: MTSAT Satellite Augmentation System (Japan SBAS) PRN 129, 137
- SDCM: System for Differential Correction and Monitoring (Russia SBAS) PRN 125, 141, 140
- SouthPAN: Southern Positioning Augmentation Network (Australia and New Zealand SBAS) PRN 122
- WAAS: Wide Area Augmentation System (North America SBAS) PRN 133, 135, 138
- None: SBAS corrections disabled

Receiver Mode



These options affect how the Geode collects and processes positioning information, as well as how it outputs certain types of data.

Receiver Reset



Reset Options allows you to select if you would like to perform a soft reset or a receiver reset.

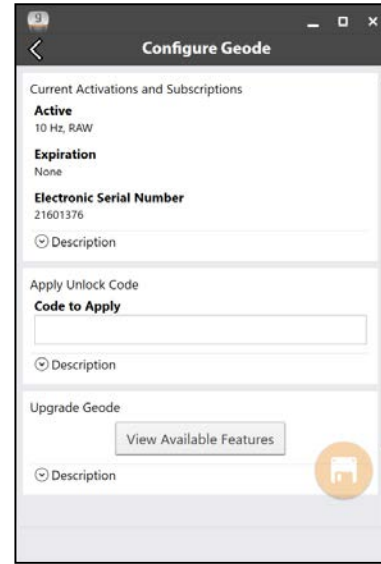
A soft reset reconfigures the Geode to all its default settings. A receiver reset does the same, but it also clears all ephemeris, almanac, and clock data. The Geode will re-download the ephemeris and almanac data the next time it connects with a positioning satellite.

This will increase the time to first fix by about 4–6 minutes the first time you turn the Geode on outside after a receiver reset.

The two Almanac messages from GPS satellites alternately repeat every 12.5 minutes. After a receiver reset, the best practice is to turn on the Geode and wait 25 minutes to ensure a complete Almanac has been stored.

! CAUTION: Resetting the receiver cannot be undone.

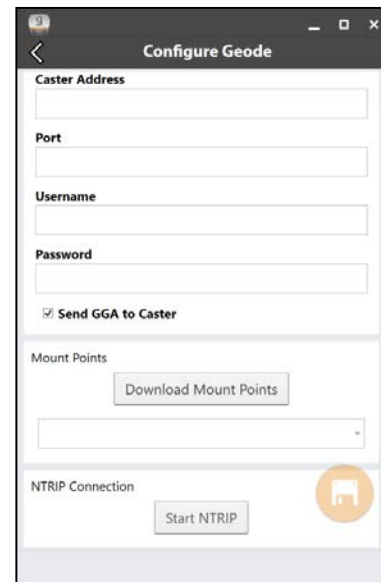
Manage Subscriptions



GNS3M devices offer a subscription to Atlas. This page allows you to view the details of your current subscription, apply the unlock code, and view the subscriptions that are available for activation.

Tap **View Available Features** to apply upgrades to the Geode. For more information about activating upgrades, see [9.5.4 Upgrade Geode](#) on page 142.

Configure NTRIP



This page is where you can enter the information supplied by your NTRIP service provider, including the caster IP address, port, username, and password.


Note: NTRIP settings are stored in the Geode Connect app, not in the Geode receiver.

As stated in [2.3.2 NTRIP Differential Correction](#) on page 11, NTRIP is a useful protocol for precise correction of real-time positioning solutions.

The Geode is able to calculate an RTK float position with decimeter-level accuracy. NTRIP services do require an

internet or cell data connection (via your mobile device) and usually involve either a free or paid subscription to the service.

If you have a subscription to an NTRIP service, Geode Connect will allow you to configure the Geode to use that service.

Note: Changes must be saved in order for them to remain from screen to screen. If the save icon in the lower right corner of the screen is orange, this means there has been a change that needs to be saved. Tap the save icon to save your changes .

To establish an NTRIP connection:

1. Ensure the handheld device you are using to host Geode Connect has a data connection.
2. Enter the identifying information supplied by your NTRIP service provider.
3. Verify "Send GGA to Caster" is checked. This tells the Geode to send its position to the caster so that the caster can locate the mount points closest to the Geode's position.
4. Tap **Save** to enable the Download Mount Points option.
5. Tap **Download Mount Points**.
6. Tap on the down arrow in the dialog box below the Download Mount Points button.

This will open a list of mount points in the network close to the Geode's position. The prefix 'SB' means 'single baseline,' which will connect the Geode with a single baseline caster. All other prefixes indicate networked baselines.

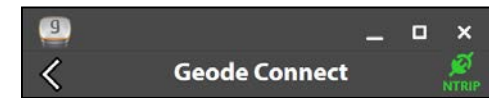
The closer the mount point, the more precise your positioning solution will be.

7. Choose the appropriate mount point.
8. If necessary, release the keyboard so that you can see the save icon.

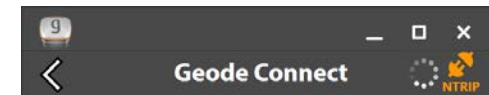
9. Tap the save icon in the bottom right corner to save your changes .

10. Tap **Start NTRIP**.

When NTRIP is connected and working, the word NTRIP and a closed green plug will appear on the upper right corner of the Home page.



If an open orange plug appears, the Geode is still trying to establish a connection to the NTRIP service. Sometimes it may take a little longer to connect. If the Geode has trouble connecting, try selecting a different mount point.



Tap on the icon to open the NTRIP screen. On this screen you can see the data that is received or stop the NTRIP connection.



Third-Party Apps and NTRIP

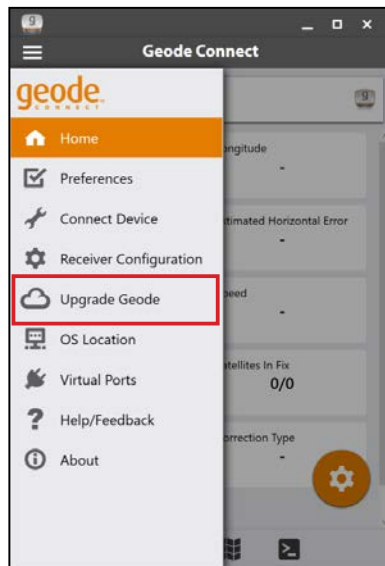
When using the Geode with Windows PC devices, some third-party mapping and data-collection apps may need some help connecting to an NTRIP service.

If the third-party app has built-in NTRIP capabilities, do not use Geode Connect. Simply connect to the Geode and configure NTRIP in the third-party app.

If the third-party app does not have built-in NTRIP capabilities, you can use Geode Connect to supply that service directly to the app. You will need to connect the Geode to both apps: Geode Connect and the third-party app. This is accomplished via Virtual COM Ports, which can be configured in Geode Connect (see Configure Virtual Port Settings on page 150).

Once the Geode is connected to both apps, configure NTRIP services in Geode Connect as described on page 139. Leave Geode Connect open while using the third-party app.

9.5.4 Upgrade Geode



On the Upgrade Geode screen you can request a quote for upgrades, activate your upgrades, or extend a subscription.

This screen can also be accessed from under Receiver Configurations > Manage Subscriptions. See [Manage Subscriptions](#) on page 139 for more information.

You can apply upgrades via activations or subscriptions.

- **Activations** include a one-time upgrade to apply a new feature to the product. The available activations include increased output rates, multi-frequency, and Atlas basic L-band corrections.
- **Subscriptions** include time-based purchases of an H10 or H30 Atlas L-band correction service.

Request a Quote

To request an activation or subscription quote,

Upgrades for Geode 310145

Activations

<input checked="" type="checkbox"/>	Geode 10Hz	\$600.00
Increases message rate limit to Ten Hertz		
<input type="checkbox"/>	Geode 20Hz	Active
<input type="checkbox"/>	Atlas Basic (H50)	Active
<input type="checkbox"/>	Geode Multi-GNSS	Active
<input type="checkbox"/>	Geode Multi-Freq	Active
Atlas I130 active until March 17, 2025		
<input type="checkbox"/>	Atlas H10: - Select Length	\$0.00
<input checked="" type="checkbox"/>	Extend Atlas H30: 1 Year	\$1,225.00

1. Select the check box next to one or more activation or subscription.

2. Select **Next**.

Note: If you have a single-frequency Geode, the only activations available are 10 Hz and 20 Hz.

Customer Information

Contact Information

First Name Last Name

Email

Phone

Company

Field Of Work/Industry
Select:

Billing Address

Address

Address Line 2

City

State/Province Postal Code

Country

Country:

3. Enter your contact information.
4. Tap **Next**.

Confirm Quote Request

Contact Information

Testing Test
test@email.com
123456789
Your company here, Agricultural

Billing Address

Anywhere
Some City, State 12345 USA

Upgrades for Geode 310177

Atlas H30 1 Year Subscription
Estimated new expire date: February 22, 2025

Activation/Subscription starts at time of purchase. Activation/Subscription is tied to product serial number and is not transferable.

5. On the Quote Summary screen, verify your information is correct then select **Send Now**.
- An email requesting your quote will be sent to Juniper Systems, and a representative will contact you.

When the request email is sent, you will receive a Quote Reference Code. This code can be used to reference your request if you encounter any problems and need to contact Juniper Systems.

Quote Request Submitted

✓ **Success!**

Quote has been successfully requested. Please allow 1-3 business days for a response.

Quote Reference Code: **VPHB3VSE**

For sales support please contact Juniper Systems at sales@junipersys.com or Tel. 435-753-1881 (Americas and APAC) or infoemva@junipersys.com or Tel. +44 (0) 1527 870773 (EMEA).

Contact Information

Testing Test
test@email.com
123456789
Your company here, Agricultural

Billing Address

Anywhere
Some City, State 12345 USA

Upgrades for Geode 310177

Atlas H30 1 Year Subscription
Estimated new expire date: February 22, 2025

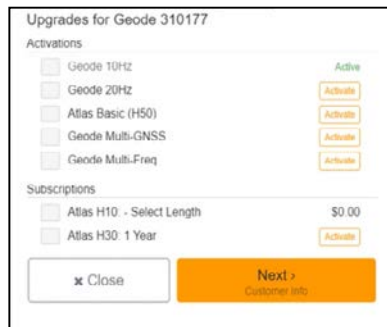
Activation/Subscription starts at time of purchase. Activation/Subscription is tied to product serial number and is not transferable.

SUCCESS

Quote has been successfully requested

Activate Upgrade

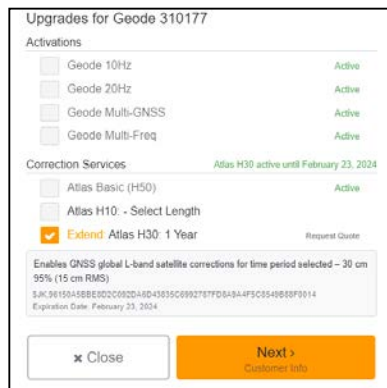
If you have already purchased an activation or subscription, you will need to activate it in Geode Connect.



1. Verify your device is connected to the GNS3 and the internet.
2. In the activations list, tap the yellow activate option next to the upgrade you would like to activate.

Extend a Subscription

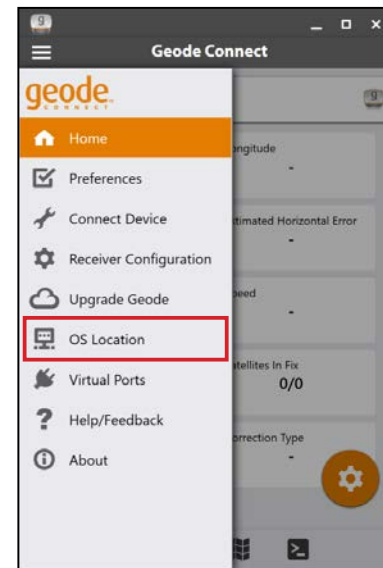
To extend your current subscription,



1. Select the check box next to your subscription. It will be marked with a yellow "Extend."
2. Select **Next**.
3. Request a quote for the subscription following the process listed in the **Request a Quote** section above.

If you purchased the subscription previously, you can activate the subscription for your GNS3 on this screen as well.

9.5.5 OS Location



Some apps depend on the Windows operating system to provide positioning data.

If you are using the Geode, it is because your project demands real-time, sub-meter, sub-foot, or decimeter accuracy. However, if your app is depending on the operating system, it may be collecting data via the consumer-grade receiver in your PC or tablet—not the Geode.

The best way to figure out where your app is getting its positioning data is to take a moment to examine the app. If the app allows you to directly choose an external receiver, you can select the Geode and trust that the app will rely on the Geode. If the app provides no option for choosing an external receiver, it is most likely relying on the Windows operating system for its data. You will need to enable Windows Location Reporting in Geode Connect.

Windows Location Reporting allows the Windows OS to use the Geode for its Location Services.



Select **On** to turn on Windows Location Services. Once the services are enabled, it is no longer necessary to keep Geode Connect open. If you choose to close Geode Connect, you will need to connect to the Geode via the third-party app or through Settings in Windows.

Note: The Geode sends data only from active NMEA sentences to Windows Location Services. To activate specific sentences, see [NMEA Sentences on page 130](#).

Test Windows Location Reporting

After configuring the Geode to send location data through the Windows OS, you can test to make sure your third-party app is now getting its data from the Geode.

Both of the following tests require that the Geode is on and has had time to build its initial almanac, which usually takes about 25 minutes after it has been turned on for the first time outside.

One-Person Test:

1. Connect the Geode to your Windows PC or tablet via Bluetooth in the third-party app or the OS. (Geode Connect is not necessary once Windows Location Reporting is enabled.)

2. Place the Geode in one stationary position. Do not move it.
3. Open your third-party mapping or data-collection app.
4. Holding your PC or tablet, walk five to ten paces out and then walk in a circle around the Geode.

If the position in the third-party app does not change significantly (remember, the Geode is just sitting there), the app is drawing its data from the Geode. You can continue to use the app and the Geode without any worries.

If the position moves in a circle, the app is drawing its data from your Windows PC or tablet. Return to page 147 and make sure Windows Location Reporting has been configured.

Two-Person Test:

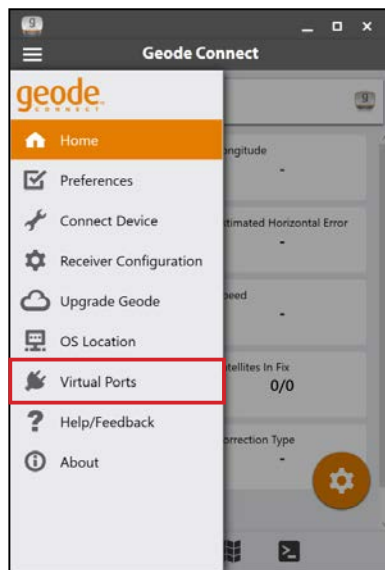
One person holds the Geode, and the other person holds the Windows PC or tablet.

1. Connect the Geode to your Windows PC or tablet via Bluetooth in the third-party app or the OS. (Geode Connect is not necessary once Windows Location Reporting is enabled.)
2. Open your third-party mapping or data-collection app.
3. The person holding the Windows PC or tablet remains stationary.
4. The person holding the Geode walks five to ten paces out and then walks in a circle around the person holding the Windows device.

If the position moves in a circle, the app is drawing its data from the Geode. Windows Location Reporting is functioning as it should.

If the position does not change, the app is drawing its data from your Windows device's internal GPS receiver. Return to page 147 and make sure Windows Location Reporting has been configured.

9.5.6 Configure Virtual Port Settings

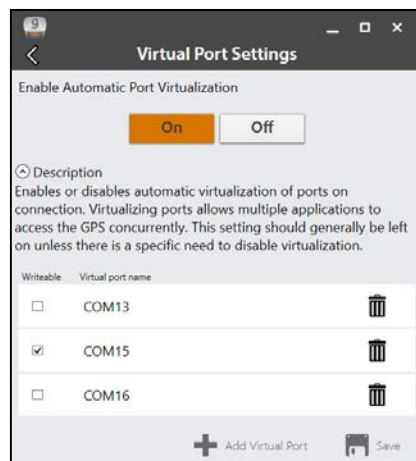


Geode Connect for Windows PC has a Virtual COM Port Driver. You can use this driver to configure virtual COM ports as writeable. Once writeable, these ports can be used for two-way communication between the Geode and third-party apps, allowing the apps to both receive and send information to the Geode.

Virtual COM ports also provide a convenient way to connect the Geode to both apps (Geode Connect and the third-party app) simultaneously.

This configuration allows the Geode to use NTRIP data from Geode Connect to correct its position and then send that corrected position to the third-party app.

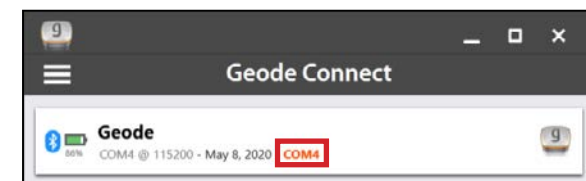
Note: The first time you select Virtual Ports, Geode Connect may prompt you to install the Virtual Port Driver. Go ahead and install it.



1. Select **On**.
2. Select the COM port you would like to make writeable (so that another app can use it to send commands to the Geode).
3. Tap **Save**.

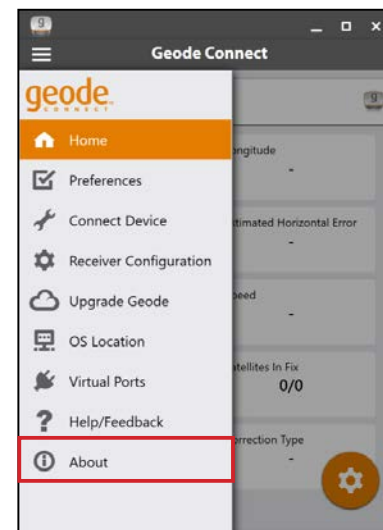
The selected port is now available for a third-party app to set up a two-way connection with the Geode.

Note: This port should not be the same as the port being used by Geode Connect. In the example above, COM15 is made available for the third-party app. Geode Connect is using COM4:



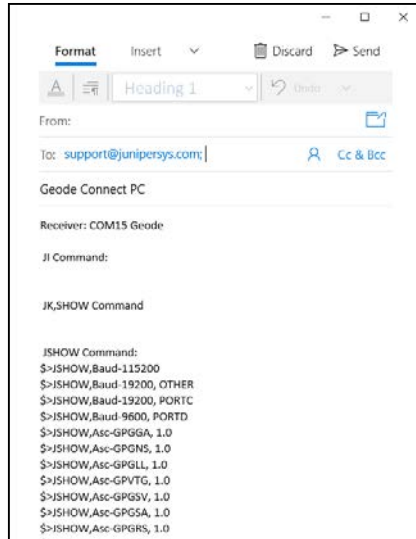
The Virtual Port Settings page can also be used to delete or deactivate virtual COM ports. Be sure to tap **Save** after each change.

9.5.7 Request Help and Send Feedback

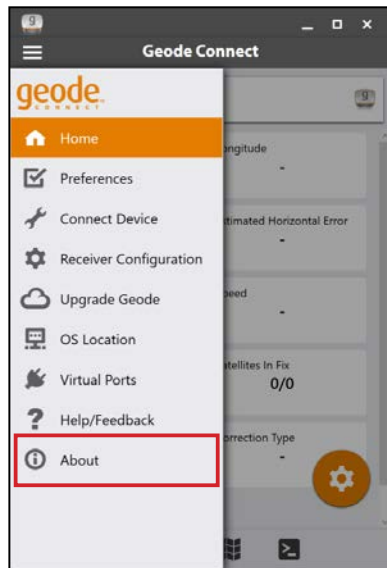


This feature links directly with the email account configured to the PC and opens an email addressed to Juniper Systems Support. The email includes detailed configuration commands from the Geode. This allows Juniper Systems Support to diagnose and solve the problem more efficiently. This info is also used when purchasing a feature upgrade for the Geode.

You can enter additional information into the email to provide further explanation about your issue



9.5.8 About



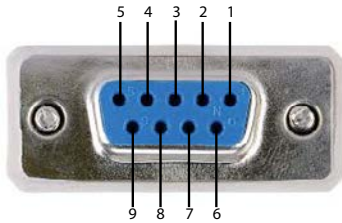
The About page shows the Geode Connect version currently in use.

A SERIAL PORT CONFIGURATION



10. Appendix A: Serial Port Configuration

The Geode has a 9-pin RS-232C serial port. This allows the Geode to be mounted to a piece of equipment such as a tractor or a precision planter. This type of configuration maintains a constant connection for data and power to the Geode. Use a straight-through 9-pin cable to establish communication between the Geode and your mobile device. The functions of each pin are listed below.



Pin	Signal	Condition
1	PPS output	Normally low, pulsing high
2	TXD out	
3	RXD in	
4	Event Mkr in	High to mark
5	GND	
6	GPS Lock out	High indicates GPS lock
7		
8	Speed Pulse out	Normally low, pulsing high
9	+12V in	

You can remotely power on and off the Geode through pin 9 of the serial connection. Apply or remove 12 V (nominal) to cycle power on the Geode.

B

WARRANTY AND REPAIR INFORMATION



11. Appendix B: Warranty and Repair Information

11.1 Limited Product Warranty

11.1.1 Two Year Warranty

Juniper Systems, Inc. ("JS") warrants that the Geode Receiver shall be free from defects in materials and workmanship, under normal intended use, for a period of 24 months from the date of shipment.

11.1.2 Ninety Day Warranty

JS warrants that the following items shall be free from defects in materials and workmanship, under normal intended use, for a period of ninety (90) days from the date of shipment:

- User documentation
- Accessories

11.1.3 Warranty Exclusions

This warranty shall not apply in the following conditions:

- (i) The product has been set up improperly or has been improperly installed or calibrated.
- (ii) The product is operated in a manner that is not in accordance with the user documentation.
- (iii) The product is used for a purpose other than for which it was designed.
- (iv) The product has been used in environmental conditions outside of those specified for the product.
- (v) The product has been subject to any modification, alteration, or change by or on behalf of customer (except and unless modified, changed or altered by JS or under direct supervision of JS).
- (vi) The defect or malfunction results from misuse or accident.

- (vii) The serial number on the product has been tampered with or removed.
- (viii) The product has been opened or tampered with in any way.

This warranty is exclusive, and JS will not assume and hereby expressly disclaims any further warranties, whether express or implied, including, without limitation, any warranty as to merchantability, fitness for a particular purpose, non-infringement or any warranties arising from the course of performance, dealing, or usage of trade. JS specifically makes no warranties as to the suitability of its products for any particular application. JS makes no warranties regarding the following:

- Its products will meet your requirements or will work in combination with any hardware or applications software products provided by third parties.
- The operation of its products will be uninterrupted or error-free.
- All defects in the product will be corrected.

JS shall not be responsible for software, firmware, information, or memory data contained in, stored on, or integrated with any products returned to JS for repair, whether under warranty or not.

11.1.4 Remedy

In the event a defect in materials or workmanship is discovered and reported to JS within the specified warranty period, JS will, at its option, repair the defect or replace the defective part or product. Replacement products may be new or reconditioned. JS warrants any replaced or repaired product for a period of ninety (90) days from the date of return shipment or through the end of the original warranty period, whichever is longer.

11.1.5 Limitation of Liability

To the fullest extent allowed by law, the obligation of JS shall be limited to the repair or replacement of the product. JS shall in no event be liable for special, incidental, or

consequential, indirect, special or punitive damages of any kind, or for loss of revenue or profits, loss of business, loss of information or data, or other financial loss arising out of or in connection with the sale, installation, maintenance, use, performance, failure, or interruption of any product. Any responsibility and/or liability of JS shall, in connection with a warranted product, be limited in the maximum amount to the original purchase price.

11.1.6 Governing Law

This warranty is governed by the laws of Utah, U.S.A. and excludes the United Nations Convention on Contracts for the International Sale of Goods. The courts of Utah shall have exclusive personal jurisdiction in case of any disputes arising out of or in connection with this warranty.

11.1.7 Warranty Repairs

Warranty information for the Geode Receiver is located on our website at www.junipersys.com/support/my-product. You can check warranty status, and view warranty terms and conditions.

To obtain warranty repair, paid upgrade, or service on the Geode Receiver, submit a repair order on our website at www.junipersys.com/support/my-product or contact an authorized repair center within the applicable warranty period. Products returned for repair or service without proper authorization may acquire an additional handling fee and/or delay in the repair. The customer is responsible to prepay all shipping costs when sending equipment to a repair center. The repair center will return the repaired equipment by the same method it was received with costs of shipping prepaid.

Services and Materials Provided Under Warranty

- Analysis of problem by service technician
- Labor and materials required to fix defective parts
- Functional analysis performed after repair
- Repair turnaround within 10 working days of receipt unless special circumstances exist
- Shipping costs to return device to customer

JS strives to provide continued full repair services for our products for five years or more from the final production date of each product model. However, in some rare cases (depending on the repair need), it may not be possible to perform a repair due to an unforeseen discontinuation or lack of supplied parts from third-party vendors. Repair support for a product may continue beyond five years if obtaining replacement parts or tools remains economically feasible. Our policy is that we will do what is best and most beneficial for our customers and company.

11.2 Repairs, Upgrades, and Evaluations

! **CAUTION:** Do not attempt to repair the Geode Receiver yourself. This action voids the warranty. There are no user serviceable parts inside the Geode.

Information about repairs, upgrades, and evaluations is located on our website at www.junipersys.com/support/my-product. You can locate a repair center, submit a repair order, check repair status, view terms and conditions, get shipping instructions, and view lead times.

Before returning a unit, please get permission by submitting a repair order from our website and waiting for confirmation or by contacting a repair center directly. Be prepared to provide the following information:

- Product serial number (see label on bottom of unit)
- Your name
- Name and shipping address of company/university/agency
- Best contact method (phone, fax, email)
- Clear, highly-detailed description of the repair or upgrade
- Credit card or purchase order number and billing address (for a repair or upgrade that is not covered by the standard warranty or an extended warranty policy)



REGULATORY INFORMATION




12. Appendix C: Warnings, Licensing, and Regulations

12.1 Product Warnings

Follow the warnings listed below to use the Geode and accessories safely.


12.1.1 Battery Warnings

 **WARNING!** This device comes with a lithium-ion rechargeable battery pack. To reduce the risk of fire or burns, do not disassemble, crush, puncture, short external contacts, or expose the battery pack to fire.

The Geode unit contains no user-serviceable parts. If the unit needs service, please send it to a authorized service center.

Improper battery use may result in a fire, explosion or other hazard.

12.1.2 Wall Charger Warnings

 **WARNING!** To reduce the risk of personal injury, electrical shock, fire or damage to the equipment:

Plug the wall charger into an electrical outlet that is easily accessible at all times.

Do not place anything on the wall charger cord or any of the other cables. Arrange them so that no one may accidentally step on or trip over them.

Do not pull on a cord or cable. When unplugging the wall charger from the electrical outlet, pull on the plug, not the cord.

Use only wall chargers intended for the Geode Receiver. Using any other external power source can damage your product and void your warranty.

12.2 Certifications and Standards

12.2.1 FCC: United States

In compliance with the FCC rules 47 CFR 15.19(a)(3), the statements that follow must appear on the device or in the user documentation.

This device complies with Part 15 of the FCC Rules. Operation of this equipment is subject to the following two conditions:

1. The device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

In compliance with the FCC rules, 47 CFR 15.105(b), the user must be notified that this equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the 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 and, if not installed and used in accordance with the instructions, 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 turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into 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.

In compliance with the FCC rules, 47 CFR 15.21, the user must be notified that changes or modifications to the device that are not expressly approved by the manufacturer could void the user's authority to operate the equipment.

Only approved accessories may be used with this equipment. In general, all cables must be high quality, shielded, correctly terminated, and normally restricted to two meters in length. Wall chargers approved for this product employ special provisions to avoid radio interference and should not be altered or substituted. When used with a 9-pin serial cable, a ferrite is required on the cable near the end of the cable that connects to the Geode.

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

Contains FCC ID: X3ZBTMOD8

12.2.2 Industry Canada

In compliance with Industry Canada rules, the following statement must appear on the device or in the user documentation:

This Class B digital apparatus complies with Canadian ICES-003.

Contains IC ID: 8828A-MOD8

12.2.3 Radio Frequency Safety

This device operates in compliance with the FCC radio frequency exposure limits for an uncontrolled environment. Users must follow instructions provided in the user documentation to satisfy compliance with FCC radio frequency exposure requirements.

12.2.4 CE Marking (European Union)

Products bearing the CE marking comply with EU Directive 2014/53/EU.

CE compliance of this device is valid only if powered with/by a CE-marked wall charger provided by the manufacturer.

12.2.5 Declaration of Conformity

The Declaration of Conformity for CE Marking is available at: <http://www.junipersys.com/doc>.

D

SPECIFICATIONS



13. Appendix D: Geode Receiver Specifications

FEATURE	SPECIFICATION
Receiver	<ul style="list-style-type: none"> ■ Receiver Type: GNSS multi-frequency, multi-constellation (GNS3M, when activated); single-frequency (GNS3S) ■ Signals: <ul style="list-style-type: none"> ■ GPS: L1CA, L1P, L1C, L2P, L12P, L2C, L5 ■ GLONASS: G1, G2 ■ Beidou: B1, B2, B3 (without L5) ■ GALILEO E1BC, E5a, E5b ■ QZSS: L1CA, L1C, L2C, L5 ■ Channels: 800+ ■ SBAS Support: 3-channel parallel tracking ■ L-band: Atlas worldwide 1525-1560 MHz (with subscription) ■ Update Rate: 1 Hz standard, up to 10 Hz or 20 Hz (optional)
Accuracy	<ul style="list-style-type: none"> ■ SBAS: <30 cm HRMS, <60 cm 2DRMS ■ Atlas (95%): <ul style="list-style-type: none"> ■ H10: 10 cm ■ H30: 30 cm ■ Basic: 50 cm (requires subscription) ■ Autonomous: 1.2 meters HRMS ■ Cold Start: 60 sec typical (no almanac) ■ Reacquisition: 15 sec Atlas, all others <1 sec
Communications	<ul style="list-style-type: none"> ■ Bluetooth® 4.1 SPP, IAP2, EAP ■ Bluetooth Range: Class 1 Long Range ■ Ports: USB-C, Serial RS-232C DB-9 ■ Serial Baud Rates: 4800–115200

FEATURE	SPECIFICATION
Receiver Protocols	<ul style="list-style-type: none"> ■ Data I/O Protocol: NMEA 0183, Crescent Raw Binary (proprietary) ■ Correction I/O Protocol: Hemisphere GNSS Proprietary, ROX, RTCM v2.3, RTCM v3.2, CMR, CMR+ ■ Other: 1PPS Timing Output, Speed Pulse, Event Marker Input (optional)
Power	<ul style="list-style-type: none"> ■ Input Voltage: 5 V DC @ 3 A USB ■ Power Consumption: 1.7–2 W nominal ■ Overtime II Technology™ Battery: 3.6 V 6000 mAh Li-ion <ul style="list-style-type: none"> ■ GNS3M: 10 hours ■ GNS3S: 15+ hours ■ Charging time less than 4 hours
Output Power	<ul style="list-style-type: none"> ■ Output signals variable from 6 to -6 V DC
Input Power	<ul style="list-style-type: none"> ■ 0 to 5 V DC (max +/- 15 V DC)
Antenna	<ul style="list-style-type: none"> ■ Internal precision single/multi-GNSS with integrated ground plane ■ External Antenna Port: <ul style="list-style-type: none"> ■ GNS3M: MCX type, 50 ohm 15 V DC @ 45 mA maximum ■ GNS3S: MCX type, 50 ohm 15 V DC @ 20 mA maximum
Juniper Rugged™	<ul style="list-style-type: none"> ■ Operating Temp: -20° C to +60° C ■ Storage Temp: -30° C to +60° C ■ Meets or exceeds MIL-STD 810G (Drop, Vibration, Temperature, Ingress Protection) ■ Enclosure Rating: IP68 (1.4 meters for 30 min)

FEATURE	SPECIFICATION
Receiver Upgrades	<ul style="list-style-type: none"> ■ 10 Hz Data Rate ■ 20 Hz Data Rate ■ Multi-Frequency ■ Atlas Basic ■ Atlas H30 ■ Atlas H10
Software	<ul style="list-style-type: none"> ■ Geode Connect™ software provides configuration, communications setup, and receiver settings ■ Available for: <ul style="list-style-type: none"> ■ iPhone and iPad ■ Android 7 and above ■ Windows PC (10/11)
Included Accessories	<ul style="list-style-type: none"> ■ Cable USB-A to USB-C ■ Cable USB-C to USB-C ■ 5/8 x 11 Pole Mount Adapter ■ USB charger
Dimensions	<ul style="list-style-type: none"> ■ 110x110x57 mm (4.36x4.36x2.5 in) ■ 394g (14oz) ■ Mount: 1/4x20 camera stud and M4x5 mm AMPS Diagonal

FEATURE	SPECIFICATION
Compatibility	<ul style="list-style-type: none"> ■ Geode Connect™ software provides configuration, communications setup, and receiver settings. ■ Windows® ■ Android™ 7 and above ■ iPad and iPhone. Full list of compatible Apple™ devices: <ul style="list-style-type: none"> ■ iPhone 13 Pro Max, iPhone 13 Pro, iPhone 13, iPhone 13 mini, iPhone 12 Pro Max, iPhone 12 Pro, iPhone 12, iPhone 12 mini, iPhone 11 Pro Max, iPhone 11 Pro, iPhone 11, iPhone XS Max, iPhone XS, iPhone XR, iPhone X, iPhone 8, iPhone 8 Plus, iPhone 7, iPhone 7 Plus, iPhone SE, iPhone 6s Plus, iPhone 6s, iPhone 6 Plus, iPhone 6, iPad Air 2, iPod Touch (7th generation), iPod Touch (6th generation), iPad (9th generation), iPad mini (6th generation), iPad Pro 12.9-inch (5th generation), iPad Pro 11-inch (3rd generation), iPad (8th generation), iPad (7th generation), iPad Air (4th generation), iPad Pro 11-inch (2nd generation), iPad Pro 12.9-inch (4th generation), iPad Pro 11-inch, iPad Pro 12.9-inch (2nd generation), iPad Air (3rd generation), iPad mini (5th generation), iPad mini 4, iPad mini 3, iPad min 2 ■ For more information visit the product website: https://junipersys.com/products/geode.

E

INDEX



Index

A

Accuracy 5

- correction
 - Atlas 12
 - definition 5–6
 - disclaimer 2, 9
 - four satellites 9
 - mutli-GNSS 7, 8
 - NTRIP 10–11
 - SBAS 9–10
 - sub-meter, sub-foot, or sub-decimeter 5, 8

adapter 16, 17, 21

Android

- Learn Geode Connect 67–105
- Set Up Geode Connect 63–65

antenna

- multi-frequency antenna 3
- single frequency 3, 15, 165

App Store ii, 25

Atlas; *See also* subscription

B

base station 11

battery

- charging 21
 - error 16
 - in the field 16
- hours of use 16
- LED status indicator 15
- temperature
 - charging 21, 166
 - operating 166
 - storage 166

BeiDou 7, 31, 70, 118, 165

Bluetooth wireless technology ii, 14, 20, 165

- Connect to
 - Android 64
 - iPad and iPhone 25

- Windows PC 107
- LED indicator 15
- Troubleshooting 109

C

carrier phase tracking 2, 10

carrying options 17

Certifications and Standards 161

charge; *See also* battery

circular error probable (CEP) 6

connection; *See also* Bluetooth wireless technology

- serial 111
- USB 110

correction

- Atlas 2, 3, 12
 - Android 90
 - iPad and iPhone 46
 - subscription 52, 96, 138
 - Windows PC 132
- indicate 31, 69, 118
- NTRIP 2, 10–11, 49; *See also* NTRIP
 - Android 90, 97, 98, 99
 - iPad and iPhone 53, 54
 - Windows PC 132, 138, 139, 140
 - third-party apps 141, 149
- SBAS 2, 9–10, 165
 - Android 70, 90, 91, 92
 - iPhone and iPad 31, 46, 47, 48
 - SBAS Ranging 50, 93
 - Windows PC 118, 132, 133, 134, 135

Crescent Raw Binary data 14

D

data-collection 13, 23, 28, 67, 115

- apps 51, 80, 83, 94, 136, 141, 147

DGPS fix 28, 49, 68, 116

Documentation 21

2DRMS 6

E**EGNOS 47, 48, 91, 92, 133, 134****error sources 5**

- clocks 8
- ionospheric activity 8, 9
- ionospheric errors 9
- multipath environment noise 8
- satellite orbits 8

external antenna 15, 17**G****GAGAN 48, 92, 134****Galileo 7, 31, 70, 118, 165****Geode Connect 13**

- Learn for Android 66
- Set up for Android 62
- Learn for iPad and iPhone 27, 28
- Learn for Windows PC 114
- Set up for iPad and iPhone 24, 25, 26
- Set up for Windows PC 106
- utility app 13, 25–26, 63–64, 107–108

Global Navigation Satellite System (GNSS)

- augmentation 8
- multi-GNSS 7, 31, 70, 118
- vs. GPS 6–8

Global Positioning System (GPS)

- accuracy and precision 5
- number of satellites 7
- only 49, 93, 135
- satellite constellation, United States 7–8
- vs GNSS 6–8

GLONASS 7, 31, 70, 118, 165**GNS2 3****GNS3M 3, 12, 15, 52, 96, 138, 167****GNS3S 3, 15, 167****GNSS errors 8****Google Play 63****H****Hemisphere GNSS 35, 77, 121****Home page**

- Android 68
- iPad and iPhone 28
- Windows PC 116

I**ideal conditions 6, 8, 9****ionosphere 5, 8****IP68 2, 14, 166****iPad and iPhone**

- Learn Geode Connect 28–60
- Set Up Geode Connect 25–26

L**LED Status Indicators 15, 20****Limitation of Liability 156****Location page 71****M****Map page 119****MCX Antenna Connector 20****mixed, receiver mode 49, 93, 135****mock location provider 23, 80, 80–105, 81, 82, 83, 84****mount point 54, 98, 139****MSAS 48, 92, 134****multipath environment 8****N****Network**

- CORS 10
- NTRIP 11
- regional 9

NMEA 14, 20, 34, 42, 43, 76, 87, 121, 129, 165

- capture, save, and share 35, 36, 122
- null 49, 93, 135

NTRIP 10, 10–11, 53

- configure 53–54, 97–99
- correction source 46, 90, 132
- networks 11
- RTK via internet connection 11
- third-party apps on Windows PC 141

O**owner's manual 21****P****Points page 31****port**

- 9-pin RS-232C serial 17, 111, 153
- Bluetooth wireless 14, 80; *See also* Bluetooth wireless technology
- external antenna 15, 17
- Virtual COM port 148

Port Connection

- for Android 85
- for iPad and iPhone 40
- for Windows PC 126

post processing 5**power supply 16****precision 5, 6, 11, 14****protocol**

- Crescent Raw Binary data 14
- NMEA 14, 20, 165
- NTRIP 10–12, 53, 97, 138, 141
- RTCM2 14, 165

Q**QZSS 31, 70, 118****R****radio frequency safety 162****real-time 2, 5, 8, 9, 53, 80, 97, 138, 145****Real-Time Kinematic (RTK) Positioning 10–12****receiver mode 49–50, 92–93, 134–135**

- Glofix 49
- mixed 49, 93, 135
- null NMEA 49, 93, 135
- SBAS ranging 50, 93, 135
- SureTrack 50, 93, 135
- tunnel 50, 93, 135

receiver reset 22, 51, 95, 137**reliability 6, 14, 25, 63, 107****repair 158****reset; *See also* receiver reset; *See also* soft reset****Root Mean Square (RMS) 6****RS-232C 17, 20, 111, 153, 165, 166****RTCM 14, 165****RTK 10, 28, 53, 68, 97, 116, 138****S****satellite**

- constellation
 - BeiDou (China) 7, 31, 70, 118, 165
 - GALILEO (EU) 7, 31, 70, 118, 165
 - GLONASS (Russia) 7, 31, 70, 118, 165
 - GPS (US) 7, 31, 70, 118, 165
- orbits 8
- skyplot 30, 69, 117

SBAS 9–10

- correction source 46, 90, 132
- map 47, 91, 133
- ranging 50, 93, 135

SDCM 48, 92, 134**send command 34, 77, 121****serial port 17, 111; *See also* RS-232C****Settings page 37, 78, 123****Skyplot 30–31, 69–71, 117–119****soft reset 22, 51, 95, 137****SouthPAN 48, 92, 134****specifications 165–172****subscription 3, 11, 12, 15, 52, 53, 96, 97, 138, 139**

T

Terminal 34, 76, 121

twice the distance root mean square (2DRMS) 6

U

update rate 43, 88, 130, 166

USB 13, 41, 86, 107, 111, 128, 165

connection 110

power supply 16

USB-A 16, 167

USB-C 17, 20, 21, 167

W

WAAS 47, 48, 91, 92, 133, 134, 165

warnings 160

warranty 155–158

waypoints 31, 71, 119

Windows PC

Learn Geode Connect 115–151

Set up Geode Connect 107–113