geode™

OWNER'S MANUAL

Part Number 25714-03

⚠ **WARNING!** This symbol indicates that failure to follow directions could result in serious injury.

🛈 **CAUTION:** This symbol indicates that failure to follow directions could result in damage to equipment or loss of information.

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INTRODUCTION

Introduction

The Juniper Systems Geode GNS2 Sub-meter GPS Receiver is a full-functioned GPS receiver. With the Geode, you can collect real-time, sub-meter GNSS data. It works with a wide range of iPhone®, iPad®, Android®, Windows®, and Windows Embedded Handheld 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 sub-meter GNSS data in harsh environments—including heavy 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. It can survive multiple drops from 1.2 meters (4 ft) to concrete. It is designed to withstand harsh environments and provide consistently reliable performance. While stand-alone single-frequency GPS receivers are accurate to only two to five meters or more, the Geode uses SBAS corrections and combines complex smoothing algorithms and full-wave carrier phase tracking to deliver accuracies better than 30 cm RMS (60 cm 2DRMS).

The Geode is available in several configurations, including GPS only or multi-constellation GNSS with various output rates and port options.

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

Geode and Geode GNS2

This manual supports all configurations of the original Geode Sub-meter GPS Receiver as well as the more recent Geode GNS2 configurations. The Geode GNS2 retains all the features of the original Geode with the addition of iPhone and iPad compatibility. The original Geode does not work with iPhone or iPad.

Features that are specific to the Geode GNS2 are identified throughout the manual. Accessories for the Geode are compatible with the original Geode and Geode GNS2.

Model information can be found on the label located on the underside of each Geode. All Geode GNS2 models are indicated with "GNS2" to the right of the Geode logo, as seen in the image below.

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GEODE FEATURES

Geode Features

The Geode is a real-time, sub-meter receiver. This means that the Geode is able to deliver sub-meter accuracy with 95 to 98 percent precision in the very moment that 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.

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 accuracy. This means that the Geode can plot a position to within a sub-meter 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 to 98 percent of the points on a scatter plot will fall within a sub-meter radius of the true point.
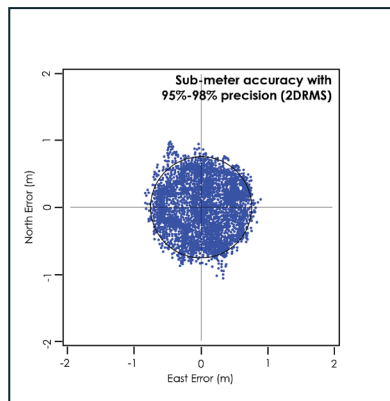
GPS manufacturers quote their accuracies in different ways. They use different statistical descriptions of probability. A GPS receiver may be sub-meter. That is, it may be able to
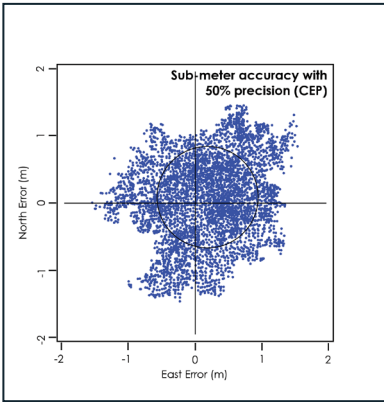
plot points within a meter radius of the true point. However, those points may only fall within that meter radius, 50 to 60 percent of the time. The accuracy for those receivers is sub-meter, but the precision is only 50 or 60 percent.

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 on around 65% of a job. 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.

GPS vs GNSS (optional upgrade)

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 October of 2018, the GPS constellation consists of 31 operational satellites. In ideal conditions, users 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 24 GPS satellites 95% of the time.
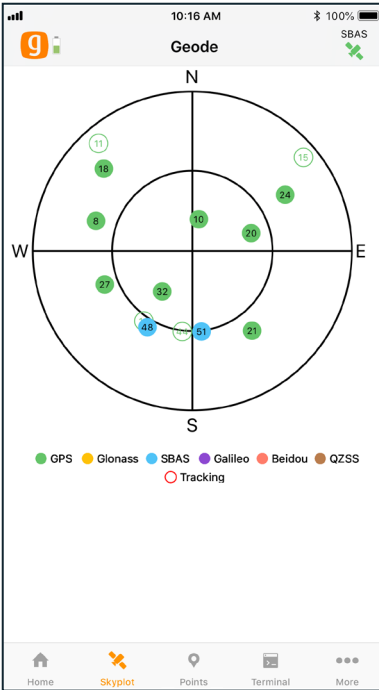
The standard configuration for the Geode is that of a GPS receiver. This means that it receives positioning data from the US government's GPS constellation of satellites. In order to calculate an accurate position, the Geode (or any GPS receiver) needs a direct line of sight with at least four satellites. Without that fourth satellite, the receiver has to estimate altitude which can affect horizontal accuracy by 100s 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 an optional GNSS upgrade. GNSS stands for Global Navigation Satellite System, and it encompasses satellite constellations from various countries and unions. Specifically, the Geode with the Multi-GNSS constellation upgrade can receive positioning data from the following satellite constellations: GPS (US), GLONASS (Russia), GALILEO (European Union), and 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 four or more 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 makes the Geode's ability to deliver real-time sub-meter 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.
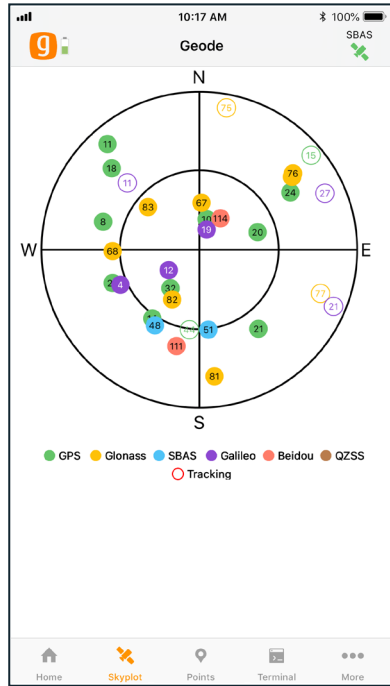

GNSS Augmentation

GNSS data (including GPS) unavoidably will 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 that it can provide real-time high accuracy positions in the rugged, less-than-ideal environments it was built for.

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 atmospheric and ionospheric disturbances, satellite orbit errors, and inaccurate clocks. Each of these errors 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 monitor. Any discrepancy is determined to be an error. These errors are sent to master SBAS stations, 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 around five meters. Using SBAS, users 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 60cm 2DRMS. In other words, 95 to 98 percent of the positions recorded by the Geode will be within a two-foot radius of the true point.

NTRIP Differential Correction

NTRIP stands for Network Transport of RTCM via Internet Protocol. It is the internet upgrade for 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 station called a base. This base is a GPS receiver in a known location that continuously receives positions from GPS satellites. It compares those satellite-generated positions to its known position, calculates corrections, and casts those corrections to the surrounding area via radio signal. 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 and 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.

Update Interval Rate 1 Hz vs 10 Hz (optional upgrade)

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

There is an optional upgrade available for update intervals as fast as 10Hz (10 updates per second). The 10Hz configuration allows you to choose three additional update rates: 2Hz, 5Hz, and 10Hz. Higher update rates are important for projects in which you are collecting data at faster speeds and in greater detail.

Note: Geode Connect for iPhone and iPad does not currently support update rates faster than 2Hz.

Operating Systems

The Geode Sub-meter 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, Windows 8/10, and Windows Embedded Handheld.

Geode Connect

Geode Connect is a simple utility app designed to make the Geode easy to use. Geode Connect provides the user 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 user configuration settings.

Although Geode Connect has data-collection and mapping 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 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: *Geode Connect for iPad and iPhone*, on page 23.
- Chapter 5: *Geode Connect for Android*, on page 43.
- Chapter 6: *Geode Connect for Windows PC*, on page 75.
- Chapter 7: *Geode Connect for Windows Embedded Handheld*, on page 109.

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 Sub-meter GPS Receiver or the device's own internal, consumer-grade GPS receiver. For information about identifying and solving this problem, please see *.*

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.

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 2: *Getting Started*, on page 19).

Antennas

The Geode comes with an internal high-sensitivity dual-feed Multi-GNSS antenna with integrated ground plane.

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. Juniper Systems recommends using the External Cabled Magnetic Antenna available through your sales representative or by emailing *sales@junipersys.com*. Consult Juniper Systems Technical Support before using the Geode with any other external antenna.

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; 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.

Power Supply and Battery

The Geode comes with a 10W, 100-240 VAC universal USB power supply with adapters for US, Japan, UK, EU, and AU/NZ.

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.

The Geode has an internal, non-removable battery that can provide 10+ hours 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 remaining power.

To charge the Geode in the field, use the included USB cable and a vehicle USB adapter to plug the Geode in to a vehicle's 12V 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 that 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 letting 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.

Connector Ports

The Geode comes standard with a micro-USB 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 20 mA of power. Juniper Systems recommends using the External Cabled Magnetic Antenna available through your sales representative or by emailing *sales@junipersys.com*. Consult Juniper Systems Technical Support before using the Geode with any other external antenna.

The Geode has an optional configuration that 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 135.

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 your specific use case and 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.

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" (7mm) 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.

Mounting Plate

The Geode can be mounted on a standard AMPS-style mounting plate when mounted diagonally. Many other attachments support the AMPS-style mounting interface. Use attachment screws size #6-32 that are less than 0.17" (4.5mm) long.

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GETTING STARTED

Getting Started

The Geode Sub-meter 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** Micro USB Port

5 #6-32 Amps Port (1 of 2)   **7** GNS2 Label

6 RS–232C Serial Port   **8** 1/4"–20 Attachment Port

Perform Initial Tasks

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

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.

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 end of the included USB charge cable into the wall charger.
2. Insert the micro USB 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.

Turn on the Geode

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

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, Windows, or Windows Embedded Handheld.

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

- Chapter 4: *Geode Connect for iPad and iPhone*, on page 23.
- Chapter 5: *Geode Connect for Android*, on page 43.
- Chapter 6: *Geode Connect for Windows PC*, on page 75.
- Chapter 7: *Geode Connect for Windows Embedded Handheld*, on page 109.

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 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 (See Chapter 5: *Geode Connect for Android*, on page 43).

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GEODE CONNECT FOR
iPad AND iPhone

Geode Connect for iPad and iPhone
(Geode GNS2 models only)

As a configuration and communication utility for the Geode GNS2 Sub-meter GPS Receiver, Geode Connect provides users 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, 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 iPhone, iPad, and third-party apps.

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

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

Connect to the Geode through Geode Connect
To pair your Geode GNS2 with an iPhone or iPad via Bluetooth, you can use Geode Connect to connect your devices directly.

1. Power on the Geode and open Geode Connect on your device.
2. Click **OK** to pair your device with the Geode.
3. On the Geode Connect Device screen, tap **Discover Nearby Devices**.

> Discover Nearby Devices

4. Tap **OK**.

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

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 screen, select your Geode.

When your Geode is selected, the Home screen will appear.

Connect to the Geode through the OS

To pair your Geode GNS2 through the OS of an iPhone or iPad via Bluetooth, pair the Geode, then connect it in the Geode Connect app.

1. Power on the Geode GNS2.
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. Go to *Connect Device*.
8. Tap on the Geode you wish to connect with.
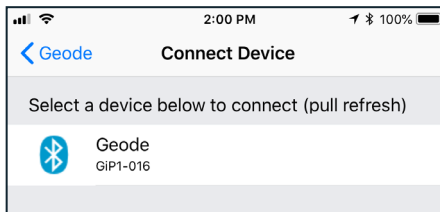
Features

Geode Connect is a utility app that allows you to customize and fine-tune the Geode to your specific project or application. Each feature in Geode Connect serves one of two primary functions: configuration of the Geode or validation of Geode accuracy. 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.

Most of the features in Geode Connect include a description below the options available.
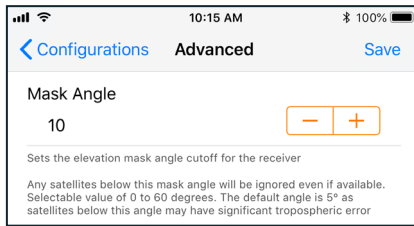
The features available in Geode Connect for iPad and iPhone are as follows:

View Receiver Information and Data Output

The Home screen for Geode Connect serves as a dashboard for the Geode receiver. On this screen, 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, and PDOP.
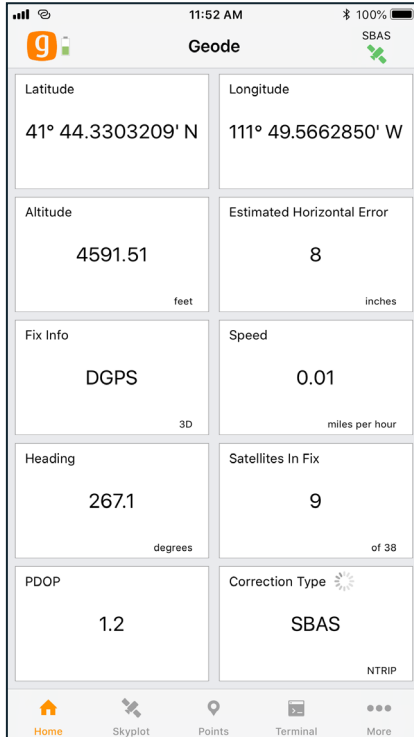
From this screen, you can access the Skyplot, Waypoints, and Terminal screens. Tapping on the device configuration at the top will allow you to change receivers, and tapping on the Settings icon at the bottom will allow you to configure the currently connected receiver.

View Real-time Satellite Skyplot

Tap *Skyplot* on the navigation bar.

The Skyplot screen shows what 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 screen, each satellite is identified by space vehicle number (SVN) and a 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.
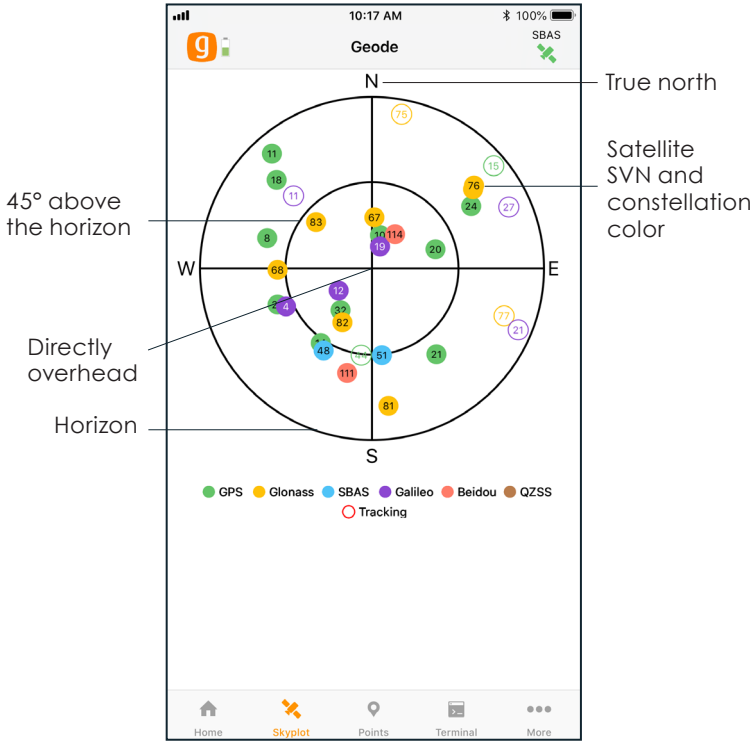
Satellite symbols displayed as outlined circles indicate that the satellites are being tracked, but they are not yet a part of the positioning solution.

The Skyplot screen 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 now support Galileo and BeiDou constellations in addition to GPS and GLONASS.

Capture and Export Waypoints

Tap *Points* on the navigation bar.

The Waypoint Capture screen allows users to demonstrate point capture and export captured data as JSON, 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.
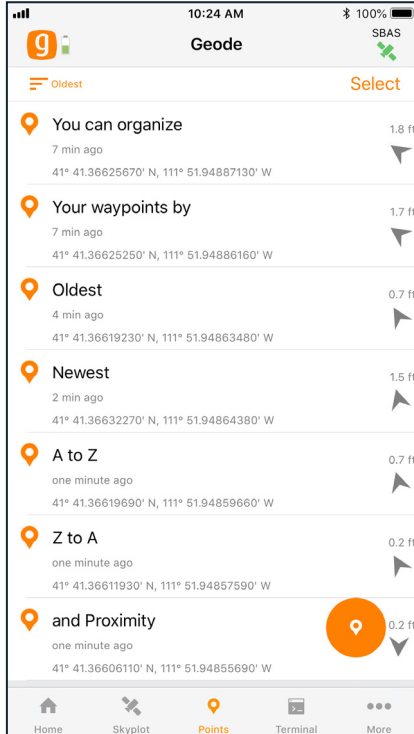
Capture Waypoints

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

2. To type a description for the waypoint (optional), tap on the waypoint you wish to describe.

3. Tap on the waypoint name beneath the coordinates.

4. Type your description.
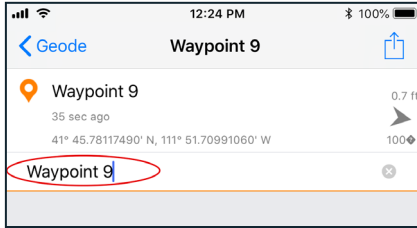
Organize Waypoints

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.

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 (JSON, CSV, KML, or KMZ).

7. Tap *Export*.

8. Export or share according to the apps and instructions for your iPad or iPhone.

Customize Data Output and Configure the Receiver

Tap *Terminal* on the navigation bar.

The Terminal screen displays the NMEA sentences the Geode is receiving. It provides the options to include timestamps (top left) or to auto scroll the data (top right).
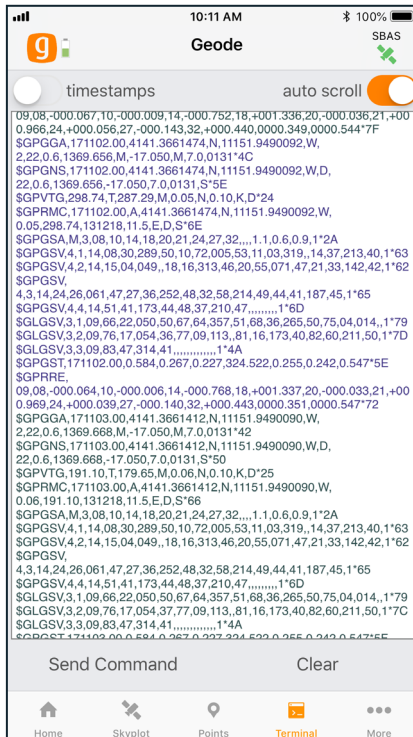
At the bottom of the Terminal screen, you can send commands to the Geode. This gives you complete flexibility in configuring the Geode and customizing data output.

1. Tap *Send Command*.
2. Tap *Show/Hide logging* to show or hide the NMEA string 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. The Terminal screen is a powerful tool. However, it is possible to cause communication or other errors in the Geode that may require technical assistance to repair.

Customize App Preferences

On the navigation bar, tap *More* > *Preferences.*

The App Preferences screen allows you to customize your preferences for how information is displayed in Geode Connect.
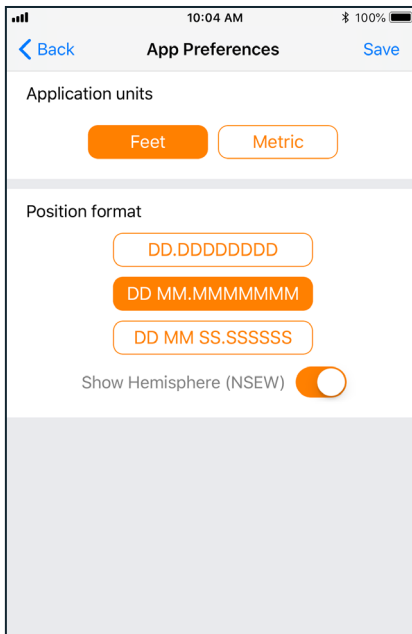
You can specify application units (feet or metric), position format, and whether or not the app will show the hemisphere.

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.*

Configure Geode

On the navigation bar, tap *More > Receiver Configuration.*

This will open the Configurations screen.

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.

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

You can choose which GNSS constellations to use in your solution, GPS and Multi-GNSS (if the Geode has this upgrade). 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.

You can specify preferences for NMEA precision (number of decimal places) as well as update rate.
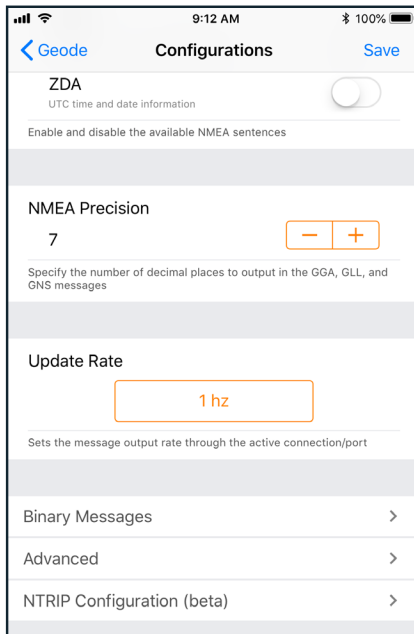
Note: iPhone and iPad do not currently support update rates higher than 2Hz. If your Geode is configured to work at a higher update rate, you will need to lower it in order for it to work with iPhone or iPad.

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.*

Configure Advanced Settings

On the navigation bar, tap *More > Receiver Configuration > Advanced* (at the bottom of the screen).

This will take you to a screen where you can configure more advanced settings for the Geode.

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.

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

SBAS–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.

Receiver Mode–These options affect how the Geode collects and processes positioning information, as well as how it out puts certain types of data.

- **Glofix**: This is proprietary technology that improves the Geode's sub-meter precision and accuracy. The recommendation is to always leave this option checked.
- **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 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. To save changes, tap Save *in the upper right corner before you leave this screen.*

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.
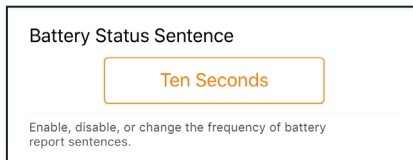
Battery Status Sentence

Ten Seconds

Enable, disable, or change the frequency of battery report sentences.

The message is sent out from the Geode as a custom message along with the NMEA strings. The message is visible in the terminal screen, as are all other NMEA messages and commands. In Geode Connect, the battery status sentence looks like this:

Battery sentence →

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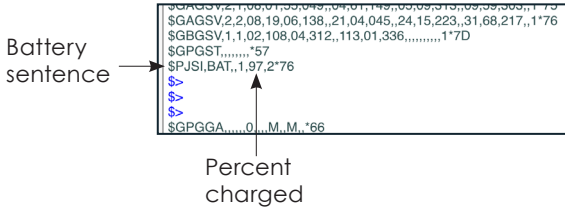
This sentence may not be recognized by some navigation or data-collection apps. If it causes problems in an app, disable it.

Factory Reset–Tapping *Reset Receiver* will bring up the following dialog box:
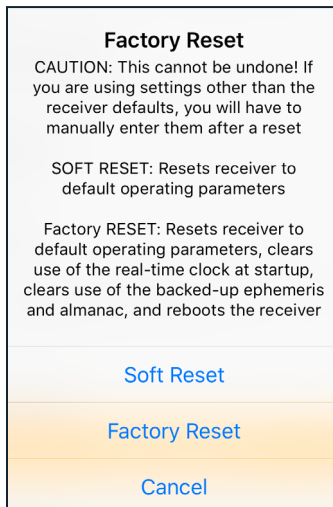
Factory Reset

CAUTION: This cannot be undone! If you are using settings other than the receiver defaults, you will have to manually enter them after a reset

SOFT RESET: Resets receiver to default operating parameters

Factory RESET: Resets receiver to default operating parameters, clears use of the real-time clock at startup, clears use of the backed-up ephemeris and almanac, and reboots the receiver

Soft Reset

Factory Reset

Cancel

A soft reset reconfigures the Geode to all its default settings. A factory reset does the same, but it also clears all ephemeris and almanac 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 factory reset.

The Almanac message from GPS satellites repeats every 12.5 minutes. After a Factory 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.

Configure NTRIP

On the navigation bar, tap *More > Receiver Configuration > NTRIP Configuration* (at the bottom of the screen).

This will open the NTRIP Configuration screen.

This screen 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 Chapter 3: *Geode Features*, 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. Leave the default selection: *Send GGA to Caster.* 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.

   Remember, 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 screen, just below the receiver identifying information.
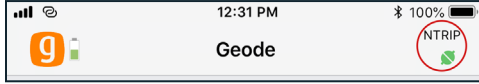
If NTRIP appears on the home screen with an open orange plug, the Geode is still trying to establish a connection to the NTRIP service.
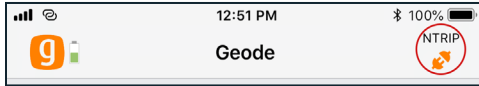
Request Help and Send Feedback

On the navigation bar, tap *More > Help/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.

5
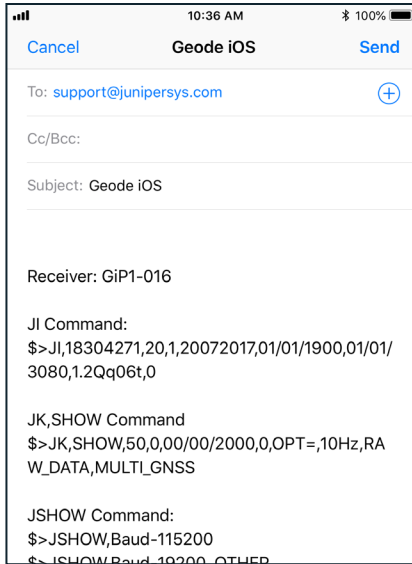
GEODE CONNECT FOR
ANDROID

Geode Connect for Android

As a configuration and communication utility for the Geode Sub-meter GPS Receiver, Geode Connect provides users 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, 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.

Download and Install

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

Google Play

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

Juniper Systems Webpage

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

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

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 right corner.
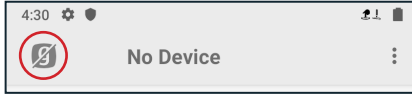
5. The app will display a list of local Bluetooth wireless devices. Identify your Geode via the serial number printed on its bottom panel. Tap on the name of the Geode you wish to pair with.
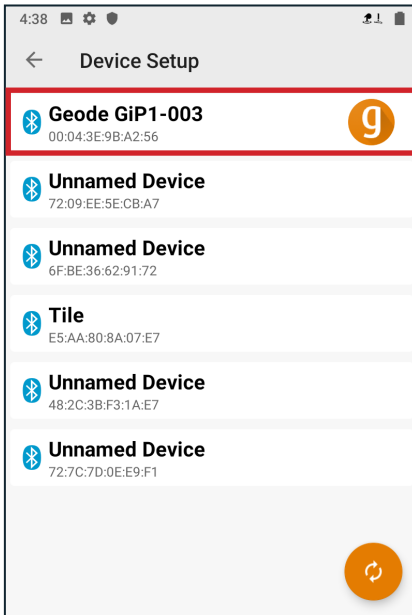
Note: If your Geode doesn't show up in the list of devices, check to make sure it is turned on and not paired with another device. Then tap the refresh icon at the bottom of the list of devices ↻ *.*

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

The Geode should now be connected to your Android device.

Features

Geode Connect is a utility app that allows you to customize and fine-tune the Geode to your specific project or application. Each feature in Geode Connect serves one of two primary functions: configuration of the Geode or validation of Geode accuracy. 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.

Most of the features in Geode Connect include a Help toggle below the options available.
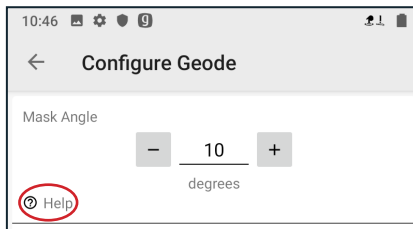
Tapping on *Help* will reveal detailed descriptions of the options available with that specific feature.
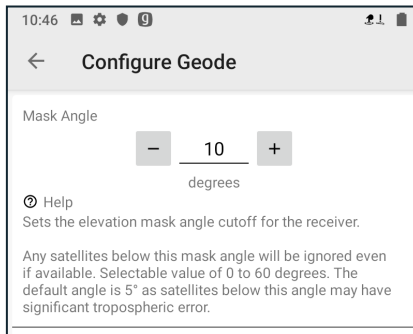
The features available in Geode Connect for Android are as follows:

View Receiver Information and Data Output

The Home screen for Geode Connect serves as a dashboard for the Geode receiver. On this screen, 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 type.
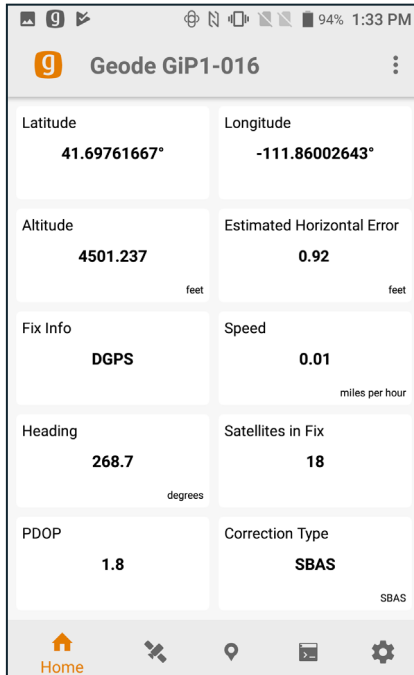
From this screen, you can access the Skyplot, Waypoint, and Terminal screens. Tapping on the Geode name at the top will allow you to change receivers, and tapping on the gear icon at the bottom will allow you to configure the currently connected receiver.

View Real-time Satellite Skyplot

Tap the Skyplot icon ![icon] on the navigation bar.

The Skyplot screen shows what 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 screen, each satellite is identified by space vehicle number (SVN) and a 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.

The Skyplot screen 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 now support Galileo and BeiDou constellations in addition to GPS and GLONASS. After a firmware update, the Geode supports additional satellite constellations to increase the reliability of an already accurate solution.

If the Skyplot screen is not displaying data:

1. Go to Settings 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 💾 .

Capture and Share Waypoints

Tap the Points icon ⦿ on the navigation bar.

This opens the Waypoint Capture screen, which allows users to demonstrate point capture and share captured data as JSON, 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.
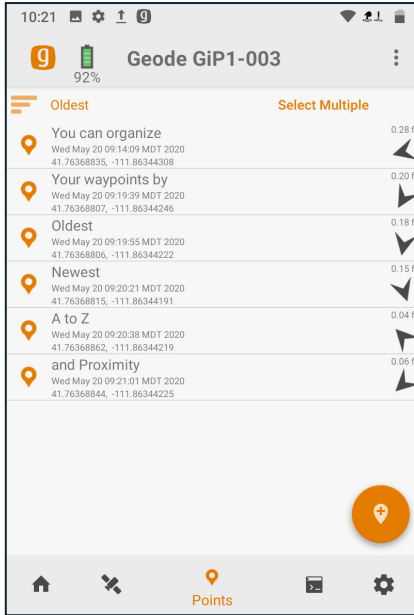
Capture Waypoints

Note: Geode Connect for Android only records waypoints if the following NMEA sentences are <u>all</u> three activated: GSA, RRE, and GGA. See **Configure Receiver Settings** *on page 58 for instructions on how to enable NMEA sentences.*

1. With the Geode in the position you would like to capture, tap the Waypoint Plus icon.
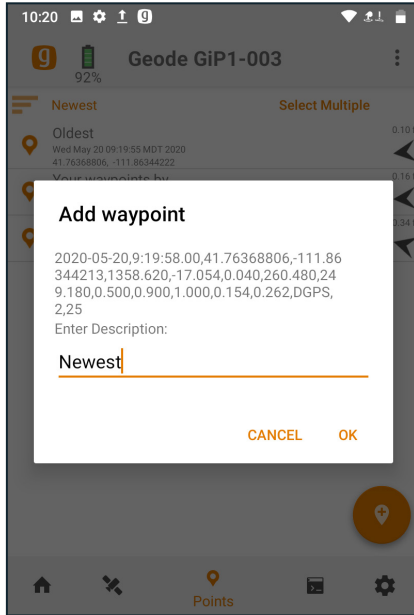
2. Type a description or name for the waypoint (optional).
3. Tap *OK*.

Delete Waypoints

1. On the Waypoint screen, tap *Select Multiple*.
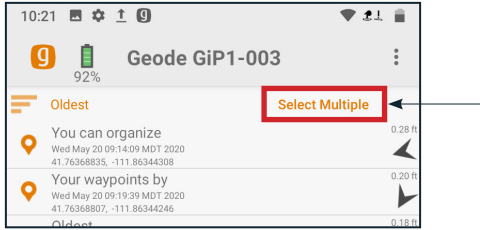
2. Select the Waypoint(s) you want to delete.
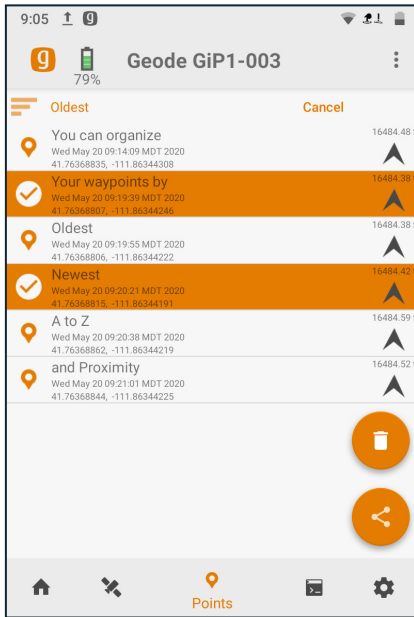
3. Tap the Trash icon.

4. Tap *Delete* in the dialogue box.

Share Waypoints

1. On the Waypoint screen, tap *Select Multiple*.
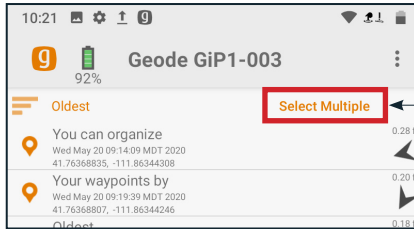
2. Select the Waypoint(s) you want to share.
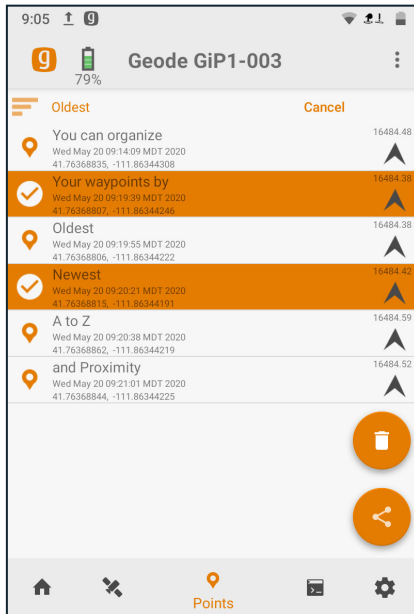
3. Tap the Share icon 🔗.

4. Name the waypoint file.

5. Choose the file type: JSON, CSV, KML, or KML.
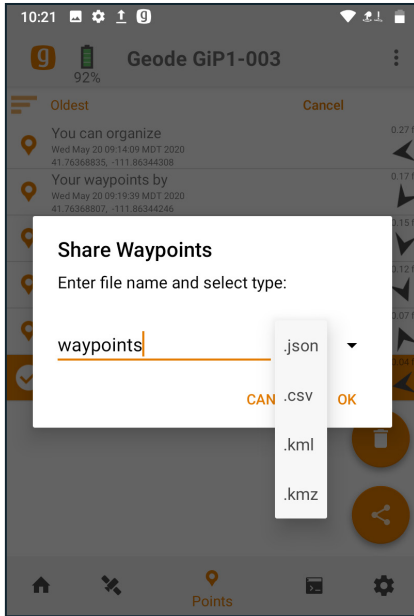
6. Tap *OK*. Geode Connect will package the waypoints in the file type chosen and prompt you to use your device to share the file.

7. Choose the app you would like to use to share the file.

8. Follow the instructions on your device to finish the file share.

Customize Data Output and Configure the Receiver

Tap the Terminal icon 📟 on the navigation bar.

The Terminal screen displays the NMEA sentences the Geode is receiving. It provides the options to clear the stream (top left), include timestamps (top center) or to auto scroll the data (top right).
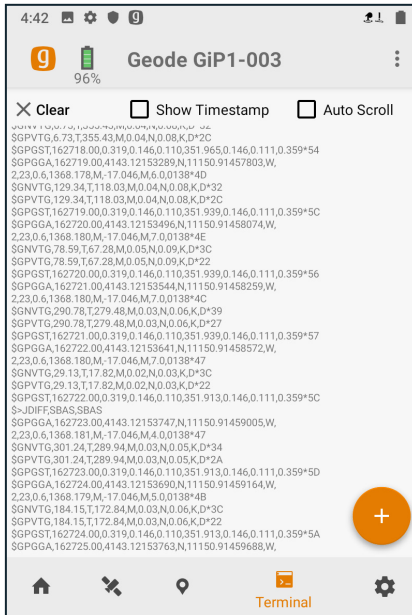
This screen also gives users complete flexibility to configure the Geode and customize data output.

Tap the Plus icon ➕ to reveal the following options:
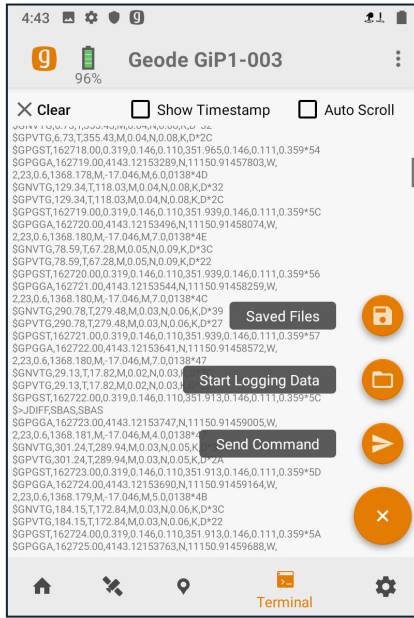
- To start logging data received by the Geode, tap the file icon. 📁 Tap it again to stop logging data.
- To view saved data logging files, tap the disk icon. 💾 Tap the three vertical dots to the left of a log file to delete or share it.
- To send a command to the Geode, tap the command icon. ➤ The dialog 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. Under *General,* tap on *Technical Reference Guide* (it may include a version number).

⊘ **CAUTION:** Use at your own risk. The Terminal screen is a powerful tool. However, it is possible to cause

communication or other errors in the Geode that may require technical assistance to repair.

Customize App Preferences

1. On any of the home screens, tap the vertical menu in the upper right corner.
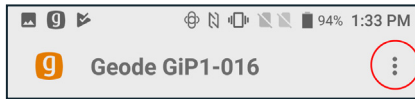
2. Tap *App Settings*.

This opens the Preferences screen, which 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.
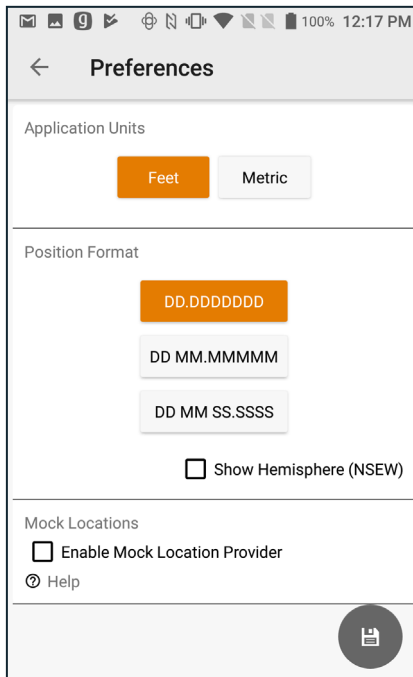
This screen is also where you enable Geode Connect as the mock location provider for your Android device. Please see *page 69* for more about mock locations.

Note: Changes must be saved in order for them to remain from screen to screen. If the disk 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 disk icon to save changes.

Configure Receiver Settings

On any of the home screens, tap the gear icon in the navigation bar.

This will open the Receiver Settings screen.

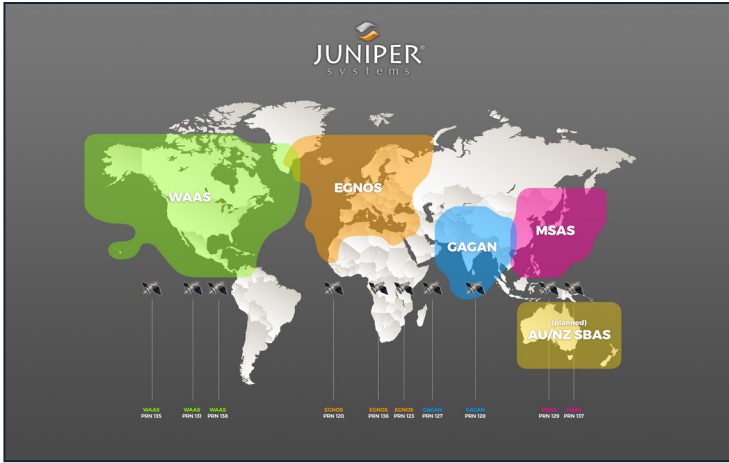*Note: The following screens and options are only available if you are actively connected to a Geode receiver. Changes saved on these screens are changes made to the Geode receiver, not Geode Connect. This means that these changes crossover and are effective in other navigational and data-collecting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

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

You can choose which GNSS constellations to use in your solution, GPS and Multi-GNSS (if the Geode has this upgrade).
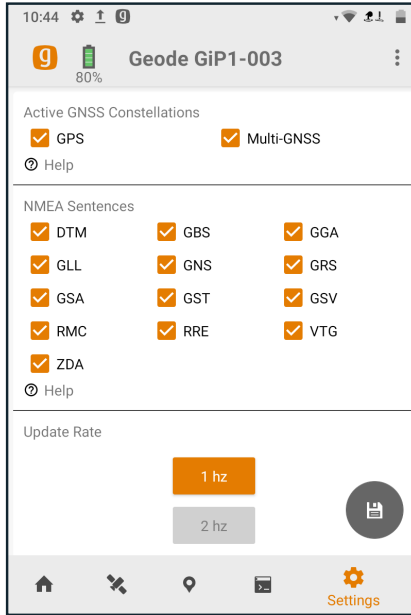
You can choose which NMEA sentences you want the Geode to receive. In most instances, the default NMEA sentences will be sufficient for your project or application. For more information about what information is carried on each NMEA sentence, tap *Help* below the sentence options.

You can also specify preferences for NMEA precision (number of decimal places) and the update rate (with the 10Hz upgrade).

Note: Changes must be saved in order for them to remain from screen to screen. If the disk 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 disk icon to save changes.

Configure Advanced Settings

On the Receiver Settings screen, scroll down and tap *Advanced.*

This will take you to a screen where you can configure more advanced settings for the Geode.

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.

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

SBAS–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.

Correction Source–Specifies whether the Geode should automatically choose its correction source or accept only SBAS or only NTRIP corrections. When the correction source is set to Auto, the Geode is programed to choose a source according to accuracy level.

When available, NTRIP is the Geode's most accurate correction source, and therefore, its first choice. If the Geode loses its NTRIP connection, it will try to reconnect. If it fails to reconnect (usually after about two minutes), it will default to an SBAS-corrected solution. 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.

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.

Receiver Mode–These options affect how the Geode collects and processes positioning information, as well as how it out puts certain types of data.

- **Glofix**: This is proprietary technology that improves the Geode's sub-meter precision and accuracy. The recommendation is to always leave this option checked.
- **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 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 disk 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 disk icon to save changes.

Battery Status Sentence–This gives the option to choose how frequently the Geode sends a battery status message.
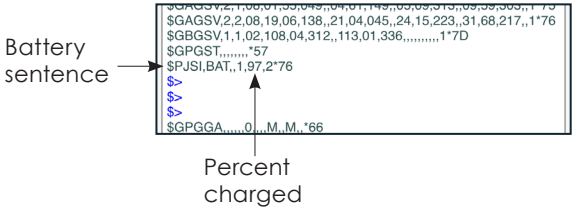

The message is used by Geode Connect and other applications to display the battery capacity status. The default setting is Ten Seconds.

The message is sent out from the Geode as a custom message along with the NMEA strings. The message is visible in the terminal screen, as are all other NMEA messages and commands.
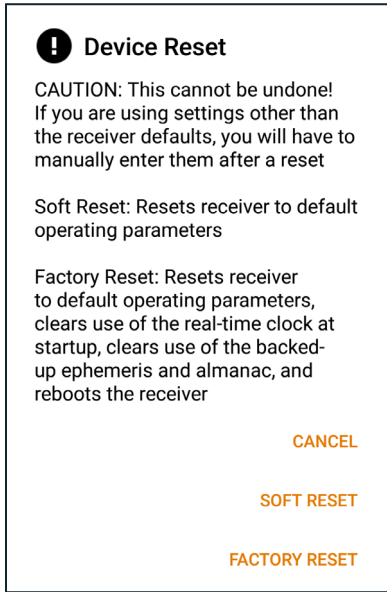
In Geode Connect, the battery status sentence looks like this:

Battery sentence →

Percent charged

```
$GAGSV,2,1,08,01,33,049,,04,01,149,,05,09,313,,09,39,303,,1*75
$GAGSV,2,2,08,19,06,138,,21,04,045,,24,15,223,,31,68,217,,1*76
$GBGSV,1,1,02,108,04,312,,113,01,336,,,,,,,,,,1*7D
$GPGST,,,,,,,,*57
$PJSI,BAT,,1,97,2*76
$>
$>
$>
$GPGGA,,,,,,0,,,,M,,M,,*66
```

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

Note: GNS1 Geode models do not have this feature. There is no battery indicator if you are using an earlier Geode model, as seen in the image below:

Geode GiP1-016

Factory Reset–Tapping *Reset Receiver* will bring up the following dialog box:

Device Reset

CAUTION: This cannot be undone! If you are using settings other than the receiver defaults, you will have to manually enter them after a reset

Soft Reset: Resets receiver to default operating parameters

Factory Reset: Resets receiver to default operating parameters, clears use of the real-time clock at startup, clears use of the backed-up ephemeris and almanac, and reboots the receiver

CANCEL

SOFT RESET

FACTORY RESET

A soft reset reconfigures the Geode to all its default settings. A factory reset does the same, but it also clears all ephemeris and almanac 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 factory reset.

The Almanac message from GPS satellites repeats every 12.5 minutes. After a Factory 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.

Configure NTRIP

On the Receiver Settings screen, scroll down and tap *NTRIP Configuration*.

This will open the NTRIP Configuration screen.

This screen 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 Chapter 3: *Geode Features*, 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 disk 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 disk icon to save changes.

To establish an NTRIP connection:

1. Make sure that 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. Leave the default selection: *Send GGA to Caster*. 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 *Download Mount Points*.
5. Tap on the down arrow just above the Start NTRIP 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.

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

6. Choose the appropriate mount point.

7. Tap the Android system down arrow at the bottom of the screen to release the keyboard.

8. Tap the disk icon in the bottom right corner to save changes. 💾

9. Tap *Start NTRIP*.

To set NTRIP as the only correction source (strongly recommended, see):

1. Still on the NTRIP Configuration screen, tap the back arrow. ←

2. Tap *Advanced*.

3. Under Correction Source, tap on NTRIP.
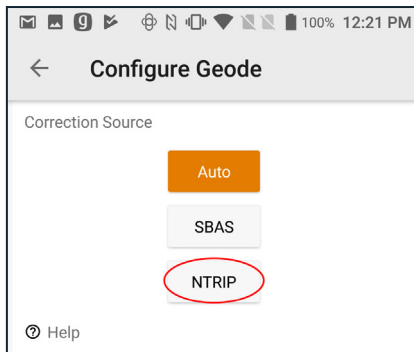
This will tell the Geode to use only NTRIP corrections. If it loses its NTRIP connection, the Geode will default to an autonomous (uncorrected) solution, not an SBAS corrected solution.

When NTRIP is connected and working, the word NTRIP and a closed green plug will appear on the right side of the Home screen, just below the receiver identifying information.

Geode GiP1-016 NTRIP 83% 2:14 PM

If NTRIP appears on the home screen next to an open orange plug, the Geode is still trying to establish a connection to the NTRIP service.

Geode GiP1-016 NTRIP 83% 2:14 PM
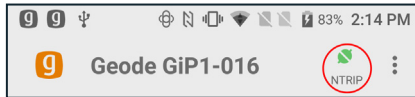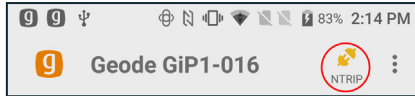
Third-Party Apps and Mock Location Provider

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 accuracy. However, if your app is depending on the operating system, 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 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 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. Doing so requires some configuration adjustments in the Android operating system as well as in Geode Connect.

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 screen, go to *Settings > About phone* (or *About Tablet*)

2. Tap *Build Number* seven (yes, seven) times. This will unlock the Developer options.

> Kernel version
>
> 3.18.22Aroot@agold1503 #5 Mon Nov 14
>
> You are now 4 steps away from being a developer.
>
> Build number
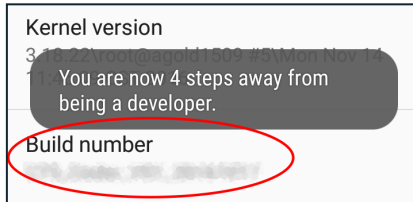
Note: Build Number *may not look like you can tap on it. Tap on it anyway After three taps, Android will prompt you to continue becoming a developer.*

Once you are a developer, close 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*.

3. Tap the Save icon.

> Mock Locations
>
> ☑ Enable Mock Location Provider
>
> ⑦ Help
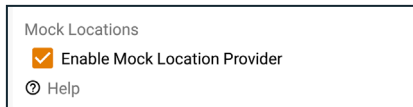
Geode Connect will prompt you to open Developer Options.

4.   Tap OK.

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

Enable Mock Locations?

Mock Locations must be enabled in Developer Options for Mock Location Provider to function.

Open Developer Options now?

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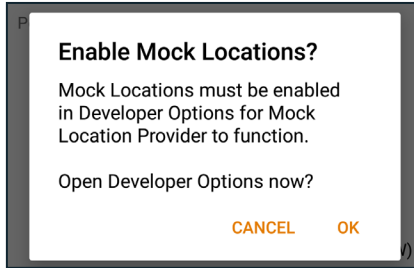
5.   Tap *Select mock location app.* (In older versions of Android, the option will be *Allow mock locations*, and it will not ask you for a specific app.)

Select mock location app
No mock location app set

Enable view attribute inspection
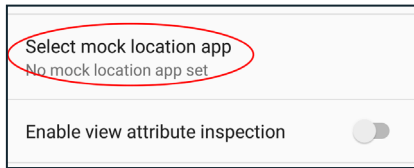
6.   Tap *Geode Connect* in the list of possible apps.

Select application

Nothing

g   Geode Connect
com.juniper.geode2a
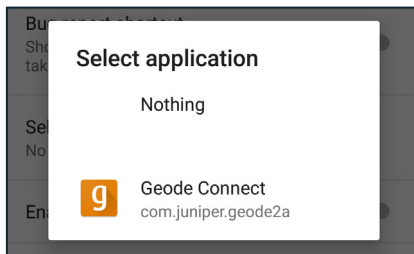
7.   Tap the Android *Back* button to return to Geode Connect.

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 69 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. 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 69 and make sure all mock location provider settings have been properly configured.

Request Help and Send Feedback

1. On any of the home screens, tap the vertical menu in the upper right corner.

2. 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.

6
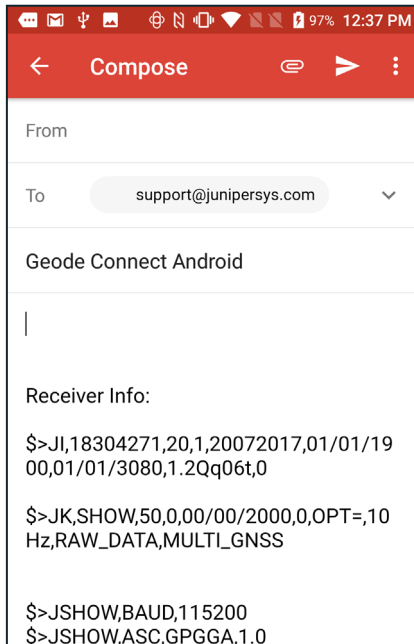
GEODE CONNECT FOR WINDOWS PC

Geode Connect for Windows PC

As a configuration and communication utility for the Geode Sub-meter GPS Receiver, Geode Connect provides users 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, 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.

Download and Install

Geode Connect is available for download on the Juniper Systems webpage.

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

Connect with the Geode

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

Pair via Bluetooth

1. Power on the Geode.
2. Make sure Bluetooth wireless technology is enabled on your Windows device.
3. Open Geode Connect.
4. 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 screen when you open the app.

5. Tap *Change Device*. This opens the Device Setup screen.

6. The app will display a list of local wireless and connected devices. Identify your Geode via the serial number printed on its bottom panel. Tap on the name of the Geode you wish to pair with.
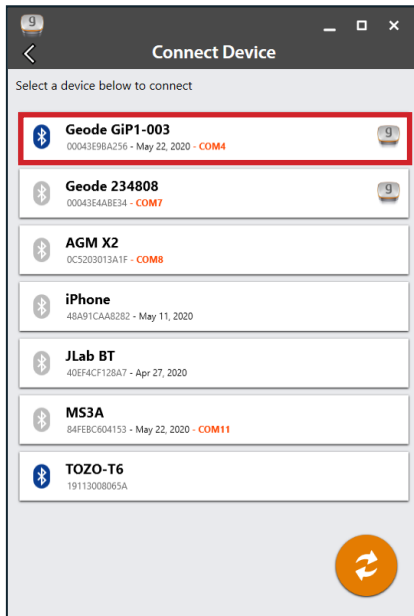
Note: If your Geode doesn't show up in the list of devices, check to make sure it is turned on and not paired with another device. Then tap the refresh icon at the bottom of the list of devices .

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

8. 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 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:
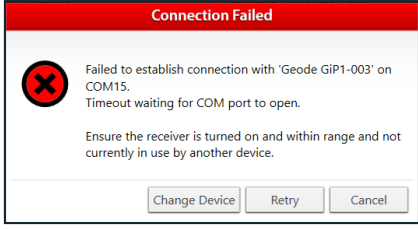
1. Select *Retry*.

   This may fix the connection. If not, Geode Connect will display the following:
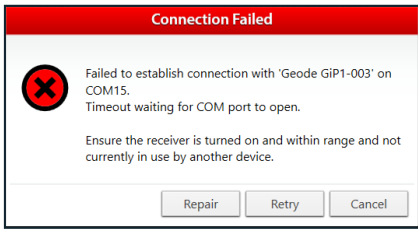
2. Select *Repair*.

   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 again with the pair sequence for a Bluetooth connection.

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.

1. Make sure your Windows PC or tablet is in *Desktop mode*, not *Tablet mode*.
2. Power on the Geode *before* you plug it into your device.
3. Plug the USB cable into your mobile device and your 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.

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 screen when you open the app.

6. Tap *Change Device*. This opens the Device Setup screen.
7. 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. Tap 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 (optional upgrade)

The Geode has an optional configuration that provides 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 135.
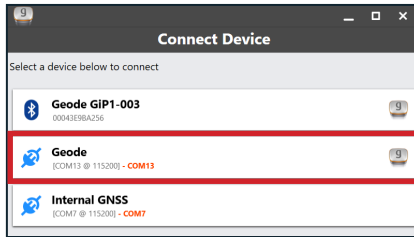
To communicate between a PC and a Geode over a straight-through serial cable:

1. Open Geode Connect.

2. 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 screen when you open the app.

3. Tap *Change Device.* This opens the Device Setup screen.

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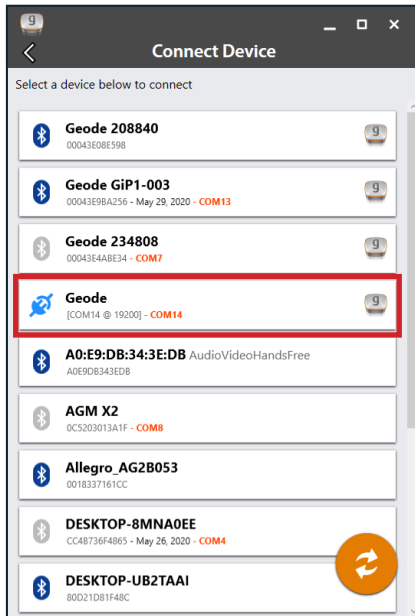
Note: If your Geode doesn't show up in the list of devices, check to make sure it is turned on and connected to your device. Then tap the refresh icon at the bottom of the list of devices 🔄.

The Geode will then connect to the host device.

Unique Geode Configuration Per Connection Type

The Geode remembers its configuration *per each connection type*. If you plan to switch between Bluetooth wireless and USB or RS-232, the Geode will not remember its settings between these connections. You will need to configure it for each connection type.

If you switch between devices, but always use the same connection type (e.g., Bluetooth wireless), the Geode will remember the settings from device to device. The same is true of switching between COM ports, as long as the connection type is consistent.

This affords the user a certain amount of flexibility. If you have multiple uses for the Geode and would prefer not to have 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-232 connection: settings optimized for speed and unobstructed open sky

The user wouldn't need to reconfigure the Geode for each task. If the Geode were uniquely configured for each connection type, switching the connection would switch the settings.

Features

Geode Connect is a utility app that allows you to customize and fine-tune the Geode to your specific project or application. Each feature in Geode Connect serves one of two primary functions: configuration of the Geode or validation of Geode accuracy. 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.

Most of the features in Geode Connect include a Description toggle below the options available.
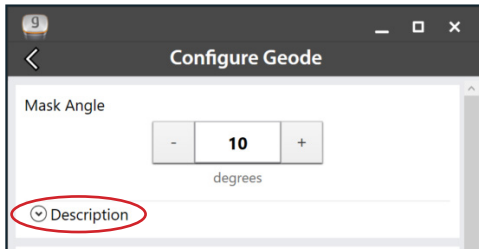
Tapping on *Description* will reveal detailed descriptions of the options available with that specific feature.
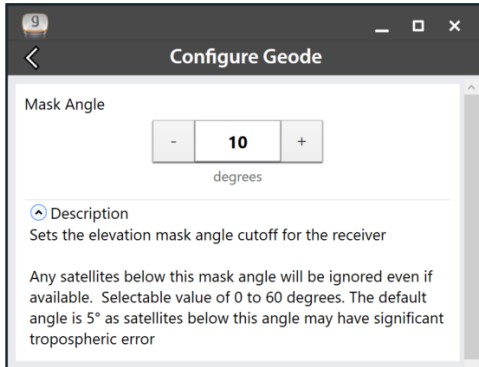
The features available in Geode Connect for Windows PC are as follows:

View Receiver Information and Data Output

The Home screen for Geode Connect serves as a dashboard for the Geode receiver. On this screen, 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, and PDOP.
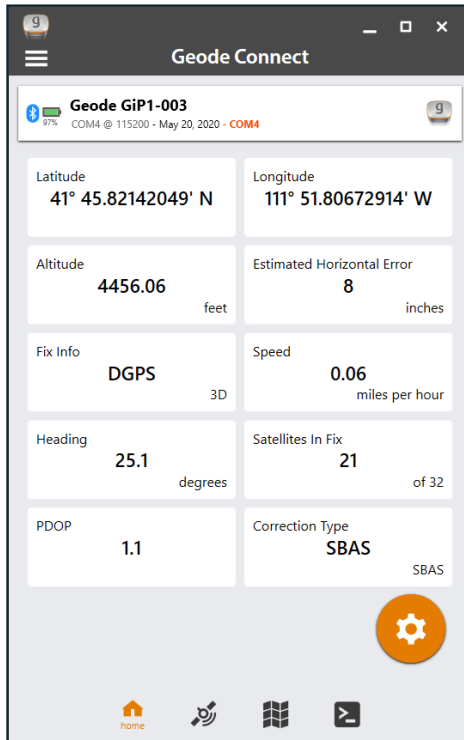
From this screen, you can access the Skyplot, Map View, and Terminal screens. Tapping on the device configuration at the top will allow you to change receivers, and tapping on the Settings icon at the bottom will allow you to configure the currently connected receiver.

View Real-time Satellite Skyplot

Tap the satellite icon ✖ on the navigation bar.

The Skyplot screen shows what 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 screen, each satellite is identified by space vehicle number (SVN) and a 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.

The Skyplot screen 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 now support Galileo and BeiDou constellations in addition to GPS and GLONASS. After a firmware update, the Geode supports additional satellite constellations to increase the reliability of an already accurate solution.

If the Skyplot screen is not displaying data:

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

View and Capture Waypoints on a Map

Tap the map icon ▦ on the navigation bar.

The Map View screen allows users to see their position in relation to public roads and other landmarks.

On the Map View screen, you can capture, compare, and navigate to waypoints.
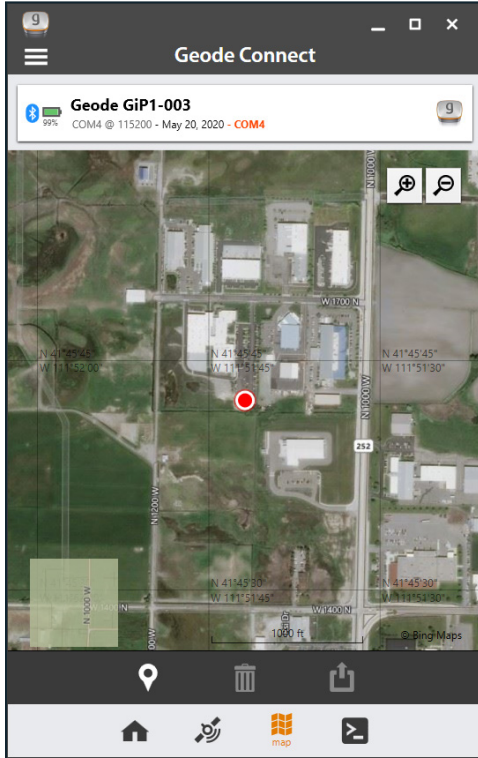
Capture, View, and Compare Waypoints

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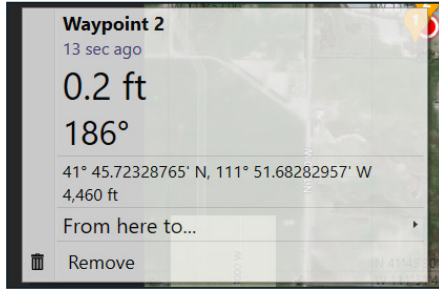
Geode Connect will show you the waypoint's distance and bearing compared to your current position. It will also display the latitude, longitude, and altitude of the waypoint.

To delete the waypoint, tap on Remove.

To compare the waypoint to another waypoint,

- Tap on From here to. . .
- Select the waypoint you want to compare your current position to.
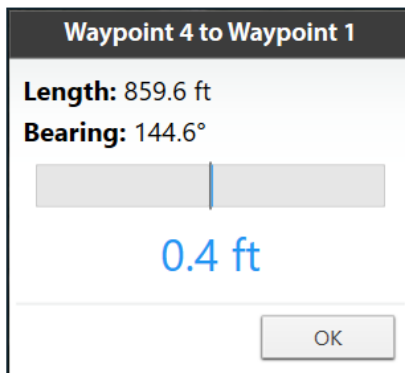
The blue shaded area represents the cross track error between where you are now and what it would take for you to get back on the direct path between the two waypoints.

Customize Data Output and Configure the Receiver

Tap on the terminal icon on the navigation bar.

The Terminal screen displays the NMEA sentences the Geode is receiving. It provides the options to include timestamps (top left) or to auto scroll the data (top right).
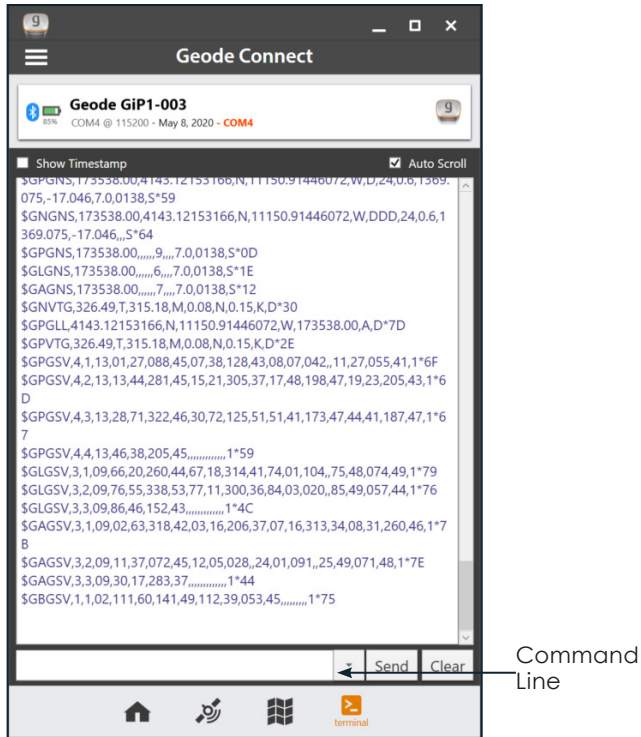
Command Line

At the bottom of the Terminal screen, there is a command line, which gives users complete flexibility in configuring the Geode and customizing data output.

Tapping the down arrow next to the command line will reveal *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. Under *General,* tap on *Technical Reference Guide* (it may include a version number).

⚠ **CAUTION:** Use at your own risk. The Terminal screen is a powerful tool. However, it is possible to cause communication or other errors in the Geode that may require technical assistance to repair.

Customize App Preferences

Go to *Main Menu > Preferences.*

The Preferences screen allows you to customize your preferences for how information is displayed in Geode Connect.
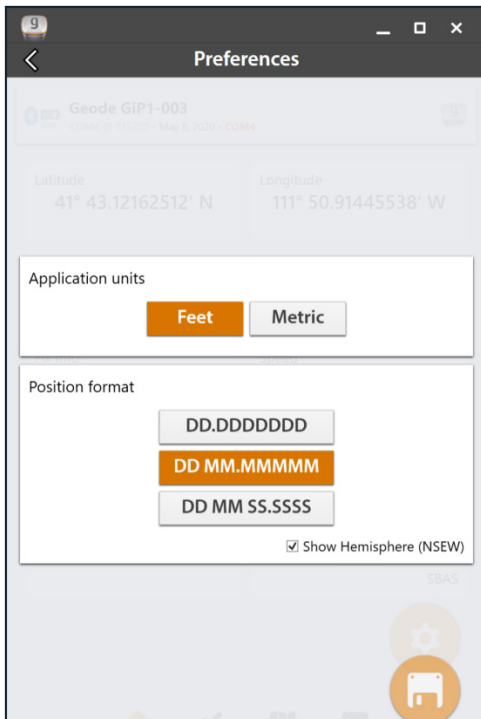
You can specify application units (feet or metric), position format, and whether or not the app will show the hemisphere.

Note: Changes must be saved in order for them to remain from screen to screen. If the disk 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 disk icon to save changes.

Configure Geode

Go to *Home* > ⚙ (in the bottom right corner of the screen).

This will open the Configure Geode screen.

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.

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

You can choose which GNSS constellations to use in your solution, GPS and Multi-GNSS (if the Geode has this upgrade).

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. For more information about what information is carried on each NMEA sentence, tap on *Description* below the sentence options.

You can also specify preferences for NMEA precision (number of decimal places) and the update rate (with the 10Hz upgrade).

Note: Changes must be saved in order for them to remain from screen to screen. If the disk 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 disk icon to save changes.
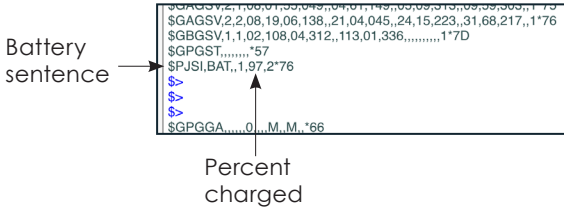
Configure Advanced Settings

On the Configure Geode screen, scroll down and tap *Advanced*.

This will take you to a screen where you can configure more advanced settings for the Geode.

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.

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

SBAS–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.

Receiver Mode–These options affect how the Geode collects and processes positioning information, as well as how it out puts certain types of data.

- **Glofix**: This is proprietary technology that improves the Geode's sub-meter precision and accuracy. The recommendation is to always leave this option checked.

- **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 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 disk 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 disk icon to save changes.

Battery Status Sentence (GNS2 only)–This gives the option to choose how frequently the Geode sends a battery status message.
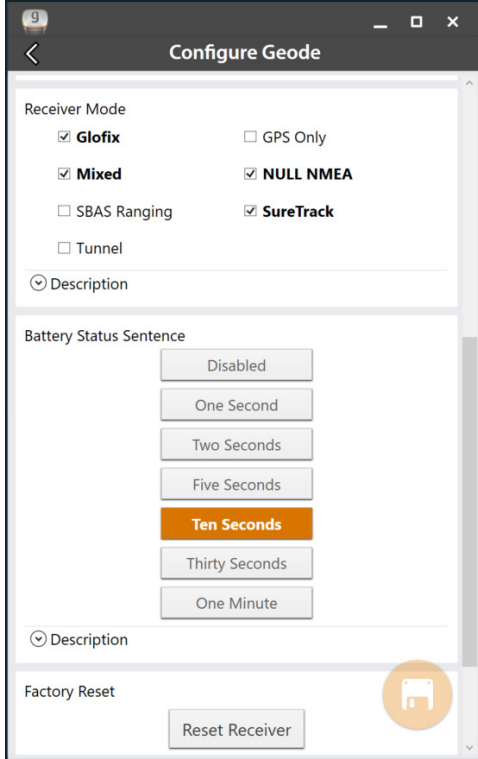
The message is used by Geode Connect and other applications to display the battery capacity status. The default setting is Ten Seconds.

Battery indicator

The message is sent out from the Geode as a custom message along with the NMEA strings. The message is visible in the terminal screen, as are all other NMEA messages and commands. In Geode Connect, the battery status sentence looks like this:

Battery sentence

Percent charged

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

Note: GNS1 Geode models do not have this feature. There is no battery indicator if you are using an earlier Geode model, as seen in the image below:

Factory Reset–Tapping *Reset Options* will bring up the following dialog box:
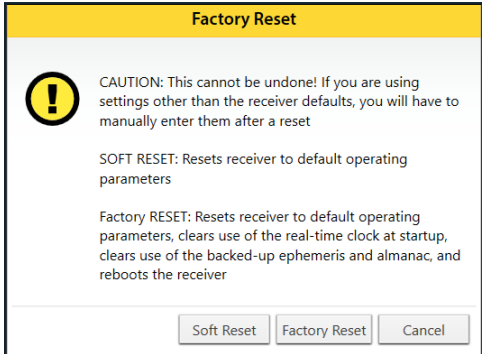
A soft reset reconfigures the Geode to all its default settings. A factory reset does the same, but it also clears all ephemeris and almanac data. The Geode will re-download the ephemeris and almanac data the next time it connects with a positioning satellite. This will increase the time to first fix by about 4–6 minutes the first time you turn the Geode on outside after a factory reset.
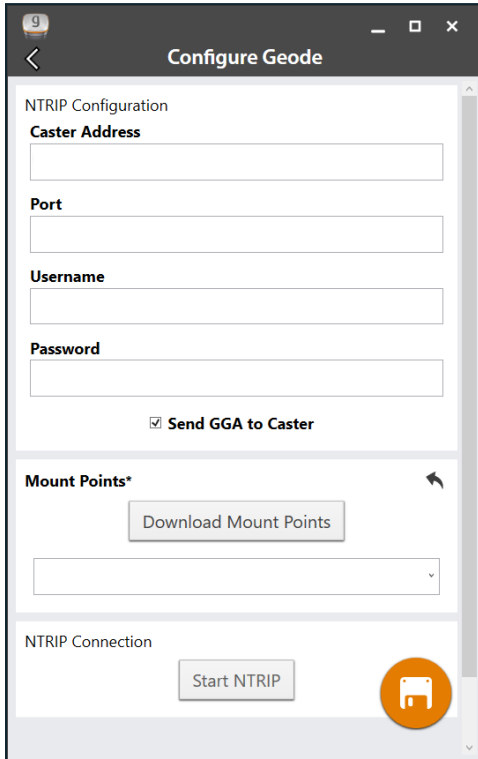
The Almanac message from GPS satellites repeats every 12.5 minutes. After a Factory Reset, the best practice is to turn on the Geode and wait 25 minutes to ensure a complete Almanac has been stored.

CAUTION: Resetting the receiver cannot be undone.

Configure NTRIP

1. Go to *Home* > ⚙ (in the bottom right corner of the screen).
2. Tap on *NTRIP Configuration*.

This will open the NTRIP Configuration screen.

This screen 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 Chapter 3: *Geode Features*, 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 disk 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 disk icon to save changes.

To establish an NTRIP connection:

1. Make sure that 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. Leave the default selection: *Send GGA to Caster.* 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 *Download Mount Points.*
5. 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.

    Remember, the closer the mount point, the more precise your positioning solution will be.
6. Choose the appropriate mount point.
7. If necessary, release the keyboard so that you can see the disk icon.
8. Tap the disk icon in the bottom right corner to save changes.
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 screen just below the receiver identifying information.

If NTRIP appears on the home screen next to an open orange plug, the Geode is still trying to establish a connection to the NTRIP service.
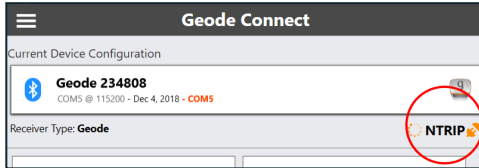
If the open plug turns red, then the NTRIP connection has failed, and you will need to return to the NTRIP Configuration screen and try again to establish a connection.
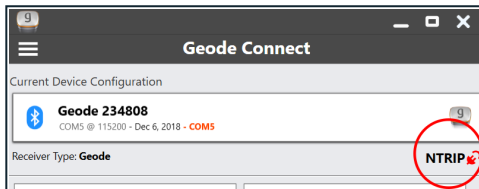
Third-Party Apps and NTRIP

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* below).

Once the Geode is connected to both apps, configure NTRIP services in Geode Connect as described on page 100. Leave Geode Connect open while using the third-party app.

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.

To enable virtual COM ports as writeable:

1. From the Home screen, tap the menu icon ▤ in the navigation bar.
2. Select *Virtual Ports*.
   Note: The first time you select Virtual Ports, Geode Connect may prompt you to install the Virtual Port Driver. Go ahead and install it.

Geode Connect will open the following screen:
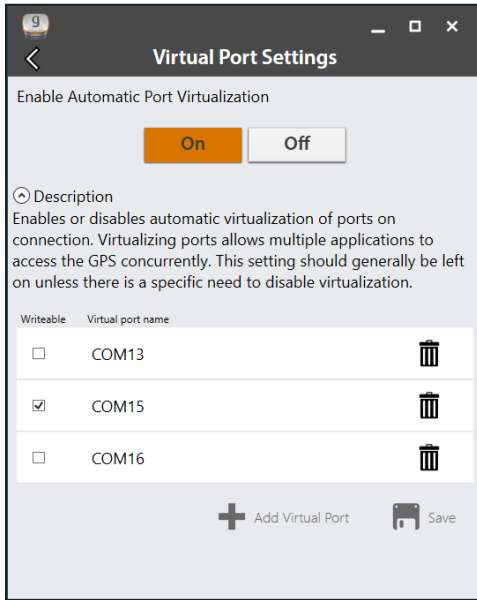
3. Select *On*.
4. Select the COM port you would like to make writeable (so that another app can use it to send commands to the Geode).
5. Tap *Save*.

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 screen can also be used to delete or deactivate virtual COM ports. Be sure to tap *Save* after each change.

Third-Party Apps and Windows Location Reporting

While some third-party apps connect directly with the Geode through a virtual COM port (as described above), other 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 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.

To enable Windows Location Services:

1. From the Home screen, tap the menu icon ☰ in the navigation bar.
2. Select *OS Location*.

Geode Connect will open the following screen:
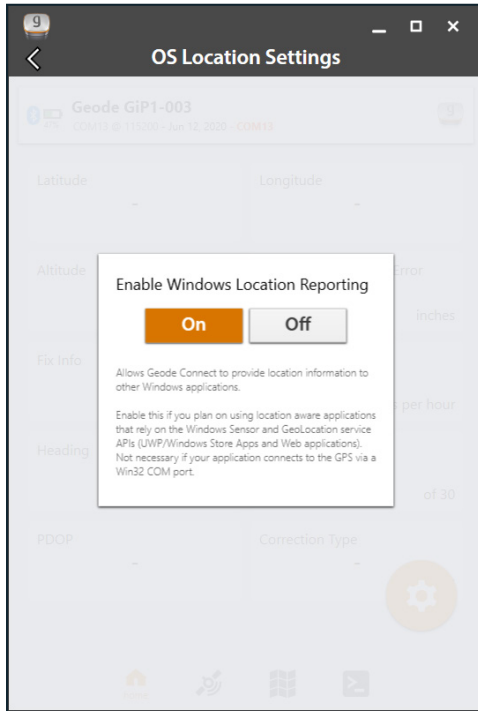
3. Select *On*.

Once Windows Location 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* **Configure Geode** *on page 91.*

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, usually 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 105 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 105 and make sure Windows Location Reporting has been configured.

Request Help and Send Feedback

1. On any of the home screens, tap the menu icon ▤.

2. Tap *Help & 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.

7
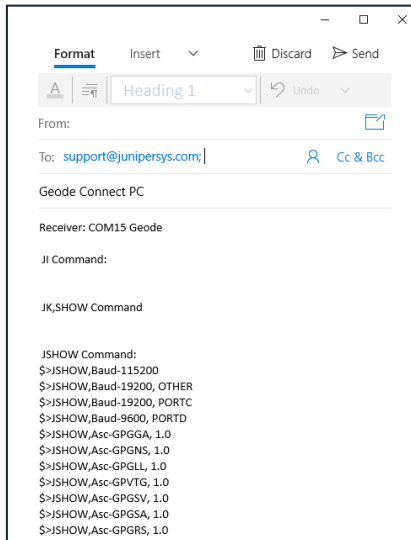
GEODE CONNECT FOR WINDOWS EMBEDDED HANDHELD

Geode Connect for Windows Embedded Handheld

As a configuration and communication utility for the Geode Sub-meter GPS Receiver, Geode Connect provides users 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, and PDOP.

This chapter gives an overview of the features included in Geode Connect for Windows Embedded Handheld. 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 Embedded Handheld operating system and third-party apps.

Download and Install

Geode Connect is available for download on the Juniper Systems webpage.

1. Go to *www.junipersys.com/support/geode/downloads*
2. Tap on Geode Connect for Microsoft Windows Embedded Handheld 6.5.
3. Download the file and follow the instructions on your device to install the app.

Connect with the Geode

The Geode connects with Windows Embedded Handheld devices via Bluetooth wireless technology and RS-232 cable.

Pair via Bluetooth

1. Power on the Geode.
2. Make sure Bluetooth wireless technology is enabled on your Windows Embedded Handheld device.
3. Open Geode Connect.
4. Tap the Main Menu bars:

---

5. Tap *Connect Geode.*

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

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

The Geode should now be connected to your Windows device.

Connect via Serial Port (optional upgrade)

The Geode has an optional configuration that provides 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 135.

To communicate between a Windows Embedded Handheld device and a Geode over a straight-through serial cable:

1. Power on the Geode.
2. Make sure Bluetooth wireless technology is enabled on your Windows Embedded Handheld device.
3. Open Geode Connect.
4. Tap the Main Menu bars: ☰
5. Tap *Connect Geode*.

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 serial cable will have a plug icon 🔌 next to it. Tap 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 ↻.

The Geode will then connect to the host device.

Unique Geode Configuration Per Connection Type

The Geode remembers its configuration *per each connection type*. If you plan to switch between Bluetooth wireless and RS-232, the Geode will not remember its settings between these connections. You will need to configure it for each connection type.

For more information about configurations being unique to connection type, see page 82.

Features

Geode Connect is a utility app that allows you to customize and fine-tune the Geode to your specific project or application. Each feature in Geode Connect serves one of two primary functions: configuration of the Geode or validation of Geode accuracy. 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.

The features available in Geode Connect for Windows Embedded Handheld are as follows:

View Receiver Information and Data Output

The Home screen for Geode Connect serves as a dashboard for the Geode receiver. On this screen, you can view connection status, correction mode, and positioning data. It displays latitude, longitude, speed, altitude, heading, PDOP, estimated horizontal error, and number of satellites in fix.
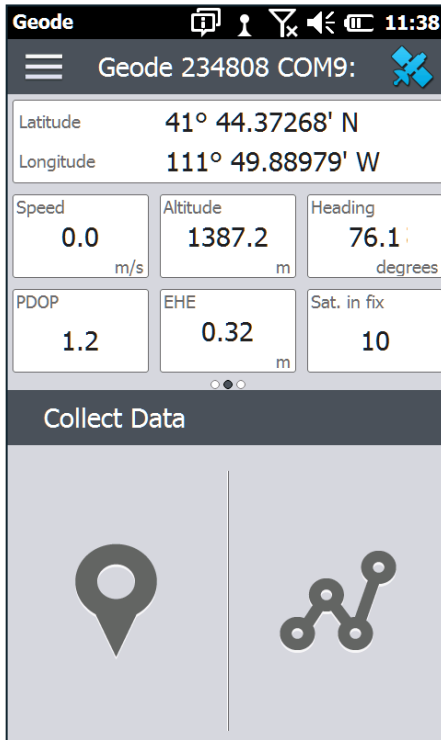
From this screen, you can access the Satellite Signal Strength and NMEA Output screens by swiping the top half right or left, respectively. Tap on the satellite icon in the top left corner to disconnect or reconnect the Geode.

View Real-time Satellite Signal Strength

On the Home screen, swipe the top half of the screen left to right.

The Satellite Signal Strength screen shows satellites available for the positioning solution and how strong their signals are.
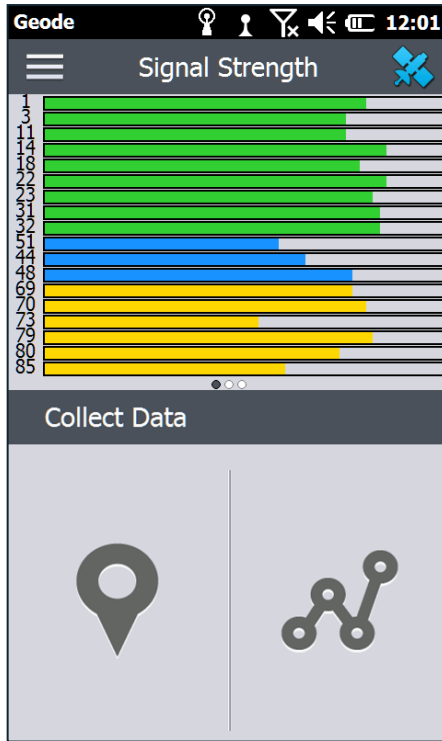
Multi-GNSS Geode models now support Galileo and BeiDou constellations in addition to GPS and GLONASS. After a firmware update, the Geode supports additional satellite constellations to increase the reliability of an already accurate solution. However, the Satellite Signal Strength screen in Geode Connect for Windows Embedded Handheld does not currently display Galileo and BeiDou satellites.

If your Geode has Multi-GNSS capability, but the satellites are not displaying on this screen, you can verify the Geode is outputting Multi-GNSS data on the NMEA Output screen. NMEA messages for GLONASS, Galileo, and BeiDou begin with GL, GA, and GB, respectively.

GLONASS ———— $GLGSV,3,3,09,88,34,293,38,,,,,,,,,,,,1*45
$GAGSV,2,1,07,02,32,085,48,03,07,080,,07,60,296,40,08
,55,059,45,1*72
Galileo ———— $GAGSV,2,2,07,25,11,034,35,26,40,271,37,30,21,142,42,
,,,,1*45
BeiDou ———— $GBGSV,1,1,01,114,29,093,42,,,,,,,,,,,,1*74
$GPGST,173029.00,1.017,0.462,0.330,11.445,0.457,0.33
6,0.956*61
GPS ———— $GPRRE,09,01,-000.054,10,-000.208,11,-002.038,14,-00
0.194,18,+000.090,22,+000.134,25,+000.134,31,+000.2

View NMEA Messages Output

On the Home screen, swipe the top half of the screen right to left. This will open the NMEA Output screen, which displays the NMEA messages the Geode is receiving.
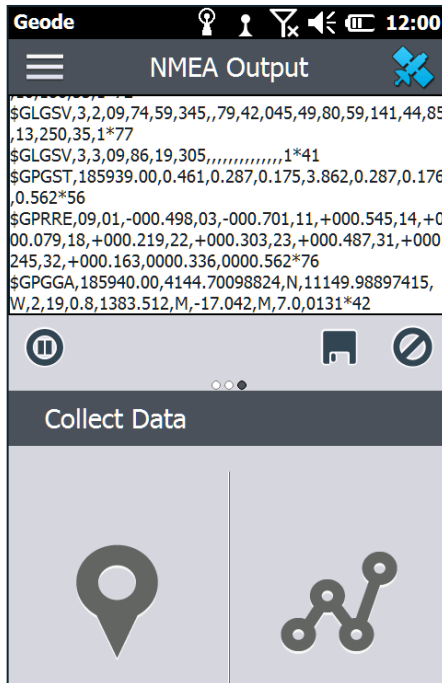
To save this data, tap the disk icon in the middle of the screen and name the file.

Configure App Settings

Go to *Main Menu > Settings.*
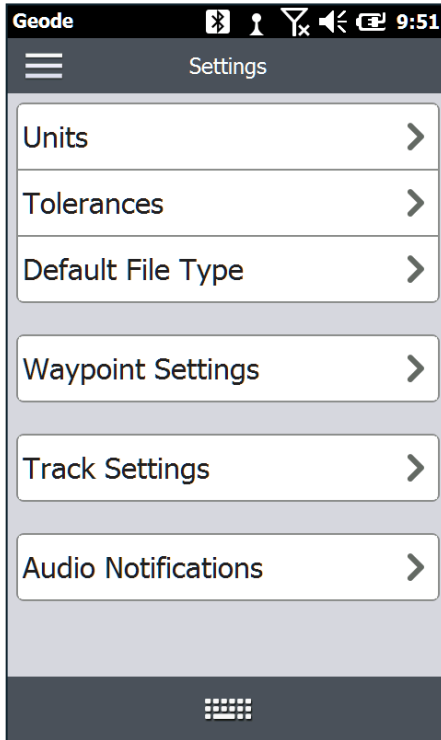
This screen directs you to settings and preferences for how Geode Connect will collect and display data. Tap through all the settings to configure the app to work for your specific project.

Configure Geode

With a Geode connected,

Go to Main *Menu > Geode Configuration.*

This will open the Geode Configuration screen.

This screen allows you to configure the Geode according to the specific needs of your project or application.
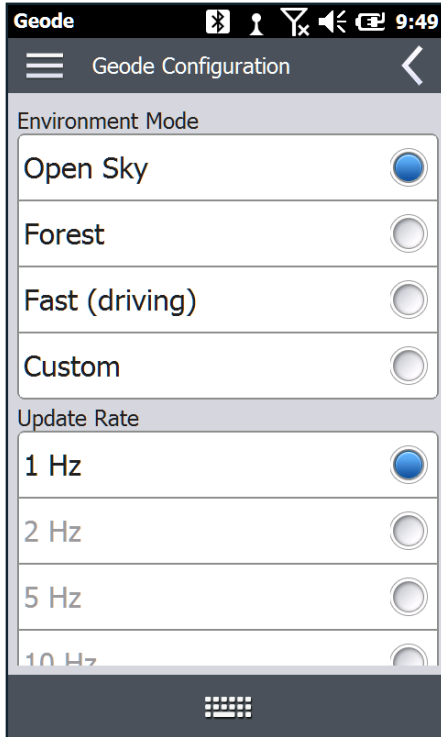
Note: Changes saved on this screen are changes made to the Geode receiver, not Geode Connect. This means that these changes crossover and are effective in other navigational and data-collecting apps.

With Environment settings, you can choose a predefined configuration for the Geode based on your environment or the needs of your project. The default environmental configuration is Open Sky. If Open Sky, Forest, or Fast don't

describe your project, choose Custom, and use Advanced settings to customize the Geode yourself.

This screen also lets you specify the update rate (with the 10Hz upgrade) and how precise the NMEA messages will be (number of decimal places).

Note: Changes must be saved in order for them to remain from screen to screen. If the disk icon appears in the title bar, this means there has been a change that needs to be saved. Tap the disk icon to save changes. 🖫

Configure NMEA and Binary Logging

On the Configure Geode screen, scroll down and tap *NMEA/Logging*. This will open the NMEA and Binary Logging screen.
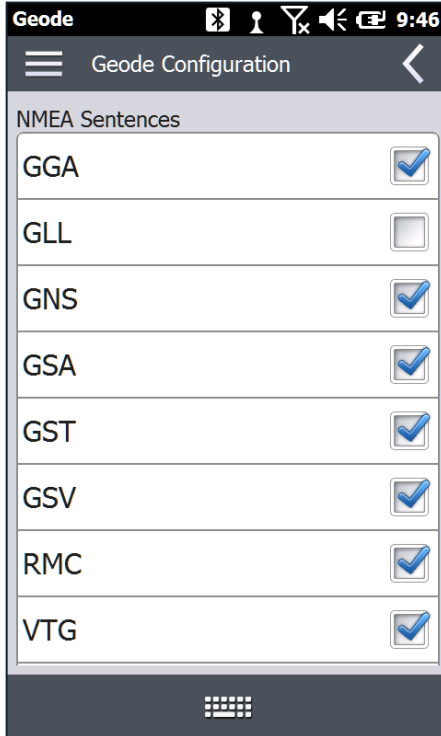
This screen allows you to choose which NMEA sentences you want the Geode to receive. In most instances,

the default NMEA sentences will be sufficient for your project or application. You can also choose which GNSS constellations to use in your solution—GPS and Multi-GNSS (if the Geode has this upgrade)—preferences for NMEA precision and which binary messages you want the Geode to output. Bin 95 and Bin 96 messages contain information required for post processing.

Configure Advanced Settings

On the first level Geode Configuration screen, scroll down and tap *Advanced Settings*.

This will take you to a screen where you can configure more advanced settings for the Geode.
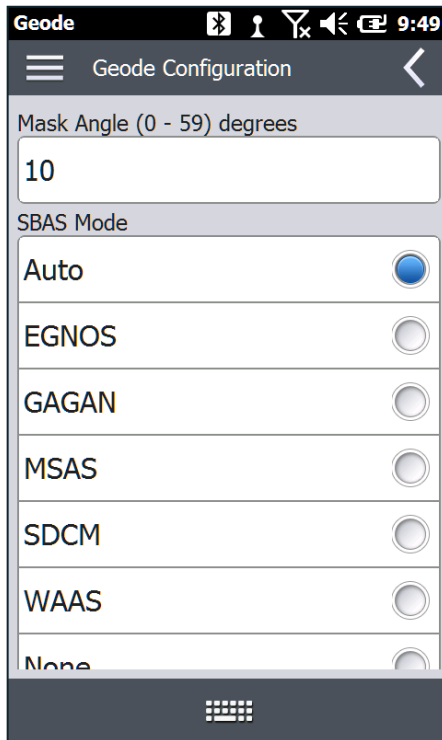
Note: Changes saved on this screen are changes made to the Geode receiver, not Geode Connect. This means that these changes crossover and are effective in other navigational and data-collection apps.

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

SBAS–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.

Receiver Mode–These options affect how the Geode collects and processes positioning information, as well as how it out puts certain types of data.

- **Glofix**: This is proprietary technology that improves the Geode's sub-meter precision and accuracy. The recommendation is to always leave this option checked.

- **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 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 disk icon appears in the title bar, this means there has been a change that needs to be saved. Tap the disk icon to save changes.

Factory Reset–A soft reset reconfigures the Geode to all its default settings. A factory reset does the same, but it also clears all ephemeris and almanac 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 factory reset.

The Almanac message from GPS satellites repeats every 12.5 minutes. After a Factory Reset, the best practice is

to turn on the Geode and wait 25 minutes to ensure a complete Almanac has been stored.
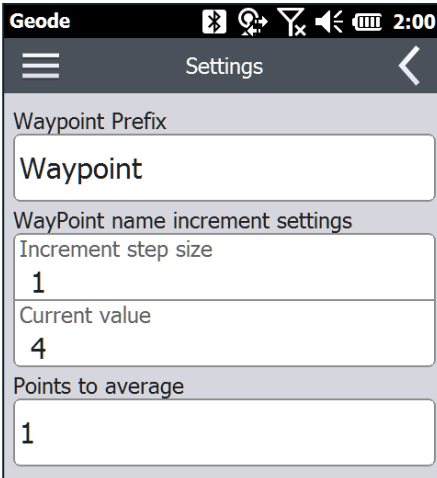
CAUTION: Resetting the receiver cannot be undone.

Working with Waypoints and Tracks

With Geode Connect for Windows Embedded Handheld, you can collect, view, compare, and export detailed waypoints and tracks.

Configure Waypoint Settings

Go to *Main Menu > Settings > Waypoint Settings.*

Collect Waypoints

With the Geode in the position you would like to capture, go to *Home > Collect Data* and tap the large waypoint icon in the bottom left corner.

This opens the Collect Waypoint screen.
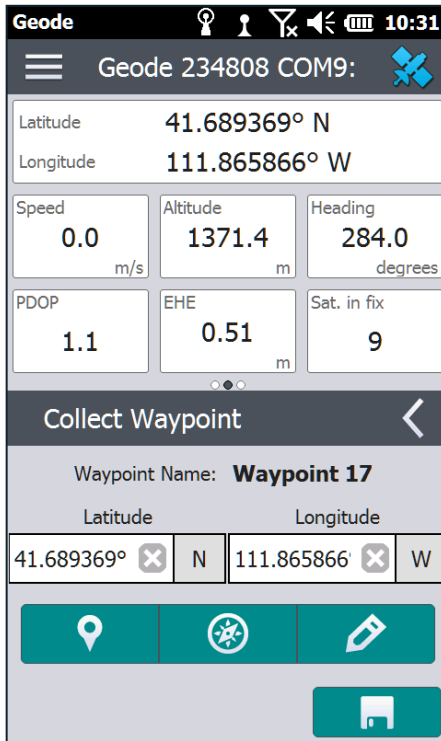
- To capture a waypoint, tap the waypoint icon.
- To save a captured waypoint, tap the disk icon.
- To navigate to a captured waypoint, tap the nav icon.
- To add a description and see details for a captured waypoint, tap the pencil icon.

Manage and Export Waypoints

Go to *Main Menu > Waypoints*.

The Waypoints screen displays all the waypoints collected thus far.
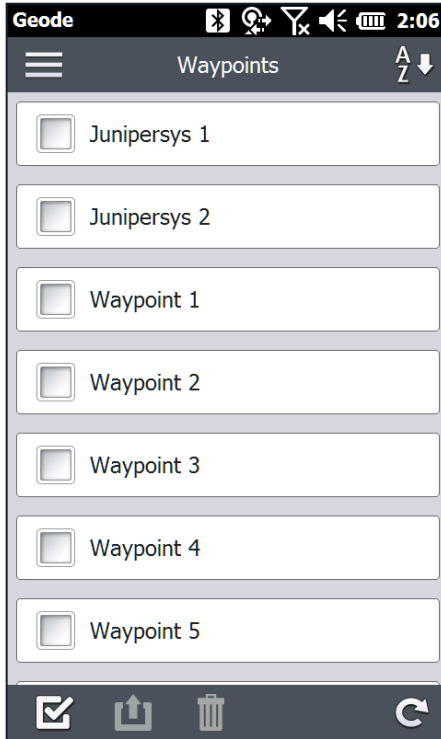
To export waypoints:

1. Select the waypoints you would like to export.
2. Tap the export icon.
3. Name the export file.
4. Choose the file type (.kml, .kmz, or .csv).
5. Tap the check icon.
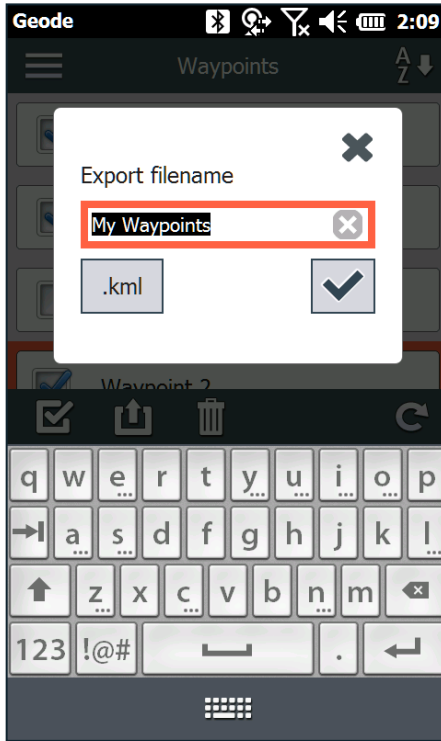
Geode Connect exports the waypoint file onto your Windows Embedded Handheld in *My Documents > Exports*.

To view detailed information about a specific waypoint or to add a description:

1. Tap on the waypoint.
2. Tap the pencil icon.
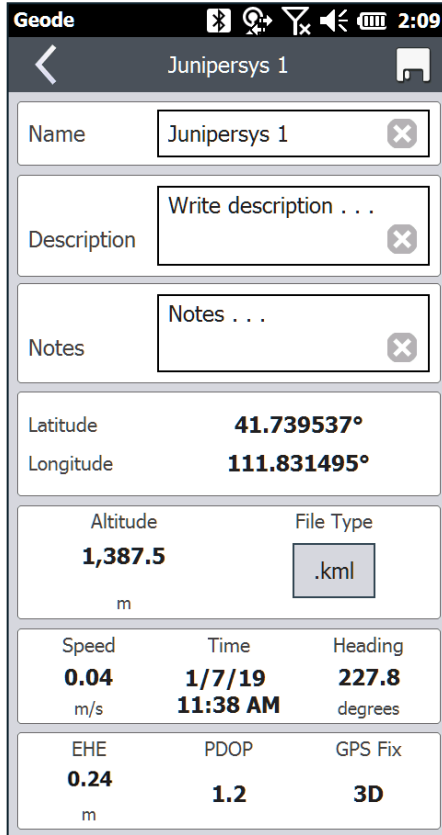
Note: Changes must be saved in order for them to remain from screen to screen. Tap the disk icon to save changes.

Configure Track Settings

Go to *Main Menu > Settings > Track Settings.*

Collect Tracks

With the Geode in the position you would like to begin the track, go to *Home > Collect Data* and tap the large track icon in the bottom right corner.

This opens the Collect Track screen.
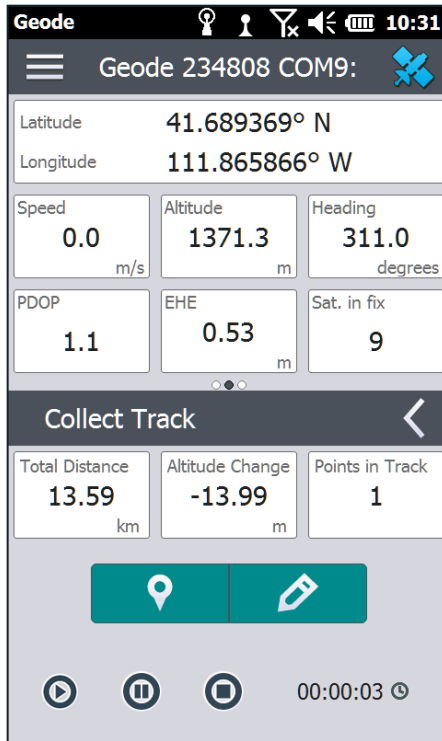
- To begin a track, tap the play icon.
  Geode Connect collects waypoints on the track according to the Collection Mode specified in Track Settings.
- To add a description and see details for a track, tap the pencil icon.
- To add a waypoint in addition to those automatically collected, tap the waypoint icon.

Manage and Export Tracks

Go to *Main Menu > Tracks*.

The Tracks screen displays all the tracks collected thus far.
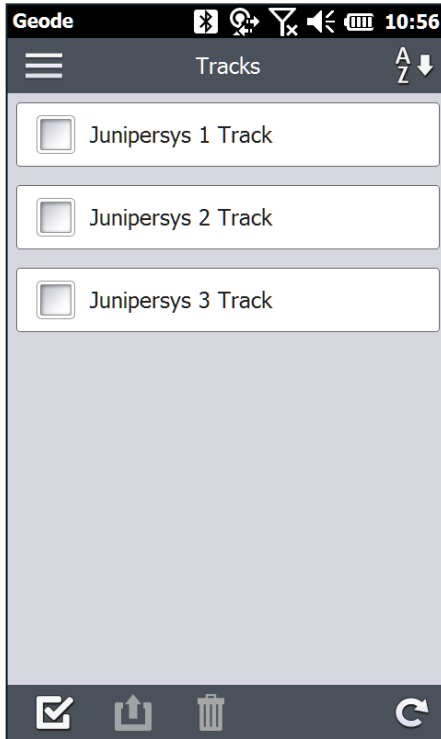
To export tracks:

1. Select the tracks you would like to export.
2. Tap the export icon.
3. Name the export file.
4. Choose the file type (.kml, .kmz, or .csv).
5. Tap the check icon.
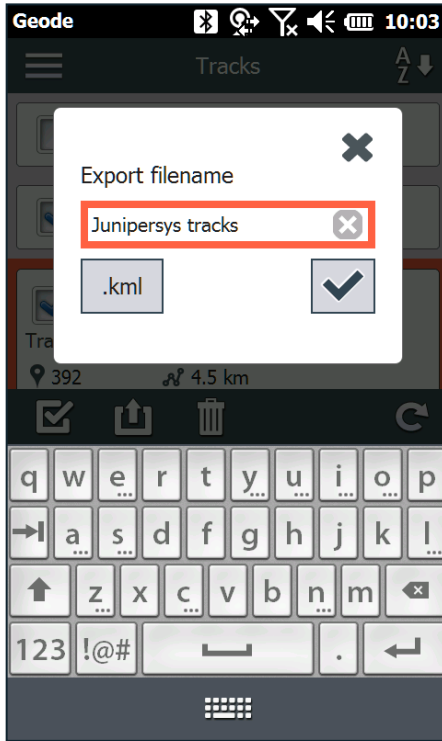
Geode Connect exports the track file onto your Windows Embedded Handheld in *My Documents > Exports*.

To view detailed information about a specific waypoint or to add a description:

1. Tap on the track.
2. Tap the pencil icon.

Note: Changes must be saved in order for them to remain from screen to screen. Tap the disk icon to save changes.

A

SERIAL PORT CONFIGURATION

Serial Port Configuration (optional)

The Geode can come with an optional configuration that provides 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.
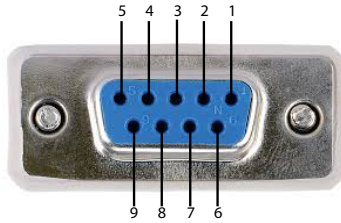
Pin	Signal	Condition
1	PPS output	Normally low, pulsing high
2	TXD out	
3	RXD in	
4	Event Mkr in	High to mark
5	GND	
6	GPS Lock out	High indicates GPS lock
7		
8	Speed Pulse out	Normally low, pulsing high
9	+12V in	

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

B

WARRANTY AND REPAIR INFORMATION

Warranty and Repair Information

Limited Product Warranty

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.

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

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.

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.

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.

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.

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.

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)

C

REGULATORY INFORMATION

Warnings, Regulatory Information, Licensing

Product Warnings

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

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.

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.

Certifications and Standards

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

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

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.

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.

Declaration of Conformity

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

D

SPECIFICATIONS

Geode Receiver Specifications

FEATURE	SPECIFICATION
Receiver	■ Receiver Type: GNSS single frequency with carrier tracking ■ Signals Received: GPS, SBAS, BeiDou (optional), Galileo (optional), GLONASS (optional) ■ Channels: 162 ■ SBAS Tracking: 3-channel parallel tracking ■ Update Rate: 1 Hz standard, 2–10 Hz (optional)
Accuracy	■ SBAS (WAAS): <30 cm Horizontal RMS ■ (<60 cm 2DRMS)1 ■ Cold Start: <60 sec typical (no almanac) ■ Reacquisition: <1 sec
Communications	■ Bluetooth® 4.0 (SPP, IAP2, EAP) ■ Bluetooth Range: Class 1 Long Range up to 100 m (330 ft) depending on connection host device range. ■ Ports: Micro USB Client 2.0; Serial RS232C DB-9 (optional) ■ Serial Baud Rates: 4800–115200
Receiver Protocols	■ Data I/O Protocol: NMEA-0183, Raw Binary (proprietary), RTCM2, RTCM3 ■ Other: 1PPS Timing Output, Speed Pulse, Event Marker Input (optional)
Power	■ USB Input Voltage: 5 VDC @ 2A ■ Power Consumption: 1.7–2 W nominal ■ Overtime Technology™ Battery: Rechargeable Li-ion battery pack, 3.6VDC 6000 mAh, 21.6 whr ■ Run time up to 10 hours ■ Charging Time 4 to 6 hours
Output Power	■ Output signals variable from 6 to -6 VDC

FEATURE	SPECIFICATION
Input Power	■ 0 to 5 VDC (max +/- 15 VDC)
Antenna	■ Internal precision multi-GNSS with integrated ground plane ■ External Antenna Port: MCX type, 50 ohm 3.3VDC @ 20 mA maximum
Juniper Rugged™	■ 2-meter pole drop ■ Operating Temp: -20° C to +60° C ■ Storage Temp: -30° C to +60° C ■ Battery Charging Temp: 0° C to 50° C ■ Enclosure Rating: IP68 ■ Dimensions: 4.4 x 4.4 x 1.7 inch (111 x 111 x 43 mm) ■ Weight: 0.8 lb (360 g) ■ Mount: 1/4" x 20 camera insert and #6-32 AMPS (diagonal)
Receiver Upgrades	■ 2Hz–10 Hz update rate ■ Multi-GNSS ■ Serial RS232C DB-9 port

Software	■ Geode Connect™ software provides configuration, communications setup, and receiver settings
	■ Available for:
	  ■ iPhone and iPad
	  ■ Android 4.2.x and above
	  ■ Windows PC (8/10)
	  ■ Windows Embedded Handheld 6.5

Included Accessories	■ 5VDC USB Universal Charger ■ USB Data/Charging Cable (USB-A to Micro-B) ■ Universal Plug Kit ■ 5/8 x 11 Pole Adapter
Optional Accessories	■ Smart phone Adapter Tray ■ External Patch Antenna ■ Antenna Cable

FEATURE	SPECIFICATION
Models	■ Geode GPS, 1 Hz ■ Geode GPS with 9-pin serial port, 1 Hz ■ Geode Multi-GNSS, 1 Hz ■ Geode Multi-GNSS with 9-pin serial port, 1 Hz ■ Geode Multi-GNSS Sub-meter Receiver, 10Hz ■ Geode Multi-GNSS Sub-meter Receiver, 10Hz with 9-pin Port
Compatibility	■ All Geode models are compatible with Android 4.2.x and above, Windows 10, and Windows Embedded 6.5.3 devices. ■ Geode GNS2 is a registered Made for iPhone|iPad accessory. As of September 2019, Geode GNS2 models are compatible with the following: ■ 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, iPod Touch (7th generation), iPad mini (5th generation), iPad (7th generation), iPad (6th Generation), iPad Pro 12.9 inch (3rd Generation), iPad Pro 12.9 inch (2nd Generation), iPad Pro 12.9 inch (1st Generation), iPad Pro 11-inch, iPad Pro 10.5 inch ■ Windows® PC (8/10) ■ Windows® Embedded Handheld 6.5 ■ Android™ 4.x and above

E

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