GISmore

Operator's Manual

Version 2.0

Last Revised June 29, 2012

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PREFACE

Thank you for purchasing this product. The materials available in this Manual (the "Manual") have been prepared by JAVAD GNSS, Inc. ("JAVAD GNSS") for owners of JAVAD GNSS products. It is designed to assist owners with the use of the GISmore and its use is subject to these terms and conditions (the "Terms and Conditions").

Note: Please read these Terms and Conditions carefully.

Terms and Conditions

USE – JAVAD GNSS receivers are designed to be used by a professional. The user is expected to have a good knowledge and understanding of the user and safety instructions before operating, inspecting or adjusting. Always wear the required protectors (safety shoes, helmet, etc.) when operating the receiver.

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Regulatory Information

The following sections provide information on this product's compliance with government regulations.

FCC Class B Compliance

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

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

This 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 residential installations. 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 interference to radio or television equipment 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.
- Move the equipment away from the receiver.
- Plug the equipment into an outlet on a circuit different from that to which the receiver is powered.
- Consult the dealer or an experienced radio/television technician for additional suggestions.

Note: Any changes or modifications to the equipment not expressly approved by the party responsible for compliance could void your authority to operate such equipment.

Canadian Emissions Labeling Requirements

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Réglement sur le matériel brouilleur du Canada.

WEEE Directive

The following information is for EU-member states only: The use of the symbol indicates that this product may not be treated as household waste. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product. For more detailed information about the take-back and recycling of this product, please contact your supplier where you purchased the product or consult.

Manual Conventions

This manual uses the following conventions:

Example	Description
File ▸ *Exit*	Click the *File* menu and click *Exit*
MinPad	This format represents titles of dialog windows/boxes, names of menu options, identifies program interface objects, such as checkboxes, edit boxes, radio buttons, etc.
`Temp`	This format is used to enter various string information (e.g., file and directory names) as well as operator commands.

Note: Supplementary information that can have an affect on system operation, system performance, measurements, or personal safety.

CAUTION: *Notification that an action has the potential to adversely affect system operation, system performance, data integrity, or personal health.*

Warning: *Notification that an action will result in system damage, loss of data, loss of warranty, or personal injury.*

DANGER: UNDER NO CIRCUMSTANCES SHOULD THIS ACTION BE PERFORMED.

Screen Captures

This manual includes sample screen captures. Your actual screen can look slightly different from the sample screen due to the receiver you have connected, operating system used and settings you have specified. This is normal and not a cause for concern.

Technical Assistance

If you have a problem and cannot find the information you need in the product documentation, contact your local dealer. Alternatively, request technical support using the JAVAD GNSS World Wide Web site at: www.javad.com

To contact JAVAD GNSS Customer Support use the QUESTIONS button available on the www.javad.com.

Description and Operation

1. Principles of Operation

GISmore receiver is based on our TRIUMPH Technology implemented in our TRIUMPH Chip. For the first time in the GNSS history we offer very powerful GIS field mapping receiver with up to 100 Hz RTK, 216 channels of single frequency GPS, Galileo and GLONASS in a small attractive, sturdy, and watertight box.

Using its internal Bluetooth and GSM/GPRS connection the receiver can access local GNSS Reference Station Network. As standard future the GISmore receiver provides access to the SBAS correction services. In addition to post-processed DGPS capabilities, the GISmore utilizes external correction services for real-time DGPS mapping and navigation applications.

All GNSS, GSM, and Bluetooth® antennas are conveniently hidden and protected (Figure 1).

Figure 1. GISmore Receiver

GISmore can receive and processes multiple signal types improving the accuracy and reliability of your survey points and positions, especially under difficult jobsite conditions.

GISmore receiver can access the GPS (Global Positioning System) satellites of the United States, the Galileo (an upcoming global positioning system maintained and operated by Galileo Industries), increasing the number of satellites your receiver can detect, thus improving the accuracy of your measuring points, increasing productivity, and reducing cost.

Several other features, including multipath mitigation and common tracking, provide under-canopy and low signal strength reception. The GISmore receiver provides the functionality, accuracy, availability, and integrity needed for fast and easy data collection.

The GISmore is a multi-function, multi-purpose receiver intended for precision markets. Precision markets means markets for equipment, subsystems, components and software for surveying, construction,

commercial mapping, civil engineering, precision agriculture and land-based construction and agriculture machine control, photogrammetry mapping, hydrographic and any use reasonably related to the foregoing.

1.1. GNSS Overview

Currently, the following three global navigation satellite systems (GNSS) offer line-of-site radio navigation and positioning, velocity, and time services on a global, all-weather scale to any user equipped with a GNSS tracking receiver on or near the Earth's surface:

- GPS – the Global Positioning System maintained and operated by the United States Department of Defense. For information on the status of this system, visit the US Naval Observatory website (http://tycho.usno.navy.mil/) or the US Coast Guard website (http://www.navcen.uscg.gov/).
- GLONASS – the Global Navigation Satellite System maintained and operated by the Russian Federation Ministry of Defense. For information on the status of this system, visit the Coordinational Scientific Information Center website (http://www.glonasscenter.ru/frame_e.html).
- Galileo – an upcoming global positioning system maintained and operated by Galileo Industries, a joint venture of several European space agencies/companies working closely with the European Space Agency. Unlike GPS and GLONASS, this is a civil endeavor and is currently in the development and validation stage. For information on the status of this system, visit the Galileo Industries website (http://www.galileo-industries.net).

Despite numerous technical differences in the implementation of these systems, satellite positioning systems have three essential components:

- Space – GPS, GLONASS, and Galileo satellites orbit approximately 12,000 nautical miles above Earth and are equipped with a clock and radio. These satellites broadcast ranging signals and various digital information (ephemerides, almanacs, time&frequency corrections, etc.).
- Control – Ground stations located around the Earth that monitor the satellites and upload data, including clock corrections and new ephemerides (satellite positions as a function of time), to ensure the satellites transmit data properly.
- User – The community and military that use GNSS receivers to calculate positions.

1.2. Calculating Absolute Positions

When calculating an absolute position, a stationary or moving receiver determines its three-dimensional position with respect to the origin of an Earth-Center Earth-Fixed coordinate system. To calculate this position, the receiver measures the distance (called pseudoranges) between it and at least four satellites. The measured pseudoranges are corrected for clock differences (receiver and satellites) and signal propagation delays due to atmospheric effects. The positions of the satellites are computed from the ephemeris data transmitted to the receiver in navigation messages. When using a single satellite system, the minimum number of satellites needed to compute a position is four. In a mixed satellite scenario (GPS, GLONASS, Galileo), the receiver must lock onto five or more satellites to account for the different time scales used in these systems and to obtain an absolute position.

1.3. Calculating Differential Positions

DGPS, or Differential GPS, is a relative positioning technique where the measurements from two or more remote receivers are combined and processed using sophisticated algorithms to calculate the receivers' relative coordinates with high accuracy.

DGPS accommodates various implementation techniques that can be classified according to the following criteria:

- The type of GNSS measurements used, either code-phase differential measurements or carrier-phase differential measurements
- If real-time or post-mission results required Real-time applications can be further divided according to the source of differential data and communication link used.

With DGPS in its most traditional approach, one receiver is placed at a known, surveyed location and is referred to as the reference receiver or base station. Another receiver is placed at an unknown location and is referred to as the remote receiver or rover. The reference station collects the code-phase and carrier-phase measurements from each GNSS satellite in view.

- For real-time applications, these measurements and the reference station coordinates are then built up to the industry standard RTCM – or various proprietary standards established for transmitting differential data – and broadcast to the remote receiver(s) using a data communication link. The remote receiver applies the transmitted measurement information to its observed measurements of the same satellites.
- For post-mission applications, the simultaneous measurements from reference and rover stations are normally recorded to the receiver's internal memory (not sent over communication link). Later, the data are downloaded to computer, combined, and processed.

Using this technique, the spatially correlated errors – such as satellite orbital errors, ionospheric errors, and tropospheric errors – can be significantly reduced, thus improving the position solution accuracy.

A number of differential positioning implementations exist, including post-processing measuring, real-time kinematic measuring, maritime radio beacons, geostationary satellites, and satellite based augmentation systems (WAAS, EGNOS, MSAS). The real-time kinematic (RTK) method is the most precise method of real-time measuring. RTK requires at least two receivers collecting navigation data and communication data link between the receivers. One of the receivers is usually at a known location (Base) and the other is at an unknown location (Rover). The Base receiver collects carrier phase measurements, generates RTK corrections, and sends this data to the Rover receiver. The Rover processes this transmitted data with its own carrier phase observations to compute its relative position with high accuracy, achieving an RTK accuracy of up to 1 cm horizontal and 1.5 cm vertical.

2. Getting Acquainted

The GISmore is a 216-channel GNSS receiver with internal batteries, an internal GSM modem, and a Bluetooth® wireless technology module. The GISmore is a receiver that has been configured for surveying. The GISmore is built with internal memory for recording survey data, and recorded data can be downloaded using the Bluetooth® wireless technology. The GISmore receiver's advanced design reduces the number of cable required for operation, allowing you to survey more reliably and efficiently. The casing allocates space for a rechargeable battery, a Bluetooth® wireless technology module, a multi-system receiver board, and a GSM/GPRS modem.

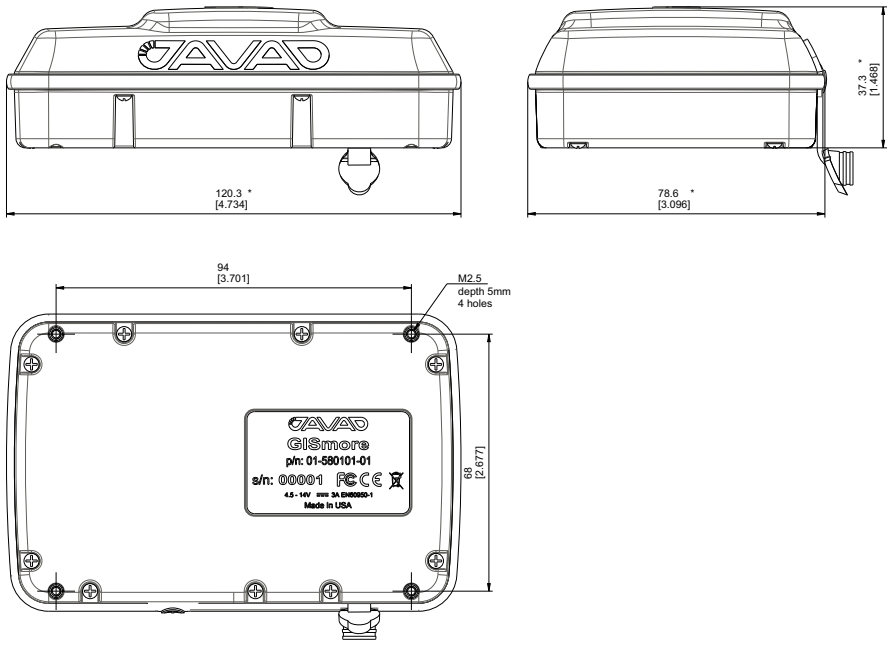


Figure 2. GISmore dimensions in mm

Table 1.

2.1. Bluetooth® Module

A combination of software and hardware technology that makes the GISmore mobile, wireless, GNSS receiver that supports a point-to-point serial profile. As such, the GISmore can transfer and synchronize files between the receiver and any other Bluetooth® wireless technology device that supports serial profile, including portable handheld devices and external controllers, Bluetooth® adapters for PC-USB/RS ports, mobile computers and phones, IPAQs, PCMCA-to-Bluetooth adapters, etc.

With Bluetooth® wireless technology, the receiver's reception and transmission distance is 10 meters (32 feet) for interior projects and 30–50 meters (98–164 feet) for exterior projects. The Bluetooth® module's processor and firmware are independent of the receiver card and power board.

2.2. Modem

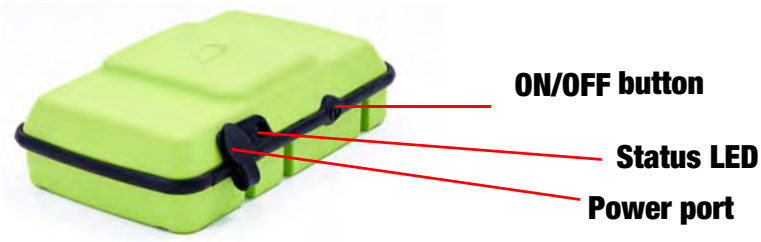
The GISmore receiver incorporates an internal Cellular GSM/GPRS Modem with Telit® Module (GE864 - QUAD) - GSM/GPRS single quad-band cell phone frequency modem (Europe: 900/1800 MHz; USA and Canada: 850/1900 MHz).

Note: To comply with RF exposure requirements, maintain at least 20 cm between the user and the transceiver.

The Base station operator is responsible for complying with local regulations for radio operation. In the US, the FCC regulates the use of radio transmitters, requiring a license. Broadcasting without a license can result in severe penalties including the confiscation of your radio and GNSS equipment.

2.3. External Components

The GISmore casing includes a user interface, and a power port.



- The *On/Off* (*power) button* turns the receiver on and off.
- *Status LED* - the unit status indicator shows information on the network service availability and call status

	Charger	Charge %	Period	Time	Count	Color
position + solution +	disconnected	50 - 100	steady			Green
position + solution -						Yellow
position - solution -						Red
		< 50	1	0.5	1	solution
		low battery	1	0.1	2	solution
charging	connected	< 100%	3	0.5	1	solution
charge complete		= 100%	3	1.5	1	solution
charge error		error	3	0.25	2	solution
Sleep			10	0.25	1	Red

- The *Power Supply unit* charges the internal battery when connected to a grounded outlet. This unit converts the alternating current (AC) normally supplied from an electrical outlet to a direct current (DC) used to charge the batteries and/or power the receiver.

3. Option Authorization File (OAF)

JAVAD GNSS issues an Option Authorization File (OAF) to enable the specific options that customers purchase. An Option Authorization File allows customers to customize and configure the GISmore according to particular needs, thus only purchasing those options needed.

Typically, all GISmore receivers ship with a temporary OAF that allows the receiver to be used for a predetermined period of time. When the receiver is purchased, a new OAF activates desired, purchased options permanently. Receiver options remain intact when clearing the NVRAM or resetting the receiver.

The OAF enables the following kinds of functions. For a complete list of available options and details, visit the JAVAD GNSS website (http://www.javad.com) or consult your dealer.

Standard Configuration:

- GPS L1
- GLONASS L1 (G3 only)
- Update Rate 1 Hz
- RAIM
- Internal GNSS Antenna
- Internal GSM/GPRS Module
- Bluetooth® Interface
- Internal Bluetooth/GSM Antenna
- Internal Rechargeable Li-Ion Battery

Optional Features:

- Galileo E1
- Update Rate 5Hz, 10Hz, 20Hz, 50Hz, 100Hz
- RTK Rate 1 Hz, 5Hz, 10Hz, 20Hz, 50Hz, 100Hz
- Data Recording up to 256 MB
- Multi-Base Code Differential Rover
- Code Differential Base
- Advanced Multipath Reduction
- KFK WAAS/EGNOS (SBAS)

4. Operation

GISmore receiver can be configured via Victor controller with Tracy software, or via new JAVAD GNSS VICTOR-VS controller with Tracy software or TRIUMPH software. Refer to the *Tracy Software Manual* for detailed description how to configure receiver using Tracy software. Refer to *TRIUMPH-VS Operator's Manual* for detailed description how to configure GISmore using TRIUMPH Software. These manuals are available at www.javad.com.

Sections below describe how to configure the receiver using PC and NetView software.

4.1. Software Installation

Installing NetView

Use the NetView software program for configuring and maintaining the receiver. This software is available on the JAVAD GNSS website. NetView™ is a comprehensive Windows® software product designed for controlling GNSS receivers developed by JAVAD GNSS.

Note: Refer to the *NetView Software Manual* for full details on installing and using NetView Software.

1. If downloading the program from the website, extract the program files into a folder on your hard drive.
2. Navigate to the location of the NetView program and double-click the Setup.exe icon.
3. Follow the on-screen installation instructions. Click *Install* to continue. Keep the default installation location or select a new location.
4. If desired, create a shortcut on the computer's desktop for quick access to NetView.

Installing ModemVU

ModemVU™ is a Windows® application is a configuration program for the radio modem inside the receiver. ModemVU is available from the JAVAD GNSS website.

Note: Refer to the *ModemVU Software Manual* for full details on installing and using ModemVU Software.

1. If downloading the program from the website, extract the program files into a folder on your hard drive.
2. Navigate to the location of the ModemVU program and double-click the Setup.exe icon.
3. Follow the on-screen installation instructions. Click *Next* to continue, *Back* to get back to previous step, or *Cancel* to quit the installation.
4. Keep the default installation location or select a new location.
5. Click *Finish* to complete the installation.
6. If desired, create a shortcut on the computer's desktop for quick access to ModemVU.

4.2. Installing Optional SIM Card

The SIM card provides telephony communication for data transfer between two GSM-capable receivers. The SIM card can be purchased at your local cellular phone supply store. Once installed, the card generally remains installed.

The SIM card must support Circuit Switched Data to communicate directly between receivers. The SIM card must have GPRS support to communicate with a GPS Network IP address.

To install SIM card:

1. Ensure the receiver is turned off.
2. Open the bottom of the case screwing off 9 self taping screws (Figure 3).

Figure 3. SIM Card installation

3. Remove battery and open SIM holder.
4. Carefully insert the SIM into the SIM card holder and push it to LOCK to close it tightly.

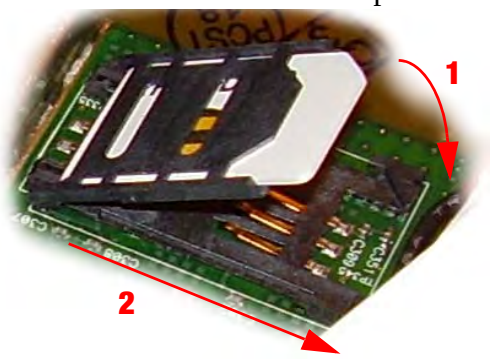


Figure 4. SIM Card installation 2

5. Ensure the cords are located so that will not be stepped on, tripped over, or otherwise subjected to damage

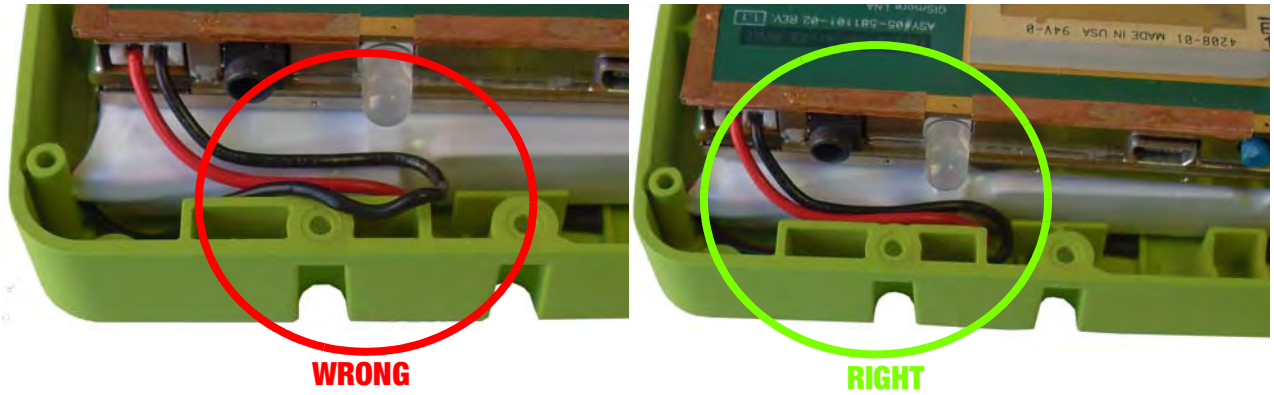


Figure 5. SIM Card installation 3

6. Close the case.

4.3. Charging the Battery

CAUTION: *Risk of explosion if battery is replaced by an incorrect type. Dispose of used battery according to the instructions.*

Before beginning to work, fully charge the battery for maximum operating time. An approximately 6-hour charge cycle will fully charge the battery. The battery can not be overcharged.

The Li-Ion batteries used in the battery should run at no less than 80% capacity after 500 charging cycles. These batteries do not need to be drained before recharging.

Note: The batteries are shipped from the factory with 40% of power. Fully charge the batteries before measuring and surveying.

DANGER: NEVER ATTEMPT TO OPEN THE CASING OF THE DETACHABLE BATTERIES! LITHIUM-ION BATTERIES CAN BE DANGEROUS IF MISHANDLED!

DANGER: DO NOT INCINERATE OR HEAT BATTERY PACK ABOVE 212 DEGREES FAHRENHEIT (100 DEGREES CELSIUS). EXCESSIVE HEAT CAN CAUSE SERIOUS DAMAGE AND POSSIBLE EXPLOSION.

DANGER: THE BATTERIES (OR BATTERIES INSTALLED) SHALL NOT BE EXPOSED TO EXCESSIVE HEAT SUCH AS SUNSHINE, FIRE OR THE LIKE.

Warning: *Do not attempt to open the battery pack.*

Warning: *Do not disassemble the battery pack.*

Warning: *Do not charge in conditions different than specified.*

Warning: *Do not use other than the specified battery charger.*

Warning: *Do not short circuit the battery pack.*

Warning: *Do not crush or modify the battery pack.*

Power supply requirements

The socket-outlet shall be installed near the equipment and shall be easily accessible.

The external power supply needs to be Listed for US and Certified for EU countries, it needs also to be a Limited Power Source and rated for Outdoor Use and have an output rated for +4.5 to + 14 volts DC, 3A. This may not be the same range as other JAVAD GNSS products with which you are familiar.

CAUTION: *To avoid the introduction of hazards when operating and installing, before connecting of the equipment to the supply, make sure that the supply meets local and national safety ordinances and matches the equipment's voltage and current requirements.*

CAUTION: *Never attempt any maintenance or cleaning of the supply while plugged in. Always remove supply from AC power before attempting service or cleaning.*

Warning: *If the voltage supplied is below the minimum specification, the receiver will suspend operation. If the voltage supplied is above the maximum specification, the receiver may be permanently damaged, voiding your warranty.*

Make sure cords are located so that will not be stepped on, tripped over, or otherwise subjected to damage or stress. Do not operate equipment with a damaged cord or plug – replace immediately. To reduce the risk of damage to the equipment, pull by the plug body rather than the output cord when disconnecting the equipment.

Do not operate the supply if it has received a sharp blow, been dropped, or otherwise damaged. Do not disassemble the supply.

Warning: *Before connecting the external power source and the receiver, make sure that the power source matches the receiver's voltage and current requirements.*

Powering the Receiver

To charge the receiver internal battery, take the following steps:

- Plug the connector into the power port of the receiver.
- Plug the other end of this cable into an AC outlet.
- Turn off the receiver by pressing and holding the *power* key for more than one and less than four seconds.
- Leave overnight.

4.4. Turning On/Off the Receiver

To turn ON the receiver, press and hold the power button. To turn OFF the receiver, press and hold the power key for more than one and less than four seconds (until LED is off). This delay (about 1 second) will prevent the receiver from being turned off by mistake.

4.5. Connecting the Receiver and a Computer

JAVAD GNSS NetView software provides an interface for various configuration, monitoring, and management functions for the receiver. To configure, manage files, or maintain the receiver, connect the receiver and a computer using Bluetooth and start NetView:

Once you have established a connection between the receiver and the computer/controller, you will be able to configure the receiver and its components, send commands to the receiver, download files from the receiver's memory; as well as, upload new firmware, upload an OAF, and upload configuration files to a receiver, using NetView.

The GISmore receiver contains Bluetooth® wireless technology that allows file transfer and synchronization between the receiver and any other external device that supports Bluetooth® wireless technology; for example, JAVAD GNSS Victor, an IPAQ, or a computer with USB-to-Bluetooth® adapter or PCMCA-to-Bluetooth® adapter installed.

The GISmore and external device connection procedure varies slightly depending on the type of external device used. In general, the connection procedure is as follows:

Note: Refer to your Bluetooth®-enabled external device documentation for more detailed connection information.

1. Turn on a Bluetooth®-enabled external device and your receiver. The default external device mode is Master; the receiver's Bluetooth® module mode is Slave.
2. Instruct the external device (Master) to search for the receiver (Slave).
3. Once the Master device detects the receiver, use the procedure described in the external device's documentation to connect it with the receiver.
4. Start NetView, select SER as type of connection mode, and specify the port the receiver is connected to.

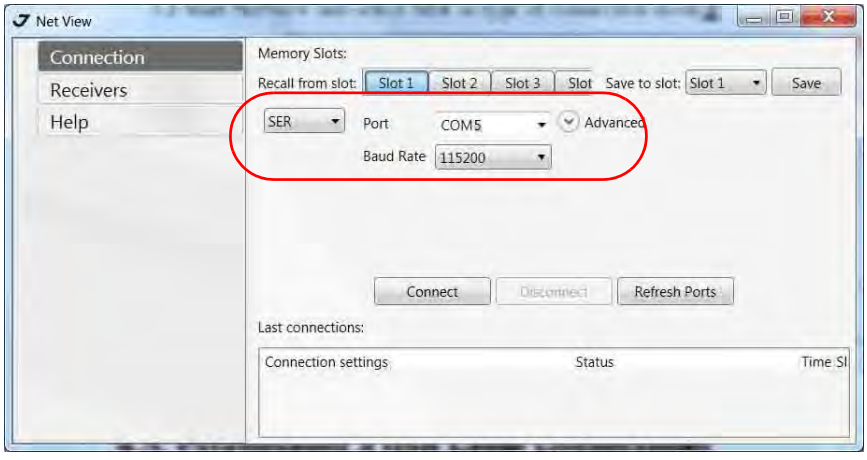


Figure 6. NetView - Connection via Bluetooth

5. GISmore Configuration

5.1. Configuring Receiver

GISmore receiver can be configured according the desired survey type, for RTK DGPS or for post-processing:

- A stand-alone L1 device for mapping.
- A static rover which collects observation data from the same satellites during the same time interval as the static base station.
- An RTK DGPS rover which collects measurement information and accepts corrections from the RTK DGPS Base station to compute its relative position.
- A rover acting as a repeater to re-transmit RTK Base station measurements to other rover receivers, extending the range of a GPS system.

Note: Refer to the *NetView Software Manual* for full software description.

1. Connect the receiver and computer as described in "Connecting the Receiver and a Computer" on page 19. Start NetView. Select the connection type (SER) and connect the receiver and PC.
2. Click *Receiver* ▸ *Parameters* on the left panel.

Note: Click *Apply* every time after the parameter was changed, otherwise the receiver won't save the changes. Click *Refresh*, to ensure the changed parameters and new configuration are saved.

3. In the *General* tab check the parameter *Antenna Input* is `Internal` (Figure 7).

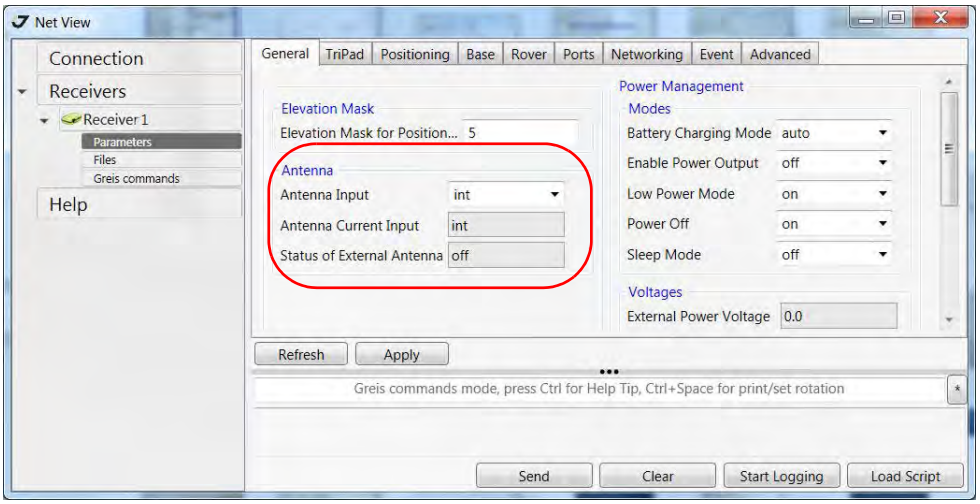


Figure 7. General tab

4. Open the *TriPad* tab and set the following parameters (Table 2), click *Apply* (Figure 8 on page 21).

Table 2. TriPad Settings

Parameter	Base	Rover
Implicit Message Output Period	15 seconds	
Elevation mask angle	15 degrees	
File name prefix	Enter a unique ID, such as the last 3 digits of receiver's serial number. By deafault the prefix is `log`	

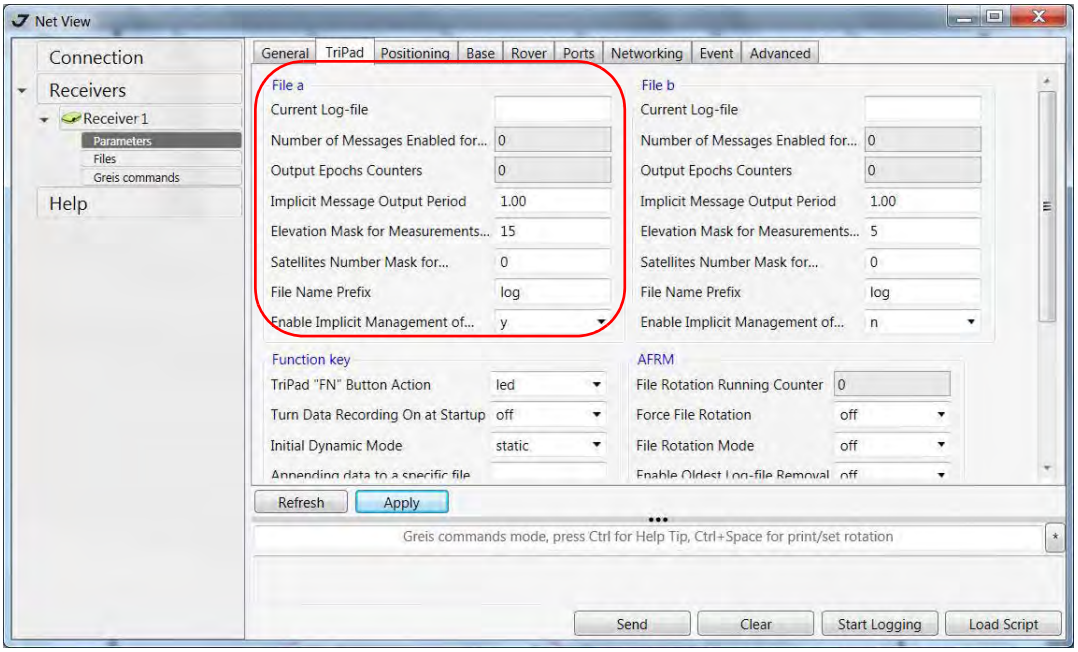


Рисунок 8. TriPad tab settings

5. Open *Positioning* tab and set the Elevation mask to 15 degrees (Figure 9).

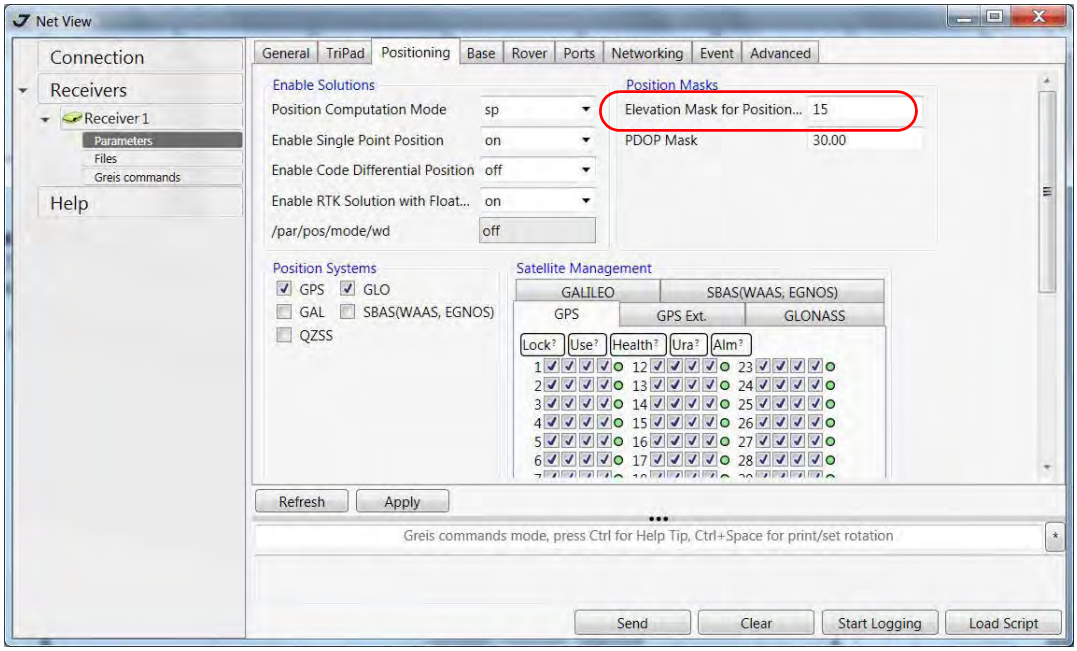


Figure 9. Positioning tab - Elevation Mask

- To set up the rover, open *Positioning* tab and set the *Position Computation Mode* - this drop-down list box allows selecting the mode of position computation:
    - pd -carrier phase differential (RTK) with fixed ambiguities
    - pf - carrier phase differential (RTK) with float ambiguities
    - cd- code differential (DGPS) mode
    - wd - wide area code differential mode (WDGPS)
    - sp - single point positioning mode1
- Open the *Rover* tab and set up the following parameters:
    - *RTK Position Computation Mode* – select *Extrapolation* for RTK float (kinematic), or *Delay* for RTK fixed (static).
      If *Extrapolation* is selected, the rover will extrapolate the base station's carrier phase measurements when computing the rover's current RTK position. If *Delay* is selected, the rover will not extrapolate the base station's carrier phase measurements to compute the current rover position. Instead, the RTK engine will compute either a delayed RTK position (for the epoch to which the newly received RTCM/CMR message corresponds) or the current stand-alone position (while waiting for new RTCM/CMR messages coming from the base).
    - *Confidence Level for Ambiguity* – list box governs the process of the RTK engine fixing integer ambiguities. The RTK engine uses the ambiguity fix indicator when making a decision whether to fix ambiguities or not. Low, Medium and High correspond to the indicator's 95%, 99.5% and 99.9% states, respectively. The higher the specified confidence level, the longer the integer

ambiguity search time. This is the price one pays for the higher reliability of the ambiguity fixed solution..

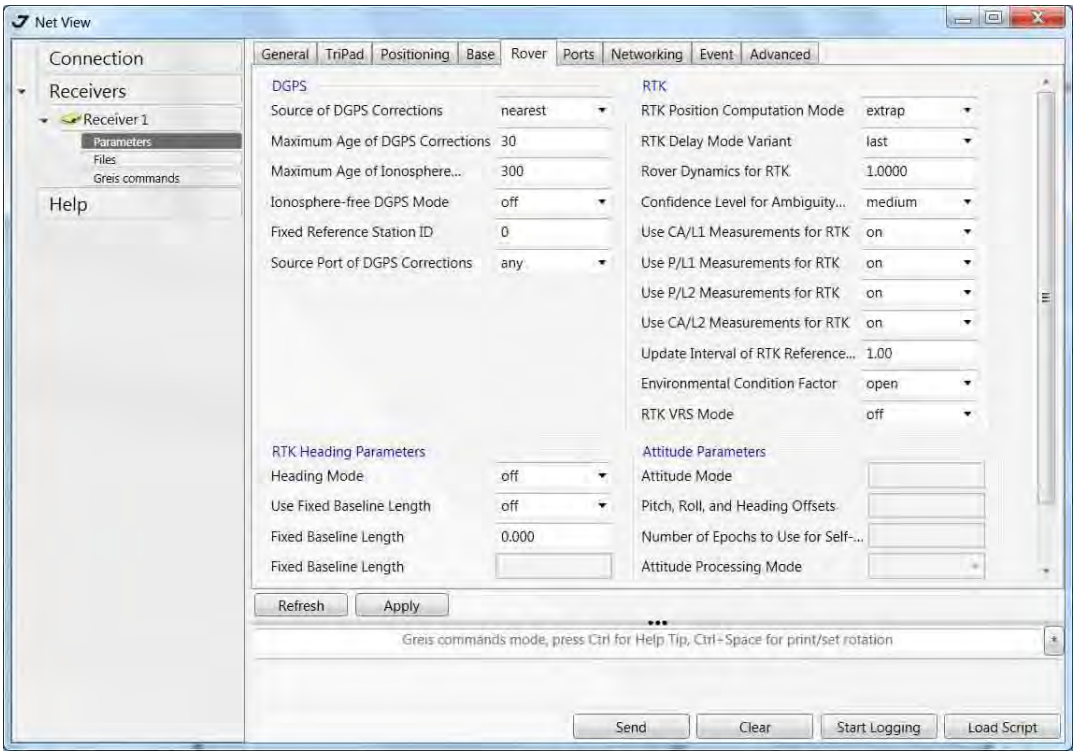


Figure 10. Rover tab

6. For RTK DGPS survey, open the *Ports* tab and set up the parameters according Table 3, then click *Apply* (Figure 11 on page 24).

Note: For the survey with the post-processing keep default parameters.

Table 3. Settings for Ports tab

Parameter	Base	Rover
Input	-	The same correction type as Base has
Output	Select the correction type.	None
Period (sec)	Set the period of correction output	-
Baud rate	baud rate for the corresponding receiver port	
RTS/CTS	Enable	

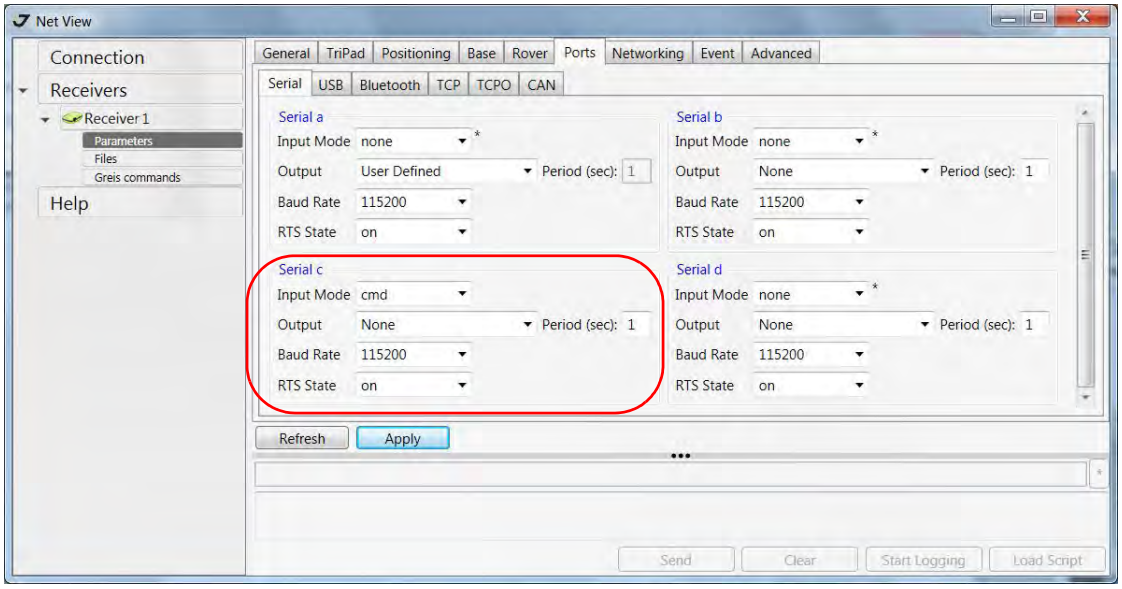


Figure 11. Ports tab

7. Open *Advanced* tab, and then *Multipath Reduction* subtab. Activate *Code multipath reduction* (`mpnew`) on base and rover for DGPS mode.
   For RTK DGPS mode activate *Carrier multipath reduction* (`mpnew`) as well (Figure 12).

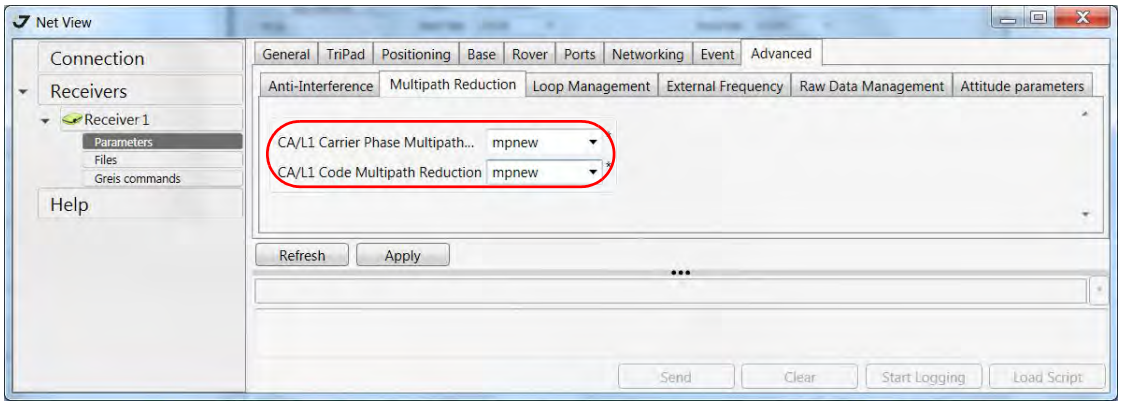


Figure 12. Multipath Reduction

8. Click *Apply*, to save the made changes and settings into receiver's memory and close the dialog window. The receiver configuration will be kept in the receiver till you will change them or will clear NVRAM. For detailed description of settings and parameters see *NetView Software Manual*.

5.2. Configuring the GSM/GPRS Module

ModemVU is JAVAD GNSS's configuration utility for modems embedded in JAVAD GNSS receivers. ModemVU provides the following functions:

- Connecting a computer to an integrated GSM/GPRS module via a serial port or Bluetooth® wireless technology.
- Displaying information about the radio modem installed in the receiver.
- Programming the radio modem's settings.

See the *ModemVU Software Manual* available on the JAVAD GNSS website for details on configuring the receiver with an GSM radio modem. To configure an GSM module, have the following ready:

- Computer running Windows®;
- ModemVU Software installed on the computer;

1. Connect the computer and receiver. Turn on the receiver.
2. Start ModemVU.
3. Select the GISmore (Figure 13), and click *OK*.
4. Select the COM port the receiver is connected to. Click *Connect*.

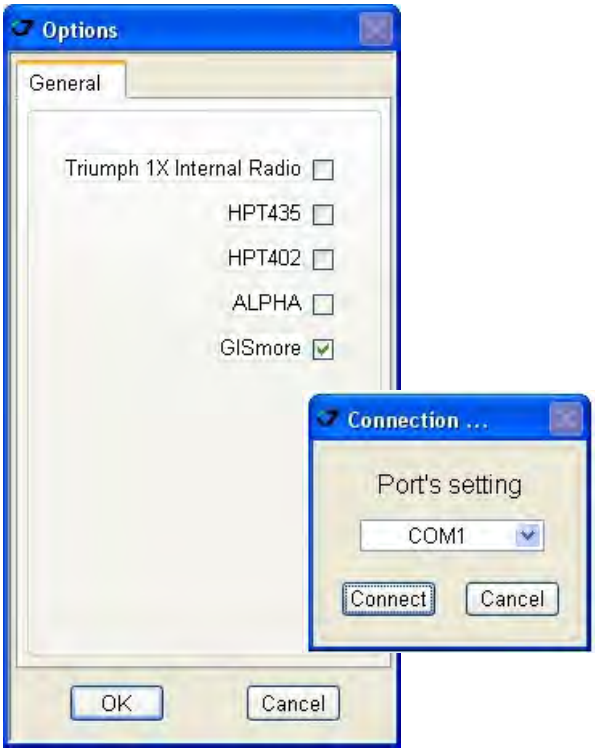


Figure 13. Options window

Configuring the GSM module for Point-to-Point radio link

Note: To comply with RF exposure requirements, maintain at least 20 cm between the user and the GSM modem.

1. On the *General* tab, set the following parameters (Table 4) and click *Apply* (Figure 14 on page 26). In this tab modem and service status and possible errors are displayed.

Table 4. Receiver Parameters for the General Tab

Parameter	Rover Receiver
Mode	Master
PIN	Enter a Personal Identification Number (PIN) if required.

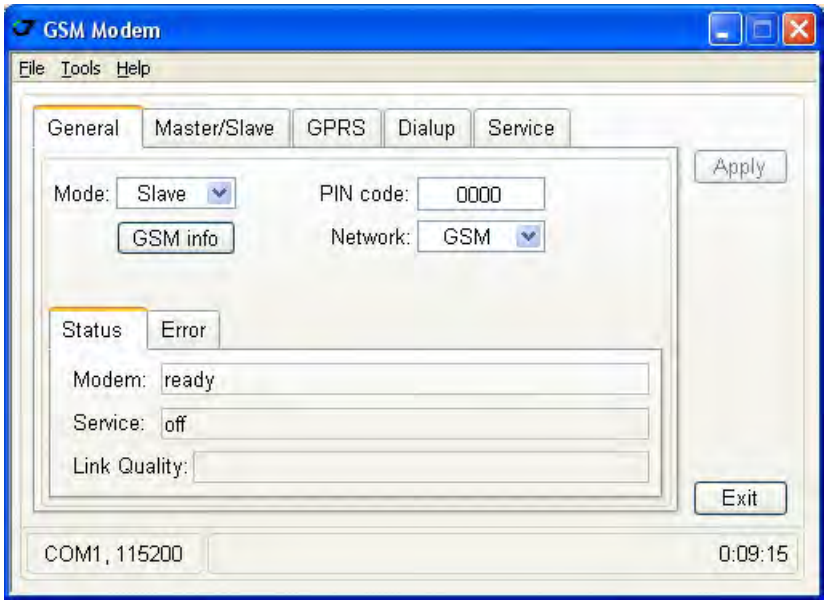


Figure 14. General tab

2. On the *Master/Slave* tab, set the following parameters (Table 5) and click *Apply* (Figure 14 on page 26).

Table 5. Receiver Parameters for the Master/Slave Tab

Parameter	Rover Receiver
Dial number	Enter the phone number of the base GSM modem.
Send time out	Enter a period of time in seconds in which the base/rover GSM modem will send a service word to the rover/base GSM modem. • This parameter is used to maintain reliable communication between a pair of modems and avoid unnecessary modem reinitialization. • To ensure reliable and secure modem communication, this parameter must be larger then the period for transmitting differential corrections.

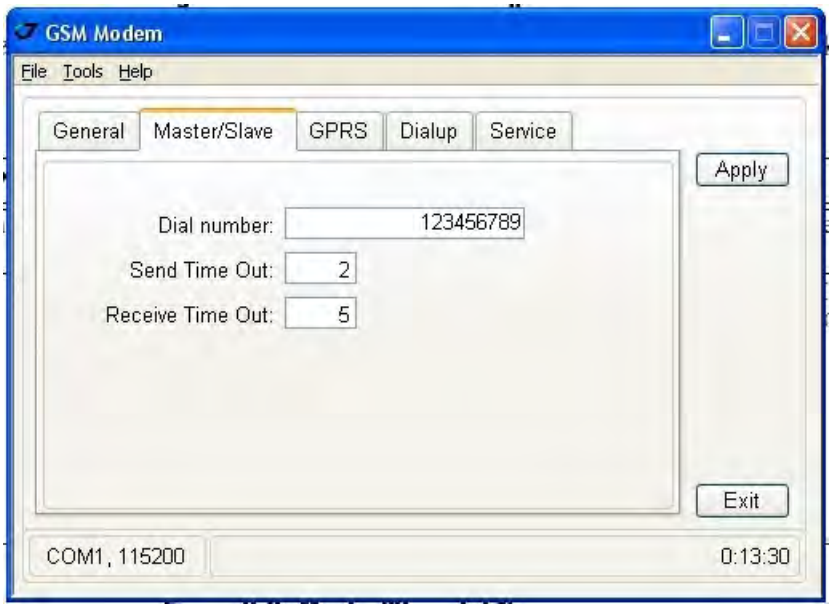


Figure 15. Master/Slave tab

3. Click *Apply*, and then click *File* ▸ *Disconnect*.

Configuring the GSM module for Internet access

Note: To comply with RF exposure requirements, maintain at least 20 cm between the user and the GSM modem.

1. On the *General* tab, set the following parameters (Table 6) and click *Apply* (Figure 16). In this tab modem and service status and possible errors are displayed.

Table 6. Receiver Parameters for the General Tab

Parameter	Rover Receiver
Mode	GPRS
PIN	Enter a Personal Identification Number (PIN) if required.

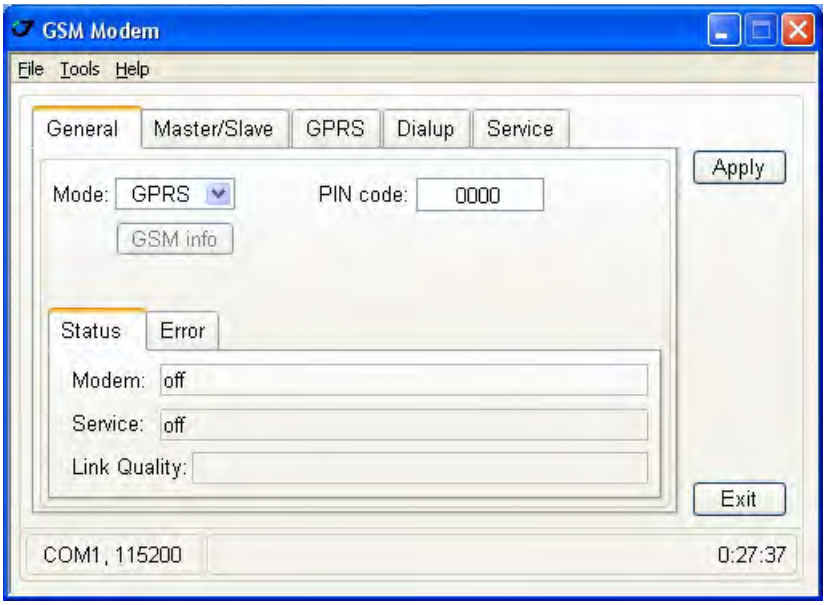


Figure 16. General tab

2. In the *GPRS* tab it is necessary to set the dial number, user name and password, access point name and PDP context identifier to establish a GPRS connection. Usually, this information is given by cell provider (Figure 1-1 on page 28).

   PPP button opens the PPP parameters window, that allows user to set up the Point-to-Point protocol parameters. The Point-to-Point Protocol, or PPP, is commonly used to establish a direct connection between two nodes. Usually, information of PPP parameters is given by Internet service provider.

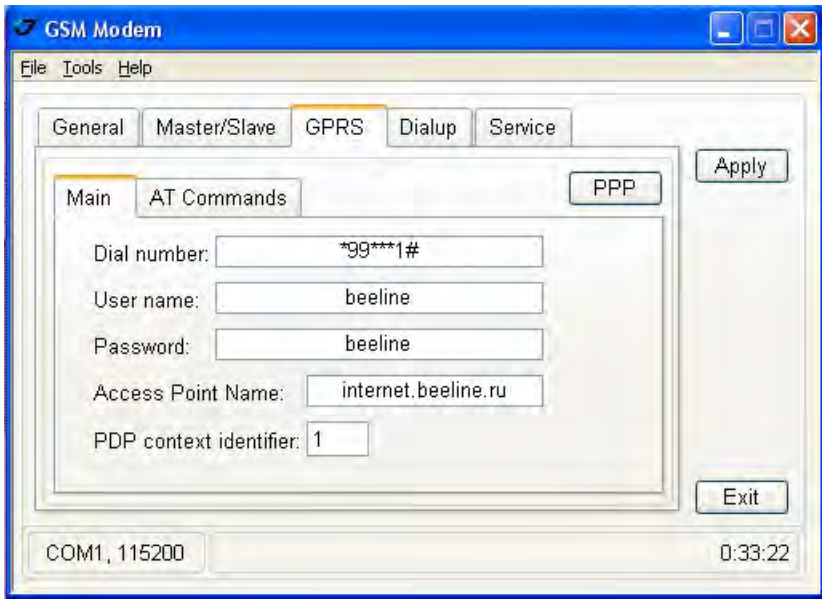


Figure 1-1. GPRS tab

3. In the *Service* tab *Main* subtab specify the following parameters (Table 1-1) and click *Apply* (Figure 1-2 on page 29).

Table 1-1. Receiver Parameters for the Service Tab Main Subtab

Parameter	Value
Mode	•OFF means service is disabled. •RCV means that modem will receive data from another (remote) JAVAD GNSS receiver configured as a base station. •This base station have to be connected with Internet via Ethernet or GPRS and have static IP address. •NTRIP are useful to provide a method to establish connection to an NTRIP caster, request data from particular mount point, and then receive and use the data as RTK/DGPS corrections. •SERVER - this mode allows working with JAVAD server.
TCPCL port	Specify the type of incoming data to accept on the TCPCL receiver port: •None means that the port will ignore any incoming data. •Command - port is in command mode. Being in this mode, the receiver's port recognizes commands sent by the user. •Echo - echo mode. •RTCM 2.x - RTCM 2.x input mode. •RTCM 3.x - RTCM 3.x input mode. •CMR - CMR/CMR+ input mode. For more information on CMR format, please refer to ftp://ftp.trimble.com/pub/survey/cmr. •JPS - JPS input mode. In this mode receiver is capable to recognize both standard and non-standard JPS messages.

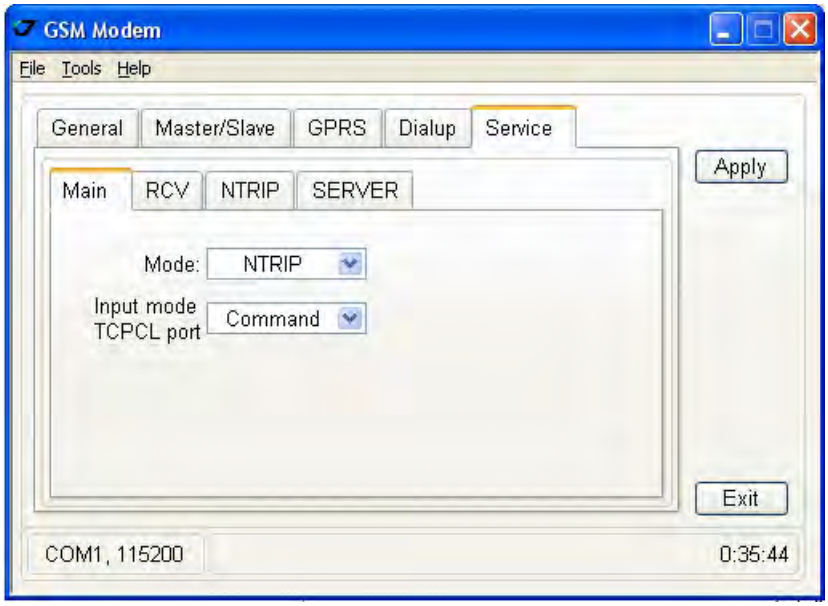


Figure 1-2. Service tab

4. Set up the GSM module making settings in the appropriate subtabs according selected mode.
5. After all settings click *Apply*, then click *File* ▸ *Disconnect*.
6. If needed, launch TriVU and set up the receiver to run as an RTK Base station.

Settings for the RCV subtab

The *RCV* subtab is depicted in Figure 1-3.

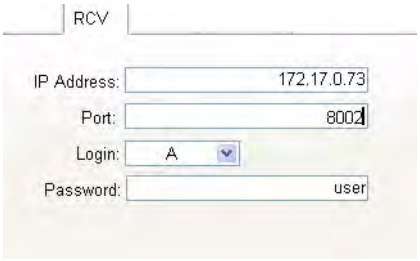


Figure 1-3. RCV subtab

- *IP address* - IP address of base station.
- *Port* - base station's port
- *Login* - designation of base station's TCP port (A, B, C, D, E or empty).
- *Password* - password of base station.

IP address, Port, Login, and Password are the parameters of other receiver, configured as a base station and connected with Internet via Ethernet or GPRS.

The description of these parameters exceeds the scope of this document, see *TriVU Software Manual*, available from http:///www.javad.com, for detailed information of base station's configuration and Ethernet and TCP port settings.

Settings for the NTRIP subtab

The *NTRIP* subtab is depicted in Figure 1-4:

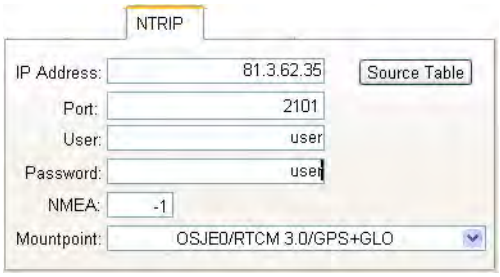


Figure 1-4. NTRIP subtab

- *IP address* - The value of this field should match the IP address of the NTRIP caster to use.
- *Port* - The value of this field should match the IP port the NTRIP caster is listening on for connections.
- *User* - This parameter specifies user ID for the protected space of the requested mount point.Only basic authentication scheme is supported. If empty, no user or password values will be sent to the NTRIP caster.
- *Password* - This field specifies the password for the protected space of the requested mount point. Only basic authentication scheme is supported.

As usually, this information is given by NTRIP service provider.

- NMEA - this box allows using appropriate parameter to receive/no receive the GGA messages for NTRIP caster:
    - -1 – receiver will not send NMEA GGA messages to NTRIP caster.
    - 0 – receiver will send NMEA GGA message to NTRIP caster only once after connection to the caster is established.
    - [1…86400] – receiver will send NMEA GGA messages to the NTRIP caster periodically, every specified number of seconds.

Mountpoint drop-down list box allows to select the necessary mount point from the list. This drop-down list box specifies the mount point of the NTRIP caster to get data from. The detailed information about each mount point it is possible to obtain and view clicking the *Source Table* button.

The description of these parameters exceeds the scope of this document, see *ModemVU Software Manual*, available from http:///www.javad.com for detailed information.

6. Setup and Survey

GPS receiver is a cost-effective L1 GPS survey instrument for productive control, topographic and GIS surveys. After configuring the receivers for surveying, each receiver needs to be setup up and the receiver's height measured and the survey can begin.

6.1. Receiver Setup

A typical GPS survey system consists of a Base station set up over a known point and a Rover receiver set up to be a mobile data collector.

Note: The Base station must be set up, logging data, and transmitting data before setting up the Rover receiver. Receiver setup for either post-process or RTK surveys is the same.

GISmore is suitable for GIS applications which do not require precise antenna installation even for RTK DGPS mode. The main goal of RTK solution in GISmore is to make job of GIS operator much more reliable and effective by providing to him RTK quality of positioning for applications where before it was impossible.

An example of GISmore installation is inside of safety helmet of operator and on the standard pole:

Figure 1-5. GISmore possible installation

6.2. Single-Frequency Static Surveying

This method, sometimes called static surveying, is used surveying projects that require high accuracy. In this method, each receiver at each point logs data continuously for a pre-planned length of time. The duration of data collection depends on

- required precision
- number of visible satellites
- satellite geometry (DOP)
- whether the receivers are single frequency or dual frequency
- distance between receivers

Static surveying is the classic survey method, well suited for all kinds of baselines (short, medium, long). At least two receiver antennas, plumbed over survey marks, simultaneously collect raw data at each end of a baseline during a certain period of time. These two receivers track four or more common satellites, have a common data logging rate (5–30 seconds), and the same elevation mask angles. The length of the observation sessions can vary from a few minutes to several hours. The optimal observation session length depends on the surveyor's experience as well as the following factors:

Generally, single-frequency receivers are used for baselines whose lengths do not exceed 15 kilometers (9.32 miles). For baselines of 15 kilometers or greater, use dual-frequency receivers.

After the survey completes, data the receivers collect can be downloaded onto a computer and processed using post-processing software (for example, JAVAD GNSS Justin).

6.3. Kinematic (Stop & Go) Surveying

In a kinematic, stop and go survey, the stationary receiver (Base station) is set up at a known point such as a survey monument, or an unknown point. The receiver continually tracks satellites and logs raw data into its memory. The Rover receiver is set up at an unknown point and collects data in static mode for 2 to 10 minutes. When finished, assign the Rover to kinematic status and move to the next survey point. At this

point, and each subsequent point, the receiver is changed to static mode to collect data. So, while moving, the Rover is in kinematic mode, and while collecting data, the Rover is in static mode.

1. Set up the Rover at an unknown point and press power. Allow the Rover to collect static data for two to ten minutes.
2. When finished, assign the Rover to kinematic.
3. Move the Rover to the next location (survey point), and collect the data in static mode for two to ten minutes.
4. Repeat steps until all points have been surveyed. The occupation time for the points depends on the same factors as for the static survey method.
5. When finished, stop logging data. Turn off the Rover if needed. This method of GNSS survey allows the operator to reduce the point occupation time, thus permitting field crews to survey many more points compared to the other methods available.

6.4. Differential GPS (DGPS) Surveying

Differential GPS is a data collection technique that uses an extra GPS receiver and some complex calculations to increase the accuracy of GPS positions. It is based on the fact that any pseudorange errors in a GPS signal are common to all receivers within a radius of several hundred miles. Differential GPS can provide accuracies from submeter to around five meters. Without differential correction accuracy may only be within 100 meters CEP.

The extra receiver, known as the base station, is placed on a known reference position. It receives GPS data from all satellites in view. One or more rover receivers collect GPS data at unknown locations using some of the same satellites that the base is receiving data from. Differential correction then compares the base station data with the known base station location and computes the error associated with each satellite pseudorange. This error is used to correct the rover positions, improving their accuracy.

Differential GPS corrections can be applied at the time the data is being collected in the field (real-time differential GPS using radios). Differential corrections can also be applied in the office once the rover and base station files are transferred to your office computer. This is called post processed differential correction and is carried out by the Differential Correction utility.

7. Receiver and File Maintenance

If post-processing the data after completing a measuring, the data in the receiver's memory will need to be downloaded to a computer. Downloading and deleting files will also prepare the receiver's memory for the next measuring. Occasionally, the receiver's NVRAM may need to be cleared to eliminate communication or tracking problems. As project expectations expand, the receiver's OAF may need to be updated to provide expanded operation and functionality. The receiver requires firmware to properly operate and provide appropriate functionality. As JAVAD GNSS releases firmware updates, loading these updates into the receiver will ensure that the receiver operates at its full potential.

7.1. Downloading Files to a Computer

When your measuring finishes, you can download your measuring files to a computer for storage, post-processing, or backup. Also, the GISmore memory holds a finite amount of files and information, so downloading the files to a computer ensures that no files are lost. You should download files as soon as possible after collecting data at the jobsite. NetView provides a File Manager to download files to your computer and delete files from the receiver GISmore.

1. Connect your receiver and computer. See "Connecting the Receiver and a Computer" on page 19 for this procedure. Start NetView. Establish connection between NetView and receiver.
2. Click *File* on the left panel. On the right panel appears the list of files, saved in receiver's memory. Select the file(s) to download (Figure 2).

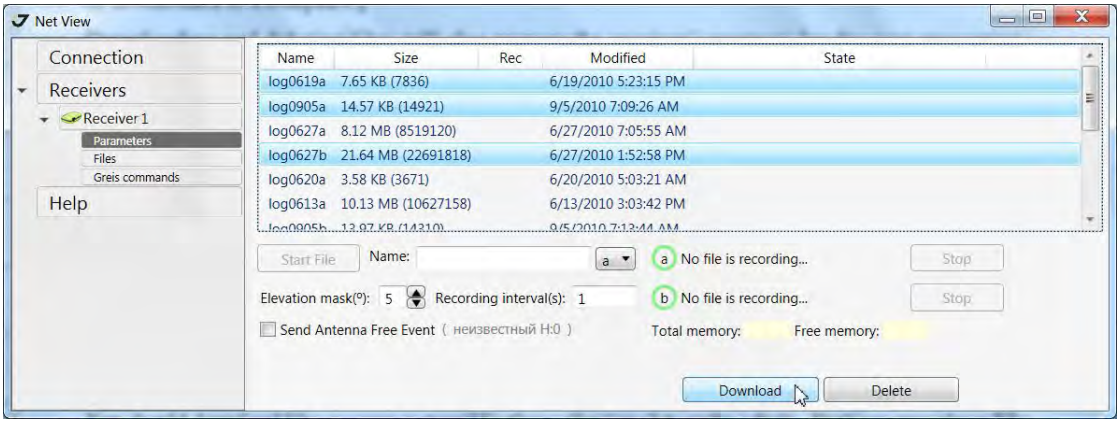


Figure 2. Download Files

Note: To select multiple files, hold down the shift key and click on nonsequential files to select several files at once; or hold down the Ctrl key and click on individual files.

3. Click the *Download* button. During the download, status indicators display each file.

7.2. Deleting Files

Use the following steps to delete files from your receiver.

1. Connect your receiver and computer. See “Connecting the Receiver and a Computer” on page 19 for this procedure. Start NetView. Establish connection between NetView and receiver.
2. Click *File* on the left panel. On the right panel appears the list of files, saved in receiver’s memory. Select the file(s) to delete

Note: To select multiple files, hold down the shift key and click on nonsequential files to select several files at once; or hold down the Ctrl key and click on individual files.

3. Click *Delete*. Click *Yes* at the delete files confirmation dialog box. NetView deletes the selected files.

7.3. Managing Receiver Options

Checking an OAF

Note: For a complete list of options and their details, visit the JAVAD GNSS website.

You can check the status of your receiver's options, and load any new OAFs via NetView.

1. Connect your receiver and computer. See “Connecting the Receiver and a Computer” on page 19 for this procedure. Start NetView. Establish connection between NetView and receiver.
2. Click on the receiver name on the left panel. On the right open *Options* tab.
   - *Option name* – a name/description of the option
   - *Current* – shows if the option is in force at the present or not
   - *Purchased* – if the option is purchased or not
   - *Leased* – if the option is leased or not
   - *Date* – the date the leased option will be disabled, if applicable

Loading OAFs

JAVAD GNSS dealers provide customers with OAF files. For any OAF related questions, E-mail at support@javad.com. Please have your receiver ID number available.

1. Connect your receiver and computer. See “Connecting the Receiver and a Computer” on page 19 for this procedure. Start NetView. Establish connection between NetView and receiver.
2. Click on the receiver name on the left panel. On the right open *Options* tab.
3. To upload a new options file, click on *Upload* button, and select the options file. *Refresh* – Updates the window
4. Navigate to the location of the new Option Authorization File. OAFs have .jpo extension and are unique to each receiver.

7.4. Clearing the NVRAM

The receiver's Non-Volatile Random Access Memory (NVRAM) holds data required for satellite tracking, such as almanac and ephemeris data, and receiver position. The NVRAM also keeps the current receiver's settings, such as active antenna input, elevation masks and recording interval, and information about the receiver's internal file system.

Even though clearing the NVRAM is not a common (nor normally a recommended) operation, there are times when clearing the NVRAM can eliminate communication or tracking problems. Clearing the NVRAM in your GISmore can be interpreted as a "soft boot" in your computer. After clearing the NVRAM, your receiver will require some time to collect new ephemerides and almanacs (around 15 minutes). Clearing the NVRAM of your receiver will not delete any files already recorded in your GISmore's memory. However, it will reset your receiver settings to factory default values. In addition, the NVRAM keeps information about the receiver file system.

1. Connect your receiver and computer. See "Connecting the Receiver and a Computer" on page 19 for this procedure. Start NetView. Establish connection between NetView and receiver.
2. Click on the receiver name on the left panel. On the right click on *Actions* ▸ *Clear NVRAM*.
3. Confirm NVRAM clearing.

7.5. Checking Firmware Version

Use NetView to check the firmware version of your receiver.

1. Connect your receiver and computer. See "Connecting the Receiver and a Computer" on page 19 for this procedure. Start NetView. Establish connection between NetView and receiver.
2. Click on the receiver name on the left panel. On the right appears the information about receiver including receiver model, ID, firmware version.
3. To save this information to the .txt file, click *Reports* ▸ *Receiver info* on the right panel.

7.6. Loading New Firmware

Base and Rover receivers must be loaded with the same firmware version. Use the latest firmware version, available for download from the JAVAD GNSS website, to ensure your receiver has the most recent updates.

To load new firmware use NetView.

1. Connect your receiver and computer. See "Connecting the Receiver and a Computer" on page 19 for this procedure. Start NetView. Establish connection between NetView and receiver.
2. Click on the receiver name on the left panel. On the right appears the information about receiver.
3. Click *Action* ▸ *Update firmware*.

Select the file with the mew firmware and click *Open*.

TROUBLESHOOTING

This chapter will help you diagnose and solve some common problems you may encounter with your receiver.

Warning: *Do not attempt to repair equipment yourself. Doing so will void your warranty and may damage the hardware.*

1. Check This First!

Before contacting JAVAD GNSS support, check the following:

- Check all external receiver connections carefully to ensure correct and secure connections. Double check for worn or defective cables.
- Check all power sources.
- Check that the most current software is downloaded onto the computer and that the most current firmware is loaded into the receiver. Check the JAVAD GNSS website for the latest updates.

Then, try the following:

- Reset the receiver using NetView: *Receiver name (on the left panel)* ▸ *Actions* ▸ *Reset.*
- Restore default settings using NetView *Receiver name (on the left panel)* ▸ *Actions* ▸ *Initial parameters.*
- Clear the NVRAM (see “Clearing the NVRAM” on page 36).

If the problem persists, see the following sections for other solutions.

2. Receiver Problems

The following are some of the most commonly encountered receiver problems.

Cable specific problems

- The cable is not properly plugged in.
    - Check that the cable connector is attached to the correct receiver port.
    - Unplug the cable, then securely and properly reconnect it to the receiver.
- The cable is damaged.
    - Use an undamaged cable. Contact your Dealer to replace the cable.

Generic problems

- The receiver port used for connection is not in Command mode.
    - Connect your receiver and a computer using a free port (see “Connecting the Receiver and a Computer” on page 19) and start NetView.
    - Change the *Input* for the port used for connection to “Command”.
- The receiver does not lock on to satellites for a long period of time.
    - See “Managing Receiver Options” on page 35 for details on how to check current options.
    - Order a new OAF with the desired options activated to enable or extend validity of the corresponding receiver options. Contact your dealer or visit the JAVAD GNSS website for details.
    - Refer to the *NetView Software Manual* for a detailed description of options.

The receiver tracks too few satellites

- The elevation mask value is too high (above 15 degrees).
    - Lower the elevation mask.
    - The measuring is conducted near obstructions (tree canopy, tall buildings, etc.).
- Check that the Multipath Reduction boxes have been enabled.
    - Connect your receiver and a computer using a free port (see “Connecting the Receiver and a Computer” on page 19) and start NetView.
    - Click enable Multipath reduction and click *Apply.*
- Move to an area free of obstructions, if applicable.

The receiver cannot obtain Code Differential and/or RTK solutions.

- Incorrect Base coordinates entered
    - Specify the correct coordinates for the Base station using NetView or another suitable field data collection software.
- The receiver is not configured as a Base or Rover.
    - If the receiver should function as a Base, ensure it has the proper configuration.
    - If the receiver should function as a Rover, ensure it has the proper configuration.
- The corresponding receiver options may be disabled or expired.
    - See “Managing Receiver Options” on page 35 for details on how to check current options.
    - Order a new OAF with the desired options activated to enable or extend validity of the corresponding receiver options. Contact your dealer or visit the JAVAD GNSS website for details.
    - Refer to the *NetView Software Manual* for a detailed description of options.
- There are not enough common satellites. In order to obtain a fixed solution, the Base and Rover should track at least five common satellites.
    - Ensure that both the Rover and Base receivers use the same, and updated, almanac.
    - Check the elevation masks of the Rover and Base receivers; they should be the same.
    - A discrepancy exists between the differential standards used at the Base and Rover receivers. Ensure the Base and Rover receivers use the same corrections input/output format:
    - Connect your receiver and a computer and start NetView. See “Connecting the Receiver and a Computer” on page 19.
    - Click and the *Ports* tab. Use the same input/output format for both receivers.

- Poor satellite geometry (PDOP/GDOP values are too high).
    - Conduct your measuring when PDOP values are low.
    - The elevation mask is above 15 degrees.
    - Lower the elevation mask.
- The transmitting and/or receiving antenna may be improperly connected.
    - Check that the radio modem's antenna is securely and properly connected to the antenna connector.
    - Check that the radio modem's antenna is undamaged. If damaged, contact your JAVAD GNSS dealer to replace the antenna.
- The specified baud rate is incompatible with the baud rates the receiver supports.
    - The baud rate is the rate at which the receiver transmits differential messages to the receiver and vice versa. Change the baud rate to that which your receiver supports.
- The Base and Rover receivers use different radio link parameters.
    - Configure the Base and Rover radio receivers according to the procedures listed in the applicable section.
- The distance between the Base and Rover is too far.
    - Close the distance between the Base and Rover.
    - Use repeaters to increase radio coverage.
- There may be a source of radio interference that disrupts radio communications.
    - Change the RF channel (if possible).
    - Use a spectrum analyzer to detect the radio characteristics of the interfering signal and change your system's configuration accordingly.
    - Remove the source of jamming signal or relocate your radio antennas (if possible).

The receiver does not start data logging

- The memory option is disabled or expired.
    - Check that the memory option is enabled. For details, see "Checking an OAF" on page 35.
- The receiver's memory has no free space.
    - Download and/or delete data files to free up space for new files (see "Connecting the Receiver and a Computer" on page 19 and "Deleting Files" on page 35).
    - Use the AFRM feature.

3. Technical Support

If the troubleshooting hints and tips in this Operator's Manual fail to remedy the problem, contact JAVAD GNSS Support.

Before contacting JAVAD GNSS Customer support about any problems with the receiver, see "Check This First!" on page 37 for some solutions that may fix the issue.

To contact JAVAD GNSS Customer Support use the QUESTIONS button available on the www.javad.com.

Note: For quick and effective support, provide a detailed description of the problem.

SPECIFICATIONS

This JAVAD GNSS product is a 216-channel GNSS receiver with a Bluetooth® wireless technology module, GMS module, and a rugged plastic housing.

Note: Performance specifications assume a minimum of 6 GPS satellites above 15 degrees in elevation and adherence to the procedures recommended in this manual.

Note: In areas of high multipath, during periods of large PDOP, and during periods of increased ionospheric activity, performance may degrade.

Note: Use robust checking procedures in areas of extreme multipath or under dense foliage.

1. Receiver Specifications

The following sections provide specifications for the receiver and its internal components.

1.1. General Details

Table 1. Receiver General Specificationsl

Physical	
Enclosure	Plastic, waterproof IP 55
Color	JAVAD GNSS Green
Dimensions	79 x 37x 123
Weight	302 g
GNSS Antenna	Internal
Battery	Internal
Seals	Silicon
Keys	Power – On/Off
LED	Battery status
Environment	
Operating temperature	-30° C to +55° C (with battery) / -40° C to +80° C (without battery)
Storage temperature	-20° C to +35°C, 45 to 85% RH (with battery within 1 year) -20° C to +40°C, 45 to 85% RH (with battery within 6 month) -20° C to +45°C, 45 to 85% RH (with battery within 1 month) -20° C to +50°C, 45 to 85% RH (with battery within 1 week) -45° C to +85° C (without battery)

Humidity	95% non-condensing
Power	
Internal battery	Li-Ion, 5.85 Ah, 3.7 V
Number of built-in batteries	1 battery
Operating time	Up to 7 hours
Input voltage	+4.5 to +14 V DC
On-board	Backup battery for timekeeping and almanac data storage10 years minimum operation
External power	
Port	1 port
Input voltage	+5 to +15 V DC
I/O	
Communication Port	Bluetooth® V2.0+EDR Class 2 supporting SPP Slave and Master Profiles
Connectors	External power
Data Features	
Up to 100 Hz update rate for real time position and raw data (code and carrier) 10 cm code phase and 1 mm carrier phase precision Hardware Viterbi decoder RTCM SC104 versions 2.x and 3.x Input/ Output	NMEA 0183 versions 2.x and 3.0 Output Multi-Base Code Differential Rover Code Differential Base Geoid and Magnetic Variation models RAIM Different DATUMs support Output of grid coordinates
Technology	
Low signal tracking, Advanced Multipath mitigation, KFK WAAS/EGNOS (SBAS), Adjustable PLL and DLL parameters	
NMEA	
NMEA version	Ver. 2.1, 2.2, 2.3, 3.0
Messages	GGA, GLL, GNS, GRS, GSA, GST, GSV, HDT, RMC, VTG, ZDA, ROT, GMP
Output interval	1Hz standard; 5, 10, 20Hz optional
DGPS	
Correction format	RTCM SC104 Ver 2.1, 2.2, 2.3, and 3.0
RTCM 2.x message type	1, 3, 9, 31, 32, 34; user selectable
RTCM 3.0 message type	1003, 1004, 1005, 1006, 1007, 1008, 1011, 1012, 1019, 1020; user selectable
Process interval	1, 5, 10, 20 Hz optional
Output interval for RTCM correction data	1, 5, 10, 20 Hz optional
Elevation mask	0 to 90 deg (independent of data logging)
Multi-base DGPS	Differential correction select mode: Nearest, Mix, Best (optional)
RTK	
Correction format	RTCM SC104 Ver 2.2, 2.3, or 3.0

RTCM 2.x message type	3, 18, 19, 20, 21, 22; user selectable
RTCM 3.0 message type	1003, 1004, 1005, 1006, 1007, 1008, 1019, 1011, 1012, 1020; user selectable
Ambiguity initialize	OTF (L1, L1/L2)
Baseline Length	Up to 50 km in the morning and evening; up to 32 km at noon.
Initialize time	5 seconds to 10 min depending on the base line length and multipath conditions
Output interval for CMR/RTCM	1 Hz standard; 5, 10, 20 Hz optional
Elevation	0 to 90 degrees (independent of data logging)
Solution mode	Delay (synchronization); Extrapolation (not synchronized)
Process interval	1, 5, 10, 20, 50, 100 Hz optional
Latency	Delay mode – 20 msec to 20 sec (depends on latency which receives corrections data from base receiver) Extrapolation – 20 to 30 msec
Status	Fix, Float, DOP, Data Link Status, Modem Latency, Common satellites, Percentage of fixing
Results	RTK coordinates, HRMS, VRMS, Covariance Matrix
Ambiguity fixing level	Selectable thresholds. Low: 95%; Medium: 99.5%; High: 99.9%
Survey Modes	
Base or Rover	Static, Fast Static; Kinematic (Stop and Go); RTK (Real-time Kinematic); DGPS (Differential GPS); SBAS DGPS
Survey Accuracy	
Autonomous	< 2 m
Static, Fast Static	Horizontal: 0.7 cm + 0.5 ppm * base_line_length Vertical: 1 cm + 0.5 ppm * base_line_length
Kinematic, RTK	Horizontal: 1.5 cm + 1 ppm * base_line_length Vertical: 2 cm + 1.5 ppm * base_line_length
RTK (OTF)	Horizontal: 1.5 cm + 1 ppm * base_line_length Vertical: 2 cm + 1.5 ppm * base_line_length
DGPS	< 0.25 m Post Processing, < 0.5 m Real Time
Cold Start//Warm Start/Reacquisition	< 35 sec/< 5 sec/< 1 sec

1.2. GNSS Board Details

Table 2. GNSS Board Specifications

Tracking Signals	
GISmore	GPS L1; Galileo E1; GLONASS L1 (G3 only)
Tracking Functions	
Multipath reduction	Code and Carrier
PLL/DLL settings	Bandwidth, order, adjustable Smoothing interval Code and Carrier
WAAS/EGNOS	WAAS optional; EGNOS optional

Memory	
Internal Memory	Up to 256MB of on board non-removable memory for data storage
Raw Data Recording	Up to 100 times per second (100Hz)
Data Type	Code and Carrier from GPS L1, Galileo E1, GLONASS L1

1.3. Bluetooth® Module Details

Table 3. Bluetooth® Module Specifications

Range	up to 10 m (indoor); up to 50 m (outdoor)
Type	Class 2
Service classes	Miscellaneous
Supported profiles	LM, L2CAP, SDP, SPPP
Frequency Country Code	North America and Europe

1.4. GSM Module Details

Table 4. GSM Module Specifications

Operating Systems	Quad band: 850/900/1800/1900 MHz
Tx power	850/900 MHz – Class 4 (2 Watt); 1800/1900 MHz – Class 1 (1 Watt)
Typical RX sensitivity	-106dBm (4dB margin on top of spec)
GPRS	Multi-slot class 10 (4 down; 2 up; 5 Total); Max BR 85.6 Kbps Class B GSM 07.10 multiplexing protocol
EDGE	Multi-slot class 10 (4 Down; 2 Up; 5 Total) Max BR Downlink 236.8 Kbps (Over RS232) Coding Scheme MCS1-MCS9
CSD	Max BR 14.4 Kbps
SIM Card	SIM card support, 3.0 V, STK 3.1
Regulatory and Approvals	FCC, IC, CCC; FTA, PTCRB; R&TTE; GCF; EMC; QS9000 manufacturing; RoHS/WEEE

SAFETY WARNINGS

- Read these instructions.
- Keep these instructions.
- Heed all warnings.
- Follow all instructions.
- Clean only with a damp cloth.
- Do not block any of the ventilation openings. Install in accordance with the manufacturer's instructions.
- Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
- Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
- Only use attachments/accessories specified by the manufacturer.
- Use only with a pole, cart, stand, or tripod, specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.
- Unplug this apparatus during lightning storms or when unused for long periods of time.
- Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, or has been dropped.
- Apparatus shall not be exposed to dripping or splashing and no objects filled with liquids, shall be placed on the apparatus.

General Warnings

JAVAD GNSS receivers are designed for survey and survey related uses (that is, surveying coordinates, distances, angles and depths, and recording such measurements). This product should never be used:

- Without the user thoroughly understanding operator’s manual.
- After disabling safety systems or altering the product.
- With unauthorized accessories.
- Without proper safeguards at the survey site.
- Contrary to applicable laws, rules, and regulations.

DANGER: THE GISMORE RECEIVER SHOULD NEVER BE USED IN DANGEROUS ENVIRONMENTS. USE IN RAIN OR SNOW FOR A LIMITED PERIOD IS PERMITTED.

Warning: *To comply with RF exposure requirements, maintain at least 20 cm between the user and the GSM module modem.*

Battery Pack Warnings

CAUTION: *Risk of explosion if battery is replaced by an incorrect type. Dispose of used battery according to the instructions.*

DANGER: NEVER ATTEMPT TO OPEN THE CASING OF THE DETACHABLE BATTERIES! LITHIUM-ION BATTERIES CAN BE DANGEROUS IF MISHANDLED!

DANGER: DO NOT INCINERATE OR HEAT BATTERY PACK ABOVE 212 DEGREES FAHRENHEIT (100 DEGREES CELSIUS). EXCESSIVE HEAT CAN CAUSE SERIOUS DAMAGE AND POSSIBLE EXPLOSION.

DANGER: THE BATTERIES (OR BATTERIES INSTALLED) SHALL NOT BE EXPOSED TO EXCESSIVE HEAT SUCH AS SUNSHINE, FIRE OR THE LIKE.

Warning: *Do not attempt to open the battery pack.*

Warning: *Do not disassemble the battery pack.*

Warning: *Do not charge in conditions different than specified.*

Warning: *Do not use other than the specified battery charger.*

Warning: *Do not short circuit the battery pack.*

Warning: *Do not crush or modify the battery pack.*

Power Supply

Connect the supplied adapter to the side of the unit in the slot marked “PWR”. Plug the two-prong end of the power cord to an AC100-240V outlet.

If you have difficulty inserting the plug, turn it over and reinsert it. If the unit will not the used for a long time, disconnect the plug from the outlet.

Note: Before plugging the power cord into an AC outlet, make sure that all the connections have been made.

CAUTION: *To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.*

CAUTION: *To avoid the introduction of hazards when operating and installing, before connecting of the equipment to the supply, make sure that the supply meets local and national safety ordinances and matches the equipment’s voltage and current requirements.*

CAUTION: *Never attempt any maintenance or cleaning of the supply while plugged in. Always remove supply from AC power before attempting service or cleaning.*

Warning: *If the voltage supplied is below the minimum specification, the receiver will suspend operation. If the voltage supplied is above the maximum specification, the receiver may be permanently damaged, voiding your warranty.*

Make sure cords are located so that will not be stepped on, tripped over, or otherwise subjected to damage or stress. Do not operate equipment with a damaged cord or plug – replace immediately. To reduce the risk of damage to the equipment, pull by the plug body rather than the output cord when disconnecting the equipment.

Do not operate the supply if it has received a sharp blow, been dropped, or otherwise damaged. Do not disassemble the supply.

Warning: *Before connecting the external power source and the receiver, make sure that the power source matches the receiver's voltage and current requirements.*

Usage Warnings

If this product has been dropped, altered, transported or shipped without proper packaging, or otherwise treated without care, erroneous measurements may occur.

Note: Do not connect or disconnect equipment with wet hands, you are at risk of electric shock if you do!

The owner should periodically test this product to ensure it provides accurate measurements. Inform JAVAD GNSS immediately if this product does not function properly.

Only allow authorized JAVAD GNSS warranty service centers to service or repair this product.

Storage Precautions

1. Always clean the instrument after use. Wipe off dust with a cleaning brush, then wipe off dirt with a soft cloth.
2. Store in a location with a temperature of -20° +35°C, and no exposure to direct sunlight.
3. Use a clean cloth, moistened with a neutral detergent or water, to clean the receiver. Never use an abrasive cleaner, ether, thinner benzene, or other solvents.
4. Always make sure the instrument is completely dry before storing. Dry the receiver with a soft, clean cloth.

WARRANTY TERMS

JAVAD GNSS electronic equipment are guaranteed against defective material and workmanship under normal use and application consistent with this Manual. The equipment is guaranteed for the period indicated, on the warranty card accompanying the product, starting from the date that the product is sold to the original purchaser by JAVAD GNSS' Authorized Dealers[1].

During the warranty period, JAVAD GNSS will, at its option, repair or replace this product at no additional charge. Repair parts and replacement products will be furnished on an exchange basis and will be either reconditioned or new. This limited warranty does not include service to repair damage to the product resulting from an accident, disaster, misuses, abuse or modification of the product.

Warranty service may be obtained from an authorized JAVAD GNSS warranty service dealer. If this product is delivered by mail, purchaser agrees to insure the product or assume the risk of loss or damage in transit, to prepay shipping charges to the warranty service location and to use the original shipping container or equivalent. A letter should accompany the package furnishing a description of the problem and/or defect.

The purchaser's sole remedy shall be replacement as provided above. In no event shall JAVAD GNSS be liable for any damages or other claim including any claim for lost profits, lost savings or other incidental or consequential damages arising out of the use of, or inability to use, the product.

1. The warranty against defects in JAVAD GNSS battery, charger, or cable is 90 days.

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