Maxor GGDT

Operator's Manual

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PREFACE

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

Notice: Please read these Terms and Conditions carefully.

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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.

Warning: **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

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**
Enter	Press or click the button or key labeled **Enter**.

Tip: Supplementary information that can help you to configure, maintain, or

Notice: *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.

1

INTRODUCTION

This chapter provides an overview of the Maxor GGDT, including its features and physical elements. Also a brief description of the principals of GPS operation is presented.

Overview

Javad Navigation System's Maxor GGDT is a dual-frequency, GNSS receiver built to be the most advanced and compact receiver for the navigation market (Figure 1-1).

Figure 1-1. Maxor GGDT Receiver

The Maxor GGDT can receive and process both L1 and L2 signals, improving the accuracy of your measuring points and positions. The GNSS component of Maxor GGDT receivers means you can access both the GPS (Global Positioning System) satellites of the United States, and the GLONASS (Global Navigation Satellite System) satellites of the Russian Federation, increasing the

number of satellites your receiver can detect, thus improving the accuracy of your measuring points, increasing productivity, and reducing cost.

The dual-frequency and GNSS features of the Maxor GGDT combine to provide the only real time kinematic (RTK) system accurate for short and long baselines. Several other features, including multipath mitigation and common tracking, provide under-canopy and low signal strength reception. The Maxor GGDT receiver provides the functionality, accuracy, availability, and integrity needed for fast and easy data collection.

Principles of Operation

The measuring with the right GPS receiver can provide users accurate and precise positioning, a requirement for any measuring project.

This section gives an overview of GPS and receiver functions to help you understand and apply GPS principles, allowing you to get the most out of your receiver.

GPS Overview

The Global Positioning System (GPS) is a satellite-based, line-of-sight radio navigation system run by the United States Department of Defense (DoD). This system offers a global, all weather, 24-hour positioning, velocity, and time service to any user equipped with a GPS tracking receiver, who is on or near the Earth's surface.

The Global Navigation Satellite System (GLONASS) is the Russian Federation Ministry of Defense counterpart to GPS. At any one time, with a standard 15-degree angle, up to 10 or 12 GPS satellites are visible from any point on earth. When a receiver can also track GLONASS satellites, between 10 and 16 satellites are visible.

For information on the current status of the GPS constellation, visit http://tycho.usno.navy.mil/ or http://www.navcen.uscg.gov/.

For GLONASS, visit http://www.glonass-center.ru/frame.html.

Despite numerous technical differences in the implementation of these systems, both GPS and GLONASS have three essential components:

- Space – GPS and GLONASS satellites orbiting approximately 12,000 nautical miles above Earth and are equipped with a clock and radio. These satellites broadcast 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 GPS/GLONASS receivers and the corresponding satellites to calculate positions.

Calculating Positions

Once the receiver locks on to a satellite, it starts recording measurements and receiving the various digital information (ephemeris, almanac, and so on) satellites broadcast. To calculate a position, receivers use the following formula:

$$Velocity \times Time = Distance$$

Where Velocity is the speed at which radio waves travel (i.e., the speed of light) and Time is the difference between the signal transmission time and signal reception time.

To calculate absolute 3-D positions – latitude, longitude, altitude – the receiver must lock on to four satellites. In a mixed, GPS and GLONASS scenario, receiver must lock onto at least five satellites to obtain an absolute position.

To provide fault tolerance using only GPS or only GLONASS, the receiver must lock onto a fifth satellite. Six satellites will provide fault tolerance in mixed scenarios. Usually, the number of GPS and GLONASS satellites in view does not exceed twenty (20).

Once locked on to a satellite, the receiver collects ephemerides and almanacs, saving this information to its NVRAM (Non-Volatile RAM).

- GPS and GLONASS satellites broadcast ephemeris data cyclically, with a period of 30 seconds.

- GPS satellites broadcast almanac data cyclically with a period of 12.5 minutes; GLONASS satellites broadcast almanac data cyclically with a period of 2.5 minutes.

GPS Positioning

Achieving quality position results requires the following three elements:

- Accuracy – The accuracy of a position depends upon the number, signal integrity, and placement (also known as Dilution of Precision, or DOP) of satellites.

  –Differential GPS (DGPS) strongly mitigates atmospheric and orbital errors, and counteracts antispoofing signals the US Department of Defense transmits with GPS signals.

–The more satellites in view, the stronger the signal, the lower the DOP number, providing more accurate positioning.

- Availability – The availability of satellites affects the calculation of valid positions. The more visible satellites available, the more valid and accurate the position. Natural and man-made objects can block, interrupt, and weaken signals, lowering the number of available satellites.

- Integrity – Fault tolerance allows a position to have greater integrity, increasing accuracy. Several factors combine to provide fault tolerance, including:

  –Receiver Autonomous Integrity Monitoring (RAIM) detects faulty GPS and GLONASS satellites and removes them from the position calculation.

  –Satellite Based Augmentation Systems (WAAS, EGNOS, etc.) create and transmit DGPS correction messages.

  –Five or more visible satellites for only GPS or only GLONASS; six or more satellites for mixed scenarios.

  –Current ephemerides and almanacs.

  –Several algorithms to detect and correct faulty information.

Conclusion

GNSS users can use JNS GNSS receivers to collect data from a network of satellites and control stations to triangulate precise points anywhere on Earth.

This overview simply outlines the basics of GPS and GLONASS positioning. For more detailed information, visit the JNS website (http://www.javad.com).

Receiver Overview

When power is turned on and the receiver self-test completes, the receiver's 20 channels initialize and begin tracking visible GNSS satellites. Each of the receiver's channels can be used to track C/A-L1, P-L1, or P-L2 signals. The number of channels available allows the receiver to track all visible satellites at any time and location. The antenna receives the different signals for processing.

An internal antenna equipped with a low noise amplifier (LNA) and the receiver's radio frequency (RF) device are connected with a coaxial cable. The wide-band signal received is down-converted, filtered, digitized, and assigned to different channels. The receiver processor controls the process of signal tracking.

Once the signal is locked in the channel, it is demodulated and necessary signal parameters (carrier and code phases) are measured. In addition, broadcast navigation data are retrieved from the navigation frame.

After the receiver locks on to four or more satellites, it is possible to solve the so-called "absolute positioning problem" and compute the receiver's coordinates (in WGS-84 or another datum) and time. All this information is stored in the receiver's memory, which can be downloaded later onto a computer and processed using a post-processing software package. When the receiver is run in RTK mode, raw data measurements can also be recorded into the receiver's internal memory. This allows the operator to double check real-time results obtained in the field.

Depending on your options, capabilities of the receiver include:

- Common Tracking
- Multipath reduction
- Satellite Based Augmentation Systems (WAAS, EGNOS, etc.)
- Adjustable phase locked loop (PLL) and delay lock loop (DLL) parameters
- Dual-frequency static, kinematic, real-time kinematic (RTK), and differential GPS (DGPS) measuring modes
- Auto data logging
- Setting different mask angles
- Setting different measuring parameters
- Static or dynamic modes

Maxor GGDT Accessory Kit

Although the Maxor GGDT can be supplied with a number of different accessories, this manual refers to the standard kit.

The contents of the standard accessory kit contain:

• Cables

• Software

• Literature

Cables

Standard Maxor GGDT accessories include the following cables:

Receiver-to-computer RS232 serial cable – connects the receiver's serial port and an external device (hand-held controller or computer)

Receiver-to-SAE power cable – connects the receiver's power port and the power supply's SAE connector or the extension cable's SAE connector

SAE-to-SAE cable extension – connects SAE connectors over longer distances

USB cable – connects the receiver and an external device (hand-held controller or computer) via the USB ports

Power supply with SAE connector and power/charger cable

Software

Standard Maxor GGDT software includes:

- PCView Lite– controller software that can run on a Windows®-based computer. Please refer to the *PCView Software Manual* for detailed information on this software.
- GPS radio configuration software – for configuring the radio; such as, "Modem-JNS" and "FieldView".

Software and software manuals are also available on the JNS website:

http://www.javad.com

The following software will also be useful for operating, caring for and using your Maxor GGDT receiver, and may be required for some applications.

- FLoader – JNS's firmware loader; available from the JNS website.
- Modem-JNS - JNS's modem configuration software; available from the JNS website.
- BTCONF – JNS's Bluetooth® module configuration program; available from the JNS website.
- FieldView – JNS's field data collection software; among many other functions, can be used to configure the radio modem.
- Ensemble – JNS's post-processing software.

Literature

Maxor GGDT literature, including manuals and other product information are available on the JNS website (http://www.javad.com):

- Maxor GGDT Operator's Manual
- Functional specifications

The following manuals will also be useful for operating and caring for your Maxor GGDT receiver.

- PCView Software Manual
- Modem-JNS Software Manual
- FLoader User's Manual
- BTCONF User's Manual
- MinPad User's Manual

Getting to Know Your Maxor GGDT

The Maxor GGDT is 159 mm wide, 162 mm deep, and 115 mm height, weighs ~ 1.620 kg (~1.760 kg with modem). Maxor GGDT is versatile receiver and can be configured in several different ways, depending on the usage and function of the receiver at the jobsite. The casing allocates space for two no removable, on-board Li-Ion batteries and two cards. One of those cards is the GPS/GNSS receiver and the other is used for communications.

The Maxor GGDT has standard interior receiver components and two end panels for user interface, communication, and power supply. For Maxor GGDT specifications, see Appendix B on page 139.

Internal Components

Features inside the Maxor GGDT casing include:

GNSS Receiver Board

The Maxor GGDT is supplied with board GGD-112T. Table below lists the options available for this card model.

Table 1-1. Options for Maxor GGDT

	Available Options
GGD-112T	GD: GPS L1/L2 GG: GPS/GLONASS L1 GGD: GPS/GLONASS L1/L2

A SBAS-enabled JNS receiver allows simultaneous tracking of two SBAS satellites. Each of the SBAS satellites is allocated its own channel.

GNSS Antenna

An internal micro-strip, zero-centered antenna capable of receiving GPS L1/L2 and GLONASS L1/L2 signals.

Bluetooth® Module

A combination of software and hardware technology that makes the Maxor GGDT mobile, wireless, GNSS receiver that supports a point-to-point serial profile. As such, the Maxor GGDT can transfer and synchronize files between the receiver and any other Bluetooth® wireless technology device that supports serial profile, including portable handheld devices and exter-

nal 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.

Radio Modem

The Maxor GGDT incorporates an internal modem.

Your Maxor GGDT may be equipped with one of the following communication boards (however, your receiver may also be configured without a radio/modem):

- UHF 450-470 MHz - a Javad Navigation Systems 2 W transceiver for 450-470 MHz (optional to UHF could be added an integrated GSM/GPRS module for Europe or USA).
- UHF ISM 902-928 MHz - a Javad Navigation Systems 1 W transceiver for 902-928 MHz (for USA, Canada and Australia).
- UHF SATELLINE-3AS/TC - a Satel Oy 1W transceiver for 380-470 MHz.
- UHF SATELLINE-3ASrm - a Satel Oy radio data receiver: either 450-470 MHz or 430-450 MHz or 410-430 MHz.
- PDL™ UHF modem – a Pacific Crest PDL (Positioning Data Link) modem; either a 450-470 MHz or 430-450 MHz; receiving only.
- GSM/GPRS – a single dual-band cell phone frequency modem (Europe: 900/1800 MHz; USA and Canada: 900/1900 MHz).
- Beacon receiver intended to receive pseudorange corrections transmitting by Radiobeacon stations (283.5-325 kHz).
- L-band receiver intended for particularly geostationary satellite communication networks satellite service (1525-1559 MHz).

Notice: *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.

The internal radio modem comes with a number of preset frequencies programmed at JNS.

Warning: **The use of these preset frequencies without a license is illegal. Contact your local authorities (the FCC in the US) to use these preset frequencies.**

Complete information regarding your radio system can also be found in your radio modem documentation.

Power Board

The internal power board manages receiver power and battery charging, and is connected to the receiver board and the batteries. The power board receives power from the internal batteries, even when the receiver is turned off. This feature allows the internal batteries to charge, regardless of the receiver's status (on or off). To prevent the batteries from discharging when the receiver is stored, put the receiver in Zero Power Mode (see "Zero Power Mode" on page 120 for more information). The batteries will not charge in this mode.

The power board's processor and firmware are independent of the receiver card. To ensure firmware compatibility, the GPS receiver board and power board must be loaded with firmware from the same package.

Battery

The Maxor GGDT receiver is equipped with two no removable, on-board, rechargeable Lithium-Ion battery packs connected to the receiver's power board. Each one of these Lithium-Ion battery packs is 7.4 V and 4 Ah, giving you a total power of 7.4 V nominal, and 8 Ah when fully charged.

The Li-Ion batteries used in the Maxor GGDT should run at no less than 98% capacity after 500 charging cycles. These batteries do not need to be drained before recharging.

A battery charger (AC adapter) is included with the standard package.

External Components

The Maxor GGDT casing includes panels for antenna attachment, a user interface, a power port, and ports for configuration.

Radome

Figure 1-2 on page 33 shows the radome components.

- Internal antenna – Location of GPS/GLONASS internal antenna.
- Modem antenna connector – Modem antenna connector used for internal RF connection. This is:

- a BNC female connector for Pacific Crest PDL (UHF) modems, Javad
Navigation Systems 2 Watts transceiver for 450-470 MHz, and for Satel
modems, or
- a TNC female connector for GSM modems, or
- R-TNC for JNS UHF 902-928 MHz 1W transceiver.

Figure 1-2. Maxor GGDT Radome

Bottom Panel

Figure 1-3 shows the Maxor GGDT's bottom panel components.

- Antenna Reference Point (ARP)

- The GPS/GLONASS external antenna connector (standard configu-
ration)

Figure 1-3. Maxor GGDT Bottom Panel

Front Panel

Figure 1-4 shows the Maxor GGDT's front panel components.
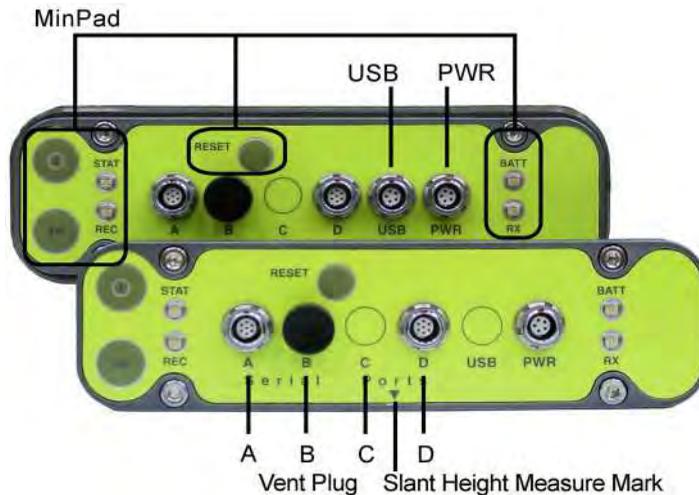
Figure 1-4. Maxor GGDT Front Panel (with and without USB)

- MinPad – The simple user interface for the Maxor GGDT receiver. The MinPad consists of three keys and up to four, three-color LEDs.

  See "Using MinPad" on page 103 for descriptions and usages of the MinPad components.

- Four serial ports:

  –Port A used for communication between the Maxor GGDT and a controller or any other external device.

  –Port B used internally to connect the receiver board with the Bluetooth® module.

  –Port C used internally to connect the modem and receiver boards.

  –Port D used for communication between the receiver and an external device.

- Vent plug – Equalizes the pressure between the inside of the receiver and the outside environment.

- USB – Used for high-speed data transfer and communication between the receiver and an external device.

- PWR – The power input port to which an external power source (+10 to +25 V DC) is connected and where the unit is charged.

- Slant height measure mark (SHMM)

Back panel

Figure 1-5 shows the back panel components.

Notice: *Standard Maxor GGDT configuration does not contain any back panel connectors.*
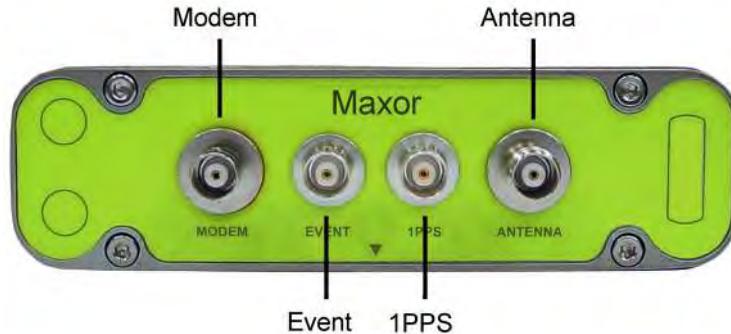
Figure 1-5. Maxor GGDT Back Panel

- Modem (optional) – Modem antenna connector used for internal RF connection. This is a BNC female connector for UHF modems, or a TNC female connector for GSM modems.
- Event (optional) – The BNC event marker connector; provides event input synchronized with a specified reference time.
- 1PPS (optional) – The BNC connector for 1 pulse-per-second (1PPS); generates 1PPS signals with programmable reference time, period, and offset; synchronized to a specified reference time.
- Antenna (optional) – External GPS/GLONASS antenna connector.
- Receiver serial number.
- Slant height measure mark (SHMM).

Option Authorization File (OAF)

Javad Navigation Systems 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 Maxor GGDT according to particular needs, thus only purchasing those options needed.

Typically, all Maxor GGDT 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 JNS website (http://www.javad.com) or consult your dealer.

- Type of signal (standard L1; optional L2)
- Memory (standard 0 MB)
- Update rate standard 1Hz (optional 5, 10, or 20 Hz)
- RTK at 1 Hz, 5 Hz, 10 Hz, and 20 Hz
- RTCM/CMR Input/Output
- Event marker
- Common Tracking
- Advanced multipath reduction
- Wide Area Augmentation System (WAAS) and European Geostationary Navigation Overlay Service (EGNOS)
- Receiver Autonomous Integrity Monitoring (RAIM)
- 1 PPS (Pulse-Per-Second; a timing signal)

CONFIGURATION

2

This chapter discusses how to configure the Maxor GGDT, including instructions for charging the receiver, connecting to a computer, configuring the receiver's MinPad interface, on-board radio modem, and Bluetooth® module.

Chapter Tip: Before you can use your Maxor GGDT, you need to:

1. Power your Maxor GGDT. See "Powering the Maxor GGDT" on page 37 and "Charging the Maxor GGDT" on page 43.

2. Configure the various parts of your Maxor GGDT. See:
   • "Connecting the Maxor GGDT and a Computer" on page 44,
   • "Maxor GGDT Configuration" on page 48,
   • "MinPad Configuration" on page 52,
   • "Radio Configuration" on page 58,
   • "Bluetooth® Module Configuration" on page 77.

3. Collect an almanac. See "Collecting Almanacs" on page 81.

Powering the Maxor GGDT

You can power the receiver using:
   • Internal batteries
   • External DC power source (user-supplied)
   • A battery charger

Internal Batteries

With a full charge, and depending on the type and mode of the on-board radio modem, the internal batteries should power both the GPS receiver and the radio modem according to the times listed in table below.

Table 2-1. Operating Times

Modem Type/Mode	Time
Any/Off	18 hours
UHF/On and in Receiving mode only	16 hours
UHF/On and in 1 Watts Transmitting mode	10 hours
UHF/On and in 2 Watts Transmitting mode	7 hours
GSM/Standby mode[a]	13 - 15 hours
GSM/Data Transfer mode[b]	13 - 15 hours

a. In this mode, the GSM modem is ready to transmit or receive data, without being used for an actual data transfer.
b. In this mode, the GSM modem transmits or receives data.

External DC Power Source (user-supplied)

Power supply requirements

In addition to the internal batteries, you can power your receiver with an external power source. A single external power supply with 5 pin ODU connector or SAE connector is necessary to operate the JNS Gyro-2T. If external power supply has only SAE connector, Receiver-to-SAE power cable shall be used. 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 10-25 V DC, 2.5 A. This may not be the same range as other JNS 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.***

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

Warning: **If the voltage supplied is below the minimum specifi-
cation, the receiver will suspend operation. If the volt-
age 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.**

Notice: *When the receiver uses an external battery as the primary power
source, make sure that the charger mode is set to Off. Otherwise, the
external battery will also charge the internal batteries, causing opera-
tion time to decrease. See "Power Management" on page 41 for more
information on setting the charger mode.*

1. Connect the SAE ends of the battery clip-to-SAE and the SAE-to-
   power plug cables.
2. Plug the power cable into the receiver's power port.
3. Attach the battery clip to the battery.

Battery Charger

The same charger used to charge the internal batteries can be used as an
external power supply for the receiver. The charger is provided with the
standard receiver package.

To use power from the battery charger, connect the equipment as follows
(Figure 2-1 on page 40):

- Plug the Receiver-to-SAE cable's 5-pin connector into the power port
  of the receiver (labeled PWR).

- Connect the opposite end of this cable with the battery charger's SAE connector.
- Plug the appropriate end of the power supply-to-outlet cable into the battery charger.
- Plug the other end of this cable into an AC outlet.
- Press and hold the **Reset** key for about one second to ensure that the receiver is in **Normal** mode for accepting power.
- Turn on the receiver by pressing and holding the green power key for about 0.5 seconds.

Figure 2-1. Maxor GGDT Charging

Tip: View the pattern of blinks of the BATT LED to make sure the receiver takes power from the external source.

Solid light – an External power supply is used and the batteries are not being charged.

Blinking once a second – an external power supply is used and the batteries are being charged.

Power Management

Use JNS's PCView software to manage the receiver's power. The complete description of PCView exceeds the scope of this manual, but can be found in the *PCView Software Manual*. The latest copy of this software and the manual can be downloaded from the JNS website (http://www.javad.com).

To access the tab controlling the power settings of your receiver, take the following steps:

1. Connect your receiver and computer. See "Connecting the Maxor GGDT and a Computer" on page 44 for this procedure.

2. Start PCView.

3. Once connected, click **Configuration->Receiver**.

4. Select the **Power Mode** drop-down list to set the desired power source (Figure 2-2). **Current Mode** displays the current power source.
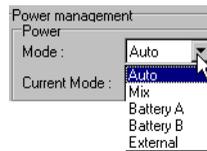
Figure 2-2. Select Power Mode

- **Auto** – receiver automatically selects the power source.
- **Mix** – receiver automatically detects and consumes power from the source with the largest voltage.
- **Battery A** – receiver consumes power from battery A.
- **Battery B** – receiver consumes power from battery B.
- **External** – receiver uses an external power supply.

5. Select the **Charger Mode** drop-down list to set the desired charger mode (Figure 2-3). **Current Mode** displays the charging battery: a, b, or none (off).
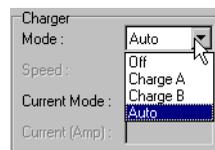
Figure 2-3. Select Charger Mode

- **Off** – receiver will not charge batteries.
- **Charge A** – receiver will charge only battery A.

- **Charge B** – receiver will charge only battery B.
- **Auto** – receiver will automatically detect and charge both batteries.

6. Select the **Power output modes Ports** drop-down list to set power output on the serial ports (Figure 2-4).
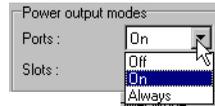
Figure 2-4. Select Power Output Modes – Ports

- **On** – the power board delivers voltage on pin one of all serial port connectors when the receiver is turned on. If the receiver is turned off, there will not be any power on the ports.
- **Off** – the power is absent, even if the receiver is on.
- **Always** – the power board delivers voltage on pin one of all serial port connectors, even if the receiver is off.

7. Select the **Power output modes Slots** drop-down list to set power output on internal slots (Figure 2-5).
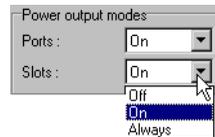
Figure 2-5. Select Power Output Modes – Slots

- **On** – all slots have power if the receiver is turned on.
- **Off** – internal slots do not have power, even if the receiver is turned on.
- **Always** – internal slots have power, even if the receiver is turned off.

8. View the **Voltages** information (Figure 2-6).
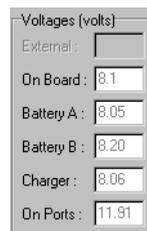
Figure 2-6. View Voltages Information

- **External** – displays the external power supply's voltage.
- **On Board** – displays the voltage drawn by the receiver board.

- **Battery A** – displays the voltage of battery A.
- **Battery B** – displays the voltage of battery B.
- **Charger** – displays the charger's output voltage during battery charging.
- **On Ports** – displays the voltage output on pin one of all serial ports connectors.

9. Select and check each of the **Turn on/off Slots** check boxes to enable the corresponding internal slots (Figure 2-7).
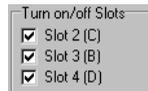
Figure 2-7. Enable Slots

10. Select and check the **Enable Low Power Mode** check box to put the receiver's processor into low power consumption mode (Figure 2-8).

Figure 2-8. Activate Low Power Mode

11. Click **Apply**.

Charging the Maxor GGDT

To charge the receiver internal batteries, take the following steps and refer to Figure 2-1 on page 40:

- Plug the Receiver-to-SAE cable's 5-pin connector into the power port of the receiver (labeled PWR).
- Connect the opposite end of this cable with the battery charger's SAE connector.
- Plug the appropriate end of the power supply-to-outlet cable into the battery charger.
- Plug the other end of this cable into an AC outlet.
- Press and hold the **Reset** key for about one second to ensure that the receiver is in Normal mode for charging. The receiver will not charge in Zero Power Mode (see "Zero Power Mode" on page 120 for more information).
- Turn off the receiver by pressing and holding the green **power** key for more than one and less than four seconds (until both STAT and the REC LEDs turn off).

- Leave overnight. Fully charging the batteries takes approximately seven hours. The internal batteries cannot be overcharged.

Tip: To check the status of the internal batteries, view the BATT LED on the receiver front panel. A green light indicates greater than 90% charge. An orange light indicates an intermediate charge. A red light indicates less than 10% charge.

The Li-Ion batteries used in the receiver should run at no less than 98% capacity after 500 charging cycles. These batteries do not need to be drained before recharging.

Connecting the Maxor GGDT and a Computer

To configure, manage files, or maintain the Maxor GGDT, you need to connect the receiver and a computer using an RS232 cable, and start PCView. In addition, if an USB port is available on your Maxor GGDT, you can use an USB cable and a computer with the JNS USB driver for such connection.

Once you have established a connection between the receiver and the computer, you will be able to:

- Configure the receiver and its components
- Send commands to the receiver
- Download files from the receiver's memory
- Use FLoader to load new firmware to the receiver
- Use PCView to load OAFs and configuration files to the receiver

Establishing a Wireless Connection

The Maxor GGDT 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, an IPAQ, or a computer with USB-to-Bluetooth® adapter or PCMCA-to-Bluetooth® adapter installed.

Notice: *Changing the receiver's Port B default settings will affect the Bluetooth® link. The default settings for Port B are 115200 bps, 8 data bits, 1 stop bit, no parity, and no handshaking.*

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

Notice: *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. Once connected, continue with Step 1 in "Establishing a PCView Connection" on page 46.

If you cannot establish a connection, check that the receiver's slot three is enabled.

1. Connect your receiver and a computer using an RS232 cable (see "Establishing an RS232 Cable Connection" below).

2. Start PCView.

3. Click **Configuration->Receiver->General**.

4. In the **Turn on/off Slots** area, ensure the **Slot 3 (B)** check box is enabled.

Establishing an RS232 Cable Connection

1. Using the RS232 cable, connect the serial port of your computer (usually COM1) to the receiver's serial port A.

2. Press the **power** buttons on the receiver and computer to turn them on.

3. Continue with Step 1 in "Establishing a PCView Connection" on page 46.

Establishing a USB Cable Connection

Make sure the computer has JNS's USB driver installed (available from Support area of Free Software section of http://www.javad.com) before continuing.

1. Using the USB cable, connect the USB port on the receiver to a USB port on the computer.

2. Press the power buttons on the receiver and computer to turn them on.

3. Continue with Step 1 in "Establishing a PCView Connection" below.

Establishing a PCView Connection

PCView is a personal computer software used to manage the various functions of your receiver. The full range of PCView configuration and function is outside the scope of this manual. For more information on any of the procedures in this section or on PCView, refer to the *PCView Software Manual* available on the JNS website (http://www.javad.com).

1. Once the receiver and a computer are connected, start PCView on your computer. The PCView main screen displays (Figure 2-9).
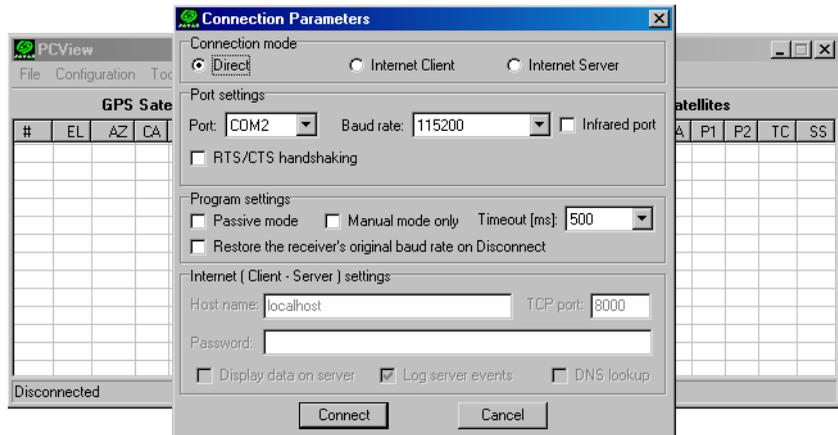
Figure 2-9. PCView Main Window

Note that the lower-left hand corner shows the receiver status as "Disconnected".

1. On the **Connection Parameters** dialog box, select the following parameters and click **Connect**:

• For Bluetooth® or RS232 connections (Figure 2-9 on page 46)

–Set the Connection mode (Direct).

–Set the port for your computer (typically COM1, COM2 for RS232 connection and COM3, COM4, etc. for Bluetooth® connection) from the Port drop-down list.

–Set the communication rate between the receiver and the computer (usually 115200) from the Baud rate drop-down list.

–For Bluetooth® connections, disable RTS/CTS handshaking. For RS232 connections enable RTS/CTS handshaking.
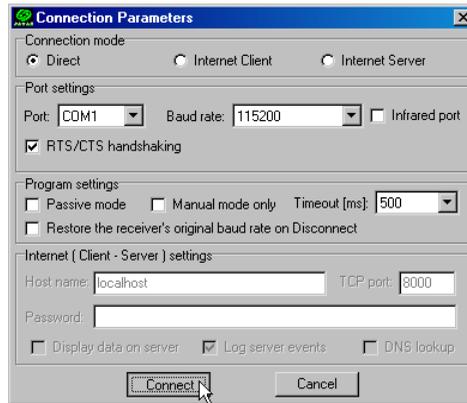
Figure 2-10. Bluetooth® and RS232 Connection Parameters

• For USB connections (Figure 2-11)

–Set the Connection mode (Direct).

–Set the port for your computer (USB) from the Port drop-down list.

–Select the receiver's ID from the **Rec ID** drop-down list.
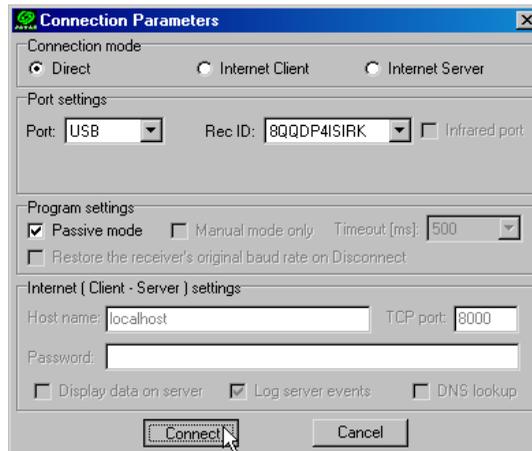
Figure 2-11. USB Connection Parameters

Once a PCView connection with the receiver has been established, the current communications settings–such as, port name, baud rate (if applicable), and flow control (if applicable)–display in the lower-left corner of the main

window of PCView. A timer begins to count up in the lower-right corner as well (Figure 2-12).
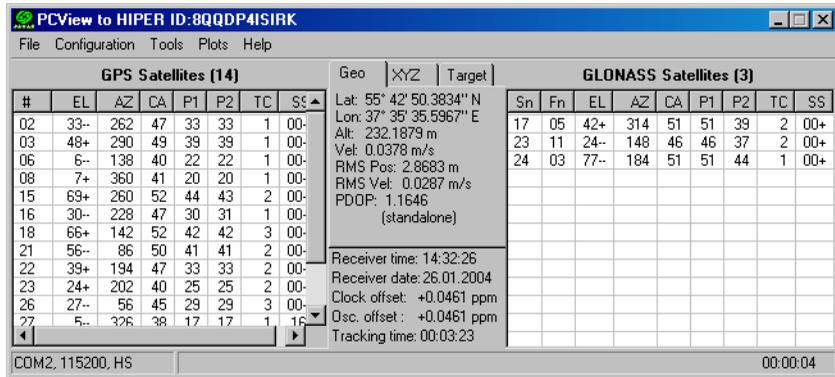
Figure 2-12. PCView Connection Established

Maxor GGDT Configuration

PCView is JNS's receiver configuration software, used to configure the various parts of the Maxor GGDT receiver. Any settings made using PCView will be saved in the receiver's memory, and will be reflected when you use the MinPad. The full range of PCView configuration and function is outside the scope of this manual.

Notice: *Refer to the PCView Software Manual to manage all possible Maxor GGDT receiver configurations.*

The following configuration is recommended for the most common applications. However, you can select configuration parameters as needed for your particular jobsite.

Notice: *Click Apply after making any configuration change, otherwise the receiver will not accept the change.*

   1. Connect your receiver and computer. See "Connecting the Maxor GGDT and a Computer" on page 44 for this procedure.

2. Once connected, start PCView and click on **Configuration->Receiver** (Figure 2-13).

Figure 2-13. Configuration->Receiver

The **Receiver Configuration** dialog box displays (Figure 2-14).
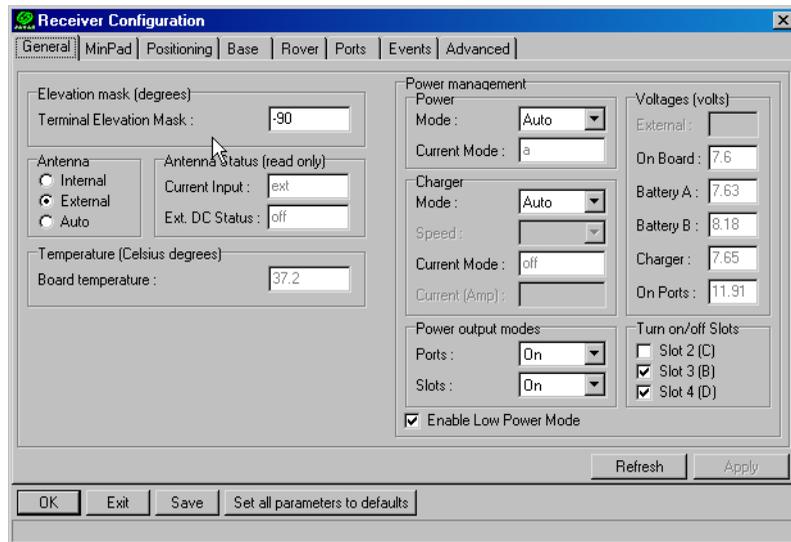
Figure 2-14. Receiver Configuration

3. Click the **MinPad** tab, configure the following settings, and click **Apply** (Figure 2-15 on page 50).

• Set the **Recording interval** in seconds.
• Set the **Elevation mask for Log file** in degrees.

• Enter the **File name prefix**. Use the last three digits of the receiver serial number.The receiver's serial number is on the back panel of the receiver.
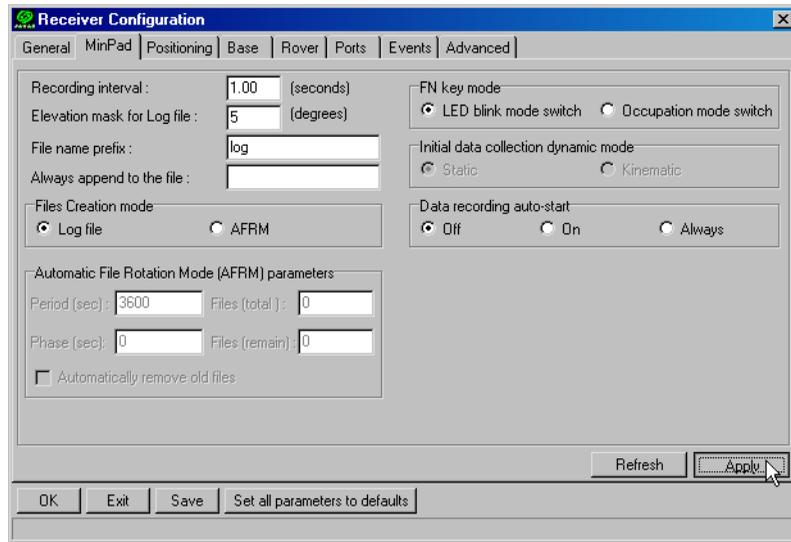
Figure 2-15. Receiver Configuration – MinPad Tab

If your jobsite is in an area that has obstructions (buildings, trees, etc.), and/or the antenna location is near reflective objects, configure the receiver to reduce errors from these sources.

4. Click the **Advanced** tab on the **Receiver Configuration** screen and then click the **Multipath Reduction** subtab. Enable the following boxes, and click **Apply** (Figure 2-16 on page 51):

• Code multipath reduction

• Carrier multipath reduction
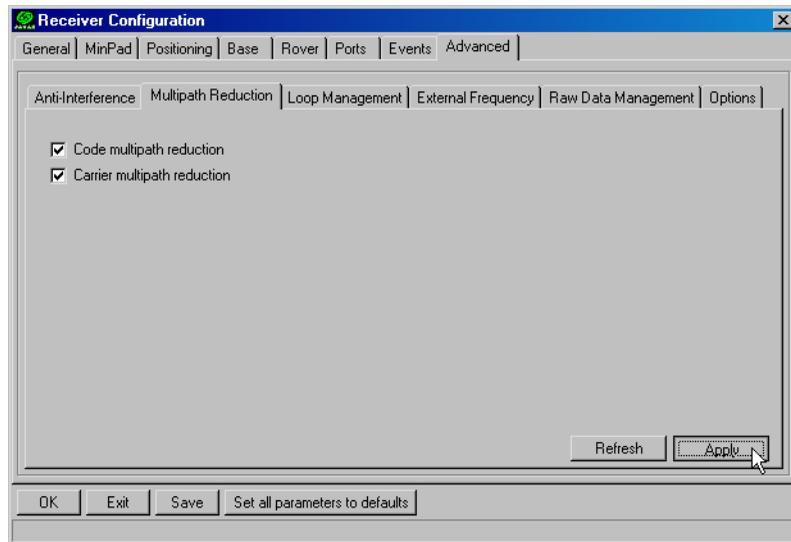
Figure 2-16. Advanced Configuration – Multipath Reduction

5. Click the **Loop Management** tab, enable the following boxes, and click **Apply** (Figure 2-17):

• Enable Common Tracking

• Static Mode (used for static receivers only, disable if using the receiver as a Rover)
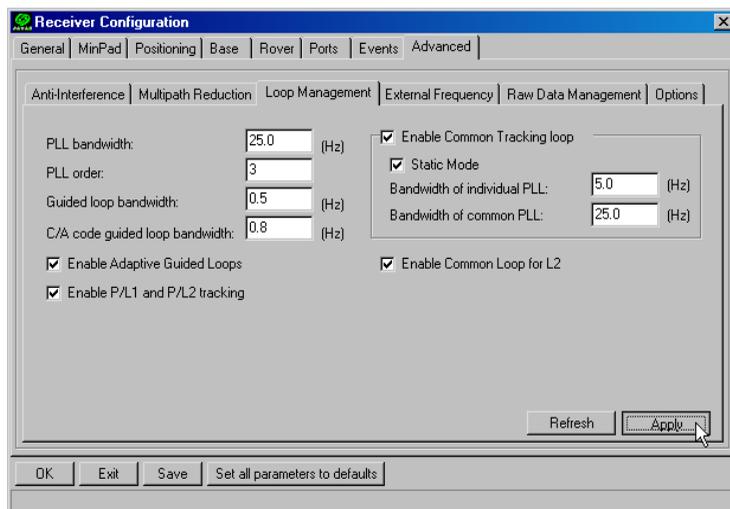
Figure 2-17. Advanced Configuration – Loop Management

6. Click **OK** to close the **Receiver Configuration** screen.

7. Click on **File->Disconnect**, and then **File->Exit** to quit PCView.

Notice: *Disconnecting the receiver from the computer before exiting will elim-*
inate any possible conflict in the management of your serial ports.

Once the receiver is configured, the configuration will remain until you change
it either using PCView or clearing the NVRAM.

MinPad Configuration

The Maxor GGDT's simple user interface (MinPad) consists of three keys
(Power, FN, and Reset) and up to four LEDs (STAT, REC, BATT, and RX) that
control and display the receiver's operation (Figure 2-18).
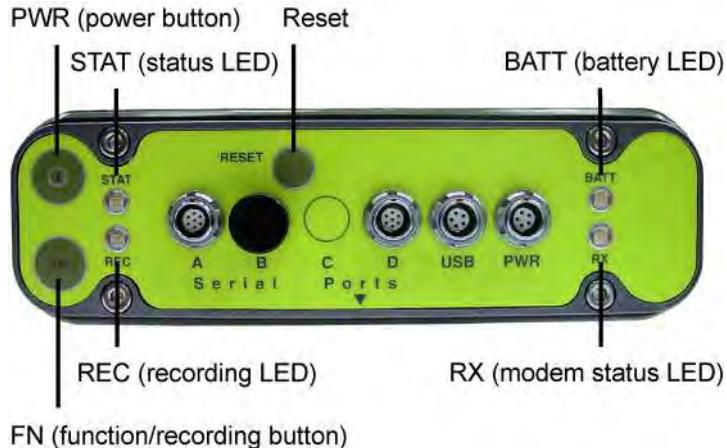
Figure 2-18. Maxor GGDT MinPad

The MinPad performs numerous functions:

- Turn the receiver on/off, put it in Sleep or Zero power mode.
- Turn data recording on or off (FN key).
- Change the receiver's information mode.
- Show the number of GPS (green) and GLONASS (orange) satellites being
  tracked (STAT LED).
- Show data recording status (REC LED).
- Show each time data records to internal memory (REC LED).

- Show the status of post-processing mode (static or dynamic) when performing a Post-Processing Kinematic measuring with the help of FN key (REC LED).
- Show the status (high charge, intermediate charge, or low charge) of the battery (BATT LED).
- Show the power source for the Maxor GGDT (BATT LED).
- Show the modem's status and if it receives signals (RX LED).

You use PCView to configure MinPad settings. Refer to the *PCView Software Manual* for all possible MinPad configurations.

1. Connect your receiver and computer. See "Connecting the Maxor GGDT and a Computer" on page 44 for this procedure.

2. Start PCView.

3. On the **Connection Parameters** dialog box, enable RTS/CTS handshaking (Figure 2-19) and then click **Connect**.
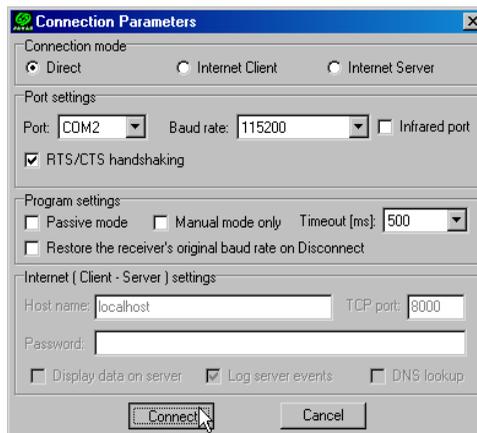
Figure 2-19. Connection Parameters – RTS/CTS Handshaking

4. Click **Configuration->Receiver** (Figure 2-20).

Figure 2-20. Configuration->Receiver

5. Click the **MinPad** tab, set the following parameters and click **Apply** (Figure 2-21 on page 54). See the following pages for descriptions of these parameters.

- Recording interval on page 54.

- Elevation mask for log file on page 54.
- File name prefix on page 55.
- Always append to the file on page 55.
- Files Creation mode on page 55.
- Automatic File Rotation Mode (AFRM) on page 55.
- FN key mode on page 56.
- Initial data collection dynamic mode on page 57.
- Data recording auto-start on page 57.
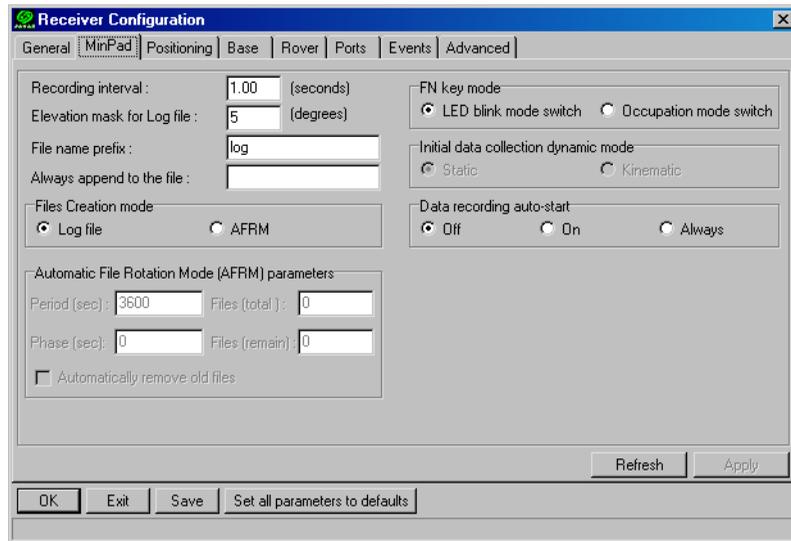
Figure 2-21. Receiver Configuration – MinPad Tab

Recording Interval parameter

This parameter specifies the message output interval into the log file when the MinPad FN key (pressed for 1-5 seconds) activates data logging. This setting is used not only when logging a single log file, but also when logging receiver data in AFRM mode. Values are 1-86400 seconds.

The default value is one second.

Elevation Mask for Log File parameter

This parameter specifies the minimum elevation angle for the satellites whose data will be put in the receiver files logged when pressing FN.

The default value is five degrees.

File Name Prefix parameter

This parameter specifies what prefix will be added to the names of the receiver files created when pressing FN. The prefix can be up to 20 characters long.

The default value is log.

Log file names have the following structure:

<prefix><month><day><sequential alphabet letter>

The file name depends on both the file creation time (month and day) and additional letter suffixes to avoid confusion between files created on the same day.

Always Append to the File parameter

If you want the new receiver data to be appended to an existing log file, enter the desired filename in this parameter. The setting can be up to 20 characters long.

Files Creation Mode parameter

This parameter has two possible operation modes:

- Log file - If the log file radio button has been selected, pressing the FN key will result in closing the current log file. If data logging is off, pressing FN will open a new log file.

- AFRM - If AFRM radio button has been selected, pressing FN will enable this mode. If AFRM has been enabled, pressing FN will disable this mode.

Automatic File Rotation Mode (AFRM) parameters

JNS receivers are capable of automatically rotating log files. During a "file rotation" event, the receiver closes the current file and opens a new one according to a user-defined schedule. The Period and Phase parameters specify this schedule. File rotation launches the moment the receiver time module Period is equal to Phase. More precisely, a new log file opens immediately before the scheduled epoch causing data tagged with this epoch to be recorded to the new log file.

When opening a new log file, the receiver enables the default set of messages outputted with the default output period. Both the default set of messages and the default output period are programmable.

- Period - specifies the time duration of each log file created in AFRM mode.

- Values are 60 to 86400 seconds. The default value is 3600 seconds.

- Phase - specifies the "phase" (constant time shift) of creating multiple log files in AFRM mode.
- Values are 0 to 86400 seconds. The default value is zero seconds.
- Files (total) - a counter that specifies how many multiple log files must be created in AFRM until this mode automatically turns off. This counter decrements on every file rotation until it value becomes zero, then file rotation automatically stops. The counter initializes with AFRM.

Note that a log file opens immediately after turning AFRM on. This startup file is not considered a file rotation event; the AFRM counter will not decrement.

Values are 0 to [231-1]. The default value is 0 (zero). Zero means that an unlimited number of log files will be created.

Notice: *The receiver's memory holds up to 512 files.*

- Files (remain) - specifies the number of files left for the receiver to create in AFRM.
- Values are 0 to [231-1]. The default value is zero.
- Automatically remove old files - when no free memory is available to log data, automatically removes the earliest log file. If this parameter is enabled, your receiver will erase the file with the earliest file creation time/date. AFRM must be enabled to use this FIFO (First-In, First-Out) feature.
- The default value is off (disabled).

FN Key Mode parameter

You use these two radio buttons to program how the receiver will react when pressing the FN key.

- LED blink mode switch - pressing FN will toggle between the MinPad's normal/extended information modes and start/stop data recording of Static measuring.

  –FN pressed less than 1 second: changes the information mode (Normal or Extended Information (EI) Modes).

  –FN pressed from 1 to 5 seconds: starts or stops recording (Static post-processing mode).

- Occupation mode switch - pressing FN (less than one second) will insert into the corresponding log file a message indicating that the measuring type has been changed from static to kinematic, or vice versa. If

the REC LED blinks green, the current mode is dynamic, if it blinks orange, the current mode is static. For more details, see Table 4-1 on page 106, and refer to the *MinPad User's Manual* and *PCView Software Manual*.

Initial Data Collection Dynamic Mode parameter

These radio buttons specify the starting occupation type descriptor inserted at the beginning of receiver files logged. You select Static or Kinematic to specify that the corresponding log file will start with a static or kinematic occupation, respectively.

Data Recording Auto-start parameter

These radio buttons allow you to program your receiver's behavior in the event of a power failure.

Table below gives the different scenarios available and the results after power is restored to the receiver. "Specified file" refers to the file name entered in the Always append to file parameter.

Table 2-2. Data Recording Parameter Behavior

Before Power Failure	Enabled Radio Button Results		
	Off	**On**	**Always**
1 Receiver data logged to file specified.	Data logging will not resume when power is restored.	Receiver will resume data logging to the same file when power is restored.	Receiver will resume data logging to the same file when power is restored.
2 Receiver data logged to default file.	Data logging will not resume when power is restored.	A new log file will open when power is restored and data will log to this file.	A new log file will open when power is restored and data will log to this file.
3 File specified; receiver data logging not started.	No file will open with this name. Data logging will not start when power is restored.	No file will open with this name. Data logging will not start when power is restored.	A log file with this name will open and data logging will start after power is restored.
4 No file specified; receiver data logging off.	Data logging will not start when power is restored.	Data logging will not start when power is restored.	A log file with a default name will open and data logging will start after power is restored.

Also, if **Always** is enabled, your receiver will automatically start logging data (to a newly created or an existing file) in the following three cases:

• After pressing the **Power** key to turn on the receiver.

- After resetting the receiver (with PCView or the **Reset** key).
- After taking the receiver out of Sleep Mode.

Radio Configuration

Notice: *Your receiver may be configured without a radio modem. If this is the case, please skip to "Bluetooth® Module Configuration" on page 77.*

The internal radio in your Maxor GGDT can be configured differently depending on your needs and working conditions. The Modem-JNS software, required to configure the radio modem, allows you to:

- access the internal modem
- configure the modem
- check or change the modem configuration

Installing Modem-JNS

Modem-JNS is JNS's radio modem configuration utility for modems embedded in Maxor GGDT family receivers. Modem-JNS provides the following functions:

- Connecting a PC to an integrated radio modem via a serial port or Bluetooth® wireless technology.
- Displaying information about the radio modem installed in the receiver.

Programming the radio modem's settings.

Modem-JNS software is available from the **Suppor**t area (**Free Software** section) of JNS website (http://www.javad.com).

If downloading the program from the website, extract the program files into a folder on your hard drive.

Notice: *Use Modem-JNS version 1.7 or newer to correctly configure the receiver.*

1. Navigate to the location of the Modem-JNS program and double-click the **Setup.exe** icon.
2. Keep the default installation location or select a new location. Click **Finish**.
3. Click **OK** to complete the installation.

For the detailed description of the Modem-JNS software see *Modem-JNS Software Manual* on our website (http://www.javad.com).

Configuring a JNS 2W UHF 450-470 radio transceiver

Configuring a Base Station's JNS 2W UHF 450-470 radio transceiver

For Maxor GGDT, the integrated JNS 2W UHF 450-470 radio transceiver provides TX/RX UHF communications between a Base Station and Rover. To configure the UHF radio modem, have the following ready:

- Computer running Windows® 98 or newer
- Modem-JNS version 1.7 or newer
- Serial cable (or Bluetooth® wireless technology capabilities)

1. Connect the computer and receiver using an RS232 cable or Bluetooth® wireless technology. See "Connecting the Maxor GGDT and a Computer" on page 44.

2. Turn on the receiver.

3. Open Modem-JNS and select the COM port the receiver is connected to (Figure 2-22).

4. Click **Connect**.

Figure 2-22. Connection to Modem-JNS

There are two scenarios for configuring the radio modem:

- with a dedicated channel
- with the Free Channel Scan (FCS) mode

Set Radio Link Parameters for a Dedicated Channel

1. From the **Protocol** control of the **Radio Link** tab, select between JNS and PDL (Figure 2-23):
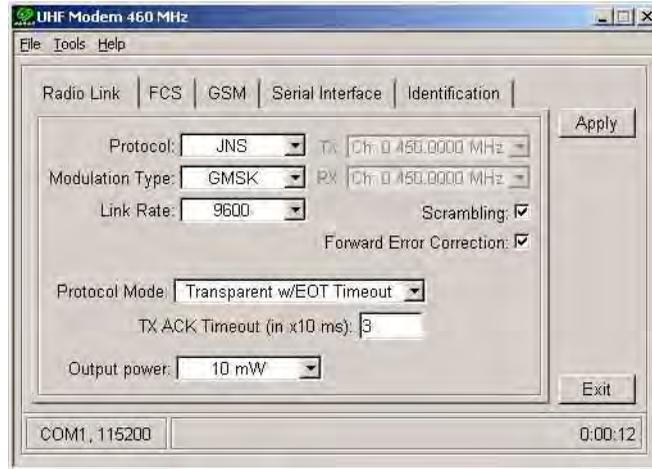
Figure 2-23. Radio Link Tab

- **JNS** – Select this protocol if all of the radio modems at your jobsite are manufactured by Javad Navigation Systems.

- **PDL** – Select this protocol if you use PDL radio modem(s) together with JNS radio modem(s) at the jobsite.

2. From the **Modulation Type** control (Figure 2-24 and Table 2-3), select a modulation scheme that will be used by your base radio modem.

Table 2-3. Modulation scheme

If the Link Rate is...	Use...
4800 baud	GMSK
9600 baud	GMSK or 4-Level-FSK
19200 baud	4-Level-FSK

Figure 2-24. Modulation Type

3. From the **Link Rate** control, select the rate at which data is transmitted over the RF link. The JNS 2W UHF 450-470 radio transceiver supports 4800, 9600, and 19200 baud. Note that this setting affects the **Modulation Type** control and vice versa

4. From the **TX** control, select the operating frequency that will be used by your base radio modem to transmit differential data.

5. Select **Scrambling** (see Figure 2-23 on page 60).

6. For a maximum data communication reliability, select the **Forward Error Correction** check box (see Figure 2-23 on page 60).

7. From the **Protocol Mode** control, select the appropriate link protocol among the following available:

   • Transparent w/EOT Character

   • Transparent w/EOT Timeout

   • Fast Async

8. If you select **Transparent w/EOT Character**, the **EOT Character (Dec)** field will be displayed. In this field enter a decimal value (usually a control character). Once the specified character is found in the incoming data stream, the modem begins data transmission.

9. If you select **Transparent w/EOT Timeout**, the TX ACK Timeout (in x10 ms) field will be displayed. In this field enter an integer value between 1 (corresponds to 10 ms) and 50 (corresponds to 500 ms). Once the timeout between incoming data exceeds the specified value, the modem begins data transmission.

10. From the **Output Power** control (see Figure 2-23 on page 60), select the level of RF transmit power from 10 mW to 2 W.

11. Click the **Serial Interface** tab (Figure 2-25) and select a baud rate for the modem's serial port. The same rate must be used for both the receiver and the modem.

Figure 2-25. Serial Interface Tab

12. Click **Apply**, then click on **File** and select **Disconnect**. If you want to close the program, click **File->Exit**.

13. Start PCView and set up the receiver to run as an RTK Base Station. For how to set up an RTK Base using PCView, refer to "Setting up an RTK Base Station" on page 95 and *PCView Software Manual*.

Set Radio Link Parameters for Free Channel Scan

1. Repeat steps 9 from "Set Radio Link Parameters for a Dedicated Channel" on page 60.

2. Click on the **FCS** tab (Figure 2-26 on page 63).
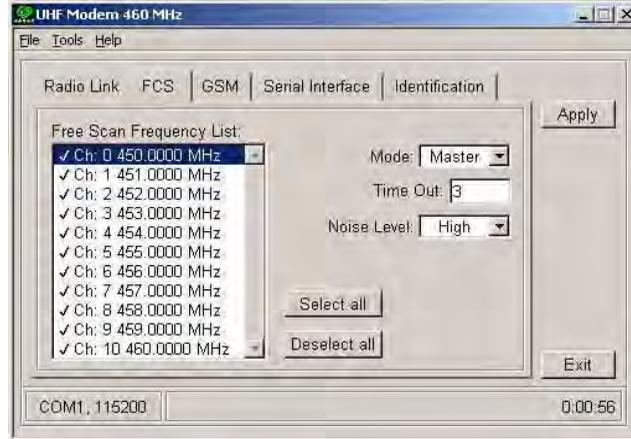
Figure 2-26. FCS Tab

3. From the **Mode** control, select **Master**.

4. In the **Free Scan Frequency List** control, you will see the frequencies that are used in the scan process. Double-click a frequency in the list to exclude/include this frequency from/to the scan process. You may also select/deselect all frequencies at one time with the **Select all** and **Deselect all** controls.

Notice: *For FCS to operate properly, you must select at least two frequencies.*

5. In the **Time Out** edit box, specify a period in seconds with which the base radio modem will send a service word to the rover radio modem.

Notice: *It is recommended to make Time out larger (by 2, 3 seconds) than the period of transmitting differential corrections.*

6. In the **Noise Level** field, specify a threshold value for the noise level.

7. Click the **Serial Interface** tab (see Figure 2-25 on page 62) and select a baud rate for the modem's serial port. The same rate must be used for both the receiver and the modem.

8. Click **Apply**, then click on **File** and select **Disconnect**. If you want to close the program, click **File->Exit**.

9. Start PCView and set up the receiver to run as an RTK Base Station. For how to set up an RTK Base using PCView, refer to "Setting up an RTK Base Station" on page 95 and *PCView Software Manual*.

Warning: **When finished configuring the radio modem, always discon-nect from Modem-JNS before exiting to prevent conflicts with serial port management.**

Configuring a Rover Station's JNS 2W UHF 450-470 radio transceiver

1. Repeat steps 4 from page 59.

There are two scenarios for configuring the radio modem:
- with a dedicated channel
- with the Free Channel Scan (FCS) mode

Set Radio Link Parameters for a Dedicated Channel

1. Repeat steps 1 - 3, described in "Set Radio Link Parameters for a Dedicated Channel" on page 60.

Notice: *The settings must be the same for base and rover.*

2. From the **RX** control, select the operating frequency that will be used by your rover radio modem to receive differential data. Must be the same for the base and rover.

3. Select **Scrambling** (see Figure 2-23 on page 60). Must be the same for base and rover.

4. For a maximum data communication reliability, select the **Forward Error Correction** check box.

5. Set the protocol mode from the **Protocol Mode** control, use the same protocol as at the base station.

6. From the **Output Power** control (see Figure 2-23 on page 60), set the level of RF transmit power to 10 mW.

7. Click the **Serial Interface** tab (Figure 2-25 on page 62) and select a baud rate for the modem's serial port. The same rate must be used for both the receiver and the modem.

8. Click **Apply**, then click on **File** and select **Disconnect**. If you want to close the program, click **File->Exit**.

9. Start PCView and set up the receiver to run as an RTK Rover Station. For how to set up an RTK Rover using PCView, refer to "Setting up an RTK Rover" on page 98 or *PCView Software Manual*.

Set Radio Link Parameters for Free Channel Scan

1. Repeat steps 9 "Set Radio Link Parameters for Free Channel Scan" on page 62.

Notice: *The settings must be the same for base and rover.*

2. Click on the **FCS** tab (Figure 2-27).
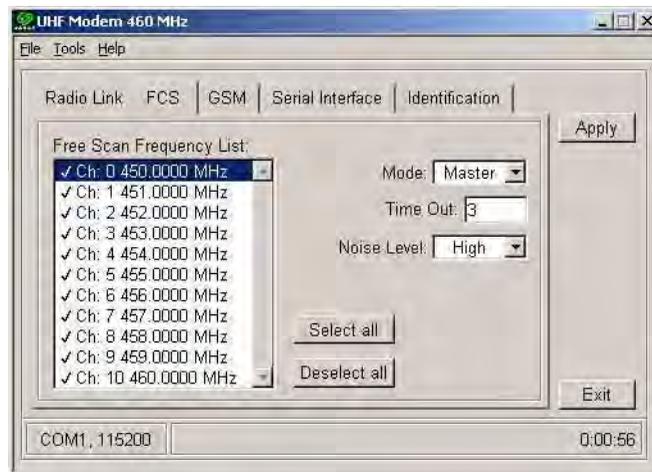
Figure 2-27. FCS Tab

3. From the **Mode** control, select **Slave**.

4. In the **Free Scan Frequency List** control, you will see the frequencies that are used in the scan process. Double-click a frequency in the list to exclude/include this frequency from/to the scan process. You may also select/deselect all frequencies at one time with the **Select all** and **Deselect all** controls.

Notice: *For FCS to operate properly, you must select at least two frequencies. Also the selected frequencies must be the same as at the base radio modem.*

5. In the **Time Out** edit box, specify a period in seconds within which the rover radio modem will listen to the incoming data on the current operating frequency. Should there be no any data detected during the specified amount of time, the rover will switch to the next frequency in the list and so forth until the frequency with data is found.

Notice: *It is recommended to make this parameter greater than the base radio modem's Time out by 2 to 3 seconds.*

6. Click the **Serial Interface** tab and select a baud rate for the modem's serial port. The same rate must be used for both the receiver and the modem.

7. Click **Apply**, then click on **File** and select **Disconnect**. If you want to close the program, click **File->Exit**.

8. Start PCView and set up the receiver to run as an RTK Base Station. For how to set up an RTK Base using PCView, refer to "Setting up an RTK Rover" on page 98 and *PCView Software Manual*.

Warning: **When finished configuring the radio modem, always disconnect from Modem-JNS before exiting to prevent conflicts with serial port management.**

Configuring a Base Station's internal GSM/GPRS integrated with 2W UHF transceiver with Modem-JNS

1. Repeat steps 4 described on page 59.

2. Click the **GSM** tab (Figure 2-28).

Figure 2-28. GSM Tab

3. In the **Mode** control, select **Slave**.

4. In the **PIN** field, enter a **Personal Identification Number** (PIN) if required.

5. For the base station, leave the **Dial** field blank.

6. In the **Send time** field, enter a period of time in seconds with which the base GSM modem will send a service word to the rover GSM modem.

This parameter is used to maintain reliable communication between the pair of modems and avoid unnecessary modem re initialization.

Notice: *To ensure reliable and secure modem communication, this parameter must be larger then the period of transmitting differential corrections. If both of your receivers are Maxor GGDT with internal GSM/GPRS integrated with 2W UHF transceivers, set Send time to zero.*

7. Click the **Serial Interface** tab and select a baud rate for the modem's serial port. The same rate must be used for both the receiver and the modem (Figure 2-25 on page 62).

8. Click **Apply**, then click on **File** and select **Disconnect**. If you want to close the program, click **File->Exit.**

9. Start PCView and set up the receiver to run as an RTK Base Station. For how to set up an RTK Base using PCView, see "Setting up an RTK Base Station" on page 95 and refer to *PCView Software Manual*.

Warning: **When finished configuring the GSM module, always disconnect from Modem-JNS before exiting to prevent conflicts with serial port management.**

Configuring a Rover Station's internal GSM/GPRS integrated with 2W UHF transceiver with Modem-JNS

1. Repeat steps 4 from page 59.

2. Click the **GSM** tab (Figure 2-29 on page 68).

3. In the **Mode** control, select **Master**.

4. In the **PIN** field, enter a SIM card's Personal Identification Number (PIN) if required.

5. In the **Dial** field, enter the phone number of the base GSM modem.

6. In the **Send** time field, enter a period of time in seconds with which the rover GSM modem will send a service word to the base GSM modem. This parameter is used to maintain reliable communication between the pair of modems and avoid unnecessary modem reinstallation.

Notice: *If both of your receivers are Maxor GGDT with internal GSM/GPRS integrated with 2W UHF transceivers, set Send time to zero.*

Figure 2-29. GSM Tab

7. Click the **Serial Interface** tab and select a baud rate for the modem's serial port. The same rate must be used for both the receiver and the modem (see Figure 2-25 on page 62).

8. Click **Apply**, then click on **File** and select **Disconnect**. If you want to close the program, click **File->Exit**.

9. Start PCView and set up the receiver to run as an RTK Rover Station. For how to set up an RTK Rover using PCView, see "Setting up an RTK Rover" on page 98 and refer to the *PCView Software Manual*.

Warning: **When finished configuring the GSM module, always disconnect from Modem-JNS before exiting to prevent conflicts with serial port management.**

Configuring a PDL™ UHF Radio Modem

1. Install the Modem-JNS Software, as described in "Configuring a Base Station's JNS 2W UHF 450-470 radio transceiver" on page 59.

2. Connect your receiver and computer. See "Connecting the Maxor GGDT and a Computer" on page 44 for this procedure, using an RS232 cable or Bluetooth® wireless technology.

3. Turn on the receiver.

4. Open Modem-JNS and select the COM port the receiver is connected to (Figure 2-30).

5. Click **Connect**.

Figure 2-30. Connection to Modem-JNS

6. Click the *Radio Link* tab and set the following parameters depending on the link rate selected (Table 2-4 and Figure 2-31):

Table 2-4. Parameters for Selected Link Rate

Controls	Link Rate	
	9600	**19200**
Channel Select: –Manual –Channel TX RX	enable set channel and frequency as desired	enable set channel and frequency as desired
Modulation Type	GMSK	4-Level-FSK
Digisquelch	High	High
Forward Error Correction	disable	enable
Scrambling	enable	enable
Local Address	0	0
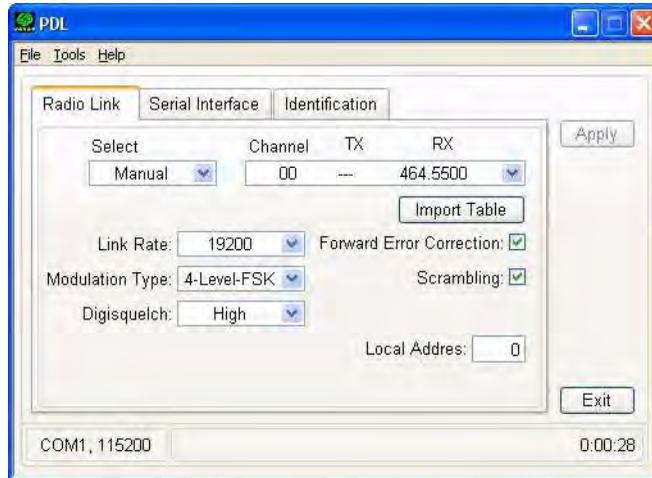
Figure 2-31. PDL Radio Link Tab

Notice: *The Base and internal Maxor GGDT (Rover) PDL radios must be configured with the same Channels, Radio Link characteristics (except Digisquelch) and Serial Interface parameters. Typically, Digisquelch is set on High for Rover and Off for Base station.*

7. Click the ***Serial Interface*** tab and select the following parameters (Figure 2-32 on page 71):

- Baud Rate - 38400
- Protocol Mode - Transparent w/EOT Timeout
- BREAK to Command - disable

Figure 2-32. PDL Serial Interface Tab

8. Click **Apply**, then click on **File** and select **Disconnect**. If you want to close the program, click **File->Exit**.

9. Start PCView and set up the receiver to run as an RTK Rover Station. For how to set up an RTK Rover using PCView, see "Setting up an RTK Rover" on page 98 and refer to the *PCView Software Manual*.

Warning: **When finished configuring the GSM module, always disconnect from Modem-JNS before exiting to prevent conflicts with serial port management.**

Configuring a Satel SATELLINE-3AS/TC Radio Data Modem/SATELLINE-3ASrm Radio Data Receiver

Configuring a Base Station's SATELLINE-3AS/TC Radio Data Modem

1. Install the Modem-JNS Software, as described in "Configuring a Base Station's JNS 2W UHF 450-470 radio transceiver" on page 59.

2. Connect your receiver and computer. See "Connecting the Maxor GGDT and a Computer" on page 44 for this procedure, using an RS232 cable or Bluetooth® wireless technology.

3. Turn on the receiver.

4. Open Modem-JNS and select the COM port the receiver is connected to (Figure 2-33).

5. Click **Connect**.

Figure 2-33. Connection to Modem-JNS

Notice: *The default settings for radio configuration should be sufficient for most job sites. Changing these settings can affect the operation of the radio modem and communication between receivers.*

There are two scenarios for configuring the radio modem:

- with a dedicated channel
- with the Free Channel Scan (FCS) mode

Set Radio Link Parameters for a Dedicated Channel

1. The *Radio Link* tab (Figure 2-34 on page 73) has settings for establishing a link between the Base Station and Rover.

Figure 2-34. Satel Radio Link Tab

Tune your Base station's SATELLINE-3AS/TC Radio Data Modem according the table below:

Table 2-5. Radio Link Tab Settings

Radio Link Settings	Optimal Scenario (~100m between receivers)	Maximum Distance Scenario (~3–4km between receivers)
Current Frequency	Base and Rover on same frequency.	Base and Rover on same frequency.
Output Power	10 mW	10 mW
Free Channel Scan	off	off

2. Click **Apply**, then click on **File** and select **Disconnect**. If you want to close the program, click **File->Exit**.

3. Start PCView and set up the receiver to run as an RTK Base Station. For how to set up an RTK Base using PCView, refer to "Setting up an RTK Base Station" on page 95 and *PCView Software Manual*.

Set Radio Link Parameters for Free Channel Scan

1. Repeat step 1 from "Set Radio Link Parameters for a Dedicated Channel" on page 73. Set the **Free Channel Scan** to On.

2. In the **FCS** tab (Figure 2-35) make the following settings:

3. From the **Type of Modem** control, select **TX Master**.

4. In the **Free Scan Frequency List** control, you will see the frequencies that are used in the scan process. You may also add/change frequencies **Add** and **Change** buttons. With **Delete** and **Delete All** buttons it is possible to delete the selected frequency or delete all frequencies from the F**ree Scan Frequency List.**

Notice: *For FCS to operate properly, you must select at least two frequencies.*

5. Set the **Channel Hop Threshold** power at -112.

6. Click **Apply**, then click on **File** and select **Disconnect**. If you want to close the program, click **File->Exit**.

7. Start PCView and set up the receiver to run as an RTK Base Station. For how to set up an RTK Base using PCView, refer to "Setting up an RTK Base Station" on page 95 and *PCView Software Manual*.

Figure 2-35. Satel FCS Tab

Warning: **When finished configuring the radio modem, always disconnect from Modem-JNS before exiting to prevent conflicts with serial port management.**

Configuring a Rover Station's SATELLINE-3AS/TC Radio Data Modem/SATELLINE-3ASrm Radio Data Receiver

Set Radio Link Parameters for a Dedicated Channel

1. Tune your rover's SATELLINE-3AS/TC Radio Data Modem/ SATELLINE-3ASrm Radio Data Receiver according the table below:

Table 2-6. Radio Link Tab Settings

Radio Link Settings	Optimal Scenario (~100m between receivers)	Maximum Distance Scenario (~3–4km between receivers)
Current Frequency	Base and Rover on same frequency.	Base and Rover on same frequency.
Free Channel Scan	off	off

2. Click **Apply**, then click on **File** and select **Disconnect**. If you want to close the program, click **File->Exit**.

3. Start PCView and set up the receiver to run as an RTK Rover Station. For how to set up an RTK Base using PCView, refer to "Setting up an RTK Rover" on page 98 and *PCView Software Manual*.

Set Radio Link Parameters for Free Channel Scan

1. Repeat step 1 from "Set Radio Link Parameters for a Dedicated Channel" on page 75. Set the **Free Channel Scan** to On.

2. In the **FCS** tab (Figure 2-35 on page 74) make the following settings:

3. From the **Type of Modem** control, select **RX Slave**.

4. In the **Free Scan Frequency List** control, you will see the frequencies that are used in the scan process. You may also add/change frequencies **Add** and **Change** buttons. With **Delete** and **Delete All** buttons it is possible to delete the selected frequency or delete all frequencies from the F**ree Scan Frequency List.**

Notice: *For FCS to operate properly, you must select at least two frequencies.*

1. Set the **Channel Hop Threshold** power at -112.
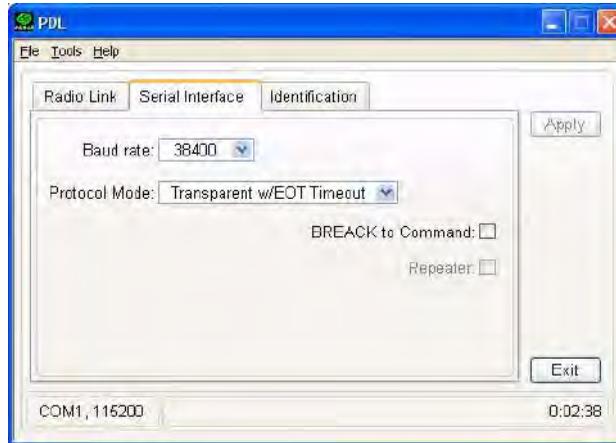
2. Click **Apply**, then click on **File** and select **Disconnect**. If you want to close the program, click **File->Exit**.

3. Start PCView and set up the receiver to run as an RTK Rover Station. For how to set up an RTK Rover using PCView, refer to "Setting up an RTK Rover" on page 98 or *PCView Software Manual*.

Warning: **When finished configuring the radio modem, always disconnect from Modem-JNS before exiting to prevent conflicts with serial port management.**

Configuring a single GSM/GPRS Modem

Notice: *To comply with RF exposure requirements, maintain at least 20 cm between the user and the single GSM/GPRS modem.*

To access your single GSM/GPRS modem, you will need to use PCView or FieldView software.

FieldView users can configure the single GSM/GPRS modem through the program's GUI whereas PCView users will have to execute all necessary GRIL commands in manual mode.

Configure a single GSM/GPRS Modem with PCView

1. Connect the computer and receiver using an RS232 cable or Bluetooth® wireless technology. See "Connecting the Maxor GGDT and a Computer" on page 44.

2. Start PCView on your computer. Once a connection between the receiver and computer has been established, change PCView to **Manual Mode** (Figure 2-36).
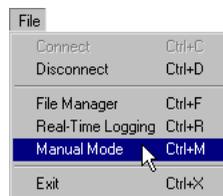
Figure 2-36. PCView: File->Manual Mode

3. Execute the following receiver commands from the **Manual Mode** window:

   • Set the internal GSM/GPRS modem to OFF:

```
%% set,/par/modem/c/mode,off
```

   • Enter the SIM card's PIN:

```
%% set,/par/modem/c/pin,<wxyz>
```

where <wxyz> stands for a specific four-digit PIN, e.g.,

```
%% set,/par/modem/c/pin,6492
```

- Enter the dial number, i.e. the phone number of the slave modem to be dialed in to:

```
%% set,/par/modem/c/dial,<slave_mod_num>
```

where <slave_mod_num> stands for a specific phone number, e.g.

```
%% set,/par/modem/c/dial,89028354554
```

Notice: *Mandatory only when running the single GSM/GPRS modem in master mode.*

- Enter the "wait on data from modem" timeout:

```
%% set,/par/modem/c/rcvtimeout,5
```

- Enter the service word repeat period:

```
%% set,/par/modem/c/sndtime,2
```

- Set the required modem mode:

```
%% set,/par/modem/c/mode,master
```

– for the receiver configured as a rover,

```
%% set,/par/modem/c/mode,slave
```

– for the receiver configured as a base.

The manual mode screen will show RE002%% in response to each of these commands. When finished, you should have seven responses in the manual mode window's reply panel.

4. Now, the receiver is completely ready for field operation. Just switch the receiver on when in filed. The receiver will automatically start working with the GSM modem.

Configure a single GSM/GPRS modem with FieldView

Refer to the *FieldView User's Manual* from http://www.javad.com for how to accomplish this task.

Bluetooth® Module Configuration

Use BTCONF, the Bluetooth® module's configuration software, and your computer to:

- access the Bluetooth® wireless technology module
- configure the Bluetooth® module
- check or change the module's configuration

To access the Bluetooth® wireless technology module, first download and install BTCONF, then connect your computer and the receiver and run the configuration program.

1. Create or locate the following folder:
   C:\Program Files\JNS\BTCONF

2. Download btconf.zip from the JNS website (http://www.javad.com) and unzip it into the BTCONF folder. This file contains Btconf.exe, the executable file for the Bluetooth® module configuration program.

To uninstall, or remove, BTCONF, delete any applicable BTCONF directories or folders, and any BTCONF shortcuts.

Once you have BTCONF available, follow these steps to configure the Bluetooth® module.

1. Using the RS232 cable, connect the serial port of your computer to the receiver's serial port A. See "Establishing an RS232 Cable Connection" on page 45.

2. Turn on the receiver and computer.

3. Run the Bluetooth® module configuration program (Btconf.exe) (Figure 2-37).
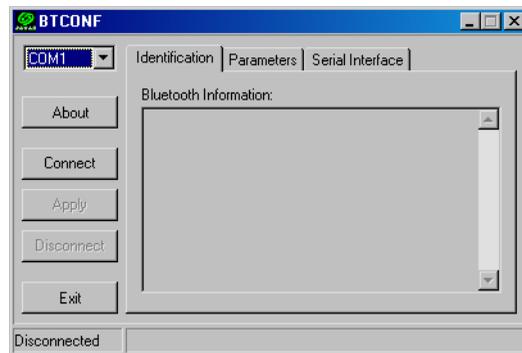
Figure 2-37. Bluetooth® Module Configuration Main Screen

Note that the lower left corner shows a "Disconnected" status for the computer and Bluetooth® module.

4. From the drop-down list in the upper left corner, select the computer serial port used for communication (Figure 2-38).
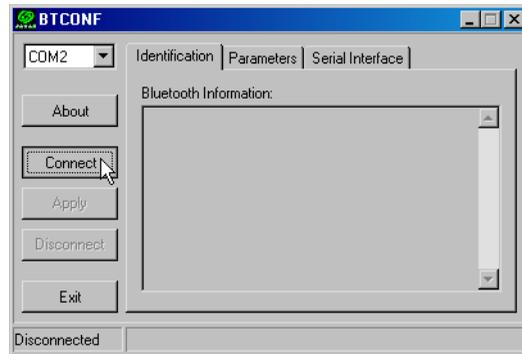
Figure 2-38. Select Communication Port and Click Connect

5. Click **Connect** to connect the computer and Bluetooth® module.

5. Once the receiver and computer connect through BTCONF, the **Identification** tab (Figure 2-39 on page 79) displays the following information:

   • Bluetooth® name – the name of the Bluetooth® module, set in the Parameters tab.

   • Bluetooth® address – the unique electronic address for your Bluetooth® module.

   • Firmware base.

   • Firmware version – the current firmware version of the Bluetooth® module.

Figure 2-39. BTCONF Identification Tab

The COM port and baud rate are displayed in the lower left corner.

6. Click the **Parameters** tab (Figure 2-40). The **Parameters** tab sets identifying and security information for your Bluetooth® module. The security sec-

tion allows you to set data security and unauthorized access parameters for the Bluetooth® module.
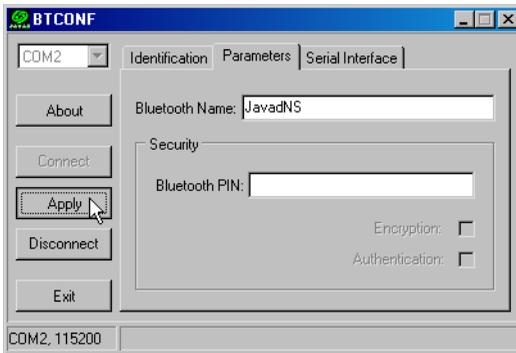
Figure 2-40. BTCONF Parameters Tab

7. Enter up to 14 characters to set a unique name for the Bluetooth® module (Figure 2-40), and click **Apply**

8. To set security parameters (Figure 2-40 on page 80), enter and enable the following, then click **Apply**:

   • Bluetooth® PIN – enter up to 16 characters to specify a personal identification number for the Bluetooth® module.

   • Encryption – enable to have the Bluetooth® module encrypt wirelessly sent data. To read encrypted data, the user must have the same PIN used in the device that sent the data.

   • Authentication – enable to require a PIN before two Bluetooth® enabled devices (such as, the receiver and a computer) can establish a communication link. The two devices must use the same PIN.

Notice   If you do not need security settings, leave these parameters disabled.
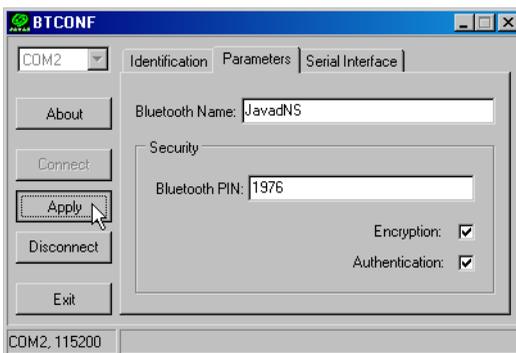
Figure 2-41. BTCONF Security Parameters

9. Click the **Serial Interface** tab (Figure 2-42). Enable **Echo** to display Blue-tooth® module replies and corresponding commands on the computer termi-nal. If needed, click **Apply**.
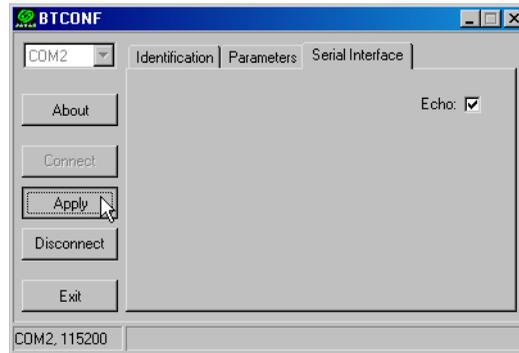
Figure 2-42. BTCONF Serial Interface Tab

10. Click **Disconnect** then **Exit** to quit BTCONF.

For detailed description of BTCONF software please, refer to "*BTCONF User's Manual*", available from http://www.javad.com.

Collecting Almanacs

Each satellite broadcasts a message (almanac) which gives the approximate orbit for itself and all other satellites. If the receiver has an almanac, you can considerably reduce the time needed to search for and lock on to satellite sig-nals.

The receiver regularly updates the almanac and stores the most recent almanac in its Non-Volatile Random Access Memory (NVRAM).

1. Set up the receiver (connect the external antenna if needed) in a location with a clear view of the sky.

2. Turn on the receiver. Wait for about 15 minutes while the receiver collects almanac data from satellites.

Notice: *If 15 minutes have passed and the receiver does not lock on to satel-lites, you may need to clear the NVRAM. See "Clearing the NVRAM" on page 118 for this procedure.*

You will need to collect or update the almanac:

• If the receiver has been off for a long time.

- If the last known receiver position, stored in the NVRAM, is different from the present position by a few hundred kilometers at least.
- After loading a new OAF.
- After loading new firmware.
- After clearing the NVRAM.
- Before measuring.

The collection and/or update of an almanac can take as long as 15 minutes.

SETUP AND MEASURING

3

Chapter Tip: To set up your Maxor GGDT receiver, you need:

1. Configure the receiver as described in Chapter 2.

2. Set up your Base or Rover station. See "Step 1" on page 83.

3. Measure the antenna height. See "Step 2" on page 84 for internal antennas, or see "External Antenna Setup" on page 86 for external antennas.

4. Begin collecting data. See "Step 3" on page 86.

All Maxor GGDT receivers include an internal, micro-strip antenna. This antenna is able to capture L1/L2 signals from GPS and GLONASS satellites. Also, your Maxor GGDT can be used with an optional external antenna.

Maxor GGDT Receiver Setup

Follow steps 1 through 3 to setup your receiver.

Step 1   Set up Receiver

This section assumes you have already configured your receiver using PCView.

1. Place the Maxor GGDT on the appropriate tripod or bipod.

2. Center the receiver over the point at which data will be collected. For most applications, this should be at a location with a clear view of the sky.

Step 2   Measure Antenna Height

The location of the antenna relative to the point being measured is very important for both surveys in which the elevation of the points is important and in surveys for horizontal location only. Horizontal surveys are often larger in area than can reliably fit on a flat plane, therefore the antenna adjustment must be done in three dimensions and then projected onto a two dimensional plane.

The receiver calculates the coordinates of the antenna's phase center. To determine the coordinates of the station marker, the user must specify the following:

- Measured height of the antenna above the station marker
- Method of measuring the antenna height
- Model of the antenna used

Antennas have two types of measurements:

- **Vertical** – measured from the marker to the antenna reference point (ARP) located on the bottom of the receiver at the base of the mounting threads.
- **Slant** – measured from the marker to the lower edge of the antenna slant height measure mark (SHMM) located on both end panels of the receiver.

1. Measure the antenna height above the point or marker (see "External Antenna Setup" on page 86 for external antenna measurements and setup).

   Figure 3-1 illustrates the antenna offsets. (See Figure 1-3 on page 33 and Figure 1-4 on page 34 for the exact SHMM location.)
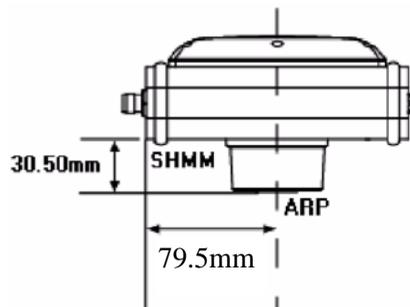
Figure 3-1. Maxor GGDT Antenna Offsets

- SHMM to ARP vertical offset = 30.5 mm

- SHMM to ARP horizontal offset = 79.5 mm

Table below gives the offset values for the receivers.

Table 3-1. Antenna Offset Values

	To L1 Phase Center	To L2 Phase Center
North	-1.7 mm	-1.2 mm
East	-0.8 mm	-0.8 mm
Up	106.0 mm	101.2 mm

The actual point to which measuring with GPS/GLONASS measures is called the Phase Center of the antenna. This is analogous to the point at which a distance meter measures in a prism. A user must enter the prism offset to compensate for this point not being at a physical surface of the prism. In the case of a GPS/GLONASS antenna, the offset is entered depending on the type of measurement taken. For vertical, the offset is simply added to the measured vertical height to produce a "true" vertical height. For slant height, the vertical height must first be calculated using the radius of the antenna, then the offset can be added. The offsets are not the same number because of the difference in location between the slant measuring point and the vertical measuring point.

2. Record the antenna height, point name, and start time in the field notes.

3. Press the power key and release it to turn the receiver on. The STAT

4. status) light (LED) will blink red at first.

5. Once the receiver has locked on to one or more satellites, the STAT light will blink green for GPS satellites, orange for GLONASS satellites, and a short red blink indicating it has not solved a position. Four or more satellites provide optimal positioning.

6. Once the short red blink is gone, the receiver has a position and measuring can begin. You should wait for green and orange lights before beginning data collection. This ensures that the receiver has the correct date and time, and is locked on to enough satellites to ensure good quality data.

   The process of locking on to satellites normally takes less than one minute. In a new area, under heavy tree canopy, or after resetting the receiver, it may take several minutes.

Step 3   Collect Data

1. To begin collecting data, press and hold the **FN** (function) key for more than one second and less than five seconds.

2. Release the **FN** key when the REC (recording) LED light turns green. This indicates that a file has opened and data collection has started. The REC LED blinks each time data is saved to the internal memory.

Tip: You can use PCView to configure data logging. See "MinPad Configuration" on page 52 or refer to the PCView Software Manual for more information.

3. When finished, press and hold the **FN** key until the REC LED light goes out.

4. Press and hold the **power** key until all lights go out, then release.

External Antenna Setup

The Maxor GGDT can also be used with an external antenna. Follow the steps below to connect an external antenna to the Maxor GGDT and measure its offset.

1. Attach the antenna to a tripod or bipod and center it over the point at which data will be collected.

2. Measure the antenna height. Antennas have two types of measurements:

   • Vertical - measured from the marker to the antenna reference point (ARP) located on the bottom of the antenna at the base of the mounting threads.

   • Slant - measured from the marker to the lower edge of the antenna's slant height measure mark (SHMM).

MarAnt+ antenna offsets are shown in Figure 3-2 on page 87;

Offset measurements for this antenna is given in table below.
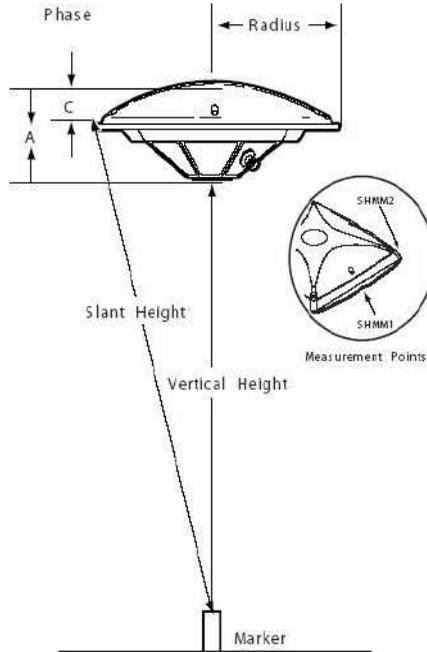
Figure 3-2. MarAnt+ Antenna Offset Measurements

Table 3-2. Antenna Offset Measurements

Antenna	Radius		A, Vertical Offset	C, Slant Offset
MarAnt+	SHMM1 69 mm 0.226 ft	SHMM2 89.7 mm 0.294 ft	54.3 mm (L1) 60.5 mm (L2)	26.8 mm (L1) 33.0 mm (L2)

3. Record the antenna height, point name, and start time in the field notes.

4. Attach the flexible RF cable from the external antenna to the antenna connector on the bottom panel of the Maxor GGDT.

5. Turn on the Maxor GGDT and continue with step 3 on page 85.

The Maxor GGDT antenna default is set to Auto, allowing the receiver to detect automatically the available antenna (whether internal or external). If you have changed this setting, or the receiver does not detect the external antenna, use the procedure below to set the External Antenna detection option.

1. Connect your receiver and computer. See "Connecting the Maxor GGDT and a Computer" on page 44 for this procedure.

2. Start PCView.

3. Click on **Configuration->Receiver** (Figure 3-3).

Figure 3-3. Configuration->Receiver

4. On the **General** tab, select the **External** Antenna option (Figure 3-4).
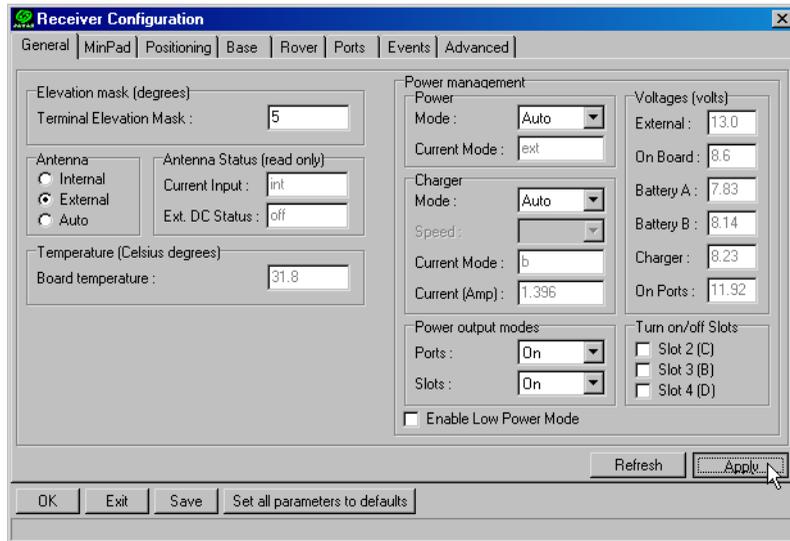
Figure 3-4. Select External Antenna Option

5. Click **Apply**, then **Refresh** to update the displayed tab with the new setting.

6. Click **Exit** to quit **Receiver Configuration** window.

7. Click **File->Disconnect**, then **File->Exit**.

Measuring with the Maxor GGDT

The Maxor GGDT receiver can be used to perform the following types of measuring:

• Static

• Kinematic

• Real-time kinematic (RTK)

Static Measuring

Static measuring is the classic measuring method, well suited for all kinds of baselines (short, medium, long). At least two receiver antennas, plumbed over the measuring 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 the same 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 user's experience as well as the following factors:

• The length of the baseline measured

• The number of satellites in view

• The satellite geometry (DOP)

• The antenna's location

• The ionospheric activity level

• The types of receivers used

• The accuracy requirements

• The necessity of resolving carrier phase ambiguities

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

Dual-frequency receivers have two major benefits. First, dual-frequency receivers can estimate and remove almost all ionospheric effect from the code and carrier phase measurements, providing much greater accuracy than single-frequency receivers over long baselines or during ionospheric storms. Secondly, dual frequency receivers need far less observation time to reach the desired accuracy requirement.

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

The procedure that follows describes the steps the operator should take to perform a Static Measuring using MinPad.

1. Connect your receiver and computer. See "Connecting the Maxor GGDT and a Computer" on page 44 for this procedure.

2. Open PCView, click **Configuration->Receiver->MinPad** and specify the following parameters, then click **Apply** (Figure 3-5):

   • **Recording Interval** – 15 seconds
   • **Elevation Mask Angle** – 15 degrees
   • **File Name Prefix** – last 3 digits of receiver serial number
   • **LED blink mode switch** – enable to start and stop static data recording using the FN key
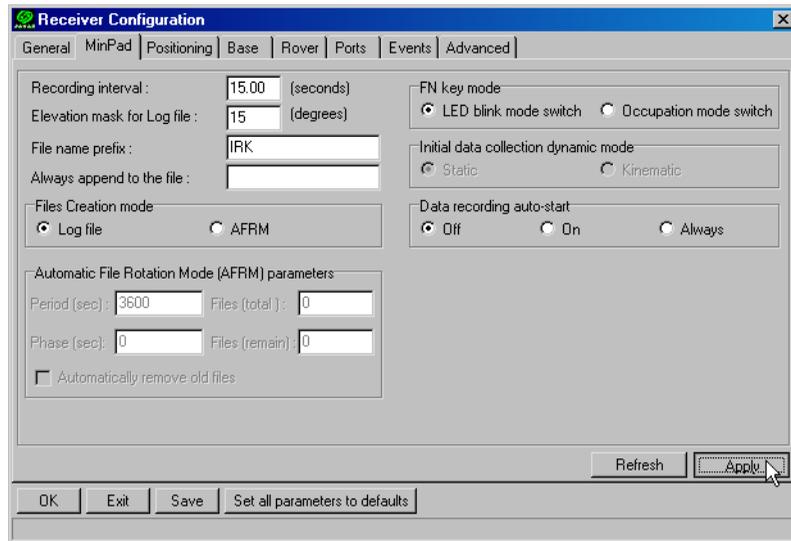
Figure 3-5. Configuration->Receiver->MinPad

3. Click the **Advanced** tab and then the **Multipath** tab, set the following parameters, then click **Apply** (Figure 3-6 on page 91):

   • **Code Multipath Reduction** – enable
   • **Carrier Multipath Reduction** – enable
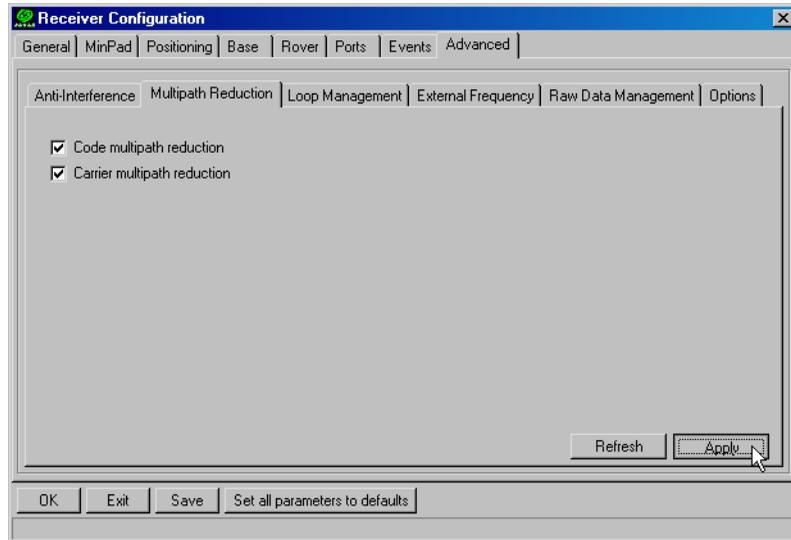
Figure 3-6. Advanced->Multipath

4. Click the **Loop Management** tab and set the following parameters, then click **Apply** (Figure 3-7 on page 91):

-   **Enable Common Tracking** – enable
-   **Static mode** – enable (disable for Rover receivers)
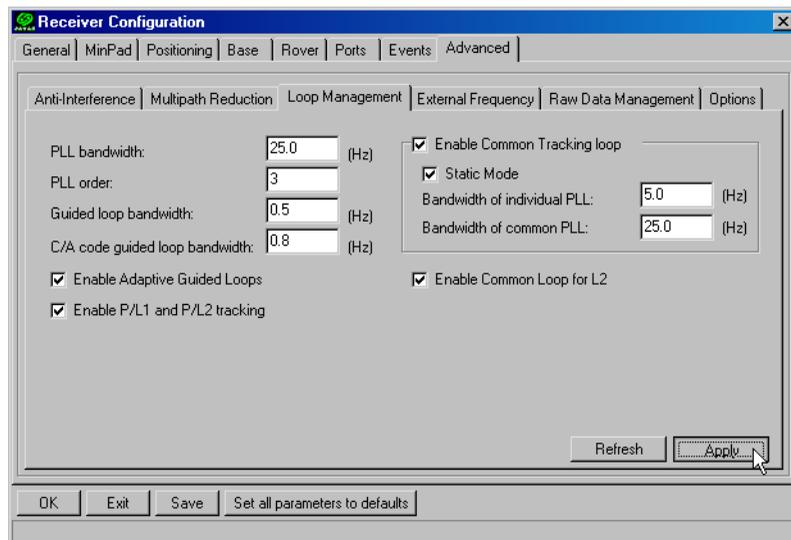
Figure 3-7. Advanced->Loop Management

5. Set up each antenna and receiver as described in "Maxor GGDT Receiver Setup" on page 83.

6. Begin your measuring.

Kinematic Measuring

You can use the kinematic measuring method in two ways:

*   Stop and go measuring
*   Kinematic continuous (trajectory) measuring

Stop and Go Measuring

The stationary receiver (Base station) is set up at a known point such as a measuring monument. The receiver continually tracks the satellites and logs the 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.

1. Using PCView, configure and set up the Base as described in "Static Measuring" on page 89.

2. Using PCView, click **Configuration->Receiver->MinPad**, and configure the Rover with the following parameters, then click **Apply** (Figure 3-8):

*   FN Key Mode, Occupation Mode Switch – enable
*   Initial data collection dynamic mode, Static – enable

See Table 4-1 on page 106 for FN key functions and REC LED statuses.
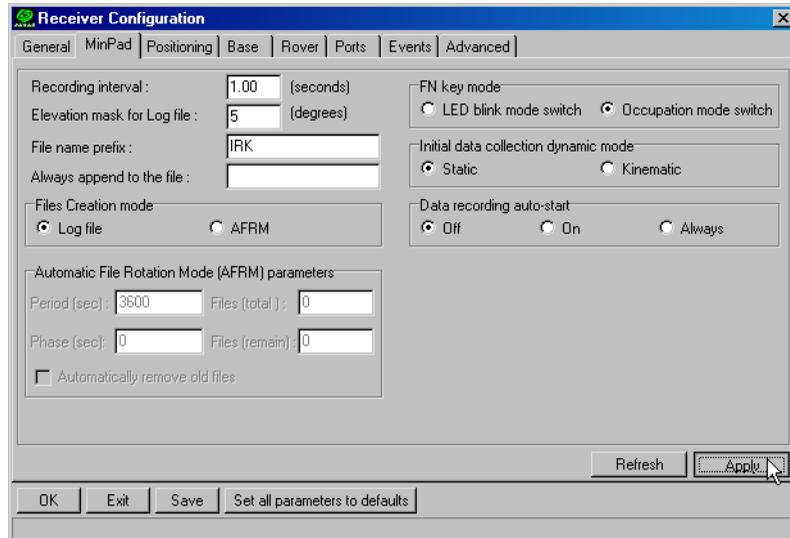
Figure 3-8. Rover MinPad Configuration

Notice: *Remember, both Base and Rover receivers must collect data from common satellites at a common data recording rate and with identical elevation mask angles.*

3. Set up the Rover at an unknown point and press **power**. Allow the Rover to collect static data for two to ten minutes. The REC LED will be orange.

4. Check the STAT light for satellites tracked.

5. When finished, press the **FN** key for less than a second to assign the Rover to kinematic.

Notice: *Remember, if the REC LED blinks green, the current mode is dynamic, if it blinks orange, the current mode is static.*

6. Move the Rover to the next location (measuring point), and press the **FN** key for less than a second to collect the data in static mode for two to ten minutes.

7. Repeat steps five and six until all points have been measured. The occupation time for the points depends on the same factors as for the static measuring method.

8. When finished, press the **FN** key for one to five seconds to stop logging data. Turn off the Rover if needed.

This method of GPS measuring allows the user to reduce the point occupation time, thus permitting field crews to measure many more points compared to the other methods available.

Kinematic Continuous

Kinematic continuous measuring, also known as trajectory measuring, allows the Rover to move without having to stand still, record data, move to another point, and repeat the procedure.

If the user knows the coordinates of the starting point, the rover will not need to be initialized. The determination of ambiguity parameters is carried out while the rover is moving and is called "on the fly ambiguity resolution". Furthermore, if loss of lock occurs (such as, an obstruction that prevents a clear view of the sky), the receiver will be re-initialized on the fly.

After the measuring completes, raw data collected by the receivers are downloaded onto a computer and processed using post-processing software (for example, Ensemble).

1. Using PCView, configure and set up the Base as described in "Static Measuring" on page 89.

2. Using PCView, click **Configuration->Receiver->MinPad**, and configure the Rover with the following parameters, then click **Apply** (Figure 3-8 on page 93):

   • FN Key Mode, Occupation Mode Switch – enable
   • Initial data collection dynamic mode, Kinematic – enable

3. Set up the Rover at a starting point with unknown coordinates and press the **power** key. Pause for several minutes while the receiver compiles an almanac.

4. Check the STAT light for satellites tracked.

5. Press the **FN** key for one to four seconds to begin logging data in kinematic mode (the antenna status is kinematic).

6. Move the Rover receiver along the selected trajectory.

7. Once the Rover receiver reaches the end point of the trajectory, pause for several minutes.

8. When finished, press the **FN** key to stop logging data and turn off the Rover.

Real-time Kinematic Measuring

Real-time kinematic (RTK) is a differential GPS process where information, such as differential corrections, is transmitted in real-time from a Base station to one or more Rover stations.

Setting up an RTK Base Station

To configure an RTK Base station using PCView, take the following steps:

1. Set up the Base station receiver's antenna as described in "Maxor GGDT Receiver Setup" on page 83.

2. Connect an external modem to port D for the Maxor GGDT receiver.

3. Press the **power** key on the receiver.

4. Check the STAT light for tracked satellites.

5. Connect your receiver and computer. See "Connecting the Maxor GGDT and a Computer" on page 44 for this procedure.

6. Click **Configuration->Receiver**.

7. Click the **Set all parameters to defaults** button located at the bottom of the Receiver Configuration screen (Figure 3-9).
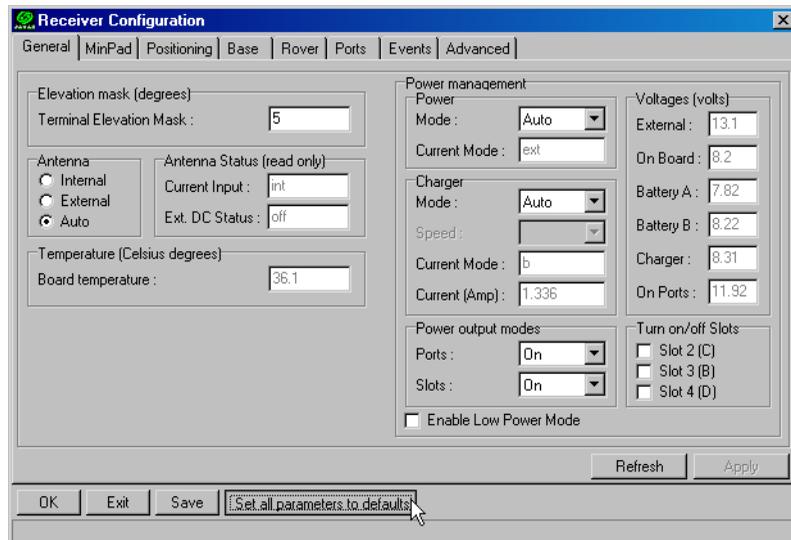
Figure 3-9. Set All Parameters to Defaults

8. On the **Receiver Configuration** screen, select the **MinPad** tab. Specify desired settings. Refer to the *PCView Software Manual* for more information.

9. Select the **Positioning** tab and set the Position Masks, Elevation mask parameter to 15 (Figure 3-10).
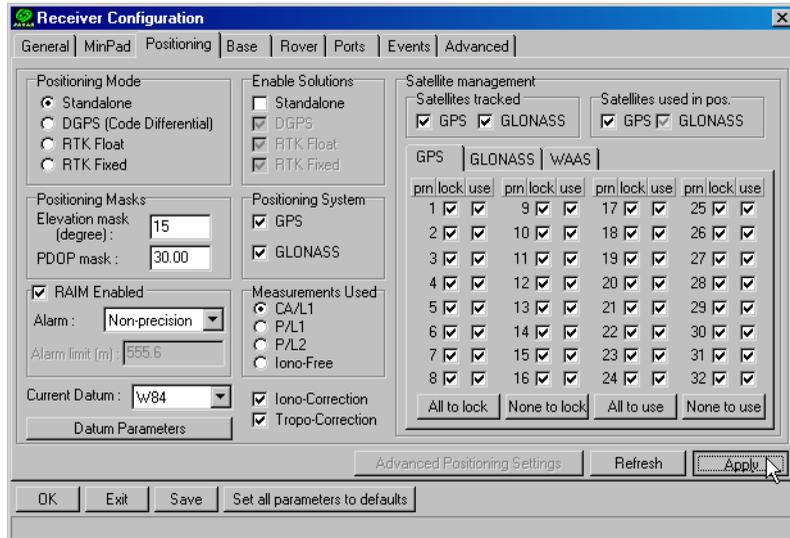
Figure 3-10. Receiver Configuration – Positioning

10. Select the **Base** tab and set the following parameters (Figure 3-11 on page 97):

- GPS/GLO at one time - enable

- Antenna position - enter Lat, Lon, and Alt values. Do one of the following:

  –If known, type in the values.

  –Click **Get from receiver**.

  –Enable Averaged and enter the Averaged Span in seconds, then click **Apply**. Click **Tools->Reset receiver** and wait until the specified interval (span) completes. Examine the Base coordinates on the Base tab, they should correspond to the coordinates obtained from the average. Click **Refresh** if the coordinates are zeros.

Notice: The reference geodetic coordinates you specify on this tab relate to the antenna L1 phase center.
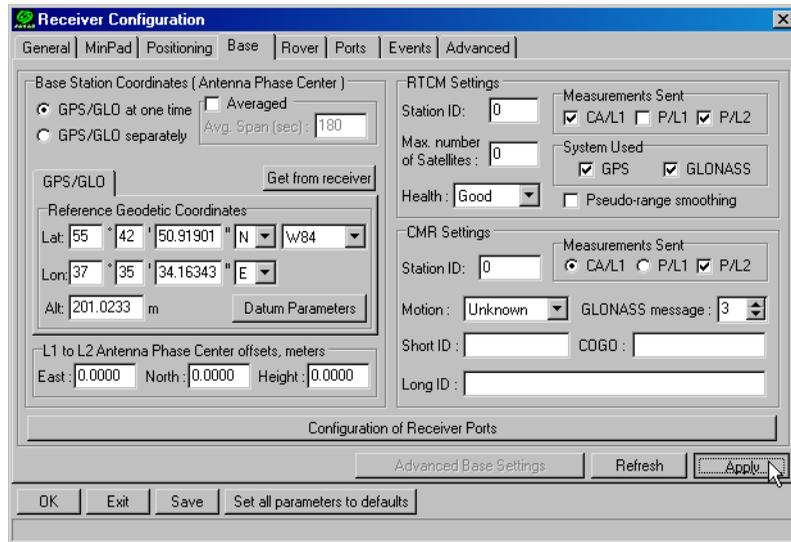
Figure 3-11. Base Tab Configuration

11. Select the **Ports** tab and set the following port parameters (Figure 3-12 on page 98). Use serial port C for an internal modem.

   • **Output** drop-down list – select type and format of differential corrections.

   • **Period** (sec) – enter interval at which receiver will generate differential corrections.

   • **Baud rate** drop-down list – select a baud rate (i.e., the rate at which differential messages will be transmitted from receiver to modem).
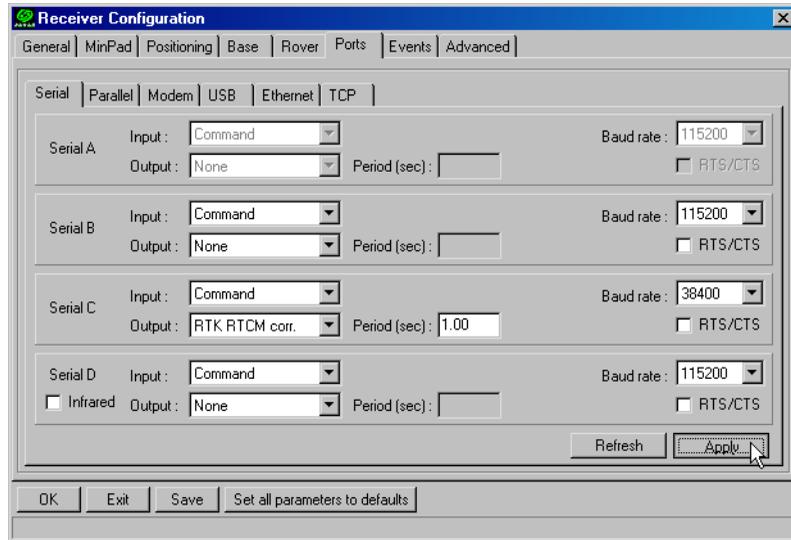
Figure 3-12. Base Configuration – Ports

12. Click **Apply**. The receiver begins sending data to the selected port.

If using an external modem, follow these steps to configure this modem:

Notice: *Connect the radio antenna before switching the modem to the transmitting mode.*

13. When finished with the previous steps, press the power button on the external modem.

14. Select the radio transmission power using the Low/High toggle on the rear panel of the modem. When in High, the AMP PWR LED will be on.

15. Use the **Channel** button to set the frequency channel. Check that the modem transmits the corrections (the TX LED will blink red each time data transmits).

For more details on the settings available for configuring the Base station, refer to the *PCView Software Manual*.

Setting up an RTK Rover

Use the following steps to set up an RTK Rover station. You should already have programmed the modem.

1. Set up the Rover station receiver's antenna as described in "Maxor GGDT Receiver Setup" on page 83.

2. Connect your receiver and computer. See "Connecting the Maxor GGDT and a Computer" on page 44 for this procedure.

3. Click **Configuration->Receiver**.

4. Select the **Positioning** tab and set the Position Masks, Elevation mask (degrees) parameter to 15 (Figure 3-10 on page 96).

5. Select the **Rover** tab and set the desired Positioning Mode (Figure 3-13).
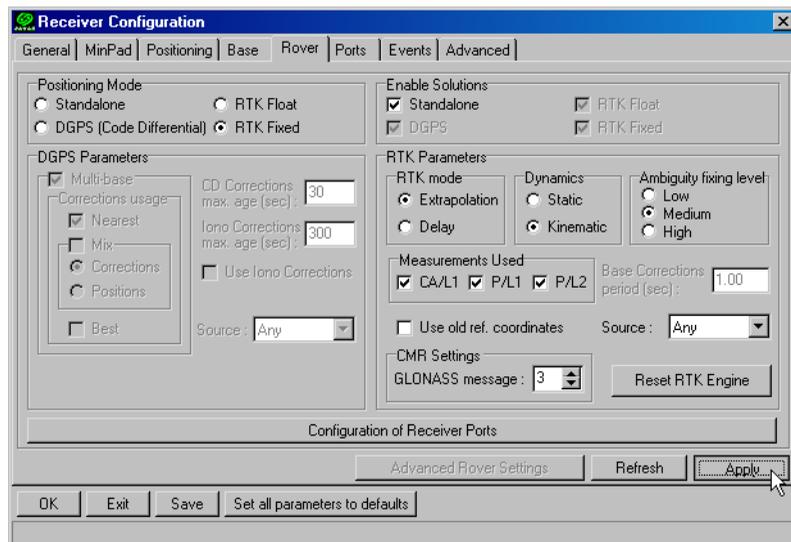
Figure 3-13. Rover Tab Configuration

Adjust the following RTK Parameters settings:

• Under RTK mode in the RTK Parameters section, choose either Extrapolation for RTK (kinematic) or Delay for RTK (static).

–Extrapolation is for low-latency, high frequency output (>= 5 Hz) RTK applications. The rover will extrapolate the base station's carrier phase measurement corrections when computing the rover's current RTK position.

–Delay is for 1 Hz high precision RTK applications. The Rover 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).

- Select the antenna status during RTK, either Static or Kinematic.
- Specify the Ambiguity fixing level (not applicable to RTK Float). The **Ambiguity Fixing Level** radio buttons govern the process of the RTK engine, fixing integer ambiguities. The RTK engine uses the ambiguity fix indicator when making decisions whether or not to fix ambiguities. 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.

6. Select the **Ports** tab and set the following parameters for Serial C (Figure 3-14):

- **Input** drop-down list – select desired differential correction format.
- **Period** (sec) – leave as is.
- **Baud rate** drop-down list – select a baud rate (i.e., the receiver port baud rate at which differential messages will be received from modem).
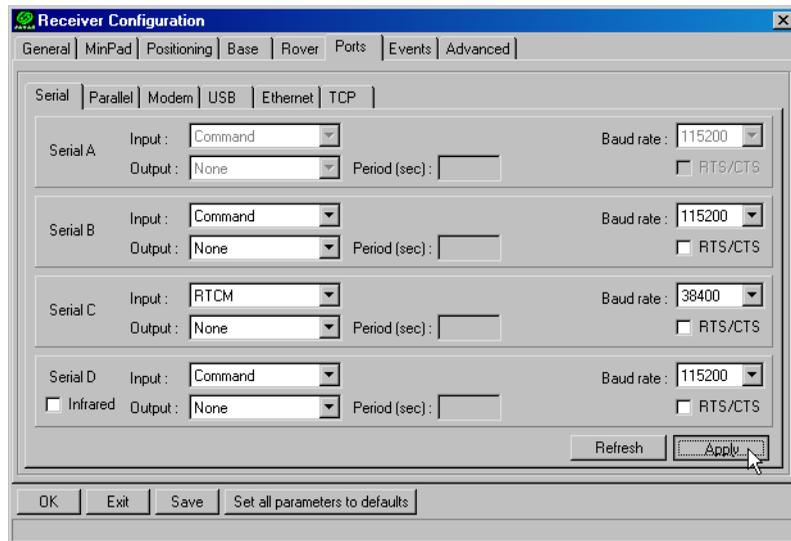
Figure 3-14. Rover Configuration – Ports

7. Click **Apply**.
8. Click **OK** to close the **Receiver Configuration** screen.
9. On the main screen, check the LQ field to ensure the receiver obtains differential corrections. Usually, the receiver will start to output the coordinates of the antenna's phase center along with the solution type within 10-30 seconds.

The geodetic coordinates displayed on the **Geo** tab are always computed in WGS84 and have four solution types.

• **Standalone** – where receiver computes 3D coordinates in autonomous mode without using differential corrections.

• **Code differential** – where the Rover receiver computes the current relative coordinate in differential mode using only pseudo ranges.

• **RTK float** – where the Rover receiver computes the current relative coordinates in differential mode using both pseudo ranges and phases; however, with a float solution, the phase ambiguity is not a fixed integer number and the "float" estimate is used instead.

• **RTK fixed** – where the Rover receiver computes current relative coordinates, with ambiguity fixing, in differential mode.

The LQ field reflects the status of the received differential messages and contains the following information:

• Data link quality in percentage

• Time (in seconds) elapsed since the last received message

• Total number of received correct messages

• Total number of received corrupt messages

• If the receiver is not (for some reason) receiving differential corrections, or if none of the ports has been configured to receive differential corrections, the LQ field will either be empty or it will look like this: 100%(999,0000,0000).

Notes:

OPERATION

4

Using MinPad

The MinPad is a user simple interface used to display and control data input and output (Figure 4-1).
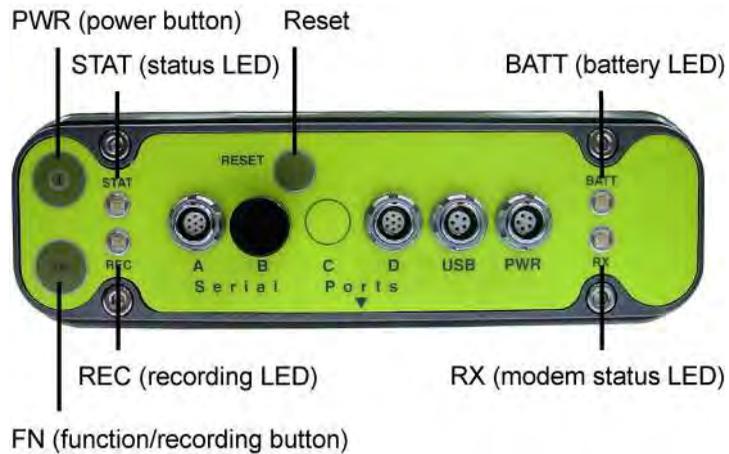
Figure 4-1. Maxor GGDT MinPad

Power Key

Pressing the **power** key turns the receiver on and off.

Status LED

- When the receiver is on and no satellites are tracked, the STAT LED will blink red.
- When satellites are tracked, the STAT LED will produce one blink for each tracked satellite (green for GPS, orange for GLONASS).

Reset Key

Pressing the reset key for about one second causes:

- a hard reset of the receiver.
- the receiver to leave Zero Power Mode and return to Normal Mode.

Notice: *Only use this procedure if the receiver does not respond to commands or does not charge the internal batteries (is in Zero Power Mode).*

FN Key and Record LED

Table 4-1 on page 106 summarizes FN key functions and REC LED statuses. See "FN Key Mode parameter" on page 56 for information on setting FN key modes.

- Pressing the **FN** key for less than one second switches the receiver between different information modes (normal and extended information), or between static and dynamic post-processing modes, depending on the receiver's configuration.

  During the first second of pressing the **FN** key, the REC LED is orange.

- Pressing the **FN** key for more than one and less than five seconds will start/stop data recording.

  During data recording the REC LED is green or orange.

  If the REC LED is red, the receiver has run out of memory, has a hardware problem, or contains an improper OAF (see "Option Authorization File (OAF)" on page 35 for more information on OAFs).

- The REC LED blinks green or orange each time data is written to the internal receiver's memory.

  You set the data recording time interval using PCView. See "Recording Interval parameter" on page 54 for information on setting this function.

  Each time you turn off or on data recording, either a new file opens or data appends to a particular file. See "Always Append to the File parameter" on page 55 and "Files Creation Mode parameter" on page 55 for information on setting this function.

- Pressing the **FN** key for more than five and less than eight seconds will turn the baud rate of serial port A to 9600. After about five seconds of pressing the **FN** key, the REC LED becomes red. Release the **FN** key while the REC LED is red (during the next three seconds).

  Pressing the **FN** key for more than eight seconds has no impact.

- After loading new firmware or clearing the receiver's NVRAM, the receiver checks its internal file system.

- During this operation, the REC LED flashes orange, and the file system is not accessible for CDU (control display unit) applications or for data recording. This operation may require from fractions of a second to several minutes, depending on the circumstances and the amount of internal memory.

Table 4-1. FN key functions and REC LED statuses

FN Key	REC LED	Status
When data recording is OFF, and the FN key is...		
Not pressed	No light	No data recording.
	Orange blink	Internal file system test in progress.
	Red	No free memory; hardware problem with data recording.
Pressed for < 1 second	If FN key mode is «LED blink mode switch»	
	Orange	Release to charge information mode.
	If FN key mode is «Occupation mode switch»	
	Orange	No function.
Pressed for 1–5 seconds	If FN key mode is «LED blink mode switch»	
	Green	Release to start data recording (post-processing occupation mode undefined).
	If FN key mode is «Occupation mode switch»	
	Green	Release to start recording (Kinematic or Static post-processing occupation mode).
Pressed for 5–8 seconds	Red	Release to turn serial port A baud rate to 9600 bps.
Pressed for > 8 seconds	No light	No function.

Table 4-1. FN key functions and REC LED statuses

FN Key	REC LED	Status
When data recording is ON, and the FN key is...		
Not pressed	Red	No free memory; hardware problem with data recording.
	If FN key mode is «LED blink mode switch»	
	Green	Data recording started (post-processing occupation mode undefined).
	If FN key mode is «Occupation mode switch»	
	Green	Data recording started (Kinematic post-processing occupation mode).
	Orange	Data recording started (Static post-processing occupation mode).
Pressed for < 1 second	If FN key mode is «LED blink mode switch»	
	Orange	Release to change information mode.
	If FN key mode is «Occupation mode switch»	
	Orange	Release to toggle between Static and Kinematic post-processing modes.
Pressed for 1–5	No light	Release to stop data recording.
Pressed for 5–8 seconds	Red	Release to turn serial port A baud rate to 9600 bps.
Pressed for > 8 seconds	No light	No function (data recording still on).

Battery LED

The color of the BATT LED indicates the level of internal battery charge in the Maxor GGDT:

- Green – indicates greater than 90% charge.
- Orange – indicates an intermediate charge.
- Red – indicates less than 10% charge.

The pattern of blinks of the BATT LED also indicates the source of power.

- Solid light – an external power supply is used and the batteries are not being charged.
- Blinking once a second – the batteries are being charged.
- Blinking once every five seconds – the Maxor GGDT uses the internal batteries for power.
- Not blinking – the receiver is in Zero Power Mode or the internal batteries are completely discharged and no external power is connected.

Notice: *When the internal batteries have completely discharged and no external power is connected, the receiver will go into Zero Power Mode to prevent the batteries from over discharging.*

RX LED

Your Maxor GGDT receiver may be equipped with a different modem type. See the full list on page 31.

The RX LED shows status of the modem's operation. The color of the RX LED indicates if the modem has power, is receiving signals, or is turned off.

JNS 2W UHF 450-470 radio transceiver

- No light – the modem is turned off.
- Solid green – the modem is in waiting mode.
- Solid green + red flashes – the modem is receiving data.
- Solid red – the modem is transmitting data.
- Red flashes + green flashes – the modem is in command mode.

PDL^{TM} UHF Modem

- No light – the modem is turned off.

- Green – the modem is on, but signal reception has not started.
- Orange – the modem is receiving a signal.

Satel SATELLINE-3AS/TC Radio Data Modem/ SATELLINE-3ASrm Radio Data Receiver

- No light – the modem is turned off.

Free Channel Scan On

- Base : Solid red - modem is in waiting or in transmitting mode.
- Rover: Solid green + red flashes - the modem is in waiting mode.

Free Channel Scan Off (equally for base and rover)

- Green flashes (RX/TX mode no data being sent or received) - the modem is in waiting mode.
- Red flashes + green flashes each time when data was received/sent (RX/TX mode) - the modem is in transmitting/receiving mode

Single GSM/GPRS radio modem

- No light – the modem is turned off.
- Solid orange – the modem is not registered in network.
- Solid green + red flashes every 2 sec. – the modem is registered in network and is in waiting mode.
- Solid green + red flashes every 0.5 sec. – the modem is during a call and receives/transmits data.

Information Modes

The Maxor GGDT has two information modes: Normal and Extended Information Mode (EIM).

Normal

In normal mode, the STAT LED indicates the number of tracked satellites and the position's computation status.

Extended Information Mode (EIM)

Extended Information Mode is used for receiver testing purposes. In this mode, the receiver continues to work as usual, but the STAT LED indicates the following "extended" information:

- Delimiter - an easily distinguishable double-blink that shows the overall status of tests performed in EIM. The STAT LED color for delimiter is calculated from the colors of other STAT LED blinks.

  –Orange: at least one blink is orange.

  –Red: no orange blink and at least one red blink.

  –Green: all other cases.
- Sufficient data for position computation.
- GPS S/N ratios are good (Table 4-2).
- GLONASS S/N ratios are good (Table 4-2).
- Oscillator's frequency offset is less than three ppm.
- Oscillator's Allan Variance is better than 2.7e-10.
- Continuous tracking time is more than 15 minutes.

Table 4-2. Signal-to-Noise (S/N) "Good" Ratios

	CA/L1	P/L1	P/L2
GPS	51	39	39
GLONASS	51	49	40

In EIM, the STAT LED blinks seven times per cycle. Each blink could be orange, red, or green.

- Orange – information for test unavailable.
- Green – receiver passed the test.
- Red – receiver failed the test.

1. To switch to EIM, press and quickly release (within one second) the **FN** key on the MinPad.

2. Watch for the delimiter double-blink. With good receiver, antenna, and observation conditions, all blinks should be green within 15 minutes of powering on.

- Green - ok
- Orange - wait
- Red - some tests failed

3. To switch back to normal, press the **FN** key.

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 Maxor GGDT 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. PCView provides a File Manager to download files to your computer and delete files from the Maxor GGDT.

1. Connect your receiver and computer. See "Connecting the Maxor GGDT and a Computer" on page 44 for this procedure.

2. Start PCView.

3. On the *Connection Parameters* dialog box, enable RTS/CTS handshaking (Figure 4-2).
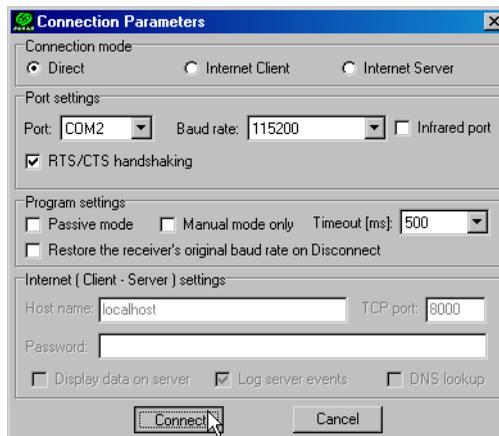
Figure 4-2. Connection Parameters – RTS/CTS Handshaking

4. Click **File->File Manager** (Figure 4-3).
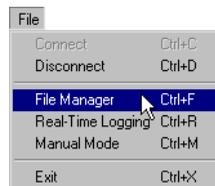
Figure 4-3. File->File Manager

5. Click the **Download path** tab on the File Manager dialog box (Figure 4-4)
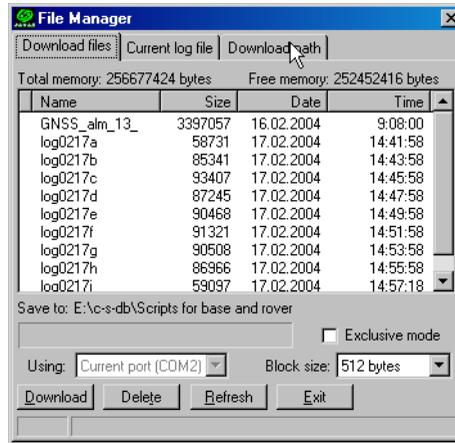
Figure 4-4. Find Files to Download

6. Navigate to and open the folder in which to download and store files. Or, type a new folder name and click **Create** to create a new folder in which to download and store files. Open this new folder.

7. Select the **Download files** tab.

8. Select the file(s) you want to download (Figure 4-5).

   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.
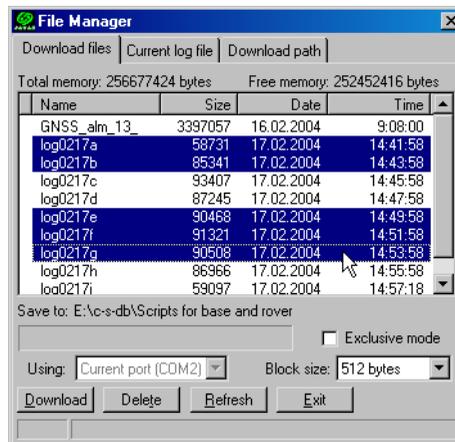
Figure 4-5. Download Files

9. Click the **Download** button. During the download, status indicators display next to each file (Figure 4-6).

   • Blue indicator – file in queue for downloading.

   • Red indicator – file currently downloading.

   • Green indicator – file has successfully downloaded.
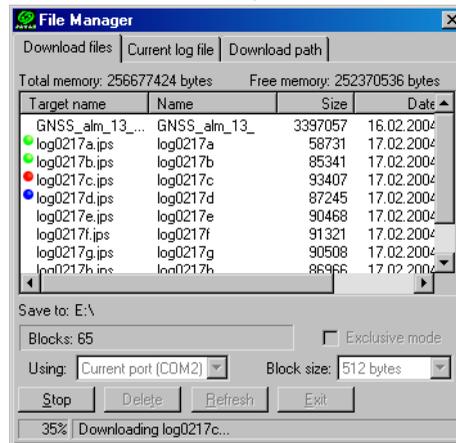
Figure 4-6. Download Files – Status Indicators

10. When finished, click **Exit** on the File Manager dialog box.

11. Continue with other operations. Or, click **File->Disconnect**, then **File->Exit** to quit PCView.

Deleting Files

Use the following steps to delete files from your receiver.

1. Connect your receiver and computer. See "Connecting the Maxor GGDT and a Computer" on page 44 for this procedure.

2. Start PCView.

3. On the Connection Parameters dialog box, enable RTS/CTS handshaking (See Figure 4-2 on page 111.)

4. Click **File->File Manager** (See Figure 4-3 on page 111.)

5. On the **Download files** tab, select the file(s) you want to delete (Figure 4-7).

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.
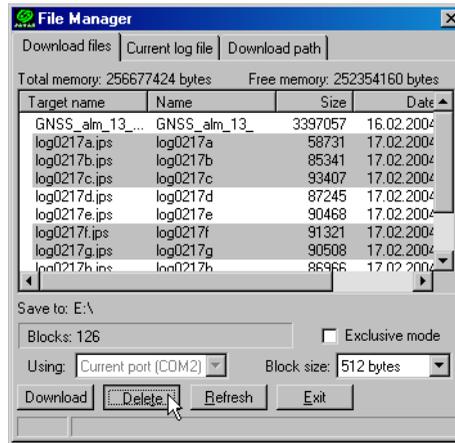
Figure 4-7. Delete Files

6. Click **Delete** (Figure 4-7).

7. Click **Yes** at the delete files confirmation dialog box. The selected files are deleted.

8. Click **Exit** on the File Manager screen.

9. Continue with other operations. Or, click **File->Disconnect**, then **File->Exit** to quit PCView.

Managing Receiver Options

Checking an OAF

Tip: For a complete list of options and their details, visit the JNS website.

You can check the status of your receiver's options, and load any new OAFs, using the RS232 cable, a computer, and PCView. Refer to the *PCView Software Manual* for a more complete description of the PCView software.

1. Connect your receiver and computer. See "Connecting the Maxor GGDT and a Computer" on page 44 for this procedure.

2. Start PCView.

3. Click **Tools->Receiver Options** (Figure 4-8).
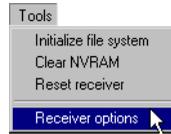
Figure 4-8. Tools->Receiver Options

The **Options Manager** screen displays (Figure 4-9 on page 116) and contains the following information:

- **Option name** – a name/description of the option.
- **Current** – the current status of the option.
- **Purchased** – if the option is purchased or not.
- **Leased** – if the option is leased or not.
- **Expiration date** – the date the option will be disabled, if applicable.

Since Options can be both purchased and leased, the "Current" status of the option displays the currently effective value. Option values can be:

- -1 or "-----" – the firmware version does not support this option.
- 0 – the receiver option is disabled.
- positive integer – the option is enabled.
- yes or no – the option is either enabled or disabled.

Figure 4-9. Option Manager

4. When finished, click **Exit** on the **Option Manager** screen, then click
   File->Disconnect to prevent conflicts with serial port management.

Loading OAFs

Javad Navigation Systems dealers provide customers with OAF files. For
any OAF related questions, E-mail JNS at options@javad.com. Please have
your receiver ID number available (see "Checking Firmware Version" on
page 120).

1. To load a new OAF, follow steps one and two in "Checking an OAF"
   on page 114.

2. Click **Load** at the bottom of the **Option Manager** screen (see Figure 4-9 on page 116).

3. Navigate to the location of the new Option Authorization File. OAFs have .jpo extension and are unique to each receiver (Figure 4-10).
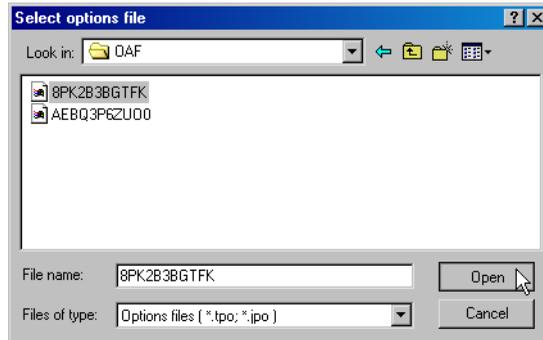
Figure 4-10. Load OAF

4. Select the appropriate file and click **Open** (Figure 4-10). The new receiver option loads onto the receiver and the Option Manager table updates.

5. When finished, click **Exit** on the Option Manager screen, then click **File->Disconnect** to prevent conflicts with serial port management.

Managing Receiver Memory

When using the Maxor GGDT in static or dynamic applications, you may need to know the amount of memory the receiver's log file occupies. The specific memory size depends on the type of data being recorded. Use the formulas below to compute the approximate size of the receiver's log files.

- **SS** – the estimated size of one epoch of raw data in the receiver's log file (expressed in bytes).
- **N** – the number of observed satellites per epoch.

When recording only L1 data:

$SS = 183 + 22*N$

When recording L1 and L2 data:

$SS = 230 + 44*N$

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 Maxor GGDT 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 Maxor GGDT's memory. However, it will reset your receiver settings to factory default values.

In addition, the NVRAM keeps information about the receiver file system. Note that after clearing the NVRAM, the receiver's STAT LED will flash orange for a few seconds indicating that the receiver is scanning and checking the file system.

You can clear the NVRAM using the MinPad or PCView.

Using MinPad to Clear NVRAM

1. Press the **power** key to turn off the receiver.
2. Press and hold the **FN** key.
3. Press and hold the **power** key for about one second. Release the **power** key while continuing to hold the **FN** key.
4. Wait until the STAT and REC LEDs are green
5. Wait until the STAT and REC LEDs blink orange.
6. Release the **FN** key while the STAT and REC LEDs blink orange.

Using PCView to Clear NVRAM

1. Connect your receiver and computer. See "Connecting the Maxor GGDT and a Computer" on page 44 for this procedure.

2. Click **Tools->Clear NVRAM** (Figure 4-11).

3. Click **OK** at the clear NVRAM confirmation dialog box. The REC LED rapidly flashes green and red; the STAT LED flashes red.
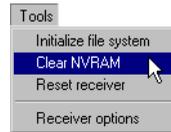
Figure 4-11. Tools->Clear NVRAM

The receiver will automatically disconnect once the NVRAM is cleared.

Changing Receiver Modes

The Maxor GGDT receiver has four modes, two information modes and two power modes:

• Normal Mode

• Extended Information Mode

• Sleep Mode

• Zero Power Mode

See "Information Modes" on page 109 for a description of Normal Mode and Extended Information Mode.

Sleep Mode

In sleep mode, the power board continues to draw power from the batteries, causing the batteries to drain over time. Put the receive in Zero Power Mode to prevent this (see "Zero Power Mode" on page 120). Follow these steps to put the Maxor GGDT into sleep mode.

1. Turn on your receiver.

2. Press the receiver's **power** key for more than four seconds and less than eight seconds. The STAT LED will be orange. The receiver enters Sleep Mode.

3. Any activity on the RS232 port will turn the receiver on.

Notice: *If you press the power key for more than 14 seconds, it will be ignored. This protects receiver operation against stuck keys.*

Zero Power Mode

When your Maxor GGDT is off, even in Sleep Mode, the power board will continue to draw power from the batteries. This means that if you fully charge your receiver, turn it off and store it, the receiver will drain its battery power in less than two months. To stop the power board from draining the batteries, you can put your receiver in Zero Power Mode.

1. Turn on your receiver.

2. Press and hold the **power** key for more than 8 seconds, but less than 14 seconds.

3. Release the **power** key when both LEDs become red. When the LEDs turn off, your receiver will be in Zero Power Mode.

4. Press the **Reset** key for about one second to return to Normal mode.

Notice: *When the internal batteries have completely discharged and no external power is connected, the receiver will go into Zero Power Mode automatically to prevent the batteries from over discharging.*

Checking Firmware Version

Use PCView to check the firmware version of your receiver.

Notice: *The Maxor GGDT receiver should be loaded with firmware version 2.3 or newer.*

1. Connect your receiver and computer. See "Connecting the Maxor GGDT and a Computer" on page 44 for this procedure.

2. Start PCView.

3. Click on **Help->About** (Figure 4-12).

Figure 4-12. Help->About

The **About PCView** dialog box opens (Figure 4-13).

About PCView

PCView for Windows 95/98/ME/NT/2000/XP
Version 2.1.14 Lite (Build: October 14, 2004)
Status : Never expired
Copyright © Javad Navigation Systems , 2000 - 2004
http://www.javad.com

Receiver model:	MAXOR
Receiver ID:	8RKW5YZP4W0
Firmware version:	2.5 Feb,18,2005 b4
RTK support:	yes
Mainboard version:	MGGDT_5
RAM size:	4096KB
Power supply (V):	0.0
Antenna input:	int
Ext. Ant. DC status:	off
Digital part 3.3V (V):	3.3
Analog part 3.3V (V):	3.3
Digital part 5V (V):	5.1
Analog part 5V (V):	4.5
Temperature (°C):	37.9
Flash memory size:	134078472 bytes
Flash memory free:	133947408 bytes
Number of files:	0
Bad blocks:	1
Write verify:	fast
Block size:	131072 bytes
Blocks for files:	1024
Physical memory:	134217728 bytes
Current port:	/dev/ser/b
Speed:	115200

Save to file   Report   Refresh   OK

Figure 4-13. About PCView

About PCView lists important information about the different hardware accessories and software properties. This list includes the following, which you will need if you contact JNS or your dealer:

- Receiver model
- Receiver IDs
- Firmware version

4. When finished, click **OK**, then click **File->Disconnect** to prevent conflicts with serial port management.

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 JNS website, to ensure your receiver has the most recent updates.

The Maxor GGDT uses FLoader, a Windows®-based utility, to load firmware onto the receiver and power boards. You can download FLoader to your computer from the JNS website (http://www.javad.com). For more information, refer to the *FLoader User's Manual*, also available on the JNS website.

1. Download and install FLoader, if applicable.

2. Download the new firmware package to your computer.

3. Physically connect your receiver and computer using the RS232 cable.

4. Activate FLoader (Figure 4-14).

Figure 4-14. Floader Main Screen

5. On the **Connection** tab, select the COM port on your computer that connects with your receiver and select its speed (usually 115200).

See the following sections to load the appropriate firmware.

Receiver and Power Board Firmware

Receiver and power board firmware is released as a compressed file that you download and decompress. This file contains the following three files:

- ramimage.ldr – the Receiver board RAM file
- main.ldp – the Receiver board Flash file
- powbrd.ldr – the Power board RAM file

Notice: *You must load all three files when loading new firmware. These files*
must come from the same firmware package.

1. In FLoader select the **Device** tab and set the Device Type as **Receiver**
(Figure 4-15).

Figure 4-15. Set Device Type

2. Click **Get from Device** for device information (Figure 4-15).

3. Select the **Program** tab and set the **Capture Method** to **Soft Break**
Capture (recommended) (Figure 4-16).
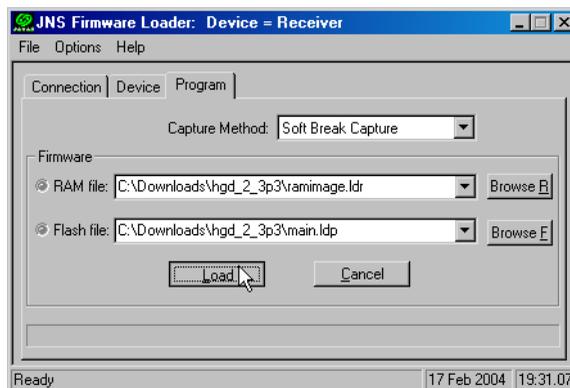
Figure 4-16. Program Tab Settings

4. Browse for and select the receiver board's RAM file and Flash file
(Figure 4-16).

5. Click **Load** and wait until 100% of the files load into your receiver.

Notice: *If you selected an incorrect RAM or Flash file, an error message dis-*
plays at the bottom of the dialog box. Reselect the correct file.

6. Select the **Device** tab and set the Device Type as Receiver's Power Board (Figure 4-17).

Figure 4-17. Set Device Type

7. Click **Get from Device** for device information (Figure 4-17).

8. Select the **Program** tab and set the **Capture Method** to **Soft Break Capture** (recommended) (Figure 4-18).
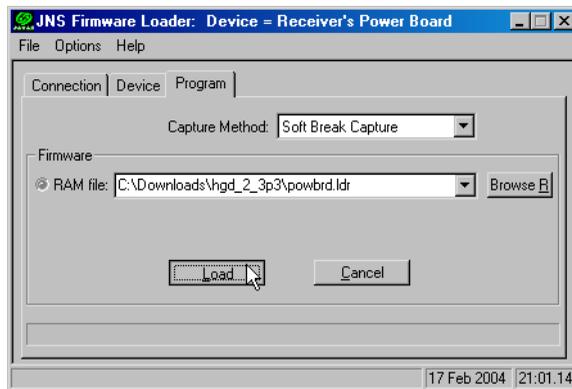
Figure 4-18. Program Tab Settings

9. Browse for and select the Power board's RAM file (Figure 4-18).

10. Click **Load** and wait until 100% of the power board file loads into your receiver.

Notice: *If you selected an incorrect RAM file, an error message displays at the bottom of the dialog box. Reselect the correct file.*

11. Click **File->Exit**.

12. Clear the receiver's NVRAM (see"Clearing the NVRAM" on page 118) and update the almanac ("Collecting Almanacs" on page 81) after loading new firmware.

Bluetooth Module Firmware

Bluetooth module firmware is released as a compressed file that you download and decompress. This file contains the following two files:

- btloader.ldr – the Bluetooth module RAM file
- btmain.ldp – the Bluetooth module Flash file

Notice: *You must load both files when loading new firmware. These files must come from the same firmware package.*

1. In FLoader, click the **Device** tab and set the *Device Type* as "Receiver". Then click **Get from Device** for device information (Figure 4-19).

Figure 4-19. Get Device Type

2. Click the **Program** tab and set the *Capture Method* to "Soft Break Capture" (recommended).

3. Browse for and select the Bluetooth module's RAM file and Flash file (Figure 4-20).

Figure 4-20. Program Tab Settings

4. Click **Load** and wait until 100% of the files load into your receiver.

Notice: *If you selected an incorrect file, an error message displays at the bottom of the dialog box. Select the correct file.*

5. Click **File -> Exit**.

5 **T**ROUBLESHOOTING

In general, as long as you follow the maintenance and safety instructions provided in this manual, you should have few problems with your Maxor GGDT. This chapter will help you diagnose and solve some common, minor problems you may encounter with your Maxor GDDT receiver.

Things to Check First

Before contacting JNS Customer support about any problems with the receiver, refer to the following list of basic suggestions that may help:

- Go through all external receiver connections carefully and make sure they are not wrong or loose.
- Double-check the cables. Cables became defective more often than the devices do.
- Check the sections below for available solutions.
- Reset the receiver using PCView (**Tools->Reset receiver**).
- Restore factory default settings using PCView (click **Configuration->Receiver**, then **Set all parameters to defaults**).
- Clear the NVRAM (see "Clearing the NVRAM" on page 118).
- Initialize the file system (click **Tools->Initialize file system**; this will erase all files inside the receiver).

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

Power Problems

All Maxor GGDT receivers are preset in the factory as "Auto Mode" for both the power and charger. If you want to check these settings,

1. Connect your receiver and computer and run PCView (see "Connecting the Maxor GGDT and a Computer" on page 44).

2. Once connected, click **Configuration->Receiver**.

3. On the **General** tab, view the **Power** and **Charger** fields.

These fields should be set to Auto. If not, change them to Auto and click **Apply**.

Tip: Clearing the NVRAM will also return the receiver to Auto Mode (see "Clearing the NVRAM" on page 118).

Table 5-1. Power Problems

Problem	
The receiver does not power up.	
Causes	**Solutions**
The receiver may be in Zero Power Mode.	Press the **Reset** key.
If no external power source used, batteries may be discharged.	Connect a fully charged external power source and retry. See "Powering the Maxor GGDT" on page 37.
The receiver has an external power source, but internal batteries are discharged.	Charge the batteries overnight. See "Powering the Maxor GGDT" on page 37.
The receiver may have a defective charger or defective internal batteries.	If after charging your internal batteries overnight, and your Maxor GGDT is not powering, contact JNS Customer Support for advice.

Receiver Problems

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

Table 5-2. Receiver Problems

Problem	
The receiver cannot establish a connection to a computer or external controller.	
Causes	**Solutions**
The Daisy Chain mode is still active.	Turn off the Daisy Chain.
The cable is not properly plugged in.	Check that the cable connector is attached to the correct serial port. Unplug the cable, then securely and properly reconnect it to the receiver. See "External Components" on page 32 and "Connector Specifications" on page 150 for information on the receiver's connectors.

Problem	
The receiver cannot establish a connection to a computer or external controller.	
Causes	**Solutions**
The cable is damaged.	Use an undamaged cable. Contact your Dealer to replace the cable.
The receiver port used for connection is not in Command mode.	Connect your receiver and a computer using a free port (see "Connecting the Maxor GGDT and a Computer" on page 44) and start PCView. Click **Configuration->Receiver->Ports**. Change the Input for the serial port used for connection to Command.

Problem	
The receiver does not lock on to satellites for a long period of time.	
Causes	**Solutions**
The receiver stores an old almanac.	Update the almanac. See "Collecting Almanacs" on page 81.
The antenna cable is damaged.	Use an undamaged cable. Contact your Dealer to replace the cable.

Problem
The receiver tracks too few satellites.

Table 5-2. Receiver Problems

Causes	Solutions
The elevation mask value is too high (e.g., 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 and start PCView. See "Connecting the Maxor GGDT and a Computer" on page 44. Click **Configuration->Advanced->Multipath Reduction** and enable the two boxes. Move to an area free of obstructions, if applicable.
Problem	
The receiver cannot obtain Code Differential and/or RTK solutions.	
Causes	**Solutions**
Incorrect Base coordinates entered.	Specify the correct coordinates for the Base station using PCView or other 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. See "Measuring with the Maxor GGDT" on page 89 for further information. If the receiver should function as a Rover, ensure it has the proper configuration. See "Measuring with the Maxor GGDT" on page 89 for further information
The corresponding receiver options may be disabled or expired.	See "Checking an OAF" on page 114 for details on how to check current options. Enable or prolong the validity of the corresponding receiver options by ordering a new OAF with the desired options activated.
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. See "Collecting Almanacs" on page 81. Check the elevation masks of the Rover and Base receivers; they should be the same.
Poor satellite geometry (PDOP/GDOP values are too high).	Conduct your measuring when PDOP values are low. Use the Standalone Mission Planning tool (http://www.javad.com) to track DOP values.
The elevation mask is above 15 degrees.	Lower the elevation mask.
The receiver and the antenna have a poor connection.	Ensure the cable is undamaged. Check the cable connector attachment to the receiver. Remove and reattach the cable connector to ensure a secure connection.

Table 5-2. Receiver Problems

The Base and Rover modems are set to different radio channels.	Set the Base and Rover receivers to the same radio channel. See "Radio Configuration" on page 58.
Problem	
The receiver cannot obtain Code Differential and/or RTK solutions.	
Causes	**Solutions**
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 PCView. See "Connecting the Maxor GGDT and a Computer" on page 44. Click **Configuration->Receiver->Ports** and set the same input/output format for both receivers.
The specified link rate is not compatible with the link rates the modem supports. The link rate is the rate at which data transmits over the RF link.	Change the link rate to that which your modem supports. See the modem's manual for link rate support information. See "Radio Configuration" on page 58 for checking the current link rate and changing the link rate.
The specified baud rate is not compatible with the baud rates the modem supports. The baud rate is the rate at which the receiver transmits differential messages to the modem and vice versa.	Change the baud rate to that which your modem supports. See the modem's manual for baud rate support information. See "Radio Configuration" on page 58 for checking the current baud rate and changing the baud rate.
The distance between Base and Rover is too far.	Close the distance between the Base and Rover. Use repeaters to increase radio coverage.
Problem	
The receiver does not start data logging.	
Causes	**Solutions**
The receiver has no free space for files.	Download receiver files to a computer (if needed) and delete files (see "Downloading Files to a Computer" on page 111 and "Deleting Files" on page 113). Use the AFRM feature. See "Automatic File Rotation Mode (AFRM) parameters" on page 55.

Table 5-2. Receiver Problems

The receiver has already logged 512 files into the internal memory.	Delete unnecessary files (see "Deleting Files" on page 113). Use the AFRM feature. See "Automatic File Rotation Mode (AFRM) parameters" on page 55.

Bluetooth® Problems

The following are some of the most commonly encountered error messages. BTCONF reports the error messages in the status bar.

Table 5-3. Bluetooth Problems

Error Message	
Can't find receiver.	
Causes	**Solutions**
The receiver is turned off.	Ensure the receiver has power and is turned on.
If using a cable, the cable's connectors are improperly attached.	Check that the cable connector is attached to the correct serial port. Unplug the cable, then securely and properly reconnect it to the receiver.
If using a cable, the cable is damaged.	Use an undamaged cable. Contact your Dealer to purchase a new cable.
The COM port the receiver is attached to differs from the one selected in BTCONF.	Ensure that the RS232 cable is attached to the COM port specified in the BTCONF communication port dropdown list. See "Bluetooth® Module Configuration" on page 77 for details.
The receiver port used for connection is not in Command mode.	Connect your receiver and a computer using a free port (see"Connecting the Maxor GGDT and a Computer" on page 44) and start PCView. Click Configuration->Receiver->Ports. Change the Input for the serial port used for connection to Command.
The settings for Port B may have been changed.	The settings for Port B are: 115200 baud rate, 8 data bits, 1 stop bit, no parity, and no handshaking. Try enabling RTS/CTS handshaking for Port B. Do not change other settings.
The corresponding receiver options may be disabled or expired.	See "Checking an OAF" on page 114 for details on checking current options. Enable, or prolong, the corresponding receiver options. Contact your dealer to order an OAF with desired receiver options.

Table 5-3. Bluetooth Problems

Error Message	
Can't find Bluetooth.	

Causes	Solutions
The receiver's Slot 3 is turned off.	Connect your receiver and a computer using an RS232 cable (see "Connecting the Maxor GGDT and a Computer" on page 44). Click Configuration->Receiver ->General. In the Turn on/off Slots area, enable the Slot 3 (B) check box.
The Bluetooth® module is linked with another device.	Close the connection with the device, then connect to your receiver.
The Bluetooth® module's processor is overloaded.	Put your receiver in Zero Power Mode. See "Zero Power Mode" on page 120 for details. Press and hold the Reset key for about one second to return the receiver to normal mode. Re-connect to the Bluetooth® module.
The receiver does not have a Bluetooth® module.	Contact your dealer to purchase a Bluetooth® enabled receiver.

Error Message	
Open COM# port failed: Access is denied.	

Causes	Solutions
Another application uses the computer port dedicated for connection.	Close the application, then re-connect. Connect the receiver via another, unused computer port.

Error Message	
After searching for available devices, none are discovered.	

Causes	Solutions
The receiver is not receiving power.	Check that the receiver is getting power and is turned on. Check that the power cable is attached to the port marked "PWR". Unplug the cable, then securely and properly reconnect it to the receiver. If the power cable is damaged, contact your Dealer to purchase a new cable.
The receiver's Slot 3 is turned off.	Connect your receiver and a computer using an RS232 cable (see "Connecting the Maxor GGDT and a Computer" on page 44). Click Configuration->Receiver->General. In the Turn on/off Slots area, enable the Slot 3 (B) check box.

Table 5-3. Bluetooth Problems

Error Message
Can see the icon for the receiver's Bluetooth® module on the computer screen, but cannot connect to it.

Causes	Solutions
Device security settings probably differ.	Make sure your Bluetooth® enabled devices use the same security settings. See "Bluetooth® Module Configuration" on page 77, for details on changing security settings.
Bluetooth® module settings may have changed.	If you changed settings for your Bluetooth® module, remove it from the list of discovered Bluetooth® devices using the Bluetooth® manager program (supplied with the device used to manage the receiver). Repeat the search.

Modem-JNS Problems

The following is the most commonly encountered Modem-JNS problem.

Table 5-4. Modem-JNS Problems

Error Message
Can't find receiver.

Causes	Solutions
The receiver is turned off.	Ensure the receiver has power and is turned on.
If using a cable, the cable's connectors are improperly attached.	Check that the cable connector is attached to the correct serial port. Unplug the cable, then securely and properly reconnect it to the receiver.
If using a cable, the cable is damaged.	Use an undamaged cable. Contact your Dealer to purchase a new cable.
If using Bluetooth wireless technology, the incorrect port is selected, or the receiver or computer does not support Bluetooth.	Use a computer or receiver that has Bluetooth wireless technology enabled/installed. Check that the computer and receiver use the correct ports for communication.

Table 5-4. Modem-JNS Problems

The corresponding modem options may be disabled or expired.	See "Managing Receiver Options" on page 114 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 JNS website for details. Refer to the *PCView Software Manual* for a detailed description of options.
The type of radio modem is disabled for detection using Modem-JNS.	1.If needed, click Cancel on the Connection dialog box or Stop on the Connecting to device dialog box. 2.In Modem-JNS, click Tools -> Options. 3.Enable the modem type installed in the receiver connected to the computer. Click Ok. 4.Click File->Connect.

Obtaining Technical Support

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

E-mail

To get in contact with JNS Customer Support by e-mail, use the following electronic mail addresses.

Table 5-5. Technical Support E-mai

For Questions Related To...	Use...
Hardware (receivers, antennas, firmware)	hardware@javad.com
OAF	options@javad.com
Ensemble	ensemble@javad.com
PCView	pcview@javad.com
FieldView	fieldview@javad.com

If in doubt which e-mail address to use for your particular question, please send it to support@javad.com.

When e-mailing JNS customer support, provide the following information for better, faster service:

1. The receiver model and configuration settings.

    In PCView, click Help ->About and click Save to file. Enter a name for the file and save it to your computer. Attach this file to the e-mail.

2. The system/hardware specifications for the computer running PCView; such as, operating system and version, memory and storage capacity, processor speed, etc.

3. The symptoms and/or error codes/messages that precede and follow the problem.

4. The activities being tried when the problem occurs. If possible, include the exact steps being taken up to when the error message or other problem occurs.

5. How regularly the problem occurs.

Generally, a customer support representative will reply within 24 hours, depending on the severity of the problem.T

Website

The Javad Navigation Systems website provides current information about JNS's line of products. The support area of the website provides access to frequently asked questions, configuration procedures, manuals, e-mail support, etc.

To access the JNS website home page, use: http://www.javad.com

APPENDIX

A
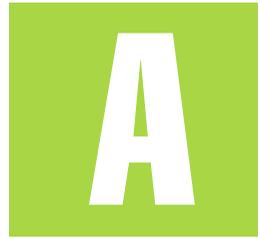
Creating Scripts

Script files allow you to save manual commands into one file. You can then load this single script instead of typing each individual command. Use the following procedure to create script files.

Tip: For more information on script files, see the PCView Software Manual.

1. Connect your receiver and computer. See "Connecting the Maxor GGDT and a Computer" on page 44 for this procedure.

2. Start PCView.

3. Click on **File->Manual Mode**.

4. Click **Edit script**.

5. Navigate to the folder in which you want to save the script file.

6. Type the file name. All files have a .jpc extension.

   For example, Daisy_38400.jpc to enable the daisy chain and Daisy_Off.jpc to disable the daisy chain.

7. Click **Yes** to create the file.

8. Type in the appropriate commands, pressing **Enter** or clicking **Send command** after each one. See Table A-1 for these commands.

Table A-1. Script Commands

To Create Daisy Chain	To End Daisy Chain

`%%set,dev/ser/crate,38400`
`%%set,dev/ser/c/echo,/cur/term`
`%%set,dev/ser/c/imode,echo`
`%%set,cur/term/eoff,QUIT`
`%%set,cur/term/echo,/dev/null`
`%%set,cur/term/imode,echo`
`%%set,cur/term/echo,/dev/ser/c`
	`QUIT`
	`%%set,cur/term/imode,cmd`
	`%%set,dev/ser/c/echo,/dev/null`
	`%%set,dev/ser/c/imode,cmd`
	`%%set,dev/ser/c/rate,38400`
	`%%set,cur/term/rate,115200`

9. Click **Save script**.

10. Click **Close editor**.

Once you have created a script file,

1. Click **Load script** on the Manual Mode dialog box.

2. Navigate to the folder that contains your script file.

3. Select the appropriate script file and click **Send command**.

APPENDIX

<div style="text-align: right">

B

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Specifications

This JNS product is a 20-channel GNSS (GPS and GLONASS) receiver with a rugged aluminum housing complete with MinPad and cable connectors, and with one of the following communication board:

- UHF 450-470 MHz - a Javad Navigation Systems 2 W transceiver for 450-470 MHz (optional to UHF could be added an integrated GSM/GPRS module for Europe or USA).

- UHF SATELLINE-3AS/TC - a Satel Oy 1W transceiver for 380-470 MHz.

- UHF SATELLINE-3ASrm - a Satel Oy radio data receiver: either 450-470 MHz or 430-450 MHz or 410-430 MHz.

- PDL^{TM} UHF modem – a Pacific Crest PDL (Positioning Data Link) modem; either a 450-470 MHz or 430-450 MHz; receiving only.

- GSM/GPRS – a single dual-band cell phone frequency modem (Europe: 900/1800 MHz; USA and Canada: 900/1900 MHz).

- UHF ISM 902-928 MHz - a Javad Navigation Systems 1 W transceiver for 902-928 MHz (for USA, Canada and Australia).

- Beacon receiver intended to receive pseudorange corrections transmitting by Radiobeacon stations (283.5-325 kHz).

- L-band receiver intended for particularly geostationary satellite communication networks satellite service (1525-1559 MHz).

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

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

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

Receiver Specifications

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

General Details

Table B-1 table lists the receiver's general specifications.

Table B-1. Maxor GGDT General Specifications

Physical	
Enclosure	Aluminum extrusion, rainproof
Color	JNS Green and Gray
Dimensions	W:159 x H: 115 x D:162 mm
Weight	1.620 kg (1.760 kg with UHF modem)
Antenna	Internal
Battery	Two internal
Controller	External
Mounting	5/8-11
Seals	Silicon (molding in Color)
Keys	Three keys: Power – On/Off Function (FN) – start/stop data logging; switch information mode. Reset – receiver hardware reset
LEDs	Four LEDs: STAT – satellite and receiver status REC – record and data status BATT – battery status RX – modem status

Table B-1. Maxor GGDT General Specifications

Environment	
Operating temperature	-30 C° to + 50 C° with batteries
Storage temperature	-20 C° to +35 C° with batteries
Humidity	95% non-condensing
Power	
Internal battery	Li-Ion, 3000 mAh, 7.4 V
Battery size	132 x 35 x 18 (mm)
Battery weight	165 g (1 battery)
Number of built-in batteries	2 batteries
Operating time	• With JNS 2W UHF 450-470 radio transceiver ~10 hours with 1 W Transmit ON ~7 hours with 2 W Transmit ON ~16 hours with Receiver ON ~13...~15 (by continuous call) hours with GSM/GPRS (GSM 900) ON ~14...~15 (by continuous call) hours with GSM/GPRS (GSM 850) ON ~13...~15 (by continuous call) hours with GSM/GPRS (DCS 1800) ON ~13...~15 (by continuous call) hours with GSM/GPRS (PCS 1900) ON • With SATELLINE-3AS/TC/SATELLINE-3ASrm ~6 hours with TX mode ON (1W) (Maximum output) ~7 hours Typical RTCM ~7 hours Typical CMR ~11 Hours with UHF Satel RX mode ON ~13 hours with UHF Satel standby mode • With UHF PDL Radio ON ~12 hours • With Radio OFF ~ 16 hours
Input voltage	+10 to +25 V DC (for work) + 10 to +25 V DC (for charge battery) Minimum Charge Current >=2 Amp

Table B-1. Maxor GGDT General Specifications

Power consumption	8.3 W with JNS UHF 450-470 MHz 2 W Transmitter ON 6 W with JNS UHF 450-470 MHz 1W Transmitter OFF 3.7 W with Receiver ON 4 W...4.6 W (during a call) with GSM/GPRS (GSM 900) ON 4 W...4.4 W (during a call) with GSM/GPRS (GSM 850) ON 4 W...4.5 W (during a call) with GSM/GPRS (DCS 1800) ON 4 W...4.6 W (during a call) with GSM/GPRS (PCS 1900) ON ~10 W with SATELLINE-3AS/TC/ TX mode ON (1W) (Maximum output) ~ 9 W Typical RTCM ~ 8.8 W Typical CMR ~ 5.5 W with RX mode ~ 4.6 W with Satel standby mode ~ 2.5W with PDL UHF radio modem (typical) ~ 2.7W with PDL UHF radio modem (maximum) ~ 3.6 W with Radio OFF
On-board	Backup battery for timekeeping and almanac data storage 10 years minimum operation
External power	1 port
I/O	
Communication Ports	Up to four high speed RS232 serial ports, a USB port, and an internal Bluetooth communication port.
Connectors	External GPS/GLONASS Antenna, Modem Antenna, 1PPS output (optional), Event Marker input (optional), PWR, USB.
MinPad	Four external LEDs ON/OFF control input Three function LEDs.
Data Features	
Up to 20 Hz update rate for real time position and raw data (code and carrier) 10cm code phase and 0.1mm carrier phase precision RTCM SC104 version 2.1, 2.2, 2.3, and RTCM3.0 Multiple Base RTCM Geoid and Magnetic Variation models RAIM Different DATUMs support Output of grid coordinates CMR and CMR+ support	

Table B-1. Maxor GGDT General Specifications

Technology	
Common tracking Low signal tracking Advanced Multipath mitigation 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	1Hz standard; 5, 10, 20 Hz optional
Output interval for RTCM correction data	1Hz standard; 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	CMR2/CMR+ (Trimble compatible), 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

Table B-1. Maxor GGDT General Specifications

Elevation	0 to 90 degrees (independent of data logging)
Solution mode	Delay (synchronization) Extrapolation (not synchronized)
Process interval	1Hz standard; 5, 10, 20Hz optional
Latency	Delay mode – 20 msec to 20 sec (depends on latency which receives corrections data from base receiver) Extrapolation – 20 to 30 msec
Raw Data logging	The receiver can record raw data at another interval during RTK operation
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%
Measuring Modes	
Base or Rover	Static Kinematic (Stop and Go) RTK (Real-time Kinematic) DGPS (Differential GPS) SBAS DGPS
Measuring Accuracy	
Static, Fast Static	For L1+L2 – H: 3mm + 0.5ppm (x baseline length); V: 5mm + 0.5ppm (x baseline length)
Kinematic, RTK	For L1+ L2, L1 – H: 10mm + 1.0ppm (x baseline length); V: 15mm + 1.0ppm (x baseline length)
DGPS	Post processing: typically 0.3m DGPS/RTCM based: typically less than 0.5m
Cold Start Warm Start Reacquisition	< 60 sec < 10 sec < 1 sec

GPS Board Details

Table B-2 lists the GPS board's general specifications.

Table B-2. GPS Board Specifications

Receiver Type (set by activating the proper OAF)	
GGD-112T	GD: GPS L1/L2 GG: GPS/GLONASS L1 GGD: GPS/GLONASS L1/L2
Tracking Specifications	
Standard Channels	20 channels (G, GG, GD, GGD) L1 GPS, L1/L2 GPS, L1 GLONASS, L1 GPS + L1 GLONASS, SBAS, PCode and Carrier
Optional	Cinderella days (see page B-146 for details)
Tracked Signals	GPS/GLONASS, L1/L2 C/A and P-Code and Carrier, SBAS
Tracking Functions	
Multi-path reduction	Code and Carrier
PLL/DLL setting	Bandwidth, order, adjustable
Common tracking loop setting	On/Off, Static Mode, Bandwidth of individual PLL, Bandwidth of common PLL
Smoothing interval	Code and Carrier
SBAS	WAAS optional EGNOS optional
Memory	
Internal Memory	Compact flash card (not removable)
Capacity	Standard – 0 MB 256 MB of data storage
Logging Time	53 hours (8 MB, 15 sec, L1/L2, 7 satellites)
Logging Interval	0.05 to 86400 seconds, depending on purchased options
PPS Output (optional)	
Number of PPS ports	1
Edge	Rise, Fall
Period	10 to 1000000000 ms
Offset	-500000000 to 500000000 msec

Table B-2. GPS Board Specifications

Reference time	GPS, GLONASS, UTC (USNO), UTC (SU)
Event Marker (optional)	
Number of event Marker ports	1
Edge	Rise, Fall
Reference time	GPS, GLONASS, UTC (USNO), UTC (SU)

Notice: *Cinderella days is an option that turns a single frequency, GPS receiver into a dual-frequency, GPS+GLONASS receiver for 24 hours every other Tuesday at GPS midnight. Refer to JNS's website for more information and specific Cinderella day dates.*

Bluetooth® Module Details

Table B-3 lists the Bluetooth® wireless technology module's general specifications.

Table B-3. Bluetooth® Module Specifications

Type	Class 2
Service classes	Miscellaneous
Supported profiles	LM, L2CAP, SDP, PPP
Frequency Country Code	North America and Europe

Internal JNS UHF Modem Details

Table B-4 lists the internal JNS UHF modem's general specifications.

Table B-4. JNS UHF Modem specifications

General	
Frequency Range	450 MHz to 470 MHz
Channel Spacing	25/12.5 kHz
Frequency Reference	2.5 ppm
Carrier Power Stability	+ 1 dB / - 2 dB
Sensitivity	-116 dBm to –110 dBm (BER 10E-3)
Adjacent Channel Selectivity	-60dB (12.5kHz), -70 dB (25 kHz)
Transmission Rate	19200 or 9600 bits per second (4- FSK) 9600 or 4800 bits per second (GMSK)
Transmission Protocols	packet switched, fast asynchronous
Forward Error Correction (FEC)	Yes
Transmitter (TX)	
Carrier power	0.01 W(+10 dBm), 0.02W (+13 dBm), 0.05 W(+17 dBm), 0.1 W(+20 dBm), 0.25 W (+24 dBm), 0.5 W (+27 dBm), 1 W (+30dBm), 2W (+33dBm)
Carrier power stability	+2dB / -3 dB
Receiver (RX)	
Sensitivity	-116...-110 dBm (BER<10 E-3)
Adjacent channel selectivity	>-60 dB @ 12.5 kHz >-70 dB @ 25 kHz

Optional GSM/GPRS Module Details

Table B-5 lists the optional GSM/GPRS Module general specifications.

Table B-5. GSM/GPRS Module specifications

Operating Systems	EGSM: 900/1800 MHz GSM 850/1900 MHz
TX Power	0.6 W (850MHz); 2 W (900 MHz); 1 W (1800/1900 MHz)

Table B-5. GSM/GPRS Module specifications

GPRS	Multi-slot class 8 (4 down, 1 up); Max BR 85.6 Kbps; Class B GSM 07.10 multiplexing protocol; Coding scheme CSCS4
CSD	Max BR 14.4 Kbps
SMS	MO/ MT Text and PDU modes; Cell broadcast.

Internal SATELLINE-3AS/TC Radio Data Receiver Module Details

Table B-6 lists the SATELLINE-3AS/TC Radio Data Receiver Module details**:**

Table B-6. SATELLINE-3AS/TC Radio Data Receiver Module Specifications

General	
Frequency Range	380...470 MHz
Channel Spacing	12.5 kHz/25 kHz
Number of Channels	160 / 80 or (2 x 160 / 2 x 80)
Frequency Stability	< ± 1.5 kHz
Type of Emission	F1D
Communication Mode	Half-Duplex
Transmitter (TX)	
Carrier power	10 mW...1 W / 50
Carrier power stability	+ 2 dB / - 3 dB
Adjacent Channel Power	according to EN 300 113
Spurious Radiations	according to EN 300 113
Receiver (RX)	
Sensitivity	- 116... –110 dBm (BER < 10 E-3) depending on Receiver settings
Common Channel Rejection	> - 12 dB
Adjacent channel selectivity	> 60 dB @ 12,5 kHz, > 70 dB @ 25 kHz
Intermodulation Attenuation	> 65 dB
Spurious Radiations	< 2 nW

Internal SATELLINE-3ASrm Radio Data Receiver Module Details

Table B-7 lists the SATELLINE-3ASrm Radio Data Receiver Module details:

Table B-7. SATELLINE-3ASrm Radio Data Receiver Module Specifications

General	
Frequency Range	380...470 MHz
Channel Spacing	12.5 kHz/25 kHz
Number of Channels	160 / 80
Frequency Stability	$< \pm 1.5$ kHz
Sensitivity	- 116... –110 dBm (BER < 10 E-3)
Common Channel Rejection	> - 12 dB
Adjacent channel selectivity	> 60 dB @ 12,5 kHz, > 70 dB @ 25 kHz
Intermodulation Attenuation	> 65 dB
Spurious Radiations	< 2 nW

Internal PDL^{TM} UHF Modem Details

Table B-8 lists the internal PDL^{TM} UHF modem's general specifications.

Table B-8. PDL^{TM} UHF Modem Specifications

General	
Frequency Range	430 MHz to 450 MHz / 450 MHz to 470 MHz
Channel Spacing	25/12.5 kHz
Frequency Reference	2.5 ppm
Sensitivity	116 dBm or better (12dB SINAD)
Adjacent Selectivity	-60 dB at 12.5 kHz
Carrier Detect Attack Time	2 ms
Transmission Rate	19200 or 9600 bps (4-level FSK) 9600 or 4800 bps (GMSK)
Transmission Protocols	Transparent, packet switched, auto-repeater, fast asynchronous, TRIMTALK^{TM}

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Table B-8. PDL^{TM} UHF Modem Specifications

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Forward Error Correction (FEC)	Hamming Code (12, 8) with Data Interleaving
Modulation	GMSK with BT of 0.5 4-level FSK

Connector Specifications

This sections lists Maxor GGDT connector details.

Radio (Modem) RF Connector

The JNS UHF 450-470 MHz, UHF SATELLINE-3AS/TC, UHF SATELLINE-3ASrm, PDL^{TM} UHF modem connector type (Table B-9) is a BNC Bulkhead Jack RF connector with an Applied Engineering Product p/n of 6501-7051-003.

<div align="center">

Table B-9. BNC RF connector specifications

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Type	Signal Name	Dir	Details
BNC	Modem I/O	I	RF input from PDL antenna

The GSM modem connector type (Table B-10) is a TNC RF connector.

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Table B-10. TNC RF connector specifications

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Type	Signal Name	Dir	Details
TNC	Modem I/O	I	RF input from GSM antenna

The UHF ISM 902-928 MHz connector type is (Table B-11) a R-TNC female RF connector.

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Table B-11. R-TNC female RF connector specificationS

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Type	Signal Name	Dir	Details
Reverse-TNC	Modem I/O	I/O	RF output from modem antenna

Power Connector

The power connector (Figure B-1) is a sealed receptacle, 5 pin, ODU p/n G80F1C-T05QF00-0000.
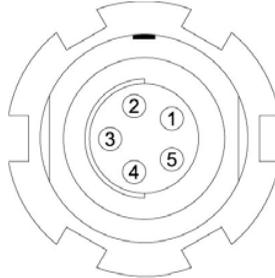
Figure B-1. Power Connector

Table B-12 gives power connector specifications.

Table B-12. Power connector specifications

Number	Signal Name	Dir	Details
1	Power_INP	P	10 to 25 volts DC input
2	Power_INP	P	10 to 25 volts DC input
3	Power_GND	P	Ground, power return
4	Power_GND	P	Ground, power return
5			Not used

Serial RS-232C Connector

For ports A and D. The RS232 connectors (Figure B-2) are sealed receptacle, 7 pin, ODU p/n G80F1C-T07QC00-0000.
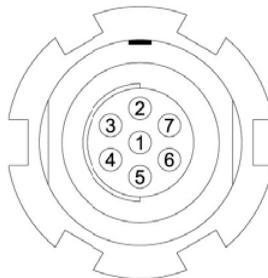
Figure B-2. RS-232C Connector

Table B-13 gives the RS-232C cable connector specifications.

Table B-13. RS-232C cable connector specifications

Number	Signal Name	Dir	Details
1	Power_OUT	P	Power Output (supplied voltage)
2	GND	-	Signal ground
3	CTS	I	Clear to send
4	RTS	O	Request to send
5	RXD	I	Receive data
6	TXD	O	Transmit data
7			Not used

USB Connector

The USB connector is a sealed receptacle, 5 pin, ODU p/n G80F1C-T05QF00-0000 (Figure B-3).
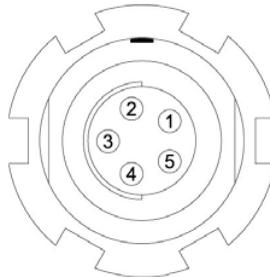
Figure B-3. USB Connector

Table B-14 gives the USB connector specifications.

Table B-14. USB specifications

Number	Signal Name	Dir	Details
1			Not used
2	USB_PWR	P	Bus power
3	GND	-	Ground
4	USB D+	I/O	Data plus
5	USB D-	I/O	Data minus

GPS External Antenna RF Connector

The external antenna connector type (Table B-15) is a TNC RF connector with an Applied Engineering Product p/n 6001-7051-003.

Table B-15. External antenna connector specifications

Type	Signal Name	Dir	Details
TNC	ANT_IN	I	RF input from LNA, 100 mA at 5.0 volts DC output

EVENT and 1PPS Connectors (Optional)

The EVENT and 1PPS connectors are coaxial female receptacles of BNC series, Kings Electronics part number KC-79-108. These connectors are optional.

Notes:

APPENDIX

C

Safety Warnings

General Warnings

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

WARNING: **The Maxor GGDT is designed for measuring and measuring related uses (i.e., measuring coordinates, distances, angles and depths, and recording such measurements). This product should never be used:**

– **Without the user thoroughly understanding this manual.**

– **After disabling safety systems or altering the product.**

– **With unauthorized accessories.**

– **Without proper safeguards at the measuring site.**

– **Contrary to applicable laws, rules, and regulations.**

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

Internal Battery Pack Warnings

DANGER: NEVER ATTEMPT TO OPEN THE MAXOR GGDT CASING OR REPLACE THE 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: HIGH TEMPERATURE MAY CAUSE FIRE. DO NOT COVER THE CHARGER WHILE IT IS CHARGING.

WARNING: Tampering with the internal batteries by end users or non-factory authorized technicians will void the receiver's warranty.

– Do not attempt to open the battery pack or replace it.

– Do not disassemble the battery pack.

– Do not charge in conditions different than specified.

– Do not use other than the specified battery charger.

– Do not short circuit.

– Do not crush or modify.

Usage Warnings

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

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

CAUTION: *The owner should periodically test this product to ensure it provides accurate measurements.*

CAUTION: **Inform JNS immediately if this product does not function properly.**

CAUTION: **Only allow authorized JNS warranty service centers to service or repair this product.**

Notes:

APPENDIX

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UHF Radio Usage

Notice: *Many countries require a license for radio users (such as the United States). Be sure you comply with all local laws while operating a UHF radio.*

Working in RTK mode has made UHF the most popular choice for communications between Base and Rover receivers. The user should know the strengths and weaknesses of this technology to get the best use out of your Maxor GGDT system.

The quality and strength on the UHF signals translates into the range of your UHF communications. The following concepts will help you get the most out of your UHF based communication systems:

1. Your system's range will greatly depend on the local conditions.

Topography, local communications and even meteorological conditions play a major role in the possible range of your RTK communications. A 35 Watt base radio will allow your Maxor GGDT system to reach distances of up to 12 miles using the standard antenna, depending on local conditions. Distances in the order of 4 to 7 miles (6 to 11 km) can be easily reached.

Tip: Use a scanner to find clear channels for communication.

2. Your system's range will increase by adjusting the antenna of your Base station in one of the following ways.

- Ensure the Base radio has a fully charged battery.

- Use directional antennas and/or repeaters to increase your system's range. Directional antennas concentrate the signal power within a more narrow direction, significantly increasing the range of your system.

- Check out the JNS accessory line for various items to elevate your Base radio.

APPENDIX

E

Warranty Terms

JNS electronic positioning 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 JNS' Authorized Dealers[1].

During the warranty period, JNS 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 JNS 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 JNS 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 battery, charger, or cable is 90 days.

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www.javad.com

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