GNSS receiver

G3100-R2

INSTRUCTION MANUAL

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PENTAX
Ahead of Vision

Before using this product, be sure that you have thoroughly read and understood this instruction manual to ensure proper operation. After reading this manual, be sure to keep in a convenient place for easy reference.

Exemption clause

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2) TIA shall not be liable for changes or disappearance of data, loss of company profit or interruption of company operation incurred by the use of this product or malfunction of it.
3) TIA shall not be liable for damage caused by usage not explained in the instruction manual.
4) TIA shall not be liable for damage to this product caused by other equipment connected to this product.

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1. Introduction

1.1. User Notice

This section provides information regarding CE, Warranty and Customer Service with Support. All specifications are typical and subject to change without prior notice. TI Asahi reserves the right for improvements and changes to this document, products and services without notice or obligation.

1.1.1. CE Mark

The G3100 carries the CE mark, which indicates compliance with the Electromagnetic Compatibility (EMC) directive and the Low Voltage Directive (LVD) of the European Union (EU).

1.1.2. Warranty

TI Asahi provides a 2-year warranty for the G3100 receiver, free from defects in materials and workmanship, from date of sale on the invoice of the original buyer. Li-ion batteries carry a 6-month warranty. A 90-day warranty is provided for the cables and other accessories. Firmware upgrades are free for life.

The warranty does not cover:

- Defects due to accidents, abuse, misuse, negligence, abnormal use or any other non-recommended use.
- Defects due to environmental conditions that do not conform to G3100 specifications
- Defects due to improper installation or operating procedures
- Defects due to modifications, alterations, or changes not made in accordance with the G3100 User Manual and other technical documentation or directly authorized by PENTAX
- Normal wear and tear use
- Shipping damage
- 3rd-party software included with the product, other than the warranty of the original manufacturer to the extent the manufacturer permits

!	*Warranty is void if the G3100 has been tampered with or opened.*

1.1.3. Customer Service and Support

Contact your PENTAX dealer for first-line support. Further problems or questions, please contact TI Asahi support.

support_service@tipentax.cn

1.2. Foreword

Congratulations on purchasing the G3100. The G3100 is a high precision GNSS satellite receiver with integrated state-of-the-art wireless communications specifically designed for the Surveying market. This G3100 User Manual contains important reference information to assist you with using your new receiver.

1.2.1. Related Software

- MicroSurvey FIELDGenius [1]
- Carlson SurvCE [1]
- Septentrio RxControl (contained in attached CD)

[1] Please ask each maker about the contents of software.

1.2.2. Revision History

Rev 1.00 (December 2011) Initial Release

2. G3100 Overview

2.1. G3100 Key Features

The G3100 is an all-in-one, cable free solution for your Surveying needs. It's a simple and easy to use GNSS surveying product, which provides the following features:

- 136 Channel AsteRx2e GNSS receiver, with L1/L2/L2C GPS, GLONASS and SBAS.
- Bluetooth.
- Internal GSM or CDMA Modem to communicate with RTK Networks.
- Internal digital GPS Radio to receive corrections.
- Two (2) Lithium-Ion Batteries for up to 10 hours of use.
- Easy-access removable SIM card for cellular service. (SIM card not Included)
- Easy-access removable 2GB SD Card for internal data logging.

2.1.1. Navigation Accuracy

Navigation Performance	Horizontal (m)	Vertical (m)
Standalone (Autonomous)	1.3	1.9
SBAS (WAAS, EGNOS, MSAS)	0.6	0.8
DGPS (RTCM1,3 / 9,3)	0.5	0.9
RTK	0.01 + 1 ppm	0.02 + 1 ppm

Table 1: Navigation Accuracy

2.1.2. G3100 Ease of Use

Figure 1: G3100, Front View

Figure 2: G3100, Rear View

The rear view of the G3100 shows the door to access the SD card and SIM card. GNSS raw data can be saved to the SD Card, and the SIM card allows cellular service with the internal GSM modem.

The ports and the product label can be seen on the underside of the G3100. There are 3 ports: two serial ports and one external power input port. Also located on the base of the G3100 is a TNC connector for a GPS antenna, which is utilized by the internal radio. **ALWAYS connect a GPS antenna before powering ON the G3100.** The threaded connector in the middle is a standard 5/8òconnector for mounting onto survey poles or accessories.

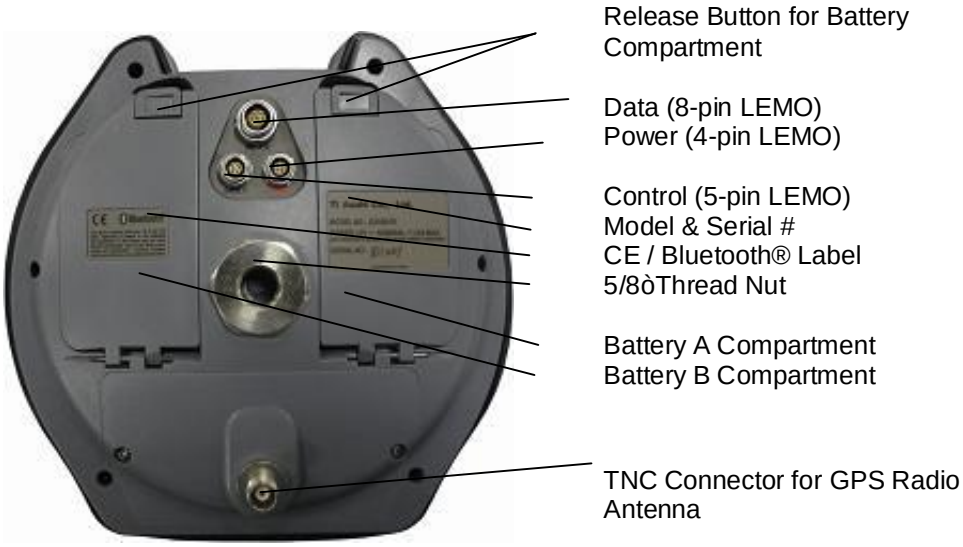


Figure 3: G3100, Bottom View

2.1.3. Shipping Case Contents

Table 2: Shipping Contents

G3100

GPS Radio Antenna

CA25 2GB SD Card

SIM Card Holder**

Getac PS-535*

(2) BP07 Lithium-ion Batteries

BC05 Battery Charger

AC05 AC Adapter

MT02 Adapter

GC17 Power Cable; unterminated *

GC15 Controller Cable*

GC16 Data Cable*

- Optional Items

*** - SIM Card not included*

A full G3100 system consists of the following items:

Items	What to use it for
GPS Radio antenna	A GPS Radio Antenna should be connected to the G3100's TNC connector **before** powering ON
Lithium-ion Battery	Provides internal power to the G3100
Battery Charger	Charge the lithium-ion batteries
Handheld Controller Device	Configure and control the G3100
Controller Cable	RS232/Serial connectivity to handheld controller or computer. [Required when upgrading firmware]
Data Cable	Communication to devices such as external radios or modems
Power Cable	Provide 9-15 VDC external power with use of battery or power supply

Preinstalled Items	What to use it for
SD Card	2GB memory card for internal data logging
SIM Card Holder	A secure GSM SIM card receptacle

2.1.4. Using the G3100

For problem free operation, the user should read this G3100 User Manual thoroughly before first use of the G3100.

2.1.5. G3100 Front Panel

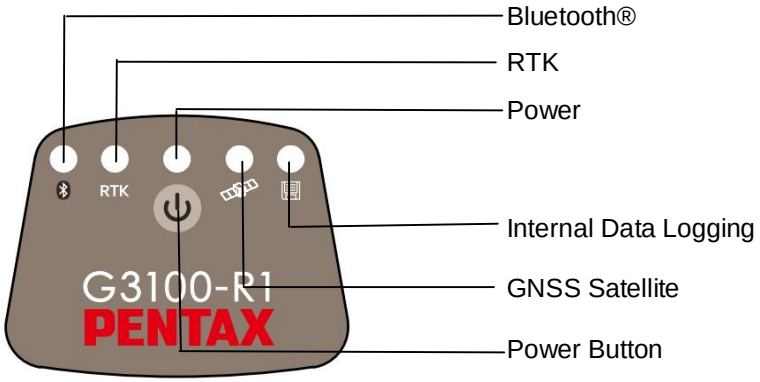


Figure 4: G3100 Front Panel Label

2.1.6. Front Panel Description

Table 3: LED Operation

LED	ICON	STATUS
BLUE		ON: Established device Communication OFF: Idle for device bonding
ORANGE	RTK	ON (Solid): Transmitting RTK corrections ON (Flashing): Receiving RTK corrections OFF: No RTK corrections
RED		ON: Receiver is Powered ON OFF: Receiver is Powered OFF
GREEN		Fast & Continuous (10 times per sec.) 0 Satellites Blinks 1 time, then pauses 1,2 Satellites Blinks 2 times, then pauses 3,4 Satellites Blinks 3 times, then pauses 5,6 Satellites Blinks 4 times, then pauses 7,8 Satellites Blinks 5 times, then pauses 9+ Satellites
RED		Internal SD card Data Logging On

2.1.7. Power Button

The power button is located on the front panel, and has the primary function for turning the G3100 ON or OFF. Secondary functions are for data logging On/Off, soft and hard receiver reboot/reset. In a

soft reboot the receiver resets the firmware, while retaining the current configurations. In a hard reboot the G3100 will recall the receiver's boot configuration file (default reboot).

Table 4: Power Button Operations

What to do	
ON	Press ⏻ and release, RED LED turns ON
OFF	Press ⏻ and hold for 4 seconds and release or until power LED turns OFF
Data Logging ON/OFF	Press ⏻ twice < 1 second apart and Data Logging LED turns ON/OFF
Soft Reboot	Press ⏻ three times < 1 second apart and Soft Reboot will occur
Hard Reboot	Press ⏻ four times < 1 second apart and Hard Reboot will occur

2.1.8. Ports

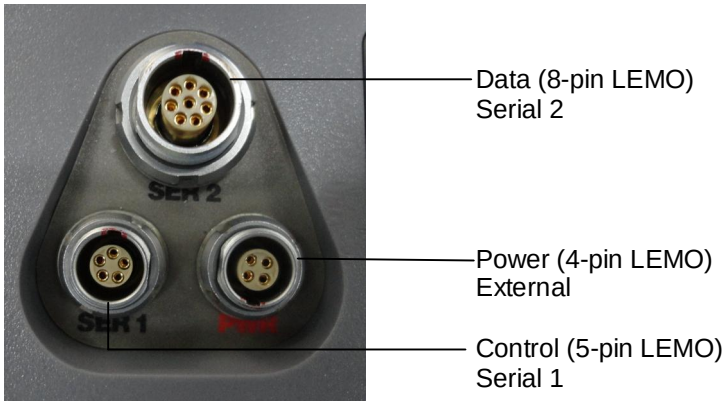


Figure 5: Ports Description

Table 5: Port Descriptions

LEMO	Description	What to use it for
8-pin	Data	External Radio
5-pin	Control	Controller or Computer
4-pin	Power	External Power

2.1.9. Power Input

The external power input is via the 4-pin LEMO connector. The specifications are:
Power Consumption: 3.6W Typical
External Power: +9VDC to +15VDC
Current: 300mA @ 12V DC Nominal

Table 6: Power Cable Description

Wire Color	Function
RED	Power (+)
BLACK	Ground (-)
GREEN	Not Used
WHITE	Not Used

2.1.10. SIM Card

Figure 6: SIM Card & SD Card Compartment

2.1.10.1. Purchasing a SIM Card w/ plan

- Cellular service not included and is the user's responsibility to purchase and activate
  - Choose a GSM/GPRS Cellular service provider
  - Call or visit the carrier's website to purchase a SIM Card and activate a new line of service with data plan
  - Choose a data plan that suits your needs

2.1.10.2. Installing SIM Card

CAUTION	***Turn Off G3100 to install or remove SIM card. Damage to SIM card may occur if installed or ejected with power ON.***

To Install/Remove SIM Card:

- Unlock SIM & SD Card compartment by turning lock groove horizontal
- Open SIM & SD Card compartment
- Push the yellow SIM Card holder eject button to release SIM Holder
- Pull out SIM Holder
- Place SIM Card in SIM Card Holder
- Hold the SIM Card in holder upside down
- Using the guide, slide SIM Card Holder in the slot. The eject button will pop out.

2.1.11. SD Card

The G3100 comes pre-installed with a 2GB SD Card for internal data logging. When using with G3100 for data logging, it will record data in SBF (Septentrio Binary Format), which can be converted into RINEX format for Post Processing.

CAUTION	***Handle the SD Card with care. When not in use, leave it inside the G3100 or place it in SD Card Holder for transportation or storage.***

A 2GB SD Card has capacity of ~8.8 days at 1Hz data rate. Memory is used at 9.4 MB/hr when logging default data at 1Hz.

File Information:
Format: Septentrio Binary Format (SBF)
Size: Up to 72kB per second

CAUTION	***Turn OFF the G3100 to install or remove SD card. Data loss and corruption may occur if SD Card is removed while G3100 is ON.***

2.1.11.1. Removing SD Card

- Unlock SIM & SD Card compartment on the back of the G3100
- Open SIM & SD Card compartment
- Push SD Card to release locking mechanism
- Pull SD Card out of the slot

2.1.11.2. Installing SD Card

- Unlock SIM & SD Card compartment on the back of the G3100
- Open SIM & SD Card compartment
- Insert SD Card using the guide
- Push SD Card into the slot until it locks into place

2.1.11.3. Formatting SD Card

Use Windows OS computer to format the SD Card prior to use

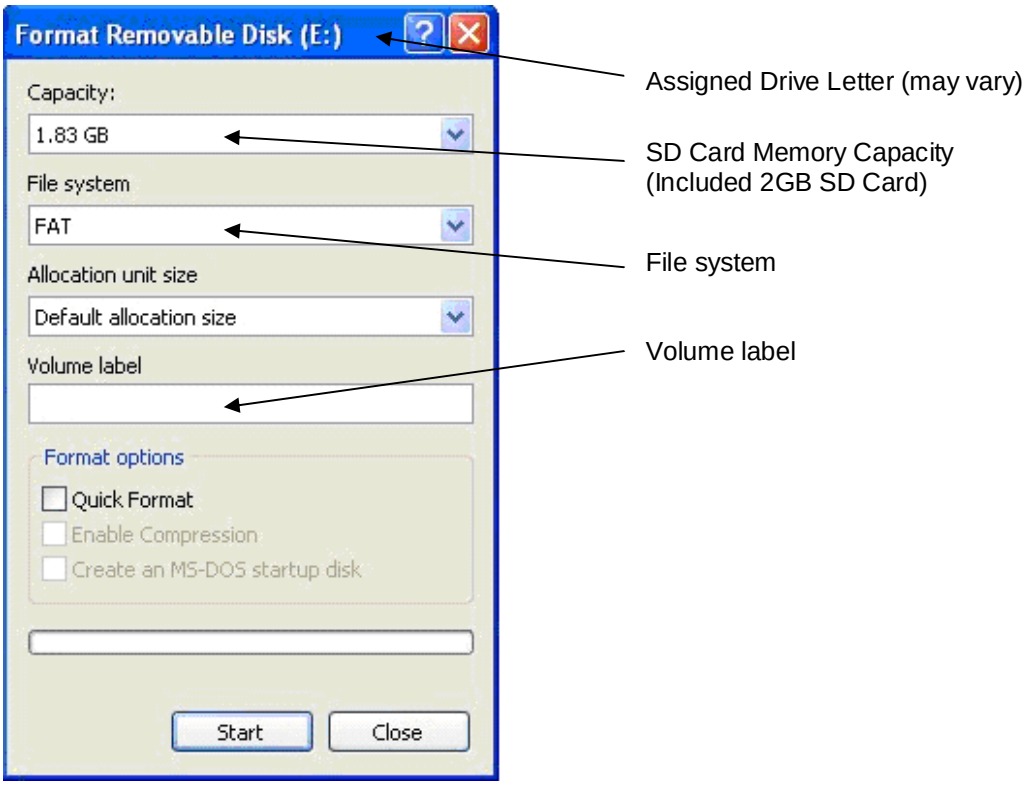


Figure 7: SD Card Formatting

- Slide SD Card into SD Card reader
- Windows will recognize SD Card as removable device and assign a drive letter
- Right click on drive letter, select Format
  - Select **FAT** as File System
  - Verify the Quick Format box is unchecked to perform a full format
- Click Start to format the SD Card
  - When done, make sure to ñSafely Remove Hardwareò as USB Mass Storage Device prior to physically removing the SD Card from computer.

2.1.11.4. Known Compatible SD Cards

!	Not all removable SD cards are guaranteed to be compatible with the G3100. *The following SD cards have been successfully tested for G3100 compatibility.*

Table 7: SD Card Compatibility

Memory Size	Description	Part #	Approximate Capacity
256MB	SanDisk ULTRA II	SDSDH-256-901	~27 hrs / ~1.1 days
1GB	SanDisk Standard	SDSDB-1024-A11	~106 hrs / ~4.4 days
1GB	SanDisk Standard	SDSDB-2048-A11	~106 hrs / ~4.4 days
1GB	Integral		~106 hrs / ~4.4 days
1GB	SanDisk Ultra® II	SDSDH-1024-901	~106 hrs / ~4.4 days
2GB	SanDisk Standard		~212 hrs / ~8.8 days
2GB	SanDisk Extreme® III	SDSDX3-2048-901	~212 hrs / ~8.8 days
2GB	Kingston Ultimate (120x)		~212 hrs / ~8.8 days

- High capacity, such as SDHC, are not supported
- SD Cards with slow speed may experience slow transfer time when loading files. Slow transfer times can also occur with SD Cards that have many files in them.
- While any compatible SD cards can be used with the G3100, using the SD Card, which came with unit, is highly recommended.

What you need to know	
Can I use different SD cards?	It is highly recommended to only use compatible SD cards.
Unable to read or write data in SD card	Use compatible SD Cards. Make sure to correctly format the SD Card prior to use.
I can't find the data logged	Data log files are located in My Computer/SD Card (selected by driver letter)/SSN folder/SSRC1 folder/.SBF file

3. G3100 Device & Specifications

3.1. Bluetooth

Specification

- CLASS 1 W/ANT HCI FW
- Frequency 2402MHz ～ 2480MHz
- version 2.0

3.2. Internal GPS Radio (Receive only)

Specification

- Operating Frequency: 1.5GHz
-
- Gain: 0dBm

What you need to know	
How do I configure my GPS Radio?	Configuration is done via data collector software
My rover is not receiving GPS corrections.	Make sure that Base Station receiver is receiving more than 5 Satellites. Check Rover Configuration is set to use the same GPS message type as Base. Check Base Station and Rover use the same GPS Radio Channel and settings.

3.3. GSM Modem

Specification

- Quad Band GSM/GPRS Class 10 Radio Device for true Global usage
- GSM 850/900MHz power class 4 (32dBm)
- GSM 1800/1900MHz power class 1 (30dBm)

3.3.1. Communication Protocol

- NTRIP
- TCP/IP
- UDP/IP
- Direct Dial

What you need to know	
What's my country operating frequency?	900/1800MHz within North America (USA, Canada) 850/1900MHz International (Europe, Asia, Latin America)
GSM Modem	Make sure that SIM Card is activated for a data plan
Will the GSM work with any cellular provider?	Only cellular providers with GSM/GPRS capability
Do I need to unlock my GSM modem?	No
Unable to connect to RTK Network	Verify IP / Port / Username / Password

3.4. Battery & Charger

The G3100 comes with two lithium-ion rechargeable batteries with a typical operating time between 8 to 10 hours.

Specifications

Battery Type: Lithium ION
Voltage: +6.2VDC to 8.4VDC
Capacity: 2500mAH

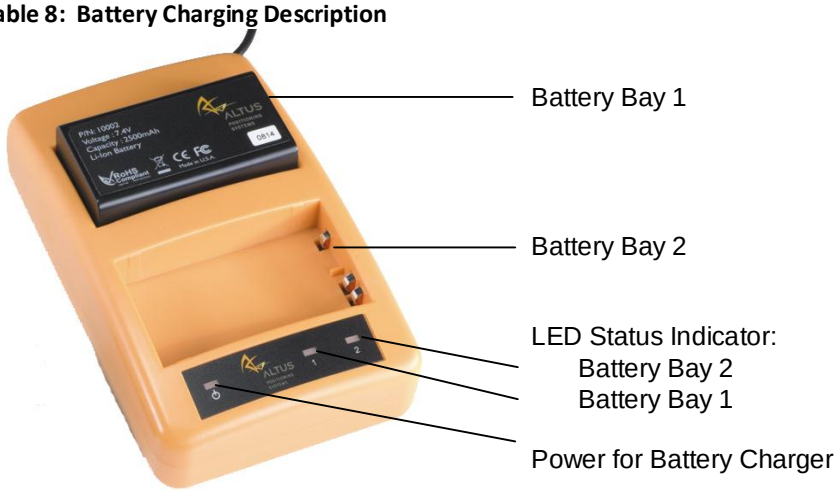
3.4.1. Battery Charger

AC Adapter

Input: 100-240VAC ~50/60Hz 1.7A
Output: 19.0VDC @ 3.16A

3.4.2. Charging Battery

Table 8: Battery Charging Description



- Plug the AC cord to AC Adapter
- Plug in AC Adapter to Battery Charger
- Plug the AC wall battery charger into the wall socket and power LED turns ON
- Place your battery in charger bay correctly
- Wait until battery LED indicator turns GREEN for a full charge

LED	Description
NONE	Battery is not seated correctly
GREEN	Battery is fully charged
RED	Battery is being re-charged
Flashing RED	Charge error or bad battery

!	*A fully discharged battery will take approximately 2 hours to fully charge and may not light the LED status indicator when first mounted.*

3.4.3. G3100 Battery Installation and Replacement

CAUTION	***Removing the battery in use will cause the G3100 to restart or turn OFF. Use the battery status indicator in data collection software to confirm which battery is "in use" before hot-swapping batteries.***

- Press button to open battery door compartment
- Use the guide to slide the battery into the G3100
- Swivel the battery door compartment up and push from the bottom until it latches completely

What you need to know	
How long can each battery last when using G3100?	A battery can last 4 - 5 hours
Will the G3100 swap to a fully charged battery if one discharges?	Yes. No user action is required
Can I remove one of the batteries while the G3100 is in use?	Before battery removal, use data collection software to check which battery is in use. Remove the battery not in use
How long does it take to charge a battery?	It takes 2 hours to fully charge a battery
How do I know if battery is fully charged?	Battery bay LED turns Green when fully charged

!	*Contact a Recycling Center to ensure proper disposal of lithium-ion Batteries.*

3.5. GNSS Antenna Offsets

3.5.1. Calibration

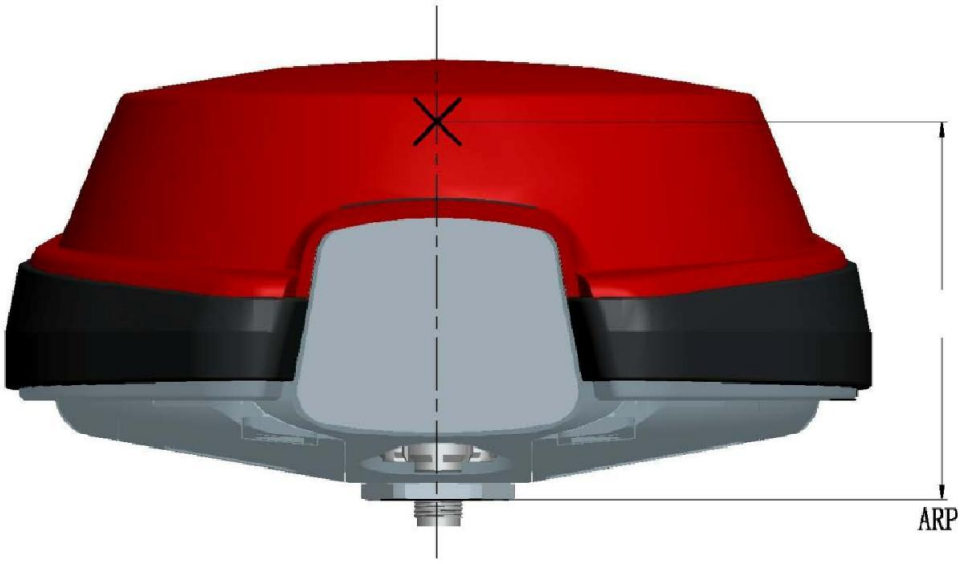


Figure 8: Phase Center Location

Vertical Offsets	
L1 Offset (mm)	101
L2 Offset (mm)	92.5

3.5.2. Slant Height Dimensions

Height of ARP =√ 【(SLANT HEIGHT) ˆ 2 — 0.0959 ˆ 2】 — 0.225

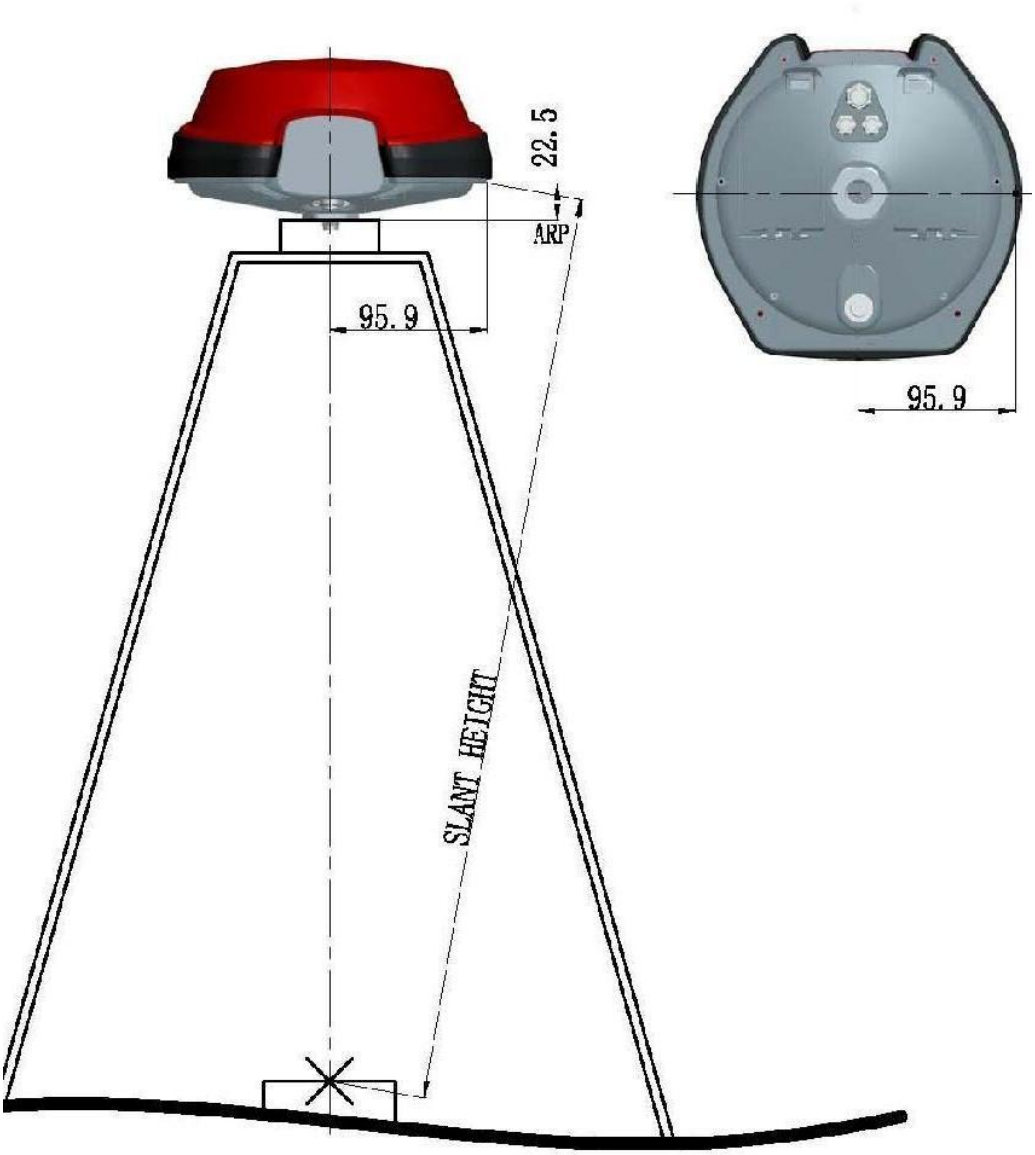


Figure 9: Slant Height Dimensions

4. Factory AsteRx2e receiver Settings

The instructions below should be used to reconfigure an G3100 back to PENTAX Default. This is the **#1 method for resolving problems** with the G3100ís operation, and should always be executed before contacting PENTAX support.

Reconfiguring the G3100 back to PENTAX Default sets the unit as a **Rover**, Message Type: **RTCM v3.1**, Logged Data Type: **SBF**. The two ways of accomplishing factory settings are:

1) Upload appropriate[1] PENTAX default script using RxControl
2) Typing the commands in line-by-line.

[1] The G3100 model is determined by the serial number found on the bottom of the receiver.

4.1. Uploading a script/text file using RxControl

A text file with factory reset commands is included on the CD shipped with each new G3100 unit. The file can also be downloaded from the PENTAX website:

- G3100 (2XXXX): **G3100 Default Config.txt**

4.1.1. From the RxControl File menu, select ñUpload scriptò

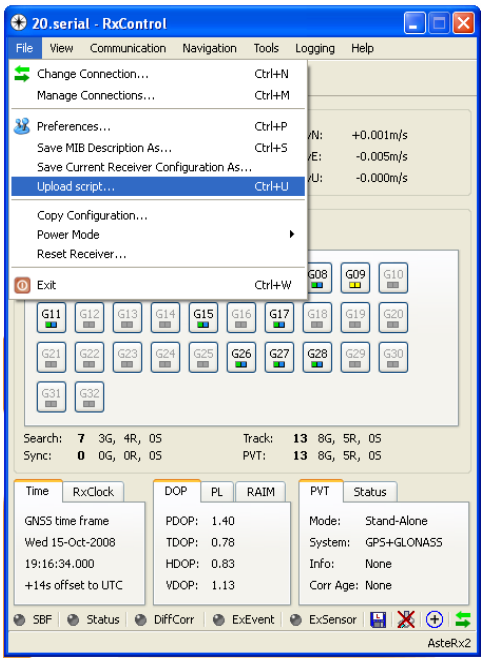


Figure 10: Upload Script

4.1.2. Select the prepared text file from the PC and click Open.

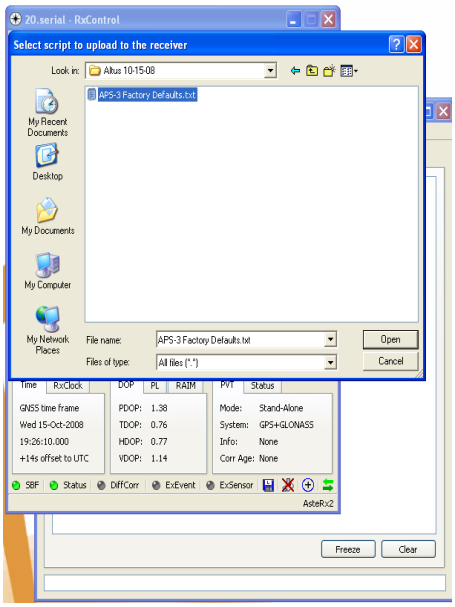


Figure 11: Script File

4.1.3.The G3100 has been successfully reconfigured to the PENTAX Default when the commands appear in the bottom left corner of the main RxControl window. The commands and return messages will populate the expert console.

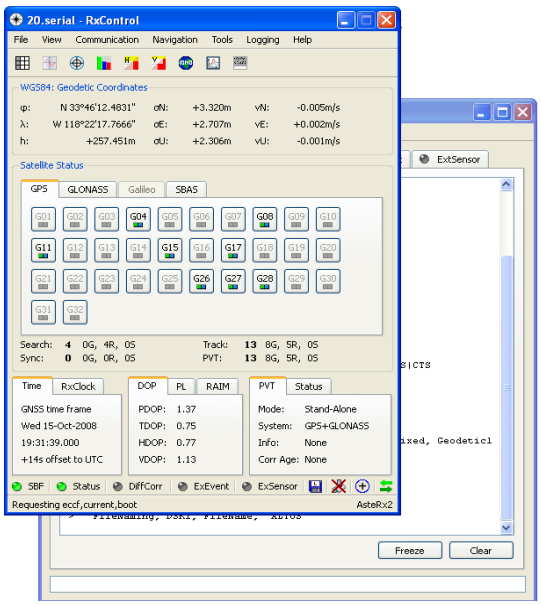


Figure 12: Script Loading

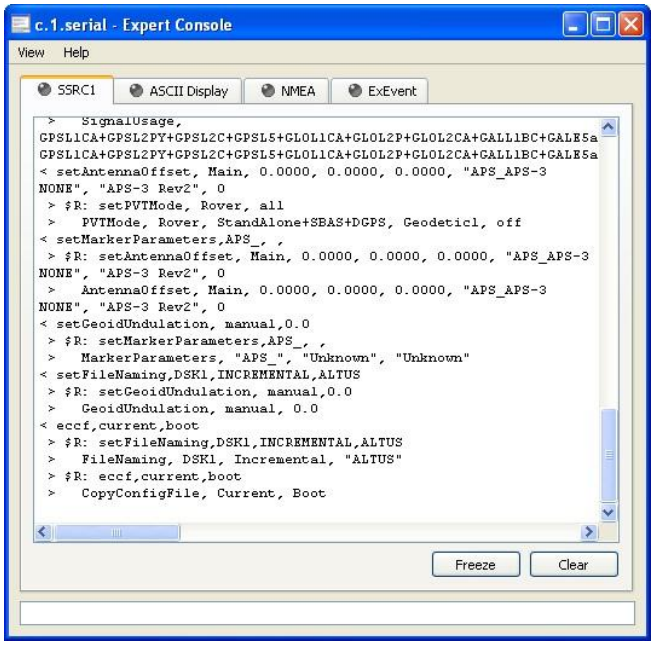


Figure 13: Script Commands and Responses

4.2. Line-by-line entry

4.2.1.Connect the G3100 to the PC via the serial cable and start RxControl.

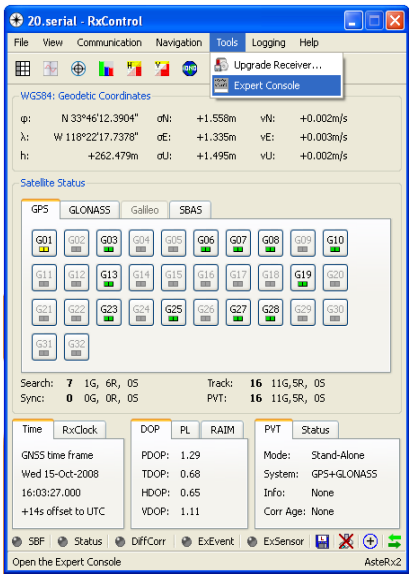


Figure 14: RxControl Display

4.2.2.In the Tools tab select the Expert Console Menu and the Expert Console window will open.

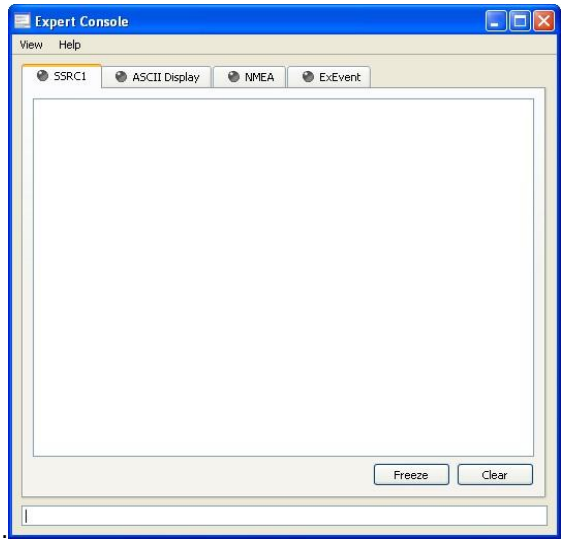


Figure 15: Expert Console

4.2.3.Select the SSRC1 tab and type the first command into the text box. **sgpf, GP1, Output,none, LevelLow**, then hit the Enter Key.

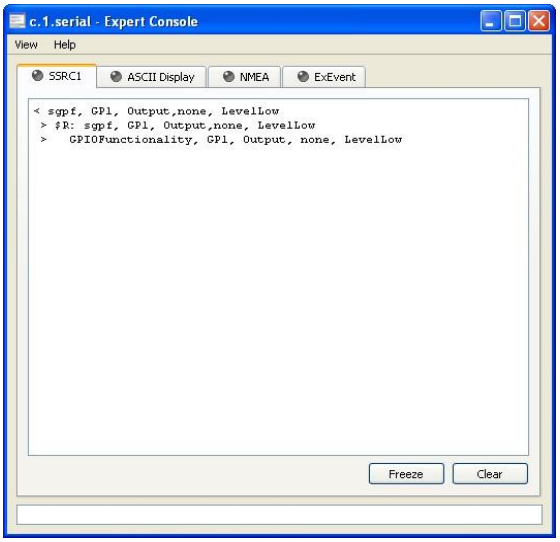


Figure 16: Expert Console SSRC1 Display

4.2.4.The command will populate the screen (< ñinputò) followed by a return message (> ñoutputò) indicating whether the command was accepted/valid ($R) or an invalid command ($R?).

!	*For more information concerning RxControl, Expert Console, and command messages refer to the Septentrio RxControl Manual on the PENTAX CD*

4.2.5. Continue entering the commands into the text box, when completed the G3100that is connected has been reconfigured to the PENTAX Default.

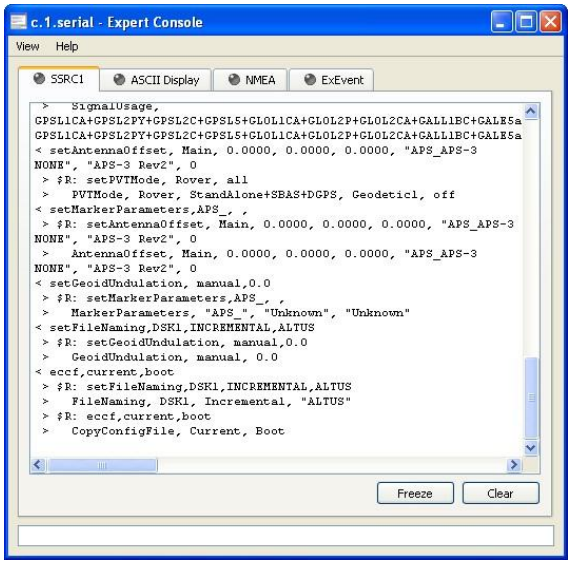


Figure 17: Commands & Responses

Commands for Manual entry:

```
sgpf, GP1, Output,none, LevelLow
sgpf, GP2, Output,none, LevelLow
sgpf, GP3, Output,none, LevelHigh
setDataInOut, COM3, CMD,SBF+NMEA
setDataInOut, COM2, RTCMv3,SBF+NMEA
setDataInOut, COM1, CMD ,SBF
setDataInOut, DSK1, CMD,SBF+NMEA
setCOMSettings, COM1, baud2400,BITS8,NO,BIT1,NONE
setCOMSettings, COM2,baud115200,BITS8,NO,BIT1, none  (or RTS|CTS for V2)*
setCOMSettings, COM3, baud115200 ,BITS8 ,NO ,BIT1 , RTS|CTS
sdcu,lowlatency,20,auto,0
sem,PVT,10
sst,all
snt,all
spm,rover,all,geodetic1
srd,high
ssu,GPS+GLONASS+GALILEO
setFixReliability, RTK, 0.2, 4.4
snu,all,all
setPVTMode, Rover, all
setAntennaOffset, Main, 0.0000, 0.0000, 0.0000, "APS_G3100       NONE", "G3100", 0
setMarkerParameters,APS_, ,
setGeoidUndulation, manual,0.0
setFileNaming,DSK1,Incremental,PENTAX
eccf,current,boot
```

5. Frequently Asked Questions

5.1. **Question:** Where is the Antenna Reference Point (ARP) located on the G3100?

Answer: *The NGS ARP is the bottom of the bolt on the underside of the G3100. For more information see section 3.4 GNSS Antenna Offsets:*

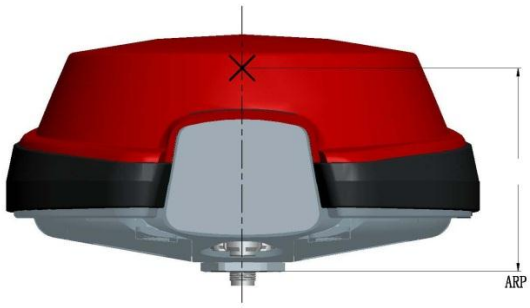


Figure 18: ARP Diagram

5.2. **Question:** *Does the G3100 L1 vertical offset need to be added to the measured height to the bolt?*

Answer: *No. Data collection software adds the vertical offset automatically when the appropriate antenna type is selected.*

5.3. **Question**: *How do I know which battery I can remove without having operations interrupted?*

Answer: *Use the battery status indicator in data collection software to confirm which battery is "in use" before hot-swapping batteries.*

5.4. **Question**: *How do I configure a unit back to the PENTAX factory defaults?*

Answer: *Located on the PENTAX CD there is a text file called "G3100_Default_Config.txt" Follow the Factory AsteRx2/AsteRx2e receiver Settings in section 3 of this manual to upload that file into the G3100.*

5.5. **Question**: What are the correct specifications for a GSM SIM card in order for it to operate with the G3100*?*
Answer: *There are three key items that must be specified to get the correct GSM SIM card and service from your cellular service provider;*

GSM SIM card (not UMTS)
Data service only
No IMEI number (i.e. no associated hardware/handset)

SIM cards that had one or more of the above 3 features incorrect did not work. In the USA, AT&T and T-Mobile provide GSM SIM cards that have been used successfully with the G3100.

5.6. **Question:** *Why am I not receiving GLONASS corrections?*
Answer: *You must first verify that the base station transmits GLONASS corrections. The G3100 first utilizes GPS satellites to get to RTK Fixed status. Then if more than 2 acceptable GLONASS satellites are available, RTK Fixed GPS+GLO RTK status is achieved.*

5.7. **Question:** *Why is my radio not receiving RTK corrections?*
Answer: *Check Base Station Configuration. Make sure that Base Station receiver is set up and using more than 5 common Satellites. Check Rover Configuration; make sure that it is configured to use the correct RTK format corrections. Both Base Station and Rover must use the same UHF Radio Channel and same correction format.*

5.8. **Question:** *How do I know which message type to select RTCM V2.3, RTCM V3.0, CMR, or CMR+?*
Answer: *Base stations transmit different messages types. It is important to confirm what message type(s) the base is transmitting so the Rover can be set accordingly.*

5.9. **Question:** *How can I verify the Windows Mobile® version my hand held device is operating on?*
Answer: *In the main view of the controller, select the Start Menu, next click Settings Menu, then select the System tab, lastly select the About icon which will display the Windows Mobile® version.*

5.10. ***Question:*** *I can't connect to the G3100 via Bluetooth®, why not?*
Answer: *Make sure that the serial cable (SER1) is disconnected. The serial cable takes precedence over Bluetooth® connectivity, and because of this Bluetooth® is unable to connect when the cable is attached. Also verify the Bluetooth® is ON/Visible on the controller. Lastly, uploading the PENTAX default script (using RxControl) will reset all COM ports and often fixes Bluetooth® connectivity.*

5.11. **Question**: *I noticed that the units get extremely hot at the top, what effect might this have on any operations?*
Answer: *The G3100 is designed to operate reliably from -20 to +65 °C. Like most manufacturers, we test beyond that limit to ensure we can operate at the published extremes.*

5.12. **Question:** *How do I update the G3100 to the latest firmware version?*
Answer: *Get the latest firmware release from TIAsahi. Connect the 5 pin controller serial cable (SER1) to the bottom of the G3100, connecting the DB9 side of the cable to a PC's RS232 serial port. Power on the G3100 and open RxControl. Once connected to the G3100 click the tools tab and select upgrade receiver. Click Ok to close connection. Then click "Next" in the RxControl Upgrade Wizard. Next select the COM port used for the connection between the G3100 and computer followed by clicking "Next". Locate the appropriate SUF file, and click "Next". Then select "Upgrade", and proceed with any other on screen directions. Once completed, firmware version can be verified in the "Help" tab of RxControl in the "Receiver Identification" menu. It can also be checked using SurvCE and FIELDGenius.*

5.13. **Question:** *My receiver will not respond to commands, why not?*
Answer: *A setting in the G3100 may have been incorrectly set causing a disruption in communication. Power the unit off, remove all power sources, turn the unit back on. After the unit boots, perform a hard reset and upload the default script.*

If you are using a USB-Serial adapter, the adapter may not be compatible with the G3100. If possible connect directly to a physical COM port on the PC. Otherwise, adapters using prolific drivers have been found to work more reliably.

5.14. **Question:** *How can I tell which G3100 model I have?*
Answer: *The G3100 model is determined by the G3100 Serial number found on the bottom of the unit.*

5.15. **Question:** *I cannot connect using the GSM modem, why not?*
Answer: *Be sure that you are selecting the G3100 model in your data collection software. Selecting the wrong model version will cause communication issues with the GSM modem.*

*The G3100 GSM modem requires that Flow Control be enabled on the system. If this was previously turned off it will need to be re-set. You can accomplish this by re-uploading the default script to the receiver or by sending the command **SCS,COM2, , , , RTS|CTS** using data collection software or RxControl.*

6. List of Typical GNSS Related Acronyms

APME	A Posteriori Multipath Estimation
ARP	Antenna Reference Point
ASCII	American Standard Code for Information Interchange
CMR	Compact Measurement Record
CPU	Central Processing Unit
CR	Carriage Return
CTS	Clear to Send
DGPS	Differential Global Positioning System
DOP	Dilution of Precision
EGNOS	European Geostationary Navigation Overlay System
ESTB	EGNOS System Test Bed
FPGA	Field Programmable Gate Array
GLONASS	Global Orbiting Navigation Satellite System (Russian alternative for GPS)
GNSS	Global Navigation Satellite System
GPRS	General Packet Radio Service
GPS	Global Position System
GPX	GPS eXchange
GSM	Global System for Mobile communications
GUI	Graphical User Interface
HERL	Horizontal External Reliability Level
HPL	Horizontal Protection Level
IGS	International GNSS Service
LAMBDA	Least-squares Ambiguity Decorrelation Adjustment
LED	Light Emitting Diode
MDB	Minimal Detectable Bias
MOPS	Minimum Operational Performance Standards
MSAS	Multi-functional Satellite Augmentation System
MT	Message Type
NGS	National Geodetic Survey
NMEA	National Marine Electronics Association
OEM	Original Equipment Manufacturer
OTF	On the Fly
PPS	Pulse Per Second
PVT	Position Velocity Time
RAIM	Receiver Autonomous Integrity Monitoring
RINEX	Receiver Independent Exchange Format
ROM	Read Only Memory
RTCA	Radio Technical Commission for Aeronautics
RTCM	Radio Technical Commission for Maritime Services
RTK	Real Time Kinematic
SBAS	Satellite Based Augmentation System
SD	Secure Digital
SDHC	Secure Digital High Capacity
SIM	Subscriber Identity Module
UHF	Ultra high frequency
VRS	Virtual Reference Station
WAAS	Wide Area Augmentation System

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FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio/TV technician for help.

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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

ISO
ISO 9001:2000
ISO 14001:2004

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