

GNSS

G2100

(G2100B,G2100R)

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

- 1) TI Asahi Co.,Ltd. (TIA) shall not be liable for damage caused by Acts of God, fire, alteration or servicing by unauthorized parties, accident, negligence, misuse, abnormal operating conditions.
- 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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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. FCC see manual addendum

The G2100 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 device will receive radio frequency and, if not installed and used in accordance with this instruction manual, may cause harmful interference to radio communications.

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.

The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

1.1.2. CE Mark

The G2100 carries the CE mark, which indicates compliance with the Electromagnetic Compatibility (EMC) directive and the Low Voltage Directive (LVD) of the European Union (EU).

1.1.3. Warranty

TI Asahi provides a 2-year warranty for the G2100B/R 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 G2100 specifications
- Defects due to improper installation or operating procedures
- Defects due to modifications, alterations, or changes not made in accordance with the G2100 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 G2100 has been tampered with or opened.

1.1.4. 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 G2100. The G2100 is a cost effective receiver which is designed for static survey and also it can be used as an RTK base station. This G2100 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]

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

1.2.2. Revision History

Firmware Version 6.210 (September 13, 2012) Initial Release for G2100

2. G2100 Overview

2.1. G2100 Key Features

The G2100 is an cable free solution for your Surveying needs. It's simple and easy to use GNSS surveying product, which provides the following features:

- 120 Channel OEM615 GNSS receiver, with L1/L2/L2C GPS, GLONASS, Galileo (E1) and SBAS.
- Bluetooth.
- Internal GSM/GPRS Modem to communicate with RTK Networks.

- Two (2) Lithium-Ion Batteries for up to 8-10 hours of use.
- Easy-access removable SIM card for cellular service. (SIM card is not Included)
- 4GB internal memory for internal data logging. It is accessible by USB connection.

2.1.1. Navigation Accuracy

Navigation Performance	Horizontal	Vertical
Standalone (Autonomous)	1.2m	N/A
SBAS (WAAS, EGNOS, MSAS)	0.6m	N/A
DGPS	0.4	N/A
RTK	1cm + 1 ppm	2cm + 1 ppm
STATIC	2.5mm + 1 ppm	5mm + 1 ppm

Figure 1: Navigation Accuracy

2.1.2. G2100 Panel Description

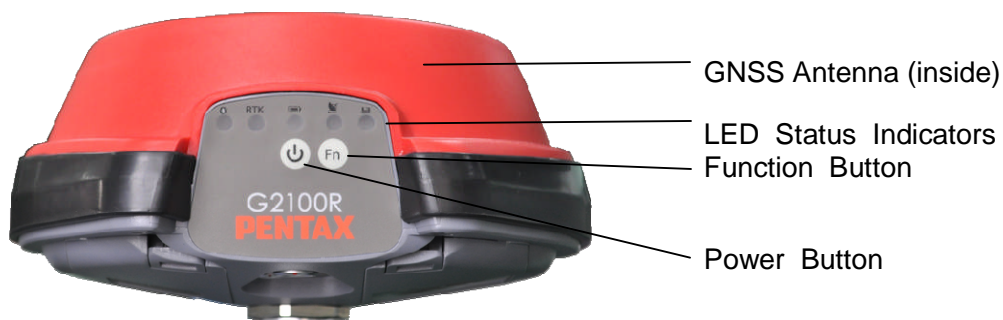


Figure 2: G2100, Front View

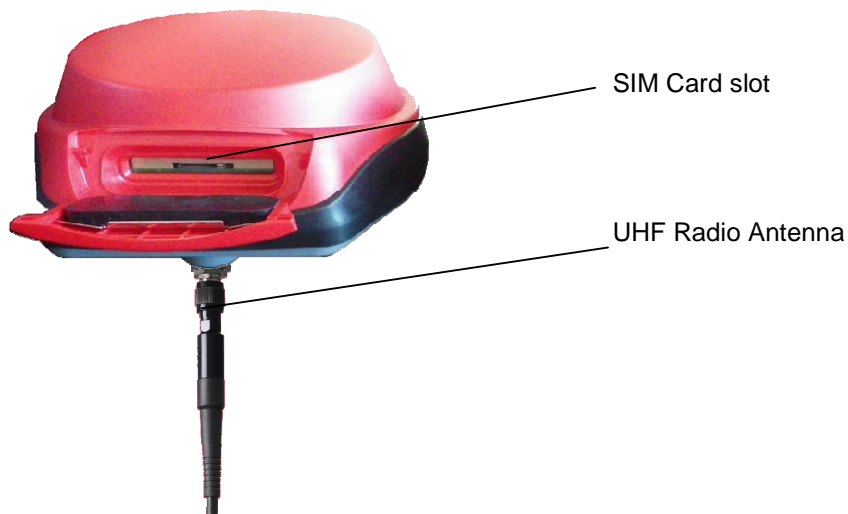


Figure 3: G2100, Rear View

The rear view of the G2100 shows the door to access the SIM card, and the SIM card allows cellular service with the internal GSM modem.

GNSS raw data can be saved as a binary data with the extension of “.TIA” to the internal memory. These saved data can be downloaded by a “Data cable of updating firmware and transferring data”.

The ports and the product label can be seen on the underside of the G2100. There are 2 ports: one serial ports and one external power input port.

The threaded connector in the middle is a standard 5/8” connector for mounting onto survey poles or accessories.

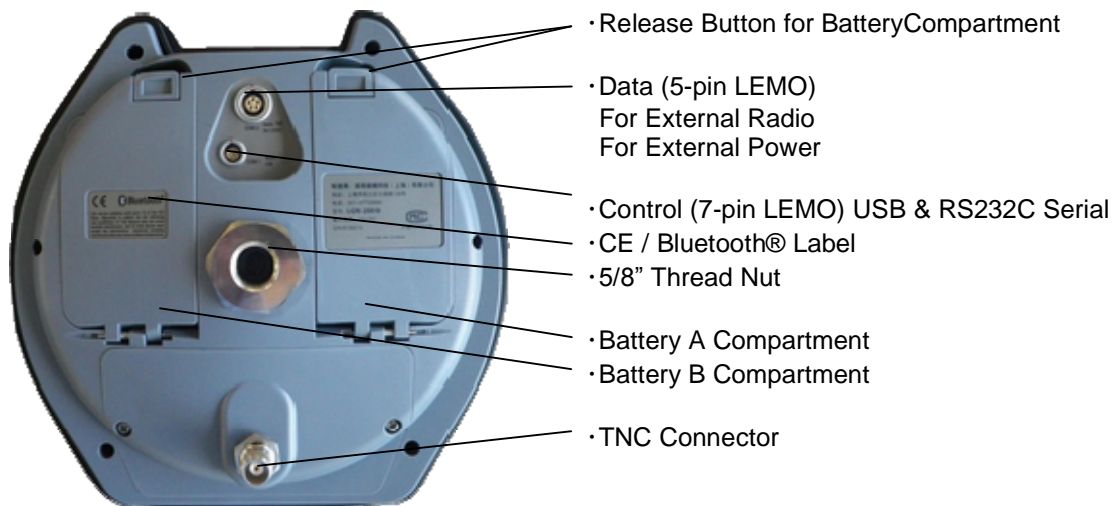


Figure 4: G2100R, Bottom View

2.1.3. Items contained in the carrying case

Table 1: Standard items

		-	
G2100B G2100R	Getac PS-535F*	-	UHF Antenna (G2100R ONLY)
			
BP07 Lithium-ion Batteries x2	BC05 Battery Charger	AC05 AC Adapter	MT02 Adapter
			
Data cable of updating firmware and transferring data for G2100*	Data Cable for External Radio & Power cable for G2100*	Data Cable for External Radio*	Power Cable for Satellite-EASy Pro 35W Radio

*- *Optional Items*

** - *SIM Card is not included*

A full G2100 system consists of the following items:

Items	What to use it for
UHF Radio Antenna (For G2100R only)	A UHF Radio Antenna for receiving RTK correction data.
Lithium-ion Battery	Provides internal power to the G2100
Battery Charger	Charge the lithium-ion batteries
Handheld Controller Device	Configure and control the G2100
Data cable of updating firmware and transferring data for G2100	Lemo 7pin connector : To G2100 COM1 Dsub 9pin RS232/Serial connector: To the handheld controller or the computer. [Required for upgrading firmware]

	USB connector : To the computer for downloading data from the internal memory.
Data Cable for External Radio & Power cable for G2100	Lemo 5pin connector : To G2100 COM2
	Dsub 9pin RS232/Serial connector: To the Data cable.
	Alligator clip type terminal: To the external battery +9...+15 V _{DC} .
Data Cable for External Radio	ODU 8pin connector: To the external radio.
Power Cable for Satellite-EASy Pro 35W Radio	ODU 4pin connector: To the external radio.
	Alligator clip type terminal: To the external power +9...+16 V _{DC} .

2.1.4. Using the G2100

For problem free operation, the user should read this G2100 User Manual thoroughly before first use of the G2100.

2.1.5. G2100 Front Panel

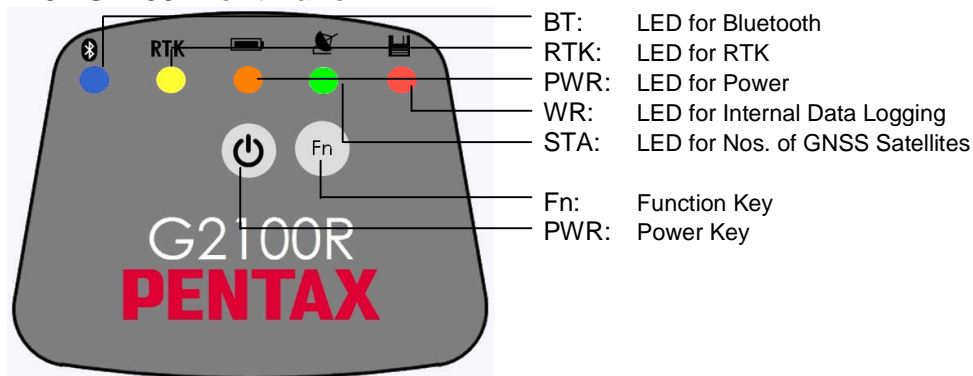








Figure 5: G2100 Front Panel Label

2.1.6. Front Panel Description

Table 2: LED Operation

Mode	Normal mode	Connection mode	Setting mode
Operation to change mode	---	Press Fn key (3Sec)	Press PWR & Fn key at once (3Sec)
Blue	ON: Established device Communication OFF: Idle for device bonding	ON:GSM/GPRS	ON:STATIC
Yellow	ON(Flashing): RTK Base Receiving correction data OFF:No RTK corrections		ON:RTK Base

 Orange		ON: Receiver is Powered ON OFF: Receiver is Powered OFF	ON:External Radio	ON:RTK Rover
 Green		Blinks 1 time , then pauses : 1 Satellites Blinks 2 times, then pauses : 2 Satellites Blinks n times, then pauses : n Satellites	N/A	
 Red		ON(Flashing): Writing data on the internal memory. It blinks 1 time for 512Byte data.		ON:Bluetooth ON This is used for changing Bluetooth ID.
All LED				ON:No meaning

2.1.7. Power Button and Start up procedure







The power button is located on the front panel, and has the primary function for turning the G2100 ON or OFF. Followings are description of start up sequence and how to select device in the connection mode.

1. PWR On: 5 LED will turn ON
2. Firmware initialization will start(takes around 10sec.)
3. PWR LED will be ON
4. Receiver will search satellites: STA LED will be ON

After pressing “Fn” key for 3sec;

5. One of LED among BT(GSM), RTK(Int radio) and PWR(Ext. radio) will be ON
6. Selection can be chaged by pressing Fn key
7. Pressing PWR key can re-start the initialization

Power Button

What to do in the “Normal mode”.	
Power ON	Press  and release, RED LED turns ON
Power OFF	Press  and hold for 5 seconds and release or until power LED turns OFF
What to do in the “Connection mode”.	
Confirm the selection	Press  to confirm the selection among STATIC, RTK Base and RTK Rover.
Change the selection	Press  to change the selection.
What to do in the “Setting mode”.	
Confirm the selection	Press  to confirm the selection.
Change the selection	Press  to change the selection.

2.1.8. Ports

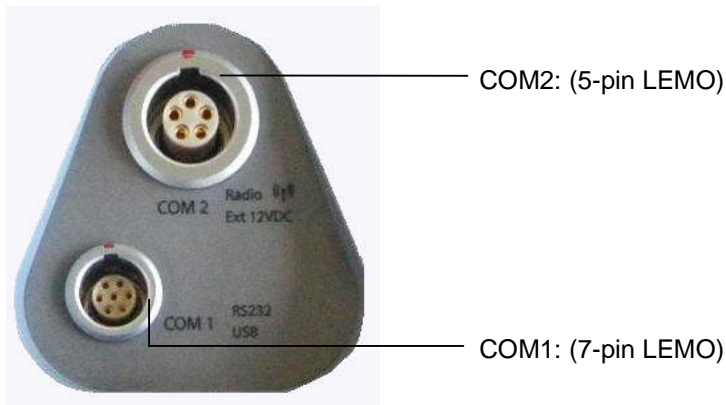


Figure 6: Ports Description

Table 3: Port Descriptions

COM	Type	Description
1	7-pin LEMO	For RS232C
		For USB
2	5-pin LEMO	For External Radio
		For External Power

2.1.9. Power Input

The external power input is via the 5-pin LEMO connector. The specifications are:

Power Consumption: 3.6 W Typical

External Power: +9VDC to +15VDC

Current: 300 mA @ 12V DC Nominal

Table 4: Power Cable Description

Wire Color	Function
RED	Power (+)
BLACK	Ground (-)

2.1.10. SIM Card

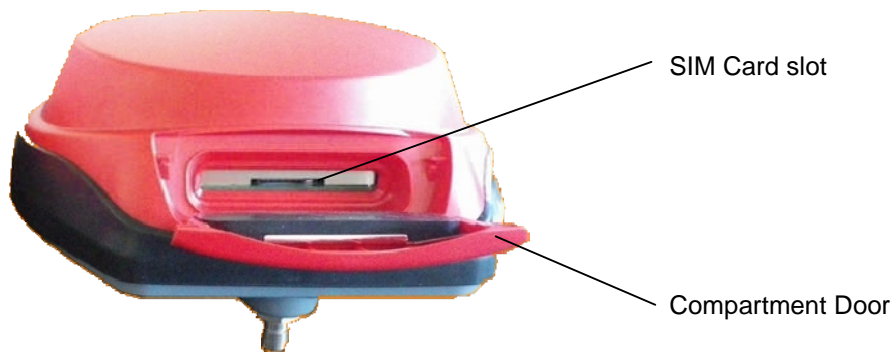



Figure 7: SIM Card Compartment

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

	Turn Off G2100 to install or remove SIM card. Damage to SIM card may occur if installed or ejected with power ON.
---	--

To Install the SIM Card:

- Unlock SIM Card compartment by turning lock groove horizontal
- Open SIM Card compartment door
- Insert the SIM Card into the SIM card slot

To Remove the SIM Card:

- Push the SIM Card to remove it
- The SIM card will pop out from the slot

2.1.11. Internal memory

The G2100 have a 4GB internal memory for data logging. When using with G2100 for data logging, data will be record in a binary file. This file can be converted into RINEX format for Post Processing.

4GB internal memory has capacity of ~ 90 days at 1Hz data rate.
Memory is used at 1.84 MB/hr when logging default data at 1Hz.

File Information

Format: Binary

File name: #####%%%.tia

is the last digit of the receiver serial number.

%%% is the 4digit incremented number.

2.1.12. Connecting USB cable

Connect Dsub 9pin connector of “Data cable of updating firmware and transferring data for G2100” to the PC. (A USB/Serial adapter may be required if the PC does not have a DB9 COM port.) The power of receiver is not required to turn ON when the USB connector (7-pin LEMO) is connected to the receiver. Then connect LEMO 7 pin connector to the COM1 port of G2100B/R receiver in the right direction.

2.1.13. Download data from internal memory

Any special driver is not required. After the connection, the receiver will be recognized and then data in the internal memory can be copied to your PC.

2.1.14. Connection for uploading the firmware.

Connect Dsub 9pin connector of “Data cable of updating firmware and transferring data for G2100” to the PC. For more detail of updating firmware, please refer the service information for corresponding firmware.

A USB/Serial adapter may be required if the PC does not have a DB9 COM port.

*Some USB/Serial adapters are not compatible with the G2100.

USB/Serial adapters with prolific drivers are preferred.*

3. G2100 Device & Specifications

3.1. Bluetooth

Specification

- Class 2 with power control
- W/ANT HCI FW
- Frequency 2400MHz ~ 2483.5MHz
- Bluetooth specification V2.0+EDR

3.2. GSM Modem

Specification

- Quad Band GSM/GPRS Class 10 Radio Device for true Global usage
- GSM 850/900MHz: power class 4 (33dBm)
- GSM 1800/1900MHz: power class 1 (30dBm)

3.2.1. Communication Protocol

- NTRIP
- TCP/IP
- UDP/IP

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

3.3. Battery & Charger

The G2100 comes with two lithium-ion rechargeable batteries with a typical operating time between 8 to 10 hours.

Specifications of Battery

- Battery Type: Lithium Ion
- Voltage: +7.2VDC
- Capacity: 2400mAH

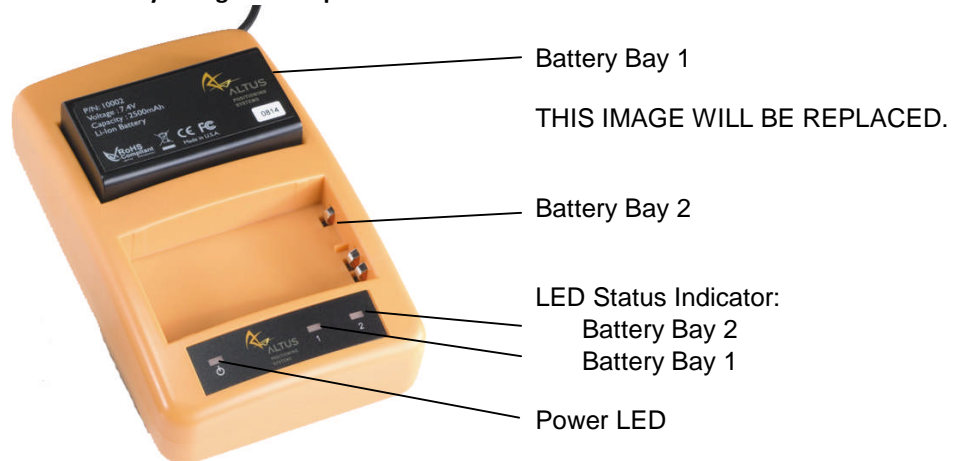
3.3.1. Battery Charger

Specifications of AC Adapter

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

3.3.2. Charging Battery

Table 5: Battery Charger 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.

3.3.3. G2100 Battery Installation and Replacement

 CAUTION	<i>Removing the battery in use will cause the G2100 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.</i>
---	--

- Press button to open battery door compartment
- Use the guide to slide the battery into the G2100
- 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 G2100?	A battery can last 4 - 5 hours
Will the G2100 swap to a fully charged battery if one discharges?	Yes. No user action is required
Can I remove one of the batteries while the G2100 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

	<i>Contact a Recycling Center to ensure proper disposal of lithium-ion Batteries.</i>
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3.4. GNSS Antenna Offsets

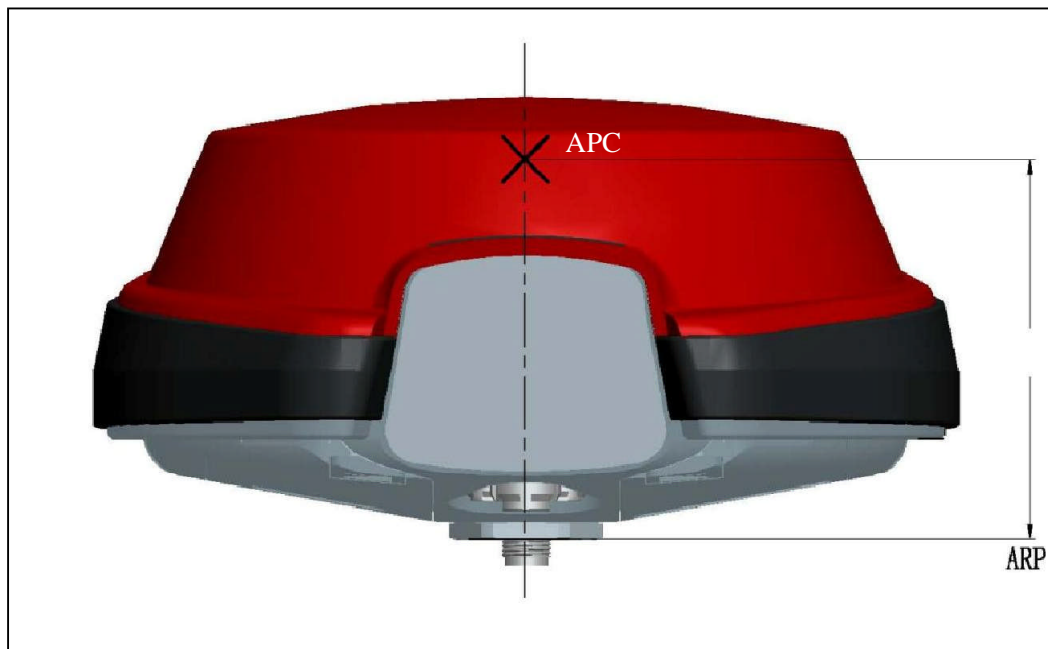


Figure 8: Phase Center Location

APC: Antenna Phase Center
ARP: Antenna Reference Point

3.4.1. Vertical Offsets

Vertical Offsets

L1 Offset (mm)	90.8
L2 Offset (mm)	94.8

3.4.2. Slant Height Dimensions

$$\text{Height of ARP} = \sqrt{[(\text{SLANT HEIGHT})^2 - 0.0959^2]} - 0.225$$

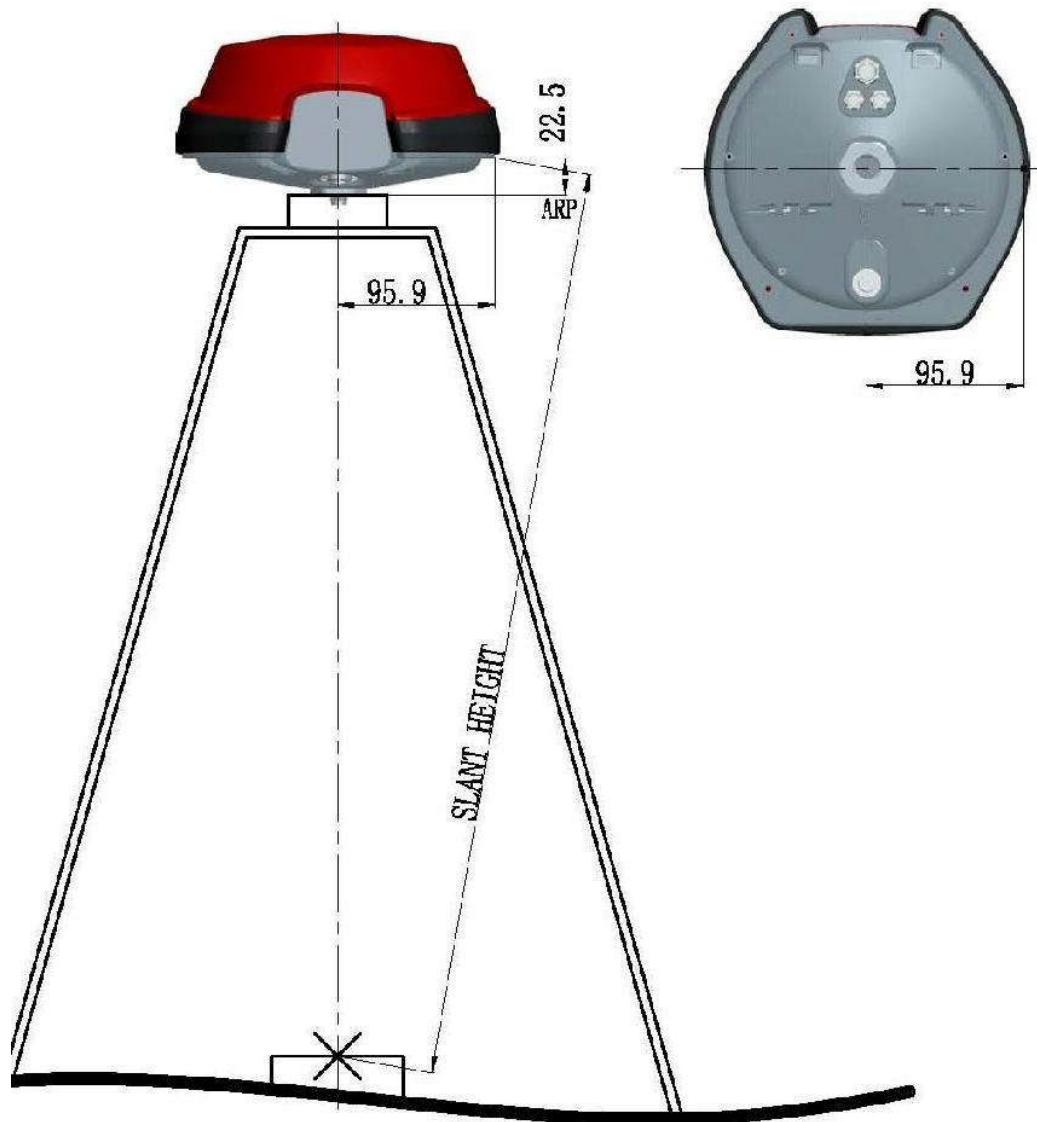


Figure 9: Slant Height Dimensions

4. Frequently Asked Questions

4.1. **Question:** Where is the Antenna Reference Point (ARP) located on the G2100?

Answer: *The ARP is the bottom of the bolt on the underside of the G2100.
For more information see section [3.5 GNSS Antenna Offsets](#):*

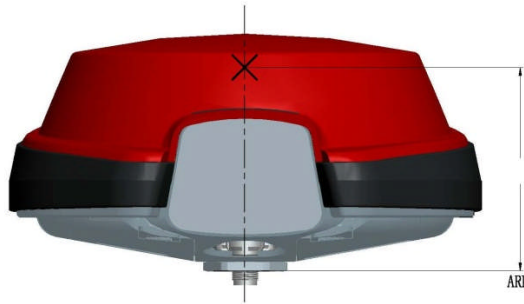


Figure 10: ARP Diagram

4.2. **Question:** *Does the G2100 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.*

4.3. **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.*

4.4. **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 "G2100_Default_Config.txt" Follow the instruction to upload that file into the G2100 in this manual.*

4.5. **Question:** What are the correct specifications for a GSM SIM card in order for it to operate with the G2100?

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.

- 4.6. **Question:** *Why am I not receiving GLONASS corrections?*
Answer: *You must first verify that the base station transmits GLONASS corrections. The G2100 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.*
- 4.7. **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.*
- 4.8. **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.*
- 4.9. **Question:** *How can I verify the Windows Mobile® version my hand held device is operating on?*
Answer: *As of Dec. 2012, TIAsahi is delivering Getac PS535F with Windows Mobile® version 6.1 classic. To confirm this version, 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.*
- 4.10. **Question:** *I can't connect to the G2100 via Bluetooth®, why not?*
Answer: *Make sure that the serial cable (COM1) 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 will reset all COM ports and often fixes Bluetooth® connectivity.*
- 4.11. **Question:** *I noticed that the units get extremely hot at the top, what effect might this have on any operations?*
Answer: *The G2100 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.*
- 4.12. **Question:** *I cannot connect using the GSM modem, why not?*
Answer: *Be sure that you are selecting the G2100 model in your data collection software. Selecting the wrong model version will cause communication issues with the GSM modem.*

5. 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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