RGM-3600 Operational Manual

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RoyalTek GPS Receiver: RGM-3600 Operational Manual

1. Introduction

Congratulation on your purchase of RGM-3600, offering diverse GPS (Global Positioning System) applications. RGM-3600 represents the latest ingenious GPS technology from the leading GPS receiver manufacturer.

Connecting to the notebook PC or Handheld PC implementing map or navigation software, RGM-3600 helps you locate one or multiple objects, conduct personal & vehicle navigation, and/or apply for geographical surveys.

Contents prepackaged with your RGM-3600 purchase:

1. RGM-3600
2. Companion CD

Product Features

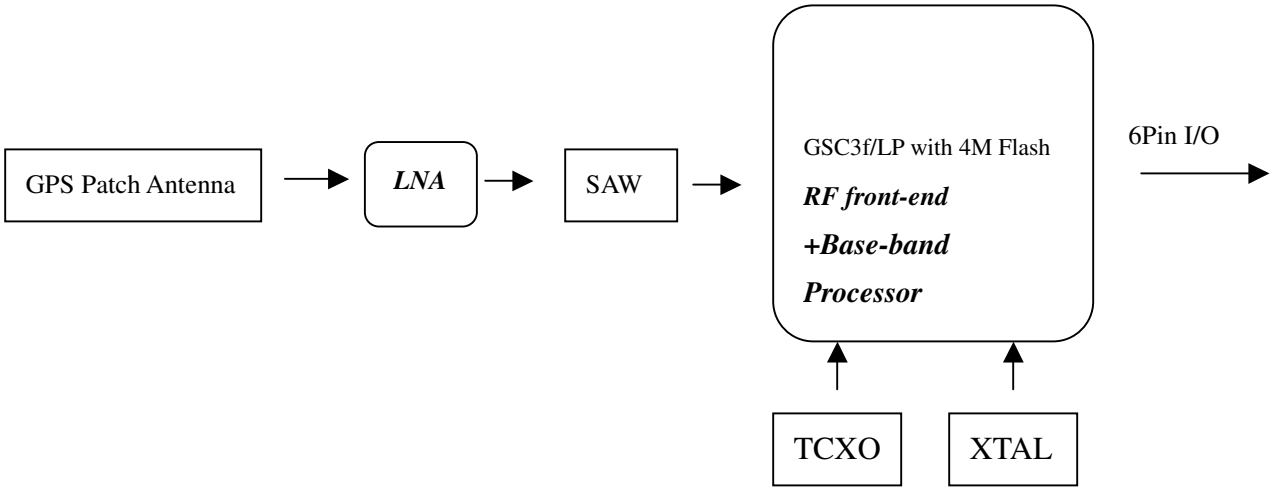
- ✧ 20 parallel channels.
- ✧ -159 dBm high GPS sensitivity.
- ✧ TCXO design.
- ✧ NMEA-0183 compliant protocol/custom protocol.
- ✧ Enhanced algorithm for navigation stability
- ✧ SBAS (WAAS, EGNOS and MSAS) support and the default SBAS is enable
- ✧ Lead-free
- ✧ Backup battery (installed)

2. RGM-3600 Picture

3. RGM-3600 System Block Diagram

System block diagram description:

a. Patch antenna with 1 Stage LNA
b. 4Mega bits flash memory on chip
c. 6pin I/O pin (pin 5, pin6 for internal)

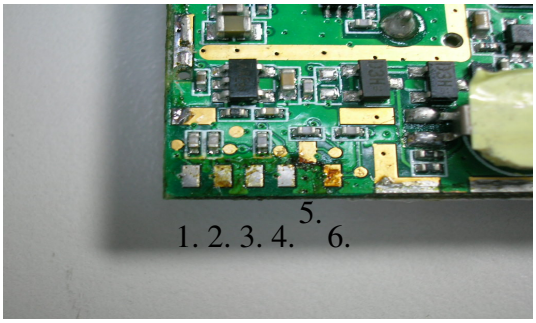


4. RGM-3600LP Technique Specification

No	Function	Specification
GPS receiver		
1	Chipset	SiRF GSC3f/LP
2	Frequency	L1 1575.42MHz.
3	Code	C.A. Code.
4	Channels	20.
5	Chipset Sensitivity	-159dBm
6	Chipset cold start	35 sec @ open sky
7	Chipset warm start	35 sec @ open sky
8	Chipset hot start	1 sec @ open sky
9	Reacquisition	0.1sec typical
10	Position accuracy	10meters at 2D RMS.
11	Maximum altitude	18000 m
12	Maximum velocity	514 m/s
13	Trickle power mode	Duty cycle ≦ 34%. (Variable)
14	Update rate	Continuous operation: 1Hz
17	Testability	It shall be able to be tested by SiRF test mode IV and single channel simulator.
18	Protocol setup	It shall store the protocol setup in the SRAM memory.
Interface Description		
19	I/O Pin	6 Pin Pin1:RX Pin2:TX Pin3:GND Pin4:VCC Pin5:NC Pin6: BOOT
Mechanical requirements		
20	Dimension	(L)48.4 mm * (W)48.4 mm * (H)15.1mm ±3mm
21	Weight	≦30g
Power consumption		
22	Vcc	DC 5V ±5%
23	Current	**TTL Version** Acquisition: 55mA (typical) Tracking: 50mA (typical) **RS-232 Version** Acquisition: 60mA (typical) Tracking: 55 mA (typical)

24	SRAM backup battery	3.3mAhr Li-Ion rechargeable battery. Battery life at full charge is ≥ 7 days.
Environment		
25	Operating temperature	-20 ~ +60℃
26	Storage temperature	-20 ~ +60℃
27	Humidity	≦95%

Hardware Interface



Module Interface Pin Number:

(VDD=2.85V±2%)

Pin #	Signal Name	I/O	Description	**Characteristics**
1	RX	I	UART	TTL:$V_{IH} \geq 0.7*VDD$ $V_{IL} \leq 0.3*VDD$ RS-232 $V_{IH} \geq 2.4V$ $V_{IL} \leq 0.6V$
2	TX	O	UART	TTL:$V_{OH} \geq 0.75*VDD$ $V_{OL} \leq 0.25VDD$ RS-232 $V_{OH} \geq 5V$ $V_{OL} \leq -5V$
3	GND	G	System Power Ground	Reference Ground
4	VCC	I	System Power	VCC:5V±5%
5	NC	NC		
6	Boot	I	Boot mode	$V_{IH} \geq 0.7*VDD$ $V_{IL} \leq 0.3*VDD$

- ***VCC(5V DC power Input)***

  This is the main DC power supply input pin. That provides voltage to the module.

- ***GND***

  GND provides the reference ground

- ***RXA***

  This is the main receiver channel and is used for receiving software commands to the board from SiRFdemo software or software written by users themselves.

  PS: Pull up if not used.

- ***TXA***

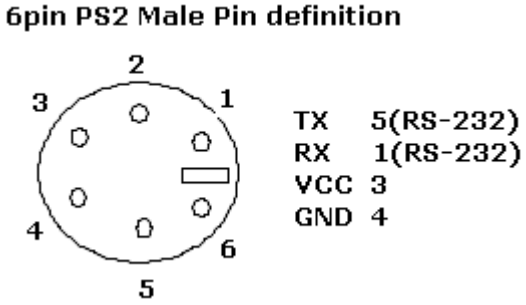
  This is the main transmitting channel and is used for outputting navigation and measurement data for SiRFdemo software or software written by users themselves.

- ***Boot***

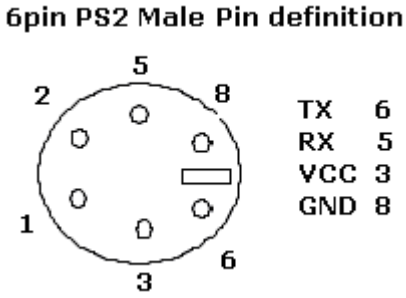
  Set this pin to high for programming flash.

Cable connector

- 6Pin Male PS2 RS-232 Interface Pin Number:



- 6Pin Male PS2 TTL Interface Pin Number:



- (Y cable) 9 pin D-SUB Interface Pin Number:

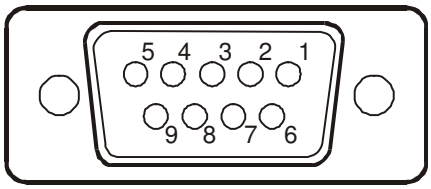
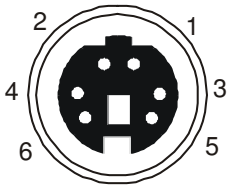


Table 2

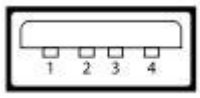
Pin NO	Signal Name	I/O	Description	Characteristics
1	No connect			
2	TX	O	Serial Data Output	High: -3V ~ -15V Low: +3V ~ +15V
3	RX	I	Serial Data Input	High: -3V ~ -15V Low: +3V ~ +15V
4	No connect			
5	GND	G	Ground	
6	No connect			
7	No connect			
8	No connect			
9	No connect			

- (Y cable) 6Pin Male PS2 Interface Pin Number:



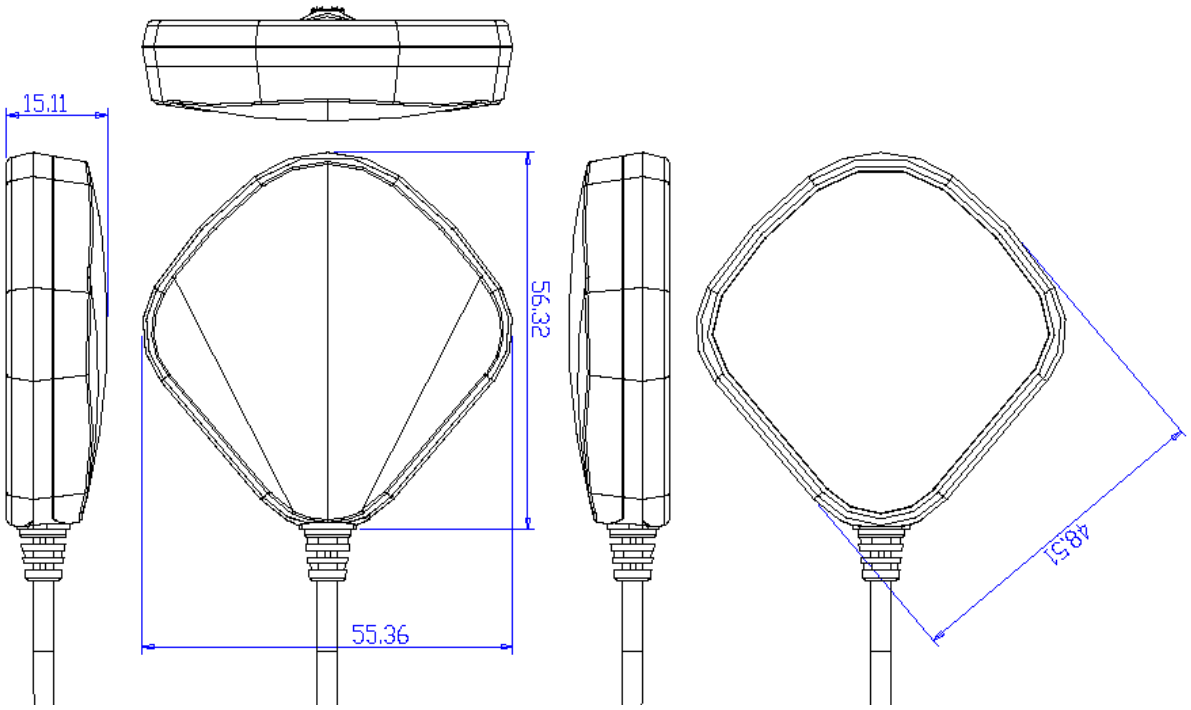
Pin #	Signal Name
1	NC
2	NC
3	GND
4	VCC
5	NC
6	NC

- USB Interface Pin Number:



Pin #	Signal Name
1	V_{bus} (4.75-5.25volts)
2	D-
3	D+
4	GND

5. Mechanical Layout



Unit：mm

6. Software Specification and NMEA Protocol

Software Specification

GPS Firmware	[GSW3] GGA(1),GSA(1),GSV(5),RMC(1) 4800 GPS Firmware
GPS Utility	- A GPS performance diagnostic utility is required - C/NO, TTFF
WAAS	- Enable

NMEA V3.0 Protocol

Its output signal level is TTL: 4800 bps (default), 8 bit data, 1 stop bit and no parity. It supports the following NMEA-0183

Messages: GGA, GLL, GSA, GSV, RMC and VTG.

NMEA Output Messages: the Engine board outputs the following messages as shown in Table 1:

Table 1 NMEA-0183 Output Messages

NMEA Record	Description
GGA	Global positioning system fixed data
GLL	Geographic position – latitude / longitude
GSA	GNSS DOP and active satellites
GSV	GNSS satellites in view
RMC	Recommended minimum specific GNSS data
VTG	Course over ground and ground speed

GGA-Global Positioning System Fixed Data

Table 2 contains the values of the following example:

$GPGGA, 161229.487, 3723.2475, N, 12158.3416, W, 1, 07, 1.0, 9.0, M, , , ,0000*18

Table 2 GGA Data Format

Name	Example	Units	Description
Message ID	$GPGGA		GGA protocol header
UTC Position	161229.487		hhmmss.sss
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		Dddmm.mmmm
E/W Indicator	W		E=east or W=west

Position Fix Indicator	1		See Table 2-1
Satellites Used	07		Range 0 to 12
HDOP	1.0		Horizontal Dilution of Precision
MSL Altitude	9.0	meters	

Units	M	meters	
Geoid Separation		meters	
Units	M	meters	
Age of Diff. Corr.		second	Null fields when DGPS is not used
Diff. Ref. Station ID	0000		
Checksum	*18		
<CR><LF>			End of message termination

Table 3 Position Fix Indicators

Value	Description
0	Fix not available or invalid
1	GPS SPS Mode, fix valid
2	Differential GPS, SPS Mode, fix valid
3	GPS PPS Mode, fix valid

GLL-Geographic Position –Latitude/Longitude

Table 3 contains the values of the following

Example: $GPGLL, 3723.2475, N, 12158.3416, W, 161229.487, A*2C

Table 3 GLL Data Format

Name	Example	Units	Description
Message ID	$GPGLL		GLL protocol header
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		Dddmm.mmmm
E/W Indicator	W		E=east or W=west
UTC Position	161229.487		hhmmss.ss
Status	A		A=data valid or V=data not valid
Checksum	*2C		
<CR><LF>			End of message termination

GSA-GNSS DOP and Active Satellites

Table 4 contains the values of the following example:

$GPGSA, A, 3, 07, 02, 26, 27, 09, 04, 15, , , , , , 1.8,1.0,1.5*33

Table 4 GSA Data Format

Name	Example	Units	Description
Message ID	$GPGSA		GSA protocol header
Mode 1	A		See Table 4-2
Mode 2	3		See Table 4-1
Satellite Used	07		Sv on Channel 1
Satellite Used	02		Sv on Channel 2
….			….
Satellite Used			Sv on Channel 12
PDOP	1.8		Position Dilution of Precision
HDOP	1.0		Horizontal Dilution of Precision
VDOP	1.5		Vertical Dilution of Precision
Checksum	*33		
＜CR＞＜LF＞			End of message termination

Table 4-1 Mode 1

Value	Description
1	Fix not available
2	2D
3	3D

Table 4-2 Mode 2

Value	Description
M	Manual-forced to operate in 2D or 3D mode
A	Automatic-allowed to automatically switch 2D/3D

GSV-GNSS Satellites in View

Table 5 contains the values of the following example:

$GPGSV, 2, 1, 07, 07, 79, 048, 42, 02, 51, 062, 43, 26, 36, 256, 42, 27, 27, 138, 42*71$GPGSV, 2, 2, 07, 09, 23, 313, 42, 04, 19, 159, 41, 15, 12, 041, 42*41

Table 5 GGA Data Format

Name	Example	Units	Description
Message ID	$GPGSV		GSV protocol header

Number of Messages[1]	2		Range 1 to 3
Messages Number[1]	1		Range 1 to 3
Satellites in View	07		
Satellite ID	07		Channel 1(Range 1 to 32)
Elevation	79	degrees	Channel 1(Maximum 90)
Azimuth	048	degrees	Channel 1(True, Range 0 to 359)
SNR (C/No)	42	dBHz	Range 0 to 99, null when not tracking
….			….
Satellite ID	27		Channel 4(Range 1 to 32)
Elevation	27	degrees	Channel 4(Maximum 90)
Azimuth	138	degrees	Channel 4(True, Range 0 to 359)
SNR (C/No)	42	dBHz	Range 0 to 99, null when not tracking
Checksum	*71		
＜CR＞＜LF＞			End of message termination

[1]Depending on the number of satellites tracked multiple messages of GSV data may be required.

RMC-Recommended Minimum Specific GNSS Data

Table 6 contains the values of the following example:

$GPRMC, 161229.487, A, 3723.2475, N, 12158.3416, W, 0.13, 309.62, 120598, ,*10

Table 6 GGA Data Format

Name	Example	Units	Description
Message ID	$GPRMC		RMC protocol header
UTC Position	161229.487		hhmmss.sss
Status	A		A=data valid or V=data not valid
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E=east or W=west
Speed Over Ground	0.13	knots	
Course Over Ground	309.62	degrees	True
Date	120598		ddmmyy
Magnetic Variation		degrees	E=east or W=west

Checksum	*10		
＜CR＞＜LF＞			End of message termination

VTG-Course Over Ground and Ground Speed

Table 7 contains the values of the following example:

$GPVTG, 309.62, T, , M, 0.13, N, 0.2, K*6E

Table 7 VTG Data Format

Name	Example	Units	Description
Message ID	$GPVTG		VTG protocol header
Course	309.62	degrees	Measured heading
Reference	T		True
Course		degrees	Measured heading
Reference	M		Magnetic
Speed	0.13	knots	Measured horizontal speed
Units	N		Knots
Speed	0.2	km/hr	Measured horizontal speed
Units	K		Kilometer per hour
Checksum	*6E		
＜CR＞＜LF＞			End of message termination

GPS Receiver User's Tip

A. GPS signals are affected by weather and environmental conditions. It is suggested to use the GPS receiver under less shielding environments to ensure GPS receiver has better receiving performance.

B. When GPS receiver is in moving condition, it will prolong the time to fix the position. It is suggested to wait for the satellite signals to be locked at a fixed point when first power-on the GPS receiver before using.

C. The following situations will affect the GPS receiving performance:
   i. Solar control filmed windows.
   ii. Metal shielded, such as umbrella, or in vehicle.
   iii. Among high buildings.
   iv. Under bridges and tunnels.
   v. Under high voltage cables and near by radio wave sources, such as mobile phone base stations.
   vi. Bad and heavy cloudy weather.

D. If the satellite signals can not be locked or have encountered receiving problem (within the urban area), the following steps are suggested:
   i. Plug the external active antenna into the GPS receiver and set the antenna outdoor or on the roof of the vehicle for better receiving..
   ii. Move to another open space or reposition the GPS receiver towards the direction with fewer blockages.
   iii. Move the GPS receiver away from sources of interference
   iv. Wait until the weather condition has improved.

E. With a backup battery, the GPS receiver can fix a position immediately at next power-on if the built-in backup battery is fully charged.

7. Package Specification and Order Information

- Color box (40pcs/carton)
- Honeycomb (160pcs/box)
- White box (40pcs/carton)

8. Revision History

Title	RGM-3600 GPS Receiver		
Doc Type	Operational Manual		
Revision Number	Date	Author	Change notice
1.0	2007/03/26	Amy.liu	Initial Release
1.1	2007/05/15	Amy.liu	Modify 4. RGM-3600LP Technique Specification - Chipset Sensitivity、 cold start、warm start、hot start
1.2	2008/05/02	Amy.liu	Modify company's address、tel.、7. Package Specification and Order Information, add 4. RGM-3600LP Technique Specification cable connector type.

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