



GPS Smart Receiver
User's Manual

GENERAL DESCRIPTION

The GPS smart receiver is a total solution GPS receiver, designed based on high sensitivity SiRF Star III architecture. This complete enabled GPS smart receiver provides high position, velocity and time accuracy performances as well as high sensitivity and tracking capabilities.

The GPS smart receiver is ideal for many applications such as car navigation, mapping, surveying, security and so on.

APPLICATIONS

- Automotive
- Asset tracking
- Personal/Portable Navigation
- Location Based Services enabled devices
- Sports and Recreation
- Geographic Surveying

KEY PRODUCT FEATURES

- Built-in SiRF Star III chipset
- 200,000 effective correlators for fast TTFF
- 20 channels "All-In-View" tracking
- Cold/Warm/Hot start time: 42/38/1 sec. (average)
- Superior sensitivity: -159dBm tracking
- Reacquisition time: 0.1 sec.
- Low power design (75mA, tracking)
- Build-in low noise, high gain active antenna
- Super-cohesive magnetic for installation
- Apply to host devices with TTL/RS232
- Size: 47.0 (L) X 39.0 (W) X 16 (H) mm
- Weight: 66.6g

SPECIFICATIONS

Key Technology SiRF Star III chipset

Performance

Receiver

Frequency L1, 1575.42MHz
C/A Code 1.023MHz chip rate
Channel 20 channels all in view

Tracking Sensitivity -159dBm

Acquisition Rate

Cold Start 42 sec. (average)
Warm Start 38 sec. (average)
Hot Start 1 sec. (average)
Reacquisition 0.1sec. (average)
Update Rate 1 Hz (max.)

Accuracy

Position 5 - 25m CEP without SA
Velocity 0.1m/sec, without SA
Time 1 μ s synchronized to GPS time

Dynamic Condition

Altitude <18,000m (60,000 feet)
Velocity <515m/sec (1,000 knots)
Acceleration <4G
Motional Jerk 20m/sec³ max.

GPS Protocol NMEA0183

Interface

TTL Yes
RS232 Yes

Dimensions

W x L x H (mm) 39 x 47 x 16
W x L x H (inch) 1.54 x 1.85 x 0.63

Weight 66.6g (2m, cable included)
112.2g (5m, cable included)

Power

DC 3.7 ~ 6V, typical 5V
Internal Back-up battery 3.0V, 5.5mAh, Lithium battery
Back-up Current 7 μ A typ.

Environmental

Operating Temperature -40 °C ~ +85 °C
Storage Temperature -55 °C ~ +85 °C
Relative Humidity 5% to 90% non-condensing

General NMEA Format

\$GPGGA

This message transfers global positioning system fix data. The \$GPGGA message structure is shown below:

Field	Format	Min chars	Max chars	Notes
Message ID	\$GPGGA	6	6	GGA protocol header.
UTC Time	hhmmss.sss	2,2,2,3	2,2,2,3	Fix time to 1ms accuracy.
Latitude	float	3,2,4	3,2,4	Degrees * 100 + minutes.
N/S Indicator	char	1	1	N=north or S=south
Longitude	float	3,2,4	3,2,4	Degree * 100 + minutes.
E/W indicator	Char	1	1	E=east or W=west
Position Fix Indicator	Int	1	1	0: Fix not available or invalid. 1: GPS SPS mode. Fix available.
Satellites Used	Int	2	2	Number of satellites used to calculate fix.
HDOP	Float	1,1	3,1	Horizontal Dilution of Precision.
MSL Altitude	Float	1,1	5,1	Altitude above mean seal level
Units	Char	1	1	M Stands for "meters".
Geoid Separation	Int	(0) 1	4	Separation from Geoid, can be blank.
Units	Char	1	1	M Stands for "meters".
Age of Differential Corrections	int	(0) 1	5	Age in seconds Blank (Null) fields when DGPS is not used.
Diff Reference Corrections	int	4	4	0000.
Checksum	*xx	(0) 3	3	2 digits.
Message terminator	<CR> <LF>	2	2	ASCII 13, ASCII 10.

\$GPGLL

This message transfers Geographic position, Latitude, Longitude, and time. The \$GPGLL message structure is shown below:

Field	Format	Min chars	Max chars	Notes
Message ID	\$GPGLL	6	6	GLL protocol header.
Latitude	Float	1,2.1	3,2.4	Degree * 100 + minutes.
N/S Indicator	Char	1	1	N=north or S=south.
Longitude	Float	1,2.1	3,2.4	Degree * 100 + minutes.
E/W indicator	Character	1	1	E=east or W=west.
UTC Time	hhmmss.sss	1,2,2.1	2,2,2.3	Fix time to 1ms accuracy.
Status	Char	1	1	A Data Valid. V Data invalid.
Mode Indicator	Char	1	1	A Autonomous
Checksum	*xx	(0) 3	3	2 digits.
Message terminator	<CR><LF>	2	2	ASCII 13, ASCII 10.

\$GPGSA

This message transfers DOP and active satellites information. The \$GPGSA message structure is shown below:

Field	Format	Min chars	Max chars	Notes
Message ID	\$GPGSA	6	6	GSA protocol header.
Mode	Char	1	1	M Manual, forced to operate in selected mode. A Automatic switching between modes.
Mode	Int	1	1	1 Fix not available. 2 2D position fix. 3 3D position fix.
Satellites Used	Int	2	2	SV on channel 1.
Satellites Used	Int	2	2	SV on channel 2.
...
Satellites Used	Int	2	2	SV on channel 12.
PDOP	Float	1.1	3.1	
HDOP	Float	1.1	3.1	
VDOP	Float	1.1	3.1	
Checksum	*xx	0	3	2 digits
Message terminator	<CR> <LF>	2	2	ASCII 13, ASCII 10

\$GPGSV

This message transfers information about satellites in view. The \$GPGSV message structure is shown below. Each record contains the information for up to 4 channels, allowing up to 12 satellites in view. In the final record of the sequence the unused channel fields are left blank with commas to indicate that a field has been omitted.

Field	Format	Min chars	Max chars	Notes
Message ID	\$GPGSV	6	6	GSA protocol header.
Number of messages	Int	1	1	Number of messages in the message sequence from 1 to 3.
Message number	Int	1	1	Sequence number of this message in current sequence, form 1 to 3.
Satellites in view	Int	1	2	Number of satellites currently in view.
Satellite Id	Int	2	2	Satellite vehicle 1.
Elevation	Int	1	3	Elevation of satellite in degrees.
Azimuth	Int	1	3	Azimuth of satellite in degrees.
SNR	Int	(0) 1	2	Signal to noise ration in dBHz, null if the sv is not in tracking.
Satellite Id	Int	2	2	Satellite vehicle 2.
Elevation	Int	1	3	Elevation of satellite in degrees.
Azimuth	Int	1	3	Azimuth of satellite in degrees.
SNR	Int	(0) 1	2	Signal to noise ration in dBHz, null if the sv is not in tracking.
Satellite Id	Int	2	2	Satellite vehicle 3.
Elevation	Int	1	3	Elevation of satellite in degrees.
Azimuth	Int	1	3	Azimuth of satellite in degrees.
SNR	Int	(0) 1	2	Signal to noise ration in dBHz, null if the sv is not in tracking.
Satellite Id	Int	2	2	Satellite vehicle 4.
Elevation	Int	1	3	Elevation of satellite in degrees.
Azimuth	Int	1	3	Azimuth of satellite in degrees.
SNR	Int	(0) 1	2	Signal to noise ration in dBHz, null if the sv is not in tracking.
Checksum	*xx	(0) 3	3	2 digits.
Message terminator	<CR> <LF>	2	2	ASCII 13, ASCII 10.

\$GPRMC

This message transfers recommended minimum specific GNSS data. The \$GPRMC message format is shown below.

Field	Format	Min chars	Max chars	Notes
Message ID	\$GPRMC	6	6	RMC protocol header.
UTC Time	hhmmss.sss	1,2,2.1	2,2,2.3	Fix time to 1ms accuracy.
Status	char	1	1	A Data Valid. V Data invalid.
Latitude	Float	1,2.1	3,2.4	Degrees * 100 + minutes.
N/S Indicator	Char	1	1	N=north or S=south.
Longitude	Float	1,2.1	3,2.4	Degrees * 100 + minutes.
E/W indicator	Char	1	1	E=east or W=west.
Speed over ground	Float	1,1	5.3	Speed over ground in knots.
Course over ground	Float	1.1	3.2	Course over ground in degrees.
Date	ddmmyy	2,2,2	2,2,2	Current date.
Magnetic variation	Blank	(0)	(0)	Not used.
E/W indicator	Blank	(0)	(0)	Not used.
Mode	Char	1	1	A Autonomous
Checksum	*xx	(0) 3	3	2 digits.
Message terminator	<CR> <LF>	2	2	ASCII 13, ASCII 10.

\$GPVTG

This message transfers Velocity, course over ground, and ground speed. The \$GPVTG message format is shown below.

Field	Format	Min chars	Max chars	Notes
Message ID	\$GPVTG	6	6	VTG protocol header.
Course (true)	Float	1.1	3.2	Measured heading in degrees.
Reference	Char	1	1	T = true heading.
Course (magnetic)	Float	1.1	3.2	Measured heading (blank).
Reference	Char	1	1	M = magnetic heading.
Speed	Float	1.1	4.2	Speed in knots.
Units	Char	1	1	N = knots.
Speed	Float	1.1	4.2	Speed
units	Char	1	1	K = Km/h.
Mode	Char	1	1	A Autonomous
Checksum	*xx	(0) 3	3	2 digits.
Message terminator	<CR> <LF>	2	2	ASCII 13, ASCII 10.

\$GPZDA

This message transfers UTC Time and Date. Since the latency of preparing and transferring the message is variable, and the time does not refer to a particular position fix, the seconds precision is reduced to 2 decimal places. The \$GPZGA message format is shown below.

Field	Format	Min chars	Max chars	Notes
Message ID	\$GPZDA	6	6	ZDA protocol header.
UTC time	hhmmss.ss	2,2,2,2	2,2,2,2	00000000.00 to 235959.99
UTC day	dd	2	2	01 to 31, day of month.
UTC month	mm	2	2	01 to 12.
UTC Year	yyyy	4	4	1989-9999.
Local zone hours	Int	(-)2	(-)2	Offset of local time zone (-13) to 13.
Local zone minutes	Unsigned	2	2	
Checksum	*xx	(0) 3	3	2 digits.
Message terminator	<CR> <LF>	2	2	ASCII 13, ASCII 10.

