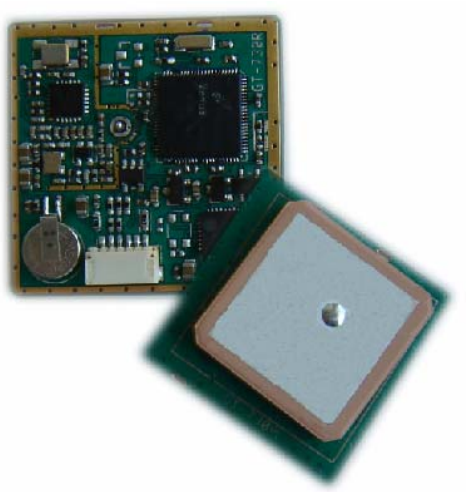
GPS Module Series Model: GT-720RW

ROM version



Technical Manual

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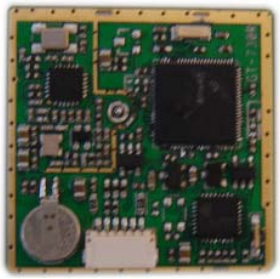
2F., No.136, Ziqiang S. Rd., Zhubei City, Hsinchu County 30264, Taiwan (R.O.C.)
TEL：886-3-6578491 FAX：886-3-6578492

MADE IN TAIWAN

Contents



GT-720RW

Fast-Acquisition High-Sensitivity 65-Channel GPS Receiver Module

The **GT-720RW** is a compact all-in-one GPS module solution intended for a broad range of Original Equipment Manufacturer (OEM) products, where fast and easy system integration and minimal development risk is required.

The **GT-720RW** is optimized for applications requiring ultra performance, low cost, and maximum flexibility; it is suitable for a wide range of OEM configurations including handhelds, sensors, asset tracking, PDA-centric personal navigation system, and vehicle navigation products.

65 parallel channels and 20000+ correlators provide fast satellite signal acquisition and short start-up time. Acquisition sensitivity of -155dBm and tracking sensitivity of -158 dBm offer good performance even under difficult environments.

Both the LVTTL-level and RS232 signal interface are provided on the interface connector. Supply voltage of 3.3V~6.0V is supported.

1. FEATURES

- 65 channel to acquire and track satellites simultaneously
- Industry-leading TTFF speed
- Signal detection better than -158 dBm
- 0.5 PPM TCXO for quick cold start
- Integral LNA with low power control
- SBAS (WAAS/EGNOS) capable
- Cold start < 45sec
- Hot start < 1sec
- Accuracy 5m CEP
- RoHS compliance

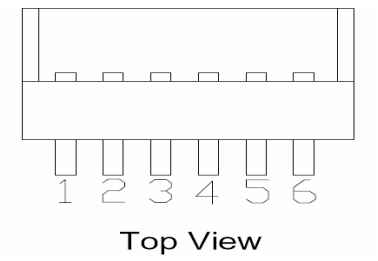
2. PERFORMANCE

2.1 RECEIVER SPECIFICATIONS

Parameter	Specification
Receiver Type	65 channel
Re-acquisition sensitivity	-155dBm
Tracking sensitivity	-158dBm
Cold start sensitivity	-137dBm
Receiver frequency	1575.42MHz
Code	C/A code
Accuracy (1) Position (2) Velocity	 5m CEP 0.1m/sec
Startup Time hot start warm start cold start	 < 1 sec < 35 sec < 45 sec
Signal Reacquisition	<1s
Update Rate	1Hz (standard)
Operational Limits (1) Altitude (2) velocity	 < 18,000m < 500m/s
Dynamics	4G (39.2m/sec^2)
Datum	WGS-84(Default)
Protocol	NMEA-0183 V3.01
Connector	1.25mm pitch, right angle, 6 pin wafer connector

2.2 ELECTRIC SPECIFICATIONS

2.2.1 PIN ASSIGNMENT



NO.	Signal name	I/O	V	Description	Notes
1	FTX0	O	-	Asynchronous serial output at LVTTL level to output NMEA message	
2	FRX0	I	-	Asynchronous serial Input at LVTTL level to Input NMEA message	
3	TX0	O	-	Asynchronous serial output at RS-232 level to output NMEA message	
4	RX0	I	-	Asynchronous serial Input at RS-232 level to Input NMEA message	
5	VCC	P	0V~6V	Main power stability	
6	GND	O	-	Power and signal ground	

2.2.2 ABSOLUTE MAXIMUM RATINGS

Item	Absolute maximum ratings	Unit
RX0 input voltage	0~3.3 (Max 4.0V)	V
FRX0 input voltage	0~3.3 (Max 5.0V)	V
VCC input voltage	0~3.3 (Max 6.0V)	V

2.2.3 DC ELECTRICAL CHARACTERISTICS

Item			Min.	TYP	Max	Unit	Notes
TX0 (Output)	H	Voltage	2.6	-	3.3	V	
	L	Voltage	0	-	0.4	V	
RX0 (Input)	H	Voltage	2.6	-	3.3	V	
	L	Voltage	0	--	0.4	V	
VCC	Voltage		3.0	3.3	3.6	V	
	Current		-	62mA	76mA	mA	@3.3V

2.2.4 GPS STATUS INDICATOR

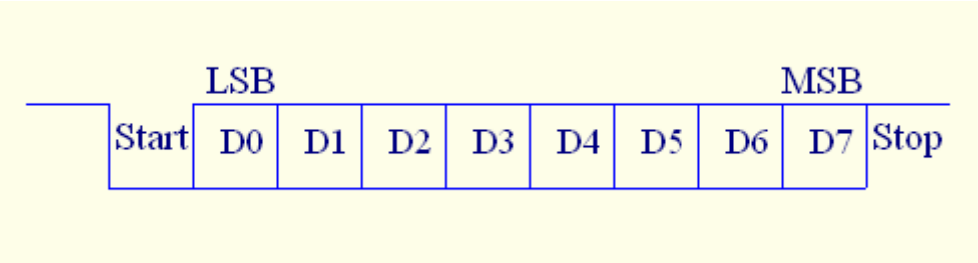
The **GT-730RW** provides GPS status indicator. On board LED shows fix or non-fix. In fix mode, the LED will be light for 1second and turn-off for 1second. In another mode, the pin will be light for 2 second and turn-off for 2 second.

2.3 ENVIRONMENT SPECIFICATION

Parameter		Specification
Temperature	Operating	-20℃~+60℃
	Storage	-40℃~+80℃
Humidity		5%~95%

3. COMMUNICATION SEPECIFICATIONS

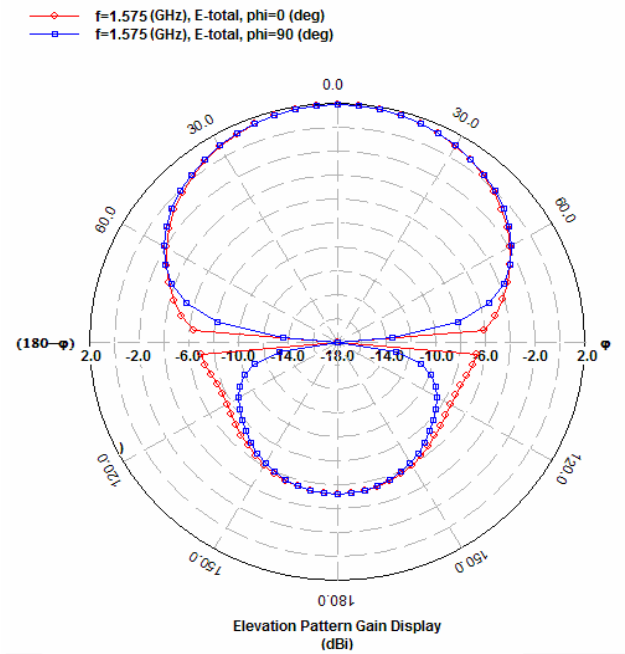
Item	Description
Interface	Full duplex serial interface
Bit rate	4800/9600/38400/115200bps
Start bit	1bit
Stop bit	1bit
Data bit	8bit
Parity	none
Transmission data	SACII NMEA0183 Ver:3.01
Update rate	1Hz
Output sentence	GGA/GSA/GSV/RMC(typ)



4. CONNECOTR

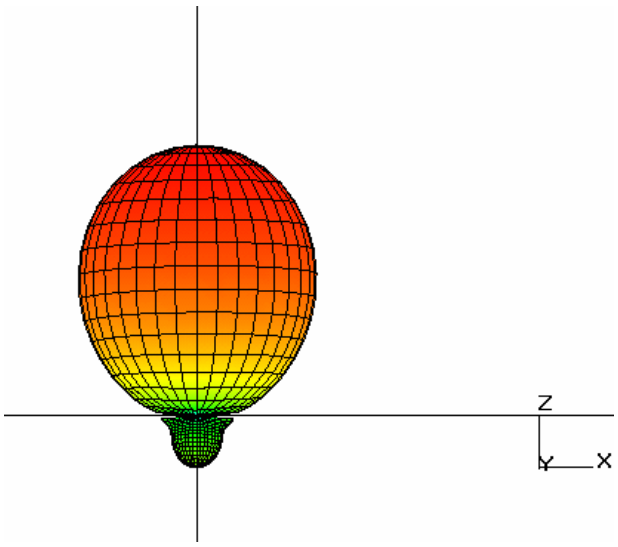
The connector mounted on the **GT-720RW** GPS receiver module is a Molex's board to wire connector, part number is 51021-0600. The mating plugs part number is 53261-0671.

5. ON BOARD PATCH ANTENNA

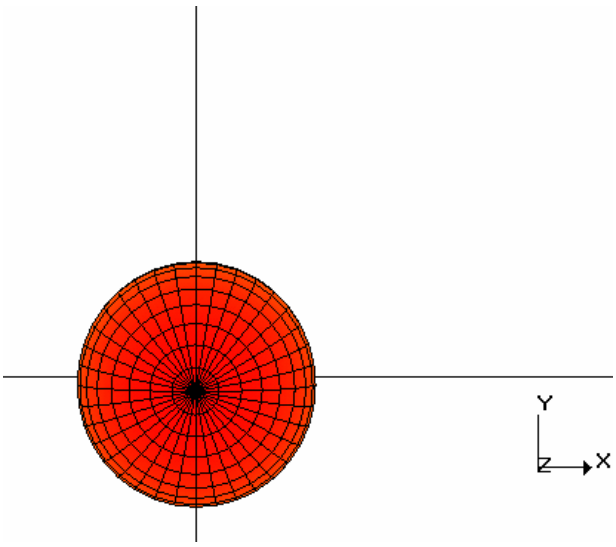


The **GT-720RW** mounted a patch antenna which radiates normally to its patch surface, the elevation for φ at 90 degrees would be important.

Left figure is shows the gain of the antenna at 1575MHz for φ = 90 degrees in the free space. The maximum gain is obtained in the broadside direction and this is measured to be 2 dBi for φ at 90 degrees. The backlobe radiation is sufficiently small and is measured to be -5.3 dBi for the left plot. The 3D plots for the antenna are shown in above Figure at different angles; it is easier to understand the radiation from the antenna.



(1)



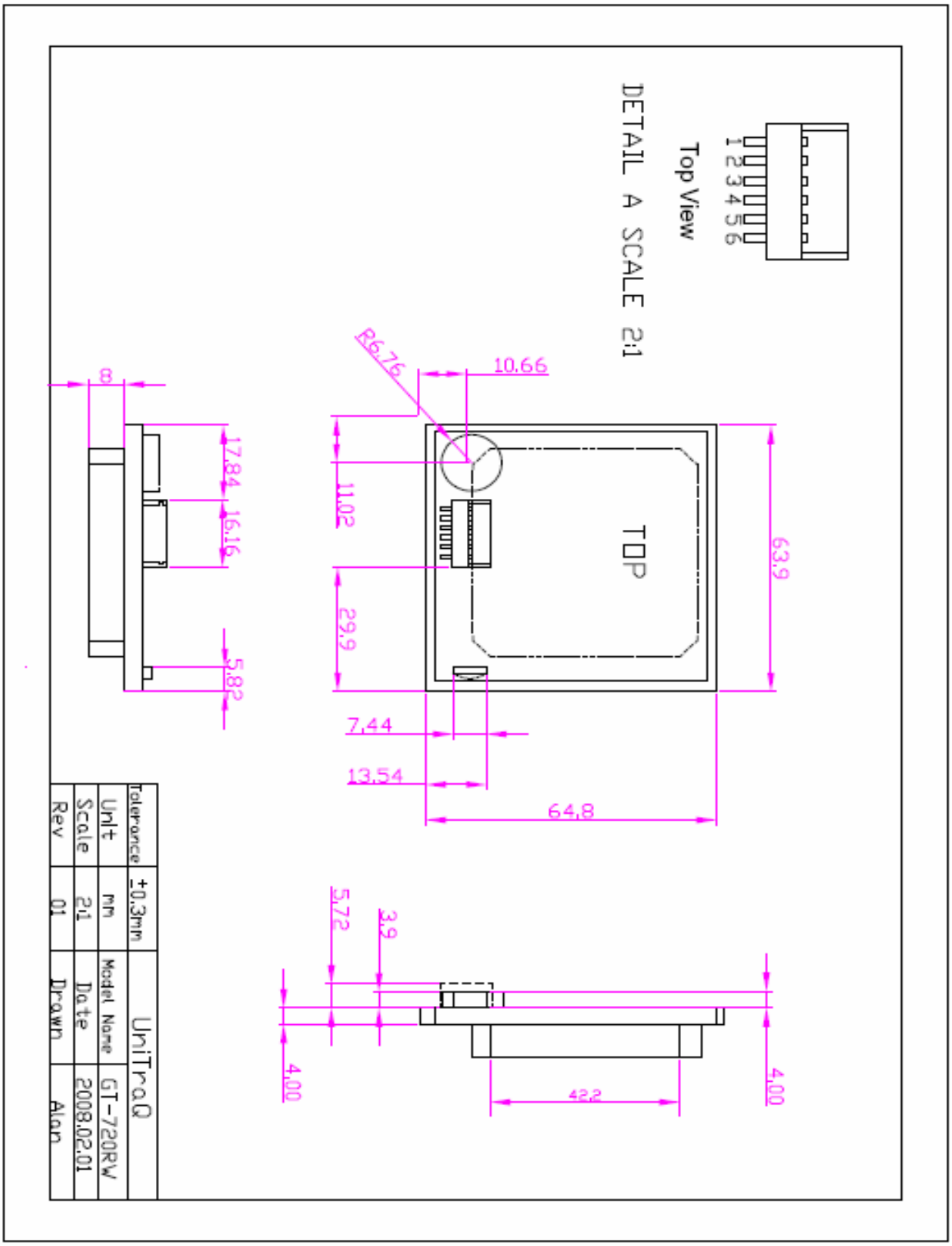
(2)

(1) 3D view of radiation pattern looking along the Y axis in the XZ plane

(2) 3D view of radiation pattern looking along the Z axis in the XY plane

When the **GT-720RW** designed would be placed into a device, its patch antenna surface orientation shall be vertically upturned to the sky. Also, shouldn't put metal on the antenna above and selected suitable material for converge the **GT-720RW** if is required.

6. MECHANIC DIMENSION



7. APPROVED NMEA MESSAGE

The serial interface protocol is based on the National Marine Electronics Association's NMEA 0183 ASCII interface specification. This standard is fully define in "NMEA 0183, Version 3.01" The standard may be obtained from NMEA, www.nmea.org

7.1 GGA – GLOBAL POSITIONING SYSTEM FIX DATA

Time, position and fix related data for a GPS receiver.

Structure:

$GPGGA,hhmmss.sss,ddmm.mmmm,a,dddmm.mmmm,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12 13

Example:

$GPGGA,060932.448,2447.0959,N,12100.5204,E,1,08,1.1,108.7,M,,,,0000*0E<CR><LF>

Field	Name	Example	Description
1	UTC Time	060932.448	UTC of position in hhmmss.sss format, (000000.00 ~ 235959.99)
2	Latitude	2447.0959	Latitude in ddmm.mmmm format Leading zeros transmitted
3	N/S Indicator	N	Latitude hemisphere indicator, 'N' = North, 'S' = South
4	Longitude	12100.5204	Longitude in dddmm.mmmm format Leading zeros transmitted
5	E/W Indicator	E	Longitude hemisphere indicator, 'E' = East, 'W' = West
6	GPS quality indicator	1	GPS quality indicator 0: position fix unavailable 1: valid position fix, SPS mode 2: valid position fix, differential GPS mode 3: GPS PPS Mode, fix valid 4: Real Time Kinematic. System used in RTK mode with fixed integers 5: Float RTK. Satellite system used in RTK mode. Floating integers 6: Estimated (dead reckoning) Mode 7: Manual Input Mode 8: Simulator Mode
7	Satellites Used	08	Number of satellites in use, (00 ~ 12)
8	HDOP	1.1	Horizontal dilution of precision, (00.0 ~ 99.9)
9	Altitude	108.7	mean sea level (geoid), (-9999.9 ~ 17999.9)
10	Geoid Separation		Geoid separation in meters according to WGS-84 ellipsoid (-999.9 ~ 9999.9)
11	DGPS Age		Age of DGPS data since last valid RTCM transmission in xxx format (seconds) NULL when DGPS not used
12	DGPS Station ID	0000	Differential reference station ID, 0000 ~ 1023 NULL when DGPS not used
13	Checksum	0E	

Note: The checksum field starts with a '*' and consists of 2 characters representing a hex number. The checksum is the exclusive OR of all characters between '$' and '*'.

7.2 GLL - LATITUDE AND LONGITUDE, WITH TIME OF POSITION FIX AND STATUS

Latitude and longitude of current position, time, and status.

Structure:

$GPGLL,ddmm.mmmm,a,dddmm.mmmm,a,hhmmss.sss,A,a*hh<CR><LF>
1 2 3 4 5 6 7 8

Example:

$GPGLL,4250.5589,S,14718.5084,E,092204.999,A,A*2D<CR><LF>

Field	Name	Example	Description
1	Latitude	4250.5589	Latitude in ddmm.mmmm format Leading zeros transmitted
2	N/S Indicator	S	Latitude hemisphere indicator 'N' = North 'S' = South
3	Longitude	14718.5084	Longitude in dddmm.mmmm format Leading zeros transmitted
4	E/W Indicator	E	Longitude hemisphere indicator 'E' = East 'W' = West
5	UTC Time	092204.999	UTC time in hhmmss.sss format (000000.00 ~ 235959.99)
6	Status	A	Status, 'A' = Data valid, 'V' = Data not valid
7	Mode Indicator	A	Mode indicator 'N' = Data not valid 'A' = Autonomous mode 'D' = Differential mode 'E' = Estimated (dead reckoning) mode 'M' = Manual input mode 'S' = Simulator mode
8	Checksum	2D	

7.3 GSA - GPS DOP AND ACTIVE SATELLITES

GPS receiver operating mode, satellites used in the navigation solution reported by the GGA or GNS sentence and DOP values.

Structure:

$GPGSA,A,x,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,x.x,x.x,x.x*hh<CR><LF>
1 2 3 3 3 3 3 3 3 3 3 3 3 4 5 6 7

Example:

$GPGSA,A,3,01,20,19,13,,,,,,,,,40.4,24.4,32.2*0A<CR><LF>

Field	Name	Example	Description
1	Mode	A	Mode 'M' = Manual, forced to operate in 2D or 3D mode 'A' = Automatic, allowed to automatically switch 2D/3D
2	Mode	3	Fix type 1 = Fix not available 2 = 2D 3 = 3D
3	Satellite used 1~12	01,20,19,13,,,,,,,,,	Satellite ID number, 01 to 32, of satellite used in solution, up to 12 transmitted
4	PDOP	40.4	Position dilution of precision (00.0 to 99.9)
5	HDOP	24.4	Horizontal dilution of precision (00.0 to 99.9)
6	VDOP	32.2	Vertical dilution of precision (00.0 to 99.9)
7	Checksum	0A	

7.4 GSV - GPS SATELLITE IN VIEW

Number of satellites in view, PRN number, elevation angle, azimuth angle, and C/No. Four satellites details are transmitted per message. Additional satellite in view information is send in subsequent GSV messages.

Structure:

$GPGSV,x,x,xx,xx,xx,xxx,xx,…,xx,xx,xxx,xx *hh<CR><LF>
1 2 3 4 5 6 7 4 5 6 7 8

Example:

$GPGSV,3,1,09,28,81,225,41,24,66,323,44,20,48,066,43,17,45,336,41*78<CR><LF>
$GPGSV,3,2,09,07,36,321,45,04,36,257,39,11,20,050,41,08,18,208,43*77<CR><LF>

Field	Name	Example	Description
1	Number of message	3	Total number of GSV messages to be transmitted (1-3)
2	Sequence number	1	Sequence number of current GSV message
3	Satellites in view	09	Total number of satellites in view (00 ~ 12)
4	Satellite ID	28	Satellite ID number, GPS: 01 ~ 32, SBAS: 33 ~ 64 (33 = PRN120)
5	Elevation	81	Satellite elevation in degrees, (00 ~ 90)
6	Azimuth	225	Satellite azimuth angle in degrees, (000 ~ 359)
7	SNR	41	C/No in dB (00 ~ 99) Null when not tracking
8	Checksum	78	

7.5 RMC - RECOMMANDED MINIMUM SPECIFIC GPS/TRANSIT DATA

Time, date, position, course and speed data provided by a GNSS navigation receiver.

Structure:

$GPRMC,hhmmss.sss,A,dddmm.mmmm,a,dddmm.mmmm,a,x.x,x.x,ddmmyy,x.x,a,a*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 1112 13

Example:

$GPRMC,092204.999,A,4250.5589,S,14718.5084,E,0.00,89.68,211200,,A*25<CR><LF>

Field	Name	Example	Description
1	UTC time	092204.999	UTC time in hhmmss.sss format (000000.00 ~ 235959.999)
2	Status	A	Status 'V' = Navigation receiver warning 'A' = Data Valid
3	Latitude	4250.5589	Latitude in dddmm.mmmm format Leading zeros transmitted
4	N/S indicator	S	Latitude hemisphere indicator 'N' = North 'S' = South
5	Longitude	14718.5084	Longitude in dddmm.mmmm format Leading zeros transmitted
6	E/W Indicator	E	Longitude hemisphere indicator 'E' = East 'W' = West
7	Speed over ground	000.0	Speed over ground in knots (000.0 ~ 999.9)
8	Course over ground	000.0	Course over ground in degrees (000.0 ~ 359.9)
9	UTC Date	211200	UTC date of position fix, ddmmyy format
10	Magnetic variation		Magnetic variation in degrees (000.0 ~ 180.0)
11	Magnetic Variation		Magnetic variation direction 'E' = East 'W' = West
12	Mode indicator	A	Mode indicator 'N' = Data not valid 'A' = Autonomous mode 'D' = Differential mode 'E' = Estimated (dead reckoning) mode 'M' = Manual input mode 'S' = Simulator mode
13	checksum	25	

7.6 VTG - COURSE OVER GROUND AND GROUND SPEED

The Actual course and speed relative to the ground.

Structure:

GPVTG,x.x,T,x.x,M,x.x,N,x.x,K,a*hh<CR><LF>
1 2 3 4 5 6

Example:

$GPVTG,89.68,T,,M,0.00,N,0.0,K,A*5F<CR><LF>

Field	Name	Example	Description
1	Course	89.68	True course over ground in degrees (000.0 ~ 359.9)
2	Course		Magnetic course over ground in degrees (000.0 ~ 359.9)
3	Speed	0.00	Speed over ground in knots (000.0 ~ 999.9)
4	Speed	0.00	Speed over ground in kilometers per hour (0000.0 ~ 1800.0)
5	Mode	A	Mode indicator 'N' = not valid 'A' = Autonomous mode 'D' = Differential mode 'E' = Estimated (dead reckoning) mode 'M' = Manual input mode 'S' = Simulator mode
6	Checksum	5F	

7.7 ZDA -TIME AND DATE

Structure:

$GPRMC,hhmmss.sss,dd,mm.yyyy, , ,xxx<CR><LF>
1 2 3 4 5 6 7

Example:

$GPZDA,104548.04,25,03,2004,,*6C<CR><LF>

Field	Name	Example	Description
1	UTC time	104548.04	UTC time in hhmmss.ss format, 000000.00 ~ 235959.99
2	UTC time: day	25	UTC time: day (01 ... 31)
3	UTC time: month	03	UTC time: month (01 ... 12)
4	UTC time: year	2004	UTC time: year (4 digit year)
5			Local zone hour Not being output by the receiver (NULL)
6			Local zone minutes Not being output by the receiver (NULL)
7	6C	6C	Checksum

UniTraQ International Corp

2F., No.136, Ziqiang S. Rd., Zhubei City, Hsinchu County 30264, Taiwan (R.O.C.)

TEL：886-3-6578491 FAX：886-3-6578492

Email support@unitraq.com
Website www.unitraq.com

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