

Marine GPS Receiver & Locator

MODEL: MR-650U

Small size and ruggedness, demand of vehicle locating and marine navigation GPS Receiver that will sustain harsh environment.



MR650U is a Mini Marine GPS receiver build-in well-known U-blox6 chipset. MR650U provides customer high position, velocity and time accuracy performances as well as high sensitivity and tracking capabilities. Customers benefit from the strength of both companies. Thanks to the low power consumption technology, the GPS-Mouse receiver is ideal for many portable applications such as PDA, Tablet PC, smart phone etc.

Features

- u-blox 6 solution
- 50-channel GPS
- SBAS (WAAS, EGNOS, MSAS, GAGAN)
- GALILEO Ready
- A-GPS
- UART, USB interface supported
- 25.0 x 25.0 x 4.0 mm patch antenna
- Wire-to-board connector
- RoHS compliant
- Water proof IP67

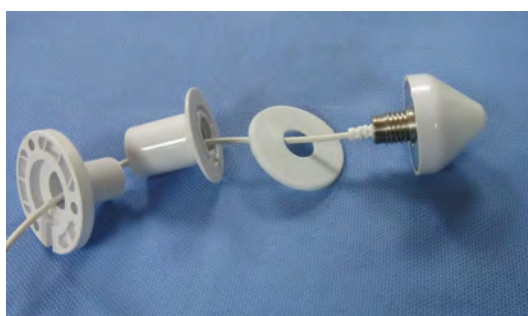
Applications

- Automotive
- Personal/Portable Navigation (PDA)
- Geographic Surveying
- Sports and Recreation
- Marine Navigation
- Fleet Management
- AVL and Location-Based Services

Specifications	Parameter	Description
General		L1 1575.42MHz GALILEO Open Service L1 ublox6 50 channels, C/A code
Sensitivity		-160dBm (tracking) -147dBm (Acquisition/Reacquisition)
Accuracy	Position	5.0 meters CEP
	DGPS Accuracy	2.0 meters CEP
	Time	30 nanosecond rms (1 PPS)
Acquisition	Cold start	32 sec. (typical)
	Warm start	32 sec. (typical)
	Hot start	1 sec. (typical)
Reacquisition		< 1 sec, typical
Dynamics	Altitude	50,000 meters max.
	Velocity	500 meters /sec max.
		.
Operation Temperature		-40° C to +85° C
Storage Temperature		-45° C to +90° C
Operating Humidity		0% to 95% RH, non condensing
Water Resistance		100% waterproof
Primary Power		7V ~ 40V DC
Power Consumption		150mA
Protocol		NMEA0183 v2.3
Signal level		RS-232(standard), & RS-422 optional
NMEA Message		GGA,GSA,GSV, RMC, VTG(Default)
EMI filter		Rejects power line interference
Power cable		UL 2464/28Awg 10M
Enclosure		High impact, corrosion-proof polycarbonate resin
Connector		Open
Dimensions		60mm(Dia.) x 95mm(H)
Weight		200 grams
Standard Mounting		FB1 & optional FB2 & FB3A

* This specification is subject to change without prior notice

User selectable datum *Pole mount to 1"-14 UNS threaded mast



I/O PIN & CABLE	
Wire	Function
White (白)	Receive
Green(綠)	Transmit
Yellow(黃)	GND
Bare Braid(隔離地線/熱縮黑)	Earth/GND
Blue(藍)	1PPS or N.C
Purplr(紫)	N.C
Black(黑)	Power- GND
Red(紅)	Power+

RS422 I/O Connection

Wire	Function
White (R+) 白	Differential input +
Green (T-) 綠	Differential output -
Yellow (T+) 黃	Differential output +
Purplr (R-) 紫	Differential input -
Blue 藍	1PPS or N.C
Bare Braid(隔離地線/熱縮黑)	Earth/GND
Black (-) 黑	Power- GND
Red (+) 紅	Power+

Table 3 NMEA-0183 V2.3 Output Messages

NMEA Sentence	Description
GGA (default)	Global Positioning System Fixed Data
GLL	Geographic Position - Latitude/Longitude
GSA (default)	GNSS DOP and Active Satellites
GSV (default)	GNSS Satellites in View
RMC (default)	Recommended Minimum Specific GNSS data
VTG (default)	Course Over Ground and Ground Speed
ZDA (default)	Time and Date

GGA--- Global Positioning System Fixed Data

Table 4 contains the values for the following example:

\$GPGGA,092725.00,4717.11399,N,00833.91590,E,1,8,1.01,499.6,M,48.0,M,,0*5B

Table 4 GGA Data Format

Name	Example	Units	Description
Message ID	\$GPGGA		GGA protocol header
UTC Time	092725.00		hhmmss.ss, Current time
Latitude	4717.11399		ddmm.mmmmm, Degrees + minutes
N/S Indicator	N		N=north or S=south
Longitude	00833.91590		dddmm.mmmmm, Degrees + minutes
E/W Indicator	E		E=east or W=west
Position Fix Indicator	1		See Table 5
Satellites Used	8		Range 0 to 12
HDOP	1.01		Horizontal Dilution of Precision
MSL Altitude	499.6	m	
Units	M	meters	Meters (fixed field)
Geoid Separation	48.0	m	
Units	M	meters	Meters (fixed field)
Age of Differential Corrections		second	Blank (Null) fields when DGPS is not used
Diff. Ref. Station ID	0		
Checksum	*5B		
<CR> <LF>			End of message termination

Table 5 Position Fix Indicator

Value	Description
0	No fix or invalid

Standard GPS (2D/3D)	
2	Differential GPS
6	Estimated (DR) Fix

GLL--- Geographic Position – Latitude/Longitude

Table 6 contains the values for the following example:

\$GPGLL,4717.11364,N,00833.91565,E,092321.00,A,A*60

Table 6 GLL Data Format

Name	Example	Units	Description
Message ID	\$GPGLL		GLL protocol header
Latitude	4717.11364		ddmm.mmmmm, Degrees + minutes
N/S Indicator	N		N=north or S=south
Longitude	00833.91565		dddmm.mmmmm, Degrees + minutes
E/W Indicator	E		E=east or W=west
UTC Time	092321.00		hhmmss.ss, Current time
Status	A		V = Data Invalid / Receiver Warning, A=Data Valid
Status	A		N=No Fix, A=Autonomous GNSS Fix, D=Differential GNSS Fix, E=Estimated/Dead Reckoning Fix
Checksum	*60		
<CR> <LF>			End of message termination

GSA---GNSS DOP and Active Satellites

Table 7 contains the values for the following example:

\$GPGSA,A,3,23,29,07,08,09,18,26,28,,,,,1.94,1.18,1.54*0D

Table 7 GSA Data Format

Name	Example	Units	Description
Message ID	\$GPGSA		GSA protocol header
Mode 1 (Smode)	A		See Table 8
Mode 2 (Fix Status)	3		See Table 9
Satellite Used	23		SV on Channel 1
Satellite Used	29		SV on Channel 2
			Repeated for each channel
Satellite Used			Sv on Channel 12
PDOP	1.94		Position Dilution of Precision (00.0 to 99.99)
HDOP	1.18		Horizontal Dilution of Precision (00.0 to 99.99)

VDOP	1.54		Vertical Dilution of Precision (00.00 to 99.99)
Checksum	*0D		
<CR> <LF>			End of message termination

Table 8 Mode 1 (Smode)

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

Table 9 Mode 2 (Fix Status)

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

GSV---GNSS Satellites in View

Table 10 contains the values for the following example:

\$GPGSV,3,1,10,23,38,230,44,29,71,156,47,07,29,116,41,08,09,081,36*7F

\$GPGSV,3,2,10,10,07,189,,05,05,220,,09,34,274,42,18,25,309,44*72

\$GPGSV,3,3,10,26,82,187,47,28,43,056,46*77

Table 10 GSV Data Format

Name	Example	Units	Description
Message ID	\$GPGSV		GSV protocol header
Number of Messages	3		Total number of GPGSV messages being output , Range 1 to 3
Message Number	1		Number of this message, Range 1 to 3
Satellites in View	10		
Satellite ID	23		SV ID (GPS: 1-32, SBAS 33-64 (33=PRN120))
Elevation	38	degree	Maximum 90
Azimuth	230	degree	Range 0 to 359
SNR (C/No)	44	dBHz	Range 0 to 99, null when not tracking
			Data of 2nd, 3rd Satellite (same as above)
Satellite ID	29		SV ID
Elevation	71	degree	Maximum 90
Azimuth	156	degree	Range 0 to 359
SNR (C/No)	47	dBHz	Range 0 to 99, null when not tracking
Checksum	*7F		
<CR> <LF>			End of message termination

RMC---Recommended Minimum Specific GNSS Data

Table 11 contains the values for the following example:

```
$GPRMC,083559.00,A,4717.11437,N,00833.91522,E,0.004,77.52,091202,,,A*57
```

Table 11 RMC Data Format

Name	Example	Units	Description
Message ID	\$GPRMC		RMC protocol header
UTC Time	083559.00		hhmmss.ss, Current time
Status	A		A=data valid or V=data not valid
Latitude	4717.11437		ddmm.mmmmm, Degrees + minutes
N/S Indicator	N		N=north or S=south
Longitude	00833.91522		dddmm.mmmmm, Degrees + minutes
E/W Indicator	E		E=east or W=west
Speed	0.004	knots	Speed Over Ground
COG	77.52	degree	Course Over Ground (true)
Date	091202		Ddmmyy, Current Date in Day, Month Year format
Magnetic Variation		degrees	E=east or W=west (Not being output by receiver)
Magnetic variation E/W indicator			Not being output by receiver
Mode Indicator	A		N=No Fix, A=Autonomous GNSS Fix, D=Differential GNSS Fix, E=Estimated/Dead Reckoning Fix
Checksum	*53		
<CR> <LF>			End of message termination

VTG---Course Over Ground and Ground Speed

Table 12 contains the values for the following example:

```
$GPVTG,77.52,T,,M,0.004,N,0.008,K,A*06
```

Table 12 VTG Data Format

Name	Example	Units	Description
Message ID	\$GPVTG		VTG protocol header
COG	77.52	degrees	Course Over Ground (true)
	T		True
COG		degrees	Course Over Ground (maganetic) (Not being output by receiver)
	M		Magnetic
Speed	0.004	knots	Speed over ground
Units			Knots

Speed	0.008	km/hr	Speed over ground
Units	K		Kilometer per hour
Mode	A		N=No Fix, A=Autonomous GNSS Fix, D=Differential GNSS Fix, E=Estimated/Dead Reckoning Fix
Checksum	*0B		
<CR> <LF>			End of message termination

ZDA---Time and Date

Table 13 contains the values for the following example:

\$GPZDA,082710.00,16,09,2002,00,00*64

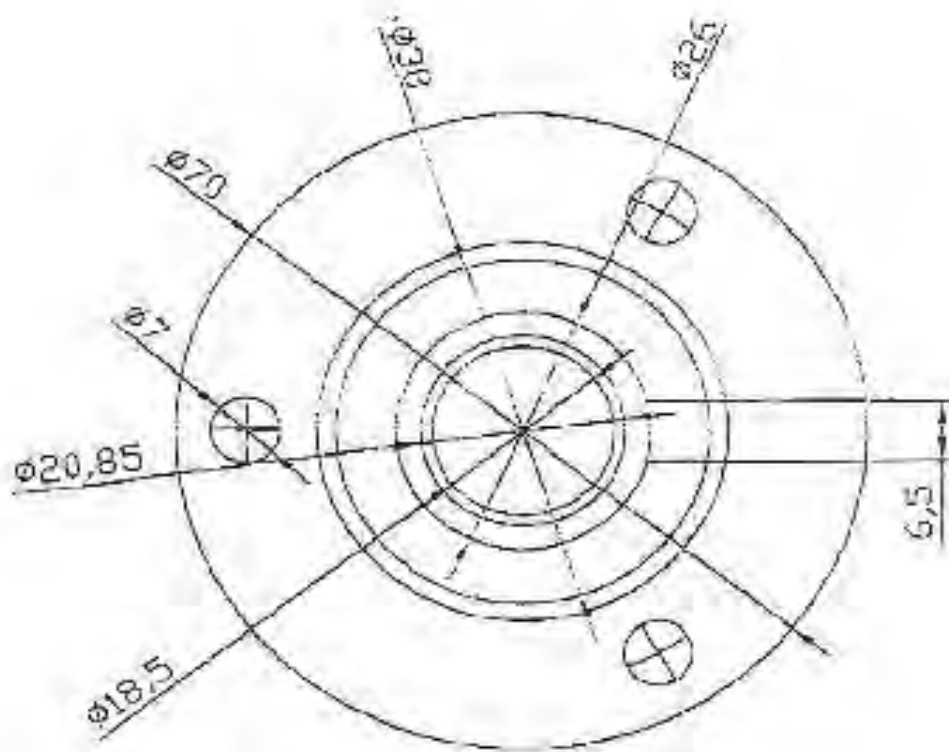
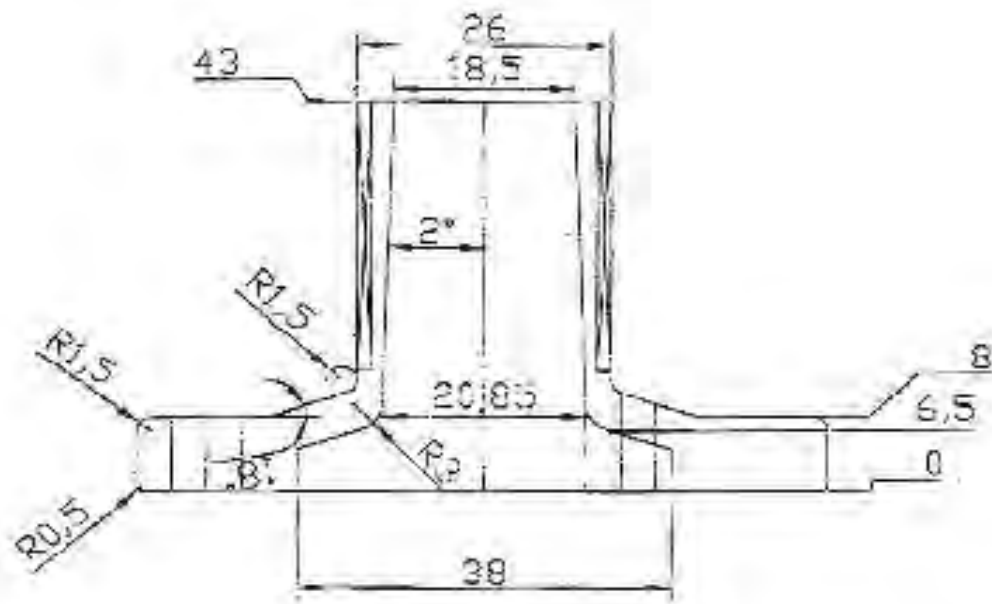
Table 13 ZDA Data Format

Name	Example	Units	Description
Message ID	\$GPZDA		ZDA protocol header
UTC Time	081727.00	degrees	hhmmss.ss
Day	16		01 to 31
Month	09		01 to 12
Year	2002		4 digit year
Local zone hours	00		(Not being output by receiver) (fixed to 00)
Local zone minutes	00		(Not being output by receiver) (fixed to 00)
Checksum	*64		
<CR> <LF>			End of message termination

Standard :



FB1 Base mounting :



Optional RS232 Interface cable & Power cable :

MR620A



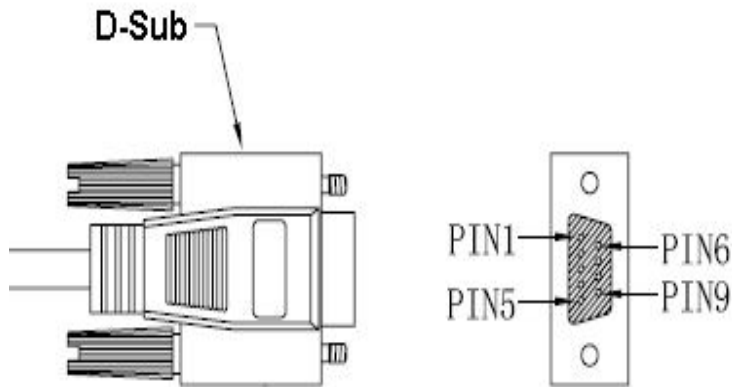
MR620B



MR620C



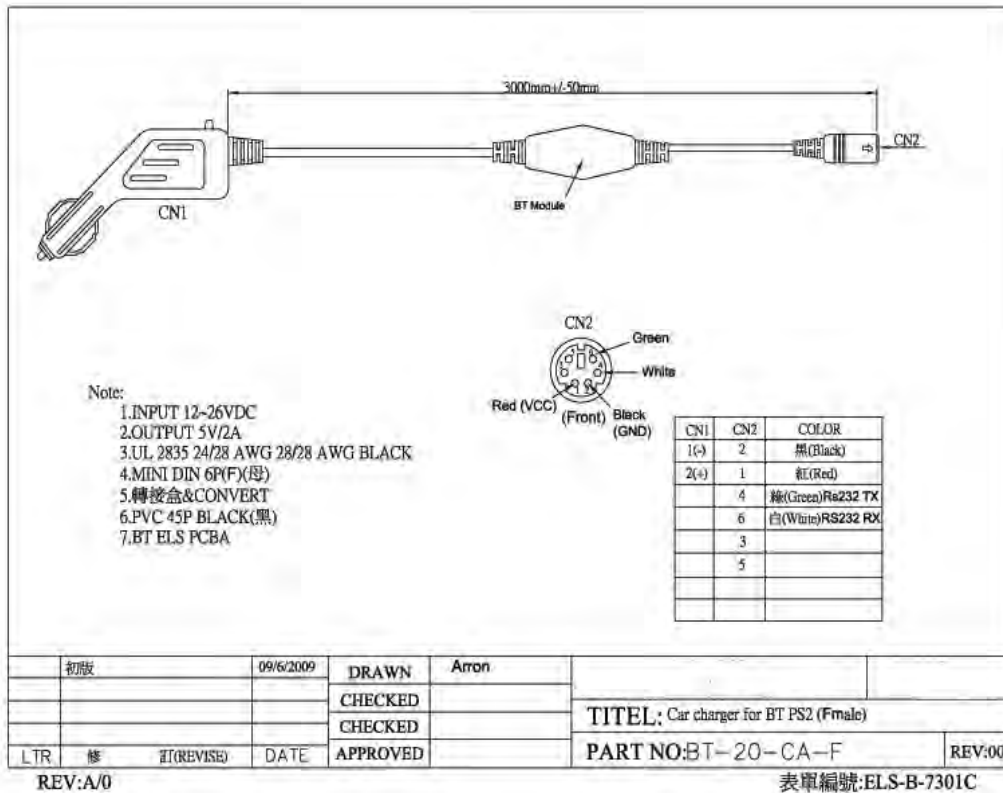
Pin Assignment of D-SUB 9 PIN Female connector



MR620A			MR620B		MR620C
DB9(F) – RS232 & Power cable			OPEN – RS232 & Power cable		DB9
PIN1	N.C	VCC 12~40V to 5V	Red	Vcc	VCC 5V
PIN2	RS232-TX		Green	RS232-TX	RS232-TX
PIN3	RS232-RX		White or Blue	RS232-RX	RS232-RX
PIN4	N.C.		Yellow	TTL - TX	N.C.
PIN5	GND	GDN	Orange	TTL - RX	GND
PIN6	N.C.		Black	GND	N.C.
PIN7	N.C.		Shielded wire	GND	N.C.
PIN8	N.C.				N.C.
PIN9	N.C.				N.C.

Optional Bluetooth interface cable
MR620BT

<https://www.bjnav.com/>



Optional : USB interface cable
MR620-USB(5V)



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GGA (default)	Global Positioning System Fixed Data
GLL (default)	Geographic Position - Latitude/Longitude
GSA (default)	GNSS DOP and Active Satellites
GSV (default)	GNSS Satellites in View
RMC (default)	Recommended Minimum Specific GNSS data
VTG (default)	Course Over Ground and Ground Speed
ZDA (default)	Time and Date

GGA--- Global Positioning System Fixed Data

Table 4 contains the values for the following example:

\$GPGGA,092725.00,4717.11399,N,00833.91590,E,1,8,1.01,499.6,M,48.0,M,,0*5B

Table 4 GGA Data Format

Name	Example	Units	Description
Message ID	\$GPGGA		GGA protocol header
UTC Time	092725.00		hhmmss.ss, Current time
Latitude	4717.11399		ddmm.mmmmm, Degrees + minutes
N/S Indicator	N		N=north or S=south
Longitude	00833.91590		dddmm.mmmmm, Degrees + minutes
E/W Indicator	E		E=east or W=west
Position Fix Indicator	1		See Table 5
Satellites Used	8		Range 0 to 12
HDOP	1.01		Horizontal Dilution of Precision
MSL Altitude	499.6	m	
Units	M	meters	Meters (fixed field)
Geoid Separation	48.0	m	
Units	M	meters	Meters (fixed field)
Age of Differential Corrections		second	Blank (Null) fields when DGPS is not used
Diff. Ref. Station ID	0		
Checksum	*5B		
<CR> <LF>			End of message termination

Table 5 Position Fix Indicator

Value	Description
0	No fix or invalid

Standard GPS (2D/3D)	
2	Differential GPS
6	Estimated (DR) Fix

GLL--- Geographic Position – Latitude/Longitude

Table 6 contains the values for the following example:

\$GPGLL,4717.11364,N,00833.91565,E,092321.00,A,A*60

Table 6 GLL Data Format

Name	Example	Units	Description
Message ID	\$GPGLL		GLL protocol header
Latitude	4717.11364		ddmm.mmmmm, Degrees + minutes
N/S Indicator	N		N=north or S=south
Longitude	00833.91565		dddmm.mmmmm, Degrees + minutes
E/W Indicator	E		E=east or W=west
UTC Time	092321.00		hhmmss.ss, Current time
Status	A		V = Data Invalid / Receiver Warning, A=Data Valid
Status	A		N=No Fix, A=Autonomous GNSS Fix, D=Differential GNSS Fix, E=Estimated/Dead Reckoning Fix
Checksum	*60		
<CR> <LF>			End of message termination

GSA---GNSS DOP and Active Satellites

Table 7 contains the values for the following example:

\$GPGSA,A,3,23,29,07,08,09,18,26,28,,,,,1.94,1.18,1.54*0D

Table 7 GSA Data Format

Name	Example	Units	Description
Message ID	\$GPGSA		GSA protocol header
Mode 1 (Smode)	A		See Table 8
Mode 2 (Fix Status)	3		See Table 9
Satellite Used	23		SV on Channel 1
Satellite Used	29		SV on Channel 2
			Repeated for each channel
Satellite Used			Sv on Channel 12
PDOP	1.94		Position Dilution of Precision (00.0 to 99.99)
HDOP	1.18		Horizontal Dilution of Precision (00.0 to 99.99)

VDOP	1.54		Vertical Dilution of Precision (00.00 to 99.99)
Checksum	*0D		
<CR> <LF>			End of message termination

Table 8 Mode 1 (Smode)

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

Table 9 Mode 2 (Fix Status)

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

GSV---GNSS Satellites in View

Table 10 contains the values for the following example:

\$GPGSV,3,1,10,23,38,230,44,29,71,156,47,07,29,116,41,08,09,081,36*7F

\$GPGSV,3,2,10,10,07,189,,05,05,220,,09,34,274,42,18,25,309,44*72

\$GPGSV,3,3,10,26,82,187,47,28,43,056,46*77

Table 10 GSV Data Format

Name	Example	Units	Description
Message ID	\$GPGSV		GSV protocol header
Number of Messages	3		Total number of GPGSV messages being output , Range 1 to 3
Message Number	1		Number of this message, Range 1 to 3
Satellites in View	10		
Satellite ID	23		SV ID (GPS: 1-32, SBAS 33-64 (33=PRN120))
Elevation	38	degree	Maximum 90
Azimuth	230	degree	Range 0 to 359
SNR (C/No)	44	dBHz	Range 0 to 99, null when not tracking
			Data of 2nd, 3rd Satellite (same as above)
Satellite ID	29		SV ID
Elevation	71	degree	Maximum 90
Azimuth	156	degree	Range 0 to 359
SNR (C/No)	47	dBHz	Range 0 to 99, null when not tracking
Checksum	*7F		
<CR> <LF>			End of message termination

RMC---Recommended Minimum Specific GNSS Data

Table 11 contains the values for the following example:

```
$GPRMC,083559.00,A,4717.11437,N,00833.91522,E,0.004,77.52,091202,,,A*57
```

Table 11 RMC Data Format

Name	Example	Units	Description
Message ID	\$GPRMC		RMC protocol header
UTC Time	083559.00		hhmmss.ss, Current time
Status	A		A=data valid or V=data not valid
Latitude	4717.11437		ddmm.mmmmm, Degrees + minutes
N/S Indicator	N		N=north or S=south
Longitude	00833.91522		dddmm.mmmmm, Degrees + minutes
E/W Indicator	E		E=east or W=west
Speed	0.004	knots	Speed Over Ground
COG	77.52	degree	Course Over Ground (true)
Date	091202		Ddmmyy, Current Date in Day, Month Year format
Magnetic Variation		degrees	E=east or W=west (Not being output by receiver)
Magnetic variation E/W indicator			Not being output by receiver
Mode Indicator	A		N=No Fix, A=Autonomous GNSS Fix, D=Differential GNSS Fix, E=Estimated/Dead Reckoning Fix
Checksum	*53		
<CR> <LF>			End of message termination

VTG---Course Over Ground and Ground Speed

Table 12 contains the values for the following example:

```
$GPVTG,77.52,T,,M,0.004,N,0.008,K,A*06
```

Table 12 VTG Data Format

Name	Example	Units	Description
Message ID	\$GPVTG		VTG protocol header
COG	77.52	degrees	Course Over Ground (true)
	T		True
COG		degrees	Course Over Ground (maganetic) (Not being output by receiver)
	M		Magnetic
Speed	0.004	knots	Speed over ground
Units			Knots

Speed	0.008	km/hr	Speed over ground
Units	K		Kilometer per hour
Mode	A		N=No Fix, A=Autonomous GNSS Fix, D=Differential GNSS Fix, E=Estimated/Dead Reckoning Fix
Checksum	*0B		
<CR> <LF>			End of message termination

ZDA---Time and Date

Table 13 contains the values for the following example:

\$GPZDA,082710.00,16,09,2002,00,00*64

Table 13 ZDA Data Format

Name	Example	Units	Description
Message ID	\$GPZDA		ZDA protocol header
UTC Time	081727.00	degrees	hhmmss.ss
Day	16		01 to 31
Month	09		01 to 12
Year	2002		4 digit year
Local zone hours	00		(Not being output by receiver) (fixed to 00)
Local zone minutes	00		(Not being output by receiver) (fixed to 00)
Checksum	*64		
<CR> <LF>			End of message termination