

# L86 GNSS

# Protocol Specification

**GNSS Module Series**

Rev. L86\_GNSS\_Protocol\_Specification\_V1.2

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### 3.14. Packet Type: 223 PMTK\_SET\_AL\_DEE\_CFG

This message is used to config DEE.

Data Field:  
\$PMTK223,SV,SNR,Extension  
threshold,Extension gap  
Example:  
\$PMTK223,1,30,180000,60000\*3C<CR><LF>  
Response:  
\$PMTK001,223,3\*33<CR><LF>

Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	223
SV	Range: 1~4 (Default value: 1)
SNR	Range: 25~30 (Default value: 30)
Extension Threshold	Range: 40000~180000 (Default value: 180000)
Extension Gap	Range: 0~3600000 (Default value: 60000)
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

### 3.15. Packet Type: 225 PMTK\_SET\_PERIODIC\_MODE

This message is used to enter periodic mode for power saving.

Data Field:  
\$PMTK225,Type,Run time,Sleep time,Second run time,Second sleep time  
Example:  
\$PMTK225,8\*23<CR><LF>  
Response:  
\$PMTK001,225,3\*35<CR><LF>

Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	225
Type	'0'=Back to normal mode '1'=Periodic Backup mode '2'=Periodic Standby mode '4'=Perpetual Backup mode '8'=AlwaysLocate Standby mode '9'=AlwaysLocate Backup mode
Run Time	'0': Disable >='1000': Enable (Range: 1000~518400000)
Sleep Time	(Range: 1000~518400000)
Second Run Time	'0': Disable >='1000': Enable (Range: 1000~518400000)
Second Sleep Time	(Range: 1000~518400000)
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

**NOTE**

The unit of run time or sleep time is msec, the second run time should be larger than the first run time when the first run time is non-zero value.

### 3.16. Packet Type: 251 PMTK\_SET\_NMEA\_BAUDRATE

This message is used to set NMEA port baud rate. Using PMTK251 command to setup baud rate setting, the setting will be back to default value in the condition: Full cold start command is issued.

Data Field:

\$PMTK251,Baudrate

Example:

\$PMTK251,38400\*27<CR><LF>

Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	251
Baud Rate	Baud rate setting: 9600 - default setting 4800 9600 14400 19200 38400 57600 115200
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

### 3.17. Packet Type: 255 PMTK\_SET\_SYNC\_PPS\_NMEA

This message is used to enable or disable fix NMEA output time behind PPS function.(Default off)

Data Field:  
\$PMTK255,Enable  
Example:  
\$PMTK255,0\*2C<CR><LF>  
Response:  
\$PMTK001,255,3\*32<CR><LF>

Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	255
Enable	'0'=Disable '1'=Enable

*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

### 3.18. Packet Type: 256 PMTK\_SET\_TIMING\_PRODUCT

This message is used to enable or disable timing product mode.(Default off)

Data Field:  
\$PMTK256,Enable  
Example:  
\$PMTK256,0\*2F<CR><LF>  
Response:  
\$PMTK001,256,3\*31<CR><LF>

Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	256
Enable	'0'=Disable '1'=Enable
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

### 3.19. Packet Type: 285 PMTK\_SET\_PPS\_CONFIG

This message is used to set PPS type.

Data Field:  
\$PMTK285,Type,PPSPulseWidth  
Example:  
\$PMTK285,4,100\*38<CR><LF>

Response:  
\$PMTK001,285,3\*3F<CR><LF>

Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	285
Type	'0'=Disable '1'=After the first fix '2'=3D fix only '3'=2D/3D fix only '4'=Always
PPSPulseWidth	2~998 (Unit: ms)
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

### 3.20. Packet Type: 286 PMTK\_SET\_AIC\_ENABLED

This message is used to enable or disable AIC function. It is suggested to set cold start command first and then PMTK command.

Data Field:  
\$PMTK286,Enable  
Example:  
\$PMTK286,0\*22<CR><LF>  
Response:  
\$PMTK001,286,3\*3C<CR><LF>

Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	286
Enable	'0'=Disable '1'=Enable

*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

### 3.21. Packet Type: 301 PMTK\_API\_SET\_DGPS\_MODE

This message is used to configure the source mode of DGPS correction data.

Data Field:  
\$PMTK301,Mode  
Example:  
\$PMTK301,2\*2E<CR><LF>  
Response:  
\$PMTK001,301,3\*32<CR><LF>

Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	301
Mode	DGPS data source mode. '0'=No DGPS source '1'=RTCM '2'=SBAS(Include WAAS/EGNOS/GAGAN/MSAS)
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

### 3.22. Packet Type: 313 PMTK\_API\_SET\_SBAS\_ENABLED

This message is used to enable or disable to search a SBAS satellite. SBAS (Satellite Based Augmentation Systems) is a system that supports wide-area or regional augmentation through geostationary satellite broadcast messages. The geostationary satellite broadcast GNSS integrity and correction data with the assistance of multiple ground stations which are located at accurately-surveyed



points.

Data Field:  
\$PMTK313,Enable  
Example:  
\$PMTK313,1\*2E<CR><LF>  
Response:  
\$PMTK001,313,3\*31<CR><LF>

Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	313
Enable	'0'=Disable '1'=Enable
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

### 3.23. Packet Type: 314 PMTK\_API\_SET\_NMEA\_OUTPUT

This message is used to set NMEA sentence output frequencies. There are totally 19 data fields that present output frequencies for the 19 supported NMEA sentences individually.

Supported Frequency Setting:

- 0 - Disabled or not supported sentence
- 1 - Output once every one position fix
- 2 - Output once every two position fixes
- 3 - Output once every three position fixes
- 4 - Output once every four position fixes
- 5 - Output once every five position fixes

Data Field:  
None  
Example:  
The module only output RMC once every one position fix.

```
$PMTK314,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0*29<CR><LF>
```

Response:

```
$PMTK001,314,3*36<CR><LF>
```

Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	314
0 GLL	GLL interval - Geographic Position - Latitude longitude
1 RMC	RMC interval - Recommended Minimum Specific GNSS Sentence
2 VTG	VTG interval - Course Over Ground and Ground Speed
3 GGA	GGA interval - GPS Fix Data
4 GSA	GSA interval - GNSS DOPS and Active Satellites
5 GSV	GSV interval - GNSS Satellites in View
6 GRS	GRS interval – GNSS Range Residuals
7 GST	GST interval – GNSS Pseudorange Error Statistics
8 Reserved	Always 0
9 Reserved	Always 0
10 Reserved	Always 0
11 Reserved	Always 0
12 Reserved	Always 0
13 Reserved	Always 0
14 Reserved	Always 0
15 Reserved	Always 0
16 Reserved	Always 0
17 ZDA	ZDA interval - Time and Date
18 MCHN	PMTKCHN interval - GNSS channel status

*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

To restore the system default setting, use below message:

Example:  
\$PMTK314,-1\*04<CR><LF>

Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	314
Restore	Always -1
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

### 3.24. Packet Type: 351 PMTK\_API\_SET\_SUPPORT\_QZSS\_NMEA

The receiver support new NMEA format for QZSS. The command allow user enable or disable QZSS NMEA format. Default is disable QZSS NMEA format.

Data Field:  
\$PMTK351,Enable  
Example:  
\$PMTK351,1\*28<CR><LF>  
Response:  
\$PMTK001,351,3\*37<CR><LF>

Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message

Packet Type	351
QZSS_Enable	'0'=Disable '1'=Enable
*	End character of data field
Checksum	Hexadecimal checksum

### 3.25. Packet Type: 352 PMTK\_API\_SET\_STOP\_QZSS

QZSS is regional positioning service. This command is used to enable or disable QZSS function. Default is enabled.

Data Field:  
\$PMTK352,Enable  
Example:  
\$PMTK352,0\*2A<CR><LF>  
Response:  
\$PMTK001,352,3\*34<CR><LF>

Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	352
QZSS_Enable	'0'=Enable '1'=Disable
*	End character of data field
Checksum	Hexadecimal checksum

### 3.26. Packet Type: 353 PMTK\_API\_SET\_GNSS\_SEARCH\_MODE

This command is used to configure the receiver to start searching satellite system.

Data Field:  
\$PMTK353,GPS\_Enable,GLONASS\_Enable,GALILEO\_Enable,GALILEO\_FULL\_Enable,BEIDOU\_Enab

le  
Example:  
\$PMTK353,1,1,0,0,0\*2B<CR><LF>: Search GPS+GLONASS  
Response:  
\$PMTK001,353,3,1,1,0,0,0,3\*36<CR><LF>

Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	353
GPS_Enable	'0'=Disable (DO NOT search GPS satellites) '1'or non-ZERO: search GPS satellites
GLONASS_Enable	'0'=Disable (DO NOT search GLONASS satellites) '1'or non-ZERO: search GLONASS satellites
GALILEO_Enable	'0'=Disable (DO NOT search Galileo satellites) '1'or non-ZERO: search Galileo satellites
GALILEO_FULL_Enable	'0'=Disable (DO NOT search Galileo full mode satellites) '1'or non-ZERO: search Galileo satellites
BEIDOU_Enable	'0'=Disable '1'or non-ZERO: search BeiDou satellites
*	End character of data field
Checksum	Hexadecimal checksum

**NOTE**

1. If the receiver is fixed by GPS only, it will print GPRMC, GPVTG, GPGGA, GPGSA, GPGSV, GPGLL and GPTXT.
2. If the receiver is fixed by GPS only, and can also search QZSS satellite, it will print GPRMC, GPVTG, GPGGA, GPGSA, QZQSA, GPGSV, QZGSV, GPGLL and GPTXT.
3. If the receiver is fixed by GLONASS only, it will print GNRMC, GPVTG, GPGGA, GNGSA, GPGSV, GLGSV, GNGLL and GPTXT.
4. If the receiver is fixed by multi-GNSS, it will print GNRMC, GPVTG, GPGGA, GNGSA, GPGSV, GLGSV, GNGLL and GPTXT.
5. In the state of no satellite positioning, it will print initial state of NMEA, such as GPRMC, GPVTG, GPGGA, GPGSA, GPGSV, GPGLL and GPTXT. The time before satellite positioning after cold start, warm start or hot start belongs to this situation.
6. We use GPS+GLONASS or one of them. At present Galileo and BeiDou are not supported yet.

### 3.27. Packet Type: 386 PMTK\_API\_SET\_STATIC\_NAV\_THD

This message is used to set the speed threshold for static navigation. If the actual speed is below the threshold, output position will keep the same and output speed will be zero. If threshold value is set to 0, this function is disabled.

Data Field:  
\$PMTK386,Speed\_threshold  
Example:  
\$PMTK386,0.3\*3E<CR><LF>  
Response:  
\$PMTK001,386,3\*3D<CR><LF>

Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	386
Speed_threshold	0~2m/s
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

### 3.28. Packet Type: 400 PMTK\_API\_Q\_FIX\_CTL

This message is used to query the rate of position fixing activity.

Refer to PMTK\_API\_SET\_FIX\_CTL for setting the rate.

Refer to PMTK\_DT\_FIX\_CTL for the result of the query.

Data Field:  
None  
Example:  
\$PMTK400\*36<CR><LF>

Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	400
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

### 3.29. Packet Type: 401 PMTK\_API\_Q\_DGPS\_MODE

This message is used to query the setting of DGPS mode.

Refer to PMTK\_API\_SET\_DGPS\_MODE for setting the DGPS mode.

Refer to PMTK\_DT\_DGPS\_MODE for the result of the query.

Data Field:

None

Example:

\$PMTK401\*37<CR><LF>

Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	401
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

### 3.30. Packet Type: 413 PMTK\_API\_Q\_SBAS\_ENABLED

This message is used to query the setting of SBAS.

Refer to PMTK\_API\_SET\_SBAS\_ENABLE for SBAS setting.

Refer to PMTK\_DT\_SBAS\_ENABLED for the result of the query.

Data Field:	
None	
Example:	
\$PMTK413*34<CR><LF>	
Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	413
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

### 3.31. Packet Type: 414 PMTK\_API\_Q\_NMEA\_OUTPUT

This message is used to query the current NMEA sentence output frequencies.

Refer to PMTK\_API\_SET\_NMEA\_OUTPUT for the frequencies setting.

Refer to PMTK\_DT\_NMEA\_OUTPUT for the result of the query.

Data Field:	
None	
Example:	
\$PMTK414*33<CR><LF>	
Field	Description



\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	414
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

### 3.32. Packet Type: 605 PMTK\_Q\_RELEASE

This message is used to query the firmware release information.

Refer to PMTK\_DT\_RELEASE for the result of the query.

Data Field: None Example: \$PMTK605*31<CR><LF>	
Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	605
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

### 3.33. Packet Type: 500 PMTK\_DT\_FIX\_CTL

This message is the response to PMTK\_API\_Q\_FIX\_CTL.

Data Field: \$PMTK500,Fix interval Example: \$PMTK500,1000,0,0,0,0*1A<CR><LF>	
Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	500
Fix Interval	Position fix interval [msec]. Greater than 100
Reserved	Always 0
Reserved	Always 0
Reserved	Always 0
Reserved	Always 0
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

### 3.34. Packet Type: 501 PMTK\_DT\_DGPS\_MODE

This message is the response to PMTK\_API\_Q\_DGPS\_MODE.

Data Field: \$PMTK513,Enable Example: \$PMTK513,1*28<CR><LF>	
Field	Description

\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	501
Mode	DGPS data source mode. '0'=No DGPS source '1'=RTCM '2'=SBAS
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

### 3.35. Packet Type: 513 PMTK\_DT\_SBAS\_ENABLED

This message is the response to PMTK\_API\_Q\_SBAS\_ENABLED.

Data Field:  
\$PMTK513,Enable  
Example:  
\$PMTK513,1\*28<CR><LF>

Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	513
Enable	'0'=Disable '1'=Enable
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

### 3.36. Packet Type: 514 PMTK\_DT\_NMEA\_OUTPUT

This message is the response to PMTK\_API\_Q\_NMEA\_OUTPUT.

Data Field:

None

Example:

```
$PMTK514,1,1,1,1,1,1,0,0,0,0,0,0,0,0,0,0,0*2E<CR><LF>
```

Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	514
0 GLL	GLL interval - Geographic Position - Latitude longitude
1 RMC	RMC interval - Recommended Minimum Specific GNSS Sentence
2 VTG	VTG interval - Course Over Ground and Ground Speed
3 GGA	GGA interval - GPS Fix Data
4 GSA	GSA interval - GNSS DOPS and Active Satellites
5 GSV	GSV interval - GNSS Satellites in View
6 GRS	GRS interval – GNSS Range Residuals
7 GST	GST interval – GNSS Pseudorange Error Statistics
8 Reserved	
9 Reserved	
10 Reserved	
11 Reserved	
12 Reserved	
13 Reserved	
14 Reserved	
15 Reserved	

16	Reserved
17	ZDA ZDA interval - Time and Date
18	MCHN PMTKCHN interval - GNSS channel status
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

### 3.37. Packet Type: 705 PMTK\_DT\_RELEASE

This message is the response to PMTK\_Q\_RELEASE.

Data Field: \$PMTK705, Release string, Build ID, Product Model(,SDK Version) Example: \$PMTK705,AXN_3.10_3333_12102201,0000,QUECTEL-L76,*18<CR><LF>	
Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	705
Release String	Firmware release name and version 3318: Mcore_x.x 3329: AXN_x.x 3339: AXN_x.x 3333: AXN_x.x
Build ID	Build ID set in CoreBuilder for firmware version control
Product Model	Product Model set in CoreBuilder for product identification
SDK Version (Optional)	Showing SDK version if the firmware is used for SDK
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

### 3.38. Packet Type: 869 PMTK\_EASY\_ENABLE

This message is used to enable or disable EASY function, and it also can be used to query if EASY is enabled or disabled.

Data Field:  
\$PMTK869,CmdType[, Enabled]  
Example:  
\$PMTK869,1,1\*35<CR><LF>  
Response:  
\$PMTK001,869,3\*37<CR><LF>

Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	869
CmdType	'0'=Query '1'=Set '2'=Result for Query operation
Enabled	'0'=Disable '1'=Enable
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

#### NOTES

1. If EASY is disabled, the receiver returns:  
\$PMTK869,2,0,0\*2B<CR><LF>
2. If EASY is enabled and not finished yet, the receiver may return:  
\$PMTK869,2,1,0\*2A<CR><LF>
3. If EASY is enabled and finished after 1 day, the receiver may return:  
\$PMTK869,2,1,1\*2B<CR><LF>
4. If EASY is enabled and finished after 2 days, the receiver may return:  
\$PMTK869,2,1,2\*28<CR><LF>
5. If EASY is enabled and finished after 3 days, the receiver may return:  
\$PMTK869,2,1,3\*29<CR><LF>

### 3.39. Packet Type: 875 PMTK\_PMTKLSC\_STN\_OUTPUT

This message is used to enable or disable PMTKLSC Sentence output. Query if PMTKLSC Sentence output enabled or disabled.

Data Field:

\$PMTK875,CmdType[,Enabled]

Example:

\$PMTK875,1,1\*38<CR><LF>: Enable PMTKLSC and PMTKLSCB Sentence output

Response:

\$PMTKLSC,Parameter1,Parameter2,Parameter3\*CS

\$PMTKLSB,Parameter1,Parameter2,Parameter3\*CS

Where Parameter1: current leap second

Parameter2: leap indicator, 1 means updated from broadcast data

Parameter3: next leap second

Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	875
CmdType	'0'=Query '1'=Set '2'=Result for Query operation
Enabled	'0'=Disable '1'=Enable
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

### 3.40. Packet Type: 886 PMTK\_FR\_MODE

This message is used to set navigation mode.

Data Field:

\$PMTK886,CmdType

Example:

\$PMTK886,3\*2B<CR><LF>

Response:

\$PMTK001,886,3\*36

Field	Description
\$	Each NMEA message starts with '\$'
PMTK	MTK proprietary message
Packet Type	886
CmdType	'0'=Normal mode: For general purpose '1'=Fitness mode: For running and walking purpose that the low-speed (<5m/s) movement will have more effect on the position calculation. '2'=Aviation mode: For high-dynamic purpose that the large-acceleration movement will have more effect on the position calculation. '3'=Balloon mode: For high-altitude balloon purpose that the vertical movement will have more effect on the position calculation.
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message



# 4 Appendix A Reference

**Table 3: Related Documents**

SN	Document Name	Remark
[1]	Quectel_L86_Hardware_Design	L86 Hardware Design
[2]	Quectel_L86_EVB_User Guide	L86 EVB User Guide
[3]	Quectel_L86_Reference_Design	L86 Reference Design

**Table 4: Terms and Abbreviations**

Abbreviation	Description
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GLONASS	Global Navigation Satellite System(The Russian GNSS)
NMEA	National Marine Electronics Association
PMTK	Private protocol of MTK
GGA	NMEA: Global Positioning System Fix Data
RMC	NMEA: Recommended Minimum Position Data
GSA	NMEA: GNSS DOP and Active Satellites
GSV	NMEA: GNSS Satellites in View
GLL	NMEA: Geographic Position – Latitude/Longitude
VTG	NMEA: Track Made Good and Ground Speed
SBAS	Satellite-Based Augmentation System
AGPS	Assisted Global Positioning System

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DGPS	Differential Global Positioning System
EASY	Embedded Assist System
AIC	Active Interference Cancellation
PDOP	Position Dilution Of Precision
VDOP	Vertical Dilution Of Precision
HDOP	Horizontal Dilution Of Precision
WAAS	Wide Area Augmentation System
PPS	Pulse Per Second
UTC	Universal Time Coordinated

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# 5 Default Configurations

**Table 5: Default Configurations**

Item	Default
NMEA Port Baud Rate	9600bps
Datum	WGS84
Rate of Position Fixing	1HZ
DGPS Mode	SBAS
SBAS Enable	Enable
NMEA Output Messages	GGA, RMC, GSA, GSV, VTG, GLL and TXT
AIC	On
EASY	On