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Wireless Module Expert

L86 GNSS

Protocol Specification

GNSS Module Series

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About the Document

History

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1.0	2014-08-18	Bond SUN	Initial
1.1	2014-12-19	Connie ZHOU	1. Modified the description of DGPS_MODE. 2. Added parameter for "Fix status" in GPGGA sentence. 3. Added parameter for packet type 353. 4. Modified the Notes in Chapter 2.1.

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1 Introduction

L86 GNSS module can use both GLONASS and GPS constellation and features accurate acquisition. The module supports autonomous GNSS C/A, SBAS function (including WAAS and EGNOS) and AGPS (EASY function). It can be used in the positioning, navigation and other industries.

This document describes the software aspects of L86. L86 supports NMEA 0183 standard commands. MTK NMEA extended packet is supported to control and configure L86 GNSS module.

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2 Standard NMEA Packet Protocol

L86 supports NMEA 0183 standard messages. The following table shows the structure of a NMEA 0183 standard message.

Table 1: Structure of NMEA Message

Filed	Length (Bytes)	Description
$	1	Each NMEA message starts with '$'
Talker ID	1~2	Talker IDs can be 'GP' and 'GN' when the message ID is RMC, GSA or GLL, and Talker IDs can be 'GP' and 'GL' when the message ID is GSV. Otherwise, Talker ID is always 'GP'.
NMEA Message ID	3	NMEA message ID
Data Field	Variable, depends on the NMEA message type	Data fields, delimited by comma ','
*	1	End character of data field
Checksum	2	A hexadecimal number calculated by exclusive OR of all characters between '$' and '*'
<CR><LF>	2	Each NMEA message ends with 'CR' and 'LF'

NOTE

The default output message of L86 has the following seven sentences: RMC, VTG, GGA, GSA, GSV, GLL and GPTXT.

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2.1. --RMC

RMC, recommended minimum position data (including position, velocity and time).

Example:
$GNRMC,110332.000,A,3150.7822,N,11711.9278,E,0.01,37.48,111214,,,D*43<CR><LF>
$GPRMC,110950.000,A,3150.7849,N,11711.9292,E,0.01,282.88,111214,,,D*6A<CR><LF>

Field	Description
$	Each NMEA message starts with '$'
--RMC	Message ID
UTC Time	Time in format 'hhmmss.sss'
Data Valid	'V'=Invalid 'A'=Valid
Latitude	Latitude in format 'ddmm.mmmm' (degree and minutes)
N/S	'N'=North 'S'=South
Longitude	Longitude in format 'dddmm.mmmm' (degree and minutes)
E/W	'E'=East 'W'=West
Speed	Speed over ground in knots
COG	Course over ground in degree
Date	Date in format 'ddmmyy'
Magnetic Variation	Magnetic variation in degree, not being output
E/W	Magnetic variation E/W indicator, not being output
Positioning Mode	'N'=No fix 'A'=Autonomous GNSS fix 'D'=Differential GNSS fix
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

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NOTES

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 is belong to this situation.

2.2. GPVTG

VTG, track made good and ground speed.

Example: $GPVTG,37.48,T,,M,0.01,N,0.01,K,D*00<CR><LF>	
Field	**Description**
$	Each NMEA message starts with '$'
GPVTG	Message ID
COG (T)	Course over ground (true) in degree
T	Fixed field, true
COG (M)	Course over ground (magnetic), not being output
M	Fixed field, magnetic
Speed	Speed over ground in knots
N	Fixed field, knots
Speed	Speed over ground in km/h
K	Fixed field, km/h
Positioning Mode	'N'=No fix 'A'=Autonomous GNSS fix

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	'D'=Differential GNSS fix
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

2.3. GPGGA

GGA, global positioning system fix data, is the essential fix data which provides 3D location and accuracy data.

Example: $GPGGA,110332.000,3150.7822,N,11711.9278,E,2,14,0.75,46.0,M,0.0,M,0000,0000*63<CR><LF>	
Field	**Description**
$	Each NMEA message starts with '$'
GPGGA	Message ID
UTC Time	Time in format 'hhmmss.sss'
Latitude	Latitude in format 'ddmm.mmmm' (degree and minutes)
N/S	'N'=North 'S'=South
Longitude	Longitude in format 'dddmm.mmmm' (degree and minutes)
E/W	'E'=East 'W'=West
Fix Status	'0'=Invalid '1'=GNSS fix '2'=DGPS fix '6'=Estimated (dead reckoning) Mode
Number of SV	Number of satellites being used (0~12)
HDOP	Horizontal Dilution of Precision
Altitude	Altitude in meters according to WGS84 ellipsoid
M	Fixed field, meter

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GeoID Separation	Height of GeoID (mean sea level) above WGS84 ellipsoid, meter
M	Fixed field, meter
DGPS Age	Age of DGPS data in seconds, empty if DGPS is not used
DGPS Station ID	DGPS station ID, empty if DGPS is not used
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

2.4. --GSA

GSA, GNSS DOP and Active Satellites, provide details on the fix, including the numbers of the satellites being used and the DOP. At most the first 12 satellite IDs are output.

Example:
$GPGSA,A,3,25,24,04,12,14,15,,,,,,,2.09,1.49,1.47*00<CR><LF>
$GNGSA,A,3,22,14,12,15,31,25,24,04,193,,,,1.28,0.75,1.03*29<CR><LF>

Field	Description
$	Each NMEA message starts with ‘$’
--GSA	Message ID
Mode	Auto selection of 2D or 3D fix ‘M’=Manual, forced to switch 2D/3D mode ‘A’=Allowed to automatically switch 2D/3D mode
Fix Status	‘1’=No fix ‘2’=2D fix ‘3’=3D fix
Satellite Used 1	Satellite used on channel 1
Satellite Used 2	Satellite used on channel 2
Satellite Used 3	Satellite used on channel 3
Satellite Used 4	Satellite used on channel 4
Satellite Used 5	Satellite used on channel 5

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Satellite Used 6	Satellite used on channel 6
Satellite Used 7	Satellite used on channel 7
Satellite Used 8	Satellite used on channel 8
Satellite Used 9	Satellite used on channel 9
Satellite Used 10	Satellite used on channel 10
Satellite Used 11	Satellite used on channel 11
Satellite Used 12	Satellite used on channel 12
PDOP	Position Dilution of Precision
HDOP	Horizontal Dilution of Precision
VDOP	Vertical Dilution of Precision
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

NOTE

If the receiver is fixed by multi-GNSS, it will print two GNGSA sentences. One is for GPS satellite, the other is for GLONASS satellite. For the details, please see the Notes in Chapter 2.1.

2.5. --GSV

GSV, GNSS Satellites in View. One GSV sentence can only provide data for at most 4 satellites, so several sentences might be required for the full information. Since GSV includes satellites that are not used as part of the solution, GSV sentence contains more satellites than GGA does.

Example:
$GPGSV,4,1,13,22,74,270,17,18,56,162,11,25,53,128,51,14,51,325,49*77<CR><LF>
$GPGSV,4,2,13,42,45,141,39,12,41,067,46,193,37,171,21,31,31,243,16*48<CR><LF>
$GPGSV,4,3,13,24,23,047,44,04,10,304,19,15,09,097,35,21,05,189,14*74<CR><LF>
$GPGSV,4,4,13,32,01,319,*40<CR><LF>
$GLGSV,2,1,07,72,74,021,49,74,66,010,45,75,51,230,,71,39,128,50*6F<CR><LF>
$GLGSV,2,2,07,65,25,329,33,73,16,031,37,76,01,218,*50<CR><LF>

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Field	Description
$	Each NMEA message starts with '$'
GPGSV	Message ID
Number of Message	Number of messages, total number of GPGSV messages being output (1~3)
Sequence Number	Sequence number of this entry (1~3)
Satellites in View	Total satellites in view
Satellite ID 1	Satellite ID
Elevation 1	Elevation in degree (0~90)
Azimuth 1	Azimuth in degree (0~359)
SNR 1	Signal to Noise Ration in dBHz (0~99), empty if not tracking
Satellite ID 2	Satellite ID
Elevation 2	Elevation in degree (0~90)
Azimuth 2	Azimuth in degree (0~359)
SNR 2	Signal to Noise Ration in dBHz (0~99), empty if not tracking
Satellite ID 3	Satellite ID
Elevation 3	Elevation in degree (0~90)
Azimuth 3	Azimuth in degree (0~359)
SNR 3	Signal to Noise Ration in dBHz (0~99), empty if not tracking
Satellite ID 4	Satellite ID
Elevation 4	Elevation in degree (0~90)
Azimuth 4	Azimuth in degree (0~359)
SNR 4	Signal to Noise Ration in dBHz (0~99), empty if not tracking
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

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NOTE

If the receiver is fixed by multi-GNSS, it will print one more sentence (GPGSV) for GPS satellites and one more sentence (GLGSV) for GLONASS satellites. For the details, please see the Notes in Chapter 2.1.

2.6. --GLL

GLL, Geographic Latitude and Longitude, contains position information, time of position fix and status.

Example:
$GPGLL,3150.7849,N,11711.9292,E,110950.000,A,D*52<CR><LF>
$GNGLL,3150.7822,N,11711.9278,E,110332.000,A,D*4B<CR><LF>

Field	Description
$	Each NMEA message starts with '$'
--GLL	Message ID
Latitude	Latitude in format 'ddmm.mmmm' (degree and minutes)
N/S	'N'=North 'S'=South
Longitude	Longitude in format 'dddmm.mmmm' (degree and minutes)
E/W	'E'=East 'W'=West
UTC Time	Time in format 'hhmmss.sss'
Data Valid	'V'=Invalid 'A'=Valid
Positioning Mode	'N'=No fix 'A'=Autonomous GNSS fix 'D'=Differential GNSS fix
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

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NOTE

For the details, please see the Notes in Chapter 2.1.

2.7. GPTXT

This message is used to ouput information.

Example:
$GPTXT,01,01,02,ANTSTATUS=OK*3B<CR><LF>

Field	Description
$	Each NMEA message starts with '$'
GPTXT	Message ID
XX	Total number of messages in this transmission. (01~99)
YY	Message number in this transmission. (01~99)
ZZ	Severity of the message '00'=ERROR '01'=WARNING '02'=NOTICE '07'=USER
Text Message	Output information
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

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3 MTK NMEA Packet Protocol

This chapter introduces the MTK NMEA packet protocol, which is a set of extension messages of the standard NMEA packet protocol. These messages are used to control and configure L86 GNSS module. The following table shows the structure of a MTK NMEA packet.

Table 2: Structure of MTK NMEA Packet

Filed		Length (Bytes)	Description
$		1	Each NMEA message starts with '$'
Talker ID		1	'P' for proprietary message
NMEA Data Type		3	Always 'MTK' to indicate MTK proprietary message
Data Filed	Packet Type	3	Packet type, from '000' to '999'
	Packet Data	Variable, depend on the packet type	Data fields, delimited by comma ','
*		1	End character of data field
Checksum		2	A hexadecimal number calculated by exclusive OR of all characters between '$' and '*'
<CR><LF>		2	Each NMEA message ends with 'CR' and 'LF'

3.1. Packet Type: 010 PMTK_SYS_MSG

This message is used to automatically output system messages by GNSS module.

Example: $PMTK010,001*2E<CR><LF>	
Field	**Description**
$	Each NMEA message starts with '$'

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PMTK	MTK proprietary message
Packet Type	010
Message	System message ‘0’=unknown ‘1’=startup ‘2’=notification for the host aiding EPO ‘3’=notification for the transition to normal mode is successfully done
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

3.2. Packet Type: 011 PMTK_TXT_MSG

This message is used to automatically output system messages by GNSS module.

Example: $PMTK011,MTKGPS*08<CR><LF>	
Field	**Description**
$	Each NMEA message starts with ‘$’
PMTK	MTK proprietary message
Packet Type	011
Message	MTKGPS
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

3.3. Packet Type: 001 PMTK_ACK

Acknowledgement of PMTK command. In order to inform the sender whether the receiver has received the packet, an acknowledge packet PMTK_ACK should return after the receiver receives a packet.

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Some commands will cause the GNSS module to restart or change the baud rate. There is no PMTK_ ACK for those commands as listed below.

PMTK_CMD_HOT_START
PMTK_CMD_WARM_START
PMTK_CMD_COLD_START
PMTK_CMD_FULL_COLD_START
PMTK_SET_NMEA_BAUDRATE

Example: $PMTK001,869,3*37<CR><LF>	
Field	**Description**
$	Each NMEA message starts with ‘$’
PMTK	MTK proprietary message
Packet Type	001
Command	The packet type that the acknowledge responds
Flag	‘0’=Invalid packet ‘1’=Unsupported packet type ‘2’=Valid packet, but action failed ‘3’=Valid packet, action succeeded
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

3.4. Packet Type: 101 PMTK_CMD_HOT_START

This message is used to hot start the GNSS module (use all available data in the NV store). Normally hot start means the GNSS module was powered down less than 3 hours (RTC must be alive) and its ephemeris is still valid. As there is no need for downloading ephemeris, it’s the fastest startup method.

Example: $PMTK101*32<CR><LF>	
Field	**Description**
$	Each NMEA message starts with ‘$’

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PMTK	MTK proprietary message
Packet Type	101
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

3.5. Packet Type: 102 PMTK_CMD_WARM_START

This message is used to warm start the GNSS module. Warm start means the GNSS module has approximate information of time, position and coarse data on satellite positions. But it needs to download ephemeris until it can get a fix. Using this message will force the GNSS warm restarted without using the ephemeris data in NV.

Example: $PMTK102*31<CR><LF>	
Field	**Description**
$	Each NMEA message starts with '$'
PMTK	MTK proprietary message
Packet Type	102
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

3.6. Packet Type: 103 PMTK_CMD_COLD_START

This message is used to cold start the GNSS module. Using this message will force the GNSS cold restarted without using any prior location information, including time, position, almanacs and ephemeris data.

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Example: $PMTK103*30<CR><LF>	
Field	**Description**
$	Each NMEA message starts with '$'
PMTK	MTK proprietary message
Packet Type	103
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

3.7. Packet Type: 104 PMTK_CMD_FULL_COLD_START

This message is essentially a cold restart, but additionally clears system and user configurations at re-start. That is, reset the GNSS module to the factory status. Full cold start means the GNSS module has no information on last location. It needs to search the full time and frequency space, and also all possible satellite numbers before it can get a fix.

Example: $PMTK104*37<CR><LF>	
Field	**Description**
$	Each NMEA message starts with '$'
PMTK	MTK proprietary message
Packet Type	104
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

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3.8. Packet Type: 161 PMTK_CMD_STANDBY_MODE

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

Example: $PMTK161,0*28<CR><LF>	
Field	**Description**
$	Each NMEA message starts with '$'
PMTK	MTK proprietary message
Packet Type	161
Type	'0'=Stop mode
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

3.9. Packet Type: 183 PMTK_LOCUS_QUERY_STATUS

This message is used to query LOCUS logging status.

Example: $PMTK183*38<CR><LF>	
Field	**Description**
$	Each NMEA message starts with '$'
PMTK	MTK proprietary message
Packet Type	183
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

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Return:

Example: $PMTKLOG,456,0,11,31,2,0,0,0,3769,46*48<CR><LF>	
Field	**Description**
$	Each NMEA message starts with '$'
PMTK	MTK proprietary message
Packet Type	LOG
Serial#	Logging serial number: 0~65535
Type	Logging type-0: Overlap, 1: Fullstop
Mode	Logging mode-0x08: Interval logger
Content	Logging contents of configuration
Interval	Logging interval setting (valid when interval mode is selected)
Distance	Logging distance setting (valid when distance mode is selected)
Speed	Logging speed setting (valid when speed mode is selected)
Status	Logging status-1: Stop logging, 0: Logging
Number	Logging number of data record
Percent	Logging life used percentage (0%~100%)
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

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3.10. Packet Type: 184 PMTK_LOCUS_ERASE_FLASH

This message is used to erase logger flash.

Example: $PMTK184,1*22<CR><LF>	
Field	**Description**
$	Each NMEA message starts with '$'
PMTK	MTK proprietary message
Packet Type	184
Type	'1'=Erase all logger internal flash data
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

3.11. Packet Type: 185 PMTK_LOCUS_STOP_LOGGER

This message is used to stop or start logging data.

Example: $PMTK185,1*23<CR><LF>	
Field	**Description**
$	Each NMEA message starts with '$'
PMTK	MTK proprietary message
Packet Type	185
Status	'0'=Start logging '1'=Stop logging
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

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3.12. Packet Type: 622 PMTK_Q_LOCUS_DATA

This message is used to dump locus flash data.

Example: $PMTK622,1*29<CR><LF>	
Field	**Description**
$	Each NMEA message starts with '$'
PMTK	MTK proprietary message
Packet Type	622
Type	'1'=dump partial in used flash data
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

3.13. Packet Type: 220 PMTK_SET_POS_FIX

This message is used to set position fix interval.

Example: $PMTK220,1000*1F<CR><LF>	
Field	**Description**
$	Each NMEA message starts with '$'
PMTK	MTK proprietary message
Packet Type	220
Interval	Position fix interval [msec]. Must be greater than 200
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

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3.14. Packet Type: 223 PMTK_SET_AL_DEE_CFG

This message is used to config DEE.

Example: $PMTK223,1,30,180000,60000*3C<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.

Example: $PMTK225,8*23<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

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	'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 larger than first run time when non-zero value.

3.16. Packet Type: 251 PMTK_SET_NMEA_BAUDRATE

This message is used to set NMEA port baud rate. Using PMTK251command to setup baud rate setting, the setting will be back to default value in the condition: Full cold start command is issued.

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

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	14400 19200 38400 57600 115200
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

3.17. 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.

Example:
$PMTK286,0*22<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

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3.18. Packet Type: 300 PMTK_API_SET_FIX_CTL

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

Example: $PMTK300,1000,0,0,0,0*1C<CR><LF>	
Field	**Description**
$	Each NMEA message starts with '$'
PMTK	MTK proprietary message
Packet Type	300
Fix Interval	Position fix interval [msec]. Must be greater than 100
Reserved	0
Reserved	0
Reserved	0
Reserved	0
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

3.19. Packet Type: 301 PMTK_API_SET_DGPS_MODE

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

Example: $PMTK301,2*2E<CR><LF>	
Field	**Description**
$	Each NMEA message starts with '$'
PMTK	MTK proprietary message
Packet Type	301

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Mode	DGPS data source mode ‘0’=No DGPS source ‘2’=WAAS and it can also support EGNOS/MSAS/GAGAN
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

3.20. 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.

Example: $PMTK313,1*2E<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

3.21. 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.

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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

Example:
The module only output RMC once every one position fix.
$PMTK314,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0*29<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 Reserved	Always 0
7 Reserved	Always 0
8 Reserved	Always 0
9 Reserved	Always 0
10 Reserved	Always 0
11 Reserved	Always 0
12 Reserved	Always 0
13 Reserved	Always 0

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14 Reserved	Always 0
15 Reserved	Always 0
16 Reserved	Always 0
17 ZDA	ZDA interval - Time and Date
18 Reserved	Always 0
*	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

3.22. 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.

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Example: $PMTK352,0*2A<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

3.23. Packet Type: 353 PMTK_API_SET_GNSS_SEARCH_MODE

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

Example: $PMTK353,GPS_Enable,GLONASS_Enable Response: $PMTK001,353,3,1,0,0,1*35<CR><LF>:Use GPS $PMTK001,353,3,0,1,0,2*36<CR><LF>:Use GLONASS $PMTK001,353,3,1,1,0,3*36<CR><LF>:Use GPS+GLONASS	
Field	**Description**
$	Each NMEA message starts with '$'
PMTK	MTK proprietary message
Packet Type	353
GPS_Enable	'0'=Disable '1'or non-ZERO=search GPS satellites
GLONASS_Enable	'0'=Disable '1'or non-ZERO=search GLONASS satellites
GALILEO_Enable	'0'=Disable '1'or non-ZERO=search GALILEO satellites
*	End character of data field
Checksum	Hexadecimal checksum

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NOTE

We use GPS+GLONASS or one of them. At present Galileo is not supported yet.

3.24. 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.

Example: $PMTK386,0.4*39<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

3.25. 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.

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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

3.26. 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.

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

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3.27. 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.

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

3.28. 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.

Example: $PMTK414*33<CR><LF>	
Field	**Description**
$	Each NMEA message starts with '$'
PMTK	MTK proprietary message
Packet Type	414

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

3.29. 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.

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

3.30. Packet Type: 500 PMTK_DT_FIX_CTL

This message is the response to PMTK_API_Q_FIX_CTL.

Example: $PMTK500,1000,0,0,0,0*1A<CR><LF>	
Field	**Description**
$	Each NMEA message starts with '$'
PMTK	MTK proprietary message

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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

3.31. Packet Type: 501 PMTK_DT_DGPS_MODE

This message is the response to PMTK_API_Q_DGPS_MODE.

Example: $PMTK501,1*2B<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 '2'=WAAS
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

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3.32. Packet Type: 513 PMTK_DT_SBAS_ENABLED

This message is the response to PMTK_API_Q_SBAS_ENABLED.

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

3.33. Packet Type: 514 PMTK_DT_NMEA_OUTPUT

This message is the response to PMTK_API_Q_NMEA_OUTPUT.

Example: $PMTK514,1,1,1,1,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0*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

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4 GSA	GSA interval - GNSS DOPS and Active Satellites
5 GSV	GSV interval - GNSS Satellites in View
6 Reserved	
7 Reserved	
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 Reserved	Always 0
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

3.34. Packet Type: 705 PMTK_DT_RELEASE

This message is the response to PMTK_Q_RELEASE.

Example: $PMTK705,AXN_3.20_3333_13071501,0001,QUECTEL-L86,*16 <CR><LF>	
Field	**Description**
$	Each NMEA message starts with '$'

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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

3.35. 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.

Example: $PMTK869,1,1*35<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

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Checksum	Hexadecimal checksum
<CR><LF>	Each of message

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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

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