L70 GPS

Protocol Specification

GPS Module Series

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About the Document

History

Revision	Date	Author	Description
1.0	2012-07-09	Ada LI	Initial
1.1	2013-03-21	Dishon ZHOU	1. Deleted the description of RTCM. 2. Added LOCUS of packet type 183, 184, 185 and 622. 3. Deleted packet type 120.
2.0	2013-05-20	Ada LI	Modified type 225.
2.1	2013-09-25	Ada LI	1. Modified the description of RMC. 2. Modified the example of packet type 314 and 514.
2.2	2014-08-19	Ada LI	1. Modified the description of GGA. 2. Added packet type 220 and 223.
2.3	2015-08-21	Connie ZHOU	1. Modified the description of packet type 251. 2. Modified the example of packet type 386. 3. Added packet type 351, 352, 262, 285 and 875.
2.4	2015-09-11	Connie ZHOU	Added packet type 886.
2.5	2015-12-03	Connie ZHOU	Added packet type 255.

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1 Introduction

L70 is a full featured GPS module with super sensitivity. It is characteristic of low power consumption and compact size. The module supports autonomous GPS C/A, SBAS function (including WAAS and EGNOS) and AGPS (EASY function). It can be used in the positioning, navigation and other industries.

Now L70 supports SDK commands which are developed by Quectel. At present the SDK commands contain $PQFLP, $PQBAUD, $PQ1PPS, $PQEPE and so on. For more infomations please refer to *Quectel_GNSS_SDK_Commands_Manual*.

This document describes the software aspects of L70. L70 supports NMEA 0183 standard commands. MTK NMEA extended packet is supported to control and configure L70 GPS module.

2 Standard NMEA Packet Protocol

L70 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 '$'
Talker ID	1~2	'GP' for a GPS receiver.
NMEA Message ID	3	NMEA message ID
Data Field	Variable, depend on the NMEA message type	Data fields, delimited by comma ','
*	1	End character of data field
Checksum	2	A hexadecimal number calculated by exclusive OR of all characters between '$' and '*'
<CR><LF>	2	Each NMEA message ends with 'CR' and 'LF'

NOTE

The default output message of L70 has the following six sentences: RMC, VTG, GGA, GSA, GSV and GLL.

2.1. GPRMC

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

Example: $GPRMC,013732.000,A,3150.7238,N,11711.7278,E,0.00,0.00,220413,,,A*68<CR><LF>	
Field	**Description**

$	Each NMEA message starts with ‘$’
GPRMC	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 GPS fix ‘D’=Differential GPS fix
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

2.2. GPVTG

VTG, track made good and ground speed.

Example: $GPVTG,0.0,T,,M,0.0,N,0.1,K,A*0C<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 GPS fix 'D'=Differential GPS 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,074244.000,3150.7827,N,11711.9302,E,1,4,2.13,49.0,M,0.0,M,,*56<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’=GPS fix ‘2’=DGPS fix
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
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. GPGSA

GSA, GPS DOP and Active Satellites, provides 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,3,14,06,16,31,23,,,,,,,,1.66,1.42,0.84*0F<CR><LF>	
Field	**Description**
$	Each NMEA message starts with ‘$’
GPGSA	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
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

2.5. GPGSV

GSV, GPS 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,3,1,12,01,05,060,18,02,17,259,43,04,56,287,28,09,08,277,28*77<CR><LF>
$GPGSV,3,2,12,10,34,195,46,13,08,125,45,17,67,014,,20,32,048,24*74<CR><LF>
$GPGSV,3,3,12,23,13,094,48,24,04,292,24,28,49,178,46,32,06,037,22*7D<CR><LF>

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 (00~90)
Azimuth 1	Azimuth in degree (000~359)
SNR 1	Signal to Noise Ration in dBHz (00~99), empty if not tracking
Satellite ID 2	Satellite ID
Elevation 2	Elevation in degree (00~90)
Azimuth 2	Azimuth in degree (000~359)
SNR 2	Signal to Noise Ration in dBHz (00~99), empty if not tracking
Satellite ID 3	Satellite ID
Elevation 3	Elevation in degree (00~90)
Azimuth 3	Azimuth in degree (000~359)
SNR 3	Signal to Noise Ration in dBHz (00~99), empty if not tracking
Satellite ID 4	Satellite ID
Elevation 4	Elevation in degree (00~90)

Azimuth 4	Azimuth in degree (000~359)
SNR 4	Signal to Noise Ration in dBHz (00~99), empty if not tracking
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

2.6. GPGLL

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

Example: $GPGLL,3110.2908,N,12123.2348,E,041139.000,A,A*59<CR><LF>	
Field	**Description**
$	Each NMEA message starts with ‘$’
GPGLL	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 GPS fix ‘D’=Differential GPS fix
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

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 L70 GPS 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 GPS module.

Data Field: None Example: $PMTK010,001*2E<CR><LF>	
Field	**Description**

$	Each NMEA message starts with ‘$’
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 GPS module.

Data Field:
None
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.

Some commands will cause the GPS 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

Data Field:
$PMTK001,Cmd,Flag
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 GPS module (use all available data in the NV store). Normally hot start means the GPS 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.

Data Field: None Example: $PMTK101*32<CR><LF>	
Field	**Description**
$	Each NMEA message starts with '$'
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 GPS module. Warm start means the GPS 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 GPS warm restarted without using the ephemeris data in NV.

Data Field: None 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 GPS module. Using this message will force the GPS cold restarted without using any prior location information, including time, position, almanacs and ephemeris data.

Data Field: None 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 clear system and user configurations at re-start. That is, reset the GPS module to the factory status. Full cold start means the GPS 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.

Data Field: None 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

3.8. Packet Type: 161 PMTK_CMD_STANDBY_MODE

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

Data Field: $PMTK161,Type Example: $PMTK161,0*28<CR><LF> Response: $PMTK001,161,3*36<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.

Data Field: None Example: $PMTK183*38<CR><LF> Response: $PMTK001,183,3*3A<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

Return:

Data Field: $PMTKLOG,Serial#,Type, Mode, Content, Interval, Distance, Speed, Status, Log number, Percent*CH 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

3.10. Packet Type: 184 PMTK_LOCUS_ERASE_FLASH

This message is used to erase logger flash.

Data Field:
$PMTK184,Type
Example:
$PMTK184,1*22<CR><LF>
Response:
$PMTK001,184,3*3D<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.

Data Field: $PMTK185,Stutas Example: $PMTK185,1*23<CR><LF> Response: $PMTK001,185,3*3C<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

3.12. Packet Type: 622 PMTK_Q_LOCUS_DATA

This message is used to dump locus flash data.

Data Field: $PMTK622,Type Example: $PMTK622,1*29<CR><LF> Response: $PMTK001,622,3*36<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.

Data Field: $PMTK220, Interval Example: $PMTK220,1000*1F<CR><LF> Response: $PMTK001,220,3*30<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

3.14. Packet Type: 223 PMTK_SET_AL_DEE_CFG

This message is used to configure 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: 0 or 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 for 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 when the full cold start command is issued. You can use the SDK command $PQBAUD to permanently modify and save baud rate. For details please refer to *Quectel_GNSS_SDK_Commands_Manual*.

Data Field: $PMTK251,Baudrate Example: $PMTK251,115200*1F<CR><LF>	
Field	**Description**
$	Each NMEA message starts with '$'
PMTK	MTK proprietary message
Packet Type	251
Baud Rate	Baud rate setting: 4800 9600 - default setting 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: 262 PMTK_SET_FLP_MODE

This message is used to set FLP mode. Fitness low power (FLP) is an optimized solution for wearable, fitness and tracking device. You can use the SDK command $PQFLP to permanently modify and save. For details please refer to *Quectel_GNSS_SDK_Commands_Manual*.

Data Field:
$PMTK262,Mode
Example:
$PMTK262,1*29<CR><LF>
Response:
$PMTK001,262,3,1*2B<CR><LF>

Field	Description
$	Each NMEA message starts with ‘$’
PMTK	MTK proprietary message
Packet Type	262
Mode	‘0’=Normal mode ‘1’=FLP mode
*	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. You can use the SDK command $PQ1PPS to permanently set and save. For details please refer to *Quectel_GNSS_SDK_Commands_Manual*.

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 send 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 GPS 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 Settings:

- 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.
$PMTK314,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0*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 GPS Sentence
2 VTG	VTG interval – Course Over Ground and Ground Speed
3 GGA	GGA interval – GPS Fix Data
4 GSA	GSA interval – GPS DOPS and Active Satellites
5 GSV	GSV interval – GPS Satellites in View
6 GRS	GRS interval – GPS Range Residuals
7 GST	GST interval – GPS 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 Reserved	PMTKCHN interval – GPS 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

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

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: 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

3.27. Packet Type: 400 PMTK_API_Q_FIX_CTL

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

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

3.28. 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

3.29. 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

3.30. 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

3.31. 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

3.32. 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

3.33. Packet Type: 501 PMTK_DT_DGPS_MODE

This message is the response to PMTK_API_Q_DGPS_MODE.

Data Field: $PMTK501,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 ‘1’=RTCM ‘2’=SBAS
*	End character of data field
Checksum	Hexadecimal checksum
<CR><LF>	Each of message

3.34. 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

3.35. Packet Type: 514 PMTK_DT_NMEA_OUTPUT

This message is the response to PMTK_API_Q_NMEA_OUTPUT.

Data Field: None Example: $PMTK514,1,1,1,1,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0*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 GPS Sentence
2 VTG	VTG interval – Course Over Ground and Ground Speed
3 GGA	GGA interval – GPS Fix Data
4 GSA	GSA interval – GPS DOPS and Active Satellites
5 GSV	GSV interval – GPS Satellites in View
6 Reserved	GRS interval – GPS Range Residuals
7 Reserved	GST interval – GPS 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 Reserved	PMTKCHN interval – GPS channel status

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

3.36. 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_2.10_3339_11092201,0004,QUECTEL-L70,*1A<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
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

3.37. 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

3.38. Packet Type: 875 PMTK_PMTKLSC_STN_OUTPUT

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

Data Field: $PMTK875,CmdType[,Enabled] Example: $PMTK875,1,1*38<CR><LF> : Enable PMTKLSC Sentence output Response: $PMTKLSC,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

3.39. 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_L70_Hardware_Design	L70 Hardware Design
[2]	Quectel_L70_EVB_User Guide	L70 EVB User Guide
[3]	Quectel_L70_Reference_Design	L70 Reference Design
[4]	Quectel_GNSS_SDK_Commands_Manual	GNSS SDK Commands Manual

Table 4: Terms and Abbreviations

Abbreviation	Description
GPS	Global Navigation Satellite System
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: GPS DOP and Active Satellites
GSV	NMEA: GPS 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
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
FLP	Fitness Low Power

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 and GLL
AIC	On
EASY	On