# L76 Series GNSS Protocol Specification

**GNSS Module Series**

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# About the Document

## History

| Revision | Date | Author | Description |
|---|---|---|---|
| 1.0 | 2013-02-08 | Ada LI | Initial |
| 1.1 | 2013-02-25 | Ada LI | 1. Modified the default baud rate of Packet Type 251.<br>2. Modified '2'=SBAS of Packet Type 301 into '2'=WAAS.<br>3. Added the Release string of Packet Type 705.<br>4. Added the description of AIC and WAAS in Table 2.<br>5. Added Packet Type 352 |
| 1.2 | 2013-03-22 | Dishon ZHOU | 1. Deleted the description of RTCM.<br>2. Added LOCUS's Packet Type 183,184,185 and 622.<br>3. Deleted Packet Type 291 and 120.<br>4. Modified Packet Type 353. |
| 1.3 | 2013-09-29 | Ada LI | 1. Modified the description of RMC.<br>2. Modified the Example of Packet Type 314,352 and 514. |
| 1.4 | 2014-08-19 | Ada LI | 1. Modified the description of GGA.<br>2. Modified the description of PMTK 251.<br>3. Added Packet Type 220 and 223. |
| 1.5 | 2014-12-19 | Connie ZHOU | 1. Modified the description of DGPS_MODE.<br>2. Added parameter for "Fix status" in GPGGA sentence.<br>3. Added parameter for packet type 353.<br>4. Modified the Notes in Chapter 2.1. |
| 2.0 | 2015-08-05 | Connie ZHOU | 1. Added BEIDOU and GALILEO sentences description<br>2. Modified Packet Type 353<br>3. Modified Packet Type 622<br>4. Added Packet Type 351<br>5. Added Packet Type 875 |

| | | | |
|---|---|---|---|
| 2.1 | 2015-10-12 | Connie ZHOU | 1. Added Packet Type 255,256,285 and 886<br>2. Added the Notes for packet type 869<br>3. Deleted Packet Type 300 |
| 3.0 | 2016-04-26 | Ziv LIAO | Incorporated related information of L76-L module |

# Contents

# Table Index

# 1 Introduction

L76 series module can use GPS, GLONASS, BDS and GALILEO 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 L76 series. L76 series supports NMEA 0183 standard commands. MTK NMEA extended packet is enabled to control and configure L76 series module.

L76-L, which comes with built-in LNA, provides better performance than L76 in weak signal areas.

# 2 Standard NMEA Packet Protocol

L76 series supports NMEA 0183 standard messages. The following table shows the structure of a NMEA 0183 standard message.

## 2.1. --RMC

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

Example:
$GPRMC,015606.000,A,3150.7584,N,11712.0491,E,0.00,231.36,280715,,,A*67<CR><LF>
$GNRMC,084629.000,A,3150.7822,N,11711.9323,E,0.00,119.00,240715,,,D*7C<CR><LF>
$BDRMC,020547.000,A,3150.7813,N,11711.9212,E,0.37,229.71,280715,,,A*7C<CR><LF>

| Field | Description |
|---|---|
| $ | Each NMEA message starts with '$' |
| --RMC | Message ID |
| UTC Time | Time in format 'hhmmss.sss' |
| Data Valid | 'V'=Invalid<br>'A'=Valid |
| Latitude | Latitude in format 'ddmm.mmmm' (degree and minutes) |
| N/S | 'N'=North<br>'S'=South |
| Longitude | Longitude in format 'dddmm.mmmm' (degree and minutes) |
| E/W | 'E'=East<br>'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<br>'A'=Autonomous GNSS fix<br>'D'=Differential GNSS fix |
| * | End character of data field |
| Checksum | Hexadecimal checksum |
| <CR><LF> | Each of message |

**NOTE**

For the details, please refer to the Notes of Chapter 3.27.

## 2.2. --VTG

VTG, track made good and ground speed.

Example:
$GPVTG,227.15,T,,M,0.00,N,0.00,K,A*3E<CR><LF>
$GNVTG,19.11,T,,M,0.16,N,0.30,K,A*1F<CR><LF>
$BDVTG,229.71,T,,M,0.37,N,0.68,K,A*29<CR><LF>

| Field | Description |
|---|---|
| $ | Each NMEA message starts with '$' |
| --VTG | 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<br>‘A’=Autonomous GNSS fix<br>‘D’=Differential GNSS fix |
| * | End character of data field |
| Checksum | Hexadecimal checksum |
| <CR><LF> | Each of message |

**NOTE**

For the details, please refer to the Notes of Chapter 3.27.

## 2.3. --GGA

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

Example:
$GPGGA,015606.000,3150.7584,N,11712.0491,E,1,5,2.28,265.0,M,0.0,M,,*65<CR><LF>
$GNGGA,083354.000,3150.7790,N,11711.9289,E,1,8,2.85,53.2,M,0.0,M,,*4B<CR><LF>
$BDGGA,020547.000,3150.7813,N,11711.9212,E,1,3,3.65,55.3,M,0.0,M,,*4C<CR><LF>

| Field | Description |
|---|---|
| $ | Each NMEA message starts with ‘$’ |
| --GGA | Message ID |
| UTC Time | Time in format ‘hhmmss.sss’ |
| Latitude | Latitude in format ‘ddmm.mmmm’ (degree and minutes) |
| N/S | ‘N’=North<br>‘S’=South |
| Longitude | Longitude in format ‘dddmm.mmmm’ (degree and minutes) |
| E/W | ‘E’=East<br>‘W’=West |
| Fix Status | ‘0’=Invalid<br>‘1’=GNSS fix |

| | |
|---|---|
| | '2'=DGPS fix<br>'6'=Estimated (dead reckoning) Mode |
| Number of SV | Number of satellites being used (0~24) |
| 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 |

**NOTE**

For the details, please refer to the Notes of Chapter 3.27.

## 2.4. --GSA

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

Example:
$GPGSA,A,3,03,17,11,23,193,,,,,,,,3.72,2.85,2.39*3C<CR><LF>
$GNGSA,A,3,23,09,17,03,01,193,,,,,,,1.23,0.74,0.99*28<CR><LF>
$BDGSA,A,2,10,11,07,,,,,,,,,,3.79,3.65,1.00*18<CR><LF>
$GAGSA,A,3,12,,,,,,,,,,,,0.91,0.58,0.70*12<CR><LF>

| Field | Description |
|---|---|
| $ | Each NMEA message starts with '$' |

| | |
|---|---|
| --GSA | Message ID |
| Mode | Auto selection of 2D or 3D fix<br>'M'=Manual, forced to switch 2D/3D mode<br>'A'=Allowed to automatically switch 2D/3D mode |
| Fix Status | '1'=No fix<br>'2'=2D fix<br>'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 |

**NOTE**

For the details, please refer to the Notes of Chapter 3.27.

## 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,3,1,11,193,69,099,30,17,62,354,36,06,47,272,,03,40,054,30*4E<CR><LF>
$GPGSV,3,2,11,02,13,255,,01,12,055,19,23,11,102,25,11,05,074,24*75<CR><LF>
$GPGSV,3,3,11,24,03,303,,47,,,,32,,,21*4D<CR><LF>
$GLGSV,3,1,11,69,48,142,39,68,43,058,51,83,40,049,51,84,40,334,43*64<CR><LF>
$GLGSV,3,2,11,74,30,271,15,73,17,218,19,75,13,324,30,70,07,184,*6E<CR><LF>
$GLGSV,3,3,11,85,06,296,34,82,02,092,21,67,02,023,*56<CR><LF>
$BDGSV,2,1,06,08,63,015,30,11,59,350,32,12,39,081,26,14,29,184,21*68<CR><LF>
$BDGSV,2,2,06,13,07,295,,01,,,26*50<CR><LF>
$GAGSV,1,1,01,12,46,287,38*5E<CR><LF>

| Field | Description |
|---|---|
| $ | Each NMEA message starts with '$' |
| --GSV | 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 |

**NOTE**

If the receiver is fixed by multi-GNSS, it will output GPGSV sentences of GPS satellites, or GLGSV sentences of GLONASS satellites, or BDGSV sentences of BEIDOU satellites. For the details, please refer to the Notes of Chapter 3.27.

## 2.6. --GLL

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

Example:
$GPGLL,3150.7584,N,11712.0491,E,015606.000,A,A*5C<CR><LF>
$GNGLL,3150.7790,N,11711.9289,E,083354.000,A,A*4D<CR><LF>
$BDGLL,3150.7813,N,11711.9212,E,020547.000,A,A*49<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<br>‘S’=South |

| | |
|---|---|
| Longitude | Longitude in format ‘dddmm.mmmm’ (degree and minutes) |
| E/W | ‘E’=East<br>‘W’=West |
| UTC Time | Time in format ‘hhmmss.sss’ |
| Data Valid | ‘V’=Invalid<br>‘A’=Valid |
| Positioning Mode | ‘N’=No fix<br>‘A’=Autonomous GNSS fix<br>‘D’=Differential GNSS fix |
| * | End character of data field |
| Checksum | Hexadecimal checksum |
| <CR><LF> | Each of message |

**NOTE**

For the details, please refer to the Notes of Chapter 3.27.

# 3 MTK NMEA Packet Protocol

This chapter introduces the MTK NMEA packet protocol, which is a set of extension messages of standard NMEA packet protocol. These messages are used to control and configure L76 series GNSS module. The following table shows the structure of a MTK NMEA packet.

## 3.1. Packet Type: 010 PMTK_SYS_MSG

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

| Data Field:<br>None<br>Example:<br>$PMTK010,001*2E<CR><LF> | |
|---|---|
| **Field** | **Description** |
| $ | Each NMEA message starts with '$' |
| PMTK | MTK proprietary message |
| Packet Type | 010 |
| Message | System message<br>'0'=Unknown<br>'1'=Startup<br>'2'=Notification for the host aiding EPO<br>'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.

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 be returned after the receiver receives a packet.

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

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 |
| Cmd | The packet type that the acknowledge responds |
| Flag | '0'=Invalid packet<br>'1'=Unsupported packet type<br>'2'=Valid packet, but action failed<br>'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.

| Data Field:<br>None<br>Example:<br>$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 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.

| Data Field:<br>None<br>Example:<br>$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.

| Data Field:<br>None<br>Example:<br>$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 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.

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 logging status.

| Data Field:<br>None<br>Example:<br>$PMTK183*38<CR><LF><br>Response:<br>$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:

| Example:<br>$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:<br>$PMTK184,Type<br>Example:<br>$PMTK184,1*22<CR><LF><br>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:<br>$PMTK185,Stutas<br>Example:<br>$PMTK185,1*23<CR><LF><br>Response:<br>$PMTK001,185,3*3C<CR><LF> | |
|---|---|
| **Field** | **Description** |
| $ | Each NMEA message starts with '$' |
| PMTK | MTK proprietary message |
| Packet Type | 185 |
| Status | '0'=Start logging<br>'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:<br>$PMTK622,Type<br>Example:<br>$PMTK622,1*29<CR><LF><br>Response:<br>$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 LOCUS 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:<br>$PMTK220, Interval<br>Example:<br>$PMTK220,1000*1F<CR><LF><br>Response:<br>$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]. [Range:100~10000] |
| * | 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 config DEE.

| Data Field:<br>$PMTK223,SV,SNR,Extension threshold,Extension gap<br>Example:<br>$PMTK223,1,30,180000,60000*3C<CR><LF><br>Response:<br>$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:<br>$PMTK225,Type,Run time,Sleep time,Second run time,Second sleep time<br>Example:<br>$PMTK225,8*23<CR><LF><br>Response:<br>$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<br>'1'=Periodic Backup mode<br>'2'=Periodic Standby mode<br>'4'=Perpetual Backup mode<br>'8'=AlwaysLocate™ Standby mode<br>'9'=AlwaysLocate™ Backup mode |
| Run Time | '0': Disable<br>>='1000': Enable (Range: 1000~518400000) |
| Sleep Time | (Range: 1000~518400000) |
| Second Run Time | '0': Disable<br>>='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 a 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.

| Data Field:<br>$PMTK251,Baudrate<br>Example:<br>$PMTK251,38400*27<CR><LF> | |
|---|---|
| **Field** | **Description** |
| $ | Each NMEA message starts with '$' |
| PMTK | MTK proprietary message |
| Packet Type | 251 |
| Baud Rate | Baud rate setting:<br>9600 - default setting<br>4800<br>9600<br>14400<br>19200<br>38400<br>57600<br>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:<br>$PMTK255,Enable<br>Example:<br>$PMTK255,0*2C<CR><LF><br>Response: |
|---|

| $PMTK001,255,3*32<CR><LF> | |
|---|---|
| **Field** | **Description** |
| $ | Each NMEA message starts with '$' |
| PMTK | MTK proprietary message |
| Packet Type | 255 |
| Enable | '0'=Disable<br>'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:<br>$PMTK256,Enable<br>Example:<br>$PMTK256,0*2F<CR><LF><br>Response:<br>$PMTK001,256,3*31<CR><LF> | |
|---|---|
| **Field** | **Description** |
| $ | Each NMEA message starts with '$' |
| PMTK | MTK proprietary message |
| Packet Type | 256 |
| Enable | '0'=Disable<br>'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:<br>$PMTK285,Type,PPSPulseWidth<br>Example:<br>$PMTK285,4,100*38<CR><LF><br>Response:<br>$PMTK001,285,3*3F<CR><LF> | |
|---|---|
| **Field** | **Description** |
| $ | Each NMEA message starts with '$' |
| PMTK | MTK proprietary message |
| Packet Type | 285 |
| Type | '0'=Disable<br>'1'=After the first fix<br>'2'=3D fix only<br>'3'=2D/3D fix only<br>'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:<br>$PMTK286,Enable<br>Example: |
|---|

| $PMTK286,0*22<CR><LF><br>Response:<br>$PMTK001,286,3*3C<CR><LF> | |
|---|---|
| **Field** | **Description** |
| $ | Each NMEA message starts with '$' |
| PMTK | MTK proprietary message |
| Packet Type | 286 |
| Enable | '0'=Disable<br>'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:<br>$PMTK301,Mode<br>Example:<br>$PMTK301,2*2E<CR><LF><br>Response:<br>$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.<br>'0'=No DGPS source<br>'1'=RTCM<br>'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 searching 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<br>‘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 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 the following message:

| Example:<br>$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 users to enable or disable QZSS NMEA format. QZSS NMEA format is disabled by defult.

| Data Field:<br>$PMTK351,Enable<br>Example:<br>$PMTK351,1*28<CR><LF><br>Response:<br>$PMTK001,351,3*37<CR><LF> | |
|---|---|
| **Field** | **Description** |
| $ | Each NMEA message starts with '$' |
| PMTK | MTK proprietary message |
| Packet Type | 351 |
| QZSS_Enable | '0'=Disable<br>'1'=Enable |
| * | End character of data field |
| Checksum | Hexadecimal checksum |
| <CR><LF> | Each of message |

## 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. QZSS function is enabled bu defualt.

| Data Field:<br>$PMTK352,Enable<br>Example:<br>$PMTK352,0*2A<CR><LF><br>Response:<br>$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 |
| <CR><LF> | Each of message |

## 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_Enable
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)<br>'1'or non-ZERO : search GPS satellites |
| GLONASS_Enable | '0'=Disable(DO NOT search GLONASS satellites)<br>'1'or non-ZERO : search GLONASS satellites |
| GALILEO_Enable | '0'=Disable(DO NOT search GALILEO satellites)<br>'1'or non-ZERO : search GALILEO satellites |
| GALILEO_FULL_Enable | '0'=Disable (DO NOT search GALILEO FULL mode satellites)<br>'1'or non-ZERO : search GALILEO satellites |
| BEIDOU_Enable | '0'=Disable<br>'1'or non-ZERO : search BEIDOU satellites |
| * | End character of data field |
| Checksum | Hexadecimal checksum |
| <CR><LF> | Each of message |

**NOTES**

Actually GLONASS only, BEIDOU only, and GALILEO only mode is only for testing purpose. Please use GPS+GLONASS or GPS+BEIDOU in the real application. In Europe, GPS+GLONASS+GALILEO will be used too. GLONASS and BEIDOU can not be enabled at the same time.

A. When the firmware supports GPS and GLONASS systems, the NMEA Sentences output as below:

1. If the receiver is fixed by GPS only, it will print GPRMC, GPVTG, GPGGA, GPGSA, GPGSV and GPGLL.
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 and GPGLL.
3. If the receiver is fixed by GLONASS only, it will print GNRMC, GPVTG, GPGGA, GNGSA, GPGSV, GLGSV and GNGLL.
4. If the receiver is fixed by GPS and GLONASS, it will print GNRMC, GPVTG, GPGGA, GNGSA, GPGSV, GLGSV and GNGLL.
5. In the state of no satellite positioning, it will print initial state of NMEA, such as GPRMC, GPVTG, GPGGA, GPGSA, GPGSV and GPGLL. The time before satellite positioning after cold start, warm start or hot start is belong to this situation.

B. When the firmware supports GPS and BEIDOU systems, the NMEA Sentences output as below:

1. If the receiver is fixed by GPS only, it will print GPRMC, GPVTG, GPGGA, GPGSA, GPGSV and GPGLL.
2. If the receiver is fixed by BEIDOU only, it will print BDRMC, BDVTG, BDGGA, BDGSA, BDGSV and BDGLL.
3. If the receiver is fixed by GPS and BEIDOU, it will print GNRMC, GNVTG, GNGGA,GPGSA, BDGSA ,GPGSV, BDGSV and GNGLL.
4. In the state of no satellite positioning, it will print initial state of NMEA, such as GNRMC, GNVTG, GNGGA and GNGLL. The time before satellite positioning after cold start, warm start or hot start is belong to this situation.

C. When the firmware supports GPS, GLONASS and GALILEO systems, the NMEA Sentences output as below:

1. If the receiver is fixed by GPS, GLONASS and GALILEO, it will print GNGGA, GPGSA, GLGSA, GAGSA, GPGSV ,GLGSV, GAGSV, GNRMC, GNVTG and GNGLL.

## 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 be 0, this function is disabled.

Data Field:
$PMTK386,Speed_threshold
Example:

| $PMTK386,0.3*3E<CR><LF><br>Response:<br>$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:<br>None<br>Example:<br>$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:<br>None<br>Example:<br>$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:<br>None<br>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:<br>None<br>Example:<br>$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:<br>None<br>Example:<br>$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:<br>$PMTK500,Fix interval<br>Example:<br>$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:<br>$PMTK501,Mode<br>Example:<br>$PMTK501,1*2B<CR><LF> | |
|---|---|
| **Field** | **Description** |
| $ | Each NMEA message starts with '$' |
| PMTK | MTK proprietary message |
| Packet Type | 501 |
| Mode | DGPS data source mode<br>'0'=No DGPS source<br>'1'=RTCM<br>'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:<br>$PMTK513,Enable<br>Example:<br>$PMTK513,1*28<CR><LF> | |
|---|---|
| **Field** | **Description** |
| $ | Each NMEA message starts with '$' |
| PMTK | MTK proprietary message |
| Packet Type | 513 |
| Enable | '0'=Disable<br>'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:<br>None<br>Example:<br>$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 |
| 4 GSA | GSA interval - GNSS DOPS and Active Satellites |
| 5 GSV | GSV interval - GNSS Satellites in View |
| 6 Reserved | GRS interval – GNSS Range Residuals |
| 7 Reserved | 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 Reserved | 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:<br>$PMTK705, Release string, Build ID, Product Model(,SDK Version)<br>Example:<br>$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<br>3318: Mcore_x.x<br>3329: AXN_x.x<br>3339: AXN_x.x<br>3333: AXN_x.x<br>3337: 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 whether EASY is enabled or disabled.

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

| Field | Description |
|---|---|
| $ | Each NMEA message starts with '$' |
| PMTK | MTK proprietary message |
| Packet Type | 869 |
| CmdType | '0'=Query<br>'1'=Set<br>'2'=Result for Query operation |
| Enabled | '0'=Disable<br>'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 is not finished yet, the receiver may return:
   $PMTK869,2,1,0*2A<CR><LF>
3. If EASY is enabled and is finished 1-day extension, the receiver may return:
   $PMTK869,2,1,1*2B<CR><LF>
4. If EASY is enabled and is finished 2-day extension, the receiver may return:
   $PMTK869,2,1,2*28<CR><LF>
5. If EASY is enabled and is finished 3-day extension, 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 whether 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:

| $PMTKLSC,Parameter1,Parameter2,Parameter3*CS<br>$PMTKLSB,Parameter1,Parameter2,Parameter3*CS<br>Where Parameter1 : current leap second<br>Parameter2 : leap indicator, 1 means updated from broadcast data<br>Parameter3 : next leap second | |
|---|---|
| **Field** | **Description** |
| $ | Each NMEA message starts with '$' |
| PMTK | MTK proprietary message |
| Packet Type | 875 |
| CmdType | '0'=Query<br>'1'=Set<br>'2'=Result for Query operation |
| Enabled | '0'=Disable<br>'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:<br>$PMTK886,CmdType<br>Example:<br>$PMTK886,3*2B<CR><LF><br>Response:<br>$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<br>‘1’=Fitness mode: For running and walking purpose that the low-speed (<5m/s) movement will have more effect on the position calculation.<br>‘2’=Aviation mode: For high-dynamic purpose that the large-acceleration movement will have more effect on the position calculation.<br>‘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 References

**Table 1: Related Documents**

| SN | Document Name | Remark |
|---|---|---|
| [1] | Quectel_L76_Series_Hardware_Design | L76 Series Hardware Design |
| [2] | Quectel_L76_Series_EVB_User Guide | L76 Series EVB User Guide |
| [3] | Quectel_L76_Series_Reference_Design | L76 Series Reference Design |

**Table 2: Terms and Abbreviations**

| Abbreviation | Description |
|---|---|
| GNSS | Global Navigation Satellite System |
| GPS | Global Positioning System |
| GLONASS | Global Navigation Satellite System(The Russian GNSS) |
| BDS | BeiDou Navigation Satellite System |
| GALILEO | Galileo satellite navigation 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: 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 |
| GBS | NMEA: GPS Satellite Fault Detection |
| 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 |

**Table 3: Structure of NMEA Message**

| Filed | Length (Bytes) | Description |
|---|---|---|
| $ | 1 | Each NMEA message starts with '$' |
| Talker ID | 1~2 | Talker IDs can be 'GP', 'GN' and 'BD' when the message ID is RMC, VTG, GLL or GGA, Talker IDs can be 'GP', 'GN', 'BD' and 'GA' when the message ID is GSA, Talker IDs can be 'GP', 'GL', 'BD' and 'GA' when the message ID is GSV, and Talker IDs can be 'GN' when the message ID is GBS. |
| NMEA Message ID | 3 | NMEA message ID |
| Data Field | Variable, depend on the NMEA message type | Data fields, delimited by comma ',' |
| * | 1 | End character of data field |
| Checksum | 2 | A hexadecimal number calculated by exclusive OR of all characters between '$' and '*' |

| | | |
|---|---|---|
| <CR><LF> | 2 | Each NMEA message ends with ‘CR’ and ‘LF’ |

**NOTE**

The default output message of L76 series has the following six sentences: RMC, VTG, GGA, GSA, GSV and GLL. But if the receiver is fixed by GPS, GLONASS and GALILEO, the default output message of L76 series has the following six sentences: RMC, VTG, GGA, GSA, GSV and GBS.

**Table 4: 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’ |

# 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 |