Telit MT GNSS Software User Guide

1VV0301162 r3 – 2016-05-16

Making machines talk.

APPLICABILITY TABLE

PRODUCT
SL869-V2
SL871
SL871L
SL869-V2S
SL871-S
SE868-A
SE868-AS
SC872-A

SW Version
MT33-2.1.8
AXN 3.8.10

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Notice

While reasonable efforts have been made to assure the accuracy of this document, Telit assumes no liability resulting from any inaccuracies or omissions in this document, or from use of the information obtained herein. The information in this document has been carefully checked and is believed to be entirely reliable. However, no responsibility is assumed for inaccuracies or omissions. Telit reserves the right to make changes to any products described herein and reserves the right to revise this document and to make changes from time to time in content hereof with no obligation to notify any person of revisions or changes. Telit does not assume any liability arising out of the application or use of any product, software, or circuit described herein; neither does it convey license under its patent rights or the rights of others.

It is possible that this publication may contain references to, or information about Telit products (machines and programs), programming, or services that are not announced in your country. Such references or information must not be construed to mean that Telit intends to announce such Telit products, programming, or services in your country.

Copyrights

This instruction manual and the Telit products described in this instruction manual may be, include or describe copyrighted Telit material, such as computer programs stored in semiconductor memories or other media. Laws in the Italy and other countries preserve for Telit and its licensors certain exclusive rights for copyrighted material, including the exclusive right to copy, reproduce in any form, distribute and make derivative works of the copyrighted material. Accordingly, any copyrighted material of Telit and its licensors contained herein or in the Telit products described in this instruction manual may not be copied, reproduced, distributed, merged or modified in any manner without the express written permission of Telit. Furthermore, the purchase of Telit products shall not be deemed to grant either directly or by implication, estoppel, or otherwise, any license under the copyrights, patents or patent applications of Telit, as arises by operation of law in the sale of a product.

Computer Software Copyrights

The Telit and 3rd Party supplied Software (SW) products described in this instruction manual may include copyrighted Telit and other 3rd Party supplied computer programs stored in semiconductor memories or other media. Laws in the Italy and other countries preserve for Telit and other 3rd Party supplied SW certain exclusive rights for copyrighted computer programs, including the exclusive right to copy or reproduce in any form the copyrighted computer program. Accordingly, any copyrighted Telit or other 3rd Party supplied SW computer programs contained in the Telit products described in this instruction manual may not be copied (reverse engineered) or reproduced in any manner without the express written permission of Telit or the 3rd Party SW supplier. Furthermore, the purchase of Telit products shall not be deemed to grant either directly or by implication, estoppel, or otherwise, any license under the copyrights, patents or patent applications of Telit or other 3rd Party supplied SW, except for the normal non-exclusive, royalty free license to use that arises by operation of law in the sale of a product.

Usage and Disclosure Restrictions

License Agreements

The software described in this document is the property of Telit and its licensors. It is furnished by express license agreement only and may be used only in accordance with the terms of such an agreement.

Copyrighted Materials

Software and documentation are copyrighted materials. Making unauthorized copies is prohibited by law. No part of the software or documentation may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language or computer language, in any form or by any means, without prior written permission of Telit

High Risk Materials

Components, units, or third-party products used in the product described herein are NOT fault-tolerant and are NOT designed, manufactured, or intended for use as on-line control equipment in the following hazardous environments requiring fail-safe controls: the operation of Nuclear Facilities, Aircraft Navigation or Aircraft Communication Systems, Air Traffic Control, Life Support, or Weapons Systems (High Risk Activities"). Telit and its supplier(s) specifically disclaim any expressed or implied warranty of fitness for such High Risk Activities.

Trademarks

TELIT and the Stylized T Logo are registered in Trademark Office. All other product or service names are the property of their respective owners.

Contents

1. Introduction

1.1. Scope

This document describes the serial communications interface between the GNSS receiver module and the Host Processor software.

1.2. Contact Information, Support

For general contact, technical support, to report documentation errors and to order manuals, contact Telit Technical Support Center (TTSC) at:

TS-EMEA@telit.com
TS-AMERICAS@telit.com
TS-APAC@telit.com

Alternatively, use:

http://www.telit.com/en/products/technical-support-center/contact.php

For detailed information about where you can buy the Telit receivers or for recommendations on accessories and components visit:

http://www.telit.com

To register for product news and announcements or for product questions contact Telit Technical Support Center (TTSC).

Our aim is to make this guide as helpful as possible. Keep us informed of your comments and suggestions for improvements.

Telit appreciates feedback from the users of our information.

1.3. Text Conventions

Danger – This information MUST be followed or catastrophic equipment failure or bodily injury may occur.

Caution or Warning – Alerts the user to important points about integrating the receiver, if these points are not followed, the receiver and end user equipment may fail or malfunction.

Tip or Information – Provides advice and suggestions that may be useful when integrating the receiver.

All dates are in ISO 8601 format, i.e. YYYY-MM-DD.

1.4. Related Documents

- NMEA 0183, Version 3.00, National Marine Electronics Association
- Interface Specification IS-GPS-200G, 2012-09-05
- MTK NMEA Packet User Manual
  Revision: 3.5, Linked FW Version: AXN 3.6/3.8/2.3/2.5,
  Release Date: 2016/3/17
- MTK NMEA Sentence Output
  Release Date: 2013-Sep-27, Rev 3.1

2. Communication Interface

The serial communication interface between the GNSS receiver module and the host processor is based on the NMEA-0183 protocol standard specified by the National Marine Electronics Association (NMEA). This is an ASCII-based standard that is widely used in the GPS industry for serial communication with GNSS receivers.

2.1. Serial Communication

Serial communication with the GNSS receiver is primarily conducted over the serial port. There is no hardware flow control. The default port settings are:

- 9600 Baud
- Eight data bits
- No parity bits
- One stop bit

Some Firmware versions may have different default values than those given above.

2.2. NMEA Characteristics

This subsection highlights characteristics of the NMEA-0183 protocol as they pertain to serial communication with the GNSS module.

Start and Termination
An NMEA data packet is transmitted as an ASCII string beginning with a "$" character, but it is terminated with <Carriage Return> <Line Feed> character sequence.

Proprietary Packets
Proprietary data packets are allowed by the NMEA protocol standard.

Checksums
The NMEA standard specifies a two-character checksum field that follows a "*" delimiting character placed at the end of the ASCII data string. The checksum is calculated as the 8-bit exclusive-OR (XOR) of all characters in the string between the "$" and "*" delimiters.

Data Packet
The NMEA standard specifies a maximum number of characters for each data packet, 82 bytes.

2.3. NMEA Standard Sentences

Serial communication between the Host Processor and the GNSS module is accomplished using messages following the NMEA 0183 standard. Standard NMEA messages output by the receiver are called “Sentences” and always start with an ASCII ‘$’ character (Hex value 0x24). All NMEA sentences also end or terminate with a two character Carriage Return <CR> (ASCII hex value 0x0D) Line Feed <LF> (ASCII hex value 0xA) sequence.

After the starting ‘$’ character a NMEA sentence contains a two character Talker Identifier which may have the values GP for GPS, GL for GLONASS, BD for BEIDOU (COMPASS), GA for Galileo, or GN for Global Navigation that can be a combination of the individual navigation system (GPS, GL, etc). The Talker Identifier indicates the GNSS system source of the information contained in the sentence. Following the Talker Identifier is a three character Sentence Identifier. The Sentence Identifier indicates the type of the sentence. The GNSS module outputs the GGA GLL, GSA, GSV, RMC, VTG, and ZDA sentence types. Each type is described in its own section in this document.

Following the Sentence Identifier is a sequence of Data Fields which are separated, or delimited, by commas. The number and meaning of the data fields, which are sometimes referred to as the Payload of the sentence, is determined by the sentence type. A particular data field might be omitted from a sentence and then that field is called a NULL field. A NULL field is still separated from the other fields by commas.

After the last data field appears the ‘*’ character (ASCII hex value 0x2A) which denotes the end of the data fields. Immediately following the ‘*’ character is a two character hexadecimal checksum used to detect errors in the sentence that might have been introduced during serial transmission. The NMEA sentence checksum is computed by performing an 8-bit Exclusive OR (XOR) sum on all the characters in the sentence that appear after the ‘$’ character and before the ‘*’ character.

After the checksum appears the terminating <CR><LF> sequence.
The maximum length of a NMEA standard sentence is 82 characters, consisting of a maximum of 79 characters in the string between the starting ‘$’ character and the terminating <CR><LF>.

The following table gives the format of the NMEA standard output sentences.

Standard NMEA Sentence Format
Example of typical NMEA sentence:
$GNVTG,76.25,T,,M,0.57,N,1.05,K,A*13<CR><LF>

Field	Example	Comment
$	$	Start of Sentence
Talker ID	GN	Navigation System GP = GPS GL = GLONASS BD = BEIDOU (COMPASS) GA = Galileo GN = Global Navigation / Multi-constellation
Sentence ID	VTG	NMEA Sentence Identifier GGA, GLL, GSA, GSV, RMC, VTG, ZDA
Data Fields	76.25	The number of Data Fields depends upon the sentence type. A comma symbol ‘,’ is used to separate, or delimit, each data field from another. NULL fields contain no characters, but are separated by commas from the other data fields.
	T	
	<NULL>	
	M	
	0.57	
	N	
	1.05	
	K	
	A	
End of Data Fields	*	Asterisk delimiter denoting the end of the Data Fields.
Checksum	13	Two character hexadecimal checksum value computed by taking the 8-bit Exclusive OR (XOR) sum of all characters between the ‘$’ and ‘*’ characters.
Terminator	<CR><LF>	Carriage Return <CR> Line Feed <LF> sequence indicating the end of a packet

The highlights of this NMEA sentence:

- A NMEA sentence always starts with the starting character “$”
- A sentence type is defined by the concatenation of Talks ID and Sentence ID.
  In the example, “GNVTG” header indicates the sentence has “GN” as the Talker ID, and the Sentence type is “VTG”.
  The “GN” Talker ID signifies that this VTG sentence contains the data that is sourced form a combination of individual constellations (GPS, GLONASS, Galileo, etc).
- Data fields is the text string following the Sentence ID “VTG”.

NMEA Standard and Versions

The NMEA standard (a.k.a. NMEA 0183) is updated from time to time, as the new feature is enabled, new data type (as defined by the Sentence ID) is added, and new data fields are expanded in the existing sentences. As a result, a valid NMEA sentence may have version-specific definition and implementation.

The following tables illustrate the definition of Talk ID headers (GP, GL, or GN) with respect to the data source of constellation systems

- NMEA 0183 3.01 version:

Talk ID	GPS Only	GLONASS Only	BEIDOU Only	Galileo Only	GPS + GLONASS	GPS + BEIDOU	GPS + Galileo	GPS + GLONASS + Galileo
GGA	GP	GL	BD	GA	GN	GN	GN	GN
RMC								
GLL								
VTG								
ZDA								
GSA					GP + GL	GP + BD	GP + GA	GP + GL + GA
GSV					GP + GL	GP + BD	GP + GA	GP + GL + GA

From the table above, there can be the following examples of valid NMEA sentences:

- For a GPS constellation only scenario: All NMEA sentences will have “GP” as the Talker IDs, such as GPGGA. GPRMC, GPGSA, GPGSV, etc.

- For a GNSS system where satellites from GPS + GLONASS constellations are tracked, All NMEA sentences, with exception of GSA and GSV, will have “GN” as Talker ID, such as GNGGA. GNRMC, GNGLL, etc.
  As of the GSA and GSV sentences, the following NMEA sentence headers are expected: GPGSA, GLGSA, GPGSV, and GLGSV.

- NMEA 0183 4.10 version:

Talk ID	GPS Only	GLONASS Only	BEIDOU Only	Galileo Only	GPS + GLONASS	GPS + BEIDOU	GPS + Galileo	GPS + GLONASS + Galileo
GGA	GP	GL	BD	GA	GN	GN	GN	GN
RMC								
GLL								
VTG								
ZDA								
GSA								
GSV					GP + GL	GP + BD	GP + GA	GP + GL + GA

From the table above, there can be the following examples of valid NMEA sentences:

- For a GPS constellation only scenario: All NMEA sentences will have “GP” as the Talker IDs, such as GPGGA. GPRMC, GPGSA, GPGSV, etc.

- For a GNSS system where satellites from GPS + GLONASS constellations are tracked, All NMEA sentences, with exception of GSV, will have “GN” as the Talker ID, such as GNGGA. GNRMC, GNGLL, GNGSA, etc.
  As of the GSV sentences, the following NMEA sentence headers are expected: GPGSV and GLGSV.

By comparing the definitions of NMEA standard version 3.01 and version 4.10 with respect to the Talker ID, it is obvious that, for a GNSS system GPS + GLONASS, the GSA message’s Talker ID changed from “GP” and “GL” (in version 3.01) to a homogenous “GN” (in version 4.10).

2.4. MTK NMEA Packets

In addition to the use of NMEA standard sentences, the GNSS module communication with the host processor is accomplished using proprietary messages called MTK NMEA packets.
MTK NMEA packets are messages that follow the NMEA sentence format with the exception that the maximum number of characters in a packet is allowed to be 255. MTK packets allow the user to send commands to the GNSS module and for the module to send information to the user.

A MTK NMEA packet begins with the '$' character and is followed by the talker identifier string "PMTK" which is then followed by a three character numerical identifier (Pkt Type) for the packet. The format of the MTK NMEA packets is given in the following table.

MTK NMEA Packet Format
Example of typical NMEA MTK packet:
$PMTK300,1000,0,0,0,0*1C<CR><LF>

Field	Example	Comment
Preamble	$	Start of packet
Header	PMTK	Talker ID – Four character string
	300	Pkt Type – Three character numeric string indicating the Message ID (MID) of the packet.
Data Fields	1000	The number of Data Fields depends upon the packet type. A comma symbol ',' is used to separate, or delimit, each data field from another. NULL fields contain no characters, but are separated by commas from the other data fields.
	0	
	0	
	0	
	0	
End of Data Fields	*	Asterisk delimiter denoting the end of the Data Fields.
Checksum	1C	Two character hexadecimal checksum value computed by taking the 8-bit Exclusive OR (XOR) sum of all characters between the '$' and '*' characters.
Terminator	<CR><LF>	Carriage Return <CR> Line Feed <LF> sequence indicating the end of a packet

3. NMEA Output Messages

3.1. GGA-Global Positioning System Fix Data

Time, position and fix related data for a GPS receiver.
Synopsis:
$GPGGA,UTCTime,Latitude,N/SIndicator,Longitude,E/WIndicator,GPSQualityIndicator,SatellitesUsed,HDOP,MSLAltitude,MSLAltitudeUnits,GeoidSeparation,SeparationUnits,DGPSAge,DGPSStationID

Field	Example	Comments
Preamble	$	Start of sentence
Talker ID	GP	Navigation System GP = GPS GL = GLONASS BD = BEIDOU (COMPASS) GA = Galileo GN = Global Navigation / Multi-constellation
Sentence ID	GGA	Global Positioning System Fix Data Sentence
UTC Time	082651.100	hhmmss.sss (hours,minutes,seconds)
Latitude	2446.4768	ddmm.mmmm (degrees and minutes)
N/SIndicator	N	N = North, S = South
Longitude	12100.0344	ddmm.mmmm (degrees and minutes)
E/WIndicator	E	E = East, W = West
GPSQualityIndicator	1	0 = Fix not available or invalid 1 = GPS Standard Positioning Service (SPS) Mode, fix valid 2 = Differential GPS (DGPS) SPS Mode, fix valid 3 = GPS Precise Positioning Service (PPS), fix valid 4 = Real Time Kinematic (RTK) 5 = Float RTK 6 = Estimated (dead reckoning) Mode 7 = Manual Input Mode 8 = Simulator Mode
SatellitesUsed	07	Number of satellites in use (00-12)
HDOP	0.75	Horizontal Dilution of Precision
MSLAltitude	140.00	Antenna altitude above/below Mean Sea Level (MSL) geoid surface.
MSLAltitudeUnits	M	M = meters
GeoidSeparation	15.03	The difference between the WGS84 earth ellipsoid surface and the mean-sea-level (geoid) surface. Negative Geoid Separation values indicate that the MSL surface is below the ellipsoid surface. Ellipsoidal altitude = MSL Altitude + Geoid Separation
SeparationUnits	M	M = meters

DGPSAge		Age of DGPS data in seconds since last update, Null field when DGPS is not used
DGPSStationID		0000-1023
End of Data Fields	*	Asterisk delimiter
Checksum	6A	Two character hexadecimal value
Terminator	<CR><LF>	End of sentence sequence

Example:

- $GPGGA,082651.100,2446.4768,N,12100.0344,E,1,07,0.75,140.00,M,15.03,M,,*6A<CR><LF>

3.2. GLL-Geographical Position-Latitude/Longitude

Latitude, Longitude, time and status of Navigation Solution.

Synopsis:

$GPGLL,Latitude,N/SIndicator,Longitude,E/WIndicator,UTCTime,Status,PositioningMode Indicator

Field	Example	Comments
Preamble	$	Start of sentence
Talker ID	GP	Navigation System GP = GPS GL = GLONASS BD = BEIDOU (COMPASS) GA = Galileo GN = Global Navigation / Multi-constellation
Sentence ID	GLL	Geographical Position-Latitude/Longitude
Latitude	2446.4768	ddmm.mmmm (degrees and minutes)
N/SIndicator	N	N = North, S = South
Longitude	12100.0344	dddmm.mmmm (degrees and minutes)
E/WIndicator	E	E = East, W = West
UTCTime	082651.10	hhmmss.ss (hours, minutes, seconds)
Status	A	A = Data Valid (only when the mode indicator is A or D)
PositioningModeIndicator	A	A = Autonomous mode D = Differential mode E = Estimated (dead reckoning) mode M = Manual input mode S = Simulator mode N = No fix, Data not valid
End of Data Fields	*	Asterisk delimiter
Checksum	6B	Two character hexadecimal value
Terminator	<CR><LF>	End of sentence sequence

Example:

- $GPGLL,2446.4768,N,12100.0344,E,082652.10,A,A*6B<CR><LF>

3.3. GSA-GNSS DOP and Active Satellites

GNSS receiver operating mode, satellites used in the navigation solution and DOP values.
Note: GLONASS SVIDS range from 65 to 96

Synopsis:

$GPGSA,Mode1,Mode2,IDOfSatelliteInUse,IDOfSatelliteInUse,,,,,,,,,,,PDOP,HDOP,VDOP, GNSSSystemID

Field	Example	Comments
Preamble	$	Start of sentence
Talker ID	GP	Navigation System GP = GPS GL = GLONASS BD = BEIDOU (COMPASS) GA = Galileo GN = Global Navigation / Multi-constellation (Support from NMEA version 4.10)
Sentence ID	GSA	GNSS DOP and Active Satellites
Mode1	A	M = Manual, forced to operate in 2D or 3D mode A = Automatic, allowed to automatically switch 2D/3D
Mode2	3	1 = No Fix, 2 = 2D, 3 = 3D
IDOfSatelliteInUse	30	Satellite used on channel 1
IDOfSatelliteInUse	03	Satellite used on channel 2
IDOfSatelliteInUse	25	Satellite used on channel 3
IDOfSatelliteInUse	20	Satellite used on channel 4
IDOfSatelliteInUse	06	Satellite used on channel 5
IDOfSatelliteInUse	16	Satellite used on channel 6
IDOfSatelliteInUse	14	Satellite used on channel 7
IDOfSatelliteInUse		Satellite used on channel 8
IDOfSatelliteInUse		Satellite used on channel 9
IDOfSatelliteInUse		Satellite used on channel 10
IDOfSatelliteInUse		Satellite used on channel 11
IDOfSatelliteInUse		Satellite used on channel 12
PDOP	2.25	Position Dilution of Precision
HDOP	1.00	Horizontal Dilution of Precision
VDOP	2.0	Vertical Dilution of Precision
GNSSSystemID	1	GNSS system ID. 1 = GPS, 2 = GLONASS, 3 = GALILEO, 4 = BEIDOU. (Support from NMEA version 4.10)
End of Data Fields	*	Asterisk delimiter
Checksum	05	Two character hexadecimal value
Terminator	<CR><LF>	End of sentence sequence

Example:

- $GPGSA,A,3,30,03,25,20,06,16,14,,,,,,2.25,1.00,2.0*05<CR><LF>

3.4. GSV-GNSS Satellites in View

Number of Space Vehicle (SV) satellites in view, satellite ID numbers, elevation, azimuth and Signal to Noise (SNR) values. Four satellite maximum per message.

Synopsis:

$GPGSV, NumberOfSentences,SentenceNumber,SatellitesInView,SatelliteID1,Elevation1, Azimuth1,SNR1,SatelliteID2,Elevation2,Azimuth2,SNR2,SatelliteID3,Elevation3,Azimuth3, SNR3,SatelliteID4,Elevation4,Azimuth4,SNR4

Field	Example	Comments
Preamble	$	Start of sentence
Talker ID	GP	Navigation System GP = GPS GL = GLONASS BD = BEIDOU (COMPASS) GA = Galileo
Sentence ID	GSV	GNSS Satellites in View
NumberOfSentences	2	Total number of sentences (1-9)
SentenceNumber	1	Sequence number of this entry (1-9)
SatellitesInView	08	Total number of satellites in view
SatelliteID1	30	GPS Range: 1-32, GLONASS Range: 65-96
Elevation1	09	Elevation angle in degrees, 0-90
Azimuth1	045	Azimuth angle in degrees, True, 000-359
SNR1	31	SNR (C/No), 00-99 dB-Hz, null while not tracking
SatelliteID2	03	GPS Range: 1-32, GLONASS Range: 65-96
Elevation2	11	Elevation angle in degrees, 0-90
Azimuth2	196	Azimuth angle in degrees, True, 000-359
SNR2	40	SNR (C/No), 00-99 dB-Hz, null while not tracking
SatelliteID3	25	GPS Range: 1-32, GLONASS Range: 65-96
Elevation3	52	Elevation angle in degrees, 0-90
Azimuth3	007	Azimuth angle in degrees, True, 000-359
SNR3	45	SNR (C/No), 00-99 dB-Hz, null while not tracking
SatelliteID4	20	GPS Range: 1-32, GLONASS Range: 65-96
Elevation4	17	Elevation angle in degrees, 0-90
Azimuth4	300	Azimuth angle in degrees, True, 000-359
SNR4	39	SNR (C/No), 00-99 dB-Hz, null while not tracking
End of Data Fields	*	Asterisk delimiter
Checksum	79	Two character hexadecimal value
Terminator	<CR><LF>	End of sentence sequence

Example:

- $GPGSV,2,1,08,30,09,045,31,03,11,196,40,25,52,007,45,20,17,300,39*79<CR><LF>

3.5. RMC-Recommended Minimum Specific GNSS Data

The time, date, position, course and speed data provided by a GNSS navigation receiver.

Synopsis:

$GPRMC,UTCTime,DataValidStatus,Latitude,N/AIndicator,Longitude,,/WIndicator, SpeedOverGround,CourseOverGround,UTCDate,MagneticVariation,MagneticVariation, ModeIndicator,NavStatus

Field	Example	Comments
Preamble	$	Start of sentence
Talker ID	GP	Navigation System GP = GPS GL = GLONASS BD = BEIDOU (COMPASS) GA = Galileo GN = Global Navigation / Multi-constellation
Sentence ID	RMC	Recommended Minimum Specific GNSS Data
UTCTime	082653.100	hhmmss.sss (hours, minutes, seconds)
DataValidStatus	A	A = Data valid V = Navigation receiver warning (data invalid)
Latitude	2446.4768	ddmm.mmmm (degrees and minutes)
N/AIndicator	N	N = North, S = South
Longitude	12100.0344	dddmm.mmmm (degrees and minutes)
E/WIndicator	E	E = East, W = West
SpeedOverGround	0.00	Knots
CourseOverGround	128.42	Degrees true
UTCDate	270705	ddmmyy (day, month, year)
MagneticVariation		Degrees magnetic
MagneticVariation		E = East, W = West
ModeIndicator	A	A = Autonomous mode D = Differential mode E = Estimated (dead reckoning) mode M = Manual input mode S = Simulator mode N = Data not valid
NavStatus	S	(Support from NMEA version 4.10) S = Safe C = Caution U = Unsafe V = Invalid
End of Data Fields	*	Asterisk delimiter
Checksum	67	Two character hexadecimal value
Terminator	<CR><LF>	End of sentence sequence

Example:

- $GPRMC,082653.100,A,2446.4768,N,12100.0344,E,0.00,128.42,270705,,,A,S*67 <CR><LF>

3.6. VTG-Course over Ground and Ground Speed

The actual course and speed relative to the ground.

Synopsis:

$GPVTG,CourseOverGround,Reference,CourseOverGround,Reference,SpeedOverGround,Units,SpeedOverGround,Units,PositioningModeIndicator

Field	Example	Comments
Preamble	$	Start of sentence
Talker ID	GP	Navigation System GP = GPS GL = GLONASS BD = BEIDOU (COMPASS) GA = Galileo GN = Global Navigation / Multi-constellation
Sentence ID	VTG	Course Over Ground and Ground Speed
CourseOverGround	128.42	Measured heading, degrees true
Reference	T	T = True heading
CourseOverGround		Measured heading, degrees magnetic
Reference		M = Magnetic heading
SpeedOverGround	0.00	Measured horizontal speed
Units	N	N = Knots
SpeedOverGround	0.00	Measured horizontal speed
Units	K	K = Kilometers/hour (Km/h)
PositioningModeIndicator	A	A = Autonomous mode D = Differential mode E = Estimated (dead reckoning) mode M = Manual input mode S = Simulator mode N = Data not valid
End of Data Fields	*	Asterisk delimiter
Checksum	7D	Two character hexadecimal value
Terminator	<CR><LF>	End of sentence sequence

Example:

- $GPVTG,128.42,T,,,0.00,N,0.00,K,A*7D<CR><LF>

3.7. GRS-GNSS Range Residuals

GNSS range residuals.
The message that is used to support the Receiver Autonomous Integrity Monitoring (RAIM).
Synopsis:
$GPGRS,UTCTime,Mode,Residual1,Residual2,,,,,,,,,Residual12

Field	Example	Comments
Preamble	$	Start of sentence
Talker ID	GP	Navigation System GP = GPS GL = GLONASS BD = BEIDOU (COMPASS) GA = Galileo GN = Global Navigation / Multi-constellation
Sentence ID	GRS	GNSS range residuals
UTCTime	220320.000	hhmmss.sss (hours, minutes, seconds)
Mode	0	Mode: 0 = residuals were used to calculate the position given in the matching GGA or GNS sentence 1 = Range residuals were recomputed after the GGA or GNS position was computed.
Residual1	-0.8	Range residuals in meters for satellites used in the navigation solution. Order must match order of the satellites ID numbers in GSA. When GRS is used GSA and GSV are generally required.
Residual2	-0.2	
……		
Residual12		
End of Data Fields	*	Asterisk delimiter
Checksum	55	Two character hexadecimal value
Terminator	<CR><LF>	End of sentence sequence

Example:
$GPGRS,220320.000,0,-0.8,-0.2,-0.1,-0.2,0.8,0.6,,,,,,*55<CR><LF>

3.8. GST-GNSS Pseudorange Noise Statistics

GNSS pseudorange noise (errors) statistics.
The message that is used to support the Receiver Autonomous Integrity Monitoring (RAIM).
Synopsis:
$GPGST,UTCTime,StdErrRange,StdMaj,StdMin,StdAngMajN,StdLatError,StdLonError, StdAltError

Field	Example	Comments
Preamble	$	Start of sentence
Talker ID	GP	Navigation System GP = GPS GL = GLONASS BD = BEIDOU (COMPASS) GA = Galileo GN = Global Navigation / Multi-constellation
Sentence ID	GST	GNSS pseudorange noise (errors) statistics
UTCTime	220320.000	hhmmss.sss (hours, minutes, seconds)
StdErrRange	1.3	RMS value of the standard deviation of the range inputs to the navigation process (range inputs include pseudoranges and DGPS corrections)
StdMaj	0.8	Standard deviation of semi-major axis of error ellipse, in meters
StdMin	0.5	Standard deviation of semi-minor axis of error ellipse, in meters
StdAngMajN	166.1	Orientation of semi-major axis of error ellipse, in degrees from true north
StdLatError	0.8	Standard deviation of latitude error, in meters
StdLonError	0.6	Standard deviation of longitude error, in meters
StdAltError	1.6	Standard deviation of altitude error, in meters
End of Data Fields	*	Asterisk delimiter
Checksum	4F	Two character hexadecimal value
Terminator	<CR><LF>	End of sentence sequence

Example:
$GPGST,220320.0,1.3,0.8,0.5,166.1,0.8,0.6,1.6,*4F<CR><LF>

3.9. ZDA-UTC Date/Time and Local Time Zone Offset

UTC, day, month, year and local time zone. This message is sent by systems which support a one Pulse Per Second (PPS) time mark output pulse.

Synopsis:

$GPZDA,UTCTime,UTCDay,UTCMonth,UTCYear,LocalZoneHour,LocalZoneMinutes

Field	Example	Comments
Preamble	$	Start of sentence
Talker ID	GP	Navigation System GP = GPS GL = GLONASS BD = BEIDOU (COMPASS) GA = Galileo GN = Global Navigation / Multi-constellation
Sentence ID	ZDA	UTC Date and Time
UTCTime	201530.000	hhmmss.sss hh = UTC hours. mm = UTC minutes. ss.ss = UTC seconds.
UTCDay	04	Range: 01 to 31
UTCMonth	07	Range: 01 to 12
UTCYear	2016	Range: 1980 to 2079
LocalZoneHour	00	Offset from UTC. Number of whole hours added to local time to obtain Greenwich Mean Time (GMT). The Local zone hour is negative for East longitudes. Range: -13 to 13 Null or always zero if not supported
LocalZoneMinutes	00	Offset from UTC. Local zone minutes have the same sign as the Local zone hour. Range 00 to 59 Null or always zero if not supported
End of Data Fields	*	Asterisk delimiter
Checksum	50	Two character hexadecimal value
Terminator	<CR><LF>	End of sentence sequence

Example:

- $GPZDA,201530.000,04,07,2016,00,00*50<CR><LF>

4. MTK NMEA Input Messages

4.1. MTK000-Test

This message is a test packet used to test serial communication with the GNSS module.
Synopsis:
$PMTK000

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK000	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	32	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Command a Test message:
  $PMTK000*32<CR><LF>

  Response
  Upon receiving this packet the module will respond with the packet message:
  $PMTK001,0,3*30<CR><LF>

4.2. MTK101-Hot Restart Command

This command directs the receiver to conduct a Hot Restart that uses all available data in the Non-Volatile (NV) Store.
Synopsis:
$PMTK101

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK101	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	32	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Command a Hot Restart:
  $PMTK101*32<CR><LF>

4.3. MTK102-Warm Restart Command

This command directs the receiver to conduct a Warm Restart that does not use ephemeris data.
Synopsis:
$PMTK102

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK102	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	31	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:
- Command a Warm Restart:
  $PMTK102*31<CR><LF>

4.4. MTK103-Cold Restart Command

This command directs the receiver to conduct a Cold Restart that does not use Time, Position, Almanacs and Ephemeris data at re-start.
Synopsis:
$PMTK103

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK103	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	30	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:
- Command a Cold Restart:
  $PMTK103*30<CR><LF>

4.5. MTK104-Full Cold Restart Command

This command directs the receiver to conduct a Full Cold Restart that additionally clears system and user configurations at re-start. Resets the receiver to the factory default status.
Synopsis:
$PMTK104

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK104	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	37	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:
- Command a Full Cold Restart:
  $PMTK104*37<CR><LF>

4.6. MTK120-Clear Flash Aid Data

This command directs the receiver to erase aiding data stored in the flash memory.
Synopsis:
$PMTK120

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK120	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	31	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:
- Clear aiding data in flash:
  $PMTK120*31<CR><LF>

4.7. MTK127-Clear Extended Prediction Orbit(EPO) Data

This command directs the receiver to erase the Extended Predication Orbit (EPO) data stored in the flash memory.

Synopsis:
$PMTK127

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK127	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	36	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Clear EPO data in flash:
  $PMTK127*36<CR><LF>

4.8. MTK161-Set to Standby Mode

This command directs the receiver to enter standby mode for power saving.

Synopsis:
$PMTK161

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK161	Talker ID, Pkt Type
Standby Type	0	0 = Stop mode 1 = Sleep mode
End of Data Fields	*	Asterisk delimiter
Checksum	28	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Stop Standby Mode:
  $PMTK161,0*28<CR><LF>

4.9. MTK183-Query Logging Status

This command queries the logging status.
Synopsis:
$PMTK183

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK183	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	38	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Query logging status:
  $PMTK183*38<CR><LF>
  Response:
  $PMTKLOG,32,1,b,31,1,0,0,0,8032,100*2F<CR><LF>

4.10. MTK184-Erase Logger Flash

This command erases logger flash.
Synopsis:
$PMTK184,EraseType

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK184	Talker ID, Pkt Type
EraseType	1	Erase type: 1 = Erase all logger internal flash data
End of Data Fields	*	Asterisk delimiter
Checksum	22	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Erase logger flash:
  $PMTK184,1*22<CR><LF>
  Response:
  $PMTK001,184,3*3D<CR><LF

4.11. MTK185-Stop Logging Data

This command stops logging data.
Synopsis:
$PMTK185,Flag

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK185	Talker ID, Pkt Type
Flag	1	Flag: 0 = Start logging data 1 = Stop logging data
End of Data Fields	*	Asterisk delimiter
Checksum	23	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Stop logging data:
  $PMTK185,1*23<CR><LF>
  Response:
  $PMTK001,185,3*3C<CR><LF>

4.12. MTK186-Snapshot Write Log

This command snapshot write log.
Synopsis:
$PMTK186,Flag

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK186	Talker ID, Pkt Type
Flag	1	1 = Snapshot log data
End of Data Fields	*	Asterisk delimiter
Checksum	20	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Snapshot log data:
  $PMTK186,1*20<CR><LF>
  Response:
  $PMTK001,186,3*3F<CR><LF>

4.13. MTK187-Configure Locus Setting

This command configures locus setting.
Synopsis:
$PMTK187,Mode,Setting

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK187	Talker ID, Pkt Type
Mode	1	Interval mode (second): (1 sec ≤ Interval ≤ 12 hours)
Setting	5	New setting instead of the original configuration (e.g. change to 5 seconds)
End of Data Fields	*	Asterisk delimiter
Checksum	38	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Configure locus setting: interval = 1 second, setting = 5:
  $PMTK187,1,5*38<CR><LF>
  Response:
  $PMTK001,187,3*3E<CR><LF>

4.14. MTK220-Position Fix Interval

This command sets the position fix interval.
Synopsis:
$PMTK220,Interval

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK220	Talker ID, Pkt Type
Interval	1000	Position fix interval [msec] Must be larger than 200.
End of Data Fields	*	Asterisk delimiter
Checksum	1F	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Set position fix interval to 1 second:
  $PMTK220,1000*1F<CR><LF>

4.15. MTK223-Set AlwaysLocate™ Values to Extend Receive Time

This command directs the receiver to extend the amount of time the receiver is on with set values used by the AlwaysLocate™ feature.

Synopsis:
$PMTK223,SV,SNR,ExtensionThreshold,ExtensionGap

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK223	Talker ID, Pkt Type
SV		Default value: SV = 1 (Range: 1 to 4)
SNR		Default value: SNR = 30 (Range: 25 to 30)
ExtensionThreshold		Default value: Extension threshold = 180000 msec (Range: 40000 to 180000}
ExtensionGap		Default value: Extension gap = 60000 msec (Range: 0 to 3600000) Extension gap is the limitation of the interval between neighboring Dynamic Ephemeris Extension (DEE) intervals.
End of Data Fields	*	Asterisk delimiter
Checksum	CS	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- The following parameters can be set by a most command message:
  Default value: SV = 1 [Range: 1 ~ 4]
  Default value: SNR = 30 [Range: 25 ~ 30]
  Default value: Extension threshold = 180000 msec [Range: 40000 ~ 180000]
  Default value: Extension gap = 60000 msec [Range: 0 ~ 3600000]
  (Extension gap is the limitation between the neighbor values)

Note:
This command is not supported in AXN3.0

4.16. MTK225-Set Periodic Power Saving Mode

This command sets the receiver's Periodic Power Saving Mode Settings: (See following chart)
In RUN stage, the GPS receiver measures and calculates positions.
In SLEEP stage, the GPS receiver may enter two different power saving modes. One is "Periodic Standby Mode" and another is "Periodic Backup Mode". Due to hardware limitation, the maximum power down duration (SLEEP) is 2407 seconds. If the configured "SLEEP" interval is larger than 2047 seconds, GPS firmware will automatically extend the interval by software method. However, GPS system will be powered on for the interval extension and powered down again after the extension is done.

Synopsis:
$PMTK225,Type,RunTime,SleepTime,SecondRunTime,SecondSleepTime

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK225	Talker ID, Pkt Type
Type		Sets operation mode of power saving. 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
RunTime		Duration [msec] to fix for (or attempt to fix for) before switching from running mode back to a minimum power sleep mode. 0: Disable 1000 or greater: Enable Range: 1000 to 518400000
SleepTime		Interval [msec] to come out of a minimum power sleep mode and start running in order to get a new position fix. Range: 1000 to 518400000
SecondRunTime		Duration [msec] to fix for (or attempt to fix for) before switching from running mode back to a minimum power sleep mode. 0: Disable 1000 or greater: Enable Range: Second set both 0 or 1000 to 518400000 Note: The SecondRunTime should be larger than the First run time when non-zero value.

SecondSleepTime		Interval [msec] to come out of a minimum power sleep mode and start running in order to get a new position fix. Range: second set both 0 or 1000 to 518400000.
End of Data Fields	*	Asterisk delimiter
Checksum	CS	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- The following illustrates how the parameters can be set:

- **Type** : Set operation mode of power saving
  - ‘0’: Back to normal mode
  - ‘1’ Periodc backup mode
  - ‘2’ Periodic standby mode
  - ‘4’: Perpetual backup mode
  - ‘8’: AlwaysLocate™ standby mode
  - ‘9’: AlwaysLocate™ backup mode

- **Run time**: Duration [msec] to fix for (or attempt to fix for) before switching from running mode back to a minimum power sleep mode.
  - ‘0’: Disable
  - >= ‘1000’: Enable [Range: 1000~518400000]

- **Sleep time**: Interval [msec] to come out of a minimum power sleep mode and start running in order to get a new position fix. [Range: 1000~518400000]

- **Second run time**: Duration [msec] to fix for (or attempt to fix for) before switching from running mode back to a minimum power sleep mode.
  - ‘0’: Disable
  - >= ‘1000’: Enable [Range: Second set both 0 or 1000~518400000]

- **Second sleep time**: Interval [msec] to come out of a minimum power sleep mode and start running in order to get a new position fix. [Range: Second set both 0 or 1000~518400000].

Note the Second run time should larger than First run time when non-zero value.

- How to enter Periodic modes and enter AlwaysLocate modes

Packet PMTK225 Usage Examples
Example: How to enter Periodic modes Periodic Backup Mode

PMTK225,0 PMT223,1,25,180000,60000 PMT225,1,3000,12000,18000,72000 Periodic Standby Mode PMTK225,0 PMTK223,1,25,180000,60000 PMTK225,2,3000,12000,18000,72000
Example: How to enter AlwaysLocate™ mode AlwaysLocate™ Standby PMTK225,0 PMTK225,8 AlwaysLocate™ Backup PMTK225,0 PMTK225,9

Note:
This command is not supported in AXN3.0

4.17. MTK250-Set Output Format for Current Port

This command sets data output format for current port.
Synopsis:
$PMTK250,InputType,OutputType,BaudRate

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK250	Talker ID, Pkt Type
InputType	1	Input type: 0 = DPORT_IN_NONE (No data input) 1 = DPORT_IN_RTCM (RTCM input) 3 = DPORT_IN_NMEA (MTK NMEA)
OutputType	3	Output type: 0 = DPORT_OUT_NONE (No data output) 3 = DPORT_OUT_DEBUG (MTK NMEA)
BaudRate	9600	Baud rate setting: 4800 9600 19200 38400 57600 115200 460800 921600
End of Data Fields	*	Asterisk delimiter
Checksum	14	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Set current port to RTCM input, MTK NMEA output at baud rate 9600:
  $PMTK250,1,3,9600*14<CR><LF>

4.18. MTK251-Set NMEA Baud Rate

This command sets the NMEA port baud rate. The setting will return to the default value under two conditions.

1. Full cold start command is issued
2. Enter standby mode

Synopsis:
$PMTK251,BaudRate

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK251	Talker ID, Pkt Type
BaudRate	38400	NMEA serial port BaudRate 0 = Default setting 4800 † 9600 14400 19200 38400 57600 115200 230400 † 460800 921680 †
End of Data Fields	*	Asterisk delimiter
Checksum	27	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence
† Not supported by all firmware versions		

Example:

- Set current port NMEA output at baud rate 38400:
  $PMTK251,38400*27<CR><LF>

4.19. MTK253-Set Output Format for Current Port

This command sets data output format for current port.
Synopsis:
$PMTK253,SetFlag

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK253	Talker ID, Pkt Type
SetFlag	1	Set flag: 0 = NMEA mode 1 = Binary mode
End of Data Fields	*	Asterisk delimiter
Checksum	2B	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Set the current port to binary mode:
  $PMTK253,1*2B<CR><LF>

Note:
When you switch from binary mode to NMEA mode, you will receive a binary ACK after the command is processed.
When you switch from NMEA mode to binary mode, NO ACK will be sent.

4.20. MTK255-Set Sync PPS NMEA

This command enables or disables the fix NMEA output time behind PPS.
The latency range of the beginning of UART Tx is between 170 ms and 180 ms at MT3339 platform (465 ms~485ms at MT3333 platform) and behind the rising edge of PPS.
Synopsis:
$PMTK255,SetFlag

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK255	Talker ID, Pkt Type
SetFlag	1	Set flag: 0 = Disable 1 = Enable
End of Data Fields	*	Asterisk delimiter
Checksum	23	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Enabled the sync PPS NMEA:

$PMTK255,1*22<CR><LF>

4.21. MTK256-Enable/Disable Timing Product Mode

This command enables or disables the timing product mode. The default timing mode is set at disabled.
When it is enabled, this mode will improve the timing accuracy of the PPS output. The improvement of the timing is listed in the following table.

Constellation	Timing Mode Disabled	Timing Mode Enabled (Supported after AXN 3.8)
GPS	20 ns	< 15 ns
GPS + GLONASS	35 ns	< 15 ns
GPS + BD	50 ns	< 15 ns

Synopsis:
$PMTK256,SetFlag

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK256	Talker ID, Pkt Type
SetFlag	1	Set flag – 0 = timing mode disabled (turned OFF) 1 = timing mode enabled (turned ON)
Checksum	2E	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Enable the timing mode:
  $PMTK256,1*2E<CR><LF>

Note:
This mode is supported after AXN 3.8.

4.22. MTK257-Set Solution Priority (Fast TTFF or High Position Accuracy)

This command sets the solution priority either a fast TTFF or a high position accuracy. The default is set at the high position accuracy.
This command is to assist the user in customize the functionality in the signal blockage situations such as when a vehicle comes out of a tunnel or a garage.
Synopsis:
$PMTK257,SetFlag

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK257	Talker ID, Pkt Type
SetFlag	1	Set flag – 0 = set at the fast TTFF priority 1 = set at the high accuracy positioning priority
Checksum	2F	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Enable the high accuracy:
  $PMTK257,1*2F<CR><LF>

4.23. MTK258-Set Commport Working Mode

This command sets the working mode of a comport.

Synopsis:

$PMTK258,Port_no,Interface,BaudRate,Protocol,Debug

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK258	Talker ID, Pkt Type
Port	1	Port number – Choose a port to configure: 1 = Port0 2 = Port1 Etc.
Interface	2	Set interface type: 1 = NONE 2 = UART 3 = I2C (Only support on Port1) 4 = SPI (Only support on Port1)
BaudRate	9600	Set baud rate of chosen port Support 4800, 9600, 14400, 19200, 38400, 57600, 115200, 230400, 460800, 921600
Protocol		Set input type of chosen port: 1 = NMEA 2 = RTCM (Only support on Port1)
Debug		Enable or disable debug log output on chosen port: 1 = OFF 2 = ON
Checksum	1D	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Configure port0: input & output NMEA through UART, no debug log output, 9600 bps.
  $PMTK258,1,2,9600,1,1*1D<CR><LF>
- Turn on Debug for Port 0
  $PMTK258,1,0,0,0,2*22<CR><LF>

4.24. MTK262-Set FLP/GLP

This command enables or disables FLP/GLP mode. The default mode is set at disabled.
Synopsis:
PMTK262,SetFlag

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK262	Talker ID, Pkt Type
SetFlag	1	Set flag – 0 = FLP mode disabled (turned OFF) 1 = FLP mode enabled (turned ON) for MT3339 2 = GLP mode enabled (turned ON) for MT3333
Checksum	29	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Enable FLP mode for MT3339:
  $PMTK262,1*29<CR><LF>

- Enable GLP mode for MT3333:
  $PMTK262,3*2B<CR><LF>

4.25. MTK285-Configure PPS Setting

This command configures the PPS setting.
Synopsis:
$PMTK285,PPSType,PPSPulseWidth

Field	Example	Comments
Preamble	$	Start of sentence
Header	PMTK285	Talker ID, Pkt Type
PPSType	2	Availability and Type: 0 = Disable 1 = after the first fix 2 = 3D fix only 3 = 2D/3D fix only 4 = always
PPSPulseWidth	100	PPS Pulse Width (Unit: ms)
End of Data Fields	*	Asterisk delimiter
Checksum	23	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Set PPS to 3D fix only, and pulse width = 100 ms:
  $PMTK285,2,100*23<CR><LF>

4.26. MTK286-Set the Active Interference Cancellation (AIC) Function

This command enables or disables the Active Interference Cancellation function.
Synopsis:
$PMTK286,SetFlag

Field	Example	Comments
Preamble	$	Start of sentence
Header	PMTK286	Talker ID, Pkt Type
SetFlag	1	0 = Disable 1 = Enable
End of Data Fields	*	Asterisk delimiter
Checksum	23	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Enable the AIC:
  $PMTK286,1*23<CR><LF>

4.27. MTK299–Set Output Debug

This command enables or disables Debug Log output.
Synopsis:
$PMTK299,SetFlag

Field	Example	Comments
Preamble	$	Start of sentence
Header	PMTK299	Talker ID, Pkt Type
SetFlag	1	0 = Disable 1 = Enable
End of Data Fields	*	Asterisk delimiter
Checksum	2D	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Enable the debug output:
  $PMTK299,1*2D<CR><LF>

Note:
This command may not be available in some firmware versions.

4.28. MTK301-Set DGPS Correction Data Source

This command sets the DGPS correction data source mode.
Synopsis:
$PMTK301,Mode

Field	Example	Comments
Preamble	$	Start of sentence
Header	PMTK301	Talker ID, Pkt Type
Mode	1	DGPS source 0 = No DGPS source 1 = RTCM 2 = SBAS (WAAS/EGNOS/MSAS)
End of Data Fields	*	Asterisk delimiter
Checksum	2D	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Set the DGPS source as RTCM:
  $PMTK301,1*2D<CR><LF>

4.29. MTK308-Set DR limit

This command sets the number of estimated fix when entering a tunnel.
Synopsis:
$PMTK308,DR_LIMIT

Field	Example	Comments
Preamble	$	Start of sentence
Header	PMTK308	Talker ID, Pkt Type
DR Limit	3	Number of Estimated Fix 0 = Disable the estimated fix when entering a tunnel N = Keep outputting N fixes when entering a tunnel
End of Data Fields	*	Asterisk delimiter
Checksum	26	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Disable the estimated fix when entering the tunnel
  $PMTK308,0*25<CR><LF>
- Keep outputting 3 fixes when entering the tunnel
  $PMTK308,3*26<CR><LF>

4.30. MTK311-Set Satellite Elevation Mask

This command sets satellite elevation mask, in degree.
Synopsis:
$PMTK311,Degree

Field	Example	Comments
Preamble	$	Start of sentence
Header	PMTK311	Talker ID, Pkt Type
Degree	5	Elevation mask, in degree
End of Data Fields	*	Asterisk delimiter
Checksum	28	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Set the elevation mask to 5 degree:
  $PMTK311,5*28<CR><LF>

Note:
Only support in AXN3.8 after 2015/6/17, and AXN2.5 after 2015/10/19.

4.31. MTK313-Enable or Disable SBAS Search

This command enables or disables SBAS satellite search.
Synopsis:
$PMTK313,SBASSearch

Field	Example	Comments
Preamble	$	Start of sentence
Header	PMTK313	Talker ID, Pkt Type
SBASSearch	1	Enable SBAS satellite search and use 0 = Disable 1 = Enable
End of Data Fields	*	Asterisk delimiter
Checksum	2E	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Enable SBAS satellite search
  $PMTK313,1*2E<CR><LF>

4.32. MTK314-Set NMEA Sentence Output Rates

This command sets the NMEA sentence output rates.
Synopsis:
$PMTK314, DataFields, …,
This packet contains 21 data fields used to set the output rates for the various NMEA sentences.

Field	Example	Comments	
Preamble	$	Start of sentence	
Header	PMTK314	Talker ID, Pkt Type	
0. NMEA_SEN_GLL	1	GLL output rate	Supported Frequency Settings 0 = Disabled or not supported 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
1. NMEA_SEN_RMC	1	RMC output rate	
2. NMEA_SEN_VTG	1	VTG output rate	
3. NMEA_SEN_GGA	1	GGA output rate	
4. NMEA_SEN_GSA	1	GSA output rate	
5. NMEA_SEN_GSV	5	GSV output rate	
6. NMEA_SEN_GRS	0	GRS output rate	
7. NMEA_SEN_GST	0	GST output rate	
8. Reserved	0		
9. Reserved	0		
10. Reserved	0		
11. Reserved	0		
12. Reserved	0		
13. Reserved	0		
14. Reserved	0		
15. Reserved	0		
16. Reserved	0		
17. NMEA_SEN_ZDA	1	ZDA output rate	
18. NMEA_SEN_MCHN	1	PMTKCHN output rate	
19. NMEA_SEN_DTM	0	GPDTM output rate	
20. NMEA_SEN_GBS	0	GPGBS output rate	
End of Data Fields	*	Asterisk delimiter	
Checksum	2C	Two character hexadecimal value	
Terminator	<CR><LF>	End of packet sequence	

Example:

- Set NMEA sentences' outputs as the following:
  At 1 second interval: GLL, RMC, VTG, GGA, GSA, ZDA, MCHN;
  At 5 second interval: GSV.
  $PMTK314,1,1,1,1,1,5,0,0,0,0,0,0,0,0,0,0,0,1,1,0,0*2C<CR><LF>

The output rates for all the NMEA sentences may be restored to their default values by sending the command:

```
$PMTK314,-1*04<CR><LF>
```

4.33. MTK324-Set Port Output Message Intervals

This command sets the output message intervals on output port.
Synopsis:
$PMTK324,Port_no,GLL,RMC,VTG,GGA,GSA,GSV……

Field	Example	Comments
Preamble	$	Start of sentence
Header	PMTK324	Talker ID, Pkt Type
Port	1	Port Number 1 = Port0 2 = Port1
Output Intervals GLL	1	Output intervals par messages: GLL,RMC,VTG,GGA,GSA,GSV……
Output Intervals RMC	2	
…	0	
End of Data Fields	*	Asterisk delimiter
Checksum	35	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- UART0 will output GLL every one fix, and output RMC every two fix:
  $PMTK324,1,1,2,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0*35<CR><LF>

- UART1 will output GLL every two fix, and output RMC every one fix….
  $PMTK324,2,2,1,1,1*2A<CR><LF>

4.34. MTK326-Set up PPS

This command contains the local millisecond and phase where the PPS should be placed.
Synopsis:
$PMTK326,PPSByUser,LocalMs,Phase

Field	Example	Comments
Preamble	$	Start of sentence
Header	PMTK326	Talker ID, Pkt Type
PPSByUser	1	PPS by User 1 = PPS output by user 0 = PPS output automatically
LocalMs	1345	Local receiver time tick (ms). Range: 0-4294967295(2^32-1)
Phase	555	Phase: Time tick phase 0-262143.
End of Data Fields	*	Asterisk delimiter
Checksum	3F	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Set PPS as following: output by use, Local_ms = 1345 ms, Phase = 555:
  $PMTK326,1,1345,555*3F<CR><LF>

4.35. MTK330-Set Default Datum

This command allows the user to select the default datum used by the receiver from 222 different datum. See Appendix A for a complete datum list.

Synopsis:
$PMTK330,Datum

Field	Example	Comments
Preamble	$	Start of sentence
Header	PMTK330	Talker ID, Pkt Type
Datum	0	0 = WGS84 1 = TOKYO-M 2 = TOKYO-A
End of Data Fields	*	Asterisk delimiter
Checksum	2E	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Set datum to be WGS84:
  $PMTK330,0*2E<CR><LF>

4.36. MTK331-Set User Defined Datum

This command sets user defined datum.
Synopsis:
$PMTK331,majA,eec,dX,dY,dZ

Field	Example	Comments
Preamble	$	Start of sentence
Header	PMTK331	Talker ID, Pkt Type
majA	6377397.155	User defined datum semi-major axis(meters) Range: 0 to 7000000
eec	299.1528128	User defined datum eccentric (meters) Range: 0 to 330
dX	-148.0	User defined datum to WGS84 X axis offset (meters)
dY	507.0	User defined datum to WGS84 Y axis offset (meters)
dZ	685.0	User defined datum to WGS84 Z axis offset (meters)
End of Data Fields	*	Asterisk delimiter
Checksum	16	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Set a user-defined datum as the following:
  $PMTK331,6377397.155,299.1528128,-148.0,507.0,685.0*16<CR><LF>

4.37. MTK335-Set Real Time Clock (RTC)UTC Time

This command sets the Real Time Clock (RTC) UTC time.
Note: The command does not update the GPS time which is maintained by the GPS receiver. After setting, the RTC UTC time may be updated by the GPS receiver with a more accurate time after 60 seconds.
Synopsis:
$PMTK335,Year,Month,Day,Hour,Min,Sec

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK335	Talker ID, Pkt Type
Year	2016	
Month	1	Range: 1 to 12
Day	1	Range: 1 to 31
Hour	0	Range: 0 to 23
Minute	0	Range: 0 to 59
Second	0	Range: 0 to 59
End of Data Fields	*	Asterisk delimiter
Checksum	02	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Set the RTC to the time: 00:00:00, 01/01/2016:
  $PMTK335,2016,1,1,0,0,0*02<CR><LF>

4.38. MTK351-Enable or Disable QZSS NMEA Format

The receiver supports the new NMEA format for QZSS. This command enables or disables the QZSS NMEA format. The default is to disable the QZSS NMEA format.

Synopsis:
$PMTK351,SetFlag

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK351	Talker ID, Pkt Type
SetFlag	1	0 = Disable 1 = Enable
End of Data Fields	*	Asterisk delimiter
Checksum	28	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Enable QZSS NMEA Format:
  $PMTK351,1*28<CR><LF>

4.39. MTK352-Set the Stop QZSS Function

This message commands the receiver to enable or disable the "Stop QZSS Function." Since QZSS is a regional position service, the default setting is to enable the "Stop QZSS Function" which disables the receiver's QZSS operating mode.

Synopsis:
$PMTK352,SetFlag

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK352	Talker ID, Pkt Type
SetFlag	1	0 = Disable (Enables QZSS) 1 = Enable (Disables QZSS)
End of Data Fields	*	Asterisk delimiter
Checksum	2B	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Examples:

- Disables the "Stop QZSS Function", Enables QZSS:
  $PMTK352,0*2A<CR><LF>
- Enables the "Stop QZSS Function", Disables QZSS:
  $PMTK352,1*2B<CR><LF>

4.40. MTK353-Set GNSS Search Mode

This command sets the receiver to search specified satellite systems.
The setting will be available when NVRAM data is valid.
Synopsis:
$PMTK353,GPS_Enable,GLONASS_Enable,GALILEO_Enable,GALILEO_FULL_Enable,
BEIDOU_Enable

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK353	Talker ID, Pkt Type
GPS_Enabled	0	0 : Disable (DO NOT search GPS satellites) 1, or non-ZERO: search GPS satellites
GLONASS_Enabled	1	0 : Disable (DO NOT search GLONASS satellites) 1, or non-ZERO: search GLONASS satellites
GALILEO_Enabled †	0	0 : Disable(DO NOT search GALILEO satellites) 1, or non-ZERO: search GALILEO satellites
GALILEO_FULL_Enabled †	0	0 : Disable (DO NOT search GALILEO FULL satellites) 1, or non-ZERO : search GALILEO FULL satellites
BEIDOU_Enabled	0	0 : Disable (DO NOT search BEIDOU satellites) 1, or non-ZERO : search BEIDOU satellites
End of Data Fields	*	Asterisk delimiter
Checksum	2A	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence
† The GALILEO navigation system is not supported by some firmware version.		

Example:

- Enabled search for GLONASS constellation:
  $PMTK353,0,1,0,0,0*2A<CR><LF>

4.41. MTK355-Query GNSS Search Mode

This command queries GLONASS, BEIDOU and GALILEO search setting.
Synopsis:
$PMTK355

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK355	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	31	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Query the search mode for GNSS constellation:
  $PMTK355*31<CR><LF>
  Output:
  $PMTK001,353,3,1,0,1,0
  The response indicates that GPS + BEIDOU are enabled.

4.42. MTK356-Set HDOP Threshold

This command sets the HDOP threshold.
Note: If the HDOP value is larger than this threshold value, then the position will not be fixed.
Synopsis:
$PMTK356,HDOPThreshold

Field	Set Example	Comments
Preamble	$	Start of packet
Header	PMTK356	Talker ID, Pkt Type
HDOPThreshold	0.8	0: Disable this function Other value: Enable “Set the HDOP Threshold” Response value: HDOPThreshold
End of Data Fields	*	Asterisk delimiter
Checksum	38	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Set the HDOP threshold value to 0.8:
  $PMTK356,0.8*38<CR><LF>
  Response:
  $PMTK356,0.8,SetOK!*5F<CR><LF>

4.43. MTK357-Get HDOP Threshold

This command gets the HDOP threshold.
Synopsis:
$PMTK357,HDOPThreshold

Field	Get Example	Comments
Preamble	$	Start of packet
Header	PMTK357	Talker ID, Pkt Type
HDOPThreshold		0: Disabled Other values: Enabled
End of Data Fields	*	Asterisk delimiter
Checksum	33	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Get the HDOP threshold:
  $PMTK357*33
  Response:
  $PMTK357,0.8*39<CR><LF>

4.44. MTK386-Set Speed Threshold for Static Navigation

This command sets the speed threshold for static navigation.
Note: If the actual speed is below the specified threshold, the output position will remain the same and the output speed will be zero. If the threshold value is set to 0, then this function is disabled.
Synopsis:
$PMTK386,SpeedThreshold

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK386	Talker ID, Pkt Type
SpeedThreshold	0.4	Units: meters/second (m/s) 0: Disabled Other values: Enabled The minimum is 0.1 m/s, the maximum is 2.0 m/s
End of Data Fields	*	Asterisk delimiter
Checksum	39	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Set the speed threshold to 0.4 m/s:
- $PMTK386,0.4*39<CR><LF>

4.45. MTK399-Write Flash Data

This command writes data to the flash memory.
Synopsis:
$PMTK399, Address,Length,Data0,Data1,Data2, ...

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK399	Talker ID, Pkt Type
Address	1c0	The starting address in hex format (the address is fixed at 0x1C0)
Length	7	The number of bytes of incoming data fields in hex format. (Max length = 7 bytes)
Data0	30	DataN: Data byte in hex format
Data1	5C	
Data2	22	
Data3	1D	
Data4	02	
Data5	04	
Data6	01	
End of Data Fields	*	Asterisk delimiter
Checksum	4F	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Write a block of data (7 bytes length) to flash, with starting address 0x01C0:
  $PMTK399,1c0,7,30,5C,22,1D,02,04,01*4F<CR><LF>

4.46. MTK400-Query Fix Control Value

This command queries the Fix Control value. The receiver responds with a PMTK500 packet.
Synopsis:
$PMTK400

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK400	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	36	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Query the fix control value:
  $PMTK400*36<CR><LF>
  Response:
  $PMTK500,1000,0,0,0,0*1A<CR><LF>

4.47. MTK401-Query DGPS Mode

This command queries the DGPS Mode. This is the DGPS data source that is selected. The receiver responds with a PMTK501 packet.
Synopsis:
$PMTK401

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK401	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	37	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Query DGPS mode:
  $PMTK401*37<CR><LF>

4.48. MTK408-Query DR Limit

This command queries the number estimated fix when entering a tunnel.
Synopsis:
$PMTK408

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK408	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	3E	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Query DGPS mode:
  $PMTK408*3E<CR><LF>
  Response:
  $PMTK508,0*23<CR><LF>

4.49. MTK411-Query Satellite Elevation Mask

This command queries the satellite elevation mask.
Synopsis:
$PMTK411

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK411	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	36	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Query satellite elevation mask:
  $PMTK411*36<CR><LF>
  Response:
  $PMTK511,5*2E<CR><LF>

Note: This command is supported after AXN 3.8 and AXN 2.5.

4.50. MTK413-Query SBAS Status

This command queries the SBAS status. The receiver responds with a PMTK513 packet.
Synopsis:
$PMTK413

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK413	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	34	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Query the SBAS status:
  $PMTK413*34<CR><LF>
  Response:
  $PMTK513,1*28<CR><LF>

4.51. MTK414-Query NMEA Output Rates

This command queries the current NMEA sentence output rates. The receiver responds with a PMTK514 packet.
Synopsis:
$PMTK414

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK414	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	33	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Query the NMEA output rates:
  $PMTK414*33<CR><LF>
  Response:
  $PMTK514,1,1,1,1,1,5,1,1,1,1,1,1,0,1,1,1,1,1,1*2A<CR><LF>

4.52. MTK430-Query Default Datum

This commands queries the default datum. The receiver responds with a PMTK530 packet.
Synopsis:
$PMTK430

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK430	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	35	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Query the default datum:
  $PMTK430*35<CR><LF>
  Response:
  $PMTK530,0*28<CR><LF>

4.53. MTK431-Query Datum Advance

This command queries the user defined datum. The receiver responds with the PMTK530 packet.
Synopsis:
$PMTK431

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK431	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	34	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Query the user-defined datum:
  $PMTK431*34<CR><LF>

4.54. MTK435-Query UTC Time

This command queries the current RTC UTC time.
Synopsis:
$PMTK435

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK435	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	30	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Query the current UTC time:
  $PMTK435*30<CR><LF>
  Response:
  $PMTK535,2016,3,30,0,32,14*30<CR><LF>

4.55. MTK449-Query Ephemeris Downloading Status

This command queries the current status of ephemeris downloading.
Synopsis:
$PMTK449

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK449	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	3B	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Query the status of ephemeris downloading:
  $PMTK449*3B<CR><LF>
  Response:
  $PMTK001,3,1*24: Ephemeris downloading finished

- Query the status of ephemeris downloading:
  $PMTK449*3B<CR><LF>
  Response;
  $PMTK001,3,0*25: Ephemeris downloading in progress

4.56. MTK499-Get Flash Data

This command reads the flash memory. The receiver responds with the PMTK599 packet.
Synopsis:
$ PMTK499,Address,Length

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK499	Talker ID, Pkt Type
Address	1C0	The starting address in hex format. (The address is fixed at 0x1C0)
Length	7	The number of bytes requested in hex format. (Maximum length is 7 bytes)
End of Data Fields	*	Asterisk delimiter
Checksum	43	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Read the data of 7 bytes, with the starting address of 0x1C0:
  $PMTK499,1C0,7*43<CR><LF>
  Response:
  $PMTK599,1C0,7,30,5C,22,1D,02,04,01*59<CR><LF>

4.57. MTK602-Query Data Port Data Type and Baud Rate

This command queries the data port for input/output data type and baud rate information. The receiver responds with the PMTK702 packet.
Synopsis:
$ PMTK602

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK602	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	36	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Query the data port for data type and baud rate:
  $PMTK602*36<CR><LF>
  Response:
  $PMTK702,1,1,9600*14<CR><LF>

4.58. MTK605-Query Firmware Release Information

This command queries the receiver for the firmware release information. The receiver responds with the PMTK705 packet.

Synopsis:

$ PMTK605

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK605	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	31	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Query the firmware release information:
  $PMTK605*31<CR><LF>

4.59. MTK607-Query EPO Info

This command queries the receiver for the Extended Prediction Orbit (EPO) Data Valid day check.

Synopsis:

$ PMTK607

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK607	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	33	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Query the EPO information:
  $PMTK607*33<CR><LF>
  Response:
  $PMTK707,56,1468,172800,1470,151200,1468,259200,1468,259200*1F<CR><LF>

Note:

Please refer to the **Section MTK707-EPO Status** for detailed message description.

4.60. MTK612-Query Comport Status

This command queries the status from a comport.
Synopsis:
$ PMTK612,Port

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK612	Talker ID, Pkt Type
Port	1	Port Number: 1 = Port0 2 = Port1
End of Data Fields	*	Asterisk delimiter
Checksum	2A	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Query the com port status:
  $PMTK612,1*2A<CR><LF>
  Response:
  $PMTK001,612,3,1,2,115200,1,1*1D<CR><LF>

4.61. MTK622-Dump Locus Flash Data

This command triggers receiver to dump locus flash data.
Synopsis:
$PMTK622,Type,Offset,Size

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK622	Talker ID, Pkt Type
Type	0	Dum type: 0 = Dump full locus flash data 1 = Dump partial data (only the used flash data will be dumped) 2 = Dump with target sectors (followed by the additional parameters as specified below)
Offset†		(† Only on type 2) The start address for dump (0<=offset<32, the unit is sector[4KB])
Size†		(† Only on type 2) The dump length (0<=size<=32, the unit is sector[4KB])
End of Data Fields	*	Asterisk delimiter
Checksum	28	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Dump full locus flash data:
  $PMTK622,0*28
- Dump partial in used locus flash data:
  $PMTK622,1*29
- Dump specified sectors' locus flash data:
  (Skip sector 1,2,3. Dump sector4 and sector5 locus flash data)
  $PMTK622,2,3,2*2B

Note:
If the input values of offset and size are out of range, it will dump all LOCUS flash like using $PMTK622,0*28.

4.62. MTK660-Query Ephemeris Available SV

This command queries the receiver as to the satellites whose ephemeris will be available after a given time interval has elapsed. The receiver will respond with a PMTK001 message containing a flag for each SV from 1 to 32 indicating the availability of the ephemeris data for that SV after the given time interval.

Synopsis:
$PMTK660,TimeInterval

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK660	Talker ID, Pkt Type
TimeInterval	1800	Seconds. Must be greater than zero and less than or equal to 7200 (2 hours)
End of Data Fields	*	Asterisk delimiter
Checksum	17	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Query the satellite SVIDs whose ephemeris data is available in 1800 seconds:
  $PMTK660,1800*17<CR><LF>
  Response:
  $PMTK001,660,3,40449464*17<CR><LF>

This response indicates which Ephemeris (EPH) will be available after 1800 seconds. The bit flag indicators for the 32 SVs are expressed by eight hexadecimal characters.
In the example, we have:

Hexadecimal	MSB Binary Representation LSB
40449464	0100 0000 0100 0100 1001 0100 0110 0100

The binary representation indicates that the SVs 3, 6, 7, 11, 13, 16, 19, 23, and 31 will have EPH data available after 1800 seconds.

4.63. MTK661-Query Almanac Available SV

This command queries the receiver as to the satellites whose almanacs will be available after a given time interval has elapsed. The receiver will respond with a PMTK001 message containing a flag for each SV from 1 to 32 indicating the availability of the almanac data for that SV after the given time interval.

Synopsis:
$PMTK661,TimeInterval

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK661	Talker ID, Pkt Type
TimeInterval	30	Days. Must be greater than zero and less than or equal to 365 (1 year for maximum)
End of Data Fields	*	Asterisk delimiter
Checksum	1C	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Query the satellite SVIDs whose Almanacs data is available in 30 days:
  $PMTK661,30*1C<CR><LF>
  Response:
  $PMTK001,661,3,fec0bfff*49<CR><LF>

This response indicates which Almanacs will be available after 30 days. The bit flag indicators for the 32 SVs are expressed by eight hexadecimal characters.
In the example, we have:

Hexadecimal	MSB Binary Representation LSB
fec0bfff	1111 1110 1100 0000 1011 1111 1111 1111

The binary representation indicates that the SVs 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 23, 24, 26, 27, 28, 29, 30, 31, 32 will have almanac data available after 30 days.

4.64. MTK667-Query UTC Correction Data

This command queries the current UCT correction parameters. The receiver will respond with a packet containing the UTC correction parameters.

Synopsis:
$PMTK667

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK667	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	35	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Query the UTC correction data:
  $PMTK667*35<CR><LF>
  Response (if correction data available):
  $PMTK001,667,3,0,0,16,507904,237,237,3,17*0A
  Response (if correction data NOT available):
  $PMTK001,667,2*36

- Response Data Format:
  $PMTK001,667,3,A0,A1,dtLS,Tot,WNt,WNLSF,DN,dtLSF*CS<CR><LF>

PMTK001 Acknowledge with UTC Correction Data		
Field	**Example**	**Comments**
Preamble	$	Start of packet
Header	PMTK001	Talker ID, Pkt Type
Cmd	667	The command/packet type that is acknowledged to
Flag	3	0 = Invalid command/packet 1 = Unsupported command/packet type 2 = Valid command/packet, but action failed. 3 = Valid command/packet, and action succeeded
A0	0	UTC parameter A0. Units: (seconds)/(2^-30)
A1	0	UTC parameter A1. Units: (seconds/seconds)/(2^50)
dtLS	16	UTC time difference due to leap seconds before event. Units: seconds
Tot	507904	UTC reference time of week. Units: (seconds/2^12)
WNt	237	UTC reference week number. Units: weeks
WNLSF	237	UTC week number when next leap second event occurs. Units: weeks
DN	3	UTC day of week when next leap second occurs. Units: days
dtLSF	17	UTC time difference due to leap seconds after event. Units: seconds
End of Data Fields	*	Asterisk delimiter
Checksum	CS	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

4.65. MTK668-Get GPS Ephemeris Data

This command retrieves ephemeris data of a GPS satellite, in Kepler format.
Synopsis:
$PMTK668,SVID

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK668	Talker ID, Pkt Type
SVID	3	The SVID of the satellite. Choose which satellite's ephemeris you want to get.
End of Data Fields	*	Asterisk delimiter
Checksum	25	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Get the ephemeris data for GPS SVID = 3:
  $PMTK668,3*25<CR><LF>

  Response:
  $PMTK668,3,804,0,1378,97,18900,0,211,348491,97,1529,14047,-433441886,1302,8251567,3333,2702051329,18900,26,935176585,4,655529795,8214,-2063355058,-23169,3,0*3D

Please refer to the **Section 5.14 MTK668-GPS Satellite Ephemeris Data** for more details.

4.66. MTK669-Get BEIDOU Ephemeris Data

This command retrieves ephemeris data of a BEIDOU satellite, in Kepler format.
Synopsis:
$PMTK669,SVID

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK669	Talker ID, Pkt Type
SVID	3	The SVID of the satellite. Choose which satellite's ephemeris you want to get.
End of Data Fields	*	Asterisk delimiter
Checksum	24	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Get the ephemeris data for BEIDOU SVID = 3:
  $PMTK669,3*24<CR><LF>

  Response:
  $PMTK669,3,804,0,1567,2,38250,0,-26092,-4263927,0,-21176,581,1267572402,-23869,2546953,66039,3404432795,38250,-126,22528884,-260,55957758,-59905,-1898601724,2465,6,0*19

Please refer to the **Section 5.14 MTK669-BEIDOU Satellite Ephemeris Data** for more details.

4.67. MTK670-Get Ionospheric Parameters

This command retrieves ionospheric parameters.
Synopsis:
$PMTK670

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK670	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	33	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Get the ionospheric parameters:
  $PMTK670*33<CR><LF>

  Response:
  $PMTK001,670,3,19,3,-2,-1,63,10,-3,-4*15

- Response Data Format:
  $PMTK001,670,3,α0,α1,α2 ,α3, β0, β1, β2 , β3 *CS<CR><LF>

PMTK001 Acknowledge with Ionospheric Parameters		
Field	**Example**	**Comments**
Preamble	$	Start of packet
Header	PMTK001	Talker ID, Pkt Type
Cmd	670	The command/packet type that is acknowledged to
Flag	3	0 = Invalid command/packet 1 = Unsupported command/packet type 2 = Valid command/packet, but action failed. 3 = Valid command/packet, and action succeeded
α0	Seconds	IONO parameterα0
α1	sec/semi-circle	IONO parameterα1
α2	sec/(semi-circle)^2	IONO parameterα2
α3	sec/(semi-circle)^3	IONO parameterα3
β0	Seconds	IONO parameterβ0
β1	sec/semi-circle	IONO parameterβ1
β2	sec/(semi-circle)^2	IONO parameterβ2
β3	sec/(semi-circle)^3	IONO parameterβ3
End of Data Fields	*	Asterisk delimiter
Checksum	24	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

4.68. MTK810-Test All

This command directs the receiver to enter Mass Production (MP) test mode and sets the test item and SV id.
Supported Test Items:

TEST_INFO.	Include f/w version, NMEA type and NMEA output rate.
TEST_ACQ.	The time of acquiring the specific SV.
TEST_BITSYNC.	The time of bit sync.
TEST_SIGNAL.	Include phase error, TCXO clock/drift and C/No mean/sigma.

For each test selected, a PMTK test result packet will be sent by the receiver.

Synopsis:
$PMTK810,Bitmap,SVID

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK810	Talker ID, Pkt Type
Bitmap	0003	Test Items Bit 0: TEST_INFO Bit 1: TEST_ACQ Bit 2: TEST_BITSYNC Bit 3: TEST_SIGNAL † Bits 4-15: Reserved
SVID	1D	Satellite ID. Range: 1-20 (Hex format)
End of Data Fields	*	Asterisk delimiter
Checksum	4D	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence
† When the TEST_ SIGNAL Bit3 is set, the TEST_ACQ Bit1 and the TEST_BITSYNC Bit2 must also be set in order for the testing process to be completed correctly.		

Example:

- Command to start MP test mode with the following setup:
  - Test item: TEST_INFO + TEST_ACQ
  - SV id = 29 (0x1D):

  $PMTK810,0003,1D*4D<CR><LF>

4.69. MTK811-Test Stop

This command directs the receiver to leave MP test mode.
Synopsis:
$PMTK811

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK811	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	3A	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:
- Stop the MP test mode:
  $PMTK811*3A<CR><LF>

4.70. MTK837-Jamming scan test

This command directs the receiver to enter jamming scan test.
Synopsis:
$PMTK837, JamScanType,JamScanNum

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK837	Talker ID, Pkt Type
JamScanType	1	1 = Enable jamming scan
JamScanNum	50	Jamming scan test times
End of Data Fields	*	Asterisk delimiter
Checksum	0A	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:
- Command to enter the jamming scan test:
  $PMTK837,1,50*0A<CR><LF>
  Jamming scan test 50 times.

4.71. MTK869-Query or Set EASY Function

This command queries, or sets (enable/disable) the EASY function of the receiver.

Synopsis:
$PMTK869,Command,SetFlag

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK869	Talker ID, Pkt Type
Command	1	Command Type: 0 = Query 1 = Set (Enable or Disable)
SetFlag †	1	(†Only in Command = 1) in the Command Type above: 0 = Disable 1 = Enable
End of Data Fields	*	Asterisk delimiter
Checksum	35	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Query EASY status:
  $PMTK869,0*29<CR><LF>

  Response (if EASY is disabled):
  $PMTK869,2,0,0*37<CR><LF>

- Enable EASY:
  $PMTK869,1,1*35<CR><LF>

- Disable EASY:
  $PMTK869,1,0*30<CR><LF>

4.72. MTK875-Enable PMTKLSC Leap Second Change (LSC)

This command enables or disables the PMTKLSC output. Query if PMTKLSC Sentence output enabled or disabled.

Synopsis:
$PMTK875,CmdType,Enable

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK875	Talker ID, Pkt Type
CmdType	1	0 = Query 1 = Set 2 = Result for Query operation
Enable	1	0 = Disable 1 = Enable Omit for Query commands
End of Data Fields	*	Asterisk delimiter
Checksum	38	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Enable PMTKLSC and PMTKLSCB sentence output:
  $PMTK875,1,1*38<CR><LF>
- Disable PMTKLSC and PMTKLSCB sentence output
  $PMTK875,1,0*39<CR><LF>
- Query PMTKLSC sentence output enabled
  $PMTK875,0*24<CR><LF>
  Response:
  $PMTK875,2,0*3A<CR><LF>
  PMTKLSC sentence output disabled.

Response Messages Format:
$PMTKLSC, Parameter1, Parameter2, Parameter3*CS
$PMTKLSCB, Parameter1, Parameter2, Parameter3*CS
Where PMTKLSC is the LSC packet
PMTKLSCB is the BEIDOU LSC packet
Parameter1 is the current leap second
Parameter2 is the leap indicator, 1 means updated from broadcast data
Parameter3 is the next leap second.
CS = Checksum

Examples:

- $PMTKLSC,16,1,16*43 <CR><LF>
- $PMTKLSCB,0,0,0*00<CR><LF>

4.73. MTK886-Set Navigation Mode

This command sets navigation mode.
Synopsis:
$PMTK886,Command

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK886	Talker ID, Pkt Type
Command	1	Command Type: 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 of Data Fields	*	Asterisk delimiter
Checksum	35	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- Enter the normal mode:
  $PMTK886,0*28<CR><LF>
- Enter the fitness mode:
  $PMTK886,1*29<CR><LF>
- Enter the aviation mode:
  $PMTK886,2*2A<CR><LF>
- Enter the balloon mode:
  $PMTK886,3*2B<CR><LF>

5. MTK NMEA Output Messages

5.1. MTK001-Acknowledge

This is the Acknowledge message sent by the receiver in response to a PMTK packet command.
Synopsis:
$ PMTK001,Cmd,Flag

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK001	Talker ID, Pkt Type
Cmd	604	The command/packet type that triggered the acknowledge.
Flag	3	0 = Invalid command/packet 1 = Unsupported command/packet type 2 = Valid command/packet, but action failed. 3 = Valid command/packet, and action succeeded
End of Data Fields	*	Asterisk delimiter
Checksum	32	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- $PMTK001,604,3*32<CR><LF>
  Ack the PMTK604 message, "valid command"

5.2. MTK010-System Message

This message is used by the GPS module to output system messages.
Synopsis:
$ PMTK001,Msg

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK010	Talker ID, Pkt Type
Msg	001	The system message 0 = UNKNOWN 1 = STARTUP 2 = Notification for the host aiding Extended Prediction Orbit (EPO) 3 = Notification for the transition to Normal mode is successfully done
End of Data Fields	*	Asterisk delimiter
Checksum	2E	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- $PMTK010,001*2E<CR><LF>
  System message : This is a startup.

5.3. MTK011-Text Message

This message contains a text message sent by the GNSS receiver to the host processor.
Synopsis:
$PMTK011,Message

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK011	Talker ID, Pkt Type
Message	MTKGPS	Message from receiver
End of Data Fields	*	Asterisk delimiter
Checksum	08	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- $PMTK011,MTKGPS*08<CR><LF>
  Message: This is MTK GPS.

5.4. MTK500-Data Fix Control Value

This message reports the rate of position fixing activity
Synopsis:
$PMTK500,FixInterval,…

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK500	Talker ID, Pkt Type
FixInterval	1	Position Fix Interval (ms) Range: 100 ~ 10000
End of Data Fields	*	Asterisk delimiter
Checksum	2B	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:
- $PMTK500,1000,0,0,0,0*1A<CR><LF>
  Data fix interval = 1 second

5.5. MTK501-DGPS Data Source Mode

This packet gives the DGPS data source mode. The receiver sends this packet in response to receiving the PMTK401 poll packet.
Synopsis:
$PMTK501,Mode

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK501	Talker ID, Pkt Type
Mode	1	DGPS data source mode 0 = No DGPS source 1 = RTCM 2 = SBAS (WAAS/EGNOS/MSAS)
End of Data Fields	*	Asterisk delimiter
Checksum	2B	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:
- $PMTK501,1*2B<CR><LF>
  DGPS Source: RTCM

5.6. MTK508-DR Limit

This packet reports the number of estimated fixes when entering a tunnel.
Synopsis:
$PMTK508,DRLimit

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK508	Talker ID, Pkt Type
DRLimit	3	DR limit = 3
End of Data Fields	*	Asterisk delimiter
Checksum	2E	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:
- $PMTK508,3*20<CR><LF>
  DR limit = 3

5.7. MTK511-Satellite Elevation Mask

This packet is a response message of $PMTK411. It outputs the satellite elevation mask, in degree.
Synopsis:
$PMTK511,Degree

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK511	Talker ID, Pkt Type
Degree	5	Curent satellite elevation mask, in degree
End of Data Fields	*	Asterisk delimiter
Checksum	2E	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:
- $PMTK511,5*2E<CR><LF>
  Elevation mask = 5 degree.

5.8. MTK513-SBAS Enabled

This packet reports if the receiver is enabled to search for SBAS satellites or not.
It is sent by the receiver in response to a PMTK413 poll packet.

Synopsis:
$PMTK513,Enabled

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK513	Talker ID, Pkt Type
Enabled	1	0 = SBAS Disabled 1 = SBAS Enabled
End of Data Fields	*	Asterisk delimiter
Checksum	28	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- $PMTK513,1*28<CR><LF>
  SBAS enabled

5.9. MTK514-NMEA Output Rates

This packet reports the receiver's NMEA sentences output rate settings. It is sent by the receiver in response to receiving a PMTK414 poll packet. There are a total of 19 data fields that present output frequencies for the supported NMEA sentences individually. Please refer to the PMTK314 packet description for the supported NMEA sentences and frequency settings.

Synopsis:

$PMTK514,<val0>,<val0>,…<val20>

There are totally 21 data fields that present output frequencies for the 21 supported NMEA sentences individually.

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK514	Talker ID, Pkt Type
0. GLL	1	Allowed values: 0 = Message disabled or not supported 1 = Output every position fix 2 = Output every two position fixes 3 = Output every three position fixes 4 = Output every four position fixes 5 = Output every five position fixes
1. RMC	1	
2. VTG	1	
3. GGA	1	
4. GSA	1	
5. GSV	5	
6. GRS	0	
7. GST	0	
8. Reserved	0	
9. Reserved	0	
10. Reserved	0	
11. Reserved	0	
12. Reserved	0	
13. Reserved	0	
14. Reserved	0	
15. Reserved	0	
16. Reserved	0	
17. ZDA	1	
18. MCHN	0	
19. DTM	0	
20. GBS	0	
End of Data Fields	*	Asterisk delimiter
Checksum	2A	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- $PMTK514,1,1,1,1,1,5,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0*2B<CR><LF>

5.10. MTK530-Current Datum

This packet reports the current datum used by the receiver.

Synopsis:

$PMTK530,Datum

Field	Example	Comments
Preamble	$	Start of packet
Header	530	Talker ID, Pkt Type
Datum	0	0 = WGS84 1 = TOKYO-M 2 = TOKYO-A See Appendix A for a total list of supported datum.
End of Data Fields	*	Asterisk delimiter
Checksum	28	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- $PMTK530,0*28<CR><LF>
  Current datum = WGS84

5.11. MTK535-RTC UTC Time

This command reports the current RTC UTC time.

Synopsis:

$ PMTK535,Year,Month,Day,Hour,Min,Sec

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK535	Talker ID, Pkt Type
Year	2016	UTC time: Year
Month	3	UTC time: Month 1 ~ 12
Day	30	UTC time: Day 1 ~ 31
Hour	0	UTC time: Hour 0 ~ 23
Min	32	UTC time: Minute 0 ~ 59
Sec	14	UTC time: Second 0 ~ 59
End of Data Fields	*	Asterisk delimiter
Checksum	04	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- $PMTK535,2016,3,30,0,32,14*30<CR><LF>
  Current RTC time: 00:32:14, 03/30/2016

5.12. MTK599-Flash Data

This packet reports data in the flash memory.

Synopsis:

$ PMTK599, <there are total 'length + 2' data fields>

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK599	Talker ID, Pkt Type
Starting address	1C	Hex format
Length	7	Hex format
Data byte	30	Hex format N (=Length) data bytes
Data byte	5C	
Data byte	22	
Data byte	1D	
Data byte	02	
Data byte	04	
Data byte	01	
End of Data Fields	*	Asterisk delimiter
Checksum	59	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- $PMTK599,1C,7,30,5C,22,1D,02,04,01*59<CR><LF>
  Date bytes from the starting address 0x1C, with the length = 7 bytes

5.13. MTK668-GPS Satellite Ephemeris Data

This packet reports ephemeris data of a GPS satellite, in Kepler format.

Synopsis:

$PMTK668,PRN,WeekNo,URAI,IDOT,IODE,Toc,af2,af1,af0,IODC,Crs,dn,M0,Cuc,e,Cus,SqrtA,Toe,Cic,Omega0,Cis,i0,Crc,w,OmegaDot,Tgd,SVHealth

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK668	PMTK command ID
PRN		SVID of satellite
WeekNo		Reference week number[weeks]
URAI		Figure of Merit – Defines URA
IDOT		Rate of inclination angle[rad/s]
IODE		Issue of data counter
Toc		Reference time of week[s]
af2		SV clock correction polynomial coefficient[s/s/s]
af1		SV clock correction polynomial coefficient[s/s]
af0		SV clock correction polynomial coefficient[s]
IODC		Issue of data counter
Crs		Ampof sin harmonic corr term orbit radius[m]
dn		Delta n mean motion diff from computed value[rad/s]
M0		Mean anomaly at reference time[rad]
Cuc		Amplitude of cos harm corr term arg of latitude[rad]
e		Eccentricity
Cus		Amplitude of sin harm corr term arg of latitude[rad]
SqrtA		Square root of the semi-major axis
Toe		Reference time of week[Ephemeris terms][s]
Cic		Amplitude of cos harm corr term ang of inclination[rad]
Omega0		Longitude of ascending node of orbit plane[rad]
Cis		Amplitude of sin harm corr term ang of inclination[rad]

i0		Inclination angle at reference time[rad]
Crc		Amplitude of cos harm corr term orbit radius[rad]
w		Argument of perigee[rad]
OmegaDot		Rate of right ascention[rad/s]
Tgd		Group delay[s]
SVHealth		The 5 LSBs of the NAV data's health status from the ephemeris
End of Data Fields	*	Asterisk delimiter
Checksum	CS	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- $PMTK668,3,804,0,1378,97,18900,0,211,348491,97,1529,14047,-433441886,1302,8251567,3333,2702051329,18900,26,935176585,4,655529795,8214,-2063355058,-23169,3,0*3D

  If ephemeris data of specified satellite is not available, the receiver responses $PMTK001,668,3,0*24

Note:
Please use the factor scale **(refer to ICD-GPS-200C, page 96)** to calculate the actual value.

http://www.gps.gov/technical/icwg/ICD-GPS-200C.pdf

5.14. MTK669-BEIDOU Satellite Ephemeris Data

This packet reports ephemeris data of a BEIDOU satellite, in Kepler format.

Synopsis:

$PMTK669,PRN,WeekNo,URAI,IDOT,IODE,Toc,af2,af1,af0,IODC,Crs,dn,M0,Cuc,e,Cus,SqrtA,Toe,Cic,Omega0,Cis,i0,Crc,w,OmegaDot,Tgd,SVHealth

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK669	PMTK command ID
PRN		SVID of satellite
WeekNo		Reference week number[weeks]
URAI		Figure of Merit – Defines URA
IDOT		Rate of inclination angle[rad/s]
IODE		Issue of data counter
Toc		Reference time of week[s]
af2		SV clock correction polynomial coefficient[s/s/s]
af1		SV clock correction polynomial coefficient[s/s]
af0		SV clock correction polynomial coefficient[s]
IODC		Issue of data counter
Crs		Ampof sin harmonic corr term orbit radius[m]
dn		Delta n mean motion diff from computed value[rad/s]
M0		Mean anomaly at reference time[rad]
Cuc		Amplitude of cos harm corr term arg of latitude[rad]
e		Eccentricity
Cus		Amplitude of sin harm corr term arg of latitude[rad]
SqrtA		Square root of the semi-major axis
Toe		Reference time of week[Ephemeris terms][s]
Cic		Amplitude of cos harm corr term ang of inclination[rad]
Omega0		Longitude of ascending node of orbit plane[rad]
Cis		Amplitude of sin harm corr term ang of inclination[rad]
i0		Inclination angle at reference time[rad]

Crc		Amplitude of cos harm corr term orbit radius[rad]
w		Argument of perigee[rad]
OmegaDot		Rate of right ascention[rad/s]
Tgd		Group delay[s]
SVHealth		The 5 LSBs of the NAV data's health status from the ephemeris
End of Data Fields	*	Asterisk delimiter
Checksum	CS	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- $PMTK669,3,804,0,1567,2,38250,0,-26092,-4263927,0,-21176,581,1267572402,-23869,2546953,66039,3404432795,38250,-126,22528884,-260,55957758,-59905,-1898601724,2465,6,0*19

  If ephemeris data of specified satellite is not available, the receiver responds $PMTK001,669,3,0*25

Note:
Please use the factor scale **(refer to ICD-GPS-200C, page 96)** to calculate the actual value.

http://www.gps.gov/technical/icwg/ICD-GPS-200C.pdf

5.15. MTK702-Output Data Port Data Type and Baud Rate

This output displays data port input/output data type and baud rate.

Synopsis:

$PMTK702,InputType,OutputType,BaudRate

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK702	Talker ID, Pkt Type
InputType	1	Input type: 0 = DPORT_IN_NONE 1 = DPORT_IN_RTCM 2 = DPORT_IN_NMEA
OutputType	1	Output type: 0 = DPORT_OUT_NONE 1 = DPORT_OUT_DEBUG
BaudRate	9600	Baud rate setting: 4800 9600 19200 38400 57600 115200
End of Data Fields	*	Asterisk delimiter
Checksum	31	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- $PMTK702,1,1,9600*14<CR><LF>
  Port I/O data type and baud rate: In = RTCM, Out = Debug On, baud rate = 9600

5.16. MTK705-Firmware Release Information

This message reports firmware release information.

Synopsis:

$PMTK705,ReleaseStr,Build_ID,Product_Model,(SDK_Version,)

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK705	Talker ID, Pkt Type
ReleaseStr	AXN_0.2	Firmware release name and version, AXN_x.x
Build_ID	1234	Build ID set in CoreBuilder for firmware version control
Product_Model	ABCD	Product Model set in CoreBuilder for product identification
SDK_Version (optional)		Showing SDK version if the firmware is used for SDK
End of Data Fields	*	Asterisk delimiter
Checksum	14	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- $PMTK705,AXN_0.2,1234,ABCD,*14<CR><LF>

5.17. MTK707-EPO Status

This message reports firmware release information.

Synopsis:

$PMTK707,Set,FWN,FTOW,LWN,LTOW,FCWN,FCTOW,LCWN,LCTOW

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK707	Talker ID, Pkt Type
Set	56	Total number of sets of EPO data stored in chip
FWN	1468	GPS Week Number of the first set of EPO data
FTOW	172800	GPS TOW of the first set of EPO data
LWN	1470	GPS Week Number of the last set of EPO data
LTOW	151200	GPS TOW of the last set of EPO data
FCWN	1468	GPS Week Number of the first set of the currently used EPO data
FCTOW	259200	GPS TOW of the first set of the currently used EPO data
LCWN	1468	GPS Week Number of the last set of the currently used EPO data
LCTOW	259200	GPS TOW of the last set of the currently used EPO data
End of Data Fields	*	Asterisk delimiter
Checksum	14	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- $PMTK707,56,1468,172800,1470,151200,1468,259200,1468,259200*14<CR><LF>

5.18. MTK721-EPO Data for a Single Satellite

This message outputs EPO data for a single satellite.

Synopsis:

$PMTK721,SatID,W[0],…,W[17]

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK721	Talker ID, Pkt Type
SatID	11	Satellite PRN number [Represented in HEX characters] for the EPO data to Follow. Valid range: GPS: 1 ~ 32 GLONASS: 55 ~ 88 BEIDOU: 1 ~ 14
EPO Segment data	W[0] ~ W[17]	Words [LSB first] of one EPO segment data – total 72 bytes.
End of Data Fields	*	Asterisk delimiter
Checksum	CS	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- $PMTK721,11,6a043d2f,d52e00,0d2f1a3d,…,…,……..*CS<CR><LF>
  The packet contains EPO data of satellite PRN 17.

5.19. MTK740-Current UTC

This packet contains the current UTC time. Please do not use local time, which has time-zone offset. To have a faster TTFF, the accuracy of the reference UTC shall be within 3 seconds of the actual UTC time.

Synopsis:

$PMTK740,YYYY,MM,DD,hh,mm,ss

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK740	Talker ID, Pkt Type
YYYY	2016	UTC time: year in 4 digits (>1980)
MM	2	UTC time: month (1-12)
DD	10	UTC time: day (1-31)
hh	9	UTC time: hour (0-23)
mm	0	UTC time: minute (0-59)
ss	58	UTC time: second (0-59)
End of Data Fields	*	Asterisk delimiter
Checksum	05	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- $PMTK740,2016,2,10,9,0,58*05<CR><LF>
  This example indicates that the current U TC time is 2016/02/10, 09:00:58

5.20. MTK741-Reference Location Data

This packet contains reference location data for the GPS receiver without accuracy information. To have a faster TTFF, the accuracy of the location data shall be better than 30km.

Synopsis:

$PMTK741,Lat,Long,Alt,YYYY,MM,DD,hh,mm,ss

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK741	Talker ID, Pkt Type
Lat	24.772816	WGS84 geodetic latitude. (degrees) Minus: south; Plus: north The GPS chip will check that this value is within the range -90.0 to 90.0. NOTE: This value should be expressed as a floating point number with six positions after the decimal point.
Long	121.022636	WGS84 geodetic longitude. (degrees) Minus: west; Plus: east The GPS chip will check that this value is within the range -180.0 to 180.0. NOTE: This value should be expressed as a floating point number with six positions after the decimal point.
Alt	160	WGS84 ellipsoid altitude. (meters)
YYYY	2016	Reference UTC time: year in 4 digits (>1980)
MM	8	Reference UTC time: month (1-12)
DD	1	Reference UTC time: day (1-31)
hh	08	Reference UTC time: hours (0-23)
mm	00	Reference UTC time: minutes (0-59)
ss	00	Reference UTC time: seconds (0-59)
End of Data Fields	*	Asterisk delimiter
Checksum	12	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- $PMTK741,24.772816,121.022636,160,2016,8,1,08,00,00*12<CR><LF>

5.21. MTK812-Test Finish

This packet reports the Mass Production (MP) testing has finished.
Synopsis:
$PMTK812

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK812	Talker ID, Pkt Type
End of Data Fields	*	Asterisk delimiter
Checksum	39	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:
- $PMTK812*39<CR><LF>

5.22. MTK813-Test All ACQ

This packet is the result of the TEST ACQ test.
Synopsis:
$PMTK813,SVID,AcqTime

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK813	Talker ID, Pkt Type
SVID	29	Satellite ID
AcqTime	2	Acquisition Time (seconds)
End of Data Fields	*	Asterisk delimiter
Checksum	36	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:
- $PMTK813,29,2*01<CR><LF>
  The target device acquires SV29 within 2 seconds.

5.23. MTK814-Test All Bit Sync

This packet reports the result of the TEST_BITSYNC test.
Synopsis:
$PMTK814,SVID,BitSyncTime

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK814	Talker ID, Pkt Type
SVID	29	Satellite ID
BitSyncTime	1	Time to reach Bit Sync state (seconds)
End of Data Fields	*	Asterisk delimiter
Checksum	36	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:
- $PMTK814,29,1*05<CR><LF>
  With regard to SV29, the target device reach bit sync state within 1 second.

5.24. MTK815-Test All Signal

This packet reports the result of the TEST_SIGNAL test.
Synopsis:
$PMTK815,SVID,TestingTime,PhaseError,TCXOOffset,TCXODrift,C/NoMean,C/NoSigma

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK815	Talker ID, Pkt Type
SVID	29	Satellite ID
TestingTime	16	Test duration (seconds)
PhaseError	98	Scale factor: 0.01
TCXOOffset	10000	Scale factor: 0.001 (Hz)
TCXODrift	30	Scale factor: 0.001 (Hz)
C/NoMean	4100	Scale factor: 0.01
C/NoSigma	0	Scale factor: 0.01
End of Data Fields	*	Asterisk delimiter
Checksum	18	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:
$PMTK815,29,16,98,10000,30,4100,0*18<CR><LF>

5.25. MTK869-EASY State

This command reports the EASY function state.

Synopsis:

$PMTK869,EASYResponseID,EASYState,EASYExtensionDay

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK869	Talker ID, Pkt Type
EASYResponseID	2	Response ID: 2 = This is the PMTK869 response message
EASYState	1	Current EASY state: 0 = EASY disabled 1 = EASY enabled, and the state is further indicated by the Extension Day value (below)
EASYExtensionDay	1	Current EASY Extension Day. If EASY is enabled, this value indicates the following: 0 = in the middle of EASY extension process 1 = has completed the EASY process; the extension is 1-day. 2 = has completed the EASY process; the extension the 2-day 3 = has completed the EASY process; the extension the 3-day
End of Data Fields	*	Asterisk delimiter
Checksum	CS	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- $PMTK869,2,0,0*37<CR><LF>
  EASY disabled.
- $PMTK869,2,1,0*2A<CR><LF>
  EASY is enabled and the device is in the middle of the EASY process.
- $PMTK869,2,1,1*2B<CR><LF>
  EASY is enabled and device has completed the 1-day EASY process.
- $PMTK869,2,1,2*28<CR><LF>
  EASY is enabled and device has completed the 2-day EASY process.

5.26. MTKLOG-Logging Status

This message outputs the logging status.
Synopsis:
$PMTKLOG,Serial#,Type,Mode,Content,Interval,Distance,Speed,Status,LogNumber,Percent

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTKLOG	Talker ID, Pkt Type
Serial#	32	Logging serial number : 0~65535
Type	1	Logging type: 0 = Overlap 1 = Full Stop
Mode	b	Logging mode: Interval logger
Content	31	Logging contents of configuration
Interval	1	
Distance	0	
Speed	0	Logging speed setting
Status	0	Logging status: 1 = Stop Logging 0 = Logging
Lognumber	8032	Log number
Percent	100	Logging life used percentage
End of Data Fields	*	Asterisk delimiter
Checksum	2F	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Example:

- $PMTK183*38<CR><LF>
  Response:
  $PMTKLOG,32,1,b,31,1,0,0,0,8032,100*2F<CR><LF>

5.27. TXT-Antenna Detection Sentence

This message outputs the antenna detection status.
Synopsis:
$GPTXT,MessageTotal,MessageNumber,MessageType,ANTSTATUS=

Field	Example	Comments
Preamble	$	Start of packet
Header	GPTXT	Talker ID, Pkt Type
MessageTotal	01	Total number of messages in this transmission, 01..99
MessageNumber	01	Message number in this transmission
MessageType	02	Text Identifier: 02: Antenna status
AntennaStatus	ANTSTATUS=OK	Antenna Status: ANTSTATUS=SHORT: Antenna in short connection. ANTSTATUS=OK: Antenna is OK ANTSTATUS=OPEN: Antenna is Open
End of Data Fields	*	Asterisk delimiter
Checksum	3B	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Examples:

$GPTXT,01,01,02,ANTSTATUS=SHORT*6D<CR><LF>
The antenna is at short connection

$GPTXT,01,01,02,ANTSTATUS=OK*3B<CR><LF>
The antenna status OK

$GPTXT,01,01,02,ANTSTATUS=OPEN*2B<CR><LF>
The antenna is at open connection

5.28. EPE-Accuracy Estimate Sentence

This message outputs the estimate value of the accuracy.
Synopsis:
$GPEPE,HorEPE,VerEPE

Field	Example	Comments
Preamble	$	Start of packet
Header	GPEPE	Talker ID, Pkt Type
HorEPE	xx.xx	Horizontal accuracy estimate (m)
VerEPE	xx.xx	Vertical accuracy estimate (m)
End of Data Fields	*	Asterisk delimiter
Checksum	hh	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Examples:

$GPEPE,10.43,34.82*4C

This EPE reports: Horizontal EPE = 10.43 (m); Vertical EPE = 34.82 (m)

6. APPENDIX

6.1. Appendix A: Datum List

No	Datum	Region
0	WGS1984	International
1	Tokyo	Japan
2	Tokyo	Mean For Japan, South Korea, Okinawa
3	User Setting	User Setting
4	Adindan	Burkina Faso
5	Adindan	Cameroon
6	Adindan	Ethiopia
7	Adindan	Mali
8	Adindan	Mean For Ethiopia, Sudan
9	Adindan	Senegal
10	Adindan	Sudan
11	Afgooye	Somalia
12	Ain El Abd1970	Bahrain
13	Ain El Abd1970	Saudi Arabia
14	American Samoa1962	American Samoa Islands
15	Anna 1 Astro1965	Cocos Island
16	Antigua Island Astro1943	Antigua(Leeward Islands)
17	Arc1950	Botswana
18	Arc1950	Burundi
19	Arc1950	Lesotho
20	Arc1950	Malawi
21	Arc1950	Mean For Botswana, Lesotho, Malawi, Swaziland, Zaire, Zambia, Zimbabwe
22	Arc1950	Swaziland
23	Arc1950	Zaire
24	Arc1950	Zambia
25	Arc1950	Zimbabwe
26	Arc1960	Mean For Kenya Tanzania
27	Arc1960	Kenya

28	Arc1960	Tanzania
29	Ascension Island1958	Ascension Island
30	Astro Beacon E 1945	Iwo Jima
31	Astro Dos 71/4	St Helena Island
32	Astro Tern Island (FRIG)1961	Tern Island
33	Astronomical Station 1952	Marcus Island
34	Australian Geodetic 1966	Australia, Tasmania
35	Australian Geodetic 1984	Australia, Tasmania
36	Ayabelle Lighthouse	Djibouti
37	Bellevue (IGN)	Efate and Erromango Islands
38	Bermuda 1957	Bermuda
39	Bissau	Guinea-Bissau
40	Bogota Observatory	Colombia
41	Bukit Rimpah	Indonesia(Bangka and Belitung Ids)
42	Camp Area Astro	Antarctica(McMurdi Camp Area)
43	Campo Inchauspe	Argentina
44	Canton Astro1966	Phoenix Island
45	Cape	South Africa
46	Cape Canaveral	Bahamas, Florida
47	Carthage	Tunisia
48	Chatham Island Astro1971	New Zealand(Chatham Island)
49	Chua Astro	Paraguay
50	Corrego Alegre	Brazil
51	Dabola	Guinea
52	Deception Island	Deception Island, Antarctica
53	Djakarta (Batavia)	Indonesia(Sumatra)
54	Dos 1968	New Georgia Islands (Gizo Island)
55	Easter Island 1967	Easter Island
56	Estonia CoordinateSystem1937	Estonia
57	European 1950	Cyprus
58	European 1950	Egypt

59	European 1950	England, Channel Islands, Scotland, Shetland Islands
60	European 1950	England, Ireland, Scotland, Shetland Islands
61	European 1950	Finland, Norway
62	European 1950	Greece
63	European 1950	Iran
64	European 1950	Italy (Sardinia)
65	European 1950	Italy (Sicily)
66	European 1950	Malta
67	European 1950	Mean For Austria, Belgium, Denmark, Finland, France, W Germany, Gibraltar, Greece, Italy, Luxembourg, Netherlands Norway, Portugal, Spain, Sweden, Switzerland
68	European 1950	Mean For Austria, Denmark, France, W Germany, Netherland , Switzerland
69	European 1950	Mean For Iraq, Israel, Jordan, Lebanon, Kuwait, Saudi Arabia, Syria
70	European 1950	Portugal, Spain
71	European 1950	Tunisia,
72	European 1979	Mean For Austria, Finland ,Netherlands ,Norway, Spain, Sweden, Switzerland
73	Fort Thomas 1955	Nevis St Kitts (Leeward Islands)
74	Gan	Republic Of Maldives
75	Geodetic Datum 1970	New Zealand
76	Graciosa Base SW1948	Azores (Faial, Graciosa, Pico, Sao, Jorge, Terceria)
77	Guam1963	Guam
78	Gunung Segara	Indonesia (Kalimantan)
79	Gux l Astro	Guadalcanal Island
80	Herat North	Afghanistan
81	Hermannskogel Datum	Croatia-Serbia, Bosnia-Herzegoivna
82	Hjorsey 1955	Iceland
83	Hongkong 1963	Hongkong
84	Hu Tzu Shan	Taiwan
85	Indian	Bangladesh
86	Indian	India, Nepal
87	Indian	Pakistan
88	Indian 1954	Thailand

89	Indian 1960	Vietnam (Con Son Island)
90	Indian 1960	Vietnam (Near 16 deg N)
91	Indian 1975	Thailand
92	Indonesian 1974	Indonesia
93	Ireland 1965	Ireland
94	ISTS 061 Astro 1968	South Georgia Islands
95	ISTS 073 Astro 1969	Diego Garcia
96	Johnston Island 1961	Johnston Island
97	Kandawala	Sri Lanka
98	Kerguelen Island 1949	Kerguelen Island
99	Kertau 1948	West Malaysia and Singapore
100	Kusaie Astro 1951	Caroline Islands
101	Korean Geodetic System	South Korea
102	LC5 Astro 1961	Cayman Brac Island
103	Leigon	Ghana
104	Liberia 1964	Liberia
105	Luzon	Philippines (Excluding Mindanao)
106	Luzon	Philippines (Mindanao)
107	M'Poraloko	Gabon
108	Mahe 1971	Mahe Island
109	Massawa	Ethiopia (Eritrea)
110	Merchich	Morocco
111	Midway Astro 1961	Midway Islands
112	Minna	Cameroon
113	Minna	Nigeria
114	Montserrat Island Astro 1958	Montserrat (Leeward Island)
115	Nahrwan	Oman (Masirah Island)
116	Nahrwan	Saudi Arabia
117	Nahrwan	United Arab Emirates
118	Naparima BWI	Trinidad and Tobago
119	North American 1927	Alaska (Excluding Aleutian Ids)
120	North American 1927	Alaska (Aleutian Ids East of 180 deg W)
121	North American 1927	Alaska (Aleutian Ids West of 180 deg W)

122	North American 1927	Bahamas (Except San Salvador Islands)
123	North American 1927	Bahamas (San Salvador Islands)
124	North American 1927	Canada (Alberta, British Columbia)
125	North American 1927	Canada (Manitoba, Ontario)
126	North American 1927	Canada (New Brunswick, Newfoundland, Nova Scotia, Quebec)
127	North American 1927	Canada (Northwest Territories, Saskatchewan)
128	North American 1927	Canada (Yukon)
129	North American 1927	Canal Zone
130	North American 1927	Cuba
131	North American 1927	Greenland (Hayes Peninsula)
132	North American 1927	Mean For Antigua, Barbados, Barbuda, Caicos Islands, Cuba, Dominican, Grand Cayman, Jamaica, Turks Islands
133	North American 1927	Mean For Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua
134	North American 1927	Mean For Canada
135	North American 1927	Mean For Conus
136	North American 1927	Mean For Conus (East of Mississippi River Including Louisiana, Missouri, Minnesota)
137	North American 1927	Mean For Conus (West of Mississippi River Excluding Louisiana, Minnesota, Missouri)
138	North American 1927	Mexico
139	North American 1983	Alaska (Excluding Aleutian Ids)
140	North American 1983	Aleutian Ids
141	North American 1983	Canada
142	North American 1983	Conus
143	North American 1983	Hawaii
144	North American 1983	Mexico, Central America
145	North Sahara 1959	Algeria
146	Observatorio Meteorologico 1939	Azores (Corvo and Flores Islands)
147	Old Egyptian 1907	Egypt
148	Old Hawaiian	Hawaii
149	Old Hawaiian	Kauai
150	Old Hawaiian	Maui
151	Old Hawaiian	Mean For Hawaii, Kauai, Maui, Oahu

152	Old Hawaiian	Oahu
153	Oman	Oman
154	Ordnance Survey Great Britain 1936	England
155	Ordnance Survey Great Britain 1936	England, Isle of Man, Wales
156	Ordnance Survey Great Britain 1936	Mean For England ,Isle of Man, Scotland, Shetland Island, Wales
157	Ordnance Survey Great Britian1936	Scotland, Shetland Islands
158	Ordnance Survey Great Britain 1936	Wales
159	Pico de las Nieves	Canary Islands
160	Pitcairn Astro 1967	Pitcairn Island
161	Point 58	Mean For Burkina Faso and Niger
162	Pointe Noire 1948	Congo
163	Porto Santo 1936	Porto Santo, Madeira Islands
164	Provisional South American 1956	Bolivia
165	Provisional South American 1956	Chile (Northern Near 19 deg S)
166	Provisional South American 1956	Chile (Southern Near 43 deg S)
167	Provisional South American 1956	Colombia
168	Provisional South American 1956	Ecuador
169	Provisional South American 1956	Guyana
170	Provisional South American 1956	Mean For Bolivia, Chile, Colombia, Ecuador, Guyana, Peru, Venezuela
171	Provisional South American 1956	Peru
172	Provisional South American 1956	Venezuela
173	Provisional South Chilean 1963	Chile (Near 53 deg S) (Hito XVIII)
174	Puerto Rico	Puerto Rico, Virgin Islands
175	Pulkovo 1942	Russia

176	Qatar National	Qatar
177	Qornoq	Greenland (South)
178	Reunion	Mascarene Island
179	Rome 1940	Italy (Sardinia)
180	S-42 (Pulkovo 1942)	Hungary
181	S-42 (Pulkovo 1942)	Poland
182	S-42 (Pulkovo 1942)	Czechoslovakia
183	S-42 (Pulkovo 1942)	Latvia
184	S-42 (Pulkovo 1942)	Kazakhstan
185	S-42 (Pulkovo 1942)	Albania
186	S-42 (Pulkovo 1942)	Romania
187	S-JTSK	Czechoslovakia (Prior 1 Jan1993)
188	Santo (Dos) 1965	Espirito Santo Island
189	Sao Braz	Azores (Sao Miguel, Santa Maria Ids)
190	Sapper Hill 1943	East Falkland Island
191	Schwarzeck	Namibia
192	Selvagem Grande 1938	Salvage Islands
193	Sierra Leone 1960	Sierra Leone
194	South American 1969	Argentina
195	South American 1969	Bolivia
196	South American 1969	Brazil
197	South American 1969	Chile
198	South American 1969	Colombia
199	South American 1969	Ecuador
200	South American 1969	Ecuador (Baltra, Galapagos)
201	South American 1969	Guyana
202	South American 1969	Mean For Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Trinidad and Tobago, Venezuela
203	South American 1969	Paraguay
204	South American 1969	Peru
205	South American 1969	Trinidad and Tobago
206	South American 1969	Venezuela
207	South Asia	Singapore

208	Tananarive Observatory 1925	Madagascar
209	Timbalai 1948	Brunei, E Malaysia (Sabah Sarawak)
210	Tokyo	Japan
211	Tokyo	Mean For Japan, South Korea, Okinawa
212	Tokyo	Okinawa
213	Tokyo	South Korea
214	Tristan Astro 1968	Tristam Da Cunha
215	Viti Levu 1916	Fiji (Viti Levu Island)
216	Voirol 1960	Algeria
217	Wake Island Astro 1952	Wake Atoll
218	Wake-Eniwetok 1960	Marshall Islands
219	WGS 1972	Global Definition
220	WGS 1984	Global Definition
221	Yacare	Uruguay
222	Zanderij	Suriname

7. Document History

Revision	Date	Changes
0	2014-07-17	First issue
1	2014-10-22	Added SL869-V2S to applicability table
2	2015-02-12	Added SL871-S, SE868-A, SE868-AS and SC872-A top applicability table. Updated Flash variant SW string to MT33-1.1.106
3	2016-05-16	Added and modified the packets according to the following Mediatek manual: MTK NMEA Packet User Manual Revision: 3.5, Linked FW Version: AXN 3.6/3.8/2.3/2.5, Release Date: 2016/3/17 MTK NMEA Sentence Output Release Date: 2015-Nov-30, Rev 3.3