Telit MT GNSS Software User Guide

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Making machines talk.

APPLICABILITY TABLE

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

SW Version
MT33-1.1.106
AXN 2.1

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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-NORTHAMERICA@telit.com
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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

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, GN for Global Navigation, or BD for BeiDou (COMPASS) Navigation System. 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 NEMA 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	Talker Identifier GP = GPS GL = GLONASS GN = Global Navigation BD = BeiDou (COMPASS)
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

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

Field	Example	Comments
Preamble	$	Start of sentence
Talker ID	GP	Navigation System GP=GPS GL=GLONASS GN=Global Navigation BD= BeiDou (COMPASS)
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/S Indicator	N	N = North, S = South
Longitude	12100.0344	ddmm.mmmm (degrees and minutes)
E/W Indicator	E	E = East, W = West
GPS Quality Indicator	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
Satellites Used	07	Number of satellites in use (00-12)
HDOP	0.75	Horizontal Dilution of Precision
MSL Altitude	140.00	Antenna altitude above/below Mean Sea Level (MSL) geoid surface.
MSL Altitude Units	M	M = meters
Geoid Separation	15.03	The difference between the WGS-84 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
Separation Units	M	M = meters
DGPS Age		Age of DGPS data in seconds since last update, Null field when DGPS is not used
DGPS station ID		0000-1023
End of Data Fields	*	Asterisk delimiter
Checksum	6A	Two character hexadecimal value
Terminator	<CR><LF>	End of sentence sequence

3.2. GLL-Geographical Position - Latitude/Longitude

Latitude, Longitude, time and status of Navigation Solution.
Example:
$GPGLL,2446.4768,N,12100.0344,E,082652.10,A,A*6B<CR><LF>

Field	Example	Comments
Preamble	$	Start of sentence
Talker ID	GP	Navigation System GP=GPS GL=GLONASS GN=Global Navigation BD= BeiDou (COMPASS)
Sentence ID	GLL	Geographical Position-Latitude/Longitude
Latitude	2446.4768	ddmm.mmmm (degrees and minutes)
N/S Indicator	N	N = North, S = South
Longitude	12100.0344	dddmm.mmmm (degrees and minutes)
E/W Indicator	E	E = East, W = West
UTC Time	082651.10	hhmmss.ss (hours, minutes, seconds)
Status	A	A = Data Valid (only when the mode indicator is A or D)
Positioning Mode Indicator	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

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
Example:
$GPGSA,A,3,30,03,25,20,06,16,14,,,,,2.25,1.00,2.00*05<CR><LF>

Field	Example	Comments
Preamble	$	Start of sentence
Talker ID	GP	Navigation System GP=GPS GL=GLONASS BD= BeiDou (COMPASS)
Sentence ID	GSA	GNSS DOP and Active Satellites
Mode 1	A	M = Manual, forced to operate in 2D or 3D mode A = Automatic, allowed to automatically switch 2D/3D
Mode 2	3	1 = No Fix, 2 = 2D, 3 = 3D
ID of Satellite in use	30	Satellite used on channel 1
ID of Satellite in use	03	Satellite used on channel 2
ID of Satellite in use	25	Satellite used on channel 3
ID of Satellite in use	20	Satellite used on channel 4
ID of Satellite in use	06	Satellite used on channel 5
ID of Satellite in use	16	Satellite used on channel 6
ID of Satellite in use	14	Satellite used on channel 7
ID of Satellite in use		Satellite used on channel 8
ID of Satellite in use		Satellite used on channel 9
ID of Satellite in use		Satellite used on channel 10
ID of Satellite in use		Satellite used on channel 11
ID of Satellite in use		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
End of Data Fields	*	Asterisk delimiter
Checksum	05	Two character hexadecimal value
Terminator	<CR><LF>	End of sentence sequence

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

Field	Example	Comments
Preamble	$	Start of sentence
Talker ID	GP	Navigation System GP=GPS GL=GLONASS BD= BeiDou (COMPASS)
Sentence ID	GSV	GNSS Satellites in View
Number of sentences	2	Total number of sentences (1-9)
Sentence Number	1	Sequence number of this entry (1-9)
Satellites in View	08	Total number of satellites in view
Satellite ID 1	30	GPS Range: 1-32, GLONASS Range: 65-96
Elevation 1	09	Elevation angle in degrees, 0-90
Azimuth 1	045	Azimuth angle in degrees, True, 000-359
SNR 1	31	SNR (C/No), 00-99 dB-Hz, null while not tracking
Satellite ID 2	03	GPS Range: 1-32, GLONASS Range: 65-96
Elevation 2	11	Elevation angle in degrees, 0-90
Azimuth 2	196	Azimuth angle in degrees, True, 000-359
SNR 2	40	SNR (C/No), 00-99 dB-Hz, null while not tracking
Satellite ID 3	25	GPS Range: 1-32, GLONASS Range: 65-96
Elevation 3	52	Elevation angle in degrees, 0-90
Azimuth 3	007	Azimuth angle in degrees, True, 000-359
SNR 3	45	SNR (C/No), 00-99 dB-Hz, null while not tracking
Satellite ID 4	20	GPS Range: 1-32, GLONASS Range: 65-96
Elevation 4	17	Elevation angle in degrees, 0-90
Azimuth 4	300	Azimuth angle in degrees, True, 000-359
SNR 4	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

3.5. RMC-Recommended Minimum Specific GNSS Data

The time, date, position, course and speed data provided by a GNSS navigation receiver.
Example:
$GPRMC,082653.100,A,2446.4768,N,12100.0344,E,0.00,128.42,270705,,,A*67 <CR><LF>

Field	Example	Comments
Preamble	$	Start of sentence
Talker ID	GP	Navigation System GP=GPS GL=GLONASS GN=Global Navigation BD= BeiDou (COMPASS)
Sentence ID	RMC	Recommended Minimum Specific GNSS Data
UTC Time	082653.100	hhmmss.sss (hours, minutes, seconds)
Data Valid Status	A	A = Data valid V = Navigation receiver warning (data invalid)
Latitude	2446.4768	ddmm.mmmm (degrees and minutes)
N/A Indicator	N	N = North, S = South
Longitude	12100.0344	dddmm.mmmm (degrees and minutes)
E/W Indicator	E	E = East, W = West
Speed over ground	0.00	Knots
Course over ground	128.42	Degrees true
UTC Date	270705	ddmmyy (day, month, year)
Magnetic variation		Degrees magnetic
Magnetic variation		E = East, W = West
Mode Indicator	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	67	Two character hexadecimal value
Terminator	<CR><LF>	End of sentence sequence

3.6. VTG-Course over Ground and Ground Speed

The actual course and speed relative to the ground.
Example:
$GPVTG,128.42,T,,,0.00,N,0.00,K,A*7D<CR><LF>

Field	Example	Comments
Preamble	$	Start of sentence
Talker ID	GP	Navigation System GP=GPS GL=GLONASS GN=Global Navigation BD= BeiDou (COMPASS)
Sentence ID	VTG	Course Over Ground and Ground Speed
Course over ground	128.42	Measured heading, degrees true
Reference	T	T = True heading
Course over ground		Measured heading, degrees magnetic
Reference		M = Magnetic heading
Speed over ground	0.00	Measured horizontal speed
Units	N	N = Knots
Speed over ground	0.00	Measured horizontal speed
Units	K	K = Kilometers/hour (Km/h)
Positioning Mode Indicator	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

3.7. 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.
Example:
$GPZDA,201530.000,04,07,2002,00,00*50<CR><LF>

Field	Example	Comments
Preamble	$	Start of sentence
Talker ID	GP	Navigation System GP=GPS GL=GLONASS GN=Global Navigation BD= BeiDou (COMPASS)
Sentence ID	ZDA	UTC Date and Time
UTC time	201530.000	hhmmss.sss hh = UTC hours. mm = UTC minutes. ss.ss = UTC seconds.
UTC Day	04	Range: 01 to 31
UTC Month	07	Range: 01 to 12
UTC Year	2002	Range: 1980 to 2079
Local zone hour	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
Local zone minutes	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

4. MTK NMEA Input Messages

4.1. MTK000-Test

This message is a test packet used to test serial communication with the GNSS module.
Upon receiving this packet the module will respond with the packet message:
$PMTK001,0,3*30<CR><LF>
Example:
$PMTK000*32<CR><LF>

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

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.
Example:
$PMTK101*32<CR><LF>

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

4.3. MTK102-Warm Restart Command

This command directs the receiver to conduct a Warm Restart that does not use ephemeris data.
Example:
$PMTK102*31<CR><LF>

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

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.
Example:
$PMTK103*30<CR><LF>

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

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.
Example:
$PMTK104*37<CR><LF>

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

4.6. MTK161-Standby Mode

This command directs the receiver to enter standby mode for power saving.
Example:
$PMTK161,0*28<CR><LF>

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

4.7. MTK120-Clear the flash aid data

This command directs the receiver to erase aiding data stored in the flash memory
Example:
$PMTK120*31<CR><LF>

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

4.8. MTK127-Clear the Extended Prediction Orbit(EPO)data

This command directs the receiver to erase the Extended Predication Orbit (EPO) data stored in the flash memory.
Example:
$PMTK127*36<CR><LF>

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

4.9. MTK220-Position Fix Interval

This command sets the position fix interval.
Example:
$PMTK220,1000*1F<CR><LF>

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

4.10. MTK223-Set the 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.

Field	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)
Extension threshold	Default value: Extension threshold = 180000 msec (Range: 40000 to 180000}
Extension gap	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	XX - Two character hexadecimal value
Terminator	<CR><LF> - End of packet sequence

4.11. MTK225-Set the 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.

Field	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
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 or greater: Enable Range: 1000 to 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 to 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 or greater: Enable Range: Second set both 0 or 1000 to 518400000. Note: The Second Run Time should be larger than the First run time when non-zero value.
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 to 518400000.
End of Data Fields	* - Asterisk delimiter
Checksum	XX - Two character hexadecimal value
Terminator	<CR><LF> - End of packet sequence

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

4.12. MTK251-Set the 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

Example:
$PMTK251,38400*27<CR><LF>

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK251	Talker ID, Pkt Type
Baudrate	38400	NMEA serial port baudrate 0 = Default setting 4800 (See Note 1) 9600 14400 19200 38400 57600 115200 230400 (See Note 1) 460800 921680 (See Note 1)
End of Data Fields	*	Asterisk delimiter
Checksum	27	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence
Note 1: Not supported by all firmware versions		

4.13. MTK286-Set the Active Interference Cancellation (AIC) function

This command enables or disables the Active Interference Cancellation function.
Example:
$PMTK286,1*23<CR><LF>

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

4.14. MTK299–Set the Output Debug

This command enables or disables Debug Log output.
Example:
$PMTK299,1*2D<CR><LF>
Note: This command may not be available in some firmware versions.

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

4.15. MTK300-Set the Fix Interval between Position Fixes

This command sets the Fix Interval between Position Fixes
Upon receipt of this packet, the receiver will respond with a PMTK001 message containing the specified fix interval.
Note: Changes made using this command are not permanently stored in Flash.
Example:
#PMTK300,1000,0,0,0,0*1C<CR><LF>

Field	Example	Comments
Preamble	$	Start of sentence
Header	PMTK300	Talker ID, Pkt Type
Fix Interval	1000	Position fix interval in milliseconds. Range: 100 to 10000
Reserved	0	must be zero
Reserved	0	must be zero
Reserved	0	must be zero
Reserved	0	must be zero
End of Data Fields	*	Asterisk delimiter
Checksum	1C	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

4.16. MTK301-Set the DGPS correction data source mode

This command sets the DGPS correction data source mode.
Example:
$PMTK301,1*2D<CR><LF>

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

4.17. MTK313-Set the Enable or Disable SBAS satellite search

This command enables or disables SBAS satellite search.
Example:
$PMTK313,1*2E<CR><LF>

Field	Example	Comments
Preamble	$	Start of sentence
Header	PMTK313	Talker ID, Pkt Type
SBAS Search	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

4.18. MTK314-Set the NMEA sentence output rates

This command sets the NMEA sentence output rates.
This packet contains 19 data fields used to set the output rates for the various NMEA sentences.
Example:
$PMTK314,1,1,1,1,1,5,0,0,0,0,0,0,0,0,0,0,0,1,0*2D<CR><LF>

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. Reserved	0		
7. Reserved	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. NMEA_SEN_ZDA	1	ZDA output rate	
18. Reserved	0		
End of Data Fields	*	Asterisk delimiter	
Checksum	2D	Two character hexadecimal value	
Terminator	<CR><LF>	End of packet sequence	

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

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

4.19. MTK330-Set the 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.
Example:
$PMTK330,0*2E<CR><LF>

Field	Example	Comments
Preamble	$	Start of sentence
Header	PMTK330	Talker ID, Pkt Type
Datum	0	0 = WGS-84 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

4.20. MTK331-Set the user defined datum

This command sets user defined datum.
Example:
$PMTK331,6377397.155,299.1528128,-148.0,507.0,685.0*16<CR><LF>

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

4.21. MTK335-Set the 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.
Example:
$PMTK335,2007,1,1,0,0,0*02<CR><LF>

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK335	Talker ID, Pkt Type
Year	2007	
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

4.22. MTK351-Set the 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.
Example:
$PMTK351,1*28<CR><LF>

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

4.23. 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.
Examples:
$PMTK352,0*2A<CR><LF> : Disables the "Stop QZSS Function", Enables QZSS
$PMTK352,1*2B<CR><LF> : Enables the "Stop QZSS Function", Disables QZSS

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK352	Talker ID, Pkt Type
QZSS Stop Function	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

4.24. MTK353-Set the GNSS Search Mode

This command sets the receiver to search specified satellite systems.
The setting will be available when NVRAM data is valid.
Example:
$PMTK353,0,1,0,0,0*2A<CR><LF>

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.		

4.25. MTK355-Query the GNSS search mode

This command queries GLONASS, BEIDOU and GALILEO search setting.
Query Example:
$PMTK355*31<CR><LF>
Acknowledge Example:
$PMTK001,355,3,GLON_Enable,BEIDOU_Enabled,GALILEO_Enabled

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

4.26. MTK356-Set the 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.
Set Example:
$PMTK356,0.8*38<CR><LF>
Return Example:
$PMTK356,0.8,Set OK!*5F<CR><LF>

Field	Set Example	Return Example	Comments
Preamble	$	$	Start of packet
Header	PMTK356	PMTK356	Talker ID, Pkt Type
HDOPThreshold	0.8	0.8	0: Disable this function Other value: Enable “Set the HDOP Threshold” Return value: HDOPThreshold
Return Msg		Set OK!	HDOP setting return message.
End of Data Fields	*	*	Asterisk delimiter
Checksum	38	5F	Two character hexadecimal value
Terminator	<CR><LF>	<CR><LF>	End of packet sequence

4.27. MTK357-Get the HDOP Threshold

This command gets the HDOP threshold.
Get Example:
$PMTK357*33
Return Example:
$PMTK357,0.8*39<CR><LF>

Field	Get Example	Return Example	Comments
Preamble	$	$	Start of packet
Header	PMTK357	PMTK357	Talker ID, Pkt Type
HDOPThreshold		0.8	0: Disabled Other values: Enabled
End of Data Fields	*	*	Asterisk delimiter
Checksum	33	39	Two character hexadecimal value
Terminator	<CR><LF>	<CR><LF>	End of packet sequence

4.28. MTK386-Set the 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.
Example:
$PMTK386,0.4*39<CR><LF>

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK386	Talker ID, Pkt Type
Nav Speed Threshold	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

4.29. MTK389-Set the TCXO debug

This command sets the switch controlling the display of the TCXO drift at every fix.
Example:
$PMTK389,1*2D<CR><LF>

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK389	Talker ID, Pkt Type
on_off	1	0 = off 1 = on (Turn on $PMTK589 output at every fix)
End of Data Fields	*	Asterisk delimiter
Checksum	2D	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

4.30. MTK399-Set the flash data

This command writes data to the flash memory.
Example:
$PMTK399,1c0,7,30,5C,22,1D,02,04,01*4F<CR><LF>

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

4.31. MTK400-Query the Fix Control value

This command queries the Fix Control value. The receiver responds with a PMTK500 packet.
Example:
$PMTK400*36<CR><LF>

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

4.32. MTK401-Query the DGPS Mode

This command queries the DGPS Mode. This is the DGPS data source that is selected. The receiver responds with a PMTK501 packet.
Example:
$PMTK401*37<CR><LF>

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

4.33. MTK413-Query the SBAS status

This command queries the SBAS status. The receiver responds with a PMTK513 packet.
Example:
$PMTK413*34<CR><LF>

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

4.34. MTK414-Query the NMEA output rates

This command queries the current NMEA sentence output rates. The receiver responds with a PMTK514 packet.
Example:
$PMTK414*33<CR><LF>

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

4.35. MTK430-Query the default datum

This commands queries the default datum. The receiver responds with a PMTK530 packet.
Example:
$PMTK430*35<CR><LF>

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

4.36. MTK431-Query the datum advance

This command queries the user defined datum. The receiver responds with the PMTK530 packet.
Example:
$PMTK431*34<CR><LF>

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

4.37. MTK499-Get the Flash data

This command reads the flash memory. The receiver responds with the PMTK599 packet.
Example:
$PMTK499,1C0,7*43<CR><LF>

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

4.38. MTK500-Data Fix control

These parameters control the rate of position fixing activity.
Example:
$PMTK500,1000,0,0,0,0*1A<CR><LF>

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK500	Talker ID, Pkt Type
Fix Interval	1000	Position fix interval. (msec) [>=200]
Data Field	0	
Data Field	0	
Data Field	0	
Data Field	0	
End of Data Fields	*	Asterisk delimiter
Checksum	1A	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

4.39. MTK605-Query the Firmware release information

This command queries the receiver for the firmware release information. The receiver responds with the PMTK705 packet.
Example:
$PMTK605*31<CR><LF>

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

4.40. MTK607-Query the EPO info

This command queries the receiver for the Extended Prediction Orbit (EPO) Data Valid day check.
Example:
$PMTK607*33<CR><LF>

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

4.41. MTK660-Query the Available SV Ephemeris

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.
Example:
$PMTK660,1800*17<CR><LF>
Response from Receiver:
$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.

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK660	Talker ID, Pkt Type
Time Interval	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

4.42. MTK661-Query the Available SV ALM

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.
Example:
$PMTK661,30*1C<CR><LF>
Response from Receiver:
$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.

Field	**Example**	**Comments**
Preamble	$	Start of packet
Header	PMTK661	Talker ID, Pkt Type
Time Interval	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

4.43. MTK667-Query the UTC Correction Data

This command queries the current UCT correction parameters. The receiver will respond with a packet containing the UTC correction parameters.
Query Example:
$PMTK667*35<CR><LF>
Response Example:
$PMTK667,0,0,16,507904,237,3,17*12<CR><LF>

PMTK667 Query		
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

PMTK667 Response		
Field	**Example**	**Comments**
Preamble	$	Start of packet
Header	PMTK667	Talker ID, Pkt Type
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	12	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

4.44. 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.
Example:
$PMTK810,0003,1D*4D<CR><LF>

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 (See Note below) Bits 4-15: Reserved
SVID	1D	Satellite ID. Range: 1-20 (Hex format)
End of Data Fields	*	Asterisk delimiter
Checksum	1D	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

Note: 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.

4.45. MTK811-Test Stop

This command directs the receiver to leave MP test mode.
Example:
$PMTK811*3A<CR><LF>

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

4.46. MTK837-Jamming scan test

This command directs the receiver to enter jamming scan test .
Example:
$PMTK837,1,50*0A<CR><LF>
Jamming scan test 50 times.

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

4.47. MTK875-Enable the PMTKLSC Leap Second Change (LSC)

This command enables or disables the PMTKLSC output.
Query if PMTKLSC sentence output enabled.
Set Example:
$PMTK875,1,1*38<CR><LF>
PMTKLSC and PMTKLSCB sentence output
Set Example:
$PMTK875,1,0*39<CR><LF>
Disables PMTKLSC and PMTKLSCB sentence output
Query Example:
$PMTK875,0*24<CR><LF>
Query PMTKLSC sentence output enabled
Response Example:
$PMTK875,2,0*3A<CR><LF>
PMTKLSC sentence output disabled.

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

Returned Messages:
$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>

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.
Example:
$PMTK001,604,3*32<CR><LF>

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

5.2. MTK010-System Message

This message is used by the GPS module to output system messages.
Example:
$PMTK010,001*2E<CR><LF>

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

5.3. MTK011-Text Message

This message contains a text message sent by the GNSS receiver to the host processor.
Example:
$PMTK011,MTKGPS*08<CR><LF>

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

5.4. 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.
Example:
$PMTK501,1*2B<CR><LF>

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

5.5. 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.
Example:
$PMTK513,1*28<CR><LF>

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

5.6. 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.
Example:
$PMTK514,1,1,1,1,1,5,1,1,1,1,1,1,0,1,1,1,1,1,1*2A<CR><LF>

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. Reserved	1	
7. Reserved	1	
8. Reserved	1	
9. Reserved	1	
10. Reserved	1	
11. Reserved	1	
12. Reserved	0	
13. Reserved	1	
14. Reserved	1	
15. Reserved	1	
16. Reserved	1	
17. ZDA	1	
18. Reserved	1	
End of Data Fields	*	Asterisk delimiter
Checksum	2A	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

5.7. MTK530-Current datum

This packet reports the current datum used by the receiver.
Example:
$PMTK530,0*28<CR><LF>

Field	Example	Comments
Preamble	$	Start of packet
Header	530	Talker ID, Pkt Type
Datum	0	0 = WGS-84 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

5.8. MTK589-TCXO clock drift value

This packet reports the value of the TCXO clock drift value.
Example:
$PMTK589,1,052130.000,-0.4712*03<CR><LF>

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK589	Talker ID, Pkt Type
valid	1	0 = data is not reliable 1 = data is ready
UTC	052130.000	UTC time
TCXO_drift_ppm	-0.4712	TCXO clock drift in ppm
End of Data Fields	*	Asterisk delimiter
Checksum	03	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

5.9. MTK599-Flash Data

This packet reports data in the flash memory.
Example:
$PMTK599,1C,7,30,5C,22,1D,02,04,01*59<CR><LF>

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

5.10. MTK705-Firmware release information

This message reports firmware release information.
Example:
$PMTK705,AXN_0.2,1234,ABCD,*14<CR><LF>

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

5.11. 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.
Example:
$PMTK740,2010,2,10,9,0,58*05<CR><LF>
This example indicates that the current U TC time is 2010/Feb/10, 09:00:58

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK740	Talker ID, Pkt Type
YYYY	2010	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

5.12. 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.
Example:
$PMTK741,24.772816,121.022636,160,2011,8,1,08,00,00*12<CR><LF>

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK471	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	2011	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	36	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

5.13. MTK812-Test Finish

This packet reports the Mass Production (MP) testing has finished.
Example:
$PMTK812*39<CR><LF>

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

5.14. MTK813-Test All ACQ

This packet is the result of the TEST ACQ test.
Example:
$PMTK813,29,2*01<CR><LF>
The target device acquires SV29 within 2 seconds.

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

5.15. MTK814-Test All Bit Sync

This packet reports the result of the TEST_BITSYNC test.
Example:
$PMTK814,29,1*05<CR><LF>
With regard to SV29, the target device reach bit sync state within 1 second.

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK814	Talker ID, Pkt Type
SVID	29	Satellite ID
BitSync Time	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

5.16. MTK815-Test all Signal

This packet reports the result of the TEST_SIGNAL test.
Example:
$PMTK815,29,16,98,10000,30,4100,0*18<CR><LF>

Field	Example	Comments
Preamble	$	Start of packet
Header	PMTK815	Talker ID, Pkt Type
SVID	29	Satellite ID
Testing Time	16	Test duration (seconds)
Phase Error	98	Scale factor: 0.01
TCXO offset	10000	Scale factor: 0.001 (Hz)
TCXO Drift	30	Scale factor: 0.001 (Hz)
C/No mean	4100	Scale factor: 0.01
C/No sigma	0	Scale factor: 0.01
End of Data Fields	*	Asterisk delimiter
Checksum	18	Two character hexadecimal value
Terminator	<CR><LF>	End of packet sequence

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 variat SW string to MT33-1.1.106