V13
Software User Guide

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APPLICABILITY TABLE

PRODUCTS

- SE868-A
- SE868-AS
- SE868K3-A
- SE868K3-AL
- SE868K7-A
- SE868K7-AL
- SE878K3-A
- SL871
- SL871L
- SL871-S
- SL871L-S
- SL869-V2
- SL869L-V2
- SL869-V2S
- SL869L-V2S
- SC872-A
- SC874-A

SOFTWARE

- V13-2.2.1-STD-3.8.13 and subsequent versions
- V13-2.3.1-STD-5.1.5 and subsequent versions
- AXN_2.32_3337_15010801

CONTENTS

TABLE LIST

1. INTRODUCTION

1.1. Scope

This document describes the basic serial communication interface for any GNSS receiver module within the V13 firmware family.

1.2. Audience

This document is intended for public distribution to potential customers who are evaluating a GNSS module from the V13 firmware family listed in the Applicability Table. It can also be used by customers who are developing application software for a Host Processor contained within their product that incorporates one of the listed modules.

1.3. Contact Information, Support

For general contact, technical support services, technical questions and report documentation errors contact Telit Technical Support at:

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

Alternatively, use:

https://www.telit.com/contact-us

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

http://www.telit.com

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.

1.4. 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 module, if these points are not followed, the module and end user equipment may fail or malfunction.

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

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

1.5. Related Documents

[1] NMEA-0183 Standard for Interfacing Marine Electronic Devices Version 3.01
[2] Interface Specification IS-GPS-200G, 2012-09-05
[3] Galileo-OS-SIS-ICD, Issue 1.3, December 2016
[4] MTK NMEA Packet User Manual
[5] MTK NMEA Sentence Output
[6] Telit SE868xx-A Family Product User Guide, 1VV0301201
[7] Telit SL871 Family Product User Guide, 1VV0301170
[8] Telit SL869x-V2 Family Product User Guide, 1VV0301175
[9] Telit SC872-A Product User Guide, 1VV0301202
[10] Telit GNSS Software Extensions User Guide, 1VV0301544

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 [1].

This document does not describe the NMEA 0183 standard, however an overview of NMEA messages format is provided in Appendix A – Standard NMEA Messages Format.

This document makes use of MediaTek specific terminology which may differ from the one used in the NMEA-0183 protocol standard specification.

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

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

2.2. Proprietary NMEA Message Format

In addition to the use of standard NMEA sentences, the GNSS receiver modules within the V13 firmware family communicates with the host processor using MediaTek proprietary messages.

These messages start with the “$” character, which is then followed by the proprietary address field string that uses the Manufacturer’s Mnemonic Code registered by MediaTek with the NMEA, which is “MTK”. Thus, the proprietary address field is of the form:

$PMTKxxx

Where, *xxx* represents a Sentence Identifier in decimal format referred to as PktType.

The MTK NMEA packets are messages that follow the NMEA sentence format with the exception that the maximum allowed number of characters in a packet is 255.

Section 3.2 Proprietary NMEA Output Messages and 4.1 Proprietary NMEA Input Messages of this document describe MediaTek Proprietary NMEA Messages that can be used to control the receiver and output extra information beyond the NMEA-0183 standard definition.

In addition to the standard NMEA output messages as well as MediaTek proprietary messages, V13 firmware supports Telit proprietary messages, that comply with NMEA 0183, to further enhance the control of the GNSS receiver and expose more functionalities.
Please contact Telit Technical Support for further information.

3. NMEA OUTPUT MESSAGES

V13 firmware outputs a set of standard NMEA messages which have formats that are compatible with the NMEA sentences in version 3.01 of the NMEA-0183 Interface Standard. The set of standard NMEA messages are described in section 3.1 Standard NMEA Output Messages below.

Additionally, the Beidou GNSS constellation is incorporated into these standard message formats by the introduction of a 'BD' Talker Identifier, and also by including Beidou as "another satellite system" mentioned in the GNS format description in the NMEA Interface Standard.

Satellite IDs used by V13 firmware for the Galileo and Beidou constellations, as well as IDs for QZSS and SBAS satellites, are specified in Appendix B – Satellite ID Mapping of this guide.

Note that satellite IDs for GPS, GLONASS and SBAS satellites are as specified in the NMEA Interface Standard.

3.1. Standard NMEA Output Messages

3.1.1. GGA – Global Positioning System Fix Data

This message provides time, position, and fix related data for a GNSS receiver.

An example of this message is:

*$GPGGA,002153.000,3342.6618,N,11751.3858,W,1,10,1.2,27.0,M,-34.2,M,,*5E*
<CR><LF>

Field	Example	Description
Talker ID	GP	Navigation System GP = GPS GL = GLONASS BD = BEIDOU (BDS) GA = GALILEO GN = Global Navigation/Multi-constellation
Sentence ID	GGA	Global Positioning System Fix Data
UTC Time	002153.000	hhmmss.sss (hours,minutes,seconds)
Latitude	3342.6618	ddmm.mmmm (degrees and minutes)
N/S Indicator	N	N = North, S = South
Longitude	11751.3858	dddmm.mmmm (degrees and minutes)
E/W Indicator	W	E = East, W = West
Position Fix 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

Field	Example	Description
		6 = Estimated (dead reckoning) Mode
Satellites Used	10	Number of satellites in use in fix. Range is 0 to24.
HDOP	1.2	Horizontal Dilution of Precision
MSL Altitude	27.0	Antenna altitude above/below Mean Sea Level (MSL) geoid surface
Units	M	M = Meters
Geoid Separation	-34.2	Geoid-to-ellipsoid separation Ellipsoid altitude: Geoid MSL altitude – Geoid Separation
Units	M	M = Meters
Age of Differential Data	-	NULL, field not supported
Diff. Ref. Station ID	-	NULL, field not supported

Table 1 GGA – Global Positioning System Fix Data Message Structure

A valid status is derived from all the parameters set in the software. This includes the minimum number of satellites required, any DOP mask setting and the presence of DGPS corrections. If a required factor is not met, the solution is marked as invalid.

3.1.2. GLL – Geographical Position-Latitude/Longitude

This message provides latitude, longitude, time, and status of Navigation Solution.

An example of this message is:

*$GPGLL,3723.2475,N,12158.3416,W,161229.487,A,A*41<CR><LF>*

Field	Example	Description
Talker ID	GP	Navigation System GP = GPS GL = GLONASS BD = BEIDOU (BDS) GA = GALILEO GN = Global Navigation/Multi-constellation
Sentence ID	GLL	Geographical Position-Latitude/Longitude
Latitude	3723.2475	ddmm.mmmm (degrees and minutes)

Field	Example	Description
N/S Indicator	N	N = North, S = South
Longitude	12158.3416	dddmm.mmmm (degrees and minutes)
E/W Indicator	W	E = East, W = West
UTC Time	161229.487	hhmmss.sss (hours,minutes,seconds)
Status	A	A = Data valid V = Data not valid
Mode	A	A = Autonomous D = DGPS E = DR N = Output Data Not Valid

Table 2 GLL – Geographical Position-Latitude/Longitude Message Structure

3.1.3. GSA – GNSS DOP and Active Satellites

This message provides GNSS receiver operating mode, satellites used in the navigation solution, and DOP values.

An example of this message is:

*$GPGSA,A,3,07,02,26,27,09,04,15,,,,,1.8,1.0,1.5,1*2E<CR><LF>*

Field	Example	Description
Talker ID	GN	Navigation System GP = GPS GL = GLONASS BD = BEIDOU (BDS) GA = GALILEO
Sentence ID	GSA	GNSS DOP and Active Satellites
Mode 1	A	A = Automatic, allowed to automatically switch 2D/3D
Mode 2	3	1 = Fix not available 2 = 2D (<4SV s used) 3 = 3D (>3 SV s used)
Satellite Used [1]	07	Satellite ID used in the solution – Range varies by constellation (see Appendix B – Satellite ID Mapping)
Satellite Used [2]	02	Satellite ID used in the solution – Range varies by constellation (see Appendix B – Satellite ID Mapping)
Satellite Used [3]	26	Satellite ID used in the solution – Range varies by constellation (see Appendix B – Satellite ID Mapping)

Field	Example	Description
Satellite Used [4]	27	Satellite ID used in the solution – Range varies by constellation (see Appendix B – Satellite ID Mapping)
Satellite Used [5]	09	Satellite ID used in the solution – Range varies by constellation (see Appendix B – Satellite ID Mapping)
Satellite Used [6]	04	Satellite ID used in the solution – Range varies by constellation (see Appendix B – Satellite ID Mapping)
Satellite Used [7]	15	Satellite ID used in the solution – Range varies by constellation (see Appendix B – Satellite ID Mapping)
Satellite Used [8]	-	Satellite ID used in the solution – Range varies by constellation (see Appendix B – Satellite ID Mapping)
Satellite Used [9]	-	Satellite ID used in the solution – Range varies by constellation (see Appendix B – Satellite ID Mapping)
Satellite Used [10]	-	Satellite ID used in the solution – Range varies by constellation (see Appendix B – Satellite ID Mapping)
Satellite Used [11]	-	Satellite ID used in the solution – Range varies by constellation (see Appendix B – Satellite ID Mapping)
Satellite Used [12]	-	Satellite ID used in the solution – Range varies by constellation (see Appendix B – Satellite ID Mapping)
PDOP	1.8	Position Dilution of Precision
HDOP	1.0	Horizontal Dilution of Precision
VDOP	1.5	Vertical Dilution of Precision

Table 3 GSA – GNSS DOP and Active Satellites Message Structure

3.1.4. GSV – GNSS Satellites in View

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

An example of GPS-only messages are:

*$GPGSV,2,1,07,07,79,048,42,02,51,062,43,26,36,256,42,27,27,138,42*71<CR><LF>*

*$GPGSV,2,2,07,09,23,313,42,04,19,159,41,15,12,041,42*41<CR><LF>*

Examples of GLONASS-only satellites in view reporting messages are:

*$GLGSV,2,1,07,73,14,302,39,66,33,037,39,80,13,251,38,83,16,313,38*64<CR><LF>*

*$GLGSV,2,2,07,81,36,083,36,68,29,185,31,82,53,003,43*53<CR><LF>*

Field	Example	Description
Talker ID	GP	Navigation System GP = GPS GL = GLONASS BD = BEIDOU (BDS) GA = GALILEO
Sentence ID	GSV	GNSS Satellites in View
Number of Messages	2	Total number of GSV messages to be sent in this group
Message Number	1	Message number in this group of GSV messages
Satellite in View	07	Total number of satellites in view
Satellite ID1	07	Range varies by constellation (see Appendix B – Satellite ID Mapping)
Elevation1	79	Elevation angle in degrees, 0-90
Azimuth1	048	Azimuth angle in degrees, True, 000-359 clockwise from true North
SNR1	42	SNR (C/No), 00-99 dB-Hz, null while not tracking
Satellite ID2	02	Range varies by constellation (see Appendix B – Satellite ID Mapping)
Elevation2	51	Elevation angle in degrees, 0-90
Azimuth2	062	Azimuth angle in degrees, True, 000-359 clockwise from true North
SNR2	43	SNR (C/No), 00-99 dB-Hz, null while not tracking
Satellite ID3	26	Range varies by constellation (see Appendix B – Satellite ID Mapping)
Elevation3	36	Elevation angle in degrees, 0-90
Azimuth3	256	Azimuth angle in degrees, True, 000-359 clockwise from true North
SNR3	42	SNR (C/No), 00-99 dB-Hz, null while not tracking
Satellite ID4	27	Range varies by constellation (see Appendix B – Satellite ID Mapping)
Elevation4	27	Elevation angle in degrees, 0-90
Azimuth4	138	Azimuth angle in degrees, True, 000-359 clockwise from true North
SNR4	42	SNR (C/No), 00-99 dB-Hz, null while not tracking

Table 4 GSV – GNSS Satellites in View Message Structure

3.1.5. RLM – Return Link Message

This message is used to transfer a Return Link Message received by a Return Link Service (RLS) compatible GNSS Receiver from a Cospas-Sarsat recognized Return Link Service Provider (RLSP) to an RLS compliant Cospar-Sarsat 406 MHz Beacon.

The RLM sentence supports communications to an emitting beacon once a distress alert has been detected, located, and confirmed. The communications may include acknowledgement of the alert to the emitting beacon as well as optional text messages and may also include remote beacon configuration and testing.

An example of this message is:

*$GARLM,0A0A0A0A0A0A0A0,120051.00,1,8AA0*04<CR><LF>*

Field	Example	Description
Talker ID	GA	Navigation System GP = GPS GL = GLONASS BD = BEIDOU (BDS) GA = GALILEO GN = Global Navigation/Multi-constellation
Sentence ID	RLM	Return Link Message
Beacon ID	0A0A0A0A0A0A0A0	hhhhhhhhhhhhhhh Identifies the beacon intended to receive this message. This is a fixed length 15 hexadecimal character data field
Time of reception	120051.00	hhmmss.ss Indicates the RLM timestamp (i.e. the time of reception of the last 20 bit packet of the RLM) in UTC. The field does not support decimal seconds. Any decimal point or decimal seconds should be ignored. A = Data valid V = Data not valid
Message code	1	h The Message code field identifies the Type of RLM Message Service: 0 = Reserved for future RLM services 1 = Acknowledgement Service RLM 2 = Command Service RLM 3 = Message Service RLM 4 – E = Reserved for future RLM services F = Test Service RLM (currently used only by the Galileo Program)

Field	Example	Description
Message body	8AA0	h - - h The Message body is a variable length field encapsulating the data parameters provided by the RLSP into hexadecimal format. Galileo OS SIS ICD defines a Short Message containing 16 bits (4 hex characters) and a Long Message containing 96 bits (24 hex characters). Other GNSS, such as GLONASS may define a different length message.

Table 5 RLM – Return Link Message Structure

The content and structure of **Beacon ID**, **Message code,** and **Message body** fields are defined by [3].

3.1.6. RMC – Recommended Minimum Specific GNSS Data

This message provides time, date, position, course and speed data provided by a GNSS navigation receiver.

An example of this message is:

*$GPRMC,161229.487,A,3723.2475,N,12158.3416,W,0.13,309.62,120598,,,A,*7D <CR><LF>*

Field	Example	Description
Talker ID	GP	Navigation System GP = GPS GL = GLONASS BD = BEIDOU (BDS) GA = GALILEO GN = Global Navigation/Multi-constellation
Sentence ID	RMC	Recommended Minimum Specific GNSS Data
UTC Time	161229.487	hhmmss.sss (hours,minutes,seconds)
Status	A	A = Data valid V = Data not valid
Latitude	3723.2475	ddmm.mmmm (degrees and minutes)
N/S Indicator	N	N = North, S = South
Longitude	12158.3416	dddmm.mmmm (degrees and minutes)

Field	Example	Description
E/W Indicator	W	E = East, W = West
Speed Over Ground	0.13	Knots
Course Over Ground	309.62	True, degrees
Date	120598	ddmmyy (day, month, year)
Magnetic Variation	-	NULL, field not supported
East/West Indicator	-	NULL, field not supported
Mode	A	A = Autonomous mode D = Differential mode E = Estimated (dead reckoning) mode N = Data not valid

Table 6 RMC – Recommended Minimum Specific GNSS Data Message Structure

3.1.7. VTG – Course over Ground and Ground Speed

This message provides the actual course and speed relative to the ground.

An example of this message is:

*$GPVTG,309.62,T,,,0.13,N,0.2,K,A*4E<CR><LF>*

Field	Example	Description
Talker ID	GP	Navigation System GP = GPS GL = GLONASS BD = BEIDOU (BDS) GA = GALILEO GN = Global Navigation/Multi-constellation
Sentence ID	VTG	Course over Ground and Ground Speed
Course Over Ground	309.62	Measured heading, degrees
Reference	T	True
Course Over Ground	-	NULL, field not supported
Reference	-	NULL, field not supported
Speed Over Ground	0.13	Measured horizontal speed
Units	N	Knots
Speed Over Ground	0.2	Measured horizontal speed

Field	Example	Description
Units	K	Km/h
Mode	A	A = Autonomous mode D = Differential mode E = Estimated (dead reckoning) mode N = Data not valid

Table 7 VTG – Course Over Ground and Ground Speed Message Structure

3.1.8. ZDA – UTC Date/Time and Local Time Zone Offset

This message provides UTC, day, month, year, and local time zone.

ZDA is included only with systems that support a time-mark output pulse identified as 1PPS. This message outputs the time associated with the current 1PPS pulse. Each message is output within a few hundred m/s after the 1PPS pulse rising edge and provides the time of the pulse that just occurred.

This message reports the UTC time and date represented by the immediately preceding 1PPS pulse.

An example of this message is:

*$GNZDA,080619.000,06,02,2019,,*40<CR><LF>*

Field	Example	Description
Talker ID	GP	Navigation System GP = GPS GL = GLONASS BD = BEIDOU (BDS) GA = GALILEO GN = Global Navigation/Multi-constellation
Sentence ID	ZDA	UTC Date/Time and Local Time Zone Offset
UTC Time	080619.000	hhmmss.sss (hours,minutes,seconds)
Day	06	01 to 31
Month	02	01 to 12
Year	2019	1980 to 2079
Local Zone Hour	-	NULL, field not supported
Local Zone Minutes	-	NULL, field not supported

Table 8 ZDA – UTC Date/Time and Local Time Zone Offset Message Structure

3.2. Proprietary NMEA Output Messages

3.2.1. PMTK001 – Acknowledge

PMTK001 message is sent by the GNSS receiver in response to a PMTK packet command.

An example of this message is:

*$PMTK001,604,3*32<CR><LF>*

Field	Example	Description
Message Header	PMTK001	Acknowledge
Cmd	604	Acknowledged MTK Packet
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

Table 9 PMTK001 – Acknowledge Message Structure

3.2.2. PMTK010 – System Message

PMTK010 message is used by the GNSS receiver to output system messages.

An example of this message is:

*$PMTK010,001*2E<CR><LF>*

Field	Example	Description
Message Header	PMTK010	System Message
Msg	001	System messages 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

Table 10 PMTK010 – System Message Structure

3.2.3. PMTK011 – Text Message

PMTK011 message is used by the GNSS receiver to send a text message to host processor.

An example of this message is:

*$PMTK011,MTKGPS*08<CR><LF>*

Field	Example	Description
Message Header	PMTK011	Text Message
Message	MTKGPS	Text Message

Table 11 PMTK011 – Text Message Structure

3.2.4. PMTK357 – HDOP Threshold Value

PMTK357 message reports the HDOP threshold.

This message is sent in response to a PMTK357 poll command.

An example of this message is:

*$PMTK357,0.8*39<CR><LF>*

Field	Example	Description
Message Header	PMTK357	HDOP Threshold Value
HDOP Threshold	0.8	Threshold value currently in use

Table 12 PMTK357 – HDOP Threshold Value Message Structure

3.2.5. PMTK500 – Data Fix Control Value

PMTK500 message reports the rate of position fixes.

This message is sent in response to a PMTK400 poll command.

An example of this message is:

*$PMTK500,1000,0,0,0,0*1A<CR><LF>*

Field	Example	Description
Message Header	PMTK500	Data Fix Control Value
FixInterval	1000	Position Fix Interval (ms) 100 ~ 10000
Reserved	0	-
Reserved	0	-

Field	Example	Description
Reserved	0	-
Reserved	0	-

Table 13 PMTK500 – Data Fix Control Value Message Structure

3.2.6. PMTK501 – DGPS Data Source Mode

PMTK501 message reports information on the source of DGPS data.

This message is sent in response to a PMTK401 poll command.

An example of this message is:

*$PMTK501,1*2B<CR><LF>*

Field	Example	Description
Message Header	PMTK501	DGPS Data Source Mode
Mode	1	DGPS Data Source Mode 0 = No DGPS source 1 = RTCM 2 = SBAS (WAAS/EGNOS/MSAS)

Table 14 PMTK501 – DGPS Data Source Mode Message Structure

3.2.7. PMTK511 – Satellite Elevation Mask

PMTK511 message reports information on the current elevation mask setting.

This message is sent in response to a PMTK411 poll command.

An example of this message is:

*$PMTK511,5*2E<CR><LF>*

Field	Example	Description
Message Header	PMTK511	Satellite Elevation Mask
Mode	5	Current Satellite elevation mask (degrees)

Table 15 PMTK511 – Satellite Elevation Mask Message Structure

3.2.8. PMTK513 – SBAS Status

PMTK513 message reports information on the status of SBAS (enabled/disabled).

This message is sent in response to a PMTK413 poll command.

An example of this message is:

*$PMTK513,1*28<CR><LF>*

Field	Example	Description
Message Header	PMTK513	SBAS Enabled
Mode	1	0 = SBAS Disabled 1 = SBAS Enabled

Table 16 PMTK513 – SBAS Status Message Structure

3.2.9. PMTK514 – NMEA Output Rates

PMTK514 message reports information on the NMEA output messages rate settings.

This message is sent in response to a PMTK414 poll command.

An example of this message is:

*$PMTK514,1,1,1,1,1,5,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0*37<CR><LF>*

Field	Example	Description
Message Header	PMTK514	NMEA Output Rates
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	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	

Field	Example	Description
16. Reserved	0	
17. ZDA	1	
18. Reserved	0	
19. Reserved	0	
20. Reserved	0	
21. Reserved	0	

Table 17 PMTK514 – NMEA Output Rates Message Structure

Please refer to PMTK314 command description for the supported NMEA sentences and rate settings.

3.2.10. PMTK530 – Current Datum

PMTK530 message reports the current Datum used by the receiver.

This message is sent in response to a PMTK430 poll command.

An example of this message is:

*$PMTK530,0*28<CR><LF>*

Field	Example	Description
Message Header	PMTK530	Current Datum
Datum	0	0 = WGS84 1 = TOKYO-M 2 = TOKYO-A See Appendix C – Datum List for information on supported datums

Table 18 PMTK530 – Current Datum Message Structure

3.2.11. PMTK535 – RTC UTC Time

PMTK535 message reports the current RTC UTC time.

This message is sent in response to a PMTK435 poll command.

An example of this message is:

*$PMTK535,2016,3,30,0,32,14*30<CR><LF>*

Field	Example	Description
Message Header	PMTK535	RTC UTC Time
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

Table 19 PMTK535 – RTC UTC Time Message Structure

3.2.12. PMTK702 – Output Data Port Data Type and Baud Rate

PMTK702 message reports the current data port input/output data type and baud rate settings.

This message is sent in response to a PMTK602 poll command.

An example of this message is:

*$PMTK702,1,1,9600*14<CR><LF>*

Field	Example	Description
Message Header	PMTK702	Output Data Port Data Type and Baud Rate
InputType	1	Input type 0 = DPORT_IN_NONE 1 = DPORT_IN_RTCM 2 = DPORT_IN_NMEA
OutputType	1	Output type 0 = DPORT_OUT_NONE 3 = DPORT_OUT_DEBUG
BaudRate	9600	Baud rate setting 4800 9600 19200 38400 57600 115200

Table 20 PMTK702 – Output Data Port Data Type and Baud Rate Message Structure

4. NMEA INPUT MESSAGES

4.1. Proprietary NMEA Input Messages

4.1.1. PMTK000 – Test

PMTK000 message is used to test serial communication with the GNSS module.

An example of this message is:

*$PMTK000*32<CR><LF>*

Field	Example	Description
Message Header	PMTK000	Test packet

Table 21 PMTK000 – Test Message Structure

4.1.2. PMTK101 – Hot Restart Command

PMTK101 message is used to command a Hot Restart that uses all available data in the Non-Volatile (NV) Storage.

An example of this message is:

*$PMTK101*32<CR><LF>*

Field	Example	Description
Message Header	PMTK101	Hot Restart Command

Table 22 PMTK101 – Hot Restart Command Message Structure

4.1.3. PMTK102 – Warm Restart Command

PMTK102 message is used to command a Warm Restart that does not use ephemerides data.

An example of this message is:

*$PMTK102*31<CR><LF>*

Field	Example	Description
Message Header	PMTK102	Warm Restart Command

Table 23 PMTK102 – Warm Restart Command Message Structure

4.1.4. PMTK103 – Cold Restart Command

PMTK103 message is used to command a Cold Restart that does not use position and ephemerides data at re-start.

Example of this messages are:

*$PMTK103*30<CR><LF>*

*$PMTK103,2*2E<CR><LF>*

Field	Example	Description
Message Header	PMTK103	Cold Restart Command
Mode	-	0 = Default mode (Almanac + Clock information are retained) 2 = Industry standard (Almanac only is retained) This field is optional

Table 24 PMTK103 – Cold Restart Command Message Structure

SE868-A, SE868K3-A, SE868K3-AL, SL871, SL871L, SL869-V2, SL869L-V2

The Mode field is supported only on ANX 5.1.13 and latest

4.1.5. PMTK104 – Full Cold Restart Command

PMTK104 message is used to command a Full Cold Restart that additionally clears system and user configurations at re-start.

The GNSS receiver is reset to its factory defaults.

An example of this message is:

*$PMTK104*37<CR><LF>*

Field	Example	Description
Message Header	PMTK104	Full Cold Restart Command

Table 25 PMTK104 – Full Cold Restart Command Message Structure

4.1.6. PMTK161 – Set Standby Mode

PMTK161 message is used to command the GNSS receiver to enter standby mode.

An example of this message is:

*$PMTK161,0*28<CR><LF>*

Field	Example	Description
Message Header	PMTK161	Set Standby Mode

Field	Example	Description
Standby Type	0	0 = Stop mode 1 = Sleep mode

Table 26 PMTK161 – Set Standby Mode Message Structure

4.1.7. PMTK220 – Position Fix Interval

PMTK220 message is used to configure the rate of position fixes.

An example of this message is:

*$PMTK220,1000*1F<CR><LF>*

Field	Example	Description
Message Header	PMTK220	Position Fix Interval
Interval	1000	Position fix interval (ms) Must be greater than 200

Table 27 PMTK220 – Position Fix Interval Message Structure

4.1.8. PMTK250 – Set Output Format for DPort

PMTK250 message is used to configure the data output format for the DPort.

An example of this message is:

*$PMTK250,1,3,9600*14<CR><LF>*

Field	Example	Description
Message Header	PMTK250	Set Output Format for DPort
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

Field	Example	Description
		57600 115200

Table 28 PMTK250 – Set Output Format for DPort Message Structure

4.1.9. PMTK251 – Set NMEA Baudrate

PMTK251 message is used to configure the data output format for the DPort.

An example of this message is:

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

Field	Example	Description
Message Header	PMTK251	Set NMEA Baudrate
BaudRate	38400	NMEA serial port Baudrate 0 = Default setting 4800 (*) 9600 14400 19200 38400 57600 115200 230400 (*) 460800 921680 (*) (*) Not supported by all firmware versions

Table 29 PMTK251 – Set NMEA Baudrate Message Structure

4.1.10. PMTK258 – Set Com Port Working Mode

PMTK258 message is used to configure the working mode of a communication port.

An example of this message is:

*$PMTK258,1,2,9600,1,1*1D<CR><LF>*

Field	Example	Description
Message Header	PMTK258	Set Com Port Working Mode
Port	1	Port number to be configured

Field	Example	Description
		1 = Port0 2 = Port1
Interface	2	Interface type 1 = NONE 2 = UART 3 = I2C (Only support on Port1) 4 = SPI (Only support on Port1)
BaudRate	9600	Baud rate 4800 9600 14400 19200 38400 57600 115200 230400 460800 921680
Protocol	1	Input type 1 = NMEA 2 = RTCM (Supported on Port1 only)
Debug	1	Enable or disable debug log output 1 = OFF 2 = ON

Table 30 PMTK258 – Set Com Port Working Mode Message Structure

4.1.11. PMTK301 – Set DGPS Correction Data Source

PMTK301 message is used to configure the source for DGPS correction.

An example of this message is:

*$PMTK301,1*2D<CR><LF>*

Field	Example	Description
Message Header	PMTK301	Set DGPS Correction Data Source
Port	1	DGPS source 0 = No DGPS source 1 = RTCM

Field	Example	Description
		2 = SBAS (WAAS/EGNOS/MSAS)

Table 31 PMTK301 – Set DGPS Correction Data Source Message Structure

4.1.12. PMTK311 – Set Satellite Elevation Mask

PMTK311 message is used to configure satellite elevation mask.

An example of this message is:

*$PMTK311,5*28<CR><LF>*

Field	Example	Description
Message Header	PMTK311	Set Satellite Elevation Mask
Port	5	Elevation Mask (degrees)

Table 32 PMTK311 – Set Satellite Elevation Mask Message Structure

SE868-AS, SE868K7-A, SE868K7-AL, SL871-S, SL871L-S, SL869-V2S, SL869L-V2S

Supported on ANX 2.10 and latest

4.1.13. PMTK313 – Enable or Disable SBAS Search

PMTK313 message is used to enable or disable the SBAS satellite search.

An example of this message is:

*$PMTK313,1*2E<CR><LF>*

Field	Example	Description
Message Header	PMTK313	Enable or Disable SBAS Search
Port	1	Enable SBAS satellite search and use 0 = Disable 1 = Enable

Table 33 PMTK313 – Enable or Disable SBAS Search Message Structure

4.1.14. PMTK314 – Set NMEA Sentence Output Rates

PMTK314 message is used to configure the NMEA output messages rate.

An example of this message is:

*$PMTK314,1,1,1,1,1,5,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0*31<CR><LF>*

Field	Example	Description
Message Header	PMTK314	Set NMEA Sentence Output Rates
0. GLL	1	Supported message rates 0 = Disabled or not supported 1 = Output once for every 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. RMC	1	
2. VTG	1	
3. GGA	1	
4. GSA	1	
5. GSV	5	
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. ZDA	1	
18. Reserved	0	
19. Reserved	0	
20. Reserved	0	
21. Reserved	0	
22. Reserved	0	
23. Reserved	0	

Table 34 PMTK314 – Set NMEA Sentence Output Rates Message Structure

4.1.15. PMTK324 – Set Com Port NMEA Sentence Output Rates

PMTK324 message is used to configure the NMEA output messages rate of a communication port.

An example of this message is:

*$PMTK324,1,1,1,1,1,1,5,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0*2F<CR><LF>*

Field	Example	Description
Message Header	PMTK324	Set Com Port NMEA Sentence Output Rates
Port	1	Port Number 1 = Port0 2 = Port1
0. GLL	1	Supported message rates 0 = Disabled or not supported 1 = Output once for every 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. RMC	1	
2. VTG	1	
3. GGA	1	
4. GSA	1	
5. GSV	5	
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. ZDA	1	
18. Reserved	0	
19. Reserved	0	
20. Reserved	0	

Field	Example	Description
21. Reserved	0	
22. Reserved	0	
23. Reserved	0	

Table 35 PMTK324 – Set Com Port NMEA Sentence Output Rates Message Structure

SE868-AS, SE868K7-A, SE868K7-AL, SL871-S, SL871L-S, SL869-V2S, SL869L-V2S

This command is not supported on AXN 2.32 and previous

4.1.16. PMTK330 – Set Default Datum

PMTK330 message is used to set the default datum to be used.

See Appendix C – Datum List for all the supported datums.

An example of this message is:

*$PMTK330,0*2E<CR><LF>*

Field	Example	Description
Message Header	PMTK330	Set Default Datum
Datum	0	0 = WGS84 1 = TOKYO-M 2 = TOKYO-A .. See Appendix C – Datum List

Table 36 PMTK330 – Set Default Datum Message Structure

4.1.17. PMTK351 – Enable or Disable QZSS NMEA Format

PMTK351 message is used to enable the new NMEA format for QZSS.

QZSS NMEA format is disabled by default.

An example of this message is:

*$PMTK351,1*28<CR><LF>*

Field	Example	Description
Message Header	PMTK351	Enable or Disable QZSS NMEA Format
SetFlag	1	0 = Disable 1 = Enable

Table 37 PMTK351 – Enable or Disable QZSS NMEA Format Message Structure

4.1.18. PMTK352 – Set the Stop QZSS Function

PMTK352 message is used to enable or disable the “Stop QZSS Function”.

An example of this message is:

*$PMTK352,0*2A<CR><LF>*

Field	Example	Description
Message Header	PMTK352	Enable or Disable QZSS NMEA Format
SetFlag	0	0 = Disable (Enables QZSS) 1 = Enable (Disables QZSS)

Table 38 PMTK352 – Set the Stop QZSS Function Message Structure

4.1.19. PMTK356 – Set HDOP Threshold

PMTK356 message is used to set the HDOP threshold.

The position fix is not valid when the HDOP value is larger than the threshold value currently set.

An example of this message is:

*$PMTK356,0.8*38<CR><LF>*

An example of answer to this message is:

*$PMTK356,0.8 Set OK!*5F<CR><LF>*

Field	Example	Description
Message Header	PMTK356	Set HDOP Threshold
HDOPThreshold	0.8	0 = Disable this function Other values = HDOP Threshold value to be set

Table 39 PMTK356 – Set HDOP Threshold Message Structure

4.1.20. PMTK357 – Get HDOP Threshold

PMTK357 message is used to get the HDOP threshold currently set.

An example of this message is:

*$PMTK357*33<CR><LF>*

Field	Example	Description
Message Header	PMTK357	Get HDOP Threshold

Table 40 PMTK357 – Get HDOP Threshold Message Structure

4.1.21. PMTK386 – Set Speed Threshold for Static Navigation

PMTK386 message is used to set the speed threshold for static navigation.

If the current speed is below the specified threshold, the position fix will remain the same and the speed output will be zero.

If the speed threshold value is set to 0, this function is disabled.

An example of this message is:

*$PMTK386,0.4*39<CR><LF>*

Field	Example	Description
Message Header	PMTK386	Set Speed Threshold for Static Navigation
SpeedThreshold	0.4	Speed threshold to be set, meters/second (m/s) 0: Disabled Other values: Enabled The minimum is 0.1 m/s, the maximum is 2.0 m/s

Table 41 PMTK386 – Set Speed Threshold for Static Navigation Message Structure

4.1.22. PMTK400 – Query Fix Control Value

PMTK400 message is used to query the rate of fixing activity.

The GNSS receiver responds with a PMTK500 message.

An example of this message is:

*$PMTK400*36<CR><LF>*

Field	Example	Description
Message Header	PMTK400	Query Fix Control Value

Table 42 PMTK400 – Query Fix Control Value Message Structure

4.1.23. PMTK401 – Query DGPS Mode

PMTK401 message is used to query the DGPS source currently selected.

The GNSS receiver responds with a PMTK501 message.

An example of this message is:

*$PMTK401*37<CR><LF>*

Field	Example	Description
Message Header	PMTK401	Query DGPS Mode

Table 43 PMTK401 – Query DGPS Mode Message Structure

4.1.24. PMTK411 – Query Satellite Elevation Mask

PMTK411 message is used to query the satellite elevation mask currently set.

The GNSS receiver responds with a PMTK511 message.

An example of this message is:

*$PMTK411*36<CR><LF>*

Field	Example	Description
Message Header	PMTK411	Query Satellite Elevation Mask

Table 44 PMTK411 – Query Satellite Elevation Mask Message Structure

SE868-AS, SE868K7-A, SE868K7-AL, SL871-S, SL871L-S, SL869-V2S, SL869L-V2S

Supported on ANX 2.10 and latest

4.1.25. PMTK413 – Query SBAS Status

PMTK413 message is used to query the SBAS status.

The GNSS receiver responds with a PMTK513 message.

An example of this message is:

*$PMTK413*34<CR><LF>*

Field	Example	Description
Message Header	PMTK413	Query SBAS Status

Table 45 PMTK413 – Query SBAS Status Message Structure

4.1.26. PMTK414 – Query NMEA Output Rates

PMTK414 message is used to query the current NMEA sentence output rates.

The GNSS receiver responds with a PMTK514 message.

An example of this message is:

*$PMTK414*33<CR><LF>*

Field	Example	Description
Message Header	PMTK414	Query NMEA Output Rates

Table 46 PMTK414 – Query NMEA Output Rates Message Structure

4.1.27. PMTK430 – Query Default Datum

PMTK430 message is used to query the default Datum.

The GNSS receiver responds with a PMTK530 message.

An example of this message is:

*$PMTK430*35<CR><LF>*

Field	Example	Description
Message Header	PMTK430	Query Default Datum

Table 47 PMTK430 – Query Default Datum Message Structure

4.1.28. PMTK435 – Query RTC UTC Time

PMTK435 message is used to query the current RTC UTC Time.

The GNSS receiver responds with a PMTK535 message.

An example of this message is:

*$PMTK435*30<CR><LF>*

Field	Example	Description
Message Header	PMTK435	Query RTC UTC Time

Table 48 PMTK435 – Query RTC UTC Time Message Structure

4.1.29. PMTK602 – Query Data Port Data Type and Baud Rate

PMTK602 message is used to query the current data port input/output data type and baud rate settings.

The GNSS receiver responds with a PMTK702 message.

An example of this message is:

*$PMTK602*36<CR><LF>*

Field	Example	Description
Message Header	PMTK602	Query Data Port Data Type and Baud Rate

Table 49 PMTK602 – Query Data Port Data Type and Baud Rate Message Structure

4.1.30. PMTK612 – Query COM Port Status

PMTK612 message is used to query the status of a specific communication port.

The GNSS receiver responds with a PMTK001 message.

An example of this message is:

*$PMTK612,1*2A<CR><LF>*

Field	Example	Description
Message Header	PMTK612	Query COM Port Status
Port	1	Port Number 1 = Port0 2 = Port1

Table 50 PMTK612 – Query COM Port Status Message Structure

4.1.31. PMTK886 – Set Navigation Mode

PMTK886 message is used to change the navigation mode.

An example of this message is:

*$PMTK886,1*29<CR><LF>*

Field	Example	Description
Message Header	PMTK886	Set Navigation Mode
Mode	1	Navigation Mode 0 = Normal mode – for general purpose 1 = Fitness mode – for low dynamics like running and walking (speed < 10m/s) 2 = Aviation mode – for high-dynamics (high levels of acceleration) 3 = Balloon mode – for high-altitude (like weather balloons) 4 = Stationary mode – for stationary applications (like survey equipment)

Table 51 PMTK886 – Set Navigation Mode Message Structure

5. APPENDIX A – STANDARD NMEA MESSAGES FORMAT

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, and so on). 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. Each type is described in its own section in this document.

Following the Sentence Identifier is a sequence of Data Fields that 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) 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>.

6. APPENDIX B – SATELLITE ID MAPPING

SATELLITE ID MAPPING

Value	Constellation	Description
1 to 32	GPS	Satellite PRN code
33 to 64	SBAS	PRN - 87
193 to 195	QZSS	PRN
65 to 96	GLONASS	Slot # + 64
1 to 30	BEIDOU	PRN
1 to 36	GALILEO	PRN

Table 52 Satellite ID Mapping

7. APPENDIX C – DATUM LIST

DATUM LIST

Number	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

Number	Datum	Region
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

Number	Datum	Region
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

Number	Datum	Region
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)

Number	Datum	Region
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)

Number	Datum	Region
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)

Number	Datum	Region
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

Number	Datum	Region
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

Number	Datum	Region
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

Number	Datum	Region
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
223	PZ-90 v11	GLONASS

Table 53 Datum List

8. GLOSSARY AND ACRONYMS

ASCII	American Standard Code for Information Interchange
BE	Broadcast Ephemeris
DGPS	Differential Global Positioning System
DOP	Dilution of Precision
EPO	Extended Prediction Orbit
NMEA	National Marine Electronics Association
PRN	Pseudo-Random Noise
SRAM	Static Random Access Memory
UTC	Co-ordinated Universal Time

9. 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
4	2017-10-30	The following three messages are re-categorized from Output to Input: 4.68. MTK721-EPO Data 4.69. MTK740-Set Reference Time 4.70. MTK741-Set Reference Location Added the following Telit NMEA messages: 6.1. VERSION-Telit Software Version Message 6.2. ANT-Antenna Status Message 6.3. JAM-Jamming Detection Status 6.4. LNA-LNA Gain Message 6.5. ODO-ODO Messages Added the following Operational Use Cases: 7.1. AUX Port 7.2. GLP Mode 7.3. Host EPO 7.4. EASY Mode Changes/Updates: 5.25. EPE-Accuracy Estimate Sentence: Added the following information: There is no user control of the output of the GPEPE. Once enabled this message will always be sent out. The message talker ID is always “GP” even when SVs from multiple GNSS constellations are being used to compute the navigation fix.
5	2019-11-13	General Document reorganization: Moved the entire (legacy) PTWS command set in the Telit GNSS Software Extensions User Guide

	Moved “Operational Use Cases” paragraph in the V13 Software Authorized User Guide
	Added the following NMEA Output Message:
	3.1.6 RLM-Return Link Message
	Updated Telit Techical Support access link

SUPPORT INQUIRIES

Link to **www.telit.com** and contact our technical support team for any questions related to technical issues.

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