LC29H&LC79H GNSS Protocol Specification

GNSS Module Series

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About the Document

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1 Introduction

Quectel LC29H and LC79H GNSS modules support GPS, Galileo, GLONASS, BeiDou, QZSS constellations. Concurrent tracking of GPS L1 C/A, GLONASS L1, BeiDou B1, Galileo E1, GPS L5, BeiDou B2a, and Galileo E5a frequency bands provides fast and accurate acquisition and makes these modules ideal solutions for positioning and navigation in various vertical markets.

This document describes the software commands that are needed to control and modify the module configuration. The software commands are NMEA proprietary commands defined by Quectel (PQTM messages) and the chipset supplier (PAIR messages). To report GNSS information, the modules support output messages in NMEA 0183 standard protocol format.

> **NOTE**
>
> Only use the commands listed in this document. Quectel assumes no responsibility if you use commands that are not listed in this document.

2 NMEA Protocol

2.1. Structure of NMEA Protocol Messages
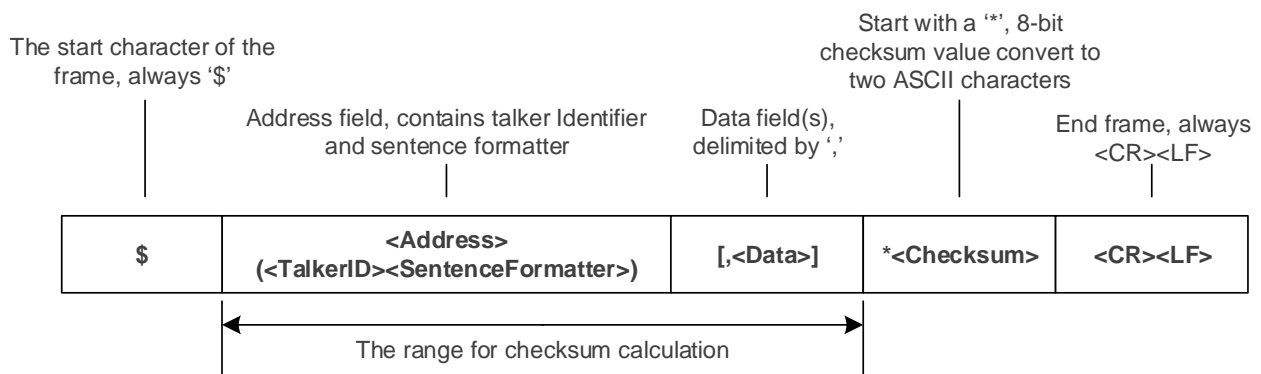
Figure 1: Structure of NMEA Protocol Messages

Table 1: Structure of NMEA Protocol Messages

Field	Description
$	Start of the sentence (Hex 0x24).
Address	**In Standard Messages:** In NMEA standard messages, this field consists of a two-character talker identifier (TalkerID) and a three-character sentence formatter (SentenceFormatter). The talker identifier serves to define the nature of the data being transmitted. For more information on the TalkerID, see *Table 2: NMEA Talker ID.* The sentence formatter is used to define data format and type. **In Proprietary Messages:** In NMEA proprietary messages, this field consists of the proprietary character **P** followed by a three-character Manufacturer's Mnemonic Code, used to identify the TALKER issuing a proprietary sentence, and any additional characters as required.
Data	Data fields, delimited by comma (**,**). Variable length (depends on the NMEA message type).

Checksum	The checksum field follows the checksum delimiter character *. The checksum is the 8-bit exclusive OR of all characters in the sentence, including the comma (,) delimiter, between but not including the $ and the * delimiters.
<CR><LF>	End of the sentence (Hex 0x0D 0x0A).

Table 2: NMEA Talker ID

GNSS Constellation Configuration	TalkerID (NMEA V3.01)	TalkerID (NMEA V4.10)
GPS	GP	GP
GLONASS	GL	GL
Galileo	GA	GA
BeiDou	BD	GB
QZSS	GP	GP
Combination of Multiple Satellite Systems	GN	GN

2.2. Standard Messages

This chapter explains the NMEA 0183 V3.01 and NMEA 0183 V4.10 standard messages supported by the modules.

2.2.1. RMC

Recommended Minimum Specific GNSS Data. Time, date, position, course, and speed data provided by a GNSS receiver.

Type:

Output

Synopsis:

Format for NMEA 0183 Rev 3.01:

$<TalkerID>RMC,<UTC>,<Status>,<Lat>,<N/S>,<Lon>,<E/W>,<SOG>,<COG>,<Date>,<MagVar>,<MagVarDir>,<ModeInd>*<Checksum><CR><LF>

Format for NMEA 0183 Rev 4.10 (default):

$<TalkerID>RMC,<UTC>,<Status>,<Lat>,<N/S>,<Lon>,<E/W>,<SOG>,<COG>,<Date>,<MagVar>,<MagVarDir>,<ModeInd>,<NavStatus>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Example	Description
<TalkerID>	String, 2 characters	-	$GN	Talker identifier. See *Table 2: NMEA Talker ID.*
RMC	String, 3 characters	-	RMC	Recommended Minimum Specific GNSS Data.
<UTC>	hhmmss.sss	-	114736.000	Position fix UTC: hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds
<Status>	Character	-	A	Positioning system status: A = Data valid V = Invalid D = Differential
<Lat>	ddmm.mmmmmm	-	3149.288062	Latitude: dd: Degrees (00–90) mm: Minutes (00–59) mmmmmm: Decimal fraction of minutes Note that this field is empty in case of an invalid value.
<N/S>	Character	-	N	Latitude direction: N = North S = South Note that this field is empty in case of an invalid value.
<Lon>	dddmm.mmmmmm	-	11706.924786	Longitude: ddd: Degrees (000–180) mm: Minutes (00–59) mmmmmm: Decimal fraction of minutes Note that this field is empty in case of an invalid value.
<E/W>	Character	-	E	Longitude direction: E = East W = West Note that this field is empty in case of an invalid value.

<SOG>	Numeric	Knot	0.00	Speed over ground. Variable length. Note that this field is empty in case of an invalid value.
<COG>	Numeric	Degree	0.00	Course over ground. Variable length. Maximum value: 359.9. Note that this field is empty in case of an invalid value.
<Date>	ddmmyy	-	160420	Date: dd: Day of month mm: Month yy: Year
<MagVar>	-	-	-	Magnetic variation. Not supported.
<MagVarDir>	-	-	-	The direction of magnetic variation. Not supported.
<ModeInd>	Character	-	A	Mode indicator: A = Autonomous mode. Satellite system used in non-differential mode in position fix. D = Differential mode. Satellite system used in differential mode in position fix. Corrections from ground stations or Satellite Based Augmentation System (SBAS). E = Estimated (dead reckoning) mode. F = Float RTK. Satellite system used in RTK mode with floating integers. M = Manual input mode N = No fix. Satellite system not used in position fix, or fix not valid. R = Real Time Kinematic (RTK). Satellite system used in RTK mode with fixed integers.
<NavStatus>	Character	-	V	Navigational status. Not supported. Always "V" (invalid).
<Checksum>	Hexadecimal	-	-	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example for NMEA 0183 Rev 3.01:

$GNRMC,012237.000,A,3149.332762,N,11706.913266,E,0.07,179.24,030821,,,A,V*0F

Example for NMEA 0183 Rev 4.10:

$GNRMC,114736.000,A,3149.288062,N,11706.924786,E,0.00,0.00,160420,,,A,V*03

2.2.2. GGA

Global Positioning System Fix Data. Time, position, and fix-related data for a GNSS receiver.

Type:

Output.

Synopsis:

Format for NMEA 0183 Rev 3.01:

$<TalkerID>GGA,<UTC>,<Lat>,<N/S>,<Lon>,<E/W>,<FixStatus>,<NumSatUsed>,<HDOP>,<Alt>,M,<Sep>,M,<DiffAge>,<DiffStation>*<Checksum><CR><LF>

Format for NMEA 0183 Rev 4.10 (default):

$<TalkerID>GGA,<UTC>,<Lat>,<N/S>,<Lon>,<E/W>,<FixStatus>,<NumSatUsed>,<HDOP>,<Alt>,M,<Sep>,M,<DiffAge>,<DiffStation>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Example	Description
<TalkerID>	String, 2 characters	-	$GP	Talker identifier. See *Table 2: NMEA Talker ID.*
GGA	String, 3 characters	-	GGA	Global Positioning System Fix Data.
<UTC>	hhmmss.sss	-	140145.000	Position fix UTC: hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds
<Lat>	ddmm.mmmmmm	-	3150.863861	Latitude: dd: Degrees (00–90) mm: Minutes (00–59) mmmmmm: Decimal fraction of minutes Note that this field is empty in case of an invalid value.
<N/S>	Character	-	N	Latitude direction: N = North

				S = South Note that this field is empty in case of an invalid value.
<Lon>	dddmm.mmmmmm	-	11711.928739	Longitude: ddd: Degrees (000–180) mm: Minutes (00–59) mmmmmm: Decimal fraction of minutes Note that this field is empty in case of an invalid value.
<E/W>	Character	-	E	Longitude direction: E = East W = West Note that this field is empty in case of an invalid value.
<FixStatus>	Numeric, 1 digit	-	1	0 = Invalid 1 = GNSS fix 2 = DGPS fix
<NumSatUsed> [1]	Numeric, 2 digits	-	11	Number of satellites in use.
<HDOP>	Numeric	-	0.79	Horizontal dilution of precision. Note that this field is empty in case of an invalid value.
<Alt>	Numeric	Meter	175.165	Altitude above mean-sea-level (geoid). Note that this field is empty in case of an invalid value.
M	Character	-	M	-
<Sep>	Numeric	Meter	0.009	Geoidal separation (the difference between the WGS84 earth ellipsoid surface and the mean-sea-level surface). Note that this field is empty in case of an invalid value.
M	Character	-	M	-
<DiffAge>	-	-	-	Age of differential GPS data. Not supported.
<DiffStation>	-	-	-	Differential reference station ID. Not supported.

---

[1] According to the NMEA 0183 specification the number of satellites in use is between 00 and 12. However, in the multi-constellation solution, the number of satellites in use may exceed 12.

<Checksum>	Hexadecimal	-	*53	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

$GPGGA,140145.000,3150.863861,N,11711.928739,E,1,11,0.79,175.165,M,0.009,M,,*53

NOTE

The NMEA 0183 specification indicates that GGA messages are GPS specific. However, when the receiver is configured for multi-constellations, the content of GGA messages will be generated from the multi-constellation solution.

2.2.3. GSV

GNSS Satellites in View. The GSV sentence provides the number of satellites in view (SV), satellite ID numbers, elevation, azimuth, and SNR value, and it contains maximum four satellites per transmission. Therefore, it may take several sentences to get complete information. The total number of sentences being transmitted and the sentence number are indicated in the first two data fields.

Type:

Output.

Synopsis:

Format for NMEA 0183 Rev 3.01:

$<TalkerID>GSV,<TotalNumSen>,<SenNum>,<TotalNumSat>,<SatID>,<SatElev>,<SatAz>,<SatCN0>*<Checksum><CR><LF>

Format for NMEA 0183 Rev 4.10 (default):

$<TalkerID>GSV,<TotalNumSen>,<SenNum>,<TotalNumSat>,<SatID>,<SatElev>,<SatAz>,<SatCN0>,<SignalID>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Example	Description
<TalkerID>	String, 2 characters	-	$GP	Talker identifier. See *Table 2: NMEA Talker ID*.
GSV	String, 3 characters	-	GSV	GNSS Satellites in View.

<TotalNumSen>	Numeric	-	4	Total number of sentences. Range: 1–9.
<SenNum>	Numeric	-	1	Sentence number. Range: 1–TotalNumSen.
<TotalNumSat>	Numeric	-	16	Total number of satellites in view.
Start of repeat block. Repeat times: 1–4.				
<SatID>	Numeric	-	28	Satellite ID. See *Table 5: GNSS Numbering*.
<SatElev>	Numeric	Degree	55	Satellite elevation. Range: 0–90.
<SatAz>	Numeric	Degree	180	Satellite azimuth, with true north as the reference plane. Range: 0–359.
<SatCN0>	Numeric	dB-Hz	33	Satellite C/N_0. Range 00–99. Null when not tracking.
End of repeat block.				
<SignalID>	Numeric	-	1	GNSS signal ID. See *Table 5: GNSS Numbering*.
<Checksum>	Hexadecimal	-	*58	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example for NMEA 0183 Rev 3.01:

$GPGSV,3,1,12,02,04,037,,05,27,125,44,06,78,051,23,07,83,021,30*7C
$GPGSV,4,1,16,17,65,026,,195,65,084,20,19,56,340,,28,55,180,33*45

Example for NMEA 0183 Rev 4.10:

$GPGSV,4,1,16,17,65,026,,195,65,084,20,19,56,340,,28,55,180,33,1*58
$GPGSV,4,2,16,06,50,281,14,193,46,133,23,41,37,232,31,03,32,047,17,1*56
$GPGSV,4,3,16,199,24,153,,02,22,263,21,194,21,172,36,09,12,131,30,1*66
$GPGSV,4,4,16,04,12,098,28,22,09,041,,01,02,060,,24,02,294,,1*6D
$GAGSV,2,1,08,12,52,310,,33,47,039,07,31,46,214,29,24,41,290,11,7*74
$GAGSV,2,2,08,11,11,270,,01,10,171,35,26,06,071,,25,04,327,,7*7E

NOTE

GN cannot be used for GSV sentences. If satellites of multiple constellations are in view, use separate GSV sentences with the corresponding talker ID for each constellation.

2.2.4. GSA

GNSS DOP and Active Satellites. GNSS receiver operating mode, satellites used in the navigation solution reported by the GGA or GNS sentence, and DOP values.

Type:

Output.

Synopsis:

Format for NMEA 0183 Rev 3.01:

$<TalkerID>GSA,<Mode>,<FixMode>,<SatID>,…,<SatID>,<PDOP>,<HDOP>,<VDOP>*<Checksum><CR><LF>

Format for NMEA 0183 Rev 4.10 (default):

$<TalkerID>GSA,<Mode>,<FixMode>,<SatID>,…,<SatID>,<PDOP>,<HDOP>,<VDOP><SystemID>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Example	Description
<TalkerID>	String, 2 characters	-	$GN	Talker identifier. See *Table 2: NMEA Talker ID*.
GSA	String, 3 characters	-	GSA	GNSS DOP and Active Satellites.
<Mode>	Character	-	A	Auto selection of 2D or 3D fix M = Manual, forced to operate in 2D or 3D mode A = Automatic, allowed to automatically switch to 2D/3D
<FixMode>	Numeric	-	3	1 = Fix not available 2 = 2D 3 = 3D
Start of repeat block. Repeat times: 12.				
<SatID>	Numeric	-	23	ID numbers of satellites used in solution. See *Table 5: GNSS Numbering.*
End of repeat block.				
<PDOP>	Numeric	-	1.1	Position dilution of precision. Maximum value: 99.0.
<HDOP>	Numeric	-	0.6	Horizontal dilution of precision.

				Maximum value: 99.0.
<VDOP>	Numeric	-	0.9	Vertical dilution of precision. Maximum value: 99.0.
<SystemID>	Numeric	-	1	GNSS system ID. See *Table 5: GNSS Numbering.*
<Checksum>	Hexadecimal	-	*3E	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example for NMEA 0183 Rev 3.01:

$GNGSA,A,3,23,03,22,09,01,19,17,06,31,11,,,1.1,0.6,0.9*23

Example for NMEA 0183 Rev 4.10:

$GNGSA,A,3,23,03,22,09,01,19,17,06,31,11,,,1.1,0.6,0.9,1*3E

2.2.5. VTG

Course Over Ground & Ground Speed. The actual course and speed relative to the ground.

Type:

Output.

Synopsis:

Format for NMEA 0183 Rev 3.01:

$<TalkerID>VTG,<COGT>,T,<COGM>,M,<SOGN>,N,<SOGK>,K,<ModeInd>*<Checksum><CR><LF>

Format for NMEA 0183 Rev 4.10 (default):

$<TalkerID>VTG,<COGT>,T,<COGM>,M,<SOGN>,N,<SOGK>,K,<ModeInd>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Example	Description
<TalkerID>	String, 2 characters	-	$GP	Talker identifier. See *Table 2: NMEA Talker ID*.
VTG	String, 3 characters	-	VTG	Course Over Ground & Ground Speed.
<COGT>	Numeric	Degrees	183.85	Course over ground, in true north course direction.

T	Character	-	T	Course over ground. (degrees true, fixed field)
<COGM>	Numeric	Degrees	-	Course over ground (magnetic). Not supported.
M	Character	-	M	Course over ground. (degrees magnetic, fixed field)
<SOGN>	Numeric	Knots	0.00	Speed over ground in knots.
N	Character	-	N	Speed over ground (knots, fixed field).
<SOGK>	Numeric	km/h	0.00	Speed over ground in kilometers per hour.
K	Character	-	K	Speed over ground. (kilometers per hour, fixed field).
<ModeInd>	Character	-	A	Positioning system mode indicator: A = Autonomous mode D = Differential mode E = Estimated (dead reckoning) mode F = Float RTK. Satellite system used in real time kinematic mode with floating integers N = No fix. Satellite system not used in position fix, or fix not valid. R = Real Time Kinematic. Satellite system used in RTK mode with fixed integers
<Checksum>	Hexadecimal	-	*3A	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

$GPVTG,183.85,T,,M,0.00,N,0.00,K,A*3A

2.2.6. GLL

Geographic Position – Latitude/Longitude. Latitude and longitude of the GNSS receiver position, the time of position fix and status.

Type:

Output.

Synopsis:

Format for NMEA 0183 Rev 3.01:

$<TalkerID>GLL,<Lat>,<N/S>,<Lon>,<E/W>,<UTC>,<Status>,<ModeInd>*<Checksum><CR><LF>

Format for NMEA 0183 Rev 4.10 (default):

$<TalkerID>GLL,<Lat>,<N/S>,<Lon>,<E/W>,<UTC>,<Status>,<ModeInd>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Example	Description
<TalkerID>	String, 2 characters	-	$GN	Talker identifier. See *Table 2: NMEA Talker ID*.
GLL	String, 3 characters	-	GLL	Geographic Position – Latitude/Longitude.
<Lat>	ddmm.mmmmmm	-	3149.251540	Latitude: dd: Degrees (00–90) mm: Minutes (00–59) mmmmmm: Decimal fraction of minutes Note that this field is empty in case of an invalid value.
<N/S>	Character	-	N	Latitude direction: N = North S = South Note that this field is empty in case of an invalid value.
<Lon>	dddmm.mmmmmm	-	11706.946578	Longitude: ddd: Degrees (000–180) mm: Minutes (00–59) mmmmmm: Decimal fraction of minutes Note that this field is empty in case of an invalid value.
<E/W>	Character	-	E	Longitude direction: E = East W = West Note that this field is empty in case of an invalid value.
<UTC>	hhmmss.sss	-	131018.000	Position UTC: hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds
<Status>	Character	-	A	Positioning system status: V = Invalid

				A = Autonomous
				D = Differential
<ModeInd>	Character	-	A	Positioning system mode indicator: A = Autonomous mode D = Differential mode E = Estimated (dead reckoning) mode F = Float RTK. Satellite system used in real time kinematic mode with floating integers N = No fix. Satellite system not used in position fix, or fix not valid R = Real Time Kinematic. Satellite system used in RTK mode with fixed integers
<Checksum>	Hexadecimal	-	*45	Checksum
<CR><LF>	Character	-	-	Carriage return and line feed

Example:

```
//GPS + GLONASS + Galileo + BeiDou mode:
$GNGLL,3149.251540,N,11706.946578,E,131018.000,A,A*45
```

2.3. PQTM Messages

This chapter explains PQTM messages (proprietary NMEA messages defined by Quectel) supported by LC29H and LC79H modules.

2.3.1. PQTMANTENNASTATUS

Queries antenna status.

Type:

Get.

Synopsis:

```
$PQTMANTENNASTATUS,<Status>,<Mode_ind>,<Power_ind>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Status>	Numeric	-	0 = Normal 1 = Open circuit 2 = Short
<Mode_ind>	Numeric	-	0 = Auto mode 1 = Internal mode 2 = External mode
<Power_ind>	Numeric	-	0 = Power off 1 = Power on

Example:

$PQTMANTENNASTATUS,0,0,0*4F

2.3.2. PQTMCFGANTENNA

Configures/queries antenna operation mode.

Type:

Set/Get.

Synopsis:

$PQTMCFGANTENNA,<R/W>,<Mode>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Description
<R/W>	Numeric	-	0 = Read configuration 1 = Set configuration
<Mode>	Numeric	-	0 = Auto mode 1 = Internal mode 2 = External mode

Example:

//Set antenna to auto mode:
$PQTMCFGANTENNA,1,0*04

//Response:
$PQTMCFGANTENNAOK*1
//Query antenna operation mode:
$PQTMCFGANTENNA,0*19

```
//Response:
$PQTMCFGANTENNA,0,0*5
```

> **NOTE**
>
> **<Mode>** should be omitted in the command if **<R/W>** is 0.

2.4. PAIR Messages

This chapter explains PAIR messages (proprietary NMEA messages defined by the chipset supplier). "**P**" means proprietary message, "**AIR**" means the command defined by the chipset supplier.

2.4.1. Packet Type: 001 PAIR_ACK

Acknowledges a PAIR command. An acknowledgement packet **PAIR_ACK** is returned to inform the sender that the receiver has received the packet.

Type:

Output.

Synopsis:

```
$PAIR001,<Command_ID>,<Result>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Command_ID>	Numeric	-	The type of command/packet to be acknowledged.
<Result>	Numeric	-	0 = The command has been successfully sent 1 = The command is being processed. Please wait for the result 2 = Command sending failed 3 = The command ID is not supported 4 = Command parameter error. Out of range/some parameters were lost/checksum error 5 = The MNL service is busy

Example:

```
$PAIR001,002,0*39
```

2.4.2. Packet Type: 002 PAIR_GNSS_SUBSYS_POWER_ON

Powers on the GNSS system, including DSP/RF/PE/Clock, etc.

Type:

Command.

Synopsis:

$PAIR002*<Checksum><CR><LF>

Parameter:

None.

Result:

Returns a **PAIR_ACK** message.

Example:

$PAIR002*38
$PAIR001,002,0*39

2.4.3. Packet Type: 003 PAIR_GNSS_SUBSYS_POWER_OFF

Powers off the GNSS system, including DSP/RF/PE/Clock, etc. After you send this command, CM4 can still receive commands (including PAIR commands that are not reliant on DSP).

Type:

Command.

Synopsis:

$PAIR003*<Checksum><CR><LF>

Parameter:

None.

Result:

Returns a **PAIR_ACK** message.

Example:

$PAIR003*39

$PAIR001,003,0*38

2.4.4. Packet Type: 004 PAIR_GNSS_SUBSYS_HOT_START

Performs a hot start (uses all available data in the NVM). Normally a hot start means that the GNSS module has been powered down for less than 2 hours (RTC must be alive) with its ephemeris still valid. Therefore, there is no need to download an ephemeris again upon a hot start, which makes this startup method the fastest.

Type:

Command.

Synopsis:

$PAIR004*<Checksum><CR><LF>

Parameter:

None.

Result:

Returns a **PAIR_ACK** message.

Example:

$PAIR004*3E
$PAIR001,004,0*3F

2.4.5. Packet Type: 005 PAIR_GNSS_SUBSYS_WARM_START

Performs a warm start. A warm start means that the GNSS module remembers only rough time, position, and ephemeris data, and thus needs to download an ephemeris before it can fix a position.

Type:

Command.

Synopsis:

$PAIR005*<Checksum><CR><LF>

Parameter:

None.

Result:

Returns a **PAIR_ACK** message.

Example:

```
$PAIR005*3F
$PAIR001,005,0*3E
```

2.4.6. Packet Type: 006 PAIR_GNSS_SUBSYS_COLD_START

Performs a cold start, which means that there is no location information stored in the receiver, including time, position, and almanacs and ephemeris data.

Type:

Command.

Synopsis:

```
$PAIR006*<Checksum><CR><LF>
```

Parameter:

None.

Result:

Returns a **PAIR_ACK** message.

Example:

```
$PAIR006*3C
$PAIR001,006,0*3D
```

2.4.7. Packet Type: 007 PAIR_GNSS_SUBSYS_FULL_COLD_START

Performs a cold start and clears system and user configurations at the start, i.e., resets the module to its factory settings. Upon a full cold start, the module loses all data on the previous position. Therefore, it needs to search over the full frequency spectrum for all visible satellites before it can fix a position.

Type:

Command.

Synopsis:

```
$PAIR007*<Checksum><CR><LF>
```

Parameter:

None.

Result:

Returns a **PAIR_ACK** message.

Example:

```
$PAIR007*3D
$PAIR001,007,0*3C
```

2.4.8. Packet Type: 010 PAIR_REQUEST_AIDING

Notifies the expiration of GNSS aiding data stored in the module. This message is automatically output when the module powers up.

Type:

Output.

Synopsis:

```
$PAIR010,<Type>,<GNSS_System>,<WN>,<TOW>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Type>	Numeric	-	Data type. 0 = Need to update EPO data 1 = Need to update the time 2 = Need to update the location
<GNSS_System>	Numeric	**-**	GNSS data type needed. 0 = Need GPS data 1 = Need GLONASS data 2 = Need Galileo data 3 = Need BeiDou data 4 = Need QZSS data
<WN>	Numeric	Week	Week Number (accommodating roll-over)
<TOW>	Numeric	Second	Time of Week

Example:

```
$PAIR010,0,0,2044,369413*33
```

2.4.9. Packet Type: 050 PAIR_COMMON_SET_FIX_RATE

Sets position fix interval. The ULP (Ultra Low Power) mode only supports 1 Hz.

Type:

Set.

Synopsis:

$PAIR050,<Time>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Description
<Time>	Numeric	Millisecond	Position fix interval. Range: 100–1000. Default value: 1000.

Result:

Returns a **PAIR_ACK** message.

Example:

$PAIR050,1000*12
$PAIR001,050,0*3E

> **NOTE**
>
> If you need to save the configuration, power off the GNSS system with **PAIR003** command and reboot it with **PAIR002** command.

2.4.10. Packet Type: 051 PAIR_COMMON_GET_FIX_RATE

Queries the position fix interval.

Type:

Get.

Synopsis:

$PAIR051*<Checksum><CR><LF>

Parameter:

None.

Result:

Returns a **PAIR_ACK** message and the query result.

Query result message format:

$PAIR051,<Time>*<Checksum><CR><LF>

Parameter included in the result:

Field	Format	Unit	Description
<Time>	Numeric	Millisecond	Position fix interval. Range: 100–1000. Default value: 1000.

Example:

$PAIR051*3E
$PAIR001,051,0*3F
$PAIR051,1000*13

2.4.11. Packet Type: 058 PAIR_COMMON_SET_MIN_SNR

Sets the minimum SNR of satellites in use. If the minimum SNR threshold value is set, the module will not use the satellites with SNR below the threshold.

Type:

Set.

Synopsis:

$PAIR058,<MIN_SNR>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Description
<MIN_SNR>	Numeric	dB-Hz	Minimum SNR threshold of satellites in use. Range: 9–37. Default value: 9

Result:

Returns a **PAIR_ACK** message.

Example:

$PAIR058,15*1F
$PAIR001,058,0*36

2.4.12. Packet Type: 059 PAIR_COMMON_GET_MIN_SNR

Queries the minimum SNR of satellites in use.

Type:

Get.

Synopsis:

$PAIR059*<Checksum><CR><LF>

Parameter:

None.

Result:

Returns a **PAIR_ACK** message and the query result.

Query result message format:

$PAIR059,<MIN_SNR>*<Checksum><CR><LF>

Parameter included in the result:

Field	Format	Unit	Description
<MIN_SNR>	Numeric	dB-Hz	Minimum SNR threshold of satellites in use. Range: 9–37. Default value: 9.

Example:

$PAIR059*36
$PAIR001,059,0*37
$PAIR059,15*1E

2.4.13. Packet Type: 062 PAIR_COMMON_SET_NMEA_OUTPUT_RATE

Sets the output interval of standard NMEA sentences of each type.

Type:

Set.

Synopsis:

$PAIR062,<Type>,<Output_Rate>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Description
<Type>	Numeric	-	NMEA type: -1 = Reset the output rates of all types of sentences to the default value 0 = NMEA_SEN_GGA 1 = NMEA_SEN_GLL 2 = NMEA_SEN_GSA 3 = NMEA_SEN_GSV 4 = NMEA_SEN_RMC 5 = NMEA_SEN_VTG
<Output_Rate>	Numeric	-	RMC sentence output frequency: 0 = Disable sentence output n = Output once every n position fix(es) Range of n: 0–20. Default value: 1.

Result:

Returns a **PAIR_ACK** message.

Example:

$PAIR062,0,3*3D
$PAIR001,062,0*3F

2.4.14. Packet Type: 063 PAIR_COMMON_GET_NMEA_OUTPUT_RATE

Queries the output interval of standard NMEA sentences of each type.

Type:

Get.

Synopsis:

$PAIR063,<Type>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Description
\<Type\>	Numeric	-	NMEA type: -1 = Return the output rate of every type of standard NMEA sentence. 0 = NMEA_SEN_GGA 1 = NMEA_SEN_GLL 2 = NMEA_SEN_GSA 3 = NMEA_SEN_GSV 4 = NMEA_SEN_RMC 5 = NMEA_SEN_VTG

Result:

Returns a **PAIR_ACK** message and the query result.

Query result message format:

$PAIR063,\<Type\>,\<Output_Rate\>*\<Checksum\>\<CR\>\<LF\>

Parameters included in the result:

Field	Format	Unit	Description
\<Type\>	Numeric	-	NMEA sentence type: 0 = NMEA_SEN_GGA 1 = NMEA_SEN_GLL 2 = NMEA_SEN_GSA 3 = NMEA_SEN_GSV 4 = NMEA_SEN_RMC 5 = NMEA_SEN_VTG
\<Output_Rate\>	Numeric	-	Output interval setting: 0 = Disabled or not supported n = Output once every n position fixes. Range of n: 1–20. Default value: 1

Example:

$PAIR063,0*23
$PAIR001,063,0*3E
$PAIR063,0,3*3C

2.4.15. Packet Type: 066 PAIR_COMMON_SET_GNSS_SEARCH_MODE

Sets the types of GNSS satellites the module searches for. The setting is valid when the NVM data are valid. The module is restarted when it receives this command.

Type:

Set.

Synopsis:

$PAIR066,<GPS_Enabled>,<GLONASS_Enabled>,<Galileo_Enabled>,<BeiDou_Enabled>,<QZSS_Enabled>,0*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Description
<GPS_Enabled>	Numeric	-	0 = Disable (DO NOT search for GPS satellites) 1 = Search for GPS satellites
<GLONASS_Enabled>	Numeric	-	0 = Disable (DO NOT search for GLONASS satellites) 1 = Search for GLONASS satellites
<Galileo_Enabled>	Numeric	-	0 = Disable (DO NOT search for Galileo satellites) 1 = Search for Galileo satellites
<BeiDou_Enabled>	Numeric	-	0 = Disable (DO NOT search for BeiDou satellites) 1 = Search for BeiDou satellites
<QZSS_Enabled>	Numeric	-	0 = Disable (DO NOT search for QZSS satellites) 1 or other non-zero values = Search for QZSS satellites
<Reserved>	Numeric	-	Keep it as 0

Result:

Returns a **PAIR_ACK** message.

Example:

//Search for GPS + GLONASS + Galileo + BeiDou satellites:
$PAIR066,1,1,1,1,0,0*3A
$PAIR001,066,0*3B

> **NOTE**
>
> LC29H and LC79H modules are capable of accessing GPS, Galileo, GLONASS, BeiDou, and QZSS systems.
>
> When dual bands (L1 + L5) are enabled (default), only the following GNSS search mode is supported:
> - GPS + Galileo + GLONASS + BeiDou + QZSS
>
> When only the single band L1 is enabled with **PAIR104,0**, the following GNSS search modes are supported:

- GPS only
- GPS + GLONASS
- GPS + Galileo
- GPS + BeiDou
- GPS + GLONASS + Galileo + BeiDou
- GPS + GLONASS + Galileo + BeiDou + QZSS

2.4.16. Packet Type: 067 PAIR_COMMON_GET_GNSS_SEARCH_MODE

Queries the GNSS search mode.

Type:

Get.

Synopsis:

$PAIR067*<Checksum><CR><LF>

Parameter:

None

Result:

Returns a **PAIR_ACK** message and the query result.

Query result message format:

$PAIR067<GPS_Enabled>,<GLONASS_Enabled>,<Galileo_Enabled>,<BeiDou_Enabled>,<QZSS_Enabled>,0*<Checksum><CR><LF>

Parameter included in the result:

Field	Format	Unit	Description
<GPS_Enabled>	Numeric	-	0 = Disabled (DO NOT search for GPS satellites) 1 = Search for GPS satellites
<GLONASS_Enabled>	Numeric	-	0 = Disabled (DO NOT search for GLONASS satellites) 1 = Search for GLONASS satellites
<Galileo_Enabled>	Numeric	-	0 = Disabled (DO NOT search for Galileo satellites) 1 = Search for Galileo satellites
<BeiDou_Enabled>	Numeric	-	0 = Disabled (DO NOT search for BeiDou satellites) 1 = Search for BeiDou satellites
<QZSS_Enabled>	Numeric	-	0 = Disabled (DO NOT search for QZSS satellites) 1 or other non-zero values = Search for QZSS satellites

<Reserved>	Numeric	-	Kept as 0

Example:

```
$PAIR067*3B
$PAIR001,067,0*3A
$PAIR067,1,0,0,0,0,0*3A
```

2.4.17. Packet Type: 070 PAIR_COMMON_SET_STATIC_THRESHOLD

Sets the speed threshold for static navigation. If the actual speed is below the threshold, the output position remains unchanged and the output speed is zero. If the threshold value is set to 0, this function is disabled.

Type:

Set.

Synopsis:

```
$PAIR070,<Speed_threshold>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Speed_threshold>	Numeric	dm/s	Speed threshold. Range: 0–20. Default value: 0

Result:

Returns a **PAIR_ACK** message.

Example:

```
$PAIR070,4*25
$PAIR001,070,0*3C
```

2.4.18. Packet Type: 071 PAIR_COMMON_GET_STATIC_THRESHOLD

Queries the static navigation speed threshold.

Type:

Get.

Synopsis:

$PAIR071*<Checksum><CR><LF>

Parameter:

None

Result:

Returns a **PAIR_ACK** message and the query result.

Query result message format:

$PAIR071,<Speed_threshold>*<Checksum><CR><LF>

Parameter included in the result:

Field	Format	Unit	Description
<Speed_threshold>	Numeric	dm/s	Speed threshold. Range: 0–20. Default value: 0

Example:

$PAIR071*3C
$PAIR001,071,0*3D
$PAIR071,0*20

2.4.19. Packet Type: 072 PAIR_COMMON_SET_ELEV_MASK

Sets satellite elevation mask.

Type:

Set.

Synopsis:

$PAIR072,<Degree>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Description
<Degree>	Numeric	Degree	Satellite elevation mask. Range: -90–90. Default value: 5

Example:

$PAIR072,5*26
$PAIR001,072,0*3E

NOTE

The satellite elevation mask should not be higher than 10 degrees, because the number of satellites in use for the positioning decreases with the increase of satellite elevation mask.

2.4.20. Packet Type: 073 PAIR_COMMON_GET_ELEV_MASK

Queries satellite elevation mask.

Type:

Get.

Synopsis

$PAIR073*<Checksum><CR><LF>

Parameter:

None.

Result:

Returns a **PAIR_ACK** message and the query result.

Query result message format:

$PAIR073,<Degree>*<Checksum><CR><LF>

Parameter included in the result:

Field	Format	Unit	Description
<Degree>	Numeric	Degree	Satellite elevation mask Range: -90–90. Default value: 5

Example:

$PAIR073*3E
$PAIR001,073,0*3F
$PAIR073,5*27

2.4.21. Packet Type: 074 PAIR_COMMON_SET_AIC_ENABLE

Enables or disables the AIC function. It is recommended to send the cold start command first and then this command.

Type:

Set.

Synopsis

$PAIR074,<Enabled>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Description
<Enabled>	Numeric	-	0 = Disable 1 = Enable (default)

Result:

Returns a **PAIR_ACK** message.

Example：

$PAIR074,1*24
$PAIR001,074,0*38

2.4.22. Packet Type: 080 PAIR_COMMON_SET_NAVIGATION_MODE

Sets navigation mode.

Type:

Set.

Synopsis:

$PAIR080,<CmdType>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Description
<CmdType>	Numeric	-	0 = Normal Mode. For general purposes. (default) 1 = Fitness Mode: For running and walking purposes so that the

low-speed (< 5 m/s) movement will have more effect on position calculation.

2 = Reserved

3 = Reserved

4 = Stationary Mode: For stationary applications where zero dynamics is assumed.

5 = Reserved

6 = Reserved

7 = Swimming Mode: For swimming purpose so that it smooths the trajectory and improves the accuracy of distance calculation.

Result:

Returns a **PAIR_ACK** message.

Example:

$PAIR080,1*2F
$PAIR001,080,0*33

2.4.23. Packet Type: 081 PAIR_COMMON_GET_NAVIGATION_MODE

Queries navigation mode.

Type:

Get.

Synopsis:

$PAIR081*<Checksum><CR><LF>

Parameter:

None

Result:

Returns a **PAIR_ACK** message and the query result.

Query result message format:

$PAIR081,<CmdType>*<Checksum><CR><LF>

Parameter included in the result:

Field	Format	Unit	Description
<CmdType>	Numeric	-	0 = Normal Mode. For general purposes. 1 = Fitness Mode: For running and walking purposes so that the low-speed (< 5 m/s) movement will have more effect on position calculation. 2 = Reserved 3 = Reserved 4 = Stationary Mode: For stationary applications where zero dynamics is assumed. 5 = Reserved 6 = Reserved 7 = Swimming Mode: For swimming purpose so that it smooths the trajectory and improves the accuracy of distance calculation.

Example:

```
$PAIR081*33
$PAIR001,081,0*32
$PAIR081,0*2F
```

2.4.24. Packet Type: 098 PAIR_COMMON_SET_NMEA_POS_DECIMAL_PRECISION

Sets the coordinates precision, i.e., the decimal places in the output coordinates.

Type:

Set.

Synopsis:

```
$PAIR098,<Mode>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Mode>	Numeric	-	0 = Latitude, Longitude: 4; Altitude: 1. 1 = Latitude, Longitude: 5; Altitude: 2. 2 = Latitude, Longitude: 6; Altitude: 3 (default) 3 = Latitude, Longitude: 7; Altitude: 3.

Result:

Returns a **PAIR_ACK** message.

Example:

$PAIR098,0*27
$PAIR001,098,0*3A

2.4.25. Packet Type: 099 PAIR_COMMON_GET_NMEA_POS_DECIMAL_PRECISION

Queries the precision of coordinates.

Type:

Get.

Synopsis:

$PAIR099*<Checksum><CR><LF>

Parameter:

None

Result:

Returns a **PAIR_ACK** message and the query result.

Query result message format:

$PAIR099, <Mode>*<Checksum><CR><LF>

Parameter included in the result:

Field	Format	Unit	Description
<Mode>	Numeric	-	0 = Latitude, Longitude: 4; Altitude: 1. 1 = Latitude, Longitude: 5; Altitude: 2. 2 = Latitude, Longitude: 6; Altitude: 3 (default) 3 = Latitude, Longitude: 7; Altitude: 3.

Example:

$PAIR099*3A
$PAIR001,099,0*3B
$PAIR099,3*25

2.4.26. Packet Type: 100 PAIR_COMMON_SET_NMEA_OUTPUT_MODE

Sets NMEA output mode.

Type:

Set.

Synopsis:

$PAIR100,<NMEA_Mode>,<PROPRIETARY_Mode>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Description
<NMEA_Mode>	Numeric	-	0 = Disable NMEA output 1 = Enable ASCII NMEA 4.10 output (default) 2 = Enable ASCII NMEA 3.01 output
<PROPRIETARY_Mode>	Numeric	-	0 = Disable proprietary sentence output (default) 1 = Enable proprietary sentence output

Result:

Returns a **PAIR_ACK** message.

Example:

$PAIR100,1,0*3A
$PAIR001,100,0*3A

2.4.27. Packet Type: 101 PAIR_COMMON_GET_NMEA_OUTPUT_MODE

Queries NMEA output mode.

Type:

Get.

Synopsis:

$PAIR101*<Checksum><CR><LF>

Parameter:

None

Result:

Returns a **PAIR_ACK** message and the query result.

Query result message format:

$PAIR101,<NMEA_Mode>,<PROPRIETARY_Mode>*<Checksum><CR><LF>

Parameter included in the result:

Field	Format	Unit	Description
<NMEA_Mode>	Numeric	-	0 = Disabled NMEA output 1 = Enabled ASCII NMEA 4.10 output (default) 2 = Enabled ASCII NMEA 3.01 output
<PROPRIETARY_Mode>	Numeric	-	0 = Disabled proprietary sentence output (default) 1 = Enabled proprietary sentence output

Example:

$PAIR101*3A
$PAIR001,101,0*3B
$PAIR101,0,1,*3B

2.4.28. Packet Type: 104 PAIR_COMMON_SET_DUAL_BAND

Sets Dual Band state when the GNSS system is powered off.

Type:

Set.

Synopsis:

$PAIR104,<DUAL_BAND_Enable>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Description
<DUAL_BAND_Enable>	Numeric	-	0 = Disable 1 = Enable (default)

Result:

Returns a **PAIR_ACK** message.

Example:

$PAIR104,0*23
$PAIR001,104,0*3E

> **NOTE**
>
> This command fails in the following cases:
> 1. The GNSS system is powered on. In this case, power off the GNSS system with **PAIR003** before sending this command.
> 2. The GNSS search mode cannot be supported in the Dual Band state, for example:
>   If the GNSS search mode is GPS + GLONASS, **PAIR104,1** would fail because Dual Band doesn't support GPS + GLONASS search mode.

2.4.29. Packet Type: 105 PAIR_COMMON_GET_DUAL_BAND

Queries whether Dual Band is enabled or disabled.

Type:

Get.

Synopsis:

$PAIR105*<Checksum><CR><LF>

Parameter:

None.

Result:

Returns a **PAIR_ACK** message and the query result.

Query result message format:

$PAIR105,<Enable>*<Checksum><CR><LF>

Parameter included in the result:

Field	Format	Unit	Description
<Enable>	Numeric	-	0 = Disabled 1 = Enabled (default) 3 = Critical status

Example:

$PAIR105*3E
$PAIR001,105,0*3F
$PAIR105,1*23

2.4.30. Packet Type: 391 PAIR_TEST_JAMMING_DETECT

Enables or disables jamming detection.

Type:

Command.

Synopsis:

$PAIR391,<CmdType>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Description
<CmdType>	Numeric	-	0 = Disable jamming detection function (default) 1 = Enable jamming detection function

Result:

Returns a **PAIR_ACK** message and the query result.

Query result message format:

$PAIRSPF,<Status>*<Checksum><CR><LF>

Parameter included in the result:

Field	Format	Unit	Description
<Status>	Numeric	-	1 = No jamming, good status 2 = Warning status 3 = Critical status

Example:

```
$PAIR391,1*2C
$PAIR001,391,0*30
//Good  status:
$PAIRSPF,1*52
//Warning  status:
$PAIRSPF,2*51
//Critical  status:
$PAIRSPF,3*50
```

> **NOTE**
>
> After jamming detection is enabled, the module starts to detect if there is any jamming.
> 1. If there is no jamming, **$PAIRSPF,1*52** will be reported to indicate good status (status 1).
> 2. If there is continuous jamming, the module status will change from 1 to 2 and finally to 3.
>   - When no fix has been completed: module status is 1 right after the jamming detection is enabled, and then changes to 2 when jamming is detected. During this process, the module keeps attempting to get a fix; if in vain after 200 s, the module status changes to 3 at last.
>   - After a successful fix: module status is 1 right after jamming detection is enabled, and changes to 2 and 3 consecutively when jamming is detected.

2.4.31. Packet Type: 400 PAIR_DGPS_SET_MODE

Sets the source of DGPS correction data.

Type:

Set.

Synopsis:

$PAIR400,<Mode>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Description
<Mode>	Numeric	-	DGPS data source. 0 = No DGPS source 2 = SBAS (Includes WAAS/EGNOS/GAGAN) (default)

Result:

Retuns a **PAIR_ACK** message.

Example:

$PAIR400,2*20
$PAIR001,400,0*3F

2.4.32. Packet Type: 401 PAIR_DGPS_GET_MODE

Queries the source of DGPS correction data.

Type:

Get.

Synopsis:

$PAIR401*<Checksum><CR><LF>

Parameter:

None.

Result:

Returns a **PAIR_ACK** message and the query result.

Query result message format:

$PAIR401,<Mode>*<Checksum><CR><LF>

Parameter included in the result:

Field	Format	Unit	Description
<Mode>	Numeric	-	DGPS data source. 0 = No DGPS source 2 = SBAS (Including WAAS/EGNOS/GAGAN/MSAS) (default)

Example:

$PAIR401*3F
$PAIR001,401,0*3E
$PAIR401,2*21

2.4.33. Packet Type: 410 PAIR_SBAS_ENABLE

Enables or disables the searching of SBAS satellites. SBAS supports wide-area or regional augmentation through geostationary satellite broadcast messages. The geostationary satellites broadcast GNSS integrity and correction data with the assistance of multiple ground stations that are located at accurately-surveyed points.

Type:

Set.

Synopsis

$PAIR410,<Enabled>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Description
<Enabled>	Numeric	-	0 = Disable 1 = Enable (default)

Result:

Returns a **PAIR_ACK** message.

Example:

$PAIR410,1*22
$PAIR001,410,0*3E

2.4.34. Packet Type: 411 PAIR_SBAS_GET_STATUS

Queries if the searching of SBAS satellites is enabled or not.

Type:

Get.

Synopsis

$PAIR411*<Checksum><CR><LF>

Parameter:

None.

Result:

Returns a **PAIR_ACK** message and the query result.

Query result message format:

$PAIR411,<Enabled>*<Checksum><CR><LF>

Parameter included in the result:

Field	Format	Unit	Description
<Enabled>	Numeric	-	0 = Disabled 1 = Enabled (default)

Example:

```
$PAIR411*3E
$PAIR001,411,0*3F
$PAIR411,2*21
```

2.4.35. Packet Type: 490 PAIR_EASY_ENABLE

Enables or disables EASY™ function.

Type:

Set.

Synopsis:

```
$PAIR490,<Enable>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Enabled>	Numeric	-	0 = Disable 1 = Enable (default)

Result:

Returns a **PAIR_ACK** message.

Example:

```
$PAIR490,1*2A
$PAIR001,490,0*36
```

2.4.36. Packet Type: 491 PAIR_EASY_GET_STATUS

Queries the status of EASY™.

Type:

Get.

Synopsis:

```
$PAIR491*<Checksum><CR><LF>
```

Parameter:

None.

Result:

Returns a **PAIR_ACK** message and the query result.

Query result message format:

$PAIR491,<Enable>,<Status>*<Checksum><CR><LF>

Parameter included in the result:

Field	Format	Unit	Description
<Enable>	Numeric	-	Enabled or disabled: 0 = Disabled 1 = Enabled (default)
<Status>	Numeric	-	0 = Not finished 1 = Finished 1-day extension 2 = Finished 2-day extension 3 = Finished 3-day extension

Example:

$PAIR491*36
$PAIR001,491,0*37
$PAIR491,1,0*37

> **NOTE**
>
> If EASY™ function is not enabled, only the **<Enable>** value will be returned after executing this command.

2.4.37. Packet Type: 513 PAIR_NVM_SAVE_SETTING

Saves the current configurations to the file system.

Type:

Command.

Synopsis:

$PAIR513*<Checksum><CR><LF>

Parameter:

None.

Result:

Returns a **PAIR_ACK** message.

Example:

```
$PAIR513*3D
$PAIR001,513,0*3C
```

NOTE

If the hardware cannot sustain power supply to RTC, this command needs to be sent every time after you modify any parameters.

2.4.38. Packet Type: 650 PAIR_LOW_POEWR_ENTER_RTC_MODE

Shuts down all systems, including GNSS and CM4. When this command is sent, CM4 will be set to the RTC-Mode, in which it cannot receive any commands. CM4 can be awoken by the timer or the RTC_EINT pin. All system resources will re-initialize after wake up.

Type:

Set.

Synopsis:

```
$PAIR650,<Second>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Second>	Numeric	Second	Time to leave RTC-Mode. Range: 0 and 10–62208000.

Result:

- If there is no error, the RTC will be set into RTC-Mode and cannot receive any commands.

- In case of any command parameter error, the **PAIR_ACK** message will be returned.

Example:

```
$PAIR650,2*27
$PAIR001,650,4*3C
```

<Second>=0: enter RTC-Mode without a timer.

2.4.39. Packet Type: 690 PAIR_PERIODIC_SET_MODE

Sets Periodic Power Saving Mode configurations.

Type:

Set.

Synopsis:

$PAIR690,<Mode>,<FirstRun>,<FirstSleep>,<SecondRun>,<SecondSleep>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Description
<Mode>	Numeric	-	0 = Disable periodic mode (default) 1 = Enable smart periodic mode 2 = Enable Strict periodic mode
<FirstRun>	Numeric	Second	Run time. Range: 3–518400.
<FirstSleep>	Numeric	Second	Sleep time. Range: 3–518400.
<SecondRun>	Numeric	Second	Second run time. Range: 0–518400.
<SecondSleep>	Numeric	Second	Second sleep time. Range: 0–518400

Result:

Returns a **PAIR_ACK** message.

Example:

$PAIR690,1,21,39,48,72*28
$PAIR001,690,0*34

2.4.40. Packet Type: 691 PAIR_PERIODIC_GET_MODE

Queries Periodic Power Saving Mode configurations.

Type:

Get.

Synopsis:

$PAIR691*<Checksum><CR><LF>

Parameter:

None

Result:

Returns a **PAIR_ACK** message and the query result.

Query result message format:

$PAIR691,<Mode>,<FirstRun>,<FirstSleep>,<SecondRun>,<SecondSleep>*<Checksum><CR><LF>

Parameters included in the result:

Field	Format	Unit	Description
<Mode>	Numeric	-	0 = Periodic mode disabled 1 = Smart periodic mode enabled 2 = Strict periodic mode enabled
<FirstRun>	Numeric	Second	Run time. Range: 3–518400
<FirstSleep>	Numeric	Second	Sleep time. Range: 3–518400
<SecondRun>	Numeric	Second	Second run time. Range: 0–518400
<SecondSleep>	Numeric	Second	Second sleep time. Range: 0–518400

Example:

$PAIR691*34
$PAIR001,691,1*34
$PAIR691,0,21,39,48,72*28

2.4.41. Packet Type: 752 PAIR_PPS_SET_CONFIG_CMD

Sets PPS configurations.

Type:

Set.

Synopsis:

$PAIR752,<PPSType>,<PPSPulseWidth>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Description
<PPSType>	Numeric	-	0 = Disable 1 = After the first fix 2 = 3D fix only (default) 3 = 2D/3D fix only 4 = Always
<PPSPulseWidth>	Numeric	Millisecond	PPS Pulse Width. Range: 1–999. Default value: 100

Result:

Returns a **PAIR_ACK** message.

Example：

```
$PAIR752,2,100*39
$PAIR001,752,0*3B
```

2.4.42. Packet Type: 864 PAIR_IO_SET_BAUDRATE

Sets the NMEA port baud rate.

Type:

Set.

Synopsis:

```
$PAIR864,<Port_Type>,<Port_Index>,<Baudrate>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Port_Type>	Numeric	-	HW Port Type 0 = UART
<Port_Index>	Numeric	-	HW Port Index 0 = UART0
<Baudrate>	Numeric	bps	Baud rate: 4800 9600 19200 38400 57600 115200 (default)

921600

Result:

Returns a **PAIR_ACK** message.

Example:

```
$PAIR864,0,0,115200*1B
$PAIR001,864,0*31
```

> **NOTE**
>
> The configurations take effect after module rebooting and are saved automatically without executing **$PAIR513**.

2.4.43. Packet Type: 865 PAIR_IO_GET_BAUDRATE

Queries the baud rate configuration of the current NMEA UART port.

Type:

Get.

Synopsis:

```
$PAIR865,<Port_Type>,<Port_Index>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Port_Type>	Numeric	-	HW Port 0 = UART
<Port_Index>	Numeric	-	HW Port Index 0 = UART0

Result:

Returns a **PAIR_ACK** and the query result.

Query result message format:

```
$PAIR865,<Baudrate>*<Checksum><CR><LF>
```

Parameter included in the result:

Field	Format	Unit	Description
<Baudrate>	Numeric	bps	Baud rate: 4800 9600 19200 38400 57600 115200 (default) 921600

Example:

$PAIR865,0,0*31
$PAIR001,865,0*30
$PAIR865,115200*1A

3 Appendix A References

Table 3: Related Documents

Document Name
[1] [Quectel_LC29H_Hardware_Design](#)
[2] [Quectel_LC29H_EVB_User_Guide](#)
[3] Quectel_LC29H_Reference_Design
[4] [Quectel_LC79H_Hardware_Design](#)
[5] [Quectel_LC79H_EVB_User_Guide](#)
[6] Quectel_LC79H_Reference_Design

Table 4: Terms and Abbreviations

Abbreviation	Description
2D	2 Dimension
3D	3 Dimension
ACK	Acknowledgement
AIC	Active Interference Cancellation
BeiDou	BeiDou Navigation Satellite System
CM4	Cortex-M4
DGPS	Differential Global Positioning System
DOP	Dilution of Precision
DSP	Digital Signal Processing
EASY^{TM}	Embedded Assist System
EGNOS	European Geostationary Navigation Overlay Service
EPO	Extended Prediction Orbit

GAGAN	GPS-aided GEO Augmented Navigation
Galileo	Galileo Satellite Navigation System (EU
GGA	Global Positioning System Fix Data
GLL	Geographic Position – Latitude/Longitude
GNS	GNSS Fix Data
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GSA	GNSS DOP and Active Satellites
GSV	GNSS Satellites in View
HDOP	Horizontal Dilution of Precision
HW	Hardware
ID	Identifier
MNL	MTK Navigation Lib
MSAS	Multi-functional Satellite Augmentation System
NMEA	NMEA (National Marine Electronics Association) 0183 Interface Standard
NVM	Non-volatile Memory
PAIR	Proprietary Protocol of MTK
PDOP	Position Dilution of Precision
PE	Positioning Engine
PPS	Pulse Per Second
PQTM	Quectel Proprietary Protocol
QZSS	Quasi-Zenith Satellite System
RF	Radio Frequency
RMC	Recommended Minimum Specific GNSS Data
RTC	Real-time Clock
RTK	Real Time Kinematic
SBAS	Satellite-Based Augmentation System
SNR	Signal-to-noise Ratio

SV	Satellites in View
UART	Universal Asynchronous Receiver/Transmitter
ULP	Ultra-Low Power
UTC	Coordinated Universal Time
VDOP	Vertical Dilution of Precision
VTG	Course Over Ground and Ground Speed
WAAS	Wide Area Augmentation System
WGS84	World Geodetic System 1984

4 Appendix B GNSS Numbering

Table 5: GNSS Numbering

GNSS Type	System ID	Satellite ID	Signal ID
GPS	1	1–32	1 = L1 C/A 8 = L5
GLONASS	2	65–88	1 = L1
Galileo	3	1–36	1 = E5a 7 = E1
BeiDou	4	1–63	1 = B1 5 = B2a
QZSS	-	193–199	-
SBAS	-	33–51	-

5 Appendix C Default Configurations

Table 6: Default Configurations

Item	Default
NMEA Port Baud Rate	115200 bps
Datum	WGS84
Rate of Position Fixing	1 Hz
DGPS Mode	SBAS
SBAS Enable	Enabled
NMEA Output Messages	RMC, GGA, GSV, GSA, VTG, GLL
AIC	Enabled
EASY™	Enabled
GNSS Configuration	GPS + Galileo + GLONASS + BeiDou + QZSS