LC76F GNSS Protocol Specification

GNSS Module Series

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About the Document

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-	2021-05-24	Creation of the document
1.0	2021-09-17	Released
1.1	2022-05-11	1. Changed the NMEA version from V4.11 to V4.1. 2. Deleted BeiDou information. 3. Added Galileo information. 4. Deleted $PGKC149 command. 5. Deleted the appendix Default Configurations. 6. Added $PGKC047 command. 7. Updated the description of <ModeInd> in RMC, VTG and GLL sentences (*Chapters 2.2.1*, *2.2.5* and *2.2.6*). 8. Updated the description of <PDOP>, <HDOP> and <VDOP> in GSA sentences (*Chapter 2.2.4*). 9. Updated the name of all PGKC messages (*Chapter 2.3*). 10. Updated the description of <StartType> and added notes in $PGKC030 command (*Chapter 2.3.2*). 11. Updated the notes and the example of $PGKC105 (*Chapter 2.3.6*). 12. Updated the description of <Width> in $PGKC161 command (*Chapter 2.3.10*). 13. Added the default state of <Mode> in $PGKC239 command (*Chapter*

		2.3.13). 14. Deleted the unit of all parameters in $PGKC242 and $PGKC244 (Chapters 2.3.16 and 2.3.18). 15. Added a note in $PGKC280 command (Chapter2.3.20). 16. Updated the notes of $PGKC284 and $PGKC356 commands (Chapters 2.3.21 and 2.3.22). 17. Modified the example of $PGKC639.
1.2	2022-09-15	1. Deleted $PGKC047 and $PGKC639 command. 2. Added ZDA message (Chapter 2.2.7). 3. Updated the description of $PGKC101, $PGKC201 and $PGKC202 messages (Chapters 2.3.5, 2.3.11 and 2.3.12). 4. Updated the parameter description of $PGKC242 and $PGKC244 messages (Chapters 2.3.16 and 2.3.18). 5. Added PQ messages (Chapter 2.4).

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1 Introduction

Quectel LC76F GNSS module supports GPS, GLONASS, Galileo and QZSS constellations. Concurrent tracking of GPS L1 C/A, GLONASS L1, Galileo E1 and QZSS L1 frequency bands provides fast and accurate acquisition and makes this module an ideal solution 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 the chipset supplier (PGKC messages and PQ messages). To report GNSS information, the module supports output messages in NMEA 0183 standard protocol format.

NOTE

Quectel assumes no responsibility if commands other than the ones listed herein are used.

2 NMEA Protocol

2.1. Structure of NMEA Protocol Messages

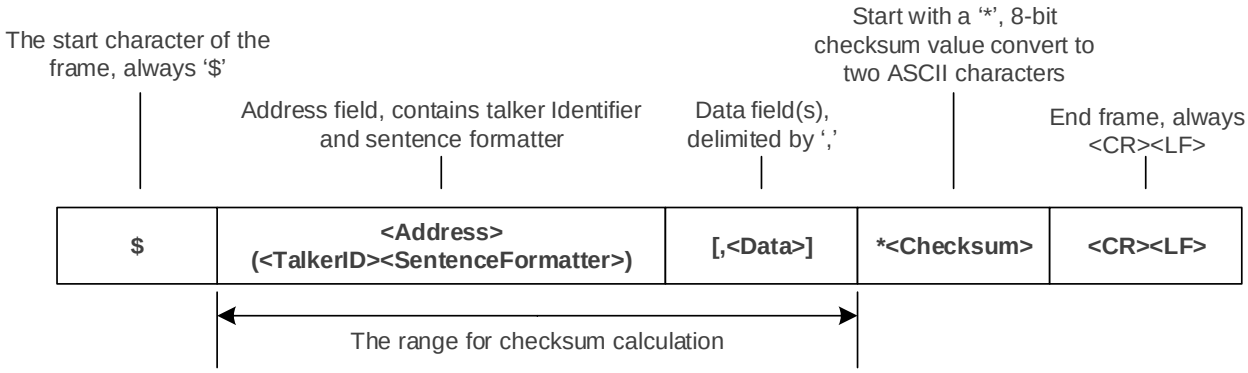

Figure 1: Structure of NMEA Protocol Messages

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).

Field	Description
<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 V4.10)
GPS	GP
GLONASS	GL
Galileo	GA
QZSS	GP
Combination of Multiple Satellite Systems	GN

NOTE

1. QZSS is always enabled.
2. TalkerID is **GP** in both QZSS and GPS satellite configurations, see *Table 4: GNSS Numbering* for more information about satellite identifiers.

2.2. Standard Messages

This chapter explains the NMEA 0183 V4.10 standard messages supported by the module.

2.2.1. RMC

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

Type:

Output

Synopsis:

```
$<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
$	Character	-	$	Each NMEA message starts with **$**.
<TalkerID>	String, 2 characters	-	GP	Talker identifier. See *Table 2: NMEA Talker ID.*
RMC	String, 3 characters	-	RMC	Recommended Minimum Specific GNSS Data.
<UTC>	hhmmss.sss	-	052457.000	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 = Navigation receiver warning
<Lat>	ddmm.mmmmmm	-	3149.332458	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	-	11706.913542	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

Field	Format	Unit	Example	Description
				Note that this field is empty in case of an invalid value.
<SOG>	Numeric	Knot	0.00	Speed over ground. Variable length.
<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	-	240521	Date: dd: Day of month mm: Month yy: Year Note that this field is empty in case of an invalid value.
<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 M = Manual input mode N = No fix. Satellite system not used in position fix, or fix not valid S = Simulator mode
<NavStatus>	Character	-	V	Navigational status. V = Navigational status not valid, equipment is not providing navigational status indication. Note that this parameter is only available in NMEA 4.10 and later.
<Checksum>	Hexadecimal	-	18	Checksum
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
//GPS + GLONASS mode:
$GNRMC,052609.000,A,3149.334646,N,11706.912720,E,0.00,0.00,240521,,,A,V*03
//GPS only mode:
$GPRMC,052457.000,A,3149.332458,N,11706.913542,E,0.00,0.00,240521,,,A,V*18
```

2.2.2. GGA

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

Type:

Output

Synopsis:

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

Parameter:

Field	Format	Unit	Example	Description
$	Character	-	$	Each NMEA message starts with **$**.
<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	-	052457.000	Position fix UTC: hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds
<Lat>	ddmm.mmmmmm	-	3149.332458	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

Field	Format	Unit	Example	Description
				of an invalid value.
<Lon>	dddmm.mmmmmm	-	11706.913542	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.
<Quality>	Numeric, 1 digit	-	1	GPS quality indicator: 0 = Fix not available or invalid 1 = GPS SPS Mode, fix valid 2 = Differential GPS, SPS Mode, or Satellite Based Augmentation System (SBAS), fix valid 6 = Estimated (dead reckoning) mode
<NumSatUsed>[1)]	Numeric, 2 digits	-	10	Number of satellites in use.
<HDOP>	Numeric	-	0.86	Horizontal dilution of precision. Note that this field is empty in case of an invalid value.
<Alt>	Numeric	Meter	55.434	Altitude above mean-sea-level (geoid). Note that this field is empty in case of an invalid value.
M	Character	-	M	Unit of **<Alt>**. “M” = Meter. Note that this field is empty in case of an invalid value.
<Sep>	Numeric	Meter	-0.337	Geoid separation (the difference between the earth ellipsoid surface and the mean-sea-level (geoid) surface defined by the reference datum used in the position solution). Note that this field is empty in case of an invalid value.

Field	Format	Unit	Example	Description
M	Character	-	M	Unit of **<Sep>**. "M" = Meter. Note that this field is empty in case of an invalid value.
<DiffAge>	-	-	-	Differential GPS data age. Not supported.
<DiffStation>	-	-	-	Differential reference station ID. Not supported.
<Checksum>	Hexadecimal	-	46	Checksum
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
//GPS + GLONASS mode:
$GNGGA,052609.000,3149.334646,N,11706.912720,E,1,13,0.79,54.863,M,-0.337,M,,*51
//GPS only mode:
$GPGGA,052457.000,3149.332458,N,11706.913542,E,1,10,0.86,55.434,M,-0.337,M,,*46
```

NOTE

1. The NMEA 0183 specification indicates that the **GGA** message is GPS specific. However, when the receiver is configured for multi-constellations, the content of **GGA** message will be generated from the multi-constellation solution.
2. [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.

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 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:

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

Parameter:

Field	Format	Unit	Example	Description
$	Character	-	$	Each NMEA message starts with **$**.
<TalkerID>	String, 2 characters	-	GP	Talker identifier. See *Table 2: NMEA Talker ID*
GSV	String, 3 characters	-	GSV	GNSS Satellites in View.
<TotalNumSen>	Numeric	-	3	Total number of sentences. Range: 1–9.
<SenNum>	Numeric	-	1	Sentence number. Range: 1–**<TotalNumSen>**.
<TotalNumSat>	Numeric	-	11	Total number of satellites in view.
Start of repeat block. Repeat times: 1–4.				
<SatID>	Numeric	-	14	Satellite ID. See *Table 4: GNSS Numbering*
<SatElev>	Numeric	Degree	80	Satellite elevation. Range: 00–90.
<SatAz>	Numeric	Degree	316	Satellite azimuth, with true north as the reference plane. Range: 000–359.
<SatCN0>	Numeric	dB-Hz	44	Satellite C/N_0.Range: 00–99. Null when not tracking.
End of repeat block.				
<SignalID>	Numeric	-	1	GNSS signal ID. See *Table 4: GNSS Numbering*
<Checksum>	Hexadecimal	-	67	Checksum
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
//GPS + GLONASS mode:
$GPGSV,4,1,15,14,81,314,42,28,61,321,40,03,45,102,38,01,40,038,40,1*60
$GPGSV,4,2,15,22,35,065,39,19,30,295,37,30,27,216,37,06,23,234,37,1*69
$GPGSV,4,3,15,193,21,138,33,21,20,046,33,17,,,40,31,,,17,1*50
$GPGSV,4,4,15,26,,,17,194,,,35,195,,,33,1*65
$GLGSV,2,1,06,70,72,200,34,84,52,084,22,85,43,342,32,69,42,032,36,1*7E
$GLGSV,2,2,06,75,,,15,71,,,22,1*7E
//GPS only mode:
$GPGSV,3,1,11,14,80,316,44,28,60,322,42,03,45,103,38,01,41,038,41,1*67
$GPGSV,3,2,11,22,35,065,39,19,30,295,40,30,27,216,39,06,23,233,38,1*6C
```

```
$GPGSV,3,3,11,21,21,046,37,193,20,138,36,07,07,183,37,1*6A
```

NOTE

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

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:

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

Parameter:

Field	Format	Unit	Example	Description
$	Character	-	$	Each NMEA message starts with **$**.
<TalkerID>	String, 2 characters	-	GP	Talker identifier. See *Table 2: NMEA Talker ID*
GSA	String, 3 characters	-	GSA	GNSS DOP and Active Satellites.
<Mode>	Character	-	A	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	Fix mode: 1 = Fix not available 2 = 2D 3 = 3D
Start of repeat block. Repeat times: 12.				
<SatID>	Numeric	-	-	ID numbers of satellites used in solution. See *Table 4: GNSS Numbering* Note that this field is empty in case of an invalid value.

Field	Format	Unit	Example	Description
End of repeat block.				
<PDOP>	Numeric	-	1.21	Position dilution of precision. Maximum value: 99.0. Note that this field is empty in case of an invalid value.
<HDOP>	Numeric	-	0.86	Horizontal dilution of precision. Maximum value: 99.0. Note that this field is empty in case of an invalid value.
<VDOP>	Numeric	-	0.85	Vertical dilution of precision. Maximum value: 99.0. Note that this field is empty in case of an invalid value.
<SystemID>	Numeric	-	1	GNSS system ID. See *Table 4: GNSS Numbering.*
<Checksum>	Hexadecimal	-	26	Checksum
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
//GPS + GLONASS mode:
$GNGSA,A,3,28,03,01,22,19,30,06,193,14,21,,,1.63,0.79,1.43,1*35
$GNGSA,A,3,84,73,83,,,,,,,,,1.63,0.79,1.43,2*0D
//GPS only mode:
$GPGSA,A,3,28,03,01,22,19,30,06,21,193,14,,,1.21,0.86,0.85,1*26
```

NOTE

If less than 12 satellites are used for navigation, the remaining **<SatID>** fields are left empty. If more than 12 satellites are used for navigation, only the IDs of the first 12 are output.

2.2.5. VTG

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

Type:

Output

Synopsis:

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

Parameter:

Field	Format	Unit	Example	Description
$	Character	-	$	Each NMEA message starts with **$**.
<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	0.00	Course over ground, in true north course direction. Note that this field is empty in case of an invalid value.
T	Character	-	T	Fixed field: true. (degrees true, fixed field) Note that this field is empty in case of an invalid value.
<COGM>	Numeric	Degrees	-	Course over ground (magnetic). Not supported.
M	Character	-	M	Fixed field: magnetic. Speed over ground in knots. Note that this field is empty in case of an invalid value.
<SOGN>	Numeric	Knots	0.00	Speed over ground in knots. Note that this field is empty in case of an invalid value.
N	Character	-	N	Fixed field: knot. Note that this field is empty in case of an invalid value.
<SOGK>	Numeric	km/h	0.00	Speed over ground in kilometers per hour. Note that this field is empty in case of an invalid value.
K	Character	-	K	Fixed field: kilometers per hour. Note that this field is empty in case of an invalid value.
<ModeInd>	Character	-	A	The mode indicator of the positioning system: A = Autonomous mode. Satellite system used in non-differential mode in position

Field	Format	Unit	Example	Description
				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 M = Manual input mode N = No fix. Satellite system not used in position fix, or fix not valid. S = Simulator mode
<Checksum>	Hexadecimal	-	3D	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
//GPS + GLONASS mode:
$GNVTG,0.00,T,,M,0.00,N,0.00,K,A*23
//GPS only mode:
$GPVTG,0.00,T,,M,0.00,N,0.00,K,A*3D
```

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:

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

Parameter:

Field	Format	Unit	Example	Description
$	Character	-	$	Each NMEA message starts with **$**.
<TalkerID>	String, 2 characters	-	GP	Talker identifier. See *Table 2: NMEA Talker ID.*

Field	Format	Unit	Example	Description
GLL	String, 3 characters	-	GLL	Geographic Position-Latitude/Longitude.
<Lat>	ddmm.mmmmmm	-	3149.332458	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	-	11706.913542	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	-	052457.000	Position UTC: hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds Note that this field is empty in case of an invalid value.
<Status>	Character	-	A	Positioning system status: A = Data valid V = Data not valid
<ModeInd>	Character	-	A	The mode indicator of the positioning system: 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

Field	Format	Unit	Example	Description
				Satellite Based Augmentation System (SBAS) E = Estimated (dead reckoning) mode M = Manual input mode N = No fix. Satellite system not used in position fix, or fix not valid. S = Simulator mode
<Checksum>	Hexadecimal	-	55	Checksum
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
//GPS + GLONASS mode:
$GNGLL,3149.334646,N,11706.912720,E,052609.000,A,A*4E
//GPS only mode:
$GPGLL,3149.332458,N,11706.913542,E,052457.000,A,A*55
```

2.2.7. ZDA

Time and Date. UTC, day, month, year and local time zone.

Type:

Output

Synopsis:

```
$<TalkerID>ZDA,<UTC>,<Day>,<Month>,<Year>,<LocalHour>,<LocalMin>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Example	Description
$	Character	-	$	Each NMEA message start with **$**.
<TalkerID>	String, 2 characters	-	GP	Talker identifier. See *Table 2: NMEA Talker ID*
ZDA	String, 3 characters	-	ZDA	Time and Date. UTC, day, month, year and local time zone.
<UTC>	hhmmss.sss	-	113809.000	Position fix UTC: hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59)

Field	Format	Unit	Example	Description
				sss: Decimal fraction of seconds
<Day>	Numeric	-	13	Day of month. Range: 01–31.
<Month>	Numeric	-	09	Month. Range: 01–12.
<Year>	Numeric	-	2022	Year.
<LocalHour>	Numeric	-	-	Local zone hours, 00 to ±13 hours. Not supported.
<LocalMin>	Numeric	-	-	Local zone minutes, 00 to +59 minutes. Not supported.
<Checksum>	Hexadecimal	-	*5D	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
//GPS + GLONASS mode:
$GNZDA,114213.000,13,09,2022,,*45
//GPS only mode:
$GPZDA,113809.000,13,09,2022,,*5D
```

NOTE

LC76F module does not support output local time zone due to firmware limitation.

2.3. PGKC Messages

This chapter explains **$PGKC** messages (proprietary NMEA messages defined by the chipset supplier) supported by LC76F module.

PGKC Message Format:

```
$PGKC<Command>,<Arguments>*<Checksum><CR><LF>
```

Command: Represents the number of the command to be sent. See the specific value below.

Arguments: Indicates the parameters, which can be multiple, needed to send the command. Different commands correspond to different data. See the specific values below.

2.3.1. PGKC001: PGKC_ACK

Acknowledges a PGKC command.

Type:

Output

Synopsis:

```
$PGKC001,<Cmd>,<AckType>{,<Par1>,…,<ParN>}*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Cmd>	Numeric	-	Type of command to be acknowledged.
<AckType>	Numeric	-	Type of acknowledge. 1 = Unsupported command 2 = Valid command, but action failed 3 = Valid command, and action succeeded
{,<Par1>,…,<ParN>}	Numeric	-	Extended parameters.

Example:

```
$PGKC001,115,3,1,0,0,0,0,1*28
```

2.3.2. PGKC030: PGKC_HOT_WARM_COLD_FULL_COLD_START

Starts the system.

Type:

Command

Synopsis:

```
$PGKC030,<StartType>,<RestartMode>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<StartType>	Numeric	-	Start type. 1 = Hot start 2 = Warm start

			3 = Cold start 4 = Full cold start
<RestartMode>	Numeric	-	Restart mode. 1 = Soft restart 2 = Hardware restart 3 = Clear the NVRAM and keep the Flash restart

Result:

Returns **$PGKC001** message.

Example:

```
$PGKC030,1,1*2C
$PGKC001,30,3*1E
```

NOTE

1. **<RestartMode>** can only be set to 1 for hot or warm start, and can be set to 1, 2, or 3 for cold start or full cold start.
2. When **<RestartMode>** is 2 or 3 and the command is executed successfully, there is no reply.
3. The full cold start, which not only includes the features of a cold start, but also clears the system/user configuration at startup.

2.3.3. PGKC040: PGKC_ERASE_FLASH_DATA

Erases almanac and ephemeris information in the flash.

Type:

Command

Synopsis:

```
$PGKC040*<Checksum><CR><LF>
```

Parameter:

None

Result:

Returns **$PGKC001** message.

Example:

```
$PGKC040*2B
$PGKC001,40,3*19
```

NOTE

Although the command has been executed successfully, the module is still positioning.

2.3.4. PGKC051: PGKC_STANDBY_MODE

Sets the module to standby mode or makes it exit standby mode.

Type:

Command

Synopsis:

```
$PGKC051,<Mode>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Mode>	Numeric	-	Operating mode. 0 = Standby mode

Result:

Returns **$Enter_Standby_Mode** or **$Exit_Standby_Mode** message.

Example:

```
$PGKC051,0*37
$Enter_Standby_Mode*3C
```

NOTE

The module can be woken up from this mode by sending any command or by rebooting.

2.3.5. PGKC101: PGKC_SET_FIX_INTERVAL

Sets position fix interval.

Type:

Set

Synopsis:

```
$PGKC101,<Interval>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Interval>	Numeric	ms	Position fix interval. Range: 100–10000. Default: 1000.

Result:

Returns **$PGKC001** message.

Example:

```
$PGKC101,1000*02
$PGKC001,101,3,1000*00
```

NOTE

If you want to output NMEA messages at a high frequency (≥ 1 Hz), the UART baud rate needs to be 115200 bps or above.

2.3.6. PGKC105: PGKC_ENTER_LOW_POWER_MODE

Sets the module into low power mode.

Type:

Command

Synopsis:

```
$PGKC105,<Mode>,<RunTime>,<SleepTime>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Mode>	Numeric	-	Operating mode: 0 = Normal mode (continuous mode) 1 = Periodic low power mode (periodic mode) 4 = Backup mode 8 = Standby mode
<RunTime>	Numeric	ms	Run time.
<SleepTime>	Numeric	ms	Sleep time.

Result:

Returns **$PGKC001** message.

Example:

```
//Normal mode:
$PGKC105,0*37
$PGKC001,105,3*29

//Periodic low power mode:
$PGKC105,1,1000,2000*35
$PGKC001,105,3*29
$Enter_Standby_Mode*3C

//Backup mode:
$PGKC105,4*33
$PGKC001,105,3*29
$Enter_Standby_Mode*3C

//Standby mode:
$PGKC105,8*3F
$PGKC001,105,3*29
$Enter_Standby_Mode*3C
```

NOTE

1. The **$PGKC105,0*37** command is sent via UART to wake up the module.
2. Sleep time and run time need to be set only when **<Mode>** is 1, and make sure the value of sleep time and run time is ≥ 1000 ms.
3. If the **<Mode>** is 4, you can pull up the WAKEUP pin to exit backup mode.
4. When the **<Mode>** is 1, 4 or 8, in addition to the **$PGKC001,105,3*29** message, there is an

$Enter_Standby_Mode*3C message in the response.

2.3.7. PGKC115: PGKC_SET_GNSS_SEARCH_MODE

Sets the satellite constellations search mode.

Type:

Set

Synopsis:

```
$PGKC115,<GPS>,<GLONASS>,<Res>,<Galileo>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<GPS>	Numeric	-	Enable or disable GPS. 0 = Disable 1 = Enable
<GLONASS>	Numeric	-	Enable or disable GLONASS. 0 = Disable 1 = Enable
<Res>	Numeric	-	Reserved. Always “0”.
<Galileo>	Numeric	-	Enable or disable Galileo. 0 = Disable 1 = Enable

Result:

Returns **$PGKC001** message.

Example:

```
$PGKC115,1,0,0,0*2B
$PGKC001,115,3,1,0,0,0,0,1*28
```

NOTE

The constellation configuration supported by LC76F are as follows:

- GPS only
- GPS + GLONASS
- GPS + Galileo

- GPS + GLONASS + Galileo

2.3.8. PGKC121: PGKC_SET_GNSS_SEARCH_MODE_IN_FLASH

Sets the satellite constellations search mode and saves it in flash.

Type:

Set

Synopsis:

```
$PGKC121,<GPS>,<GLONASS>,<Res>,<Galileo>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<GPS>	Numeric	-	Enable or disable GPS. 0 = Disable 1 = Enable
<GLONASS>	Numeric	-	Enable or disable GLONASS. 0 = Disable 1 = Enable
<Res>	Numeric	-	Reserved. Always “0”.
<Galileo>	Numeric	-	Enable or disable Galileo. 0 = Disable 1 = Enable

Result:

Returns **$PGKC001** message.

Example:

```
$PGKC121,1,0,0,0*2C
$PGKC001,121,3,1,0,0,0*2E
```

NOTE

1. The constellation configuration supported by LC76F are as follows:
   - GPS only
   - GPS + GLONASS
   - GPS + Galileo

- GPS + GLONASS + Galileo

2. In contrast to **$PKGC115**, the settings configured with **$PKGC121** are stored in flash and retained after restart.

2.3.9. PGKC147: PGKC_SET_NMEA_BAUDRATE

Sets the UART interface baud rate.

Type:

Set

Synopsis:

```
$PGKC147,<Baudrate>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Baudrate>	Numeric	bps	Baud rate: 9600 (default) 14400 19200 38400 57600 115200 230400 460800 921600

Example:

```
$PGKC147,115200*06
```

2.3.10. PGKC161: PGKC_SET_1PPS_MODE

Configures the 1PPS.

Type:

Set

Synopsis:

```
$PGKC161,<WorkMode>,<Width>,<Period>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<WorkMode>	Numeric	-	1PPS work mode. 0 = Disable 1PPS 1= The first fix 2 = 3D fix only 3 = 2D/3D fix only 4 = Always enable 1PPS
<Width>	Numeric	ms	1PPS pulse width. Range: 0–998. Default value: 100.
<Period>	Numeric	ms	1PPS pulse period. Minimum value: 1000. Default value: 1000.

Result:

Returns **$PGKC001** message.

Example:

```
$PGKC161,2,500,2000*00
$PGKC001,161,3*2B
```

2.3.11. PGKC201: PGKC_GET_FIX_INTERVAL

Queries position fix interval.

Type:

Get

Synopsis:

```
$PGKC201*<Checksum><CR><LF>
```

Parameter:

None

Result:

Returns **$PGKC202** message.

Example:

```
$PGKC201*2C
$PGKC202,1000,0,0,0.0,0.0*02
```

2.3.12. PGKC202: PGKC_OUTPUT_FIX_INTERVAL

Responds to the **$PGKC201** and returns position fix interval.

Type:

Output

Synopsis:

```
$PGKC202,<Interval>,<Res1>,<Res2>,<Res3>,<Res4>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Interval>	Numeric	ms	Position fix interval.
<Res1>	Numeric	-	Always “0”.
<Res2>	Numeric	-	Always “0”.
<Res3>	Numeric	-	Always “0.0”.
<Res4>	Numeric	-	Always “0.0”.

Example:

```
$PGKC202,1000,0,0,0.0,0.0*02
```

2.3.13. PGKC239: PGKC_SBAS_STATE

Enables/Disables searching SBAS satellites.

Type:

Set

Synopsis:

```
$PGKC239,<Mode>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Mode>	Numeric	-	Enable or disable SBAS satellite searching. 0 = Disable 1 = Enable (default)

Result:

Returns **$PGKC001** message.

Example:

```
$PGKC239,1*3A
$PGKC001,239,3*25
```

NOTE

If searching an SBAS satellite is enabled, the satellite information is output in the **GSV** message.

2.3.14. PGKC240: PGKC_QUERY_SBAS_STATE

Queries SBAS status to check if it is enabled or not.

Type:

Query

Synopsis:

```
$PGKC240*<Checksum><CR><LF>
```

Parameter:

None

Result:

Returns **$PGKC241** message.

Example:

```
$PGKC240*29
$PGKC241,1*35
```

2.3.15. PGKC241: PGKC_OUTPUT_SBAS_STATE

Responds to the **$PGKC240** and returns the information on whether SBAS is enabled or disabled.

Type:

Output

Synopsis:

```
$PGKC241,<Mode>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Mode>	Numeric	-	Enable or disable SBAS satellite. 0 = Disable 1 = Enable

Example:

```
$PGKC241,1*35
```

2.3.16. PGKC242: PGKC_SET_NMEA_OUTPUT_FREQUENCY

Sets the NMEA message output interval of corresponding NMEA type.

Type:

Set

Synopsis:

```
$PGKC242,<GLL>,<RMC>,<VTG>,<GGA>,<GSA>,<GSV>,<Res1>,…,<Res11>,<ZDA>,<Res13>,…,<Res15>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<GLL>	Numeric	-	GLL output frequency. 0 = Disable the output of GLL message. N = Output message once every N position fix(es).
<RMC>	Numeric	-	RMC output frequency. 0 = Disable the output of RMC message. N = Output message once every N position fix(es).

Field	Format	Unit	Description
<VTG>	Numeric	-	VTG output frequency. 0 = Disable the output of VTG message. N = Output message once every N position fix(es).
<GGA>	Numeric	-	GGA output frequency. 0 = Disable the output of GGA message. N = Output message once every N position fix(es).
<GSA>	Numeric	-	GSA output frequency. 0 = Disable the output of GSA message. N = Output message once every N position fix(es).
<GSV>	Numeric	-	GSV output frequency. 0 = Disable the output of GSV message. N = Output message once every N position fix(es).
<Res1>,…,<Res11>	Numeric	-	Always “0”.
<ZDA>	Numeric	-	ZDA output frequency. 0 = Disable the output of ZDA message. N = Output message once every N position fix(es).
<Res13>,…,<Res15>	Numeric	-	Always “0”.

Result:

Returns **$PGKC001** message.

Example:

```
$PGKC242,1,1,1,1,1,1,0,0,0,0,0,0,0,0,0,0,1,0,0,0*36
$PGKC001,242,3*29
```

2.3.17. PGKC243: PGKC_GET_NMEA_OUTPUT_FREQUENCY

Gets the NMEA message output interval of corresponding NMEA type.

Type:

Get

Synopsis:

```
$PGKC243*<Checksum><CR><LF>
```

Parameter:

None

Result:

Returns **$PGKC244** message.

Example:

```
$PGKC243*2A
$PGKC244,1,1,1,1,1,1,0,0,0,0,0,0,0,0,0,0,1,0,0,0*30
```

2.3.18. PGKC244: PGKC_OUTPUT_NMEA_FREQUENCY

Responds to the **$PKGC243** and returns the message output interval of corresponding NMEA type.

Type:

Output

Synopsis:

```
$PGKC244,<GLL>,<RMC>,<VTG>,<GGA>,<GSA>,<GSV>,<Res1>,…,<Res11>,<ZDA>,<Res13>,…,<Res15>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<GLL>	Numeric	-	GLL output frequency. 0 = Disable the output of GLL message. N = Output message once every N position fix(es).
<RMC>	Numeric	-	RMC output frequency. 0 = Disable the output of RMC message. N = Output message once every N position fix(es).
<VTG>	Numeric	-	VTG output frequency. 0 = Disable the output of VTG message. N = Output message once every N position fix(es).
<GGA>	Numeric	-	GGA output frequency. 0 = Disable the output of GGA message. N = Output message once every N position fix(es).
<GSA>	Numeric	-	GSA output frequency. 0 = Disable the output of GSA message. N = Output message once every N position fix(es).
<GSV>	Numeric	-	GSV output frequency. 0 = Disable the output of GSV message. N = Output message once every N position fix(es).
<Res1>,…,<Res11>	Numeric	-	Always “0”.

Field	Format	Unit	Description
<ZDA>	Numeric	-	ZDA output frequency. 0 = Disable the output of ZDA message. N = Output message once every N position fix(es).
<Res1>,…,<Res15>	Numeric	-	Always “0”.

Example:

```
$PGKC244,1,1,1,1,1,1,0,0,0,0,0,0,0,0,0,0,1,0,0,0*30
```

2.3.19. PGKC279: PGKC_QUERY_RTC_TIME

Queries RTC time.

Type:

Query

Synopsis:

```
$PGKC279*<Checksum><CR><LF>
```

Parameter:

None

Result:

Returns **$PGKC280** message.

Example:

```
$PGKC279*23
$PGKC280,2021,5,28,2,59,38*2E
```

2.3.20. PGKC280: PGKC_OUTPUT_RTC_TIME

Responds to the **$PKGC279** and returns the RTC time.

Type:

Output

Synopsis:

```
$PGKC280,<Year>,<Month>,<Day>,<Hour>,<Minute>,<Second>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Year>	Numeric	-	Year.
<Month>	Numeric	-	Month. Range: 1–12.
<Day>	Numeric	-	Day of month. Range: 1–31.
<Hour>	Numeric	-	Hour. Range: 0–23.
<Minute>	Numeric	-	Minute. Range: 0–59.
<Second>	Numeric	-	Second. Range: 0–59.

Example:

```
$PGKC280,2021,5,28,2,59,38*2E
```

NOTE

Returns RTC time in UTC time format.

2.3.21. PGKC284: PGKC_SET_SPEED_THRESHOLD_VALUE

Sets the speed threshold value. When the speed is lower than the threshold value, the output speed is 0.

Type:

Set

Synopsis:

```
$PGKC284,<SpdThrd>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<SpdThrd>	Numeric	m/s	Speed threshold value. Value: higher than 0.

Result:

Returns **$PGKC001** message.

Example:

```
$PGKC284,0.5*26
$PGKC001,284,3*23
```

NOTE

1. When the **<SpdThrd>** is set to 0, the speed threshold is off.
2. If the speed is set to a negative number, the command will not take effect, keep the original speed threshold output.

2.3.22. PGKC356: PGKC_SET_HDOP_THRESHOLD_VALUE

Sets the HDOP threshold value. If the actual HDOP value is greater than the threshold value, no positioning information is reported.

Type:

Set

Synopsis:

```
$PGKC356,<HDOP_Thrd>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<HDOP_Thrd>	Numeric	-	HDOP threshold value. Value: higher than 0.

Result:

Returns **$PGKC356** message.

Example:

```
$PGKC356,0.7*2A
$PGKC356,0.7 Set OK!*4D
```

NOTE

1. When the **<HDOP_Thrd>** is set to 0, the HDOP threshold is off.
2. If the **<HDOP_Thrd>** is not less than 0, this command is valid, otherwise it is invalid.

2.3.23. PGKC357: PGKC_GET_HDOP_THRESHOLD_VALUE

Gets the HDOP threshold value.

Type:

Get

Synopsis:

```
$PGKC357*<Checksum><CR><LF>
```

Parameter:

None

Result:

Returns **$PGKC357** message.

Example:

```
$PGKC357*2E
$PGKC357,0.7*2B
```

2.3.24. PGKC462: PGKC_QUERY_SOFTWARE_VERSION

Queries the current software version.

Type:

Query

Synopsis:

```
$PGKC462,<Type>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Type>	Numeric	-	Version type: 3 = Software major version 4 = Subversion

Result:

Returns **$PGKC463** message.

Example:

```
//Query current software major version:
$PGKC462,3*30
$PGKC463,LC76FANR01A01*56

//Query current software subversion:
$PGKC462,4*37
$PGKC463,V01*55
```

2.3.25. PGKC463: PGKC_OUTPUT_SOFTWARE_VERSION

Responds to **$PKGC462** and returns the current software version.

Type:

Output

Synopsis:

```
$PGKC463,<Type>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Type>	Numeric	-	Software version.

Example:

```
$PGKC463,LC76FANR01A01*56
$PGKC463,V01*55
```

2.3.26. PGKC786: PGKC_SET_POSITION_MODE

Sets the positioning mode.

Type:

Set

Synopsis:

```
$PGKC786,<PosMode>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<PosMode>	Numeric	-	Positioning mode. 0 = Normal mode 1 = Fitness mode: For running and walking purpose 2 = Aviation mode: For high-dynamic purpose 3 = Balloon mode: For high-altitude balloon purpose

Result:

Returns **$PGKC001** message.

Example:

```
$PGKC786,1*3B
$PGKC001,786,3*24
```

2.4. PQ Messages

This chapter explains the **PQ** messages which are defined and developed by Quectel. The configuration parameters saved by **PQ** messages will still exist in flash even after upgrading the modules' firmware.

2.4.1. PQEPE

Enables/disables **$PQEPE** message output. If enabled, **$PQEPE** message will be automatically output.

Type:

Set/Output

Synopsis:

```
//Set Command:
$PQEPE,W,<Mode>,<Save>*<Checksum><CR><LF>
//Output message:
$PQEPE,<EPE_Hori>,<EPE_Vert>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Mode>	Numeric	-	Enable or disable **$PQEPE** message output. 0 = Disable (default) 1 = Enable
<Save>	Numeric	-	Saving operation. 0 = Parameter is not saved, and is invalid after restart 1 = Parameter is saved in flash, and is valid after restart
<EPE_Hori>	Numeric	Meter	Estimated horizontal position error.
<EPE_Vert>	Numeric	Meter	Estimated vertical position error.

Result:

- If successful, the module returns:

```
$PQEPE,W,OK*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQEPE,W,ERROR*<Checksum><CR><LF>
```

Example:

```
//Enable PQEPE message output and save parameters into flash:
$PQEPE,W,1,1*2A
//Set successfully:
$PQEPE,W,OK*02

//Output message:
$PQEPE,5.3050,3.2000*53
```

NOTE

The configuration made by this command takes effect immediately.

2.4.2. PQGEO

Configures parameters of Geo-fence. This command can also get Geo-fence setting and query the Geo-fence ID status of current position.

Type:

Set/Get/Query/Output

Synopsis:

```
//Set/Get/Query Command:
$PQGEO,<Type>,<GEO_ID>,<Mode>,<Shape>,<Lat0>,<Lon0>,<Lat1/Radius>,<Lon1>,<Lat2>,<Lon2>,<Lat3>,<Lon3>*<Checksum><CR><LF>
//Output message:
$PQGEO,<GEO_ID>,<Action>,<FixStatus>,<UTC&Time>,<Lat>,<Lon>,<MSL_Alt>,<SOG>,<COG>,<FixMode>,<Res1>,<HDOP>,<PDOP>,<VDOP>,<Res2>,<GPS_SV>,<GPS_SatUsed>,*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Type>	String	-	Command type. W = Set R = Get Q = Query When **<Type>** is **R** or **Q**, other parameters can be omitted except **<GEO_ID>**.
<GEO_ID>	Numeric	-	Geo-fence ID. Range: 0-9.
<Mode>	Numeric	-	URC report mode. 0 = Disable URC to be reported when entering or leaving the Geo-fence 1 = Enable URC to be reported when entering the Geo-fence 2 = Enable URC to be reported when leaving the Geo-fence 3 = Enable URC to be reported when entering or leaving the Geo-fence If **<Mode>** is 0, the parameters after **<Mode>** can be omitted.
<Shape>	Numeric	-	Fence shape. 0 = Circularity with center and radius 1 = Circularity with center and one point on the circle 2 = Triangle

Field	Format	Unit	Description
			3 = Quadrangle
<Lat0>	±dd.dddddd	Degree	The latitude of a point which is defined as the center of the Geo-fence circular region or the first point. Range: -90.000000–90.000000 (variable length, 4 to 6 digits).
<Lon0>	±ddd.dddddd	Degree	The longitude of a point which is defined as the center of the Geo-fence circular region or the first point. Range: -180.000000–180.000000 (variable length, 4 to 6 digits).
<Lat1/Radius>	±dd.dddddd	Meter/ Degree	When **<Shape>** is 0, this parameter is radius. Range: 0-6000000.0. When **<Shape>** is other values, this parameter is latitude1. Range: -90.000000–90.000000 (variable length, 4 to 6 digits). If **<Shape>** is 0, the parameters after **<Lat1/radius>** must be omitted.
<Lon1>	±ddd.dddddd	Degree	The longitude of the second point. Range: -180.000000–180.000000 (variable length, 4 to 6 digits). If **<Shape>** is 1, the parameters after **<Lon1>** must be omitted.
<Lat2>	±dd.dddddd	Degree	The latitude of the third point. Range: -90.000000–90.000000 (variable length, 4 to 6 digits).
<Lon2>	±ddd.dddddd,	Degree	The longitude of the third point. Range: -180.000000–180.000000 (variable length, 4 to 6 digits). If **<Shape>** is 2, the parameters after **<Lon2>** must be omitted.
<Lat3>	±dd.dddddd	Degree	The latitude of fourth point. Range: -90.000000–90.000000 (variable length, 4 to 6 digits).
<Lon3>	±ddd.dddddd	Degree	The longitude of fourth point. Range: -180.000000–180.000000 (variable length, 4 to 6 digits).
<Status>	Numeric	-	The status of current position. 0 = Unknown position 1 = Inside the Geo-fence 2 = Outside the Geo-fence

Field	Format	Unit	Description
<GEO_ID>	Numeric	-	Geo-fence ID. Range: 0–9.
<Action>	Numeric	-	The current action of the module. 1 = Entering the Geo-fence 2 = Leaving the Geo-fence
<FixStatus>	Numeric	-	Fix status. 0 = No fix 1 = 2D fix 2 = 3D fix
<UTC&Time>	DyyMMddThhmmss.sss	-	UTC time. D: char 'D', refers to date yy: current year - 2000 MM: 01–12 dd: 01–31 T: char 'T', refers to time hh: 0–23 mm: 0–59 ss.sss: 00.000–59.9999
<Lat>	±dd.dddddd	Degree	The latitude of current position. Range: -90.000000–90.000000.
<Lon>	±ddd.dddddd	Degree	The longitude of current position. Range: -180.000000–180.000000.
<MSL_Alt>	Numeric	Meter	Mean sea level (MSL) altitude.
<SOG>	Numeric	km/h	Speed over ground.
<COG>	Numeric	Degree	Course over ground. Range: 0–360.00.
<FixMode>	Numeric	Degree	Fix mode. 0 = No fix 1 = Estimated mode 2 = Position fixed 3 = Position fixed in DGPS mode
<Res1>	Numeric	-	Reserved.
<HDOP>	Numeric	-	Horizontal dilution of precision.
<PDOP>	Numeric	-	Position dilution of precision.
<VDOP>	Numeric	-	Vertical dilution of precision.
<Res2>	Numeric	-	Reserved.
<GPS_SV>	Numeric	-	GPS satellites in view.

Field	Format	Unit	Description
<GPS_SatUsed>	Numeric	-	GPS satellites used.

Result:

1) Set:

- If successful, the module returns:

```
$PQGEO,W,OK*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQGEO,W,ERROR*<Checksum><CR><LF>
```

2) Get:

- If successful, the module returns:

```
$PQGEO,R,<GEO_ID>,<Mode>,<Shape>,<Lat0>,<Lon0>,<Lat1/Radius>,<Lon1>,<Lat2>,<Lon2>,<Lat3>,<Lon3>*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQGEO,R,ERROR*<Checksum><CR><LF>
```

3) Query:

- If successful, the module returns:

```
$PQGEO,Q,<GEO_ID>,<Status>*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQGEO,Q,ERROR*<Checksum><CR><LF>
```

Example:

```
//Enable the Geo-fence 0 to report when the module is entering the circularity with center and radius:
$PQGEO,W,0,1,0,31.85913,117.1933,500.0*26
//Set successfully:
$PQGEO,W,OK*1F
//Disable the Geo-fence 4 to report when the module is entering or leaving the circularity with center and one point on the circle:
$PQGEO,W,4,3,1,31.91133,117.1129,31.994856,117.070281*1C
//Set successfully:
$PQGEO,W,OK*1F
//Set the Geo-fence 3 not report when entering or leaving the Geo-fence:
$PQGEO,W,3,0*34
```

```
//Set successfully:
$PQGEO,W,OK*1F

//Get the Geo-fence 0 settings:
$PQGEO,R,0*2E
//Get successfully:
$PQGEO,R,0,1,0,31.859130,117.193300,500.0*13
//Get the Geo-fence 4 settings:
$PQGEO,R,4*2A
//Get successfully:
$PQGEO,R,4,3,1,31.911330,117.112900,31.994856,117.070281*29

//Query the Geo-fence 0 status of current position:
$PQGEO,Q,0*2D
//Query successfully:
$PQGEO,Q,0,1*30
//Query the Geo-fence 4 status of current position:
$PQGEO,Q,4*29
//Query successfully:
$PQGEO,Q,4,2*37

//Output message:
$PQGEO,0,1,2,D150506T070127.000,31.856038,117.197110,49.4,14.92,0.18,2,,1.11,2.95,2.74,,14,9*5D
```

NOTE

1. If **<Mode>** is 0 and no parameters follow **<Mode>**, this command can delete the Geo-fence.
2. **$PQGEO,R,10*1F** can query parameters of all Geo-fences.
3. The command takes effect immediately after setting, and the parameters will be automatically saved into flash.
4. Input the latitude and longitude in sequence in clockwise or counter-clockwise order.

2.4.3. PQJAM

Enables/disables the jamming detection function, or queries the status of the function.

Type:

Set/Get

Synopsis:

```
$PQJAM,<Type>,<Mode>,<Save>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Type>	String	-	Command type. W = Set R = Get When **<Type>** is **R, <Mode>** and **<Save>** can be omitted.
<Mode>	Numeric	-	Mode of jamming detection function. 0 = Disabled (default) 1 = Enabled
<Save>	Numeric	-	Save operation. 0 = All parameters are not saved and will be invalid on restart 1 = All parameters are saved in flash and remains valid after restart

Result:

1) Set:

- If successful, the module returns:

```
$PQJAM,W,OK*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQJAM,W,ERROR*<Checksum><CR><LF>
```

2) Get:

```
$PQJAM,R,<Mode>*<Checksum><CR><LF>
```

Example:

```
//Enable jamming detection function:
$PQJAM,W,1,1*3C
//Set successfully:
$PQJAM,W,OK*14

//Get the mode of jamming detection function:
$PQJAM,R*39
//Get successfully:
$PQJAM,R,1*24
```

NOTE

1. The configuration made by this command takes effect immediately.
2. The command is not supported in Backup mode.
3. This command is supported in LC76FANR01A03_GLN and above versions.

2.4.4. PQSPF

Periodically outputs the jamming status at 1Hz frequency, when jamming detection function is enabled.

Type:

Output

Synopsis:

```
$PQSPF,<Status>*<Checksum><CR><LF>
```

Parameter:

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

Example:

```
$PQSPF,1*59
```

3 Appendix A References

Table 3: Terms and Abbreviations

Abbreviation	Description
2D	2 Dimension
3D	3 Dimension
GPD	Geographic Position Data
COG	Course over Ground
COGM	Course over Ground (in Magnetic North Course Direction)
COGT	Course over Ground (in True North Course Direction)
DGPS	Differential Global Positioning System
DOP	Dilution of Precision
GGA	Global Positioning System Fix Data
GLL	Geographic Position-Latitude and Longitude
GLONASS	Global Navigation Satellite System (Russian)
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GSA	GPS DOP and Active Satellites
GSV	GNSS Satellites in View
EPE	Estimated Position Error
HDOP	Horizontal Dilution of Precision
MSL	Mean Sea Level
NMEA	NMEA (National Marine Electronics Association) 0183 Interface Standard

PDOP	Position Dilution of Precision
PPS	Pulse Per Second
QZSS	Quasi-Zenith Satellite System
RMC	Recommended Minimum Specific GNSS Data
RTC	Real-time Clock
RTK	Real Time Kinematic
SBAS	Satellite-Based Augmentation System
SNR	Signal to Noise Ratio
SOG	Speed over Ground
SPS	Standard Positioning Service
UTC	Coordinated Universal Time
VDOP	Vertical Dilution of Precision
VTG	Course Over Ground & Ground Speed
WGS84	World Geodetic System 1984

4 Appendix B GNSS Numbering

Table 4: GNSS Numbering

GNSS Type	System ID	Satellite ID	Signal ID
GPS	1	1–32	1 = L1 C/A
GLONASS	2	65–96	1 = L1
Galileo	3	1-36	7 = E1
QZSS	5	193–196	1 = L1
SBAS	-	33–64	-