

# L76K GNSS Protocol Specification

## GNSS Module Series

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# About the Document

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## Revision History

Version	Date	Description
-	2020-07-28	Creation of the document
1.0	2021-09-10	First official release
1.1	2021-12-16	<ol style="list-style-type: none"> <li>1. Updated the &lt;TalkerID&gt; in BeiDou satellite configuration (Table 2).</li> <li>2. Updated the description of &lt;UTC&gt; and &lt;M&gt; parameters in GGA (Chapter 2.2.2).</li> <li>3. Updated the examples of GSV, VTG and ZDA (Chapter 2.2.3, 2.2.5 and 2.2.8).</li> <li>4. Changed the parameter name from &lt;Flag&gt; to &lt;Interval&gt; of PCAS02 (Chapter 2.3.2).</li> <li>5. Updated the message type of CFG-PRT, CFG-MSG and CFG-RATE (Chapter 3.2.2.1, 3.2.2.2 and 3.2.2.4).</li> </ol>

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# 1 Introduction

Quectel L76K GNSS module supports GPS, GLONASS, BeiDou and QZSS constellations. Concurrent tracking of GPS L1 C/A, GLONASS L1, BeiDou B1, and QZSS L1 frequency bands provides fast and accurate acquisition and makes this module the 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 (PCAS commands) and CASIC commands. To report GNSS information, the module supports output messages in NMEA 0183 standard protocol or CASIC protocol format.

**NOTE**

1. The default configuration is GPS + BeiDou. QZSS is always enabled and can not be disabled.
2. Only use the commands listed in this document. Quectel assumes no responsibility if other commands are used.



# 2 NMEA Protocol

## 2.1. Structure of NMEA Protocol Messages

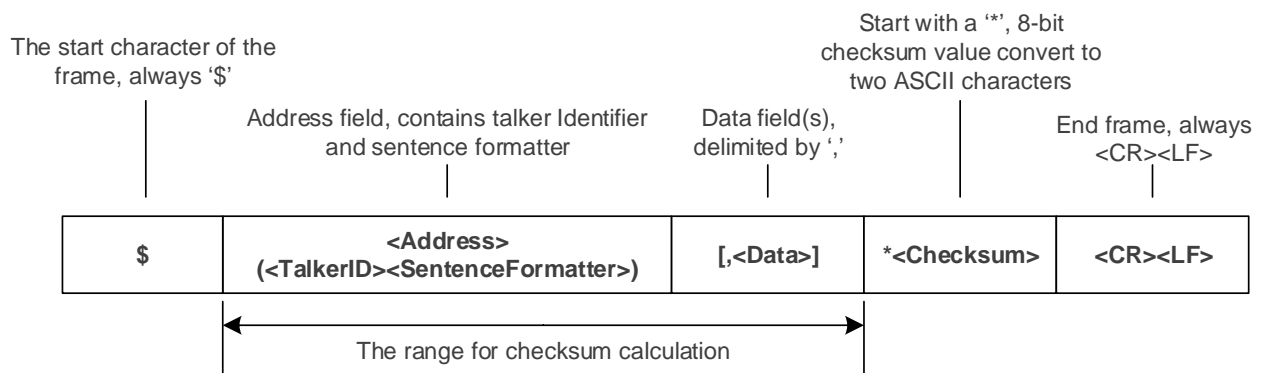


Figure 1: Structure of NMEA Protocol Messages

Table 1: Structure of NMEA Protocol Messages

Field	Description
\$	Start of the sentence (Hex 0x24).
<Address>	<p><b>In Standard Messages:</b> 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 <a href="#">Table 2: NMEA TalkerID</a>.</p> <p>The sentence formatter is used to define data format and type.</p> <p><b>In Proprietary Messages:</b> In NMEA proprietary messages, this field consists of the proprietary character <b>P</b> followed by a three-character Manufacturer's Mnemonic Code, used to identify the TALKER issuing a proprietary sentence, and any additional characters as required.</p>
<Data>	Data fields, delimited by comma (,). Variable length (depends on the NMEA message type).

	The checksum field follows the checksum delimiter character *.
<Checksum>	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 TalkerID**

GNSS Constellation Configuration	TalkerID
GPS	GP
GLONASS	GL
BeiDou	BD
QZSS	GP
Combination of Multiple Satellite Systems	GN

**NOTE**

<TalkerID> is GP in both QZSS and GPS satellite configurations, see [Table 16: GNSS Numbering](#) for more information about satellite identifiers.

## 2.2. Standard Messages

This chapter explains the NMEA 0183 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
\$	-	-	\$	Each NMEA message starts with \$.
<TalkerID>	String	-	GN	Talker identifier. See <a href="#">Table 2: NMEA TalkerID</a> .
RMC	String	-	RMC	Recommended Minimum Specific GNSS Data.
<UTC>	hhmmss.sss	-	071556.000	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.mmmmm	-	3149.29103	Latitude: dd: Degrees (00–90) mm: Minutes (00–59) mmmmm: 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.mmmmm	-	11706.92916	Longitude: ddd: Degrees (000–180) mm: Minutes (00–59) mmmmm: 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	-	250420	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. N = No fix. Satellite system not used in position fix, or fix not valid.
<NavStatus>	Character	-	V	Navigational status. S = safe C = Caution U = Unsafe V = Navigational status not valid
<Checksum>	Hexadecimal	-	*09	Checksum.
<CR><LF>	String	-	-	Carriage return and line feed.

**Example:**

```
$GNRMC,071556.000,A,3149.29103,N,11706.92916,E,0.00,0.00,250420,,,A,V*09
```

**NOTE**

<TalkerID> is GP in both QZSS and GPS satellite configurations, see [Table 16: GNSS Numbering](#) for more information about satellite identifiers.

**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
\$	-	-	\$	Each NMEA message starts with \$.
<TalkerID>	String	-	GN	Talker identifier. See <a href="#">Table 2: NMEA TalkerID</a> .
GGA	String	-	GGA	Global Positioning System Fix Data.
<UTC>	hhmmss.sss	-	071556.000	Position fix UTC: hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds
<Lat>	ddmm.mmmmm	-	3149.29103	Latitude: dd: Degrees (00–90) mm: Minutes (00–59) mmmmm: 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.mmmmm	-	11706.92916	Longitude: ddd: Degrees (000–180) mm: Minutes (00–59) mmmmm: 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> <sup>1)</sup>	Numeric, 2 digits	-	21	Number of satellites in use.
<HDOP>	Numeric	-	0.7	Horizontal dilution of precision.
<Alt>	Numeric	Meter	75.7	Altitude above mean-sea-level (geoid). Note that this field is empty in case of an invalid value.
M	Character	-	M	Note that this field is empty in case of an invalid value.
<Sep>	Numeric	Meter	-5.0	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.
M	Character	-	M	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	-	*69	Checksum.
<CR><LF>	String	-	-	Carriage return and line feed.

**Example:**

```
$GNGGA,071556.000,3149.29103,N,11706.92916,E,1,21,0.7,75.7,M,-5.0,M,,*69
```

**NOTE**

1. **<TalkerID>** is GP in both QZSS and GPS satellite configurations, see [Table 16: GNSS Numbering](#) for more information about satellite identifiers.
2. 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.
3. <sup>1)</sup> 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
\$	-	-	\$	Each NMEA message starts with \$.
<TalkerID>	String	-	GP	Talker identifier. See <a href="#">Table 2: NMEA TalkerID</a> .
GSV	String	-	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	-	12	Total number of satellites in view. Maximum value: 32.
Start of repeat block. Repeat times: 1–4.				
<SatID>	Numeric	-	02	Satellite ID. See <a href="#">Table 16: GNSS Numbering</a> .

<SatElev>	Numeric	Degree	49	Satellite elevation. Range: 00–90.
<SatAz>	Numeric	Degree	123	Satellite azimuth, with true north as the reference plane. Range: 000–359.
<SatCN0>	Numeric	dB-Hz	43	Satellite C/N <sub>0</sub> . Range: 00–99. Null when not tracking.
End of repeat block.				
<SignalID>	Numeric	-	0	GNSS signal ID. <a href="#">Table 16: GNSS Numbering</a> . Default: 0.
<Checksum>	Hexadecimal	-	*66	Checksum.
<CR><LF>	String	-	-	Carriage return and line feed.

**Example:**

```
$GPGSV,3,1,12,02,49,123,43,05,60,005,43,06,06,127,29,07,05,042,33,0*66
$GPGSV,3,2,12,13,79,139,44,15,55,225,44,18,12,314,36,20,44,055,42,0*6C
$GPGSV,3,3,12,29,48,275,42,30,20,069,38,193,69,062,42,195,46,160,42,0*6A
$BDGSV,4,1,16,01,43,135,36,03,54,193,36,04,31,120,34,06,43,189,35,0*7B
$BDGSV,4,2,16,07,06,196,28,08,63,008,35,09,30,194,32,10,09,210,29,0*74
$BDGSV,4,3,16,13,59,342,38,16,50,184,37,27,57,183,40,30,53,295,39,0*77
$BDGSV,4,4,16,32,65,305,41,38,68,046,40,39,59,181,38,41,40,042,38,0*78
```

**NOTE**

1. **<TalkerID>** is GP in both QZSS and GPS satellite configurations, see [Table 16: GNSS Numbering](#) for more information about satellite identifiers.
2. **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:**

```
$<TalkerID>GSA,<Mode>,<FixMode>,<SatID>,...,<SatID>,<PDOP>,<HDOP>,<VDOP><SystemID>*<C
checksum><CR><LF>
```



**Parameter:**

Field	Format	Unit	Example	Description
\$	-	-	\$	Each NMEA message starts with \$.
<TalkerID>	String	-	GN	Talker identifier. See <a href="#">Table 2: NMEA TalkerID</a> .
GSA	String	-	GSA	GNSS DOP and Active Satellites.
<Mode>	Character	-	A	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	-	10	ID numbers of satellites used in solution. See <a href="#">Table 16: GNSS Numbering</a> .
End of repeat block.				
<PDOP>	Numeric	-	2.5	Position dilution of precision. Maximum value: 99.0.
<HDOP>	Numeric	-	2.0	Horizontal dilution of precision. Maximum value: 99.0.
<VDOP>	Numeric	-	1.5	Vertical dilution of precision. Maximum value: 99.0.
<SystemID>	Numeric	-	1	GNSS system ID. See <a href="#">Table 16: GNSS Numbering</a> .
<Checksum>	Hexadecimal	-	*35	Checksum.
<CR><LF>	String	-	-	Carriage return and line feed.

**Example:**

```
$GNGSA,A,3,10,13,15,20,,,,,,,,,2.5,2.0,1.5,1*35
```

**NOTE**

- <TalkerID> is GP in both QZSS and GPS satellite configurations, see [Table 16: GNSS Numbering](#) for more information about satellite identifiers.
- 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
\$	-	-	\$	Each NMEA message starts with \$.
<TalkerID>	String	-	GN	Talker identifier. See <a href="#">Table 2: NMEA TalkerID</a> .
VTG	String	-	VTG	Course Over Ground & Ground Speed.
<COGT>	Numeric	Degrees	0.00	Course over ground, in true north course direction.
T	Character	-	T	--
<COGM>	Numeric	Degrees	-	Course over ground (magnetic). Not supported.
M	Character	-	M	--
<SOGN>	Numeric	Knots	0.00	Speed over ground in knots.
N	Character	-	N	-
<SOGK>	Numeric	km/h	0.00	Speed over ground in kilometers per hour.
K	Character	-	K	-
<ModeInd>	Character	-	A	The mode indicator of the positioning system: A = Autonomous mode. Satellite system used in non-differential mode in position fix E = Estimated (dead reckoning) mode N = No fix. Satellite system not used in position fix, or fix not valid.
<Checksum>	Hexadecimal	-	*23	Checksum.

<code>&lt;CR&gt;&lt;LF&gt;</code>	String	-	-	Carriage return and line feed.
-----------------------------------	--------	---	---	--------------------------------

**Example:**

```
$GNVTG,0.00,T,,M,0.00,N,0.00,K,A*23
```

**NOTE**

`<TalkerID>` is GP in both QZSS and GPS satellite configurations, see [Table 16: GNSS Numbering](#) for more information about satellite identifiers.

**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
\$	-	-	\$	Each NMEA message starts with \$.
<TalkerID>	String	-	GN	Talker identifier. See <a href="#">Table 2: NMEA TalkerID</a> .
GLL	String	-	GLL	Geographic Position – Latitude/Longitude.
<Lat>	ddmm.mmmmm	-	3149.29103	Latitude: dd: Degrees (00–90) mm: Minutes (00–59) mmmmm: 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.mmmmm	-	11706.92916	Longitude: ddd: Degrees (000–180) mm: Minutes (00–59) mmmmm: 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	-	071556.000	Position UTC: hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds (variable length, 1 to 3 digits)
<Status>	Character	-	A	Positioning system status: V = Invalid A = Autonomous
<ModeInd>	Character	-	A	Mode indicator: A = Autonomous mode. Satellite system used in non-differential mode in position fix E = Estimated (dead reckoning) mode. N = No fix. Satellite system not used in position fix, or fix not valid
<Checksum>	Hexadecimal	-	*45	Checksum.
<CR><LF>	String	-	-	Carriage return and line feed.

**Example:**

```
$GNGLL,3149.29103,N,11706.92916,E,071556.000,A,A*45
```

**NOTE**

<TalkerID> is GP in both QZSS and GPS satellite configurations, see [Table 16: GNSS Numbering](#) for more information about satellite identifiers.

### 2.2.7. TXT

Text Transmission.

**Type:**

Output.

**Synopsis:**

```
$<TalkerID>TXT,<TotalNumSen>,<SenNum>,<TextID>,<TextMsg>* <Checksum><CR><LF>
```

**Parameter:**

Field	Format	Unit	Example	Description
\$	-	-	\$	Each NMEA message starts with \$.
<TalkerID>	String	-	GP	Talker identifier. Always "GP".
TXT	String	-	TXT	Text Transmission.
<TotalNumSen>	Numeric	-	01	Total number of sentences. Range: 01–99.
<SenNum>	Numeric	-	01	Sentence number. Range: 01–99.
<TextID>	Numeric	-	02	Text identifier: 00 = Error message 01 = Warning message 02 = General information 03 = User Information
<TextMsg>	String	-	MA=CASIC	Text message.
<Checksum>	Hexadecimal	-	*27	Checksum.
<CR><LF>	String	-	-	Carriage return and line feed.

**Example:**

```
$GPTXT,01,01,02,MA=CASIC*27
$GPTXT,01,01,01,ANTENNA OPEN*25
```

### 2.2.8. ZDA

Time & Time. 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
\$	-	-	\$	Each NMEA message starts with \$.
<TalkerID>	String	-	GN	Talker identifier. See <a href="#">Table 2: NMEA TalkerID</a> .
ZDA	String	-	ZDA	Time & Time. UTC, day, month, year and local time zone.
<UTC>	hhmmss.sss	-	053712.000	Position fix UTC: hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds (variable length, 1–3 digits)
<Day>	Numeric	day	21	Day of month. Range: 01–31.
<Month>	Numeric	Month	10	Month. Range: 01–12.
<Year>	Numeric	Year	2021	Year.
<LocalHour>	Numeric	-	00	Not supported. Default value: 00.
<LocalMin>	Numeric	-	00	Not supported. Default value: 00.
<Checksum>	Hexadecimal	-	*49	Checksum.
<CR><LF>	String	-	-	Carriage return and line feed.

**Example:**

```
$GNZDA,053712.000,21,10,2021,00,00*49
```

**NOTE**

<TalkerID> is GP in QZSS satellite configurations, see [Table 16: GNSS Numbering](#) for more information.

## 2.3. PCAS Messages

This chapter explains the PCAS messages (proprietary NMEA messages defined by the chipset supplier) supported by L76K module.

### 2.3.1. PCAS01

Sets NMEA port baudrate.

**Type:**

Set.

**Synopsis:**

```
$PCAS01,<CMD>*<Checksum><CR><LF>
```

**Parameter:**

Field	Format	Unit	Description
<CMD>	Numeric	bps	Baud rate: 0 = 4800 1 = 9600 2 = 19200 3 = 38400 4 = 57600 5 = 115200

**Example:**

```
$PCAS01,1*1D
```

### 2.3.2. PCAS02

Sets positioning frequency.

**Type:**

Set.

**Synopsis:**

```
$PCAS02,<Interval>*<Checksum><CR><LF>
```

**Parameter:**

Field	Format	Unit	Description
<Interval>	Numeric	ms	Positioning interval: 1000 = Set the positioning frequency to 1 Hz 500 = Set the positioning frequency to 2 Hz 200 = Set the positioning frequency to 5 Hz

**Example:**

```
$PCAS02,1000*2E
```

**NOTE**

It is required to set the type of NMEA sentences output to single and change the baud rate to 115200 bps when the <Interval> is less than 1000.

**2.3.3. PCAS03**

Sets the NMEA sentence output type and frequencies.

**Type:**

Set.

**Synopsis:**

```
$PCAS03,<nGGA>,<nGLL>,<nGSA>,<nGSV>,<nRMC>,<nVTG>,<nZDA>,<nANT>,<Res>,<Res>,<Res>,<Res>,<Res>,<Res>,<Res>*<Checksum><CR><LF>
```

**Parameter:**

Field	Format	Unit	Description
<nGGA>	Numeric	-	GGA sentence output frequency: Output once every N (1–9) position fix. “0” indicates no output. Null means keeping the previous configuration.
<nGLL>	Numeric	-	GLL sentence output frequency: Output once every N (1–9) position fix. “0” indicates no output. Null means keeping the previous configuration.
<nGSA>	Numeric	-	GSA sentence output frequency: Output once every N (1–9) position fix. “0” indicates no output.



			Null means keeping the previous configuration.
<nGSV>	Numeric	-	GSV sentence output frequency: Output once every N (1–9) position fix. “0” indicates no output. Null means keeping the previous configuration.
<nRMC>	Numeric	-	RMC sentence output frequency: Output once every N (1–9) position fix. “0” indicates no output. Null means keeping the previous configuration.
<nVTG>	Numeric	-	VTG sentence output frequency: Output once every N (1–9) position fix. “0” indicates no output. Null means keeping the previous configuration.
<nZDA>	Numeric	-	ZDA sentence output frequency: Output once every N (1–9) position fix. “0” indicates no output. Null means keeping the previous configuration.
<nANT>	Numeric	-	ANT sentence output frequency: Output once every N (1–9) position fix. “0” indicates no output. Null means keeping the previous configuration.
<Res>	Numeric	-	Always “0”.
<Res>	Numeric	-	Always “0”.
<Res>	Numeric	-	Reserved.
<Res>	Numeric	-	Reserved.
<Res>	Numeric	-	Always “0”.
<Res>	Numeric	-	Always “0”.

**Example:**

```
$PCAS03,1,1,1,1,1,1,1,1,0,0,,,0,0*02
```

**NOTE**

The ANT information of NMEA proprietary messages is included in the NMEA standard TXT sentence.

### 2.3.4. PCAS04

Configures the receiver to start searching for satellites.

**Type:**

Set.

**Synopsis:**

```
$PCAS04,<Mode>*<Checksum><CR><LF>
```

**Parameter:**

Field	Format	Unit	Description
<Mode>	Numeric	-	GNSS satellite configuration: 1 = GPS 2 = BeiDou 3 = GPS + BeiDou (default) 4 = GLONASS 5 = GPS + GLONASS 6 = BeiDou + GLONASS 7 = GPS + BeiDou + GLONASS

**Example:**

```
$PCAS04,3*1A
```

**NOTE**

The QZSS is enabled by default, but it does not support configuration.

### 2.3.5. PCAS10

Restarts the module.

**Type:**

Input.

**Synopsis:**

```
$PCAS10,<Flag>*<Checksum><CR><LF>
```

**Parameter:**

Field	Format	Unit	Description
<Flag>	Numeric	-	Restart mode: 0 = Hot Start 1 = Warm Start 2 = Cold Start 3 = Cold start and restore factory setting.

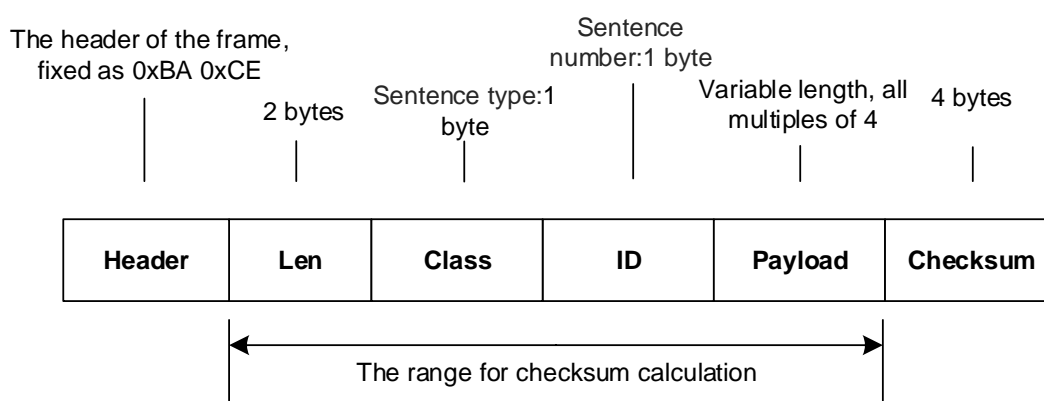
**Example:**

```
$PCAS10,0*1C
```

# 3 CASIC Protocol

This chapter explains the the chipset supplier CASIC proprietary protocol supported by L76K module.

## 3.1. Structure of CASIC Protocol Messages



**Figure 2: Structure of CASIC Protocol Messages**

**Table 3: Structure of CASIC Protocol Messages**

Field	Description
Header	CASIC protocol frame header consisting of 2 bytes: 0xBA, 0xCE.
Len	Payload length (Not including Header, Len, Class, ID and Checksum).
Class	Message type, which is the basic subset to which the current sentence belongs.
ID	Message ID.
Payload	Message payload, with a variable number of bytes, is a multiple of 4.
Checksum	Checksum is the last field in the statement that sums up all the data from Len to Payload (Four bytes per word).

**Checksum sample code:**

```
Checksum = (ID << 24) + (Class << 16) + Len;
for (i = 0; i < (Len / 4); i++)
{
Checksum = Checksum + Payload [i];
}
```

**NOTE**

If the command is used for querying or getting parameters, the payload is empty and the payload length is 0.

**3.1.1. Data Type**

**Table 4: Data Type**

Abbreviation	Type	Length (Byte)	Note
U1	Unsigned character	1	-
I1	Signed character	1	Complement
U2	Unsigned short integer	2	-
I2	Signed short integer	2	Complement
U4	Unsigned long integer	4	-
I4	Signed long integer	4	Complement
R4	IEEE754 float	4	-
R8	IEEE754 double	8	-

**3.1.2. Message Overview**

**Table 5: Message Overview**

Message	ID
ACK-NACK	0x05 0x00
ACK-ACK	0x05 0x01
CFG-PRT	0x06 0x00

CFG-MSG	0x06 0x01
CFG-RST	0x06 0x02
CFG-RATE	0x06 0x04
NMEA-GGA	0x4E 0x00
NMEA-GLL	0x4E 0x01
NMEA-GSA	0x4E 0x02
NMEA-GSV	0x4E 0x03
NMEA-RMC	0x4E 0x04
NMEA-VTG	0x4E 0x05
NMEA-ZDA	0x4E 0x08

### 3.2. CASIC Messages

#### 3.2.1. ACK

##### 3.2.1.1. ACK-NACK (0x05 0x00)

This response indicates incorrect reception.

**Type:**

Output.

**Structure:**

Header	Len (Byte)	ID	Payload	Checksum
0xBA 0xCE	4	0x05 0x00	See <a href="#">Table 6: ACK-NACK Message Payload</a>	4 bytes

**Table 6: ACK-NACK Message Payload**

Byte Offset	Data Type	Scaling	Name	Unit	Description
0	U1	-	ClsID	-	The type of the message received incorrectly.

1	U1	-	MsgID	-	The number of the message received incorrectly.
2	U2	-	Res	-	Reserved.

**3.2.1.2.ACK-ACK (0x05 0x01)**

This response indicates correct reception.

**Type:**

Output.

**Structure:**

Header	Len (Byte)	ID	Payload	Checksum
0xBA 0xCE	4	0x05 0x01	See <a href="#">Table 7: ACK-ACK Message Payload</a>	4 bytes

**Table 7: ACK-ACK Message Payload**

Byte Offset	Data Type	Scaling	Name	Unit	Description
0	U1	-	ClsID	-	The type of the message received correctly.
1	U1	-	MsgID	-	The number of the message received correctly.
2	U2	-	Res	-	Reserved.

**3.2.2. CFG**

**3.2.2.1.CFG-PRT (0x06 0x00)**

Sets/Gets serial port operation mode.

**Type:**

Set/Get.

Structure:

Header	Len (Byte)	ID	Payload	Checksum
0xBA 0xCE	Payload Length	0x06 0x00	See <a href="#">Table 8: CFG-PRT Message Payload</a>	4 bytes

**Table 8: CFG-PRT Message Payload**

Byte Offset	Data Type	Scaling	Name	Unit	Description
0	U1	-	PortID	-	UART ID.
1	U1	-	ProtoMask	-	Protocol control mask. Each port simultaneously supports multiple protocols. If the corresponding bit is 1, it means that the protocol is enabled. See <a href="#">Table 9: ProtoMask</a> for more information.
2	U2	-	Mode	-	UART working mode mask; See <a href="#">Table 10: Mode Flag Bits</a> for more information.
4	U4	-	BaudRate	bps	Baud rate.

**Table 9: ProtoMask**

Mask	Description
Bit 0	1 = Binary protocol input
Bit 1	1 = Text protocol input
Bit 4	1 = Binary protocol output
Bit 5	1 = Text protocol output

**Table 10: Mode Flag Bits**

Mask	Value	Description
[6:7]	00	5 bits
	01	6 bits
	10	7 bits



	11	8 bits.
[9:11]	10x	None.
	001	Odd.
	000	Even
	x1x	Reserved
[12:13]	00	1 stop bit
	01	1.5 stop bits
	10	2 stop bits
	11	Reserved

**Example:**

```

//Get:
//Send:
BA CE 00 00 06 00 00 00 06 00

//Respond:
BA CE 08 00 06 00 01 07 C0 08 00 C2 01 00 09 C9 C7 08 // Current UART1 configuration (invalid).
BA CE 08 00 06 00 00 FF C0 08 80 25 00 00 88 24 C7 08 // Current UART0 configuration.

//ACK:
BA CE 04 00 05 01 06 00 00 00 0A 00 05 01

//Set:
//Send:
//Configured the current UART port baud rate to 9600 bps:
BA CE 08 00 06 00 FF 33 C0 08 80 25 00 00 87 59 C6 08

//ACK:
BA CE 04 00 05 01 06 00 00 00 0A 00 05 01
    
```

**3.2.2.2.CFG-MSG (0x06 0x01)**

Sets/Gets the frequency of NMEA sentences to be sent.

**Type:**

Set/Get.

**Structure:**

Header	Len (Byte)	ID	Payload	Checksum
0xBA 0xCE	Payload Length	0x06 0x01	See <a href="#">Table 11: CFG-MSG Message Payload</a>	4 bytes

**Table 11: CFG-MSG Message Payload**

Byte Offset	Data Type	Scaling	Name	Unit	Description
0	U1	-	ClsID	-	Message type. See <a href="#">Table 5: Message Overview</a> .
1	U1	-	MsgID	-	Message number. <a href="#">See Table 5: Message Overview</a> .
2	U2	-	Rate	-	Frequency of NMEA sentences. Range 0–9. 0: No output N: Output once every N (1–9) position fix. 0xFFFF: Immediate output once, equivalent to query output.

**Example:**

```
//Get:
//Send:
BA CE 00 00 06 01 00 00 06 01

//Respond:
BA CE 04 00 06 01 03 11 00 00 07 11 06 01

//ACK:
BA CE 04 00 05 01 06 01 00 00 0A 01 05 01

//Set:
//Send:
//Configured the GGA sentence output frequency:
BA CE 04 00 06 01 4E 00 01 00 52 00 07 01
```

```
//ACK:
BA CE 04 00 05 01 06 01 00 00 0A 01 05 01
```

**3.2.2.3.CFG-RST (0x06 0x02)**

Restarts the module or cleans up the saved data structures.

**Type:**

Command.

**Structure:**

Header	Len (Bytes)	ID	Payload	Checksum
0xBA 0xCE	4	0x06 0x02	See <a href="#">Table 12: CFG-RST Message Payload</a>	4 bytes

**Table 12: CFG-RST Message Payload**

Byte Offset	Data Type	Scaling	Name	Unit	Description
0	U2	-	NavBbrMask	-	Clear the contents of battery-backed RAM. Each bit of the mask represents one section of RAM. Bit 0 = Ephemeris Bit 1 = Almanac Bit 2 = Health information Bit 3 = Ionospheric parameter Bit 4 = Receive positioning information Bit 5 = Clock drift (clock frequency offset) Bit 6 = Crystal vibration parameters Bit 7 = UTC fixes parameters Bit 8 = RTC Bit 9 = Configuration information
2	U1	-	ResetMode	-	Reset mode. 0 = Immediate hardware reset (Achieved via Watchdog) 1 = Software reset 2 = Software reset (GPS only) 4 = Hardware reset after power off

(Achieved via Watchdog)

3	U1	-	StartMode	-	Start mode. 0 = Hot start 1 = Warm start 2 = Cold start 3 = Factory data reset
---	----	---	-----------	---	--

**Example:**

```
//Configuration:
//Send:
//Clear configuration information:
BA CE 04 00 06 02 FF 01 00 00 03 02 06 02

//ACK:
BA CE 04 00 05 01 06 02 00 00 0A 02 05 01
```

**3.2.2.4.CFG-RATE (0x06 0x04)**

Sets/Gets the time interval for positioning.

**Type:**

Set/Get.

**Structure:**

Header	Len (Byte)	ID	Payload	Checksum
0xBA 0xCE	4	0x06 0x04	See <a href="#">Table 13: CFG-RATE Message Payload</a>	4 bytes

**Table 13: CFG-RATE Message Payload**

Byte Offset	Data Type	Scaling	Name	Unit	Description
0	U2	-	Interval	ms	Time interval between two positions. 200 500 1000
2	U2	-	Res	-	Reserved.

**Example:**

```
//Get:
//Send:
BA CE 00 00 06 04 00 00 06 04

//Respond:
BA CE 04 00 06 04 E8 03 00 00 EC 03 06 04

//ACK
BA CE 04 00 05 01 06 04 00 00 0A 04 05 01

//Set:
//Send:
//The fix rate is 2 Hz.
BA CE 04 00 06 04 F4 01 00 00 F8 01 06 04

//ACK:
BA CE 04 00 05 01 06 04 00 00 0A 04 05 01
```

# 4 Appendix A References

**Table 14: Related Documents**

Document Name
[1] <a href="#">Quectel L76K Hardware Design</a>
[2] <a href="#">Quectel L76K EVB User Guide</a>
[3] <a href="#">Quectel_L76K_Reference_Design</a>

**Table 15: Terms and Abbreviations**

Abbreviation	Description
2D	2 Dimension
3D	3 Dimension
ACK	Acknowledgement
ANT	Antenna
BeiDou	BeiDou Navigation Satellite System
CASIC	China Aerospace Science & Industry Corporation
CFG	Configure
COG	Course over Ground
COGM	Course over Ground (in Magnetic North Course Direction)
COGT	Course over Ground (in True North Course Direction)
C/N <sub>0</sub>	Carrier-to-Noise-Density Ratio
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)
GNS	Global Network Service
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GSA	GPS DOP and Active Satellites
GSV	GNSS Satellites in View
HDOP	Horizontal Dilution of Precision
NACK	Negative Acknowledgement
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 Kinematic
SBAS	Satellite-Based Augmentation System
SNR	Signal-to-Noise Ratio
SOG	Speed over Ground
SPS	Standard Positioning Service
TXT	Text Transmission
UART	Universal Asynchronous Receiver/Transmitter
UTC	Coordinated Universal Time
VDOP	Vertical Dilution of Precision

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VTG	Course Over Ground & Ground Speed
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WGS84	World Geodetic System 1984
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ZDA	Time & Date
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# 5 Appendix B GNSS Numbering

Table 16: GNSS Numbering

GNSS Type	System ID	Satellite ID	Signal ID
GPS	1	1–32	1 = L1 C/A
GLONASS	2	65–88	1 = L1
BeiDou	4	1–63	1 = B1
QZSS	5	193–197	1 = L1

# 6 Appendix C Default Configuration

**Table 17: Default Configurations**

Item	Default
NMEA Port Baud Rate	9600 bps
Datum Reference	WGS84
Rate of Position Fixing	1 Hz
DGPS	Disable
NMEA Standard Messages	RMC, GGA, GSV, GSA, VTG, GLL, TXT, and ZDA
GNSS Configuration	GPS + BeiDou