LG290P/LG580P/LG680P

High-precision module product data interface protocol

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1 Common configuration instructions

The input commands of our company's GNSS series high-precision positioning modules support simplified ASCII format, are case-insensitive, and have no check digits, making it easier for users to remember and use the commands. All commands consist of a command header and configuration parameters (the parameter part can be empty, then the command has only one command header), and the header field contains the command name or message header. Common commands are shown in the following table:

Table 1-1 Common instruction sets

Command name	Functional Description
Freset	Restore factory settings. Note: The factory baud rate is 115200.
version	Query version number
config	Query the serial port configuration status of the high-precision positioning module
mask BDS	Disable BDS satellite system Can be disabled individually BDS, GPS, GLO, GAL MASK B1 disables B1 frequency
unmask BDS	BDS satellite system activated BDS, GPS, GLO, GAL , etc. can be enabled separately The high-precision positioning module tracks all supported satellite systems by default. unmask B1 enables B1 frequency
config com1 115200	Set com1 baud rate to 115200 set com1 ,com2 ,and com3 to 9600 ,19200, 38400 , 57600 , 115200, 230400, 460800, and 921600 respectively. Any commonly used baud rate can also be configured with a high baud rate, such as 1000000, 2000000, 4000000, etc.

unlog	unlog disables all output of the current serial port unlog GPGGA disables the current serial port GPGGA output unlog com1 disables com1 port data output unlog com1 GPGGA disables GPGGA output on com1 port
saveconfig	Save Settings
mode base	Set as Base Station
log comx rtcm1074 ontime 1 log comx rtcm1006 ontime 1	In base station mode, comx sends 1074 differential messages and 1006 coordinate messages, with an interval of 1 second. comx can specify com1, com2, com3, any one
log com1 gpgga ontime 1	Set the GPGGA message output to 1Hz The message type and update rate can be set by yourself; 1, 0.5, 0.2, 0.1 correspond to Output frequency 1Hz, 2Hz, 5Hz, 10Hz
log com1 gpths ontime 1	Output the current heading information GPTHS

1.1 Base station settings

The RTK base station (fixed base station) installs the receiver antenna in a fixed position and does not move during the entire use process. At the same time, the precise coordinates of the known measuring station and the received satellite information are directly or processed and sent to the mobile station receiver (to be positioned point ）The mobile station receiver receives the information of the base station while receiving the satellite observation value, performs RTK positioning and calculation, and realizes RTK high-precision positioning, reaching cm or mm level positioning accuracy.

Applicable products: LG680P, LG580P, LG290P

When the precise coordinates are known, the commands entered into the high-precision positioning module are as shown in Table 1-2 Fixed base station mode.

Table 1-2 Fixed base station mode

Serial number	instruction	illustrate
1	mode base 31.24181388 121.49526666 17.03	Set to base station mode and configure accurate latitude, longitude and altitude information
2	log com1 rtcm1006 ontime 10	Configure RTK base station coordinate message in com1 , 10 seconds Interval output
3	log com1 rtcm1074 ontime 1	Configure GPS differential message on com1 , 1 second interval
4	log com1 rtcm1084 ontime 1	Configure GLO differential message on com1 , 1 second interval
5	log com1 rtcm1094 ontime 1	Configure GAL differential message on com1 , 1 second interval
6	log com1 rtcm1114 ontime 1	Configure QZSS differential message on com1 , 1 second interval
7	log com1 rtcm1124 ontime 1	Configure BDS differential message in com1 , 1 second interval
8	saveconfig	Save Configuration

Autonomous optimization to set the base station: When the base station cannot obtain accurate coordinates, the receiver can be set to perform autonomous convergence and optimization at the installation point for a certain period of time, and the results can be autonomously set as the coordinates of the base station. For example, the following command sets the receiver to autonomously locate for 120 seconds to obtain the base station coordinates, and sets the StationID to 1234:

mode base 1234 time 120

1.2 Rover Setup

RTK rover (mobile station) receives the differential correction information from the base station in real time, and receives satellite signals for RTK positioning and calculation, achieving RTK high-precision positioning. The receiver can adaptively identify the port and format of RTCM data input. Examples of common commands for RTK mobile stations are as follows:

mode rover

log com1 gpgga ontime 0.1

saveconfig

Applicable products: LG680P, LG580P, LG290P

1.3 Heading settings

This command is used to set the receiver to support dual antenna heading.

Heading heading refers to the main antenna of the dual antenna receiver. A baseline vector is formed between the antenna (ANT1) and the slave antenna (ANT2), and the angle between the baseline vector and the true north in the counterclockwise direction is determined. The dual-antenna directional receiver is powered on by default for Heading operation.

Examples of common commands are as follows:

log com1 gpths ontime 0.1

log com1 ksxt ontime 0.1

saveconfig

Applicable products: LG580P

1.4 Heading2 orientation settings

Heading2 Heading refers to the base station's GNSS antenna and the rover's antenna forming a baseline vector, and determining the angle between the baseline vector and the true north in the counterclockwise direction.

For receivers that support dual-antenna heading, Heading2 heading refers to the heading between the main antenna (ANT1) of the dual-antenna receiver and the GNSS antenna of the base station .

Commonly used directional instructions are as follows:

mode heading2

log com1 gpths2 ontime 1

Applicable products: LG290P, LG680P, LG580P

2 High-precision positioning module command classification

The commands of the high-precision positioning module are mainly divided into MODE instruction set, CONFIG instruction set, MASK instruction set, data output instruction set, and instructions such as saving configuration and restoring factory settings.

Table 2-1 Classification of high- precision positioning module instructions

Serial number	instruction	describe	Applicable high-precision positioning module models
1	mode directive	Configure the working mode of the high-precision positioning module. For example: base stations, mobile stations, etc.	LG680P/LG580P/LG290P
		Query the current working mode of the high-precision positioning module Mode	LG680P/LG580P/LG290P
2	config directive	Configure the functions and interfaces of the high-precision positioning module Related instruction sets	LG680P/LG580P/LG290P
		Query the current configuration information of the high-precision positioning module interest	LG680P/LG580P/LG290P
3	mask instruction	Set the satellite system tracked by the high-precision positioning module System, frequency, altitude angle	LG680P/LG580P/LG290P

		Query the satellite system tracked by the high-precision positioning module System, frequency, altitude angle	LG680P/LG580P/LG290P
4	Data output indicator Order Collection	Request to output information such as positioning and orientation set	LG680P/LG580P/LG290P
5	Other instructions	Save configuration, restore factory configuration and other instructions	LG680P/LG580P/LG290P

3 MODE command

The mode command is used to set the working mode of the high-precision positioning module. The working modes of the high-precision positioning module include base station working mode, rover working mode, and orientation working mode. Re-enter a new working mode command to the high-precision positioning module, and the high-precision positioning module will recalculate according to the working mode entered last time. For example, if the high-precision positioning module is in the base station working mode and resends the RTK rover working mode, the high-precision positioning module will enter the rover working mode and perform

RTK initialization and other calculation work. The high-precision positioning module has the working mode of all the above functions, but in actual use, it is necessary to obtain the corresponding functions according to the actual purchased authorization. The high-precision positioning module defaults to the rover working mode, and the high-precision positioning module can automatically identify the RTCM data format protocol category, and the user does not need to specify the type.

The command format is:

Mode [mode name] [parameters]

ASCII syntax:

mode base 40.45628476579 116.2859754968 58.0984

mode rover

Applicable products: LG680P, LG580P, LG290P

Table 3-1 High-precision positioning module working mode list

Serial number	Working Mode	Working mode description
1	base	Set the high-precision positioning module as the base station working mode
2	rover	Set the high-precision positioning module as the mobile station working mode
3	heading2	Set the high-precision positioning module to directional working mode

3.1 High-precision positioning module working mode query

The high-precision positioning module supports the use of the MODE command to query the current working mode. The command format is:

mode

ASCII

syntax:

mode

Applicable products: LG680P, LG580P, LG290P

Information output example:

#MODE,90,GPS,FINE,2322,357983000,0,0,18,701;MODE ROVER*2F

Table 3-2 High - precision positioning module working mode query command

instruction	describe
mode	Query the high-precision positioning module, current working mode such as: base station, mobile station

3.2 Setting base station mode with precise coordinates

This command sets the coordinate values of the base station receiver, so that the receiver works in base station mode. The receiver supports coordinate input in both geodetic coordinate system and Earth-centered Earth-fixed coordinate system. After setting the base station coordinates, the position information output by the receiver (in the GPGGA statement) always displays the input coordinate values.

), longitude (degrees), in the geodetic coordinate system . The latitude coordinate is in degrees and the value range is -90 ≤ param1 ≤ 90; the longitude coordinate is in degrees and the value range is -180 ≤ param2 ≤ 180; the altitude is in meters and the value range is -30000 ≤ param3 ≤ 30000 meters.

Enter the coordinates in the Earth-centered Earth-fixed coordinate system. The X -axis coordinate value in the Earth-centered Earth-fixed coordinate system is in meters, and the value range is : param1 < -90 or param1 > 90; the Y-axis coordinate value in the Earth-centered Earth-fixed coordinate system is in meters, and the value range is: param2 < -180 or param2 > 180; the Z -axis coordinate value in the Earth-centered Earth-fixed coordinate system is in meters, and the value range is: param3 < -30000 or param3 > 30000.

The "[ID]" in the command is the ID number of the base station. The value range of ID is an integer between 0 and 4095. The command format is:

mode base [ID] [param1 param2 param3]

ASCII syntax:

mode base 40.45628476579 116.2859754968 58.0984

mode base - 2160489.0276 4383620.1006

4084738.1110 Applicable products: LG680P, LG580P,

LG290P

Table 3 - 3 Reference station working mode parameter list

Mode Commands	Mode Name	ID	Parameter List	Parameter Description
mode	base	Base station ID , 0~40 between 95 (optional)	param1	Input coordinate parameters: -90≤param1≤90, the latitude coordinate in the geodetic coordinate system, in degrees, with 11 valid digits.
				param1 < -90 or param1 > 90, is the X- axis coordinate value in the Earth-centered Earth-fixed coordinate system , in meters, with 4 valid digits.
			param2	Enter the coordinate parameters: -180≤param2≤180, longitude coordinate in the geodetic coordinate system, in degrees, with 11 valid digits
				Param2 < -180 or param2 > 180, is the Y-axis coordinate value in the Earth-centered Earth-fixed coordinate system, in meters, with 4 valid digits.
			param3	Enter the coordinate parameters: -30000≤param3≤30000, is the altitude , in meters, input valid digits 6
				Param3 < -30000 or Param3 > 30000, which is the Z- axis coordinate value in the Earth-centered Earth-fixed coordinate system , in meters, with a valid digit of 4. Bit

3.3 Setting the base station mode in autonomous optimization mode

Set the receiver to optimize the positioning results autonomously. After the optimization reaches the specified time or the plane accuracy and elevation accuracy of the optimized coordinates reach the set accuracy limit, the receiver will stop the autonomous optimization calculation and set the final optimized coordinates as the base station coordinates. When the receiver is started in autonomous optimization mode, if the user manually enters fixed coordinates, the receiver will switch to the working mode where the coordinate values entered by the user are the base station position.

Table 3 - 4 Reference station working parameters list

Mode Commands	Mode Name	ID	Command name	Parameter List	Parameter Description
mode	base	0-409 Integer between 5	time	T	The maximum time, in seconds, to calculate the average position.

3.4 Base station mode with default parameters

The default base station mode, mode base , enter the command base without parameters. The receiver will start the default base station configuration. The default base station configuration is: the average coordinates of the current positioning result of the receiver for 60 seconds are set as the coordinates of the base station. The average value of 60 seconds meets the following conditions: the optimization time reaches 60s, or the plane accuracy tolerance of the position average reaches the default value of 1.5m and the elevation accuracy tolerance of the position average reaches the default value of 2.5m.

The

command

format is:

mode base

ASCII

syntax:

mode base

Applicable products: LG680P, LG580P, LG290P

Table 3-5 Base station working mode parameter list

Mode Commands	Mode Name	Parameter List	Parameter Description
Mode	Base	-	Set as default base station mode

Table 3 - 6 Reference station working mode parameter list

Mode Commands	Mode Name	ID	Parameter Description
mode	base	0≤ID<4096 (integer)	Set the high-precision positioning module to base station working mode and set its ID number.

Used to configure the receiver in rover mode for several working modes of RTK, SPP, PPP and other algorithm engines. The currently supported modes are as follows:

1. UAV flight dynamic mode（UAV）suitable for most UAV dynamic scenes, such as agricultural UAV, surveying and mapping

Drones, aerial photography drones, inspection drones, etc., with large vertical acceleration and horizontal speeds comparable to those of vehicles. The maximum horizontal speed is 50m/s, the maximum vertical speed is 30m/s, the maximum altitude is 18,000m, and the position change rate is large.

2. Vehicle dynamic mode（AUTO MOTIVE）Suitable for passenger cars and park logistics intelligent driving applications, with low vertical acceleration , diverse scene changes, maximum horizontal speed of 100m/s, maximum vertical speed of 15m/s, and general position change rate .

3. Precision measurement mode（SURVEY）This scenario is mainly suitable for high-precision measurement antennas and application scenarios with higher positioning accuracy requirements and low dynamic characteristics. The scenario is suitable for application scenarios such as surveying and mapping, precision agriculture, lawn mowers, road rollers, pile drivers, handheld GIS , dotting devices, and high-precision tablets.

4. Default mode: Select different default modes according to the board model, and the default status can be queried.

Table 3-7 Default configuration of rover mode

Product Model	Default Mode	Remark
LG680P	SURVEY	Precision measurement mode
LG580P	UAV	Drone flight dynamic mode
LG290P	SURVEY	Precision measurement mode

The command

format is: Mode

rover

[parameters]

simplified ASCII

syntax:

Mode rover //When the following parameter is empty, configure it

to the default mode mode rover SURVEY Applicable products:

LG680P, LG580P, LG290P

3.5 heading2 mode directive

This command is used to set the orientation between two high-precision positioning modules. Heading2 orientation means that the GNSS antenna of the base station and the antenna of the rover form a baseline vector, and determine the angle between the counterclockwise direction of this baseline vector and the true north.

Supports dual-antenna directional high-precision positioning module. Heading2 directional refers to the main antenna of the dual-antenna high-precision positioning module.

(ANT1) is the orientation relative to the

base station's GNSS antenna.

Simplified ASCII syntax:

mode heading2

mode heading2 fixlength

mode heading2 VARIABLELENGTH

mode heading2 STATIC

mode heading2 LOWDYNAMIC

Applicable products: LG290P, LG680P, LG580P

Table 3 – 8 Directional working mode parameters

Mode Commands	Mode Name	Command parameters	Parameter Description
mode	heading2	fixlength	Enable heading2 directional mode, and enter the directional mode where the distance between the mobile base station and the directional terminal antenna remains fixed, and the two antennas can move or remain stationary synchronously . heading2 parameter is missing The default is fixlength mode)
		static	Enable heading2 directional mode, and enter the directional mode where both the mobile base station and the directional end antenna are in a stationary state
		variablelength	Enable heading2 directional mode and enter the relative position and distance between the mobile base station and the directional terminal antenna. Directional mode that changes dynamically in real time
		lowdynamic	Enable heading2 directional mode, low dynamic, suitable for Used for low-speed moving carriers such as pile drivers
		tractor	Working mode for agricultural machinery applications

4 CONFIG Directive

config is a command header used to configure the receiver's serial port, PPS pulse, elevation anomaly value, DGNSS engine, RTK engine and other properties. That is, CONFIG is required as the command header when configuring the receiver's properties . The currently supported configurations are as follows:

1） Serial port baud rate properties;
2） PPS output pulse period and other characteristics;
3） Elevation outliers;
4） DGPS engine properties;

5) RTK engine

properties; 6) heading

engine properties; 7)

SBAS function;

8) EVENT function.

The characters that can be parsed include: numbers, uppercase and lowercase letters, and some specific illegal characters, including double quotes (" "), hyphens (-), colons (:), and dollar signs ($), commas (,), forward slashes (/), and backslashes (\\ ). Characters other than the above are not parsed as commands.

The command format is:

Config [device/function

name] [parameters]

command example:

config com1 115200 8 n 1

Applicable products: LG680P, LG580P, LG290P

Table 4-1 List of device/function names

Serial number	Device/Function Name	Parameter Description
1	COM1	COM1 serial port and COM1 related configuration, such as baud rate, parity bit
2	COM2	COM2 serial port and COM2 related configuration, such as baud rate, parity bit
3	COM3	COM3 serial port and COM3 related configuration, such as baud rate, parity bit
4	PPS	Set the high-precision positioning module to output a PPS pulse signal with a specific period and pulse width. Upper and lower edges
5	EVENT	Event triggering
6	UNDULATION	Set to enter a specific geoid gap or use a built-in geoid gap grid value
7	RTK	Configure RTK parameters, such as setting mode, differential effective time

8	DGPS	Configure DGPS parameters, such as DGPS differential effective time

Table 4-2 High - precision positioning module configuration query instructions

instruction	describe
CONFIG	Query the current function and configuration information of the receiver

4.1 Serial port configuration

The serial port is the interface for the receiver to input and output data. The serial port configuration command starts with CONFIG , followed by the serial port device and serial port properties, which are used to set the serial port's baud rate, data bit, parity check, stop bit characteristics, etc.

The module supports three serial ports, namely COM1, COM2, and COM3. The three serial ports of the high-precision positioning module have the same functions, but the data input and output of each serial port work independently with their own configurations. The other three serial ports can be configured with each other, that is, the serial port properties of COM2 can be configured through COM1 , and the serial port properties of COM1 can be configured through COM2 . When integrating the module, it is recommended to keep COM1 as the upgrade interface.

The command format is:

CONFIG [serial port device number]

[serial port attribute parameters]

command example:

CONFIG COM1 115200

CONFIG COM1 115200 8 n 1

Applicable products: LG680P, LG580P, LG290P

Table 4 - 3 Serial port device parameter list

instruction	Serial Port	Serial number	parameter	Parameter Description
		1	Baud rate	Set the baud rate of the serial port.

CONFIG	COM1 COM2 COM3	2	Data bits	Set the data bit of the serial port; if you want to set the data bit of the serial port, make sure that the preceding baud rate is not empty. Note: The data bits supported in data transmission: 7 or 8, currently the product only supports 8 bits.
		3	Parity	Set the parity check of the serial port; if you want to set the parity check of the serial port, make sure that the previous parameter cannot be empty. Note: Parity check supported in data transmission: N, E, O. Currently the product only supports N.
		4	Stop bits	Set the stop bit of the serial port; if you want to set the stop bit of the serial port, make sure the previous parameter is not empty. Note: The stop bits supported in data transmission: 1 or 2. Currently the product only supports 1 bit.

Table 4 – 4 Baud rates supported by the serial port

Serial port name	describe
COM1	9600,19200,38400,57600,115200,230400,460800,921600 1,000,000, 1,500,000, 2000000, 3000000, 4000000
COM2	9600,19200,38400,57600,115200,230400,460800,921600 1,000,000, 1,500,000, 2000000, 3000000, 4000000
COM3	9600,19200,38400,57600,115200,230400,460800,921600 1,000,000, 1,500,000, 2000000, 3000000, 4000000

4.2 PPS pulse configuration

This command sets the high-precision positioning module to output a PPS pulse signal with a specific period and pulse width, and can compensate for the PPS delay .

The command format is:

CONFIG PPS [Device Parameters]

Command example:

CONFIG PPS ENABLE GPS POSITIVE 500000 100000 0

0Applicable products: LG680P, LG580P, LG290P

Table 4 – 5 PPS Function Table

Instruction Header	PPS Function	Enable Parameters	describe
CONFIG	PPS	DISABLE	Turn off PPS output.
		ENABLE	Enable PPS output, and the PPS signal is output only when the time is valid ; when the satellite is locked and the high-precision positioning module does not locate, there is no PPS signal output. The default is ENABLE.

Table 4 - 6 PPS Configuration Directives

Instruction Header	PPS Function	Enable Parameters	PPS Parameters	ASCII code value	describe
CONFIG	PPS	DISABLE	-	-	Disable PPS output
		ENABLE	Time Reference	GPS/BDS	Currently only supports BDST and GPST
			Polarity	POSITIVE	PPS rising edge is effective. Recognition
				NEGATIVE	PPS falling edge is valid
			Width	Pulse width (should be smaller than period)	PPS pulse width (unit: microseconds) Default value: 100000
			Period	Pulse output period	Pulse period (unit: milliseconds), the value is limited to: 50, 100, 200, 500, 1000, and any whole second period within 20 seconds that is divisible by 604800 seconds (for example 2000,3000,4000,7000, etc.) Default value: 1000
			RF Delay	RF Delay (nanoseconds)	Not supported yet. Default value: 0
			UserDelay	User set delay (nanoseconds)	-32768 Integer between ~32767 Default value: 0

4.3 Elevation anomaly correction value

This command inputs a specific geoid gap or uses a built-in geoid gap grid value. The command format is:

CONFIG UNDULATION [parameters]

Command example:

CONFIG UNDULATION 9.7

Applicable products: LG680P, LG580P, LG290P

Table 4-7 Elevation anomaly correction value configuration table

Instruction Header	Elevation anomaly	Parameter List	Parameter Description
CONFIG	UNDULATION	Auto	Using the built-in grid table (default configuration)
		Separation(m)	Use the geoid difference value specified by the user, the value range is: ±1000.0m

4.4 Single and dual antenna mode switching

This command is used to configure the GNSS module to work in single-antenna mode or dual-antenna mode. Saveconfig and restart to take effect.

The command format is:

CONFIG HEADING DUALANT ON

CONFIG HEADING DUALANT OFF

Command example:

CONFIG HEADING DUALANT ON

CONFIG HEADING DUALANT OFF

Applicable products: LG580P

4.5 DGPS pseudo-range differential data age configuration

This command is used to set the maximum age of received DGPS differential data. The received DGPS differential data that is later than the specified age will be ignored. It is also used to prohibit DGPS positioning calculation.

The command

format is: CONFIG

DGPS [parameters]

Command example:

CONFIG DGPS TIMEOUT 100

Applicable products: LG680P, LG580P, LG290P

Table 4-8 Configure the DGPS pseudorange differential data age

Instruction Header	DGPS engine	parameter	Parameter List	Parameter Description
CONFIG	DGPS	TIMEOUT	0	Disable DGPS positioning
			1- 1800	Maximum age of data (default = 300) , seconds

4.6 RTK Engine Configuration

This command configures the RTK engine, configures the RTK working mode, or clears RTK parameters. The command format is:

CONFIG RTK [parameters]

CONFIG RTK RELIABILITY [parameter 1] [parameter 2]

Command example:

CONFIG RTK TIMEOUT 60

CONFIG RTK RELIABILITY 3 1

Applicable products: LG680P, LG580P, LG290P

Table 4 – 9 RTK module configuration instructions

Instruction Header	RTK Engine	Command parameters	Parameter Description
CONFIG	RTK	TIMEOUT	0 : Disable RTK function 1-1800 : Maximum age of data，in seconds. The maximum age can be set to 600s for the version without Standalone license (currently supports a maximum of 256, to be changed) The default value is 120s .
		RELIABILITY	RTK engine reliability threshold configuration: 1: Loose reliability requirements 2: General reliability requirements 3: Strict reliability requirements (default state) 4: Strict reliability requirements

		RESET	Reset RTK solution
		DISABLE	Do not calculate RTK results, including floating point solutions and fixed solutions

4.7 STANDALONE Configuration

This command is used to set the STANDALONE function of the high-precision positioning module. In the STANDALONE mode, the high-precision positioning module can still perform centimeter-level positioning for a period of time when no differential correction data is received.

The command format is

CONFIG STANDALONE [Function parameter] [Parameter 1] [Parameter 2] [Parameter 3]

Command example:

CONFIG STANDALONE ENABLE 40.113452 114.212234 57.23

CONFIG STANDALONE DISABLE

Applicable products: LG680P, LG580P, LG290P

Table 4 – 10 STANDLONE Parameters

Instruction Header	STANDALONE instruction	Function parameters	Param1	Param2	Param3
CONFIG	STANDALONE	ENABLE	param1 is Geodetic coordinate system The latitude below Standard, in degrees B(input valid 11 bits) , range [-90, 90]	param2 is Geodetic coordinate system The longitude of the following Standard, in degrees B(input valid 11 bits) , range [-180, 180]	param3 is Geodetic coordinate system The altitude below is high, In meters (Enter valid bit 6), value domain [- 30000, 30000]
			Time parameters,		

		ENABLE	used to configure automatic Enter standalone Waiting mode Time, Unit s , range [3,100], silent Recognition value 100s		
		ENABLE	When it is empty, it is the default mode, using the high-precision positioning module The calculated position is used as the initial value		
		DISABLE			

4.8 HEADING engine configuration

This command is used to set the high-precision positioning module that supports dual-antenna orientation of a single board (module). Set the fixed baseline length, variable baseline length, and low dynamic mode of Heading orientation . The high-precision positioning module with dual-antenna orientation of a single board (module) is powered on by default to perform Heading work.

The command format is:

CONFIG HEADING [parameters]

CONFIG HEADING LENGTH [parameter 1] [parameter 2 (optional)]

Command example:

CONFIG HEADING FIXLENGTH

CONFIG HEADING VARIABLELENGTH

CONFIG HEADING STATIC

CONFIG HEADING LOWDYNAMIC

Applicable products: LG580P

Table 4 – 11 Heading engine configuration parameters

Instruction Header	Heading Engine	Command parameters	Parameter Description
CONFIG	HEADING	FIXLENGTH	the main antenna (ANT1) and the slave antenna (ANT2) of the dual-antenna high-precision positioning module remains fixed, and the two antennas can move synchronously or remain stationary (default mode)
		VARIABLELENGTH	The relative position and distance between the main antenna (ANT1) and the slave antenna (ANT2) of the dual-antenna high-precision positioning module change dynamically in real time
		STATIC	The main antenna (ANT1) and the slave antenna (ANT2) of the dual-antenna high-precision positioning module are both in a stationary state.
		LOWDYNAMIC	Low dynamic, for low-speed moving loads such as pile drivers Body can be enabled
		TRACTOR	For agricultural machinery applications, working mode
		LENGTH	Used to configure dual antennas with known baseline length The scene

		RELIABILITY	Heading engine reliability threshold configuration : 1 : Relaxed reliability requirements 2 : General reliability requirements 3 : Strict reliability requirements (default state) 4 : Strict reliability requirements

Table 4 – 12 HEADINGLENGTH configuration parameter

Instruction Header	Heading Engine	Parameter 1	Parameter 2
CONFIG	HEADING LENGTH	Fixed baseline length Degree, unit: cm. Such as baseline length 20cm , then enter 20	The tolerance range, unit: cm. If the tolerance range is 3 cm, enter 3

4.9 HEADING heading and pitch offset configuration

This command is used to set the offset of heading angle and pitch angle. The offset will correct the output of high-precision positioning module. Heading and pitch angles in HEADING and GPTHS information.

The command format is:

CONFIG HEADING OFFSET [Headingoffset Pitchoffset]

command example:

CONFIG HEADING OFFSET 90 45

Applicable products: LG580P

Table 4 - 13 Heading and pitch offset configuration parameters

Instruction Header	Heading	Command parameters	Parameter Description
CONFIG	HEADING OFFSET	Headingoffset	Course angle correction value, unit: deg; value range: -180.0~180.0
		Pitchoffset	Pitch angle correction value, unit : deg; value range: -90.0~90.0

For the acquisition and configuration of the heading and pitch angle offsets of the dual antenna HEADING , refer to the following detailed description and illustrations.

4.9.1 HEADING Heading angle compensation

Figure 4-1 , the main antenna points to the baseline vector of the slave antenna and rotates counterclockwise to the true north direction on the horizontal plane. The rotation angle is the heading angle of the dual antennas, ranging from 0° to 360°.

The vehicle's forward axis rotates counterclockwise on the horizontal plane until the main antenna points to the baseline vector of the slave antenna. The rotation angle is the dual antenna heading installation angle, which ranges from -180° to 180° (if the rotation angle is greater than 180 °, 360° needs to be subtracted to convert it to this range)

The heading angle of the vehicle = the heading angle of the dual antennas + the heading installation angle of the dual antennas, ranging from 0° to 360 °.

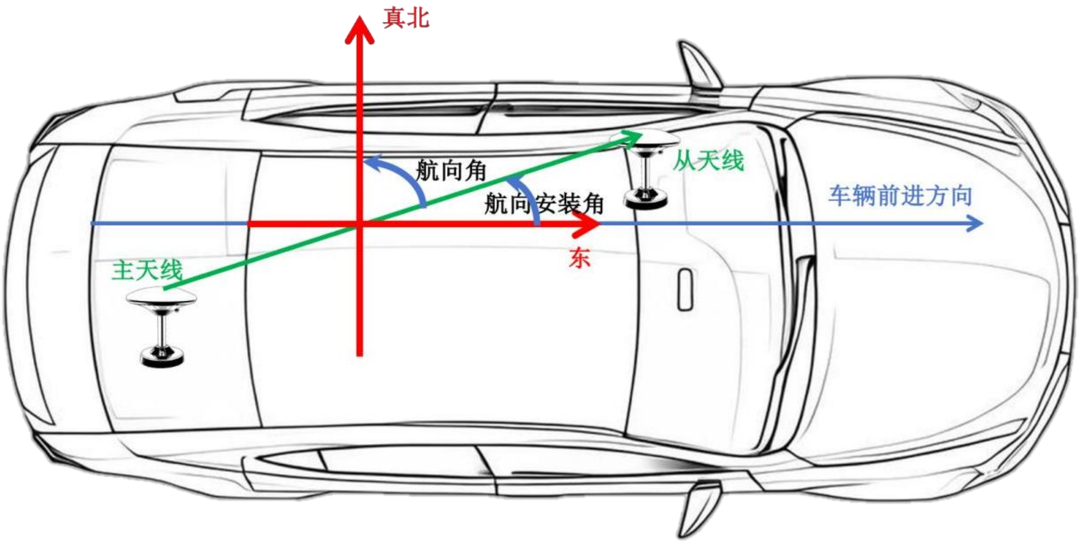


Figure 4-1 HEADING Schematic diagram of heading angle compensation

The following are some common dual antenna installation methods and heading angle compensation configuration command examples.

Figure 4-2 shows installation method 1. In this case, the heading installation angle is close to 0°. In this case, there is no need to measure and configure the heading and pitch angle compensation.

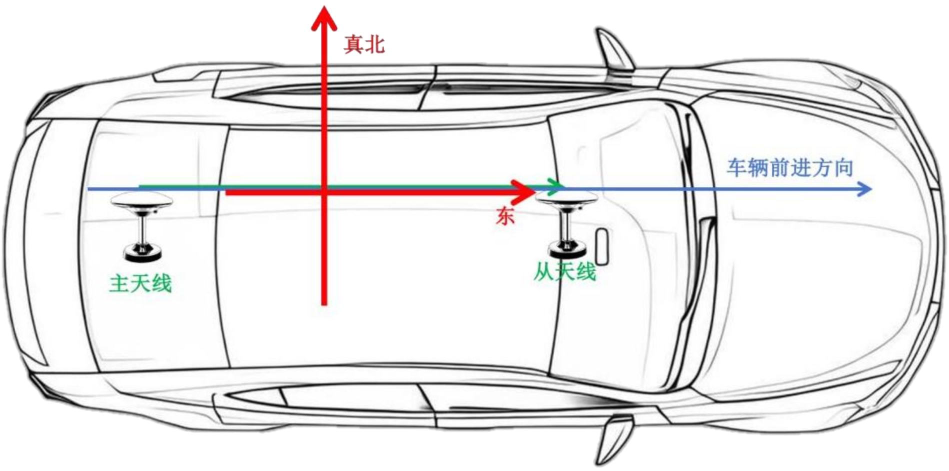


Figure 4-2 Common installation method 1

Figure 4-3 shows installation method 2. At this time, the heading installation angle is close to 180 °, and the heading compensation configuration command is: CONFIG HEADING OFFSET 180 0

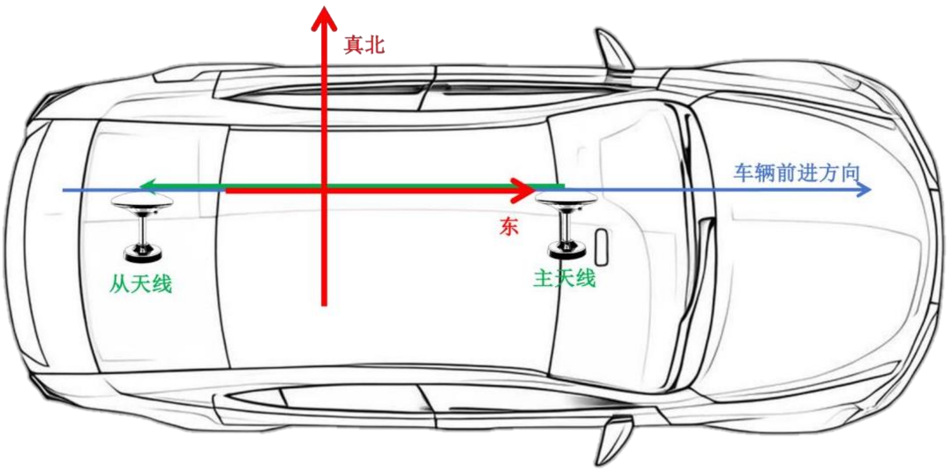


Figure 4-3 Common installation method 2

Figure 4-4 shows installation method 3. At this time, the heading installation angle is close to -90 ° , and the heading compensation configuration command is: CONFIG HEADING OFFSET -90 0

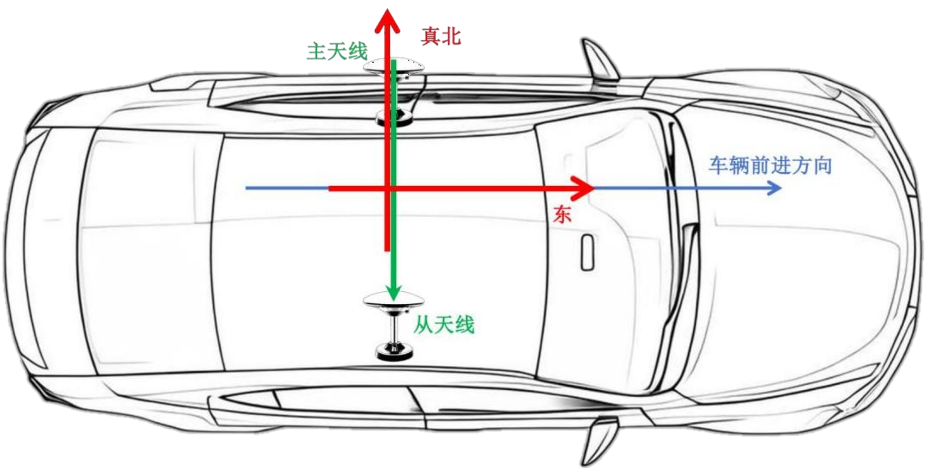


Figure 4-4 Common installation method three

Figure 4-5 shows installation method 4. At this time, the heading installation angle is close to 90 °, and the heading compensation configuration command is: CONFIG HEADING OFFSET 90 0

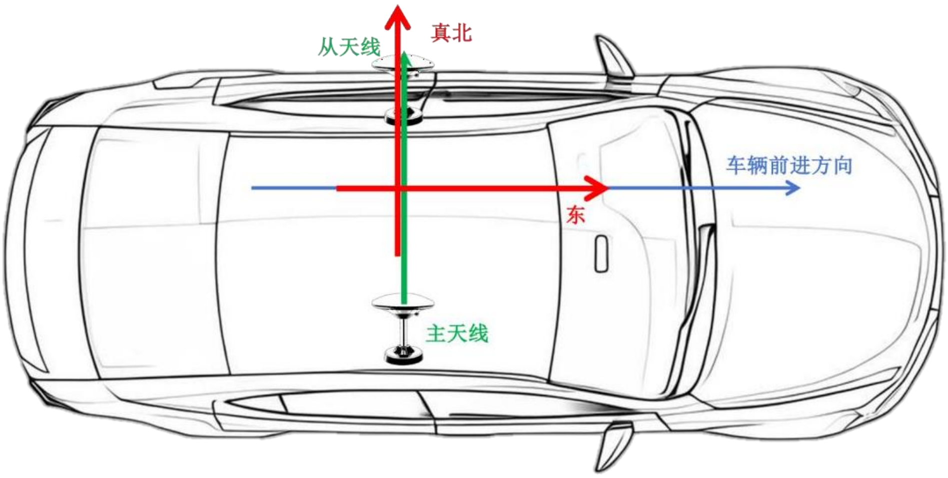


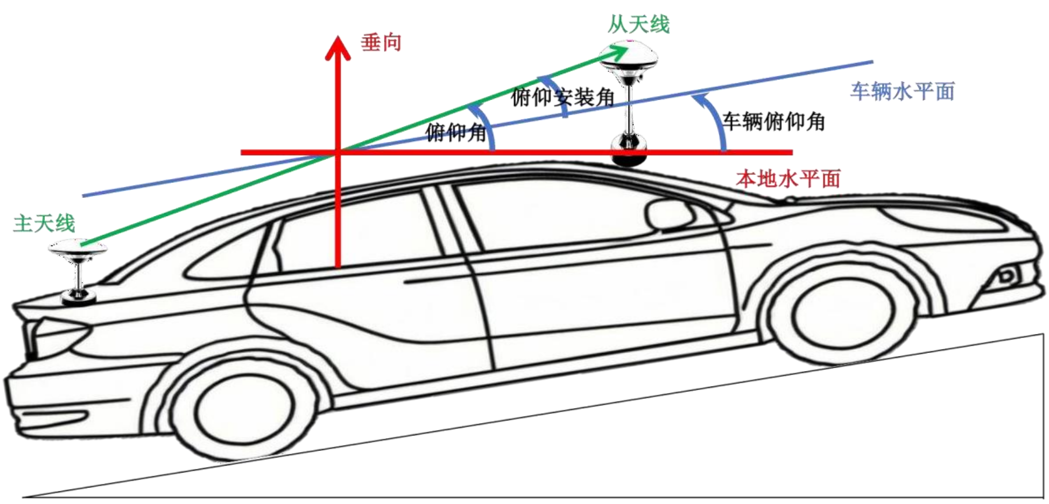
Figure 4-5 Common installation method 4

4.9.2 HEADING pitch angle compensation

As shown in Figure 4-2, the angle between the baseline vector of the master antenna pointing to the slave antenna and the local horizontal plane is the elevation angle of the dual antennas. If the vector points above the local horizontal plane, it is positive; if it points below the local horizontal plane, it is negative. The range is -90°~90°.

The angle between the baseline vector of the main antenna pointing to the slave antenna and the horizontal plane of the vehicle, that is, the pitch installation angle of the dual antennas. The vector is negative when it points above the horizontal plane of the vehicle and positive when it points below the horizontal plane of the vehicle, ranging from -90° to 90°.

The vehicle's pitch angle = the dual antenna's pitch angle + the dual antenna's pitch installation angle, ranging from -90° to 90 °.



Figures 4-6 HEADING Pitch angle compensation diagram

4.10 SBAS configuration

This command configures the

SBAS function to be turned on or

off. The command format is:

CONFIG SBAS [parameter 1] [parameter 2]

Command example:

CONFIG SBAS ENABLE WAAS

Applicable products: LG680P, LG580P, LG290P

Table 4-14 SBAS configuration instructions

Instruction Header	SBAS Engine	Parameter 1	Parameter 2	Parameter Description
CONFIG	SBAS	Disable*		Disable SBAS
		Enable	Auto	SBAS automatic star selection mode (default)
		Enable	WAAS	Enable WAAS function alone
		Enable	GAGAN	Enable the GAGAN function separately
		Enable	MSAS	Enable the MSAS function separately
		Enable	EGNOS	Enable EGNOS function separately
		Enable	SDCM	Enable SDCM function separately
		Enable	BDS	Enable BDSBAS function separately

Note: The Enable configuration only allows a single SBAS system to work, and multiple SBAS systems cannot run simultaneously.

4.11 SIGNALGROUP tracking channel mode configuration

This command is used to select different combinations of receiver master and slave antenna tracking frequency points. Parameter 1 represents the frequency point of the main antenna

Combination, parameter 2 represents the frequency combination from the antenna.

Single-antenna products only support parameter 1 configuration. When configuring parameter 2 , the system will report an error and prompt that the parameter is not supported.

For dual-antenna products , you can configure parameter 1 and parameter 2. When parameter 2 is not configured, the default configuration is 0 .

parameter 1 and parameter 2 , please refer to the following.

After the command is configured, if it is different from the current configuration of the configured module, the module will automatically restart and implement the new configuration scheme.

This command will be automatically saved after configuration, and does not need to be saved using the Saveconfig command. Therefore, if multiple CONFIG configurations are performed on the module, and the configuration includes SIGNALGROUP configuration, ensure that other configurations are saved by the module to avoid restarting the module due to SIGNALGROUP configuration, resulting in other configuration instructions not being saved by the module.

Command format:

CONFIG SIGNALGROUP [parameter 1] [parameter 2]

Command example:

CONFIG SIGNALGROUP 1

CONFIG SIGNALGROUP 2 3

Applicable products: LG580P, LG680P, LG290P

Table 4-15 Commands for configuring the master and slave antenna frequency combination

Instruction Header	Function Name	Parameter 1	Parameter 2	Parameter Description
CONFIG	SIGNALGROUP	Main antenna TypeNum	From Antenna TypeNum	TypeNum definition is detailed in the table below

Table 4 - 16 frequency combination table

TypeNum	Frequency combination description
0	Turn off the antenna
1	GPS: L1CA, L2C, L5 GLO: G1, G2 GAL: E1, E5a, E5b, E6 BDS: B1I, B1C, B2I, B2a, B2b, B3I QZS: L1CA, L2C, L5, L6 IRN: L5 SBAS A single Beidou module supports the following frequencies: BDS: B1I, B1C, B2I, B2a, B2B, B3I BDSBAS

2	GPS: L1CA, L2C, L5 GAL: E1, E5a, E5b BDS: B1I, B1C, B2I, B2a, B2b QZS: L1CA, L2C, L5 IRN: L5 SBAS Single Beidou module supports the following frequencies: BDS : B1I, B1C , B2I, B2a , B2b BDSBAS
3	GPS: L1CA GAL: E1 BDS: B1I, B1C QZS: L1CA SBAS Single Beidou module supports the following frequencies: BDS: B1I, B1C BDSBAS
4	GPS: L1CA, L2C, L5 GLO: G1 GAL: E1, E5a, E5b BDS: B1I, B1C, B2I, B2a, B2b QZS: L1CA, L2C, L5 IRN: L5 SBAS Single Beidou module supports the following frequencies: BDS : B1I, B1C , B2I, B2a , B2b BDSBAS

5	GPS: L1CA, L2C, L5 GAL: E1, E5a BDS: B1I, B1C, B2a QZS: L1CA, L2C, L5 IRN: L5 SBAS Single Beidou module supports the following frequencies: BDS: B1I, B1C, B2a BDSBAS
6	GPS: L1CA, L5 GAL: E1, E5a, E5b BDS: B1I, B1C, B2I, B2a, B2b QZS: L1CA, L5 IRN: L5 SBAS Single Beidou module supports the following frequencies: BDS : B1I, B1C , B2I, B2a , B2b BDSBAS

Table 4 - 17 Configurations and default frequency combinations supported by the product

Product Model	Supported TypeNum configuration combinations Master Antenna	Slave Antenna	Remark
LG290P	1		Full frequency module
LG680P	1		Full frequency module
CM291	1		Single Beidou module
CM681	1		Single Beidou module
LG580P	2	2	Dual antenna default configuration
	4	0	Single Antenna Mode

D	4	5	
	4	6	

LG580PQ or CM581	2	2	Dual antenna default configuration
	1	3	Main antenna full frequency, slave antenna single frequency
	1	0	Single Antenna Mode
	4	5	
	4	6	

5 MASK instruction

5.1 MASK configuration query

The high-precision module supports the use of the MASK command to query the currently set satellite system, frequency, satellite number, altitude angle and other tracking and application configurations.

The

command

format is:

MASK

Command

example:

MASK

Applicable products: LG680P, LG580P, LG290P

Example message output:

$CONFIG,MASK,MASK 5*3B

$CONFIG,MASK,MASK GPS*4A

$CONFIG,MASK,MASK QZSS*05

$CONFIG,MASK,MASK GPSL1*37

$CONFIG,MASK,MASK GALE5a*55

$CONFIG,MASK,GPSMaskPrn:4,*24

$CONFIG,MASK,IRNSSMaskPrn:3,*32

Table 5-1 High - precision module MASK configuration query instructions

instruction	describe
MASK	Query the current MASK configuration of the module

5.2 MASK is used to shield the satellite signals received by the high-precision module

This command is used to set the satellite system, satellite frequency, satellite number, and satellite cut-off elevation angle received by the high-precision module. The default configuration of the MASK elevation angle is 5 degrees.

The command format is:

MASK

[Frequency/Satellite

System] MASK [Altitude

Angle]

MASK [satellite system] PRN

[satellite number] Command

example:

MASK GPS Disable the module to track

GPS satellite system MASK BDS Disable

the module to track BDS satellite system

MASK GLO Disable the module to track

GLO satellite system MASK GAL Disable

the module to track GAL satellite system

MASK QZSS Disable the module to track

QZSS satellite system MASK IRNSS Disable

module tracking IRNSS Satellite system

MASK 5 sets the module's satellite tracking

cutoff angle to 5 degrees MASK B1 module tracking

is prohibited BDS Systematic B1 Frequency signal

MASK E5a prohibits the module from tracking the E5a frequency signal of the GALILEO system MASK GPS PRN 10 The module is prohibited from tracking GPS satellites with a PRN of 10. Applicable products: LG680P, LG580P, LG290P

Table 5-2 Mask instruction parameters (1)

Function Name	Parameter 1
MASK	Altitude angle (range: -90°~90°, default value 5°)

Table 5-3 Mask instruction parameters (2)

Function Name	Parameter 1
MASK	Frequency/Satellite system (refer to Table 5-5 for details)

Table 5 - 4 Mask instruction parameters (3)

Function Name	Parameter 1	Fixed value	Parameter 2
MASK	Satellite system	PRN	Satellite number. See Table 5 - 6 satellite PRN definition

Table 5-5 Satellite systems and frequencies

Serial num ber	system	Satellite frequency	describe
1	GPS	L1, L1CA, L2, L2C, L5	GPS satellite system supports frequency signals: L1CA (i.e. L1C/A), L2C, L5 When MASK When L1 , it acts on L1C/A When MASK When L2 , it acts on L2C
2	BDS	B1, B2, B3 , B1I, B2I, B3I , BD3B1C 、 BD3B2A, BD3B2B	BeiDou-2 satellite system supports frequency signals: B1I, B2I, B3I BeiDou-3 satellite system supports frequency signals: B1I, B3I , BD3B1C, BD3B2A, BD3B2B When MASK When B1 , shield B1I and BD3B1C When MASK When B2 , shield B2I , B2a and B2b When MASK When B3 , shield B3I
3	GLO	R1, R2	GLONASS system supports frequency signals: R1, R2
4	GAL	E1, E5a, E5b	Galileo system supports frequency signals: E1, E5b, E5a

5	QZS	Q1, Q2, Q5, Q6, Q6D, Q6E	The QZSS system supports the following frequency signals: QZSS L1CA, QZSSL2C, QZSS L5, QZSSL6 When MASK When Q1 , it acts on QZSS When L1CA is MASK Q2 , it acts on QZSS L2 When MASK When Q5 , it acts on QZSS L5 as MASK Q6, acts on QZSS L6 When MASK Q6D , in QZSS When L6 is turned on, configure to block L6D and receive L6E type messages When MASK Q6E , at QZSS When L6 is turned on, configure to block L6E and receive L6D type messages Note Only [illegible] support Q6
6	IRNSS	I5	IRNSS supports frequency signals: E1, E5b, E5a

Table 5-6 Satellite PRN Definition

Satellite system	PRN
BDS	1- 63
GPS	1- 32
GLONASS	38- 61
GALILEO	1- 36
SBAS	120- 158
QZS	193-202
IRNSS	1- 15

5.3 UNMASK is used to remove the shielding of satellite signals received by the high-precision module

This command is used to set the satellite system and satellite frequency received by the high-precision positioning module. The command format is:

UNMASK [frequency/satellite

system] UNMASK [satellite

system] PRN [satellite number]

Command example:

UNMASK GPS enabled modules to track

GPS satellite systemsUNMASK BDS enabled

modules to track BDS satellite systemsUNMASK

GLO enabled modules to track

GLO satellite systemsUNMASK GAL enabled

modules to track GAL satellite systemsUNMASK

QZSS enabled modules to track

QZSS satellite systemsUNMASK IRNSS

enabled modules to track

IRNSS Satellite system

UNMASK B1 enables the module to track the B1

frequency signal of the BDS system. UNMASK E5a enables the

module to track GALILEO SYSTEM E5a frequency signal

UNMASK GPS PRN 10 enables the module to track GPS

satellites with PRN 10 Applicable products: LG680P, LG580P,

LG290P

Table 5 – 7 Unmask command parameters (1)

Function Name	parameter
UNMASK	Frequency/satellite system, refer to Table 5-5 Satellite system and frequency . type messages when L6 is turned on. applied to Q6D , it means receiving L6E when L6 is turned on. Type Message

Table 5 – 8 Unmask command parameters (2)

Function Name	Parameter 1	Fixed value	Parameter 2
UNMASK	Satellite system	PRN	Satellite number. See Table 5 – 6 Satellite PRN definition

6 Other instructions

6.1 LOG opens the serial port output

This command is used to open the serial port to output specific data information. The configurable parameter [statement] opens the corresponding data information for output; the configurable parameter [port] opens the port output. If no port is specified, the default is the port currently receiving the command.

The command format is: LOG [port] [message] ontime [message rate]

6.2 UNLOG stops serial port output

This command is used to stop the serial port from outputting specific data information. The configurable parameter [statement] stops outputting the corresponding data information; the configurable parameter [port] stops port output. If no port is specified, the default is the port currently receiving the command.

The command format is: UNLOG [port] [message]

6.3 FRESET Clears the data in the non-volatile memory and restarts the high-precision positioning module

This command clears all user-specific configurations and satellite ephemeris and position information stored in the non-volatile memory and restores the factory settings. The factory setting baud rate is 115200bps. This command will force the high-precision positioning module to restart.

The

command

format is:

FRESET

Applicable products: LG680P, LG580P, LG290P

Table 6-1 The FRESET instruction parameters are as follows

Instruction Header	Command parameters	describe
FRESET	-	Clear the saved settings, satellite ephemeris, location information, etc., and restore the factory settings of the high-precision positioning module. The factory setting baud rate is 115200bps

6.4 RESET Restart the high-precision positioning module

This command is used to restart the high-precision positioning module. It can also restart the high-precision positioning module and clear the satellite ephemeris, position information, satellite almanac, ionosphere and UTC parameters and other data stored in the high-precision positioning module.

The

command

format is:

RESET

Applicable products: LG680P, LG580P, LG290P

Table 6-2 Reset Command

Instruction Header	Command parameters	describe
RESET	-	Restart the high-precision positioning module
	EPHEM	Restart the receiver to clear the saved satellite ephemeris
	IONUTC	Restart the receiver to clear the ionosphere and UTC parameters
	ALMANAC	Restart the receiver to clear the almanac
	POSITION	Restart the receiver to clear the position
	TIME	Restart the receiver to clear time related information
	ALL	Restart the receiver to clear all the above information.

6.5 Saveconfig saves the user configuration to non-volatile memory

This command saves the current user configuration to non-volatile memory. The command format is:

SAVECONFIG

Applicable products: LG680P, LG580P, LG290P

Table 6-3 Saveconfig directive parameters

Instruction Header	Command parameters	describe
SAVECONFIG	-	Save user configuration to non-volatile memory

6.6 NMEATALKER

This command is used to change the NMEA sentence header.

Currently, only AUTO and GP are supported . The command format is:

NMEATALKER AUTO

NMEATALKER GP

6.7 TRACKSV

This command is used to override the automatic satellite/channel assignment for all satellites with a manual command. The command format is:

TRACKSV [Satellite system] [Satellite number] NEVER

6.8 UNLOCKOUTALL

This command allows all previously locked satellites or systems to be restored to the solution. The command format is:

UNLOCKOUTALL

Command example:

UNLOCKOUTALL

6.9 FIX

The command format used for this instruction is: FIX none

Command example:

FIX none

6.10 INTERFACEMODE

This command is used to specify the type of data that a particular port on the receiver can send and receive. For example, to receive RTCMV3 differential correction, set the port's receive type to RTCMV3.

The command format is:

INTERFACEMODE [port] [type] [type]

ON command example:

INTERFACEMODE COM1 NOVATEL NOVATEL ON

7 Data output instructions

Data output commands are used to output positioning, orientation and other information, using NMEA standard data output commands. LOG COM1 GPGGA ONTIME 1

LOG COM1 GPGSV ONTIME 1

7.1 Binary message

The supported binary messages are shown in the following table.

BESTPOS	RANGE
BESTVEL	RANGECMP2
PSRDOP	GPSEPHEM
PSRVEL	GLOEPHEMERIS
TIME	GALEPHEMERIS
REFSTATION	BD2EPHEM
RTKDOP	QZSSEPHEMERIS
SATVIS2	BD2IONUTC
BESTSAT	IONUTC
HEADING	

7.1.1 BESTPOSBest location

calculated by the Hyperposition module . In addition, the Hyperposition module reports several status indicators, including the differential age, which is useful for predicting anomalies caused by interruptions in differential corrections. If the age is 0, differential corrections are not being used.

Recommended input:

LOG COM1 BESTPOSB ONTIME 1

Applicable products: LG680P, LG580P, LG290P

Table 7-1 BESTPOS Data Structure

ID	Fields	Data Description	type	Number of bytes
1	BESTPOS header	Log header, refer to Table 9-24 Binary information Header structure		H
2	solstatus	Solution status (refer to Table 9-51 Solution status)	Enum	4
3	postype	Position type (refer to Table 9-50 Position or speed type)	Enum	4
4	lat	Latitude, degrees	Double	8
5	lon	Longitude, degrees	Double	8
6	hgt	Altitude, m	Double	8
7	undulation	Geoid Disparity - Geoid and WGS84 ellipsoids (meters)	Float	4
8	datumid#	Coordinate system ID number, currently only supports WGS84 (61 in binary)	Enum	4
9	latσ	Latitude standard deviation, m	Float	4
10	lonσ	Standard deviation of longitude, m	Float	4
11	hgtσ	Height standard deviation, m	Float	4
12	stnid	Base station ID , default value is 0	Char[4]	4
13	diff_age	Differential age, s	Float	4
14	sol_age	The age of the solution, s	Float	4
15	#SVs	Number of satellites tracked	Uchar	1
16	#solnSVs	The number of satellites used in the solution	Uchar	1
17	Reserved	reserve	Uchar	1
18	Reserved	reserve	Uchar	1
19	Reserved	reserve	Uchar	1
20	extsolstat	The status of the extended solution, refer to Table 9-71 Extended Solution state	Hex	1
twenty one	Galileo sigmask	Galileo . Reference table 9-53Signal mask used by Galileo	Hex	1

twenty two	GPS, GLONASS and BDS Sigma sk	Signal masks used by GPS, GLONASS and BDS (see Table for GPS/GLONASS/BDS Signal Mask)	Hex	1
twenty three	xxxx	32 -bit CRC checksum (ASCII and binary only)	Hex	4
twenty four	[CR][LF]	Statement terminator (ASCII only)	-	-

7.1.2 BESTVELBest Available Speed

This command contains the best available speed information calculated by the hyper-precision positioning module. In addition, the hyper-precision positioning module also reports a speed status indicator, which is very useful to indicate whether the corresponding data is valid. This speed measurement sometimes has an associated delay .

Recommended input:

LOG COM1 BESTVELB ONTIME 1

Applicable products: LG680P, LG580P, LG290P

Table 7-2 BESTVEL Data Structure

ID	Fields	Data Description	type	Number of bytes
1	BESTVEL header	Log header, refer to Table 9-24 Binary information Header structure		H
2	solstatus	Solution status, refer to Table 9-51 Solution status	Enum	4
3	veltype	Speed type, refer to Table 9-50 Position or speed type type	Enum	4
4	latency	The delay value is calculated from the velocity time scale in seconds . Subtracting the delay from the epoch time gives a more accurate value. Accurate speed results.	Float	4
5	age	Differential age, s	Float	4
6	horspd	Horizontal speed above ground, m/s	Double	8
7	trkgnd	Actual direction of motion relative to true north (relative ground track), deg	Double	8
8	vertspd	Vertical speed, m/s , positive values indicate altitude Increase	Double	8
9	Reserved	reserve	UINT	4
10	xxxx	32 -bit CRC checksum (ASCII and	Hex	4

		binary only)		
11	[CR][LF]	Statement terminator (ASCII only)	-	-

7.1.3 PSRDOP Pseudorange Dilution of Precision

The DOP is calculated from the geometric distribution of the satellites that the receiver is currently tracking and using in the position solution. The LOG command configures the output frequency. The message length is variable, depending on the number of satellites being tracked.

Message ID:174

Applicable products: LG680P, LG580P, LG290P

Table 7-3 PSRDOP message structure

Data Field	type	describe	Number of bytes	Offset
PSRDOP Header	Header	-	H	0
gdop	Geometric Dilution of Precision - Assuming 3-D position and receiver clock Difference (all 4 parameters) unknown	Float	4	H
pdop	Position Dilution of Precision - Assuming the 3-D position is unknown, the receiver Clock error known	Float	4	H+4
hdop	Horizontal Dilution of Precision	Float	4	H+8
htdop	Horizontal position and time dilution of precision	Float	4	H+12
tdop	Time Dilution of Precision - Assuming the 3-D position is known, the receiver Clock error unknown	Float	4	H+16
cutoff	Cut-off height angle	Float	4	H+20
#PRN	Total number of satellites tracked	Long	4	H+24
PRN	PRN of the tracking satellite . This is a null field until a position solution is available . (Channel offset +70 for Galileo , +70 for QZSS) Channel Offset + 11)	ULong	4	H+28
NextPRN offset=H+28+#prn *4)				
xxxx	32 -bit CRC checksum (ASCII and binary only)	Hex	4	H+28+ #prn*4
[CR][LF]	Statement terminator (ASCII only)	-	-	-

7.1.4 PSRVEL pseudorange velocity

The DOP is calculated from the geometric distribution of the satellites that the receiver is currently tracking and using in the position solution. The LOG command configures the output frequency. The message length is variable, depending on the number of satellites being tracked.

Message ID: 100

Applicable products: LG680P, LG580P, LG290P

Table 7-4 PSRVEL message structure

Data Field	type	describe	Number of bytes	Offset
PSRVEL Head	Header	-	H	0
sol status	Solution status, for details refer to Table 1.20 Solution status	Enum	4	H
vel type	Position type, for details, refer to Table 1.19 Position or speed type type	Enum	4	H+4
latency	The delay value calculated from the velocity time scale, in seconds. Subtracting the delay from the epoch time gives a more accurate velocity. result.	Float	4	H+8
age	Differential age, s	Float	4	H+12
hor spd	Horizontal speed above ground, m/s	Double	8	H+16
trk gnd	Actual direction of motion relative to true north (relative to the Earth) surface trajectory), deg	Double	8	H+24
vert spd	Vertical speed, m/s, positive values indicate increasing altitude (upward), Negative values indicate a decrease in altitude (downward)	Double	8	H+32
Reserved	reserve	UINT	4	H+40
xxxx	32 -bit CRC checksum (ASCII and binary only)	Hex	4	H+44
[CR][LF]	Statement terminator (ASCII only)	-	-	-

7.2 NMEA data output commands

Optisens products support NMEA standard protocol Version 4.11 . For details, please refer to the NMEA official website www.nmea.org related documents.

When users use Optisens products to request NMEA message output, the input command needs to add GP before the message name , such as GPGSV, GPGGA. In the message output, GP represents the satellite system: if the current satellite system is GPS, the message output is GP ; if the current satellite system is BDS, the message output is GB (the command input is still G P) and so on. The following provides command input examples and message output instructions:

Correct command input: GPGSV/GPGGA/...

Wrong command input: GBGSV/GLGSV/GAGGA/...

Table 7-5 Satellite systems and their simplified symbols

Satellite system	Message Output
GPS	GP
BDS	GB
GLONASS	GL
Galileo	GA
QZS	GQ
Multi-system joint positioning	GN

7.2.1 GPGGA outputs time position and positioning information

This message outputs time, location

and positioning related information.

Recommended input:

LOG COM1 GPGGA ONTIME 1

$GPGGA,025754.00,4004.74102107,N,11614.19532779,E,1,18,0.7,63.3224,M,- 9.

7848,M,,*58

Applicable products: LG680P, LG580P, LG290P

Table 7-6 GPGGA Data Structure

ID	Fields	Data Description	symbol	Example
1	$GPGGA	Log Header		$GPGGA
2	utc	UTC time corresponding to the location , hh/mm/ss.ss	hhmmss.ss	170659.00
3	lat	Latitude (DD mm.mm)	llll.ll	4001.1220
4	latdir	Latitude direction (N=North, S=South)	a	N
5	lon	Longitude (DDD mm.mm)	yyyyy.yy	11600.3622
6	londir	Longitude direction (E=East, W=West)	a	E
7	qual	GPS Quality Indicator 0 = Positioning not available or invalid 1 = Single point positioning 2 = Pseudorange differential or SBAS positioning 4 = RTK fixed solution 5=RTK floating point solution 6 = Inertial navigation	x	1
8	#sats	Number of satellites in use. May not match number seen Consistency	xx	10

9	hdop	Horizontal Dilution of Precision	xx	1.0
10	alt	Antenna height, above/below mean sea level	xx	1098.44
11	a-units	Antenna height unit (M=m)	M	M
12	undulation	Geoid Disparity – The distance between the geoid and the WGS84 ellipsoid. Positive values are obtained when the geoid is above the ellipsoid, negative values are obtained when the geoid is above the ellipsoid .	xx	-15.174
13	u-units	Geoid difference unit (M=m)	M	M
14	age	Age of differential data, in seconds	xx	(No differential data When empty)
15	stnID	Differential base station ID, 0000-4096	xxxx	(No differential data When empty)
16	*xx	Checksum	*hh	*3F
17	[CR][LF]	Statement terminator		[CR][LF]

7.2.2 GPRMC GNSS Recommended Information

This message outputs information and GNR M C The message is consistent with the standard, but it is mandatory to output with the "$ G P R M C " header. Whether it is single-system positioning or multi-system joint positioning, it is always output with the "$ G P R M C " header. The message contains the time, date, position, heading and speed information calculated by the high-precision positioning module. R M C The information is the most compact navigation information recommended by the high-precision positioning module.

Recommended input:

LOG COM1 GPRMC ONTIME 1

$GPRMC,094403.00,A,4004.73794422,N,11614.18999462,E,0.037,5.5,260815,6.

5,W,A*35

Applicable products: LG680P, LG580P, LG290P

Table 7 - 7 GPRMC Data Structure

ID	Fields	Data Description	symbol	Example
1	$GPRMC	Log Header		$GPRMC
2	utc	The UTC time corresponding to the location	hhmmss.ss	144326.00
3	posstatus	Position Status: A = valid, V = invalid	A	A
4	lat	Latitude (DD mm.mm)	llll.ll	5107.0017737
5	latdir	Latitude direction N = North Latitude, S = South Latitude	a	N
6	lon	Longitude (DDD mm.mm)	yyyyy.yy	11402.3291611
7	londir	Longitude direction E = East longitude, W = West longitude	a	W
8	speedKn	Ground speed, knot	xx	0.080
9	tracktrue	True north track direction, deg	xx	323.3
10	date	Date: dd/mm/yy	xxxxxx	210307
11	magvar	Magnetic declination, deg [b]	xx	0.0
12	vardir	Magnetic declination direction E/W [c]	a	E
13	modeind	Locating mode indicator	a	A
14	*xx	Checksum	*hh	*72
15	[CR][LF]	Statement terminator		[CR][LF]

7.2.3 GPGSV visible satellite status output

This message contains the number of visible SVs , PRN number, elevation, azimuth and SNR value. Each message contains up to 4 satellites. When necessary, additional satellite data can be sent in 2 or more messages (up to 9). The total number of messages transmitted and the current message being transmitted are indicated in the first two fields.

Recommended input:

LOG COM1 GPGSV ONTIME 1

$GPGSV,3,1,09,02,51,123,47,05,69,022,49,07,12,050,41,13,58,174,48*75

$GPGSV,3,2,09,15,32,210,45,20,44,281,45,29,49,272,49,30,19,081,40*74

$GPGSV,3,3,09,21,07,307,36*45

$GLGSV,2,1,08,74,05,021,37,66,69,333,49,82,34,325,46,75,07,070,42*61

$GLGSV,2,2,08,65,23,043,44,88,33,164,40,81,77,244,49,67,33,250,45*6E

$GAGSV,1,1,04,03,86,345,48,05,33,050,44,08,35,236,43,22,42,156,45*64

$BDGSV,3,1,10,01,36,146,42,02,34,225,38,03,43,188,40,04,25,124,38*6F

$BDGSV,3,2,10,05,17,249,36,06,74,234,45,08,56,155,44,13,79,211,47*67

$BDGSV,3,3,10,14,37,054,45,09,46,229,41*6F

Applicable products: LG680P, LG580P,

LG290P

Table 7 – 8 GPGSV Data Structure

ID	Fields	Data Description	symbol	Example
1	$GPGSV	Log Header		$GPGSV
2	#msgs	Total number of messages (1-9)	x	3
3	msg#	Number of messages (1-9)	x	1
4	#sats	The total number of satellites visible. May be different from the value used In	xx	09

5	prn	Satellite PRN numberGPS =1~32GLONASS=65~96 Galileo=1~38BDS=1~37SBAS=120~141 and 183~187 QZSS=193~197	xxx	03
6	elev	Elevation angle, maximum 90 degrees	xx	51
7	azimuth	True north azimuth (degrees), 000 to 359	xxx	140
8	SNR	Signal-to-noise ratio (C/No), 00-99dB-Hz , no tracking hour	xx	42
9- 16	Next sat	2nd -3rd SV , the set sum of "Satellite ID-Altitude- Azimuth - SNR", the number of characters is variable. Each message supports up to 4 sets. When less than four sets are transmitted , the unused set fields do not need to be empty. The fourth SV is the set sum of "Satellite ID-Altitude- Azimuth - SNR", with a variable number of characters. Each message supports up to 4 sets. When less than four sets are transmitted, the unused set fields do not need to be empty.		
17	SysID	GNSS system ID	h	
18	*xx	Checksum	*hh	*72
19	[CR][LF]	Statement terminator		[CR][LF]

7.2.4 GPGSA DOP value and effective satellite information

This command includes the GNSS high-precision positioning module positioning mode, the satellites used for positioning and the DOP value. Recommended input:

LOG COM1 GPGSA ONTIME 1

$GNGSA,M,3,05,13,02,29,20,15,30,07,,,,,1.1,0.6,0.9*23

$GNGSA,M,3,81,66,82,88,67,,,,,,,,1.1,0.6,0.9*2D

$GNGSA,M,3,02,21,07,04,,,,,,,,,1.1,0.6,0.9*24

$GNGSA,M,3,13,06,08,09,03,14,01,02,04,05,,,1.1,0.6,0.9*2E

Applicable products: LG680P, LG580P, LG290P

Table 7 – 9 GPGSA Data Structure

ID	Field	Data Description	symbol	example
1	$GPGSA	Log Header		$GPGSA
2	modeMA	A = Auto 2D/3D M = Manual, forces running in 2D or 3D	M	M
3	mode123	Mode: 1 = Fixed or Unavailable; 2 = 2D; 3=3D	x	3
4- 15	prn	numberused in the solution (unused fields are empty), 12 fields in total . (GPS: 1 to 32, GLONASS: 65 to 96, Galileo1 to 38, BDS1 to 63, SBAS120 to 141 and 183 to 187, QZSS193 to 197)	xx,xx,.....	18,03,13,25,16 , 24,12,20,,,,,
16	pdop	Position Dilution of Precision	xx	1.5
17	hdop	Plane Dilution of Precision	xx	0.9
18	vdop	Elevation Dilution of Precision	xx	1.2
19	*xx	Checksum	*hh	*3F
20	[CR][LF]	Statement terminator		[CR][LF]

7.2.5 GPVTG ground speed information

This command is used to set the current serial port or the specified serial port to output ground speed information. Recommended input:

LOG COM1 GPVTG ONTIME 1

$GNVTG,330.424,T,337.152,M,0.01159,N,0.02147,K,A*32

Applicable products: LG680P, LG580P, LG290P

Table 7 – 10 GPVTG data structure

ID	Fields	Data Description	symbol	Example
1	$GPVTG	Log Header		$GPVTG
2	Headingtrue	The ground heading based on true north (000~359 degrees, the leading 0 will also be	hhh	

		transmitted lose)		
3	TRUENORTH	True North Reference System	T	
4	Headingmag	Ground heading relative to magnetic north (000~359 degrees, leading zeros will also be transmitted)	hhh	
5	MAGNETIC NORTH	Magnetic North Reference System	M	
6	speedKn	Ground speed (000.0~999.9 knots, front 0 will also be transmitted)	sss.s	
7	N	knot	N	
8	speedKm	Ground speed (0000.0~1851.8 km/h The leading 0 will also be transmitted)	ssss.s	
9	K	Kilometers per hour	K	
10	Modeind	Mode indication (only NMEA01833.00 version output, A = autonomous positioning, D = differential, E = estimation, N = invalid data)	a	
11	*xx	Checksum	*hh	*72
12	[CR][LF]	Statement terminator		[CR][LF]

7.2.6 GPGLL Geolocation Information

This command is used to set the current serial port or specify the serial port to output latitude, longitude, UTC time and other information. Recommended input:

LOG COM1 GPGLL ONTIME 1

Applicable products: LG680P, LG580P, LG290P

Table 7 – 11 GPGLL Data Structure

ID	Fields	Data Description	symbol	Example
1	$GPGLL	Log Header		$GPGLL
2	lat	Latitude (DD mm.mm)	ddmm.mmmm	
3	latdir	Latitude direction (N=North, S=South)	a	
4	lon	Longitude (DDD mm.mm)	dddmm.mmm	
5	londir	Longitude direction (E=East, W=West)	a	
6	Utc	UTC time	hhmmss.sss	
7	modeind	Positioning status, A = Positioning, V = Not Positioning	a	
8	*xx	Checksum	*hh	*72
9	[CR][LF]	Statement terminator		[CR][LF]

7.2.7 GPZDA Date and Time

This command is used to set the current serial port or the specified serial port to output UTC date and time.

Recommended input:

LOG COM1 GPZDA ONTIME 1

$GPZDA,055435.00,13,11,2018,,*73

Applicable products: LG680P, LG580P, LG290P

Table 7 – 12 GPZDA data structure

ID	Fields	Data Description	symbol	Example
1	$GPZDA	Log Header		$GPZDA
2	Utc	UTC time	hhmmss.	
3	Day	day	xx	
4	Month	moon	xx	
5	Year	Year	xxxx	

6	Localzonedescription	The local time zone description, 00 to +/- 13 hours	xx	
7	Localzoneminutesdescription	Minute description of the area (with small same symbol as	xx	
8	*xx	Checksum	*hh	*72
9	[CR][LF]	Statement terminator		[CR][LF]

7.2.8 GPGST pseudorange observation noise statistics

This message contains pseudorange observation noise, which will be passed to the positioning result to provide the accuracy information of the positioning solution . In addition to the RMS field, this information reflects the accuracy of the position in BESTPOS and GPGGA . Since the RMS field is dedicated to pseudorange, it cannot reflect the observation accuracy of the carrier phase, but it can reflect the accuracy of the positioning solution calculated by pseudorange in PSRPOS .

Recommended input:

LOG COM1 GPGST ONTIME 1

$GPGST,141451.00,1.18,0.00,0.00,0.0000,0.00,0.00,0.00*6B

Applicable products: LG680P, LG580P, LG290P

Table 7 - 13 GST Data Structure

ID	Fields	Data Description	symbol	Example
1	$GPGST	Log Header		$GPGST
2	utc	UTC time corresponding to the location (hours/minutes /second/ tenth of a second)	hhmmss.ss	173653.00
3	rms	The standard deviation of the pseudorange used for positioning calculation, RMS .	xx	2.73
4	smjrstd	The major semi-axis of the error ellipse, m	xx	2.55
5	smnrstd	The semi-minor axis of the error ellipse, m	xx	1.88
6	orient	Direction of the error ellipse, deg	xx	15.2525
7	latstd	Standard deviation of latitude error, m	xx	2.51
8	lonstd	Standard deviation of longitude error, m	xx	1.94
9	altstd	Standard deviation of height error, m	xx	4.30
10	*xx	Checksum	*hh	*6E
11	[CR][LF]	Statement terminator		[CR][LF]

7.2.9 KSXT Positioning and orientation data output statement

This message contains the time, position, location and orientation related data of the GNSS high-precision positioning module.

Recommended input:

LOG COM1 KSXT ONTIME 1

$KSXT,20190909084745.00,116.23662400,40.07897925,68.3830,299.22,-67.03,190.28,0.022,,1,3,46,28,,,,-0.004,-0.021,-0.020,,*27

Applicable products: LG680P, LG580P, LG290P

Table 7 - 14 KSXT Data Structure

ID	Fields	Data Description	symbol
1	$KSXT	Frame Header	$KSXT
2	utc	The UTC time corresponding to the location, yyyy/mm/dd/hh/mm/ss.ss	yyyymmddhhmmss.ss
3	lon	Longitude (unit: degrees) , keep decimal places 8 significant digits	DDD.DDDDDDDD
4	lat	Latitude (unit: degrees) , keep decimal places 8 significant digits	DD.DDDDDDDD
5	Height	Altitude (unit: meter) , keep decimal point Last 4 significant digits	
6	Heading	Azimuth	a
7	pitch	Pitch Angle	
8	tracktrue	Speed Angle	
9	Vel	Horizontal speed	
10	Roll	Roll	
11	POSqual	GNSS position quality indicator 0 = Position not available or invalid 1 = Single point positioning 2 = RTK floating point solution 3 = RTK fixed solution	x
12	HEADING qual	GNSS orientation quality indicator 0 = Position not available or invalid 1 = Single point positioning 2 = RTK floating point solution 3 = RTK fixed solution	
13	#solnSVs	Number of satellites used by the front antenna The number of satellites currently involved in the solution of the	

		front antenna	
14	#solnSVs	Number of satellites used by rear antenna The number of satellites currently involved in the solution of the rear antenna	
15	East	East position coordinates: East position in the geographic coordinate system with the base station as the origin , unit: meter, 3 decimal places	
16	north	North position coordinates: North position in the geographic coordinate system with the base station as the origin , unit: meter, 3 decimal places	
17	up	Celestial position coordinates: zenith position in the geographic coordinate system with the base station as the origin , unit: 3 decimal places	
18	EastVel	Eastward speed: Eastward speed in geographic coordinate system , unit: Km/h (left blank if not available) Eastward speed in geographic coordinate system, 3 decimal places	
19	northVel	Northward speed: Northward speed in geographic coordinate system , 3 decimal places, unit: Km/h (such as None is empty)	
20	upVel	Celestial velocity: zenith velocity in geographic coordinate system, 3 decimal places, unit: Km/h (leave blank if none)	
twenty one	reserve		

twenty two	reserve		
twenty three	Check digit	XOR check (hexadecimal string, check from the frame header)	*FF

7.3 VERSION version and authorization information

The version information includes the product name, firmware version, authorization status, product PN number, device ID, etc. of the high-precision positioning module. The authorization date format is: YYYYMMDD.

ASCII output

syntax: VERSION

VERSION A

BINARY output syntax:

VERSION B

Message output:

#VERSIONA,93,GPS,FINE,2327,467820000,0,0,18,765;LG580P,LG580P_SDK.1.0.1_GNSS.1.0.2,20271205,11141002210,00004D1988C2F842,2024/08/16*74

Applicable products: LG680P, LG580P, LG290P

Table 7 – 15 VERSION Data Structure

ID	Fields	type	describe
1	VERSION A Header	See Table 6 – 16	Message Header
2	Type	Char ; no more than 16 characters	Product Type UNKNOWN LG680P LG580P LG290P
3	swversion	Char ; no more than 64	Firmware version

		characters	
4	Auth	Char ; no more than 8 characters	Authorization information. After authorization, the expiration date is displayed in the format YYYYMMDD ; unauthorized display 0

5	PN	Char ; no more than 16 characters	Product PN Number
6	UniqID	Char ; no more than 64 characters	Device unique ID
7	Compile time	Char ; no more than 16 characters	Firmware compilation date YYYY/MM/DD
8	*XX	* is the checksum separator; XX is 2 characters in Hex format	8 -bit checksum in hexadecimal format
9	[CR][LF]	-	Statement terminator

Table 7 – 16 ASCII data format Header structure

ID	Fields	type	describe
1	Sync	Char	Synchronization character, ASCII information always begins with a " # " Character Start
2	Message	Char	Log or command ASCII name
3	CPUIdle	Uchar	Minimum percentage of processor idle time, measured per second Count 1 time
4	TimeRef	Uchar	The time system in which the receiver works (GPST or BDST)
5	TimeStatus	Uchar	GPS time quality. The current value is Unknown or Fine. The former indicates that the receiver has not yet calculated the accurate

			GPS time.
6	W	Ushort	GPS Week Number
7	Ms	Ushort	GPS week seconds, accurate to ms
8	reserved	Ulong	-
9	version	Uchar	Unicore format version number reserved field
10	Leap Sec	Uchar	Leap Second
11	Output Delay	Ushort	Data output time delay (the time difference between data output and GNSS satellite signal sampling), unit: ms

7.4 CMR

The command format is:

Log [port] CMROBS / CMRREF ontime [request

frequency] command example:

Log CMROBS ontime 1 //The current serial port outputs CMROBS messages at 1Hz

7.5 RTCM V2 differential message

Supports 1, 3, 9, 18, 19, 31, 32, 41

commands in the following format:

Log [port] rtcm message number ontime [request frequency]

7.6 RTCM V3 differential message

GNSS (Global Navigation Satellite Systems) differential information standard recommended by the RTCM Committee Version3,

See http://www.rtcm.org/overview.php for some information on currently supported 3.0 and 3.2 .

The output of this command follows the RTCM standard format, including 1004, 1005, 1006, 1007, 1012, 1019, 1020, 1033, 1041, 1042, 1044, 1046, MSM-1, MSM-2, MSM-3, MSM-4, MSM-5, MSM-6, MSM-7 and other messages, which are defined as RTCM1005, RTCM1006, RTCM1019, RTCM1074

wait.

The command format is:

Log [port] rtcm message number

ontime [request frequency] Command

example:

Log COM1 rtcm1005 ontime 1 //COM1 port outputs RTCM1005 messages

at 1Hz ; non-ephemeris messages, i.e. messages other than 1019;1020;1041;1042;1044;1046, can have delay parameters. The command format is:

LOG COM1 RTCM1005 ONTIME 1 [delay (optional)]

In the current serial port, the rate must be unified. If the last input rate is different from the previous message configuration, all RTCM message rates are updated to the latest rate. If the delay time is greater than the current rate, it is automatically cleared. The delay time must be an integer multiple of 100ms and must be less than the output rate.

Group1– Observations:

RTCM1004 Extended GPS RTK L1 and L2

observations RTCM1012 Extended GLONASS

RTK L1 and L2 observations RTCM1071 GPS

MSM1

RTCM1072 GPS MSM2

RTCM1073 GPS MSM3 (full pseudorange and phase

pseudorange information) RTCM1074 GPS MSM4 (all

pseudorange, carrier and CNR observations)

RTCM1075 GPS MSM5 (all pseudorange, carrier, Doppler and CNR

observations) RTCM1076 GPS MSM6 (complete pseudorange, phase

pseudorange and CNR (high-precision solution)

RTCM1077 GPS MSM7 (full pseudorange, phase pseudorange, phase pseudorange

rate and CNR (high-precision solution) RTCM1081 GLONASS MSM1

RTCM1082 GLONASS MSM2

RTCM1083 GLONASS MSM3 (all pseudorange and phase

pseudorange information) RTCM1084 GLONASS MSM4 (all

pseudorange, carrier and CNR observations)

RTCM1085 GLONASS MSM5 (full pseudorange, carrier, Doppler and CNR

observations) RTCM1086 GLONASS MSM6 (full pseudorange, phase

pseudorange and CNR (high-precision solution) RTCM1087 GLONASS MSM7

(full pseudorange, phase pseudorange, phase pseudorange rate and CNR (high

precision

Solve)

RTCM1091 GALILEO MSM1

RTCM1092 GALILEO MSM2

RTCM1093 GALILEO MSM3 (all pseudorange and phase pseudorange information) RTCM1094 GALILEO MSM4 (all pseudorange, carrier and CNR observations)

RTCM1095 GALILEO MSM5 (full pseudorange, carrier, Doppler and CNR

observations) RTCM1096 GALILEO MSM6 (full pseudorange, phase

pseudorange and CNR (high-precision solution) RTCM1097 GALILEO MSM7

(full pseudorange, phase pseudorange, phase pseudorange rate and CNR

(high precision

Solve)

RTCM1111 QZS MSM1

RTCM1112 QZS MSM2

RTCM1113 QZSS MSM3 (all pseudorange and phase

pseudorange information) RTCM1114 QZS MSM4 (all

pseudorange, carrier and CNR observations)

RTCM1115 QZSS MSM5 (all pseudorange, carrier, Doppler and CNR

observations) RTCM1116 QZS MSM6 (complete pseudorange, phase

pseudorange and CNR (high-precision solution)

RTCM1117 QZS MSM7 (complete pseudorange, phase pseudorange, phase pseudorange

rate and CNR (high-precision solution) RTCM1121 BDS MSM1

RTCM1122 BDS MSM2

RTCM1123 BDS MSM3 (Beidou pseudorange and phase

pseudorange information) RTCM1124 BDS MSM4 (all

pseudorange, carrier and CNR observations)

RTCM1125 BDS MSM5 (all pseudorange, carrier, Doppler and CNR

observations) RTCM1126 BDS MSM6 (complete Beidou pseudorange,

phase pseudorange and CNR (high-precision solution)

RTCM1127 BDS MSM7 (complete Beidou pseudorange, phase pseudorange,
phase pseudorange rate and CNR (high precision

untie

Calculate)

RTCM1131 NavIC/IRNSS MSM1

RTCM1132 NavIC/IRNSS MSM2

RTCM1133 NavIC/IRNSS MSM3 (all pseudorange and phase pseudorange information) RTCM1134 NavIC/IRNSS MSM4 (all pseudorange, carrier and CNR observations)

RTCM1135 NavIC/IRNSS MSM5 (all pseudorange, carrier, Doppler and CNR observations) RTCM1136 NavIC/IRNSS MSM6 (complete pseudorange, phase pseudorange and CNR (high-precision solution)

RTCM1137 NavIC/IRNSS MSM7 (full pseudorange, phase pseudorange, phase pseudorange rate and CNR (high-precision solution)

Group2– Base station coordinates:

RTCM1005 RTK base station antenna reference point

coordinates (ARP) RTCM1006 RTK base station antenna

reference point coordinates (including antenna height)

Group3-auxiliary information:

RTCM1041 NavIC/IRNSS ephemeris

RTCM1042 BDS ephemeris (based on

RTCM3.03 standard) RTCM1019 GPS

ephemeris

RTCM1020 GLONASS

ephemeris RTCM1044 QZSS

ephemeris RTCM1046

GALILEOI/NAV ephemeris

Group 4 – Base Station

Antenna Description:

RTCM1007 Antenna

Description and Installation

Information RTCM1033

Applicable products: LG680P, LG580P, LG290P