High Precision GNSS Board and Receivers

Version：

Commands and Logs Reference Manual

Preface

Welcome to use Unicore product. This manual introduces the guidelines of our GNSS boards and receivers, such as commands and logs, default configuration as well as some application examples.

> ☞ ***Note: This manual is for all Unicore High Precision GNSS products. Please refer to corresponding content for different receiver type or using mode such as CORS, RTK or Heading application according to PURCHASE OPTION.***

For Readers

The manual is suitable for the person who has certain understanding of GNSS receiver. It is not general reader -oriented.

Structure of Document

The manual includes the following chapters:

1. Command Reference: Commands to configure receiver and reference examples.
2. Log Reference : Log message outputted from receiver and reference examples.
3. Default Configuration: Factory Configuration Parameters..
4. 32 bit CRC: Every ASCII or binary Log message contains a CRS bits, this section gives a C source code for CRC calculating.
5. Network Configuration: Detailed steps to configure network communication parameters and FTP file push.
6. UDP Connection: Detailed steps to configure UDP network connection.
7. RTK Configuration: Example of how to configure Base and Rover.
8. Heading Configuration: Example of how to configure Heading mode.
9. Outputting Raw Measurement: Example of how to output raw measurement.

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1. 1. Command Reference

1.1 *Command Format*

Only abbreviated ASCII format is available for current version. Without CRC bits, abbreviated ASCII is easy to use for users' input.

All commands compose with command header and configuration parameters (parameter part can be empty then the command only has one header). Header field contains the command name or the message.

1.2 *ANTENNAPOWER Configure antenna feed*

This command enables or disables the feed from the internal power source of the receiver to the low-noise amplifier (LNA) of an active antenna.

Abbreviated ASCII Syntax
ANTENNAPOWER switch
Input example: ANTENNAPOWER ON

ID	Field	ASCII Value	Description
1	ANTENNAPOWER Header	-	
2	switch	OFF	Disables internal antenna feed
		ON	Enables internal antenna feed (default)

☞ ***The command automatically takes effect and the configuration can be saved into non-volatile memory by using SAVECONFIG command.***

1.3 *AUTHCODE Add authorization code for new receiver/model*

This command is used to add or remove authorization codes from the receiver.
Abbreviated ASCII Syntax:
AUTHCODE string [model]

Field	Field	ASCII Value	Description
1	AUTHCODE header	-	This field contains the command name or the message header depending on whether the command is abbreviated ASCII, ASCII or binary, respectively.
2	code string	String	Authorization code string

Field	Field	ASCII Value	Description
3	model	String	Model name of the receiver

☞ ***MODE value will be provided by license file. The command takes effect after restarting receiver.***

1.4 *CLOCKSWITCH Enable/disable external clock*

This command switches clock between external and internal clock. Once clock source changed, system restarts automatically.

The usage of the command requires hardware support of receiver. It is invalid to boardsand receivers that do not support external clock like UB280.

Abbreviated ASCII Syntax
CLOCKSWITCH switch
Input example: CLOCKSWITCH DISABLE

ID	Field	ASCII Value	Description
1	CLOCKSWITCH Header	-	
2	switch	ENABLE	Enable external clock
		DISABLE	Disable external clock (By default)

☞ ***The command automatically takes effect and the configuration can be saved into non-volatile memory by using SAVECONFIG command.***

1.5 *COM Control serial port*

This command allows you to configure the data communication parameters for the serial pot. Different control sources of same port are not recommended, especially when the port is in use or connected to peripherals.

Binary is not supported for this command.

Abbreviated ASCII Syntax
COM port bps
Input example: COM COM2 115200

ID	Field	ASCII Value	Description

ID	Field	ASCII Value	Description
1	COM header	-	
2	port	See Table 1 COM Port Identifiers	Port to configure.
3	bps/baud	Supported baud rate is different for each port, see Table 2 COM Serial Port Baud Rate	Communication baud rate (bps), default = 115200.

☞ ***The command automatically takes effect and the configuration can be saved into non-volatile memory by using SAVECONFIG command.***

Table 1 COM Port Identifiers

ASCII	Description
COM1	COM port 1
COM2	COM port 2
COM3	COM port 3

Table 2 COM Serial Port Baud Rate

ASCII	Description
COM1	9600, 19200, 38400, 57600, 115200, 230400, 460800
COM2	9600, 19200, 38400, 57600, 115200, 230400
COM3	9600, 19200, 38400, 57600, 115200, 230400

1.6 *DATASERVERCONFIG Configure data server*

This command can be used to configure the network server on which observation documents are stored. This server follows FTP protocol.

Abbreviated ASCII Syntax
DATASERVERCONFIG IPAddress username password uploadDirectory
Input example: DATASERVERCONFIG FTP 192.168.10.10 root unicore /test/

ID	Field	ASCII Value	Description
1	DATASERVERCONFIG header	-	

ID	Field	ASCII Value	Description
2	IPAddress		IP address of data storage server
3	username		user name of accessing data storage server
4	password		password of accessing data storage server
5	uploadDirectory		directory used for uploading data (user needs to create this directory first, and only English directory name is supported.)

☞ ***This command is only applicable to board capable of network communication. The command automatically takes effect and the configuration can be saved into non-volatile memory by using SAVECONFIG command.***

1.7 *ECUTOFF Set satellite elevation cut-off*

This command sets the elevation cut-off angle for searched satellites. The receiver only automatically searches for a satellite when it rises above the cut-off angle. Satellites falling below the cut-off angle are no longer searched unless they were re-configured.

Abbreviated ASCII Syntax:
ECUTOFF system angle
Input example: ECUTOFF GPS 10.0

ID	Field	ASCII Value	Description
1	ECUTOFF header	-	
2	system	See Table 1	Setting elevation cut-off angle for satellite systems
3	angle	±90.0 degrees	Elevation cut-off angle relative to horizontal plane. (default =5)

☞ ***The command automatically takes effect and the configuration can be saved into non-volatile memory by using SAVECONFIG command.***

1.8 *FIX Configure fixing parameters*

This command fixes receiver positions.

Abbreviated ASCII Syntax:
FIX [type][param1][param2][param3]Input example: FIX POSITION 40.36136389 116.254891356 100.253

ID	Field	ASCII Value	Description
1	FIX header	-	Message ID. (MSG ID = 7)
2	type	See Table 3	Fix type
3	param1	See Table 4	Fix Parameter 1
4	param2		Fix Parameter 2
5	param3		Fix Parameter 3

☞ ***The command automatically takes effect and the configuration can be saved into non-volatile memory by using SAVECONFIG command.***

Table 3 FIX types

ASCII	Description
NONE	Unfix. Clears any previous FIX commands
POSITION	Configures the receiver with its position fixed. This command is used when it is necessary to generate differential correction information.

Table 4 FIX parameters

ASCII	Parameter 1	Parameter 2	Parameter 3
NONE	Not used	Not used	Not used
POSITION	Lat (-90 to 90 degrees) where a '-' sign denotes south and a '+' sign denotes north	Lon (-360 to 360 degrees) where a '-' sign denotes west and a '+' sign denotes east	Average sea level: -1000 to 20000000 m

☞ ***It is strongly recommended that the FIX entered be good to within a few meters. If the error between position entered and positioning result is over 1km, the command will be invalid.***

☞ ***The values entered reflect the precise position of the base station antenna phase center. The height values entered are based on average sea level, with height abnormal errors***

with ellipsoidal height.

☞ *The position is based on WGS84 datum only for current version.*

1.9 *FRESET Clear selected data from NVM and Reset receiver*

This command clear all user-specific configurations, satellite ephemeris, position information, and factory settings stored in non-volatile memory and force to reset receiver.

This command will not clear parameters set by NETCONFIG.

Abbreviated ASCII Syntax
FRESET

ID	Field	ASCII Value
1	FRESET header	-

1.10 *HEADING Set Heading working mode*

This command is used to turn on or off Heading working mode for receivers. In Heading working mode, receivers will calculate the vector length, position, pitch azimuth of Moving Base.

The mode requires the support of receiver with corresponding authorization, and only applies to dual boards or receivers with Heading working mode.

Abbreviated ASCII Syntax:

HEADING switch
Input example: HEADING enable

ID	Field	ASCII Value	Description
1	HEADING header	-	
2	switch	enable	Enable heading mode
		disable	Disable Heading mode

☞ *For dual antenna heading products, when a board is set to heading mode, the position(single point, DGPS) and speed information update will be on 1Hz update rate, and only for the heading calculation based on carrier phase. The update frequency of*

heading information depends on the authorization and settings of board.

☞ ***The command automatically takes effect and the configuration can be saved into non-volatile memory by using SAVECONFIG command.***

1.11 HEADINGMODE Set Moving Status Of HEADING Receiver

This command is used to set moving status of Heading (Slave) receiver relative to Moving base (Master) in order to improve the heading precision in static or fixed vector length mode.

Abbreviated ASCII Syntax
HEADINGMODE mode
Input example: HEADINGMODE FIXLENGTH

ID	Field	ASCII Value	Description
1	HEADINGMODE Header	-	
2	Mode	STATIC	Both of Moving base and Heading receiver are static.
		FIXLENGTH（Default）	The vector length between Moving base and Heading receiver is fixed.
		VARIABLELENGTH	The vector length between Moving base and Heading receiver is variable.

☞ ***The command automatically takes effect and the configuration can be saved into non-volatile memory by using SAVECONFIG command.***

1.12 *HEADINGOFFSET Set heading and pitch correction values*

The command is used to set the correction values for heading and pitch angles. The correction values will correct the heading and pitch angles in HEADING and GPHDT information transmitted by receivers.

Abbreviated ASCII syntax
HEADINGOFFSET heading offset in deg [pitch offset in deg]
Input example: HEADINGOFFSET 16.0

ID	Field	ASCII Value	Description

1	HEADINGOFFSET header	-	
2	Headingoffsetindeg	±90-180.0 degrees - 180.0	Correction value of course angle
	Pitchoffsetindeg	-90.0 - 90.0	Correction value of pitch angle

1.13 *LOG Request transmitting information from receiver*

This command allows you to trigger log events for different types of data output.

Abbreviated ASCII Syntax:
LOG [port] message [trigger [period [offset [hold]]]]
Input example: LOG COM1 PSRPOSA ONTIME 1 0 NOHOLD

ID	Field	ASCII Value	Description
1	LOG header		
2	port	See Table 8 COM Port Identifiers	Output port
3	message	Any valid information ID, See Table 5	Message ID of log to output
4	Message type	Any valid message name, with an optional A or B suffix	Message type of log
6	trigger	Not all trigger types are supported for every log, see Table 6	
		ONCHANGED	Outputs the current moment message and then continue to transmit when the message is changed
		ONTIME	Output on a time interval
		ONCE	Output only the current moment message
7	period	For the output rate higher than 1Hz, the valid values are 0.2 and 0.5. For logging slower than 1Hz any integer value is accepted.	Log period (for ONTIME trigger) in seconds Different update rate supported for different logs, see Table 6
8	offset	0	The time offset relative to the moment corresponding to the period (not support)

ID	Field	ASCII Value	Description
9	hold	NOHOLD	Allow log to be removed by the UNLOGALL command
		HOLD	Prevent log from being removed by the default UNLOGALL command

☞ ***The command automatically takes effect and the configuration can be saved into non-volatile memory by using SAVECONFIG command.***

Table 5 LOG information

DATATYPE	MESSAGE ID	DESCRIPTION
BD2EPHEM	1047	BD ephemeris data
BD2IONUTC	2010	BD ionosphere data and UTC data
BESTPOS	42	Best position information
BESTVEL	99	Best speed data
COMCONFIG	317	Current COM port configuration
GLOEPHEMERIS	723	GLONASS ephemeris data
GPSEPHEM	7	GPS ephemeris data
GPGGA	218	GPS fix data and geoid undulation
GPGSA	221	GPS DOP and valid satellites
GPGSV	223	GPS satellites in view
GPHDT	1045	Heading in Degrees True
GPZDA	227	UTC time and date
HEADING	971	Heading information
IONUTC	8	GPS ionosphere parameters and UTC data
LOGLIST	5	Log list
PSRDOP	174	Pseudo-range DOP
PSRPOS	47	Pseudo-range position information
PSRVEL	100	Pseudo-range speed information
RANGE	43	Satellite range information
RAWEPHEM	41	Raw ephemeris
REFSTATION	175	Base station position and health
SATVIS	48	Information of satellite in view
TIME	101	Time information
VERSION	37	Receiver hardware and software version information

Table 6 Trigger type and transmit period

DATATYPE	TRIGGER TYPE	LOG PERIOD(second)
BESTPOS	ONTIME ONCE	0.1~ 0.05, >=1
BESTVEL	ONTIME ONCE	0.1~ 0.05, >=1
BD2EPHEM	ONTIME ONCE ONCHANGED	>=1
BD2IONUTC	ONTIME ONCE ONCHANGED	>=1
COMCONFIG	ONTIME ONCE	>=1
GLOEPHEMERIS	ONTIME ONCE ONCHANGED	>=1
GPSEPHEM	ONTIME ONCE ONCHANGED	>=1
GPGGA	ONTIME ONCE	0.1~ 0.05, >=1
GPGSA	ONTIME ONCE	0.1~ 0.05, >=1
GPGSV	ONTIME ONCE	0.1~ 0.05, >=1
GPHDT	ONCE ONCHANGED	0.1~ 0.05, >=1
GPZDA	ONTIME ONCE	0.1~ 0.05, >=1
HEADING	ONCE ONCHANGED	0.1~ 0.05, >=1
IONUTC	ONTIME ONCE ONCHANGED	>=1
MATCHEDPOS	ONCHANGED ONCE	--
LOGLIST	ONCE	>=1
PSRDOP	ONCHANGED ONCE	0.1~ 0.05, >=1
PSRPOS	ONTIME ONCE	0.1~ 0.05, >=1
PSRVEL	ONTIME ONCE	0.1~ 0.05, >=1
RANGE	ONTIME ONCE	0.1~ 0.05, >=1
RAWEPHEM	ONTIME ONCE ONCHANGED	>=1

DATATYPE	TRIGGER TYPE	LOG PERIOD(second)
REFSTATION	ONCE ONCHANGED	--
RTCM	ONTIME ONCE	>=1
RTKDATA	ONCE ONCHANGED	--
RTKDOP	ONTIME ONCE	0.1~ 0.05, >=1
RTKPOS	ONTIME ONCE	0.1~ 0.05, >=1
RTKVEL	ONTIME ONCE	0.1~ 0.05, >=1
SATVIS	ONTIME ONCE	0.1~ 0.05, >=1
TIME	ONTIME ONCE	0.1~ 0.05, >=1
VERSION	ONTIME ONCE	0.1~ 0.05, >=1

☞ ***Parameter log period is valid for ONTIME trigger mode only. When the output period is less than 1s, the value must be an integer multiple of 0.05s.***

1.14 *MOVINGBASESTATION set moving base*

The command is used to set on/off moving base working mode for receivers.in moving base working mode. In moving base working mode, receivers will send interpreted position and observation value information to Heading port.

The mode requires supports of receivers with corresponding authorizations; but the command is not supported by Heading boards with single board and dual antenna like UB280.

Abbreviated ASCII Syntax:
MOVINGBASESTATION switch
Input example: MOVINGBASESTATION ENABLE

ID	Field	ASCII Value	Description
1	MOVINGBASE STATION Header	-	
2	switch	enable	Enable moving base mode
		disable	Disable moving base mode

☞ ***The command automatically takes effect and the configuration can be saved into non-volatile memory by using SAVECONFIG command.***

1.15 *NETCONFIG Set network configuration*

This command may be used to configure board network setting.

Abbreviated ASCII Syntax:
NETCONFIG [autoconf [conf]]
Input example: NETCONFIG static 192.168.10.227::192.168.10.1:255.255.255.0:UB370:eth0

ID	Field	ASCII Value	Description
1	NETCONFIG header	-	
2	Autoconf		Method to use for auto configuration. **DHCP**: use DHCP, [conf] parameter must be NULL **STATIC**: [conf] parameter isn't NULL
3	conf		[conf]: its format is as following: string = **<client-ip>:<server-ip>:<gw-ip>:<netmask>:<hostname>:<device>** **client-ip**: IP address of receiver， default is 192.168.0.100 **server-ip**: IP address of the DHCP server **gw-ip**: IP address of a gateway, default is 192.168.0.1 **netmask**: Netmask for local network interface, default is 255.255.255.0 **hostname**: Name of the Board. Absence will not trigger auto configuration. **device**: Name of network device to use

☞ ***This command is only applicable to board capable of network communication***
The command automatically takes effect and the configuration can be saved into non-volatile memory by using SAVECONFIG command.

1.16 *NETPORTCONFIG Configure network port*

This command may be used to configure TCP port and client server connecting with receiver network.

Abbreviated ASCII Syntax:
NETPORTCONFIG [DeviceName] [IP] prototype port
Input example: NETPORTCONFIG TCP 40001
NETPORTCONFIG ICOM1 192.168.10.10 TCP 40001

ID	Field	ASCII Value	Description
1	NETPORTCONFIG Header	-	

ID	Field	ASCII Value	Description
2	DevName	ICOM1/ICOM2/ICOM3 (When the receiver is used as Client, the default port is ICOM1; when the receiver is acted as a Server, devices are generated automatically starting from ICOM4 as soon as the client is connected)	Device Name for network communication of board
3	IP/ServerName	XXX.XXX.XXX.XXX/String	For client mode, the IP address or hostname of remote server is applied For server mode, the IP or hostname is not needed
4	Prototype	TCP UDP	Protocol for network connection
5	Port	XXXXXX	When port for network connection 40000 – 50000 as server is disconnected, default is 40000

☞ ***This command is only applicable to board capable of network communication***

The command automatically takes effect and the configuration can be saved into non-volatile memory by using SAVECONFIG command.

1.17 *NETUPLOAD Set data upload parameters*

This command is used to record raw data file into USB mass storage or upload to ftp server with specified record interval and span.

Abbreviated ASCII Syntax:
NETUPLOAD [sample period][upload interval]
Input example: NETUPLOAD 5 10

ID	Field	ASCII Value	Description
1	NETUPLOAD Header	-	
2	Sample period	1 ~ 30	Sample period of raw measurement (in second)(default = 30)
3	Upload interval	3 ~ 86400	Upload interval of data package (in minute). (default = 30)

☞

This command is only applicable to boards capable of network and USB interface communication, through external USB storage device to preserve BESTPOS, RANGE, GPSEPHEM, GLOEPHEMERIS, BD2EPHEM, IONUTC, BD2IONUTC information.

The command automatically takes effect and the configuration can be saved into non-volatile memory by using SAVECONFIG command.

1.18 *NTRIPCONFIG Configures NTRIP*

This command sets up and configures NTRIP communication. NCOM1/2/3 only support server mode, NCOM20 only support client mode.

Abbreviated ASCII Syntax:
NTRIPCONFIG port type [protocol [endpoint [mountpoint [usernam [password]]]]]
Input example: NTRIPCONFIG NCOM1 server V1 192.168.10.98:2100 UR360 "" 123456

ID	Field	ASCII Value	Description
1	NTRIPCONFIG Header	-	
2	port	NCOM1/2/3/20	Port to configure.
3	type	Disable	NTRIP mode
		Client	
		Server	
4	protocol	V1 (default)	NTRIP Protocol version
5	endpoint	IP:Port Max 80 character	IP address or Host name of NTRIP CASTER, and port number
6	mountpoint	Max 80 character	Mount point assigned by NTRIP caster
7	user	Max 30 character	User name to access NTRIP caster, “” indicates the empty string (when a user name is not required)
8	password	Max 30 character	Password to access NTRIP caster

☞ ***This command is only applicable to boards capable of network and USB interface communication.***

The command automatically takes effect and the configuration can be saved into non-volatile memory.

1.19 *PASSWD Set password for network access*

This command set password for connecting receiver of network communication. Wrong password induce user cannot pass receiver of network communication. Once password changed, user need input the new one next access.

Abbreviated ASCII Syntax:
PASSWD usename oldPassword newPassword1 newPassword2
Input example: PASSWD root “unicore” “unicore2” “unicore2”

ID	Field	ASCII Value	Description

ID	Field	ASCII Value	Description
1	PASSWD Header	-	
2	Usename		User name, blank user name is invalid, neither permit "," nor " ". Length less than 16 chars.
3	oldPassword		Old password, length 6~16 chars, use "" figuring out this field, not permit "," nor " " in password string. eg. "123456", "abcdefgh"
4	newPassword1		New password, same format as old password
5	newPassword2		Confirm new password, same format as old password, make sure it is same as newPassword1.

☞ ***The command automatically takes effect and the configuration can be saved into non-volatile memory by using SAVECONFIG command.***

1.20 *PPSCONFIG Configure PPS*

Abbreviated ASCII Syntax:
PPSCONFIG Time ref switch polarity width antDelay rfDelay usrDelay
Input example: PPSCONFIG BD2 ENABLE POSITIVE 100000 0 0 0

ID	Field	ASCII Value	Description
1	PPSCONFIG header	-	
2	Time ref	See Table 1	Only support BDS and GPS at present
3	switch	DISABLE	Disable PPS output (once this field is set as disable, receiver turns off PPS output and all other parameters are ignored).
		ENABLE	Turn on PPS output
4	polarity	POSITIVE	PPS rising edge is valid
		NEGATIVE	PPS falling edge is valid
5	Width	Width of PPS pulse (us), <period	Width of PPS pulse (us)
6	Period	Value could be: 50,100,200,250,500,1000,2000,3000…,20000	Period of PPS pulse(ms)
7	RF Delay	-32768~32767	Delay of RF(ns)
8	User Delay	Integer between	Delay of user setting (ns)

		-2147483648~2147483647	

☞ ***The command automatically takes effect and the configuration can be saved into non-volatile memory by using SAVECONFIG command.***

1.21 *RTKCOMMAND Restart RTK resolving or set the RTK filter to its defaults*

This command provides the ability to reset the RTK engine and clear any set RTK parameters.

For products with single board and dual antenna, the command takes effects to Movingbase and Heading at the same time.

Abbreviated ASCII Syntax:
RTKCOMMAND action
ASCII Example:
rtkcommand reset

Field	Field	ASCII Value	Description
1	RTKCOMMAND header	-	
2	type	USE_DEFAULTS	Reset to defaults
		RESET	Reset RTK resolving

1.22 *RTKDYNAMICS Set the RTK dynamics mode*

This command provides the ability to specify how the receiver process observation data. There are three modes: STATIC, DYNAMIC, and AUTO. The STATIC mode forces the RTK to treat the rover station in stationary when RTK is resolving, regardless of the output of the motion detector.

DYNAMIC forces the RTK to treat the receiver in motion when RTK is resolving. If the receiver is undergoing very slow motion (moving in a speed lower than 2.5 cm/s for more than 5 seconds), you should use DYNAMIC mode (as opposed to AUTO) to prevent inaccurate results and possible resets.

On start-up, the receiver defaults to the DYNAMIC setting.

For products with single board and dual antenna, the command takes effects to Movingbase and Heading at the same time.

Abbreviated ASCII Syntax:
RTKDYNAMICS mode
ASCII Example:
RTK DYNAMICS STATIC

Field	Field	ASCII Value	Description

Field	Field	ASCII Value	Description
1	RTKDYNAMICS header	-	
2	mode	See Table 11	Set the dynamics mode

☞ ***The command automatically takes effect and the configuration can be saved into non-volatile memory by using SAVECONFIG command.***

Table 7 Dynamics Mode

ASCII	Description
AUTO	Automatically determine dynamics mode
STATIC	Static mode
DYNAMIC	Dynamic mode (default setting)

1.23 *RTKTIMEOUT Set maximum age of RTK data*

This command is used to set the maximum age of RTK data that can be accepted by a rover station. RTK data received that is lagged behind the specified age is ignored.

Abbreviated ASCII Syntax:
RTKTIMEOUT delay
Factory Default:
rtktimeout100
ASCII Example (rover station):
rtktimeout 20

Field	Field	ASCII Value	Description
1	RTKTIMEOUT header	-	
2	delay	2-100s	Maximum RTK data age (default = 100 s)

☞ ***The command automatically takes effect and the configuration can be saved into non-volatile memory by using SAVECONFIG command.***

1.24 *SAVECONFIG Save current configuration into NVM*

This command save current user configuration into non-volatile memory (NVM), including LOG (except logs supposed to be output only once and having none trigger event), port configuration, etc.

Abbreviated ASCII Syntax:
SAVECONFIG

ID	Field	ASCII Value	Description
1	SAVECONFIG header		

1.25 *SYSCONTROL Control system to track satellites*

This command allows you to control the satellite systems for tracking.

Abbreviated ASCII Syntax:
SYSCONTROL switch system
Input example: SYSCONTROL DISABLE BD2

ID	Field	ASCII Value	Description
1	SYSCONTROL header	--	
2	switch	DISABLE	Disable indicated system
		ENABLE	Enable indicated system which is disabled; reset active systems and restart to get fixing.
3	System	See 错误！未找到引用源。, System Types	

☞ ***The command automatically takes effect and the configuration can be saved into non-volatile memory by using SAVECONFIG command.***

1.26 *UNDULATION Choose undulation model*

This command permits you to either enter a specific geoid undulation or use the internal grid value of geoid undulations. In the option field, the EGM96 table provides ellipsoid heights at a 0.25° by 0.25° grid while the OSU89B is implemented at a 2° by 3° grid. In areas of rapidly changing geoid, using 2° by 3° grid may obtain erroneous height in an area.

EGM96 provides a more accurate model of geoid with a denser grid. The model is more accurate because the accuracy of the grid points of geoid undulation has also improved from OSU89B to EGM96. For example, the default grid (EGM96) is useful where there are underwater canyons, steep drop-offs or mountainous areas.

The geoid undulation reported in the BESTPOS, MATCHEDPOS, PSRPOS and RTKPOS logs are in reference to the ellipsoid of the chosen datum.

Abbreviated ASCII Syntax: Message ID: 214
UNDULATION option [separation]
Factory Default:
undulation egm96
ASCII Example 1:
undulation osu89b
ASCII Example 2:
undulation user -5.599999905

ID	Field	ASCII Value	Description
1	UNDULATION header	--	
2	option	TABLE	Use the internal grid table (same as EGM96)
		USER	Use the user specified geoid undulation value
		OSU89B	Use the OSU89B model grid
		EGM96	Use model grid of EGM96 table (default)
3	separation	±1000.0m	The geoid undulation value (required for the USER option)

☞ ***When using UNDULATION and FIX continually, UNDULATION should be first configured.***

☞ ***The command automatically takes effect and the configuration can be saved into non-volatile memory by using SAVECONFIG command.***

1.27 *UNLOG Stop outputting specific log*

This command stops outputting specific log. Parameter [port] can be configured, and it is recognized as that port received this command by default if none port is indicated.

Abbreviated ASCII Syntax:
UNLOG [port] datatypet
Input example: UNLOG COM1 RANGEA

ID	Field	ASCII Value	Description
1	UNLOG header	--	

ID	Field	ASCII Value	Description
2	port	See Table 8 (decimal values greater than 16 may be used)	Port to which log is being sent (default = current port)
3	message	Message Name	Message Name of log to be disabled

1.28 *UNLOGALL Stop outputting all logs*

This command removes all logs from specified port and does not change the log configuration of other ports. If none port is indicated, CURRENT_PORT would take place and the command has effect on it.

Abbreviated ASCII Syntax:
UNLOGALL [port]
Input example: UNLOGALL COM2 TRUE

ID	Field	ASCII Value	Description
1	UNLOGALL header	--	
2	port	See Table 8	Port to clear (default = current port)
3	Held	FALSE	Does not remove logs with the HOLD parameter (default)
		TRUE	Removes previously held logs, even those with the HOLD parameter

Table 8 Detailed Port Identifiers

ASCII Port Name	Description
COM1	COM port 1
COM2	COM port 2
COM3	COM port 3
ICOM1	IP virtual COM port
ICOM2	IP virtual COM port
ICOM3	IP virtual COM port

2. Appendix B. LOG Reference

2.1 *LOG HEADER FORMAT*

2.1.1 *Binary format*

Binary message is a strict conventional machine readable format and it is ideal choice for application of large amount data transmission. Since the inherent compression format, binary message has much smaller data amount compared to ASCII. So communication ports of the receiver are able to transmit or receive more data. We define the binary format as below:

1. Basic format of:
   Header 3 Sync bytes plus 25 bytes of header information. The header length is variable as fields may be appended in the future. Always check the header length.
   Data variable
   CRC 4 bytes
2. The 3 Sync bytes will always be:

Byte	Hex	Decimal
First	AA	170
Second	44	68
Third	12	18

3. The CRC is a 32-bit CRC applied to all data including the header.
4. Header format see 03 **Binary Message Header Structure**

Table 9 Binary Message Header Structure

ID	Field Name	Field	Description	Bytes	Offset	Ignored on Input
1	Sync	Char	Hexadecimal 0xAA.	1	0	N
2	Sync	Char	Hexadecimal 0x44.	1	1	N
3	Sync	Char	Hexadecimal 0x12.	1	2	N
4	Header Length	Uchar	Header length 0x1C	1	3	N
5	Message ID	Ushort	Log message ID, see Table 8	2	4	N
6	Message Type	Char	00 = Binary 01 = ASCII 10 = Abbreviated ASCII	1	6	N
7	Port Address	Uchar	Not support in current version	1	7	N
8	Message	Ushort	Length of message (Bytes), not include	2	8	N

ID	Field Name	Field	Description	Bytes	Offset	Ignored on Input
	Length		log header and CRC bit.			
9	Reserved	Ushort	Reserved	2	10	N
10	Idle Time	Uchar	Processor idle time between two logs with same message ID in the latest second. Time percentage (0~100%) is calculated as time (0~200) divided by 2.	1	12	Y
11	Time Status	Enum	GPS time quality	1	13	N
12	Week	Ushort	GPS week number	2	14	N
13	ms	Ulong	GPS seconds of week with MS as the unit	4	16	N
14	Reserved	Ulong		4	20	Y
15	BD2 time offset to GPS Second	Ushort	Leap second bias between BD and GPS. This field stores bias between GPS second within one week and BD's, once receiver succeeds tracking both GPS and BD2 satellites. This field is used to calculate BD2 satellite coordinate. BD second = GPS Second – BD2 Leap Second	2	24	Y
16	Reserved	Ushort		2	26	Y

Table 10 Supported Port Identifiers

ASCII Port Name	Description
COM1	COM Port 1
COM2	COM Port 2
COM3	COM Port 3

ASCII Port Name	Description
ICOM1	TCP/IP or virtual COM port
ICOM2	TCP/IP or virtual COM port
ICOM3	TCP/IP or virtual COM port
ICOM4	TCP/IP or virtual COM port
……	……
ICOM10	TCP/IP or virtual COM port
NCOM1	NTRIP Server port (network connections)
NCOM2	NTRIP Server port (network connections)
NCOM3	NTRIP Server port (network connections)
……	……
NCOM10	NTRIP Server port (network connections)
NCOM20	NTRIP Client port (network connections)

2.1.2 *ASCII format*

User and computer may directly view ASCII information. All the ASCII information follows the general convetions below:

1. "#" is the prefix character for each information;
2. Variable length of each log information or command depends on data size and format;
3. All the data field is separated by ",", but there are two exceptions:

- In the first exception, the last Header field is followed by ",", indicating the beginning of data information;
- In the second exception, the last data field is "*", indicating the ending of data information.

4. There are a hexadecimal digit starting with "*" and a line feed carriage return indicating the end of the line at the end of each log information. For example, *1234ABCD[CR][LF]. Hexadecimal digit is the 32-bit CRC checksum for all the characters, excluding "#" identifier and "*" as well as the followed 8-bit CRC number, of the log information.
5. Each ASCII character string is a field quoted by double quotation marks, for example, "ASCII string". If a separator is within double quotation marks, the character string is also a field and the separator will be ignored (for example, "xxx,xxx"). Double quotation marks are not allowed to appear in character string.
6. If the receive detects a wrongly inputting information, an error message will be returned.

ASCII information structure

header;	data field...,	data field...,	data field...	*xxxxxxxx	[CR][LF]

For description of ASCII information Header structure, please see Table 11

Table 11 ASCII information Header structure

ID	Field Name	Field	Description	Ignored on Input
1	Sync	Char	Sync character, ASCII information always start with "#" character	N
2	Message	Char	ASCII names of Log or command in this manual, see Table 5	N
3	Port	Char	Interface name that generates log information. Character string is composed of interface name and the suffix starting with x, which is a number from 1-31, indicating the virtual interface. In the virtual interface is not specified, then the virtual interface is 0.	Y
4	Sequence #	Long	Used for the output of more than 1 log. It is a progressively decreasing number from N-1 to 0, and 0 means the last log. If many pieces of log information appear to be 1, then the value is 0.	N
5	% Idle Time	Float	The minimum percentage of processor idle time, calculate once per second.	Y
6	Time Status	Enum	GPS time quality	Y
7	Week	Ulong	GPS week number	Y
8	Seconds	GPSec	GPS seconds of week, correct to ms.	Y
9	Receiver Status	Ulong	8-bit hexadecimal number indicating various hardware and software states.	Y
10	BD2 time offset to GPS Second	Char	Leap second bias between BD and GPS. This field stores bias between GPS second within one week and BD's, once receiver succeeds tracking both GPS and BD2 satellites. This field is used to calculate BD2 satellite coordinate. BD second = GPS Second – BD2 Leap Second	Y
11	Receiver s/w Version	Ulong	The value between 0 –65535 is used to indicate the creating number of receiver firmware.	Y
12	;	Char	The character indicates the end of Header	N

2.2 *BD2EPHEM BD2 ephemeris data*

This log message records BD2 ephemeris data. User can send Log BD2EPHEM command to trigger this log event.

Message ID: 1047
Recommended Input:

LOG BD2EPHEMA ONCHANGED

LOG Message output:

#BD2EPHEMA,COM1,0,98.0,SATTIME,1740,98268.000,00000000,e,0;161,98220.0,0,1,1,1740,1740,97200.0,4.216333630e+07,1.415058943e-09,-2.444945135e+00,1.8965790514e-04,2.0674088174e+00,1.830048859e-07,2.378597856e-05,-7.33328125e+02,4.21875000e+00,-5.168840289e-08,6.658956409e-08,9.0476453690e-02,7.046722096e-10,-2.658439412e+00,-3.11798702e-10,0,97200.0,1.420000000e-08,-1.040000000e-08,9.92621e-05,1.79750e-11,0.00000,TRUE,7.292473550e-05,4.00000000e+00*3f0be421
#BD2EPHEMA,COM1,0,98.0,SATTIME,1740,98268.000,00000000,e,0;162,98220.0,0,1,1,1740,1740,97200.0,4.216442056e+07,4.982707550e-09,-1.014140944e+00,2.8654525522e-04,-7.2526837701e-01,1.237168908e-05,1.663621515e-05,-5.08703125e+02,3.75093750e+02,2.440065145e-07,5.774199963e-08,6.1946736490e-02,6.575273887e-10,-2.342245458e+00,-3.91337729e-09,0,97200.0,6.000000000e-09,-1.360000000e-08,-5.07863e-05,-3.09130e-11,0.00000,TRUE,7.292549031e-05,4.00000000e+00*1c6a23cc
#BD2EPHEMA,COM1,0,98.0,SATTIME,1740,98268.000,00000000,e,0;163,98220.0,0,1,1,1740,1740,97200.0,4.216663202e+07,2.412957652e-09,8.894587682e-01,2.1753541660e-04,-1.8602859104e+00,1.692678779e-06,2.207048237e-05,-6.75625000e+02,4.59062500e+01,-7.264316082e-08,1.741573215e-07,9.7410771698e-02,7.250302004e-10,-2.581511624e+00,-1.43434546e-09,0,97200.0,5.700000000e-09,-8.000000000e-09,-5.69606e-05,6.21458e-12,0.00000,TRUE,7.291718409e-05,4.00000000e+00*d9026d53
#BD2EPHEMA,COM1,0,98.0,SATTIME,1740,98268.000,00000000,e,0;164,98220.0,0,1,1,1740,1740,97200.0,4.216410667e+07,3.262278744e-09,-1.614571753e+00,3.0810583849e-04,1.3766613382e+00,1.059146598e-05,2.165883780e-05,-6.69796875e+02,3.25781250e+02,9.778887033e-09,1.029111445e-07,8.9466327775e-02,7.468168222e-10,-2.448687759e+00,-2.11151652e-09,0,97200.0,5.700000000e-09,-7.600000000e-09,-2.00751e-04,8.17124e-12,0.00000,TRUE,7.292458416e-05,4.00000000e+00*66bdf0ff

ID	Field	Data Description	Format	Bytes	Offset
1	BD2EPHEM header	Log header		H	0
2	PRN	Satellite PRN number (BD2 161 to 197)	Ulong	4	H
3	Tow	Time Stamp of Subframe 0(seconds)	Double	4	H+4
4	Health	Health Status –a 6-bit health code as defined in BD ICD	Ulong	4	H+12
5	IODE1	Ephemeris data age 1	Ulong	4	H+16
6	IODE2	Ephemeris data age 2 = IODE1 for BD	Ulong	4	H+20
7	Week	BD2 Integer count	Ulong	4	H+24
8	Z Week	Z count week number. This is the week number from subframe 1 of the ephemeris. The ‘TOE week’ (field #7) is derived from this to account for rollover.	Ulong	4	H+28
9	Toe	Reference moment for ephemeris, seconds	Double	8	H+32
10	A	Semiaxis of orbit length, meters	Double	8	H+40
11	ΔN	Correction value of satellites’ average angular velocity, radians/second	Double	8	H+48
12	M0	Mean anomaly of reference time, radians	Double	8	H+56
13	Ecc	Eccentricity	Double	8	H+64

ID	Field	Data Description	Format	Bytes	Offset
14	ω	Argument of perigee, radians	Double	8	H+72
15	Cuc	Argument of latitude (amplitude of cosine, radians)	Double	8	H+80
16	Cus	Argument of latitude (amplitude of sine, radians)	Double	8	H+88
17	crc	Orbit radius (amplitude of cosine, meters)	Double	8	H+96
18	crs	Orbit radius (amplitude of sine, meters)	Double	8	H+104
19	cic	Inclination (amplitude of cosine, radians)	Double	8	H+112
20	cis	Inclination (amplitude of sine, radians)	Double	8	H+120
21	I0	Orbit inclination angle at reference time, radians	Double	8	H+128
22	IDOT	Changing rate of orbit inclination angle, radians/second	Double	8	H+136
23	Ω0	Ascending node right ascension, radians	Double	8	H+144
24	Ω dot	Changing rate of ascending node right ascension, radians/second	Double	8	H+152
25	iodc	Clock data age	Ulong	4	H+160
26	toc	Reference time for satellite clock error, seconds	Double	8	H+164
27	tgd1	Group delay of B1 (delay inequality of devices on satellite B1), seconds	Double	8	H+172
28	tgd2	Group delay of B2 (delay inequality of devices on satellite B2),seconds	Double	8	H+180
29	af0	Satellite clock error parameter, seconds (s)	Double	8	H+188
30	af1	Satellite clock rate parameter, (s/s)	Double	8	H+196
31	af2	Satellite clock offset parameter, (s/s/s)	Double	8	H+204
32	AS	Anti-spoofing on: 0 = FALSE 1 = TRUE	Enum	4	H+212
33	N	Corrected mean angular velocity, radians/second	Double	8	H+216
34	URAI	Index of precision for user distance	Double	8	H+224
35	xxxx	32-bit CRC (ASCII and Binary only)	Hex	4	H+232
36	[CR][LF]	Sentence terminator (ASCII only)	-	-	-

2.3 *BD2IONUTC BD2 ionosphere parameters and UTC data*

The Ionospheric Model parameters (ION) and the Universal Time Coordinated parameters (UTC) are provided.

Message ID: 2010
Recommended Input:
LOG BD2IONUTCA ONCE
LOG Message output:
#BD2IONUTCA,COM1,0,49.0,SATTIME,1640,352805.000,00000000,e,0;1.024454832077026e-08,2.011656761169434e-07,-1.668930053710938e-06,3.099441528320312e-06,1.474560000000000e+05,-9.830400000000000e+05,7.667712000000000e+06,-6.684672000000000e+06,0,0,0.000000000000000e+00,0.000000000000000e+00,0,0,0,0,0*aef91616

ID	Field	Data Description	Format	Bytes	Offset
1	BD2IONUTC header	Log header		H	0
2	a0	Alpha parameter constant term	Double	8	H
3	a1	Alpha parameter 1st order term	Double	8	H+8
4	a2	Alpha parameter 2nd order term	Double	8	H+16
5	a3	Alpha parameter 3rd order term	Double	8	H+24
6	b0	Beta parameter constant term	Double	8	H+32
7	b1	Beta parameter 1st order term	Double	8	H+40
8	b2	Beta parameter 2nd order term	Double	8	H+48
9	b3	Beta parameter 3rd order term	Double	8	H+56
10	utc wn	UTC reference week number	Ulong	4	H+64
11	tot	Reference time of UTC parameters	Ulong	4	H+68
12	A0	Clock error of UTC relative to BDT	Double	8	H+72
13	A1	Clock rate of UTC relative to BDT	Double	8	H+80
14	wn lsf	Week count for new leap second taking effects	Ulong	4	H+88
15	dn	Seconds of week for new leap second taking effects (the range is 1 to 7 where Sunday = 1 and Saturday = 7)	Ulong	4	H+92
16	deltat ls	Corrections of accumulative leap second for BDT relative to UTC before the new leap second taking effects	Long	4	H+96
17	deltat lsf	Corrections of accumulative leap second for BDT relative to UTC after the new leap second taking effects	Long	4	H+100

ID	Field	Data Description	Format	Bytes	Offset
18	deltat utc	Time difference of BDT relative to UTC	Ulong	4	H+104
19	xxxx	32-bit CRC (ASCII and Binary only)	Hex	4	H+108
20	[CR][LF]	Sentence terminator (ASCII only)	-	-	-

2.4 *BESTPOS Best Position*

This log contains the best available combined GPS and inertial navigation system (INS - if available) position (in metres) computed by the receiver. In addition, it reports several status indicators, including differential age, which is useful in predicting anomalous behavior brought about by outages in differential corrections. A differential age of 0 indicates that no differential correction was used.

Message ID: 42
Recommended Input:
LOG BESTPOSA ONTIME 1
LOG message output
#BESTPOSA,COM1,0,83.5,FINESTEERING,1419,336148.000,00000040,6145,2724;SOL_COMPUTED,SINGLE,51.11636418888,-114.03832502118,1064.9520,-16.2712,WGS84,1.6961,1.3636,3.6449,"",0.000,0.000,8,8,8,8,0,0,0,06,0,03*6F63A93D

Field	Field	Data Description	Format	Bytes	Offset
1	BESTPOS header	Log header		H	0
2	sol status	Solution status (See Table 17 Solution Status)	Enum	4	H
3	pos type	Position type (See Table 16 Position or Velocity Type)	Enum	4	H+4
4	lat	Latitude	Double	8	H+8
5	lon	Longitude	Double	8	H+16
6	hgt	Height above sea level	Double	8	H+24
7	undulation	Geoid undulation - the distance between the geoid and the WGS84 ellipsoid (m)	Float	4	H+32
8	datum id#	ID code of coordinate system, only supporting WGS84 at present, ID: WE	Enum	4	H+36
9	lat σ	Latitude standard deviation	Float	4	H+40
10	lon σ	Longitude standard deviation	Float	4	H+44
11	hgt σ	Height standard deviation	Float	4	H+48
12	stn id	Base station ID	Char[4]	4	H+52
13	diff_age	Differential age in seconds	Float	4	H+56

Field	Field	Data Description	Format	Bytes	Offset
14	sol_age	Solution age in seconds	Float	4	H+60
15	#SVs	Number of satellite vehicles tracked	Uchar	1	H+64
16	#solnSVs	Number of satellite vehicles used in solution	Uchar	1	H+65
17	Reserved		Uchar	1	H+66
18			Uchar	1	H+67
19			Uchar	1	H+68
20			Hex	1	H+69
21			Hex	1	H+70
22	sig mask	Signals used mask (See Table 18 Signal Mask)	Hex	1	H+71
23	xxxx	32-bit CRC (ASCII and Binary only)	Hex	4	H+72
24	[CR][LF]	Sentence terminator (ASCII only)	-	-	-

2.5 *BESTVEL Best Available Velocity Data*

This log contains the best available velocity information computed by the receiver. In addition, it reports a velocity status indicator, which is useful in indicating whether or not the corresponding data is valid. The velocity measurements sometimes have a latency associated with them.

Message ID: 99
Recommended Input:
LOG BESTVELA ONTIME 1
LOG message output:
#BESTVELA,COM1,0,61.0,FINESTEERING,1337,334167.000,00000000,827B,1984;SOL_COMPUTED,PSRDIFF,0250,4.000,0.0206,227.712486,0.0493,0.0*0E68BF05

Field	Field	Data Description	Format	Bytes	Offset
1	BESTVEL header	Log header		H	0
2	sol status	Solution status, See Table 17 Solution Status	Enum	4	H
3	vel type	Velocity type, See Table 16 Position or Velocity Type	Enum	4	H+4
4	latency	A measure of the latency based on the velocity time tag in seconds. It should be subtracted from the epoch time to give more accurate velocity results.	Float	4	H+8
5	age	Differential age in seconds	Float	4	H+12
6	hor spd	Horizontal speed over ground, in meters per	Double	8	H+16

Field	Field	Data Description	Format	Bytes	Offset
		second			
7	trk gnd	Actual direction of motion over ground (track over ground) with respect to True North, in degrees	Double	8	H+24
8	vert spd	Vertical speed, in meters per second, where positive values indicate increasing altitude (up) and negative values indicate decreasing altitude (down)	Double	8	H+32
9	Reserved		Float	4	H+40
10	xxxx	32-bit CRC (ASCII and Binary only)	Hex	4	H+44
11	[CR][LF]	Sentence terminator (ASCII only)	-	-	-

2.6 *BINEX BINEX Data Streaming*

BINEX format is defined by UNAVCO and some GNSS manufactories as “binary RINEX” for transferring real timing stream in CORS, GBAS application. For detailed description on BINEX, please refer to UNAVCO WEB site（http:// http://binex.unavco.org/binex.html）.

At present, Unicore receiver only output few BINEX record for raw measurement and ephemeris of BDS, GPS and GLONASS, including:

RECORD ID 0x01: SUBRECORD 0x01、0x02 and 0x05（BDS、GPS and GLONASSBDS ephemeris）

RECORD ID 0x7f: SUBRECORD 0x05（Raw measurement）

Recommended Input:
LOG BINEX7F05 ONTIME 1
LOG BINEX70101 ONTIME ONCHANGED
LOG BINEX70102 ONTIME ONCHANGED
LOG BINEX70105 ONTIME ONCHANGED

2.7 *CMR CRM differential message*

The Compact Measurement Record (CMR) Format is a standard communications protocol used in Real-Time Kinematic (RTK) systems to transfer GPS carrier phase and code pseudo-range observations from a base station to one or more rover stations.

CMROBS GPS OBSERVATIONS
CMRBD2OBS BDS OBSERVATIONS (Unicore)

CMRGLOOBS GLONASS OBSERVATIONS
CMRREF BASE STATION POSITION INFORMATION
CMRDESC BASE STATION DESCRIPTION INFORMATION

2.8 *COMCONFIG Current configuration of COM port*

This log message outputs current configuration of each port of the receiver.

Message ID: 317
Recommended Input:
LOG COMCONFIGA ONCE
LOG Message output:
#COMCONFIGA,COM1,0,6.0,FINE,1690,96471.000,00000000,e,0;2,COM1,115200,N,8,1,N,OFF,ON,UNICORE,UNICORE,ON,COM2,115200,N,8,1,N,OFF,ON,RTCMV3,NONE,ON*ff47057d

ID	Field	Data Description	Format	Bytes	Offset
1	COMCONFIG header	Log header		H	0
2	#port	Number of ports with information to follow	Long	4	H
3	port	Serial port identifier, See Table 13, COM Port Identifiers	Enum	4	H+4
4	baud	Communication baud rate	Ulong	4	H+8
5	parity	See Table 12 Parity Check Bit	Enum	4	H+12
6	databits	Number of data bits	Ulong	4	H+16
7	stopbits	Number of stop bits	Ulong	4	H+20
8	handshake	See Table 13 Handshaking	Enum	4	H+24
9	echo	When echo is on, the port is transmitting any input characters as they are received.0 = OFF 1 = ON	Enum	4	H+28
10	breaks	Breaks are turned on or off 0 = OFF, 1 = ON	Enum	4	H+32
11	rx type	The status of the receiving mode, See Table 14 Interface Modes	Enum	4	H+36
12	tx type	The status of the transmitting mode, See Table 14 Interface Modes	Enum	4	H+40
13	response	Responses are turned on or off 0 = OFF, 1 = ON *only ON is supported at present	Enum	4	H+44
14	next port offset = H + 4 + (#port x 44)				

ID	Field	Data Description	Format	Bytes	Offset
15	xxxx	32-bit CRC (ASCII and Binary only)	Hex	4	H+4+(#port x44)
16	[CR][LF]	Sentence terminator (ASCII only)	-	-	-

Table 12 Parity Check Bit

Binary	ASCII	Description
0	N	No parity check bit (default)
1	E	Even parity check
2	O	Odd parity check

Table 13 Handshaking

Binary	ASCII	Description
0	N	No handshaking (default)
1	XON	XON/XOFF software handshaking
2	CTS	CTS/RTS hardware handshaking

Table 14 Interface Modes

Binary Value	ASCII	Description
0	NONE	The port doesn't accepts/generates UNICORE commands and logs (Disabled)
1	UNICORE	The port accepts/generates UNICORE commands and logs
2	RTCM	The port accepts/generates RTCM V2.3 corrections
4	CMR	The port accepts/generates CMR corrections
14	RTCMV3	The port accepts/generates RTCM Version 3.0 corrections

2.9 *GALEPHEMERIS Galileo ephemeris data*

This log contains Galileo ephemeris information. Multiple messages are transmitted, one for each SVID with date

Message ID: 1122

Recommended Input:

LOG GALEPHEMERIS ONCHANGED

LOG Message output:

#GALEPHEMERISA,ICOM4,0,38.0,FINE,1964,378547.900,51748,51750,18;1,TRUE,TRUE,0,0,0,0,0,0,107,0,102,368400,5.44061271e+03,2.6233e-09,-2.64845874e-01,2.964769956e-04,-2.683740745e+00,4.4405e-06,8.3521e-06,1.760e+02,9.628e+01,-6.3330e-08,-4.0978e-08,9.966995360e-01,-1.3572e-11,-4.449752948e-01,-5.31057835e-09,368400,-1.498949132e-04,-8.611778e-12,0.0e+00,368400,-1.498953789e-04,-

8.611778e-12,0.0e+00,-5.355e-09,-6.054e-09*f40dd716
#GALEPHEMERISA,ICOM4,0,38.0,FINE,1964,378547.900,51748,51750,18;7,FALSE,TRUE,0,0,0,1,0,1,107,0,116,376800,5.44061729e+03,3.4666e-09,3.02866869e+00,3.526151413e-04,-1.294407283e+00,4.8615e-07,6.3218e-06,1.984e+02,1.288e+01,1.1176e-08,-1.6764e-08,9.527489726e-01,9.7504e-11,-2.532415759e+00,-5.70880922e-09,0,0.000000000e+00,0.000000e+00,0.0e+00,376800,1.779921586e-04,-6.096457e-12,0.0e+00,2.328e-10,2.328e-10*16f86430
#GALEPHEMERISA,ICOM4,0,38.0,FINE,1964,378547.900,51748,51750,18;8,TRUE,TRUE,0,0,0,0,0,0,107,0,106,370800,5.44061679e+03,3.3855e-09,2.78232972e+00,2.966088941e-04,-1.002058146e+00,4.0419e-07,6.4205e-06,1.977e+02,1.141e+01,1.1176e-08,3.7253e-09,9.586720163e-01,1.2393e-10,-2.543183626e+00,-5.66166440e-09,370800,6.749329157e-03,-8.299139e-12,0.0e+00,370800,6.749328109e-03,-8.313350e-12,0.0e+00,-8.848e-09,-1.024e-08*e9fef5f0
#GALEPHEMERISA,ICOM4,0,38.0,FINE,1964,378547.900,51748,51750,18;12,FALSE,TRUE,0,0,0,0,0,0,107,0,112,374400,5.44059835e+03,2.8926e-09,8.17346110e-01,2.347046975e-04,3.498849803e-01,-5.2210e-06,5.7090e-06,2.260e+02,-1.133e+02,-5.7742e-08,1.4901e-08,9.750216195e-01,-1.5501e-10,1.645172194e+00,-5.51701552e-09,0,0.000000000e+00,0.000000e+00,0.0e+00,374400,2.286301868e-03,8.431300e-11,0.0e+00,-1.560e-08,-1.583e-08*84e87104
#GALEPHEMERISA,ICOM4,0,38.0,FINE,1964,378547.900,51748,51750,18;14,FALSE,TRUE,3,0,3,1,0,1,107,0,114,375600,5.28933449e+03,6.3824e-09,2.38648303e-01,1.632419589e-01,1.174579274e+00,-1.2647e-06,8.0429e-06,2.137e+02,-2.144e+01,-4.0308e-06,1.3039e-08,8.793681371e-01,-2.2501e-10,1.149104225e+00,-1.02911430e-08,0,0.000000000e+00,0.000000e+00,0.0e+00,375600,6.724341016e-03,-6.679102e-12,0.0e+00,3.283e-08,3.679e-08*f70bcfb2
#GALEPHEMERISA,ICOM4,0,38.0,FINE,1964,378547.900,51748,51751,18;19,FALSE,TRUE,0,0,0,0,0,0,107,0,117,377400,5.44060772e+03,3.3551e-09,2.44968925e+00,2.371859737e-04,-2.138293966e+00,5.5879e-07,6.2007e-06,2.052e+02,1.044e+01,2.6077e-08,1.6764e-08,9.584728707e-01,1.5358e-10,-2.537797406e+00,-5.64630662e-09,0,0.000000000e+00,0.000000e+00,0.0e+00,377400,1.365895150e-05,3.979039e-13,0.0e+00,-8.848e-09,-9.779e-09*5185ae6d
#GALEPHEMERISA,ICOM4,0,38.0,FINE,1964,378547.900,51748,51751,18;24,TRUE,TRUE,0,0,0,0,0,0,107,0,103,369000,5.44061761e+03,2.6823e-09,8.83278681e-01,1.455501188e-04,9.429208124e-01,4.2338e-06,7.5568e-06,1.933e+02,8.834e+01,-2.0489e-08,9.4995e-08,9.942857183e-01,3.0001e-11,-4.406541756e-01,-5.40093926e-09,369000,5.692872975e-03,3.996234e-10,0.0e+00,369000,5.692878272e-03,3.996234e-10,0.0e+00,4.261e-08,4.773e-08*2a85a0fc
#GALEPHEMERISA,ICOM4,0,38.0,FINE,1964,378547.900,51748,51751,18;26,FALSE,TRUE,0,0,0,0,0,0,107,0,117,377400,5.44061113e+03,3.0180e-09,6.72907828e-01,2.377389465e-04,2.443338367e+00,-6.6590e-06,6.8061e-06,1.971e+02,-1.410e+02,1.3039e-08,0.0000e+00,9.713301505e-01,-2.3930e-10,1.650053499e+00,-5.65594988e-09,0,0.000000000e+00,0.000000e+00,0.0e+00,377400,6.895145692e-03,-4.337153e-11,0.0e+00,6.985e-10,6.985e-10*e7ca5a4c

ID	Field	Data Description	Format	Bytes	Offset
1	GALEPHEMERIS header	Log header		H	0
2	SatId	Satellite ID	Ulong	4	H
3	FNAVReceived	Indicates FNAV ephemeris data received	Bool	4	H+4
4	INAVReceived	Indicates INAV ephemeris data received	Bool	4	H+8
5	E1BHealth	E1B health status bits (only valid if INAVReceived is TRUE)	Uchar	1	H+12
6	E5aHealth	E5a health status bits (only valid if FNAVReceived is TRUE)	Uchar	1	H+13
7	E5bHealth	E5b health status bits (only valid if INAVReceived is TRUE)	Uchar	1	H+14

ID	Field	Data Description	Format	Bytes	Offset
8	E1BDVS	E1B data validity status (only valid if INAVReceived is TRUE)	Uchar	1	H+15
9	E5aDVS	E5a data validity status (only valid if FNAVReceived is TRUE)	Uchar	1	H+16
10	E5bDVS	E5b data validity status (only valid if INAVReceived is TRUE)	Uchar	1	H+17
11	SISA	Signal in space accuracy	Uchar	1	H+18
12	Reserved		Uchar	1	H+19
13	IODNav	Issue of data ephemeris	Ulong	4	H+20
14	T0e	Ephemeris reference time (s)	Ulong	4	H+24
15	RootA	Square root of semi-major axis	Double	8	H+28
16	DeltaN	Mean motion difference (radians/s)	Double	8	H+36
17	M0	Mean anomaly at ref time (radians)	Double	8	H+44
18	Ecc	Eccentricity (unitless)	Double	8	H+52
19	Omega	Argument of perigee (radians)	Double	8	H+60
20	Cuc	Amplitude of the cosine harmonic correction term to the argument of latitude (radians)	Double	8	H+68
21	Cus	Amplitude of the sine harmonic correction term to the argument of latitude (radians)	Double	8	H+76
22	Crc	Amplitude of the cosine harmonic correction term to the orbit radius (m)	Double	8	H+84
23	Crs	Amplitude of the sine harmonic correction term to the orbit radius (m)	Double	8	H+92
24	Cic	Amplitude of the cosine harmonic correction term to the angle of inclination (radians)	Double	8	H+100
25	Cis	Amplitude of the sine harmonic correction term to the angle of inclination (radians)	Double	8	H+108
26	I0	Inclination angle at ref time (radians)	Double	8	H+116
27	IDot	Rate of inclination angle (radians/s)	Double	8	H+124
28	Omega0	Longitude of ascending node of orbital plane at weekly epoch (radians)	Double	8	H+132
29	OmegaDot	Rate of right ascension (radians/s)	Double	8	H+140
30	FNAVT0c	Clock correction data reference time of week from the F/NAV message (s). Only valid if FNAVReceived is TRUE	Ulong	4	H+148
31	FNAVAf0	SV clock bias correction coefficient from the F/NAV message (s). Only valid if FNAVReceived is TRUE	Double	8	H+152
32	FNAVAf1	SV clock drift correction coefficient from the F/NAV message (s/s). Only valid if FNAVReceived is TRUE	Double	8	H+160

ID	Field	Data Description	Format	Bytes	Offset
33	FNAVAf2	SV clock drift rate correction coefficient from the F/ NAV message (s/s^2). Only valid if FNAVReceived is TRUE	Double	8	H+168
34	INAVT0c	Clock correction data reference time of week from the I/NAV message (s). Only valid if INAVReceived is TRUE	Ulong	4	H+176
35	INAVAf0	SV clock bias correction coefficient from the I/NAV message (s). Only valid if INAVReceived is TRUE	Double	8	H+180
36	INAVAf1	SV clock drift correction coefficient from the I/NAV message (s/s). Only valid if INAVReceived is TRUE	Double	8	H+188
37	INAVAf2	SV clock drift rate correction coefficient from the I/ NAV message (s/s^2). Only valid if INAVReceived is TRUE	Double	8	H+196
38	E1E5aBGD	E1, E5a broadcast group delay	Double	8	H+204
39	E1E5bBGD	E1, E5b broadcast group delay. Only valid if INAVReceived is TRUE	Double	8	H+212
40	xxxx	32-bit CRC (ASCII and Binary only)	Hex	4	H+220
41	[CR][LF]	Sentence terminator (ASCII only)	-	-	-

2.10 *GLOEPHEMERIS GLONASS ephemeris data*

GLONASS ephemerides are referenced to the PZ90.02 geodetic datum. No adjustment between the GPS and GLONASS reference frames are made for positioning.

Message ID: 723

Recommended Input:

LOG GLOEPHEMERISA ONCHANGED

LOG Message output:

#GLOEPHEMERISA,COM1,3,49.0,SATTIME,1364,413624.000,00000000,6b64,2310;43,8,1,0,1364,413114000,10786,792,0,0,87,0,9.0260864257812500e+06,-6.1145468750000000e+06,2.2926090820312500e+07,1.4208841323852539e+03,2.8421249389648438e+03,1.9398689270019531e+02,0.00000000000000000,-2.79396772384643555e-06,-2.79396772384643555e-06,2.12404876947402954e-04,-1.396983862e-08,-3.63797880709171295e-12,78810,3,15,0,12*a02ce18b

#GLOEPHEMERISA,COM1,2,49.0,SATTIME,1364,413626.000,00000000,6b64,2310;44,11,1,0,1364,413116000,10784,792,0,0,87,13,-1.2882617187500000e+06,-1.9318657714843750e+07,1.6598909179687500e+07,9.5813846588134766e+02,2.0675134658813477e+03,2.4769935607910156e+03,2.79396772384643555e-06,-3.72529029846191406e-06,-1.86264514923095703e-06,6.48368149995803833e-05,-4.656612873e-09,3.63797880709171295e-12,78810,3,15,3,28*e2d5ef15

#GLOEPHEMERISA,COM1,1,49.0,SATTIME,1364,413624.000,00000000,6b64,2310;45,13,0,0,1364,413114000,10786,0,0,0,87,0,-1.1672664062500000e+07,-2.2678505371093750e+07,4.8702343750000000e+05,-1.1733341217041016e+02,1.3844585418701172e+02,3.5714883804321289e+03,2.79396772384643555e-06,-2.79396772384643555e-06,0.00000000000000000,-4.53162938356399536e-05,5.587935448e-09,-2.36468622460961342e-11,78810,0,0,0,8*c15abfeb

#GLOEPHEMERISA,COM1,0,49.0,SATTIME,1364,413624.000,00000000,6b64,2310;59,17,0,0,1364,413114000,10786,0,0,0,87,0,-2.3824853515625000e+05,-1.6590188964843750e+07,1.9363733398437500e+07,1.3517074584960938e+03,-2.2859592437744141e+03,-1.9414072036743164e+03,1.86264514923095703e-06,-3.72529029846191406e-06,-1.86264514923095703e-06,7.92574137449264526

e-05,4.656612873e-09,2.72848410531878471e-12,78810,0,0,0,12*ed7675f5

ID	Field	Data Description	Format	Bytes	Offset
1	GLOEPHEMERIS header	Log header		H	0
2	sloto	Slot information offset, conver toPRN identification (Slot + 37)	Ushort	2	H
3	freqo	Frequency number corrections in the range 0 to 20	Ushort	2	H+2
4	sat type	Satellite type where 0 = GLO_SAT 1 = GLO_SAT_M (M type satellites)	Uchar	1	H+4
5	Reserved			1	H+5
6	e week	Ephemeris reference time integer (relative to GPS time)	Ushort	2	H+6
7	e time	Reference time of ephemeris (relative to GPS time) in ms	Ulong	4	H+8
8	t offset	Integer seconds between GPS and GLONASS time. A positive value implies GLONASS is ahead of GPS time.	Ulong	4	H+12
9	Nt	Current date number. This field is only output for the GLONSS-M satellites.	Ushort	2	H+16
10	Reserved			1	H+18
11	Reserved			1	H+19
12	issue	15-minute interval number corresponding to ephemeris reference time	Ulong	4	H+20
13	health	Ephemeris health where 0 = GOOD 1 = BAD	Ulong	4	H+24
14	pos x	X coordinate for satellite at reference time (PZ-90.02), in metres	Double	8	H+28
15	pos y	Y coordinate for satellite at reference time (PZ-90.02), in metres	Double	8	H+36
16	pos z	Z coordinate for satellite at reference time (PZ-90.02), in metres	Double	8	H+44
17	vel x	X coordinate for satellite velocity at reference time (PZ-90.02), in metres/s	Double	8	H+52
18	vel y	Y coordinate for satellite velocity at reference time (PZ-90.02), in metres/s	Double	8	H+60
19	vel z	Z coordinate for satellite velocity at reference time (PZ-90.02), in metres/s	Double	8	H+68
20	LS acc x	X coordinate for lunisolar perturbation acceleration at reference time (PZ-90.02), in metres/s/s	Double	8	H+76
21	LS acc y	Y coordinate for lunisolar perturbation	Double	8	H+84

ID	Field	Data Description	Format	Bytes	Offset
		acceleration at reference time (PZ-90.02), in metres/s/s			
22	LS acc z	Z coordinate for lunisolar perturbation acceleration at reference time (PZ-90.02), in metres/s/s	Double	8	H+92
23	tau_n	Correction to the nth satellite time t_n relative to GLONASS time t_c, in seconds	Double	8	H+100
24	delta_tau_n	Transmission latency between RF signal in L2 and RF signal in L1 of nth satellite, in seconds	Double	8	H+108
25	gamma	Frequency correction, in seconds/second	Double	8	H+116
26	Tk	Time of frame start (since start of GLONASS day), in seconds	Ulong	4	H+124
27	P	Technological parametre	Ulong	4	H+128
28	Ft	Predicted satellite user range accuracy	Ulong	4	H+132
29	age	Age of data, in days	Ulong	4	H+136
30	Flags	Information flags	Ulong	4	H+140
31	xxxx	32-bit CRC (ASCII and Binary only)	Hex	4	H+144
32	[CR][LF]	Sentence terminator (ASCII only)	-	-	-

2.11 *GPSEPHEM GPS ephemeris data*

User can record GPS ephemeris using this command。

Message ID: 7

Recommended Input:

LOG GPSEPHEMA ONCHANGED

LOG Message output:

#GPSEPHEMA,COM1,0,49.0,SATTIME,0,0.000,00000000,e,0;9,354990.000000,0,17,17,1640,1640,359984.000000,2.656025221e+07,4.268392081e-09,1.265116550e+00,1.743639424e-02,1.575783199e+00,-2.214685082e-06,2.011656761e-07,3.884062500e+02,-3.537500000e+01,-1.173466444e-07,-3.185123205e-07,9.832984896e-01,-2.678683006e-11,1.877677745e+00,-8.428565369e-09,17,359984.000000,-5.587935448e-09,8.66796e-05,2.38742e-12,0.00000,TRUE,1.458590353e-04,4.000000000e+00*b5c5145f

#GPSEPHEMA,COM1,0,49.0,SATTIME,0,0.000,00000000,e,0;12,354990.000000,0,63,63,1640,1640,360000.000000,2.656099374e+07,3.951950329e-09,1.837411750e+00,3.707165364e-03,-1.489442481e-01,-7.005408406e-06,9.173527360e-06,2.106875000e+02,-1.309375000e+02,3.911554813e-08,5.774199963e-08,9.758708024e-01,2.678683006e-11,2.961028683e+00,-7.685320124e-09,63,360000.000000,-1.210719347e-08,2.77115e-06,2.61480e-12,0.00000,TRUE,1.458526110e-04,4.000000000e+00*0b952174

#GPSEPHEMA,COM1,0,49.0,SATTIME,0,0.000,00000000,e,0;31,354990.000000,0,72,72,1640,1640,360000.000000,2.656041550e+07,4.128029092e-09,1.968904803e+00,7.602722500e-03,-9.526977646e-01,-2.333894372e-06,6.519258022e-08,3.856875000e+02,-4.571875000e+01,9.872019291e-08,3.166496754e-08,9.795546262e-01,-1.032185852e-10,1.907342403e+00,-8.116052352e-09,72,360000.000000,-1.303851604e-08,9.62568e-05,5.79803e-12,0.00000,TRUE,1.458575499e-04,4.000000000e+00*44d404bf

ID	Field	Data Description	Format	Bytes	Offset
1	GPSEPHEM header	Log header		H	0
2	PRN	Satellite PRN number (GPS: 1 to 32)	Ulong	4	H
3	tow	Time Stamp of Subframe 0(seconds)	Double	4	H+4
4	health	Health Status –a 6-bit health code as defined in ICD-GPS-200a	Ulong	4	H+12
5	IODE1	Age of ephemeris data 1	Ulong	4	H+16
6	IODE2	Age of ephemeris data 2 = IODE1 for GPS	Ulong	4	H+20
7	Week	GPS Week number	Ulong	4	H+24
8	Z Week	Z count week number. This is the week number from subframe 1 of the ephemeris. The 'toe week' (field #7) is derived from this.	Ulong	4	H+28
9	Toe	Reference time for ephemeris, seconds	Double	8	H+32
10	A	Semi-major axis of satellite orbit, meters	Double	8	H+40
11	ΔN	Corrections of satellite's mean angular velocity, radians/second	Double	8	H+48
12	M0	Mean anomaly of TOE, radians	Double	8	H+56
13	Ecc	Eccentricity of satellite orbit	Double	8	H+64
14	ω	Argument of perigee, radians	Double	8	H+72
15	cuc	Argument of latitude (amplitude of cosine, radians)	Double	8	H+80
16	cus	Argument of latitude (amplitude of sine, radians)	Double	8	H+88
17	crc	Orbit radius (amplitude of cosine, meters)	Double	8	H+96
18	crs	Orbit radius (amplitude of sine, meters)	Double	8	H+104
19	cic	Inclination (amplitude of cosine, radians)	Double	8	H+112
20	cis	Inclination (amplitude of sine, radians)	Double	8	H+120
21	I0	Inclination angle at TOE time, radians	Double	8	H+128
22	IDOT	Changing rate of inclination angle, radians/second	Double	8	H+136
23	Ω0	Ascending node right ascension, radians	Double	8	H+144
24	Ω dot	Changing rate of ascending node right ascension, radians/second	Double	8	H+152
25	iodc	Age of clock data	Ulong	4	H+160

ID	Field	Data Description	Format	Bytes	Offset
26	toc	Reference time of satellite clock error, seconds	Double	8	H+164
27	tgd	Group delay, seconds	Double	8	H+172
28	af0	Satellite clock error parameter, seconds (s)	Double	8	H+180
29	af1	Satellite clock rate parameter, (s/s)	Double	8	H+188
30	af2	Satellite clock offset parameter, (s/s/s)		8	H+196
31	AS	Anti-spoofing on: 0 = FALSE 1 = TRUE	Enum	4	H+204
32	N	Correction mean angular velocity, radians/second	Double	8	H+208
33	URA	User Distance Range Accuracy index. The ICD specifies that the URA index transmitted in the ephemerides can be converted to a nominal standard deviation value using an algorithm listed there. We publish the square of the nominal value (variance).	Double	8	H+216
34	xxxx	32-bit CRC (ASCII and Binary only)	Hex	4	H+224
35	[CR][LF]	Sentence terminator (ASCII only)	-	-	-

2.12 *GPGGA GPS Fix Data and Undulation*

Time, position and fix-related data of the GPS receiver.

Message ID: 218
Recommended Input:
LOG GPGGA ONTIME 1
LOG Message output:
$GNGGA,025754.00,4004.74102107,N,11614.19532779,E,1,,0.7,63.3224,M,-9.7848,M,00,0000*58

ID	Field	Data Description	Symbol	Example
1	$GPGGA	Log header[a]		$GPGGA
2	utc	UTC time of corresponding position(hours/minutes/seconds/decimal seconds)	hhmmss.ss	170659.00
3	lat	Latitude(DDmm.mm)	llll.ll	4001.1220
4	lat dir	Latitude direction(N = North, S = South)	a	N
5	lon	Longitude(DDDmm.mm)	yyyyy.yy	11600.3622
6	lon dir	Longitude direction(E = East, W = West)	a	E

ID	Field	Data Description	Symbol	Example
7	GPS qual	GPS Quality indicator 0 = fix not available or invalid 1 = point fix 2 = pseudo-range difference 4 = RTK fixed solution 5 = RTK floating solution 7 = Position set by user(Fixed Position)	x	1
8	# sats	Number of satellites in use. May be different to the number in view	xx	10
9	hdop	Horizontal dilution of precision	x.x	1.0
10	alt	Antenna altitude above/below mean sea level	x.x	1098.44
11	a-units	Units of antenna altitude(M = metres)	M	M
12	undulation	Geoid undulation – the distance between the geoid and the WGS84 ellipsoid	x.x	-15.174
13	u-units	Units of geoid undulation(M = metres)	M	M
14	age	Age of Differential data(in seconds)[b]	xx	(empty when no differential data is present)
15	stn ID	Differential base station ID, 0000-1023	xxxx	(empty when no differential data is present)
16	*xx	Checksum	*hh	*3F
17	[CR][LF]	Sentence terminator		[CR][LF]

a) The talker (the first 2 characters after the $ sign in the log header) is set to GP (GPS only), BD (BD2 only), or GN (All systems).

b) The maximum age reported here is limited to 99 seconds.

2.13 *GPGSA GPS DOP and Active Satellites*

GPS receiver operating mode, satellites used for navigation and DOP values.

Message ID: 221

Recommended Input:

LOG GPGSA ONTIME 1

LOG Message output:

$GPGSA,M,3,22,25,12,14,18,09,31,,,,,1.7,0.9,1.4*37

ID	Field	Data Description	Symbol	Example
1	$GPGSA	Log header[a]		$GPGSA
2	mode MA	A = Automatic 2D/3D M = Manual, forced to operate in 2D or 3D	M	M

ID	Field	Data Description	Symbol	Example
3	mode 123	Mode: 1 = Fix not available; 2 = 2D; 3 = 3D	x	3
4 - 15	prn	PRN numbers of satellites used in solution (null for unused fields), total of 12 fields. (GPS: 1 to 32, GLONASS: 65 to 96 and BD2: 161 to 197)	xx,xx,.....	18,03,13, 25,16, 24,12, 20,,,,
16	pdop	Position dilution of precision	x.x	1.5
17	hdop	Horizontal dilution of precision	x.x	0.9
18	vdop	Elevation dilution of precision	x.x	1.2
19	*xx	Checksum	*hh	*3F
20	[CR][LF]	Sentence terminator		[CR][LF]

a) The talker (the first 2 characters after the $ sign in the log header) is set to GP (GPS only), BD (BD2 only), or GN (All systems)

2.14 GPGST Pseudorange measurement noise statistics

This log contains pseudorange measurement noise statistics are translated in the position domain in order to give statistical measures of the quality of the position solution.

This log reflects the accuracy of the solution type used in the BESTPOS and GPGGA, except for the RMS field. The RMS field, since it specifically relates to pseudorange inputs, does not represent carrier-phase based positions. Instead it reflects the accuracy of the pseudorange position which is given in the PSRPOS log.

Message ID: 222
Recommended Input:
LOG GPGST ONTIME 1

LOG Message output:
$GPGST,141451.00,1.18,0.00,0.00,0.0000,0.00,0.00,0.00*6B

ID	Field	Data Description	Symbol	Example
1	$GPGST	Log header[a]		$GPGST
2	utc	UTC time status of position (hours/minutes/seconds/ decimal seconds)	hhmmss.ss	173653.00
3	rms	RMS value of the standard deviation of the range inputs to the navigation process. Range inputs include pseudoranges and DGPS corrections	x.x	2.73
4	smjr std	Standard deviation of semi-major axis of error ellipse (m)	x.x	2.55
5	smnr std	Standard deviation of semi-minor axis of error ellipse (m)	x.x	1.88

6	orient	Orientation of semi-major axis of error ellipse (degrees from true north)	x.x	15.2525
7	lat std	Standard deviation of latitude error (m)	x.x	2.51
8	lon std	Standard deviation of longitude error (m)	x.x	1.94
9	alt std	Standard deviation of altitude error (m)	x.x	4.30
10	*xx	Checksum	*hh	*6E
11	[CR][LF]	Sentence terminator		[CR][LF]

a) The talker (the first 2 characters after the $ sign in the log header) is set to GP (GPS only), BD (BD2 only), or GN (All systems)

2.15 *GPGSV GNSS Satellites in View*

Number of SVs in view, PRN numbers, elevation, azimuth and SNR value. Four satellites maximum per message. When required, additional satellite data sent in 2 or more messages (a maximum of 9). The total number of messages being transmitted and the current message being transmitted are indicated in the first two fields.

Message ID: 223
Recommended Input:
LOG GPGSV ONTIME 1
LOG Message output:
$GPGSV,3,1,11,18,87,050,48,22,56,250,49,21,55,122,49,03,40,284,47*78

ID	Field	Data Description	Symbol	Example
1	$GPGSV	Log header [a]		$GPGSV
2	# msgs	Total number of messages (1-9)	x	3
3	msg #	Message number (1-9)	x	1
4	# sats	Total number of satellites in view. May be different from the number of satellites in use.	xx	09
5	prn	Satellite PRN number (GPS: 1 to 32, GLONASS: 65 to 96 and BD2: 161 to 197)	xxx	03
6	elev	Elevation, degrees, 90 maximum	xx	51
7	azimuth	Azimuth, degrees True, 000 to 359	xxx	140
8	SNR	SNR (C/No) 00-99 dB-Hz, null when not tracking	xx	42
… … …	… … …	Next satellite PRN number, elevation, azimuth, SNR, --- Last satellite PRN number, elevation, azimuth, SNR,		
variable	*xx	Checksum	*hh	*72
variable	[CR][LF]	Sentence terminator		[CR][LF]

a) The talker (the first 2 characters after the $ sign in the log header) is set to GP (GPS only), BD (BD2 only), or GN (All systems).

2.16 *GPHDT GPS Heading Log*

This log contains actual heading information in degrees from True North.

Transmitting the information requires receiver to support heading working mode.

Message ID: 1045
Recommended Input:
LOG GPHDT ONCHANGED
LOG Message output:
$GNHDT,178.7236,T*15

Field	Structure	Field Description	Symbol	Example
1	$GPHDT	Log header [a]		$GPHDT
2	heading	Heading angle	X.X	178.7236
3	TRUE	True North	T	T
4	*XX	Checksum	*hh	*15
5	[CR][LF]	Sentence terminator		[CR][LF]

2.17 *GPRMC GPS Recommended Information*

This log contains time, date, position, heading and velocity data calculated by receivers. RMC is the recommended minimum navigation data for receivers.
The GPRMC log outputs these messages without waiting for a valid almanac. Instead, it uses a UTC time, calculating with default parameters. In this case, the UTC time status is set to WARNING since it may not be one hundred percent accurate. When a valid almanac is available, the receiver uses the real parameters to calculate. Then the UTC time status is set to VALID.

Message ID: 225
Recommended Input:
LOG GPRMC ONTIME 1
LOG Message output:
$GPRMC,144326.00,A,5107.0017737,N,11402.3291611,W,0.080,323.3,210307,0.0,E,A*20

ID	Field	Data Description	Symbol	Example
1	$GPRMC	Log header [a]		$GPRMC
2	utc	UTC of corresponding position	hhmmss.ss	144326.00
3	pos status	Position status: A = valid, V = invalid	A	A
4	lat	Latitude (DDmm.mm)	llll.ll	5107.0017737

ID	Field	Data Description	Symbol	Example
5	lat dir	Latitude direction N = North, S = South	a	N
6	lon	Longitude (DDDmm.mm)	yyyyy.yy	11402.3291611
7	lon dir	Longitude direction E = East, W = West	a	W
8	speed Kn	Speed over ground, knots	x.x	0.080
9	track true	Track direction, degrees	x.x	323.3
10	date	Date: dd/mm/yy	xxxxxx	210307
11	mag var	Declination, degrees [b]	x.x	0.0
12	var dir	Declination direction E/W [c]	a	E
13	mode ind	Positioning system mode indicator, See	a	A
14	*xx	Checksum	*hh	*72
15	[CR][LF]	Sentence terminator		[CR][LF]

a) Talker (the first 2 characters after the $ sign in the log header) is set to GP (GPS only), BD (BD2 only), or GN (All systems).
b) Note that this field is the actual declination and will always be positive. The direction of the declination is always positive.
c) Easterly offsetangle (E) should be subtracted from actual heading and Westerly ofset angle (W) should be added to actual heading.

Table 15 NMEA Positioning System Mode Indicator

Mode	Indicate
A	Autonomous
D	Differential
E	Estimated (dead reckoning) mode
M	Manual input
N	Data not valid

2.18 GPVTG Track made good and ground speed

This log contains the track made good and speed relative to the ground.

The GPVTG log outputs these messages without waiting for a valid almanac. Instead, it uses a UTC time, calculated with default parameters. In this case, the UTC time status is set to WARNING since it may not be one hundred percent accurate. When a valid almanac is available, the receiver uses the real parameters. Then the UTC time status is set to VALID.

Message ID: 226
Recommended Input:
LOG GPVTG ONTIME 1
LOG Message output:

$GPVTG,353.763,T,360.233,M,0.02335,N,0.04324,K,A*3B

ID	Field	Data description	Symbol	Example
1	$GPVTG	Log header[a]		$GPVTG
2	track true	Track made good, degrees True	x.x	24.168
3	T	True track indicator	T	T
4	track mag	Track made good, degrees Magnetic;Track mag = Track true + (MAGVAR correction)	x.x	24.168
5	M	Magnetic track indicator	M	M
6	speed Kn	Speed over ground, knots	x.x	0.4220347
7	N	Nautical speed indicator (N = Knots)	N	N
8	speed Km	Speed, kilometres/hour	x.x	0.781608
9	K	Speed indicator (K = km/hr)	K	K
10	mode ind	Positioning system mode indicator, see Table 错误！未找到引用源。	a	A
11	*xx	Checksum	*hh	*7A
12	[CR][LF]	Sentence terminator		[CR][LF]

a) Talker (the first 2 characters after the $ sign in the log header) is set to GP (GPS only), BD (BD2 only), or GN (All systems).

2.19 *GPZDA UTC Time and Date*

The GPZDA can be output without waiting for a valid almanac. Instead, it uses a UTC time calculated with default parameters.

Message ID: 227
Recommended Input:
LOG GPZDA ONTIME 1
LOG Message output:
$GPZDA,024412.00,16,06,2011,,*64

ID	Field	Data Description	Symbol	Example
1	$GPZDA	Log header[a]		$GPZDA
2	utc	UTC time	Hhmmss.ss	170659.00
3	Day	Day, 01 to 31	xx	08
4	month	Month, 01 to 12	xx	05
5	year	Year	xxxx	1998
6	null	Local time zone description – not available[b]	xx	(empty if no data is present)
7	null	Local time zone minute description – not available[b]	xx	(empty if no data is present)
8	*xx	Checksum	*hh	*6F
9	[CR][LF]	Sentence terminator		[CR][LF]

a) Talker (the first 2 characters after the $ sign in the log header) is set to GP (GPS only), BD (BD2 only), or GN (All systems)
b) Local time zones are not supported by UB370. Field 6 and 7 are always null.

2.20 *HEADING Heading Information*

The heading is the angle from True North of the base to rover vector in a clockwise direction. This log can be output from the receiver(Heading) currently.

Message ID: 971
Recommended Input:
LOG HEADINGA ONCHANGED
LOG Message output:
#HEADINGA,COM1,0,29.0,FINE,1740,367835.000,00000000,e,0;SOL_COMPUTED,NARROW_INT,0.0014,286.2120,41.0552,0.0000,416.9299,654.8104,"0",20,17,17,17,0,01,0,c3*ce3d9c8e

Field	Field	Data Description	Format	Bytes	Offset
1	HEADING header	Log header		H	0
2	sol stat	Solution status, see Table 17	Enum	4	H
3	pos type	Position type, see Table 16	Enum	4	H+4
4	length	Baseline length (0 to 3000 m)	Float	4	H+8
5	heading	Heading (0 to 360.0 degrees)	Float	4	H+12
6	pitch	Pitch (±90 degrees)	Float	4	H+16
7	Reserved		Float	4	H+20
8	hdgstddev	Heading standard deviation	Float	4	H+24
9	ptchstddev	Pitch standard deviation	Float	4	H+28
10	stn id	Base station ID	Float	4	H+32
11	#SVs	Number of tracked satellites	Uchar	1	H+36
12	#solnSVs	Number of satellites in use	Uchar	1	H+37
13	#obs	Number of satellites above the elevation cut-off angle	Uchar	1	H+38
14	#multi	Number of satellites above elevation cut-off angle with L2	Uchar	1	H+39
15	Reserved		Uchar	1	H+40
16	ext sol stat	Extended solution status, see Table 25	Uchar	1	H+41
17	Reserved		Uchar	1	H+42

Field	Field	Data Description	Format	Bytes	Offset
18	sig mask	Signal mask, see Table 18	Uchar	1	H+43
19	xxxx	32-bit CRC (ASCII and Binary only)	Hex	4	H+44
20	[CR][LF]	Sentence terminator (ASCII only)	_	_	_

☞ ***For products like UB280 with single board and dual antennas, heading transmitting frequency is consistent with GGA, PSRPOS and RTKPOS etc., which means GGA is on 5Hz and Heading is on 5Hz. If no any position and velocity information transmitted, Heading is transmitted on 1Hz.***

2.21 *IONUTC GPS ionosphere parameters and UTC data*

The Ionospheric Model parameters (ION) and the UTC time parameters are provided.

Message ID: 8
Recommended Input:
LOG IONUTCA ONCHANGED
LOG Message output:
#IONUTCA,COM1,0,49.0,SATTIME,1636,29067.000,00000000,e,0;1.117587089538575e-08,2.235174179077149e-08,-5.960464477539060e-08,-1.192092895507812e-07,9.830400000000000e+04,1.310720000000000e+05,-1.310720000000000e+05,-5.898240000000000e+05,1636,233472,-1.862645149230958e-09,-2.664535259100000e-15,1768,4,15,15,0*d83d7575

Field	Field	Data Description	Format	Bytes	Offset
1	IONUTC header	Log header		H	0
2	a0	Alpha parameter constant term	Double	8	H
3	a1	Alpha parameter 1st order term	Double	8	H+8
4	a2	Alpha parameter 2nd order term	Double	8	H+16
5	a3	Alpha parameter 3rd order term	Double	8	H+24
6	b0	Beta parameter constant term	Double	8	H+32
7	b1	Beta parameter 1st order term	Double	8	H+40
8	b2	Beta parameter 2nd order term	Double	8	H+48
9	b3	Beta parameter 3rd order term	Double	8	H+56
10	utc wn	UTC reference week	Ulong	4	H+64
11	tot	Reference time of UTC time parameters	Ulong	4	H+68
12	A0	Clock error of UTC relative to GPS	Double	8	H+72

Field	Field	Data Description	Format	Bytes	Offset
13	A1	Clock rate of UTC relative to BDT	Double	8	H+80
14	wn lsf	Week count for new leap second taking effects	Ulong	4	H+88
15	dn	Seconds of week for new leap second taking effects (the range is 1 to 7 where Sunday = 1 and Saturday = 7)	Ulong	4	H+92
16	deltat ls	Corrections of accumulative leap second for GPS relative to UTC before the new leap second taking effects	Long	4	H+96
17	deltat lsf	Corrections of accumulative leap second for GPS relative to UTC after the new leap second taking effects	Long	4	H+100
18	deltat utc	Time difference of GPS relative to UTC	Ulong	4	H+104
19	xxxx	32-bit CRC (ASCII and Binary only)	Hex	4	H+108
20	[CR][LF]	Sentence terminator (ASCII only)	-	-	-

2.22 *LOGLIST LOG List*

This message lists log messages in the system, binary format is not supported.

Message ID: 5
Recommended Input:
LOG LOGLISTA ONCE
LOG Message output:
#LOGLISTA,ICOM1,0,91.0,FINE,1822,355897.000,00000000,14,0;19, LOG ICOM3 RANGEB ONTIME 1 0 NOHOLD,LOG ICOM3 BD2IONUTCB ONCHANGED ,LOG ICOM3 GPSEPHEMB ONCHANGED ,LOG ICOM3 BD2EPHEMB ONCHANGED ,LOG ICOM3 IONUTCB ONCHANGED ,LOG ICOM3 GLOEPHEMERISB ONCHANGED ,LOG ICOM3 TIMEB ONTIME 1 0 NOHOLD,LOG ICOM3 BESTPOSB ONTIME 1 0 NOHOLD,LOG ICOM3 BESTVELB ONTIME 1 0 NOHOLD,LOG COM2 RANGEB ONTIME 1 0 NOHOLD,LOG COM2 RTKDOPB ONTIME 1 0 NOHOLD,LOG COM2 PSRDOPB ONCHANGED ,LOG COM2 TIMEB ONTIME 1 0 NOHOLD,LOG COM2 SATVISB ONTIME 1 0 NOHOLD,LOG COM2 BESTPOSB ONTIME 1 0 NOHOLD,LOG MRTK0 GPSEPHEMB ONCHANGED ,LOG MRTK0 BD2EPHEMB ONCHANGED ,LOG MRTK0 GLOEPHEMERISB ONCHANGED ,LOG MRTK0 GALEPHEMERISB ONCHANGED ,*1ba9f9f7

ID	Field	Data Description	Format
1	LOGLIST (ASCII)header	Log header	
2	#port	Number of messages to follow, maximum = 30	Long
3	LOG	“LOG” string	
4	port	Output port, see Table 8, Detailed Port Identifiers	Enum
5	message	Message name of log with no suffix for abbreviated ASCII, an A suffix for ASCII and a B suffix for	Char [ ]

ID	Field	Data Description	Format
		binary.	
6	trigger	Message output trigger mode: ONCHANGED, ONTIME, or ONCE	
7	period	Period(in seconds) of Log(ONTIME)	
8	offset	0 at present	
9	hold	NOHOLD or HOLD	
10...	Next port		
variable	xxxx	32-bit CRC	Hex
variable	[CR][LF]	Sentence terminator	-

2.23 *MATCHEDPOS Matched RTK Position*

This log represents positions that have been computed with observation data from base stations and rover station with the same epoch.

Message ID: 96
Recommended Input:
LOGMATCHEDPOSA ONCHANGED
LOG Message output:
#MATCHEDPOSA,COM1,0,43.0,FINE,1637,553171.000,00000000,0,0;SOL_COMPUTED,NARROW_INT,40.08745302253,116.23178643978,50.4136,0.0000,WGS84,0.0070,0.0066,0.0125,"0",0.000,0.000,10,9,9,6,0,1,0,3*3e1814cd

Field	Field	Data Description	Format	Bytes	Offset
1	MATCHED-POS header	Log header		H	0
2	sol status	Solution status (See Table 17)	Enum	4	H
3	pos type	Position type (See Table 16)	Enum	4	H+4
4	lat	Latitude	Double	8	H+8
5	lon	Longitude	Double	8	H+16
6	hgt	Height above sea level	Double	8	H+24
7	undulation	Geoid undulation - the distance between the geoid and the WGS84 ellipsoid (m)	Float	4	H+32
8	datum id#	Coordinate system ID, only support WGS84 at present, ID: WE	Enum	4	H+36

Field	Field	Data Description	Format	Bytes	Offset
9	lat σ	Latitude standard deviation	Float	4	H+40
10	lon σ	Longitude standard deviation	Float	4	H+44
11	hgt σ	Height standard deviation	Float	4	H+48
12	stn id	Base station ID	Char[4]	4	H+52
13	Reserved		Float	4	H+56
14			Float	4	H+60
15	#SVs	Number of satellite vehicles tracked	Uchar	1	H+64
16	#solnSVs	Number of satellite vehicles in use	Uchar	1	H+65
17	#gbL1	Number of satellite with single frequency in use	Uchar	1	H+66
18	#gbL1L2	Number of satellite with dual or triple frequency in use	Uchar	1	H+67
19	Reserved		Uchar	1	H+68
20	ext sol stat	Extended solution status (See Table 25, Extended Solution Status)	Hex	1	H+69
21	Reserved		Hex	1	H+70
22	sig mask	Signal mask - if 0, signals used in solution are unknown (See Table 18 错误！未找到引用源。)	Hex	1	H+71
23	xxxx	32-bit CRC (ASCII and Binary only)	Hex	4	H+72
24	[CR][LF]	Sentence terminator (ASCII only)	-	-	-

2.24 *MATCHEDPOSH Matched RTK Position*

For products with single board and dual antennas, this log represents positions that have been computed with observation data from base stations and moving station with the same epoch..

Message ID: 6006

LOGMATCHEDPOSHA ONCHANGED

LOG Message output:

#MATCHEDPOSHA,COM1,0,43.0,FINE,1637,553171.000,00000000,0,0;SOL_COMPUTED,NARROW_INT,40.08745302253,116.23178643978,50.4136,0.0000,WGS84,0.0070,0.0066,0.0125,"0",0.000,0.000,10,9,9,6,0,1,0,3*3e1814cd

Field	Field	Data Description	Format	Bytes	Offset

Field	Field	Data Description	Format	Bytes	Offset
1	MATCHEDPOSH header	Log header		H	0
2	sol status	Solution status (See Table 17)	Enum	4	H
3	pos type	Position type (See Table 16)	Enum	4	H+4
4	lat	Latitude	Double	8	H+8
5	lon	Longitude	Double	8	H+16
6	hgt	Height above sea level	Double	8	H+24
7	undulation	Geoid undulation - the distance between the geoid and the WGS84 ellipsoid (m)	Float	4	H+32
8	datum id#	Coordinate system ID, only support WGS84 at present, ID: WE	Enum	4	H+36
9	lat σ	Latitude standard deviation	Float	4	H+40
10	lon σ	Longitude standard deviation	Float	4	H+44
11	hgt σ	Height standard deviation	Float	4	H+48
12	stn id	Base station ID	Char[4]	4	H+52
13	Reserved		Float	4	H+56
14			Float	4	H+60
15	#SVs	Number of satellite vehicles tracked	Uchar	1	H+64
16	#solnSVs	Number of satellite vehicles in use	Uchar	1	H+65
17	#gbL1	Number of satellite with single frequency in use	Uchar	1	H+66
18	#gbL1L2	Number of satellite with dual or triple frequency in use	Uchar	1	H+67
19	Reserved		Uchar	1	H+68
20	ext sol stat	Extended solution status (See Table 25)	Hex	1	H+69
21	Reserved		Hex	1	H+70
22	sig mask	Signal mask - if 0, signals used in solution are unknown (See Table 18 错误！未找到引用源。)	Hex	1	H+71
23	xxxx	32-bit CRC (ASCII and Binary only)	Hex	4	H+72
24	[CR][LF]	Sentence terminator (ASCII only)	-	-	-

☞ ***This message is only applicable for heading products.***

2.25 *NETSTATUS Network Status*

This log represents network status, especially when receiver working in DHCP mode set by NETCONFIG command.

Binary is not support in current version.

Message ID: 2014
Recommended Input:
LOG NETSTATUSA ONCE

ID	Field	Data Description
1	NETSTATUS header	Log header
2	status	string = **<client-ip>:<server-ip>:<gw-ip>:<netmask>:<hostname>:<device>** **client-ip**: IP address of receiver **server-ip**: IP address of the DHCP server **gw-ip**: IP address of a gateway if the server is on a different subnet. **netmask**: Net mask for local network interface. If unspecified **hostname**: Name ofreceiver. May be supplied by auto configuration, but its absence will not trigger auto configuration. **device**: Name of network device to use
4	xxxx	32bit CRC(ASCII and Binary)
5	[CR][LF]	End of message (ASCII)

2.26 *PASSCOM Redirect Data*

The redirect log feature enables the receiver to redirect any ASCII or binary data that is input at a specified port to any specified receiver port.

Message ID:
PASSCOM1 Message ID:233
PASSCOM2 Message ID:234
PASSCOM3 Message ID:235

Recommended Input:
LOG PASSCOM2A ONCHANGED
LOG Message output:
#PASSCOM2A,COM1,0,64.0,FINESTEERING,1337,400920.201,00000000,2b46,1984;
80,ED,SINGLE,51.11636326036,-114.03824210485,1062.6015,-16.2713,WGS84,
1.8963,1.0674*807fd3ca

Field	Field	Data Description	Format	Bytes	Offset
1	PASSACOM header	Log header		H	0
2	#bytes	Number of bytes to follow	Ulong	4	H

Field	Field	Data Description	Format	Bytes	Offset
3	data	Message data	Char[80]	80	H+4
4	xxxx	32-bit CRC (ASCII and Binary only)	Hex	4	H+8+(#bytes)
5	[CR][LF]	Sentence terminator (ASCII only)	-	-	-

2.27 *PSRDOP Pseudo-range DOP*

The dilution of precision data is calculated using the geometric distribution of only those satellites that are currently being tracked and used in the position solution by the receiver. This log is updated once every 60 seconds or whenever a change in the satellite constellation occurs. Therefore, the total number of data fields output by the log is variable and depends on the number of SVs that are being tracked.

Message ID: 174
Recommended Input:
LOG PSRDOPA ONCHANGED
LOG Message output:
#PSRDOPA,COM1,0,47.0,FINE,1640,368295.000,00000000,e,0;1.759970,1.533887,0.785047,1.166612,0.862950,10.000000,13,31,29,16,23,6,3,20,32,168,167,161,163,164*5fcaac4b

Field	Field	Data Description	Format	Bytes	Offset
1	PSRDOP header	Log header		H	0
2	gdop	Geometric dilution of precision - assumes 3-D position and receiver clock error (all 4 parameters) are unknown.	Float	4	H
3	pdop	Position dilution of precision - assumes 3-D position is unknown and receiver clock offset is known.	Float	4	H+4
4	hdop	Horizontal dilution of precision.	Float	4	H+8
5	htdop	Horizontal position and time dilution of precision.	Float	4	H+12
6	tdop	Time dilution of precision - assumes 3-D position is known and only the receiver clock error is unknown.	Float	4	H+16
7	cutoff	Elevation cut-off angle.	Float	4	H+20
8	#PRN	Total number of satellites tracked	Long	4	H+24
9	PRN	PRN tracking SV, null field until position solution available.	Ulong	4	H+28
10...	Next PRN offset = H + 28 + (#prn x 4)				
variable	xxxx	32-bit CRC (ASCII and Binary only)	Hex	4	H+28+ (#prn x 4)

Field	Field	Data Description	Format	Bytes	Offset
variable	[CR][LF]	Sentence terminator (ASCII only)	-	-	-

2.28 *PSRPOS Pseudo-range position information*

This log contains the receiver's pseudo-range fixing position, positioning precision, status and other information.

Message ID: 47
Recommended Input:
LOG PSRPOSA ONTIME 1
LOG Message output:
#PSRPOSA,COM1,0,48.0,FINE,1640,368366.000,00000000,e,0;SOL_COMPUTED,SINGLE,40.0369620
4192,116.30176579652,68.8433,-9.7989,WGS84,1.2588,1.2050,3.0857,"",0.000,0.000,14,13,0,0,0,06,0,c3
*4b9bb40c

Field	Field	Data Description	Format	Bytes	Offset
1	PSRPOS header	Log header		H	0
2	sol status	Solution status (See Table 17, Solution Status)	Enum	4	H
3	pos type	Position type (See Table 16,Position or Velocity Type)	Enum	4	H+4
4	lat	Latitude	Double	8	H+8
5	lon	Longitude	Double	8	H+16
6	hgt	Height above sea level	Double	8	H+24
7	undulation	Geoid undulation - the distance between the geoid and the WGS84 ellipsoid (m)	Float	4	H+32
8	datum id#	Coordinate system ID, only support WGS84 at present, ID: WE	Enum	4	H+36
9	lat σ	Latitude standard deviation	Float	4	H+40
10	lon σ	Longitude standard deviation	Float	4	H+44
11	hgt σ	Height standard deviation	Float	4	H+48
12	stn id	Base station ID	Char[4]	4	H+52
13	diff_age	Differential age in seconds	Float	4	H+56
14	sol_age	Solution age in seconds	Float	4	H+60
15	#SVs	Number of satellite vehicles tracked	Uchar	1	H+64
16	#solnSVs	Number of satellite vehicles in use	Uchar	1	H+65

Field	Field	Data Description	Format	Bytes	Offset
17	Reserved		Uchar	1	H+66
18			Uchar	1	H+67
19			Uchar	1	H+68
20			Hex	1	H+69
21			Hex	1	H+70
22	sig mask	Signals mask (See 错误！未找到引用源。 Table 18)	Hex	1	H+71
23	xxxx	32-bit CRC (ASCII and Binary only)	Hex	4	H+72
24	[CR][LF]	Sentence terminator (ASCII only)	-	-	-

Table 16 Position or Velocity Type

Type (binary)	Type (ASCII)	Description
0	NONE	No solution
1	FIXEDPOS	Position has been fixed by the FIX POSITION command
2	FIXEDHEIGHT	Does not support temporarily
8	DOPPLER_VELOCITY	The velocity is derived from real-time Doppler meassage
16	SINGLE	Single point position
17	PSRDIFF	Pseudo-range difference decomposing
32	L1_FLOAT	L1 floating solution
33	IONOFREE_FLOAT	Ionospheric-free floating solution
34	NARROW_FLOAT	Narrow-lane floating solution
48	L1_INT	L1 fixed solution
49	WIDE_INT	Wide-lane fixed solution
50	NARROW_INT	Narrow-lane fixed solution

Table 17 Solution Status

Solution Status		Description
(Binary)	(ASCII)	
0	SOL_COMPUTED	Computed
1	INSUFFICIENT_OBS	Insufficient observations
2	NO_CONVERGENCE	No convergence
4	COV_TRACE	Trace of convariance matrix exceeds maximum (trace>1000 m)

Table 18 Signal Mask

Bit	Mask	Description
0	0x01	GPS L1 used in Calculation
1	0x02	GPS L2 used in Calculation
2	0x04	GPS L5 used in Calculation
3	0x08	BDS B3 used in Calculation
4	0x10	GLONASS L1 used in Calculation
5	0x20	GLONASS L2 used in Calculation
6	0x40	BD2 B1 used in Calculation
7	0x80	BD2 B2 used in Calculation

2.29 *PSRVEL Pseudo-range Velocity*

This log contains the receiver's pseudo-range fixing position, positioning precision, status and other information.

Message ID: 100
Recommended Input:
LOG PSRVELA ONTIME 1
LOG Message output:
#PSRVELA,COM1,0,47.0,FINE,1640,368625.000,00000000,e,0;SOL_COMPUTED,SINGLE,0.000000,0.000000,0.003886,193.599382,0.093041,0.000000*3764fb85

Field	Field	Data Description	Format	Bytes	Offset
1	PSRVEL header	Log header		H	0
2	sol status	Solution status, See Table 17, Solution Status	Enum	4	H
3	vel type	Velocity type, See Table 16, Position or Velocity Type	Enum	4	H+4
4	latency	The latency value calculated by velocity time tag in seconds. It should be subtracted from the epoch time to give improved results.	Float	4	H+8
5	age	Differential age in seconds	Float	4	H+12
6	hor spd	Horizontal speed over ground, in meters per second	Double	8	H+16
7	trk gnd	Actual direction of motion over ground (track over ground) with respect to True North, in degrees	Double	8	H+24
8	vert spd	Vertical speed, in meters per second, where positive values indicate increasing altitude (up) and negative values indicate decreasing	Double	8	H+32

Field	Field	Data Description	Format	Bytes	Offset
		altitude (down)			
9	Reserved		Float	4	H+40
10	xxxx	32-bit CRC (ASCII and Binary only)	Hex	4	H+44
11	[CR][LF]	Sentence terminator (ASCII only)	-	-	-

2.30 *RANGE Raw observation data information*

RANGE contains observation information of channels tracked by receivers. For products with single board and dual antennas, the Log is the measurement information from corresponding moving base port.

For specificated PRN, there are two channels with same PRN in range log when L1 signal and L2 signal are both tracked. As description of Table 20, bit 20 indicates the channel's tracking status. Bit 20 is 1 when the PRN has more than one measurement, and bit 21-25 shows whether the tracked signal is L1 or L2.

Message ID: 43

Recommended Input:

LOG RANGEA ONTIME 1

LOG Message output:

#RANGEA,ICOM4,0,42.0,FINE,1964,380691.400,35225,35227,18;89,2,0,22008609.217,0.060,-115656027.419738,0.006,-2518.539,45.5,26.213,28101c24,2,0,22008603.995,0.111,-90121553.223597,0.009,-1962.684,42.3,22.813,21301c2b,5,0,20843244.609,0.040,-109531994.150812,0.005,-1245.253,50.6,26.213,28101c44,5,0,20843241.532,0.071,-85349591.089545,0.007,-970.872,45.8,22.813,21301c4b,5,0,20843242.159,0.045,-85349587.082066,0.005,-970.295,47.3,22.213,22301c4b,7,0,25095247.742,0.086,-131876429.574872,0.008,-1606.122,42.2,26.213,28101c64,7,0,25095246.067,0.456,-102760828.434135,0.042,-1251.769,32.1,16.000,21301c6b,7,0,25095244.587,0.177,-102760811.507111,0.017,-1251.703,33.3,22.213,22301c6b,13,0,20382060.029,0.040,-107108452.972599,0.005,811.107,49.1,26.213,28101c84,13,0,20382055.966,0.072,-83461110.796399,0.007,631.990,45.7,22.713,21301c8b,15,0,21438725.460,0.040,-112661267.362897,0.005,2614.623,48.4,26.213,28101ca4,15,0,21438722.682,0.093,-87787985.662570,0.008,2037.057,43.9,22.613,21301cab,15,0,21438723.236,0.056,-87787993.649488,0.006,2037.346,46.0,22.813,22301cab,20,0,20764082.342,0.046,-109115994.667446,0.005,1394.628,47.3,26.213,28101cc4,20,0,20764078.662,0.086,-85025431.514416,0.008,1087.034,44.5,22.613,21301ccb,21,0,24665388.661,0.097,-129617494.791505,0.009,2967.762,40.9,26.213,28101ce4,21,0,24665385.258,0.223,-101000627.306408,0.023,2312.878,35.3,22.713,21301ceb,29,0,21626078.069,0.040,-113645810.172148,0.005,-1393.510,48.4,26.213,28101d04,29,0,21626075.643,0.101,-88555164.508750,0.009,-1086.245,43.1,22.513,21301d0b,29,0,21626076.353,0.068,-88555168.505205,0.007,-1085.863,44.5,21.613,22301d0b,30,0,23592497.388,0.082,-123979418.449711,0.008,-37.216,42.7,26.213,28101d24,30,0,23592497.802,0.172,-96607339.151622,0.016,-28.802,38.4,22.613,21301d2b,30,0,23592498.198,0.084,-96607339.157198,0.008,-28.998,42.5,21.213,22301d2b,39,3,19920109.110,0.040,-106297521.461169,0.005,-1505.217,51.7,15.400,28111c24,39,3,19920110.266,0.040,-82675853.471222,0.005,-1170.667,49.3,15.400,20b11c2b,55,4,20268253.397,0.040,-108193316.076000,0.005,1881.914,49.3,15.400,28111c44,55,4,20268253.957,0.040,-84150355.546105,0.005,1463.721,49.0,15.400,20b11c4b,49,6,23467443.225,0.100,-125358869.890715,0.009,3172.865,40.5,9.600,28111c64,48,7,23330271.166,0.074,-124669893.625643,0.007,800.865,43.7,13.600,28111c84,48,7,23330276.705,0.103,-96965499.093055,0.009,622.928,40.1,15.400,20b11c8b,38,8,23769043.028,0.071,-127059156.031192,0.007,-3343.405,44.0,15.400,28111ca4,38,8,23769051.921,0.151,-98823827.650989,0.014,-2600.331,35.5,13.600,

20b11cab,54,11,19814100.193,0.040,-106029251.906514,0.005,-2259.372,50.9,15.400,28111cc4,54,11,19
814100.387,0.040,-82467198.142583,0.005,-1757.255,50.3,15.400,20b11ccb,40,12,20608451.682,0.040,-1
10318654.845101,0.005,1646.198,48.3,15.400,28111ce4,40,12,20608449.384,0.040,-85803388.057696,0.0
05,1280.395,48.3,15.400,20b11ceb,61,9,23328612.213,0.110,-124748553.253695,0.009,-4543.094,39.2,7.
600,28111d24,61,9,23328614.033,1.513,-97026707.755542,0.023,-3533.468,29.6,3.600,20b11d2b,1,0,380
08581.987,0.089,-197920663.830512,0.008,-9.664,41.8,29.313,2c141c24,1,0,38008571.319,0.048,-153044
767.686064,0.006,-7.484,47.0,27.313,26341c2b,1,0,38008573.590,0.069,-160826714.417185,0.007,-7.844,
44.4,27.513,26a41c20,3,0,37717804.871,0.093,-196406508.961943,0.008,-24.053,41.4,29.313,2c141c44,3,
0,37717797.245,0.043,-151873941.999178,0.005,-18.594,47.6,27.413,26341c4b,3,0,37717799.156,0.062,-
159596351.378491,0.006,-19.551,45.2,27.613,26a41c40,6,0,36222804.317,0.051,-188621648.755627,0.00
6,46.504,46.7,28.813,28141c64,6,0,36222796.947,0.040,-145854193.246055,0.005,36.009,51.6,18.113,22
341c6b,6,0,36222796.923,0.040,-153270508.360616,0.005,37.828,50.2,18.113,22a41c60,8,0,37183276.02
1,0.079,-193623074.750266,0.007,-1173.771,43.1,28.613,28141c84,8,0,37183268.311,0.041,-149721615.4
40782,0.005,-907.579,47.8,24.113,22341c8b,8,0,37183267.735,0.048,-157334573.683681,0.005,-953.760,
47.0,24.113,22a41c80,9,0,37559405.550,0.079,-195581685.594022,0.007,439.056,43.1,28.513,28141ca4,9
,0,37559400.551,0.040,-151236142.568628,0.005,339.565,49.1,24.113,22341cab,9,0,37559398.731,0.044,
-158926108.450182,0.005,356.713,47.5,24.113,22a41ca0,11,0,24117633.376,0.088,-125586847.258474,0.
008,-3226.508,42.0,28.413,28141cc4,11,0,24117629.427,0.040,-97111701.819511,0.005,-2494.916,48.5,2
4.213,22341ccb,11,0,24117627.973,0.045,-102049577.850102,0.005,-2621.796,47.3,24.213,22a41cc0,14,0
,21596621.888,0.043,-112459278.489687,0.005,-131.025,47.7,24.213,28141ce4,14,0,21596616.046,0.040,
-86960625.978749,0.005,-101.296,54.9,24.213,22341ceb,14,0,21596615.016,0.040,-91382345.472463,0.0
05,-106.508,53.7,24.213,22a41ce0,2,0,38238066.165,0.114,-199115643.768464,0.010,-24.901,38.7,28.613
,2c141d04,2,0,38238057.987,0.059,-153968815.447396,0.006,-19.209,45.6,26.813,26341d0b,2,0,3823806
1.189,0.073,-161797750.803982,0.007,-20.231,43.8,27.013,26a41d00,4,0,39068199.136,0.118,-203438372
.559277,0.010,-19.219,38.3,28.613,2c141d24,4,0,39068193.216,0.067,-157311428.087558,0.007,-14.906,4
4.6,25.613,26341d2b,4,0,39068194.236,0.090,-165310315.762163,0.008,-15.742,41.8,25.513,26a41d20,13
,0,35816311.029,0.045,-186504932.879649,0.005,-624.831,47.4,24.113,28141d44,13,0,35816310.492,0.04
0,-144217442.571483,0.005,-483.091,50.0,24.113,22341d4b,13,0,35816309.161,0.040,-151550524.69703
2,0.005,-507.703,49.5,24.113,22a41d40,5,0,39789477.759,0.134,-207194249.378367,0.012,-29.753,36.8,2
5.813,2c141d64,5,0,39789472.041,0.080,-160215716.176850,0.007,-22.888,43.0,22.713,26341d6b,5,0,397
89472.815,0.100,-168362282.053302,0.009,-24.068,40.5,22.713,26a41d60,4,0,28039617.614,0.162,-14734
9185.232920,0.015,2433.853,34.5,9.300,28331c24,4,0,28039619.353,0.100,-110033488.948850,0.009,181
7.490,40.5,15.500,21931c2b,4,0,28039615.307,0.091,-112903910.385027,0.008,1864.866,41.6,25.313,223
31c20,7,0,27605298.111,0.114,-145066831.410090,0.010,-2486.548,38.7,21.313,28331c44,7,0,27605301.1
36,0.116,-108329130.792739,0.010,-1856.838,38.5,20.613,21931c4b,7,0,27605297.284,0.103,-111155091.
705453,0.009,-1905.267,40.2,25.313,22331c40,12,0,23975765.092,0.077,-125993498.666217,0.007,1394.
795,43.4,24.313,28331c64,12,0,23975762.404,0.063,-94086041.164532,0.006,1041.466,45.2,20.613,2193
1c6b,12,0,23975759.756,0.040,-96540448.325016,0.005,1068.706,48.0,25.313,22331c60,14,0,19520792.4
48,0.065,-102582461.498323,0.007,-2915.962,44.9,25.313,28331c84,14,0,19520801.915,0.045,-76603819.
107641,0.005,-2177.558,47.4,20.613,21931c8b,14,0,19520798.391,0.040,-78602166.235218,0.005,-2234.3
13,49.0,25.313,22331c80,19,0,23856500.574,0.078,-125366761.447005,0.007,948.803,43.3,24.013,28331
ca4,19,0,23856499.914,0.058,-93618029.528303,0.006,708.443,45.8,20.613,21931cab,19,0,23856496.598,
0.040,-96060224.604443,0.005,726.967,48.5,25.313,22331ca0,26,0,25072291.008,0.089,-131755782.8613
35,0.008,-3078.179,41.8,24.913,28331cc4,26,0,25072294.295,0.092,-98389066.790710,0.008,-2298.658,4
1.5,20.613,21931ccb,26,0,25072290.397,0.075,-100955723.696600,0.007,-2358.533,43.6,25.313,22331cc0
*7ed6c4ae

Field	Type	Data Description	Format	Bytes	Offset
1	RANGE header	Log header		H	0
2	# obs	Number of pieces of corresponding observations information	Long	4	H

Field	Type	Data Description	Format	Bytes	Offset
3	PRN/ slot	Satellite PRN number (GPS: 1 to 32,and GLONASS: 38 to 61,and BD2 1 to 65,and Galileo 1 to 35)	UShort	2	H+4
4	glofreq	(GLONASS Frequency + 7), GPS and BD2 not use	Ushort	2	H+6
5	psr	Pseudo-range measurement (m)	Double	8	H+8
6	psr std	Pseudo-range measurement standard deviation (m)	Float	4	H+16
7	adr	Carrier phase, week (accumulated Doppler)	Double	8	H+20
8	adr std	Carrier phase standard deviation (week)	Float	4	H+28
9	dopp	Instantaneous Doppler (Hz)	Float	4	H+32
10	C/No	Carrier to noise ratio C/No = 10[log10(S/N0)] (dB-Hz)	Float	4	H+36
11	locktime	# Continuous tracking in seconds (no cycle slipping)	Float	4	H+40
12	ch-tr-status	Channel tracking status (See Table 20)	Ug	4	H
13…	Next PRN offset = H + 4 + (#obs x 44)				
variable	xxxx	32-bit CRC (ASCII and Binary only)	Hex	4	H+4+ (#obs x 44)
variable	[CR][LF]	Sentence terminator (ASCII only)	-	-	-

Table 19 Tracking State

State	Description	State	Description
0	Reserved	7	Reserved
1	Reserved	8	Reserved
2	Reserved	9	Reserved
3	Reserved	10	Reserved
4	L1 phase lock loop	11	L2 phase lock loop
5	Reserved	19	Reserved

State	Description	State	Description
6	Reserved		

Table 20 Channel Tracking Status

Nibble #	Bit #	Mask	Description	Range Value
N0	0	0x00000001	Tracking Status	0-11, See Table 19,Tracking State
	1	0x00000002		
	2	0x00000004		
	3	0x00000008		
N1	4	0x00000010		
	5	0x00000020	SV Channel number	0-n
	6	0x00000040		
	7	0x00000080		
N2	8	0x00000100		
	9	0x00000200		
	10	0x00000400	phase lock flag	0 = Invalid, 1 = Valid
	11	0x00000800	parity known flag	0 = Invalid, 1 = Valid
N3	12	0x00001000	code locked flag	0 = Invalid, 1 = Valid
	13	0x00002000	Reserved	
	14	0x00004000		
	15	0x00008000		
N4	16	0x00010000	Sat System	0 = GPS 1 = GLONASS 2 = SBAS 3 = GAL 4 = BD2 5 = QZSS 6-7 = Reserved
	17	0x00020000		
	18	0x00040000		
	19	0x00080000	Reserved	
N5	20	0x00100000	Grouping [a]	0 = Not grouped, 1 = Grouped
	21	0x00200000	Signal	Based on Sat system: GPS: 0 = L1C/A 5 = L2P (W) 9 = L2P (Y) 6 = L5 I 14 = L5Q 17 = L2C GLONASS: 0 = L1 5 = L2 BD2: 0 =B1I 4 = B1Q 5 = B2Q 17 = B2I 6 = B3Q 21 = B3I GAL: 1 =E1B 2 = E1C 12 = E5A 17= E5B
	22	0x00400000		
	23	0x00800000		
N6	24	0x01000000		
	25	0x02000000		

Nibble #	Bit #	Mask	Description	Range Value
	26	0x04000000	BD2 GEO Flag/ GPS L2C Flag	
	27	0x08000000	Primary L1 channel	
N7	28	0x10000000	Reserved	
	29	Reserved	Reserved	
	30	0x40000000	Reserved	
	31	0x80000000	Reserved	

a. Grouped: Channel has an associated channel (L1/L2 or B1/B2 /B3 pairs)

2.31 *RANGECMP Raw observation data information in compression format*

The information contains RANGE data information in compression format.

Message ID: 140
Recommended input:
LOG RANGECMPA ONTIME 1
LOG information output:
#RANGECMPA,COM1,0,63.5,FINESTEERING,
1429,226780.000,00000000,9691,2748;
26,
049C10081857F2DF1F4A130BA2888EB9600603A709030000,
0B9C3001225BF58F334A130BB1E2BED473062FA609020000,
449C1008340400E0AAA9A109A7535BAC2015CF71C6030000,
4B9C300145030010A6A9A10959C2F09120151F7166030000,
...
0B9D301113C8FFEFC284000C6EA051DBF3089DA1A0010000,
249D1018C6B7F67FA228820AF2E5E39830180AE1A8030000,
2B9D301165C4F8FFB228820A500A089F31185FE0A8020000,
449D1018BE18F41F2AACAD0A1A934EFC40074ECF88030000,
4B9D301182B9F69F38ACAD0A3E3AC28841079FCB88020000,
849D101817A1F95F16D7AF0A69FBE1FA401D3FD064030000,
8B9D30112909FB2F20D7AF0A9F24A687521DDECE64020000,
249E1118AF4E0470F66D4309A0A631CD642CF5B821320000,
2B9EB110A55903502F6E4309EE28D1AD032C7CB7E1320000,
849E1118B878F54F4ED2AA098C35558A532BDE1765220000,
8B9EB110ABCFF71F5ED2AA09CB6AD0F9032B9D16C5220000*0EEEAD18

Table 21 Rangecmp record format

Data	Bit(s) low to high	Bit length (bits)	Scale factor	Unit
Channel Tracking Status	0-31	32	See Table 20 Channel Tracking Status	-
Doppler Frequency	32-59	28	1/256	Hz

Pseudorange (PSR)	60-95	36	1/128	m
ADR[1]	96-127	32	1/256	cycles
StdDev-PSR	128-131	4	See [2]	m
StdDev-ADR	132-135	4	(n+1)/512	cycles
PRN/Slot[3]	136-143	8	1	-

[1] ADR is calculated following the formula below:

ADR_ROLLS = (RANGECMP_PSR / WAVELENGTH + RANGECMP_ADR) / MAX_VALUE

Round to the nearest integer, rounding methods:

IF (ADR_ROLLS $\leq$ 0)
    ADR_ROLLS = ADR_ROLLS - 0.5
ELSE
    ADR_ROLLS = ADR_ROLLS + 0.5

Obtain rounded ADR_ROLLS.

Corrected ADR is:

CORRECTED_ADR = RANGECMP_ADR - (MAX_VALUE*ADR_ROLLS)

Here,

ADR is in week
WAVELENGTH = 0.1902936727984 for GPS L1
WAVELENGTH = 0.2442102134246 for GPS L2
MAX_VALUE = 8388608

Note: different GLONASS satellites has different L1 and L2wave length, please refer to related materials for details.

[2]

Code	StdDev-PSR
0	0.050
1	0.075
2	0.113
3	0.169
4	0.253
5	0.380
6	0.570
7	0.854
8	1.281
9	2.375
10	4.750
11	9.500
12	19.000
13	38.000
14	76.000
15	152.000

Lock Time[4]	144-164	21	1/32	s
C/No[5]	165-169	5	(20 + n)	dB-Hz
Reserved	170-191	22		

[3] GPS: 1 to 32, GLONASS: 38 to 61; BDS: 161 to 197

[4] Tracking time are able to show maximum continuous tracking time of 65535.96875s (2097151/32) because it is limited by the maximum of 2,097,151 in RANGECMP record.

[5] C/N0 is limited to 20-51dB-Hz. Therefore, if the output is C/N0 = 20 dB-Hz, the actual value may be lower; if the output is C/N0 = 51 dB-Hz, the actual value may be higher.

Field	Type	Data Description	Format	Bytes	Offset
1	RANGECMP header	Log Header		H	0
2	#obs	Number of satellite observation data included in the information below	Ulong	4	H
3	1st range record	Table 21 RANGE information in compression format in Rangecmp record format	Hex	24	H+4
4	Next Rangecmp offset = H+4 (#obs x 24)				
5	xxxx	32-bit CRC (ASCII and binary only)	Ulong	4	H+4+ (#obs x
6	[CR][LF]	Sentence terminator (ASCII only)	-	-	-

2.32 *REFSTATION Base Station Position and Health*

This log contains the ECEF Cartesian position of the base station as received through the RTCM, RTCMV3, or CMR message. It also features a time tag, the health status of the base station, and the station ID. Field 6 represents the health status of the base station with 8 possible values (0 to 7), while 0-5 indicates the UDRE scale factor (1σ). UDRE scale factor corresponding 0-5 are listed below:
0: 1 (Healthy) 1: 0.75 2: 0.5 3: 0.3 4: 0.2 5: 0.1

When the health field of base station is applied to RTCM base station only, 6 means the base stations is not under monitoring, and 7 means the base station is not working.

Message ID: 175
Recommended Input:
LOG REFSTATIONA ONCHANGED
LOG Message output:
#REFSTATIONA,COM1,0,66.5,FINESTEERING,1364,490401.124,80000000,4E46,2310;00000000,-1634532.443,-3664608.907,4942482.713,0,RTCA,"AAAA"*1E2A0508

Field	Field	Data Description	Format	Bytes	Offset
1	REFSTATION header	Log header		H	0
2	status	Status of the base station (see Table 22)	ULong	4	H
3	x	ECEF X value	Double	8	H+4
4	y	ECEF Y value	Double	8	H+12
5	z	ECEF Z value	Double	8	H+20
6	health	Base station health, see the descrption of this paragraph	Ulong	4	H+28
7	stn type	Base station type, see Table 23	Enum	4	H+32
8	stn ID	Base station ID	Char[5]	8a	H+36
9	xxxx	32-bit CRC (ASCII and Binary only)	Hex	4	H+44
10	[CR][LF]	Sentence terminator (ASCII only)	-	-	-

Field	Field	Data Description	Format	Bytes	Offset
Field	Field	Data Description	Format	Bytes	Offset

Table 22 Base Station Status

Bit #	Mask	Description	Bit = 0	Bit = 1
0	0x00000001	Validity of the base station	Valid	Invalid

Table 23 Base Station Type

Base Station Type (Binary) (ASCII)		Description
0	NONE	Base station is not used
1	RTCM	Base station is RTCM v2
2	Reserved	Reserved
3	CMR	Base station is CMR
4	RTCMV3	Base station is RTCM v3

2.33 *RTCM V2 Differential Message*

RTCM Recommended Standards for Differential GNSS (Global Navigation Satellite Systems) Service, Version 2 at http://www.rtcm.org/overview.php.

The log which implement the RTCM standard format for Type 1, 3, 18, 19, 31 and 33 messages and more are defined as RTCM1, RTCM2, RTCM18, RTCM19, RTCM 31 and RTCM32.

RTCM V2:
RTCM1 DIFFERENTIAL GPS CORRECTIONS
RTCM3 BASE STATION PARAMETERS
RTCM18 RAW MEASUREMENTS
RTCM19 RAW MEASUREMENTS
RTCM24 ANTENNA REFERENCE INFORMATION(only support decoding at present)
RTCM31 DIFFERENTIAL GLONASS
RTCM32 GLONASS BASE PARAMETERS

Recommended Input:
LOG COM2 RTCM18 ONTIME 1

2.34 *RTCM V3 Differential Message*

RTCM Recommended Standards for Differential GNSS (Global Navigation Satellite Systems) Service, Version 3 and Version 3.2 at http://www.rtcm.org/overview.php.

The logs which implement the RTCM Standard Format for Type 1004, 1006, 1007, 1019, 1033, 1104 messages and more are defined as the RTCM1004, RTCM1006, RTCM1007, RTCM1019, RTCM1033 and RTCM1104 logs, etc.

RTCM V3:
Group 1 - Observations:
RTCM1001 L1Only GPS RTK
RTCM1002 Extended L1 Only GPS RTK
RTCM1003 L1 And L2 GPS RTK
RTCM1004 Extended L1and L2 GPS RTK
RTCM1009 L1-Only GLONASS RTK
RTCM1010 Extended L1 Only GLONASS RTK
RTCM1011 L1/L2 GLONASS RTK
RTCM1012 Extended L1/L2 GLONASS RTK

RTCM1074 GPS MSM4（all pseudo-range, carriers, and CN0 observation value）
RTCM1075 GPS MSM5 (all pseudo-range, carriers, Doppler and CN0 observation value)
RTCM1084 GLONASS MSM4（all pseudo-range, carriers, and CN0 observation value）
RTCM1085 GLONASS MSM5 (all pseudo-range, carriers, Doppler and CN0 observation value)
RTCM1124 BDS MSM4（all pseudo-range, carriers, and CN0 observation value）
RTCM1125 BDS MSM5 (all pseudo-range, carriers, Doppler and CN0 observation value)

Group 2 - Base Station Coordinates:
RTCM1005 RTK Base Antenna Reference Point (ARP)
RTCM1006 RTK Base ARP with Antenna Height

Group 3 - Antenna Description:
RTCM1007 Extended Antenna Descriptor and Setup Information

Group 4 - Auxiliary Operation Information:
RTCM1019 GPS Ephemerides
RTCM1020 GLONASS Ephemerides
RTCM1033 Receiver and antenna description
RTCM1105 Only for Unicore receiver，is used to output heading information from Heading to Moving base.

Recommended Input:
LOG COM2 RTCM1004 ONTIME 1

☞

Observation information of RTCM 1074-1125 belongs to the RTCM v3.2 differential message, it not recommend to mix use it with RTCM v3.0.
It is not recommend to mix use MS4 and MS5, namely the observation of BDS, GPS and GLONASS values should either use MS4, or MS5. If the radio transmission bandwidth is limited, please use MS4.

2.35 *RTKDATA RTK Solution Parameters*

This is the “RTK output” log, and it contains miscellaneous information regarding the RTK solution.

Message ID: 215
Recommended Input:
LOG RTKDATAA ONCHANGED
LOG Message output:
#RTKDATAA,COM1,0,45.0,FINE,1637,553172.000,00000000,0,0;SOL_COMPUTED,NARROW_INT,0
0000103,10,9,9,6,0,01,0,3,HNAV,0,4.3496e-05,-1.3770e-05,7.5487e-07,-1.3770e-05,9.5132e-05,6.1911e-0
5,7.5487e-07,6.1911e-05,1.0833e-04,0.0000,0.0000,0.0000,0.0000,0.0000,0.0000,3,9,6,NARROW_INT,0.
000712443,7,L1_INT,0.002354032,13,NARROW_INT,0.002983491,16,NARROW_INT,-0.001584528,19,
NARROW_INT,-0.000838759,21,L1_INT,0.003984752,23,NARROW_INT,0.002437893,31,L1_INT,-0.00
0497515,3,REFERENCE,0.000000000*4b974a71

Field	Field	Data Description	Format	Bytes	Offset
1	RTKDATA header	Log header		H	0
2	sol status	Solution status, see Table 17, Solution Status	Enum	4	H
3	pos type	Position type, see Table 16, Position or Velocity Type	Enum	4	H+4
4	rtk info	RTK information, see Table 24, RTK Information	Ulong	4	H+8
5	#SVs	Number of satellite vehicles tracked	Uchar	1	H+12
6	#solnSVs	Number of satellite vehicles in use	Uchar	1	H+13
7	#gbL1	Number of satellite with single frequency in use	Uchar	1	H+14
8	#gbL1L2	Number of satellite with dual or Triple frequency in use	Uchar	1	H+15
9	Reserved		Uchar	1	H+16
10	ext sol stat	Extended solution status, see Table 27, Extended Solution Status	Hex	1	H+17
11	Reserved		Hex	1	H+18
12	sig mask	Signal mask - if 0, signals used in solution are unknown, see 错误！未找到引用源。	Hex	1	H+19
13	Reserved		Enum	4	H+20
14	Reserved		Ulong	4	H+24
15-23	[C]	The Cxx, Cxy, Cxz, Cyx, Cyy, Cyz, Czx, Czy and Czz components in (meters)2, of the ECEF position covariance matrix (3x3).	Float	36	H+28
24	Reserved		Double	8	H+64
25			Double	8	H+72
26			Double	8	H+80
27			Float	4	H+88
28			Float	4	H+92
29			Float	4	H+96
30	ref PRN	Reference satellite PRN	Ulong	4	H+100
31	# SV	Number of the rest of SVs to follow	Long	4	H+104
32	PRN	Satellite PRN number	Ulong	4	H+108

Field	Field	Data Description	Format	Bytes	Offset
33	Amb	Ambiguity type, see Table , Ambiguity Type	Enum	4	H+112
34	res	Residual (m)	Float	4	H+116
35…	Next SV offset = H + 108 + (obs x 12)				
Variable	xxxx	32-bit CRC (ASCII and Binary only)	Hex	4	H+108+(12xobs)
variable	[CR][LF]	Sentence terminator (ASCII only)	-	-	-

Table 24 RTK Information

Bit#	Mask	Description	Bit = 0	Bit = 1
0	0x00000001	RTK dynamics	Static	Dynamic
1	0x00000002	RTK dynamics mode	Auto	Forced
2	0x00000004	Severe differential ionosphere detected	No	Yes

Table 25 Extended Solution Status

Bit	Mask	Description
0	0x01	Advance RTK Verified 0 = Not Verified 1 = Verified
1-3	0x0E	Pseudo-range Ionospheric Correction 0 = Unknown 1 = Klobuchar Broadcast ephemeris correction 2 = SBAS Ionosheric grid correction 3 = Multi-frequency Correction 4 = PSRDiff Correction

Table 26 Ambiguity Type

Ambiguity Type (binary)	Ambiguity Type (ASCII)	Description
0	UNDEFINED	Undefined
1	L1_FLOAT	L1 floating solution
2	IONOFREE_FLOAT	Ionospheric-free floating solution
3	NARROW_FLOAT	Narrow-lane floating solution
4	NLF_FROM_WL1	Narrow-lane floating solution derived from integer wide-lane fixed solution
5	L1_INT	L1 fixed solution
6	WIDE_INT	Wide-lane fixed solution
7	NRROW_INT	Narrow-lane fixed solution

8	IONOFREE_DISCRETE	Discrete ionospheric-free ambiguity
9 - 10	Reserved	
11	REFERENCE	Double-difference reference satellite (There are three references for BD if GLONASS is being used). The residuals of the references are always 0.0.

2.36 *RTKDATAH RTK Solution parameters*

For dual antenna board, this is a "RTK output" log and it contains information regarding the Heading RTK solution.

Message ID: 6007
LOG RTKDATAHA ONCHANGED
LOG Message output:
#RTKDATAHA,COM1,0,45.0,FINE,1637,553172.000,00000000,0,0;SOL_COMPUTED,NARROW_INT,00000103,10,9,9,6,0,01,0,3,HNAV,0,4.3496e-05,-1.3770e-05,7.5487e-07,-1.3770e-05,9.5132e-05,6.1911e-05,7.5487e-07,6.1911e-05,1.0833e-04,0.0000,0.0000,0.0000,0.0000,0.0000,0.0000,3,9,6,NARROW_INT,0.000712443,7,L1_INT,0.002354032,13,NARROW_INT,0.002983491,16,NARROW_INT,-0.001584528,19,NARROW_INT,-0.000838759,21,L1_INT,0.003984752,23,NARROW_INT,0.002437893,31,L1_INT,-0.000497515,3,REFERENCE,0.000000000*4b974a71

Field	Field	Data Description	Format	Bytes	Offset
1	RTKDATAH header	Log header		H	0
2	sol status	Solution status, see Table 17, Solution Status	Enum	4	H
3	pos type	Position type, see Table 16, Position or Velocity Type	Enum	4	H+4
4	rtk info	RTK information, see Table 24, RTK Information	Ulong	4	H+8
5	#SVs	Number of satellite vehicles tracked	Uchar	1	H+12
6	#solnSVs	Number of satellite vehicles in use	Uchar	1	H+13
7	#gbL1	Number of satellite with single frequency in use	Uchar	1	H+14
8	#gbL1L2	Number of satellite with dual or Triple frequency in use	Uchar	1	H+15
9	Reserved		Uchar	1	H+16
10	ext sol stat	Extended solution status, see Table 25, Extended Solution Status	Hex	1	H+17
11	Reserved		Hex	1	H+18
12	sig mask	Signal mask - if 0, signals used in solution are unknown, see Table 18 错误！未找到引用源。	Hex	1	H+19
13	Reserved		Enum	4	H+20
14	Reserved		Ulong	4	H+24

Field	Field	Data Description	Format	Bytes	Offset
15-23	[C]	The Cxx, Cxy, Cxz, Cyx, Cyy, Cyz, Czx, Czy and Czz components in (meters)2, of the ECEF position covariance matrix (3x3).	Float	36	H+28
24	Reserved		Double	8	H+64
25			Double	8	H+72
26			Double	8	H+80
27			Float	4	H+88
28			Float	4	H+92
29			Float	4	H+96
30	ref PRN	Reference satellite PRN	Ulong	4	H+100
31	# SV	Number of the rest of SVs to follow	Long	4	H+104
32	PRN	Satellite PRN number	Ulong	4	H+108
33	Amb	Ambiguity type, see Table 26	Enum	4	H+112

2.37 *RTKDOP DOP Values from the RTK Filter*

This log contains the DOP values calculated by the RTK.
The RTKDOP log contains single-point DOPs, calculated using only the satellites used in the RTK solution, that is, those used for the RTKPOS position. Calculation of the RTK DOPs is limited to once a second.

Message ID: 952
Recommended Input:
LOG RTKDOPA ONTIME 1
LOG Message output:
#RTKDOPA,COM1,0,43.0,FINE,1633,459641.000,00000000,0,0;2.0232,1.7895,0.8897,1.2971,0.9438,5.0,9,14,16,20,22,25,29,30,32,31*83662c6c

Field	Field	Data Description	Format	Bytes	Offset
1	RTKDOP header	Log header		H	0
2	GDOP	Geometric DOP	Float	4	H
3	PDOP	Position DOP	Float	4	H+4
4	HDOP	Horizontal DOP	Float	4	H+8
5	HTDOP	Horizontal and Time DOP	Float	4	H+12
6	TDOP	Time DOP	Float	4	H+16
7	elev mask	Elevation cut-off angle	Float	4	H+20
8	#sats	Total of satellites in use of calculation	Ulong	4	H+24
9	sats	Satellites in use at time of calculation	Ulong[#sats]	4x(#sats)	H+28

Field	Field	Data Description	Format	Bytes	Offset
10	xxxx	32-bit CRC (ASCII and Binary only)	Hex	4	variable
11	[CR][LF]	Sentence terminator (ASCII only)	-	-	-

2.38 *RTKPOS RTK Low Latency Position Data*

This log contains the low latency RTK position computed by the receiver, along with two status flags. In addition, it reports other status indicators, including differential age, which is useful in predicting anomalous behavior brought about by outages in differential correction information. This log is recommended to be used in dynamics mode. Improved precision can be obtained in static operation with the MATCHEDPOS log.

With the system operating in an RTK mode, this log reflects if the solution is a good RTK low latency solution (from extrapolated base station measurements) or invalid. A valid RTK low latency solution is computed for up to 60 seconds after reception of the last base station observation.

Message IDL 141
Recommended Input:
LOG RTKPOSA ONTIME 1
LOG Message output:
#RTKPOSA,COM1,0,95.0,FINE,1623,113864.000,00000000,0,0;SOL_COMPUTED,NARROW_INT,40.03693414126,116.30175020528,55.1119,0.0000,WGS84,0.0162,0.0146,0.0554,"0",1.000,0.000,8,7,7,5,0,1,0,3*9eeebab7

Field	Field	Data Description	Format	Bytes	Offset
1	RTKPOS header	Log header		H	0
2	sol status	Solution status, See Table 17, Solution Status	Enum	4	H
3	pos type	Position type, See Table 16，Position or Velocity Type	Enum	4	H+4
4	lat	Latitude	Double	8	H+8
5	lon	Longitude	Double	8	H+16
6	hgt	Height above sea level	Double	8	H+24
7	undulation	Geoid undulation - the relationship between the geoid and the WGS84 ellipsoid (m)	Float	4	H+32
8	datum id#	Coordinate system ID, only support WGS84 at present, ID: WE	Enum	4	H+36
9	lat σ	Latitude standard deviation	Float	4	H+40
10	lon σ	Longitude standard deviation	Float	4	H+44
11	hgt σ	Height standard deviation	Float	4	H+48
12	stn id	Base station ID	Char[4]	4	H+52
13	diff_age	Differential age in seconds	Float	4	H+56
14	sol_age	Solution age in seconds	Float	4	H+60

Field	Field	Data Description	Format	Bytes	Offset
15	#SVs	Number of satellite vehicles tracked	Uchar	1	H+64
16	#solnSVs	Number of satellite vehicles used in solution	Uchar	1	H+65
17	Reserved		Uchar	1	H+66
18			Uchar	1	H+67
19			Uchar	1	H+68
20			Hex	1	H+69
21			Hex	1	H+70
22	sig mask	Signals mask, See Table 18 错误！未找到引用源。	Hex	1	H+71
23	xxxx	32-bit CRC (ASCII and Binary only)	Hex	4	H+72
24	[CR][LF]	Sentence terminator (ASCII only)	-	-	-

2.39 *RTKVEL RTK Velocity*

This log contains the RTK velocity information computed by the receiver. In addition, it reports other velocity status indicators including differential age, which is useful in predicting anomalous behavior brought about by outages in differential corrections. The velocity measurements precision sometimes associated with its transmitting latency.. The time of validity is the time tag in the log minus the latency value.

Message ID: 216
Recommended Input:
LOG RTKVELA ONTIME 1
LOG Message output:
#RTKVELA,COM1,0,43.5,FINESTEERING,1364,496137.000,00100000,71E2,2310;SOL_COMPUTED,NARROW_INT,0.250,1.000,0.0027,207.645811,0.0104,0.0*F551CC42

Field	Field	Data Description	Format	Bytes	Offset
1	RTKVEL header	Log header		H	0
2	sol status	Solution status, See Table 17	Enum	4	H
3	vel type	Velocity type, See Table 16	Enum	4	H+4
4	latency	The latency value calculated by velocity time tag in seconds. It should be subtracted from the epoch time to give improved results.	Float	4	H+8
5	age	Differential age in seconds	Float	4	H+12
6	horspd	Horizontal speed over ground, in meters per second	Double	8	H+16
7	trkgnd	Actual direction of motion over ground (track over ground) with respect to True North, in degrees	Double	8	H+24

Field	Field	Data Description	Format	Bytes	Offset
8	vertspd	Vertical speed, in meters per second, where positive values indicate increasing altitude (up) and negative values indicate decreasing altitude (down)	Double	8	H+32
9	Reserved		Float	4	H+40
10	xxxx	32-bit CRC (ASCII and Binary only)	Hex	4	H+44
11	[CR][LF]	Sentence terminator (ASCII only)	-	-	-

2.40 *SATVIS Satellite in View*

This log contains the list of satellite in view and satellite information.

Message ID: 48
Recommended Input:
LOG SATVISA ONTIME 1
LOG Message output:
#SATVISA,COM1,0,48.0,FINE,1640,371048.000,00000000,e,0;TRUE,TRUE,17,3,0,0,41.190685,186.419877,0.000000,0.000000,6,0,0,51.706690,165.885610,0.000000,0.000000,13,0,0,26.893453,316.113012,0.000000,0.000000,16,0,0,75.204078,300.760386,0.000000,0.000000,19,0,0,11.127860,191.716156,0.000000,0.000000,20,0,0,8.409325,246.694548,0.000000,0.000000,21,0,0,7.988951,85.878864,0.000000,0.000000,23,0,0,53.522298,289.143272,0.000000,0.000000,29,0,0,7.220252,36.064232,0.000000,0.000000,30,0,0,65.566387,32.858640,0.000000,0.000000,31,0,0,38.664195,98.451945,0.000000,0.000000,32,0,0,8.823622,223.616555,0.000000,0.000000,161,0,0,35.879199,139.716082,0.000000,0.000000,163,0,0,33.788116,225.567557,0.000000,0.000000,164,0,0,26.012868,124.030921,0.000000,0.000000,167,0,0,65.324708,143.221076,0.000000,0.000000,168,0,0,70.829717,216.400078,0.000000,0.000000*50e17350

Field	Field	Data Description	Format	Bytes	Offset
1	SATVIS header	Log header		H	0
2	sat vis	Is satellite visibility in view? 0 = FALSE 1 = TRUE	Enum	4	H
3	comp alm	Was complete BD2 /GPS/GLO ephemeris used?0 = FALSE 1 = TRUE	Enum	4	H+4
4	#sat	Number of satellites with data	Ulong	4	H+8
5	PRN/slot	Satellite PRN number (GPS: 1 to 32, and GLONASS: 38 to 61,and BD2 161 to 197)	Short	2	H+12
6	glofreq	(GLONASS Frequency + 7), GPS and BD2 not use	Short	2	H+14
7	health	Satellite health	Ulong	4	H+16
8	elev	Elevation (degrees)	Double	8	H+20
9	az	Azimuth (degrees)	Double	8	H+28

Field	Field	Data Description	Format	Bytes	Offset
10	true dop	Theoretical Doppler of satellite - the expected Doppler frequency based on a satellite's motion relative to the receiver. It is computed using the satellite's coordinates and velocity, and the receiver's coordinates and velocity. (Hz)	Double	8	H+36
11	app dop	Actual Doppler for this receiver – similar to the Theoretical Doppler above but with clock error correction added. (Hz)	Double	8	H+44
12	Next satellite offset = H + 12 + (#sat x 40)				
variable	xxxx	32-bit CRC (ASCII and Binary only)	Hex	4	H+12+ (#sat x 40)
variable	[CR][LF]	Sentence terminator (ASCII only)	-	-	-

2.41 *TIME Time information*

This log provides several time related pieces of information including receiver clock error and UTC time and offset.

Message ID: 101
Recommended Input:
LOG TIMEA ONTIME 1
LOG Message output:
#TIMEA,COM1,0,47.0,FINE,1640,371112.000,00000000,e,0;VALID,-0.000258012,0.000000010,-15.000 00000000,2011,6,16,7,4,57000,VALID*c4de1976

Field	Field	Data Description	Format	Bytes	Offset
1	TIME header	Log header		H	0
2	clock status	Clock model (not including current measurement data) Not support temporarily	Enum	4	H
3	offset	In contrast to receiver clock error of GPS in seconds. A positive offset implies that the receiver clock is ahead of GPS time. To derive GPS time, use the following formula: GPS time = receiver time – clock error	Double	8	H+4
4	offset std	Receiver clock error standard deviation.	Double	8	H+12
5	utc offset	The offset from GPS time to UTC time, computed using ephemeris parameters. UTC time is GPS time plus the current UTC offset plus the receiver clock error: UTC time = GPS time + clock error + UTC offset	Double	8	H+20

Field	Field	Data Description	Format	Bytes	Offset
6	utc year	UTC year	Ulong	4	H+28
7	utc month	UTC month (0-12) [a]	Uchar	1	H+32
8	utc day	UTC day (0-31) [a]	Uchar	1	H+33
9	utc hour	UTC hour (0-23)	Uchar	1	H+34
10	utc min	UTC minute (0-59)	Uchar	1	H+35
11	utc ms	UTC millisecond (0-60999) [b]	Ulong	4	H+36
12	utc status	UTC status 0 = Invalid 1 = Valid 2 = Warning[c]	Enum	4	H+40
13	xxxx	32-bit CRC (ASCII and Binary only)	Hex	4	H+44
14	[CR][LF]	Sentence terminator (ASCII only)	-	-	-

a. If UTC time is unknown, the values for month and day are 0.
b. Maximum of 60999 when leap second is applied.
c. Indicates that the leap seconds value is used as a default due to the lack of an almanac.

2.42 *VERSION Version information*

This log message contains the product name, function authorization, serial number, hardware version, firmware version of receivers.

Message ID: 37
Recommended Input:
LOG VERSIONA ONCE
LOG Message output:
#VERSIONA,ICOM4,0,86.0,FINE,1811,123967.000,00000000,000e,0;1,ENCLOSURE,"B123G125R12E0-HMRBDP1010-S100-P100-L:2015-6-28","080101001800-562001133200003","UB370-3.02","R4.00Build3.10722","none","",""*26c637b9

Field	Field	Data Description	Format	Bytes	Offset
1	VERSION header	Log header		H	0
2	# comp	Number of receivers/boards (cards, and so on)	Long	4	H
3	type	Component type	Enum	4	H+4
4	model	Valid model name or display *Invalid* when auth code expired	Char[16]	16	H+8
5	psn	Product part number and serial number	Char[16]	16	H+24
6	hw version	Hardware version	Char[16]	16	H+40
7	sw version	Firmware version	Char[16]	16	H+56

Field	Field	Data Description	Format	Bytes	Offset
8	boot version	Boot and BB version	Char[16]	16	H+72
9	Reserved	Reserved	Char[12]	12	H+88
10	comp time	Firmware compile date and time	Char[12]	12	H+100
11...	Next component offset = H + 4 + (#comp x 108)				
variable	xxxx	32-bit CRC (ASCII and Binary only)	Hex	4	H+4+ (#compx 108)
variable	[CR][LF]	Sentence terminator (ASCII only)	-	-	-

☞ ***Note:*** *current "product type" supports ENCLOSURE and BOARD only;*

☞ *Mode information indicates feature options supported by receivers, which are divided into four parts, namely, signal type-PVT options-output rate-authorization time.*

☞ ***Signal type:*** *starting with B, G, R, E and S, the following numbers indicates frequency point and 0 indicates the system is not supported;*

☞ ***PVT options:*** *the mix of letters and numbers indicate PVT features like base stations, rover stations and heading, etc., equipped with receivers;*

☞ ***Output rate:*** *raw observation data and PVT output rate provided by receivers. Information displayed depends on specific board and corresponding authorization code*

☞ ***Authorization time:*** *only working in single frequency mode, the receiver time is more than auth time and only GGA information on 1Hz is output. If the authorization time is more than 100 years, the receivers are authorized permanently.*

BDS		GPS		GLONASS		Galileo		SBAS/L	
B1		**G1**		**R1**		**E0**		**S0**	
B0	Disable	**G0**	Disable	**R0**	Disable	**E0**	Disable	**S0**	Disable
B1	B1	**G1**	L1	**R1**	G1	**E1**	E1	**S1**	SBAS
B12	B1, B2	**G12**	L1, L2	**R12**	G1, G2	**E15a**	E1, E5a	**SL**	SBAS, L
B123	B1, B2, B3	**G125**	L1, L2, L5		Reserved	**E15a5b**	E1, E5a, E5b		Reserved
B13	B1,B3		Reserved		Reserved		Reserved		Reserved

Position/ Correction mode		Dynamic		Altitude		PPS		Event	
S		**0**		**0**		**0**		**0**	
H	Heading	0	515m/s	0	18000	0	Disable	0	Disable

					m				
R	RTK Fixed	3	No limit.	3	No limit.	1	Enable	1	Enable
B	RTK TX, DGPS TX								
S	Single								
P	PPP								
U	Reserved								
M	Moving Base								
D	DGPS Rx								

Measure Rate		**Position Rate**	
S0		P1000	
1000	1Hz	1000	1Hz
200	5Hz	200	5Hz
100	10Hz	100	10Hz
50	20Hz	50	20Hz
	Reserved		Reserved
	Reserved		Reserved
0	None	0	None

2.43 *Query messages show receiver settings set by corresponding command*

Following LOG followed by the following commands are able to display current parameters of the commands, all parameter formats are same as corresponding command.

For example:
LOG ECUTOFF

- ECUTOFF
- BD2ECUTOFF
- FIX
- NETCONFIG
- DATASERVERCONFIG
- NETPORTCONFIG
- NETUPLOAD
- ANTENNAPOWER
- PPSCONFIG

3. Default configuration of receiver

Factory configuration of receiver:

ANTENNAPOWER ON

ECUTOFF BD2 5.0

ECUTOFF GPS 5.0

ECUTOFF GLONASS 5.0

CLOCKSWITCH disable

COM COM1 115200

COM COM2 115200

COM COM3 115200

FIX NONE

NETUPLOAD 30 30

PPSCONFIG GPS ENABLE NEGATIVE 1000 0 0 0

4. 32-Bit CRC

Both ASCII and binary format log messages contain 32-bit CRC, which provide further assurance of transmitted/received data. The following C algorithm gives an example to generate CRC bits:

```
const ULONG aulCrcTable[256] =
{
    0x00000000UL, 0x77073096UL, 0xee0e612cUL, 0x990951baUL, 0x076dc419UL, 0x706af48fUL,
    0xe963a535UL, 0x9e6495a3UL, 0x0edb8832UL, 0x79dcb8a4UL, 0xe0d5e91eUL, 0x97d2d988UL,
    0x09b64c2bUL, 0x7eb17cbdUL, 0xe7b82d07UL, 0x90bf1d91UL, 0x1db71064UL, 0x6ab020f2UL,
    0xf3b97148UL, 0x84be41deUL, 0x1adad47dUL, 0x6ddde4ebUL, 0xf4d4b551UL, 0x83d385c7UL,
    0x136c9856UL, 0x646ba8c0UL, 0xfd62f97aUL, 0x8a65c9ecUL, 0x14015c4fUL, 0x63066cd9UL,
    0xfa0f3d63UL, 0x8d080df5UL, 0x3b6e20c8UL, 0x4c69105eUL, 0xd56041e4UL, 0xa2677172UL,
    0x3c03e4d1UL, 0x4b04d447UL, 0xd20d85fdUL, 0xa50ab56bUL, 0x35b5a8faUL, 0x42b2986cUL,
    0xdbbbc9d6UL, 0xacbcf940UL, 0x32d86ce3UL, 0x45df5c75UL, 0xdcd60dcfUL, 0xabd13d59UL,
    0x26d930acUL, 0x51de003aUL, 0xc8d75180UL, 0xbfd06116UL, 0x21b4f4b5UL, 0x56b3c423UL,
    0xcfba9599UL, 0xb8bda50fUL, 0x2802b89eUL, 0x5f058808UL, 0xc60cd9b2UL, 0xb10be924UL,
    0x2f6f7c87UL, 0x58684c11UL, 0xc1611dabUL, 0xb6662d3dUL, 0x76dc4190UL, 0x01db7106UL,
    0x98d220bcUL, 0xefd5102aUL, 0x71b18589UL, 0x06b6b51fUL, 0x9fbfe4a5UL, 0xe8b8d433UL,
    0x7807c9a2UL, 0x0f00f934UL, 0x9609a88eUL, 0xe10e9818UL, 0x7f6a0dbbUL, 0x086d3d2dUL,
    0x91646c97UL, 0xe6635c01UL, 0x6b6b51f4UL, 0x1c6c6162UL, 0x856530d8UL, 0xf262004eUL,
    0x6c0695edUL, 0x1b01a57bUL, 0x8208f4c1UL, 0xf50fc457UL, 0x65b0d9c6UL, 0x12b7e950UL,
    0x8bbeb8eaUL, 0xfcb9887cUL, 0x62dd1ddfUL, 0x15da2d49UL, 0x8cd37cf3UL, 0xfbd44c65UL,
    0x4db26158UL, 0x3ab551ceUL, 0xa3bc0074UL, 0xd4bb30e2UL, 0x4adfa541UL, 0x3dd895d7UL,
    0xa4d1c46dUL, 0xd3d6f4fbUL, 0x4369e96aUL, 0x346ed9fcUL, 0xad678846UL, 0xda60b8d0UL,
    0x44042d73UL, 0x33031de5UL, 0xaa0a4c5fUL, 0xdd0d7cc9UL, 0x5005713cUL, 0x270241aaUL,
```

```
    0xbe0b1010UL, 0xc90c2086UL, 0x5768b525UL, 0x206f85b3UL, 0xb966d409UL, 0xce61e49fUL,
    0x5edef90eUL, 0x29d9c998UL, 0xb0d09822UL, 0xc7d7a8b4UL, 0x59b33d17UL, 0x2eb40d81UL,
    0xb7bd5c3bUL, 0xc0ba6cadUL, 0xedb88320UL, 0x9abfb3b6UL, 0x03b6e20cUL, 0x74b1d29aUL,
    0xead54739UL, 0x9dd277afUL, 0x04db2615UL, 0x73dc1683UL, 0xe3630b12UL, 0x94643b84UL,
    0x0d6d6a3eUL, 0x7a6a5aa8UL, 0xe40ecf0bUL, 0x9309ff9dUL, 0x0a00ae27UL, 0x7d079eb1UL,
    0xf00f9344UL, 0x8708a3d2UL, 0x1e01f268UL, 0x6906c2feUL, 0xf762575dUL, 0x806567cbUL,
    0x196c3671UL, 0x6e6b06e7UL, 0xfed41b76UL, 0x89d32be0UL, 0x10da7a5aUL, 0x67dd4accUL,
    0xf9b9df6fUL, 0x8ebeeff9UL, 0x17b7be43UL, 0x60b08ed5UL, 0xd6d6a3e8UL, 0xa1d1937eUL,
    0x38d8c2c4UL, 0x4fdff252UL, 0xd1bb67f1UL, 0xa6bc5767UL, 0x3fb506ddUL, 0x48b2364bUL,
    0xd80d2bdaUL, 0xaf0a1b4cUL, 0x36034af6UL, 0x41047a60UL, 0xdf60efc3UL, 0xa867df55UL,
    0x316e8eefUL, 0x4669be79UL, 0xcb61b38cUL, 0xbc66831aUL, 0x256fd2a0UL, 0x5268e236UL,
    0xcc0c7795UL, 0xbb0b4703UL, 0x220216b9UL, 0x5505262fUL, 0xc5ba3bbeUL, 0xb2bd0b28UL,
    0x2bb45a92UL, 0x5cb36a04UL, 0xc2d7ffa7UL, 0xb5d0cf31UL, 0x2cd99e8bUL, 0x5bdeae1dUL,
    0x9b64c2b0UL, 0xec63f226UL, 0x756aa39cUL, 0x026d930aUL, 0x9c0906a9UL, 0xeb0e363fUL,
    0x72076785UL, 0x05005713UL, 0x95bf4a82UL, 0xe2b87a14UL, 0x7bb12baeUL, 0x0cb61b38UL,
    0x92d28e9bUL, 0xe5d5be0dUL, 0x7cdcefb7UL, 0x0bdbdf21UL, 0x86d3d2d4UL, 0xf1d4e242UL,
    0x68ddb3f8UL, 0x1fda836eUL, 0x81be16cdUL, 0xf6b9265bUL, 0x6fb077e1UL, 0x18b74777UL,
    0x88085ae6UL, 0xff0f6a70UL, 0x66063bcaUL, 0x11010b5cUL, 0x8f659effUL, 0xf862ae69UL,
    0x616bffd3UL, 0x166ccf45UL, 0xa00ae278UL, 0xd70dd2eeUL, 0x4e048354UL, 0x3903b3c2UL,
    0xa7672661UL, 0xd06016f7UL, 0x4969474dUL, 0x3e6e77dbUL, 0xaed16a4aUL, 0xd9d65adcUL,
    0x40df0b66UL, 0x37d83bf0UL, 0xa9bcae53UL, 0xdebb9ec5UL, 0x47b2cf7fUL, 0x30b5ffe9UL,
    0xbdbdf21cUL, 0xcabac28aUL, 0x53b39330UL, 0x24b4a3a6UL, 0xbad03605UL, 0xcdd70693UL,
    0x54de5729UL, 0x23d967bfUL, 0xb3667a2eUL, 0xc4614ab8UL, 0x5d681b02UL, 0x2a6f2b94UL,
    0xb40bbe37UL, 0xc30c8ea1UL, 0x5a05df1bUL, 0x2d02ef8dUL
};


// Calculate and return the CRC for usA binary buffer
ULONG CalculateCRC32(UCHAR *szBuf, INT iSize)
{
    int             iIndex;
    ULONG    ulCRC = 0;
    for (iIndex=0; iIndex<iSize; iIndex++)
    {
        ulCRC = aulCrcTable[(ulCRC ^ szBuf[iIndex]) & 0xff] ^ (ulCRC >> 8);
    }
    return ulCRC;
}
```

5. Example of network configuration

User need to configure the network and FTP storage before using related functions. Detail steps as below (suppose the IP address is 192. 168.10.168):

1. Set the IP address by input the command:
   NETCONFIG static 192.168.10.168::192.168.10.1:255.255.255.0:UB370:eth0
2. Configure the TCP port: *NETPORTCONFIG TCP 45000*
3. Set storage path of FTP: *DATASERVERCONFIG FTP 192.168.20.30* root unicore /test/
   (Notice: make sure the path exists on ftp server before configuration, or else related data cannot be stored to ftp).
4. Save current configuration: *SAVECONFIG*
   All steps can be implemented through the serial port using CDT software to configure.

6. Example of UDP connection

User need to configure the network parameters of the receiver before using UDP connection. Detail steps as below (suppose the IP addresses of receiver and UDP client is 192.168.10.168 and 192.168.10.188 respectively):

1. Set the IP address of receiver by input the command:
   NETCONFIG static 192.168.10.168::192.168.10.1:255.255.255.0:UR370:eth0
2. Configure the network parameters of UDP client:
   NETPORTCONFIG 192.168.10.188 45000 1
3. Log messages output from ICOM1:
   LOG ICOM1 RANGB ONTIME 1
   ……
4. Save current configuration: *SAVECONFIG*
5. Use UDP client tool to get the data stream through network.

   All commands can be implemented through the serial port using CDT or other serial port tools, and also through the network using CDT.

7. Example of RTK application configuration

User need to configure the RTK parameters of the receiver. Detailed configuration steps as follows:
Base station configuration:

1. FIX POSITION 40.000302123 116.289244543 55.130
   LOG COM2 RTCM1074 ONTIME 1
   LOG COM2 RTCM1084 ONTIME 1
   LOG COM2 RTCM1094 ONTIME 1

LOG COM2 RTCM1124 ONTIME 1
LOG COM2 RTCM1005 ONTIME 10

2. SAVECONFIG

Rover station configuration:

1. The receiver defaults to a rover station

8. Example of Outputting Raw Measurement Configuration

For post-processing relative position or data analyzing, the raw measurement (raw data) is required. If the receiver is activated by this option, it can be configured to output those message as following.

Usually, 1sec interval binary message is better for data analyzing, and bigger interval for post-processing (15s, 30s etc.). User can recorded those message into a file.

LOG COM2 VERSION ONCE
LOG COM2 TIMEB ONTIME 1
LOG COM2 BESTPOSB ONTIME 1
LOG COM2 BESTVELB ONTIME 1
LOG COM2 BD2EPHEMB ONCHANGED
LOG COM2 BD2IONUTCB ONCHANGED
LOG COM2 GPSEPHEMB ONCHANGED
LOG COM2 IONUTCB ONCHANGED
LOG COM2 GLOEPHEMERISB ONCHANGED
LOG COM2 GALEPHEMERISB ONCHANGED
LOG COM2 RANGEB ONTIME 1

When the receiver is operated as rover, another log is suggested:
LOG COM2 REFSTATIONB ONCHANGED