Application Note AN0028

Binary Messages

Of

SkyTraq Venus 8 GNSS Receiver

Ver 1.4.25

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Binary Message Protocol

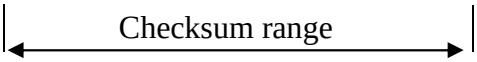
The SkyTraq binary message protocol manual provides the detailed descriptions on the SkyTraq binary protocol serving as a communicating interface between SkyTraq GNSS receivers and an external host such as PC, Notebook and mobile personal device. It is a standard protocol used by all SkyTraq devices and provides users a satisfactory control over the GNSS receivers.

The SkyTraq GNSS receiver outputs standard NMEA messages during normal operation. This NMEA messages may be a scheduled output at a specified rate subject to user's requests. The SkyTraq binary message protocol is designed with cares on reliable transmissions of data, ease & efficiency of implement, and payload independence mechanism which ensure users to retrieve data in a most effective & flexible way. The overall binary protocol messages can be categorized as input and output messages. Input messages provide the functionality to users to control the behavior of the GNSS receiver and to retrieve the detailed information of the GNSS status in real-time. Output messages, on the other hand, are information strings that GNSS receiver responses to requests from hosts and can optionally periodically reports the Position, Velocity and Time (PVT) via NMEA or binary messages.

BINARY MESSAGE STRUCTURE

Message Format

The following picture shows the structure of a binary message.



Start of Sequence	Payload Length (PL)	Payload		Checksum (CS)	End of Sequence
		Message ID	Message Body		
0xA0, 0xA1	Two bytes	Message ID: 1 bytes; Payload up to 65535 bytes		One byte	0x0D, 0x0A

The syntax of the message is shown below.

<0xA0,0xA1><PL><Message ID><Message Body><CS><0x0D,0x0A>

Start of Sequence

This field contains two bytes of values 0xA0, 0xA1 which indicate start of Messages.

Payload Length

The payload length (PL) field contains 16 bits of value which indicates the length of payload.

Payload

The payload field consists of 2 sub-fields, Message ID and Message Body. Message ID field defines the message ID.

Sub-Field	Values
Message ID (ID)	0x01~0xFF
Message Body	Data Bytes

Message Body

The Message Body may further consist of 2 sub-fields, Sub-Message ID (Sub-ID) and Sub-Message Body.

Sub-Field	Values

Sub-Message ID(SID)	0x01~0xFF
Sub-Message Body	Data Bytes

Checksum

Checksum (CS) field is transmitted in all messages. The checksum field is the last field in a message before the end of sequence field. The checksum is the 8-bit exclusive OR of only the payload bytes which start from Message ID until the last byte prior to the checksum byte. A reference to the calculation of CS is provided below,

CS = 0, N=PL;
For n = 0 to N
CS = CS ^ <Payload Byte # n>

End of Sequence

This field contains two bytes of values 0x0D, 0x0A which indicate end of Messages.

Data Byte Ordering

All payloads in binary protocol are transferred in big-endian format. The high order byte is transmitted first followed by the low order byte for data size larger than a byte (e.g. UINT32, DPFP).

Data Type Definition

UINT8	8 bit unsigned integer
UINT16	16 bit unsigned integer
UINT32	32 bit unsigned integer
SINT8	8 bit signed integer
SINT16	16 bit signed integer
SINT32	32 bit signed integer
SPFP	32 bit single precision floating point number
DPFP	64 bit double precision floating point number

MESSAGE FLOW

Host can perform actions to GNSS receiver by issuing a request or a set message. The message flow between Host and GNSS receiver is designed under the considerations of certain reliable transmission. SkyTraq binary message protocol requires an ACK response from the GNSS receiver upon receiving a successful input message and on the other hand, requires a NACK response from the receiver to a failed input message. Figure 1 shows a message flow that a host requests information from GNSS receiver and the GNSS receiver responses with an ACK and information respectively. Figure 2 shows a message flow with un-successful input message. Therefore, all requests (input messages) will have a corresponding ACK or NACK to be related with. However, output messages will not require the host to confirm by an ACK or NACK back in current design.

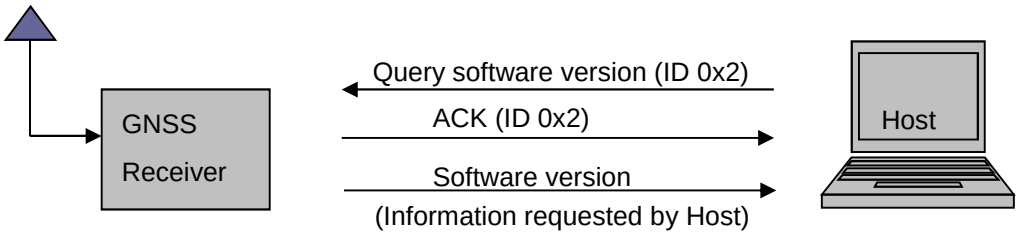


Figure 1

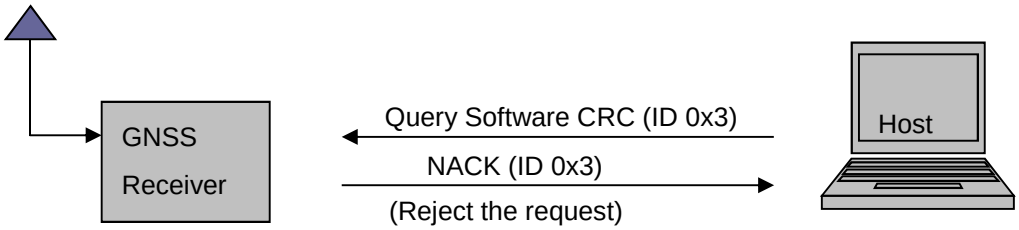


Figure 2

MESSAGE LIST

This section provides brief information about available SkyTraq binary input, output and sub-id messages shown in a tabular list. All the messages are listed by Message ID. Full descriptions of input and output messages will be described in later Sections.

Input System Messages				
ID (Hex)	ID (Decimal)	Attribute	Name	Descriptions
0x1	1	Input	System Restart	Force system to restart
0x2	2	Input	Query Software version	Query revision information of software
0x3	3	Input	Query Software CRC	Query the CRC of the software
0x4	4	Input	Set Factory Defaults	Set system to factory default values
0x5	5	Input	Configure Serial Port	Set up serial port COM, baud rate, data bits, stop bits and parity
0x6	6	Input	Reserved	Reserved
0x7	7	Input	Reserved	Reserved
0x8	8	Input	Configure NMEA	Configure NMEA output message
0x9	9	Input	Configure Message Type	Configure and select the output message type
0xB	11	Input	Software Image Download	Software image download to system flash
0xC	12	Input	Configure Power Mode	Set system power mode
0xE	14	Input	Configure Position Update Rate	Configure the position update rate of GNSS system
0x10	16	Input	Query Position Update Rate	Query the position update rate of GNSS system
0x11	17	Input	Configure Navigation Data Message Interval	Configure the navigation output message interval
0x15	21	Input	Query Power Mode	Query the power mode status of GNSS receiver
Input GNSS Messages				
ID (Hex)	ID (Decimal)	Attribute	Name	Descriptions
0x29	41	Input	Configure Datum	Configure Datum of the GNSS receiver
0x2A	42	Input	Configure DOP Mask	Configure values of DOP mask
0x2B	43	Input	Configure Elevation and CNR Mask	Configure values of Elevation and CNR Mask
0x2D	45	Input	Query Datum	Query datum used by the GNSS receiver

0x2E	46	Input	Query DOP Mask	Query the information of DOP mask used by GNSS receiver
0x2F	47	Input	Query Elevation and CNR Mask	Query the values of elevation mask and CNR mask used by GNSS receiver
0x30	48	Input	Get GPS Ephemeris	Retrieve GPS ephemeris data of the GNSS receiver
0x39	57	Input	Configure Position Pinning	Enable or disable position pinning of GNSS receiver
0x3A	58	Input	Query Position Pinning	Query position pinning status of the GNSS receiver
0x3B	59	Input	Configure Position Pinning Parameters	Set position pinning parameters of GNSS receiver
0x41	65	Input	Set GPS Ephemeris	Set GPS ephemeris data to the GNSS receiver
0x45	69	Input	Configure 1PPS Cable Delay	Configure cable delay of 1PPS timing
0x46	70	Input	Query 1PPS Cable Delay	Query 1PPS cable delay of GNSS receiver
Messages with Sub-ID				
ID/Sub-ID (Hex)	ID/Sub-ID (Decimal)	Attribute	Name	Descriptions
0x62/0x1	0x62/0x1	Input	Configure SBAS	Configure SBAS parameters of GNSS receiver
0x62/0x2	0x62/0x2	Input	Query SBAS Status	Query SBAS status of GNSS receiver
0x62/0x3	0x62/0x3	Input	Configure QZSS	Configure QZSS parameters of GNSS receiver
0x62/0x4	0x62/0x4	Input	Query QZSS Status	Query QZSS status of GNSS receiver
062/0x80	062/0x80	Output	SBAS Status	SBAS status of GNSS receiver
062/0x81	062/0x81	Output	QZSS Status	QZSS status of GNSS receiver
0x63/0x1	0x63/0x1	Input	Configure SAEE	Configure SAEE of GNSS receiver
0x63/0x2	0x63/0x2	Input	Query SAEE	Query SAEE of GNSS receiver
0x63/0x80	0x63/0x80	Output	SAEE status	SAEE status of GNSS receiver
0x64/0x1	0x64/0x1	Input	Query Boot Status	Query boot status of GNSS receiver
0x64/0x2	0x64/0x2	Input	Configure Extended NMEA Message Interval	Configure extended NMEA message interval of GNSS Receiver
0x64/0x3	0x64/0x3	Input	Query Extended NMEA Message Interval	Query extended NMEA message interval of GNSS receiver
0x64/0x6	0x64/0x6	Input	Configure Interference	Configure interference detection of GNSS

			Detection	receiver
0x64/0x7	0x64/0x7	Input	Query Interference Detection Status	Query interference detection status of GNSS receiver
0x64/0x17	100/23	Input	Configure GNSS Navigation Mode	Configure the navigation mode of GNSS receiver
0x64/0x18	100/24	Input	Query GNSS Navigation Mode	Query the navigation mode of GNSS receiver
0x64/0x19	100/0x25	Input	Configure GNSS constellation type for navigation solution	Configure the GNSS constellation type used for navigation solution
0x64/0x1A	100/0x26	Input	Query GNSS constellation type for navigation solution	Query the GNSS constellation type used for navigation solution
0x64/0x80	0x64/0x80	Output	GNSS Boot Status	Boot status of the GNSS receiver
0x64/0x81	0x64/0x81	Output	Extended NMEA Message Interval	Extended NMEA message interval of GNSS receiver
0x64/0x83	0x64/0x83	Output	Interference Detection Status	Interference detection status of GNSS receiver
0x64/0x8B	0x64/0x8B	Output	GNSS Navigation Mode	navigation mode of GNSS receiver
0x64/0x8C	0x64/0x8C	Output	GNSS constellation type for navigation solution	Replying the GNSS constellation type used for navigation solution
0x65/0x1	0x65/0x1	Input	Configure 1PPS Pulse Width	Configure 1PPS pulse width of GNSS receiver
0x65/0x2	0x65/0x2	Input	Query 1PPS Pulse Width	Query 1PPS pulse width of GNSS receiver
0x65/0x80	0x65/0x80	Output	1PPS Pulse Width	1PPS pulse width of GNSS receiver
Output System Messages				
ID (Hex)	ID (Decimal)	Attribute	Name	Descriptions
0x80	128	Output	Software Version	Software revision of the receiver
0x81	129	Output	Software CRC	Software CRC of the receiver
0x82	130	Output	Reserved	Reserved
0x83	131	Output	ACK	ACK to a successful input message
0x84	132	Output	NACK	Response to an unsuccessful input message
0x86	134	Output	Position Update Rate	Position update rate of GNSS system
Output GNSS Messages				
ID	ID	Attribute	Name	Descriptions

(Hex)	(Decimal)			
0xA8	168	Output	Navigation Data Message	Output user navigation data in binary format
0xAE	174	Output	GNSS Datum	Datum used by the GNSS receiver
0xAF	175	Output	GNSS DOP Mask	DOP Mask used by the GNSS receiver
0xB0	176	Output	Elevation and CNR Mask	Elevation and CNR Mask used by the GNSS receiver
0xB4	180	Output	GNSS Position Pinning Status	Position pinning status of the GNSS receiver
0xB9	185	Output	GNSS Power Mode Status	Power mode status of GNSS receiver
0xBB	187	Output	GNSS 1PPS Cable Delay	1PPS cable delay of the GNSS receiver

INPUT MESSAGES

SYSTEM RESTART – Force System to restart (0x1)

This is a request message which will reset and restart the GNSS receiver. This command is issued from the host to GNSS receiver and GNSS receiver should respond with an ACK or NACK. The payload length is 15 bytes.

Structure:

<0xA0,0xA1>< PL><01>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 0F 01 01 07 D8 0B 0E 08 2E 03 09 C4 30 70 00 64 16 0D 0A

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	01		UINT8	-
2	Start Mode	01	00 = Reserved 01 = System Reset, Hot start 02 = System Reset, Warm start 03 = System Reset, Cold start 04 = Reserved	UINT8	
3-4	UTC Year	07D8	>= 1980	UINT16	
5	UTC Month	0B	1 ~ 12	UINT8	
6	UTC Day	0E	1 ~ 31	UINT8	
7	UTC Hour	08	0 ~ 23	UINT8	
8	UTC Minute	2E	0 ~ 59	UINT8	
9	UTC Second	03	0 ~ 59	UINT8	
10-11	Latitude	09C4	Between – 9000 and 9000 > 0: North Hemisphere < 0: South Hemisphere	SINT16	1/100 degree
12-13	Longitude	3070	Between – 18000 and 18000 > 0: East Hemisphere < 0: West Hemisphere	SINT16	1/100 degree
14-15	Altitude	0064	Between –1000 and 18300	SINT16	Meter
Payload Length : 15 bytes					

QUERY SOFTWARE VERSION – Query revision information of loaded software (0x2)

This is a request message which is issued from the host to GNSS receiver to retrieve loaded software version. The GNSS receiver should respond with an ACK along with information of software version, ***"SOFTWARE VERSION, ID: 0x80"***, when succeeded and should respond with an NACK when failed. The payload length is 2 bytes.

Structure:

<0xA0,0xA1>< PL><02>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 02 02 00 02 0D 0A

1 2

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	02		UINT8	
2	Software Type	00	00 = Reserved 01 = System code	UINT8	
Payload Length : 2 bytes					

QUERY SOFTWARE CRC – Query CRC information of loaded software (0x3)

This is a request message which is issued from the host to GNSS receiver to retrieve loaded software CRC. The GNSS receiver should respond with an ACK along with information of software CRC, ***"SOFTWARE CRC, ID: 0x81"***, when succeeded and should respond with an NACK when failed. The payload length is 2 bytes.

Structure:

<0xA0,0xA1>< PL><03>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 02 03 00 03 0D 0A

1 2

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	03		UINT8	
2	Software Type	00	00 = Reserved 01 = System code	UINT8	
Payload Length : 2 bytes					

SET FACTORY DEFAULTS – Set the system to factory default values (0x4)

This is a request message which is issued from the host to GNSS receiver. It will reset the GNSS receiver's internal parameters to factory default values. The GNSS receiver should respond with an ACK when succeeded and should respond with an NACK when failed. The user data will be erased and filled with factory default values. The payload length is 2 bytes.

Structure:

<0xA0,0xA1>< PL><04>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 02 04 00 04 0D 0A

1 2

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	04		UINT8	
2	Type	00	00 = Reserved 01 = reboot after setting to factory defaults	UINT8	
Payload Length : 2 bytes					

CONFIGURE SERIAL PORT – Set up serial port property (0x5)

This is a request message which will configure the serial COM port, baud rate. This command is issued from the host to GNSS receiver and GNSS receiver should respond with an ACK or NACK. The payload length is 4 bytes.

Structure:

<0xA0,0xA1>< PL><05>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 04 05 00 00 00 05 0D 0A

1 2 3 4

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	05		UINT8	
2	COM port	00	00 = COM 1	UINT8	
3	Baud Rate	00	0: 4800 1: 9600 2: 19200 3: 38400 4: 57600 5: 115200 6: 230400 7: 460800 8: 921600	UINT8	
4	Attributes	00	0: update to SRAM 1: update to both SRAM & FLASH 2. temporarily	UINT8	
Payload Length : 4 bytes					

CONFIGURE NMEA MESSAGE – Configure NMEA message interval (0x8)

This is a request message which will set NMEA message configuration. This command is issued from the host to GNSS receiver and GNSS receiver should respond with an ACK or NACK. The payload length is 9 bytes.

Structure:

<0xA0,0xA1>< PL><08>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 09 08 01 01 01 00 01 00 00 00 08 0D 0A

1 2 3 4 5 6 7 8 9

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	08		UINT8	
2	GGA Interval	01	0 ~255, 0: disable	UINT8	Second
3	GSA Interval	01	0 ~255, 0: disable	UINT8	Second
4	GSV Interval	01	0 ~255, 0: disable	UINT8	Second
5	GLL Interval	00	0 ~255, 0: disable	UINT8	Second
6	RMC Interval	01	0 ~255, 0: disable	UINT8	Second
7	VTG Interval	00	0 ~255, 0: disable	UINT8	Second
8	ZDA Interval	00	0 ~255, 0: disable	UINT8	Second
9	Attributes	00	0: update to SRAM 1: update to both SRAM & FLASH	UINT8	
Payload Length : 9 bytes					

CONFIGURE MESSAGE TYPE – Configure and select output message type (0x9)

This is a request message which will change the GNSS receiver output message type. This command is issued from the host to GNSS receiver and GNSS receiver should respond with an ACK or NACK. The payload length is 3 bytes.

Structure:

<0xA0,0xA1>< PL><09>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 03 09 00 00 09 0D 0A

1 2 3

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	09		UINT8	
2	Type	00	00 : No output 01 : NMEA message 02 : Binary Message	UINT8	
3	Attributes	00	0: update to SRAM 1: update to both SRAM & FLASH	UINT8	
Payload Length : 3 bytes					

SOFTWARE IMAGE DOWNLOAD – Download software image to system flash (0xB)

This is a request message which is issued from the host to GNSS receiver to download image to system flash. The GNSS receiver should respond with an ACK when succeeded and should respond with an NACK when failed. The payload length is 6 bytes.

Structure:

<0xA0,0xA1>< PL><0B>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 06 0B 07 00 00 00 00 0C 0D 0A

1 2 3 4 5 6

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	0B		UINT8	
2	Baud	07	0: 4800 1: 9600 2: 19200 3: 38400 4: 57600 5: 115200 6: 230400 7: 460800 8: 921600	UINT8	
3	Flash Type	00	0: default, auto 1: QSPI Winbond 2. QSPI EON 3: Parallel Flash NUMONYX 4. Parallel Flash EON	UINT8	
4-5	Flash ID	00 00	If field 3 is not 0, then need to specify the flash ID	UINT16	
6	Buffer Used Index	00	0:8k 1:16K 2:24K 3:32K	UINT8	
Payload Length : 6 bytes					

CONFIGURE SYSTEM POWER MODE –Set the power mode of GNSS system (0xC)

This is a request message which is issued from the host to GNSS receiver to configure the system power mode. By default power save mode is enabled, to reduce current consumption by the search engine. The GNSS receiver should respond with an ACK when succeeded and should respond with an NACK when failed. The payload length is 3 bytes.

Structure:

<0xA0,0xA1>< PL><0C>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 03 0C 00 00 0C 0D 0A

1 2 3

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	0C		UINT8	
2	Mode	00	00 = Normal (disable) 01 = Power Save (enable)	UINT8	
3	Attributes	00	0: update to SRAM 1: update to both SRAM & FLASH 2: temporarily enabled	UINT8	
Payload Length : 3 bytes					

CONFIGURE SYSTEM POSITION RATE – Configure the position update rate of GNSS system (0xE)

This is a request message which is issued from the host to GNSS receiver to configure the system position update rate. Receivers with position rate 4 or higher needs to configure baud rate to 38400 or higher value. The GNSS receiver should respond with an ACK when succeeded and should respond with an NACK when failed. The payload length is 3 bytes.

Structure:

<0xA0,0xA1>< PL><0E>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 03 0E 01 00 0F 0D 0A

1 2 3

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	0E		UINT8	
2	Rate	01	Value with 1, 2, 4, 5, 8, 10, 20, 25, 40, 50 01: 1Hz update rate Note: value with 4 ~10 should work with baud rate 38400 or higher, value with 20 should work with baud rate 115200 or higher, value with 40, 50 should work with 921600	UINT8	
3	Attributes	00	0: update to SRAM 1: update to both SRAM & FLASH	UINT8	
Payload Length : 3 bytes					

QUERY POSITION UPDATE RATE – Query the position update rate of GNSS system (0x10)

This is a request message which is issued from the host to GNSS receiver to query position update rate. The GNSS receiver should respond with an ACK along with information of position update rate, ***"POSITION UPDATE RATE, ID: 0x86"***, when succeeded and should respond with an NACK when failed. The payload length is 1 byte.

Structure:

<0xA0,0xA1>< PL><10>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 01 10 10 0D 0A

1

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	10		UINT8	
Payload Length : 1 byte					

CONFIGURE NAVIGATION DATA MESSAGE INTERVAL – Configure binary navigation data message interval (0x11)

This is a request message which will set navigation data message interval. The navigation message is one of SkyTraq binary messages. This command is issued from the host to GNSS receiver and GNSS receiver should respond with an ACK or NACK. The payload length is 3 bytes.

Structure:

<0xA0,0xA1>< PL><11>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 03 11 01 00 10 0D 0A

1 2 3

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	11		UINT8	
2	Navigation Message Interval	01	0 ~255, 0: disable	UINT8	Second
3	Attributes	00	0: update to SRAM 1: update to both SRAM & FLASH	UINT8	
Payload Length : 3 bytes					

QUERY POWER MODE – Query status of power mode of GNSS receiver (0x15)

This is a request message which is issued from the host to GNSS receiver to query power mode status. The GNSS receiver should respond with an ACK along with power mode status, ***"GNSS POWER MODE STATUS, ID: 0xB9"***, when succeeded and should respond with an NACK when failed. The payload length is 1 byte.

Structure:

<0xA0,0xA1>< PL><15>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 01 15 15 0D 0A

1

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	15		UINT8	
Payload Length : 1 byte					

CONFIGURE DATUM – Configure datum used for GNSS position transformation (0x29)

This is a request message which will setup parameters used for GNSS position transformation. This command is issued from the host to GNSS receiver and GNSS receiver should respond with an ACK or NACK. The payload length is 19 bytes.

Structure:

<0xA0,0xA1>< PL><29>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 13 29 00 13 07 FF 7A FF 97 FE D9 00 7D DF 39 00 46 F4 10 00 CE 0D 0A

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	29		UINT8	
2-3	index	0013	Refer to Appendix B for available Datum	UINT16	
4	Ellip idx	07	Refer to Appendix A for available Value	UINT8	
5-6	Delta X	FF7A	Refer to Appendix A and B for available Delta X	SINT16	Meter
7-8	Delta Y	FF97	Refer to Appendix A and B for available Delta Y	SINT16	Meter
9-10	Delta Z	FED9	Refer to Appendix A and B for available Delta Z	SINT16	Meter
11-14	Semi-major axis	007DDF39	Refer to Appendix A	UINT32	
15-18	Inversed Flattening	0046F410	Refer to Appendix A	UINT32	
19	Attributes	00	0: update to SRAM 1: update to both SRAM & FLASH	UINT8	
Payload Length : 19 bytes					

1. In order to reduce number of bytes to send in the configure datum command, the Semi-Major Axis is to be deducted by 6,370,000, with the result multiplied by 1,000.
   Thus if converting 6,378,249.145 the result would be: 6,378,249.145 – 6,370,000 equals 8,249.145 And converting 8,249.145 x 1000 to hex is 007DDF39.
2. Same as for Inversed Flattening which is to be deducted by 293; with the result multiplied by 10,000,000 then converted to hex.
3. The exception is: the Inversed Flattening for Ellipsoid index 20 and 23 will lose precision after deducting by 293, multiply by 10,000,000 and convert to hex. Therefore, upon receiving the configure datum command, our firmware will use the internal hardcoded inversed flattening values for of 20 and 23, regardless of what is sent in the set datum command.

CONFIGURE DOP MASK – Configure values of DOP mask (0x2A)

This is a request message which will set the GNSS receiver DOP mode and its corresponding mask. This command is issued from the host to GNSS receiver and GNSS receiver should respond with an ACK or NACK. If either value of PDOP, HDOP or GDOP is not valid, the GNSS receiver will respond with an NACK. The payload length is 9 bytes.

Structure:

<0xA0,0xA1>< PL><2A>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 09 2A 01 00 32 00 32 00 32 00 19 0D 0A

1 2 3 4 5 6 7 8 9

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	2A		UINT8	
2	DOP Mode Select	01	00 : Disable 01 : Auto mode, PDOP when 3-D fix and HDOP when 2-D fix 02 : PDOP only 03 : HDOP only 04 : GDOP only	UINT8	
3-4	PDOP Value	0032	Valid values between 0.5~30 Valid input value 5 ~ 300	UINT16	0.1
5-6	HDOP Value	0032	Valid values between 0.5~30 Valid input value 5 ~ 300	UINT16	0.1
7-8	GDOP Value	0032	Valid values between 0.5~30 Valid input value 5 ~ 300	UINT16	0.1
9	Attributes	00	0: update to SRAM 1: update to both SRAM & FLASH	UINT8	
Payload Length : 9 bytes					

CONFIGURE ELEVATION AND CNR MASK – Configure values of elevation and CNR mask (0x2B)

This is a request message which will configure the satellite elevation and CNR mask of GNSS receiver. This command is issued from the host to GNSS receiver and GNSS receiver should respond with an ACK or NACK. If either value of elevation or CNR mask is not valid, the GNSS receiver will respond with an NACK. The payload length is 5 bytes.

Structure:

<0xA0,0xA1>< PL><2B>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 05 2B 01 05 0A 00 25 0D 0A

1 2 3 4 5

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	2B		UINT8	
2	Elevation and CNR Mode Select	01	00 : Disable 01 : Elevation and CNR both 02 : Elevation only 03 : CNR only	UINT8	
3	Elevation Mask	05	Valid values between 3~85	UINT8	Degree
4	CNR Mask	0A	Valid values between 0~40	UINT8	dB
5	Attributes	00	0: update to SRAM 1: update to both SRAM & FLASH	UINT8	
Payload Length : 5 bytes					

QUERY DATUM – Query datum used by the GNSS receiver (0x2D)

This is a request message which is issued from the host to GNSS receiver to retrieve used datum information. The GNSS receiver should respond with an ACK along with the datum information, ***"GNSS DATUM, ID: 0xAE"***, when succeeded and should respond with an NACK when failed. The payload length is 1 byte.

Structure:

<0xA0,0xA1>< PL><2D>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 01 2D 2D 0D 0A

1

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	2D		UINT8	
Payload Length : 1 byte					

QUERY DOP MASK – Query information of DOP mask used by the GNSS receiver (0x2E)

This is a request message which is issued from the host to GNSS receiver to retrieve information of DOP mask. The GNSS receiver should respond with an ACK along with DOP mask information, ***"GNSS DOP MASK, ID: 0xAF"***, when succeeded and should respond with an NACK when failed. The payload length is 1 byte.

Structure:

<0xA0,0xA1>< PL><2E>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 01 2E 2E 0D 0A

1

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	2E		UINT8	
Payload Length : 1 byte					

QUERY ELEVATION AND CNR MASK – Query elevation and CNR mask used by the GNSS receiver (0x2F)

This is a request message which is issued from the host to GNSS receiver to retrieve information of elevation and CNR mask. The GNSS receiver should respond with an ACK along with elevation and CNR mask information, ***"GNSS ELEVATION AND CNR MASK, ID: 0xB0"***, when succeeded and should respond with an NACK when failed. The payload length is 1 byte.

Structure:

<0xA0,0xA1>< PL><2F>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 01 2F 2F 0D 0A

1

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	2F		UINT8	
Payload Length : 1 byte					

GET GPS EPHEMERIS – Get GPS ephemeris used of GNSS receiver (0x30)

This is a request message which is issued from the host to GNSS receiver to retrieve GPS ephemeris data. The GNSS receiver should respond with an ACK along with information of ephemeris, ***"GPS EPHEMERIS DATA, ID: 0xB1"***, when succeeded and should respond with an NACK when failed. The payload length is 2 bytes.

Structure:

<0xA0,0xA1>< PL><30>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 02 30 00 30 0D 0A

1 2

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	30		UINT8	
2	SV #	00	0: means all SVs 1~32 : mean for the particular SV	UINT8	
Payload Length : 2 bytes					

CONFIGURE POSITION PINNING – Enable or disable position pinning of GNSS receiver (0x39)

This is a request message which is issued from the host to GNSS receiver to configure the system position pinning. The GNSS receiver should respond with an ACK when succeeded and should respond with an NACK when failed. The payload length is 3 bytes.

Structure:

<0xA0,0xA1>< PL><39>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 03 39 01 01 39 0D 0A

1 2 3

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	39		UINT8	
2	Position pinning	01	0: default 1: enable 2: disable	UINT8	
3	Attributes	01	0: update to SRAM 1: update to both SRAM & FLASH	UINT8	
Payload Length : 3 bytes					

QUERY POSITION PINNING – Query position pinning status of GNSS receiver (0x3A)

This is a request message which is issued from the host to GNSS receiver to query position pinning status. The GNSS receiver should respond with an ACK along with position pinning status, ***"GNSS POSITION PINNING STATUS, ID: 0xB4"***, when succeeded and should respond with an NACK when failed. The payload length is 1 byte.

Structure:

<0xA0,0xA1>< PL><3A>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 01 3A 3A 0D 0A

1

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	3A		UINT8	
Payload Length : 1 byte					

CONFIGURE POSITION PINNING PARAMETERS – Set position pinning parameters of GNSS receiver (0x3B)

This is a request message which is issued from the host to GNSS receiver to configure the system position pinning parameters. The GNSS receiver should respond with an ACK when succeeded and should respond with an NACK when failed. The payload length is 12 bytes.

Structure:

<0xA0,0xA1>< PL><3B>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 0C 3B 00 02 00 0A 00 08 00 2D 01 F4 01 E2 0D 0A

1 2 3 4 5 6 7 8 9 10 11

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	3B		UINT8	
2-3	Pinning speed	0002		UINT16	Km/Hr
4-5	Pinning cnt	000A		UINT16	Second
6-7	Unpinning speed	0008		UINT16	Km/Hr
8-9	Unpinning cnt	002D		UINT16	Second
10-11	Unpinning distance	01F4		UINT16	Meter
12	Attributes	01	0: update to SRAM 1: update to both SRAM & FLASH	UINT8	
Payload Length : 12 bytes					

SET GPS EPHEMERIS – Set GPS ephemeris to GNSS receiver (0x41)

This is a request message which is issued from the host to GNSS receiver to set GPS ephemeris data (open an ephemeris file) to GNSS receiver. The GNSS receiver should respond with an ACK when succeeded and should respond with an NACK when failed. The payload length is 87 bytes.

Structure:

<0xA0,0xA1>< PL><41>< message body><CS><0x0D,0x0A>

Example:

A0	A1	00	57	41	00	02	00	77	88	04	61	10	00	00	00	00	00	00	00	00	00	00	00	00	DB	DF	59	A6	00	00	1E
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28

0A	47	7C	00	77	88	88	DF	FD	2E	35	A9	CD	B0	F0	9F	FD	A7	04	8E	CC	A8	10	2C	A1	0E	22	31	59	A6	74	00
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60

77	89	0C	FF	A3	59	86	C7	77	FF	F8	26	97	E3	B9	1C	60	59	C3	07	44	FF	A6	37	DF	F0	B0	2E	0D	0A
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87			

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	41		UINT8	
2-3	SV id	0x1	Satellite id	UINT16	
4	SubFrameData[0][0]	00	Eph data subframe 1	UINT8	
5	SubFrameData[0][1]	00	Eph data subframe 1	UINT8	
6	SubFrameData[0][2]	00	Eph data subframe 1	UINT8	
7	SubFrameData[0][3]	00	Eph data subframe 1	UINT8	
8	SubFrameData[0][4]	00	Eph data subframe 1	UINT8	
9	SubFrameData[0][5]	00	Eph data subframe 1	UINT8	
10	SubFrameData[0][6]	00	Eph data subframe 1	UINT8	
11	SubFrameData[0][7]	00	Eph data subframe 1	UINT8	
12	SubFrameData[0][8]	00	Eph data subframe 1	UINT8	
13	SubFrameData[0][9]	00	Eph data subframe 1	UINT8	
14	SubFrameData[0][10]	00	Eph data subframe 1	UINT8	
15	SubFrameData[0][11]	00	Eph data subframe 1	UINT8	
16	SubFrameData[0][12]	00	Eph data subframe 1	UINT8	
17	SubFrameData[0][13]	00	Eph data subframe 1	UINT8	
18	SubFrameData[0][14]	00	Eph data subframe 1	UINT8	
19	SubFrameData[0][15]	00	Eph data subframe 1	UINT8	
20	SubFrameData[0][16]	00	Eph data subframe 1	UINT8	
21	SubFrameData[0][17]	00	Eph data subframe 1	UINT8	

22	SubFrameData[0][18]	00	Eph data subframe 1	UINT8	
23	SubFrameData[0][19]	00	Eph data subframe 1	UINT8	
24	SubFrameData[0][20]	00	Eph data subframe 1	UINT8	
25	SubFrameData[0][21]	00	Eph data subframe 1	UINT8	
26	SubFrameData[0][22]	00	Eph data subframe 1	UINT8	
27	SubFrameData[0][23]	00	Eph data subframe 1	UINT8	
28	SubFrameData[0][24]	00	Eph data subframe 1	UINT8	
29	SubFrameData[0][25]	00	Eph data subframe 1	UINT8	
30	SubFrameData[0][26]	00	Eph data subframe 1	UINT8	
31	SubFrameData[0][27]	00	Eph data subframe 1	UINT8	
32~59	SubFrameData[1][0~27]	00	Eph data subframe 2, same as field 4-31	UINT8	
60-87	SubFrameData[2][0~27]	00	Eph data subframe 3, same as field 4-31	UINT8	
Payload Length : 87 bytes					

CONFIGURE 1PPS CABLE DELAY – Configure cable delay of 1PPS timing (0x45)

This is a request message which will set the cable delay of 1PPS timing to the GNSS receiver. This command is issued from the host to GNSS receiver and GNSS receiver should respond with an ACK or NACK. If value of cable delay is not valid, the GNSS receiver will respond with an NACK. The payload length is 6 bytes.

Structure:

<0xA0,0xA1>< PL><45>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 06 45 00 00 00 00 00 45 0D 0A

1 2 3 4 5 6

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	45		UINT8	-
2-5	Cable Delay	00000000	Cable delay adjustment for 1PPS Valid input value -500000~+500000	SINT32	1/100 ns
6	Attributes	00	0: update to SRAM 1: update to both SRAM & FLASH	UINT8	
Payload Length : 6 bytes					

QUERY 1PPS CABLE DELAY – Query 1PPS cable delay of the GNSS receiver (0x46)

This is a request message which is issued from the host to GNSS receiver to query 1PPS cable delay. The GNSS receiver should respond with an ACK along with information of 1PPS cable delay, ***"GNSS 1PPS CABLE DELAY, ID: 0xBB"***, when succeeded and should respond with an NACK when failed. The payload length is 1 byte.

Structure:

<0xA0,0xA1>< PL><46>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 01 46 46 0D 0A

1

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	46		UINT8	
Payload Length : 1 byte					

MESSAGES WITH Sub-ID*1

*1: Message ID with range from 0x60~0x6F contains both input and output messages.

CONFIGURE SBAS – Configure SBAS parameters of GNSS receiver (ID: 0x62, SID: 0x1)

This is a request message which is issued from the host to GNSS receiver to configure SBAS parameters. The GNSS receiver should respond with an ACK when succeeded and should respond with an NACK when failed. The payload length is 9 bytes.

Structure:

<0xA0,0xA1>< PL><62><01>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 09 62 01 01 01 08 01 03 07 00 6E 0D 0A

1 2 3 4 5 6 7 8 9

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	62		UINT8	
2	Message Sub-ID	01		UINT8	
3	Enable	01	0: disable SBAS system 1: enable SBAS system	UINT8	
4	Ranging	01	0: do not use SBAS satellite for navigation 1: use SBAS satellite for navigation	UINT8	
5	Ranging URA Mask	08	Default:8, range 0~15	UINT8	
6	Correction	01	0: disable the correction 1: enable the correction	UINT8	
7	Number of tracking channels	03	Value: 0~3 Set how many channels are reserved for SBAS tracking	UINT8	
8	Subsystem mask	07	Allows selectively enabling/disabling SBAS satellites Bit0: WAAS, 1: enable; 0: disable Bit1: EGNOS, 1: enable; 0: disable Bit2: MSAS, 1: enable; 0: disable	UINT8	
9	Attributes	00	0: update to SRAM 1: update to both SRAM & FLASH	UINT8	
Payload Length : 9 bytes					

QUERY SBAS STATUS – Query SBAS status of GNSS receiver (ID: 0x62, SID: 0x2)

This is a request message which is issued from the host to GNSS receiver to query SBAS status. The GNSS receiver should respond with an ACK along with SBAS status, ***"SBAS STATUS, ID: 0x62, SID: 0x80"***, when succeeded and should respond with an NACK when failed. The payload length is 2 byte.

Structure:

<0xA0,0xA1>< PL><62><02>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 02 62 02 60 0D 0A

1 2

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	62		UINT8	
2	Message Sub-ID	02		UINT8	
Payload Length : 2 byte					

CONFIGURE QZSS – Configure QZSS of GNSS receiver (ID: 0x62, SID: 0x3)

This is a request message which is issued from the host to GNSS receiver to configure QZSS parameters. The GNSS receiver should respond with an ACK when succeeded and should respond with an NACK when failed. The payload length is 5 bytes.

Structure:

<0xA0,0xA1>< PL><62><03>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 05 62 03 01 03 00 63 0D 0A

1 2 3 4 5

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	62		UINT8	
2	Message Sub-ID	03		UINT8	
3	Enable	01	0: disable QZSS system 1: enable QZSS system	UINT8	
4	Number of tracking channels	03	Value: 1~3 Set how many channels are used for QZSS tracking, default: 1	UINT8	
5	Attributes	00	0: update to SRAM 1: update to both SRAM & FLASH	UINT8	
Payload Length : 5 bytes					

QUERY QZSS STATUS – Query QZSS status of GNSS receiver (ID: 0x62, SID: 0x4)

This is a request message which is issued from the host to GNSS receiver to query QZSS status. The GNSS receiver should respond with an ACK along with QZSS status, ***"QZSS STATUS, ID: 62, SID: 0x81"***, when succeeded and should respond with an NACK when failed. The payload length is 2 byte.

Structure:

<0xA0,0xA1>< PL><62><04>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 02 62 04 66 0D 0A

1 2

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	62		UINT8	
2	Message Sub-ID	04		UINT8	
Payload Length : 2 byte					

SBAS STATUS – SBAS status of GNSS receiver (ID: 0x62, SID: 0x80)

This is a response message to ***"QUERY SBAS STATUS, ID: 0x62, SID: 0x2"*** which provides the SBAS status of GNSS receiver. This message is sent from the GNSS receiver to host. The payload length is 8 bytes.

Structure:

<0xA0,0xA1>< PL><62><80>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 08 62 80 01 01 08 01 03 07 EF 0D 0A

1 2 3 4 5 6 7 8

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	62		UINT8	
2	Message Sub-ID	80		UINT8	
3	Enable	01	0: disable SBAS system 1: enable SBAS system	UINT8	
4	Ranging	01	0: do not use SBAS satellite for navigation 1: use SBAS satellite for navigation	UINT8	
5	Ranging URA Mask	08	Range 0~15 default 8	UINT8	
6	Correction	01	0: disable the correction 1: enable the correction	UINT8	
7	Number of tracking channels	03	Value: 0~3 Set how many channels are reserved for SBAS tracking	UINT8	
8	Subsystem mask	07	Allows selectively enabling/disabling SBAS satellites Bit0: WAAS, 1: enable; 0: disable Bit1: EGNOS, 1: enable; 0: disable Bit2: MSAS, 1: enable; 0: disable	UINT8	
Payload Length : 8 bytes					

QZSS STATUS – QZSS status of GNSS receiver (ID: 0x62, SID: 0x81)

This is a response message to ***"QUERY QZSS STATUS, ID: 0x62, SID: 0x4"*** which provides the QZSS status of GNSS receiver. This message is sent from the GNSS receiver to host. The payload length is 4 bytes.

Structure:

<0xA0,0xA1>< PL><62><81>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 04 62 81 01 03 E1 0D 0A

1 2 3 4

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	62		UINT8	
2	Message Sub-ID	81		UINT8	
3	Enable	01	0: disable QZSS system 1: enable QZSS system	UINT8	
4	Number of tracking channels	03	Value: 1~3 Set how many channels are used for QZSS tracking	UINT8	
Payload Length : 4 bytes					

CONFIGURE SAEE – configure SAEE of GNSS receiver (ID: 0x63, SID: 0x1)

This is a request message which is issued from the host to GNSS receiver to configure enable or disable Self-Aided Ephemeris Estimation (SAEE). The GNSS receiver should respond with an ACK when succeeded and should respond with an NACK when failed. The payload length is 4 bytes.

Structure:

<0xA0,0xA1>< PL><63><01>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 04 63 01 01 01 62 0D 0A

1 2 3 4

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	63		UINT8	
2	Message Sub-ID	01		UINT8	
3	Enable	01	0: SAEE mode default ROM version decided by HW power-on latch 1: SAEE enable 2: SAEE disable	UINT8	
4	Attributes	01	0: update to SRAM 1: update to both SRAM & FLASH	UINT8	
Payload Length : 4 bytes					

QUERY SAEE STATUS – Query SAEE status of GNSS receiver (ID: 0x63, SID: 0x2)

This is a request message which is issued from the host to GNSS receiver to query SAEE status. The GNSS receiver should respond with an ACK along with SAEE status, ***"SAEE STATUS, ID: 63, SID: 0x80"***, when succeeded and should respond with an NACK when failed. The payload length is 2 bytes.

Structure:

<0xA0,0xA1>< PL><63><0x2>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 02 63 02 61 0D 0A

1 2

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	63		UINT8	
2	Message Sub-ID	02		UINT8	
Payload Length : 2 bytes					

SAEE STATUS – SAEE status of GNSS receiver (ID: 0x63, SID: 0x80)

This is a response message to ***"QUERY SAEE STATUS, ID: 0x63, SID: 0x2"*** which provides the SAEE status of GNSS receiver. This message is sent from the GNSS receiver to host. The payload length is 3 bytes.

Structure:

<0xA0,0xA1>< PL><63><80>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 03 63 80 01 E2 0D 0A

1 2 3

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	63		UINT8	
2	Message Sub-ID	80		UINT8	
3	Status	01	0: SAEE mode default ROM version decided by HW power-on latch 1: SAEE enable 2: SAEE disable	UINT8	
Payload Length : 3 bytes					

QUERY GNSS BOOT STATUS – Query boot status of GNSS receiver (ID: 0x64, SID: 0x1)

This is a request message which is issued from the host to GNSS receiver to query boot status. The GNSS receiver should respond with an ACK along with boot status, ***"GNSS BOOT STATUS, ID: 64, SID: 0x80"***, when succeeded and should respond with an NACK when failed. The payload length is 2 bytes.

Structure:

<0xA0,0xA1>< PL><64><01>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 02 64 01 65 0D 0A

1 2

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	64		UINT8	
2	Message Sub-ID	01		UINT8	
Payload Length : 2 bytes					

CONFIGURE EXTENDED NMEA MESSAGE INTERVAL – Configure extended NMEA message Interval of GNSS receiver (ID: 0x64, SID: 0x2)

This is a request message which will set NMEA message interval configuration. This command is issued from the host to GNSS receiver and GNSS receiver should respond with an ACK or NACK. The payload length is 15 bytes.

Structure:

<0xA0,0xA1>< PL><64><02>< message body><CS><0x0D,0x0A>

Example:

A0	A1	00	0F	64	02	01	01	03	01	01	01	01	00	00	00	00	00	01	64	0D	0A
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	64		UINT8	
2	Message Sub-ID	02		UINT8	
3	GGA Interval	01	0 ~255, 0: disable	UINT8	Second
4	GSA Interval	01	0 ~255, 0: disable	UINT8	Second
5	GSV Interval	03	0 ~255, 0: disable	UINT8	Second
6	GLL Interval	01	0 ~255, 0: disable	UINT8	Second
7	RMC Interval	01	0 ~255, 0: disable	UINT8	Second
8	VTG Interval	01	0 ~255, 0: disable	UINT8	Second
8	ZDA Interval	01	0 ~255, 0: disable	UINT8	Second
10	GNS Interval	00	0 ~255, 0: disable	UINT8	Second
11	GBS Interval	00	0 ~255, 0: disable	UINT8	Second
12	GRS Interval	00	0 ~255, 0: disable	UINT8	Second
13	DTM Interval	00	0 ~255, 0: disable	UINT8	Second
14	GST Interval	00	0 ~255, 0: disable	UINT8	Second
15	Attributes	01	0: update to SRAM 1: update to both SRAM & FLASH	UINT8	
Payload Length : 15 bytes					

QUERY EXTENDED NMEA MESSAGE INTERVAL – Query extended NMEA message interval of GNSS receiver (ID: 0x64, SID: 0x3)

This is a request message which is issued from the host to GNSS receiver to query extended nmea message interval. The GNSS receiver should respond with an ACK along with nmea message interval, ***"EXTENDED NMEA MESSAGE INTERVAL, ID: 0x64, SID: 0x81***", when succeeded and should respond with an NACK when failed. The payload length is 2 bytes.

Structure:

<0xA0,0xA1>< PL><64><03><CS><0x0D,0x0A>

Example:

A0 A1 00 02 64 03 67 0D 0A

1 2

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	64		UINT8	
2	Message Sub-ID	03		UINT8	
Payload Length : 2 bytes					

CONFIGURE INTERFERENCE DETECTION – Configure the interference detection of GNSS receiver (ID: 0x64, SID: 0x6)

This is a request message which is issued from the host to GNSS receiver to configure interference detect control. The GNSS receiver should respond with an ACK when succeeded and should respond with an NACK when failed. The payload length is 4 bytes.

Structure:
<0xA0,0xA1>< PL><64><06>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 04 64 06 01 00 E1 0D 0A
1 2 3 4

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	64		UINT8	
2	Message Sub-ID	06		UINT8	
3	Interference Detect Control	01	0: disable 1: enable	UINT8	
4	Attributes	00	0: update to SRAM 1: update to both SRAM & FLASH	UINT8	
Payload Length : 4 bytes					

QUERY INTERFERENCE DETECTION STATUS – Query the status of interference detection of the GNSS receiver (ID: 0x64, SID: 0x7)

This is a request message which is issued from the host to GNSS receiver to query interference detection status. The GNSS receiver should respond with an ACK along with information of interference detection status, ***"INTERFERENCE DETECTION STATUS, ID: 0x64, SID: 0x83"***, when succeeded and should respond with an NACK when failed. The payload length is 2 bytes.

Structure:

<0xA0,0xA1>< PL><64><07>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 02 64 07 63 0D 0A

1 2

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	64		UINT8	
2	Message Sub-ID	07		UINT8	
Payload Length : 2 bytes					

CONFIGURE GNSS NAVIGATION MODE – Configure the navigation mode of GNSS receiver (ID: 0x64, SID: 0x17)

This is a request message which is issued from the host to GNSS receiver to configure the system navigation mode. The GNSS receiver should respond with an ACK when succeeded and should respond with an NACK when failed. The payload length is 4 bytes.

Structure:

<0xA0,0xA1>< PL><64><17>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 04 64 17 00 00 73 0D 0A

1 2 3 4

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	64		UINT8	
2	Message Sub-ID	17		UINT8	
3	Navigation mode	00	0: auto 1: pedestrian 2: car 3: marine 4: balloon 5: airborne	UINT8	
4	Attributes	00	0: update to SRAM 1: update to both SRAM & FLASH	UINT8	
Payload Length : 4 bytes					

QUERY GNSS NAVIGATION MODE – Query the navigation mode of GNSS receiver (ID: 0x64, SID: 0x18)

This is a request message which is issued from the host to GNSS receiver to query navigation mode. The GNSS receiver should respond with an ACK along with navigation mode, ***"GNSS NAVIGATION MODE, ID: 0x64, SID: 0x8B"***, when succeeded and should respond with an NACK when failed. The payload length is 2 bytes.

Structure:

<0xA0,0xA1>< PL><64><18>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 02 64 18 7C 0D 0A

1 2

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	64		UINT8	
2	Message Sub-ID	18		UINT8	
Payload Length : 2 bytes					

CONFIGURE GNSS CONSTELLATION TYPE FOR NAVIGATION SOLUTION – Set the GNSS constellation type for navigation solution (ID: 0x64, SID: 0x19)

This is a request message which is issued from the host to GNSS receiver to configure the GNSS constellation type for navigation solution. The GNSS receiver should respond with an ACK when succeeded and should respond with an NACK when failed. The payload length is 5 bytes.

Structure:
<0xA0,0xA1>< PL><64><19>< message body><CS><0x0D,0x0A>

Example:
A0 A1 00 05 64 19 00 09 00 74 0D 0A
1 2 3 4 5

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	64		UINT8	
2	Sub ID	19		UINT8	
3-4	Navigation mode	00 09	Bit 0: GPS Bit 1: Glonass Bit 2: Galileo Bit 3: Beidou	UINT16	
5	Attributes	00	0: update to SRAM 1: update to both SRAM & FLASH	UINT8	
Payload Length : 5 bytes					

QUERY GNSS CONSTELLATION TYPE FOR NAVIGATION SOLUTION – Query the GNSS constellation type for navigation solution (ID: 0x64, SID: 0x1A)

This is a request message which is issued from the host to GNSS receiver to query GNSS constellation type for navigation solution. The GNSS receiver should respond with an ACK along with constellation type, "***GNSS CONSTELLATION TYPE FOR NAVIGATION SOLUTION, ID 0x64, SID 0x8C***", when succeeded and should respond with an NACK when failed. The payload length is 2 bytes.

Structure:
<0xA0,0xA1>< PL><64><1A>< message body><CS><0x0D,0x0A>

Example:
A0 A1 00 02 64 1A 7E 0D 0A
1 2

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	64		UINT8	
2	Sub ID	1A		UINT8	
Payload Length : 2 bytes					

GNSS BOOT STATUS – Boot status of GNSS receiver (ID: 0x64, SID: 0x80)

This is a response message to ***"QUERY GNSS BOOT STATUS, ID: 0x64, SID: 0x1"*** which provides the boot status of GNSS receiver. This message is sent from the GNSS receiver to host. The payload length is 4 bytes.

Structure:

<0xA0,0xA1>< PL><64><80>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 04 64 80 00 01 E5 0D 0A

1 2 3 4

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	64		UINT8	
2	Message Sub-ID	80		UINT8	
3	Fail Over	00	0: Boot from flash OK 1: Boot from ROM due to flash boot failure	UINT8	
4	Flash Type	01	00: ROM Bit 1: Winbond-type QSPI Flash Bit 2: EON-type QSPI Flash Bit 3: Parallel Flash	UINT8	
Payload Length : 4 bytes					

EXTENDED NMEA MESSAGE INTERVAL– Extended NMEA message interval of the GNSS receiver (ID: 0x64, SID: 0x81)

This is a response message to ***"QUERY EXTENDED NMEA MESSAGE INTERVAL, ID: 0x64, SID: 0x3"*** which provides the extended NMEA message interval of the GNSS receiver. This message is sent from the GNSS receiver to host. The payload length is 14 bytes.

Structure:

<0xA0,0xA1>< PL><64><81>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 0E 64 81 01 01 03 01 01 01 01 00 00 00 00 00 E6 0D 0A

1 2 3 4 5 6 7 8 9 10 11 12 13 14

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	64		UINT8	
2	Message Sub-ID	81		UINT8	
3	GGA Interval	01	0 ~255, 0: disable	UINT8	Second
4	GSA Interval	01	0 ~255, 0: disable	UINT8	Second
5	GSV Interval	03	0 ~255, 0: disable	UINT8	Second
6	GLL Interval	01	0 ~255, 0: disable	UINT8	Second
7	RMC Interval	01	0 ~255, 0: disable	UINT8	Second
8	VTG Interval	01	0 ~255, 0: disable	UINT8	Second
9	ZDA Interval	01	0 ~255, 0: disable	UINT8	Second
10	GNS Interval	00	0 ~255, 0: disable	UINT8	Second
11	GBS Interval	00	0 ~255, 0: disable	UINT8	Second
12	GRS Interval	00	0 ~255, 0: disable	UINT8	Second
13	DTM Interval	00	0 ~255, 0: disable	UINT8	Second
14	GST Interval	00	0 ~255, 0: disable	UINT8	Second
Payload Length : 14 bytes					

INTERFERENCE DETECTION STATUS – Interference detection status of GNSS receiver (ID: 0x64, SID: 0x83)

This is a response message to ***"QUERY INTERFERENCE DETECTION STATUS, ID: 0x64, SID: 0x7"*** which provides the status of interference detection of the GNSS receiver. This message is sent from the GNSS receiver to host. The payload length is 4 bytes.

Structure:

<0xA0,0xA1>< PL><64><83>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 04 64 83 01 01 E7 0D 0A

1 2 3 4

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	64		UINT8	
2	Message Sub-ID	83		UINT8	
3	Interference Detection Control	01	Interference detection control status 0: disable 1: enable	UINT8	
4	Interference Status	01	0: unknown 1: no interference 2: lite 3: critical	UINT8	
Payload Length : 4 bytes					

GNSS NAVIGATION MODE – Navigation mode of the GNSS receiver (ID: 0x64, SID: 0x8B)

This is a response message to ***"QUERY GNSS NAVIGATION MODE, ID: 0x64, SID: 0x18"*** which provides the navigation mode of the GNSS receiver. This message is sent from the GNSS receiver to host. The payload length is 3 bytes.

Structure:

<0xA0,0xA1>< PL><64><8B>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 03 64 8B 00 EF 0D 0A

1 2 3

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	64		UINT8	
2	Message Sub-ID	8B		UINT8	
3	Navigation mode	00	0: auto 1: prdestrian 2: car 3: marine 4: balloon 5: airborne	UINT8	
Payload Length : 3 bytes					

GNSS CONSTELLATION TYPE FOR NAVIGATION SOLUTION – GNSS constellation type for navigation solution (ID: 0x64, SID: 0x8C)

This is a response message to ***"QUERY GNSS CONSTELLATION TYPE FOR NAVIGATION SOLUTION, ID 0x64, SID 0x1A"*** which provides the GNSS constellation type of the GNSS receiver. This message is sent from the GNSS receiver to host. The payload length is 4 bytes.

Structure:

<0xA0,0xA1>< PL><64><8C>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 04 64 8C 00 09 E1 0D 0A

1 2 3 4

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	64		UINT8	
2	Sub ID	8C		UINT8	
3-4	Navigation mode	00 09	Bit 0: GPS Bit 1: Glonass Bit 2: Galileo Bit 3: Beidou	UINT16	
Payload Length : 4 bytes					

CONFIGURE 1PPS PULSE WIDTH – Configure 1PPS pulse width of GNSS receiver (ID: 0x65, SID: 0x1)

This is a request message which will set the pulse width of 1PPS timing to the GNSS receiver. This command is issued from the host to GNSS receiver and GNSS receiver should respond with an ACK or NACK. If value of pulse width is not valid, the GNSS receiver will respond with an NACK. The payload length is 7 bytes.

Structure:

<0xA0,0xA1>< PL><65><01>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 07 65 01 00 00 00 01 00 65 0D 0A

1 2 3 4 5 6 7

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	65		UINT8	-
2	Message Sub-ID	01		UINT8	
3-6	Pulse Width	00 00 00 01	Pulse width of 1PPS timing Valid value between 1~100000	UINT32	us
7	Attributes	00	0: update to SRAM 1: update to both SRAM & FLASH	UINT8	
Payload Length : 7 bytes					

QUERY 1PPS PULSE WIDTH – Query 1PPS pulse width of GNSS receiver (ID: 0x65, SID: 0x2)

This is a request message which is issued from the host to GNSS receiver to query 1PPS pulse width. The GNSS receiver should respond with an ACK along with information of 1PPS pulse width, ***"1PPS PULSE WIDTH, ID: 0x65, SID: 0x80"***, when succeeded and should respond with an NACK when failed. The payload length is 2 bytes.

Structure:

<0xA0,0xA1>< PL><65><02>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 02 65 02 67 0D 0A

1 2 3

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	65		UINT8	
2	Message Sub-ID	02		UINT8	
Payload Length : 2 bytes					

1PPS PULSE WIDTH – 1PPS pulse width of GNSS receiver (ID: 0x65, SID: 0x80)

This is a response message to ***"QUERY 1PPS PULSE WIDTH, ID: 0x65, SID: 0x2"*** which provides the 1PPS pulse width of the GNSS receiver. This message is sent from the GNSS receiver to host. The payload length is 6 bytes.

Structure:

<0xA0,0xA1>< PL><65><80>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 06 65 80 00 00 00 01 E4 0D 0A

1 2 3 4 5 6

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	65		UINT8	-
2	Message Sub-ID	80		UINT8	
3-6	Pulse Width	00 00 00 01	Pulse Width of 1PPS timing mode	UINT32	us
Payload Length : 6 bytes					

OUTPUT MESSAGES

SOFTWARE VERSION – Software version of the GNSS receiver (0x80)

This is a response message to ***"QUERY SOFTWARE VERSION, ID: 0x2"*** which provides the software version of the GNSS receiver. This message is sent from the GNSS receiver to host. The example below output the SkyTraq software version as 01.01.01-01.03.14-07.01.18 on System image. The payload length is 14 bytes.

Structure:

<0xA0,0xA1>< PL><80>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 0E 80 01 00 01 01 01 00 01 03 0E 00 07 01 12 98 0D 0A

1 2 3 4 5 6 7 8 9 10 11 12 13 14

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	80		UINT8	
2	Software Type	00	0: Reserved 1: System code	UINT8	
3-6	Kernel Version	00010101	X1.Y1.Z1 = SkyTraq Kernel Version Ex. X1=01, Y1=00, Z1=01 (1.0.1)	UINT32	
7-10	ODM version	0001030E	X1.Y1.Z1 = SkyTraq Version Ex. X1=01, Y1=03, Z1=01 (1.3.1)	UINT32	
11-14	Revision	00070112	YYMMDD = SkyTraq Revision Ex. YY=06, MM=01, DD=10 (060110)	UINT32	
Payload Length : 14 bytes					

SOFTWARE CRC – Software CRC of the GNSS receiver (0x81)

This is a response message to ***"QUERY SOFTWARE CRC, ID: 0x3"*** which provides the software CRC of the GNSS receiver. This message is sent from the GNSS receiver to host. The payload length is 4 bytes.

Structure:

<0xA0,0xA1>< PL><81>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 04 81 01 98 76 6E 0D 0A

1 2 3 4

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	81		UINT8	
2	Software Type	00	0: Reserved 1: System code	UINT8	
3-4	CRC	9876	CRC value	UINT16	
Payload Length : 4 bytes					

ACK – Acknowledgement to a Request Message (0x83)

This is a response message which is an acknowledgement to a request message. The payload length is 2 bytes

Structure:

<0xA0,0xA1>< PL><83>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 02 83 02 81 0D 0A

1 2

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	83		UINT8	
2	ACK ID*1*	02	Message ID of the request message	UINT8	
Payload Length : 2 bytes					

*1: ACK ID may further consist of message ID and message sub-ID which will become 3 bytes of ACK message.

NACK – Response to an unsuccessful request message (0x84)

This is a response message which is a response to an unsuccessful request message. This is used to notify the Host that the request message has been rejected. The payload length is 2 bytes

Structure:

<0xA0,0xA1>< PL><84>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 02 84 01 82 0D 0A

1 2

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	84		UINT8	
2	NACK ID*1	01	Message ID of the request message	UINT8	
Payload Length : 2 bytes					

*1: NACK ID may further consist of message ID and message sub-ID which will become 3 bytes of NACK message.

POSITON UPDATE RATE – Position Update rate of the GNSS system (0x86)

This is a response message to ***"QUERY POSITION UPDATE RATE, ID: 0x10"*** which provides the position update rate of the GNSS receiver. This message is sent from the GNSS receiver to host. The payload length is 2 bytes.

Structure:

<0xA0,0xA1>< PL><86>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 02 86 01 87 0D 0A

1 2

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	86		UINT8	
2	Update Rate	01	01: 1Hz	UINT8	
Payload Length : 2 bytes					

NAVIGATION DATA MESSAGE – Message of user navigation data in binary format (0xA8)

This is a response message which provides data of user navigation solution in binary format. This message is sent from the GNSS receiver to host. The payload length is 59 bytes

Structure:

<0xA0,0xA1>< PL><A8>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 3B A8 02 08 06 04 02 32 18 18 0E C5 E1 99 48 20 78 ED 00 00 2E 3B 00 00 26 93 00 93 00 93

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29

00 93 00 93 00 93 EE 35 4D 30 1D 99 AA 37 0F D7 0B 74 00 00 00 00 00 00 00 00 00 00 00 F5 0D 0A

30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	A8		UINT8	
2	Fix Mode	02	Quality of fix 0: no fix 1: 2D 2: 3D 3: 3D+DGNSS	UINT8	
3	Number of SV in fix	08	Number of SV in fix 0-12	UINT8	
4-5	GNSS Week	0604	GNSS week number	UINT16	
6-9	TOW	02321818	GNSS time of week Scaling 0.01	UINT32	1/100 sec
10-13	Latitude	0EC5E199	> 0: North Hemisphere < 0: South Hemisphere Scaling 1e-7	SINT32	1/1e-7 degree
14-17	Longitude	482078ED	> 0: East Hemisphere < 0: West Hemisphere	SINT32	1/1e-7 degree
18-21	ellipsoid altitude,	00002E3B	height above ellipsoid Scaling 0.01	UINT32	1/100 meter
22-25	mean sea level altitude	00002693	height above mean sea level Scaling 0.01	UINT32	1/100 meter
26-27	GDOP	0093	Geometric dilution of precision Scaling 0.01	UINT16	1/100
28-29	PDOP	0093	Position dilution of precision Scaling 0.01	UINT16	1/100
30-31	HDOP	0093	Horizontal dilution of precision Scaling 0.01	UINT16	1/100

32-33	VDOP	0093	Vertical dilution of precision Scaling 0.01	UINT16	1/100
34-35	TDOP	0093	Time dilution of precision Scaling 0.01	UINT16	1/100
36-39	ECEF-X	EE354D30	ECEF X coordinate Scaling 0.01	SINT32	1/100 meter
40-43	ECEF-Y	1D99AA37	ECEF Y coordinate Scaling 0.01	SINT32	1/100 meter
44-47	ECEF-Z	0FD70B74	ECEF Z coordinate Scaling 0.01	SINT32	1/100 meter
48-51	ECEF-VX	00000000	ECEF X Veolcity Scaling 0.01	SINT32	1/100 m/s
52-55	ECEF-VY	00000000	ECEF Y Veolcity Scaling 0.01	SINT32	1/100 m/s
56-59	ECEF-VZ	00000000	ECEF Z Veolcity Scaling 0.01	SINT32	1/100 m/s
Payload Length : 59 bytes					

GNSS DATUM – datum used by the GNSS receiver (0xAE)

This is a response message to ***"QUERY DATUM, ID: 0x2D"*** which provides the datum information of the GNSS receiver. This message is sent from the GNSS receiver to host. The payload length is 3 bytes.

Structure:

<0xA0,0xA1>< PL><AE>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 03 AE 00 13 BD 0D 0A

1 2 3

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	AE		UINT8	
2-3	Datum Index	0013	Datum index Refer to Appendix A & B	UINT16	
Payload Length : 3 bytes					

GNSS DOP MASK – DOP Mask used by the GNSS receiver (0xAF)

This is a response message to ***"QUERY DOP MASK, ID: 0x2E"*** which provides the information of DOP masks of the GNSS receiver. This message is sent from the GNSS receiver to host. The payload length is 8 bytes.

Structure:

<0xA0,0xA1>< PL><AF>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 08 AF 01 00 32 00 32 00 32 9C 0D 0A

1 2 3 4 5 6 7 8

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	AF		UINT8	
2	DOP Mode Select	01	00 : Disable 01 : Auto mode, PDOP when 3-D fix and HDOP when 2-D fix 02 : GDOP only 03 : PDOP only 04 : HDOP only	UINT8	
3-4	PDOP Value	0032	Valid values between 0.5~30 Valid output value 5 ~ 300	UINT16	1/10
5-6	HDOP Value	0032	Valid values between 0.5~30 Valid output value 5 ~ 300	UINT16	1/10
7-8	GDOP Value	0032	Valid values between 0.5~30 Valid output value 5 ~ 300	UINT16	1/10
Payload Length : 8 bytes					

GNSS ELEVATION AND CNR MASK – Elevation and CNR mask used by the GNSS receiver (0xB0)

This is a response message to "***QUERY ELEVATION AND CNR MASK, ID: 0x2F"*** which provides the information of elevation and CNR masks of the GNSS receiver. When enabled, satellite with elevation angle above the elevation mask value and tracked signal with CNR above the CNR mask value will be used for position fix. This message is sent from the GNSS receiver to host. The payload length is 4 bytes.

Structure:

<0xA0,0xA1>< PL><B0>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 04 B0 01 05 00 B4 0D 0A

1 2 3 4

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	B0		UINT8	
2	Elevation and CNR Mask Select	01	00 : Disable 01 : Elevation and CNR both 02 : Elevation only 03 : CNR only	UINT8	
3	Elevation Mask	05	Value of elevation mask	UINT8	Degree
4	CNR Mask	00	Value of CNR mask	UINT8	dB
Payload Length : 4 bytes					

GPS EPHEMERIS DATA – GPS ephemeris data of the GPS receiver (0xB1)

This is a response message to ***"GET GPS EPHEMERIS, ID: 0x30"*** which provides the GPS Ephemeris Data of the GNSS receiver to Host. The Host will save the ephemeris data as an ephemeris file. This message is sent from the GNSS receiver to host. The payload length is 87 bytes.

Structure:

<0xA0,0xA1>< PL><B1>< message body><CS><0x0D,0x0A>

Example:

A0	A1	00	57	B1	00	02	00	77	88	04	61	10	00	00	00	00	00	00	00	00	00	00	00	00	DB	DF	59	A6	00	00	1E
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28

0A	47	7C	00	77	88	88	DF	FD	2E	35	A9	CD	B0	F0	9F	FD	A7	04	8E	CC	A8	10	2C	A1	0E	22	31	59	A6	74	00
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60

77	89	0C	FF	A3	59	86	C7	77	FF	F8	26	97	E3	B9	1C	60	59	C3	07	44	FF	A6	37	DF	F0	B0	5E	0D	0A
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87			

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	B1		UINT8	
2-3	SV id	0x1	Satellite id	UINT16	
4	SubFrameData[0][0]	00	Eph data subframe 1	UINT8	
5	SubFrameData[0][1]	00	Eph data subframe 1	UINT8	
6	SubFrameData[0][2]	00	Eph data subframe 1	UINT8	
7	SubFrameData[0][3]	00	Eph data subframe 1	UINT8	
8	SubFrameData[0][4]	00	Eph data subframe 1	UINT8	
9	SubFrameData[0][5]	00	Eph data subframe 1	UINT8	
10	SubFrameData[0][6]	00	Eph data subframe 1	UINT8	
11	SubFrameData[0][7]	00	Eph data subframe 1	UINT8	
12	SubFrameData[0][8]	00	Eph data subframe 1	UINT8	
13	SubFrameData[0][9]	00	Eph data subframe 1	UINT8	
14	SubFrameData[0][10]	00	Eph data subframe 1	UINT8	
15	SubFrameData[0][11]	00	Eph data subframe 1	UINT8	
16	SubFrameData[0][12]	00	Eph data subframe 1	UINT8	
17	SubFrameData[0][13]	00	Eph data subframe 1	UINT8	
18	SubFrameData[0][14]	00	Eph data subframe 1	UINT8	
19	SubFrameData[0][15]	00	Eph data subframe 1	UINT8	
20	SubFrameData[0][16]	00	Eph data subframe 1	UINT8	
21	SubFrameData[0][17]	00	Eph data subframe 1	UINT8	

22	SubFrameData[0][18]	00	Eph data subframe 1	UINT8	
23	SubFrameData[0][19]	00	Eph data subframe 1	UINT8	
24	SubFrameData[0][20]	00	Eph data subframe 1	UINT8	
25	SubFrameData[0][21]	00	Eph data subframe 1	UINT8	
26	SubFrameData[0][22]	00	Eph data subframe 1	UINT8	
27	SubFrameData[0][23]	00	Eph data subframe 1	UINT8	
28	SubFrameData[0][24]	00	Eph data subframe 1	UINT8	
29	SubFrameData[0][25]	00	Eph data subframe 1	UINT8	
30	SubFrameData[0][26]	00	Eph data subframe 1	UINT8	
31	SubFrameData[0][27]	00	Eph data subframe 1	UINT8	
32~59	SubFrameData[1][0~27]	00	Eph data subframe 2, same as field 4-31	UINT8	
60-87	SubFrameData[2][0~27]	00	Eph data subframe 3, same as field 4-31	UINT8	
Payload Length : 87 bytes					

GNSS POSITON PINNING STATUS – Position pinning status of the GNSS receiver (0xB4)

This is a response message to ***"QUERY POSITION PINNING, ID 0x3A"*** which provides the position pinning status and position pinning parameters of the GNSS receiver. This message is sent from the GNSS receiver to host. The payload length is 12 bytes.

Structure:

<0xA0,0xA1>< PL><B4>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 0C B4 02 00 02 00 0A 00 08 00 2D 01 F4 67 0D 0A

1 2 3 4 5 6 7 8 9 10 11 12

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	B4		UINT8	
2	status	02	0: default 1: enable 2: disable	UINT8	
3-4	Pinning speed	0002	Be effective when status is enable	UINT16	Km/Hr
5-6	Pinning cnt	000A	Be effective when status is enable	UINT16	Second
7-8	Unpinning speed	0008	Be effective when status is enable	UINT16	Km/Hr
9-10	Unpinning cnt	002D	Be effective when status is enable	UINT16	Second
11-12	Unpinning distance	01F4	Be effective when status is enable	UINT16	Meter
Payload Length : 12 bytes					

GNSS POWER MODE STATUS – Power mode status of the GNSS receiver (0xB9)

This is a response message to ***"QUERY POWER MODE, ID: 0x15"*** which provides the power mode status of the GNSS receiver. This message is sent from the GNSS receiver to host. The payload length is 2 bytes.

Structure:

<0xA0,0xA1>< PL><B9>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 02 B9 00 B9 0D 0A

1 2

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	B9		UINT8	
2	Mode	00	00 = Normal (disable power save) 01 = Power Save (enable power save)	UINT8	
Payload Length : 2 bytes					

GNSS 1PPS CABLE DELAY – 1PPS cable delay of the GNSS receiver (0xBB)

This is a response message to ***"QUERY 1PPS CABLE DELAY, ID: 0x46"*** which provides the 1PPS cable delay of the GNSS receiver. This message is sent from the GNSS receiver to host. The payload length is 5 bytes.

Structure:

<0xA0,0xA1>< PL><BB>< message body><CS><0x0D,0x0A>

Example:

A0 A1 00 05 BB 00 00 00 00 BB 0D 0A

1 2 3 4 5

Field	Name	Example(hex)	Description	Type	Unit
1	Message ID	BB		UINT8	-
2-5	Cable Delay	00000000	Cable delay of 1PPS timing mode Return value is in unit of 1/100 ns. Ex. If 100 is the cable delay, it's of value 1ns.	SINT32	1/100 ns
Payload Length : 5 bytes					

A. Ellipsoid List

Ellipsoid Index	Ellipsoid	Semi-major axis (a)	Inversed Flattening (1/f)
1	Airy 1830	6377563.396	299.3249646
2	Modified Airy	6377340.189	299.3249646
3	Australian National	6378160	298.25
4	Bessel 1841 (Namibia)	6377483.865	299.1528128
5	Bessel 1841	6377397.155	299.1528128
6	Clarke 1866	6378206.4	294.9786982
7	Clarke 1880	6378249.145	293.465
8	Everest (India 1830)	6377276.345	300.8017
9	Everest (Sabah Sarawak)	6377298.556	300.8017
10	Everest (India 1956)	6377301.243	300.8017
11	Everest (Malaysia 1969)	6377295.664	300.8017
12	Everest (Malay. & Sing)	6377304.063	300.8017
13	Everest (Pakistan)	6377309.613	300.8017
14	Modified Fischer 1960	6378155	298.3
15	Helmert 1906	6378200	298.3
16	Hough 1960	6378270	297
17	Indonesian 1974	6378160	298.247
18	International 1924	6378388	297
19	Krassovsky 1940	6378245	298.3
20	GRS 80	6378137	298.257222101
21	South American 1969	6378160	298.25
22	WGS 72	6378135	298.26
23	WGS 84	6378137	298.257223563

B. Datum Reference List

Datum index	Datum Name	Delta X	Delta Y	Delta Z	Ellipsoid	Ellipsoid Index	Region of Use
0	WGS-84	0	0	0	WGS 84	23	Global
1	Adindan	-118	-14	218	Clarke 1880	7	Burkina Faso
2	Adindan	-134	-2	210	Clarke 1880	7	Cameroon
3	Adindan	-165	-11	206	Clarke 1880	7	Ethiopia
4	Adindan	-123	-20	220	Clarke 1880	7	Mali
5	Adindan	-166	-15	204	Clarke 1880	7	MEAN FOR Ethiopia; Sudan
6	Adindan	-128	-18	224	Clarke 1880	7	Senegal
7	Adindan	-161	-14	205	Clarke 1880	7	Sudan
8	Afgooye	-43	-163	45	Krassovsky 1940	19	Somalia
9	Ain el Abd 1970	-150	-250	-1	International 1924	18	Bahrain
10	Ain el Abd 1970	-143	-236	7	International 1924	18	Saudi Arabia
11	American Samoa 1962	-115	118	426	Clarke 1866	6	American Samoa Islands
12	Anna 1 Astro 1965	-491	-22	435	Australian National	3	Cocos Islands
13	Antigua Island Astro 1943	-270	13	62	Clarke 1880	7	Antigua (Leeward Islands)
14	Arc 1950	-138	-105	-289	Clarke 1880	7	Botswana
15	Arc 1950	-153	-5	-292	Clarke 1880	7	Burundi
16	Arc 1950	-125	-108	-295	Clarke 1880	7	Lesotho
17	Arc 1950	-161	-73	-317	Clarke 1880	7	Malawi
18	Arc 1950	-143	-90	-294	Clarke 1880	7	MEAN FOR Botswana; Lesotho; Malawi; Swaziland; Zaire; Zambia; Zimbabwe
19	Arc 1950	-134	-105	-295	Clarke 1880	7	Swaziland
20	Arc 1950	-169	-19	-278	Clarke 1880	7	Zaire
21	Arc 1950	-147	-74	-283	Clarke 1880	7	Zambia
22	Arc 1950	-142	-96	-293	Clarke 1880	7	Zimbabwe
23	Arc 1960	-160	-6	-302	Clarke 1880	7	MEAN FOR Kenya; Tanzania
24	Arc 1960	-157	-2	-299	Clarke 1880	7	Kenya
25	Arc 1960	-175	-23	-303	Clarke 1880	7	Taanzania
26	Ascension Island 1958	-205	107	53	International 1924	18	Ascension Island
27	Astro Beacon E 1945	145	75	-272	International 1924	18	Iwo Jima
28	Astro DOS 71/4	-320	550	-494	International 1924	18	St Helena Island
29	Astro Tern Island (FRIG) 1961	114	-116	-333	International 1924	18	Tern Island
30	Astronomical Station 1952	124	-234	-25	International 1924	18	Marcus Island
31	Australian Geodetic 1966	-133	-48	148	Australian National	3	Australia; Tasmania
32	Australian Geodetic 1984	-134	-48	149	Australian National	3	Australia; Tasmania
33	Ayabelle Lighthouse	-79	-129	145	Clarke 1880	7	Djibouti
34	Bellevue (IGN)	-127	-769	472	International 1924	18	Efate & Erromango Islands
35	Bermuda 1957	-73	213	296	Clarke 1866	6	Bermuda
36	Bissau	-173	253	27	International 1924	18	Guinea-Bissau
37	Bogota Observatory	307	304	-318	International 1924	18	Colombia
38	Bukit Rimpah	-384	664	-48	Bessel 1841	5	Indonesia (Bangka & Belitung Ids)
39	Camp Area Astro	-104	-129	239	International 1924	18	Antarctica (McMurdo Camp Area)
40	Campo Inchauspe	-148	136	90	International 1924	18	Argentina
41	Canton Astro 1966	298	-304	-375	International 1924	18	Phoenix Islands
42	Cape	-136	-108	-292	Clarke 1880	7	South Africa
43	Cape Canaveral	-2	151	181	Clarke 1866	6	Bahamas; Florida
44	Carthage	-263	6	431	Clarke 1880	7	Tunisia
45	Chatham Island Astro 1971	175	-38	113	International 1924	18	New Zealand (Chatham Island)
46	Chua Astro	-134	229	-29	International 1924	18	Paraguay
47	Corrego Alegre	-206	172	-6	International 1924	18	Brazil
48	Dabola	-83	37	124	Clarke 1880	7	Guinea
49	Deception Island	260	12	-147	Clarke 1880	7	Deception Island; Antarctia

50	Djakarta (Batavia)	-377	681	-50	Bessel 1841	5	Indonesia (Sumatra)
51	DOS 1968	230	-199	-752	International 1924	18	New Georgia Islands (Gizo Island)
52	Easter Island 1967	211	147	111	International 1924	18	Easter Island
53	Estonia; Coordinate System 1937	374	150	588	Bessel 1841	5	Estonia
54	European 1950	-104	-101	-140	International 1924	18	Cyprus
55	European 1950	-130	-117	-151	International 1924	18	Egypt
56	European 1950	-86	-96	-120	International 1924	18	England; Channel Islands; Scotland; Shetland Islands
57	European 1950	-86	-96	-120	International 1924	18	England; Ireland; Scotland; Shetland Islands
58	European 1950	-87	-95	-120	International 1924	18	Finland; Norway
59	European 1950	-84	-95	-130	International 1924	18	Greece
60	European 1950	-117	-132	-164	International 1924	18	Iran
61	European 1950	-97	-103	-120	International 1924	18	Italy (Sardinia)
62	European 1950	-97	-88	-135	International 1924	18	Italy (Sicily)
63	European 1950	-107	-88	-149	International 1924	18	Malta
64	European 1950	-87	-98	-121	International 1924	18	MEAN FOR Austria; Belgium; Denmark; Finland; France; W Germany; Gibraltar; Greece; Italy; Luxembourg; Netherlands; Norway; Portugal; Spain; Sweden; Switzerland
65	European 1950	-87	-96	-120	International 1924	18	MEAN FOR Austria; Denmark; France; W Germany; Netherlands; Switzerland
66	European 1950	-103	-106	-141	International 1924	18	MEAN FOR Iraq; Israel; Jordan; Lebanon; Kuwait; Saudi Arabia; Syria
67	European 1950	-84	-107	-120	International 1924	18	Portugal; Spain
68	European 1950	-112	-77	-145	International 1924	18	Tunisia
69	European 1979	-86	-98	-119	International 1924	18	MEAN FOR Austria; Finland; Netherlands; Norway; Spain; Sweden; Switzerland
70	Fort Thomas 1955	-7	215	225	Clarke 1880	7	Nevis; St. Kitts (Leeward Islands)
71	Gan 1970	-133	-321	50	International 1924	18	Republic of Maldives
72	Geodetic Datum 1949	84	-22	209	International 1924	18	New Zealand
73	Graciosa Base SW 1948	-104	167	-38	International 1924	18	Azores (Faial; Graciosa; Pico; Sao Jorge; Terceira)
74	Guam 1963	-100	-248	259	Clarke 1866	6	Guam
75	Gunung Segara	-403	684	41	Bessel 1841	5	Indonesia (Kalimantan)
76	GUX 1 Astro	252	-209	-751	International 1924	18	Guadalcanal Island
77	Herat North	-333	-222	114	International 1924	18	Afghanistan
78	Hermannskogel Datum	653	-212	449	Bessel 1841 (Namibia)	4	Croatia -Serbia, Bosnia-Herzegovina
79	Hjorsey 1955	-73	46	-86	International 1924	18	Iceland

80	Hong Kong 1963	-156	-271	-189	International 1924	18	Hong Kong
81	Hu-Tzu-Shan	-637	-549	-203	International 1924	18	Taiwan
82	Indian	282	726	254	Everest (India 1830)	8	Bangladesh
83	Indian	295	736	257	Everest (India 1956)	10	India; Nepal
84	Indian	283	682	231	Everest (Pakistan)	13	Pakistan
85	Indian 1954	217	823	299	Everest (India 1830)	8	Thailand
86	Indian 1960	182	915	344	Everest (India 1830)	8	Vietnam (Con Son Island)
87	Indian 1960	198	881	317	Everest (India 1830)	8	Vietnam (Near 16øN))
88	Indian 1975	210	814	289	Everest (India 1830)	8	Thailand
89	Indonesian 1974	-24	-15	5	Indonesian 1974	17	Indonesia
90	Ireland 1965	506	-122	611	Modified Airy	2	Ireland
91	ISTS 061 Astro 1968	-794	119	-298	International 1924	18	South Georgia Islands
92	ISTS 073 Astro 1969	208	-435	-229	International 1924	18	Diego Garcia
93	Johnston Island 1961	189	-79	-202	International 1924	18	Johnston Island
94	Kandawala	-97	787	86	Everest (India 1830)	8	Sri Lanka
95	Kerguelen Island 1949	145	-187	103	International 1924	18	Kerguelen Island
96	Kertau 1948	-11	851	5	Everest (Malay. & Sing)	12	West Malaysia & Singapore
97	Kusaie Astro 1951	647	1777	-1124	International 1924	18	Caroline Islands
98	Korean Geodetic System	0	0	0	GRS 80	20	South Korea
99	L. C. 5 Astro 1961	42	124	147	Clarke 1866	6	Cayman Brac Island
100	Leigon	-130	29	364	Clarke 1880	7	Ghana
101	Liberia 1964	-90	40	88	Clarke 1880	7	Liberia
102	Luzon	-133	-77	-51	Clarke 1866	6	Philippines (Excluding Mindanao)
103	Luzon	-133	-79	-72	Clarke 1866	6	Philippines (Mindanao)
104	M'Poraloko	-74	-130	42	Clarke 1880	7	Gabon
105	Mahe 1971	41	-220	-134	Clarke 1880	7	Mahe Island
106	Massawa	639	405	60	Bessel 1841	5	Ethiopia (Eritrea)
107	Merchich	31	146	47	Clarke 1880	7	Morocco
108	Midway Astro 1961	912	-58	1227	International 1924	18	Midway Islands
109	Minna	-81	-84	115	Clarke 1880	7	Cameroon
110	Minna	-92	-93	122	Clarke 1880	7	Nigeria
111	Montserrat Island Astro 1958	174	359	365	Clarke 1880	7	Montserrat (Leeward Islands)
112	Nahrwan	-247	-148	369	Clarke 1880	7	Oman (Masirah Island)
113	Nahrwan	-243	-192	477	Clarke 1880	7	Saudi Arabia
114	Nahrwan	-249	-156	381	Clarke 1880	7	United Arab Emirates
115	Naparima BWI	-10	375	165	International 1924	18	Trinidad & Tobago
116	North American 1927	-5	135	172	Clarke 1866	6	Alaska (Excluding Aleutian Ids)
117	North American 1927	-2	152	149	Clarke 1866	6	Alaska (Aleutian Ids East of 180øW)

118	North American 1927	2	204	105	Clarke 1866	6	Alaska (Aleutian Ids West of 180øW)
119	North American 1927	-4	154	178	Clarke 1866	6	Bahamas (Except San Salvador Id)
120	North American 1927	1	140	165	Clarke 1866	6	Bahamas (San Salvador Island)
121	North American 1927	-7	162	188	Clarke 1866	6	Canada (Alberta; British Columbia)
122	North American 1927	-9	157	184	Clarke 1866	6	Canada (Manitoba; Ontario)
123	North American 1927	-22	160	190	Clarke 1866	6	Canada (New Brunswick; Newfoundland; Nova Scotia; Quebec)
124	North American 1927	4	159	188	Clarke 1866	6	Canada (Northwest Territories; Saskatchewan)
125	North American 1927	-7	139	181	Clarke 1866	6	Canada (Yukon)
126	North American 1927	0	125	201	Clarke 1866	6	Canal Zone
127	North American 1927	-9	152	178	Clarke 1866	6	Cuba
128	North American 1927	11	114	195	Clarke 1866	6	Greenland (Hayes Peninsula)
129	North American 1927	-3	142	183	Clarke 1866	6	MEAN FOR Antigua; Barbados; Barbuda; Caicos Islands; Cuba; Dominican Republic; Grand Cayman; Jamaica; Turks Islands
130	North American 1927	0	125	194	Clarke 1866	6	MEAN FOR Belize; Costa Rica; El Salvador; Guatemala; Honduras; Nicaragua
131	North American 1927	-10	158	187	Clarke 1866	6	MEAN FOR Canada
132	North American 1927	-8	160	176	Clarke 1866	6	MEAN FOR CONUS
133	North American 1927	-9	161	179	Clarke 1866	6	MEAN FOR CONUS (East of Mississippi; River Including Louisiana; Missouri; Minnesota)
134	North American 1927	-8	159	175	Clarke 1866	6	MEAN FOR CONUS (West of Mississippi; River Excluding Louisiana; Minnesota; Missouri)
135	North American 1927	-12	130	190	Clarke 1866	6	Mexico
136	North American 1983	0	0	0	GRS 80	20	Alaska (Excluding Aleutian Ids)
137	North American 1983	-2	0	4	GRS 80	20	Aleutian Ids
138	North American 1983	0	0	0	GRS 80	20	Canada
139	North American 1983	0	0	0	GRS 80	20	CONUS
140	North American 1983	1	1	-1	GRS 80	20	Hawaii
141	North American 1983	0	0	0	GRS 80	20	Mexico; Central America
142	North Sahara 1959	-186	-93	310	Clarke 1880	7	Algeria
143	Observatorio Meteorologico 1939	-425	-169	81	International 1924	18	Azores (Corvo & Flores Islands)
144	Old Egyptian 1907	-130	110	-13	Helmert 1906	15	Egypt
145	Old Hawaiian	89	-279	-183	Clarke 1866	6	Hawaii
146	Old Hawaiian	45	-290	-172	Clarke 1866	6	Kauai
147	Old Hawaiian	65	-290	-190	Clarke 1866	6	Maui

148	Old Hawaiian	61	-285	-181	Clarke 1866	6	MEAN FOR Hawaii; Kauai; Maui; Oahu
149	Old Hawaiian	58	-283	-182	Clarke 1866	6	Oahu
150	Oman	-346	-1	224	Clarke 1880	7	Oman
151	Ordnance Survey Great Britain 1936	371	-112	434	Airy 1830	1	England
152	Ordnance Survey Great Britain 1936	371	-111	434	Airy 1830	1	England; Isle of Man; Wales
153	Ordnance Survey Great Britain 1936	375	-111	431	Airy 1830	1	MEAN FOR England; Isle of Man; Scotland; Shetland Islands; Wales
154	Ordnance Survey Great Britain 1936	384	-111	425	Airy 1830	1	Scotland; Shetland Islands
155	Ordnance Survey Great Britain 1936	370	-108	434	Airy 1830	1	Wales
156	Pico de las Nieves	-307	-92	127	International 1924	18	Canary Islands
157	Pitcairn Astro 1967	185	165	42	International 1924	18	Pitcairn Island
158	Point 58	-106	-129	165	Clarke 1880	7	MEAN FOR Burkina Faso & Niger
159	Pointe Noire 1948	-148	51	-291	Clarke 1880	7	Congo
160	Porto Santo 1936	-499	-249	314	International 1924	18	Porto Santo; Madeira Islands
161	Provisional South American 1956	-270	188	-388	International 1924	18	Bolivia
162	Provisional South American 1956	-270	183	-390	International 1924	18	Chile (Northern; Near 19 øS)
163	Provisional South American 1956	-305	243	-442	International 1924	18	Chile (Southern; Near 43 øS)
164	Provisional South American 1956	-282	169	-371	International 1924	18	Colombia
165	Provisional South American 1956	-278	171	-367	International 1924	18	Ecuador
166	Provisional South American 1956	-298	159	-369	International 1924	18	Guyana
167	Provisional South American 1956	-288	175	-376	International 1924	18	MEAN FOR Bolivia; Chile; Colombia; Ecuador; Guyana; Peru; Venezuela
168	Provisional South American 1956	-279	175	-379	International 1924	18	Peru
169	Provisional South American 1956	-295	173	-371	International 1924	18	Venezuela
170	Provisional South Chilean 1963	16	196	93	International 1924	18	Chile (Near 53 øS) (Hito XVIII)
171	Puerto Rico	11	72	-101	Clarke 1866	6	Puerto Rico; Virgin Islands
172	Pulkovo 1942	28	-130	-95	Krassovsky 1940	19	Russia
173	Qatar National	-128	-283	22	International 1924	18	Qatar
174	Qornoq	164	138	-189	International 1924	18	Greenland (South)
175	Reunion	94	-948	-1262	International 1924	18	Mascarene Islands
176	Rome 1940	-225	-65	9	International 1924	18	Italy (Sardinia)
177	S-42 (Pulkovo 1942)	28	-121	-77	Krassovsky 1940	19	Hungary
178	S-42 (Pulkovo 1942)	23	-124	-82	Krassovsky 1940	19	Poland
179	S-42 (Pulkovo 1942)	26	-121	-78	Krassovsky 1940	19	Czechoslavakia
180	S-42 (Pulkovo 1942)	24	-124	-82	Krassovsky 1940	19	Latvia
181	S-42 (Pulkovo 1942)	15	-130	-84	Krassovsky 1940	19	Kazakhstan
182	S-42 (Pulkovo 1942)	24	-130	-92	Krassovsky 1940	19	Albania

183	S-42 (Pulkovo 1942)	28	-121	-77	Krassovsky 1940	19	Romania
184	S-JTSK	589	76	480	Bessel 1841	5	Czechoslavakia (Prior 1 JAN 1993)
185	Santo (DOS) 1965	170	42	84	International 1924	18	Espirito Santo Island
186	Sao Braz	-203	141	53	International 1924	18	Azores (Sao Miguel; Santa Maria Ids)
187	Sapper Hill 1943	-355	21	72	International 1924	18	East Falkland Island
188	Schwarzeck	616	97	-251	Bessel 1841 (Namibia)	4	Namibia
189	Selvagem Grande 1938	-289	-124	60	International 1924	18	Salvage Islands
190	Sierra Leone 1960	-88	4	101	Clarke 1880	7	Sierra Leone
191	South American 1969	-62	-1	-37	South American 1969	21	Argentina
192	South American 1969,	-61	2	-48	South American 1969	21	Bolivia
193	South American 1969,	-60	-2	-41	South American 1969	21	Brazil
194	South American 1969,	-75	-1	-44	South American 1969	21	Chile
195	South American 1969,	-44	6	-36	South American 1969	21	Colombia
196	South American 1969,	-48	3	-44	South American 1969	21	Ecuador
197	South American 1969,	-47	26	-42	South American 1969	21	Ecuador (Baltra; Galapagos)
198	South American 1969,	-53	3	-47	South American 1969	21	Guyana
199	South American 1969,	-57	1	-41	South American 1969	21	MEAN FOR Argentina; Bolivia; Brazil; Chile; Colombia; Ecuador; Guyana; Paraguay; Peru; Trinidad & Tobago; Venezuela
200	South American 1969,	-61	2	-33	South American 1969	21	Paraguay
201	South American 1969,	-58	0	-44	South American 1969	21	Peru
202	South American 1969,	-45	12	-33	South American 1969	21	Trinidad & Tobago
203	South American 1969,	-45	8	-33	South American 1969	21	Venezuela
204	South Asia	7	-10	-26	Modified Fischer 1960	14	Singapore
205	Tananarive Observatory 1925	-189	-242	-91	International 1924	18	Madagascar
206	Timbalai 1948	-679	669	-48	Everest (Sabah Sarawak)	9	Brunei; E. Malaysia (Sabah Sarawak)
207	Tokyo	-148	507	685	Bessel 1841	5	Japan
208	Tokyo	-148	507	685	Bessel 1841	5	MEAN FOR Japan; South Korea; Okinawa
209	Tokyo	-158	507	676	Bessel 1841	5	Okinawa
210	Tokyo	-147	506	687	Bessel 1841	5	South Korea
211	Tristan Astro 1968	-632	438	-609	International 1924	18	Tristan da Cunha
212	Viti Levu 1916	51	391	-36	Clarke 1880	7	Fiji (Viti Levu Island)
213	Voirol 1960	-123	-206	219	Clarke 1880	7	Algeria
214	Wake Island Astro 1952	276	-57	149	International 1924	18	Wake Atoll
215	Wake-Eniwetok 1960	102	52	-38	Hough 1960	16	Marshall Islands
216	WGS 1972	0	0	0	WGS 72	22	Global Definition
217	Yacare	-155	171	37	International 1924	18	Uruguay

218	Zanderij	-265	120	-358	International 1924	18	Suriname

Change Log

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