



# **PL-6315 GPS Receiver Binary Message Protocol User's Reference Guide**

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## 1.0 Binary Message Structure

The PL-6315 binary message comprises of binary string with length of up to 255 characters. It has the following format:

### Format

%%<Message Start>Message Body><Message End><CR><LF>

Description		Value	
Leading Byte 1		%	25h
Leading Byte 2		%	25h
Message Start	Message Type		↓
	Message ID		
Message Body			Up to 250 bytes ↑
Message End	Checksum Byte	<CS>	xxh
Ending Byte 1		<CR>	0Dh
Ending Byte 2		<LF>	0Ah

**Message Start:** <Frame Type> <Frame ID>

Message Type: ACK (06h), NAK (15h), Input (F1h), Output (F2h)

Message ID: Number between 0x01, 0xEF

**Message Body:** Contains input parameter or output information related to the particular message.

**Message End:** Checksum byte. The checksum is calculated by performing exclusive-or, XOR, of all bytes from <Message Type> till the last byte prior to <Checksum Byte>:

$$CS = CS \wedge \text{<Data Byte>}, \text{ where initially } CS = 0$$

### Sample C-Code for Calculating Checksum

```
char BIN_ComputeChecksum( char* buf, int len )
{
    int i;
    char chksum;

    chksum = 0;

    for (i=0; i<len; i++ ) chksum ^= buf[i];

    return sum;
}
```

**Sample Binary Message:** The following binary message sets baud-rate to 19200.

25 25 f1 02 00 02 00 00 00 00 00 00 00 f3 0d 0a

---

## 2.0 Binary Input Message Type <F1h>

This group of binary messages are used to configure the GPS receiver, or to request information from the GPS receiver. If the receiver carries out the command successfully, ACK binary message is returned; otherwise NAK binary message is returned.

### Data Types Used

UINT08: 8bit unsigned integer	SINT16: 16bit signed integer
UINT16: 16bit unsigned integer	SINT32: 32bit signed integer
UINT32: 32bit unsigned integer	SPFP: 32bit single precision floating point number
SINT08: 8bit signed integer	DPFP: 64bit double precision floating point number

### Byte Ordering

All data is in little-endian format, with low-order byte (LSB) at lower address.

### ACK/NAK

An output ACK message indicates GPS accepts the message while NAK indicates GPS cannot execute the command at the moment. However, an error input command will not get any acknowledge message from GPS.

## 2.1 Restart (01h)

<b>Command</b>	<b>Restart (01h)</b>	
<b>String</b>	%<F1h><01h>< Parameter Bytes><CS><CR><LF>	
<b>Length</b>	23	
<b>Response</b>	<b>ACK</b>	%<06h><01h><CS><CR><LF>
	<b>NAK</b>	%<15h><01h><CS><CR><LF>
<b>Description</b>	Force system to restart	

Parameters		Data (Range)	Type (Little-endian)	Unit	Byte #
Restart Type		0: Hardware Reset (all parameters below are unused) 1: Initialized Restart	UNT08	-	1
Start Mode		When Restart type is Initialized Restart 1: Hot start 2: Warm start 3: Cold start 4: Test start 5: Hot start with position 6: Warm start with time/position 7: Cold start with aided Time/Position	UINT08	-	2
(UTC) Date & Time	Year	>= 1980	UINT16	-	3 – 4
	Month	1 ~ 12	UINT08	-	5
	Day	1 ~ 31	UINT08	-	6
	Hour	0 ~ 23	UINT08	-	7
	Minute	0 ~ 59	UINT08	-	8
	Second	0 ~ 59	UINT08	-	9
Reserved		-	UINT08	-	10
(WGS-84) Initial Position	Latitude	Between – 9000 and 9000 > 0: North Hemisphere < 0: South Hemisphere	SINT16	1/100 degree	11 – 12
	Longitude	Between – 18000 and 18000 > 0: East Hemisphere < 0: West Hemisphere	SINT16	1/100 degree	13 – 14
	Altitude	Between –1000 and 18300	SINT16	Meter	15 – 16

## 2.2 Baud-Rate Configuration (02h)

<b>Command</b>	<b>Baud-Rate Configuration (02h)</b>	
<b>String</b>	%%<F1h><02h>< Parameter bytes><CS><CR><LF>	
<b>Length</b>	15	
<b>Response</b>	<b>ACK</b>	%%<06h><02h><CS><CR><LF>
	<b>NAK</b>	%%<15h><02h><CS><CR><LF>
<b>Description</b>	Configure serial port baud-rate	

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
UART Selection	0: UART1 1: UART2	UNT08	-	1
Baud Rate	0: 4800 1: 9600 2: 19200 3: 38400 4: 57600 5: 115200	UNT08	-	2
All non-used byte should be set to 0				3 - 8

## 2.3 Set Datum (03h)

**Command**                    **Set Datum (03h)**

**String**                      %%<F1h><03h>< Parameter bytes><CS><CR><LF>

**Length**                      15

**Response**    **ACK**    %%<06h><03h ><CS><CR><LF>

**NAK**    %%<15h><03h ><CS><CR><LF>

**Description**                    *Used to setup datum parameters for position transformation if non-WGS84 datum is required. Refer to Appendix A and B for the parameters to use.*

<b>Parameters</b>	<b>Data (Range)</b>	<b>Type (Little-endian)</b>	<b>Unit</b>	<b>Byte #</b>
<i>Ellipsoid index</i>	<i>See appendix A</i>	<i>UINT16</i>	<i>-</i>	<i>1 – 2</i>
<i>Delta X</i>	<i>See appendix B</i>	<i>SINT16</i>	<i>Meter</i>	<i>3 – 4</i>
<i>Delta Y</i>	<i>See appendix B</i>	<i>SINT16</i>	<i>Meter</i>	<i>5 – 6</i>
<i>Delta Z</i>	<i>See appendix B</i>	<i>SINT16</i>	<i>Meter</i>	<i>7 – 8</i>

## 2.4 Set NMEA Configuration (04h)

<b>Command</b>	<b>Set NMEA Configuration (04h)</b>	
<b>String</b>	%%<F1h><04h>< Parameter bytes><CS><CR><LF>	
<b>Length</b>	15	
<b>Response</b>	<b>ACK</b>	%%<06h><04h ><CS><CR><LF>
	<b>NAK</b>	%%<15h><04h ><CS><CR><LF>

**Description** Define the output interval between two consecutive NMEA sentences of the same type. When all values are set to 0, no NMEA message is output. Configuration flag contains decimal digits for position and time

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
Configuration flag	Bit7:0: Disable, 1:Enable, Bit[0..2]: Position digits Bit[3..5]: Time digits	UINT08	-	1
RMC Interval	0 ~ 255, 0: Disable	UINT08	Second	2
VTG Interval	0 ~ 255, 0: Disable	UINT08	Second	3
GGA Interval	0 ~ 255, 0: Disable	UINT08	Second	4
GSA Interval	0 ~ 255, 0: Disable	UINT08	Second	5
GSV Interval	0 ~ 255, 0: Disable	UINT08	Second	6
GLL Interval	0 ~ 255, 0: Disable	UINT08	Second	7
ZDA Interval	0 ~ 255, 0: Disable	UINT08	Second	8



## 2.6 Clock Offset (06h)

<b>Command</b>	<b>Clock Offset (06h)</b>	<b>(6315)</b>
<b>String</b>	%%<F1h><06h>< Parameter bytes><CS><CR><LF>	
<b>Length</b>	11	
<b>Response</b>	<b>ACK</b>	%%<06h><06h><CS><CR><LF>
	<b>NAK</b>	%%<15h><06h><CS><CR><LF>
<b>Description</b>	To query clock offset/ To Set clock offset	

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
Clock	0: query	SINT32	-	1 - 4



## 2.8 Read Ephemeris Data (09h)

**Command**                    *Read Ephemeris Data (09h)*

**String**                     %%<F1h><09h>< Parameter bytes><CS><CR><LF>

**Length**                    8

**Response**    **ACK**    %%<06h><09h><CS><CR><LF>

**NAK**    %%<15h><09h><CS><CR><LF>

**Description**                *The Ephemeris data of corresponding PRN will be output sequentially one by one per second*

<i>Parameters</i>	<i>Data (Range)</i>	<i>Type (Little-endian)</i>	<i>Unit</i>	<i>Byte #</i>
<i>PRN</i>	<i>0: all 1~32: Satellite PRN</i>	<i>UINT08</i>	<i>-</i>	<i>1</i>

## 2.9 Load Ephemeris Data (0Ah)

<b>Command</b>	<b>Load Ephemeris Data (0Ah)</b>	
<b>String</b>	%%<F1h><0Ah>< Parameter bytes><CS><CR><LF>	
<b>Length</b>	129	
<b>Response</b>	<b>ACK</b>	%%<06h><0Ah><CS><CR><LF>
	<b>NAK</b>	%%<15h><0Ah><CS><CR><LF>
<b>Description</b>	Load ephemeris into Receiver	

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
PRN	1~32: PRN	UINT08	-	1
reserved	-	UINT08		2
Flags	-	UINT08		3
IODE	-	UINT08		4
IODC	-	UINT16		5-6
WN	-	UINT16		7-8
URA	-	SINT08		9
Health	-	UINT08		10
TGD	-	Single float		11-14
TOC	-	SINT32		15-18
AF2	-	Single float		19-22
AF1	-	Single float		23-26
AF0	-	Single float		27-30
Crs	-	Single float		31-34
Delta_n	-	Single float		35-38
Cuc	-	Single float		39-42
M0	-	Double float		43-50
E	-	Double float		51-58
Cus	-	Single float		59-62
TOE	-	SINT32		63-66
A	-	Double float		67-74
Omega0	-	Double float		75-82
Cic	-	Single float		83-86
Cis	-	Single float		87-90
I0	-	Double float		91-98
Omega	-	Double float		99-116
Crc	-	Single float		117-110
OMEGADOT	-	Single float		111-114
IDOT	-	Single float		115-118
AODO	-	SINT16		119-120
CRC	-	UINT16		121-122

## 2.10 Read Almanac Data (0Bh)

<b>Command</b>	<b>Read Almanac Data (0Bh)</b>	
<b>String</b>	%%<F1h><0Bh>< Parameter bytes><CS><CR><LF>	
<b>Length</b>	8	
<b>Response</b>	<b>ACK</b>	%%<06h><0Bh><CS><CR><LF>
	<b>NAK</b>	%%<15h><0Bh><CS><CR><LF>
<b>Description</b>	The Almanac data of corresponding PRN will be output sequentially one by one per second	

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
PRN	0: all 1~32: Satellite PRN	UINT08	-	1

## 2.11 Load Almanac Data (0Ch)

<b>Command</b>	<b>Load Almanac Data (0Ch)</b>	
<b>String</b>	%%<F1h><0Ch>< Parameter bytes><CS><CR><LF>	
<b>Length</b>	57	
<b>Response</b>	<b>ACK</b>	%%<06h><0Ch><CS><CR><LF>
	<b>NAK</b>	%%<15h><0Ch><CS><CR><LF>
<b>Description</b>	Load Alamanc into receiver	

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
PRN	1-32: PRN	UINT08	-	1
reserved	-	UINT08		2
Valid	-	UINT08		3
health	-	UINT08		4
WNt	-	UINT16		5 – 6
E	-	Single float		7 – 8
toa	-	UINT32		9 – 12
I0	-	Single float		13 – 16
OMEGADOT	-	Single float		17 – 20
A	-	Single float		21 – 24
OMEGA0	-	Single float		25 – 28
Omega	-	Single float		29 – 32
M0	-	Single float		33 – 36
Af0	-	Single float		37 – 40
Af1	-	Single float		41 – 44
Wna	-	UINT16		45 – 48
CRC	-	UINT16		49 - 50

## 2.12 Set Module ID (0Dh)

<b>Command</b>	<b>Set Module ID (0Dh)</b>	
<b>String</b>	%%<F1h><0Dh>< Parameter byte><CS><CR><LF>	
<b>Length</b>	16	
<b>Response</b>	<b>ACK</b>	%%<06h><0Dh><CS><CR><LF>
	<b>NAK</b>	%%<15h><0Dh><CS><CR><LF>
<b>Description</b>	Setup Module ID.	

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
Type	1: Module ID type	UINT08	-	1
ID	1~2 <sup>32</sup>	UINT32	-	2 - 5
Reserved	-	UINT32	-	6 - 9

### 2.13 Query Module ID (0Eh)

<b>Command</b>	<b>Query Module ID (0Eh)</b>	
<b>String</b>	%%<F1h><0Eh>< Parameter byte><CS><CR><LF>	
<b>Length</b>	8	
<b>Response</b>	<b>ACK</b>	%%<06h><0Eh><CS><CR><LF>
	<b>NAK</b>	%%<15h><0Eh><CS><CR><LF>
	<b>85h</b>	See message 85h for detail
<b>Description</b>	Retrieve User ID of the module.	

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
Type	1: User ID retrieval	UINT08	-	1

## 2.14 Set DOP Mask (0Fh)

<b>Command</b>	<b>Set DOP Mask (0Fh)</b>	
<b>String</b>	%%<F1h><0Fh>< Parameter byte><CS><CR><LF>	
<b>Length</b>	22	
<b>Response</b>	<b>ACK</b>	%%<06h><0Fh><CS><CR><LF>
	<b>NAK</b>	%%<15h><0Fh><CS><CR><LF>

**Description** To set the DOP mask value and which type of DOP mask to use. When the calculated DOP value is higher than this mask value, no valid position data will be available.

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
DOP Mask Reference	0: Disable DOP masking 1: Use GDOP 2: Use PDOP* (default) 3: Use HDOP	UINT08	-	1
GDOP Mask value	0 ~ 255	UINT08	-	2
PDOP mask value	0 ~ 255	UINT08	-	3
HDOP Mask value	0 ~ 255	UINT08	-	4

## 2.15 Set Elevation Mask (10h)

**Command**                    **Set Elevation Mask (10h)**

**String**                      %%<F1h><10h>< Parameter byte><CS><CR><LF>

**Length**                      8

**Response**    **ACK**    %%<06h><10h><CS><CR><LF>

**NAK**    %%<15h><10h><CS><CR><LF>

**Description**                    Set satellite elevation mask value. Satellite with elevation angle below this mask value is not used for position fix

<i>Parameters</i>	<i>Data (Range)</i>	<i>Type (Little-endian)</i>	<i>Unit</i>	<i>Byte #</i>
<i>Mask value</i>	<i>0 ~ 89</i>	<i>UINT08</i>	<i>Degree</i>	<i>1</i>

## 2.16 DGPS Control (11h)

**Command**                    *DGPS Control (11h)*

**String**                     %%<F1h><11h>< Parameter byte><CS><CR><LF>

**Length**                    9

**Response**    **ACK**    %%<06h><11h><CS><CR><LF>

**NAK**    %%<15h><11h><CS><CR><LF>

**Description**                *Enable / disable DGPS*

<i>Parameters</i>	<i>Data (Range)</i>	<i>Type (Little-endian)</i>	<i>Unit</i>	<i>Byte #</i>
<i>Item</i>	0: Disable 1: WAAS / EGNOS	UINT08	-	1
<i>Reserved</i>	-	UINT08	-	2

## 2.17 1PPS Control (12h)

**Command**                    **1PPS Control (12h)**

**String**                      %%<F1h><11h>< Parameter byte><CS><CR><LF>

**Length**                      10

**Response**    **ACK**    %%<06h><12h><CS><CR><LF>

**NAK**    %%<15h><12h><CS><CR><LF>

**Description**                    *Enable / disable 1PPS and setup pulse width and PPM signal.*

- 1PPS signal is output when GPS satisfies the following condition at least 3 minutes.
  - Stationary state.
  - 3D position fix.
- Any interrupt on one of the conditions results in restarting the counter (3 minutes).
- Pulse width = Pulse basic width x Multiplier

*MMP field is used to define another signal output with 10us in width around 28~35us right after 1PPS.*

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
Item	0: Disable 1: Pulse when lock 2: Always Pulse even lose lock	UINT08	-	1
Pulse basic width	Bit[0..1] 0: 20 ms 1: 1 ms 2: 20 us 3: 1 us Disable: signal type	UINT08	-	2
	Bit[2..7]: PPM period 1..60, 0: disable		minute	
Multiplier	1 ~ 16 times, <i>for 1PPS only</i>	UINT08	-	3

## 2.18 Set Output Format (13h)

<b>Command</b>	<b>Set Output Format (13h)</b>	
<b>String</b>	%%<F1h><13h>< Parameter byte><CS><CR><LF>	
<b>Length</b>	8	
<b>Response</b>	<b>ACK</b>	%%<06h><13h><CS><CR><LF>
	<b>NAK</b>	%%<15h><13h><CS><CR><LF>
<b>Description</b>	Change to different message output format	

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
Type	0: No output (Permanent change*) 1: NMEA (Permanent change*) 2: Binary (Temporary change, back to original after recycle power) 3: Binary (Permanent change*) **Permanent change means setting will be saved into flash for PL-6315.	UINT08	-	1

## 2.19 Power Saving Mode (14h)

<b>Command</b>	<b>Power Saving Mode (14h)</b>	
<b>String</b>	%%<F1h><14h>< Parameter byte><CS><CR><LF>	
<b>Length</b>	11	
<b>Response</b>	<b>ACK</b>	%%<06h><14h><CS><CR><LF>
	<b>NAK</b>	%%<15h><14h><CS><CR><LF>
<b>Description</b>	Control power saving cycle behavior	

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
Sleep Duration	0: disable, 1~3600	SINT16	second	1-2
Sleep mode	Bit 0: 1: deep sleep, 0 : normal sleep	UINT08	bit	3
Tracking time	2 ~ 9	UINT08	100ms	4

## 2.20 Maintain Customized ID (16h)

<b>Command</b>	<b>Maintain customized ID (16h)</b>	
<b>String</b>	%%<F1h><16h>< Parameter byte><CS><CR><LF>	
<b>Length</b>	41	
<b>Response</b>	<b>ACK</b>	%%<06h><16h><CS><CR><LF>
	<b>NAK</b>	%%<15h><16h><CS><CR><LF>
	<b>8Dh</b>	See 8Dh message for detail
<b>Description</b>	Read or set customized ID string When Read ID, length/ID string field are ignored	

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
<i>action</i>	0: Read ID, 1: Set ID	UINT08	-	1
<i>length</i>	0~16	UINT08	-	2
<i>ID string</i>	Printable string	-	-	3-18
<i>reserved</i>	-	-	-	19-34

## 2.21 Query Navigation Parameters (17h)

<b>Command</b>	<b>Query Navigation Parameters (17h)</b>	
<b>String</b>	%<F1h><17h>< Parameter byte><CS><CR><LF>	
<b>Length</b>	8	
<b>Response</b>	<b>ACK</b>	%<06h><17h><CS><CR><LF>
	<b>NAK</b>	%<15h><17h><CS><CR><LF>
	<b>86h</b>	See message 86h for detail
<b>Description</b>	Query current navigation parameters: <ul style="list-style-type: none"> <li>- Position update rate</li> <li>- DOP mask</li> <li>- Elevation mask</li> <li>- 1PPS parameter</li> <li>- DGPS</li> </ul>	

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
Type	0: all	UINT08	-	1

## 2.22 Query System Settings (18h)

<b>Command</b>	<b>Query System Settings (18h)</b>	
<b>String</b>	%%<F1h><18h>< Parameter byte><CS><CR><LF>	
<b>Length</b>	8	
<b>Response</b>	<b>ACK</b>	%%<06h><18h><CS><CR><LF>
	<b>NAK</b>	%%<15h><18h><CS><CR><LF>
	<b>87h</b>	See message 87h for detail
<b>Description</b>	Query current system settings: <ul style="list-style-type: none"> <li>- NMEA configuration</li> <li>- Firmware revision</li> <li>- IO settings</li> <li>- Output format</li> <li>- Locale</li> <li>- Datum</li> </ul>	

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
Type	0: all	UINT08	-	1

## 2.23 Set Local Time (19h)

<b>Command</b>	<b>Set Local Time (19h)</b>	
<b>String</b>	%%<F1h><19h><CS><CR><LF>	
<b>Length</b>	12	
<b>Response</b>	<b>ACK</b>	%%<06h><19h><CS><CR><LF>
	<b>NAK</b>	%%<15h><19h><CS><CR><LF>

**Description** Set up user local time information. This command is useful to instruct module to output time information based on used zone.  
 When flag is set to 0, system time is equal to UTC time.  
 When flag is set to 1, system time is adjusted to local time

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
Flag	0: only local time is affected (e.g. ZDA sentence) 1: both local and system time are affected (e.g. GGA sentence)	UINT08	-	1
Time Zone Hour (GMT+-)	-12 ~ +12	SINT08	Hour	2
Time Zone Minute (GMT+-)	-59 ~ +59 'sign' should be the same as used for Hour	SINT08	Minute	3
Time Zone Second (GMT+-)	-59 ~ +59 'sign' should be the same as used for Hour	SINT08	Second	4
Adjust	Normal: 0 For Daylight Saving Time or Summer Time	SINT08	Hour	5

## 2.24 Set Extended Datum (1Bh)

<b>Command</b>	<b>Set Extended Datum (1Bh)</b>	
<b>String</b>	%%<F1h><1Bh>< Parameter bytes><CS><CR><LF>	
<b>Length</b>	29	
<b>Response</b>	<b>ACK</b>	%%<06h><1Bh ><CS><CR><LF>
	<b>NAK</b>	%%<15h><1Bh ><CS><CR><LF>

**Description**                    *Set up datum parameters used for position transformation*  
*This command is used to input datum parameter other than build-in supported ones.*  
*All information provided is based on WGS84 at initial position information.*

Parameters		Data (Range)	Type (Little-endian)	Unit	Byte #
Ellipsoid Parameters	A	Semi-major axis	DPFP	-	1 – 8
	1/f	Inversed Flattening	DPFP	-	9 – 16
Delta X		+ - 2 <sup>15</sup>	SINT16	Meter	17 – 18
Delta Y		+ - 2 <sup>15</sup>	SINT16	Meter	19 – 20
Delta Z		+ - 2 <sup>15</sup>	SINT16	Meter	21 - 22

## 2.25 Set Status Led Pattern (1Ch)

<b>Command</b>	<b>Set Status Led Pattern (1Ch)</b>	
<b>String</b>	%<F1h><1Ch>< Parameter bytes><CS><CR><LF>	
<b>Length</b>	24	
<b>Response</b>	<b>ACK</b>	%<06h><1Ch ><CS><CR><LF>
	<b>NAK</b>	%<15h><1Ch ><CS><CR><LF>
<b>Description</b>	Set up LED pattern Each bit is 200 ms long in time	

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
<i>Index</i>	0: Standard Status LED 1: Data Logger LED	UINT08	-	1
<i>Non Fix / Data Logger clear</i>	0x0~0xFFFF, bit 15 = 1 for 3-second pattern bit 15 = 0 for 2-second pattern	UINT32	-	2 – 5
<i>Fix / POI</i>	0x0~0xFFFF, bit 15 = 1 for 3-second pattern bit 15 = 0 for 2-second pattern	UINT32		6 – 9
<i>Non Fix, full</i>	0x0~0xFFFF, bit 15 = 1 for 3-second pattern bit 15 = 0 for 2-second pattern	UINT32		10 – 13
<i>Fix, full</i>	0x0~0xFFFF, bit 15 = 1 for 3-second pattern bit 15 = 0 for 2-second pattern	UINT32		14 - 17

## 2.26 Record Trace (1Dh)

<b>Command</b>	<b>Record Trace (1Dh)</b>	<b>Special HW required</b>
<b>String</b>	%%<F1h><1Dh>< Parameter bytes><CS><CR><LF>	
<b>Length</b>	8	
<b>Response</b>	<b>ACK</b> %%<06h><1Dh ><CS><CR><LF>	
	<b>NAK</b> %%<15h><1Dh ><CS><CR><LF>	
<b>Description</b>	<i>Parameter Action</i> Start/stop recording the user trace.	

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
Action	Bit: 0 0 = stop, 1 = start	UINT08	-	1

\* Need special H/W

## 2.27 Read Trace Log (1Eh)

<b>Command</b>	<b>Read Trace Log (1Eh)</b>	<b>Special HW required</b>
<b>String</b>	%%<F1h><1Eh>< Parameter bytes><CS><CR><LF>	
<b>Length</b>	10	
<b>Response</b>	<b>ACK</b> %%<06h><1Eh ><CS><CR><LF> <b>NAK</b> %%<15h><1Eh ><CS><CR><LF> <b>88h</b> Packed trace record (See output message 88h) <b>D4h</b> Extended trace record (See output message D4h)	

**Description** Start/stop reading the trace log.  
 A NAK message is returned when system is in recording. When logged records are outputting, the normal position messages (NMEA/Binary) are temporarily disabled until reading stops.

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
Action	0: stop, 1: Read packed trace record	UINT08	-	1
Baud rate	0: 4800 1: 9600 2: 19200 3: 38400 4: 57600 5: 115200	UINT08	-	2
Port	0 = RS232 COM 1	UINT08	-	3

\* Need special H/W

## 2.28 Maintain Trace (1Fh)

<b>Command</b>	<b>Maintain Trace (1Fh)</b>	<b>Special HW required)</b>
<b>String</b>	%%<F1h><1F>< Parameter bytes><CS><CR><LF>	
<b>Length</b>	15	
<b>Response</b>	<b>ACK</b>	%%<06h><1Fh ><CS><CR><LF>
	<b>NAK</b>	%%<15h><1Fh><CS><CR><LF>
	<b>89h/8Ah/</b>	(see output message 89h/8Ah)
	<b>8Ch</b>	when action = 0, outputs 8Ah when action = 2, output 89h when action = 4, output 8Ch

### Description

#### Action

0: system returns message 8Ah  
 2: System returns message 89h  
 4: System returns message 8Ch

#### Setup

Bit 0: action on memory full  
 Bit 1: Power on action  
 Bit 2: record type, when changed, all logged records are erased  
**Distance** is the distance between two contiguous recorded points.  
**Time Period** is the time between two contiguous recorded points.  
**Speed** is the speed of recorded point.

*Note: When one of three parameters reaches the criteria, this trace is recorded. If one of the parameter is 0, it is ignored. If all parameters are 0, the trace is recorded in every single second. When recording reaches the storage limitation, system will erase the earliest records to make space for newest records if 'Continue on full' is selected. Technically, it is a FIFO ring buffer.*

*Note: This ring buffer is consisted of several 4K-byte sectors. When ring buffer is full, system erases the oldest whole sector to make room for incoming records if 'continue on full' is selected. Users should see a 100% used percentage of ring buffer when ring buffer is full, however, the number of logged records may be reduced because the erased sector contains more than one records while only one new coming record is added at that moment.*

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
Action	0: Read log status, 1: Clear all trace records 2: Read configuration and status 3: Set up configuration (see below) 4. Test	UINT08	-	1
Setup	Bit 0: 0- Continue on full, 1- Stop on full Bit 1: 0- Power on stop, 1- Power on Logging Bit 2: 0- packed, 1- extended	UINT08	-	2
Distance	0 ~ 65535	UINT16	meter	3 – 4
Time Period	0 ~ 65535	UINT16	seconds	5 – 6
Speed	0 ~ 65535	UINT16	meter/sec	7 – 8

\* Need special H/W

## 2.29 Set GPIOs (21h)

<b>Command</b>	<b>Set GPIOs (21h)</b>	
String	%%<F1h><21>< Parameter bytes><CS><CR><LF>	
Length	15	
Response	ACK	%%<06h><21h ><CS><CR><LF>
	NAK	%%<15h><21h><CS><CR><LF>
Description	Change GPIO output level in TTL	

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
GPIO bit Mask	0x00000000 ~ 0xFFFFFFFF	UINT32	-	!-4
Level pattern	0x00000000 ~ 0xFFFFFFFF	UINT32	-	5-8

## 2.30 Set Receiver Parameters (22h)

<b>Command</b>	<b>Set Receiver Parameters (22h)</b>	
String	%%<F1h><22>< Parameter bytes><CS><CR><LF>	
Length	23	
Response	ACK	%%<06h><22h ><CS><CR><LF>
	NAK	%%<15h><22h><CS><CR><LF>
Description	<p>Change receiver parameters:</p> <p><i>Antenna detection is a feature is used to monitor the antenna status. When it is detected fail, GPS will report \$PLCS statement once and later periodically reported on the boundary 60 seconds with respect to UTC time.</i></p> <p><i>When antenna is good, \$PLCS,HW,ANT,A*25&lt;CR&gt;&lt;LF&gt; is output</i></p> <p><i>When antenna is no good, \$PLCS,HW,ANT,V*32&lt;CR&gt;&lt;LF&gt; is output</i></p>	

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
Static speed	0~255	UINT08	0.1m/s	!
Special Function	Bit[0]: 0: no limited, 1: 18000m	UINT08		2
Antenna Failure Detection	Report period Bit[0..5]: n n = 0, no antenna detection n = 1, 1 second period n > 1, Poll period (n-1)x 60 n = 61 is the maximum number for 1 hour period (3600 seconds)	UINT08	60 seconds	3
	Failure signal active direction Bit[6]: 0 = GPIO10 Low is fail, 1 = GPIO10 high is fail Show mode Bit[7]: 0 = show failure sentence only as long as error detected 1 = always show the antenna status Normal sentence "\$PLCS,ANT,A*25" Failure sentence "\$PLCS,ANT,V*32"			
Reserved				4-16

### **3.0 Binary Output Message Type <F2h>**

This group of binary messages is output in response to commands that requests additional receiver information.

#### **Data Types Used**

(See Binary Input Message Type <F1h>)

#### **Byte Ordering**

(See Binary Input Message Type <F1h>)

### 3.1 Firmware Revision (80h)

**Message**                    *Firmware Revision (80h)*  
**String**                     *%%<F2h><80h>< Information bytes><CS><CR><LF>*  
**Length**                     *29*  
**Description**                *Output the revision information of Prolific firmware.  
 This message is provided by request.*

<b>Parameters</b>	<b>Data (Range)</b>	<b>Type (Little-endian)</b>	<b>Unit</b>	<b>Byte #</b>
<i>Revision code</i>	<i>Xxxxxxxxxxxx</i>	<i>UINT08</i>	<i>-</i>	<i>1-12</i>
<i>Date</i>	<i>Example 2003/11/01 as below This value is represented as 20031101</i>	<i>UINT32</i>	<i>-</i>	<i>13-16</i>
<i>Time</i>	<i>Example 12:08:01: 120801 This 4-byte value has value 120801</i>	<i>UINT32</i>	<i>-</i>	<i>17-20</i>
<i>CRC</i>	<i>CRC of the firmware code</i>	<i>UINT16</i>	<i>-</i>	<i>21-22</i>

### 3.2 Epheremis Data (83h)

**Message** *Epheremis Data (83h)*  
**String** *%%<F2h><83h>< Information bytes><CS><CR><LF>*  
**Length** *129*  
**Description** *Output the Epheremis information of one SV*

<b>Parameters</b>	<b>Data (Range)</b>	<b>Type (Little-endian)</b>	<b>Unit</b>	<b>Byte #</b>
<i>Total # of epheremis</i>	<i>0~32</i>	<i>UINT08</i>	<i>-</i>	<i>1</i>
<i>PRN</i>	<i>1~32: PRN</i>	<i>UINT08</i>	<i>-</i>	<i>2</i>
<i>Flags</i>	<i>-</i>	<i>UINT08</i>		<i>3</i>
<i>IODE</i>	<i>-</i>	<i>UINT08</i>		<i>4</i>
<i>IODC</i>	<i>-</i>	<i>UINT16</i>		<i>5-6</i>
<i>WN</i>	<i>-</i>	<i>UINT16</i>		<i>7-8</i>
<i>URA</i>	<i>-</i>	<i>SINT08</i>		<i>9</i>
<i>Health</i>	<i>-</i>	<i>UINT08</i>		<i>10</i>
<i>TGD</i>	<i>-</i>	<i>Single float</i>		<i>11-14</i>
<i>TOC</i>	<i>-</i>	<i>SINT32</i>		<i>15-18</i>
<i>AF2</i>	<i>-</i>	<i>Single float</i>		<i>19-22</i>
<i>AF1</i>	<i>-</i>	<i>Single float</i>		<i>23-26</i>
<i>AF0</i>	<i>-</i>	<i>Single float</i>		<i>27-30</i>
<i>Crs</i>	<i>-</i>	<i>Single float</i>		<i>31-34</i>
<i>Delta_n</i>	<i>-</i>	<i>Single float</i>		<i>35-38</i>
<i>Cuc</i>	<i>-</i>	<i>Single float</i>		<i>39-42</i>
<i>M0</i>	<i>-</i>	<i>Double float</i>		<i>43-50</i>
<i>E</i>	<i>-</i>	<i>Double float</i>		<i>51-58</i>
<i>Cus</i>	<i>-</i>	<i>Single float</i>		<i>59-62</i>
<i>TOE</i>	<i>-</i>	<i>SINT32</i>		<i>63-66</i>
<i>A</i>	<i>-</i>	<i>Double float</i>		<i>67-74</i>
<i>Omega0</i>	<i>-</i>	<i>Double float</i>		<i>75-82</i>
<i>Cic</i>	<i>-</i>	<i>Single float</i>		<i>83-86</i>
<i>Cis</i>	<i>-</i>	<i>Single float</i>		<i>87-90</i>
<i>I0</i>	<i>-</i>	<i>Double float</i>		<i>91-98</i>
<i>Omega</i>	<i>-</i>	<i>Double float</i>		<i>99-116</i>
<i>Crc</i>	<i>-</i>	<i>Single float</i>		<i>117-110</i>
<i>OMEGADOT</i>	<i>-</i>	<i>Single float</i>		<i>111-114</i>
<i>IDOT</i>	<i>-</i>	<i>Single float</i>		<i>115-118</i>
<i>AODO</i>	<i>-</i>	<i>SINT16</i>		<i>119-120</i>
<i>CRC</i>	<i>-</i>	<i>UINT16</i>		<i>121-122</i>

### 3.3 Almanac Data (84h)

<b>Message</b>	<b>Almanac Data (84h)</b>
<b>String</b>	%%<F2h><84h>< Information bytes><CS><CR><LF>
<b>Length</b>	57
<b>Description</b>	Output the Almanac information of one SV.

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
Total # of Almanac	0 ~ 32	UINT08	-	1
PRN	1~32: PRN	UINT08	-	2
Valid	-	UINT08		3
health	-	UINT08		4
WNt	-	UINT16		5 – 6
E	-	Single float		7 – 8
toa	-	UINT32		9 – 12
I0	-	Single float		13 – 16
OMEGADOT	-	Single float		17 – 20
A	-	Single float		21 – 24
OMEGA0	-	Single float		25 – 28
Omega	-	Single float		29 – 32
M0	-	Single float		33 – 36
Af0	-	Single float		37 – 40
Af1		Single float		41 – 44
Wna		UINT16		45 – 48
CRC		UINT16		49 - 50

### 3.4 Module ID (85h)

**Message**                    **Module ID (85h)**  
**String**                    %%<F2h><85h>< Information bytes><CS><CR><LF>  
**Length**                    12  
**Description**              Provides module Identifier

<i>Parameters</i>	<i>Data (Range)</i>	<i>Type (Little-endian)</i>	<i>Unit</i>	<i>Byte #</i>
<i>Type</i>	1: Module ID	UINT08	-	1
<i>ID</i>	0 ~ 2 <sup>32</sup>	UINT32	-	2 - 5

### 3.5 Navigation Parameters (86h)

**Message**                      *Navigation Parameters (86h)*  
**String**                        %%<F2h><86h>< Information bytes><CS><CR><LF>  
**Length**                        25  
**Description**                *Used to show current navigation parameters*

Parameters		Data (Range)	Type (Little-endian)	Unit	Byte #
Update rate		0 ~ 5	UINT08	Hz	1
DOP	Mask	0: Disable, 1: GDOP 2: PDOP 3: HDOP:	UINT08	-	2
	GDOP	0 ~ 255	UINT08	Degree	3
	PDOP	0 ~ 255	UINT08	Degree	4
	HDOP	0 ~ 255	UINT08	Degree	5
Elevation mask		0 ~ 89	UINT08	Degree	6
DGPS		0: disable    1: WAAS	UINT08	-	7
1PPS	Signal	0: off, 1: pulse when lock; 2: always	UINT08	-	8
	Width	0: 2ms, 1: 1ms, 2: 20us, 3: 1us	UINT08	-	9
	Multiplier	1 ~ 16	UINT08	-	10
Sleep Time		-1 ~ 3600	SINT16	-	11 – 12
Maximum static Speed		0	UINT16	-	13
High limitation		1: on	-	--	14
Scenario		0~3	UINT08		15
Tracking interval for sleep mode		2 ~ 9	UINT08	100ms	16
Reserved 2		0	UINT32	-	17 – 18

### 3.6 System Settings (87h)

<b>Message</b>	<b>Systems Settings (87h)</b>
<b>String</b>	%%<F2h><87h>< Information bytes><CS><CR><LF>
<b>Length</b>	55
<b>Description</b>	Used to show current system settings

Parameters		Data (Range)	Type (Little-endian)	Unit	Byte #
COM 1		0: 4800 1: 9600 2: 19200 3: 38400 4: 57600 5: 115200	UINT08	-	1
COM 2		0: 4800 1: 9600 2: 19200 3: 38400 4: 57600 5: 115200	UINT08	-	2
NMEA	Check sum	Bit7: 0: Disable, 1: Enable	UINT08	-	3
	RMC	0 ~ 255, 0: Disable	UINT08	Degree	4
	VTG	0 ~ 255, 0: Disable	UINT08	Degree	5
	GGA	0 ~ 255, 0: Disable	UINT08	Degree	6
	GSA	0 ~ 255, 0: Disable	UINT08	Degree	7
	GSV	0 ~ 255, 0: Disable	UINT08	Degree	8
	GLL	0 ~ 255, 0: Disable	UINT08	Degree	9
	ZDA	0 ~ 255, 0: Disable	UINT08	Degree	10
Output Format		Com 1 [0:3], com 1 [4:7] 0: No output 1: NMEA 2: Binary (Temporary) 3: Binary (Permanent)	UINT08	Degree	11
Locale	Flag	0: only local time is affected (e.g. ZDA sentence) 1: both local and system time are affected (e.g. GGA sentence)	UINT08	-	12
	Hour	-12 ~ +12	SINT08	Hour	13
	Minutes	-59 ~ +59 'sign' is the same as used for Hour	SINT08	Minute	14
	Second	-59 ~ +59 'sign' is the same as used for Hour	SINT08	Second	15
	Adjusted Hour	Normal: 0 For Daylight Saving Time or Summer Time	SINT08	Hour	16
Ellipsoid Index		0 ~ 23: system defined, 65535: User defined	UINT16	-	17 - 18
A		Semi-major axis	DPFP	-	19 - 26

	<i>1/f</i>	<i>Inversed Flattening</i>	<i>DPFP</i>	-	<i>27 – 34</i>
	<i>Delta X</i>	$\pm 2^{15}$	<i>SINT16</i>	<i>Meter</i>	<i>35 – 36</i>
	<i>Delta Y</i>	$\pm 2^{15}$	<i>SINT16</i>	<i>Meter</i>	<i>37 – 38</i>
	<i>Delta Z</i>	$\pm 2^{15}$	<i>SINT16</i>	<i>Meter</i>	<i>39 – 40</i>
<i>Reserved 1</i>		<i>0</i>	<i>UINT32</i>	-	<i>41 – 44</i>
<i>Reserved 2</i>		<i>0</i>	<i>UINT32</i>	-	<i>45 – 48</i>

### 3.7 Packed Trace Record (88h)

<b>Message</b>	<b>Packed Trace Record (88h)</b>	<b>Special HW required</b>
<b>String</b>	%%<F2h><88h>< Information bytes><CS><CR><LF>	
<b>Length</b>	27	
<b>Description</b>	Used to output logged trace records	

Parameters		Data (Range)	Type (Little-endian)	Unit	Byte #
GPS Time		Bit [15..9]: 0~127: Year, 1980~2107	-	-	1 – 2
		Bit [8..5]: Month: 1 ~ 12			
		Bit [4..0]: Day: 1 ~ 31			
		Time of day: 0 ~ 43199, bi-second			UINT16
Position (ECEF)	X	+/- 2 <sup>31</sup>	SINT32	Meter	5 – 8
	Y	+/- 2 <sup>31</sup>	SINT32	Meter	9 – 12
	Z	+/- 2 <sup>31</sup>	SINT32	Meter	13 – 16
POI		[11:0] 0: no POI, <b>see table below*</b> [15..12]: version	UINT16	-	17 – 18
Information	Latest Flag	Bit [15]: 1- the last record	UINT16	-	19 – 20
	Mode	Bit [13]: 0 - 2D fix, 1 - 3D fix			
	DGPS	Bit [12]: 0-No, 1-Yes			
	Velocity	bit [11:0]			

POI button	Button 1	Button 2	Button 3	# of LED Flash	Correspondent Bit (POI value)
Clear logged data	> 3 seconds	-	-	3	-
POI ID - I	-	-	< 1 second	1	Bit 0
POI ID - II	-	< 1 second	-	1	Bit 1
POI ID - III	< 1 second	-	-	1	Bit 2
POI ID - IV	-	-	> 3 seconds	1	Bit 3
POI ID - V	-	> 3 seconds	-	1	Bit 4

## 3.8 Trace Buffer Configuration and Status (89h)

<b>Message</b>	<b>Trace Buffer Configuration and Status (89h)</b>	<b>Special HW required</b>
<b>String</b>	%<F2h><89h>< Information bytes><CS><CR><LF>	
<b>Length</b>	25	
<b>Description</b>	Used to show status/configuration of the trace buffer.	

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
State	0: stop, 1: recording, 2: Reading	UINT08	-	1
Size	Bit[3..0]: channel 1 size ID Bit[7..4]: channel 0 size ID  Ch size = $(2^{(ID-1)}) * 64 * 1024$ Available size = Ch0 size + ch1 size - 16384 bytes	UINT08		2
Used Percentage	0 ~ 100	UINT08	%	3
# of records logged	0 ~ $2^{32}-1$	UINT32	-	4 - 7
Reading Position	0 ~ $2^{32}-1$ (zero-based)	UINT32	-	8 - 11
Setup	Bit 0: 0=continue on full; 1=stop on full Bit 1: 0=Power on stop; 1=Power on log	UINT08		12
Time Period	1 ~ 65335	UINT16	seconds	13 - 14
Distance	1 ~ 65335	UINT16	meter	15 - 16
Speed	1 ~ 65335	UINT16	meter	17 - 18

### 3.9 Extended Trace Buffer Status (8Ah)

<b>Message</b>	<b>Extended Trace Buffer Status (8Ah)</b>	<b>Special HW required</b>
<b>String</b>	%%<F2h><8Ah>< Information bytes><CS><CR><LF>	
<b>Length</b>	18	
<b>Description</b>	Used to show status of extended trace buffer	

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
State	0: stop, 1: recording, 2: Reading	UINT08	-	1
Size - 1	0 ~ 255	UINT08	64K byte	2
Used Percentage	0 ~ 100	UINT08	%	3
# of records logged	0 ~ 2 <sup>32</sup> -1	UINT32	-	4 - 7
Reading Position	0 ~ 2 <sup>32</sup> -1 (zero-based)	UINT32	-	8 - 11

### 3.10 Trace Buffer Test Status (8Ch)

<b>Message</b>	<b>Extended Trace Buffer Status (8Ch)</b>	<b>Special HW required</b>
<b>String</b>	%%<F2h><8Ch>< Information bytes><CS><CR><LF>	
<b>Length</b>	12	
<b>Description</b>	Report data logger storage status	

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
State	0: OK, 1: fail	UINT08	-	1
Reserved	-	UINT32	-	2-5

### 3.11 Customized ID (8Dh)

**Message**                    *Customized ID (8Dh)*  
**String**                     %%<F2h><8Dh>< Information bytes><CS><CR><LF>  
**Length**                    40  
**Description**              Report customized ID string

<i>Parameters</i>	<i>Data (Range)</i>	<i>Type (Little-endian)</i>	<i>Unit</i>	<i>Byte #</i>
<i>length</i>	0~32	UINT08	-	1
<i>ID string</i>	Printable string	-	-	2-33

### 3.12 User Position, Velocity & Time (D0h)

<b>Message</b>	<b>User Position, Velocity &amp; Time (D0h)</b>
<b>String</b>	%%<F2h><D0h>< Information bytes><CS><CR><LF>
<b>Length</b>	44
<b>Description</b>	Provide user PVT solution in Geodetic coordinates

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #
Week No	1 ~ 65535	UINT16	-	1 - 2
Time of Week	0 ~ 2 <sup>32</sup>	UINT32	-	3 - 6
Date	Example: 0xYYMMDD 031101 - 2003/11/01 This value is represented as 0x031101	UINT32	-	7 - 10
Time	Example: 0xHHMMSS 120801 - 12:08:01 This value is represented as 0x120801	UINT32	-	11 - 14
Latitude	- 90 ~ +90	SPFP	-	15 - 18
Longitude	-180 ~ +180	SPFP	-	19 - 22
Altitude	-1000 ~ +18000	SINT16	Meter	23 - 24
Heading	0 ~ 359	UINT16	Degree	25 - 26
Speed	0 ~ 5000	UINT16	0.1m/s	27 - 28
Fix Indicator	0: Autonomous mode 1: Differential mode 5: Data not valid	UINT08	-	29
Quality of fix	0: no fix, 1: 2D, 2; 3D, 3: 3D+DGPS	UINT08	-	30
Number of SV (line of sight)	0 - 16	UINT08	-	31
Number of SV in fix	0 - 16	UINT08	-	32
GDOP	1 ~ 255, 255 indicates > 25.5	UINT08	1/10	33
PDOP	1 ~ 255, 255 indicates > 25.5	UINT08	1/10	34
HDOP	1 ~ 255, 255 indicates > 25.5	UINT08	1/10	35
VDOP	1 ~ 255, 255 indicates > 25.5	UINT08	1/10	36
TDOP	1 ~ 255, 255 indicates > 25.5	UINT08	1/10	37

### 3.13 User Satellite Information (D5h)

**Message**                    *User Satellite Information (D5h)*  
**String**                    *%%<F2h><D5h>< Information bytes><CS><CR><LF>*  
**Length**                    *141*  
**Description**              *Provides satellite view information.*

Parameters		Data (Range)	Type (Little-endian)	Unit	Byte #
Week No		1 ~ 65535	UINT16	-	1 - 2
Time of week		0 ~ 2 <sup>32</sup>	UINT32	-	3 - 6
SV 1	PRN	0: invalid data set 1 ~ 32: GPS 33,35,42,44,47,50: WAAS/EGNOS	UINT08	-	7
	Health	0: OK, > 0: error code	UINT08		8
	Azimuth	0 ~ 359	UINT16	Degree	9 - 10
	Elevation	0 ~ 90	UINT08	Degree	11
	C/No	0 ~ 255	UINT08	--	12
	Status	BIT0 = 1: Acquired BIT4 = 1: Frame Sync BIT5 = 1: Get Ephemeris Bit 8 = 1: Position Fix	UINT16	-	13 - 14
SV 2	See SV1				15 - 22
SV 3	See SV1				23 - 30
SV 4	See SV1				31 - 38
SV 5	See SV1				39 - 46
SV 6	See SV1				47 - 54
SV 7	See SV1				55 - 62
SV 8	See SV1				63 - 70
SV 9	See SV1				71 - 78
SV 10	See SV1				79 - 86
SV 11	See SV1				87 - 94
SV 12	See SV1				95 - 102
SV 13	See SV1				103 - 110
SV 14	See SV1				111 - 118
SV 15	See SV1				119 - 126
SV 16	See SV1				127 - 134

### 3.14 User Measurement Information (D6h)

<b>Message</b>	<b>User Measurement Information (D6h)</b>
<b>String</b>	%%<F2h><D6h>< Information bytes><CS><CR><LF>
<b>Length</b>	207
<b>Description</b>	Provide channel measurement information.

Parameters	Data (Range)	Type (Little-endian)	Unit	Byte #	
Week No	1 ~ 65535	UINT16	-	1 - 2	
Time of week	0 ~ 2 <sup>32</sup>	UINT32	-	3 - 6	
Clock Offset	0 ~ 65535	UINT16	-	7 - 8	
SV 1	PRN	1 ~ 32	UINT08	-	9
	Reserved	-	UINT08	-	10
	Pseudo-range	+/- 2 <sup>31</sup>	SINT32	Meter	11 - 14
	Delta Range	+/- 2 <sup>31</sup>	SINT32	Meter	15 - 18
	Doppler	+/- 2 <sup>15</sup>	SINT16	Hz	19 - 20
SV 2	See SV1			21 - 32	
SV 3	See SV1			33 - 44	
SV 4	See SV1			45 - 56	
SV 5	See SV1			57 - 68	
SV 6	See SV1			69 - 80	
SV 7	See SV1			81 - 92	
SV 8	See SV1			93 - 104	
SV 9	See SV1			105 - 116	
SV 10	See SV1			117 - 128	
SV 11	See SV1			129 - 140	
SV 12	See SV1			141 - 152	
SV 13	See SV1			153 - 164	
SV 14	See SV1			165 - 176	
SV 15	See SV1			177 - 188	
SV 16	See SV1			189 - 200	

### 3.15 Extended Trace Record (D4h)

<b>Message</b>	<b>Extended Trace Record (D4h)</b>	<b>(By Firmware Update)</b>
<b>String</b>	%<F2h><D4h>< Information bytes><CS><CR><LF>	
<b>Length</b>	80	
<b>Description</b>	Used to output extended trace record	

Parameters		Data (Range)	Type (Little-endian)	Unit	Byte #
GPS Time	Year	Bit [15..9]: 0~127: 1980~2107	UINT16	-	1 - 2
	Month	Bit [8..5]: 1 ~ 12			
	Day	Bit [4..0]: 1 ~ 31			
	Time of day	0 ~ 43199, bi-second	UINT16		3 - 4
Position (ECEF)	X	+/- 2^31	SINT32	Meter	5 - 8
	Y	+/- 2^31	SINT32	Meter	9 - 12
	Z	+/- 2^31	SINT32	Meter	13 - 16
POI		Bit[0..4]: no POI Bit[12..15]: log data revision	UINT16	-	17 - 18
Information	Latest Flag	Bit [15]: 1 means the last record	UINT16	0.1M/S	19 - 20
	Mode	Bit [13]: 0 - 2D fix, 1 - 3D fix			
	DGPS	Bit [12]: 0-No, 1-Yes			
	Velocity	Bit [11:0]			
DOP	HDOP	0 ~ 255	UINT08		21
	PDOP	0 ~ 255	UINT08		22
Clock		0 ~ 65535	UINT16		23 - 24
# of Satellite	Visible	Bit[7..4], 0~12	UINT08		25
	Used	Bit[3..0], 0~12			
SV1	PRN-1	Bit[15..11], 0~31	UINT16		26 - 27
	CNO	Bit[10..5], 0~63			
	Status	Bit[4..0], 0~31			
	Az	Bit[15..7], 0 ~ 355	UINT16		28 - 29
	Elv	Bit[6..0], 0 ~ 90			
SV2	See SV1		UINT16		30 - 33
SV3	See SV1		UINT16		34 - 37
SV4	See SV1		UINT16		38 - 41
SV5	See SV1		UINT16		42 - 45
SV6	See SV1		UINT16		46 - 49
SV7	See SV1		UINT16		50 - 53
SV8	See SV1		UINT16		54 - 57
SV9	See SV1		UINT16		58 - 61
SV10	See SV1		UINT16		62 - 65
SV11	See SV1		UINT16		66 - 69
SV12	See SV1		UINT16		70 - 73

\* Need special H/W



## Appendix 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

## Appendix B Datum Reference List

Datum Name	Delta X	Delta Y	Delta Z	Ellipsoid	Ellipsoid Index	Region of Use
WGS-84	0	0	0	WGS 84	23	Global
WGS-84	0	0	0	WGS84	23	Global
Adindan	-118	-14	218	Clarke 1880	7	Burkina Faso
Adindan	-134	-2	210	Clarke 1880	7	Cameroon
Adindan	-165	-11	206	Clarke 1880	7	Ethiopia
Adindan	-123	-20	220	Clarke 1880	7	Mali
Adindan	-166	-15	204	Clarke 1880	7	MEAN FOR Ethiopia; Sudan
Adindan	-128	-18	224	Clarke 1880	7	Senegal
Adindan	-161	-14	205	Clarke 1880	7	Sudan
Afgooye	-43	-163	45	Krassovsky 1940	19	Somalia
Ain el Abd 1970	-150	-250	-1	International 1924	18	Bahrain
Ain el Abd 1970	-143	-236	7	International 1924	18	Saudi Arabia
American Samoa 1962	-115	118	426	Clarke 1866	6	American Samoa Islands
Anna 1 Astro 1965	-491	-22	435	Australian National	3	Cocos Islands
Antigua Island Astro 1943	-270	13	62	Clarke 1880	7	Antigua (Leeward Islands)
Arc 1950	-138	-105	-289	Clarke 1880	7	Botswana
Arc 1950	-153	-5	-292	Clarke 1880	7	Burundi
Arc 1950	-125	-108	-295	Clarke 1880	7	Lesotho
Arc 1950	-161	-73	-317	Clarke 1880	7	Malawi
Arc 1950	-143	-90	-294	Clarke 1880	7	Mean for Botswana, Lesotho, Malawi, Swaziland, Zaire, Zambia, and Zimbabwe
Arc 1950	-134	-105	-295	Clarke 1880	7	Swaziland
Arc 1950	-169	-19	-278	Clarke 1880	7	Zaire
Arc 1950	-147	-74	-283	Clarke 1880	7	Zambia
Arc 1950	-142	-96	-293	Clarke 1880	7	Zimbabwe
Arc 1960	-160	-6	-302	Clarke 1880	7	Mean for Kenya and Tanzania
Arc 1960	-157	-2	-299	Clarke 1880	7	Kenya
Arc 1960	-175	-23	-303	Clarke 1880	7	Tanzania
Ascension Island 1958	-205	107	53	International 1924	18	Ascension Island
Astro Beacon E 1945	145	75	-272	International 1924	18	Iwo Jima
Astro DOS 71/4	-320	550	-494	International 1924	18	St Helena Island
Astro Tern Island (FRIG) 1961	114	-116	-333	International 1924	18	Tern Island
Astronomical Station 1952	124	-234	-25	International 1924	18	Marcus Island
Australian Geodetic 1966	-133	-48	148	Australian National	3	Australia; Tasmania
Australian Geodetic 1984	-134	-48	149	Australian National	3	Australia; Tasmania
Ayabelle Lighthouse	-79	-129	145	Clarke 1880	7	Djibouti

Datum Name	Delta X	Delta Y	Delta Z	Ellipsoid	Ellipsoid Index	Region of Use
Bellevue (IGN)	-127	-769	472	International 1924	18	Efate & Erromango Islands
Bermuda 1957	-73	213	296	Clarke 1866	6	Bermuda
Bissau	-173	253	27	International 1924	18	Guinea-Bissau
Bogota Observatory	307	304	-318	International 1924	18	Colombia
Bukit Rimpah	-384	664	-48	Bessel 1841	5	Indonesia (Bangka & Belitung Ids)
Camp Area Astro	-104	-129	239	International 1924	18	Antarctica (McMurdo Camp Area)
Campo Inchauspe	-148	136	90	International 1924	18	Argentina
Canton Astro 1966	298	-304	-375	International 1924	18	Phoenix Islands
Cape	-136	-108	-292	Clarke 1880	7	South Africa
Cape Canaveral	-2	151	181	Clarke 1866	6	Bahamas; Florida
Carthage	-263	6	431	Clarke 1880	7	Tunisia
Chatham Island Astro 1971	175	-38	113	International 1924	18	New Zealand (Chatham Island)
Chua Astro	-134	229	-29	International 1924	18	Paraguay
Corrego Alegre	-206	172	-6	International 1924	18	Brazil
Dabola	-83	37	124	Clarke 1880	7	Guinea
Deception Island	260	12	-147	Clarke 1880	7	Deception Island; Antarctica
Djakarta (Batavia)	-377	681	-50	Bessel 1841	5	Indonesia (Sumatra)
DOS 1968	230	-199	-752	International 1924	18	New Georgia Islands (Gizo Island)
Easter Island 1967	211	147	111	International 1924	18	Easter Island
Estonia; Coordinate System 1937	374	150	588	Bessel 1841	5	Estonia
European 1950	-104	-101	-140	International 1924	18	Cyprus
European 1950	-130	-117	-151	International 1924	18	Egypt
European 1950	-86	-96	-120	International 1924	18	England; Channel Islands; Scotland; Shetland Islands
European 1950	-86	-96	-120	International 1924	18	England; Ireland; Scotland; Shetland Islands
European 1950	-87	-95	-120	International 1924	18	Finland; Norway
European 1950	-84	-95	-130	International 1924	18	Greece
European 1950	-117	-132	-164	International 1924	18	Iran
European 1950	-97	-103	-120	International 1924	18	Italy (Sardinia)
European 1950	-97	-88	-135	International 1924	18	Italy (Sicily)
European 1950	-107	-88	-149	International 1924	18	Malta
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

Datum Name	Delta X	Delta Y	Delta Z	Ellipsoid	Ellipsoid Index	Region of Use
European 1950	-87	-96	-120	International 1924	18	Mean for Austria; Denmark; France; W Germany; Netherlands; Switzerland
European 1950	-103	-106	-141	International 1924	18	Mean for Iraq; Israel; Jordan; Lebanon; Kuwait; Saudi Arabia; Syria
European 1950	-84	-107	-120	International 1924	18	Portugal; Spain
European 1950	-112	-77	-145	International 1924	18	Tunisia
European 1979	-86	-98	-119	International 1924	18	Mean for Austria; Finland; Netherlands; Norway; Spain; Sweden; Switzerland
Fort Thomas 1955	-7	215	225	Clarke 1880	7	Nevis; St. Kitts (Leeward Islands)
Gan 1970	-133	-321	50	International 1924	18	Republic of Maldives
Geodetic Datum 1949	84	-22	209	International 1924	18	New Zealand
Graciosa Base SW 1948	-104	167	-38	International 1924	18	Azores (Faial; Graciosa; Pico; Sao Jorge; Terceira)
Guam 1963	-100	-248	259	Clarke 1866	6	Guam
Gunung Segara	-403	684	41	Bessel 1841	5	Indonesia (Kalimantan)
GUX 1 Astro	252	-209	-751	International 1924	18	Guadalcanal Island
Herat North	-333	-222	114	International 1924	18	Afghanistan
Hermannskogel Datum	653	-212	449	Bessel 1841 (Namibia)	4	Croatia -Serbia, Bosnia-Herzegovina
Hjorsey 1955	-73	46	-86	International 1924	18	Iceland
Hong Kong 1963	-156	-271	-189	International 1924	18	Hong Kong
Hu-Tzu-Shan	-637	-549	-203	International 1924	18	Taiwan
Indian	282	726	254	Everest (India 1830)	8	Bangladesh
Indian	295	736	257	Everest (India 1956)	10	India; Nepal
Indian	283	682	231	Everest (Pakistan)	13	Pakistan
Indian 1954	217	823	299	Everest (India 1830)	8	Thailand
Indian 1960	182	915	344	Everest (India 1830)	8	Vietnam (Con Son Island)
Indian 1960	198	881	317	Everest (India 1830)	8	Vietnam (Near 16øN))
Indian 1975	210	814	289	Everest (India 1830)	8	Thailand
Indonesian 1974	-24	-15	5	Indonesian 1974	17	Indonesia
Ireland 1965	506	-122	611	Modified Airy	2	Ireland
ISTS 061 Astro 1968	-794	119	-298	International 1924	18	South Georgia Islands
ISTS 073 Astro 1969	208	-435	-229	International 1924	18	Diego Garcia
Johnston Island 1961	189	-79	-202	International 1924	18	Johnston Island
Kandawala	-97	787	86	Everest (India 1830)	8	Sri Lanka
Kerguelen Island 1949	145	-187	103	International 1924	18	Kerguelen Island
Kertau 1948	-11	851	5	Everest (Malay. & Sing)	12	West Malaysia & Singapore
Kusaie Astro 1951	647	1777	-1124	International 1924	18	Caroline Islands

Datum Name	Delta X	Delta Y	Delta Z	Ellipsoid	Ellipsoid Index	Region of Use
Korean Geodetic System	0	0	0	GRS 80	20	South Korea
L. C. 5 Astro 1961	42	124	147	Clarke 1866	6	Cayman Brac Island
Leigon	-130	29	364	Clarke 1880	7	Ghana
Liberia 1964	-90	40	88	Clarke 1880	7	Liberia
Luzon	-133	-77	-51	Clarke 1866	6	Philippines (Excluding Mindanao)
Luzon	-133	-79	-72	Clarke 1866	6	Philippines (Mindanao)
M'Poraloko	-74	-130	42	Clarke 1880	7	Gabon
Mahe 1971	41	-220	-134	Clarke 1880	7	Mahe Island
Massawa	639	405	60	Bessel 1841	5	Ethiopia (Eritrea)
Merchich	31	146	47	Clarke 1880	7	Morocco
Midway Astro 1961	912	-58	1227	International 1924	18	Midway Islands
Minna	-81	-84	115	Clarke 1880	7	Cameroon
Minna	-92	-93	122	Clarke 1880	7	Nigeria
Montserrat Island Astro 1958	174	359	365	Clarke 1880	7	Montserrat (Leeward Islands)
Nahrwan	-247	-148	369	Clarke 1880	7	Oman (Masirah Island)
Nahrwan	-243	-192	477	Clarke 1880	7	Saudi Arabia
Nahrwan	-249	-156	381	Clarke 1880	7	United Arab Emirates
Naparima BWI	-10	375	165	International 1924	18	Trinidad & Tobago
North American 1927	-5	135	172	Clarke 1866	6	Alaska (Excluding Aleutian Ids)
North American 1927	-2	152	149	Clarke 1866	6	Alaska (Aleutian Ids East of 180°W)
North American 1927	2	204	105	Clarke 1866	6	Alaska (Aleutian Ids West of 180°W)
North American 1927	-4	154	178	Clarke 1866	6	Bahamas (Except San Salvador Id)
North American 1927	1	140	165	Clarke 1866	6	Bahamas (San Salvador Island)
North American 1927	-7	162	188	Clarke 1866	6	Canada (Alberta; British Columbia)
North American 1927	-9	157	184	Clarke 1866	6	Canada (Manitoba; Ontario)
North American 1927	-22	160	190	Clarke 1866	6	Canada (New Brunswick; Newfoundland; Nova Scotia; Quebec)
North American 1927	4	159	188	Clarke 1866	6	Canada (Northwest Territories; Saskatchewan)
North American 1927	-7	139	181	Clarke 1866	6	Canada (Yukon)
North American 1927	0	125	201	Clarke 1866	6	Canal Zone
North American 1927	-9	152	178	Clarke 1866	6	Cuba
North American 1927	11	114	195	Clarke 1866	6	Greenland (Hayes Peninsula)

Datum Name	Delta X	Delta Y	Delta Z	Ellipsoid	Ellipsoid Index	Region of Use
North American 1927	-3	142	183	Clarke 1866	6	Mean for Antigua; Barbados; Barbuda; Caicos Islands; Cuba; Dominican Republic; Grand Cayman; Jamaica; Turks Islands
North American 1927	0	125	194	Clarke 1866	6	Mean for Belize; Costa Rica; El Salvador; Guatemala; Honduras; Nicaragua
North American 1927	-10	158	187	Clarke 1866	6	Mean for Canada
North American 1927	-8	160	176	Clarke 1866	6	Mean for CONUS
North American 1927	-9	161	179	Clarke 1866	6	Mean for CONUS (East of Mississippi; River Including Louisiana; Missouri; Minnesota)
North American 1927	-8	159	175	Clarke 1866	6	Mean for CONUS (West of Mississippi; River Excluding Louisiana; Minnesota; Missouri)
North American 1927	-12	130	190	Clarke 1866	6	Mexico
North American 1983	0	0	0	GRS 80	20	Alaska (Excluding Aleutian Ids)
North American 1983	-2	0	4	GRS 80	20	Aleutian Ids
North American 1983	0	0	0	GRS 80	20	Canada
North American 1983	0	0	0	GRS 80	20	CONUS
North American 1983	1	1	-1	GRS 80	20	Hawaii
North American 1983	0	0	0	GRS 80	20	Mexico; Central America
North Sahara 1959	-186	-93	310	Clarke 1880	7	Algeria
Observatorio Meteorologico 1939	-425	-169	81	International 1924	18	Azores (Corvo & Flores Islands)
Old Egyptian 1907	-130	110	-13	Helmert 1906	15	Egypt
Old Hawaiian	89	-279	-183	Clarke 1866	6	Hawaii
Old Hawaiian	45	-290	-172	Clarke 1866	6	Kauai
Old Hawaiian	65	-290	-190	Clarke 1866	6	Maui
Old Hawaiian	61	-285	-181	Clarke 1866	6	Mean for Hawaii; Kauai; Maui; Oahu
Old Hawaiian	58	-283	-182	Clarke 1866	6	Oahu
Oman	-346	-1	224	Clarke 1880	7	Oman
Ordnance Survey Great Britain 1936	371	-112	434	Airy 1830	1	England
Ordnance Survey Great Britain 1936	371	-111	434	Airy 1830	1	England; Isle of Man; Wales
Ordnance Survey Great Britain 1936	375	-111	431	Airy 1830	1	Mean for England; Isle of Man; Scotland; Shetland Islands; Wales

Datum Name	Delta X	Delta Y	Delta Z	Ellipsoid	Ellipsoid Index	Region of Use
Ordnance Survey Great Britain 1936	384	-111	425	Airy 1830	1	Scotland; Shetland Islands
Ordnance Survey Great Britain 1936	370	-108	434	Airy 1830	1	Wales
Pico de las Nieves	-307	-92	127	International 1924	18	Canary Islands
Pitcairn Astro 1967	185	165	42	International 1924	18	Pitcairn Island
Point 58	-106	-129	165	Clarke 1880	7	Mean for Burkina Faso & Niger
Pointe Noire 1948	-148	51	-291	Clarke 1880	7	Congo
Porto Santo 1936	-499	-249	314	International 1924	18	Porto Santo; Madeira Islands
Provisional South American 1956	-270	188	-388	International 1924	18	Bolivia
Provisional South American 1956	-270	183	-390	International 1924	18	Chile (Northern; Near 19 °S)
Provisional South American 1956	-305	243	-442	International 1924	18	Chile (Southern; Near 43 °S)
Provisional South American 1956	-282	169	-371	International 1924	18	Colombia
Provisional South American 1956	-278	171	-367	International 1924	18	Ecuador
Provisional South American 1956	-298	159	-369	International 1924	18	Guyana
Provisional South American 1956	-288	175	-376	International 1924	18	Mean for Bolivia; Chile; Colombia; Ecuador; Guyana; Peru; Venezuela
Provisional South American 1956	-279	175	-379	International 1924	18	Peru
Provisional South American 1956	-295	173	-371	International 1924	18	Venezuela
Provisional South Chilean 1963	16	196	93	International 1924	18	Chile (Near 53 °S) (Hito XVIII)
Puerto Rico	11	72	-101	Clarke 1866	6	Puerto Rico; Virgin Islands
Pulkovo 1942	28	-130	-95	Krassovsky 1940	19	Russia
Qatar National	-128	-283	22	International 1924	18	Qatar
Qornoq	164	138	-189	International 1924	18	Greenland (South)
Reunion	94	-948	-1262	International 1924	18	Mascarene Islands
Rome 1940	-225	-65	9	International 1924	18	Italy (Sardinia)
S-42 (Pulkovo 1942)	28	-121	-77	Krassovsky 1940	19	Hungary
S-42 (Pulkovo 1942)	23	-124	-82	Krassovsky 1940	19	Poland
S-42 (Pulkovo 1942)	26	-121	-78	Krassovsky 1940	19	Czechoslovakia
S-42 (Pulkovo 1942)	24	-124	-82	Krassovsky 1940	19	Latvia
S-42 (Pulkovo 1942)	15	-130	-84	Krassovsky 1940	19	Kazakhstan
S-42 (Pulkovo 1942)	24	-130	-92	Krassovsky 1940	19	Albania
S-42 (Pulkovo 1942)	28	-121	-77	Krassovsky 1940	19	Romania

Datum Name	Delta X	Delta Y	Delta Z	Ellipsoid	Ellipsoid Index	Region of Use
S-JTSK	589	76	480	Bessel 1841	5	Czechoslovakia (Prior 1 JAN 1993)
Santo (DOS) 1965	170	42	84	International 1924	18	Espirito Santo Island
Sao Braz	-203	141	53	International 1924	18	Azores (Sao Miguel; Santa Maria Ids)
Sapper Hill 1943	-355	21	72	International 1924	18	East Falkland Island
Schwarzeck	616	97	-251	Bessel 1841 (Namibia)	4	Namibia
Selvagem Grande 1938	-289	-124	60	International 1924	18	Salvage Islands
Sierra Leone 1960	-88	4	101	Clarke 1880	7	Sierra Leone
South American 1969	-62	-1	-37	South American 1969	21	Argentina
South American 1969,	-61	2	-48	South American 1969	21	Bolivia
South American 1969,	-60	-2	-41	South American 1969	21	Brazil
South American 1969,	-75	-1	-44	South American 1969	21	Chile
South American 1969,	-44	6	-36	South American 1969	21	Colombia
South American 1969,	-48	3	-44	South American 1969	21	Ecuador
South American 1969,	-47	26	-42	South American 1969	21	Ecuador (Baltra; Galapagos)
South American 1969,	-53	3	-47	South American 1969	21	Guyana
South American 1969,	-57	1	-41	South American 1969	21	Mean for Argentina; Bolivia; Brazil; Chile; Colombia; Ecuador; Guyana; Paraguay; Peru; Trinidad & Tobago; Venezuela
South American 1969,	-61	2	-33	South American 1969	21	Paraguay
South American 1969,	-58	0	-44	South American 1969	21	Peru
South American 1969,	-45	12	-33	South American 1969	21	Trinidad & Tobago
South American 1969,	-45	8	-33	South American 1969	21	Venezuela
South Asia	7	-10	-26	Modified Fischer 1960	14	Singapore
Tananarive Observatory 1925	-189	-242	-91	International 1924	18	Madagascar
Timbalai 1948	-679	669	-48	Everest (Sabah Sarawak)	9	Brunei; E. Malaysia (Sabah Sarawak)
Tokyo	-148	507	685	Bessel 1841	5	Japan
Tokyo	-148	507	685	Bessel 1841	5	Mean for Japan; South Korea; Okinawa
Tokyo	-158	507	676	Bessel 1841	5	Okinawa
Tokyo	-147	506	687	Bessel 1841	5	South Korea
Tristan Astro 1968	-632	438	-609	International 1924	18	Tristan da Cunha
Viti Levu 1916	51	391	-36	Clarke 1880	7	Fiji (Viti Levu Island)
Voirol 1960	-123	-206	219	Clarke 1880	7	Algeria
Wake Island Astro 1952	276	-57	149	International 1924	18	Wake Atoll
Wake-Eniwetok 1960	102	52	-38	Hough 1960	16	Marshall Islands
WGS 1972	0	0	0	WGS 72	22	Global Definition
Yacare	-155	171	37	International 1924	18	Uruguay
Zanderij	-265	120	-358	International 1924	18	Suriname

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## Document Revision History

Revision	Update Summary	Date
0.4	➤ Initial document release	2009-4-11
0.5	➤ Added tracking interval for Sleep mode ➤ Added 1PPM and Antenna Detection	2009-7-21