

## Location and Navigation Service (service ID: 0x2001)

Attribute ID	Attribute Name	Type	Data Type	Data
0x0001	UTC Time, Latitude, N/S Indicator, Longitude, E/W Indicator, Date	Read	ASCII	All data in the message are ASCII coded. The different fields are separated by comma (.). Are data not available stays the field empty. Are all data not available the message contains then only commas (all in all 5 commas) Time format: hhmmss.sss Latitude format: ddmn.mmmm N/S Indicator format: N or S Longitude format: dddmm.mmmm E/W Indicator format: E or W Date format: ddmmyy Max length of data bytes: hhmmss.sss,ddmm.mmmm,N,dddmm.mmmm,E,ddmmyy (42 bytes).
0x0002	Location Accuracy	Read	ASCII	All data in the message are ASCII coded. The PDOP, HDOP and VDOP can vary in length according to its value and precision. The 3 values are separated by comma. Are the values not available the message contains only commas (2). Max length of data bytes: xx.x,xx.x,xx.x (14 bytes).
0x0003	Speed Over Ground	Read	ASCII	All data in the message are ASCII coded. Speed over ground in km/h. The message can have different lengths depending on the speed and precision. If the message contains no data bytes then the speed is not available. Speed format: xxxx.xxx If speed is not available a 00hex will be returned in the data byte. Max length of data bytes: xxxx.xxx (8 bytes)
0x0004	Course Over Ground	Read	ASCII	The course is ASCII coded and measured in degrees. Course format: xxx.xx If course is not available a 00hex will be returned in the data byte. Max length of data bytes: xxx.xx (6 bytes)
0x0101	GPS Satellites Used	Read	ASCII	The number of GPS satellites used for the current location fix. Satellites used format: XX. If number of satellites is not available a 00hex will be returned in the data byte. Max length of data bytes: xx (2 bytes).
0x0102	GPS Fix Quality	Read	ASCII	The message contains only 1 byte ASCII coded. 0 = fix not available or invalid 1 = GPS SPS Mode, fix valid 2 = Differential GPS, SPS Mode, fix valid 3-5 = Not supported 6 = Dead Reckoning Mode, fix valid If the GPS Fix is not available a 00hex will be returned in the data byte. Max length of data bytes: x (1 byte).
0x0201	NMEA message	Write/Read	ASCII	send the Message ID (MID) and the corresponding parameters of an NMEA message to smartstrap, and then the smartstrap will send out the corresponding NMEA string of message (in ASCII format), end with Null character. Max is 256 characters (including Null character)
0x0202	Get GSV message	read/write	hex/ASCII coded	This message contains 1 byte of data which represents the (number-1) of the requested GSV message. Valid numbers are 00 - 07hex. Data bytes returned contain the GSV message. The \$ sign is taken out and all data including the * sign are returned. Maximum number of returned data bytes: 66

## Battery Service (Service ID: 0x2003)

Attribute ID	Attribute Name	Type	Data Type	Data
0x0001	Charge Level	Read	uint8	The percentage of charge left in the smartstrap battery (between 0 and 100).
0x0002	Capacity	Read	uint16	The total capacity of the smartstrap battery in mAh when fully charged.
0x0003	Charging status	Read	uint8	Report the charging status of the smartstrap battery: 0 = charger not attached 1 = charger attached and charging 2 = charger attached and fully charged

## Custom control of PAL (Service ID: 0x8001)

Attribute ID	Attribute Name	Type	Data Type	Data
0x0001	PAL Power Status	Read	uint8	Bit 0 (LSB): 5V Booster (1 - ENABLED; 0 - DISABLED) Bit 1 : 5V Bypass mode (1 - ENABLED; 0 - DISABLED) Bit 2 : no use, always be 0 Bit 3 : GPS Power (1 - Power On; 0 - Power Off) Bit 4 : GPS Sleep (1 - GPS Active; 0 - GPS Sleep) Bit 5 : GPSoktosend (1 - GPS ok to send; 0 - GPS not ok to send). Do not send messages to the GPS when GPSoktosend = 0 Bit 6: Auto-logging (0 - Auto-logging off, 1 - Auto-logging on) Bit 7: Logging sequence (0 - logging sequence 1, 1 - logging sequence 2)
0x0002	ADC values	Read	uint16[5]	All ADC values from smartstrap 1. smartstrap battery voltage 2. Temperature 3. Bandgap value 4. V refh 5. V refl

0x0003	PAL Power Control	Write	uint8	<p>Bit 0 (LSB): 5V Booster (1 - ENABLED; 0 - DISABLED)</p> <p>Bit 1: no use, always be 0</p> <p>Bit 2: no use, always be 0</p> <p>Bit 3: GPS Power (1 - Power On; 0 - Power Off)</p> <p>Bit 4: GPS Sleep (1 - GPS Active; 0 - GPS Sleep)</p> <p>Bit 5 &amp; 6 &amp; 7: Reserved</p> <p>Proper Power Up and Wake Up routine:  Power Up: Set bit GPS Power and GPS Sleep = 1, read status and wait for bit GPSoktosend = 1. It can take up to 5 seconds for the bit GPSoktosend = 1. The GPS Sleep bit in the status can toggle while GPSoktosend = 0.  Wake UP: Keep GPS Power = 1, set GPS Sleep = 1, read status and wait for bit GPSoktosend = 1. It can take up to 5 seconds for the bit GPSoktosend = 1. The GPS Sleep bit in the status can toggle while GPSoktosend = 0.</p> <p><b>Proper Power Down sequence:</b>  Set bit GPS Power = 0 and GPS Sleep = 0. Wait until the bits GPS Power, GPS Sleep and GPSoktosend in the Status are all 0.</p> <p><b>Proper Set to Sleep sequence:</b>  Set GPS Sleep = 0. Wait until the bits GPS Sleep and GPSoktosend in the Status are all 0.</p> <p>Do not send NMEA commands to the GPS module with GPSoktosend = 0.  Do not send NMEA commands to the GPS module with Auto-Recording = 1.</p>
0x0101	Clear Auto-Recording memory	Write	No data	<p>It will be answered with the same service ID and same attribute and error code (if error).  It can take a few seconds to erase the memory..  No data bytes are returned.  It can take more than 1 minute to clear the memory.</p>
0x0102	GPS data logging command	Write	Hex coded	<p>In the data:  Byte 0: Bit 0 = 0 stop logging, bit 0 = 1 start logging  Byte 0: Bit 1 = 0 logging sequence 1, bit 1 = 1 logging sequence 2  Byte 1: Logging interval in seconds. Hex coded. Valid logging intervals are: 01 - FF seconds. Logging interval with 00 will be rejected.  Logging sequence 1: loggingsequence, time (hhmmss.sss), latitude (ddmm.mmmm), N/S indicator (N or S), longitude (ddmm.mmmm), E/W indicator (E or W), position fix (X), satellites used (XX), HDOP, altitude (XXXX.X), unit (M)  Logging sequence 2: loggingsequence, time (hhmmss.sss), status (A or V), latitude (ddmm.mmmm), N/S indicator (N or S), longitude (ddmm.mmmm), E/W indicator (E or W), speed (XX.XX in knots), course (XXX.XX in degrees), date (ddmmyy).  The loggingsequence is 1 byte ASCII coded. 0 (30hex) for logging sequence 1, 1 (31hex) for logging sequence 2  The logging sequences are ASCII coded and the individual data are separated by comma. One log is 64 bytes long and filled up with FF(hex). Are data not available the field remains empty. Are all fields empty the log contains only commas and is filled up with FF(hex).  The GPS module is automatically set into Power Saving Mode.  Do not send NMEA messages while in Auto-Recording mode.  No data bytes are returned.  You only can activate data logging when GPS Power = 1 and GPS Sleep = 1 and GPSoktosend = 1. If one or more of this bits = 0 a message with error code is returned.  If the GPS module is already in data logging mode a message with errorcode is returned.  If the GPS module is in data logging mode and the memory is full the data logging mode is automatically terminated.</p>
0x0103	Read Auto-Recorded logs	read/write	Hex coded	<p>The data contain 3 bytes with the number (hex coded, LSByte first) of the log which shall be read. Valid log numbers are: 00 00 01 - 01 58 00 (1 - 88832 dec).  The data in the answer contain the 64 bytes log. The first byte is the log-sequence.  If at this address is no log stored the data bytes are all FF(hex).  If the log is empty the data contain only commas and is filled up with FF(hex).  Max length of data bytes: 64 data bytes.</p>
0x0104	Read number of Auto-Recorded logs	read/write	Hex coded	<p>The message contains no data. Only command.  The answer contains 3 bytes of data (hex coded, LSB first) with the number of stored logs.  Valid number of logs: 00 00 00 - 01 58 00 (0 - 88832 dec)  Max length of data bytes: 3 bytes.</p>
0x0105	Write a test log	read/write	Hex coded	<p>Write a test log.  The first 3 bytes in the data represent the number of the log: Valid log numbers are: 00 00 01 - 01 58 00 (1 - 88832 dec).  The 64 following bytes represent a log entry (fill it up with 00 01 02 03 04 05 06 ....3A 3B 3C 3D 3E 3F(hex)).  No data bytes are returned.</p>
0x0106	Write user memory	read/write	Hex coded	<p>Write user memory  The first 2 bytes represent the number of a 128 bytes page 00 01 - 50 00 hex coded LSB first (1 - 20480 dec).  The following bytes represent the data bytes to be written. There will always be written 128 bytes at once. If bytes are unused, it must be filled up with FF hex.  Length of data bytes: 130 bytes.  No data bytes are returned.</p>
0x0107	Read user memory	read/write	Hex coded	<p>The data contain 2 bytes with the number of a 128 byte page (hex coded, LSByte first). Valid numbers are: 00 01 - 50 00. (1 - 20480 dec).  The data in the answer contain the 128 bytes of this page.  Length of returned data bytes: 128 data bytes.</p>
0x0108	Clear user memory	Write	No data	<p>It will be answered with the same service ID and same attribute and error code (if error).  It can take a few seconds to erase the memory.  No data bytes are returned.  It can take more than 30 seconds to clear the memory.</p>
0x0109	Erase a sector of user memory	Write	Hex coded	<p>The data contain 2 bytes with the number of a 4kByte Sector (hex coded, LSByte first).  Valid numbers are: 00 01 - 02 80. (1 - 640 dec).  No data bytes are returned. Only error code, if error.  It can take a few hundred milliseconds to erase the memory.</p>

## NMEA Message Information

### Query/Rate Control: \$PSRF103

This message controls the output of only standard NMEA messages GGA, GLL, GSA, GSV, RMC and VTG. Using this command message, standard NMEA messages may be polled once, or setup for periodic output. Checksums must be enabled at all time.

Table 2 lists the input values for the following example:

Query the GGA message with checksum enabled.

```
$PSRF103,00,01,00,01*25<CR><LF>
```

Table 2

Name	Unit	Description
\$PSRF103	-	PSRF103 protocol header
Msg	-	Message to control. See Table 1
Mode	-	0: Set rate 1: Query one time
Rate	Seconds	Output Rate, 0: off 1 to 255: Seconds between messages
CksumEnable	-	Note: Checksum may be set to 1 at all time 1: Enable checksum

Value	Description
0	GGA
1	GLL
2	GSA
3	GSV
4	RMC
5	VTG
9	GNS

Table 1

NMEA message info:

[https://www.trimble.com/OEM\\_ReceiverHelp/V4.44/en/NMEA-0183messages\\_MessageOverview.html](https://www.trimble.com/OEM_ReceiverHelp/V4.44/en/NMEA-0183messages_MessageOverview.html)