
NovatleOEM4 GPS Library Documentation

Release 0.4

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CHAPTER 1

Changelog

version 0.4.1 Corrected bugs in reset, saveconfig and sbascontrol. Corrected messageID access using () instead [] as it is a dictionary. Added static method decoration in CRC32Value, getDebugMessage and createHeader

version 0.4 Moved from optoparse to argparse module. Changed Queue to make it compatible with python3 queue. Backwards compatibility is maintained. Restructured default location. Moved from Lib folder to base path. Moved examples to proper folder. This cause backwards compatibility problems. On import, replace `import Lib.NovatelOEM4` with simply `import NovatelOEM4`

version 0.3 logging configuration as moved outside module to enable user to use already configured logging handler. Check [multimodule logging docs](#)

version 0.2 data from bestxyz message is now placed into a Queue.Queue() FIFO

version 0.1 initial release

This module contains a few functions to interact with Novatel OEM4 GPS devices. Currently only the most important functions and definitions are configured, but the intention is to make it as much complete as possible.

A simple example can be run by executing the main function wich creates a Gps class object and execute the following commands on gps receiver:

- **begin:** on default port or given port by argv[1].
- **sendUnlogall**
- **setCom(baud=115200):** changes baudrate to 115200bps
- **askLog(trigger=2,period=0.1):** ask for log *bestxyz* with trigger *ONTIME* and period *0.1*
- wait for 10 seconds
- **shutdown:** safely disconnects from gps receiver

Example:

```
$python NovatelOEM4.py
```

Contents:

1.1 Gps Class

class NovatelOEM4.Gps (*sensorName*='GPS')

Novatel OEM4 GPS library class

This class contents is an approach to create a library for Novatel OEM 4 GPS

Parameters *sensorName* (*optional*) – A sensor name if used with multiple devices.

header_keys

all field keys for the headers of messages.

MessageID

A dictionary for the types of messages sent. Not all are implemented yet!

1.1.1 Methods

1.1.1.1 askLog

Gps.**askLog** (*logID*='BESTXYZ', *port*=192, *trigger*=4, *period*=0, *offset*=0, *hold*=0)

Request a log from receiver.

Parameters

- **logID** – log type to request.
- **port** – port to report log.
- **trigger** – trigger identifier.
- **period** – the period of log.
- **offset** – offset in seconds after period.
- **hold** – mark log with hold flag or not.

Returns True or false if command was sucessfull or not.

The log request command is defined as:

Field	ID	N Bytes	Description
1	Com header	H = 28	Header of message
2	port	ENUM = 4	identification of port
3	message	Ushort = 2	Message ID of log to output
4	messageType	char = 1	Message type (Binary)
5	RESERVED	char = 1	
6	trigger	ENUM = 4	message trigger
7	period	double = 8	Log period (for ONTIME in secs)
8	offset	double = 8	Offset for period (ONTIME in secs)
9	hold	ENUM = 4	Hold log
10	crc32	Ulong = 4	crc32 value

Note: Total byte size = header + 32 = 60 bytes

Log trigger Identifiers (field 6):

Binary	ASCII	Description
0	ONNEW	when the message is updated (not necessarily changed)
1	ONCHANGED	Current message and then continue to output when the message is changed
2	ONTIME	Output on a time interval
3	ONNEXT	Output only the next message
4	ONCE	Output only the current message
5	ONMARK	Output when a pulse is detected on the mark 1 input

1.1.1.2 begin

`Gps.begin(dataQueue, comPort='/dev/ttyUSB0', baudRate=9600)`

Initializes the gps receiver.

This function resets the current port to factory default and setup the gps receiver to be able to accept new commands. If connection to gps is made, it launches a thread used to parse messages coming from gps.

Parameters

- **comPort** – system port where receiver is connected.
- **dataQueue** – a Queue object to store incoming bestxyz messages.
- **baudRate** – baudrate to configure port. (should always be equal to factory default of receiver).

Returns True or False if the setup has gone as expected or not.

Example

```
Gps.begin(comPort="<port>",
          dataQueue=<your Queue obj>,
          baudRate=9600)
```

Default values

ComPort “/dev/ttyUSB0”

BaudRate 9600

Warning: This class uses module logging which must be configured in your main program using the `basicConfig` method. Check documentation of [module logging](#) for more info.

HW info:

Receptor Novatel Flexpak G2L-3151W.

Antenna Novatel Pinwheel.

1.1.1.3 create_header

Gps.**create_header** (*messageID*, *messageLength*, *portAddress=192*)

Creates a header object to be passed to receiver.

Parameters

- **messageID** – the corresponding value of identifying the message body.
- **messageLength** – size of message in bytes excluding CRC-32bit code.
- **portAddress** – port from where message request is sent.

Returns The header of message.

The header is defined as:

Field	Value	N Bytes	Description
1	sync[0]	UChar = 1	Hexadecimal 0xAA.
2	sync[1]	UChar = 1	Hexadecimal 0x44.
3	sync[2]	UChar = 1	Hexadecimal 0x12.
4	header-Length	UChar = 1	Length of the header (should always be 28 unless some firmware update)
5	messageID	UShort = 2	This is the Message ID code
6	messageType	UChar = 1	message type mask (binary and original message)
7	portAddress	Uchar = 1	Corresponding value of port
8	message-Length	UShort = 2	Length of message body
9	sequence	UShort = 2	This is used for multiple related logs.
10	idleTime	UChar = 1	The time that the processor is idle in the last second between successive logs with the same Message ID
11	timeStatus	Enum = 1	Indicates the quality of the GPS time
12	week	UShort = 2	GPS week number.
13	ms	int = 4	Milliseconds from the beginning of the GPS week.
14	receiver-Status	Ulong = 4	32 bits representing the status of various hardware and software components of the receiver.
15	reserved	UShort = 2	
16	swVersion	UShort = 2	receiver software build number.

Note: portAddress=192 (equal to thisport)

1.1.1.4 getDebugMessage

static Gps.**getDebugMessage** (*message*)

Create a string which contains all bytes represented as hex values

Auxiliary function for helping with debug. Receives a binary message as input and convert it as a string with the hexadecimal representation.

Parameters **message** – message to be represented.

Returns A string of corresponding hex representation of message.

1.1.1.5 parseResponses

Gps.**parseResponses** ()

A thread to parse responses from device

1.1.1.6 reset

Gps.**reset** (*delay=0*)

Performs a hardware reset

Parameters **delay** – seconds to wait before resetting. Default to zero.

Returns A boolean if request was successful or not

The reset message is defined as:

Field	value	N Bytes	Description
1	header	H = 28	Header of message
2	delay	UL = 4	Seconds to wait before reset
CRC32		UL = 4	

Following a RESET command, the receiver initiates a coldstart boot up. Therefore, the receiver configuration reverts either to the factory default, if no user configuration was saved, or the last SAVECONFIG settings. The optional delay field is used to set the number of seconds the receiver is to wait before resetting.

1.1.1.7 saveconfig

Gps.**saveconfig** ()

Save user current configuration

Returns A boolean if request was successful or not

Saveconfig message is defined as:

Field	value	N Bytes	Description
1	header	H = 28	Header of message
CRC32		UL = 4	

This command saves the user's present configuration in non-volatile memory. The configuration includes the current log settings, FIX settings, port configurations, and so on. Its output is in the RXCONFIG log.

1.1.1.8 sbascontrol

Gps. **sbascontrol** (*keywordID=1, systemID=1, prn=0, testmode=0*)

Set SBAS test mode and PRN SBAS

Parameters

- **keywordID** – True or false. Control the reception of SBAS corrections Enable = 1, Disable = 0.
- **systemID** – SBAS system to be used.
- **prn** – PRN corrections to be used.
- **testmode** – Interpretation of type 0 messages.

Returns A boolean if request was successful or not

sbascontrol message is defined as:

Field	value	N Bytes	Description
1	header	H = 28	Header of message
2	keyword	Enum = 4	Enable = 1 or Disable = 0
3	system	Enum = 4	Choose the SBAS the receiver will use
4	prn	UL = 4	0 - Receiver will use any PRN 120~138 - Receiver will use SBAS only from this PRN
5	testmode	Enum = 4	Interpretation of type 0 messages
CRC32		UL = 4	

System (Field 2) is defined as:

Binary	ASCII	Description
0	NONE	Don't use any SBAS satellites.
1	AUTO	Automatically determinate satellite system to use (default).
2	ANY	Use any and all SBAS satellites found
3	WAAS	Use only WAAS satellites
4	EGNOS	Use only EGNOS satellites
5	MSAS	Use only MSAS satellites

Testmode (field 5) is defined as:

Binary	ASCII	Description
0	NONE	Interpret Type 0 messages as they are intended (as do not use).(default)
1	ZEROTOTWO	Interpret Type 0 messages as type 2 messages
2	IG-NOREZERO	Ignore the usual interpretation of Type 0 messages (as do not use) and continue

This command allows you to dictate how the receiver handles Satellite Based Augmentation System (SBAS) corrections and replaces the now obsolete WAASCORRECTION command. The receiver automatically switches to Pseudorange Differential (RTCM or RTCA) or RTK if the appropriate corrections are received, regardless of the current setting.

1.1.1.9 sendUnlogall

Gps.**sendUnlogall** (*port=8, held=1*)

Send command unlogall to gps device.

On success clears all logs on all ports even held logs.

Returns True or False if the request has gone as expected or not.

unlogall message is defined as:

Field	value	N Bytes	Description
1	header	H = 28	Header of message
2	port	ENUM = 4	identification of port
3	Held	ENUM = 4	can only be 0 or 1. Clear logs with hold flag or not?
CRC32		UL = 4	

Note: See: OEMStar Firmware Reference Manual Rev 6 page 161

1.1.1.10 setCom

Gps.**setCom** (*baud, port=6, parity=0, databits=8, stopbits=1, handshake=0, echo=0, breakCond=1*)

Set com configuration.

Parameters

- **baud** – communication baudrate.
- **port** – Novatel serial ports identifier (default 6 = “thisport”).
- **parity** – byte parity check (default 0).
- **databits** – Number of data bits (default 8).
- **stopbits** – Number of stop bits (default 1).
- **handshake** – Handshaking (default No handshaking).
- **echo** – echo input back to user (default false)
- **breakCond** – Enable break detection (default true)

Returns True or false if command was successful or not.

The com request command is defined as:

Field	ID	N Bytes	Description
1	Com header	H = 28	Header of message
2	port	ENUM = 4	identification of port
3	baud	Ulong = 4	Communication baud rate (bps)
4	parity	ENUM = 4	Parity
5	databits	Ulong = 4	Number of data bits (default = 8)
6	stopbits	Ulong = 4	Number of stop bits (default = 1)
7	handshake	ENUM = 4	Handshaking
8	echo	ENUM = 4	No echo (default)(must be 0 or 1)
9	break	ENUM = 4	Enable break detection (default 0) ,(must be 0 or 1)

Note: Total byte size = header + 32 = 60 bytes

COM Serial Port Identifiers (field 2):

Binary	ASCII	Description
1	COM1	COM port 1
2	COM2	COM port 2
6	THISPORT	The current COM port
8	ALL	All COM ports
9	XCOM1	Virtual COM1 port
10	XCOM2	Virtual COM2 port
13	USB1	USB port 1
14	USB2	USB port 2
15	USB3	USB port 3
17	XCOM3	Virtual COM3 port

Parity(field 4):

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

Handshaking (field 7):

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

Note: See: OEMStar Firmware Reference Manual Rev 6 page 56

1.1.1.11 setDynamics

Gps.**setDynamics** (*dynamicID*)

Set Dynamics of receiver.

Parameters **dynamicID** – identifier of the type of dynamic.

Returns True or False if the request has gone as expected or not.

dynamics message is defined as:

Field	value	N Bytes	Description
1	header	H = 28	Header of message
2	dynamics	ENUM = 4	identification of dynamics
CRC32		UL = 4	

The dynamics identifiers (field 2) are defined as:

Binary	ASCII	Description
0	AIR	Receiver is in an aircraft or a land vehicle, for example a high speed train, with velocity greater than 110 km/h (30 m/s). This is also the most suitable dynamic for a jittery vehicle at any speed.
1	LAND	Receiver is in a stable land vehicle with velocity less than 110 km/h (30 m/s).
2	FOOT	Receiver is being carried by a person with velocity less than 11 km/h (3 m/s).

This command adjusts the receiver dynamics to that of your environment. It is used to optimally tune receiver parameters. The DYNAMICS command adjusts the Tracking State transition time-out value of the receiver. When the receiver loses the position solution, it attempts to steer the tracking loops for fast reacquisition (5 s time-out by default). The DYNAMICS command allows you to adjust this time-out value, effectively increasing the steering time. The three states 0, 1, and 2 set the time-out to 5, 10, or 20 seconds respectively.

Note:

- The DYNAMICS command should only be used by advanced users of GPS. The default of AIR should not be changed except under very specific conditions.
 - The DYNAMICS command affects satellite reacquisition. The constraint of the DYNAMICS filter with FOOT is very tight and is appropriate for a user on foot. A sudden tilted or up and down movement, for example while a tractor is moving slowly along a track, may trip the RTK filter to reset and cause the position to jump. AIR should be used in this case.
-

1.1.1.12 shutdown

Gps.**shutdown** ()

Prepare for exiting program

Returns always returns true after all tasks are done.

Prepare for turn off the program by executing the following tasks:

- unlogall

- reset port settings
- close port

1.1.1.13 CRC32Value

static `Gps.CRC32Value` (*i*)

Calculate the 32bits CRC of message.

See OEMStar Firmware Reference Manual Rev 6 page 24 for more information.

Parameters *i* – message to calculate the crc-32.

Returns The CRC value calculated over the input message.

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