GPS receiver with Inertial sensor 9DOF

General description:

This GPS receiver with inertial sensor provides an excellent sensitive GPS receiver and a LSM9D1 inertial sensor with: gyro, accelerator and Manetometer, all over 3 axis: X, Y and Z. The receiver can be connected to many (aero)products to provide GPS data from a modern GPS receiver and at the same time provide attitude information which can be used for safety or to provide a direction at places where a GPS is not working. Data from the GPS and from the sensor can be automatically transmitted via the interfaces: RS232 TTL, RS232C and RS485 or they can be “polled” for via a simple but robust protocol over the RS485 interface.
The user can choose between the standard GPS NMEA sentences send out or a much simplified string of data including only the generally used GPS data fields, thus saving a lot of computing power on the system this receiver is connected to.

Features:

> Small size of only: 64 * 40 * 22 mm
> Low power consumption about 90mA
> RS232 TTL & RS232C interfaces.
> Optional RS485 interface for up to 1200m cable length and up to 32 similar devices on 1 communication line using a simple multidrop protocol.
> GPS receiver available for all satellite systems.
> LSM9D1 9 DOF inertial sensor, programmable.
> Data send out automatically on intervals or the host system polls for it.
> The raw GPS receiver data is transmitted or a very simplified string of data with only the common used GPS data fields to save computing power on the host system (like transponders).
> Data output can be changed on user request.
> Calculations on the data of the sensor can be added on user specifications/request.
> Baud rate of the serial data ports adjustable. (default: 9600,N,8,1 up to 115.200,N,8,1)

Applications:

> GPS to replace older gps receivers.
> Add squitter option to transponders.
> Add attitude & direction data to GPS data (dead recognizing).
> External GPS with data via RS232 which are almost nog available anymore.
> GPS & attitude data over a long distance (up to 1200 m!).

Ordering information:

653005 GPS_attitude receiver, RS232C & TTL
653007 GPS_attitude receiver, RS485
653007 GPS_attitude receiver, RS232 & RS485

Power supply:

The GPS_ATTITUDE receiver can work on a supply of 4 to 7.5V and less then 100mA.
Advised is a 5V supply.
The 5V supplied is internally converted to 3.3V via a linear voltage stabilizer in order to provide a very noise-immune supply to the internal inertial sensor so it provides stable data.
When using the 99001001 Multdrop Master module of Rextron, the 5V (5V8) is derived from the supply voltage to that master module which has an input range of 8..30V making it suitable for 12V and 24V automotive or airplane systems.

Interfaces:

Depending on the article number ordered, the receiver communicates via RS232C/RS232TTL (default) or (on request) RS485 (1: 1 or multidrop).
The default settings of this port are: 9600 Baud, No parity and 1 stopbit.
By connecting the receiver to a PC running a terminal emulation program (like Hyperterminal, Teraterm, Putty etc) the receiver can be configured to other baud rates. (up to 115.200 as standard, higher baud rates on request).

When the RS485 interface is chosen, it can be used as a single line connecting to a host over up to 1200 meter (!) or up to 30 products from Rextron with a RS485 interface can be connected on 1 RS485 interface line in a so-called “multi-drop” way. In order to be able to “talk” to the receiver, it has its own “UAC address” consisting of 1 byte, send as 2 ASCII characters.
For this GPS_ATTITUDE receiver it is set to 11 by default but can be changed to 12, 13, 14 or 15 too, so even 5 pcs of this product could be connected to 1 RS485 line and they can be addressed by sending the correct UAC in the protocol used on the RS485 line. (See: Rextron protocol for details).

Multidrop protocol:

The data to be send to the receiver (and all other Rextron products with a RS485 interface) has the following structure:

<stx> <length> <UAC> <command> <data> <crc> <etx>

Where:

stx	= 0x02
Lenght	= the number of bytes including <length> <UAC> <command> <data> <crc> The length can be 7 to 255 (7 is the minimum data length). It is represented as 2 HEX-ASCI characters, so for example a length of: 12 would be send as: 0x31 0x32
UAC	= the address of the receiver. The address is also represented as 2 HEX-ASCII characters, so the default address of the receiver, 11, needs to be send as: 0x31 0x31.
<command>	= 1 of the commands to change a setting or ask for data. It is 1 ASCII character from: A to Z.
<data>	= The data needed for the command send.
<crc>	= a simpe 8-bit addition of all data, from (and including) <length> till (not including) <crc>. It is represented as 2HEX- ASCI characters, so a CRC of: 148 would be send as: 0x39 0x34.

GPS_ATTITUDE receiver commands:

The following commands and needed parameters are available for the GSP_ATTITUDE receiver:

A	R<register>	Read the contents of the register <register> from the LSM9D1 accelero & gyro registers.
A	W<register><value>	Write the byte: <value> to the LSM9D1 accelero & gyro register: <register> (Some registers are not allowed to write to. The GPS_ATTITUDE receiver firmware will check for allowed registers).
B	<value>	Set the host port baudrate. <value> can be: 1 = 2400Bd 2 = 4800Bd 3 = 9600Bd 4 = 19200Bd 5 = 38400Bd 6 = 115200Bd
C		Reload the settings from the default settings and make them active
D	E(nable), D(isable)	E= enable the /BUSINT function, D=disable the /BUSINT function
F		Reset to factory defaults
G		Get the last GPS data. Only the commonly used fields are send: [Status, A or V],[ddmmyyHHMMSS],[Latitude + N or S],[Longitude with E or W], [Coarse Over Ground],[Speed Over Ground],[Number of sattelites active], [MSL altitude in feet],[GPS altitude in feet],[CRLF]
I	G(ps),S(ensor) <value>	Set the Gps or Sensor data send interval. GPS: 0 = not send Sensor: 0 = not send 1 = every second 1 = 4 times per second 2 = 1 time per second
M	R<register>	Read the contents of the register <register> from the LSM9D1 magneto registers.
M	W<register><value>	Write the byte: <value> to the LSM9D1 magneto register: <register> (Some registers are not allowed to write to. The GPS_ATTITUDE receiver firmware will check for allowed registers).
P		When the LSM9D1 sensor chip is installed, an ACK answer will follow, otherwise a NAK answer.
R	E(nable), D(isable)	E= enable responses on commands, D=disable responses. When enabled, all commands send to the GPS_ATTITUDE receiver will be answered by an ACK response (command and parameters OK) or a NAK response (command and/or parameters not OK).
S		Get the actual Sensor data. The response contains all sensor values in 1 string. Example: #RSITU<gyro-X>,<gyro-Y>,<gyro-z>;<Accel-X>,<Accel-Y>,<Accel-z>;<magn-X>, <magn-Y>,<magn-Z>[CRLF]
U	<address>	Sets a new UAC address. For this product: 11, 12, 13, 14 or 15.
V		Get the product version.

Responses:

If the GPS and/or the Sensor are set to transmit data at an interval, then the responses to commands will be simple in the style of:

If both the GPS and the Sensor are set to NOT send data at an interval, the unit is in MULTIDROP mode, meaning that commands need to be send to the unit in order to get the last data.

When using the RS232C port or the RS485 port in point-to-point communication, then

When using the RS485 interface in multidrop mode, then

The format of the response , when data of the GPS and/or sensor is send on interval is:

A <CRLF>	if the command was ok
N <CRLF>	if the command is not recognized or parameters where not accepted.

The format of the response, when interval transmission is off for both the GPS and the sensor, so multidrop is used:

<SOH><LL><UAC><response><CRC><EOT>

Where:

<SOH>	= 0x01	
<LL>	= the length of the response, from <LL> to and including <CRC>, send as 2 HEX ASCII characters.	
<UAC>	= the address of this unit. Default: 11, send as 2 HEX ASCII chararcters, here: 0x31 0x31	
<response>	= A	for a valid command that did not ask for data
	N	for an invalid command and/or parameters.
	Str	a string of characters as a response on the command send.

Cable:

The GPS_ATTITUDE comes with a round cable with the following colors and connections:

Red wire	power supply, 4 to 7V5, about 90mA average.
Black wire	ground
Blue wire	data output (RS232) or data+ (RS485)
White wire	data input (RS232) or data- (RS485)
Yellow wire	/Busint signal(*)

(*) the: /Busint line is an open-drain output that can be configured by the: D command to be activated when new data from the GPS or sensor is available. In multidrop configurations the master controller can “see” from a low /Busint line that some unit on the RS485 line has data so it should poll all connected units. This can save o lot of computing time at the master controller (or other host).