

GPS time receiver/temperature sensor*

Manual version 1.03

1. Specifications

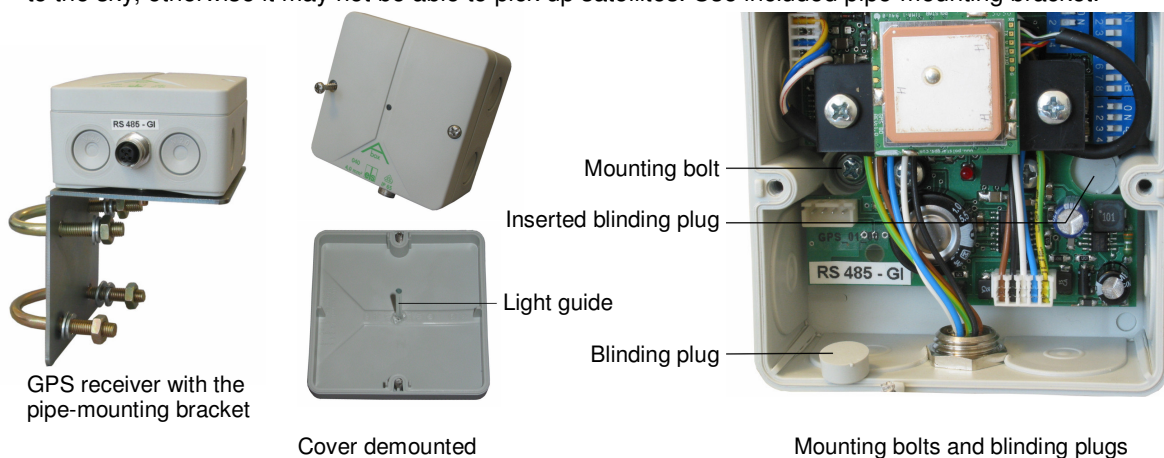
GPS (Global Positioning System) is a system of satellites in orbits that transmit extremely accurate, real time and worldwide navigation information that can be used to identify a position on the earth by anyone with a suitable GPS receiver, together with a highly accurate local time. The GPS system was commissioned by the US government initially for military use and now it is available for commercial access at no charge.

A GPS time receiver is designed to provide a precise time reference for NDC...m series clocks or a NDC-net bus. If the receiver receives GPS signal, it transmits time synchronized with the GPS time, otherwise it transmits its internal clock time. It is simple to install and it is maintenance free, yet adjustable in wide range.

GPS parameters	Tracking up to 20 satellites L1, 1575,42 MHz; Acquisition: -148dBm; Tracking: -159dBm.
Properties	Adjustable „Leap Second“ time correction 0 – 64s; Adjustable time shift compared to UTC ± 15 h 0/15/30/45 min; Enable to set automatic daylight saving time On/Off; Slave mode for NDC-net bus communication, master mode for special use; LED indication of satellite acquisition.
Temperature sensor*	Temperature measuring range $-55^{\circ}\text{C} \div +125^{\circ}\text{C}$; accuracy of $\pm 0.5^{\circ}\text{C}$ (in the range $-10^{\circ}\text{C} \div +85^{\circ}\text{C}$), $\pm 2^{\circ}\text{C}$ (in the range $-55^{\circ}\text{C} \div -10^{\circ}\text{C}$ and $85^{\circ}\text{C} \div 125^{\circ}\text{C}$).
Communication Interface	NDC-net protocol (Slave mode). RS-485 w/o galvanic insulation (for NDC-net use). Available galvanic insulation at extra cost; RS-232 (reserved, on request).
Power supply	9-24 VDC/1.5W. If the receiver w/o galvanic insulation is supplied, power supply from the nearest NDC...m clock can be used (max. 10m). In case on galvanically insulated interface external power supply should be used.
Connection	5-pin Lumberg RFM5/0.5M connector. Cable plug RSCW5/7 included in the delivery.
Environmental protection	IP65
Mount	Horizontal or vertical pipe mounting ($\varnothing 26 - 45$ mm), direct horizontal surface mounting. Galvanized pipe mounting bracket.
Operational temperature	$-30^{\circ}\text{C} \div +50^{\circ}\text{C}$

2. Installation

The receiver should be mounted in horizontal position with the case cover upwards and direct „view“ to the sky, otherwise it may not be able to pick up satellites. Use included pipe-mounting bracket.



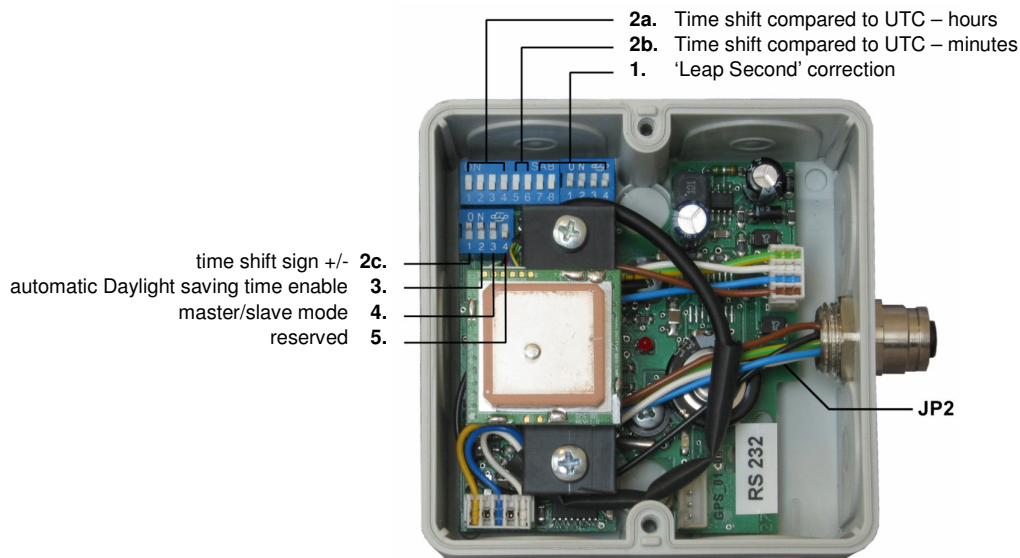
It is also possible to mount the GPS receiver to the horizontal surface. Screw off 2 screws on the case cover and remove it. Be carefull and do not break the glass light guide on the cover (see drawings above). Remove the rubber blinding plugs carefully with a narrow screwdriver (and also the bolts, if the receiver is already mounted on the bracket). Mount the receiver to the surface and put the blinding plugs back to achieve the water protection (see the drawing).

3. LED indication

There is LED indication light guide at the top of the cover. LED lights steadily in case of satellite acquisition, otherwise it blinks.

4. Settings

DIP switches are used to set GPS time receiver parameters:



Terminating resistor of the RS-485 net (NDCnet) - JP2

There is a JP2 jumper in the PCB (No. 276) under the output cables, by which the terminating resistor is connected into the NDCnet. If the JP2 jumper is closed (inserted bridge), the terminating resistor is connected. If the JP2 jumper is open (bridge not inserted), the terminating resistor is not connected. Connect the terminating resistor, if the GPS is the terminating device in the net (i.e. the first or the last on the RS-485 bus).

DIP switch 1 - 'Leap Second' correction

The GPS time is not corrected by so called Leap Second since the beginning, so compared to the UTC it is currently 14 s ahead. By means of corresponding DIP switches it is possible to set leap second correction, that means how much seconds should be subtracted from GPS time to make it equal to UTC. The correction range is 0 – 63s. This setting is depending on used hardware (GPS receiver IC) – some hardware provides already corrected time. Initial setting is done in the factory. If the initial setting is set to zero, it is necessary to make the correction on this hardware from time to time (usually 1s once per 1 – 3 years).

DIP switch '1'						Leap Seconds [s]	DIP switch '1'						Leap Seconds [s]
7	8	1	2	3	4		7	8	1	2	3	4	
off	off	off	off	off	off	0	off	on	off	off	off	off	16
off	off	off	off	off	on	1	off	on	off	off	off	on	17
off	off	off	off	off	on	2	off	on	off	off	on	off	18
off	off	off	off	on	on	3	off	on	off	off	on	on	19
off	off	off	on	off	off	4	off	on	off	on	off	off	20
off	off	off	on	off	on	5	off	on	off	on	off	on	21
off	off	off	on	on	off	6	off	on	off	on	on	off	22
off	off	off	on	on	on	7	off	on	off	on	on	on	23
off	off	on	off	off	off	8	off	on	on	off	off	off	24
off	off	on	off	off	on	9	off	on	on	off	off	on	25
off	off	on	on	off	off	10	off	on	on	off	on	off	26
off	off	on	off	on	on	11	off	on	on	off	on	on	27
off	off	on	on	off	off	12	off	on	on	on	off	off	28
off	off	on	on	off	on	13	off	on	on	on	off	on	29
off	off	on	on	on	off	14	off	on	on	on	on	off	30
off	off	on	on	on	on	15	off	on	on	on	on	on	31

Table of Leap Second corrections (stated range 0 – 31)

DIP switch 2a – Time shift compared to UTC (local time) - hours

Time shift allows to set local time or time from other time zone. Range of setting is 0 – ±15 hours (please see sign setting below).

DIP switch '2a'				time shift [hours]	DIP switch '2a'				time shift [hours]
1	2	3	4		1	2	3	4	
off	off	off	off	0	on	off	off	off	8
off	off	off	on	1	on	off	off	on	9
off	off	on	off	2	on	off	on	off	10
off	off	on	on	3	on	off	on	on	11
off	on	off	off	4	on	on	off	off	12
off	on	off	on	5	on	on	off	on	13
off	on	on	off	6	on	on	on	off	14
off	on	on	on	7	on	on	on	on	15

Table of time shift compared to UTC, hours

Central European Time (CET) is +1 hour ahead of UTC, so the time shift should be set to 1 hour, GMT is equal to UTC, so no correction is necessary (correction set to 0).

Note: If the GPS time receiver is connected to the NDC-net bus, the time shift can be set up either in GPS receiver or in NDC...m clocks. It is recommended to make local time correction in GPS receiver rather than in NDC...m clocks and keep the option of showing different time zones for NDC...m clocks.

DIP switch 2b - Time shift compared to UTC (local time) - minutes

Concerning existing time zones, minute correction can be set up in the 0/15/30/45 minute steps.

DIP witch '2b'		time shift [min]
5	6	
off	off	0
off	on	15
on	off	30
on	on	45

Table of time shift compared to UTC, minutes

DIP switch 2c - Time shift compared to UTC (local time) - sign

Time shift direction (sign) can be set by DIP switch 2c. Switch position ON means that the hour and minute correction is added to the internal time (+), OFF means the correction is subtracted (-). For the GET the switch should be ON (+).

DIP switch 3 – Automatic daylight saving time (DST) setting

It is possible to set up GPS receiver, so that it automatically provides daylight saving time correction. The automatic correction is on, if the DIP-switch position is ON.

Because the GPS time does not contain DST information, it is calculated from current date and time. If automatic DST setting is on, GPS receiver adds +1 hour on last March Sunday at 1:00 UTC (1:00 → 2:00) and remove it on last October Sunday at 2:00 UTC (2:00 → 1:00).

Note: If GPS receiver is used as NDC...m clock(s) reference and automatic DST is required, it should be set either in GPS receiver or in the clock(s), otherwise during summer time the clocks would not show correct time (1 extra hour ahead).

DIP switch 4 – GPS receiver control, master/slave mode setting

For NDC...m clock reference (NDC-net bus connection) the mode should be set to slave (DIP switch OFF), otherwise the synchronization will not work properly (it will not work either).

The DIP-switch ON position (master) is reserved for special custom applications, when the receiver transmits its time reference without any external control (e.g. if connected to PC, to MCC control clock, etc.).

* The GPS receiver can also be supplied with a built-in temperature sensor for an extra charge.