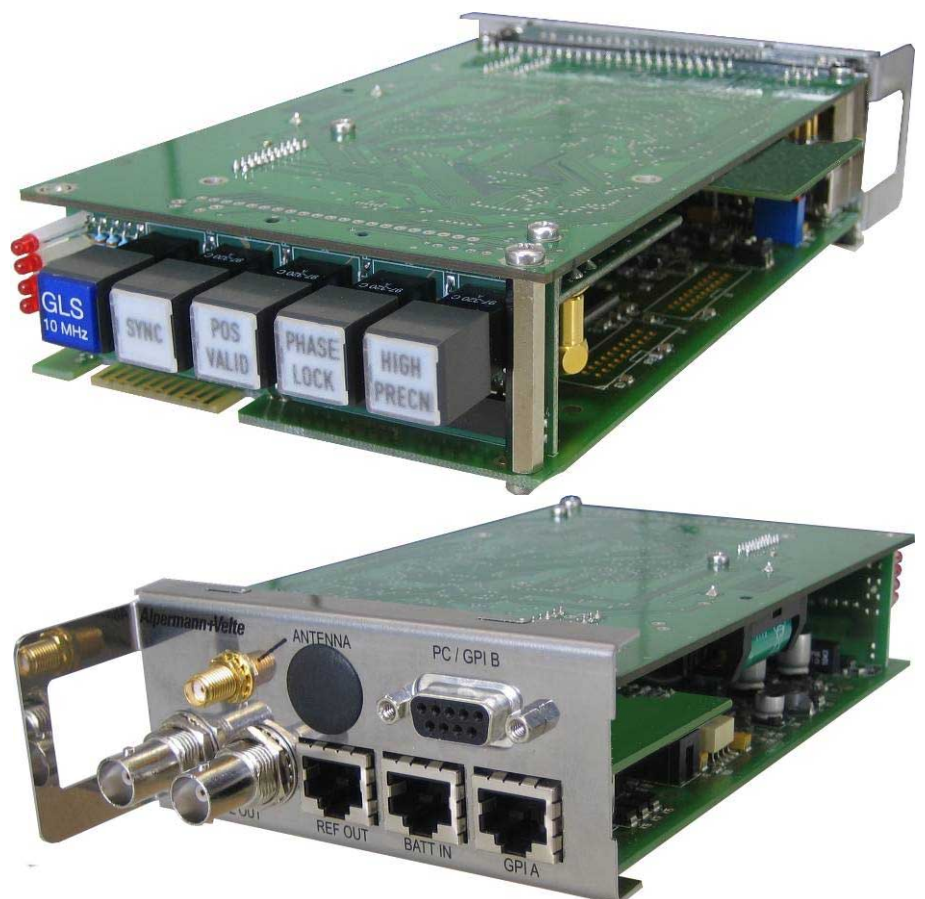


GLS 10 MHz

GLONASS/GPS Satellite Receiver Module
Time & Date Reference
Reference Frequency Output for Synchronisation Tasks

Supplement to the “Installation & Systems Manual RUBIDIUM SERIES”



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A1 Revision History

No.	Date	Subject
0.n		Preliminary documents, changes without notice.
1.0	October 31, 2011	First released document.

The latest document describes the functions of the latest module's software. You can download the latest software version from:

http://www.alpermann-velte.com/serv_e/software_e/software_e.html.

A2 Copyright

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A3 General Remarks

This manual is a supplement to the "Installation & Systems Manual RUBIDIUM SERIES". Please read the below listed chapters of the "Installation & Systems Manual RUBIDIUM SERIES", as these chapters are necessary for the safe and proper use of this Rubidium module.

- A3 Warranty,
- A4 Unpacking/Shipping/Repackaging Information,
- A5 Safety Instructions,
- A6 Certifications & Compliances,
- Plug-In a Module,
- Remove a Module.

A4 Remarks about a Battery inside

The **GLS 10 MHz** module has a special Lithium battery inside.

Battery Use Warnings



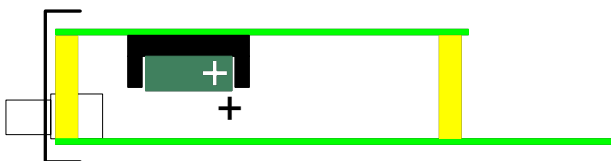
CAUTION: Danger of explosion if battery is incorrectly placed. Replace only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.



Observe precautions for handling electrostatic-sensitive devices.

Battery Replacement Procedure – qualified personnel only!

1. Remove the module from the frame as described in the related chapter of "Installation & Systems Manual RUBIDIUM SERIES".
2. You can easily locate the battery which is placed in a battery holder assembled to the upper printed circuit board. Have a replacement of same or equivalent type ready.
3. Unscrew the three nuts of the BNC connectors at the rear plate. Now you can displace the rear plate so to unscrew all the three screws which fit the upper printed circuit board.
4. You can now easily pull out the battery of the battery holder by hand.
5. Insert the new battery. The '+' on the battery must be oriented in the holder matching the '+' on the holder:



5. Reassemble: In principle follow the procedure in the reverse order.
4. Plug-in the module as described in the related chapter of "Installation & Systems Manual RUBIDIUM SERIES".

Information for end-users for a separate collection of waste batteries

1. In order to prevent waste batteries from being discarded in such a way as to pollute the environment, waste batteries should be collected and recycled. End-users shall make use of the local or national battery collection scheme. As an alternative your distributor takes back waste batteries originally delivered with this module.
2. Symbol for batteries:



= "separate collection" for all batteries.

Batteries containing mercury, cadmium, or lead, are marked with the chemical symbol for the metal concerned: Hg, Cd or Pb. This symbol will be printed beneath the symbol shown.

1 Module GLS 10 MHz

1.1 Description

The hardware consists of a combined GLONASS/GPS satellite receiver board and a CPU and I/O board with various interfaces. Standard outputs are a double 10 MHz reference frequency output, a precise PPS and a time & date serial protocol (RS232). A secondary RS232 as well as some general purpose interfaces are assigned for various special applications.

There is no initial set-up necessary. Provided the antenna has been mounted and connected properly, the module will be ready to receive GLONASS and GPS signals and to generate disciplined frequencies and a time & date protocol. The master oscillator will be disciplined by the GLONASS/GPS system for compensation of long term effects like aging and temperature dependant drift. The last recent correction value will be stored in a battery buffered memory as well as last valid almanac and ephemeris data.

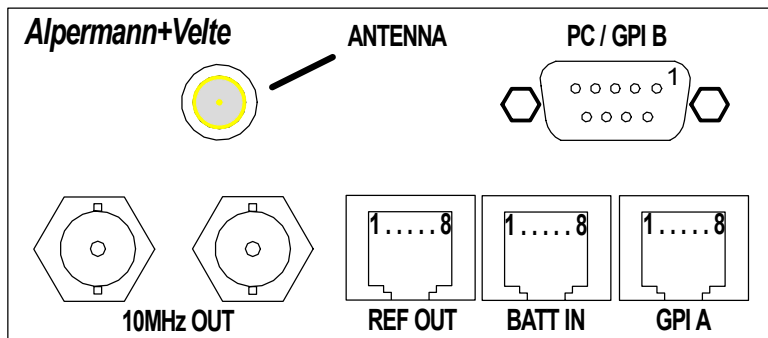
A PC is required for a special set-up and for a configuration of this module. The front panel label **GLS 10 MHz** visibly identifies where each module is located. The serial number is located on the bottom side of the lower circuit board of each module.

To realize various requirements concerning the accuracy of the frequency outputs the module may be equipped with different master oscillators. The chapter "specifications" includes a table of the technical data. Without special ordering the module will be equipped with the "TCXO" option.

The standard hardware of this module has all of the following key features:

- "Hot Swapping", i.e. it is possible to insert or remove a module without interrupting the operation of other modules in this frame.
- Failure relay, connected to the FAIL_A and FAIL_B pins of the **RLC** connector at the rear of the frame.
- RS232 and TC_link (RLC connector) interfaces to have access to the internal bus of the chassis.
- Four programmable function keys, lamps and LEDs on the front panel (RUB1 version only).
- Flash memory containing the firmware, so configuration and updates are possible via a PC connection. You can download the latest version of the program from: http://www.alpermann-velte.com/serv_e/software_e/software_e.html.
- Reference output signals: double 10 MHz, PPS, time & date serial protocol.
- Four digital outputs may be used in special applications (GPIs).

1.2 Rear Panel and Connections



Connections at the rear panel of the GLS 10 MHz module

ANTENNA: SMA female (jack).

Pin assignments:

REF OUT RJ45 jack	BATT IN RJ45 jack	GPI A RJ45 jack	PC / GPI B DSUB9F
1: PPS OUT	1: GND	1: GND	1: GPI_2 OUT
2: TXD1 OUT	2: GPI_1 OUT	2: GPI_1 OUT	2: TXD2 OUT
3:	3:	3: GND	3: RXD2 IN
6:	6:	6: GPI_2 OUT	4:
4: GND	4: GND	4: GND	5: GND
5:	5: V+ IN	5: GPI_3 OUT	6:
7:	7: GND	7: GND	7:
8:	8:	8: GPI_4 OUT	8: GPI_3 OUT
			9: GPI_4 OUT

Signal descriptions:

GND	Signal ground.
PPS OUT	Pulse Per Second output.
TXDx RXDx	RS232 signal lines: TxD = transmit line, unbalanced data output. RxD = receive line, unbalanced data input.
GPI_1 / GPI_2 GPI_3 / GPI_4	General Purpose Interface outputs according to the GPI output specification.
V+ IN	Back-up voltage input, which supplies voltage to the module in parallel with the inserted "Power Supply" module. This input is reverse voltage protected by a diode.

Functional Description and Specifications GLS 10 MHz

1.3 Specifications

Accuracy of the frequency outputs

Oscillator options:	TCXO: Standard	MQ: Medium Quality	HQ: High Quality
Short term stability ($\tau = 1s$)	$\pm 2 \cdot 10^{-9}$	$\pm 2 \cdot 10^{-10}$	$\pm 5 \cdot 10^{-12}$
PPS accuracy	$< \pm 250$ ns	$< \pm 100$ ns	$< \pm 100$ ns
Accuracy free run one day	$\pm 1 \cdot 10^{-7}$	$\pm 1.5 \cdot 10^{-9}$	$\pm 5 \cdot 10^{-10}$
Synchronous, average 24h	$\pm 1 \cdot 10^{-11}$	$\pm 5 \cdot 10^{-12}$	$\pm 1 \cdot 10^{-12}$
Phase noise [dBc/Hz]: 1 Hz/10 Hz/100 Hz/1kHz	-60/-90/ -120/-130	-75/-110/ -130/-140	-100/-130/ -140/-155
Temp. dep. drift free run	$\pm 1 \cdot 10^{-6}$ (0...60°C)	$\pm 5 \cdot 10^{-8}$ (-20...70°C)	$\pm 1 \cdot 10^{-8}$ (5...70°C)

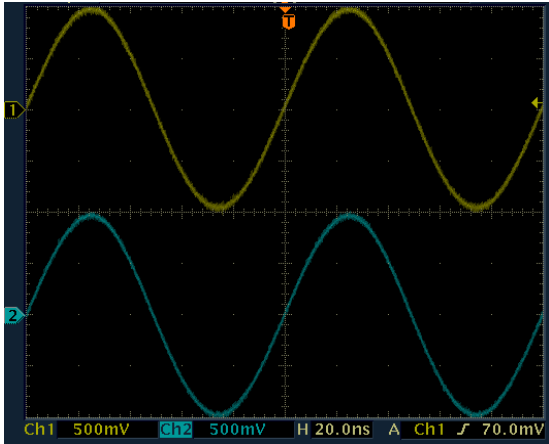
Satellites receiver

Type	Combined GLONASS/GPS receiver of type GLN170
Number of channels	16
Frequency band	L1
Codes	C/A code (GPS); standard accuracy, CT (GLONASS)

Antenna and antenna cable

Connector	SMA female (jack); antenna supply voltage: ≈ 5 V DC.
Please refer to chapter "GLONASS/GPS Antennas" for detailed technical data.	

10 MHz

Output characteristics	<p>Sinusoidal continuous wave, $350 \text{ mV}_{\text{RMS}}$ ($\approx 1 \text{ Vpp}$) terminated in 75Ω. 50Ω output available upon request.</p> <p>Screen shot of unterminated 10 MHz OUT signals:</p> 
------------------------	--

TXD1 OUT

Format	RS232, data protocol selectable Signal level (no load): $\pm 9.6 \text{ V}$
--------	--

PPS

Pulse width	200 ms, active high
Output characteristics	Output impedance: 100Ω Signal level: 4.5 V (no load), 3.8 V at 600Ω Slew rate (rising edge): $\approx 30 \text{ V}/\mu\text{s}$
Accuracy	$\leq \pm 2 \mu\text{s}$ during the first 20 minutes of operation. After synchronisation and 20 minutes of operation: see oscillator options.

GPI

GPI_1 ... GPI_4: output specification	Open Collector output of a NPN transistor at $1\text{k}\Omega$ pull-up resistor (at 5 VDC). Max. power dissipation: 200 mW . "High" state: 4.3 V (no load). "Low" state: output switched to GND. Max. collector current: 100 mA DC , fused by a 100 mA auto-recovery fuse. Collector-emitter saturation voltage: @ 100mA : typ. 200 mV ($\leq 600 \text{ mV}$), @ 10mA : typ. 90 mV ($\leq 250 \text{ mV}$). Frequency: $0 - 150 \text{ kHz}$.
--	---

V+ IN

Power requirements	$12 - 30 \text{ VDC}$; power: according to "power consumption"
--------------------	---

Others

Operating voltage	$12 - 30 \text{ VDC}$												
Power consumption (including antenna)	Dependent on oscillator option: <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td></td> <td><u>TCXO</u></td> <td><u>MQ</u></td> <td><u>HQ</u></td> </tr> <tr> <td>Warm-up:</td> <td>$5,9 \text{ W}$</td> <td>$8,2 \text{ W}$</td> <td>$8,2 \text{ W}$</td> </tr> <tr> <td>Normal operating mode:</td> <td>$5,4 \text{ W}$</td> <td>$6,2 \text{ W}$</td> <td>$6,2 \text{ W}$</td> </tr> </table>		<u>TCXO</u>	<u>MQ</u>	<u>HQ</u>	Warm-up:	$5,9 \text{ W}$	$8,2 \text{ W}$	$8,2 \text{ W}$	Normal operating mode:	$5,4 \text{ W}$	$6,2 \text{ W}$	$6,2 \text{ W}$
	<u>TCXO</u>	<u>MQ</u>	<u>HQ</u>										
Warm-up:	$5,9 \text{ W}$	$8,2 \text{ W}$	$8,2 \text{ W}$										
Normal operating mode:	$5,4 \text{ W}$	$6,2 \text{ W}$	$6,2 \text{ W}$										
Weight	$\approx 0.3 \text{ kg}$												
Mechanical	Standard circuit board (W x D): $100 \times 160 \text{ mm}$ / $3.94 \times 6.30 \text{ inch}$ Rear panel: RUB H1: $103 \times 44 \text{ mm}$ / $4.06 \times 1.73 \text{ inch}$ RUB H3: 8HP, 3RU												
Environmental characteristics	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td></td> <td><u>Operating</u></td> <td><u>Non-operating</u></td> </tr> <tr> <td>Temperature:</td> <td>$5 \text{ }^\circ\text{C}$ to $40 \text{ }^\circ\text{C}$</td> <td>$-10 \text{ }^\circ\text{C}$ to $+60 \text{ }^\circ\text{C}$</td> </tr> <tr> <td>Relative humidity, non-condensing:</td> <td>30% to 85%</td> <td>5% to 95%</td> </tr> </table>		<u>Operating</u>	<u>Non-operating</u>	Temperature:	$5 \text{ }^\circ\text{C}$ to $40 \text{ }^\circ\text{C}$	$-10 \text{ }^\circ\text{C}$ to $+60 \text{ }^\circ\text{C}$	Relative humidity, non-condensing:	30% to 85%	5% to 95%			
	<u>Operating</u>	<u>Non-operating</u>											
Temperature:	$5 \text{ }^\circ\text{C}$ to $40 \text{ }^\circ\text{C}$	$-10 \text{ }^\circ\text{C}$ to $+60 \text{ }^\circ\text{C}$											
Relative humidity, non-condensing:	30% to 85%	5% to 95%											
Battery	Type: CR 1/2 AA, 3 V , 950 mAh LI-Manganese dioxide / Organic Electrolyte Life time: $\geq 10 \text{ years}$												

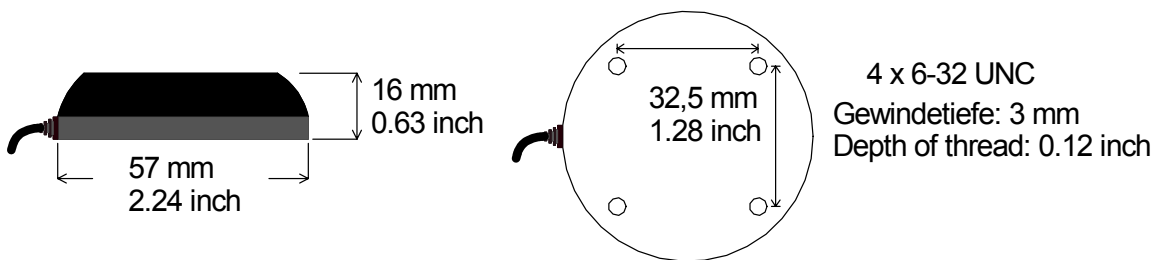
1.4 GLONASS/GPS Antennas

1.4.1 Hints for Mounting the Antenna

The GLONASS and GPS satellites are not stationary but circle round the globe in a period of about 12 hours. The antenna must be installed outdoors where an unobstructed view of the sky exists. Rooftops generally make good locations due to clear overhead sky with views to the horizon, allowing the antenna unit to see and track the maximum number of satellites throughout the day. Installations with obstructed views may prove operational, but may experience reduced reception quality and the inability to simultaneously track the maximum number of satellites.

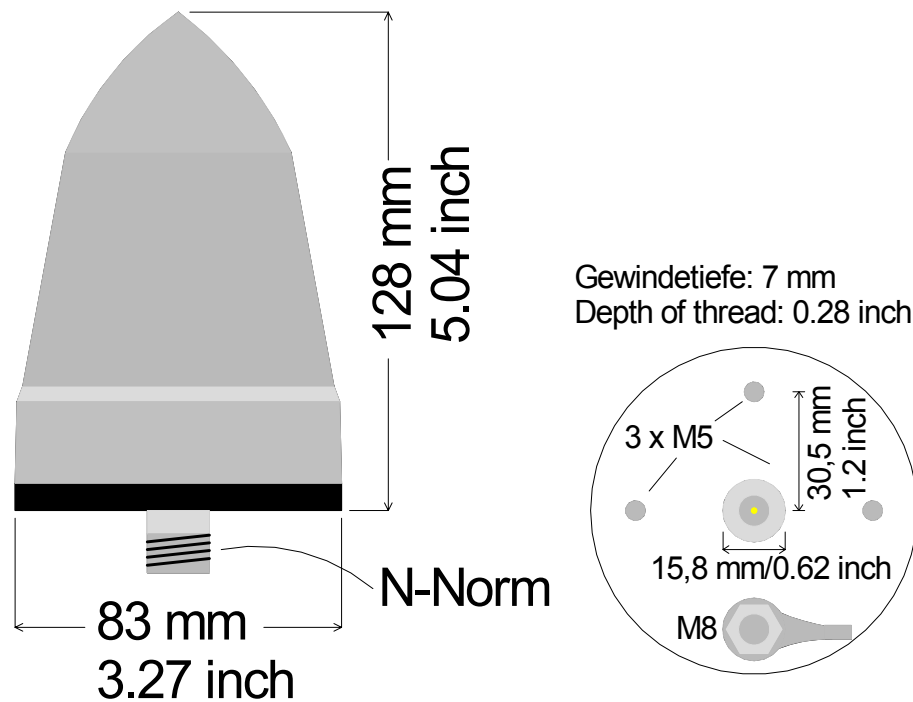
In addition to clear sky coverage, select a site which would not allow the antenna unit to become buried in drifted or accumulated snow.

1.4.2 ANTGLP: Low Profile Antenna



Antenna	Type: NV2410-5000 Frequency band: 1575.42 – 1606 MHz Amplifier gain: 25 dB min.
Operating voltage	2.5 – 5.5 V DC @ 10 mA, via antenna cable
Connector	SMA male (plug) on flying lead
Cable	RG174, 5 m, not detachable from antenna case
Weight	150 g (without accessories)
Environmental	-40 °C to +85 °C, relative humidity ≤ 95 %
Case	Plastic, black, IP67
Mounting	Magnet or permanent (pre-tapped 4 x 6-32 UNC)
More information	Please search following website for antenna type NV2410: www.nvs-gnss.com

1.4.3 ANTG: Antenna with Integrated Lightning Protection



Antenna	Type: GPSGL-TMG-SPI-40NCB Frequency band: 1575.42 ± 10 MHz, 1602 – 1615 MHz Amplifier gain: 40 dB ± 4 dB @ GPS L1 38 dB ± 4 dB @ GLONASS L1
Operating voltage	3.3 – 9.0 V DC @ < 40 mA, via antenna cable
Connector	N, female (jack)
Antenna cable	Cable with N plug at one end and SMA plug on other end. Standard cable: 20 m, Belden H155 PE, double shielded. Maximum cable length: 50 m.
Weight	230 g (without accessories)
Environmental	-40 °C to +85 °C, relative humidity ≤ 95 %
Surge immunity	According to EN61000-4-5 Level 4
Case	Plastic, white
Mounting	Wall and pipe mount kit included
More information	Please search following website for antenna type GPSGL-TMG: www.antenna.com

1.5 Features

1.5.1 Receiving GLONASS and GPS

Overview

GLONASS and GPS both are satellite-based real-time reference and navigation systems.

Both systems have been developed originally for military users.

Both systems contain a code which is freely available for civilian applications:

- GPS: SPS = Standard Positioning Service.
- GLONASS: SP = Standard Precision.

These codes have limitations compared to the restricted code reserved for military applications. Nevertheless, high precision real-time reference signals can be provided.

The message sent from each satellite contains time and date, orbital information and status data. The high precision orbital information is called ephemeris data. These data have to be known to the receiver in order to adjust its clock and to generate high precision real-time reference signals. A reduced precision subset of the ephemeris parameters is called almanac. These data are used to check which satellites are in view from a given receiver position at a given time.

Antenna and receiver evaluate signals of both systems, with the benefit of generating high precision real-time reference signals with availability 24 hours a day.

Both systems consist of at least 21 active satellites circling the earth twice a day. To get a position fix, the receiver must be in the range of at least four satellites.

After power on

The receiver's oscillator has warmed up and operates with the specified accuracy after 10 seconds (with standard oscillator option) or three minutes (with MQ or HQ oscillator option), respectively.

Synchronization and position fix are dependent on the one hand on current quality of reception (e.g. antenna's position) – this makes it difficult to reliably specify the duration until synchronization and position fix –, on the other hand on the state of the receiver as follows:

- The almanac data are lost completely (maybe because the battery is faulty or has been disconnected). The receiver enters the **Cold Boot** operating mode. With normal quality of reception it takes up to 12 minutes until new almanac data has been received completely. The receiver then enters the **Warm Boot** operating mode.
- The receiver enters the **Warm Boot** operating mode if some orbital parameters stored does not match with the parameters received (e.g. after a Cold Boot or if the position of the receiver has changed by more than 100 km). When the receiver has found four satellites in view it can switch to **Normal Operation**.
- If the position of the receiver is stationary and the quality of reception is normal, **Normal Operation** can normally be entered after a few seconds. "Receiver Locked" and "Position Valid" can mostly be indicated within one minute. "High Precision" can be reached within three minutes, "Phase Locked" normally takes 20 - 30 minutes.

GLONASS and/or GPS

The timing delay of the PPS signal derived from GLONASS system against the PPS signal derived from GPS system amounts only to some nanoseconds.

The following modes of operation can be selected – please refer to chapter “Receiver: Set-up of Receiver Functions”.

Auto GLONASS and GPS satellites are evaluated for position fix. Time (UTC) and PPS are based on GPS signals.

GPS only Evaluation of GPS signals only.

GLONASS only Evaluation of GLONASS signals only.

Although changing this mode does not disturb the output signals (PPS, 10 MHz, TxD1), it is not recommended to alter this mode during normal operation. Any change forces the receiver to an unlock state, the output signals then will be generated with free-running accuracy for a short time.

1.5.2 PPS and Time & Date Protocol

The PPS OUT pin outputs a precise pulse per second (active high). The TXD1 OUT pin outputs a RS232 data string every second. Both these signals are commonly used as the time and date reference for the Alpermann+Velte master generators: RUB GT/GL for time code, RUB GI for IRIG-B, RUB GB for black-burst, RUB GW for word clock. For example connect the REF OUT connector with a straight CAT5 cable to the REF IN connector at the RUBIDIUM SERIES modules.

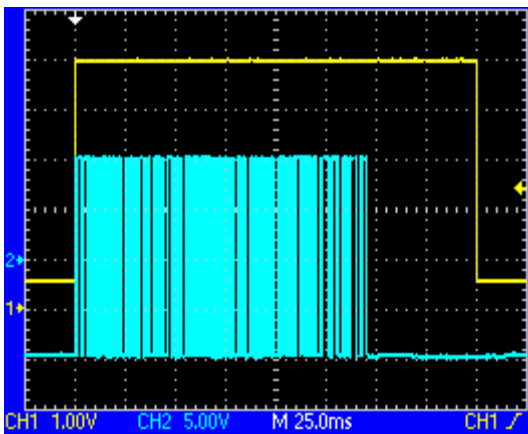
The **leading edge** of the PPS OUT pulse always is defined to be the timing reference. The difference between a GLONASS PPS and a GPS PPS amounts only to some nanoseconds.

TXD1 OUT transmits a data string containing time, date and status information. The data refers to the leading edge of the preceding PPS OUT pulse.

PPS OUT and TXD1 OUT signals can be adjusted:

Please refer to chapter "Receiver: Set-Up the Output Signals".

PPS (yellow, positive pulse) and TXD1 (blue)



PPS = 200 ms

The time zone is not selectable but belongs to the actual data protocol. Via configuration various protocols can be selected, and the interface parameters can be adjusted. In order to gain full functionality, some RUBIDIUM modules should receive only a specific data protocol. So please notice our recommendations.

Protocol	Interface Parameter	Recommended for
Meinberg Standard	2400/7E2	All RUBIDIUM modules delivered before March 2011 or modules with firmware version < 2.11.8 or all systems where no RUB GB module is integrated.
Meinberg GPS	2400/7E2	All systems where a RUB GB module is integrated. Firmware Version of the modules should be ≥ 2.11.8.

1.6 Software Update

Software updates require a (windows operating system) computer and the "RUBIDIUM CONFIGURATION" program. You can download the latest version of the program from: http://www.alpermann-velte.com/serv_e/software_e/software_e.html).

Please check the **PC** connector at your RUBIDIUM housing: there is an USB or RS232 (with a DSUB9 connector) interface installed. You now need the same interface at your computer.

The new firmware should already be stored as a **.tcf** file at your computer.

Please now execute the following steps:

1. Connect your computer to the **PC** connector of that RUBIDIUM frame where the module has been plugged.

In case of an RS232 interface: Use a straight (1:1) connection between the **PC** connector at the RUBIDIUM frame and the RS232 of the computer.

In case of an USB interface: Use a USB A-B cable between your computer and the RUBIDIUM frame.

Switch on the power of all units.

2. Execute "Rubidium Config.exe" on your computer. Select the "Port" according to the interface (USB, RS232) you are using.
3. Select the module (unit 1, 2, 3 ...).
4. Select "Flash Update" in the *File* menu.
5. Open the **.tcf**-file. Standard name: "Rubidium GLS 10 MHz version.tcf".
"version" stands for a revision no., e.g. 2.11.30.

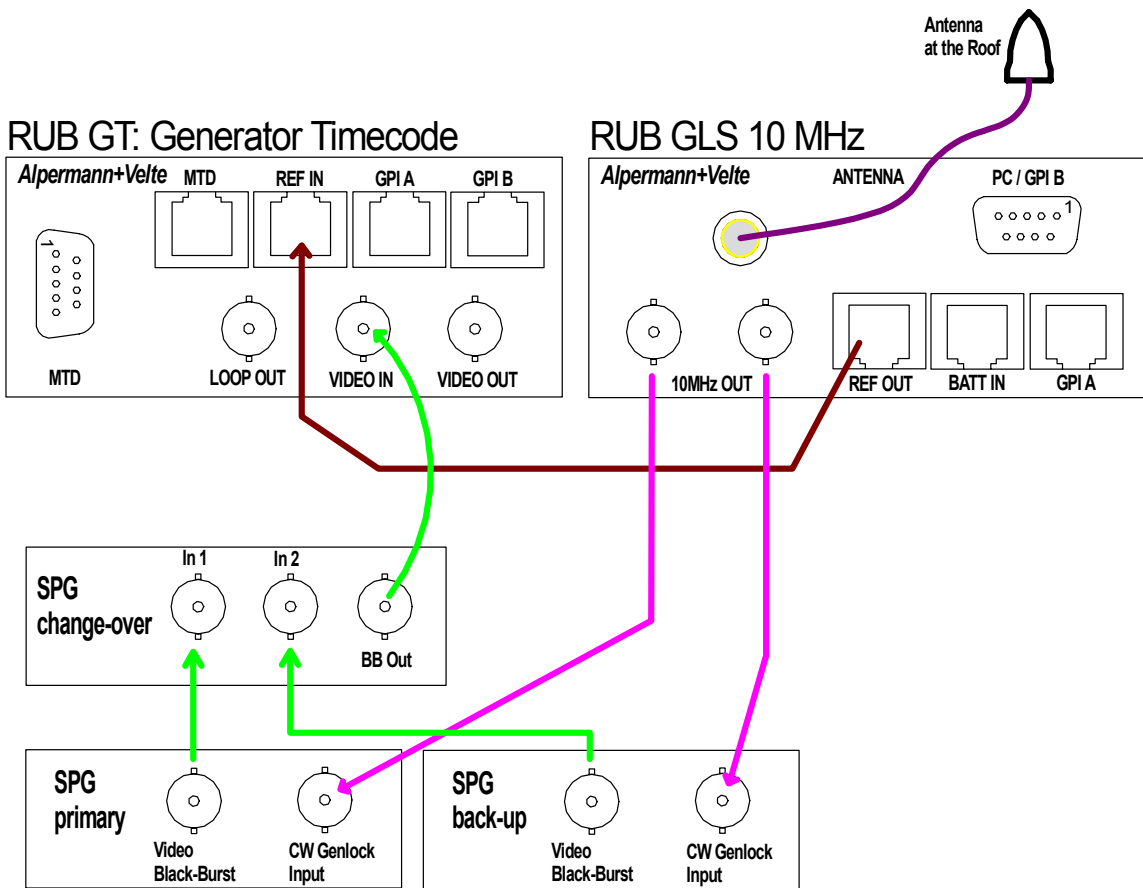
Click the OK button, update starts. Click the OK button at the end.

6. Update is finished now. We recommend to check module's configuration utilizing the "RUBIDIUM CONFIGURATION" program.

During the flash update the operation of the module stops!

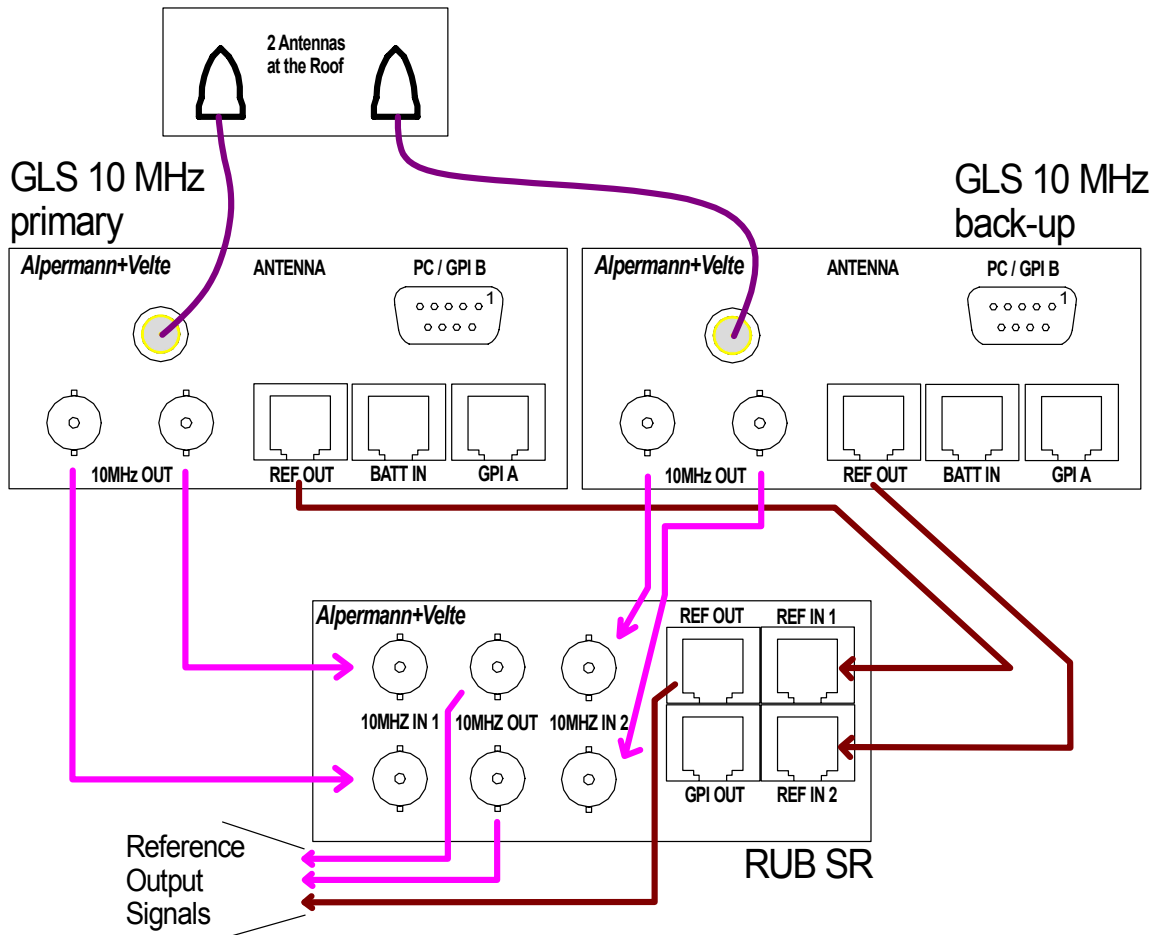
2 Applications

2.1 Time and Date Reference in a Master Time Code System



2.2 Redundant Reference System

2 x GLS 10 MHz + analyser/change-over unit SR:



3 Status Monitor

3.1 Status Monitor by the IE Module

The RUBIDIUM SERIES HTTP server, located in the **RUB IE** module, offers a status monitor. Please refer to the “Functional Descriptions and Specifications IE” manual for a detailed description of how to access the RUBIDIUM SERIES system and how to open the RUBIDIUM homepage.

- At the RUBIDIUM homepage click on “Configuration” to open the **Configuration** page.

Rubidium Series

● **Configuration**



- Click on the blue button of type **GLS 10 MHz**.
- Click on the button **Monitoring** to open the “GLS 10 MHz” status monitor.

Requirements:

- Please have Java Runtime Environment 1.6.0 or higher installed (for example download at www.java.com).
- Java should be installed as a browser plug-in (a Windows installation will do this automatically if you download Java from the source mentioned above).
- The Status Monitor works with all operating systems which support Java.

3.2 Status Monitor by a PC Program

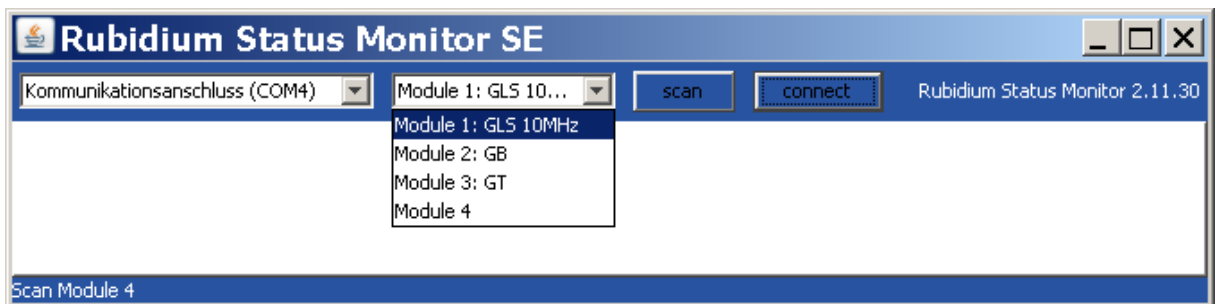


RubStatSE.exe.

The PC program **RubStatSE.exe** uses the **PC** interface (RS232 or USB) of the RUBIDIUM housing. This program is part of the "Rubidium Series, config software" packet you can download at:

http://www.alpermann-velte.com/serv_e/software_e/software_e.html.

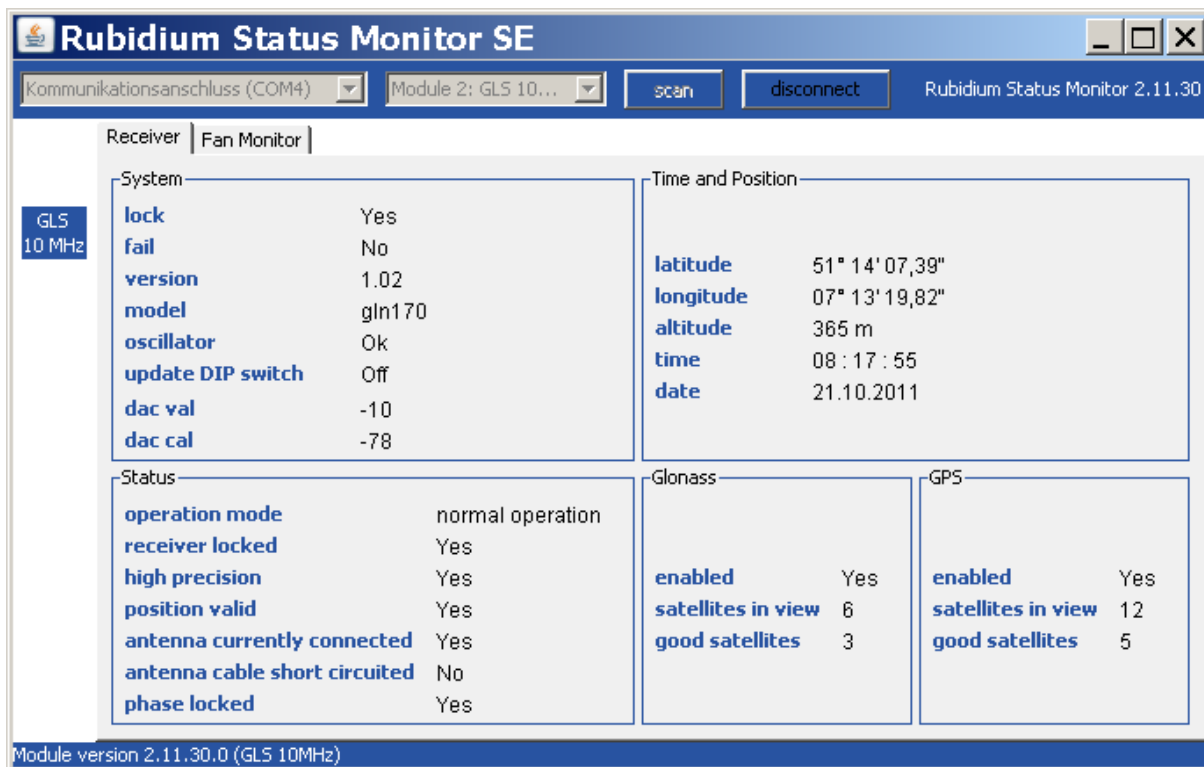
Execute this program, select the COM port or USB connection and press the **scan** button to get a list of the modules plugged to this housing. Select the module and press the **connect** button.



Requirements:

- Please have Java Runtime Environment 1.6.0 or higher installed (for example download at www.java.com).
- For a Windows operating system: Please follow the description of **RubStatSE_Readme.txt**.
- For a Linux operating system: Available on request.

3.3 Status: Receiver



System lock Position can be computed. fail Receiver not locked. version Software version of the receiver. model Receiver type. oscillator Service only. update DIP switch Ok, if SW 2 at basic board = Off. dac val Service only. dac cal Service only.		Time and Position latitude Geographic latitude. longitude Geographic longitude. altitude Altitude referred to mean sea level. time Actual time (UTC). date Actual date (UTC).	
Status operating mode normal operation/track/warm boot/cold boot/unknown. receiver locked Lock state: a minimum of one "good" satellite is necessary. high precision Accuracy of ≤ 200 ns has been achieved once and current accuracy is equal or better than 2 μ s. position valid Yes, if a minimum of four "good" satellites can be received. antenna currently connected Yes/no. antenna cable short circuited Yes/no. phase locked Phase lock of PPS and 10 MHz signals achieved.			
Glonass/GPS enabled Satellites of the GLONASS or of the GPS system can be evaluated, or both in 'Auto' mode. satellites in view Computed number of satellites with an elevation of at least 8°. good satellites Number of satellites which can be received and used for navigation.			

3.4 Status of Fan and Power Supplies

This module – as all configurable RUBIDIUM modules – is able to monitor the fan and power supplies which are plugged to the same housing as “GLS 10 MHz”.

The screenshot shows the 'Rubidium Status Monitor SE' window. It features a title bar with standard window controls and a menu bar. Below the menu bar, there are two dropdown menus: 'Kommunikationsanschluss (COM4)' and 'Module 1: GLS 10...'. To the right of these are 'scan' and 'disconnect' buttons. The main area is divided into several sections:

- Receiver:** A tabbed interface with 'Receiver' and 'Fan Monitor' tabs. The 'Fan Monitor' tab is active.
- GLS 10 MHz:** A vertical label on the left side of the main area.
- Frame:** A table with the following data:

housing	H1 (or D1, Q1, S1, T1)
fan and ps monitoring	yes
port monitoring	yes
fan failure	no
ps failure	no
fans and ps monitored by	this unit
- Port:** A table with the following data:

detected	yes
failure	no
address	1
termination	on
- Fan 1:** A table with the following data:

detected	yes
failure	no
fan fault	no
alarm	no
temp	36 °C
- Fan 2:** A table with the following data:

detected	no
failure	no
fan fault	no
alarm	no
temp	0 °C
- Power Supply 1:** A table with the following data:

detected	yes
failure	no
alarm	no
temp	43 °C
24V output	23,9 V
24V at frame	23,5 V
- Power Supply 2:** A table with the following data:

detected	no
failure	no
alarm	no
temp	0 °C
24V output	0,0 V
24V at frame	0,0 V

At the bottom of the window, the text 'Module version 2.11.30.32 (GLS 10MHz)' is displayed.

Please refer to the document “Installation & Systems Manual RUBIDIUM SERIES” for a detailed description.

4 The Rubidium Configuration Tools

4.1 The Rubidium Configuration PC Program

Please refer to the

“Installation & Systems Manual RUBIDIUM SERIES”

for a general description of this program and how to install it. In this document please notice the chapter “The Rubidium Configuration PC Program” and its subchapters:

- Overview
- Installation
- Connection to RUBIDIUM SERIES Chassis
- Starting the Program
- Store, Load and Update the Configuration on your PC
- The “Profile” Tab: Store and Load Configurations on the Module

The program RUBIDIUM CONFIGURATION uses various tab cards. With one click on the button **Configure** all available and currently activated tabs of this specific module are displayed.

Any changes at a tab will immediately be stored at the module. If you enter a number or a text press the **tabulator key** at the PC’s keyboard afterwards.

4.2 The Rubidium Series HTTP Server

Please refer to the

“Installation & Systems Manual RUBIDIUM SERIES”

for a functional overview and for an installation description of this program. In this document please notice the chapter “The Rubidium Series HTTP Server” and its subchapters:

- Overview, Connecting the IE Module
- IP Configuration, the Rubidium Homepage
- Browser Requirements
- Access to a RUBIDIUM SERIES Module
- The “Profile” Page: Store and Load Configurations on the Module or on the PC

As soon as a communication to a single module has been established, the **Configuration** page gives a list of all the links, which correspond to all the currently available or used pages of this specific module.

Changes at a page will not be stored at the module automatically. At the bottom of each page there are two buttons which should be used to store or load the module’s configuration:

Button **Save To Module**:

- Click on this button to transfer all settings on this page to the module.

Button **Reload From Module**:

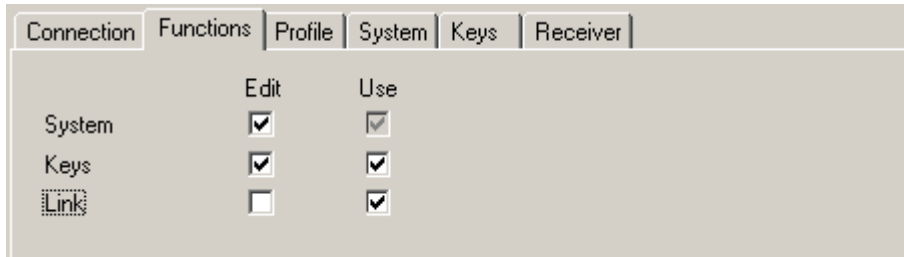
- Click on this button to load the current configuration of the module.



Every time you click on the blue button which indicates the module under configuration a **Reload** will be done automatically.

4.3 “Functions“

Click on **Functions** to see all applicable tabs/pages listed, and to activate or deactivate tabs/pages. For example (screen shot of the PC program tab):



A tab/page reflects a function of the module. **Use** checkboxes determine whether the function in the module is enabled or disabled in general. **Edit** checkboxes determine whether configuration of that specific function is allowed or not.

Edit	Use	
		Function is disabled; the tab/page is not visible.
√	√	Function is enabled; the tab/page is visible and configurable.
	√	Function is enabled but the tab/page not visible and therefore not configurable.

- We suggest that you uncheck the **Use** checkboxes of all functions you are presently not using.
- We suggest that you uncheck the **Edit** checkboxes of all functions you are presently not configuring. That avoids unintentional operating and malfunctions.

List of functions:

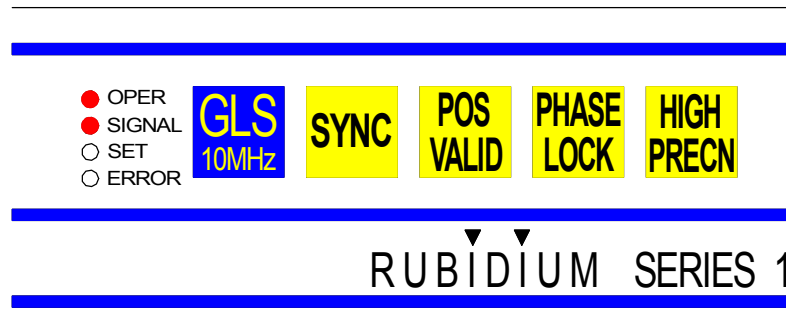
Profile	Store and Load Configurations on the Module (*)
System	Identification, Reset, SNMP, Fan Control
Keys	Keys and Lamps, LEDs and GPIs
Receiver	Set-up of Receiver Functions
Link	Communication between Modules

(*) refer to “Installation & Systems Manual RUBIDIUM SERIES”

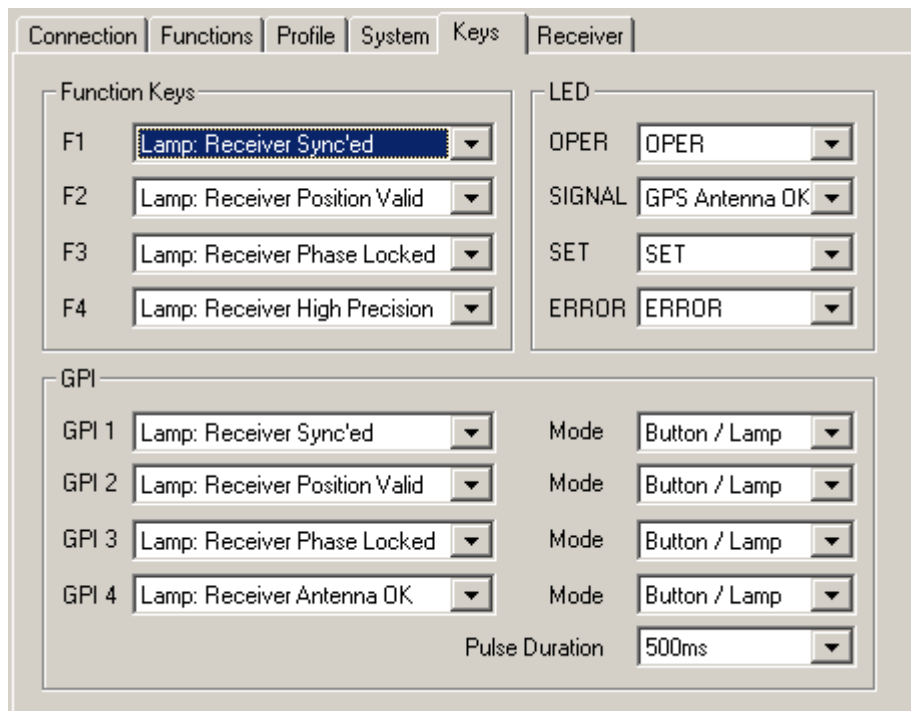
4.4 “Keys“: Keys and Lamps, LEDs and GPIs

The module has four GPIs (General Purpose Interface), the RUB1 module additionally has four illuminated buttons (keys and lamps) and four LEDs (Light Emitting Diodes). Basically the functions of these in- and outputs are programmable.

*Some functions presented by the configuration tool maybe assigned to special options, and therefore are not applicable with the standard firmware. For further information please contact **Alpermann+Velte**.*



Configuration (example shows a screen shot of the PC program tab):



Functional Description and Specifications GLS 10 MHz

Function Keys (and Lamps)

RUB1 version modules offer four keys F1, F2, F3, and F4. They can get a function independently from each other. Select a function from the drop-down list. This selects the function of the lamps as well. Please refer to table below for description.

GPI

GPI 1, GPI 2, GPI 3, and GPI 4 can get a function independently from each other, as an input or as an output. Additionally the switching characteristic is selectable. Select mode and function from drop-down lists. Please refer to table below for description of the functions.

GPI used as input:

Use drop-down list "Mode" to select the switching characteristic: "Button" or "Switch".

Button / Lamp	Trigger at falling edge ("High" → "Low")
Inv. Button / Lamp	Trigger at rising edge ("Low" → "High")
Switch	Level sensitive: "Low" = active, "High" = inactive
Inv. Switch	Level sensitive: "High" = active, "Low" = inactive

GPI used as output:

Use drop-down list "Mode" to select the switching characteristic: "Lamp" or "Pulse".

Lamp	Active "Low".
Inv. Lamp	Active "High".
Pulse	Active "Low". The pulse duration is selectable (one selection for all GPIs).
Inv. Pulse	Active "High". The pulse duration is selectable (one selection for all GPIs).

Pulse Duration Pulse width is selectable as 100 ms, 200 ms, 500 ms, 1 s, 2 s. This selection refers to all GPI outputs set to a pulse mode.

LED

RUB1 version modules offer four LEDs (named OPER, SIGNAL, SET, and ERROR) which can get a function independently from each other. The following features are suitable for this module:

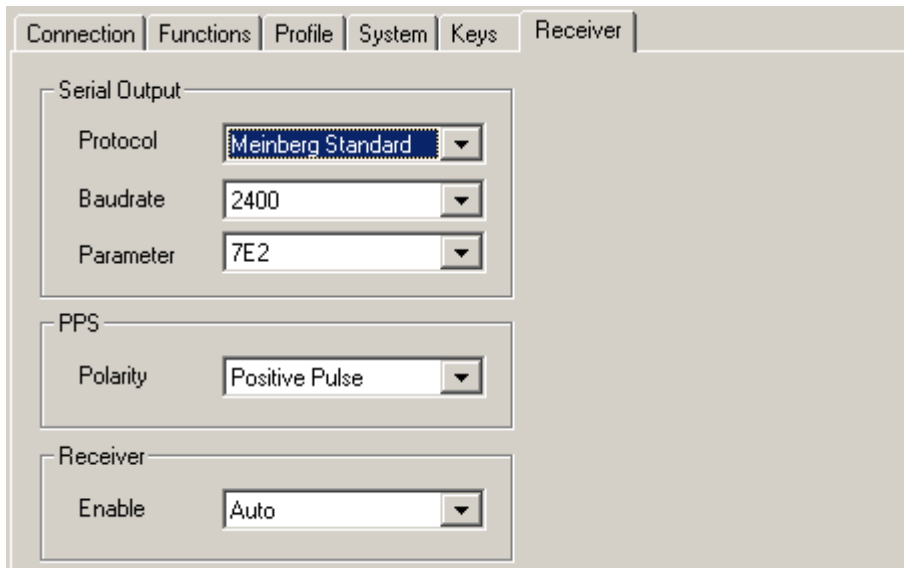
Name (in a drop-down list)	Functional description	Preferred LED
OPER	Lights up, if the module is operating.	OPER
Antenna OK	Lights up, if the module detects that an antenna has been connected.	SIGNAL

Table of functions for keys, lamps, and GPI:

Function	Description	Preferred Key	Preferred GPI set-up
No Operation	Key/lamp/GPI without function.		
Indication of receiver status:			
Lamp: Receiver Sync'ed	Active, if receiver currently is synchronized to GLONASS or GPS satellites.	F1: SYNC	GPI 1 In: Button
Lamp: Receiver Position Valid	Active, if position is valid. This requires a minimum of four "good" satellites.	F2: POS VALID	GPI 2 In: Button
Lamp: Receiver Phase Locked	Active, if phase lock of PPS and 10 MHz signals has been achieved.	F3: PHASE LOCK	GPI 3 In: Button
Lamp: Receiver High Precision	Active, if accuracy of ≤ 200 ns has been achieved once and current accuracy is equal or better than 2 μ s.	F4: HIGH PRECN	
Lamp: Receiver Antenna OK	Active, if the module detects that an antenna has been connected.		GPI 4 In: Button
Others:			
Load Profile ...	Load a profile which has been stored in the non-volatile memory of the module.		In: Button
-- General -- Lamp ...	More feedback for service purposes.		

4.5 “Receiver“: Set-Up of Receiver Functions

Configuration (example shows a screen shot of the PC program tab):

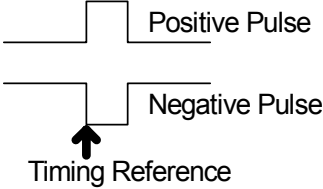


Serial Output: Adjust the TXD1 signal at the REF OUT connector

Protocol	Select the data protocol. Those protocols used in all standard applications are described in detail below.
Baudrate	Baud rate of the serial interface. The standard protocols should have 2400 selected.
Parameter	Adjust data bits, parity and stop bit of the serial interface. The standard protocols should have 7E2 selected.

PPS: Adjust the PPS OUT signal at the REF OUT connector

Polarity	Polarity of PPS OUT. Independent from the polarity, the leading edge of the PPS OUT pulse always is defined to be the timing reference. Positive Pulse: Rising edge = Timing reference. Negative Pulse: Falling edge = Timing reference.
-----------------	--



Receiver: Please refer to chapter “Receiving GLONASS and GPS”

Auto	Evaluating GLONASS and GPS satellites.
GPS only	Evaluating GPS satellites only.
Glonass only	Evaluating GLONASS satellites only.

The "Meinberg Standard" data protocol

The data string consists of 32 characters in ASCII format:

<STX>D:01.01.98;T:4;U:14.15.41;uvxy<ETX>

STX	start of text	\$02
D:	followed by the date	day.month.year
T:	followed by the day of week	1-7, 1 = Monday
U:	followed by the time	hours.minutes.seconds A leap second is transferred as second = 60
u	clock synchronization status	# = clock runs free, currently not synchronized ' ' = clock runs synchronous
v	current receiver status	* = Receiver has not checked its position ' ' = Receiver has determined its position
x	time zone indicator	S = CEST, Central European Summer Time ' ' = CET, Central European Time U = UTC
y	announcement of a time discontinuity	! = announcement start/end of Daylight Saving Time A = announcement of a leap second insertion ' ' = no announcement
ETX	end of text	\$03

The "Meinberg GPS" data protocol

The data string consists of 36 characters in ASCII format:

<STX>D:01.01.98;T:4;U:14.15.41;uvxy;lll<ETX>

STX	start of text	\$02
D:	followed by the date	day.month.year
T:	followed by the day of week	1-7, 1 = Monday
U:	followed by the time	hours.minutes.seconds A leap second is transferred as second = 60
u	clock synchronization status	# = clock runs free, currently not synchronized ' ' = clock runs synchronous
v	current receiver status	* = Receiver has not checked its position ' ' = Receiver has determined its position
x	time zone indicator	G = GPS time (= UTC + number of leap seconds)
y	announcement of a time discontinuity	A = announcement of a leap second insertion ' ' = no announcement
lll	number of leap seconds	number of leap seconds between GPS time and UTC
ETX	end of text	\$03

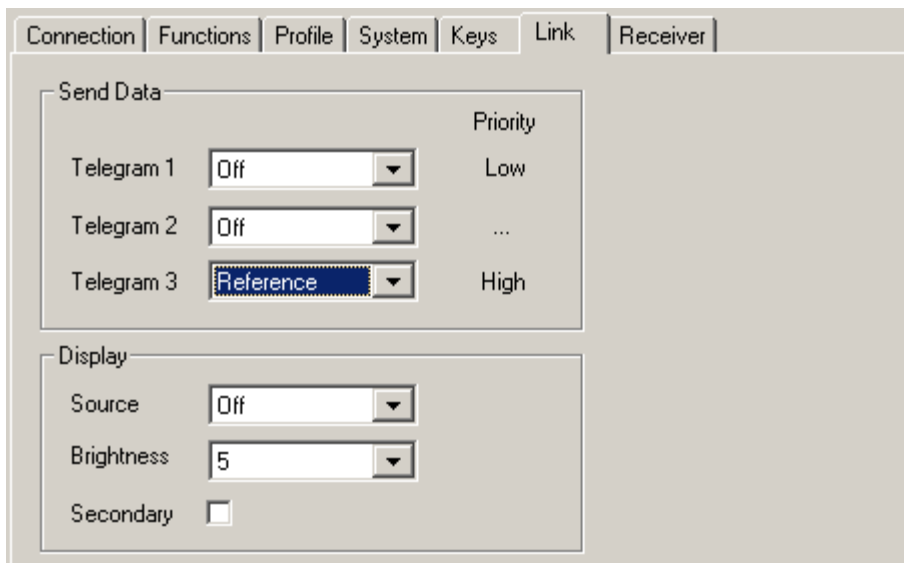
4.6 “Link”: Communication between Modules

Link uses the Rubidium internal TC_link interface to transmit or receive data. This interface is shared by all the modules in one frame, and via the **RLC** connector it is possible to link further modules at different frames.

In case that the selected module should transmit data, **Link** selects the channel and the kind of data. The receiving module must select this channel as a reader input.

In case that the selected module should receive data, the **Link** function has to be activated (**Use**), and the selected channel (“Telegram” 1 or 2 or 3) has to be switched off.

Configuration (example shows a screen shot of the PC program tab):



Send Data

Three channels (**Telegram 1 - 3**) have been provided to transmit data in a time code format. For each channel a function can be selected from the drop-down list:

- | | |
|-----------|---|
| Off | This channel will not be used to transmit data, data can be received. |
| Reference | This channel transfers time and date (UTC). |

Display

Adjust the parameters controlling the display of a RUBIDIUM **D1** or **Q1** chassis.

- | | |
|-------------------|---|
| Source | Select the kind of data to be sent and displayed: |
| Off | No data will be sent from this module. |
| Reference Time | Time of the reference (UTC) in a HH:MM:SS format. |
| Reference Date | Date of the reference (UTC) in a Day.Month.Year format. |
| Brightness | Adjust the brightness of the LEDs, steps 1 to 7. |
| Secondary | Address the “secondary” display instead of the “primary” display. |

4.7 “System“: Identification, Reset, SNMP, Fan Control

Configuration (example shows a screen shot of the PC program tab):

Info	
Module Type:	GLS 10MHz
Firmware Version:	2.11.30.32
FPGA Version:	511A
Unique ID:	3B7D17FB
Frame:	1

Unit

Name: The connected module can get a name. You may enter, change, or verify this name at this window.

Frame: Modules in a network can be uniquely identified by a frame number and the module's position within the frame. In a single frame system, you may select "Single" or "Auto" at this set-up. If a system is built-up of more than one frame, each frame has to receive a unique address (adjusted at the fan module). If you select "Auto", the module will request this frame number automatically and will show it on the info box. Likewise, it is possible to select a frame number manually.

Boot

Cold Boot: Do a cold boot of the module.

Warm Boot: Do a warm boot of the module.

Info

Displays module's status information.

SNMP Trap Enable

Activate the "Any Trap" check box to enable the SNMP functionality in general. If not checked, this module will not send any SNMP traps.

The individual traps can be enabled/disabled by a click on the corresponding check box.

Please notice the chapter "Alarms by SNMP Traps" as well.

Thermal Control

At least one module of each frame should have the fan monitoring activated. This enables the power supply monitoring – for power supplies within this frame - as well.

5 Options

5.1 Additional 10 MHz and PPS Output

Additional 10 MHz

Two 10 MHz signal outputs are available at the BNC connectors.
A third 10 MHz signal can be assembled to the RJ45 REF OUT connector pin 6 (please contact Alpermann+Velte for this option).

REF OUT RJ45 jack
6: 10 MHz additional

This 10 MHz signal has its own output stage with the same characteristics as the signals at the BNC connectors.

Additional PPS

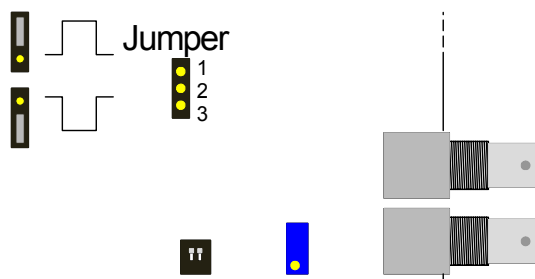
One PPS output is available at pin 1 of the RJ45 REF OUT connector. Setting a jumper an additional PPS output will be present at the same RJ45:

REF OUT RJ45 jack
3: PPS additional

This PPS signal has its own output stage with same characteristics as signal at pin 1. The jumper setting allows to inverse this signal. Always the leading edge will be the timing reference: the rising edge for an active "High" signal and the falling edge for an active "Low" signal, respectively.

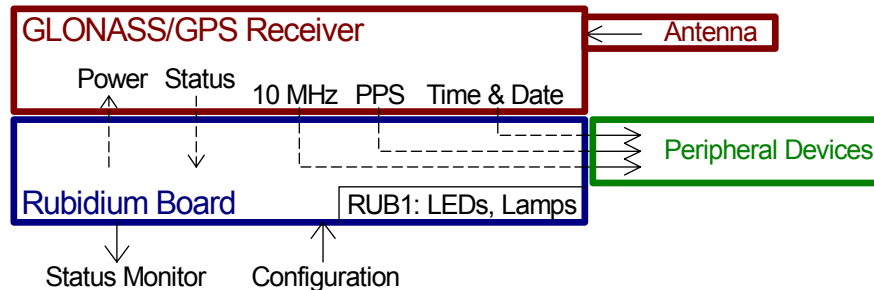
The jumper is located on the lower board of the module.

Connect 1 - 2 for an active "High" signal.
Connect 2 - 3 for an active "Low" signal.



6 Fault Finding

The GLS 10 MHz module consists of a GLONASS/GPS Receiver and a Rubidium board. Normally the module is connected via cables to peripheral devices. These are the areas where a source of failure can be found.



A Peripheral devices indicate a lost of synchronization, but the status monitor does not show a failure.

1. Check the cable connection.
2. Check the configuration: Do all parameters of the serial interface match between GLS 10 MHz and the peripheral device?

B Status monitor indicates a failure.

1. Status **antenna currently connected**: yes/no.
2. Status **antenna cable short circuited**: yes/no.
3. If 1. and 2. OK: Antenna sees no or only a few satellites (**good satellites**)? Try to find a new position of the antenna.
4. **operating mode** = "cold boot"? Antenna cable could be defective – maybe due to a bad GND connection or a shortage at the BNC plug.

Measurement with an ohmmeter: Disconnect the antenna cable. You should measure a resistance of $\geq 1 \text{ M}\Omega$ between shield and signal pin of the SMA plug.

Measurement with a voltage meter: Disconnect the antenna cable. You should measure a DC voltage of about 5 V DC between shield and signal at the ANTENNA SMA jack of the module.

C RUB1 version module has all LEDs and lamps off, maybe only LED ERROR lights up. Status monitor cannot find the module.

1. Problem of the Rubidium board. Try a flash update.