Installation & Systems Manual

Version: 4.1

September 26, 2012

RUBIDIUM SERIES

Universal Video Data Processor

Alpermann+Velte

CONTENTS

A1 Revision History

No.	Date	Subject
2.0	January 12, 2005	New title and new arrangement of the document: old title "Installation & Operation Manual" changed to "Installation & Systems Manual". Modules description will be found in separate documents.
2.1	January 27, 2005	Extended and revised.
2.2	February 09, 2005	Description of RUBIDIUM SERIES 3. Description of module GPS 10MHz.
2.3	June 02, 2005	Extended and revised.
3.0	July 28, 2005	New revision of RUB H1 frame.
3.1	November 08, 2005	New modules VI, VM, GI, SI.
3.2	December 23, 2005	S1 frame.
3.3	June 16, 2006	New modules: PQ, VL, HT, HV. T1 chassis. Chapter "Software Tools for RUBIDIUM SERIES" revised.
3.4	November 22, 2006	Chapter 2.1.5 (fan module), 4.1.8 and 4.2.6 (system) revised.
3.5	April 16, 2007	- "TC-link" instead of RS485. - Remove a module: maintain the air flow. - RUB H1 fan module: revised. - RUB H3 RC module: new.
3.6	June 25, 2007	Revised.
3.7	November 20, 2007	Revised.
3.8	April 24, 2008	Extended and revised.
3.9	August 26, 2010	Revised. New modules: GW, SW, GB.
3.A	May 20, 2011	RUB H3 PC connector: USB.
4.0	July 06, 2012	D1: revised. HT/HV: discontinued. IRIG-B 03: removed. New: Q1, XT/XV, GLS 10 MHz, SB. Completely revised.
4.1	September 26, 2012	New chapter: RUBIDIUM SERIES 3 – Exchange a Fan. New hardware version DT/DV: version 3. New LTC output gain specifications.

A2 Copyright

Printed in Germany.

For further information please contact your local dealer or:

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A3 Warranty

Alpermann+Velte warrants that their products will be free from defects in materials and workmanship for a period of two years from the date of shipment. If this product proves defective during the warranty period, Alpermann+Velte, at its option, will repair or replace the defective product without charge, provided this product are returned to Alpermann+Velte freight prepaid.

In order to obtain service under this warranty, Customer must notify Alpermann+Velte of the defect before expiration of the warranty period and make suitable arrangements for the performance of service. Customer shall be responsible for packaging and shipping the defective product to Alpermann+Velte, please notice the Shipping Information given below.

This warranty shall not apply to any defect, failure or damage caused by abuse, misuse, improper use, negligence, accident, modification, alteration, or improper or inadequate maintenance and care.

This warranty is given by Alpermann+Velte with respect to this product in lieu of any other warranties, express or implied. Alpermann+Velte and its vendors disclaim any implied warranties of merchantability or fitness for a particular purpose. Alpermann+Velte's responsibility to repair or replace defective products is the sole and exclusive remedy provided to the customer for breach of this warranty. Alpermann+Velte and its vendors will not be liable for any indirect, special, incidental, or consequential damages irrespective of whether Alpermann+Velte or the vendor has advance notice of the possibility of such damages.

A4 Unpacking/Shipping/Repackaging Information

This product has been carefully inspected, tested and calibrated before shipment to ensure years of stable and trouble-free service.

The shipping carton and pads provide protection for the product during transit. Retain the shipping cartons in case subsequent shipment becomes necessary.

Carefully unpack the product from its transit material and carefully check the product for signs of damage. In the event that the product has been damaged during transit, contact the carrier and your Alpermann+Velte dealer.

Please confirm that all items listed on the packing list have been received. Check the items against your original order to ensure that you have received the correct parts. If any item is missing, please contact your Alpermann+Velte dealer.

Ensure that all packaging material is removed from the product and its associated components before installing the unit.

Products returned to Alpermann+Velte for servicing or repair should have a tag attached showing:

- Name and complete address of the owner and the name of the person that can be contacted.
- Unit's serial number and a description of the service required or failure detected.

Products returned should be shipped prepaid in the original packaging material if possible. If the original packaging is not available or is unfit for use, supply an adequate packaging which should meet the following criteria:

- Packaging must be able to withstand the product weight.
- Product must be held rigid within the packaging.
- Allow at least two inches of space between the product and the container.
- The corners of the product must be protected.
- Seal the carton with shipping tape or an industrial stapler.

If the product is still within the warranty period, the product will be returned by prepaid shipment after servicing.

A5 Safety Instructions

The general safety information in this part is for both operating and service personnel. Alpermann+Velte products are only to be used as directed. Specific warnings and cautions will be found throughout the manual where they apply.

Review the following safety instructions to avoid injury and prevent damage to this product or any products connected to it.

- Read these instructions.
- Keep these instructions.
- Heed all warnings.
- Follow all instructions.

Safety Terms and Symbols

Terms and Symbols in this manual:

WARNING: Warning statements identify conditions or practices that could result in injury or loss of life.

CAUTION: Caution statements identify conditions or practices that could result in damage to this product or other property.

Terms and Symbols which may be found on the product:

DANGER: High Voltage.

ATTENTION: Refer to the manual.

Protective Ground (Earth) Terminal.

Disconnect the power cord if Power Supply module is removed from the frame.

Off (power entry switch 'off').

On (power entry switch 'on').

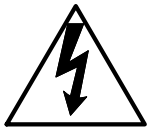
Observe precautions for handling electrostatic-sensitive devices.

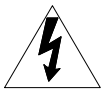
Signal Ground.

Injury Precautions

One or more Power Supply module(s) may be present within this product's frame, in that case observe the following precautions:

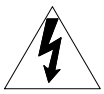
WARNING: To prevent fire or shock hazard, do not expose the unit to rain or moisture.





WARNING: Potentially lethal voltages are present within this product's Power Supply module during normal operation. The power cord of the Power Supply module must be disconnected before the module is removed from the frame. Power should not be applied to the frame without covers or panels installed, unless properly trained personnel are servicing the unit.

POWER SOURCE



This product is intended to operate from a power source that will not apply more than $264V_{rms}$ between the supply conductors or between either supply and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

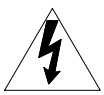
GROUNDING THE PRODUCT

This product is grounded through the grounding conductor of the power module power cord. To avoid electric shock, plug the power cord into a properly wired receptacle before connecting the product input or output terminals. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation. Upon loss of the protective ground connection, all accessible conducting parts can render an electric shock.

USE PROPER POWER CORD

To avoid fire hazard, use only the power cord specified for the power module. Do not use an extension cord.

USE PROPER FUSE



To avoid fire hazard, use only the fuse of the correct type, voltage rating, and current rating as specified for the power module.

Observe the following general precautions irrespective of the number or kind of modules plugged to the frame:

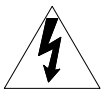
DO NOT OPERATE WITHOUT COVERS

To avoid electrical shock or fire hazard, do not operate this product with covers or panels removed.

DO NOT OPERATE IN WET/DAMP CONDITIONS

To reduce the risk of fire or electrical shock, do not expose this apparatus to rain or moisture.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE



To avoid injury or fire hazard, do not operate this product in an explosive atmosphere.

Product Damage Precautions

PREVENT OVERHEATING

To prevent product overheating, position the unit only where sufficient air circulation can be maintained. Good air circulation is essential to prevent internal heat build-up, do not block any ventilation openings. Do not expose the unit to direct sun light or any other strong lights. Keep the unit away from heat sources. Install the unit in accordance with the manufacturer's instructions.

PROVIDE PROPER ENVIRONMENT

Dust, humidity, shocks and strong electromagnetic fields must be avoided. Do not expose this apparatus to dripping or splashing water. Ensure that no objects filled with liquid are placed on the apparatus.

UNPLUG DURING LIGHTNING STORMS

Unplug this apparatus during lightning storms or when unused for long periods of time. Alternative: Use a UPS or power surge suppressor.

OBSERVE EMC REGULATIONS

The EMC regulations are observed only under the following condition: Use high quality shielded cables at data inputs and outputs.

SUSPECTED FAILURES

Whenever it is likely that safe operation is impaired, the apparatus must be made inoperative and secured against unintended operation. The appropriate service authority must then be informed. Do not operate with suspected failures. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

PREVENTIVE MAINTENANCE: CLEANING

Qualified Service Personnel Only: The apparatus should be cleaned often enough to prevent dust or dirt from accumulating. Dust accumulating in the apparatus acts as an insulating blanket, preventing proper cooling, and possibly causing overheating and component breakdown. Under high humidity conditions, accumulated dust can also provide an electrical conduction path. Remove accumulated dust with a soft cloth or small paint brush. Remove hardened dirt with a soft cloth, dampened in a mild detergent and water solution. Do not use polish or abrasive cleaners or any other chemical cleaning agents.

PREVENTIVE MAINTENANCE: VISUAL INSPECTION

Qualified Service Personnel Only: Visually inspect the apparatus for signs of damage, scorched components, and loose or disconnected pin connectors. If you discover heat damaged parts, try to determine the cause of the overheating before replacing the damaged parts; otherwise, the damage may repeat.

ATTENTION:

Observe precautions for handling electrostatic-sensitive devices. See “Electro Static Discharge (ESD) Precautions” below for details.

Electro Static Discharge (ESD) Precautions

All semiconductor devices are sensitive to ESD. To prevent any damage or degradation on components of the product caused by ESD, observe these precautions when directed to do so (installing, removing sensitive components):

1. Use a Ground Strap. Wear a grounded anti-static wrist or heel strap to discharge the static voltage from your body.
2. Use a Safe Work Area. Avoid handling components in areas that have a floor or work surface covering capable of generating a static charge. Also nothing capable of generating or holding a static charge should be allowed in the work area.
3. Handle ESD sensitive components carefully. Do not slide components over any surface. Do not touch exposed connector pins. Pick-up components by the body, never by the leads.
4. Transport and store sensitive components or assemblies in a static-protected bag or container.

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.

A6 EC Declaration of Conformity

EG-Konformitätserklärung

EC Declaration of Conformity

Der Hersteller / *The manufacturer*

Alpermann+Velte
Electronic Engineering GmbH
Otto-Hahn-Str. 42
D-42369 Wuppertal
Germany

erklärt unter alleiniger Verantwortung, dass das Produkt
declares under its sole responsibility that the product

Produktname: / *product name:* **Rubidium**

Typen: / *models:* **Rubidium Series 1, Rubidium Series 3**

Produktmodul(e): / *product module(s):* **alle** / *all*

den folgenden Richtlinien, Normen und Spezifikationen entspricht:
meets the intent of the following directives, standards and specifications:

2004/108/EG EMV-Richtlinie
2004/108/EC EMC Directive

unter Anwendung der folgenden Normen:
applying the following standards:

EN 55022:2006	Störaussendung	*Emission*
EN 55024:1998+ A1:2001 + A2:2003	Störfestigkeit	*Immunity*

2006/95/EG Niederspannungsrichtlinie
2006/95/EC Low Voltage Directive

unter Anwendung der folgenden Normen:
applying the following standards:

EN 60950-1:2006 Elektrische und mechanische Sicherheit
Electrical and mechanical safety

Alpermann + Velte
electronic engineering GmbH
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Tel. 0202-2441110

Wuppertal, den 28.06.2010

(Ort und Datum der Ausstellung)
(Place and date of issue)

(Rechtsgültige Unterschrift, Geschäftsführung)
(Legal signature, general manager)

1 Introducing the RUBIDIUM SERIES

1.1 Overview

RUBIDIUM SERIES is a modular system which offers flexibility to its users. Various rack mount frames are available.

On principle, a distinction is made between 1RU (RUB1) and 3RU (RUB3).

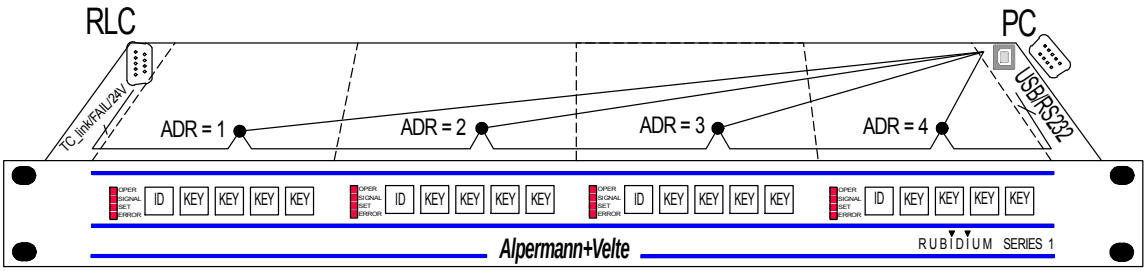
- One RUB1 module can be plugged to "RUB1 T1" as tabletop unit or for special mounting and to "RUB1 S1" for 19"/1RU mounting.
- Two RUB1 modules can be plugged to "RUB1 D1" or "RUB1 Q1". Both chassis are 19"/1RU units and include a display. "RUB1 D1" additionally has an integrated power supply and offers an XLR/DSUB/RJ45 adapter for LTC signals at the rear.
- "RUB1 H1" houses up to four RUB1 modules in 19"/1RU space.
- "RUB3 H3" chassis provides capacity for 21 slots in 19"/3RU space. It accepts RUB3 modules. Some modules require two slots, other only one slot.

Hot swapping of the rear loading modules is possible. The connectors for inputs and outputs are a standard part of the module.

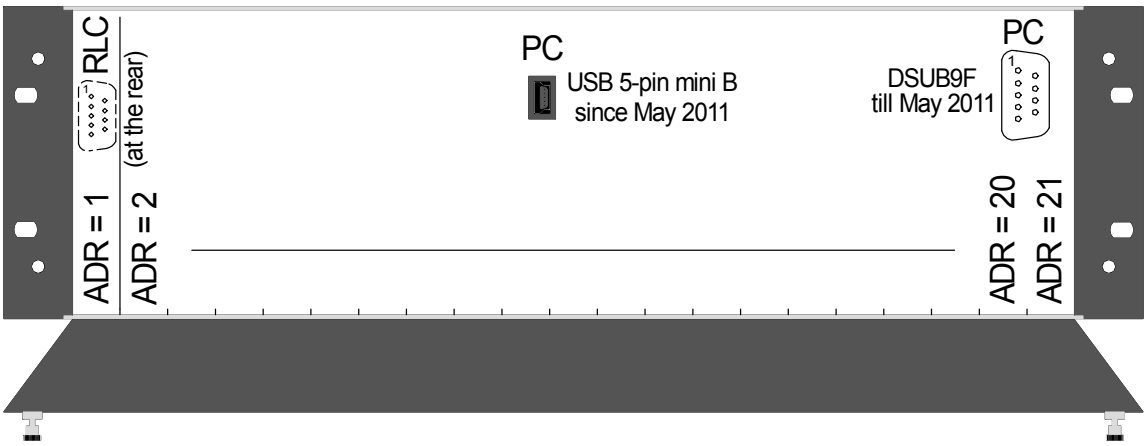
Quantity and type of the modules depend on application. In a typical application, the frame will be equipped with a power supply module (PS) and one or more time code modules (XT, AT, GT, ...). The RLC connector at the rear of the frame has a 24 V pin (not for "RUB1 D1") which enables operation without a power supply module by using external power supply. It is also possible to supply power from one internal power supply module in one frame to another frame, via this RLC connector (not for "RUB1 D1").

The slots within a frame only differ by their individual, hard wired address. Modules which have an individual configuration (e.g. the time code and video modules, but not the power supply modules), can be located by their addresses. The PC connector of the frame provides an interface for the configuration of the modules. Each module can operate as a stand-alone unit or as an interconnected complete system. The front bus of the frame distributes the internal "TC_link" interface and the supply voltage.

The "TC_link" interface is connected to the RLC connector at the rear of the frame, too. This offers a link to modules located in other frames. "FAIL" signals can be used for error detection: If a total failure occurs in any module in one frame the "FAIL" contacts of this frame's relay will close.

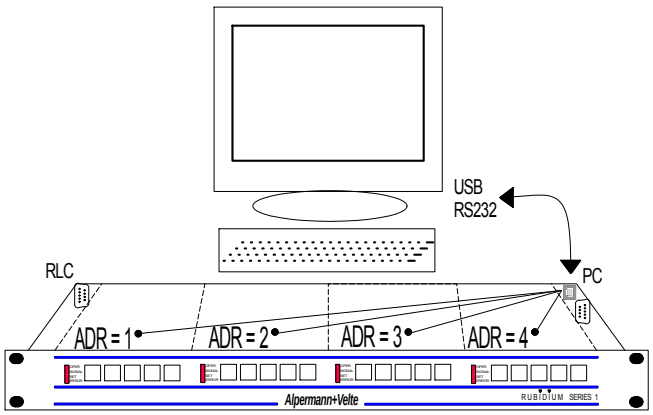


The "RUB1 H1" frame: Connectors RLC and PC, internal signal distribution



The "RUB3 H3" frame (front view): Connectors RLC and PC, slots

1.2 Configuration of the Modules: The PC Connector

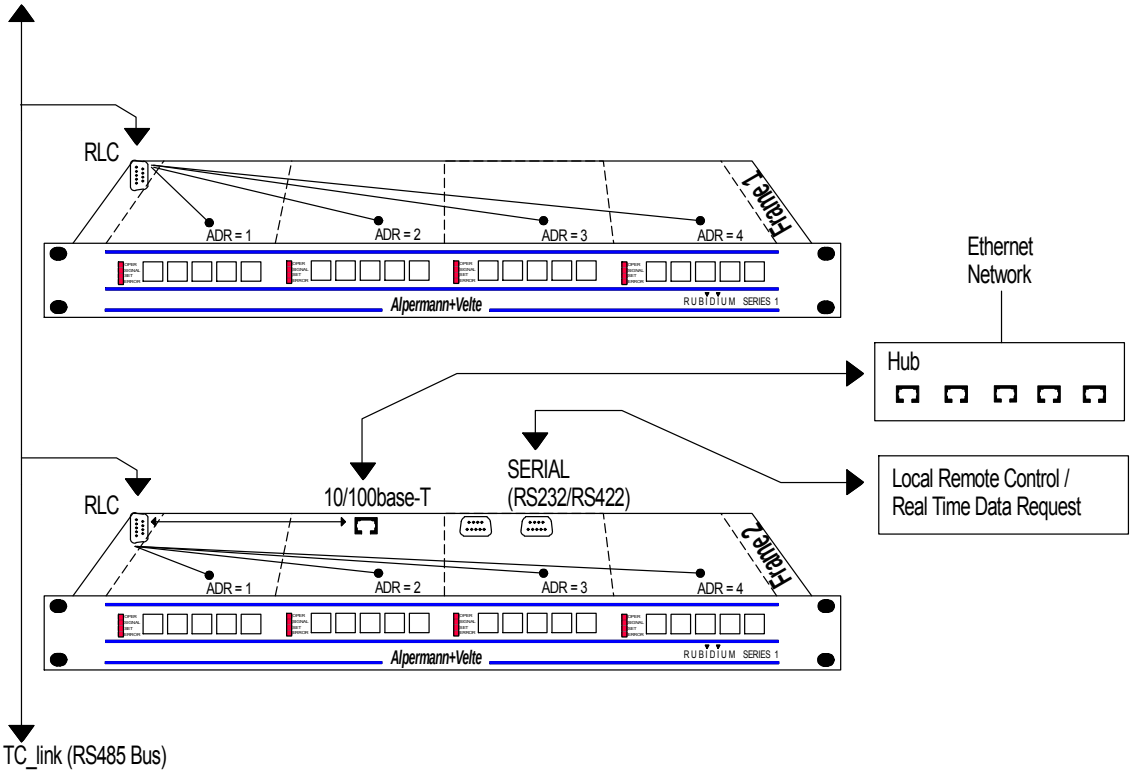


The slots of the frame only differ by their individual, hard wired address. Modules which can be individually configured (e.g. the time code and video modules, but not power supply modules), can be located by their addresses. The PC connector at the frame provides the interface for the configuration of a module. With the aid of our configuration software each module can be addressed and can receive a user selectable configuration. Chapter "The RUBIDIUM CONFIGURATION PC Program" gives a short overview of the wide range of options to set up a module. Details to the features of a single module are given in the description of the individual module.

The PC interface can be of RS232 or USB standard:

<table>
<tr><th>RS232</th><th>USB</th></tr>
<tr><td>Use a straight (1:1) cable to the standard RS232 interface of a PC.
Parameter of the RS232 interface: 38400/8/E/1.
Pin assignment of the 9-pins DSUB female PC connector:
<table>
<tr><th>Pin</th><th>Description</th></tr>
<tr><td>2</td><td>TxD, Transmit Data, output</td></tr>
<tr><td>3</td><td>RxD, Receive Data, input</td></tr>
<tr><td>5</td><td>GND, signal ground</td></tr>
</table></td><td>Minimal requirement for your PC: USB 1.1.
<u>H1/S1/T1/D1/Q1:</u>
Use a common "Type A to Type B" cable.
<u>H3:</u>
USB A to 5-pin mini B as standard accessory.</td></tr>
</table>

1.3 System Extensions: The RLC Connector and Further Interfaces



Pin assignment of the 9-pins DSUB female connector **RLC**:

Pin	Description
1	FAIL_A
2	TC_link (RS485, TR-)
3	TC_link (RS485, TR+)
4	FAIL_B
5, 6, 7	GND, signal ground
8, 9	Nominal 24 VDC, 3 A maximum. Not connected at "RUB1 D1".

1.3.1 The "TC_link" Interface

The "TC_link" interface enables a communication between modules, even between modules located in different frames. Electrically, it is based on an RS485 interface with a baud rate of 115,000. 256 modules at maximum are allowed to share one TC_link. External cables should not exceed an overall length of 4000 feet (1200 m). Termination is provided at the fan module (H1 or Q1 frame) and at the RC module (H3 frame), please refer to the related chapters.
The communication protocol depends on the module and application.

1.3.2 The FAIL Signals: Error Detecting

The FAIL signals can be used for error detection. The signals FAIL_A and FAIL_B are relay based contacts. The normally open contacts close if a breakdown of any module in this frame occurs. Each module is equipped with its own relay. The contacts are normally open during operation, but close if power fails. The relays of all modules are in parallel and connected to the FAIL_A and FAIL_B pins. So in the event of a breakdown of a module, FAIL_A and FAIL_B pins are interconnected via a relay.

Specification of FAIL_A and FAIL_B:

Maximum switching power	10 W
Maximum switching voltage	48 V
Maximum switching current	0.5 A
Maximum transportable current	1.0 A

1.3.3 24 VDC

This pin can be a voltage supply input or output.

If you have a frame without a power supply module, this pin serves as the voltage input.

Having a frame with at least one power supply module, this pin can be used to supply voltage to another frame. In this case no external voltage output of a Non-Rubidium power supply should be connected at this pin. See specifications of the power supply module if this pin is used as a voltage supply output.

Rated current: Maximum 3 A.

This is a non-fused terminal. For any use it is necessary to verify that the specifications of the power supply (output power, output current, output voltage) are in accordance with the needs of all the connected loads (overall load, overall current, rated voltage).

1.3.4 Ethernet: The Gate to a Local Area Network

The Ethernet module (IE) provides access to the "TC_link" interface of the RUBIDIUM system, thus having access to each module integrated in this system.

1.3.5 Local Serial Interfaces

Some modules provide a local serial interface, selectable as RS232 or RS422 or RS485. A controlling device can use this interface to remote control this module and/or to exchange data in real time.

1.4 Module and System Configuration

1.4.1 Overview

The software determines the functionality of the modules. The broadcast data has a nearly unlimited range of applications. The modular concept of **RUBIDIUM SERIES** and the programmable parts of the modules enhances the flexibility of our system. For example two basically identical modules could be used in completely different applications. This can be achieved either, with the same software but with different configurations (e.g. one module serves as time code reader, other module as time code generator), or with different programming of the firmware - including programming of logic electronic parts.

Moreover the **RUBIDIUM SERIES** concept allows users to combine various modules to enhance functionality. A module in such a system needs a unique identification.

So "configuration" has the following tasks:

1. Unique identification: Address and access a module in a frame and in a more complex system.
2. Installation of a module: Select the operating mode, adjust parameters, program the function keys, request and display status data, etc.
3. Update: Transfer a new software/firmware to the flash memory, program the logic devices, change data records (e.g. character fonts), etc.

The included PC program "RUBIDIUM CONFIGURATION" handles these tasks.

1.4.2 Unique Identification of a Module and a Frame

An individual hard-wired address is assigned to the module by the position within the frame: Address 1 = unit 1 = position most left (looking at the front side of the frame, see chapter "Overview"). The "RUBIDIUM CONFIGURATION" program for PC's or the RUBIDIUM SERIES HTTP Server requires this address before communication to the module can be established.

The hard-wired address alone is not sufficient to uniquely identify a module in a system consisting of more than one frame. The RUBIDIUM SERIES HTTP Server additionally offers to identify a frame by a number (1 to 31). A module than can be accessed having the right frame and the right place within the frame selected. In this case each module which is addressable must have stored the number of the frame in its non-volatile memory. The "RUBIDIUM CONFIGURATION" program for PC's enables you to enter and store this number, utilising the "System" tab.

In case of servicing - for whatever reason - is required it may be necessary to identify a module within the meaning of sales. Each module can be uniquely identified by its serial number, which is human readable and located on the bottom side of the lower circuit board of each module. Sometimes it is sufficient to know the reference to the project or the order. Easy access to this information is given by the serial number of the frame, located near the front at the outside right-handed (looking toward front of the frame). You can easily read this serial number if you pull the frame a little out of the mounting rack.

1.4.3 Installation of a Module

Install a module using the

PC program „RUBIDIUM CONFIGURATION"

or the

RUBIDIUM SERIES HTTP Server.

Once the communication to the module has been started, the operating parameters can be displayed and changed.

Check all parameters to obtain a proper configuration for your application. Some modules offer a wide range of functions. You may enable or disable functions. It is recommended to enable only those functions which are necessary for your application.

Please notice the description of the software tools in this manual. If you have further questions, please contact your local dealer or ***Alpermann+Velte*** directly.

1.4.4 Update

Most of the RUBIDIUM SERIES modules can easily get a new firmware by flash programming. The software to do this flash programming is part of the PC program "RUBIDIUM CONFIGURATION". A **.tcf** file will be supplied/available if it becomes necessary to update a module. Run the PC program "RUBIDIUM CONFIGURATION", select the appropriate module's address, and click the "Flash Update" button. The program will then ask you to locate/open the appropriate **.tcf** file.

Details to the flash update of a single module are given in the description of the individual module.

During the flash update the operation of the module stops!

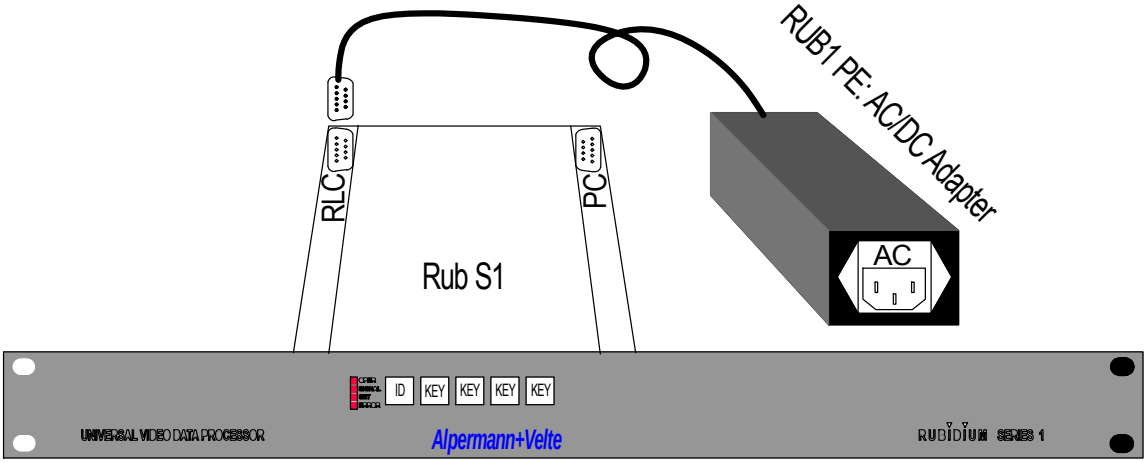
2 The Rubidium Frames

2.1 RUBIDIUM SERIES 1

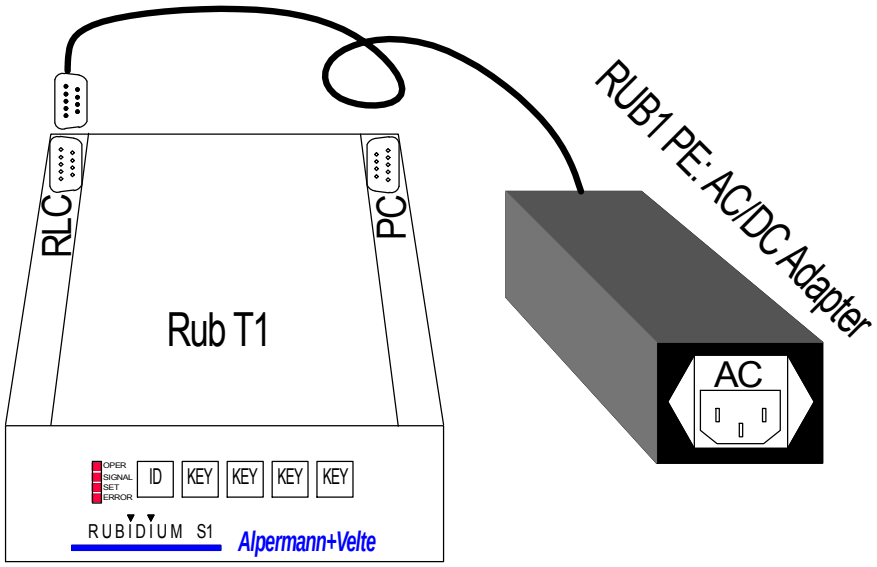
Modules belonging to *RUBIDIUM SERIES 1* are denoted as **RUB1** modules.

2.1.1 The “RUB1 S1” and “RUB1 T1” Chassis

The **RUB1 S1** chassis was designed to house one rear loading RUB1 module in 19”/1RU space.



The **RUB1 T1** chassis was designed to house one rear loading RUB1 module as a tabletop unit.



The front offers a see-through window for four status LED's and cut-outs for 4 keys and an identification button for the module.

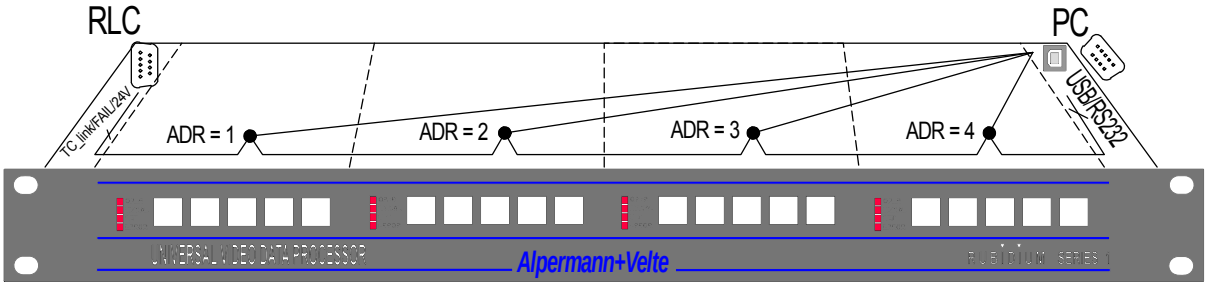
- The **PC** connector at the rear of the chassis enables access to the module. PC programs for configuration and status monitor are available.
- The **RLC** connector at the rear of the chassis serves to input the operating voltage to the module. Furthermore it has the "FAIL" and "TC_link" signals. The RUB1 PE power supply unit can be plugged directly to this connector. The "FAIL" signals can be used for error detection: If a total failure occurs in the module the "FAIL" contacts of this module's relay will close. Via the "TC_link" interface a link to modules located in other frames can be established.

Material	Covers: High-grade steel, blank; cheeks: Aluminium
Weight	0.6 kg approx.
Dimensions	143 (W) x 44.5 (H) x 180 (D, without DSUBs) mm 5.63 x 1.75 x 7.09 inch
Operating voltage and Operating current	12 – 30 VDC (for standard Rubidium modules), 1 A maximum
Maximum power dissipation	6.5 W

2.1.2 The "RUB1 H1" Frame

The **RUB1 H1** mount frame was designed to house up to four rear loading RUB1 modules in 1RU space. The connectors for inputs and outputs are a standard part of the module. There is a uniform front which offers a see-through window for four status LED's and cut-outs for 4 keys and an identification button for each module.

- The slots within a frame only differ by their individual, hard wired address (1 to 4). The internal "TC-link" interface enables communication between modules. All slots have this interface connected. Each slot is connected to an operating voltage line which distributes the power either from any power supply module plugged to this chassis or from the 24V pin at the RLC connector.
- The **PC** connector at the rear enables access to the modules at addresses 1 to 4. PC programs for configuration and status monitor are available.
- The **RLC** connector at the rear of the frame offers a link to modules located in other frames (via "TC_link"). The "FAIL" signals at this connector can be used for error detection: If a total failure occurs in any module in one frame the "FAIL" contacts of this frame's relay will close. Furthermore, a 24V pin enables operation without a power supply module by connecting external power. It is also possible to supply power from any internal power supply module to another frame via this RLC connector.



The "RUB1 H1" frame: Connectors RLC and PC, internal signal distribution

Technical data of the chassis:

Material	high-grade steel, blank
Weight	2 kg approx.
Mounting	standard 19-inch rack, 1U
Dimensions (without 19" front plate)	446.5 (W) x 44.5 (H) x 176.5 (D, without DSUBs) mm 17.58 x 1.75 x 6.95 inch
Operating voltage	12 – 30 VDC (for standard Rubidium modules), nominal 24 VDC
Power consumption	2 W (fan and fan module, without further Rubidium modules)
Maximum power dissipation	Without fan, by free air convection: 20 W With fan [3 cfm]: 34 W
Technical data of the fan	Nominal voltage: DC 12 V ± 15% Power: 0.84 W Maximum air flow [cfm]: 3

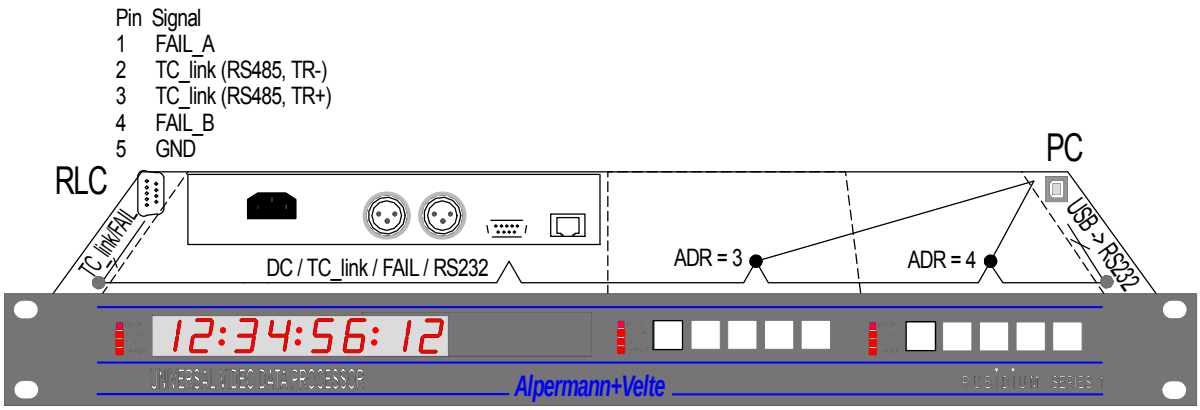
2.1.3 The "RUB1 D1" Frame

The **RUB1 D1** is a rack mount frame in 19"/1RU space. It has an integrated power supply, an 8-digit LED display at the front, and an XLR-DSUB-RJ45 adapter for LTC signals at the rear.

Chassis

The **RUB1 D1** mount frame was designed to house up to two additional rear loading RUB1 modules in 1RU space. The connectors for inputs and outputs are a standard part of each module. There is a uniform front for these modules which offers a see-through window for four status LED's and cut-outs for four keys and an identification button for each module.

- The two slots are assigned to the hard wired addresses 3 and 4 of the frame. Modules which have an individual configuration (e.g. the time code and video modules, but not the power supply modules), can be located by their addresses. Each module can operate as a stand-alone unit or as an interconnected complete system. An internal "TC-link" interface is used for the intercommunication between modules. The front bus of the frame distributes this interface and the 24 V output of the integrated power supply.
- The **PC** connector enables access to modules at addresses 3 and 4. PC programs for configuration and status monitor are available.
- The **RLC** connector at the rear of the frame offers a link to modules located in other frames (via "TC_link"). The "FAIL" signals at this connector can be used for error detection: If a total failure occurs in any module in one frame the "FAIL" contacts of this frame's relay will close. In contrast to the RUB1 H1 chassis the RLC connector does not have the 24 V connected, neither as input nor as output.



The "RUB1 D1" frame: Connectors RLC and PC, internal signal distribution

Material	High-grade steel, blank
Weight	2.4 kg approx.
Mounting	Standard 19-inch rack, 1U
Dimensions (without 19" front plate)	446.5 (W) x 44.5 (H) x 176.5 (D, without DSUBs) mm 17.58 x 1.75 x 6.95 inch
Power consumption	Max.: 7.0 W (all LEDs with maximum brightness) Typ.: 5.0 W Min.: 2.0 W (all LEDs switched off except the OPER LED)
Maximum power dissipation	Without fan, by free air convection: 20 W

Power Supply/Display/XLR-DSUB-RJ45 Adapter Module

This module is part of the delivery and fits into the appropriate double-wide slot. There is no initial set-up or configuration of this module possible; it is not addressable via any *Rubidium* configuration tool. The serial number is located on the bottom side of the circuit board of this module. This module has the following key features as these are usual for *Rubidium Series* modules:

- Failure relay, connected to the FAIL_A and FAIL_B pins of the **RLC** connector at the rear of the frame.
- Red LED (OPER) at the front indicates that the module is operating.

Overview of the main features of this module:

Power Supply

The integrated AC/DC converter delivers approximately 15 W to additional RUB1 modules in this chassis.

Display

The 8-digit display (7-segment LEDs, LED colour red, 15 mm digit height) shows data received from the **TC_link** interface.

XLR-DSUB-RJ45 Adapter

LTC signals of the *Alpermann+Velte Rubidium System* or the *MTD System* can be distributed using the connectors at the rear plate of this module. It is a hard-wired distribution from RJ45 and DSUB9 connectors to two XLR3 connectors. There is no LTC reader built-in.

For detailed information, please refer to the document "*Functional Description and Specifications* **D1**".

2.1.4 The "RUB1 Q1" Frame

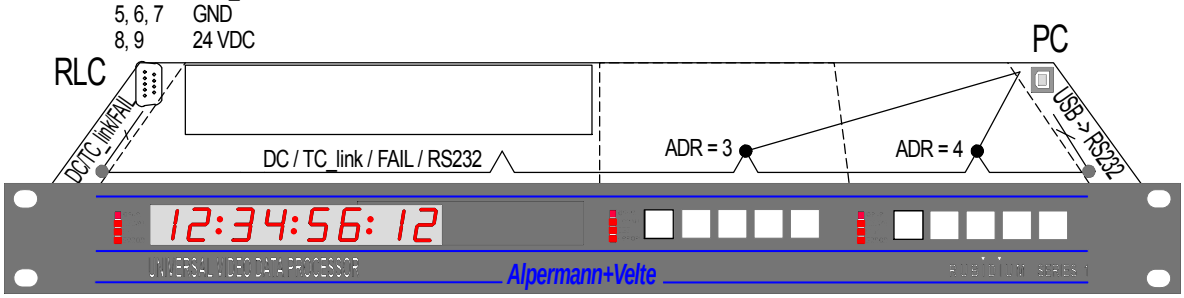
The **RUB1 Q1** is a rack mount frame in 19"/1RU space with an 8-digit display.

Chassis

The **RUB1 Q1** mount frame was designed to house up to two additional rear loading RUB1 modules in 1RU space. The connectors for inputs and outputs are a standard part of each module. There is a uniform front for these modules which offers a see-through window for four status LED's and cut-outs for four keys and an identification button for each module.

- The two slots are assigned to the hard wired addresses 3 and 4 of the frame. Any configurable module can send data to the display via internal "TC-link" interface. Display and modules receive power via internal connection. The DC operating voltage can be supplied at the RLC connector or by a power supply module plugged into this chassis.
- The **PC** connector enables access to modules at addresses 3 and 4. PC programs for configuration and status monitor are available.
- The **RLC** connector at the rear of the frame combines the "TC_link" interface (which enables communication to modules located in further chassis), the "FAIL" signal used for error detection (a total failure of any module in the frame leads to a contact closure), and the "24 VDC" operating voltage input or output.

Pin	Signal
1	FAIL_A
2	TC_link (RS485, TR-)
3	TC_link (RS485, TR+)
4	FAIL_B
5, 6, 7	GND
8, 9	24 VDC



The "RUB1 Q1" frame: connectors RLC and PC, internal signal distribution

Material	High-grade steel, blank
Weight	1 kg approx.
Mounting	Standard 19-inch rack, 1U
Dimensions (without 19" front plate)	446.5 (W) x 44.5 (H) x 176.5 (D, without RLC DSUB) mm 17.58 x 1.75 x 6.95 inch
Power consumption	Max.: 8.5 W (all LEDs with maximum brightness) Typ.: 6.0 W Min.: 3.5 W (all LEDs switched off except the OPER LED)
Maximum power dissipation	Without fan, by free air convection: 20 W With fan [3 cfm]: 34 W
Technical data of the fan	Nominal voltage: DC 12 V ± 15% Power: 0.84 W Maximum air flow [cfm]: 3

Display

This module is part of the delivery and fits into the appropriate double-wide slot. There is no initial set-up or configuration of this module possible; it is not addressable via any *Rubidium* configuration tool. The serial number is located on the bottom side of the circuit board of this module. This module has the following key features as these are usual for *Rubidium Series* modules:

- Failure relay, connected to the FAIL_A and FAIL_B pins of the **RLC** connector at the rear of the frame.
- Red LED (OPER) at the front indicates that the module is operating.

The 8-digit display (7-segment LEDs, LED colour red, 15 mm digit height) shows data received from the **TC_link** interface.

Fan Module

The **RUB1 Q1** frame has a fan module integrated. It is located at one side of the frame behind the **PC** connector. It is replaceable.

For more information about this module please refer to chapter "The Fan Module: Fan, Frame Address, TC_link Termination".

For detailed information, please refer to the document "*Functional Description and Specifications* **Q1**".

2.1.5 Plug-In a Module

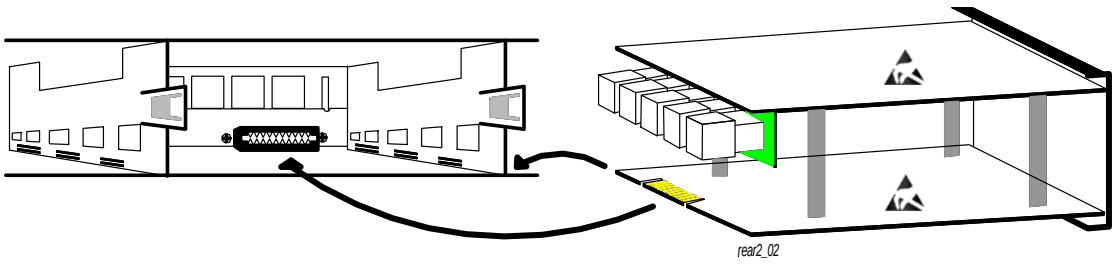
All modules of **RUBIDIUM SERIES** can be "hot swapped". To plug-in a module please proceed as follows:

- Remove the solid rear panel cover plate for the slot where the module should be installed: On the right hand side of the slot there is a small protruding tab that needs to be slightly pressed to the right, so that the rear panel cover plate can be easily removed. Retain the cover plate for possible future use.
- Remove the front panel cover plate for the slot where the module should be installed in (it pops off with the use of a small flat screwdriver). This will open the cut-outs for 4 keys and for the module identification button. Retain the cover plate for possible future use.
- Remove the module from its anti-static packing material. Hold the module by the edges or the rear plate; please do not touch the electronic components, strip conductors or pins. Retain the packing material for possible future use.

ATTENTION:

Observe precautions for handling electrostatic-sensitive devices. See "Electro Static Discharge (ESD) Precautions" at chapter A5 for details.

- The connector pads of the lower circuit board fit into the socket receptacles inside the slot. Insert the module into the appropriate slot, being careful to fit the lower circuit board into the slotted card guides located on both sides of the slot. With sufficient pressure push the module until it engages into the front socket receptacle.



Insert a module

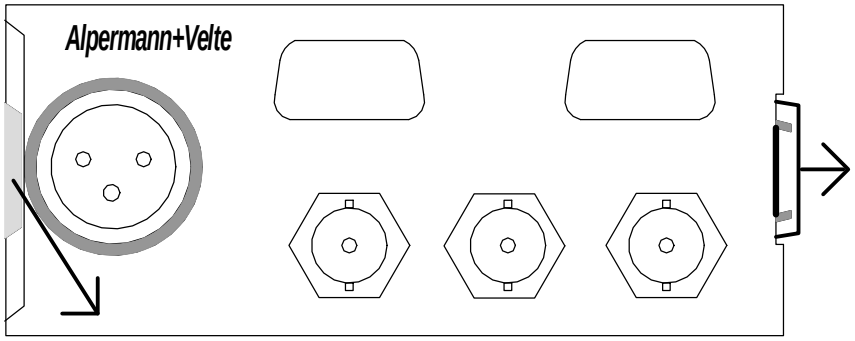
- In order to fasten the module: Take care that the rear panel of the module has fully clicked into the frames protruding tab.

2.1.6 Remove a Module

All modules of **RUBIDIUM SERIES** can be "hot swapped". There may be occasions when you must exchange a module which has a user defined configuration. If the new module should work with the same application it would be helpful to have the current configuration stored on your PC (see saving a configuration to disk in Windows help program). After exchange the new module can be reloaded with the specific configuration.

To remove a module, please proceed as follows:

- Unlock the module: On the right hand side of the slot there is a small protruding tab that needs to be slightly pressed to the right.



rear1_06

- Now pull the module out of the slot.
- Keep the anti-static packing material (original packaging material or adequate packaging) ready. Hold the module by the edges or the rear plate, do not touch the electronic components, strip conductors or pins. Slide the module into the anti-static packing material.

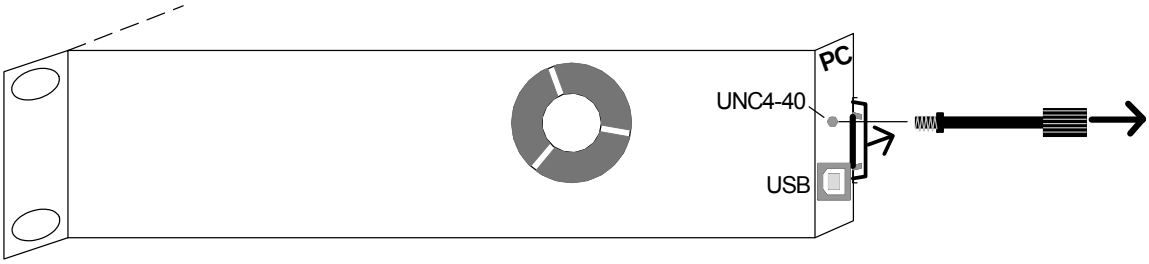
ATTENTION:

Observe precautions for handling electrostatic-sensitive devices. See "Electro Static Discharge (ESD) Precautions" at chapter A5 for details.

- Install the original front and rear panel cover plates if the slot is to remain empty. The frame is cooled by forced air drawn in from on side and expelled through the fan on the other side. In order to maintain this air flow no additional opening at the frame is allowed.

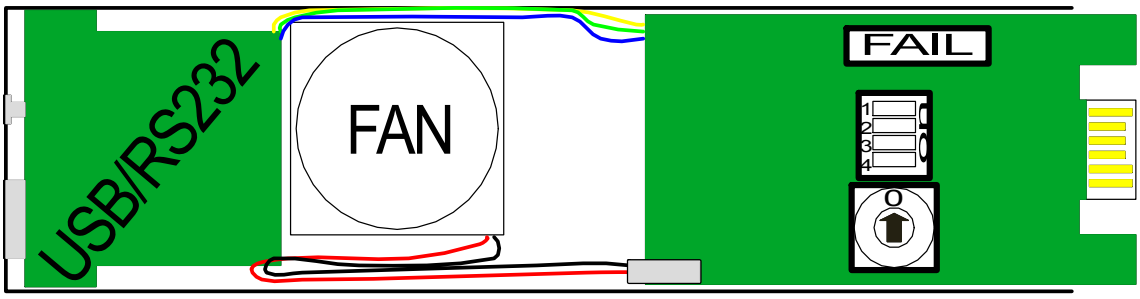
2.1.7 The Fan Module: Fan, Frame Address, TC_link Termination

RUB1 H1 and **RUB1 Q1** frames have a fan module integrated. It is located at one side of the frame behind the DSUB **PC** connector. There may be occasions when you must exchange this module:



- Frames with USB connector: It is recommended to screw a typical 4-40 UNC DSUB locking bolt into the thread as shown. Unlock the module: on the right hand side of this small slot there is a small protruding tab that needs to be slightly pressed to the right. Now pull the module out of the slot.

This module is equipped with the fan and the fan control electronic, furthermore with a fail relay for error detection, a fourfold dip switch and a rotary switch.



The contacts of the fail relay are normally open during operation, but close if this module or the fan has a failure. The contacts are (in parallel with the fail relays of all modules plugged into this frame) connected to the FAIL_A and FAIL_B pins of the RLC connector of the frame.

Please notice: The fan alarm will be raised only if there is one configurable module plugged into this frame with checkbox "**Fan monitoring**" checked!

The fourfold dip switch can be used to terminate the "TC_link" interface (RS485 bus) of the RLC connector. In a system of one or two frames all the switches should be set to position ON (= terminated). In a system of more than two frames the switches of the first and the last frame should be set to position ON, all other to position OFF.

The rotary switch sets the frame number. A system of one frame only gets number 0 (= single). In a system consisting of more than one frame the rotary switches should be set to numbers > 0 in that way that each frame gets a unique number.

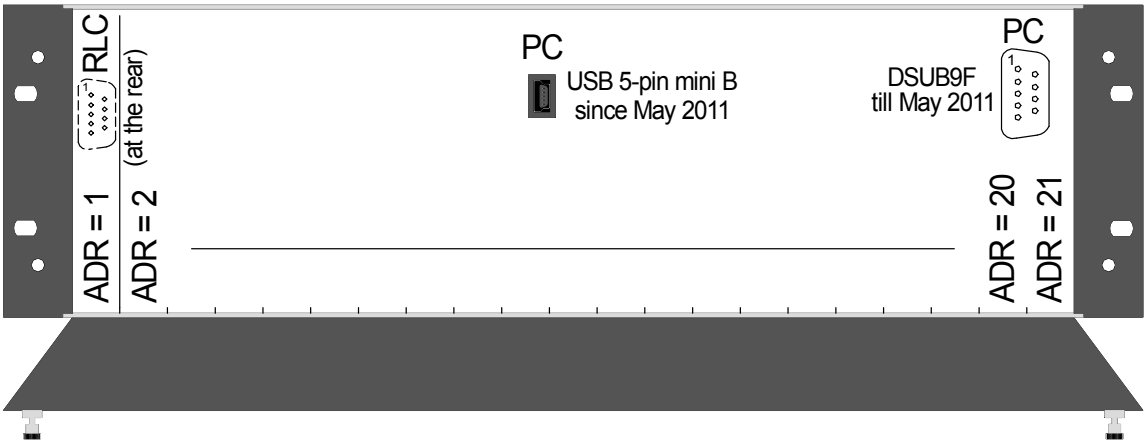
2.2 RUBIDIUM SERIES 3

Modules belonging to *RUBIDIUM SERIES 3* are denoted as **RUB3** modules.

2.2.1 The "RUB3 H3" Frame

The **RUB3 H3** mount frame provides capacity for 21 slots in 19"/3RU space. Some RUB3 modules require two slots (as AT, DT, GT, VD, PT …), other modules one slot (as AV, DV). The connectors for inputs and outputs are a standard part of the rear loading modules.

- The slots within a frame only differ by their individual, hard wired address (1 to 21). The internal "TC-link" interface enables communication between modules. All slots have this interface connected. Each slot is connected to an operating voltage line which distributes the power preferable from any power supply module plugged to this chassis.
- The **PC** connector provides an interface for the configuration of the modules. The connector can be reached behind the front plate: Unscrew both the collar screws, and then fold down the front plate.
- The RUB3 H3 frame usually comes complete with the **RC** module plugged at slot 1. This module with its two **RLC** connectors offers a link to modules located in other frames (via "TC_link"). The "FAIL" signals at this connector can be used for error detection: If a total failure occurs in any module in one frame the "FAIL" contacts of this frame's relay will close. Furthermore a 24 V pin enables operation without a power supply module by using external power supply. It is also possible to supply power from one internal power supply module to another frame, via this RLC connector.



The "RUB3 H3" frame (front view): Connectors RLC and PC, slots

Material	Aluminium
Weight	3.5 kg approx.
Mounting	Standard 19-inch rack, 3U
Dimensions (without 19" brackets)	444 (W) x 133 (H) x 248 (D) mm 17.48 x 5.25 x 9.76 inch
Maximum power dissipation	Without fan, by free air convection: 31 W With two fans [2 x 3 cfm]: 68 W
Power consumption	3.1 W (fans + RC module, without further Rubidium modules)

2.2.2 Plug-In a Module

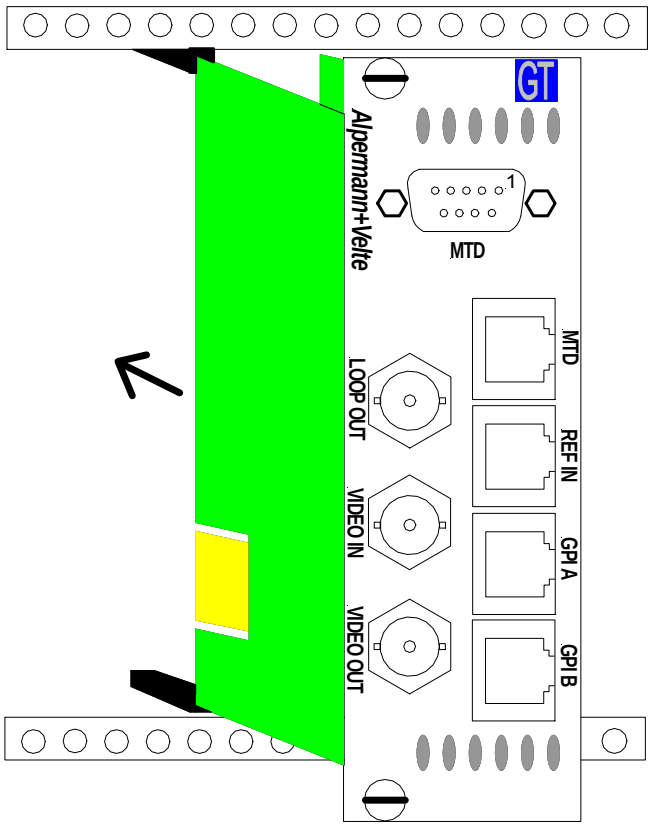
All modules of **RUBIDIUM SERIES** can be "hot swapped". To plug-in a module, please proceed as follows:

- Remove the solid rear panel cover plate for the slot where the module should be installed: Unscrew both the collar screws, so that the rear panel cover plate can be easily removed. Retain the cover plate for possible future use.
- Remove the module from its anti-static packing material. Hold the module by the edges or the rear plate, please do not touch the electronic components, strip conductors or pins. Retain the packing material for possible future use.

ATTENTION:

Observe precautions for handling electrostatic-sensitive devices. See "Electro Static Discharge (ESD) Precautions" at chapter A5 for details.

- The connector pads of the circuit board of the module fit into the socket receptacles inside the slot. In case the module consists of two boards this board is located on the left side viewed from the rear of the module. Insert this board into the appropriate slotted card guides. With sufficient pressure push the module until it engages into the front socket receptacle.



- In order to fasten the module: Fasten both the collar screws of the rear plate.

2.2.3 Remove a Module

All modules of **RUBIDIUM SERIES** can be "hot swapped". There may be occasions when you must exchange a module which has a user defined configuration. If the new module should work with the same application it would be helpful to have the current configuration stored on your PC (see saving a configuration to disk in Windows help program). After exchange the new module can be reloaded with the specific configuration.

To remove a module please proceed as follows:

- Unlock the module: Unscrew both the collar screws.
- Now pull the module out of the slot.
- Keep the anti-static packing material (original packaging material or adequate packaging) ready. Hold the module by the edges or the rear plate; do not touch the electronic components, strip conductors or pins. Slide the module into the anti-static packing material.

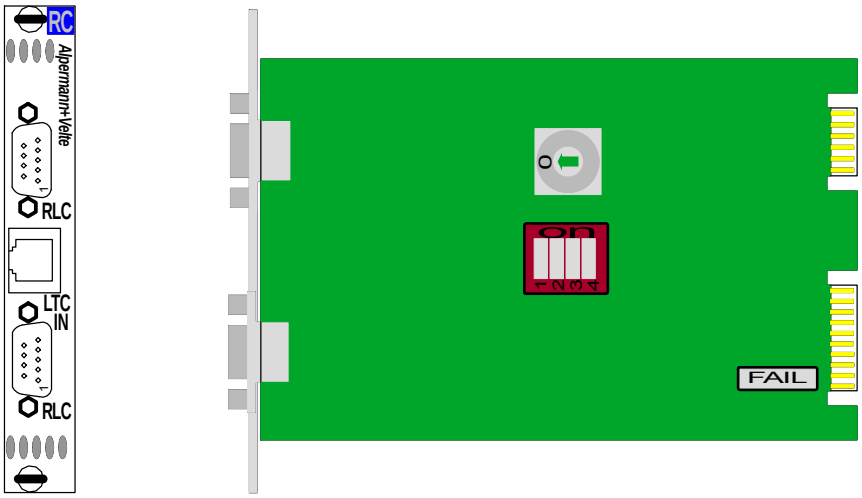
ATTENTION:

Observe precautions for handling electrostatic-sensitive devices. See "Electro Static Discharge (ESD) Precautions" at chapter A5 for details.

- Install the original rear panel cover plate if the slot is to remain empty. The frame is cooled by forced air drawn in from on side and expelled through the fan on the other side. In order to maintain this air flow no additional opening at the frame is allowed.

2.2.4 The RC Module: Fan Control, Frame Address, TC_link Termination

The **RUB3 H3** standard frame will be equipped with a RC module. This module contains the fan control electronic, a fail relay for error detection, a fourfold dip switch and a rotary switch. There are two DSUB RLC connectors and a LTC IN connector (future use) at the rear plate.



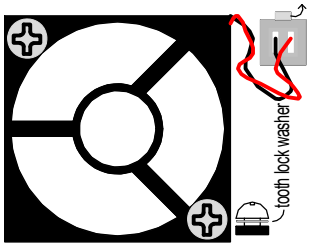
The contacts of the fail relay are normally open during operation, but close if the module fails. The contacts are (in parallel with the fail relays of all the modules plugged into this frame) connected to the FAIL_A and FAIL_B pins of the RLC connector of the frame. Mainly this relay indicates a fan failure.

The fourfold dip switch can be used to terminate the "TC_link" interface (RS485 bus) of the RLC connector. In a system of one or two frames all the switches should be set to position ON (= terminated). In a system of more than two frames the switches of the first and the last frame should be set to position ON, all other to position OFF.

The rotary switch sets the frame number. A system of one frame only gets the number 0 (= single). In a system consisting of more than one frame the rotary switches should be set to numbers > 0 in that way that each frame gets a unique number.

2.2.5 Exchange a Fan

RUB3 H3 chassis includes two fans. At chassis delivered not before August 2012, each fan are mounted with two screws and therefore can be easily exchanged. The fans can be reached behind the front plate: Unscrew both the collar screws, and then fold down the front plate.



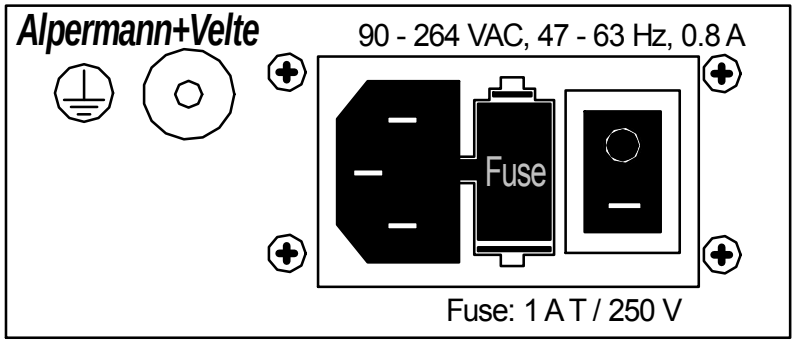
Remove a fan: In order to disconnect the connector lift the release lever and pull out the connector. Now unscrew the recessed head screws at the fan.

Insert a fan: Attach the fan using two recessed head screws with toothed lock washer. Do not apply an excessive force. Now plug the connector.

3 Modules of the System

3.1 **PS**: 60 W Power Supply of RUBIDIUM SERIES 1

This module provides power for all the modules in an RUB1 frame. It can be installed at any slot (location) of the frame just as any other module would. Power is distributed in parallel to all slots and to the 24V pin at the DSUB female connector RLC at the rear of the frame.



Input:

Inlet socket	According to IEC/EN 60320-1/C14, protection class 1
Line voltage range	90 - 264 VAC, auto-ranging
Power line frequency	47 - 63 Hz
Input current	800 mA maximum at 90 VAC
Inrush current	50 A maximum @ 264 VAC
Efficiency	86% typical at 75% load, 25 °C, nominal line, after 5 mins warm-up
Line regulation	± 0.5%

Output:

Output voltage	23.7 VDC ± 5%
Output current	0.05 A minimum, 2.5 A maximum
Turn-on delay	4 secs maximum
Ripple & Noise	1%
Load regulation	± 1%
Temperature coefficient	± 0.05% / °C
Hold-up time at 100% load	8 ms typical

Failure relay:

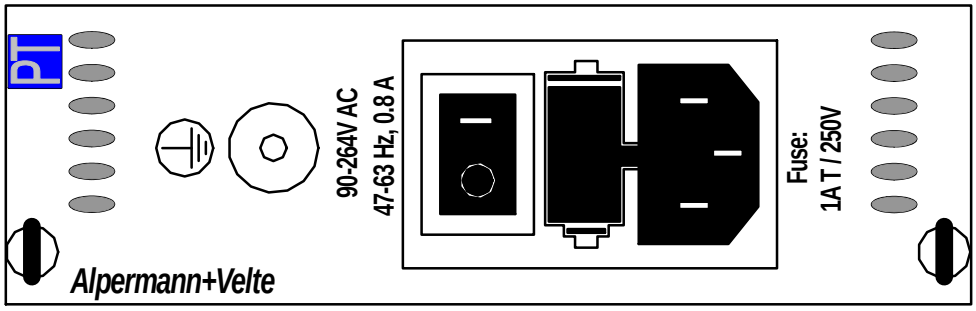
FAIL signal threshold voltage	If the output voltage (nominal 23.7 V) of the power supply falls below 20 V approximately.

Others:

Weight	0.5 kg
Mechanical	Circuit board (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch
Power consumption	8.7 W maximum

3.2 **PT**: 60 W Power Supply of RUBIDIUM SERIES 3

This module provides power for all the modules in an RUB3 frame. It can be installed at any slot (location) of the frame just as any other module would. Power is distributed in parallel to all slots and to the 24V pin at the DSUB female connectors RLC at the RC module.



Input:

Inlet socket	According to IEC/EN 60320-1/C14, protection class 1
Line voltage range	90 - 264 VAC, auto-ranging
Power line frequency	47 - 63 Hz
Input current	800 mA maximum at 90 VAC
Inrush current	50 A maximum @ 264 VAC
Efficiency	86% typical at 75% load, 25 °C, nominal line, after 5 mins warm-up
Line regulation	± 0.5%

Output:

Output voltage	23.7 VDC ± 5%
Output current	0.05 A minimum, 2.5 A maximum
Turn-on delay	4 secs maximum
Ripple & Noise	1%
Load regulation	± 1%
Temperature coefficient	± 0.05% / °C
Hold-up time at 100% load	8 ms typical

Failure relay:

FAIL signal threshold voltage	If the output voltage (nominal 23.7 V) of the power supply falls below 20 V approximately.

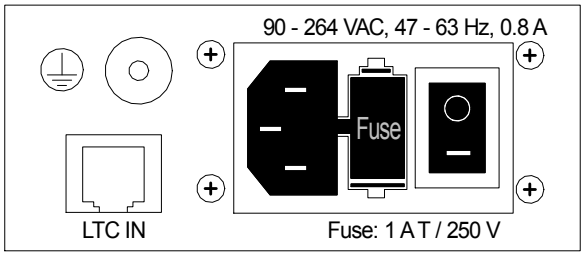
Others:

Weight	0.5 kg
Mechanical	Circuit board (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H3: 8HP, 3RU
Power consumption	8.7 W maximum

3.3 **PQ**: 60 W Power Supply with OLED Display

RUB1 frames only.

This module consists of two physical parts: As a power supply it provides the power for all the modules in the frame, as a Time Code reader it visibly displays the decoded time and user or date data. The PQ module has all the features of the PS module. Additionally it reads LTC and TC_link time code, and it visibly displays the decoded time and user or date data.



Input:

Inlet socket	According to IEC/EN 60320-1/C14, protection class 1
Line voltage range	90 - 264 VAC, auto-ranging
Power line frequency	47 - 63 Hz
Input current	800 mA maximum at 90 VAC
Inrush current	50 A maximum @ 264 VAC
Efficiency	86% typical @ 75% load, 25 °C, nominal line, after 5 mins warm-up
Line regulation	± 0.5%

Output:

Output voltage	23.7 VDC ± 5%
Output current	0.05 A minimum, 2.5 A maximum
Turn-on delay	4 secs maximum
Ripple & Noise	1%
Load regulation	± 1%
Temperature coefficient	± 0.05% / °C
Hold-up time at 100% load	8 ms typical

LTC:

LTC input	According to ANSI/SMPTE 12M-1-2008, balanced, 100 mV_{pp} - 5 V_{pp}, 20 - 37 frames/s.

Failure relay:

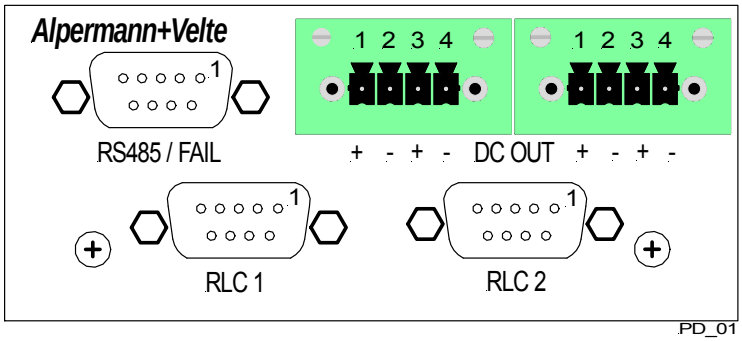
FAIL signal threshold voltage	If the output voltage (nominal 23.7 V) falls below ≈ 20 V.

Others:

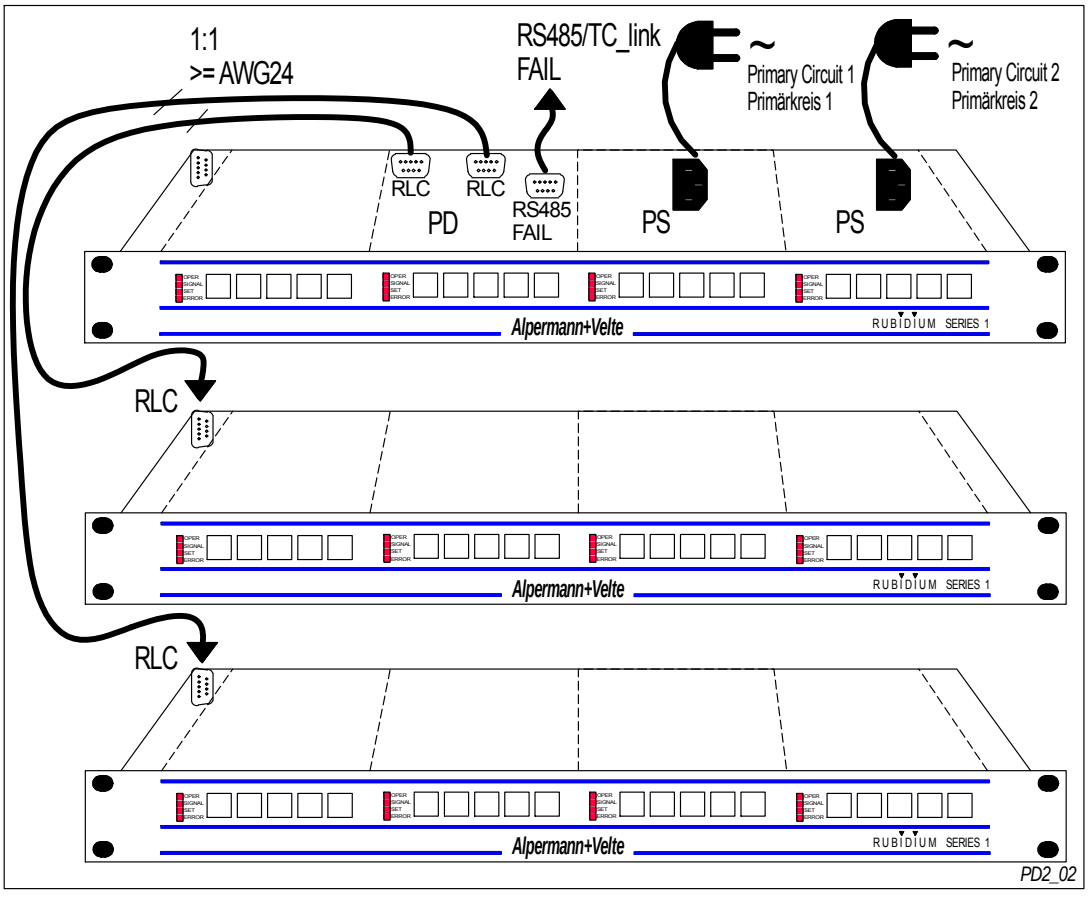
Weight	0.5 kg
Mechanical	Circuit board (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 8HP, 3RU
Power consumption	9.4 W maximum

3.4 **PD**: Power Distribution

This module distributes the DC power to any external units or to further RUBIDIUM SERIES frames (except RUB D1 chassis). It is especially used in redundant power supply systems. It can be installed at any slot (location) of a RUB H1 chassis just as any other module would. The PD module outputs the DC power of a Power Supply module which is plugged in this frame. External units can get its DC power using the terminal blocks; RUBIDIUM SERIES frames use the DSUB connector RLC 1 or RLC 2. The RLC pinning of a RUBIDIUM SERIES frame combines DC, RS485 (= TC_link) and FAIL signals. The RS485/FAIL connector at the rear of PD separates the RS485 (TC_link) and FAIL signals of the RLC1/RLC2 connectors.



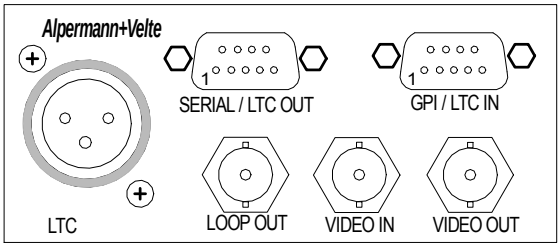
This is an example for a fail-safe operation of a RUBIDIUM SERIES 1 system using two power supply modules “PS” in parallel.



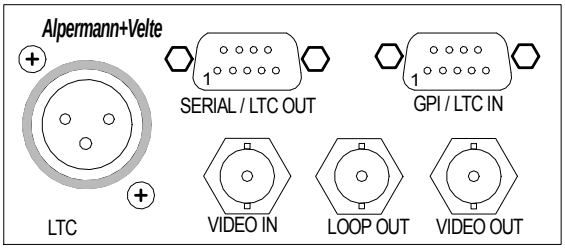
3.5 **AT**: Analogue Video Time Code

The hardware consists of an analogue video channel, time code in/outputs, serial interfaces, as well as some general purpose interfaces (GPI) which may be used for various applications.

Connections at AT module – version 1



Connections at AT module – version 2

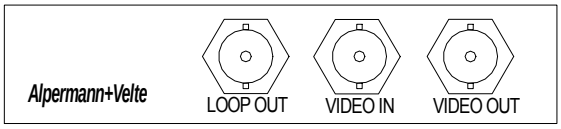


Video input VIDEO IN:	
Format	CVBS analogue video signal: PAL 625/50, NTSC 525/60
Connector	BNC (IEC169-8), 75 Ω
VITC input	According to ANSI/SMPTE 12M-1-2008
Video output LOOP OUT:	
Format	Pass-through output of VIDEO IN
Connector	BNC (IEC169-8), 75 Ω
Video output VIDEO OUT:	
Format	Refer to VIDEO IN
Connector	BNC (IEC169-8), 75 Ω
VITC output	According to ANSI/SMPTE 12M-1-2008
LTC input:	
Format	According to ANSI/SMPTE 12M-1-2008
Connector	Balanced signals LTC_IN_A and LTC_IN_B: • Via 3-pin XLR female (according to IEC 268-1) • Via 2 pins of the 9-pin DSUB female GPI/LTC IN
Input impedance	18 kΩ
Signal level	100 mV_{p-p} - 5 V_{p-p}, auto-ranging
Frequency	1.6 - 2500 frames/s
LTC output:	
Format	According to ANSI/SMPTE 12M-1-2008
Connector	Balanced signals LTC_OUT_A and LTC_OUT_B: • Optional via 3-pin XLR male (instead of LTC input) • Via 2 pins of 9-pin DSUB female SERIAL/LTC OUT
Output impedance	< 50 Ω
Signal level, adjustable	balanced use: from –17 dBu/0,31 V_{p-p} to +13 dBu/9,8 V_{p-p} unbalanced use: from –23 dBu/0,16 V_{p-p} to +7 dBu/4,9 V_{p-p}
Others:	
Operating voltage	12 - 30 VDC
Power consumption	4.5 W maximum
Weight	0.4 kg approx.
Mechanical	2 circuit boards (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 8HP, 3RU

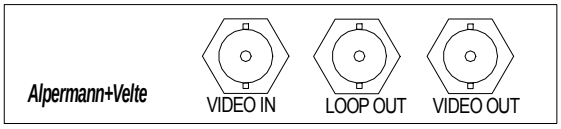
3.6 **AV**: Analogue Video

The hardware consists of an analogue video channel with character inserter and VITC reader/generator.

Connections at AV module – version 1



Connections at AV module – version 2



Video input VIDEO IN:	
Format	CVBS analogue video signal: PAL 625/50, NTSC 525/60
Connector	BNC (IEC169-8), 75 Ω
VITC input	According to ANSI/SMPTE 12M-1-2008
Video output LOOP OUT:	
Format	Pass-through output of VIDEO IN
Connector	BNC (IEC169-8), 75 Ω
Video output VIDEO OUT:	
Format	Refer to VIDEO IN
Connector	BNC (IEC169-8), 75 Ω
VITC output	According to ANSI/SMPTE 12M-1-2008
Others:	
Operating voltage	12 - 30 VDC
Power consumption	2.8 W maximum
Weight	0.2 kg approx.
Mechanical	Circuit board (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 4HP, 3RU

3.7 **AT/AV** Standard Options

You will find detailed information in the operating manuals mentioned below.
All manuals are available at: http://www.alpermann-velte.com/serv_e/bal_e/bal_e.html.

Option	Description
-B: Video bypass relay for **AT** or **AV**	The bypass relay appears in the video input to output path, not in the video loop path. The main functionality is to maintain the video path even in an event of power failure. → Operating manual: "AT / AV Modules".
-S: Sony 9P and VDCP converter for **AT**	This option handles a time code from a serial interface in order to visibly insert it in a video window or to convert it to LTC/VITC time code. Different modes of operation are available. The serial interface accepts the "Sony Protocol for Video Recorders" (Sony 9p) or the "Video Disk Control Protocol" (VDCP). → Operating manual: "AT / DT / HT / XT Modules Option S".
-O: Time code offset features for **AT**	This option combines AT and a control unit TCU to a system which handles time code offset applications in an easy way. The TCU control unit is used to enter time offsets, to select the operating mode, and to display the re-generated time. → Operating manual: "AT / DT / HT / XT Modules Option O".
-P: Biphase to time code converter for **AT**	This option has been developed for "film and time code" applications. AT accepts biphase signals at its GPI inputs. These pulses will be converted to a time (HH:MM:SS:FF), to a film frame counter and to a footage counter. These data can be output in a time code format and can visibly be displayed on a video window. → Operating manual: "AT / DT / HT / XT Modules Option P".
-I: IRIG-B reader for **AV**	The AV module will be equipped with an IRIG-B reader. IRIG-B data can visibly be displayed on a video window. → Operating manual: "AV / DV / XV Modules Option I".
-L: LTC reader for **AV**	The AV module will be equipped with an LTC reader. LTC data can visibly be displayed on a video window. → Operating manual: "AV / DV / XV Modules Option L".

3.8 **AI**: Analogue Video for Special Applications

The hardware of these modules comprises serial interfaces (RS232, RS422, RS485), 4 x GPIO, and an analogue video channel.

An option has to be selected to give functionality to the module. It is not possible to order this module without an option. A combination of options for one module is only possible if specified.

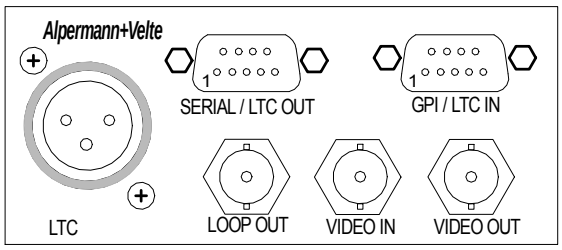
You will find detailed information in the operating manuals mentioned below.
All manuals are available at: http://www.alpermann-velte.com/serv_e/bal_e/bal_e.html.

Option	Description
-C: Clip length inserter	The option has been developed to let the module operate with an automation system. While the automation system runs the playlist a simple command can be transmitted to transfer the clip length to the module. The module starts a DOWN counter, converts this time into LTC format, and visibly inserts the time on a video window. Two independent DOWN counters are available. → Operating manual: "AI / DI / XI Modules + Option C".
-D: Daytime inserter	An external reference (GPS, DCF77) delivers a pulse per second (PPS) and time & date via serial interface. The module decodes these data, calculates the local time, and visibly inserts a precise time (HH:MM:SS:1/100) in a video window. Different formats of time and date representation are selectable. → Operating manual: "AI / DI / XI Modules + Option D".
-V: VPS decoder	VPS: Video Program System. A module with this option decodes these data of line 16 according to the European Standard EN 300 294. The decoded data can visibly be displayed on a video window. GPIO signal outputs are available signalling the state of selected bits. This option may be combined with option W. → Operating manual: "AI / DI / XI Modules + Option V".
-W: WSS decoder	WSS: Wide Screen Signalling. A module with this option decodes these data of line 23 according to the European Standard EN 300 294. The decoded data can visibly be displayed on a video window. GPIO signal outputs are available signalling the state of selected bits. This option may be combined with option V. → Operating manual: "AI / DI / XI Modules + Option W".

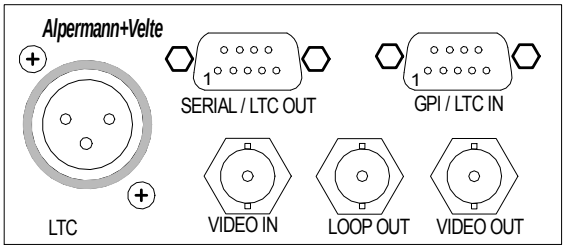
3.9 **DT**: Digital Video Time Code

The hardware consists of a digital video channel (SD), time code in/outputs, serial interfaces, as well as some general purpose interfaces (GPI) which may be used for various applications.

Connections at RUB DT – hardware version 1



Connections at RUB DT – hardware version 2/3

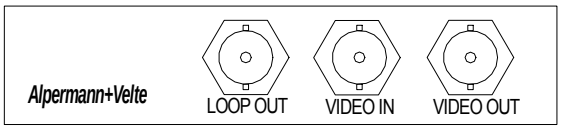


Video input VIDEO IN:	
Format	Serial digital video, according to ANSI/SMPTE 259M
Connector	BNC (IEC169-8), 75 Ω
Video time codes	D-VITC (SMPTE 266M-1994), ATC (SMPTE 12M-2-2008)
Video output LOOP OUT:	
Format	Serial digital video, according to ANSI/SMPTE 259M
Connector	BNC (IEC169-8), 75 Ω
Video output VIDEO OUT:	
Format	Serial digital video, according to ANSI/SMPTE 259M
Connector	BNC (IEC169-8), 75 Ω
Video time codes	D-VITC (SMPTE 266M-1994), ATC (SMPTE 12M-2-2008)
LTC input:	
Format	According to ANSI/SMPTE 12M-1-2008
Connector	Balanced signals LTC_IN_A and LTC_IN_B: • Via 3-pin XLR female (according to IEC 268-1) • Via 2 pins of the 9-pin DSUB female GPI/LTC IN
Input impedance	18 kΩ
Signal level	100 mV_{p-p} - 5 V_{p-p}, auto-ranging
Frequency	1.6 - 2500 frames/s
LTC output:	
Format	According to ANSI/SMPTE 12M-1-2008
Connector	Balanced signals LTC_OUT_A and LTC_OUT_B: • Optional via 3-pin XLR male (instead of LTC input) • Via 2 pins of 9-pin DSUB female SERIAL/LTC OUT
Output impedance	< 50 Ω
Signal level, adjustable	balanced use: from –17 dBu/0,31 V_{p-p} to +13 dBu/9,8 V_{p-p} unbalanced use: from –23 dBu/0,16 V_{p-p} to +7 dBu/4,9 V_{p-p}
Others:	
Operating voltage	12 - 30 VDC
Power consumption (max.)	Version 1: 4.5 W; version 2: 5.9 W; version 3: 4.7 W
Weight	0.4 kg approx.
Mechanical	2 circuit boards (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 8HP, 3RU

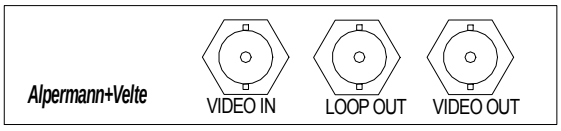
3.10 **DV**: Digital Video

Digital video channel (SD) with character inserter and D-VITC/ATC time code reader and generator.

Connections at RUB DV – hardware version 1



Connections at RUB DV – hardware version 2/3



Video input VIDEO IN:	
Format	Serial digital video, according to ANSI/SMPTE 259M
Connector	BNC (IEC169-8), 75 Ω
Video time codes	D-VITC (SMPTE 266M-1994), ATC (SMPTE 12M-2-2008)
Video output LOOP OUT:	
Format	Serial digital video, according to ANSI/SMPTE 259M
Connector	BNC (IEC169-8), 75 Ω
Video output VIDEO OUT:	
Format	Serial digital video, according to ANSI/SMPTE 259M
Connector	BNC (IEC169-8), 75 Ω
Video time codes	D-VITC (SMPTE 266M-1994), ATC (SMPTE 12M-2-2008)
Others:	
Operating voltage	12 - 30 VDC
Power consumption (max.)	Version 1: 2.8 W; version 2: 4.2 W; version 3: 3.0 W
Weight	0.2 kg approx.
Mechanical	Circuit board (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 4HP, 3RU

3.11 **DT/DV** Standard Options

You will find detailed information in the operating manuals mentioned below.
All manuals are available at: http://www.alpermann-velte.com/serv_e/bal_e/bal_e.html.

Option	Description
-B: Video bypass relay for **DT** or **DV**	The bypass relay appears in the video input to output path, not in the video loop path. The main functionality is to maintain the video path even in an event of power failure. → Operating manual: "DT / DV Modules".
-S: Sony 9P and VDCP converter for **DT**	This option handles a time code from a serial interface in order to visibly insert it in a video window or to convert it to LTC/VITC time code. Different modes of operation are available. The serial interface accepts the "Sony Protocol for Video Recorders" (Sony 9p) or the "Video Disk Control Protocol" (VDCP). → Operating manual: "AT / DT / HT / XT Modules Option S".
-O: Time code offset features for **DT**	This option combines DT and a control unit TCU to a system which handles time code offset applications in an easy way. The TCU control unit is used to enter time offsets, to select the operating mode, and to display the re-generated time. → Operating manual: "AT / DT / HT / XT Modules Option O".
-P: Biphase to time code converter for **DT**	This option has been developed for "film and time code" applications. DT accepts biphase signals at its GPI inputs. These pulses will be converted to a time (HH:MM:SS:FF), to a film frame counter and to a footage counter. These data can be output in a time code format and can visibly be displayed on a video window. → Operating manual: "AT / DT / HT / XT Modules Option P".
-I: IRIG-B reader for **DV**	The DV module will be equipped with an IRIG-B reader. IRIG-B data can visibly be displayed on a video window. → Operating manual: "AV / DV / XV Modules Option I".
-L: LTC reader for **DV**	The DV module will be equipped with an LTC reader. LTC data can visibly be displayed on a video window. → Operating manual: "AV / DV / XV Modules Option L".

3.12 **DI**: Digital Video for Special Applications

The hardware of these modules comprises serial interfaces (RS232, RS422, RS485), 4 x GPIO, and a digital video channel (SD).

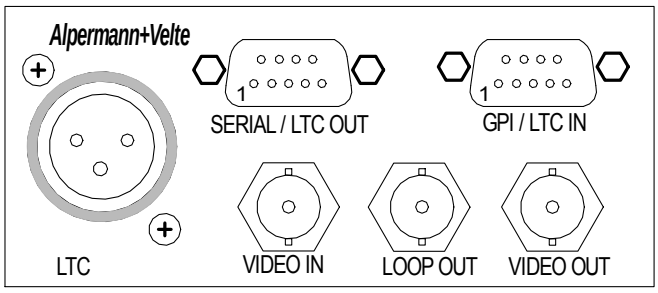
An option has to be selected to give functionality to the module. It is not possible to order this module without an option. A combination of options for one module is only possible if specified.

You will find detailed information in the operating manuals mentioned below.
All manuals are available at: http://www.alpermann-velte.com/serv_e/bal_e/bal_e.html.

Option	Description
-C: Clip length inserter	The option has been developed to let the module operate with an automation system. While the automation system runs the playlist a simple command can be transmitted to transfer the clip length to the module. The module starts a DOWN counter, converts this time into LTC format, and visibly inserts the time on a video window. Two independent DOWN counters are available. → Operating manual: "AI / DI / XI Modules + Option C".
-D: Daytime inserter	An external reference (GPS, DCF77) delivers a pulse per second (PPS) and time & date via serial interface. The module decodes these data, calculates the local time, and visibly inserts a precise time (HH:MM:SS:1/100) in a video window. Different formats of time and date representation are selectable. → Operating manual: "AI / DI / XI Modules + Option D".
-V: VPS decoder	VPS: Video Program System. A module with this option decodes these data of line 16 according to the European Standard EN 300 294. The decoded data can visibly be displayed on a video window. GPIO signal outputs are available signalling the state of selected bits. This option may be combined with option W. → Operating manual: "AI / DI / XI Modules + Option V".
-W: WSS decoder	WSS: Wide Screen Signalling. A module with this option decodes these data of line 23 according to the European Standard EN 300 294. The decoded data can visibly be displayed on a video window. GPIO signal outputs are available signalling the state of selected bits. This option may be combined with option V. → Operating manual: "AI / DI / XI Modules + Option W".

3.13 **HT**: HD/SD Video Data and Time Code (discont.)

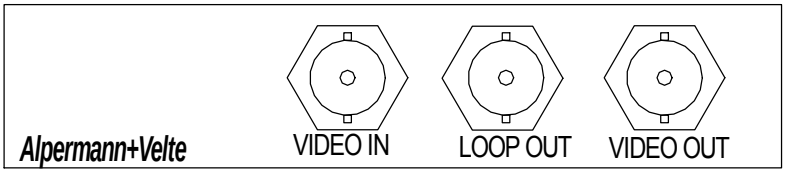
The hardware consists of a digital video channel (HD/SD), time code in/outputs, serial interfaces, as well as some general purpose interfaces which may be used for various applications.



Video input VIDEO IN:	
Format	Serial digital video, according to ANSI/SMPTE 292M (HD) or ANSI/SMPTE 259M (SD)
Connector	BNC (IEC169-8), 75 Ω
Video time codes	D-VITC (SMPTE 266M-1994), ATC (SMPTE 12M-2-2008)
Video output LOOP OUT:	
Format	Same as video input
Connector	BNC (IEC169-8), 75 Ω
Video output VIDEO OUT:	
Format	Same as video input
Connector	BNC (IEC169-8), 75 Ω
Video time codes	D-VITC (SMPTE 266M-1994), ATC (SMPTE 12M-2-2008)
LTC input:	
Format	According to ANSI/SMPTE 12M-1-2008
Connector	Balanced signals LTC_IN_A and LTC_IN_B: • Via 3-pin XLR female (according to IEC 268-1) • Via 2 pins of the 9-pin DSUB female GPI/LTC IN
Input impedance	18 kΩ
Signal level	100 mV_{p-p} - 5 V_{p-p}, auto-ranging
Frequency	1.6 - 2500 frames/s
LTC output:	
Format	According to ANSI/SMPTE 12M-1-2008
Connector	Balanced signals LTC_OUT_A and LTC_OUT_B: • Optional via 3-pin XLR male (instead of LTC input) • Via 2 pins of 9-pin DSUB female SERIAL/LTC OUT
Output impedance	< 50 Ω
Signal level, adjustable	balanced use: from –17 dBu/0,31 V_{p-p} to +13 dBu/9,8 V_{p-p} unbalanced use: from –23 dBu/0,16 V_{p-p} to +7 dBu/4,9 V_{p-p}
Others:	
Operating voltage	12 - 30 VDC
Power consumption	6.2 W maximum
Weight	0.4 kg approx.
Mechanical	2 circuit boards (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 8HP, 3RU

3.14 **HV**: HD/SD Video Data (discont.)

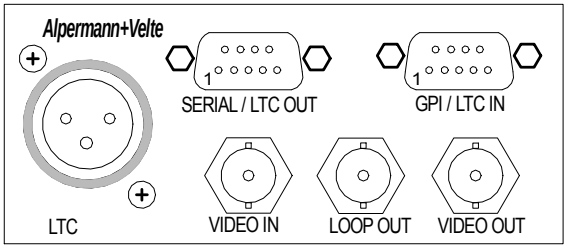
The hardware consists of a digital video channel (HD/SD) with character inserter and D-VITC/ATC time code reader and generator.



Video input VIDEO IN:	
Format	Serial digital video, according to ANSI/SMPTE 292M (HD) or ANSI/SMPTE 259M (SD)
Connector	BNC (IEC169-8), 75 Ω
Video time codes	D-VITC (SMPTE 266M-1994), ATC (SMPTE 12M-2-2008)
Video output LOOP OUT:	
Format	Same as video input
Connector	BNC (IEC169-8), 75 Ω
Video output VIDEO OUT:	
Format	Same as video input
Connector	BNC (IEC169-8), 75 Ω
Video time codes	D-VITC (SMPTE 266M-1994), ATC (SMPTE 12M-2-2008)
Others:	
Operating voltage	12 - 30 VDC
Power consumption	4.5 W maximum
Weight	0.2 kg approx.
Mechanical	Circuit board (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 4HP, 3RU

3.15 **XT**: 3G/HD/SD Video Data and Time Code

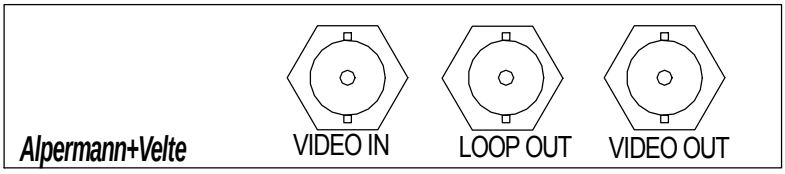
The hardware consists of a digital video channel (3G/HD/SD), time code in/outputs, serial interfaces, as well as general purpose interfaces which may be used for various applications.



Video input VIDEO IN:	
Format	Serial digital video: 3G – SMPTE 424M, HD – SMPTE 292M, SD – SMPTE 259M.
Connector	BNC (IEC169-8), 75 Ω
Video time codes	D-VITC (SMPTE 266M-1994), ATC (SMPTE 12M-2-2008)
Video output LOOP OUT:	
Format	Same as video input
Connector	BNC (IEC169-8), 75 Ω
Video output VIDEO OUT:	
Format	Same as video input
Connector	BNC (IEC169-8), 75 Ω
Video time codes	D-VITC (SMPTE 266M-1994), ATC (SMPTE 12M-2-2008)
LTC input:	
Format	According to ANSI/SMPTE 12M-1-2008
Connector	Balanced signals LTC_IN_A and LTC_IN_B: • Via 3-pin XLR female (according to IEC 268-1) • Via 2 pins of the 9-pin DSUB female GPI/LTC IN
Input impedance	18 kΩ
Signal level	100 mV_{p-p} - 5 V_{p-p}, auto-ranging
Frequency	1.6 - 2500 frames/s
LTC output:	
Format	According to ANSI/SMPTE 12M-1-2008
Connector	Balanced signals LTC_OUT_A and LTC_OUT_B: • Optional via 3-pin XLR male (instead of LTC input) • Via 2 pins of 9-pin DSUB female SERIAL/LTC OUT
Output impedance	< 50 Ω
Signal level, adjustable	balanced use: from –17 dBu/0,31 V_{p-p} to +13 dBu/9,8 V_{p-p} unbalanced use: from –23 dBu/0,16 V_{p-p} to +7 dBu/4,9 V_{p-p}
Others:	
Operating voltage	12 - 30 VDC
Power consumption	4.7 W maximum
Weight	0.4 kg approx.
Mechanical	2 circuit boards (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 8HP, 3RU

3.16 **XV**: 3G/HD/SD Video Data

The hardware consists of a digital video channel (3G/HD/SD) with character inserter and D-VITC/ATC time code reader and generator.



Video input VIDEO IN:	
Format	Serial digital video: 3G – SMPTE 424M, HD – SMPTE 292M, SD – SMPTE 259M.
Connector	BNC (IEC169-8), 75 Ω
Video time codes	D-VITC (SMPTE 266M-1994), ATC (SMPTE 12M-2-2008)
Video output LOOP OUT:	
Format	Same as video input
Connector	BNC (IEC169-8), 75 Ω
Video output VIDEO OUT:	
Format	Same as video input
Connector	BNC (IEC169-8), 75 Ω
Video time codes	D-VITC (SMPTE 266M-1994), ATC (SMPTE 12M-2-2008)
Others:	
Operating voltage	12 - 30 VDC
Power consumption	3.0 W maximum
Weight	0.2 kg approx.
Mechanical	Circuit board (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 4HP, 3RU

3.17 **XT/XV** Standard Options

You will find detailed information in the operating manuals mentioned below.
All manuals are available at: http://www.alpermann-velte.com/serv_e/bal_e/bal_e.html.

Option	Description
-B: Video bypass relay for **XT** or **XV**	The bypass relay appears in the video input to output path, not in the video loop path. The main functionality is to maintain the video path even in an event of power failure. → Operating manual: "XT / XV Modules".
-S: Sony 9P and VDCP converter for **XT**	This option handles a time code from a serial interface in order to visibly insert it in a video window or to convert it to LTC/VITC time code. Different modes of operation are available. The serial interface accepts the "Sony Protocol for Video Recorders" (Sony 9p) or the "Video Disk Control Protocol" (VDCP). → Operating manual: "AT / DT / HT / XT Modules Option S".
-O: Time code offset features for **XT**	This option combines XT and a control unit TCU to a system which handles time code offset applications in an easy way. The TCU control unit is used to enter time offsets, to select the operating mode, and to display the re-generated time. → Operating manual: "AT / DT / HT / XT Modules Option O".
-P: Biphase to time code converter for **XT**	This option has been developed for "film and time code" applications. XT accepts biphase signals at its GPI inputs. These pulses will be converted to a time (HH:MM:SS:FF), to a film frame counter and to a footage counter. These data can be output in a time code format and can visibly be displayed on a video window. → Operating manual: "AT / DT / HT / XT Modules Option P".
-I: IRIG-B reader for **XV**	The XV module will be equipped with an IRIG-B reader. IRIG-B data can visibly be displayed on a video window. → Operating manual: "AV / DV / XV Modules Option I".
-L: LTC reader for **XV**	The XV module will be equipped with an LTC reader. LTC data can visibly be displayed on a video window. → Operating manual: "AV / DV / XV Modules Option L".

3.18 **XI**: Digital Video for Special Applications

The hardware of these modules comprises serial interfaces (RS232, RS422, RS485), 4 x GPIO, and a digital video channel (SD/HD/3G).

An option has to be selected to give functionality to the module. It is not possible to order this module without an option. A combination of options for one module is only possible if specified.

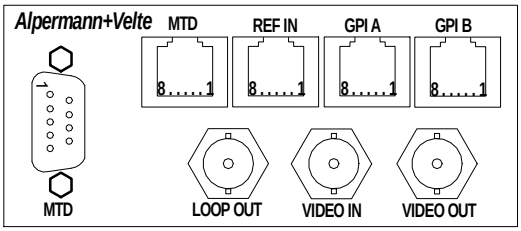
You will find detailed information in the operating manuals mentioned below.
All manuals are available at: http://www.alpermann-velte.com/serv_e/bal_e/bal_e.html.

Option	Description
-C: Clip length inserter	The option has been developed to let the module operate with an automation system. While the automation system runs the playlist a simple command can be transmitted to transfer the clip length to the module. The module starts a DOWN counter, converts this time into LTC format, and visibly inserts the time on a video window. Two independent DOWN counters are available. → Operating manual: "AI / DI / XI Modules + Option C".
-D: Daytime inserter	An external reference (GPS, DCF77) delivers a pulse per second (PPS) and time & date via serial interface. The module decodes these data, calculates the local time, and visibly inserts a precise time (HH:MM:SS:1/100) in a video window. Different formats of time and date representation are selectable. → Operating manual: "AI / DI / XI Modules + Option D".
-V: VPS decoder	VPS: Video Program System. A module with this option decodes these data out of an ancillary data packet according to SMPTE 2031 in conjunction with ETSI EN 301 775. The decoded data can visibly be displayed on a video window. GPIO signal outputs are available signalling the state of selected bits. This option may be combined with option W. → Operating manual: "AI / DI / XI Modules + Option V".
-W: WSS decoder	WSS: Wide Screen Signalling. A module with this option decodes these data out of an ancillary data packet according to SMPTE 2031 in conjunction with ETSI EN 301 775. The decoded data can visibly be displayed on a video window. GPIO signal outputs are available signalling the state of selected bits. This option may be combined with option V. → Operating manual: "AI / DI / XI Modules + Option W".

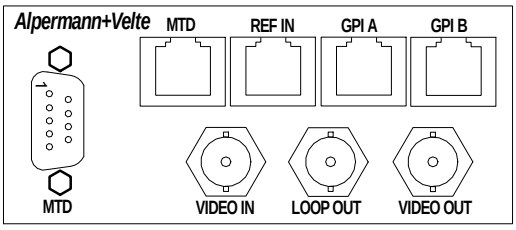
3.19 **GT**: Master Time Code Generator

The hardware consists of an analogue video channel, time code in/outputs, time and date reference in/outputs as well as some general purpose interfaces (GPI), which may be used for various applications.

Connections at GT module – version 1



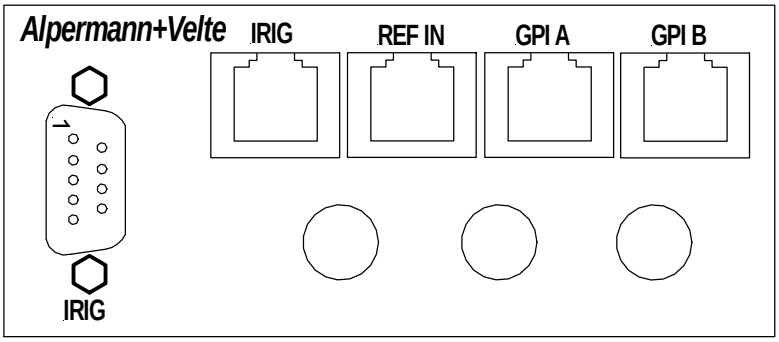
Connections at GT module – version 2



Video input VIDEO IN:		
Format	CVBS analogue video signal: PAL 625/50, NTSC 525/60	
Connector	BNC (IEC169-8), 75 Ω	
Video output LOOP OUT:		
Format	Pass-through output of VIDEO IN	
Connector	BNC (IEC169-8), 75 Ω	
Video output VIDEO OUT:		
Format	Refer to VIDEO IN	
Connector	BNC (IEC169-8), 75 Ω	
VITC output (option "V")	According to ANSI/SMPTE 12M-1-2008	
Free run accuracy (all output signals):		
TCXO	Temperature stability: ± 1 ppm; Aging: typical ± 1 ppm/year	
LTC output:		
Format	According to ANSI/SMPTE 12M-1-2008	
Connector	Balanced signals LTC_OUT_A and LTC_OUT_B, via 2 pins of the MTD connector (DSUB female and RJ45)	
Output impedance	< 50 Ω	
Signal level, adjustable	balanced use: from –17 dBu/0,31 V_{p-p} to +13 dBu/9,8 V_{p-p} unbalanced use: from –23 dBu/0,16 V_{p-p} to +7 dBu/4,9 V_{p-p}	
Time and date reference:		
Inputs	PPS (pulse per second), RxD (serial data string)	
Outputs	Telegram (seconds impulse telegram), SERIAL (serial data string)	
LTC inputs LTC_IN and REF_IN:		
Format	According to ANSI/SMPTE 12M-1-2008	
Input impedance	18 kΩ	
Signal level	100 mV_{p-p} - 5 V_{p-p}, auto-ranging	
Frequency	LTC_IN: 1.6 - 2500 frames/s; REF_IN: 19 – 33 frames/s	
Others:		
Operating voltage	12 - 30 VDC	
Power consumption (without any load at 5V pin)		5.0 W maximum
Weight	0.4 kg approx.	
Mechanical	2 circuit boards (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 8HP, 3RU	

3.20 **GI**: Master IRIG-B Generator

The hardware consists of an IRIG-B generator, time and date reference in/outputs as well as some general purpose interfaces (GPI), which may be used for various applications. The module outputs various real-time signals: IRIG-B, impulse time telegram, time and date serial data string. All output signals are PPS locked.

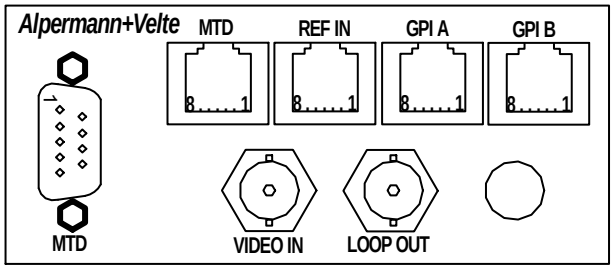


IRIG-B output:	
Format	IRIG-B123 according to IRIG STANDARD 200-98, amplitude modulated carrier signal with 1 kHz carrier frequency
Connector	Balanced signals IRIG_OUT_A and IRIG_OUT_B, via 2 pins of the IRIG connector (DSUB female and RJ45)
Output impedance	< 50 Ω
Signal level	Adjustable 140 mV_{p-p} - 4.9 V_{p-p}
Time and date reference:	
Inputs	PPS (pulse per second), RxD (serial data string)
Outputs	Telegram (seconds impulse telegram), SERIAL (serial data string)
Free run accuracy (all output signals):	
TCXO	Temperature stability: ± 1 ppm; Aging: typical ± 1 ppm/year
Others:	
Operating voltage	12 - 30 VDC
Power consumption	5.0 W maximum
Weight	0.4 kg approx.
Mechanical	2 circuit boards (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 8HP, 3RU

3.21 **GL**: LTC(MTD) Generator

The hardware consists of an analogue video channel, time code in/outputs, time and date reference in/outputs as well as some general purpose interfaces (GPI), which may be used for various applications.

Connections at GL module



Video input VIDEO IN:	
Format	CVBS analogue video signal: PAL 625/50, NTSC 525/60
Connector	BNC (IEC169-8), 75 Ω
Video output LOOP OUT:	
Format	Pass-through output of VIDEO IN
Connector	BNC (IEC169-8), 75 Ω
LTC output:	
Format	According to ANSI/SMPTE 12M-1-2008
Connector	Balanced signals LTC_OUT_A and LTC_OUT_B, via 2 pins of the MTD connectors (DSUB9 female and RJ45 jack)
Output impedance	< 50 Ω
Signal level, adjustable	balanced use: from –17 dBu/0,31 V_{p-p} to +13 dBu/9,8 V_{p-p} unbalanced use: from –23 dBu/0,16 V_{p-p} to +7 dBu/4,9 V_{p-p}
Free run accuracy	Standard crystal accuracy, ≈ 50 ppm (4.3 s/day)
LTC input:	
Format	According to ANSI/SMPTE 12M-1-2008
Connector	Balanced signals REF_IN_A and REF_IN_B, via 2 pins of the connector REF IN or GPI A or GPI B (RJ45 jack)
Input impedance	18 kΩ
Signal level	100 mV_{p-p} - 5 V_{p-p}, auto-ranging
Frequency	VTR LTC: 1.6 – 1000 frames/s Reference LTC: 19 - 33 frames/s
Time and date reference:	
Inputs	PPS (pulse per second), RxD (serial data string)
Outputs	Telegram (seconds impulse telegram), SERIAL (serial data string)
Others:	
Operating voltage	12 - 30 VDC
Power consumption	3.4 W maximum
Weight	0.4 kg approx.
Mechanical	2 circuit boards (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 8HP, 3RU

3.22 **GT/GI/GL**: Standard Options

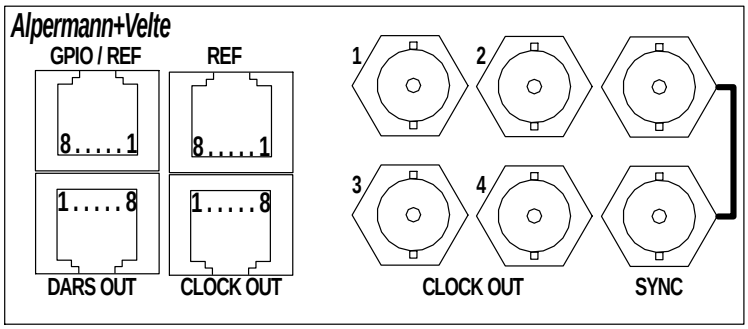
You will find detailed information in the operating manuals mentioned below.
All manuals are available at: http://www.alpermann-velte.com/serv_e/bal_e/bal_e.html.

Option	Description
-V: VITC generator for **GT**	The VITC generator inserts VITC in an analogue video. The data content will be identical to the LTC output. → Operating manual: "GT Modules".
-L: Time & date reference via external LTC for **GT** / **GL** / **GI**	With standard firmware the module accepts a time & date reference via serial data and a pulse per second (PPS). Using an external LTC instead requires this option "L". → Operating manual: "GT/GL/GI Modules Option L".
-I: Time & date reference via external IRIG-B for **GT** / **GL** / **GI**	With standard firmware the module accepts a time & date reference via serial data and a pulse per second (PPS). Using an external IRIG-B instead requires this option "L". → Operating manual: "GT/GL/GI Modules Option I".
-M: Impulse telegram output to control analogue clocks for **GT** / **GL** / **GI**	With this option a built-in distribution amplifier supplies the analogue clocks of the *Alpermann+Velte* system with power as well as with time data. The time data forms a telegram similar to the German radio time telegram DCF77. The data bits are transmitted every second except at second = 59. The time data are synchronous to the internal clock of the module. → Operating manual: "GT/GL/GI Modules Option M".
-A: Controlling MTD timers by an automation system for **GT**	With this option the module receives timer data via one or more serial interfaces. These timer data can be assigned to any MTD timer. The RS485 of the MTD system used for manual controlling the MTD timer will still be available without constraints. So each MTD timer now can be controlled manually or automatically. → Operating manual: "GT Modules Option A".

3.23 **GW**: Master Word Clock Generator

The hardware consists of four word clock outputs, a SYNC input for video or 10 MHz synchronisation, time and date reference in/outputs, as well as some general purpose interfaces (GPIO), which may be used for various applications.

Connections at GW module

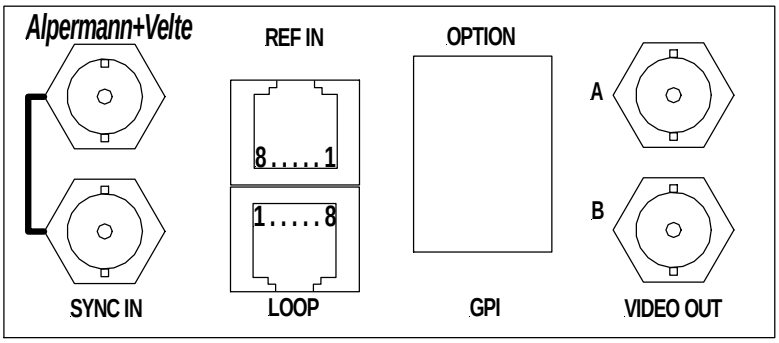


SYNC:	
Connector	BNC (IEC169-8), 75 Ω
SYNC: Signal = Video	
Format	CVBS analogue video signal: PAL 625/50, NTSC 525/60, 480i/p, 576i/p, 720p, 1080i/p, bi-level and tri-level sync signals
Signal level	1 V ± 6 dB
SYNC: Signal = 10 MHz	
Format	10 MHz, sinusoidal
Signal level	0.8 – 5.0 Vpp
4 x CLOCK OUT:	
Connector	BNC (IEC169-8), 75 Ω, in parallel to RJ45 CLOCK OUT
Output impedance	75 Ω. The output stages are capable of driving long coax cables.
Frequencies	32 kHz x 1, x 64, x 256 32/1.001 kHz x 1, x 64, x 256 44,1 kHz x 1, x 64, x 256 44,1/1.001 kHz x 1, x 64, x 256 48 kHz x 1, x 64, x 256 48/1.001 kHz x 1, x 64, x 256 96 kHz x 1, x 64
Signal level	Adjustable output level: 1.0 to 6.0 Vpp unterminated 0.5 to 3.0 Vpp @ 75 Ω
Others:	
Operating voltage	12 - 30 VDC
Power consumption	5 W maximum
Weight	0.4 kg approx.
Mechanical	2 circuit boards (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 8HP, 3RU

3.24 **GB**: Master Black Burst Generator

The hardware consists of two black burst outputs, a SYNC input for video or 10 MHz synchronisation, time and date reference in/outputs, as well as some general purpose interfaces (GPI), which may be used for various applications.

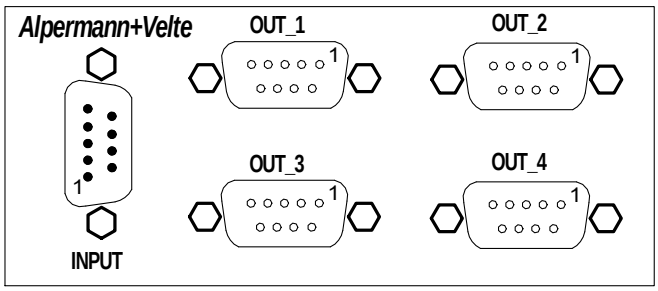
Connections at GB module



SYNC:	
Connector	BNC (IEC169-8), 75 Ω
SYNC: Signal = Video	
Format	CVBS analogue video signal: PAL 625/50, NTSC 525/60, 480i/p, 576i/p, 720p, 1080i/p, bi-level and tri-level sync signals
Signal level	1 V ± 6 dB
SYNC: Signal = 10 MHz	
Format	10 MHz, sinusoidal
Signal level	0.8 – 5.0 Vpp
2 x VIDEO OUT:	
Connector	BNC (IEC169-8), 75 Ω
Output impedance	75 Ω
Format	• PAL 625/50, with or without 8 Field Ident Pulse at line 7. • NTSC 525/60
Signal level	1 V ± 2%
8 Field Ident Pulse	Identifies the 8 field sequence in the video system PAL 625/50. Can be switched off. Level: 100% white Width: 20 µs Start: 12 µs after horizontal reference.
Others:	
Operating voltage	12 - 30 VDC
Power consumption	4 W maximum
Weight	0.4 kg approx.
Mechanical	2 circuit boards (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 8HP, 3RU

3.25 **VD**: Distribution Amplifier

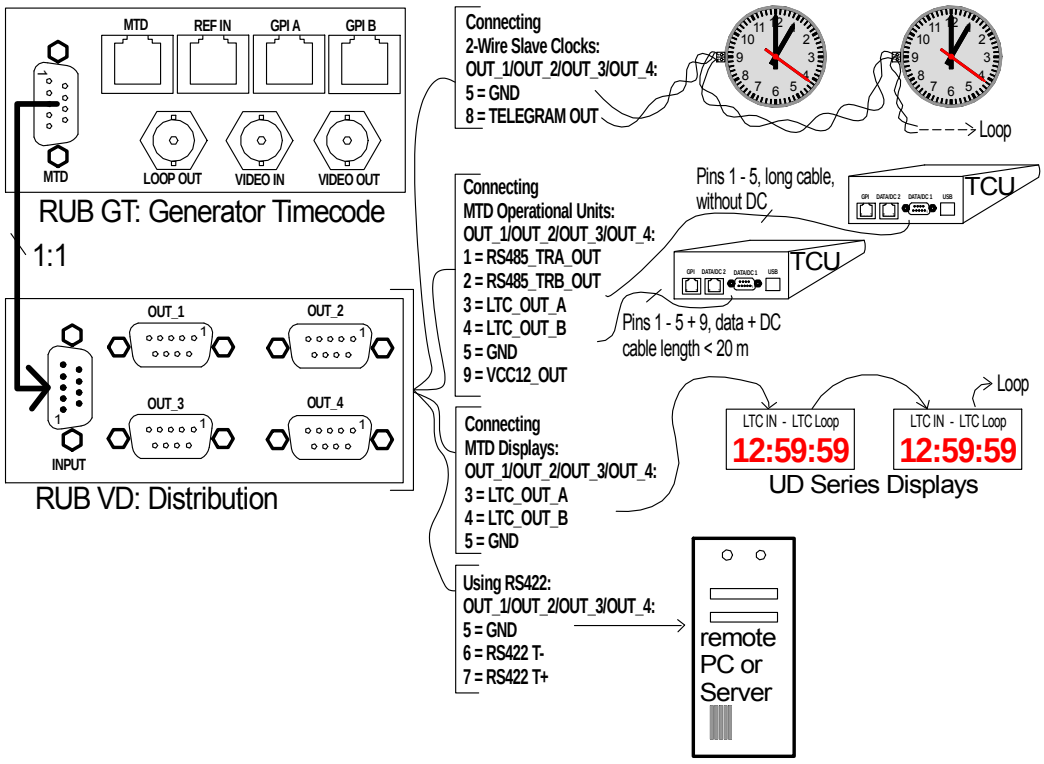
The module is a distribution and amplifier for signals which - for example - are output signals of the **MTD** connector of the **GT** module.



Pin assignment at connectors OUT_1, OUT_2, OUT_3 and OUT_4:

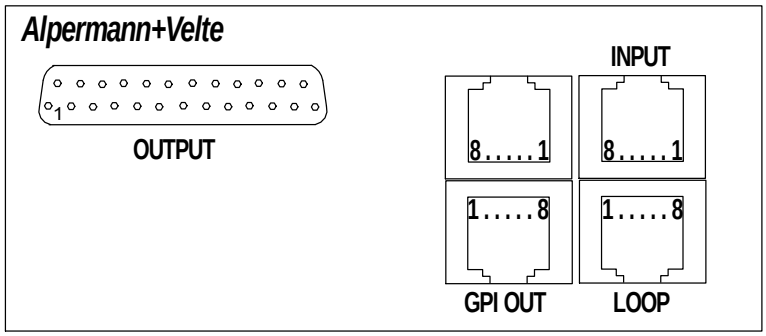
OUT_1 / OUT_2	**OUT_3 / OUT_4**
1: RS485_TRA_OUT	1: RS485_TRA_OUT
2: RS485_TRB_OUT or RS232 TxD	2: RS485_TRB_OUT
3: LTC_OUT_A	3: LTC_OUT_A
4: LTC_OUT_B	4: LTC_OUT_B
5: GND	5: GND
6: RS422 T-	6: RS422 T-
7: RS422 T+	7: RS422 T+
8: TELEGRAM OUT	8: TELEGRAM OUT
9: VCC12_OUT	9: VCC12_OUT

Connection Example:



3.26 **VI**: LTC or IRIG Distribution Amplifier

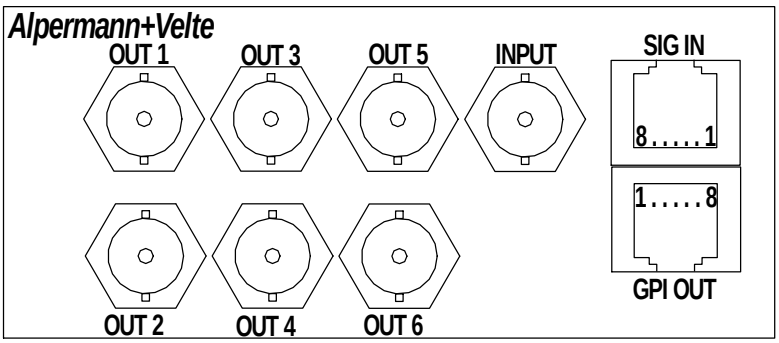
This module distributes and amplifies one input to six LTC (EBU/SMPTE) or IRIG time code outputs. A seventh spare output stage together with a change-over relay at each of the six outputs enables complete redundant output signals. Each output stage is monitored for signal failures. Alarm outputs are available: GPIs, lamps, LEDs and SNMP traps.



LTC input:	
Format	According to ANSI/SMPTE 12M-1-2008, balanced signals
Input impedance	18 kΩ
Signal level	100 mV_{p-p} - 5 V_{p-p}, auto-ranging
Frequency	19 - 33 frames/s
IRIG input:	
Format	IRIG-B123 according to IRIG STANDARD 200-98, amplitude modulated carrier signal with 1 kHz carrier frequency, balanced signals
Input impedance	18 kΩ
Signal level	100 mV_{p-p} - 5 V_{p-p}, auto-ranging
LTC or IRIG output:	
Format	According to signal input, balanced Signals
Output impedance	< 50 Ω
Gain	1 ± 1%
GPI_1 to GPI_7 outputs, indicating failures:	
Output specification	Open Collector output of a NPN Darlington transistor. Max. power dissipation: 200 mW.
"High" state	"High" state: external pull-up needed to a positive power source of less than or equal to 30 VDC, typically 1 kΩ when connected to an external +5 VDC power source.
"Low" state	"Low" state: output switched to GND. Maximum collector current = 200 mA DC, not fused. Collector-emitter saturation voltage: @100mA: typ. 0.9 V (≤ 1.1 V).
Others:	
Operating voltage	12 - 30 VDC
Power consumption	1.6 W maximum (GPI_1 – GPI_7 unconnected)
Weight	0.5 kg approx.
Mechanical	2 circuit boards (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 8HP, 3RU

3.27 **VM**: Continuous Wave Distribution Amplifier

This module distributes and amplifies one continuous wave input to six outputs. A seventh spare output stage together with a change-over relay at each of the six outputs enables complete redundant output signals. Each output stage is monitored for signal failures. Alarm outputs are available as SNMP, GPI, LEDs and lamps.

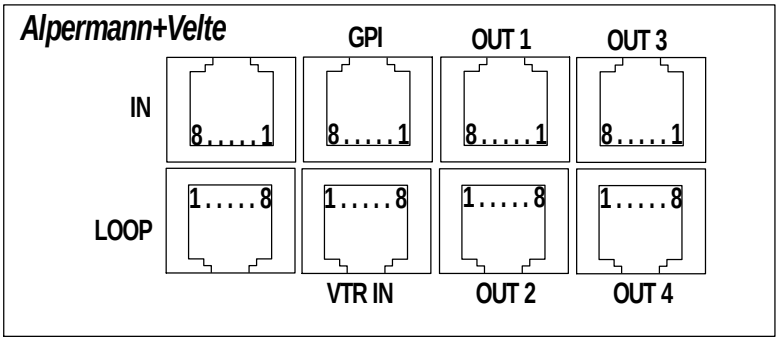


Signal input:	
Connector	BNC (IEC169-8), 75 Ω
DC range	± 5 V
Input impedance	75 Ω
Signal specifications	Frequency range: 10 MHz ± 5%, Amplitude range: 0.2 – 2.5 Vpp signal input at 75 Ω
Signal outputs:	
Connector	BNC (IEC169-8), 75 Ω
Output impedance	75 Ω
Gain	1 ± 1%
GPI_1 to GPI_7 outputs, indicating failures:	
Output specification	Open Collector output of a NPN Darlington transistor. Max. power dissipation: 200 mW.
"High" state	"High" state: External pull-up needed to a positive power source of less than or equal to 30 VDC, typically 1 kΩ when connected to an external +5 VDC power source.
"Low" state	"Low" state: Output switched to GND. Maximum collector current = 200 mA DC, not fused. Collector-emitter saturation voltage: @100 mA: typ. 0.9 V (≤ 1.1 V).
Others:	
Operating voltage	12 - 30 VDC
Power consumption	1.6 W maximum (GPI_1 – GPI_7 unconnected)
Weight	0.5 kg approx.
Mechanical	2 circuit boards (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 8HP, 3RU

3.28 **VL**: LTC Distribution and Converter Module

The VL module is a signal distribution and amplifier with two separate LTC readers and four independent LTC generators, four RS232 and RS4222 outputs and four output stages for impulse telegrams. All output signals are phase-locked to the LTC reference input.

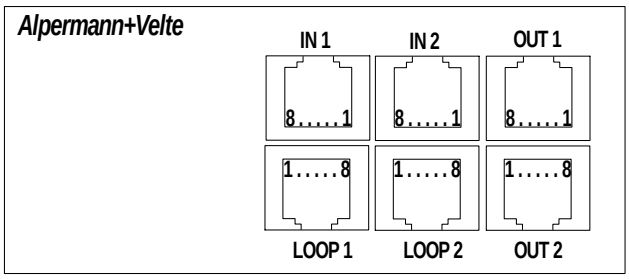
LTC time and user (binary groups) can be read, processed and converted. The independent outputs can be set up individually and can generate the processed/converted input data with various output formats. For example the Alpermann+Velte LTC(MTD) can be decoded and converted to various output formats, so that external devices can display the individual stop timers or time zone data. Impulse telegram outputs are available to control Alpermann+Velte analogue clocks.



LTC input:	
Format	according to ANSI/SMPTE 12M-1-2008, balanced
Signal level	100 mV_{p-p} - 5 V_{p-p}, auto-ranging
Frequency	Reference LTC:19 - 33 frames/s; VTR LTC: 1.6 - 2500 frames/s
LTC outputs:	
Output impedance	< 50 Ω
Signal level	adjustable: balanced use: from –17 dBu/0,31 V_{p-p} to +13 dBu/9,8 V_{p-p} unbalanced use: from –23 dBu/0,16 V_{p-p} to +7 dBu/4,9 V_{p-p}
Serial outputs:	
RS422	according to TIA/EIA-422 standard, 2400 to 115200 bps
RS232	according to EIA/TIA-232 standard, 2400 to 115200 bps
Impulse outputs:	
Format	12 V impulse telegram output used to control analogue clocks of the Alpermann+Velte MTD system
Others:	
Operating voltage	15 - 30 VDC
Power consumption	3.0 W maximum (without load at the VCC12_OUT pins)
Weight	0.4 kg approx.
Mechanical	2 circuit boards (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 8HP, 3RU

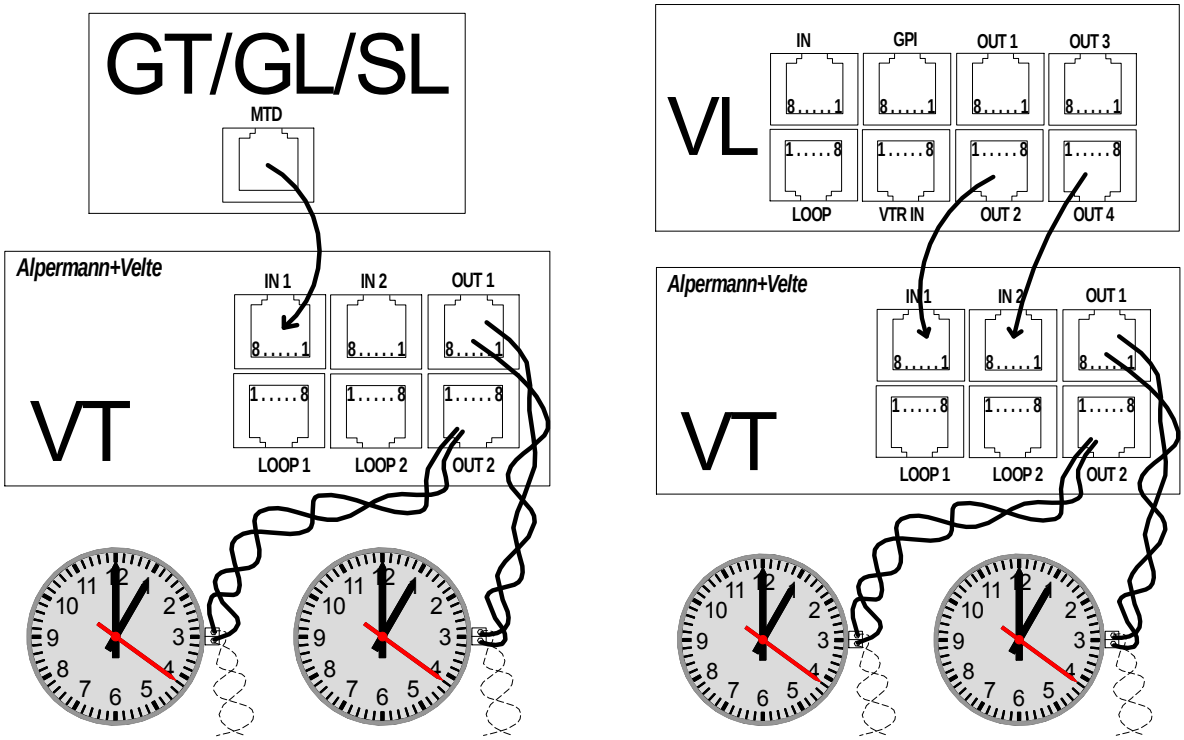
3.29 **VT**: Telegram Distribution Amplifier

This module is a distribution and amplifier for a time telegram signal used to control Alpermann+Velte analogue slave clocks with a 2-wire interface. Two output stages are available, each current limited to 800 mA. A maximum of 80 slave clocks of type "MTD Clock" or 8 slave clocks of type SC306T can be connected to each output stage.



A switch inside the module allows the selection between distributing the IN1 signal to both outputs or distributing IN1 to OUT1 and IN2 to OUT2. This way it is possible to directly connect to a GT or GL or SL module (with the same time zone for all connected analogue clocks) as well as to connect to different outputs of the VL module which then may have different time zones.

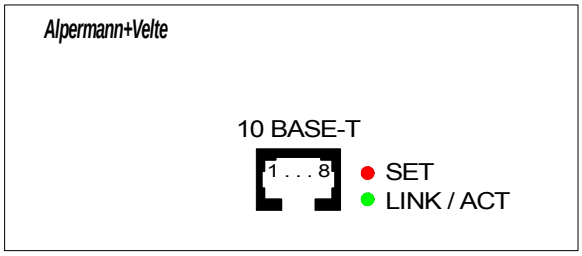
Connection Example:



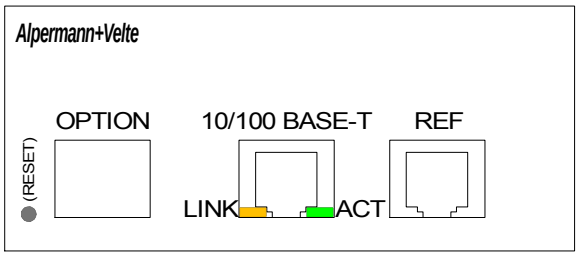
3.30 **IE**: Interface Ethernet

The Alpermann+Velte Rubidium series "IE" module is a stand alone Ethernet "mini server". This unit makes an access to all connected "RUB" modules possible (via our internal bus connections "TC_link"), thus enabling a configuration of the modules as well as to open a status monitor. Option "S" includes SNMP functionality. Option "N" includes an NTP time server, so any reference time base present on the "TC_link" internal bus (for example from a real-time time code generator or a GPS receiver) can be used as a real time source for the built-in NTP Time server.

Rear of RUB1 IE – version 1



Rear of RUB1 IE – version 2



Operating voltage	12 - 30 VDC
Power consumption	Version 1: ≤ 2.7 W Version 2: ≤ 1.8 W
Weight	0.3 kg approx.
Mechanical	Circuit board (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 4HP, 3RU
Ethernet connector	Version 1: RJ45 10 BASE-T Version 2: RJ45 10/100 BASE-T

Available options:

IE-C NTP Client: The IE module communicates via Ethernet with an NTP server, receives a time & date reference, and synchronizes this way RUBIDIUM modules.

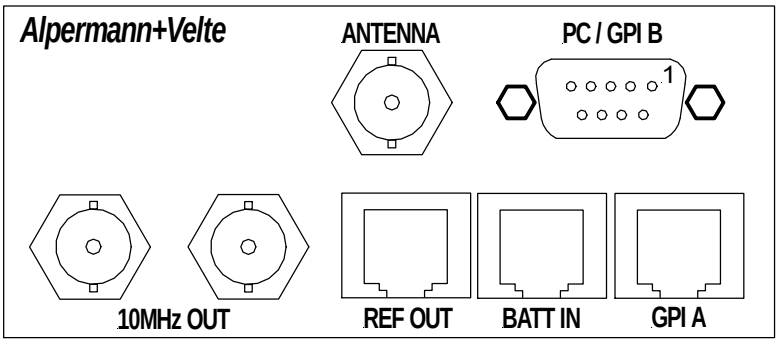
IE-M MTDoE: The IE module communicates via Ethernet with MTDoE devices like displays, studio clocks, and MTD control units. It transfers a time & date reference and MTD data received via TC_link from an MTD generator.

IE-N NTP Server: The IE module becomes a time & date reference for other devices in this network.

IE-S SNMP Agent: The IE module can be used as an SNMP Network Element. You can easily monitor and control the RUBIDIUM system using centralized network management software.

3.31 **GPS 10 MHz**: GPS Satellite Receiver

This module generates GPS disciplined frequencies and a time & date reference. It is an ideal solution for synchronization tasks.

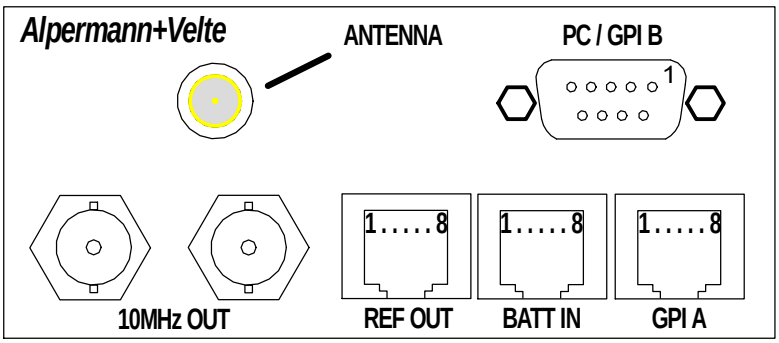


rear1_09

ANTENNA:				
Connector	BNC, 50 Ω, isolated			
Type of antenna	Remote powered antenna/converter unit, up to 250 m antenna cable RG58.			
10 MHz OUT:				
Format	Sinusoidal continuous wave, 350 mV_{RMS} (≈1 Vpp) @ 75 Ω			
Connector	BNC (IEC169-8), 75 Ω (50 Ω on request)			
REF OUT (RJ 45):				
PPS	Pulse per second, TTL, pulse width 200 ms			
TXD	Time and date serial telegram, Meinberg Standard, RS232			
BATT IN (RJ 45):				
Back-Up Power	12 to 30 VDC input			
GPI A (RJ 45):				
GPI_1 – GPI_4	General Purpose Interface, programmable outputs.			
PC (DSUB9F female):				
TXD, RXD	RS232 Interface			
Oscillator options:				
	LQ: Standard	MQ: Medium Quality	HQ: High Quality	
Short term stability	$\pm 1 \cdot 10^{-9}$	$\pm 2 \cdot 10^{-10}$	$\pm 5 \cdot 10^{-12}$	
PPS accuracy	< ±250 ns	< ±100 ns	< ±100 ns	
Accuracy free run one day	$\pm 2 \cdot 10^{-8}$	$\pm 1.5 \cdot 10^{-9}$	$\pm 5 \cdot 10^{-10}$	
Others:				
Operating voltage	12 to 30 V DC			
Power consumption	Dependent on oscillator option:	LQ	MQ	HQ
	Warm-up:	6.3 W	7.9 W	7.9 W
	Normal operating mode:	5.1 W	5.9 W	5.9 W
Weight	0.3 kg approx.			
Mechanical	Standard circuit board (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 8HP, 3RU			

3.32 **GLS 10 MHz**: GLONASS/GPS Satellite Receiver

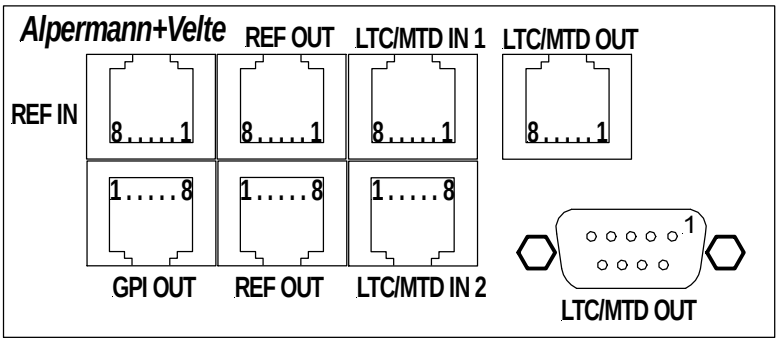
This is a combined GLONASS/GPS receiver. This module generates frequencies and time & date reference signals disciplined by the satellites. It is an ideal solution for synchronization tasks.



ANTENNA:			
Connector	SMA female (jack)		
Type of antenna	Remote powered active antenna: ANTGLP: low profile antenna, h = 16 mm, antenna cable 5 m ANTG: antenna with integrated lightning protection, cable 20 m		
10 MHz OUT:			
Format	Sinusoidal continuous wave, 350 mV_{RMS} (≈1 Vpp) @ 75 Ω		
Connector	BNC (IEC169-8), 75 Ω (50 Ω on request)		
REF OUT (RJ 45):			
PPS	Pulse per second, TTL, pulse width 200 ms		
TXD	Time and date serial telegram, Meinberg Standard, RS232		
BATT IN (RJ 45):			
Back-Up Power	12 to 30 VDC input		
GPI A (RJ 45):			
GPI_1 – GPI_4	General Purpose Interface, programmable outputs.		
PC (DSUB9F female):			
TXD, RXD	RS232 Interface		
Oscillator options:	TCXO: Standard	MQ: Medium Quality	HQ: High Quality
Short term stability	$\pm 2 \cdot 10^{-9}$	$\pm 2 \cdot 10^{-10}$	$\pm 5 \cdot 10^{-12}$
PPS accuracy	< ±250 ns	< ±100 ns	< ±100 ns
Accuracy free run one day	$\pm 1 \cdot 10^{-7}$	$\pm 1.5 \cdot 10^{-9}$	$\pm 5 \cdot 10^{-10}$
Others:			
Operating voltage	12 to 30 V DC		
Power consumption	Dependent on oscillator option: TCXO MQ HQ Warm-up: 5.9 W 8.2 W 8.2 W Normal operating mode: 5.4 W 6.2 W 6.2 W		
Mechanical	Standard circuit board (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 8HP, 3RU		

3.33 **SL**: LTC Monitoring and Changeover Unit

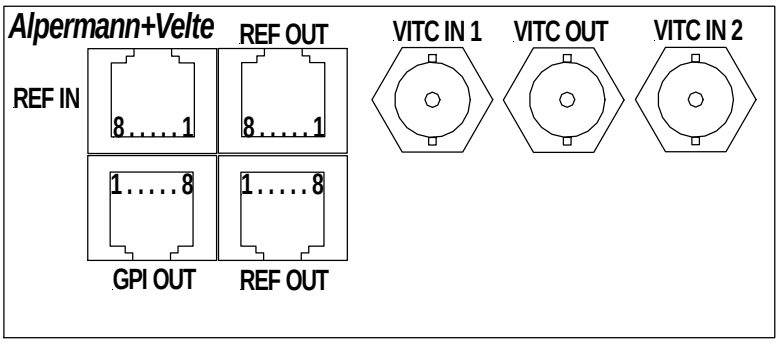
This module can frame accurate and in real-time compare and contrast two incoming LTCs for indescribable differences. In the event of a failure, "SL" automatically switches to the other faultless source. The SL module is a must for all time code systems where failure proof LTC is a requirement. This includes real-time and MTD Time Timer Timecode applications. Additionally, it monitors LTC and reference errors, LTC/LTC and LTC/reference differences, and it makes status information about all sources available.



LTC/MTD IN (2 x RJ45):	
RS485	Balanced in- or outputs of a RS485 serial interface
LTC IN	Format: ANSI/SMPTE 12M-1-2008, balanced Signal level: 100 mV_{p-p} - 5 V_{p-p}, auto-ranging Input impedance: 18 kΩ Frequency: 19 - 33 frames/s
SERIAL IN	Serial time & date data string
TELEGRAM IN	Impulse telegram
LTC/MTD OUT (RJ45 and DSUB9F):	
RS485	RS485 serial interface, hard-wired with signals at LTC/MTD IN
LTC OUT	Balanced LTC output, switched via relay to one input
SERIAL OUT	Serial time & date data string, switched via relay to one input
TELEGRAM OUT	Impulse telegram, switched via relay to one input
REF IN (RJ45):	
PPS IN	Pulse per second, input
RXD IN	Reference time & date input, serial data string
REF OUT (2 x RJ45):	
PPS OUT	Pulse per second output, hard-wired with signal at REF IN
TXD OUT	Reference time & date output, hard-wired with signal at REF IN
GPI OUT (RJ45):	
FAIL	Failure signals
WARNING	Warning signals
Others:	
Operating voltage	12 - 30 V DC
Power consumption	1.5 W maximum
Weight	0.3 kg approx.
Mechanical	Standard circuit board (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 8HP, 3RU

3.34 **SV**: VITC Monitoring and Changeover Unit

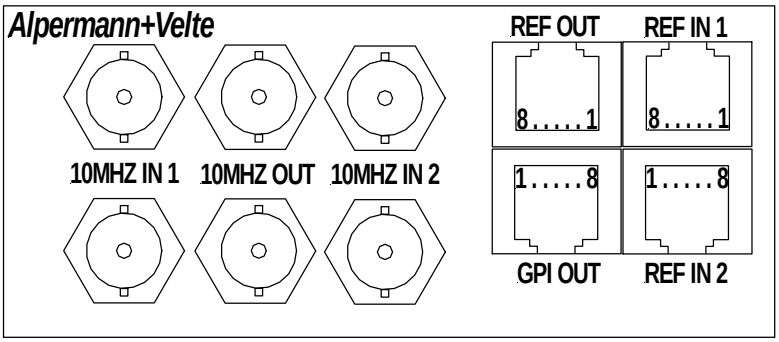
This module can frame accurate and in real-time compare and contrast two incoming VITCs for indescribable differences. In the event of a failure, "SV" automatically switches to the other faultless source. The SV module is a must for all time code systems where failure proof VITC is a requirement. This includes real-time applications. Additionally, it monitors VITC, video and reference errors, VITC/VITC and VITC/reference differences, and it makes status information about all sources available.



VITC IN (2 x BNC):	
Video format	CVBS analogue video signal: PAL 625/50, NTSC 525/60
Signal level	1 V ± 6 dB at 75 Ω
VITC	According to ANSI/SMPTE 12M-1-2008
VITC OUT (BNC):	
Video/VITC	VITC output, switched via relay to one input
REF IN (RJ45):	
PPS IN	Pulse per second, input
RXD IN	Reference time & date input, serial data string
REF OUT (2 x RJ45):	
PPS OUT	Pulse per second output, hard-wired with signal at REF IN
TXD OUT	Reference time & date output, hard-wired with signal at REF IN
GPI OUT (RJ45):	
FAIL	Failure signals
WARNING	Warning signals
Others:	
Operating voltage	12 - 30 V DC
Power consumption	1.5 W maximum
Weight	0.3 kg approx.
Mechanical	Standard circuit board (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 8HP, 3RU

3.35 **SR**: Reference Monitoring and Changeover Unit

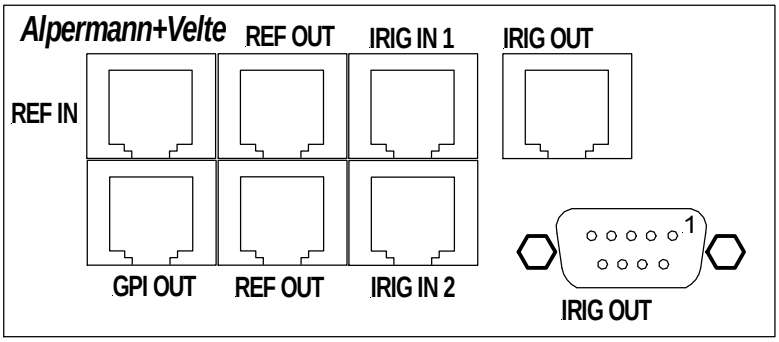
This module can compare and contrast two incoming reference signals for indescribable differences. In the event of a failure, "SR" automatically switches to the other faultless source. The SR module is a must for all real time reference systems where failure proof timing and synchronisation signals are required. Additionally, it monitors the source signals for errors and phase differences, and it makes status information about all sources available.



10 MHz IN (4 x BNC):	
10 MHz DC range	± 5 V
Input impedance	2 kΩ
Signal specifications	Frequency range: 10 MHz ± 5%, amplitude range: 0.6 – 2.5 Vpp
10 MHz OUT (2 x BNC):	
Signal	10 MHz output, switched via relay to one input
REF IN (2 x RJ45):	
PPS IN	Pulse per second, input
RXD IN	Reference time & date input, serial data string
REF OUT (RJ45):	
PPS OUT	Pulse per second output, switched via relay to one input
TXD OUT	Reference time & date output, switched via relay to one input
GPI OUT (RJ45):	
FAIL	Failure signals
WARNING	Warning signals
Others:	
Operating voltage	12 - 30 V DC
Power consumption	1.5 W maximum
Weight	0.4 kg approx.
Mechanical	Standard circuit board (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 8HP, 3RU

3.36 **SI**: IRIG Monitoring and Changeover Unit

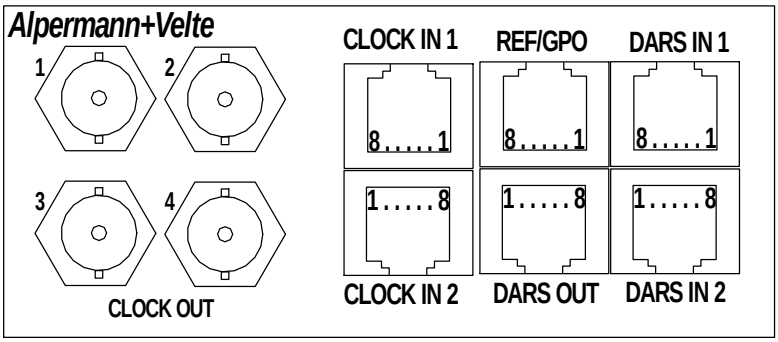
This module can frame accurate and in real-time compare and contrast two incoming IRIG time code signals for indescribable differences. In the event of a failure, "SI" automatically switches to the other faultless source. The SI module is a must for all time code systems where failure proof IRIG is a requirement. This includes real-time applications. Additionally, it monitors IRIG and reference errors, IRIG/ IRIG and IRIG /reference differences, and it makes status information about all sources available.



IRIG IN (2 x RJ45):	
IRIG IN	Format: IRIG-B123 according to IRIG STANDARD 200-98, amplitude modulated carrier signal with 1 kHz carrier frequency, balanced signals Signal level: 100 mV_{p-p} - 5 V_{p-p}, auto-ranging Input impedance: 18 kΩ
SERIAL IN	Serial time & date data string
TELEGRAM IN	Impulse telegram
IRIG OUT (RJ45 and DSUB9F):	
IRIG OUT	Balanced IRIG output, switched via relay to one input
SERIAL OUT	Serial time & date data string, switched via relay to one input
TELEGRAM OUT	Impulse telegram, switched via relay to one input
REF IN (RJ45):	
PPS IN	Pulse per second, input
RXD IN	Reference time & date input, serial data string
REF OUT (2 x RJ45):	
PPS OUT	Pulse per second output, hard-wired with signal at REF IN
TXD OUT	Reference time & date output, hard-wired with signal at REF IN
GPI OUT (RJ45):	
FAIL	Failure signals
WARNING	Warning signals
Others:	
Operating voltage	12 - 30 V DC
Power consumption	1.5 W maximum
Weight	0.3 kg approx.
Mechanical	Standard circuit board (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 8HP, 3RU

3.37 **SW**: Word Clock Monitoring and Changeover Unit

This module can supervise and analyse incoming Word Clock signals of two sources. Each source can deliver up to four different Word Clock signals. In the event of a failure of one source, "SW" automatically switches to the other faultless source. The "SW" module is a must for all Word Clock systems set-ups where a failure proof and redundant Word Clock is a requirement. Additionally it offers a status monitor indicating errors, failures, and status of all incoming signals.

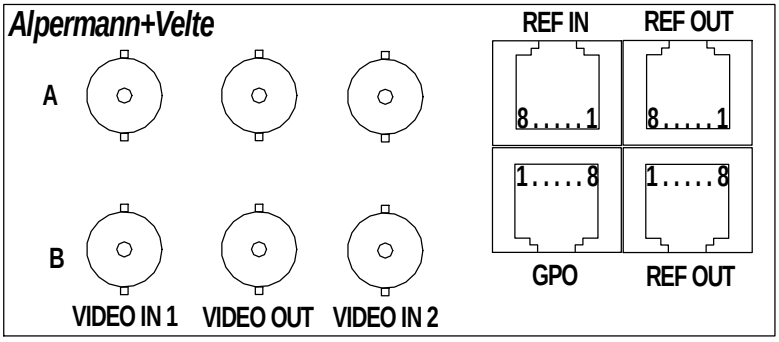


CLOCK IN (2 x RJ45):	
Connector	RJ45 – suited for direct connection to CLOCK OUT of RUB GW
Signal	4 word clock signals each RJ45
Input impedance	≈ 22 kΩ @ 48 kHz
Signal level	0.5 Vpp to 6.0 Vpp
Frequency	32 kHz to 256 x 48 kHz
4 x CLOCK OUT:	
Connector	BNC (IEC169-8), 75 Ω
Signal	Looped-through via relay from CLOCK IN 1 or 2
REF/GPO:	
Connector	RJ45
PPS IN	Pulse per second, input
RXD IN	Reference time & date input, serial data string
GPO_1 ... GPO_4	Open Collector outputs of NPN Darlington transistors
Others:	
Operating voltage	12 - 30 V DC
Power consumption	2.1 W maximum
Weight	0.4 kg approx.
Mechanical	Standard circuit board (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 8HP, 3RU

3.38 **SB**: Analogue Video Monitoring and Changeover

SB monitors and analyses two sources of video sync signals. Each source can deliver one signal or two signals of type black burst or tri-level, even with mixed types. If a signal contains VITC, this time code will be monitored and analysed as well. Both sources should deliver identical signals. In the event of a failure, SB automatically switches to the other faultless source. This automatic mode can be disabled. Manual changeover is possible likewise.

If signals of a real-time reference are connected, real-time requirements can be checked as well.



VIDEO (BNC IEC169-8, 75 Ω)	
Video format	Composite analogue video signal: PAL 625/50, NTSC 525/60, 576i/p, 480i/p, 720p, 1080i/p, bi-Level and tri-level sync signals.

Pin assignment		
REF IN RJ45 jack	REF OUT 2 x RJ45 jack	GPO RJ45 jack
1: PPS IN 2: RXD IN 3: Opt_IN 4: GND 5: VCC24G_OUT 6: 10 MHz IN 7: GND IN 8: VCC5G_OUT	1: PPS OUT 2: TXD OUT 3: Opt_OUT 4: GND 5: VCC24G_IN 6: n.c. 7: GND OUT 8: VCC5G_IN	1: GND 2: GPO_1 5: GPO_3 6: GPO_2 8: GPO_4 3: XCP 4: XCC 7: XCS

General technical data	
Operating voltage	12 - 30 VDC
Power consumption	1.5 W maximum
Weight	0.3 kg approx.
Mechanical	Standard circuit board (W x D): 100 x 160 mm / 3.94 x 6.30 inch Rear panel: RUB H1: 103 x 44 mm / 4.06 x 1.73 inch RUB H3: 8HP, 3RU

4 Software Tools for RUBIDIUM SERIES

4.1 The RUBIDIUM CONFIGURATION PC Program

4.1.1 Overview

The „RUBIDIUM CONFIGURATION" PC program was developed so that users have a uniform and easy set-up of all configurable hardware modules.

Uniform: Although the modules hardware and applications vary, one simple to use program can configure all available RUB modules.

Easy: The RUBIDIUM CONFIGURATION program identifies the module and displays only the functions, which are available to this module.

RUBIDIUM CONFIGURATION is a Windows application (Windows 2000/XP/Vista/2008/7).

4.1.2 Installation

The following software is included on the supplied CD ("Service" – "Software and Updates") or can be downloaded from the service section of our web site
(http://www.alpermann-velte.com/serv_e/software_e/software_e.html):

- **Rubidium Configuration and Status Monitor PC Programs**
- **USB Driver for Rubidium and TCU**

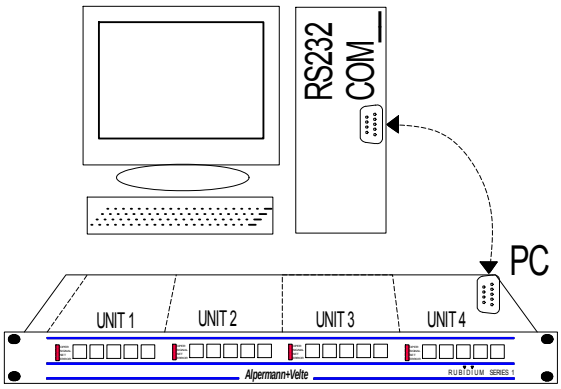
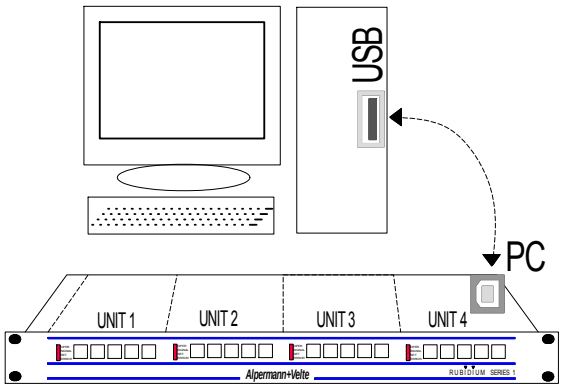
Please copy and extract this software on your computer – maybe into a RUBIDIUM directory.

If the PC interface at the Rubidium chassis uses the USB standard, please proceed as follows for your first installation:

- Use a standard A–B USB cable to connect the PC connector at the Rubidium chassis with a USB port at your computer.
- Switch on the Rubidium device and your computer.
- The operating system will automatically notice that a new USB device has been connected. It will request for a driver. The driver can be found on the CD or in the directory where you copied the Rubidium software.

4.1.3 Connection to RUBIDIUM SERIES Chassis

The RUBIDIUM CONFIGURATION program uses either a RS232 serial interface or a USB interface in order to communicate with a module. The **PC** connector at the Rubidium chassis determines the kind of this interface.

RS232	USB
	
The connection must be made with a 1:1 DSUB9 male to female extension cord, between a PC's RS 232 serial port (COM...) and the **PC** connector on the RUBIDIUM SERIES chassis. If the Rubidium's **PC** connector is being used for other applications, temporarily disconnect this cable while using this set-up program.	Use a common "Type A to Type B" cable to connect the **PC** connector on the RUBIDIUM SERIES chassis to an USB port at your computer.

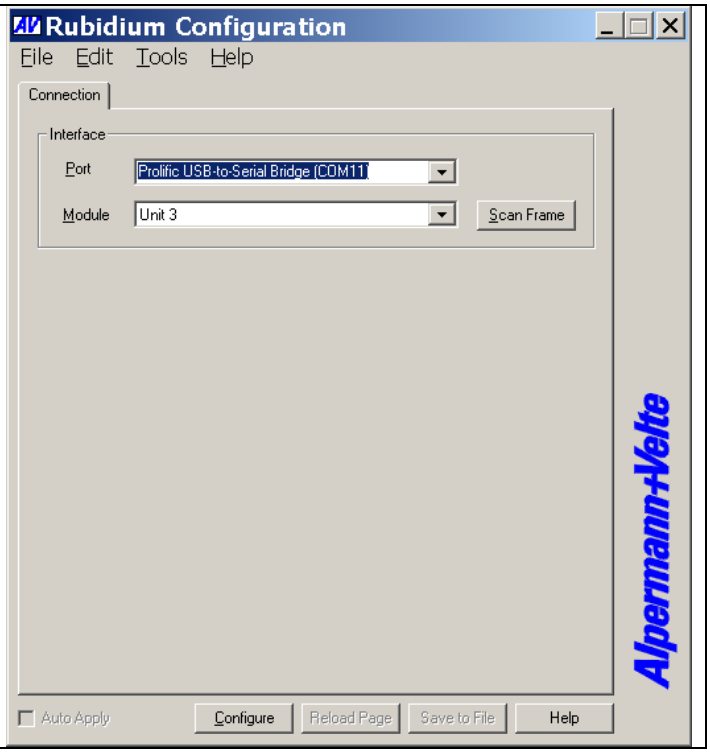
Now turn on the power of the Rubidium modules and start the **Rubidium Config.exe** program on your PC.

A communication can be established to a single module only. Please select the module that you would like to configure by choosing unit 1 (= located most left front view) up to unit 4 (RUB1 chassis) or up to unit 21 (RUB3 chassis).

4.1.4 Starting the Program

Double-clicking **Rubidium Config.exe** will start the program.

The upper menu bar, the "Connection" tab, and the lower buttons will be available now.



Interface

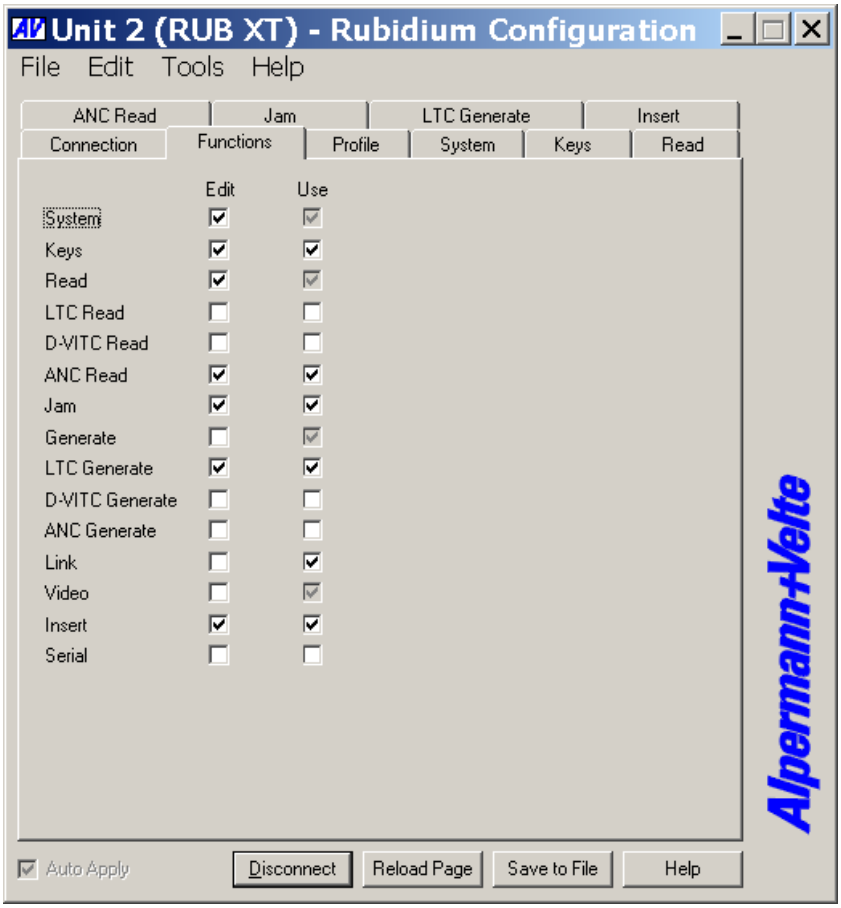
Port	The recently selected port will be shown. If this does not match the port to which the Rubidium housing is connected to, you have to select the port. Opening the drop-down list will list all ports which are available. Likewise it is possible to manually type in a port description. If the USB interface is used, the drop-down list shows the USB device with an identification code. This code includes the type of chassis, e.g.:  The following chassis are presently available: D1, H1, H3, S1, T1.
Module	Please select the module that you would like to configure, according to module's position (front view - left to right): Unit 1 to Unit 4 in case of a RUB1 chassis, Unit 1 to Unit 21 in case of a RUB3 chassis. The position "Service" is reserved for service purposes only.
Scan Frame	Click this button to start the "Scan Frame" procedure: The program automatically searches for configurable hardware modules; all modules found will then be shown at the drop-down list. Now you can easily click on the module that you would like to configure.

Next step:

- either click button **Configure** to verify or change the set-up of the selected module;
- or select a function out of the upper menu bar. It is not necessary to have the connection to a module established.

4.1.5 Overview of Tab Functions

The program RUBIDIUM CONFIGURATION works with tab cards. With one click on button **Configure** all those tabs will be displayed which are presently enabled for the selected module. Click on the **Functions** tab to see all available tabs in a list. At the "Functions" tab, you can enable and disable all tabs which are available for the selected module. Example:



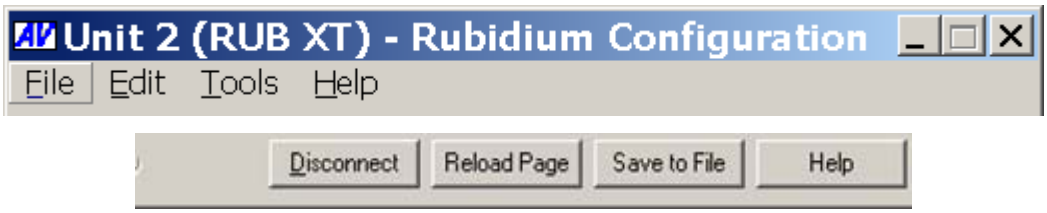
A tab reflects a function of the module. The columns **Edit** and **Use** determine whether the function in the module is activated or deactivated, and whether a set-up of that specific function is allowed or not.

Click on the applicable **Edit** and/or **Use** check-boxes to activate/deactivate a function:

Edit	**Use**	
		Function is deactivated, the tab is not visible.
√	√	Function is activated, the tab is visible, and set-up is possible.
	√	Function is activated but the tab not visible, and therefore it is currently not possible to change the set-up.

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

4.1.6 Store a Set-Up to a File, Load and Update the Set-Up of a Module



Button **Save** or select **Save** or **Save as...** at the "File" menu:

- Store the set-up as it is presented by the RUBIDIUM CONFIGURATION PC program to a new file ("Save as...") or to an existing file ("Save") at your PC. This may be helpful because ...
  - You just want to save the set-up.
  - There are several identical modules which should receive the same set-up. You can do a set-up once, and then transfer this set-up to other modules – see below.
  - There is a problem and you need help. Please contact Alpermann+Velte and send the set-up via email. Alpermann+Velte can check this set-up, and can do some tests with identical modules.

Open... at the "File" menu:

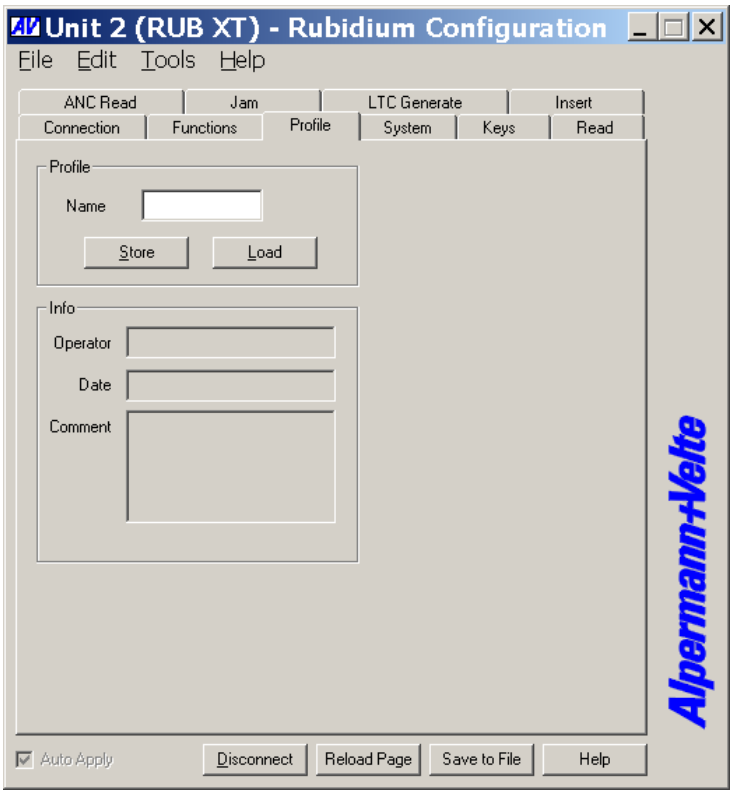
- It is possible to transfer a complete set-up stored in a file to the module. If you want to verify and change this set-up click on button **Configure** or – if a connection already is established – click button **Reload Page** for an update.

Button **Reload Page**:

- It is possible to transfer the current set-up of the module to the RUBIDIUM CONFIGURATION program, so all tabs receive an update. This is done automatically if a connection to the module has been established clicking button **Configure**.

  If a module has keys or GPIs with a "Load Profile" function (see description of the tab "Keys" in module's operating manual), the **Reload Page** button shows you the current configuration after a "Load Profile" key/GPI has been pressed.

4.1.7 The “Profile” Tab: Store and Load a Complete Set-Up on the Module

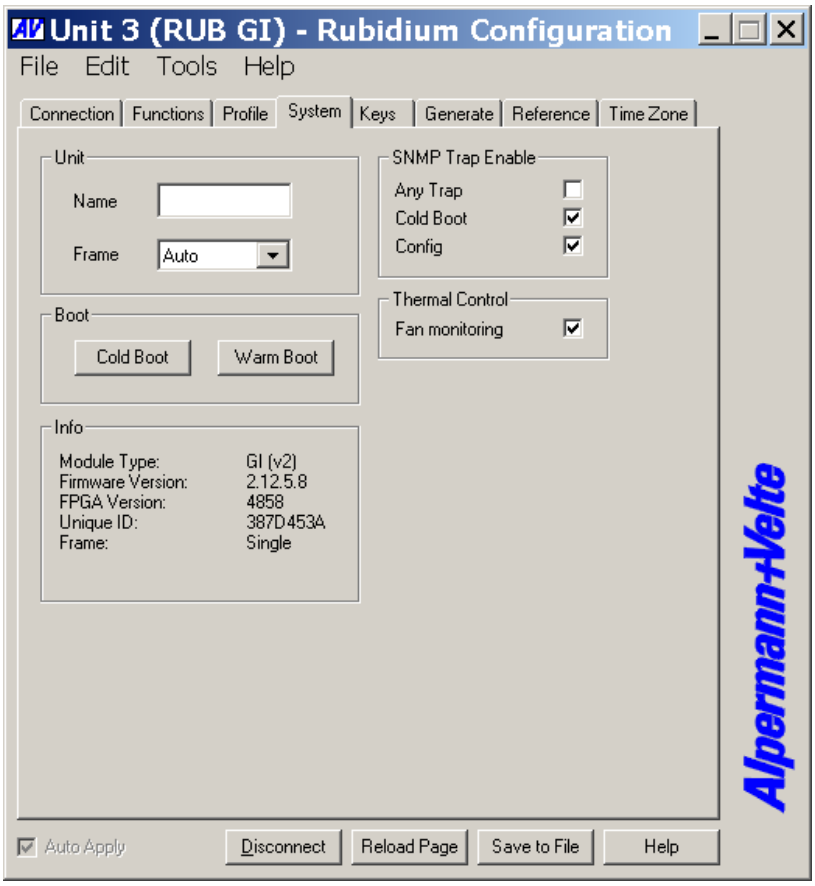


Standard modules have a flash memory to store different set-ups. A complete set-up stored to the module is called a “profile”. You can identify different profiles by a number or a name. If a module has one or more keys or GPI programmed with “Load Profile“ function, you can change the current set-up during normal operation and without using the PC program.

Profile

Name	If you want you can enter a name to identify the profile.
Store	A click on this button opens the “Store Profile“ window. Select a number or a name from the “Profile“ drop-down list, if you want you can add more information at the “Info” field, then click on the “ok“ button to store the set-up. Now the complete set-up of the module will be stored to internal memory of the module.
Load	A click on this button opens the “Load Profile“ window. Select a number or a name from the “Profile“ drop-down list, then click on the “ok“ button to load the profile. This will interrupt the operating mode of the module. The current set-up of the module will be replaced. The new set-up of the module will be automatically transferred to the PC program (automatic “Reload”), now you can verify and check this set-up. Selecting “Factory Settings“ from the “Profile“ drop-down list sets the module in the default state.

4.1.8 The "System" Tab: Module Identification, Reset, SNMP, Fan Control



Unit

Name	The connected module can get a name. You may enter, change or verify this name at this window. After a change press the **tabulator key** at the PC's keyboard.
Frame	Frame denotes the (RUB1 or RUB3) chassis. The window shows "Single" if only one frame is connected. If a system is built-up of more than one frame you need the module's position in the frame as well as the number of the frame to uniquely identify a module in an Ethernet network. In this case the frame's number will be stored on the module and is shown at this window. You can change this number if necessary – e.g. if modules have been exchanged. If you select "Auto" the module will request the frame number – which is set by the rotary switch placed on the fan module - automatically.

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:

- type of module,
- firmware versions,
- options - if there is any installed.

SNMP Trap Enable

Click "Any Trap" to enable the SNMP feature. If this check box is not activated, no SNMP trap will be generated.

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

Thermal Control

One module of each frame should be responsible for a fan module initialisation and monitoring. At the same time this module monitors the power supplies of this frame.

Click "Fan monitoring" to enable these features.

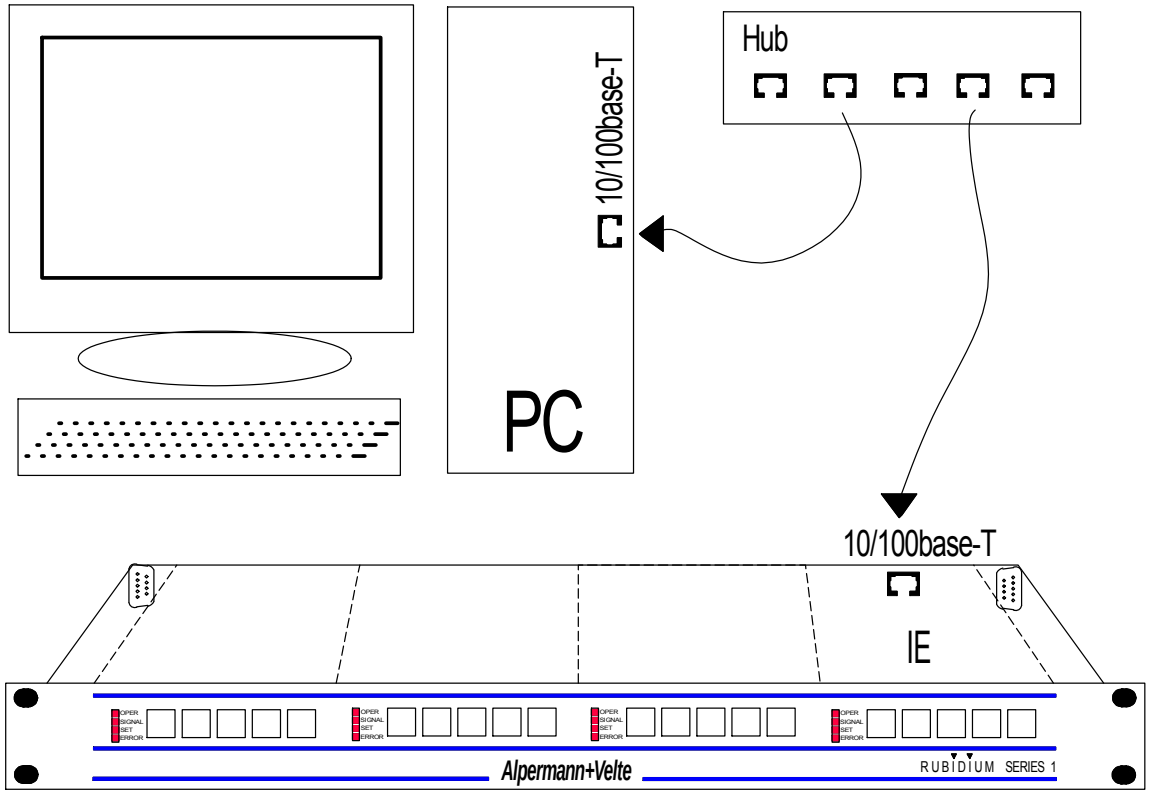
4.2 The RUBIDIUM SERIES HTTP Server

4.2.1 Overview, Connecting the IE Module

The RUBIDIUM SERIES HTTP server was developed so that users have a uniform and easy set-up of all configurable hardware modules.

The HTTP server is located in the **IE** module and can be accessed via 10/100base-T Ethernet and a web-browser.

- The **IE** module has a RJ45 connector for Ethernet interface. Connect a straight CAT5 cable if you use a hub or a switch. Use a crossover cable if you connect to the Ethernet card of your computer directly.

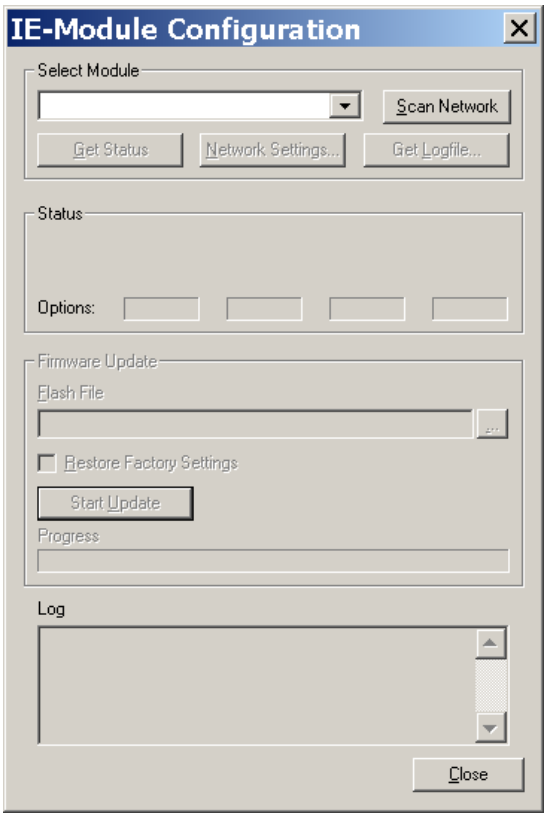


4.2.2 IP Configuration

To configure the **IE** module, it is necessary that both the module and the computer are connected to the same network as shown above. If you have a firewall running, please disable it or make the UDP port 8001 available for incoming and outgoing traffic.

The **Rubidium Config** program is part of the delivery or available at:
http://www.alpermann-velte.com/serv_e/software_e/software_e.html.

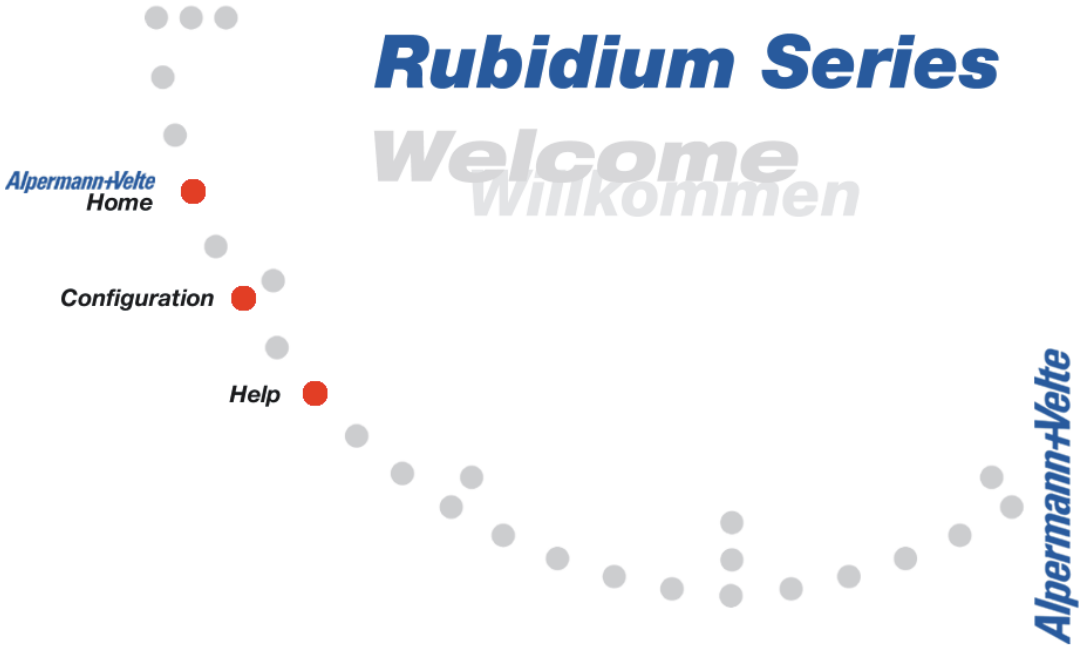
- Please copy this program to your computer.
- Turn on the power of all units.
- Start the "**Rubidium Config.exe**" program.
- Now choose "IE Module Configuration..." from the "Tools" menu. The following screen will appear:



- Press "Scan Network" to search for **IE** modules. All **IE** modules in the local network will be listed in the select box.
- Now choose the module from the list, click on "Network Settings...", and adjust the parameters like IP Address, Network Mask, Gateway, and DHCP. Then click “Config“ to store this set-up.
- The IP configuration now is complete.
- Close the "IP Configuration" dialog. A new network scan is started automatically and the configured IP address will be shown in the list.
- Now you can close all dialogs.

4.2.3 The Rubidium Homepage

To open the RUBIDIUM homepage, start an Internet Browser and type in the IP address of the **IE** module in the location bar.



- Place a direct link on your PC desktop to have an easy access to the RUBIDIUM SERIES system.

4.2.4 Browser Requirements

There is a feature included in the web configuration that allows you to save profile settings to a file or to upload them. When you want to upload a file, the browser has to be able to log on with the http://username:password@example.com syntax. When using Microsoft Internet Explorer, this feature might be disabled. As described in the knowledge base article 834489 from Microsoft (it can be found at http://support.microsoft.com/kb/834489), you have to do the following changes to the registry to enable the feature:

In the registry key **[HKEY_CURRENT_USER\Software\Microsoft\Internet Explorer\Main\FeatureControl\FEATURE_HTTP_USERNAME_PASSWORD_DISABLE]** create the DWORD values **"iexplore.exe"** and **"explorer.exe"** and set their value data to **0**.

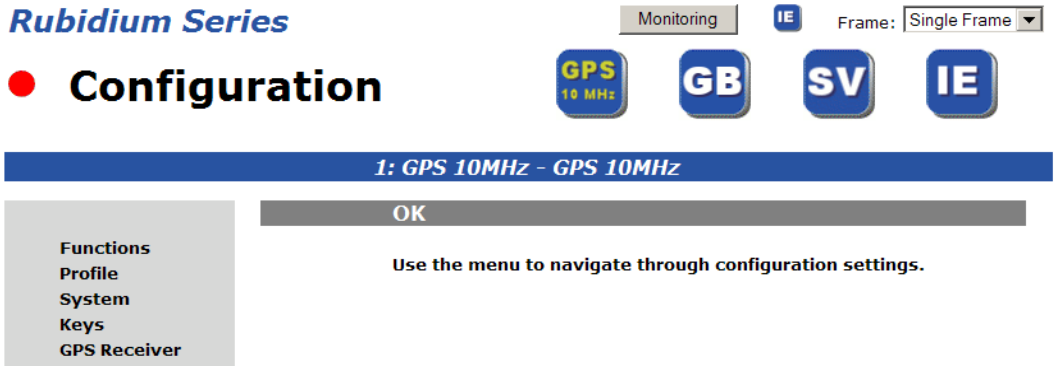
4.2.5 Accessing a Configurable Module

Click on "Configuration" at the RUBIDIUM homepage to open the **Configuration** page.

1st step: Drop-down list **Frame**: select the frame number. Please notice chapter "Identification of Modules in a RUBIDIUM System".

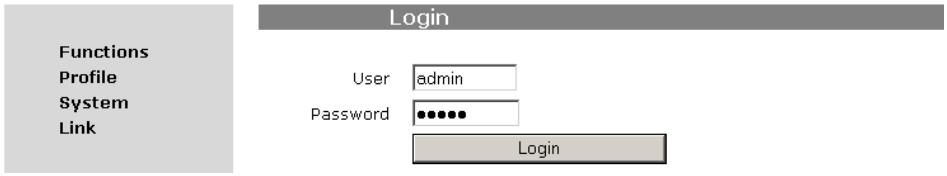
All configurable modules found will be indicated by its type in the blue buttons. Example: Module of type **GPS 10 MHz** as "unit 1", **GB** as "unit 2", **SV** as "unit 3". Numbering front view - left to right. RUB1 frames have four units at maximum, RUB3 frames 21 units.

2nd step: Click on a blue button to establish a communication to this single module. It opens a page with a list of all the links which correspond to all the available functions.



3rd step: Click on any item on this list, e.g. "Functions". This will open a page showing the current parameters. You can check the parameters and change if needed.

If it is the first time that you click on a link to a specific function, you have to pass the **LOGIN**:



The password of the "**admin**" user (administrator) is "**admin**".

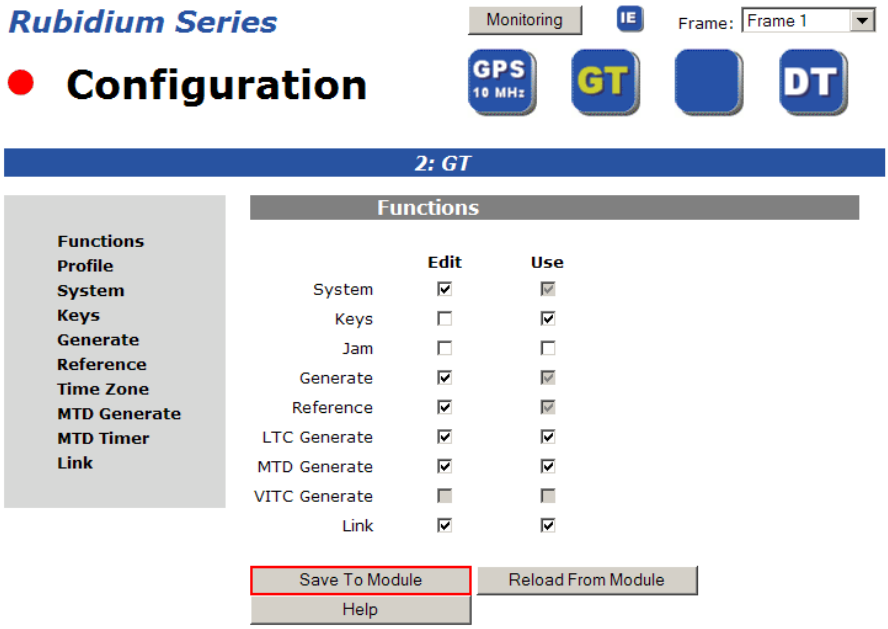
You can add, modify or delete users. For more information, please refer to the operating manual of the IE module.

A click on *Rubidium Series* terminates the connection to the module and returns to the RUBIDIUM homepage.

4.2.6 The "Functions" Page

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.

Click on the **Functions** link to get an overview of all possibly available pages and to activate or deactivate pages.



Each link in this list (each page) reflects a *function* of the module. The columns **Edit** and **Use** determine whether the function in the module is activated/deactivated and whether it is possible to change the set-up of that specific function.

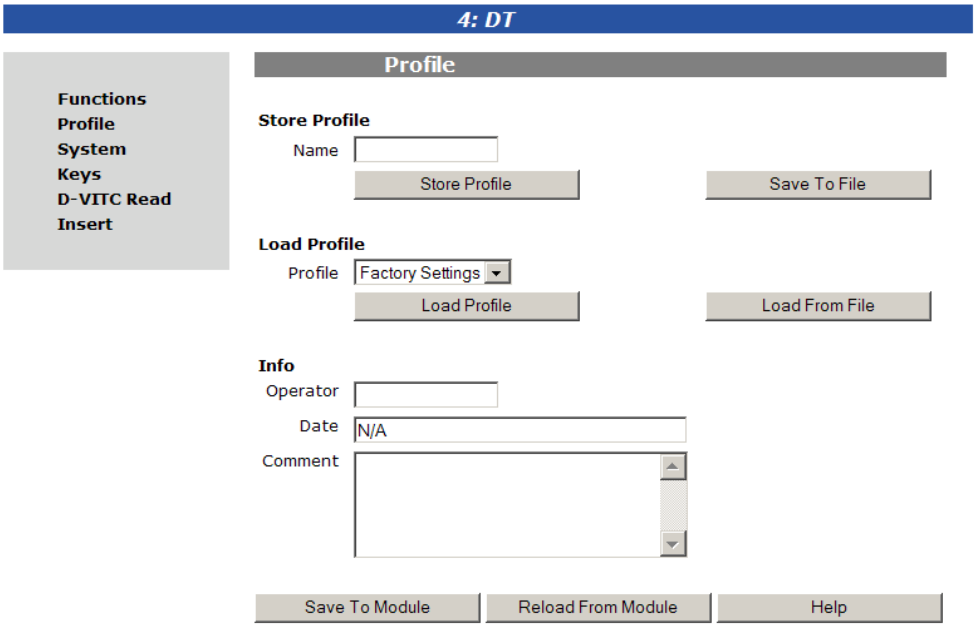
Click on the applicable **Edit** and/or **Use** check-boxes to activate/deactivate a function.

Edit	Use	
		Function is deactivated, the link is not visible.
√	√	Function is activated, the link is visibly and a configuration is possible.
	√	Function is activated but the link not visible, and therefore this function is not configurable at the moment.

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

Attention: Any change of a set-up has to be confirmed always by clicking the "**Save To Module**" button. Only this transfers and stores the new set-up to the module.

4.2.7 The "Profile" Page: Store and Load Set-Ups on the Module or on the PC



Standard modules have a flash memory to store different set-ups. A complete set-up stored to the module is called a "profile". You can identify different profiles by a number or a name. If a module has one or more keys or GPI programmed with "Load Profile" function, you can change the current set-up during normal operation and without using the PC program.

With the "Profile" page you can

- store the current set-up as a profile on the module or as a file on your PC,
- load a set-up to the module from a profile at the module or from a file at your PC.

Store Profile

Name If you want you can enter a name to identify the profile.

Store Profile A click on this button opens the "Store Profile" page.
Select a number or a name from the "Profile" drop-down list, if you want you can add more information at the "Operator" and "Comment" fields, then click on the "Store Profile" button to start the storage procedure. This procedure stores the current set-up of the module at a separate memory location on the module.

Save To File A click on "Save To File" opens the "File Download". Click on "Save" and select a directory and a file name. The type of the file should be **.tci**. Click on "Save" to start the storage procedure.

Load Profile

Profile

Select a number or a name from the drop-down list, then click on the "Load Profile" button to load the profile. This will interrupt the operating mode of the module. The current set-up of the module will be replaced.

Selecting "Factory Settings" from the drop-down list sets the module in the default state.

GT	You have to do a **reload** to verify and check this new set-up at your PC: Click on the blue button which identifies the module.

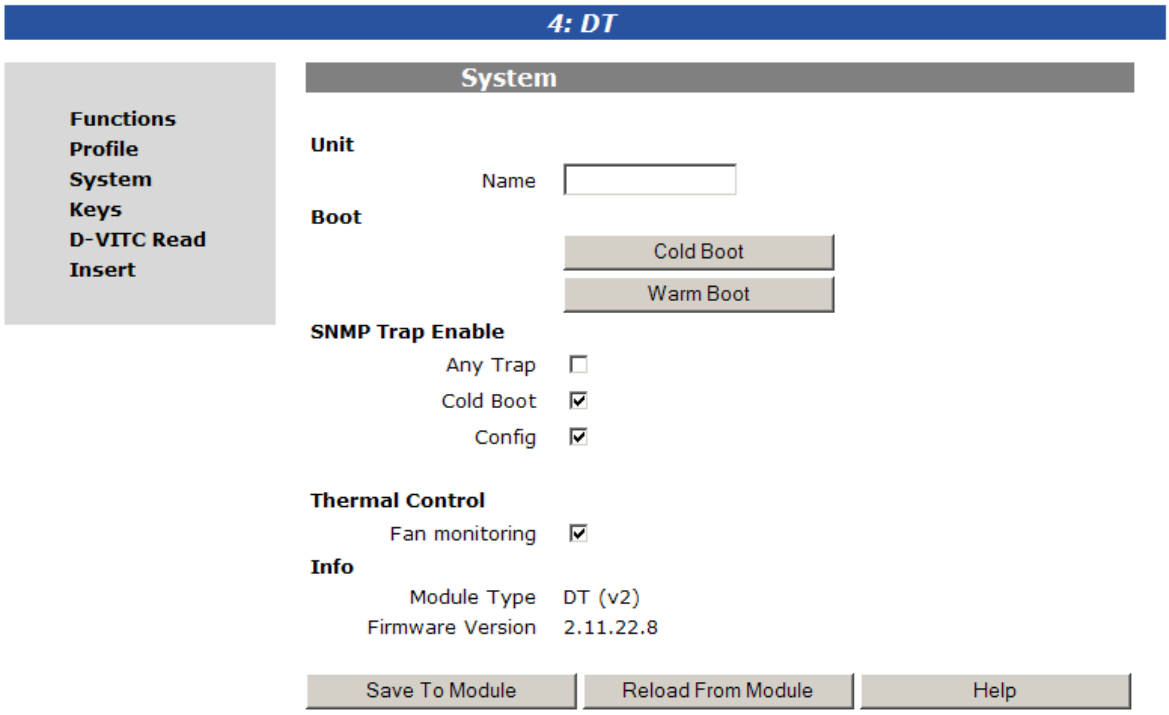
Load From File

A click on this button opens the **Profile Upload** page.
Click on "Browse..." and open the file of type **.tci**. A click on "Upload" replaces the current set-up of the module with the set-up stored in the file. At the end of the data transfer the **Configuration** page appears after an automatic reload, i.e. the list of the links (functions) has been updated.

Info

The information presented at the fields "Operator", "Date" and "Comment" has been set during the **Store Profile** procedure or has got an update by the **Load Profile** procedure.

4.2.8 The "System" Page: Module Identification, Reset, SNMP, Fan Control



Unit: The connected module can get a name. You may enter, change or verify this name at the "Name" entry. After a change click on button **Save To Module** to transfer the new name to the module. With a click on button **Reload From Module** the "Name" entry gets an update with the current name of the module.

Cold Boot: Do a cold boot of the module.

Warm Boot: Do a warm boot of the module.

SNMP Trap Enable: Activate the "Any Trap" check box to enable the SNMP feature. If this check box is not activated no SNMP trap will be generated.

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

Thermal Control: One module of each frame should be responsible for a fan module initialisation and monitoring. At the same time this module monitors the power supplies of this frame. Activate the "Fan monitoring" check box to select these features for this module.

Info: Displays module's status information: module type and firmware version.

4.3 The Status Monitor

4.3.1 Status Monitor by IE Module

The RUBIDIUM SERIES HTTP server, located in the **Rub IE** module, offers a status monitor for all configurable modules. Please refer to the chapter "The RUBIDIUM SERIERS HTTP Server" 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.

- Click on the blue button which represents the module you want to select for monitoring (**GT** at this example).
- Click on the button **Monitoring** to open the status monitor. There is no need to do the LOGIN.
- It is not possible to open more than one status monitor at the same time.

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.

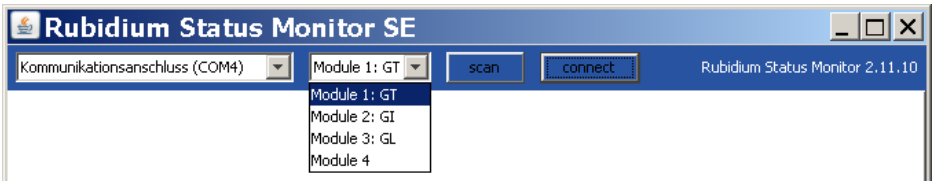
4.3.2 Status Monitor by PC Program

The PC program **RubStatSE.exe** uses the **PC** interface (RS232 or USB) of the RUBIDIUM housing. This program is part of the "Rubidium Configuration and Status Monitor PC Programs" 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.

RubStatSE.exe.



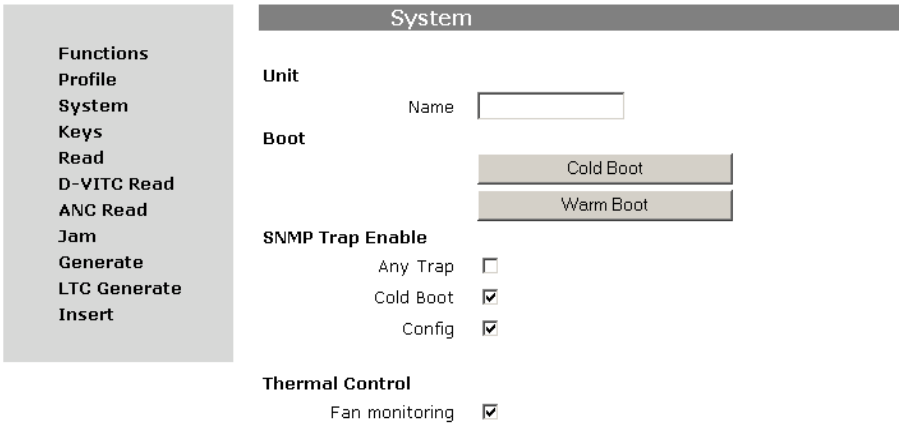
Requirements:

- 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.

4.3.3 Status of Fans and Power Supplies

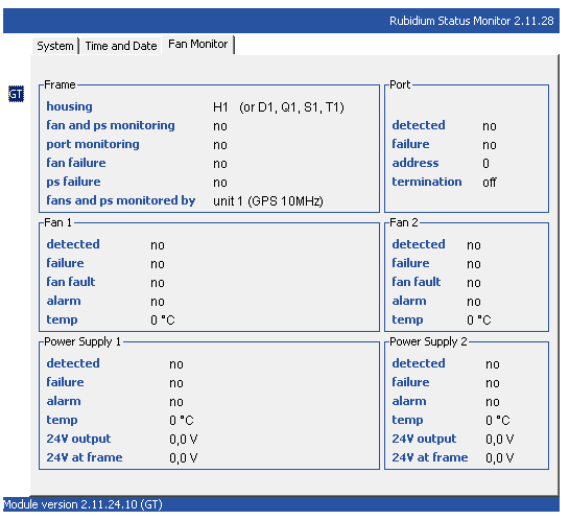
Basically, any configurable module is able to monitor the status of fans and power supplies which are located in the same frame. A RUB1 chassis holds one fan and up to two power supplies. A RUB3 chassis holds two fans and up to two power supplies.

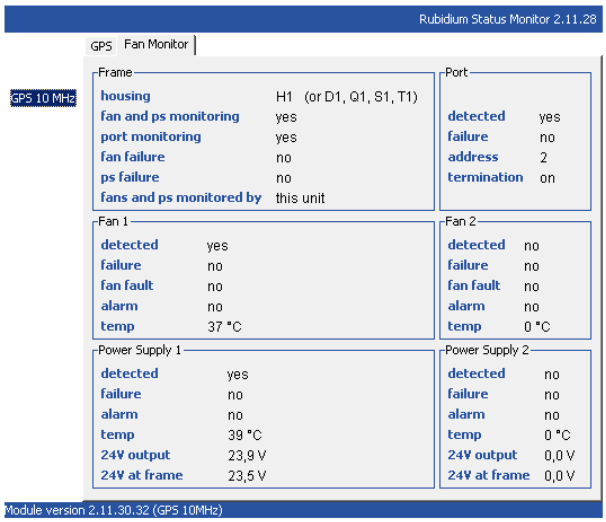
This monitoring feature has to be switched on: Click on the '**Fan monitoring**' check box of the 'System" function utilizing one of the Rubidium configuration tools:



If more than one module has "Fan Monitoring" enabled, there will be only one module which indeed is responsible for monitoring.

Example of a "**Fan Monitor**" status display: GT (left side) is not responsible for monitoring but refers to module GPS 10 MHz (right side).





Failure of a fan: "**fan failure** = yes" will be indicated if a blocking or a stop has been detected.

An **alarm** (fan or power supply) will be generated if the temperature rises above 65 °C.