
# MANUAL

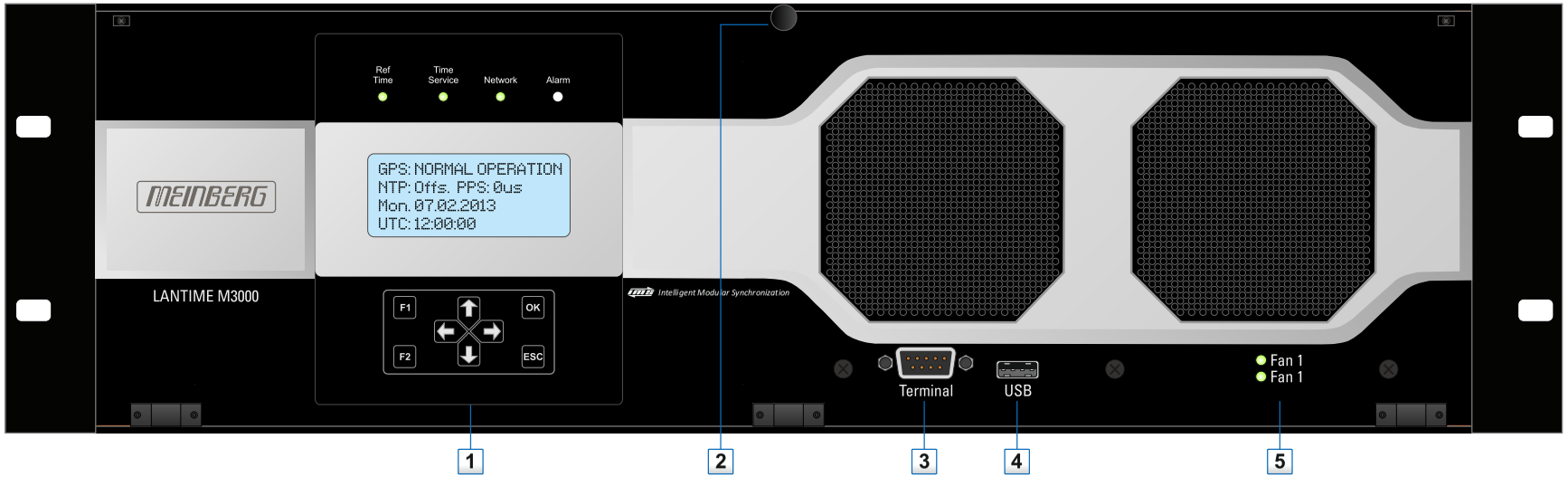
## IMS-M3000

### Modular Sync. System and NTP Server

5th December 2016

Meinberg Radio Clocks GmbH & Co. KG

# Front view (Frontansicht) IMS-M3000



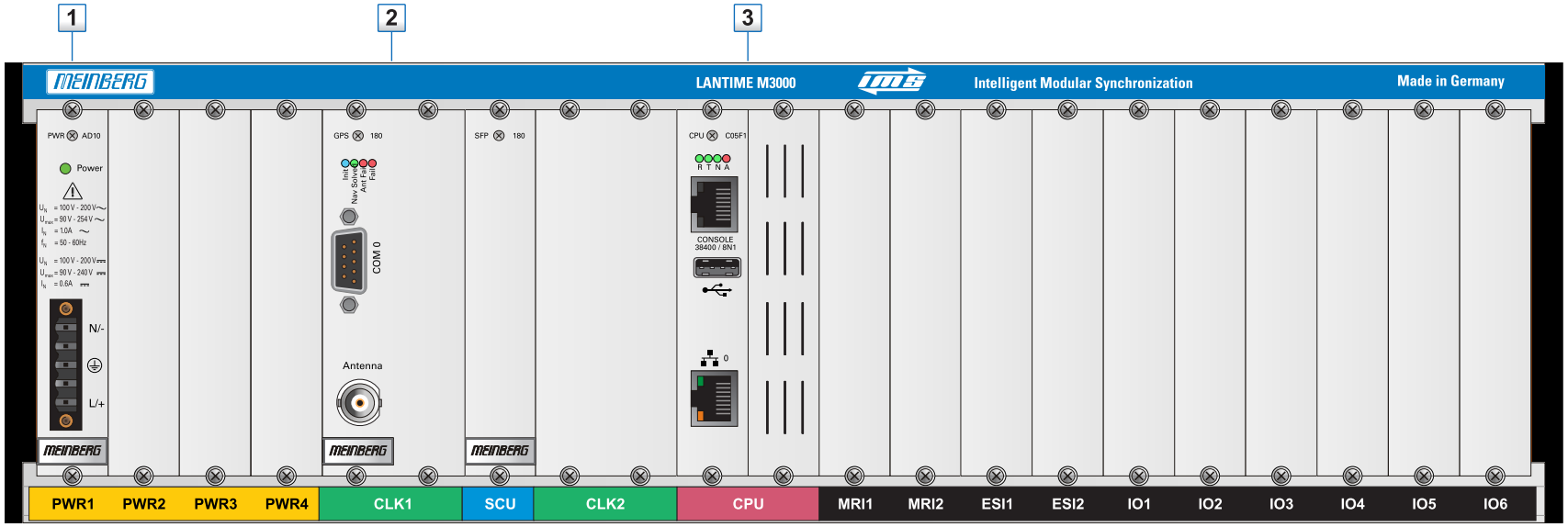

**DEUTSCH**

1. LANTIME Bedienfeldanzeige mit LC-Display, Status LEDs und Funktionstasten
2. Rändelmutter (öffnen der Front)
3. Terminal / VT100, 38400 Baud, 8N1, 9pol. D-SUB Stecker
4. USB Anschluss
5. Statusanzeige Lüfter 1 und Lüfter 2

**ENGLISCH**

1. LANTIME control panel with LC-Display, Status LEDs and function keys
2. Knurled nut (open front)
3. Terminal / VT100, 38400 Baud, 8N1, 9pin D-SUB connector
4. USB connector
5. Status indicators Fan 1 and Fan 2

# Rear view (Rückansicht) IMS-M3000




**DEUTSCH (M3000 - Basiskonfiguration)**

1. Netzteil PWR1 (100 - 240 VAC / VDC)
2. GPS Satellitenempfängermodul CLK1
3. LAN-CPU

**ENGLISH (M3000 Base Configuration)**

1. Power Supply PWR1 (100 - 240 VAC / VDC)
2. GPS Satellite Receiver Module  CLK1
3. LAN-CPU

# Table of Contents

# 1 Imprint

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# 2 Safety instructions for building-in equipment

This building-in equipment has been designed and tested in accordance with the requirements of Standard IEC60950-1 "Safety of Information Technology Equipment, including Electrical Business Equipment".

During installation of the building-in equipment in an end application (i.e. rack) additional requirements in accordance with Standard IEC60950-1 have to be taken into account.

NOTE: First attach the case to protective earth - before you connect the M3000 with the power line (see chapter Grounding connection M3000).

GND

### General Safety instructions

- The building-in equipment has been evaluated for use in office environment (pollution degree 2) and may be only used in this environment. For use in rooms with a higher pollution degree more stringent requirements are applicable.
- The equipment/building-in equipment was evaluated for use in a maximum ambient temperature of 40°C.
- The building-in equipment may not be opened.
- Protection against fire must be assured in the end application.
- The ventilation opening may not be covered.

### For AC Supply 100-240VAC

- The building-in equipment is a class 1 - equipment and must be connected to an earthed outlet (TN Power System).
- For safe operation the building-in equipment must be protected by max 16 A fuse in the power installation system.
- Disconnection of the equipment from mains is done by pulling the mains plug at the outlet. Don't use the connector at the module for disconnection from mains.

### For DC Supply 100-240VDC

- The device can be disconnected outside the unit in accordance with the regulations as in EN IEC60950-1 (e.g. through primary side line protection).
- Assembling and disassembling of the power connector is only allowed if the device is disconnected from power supply (e.g. trough primary side line protection).
- All feed lines are sufficiently protected and dimensioned.

| | |
|---|---|
| Fuse: | T2.5A |
| Connector Diameter: | 1mm$^2$ - 2,5mm$^2$ / 17AWG - 13AWG |

## 2.1 Additional Safety Hints

This manual contains important information for the installation and operation of this device as well as for your safety. Make sure to read carefully before installing and commissioning the device.

Certain operating conditions may require the observance of additional safety regulations not covered by this manual. Nonobservance of this manual will lead to a significant abatement of the security provided by this device. Security of the facility where this product is integrated lies in the responsibility of the installer.

The device must be used only for purpose named in this manual, any other use especially opteration above the limits specified in this document is considered as improper use.

Keep all documents provided with the device for later reference.

This manual is exclusively for qualified electricians or by a qualified electrician trained personnel who are familiar with the applicable national standards and specifications, in particular for the construction of high voltage devices.

## 2.2 Supply Voltage

WARNING!
This device is powered by a dangerous voltage. Nonobservance of the safety instructions of this manual may lead to serious damage to persons and property and to danger to life! Installtion, commissioning, maintenance and operation of this device are to be carried out by qualified personnel only.

The general safety instructions and standards ( e.g. IEC, DIN, VDE, EN ) for installation and work with high voltage equipment as well as the respective national standards and laws must be observed.

NONOBSERVANCE MAY LEAD TO SERIOUS DAMAGE TO PERSONS AND PROPERTY AND TO DANGER TO LIFE!

The device may not be opened. Repair services may only be carried out by the manufaturer.

Supply lines for this decice must be equipped via an appropriate switch that must be mounted close to the device and must be marked as a mains switch for the device.

To ensure safe operation supply mains connected to this decice must be equipped with a fuse and a fault-current circuit breaker according to the applicable national standards for safe operation.

The device must be connected to a protective earth with low grounding resistance according to the applicable national rules.

## 2.3 Cabling

**WARNING!**
DANGER TO LIFE BY ELECTRICAL SHOCK! NO LIVE WORKING!
Wiring or any other work done the connectors particularly when connectors are opened may never be carried out when the installation is energized. All connectors must be covered to prevent from accidental contact to life parts.

ALWAYS ENSURE A PROPER INSTALLATION!

## 2.4 Safety Hints Antenna

WARNING!
DANGER TO LIFE BY ELECTRICAL SHOCK!

Make sure to comply with the occupational health and safety standards when installing the antenna. Never work without a proper fall protection device!

Do not carry out any installation or maintenance work on the antenna system or cabling when there is a potential risk of lightning.

**Surge Voltage Protector**
Due to extremely high currents associated with lightning no surge protection device can provide absolute safety from the impacts caused by lightning!

## 2.5 Replacing the Lithium Battery

**Skilled/Service-Personnel only: Replacing the Lithium Battery**
The life time of the lithium battery on the receiver boards is at least 10 years. If the need arises to replace the battery, the following should be noted:

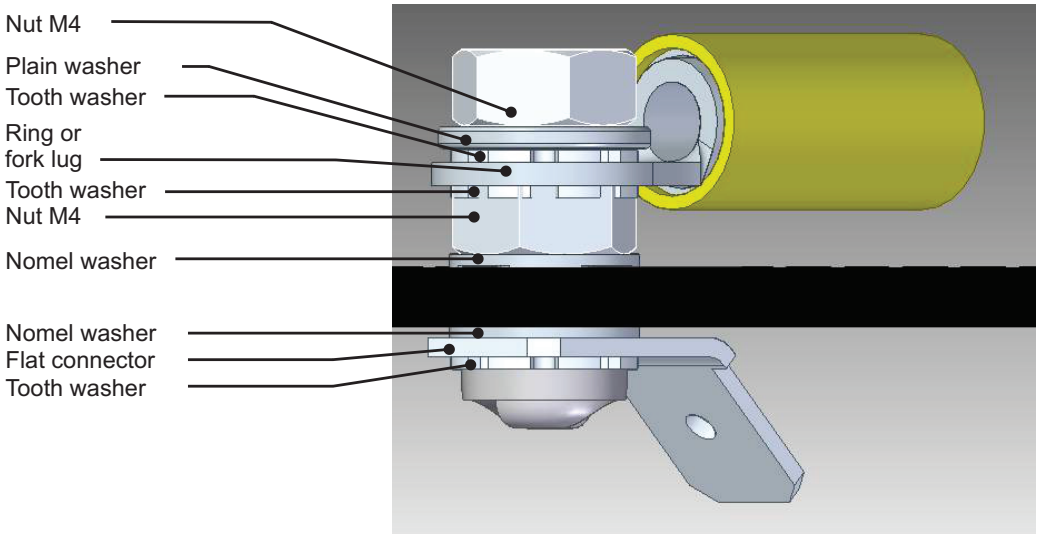
There is a Danger of explosion if the lithium battery is replaced incorrectly. Only identical batteries or batteries recommended by the manufacturer must be used for replacement.

**The waste battery has to be disposed as proposed by the manufacturer of the battery.**

## 2.6 Grounding connection M3000

**Note:**
To ensure a safe operation and to fulfil the requirements in accordance with IEC 60950-1, the system must be correctly connected to an equipotential grounding bus. On the front panel of the system a grounding connector is provided.

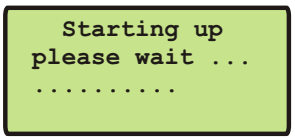
The mounting components (without a cable) are included.



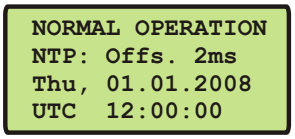

**Note:**
Use a grounding cable with >= 1,5mm$^2$
Please ensure a correct crimp connection!

# 3 Quick Start

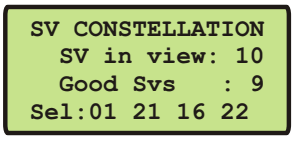
When booting the system the following message will be displayed while dots will be counted up in the lower line:.




Main Menu will be displayed with some important status informations after booting has finished:



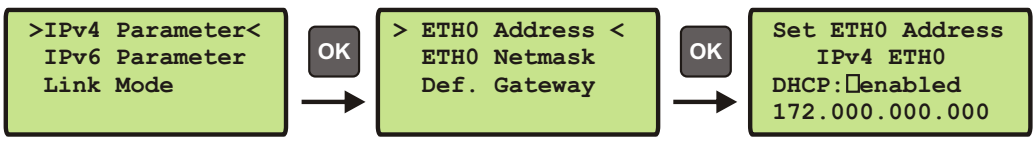

If the GPS receiver remains asynchronous (Refclock LED is still red after 12 minutes) the number of satellites in view and the good satellites are to check (press bottons $\downarrow, \rightarrow, \downarrow$ from main menu). The antenna has to be installed without any obstructions to the sky.




For first time installation enter TCP/IP address, netmask and default gateway. To get an overview of the current configuration press F2 from main menu. Press F2 again to enter SETUP configuration page. Please ask your administrator for propper TCP/IP configuration:


Then press 3 times the OK button to change to IPV4 ETH0 configuration page to enter the IP address, netmask and the default gateway:

**NOTE:** These settings are related to the first Ethernet connection (ETH0).




After this all further settings can be done via network interface, either by using a WEB browser or a Telnet Session.

**Default user: root**
**Default password: timeserver**

# 4 The Modular System LANTIME

LANTIME is a set of equipment composed of a reference clock , a single-board computer SBC ELX800 500 MHz with integrated network card, and a power supply unit, all installed in a metal desktop case and ready to operate. The interfaces provided by LANTIME are accessible via connectors in the rear panel of the case. Details of the components are described below.

The implemented NTPD distributes the reference time from the receiver cyclic in the network. Information on the NTPD is monitored on the LC-Display or can be inquired via the network.

The installation of LANTIME is very easy for the system/network administrator. The network address, the netmask and the default gateway have to be configured from the front panel of LANTIME. The network address or the equivalent name of LANTIME has to be shown to all NTP clients in the TCP/IP network.

As well as NTP the Linux system also supports a number of further network protocols: HTTP(S), FTP, SSH and Telnet. Because of this remote configuration or status requests can come from any WEB browser. This access via the network can be deactivated. Changes in the receiver status, errors or other important events are logged either on the local Linux system or on an external SYSLOG-Server. In addition messages can be sent to a data center via SNMP traps or automatically generated e-mails where they can be recorded. Furthermore all alarm messages can be displayed by the large display VP100/20/NET that is accessed via network connection. In order to avoid a service interruption several LANTIME NTP servers can be installed in the same network to obtain redundancy.

# 5 Mounting the GPS Antenna

The GPS satellites are not stationary, but circle round the globe with a period of about 12 hours. They can only be received if no building is in the line-of-sight from the antenna to the satellite, so the antenna/downconverter unit must be installed in a location that has as clear a view of the sky as possible. The best reception is achieved when the antenna has a free view of 8° angular elevation above the horizon. If this is not possible, the antenna should be installed with the clearest free view to the equator, because the satellite orbits are located between latitudes 55° North and 55° South. If this is not possible, you may experience difficulty receiving the four satellites necessary to complete the receiver's position solution.

The antenna/converter unit can be mounted on a wall, or on a pole up to 60 mm in diameter. A 50 cm plastic tube, two wall-mount brackets, and clamps for pole mounting are included. A standard RG58 coaxial cable should be used to connect the antenna/downconverter unit to the receiver. The maximum length of cable between antenna and receiver depends on the attenuation factor of the coaxial cable.

Up to four receivers can be run with one antenna/downconverter unit by using an optional antenna splitter. The total length of an antenna line from antenna to receiver must not be longer than the max. length shown in the table below. The position of the splitter in the antenna line does not matter.

The optional delivered MBG S-PRO protection kit can also be used for outdoor installation (degree of protection: IP55). However, we recommend an indoor installation, as close as possible to the wall where the antenna cable is entering, to minimize the risk of overvoltage damage, for example by lightning.

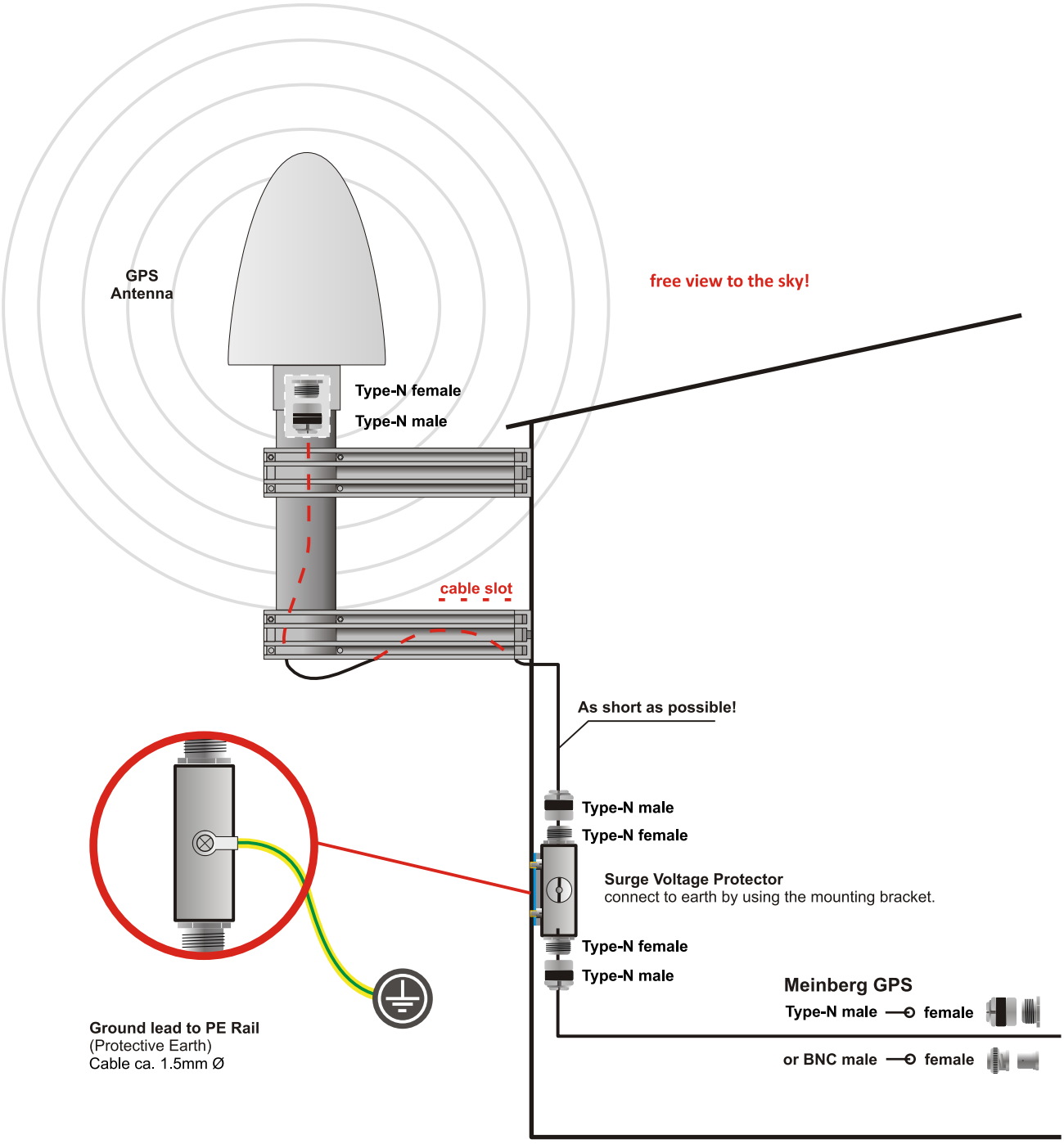
## 5.1 Example:

| Type of cable | diameter Ø [mm] | Attenuation at 100MHz [dB]/100m | max lenght. [m] |
|---|---|---|---|
| RG58/CU | 5mm | 17 | 300 (1) |
| RG213 | 10.5mm | 7 | 700 (1) |

(1)This specifications are made for antenna/converter units produced after January, 2005
The values are typically ones; the exact ones are to find out from the data sheet of the used cable

## 5.2 Antenna Assembly with Surge Voltage Protection

Optional a surge voltage protector for coaxial lines is available. The shield has to be connected to earth as short as possible by using the included mounting bracket. Normally you connect the antenna converter directly with the antenna cable to the system.



## 5.3 Antenna Short-Circuit

**(systems with front display only)**
In case of an antenna line short-circuit the following message appears in the display:


If this message appears the clock has to be disconnected from the mains and the defect eliminated. After that the clock can be powered-up again. The antenna supply voltage must be $15V_{DC}$ .

# 6 Available GPS / GLONASS L1 Antennas

For our combined GPS / GLONASS satellite receivers, there are two available antennas, which are designed for different tasks or applications. Our standard accessory includes a 40 dB L1 GPS / GLONASS L1 antenna, which is optimized for stationary operation.

For mobile applications, such as motor vehicles, ships, trains and planes we recommend the use of the RV-76G, an active GPS / GLONASS antenna, suitable for direct mounting into an enclosure (chassis, panels, etc.).

## 6.1 40dB GPS-L1/GLONASS-L1/GALILEO-E1 Timing Antenna with Integrated Lightning Protection

The GPS and GLONASS satellites are not stationary but circle round the globe in a period of about 12 hours. They can only be received if no building is in the line-of-sight from the antenna to the satellite, so the antenna unit must be installed in a location with a free view to the sky. The best reception is given when the antenna has a free view of 8° angular elevation above horizon. If this is not possible the antenna should be installed with a mostly free view to the equator because of the satellite courses which are located between latitudes of 55° North and 55° South. If even this is not possible problems occur especially when at least four satellites for positioning have to be found.

The active L1 timing reference antenna is specifically designed for long-lasting, trouble-free deployments for a variety of applications. The low noise, high gain amplifier is well suited to address attenuation issues. The proprietary quadrifiliar helix design, coupled with multistage filtering provides superior out-of-band rejection and lower elevation pattern performance than traditional patch antennas.

- Their unique radome shape sheds water and ice, while eliminating problems associated with bird perching.
- This antenna is made of materials that fully comply with provisions stipulated by EU directives RoHS 2002/95/EC.
- The antenna provides integrated lightning protection capability.
- The antenna also features ESD, reverse polarity protection and transit voltage suppression.

A standard coaxial cable with 50 ohm impedance should be used to connect the antenna to the receiver. The max. length of cable between antenna and receiver is 50 meters (H155 - Low-Loss).

See data sheet "**40 dB GPS L1/GLONASSL1/GALILEO E1 Timing Antenna with Integrated Lightning Protection**" (pctel_gpsl1gl.pdf) or download this document:

Active GPS/GLONASS Antenna
`http://www.meinbergglobal.com/download/docs/other/pctel_gpsl1gl.pdf`

## 6.2 RV-76G GPS/GLONASS Antenne for mobile Applications

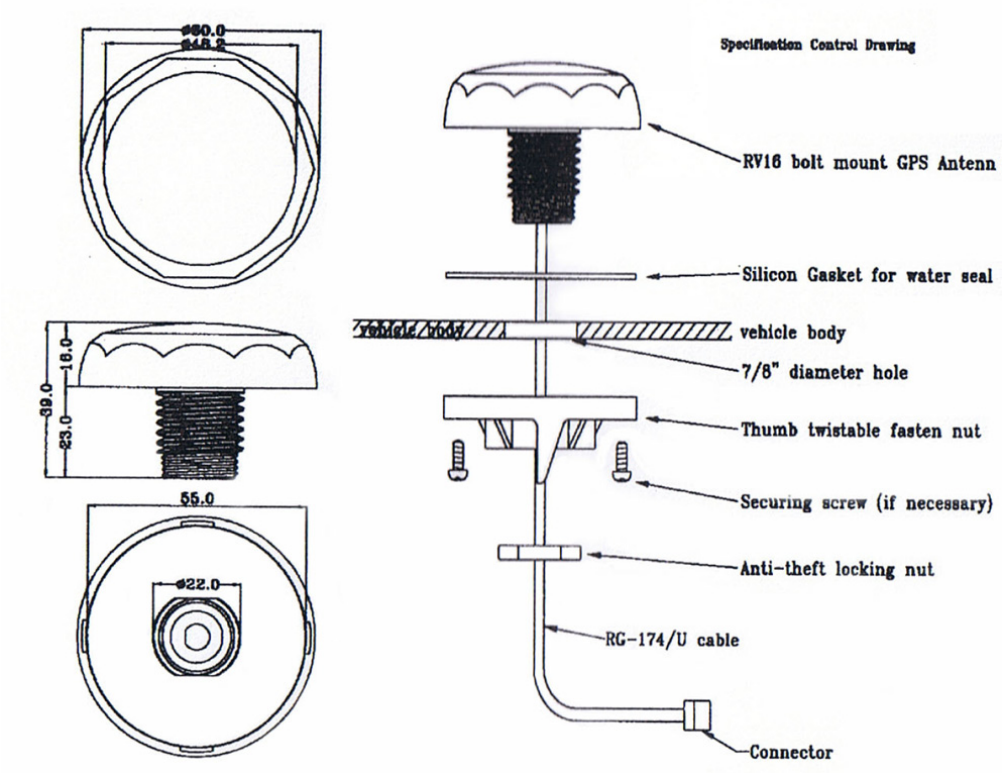
**Features**
- Low noise figure
- Fully weather proof
- Excelent temperature stability
- High sensitivity

The RV-76G GPS / GLONASS antenna is the integration of a high performance GPS patch antenna and a state-of-the-art low noise amplifier into a very low-profile, extremely compact and fully waterproof enclosure which, when connected to a GPS receiver with 5 V DC antenna power, provide adequate signal amplification and out-band rejection.

The flat design and the robustness of the case make the RV-76G to one of the most popular antennas on the vehicle navigation and marine market.

*Figure: RV-76G with Mounting Kit*

**Technical Drawing**



**Physical Characterisics**

| | |
|---|---|
| Construction | Polycarbonate radome detachable cable/connector for easy mount, rubber-O-rign between top radome and screw base for waterproof. |
| Dimensions | 60 mm in Diameter x 38 mm in height |
| Weight | 125 g (Excluding cabel and connector) |
| Color | Standard in ivory white |
| Mounting | Bulkhead mount with 0.8 inch threaded wing nut |

**Antenna Element**

| | |
|---|---|
| Center frequency | 1575.42 MHz +- 10 MHz & 1602 MHz +- 8 MHz |
| Polarization | R.H.C.P. (Right Hand Circular Polarization) |
| Gain at Zenith | +1.5 dBic typ. |
| Axial Ratio | 3 dB max.<br>*mounted on the 70mm x 70mm square ground plane* |

**Low Noise Amplifier**

| | |
|---|---|
| Center frequency | 1575.42 MHz +- 10 MHz & 1602 MHz +- 8 MHz |
| Gain | 27 dB @ 3V typ. |
| Band Width | 43 MHz min. @ =< -10 dB |
| Noise Figure | 1.5 typ. |
| Outband attenuation | 20 dB min. at Fo +/- 50 Hz |
| Supply Voltage | +2.5  +5.5 V DC |
| Current consumption | 3 V DC : 10.6 mA typ. / 5.0 V DC : 21 mA typ. |
| Impedance | 50 Ohm |

**Cable & Connector**

| | |
|---|---|
| RF cable | 5 m RG174/U (standard) |
| Pulling strength | 6 Kg @ 5 sec. With molded plastics on connector for strain relief |

**Overall performance** (antenna element, LNA & cable)

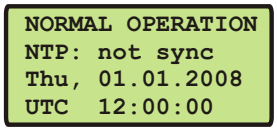
| | |
|---|---|
| Center frequency | 1575.42 MHz +- 10 MHz & 1602 MHz +- 8 MHz |
| Gain | At 90° 27 + 3dB (cable loss)<br>*Note: Mounted on the 70mm x 70mm square ground plane* |
| Noise figure | 2.0 max. |
| Band width | 2 MHz |
| Axial ratio | 3 dB max. |
| VSWR | 2.0 max. |
| Impedance | 50 Ohm |

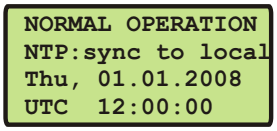
**Environmental Conditions**

| | |
|---|---|
| Operating temperature | -40°C  +85°C |
| Storage temperature | -40°C  +90°C |
| Relative humidity | 95% non-condensing |
| Waterproof | 100% waterproof |

# 7 Booting the Single Board Computer

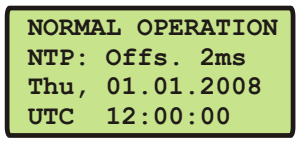
The LINUX operating system is loaded from a packed file on the flash disk of the single board computer to a RAM disk. All files of the flash disk are stored in the RAM disk after booting. This guarantees that the file system is in a defined condition after restart. This boot process takes approximately two minutes. During this time the following message appears on the display:




After starting the LINUX system, the network function is initiated and the communication program with the receiver and the NTPD (NTP daemon) is started. Then NTPD starts synchronization with the reference clocks (usually the hardware clock of the single board computer and the integrated receiver clock). The message "NTP: sync to local" is displayed until synchronization is complete.

For the synchronization of the NTPD with the time reference it is necessary that the receiver is synchronous with the incoming time signal. In this case the following message is monitored on the display:




The second line shows the user that the NTPD is synchronized with the receiver with an offset of 2ms (Figure). Because of the internal time of the NTP which is adjusted by a software PLL (phase locked loop) it takes a certain time to optimise this offset. The NTPD tries to keep the offset below +-128 ms; if the offset becomes too large, the system time is set with the receiver's time. Typically values for the offset are +-5 ms after the NTPD has already synchronized.

# 8 Configuration User Interface

There are several ways to configure the LANTIME parameters:

Command Line Interface (CLI) via TELNET
Command Line Interface via SSH
Command Line Interface via serial terminal in front panel
(38400/8N1/VT100)
HTTP Interface
Secure HTTP Interface (HTTPS)
Front panel LCD/VFD Interface (except LANTIME M100)
SNMP Management

In order to be able to configure the time server via the web interface or a telnet/SSH connection, an IP address has to be assigned via the front panel keys and LC/VF display (for automatic assignment possibilities please refer to: DHCP IPv4 or AUTOCONF IPv6). LANTIME variants without a display can be configured using the serial terminal interface (labeled "Term" or "Terminal") The termin program should be set to 38400Baud / 8N1 – VT100 emulation. Once the IPv4 address, net mask and IPv4 GATEWAY have been set up or the network interface has been automatically configured with DHCP/Autoconf, further configuration changes can be done via a network connection:

To set up a TELNET connection the following commands are entered (replace *198.168.10.10* with the IP of your LANTIME):

**telnet 198.168.10.10** // LANTIME IP address
**user: root**
**password: timeserver**

With "setup" the configuration program is started.
To set up a SSH connection the following commands are entered:

**ssh root@198.168.10.10** // LANTIME IP address
**password: timeserver**

With "setup" the configuration program is started.
To set up a HTTP connection the following address is to enter in a web browser:

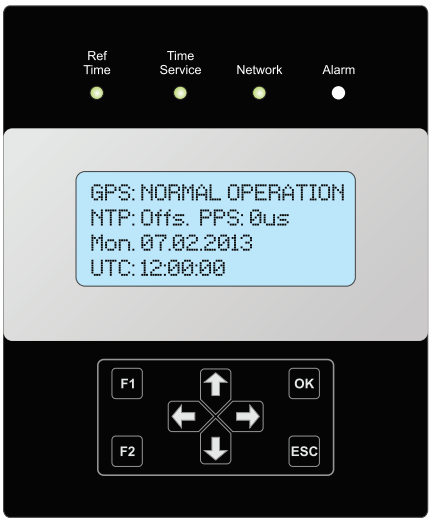
**http://198.168.10.10** // LANTIME IP address
**password: timeserver**

To set up a Secure HTTP (HTTPS) connection the following address is entered in a web browser:

**https://198.168.10.10** // LANTIME IP address
**password: timeserver**

# 9 The Menues in Detail

## 9.1 Root Menu




The root menu is shown when the receiver has completed initialization after power-up. With the four arrow buttons and the buttons „OK“, „ESC“, „F1“ and „F2“ the navigation and setting of parameters can be managed. Main menu can be reached by pressing „ESC“ some times. The main menu reflect some of the main parameters of the time server. First line shows the name of the device and the status of the Reference Clock (GPS). The text "GPS: NORMAL MODE" might be replaced by "COLD BOOT", "WARM BOOT" or "UPDATE ALMANAC". If the antenna is disconnected or not working properly, the text "ANTENNA FAULTY" is displayed instead.

Current time and date of the timeserver with the name of the time zone (NTP uses UTC time zone) will be monitored in the bottom line. If the "IGNORE LOCK" option is enabled an "*" will be shown behind the time.

**The multicolor LEDs will reflect the current state of the device:**

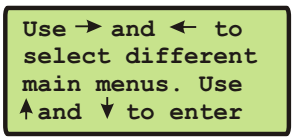
**„Ref. Time“**
green: the reference clock (e.g. integrated GPS) produce valid time.
red: the reference clock produce no valid time (e.g. not synchronized)

**„Time Service“**
green: NTP has been synchronized to reference clock.
red: NTP is not synchronous to reference clock or sync to „local clock“

**„Network“**
green: all watched network ports has been “link up“ detected
red: at least one of the watched network ports (look at „Setup Device Parameter / Check Network Linkup“) is not connected

**„Alarm“**
off: no error at moment
red: general error – more information will be shown on display.

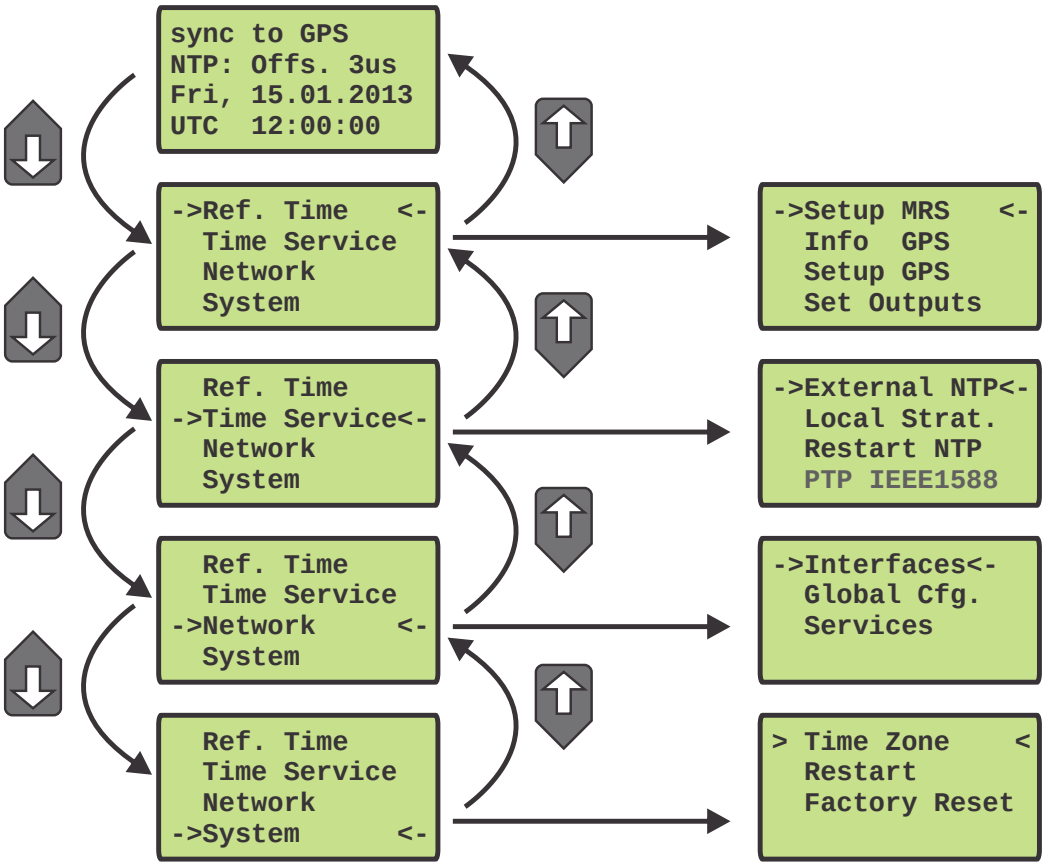
When pressing „F1“ from main menu a short description for menu navigation will be displayed:



When pressing the „OK“ button from main menu the version of the LANTIME software, the NTP and the LINUX kernel version will be displayed.

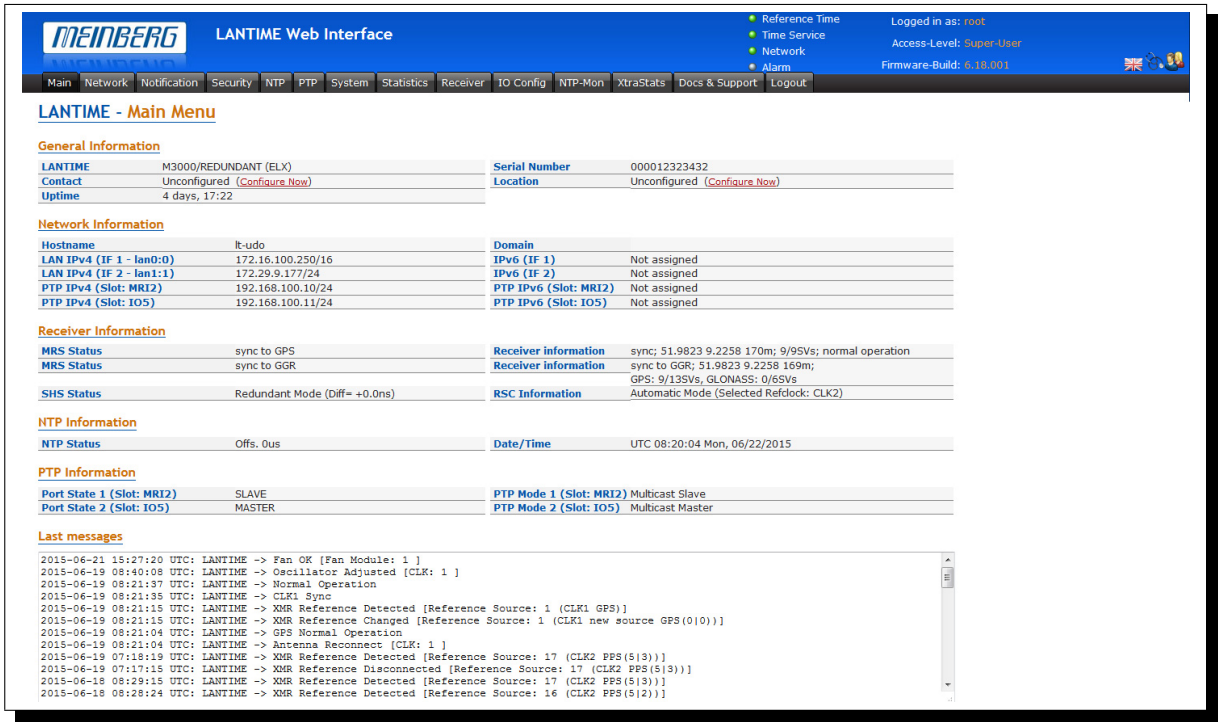
```
ELX800    VX.XXx
SN: 000000000000
NTP: X.X.Xx@X.X
Krn.: X.X.XX.X
```

The following main menus will be displayed when pressing the „UP“ and „DOWN“ arrow buttons:



# 10 The graphical user interfaces

The LANTIME offers two different options for configuration and status management: An extensive and powerful web interface and SNMP. In order to use the SNMP features of your LANTIME, you need special software like management systems or SNMP clients. In order to use the web interface, all you need is a web browser (LANTIME supports a broad range of browsers, we recommend Mozilla Firefox).




### The WEB Interface

The web interface can be used by more than one user in parallel, but the two or more running sessions may influence each other. We explicitly do not recommend the parallel usage of the configuration interfaces.

Connect to the web interface by entering the following address into the address field of your web browser: *http://198.168.10.10* (You need to replace 198.168.10.10 with the IP address of your LANTIME).

### Default Login

User: root
Password: timeserver

# 11 The WEB Interface

Connect to the web interface by entering the following address into the address field of your web browser. Example: *http://198.168.10.10*

***(You need to replace 198.168.10.10 with the IP address of your LANTIME).***

If you try a secure connection via HTTPS, then your WEB Browser generates an alarm message. You have to accept the HTTPS certificate which the LANTIME provides to you. Modification of this certificate is possible during the first session (see chapter The Web Interface - Security - HTTPS Certificate).

After entering the right password, the main menu page shows up. This page contains an overview of the most important configuration and status parameters for the system.

**System information and Status messages:**

- Information about LANTIME model and software
- Network information - first interface
- Receiver status
- NTP status
- Last messages

By using the navigation on top of the page you can reach a number of configuration menus, which are described in the next chapters.

# 12 Attachment: Technical Information

## 12.1 Technical Specifications LANTIME M3000 BGT Housing

**Housing:** Metal 19"Modular chassis, Schroff EUROPAC lab HF
Front panel: 3U/84HP (128 mm high / 426 mm wide)
Hinged front panel, prepared for subsequent fan installation (see chapter Retrofit the System with an Active Cooling Module)

**Protection Rating:** IP20

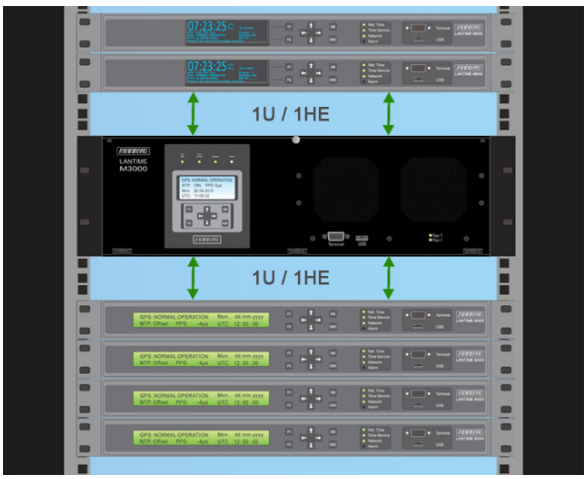
**Physical Dimensions:** 483 mm wide x 132 mm high x 270 mm deep

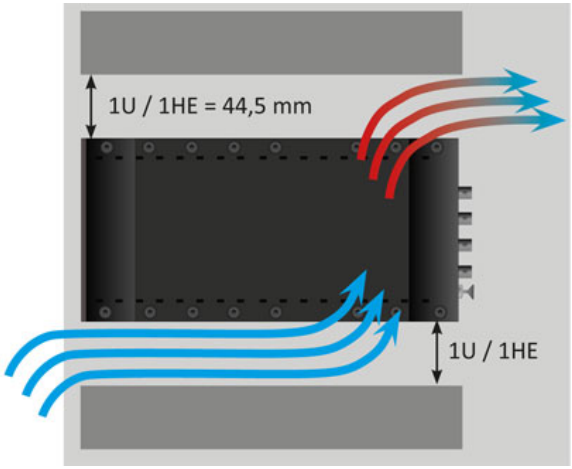
**Ambient Temperature:** 0 ... 50 °C

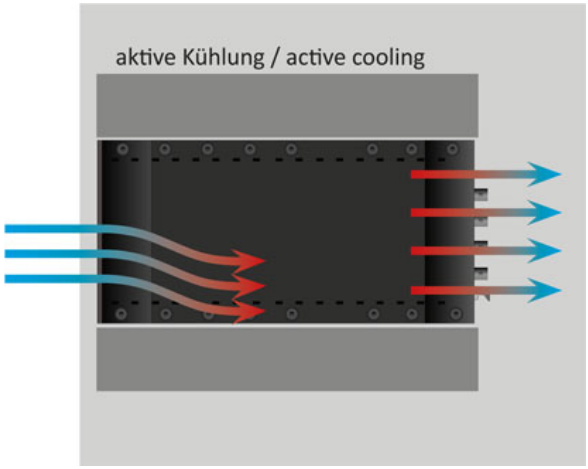
**Humidity:** 85 % max.

ATTENTION:

Due to potential excessive heat development which may cause an overheating damage during device operation it is necessary to leave space for ventilation of at least 1U height at the top and the bottom of the IMS system. If this is not possible, then the system must be equipped with an active cooling module - ACM . See chapter "Retrofit the System with an Active Cooling Module - ACM".




The left Figure shows the expected air flow during device in operation without ACM (active cooling module) and with space between devices for ventilation (1U at the bottom and the top). In the right figure the air flow during device in operation with ACM and no space between devices in a server rack is depicted.

## 12.2 ACM - Active Cooling Module

For specific configurations and/or certain environment conditions an Active Cooling Module (ACM) is necessary to be implemented. If it is possible to leave enough space (at least 1U= 45 mm) below and above the system to the next device in a server rack, then an ACM is not mandatory required. If this is not the case, your system needs to be equipped with an ACM module. However, in either case an ACM can be additionally mounted at any time (see a description below). Besides, it is recommended to add an ACM when many slots in the system are occupied – also when more power supply modules are in use.

**Retrofitting of the ACM - Module**
Additional mounting of an ACM module is user friendly and can be arranged even while the system is in operation. First loose the marked screws (Fig. 1), which makes a front panel with LC display to lean forward.

Fig. 1: Loosen the mounting screws of the front panel

**Attention:** Please note, that the front panel position should not exceed more than 90 degrees (Fig. 2) to avoid damage on neighbourhood devices or a connection cable. Insert the ACM module into the cartridge slot provided. Pay attention to correct adjustment of the two circuit boards in the guide rails (Fig.3). The module should be easily locked with electrical connector (Fig. 4) and the front panel can be closed again. To prevent the risk of injury from electrical current and rotating fans, a switch mounted on the unit (Fig. 5) separates the cooling unit from the circuit when the front panel is opened.

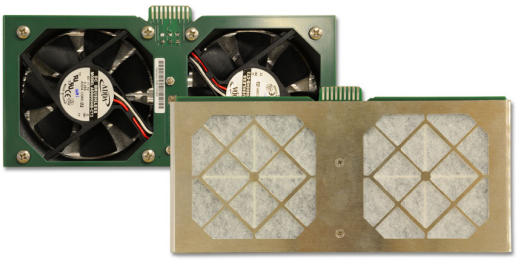


Fig. 2: Compact ACM Module with two fans

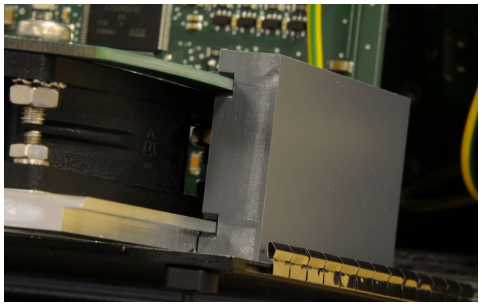


Fig. 3: Adjust the module exactly in the guide rails

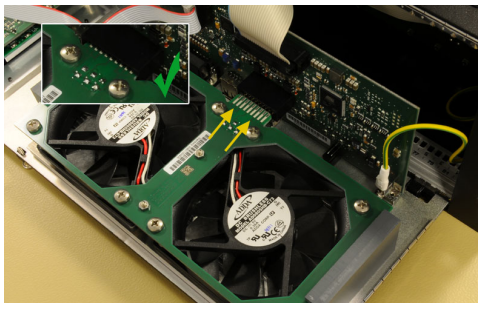


Fig. 4: Lock the plug into the system

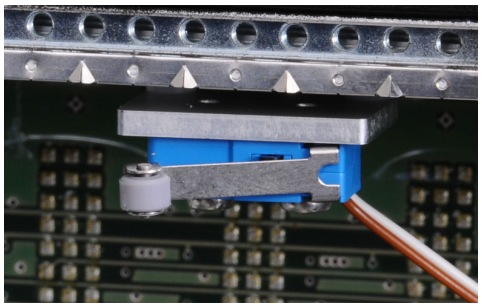


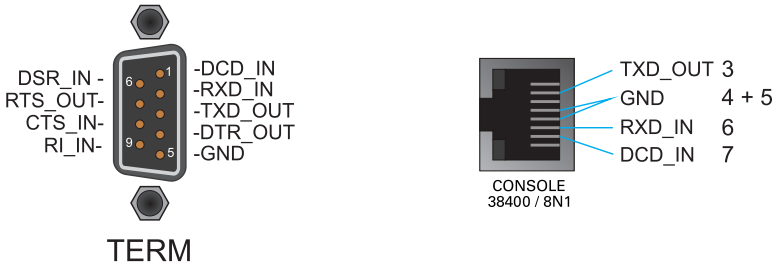
Fig. 5: The switch interrupts the power circuit after opening the front

## 12.3 Available Modules and Connectors

| Name | Type | Signal | Cable |
|---|---|---|---|
| **Front Connectors** | | | |
| Terminal | 9pin. D-SUB male | RS-232 | shielded data line |
| USB | USB Port | | USB Stick |
| **Rear Connectors** | | | |
| Power supply | 5pin. DFK male | 100-240 VAC / VDC | 5pin. MSTB clamp |
| GPS Antenna | BNC | 10MHz / 35.4MHz | shielded coaxial line |
| or | | | |
| GPS/GLONASS Antenne | SMA | L1 Frequency band: 1575.42 +- 10 MHz / 1602-1615 MHz | shielded coaxial line |
| Terminal | RJ45 | | CAB-CONSOLE-RJ45 |
| USB | USB Port | | shielded data line |
| Network LAN-CPU | RJ45 | 10/100 MBit | shielded data line |
| **Module Options** | | | |
| **Power** | | | |
| DC power supply | 5pin. DFK male | 20-72 VDC | 5pin. MSTB clamp |
| **Network** | | | |
| LNE-GbE | RJ45 | 10/100/1000 MBit | shielded data line |
| TSU-GbE | RJ45 | 10/100/1000 MBit | shielded data line |
| | SFP | 10/100/1000 MBit | shielded data line |
| **Signal Outputs:** | | | |
| CPE - configurable | BNC, DFK-2, DSUB9, ST | PPOs, serial TS, TC FO ... | shielded data line |
| BPE - fixed | BNC, ST | PPS, 10MHz, TC, 2,048kHz ... | shielded data line |
| LIU: | RJ45 jack | E1/T1 balanced 120 Ohm (Clock) | shielded data line |
| | BNC | E1/T1 unbalanced 75 Ohm (Bits) | shielded data line |
| LNO | BNC | 10MHz sine | shielded data line |
| REL | DFK-3 | Error Relay | |
| **Signal Inputs:** | | | |
| ESI | BNC, RJ45 | E1/T1, var. Freq. | shielded data line |
| MRI | BNC | 10MHz, PPS, IRIG, PP | shielded data line |

## 12.4 TERMINAL (Console)

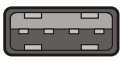
To connect a serial terminal (according to the device model), use the 9pin RS232 D-Sub connector in the front panel or the RJ45 connector of the LAN-CPU. Via the serial terminal connection it is possible to configure parameters with a command line interface. You have to use a NULL-MODEM cable (D-Sub) or a CAB-CONSOLE-RJ45 cable to establish a connection to your PC or Laptop computer.




You can use e.g. the standard Hyperterminal program shipped with your Windows operating system. Configure your terminal program with 38400 Baud, 8 Databits, no parity and 1 Stopbit. The terminal emulation have to set to VT100. After connecting to the timeserver there will be displayed the login message (press RETURN for first connection; default user: root password: timeserver).

## 12.5 USB Connector

Most LANTIME M-Series products come with a USB interface for connectiong a USB storage device, e.g. a USB stick. This USB stick can be used for different tasks in combination with the LANTIME:




- Transfer configuration parameters
- between different LANTIMEs
- Keypad locking for secure
- using the keypad of the LCD
- Transfer of log files
- Install Software Updates
- Upload and download secure certificates
- (SSL, SSH) and passwords

# 12.6 IMS Module Options

## 12.6.1 Power Supply 100-240 V AC/DC

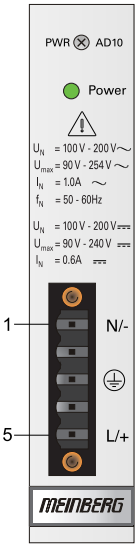
**Operational Voltage:**

$U_N$ = 100 - 240 V~
$I_N$ = 1.0 A~
$f_N$ = 50 - 60 Hz

$U_{max}$ = 90 - 254 V~
$f_{max}$ = 47 - 63 Hz

---

$U_N$ = 100 - 200 V ⎓
$I_N$ = 0.6 A ⎓
$U_{max}$ = 90 - 240 V ⎓




**Output Current:**

max. 10.0 A
min. 0.15 A

**Fuse:** internal, T2.5 A / 250 V

**Protective Class:** Class 1

**LED:** green, diameter 5mm, on if output OK

**Power Connector:** 5pin DFK

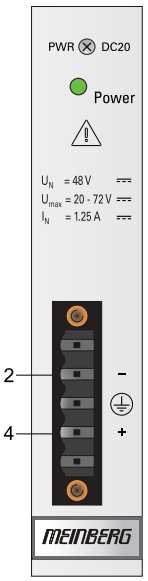
**Hotplug:** It is possible to remove or install the power supply out of the terminal equipment during operation.

**Pin Assignment:**

1: N
2: not connected
3: GND (Ground)
4: not connected
5: L

## 12.6.2 Power Supply 20-72 V DC

**Operational Voltage:**
$U_N$ = 48 V ⎓
$I_N$ = 1.25 A ⎓
$U_{max}$ = 20 - 72 V ⎓




**Output Current:** 10 A

**Output Voltage:** +5 V

**Output Power:** 50 W

**Fuse:** 6 A (T) / 250 V

**Power Connector:** 5pin DFK

**Protective Class** Class 1 - regarding EN 60950

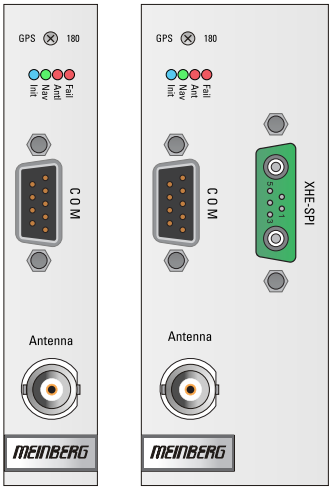
**Hotplug:** It is possible to remove or install the power supply out of the terminal equipment during operation.

**Pin Assignment:**
1: not connected
2: -
3: GND (Ground)
4: +
5: not connected

### 12.6.3 GPS Clock

**Receiver:** 12 channel GPS C/A-code receiver

**Accuracy of pulse outputs:** Depends on oscillator option:
< +-100 ns (TCXO, OCXO LQ)
< +-50 ns (OCXO-SQ, -MQ, -HQ, -DHQ)




**Antenna Cable:** shielded coax

**Cable Length:** max. 300 m to RG58,
max. 700 m to RG213

**Antenna Connector:** BNC female

**Input GPS:** Antenna circuit
1000 V DC insulated

**Local Oscillator to Converter Frequency:** 10 MHz [1]

**First IF Frequency:** 35.4 MHz [1]

1) these frequencys are
transfered via the antenna cable.

**Power Requirements:** 15 V, 100 mA (via antenna cable)

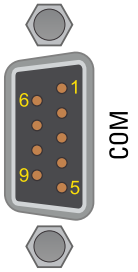
**Figure right:** GPS Receiver and
GPS with XHE-SPI Connector (optional)

**LED Indicators**

| | | |
|---|---|---|
| Init: | blue: | while the receiver passes through the initialization phase |
| | green: | the oscillator has warmed up |
| Nav.: | green: | positioning successfully |
| Ant: | red: | antenna faulty or not connected |
| | yellow: | the clock is synchronized by an external Signal - MRS mode (PPS, IRIG ...) |
| Fail: | red: | time has not synchronized |

**Pin Assignment of the DSUB9 Connectors (male):**

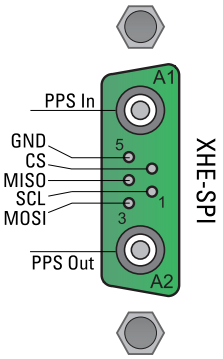
Pin 2: RxD
Pin 3: TxD
Pin 5: GND




**Pin Assignment of the optional XHE-SPI Connectors:**

A1: PPS In
A2: PPS Out

Pin 1: SCL_Out (SPI Clock)
Pin 2: CS (Chip Select)
Pin 3: MOSI (Master Out, Slave In)
Pin 4: MISO (Master In, Slave Out)
Pin 5: GND




**Attention:** Use this plug only to connect a MEINBERG IMS-XHE$^{Rb}$ Rubidium expansion chassis.

### 12.6.4 GNSS Clock

**Type of receiver:** GPS/GLONASS/Galileo/BeiDou receiver
Number of channels: 32
Frequency band: GNSS L1
1575.42 +- 10 MHz / 1602-1615 MHz

**Accuracy of Pulses:** Dependant on oscillator option
< +-100nsec (TCXO, OCXO-LQ)
< +-50ns (OCXO-SQ, -MQ, -HQ, -DHQ)

**Synchronization Time:** Max. 1 minute in normal operation mode, approx. 12 minutes after a cold start

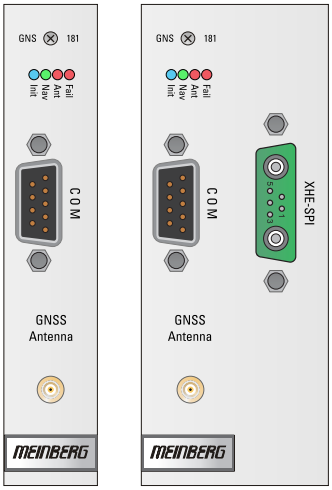
**Antenna Cable:** shielded coax cable (Belden H155 PE)

**Cable Length:** max. 100m low-loss cable

**Type of Connector:** female SMA connector

**Power Requirements:** 15 V, 100 mA (via antenna cable)

**Figure right:** GNSS Receiver and
GNSS with XHE-SPI Connector (optional)

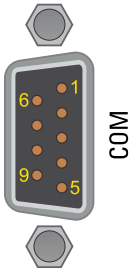



**LED Indicators**

| | | |
|---|---|---|
| **Init** | blue: | while the receiver passes through the initialization phase |
| | green: | the oscillator has warmed up |
| **Nav.** | green: | positioning successfully |
| **Ant** | red: | antenna faulty or not connected |
| | yellow: | the clock is synchronized by an external Signal - MRS mode (PPS, IRIG ...) |
| **Fail** | red: | time has not synchronized |

**Pin Assignment of the DSUB9 Connectors (male):**

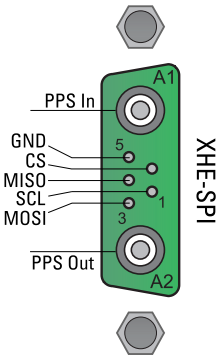
Pin 2: RxD
Pin 3: TxD
Pin 5: GND




**Pin Assignment of the optional XHE-SPI Connectors:**

A1: PPS In
A2: PPS Out

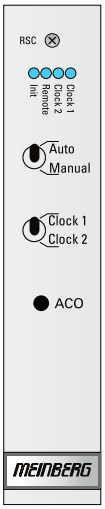
Pin 1: SCL_Out (SPI Clock)
Pin 2: CS (Chip Select)
Pin 3: MOSI (Master Out, Slave In)
Pin 4: MISO (Master In, Slave Out)
Pin 5: GND




**Attention:** Use this plug only to connect a MEINBERG IMS-XHE$^{Rb}$ Rubidium expansion chassis.

## 12.6.5 RSC Switch Card

**Theory of operation**
The RSC- Redundant Switch Control card controls the switchover of the reference clock in redundant systems with two receiver units. The RSC is used to switchover the pulse and frequency outputs and the serial interfaces between the available receivers. The controls of the module allow the selection of different modes in which the RSC operates. The status LEDs indicate which receiver is selected as a master clock and the current operating state of the switching module.




**Switch Position "Auto/Manual"**
This switch selects between automatic and manual mode. In the manual mode the module's internal selection logic is overridden and the current system for signal generation can only be selected manually by the switch Clock 1 /Clock 2. In the manual mode outputs are always enabled, regardless of the synchronization state of the clocks.

**Switch Position "Auto"**
The selection of the reference is done by an internal switch-logic of the RSC. The selection of the active system based on the TIME_SYNC signals which are generated by the receivers. The TIME_SYNC signals are indicate the synchronization of the clocks.

To avoid unnecessary changeovers in case of repeatedly occurring free run operations of one system, the master/backup order is changed with each changeover. For example, let's suppose the current master system looses its synchronization. Then a changeover is performed to a synchronous slave system and thus the former slave system becomes a new Master. No changeover is done if both systems are asynchronous. In this case the current state stays the same.

**Important:** To ensure an automatic switchover the remote function in a display-menu should be disabled. "Ref. Time -> Switch Unit": Select Switch Unit -> RSC Cntl -> REMOTE: disable. Otherwise, the system depends on the clock selected by a remote control function and the unit will not switch over to the current active clock.

**Display Menu "Remote"**
In this operation mode the selection of the reference clock is done by a display menu. A switchover of the reference clock in case of an error does not happen, pulse and frequency outputs and the serial interfaces are always enabled. Deactivation of outputs is possible by a display in the "RSC Cntl" menu.

**Switch Position "Clock 1 / Clock 2"**
Selects the active clock system in manual mode which has no effect in automatic mode.

Mode selection by a switch position in "AUTO":
Display Menu: *Switch Unit -> RSC Cntl -> REMOTE : enable*

**Display menu "Switch Unit -> RSC State"**


This menu displays the status information of the RSC:

| | |
|---|---|
| Mode: | manual \| automatic \| remote |
| Clock 1 / Clock 2: | State of receivers |
| PSU1/PSU2: | State of power supplies |
| MUX: | enabled \| disabled \| 1/2 |

| | |
|---|---|
| enabled/disabled: | disabling output signals during a free run |
| 1/2: | selected reference clock |

**Menu "Switch Unit -> RSC Cntl"**


| | | |
|---|---|---|
| REMOTE: | enable/disable | Switching between automatic and remote operation |
| OUTPUTS: | enabled/disabled | Disabling outputs during a free run |
| Selected Clk: | 1/2 | Selection of the currently active reference clock |

### 12.6.6 LAN-CPU

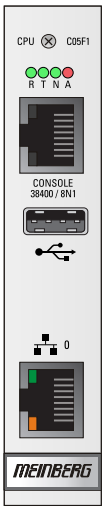
**Processor:** AMD Geode™ LX 800
(500 MHz, 128 KB L2 cache, 3.6 W)

**Main Memory:** onboard 256 MByte

**Cache Memory:** 16 KB 2nd Level Cache

**Flash Disk:** 1 GB

**Network Connector:** 10/100 Base-T with RJ45-Jack




**State LEDs:**

**LAN 0 Interface**
LED - Connect, Activity and Speed of the network connection

**LAN-CPU**
R - Reference Time
T - Time Service
N - Network
A - Alarm

### 12.6.7 MRI - Standard Reference Input Signals

If an application requires to use external synchronization sources instead of radio/GNSS signals, an MRI card enables the installed clock module to synchronize to 1PPS, 10MHz, DCLS and AM time codes (IRIG B, AFNOR, IEEE1344 or C37.118).

Each MRI card is dedicated to one clock module, if a redundant solution requires external synchronization inputs for both clock modules, two MRI cards have to be installed. The MRI card is available with 4x BNC connectors.

**Reference Inputs:** 10MHz, PPS, IRIG, TC-AM / TC-DCLS

**Status Indicators**

| | |
|---|---|
| LED St: | MRI status |
| LED In: | Status of the backplane's reference signals |
| LED A: | Status of the input signals (TC-AM/DCLS) at the board |
| LED B: | Status of the input signals (10MHz/PPS) at the board |

Initialisation: LED St: blue until USB is configured
LED In - LED B: off until USB is configured

USB is configured: LED St: blue
LED In - LED B:
0,5 sec. red -> 0,5 sec. yellow -> 0,5 sec. green -> 0,5 sec. off

Normal Operation: LED St + LED In: green
LED A: green, if timecode AM or timecode DCLS
or both signals are available at the same time
LED B: green, if 10 MHz or PPS
or both signals are available at the same time

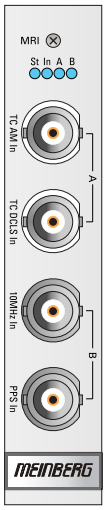
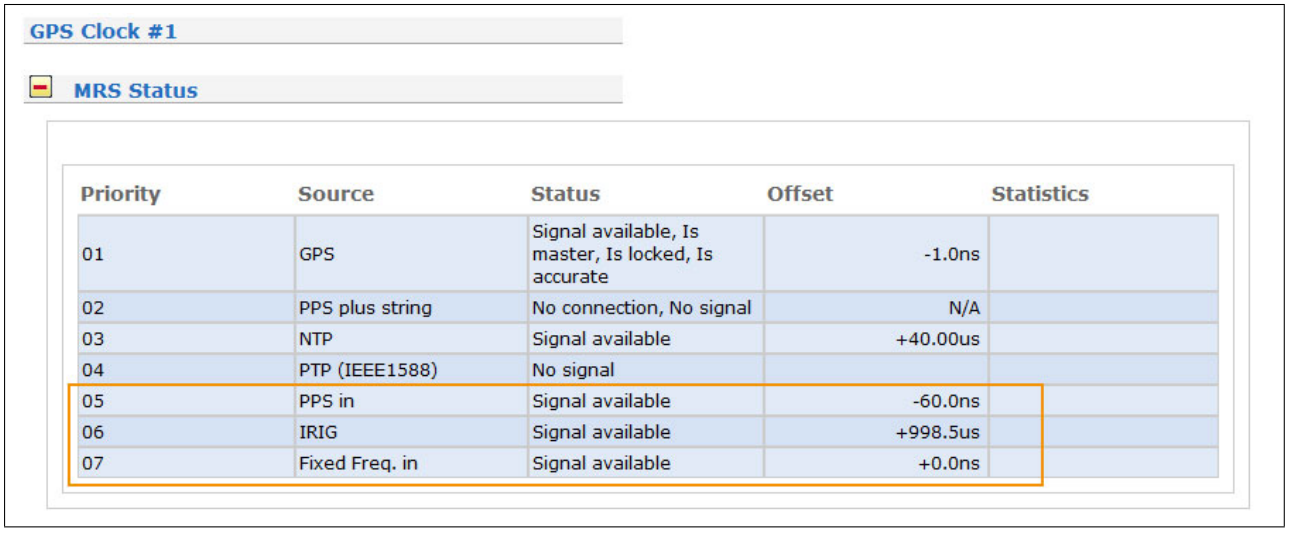



Figure right:*MRI - standard input signals via BNC female connectors*

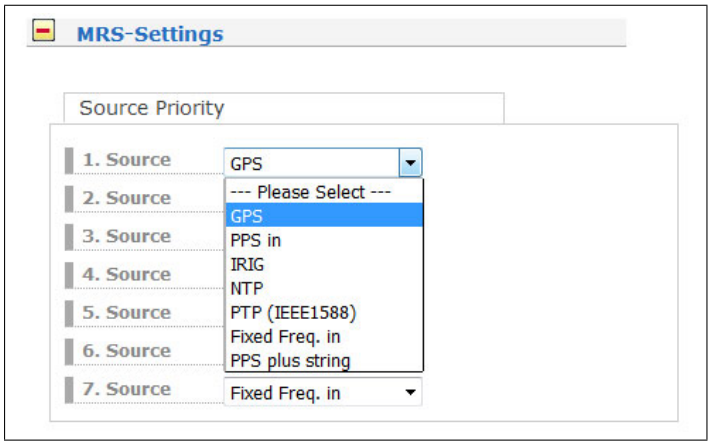
Power Requirements: 5 V +-5%, 50 mA

### MRI Configuration via the Web Interface

The MRI module is a card for fixed (none configurable) input signals (Time Code AM / DCLS, 10MHz and PPS). The provided input signals can be monitored and selected in the "Clock" menu after initializing.




*Menu MRS State: Displays the available input signals*




*MRS settings: selection and prioritization of existing input sources*

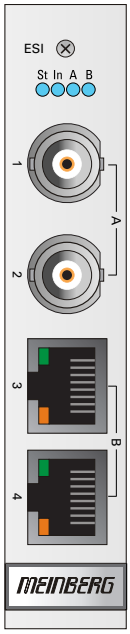
| | |
|---|---|
| 1 x PPS input: | TTL, pulse duration >= 5$\mu$s, active high, female BNC connector |
| 1 x 10 MHz input: | sine (1.5Vpp - 5Vpp) or TTL, female BNC connector |
| 1 x Time Code modulated input | BNC connector, isolated by transformer<br>Insulation voltage 3000 VDC<br>Input signal: 600mV to 8 V (Mark, peak-to-peak) |
| 1 x Time Code unmodulated input | BNC connector, isolated by opto-coupler<br>Insulation voltage: 3750 Vrms<br>Internal series resistor: 330 Ohm,<br>Max. input current: 25 mA<br>Diode forward voltage: 1.0 V...1.3 V |

## 12.6.8 ESI - Telecom Synchronisation References

### Enhanced Synchronisation Inputs

**Reference Inputs:** E1 / T1 framed/unframed, variable frequencies (1 kHz - 10 MHz)

**Power Requirements:** 5 V, +-5%, 250 mA




**Status Indicators**

| | |
|---|---|
| **LED St:** | ESI status |
| **LED In:** | Status of the backplane's reference signals |
| **LED A** | Status of the input signals (1 & 2) at the board |
| **LED B:** | Status of the input signals (1 & 2) at the board |

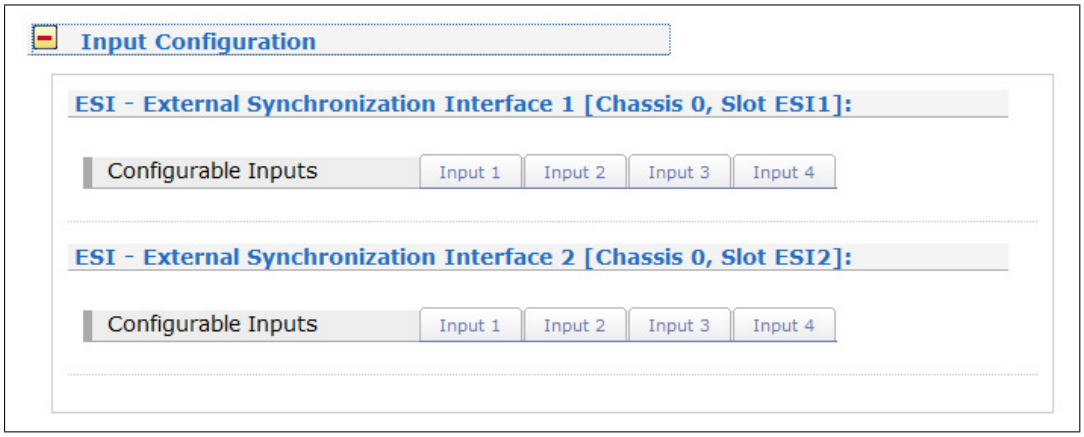
**Operation conditions:**

| | | |
|---|---|---|
| Initialisation: | **LED St** | blue until configuration is done |
| | **LED In** | off until configuration is done |
| | **LED A** | off until configuration is done |
| | **LED B** | off until configuration is done |
| expiration LEDs: | **ALL LEDs** | 0,5 sec. red → 0,5 sec. yellow → 0,5 sec. green → 0,5 sec. off |
| Normal Operation: | **LED St** | green |
| | **LED In** | green |
| | **LED A** | green, if PPS and 10MHz<br>flashing green, if only 10 MHz<br>flashing yellow, if only PPS<br>off, if no signal |
| | **LED B** | green, if Clock and Framed available<br>flashing green, if only Clock available<br>flashing yellow, if only Framed available<br>off, if no signal |

### ESI Configuration via Web Interface

#### ESI – External Synchronization Input

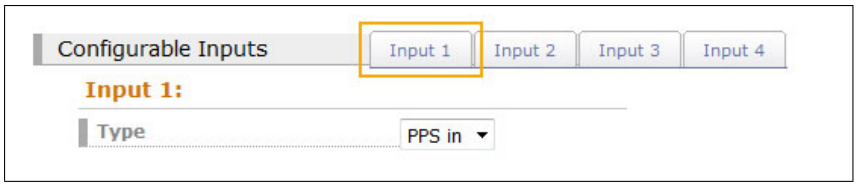
Menu "IO Config -> Input Configuration -> ESI - External Synchronization Interface"



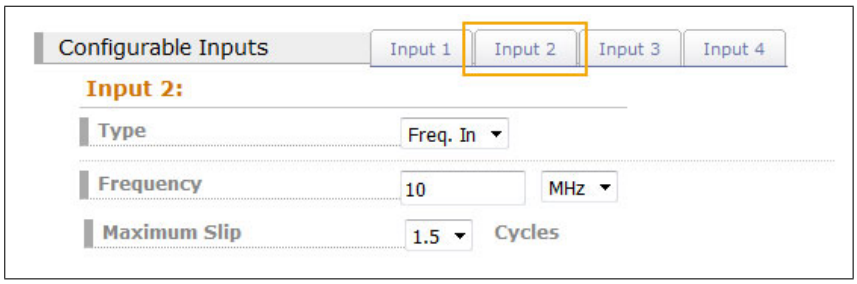

The ESI (External Synchronization Input) card is capable of adding additional synchronization sources to an IMS system. It accepts E1 and T1 sources, both as a Bitstream (2.048MBit/s/1.544Mbit/s, supporting SSM/BOC) or Frequency (2.048MHz/1.544MHz).

It also handles a configurable frequency (1 kHz - 10 MHz) and 1PPS pulse synchronization source, if required. An ESI card is, as the MRI card, dedicated to one specific clock module (depending on the slot it is installed in) and can be installed in both ESI as well as MRI slots.

#### Configurable Inputs




**Input 1:** The input 1 is dedicated to 1PPS pulse synchronization.

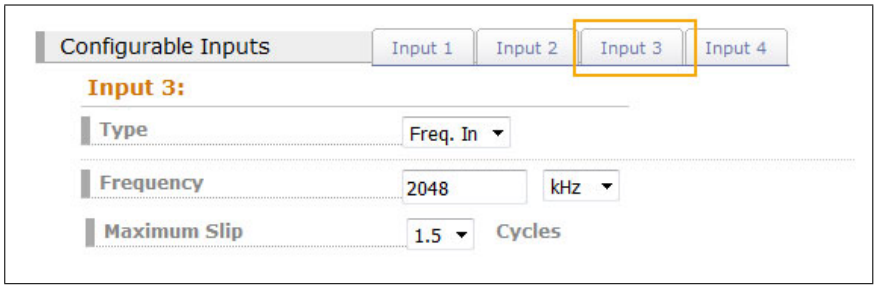



**Input 2:** The input 2 accepts as input either 2048 kHz frequency or configurable frequency in range between 1kHz and 10 MHz, also 1.544kHz if required.

**Type:**
Freq. In

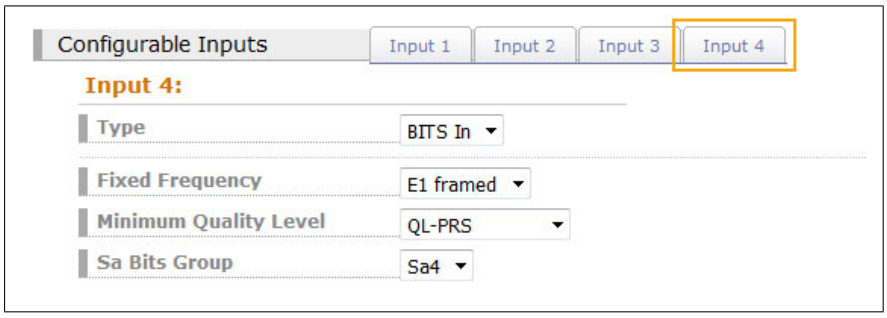
**Frequency**
Fill in a configurable frequency in range: 1 kHz - 10 MHz of input signal, 2048 kHz is set as default.

**Maximum Slip n Cycles**
A discontinuity of an integer number of cycles in the measured carrier phase resulting from a temporary loss of input signal. The maximum slip number can be selected in range between 0.5 – 3 cycles, with 1.5 as a default value.




**Input 3:** see Input 2.

**Input 4:**
As fixed frequency you can choose between E1 framed or T1 framed




**Minimum Quality Levels:**
Synchronization Status Message (SSM) in accordance with ITU G.704-1998 standard includes 4 bit long SSM quality messages received via incoming E1 framed signal. The clock source quality levels according to G.704-1998 are as follows:

| | |
|---|---|
| QL-STU/UKN | Quality unknown, existing synchronization network |
| QL-PRS | Primary Reference Source |
| QL-PRC | Primary Reference Clock - Rec. G.811 |
| QL-INV3 | reserved |
| QL-SSU-A/TNC | |
| QL-INV5 | reserved |
| QL-INV5 | reserved |
| QL-ST2 | |
| QL-SSU-B | |
| QL-INV9 | reserved |
| QL-EEC2/ST3 | |
| QL-EEC1/SEC | Synchronous Equipment Timing Source (SETS) |
| QL-SMC | |
| QL-ST3E | |
| QL-PROV | |
| QL-DNU/DUS | Do not use for synchronization |

**Example:**
User configured QL-SSU-B as Minimum Quality Level for his system. E1 input signal coming from PRC (G.811) or TNC will be allowed for synchronization, whereas signal coming from Synchronous Equipment Timing Source (SETS) will not be accepted.

**Sa Bits**
With Sa Bits you can select one of the Sa4 to Sa8 bits which is allocated for SSM quality messages.

### 12.6.9 LNE-GbE: Network Expansion with Gigabit Support

**Link speed:** 10/100/1000 Mbit

**Connector Type:** 8P8C (RJ45)

**Cable:** CAT 5.0

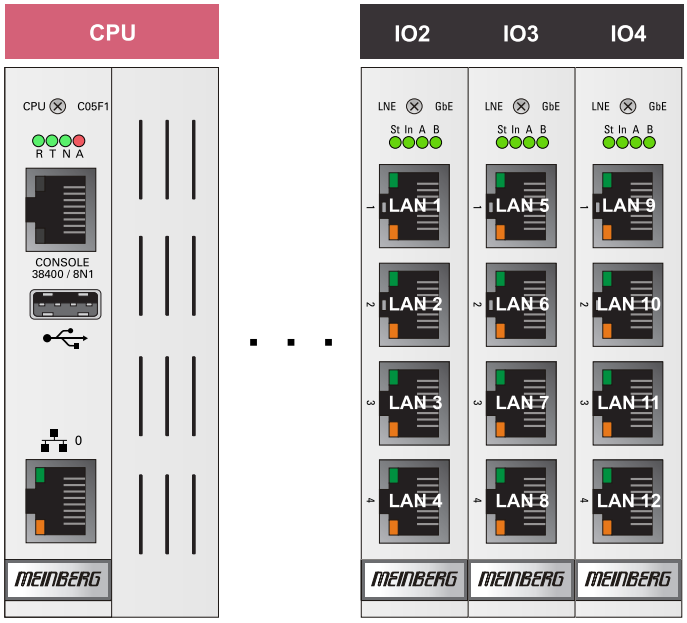
**Duplex Modes:** Half/Full/Autonegotiaton


**LED Indicators**

LED St: Init lights blue during initialisation

LED In - LED B: Shows the state of the four LAN ports after initialisation
green normal operation
red defective LAN port

**LAN interface alignment with several LNE modules in operation:**
Basically, the physical network ports are assigned according to the MAC address order. Thus, the uppermost interface on a LNE module has the lowest and the bottommost interface has the highest MAC address, respectively. Let's take an example where three LNE modules are inserted in a device. Then the logical order of network interfaces assigned in a webinterface follows the MAC address order of LNE modules, disregarding the I/O slot order by which the modules are inserted.




**LAN-CPU**
LAN 0: 00:11:22:ee:aa:66

**LNE Slot IO2**
LAN 1: ec:22:33:44:aa:7b
LAN 2: ec:22:33:44:aa:7c
LAN 3: ec:22:33:44:aa:7d
LAN 4: ec:22:33:44:aa:7e

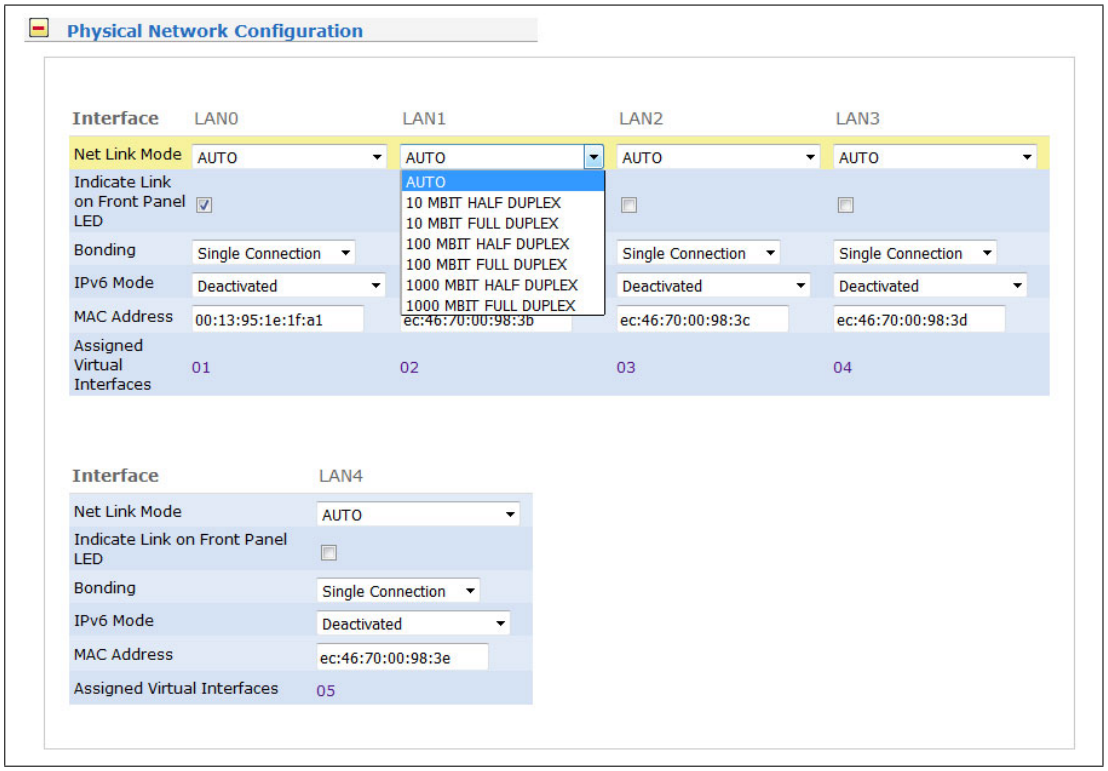
**LNE Slot IO3**
LAN 5: ec:22:33:44:aa:7f
LAN 6: ec:22:33:44:aa:80
LAN 7: ec:22:33:44:aa:81
LAN 8: ec:22:33:44:aa:82

**LNE Slot IO4**
LAN 9: ec:22:33:44:aa:83
LAN 10: ec:22:33:44:aa:84
LAN 11: ec:22:33:44:aa:85
LAN 12: ec:22:33:44:aa:86

In a factory assembling, LNE modules are sorted in an ascending order starting from left to right (see the corresponding figure above). LAN 0 is therefore always the first network interface of the LAN-CPU.

### LNE-GBE Configuration via the Web Interface

If the LNE-GBE operates in an IMS system, all network settings can be configured via the web interface then.




**Physical Network Configuration**

Net Link Mode: The network interfaces LAN1 - LAN4 (LNE-GBE) can be used in 1000 MBIT HALF / FULL duplex mode.

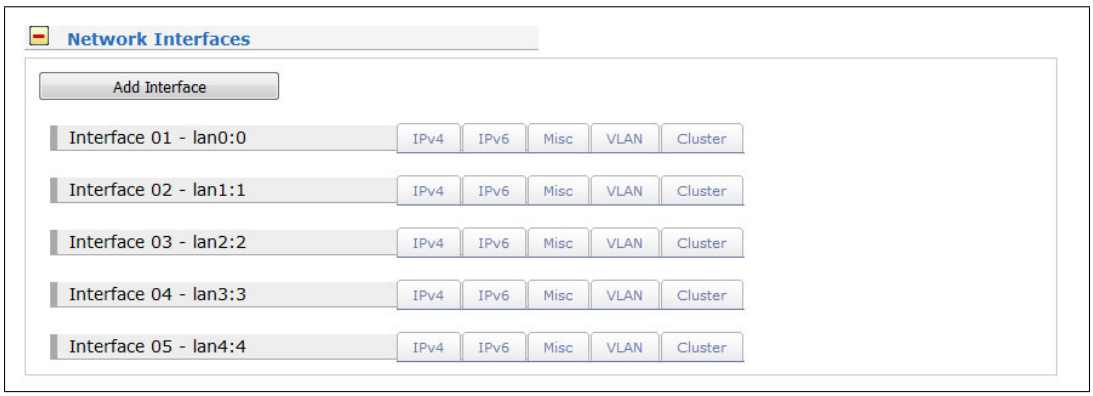
Indicate Link: LED indication for the selected physical interface, only if a front display with function keys is available.

Bonding: to optimize the reliability and the use of a of higher bandwith.

IPv6 Mode: This mode must be activated here.

MAC-Address: Displays the unique MAC address of the physical interface.

Assigned Virtual Interfaces: In the Ethernet Interfaces menu (see below) virtual network interfaces can be added.




**Menu Interfaces**

IPv4: Manually adjustment of all important parameters such as TCP / IP address, subnet mask and gateway. The DHCP client can also be activated here for automatic network configurations.

Misc: With the tab Misc the virtual interface can be assigned to a physical interface.

VLAN: With VLAN, this function can be enabled and configured.

Cluster: The cluster function can be activated with this submenu and additional Parameters such as multicast or unicast mode, TCP / IP address and subnet mask can be set up here.

### Adding/Removing an LANTIME Network Extension LNE

An LNE module can be installed in each MRI/ESI or IO Slot of a LANTIME IMS device.

## Adding a LANTIME Network Extension

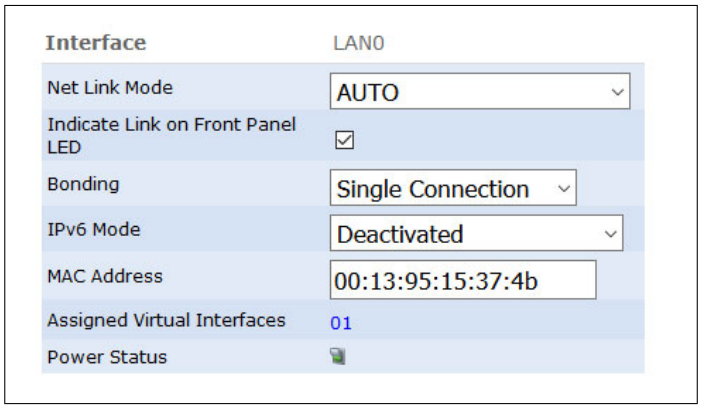
After the LNE has been installed to a slot, please start a SSH, TelNet or serial connection to the lantime. As soon as you are logged in, please execute the following command.

```
ifconfig | grep eth
```

this should give you an output with at least four entrys for each installed LNE module. The output should look like similar to the following one.

```
eth0 Link encap:Ethernet HWaddr ec:46:70:00:8b:8c
eth1 Link encap:Ethernet HWaddr ec:46:70:00:8b:8d
eth2 Link encap:Ethernet HWaddr ec:46:70:00:8b:8e
eth3 Link encap:Ethernet HWaddr ec:46:70:00:8b:8f
```

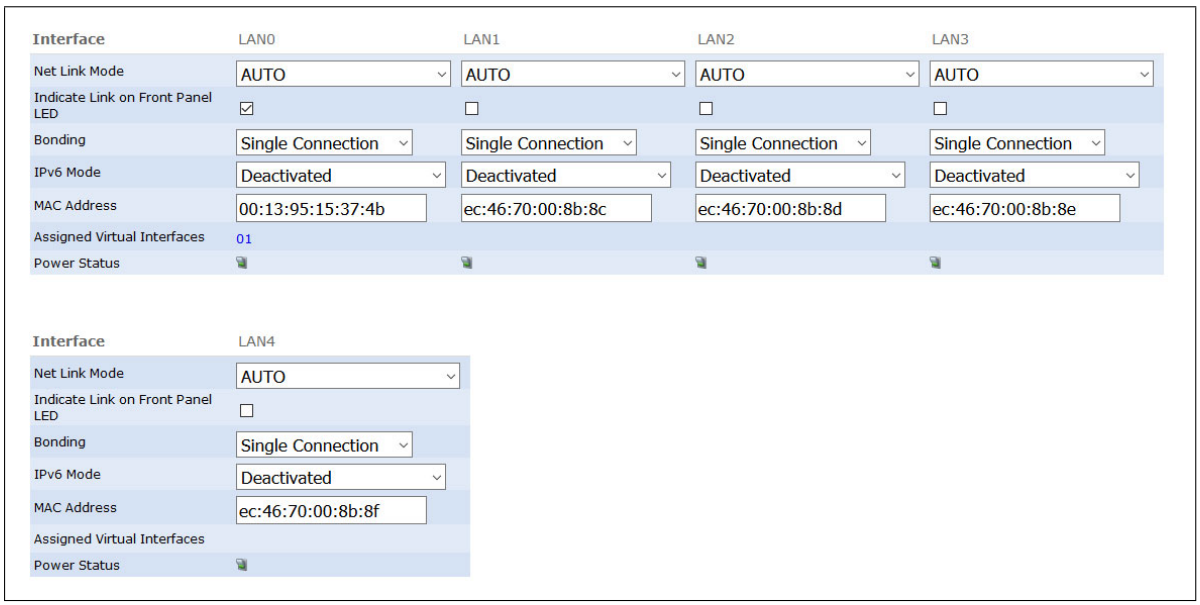
We are now sure, that the LNE module is installed properly. But as you can see in the lower figure, the module is not implemented into the LTOS yet. The figure shows the "PHYSICAL NETWORK INTERFACES" chapter of the "NETWORK" tab.




Therefore we have to use the "nicmgr" command. This will implement the interfaces into the system that way, that the lantime can use them.

```
nicmgr autoassign ; saveconfig network
```

After the nicmgr has finished it's procedure, have a look again at the web UI of the LANTIME. You should now be able to see the interfaces of the LNE module.



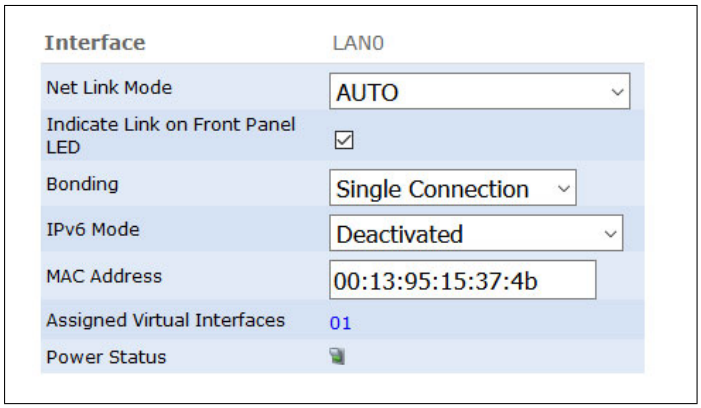

For further information how to configure a virtual network interface, take a look at the LANTIME manual.

## Removing the Network Extension from the LANTIME

In order to remove the LNE, simply remove the module from the slot it is installed at. As you will see, the "PHYSICAL INTERFACES" will still show the LNE interfaces, even if they already have been removed. Now log in to the LANTIME Command-Line-Interface using SSH, Telnet or a serial connection. Once you are logged in, exexute the following command.

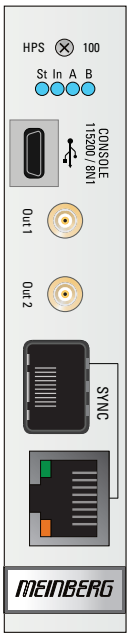
```
nicmgr autoremove ; saveconfig network
```

This will delete the interface out of the LANTIME configuration files. After that the webinterface should display the "old" state again.



## 12.6.10 HPS-100: PTP / SyncE / Hardware NTP Interface

**IEEE 1588 v2 compatible**




| | |
|---|---|
| Profiles: | IEEE 1588v2 Default Profile<br>IEEE C.37.238 Power Profile<br>IEEE 802.1AS AVB/TSN Profile<br>ITU-T G.8265.1 Telecom Frequency Profile<br>ITU-T G.8275.1 Telecom Phase/Time Profile<br>SMPTE ST 2059-2 Broadcast Profile |
| PTP Modes: | Multicast/Unicast Layer 2 (IEEE 802.3)<br>Multicast/Unicast Layer 3 (UDP IPv4/IPv6)<br>Hybrid Mode<br>E2E / P2P Delay Mechanism<br>Up to 128 messages/second per client |
| NTP Mode: | NTP Server mode (10 ns time stamp accuracy) |
| 1588 Clock Mode: | 1-Step, 2-Step for both Master and Slave operation |
| Synchronous Ethernet: | Master and Slave Capability<br>Compliant to ITU-T G.8261, G.8262 and G.8264<br>Ethernet Synchronization Messaging Channel (ESMC) |
| Network Protocols: | IPv4, IPv6<br>DHCP, DHCPv6<br>DSCP<br>IEEE 802.1q VLAN filtering/tagging<br>IEEE 802.1p QOS |
| Ethernet Interface: | Combo Port: 1 x 100/1000BASE-T RJ45, 1 x GBIT SFP - Slot |
| USB Interface: | USB 1.1 / USB 2.0 full-speed, Micro USB female connector |
| Signal Outputs: | 2x SMA (50 Ohm) connectors<br>configurable signals: 1PPS, 10MHz, 2048kHz |
| CPU: | 825 MHz Cortex A9 Dual Core on SOC |
| Time Stamp Accuracy: | 10 ns |
| Number of Clients: | *Available license:* |

**Unicast:**

| | | |
|---|---|---|
| HPS-100 [8]: | up to 8 Clients | / 1024 Multicast Hybrid Transactions |
| HPS-100 [256]: | up to 256 Clients | / 32768 Multicast Hybrid Transactions |
| HPS-100 [512]: | up to 512 Clients | / 65536 Multicast Hybrid Transactions |
| HPS-100 [1024]: | up to 1024 Clients | / 131072 Multicast Hybrid Transactions |
| HPS-100 [2048]: | up to 2048 Clients | / 262144 Multicast Hybrid Transactions |

**LED Indicators**

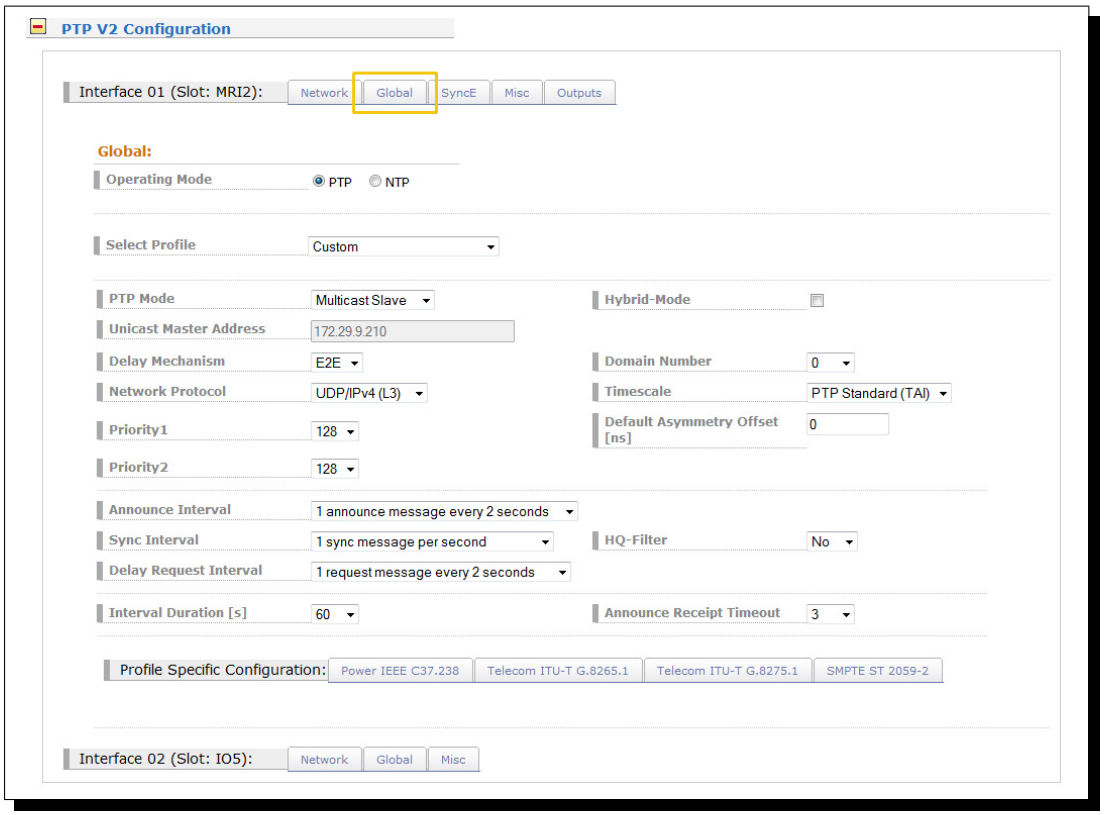
| | | |
|---|---|---|
| LED St: | Init | lights blue during initialisation,<br>off in normal operation mode |
| LED In: | red | Error - TSU does not work correctly,<br>PTP services stopped |

| | |
|---|---|
| yellow | No link, but initialized |
| green | link up |
| red | stopped |

LED A - LED B: Shows the current State of the TSU

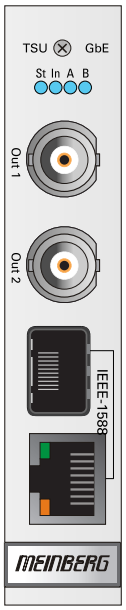
| | |
|---|---|
| yellow - yellow | Listening |
| green - off | Master Mode |
| off - green | Slave Mode |
| yellow - off | Passiv Mode |
| off - yellow | uncalibrated |
| red - red | stopped |

A detailed configuration guide you will find in the corresponding firmware manual of the system. See chapter "The Web Interface -> Configuration: PTP V2".



## 12.6.11 TSU V3: IEEE-1588 Time Stamp Unit

**TSU v3 (IEEE 1588 v2 compatible)**




| | |
|---|---|
| Profiles: | IEEE 1588v2 Default Profile<br>IEEE C.37.238 Power Profile<br>ITU-T G.8265.1 Telecom Frequency Profile<br>ITU-T G.8275.1 Telecom Phase/Time Profile<br>SMPTE ST 2059-2 Broadcast Profile |
| PTP Modes: | Multicast Layer 2 (IEEE 802.3)<br>Multicast/Unicast Layer 3 (UDP IPv4/IPv6)<br>E2E / P2P Delay Mechanism<br>Bis 128 messages/second per client |
| NTP Mode: | NTP Server mode (10 ns time stamp accuracy) |
| 1588 Clock Mode: | 1-Step, 2-Step for both Master and Slave operation |
| Synchronous Ethernet: | Master and Slave Capability<br>Compliant to ITU-T G.8261, G.8262 and G.8264<br>Ethernet Synchronization Messaging Channel (ESMC) |
| Network Protocols: | IPv4, IPv6<br>DHCP, DHCPv6<br>DSCP<br>IEEE 802.1q VLAN filtering/tagging |
| Ethernet Interface: | Combo Port:<br>1 x 100/1000BASE-T RJ45<br>1 x GBIT SFP - Slot |
| Signal Outputs: | 2x BNC (50 Ohm) connectors<br>configurable signals: 1PPS, 10MHz, 2048kHz |
| CPU: | 1 GHz Dual Core ARM |
| Time Stamp Accuracy: | 10 ns |

**LED Indicators**

| | | |
|---|---|---|
| LED St: | Init | lights blue during initialisation,<br>off in normal operation mode |
| LED In: | red | Error - TSU does not work correctly,<br>PTP services stopped |
| | yellow | No link, but initialized |
| | green | link up |
| | red | stopped |

LED A - LED B: Shows the current State of the TSU

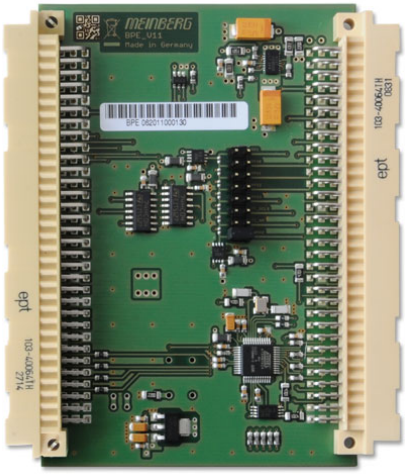
| | |
|---|---|
| yellow - yellow | Listening |
| green - off | Master Mode |
| off - green | Slave Mode |
| yellow - off | Passiv Mode |
| off - yellow | uncalibrated |
| red - red | stopped |

## 12.6.12 CPE and BPE Output Modules (Frontend - Backend)

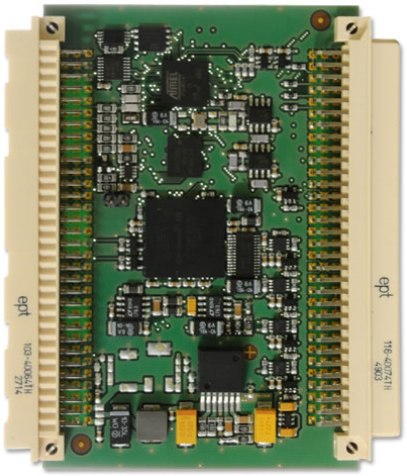
**Configurable Port Expander / Backplane Port Expander**

The standard output signals like pulses (1PPS, 1PPM and freely programmable pulses) and frequencies (10MHz, 2.048MHz, frequency synthesizer 1kHz-10MHz) are provided by two versatile I/O cards named BPE and CPE. Both of these two modules have been designed to cover a wide range of interface and signal/protocol requirements. They feature a two-tier architecture with a back-end and front-end.

The back-end is responsible for internally routing the backplane IMS synchronization signals (in case of the BPE) or for autonomously generating a wide range of different signals by using a microprocessor (on a CPE). The front-end makes a selection of the signals available on physical connectors.




BPE - Backend




CPE - Backend

## BPE - Backplane Port Expander (Frontend)

**Output Signals:** fixed:
10MHz, PPS, IRIG DCLS, IRIG AM, 2,048 MHz,
PPOs (selectable via receiver)

**Power Requirements:** 5 V +-5%, 150 mA / BNC
5 V +-5%, 150 mA / FO

**Status Indicators**

| | |
|---|---|
| LED St: | BPE status |
| LED In: | Status of the backplane's output signals |
| LED A: | BPE status - output signals (1 + 2) |
| LED B: | BPE status - output signals (3 + 4) |

Initialisation: LED St: blue until USB is configured
LED In - LED B: off until USB is configured

USB is configured: LED St: blue
LED In - LED B:
0,5 sec. red -> 0,5 sec. yellow ->
0,5 sec. green -> 0,5 sec. off

Normal Operation: LED St. + LED In: green
LED A: green, if the desired signal is present
on output 1 and output 2
LED B: green, if the desired signal is present
on output 3 and output 4

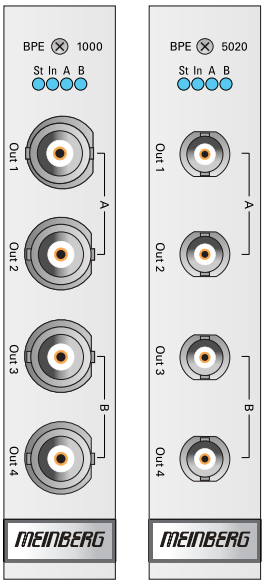



*Figure right: BPE Frontend*

BPE-1000 Standard outputs - BNC female:
PPS, 10MHz, TC DCLS and TC AM

BPE 5000 Fiber Optic ST-Connectors
PPS, 10MHz, TC DCLS und TC AM

**Available BPE Modules**

| BPE Type | Connectors | Signals | Size |
|---|---|---|---|
| **BPE-1040** | 4 x BNC female | Out 1 - Out 4: TC AM | 4HP |
| **BPE-1060** | 4 x BNC female | Out 1 - Out 4: DCF77 SIM | 4HP |
| **BPE-2000** | 4 x BNC female | Out 1: PPS, Out 2: 10MHz<br>Out 3: TC DCLS, Out 4: TC AM | 4HP |
| **BPE-2001** | 4 x BNC female | Out 1: PPS, Out 2: 10MHz<br>Out 3: TC DCLS, Out 4: TC DCLS | 4HP |
| **BPE-2010** | 4 x BNC female | Out 1 - Out 4: PPS | 4HP |
| **BPE-2014** | 4 x BNC female | Out 1 - Out 2: PPS<br>Out 3 - Out 4: 10MHz | 4HP |
| **BPE-2020** | 4 x BNC female | Out 1 - Out 4: 10MHz | 4HP |
| **BPE-2030** | 4 x BNC female | Out 1 - Out 4: TC DCLS | 4HP |
| **BPE-2050** | 4 x BNC female | Out 1 - Out 3: TC DCLS<br>Out 4: TC AM | 4HP |
| **BPE-2080** | 4 x BNC female | Out 1 - Out 4: 2.048kHz | 4HP |

## CPE - Configurable Port Expander (Frontend)

### CPE (Configurable Port Expander)

The CPE is a configurable IO card that can autonomously generate additional output signals from the integrated system clock. This module consists of a half-size standard controller card (back-end) and a dockable port expander card (front-end), like this a wide variety of available programmable output signals and physical connections are possible, including various electrical and optical interfaces.

This enables the CPE, in combination with the front end COI TS2 (CPE 3000 ...), to support up to 4 more configurable interfaces that can optionally be led out as RS232, RS422 or RS485 signal type. Furthermore, up to 8 programmable outputs (PPO) can be generated and configured in the web interface. The settings of the desired output configuration are selected in the IO Config -> Output Configuration.

It should be noted that the desired signals can be realized only with the corresponding front card.

**Output Signals:** configurable:
10MHz, PPS, IRIG DCLS, IRIG AM, PPO

**Capture-Input:** active high or active low,
permitted input level +5 V (DC)

**Power Supply:** +5 V (DC), 150-300 mA,
depending on the selected frontend

**Environmental:** Temperature 0-50 °C
Humidity max. 85 %, non condensing

**Status Indicators**

| | |
|---|---|
| LED St: | CPE status |
| LED In: | Status of the backplane's output signals |
| LED A: | currently not used |
| LED B: | currently not used |

**LED Indicators**

| | | |
|---|---|---|
| LED St: | blue | during initialisation |
| | green | normal operating mode |
| LED In: | red | no signal |
| | yellow | signal available / not sync |
| | green flash | allready sync |
| LED A: | off | currently not used |
| LED B: | off | currently not used |

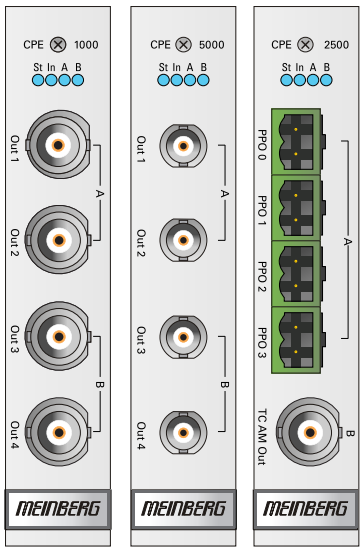
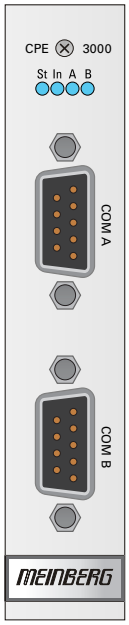


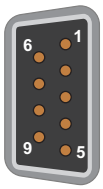

**Figure: CPE Frontends**
CPE-1000: 4 config. outputs via BNC female
CPE-5000: 4 config. outputs / FO - ST connectors
CPE-2500: 4 x prog. Pulses (DFK-2) / 1 x TC AM (BNC)

### CPE-3000: Programmable Outputs via serial Interface

The CPE 3000 module has two serial ports (COM A and B) for various output signals. The two interfaces can also be used for communication with other devices.

The possible pin assignments and module types are listed below:



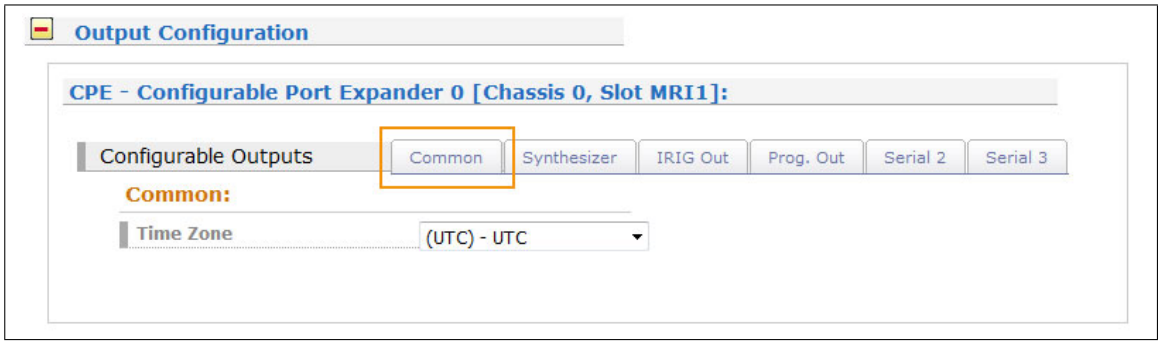




D-SUB 9
Male

| | CPE-3000 | CPE-3010 | CPE-3020 | CPE-3030 | CPE-3040 |
|---|---|---|---|---|---|
| **PIN** | **RS232+PPO** | **RS422** | **RS422+PPO** | **RS485** | **RS485+PPO** |
| 1 | PPO | RxD + | RxD + | - | - |
| 2 | TxD | RxD - | RxD - | - | - |
| 3 | RxD | - | TxD + | - | TxD + / RxD + |
| 4 | - | - | TxD - | - | TxD - / RxD - |
| 5 | GND | GND | GND | GND | GND |
| 6 | - | - | - | - | - |
| 7 | - | TxD + | PPO + | TxD + / RxD+ | PPO + |
| 8 | - | TxD - | PPO - | TxD - / RxD - | PPO - |
| 9 | - | - | - | - | - |

### CPE-3020 Configuration via Web Interface

If the CPE-3020 operates in an IMS system, the output configuration can easily be done via the web interface then.




With the "General" tab the time zone with the corresponding offset can be selected.

**Configuration: CPE-3020**
In the "IO Config" menu you can select the following values for the output connectors:

| | |
|---|---|
| Common | Time zone with the corresponding UTC offset value |
| Synthesizer | Frequency Snthesizer range 1Hz - 10MHz |
| IRIG Code | Generated IRIG output codes (B002+B122 ...) |
| Prog. Out | Programmable output |
| Serial-1 | Setting the serial port parameters (baud rate, framing, time telegram and operating mode) |

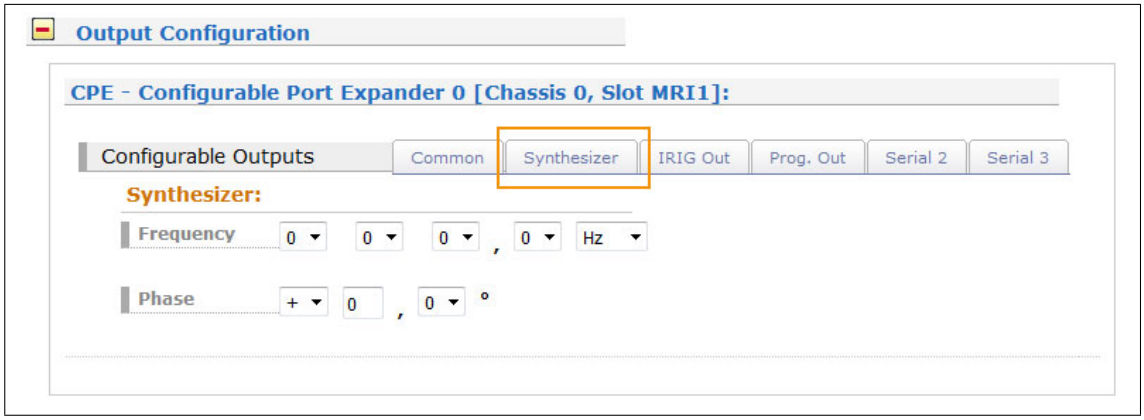



*Figure: Menu Tab "Synthesizer" Frequency for selecting the Frequency Synthesizer option in the menu "Prog. Out"*

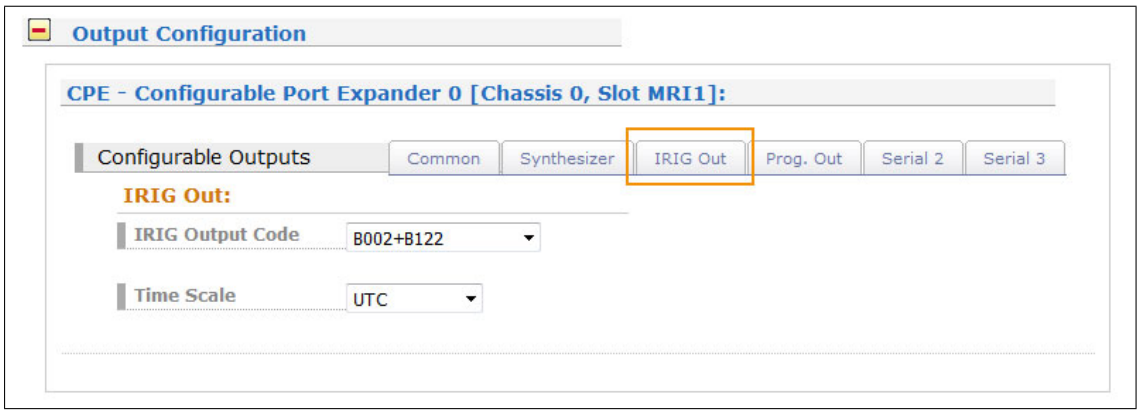



*Figure: Menu Tab "IRIG Out" Selection of the IRIG code (IRIG DCLS only)*

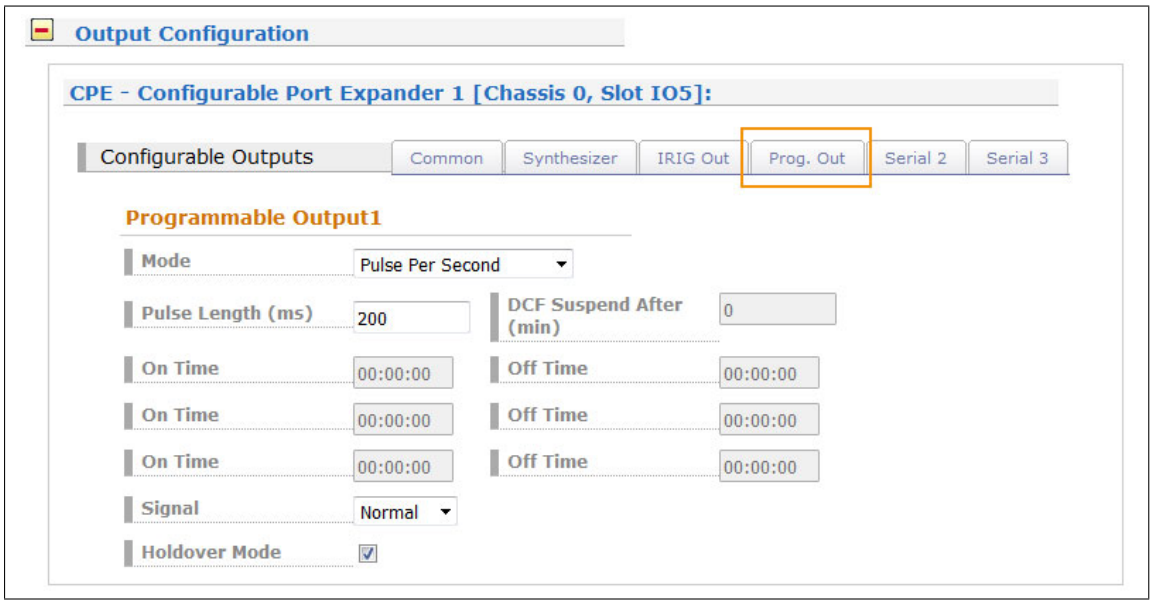



*Figure: Menu Tab "Prog. Out" Selection of the signal option for the programmable pulse output (PPO)*


*Figure: Menu Tab "Serial 1/2" Setting of the parameters for the serial port*

## 12.6.13 LIU - Line Interface Unit

Input signal: 2.048 MHz reference clock, TTL level

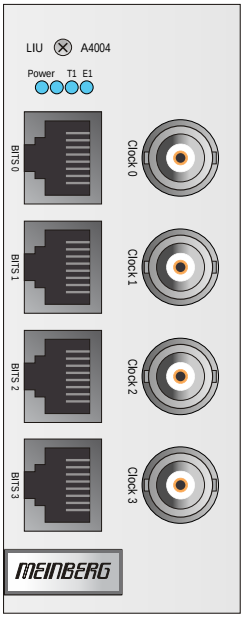
Clock: T1 - 1.544 MHz
E1 - 2.048 MHz

BITS: T1 - 1.544 MBit/s
E1 - 2.048 MBit/s

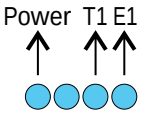
Outputs: balanced - RJ45 jack - 120 Ω (Clock)
unbalanced - BNC connector 75 Ω (Bits)

Short term stability and Accuracy: depends on oscillator of the reference clock

| | |
|---|---|
| OCXO-SQ: | $+-5 \cdot 10^{-10}$ |
| OCXO-MQ: | $+-2 \cdot 10^{-10}$ |
| OCXO-HQ: | $+-5 \cdot 10^{-12}$ |
| OCXO-DHQ: | $+-2 \cdot 10^{-12}$ |
| Rubidium: | $+-2 \cdot 10^{-11}$ |




### LED Indicators



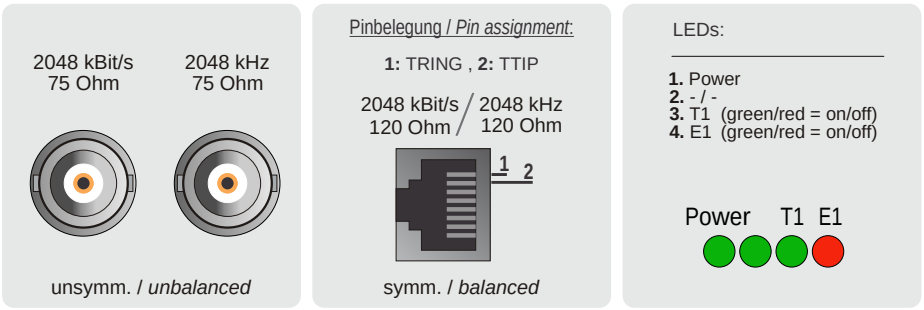

| | | |
|---|---|---|
| Power: | Init | blue during initialisation, green in normal operation mode |
| T1: | green | selected mode T1 |
| | red: | output disabled |
| | yellow: | signal quality unknown |
| E1: | green | selected mode E1 |
| | red: | output disabled |
| | yellow: | signal quality unknown |

### IMS-LIU Telecom Output Signals

The board LIU (Line Interface Unit) was designed to convert the GPS-locked standard frequency of a preconnected Meinberg satellite controlled clock (GPS and GLONASS) into several timing signals that can be used for various synchronization or measurement tasks.

Typical applications are:

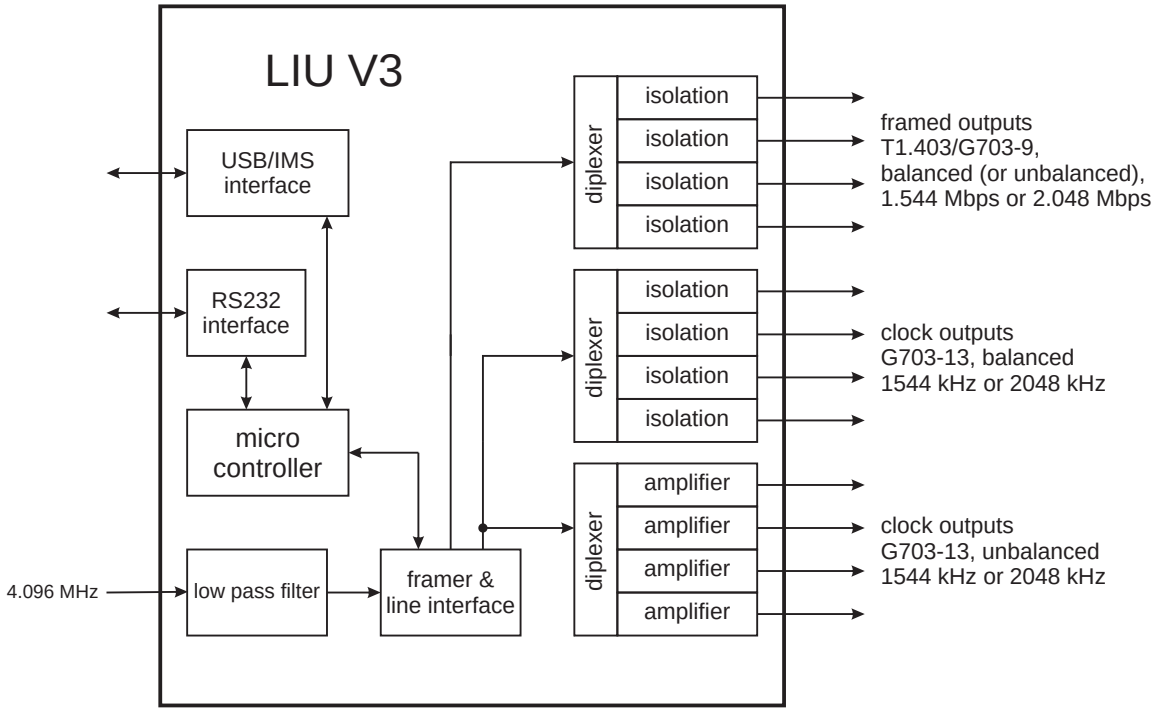
- Measurement and test of synchronization quality of Telecom networks
- Calibration and synchronization of laboratory equipment
- Test of synchronization of radio transmitters / base stations (GSM / CDMA / UMTS / DAB / DVB)




There are two separate signal paths on the board LIU. One is for providing the standard frequencies, the second path is for generation of the "telecom-signals". All output signals have high accuracy and stability because they are derived from the internal receiver's disciplined standard frequencies generated by the preconnected satellite clock. Depending on the oscillator option of the internal receiver, the following accuracies can be achieved:

### Blockdiagram LIU

The following block diagram illustrates the functional principle of the board LIU:



### Telecom Signals

These signals can be devided into two groups: the "clock" outputs and the "framed" outputs, that are provided by a framer and line interface device on the board LIU. All clock signals needed for generation of the 'telecom outputs' are derived from a 2048 kHz reference clock, which is generated by a frequency synthesizer on the preconnected GPS- or GLN-clock. This synthesizer is phase locked to the PPS signal and frequency locked to the master oscillator of the clock.

The module LIU is able to generate signals for the American T1- or the European E1-system. The mode of operation can be configured via the web interface of the IMS management module (LAN-CPU).

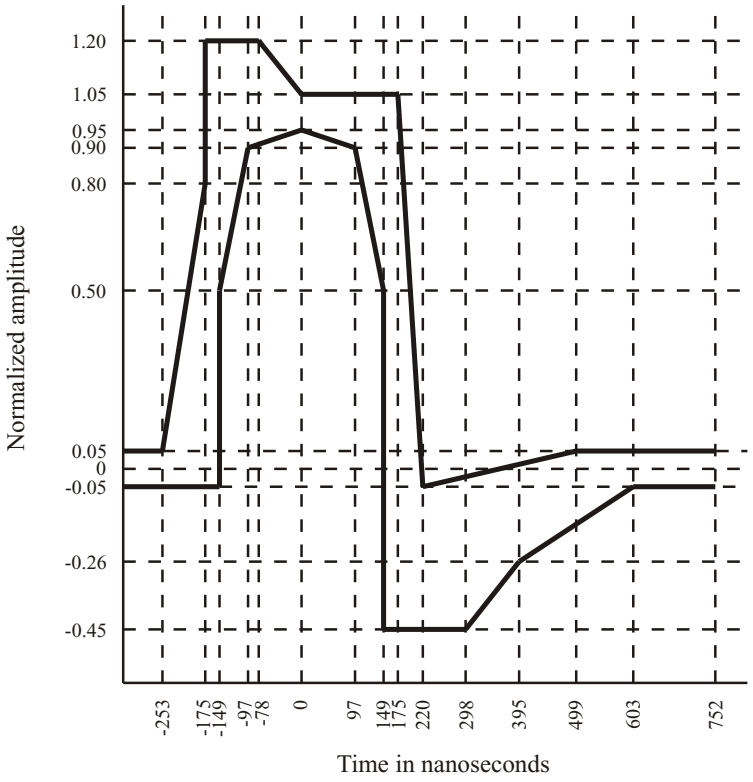
The clock outputs are standard frequencies of either 1544 kHz (T1) or 2048 kHz (E1). Four unbalanced and four balanced outputs according to ITU-T G703-13 (CCITT recommendation "Physical/electrical characteristics of hierarchical digital interfaces") are available via BNC female and RJ45 connectors.

The "framed" outputs are consisting of data signals known from digital telephony, which are distributed by using a special frame structure (EFS Framing Mode - Extended Superframe). As a synchronization unit, LIU only generates a "framed all ones" signal (data byte 0xFF hex) with a transmission speed of either 1544 kBits (T1) or 2048 kBit/s (E1). Four outputs according to ANSI T.403 (T1-mode) or ITU-T G703-9 (E1-mode) are available either unbalanced via BNC connectors or balanced via RJ45 connectors. Two different line codes used for error correction are known for the transmission of framed signals. The board LIU generates B8ZS- (in T1-mode) or HDB3-coded (in E1-mode) output signals by standard.

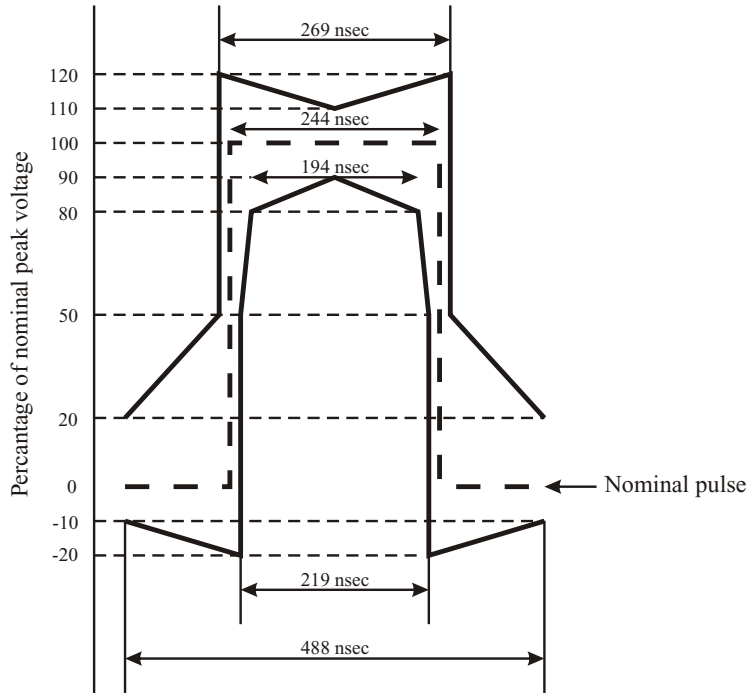
### Pulse templates

The following pulse templates are required by ANSI (T1-mode) and CCITT (E1-mode) for output signals in telecom applications. The board LIU meets these recommendations.

T1 (T.403):




E1 (G.703):



### LIU - Configuration Samples

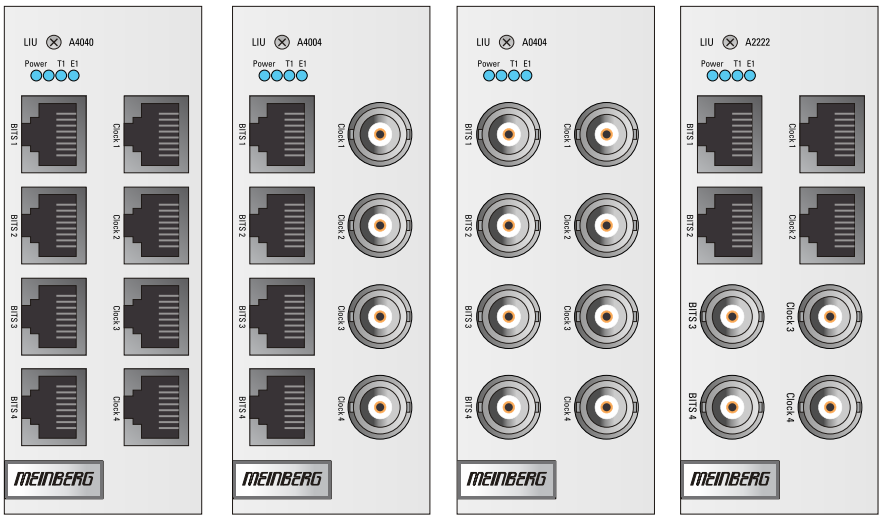
The Line Interface Unit (LIU) is available in two different sizes and different output / connector options. All outputs of a module can be operate in either the E1 or T1 in mode. Signal output settings can be done during operation via the web interface. The selected mode is indicated by the LEDs in the retainer plate.

### Signal Types

- 2048 kHz (E1 mode) or 1.544 MHz (T1 mode), G.703, 120 Ω, balanced, RJ45 socket
- 2048 kHz (E1 mode) or 1.544 MHz (T1 mode), G.703, 75 Ω, unbalanced, BNC connector
- 2048 kBit/s (E1 mode) or 1.544 MBit/s (T1 mode), 120 Ω, balanced, RJ45 socket
- 2048 kBit/s (E1 mode) or 1.544 MBit/s (T1 mode), 75 Ω, unbalanced, BNC connector

### Overview - LIU Modules for IMS Systems

| LIU Model | Size | Signal (bal./unbal.) | Connectors |
|---|---|---|---|
| LIU-A4040 | 8TE | BITS (4/0)<br>Clock (4/0) | 4 x RJ45<br>4 x RJ45 |
| LIU-A4004 | 8TE | BITS (4/0)<br>Clock (0/4) | 4 x RJ45<br>4 x BNC |
| LIU-A0404 | 8TE | BITS (0/4)<br>Clock (0/4) | 4 x BNC<br>4 x BNC |
| LIU-A0044 | 8TE | Clock (4/0)<br>Clock (0/4) | 4 x RJ45<br>4 x BNC |
| LIU-A2222 | 8TE | BITS (2/2)<br>Clock (2/2) | 2 x RJ45, 2 x BNC<br>2 x RJ45, 2 x BNC |



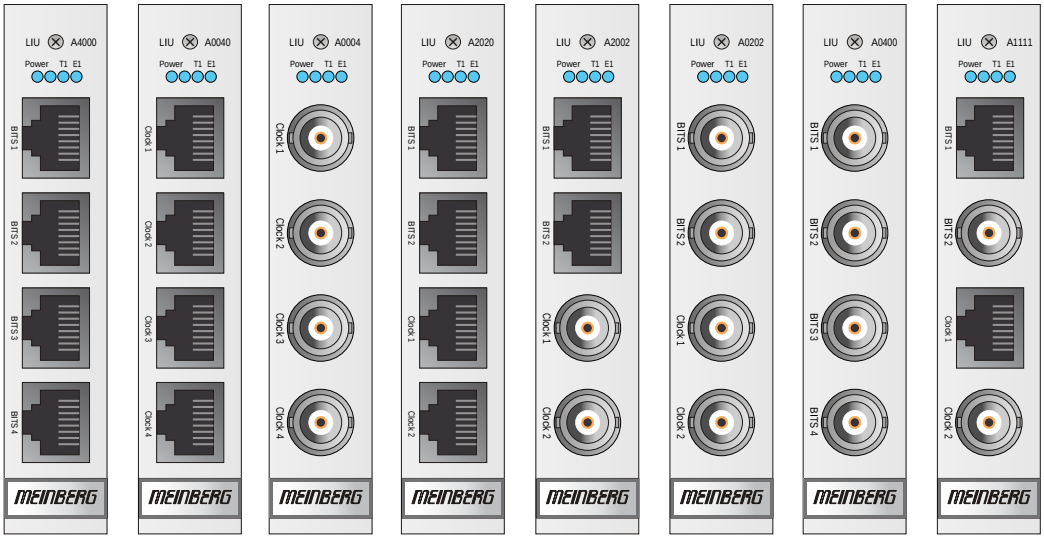

LIU-A4040
BITS (4/0)
Clock (4/0)

LIU-A4004
BITS (4/0)
Clock (0/4)

LIU-A0404
BITS (0/4)
Clock (0/4)

LIU-A2222
BITS (2/2)
Clock (2/2)

| LIU Model | Size | Signal (bal./unbal.) | Connectors |
|---|---|---|---|
| **LIU-A0040** | 4TE | Clock (4/0) | 4 x RJ45 |
| **LIU-A0004** | 4TE | Clock (0/4) | 4 x BNC |
| **LIU-A2020** | 4TE | BITS (2/0)<br>Clock (2/0) | 2 x RJ45<br>2 x RJ45 |
| **LIU-A2002** | 4TE | BITS (2/0)<br>Clock (0/2) | 2 x RJ45<br>2 x BNC |
| **LIU-A0400** | 4TE | BITS (0/4) | 4 x BNC |
| **LIU-A1111** | 4TE | BITS (1/1)<br>Clock (1/1) | 1 x RJ45, 1 x BNC<br>1 x RJ45, 1 x BNC |




LIU-A4000
BITS (4/0)

LIU-A0040
Clock (4/0)

LIU-A0004
Clock (0/4)

LIU-A2020
BITS (2/0)
Clock (2/0)

LIU-A2002
BITS (2/0)
Clock (0/2)

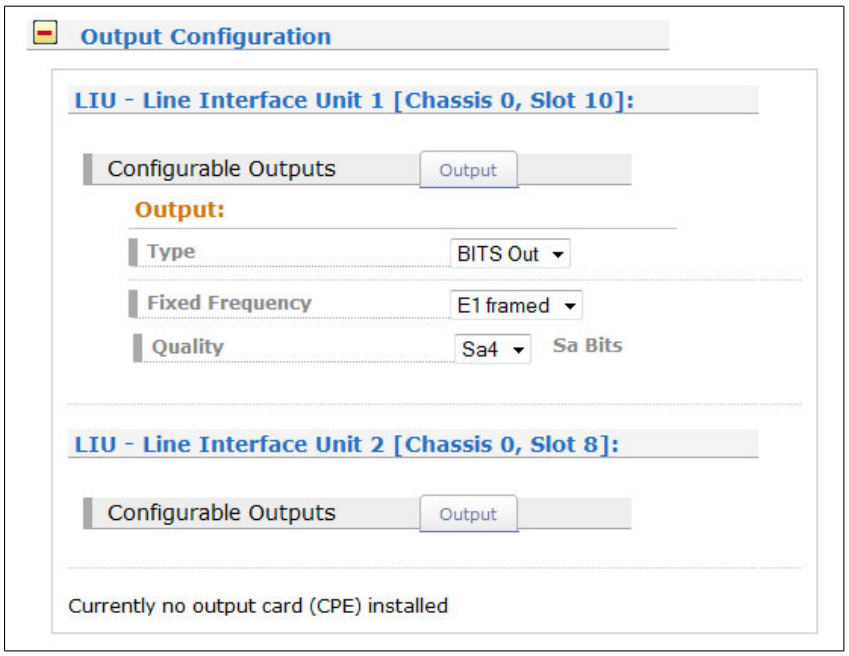
LIU_A0202
BITS (0/2)
Clock (0/2)

LIU_A0400
BITS (0/4)

LIU-A1111
BITS (1/1)
Clock (1/1)

### LIU Configuration via Web Interface

**Output Configuration of a LIU module (Line Interface Unit):**




In this menu one can select between E1 or T1 mode for the LIU outputs. The selected mode is the same for all outputs.

**T1 or E1?**
T1 is a digital carrier signal that transmits the DS - 1 signal. It has a data rate of about 1.544 Mbit/second. It contains 24 digital channels and therefore requires a device that has a digital connection.

E1 is the european equivalent to T1. T1 is the North American term whereas E1 is a European term for digital transmission. The data rate of E1 is about 2 Mbit/second. It has 32 channels at the speed of 64 Kbit/second. 2 channels among 32 are already reserved. One channel is used for signaling while the other is used for controlling. The difference between T1 and E1 lies in the number of channels here.

**Sa Bits**
ITU-T Recommendations allow for bits Sa4 to Sa8 to be used in specific point-to-point applications (e.g. transcoder equipment) within national borders. When these bits are not used and on links crossing an international border they should be set to 1.

The Sa4 bit may be used as a message-based data link for operation, maintenance and performance monitoring. The SSM Bit (Synchronization Status Message) can be selected in the Web GUI for clock quality information. Sa4 is selected as per default.

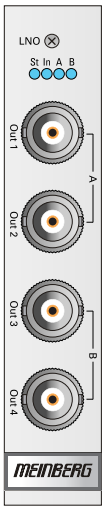
## 12.6.14 LNO - 10MHz Sinus Output Module

The LNO180 is a 10MHz generator card, which provides sine signals with low phase noise to 4 external outputs. The card has a microprocessor system, which monitors the output signals and generates status signals for the upper-level management system accordingly.

**Function of Operation**
The card has a high quality oscillator, which is locked to an external 10MHz signal. The microprocessor monitors the lock status of the PLL and the warm up phase of the oscillator. It activates the outputs only after the phase is locked. This condition is signalized by all LEDs switched from green to red. In the phase locked state the output levels of the four outputs are monitored and in case of a failure signalized by an associated red LED.

**Technical Specifications:**

| | |
|---|---|
| Frequency Input: | 10 MHz, sine ($1V_{pp}$ min.) or TTL |
| Output Level: | 5 dBm +/- 1 dBm an 50Ω |
| Warm-up time: | < 3 @ 25°C within accuracy of < +-1 x $10^{-7}$ |
| Electrical Connectors: | BNC female |




**LED Status Indicators:**

| | |
|---|---|
| All LEDs red | Outputs disabled<br>PLL not locked,<br>OCXO in warm up phase |
| | 10MHz reference not available<br>Quality of the reference signal<br>is not sufficient |
| All LEDs green: | Normal operation, outputs activated |
| Associated LED red: | defect output or short circuit during<br>normal operation |

### 12.6.15 REL1000: Error Relay Module

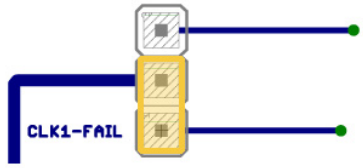
The REL1000 error relay output is connected to the TTL TIME_SYNC output of the reference clock (GPS, GLONASS ...). If the internal reference clock has been synchronized by its source, the relay will switch to mode "NO" (Normaly Open). In error case the relay switches to mode "NC" (Normaly Closed).

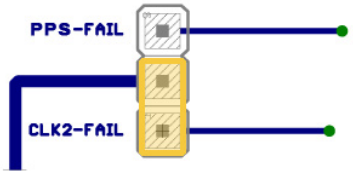
If the system isn't equipped with a second clock and RSC switch unit, the relay can be switched by 10MHz or PPS to monitor these signals.

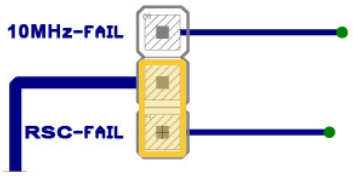
**Error Output:**

| | |
|---|---|
| Relay A: | Clock 1 / Notification Events → Relays |
| Relay B: | Clock 2 / PPS |
| Relay C: | RSC Switch Unit / 10MHz |

**In redundant mode, the jumpers on the REL1000 are set as follows:**




Please note: The REL1000 can only be used for the IMS system M500 in the following jumper setting:

**IMS-M500:**

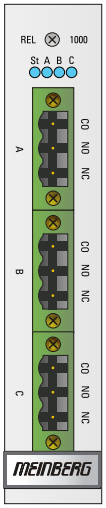
| | |
|---|---|
| Relais A: | Clock 1 |
| Relais B: | PPS |
| Relais C: | 10MHz |

**State of LED Indicators:**

Initialisation Phase:
St: blue
A: off
B: off
C: off

Boot Phase:
St: blue
A: 1s red, 1s yellow, 1s green, 1s off
B: 1s red, 1s yellow, 1s green, 1s off
C: 1s red, 1s yellow, 1s green, 1s off

Normal Operation Mode:
St: green (Status)
A: green, red in case of error (Clock 1)
B: green, red in case of error (Clock 2)
C: green, red in case of error (RSC Switch Unit)

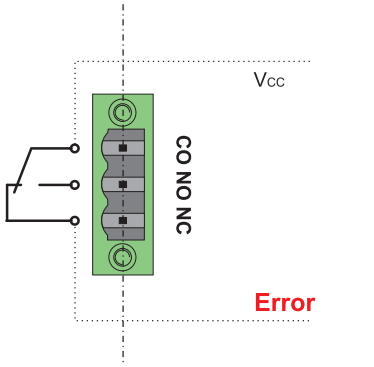



**Technical Specification ERROR Relays:**

| | | |
|---|---|---|
| Switching Voltage: | 220 V $DC_{max}$ / 250 V $AC_{max}$ | |
| Switching Load: | 60 $W_{max}$ /62.5 $VA_{max}$ | |
| UL/CSA: | 0.3 A | 125 V AC |
| | 0.3 A | 110 V DC |
| | 1 A | 30 V DC |
| Response Time: | ca.3 ms | |

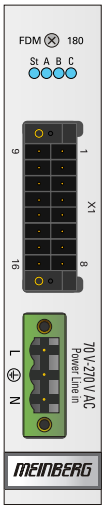
**Normal Operation**: CO - NO connected

**Error:** CO - NC connected



### 12.6.16 FDM - Frequency Deviation Monitoring

The module FDM180 was designed to calculate and monitor the frequency and its deviation in 50/60Hz power line networks.




A preconnected reference is necessary that provides a serial time string and a PPS (pulse per second). The accuracy of the measurements is derived from these signals. The module calculates the frequency as well as the time, based on the mains frequency. The time deviation (TD) is the difference of this calculated time (PLT) to the reference time (REF). This time deviation as well as the frequency itself is sent out via serial interface or is beeing converted to an analog voltage output provided by a DAC.

**Pin Assignement:** 16-pin DMC Phoenix Connector

| Pin | Signal |
|---|---|
| Pin 1 | A0 |
| Pin 2 | A1 |
| Pin 3 | GND |
| Pin 4 | n.c. |
| Pin 5 | n.c. |
| Pin 6 | GND |
| Pin 7 | COM 0 RxD in |
| Pin 8 | COM 0 TxD out |
| Pin 9 - Pin 14 | GND |
| Pin 15 | COM 1 RxD in |
| Pin 16 | COM 1 TxD out |

**LED Indicator**

| | | |
|---|---|---|
| LED St: | Init | blue during inintialisation |
| | | green - normal operation |
| LED In: | shows the state | after initialisation |
| | green | normal operation |
| | red | not connected / not sync. |
| | yellow | signal not available |
| | green blinking | Timesync |
| | green | Accurate |
| LED A: | green | FD (Frequency Deviation) within the configured limits |
| | red | FD Overflow |
| LED B: | green | TD (Time Deviation) within the configured limits |
| | red | TD Overflow |

**Input signal:** Serial time string, PPS
mains frequency, 70 - 270VAC, 50Hz or 60Hz

**Interface:** Two asynchronous serial RS232 ports, COM0 and COM1
Baudrate: 600, 1200, 2400, 4800, 9600, 19200 Baud
Framing: 7N2, 7E1, 7E2, 8N1, 8N2, 8E1, 7O2, 8O1
output and average: once per second or 100ms

**Output string:** The frequency, frequency deviation, reference time, power line time and the time deviation are send out in different available formats.

The formats are:
**STANDARD FDM String:**
F:49.984 FD:-00.016 REF:15:03:30 PLT:15:03:30.368 TD:+00.368[CR][LF]

**SHORT FDM String:**
FD:-00.016 TD:+00.368[CR][LF]

**AREVA FDM String:**
[STX]
02049.984[CR][LF]
021-00.016[CR][LF]
022+00.378[CR][LF]
02315 03 30.368[CR][LF]
024068 15 03 30 [CR][LF]
[ETX]

**Resolution of Measurement:** frequency: accuracy the oscillator (10MHz) +-100$\mu$Hz
time deviation: accuracy of reference (PPS) +-1ms

**Analog outputs:** 2 analog outputs for longtime-recording (time deviation and/or frequency deviation), range: -2.5V ... +2.5V, resolution: 16Bit

**Electrical connectors:** 96-pin VG-rail DIN 41612, X1, Power Line In

**Power supply:** +5V DC

**Current consumption:** 0.4 A - 1 A (depending on oscillator type)

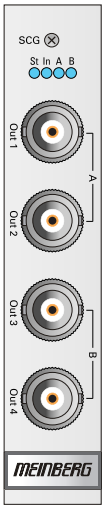
**Ambient temperature:** 0 ... 50°C / 32 ... 122°F

**Humidity:** Max. 85%

### 12.6.17 SCG - Studio Clock Generator

Add-On module for generating various audio frequencies (12kHz, 32kHz, 44.1kHz, 48kHz, 64kHz, 88.2kHz and 96kHz), with only one 10MHz input clock, for studio applications. The SCG Module provides four outputs with different frequencies.

The SCG provides a wide range of programmable word clock rates between 24Hz – 24,576MHz.




**Technical Specifications:**

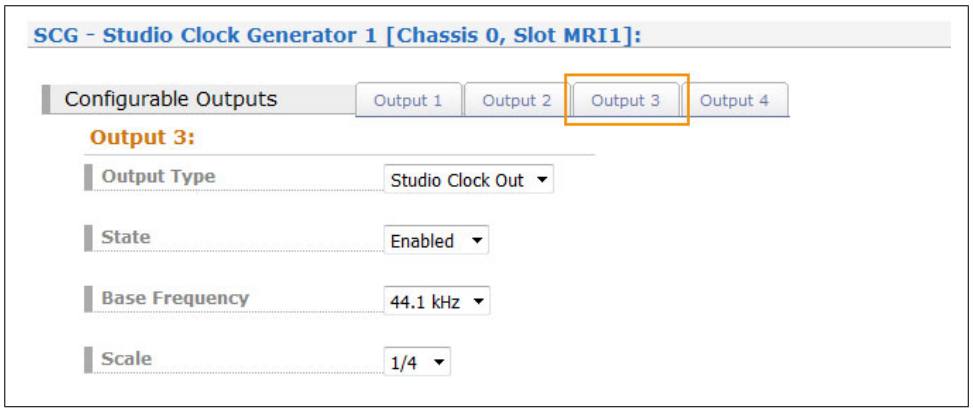
| | |
|---|---|
| **Outputs:** | 4 x BNC (2.5V TTL into 50 Ohm) outputs with configureable frequencies |
| **Input Signal:** | 10MHz, sinewave or square pulse |
| **Current Consumption:** | 5 V +- 5%, @400 mA |
| **Ambient Temperature:** | 0 ... 50°C / 32 ... 122°F |
| **Humidity:** | 85% max. |

### SCG Configuration via Web Interface

*(Firmware version 6.19 or later)*

If the SCG operates in an IMS system, the module can be easily configured via the web interface then.

**Configuration Sample: SCG Output 3**




In the "IO Configuration" menu each output frequency can be adjusted seperately. In the figure above the following value is set:

Frequency Out 3 = Base Frequency * Scale
Frequency Out 3 = 44,1 kHz * 1/4
---
Frequency Out 3 = **11,025 kHz**

**Overview Configuration SCG Sound Clock Generator Outputs 1-4**

| | |
|---|---|
| Output Type: | Studio Clock Out |
| State: | Disabled<br>Enabled |
| Base Frequency: | 32kHz<br>44.1kHz<br>48kHz |
| Scale: | 1/8 to 256 |

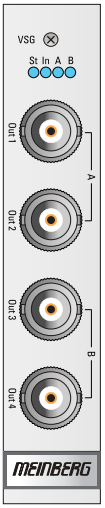
## 12.6.18 VSG - Video Sync Generator

The VSG is a video signal reference for Studio Equipment with four BNC outputs. The Module generates 1x bi-level sync (Black Burst) and 1x Tri-Level Sync and 2x Sync Signals (H-Sync, V-Sync, .. .). The LANTIME Web Interface can be used for output signal configuration and to query the state of the VSG.

**Functionality**
The board is synchronized by an external 10MHz signal. It generates configurable video signals in different formats. The generated signals have a phase reference to 1PPS.

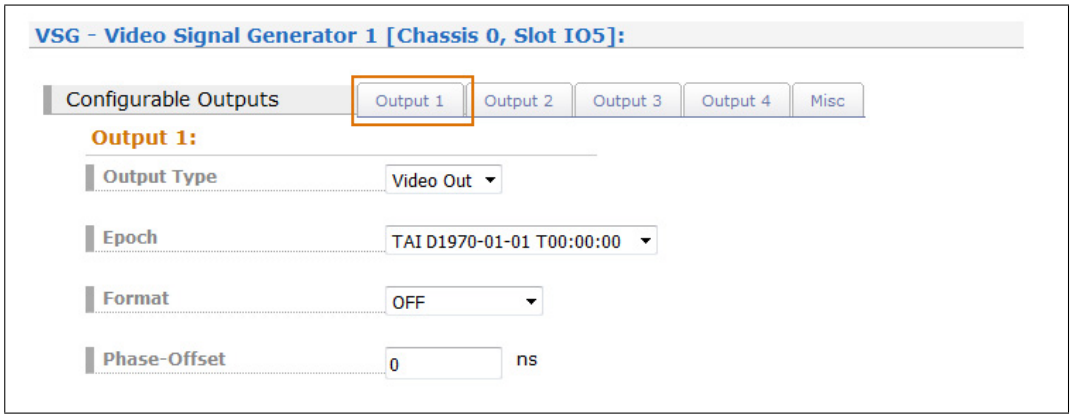
**Generated Signals:**

| | |
|---|---|
| SMPTE standards: | PAL Blackburst<br>NTSC Blackburst<br>720p/50Hz (SMPTE296M3)<br>1080i/25Hz (SMPTE274M6)<br>720p/59.94Hz (SMPTE296M1)<br>1080i/29.97Hz (SMPTE274M7)<br>V-, H-, Frame-Sync for HD and SD formats |
| **Status Info:** | ST: Status of VSG<br>In: Status of reference input<br>A: Status Out 1 + 2<br>B: Status Out 3 + 4 |
| **Electrical Connectors:** | 96-pin VG-rail DIN 41612 |
| **Power Consumption:** | 5 V +- 5%, 250 mA |
| **BNC Connectors:** | 2x BNC female, unbalanced, 300 $mV_{pp}$ @ 75Ω<br>2x BNC female, unbalanced, 2.5 V TTL @ 50Ω |
| **Ambient Temperature:** | 0 ... 55°C |
| **Humidity:** | Max. 85% |



### VSG Configuration via Web Interface

If the VSG operates in an IMS system, the module can be easily configured via the web interface then.



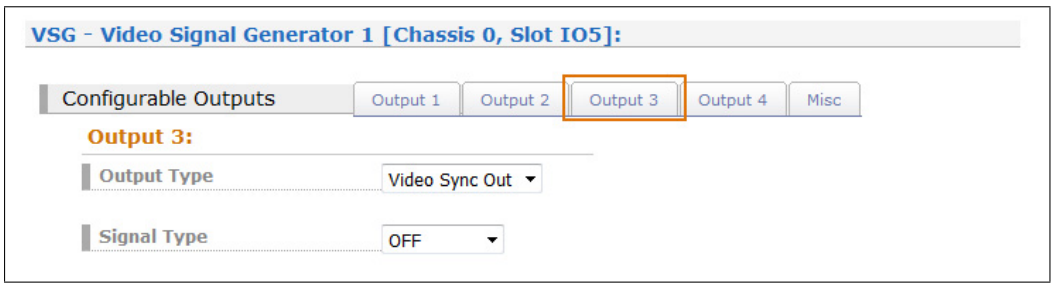

**Overview Configuration VSG Video Sync Generator Outputs 1-4**

**Output 1**

| | |
|---|---|
| Output Type: | Video Out |
| Epoch: | TAI<br>UTC<br>GPS |
| Format: | 720p 50Hz<br>1080i 25Hz<br>720p 59.94Hz<br>1080i 59.94Hz |
| Phase Offset: | [Offset Value] |

**Output 2:**

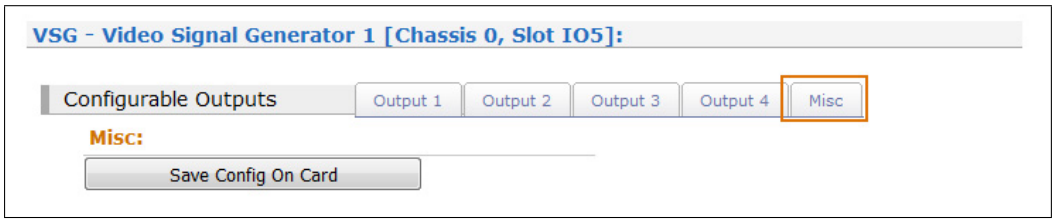
| | |
|---|---|
| Output Type: | Video Out |
| Epoch: | like Output 1 |
| Format: | NTSC<br>PAL |
| Phase Offset: | [Offset Value] |




**Output 3 / Output 4:**

| | |
|---|---|
| Output Type: | Video Sync Out |
| Signal Type: | SD H-Sync<br>SD V-Sync<br>SD Frame<br>HD H-Sync<br>HD V-Sync<br>HD Frame<br>HD Blank |

With the menu tab "Misc", the configuration of the VSG can be stored directly in the EEPROM of the card.



# 13 Declaration of Conformity

## Konformitätserklärung

Doc ID: LANTIME M3000-05032015

**Hersteller** Meinberg Funkuhren GmbH & Co. KG
*Manufacturer* Lange Wand 9, D-31812 Bad Pyrmont

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

**Produktbezeichnung**
*Product Designation* LANTIME M3000

auf das sich diese Erklärung bezieht, mit den folgenden Normen übereinstimmt
*to which this declaration relates is in conformity with the following standards*

Funkprüfung nach ETSI EN 300 440-2 Ver. 1.4.1 (2010-08)
*Radio emission test in accordance with ETSI EN 300 440-2 Ver. 1.4.1 (2010-08)*
Electromagnetic compatibility and Radio spectrum Matters (ERM); Short range devices;
Radio equipment to be used in the 1 GHz to 40 GHz frequency range
Part 2: Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive

EMV-Prüfung nach ETSI EN 301 489-1 Ver. 1.9.2 (2011-09)
*EMC in accordance with ETSI EN 301 489-1 Ver. 1.9.2 (2011-09)*
Electromagnetic compatibility and Radio spectrum Matters (ERM);
ElectroMagnetic Compatibility (EMC) standard for radio equipment and services;
Part 1: Common technical requirements

Sicherheitsprüfung nach EN 60950-1:2006
*Safety Test in accordance with EN 60950-1:2006*
Information technology equipment - safety - Part 1: General requirements

Beschränkung gefährlicher Stoffe nach EN 50581
*Restriction of hazardous substances in accordance with EN 50581*
Technical documentation for the assessment of electrical and electronic products
with respect to the restriction of hazardous substances

gemäß dem Gesetz über Funkanlagen und Telekommunikatiosendeinrichtungen (FTEG) und den Richtlinien 2014/53/EU (R&TTE), 2014/30/EU (Elektromagnetische Verträglichkeit), 2014/35/EU (Niederspannungsrichtlinie), 2011/65/EU (Beschränkung der Verwendung bestimmter gefährlicher Stoffe) und 93/68/EWG (CE Kennzeichnung) sowie deren Ergänzungen.
*in accordance with the Radio and Telecommunications Terminal Equipment Act (FTEG) and following the provisions of the directives 2014/53/EU (R&TTE), 2014/30/EU (electromagnetic compatibility), 2014/35/EU (low voltage directive), 2011/65/EU (restriction of the use of certain hazardous substances) and 93/68/EEC (CE marking) and its amendments.*

Bad Pyrmont, den 30.09.2015

Günter Meinberg
Managing Director


M3000_QSG_281116