MANUAL

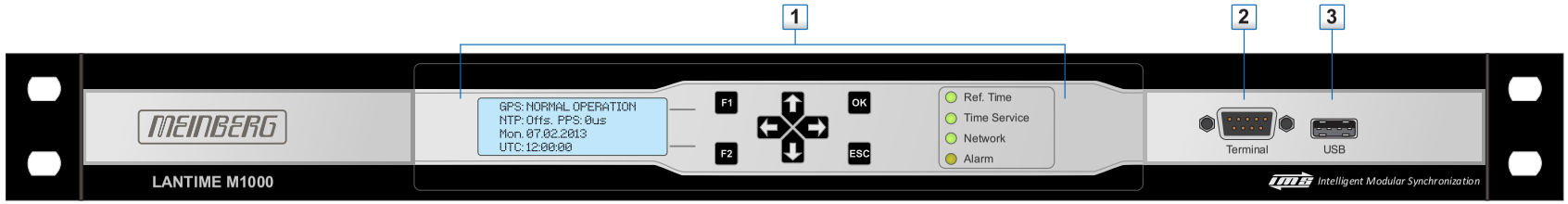
IMS-M1000

Modular Sync. System and NTP Server

5th December 2016

Meinberg Radio Clocks GmbH & Co. KG

Front view (Frontansicht) IMS-M1000



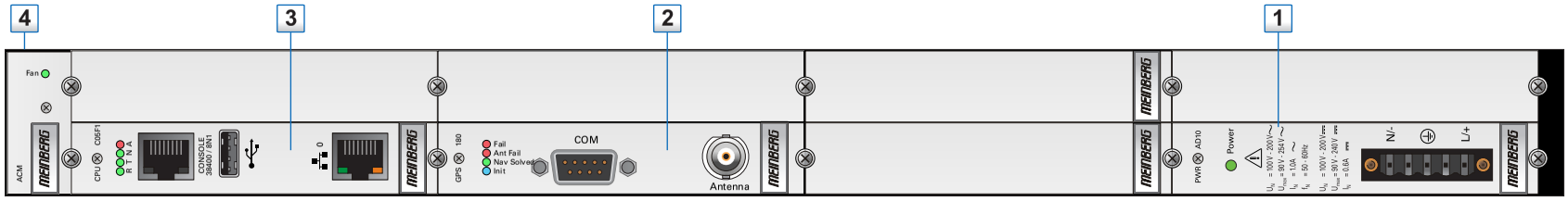
DEUTSCH

1. LANTIME Bedienfeldanzeige mit LC-Display, Status LEDs und Funktionstasten
2. Terminal / VT100, 38400 Baud, 8N1, 9pol. D-SUB Stecker
3. USB Anschluss

ENGLISCH

1. LANTIME control panel with LC-Display, Status LEDs and function keys
2. Terminal / VT100, 38400 Baud, 8N1, 9pin D-SUB connector
3. USB connector

Rear view (Rückansicht) IMS-M1000



DEUTSCH

1. Netzteil: 100 - 240 V AC (50-60Hz) / 100 - 240 V DC oder Netzteil: 20 - 72 V DC
2. GNSS Zeitcode Empfänger (GPS / GLONASS)
3. LAN-CPU mit USB Schnittstelle, LAN 0 - RJ45 Buchse
4. ACM - Active Cooling Module

ENGLISCH

1. Power Supply: 100 - 240 V AC (50-60Hz) / 100 - 240 V DC or Power Supply: 20 - 72 V DC
2. GNSS timecode receiver (GPS / GLONASS)
3. LAN-CPU with USB interface, LAN 0 - RJ45 jack
4. ACM - Active Cooling Module

Table of Contents

1 Imprint **1**

2 Safety instructions for building-in equipment **2**
2.1 Additional Safety Hints . . . 3
2.2 Supply Voltage . . . 3
2.3 Cabling . . . 4
2.4 Safety Hints Antenna . . . 4
2.5 Replacing the Lithium Battery . . . 5
2.6 Grounding connection M1000 . . . 5

3 Quick Start **6**

4 The Modular System LANTIME **7**

5 Network Timeserver with GPS synchronized time base **8**

6 Mounting the GPS Antenna **9**
6.1 Example: . . . 9
6.2 Antenna Assembly with Surge Voltage Protection . . . 10
6.3 Antenna Short-Circuit . . . 11

7 Booting the GPS180 receiver **12**

8 Booting the Single Board Computer **13**

9 Configuration User Interface **14**

10 The Menues in Detail **15**
10.1 Root Menu . . . 15

11 The graphical user interfaces **17**

12 The WEB Interface **18**

13 Attachment: Technical Information **19**
13.1 Technical Specifications M1000 . . . 19
13.2 ACM - Active Cooling Module . . . 19
13.3 Available Modules and Connectors . . . 20
13.4 TERMINAL (Console) . . . 21
13.5 USB Connector . . . 21
13.6 IMS Module Options . . . 22
13.6.1 IMS M1000 Slot Assignment . . . 22
13.6.2 Power Supply 100-240 V AC/DC . . . 23
13.6.3 Power Supply 20-72 V DC . . . 24
13.6.4 GPS Clock . . . 25
13.6.5 GNSS Clock . . . 27
13.6.6 RSC Switch Card . . . 29
13.6.7 LAN-CPU . . . 31
13.6.8 MRI - Standard Reference Input Signals . . . 32
13.6.9 ESI - Telecom Synchronisation References . . . 34
13.6.10 LNE-GbE: Network Expansion with Gigabit Support . . . 38
13.6.11 HPS-100: PTP / SyncE / Hardware NTP Interface . . . 44
13.6.12 TSU V3: IEEE-1588 Time Stamp Unit . . . 46
13.6.13 CPE and BPE Output Modules (Frontend - Backend) . . . 47
13.6.14 LIU - Line Interface Unit . . . 54

13.6.15 LNO - 10MHz Sinus Output Module 60
13.6.16 FDM - Frequency Deviation Monitoring 61
13.6.17 REL1000: Error Relay Module 63
13.6.18 SCG - Studio Clock Generator 65
13.6.19 VSG - Video Sync Generator 67

14 Declaration of Conformity **70**

1 Imprint

Meinberg Funkuhren GmbH & Co. KG
Lange Wand 9, 31812 Bad Pyrmont / Germany

Phone: + 49 (0) 52 81 / 93 09 - 0
Fax: + 49 (0) 52 81 / 93 09 - 30

Internet: http://www.meinberg.de
Mail: info@meinberg.de

Date: 2015-06-04

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 M1000 with the power line (see chapter Grounding connection M1000).

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 100-240 V AC

- 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 100-240 V DC

- The device can be disconnected outside the unit in accordance with the regulations as in IEC 60950-1 (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:

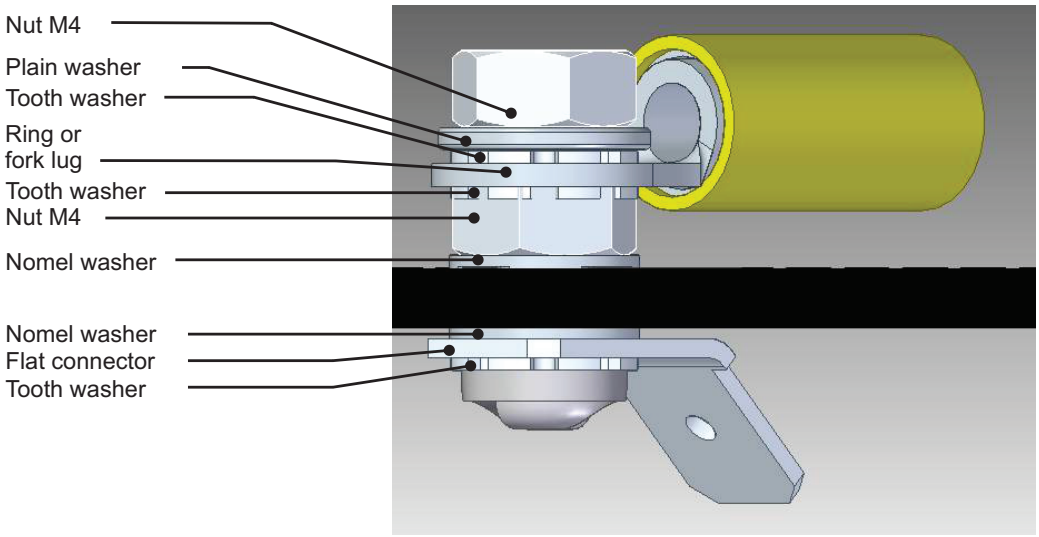
There is a Danger of explosion if the lithium battery is replaced incorrectly. Only identical batteries or batteries recommended by the manufacturer must be used for replacement.

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

2.6 Grounding connection M1000

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.

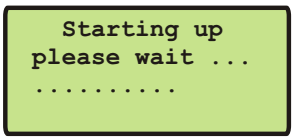
The mounting components (without a cable) are included.



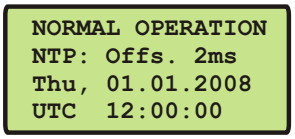
Note:
Use a grounding cable with >= 1,5mm^2
Please ensure a correct crimp connection!

3 Quick Start

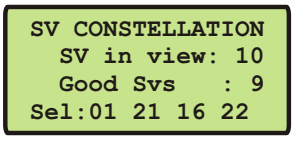
When booting the system the following message will be displayed while dots will be counted up in the lower line:.



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



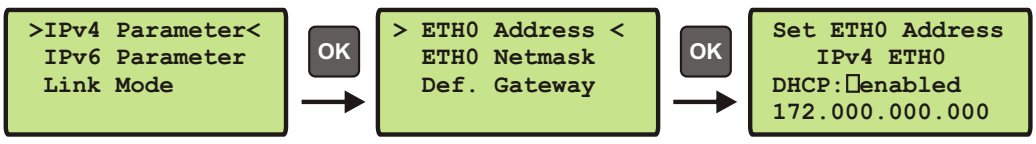
If the GPS receiver remains asynchronous (Refclock LED is still red after 12 minutes) the number of satellites in view and the good satellites are to check (press bottons $\downarrow, \rightarrow, \downarrow$ from main menu). The antenna has to be installed without any obstructions to the sky.



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 GPS180, 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 GPS180 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 Network Timeserver with GPS synchronized time base

The **LANTIME** (Local Area Network Time Server) provides a high precision time base to a TCP/IP network (Stratum-1-Server). The NTP (Network Time Protocol) is used to synchronize all NTP clients with the reference. The several LANTIME variants differ from each other by the time reference and output configuration. A GPS or combined GPS/GLONASS receiver, a long wave receiver (like DCF77, MSF or WWVB) or an IRIG time code receiver can be integrated as an internal reference as well as a combination of these references (hybrid system). External references are also possible.

The LANTIME system is a set of equipment composed of a internal receiver, a single-board computer and a power supply, all installed in a metal 19 inch modular chassis and ready to operate. A simplified LINUX operating system is installed on the single-board computers flash disk. Eight push buttons and a display can be used to configure and monitor the time server.

After the network connection has been established the time server can also be configured and monitored remotely from a workstation via TELNET or FTP. An integrated web server enables access to the LANTIME by using an ordinary web browser.

6 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 GPS180 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.

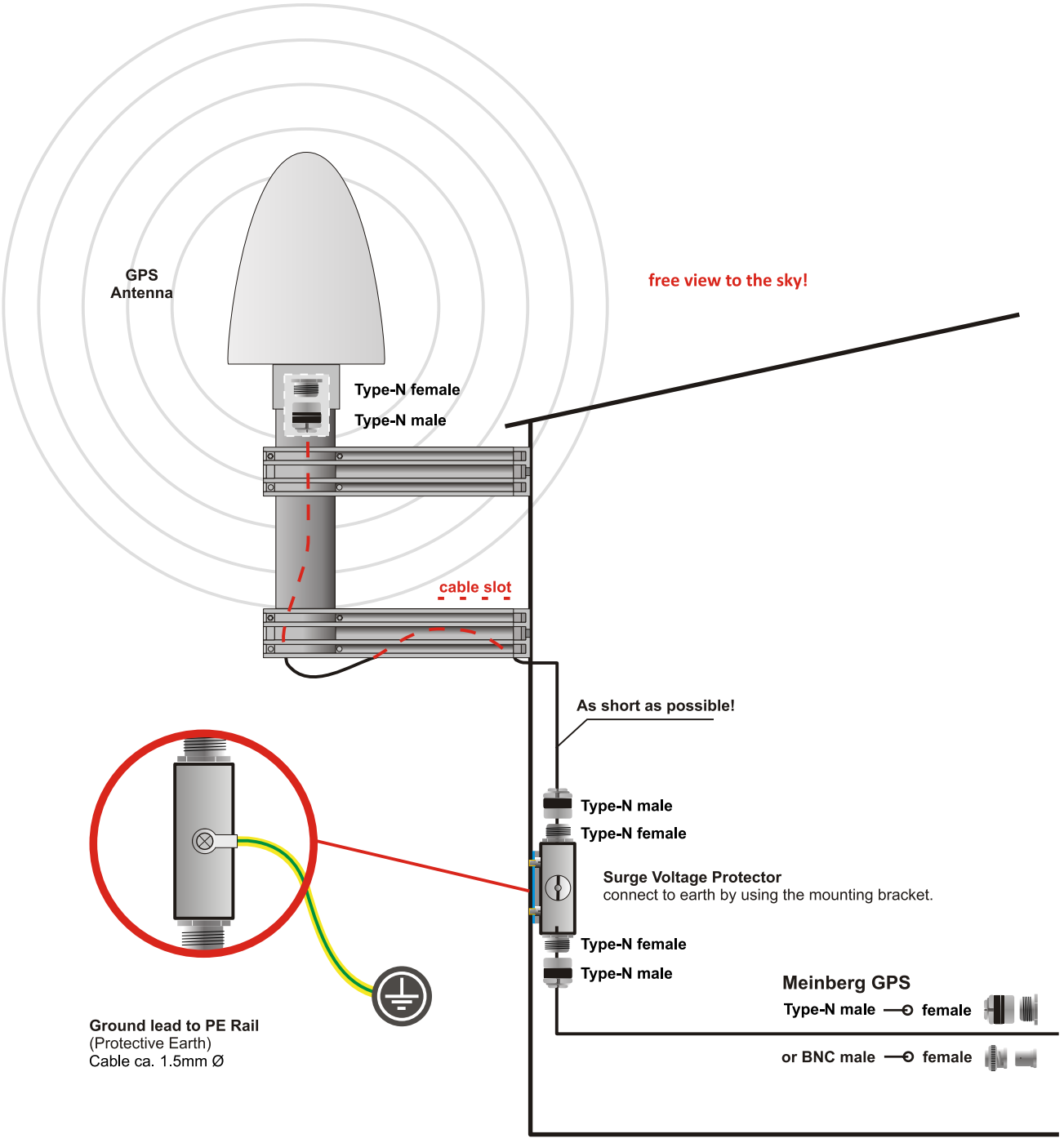
6.1 Example:

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

6.2 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.



6.3 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 $15V_{DC}$.

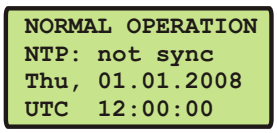
7 Booting the GPS180 receiver

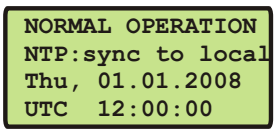
If both the antenna and the power supply have been connected, the system is ready to operate. About 2 minutes after power-up the receiver's oscillator has warmed up and operates with the required accuracy. If the receiver finds valid almanac and ephemeris data in its battery buffered memory and the receiver's position has not changed significantly since its last operation, the receiver can determine which satellites are presently in view. Only a single satellite must be received to synchronize and generate output pulses, so synchronization can be achieved within one minute after power-up.

If the receiver position has changed by more than one hundred kilometers since last operation, the satellites' real elevation and Doppler might not match those values expected by the receiver, and this will force the receiver to start scanning for satellites. This mode is called **Warm Boot** because the receiver can obtain ID numbers of existing satellites from the valid almanac. When the receiver has found four satellites in view it can update its new position and switch to **Normal Operation**. If the almanac has been lost (because the battery has been disconnected) the receiver has to scan for a satellite and read in the current almanac. This mode is called **Cold Boot**. It takes 12 minutes until the new almanac is complete and the system switches to Warm Boot mode, scanning for other satellites.

8 Booting the Single Board Computer

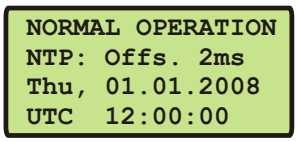
The LINUX operating system is loaded from a packed file on the flash disk of the single board computer to a RAM disk. All files of the flash disk are stored in the RAM disk after booting. This guarantees that the file system is in a defined condition after restart. This boot process takes approximately 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.

9 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:

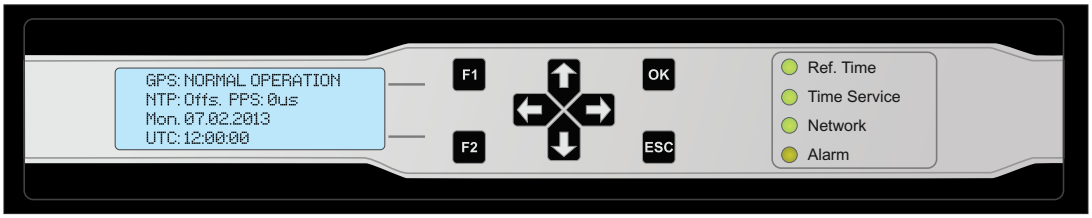
http://198.168.10.10 // LANTIME IP address
password: timeserver

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

10 The Menues in Detail

10.1 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 ma-naged. 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 status of the Reference Clock, the NTP offset and the date and time.

In case of using a GPS receiver 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:

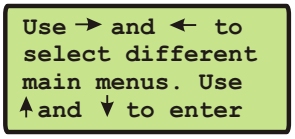
„Ref. Time“
green: the reference clock (e.g. integrated GPS) produce valid time.
red: the reference clock produce no valid time (e.g. not synchronized)

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

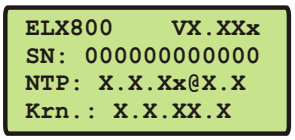
„Network“
green: all watched network ports has been “link up“ detected
red: at least one of the watched network ports (look at „Setup Device Parameter / Check Network Linkup“) is not connected

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

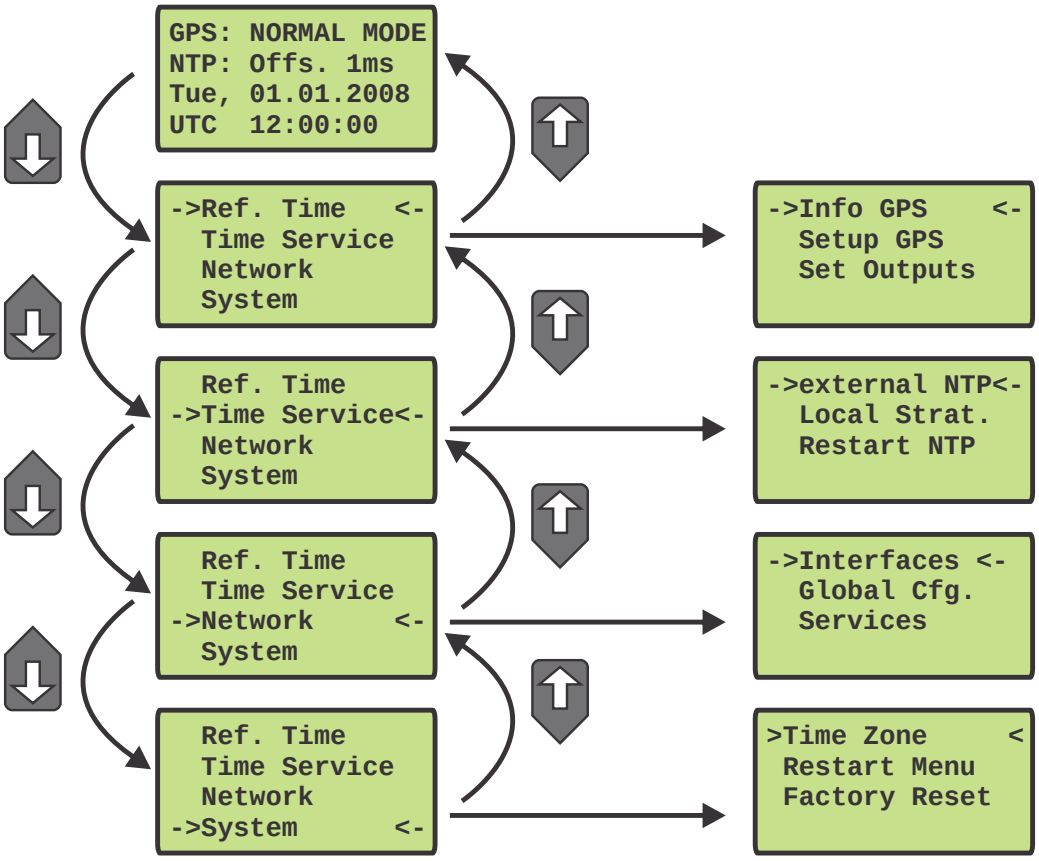
When pressing „F1“ from main menu a short description for menu navigation will be displayed:



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

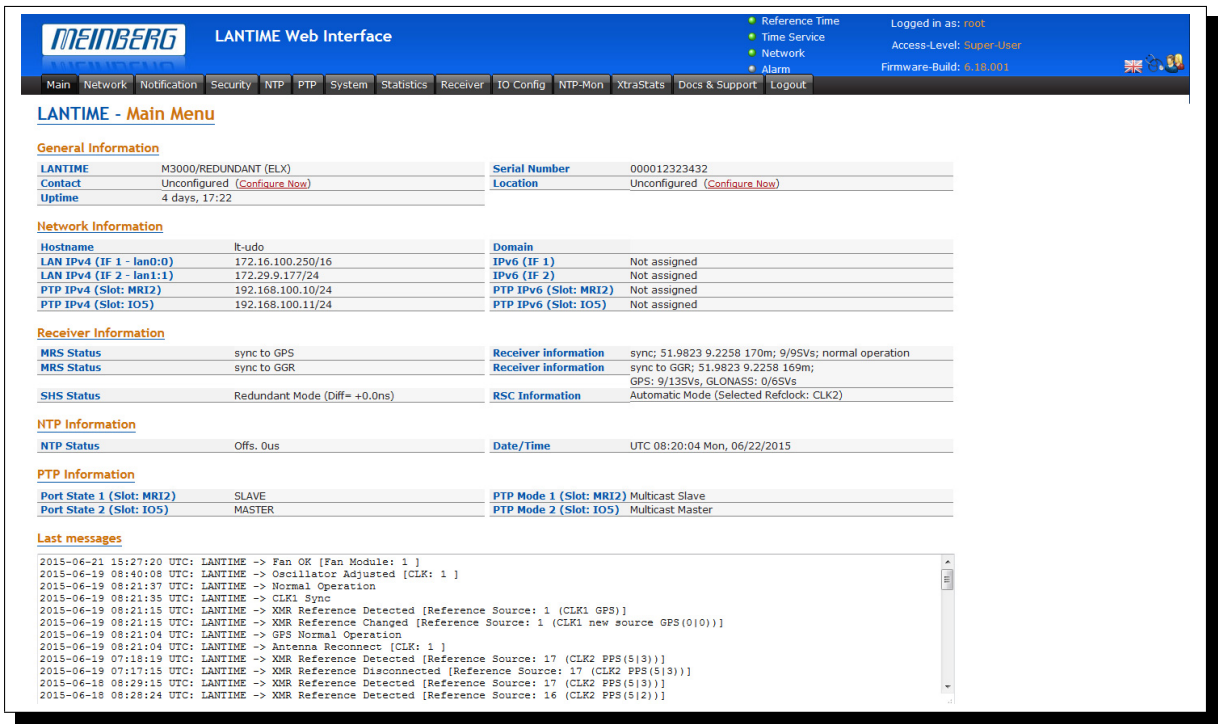


The following main menus will be displayed when pressing the „UP“ and „DOWN“ arrow buttons:



11 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

12 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.

13 Attachment: Technical Information

13.1 Technical Specifications M1000

Housing: Metal desktop case, Schroff 282T
Front panel: 1U/84HP (43 mm high / 442 mm wide)

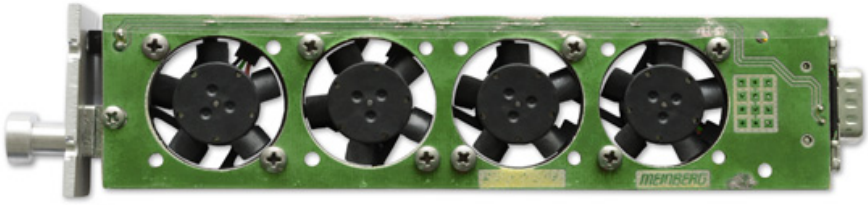
Input Fuse: Electronic

Protection Rating: IP20

Power Consumption: 50W max

Physical Dimensions: 445 mm wide x 44 mm high x 290 mm deep

13.2 ACM - Active Cooling Module



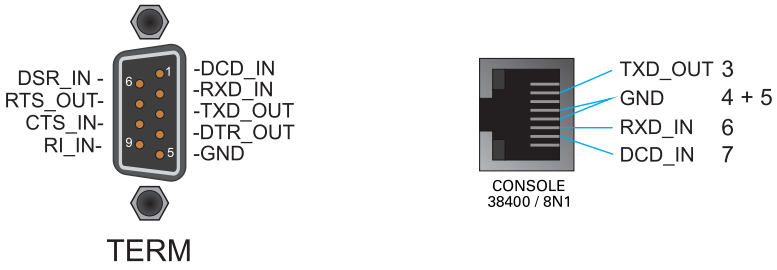
The Active Cooling Module allows the installation of the M1000 safely within the temperature specification. The ACM is easily field-replaceable and allows for a hot-plug replacement without the need to power down the unit.

13.3 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	RJ-45	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 ...	shielded data line
LIU:	RJ45 jack	balanced 120 Ohm (Clock)	shielded data line
	BNC	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

13.4 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).

13.5 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

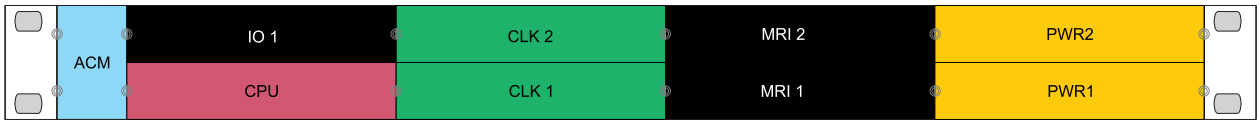
13.6 IMS Module Options

13.6.1 IMS M1000 Slot Assignment

The IMS system LANTIME M1000 is available in two different versions. A standard version with a single receiver module and in a redundant design, which allows the use of two Meinberg receivers. In this case the configuration of the I/O slots is characterized by the availability of the slots for input signals.

In the non-redundant M1000 configuration one MRI Slot, one ESI slot and two additional I/O slots are available. In the redundant receiver configuration of the M1000 chassis two MRI Slots and one I/O slot are available for input and output modules (see figure below).

with internal SPT



with internal RSC

The following modules can be used in the designated slots:

ACM Active Cooling Module

I/O All output modules (BPE, CPE, LIU, LNO ...)
All network modules (LNE, TSU ...)
TSU and HPS modules can only operate in PTP Grandmaster mode in an I/O slot.

CPU CPU Management Module

CLK All available reference clocks (GPS, GLN, PZF)

ESI ESI input module for telecom references
All output modules and all network modules
TSU and HPS modules can operate in PTP Grandmaster and Slave mode in an ESI slot.

MRI MRI standard reference input signals (PPS, 10 MHz, IRIG)
ESI input module for telecom references
All output modules and all network modules
TSU and HPS modules can operate in PTP Grandmaster and Slave mode in a MRI slot.
Additionaly SyncE can be used as input reference in a MRI Slot.

PWR All available power supplies (AC, DC)

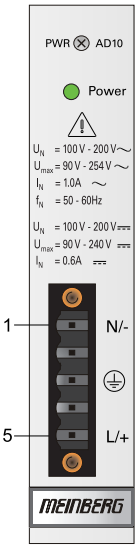
13.6.2 Power Supply 100-240 V AC/DC

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

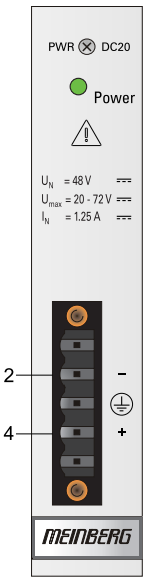
Power Connector: 5pin DFK

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

13.6.3 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

13.6.4 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

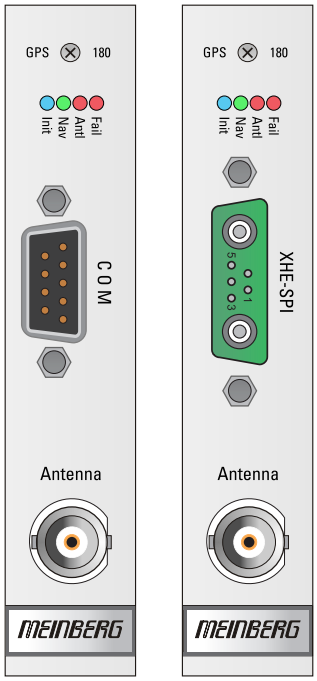
Local Oscillator to Converter Frequency: 10 MHz [1]

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 (option)

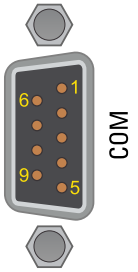


LED Indicators

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):

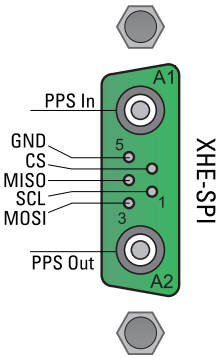
Pin 2: RxD
Pin 3: TxD
Pin 5: GND



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.

13.6.5 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)

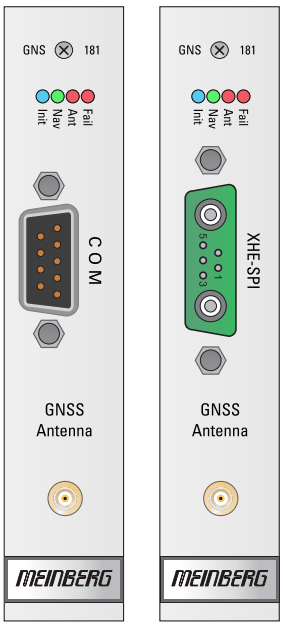
Synchronization Time: Max. 1 minute in normal operation mode, approx. 12 minutes after a cold start

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)

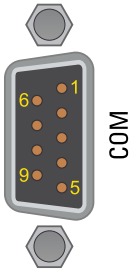


LED Indicators

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

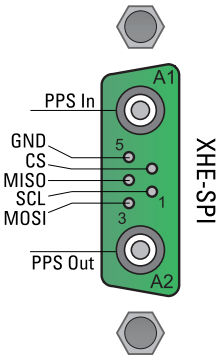


Pin Assignment of the optional XHE-SPI Connectors:

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.



13.6.6 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 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.

Display Menu: *Switch Unit -> RSC Cntl -> REMOTE : enable*

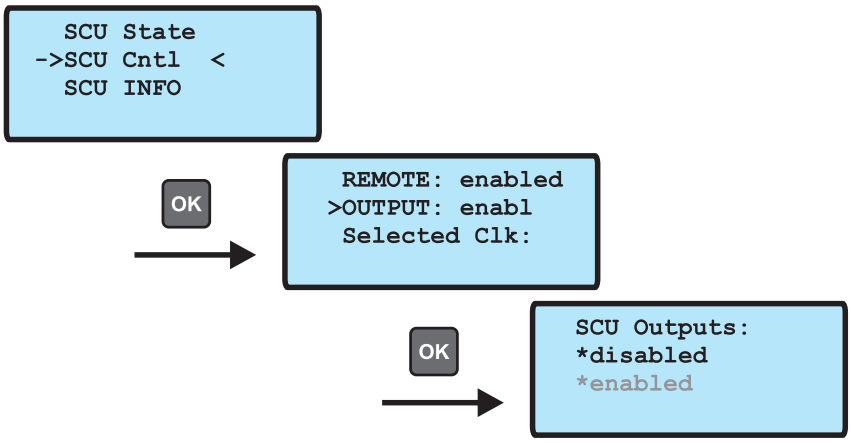
Display menu "Switch Unit -> RSC State"

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

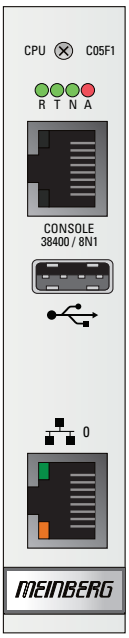
Menu "Switch Unit -> RSC Cntl"



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

13.6.7 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:	Connect, Activity and Speed of the network connection



13.6.8 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

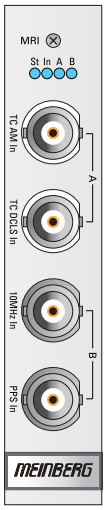
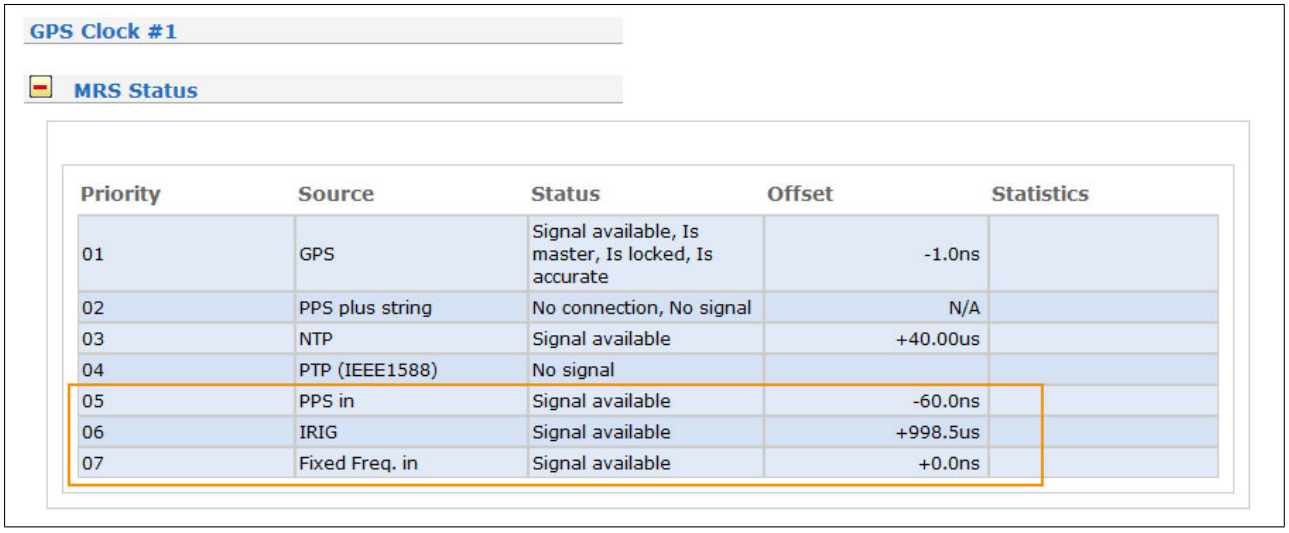


Figure right:*MRI - standard input signals via BNC female connectors*

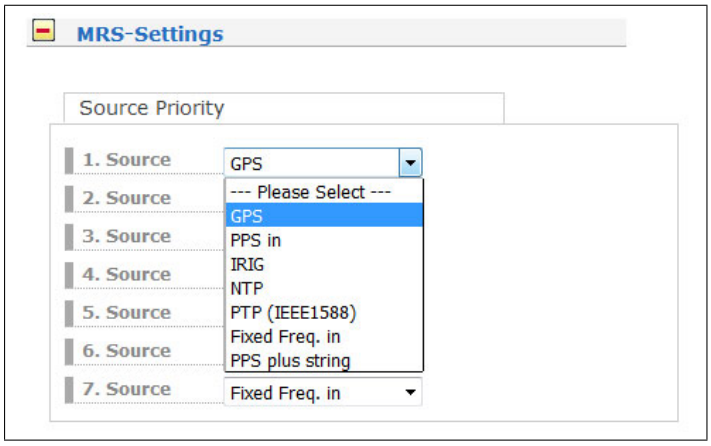
Power Requirements: 5 V +-5%, 50 mA

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

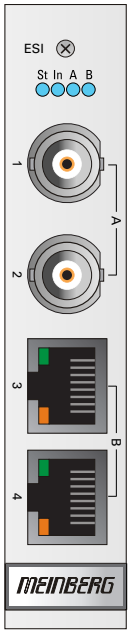
1 x PPS input:	TTL, pulse duration >= 5μs, active high, female BNC connector
1 x 10 MHz input:	sine (1.5Vpp - 5Vpp) or TTL, female BNC connector
1 x Time Code modulated input	BNC connector, isolated by transformer Insulation voltage 3000 VDC Input signal: 600mV to 8 V (Mark, peak-to-peak)
1 x Time Code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

13.6.9 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

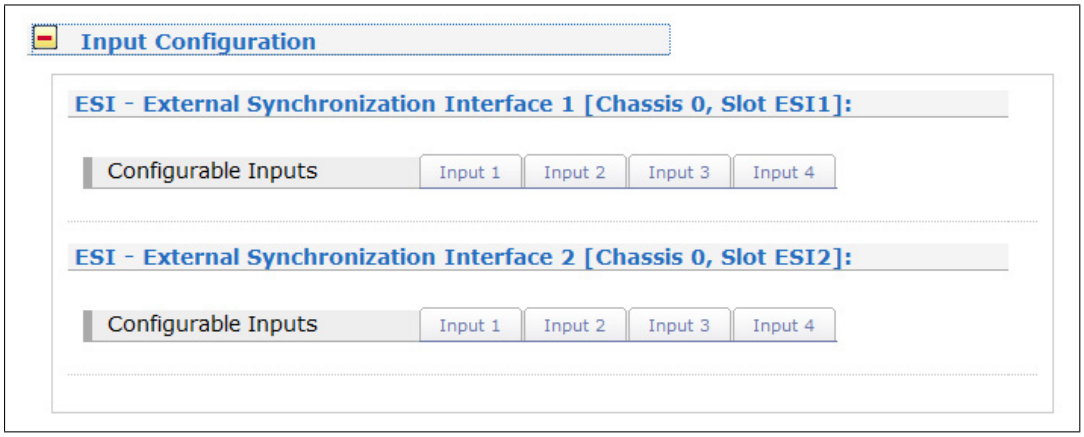
Operation conditions:

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 flashing green, if only 10 MHz flashing yellow, if only PPS off, if no signal
	LED B	green, if Clock and Framed available flashing green, if only Clock available flashing yellow, if only Framed available off, if no signal

ESI Configuration via Web Interface

ESI – External Synchronization Input

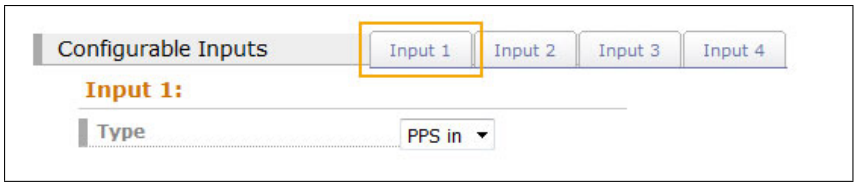
Menu "IO Config -> Input Configuration -> ESI - External Synchronization Interface"



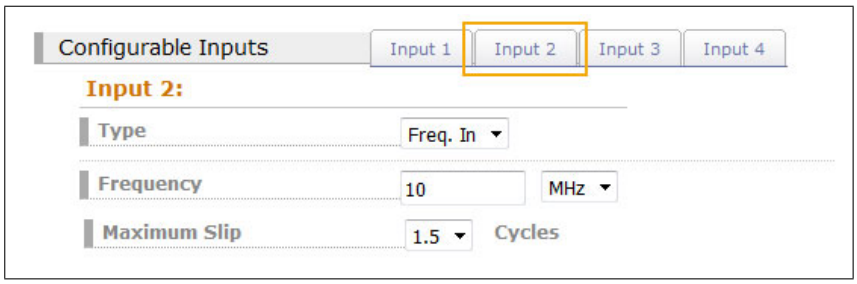
The ESI (External Synchronization Input) card is capable of adding additional synchronization sources to an IMS system. It accepts E1 and T1 sources, both as a Bitstream (2.048MBit/s/1.544Mbit/s, supporting SSM/BOC) or Frequency (2.048MHz/1.544MHz).

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.

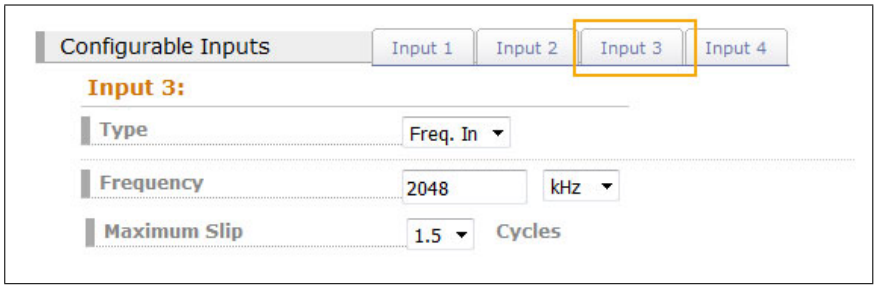


Input 2: The input 2 accepts as input either 2048 kHz frequency or configurable frequency in range between 1kHz and 10 MHz, also 1.544kHz if required.

Type:
Freq. In

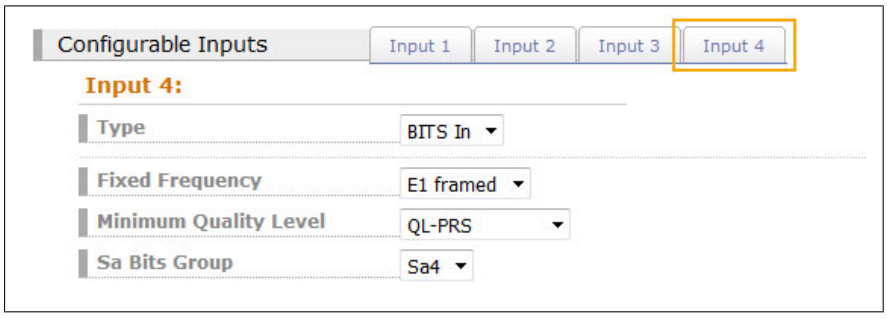
Frequency
Fill in a configurable frequency in range: 1 kHz - 10 MHz of input signal, 2048 kHz is set as default.

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.

13.6.10 LNE-GbE: Network Expansion with Gigabit Support

Link speed: 10/100/1000 Mbit

Connector Type: 8P8C (RJ45)

Cable: CAT 5.0

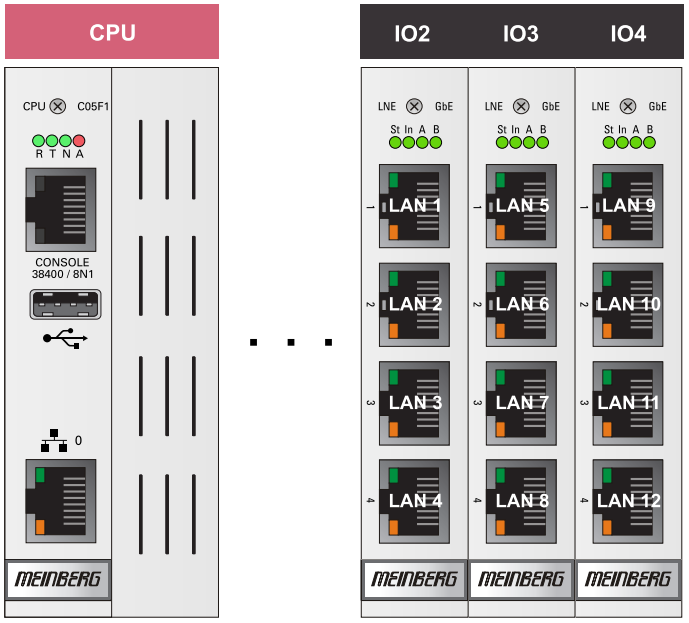
Duplex Modes: Half/Full/Autonegotiaton

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

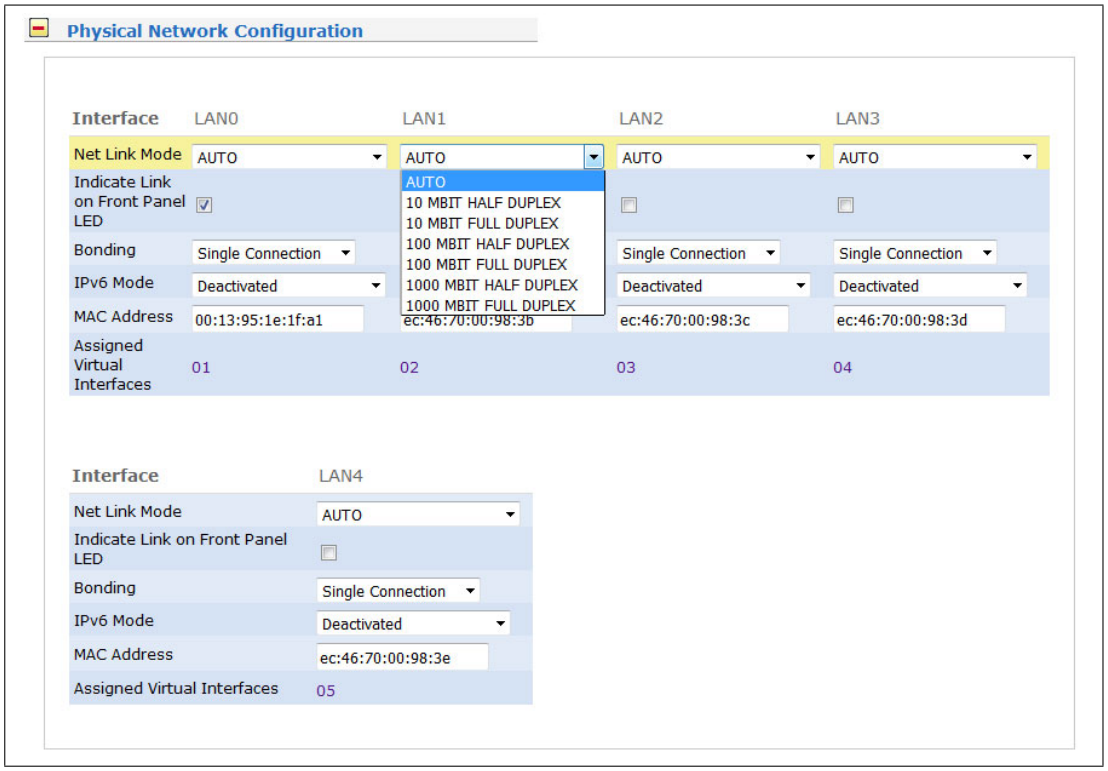
LNE Slot IO3
LAN 5: ec:22:33:44:aa:7f
LAN 6: ec:22:33:44:aa:80
LAN 7: ec:22:33:44:aa:81
LAN 8: ec:22:33:44:aa:82

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.

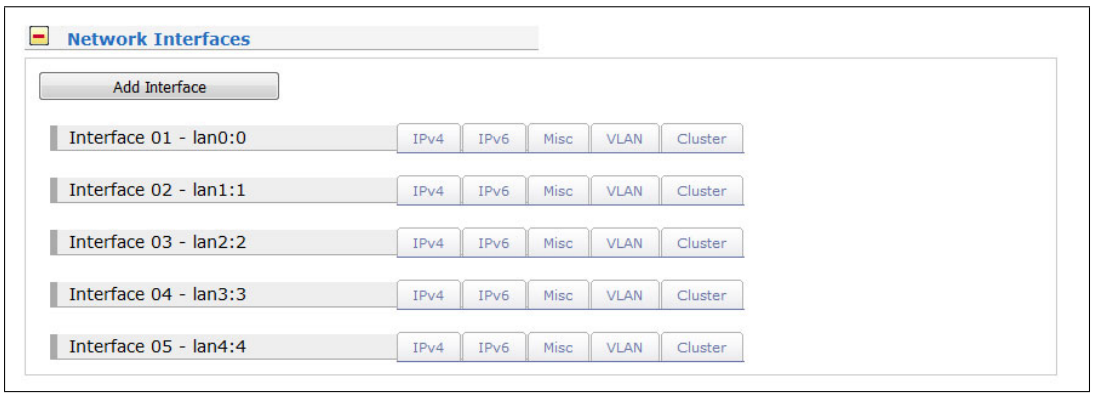
Indicate Link: LED indication for the selected physical interface, only if a front display with function keys is available.

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

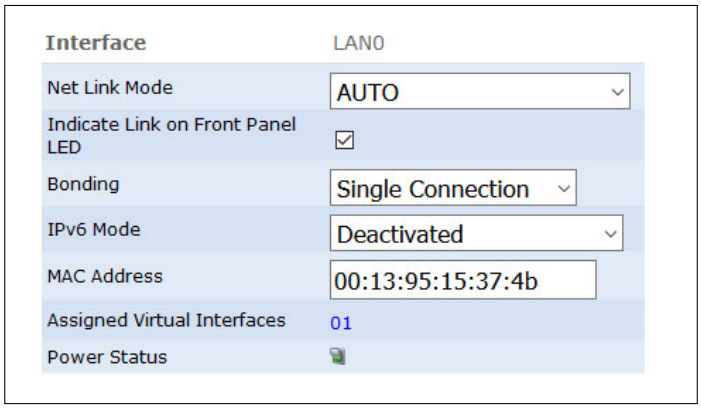
After the LNE has been installed to a slot, please start a SSH, TelNet or serial connection to the lantime. As soon as you are logged in, please execute the following command.

```
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
```

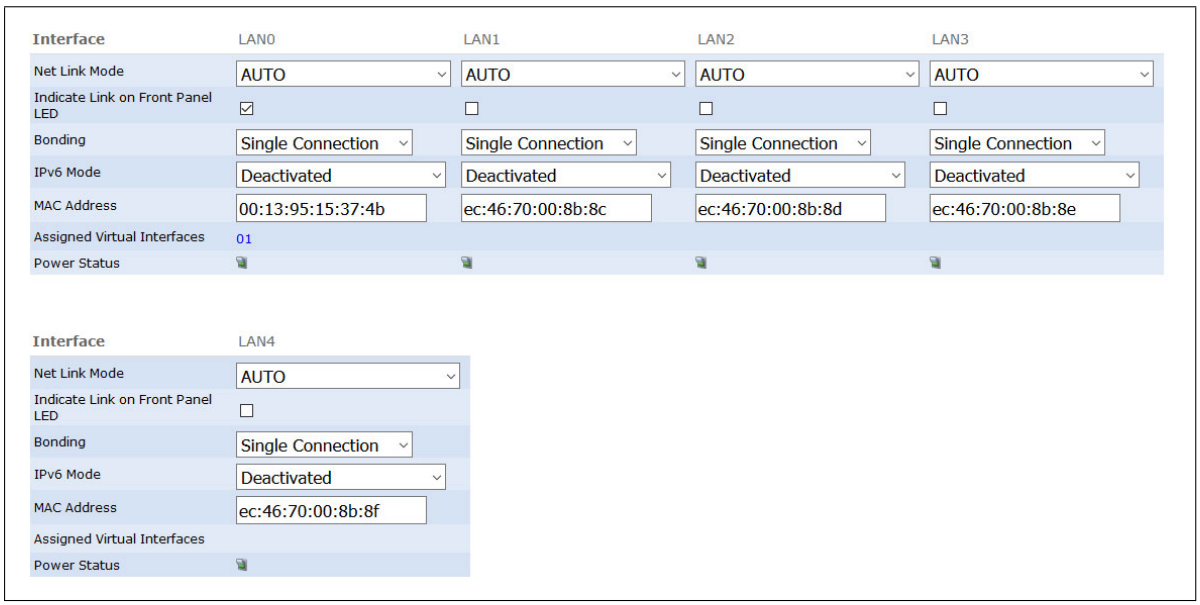
We are now sure, that the LNE module is installed properly. But as you can see in the lower figure, the module is not implemented into the LTOS yet. The figure shows the "PHYSICAL NETWORK INTERFACES" chapter of the "NETWORK" tab.



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.



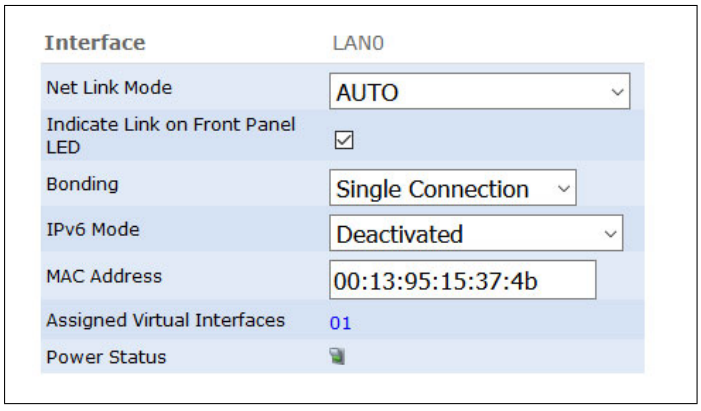
For further information how to configure a virtual network interface, take a look at the LANTIME manual.

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.

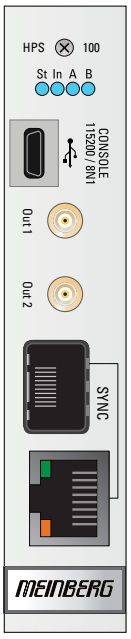
```
nicmgr autoremove ; saveconfig network
```

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



13.6.11 HPS-100: PTP / SyncE / Hardware NTP Interface

IEEE 1588 v2 compatible



Profiles:	IEEE 1588v2 Default Profile IEEE C.37.238 Power Profile IEEE 802.1AS AVB/TSN Profile ITU-T G.8265.1 Telecom Frequency Profile ITU-T G.8275.1 Telecom Phase/Time Profile SMPTE ST 2059-2 Broadcast Profile
PTP Modes:	Multicast/Unicast Layer 2 (IEEE 802.3) Multicast/Unicast Layer 3 (UDP IPv4/IPv6) Hybrid Mode E2E / P2P Delay Mechanism 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 Compliant to ITU-T G.8261, G.8262 and G.8264 Ethernet Synchronization Messaging Channel (ESMC)
Network Protocols:	IPv4, IPv6 DHCP, DHCPv6 DSCP IEEE 802.1q VLAN filtering/tagging 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 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

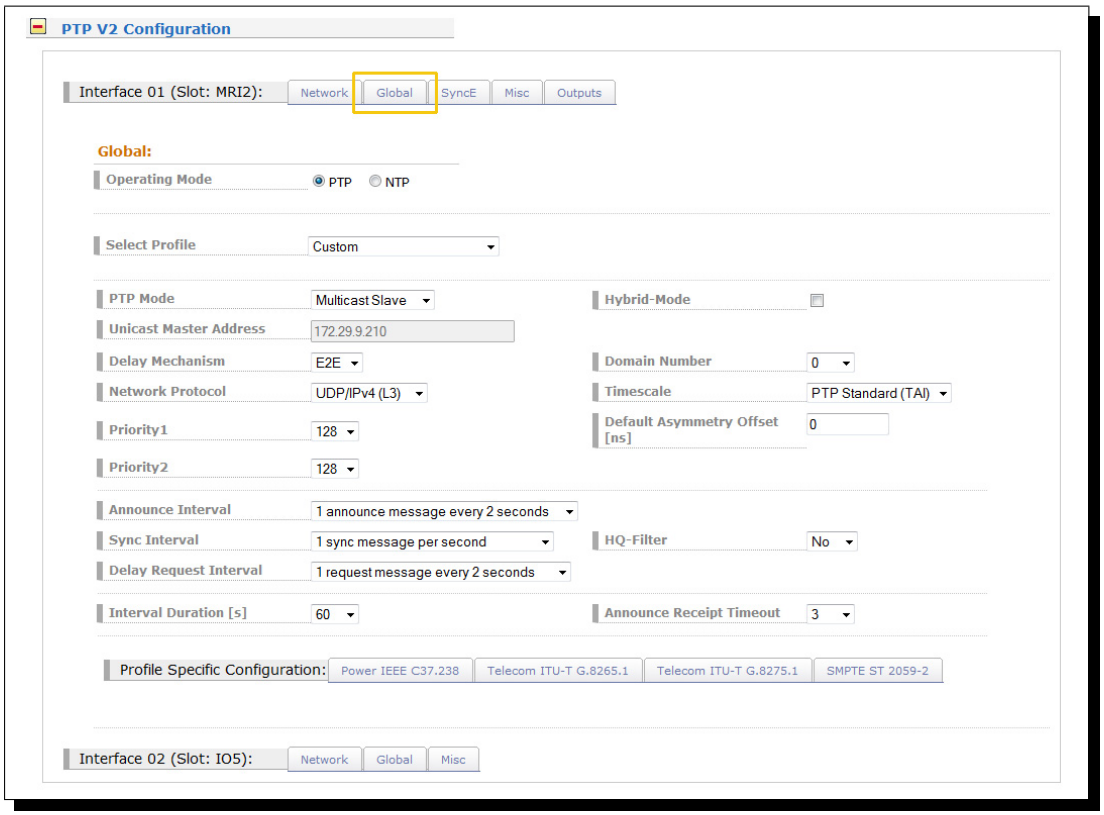
LED St:	Init	lights blue during initialisation, off in normal operation mode
LED In:	red	Error - TSU does not work correctly, PTP services stopped

yellow	No link, but initialized
green	link up
red	stopped

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

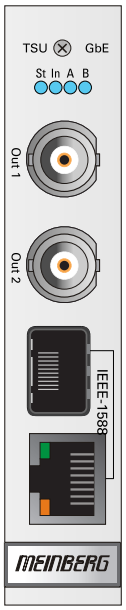
yellow - yellow	Listening
green - off	Master Mode
off - green	Slave Mode
yellow - off	Passiv Mode
off - yellow	uncalibrated
red - red	stopped

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



13.6.12 TSU V3: IEEE-1588 Time Stamp Unit

TSU v3 (IEEE 1588 v2 compatible)



Profiles:	IEEE 1588v2 Default Profile IEEE C.37.238 Power Profile ITU-T G.8265.1 Telecom Frequency Profile ITU-T G.8275.1 Telecom Phase/Time Profile SMPTE ST 2059-2 Broadcast Profile
PTP Modes:	Multicast Layer 2 (IEEE 802.3) Multicast/Unicast Layer 3 (UDP IPv4/IPv6) E2E / P2P Delay Mechanism 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 Compliant to ITU-T G.8261, G.8262 and G.8264 Ethernet Synchronization Messaging Channel (ESMC)
Network Protocols:	IPv4, IPv6 DHCP, DHCPv6 DSCP IEEE 802.1q VLAN filtering/tagging
Ethernet Interface:	Combo Port: 1 x 100/1000BASE-T RJ45 1 x GBIT SFP - Slot
Signal Outputs:	2x BNC (50 Ohm) connectors configurable signals: 1PPS, 10MHz, 2048kHz
CPU:	1 GHz Dual Core ARM
Time Stamp Accuracy:	10 ns

LED Indicators

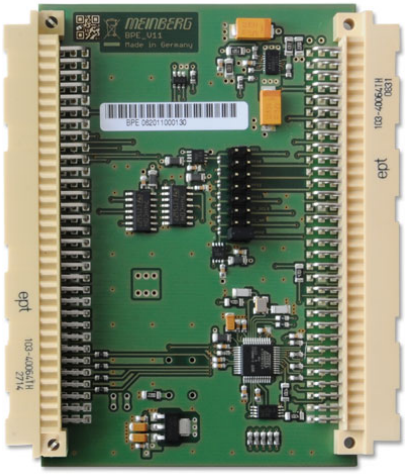
LED St:	Init	lights blue during initialisation, off in normal operation mode
LED In:	red	Error - TSU does not work correctly, PTP services stopped
	yellow	No link, but initialized
	green	link up
	red	stopped
LED A - LED B:	Shows the current State of the TSU	
	yellow - yellow	Listening
	green - off	Master Mode
	off - green	Slave Mode
	yellow - off	Passiv Mode
	off - yellow	uncalibrated
	red - red	stopped

13.6.13 CPE and BPE Output Modules (Frontend - Backend)

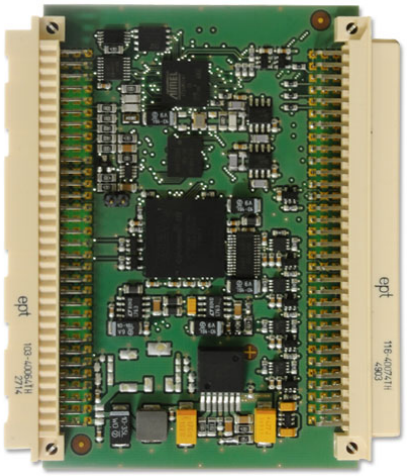
Configurable Port Expander / Backplane Port Expander

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

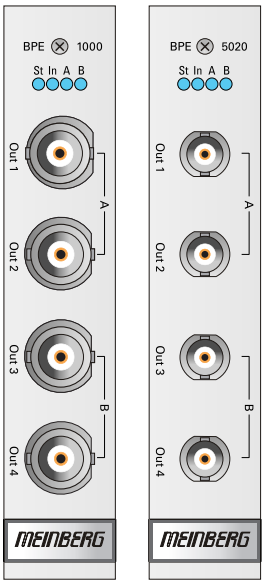


Figure right: BPE Frontend

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 Out 3: TC DCLS, Out 4: TC AM	4HP
BPE-2001	4 x BNC female	Out 1: PPS, Out 2: 10MHz 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 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 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

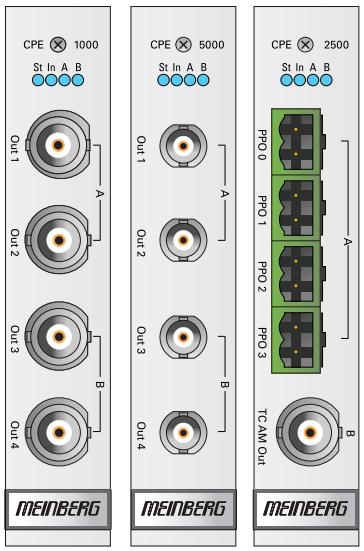
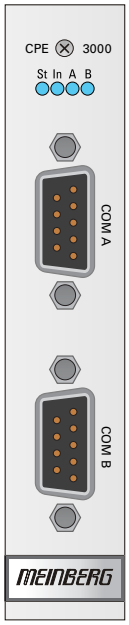


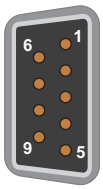
Figure: CPE Frontends
CPE-1000: 4 config. outputs via BNC female
CPE-5000: 4 config. outputs / FO - ST connectors
CPE-2500: 4 x prog. Pulses (DFK-2) / 1 x TC AM (BNC)

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:



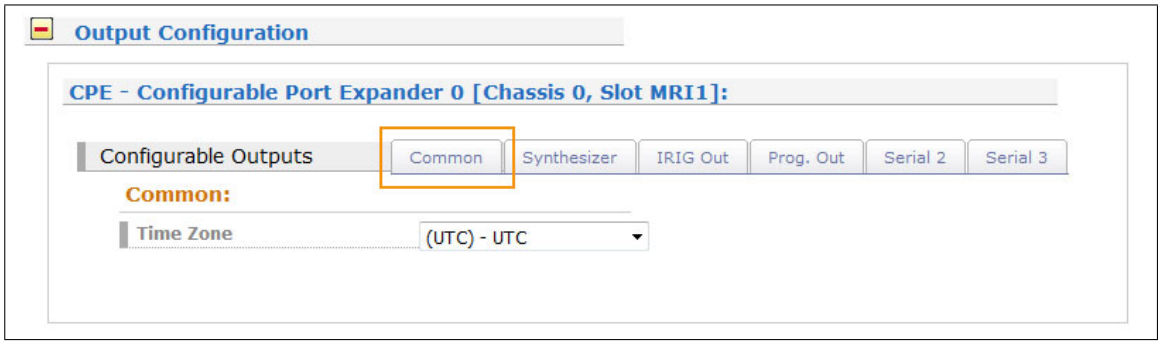


D-SUB 9
Male

	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)

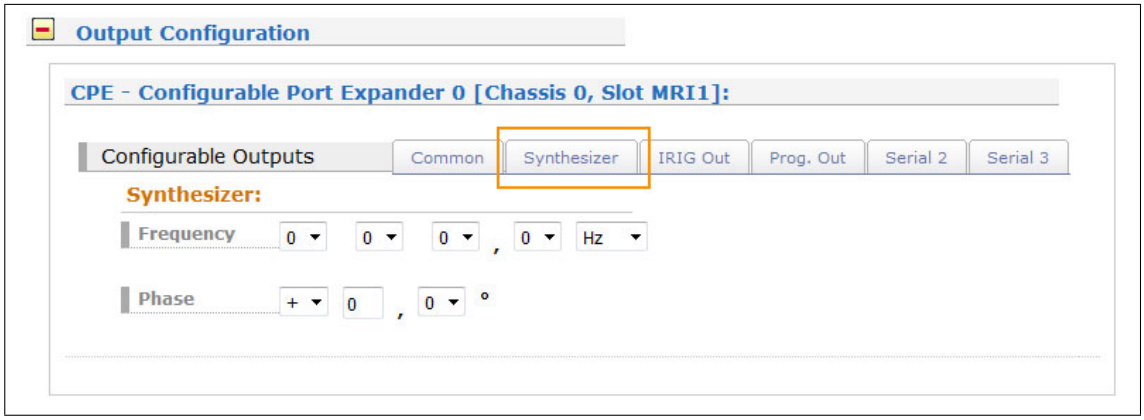


Figure: Menu Tab "Synthesizer" Frequency for selecting the Frequency Synthesizer option in the menu "Prog. Out"

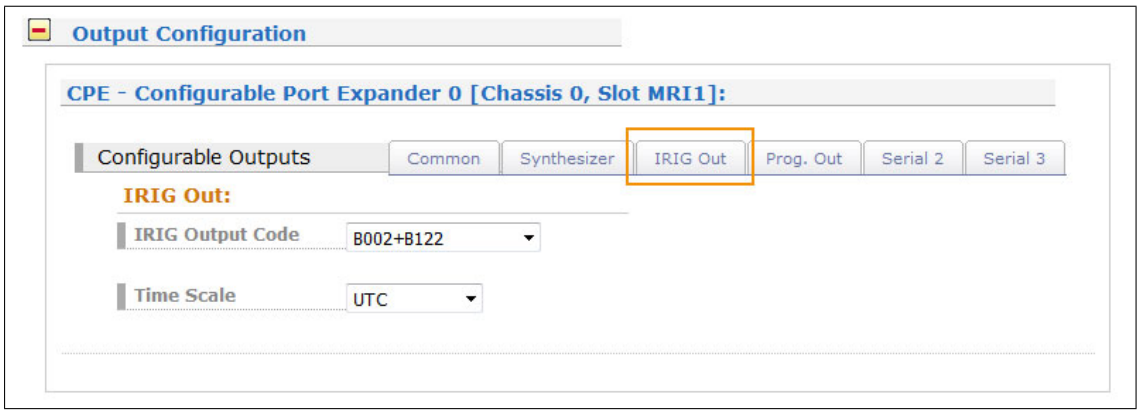


Figure: Menu Tab "IRIG Out" Selection of the IRIG code (IRIG DCLS only)

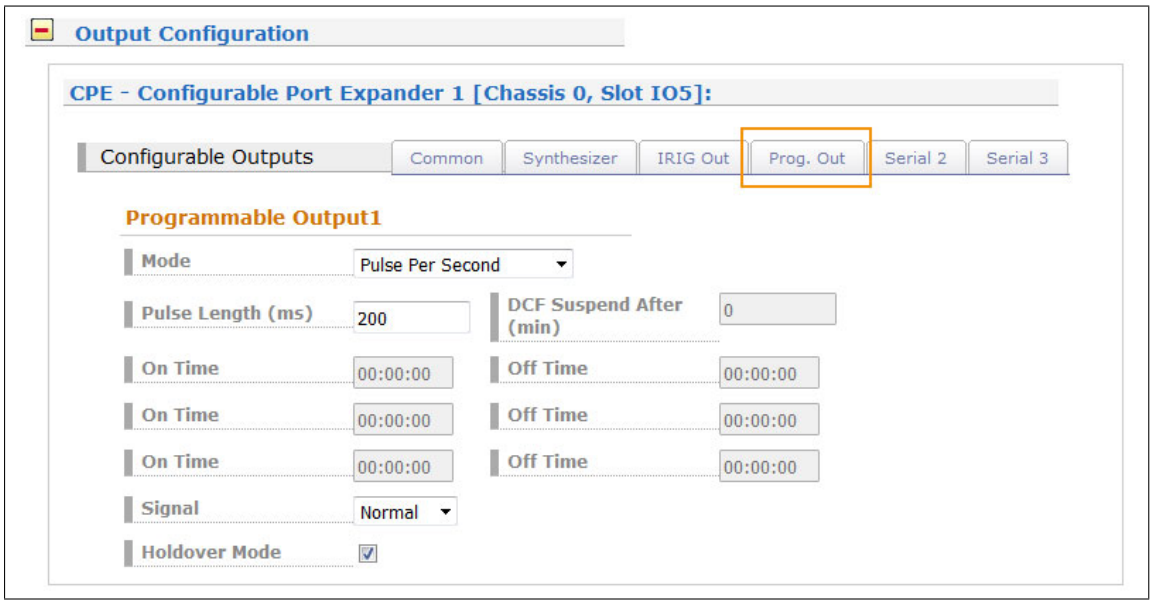


Figure: Menu Tab "Prog. Out" Selection of the signal option for the programmable pulse output (PPO)

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

13.6.14 LIU - Line Interface Unit

Input signal: 2.048 MHz reference clock, TTL level

Clock: T1 - 1.544 MHz
E1 - 2.048 MHz

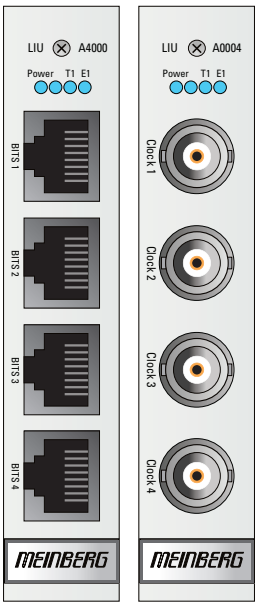
BITS: Framed Outputs 1544 kBit/s
or 2048 kBit/s (ESF - Extended Superframe)

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

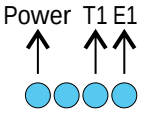
Outputs: balanced - RJ45 jack - 120 Ω (Clock)
unbalanced - BNC connector 75 Ω (Bits)

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



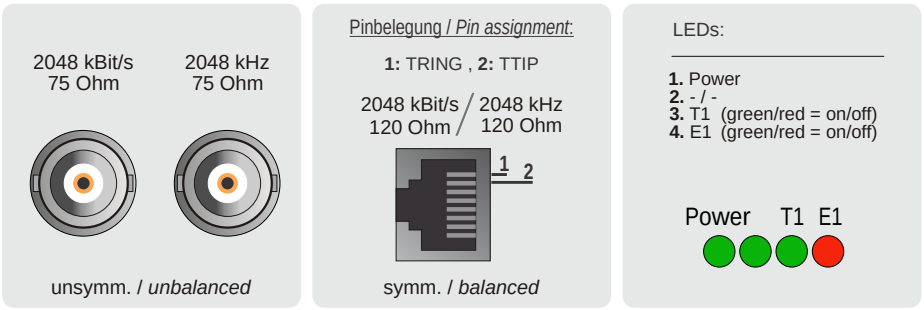
Power:	Init	blue during initialisation, green in normal operation mode
T1:	green	selected mode T1
	red:	output disabled
	yellow:	signal quality unknown
E1:	green	selected mode E1
	red:	output disabled
	yellow:	signal quality unknown

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:

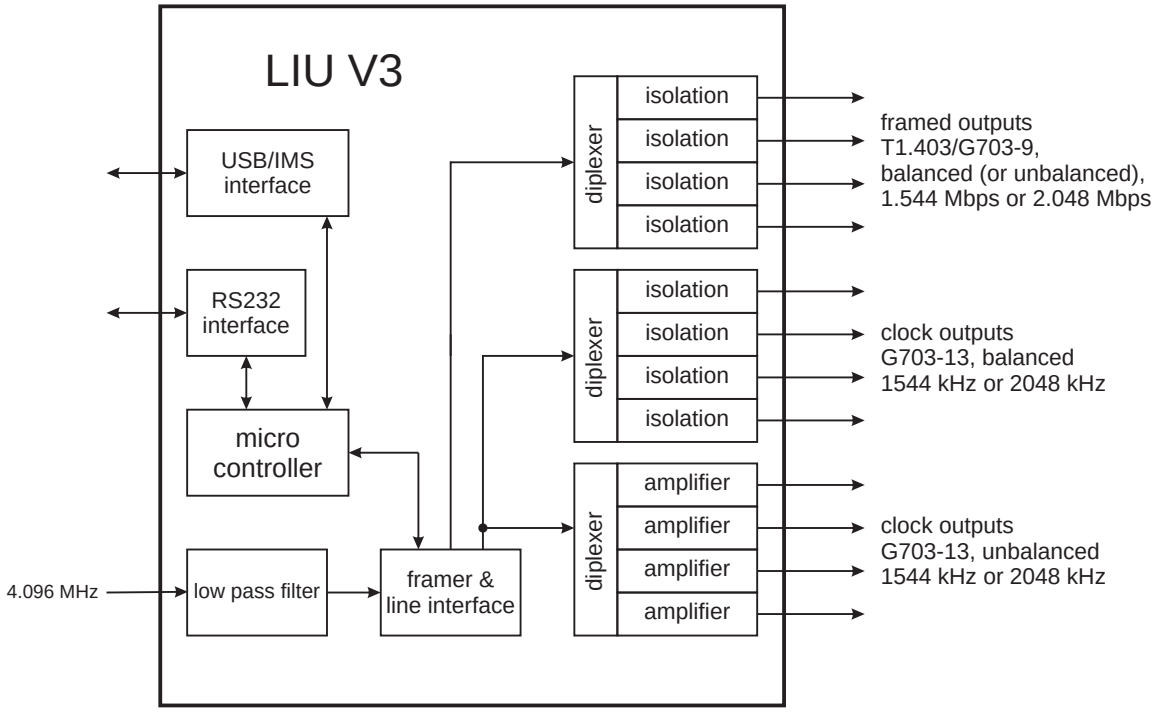
- Measurement and test of synchronization quality of Telecom networks
- Calibration and synchronization of laboratory equipment
- Test of synchronization of radio transmitters / base stations (GSM / CDMA / UMTS / DAB / DVB)



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).

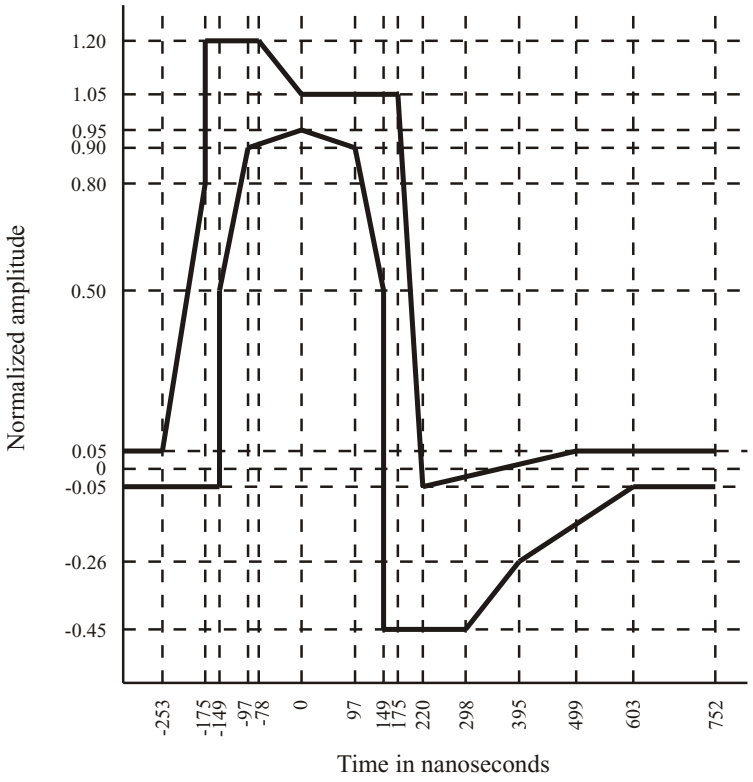
The clock outputs are standard frequencies of either 1544 kHz (T1) or 2048 kHz (E1). Four unbalanced and four balanced outputs according to ITU-T G703-13 (CCITT recommendation "Physical/electrical characteristics of hierarchical digital interfaces") are available via BNC female and RJ45 connectors.

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.

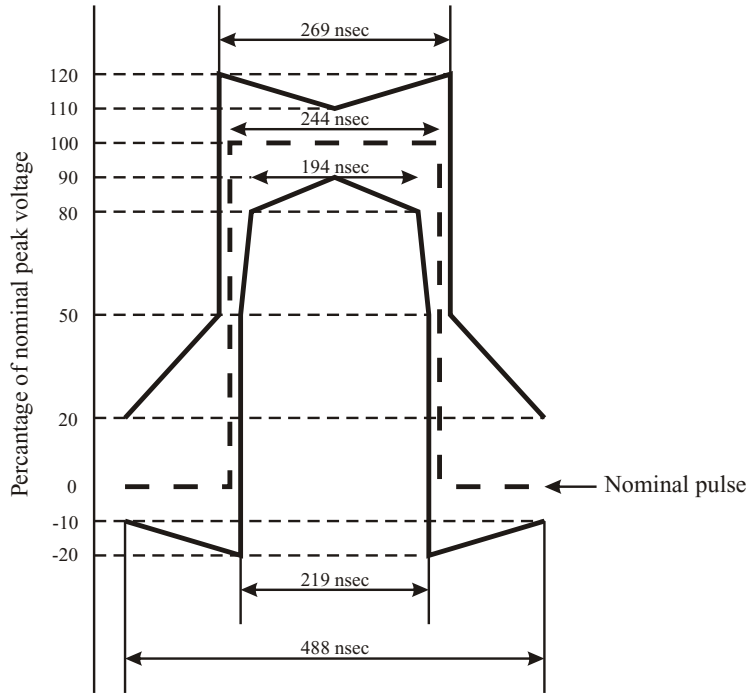
Pulse templates

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

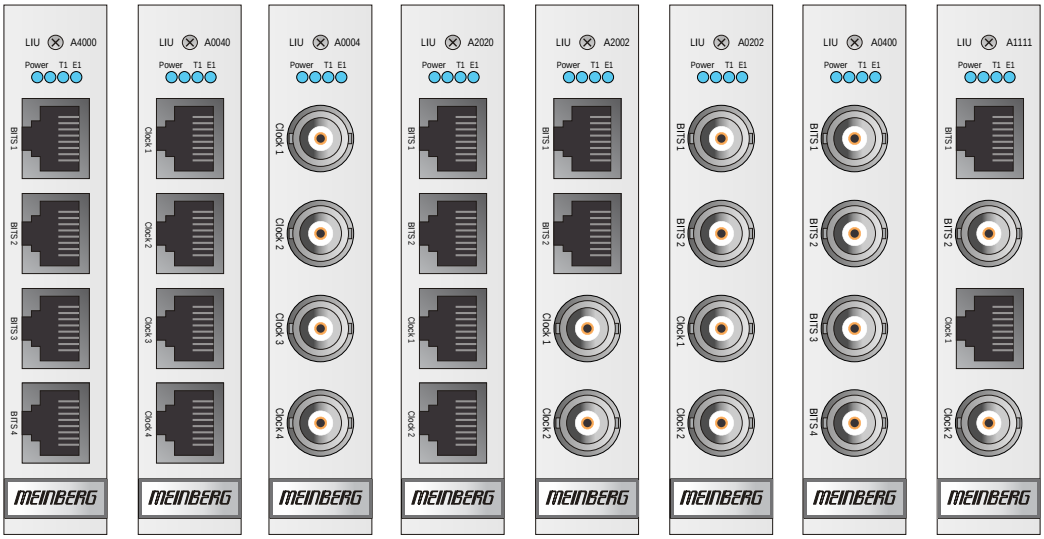
The Line Interface Unit (LIU) is available in two different sizes and different output / connector options. All outputs of a module can be operate in either the E1 or T1 in mode. Signal output settings can be done during operation via the web interface. The selected mode is indicated by the LEDs in the 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-A0040	4TE	Clock (4/0)	4 x RJ45
LIU-A0004	4TE	Clock (0/4)	4 x BNC
LIU-A2020	4TE	BITS (2/0) Clock (2/0)	2 x RJ45 2 x RJ45
LIU-A2002	4TE	BITS (2/0) Clock (0/2)	2 x RJ45 2 x BNC
LIU-A0400	4TE	BITS (0/4)	4 x BNC
LIU-A1111	4TE	BITS (1/1) Clock (1/1)	1 x RJ45, 1 x BNC 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)

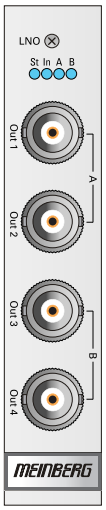
13.6.15 LNO - 10MHz Sinus Output Module

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

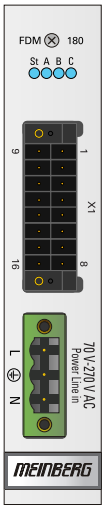


LED Status Indicators:

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

13.6.16 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) +-100μHz
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%

13.6.17 REL1000: Error Relay Module

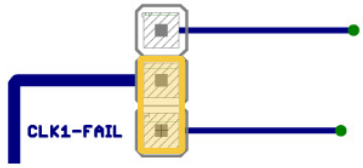
The REL1000 error relay output is connected to the TTL TIME_SYNC output of the reference clock (GPS, GLONASS ...). If the internal reference clock has been synchronized by its source, the relay will switch to mode "NO" (Normaly Open). In error case the relay switches to mode "NC" (Normaly Closed).

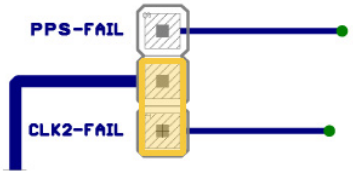
If the system isn't equipped with a second clock and RSC switch unit, the relay can be switched by 10MHz or PPS to monitor these signals.

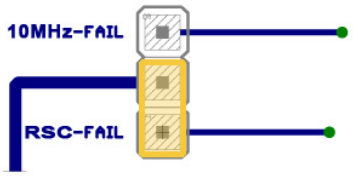
Error Output:

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:

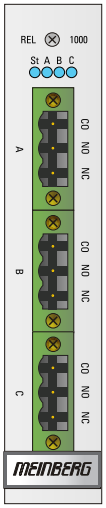
Relais A:	Clock 1
Relais B:	PPS
Relais C:	10MHz

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)

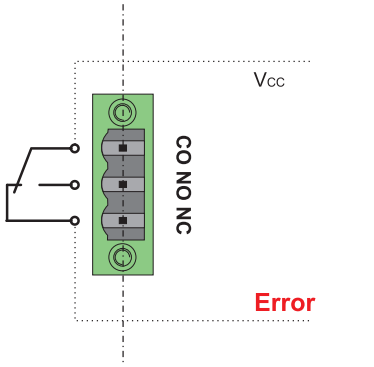


Technical Specification ERROR Relays:

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

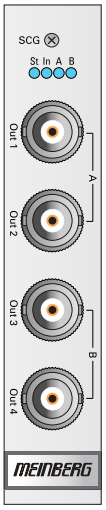
Error: CO - NC connected



13.6.18 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:

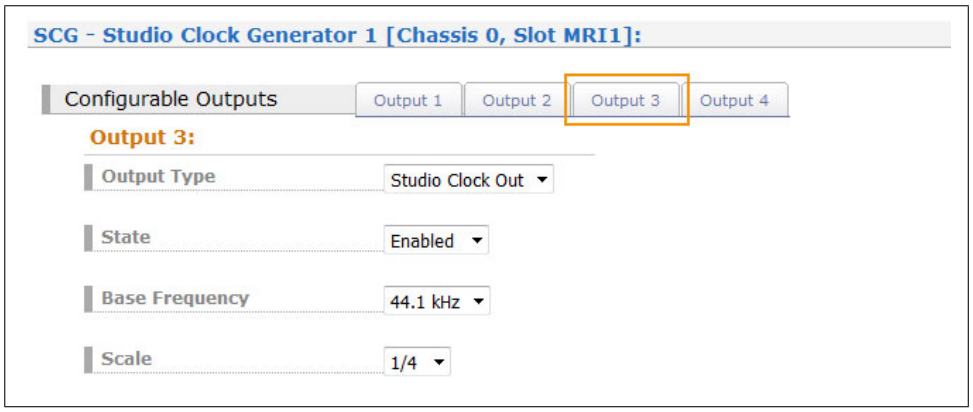
Outputs:	4 x BNC (2.5V TTL into 50 Ohm) outputs with configureable frequencies
Input Signal:	10MHz, sinewave or square pulse
Current Consumption:	5 V +- 5%, @400 mA
Ambient Temperature:	0 ... 50°C / 32 ... 122°F
Humidity:	85% max.

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 Enabled
Base Frequency:	32kHz 44.1kHz 48kHz
Scale:	1/8 to 256

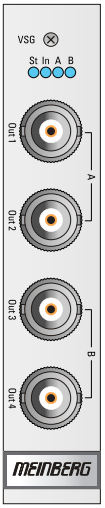
13.6.19 VSG - Video Sync Generator

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.

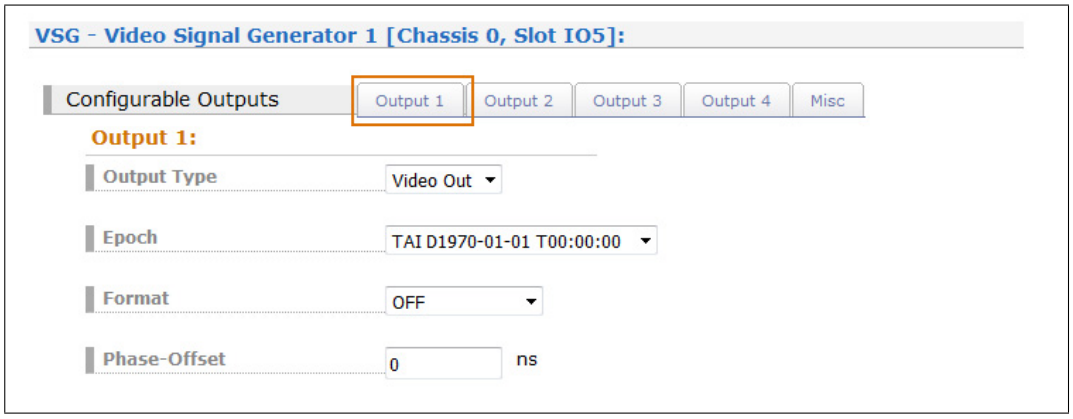
Generated Signals:

SMPTE standards:	PAL Blackburst NTSC Blackburst 720p/50Hz (SMPTE296M3) 1080i/25Hz (SMPTE274M6) 720p/59.94Hz (SMPTE296M1) 1080i/29.97Hz (SMPTE274M7) V-, H-, Frame-Sync for HD and SD formats
Status Info:	ST: Status of VSG In: Status of reference input A: Status Out 1 + 2 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 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.



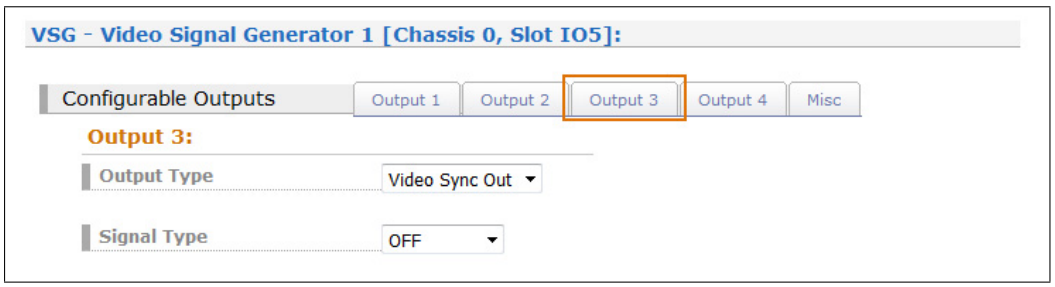
Overview Configuration VSG Video Sync Generator Outputs 1-4

Output 1

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

Output 2:

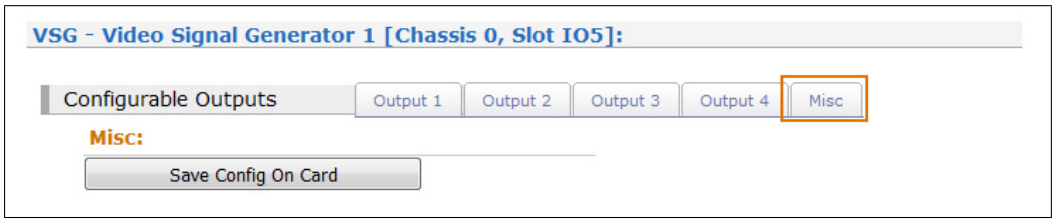
Output Type:	Video Out
Epoch:	like Output 1
Format:	NTSC PAL
Phase Offset:	[Offset Value]



Output 3 / Output 4:

Output Type:	Video Sync Out
Signal Type:	SD H-Sync SD V-Sync SD Frame HD H-Sync HD V-Sync HD Frame HD Blank

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



14 Declaration of Conformity

Konformitätserklärung

Doc ID: LANTIME M1000-2015-06-04

Hersteller *Manufacturer*	Meinberg Funkuhren GmbH & Co. KG 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 M1000**

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

EN55022:2010, Class B	Limits and methods of measurement of radio interference characteristics of information technology equipment
EN55024:2010	Limits and methods of measurement of Immunity characteristics of information technology equipment
EN 60950-1:2006 (+A11:2009 +A12:2011)	Safety of information technology equipment
EN 50581:2012	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

gemäß den Richtlinien 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.
following the provisions of the directives 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, 2015-06-04

Günter Meinberg
Managing Director

M1000_QSG_260115