The Synchronization Experts.

MANUAL

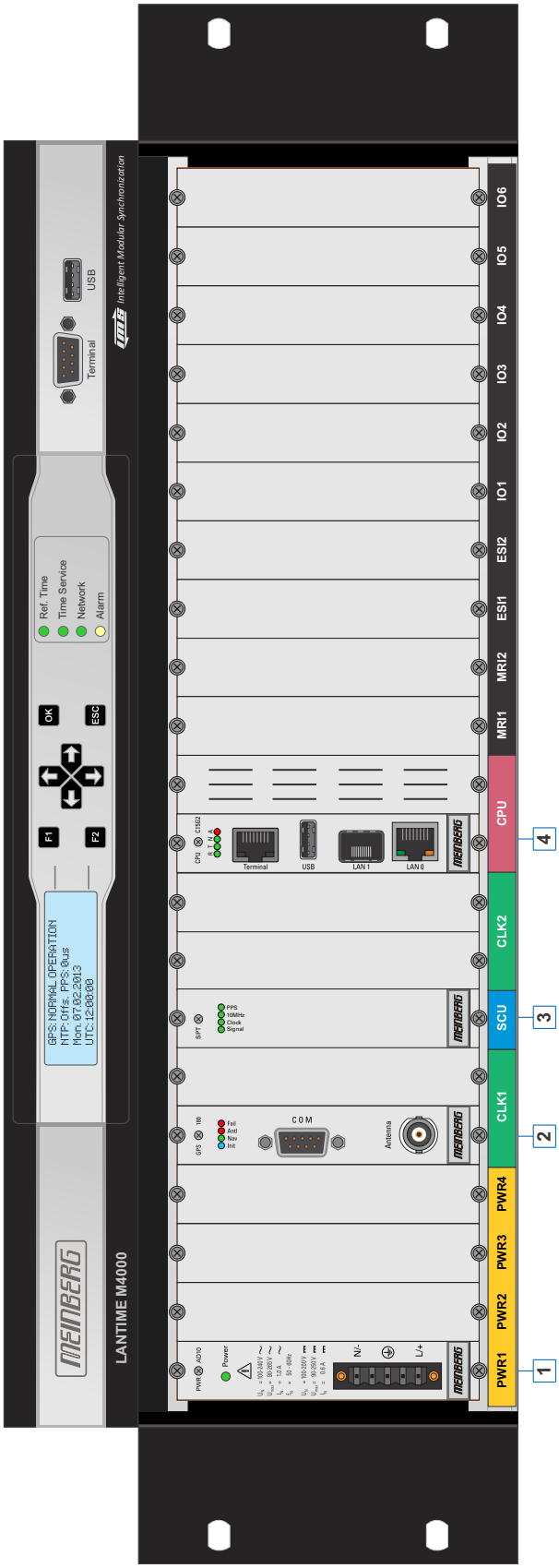
IMS - LANTIME M4000

Modular Sync. System and NTP Server

August 9, 2022

Meinberg Funkuhren GmbH & Co. KG

Front view (Frontansicht) IMS - LANTIME M4000



ENGLISH (M4000 Base Configuration)

1. Power Supply PWR1 (100-240 V AC / 100-200 V DC)
2. GPS Satellite Receiver Module CLK1
3. SPT - Standard Signal Distribution
4. LAN-CPU

DEUTSCH (M4000 - Basiskonfiguration)

1. Netzteil PWR1 (100-240 V AC / 100-200 V DC)
2. GPS Satellitenempfängermodul CLK1
3. SPT - Standard Signal Distribution
4. LAN-CPU

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1 Imprint

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2 The System LANTIME IMS M4000

2.1 IMS - Systems

The brand IMS describes a product family of Meinberg radio clocks for synchronization of time and frequency signals in networks and of directly connected systems such as signal distributors.

Meinberg's IMS Series (Intelligent Modular Synchronization) offers built-in redundancy for synchronization sources and power supplies in combination with highly modular slot based chassis, which support hot-swapping and field-expansion capabilities.

The design of our IMS enclosures allows to use up to four power supplies (both AC and DC variants can be mixed and matched), two time code receivers in combination with a signal switch module, a CPU board and up to ten I/O slots.

2.2 Target Audience

This manual is intended for professionals responsible for the installation, commissioning, maintenance, troubleshooting or operation of any of the equipment within the specified product range.

The structure and spelling of this manual assumes that the installation and commissioning technicians have knowledge of the use of electronical devices and network components.

2.3 Return of Equipment

All parts and components of your Meinberg system may only be repaired by Meinberg. In the event of a malfunction, the customer must contact our support service and never attempt to repair the device himself.

To request a device repair service, call Meinberg Technical Support to check shipping options and obtain the Return Material Authorization (RMA) number for shipping.

You can also request the RMA number from our website:
https://www.meinbergglobal.com/english/support/rma.htm.

The device must be packed in its original packaging or suitable packaging to protect it from shock and moisture. Send your device to the manufacturer's address, including sender identification and RMA number.

What must be included with the shipment?
Please return the device complete with accessories such as antenna or cable if possible. This may be important for troubleshooting.

3 LANTIME IMS M4000 System Description

3.1 Device Design, Functions and Area of Application

The IMS-LANTIME-System is a set of equipment composed of a reference module, a single-board computer module (LAN-CPU) with integrated network card, and a power supply unit, all installed in a modular chassis and ready to operate. The input/output signals of the IMS systems are provided on the connection side via I/O modules.

The implemented NTPD distributes the reference time from the reference module cyclic in the network. Information on the NTPD is monitored on the LC-Display (if available) or can be queried via the network.

The installation of an IMS 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.

3.2 IMS System Variants

The IMS system variants differ primarily in their housing form.

19 inch rack mount chassis
The base chassis contains a power supply, a receiver and the LANTIME CPU. This provides further slots for additional input and output modules.

M1000(S): four slots for expansion cards
three slots for expansion cards in redundant receiver configuration

M2000S: six slots for expansion cards

M3000(S): ten slots for expansion cards

M4000: ten slots for expansion cardsn

Redundant power supply and receiver solutions can be implemented for the following IMS series models:

M1000(S): up to two power supplies and two receivers

M2000S: up to three power supplies and two receivers

M3000(S): up to four power supplies and two receivers

M4000: up to four power supplies and two receivers

Railmount Chassis
The base chassis contains a power supply, a receiver and the LANTIME CPU.

M500: two slots for expansion cards
one configurable expansion slot (CES) with two optional output signals

3.3 Hardware Specifications

3.3.1 Chassis Variants

The IMS systems are offered in several housing variants. The hardware configuration is modular and the number of input and output options depends on the respective housing variant.

IMS system	Type	Dimension in mm* (W x H x D)	IO Slots	Power Supplies	Receivers
M500	DIN railmount	118 x 193 (227) x 160	2	1	1
M1000	19 inch rackmount 1HE / 84TE	483 x 44 x 290 (314)	4 (3)**	1 -2	1 - 2
M1000(S)	19 inch rackmount 1HE / 84TE	483 x 44 x 266 (300)	4 (3)**	1 -2	1 - 2
M2000S	19 inch rackmount 2HE / 84TE	483 x 76 x 248 (264)	6	1 - 3	1 - 2
M3000	19 inch rackmount 3HE / 84TE	483 x 133 x 280 (307)	10	1 - 4	1 - 2
M3000(S)	19 inch rackmount 3HE / 84TE	483 x 133 x 234 (268)	10	1 - 4	1 - 2
M4000	19 inch rackmountu 4HE / 84TE	483 x 133 x 274	10	1 - 4	1 - 2

The IMS systems M500, M1000, M3000 and M4000 have a 4 x 20 character LC display and a control panel with 8 function keys for direct on-site configuration. The M1000S, M2000S and M3000S models are delivered without a display. These systems, like the M4000, are optimized for ETSI rack installations due to their small housing depth.

The available configurations can be optimally adapted for specific application areas and industries.

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* The sizes in parentheses take into account the connections and module handles.

** With a redundant receiver configuration, only 3 IO slots are available in an M1000 system.

3.3.2 Environmental Requirements

Protection Rating: IP20

Ambient Temperature: 0 ... 50 °C

Storage Temperature: -20 ... 70 °C

Humidity: max. 85% (non-condensing) @ 30 °C

Please Note:
To prevent overheating damage during operation, some IMS systems are equipped with an active cooling module (ACM). The generated air flow is led through the system as shown in the figure on the right (see also chapter "ACM - Active Cooling Module" or "RCU - Rack Cooling Module").

Active cooling with ACM modules.
Active cooling modules are available for the M4000, M3000 and M1000(S) IMS systems. For the M4000 and M3000, the use of an ACM is optional. M1000 and M2000 systems are always equipped with an ACM.

Passive cooling.
Due to the small installation depth, it is not possible to integrate an ACM module in an M3000S system. For this reason, we have developed a 1U passive cooling enclosure that can be installed under the IMS system in the server rack. The RCU module (Rack Cooling Unit) provides an optimal airflow for the dissipation of the warm air.

4 Important Safety Information

4.1 Important Safety Information and Safety Precautions

The following safety information must be observed whenever the device is being installed or operated. Failure to observe this safety information and other special warnings or operating instructions in the product manuals constitutes improper usage and may violate safety standards and the manufacturer's requirements.

Depending on the configuration of your device or installed options, some information may not specifically apply to your device.

The device satisfies the requirements of the following EU regulations: EMC Directive, Low Voltage Directive, RoHS Directive and—where applicable—the Radio Equipment Directive.

If a procedure is marked with the following signal words, you may only proceed with it if you have understood and fulfilled all requirements. Hazard notices and other relevant information are classified and indicated as such in this manual according to the following system:

DANGER!
This signal word indicates a hazard with a high risk level . Such a notice refers to a procedure or other action that will very likely result in serious injury or even death if not observed or if improperly performed.

WARNING!
This signal indicates a hazard with a medium risk level . Such a notice refers to a procedure or other action that may result in serious injury or even death if not observed or if improperly performed.

CAUTION!
This signal word indicates a hazard with a low risk level . Such a notice refers to a procedure or other action that may result in minor injury if not observed or if improperly performed.

ATTENTION!
This signal word refers to a procedure or other action that may result in product damage or the loss of important data if not observed or if improperly performed.

4.2 Used Symbols

The following symbols and pictograms are used in this manual. Pictograms are used in particular to indicate potential hazards in all hazard categories.

Symbol	Beschreibung / Description
	IEC 60417-5031 Gleichstrom / *Direct current*
	IEC 60417-5032 Wechselstrom / *Alternating current*
	IEC 60417-5017 Erdungsanschluss / *Earth (ground) terminal*
	IEC 60417-5019 Schutzleiteranschluss / *Protective earth (ground) terminal*
	ISO 7000-0434A Vorsicht / *Caution*
	IEC 60417-6042 Vorsicht, Risiko eines elektrischen Schlages / *Caution, risk of electric shock*
	IEC 60417-5041 Vorsicht, heiße Oberfläche / *Caution, hot surface*
	IEC 60417-6056 Vorsicht, Gefährlich sich bewegende Teile / *Caution, moving parts*
	IEC 60417-6172 Trennen Sie alle Netzstecker / *Disconnect all power connectors*
	IEC 60417-5134 Elektrostatisch gefährdete Bauteile / *Electrostatic Discharge Sensitive Devices*
	IEC 60417-6222 Information generell / *General information*
	2012/19/EU Dieses Produkt fällt unter die B2B Kategorie. Zur Entsorgung muss es an den Hersteller übergeben werden. *This product is handled as a B2B-category product. To ensure that the product is disposed of in a WEEE-compliant fashion, it must be returned to the manufacturer.*

4.3 Product Documentation

Detailed product documentation is provided on a USB flash drive delivered with the Meinberg system. The manuals can also be downloaded from the Meinberg website at https://www.meinbergglobal.com, where you can enter your system name into the search box at the top of the page to find the relevant manual. Alternatively, contact Meinberg Support for further assistance.

The "Docs & Support" menu on the Web Interface also provides user manuals for time server administrators.

This manual contains important safety instructions for the installation and operation of the device. Please read this manual thoroughly before using the device.

This device may only be used for the purpose described in this manual. In particular, the specified operating limits of the device must be heeded. The person setting up the device is responsible for safety matters in relation to any larger system in which the device is installed!

Failure to observe these instructions may have an adverse impact on device safety!

Please keep this manual in a safe place.

Target Readership

This manual is only intended to be used by qualified electricians, or by persons who have been appropriately instructed by a qualified electrician and who are familiar with applicable national standards and with safety rules & regulations. This device may only be installed, set up, and operated by qualified personnel.

4.4 Safety during Installation

WARNING!

Pre-Operation Procedures and Preparation for Use
This mountable device has been designed and examined in accordance with the requirements of the standard IEC 62368-1 "Audio/Video, Information and Communication Technology Equipment - Part 1: Safety Requirements".

When the mountable device is to be used as part of a larger unit (e.g., electrical enclosure), there will be additional requirements in the IEC 62368-1 standard that must be observed and complied with. General requirements regarding the safety of electrical equipment (such as IEC, VDE, DIN, ANSI) and applicable national standards must be observed in particular.

The device has been developed for use in the industrial sector or in home environments and may only be used in such environments. In environments at risk of high environmental conductivity ("high pollution degree" according to IEC 60664-1), additional measures such as installation of the device in an air-conditioned electrical cabinet may be necessary.

Transport, Unpacking, Installation
If the unit has been brought into the usage area from a cold environment, condensation may develop; in this case, wait until the unit has adjusted to the temperature and is completely dry before setting it up.

When unpacking & setting up, and before operating the equipment, be sure to read the information on installing the hardware and the specifications of the device. These include, for example, dimensions, electrical characteristics, or necessary environmental conditions.

Fire safety standards must be upheld with the device in its installed state.

The device must not be damaged in any way when mounting it. In particular, holes must not be drilled into the housing.

For safety reasons, the device with the highest mass should be installed at the lowest position in the rack. Further devices should be installed from the bottom, working your way up.

The device must be protected against mechanical & physical stresses such as vibration or shock.

Connecting Data Cables

Do not connect or disconnect data cables during a thunderstorm, as doing so presents a risk in the event of a lightning strike.

The device cables must be connected or disconnected in the order specified in the user documentation for the device. Cables should always be held by the connector body when connecting or disconnecting them. Never pull a connector out by pulling on the cable. Doing so may cause the plug to be detached from the cable or cause damage to the plug itself.

Cables must be installed so that they do not represent a health & safety hazard (e.g., tripping) and are not at risk of damage (e.g., kinks).

Connecting the Power Supply

This equipment is operated at a hazardous voltage. Failure to observe the safety instructions in this manual may result in serious injury, death or property damage.

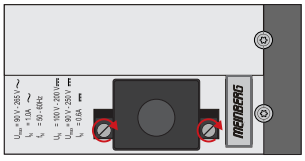
Before the device is connected to the power supply, a grounding conductor must be connected to the earth terminal of the device.

The power supply should be connected with a short, low-inductance cable.

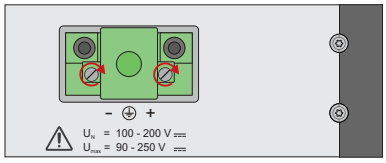
Before operation, check that all cables and lines work properly and are undamaged. Ensure in particular that the cables do not have kinks, that they are not wound too tightly around corners, and that no objects are placed on the cables.

Ensure that all connections are secure—make sure that the lock screws of the power supply plug are tightened when using a 3-pin MSTB or 5-pin MSTB connector (see diagram, LANTIME M300 power supply).

5-Pin MSTB Connector



3-Pin MSTB Connector



Faulty shielding or cabling and improperly connected plugs are a health & safety risk (risk of injury or death due to electrical shock) and may damage or even destroy your Meinberg device or other equipment.

Ensure that all necessary safety precautions have been taken. Connect all cables to the device only while the device is de-energized before turning on the power. Observe the safety instructions on the device itself (see safety symbols).

The metal chassis of the device is grounded. When installing the device in an electrical enclosure, it must be ensured that adequate clearance is provided, creepage distances to adjacent conductors are maintained, and that there is no risk of short circuits.

In the event of a malfunction or if servicing is required (e.g., damage to the chassis or power cable, ingress of fluids or foreign objects), the power supply may be cut off.

Please address any questions regarding your building's electrical, cable or antenna installations to the person or department responsible for that installation within your building.

AC Power Supply	DC Power Supply
• The device is a Protection Class 1 device and may only be connected to a grounded outlet (TN system). • For safe operation, the installation must be protected by a fuse of a rating not exceeding 16 A and equipped with a residual-current circuit breaker in accordance with applicable national standards. • The disconnection of the appliance from the mains power supply must always be performed from the mains socket and not from the appliance itself. • Mains-powered appliances are equipped with a safety-tested mains cable designed for use in the country of operation and may only be connected to a grounded shockproof socket, otherwise electric shock may occur. • Make sure that the mains socket on the appliance or the mains socket of the house installation is readily accessible for the user so that the mains cable can be pulled out of the socket in an emergency.	• In accordance with IEC 62368-1, it must be possible to disconnect the appliance from the supply voltage from a point other than the appliance itself (e.g., from the primary circuit breaker). • The power supply plug may only be fitted or dismantled while the appliance is isolated from the power supply (e.g., disconnected at the primary circuit breaker). • Supply cables must be adequately secured and have an adequate wire gauge size. *Connection Cable Wire Gauge:* *1 mm^2 – 2.5 mm^2* *17 AWG – 13 AWG* • The power supply of the device must have a suitable disconnection mechanism such as a switch. This disconnection mechanism must be readily accessible in the vicinity of the appliance and marked accordingly as a cut-off mechanism for the appliance.

4.5 Connection of Protective Earth Conductor/Grounding

ATTENTION!

In order to ensure that the device can be operated safely and to meet the requirements of IEC 62368-1, the device must be correctly connected to the protective earth conductor via the protective earth connection terminal.

If an external ground connection is provided on the housing, it must be connected to the grounding busbar (earthing busbar) for safety reasons before connecting the power supply. Like this, any possible leakage current on the housing is safely discharged to earth.

The screw, washer and toothed lock washer necessary for mounting the grounding cable are located at the grounding point of the housing. A grounding cable is not included in the contents of delivery.

Note:
Please use a grounding cable with cross-section $\geq$ 1.5 mm^2, as well as a suitable grounding clamp/lug. Always ensure that the connection is properly crimped!

4.6 Safety During Operation

WARNING!

Avoiding Short-Circuits
Protect the device against all ingress of solid objects or liquids. Ingress presents a risk of electric shock or short-circuiting!

Ventilation Slots
Ensure that the ventilation slots are clean and uncovered at all times. Blocked ventilation slots may cause heat to be trapped in the system, resulting in overheating. This may cause your device to malfunction or fail.

Appropriate Usage
The device is only deemed to be appropriately used and EMC limits (electriomagnetic compatibility) are only deemed to be observed if the chassis cover is properly fitted (thus ensuring that the device is properly cooled, fire-safe, and shielded against electrical, magnetic and electromagnetic fields).

Switching the Device Off in the Event of a Malfunction or when Repairs are Required
It is not sufficient to simply switch off the device itself in order to disconnect the power supply. If the device is malfunctioning, or if repairs become necessary, the device must be isolated from all power supplies immediately.

To do so, follow the procedure below:
- Switch off the device from the unit itself.
- Pull out all power supply plugs.
- Inform the person or department responsible for your electrical installation.
- If your device is connected to an Uninterruptible Power Supply (UPS), it will remain operational even after pulling the UPS power cable from the mains socket. In this case, you will need to shut down your UPS in accordance with the user documentation of your UPS system.

4.7 Safety During Maintenance

WARNING!

When modifying the device in any way, only use components that are approved for use with the system. Failure to comply with this requirement may result in violations of EMC or safety standards and cause the device to malfunction.

When modifying or removing components approved for the system, the force required to remove the components (approx. 60 N) presents a risk of injury to the hands. Information on which components are approved for installation can be obtained from Meinberg Technical Support.

The device must not be opened. Repairs to the device may only be performed by the manufacturer or authorized personnel. Improperly performed repairs expose the user to considerable risk (electric shock, fire hazard).

- Danger from moving parts. Keep away from moving parts.

- Parts of the device may get very hot during operation. Do not touch the surfaces of these! Switch off the device and allow it to cool if necessary before installing or removing any components.

4.8 Handling of Batteries

WARNING!

The lithium battery on the receiver modules has a life of at least ten years. Should it be necessary to replace it, please note the following:

Improper handling of the battery can lead to an explosion or to a leakage of flammable liquids or gases.

- Never short-circuit the battery.
- Never attempt to recharge the battery.
- Never throw the battery into a fire.
- The battery must only be exposed to the barometric pressure range specified by the battery manufacturer.
- The battery must only ever be replaced with one of the same type or a comparable type recommended by the manufacturer. The battery must only be replaced by the manufacturer or an authorized technician.
- Never dispose of the battery in a mechanical crusher or shredder, or in an open fire or furnace.

Please consult your local waste disposal regulations for information on how to dispose of hazardous waste.

IMPORTANT!

The battery is used to power components such as the RAM and the reserve real-time backup clock for the reference clock.

If the battery voltage drops below 3 V DC, Meinberg recommends having the battery replaced. If the battery voltage drops below the specified minimum, the following behavior may be observed in the reference clock:

- The reference clock may have the wrong date or wrong date upon power-up
- The reference clock repeatedly starts in Cold Boot mode
- Some of the configurations saved for the reference clock may be lost

4.9 Safety Information for SFP Modules

This safety information describes how the SFP modules recommended by Meinberg should be handled to ensure safe usage. These SFP modules are hot-pluggable input/output devices (I/O devices) that are connected to a network via a fiber optic or electrical connection. The safety information below must be read and heeded before installing an SFP module in a Meinberg device, before setting up a Meinberg device equipped with SFP modules for use, or before performing maintenance on such a Meinberg device.

CAUTION!

The SFP modules recommended by Meinberg are equipped with a Class 1 laser.

Risk of injury from laser radiation!

- Only use fiber optic SFP modules that are compliant with the definition of a Class 1 laser in accordance with IEC standard 60825-1.
- Fiber optic products that are not compliant with this standard may emit radiation capable of causing eye injuries.
- Never look into an unconnected connector of a fiber optic cable or an unconnected SFP port.
- Unused fiber optic connectors should always be fitted with a suitable protective cap.
- This device may be installed, replaced, and maintained only by trained and qualified personnel.

ATTENTION!

- The safety information and manufacturer specifications relating to the SFP modules used must be heeded.
- The SFP module used must be capable of providing protection against voltage spikes in accordance with IEC 62368-1.
- The SFP module used must be tested and certified in accordance with applicable standards.

4.10 Cleaning and Care

ATTENTION!

Never clean the device using liquids! Water ingress is a significant safety risk for the user (e.g., electric shock).

Liquids can cause irreparable damage to the electronics of the device! The ingress of liquids into the device chassis may cause short circuits in the electronic circuitry.

Only clean with a soft, dry cloth. Never use solvents or cleaners.

4.11 Prevention of ESD Damage

ATTENTION!

An ESDS device (electrostatic discharge-sensitive device) is any device at risk of damage or malfunction due to electrostatic discharges (ESD) and thus requires special measures to prevent such damage or malfunction. Systems and modules with ESDS devices usually bear the following symbol:

Symbol Indicating Devices with ESDS Components

The following measures will help to protect ESDS components from damage and malfunction.

When preparing to dismantle or install devices:
Ground your body (for example, by touching a grounded object) before touching sensitive devices.

Ensure that you wear a grounding strap on your wrist when handling such devices. These straps must in turn be attached to an uncoated, non-conductive metal part of the system.

Use only tools and devices that are free of static electricity.

When transporting devices:
Devices must only be touched or held by the edges. Never touch any pins or conductors on the device.

When dismantling or installing devices:
Avoid coming into contact with persons who are not grounded. Such contact may compromise your connection with the earth conductor and thus also compromise the device's protection from any static charges you may be carrying.

When storing devices:
Always store devices in ESD-proof ("antistatic") bags. These bags must not be damaged in any way. ESD-proof bags that are crumpled or have holes cannot provide effective protection against electrostatic discharges.

ESD-proof bags must have a sufficient electrical resistance and must not be made of conductive metals if the device has a lithium battery fitted on it.

4.12 Return of Electrical and Electronic Equipment

ATTENTION!

WEEE Directive on Waste Electrical and Electronic Equipment 2012/19/EU
(WEEE Waste Electrical and Electronic Equipment)

Waste Separation
Product Category: According to the device types listed in Annex I of the WEEE Directive, this product is classified as "IT and Telecommunications Equipment".

This product satisfies the labeling requirements of the WEEE Directive. The product symbol on the left indicates that this electronic product must not be disposed of in domestic waste.

Return and Collection Systems
When disposing of your old equipment, please use the national return or collection systems available to you. Alternatively, you may contact Meinberg, who will provide further assistance.

The return of electronic waste may not be accepted if the device is soiled or contaminated in such a way that it potentially presents a risk to human health or safety.

Return of Used Batteries
The EU Battery Directive prohibits the disposal of batteries marked with the WEEE trashcan symbol above in household waste.

5 Before you start

5.1 Text and Syntax Conventions

This chapter briefly describes the text and syntax conventions used in this manual.

Menu description
Example web interface menu "Network
Submenu "Network → Physical Network Configuration"
Tab in a submenu "Network → Network Interfaces → IPv4"

Menu navigation is logically separated by the right arrow.

Services
The services running on the system are shown in italics.

Example: NTP-Deamon: *ntpd*

Cross references in the document:
Cross-references in the document are displayed in dark blue font - e.g.: see chapter Support Information

Selection Options and Logical Groups:
Selection options, e.g. in a drop-down menu, are underlined and then briefly described. If several parameters are combined in a menu to logical groups, these are also underlined and displayed in bold font - e.g. PTP status → **Parent Datasets** .

Example:
Menü PTP (IEEE1588) Settings → Operation Mode

Multicast Master
...

Terminal

```
# Output via a terminal window is displayed
# in a grey box with monospace font.
```

5.2 Abbreviation List

AFNOR	Association Francaise de Normalisation time codes
AC	Alternating Current
ASCII	American Standard Code for Information Interchange
BMC	Best Master Clock
BNC	Bayonet Neil Councilman connector
Bps	Bytes per second
bps	Bits per second
CAT5	Standard Network Cable
CET	Central European Time
CLI	Command Line Interface
DB9	Connector do type D-subminiature
DC	Direct Current
DCF77	Is a longwave time signal. DCF77 stands for D=Deutschland (Germany), C=long wave signal, F=Frankfurt, 77=frequency: 77.5 kHz.
DCFMARK	Single pulse with a programmable date and time
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name Server
DSCP	Differentiated Services Code Points
DST	Daylight Saving Time
E1	European digital transmission signal at 2.048 MHz used in telecommunication networks.
E2E	End-to-end
ETH	Ethernet
FTP	File Transfer Protocol
FW	Firmware
GE / GbE	Gigabit Ethernet
GLONASS	GLObal NAvigation Satellite System from Russian Aerospace Defense Forces
GND	Ground (Connector)
GNSS	Global Navigation Satellite System (GPS, GLONASS, Galileo, Beidou)
GOAL	GPS Optical Antenna Link
GPS	Global Positioning System (USA)
GSM	Global System for Mobile Communications
HMI	Human-Machine Interface
HP	Horizontal Pitch - is a unit measure the horizontal width of rack mounted electronic equipment
HPS	High Performance Synchronization PTP/NTP/SyncE GBit module
HSR	High-availability Seamless Redundancy
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol Secure
IEC	International Electrotechnical Commission
IED	Intelligent Electronic Devices
IEEE	Institute of Electric and Electronic Engineers
IEEE 1588	Protocol for high-precision synchronization in nanosecond range (PTP)
IP	Internet Protocol
IP 20	Protection Class 20
IRIG	Inter-range instrumentation group time codes
LCD	Liquid Crystal Display
LDAP(S)	Lightweight Directory Access Protocol
LED	Light-Emitting Diode
LINUX	Unix-like multi-user computer operating system
LIU	Line Interface Unit- an module for generation E1/T1 Signals, both MBit/s (framed) and Clock (unframed)
LNE	Local Network Extention, additional Ethernet Ports
MAC	Media Access Control
MD5	Message-Digest cryptographic hash function
MESZ	Middle European Summer Time
MEZ	Middle European Time
MIB	Management Information Base
MRS	Multi Reference Source
MSF	Time signal transmitter in Anthorn, UK
NIST	National Institute of Standards and Technology
NMEA	Communication standard from National Marine Electronics Association
NTP	Network Time Protocol
NTPD	NTP Deamon
OSV	Original Shipped Version (Firmware)
OUT	Output
P2P	Peer-to-Peer
PLC	Programmable Logic Controller
PLL	Phase Locked Loop
PPM	Pulse per Minute
PRP	Parallel Redundancy Protocol
PPS	Pulse per Second
PPH	Pulse per Hour
PTB	Physical - Technical Institute Braunschweig / Germany
PTP	Precision Time Protocol
RAM	Random Access Memory
RF	Frequency of radio waves, from 3kHz to 300GHz
RG58	Standard coaxial cable used to connect an antenna and a receiver
RJ45	Ethernet Connector with 8 conductors
RMC	Remote Monitoring Control
RoHS	Restriction of Hazardous Substances
RPS	Redundant Power Supply
RS232/485	Serial port levels
RSC	Redundant Switch Control unit
RX	Receiving Data
SBC	Single Board Computer
SDU	Signal Distribution Unit

SHA-1	Secure Hash Algorithm 1
SMB	Subminiature coaxial connector
SNMP	Simple Network Management Protocol
SNTP	Simple Network Time Protocol
SMTP	Simple Mail Transfer Protocol
SPS	Standard Positioning System
SSH	Secure SHell network protocol
SSU	Synchronization Supply Unit, specific clock used in telecommunication networks
SSM	Sync Status Messages, clock quality parameters in telecommunication networks.
ST	Bayonet-lock connector
Stratum	Value defines the NTP hierarchy
SYSLOG	Standard for computer data logging
TACACS	Terminal Access Controller Access Control System
TCG	Time Code Generator
TCR	Time Code Receiver for IRIG A/B, AFNOR or IEEE1344 codes
T1	North American telecommunication signal at 1.544 MHz frequency
TCP	Transmission Control Protocol
TTL	Transistor-to-Transistor Logic
TX	Data Transmission
U	Unit - is a unit measure the vertical height of rack mounted electronic equipment.
UDP	User Datagram Protocol
UMTS	Universal Mobile Telecommunications System
UNIX	Multitasking, multi-user computer operating system
UTC	Universal Time Coordinate
VLAN	Virtual Local Area Network
WWVB	Time signal radio station Fort Collins, Colorado (USA)

5.3 Required Tools

	LANTIME IMS SERIES						
	LANTIME M1000	LANTIME M1000S	LANTIME M2000S	LANTIME M3000	LANTIME M3000S	LANTIME M4000	LANTIME M500
Mounting Rackears	TORX T20	TORX T20	TORX T20	TORX T20	TORX T20	TORX T20	x
Mounting DIN rail	x	x	x	x	x	x	Phillips PH1 x 80
Replacing IMS modules	TORX T8	TORX T8	TORX T8	TORX T8	TORX T8	TORX T8	TORX T8
FAN Installation	TORX T8	TORX T8	TORX T8	TORX T8	x	TORX T8 Flat head Screwdriver	x

	LANTIME SERIES						
	LANTIME M100	LANTIME M200	LANTIME M300	LANTIME M400	LANTIME M600	LANTIME M900	SyncFire
Mounting Rackears	x	TORX T20	TORX T20	x	TORX T20	TORX T20	x
Mounting DIN rail	Phillips PH1 x 80	x	x	Phillips PH1 x 80	x	x	x
Replacing Modules	x	x	x	x	x	TORX T8	TORX T10

Figure: Required tools from left to right - INBUS 2,5mm, Phillips PH1 x 80, Flat head Screwdriver, TORX T20, TORX T8

5.4 Preparing Installation

Meinberg IMS LANTIME systems are designed for installation in 19-inch racks or 35mm rail mount. Rack systems come with all necessary accessories (mounting brackets, screws, adapters for power supply ...). For installations in regions outside of Germany that have other standards (e.g. for power supply connections), please specify exactly which adapters or cables you need to put the device into operation when ordering.

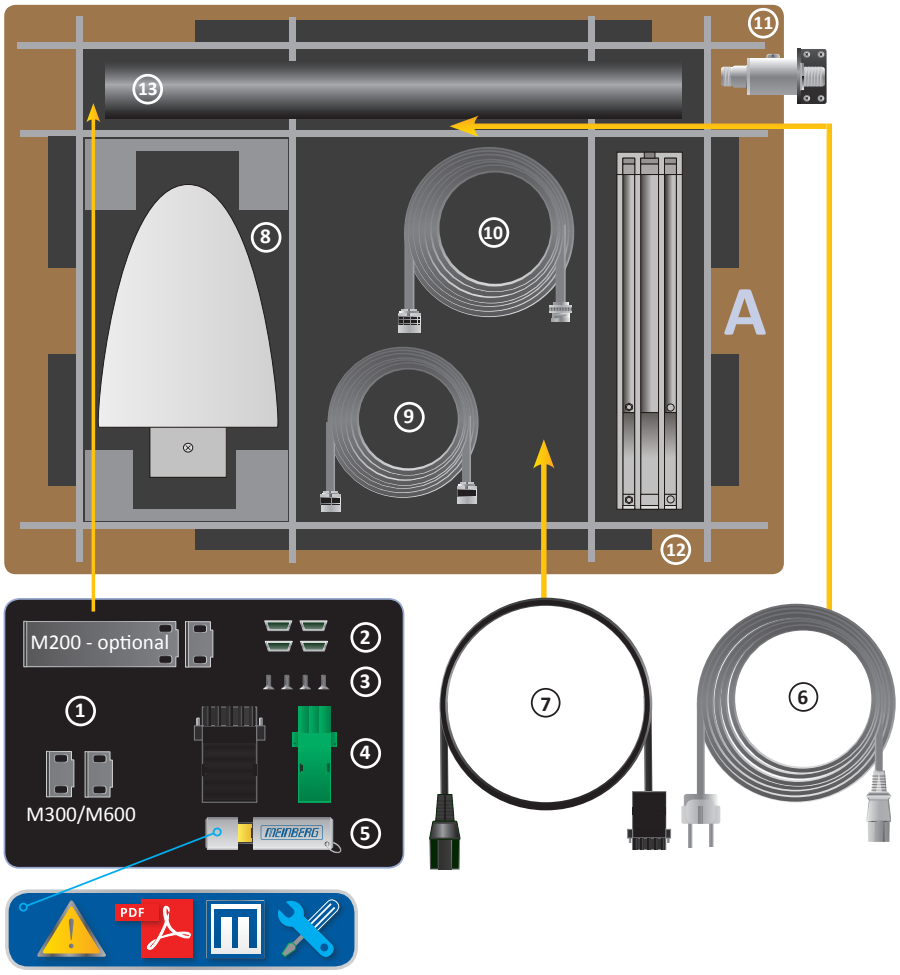
Before unboxing the system, make sure that there is sufficient space in the built-in cabinet to ensure safe ventilation of the system. Avoid dirt and dust during installation.

Caution!

To avoid damage to the system and personal injury, please make sure to follow the safety instructions in this manual.

5.5 Unboxing the Device

After unpacking the LANTIME time server, please check the contents for completeness - regarding to the included packing list.

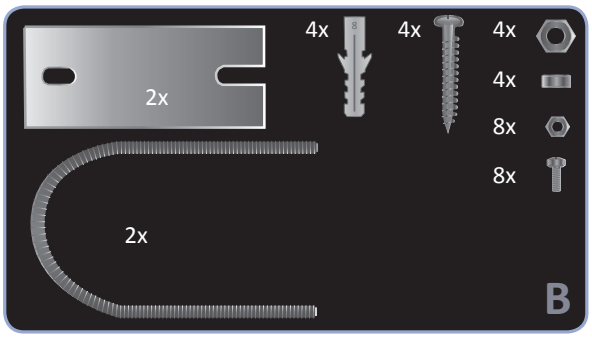


A LANTIME Package Contents

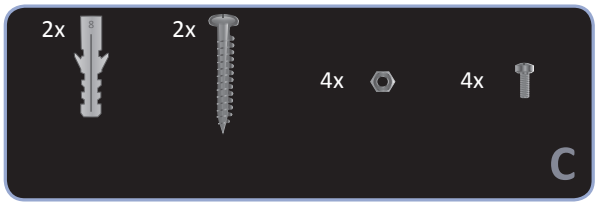
1. Assembly brackets for 19 Inch rack mounting (optional for LANTIME M200)
2. Protection spacer (M200 / M300 / M600)
3. Screws for brackets (M200 / M300 / M600)
4. 3-pin DFK connector or 5-pin DFK connector
   (additional connector in case of AC/DC or DC power supply)
5. USB stick with software and documentation
6. Power cord (only in case of AC power supply)
7. Option: power cable with 5-pin connector

Only with delivered Antenna

8. Antenna
9. Optional: cable for surge voltage protector
10. Antenna cable
11. Optional: surge voltage protector with bracket
12. Brackets for pole or wall mounting
13. Pole for antenna mounting (GPS Antenna)



B **Mounting Kit for GPS Antenna**
(wall or pole mounting)



C **Mounting Kit for Long Wave Antenna**
(wall mounting)

Information:

Please read the safety instructions and the manual carefully to familiarize yourself with the safe and proper handling of electronic devices.

The product documentation can be found on the USB Flash Memory.

5.6 Disposal of Packaging Materials

The packaging materials we use are fully recyclable:

Material	Use for	Disposal
Polystyrol	packaging frame/filling material (polystyrene peanuts, bubble wrap)	Recycling Depot
PE-LD Polyethylene low density	accessories packaging	Recycling Depot
Cardboard	shipping packaging, accessories packaging	Paper recycling

6 System Installation

19 inch rackmount

Mounting brackets and fixing screws are included in the scope of delivery of a rackmount system. If the system is supplied with an antenna and antenna cable, it is advisable to first mount the antenna in a suitable location (see chapter Antenna Mounting) and lay the antenna cable. The power supply cable and the network cable should also be available at the installation site before the system is installed. Make sure that all necessary adapters for connecting the device are available. Make sure that the voltage is disconnected from the power source during installation.

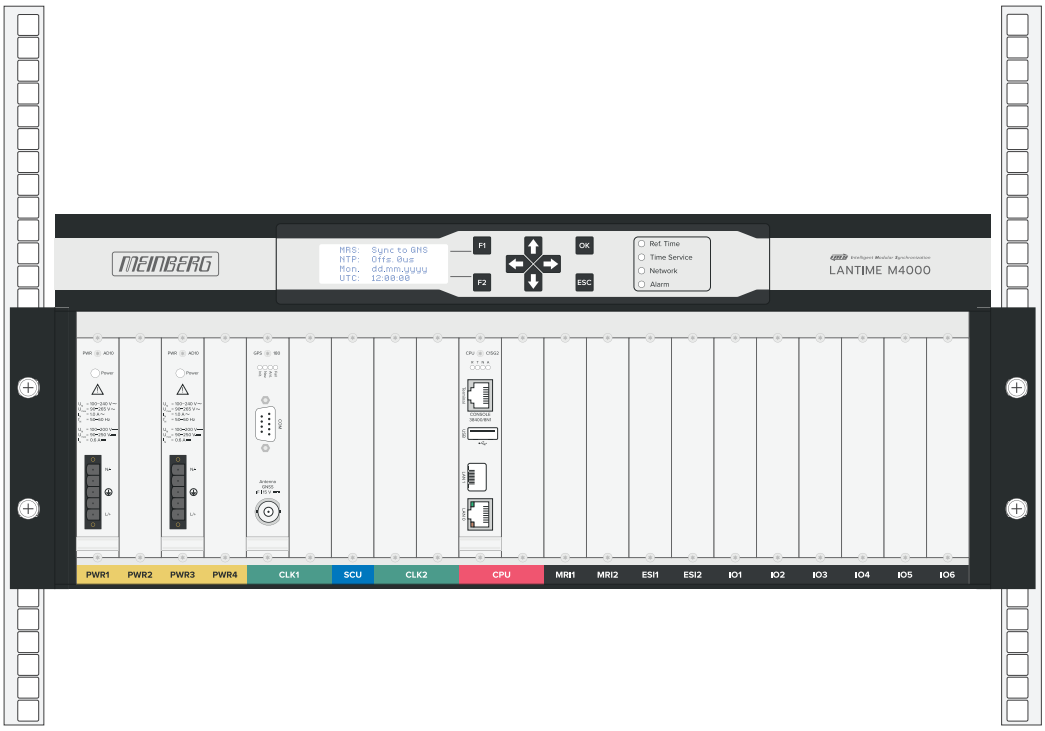


Figure: M4000 rack mount. The screws for rack mounting are not included in the delivery.

21-inch ETSI rack mount.
Due to the low depth of the housing, the M4000 chassis can also be installed in ETSI racks with a depth of 30/60 cm.

ETSI racks (=535 mm) are defined by the European Telecommunications Standards Institute (ETS 300 119).

6.1 Antenna Connection

There are two types of radio signals commonly used for timing applications: **satellite signals from Global Navigation Satellite Systems (GNSS)**, and **long wave signals** from specific time code transmitters operated by some countries.

Most GNSS signals can be received world-wide, while long wave signals can only be received up to a certain distance around the transmitting station. Also, GNSS receivers can usually track the signals from several satellites at the same time, so the signal propagation delay can be determined and compensated automatically, while long wave receivers usually receive only the signal from a single station. Last but not least the available bandwidths and signal propagation characteristics are another reason why GNSS reception usually yields a higher degree of time accuracy than long wave reception.

A detailed description of the reception modes of our reference clocks and instructions for antenna installation can be found in our LTOS firmware manual: http://www.mbg.link/doce-fw-ltos in chapter "Antenna and Receiver Information".

The following table shows the available receiver types from Meinberg

Type	Receiver	Systems	Antenna / signal reference
GPS	GPS Clock	GPS	GPSANT / Converter
GNS	GNS Clock	GPS, GLONASS Galileo, BeiDou	GNSS antenna (up to three systems in parallel)
GNS-UC	GNS-UC Clock with Up-Converter	GPS, GLONASS	GPSANT / Converter
GNM	GNM Clock	GPS, GLONASS Galileo, BeiDou	Multiband-GNSS-Antenne (up to four systems in parallel)
PZF	PZF Clock	DCF77	AW02 long wave outdoor antenna
MSF	MSF Clock	MSF (UK)	AW02-60 long wave outdoor antenna
WVB	WWVB Clock	WWVB (US)	AW02-60 long wave outdoor antenna
TCR	TCR Clock	Time code reader	Time code generator
RDT	no clock module	Network	ext. reference, ext. NTP server

6.1.1 Mounting the Antenna

6.1.1.1 Installation of the GPS Antenna

Danger!

Do not mount the antenna without an effective fall arrester!

Danger of death from falling!

- Ensure that you work safely when installing antennas!
- Never work without an effective fall arrester!

Danger!

Do not work on the antenna system during thunderstorms!

Danger of death from electric shock!

- Do not carry out any work on the antenna system or the antenna cable if there is a risk of lightning strike.
- Do not carry out any work on the antenna system if it is not possible to maintain the prescribed safe distance to exposed lines and electrical substations.

Selecting the Antenna Location

To avoid difficulties with synchronization, select a location that allows for an unobstructed view of the sky so as to ensure that enough satellites can be found. The line of sight between the antenna and satellites should not be obstructed in any way. The antenna must also not be installed under power lines or other electrical lighting or power circuits.

Installation Conditions for Optimum Operation:

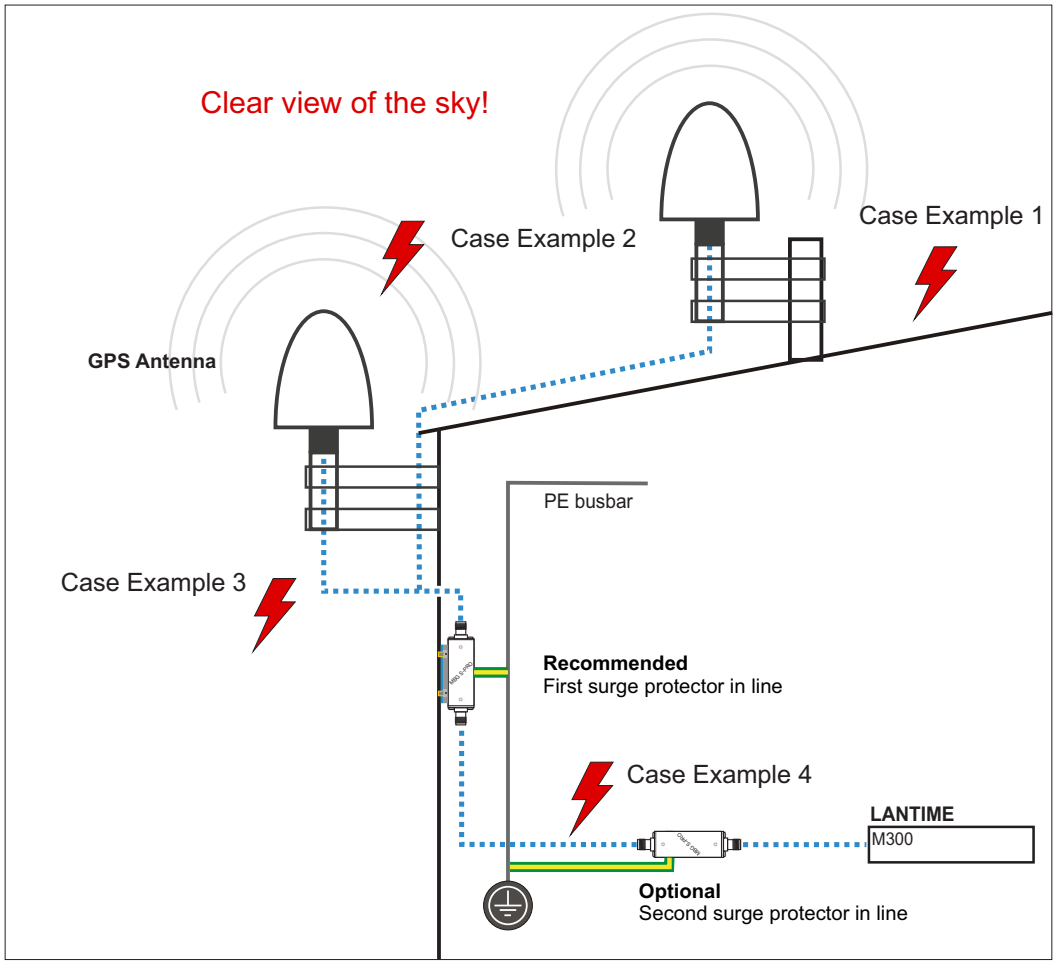
- clear view of 8° above the horizon or
- clear view towards equator (if clear view of 8° not possible) or
- clear view between 55th north and 55th south parallels (satellite orbits).

Information:

Problems may arise if all of these views are obstructed, as four satellites must be located to calculate a new position.

Important Information Regarding Surge Protection

The following illustration is a visual representation of where there is a risk of hazardous voltage surges in the cable route (from antenna to Meinberg system). The examples below explain how you can protect your Meinberg system from these.



Case Example 1:
An indirect lightning strike near the antenna or coaxial cable may induce transient voltages ("spikes" or "surges"). These spikes can be carried via the coaxial cable to the inside of the building and consequently to the system's receiver. It is therefore strongly recommended to have the surge protector installed at the point directly after the cable enters the building.

Case Example 2:
In the event of a direct lightning strike on the antenna, the resultant transient voltage may be discharged via the PE busbar (GNS L1 antenna only). This prevents the transient voltage from being carried to the coaxial cable and subsequently to the system's receiver.

Case Example 3:
If the length of the coaxial cable between the antenna and point of entry into the building is rather long (e.g., 10 meters), there is a greater risk of transient voltages being introduced into the antenna cable as a result of lightning strike. So the installation of a surge protector immediately after the point of entry into the building is also strongly recommended here.

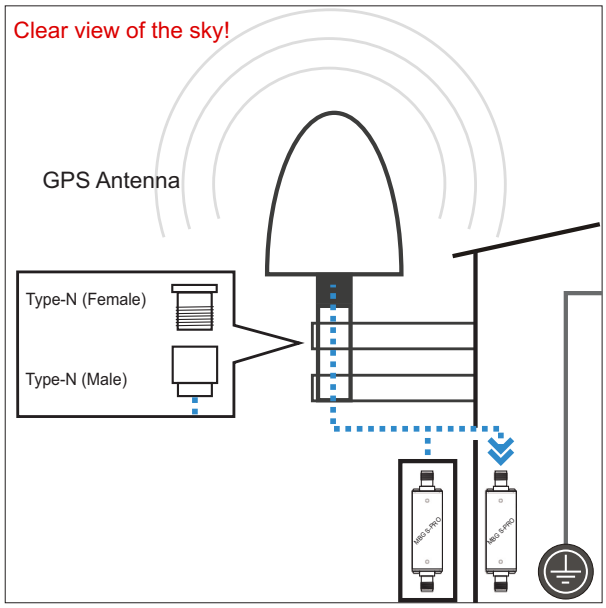
Case Example 4:
If the cable leading from the point of entry into the building to the Meinberg system is laid together with other cables (for example in a cable duct alongside high-voltage cables), transient voltages may "leak" into the antenna cable, causing damage to your system. To prevent this, a second surge protector can optionally be installed in the line just before the device.

Mounting the Antenna

1.

Use the included mounting kit to mount the antenna at a distance of 50 cm from other antennas, either on a vertical pole of a diameter of no more than 60 mm, or directly onto a wall.

The antenna cable should then be connected to the Type-N connector of the antenna. Feed the other end of the cable into the building through the wall.



Information:

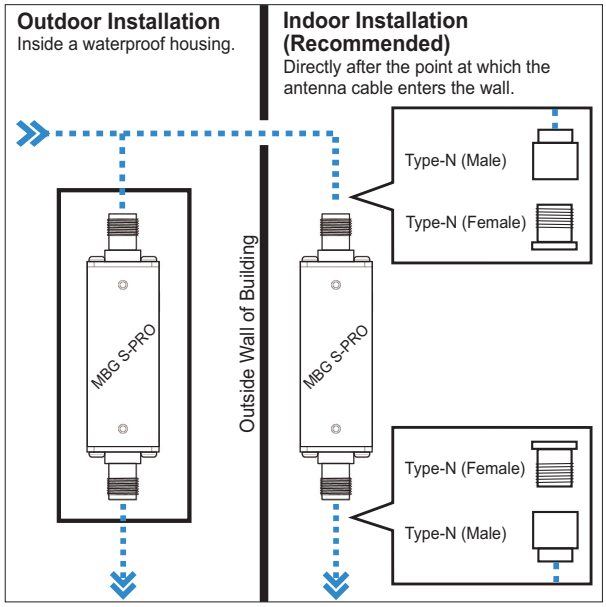
Make sure that the maximum cable length is not exceeded when installing the antenna cable between the antenna and receiver. The maximum length will depend on the type of cable used (RG213, RG58) and its attenuation factor.

2.

Voltage surges (e.g., caused by lightning strike) may be transmitted along the antenna cable and cause damage to the receiver. Using a MBG S-PRO surge protector can help to protect your receiver against such surges.

If installed in a waterproof housing, the MBG S-PRO can be installed outdoors. However, Meinberg recommends installing the surge protector indoors—as closely to the entrance point of the antenna cable as possible—in order to minimize the risk of surge damage (such as that caused by lightning strike).

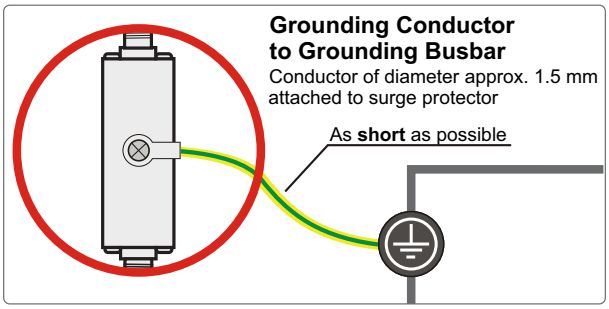
Connect the other end of the antenna cable to the female connector of the surge protector.



3.

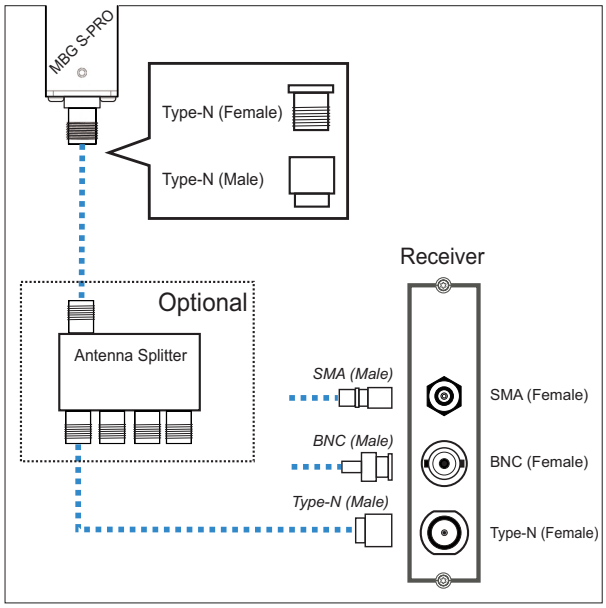
To ground the antenna cable, connect the surge protector to a grounding busbar using a grounding conductor (see illustration).

Once installation is complete, connect the other end of the antenna cable to the surge protector female connector.



4.

The next step is to connect the supplied coaxial cable from the surge protector to the receiver.

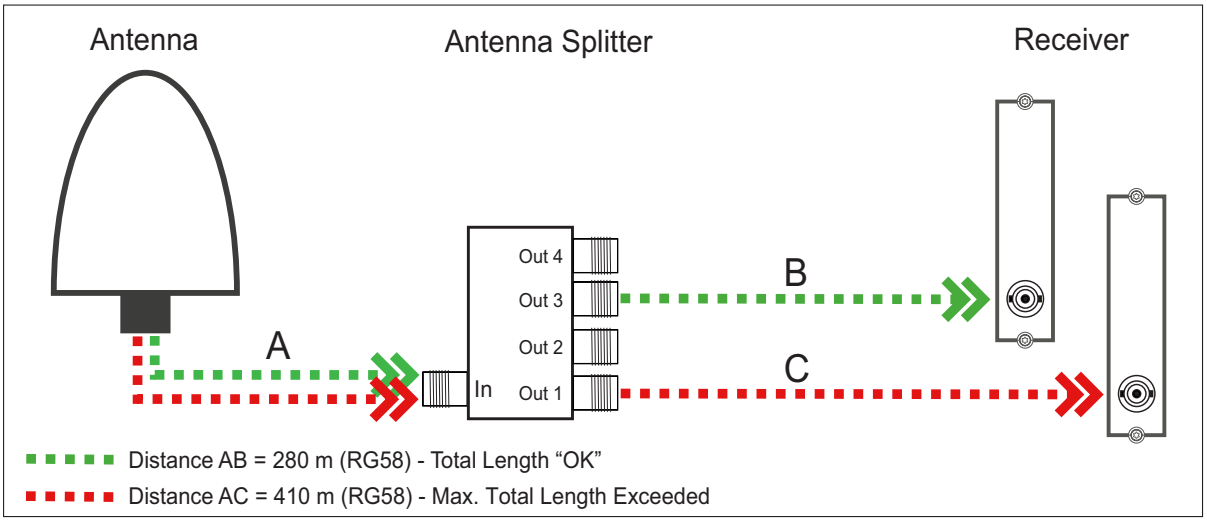


Optional Antenna Splitter

Multiple receivers can be connected to one antenna using the antenna splitter. When doing so, be aware that the total distance, comprising the cable from the antenna to the splitter, and from there to the receiver, must not exceed the maximum cable length. The splitter may be installed at any location between the surge protector and the receivers.

Information:

Please note for installation purposes that GNSS L1 components cannot be directly connected to or used with a Meinberg GPS antenna distributor.



Compensating for Signal Propagation Delay in the Antenna Cable

To enable the connected receiver to compensate for the signal propagation delay inherent in the antenna cable, you will need to enter either the length of your antenna cable in meters or the offset time in nanoseconds into your receiver.

Antenna Cable Length (m):
The satellite signal reception is delayed as a result of coaxial cable used.

Cable	Delay	Usage
RG58U	5 ns/m	For GPS and GNS-UC receivers
H155	4 ns/m	For GNS and GNM receivers

The cable length entered (from antenna to receiver) is used by the system to calculate the delay time and to automatically compensate for propagation delay. A value of 20 m is set by default.

When using a different type of coaxial cable, please use the "**By Delay**" option. You will need to calculate the delay yourself using the information provided in the product specifications provided by the manufacturer of your coaxial cable.

6.1.1.2 GNSS Antenna Installation

Two different antennas are available for our combined GPS/GLONASS/Galileo/BeiDou satellite receivers that are each designed to fulfill different tasks or applications.

The active Multi-GNSS L1 antenna is the standard accessory and can receive signals from the GPS, GLONASS, Galileo, and BeiDou satellite systems. This antenna is ideal for fixed-location systems, operates using a 5 V DC supply voltage supplied by the receiver, and features an integrated surge protector.

For mobile applications, such as cars, RVs, vans, ships, trains, and aircraft, we recommend the use of the RV-76G, an active GNSS antenna that is suitable for direct installation in an enclosure (chassis, panels, etc.)

6.1.1.3 Installation of the Multi-GNSS Antenna

Danger!

Do not mount the antenna without an effective fall arrester!

Danger of death from falling!

- Ensure that all necessary safety measures are taken when installing an antenna!
- In particular, never work without an effective fall arrester!

Danger!

Do not work on the antenna system during thunderstorms!

Danger of death from electric shock!

- Do not carry out any work on the antenna system or the antenna cable if there is a risk of lightning strike.
- Do not carry out any work on the antenna system if it is not possible to maintain the prescribed safe distance to exposed lines and electrical substations.

Selecting the Antenna Location

To avoid difficulties with synchronization, select a location that allows for an unobstructed view of the sky so as to ensure that enough satellites can be found. The line of sight between the antenna and satellites should not be obstructed in any way. The antenna must also not be installed under power lines or other electrical lighting or power circuits.

Installation Conditions for Optimum Operation:

- clear view of 8° above the horizon or
- clear view towards equator (if clear view of 8° not possible) or
- clear view between 55th north and 55th south parallels (satellite orbits).

Information:

Problems may arise if all of these views are obstructed, as four satellites must be located to calculate a new position.

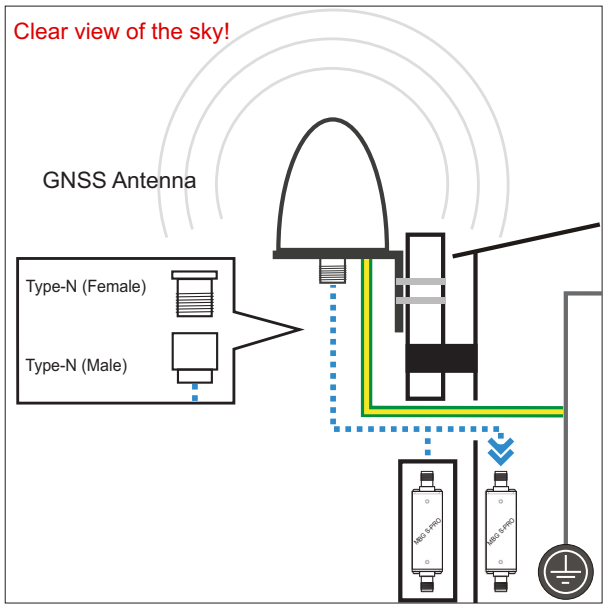
Important Information Regarding Surge Protection

Information about Meinberg surge protection can be found in the chapter Installation of the GPS Antenna .

Mounting the Antenna

1.
Use the included mounting kit to mount the L1 antenna at a distance of 50 cm from other antennas on a vertical pole of a diameter of between 60 mm and 215 mm ($2\frac{1}{2}$"-$8\frac{1}{2}$").

The antenna cable should then be connected to the Type-N connector of the antenna.



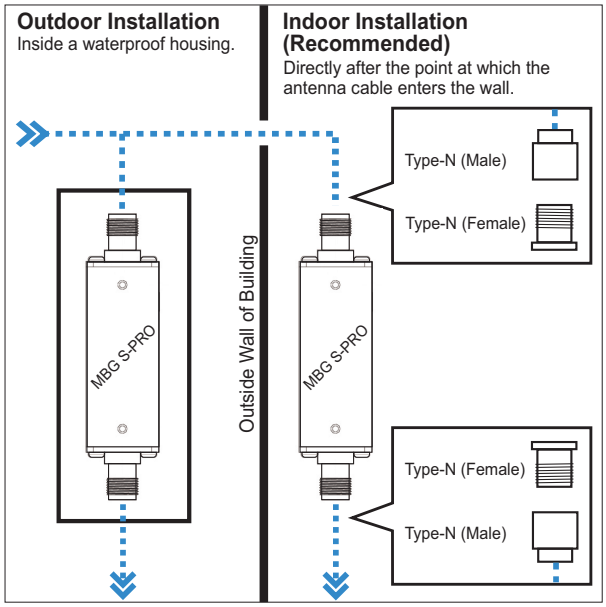
Information:

Make sure that the maximum cable length is not exceeded when installing the antenna cable between the antenna and receiver. The maximum length will depend on the type of cable used (RG213, RG58) and its attenuation factor.

2.

Voltage surges (e.g., caused by lightning strike) may be transmitted along the antenna cable and cause damage to the receiver. Using an MBG S-PRO surge protector can help to protect your receiver against such surges.

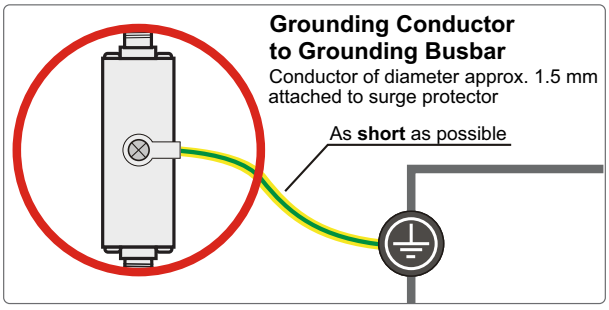
If installed in a waterproof housing, the MBG S-PRO can be installed outdoors. However, Meinberg recommends installing the surge protector indoors—as closely to the entrance point of the antenna cable as possible—in order to minimize the risk of surge damage (such as that caused by lightning strike).



3.

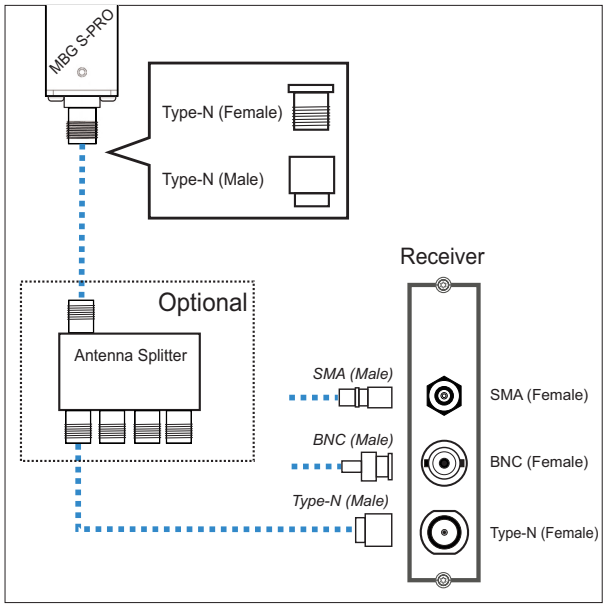
To ground the antenna cable, connect the surge protector to a grounding busbar using a grounding conductor (see illustration).

Once installation is complete, connect the other end of the antenna cable to the surge protector female connector.



4.

The next step is to connect the supplied coaxial cable from the surge protector to the receiver.

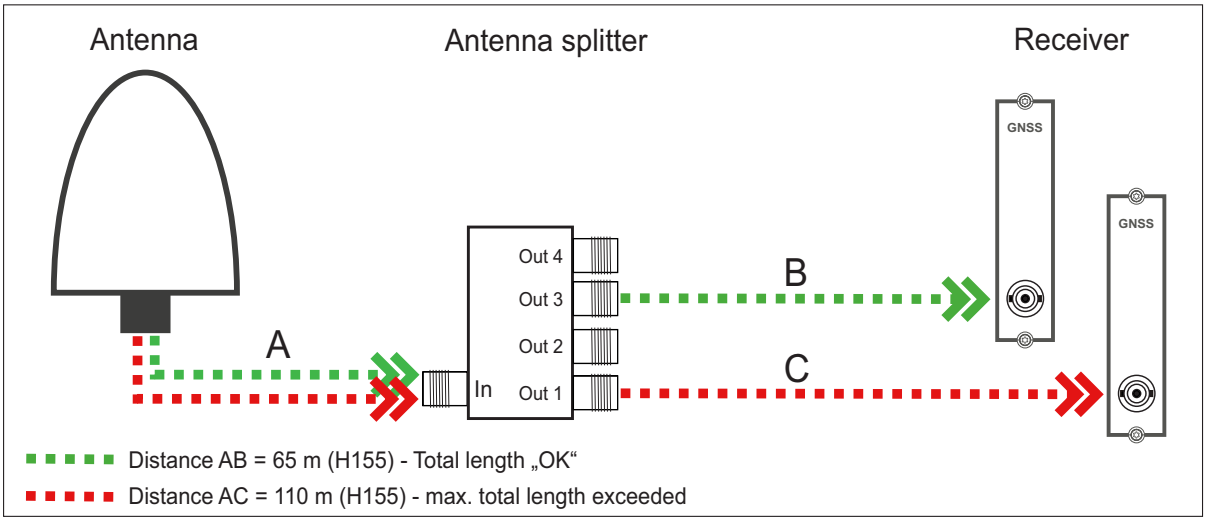


Optional Antenna Splitter

Multiple receivers can be connected to one antenna using the antenna splitter. When doing so, be aware that the total distance, comprising the cable from the antenna to the splitter, and from there to the receiver, must not exceed the maximum cable length. The splitter may be installed at any location between the surge protector and the receivers.

Information:

It is not possible to directly connect a Meinberg GPS antenna/converter unit to an L1 antenna splitter.



Compensating for Signal Propagation Delay in the Antenna Cable

To enable the connected receiver to compensate for the signal propagation delay inherent in the antenna cable, you will need to enter either the length of your antenna cable in meters or the offset time in nanoseconds into your receiver.

To do so, go to the web interface of your system to the menu "Clock → Status u. Configuration → Miscellaneous".

Antenna Cable Length (m):
The satellite signal reception is delayed as a result of coaxial cable used.

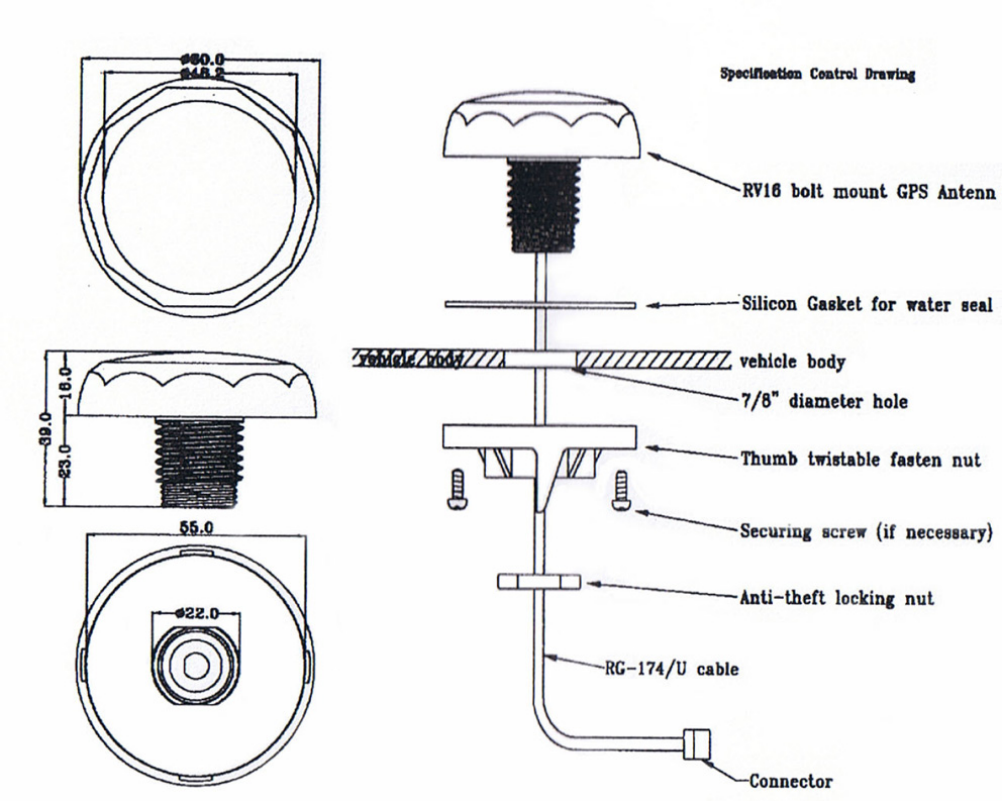
Cable	Delay	Usage
RG58U	5 ns/m	For GPS and GNS-UC receivers
H155	4 ns/m	For GNS and GNM receivers

The cable length entered (from antenna to receiver) is used by the system to calculate the delay time and to automatically compensate for propagation delay. A value of 20 m is set by default.

When using a different type of coaxial cable, please use the "**By Delay**" option. You will need to calculate the delay yourself using the information provided in the product specifications provided by the manufacturer of your coaxial cable.

6.1.1.4 Assembly of the RV-76G GPS/GLONASS Antenna for Mobile Applications

Installation of the Antenna



Further Information on the Product

Detailed specifications are provided in the manufacturer's data sheet.

Source: *Datasheet RV-76G_Catalog_V1.0_20130502 (Sanav)*

Download: *https://www.meinbergglobal.com/download/docs/other/rv-76g_en.pdf*

6.1.1.5 Installation DCF77 Antenna

Danger!

Do not mount the antenna without an effective fall arrester!

Danger of death from falling!

- Ensure that you work safely when installing antennas!
- Never work without an effective fall arrester!

Danger!

Do not work on the antenna system during thunderstorms!

Danger of death from electric shock!

- Do not carry out any work on the antenna system or the antenna cable if there is a risk of lightning strike.
- Do not carry out any work on the antenna system if it is not possible to maintain the prescribed safe distance to exposed lines and electrical substations.

Selection of the Antenna location

At the beginning of each antenna installation, the antenna location should be selected carefully. It decisively determines the receiving quality and thus the availability of the DCF77 signal. If the antenna is not precisely aligned, signal reception and timing accuracy will be affected.

The DCF antenna must be aligned towards Mainflingen near Frankfurt / Main according to the installation conditions mentioned below.

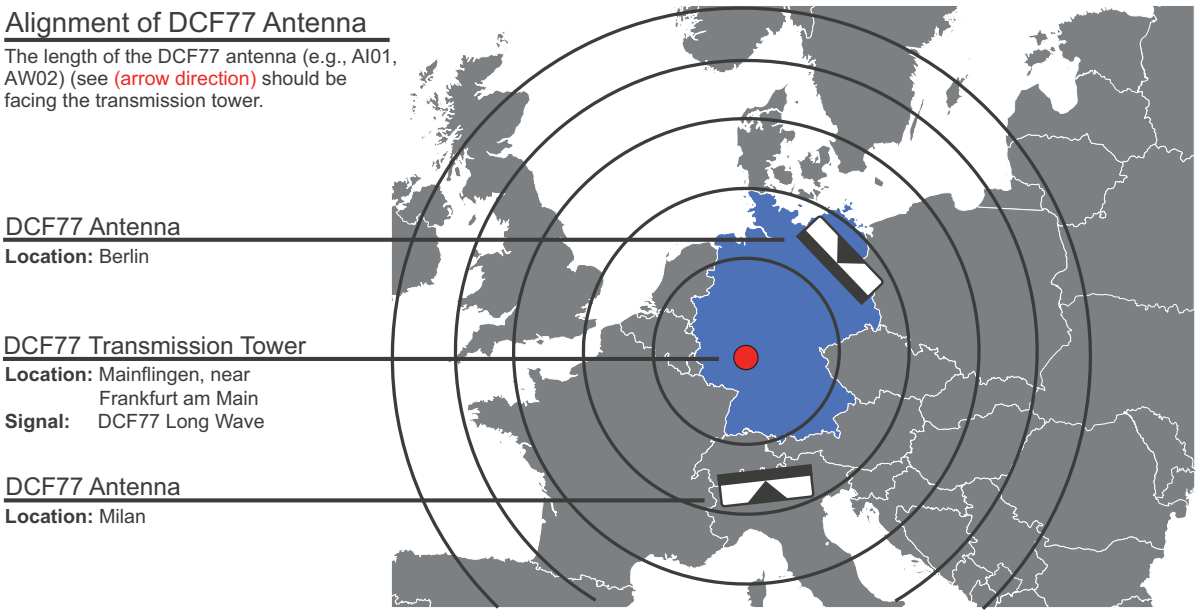


Figure: Antenna installation of a Meinberg AW02 antenna aligned to the DCF77 transmitter mast in Mainflingen (Frankfurt/Main).

A DCF77-reception in buildings is possible, but due to shielding or attenuation the reception quality can be reduced.

Criteria for impaired reception:

- Antenna installation near metallic objects (e.g. reinforced concrete walls, metal facades, thermal insulation glazing etc.)
- Antenna installation near TV or computer monitors
- Antenna installation under or near power lines

Meinberg recommends mounting the antenna outside of buildings. This has the advantage that the signal-to-noise ratio to electronic devices in buildings is usually increased and the reliability of the synchronization is thus significantly improved.

Installation conditions for optimal operation:

- Horizontal mounting of the antenna
- Long side of the DCF77-antenna aligned to the transmission tower (see illustration previous page)
- min. 30 cm distance from all metal objects

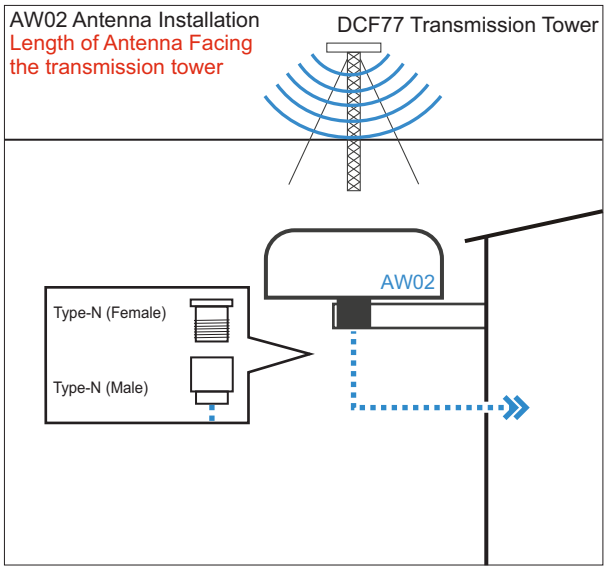
Important!

If these installation criteria cannot be met, signal reception may be affected.

Installation

1.
Mount the antenna according to the criteria mentioned above directly on a wall, using the mounting kit included in the delivery.

Now connect the antenna cable to the N standard socket of the antenna.



Procedure for antenna alignment:

When aligning your AW02 antenna it does not show itself a visual status of the reception quality of the DCF77 signal.

Meinberg recommends that the alignment and the associated reception quality check be done in a team. A good method for aligning and testing a long wave antenna is to have person 1 (at the antenna) in contact with person 2 (at the receiver).

Step 1
Person 1 rotates the antenna until person 2 reads the minimum field strength value on the front display (if present) or the modulation indicator/ LED does not yet flash every second.

Step 2
Person 1 rotates the antenna by 90° until person 2 notices a maximum reception (field strength value at maximum) or a flashing of the modulation LED every second without intermediate flickering.

However, a high signal level alone is no guarantee of good reception, as it can also be caused by electrical noise in the associated frequency range.

With good reception, the connected DCF reference clock synchronises within three minutes after switching on.

PZF Reference Clocks

IMS-PZF	Field LED (Field) flashes for 10 seconds after switching on
LANTIME with PZF clock	Field strength/correlation value can be checked in the front display and web interface.

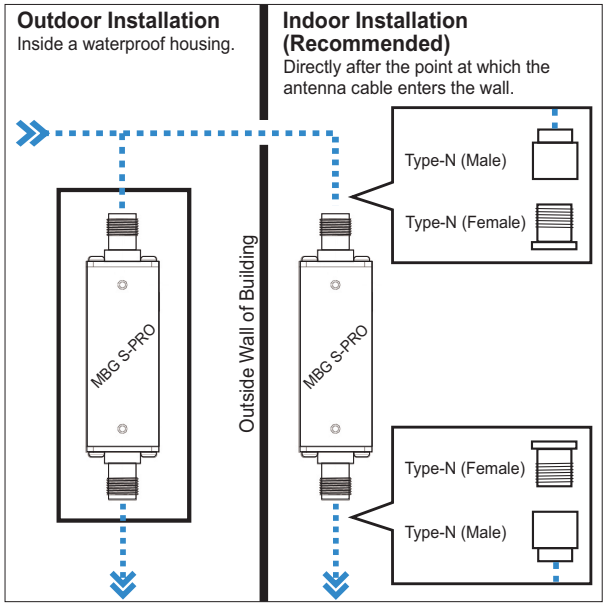
Information:

Pay attention to the maximum cable length when installing the antenna cable between antenna and receiver. This depends on the cable type used (e.g. RG58) and its attenuation factor.

2.

High voltage peaks (e.g. caused by lightning strikes) can be transmitted via the antenna cable and may cause damage to the receiver. The receiver is protected against these effects by using the MBG S-PRO surge protection.

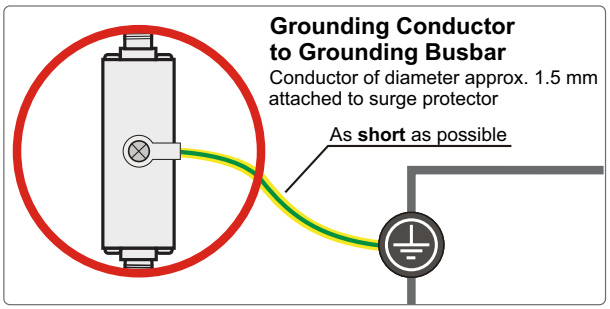
Being installed in a waterproof housing, the MBG S-PRO is also suitable for outdoor installation. Meinberg recommends the indoor installation, as soon as possible after the antenna cable enters the building to minimize the risk of overvoltage damage, e.g. due to lightning strikes.



3.

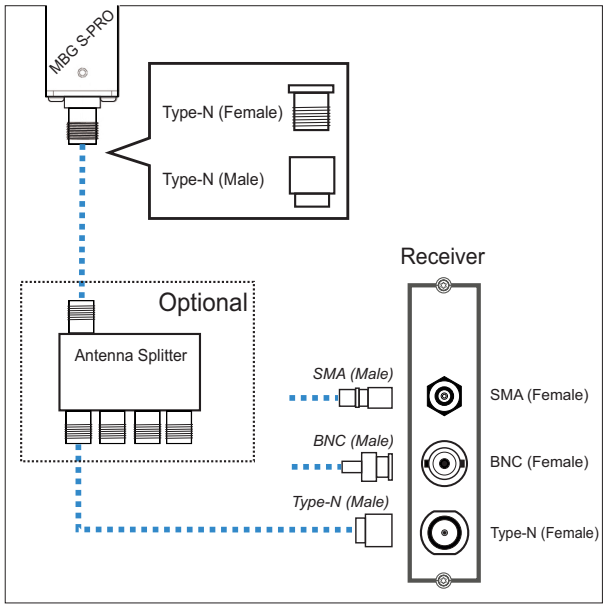
To ground the antenna cable, connect the surge protection with a grounding cable to a equipotential bonding rail (see figure).

After installation, connect the other end of the antenna cable to the socket of the surge protection.



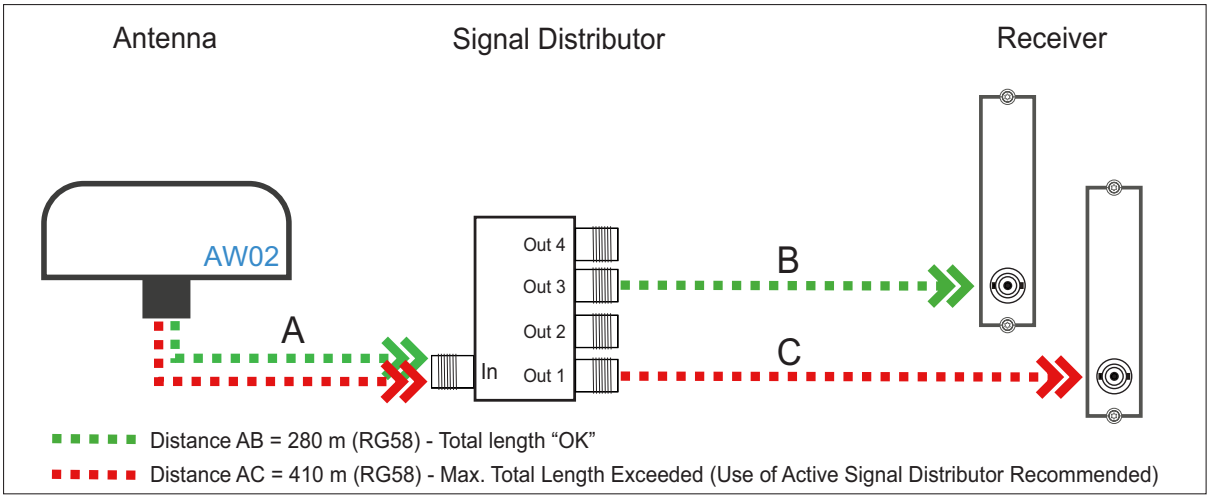
4.

The next step is to connect the supplied coaxial cable between the surge protector and receiver.



Antenna splitter option

We recommend to install an antenna distributor between antenna and receiver if the cable length exceeds 300 m. This serves on the one hand as an antenna distributor (DCF AV4) so that several receivers can be connected to one antenna and on the other hand as an amplifier of the antenna signal. The AV may be installed at any position between the surge protection (if present) and the receiver and requires a power supply of 230 V / 50 Hz.



Compensation of the DCF signal delay

To ensure that the connected receiver can compensate the transmission time from transmitter mast and receiver, you must enter the distance (linear distance) from the antenna location to the transmitter mast in kilometres in the settings of your receiver.

6.2 Connecting the System

Make sure that the system to be connected is connected to your PC or the network via either a serial or a network connection and is on the same physical network.

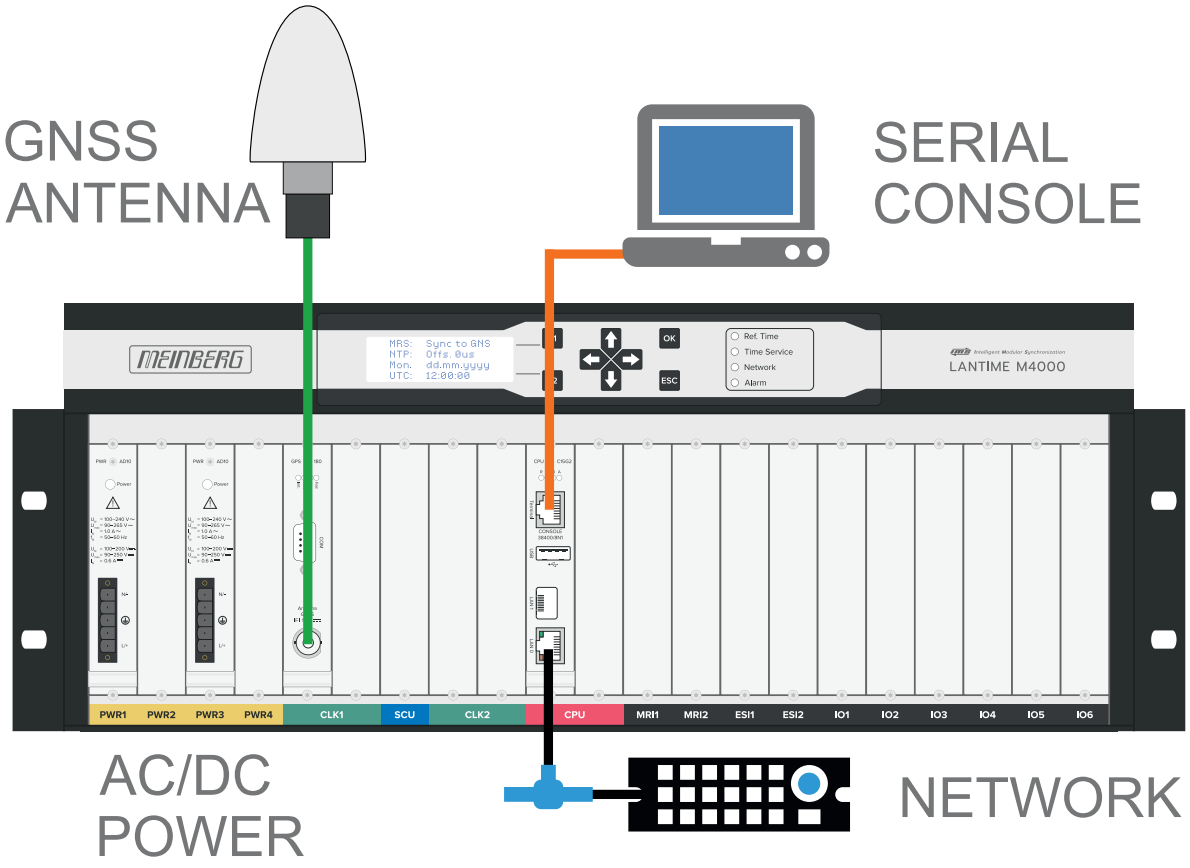


Figure: Connection scheme LANTIME M4000 with power supply, network connector, serial connection and antenna link

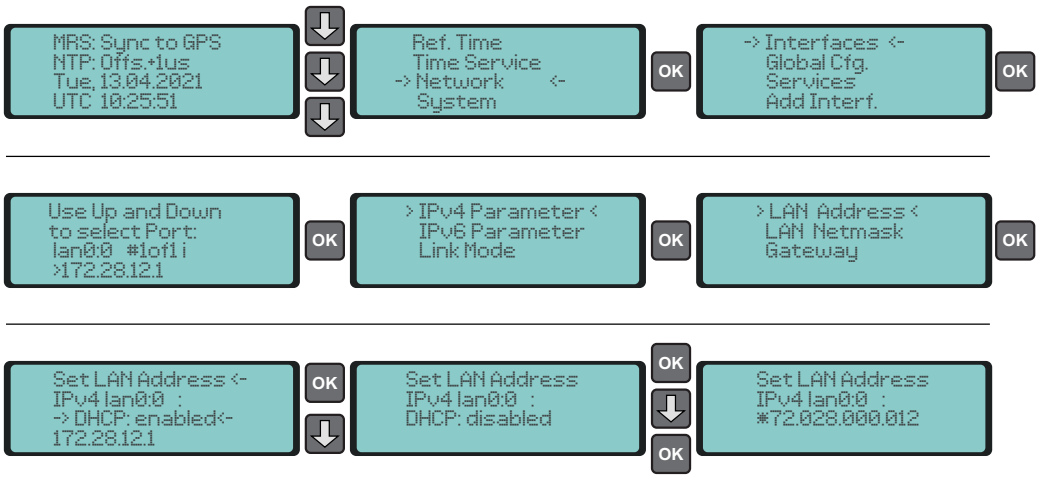
The following section describes how you can initially put a LANTIME system into operation via LED display, with help of the Web Interface or via serial connection.

6.3 Initial Network Configuration

After the system has been connected to the power supply and to the receiver antenna, the initial start-up can be started. The device starts immediately after connection to the power supply.

An IMS LANTIME system is shipped with DHCP service enabled on the LAN 0 interface. This means that you have to establish a manual network connection if no DHCP service is installed in your network environment in order to perform system settings via the web interface.

Initial network configuration via the LC display.
Except for models with S-chassis, all LANTIME IMS systems have a display with control keypad. The following figure shows the individual steps you have to perform to read out an IP via the display or to set the IP manually.



For manual configuration, you have to disable the DHCP service. After that the IP can be configured using the "← ↑ ↓ →" buttons. Always confirm your entry with the OK button to save the changes.

Serial connection with *Basic Configuration Wizard* (without LC display).
After switching on the device, a terminal program (e.g. Putty) can be started after about one minute. Connect the system's serial interface (TERM/CONSOLE) with a null modem cable or a CAB-CONSOLE-RJ45 cable. The settings for the interface must be set to 38400 baud, 8 data bits, no parity and one stop bit (8N1). The terminal emulation must be set to VT100. Computers without serial interface can be connected with a "Serial-to USB" converter.

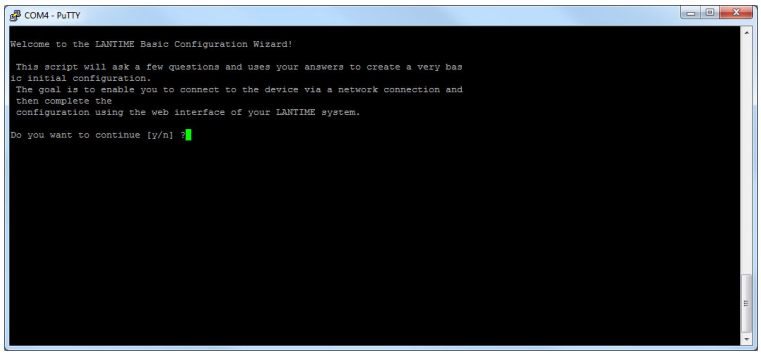
After connection is established, the prompt for the user ID should be displayed:

```
Welcome to Meinberg LANTIME
login: _
```

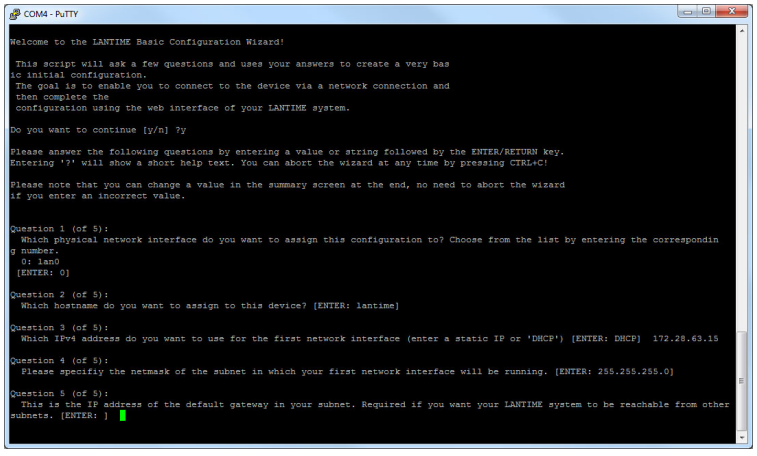
Default user: **root**
Default password: **timeserver**
(press RETURN again if necessary)

Change with the console to the directory */wizard/*. The LANTIME Basic Configuration Wizard can now be started with the "startwizard" command.

After successfully starting the Wizard, the following welcome screen will be displayed:

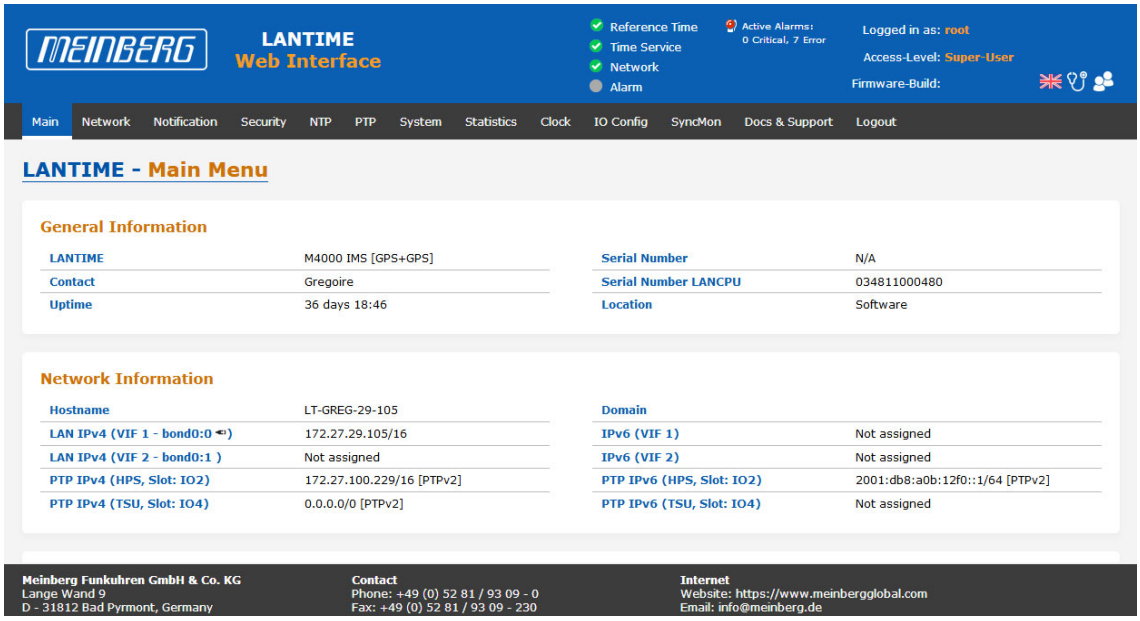


By entering "y" you start the configuration - all further settings can now be made:



Confirm your settings then.

7 System Operation - Configuration and Monitoring



The LANTIME web interface.
You have access to all NTP servers of the LANTIME M series via the LANTIME web interface. To connect simply enter the set IP address of your LANTIME system into the address line of a standard web browser. A login dialog will open - in delivery state you can use the following login data:

User: ***root***
Password: ***timeserver***

Note: Please change these credentials during the first web session on your LANTIME.

For detailed documentation about management and monitoring please refer to the latest LTOS firmware manual at:
http://www.mbg.link/doce-fw-ltos

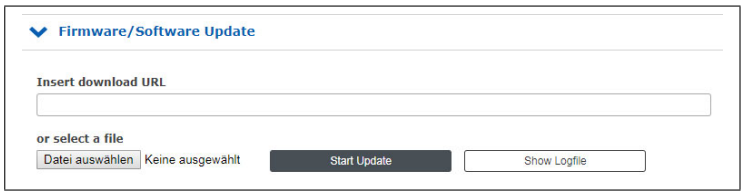
or in the menu "Documentation → Available Documents" in the web interface.

8 Maintenance, Servicing and Repairing

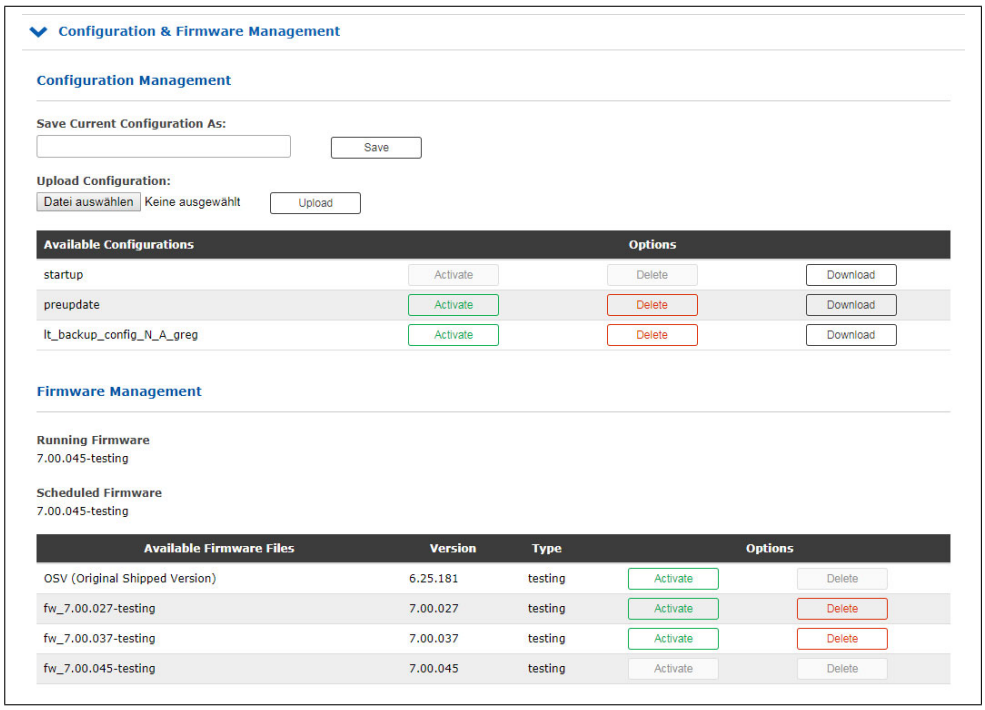
8.1 Firmware Updates

On our firmware download page at:
https://www.meinbergglobal.com/english/sw/firmware.htm

we provide the latest version of the LANTIME firmware for free download. If you need an older version, then you can request it from our support. To do so, select the option "A specified firmware version" and then enter the version of the currently used firmware and the desired firmware version (e.g. LTOS 6.24.027). For security reasons, we always recommend the latest version of the respective firmware generation (V5 / V6 / V7).

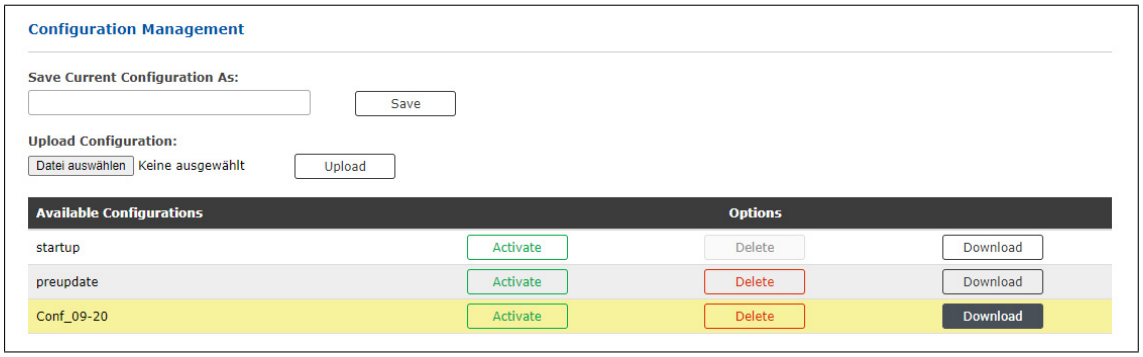


In the web interface menu "System" you can copy a new firmware version to your LANTIME under "Firmware/-Software Update". With the submenu "Configuration & Firmware Management → Firmware Management" you can easily activate different firmware versions and delete versions that are no longer needed. Existing configurations can be stored here to save them as backup. Furthermore, configurations from other LANTIMEs can be transferred to the system here.



9 Troubleshooting and Alarming

If there is a problem with your IMS LANTIME system, you can contact our technical support at any time. In order to perform a fast and targeted diagnosis of your system please provide us with a diagnostic file of the affected LANTIME system. You can create this diagnostic file via the web interface. For this select the menu "System → Diagnostics" and then use the button **Download Diagnostic File**. In the submenu "Configuration & Firmware Management" you can save your current configuration under **Configuration Management**. This file is also helpful for our staff when solving problems.



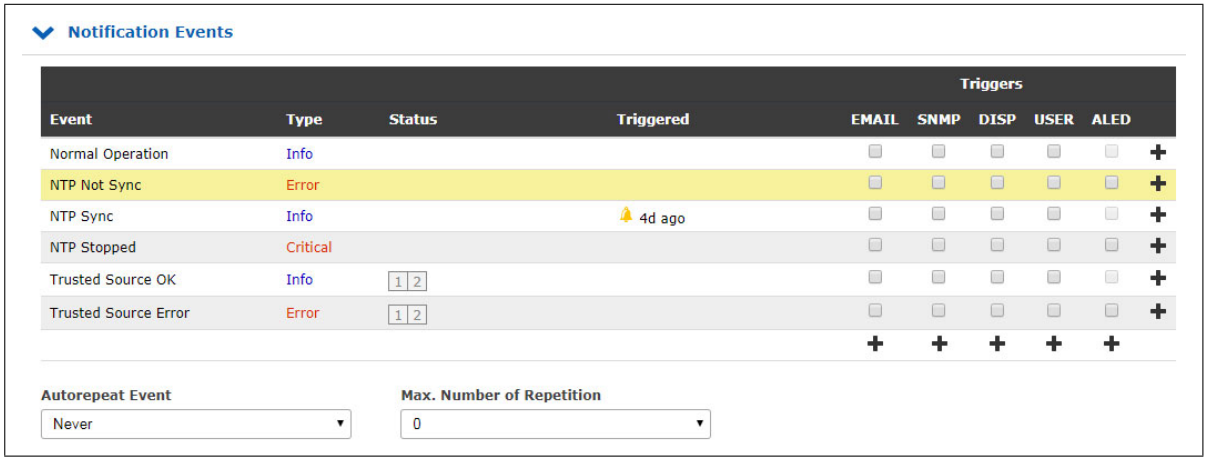
If these files are too big to send by mail, you can also use our upload page:
https://www.meinbergglobal.com/upload/

Please enter the serial number of your device again and, if already available, a support ticket number.

Otherwise there are a lot of tools available for self-help. Please also read the chapter Support Information.

9.1 System Error Messages

System messages and notifications.
In the web interface menu "Main" under **System Messages** and in the menu "Notification → Notification Events" you are able to view the last system notifications and the triggered event notifications. For the system messages the date and UTC time is displayed, for the notifications the date and UTC time of the last occurrence of the triggered event is displayed. In addition, the event level is also displayed for the notifications (Info, Action, Warning, Error, Critical).



10 Support Information

In this chapter you will learn about different levels of support at the Meinberg Company. In general, the Basic Customer Support level is included in the price you pay for your Meinberg product and demands no additional costs. It includes free e-mail, phone support and free lifetime firmware updates for the lifetime of your product, i.e. for as long as you choose to use it.

Depending on the product this level also includes a 2 or 3 year hardware warranty. You can extend the hardware warranty period after the standard warranty of your Meinberg product ends.

The chapter includes:

- Basic Customer Support
- Support Ticket System
- How to download a Diagnostic File
- Self-Help Online Tools
- NTP and IEEE 1588-PTP online tutorials
- The Meinberg Academy introduction and offerings
- Meinberg Newsletter

10.1 Basic Customer Support

Contact Meinberg via e-mail or phone.

Technical Support	
E-Mail	techsupport@meinberg.de
Service hotline	+49 (0) 5281 / 9309-888
Service hours hotline	Mon – Thu 8:00 – 17:00, Fri 8:00 – 16:00 (CET/CEST) Not available on Sat/Sun and German Public Holidays

Office (Sales/Purchase)	
E-Mail	info@meinberg.de
Service hotline	+49 (0) 5281 / 9309-888
Service hours hotline	Mon – Thu 7:30 – 17:00, Fri 07:30 – 15:00 (CET/CEST) Not available on Sat/Sun and German Public Holidays

MEINBERG Remote Support

In order to assist you with configuration, installation, monitoring and diagnostics of your Meinberg products, you can download a remote support software that allows Meinberg technical support to remote control your computer.

By following this link:
https://www.meinbergglobal.com/english/support/remote.htm

you can find all necessary information and to download the support.

LANTIME Firmware Updates

To check if an update is available for your LANTIME, please visit;
https://www.meinbergglobal.com/english/sw/firmware.htm

and fill out the form. Available firmware updates will be provided by e-mail (LANTIME firmware V5 or older versions) or with a direct download link (LANTIME firmware V6 or newer).

10.2 Support Ticket System

Meinberg assists you quickly and directly on questions regarding the initial setup of your devices, troubleshooting or if you want to update the hard- or software. We offer free support for the whole lifetime of your Meinberg product.

- Send a mail to techsupport@meinberg.de with a description of your issue.
- A support ticket will automatically be opened.
- Our support engineers will contact you as soon as possible.
- It is always helpful for our engineers to receive a diagnostic file when you send a ticket.
- The diagnostic file includes all status data of a LANTIME system logged since the last reboot and can be downloaded from all LANTIME timeservers. The file format of the diagnostic file is a tgz-archive. → See chapter How to download a Diagnostic File how to generate this file at your LANTIME system.

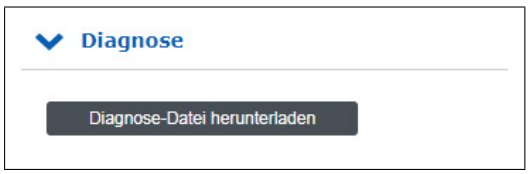
10.3 How to download a Diagnostic File

In most support cases the first action is to ask the customer to download the diagnostic file, because it is very helpful at identifying the current state of the LANTIME and finding possible errors. Therefore we recommend that you attach your Diagnostic File when sending a ticket to our support.

The diagnostic file includes all status data of a LANTIME system logged since the last reboot. It can be downloaded from all LANTIME timeservers or you can save the file on a USB stick connected to the device. The file format of the diagnostic file is a tgz-archive. The archive contains all the important configuration and logfiles.

10.3.1 Download via Web GUI

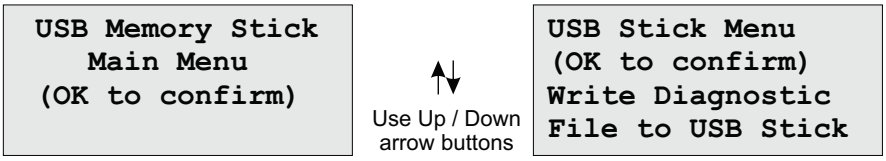
- Connect to the Web GUI by putting the IP address into the address field of the web browser.
- Open the „System“ page and the submenu "Diagnostics".
- Press the "Download Diagnostic File" button.



- The file will take some time to be created as its size is several MBs. After the file has been created it will be automatically sent to your web browser. Then save the file to your local hard disk.
- The diagnostic file is named *"lt_diag_SERIALNUMBER.tgz"* and the file format is a tgz archive. You can open the tgz archive e.g. with 7Zip (https://www.7-zip.org/).

10.3.2 Download via USB Stick

- The USB stick have to be formatted in a linux compatible file system like FAT. Connect a USB stick to the USB port of the LANTIME:
- The USB Memory Stick Menu opens automatically. Press „OK“ to confirm.
- You can use the up and down arrows to move through the menu.
- Use the „Write diagnostic File to USB stick“ option to write the current diagnostic file to the USB stick.
- You can find the Diagnostic File by opening the LANTIME folder and continue on to the Diag folder.



10.4 Self-Help Online Tools

Here is the list of some informative websites where you can query different information about the Meinberg Systems.

1. Meinberg Homepage - general:
   https://www.meinbergglobal.com/

2. NTP Download - at Meinberg:
   https://www.meinbergglobal.com/english/sw/

3. NTP Client Download for Windows (NTP-time-server-monitor):
   https://www.meinbergglobal.com/english/sw/ntp-server-monitor.htm

4. LANTIME firmware update request online form:
   https://www.meinbergglobal.com/english/sw/firmware.htm

5. Download page for Meinberg software, drivers and software:
   https://www.meinbergglobal.com/english/sw/

6. All Meinberg manuals (ENG, German versions):
   https://www.meinbergglobal.com/english/docs/

7. Meinberg Newsletter and subscription page:
   https://www.meinbergglobal.com/english/company/news.htm

8. NTP / IEEE 1588-PTP online tutorials from Meinberg:
   http://blog.meinbergglobal.com/

9. FAQs about Meinberg Products:
   https://www.meinbergglobal.com/english/faq/

10. Meinberg Knowledgebase:
    https://kb.meinbergglobal.com

11. GPS / GNSS Antenna Installation and mounting:
    https://www.meinbergglobal.com/english/info/gps-antenna-mount.htm
    https://www.youtube.com/watch?v=ZTJMKSI8OGY (YouTube video)

12. NTP support page and documentation:
    http://support.ntp.org/bin/view/Support/WebHome

10.5 NTP and IEEE 1588-PTP online tutorials

A team of Meinberg engineers are writing online tutorials covering topics on IEEE 1588 PTP, NTP, synchronization setups and configurations used in different industries.

The tutorials can be found at:
http://blog.meinbergglobal.com/

The blog provides you also the opportunity to write a comment or a question to our experts and get their reply.

Categories:
Configuration Guidelines, IEEE 1588, Industry Applications, NTP and Security.

10.6 The Meinberg Academy introduction and offerings

Meinberg Sync Academy (MSA) is an institution within the Meinberg Company which takes care for education and expert knowledge dissemination in the field of time and frequency synchronization. The academy offers tutorials and courses on the latest synchronization technologies such as NTP, IEEE 1588-PTP, synchronization networks for different industries: telecom, power, broadcasting, professional audio/video, finance, IT and . The MSA courses include both, theoretical lectures and practical hands-on labs.

If you are planning or re-designing synchronization for your networks and you need additional knowledge, see our agenda for the upcoming courses.

Homepage:	https://www.meinbergglobal.com/english/support/meinberg-sync-academy.htm
Courses:	Meinberg Product Training, NTP Complete, PTP Complete Customized Trainings and Online Trainings.
Contact Phone:	+49 (0) 5281 93093-0
E-Mail:	info@meinberg.de

10.7 Meinberg Newsletter

Meinberg publishes regularly up-to-date information, technical news, firmware updates and security advisory by the Meinberg Newsletter in both the English and German language.

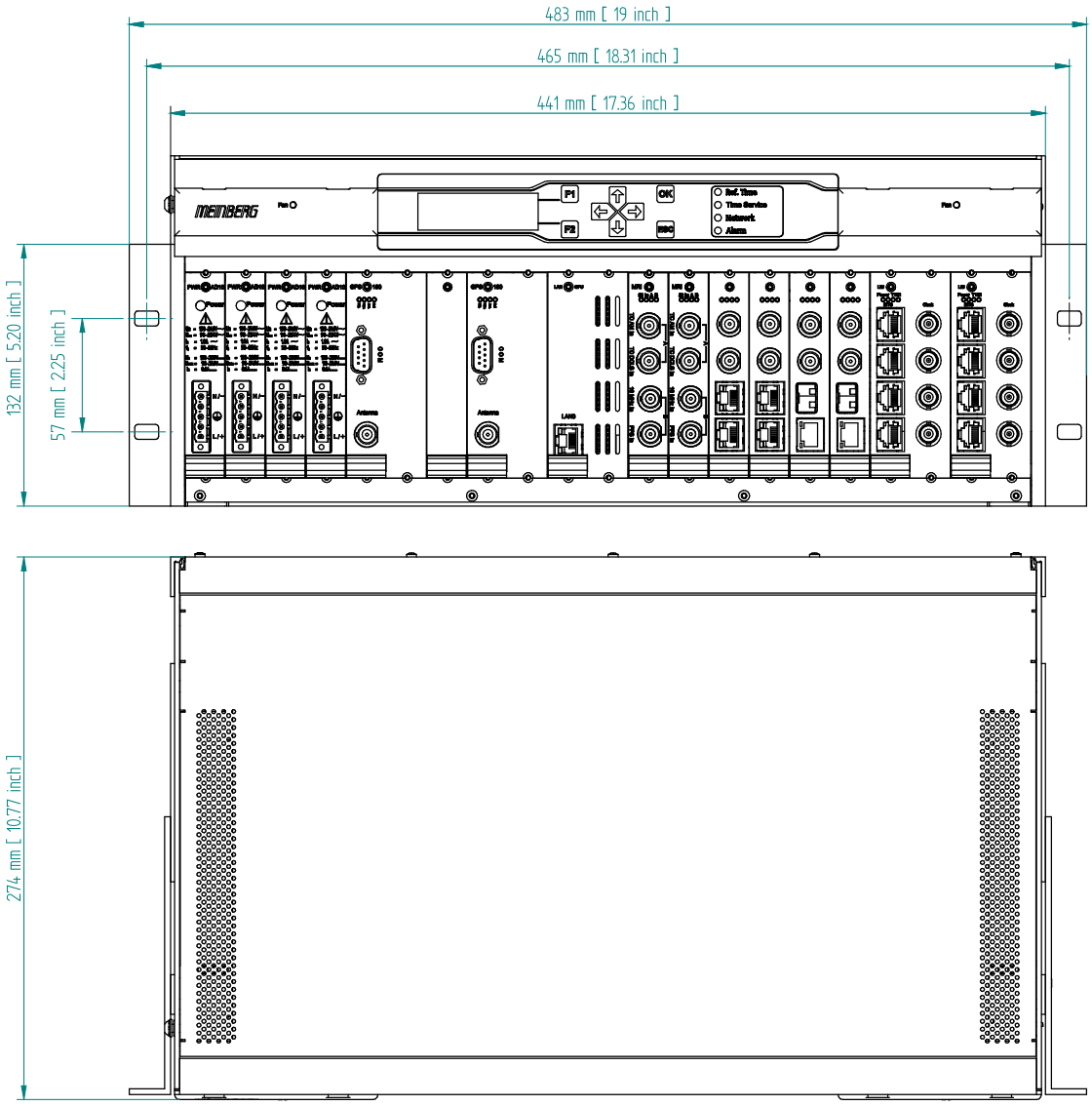
Subscribe to the newsletter here:

https://www.meinbergglobal.com/english/contact/newslett.htm

11 Technical Appendix

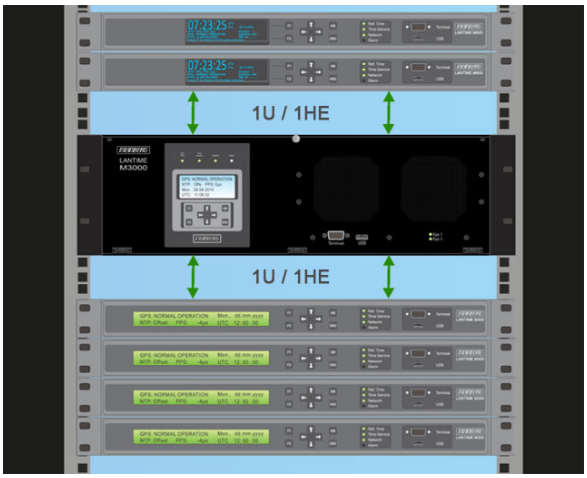
11.1 Technical Specifications LANTIME M4000 Housing

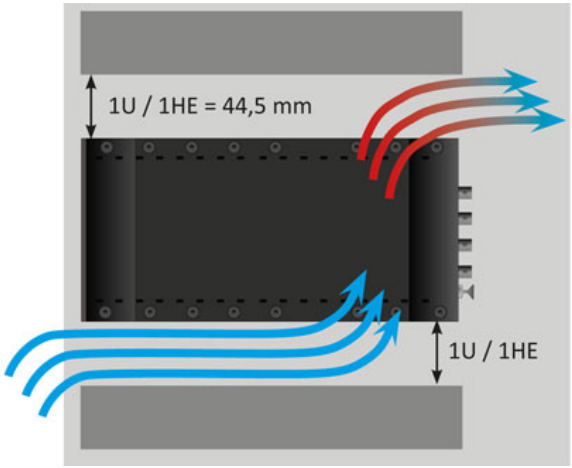
Housing: 19inch / 4U metal chassis
Optimized for ETSI rackmount (300mm / 21 inch) or 19 inch standard rack

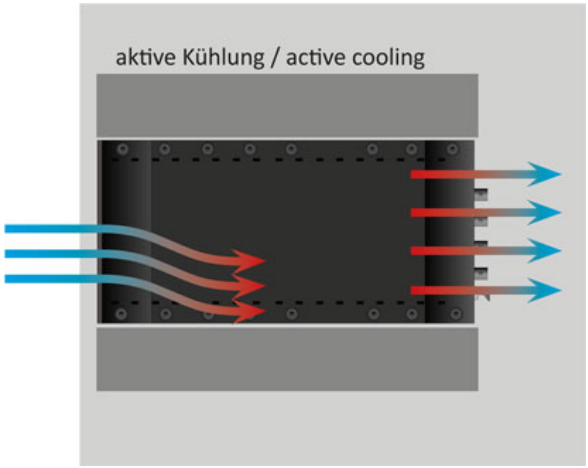


ATTENTION:

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".

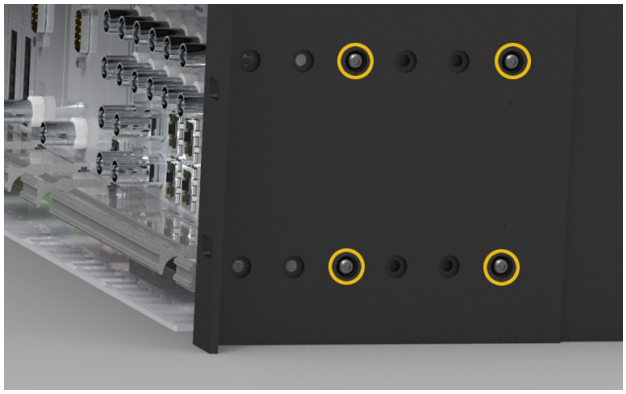






The left Figure shows the expected air flow during device in operation without ACM (active cooling module) and with space between devices for ventilation (1U at the bottom and the top). In the right figure the air flow during device in operation with ACM and no space between devices in a server rack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

11.2 IMS M4000 Chassis



The M4000 chassis is supplied with a 19-inch mounting bracket set. A bracket set for ETSI rack mount can also be supplied on request.

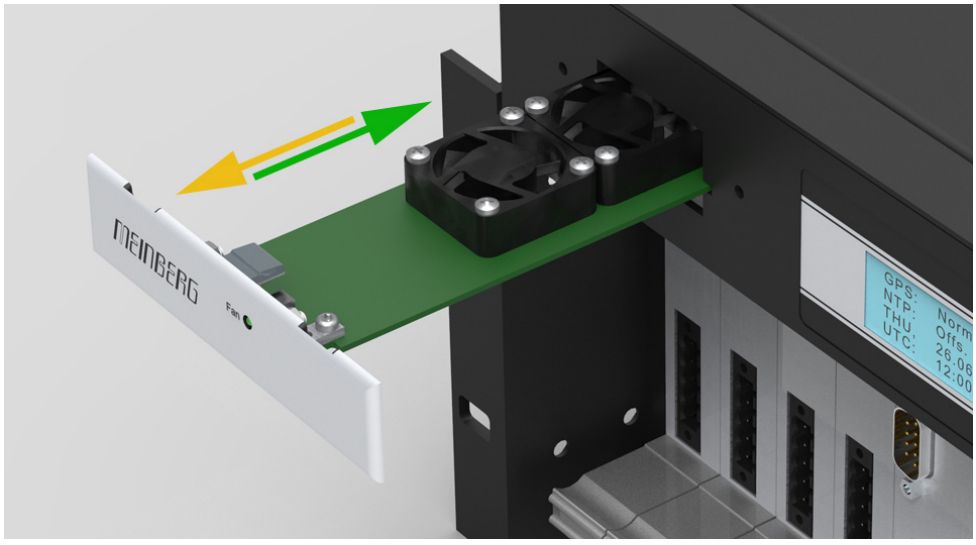
During installation, make sure that the mounting brackets are fastened at all marked points with the screws included in the delivery.

11.3 Retrofitting the Active Cooling Module - ACM

Due to high ambient temperatures and a variety of used IMS modules, the use of active cooling could be necessary. The M4000 system can be upgraded with two ACM modules during operation.

In the upper unit of the device where both display and function keys are located you will find an empty slide-in bay on the right and on the left side. To pull out the empty slide-in bays carefully introduce a tool (e.g. small screwdriver) into the indicated slots and press out the module from its anchoring.

The new Active Cooling Modules are already equipped with a front plate. Simply slide-in the ACM module into the guide rail and push until it locks into the plug in panel. At this point the LED indicator of the ACM module must light-up green.



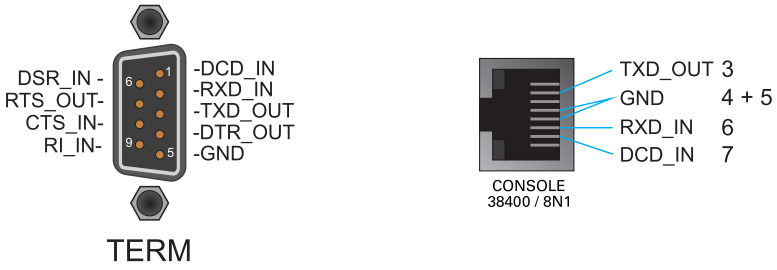
11.4 Available Modules and Connectors

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 V AC / 50-60Hz 100-200 V DC	5pin. MSTB connector
GPS Antenna	BNC	10 MHz / 35.4 MHz	shielded coaxial line
or			
Multi GNSS Antenne	SMA	L1 Frequency band: GPS/GLONASS/Galileo/BeiDou	shielded coaxial line
Terminal	RJ45	RS-232 (38400/8N1)	CAB-CONSOLE-RJ45
USB	USB Port		shielded data line
Network LAN-CPU	RJ-45	10/100/1000 Base-T	shielded data line
	SFP	1000Base-T	
Module Options			
Power			
DC power supply	5pin. DFK male	20-60 V DC or 10-36 V DC	5pin. MSTB connector
Network Modules			
LNE-GbE	RJ45	10/100/1000 MBit	shielded data line
	SFP	1000BASE-T	
HPS100	RJ45/SFP	10/100/1000 MBit	shielded data line
Output Modules:			
CPE - configurable	BNC, DFK-2, DSUB9, ST	PPOs, serial TS, TC FO ...	shielded data line
BPE - fixed	BNC, ST	PPS, 10 MHz, TC, 2048 kHz ..	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	10 MHz sine	shielded data line
REL1000	DFK-3	Error Relay	

Name	Type	Signal	Cable
Input Modules:			
ESI	BNC, RJ45	E1/T1, var. Freq.	shielded data line
MRI	BNC / FST	10 MHz, PPS, IRIG, PPOs	shielded data line
VSI	BNC	Video Sync, LTC, Word Clk and PPS Input	shielded data line
Input/Output Modules:			
PIO180	BNC	PPS, 10 MHz	shielded data line

11.5 TERMINAL (Console)

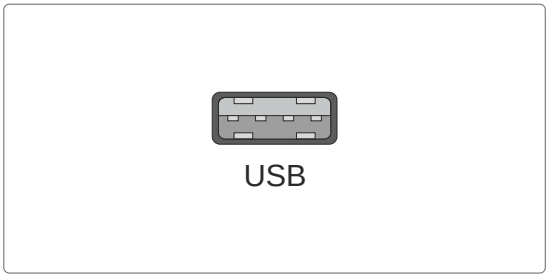
To connect a serial terminal (according to the device model), use the 9pin RS-232 D-Sub connector in the front panel or the RJ45 connector of the LAN-CPU. Via the serial terminal connection it is possible to configure parameters with a command line interface. You have to use a NULL-MODEM cable (D-Sub) 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).

11.6 USB Port

All M-series LANTIME devices have a USB interface that allow a USB storage medium such as a flash drive to be connected. USB storage media can be used for the following tasks:

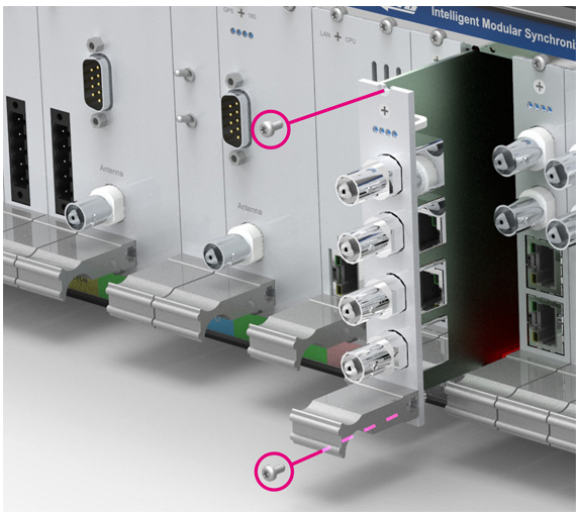


- locking the keys on the LC display to prevent unauthorized access
- backing up the LANTIME configuration
- transferring configurations between individual LANTIMES
- copying log files
- installing firmware updates
- uploading and downloading secure certificates (SSL, SSH) and passwords

11.7 Replacement or Installation of a Hot-pluggable IMS Module

If the system is supplied with an antenna and antenna cable, it is advisable to first mount the antenna in a suitable location (see chapter Antenna Mounting) and lay the antenna cable.

Please use a Torx screwdriver (T8 x 60) for removal and installation of the module.



1. Follow the safety instructions at the beginning of this manual!

2. Remove the two marked Torx screws from the module holder plate or the cover plate of the empty slot.

3. **Note when removing!**
   Pull the module carefully out of the guide rail. Note that the module is firmly anchored in the connector block of the housing. You need a certain amount of force to release the module from this link. Once the connection to the connector block of the system's backplane is loosened, the module can be easily pulled out.

4. **Note during installation!**
   Please ensure that the module is correctly inserted into the two guide rails of the system housing as otherwise damage to the module and the housing could be caused. Make sure that the module is securely locked into the connector block before you fasten the two screws.

5. Now you can put the installed module into operation.

Attachment points of an 1U IMS system

11.7.1 Important Information Regarding Hot-Pluggable IMS Modules

The following information should be strictly observed when replacing IMS modules during operation. Not all IMS modules are fully hot-pluggable. For example, it is naturally not possible to replace a power supply unit in a system without PSU redundancy without first having installed a second power supply unit while the system is in operation.

The following rules apply for the individual IMS slots:

PWR Slot:	"Hot-Swappable"	If you operate your system with only one power supply unit, a second power supply unit must be installed before removing or replacing it in order to keep your system on.
I/O, ESI and MRI Slots:	"Hot-Pluggable".	
CLK1/CLK2 Slots:	"Hot-Pluggable"	When a clock module is replaced or installed, it is important to rescan the reference clocks ("Rescan Refclocks") in the "System" menu of the Web Interface.
RSC/SPT Slots:	"Hot-Pluggable"	It will not be possible for your IMS system to switch between signal generators while the RSC/SPT is not installed.
CPU Slot:	"Not Hot-Pluggable"	Before the CPU is removed, the IMS system must be powered down. Please note that after powering on and rebooting the LANTIME Operating System, the configuration of some IMS modules may be reset to factory defaults!

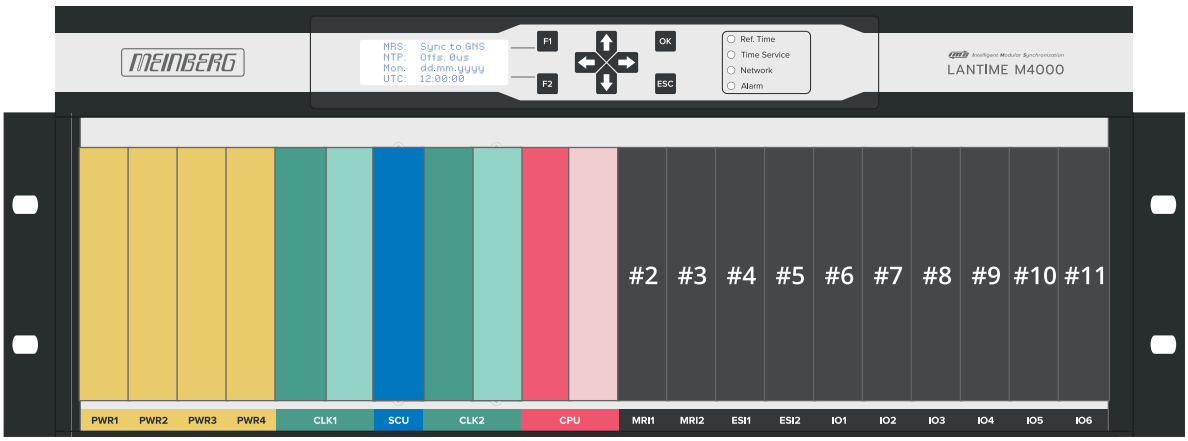
Information:

The NTP service and access to the web interface will be unavailable while the CPU is not installed. Management and monitoring functions will also be disabled.

11.8 IMS Module Options

11.8.1 IMS LANTIME IMS M4000 Slot Assignment

The system LANTIME IMS M4000 is available in a redundant design, which allows the use of two Meinberg receivers and up to four power supplies.



The following modules can be used in the designated slots:

I/O All output modules (BPE, CPE, LIU, LNO, SCG, VSG ...)
All network modules (LNE, TSU, HPS100 ...)
TSU and modules can only operate in PTP Grandmaster mode in an I/O slot.
HPS modules (with FW $\geq$1.4.1) can operate in all I/O slots as PTP master or slave.

CPU CPU Management Module

CLK All available reference clocks (GPS, GNS, GNS-UC, GNM, PZF, TCR)

SCU Switchover card when using two receivers

ESI ESI input module for telecom references
VSI Video synchronization inputs
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
VSI Video synchronization inputs
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, DC)

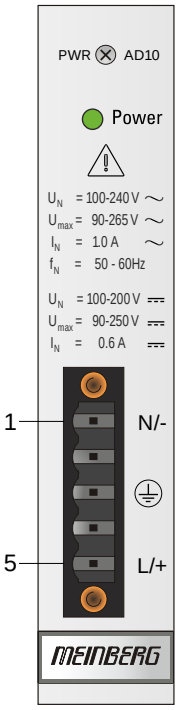
---

* In case of a redundant receiver configuration and installation in an ESI/MRI slot, the master/slave mode only works for the assigned clock. This means that if the CLK1 receiver has to be synchronized via an HPS, then the HPS must either be installed in an IO slot or in the MRI1/ESI1 slot.

11.8.2 Power Supply 100-240 V AC / 100-200 V DC

Connector Type: 5-pol. DFK

Pin Assignment:
1: N/-
2: not connected
3: PE (Protective Earth)
4: not connected
5: L/+



Input Parameter

Nominal Voltage Range:	U_N	=	100-240 V~ 100-200 V ⎓
Maximum Voltage Range:	U_N	=	90-265 V~ 90-250 V ⎓
Nominal Current:	I_N	=	1.0 A ~ 0.6 A ⎓
Nominal Frequency Range:	f_N	=	50-60Hz
Maximum Frequency Range:	f_{max}	=	47-63Hz

Output Parameter

Maximum Power:	P_{max}	=	50 W
Maximum thermal energy:	E_{therm}	=	180.00 kJ/h (170.61 BTU/h)

Danger!

This equipment is operated at a hazardous voltage.

Danger of death from electric shock!

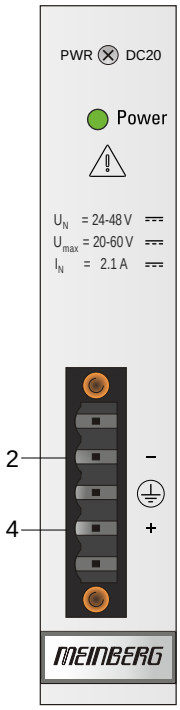
- This device must be connected by qualified personnel (electricians) only.
- Never handle exposed terminals or plugs while the power is on.
- All connectors must provide protection against contact with live parts in the form of a suitable plug body!
- Always ensure that wiring is safe!
- The device must be grounded by means of a connection with a correctly installed protective earth conductor (PE).

11.8.3 Power Supply 20-60 V DC

Connector: 5pin DFK

Pin Assignment:

1: not connected
2: V_{IN} -
3: PE (Protective Earth)
4: V_{IN} +
5: not connected



Input Parameter

Nominal voltage range:	U_N	=	24-48 V ⎓
Maximum voltage range:	U_{max}	=	20-60 V ⎓
Nominal current:	I_N	=	2.1 A

Output Parameter

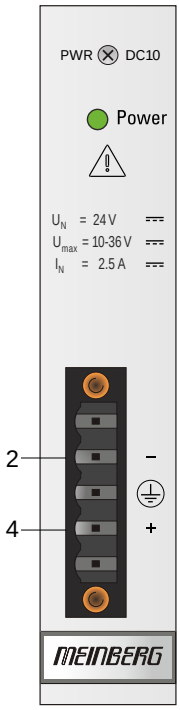
Maximum power:	P_{max}	=	50 W
Maximum thermal energy:	E_{therm}	=	180.00 kJ/h (170.61 BTU/h)

11.8.4 Power Supply 10-36 V DC

Connector: 5pin DFK

Pin Assignment:

1: not connected
2: V_{IN} -
3: PE (Protective Earth)
4: V_{IN} +
5: not connected



Input Parameter

Nominal voltage:	U_N	=	24 V ⎓
Maximum voltage range:	U_{max}	=	10-36 V ⎓
Nominal current:	I_N	=	2.5 A

Output Parameter

Maximum power:	P_{max}	=	50 W
Maximum thermal energy:	E_{therm}	=	180.00 kJ/h (170.61 BTU/h)

11.8.5 IMS Receiver Modules

The following receiver modules are available for our IMS systems:

GNSS satellite receivers

IMS-GPS receiver	12 channel GPS C/A-code receiver
IMS-GNS receiver	72 channel GPS/GLONASS/Galileo/BeiDou receiver (also for mobile applications)
IMS-GNS-UC receiver	72 channel GPS/Galileo receiver (with Meinberg antenna/converter unit)
IMS-GNM receiver	72 channel GPS/GLONASS/Galileo/BeiDou multiband receiver (simultaneous reception of all GNSS systems)

Long wave receiver (DCF77)

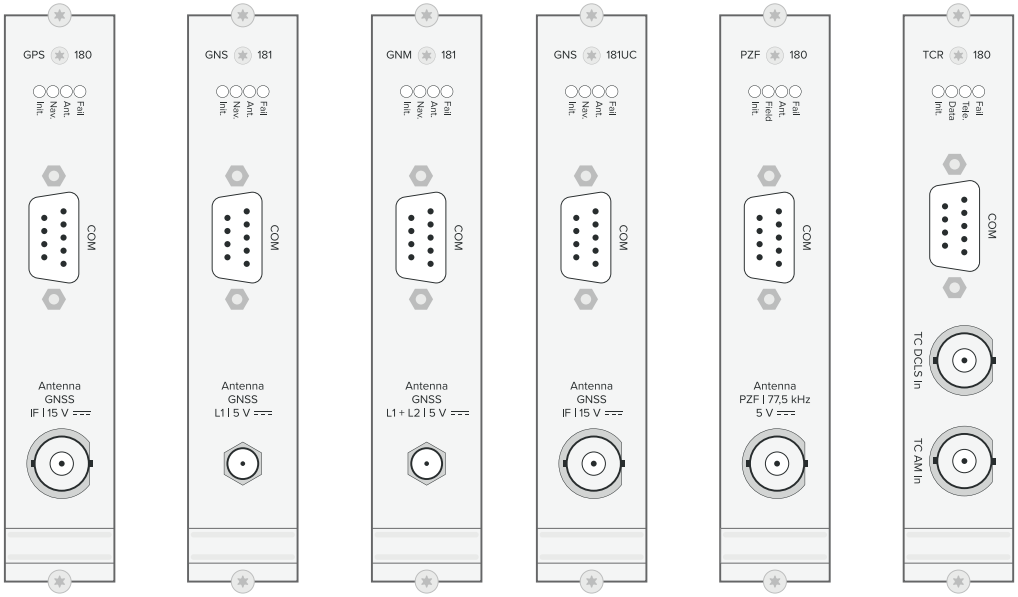
IMS-PZF receiver	high accuracy DCF77 based clock

Time code reader and generator (IRIG, AFNOR ...)

IMS-TCR receiver	decoding and generation of time codes

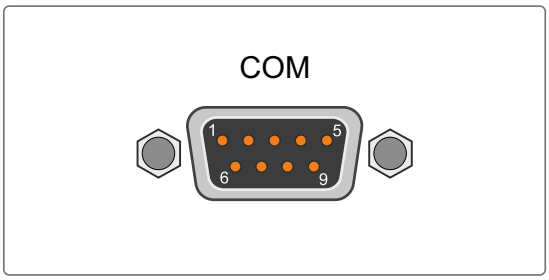
The following oscillator options are available for all receiver types:
- OCXO-SQ
- OCXO-MQ
- OCXO-HQ
- OCXO-DHQ (not for redundant M1000 configurations)

In addition to the redundant receiver configurations with two identical receivers for M1000, M2000, M3000, and M4000 models, it is also possible to configure these housing types with two different receiver systems.



Pin Assignment of the DSUB9 Connectors (male):

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



Synchronization with PPS + string:
Our IMS receivers are all MRS-capable (Multi Reference Source), which means that they can be synchronized via external sources such as 10 MHz, PPS + time string, NTP, PTP, 2048 kHz etc.. For synchronization via PPS + String no additional input module (MRS, ESI, HPS) has to be selected - the input signal and the time string can be supplied via the 9-pin DSUB connector. The connector has the following pin assignment:

Pin 1: PPS
Signal level: TTL
Pulse length: $\geq 5\ \mu s$ (active high)

Pin 2: String
The following timestrings (time telegrams) can be used:
- NMEA RMC
- NMEA ZDA
- Meinberg Standard
- Uni Erlangen

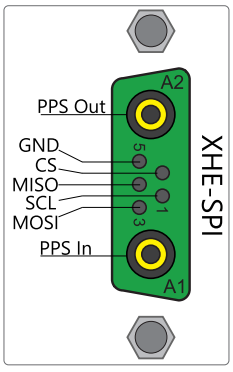
Please note:
The ext. time string must not arrive later than 500 msec. than the PPS. If the offset is greater than 500 msec, the time string is discarded and not recognized. For synchronization of the clock the information about time and date is missing.

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

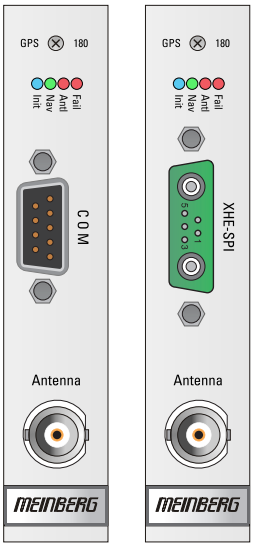
Attention: Use this plug only to connect a MEINBERG IMS-XHE^{Rb} Rubidium expansion chassis. The XHE-SPI connector is only available for Meinberg GNS receivers (GPS, GNS, GNS-UC, GNM).



11.8.5.1 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.

Antenna Power Supply: 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

11.8.5.2 GNSS Clock

Type of receiver: GPS / GLONASS / Galileo / Beidou receiver
Number of channels: 72
Frequency band: GNSS L1
1575.42 +- 10 MHz / 1602-1615 MHz

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

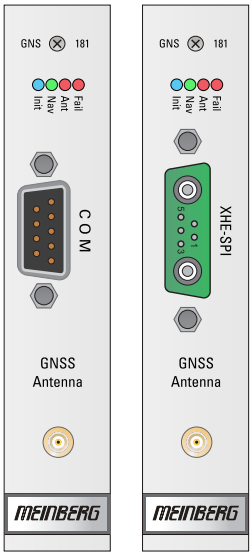
Synchronization Time: Max. 1 minute in normal operation mode, approx. 12 minutes after a cold start

Antenna Cable: shielded coax cable (Belden H155 PE)

Cable Length: max. 70 m low-loss cable

Type of Connector: female SMA connector

Antenna Power Supply: 5 V DC (via antenna cable)



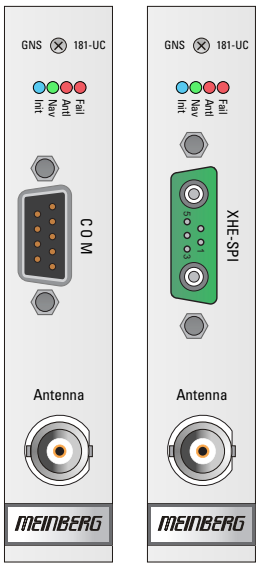
LED Indicators

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

11.8.5.3 GNS-UC Clock

GNSS receiver with UpConverter for operation on a standard Meinberg GPS antenna/converter unit.

Type of receiver:	GPS / Galileo receiver Number of channels: 72 GPS: L1C/A Galileo: E1B/C
Accuracy of Pulses:	Dependant on oscillator option < +-100 nsec (TCXO, OCXO-LQ) < +-50 ns (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
Cable Length:	max. 300 m
Type of Connector:	female BNC connector
Antenna Power Supply:	15 V, 100 mA (via antenna cable)

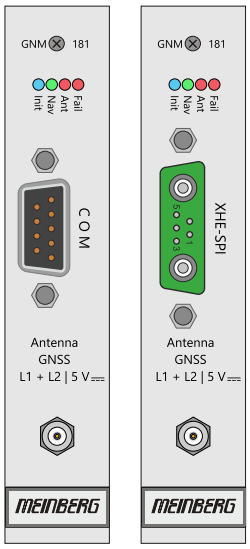


LED Indicators

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

11.8.5.4 GNM Clock

Receiver Type
184-channel
GPS, GLONASS, Galileo, Beidou



Frequency Band:

GPS:
L1C/A (1575.42 MHz)
L2C (1227.60 MHz)

GLONASS:
L1OF (1602 MHz + k*562.5 kHz
L2OF (1246 MHz + k*437.5 kHz
k = –7,..., 5, 6

Galileo:
E1-B/C (1575.42 MHz)
E5b (1207.140 MHz)

Beidou:
B1I (1561.098 MHz) B2I (1207.140 MHz)

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

Synchronization Time:
<1 minute in normal operation mode,
approx. 1 minutes after a cold start
(12 minutes in GPS only mode)

Signal Gain
40 dB

Antenna Gain:
$\geq$ 3.5 dBic / $\geq$ 3 dBic

Connection Type:
SMA female / Antenna

Cable:
shielded coaxial line (Belden H155)
Cable lenght: deductible up to max. 70 m

Antenna Power Supply:
5 V DC (via antenna cable)

Nominal Impedance:
50 Ohm

Backup Battery Type:
CR2032 – button cell lithium battery.
The hardware clock and the RAM are battery buffered. When the main power supply fails, the hardware clock runs free on quartz basis and the almanac data is stored in the RAM.
Life time of lithium battery: min. 10 years

Figure right:
GNM Multiband receiver and
GNM 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

11.8.5.5 PZF Clock

Receiver: High accuracy DCF77 correlation receiver
Two seperate receiver channels for signal conversion and best aquisition and tracking of the DCF77 signal (AM + PZF).

Synchronization Time: 2-3 minutes after correct DCF77 signal reception

Frequency Outputs: Accuracy depends on oscillator (standard: OCXO-SQ)

Pulse Outputs: Pulse per second (PPS) and pulse per minute (PPM).
TTL level, pulse width: 200 msec

Accuracy of pulsees: Better than $\pm 50 \mu$sec after synchronization and 20 minutes of operation.

Backup Battery Type: CR2032 - button cell lithium battery
When main power supply fails, hardware clock runs free on quartz basis, almanac data is stored in RAM
Life time of lithium battery min. 10 years

Oscillator Options: OCXO-SQ, OCXO-MQ, OCXO-HQ, OCXO-DHQ

Antenna Connector: BNC female

Antenna Cable: shielded Coax cable

Cable Length: 300 m with standard coax cable

Antenna Power Supply: 5 V DC (via antenna cable)

LED Indicators

Init:	blue:	while the receiver passes through the initialization phase
Field:	green:	minimum field strength needed for the correlation receiption is detected
Ant Fail:	red:	antenna faulty or not connected
Fail:	red:	time is not synchronized

11.8.5.6 TCR Clock - Time Code Reader and Generator

The IMS - TCR180 serves to decode and generate modulated (AM) and unmodulated (DC Level Shift) IRIG-A/B/G, AFNOR, C37.118 or IEEE1344 time codes. AM-codes are transmitted by modulating the amplitude of a sine wave carrier, unmodulated codes by variation of the width of pulses.

As standard the clock module TCR180 is equipped with a OCXO-SQ (Oven Controlled Xtal Oscillator) as master oscillator to provide a high accuracy in holdover mode of ± 1E-8. Optionally an OCXO-MQ or OCXO-HQ is available for better accuracy.

Receiver:
Automatic gain control within the receive circuit for modulated codes allows decoding of IRIG-A/B/G, AFNOR, C37.118 or IEEE1344 signals with a carrier amplitude of 600 mV_{pp} to 8 V_{pp}. The input stage is electrically insulated and has an impedance of either 50 Ω, 600 Ω or 5 kΩ, selectable by a jumper.

DC Level Shift Input insulated by optocoupler with internal series resistance of 220 Ω.

LED Indicators

Init	blue:	while the receiver passes the initialization phase
	off:	Oscillator not warmed up
	green:	the internal timing of the TCR180 is synchronized to the received time code (Lock)
Data	green:	correct time code detected
	red:	no correct time code detected
	yellow:	TCR180 synchronized by external source (MRS)
	yellow/green (flashing):	Holdover mode (MRS), IRIG Code available
	yellow/red (flashing):	Holdover mode (MRS), IRIG Code not available
Tele	green:	telegramm consistent
	red:	telegramm inconsistent
	yellow (flashing):	Jitter too large
Fail	red:	the internal timing of the TCR180 is in holdover mode
	off:	the internal timing of the TCR180 is synchronized to the received time code (Lock)

Generator:
The generator of TCR180 is capable of producing time codes in IRIG-A/B/G, AFNOR, C37.118 or IEEE1344 format. The codes are available as modulated (3 V_{pp} /1 V_{pp} into 50 Ω) and unmodulated (DC Level Shift) signals (TTL into 50 Ω and RS-422).

Regarding time code and its offset to UTC, the receiver and the generator can be configured independantly. Thus TCR180 can be used for code conversion.

Key Features

- IRIG Generator
- 4 programmable Pulse Outputs
- Frequency Synthesizer
- Battery Type CR2032

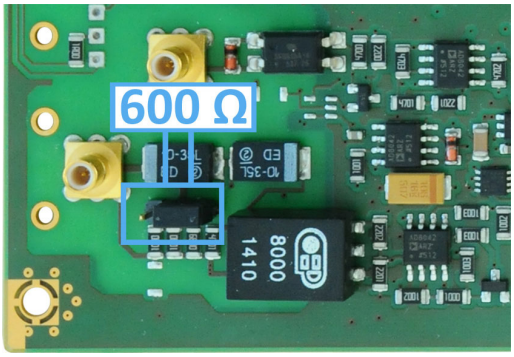


Figure 1: Jumper Settings: 600 Ω

Technical Specifications

Receiver Input

AM-input (BNC-connector):	insulated by a transformer impedance settable 50 Ω, 600 Ω, 5 kΩ 600 mV_{PP} to 8 V_{PP} (Mark)

Input Signal

DC Level Shift input:	insulated by photocoupler internal series resistance: 220 Ω maximum forward current: 60 mA diode forward voltage: 1.0 V...1.3 V

Decoding

Decoding of the following telegrams possible:	IRIG-A132 / A133 / A002 / A003 IRIG-B123 / B122 / / B126 / B127 / B002 / B003 / B006 / B007 IRIG-G142 / G146 / G002 / G006 AFNOR NFS 87-500 C37.118 IEEE1344

Accuracy of Time Base

Required Accuracy of Time Code Source:	max 100 μsec Jitter / offset 1E-5

Holdover Mode
Automatic switching
to crystal time base — accuracy approximately 1E-8
if decoder has been synchronous for more than 1h

Backup Battery
If the power supply fails, an onboard realtime clock keeps time and date information important system parameters are stored in the RAM of the system lifetime of the Lithium battery at least 10 years

Generator Outputs
Modulated output: — unbalanced sine carrier, 1 kHz
3 V_{PP} (MARK), 1 V_{PP} (SPACE) into 50 Ω

unmodulated outputs(DCLS):
TTL into 50 Ω, RS-422

Pulse Outputs
Four programmable outputs, TTL level
Default settings: active only 'if sync'

PPO_0 - PPO_3:
Idle (not active)
Timer
Single Shot
Pulse Per Second, Per Minute, Per Hour (PPS, PPM, PPH)
DCF77 Marks
Time Sync
DCLS Time Code
Synthesizer Frequency

Accuracy of Pulses
Better than ± 1 µsec after synchronization and 20 minutes of operation

Serial Port
Configurable RS-232 interface

Baudrates: — 300 Bd...115200 Bd
Framing: — 7E2, 8N1, 8N2, 8E1, 7N2, 7E1, 801
Mode of operation: — string per second
string per minute
string on request

Time telegram: — Meinberg Standard, Uni Erlangen, SAT, Meinberg Capture, ION, Computime, SPA, RACAL

Capture Inputs
Triggered by falling TTL slope

Pulse repetition time: — 1.5 msec min.
Resolution: — 800 nsec

Master Oscillator
OCXO-SQ (Oven Controlled Oscillator)

Accuracy compared to IRIG-reference:	sync. and 20 min. of operation: ± 5E-9 first 20 min. after sync.: ± 1E-8
	accuracy of oscillator: holdover, 1 day: ± 1E-7 holdover, 1 year: ± 1E-6
	short term stability: ≤ 10 sec, synchronized: ± 2E-9 ≤ 10 sec, holdover: ± 5E-9
	temperature dependant drift: holdover: ± 1E-6

Frequency Synthesizer

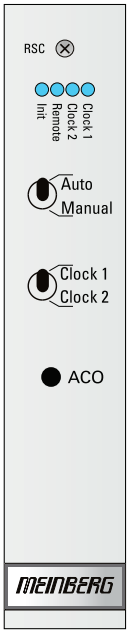
Output frequency:	fixed - 2.048MHz
Accuracy:	like system accuracy
1/8 Hz to 10 kHz:	Phase synchronous to pulse per second
10 kHz to 10 MHz:	deviation of frequency < 0.0047 Hz
Synthesizer Outputs:	TTL into 50 Ω sine wave 1.5 Vrms output impedance 200 Ω

Pulse Outputs

Pulse per second (PPS):	TTL- and RS-232 level positive pulse, pulse duration 200 msec
Pulse per minute (PPM):	TTL level positive pulse, pulse duration 200 msec

11.8.6 RSC Switch Card

General Information
The Redundant Switch Control card (RSC) controls how reference clocks are switched over in redundant systems with two reference clock modules. The RSC alternates between the available reference clocks, connecting the appropriate clock to the pulse and frequency outputs and the serial interfaces at any given time. The module switch and display controls allow different modes to be selected that dictate how the RSC operates. The status LEDs on the module indicate which reference clock is selected as the master clock as well as the current operating state of the switching module.



"Auto/Manual" Switch
This switch is used to select between Automatic and Manual mode. Manual mode is used to override the module's internal selection logic so that the current reference clock providing the clock signals is exclusively determined by the Clock 1 / Clock 2 switch. Outputs are always enabled in Manual mode, regardless of the synchronization state of the clocks.

"Auto" Switch Position
In Auto mode, the reference clock is selected by the RSC's internal switching logic. The active reference clock is selected based on the TIME_SYNC signals generated by the clock modules that are indicative of the synchronization state of these clocks.

In order to minimize unnecessary clock switching as a result of one receiver repeatedly falling out of synchronization, the master/backup relationship is changed with each clock switch. For example, if the current master clock becomes desynchronized, the RSC will switch to the backup clock (which must be synchronized), and this backup clock is then established as the new master clock. This prevents the RSC from switching back to the other clock when both clocks are synchronized.

Important: To ensure that reference clocks are switched automatically, the Manual function should be disabled via the display menu. "Ref. Time → Switch Unit": *Select Switch Unit → SCU Cntl → MANUAL: disable*. If the Manual function is left enabled, the system will use whichever reference clock has been selected under Manual control and will not switch over to the current active clock.

Information:

When removing the RSC module or (re)installing one, you will see a number of DIP switches present on the card. Meinberg expressly advises against modifying the positions of these switches. They cannot be used to influence the function or reference clock switching behavior of your IMS system in any meaningful way.

Manual Mode (Display Menu)
In this operating mode the reference clock is selected via a menu accessible from the system's display. In this case, the reference clock will not be switched in the event of an error, and pulse, frequency, and serial interface outputs remain enabled at all times.

Display Menu: *Switch Unit → SCU Cntl → MANUAL : enable*

Information:

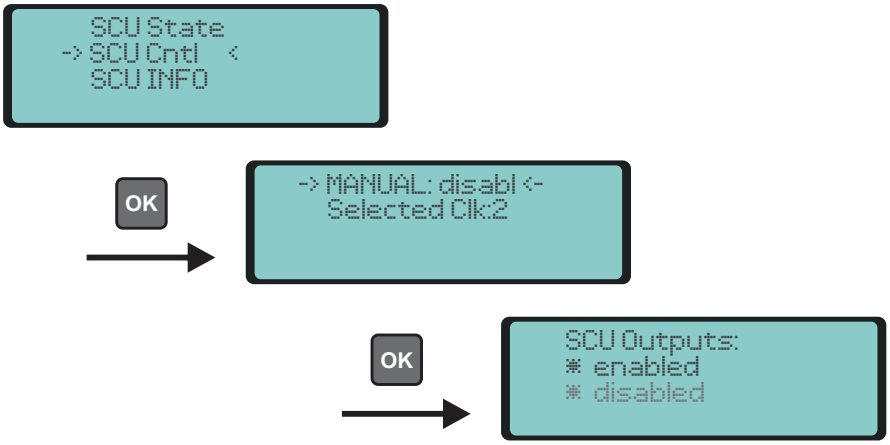
The headless M3000S system can optionally have a LANTIME Display Unit (LDU) fitted to provide access to Manual mode.

Display Menu "Switch Unit → SCU State"

This menu displays the status information of the RSC:

Mode:	Manual | Automatic
Clock 1 / Clock 2:	State of receivers
MUX:	Enabled | Disabled - State of output signals while clock is in free-run mode
Selected Clk:	Selected reference clock (1 or 2)

Display Menu "Switch Unit → SCU Cntl"



MANUAL:	Enable | Disable	Switches between Automatic and Manual Mode
Selected Clk:	1/2	Used to select the active reference clock

11.8.7 SPT - Single Pass Through

The SPT (Single Pass Through) ensures that in systems with only one reference clock, the generated signals are distributed on the backplane.

The module has a microcontroller for registering the card in the system and managing the LEDs by evaluating the signals displayed on the front panel. There are no configuration settings for the SPT via front panel display and function keys of the system or in the web interface or CLI.

Consumer Load	
Backplane:	0.7W
Power Supplies:	3.0W
FCU:	0.3W
TCR180:	4.4W
SPT:	0.2W
ELX800:	4.5W

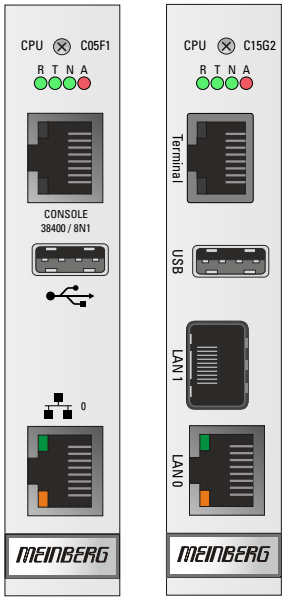
Status-LEDs
The status of the SPT is indicated by the four LEDs:

PPS:	red:	the signal was not provided to the system by the receiver, yet.
	green:	the signal is generated by the receiver and distributed in the system.
10 MHz:	red:	the signal was not provided to the system by the receiver, yet.
	green:	the signal is generated by the receiver and distributed in the system.
Clock:	red:	as long as the receiver is not synchronized, yet.
	green:	when the receiver is synchronized.
Status:	blue:	during the initialization phase.
	green:	after initialization of the receiver.
Current Consumption:	40 mA	

11.8.8 LAN-CPU

As the central management and control element, the CPU module in an LANTIME system is responsible for management, configuration and alarm notifications. It additionally provides NTP and SNTP services on its network interface.

Technical specifications IMS LAN CPU C05F1



Processor:	AMD Geode™ LX 800 Processor, 400 MT/s memory bus speed
Main Memory:	256 MByte onboard DDR memory
Cache Memory:	128 kByte L2 Cache
Flashdisk:	1 GB
Network Connector:	IEEE 802.3u 100Base-Tx via RJ45 jack, Fast Ethernet compatible
Power Consumption:	Typ. application 6,9 W @ 5V

Technical Specifications - IMS CPU-C15G2 (LTOS V7 only)

Processor:	Intel® Atom™ Processor E Series (2 Cores, 1.33GHz, TDP 3W)
Main Memory:	onboard 2 GB
Cache Memory:	1 MB 2nd Level Cache
Flash Disk:	4 GB
Network Connectors:	1 x 10/100/1000 Base-T with RJ45-Jack 1 x 1000Base-T with SFP-Jack
Power Consumption:	Typ. application 6,9 W @ 5V

Interfaces - IMS LAN-CPU

Serial Interface:	RJ45 connector console: 38400 / 8N1, connection via CAB-CONSOLE cable
USB Port:	install firmware upgrades backup and restore configuration files copy security keys lock / unlock front keys
Operating System:	GNU/Linux 4.x

Status LEDs:

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

R (Receiver)

green:	the reference clock (e.g. build-in GNSS) provides a valid time
red:	the reference clock does not provide a valid time

T (Time Service)

green:	NTP is synchronized to the reference clock, e.g. GNSS
red:	NTP is not synchronized or switched to the "local clock"

N (Network)

green:	all monitored network interfaces are connected ("Link up")
red:	at least one of the monitored network interfaces is faulty

A (Alarm)

off:	no error
red:	general error

Supported Protocols:

Network Time Protocol (NTP):	NTP v2 (RFC 1119), NTP v3 (RFC 1305), NTP v4 (RFC 5905) SNTP v3 (RFC 1769), SNTP v4 (RFC 4330)
OSI Layer 2 (Data Link Layer):	PRP (IEC 62439-3)
OSI Layer 3 (Network Layer):	IPv4, IPv6
OSI Layer 4 (Transport Layer):	TCP, UDP, TIME (RFC 868), DAYTIME (RFC 867), SYSLOG
OSI Layer 7 (Application Layer):	HTTP / HTTPS (RC 2616), DHCP, FTP, NTPv3 / NTPv4, SNTP, RADIUS, TACACS, FTP, SSH (incl. SFTP, SCP) - SSH v1.3 / SSH v1.5 / SSH v2 (OpenSSH), SNMPv1 (RFC 1157) / SNMPv2c (RFC 1901-1908) / SNMP v3 (RFC 3411-3418), Telnet (RFC 854-RFC 861)

11.8.9 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, 10 MHz, 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:

Time Code unmodulated input (DCLS)
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

selectable Time Code Inputs, modulated / unmodulated (DCLS):
B122/123 / B002/003 / B126/127 / B006/007
IEEE1344 (modulated and DCLS)
AFNOR NFS 87-500 (modulated and DCLS)

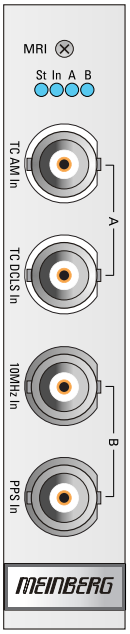
Time Code modulated input (AM),
BNC connector, isolated by transformer

Insulation voltage:	3000 V DC
Input impedance:	50 Ohm, 600 Ohm, 5 kOhm Internally selectable by jumper (default 600 Ohm)
Input signal:	600 mV to 8 V (Mark, peak-to-peak)

10 MHz input, sine (1.5 V_{pp} - 5 V_{pp})
or TTL, female BNC connector

PPS input, TTL, pulse length $\geq 5\mu s$,
active high, female BNC connector

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



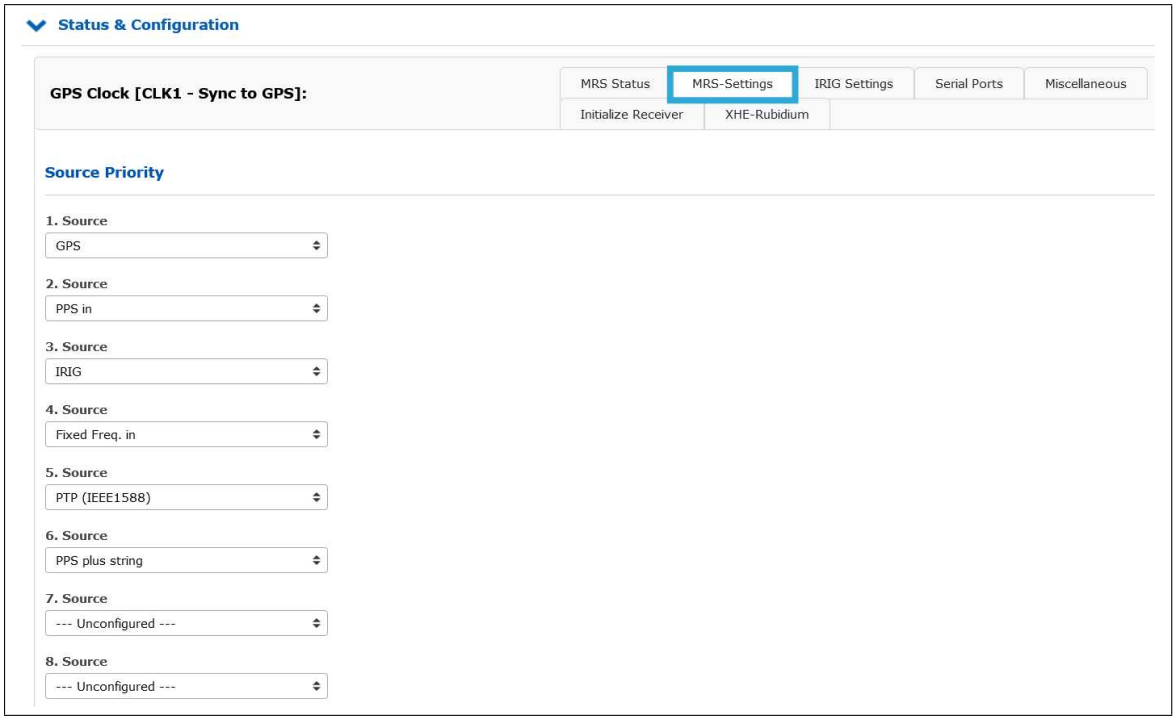
Status Indicators

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 (10 MHz/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
Power Requirements:	5 V +-5%, 50 mA

11.8.9.1 Configuration of Input Signals

Four fixed input signals (time code AM, time code DCLS, 10 MHz and PPS) can be supplied via the MRI module to synchronize the system.

MRS prioritization
The provided input signals are available for selection after initialization of the module and can than be configured and monitored.



MRS setting: selection and prioritization of the available input sources.

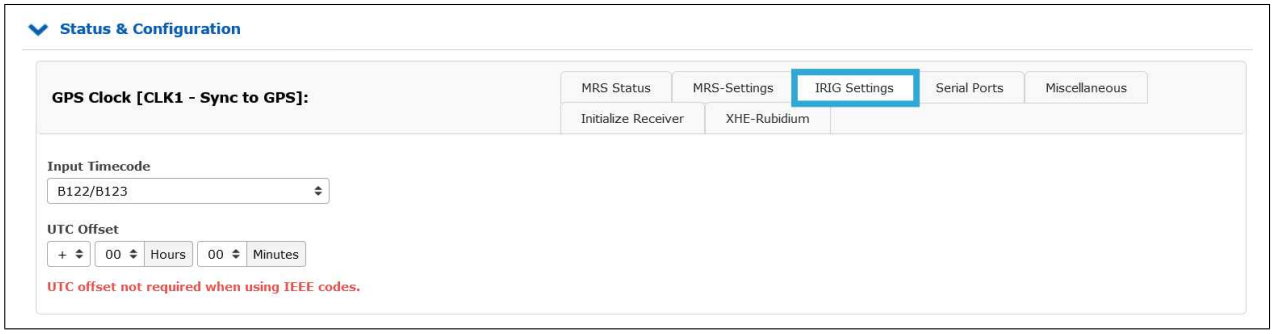
1. Open the "**Clock**" menu → "**Status & Configuration**"
2. Select the respective clock module of the corresponding MRI module
3. Click on the tab "MRS settings".
4. Configure the reference signals shown in the priority list.

IRIG settings

Several time codes are available for selection for the IRIG reference signals of the MRI.

1. Open the "**Clock**" menu → "**Status & Configuration**"
2. Select the respective clock module of the corresponding MRI module
3. Click on the tab "IRIG settings".
4. Configure a required input code and if necessary an offset to UTC.

These are to be configured in the "**Status & Configuration**" submenu in the " IRIG Settings" tab.



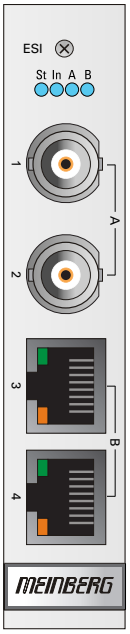
Menü: Configuration of IRIG-Timecodes

11.8.10 ESI - Telecom Synchronisation References

Enhanced Synchronisation Inputs

Reference Inputs: PPS and variable frequencies unframed, 1 kHz - 20 MHz
2,048 Mbit/s / 1,544 Mbit/s - E1/T1 framed

Input 1	1PPS (BNC female connector) TTL, pulse duration $\geq 5\mu$s, active high
Input 2	1 kHz - 20 MHz (BNC female connector) sine (400 mV_{pp} - 5 V_{pp}) or TTL
Input 3	1 kHz - 20 MHz (RJ-45) 400 mV_{pp} - 5 V_{pp} into 120 Ω, TTL
Input 4	E1 or T1 framed G.703 (RJ-45) max. attenuation -12 dB (referred to the signal level) into 120 Ω



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

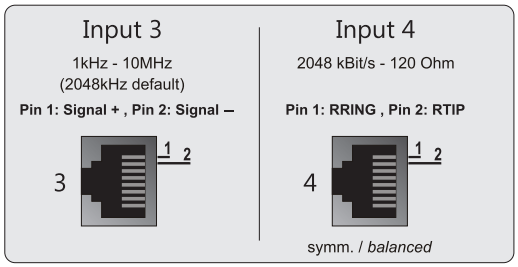
Status Indicators

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:

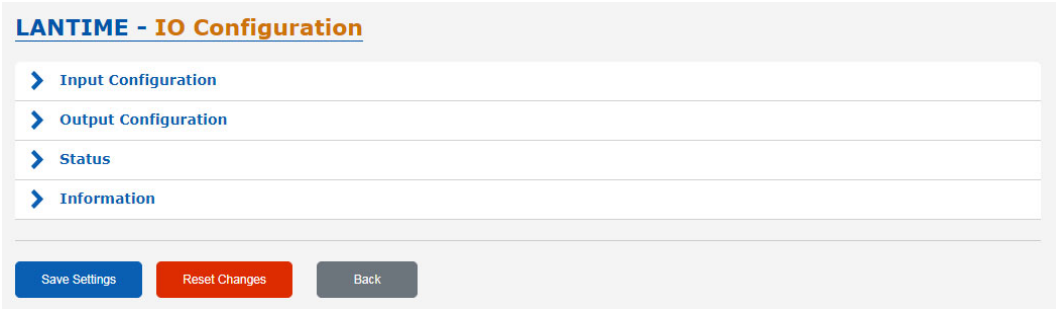
Initialisation:	**LED St**	blue until configuration is done
	LED In	off until configuration is done
	LED A	off until configuration is done
	LED B	off until configuration is done
expiration LEDs:	**ALL LEDs**	0,5 sec. red → 0,5 sec. yellow → 0,5 sec. green → 0,5 sec. off
Normal Operation:	**LED St**	green
	LED In	green
	LED A	green, if PPS and Frequency flashing green, if only Frequency 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

Pin assignment of the RJ-45 jacks (input 3 + 4)



11.8.10.1 ESI Configuration via Web Interface

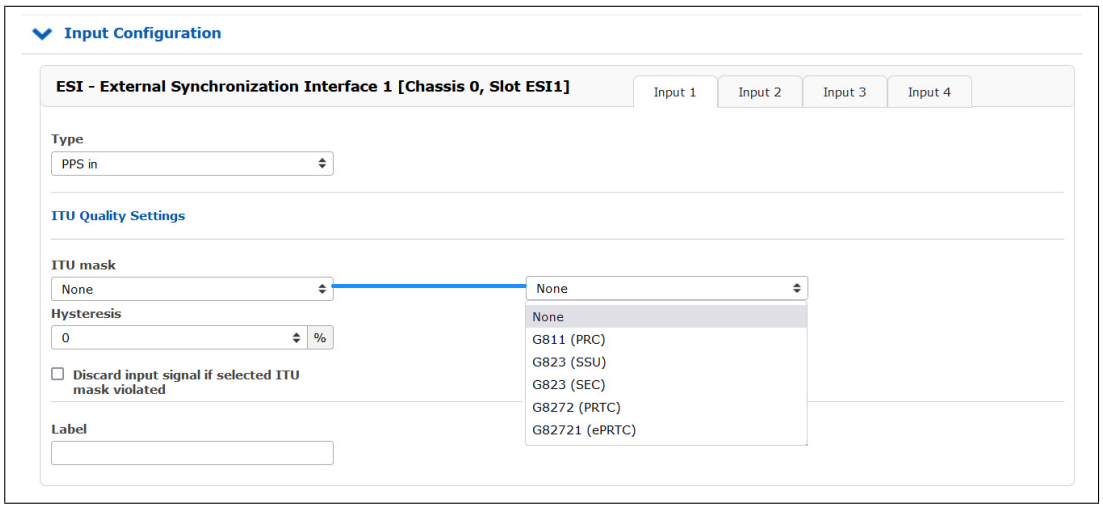
ESI – External Synchronization Input
Menu "IO Config -> Input Configuration -> ESI - External Synchronization Interface"



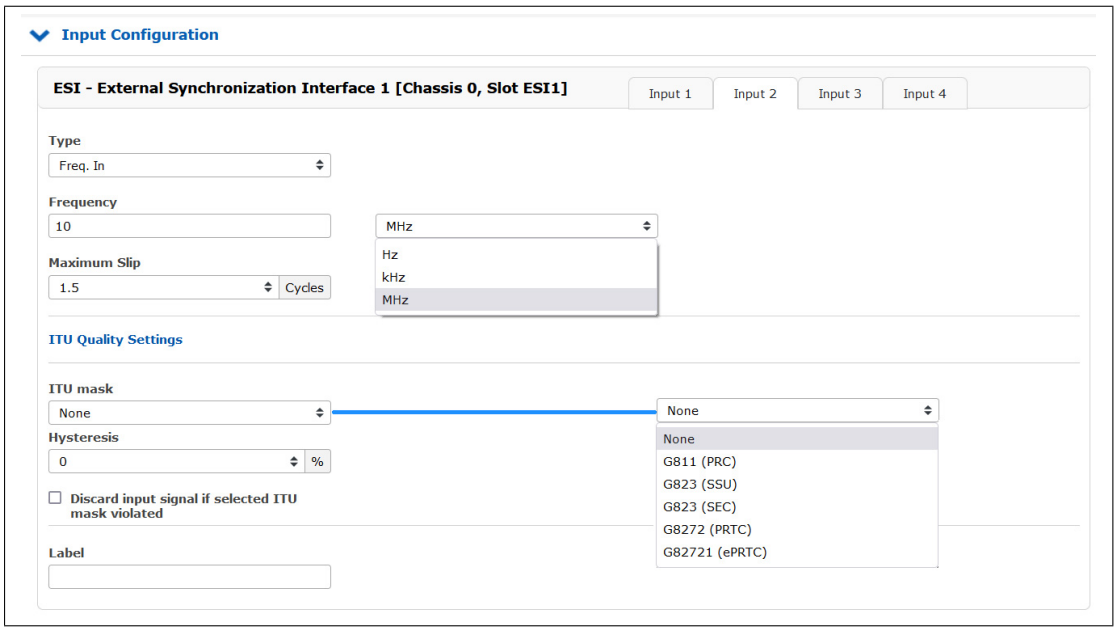
The ESI (External Synchronization Input) card is capable of adding additional synchronization sources to an IMS system. It accepts E1 and T1 sources as a Bitstream (2.048 MBit/s/1.544 Mbit/s, supporting SSM/BOC).

It also handles configurable frequencies (1 kHz - 20 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 Per Second) synchronization.



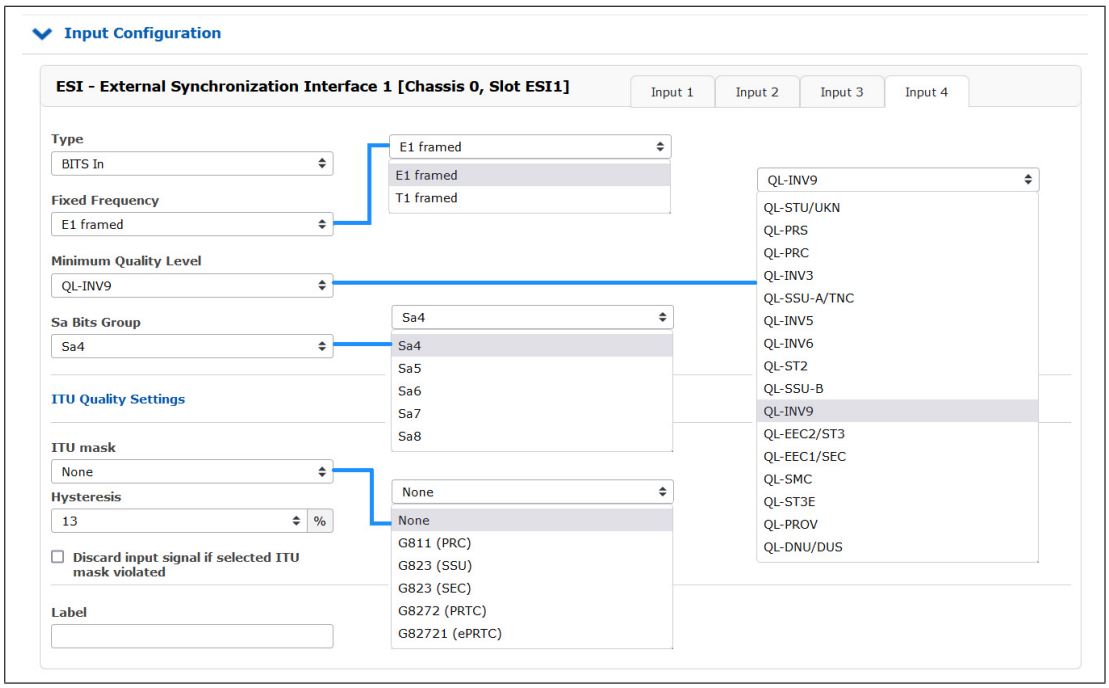
Input 2: accepts as input signal configurable frequencies from 1 kHz to 20 MHz.

Type: Freq. In

Frequency: Fill in a configurable frequency, 10 MHz is set as default value.

Maximum Slip in 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: accepts as input signal configurable frequencies from 1 kHz to 20 MHz. 2048 kHz is set as default value.



Input 4:

BITS In: 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:

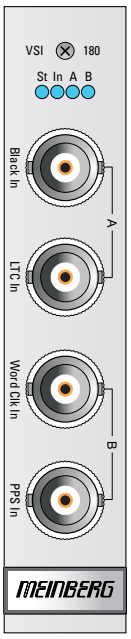
User configured QL-SSU-B as Minimum Quality Level for his system. E1 input signal coming from PRC (G.811) or TNC will be allowed for synchronization, whereas signal coming from Synchronous Equipment Timing Source (SETS) will not be accepted.

Sa Bits

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

11.8.11 VSI - Video Synchronization Input Card

Video signal input module
The VSI (Video Synchronization Input) card provides video signals to an IMS clock module as reference. It can process Black Burst (PAL), LTC (Linear Time Code) and programmable Word Clock Rates.



Connectors: 4 x BNC female

Input Signal:
Black In
Black Burst (PAL)
Input with VITC Reader
Input with Prescaler mode
(Frequency only)

Signal level: 300 mV_{ss} into 75 Ω (unbalanced)

Time Code Formats: PAL SMPTE259M / ITU-R BT.470-6
SMPTE12M-1 / SMPTE ST309M

LTC Input
LTC-Reader (25 fps)

Word Clock Input

Input signal: Word Clock Input with
programmable frequency range

Signal level: TTL

Frequency range: 1 kHz - 10 MHz

PPS Input

Input signal: PPS (pulse per second)

Signal level: TTL

Pulse lenght: $\geq$ 5 μs, aktiv high

Power Requirements: 5 V, +-5%, 300 mA

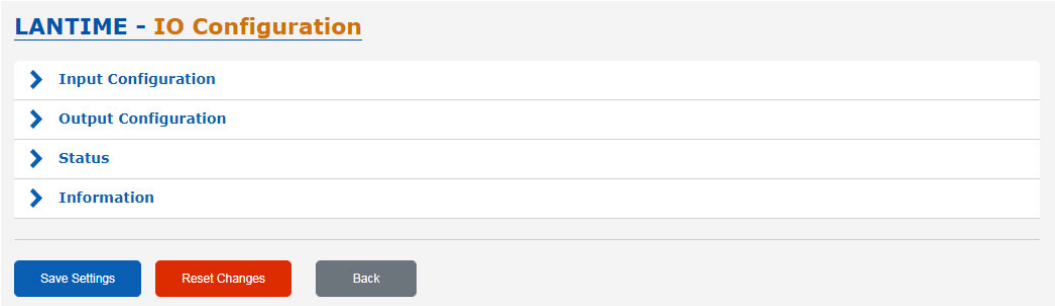
Status Indicators	**LED St:**	Status of VSI180
	LED In:	Synchronization status
	LED A	No function
	LED B:	No function

Operation conditions:

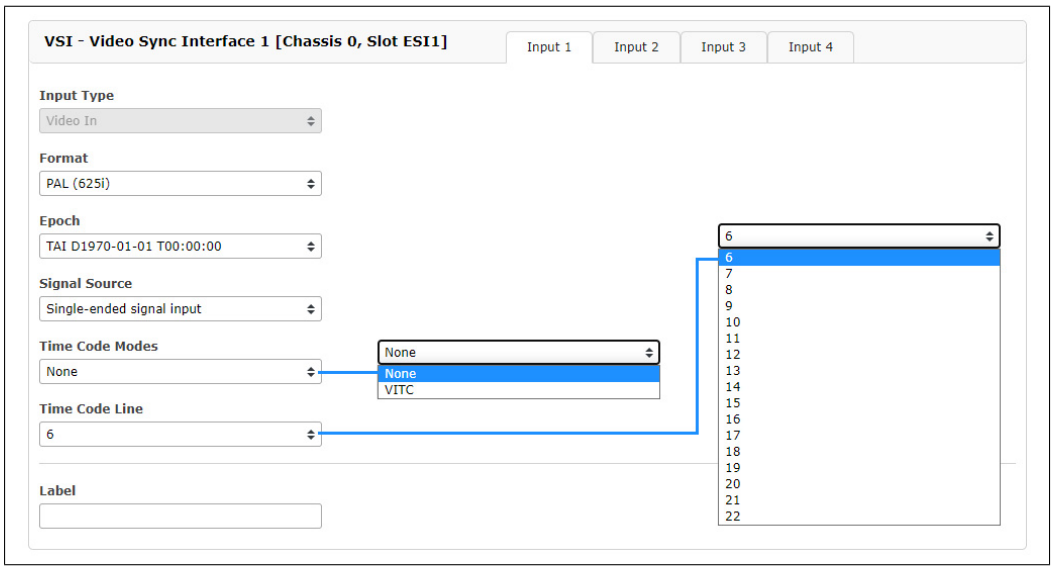
Initialisation:	**LED St**	blue during initialization green during operation
	LED In:	Shows status after initialization
	Green	Accurate
	Green Flashing	Timesync
	Yellow	Insufficient quality of the reference signal.
	Red	Reference signal not available / VSI180 is not synchronous
Normal Operation:	**LED St / In**	green
expiration LEDs:	**ALL LEDs**	0,5 sec. red → 0,5 sec. yellow → 0,5 sec. green → 0,5 sec. off

11.8.11.1 Configuration of VSI180 via Webinterface

VSI - Video Signal Input References
Menü "IO Config → Input Configuration → VSI-Module"



Video Sync Interface: configurable Inputs



Input 1: Video Sync In

Format: PAL 625i

Epoch: TAI

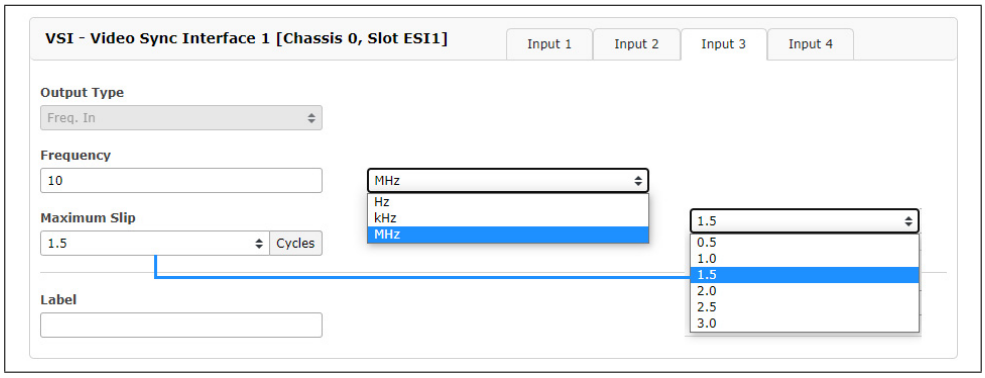
Signal Source: Single-ended signal input

Time Code Modes: VITC

Time Code Line: 6 - 22

Input 2: LTC In

Type: LTC 25 FPS (Frames per Second)



Input 3: Word Clk In

Frequency: 1 kHz - 10 MHz

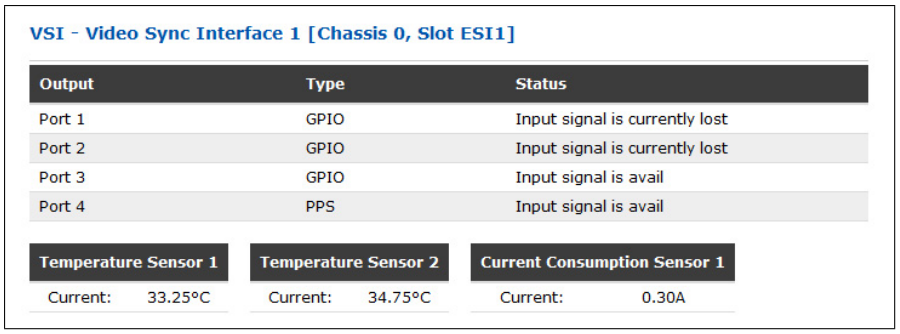
Max Slip: 0.5 - 3.0 oscillations

Input 4: PPS In

Pulse length: $\geq 5\mu$s, active high

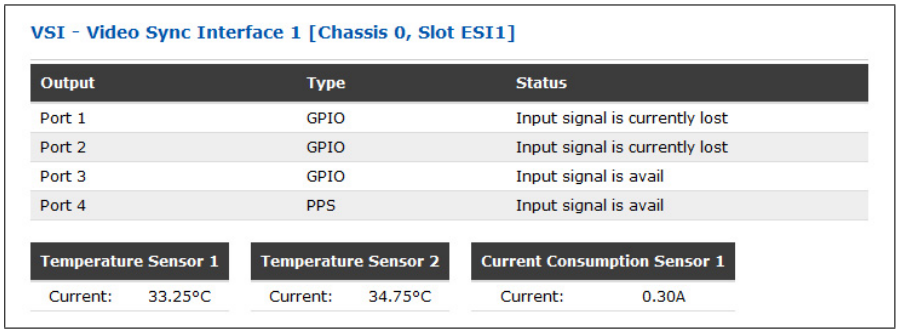
11.8.11.2 Status Monitoring of the IMS-VSI

The submenu "Status" of the "IO Config" allows you to view the status of each port of the installed IMS-VSI module. In addition, the current operating temperature of the module is displayed in this menu.



11.8.11.3 Status Monitoring of the IMS-VSI

The submenu "Status" of the "IO Config" allows you to view the status of each port of the installed IMS-VSI module. In addition, the current operating temperature of the module is displayed in this menu.



11.8.12 IMS Network Modules

11.8.12.1 LNE-GbE: Network Expansion with Gigabit Support and SFP Option

Link speed: 10/100/1000 Mbit

Connector Type: 8P8C (RJ45)

Cable: CAT 5.0

Duplex Modes: Half/Full/Autonegotiaton

LED Indicators

LED St: blue during initialisation

LED In - LED B: Shows the state of the four LAN ports after initialisation

green normal operation
red defective LAN port

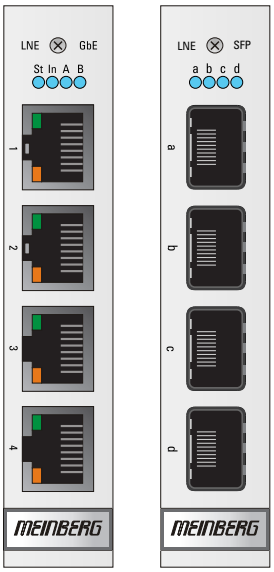


Figure right:
LNE-GbE and LNE-GbE with SFP Option

Option: LNE-SFP

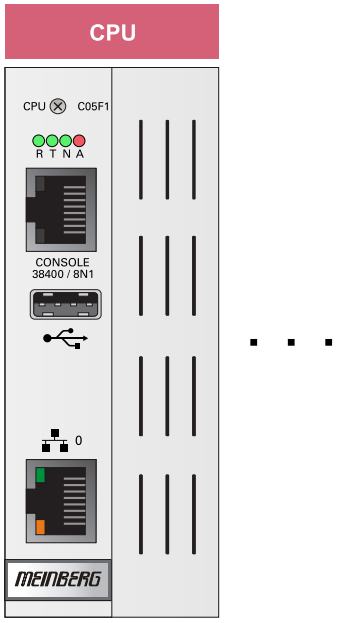
Interface: 1000BASE-T SFP

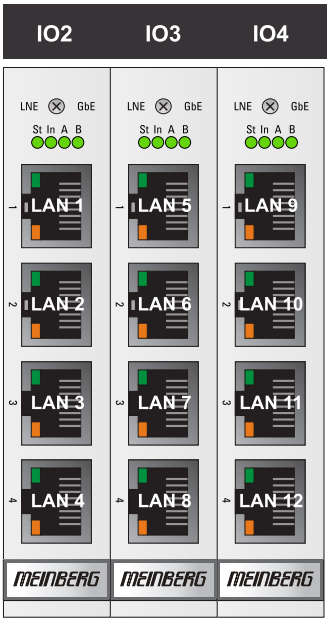
Cable: Multimode Fiber
GI 50/125 μm or GI 62.5/125 μm gradient fiber

Singlemode Fiber
E9/125 μm monomode fiber

Link Speed Electrical: 1000 Base-T
Fiber optical: 1000-FX

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

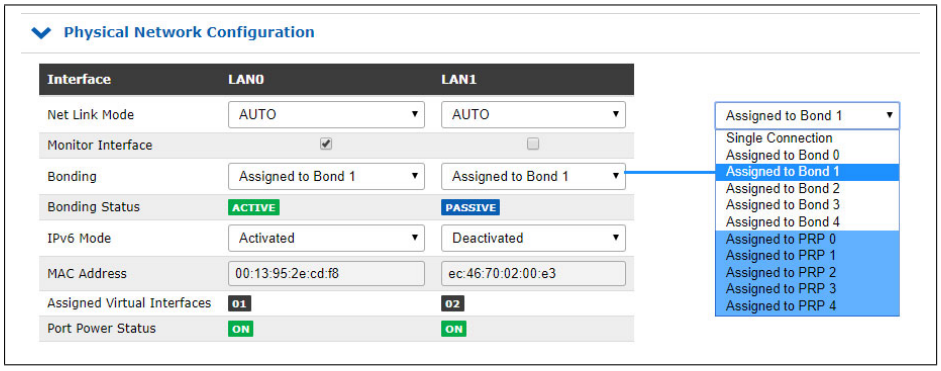
LNE Slot IO3
LAN 5: ec:22:33:44:aa:7f
LAN 6: ec:22:33:44:aa:80
LAN 7: ec:22:33:44:aa:81
LAN 8: ec:22:33:44:aa:82

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.

11.8.12.2 LNE-GBE Configuration via the Web Interface

If the LNE-GBE operates in an LANTIME 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.

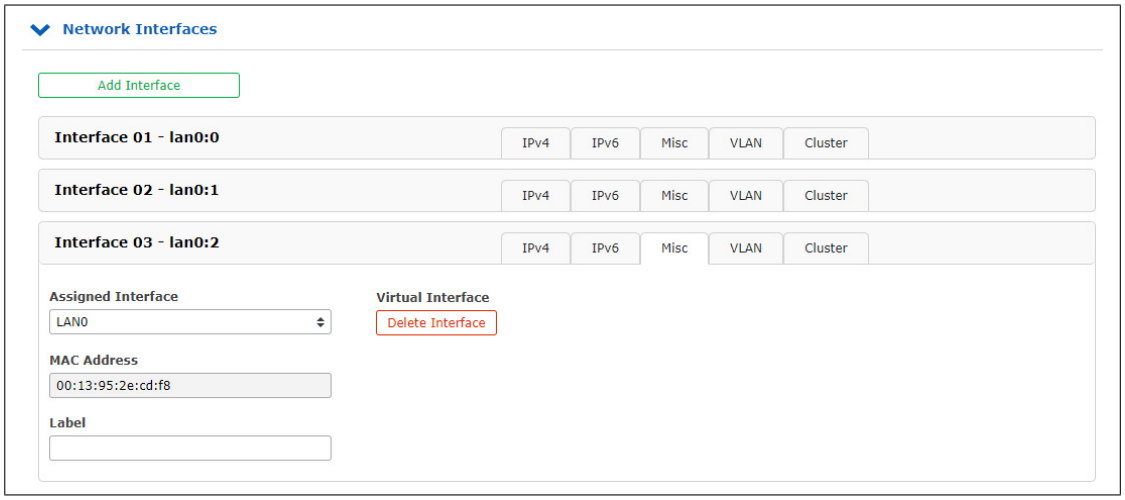
PRP: As of LANTIME firmware version 7.0, PRP can also be conveniently set via the web interface menu "Network → Physical Network Configuration". Select the same PRP group for at least two interfaces in the drop-down menu "Bonding".

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.

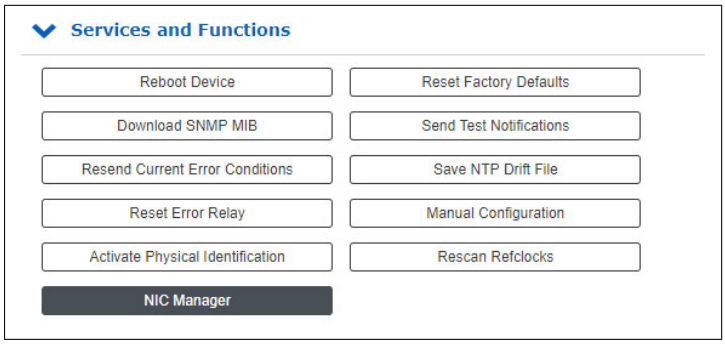
Cluster: The cluster function can be activated with this submenu and additional Parameters such as multicast or unicast mode, TCP / IP address and subnet mask can be set up here.

11.8.12.3 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.

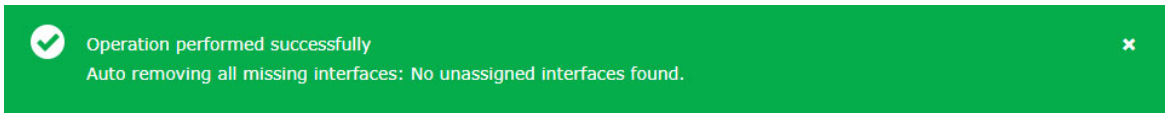
Adding a LANTIME Network Extension

After installing the LNE module, please start the web interface. In the menu "System → Services and Functions" press the button **NIC Manager** then . With this function you add all new physical network interfaces to the system's network configuration. Now it is ensured that the IMS module is correctly installed and recognized by the system.



Remove a LANTIME Network Extension LNE

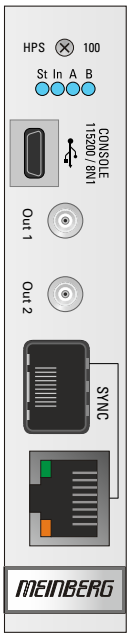
To remove a LNE network extension from the LANTIME system, the card must first be removed. However, the removed LNE interfaces are still listed in the network configuration. The "NIC Manager" can be used to update the network configuration in this case as well.



After successfully running the "NIC Manager", only the actually existing interfaces are displayed in the web interface. A system restart is not necessary.

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

IEEE 1588 v2 compatible



Profiles:	IEEE 1588v2 Default Profile IEEE 1588v1 (option) Enterprise Profile IEC 61850-9-3 Power Profile IEEE C.37.238-2011 Power Profile IEEE C.37.238-2017 Power Profile ITU-T G.8265.1 Telecom Frequency Profile ITU-T G.8275.1 Telecom Phase / Time Profile (full timing support) ITU-T G.8275.2 Telecom Phase / Time Profile (partial timing support) SMPTE ST 2059-2 Broadcast Profile IEEE 802.1AS TSN/AVB Profile AES67 Media Profile DOCSIS 3.1
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 (8 ns time stamp accuracy) NTPD Software Service (15,000 req./s)
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) **Note:** Please also refer to the chapter SFP Transceiver
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 A list of tested and recommended optical transceiver modules can be found in chapter Option LNE-SFP
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:	8 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

Performance Level Options:

Option	Unicast Clients	Delay Req./s	NTP Req./s	PTPv1	PTP Monitoring
PL-A	8	1024	1600	NO	NO
PL-B	256	32768	51200	NO	NO
PL-C	512	65536	102400	YES	NO
PL-D	1024	131072	204800	YES	YES
PL-E	2048	262144	409600	YES	YES

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

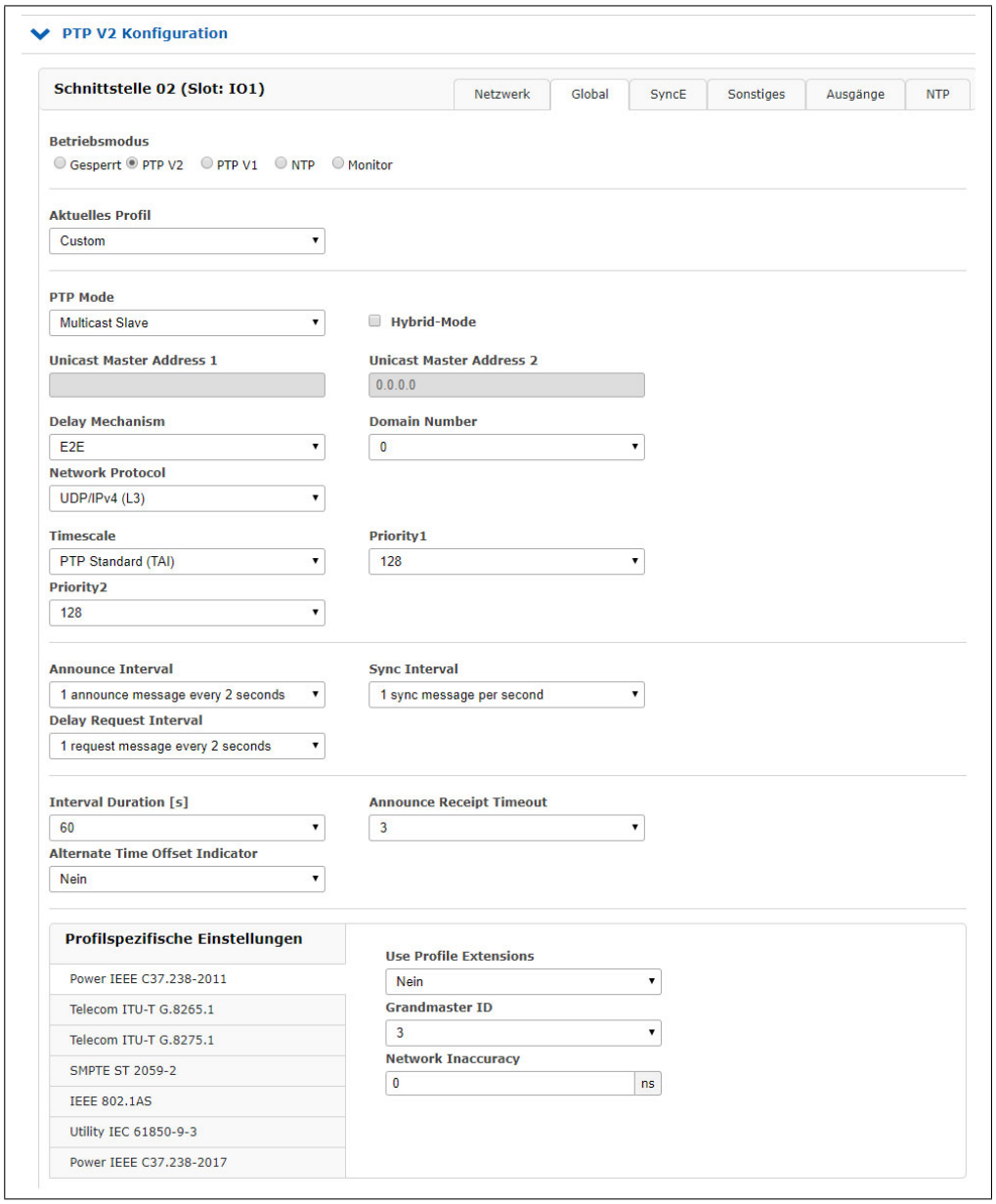


Figure: Webinterface - PTP Menu → Global Configuration

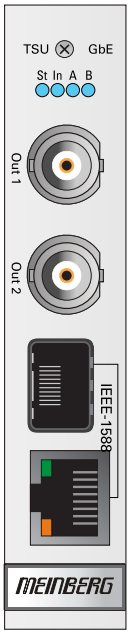
11.8.12.5 TSU V3: IEEE-1588 Time Stamp Unit

Information:

This product is no longer available and is succeeded by the IMS-HPS100. Of course, we will continue to provide support for modules that have already been shipped. Our Support Team will be happy to assist you with any questions you may have.

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 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:	Operable as Master or Slave Compliant with 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
Signal Outputs:	2x BNC (50 Ohm) Connectors Configurable Signals: Pulse-Per-Second, 10 MHz, 2048 kHz
CPU:	1 GHz Dual-Core ARM
Time Stamp Accuracy:	10 ns



LED Indicators

"St" LED:	Init	Blue during initialization
		Off during normal operation
"In" LED:	Red	Error: TSU malfunctioning, PTP services stopped
	Yellow	No link, but initialized
	Green	Link established
	Red	Stopped
"A" & "B" LEDs:	Shows the current State of the TSU	
	Yellow - Yellow	Listening
	Green - Off	Master Mode
	Off - Green	Slave Mode
	Yellow - Off	Passive Mode
	Off - Yellow	Uncalibrated
	Red - Red	Stopped

11.8.12.6 SFP Transceiver

Recommended and tested Transceivers from other Vendors

Mode	Vendor/Type	Distance
MULTI MODE:	AVAGO AFBR-5710PZ	550 m
	FINISAR FTLF8524P3BNL	500 m
SINGLE MODE:	AVAGO AFCT-5710PZ	10 km
	FINISAR FTLF1318P3BTL	10 km
	SMARTOPTICS SO-SFP-L120D-C63	80 km
RJ-45:	AVAGO ABCU-5740RZ	100 m
	FINISAR FCLF8521P2BTL	100 m

Information:

Important Note for HPS100 Modules:

Since HPS firmware version ≥1.4, an SFP Copper port is no longer supported. Therefore always use the native RJ45 port for your network copper lines.

Sending Synchronous Ethernet (SyncE) over Copper SFPs does not work!

The reason is because Copper SFPs have their own internal TCXO oscillators which are not adjustable so that the SyncE reference frequency that comes out of the system is not forwarded on the network. So the SyncE signal is free-running on a Copper SFP and therefore not useable for the next network node.

Please use a Fiber Optic SFP instead! The HPS100 module provides a native RJ45 port where SyncE via copper lines is possible.

Warning!

Prevention of Eye Injuries

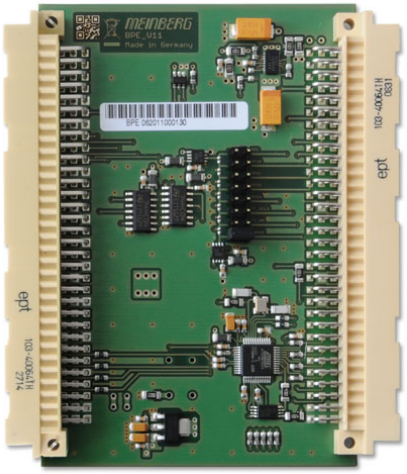
- Fiber optic SFP modules that are not compliant with the definition of a Class 1 laser in accordance with IEC standard 60825-1 may emit radiation capable of causing eye injuries.
- Never look into an unconnected connector of a fiber optic cable or an unconnected SFP port, and ensure that unused fiber optic connectors are always fitted with a suitable protective cap.

11.8.13 CPE and BPE Output Modules (Frontend - Backend, Eurocard)

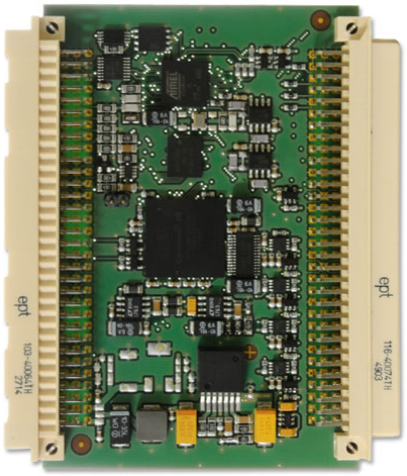
Configurable Port Expander / Backplane Port Expander

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

11.8.13.1 BPE - Backplane Port Expander

Please Note:
In principle, it should be noted that the signals that are provided via a BPE at the various connectors are always generated by the upstream clock and spread via the backplane of the system. In opposite to the CPE, the signals are not generated by the module and therefore the outputs can only be set via the receiver.

The selection and settings of the signals such as frequency, time code or programmable pulse outputs can be done via the web interface menu "Clock" or "Clock Switch Card "(for redundant systems).

Output Signals: fixed TTL signals:
10 MHz, PPS, IRIG DCLS, IRIG AM, 2.048 MHz,
PPOs (selectable via receiver)

Output Level: 5 V_{pp} without load
2.8 - 3.0 V_{pp} into 50 Ω

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)

Note: When pulse trains >= 1.6 s are configured, the LED assigned to the output remains "red" as these pulse trains are not monitored (e.g. PPM, PPH ...).

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

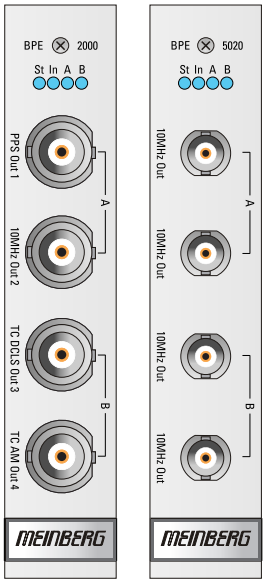


Figure right: BPE Outputs

BPE-2000 Standard outputs - BNC female:
PPS, 10 MHz, TC DCLS and TC AM

BPE 5000 Fiber Optic ST-Connectors
PPS, 10 MHz, TC DCLS und 2048kHz

11.8.13.2 Available BPE Modules

BPE Type	Connectors	Signals	Size
BPE-1040	4 x BNC female	Out 1 - Out 4: TC AM	4HP
BPE-1060 [1]	4 x BNC female	Out 1 - Out 4: DCF77 SIM	4HP
BPE-2000	4 x BNC female	Out 1: PPS, Out 2: 10 MHz Out 3: TC DCLS, Out 4: TC AM	4HP
BPE-2001	4 x BNC female	Out 1: PPS, Out 2: 10 MHz 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: 10 MHz	4HP
BPE-2016 [2]	4 x BNC Buchse	Out 1 - Out 4: progr. Pulses_1 10 V_{PP} an 50 Ω	4TE
BPE-2020	4 x BNC female	Out 1 - Out 4: 10 MHz	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: 2048 kHz	4HP
BPE-2090	4 x BNC female	Out 1 - Out 4: progr. Pulses	4HP
BPE-2091 [3]	4 x BNC female	Out 1 - Out 4: progr. Pulses_1	4HP

(1) When using the BPE-1060 module, important configuration parameters must be observed. In the web interface, you must set the mode to DCF77 Marks in the "Clock → Programmable Pulse Outputs → Prog. Out 1" menu. In the drop-down box "Signal" the setting Normal is to be selected. In the menu "Clock → Time Zone → Time Zone for external Outputs" the *Local Time Zone* must be selected.

If the corresponding time zone does not exist in this drop-down box, the time zone can be added manually in the menu "System → Display → Edit Time Zone Table".

Also see BPE-1060 4 x SIM77

(2) The outputs can be set by jumpers. Possible options are: PPS, Time Code DCLS, PPO_0, PPO_1, PPO_2 and PPO_3. Default jumper setting of this card is 4 x PPO_0 (Progr. Output 1 in the web interface).

(3) All four outputs of this BPE module have to be configured via the upstream receiver. In the web interface, the configuration of the output signals can be carried out via the menu "Clock → Programmable Pulse → Prog. Out 1". Here the option "PTTI 1PPS" must be selected to get a pulse length of 20μs.

BPE Type	Connectors	Signals	Size
BPE-2110	8 x BNC female	Out 1 - Out 8: PPS	8HP
BPE-2120	8 x BNC female	Out 1 - Out 8: 10 MHz	8HP
BPE-2180	8 x BNC female	Out 1 - Out 8: 2048 kHz	8HP
BPE-2500	4 x 2pin DFK PhotoMOS 1 x BNC female	Out 1 - Out 4: Progr. Pulse Out 5 - TC AM	4HP
BPE-2600	4 x 2pin DFK	Out 1: PPS, Out 2: 10 MHz Out 3: TC DCLS, Out 4: TC AM	4HP
BPE-2700	4 x 2pin DFK Opto Coupler 1 x BNC female	Out 1 - Out 4: Progr. Pulses Out 5 - TC AM	4HP

BPE modules with serial ports (D-SUB9 jacks)

BPE Type	Connectors	Signals	Size
BPE-3014	2 x D-SUB9 female	Out 1, Out 2: TC DCLS RS-422 Level	4HP
BPE-3050 [4]	2 x D-SUB9 female	Out 1, Out 2: Progr. Pulse RS-422 Level	4HP
BPE-3412	1 x D-SUB9 female 2 x BNC female	Out 1: Progr. Pulses, RS-422 Out 2, Out 3: TC AM	4HP
BPE-3422	4 x D-SUB9 female	Out 1 - Out 4: 1MHz RS-422 Pegel	8HP
BPE-3424	4 x D-SUB9 female	Out 1 - Out 4: TC DCLS RS-422 Pegel	8HP
BPE-3082	4 x D-SUB9 female	Out 1 - Out 4: 2048 kHz sine	8HP

(4) The outputs COM A and COM B are configured via the upstream receiver in the web interface (Menu "Clock → Programable Pulses → Prog. Out 1"). The programable pulses PP_0 of the clock are connected to both outputs of the BPE-3050 via the backplane.

BPE Type	Connectors	Signals	Size
BPE-4043	4 x RJ45	RS422, Pin_3 T-, Pin_6 T+	4HP
BPE-6042	2 x DMC 16-pin	10 x PPO - RS-422 galvanic isolated	4HP
Fiber-Optical Outputs			
BPE-5000	4 x FST	PPS, 10 MHz, TC-DCLS, 2048 kHz FO Multimode	4HP
BPE-5010	4 x FST	PPS / FO Multimode	4HP
BPE-5014	4 x FST	2 x PPS + 2 x 10 MHz / FO Multimode	4HP
BPE-5020	4 x FST	10 MHz / FO Multimode	4HP
BPE-5030	4 x FST	TC DCLS / FO Multimode	4HP
BPE-5032	4 x FST	TC DCLS / FO Singlemode	4HP
BPE-5080	4 x FST	2048 kHz / FO Multimode	4HP
BPE-5082	4 x FST	PPS, 10 MHz, 2 x 2048 kHz FO Multimode	4HP
BPE-5090	4 x FST	PPO / FO Multimode	4HP

11.8.13.3 Configuring an BPE expansion card via the Web Interface

A simple BPE expansion card usually gets its signals directly from the internal backplane of the system. The output signals of the card are pre-configured according to customer requirements.

If an output signal has to be changed, this must be done via the pre-connected receiver - in the menu "Clock → Switch Card" if you have a redundant system or in the menu "Clock → Receiver" in systems with only a single receiver. The BPE modules have no direct configuration options. This information is also displayed in the "IO Config" menu.

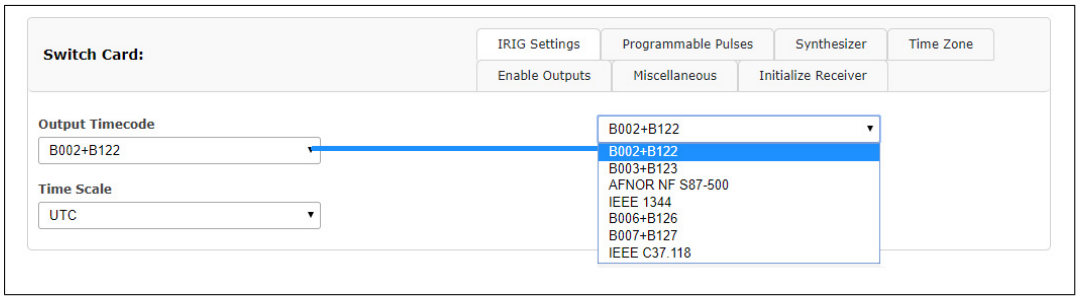


Figure: menu "Clock → Switch Card → IRIG Settings"

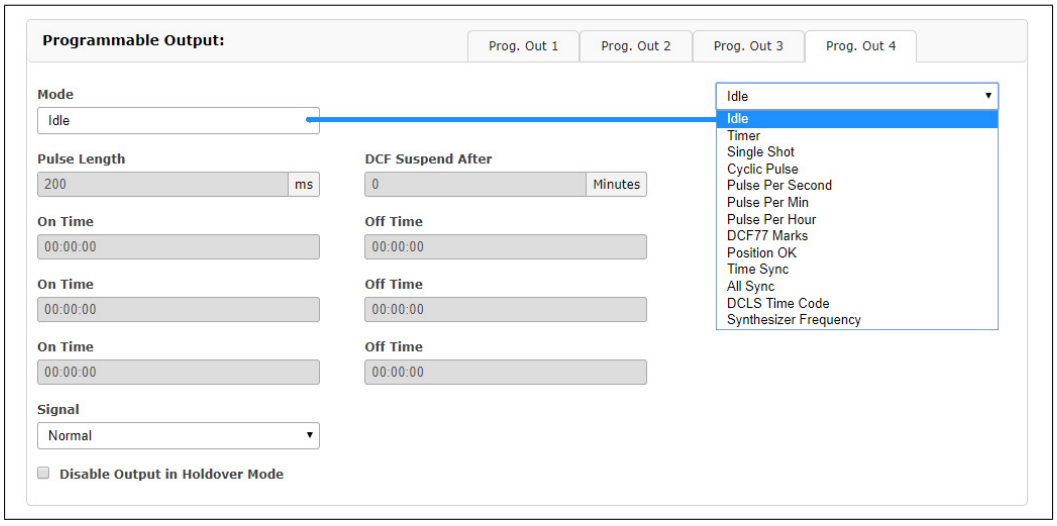


Figure: menu "Clock → Programmable Pulses → Selection of Idle mode"

11.8.13.4 BPE-8000 - Switchable Backplane Port Expander

Output Signals: adjustable via the web interface (TTL or Fiber Optical):
PPS, 10 MHz, 2048 kHz, TC-DCLS, Progr. Pulses
or fixed:
2048 kHz (ITU G.703-15), TC-AM

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

Status Indicators

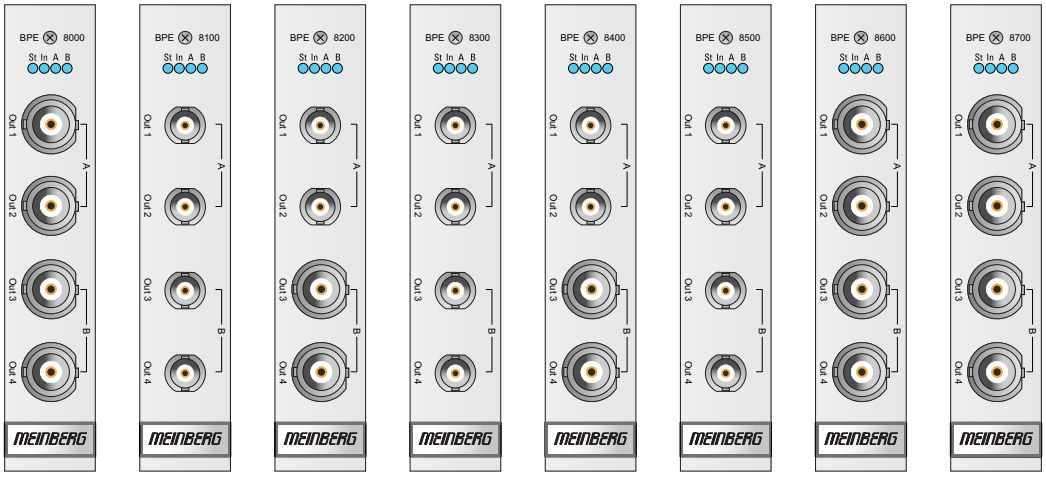
LED St:	BPE status
LED In:	Status of the backplane's output signals
LED A:	BPE status - output signals (1 + 2)
LED B:	BPE status - output signals (3 + 4)

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

Available BPE-8000 Models



BPE Module	Connectors	Signal Outputs
BPE-8000	4x BNC female	TTL
BPE-8100	4x ST	Fiber Optic - Multimode
BPE-8200	2x ST, 2x BNC female	2x Fiber Optic - Multimode, 2x TTL
BPE-8300	4x ST	Fiber Optic - Singlemode
BPE-8400	2x ST, 2x BNC female	2x Fiber Optic - Singlemode, 2x TTL
BPE-8500	4x ST	2x Fiber Optic - Multimode, 2x Fiber Optic - Singlemode
BPE-8600	4x BNC female	2048 kHz (ITU G.703-15 - 75 Ω unbalanced) *
BPE-8700	4x BNC female	3x TTL, 1x Modulated Time Code - TC-AM **

* Fixed outputs, no signal selection possible.

** BNC sockets Out 1 - Out 3 are freely programmable, Out 4 is permanently set to TC AM.

11.8.13.5 Configuring an BPE-8000 expansion card via the Web Interface

Via the web interface or the Meinberg Device Manager (MDU), the following signals can be distributed to the BNC connectors (TTL) or fiber optical connectors (ST) according to your choice: PPS, 10MHz, Time Code DCLS, 2048 kHz and programmable pulse outputs PP 1 - PP 4 of the upstream reference source. With the programmable pulse outputs, each output channel of the pulse generator (IMS receiver) can now also be switched through to all available connectors of the BPE (for example PP 1 to Out 1 - Out 4 of the BPE).

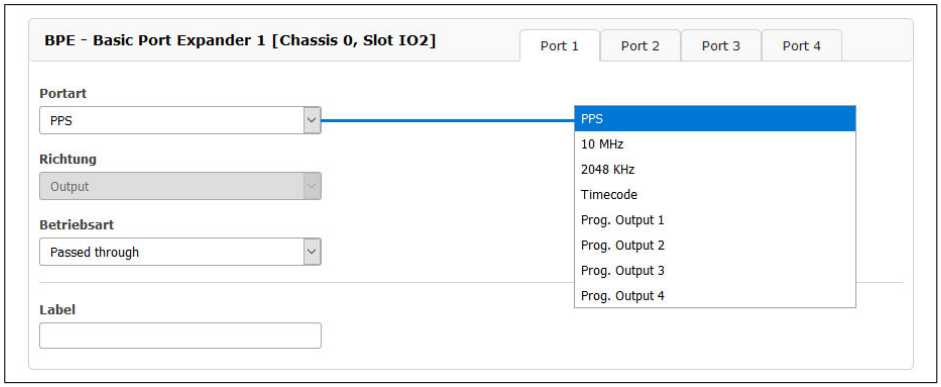
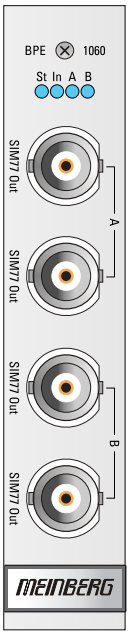


Figure: Web interface menu "IO Config → Output Configuration"

11.8.13.6 BPE-1060 4 x SIM77

Backplane Port Expander (Frontend / Backend)



Output Signals: fixed: Out 1 - Out 4: SIM77 (DCF77 compatible Signal)
via isolated female BNC connectors (-60 dBm)

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)

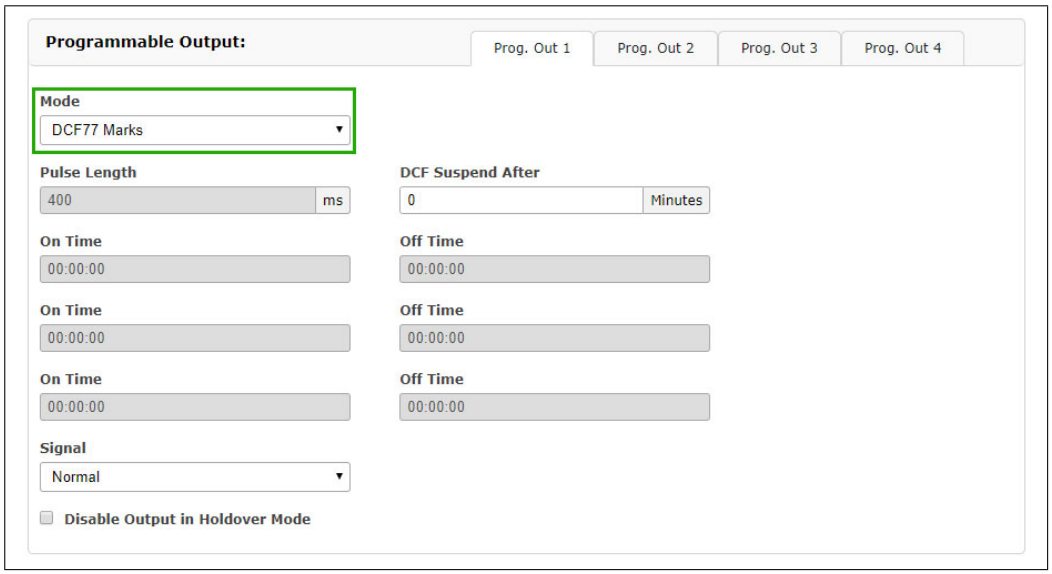
Initialisation: LED St: blue until USB is configured
LED In - LED B: off until USB is configured

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

SIM77 - amplitude-modulated time signal

The amplitude-modulated time signal is compatible with the DCF77 signal, transmitted by the German long-wave transmitter. The SIM77 signal is provided via four DC insulated BNC sockets.

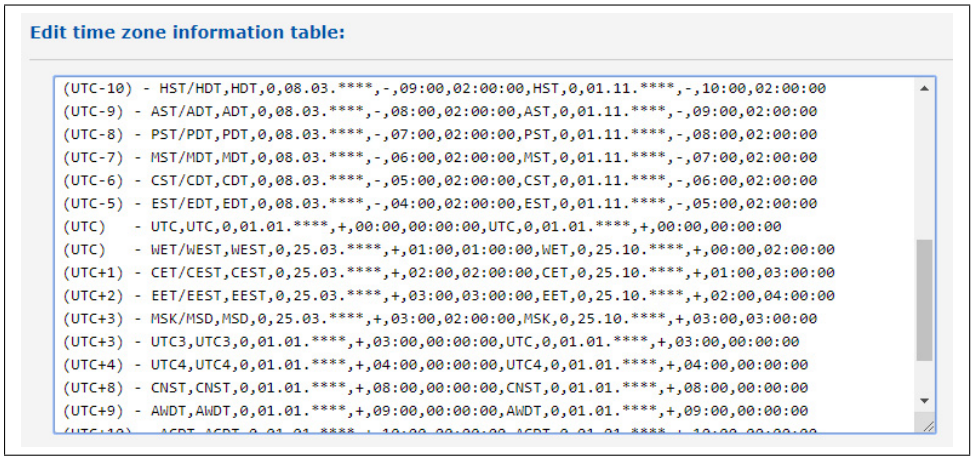


Note:
Important configuration parameters must be observed when using the BPE-1060 module in an IMS system. In the Web Interface, in the menu "Clock → Programmable pulse outputs → Prog. Out 1", the mode must be set to *DCF77 Marks*. In the "Signal" drop-down box, select *Normal* (see figure right).

The local time zone must be selected in the menu "Clock → Time Zone → Time Zone for External Outputs".

If the corresponding time zone is not available in this drop-down box, the time zone can be added manually in the menu "System → Display → Edit time zone table".

In the example below, several time zones are entered with the changeover rule for summer and winter time.



Please note, that these settings will also affect other output modules which provide the programmable pulse output "Prog. Out 1".

11.8.13.7 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 RS-232, RS-422 or RS-485 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:
10 MHz, 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

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	time sync but not accurate
	green	time sync and accurate
LED A:	green	currently not used
LED B:	green	currently not used

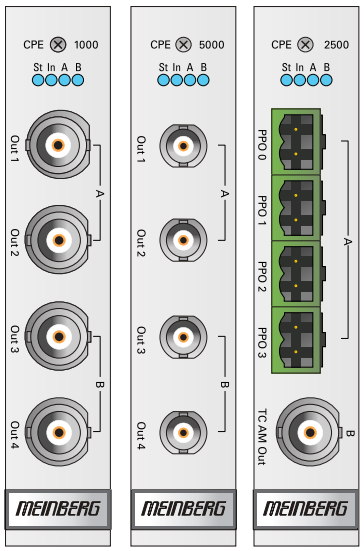


Figure: CPE Frontends
CPE-1000: 4 config. outputs via BNC female
CPE-5000: 4 config. outputs / FO - ST connectors
CPE-2500: 4 x prog. Pulses (DFK-2) / 1 x TC AM (BNC)

11.8.13.8 Available CPE Modules

BPE Type	Connectors	Signals	Size
CPE-1000	4 x BNC female	prog. pulses	4HP
CPE-1002	1 x D-SUB9 2 x BNC female	Time Telegram, RS232 Capture Inputs	4HP
CPE-1040	4 x BNC female	TC AM / BNC	4HP
CPE-1050	4 x BNC female	3 x progr. pulses, 1 x TC AM	4HP
CPE-2500	4 x DFK 2-pin PhotoMos 1 x BNC female	progr. Pulse TC AM	4HP
CPE-3000	2 x D-SUB9	serial timestring RS-232 + PPO	4HP
CPE-3010	2 x D-SUB9	serial timestring RS-422	4HP
CPE-3020	2 x D-SUB9	serial timestring RS-422 + PPO	4HP
CPE-3030	2 x D-SUB9	serial timestring RS-485	4HP
CPE-3040	2 x D-SUB9	serial timestring RS-485 + PPO	4HP
CPE-3050	2 x D-SUB9	PPO - RS-422	4HP
CPE-3060	2 x D-SUB9	serial timestring RS-422 + PPO	4HP
CPE-4020	2 x RJ45	serial timestring RS-422 + PPS	4HP
CPE-5000	4 x FST female	prog. pulses / fiber optical	4HP

11.8.13.9 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:

	CPE-3000	CPE-3010	CPE-3020	CPE-3030	CPE-3040	CPE-3050	CPE-3060	
	COM A, COM B	COM A, COM B	COM A, COM B	COM A, COM B	COM A, COM B	COM A, COM B	COM A	COM B
PIN	**Time String (RS-232) +PPO**	**Time String (RS-422)**	**Time String (RS-422) + PPO (RS-422)**	**Time String (RS-485)**	**Time String (RS-485) + PPO (RS-422)**	**PPO (RS-422)**	**Time String (RS-232) + PPO (TTL)**	**Time String (RS-422) + PPO (RS-422)**
1	PPO	RxD +	RxD +	-	-	-	PPO	RxD +
2	TxD	RxD -	RxD -	-	-	-	TxD	RxD -
3	RxD	-	TxD +	-	TxD + / RxD +	-	RxD	TxD +
4	-	-	TxD -	-	TxD - / RxD -	-	-	TxD -
5	GND	GND	GND	GND	GND	GND	GND	GND
6	-	-	-	-	-	-	-	-
7	-	TxD +	PPO +	TxD + / RxD+	PPO +	PPO +	-	PPO +
8	-	TxD -	PPO -	TxD - / RxD -	PPO -	PPO -	-	PPO -
9	-	-	-	-	-	-	-	-

11.8.13.10 CPE - Configuration via Web Interface

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

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

CPE Configuration

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 - 10 MHz
IRIG Code	Generated IRIG output codes (B002+B122 ...)
Prog. Out	Programmable output Prog. Out 1 - Prog. Out 4

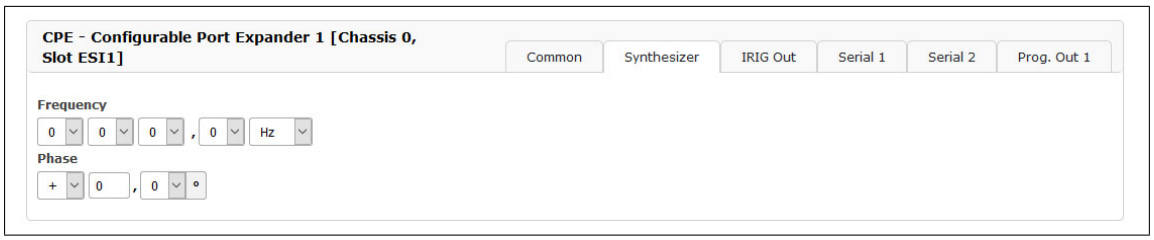


Figure: Menu Tab "Synthesizer" Frequency for selecting the Frequency Synthesizer option in the menu "Prog. Out"

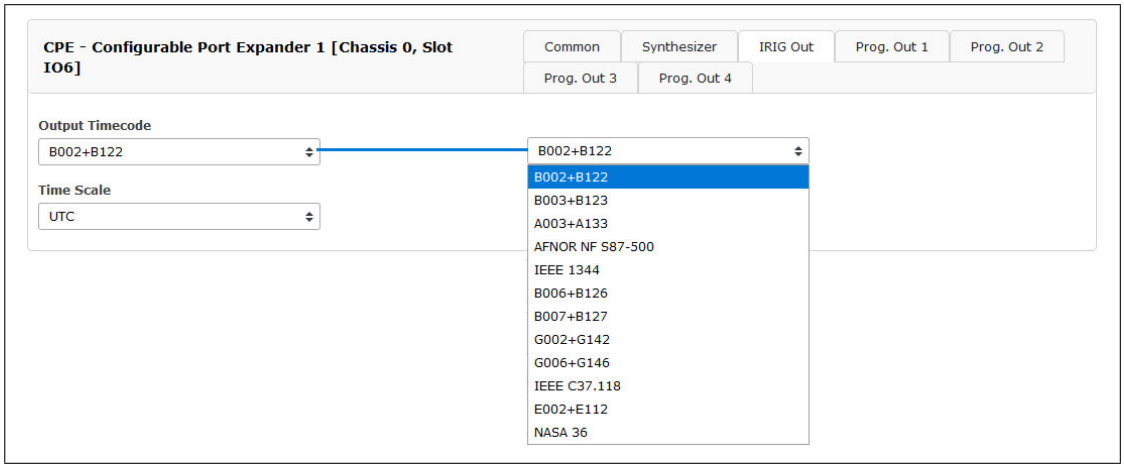


Figure: Menu Tab "IRIG Out" Selection of the IRIG code (IRIG DCLS only)

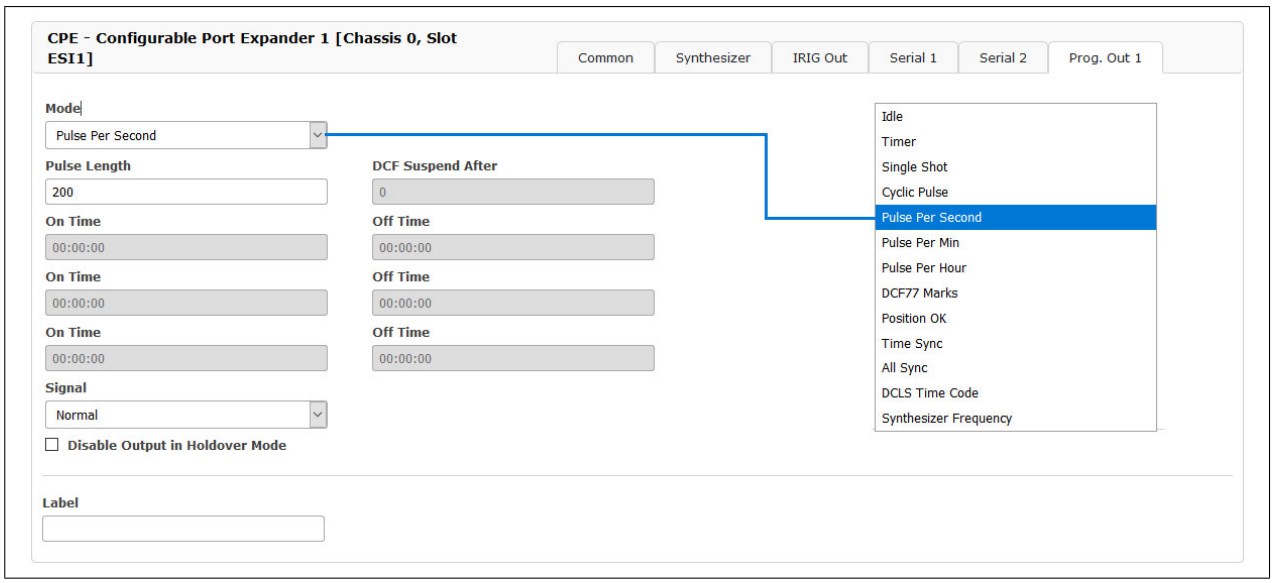


Figure: Menu Tab "Prog. Out" Selection of the signal option for the programmable pulse output (PPO)

The following programmable pulse outputs can be selected:

Idle (not in use)
Timer (3 switching-times On - Off)
Single Shot (pulse length and start time)
Cyclic Pulse (pulse length and cycle time)
Pulse Per Second (pulse length)
Pulse Per Minute (pulse length)
Pulse Per Hour (pulse length)
DCF77 Marks (timeout)
Position OK (position determined)
Time Sync (clock synchronized)
All Sync (position determined and clock synchronized)
DCLS Time Code
Synthesizer Frequency

11.8.13.11 CPE-4020: Programmable Outputs via serial Interface

The module CPE-4020 has two interfaces with RJ45-connector (COM A and B). These provide Time String + PPS with RS-422 level. The following configurations must be performed to correctly output the signals.

Baud Rate 19200

Framing 8N1

String Type Meinberg GPS

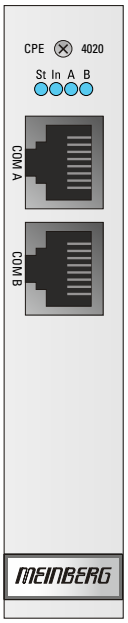
Mode per second (PPS)

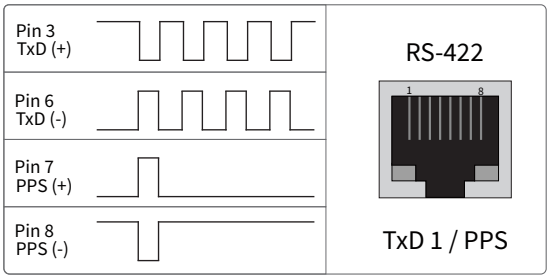
Pin assignment
Pin 3: TXD_P, serial interf. transmit pos.
Pin 5: GND (Ground)
Pin 6: TXD_N, serial interf. transmit neg.
Pin 7: SYNC_P, PPS transmit, pos.
Pin 8: SYNC_N, PPS transmit, neg.

Current Consumption: 5 V +-5%, 150 mA

Connection type: 8P8C (RJ45)

Cable: Copper twisted pair,
e.g. CAT 5.0





11.8.13.12 CPE-4020 Configuration via Web Interface

If the CPE-4020 operates in an IMS system, the output configuration can easily be done via the web interface then.

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

Configuration: CPE-4020
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 Synthesizer range 1 Hz - 10 MHz
IRIG Code: Generated IRIG output codes (B002+B122 ...)
Serial: Serial connection parameters
Prog. Out: Programmable outputs Prog. Out 1 and Prog. Out 2

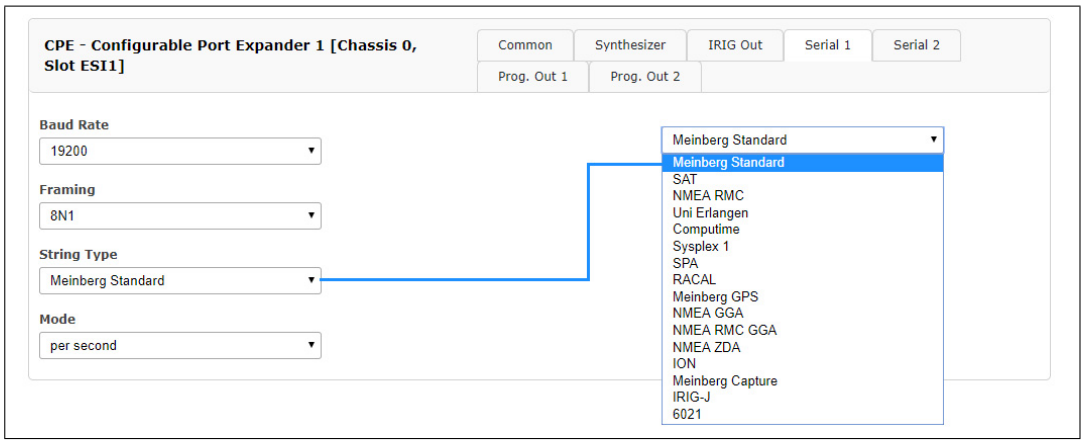


Figure: Serial connection parameter settings

The following programmable pulse outputs can be selected:

Idle (not in use)
Timer (3 switching-times On - Off)
Single Shot (pulse length and start time)
Cyclic Pulse (pulse length and cycle time)
Pulse Per Second (pulse length)
Pulse Per Minute (pulse length)
Pulse Per Hour (pulse length)
DCF77 Marks (timeout)
Position OK (position determined)
Time Sync (clock synchronized)
All Sync (position determined and clock synchronized)
DCLS Time Code
Synthesizer Frequency

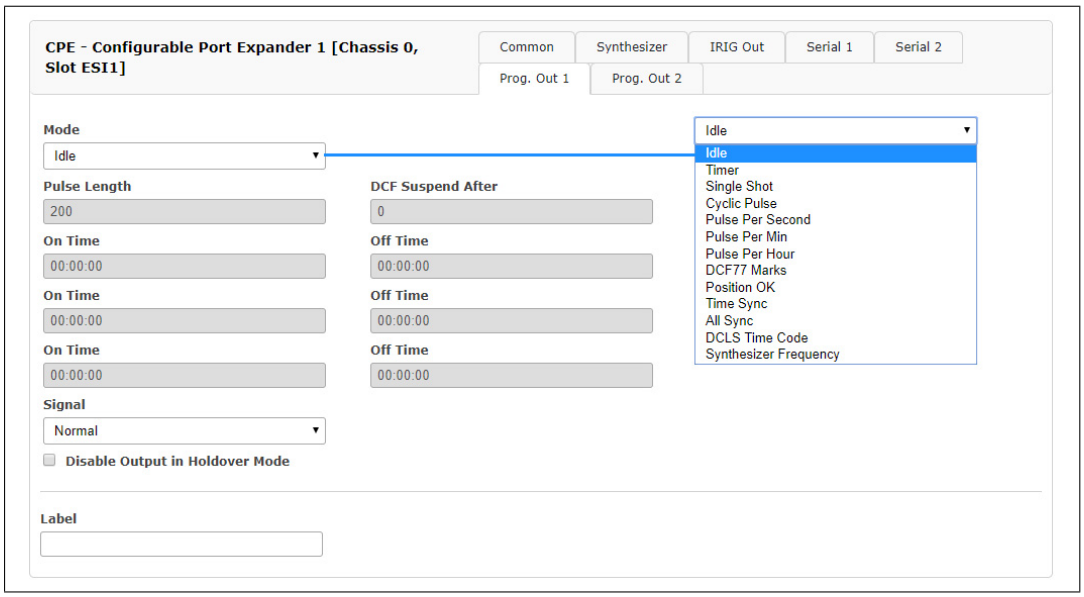
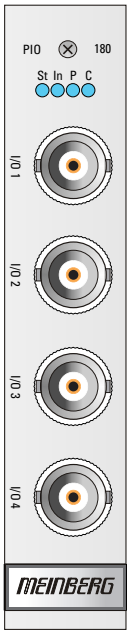


Figure: Selection of programmable pulse outputs

11.8.14 PIO180 - PPS or 10 MHz I/O Module

Technical Specifications:

Connectors:	4 x BNC female, isolated, individually switchable as input or output
Signal Options:	PPS or 10 MHz

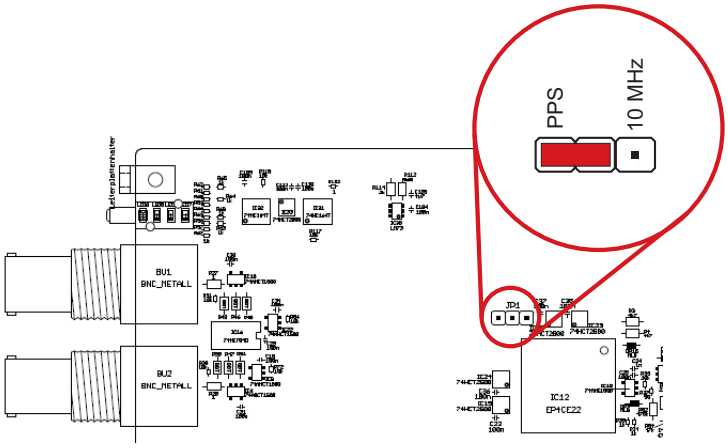


Status Indicators

LED St:	PIO status
LED In:	Status of the backplane's output signals
LED P:	display for preset PPS
LED C:	display for preset 10 MHz
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: 0,5 sec. red -> 0,5 sec. yellow -> 0,5 sec. green -> 0,5 sec. off
Normal Operation:	LED St. + LED In: green LED P: green, if card is preset to PPS LED C: green, if card is preset to 10 MHz

11.8.14.1 Pre-selection (PPS, 10 MHz)

Before installing the PIO180 module, select the required signal using the jumper setting (PPS or 10 MHz). Upon delivery all ports are preset to PPS (Pulse Per Second).

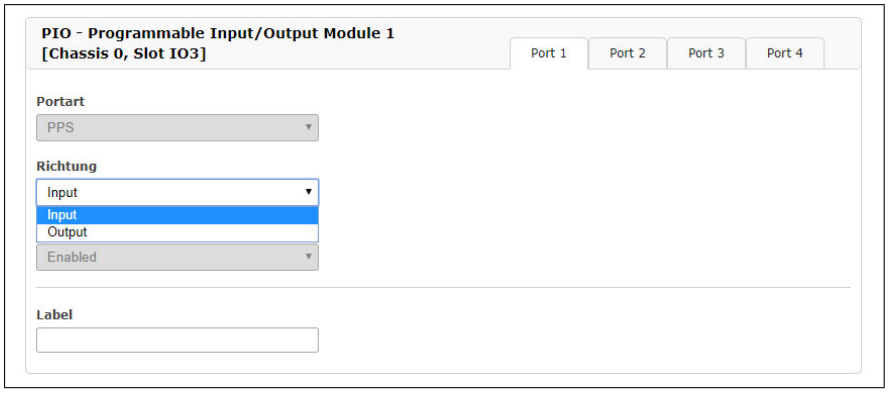


Information:

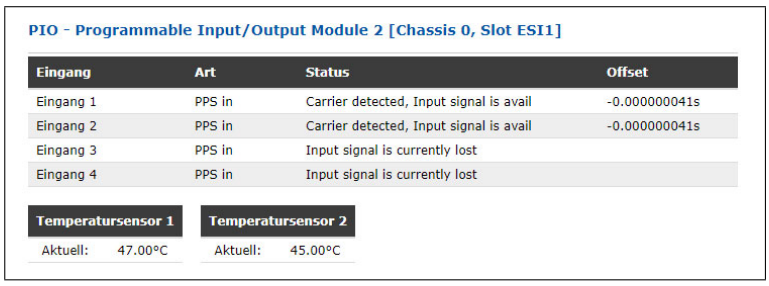
Mixed operation is not possible. All inputs/outputs are set to either PPS or 10 MHz.

11.8.14.2 PIO - Configuration via the Web Interface

In the "IO Config" menu of the web interface, each port of the PIO180 can be set separately to "Input" or "Output. To use the individual ports in **SyncMon**, the direction "Input" must be selected.



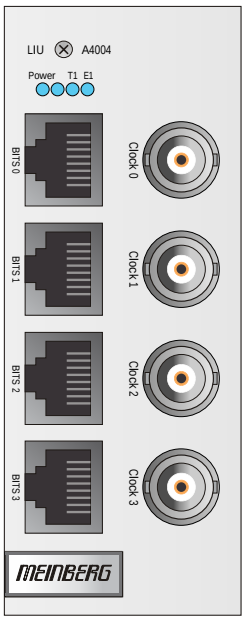
Via the web interface, each port can be set separately to "Input" or "Output". If a port is set to "Output", the system PPS or the 10 MHz reference frequency is output signal at this port. If a port is set to "Input" the incoming signal is compared to the system PPS or to the 10 MHz reference frequency. The offset values are displayed in the status window.



Download the Setup Guide on the PIO180 product page for more detailed information about the configuration and status monitoring options of the PIO180.

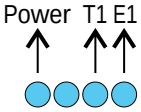
Download of the PIO180 Setup Guide:
https://www.meinbergglobal.com/download/docs/manuals/english/ims-pio.pdf

11.8.15 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

LED Indicators



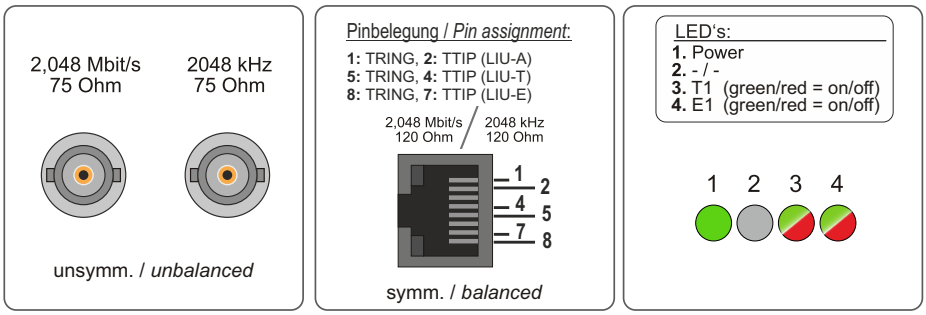
Power:	Init	blue during initialisation, green in normal operation mode
T1:	green red: yellow:	selected mode T1 output disabled signal quality unknown
E1:	green red: yellow:	selected mode E1 output disabled signal quality unknown

11.8.15.1 IMS-LIU Telecom Output Signals

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

Typical applications are:

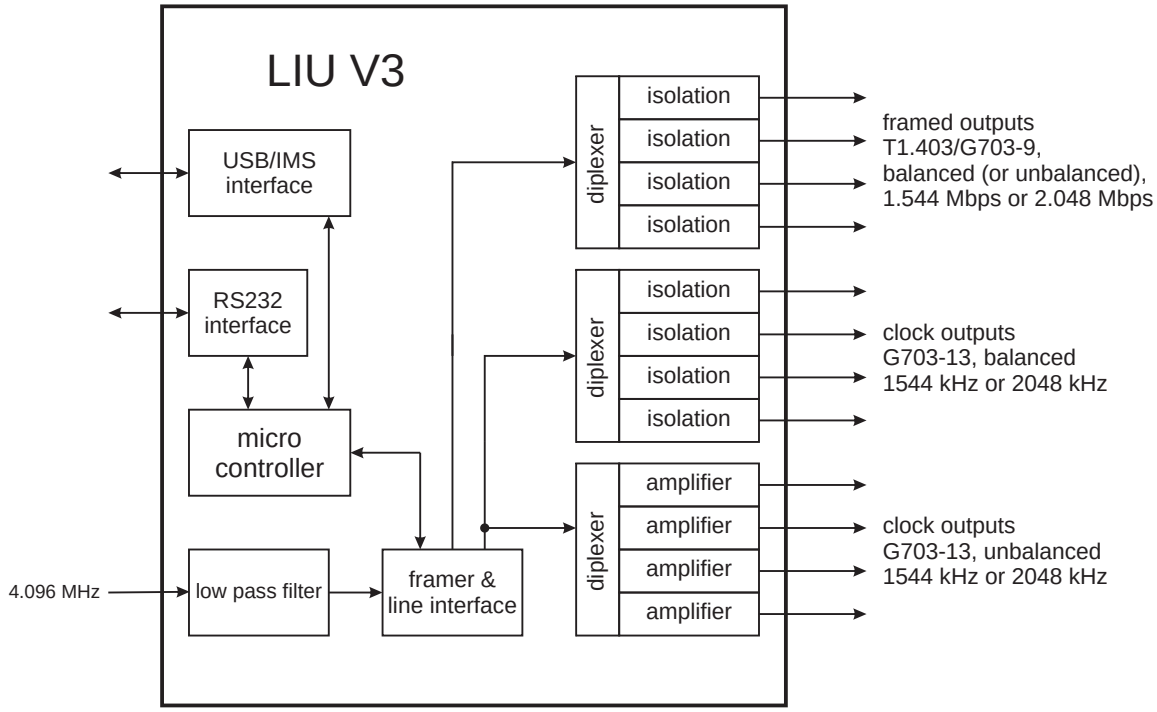
- Measurement and test of synchronization quality of Telecom networks
- Calibration and synchronization of laboratory equipment
- Test of synchronization of radio transmitters / base stations (GSM / CDMA / UMTS / DAB / DVB)



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 pre-connected satellite clock. Depending on the oscillator option of the internal receiver, the accuracies which are described in chapter LIU - Line Interface Unit can be achieved.

11.8.15.2 Block Diagram LIU

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



11.8.15.3 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).

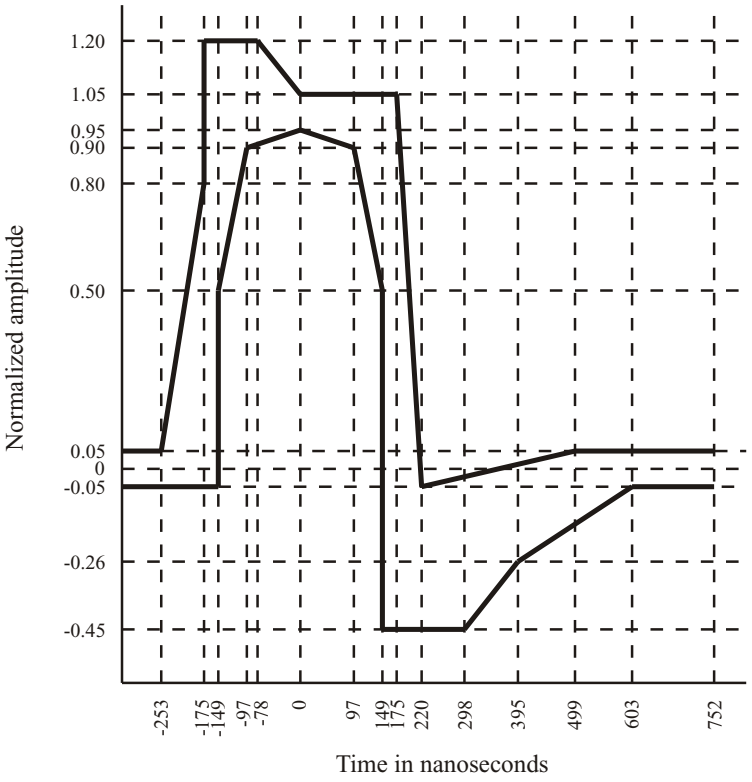
The clock outputs are standard frequencies of either 1544 kHz (T1) or 2048 kHz (E1). Four unbalanced and four balanced outputs according to ITU-T G703-13 (CCITT recommendation "Physical/electrical characteristics of hierarchical digital interfaces") are available via BNC female and RJ45 connectors.

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.

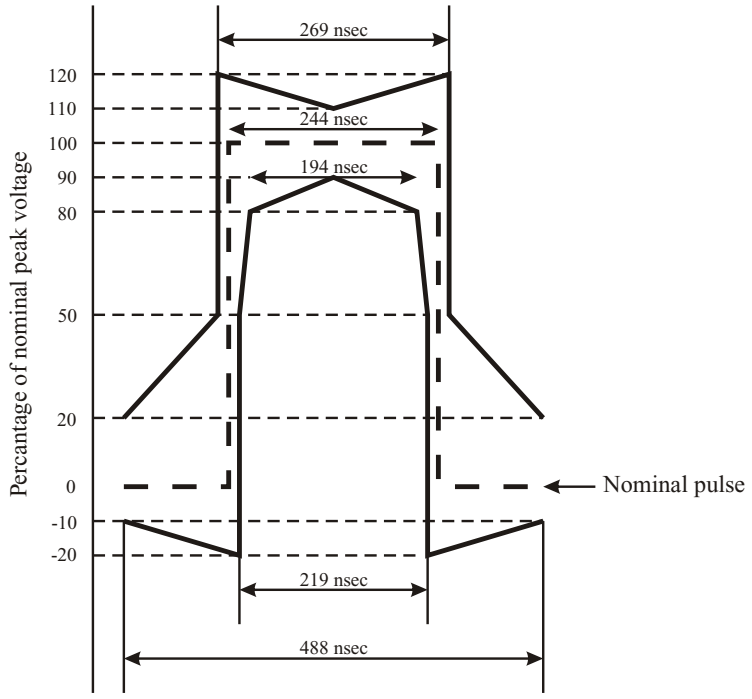
11.8.15.4 Pulse templates

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):



11.8.15.5 LIU - Configuration Samples

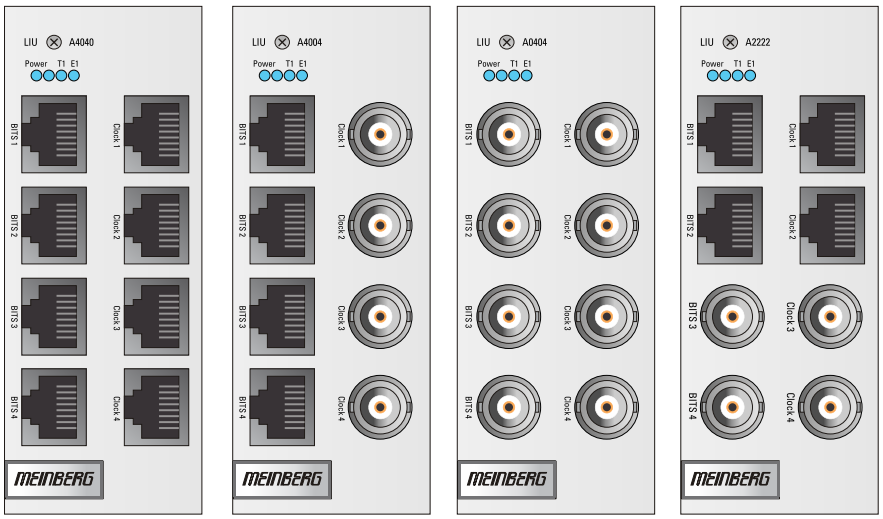
The Line Interface Unit (LIU) is available in two different sizes and different output / connector options. All outputs of a module can be operate in either the E1 or T1 in mode. Signal output settings can be done during operation via the web interface. The selected mode is indicated by the LEDs in the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

11.8.15.6 Overview - LIU Modules for IMS Systems

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



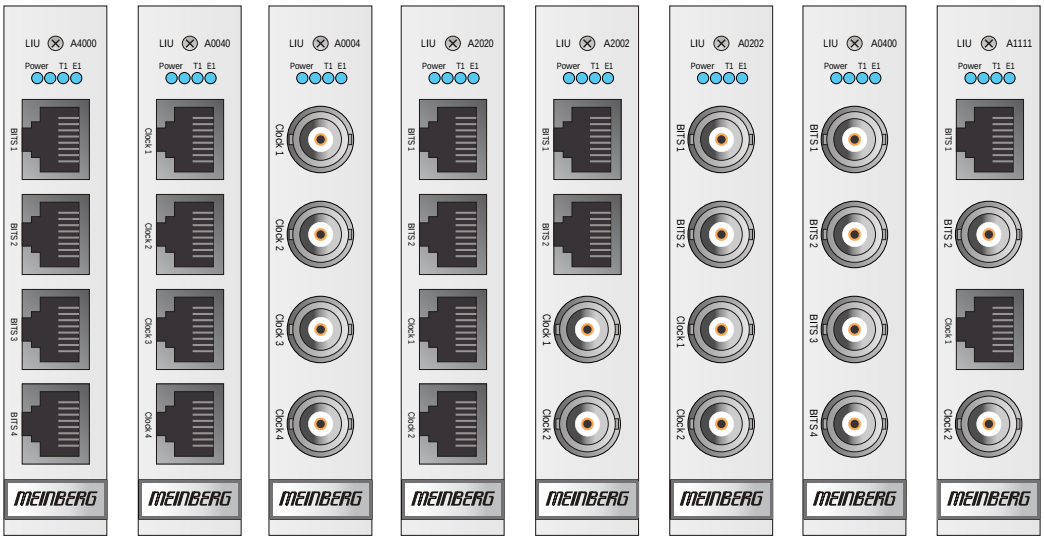
LIU-A4040
BITS (4/0)
Clock (4/0)

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-A4000	4TE	BITS (4/0)	4 x RJ45
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-A0202	4TE	BITS (0/2) Clock (0/2)	2 x BNC 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)

11.8.15.7 IMS - LIU Configuration

E1/T1 – generator available with 4 or 8 outputs
Generation of reference clocks for synchronization tasks. The module LIU (Line Interface Unit) generates different reference clock pulses which are derived from the GPS-locked master oscillator of a preconnected GPS clock. The output signals are available with high accuracy and stability therefore.

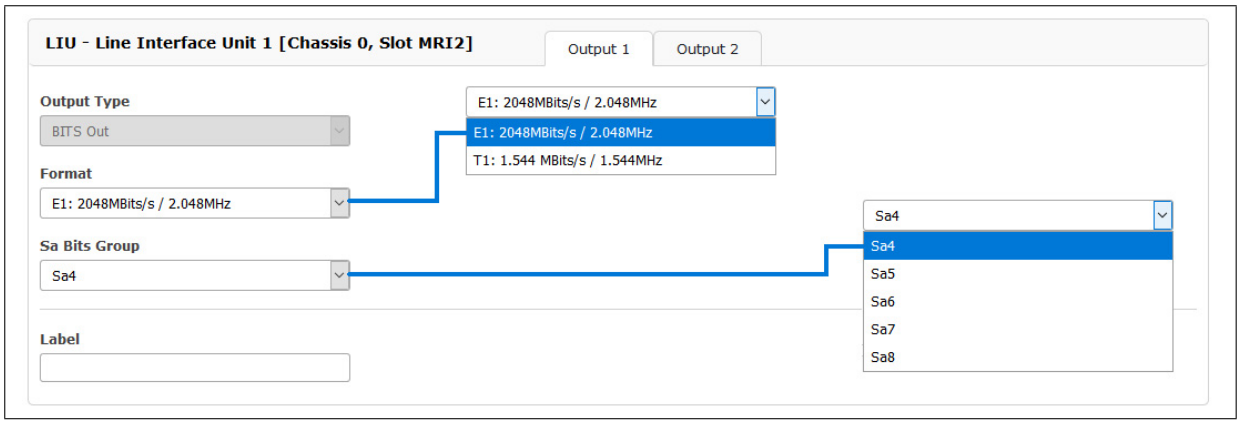


Figure: Configuration of the LIU module via the web interface menu "IO Config → Outputs Configuration"

Output Type

Clock Outputs:	2.048 MHz (E1-mode) or 1.544 MHz (T1-mode), G.703, 75 Ohm, unbalanced or 2.048 MHz (E1-mode) or 1.544 MHz (T1-mode), G.703, 120 Ohm, balanced.
BITS	framed outputs with SSM/BOC support: 2.048 Mbit/s (E1-mode) or 1.544 Mbit/s (T1-mode), 75 Ohm unbalanced or 2.048 MPs (E1-mode) or 1.544 Mbit/s (T1-mode), 120 Ohm, balanced.
Format	E1 framed (2.048 kBit) or T1 framed (1.544 kBit)
Quality	Sa Bit group location of SSM QL bits

With the pull-down menu "Output Configuration" the available outputs of the I/O slots can be configured:

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.

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 default.

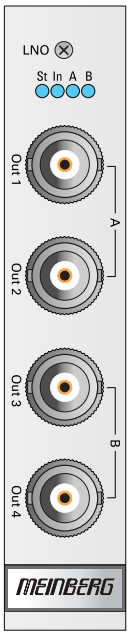
11.8.16 LNO - Sine Wave Outputs with low Phase Noise

The LNO180 is a 10 MHz (5 MHz option) 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 10 MHz 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:



Interface: 4x sine outputs - 10 MHz or 5 MHz

Output Level: 5 dBm +/- 1 dBm at 50Ω
(8 dBm or 12 dBm output level option available)

Warm-up time: < 3 @ 25 °C within accuracy of < +-1 x 10^{-7}

Harmonics: -60 dBc

Phase Noise:

LNO180 OCXO-SQ		
1 Hz	-	80 dBc/Hz
10 Hz	-	100 dBc/Hz
100 Hz	-	130 dBc/Hz
1 kHz	-	140 dBc/Hz
10 kHz	-	150 dBc/Hz

LNO180 OCXO-MQ		
1 Hz	-	85 dBc/Hz
10 Hz	-	110 dBc/Hz
100 Hz	-	135 dBc/Hz
1 kHz	-	143 dBc/Hz
10 kHz	-	155 dBc/Hz

LNO180 OCXO-HQ		
1 Hz	-	93 dBc/Hz
10 Hz	-	126 dBc/Hz
100 Hz	-	140 dBc/Hz
1 kHz	-	145 dBc/Hz
10 kHz	-	165 dBc/Hz

5 MHz Option:

LNO180/5 OCXO-MQ		
1 Hz	-	88 dBc/Hz
10 Hz	-	115 dBc/Hz
100 Hz	-	132 dBc/Hz
1 kHz	-	145 dBc/Hz
10 kHz	-	158 dBc/H

Quartz Filter: Bandwidth 1 kHz

Power Supply:	5 dBm	+5V @ 550 mA (steady state), +5V @ 670 mA (warm up)
	12 dBm:	+5V @ 970 mA (steady state), +5V @ 620 mA (warm up)

LED Status Indicators:

All LEDs red	Outputs disabled PLL not locked, OCXO in warm up phase
	10 MHz 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

11.8.17 REL1000 - Error Relay Module

The IMS-REL1000 is used as an error relay module that can be used to switch a variety of operating states (e.g. Clock Not Sync, Antenna Faulty, etc.). If the internal hardware clock is running synchronously to the reference source, the relay will switch to NO (Normaly Open) mode. In the event of an error, the relay will switch to NC (Normaly Closed) mode.

Functionality.

Depending on the IMS system, is redundant with two reference clocks and IMS-RSC module (switching unit) or with one reference clock and SPT module, different relay states can be switched. There is also the possibility to set the relays A + C by different events.

Additional documentation for the REL1000:

The setup guide supports you in a quick initial operation.

https://www.meinberg.de/download/docs/manuals/english/ims-rel.pdf

The LANTIME firmware manual provides a complete description of all configurations and status monitoring options of your Meinberg product.

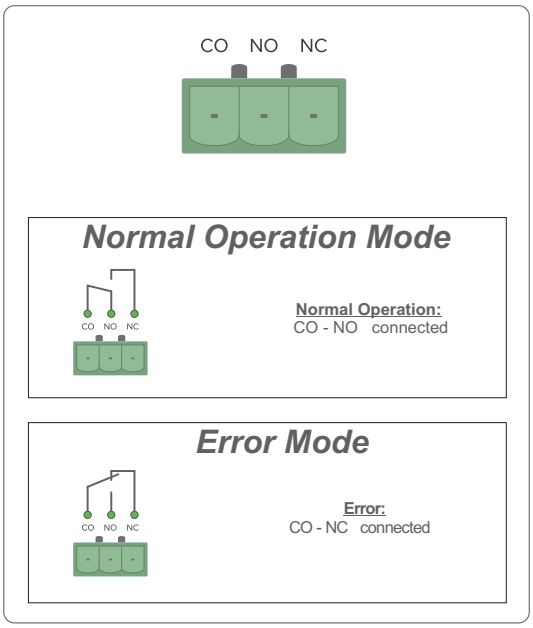
Download LTOS7 Firmware manual:
http://www.mbg.link/doce-fw-ltos

11.8.17.1 Error Relay

The illustration on the right shows the two switching states of an error relay.

Technical specification

Switching voltage max.:	220 V DC 250 V AC	
Switching current max.:	2 A	
Switching load max.:	60 W 62.5 VA	
FCC surge breakdown voltage between contacts and coil	1,500 V	
Max. operating speed (at rated load)	60 cpm	
Switching current UL/CSA:	0.3 A 0.3 A 1 A	125 V AC 110 V DC 30 V DC
Response Time:	ca. 3 ms	



Danger!

This equipment is operated at a hazardous voltage.

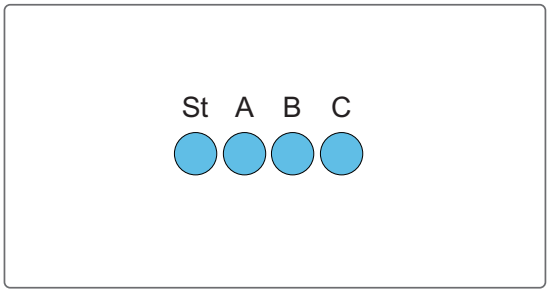
Danger of death from electric shock!

- Hazardous voltages may be passing through the terminal of the fault
- Never work with open terminals and plugs while the power is on!
- When handling the connectors of the error relay cable, always disconnect both ends of the cable from their respective devices! signal relay! Never handle the fault signal relay terminal while the signal voltage is present!

11.8.17.2 REL1000 - Status LEDs

Status indicator

LED St:	Status of the REL1000
LED A:	Status of Relais A
LED B:	Status of Relais B
LED C:	Status of Relais C



The status messages are as follows:

LED St:

Blue	During initialization
Green	During operation

LED A - Status *Relais A*
Initialization: 1 Sek. red -> 1 Sek. yellow -> 1 Sek. green -> 1 Sek off

Green flashing	*Normal Operation Mode*
Red flashing	*Error-Mode*

LED B - Status *Relais B*
Initialization: 1 Sek. red -> 1 Sek. yellow -> 1 Sek. green -> 1 Sek off

Green flashing	*Normal Operation Mode*
Red flashing	*Error-Mode*

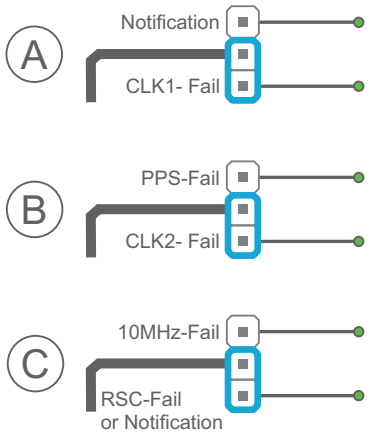
LED C - Status *Relais C*
Initialization: 1 Sek. red -> 1 Sek. yellow -> 1 Sek. green -> 1 Sek off

Green flashing	*Normal Operation Mode*
Red flashing	*Error-Mode*

11.8.17.3 Pre-selection

Depending on whether the IMS system is redundantly equipped with RSC module and two reference clocks or with an SPT module with only one reference clock, different relay states can be selected. This must be selected by setting the jumper before installing the REL1000 module.

Jumper setting in redundant operation.
In redundant operation, the jumpers on the REL1000 are set as follows on delivery (see Fig. blue mark). Both clocks and the switchover unit are monitored.



Jumper setting in operation with one reference clock.
If only one reference clock is used, the jumpers of the REL1000 are set as follows on delivery: (Relay A: CLK1-Fail; Relay B: PPS-Fail; Relay C: 10 MHz-Fail). In addition, relays A + C can also be switched by notifications (events).

Possible configurations of the error output:
Relay A: Clock 1 / event notifications → Relay
Relay B: Clock 2 / PPS
Relay C: 10 MHz / RSC or event notifications → Relay

11.8.17.4 REL1000 - Configuration via the Web Interface

The relays A + C of the REL1000 module can be switched via notifications events. If the jumpers and hardware configuration are set accordingly, a checkbox can be activated in the web interface menu "Notification → Notification Events" for various events, so that the selected relay is switched to error mode on this event.

Selectable events are "NTP not Sync" or "Clock not Sync" for example.

				Triggers								
									RELAY IO6			
Event	Type	Status	Triggered	EMAIL	SNMP	DISP	USER	ALED	REL1	REL2	REL3	
Normal Operation	Info		4d ago	☐	☐	☐	☐					+
NTP Not Sync	Error			☐	☐	☐	☐	☐				+
NTP Sync	Info		4d ago	☐	☐	☐	☐					+
NTP Stopped	Critical			☐	☐	☐	☐	☐				+

In this figure there are no selection options - the relays are switched in redundant operation via the reference clocks and the RSC switch unit.

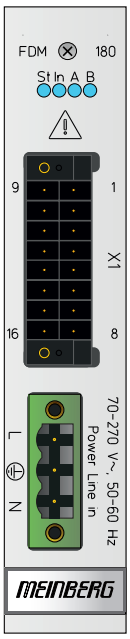
				Triggers								
									RELAY IO3			
Event	Type	Status	Triggered	EMAIL	SNMP	DISP	USER	ALED	REL1	REL2	REL3	
Normal Operation	Info		21d ago	☐	☐	☐	☐					+
NTP Not Sync	Error			☐	☐	☐	☐	☐			☑	+
NTP Sync	Info		21d ago	☐	☐	☐	☐					+
NTP Stopped	Critical			☐	☐	☐	☐	☐			☑	+

This figure shows the menu in a non-redundant system. Relay C can be controlled via notification events.

11.8.18 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
	red	ref not connected / FDM not sync
	yellow	ref. signal not useable
	green blinking	Timesync
	green	Accurate ($\leq$ 200 ns to reference)
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 - 270 V AC, 50Hz or 60Hz

Interface: Two asynchronous serial RS-232 ports, COM0 and COM1
Baudrate: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 Baud
Framing: 7N2, 7E1, 7E2, 8N1, 8N2, 8E1, 7O2
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 (10 MHz) +-100 μHz
time deviation: accuracy of reference (PPS) +- 1ms

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

Electrical connectors: 96-pin VG-rail DIN 41612

Power supply: +5 V DC

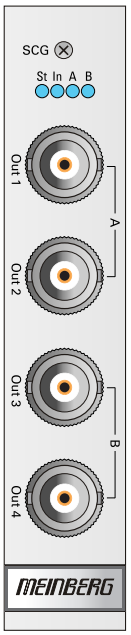
Current consumption: 0.4 A - 1 A

More detailed information about FDM - Frequency Deviation Monitoring can be found in the current LANTIME firmware manual, chapter "LTOS6 Management and Monitoring → FDM".

11.8.19 SCG-U: Studio Clock Generator

Add-On module for generating various audio frequencies (12 kHz, 32 kHz, 44.1 kHz, 48 kHz, 64 kHz, 88.2 kHz and 96 kHz), with only one 10 MHz 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 24 Hz – 12.288 MHz.



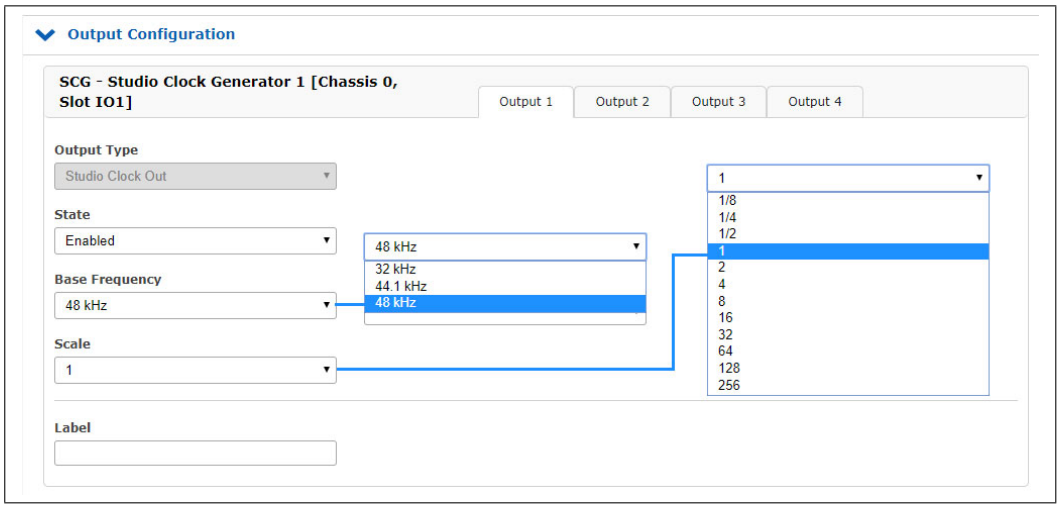
Technical Specifications:

Outputs:	4 x BNC (2.5 V TTL into 75 Ohm) outputs with configurable frequencies
Input Signal:	10 MHz, sinewave or square pulse
Current Consumption:	5 V +- 5%, @400 mA
Ambient Temperature:	0 ... 50 °C / 32 ... 122 °F
Humidity:	85% max.

11.8.19.1 SCG-U: Configuration via Web Interface

(Firmware version 6.19 or later)

If the SCG-U 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:

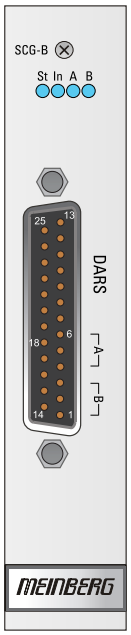
Frequency Out 3 = Base Frequency * Scale
Frequency Out 3 = 44,1 kHz * 1/4
———————————————————
Frequency Out 3 = **11,025 kHz**

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

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

11.8.20 SCG-B: Studio Clock Generator Balanced

The LANTIME IMS M4000 is an additional card for generating "Digi-tal Audio Reference Signals" for studio applications. The 25pin D-Sub female connector provides four DARS outputs, which can be configured via the web interface.

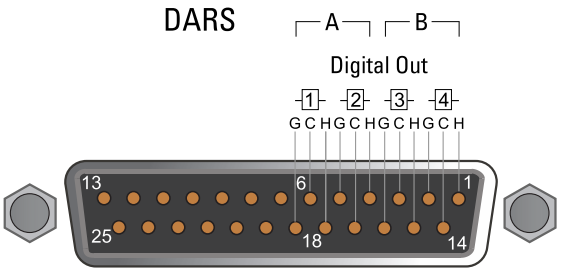


Technical Spezifications:

Outputs:	1 x 25pin female connector, 4 x DARS, IEC 60958-4 format resolution 24 bits, sampling frequency 48 kHz transformer-balanced
Input Signals:	10 MHz (sine wave or square pulse), 1PPS, Time String
Power Consumption:	5 V +- 5%, @400 mA
Environmental Temperature:	0 ... 50 °C / 32 ... 122 °F
Humidity:	max. 85%

Pin Assignment of the 25pin D-SUB female connector

DARS 1	Hot 1	Pin 18
	Cold 1	Pin 6
	GND 1	Pin 19
DARS 2	Hot 2	Pin 4
	Cold 2	Pin 17
	GND 2	Pin 5
DARS 3	Hot 3	Pin 15
	Cold 3	Pin 3
	GND 3	Pin 16
DARS 4	Hot 4	Pin 1
	Cold 4	Pin 14
	GND 4	Pin 2



11.8.20.1 SCG-B: Configuration via the Web Interface

If the SCG-B is used in an IMS system you can easily configure the Studio Clock Generator via the Web Interface.

Sample Configuration: Output 1

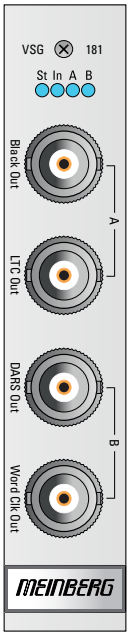
In the menu "IO Configuration" you can set the output on DARS for every output of the LANTIME IMS M4000. The four available outputs can optionally be switched off.

11.8.21 VSG181 - Video Sync Generator

The VSG181 is used as a video signal reference for studio equipment and provides the generated signals at four BNC outputs. These are 1x Bi-Level Sync (Black Burst)/Tri-Level-Sync, 1x Longitudinal Time and Control Code (LTC), 1x Digital Audio Out (DARS), and 1x Word Clock

In order to be able to provide high-precision output signals during the switchover of the RSC (IMS systems with redundant receivers), the VSG181 has its own oscillator.

Features
The VSG181 is synchronized with an external reference frequency (10 MHz), a pulse per second (1PPS) and a time telegram of the preconnected reference. These signals significantly determine the accuracy of the output signals. All output signals can be configured extensively and individually via the web interface. The generated signals have a phase reference to the 1PPS.



Black Burst Output

Output Signal: PAL, NTSC Black Burst
with VITC Support or
Tri-Level-Sync

Signal level: 300 mV_{pp} into 75 Ω (unbalanced)

Formats: Black Burst:
PAL (SMPTE259M/ITU-R BT.470-6)
NTSC (SMPTE170M/ITU-R BT.470-7)
VITC (SMPTE12M-1/SMPTE ST309M)

Tri-Level-Sync:
720p50 Hz (SMPTE296M3)
1080i25 Hz (SMPTE274M6)
720p59.94 Hz (SMPTE296M1)
1080i29.97 Hz (SMPTE274M7)

LTC Output

Signal: LTC

Signal level: TTL, 2.5 V_{pp} (MARK/SPACE) into 75 Ω

Formats: 25 fps, 23,98 fps, 29,97 fps,
29,97 fps Drop Frame

DARS Output

Output signal: DARS

Signal level: TTL, 2.5 V_{pp}
into 75 Ω

Signal type: Base frequencies: 44.1 kHz and 48 kHz

Word Clock Output

Output signal: Word Clock

Signal level: TTL, 2.5 V_{pp}
into 75 Ω

Frequency range: 24 Hz - 12,288 MHz

Base frequencies: 44.1 kHz and 48 kHz

Scaling factor: 0.125, 0.25, 0.5, 1, 2, 4,
8, 16, 32, 64, 128, 256

Status Info: ST: Status of the VSG181
In: Synchronization status
A: Status of the Blackburst output
B: Status of the LTC output

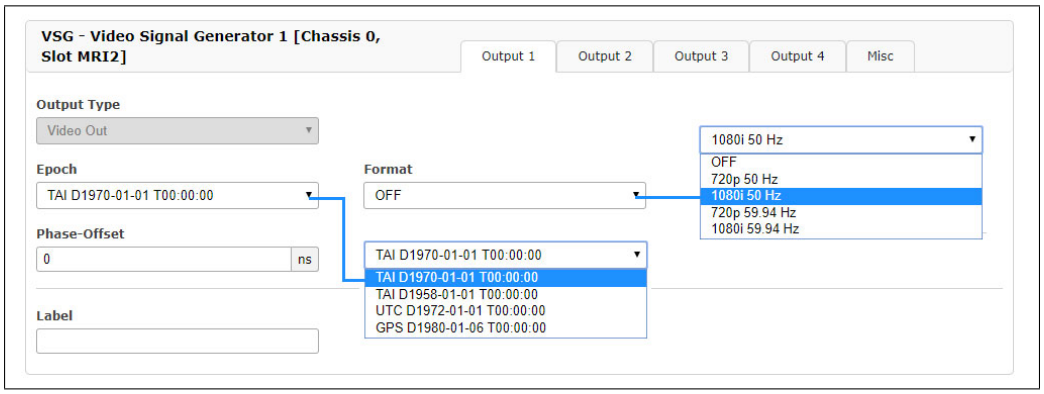
Electrical Connectors: 96-pin VG-rail DIN 41612

Power Consumption: 5 V +- 5%, 250 mA

11.8.21.1 VSG Configuration via Web Interface

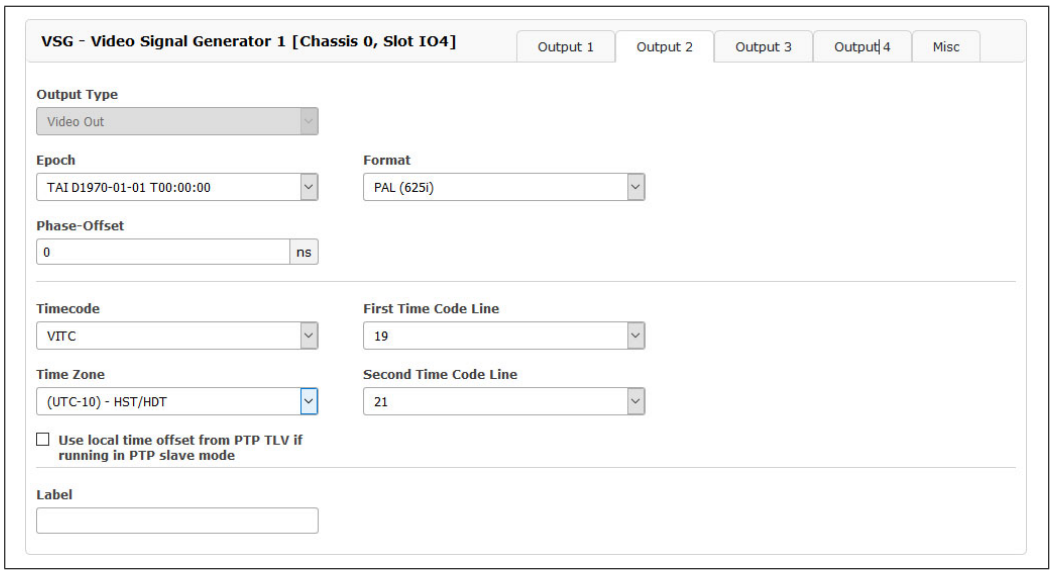
If the VSG operates in an IMS system, the module can be easily configured via the web interface then.

Overview Configuration VSG Video Sync Generator Outputs 1-4



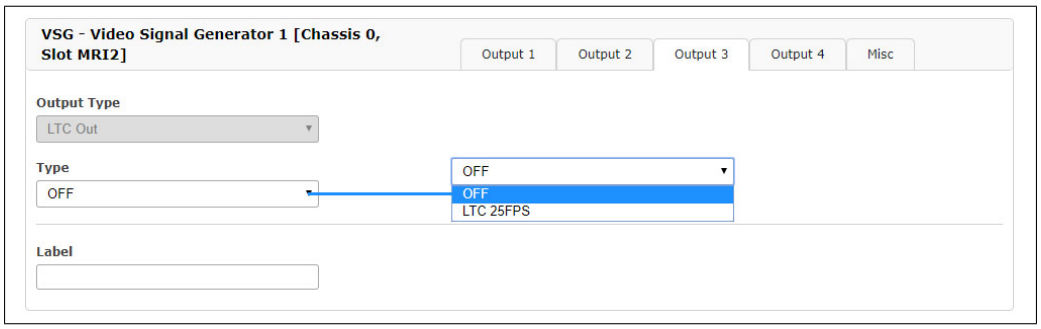
Output 1

Output Type:	Video Out
Epoch:	TAI D1970-01-01 T00:00:00 UTC D1972-01-01 T00:00:00 GPS D1980-01-06 T00:00:00
Format:	720p/50 Hz (SMPTE296M3)(HD) 1080i/25 Hz (SMPTE274M6)(HD) 720p/59,94 Hz (SMPTE296M1)(HD) 1080i/29,97 Hz (SMPTE274M7)(HD)
Phase Offset:	[Offset Value]



Output 2:

Output Type:	Video Out
Epoch:	like Output 1
Format:	NTSC (525i) PAL (625i)
Phase Offset:	[Offset Value]

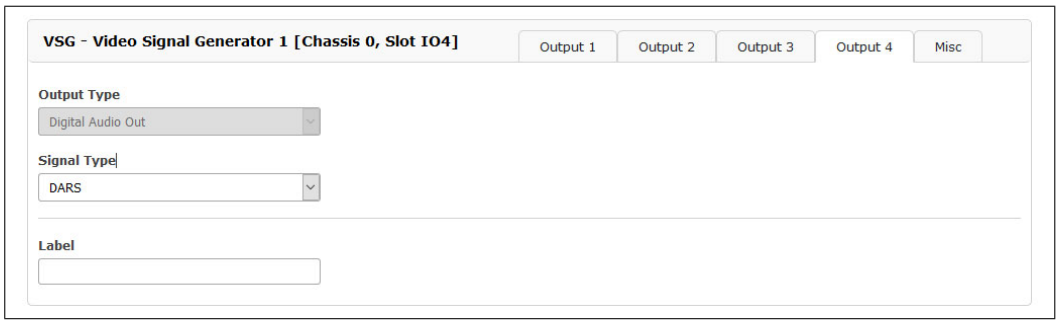


Output 3: ($\leq$ VSG FW 2.05)

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

Output 3: (VSG FW $\geq$ 2.06 - LTOS V7 required)

Output Type:	LTC Out
Signal Type:	LTC 25FPS (Frames Per Second)



Output 4:

Output Type:	Digital Audio Out
Signal Type:	DARS (AES3id)

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

11.8.22 VSG181H - Video Sync Generator with D-Sub Output

The VSG181H is used to provide a reference video or audio signal for studio equipment, with generated signals output through two BNC outputs and a 15-pin D-Sub output. The "Black Out" BNC output is used to deliver bi-level ("black & burst") and tri-level sync signals, while the "DARS Out" BNC output provides an unbalanced Digital Audio Receiver Signal (DARS). The D-Sub connector serves as a multi-output solution for several signal types, specifically balanced and unbalanced LTC signals, balanced DARS signals, and word clock signals.

To ensure that the output signals remain highly precise even when switching between clocks using the RSC module (in IMS systems with receiver redundancy), the LANTIME IMS M4000 may be fitted with a dedicated oscillator.

Features
The VSG181H is synchronized against an external reference frequency (10 MHz), a pulse-per-second signal (PPS), and a time string from an upstream clock. These synchronization signals are essential to maintaining the precision of the output signals. The Web Interface provides a wide range of adjustment and customization options for all output signal types. The signal outputs are phase-matched with the PPS signal.

Black Out Output

Output Signal: NTSC (525i @ 59.94 Hz)
"Black & Burst" ITU-R BT.1700/ SMPTE 170M

PAL (625i @ 50 Hz)
"Black & Burst", ITU-R BT.1700

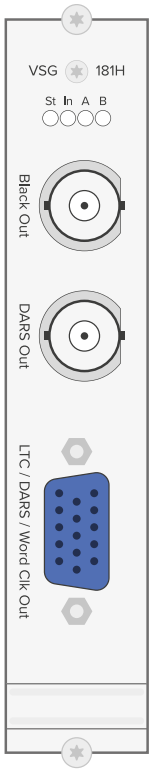
720p @ 50 Hz
Tri-Level Sync, SMPTE 296M

1080i @ 50 Hz
Tri-Level Sync, SMPTE 274M

720p @ 59.94 Hz
Tri-Level Sync, SMPTE 296M

1080i @ 59.94 Hz
Tri-Level-Sync, SMPTE 274M

PAL & NTSC signals can include embedded VITC
SMPTE 12M-1/SMPTE 309M



Signal Level: 300 mV_{pp},
75 Ω termination (unbalanced)

Connector Type: BNC Connector, Female

Cable: Coaxial Cable, Shielded

DARS Output (Unbalanced)

Output Signal: DARS (Unbalanced)

Signal Level: TTL, 2.5 V_{pp},
75 Ω termination

Signal Type: Digital audio with sample rate of
44.1 kHz or 48 kHz

Connector Type: BNC Connector, Female

Cable: Coaxial Cable, Shielded

LTC Output (Unbalanced and Balanced)

Output Signal: LTC

Signal Level: *Balanced Signal*
TTL, 2.5 V_{pp} (MARK/SPACE),
600 Ω termination, pin 1 (+) and 2 (-)

Unbalanced Signal
TTL, 2.5 V_{pp} (MARK/SPACE),
75 Ω termination, pin 15

Formats: 24 fps (23.976 Hz and 24 Hz)
25 fps
30 fps (with or without drop frame
support for adapting 30 fps time code
to 29.97 fps content)

Connector Type: D-Sub 15-Pin

DARS Output (Unbalanced)

Output Signal: DARS (Balanced)

Signal Level: TTL, 2.5 V_{pp},
110 Ω termination, pin 11 (+) and 12 (-)

Signal Type: Sample frequencies: 44.1 kHz and 48 kHz

Connector Type: D-Sub 15-Pin

Word Clock Output

Output Signal: Word Clock

Signal Level: TTL, 2.5 V_{pp},
75 Ω termination, pin 13

Frequency Range: 24 Hz – 12.288 MHz

Sample Rates: 44.1 kHz and 48 kHz

Scale Factors: At sample frequency 44.1 kHz
- *1/32, 1/16, 1/8, 1/4, 1/2, 1, 2, 4, 8, 16, 32*
- *Frequency range: 1.378125 kHz to 1.4112 MHz*

At sample frequency 48 kHz
- *1/32, 1/16, 1/8, 1/4, 1/2, 1, 2, 4, 8, 16, 32*
- *Frequency range: 1.5 kHz to 1.536 MHz*

Connector Type: D-Sub 15-Pin

Status Indicators

"St" LED: Status of the VSG181H
"In" LED: Synchronisation Sstatus
"A" LED: Status of "Black Out" Output
"B" LED: Status of "LTC" Output

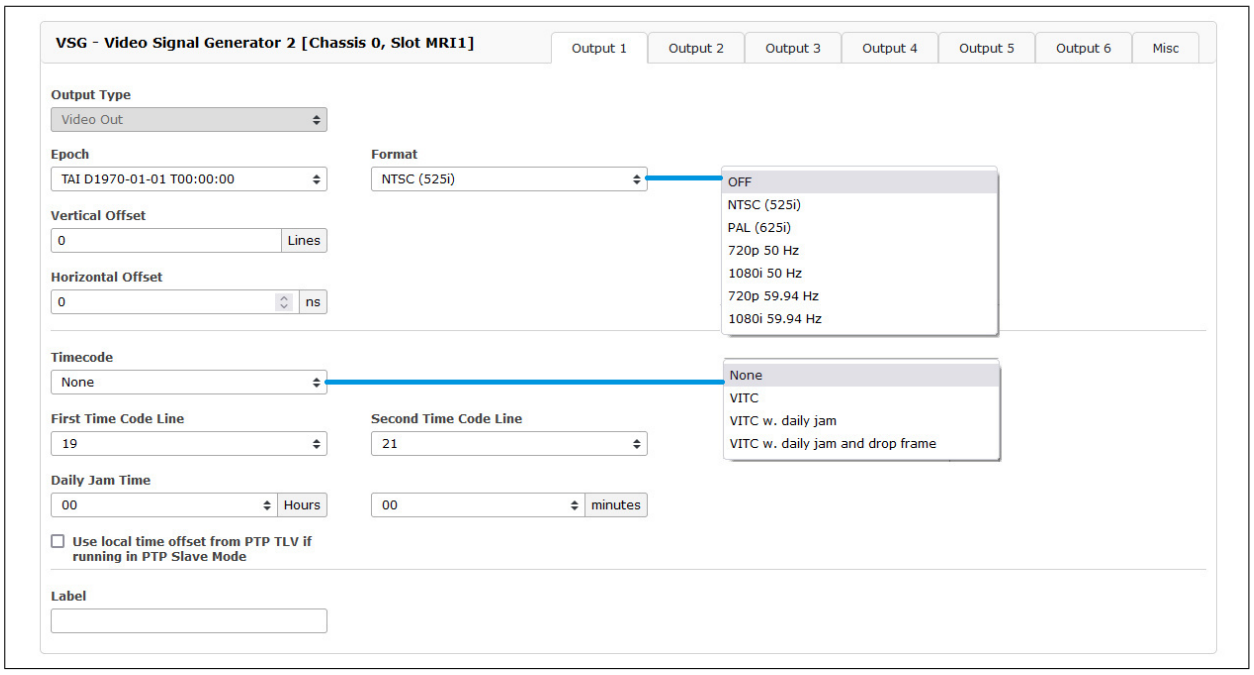
Electrical Specifications

Power Connector: 96-Pin DIN 41612 Rail

Voltage: 5 V +- 5

Current Draw: 250 mA

11.8.22.1 Configuration and Setup via Web Interface



Output 1: Black Out

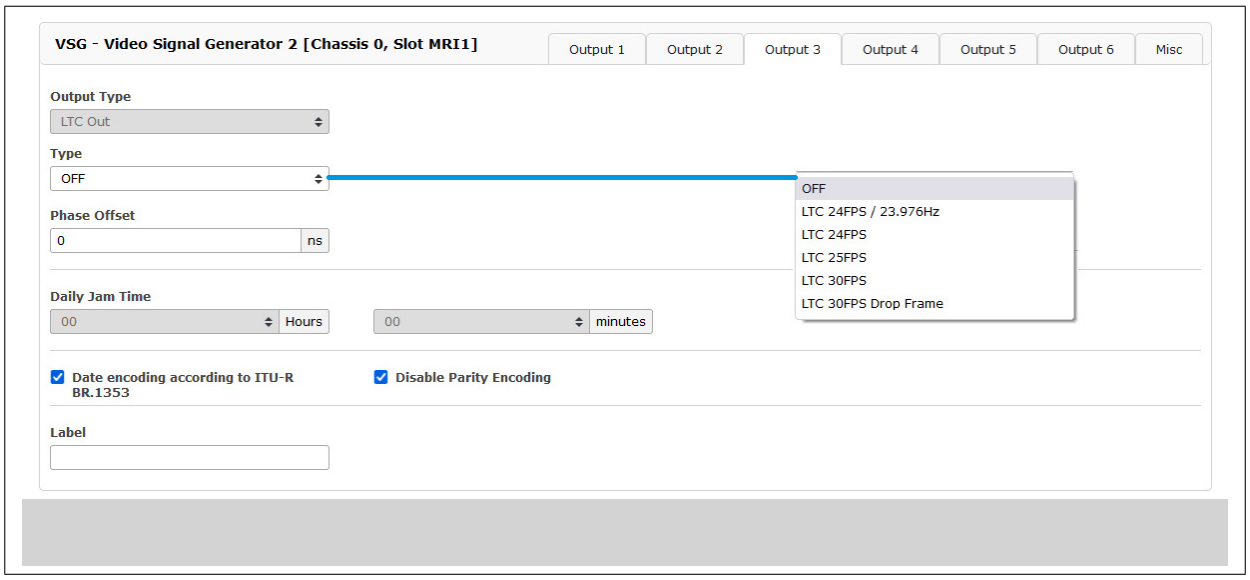
Output Type:	"Video Out" *(Analog Bi-Level-Sync ("Black & Burst") or Tri-Level-Sync Video Signal)*
Epoch:	Video signal timestamp epoch TAI D1970-01-01 T00:00:00
Format:	"OFF" "NTSC (525i)" *(59.94 Hz, "Black & Burst", ITU-R BT.1700/SMPTE ST 170:2004)* "PAL (625i)" *(50 Hz, "Black & Burst", ITU-R BT.1700)* "720p 50 Hz" *(Tri-Level Sync, SMPTE ST 296)* "1080i 50 Hz" *(Tri-Level Sync, SMPTE ST 274)* "720p 59.94 Hz" *(Tri-Level Sync, SMPTE ST 296)* "1080i 59.94 Hz" *(Tri-Level Sync, SMPTE ST 274)*
Vertical Offset:	Approximate configuration of phase offset in lines
Horizontal Offset:	Fine adjustment of phase offset in 10 ns increments

Timecode:	"VITC" "VITC w. daily jam" *(NTSC only)* "VITC w. daily jam and drop frame" *(NTSC only)*
First Time Code Line:	Select the first line in which the timecode is to be integrated. (6-22)
Second Time Code Line:	Select the second line in which the timecode is to be integrated. (6-22)
Daily Jam Time:	Define a time for the daily jam event.
Use Local Time Offset from PTP TLV if Running in PTP Slave Mode:	If the IMS LANTIME server is being operated as a PTP slave, enabling this option will cause the VSG181H to incorporate any local time offset information included in TLVs from the master clock for generating the signal and time codes.
Label:	You can use this field to define a custom label for the output, or you can leave the field blank.

Output 2 & 4: DARS

Output Type:	"Digital Audio Out" *(Digital Audio Reference Signal [DARS])*
Signal Type:	"OFF" "DARS 48 kHz" "DARS 44.1 kHz"
Label:	You can use this field to define a custom label for the output, or you can leave the field blank.

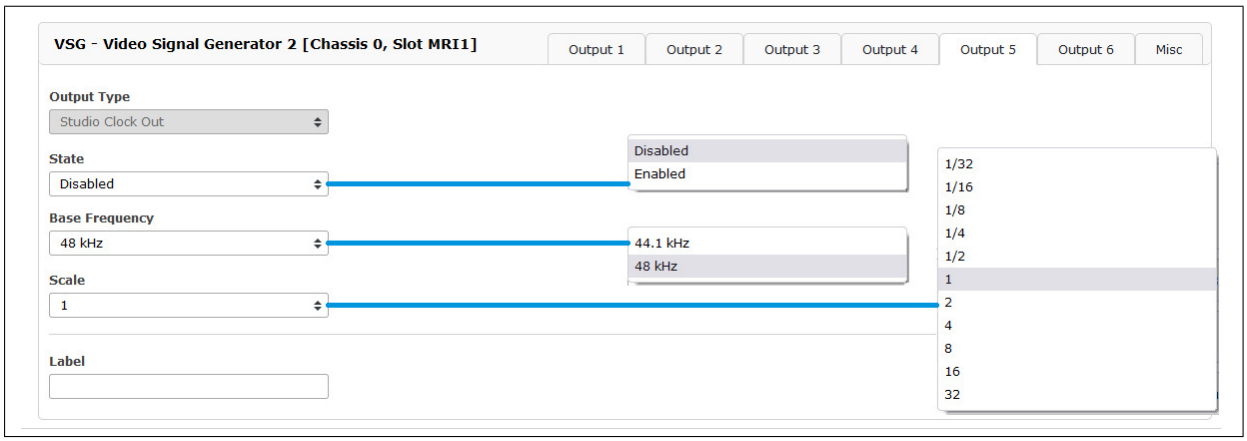
Please note: Output 4 is a "follower" port whose output is solely controlled by the configuration for Output 2 above.



Output 3 & 6: LTC

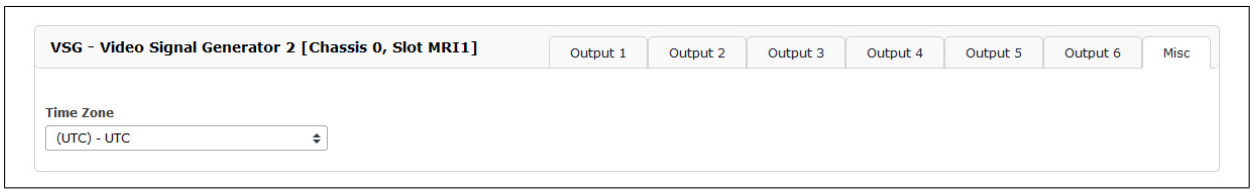
Output Type:	"LTC Out" *(Linear Time Code in Audio Signal)*
Type:	"OFF" "LTC 24 fps / 23.976 Hz" "LTC 24 fps" "LTC 25 fps" "LTC 30 fps" "LTC 30 fps Drop Frame" *(for NTSC content with a frame rate of 29.97 fps)*
Phase Offset:	You can define a phase offset here to compensate for runtime delays.
Daily Jam Time:	This is used to set a time for the daily jam event.
Date Encoding According to ITU-R BR.1353:	If this option is enabled, the module will format the date information integrated into the LTC data in accordance with the format specified in the ITU recommendation BR.1353. If it is disabled, the data will be formatted in accordance with SMPTE ST 309. A specific setting may be necessary here for compatibility reasons.
Disable Parity Encoding:	If this option is enabled, the parity bits will not be integrated into the LTC data. This may be necessary for compatibility reasons.
Label:	You can use this field to define a custom label for the output, or you can leave the field blank.

Please note: Output 6 is a "follower" port whose output is solely controlled by the configuration for Output 3 above.



Output 5: Word Clock

Output Type:	"Studio Clock Out" (Word Clock)
State:	"Disabled" "Enabled"
Base Frequency:	"44.1 kHz" "48 kHz"
Scale:	Used to set the factor by which the base frequency (sampling rate) will be multiplied by. The frequency of the output signal is thus calculated as: *Base Sampling Rate * Scale = Output Frequency*
Label:	You can use this field to define a custom label for the output, or you can leave the field blank.



Misc

Time Zone:	This can be used to set the time zone of the VSG181H module.

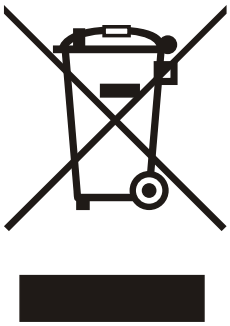
12 RoHS and WEEE

Compliance with EU Directive 2011/65/EU (RoHS)

We hereby declare that this product is compliant with the European Union Directive 2011/65/EU and its delegated directive 2015/863/EU “Restrictions of Hazardous Substances in Electrical and Electronic Equipment”. We ensure that electrical and electronic products sold in the EU do not contain lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyls (PBBs), polybrominated diphenyl ethers (PBDEs), bis(2-ethylhexyl)phthalat (DEHP), benzyl butyl phthalate (BBP), dibutyl phthalate (DBP), or diisobutyl phthalate (DIBP) above the legal limits.

WEEE status of the product

This product is handled as a B2B (Business to Business) category product. To ensure that the product is disposed of in a WEEE-compliant fashion, it must be returned to the manufacturer. Any transportation expenses for returning this product (at end-of-life) must be covered by the end user, while Meinberg will bear the costs for the waste disposal itself.



13 Declaration of Conformity

Konformitätserklärung

Doc ID: IMS LANTIME M4000-August 9, 2022

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*	**IMS LANTIME M4000**

auf das sich diese Erklärung bezieht, mit den folgenden Normen und Richtlinien übereinstimmt:
to which this declaration relates is in conformity with the following standards and provisions of the directives:

RED – Richtlinie *RED Directive* 2014/53/EU	ETSI EN 303 413 V1.1.1 (2017-06)
EMV – Richtlinie *EMC Directive* 2014/30/EU	ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-19 V2.1.1 (2019-04) DIN EN 61000-6-2:2019 DIN EN 61000-6-3:2007 + A1:2011 DIN EN 55032:2015 DIN EN 55024:2010 + A1:2015 DIN EN 61000-3-2:2019 DIN EN 61000-3-3:2013 + A1:2019
Niederspannungsrichtlinie *Low-voltage Directive* 2014/35/EU	DIN EN 62368-1:2014 + A11:2017
RoHS – Richtlinie *RoHS Directive* 2011/65/EU + 2015/863/EU	DIN EN IEC 63000:2018

Bad Pyrmont, August 9, 2022

Stephan Meinberg
Production Manager

M4000_QSG_090822