MANUAL

IMS-MDU

Modular Sync. System

14th December 2016

Meinberg Radio Clocks GmbH & Co. KG

Front view (Frontansicht) IMS-MDU

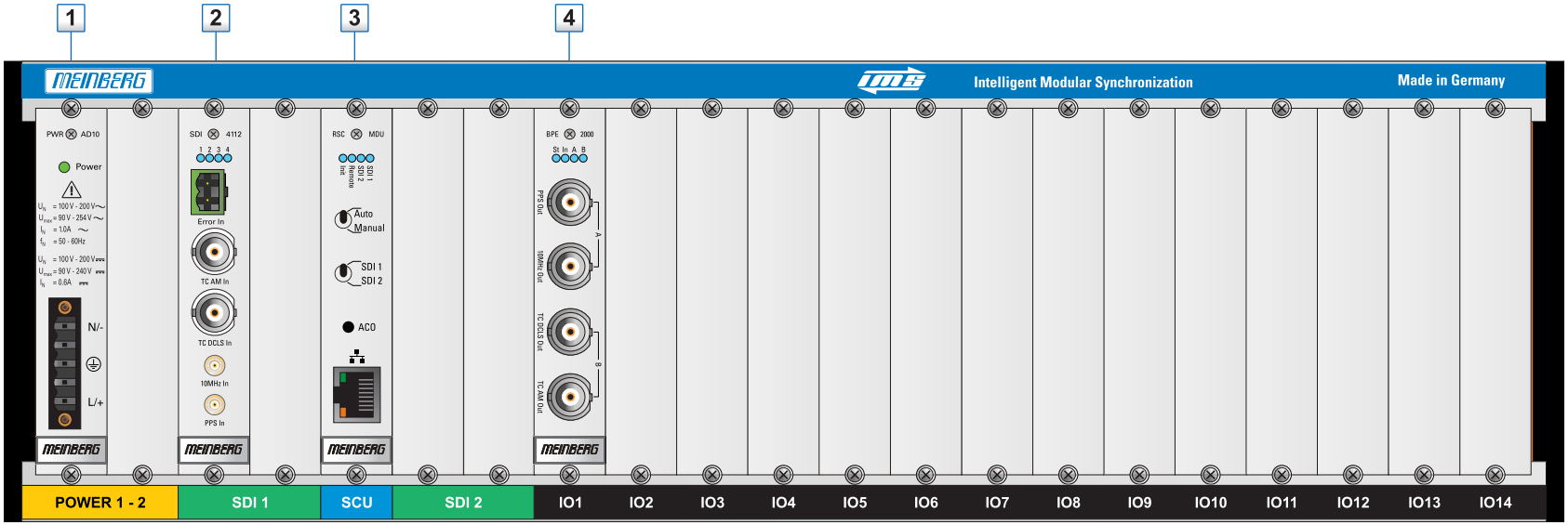
DEUTSCH

1. LED Statusanzeige: Status
Eingangssignal In 1
Eingangssignal In 2
Fehler / Alarm

ENGLISCH

1. LED status Indicators: State (normal operation: green)
Input Signal In 1
Input Signal In 2
Error / Alarm

Rear view (Rückansicht) IMS-MDU



English

1 PWR-AD10: Power Supply 100 - 240 V AC/DC
2 SDI-4112 MDU - Input Card:
external Error Input - 2pin DFK
Time Code Input (AM / DCLS via BNC female)
10MHz / PPS Input (via SMA)
3 RSC-MDU Switch Card with Network Interface
4 BPE-2000: Fixed Outputs -
PPS, 10MHz, TC-DCLS, TC-AM / BNC female

Deutsch

1 PWR-AD10: Netzteil 100 - 240 V AC/DC
2 SDI-4112 MDU Eingangskarte:
externer Error In (2pol. DFK)
Time Code Eingänge (AM / DCLS über BNC)
PPS / 10MHz Eingänge (SMA)
3 RSC-MDU Umschaltkarte mit Netzwerkschnittstelle
4 BPE-2000: Feste Augangssignale -
PPS, 10MHz, TC-DCLS, TC-AM / BNC Buchse

Table of Contents

1 Imprint

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2 Safety instructions for building-in equipment

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

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

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

GND

General Safety instructions

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

For AC Supply 100-240VAC

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

For DC Supply 100-240VDC

- The device can be disconnected outside the unit in accordance with the regulations as in EN 60950 (e.g. through primary side line protection).
- Assembling and disassembling of the power connector is only allowed if the device is disconnected from power supply (e.g. trough primary side line protection).
- All feed lines are sufficiently protected and dimensioned.

Fuse:	T3A
Connector Diameter:	1mm^2 - 2,5mm^2 / 17AWG - 13AWG

2.1 Additional Safety Hints

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

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

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

Keep all documents provided with the device for later reference.

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

2.2 Supply Voltage

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

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

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

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

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

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

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

2.3 Cabling

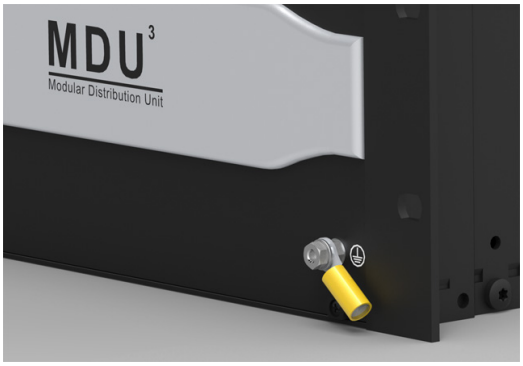
WARNING!
DANGER TO LIFE BY ELECTRICAL SHOCK! NO LIVE WORKING!
Wiring or any other work done the connectors particularly when connectors are opened may never be carried out when the installation is energized. All connectors must be covered to prevent from accidental contact to life parts.

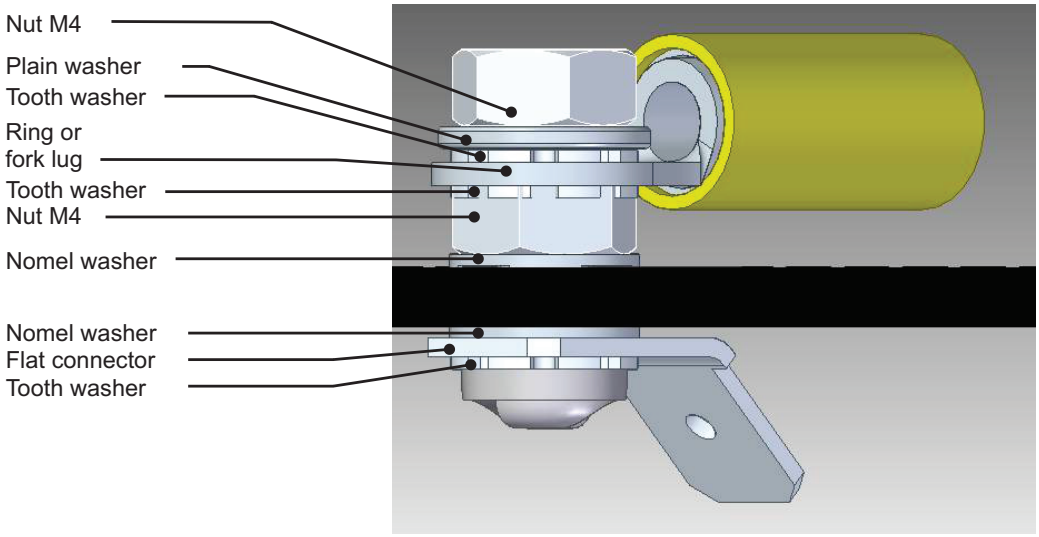
ALWAYS ENSURE A PROPER INSTALLATION!

2.4 Grounding connection IMS-MDU

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

The mounting components (without a cable) are included.





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

3 Modular System IMS-MDU

Meinberg MDU (Multi-Distribution Units) are the simplest and most convenient way to add more buffered timing signal outputs to your distribution rack. MDU systems enable multiplication of input signals coming from an external system such as a LANTIME or a GPS clock with, for example, PPS and 10MHz outputs to be expanded to a large number of output signals of the same type. The 3U / 19-inch MDU basic chassis can compose of a redundant power supply and can be equipped with one or two input modules to allow redundancy of the input signals.

An MDU Input Module (SDI - Signal Distribution Input) can provide up to four inputs via BNC or SMA connectors - with 10 MHz, PPS, TC-AM and TC-DCLS as input signals. An optional alarm relay contact and status LEDs on the front panel show the user whether an input signal, an internal error (in case of a SDI-2101) or an error of the upstream clock (SDI-4112) which can affect output signals has been detected. With a SDI-2101 module, an internal error or a status of the card can be transferred via USB interface.

The IMS-MDU System can be configured with up to 14 Output Signal Modules, each including 4 BNC female connectors (other connector types are available upon request).

For IMS-MDU Systems the following plug-in modules are available divided into below-mentioned categories:

- PWR (Power Supply)
- SDI (Signal Input Modules)
- SCU (Switchover unit for Redundant operation)
- I/O (Output modules)

PWR:
Two PWR slots - they can be equipped with various IMS power supply modules in AC / DC range 100-240 V or low DC 20-72 V. In this way a basic or redundant power supply configuration can be realized.

SDI:
Two slots for SDI Input Signal modules. They have a dual function. By default, they can be attached with two separate systems using different input cards individually or duplicated input signals to facilitate redundant operation. It is also possible to plug a Standard Meinberg Receiver into SDI slots. In this case the receiver generates output signals independently.

SCU:
In redundant operation a RSC (Redundant Switch Controller) card switches to serial interfaces and pulse / frequency outputs of the redundant input card in case of a failure of the active input module. The switching can be perfomed manually or automaticaly. All essential functions of the RSC, such as the actual switching status, alarming and operation mode can be monitored or triggered via a SNMP / Ethernet Interface.

I/O:
Up to 14 output modules can be inserted for individual configuration of the IMS-MDU system.

4 Attachment: Technical Information

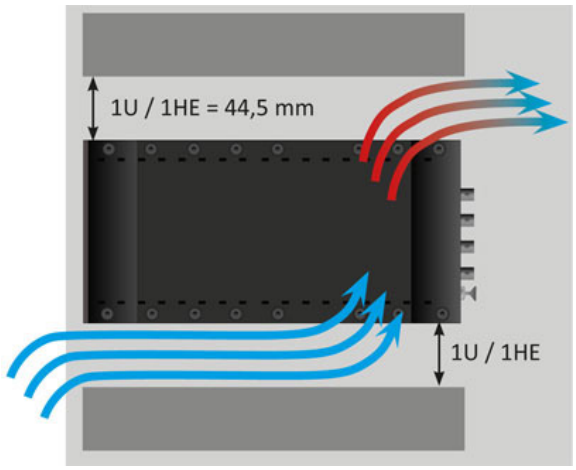
4.1 Technical Specifications IMS-MDU BGT Housing

HOUSING: Metal 19"Modular chassis, Schroff EUROPAC lab HF
Front panel: 3U/84HP (128 mm high / 426 mm wide)

PROTECTION RATING: IP20

PHYSICAL DIMENSIONS: 483 mm wide x 132 mm high x 270 mm deep

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.



The figure shows the expected air flow during device in operation with space between devices for ventilation (1U at the bottom and the top).

4.2 Available Modules and Connectors

Name	Type	Signal	Cable
Power Supply:			
PWR-AD10	5pin DFK male	100-240 VAC / VDC	5pin MSTB clamp
PWR-DC20	5pin DFK male	20-72 VDC	5pin MSTB clamp
Reference - Synchronization Signals:			
N2X180	RJ45	Network NTP / PTP	CAT 5 network cable
SDI-5302	2pin DFK	Error-In	shielded data line
	BNC	TC AM In / TC DCLS In	
	SMA	PPS In / 10MHz In	
	D-SUB9 female	Serial time telegram	
SDI-4112	2pin DFK	Error-In	shielded data line
	BNC	TC AM In / TC DCLS In	
	SMA	PPS In / 10MHz In	
SDI-2101	BNC	TC AM In / TC DCLS In	shielded data line
	USB	Status, int. Error	
Output Signals:			
LNO	4 x BNC	10MHz sine Out with internal OCXO	shielded data line
LNO	4 x BNC	10MHz sine Out	shielded data line
BPE-1040	4 x BNC	TC AM Out	shielded data line
BPE-2000	4 x BNC	PPS, 10MHz	
		TC-DCLS, TC-AM	shielded data line
BPE-2010	4 x BNC	PPS	shielded data line
BPE-2110	8 x BNC	PPS	shielded data line
BPE-2020	4 x BNC	10MHz	shielded data line
BPE-2120	8 x BNC	10MHz	shielded data line
BPE-2030	4 x BNC	TC DCLS	shielded data line
BPE-2080	4 x BNC	2048kHz	shielded data line
BPE-2530	4 x 2pin DFK	TC DCLS / PhotoMOS	shielded data line
	1 x BNC	TC AM	shielded data line
BPE-3014	2 x D-SUB9	TC/DCLS / RS422	shielded data line
BPE-3424	4 x D-SUB9	TC/DCLS / RS422	shielded data line
BPE-5030	4 x F-ST	TC-DCLS	Fiber Optical

4.3 IMS Module Options

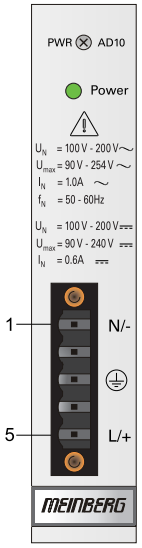
4.3.1 Power Supply 100-240 V AC/DC

Operational Voltage:

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

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

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



Output Current: max. 10.0 A
min. 0.15 A

Fuse: internal, T2.5 A / 250 V

Protective Class: Class 1

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

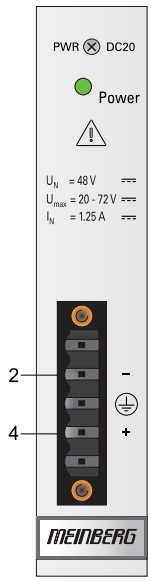
Power Connector: 5pin DFK

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

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

4.3.2 Power Supply 20-72 V DC

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



Output Current: 10 A

Output Voltage: +5 V

Output Power: 50 W

Fuse: 6 A (T) / 250 V

Power Connector: 5pin DFK

Protective Class Class 1 - regarding EN 60950

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

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

4.3.3 N2X180 - Signal Input Module

- Configuration and montoring with MBGDEVMAN
- PTP Multicast (Power Profile compatible / PTP Unicast (Telecom Profile compatible) / NTP)
- PPO (PPS, PPM, PPH ...),
- IRIG AM, Freq. Synth. sinus outputs
- Generates several different unmodulated IRIG time codes

The Meinberg N2X180 is synchronized by an PTP Grandmaster or by a NTP Server and can be used as reference time source for the IMS MDU. The module provides equipment that requires Freq.Synth/sine, PPOs (PPS, PPM, PPH, Time Code DCLS - IRIG/AFNOR/IEEE1344) or serial time string for synchronization.

The N2X180 operates as an IEEE-1588 slave clock or NTP client in a network.

This converter can synchronize many different systems. Our IEEE-1588 Grandmaster or LANTIME NTP Server, such the LANTIME M1000, can be used as a reliable time source.

In order to support network management systems the N2X180 offers an extensive SNMP Interface, which can be accessed by SNMP V1.

Four Status LEDs:

St (Status):	blue:	during initialisation
	green:	normal operation
In (Init):	red:	no network cable connected (requires a few minutes after connection)
	yellow:	signal is available, not synchronized
	green (blink):	locked to input signal and synchronized but not accurate
	green:	Oscillator is warmed up, internal clock is accurate
Sp (Speed):	out:	no cable connection
	yellow:	10 Mbit
	green:	100 Mbit
Li (Link):	out:	no cable connection
	yellow (blink):	if traffic and 10 Mbit
	green (blink):	if traffic and 100 Mbit

Technical Specifications

Power Consumption: max 5 W

Accuracy of pulse outputs:	PTP:	±100 ns (relative to the used IEEE 1588 Grandmaster Clock, after initial synchronization phase)
	NTP:	±1 ms (relativ to NTP when using a local time server after warm-up period)
Connector:	LAN	RJ-45, 10/100 BaseT
	Duplex Modes:	Half/Full/Autonegotiaton
	Cable:	CAT 5 network cable
Oscillator:	OCXO-SQ (OCXO-MQ/HQ Options are available)	

Network Time Protocol (NTP)

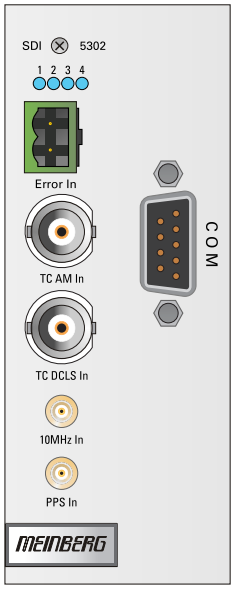
- Up to seven configurable external NTP Time Server
- Min. and max. polling interval (8s – 1024s)
- Standard NTP options (noselect, true, prefer, iburst)

Precision Time Protocol (IEEE 1588)

- UDP/IPv4 (L3) or IEEE802.3 (L2)
- E2E, E2E Hybrid or P2P Delay Mechanism
- PTP Subdomains (0-255)
- Power Profile compatible
- Telecom Profile compatible

4.3.4 SDI-5302 - Signal Input Module

Technical Spezifications SDI-5302:



Signal Inputs:	Error Input, via 2pin DFK connector, to connect to an existing error relays output (e.g. LANTIME M300...) (+ 5V current) 2 x BNC female - Time Code AM and DCLS In 2 x SMA female - PPS and 10MHz sine In 1 x Serial Time Telegram RS232 In, D-SUB9 connector Assignment: Pin 3: RxD; Pin 5: GND Time Telegram: Uni Erlangen 19200 Baud / 8N1 / per second
Current Consumption:	5 V +- 5%, @400 mA
Ambient Temperature:	0 ... 50°C / 32 ... 122°F
Humidity:	Max. 85%

Received Time Codes

Time Code modulated input, SMA connector, isolated by transformer

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

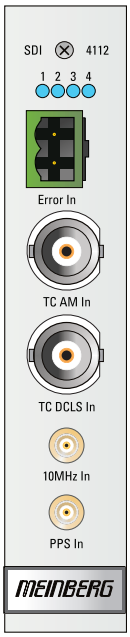
Time Code unmodulated input, BNC connector, isolated by opto-coupler

Insulation voltage:	3750 Vrms
Internal series resistor:	330 Ohm,
Max. input current:	25 mA
Diode forward voltage:	1.0 V...1.3 V

Pulse- and Frequency Input Signals

10 MHz sine Input:	sine (1.5 Vpp - 5 Vpp), female SMA connector
PPS Input:	TTL, active high, female SMA connector

4.3.5 SDI-4112 - Signal Input Module



Technical Spezifications SDI-4112:

Signal Inputs: Error Input, via 2pin DFK connector, to connect to an existing error relays output (e.g. LANTIME M300...)
(+ 5V current)
2 x BNC female - Time Code AM and DCLS In
2 x SMA female - PPS and 10MHz sine In

Current Consumption: 5 V +- 5%, @400 mA

Ambient Temperature: 0 ... 50°C / 32 ... 122°F

Humidity: Max. 85%

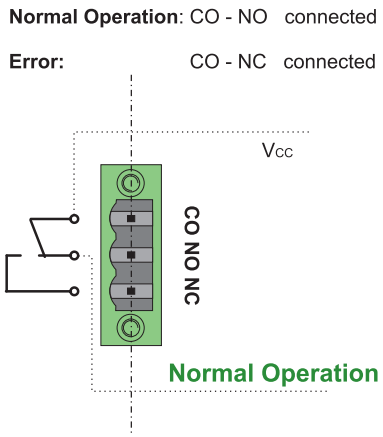
Received Time Codes
Time Code modulated input, SMA connector, isolated by transformer
Insulation voltage: 3000 VDC
Input impedance: 50 Ohm, 600 Ohm, 5 kOhm
Internally selectable by jumper (default 600 Ohm)
Input signal: 600mV to 8 V (Mark, peak-to-peak)

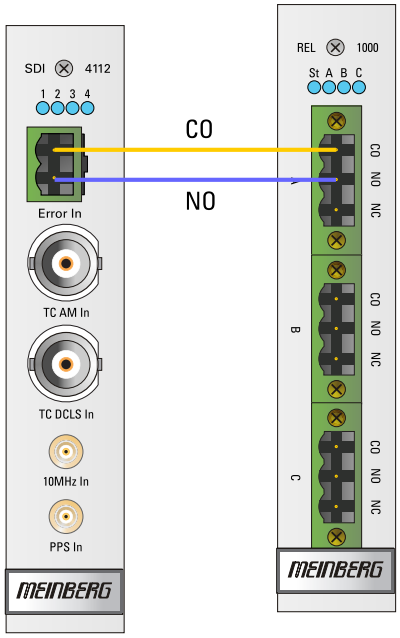
Time Code unmodulated input, BNC connector, isolated by opto-coupler
Insulation voltage: 3750 Vrms
Internal series resistor: 330 Ohm,
Max. input current: 25 mA
Diode forward voltage: 1.0 V...1.3 V

Pulse- and Frequency Input Signals
10 MHz sine Input: sine (1.5 Vpp - 5 Vpp), female SMA connector

PPS Input: TTL, active high, female SMA connector

Connection scheme:
REL-1000 Clock 1 -> SDI-4112 External Error Input





Assignment of the DIP Switch:
The monitoring of the input signals can be set with the DIP switch block. The figure on the right shows the switches 1 - 5 in ON position, in this case all inputs of the board are monitored. If, for example, no IRIG time code is connected via the assigned BNC female connector, the switches 2 and 3 should be set to position OFF, otherwise the LED 3 indicates a fault status.

DIP	Signal	LED	if "ON"
1 :	Error	LED 3 + 4	(flashes red)
2 :	TC-AM	LED 3	(red)
3 :	TC-DCLS	LED 3	(red)
4 :	10 MHz	LED 4	(red)
5 :	10 PPS	LED 4	(red)

4.3.6 SDI-2101 - Signal Input Module

Features SDI-2101

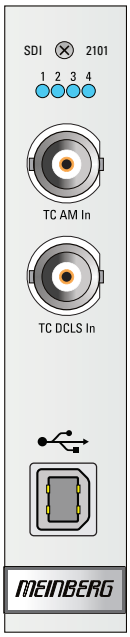
The SDI-2101 serves to receive and decode modulated (AM) and unmodulated (DC Level Shift) IRIG and AFNOR time codes. AM-codes are transmitted by modulating the amplitude of a sine wave carrier, unmodulated codes by variation of the width of pulses.

Automatic gain control within the receive circuit for modulated codes allows decoding of IRIG signals with a carrier amplitude of 600 mVpp to 8 Vpp. The input stage is electrically insulated and has an impedance of 600 Ω, it is accessible via the BNC female connector of the SDI-2101.

The unmodulated time codes must be connected to the TC-DCLS In BNC connector. An onboard optocoupler insulates the internal receive circuit.

MBGMON - Software running on the computer can read out information regarding date, time and status of the IRIG receiver.

The microprocessor system of the SDI-2101 is equipped with a Bootstrap-Loader and a Flash-EPROM. These features enable updating of the onboard software.



Functional description

After the received IRIG code has passed a consistency check, the software clock and the battery backed realtime clock of the SDI-2101 are synchronized to the external time reference. If an error in the IRIG telegram is detected, the system clock of the board switches to holdover mode. Drifting of the internal time base is limited to 1 μsec/sec by regulating the onboard quartz of SDI-2101. IRIG code includes day of year information only. The complete date is kept in the battery backed realtime clock and the software clock therefore. The received day of year is compared to this complete date once per second. If the board detects a difference between received and stored date information, the SDI-2101 switches to holdover mode but still synchronizes the internal time base to the received IRIG code.

The internal system clock is always set to the received IRIG time, which might have a local offset to UTC. Only if the SDI-2101 is configured with this offset, Meinberg driver software is able to set the system time of the computer correctly.

IRIG telegrams don't include announcers for the change of time zone (daylight saving on/off) or for the insertion of a leap second. Hence the clock will switch into freewheeling mode in case of such event, and resynchronize afterwards.

Time Code Formats

The board SDI-2101 decodes the following formats:

A133:	1000pps, amplitude modulated sine wave signal, 10 kHz carrier frequency BCD time of year, SBS time of day
A132:	1000pps, amplitude modulated sine wave signal, 10 kHz carrier frequency BCD time of year
A003:	1000pps, DC Level Shift pulse width coded, no carrier BCD time of year, SBS time of day
A002:	1000pps, DC Level Shift pulse width coded, no carrier BCD time of year
B123:	100pps, amplitude modulated sine wave signal, 1 kHz carrier frequency BCD time of year, SBS time of day
B122:	100pps, amplitude modulated sine wave signal, 1 kHz carrier frequency BCD time of year
B003:	100pps,DC Level Shift pulse width coded, no carrier BCD time of year, SBS time of day
B002:	100pps, DC Level Shift pulse width coded, no carrier BCD time of year
B007:	100 pps, DCLS Signal, no carrier BCD time-of-year, Year, SBS time-of-day
B006:	100 pps, DCLS Signal, no carrier BCD time-of-year, Year
B127:	100 pps, AM sine wave signal, 1 kHz carrier frequency BCD time-of-year, Year, SBS time-of-day
B126:	100 pps, AM sine wave signal, 1 kHz carrier frequency BCD time-of-year, Year
AFNOR NFS 87-500:	100pps, amplitude modulated sine wave signal, 1 kHz carrier frequency BCD time of year, complete date, SBS time of day
IEEE1344:	Code according to IEEE1344-1995, 100 pps, AM sine wave signal, 1kHz carrier frequency, BCD time-of-year, SBS time-of-day, IEEE1344 extensions for date, timezone, daylight saving and leap second in control functions (CF) segment.
C37.118	Like IEEE1344 - with turned sign bit for UTC-Offset37.118

The board SDI-2101 can't be used to decode amplitude modulated and DC Level Shift signals simultaneously. Depending on the selected code, only the signal at the corresponding BNC-connector is decoded.

USB Interface

The SDI-2101 contains an USB interface which is used for the communication and parameterization of the device with the Monitorprogramm.

Configuration of SDI-2101

The selection of the IRIG code and a possible offset of the received IRIG time to UTC must be set up by the monitor software via the USB interface. If the selected IRIG telegram doesn't support the complete date (only the day of year 1...366), then you have set the date, which have to be stored in the real-time clock of the board, by using the MBGMON software.

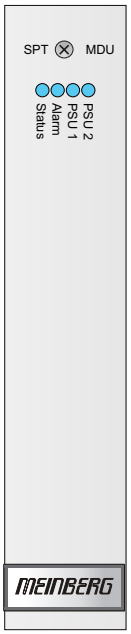
If the time zone of the received IRIG code is not UTC, the local offset to UTC must be configured to ensure correct function of the driver software. If the local time zone is MEZ for example, the board must be set to a local offset of "+60min" (MEZ= UTC + 1 h).

Technical specification SDI-2101

Receiver Input:	AM-input (BNC female): insulated by a transformer impedance settable 50 Ω input signal: 600 mVpp to 8 Vpp (Mark) other ranges on request DC Level Shift input (BNC female): insulated by optocoupler internal series resistance: 220 Ω maximum forward current: 50 mA diode forward voltage: 1.0 V...1.3 V
Decoding:	Decoding of the following telegrams possible: IRIG-A133 / A132 / A003 / A002 IRIG-B123 / B122 / B003 / B002 / B007 / B006 / B127 / B126 AFNOR NFS 87-500, IEEE1344, C37.118
Accuracy of Time Base:	+/-5 μsec compared to IRIG reference marker
Required Accuracy of Time Code Source:	+/- 100ppm
Holdover Mode:	Automatic switching to crystal time base accuracy approximately 1E-6 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. The realtime clock can work with the Backup Battery for approximately 5 days. Important system parameters are stored in the RAM of the system
Reliability of Operation:	Microprocessor supervisory circuit provides watch-dog timer, power supply monitoring and backup-battery switchover. Software watchdog monitors correct program flow and generates a reset in case of error detection
Initialization:	Software and realtime clock can be set by the USB monitor program
Interface:	USB V.1.1 connection
Power Requirements:	+5V, @ 80 mA
Ambient Temperature:	0 ... 50°C
Humidity:	max. 85 %

4.3.7 SPT Switch Card

Theory of operation
The input signals of the "SDI-1" slot are connected with the SPT-MDU to the I/O slots. In addition, the SPT-MDU monitors the state of the power supplies via two LEDs in the front panel. Another LED indicates the state of the System (Alarm).

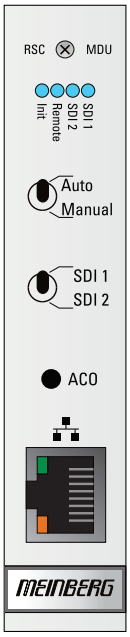


LED Indicators

Status:	blue:	while the receiver passes through the initialization phase
	green:	normal operation
Alarm:	green:	normal operation
	red:	no signal or signal faulty
PSU 1/2:	*State of power supplies*	
	green:	normal operation
	red:	supply faulty or not connected

4.3.8 RSC Switch Card

Theory of operation
The RSC- Redundant Switch Control card controls the switchover of the input modules in redundant systems with two SDI units. The RSC is used to switchover the pulse and frequency outputs between the two input modules. The controls of the switchcard allow the selection of different modes in which the RSC operates. The status LEDs indicate which SDI is selected as master and the current operating state of the switching module.



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

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

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

Important: To ensure an automatic switchover the remote function should be disabled (see next chapter "Remote Monitoring over LAN Interface").

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

Remote Monitoring over LAN Interface

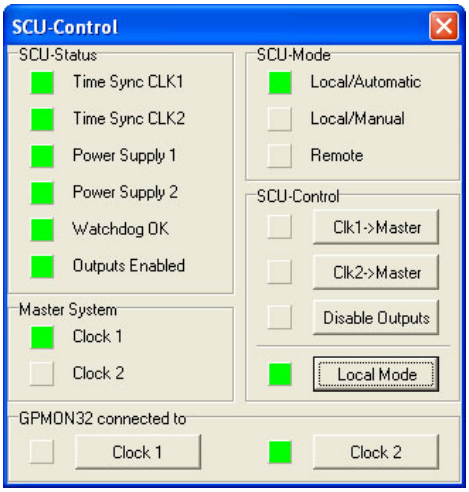
The RSC board has an Ethernet interface (10/100MBit) for remote monitoring and configuration of the clock modules. For the remote monitoring Meinberg provides an extra program GPSMON32, which can be downloaded from the web site: https://www.meinbergglobal.com/english/sw/.

After starting the program, go to *Connection -> Connection Settings* and start an automatic search of the RSC IP Address by pressing the "Find" button. The current IP Address can be changed by using for this provided field.

Login password to connect to the RSC board is per default: "meinberg" and can be changed at any time.

The SCU Control box is activated after successful connection to RSC180. With SCU-Control you can monitor the Status of the clock modules, power supply units (if redundant) and outputs. Here you can also select the active master clock.

Note: The RSC180 is the successor to the previously delivered SCU. Therefore, it is still referred to SCU in GPSMON32.



Screen: SCU Control with Remote / Local mode

SNMPv1 Management and Monitoring

The status of clocks can be automatically monitored via SNMP v1 and traps sent when a problem is detected or changes in the operation of RSC180 occur. To activate SNMP functionality, the following two MIB files should be used:
MBG-SNMP-ROOT-MIB.mib and *MBG-RSC180V3.mib* where all Meinberg RSC board OIDs for management and monitoring are defined. For a detailed overview of RSC SNMP objects and traps with corresponding descriptions, please refer to the RSC180V3 MIB file.

The IP Address for the Trap receiver can be configured using an SNMP command snmpset.
snmpset -v1 -c public <IP Address of the RSC board> MBG-SNMP-RSC180-MIB::mbgTrapIPAddress.0 a "<IP Address of the trap receiver>"

"mbgTrapIPAddress" is the read-write MIB object to set the receiver IP-address.

Configuration example:

```
snmpset -v1 -c public 172.16.75.200 MBG-SNMP-RSC180-MIB::mbgTrapIPAddress.0
a "172.16.100.197"
```

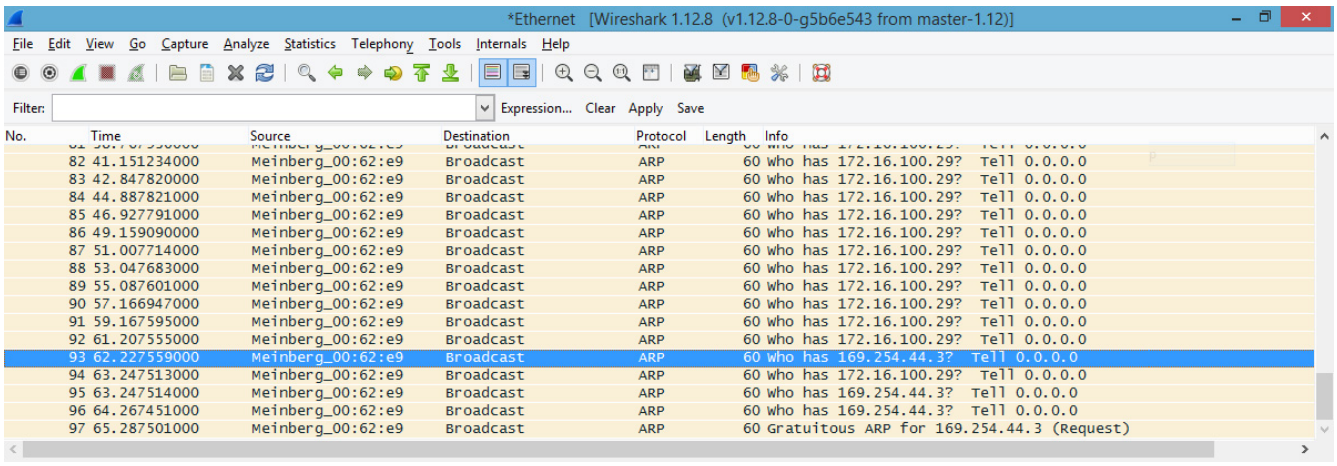
The Write-Community should be defined as "public".

Initial Start of Operation - RSC Switch Card

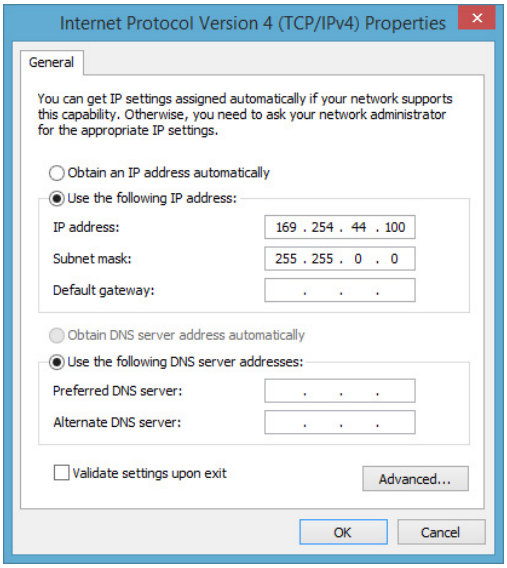
If no clock with display is available in the system and a DHCP service is not running in the network, a computer with preinstalled software (Wireshark and GPSMON32 from Meinberg) is required for the initial start of operation.

First, the network port of the computer is connected to the RSC through the network interface. Start Wireshark and connect the system with the RSC switch card to power line.

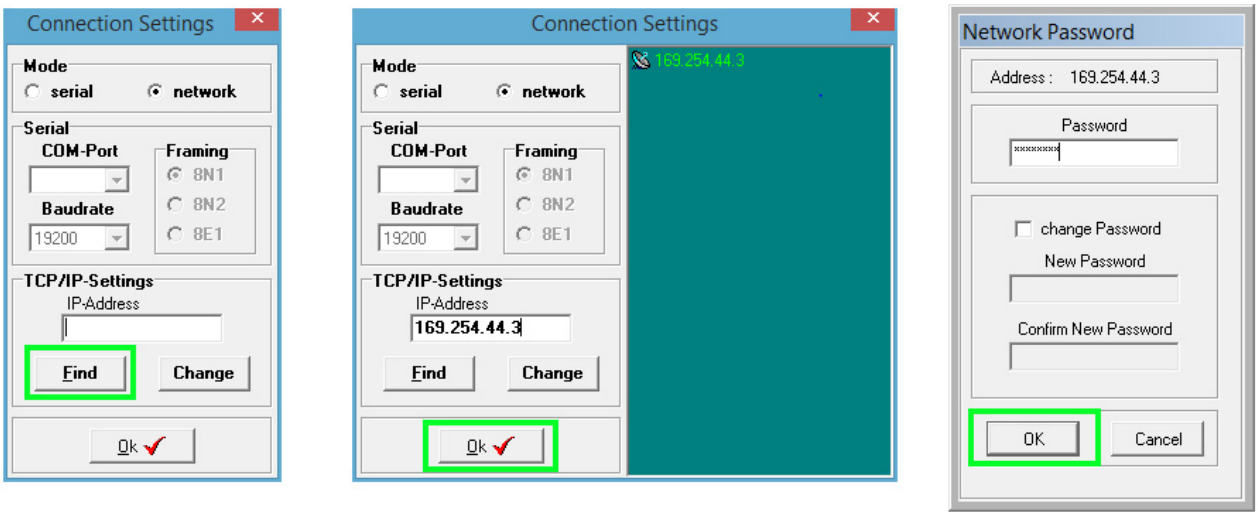
Now the RSC tries to communicate with the DHCP service for some times. If this service is not available, "zero.conf" is executed. After this, the Wireshark Monitor should display this connection. Now, an IP, similar to "169.254.xxx.xxx", was assigned to the RSC Network Port.



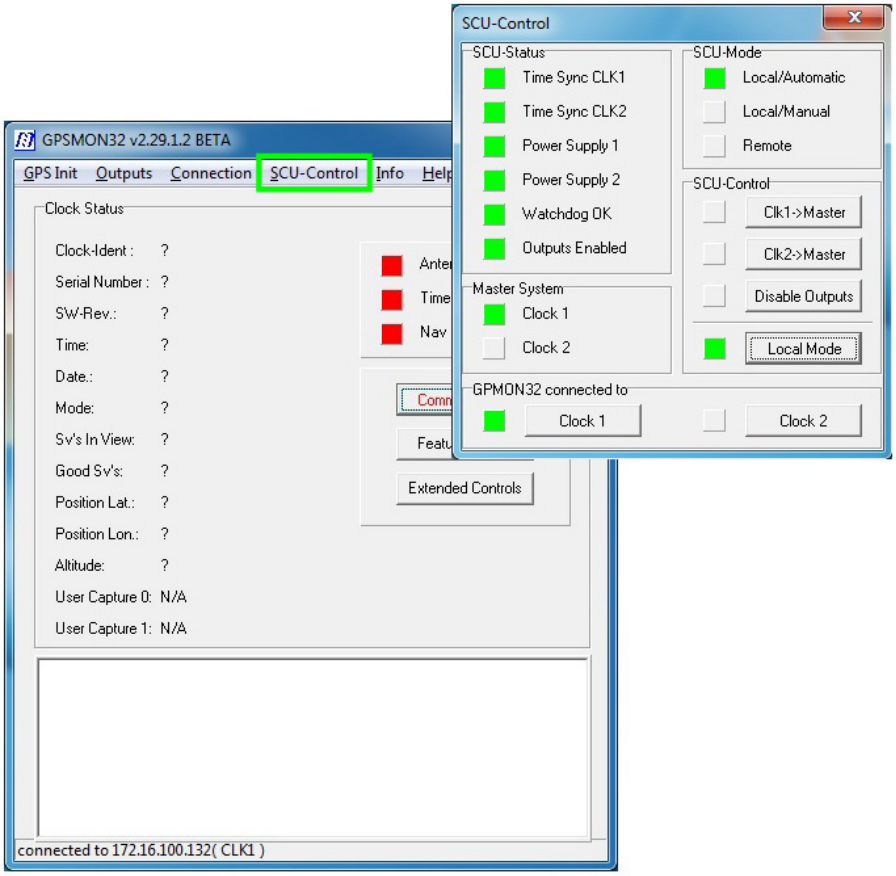
The connected computer must have an IP and a gateway address in the same name space (for example, 196.254.44.100 and 255.255.0.0 as gateway address).



GPSMON32 can now be started. The connection type Network can be selected via "Connection -> Settings". By pressing the "Find" button, the RSC in the network is detected. Enter the detected IP into the field for the network address and press "OK". A window with the request for a password input opens (use "meinberg" in delivery state).



The connection is active now, the clock in the system can now be configured via the network connection of the RSC.



4.3.9 LNO - 10MHz Sinus Output Module

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

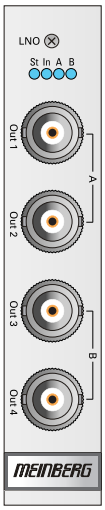
Function of Operation
The card has a high quality oscillator, which is locked to an external 10MHz signal. The microprocessor monitors the lock status of the PLL and the warm up phase of the oscillator. It activates the outputs only after the phase is locked. This condition is signalized by all LEDs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

Technical Specifications:

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

LED Status Indicators:

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



4.3.10 BPE - Backplane Port Expander (Frontend)

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

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

Status Indicators

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

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

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

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

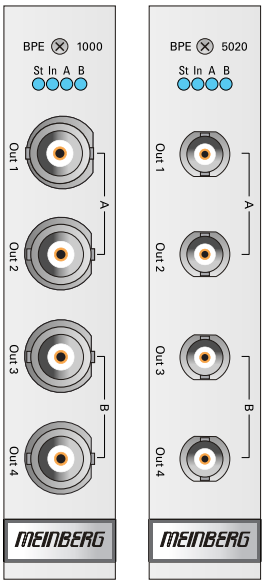


Figure right: BPE Frontend

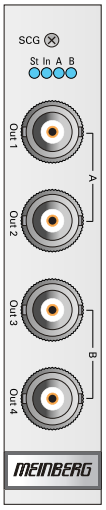
BPE-1000 Standard outputs - BNC female:
PPS, 10MHz, TC DCLS and TC AM

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

4.3.11 SCG - Studio Clock Generator

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

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

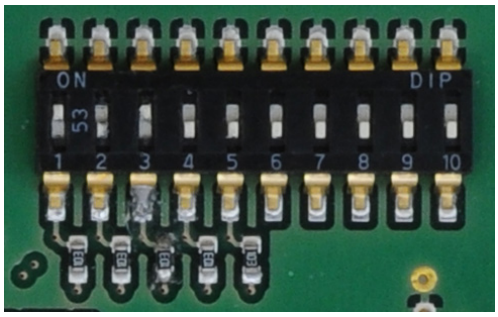


Technical Specifications:

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

Frequency configuration with DIL Switch

Adjustable via DIL Switch



Standard Version: all "OFF" (0)
48 kHz
96 kHz
44,1 kHz
88,2 kHz

HiFi Version: Bit 1 "ON" (1)
96 kHz
96 kHz
192 kHz
192 kHz

Pro Version: Bit 2 "ON" (2)
44,1 kHz
48 kHz
96 kHz
192 kHz

44.1 kHz Version: Bit 1 and Bit 2 "ON" (3)
44,1 kHz
44,1 kHz
44,1 kHz
44,1 kHz

48 kHz Version: Bit 3 "ON" (4)
48 kHz
48 kHz
48 kHz
48 kHz

44.1 kHz und 48kHz Version: Bit 1 and Bit 3 "ON" (5)
44,1 kHz
44,1 kHz
48 kHz
48 kHz

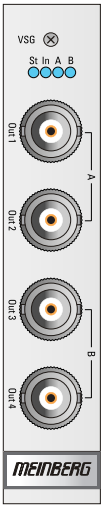
4.3.12 VSG - Video Sync Generator

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

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

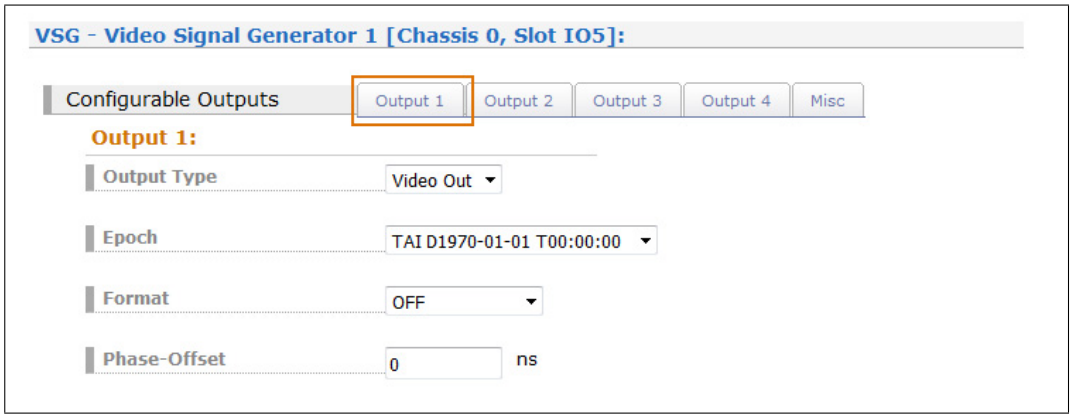
Generated Signals:

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



VSG Configuration via Web Interface

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



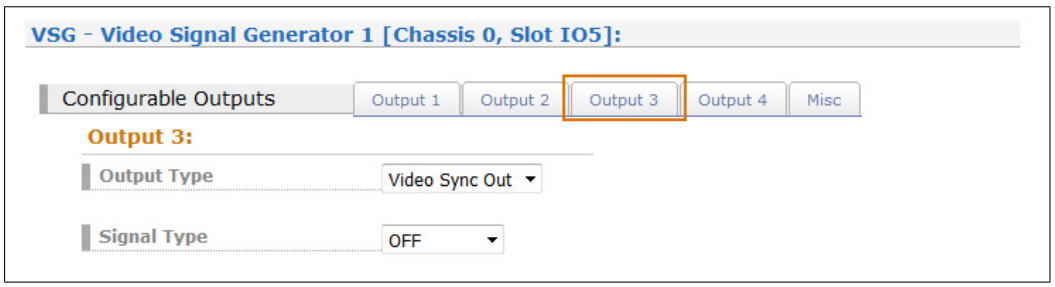
Overview Configuration VSG Video Sync Generator Outputs 1-4

Output 1

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

Output 2:

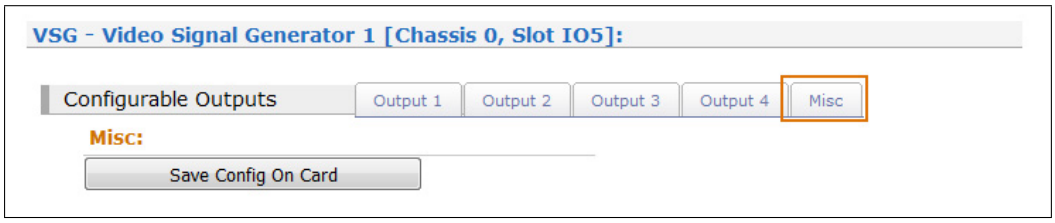
Output Type:	Video Out
Epoch:	like Output 1
Format:	NTSC PAL
Phase Offset:	[Offset Value]



Output 3 / Output 4:

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

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



5 Declaration of Conformity

Konformitätserklärung

Doc ID: IMS-MDU-2015-07-09

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

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

Produktbezeichnung **IMS-MDU**
Product Designation

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

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

gemäß den Richtlinien 2014/30/EU (Elektromagnetische Verträglichkeit), 2014/35/EU (Niederspannungsrichtlinie), 2011/65/EU (Beschränkung der Verwendung bestimmter gefährlicher Stoffe) und 93/68/EWG (CE Kennzeichnung) sowie deren Ergänzungen.
following the provisions of the directives 2014/30/EU (electromagnetic compatibility), 2014/35/EU (low voltage directive), 2011/65/EU (restriction of the use of certain hazardous substances) and 93/68/EEC (CE marking) and its amendments.

Bad Pyrmont, 2015-07-09

Günter Meinberg
Managing Director

IMS-MDU_QSG_090715