MANUAL

NTP-SLAVE-CLOCK

Analog Wall Clock - PoE Power Supply

2nd July 2015

Meinberg Radio Clocks GmbH & Co. KG

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1 Imprint

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2 NTP - Wall Clock with LAN-PoE
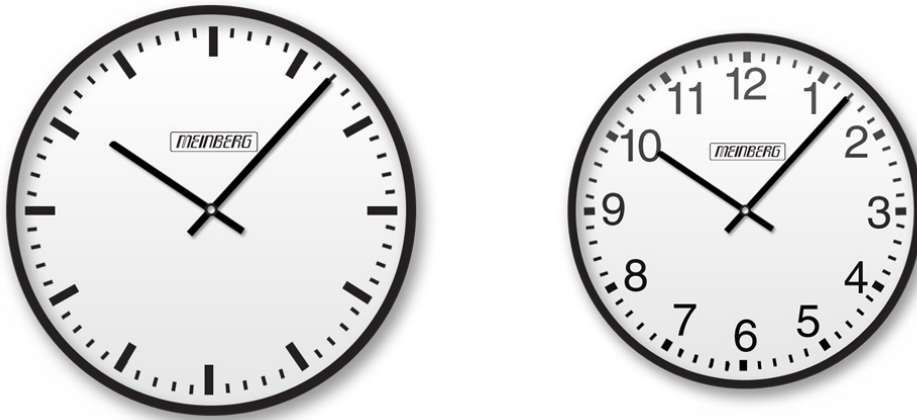
Case:	Ø cir. 300 mm, depth cir. 55 mm
	Ø cir. 400 mm, depth cir.ca. 55 mm
	metal case, white or black painted
Protection Rating:	IP 40 (EN 60529)
LAN-Bus:	For running NTP slave clocks a time server is required.
Front Glass:	Domed mineral glass on 300 mm cases, shock-resistant.
	Plexiglas on 400 mm case.
Face:	High distinction white metal with black arabic numerals for easy,
	doubt-free reading even over longer distances.
	Face printed according to DIN 41091.
Hands:	Black bar-type hour and minute hands, red second hand.
PoE:	NTP slave clocks require a PoE (Power over Ethernet) power supply.
	Appropriate hardware has to be supplied by customer.

Connection Diagram
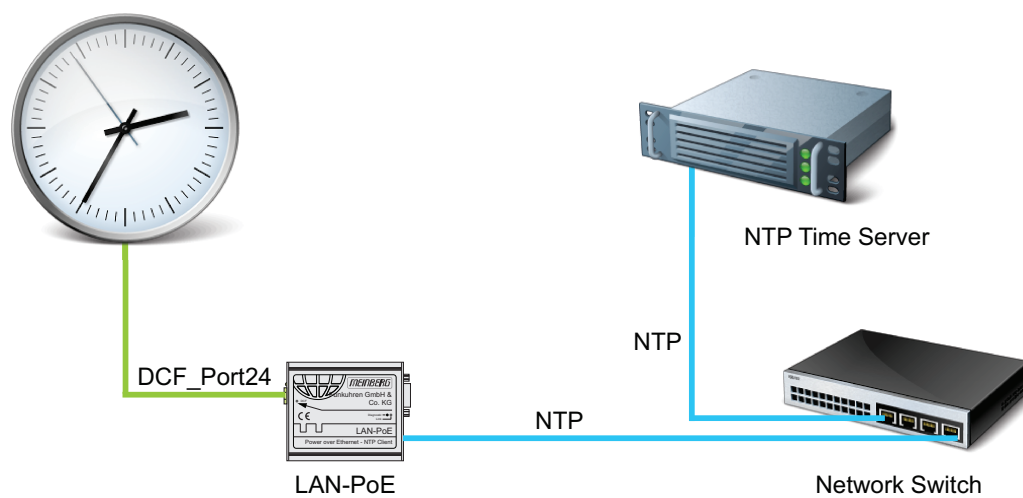
Rear View - Wall Clock with LAN-PoE Module
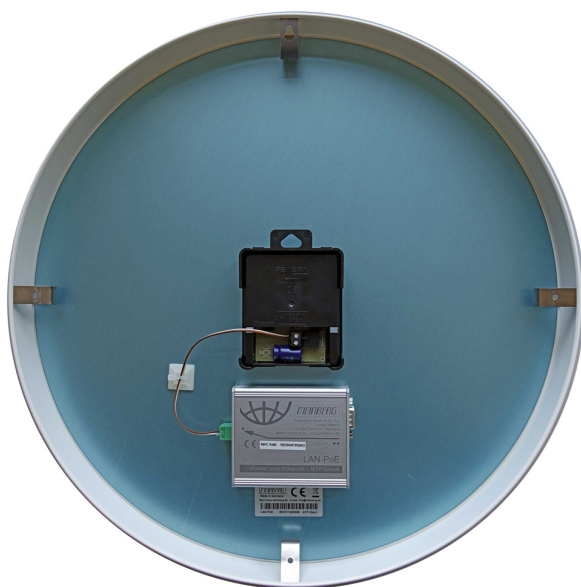
3 LAN-PoE Converter

The LanPoE converter module uses its NTP synchronized timebase to generate DCF-Port 24 pulses. Power over Ethernet technology lets the user install a synchronized clock system without the cost of installing AC outlets. The existing Ethernet LAN is used to power the module and also to synchronize the time information. It is possible to configure a number of LanPoE converters via Telnet.

Wherever a PoE-Ethernet is not available, it is recommended to use a simple midspan power injector as a power supply. Configuration of the time zone as well as changes of daylight saving configuration occurs via Telnet. The free running clock is beeing synchronized cyclic via the network connection (10/100MBit, RJ45) by a NTP time server using the Network Time Protocol. The UTC time from the NTP server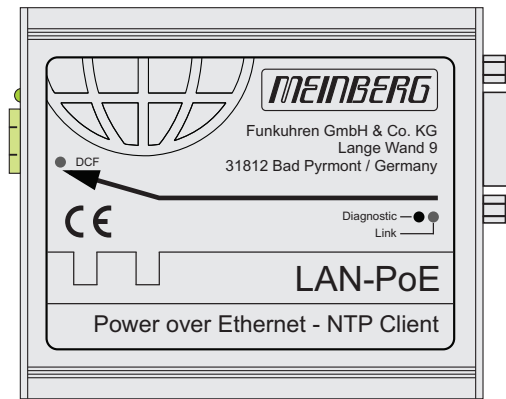 is converted into the users local time by configurable parameters and the DCF-Port 24 pulses are generated correspondingly.

3.1 Features of the LAN-PoE Converter

The LANPOE Converter unit is a stand-alone free running clock with integrated power over Ethernet supply. A time string is sent via the serial port periodically once per second after synchronization with NTP. The format of the time string is described in the section "Technical Specifications". Baudrate and framing are set to 9600 baud, 8N1. This configuration is not to be changed. The module generate also an DCF77_PORT24 output signal.

3.2 Micro Processor System

The time strings received from the network are decoded by the microprocessor system. The checked and decoded time is written to the on-board software clock and the DCF77_Port24 interface. A watchdog lets the microprocessor recover from malfunction. A power-fail comparator resets the microprocessor if the supply voltage drops below a specified threshold.

3.3 DCF77-Port24 Emulation

The Converter generate an time mark signal which is compatible with the time marks spread by the German long wave transmitter DCF77. This time mark are available as an demodulated time signal at each DFK-connector. The pulse voltage is 15 V/DC (aktiv low DCF77-Marks) with max. pulse current of 80 mA. The coding sheme is given below:
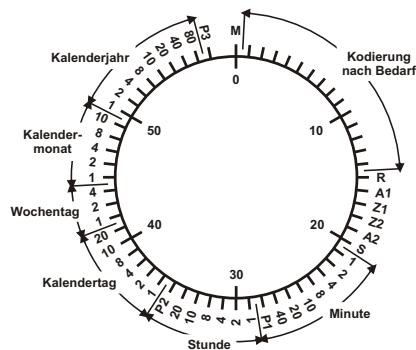
M	Minutenmarke (0.1 s)
R	Aussendung über Reserveantenne
A1	Ankündigung Beginn/Ende der Sommerzeit
Z1, Z2	Zonenzeitbits
	Z1, Z2 = 0, 1: Standardzeit (MEZ)
	Z1, Z2 = 1, 0: Sommerzeit (MESZ)
A2	Ankündigung einer Schaltsekunde
S	Startbit der codierten Zeitinformation
P1, P2, P3	gerade Paritätsbits

3.4 Serial Port

One asynchronous serial interface (RS-232) called COM are available to the user. A time string is sent via the serial port periodically once per second after synchronization with NTP. The format of the time string is described in the section "Technical Specifications". Baudrate and framing are set to 9600 baud, 8N1. This configuration is not to be changed.

3.5 Technical Specifications LAN-PoE

Interface: one serial RS232
                          Baudrate: 9600
                          Framing: 8N1

Output String: after synchronization with NTP,
                          see "Format of the Meinberg Standard Time String"

Outputs: DCF_Port24
                          pulse voltage: 15 V (active low DCF77 pulses)
                          pulse current: 80mA max.
                          over 2-pol. Phoenix DFK connector

NTP Request Time: LAN-PoE Converter inquires the time information from the NTP server
                          and sets its own free-running clock every 64s

Status-LEDs: three status LEDs; Diagnostic, Link, DCF

Connectors: RJ45 10/100MBit Ethernet connector (IEEE802.3af, PoE)
                          D-SUB9 female connector
                          DFK-2 connector

Physical
Dimensions: 24mm x 71mm x 84mm / height x width x depth

Power
Requirements: PoE (Power over Ethernet)

Ambient Temperature: 0 ... 50° C

Humidity: 85% max.

3.5.1 Connectors

Label	Connector	Type	Cable
LAN(PoE)	RJ-45	Ethernet with PoE	10 MBit data line
COM	9pin SUB-D Pin 2 - TxD; Pin 3 - RxD; Pin 5 - GND;	RS232	shielded data line
DCF_Port24	DFK	DCF_Port24	

CE Label

This device conforms to the directive 2004/108/EC on the approximation of the laws of the Member States of the European Community relating to electromagnetic compatibility.

3.5.2 Format of the Meinberg Standard Time String

The Meinberg Standard Time String is a sequence of 32 ASCII characters starting with the STX (start-of-text) character and ending with the ETX (end-of-text) character. The format is:

<STX>D:*dd.mm.yy;T:w;U:hh.mm.ss;uvxy*<ETX>

The letters printed in italics are replaced by ASCII numbers whereas the other characters are part of the time string. The groups of characters as defined below:

<STX>	Start-Of-Text, ASCII Code 02h		
	sending with one bit accuracy at change of second		
dd.mm.yy	the current date:		
	dd	day of month	(01..31)
	mm	month	(01..12)
	yy	year of	
	the century	(00..99)	

w	the day of		
	the week		(1..7, 1 = Monday)

hh.mm.ss	the current time:		
	hh	hours	(00..23)
	mm	minutes	(00..59)
	ss	seconds	(00..59, or 60 while leap second)
uv	clock status characters (depending on clock type):		

	u:	'#'	GPS: clock is running free (without exact synchr.)
			PZF: time frame not synchronized
			DCF77: clock has not synchronized after reset
		' '	(space, 20h)
			GPS: clock is synchronous (base accuracy is reached)
			PZF: time frame is synchronized
			DCF77: clock has synchronized after reset
	v:	'*'	GPS: receiver has not checked its position
			PZF/DCF77: clock currently runs on XTAL
		' '	(space, 20h)
			GPS: receiver has determined its position
			PZF/DCF77: clock is syncronized with transmitter

x	time zone indicator:			
		'U'	UTC	Universal Time Coordinated, formerly GMT
		' '	CET	European Standard Time, daylight saving disabled
		'S'		(CEST) European Summertime, daylight saving enabled

y	anouncement of discontinuity of time, enabled during last hour before discontinuity comes in effect:		
		'!'	announcement of start or end of daylight saving time
		'A'	announcement of leap second insertion
		' '	(space, 20h) nothing announced

<ETX>	End-Of-Text, ASCII Code 03h

4 Initial Start of Operation

4.1 Power Supply

The local area network must support IEEE 802.3af Power over Ethernet (PoE) in order for the LAN-PoE Converter to operate.

After network connection has been established and the LANPOE Converter has successfully synchronized, the unit generate the time of the reached NTP server, the configured time zone is taken into consideration. This is indicated by the yellow LED which starts blinking exactly once per second, corresponding to the time marks from DCF77.

4.2 Network Configuration

To identify the LANPOE Converter in the network it is neccessary to set the unique 32 bit TCP/IP address by the network administrator. Now configuration is possible by using a Telnet connection via ethernet. Initialization of the TCP/IP address for the first time may occur by two different ways: the network parameters are either given automatically by a DHCP server or set manually by the below described ARP method.

4.2.1 DHCP

If there is a DHCP server (Dynamic Host Configuration Protocol) installed in the network the described configuration can be done very easy as follows: When the TCP/IP address is 000.000.000.000 (factory default) a DHCP client is started automatically. This client took the corresponding network parameters from a DHCP server and configures the network installation of LANPOE Converter itself. The default hostname of the LANPOE Converter is Cxxxxxx, where xxxxxx is the last 6 digits of the MAC address. The MAC address of the internal netcard (Hw-Addr) is labeled beside the RJ45 connector.

4.2.2 ARP Method

This method is available under UNIX and Windows based systems. LANPOE Converter will set its address from the first directed TCP/IP packet it receives.

1. Step

On a UNIX host, create an entry in the host's ARP table using the intended IP address and the hardware address of the Device Server, which is found on the label beside the RJ45 connector in the front panel.

In order for the ARP command to work on Windows, the ARP table on the PC must have at least one IP address defined other than its own. If the ARP table is empty, the command will return an error message. Type "arp -a" at the DOS command prompt to verify that there is at least one entry in the ARP table.

If the local machine is the only entry, ping another IP address on your network to build a new entry in the ARP table; the IP address must be a host other than the machine on which you are working. Once there is at least one additional entry in the ARP table, use the following command to ARP an IP address to the LANPOE Converter:

ARP on Windows:
arp -s 191.12.3.77 00-20-4A-xx-xx-xx
ARP on Unix:
arp -s 191.12.3.77 00:20:4A:xx:xx:xx

2. Step

Now open a Telnet connection to port 1. The connection will fail quickly (3 seconds), but the LANPOE Converter will temporarily change its IP address to the one designated in this step: **telnet 191.12.3.77 1**

3. Step

Finally, open a Telnet connection to port 9999 and set all required parameters in the configuration menu of the Converter.
telnet 191.12.3.77 9999

4.3 Extended Configuration via Telnet

As soon as the network parameters of the LANPOE Converter module are correctly set, you can start configuring the unit by using a standard Telnet client. All you need to know is the IP address of the LANPOE Converter module and the correct access password. The default password is meinberg.

You need to connect to port 9999 of the module, so please start a telnet session with the IP address of the unit and port 9999.

Please note: Telnet sessions are always unencrypted, even the password is transmitted in plain text.

It is highly recommended to only connect to the module via Telnet in a secure, separated network in order to avoid a network sniffer to find out your password. The safest method is to directly connect a laptop with a crosslink cable and use this laptop to configure the unit.

The changes made during the Telnet session are activated after you left the setup with Menu Option 9 (Save and Exit). Only in this case the parameters are stored permanently and the module is restarted.

After you initiated a Telnet connection with the LANPOE Converter, you are presented the Welcome message and have to enter the access password. If the password has been entered correctly, you have to press enter again to start the setup tool:

```
*** NTP Slave Clock V1.00          :Meinberg Funkuhren ***
Hardware : Ethernet TPI
NTP Slave Clock addr               : 172.16.3.234, gateway 172.16.3.1, netmask 255.255.0.0
NTP Time Server IP 1               : 172.16.3.235
NTP Time Server IP 2               : — not set —
Display delay time [+/-ms]         : 0
NTP client stratum [1-15]          : 10
DCF_Mark output                    : aktiv high
Time Zone Daylight on              : Sun after 25.03 at 02:00 UTC +120min
Time Zone Daylight off             : Sun after 25.10 at 03:00 UTC +60min
SNMP community name for read       : public
SNMP community name for write      : public
SNMP manager IP address 1          : — not set —
SNMP manager IP address 2          : — not set —
SNMP manager IP address 3          : — not set —
SYSLOG is disable Server IP        : — not set —

Change Setup:                      0 Server configuration    5 Time Zone configuration
                                   1 Security configuration  6 NTP client configuration
                                   2 SNMP configuration      7 factory defaults
                                   3 SYSLOG configuration    8 exit without save
                                   4 DCF_Mark output           9 save and exit
                                   Your choice ?
```

4.3.1 Menu Option 0: Server configuration

The setup of the network parameters can be altered here:

IP Address : (172) .(016) .(003) .(202)
Set Gateway IP Address (Y) Y
Gateway IP Address : (172) .(016) .(003) .(002)
Netmask: Number of Bits for Host Part (0=default) (24)

IP addresses in the Telnet setup are entered as four separate decimal numbers (0-255), the Setup always shows the number to be changed and waits for an input. It looks like this:

IP Address : (172) _

„_" represents the cursor. Enter a new value and press RETURN. If you press RETURN without entering a new value, the old one is taken. After RETURN the next number is displayed:

IP Address : (172) 192 .(016) _

Now you can enter the second part of your IP address and confirm it with RETURN. Afterwards you can enter the third and finally the fourth part of the address. After entering all four parts the screen looks like this:

IP Address : (172) 192 .(016) 168 .(003) 100 .(202) 11

So, in this example you changed the IP address from 172.16.3.202 to 192.168.100.11.

The netmask for this converter has to be defined as a single decimal number representing the number of reserved bits of the host part. If your netmask has to be set to 255.255.255.0, 24 bits are set for the net part and 8 bits reserved for the host part. So you would have to enter a 8. A netmask of 255.255.0.0 is represented by a 16, in order to define a netmask of 255.0.0.0 you would have to enter 24.

Class A: 24 bits e.g. 255.000.000.000

Class B: 16 bits e.g. 255.255.000.000

Class C: 8 bits e.g. 255.255.255.000

4.3.2 Menu Option 1: Security configuration

Setting the Telnet configuration password prevents unauthorized access of the setup menu via a Telnet connection to port 9999. Default password is meinberg. To change this password enter this menu by pressing 1 and return. After the password is changed it has to be acknowledged by reentering it.

4.3.3 Menu Option 2: SNMP Configuration

Here you can setup the SNMP parameters:

SNMP community name for read (public):

The SNMP community value is some kind of a rudimentary access control. Every SNMP request pointed to the module includes a community string defined by the originator of the request. This community is checked against the configured community names and a reply is only sent if they matched. In order to improve SNMP security, the Converter module additionally checks the IP address of the SNMP client and only accepts requests by hosts configured as SNMP trap receivers. So, if you want to send SNMP requests to the module, you have to define the IP address of your PC as a SNMP trap receiver (see below).

SNMP community name for write (rwpublic):

An incoming SNMP request coming with this community string is granted read-writeaccess, meaning you can change a value. At the moment there are no variables accessible for write-access, so this value can be used to add a second SNMP community to be accepted by the module.

Enter IP addresses for SNMP traps:
1: (172) .(016) .(003) .(002)
2: (172) .(016) .(003) .(045)
3: (000) .(000) .(000) .(000)

Here you can enter up to three SNMP trap receivers. As describe above, these IP addresses are additionally used to authenticate SNMP requests. You find a description of how to enter IP addresses in the Menu Option 1 section (see above).

A description of the supported SNMP variables and the MIB can be found in the SNMP Reference section of this manual.

4.3.4 Menu Option 3: Syslog Configuration

This option allows you to configure a syslog server. The module is sending event log messages to UDP port 514(=syslog) and the configured server can record them, for example. Please note that you need to configure your syslog service to accept remote messages. Otherwise the messages are dropped by the syslog server without further notice.

A syslog server is defined like this:

******** SYSLOG Configuration ********
Use SYSLOG logging? (Y) Y

Enter IP address for SYSLOG server:(172) .(016) .(003) .(002)

4.3.5 Menüpunkt 4: DCF_Mark Configuration

In this Menue, you can change the polarity at your DCF output.

0 = activ high; 1 = activ low

4.3.6 Menu Option 5: Time Zone Configuration

Select 5 to configure the Converter's time zone settings. The NTP time is a linear time scale similar to UTC, without information about the time zone. This menu lets the user enter the range of date for daylight saving to be in effect as well as the local times's offset to UTC.

Beginning and ending of daylight saving may either be defined by exact dates for using an algorithm which allows the converter to recompute the effective dates year by year. Then, starting from the configured date, daylight saving changes the first day which matches the configured day-of-week. For example March 25, 1994 is a Friday, so the next Sunday is March 27, 1994.

4.3.7 Menu Option 6: NTP Client Configuration

Select 6 to enter the Converter's NTP configuration.

NTP Server

The IP address of up to three NTP servers can be entered here. First the first NTP server is tried to achieve. If this fails, the second and than the third NTP server is queried. In case of 0.0.0.0 is entered for the first NTP server, the Converter tries to find a NTP server itself.

Display Delay Time

This value causes the Converter to display the time delayed. It should be set to zero because of the internal compensation of the propagation time.

NTP Client Stratum

A NTP stratum can be assigned to the Converter. If the NTP server has a higher stratum during the request than the Converter, the time infomation is rejected.

4.3.8 Menu Option 7: Factory Defaults

You can reset your configuration by choosing this option. Please note that network parameters are not altered (you have to change them manually by using Menu Option 1). If you have chosen this option by accident, just abort the Telnet Session by using Menu Option 7 and reconnect.

4.3.9 Menu Option 8: Exit without save

If you changed something by accident or did not change anything, you can leave the Telnet setup by choosing this option. The telnet session is closed without saving the changes and without a reboot.

4.3.10 Menu Option 9: Save and exit

All parameters are saved in the nonvolatile memory of the module and afterwards the unit restarts in order to put the changes into effect. After 10 − 30 seconds the Converter module has finished rebooting and can be used again.

5 Declaration of Conformity

Konformitätserklärung
Doc ID: NTP-SLAVE-CLOCK-PoE-2015-03-18

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   **NTP-SLAVE-CLOCK-PoE**
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 A   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 50581:2012   Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

gemäß den Richtlinien 2004/108/EG (Elektromagnetische Verträglichkeit), 2006/95/EG (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 2004/108/EC (electromagnetic compatibility), 2006/95/EC (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, 2015-03-18

Günter Meinberg
Managing Director