



The Synchronization Experts.



MANUAL

DIS14/NET

NTP Time and Date Display

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Meinberg Funkuhren GmbH & Co. KG

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1 Imprint

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2 Safety Hints

2.1 Important Safety Instructions and Protective Measures

The following safety instructions must be respected in all operating and installation phases of the device. Non-observance of safety instructions, or rather special warnings and operating instructions in product manuals, violates safety standards, manufacturer instructions and proper usage of the device. Meinberg Funkuhren shall not be responsible for any damage arising due to non-observance of these regulations.



Depending on your device or the installed options some information is not valid for your device.



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

If a procedure is marked with the following signal words, you may only continue, if you have understood and fulfilled all requirements. In this documentation dangers and indications are classified and illustrated as follows:



DANGER!

The signal word indicates an imminently hazardous situation with a high risk level . This notice draws attention to an operating procedure or similar proceedings, of which a non-observance may result in serious personal injury or death .



WARNING!

The signal word indicates a hazard with a medium risk gradient . This notice draws attention to an operating procedure, a procedure or the like which, if not followed, can lead to serious injuries , possibly resulting in death .



CAUTION!

The signal word indicates a hazard with a low risk gradient . This notice draws attention to an operating procedure, a procedure or the like which, if not followed, can lead to minor injuries .















ATTENTION!

This notice draws attention to an operating procedure, a procedure or the like which, if not followed, can cause damage to the product or loss of important data .

2.2 Used Symbols

The following symbols and pictograms are used in this manual. To illustrate the source of danger, pictograms are used, which can occur in all hazard classes.

Symbol	Beschreibung / Description
	IEC 60417-5031 Gleichstrom / <i>Direct current</i>
	IEC 60417-5032 Wechselstrom / <i>Alternating current</i>
	IEC 60417-5017 Erdungsanschluss / <i>Earth (ground) terminal</i>
	IEC 60417-5019 Schutzleiteranschluss / <i>Protective earth (ground) terminal</i>
	ISO 7000-0434A Vorsicht / <i>Caution</i>
	IEC 60417-6042 Vorsicht, Risiko eines elektrischen Schlages / <i>Caution, risk of electric shock</i>
	IEC 60417-5041 Vorsicht, heiße Oberfläche / <i>Caution, hot surface</i>
	IEC 60417-6056 Vorsicht, Gefährlich sich bewegende Teile / <i>Caution, moving fan blades</i>
	IEC 60417-6172 Trennen Sie alle Netzstecker / <i>Disconnection, all power plugs</i>
	IEC 60417-5134 Elektrostatisch gefährdete Bauteile / <i>Electrostatic Sensitive Devices</i>
	IEC 60417-6222 Information generell / <i>Information general</i>
	2012/19/EU Dieses Produkt fällt unter die B2B Kategorie. Zur Entsorgung muss es an den Hersteller übergeben werden. <i>This product is handled as a B2B category product. In order to secure a WEEE compliant waste disposal it has to be returned to the manufacturer.</i>

The manuals for a product are included in the scope of delivery of the device on a USB stick. The manuals can also be obtained via the Internet. Enter www.meinbergglobal.com into your browser, then enter the corresponding device name in the search field at the top.



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

This device may only be used for the purpose described in this manual. In particular, the given limits of the device must be observed. The safety of the installation in which the unit is integrated is the responsibility of the installer!

Non-observance of these instructions can lead to a reduction in the safety of this device!

Please keep this manual in a safe place.

This manual is intended exclusively for electricians or persons trained by an electrician who are familiar with the applicable national standards and safety rules. Installation, commissioning and operation of this device may only be carried out by qualified personnel.

2.3 Security during Installation



WARNING!

Preparing for Commissioning

This built-in unit, has been designed and examined according to the requirements of the standard IEC 62368-1 "Audio/video, information and communication technology equipment - Part 1: Safety requirements".

When the built-in unit is used in a terminal (e.g., housing cabinet), additional requirements according to Standard IEC 62368-1 must be observed and complied with. In particular, the general requirements and the safety of electrical equipment (such as IEC, VDE, DIN, ANSI) as well as the applicable national standards are to be observed.

The device has been developed for use in the industrial sector as well as in residential areas and can only be used in such environments. For environments with higher levels of soiling, additional measures, e.g. Installation in an air-conditioned control cabinet required.

Transport, Unpacking, Installation

If the unit is brought into the operating room from a cold environment, condensation may occur, wait until the unit is temperature-controlled and absolutely dry before operating it.

When unpacking, setting up, and before operating the equipment, be sure to read the information on the hardware installation and the specifications of the equipment. These include, for example, dimensions, electrical characteristics, and necessary ambient and climatic conditions, etc.

The fire protection must be ensured in the installed state.

For mounting, the housing must not be damaged. No holes may be drilled in the housing.

For safety reasons, the device with the highest mass should be installed in the lowest position of the rack. Other devices must be placed from the bottom to the top.

The device must be protected against mechanical stress such as vibration or shock.



Connecting Data Cables

During a thunderstorm, data transmission lines must not be connected or disconnected (risk of lightning).

When wiring the devices, the cables must be connected or disconnected in the order of the arrangement described in the user documentation accompanying the device. Always attach all cables to the plug during connection and removal. Never pull the cable itself. Pulling the cable can cause the cables to disconnect from the plug.

Install the cables in way that they do not constitute a hazard (danger of tripping) and are not damaged, i.e. kinked.

Connecting Power Supply

This equipment is operated at a hazardous voltage. Non-observance of the safety instructions in this manual may result in serious personal injury or property damage.

Before connecting to the power supply, a grounding cable must be connected to the earth connection of the device.

Before operation, check that all cables and lines work properly and are undamaged. Pay particular attention to the facts that the cables do not have kinks or that they are not too short around corners, and no objects are placed on the cables. Also make sure that all connections are secure.

Faulty shielding or cabling will endanger your health (electrical shock) and may destroy other equipment.

Ensure that all necessary safety precautions have been taken. Make all connections to a unit before turning on the power. Observe the safety instructions on the device (see safety symbols).

The metal housing of the device is grounded. It must be ensured that enough air and creepage distances to neighboring voltage-carrying parts are provided during assembly in the control cabinet and no short circuits are caused.

In the case of malfunctions or servicing (e.g. in the event of a damaged housing or power cable or when fluids or foreign objects enter), the current flow can be interrupted. Questions about the house installation, need to be clarified with your house administration.

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

AC Power Supply	DC Power Supply
<ul style="list-style-type: none"> • The device is a device of protection class 1 and may only be connected to a grounded outlet (TN system). • For safe operation, the device must be protected by an installation fuse of max. 16 A and equipped with a residual current circuit breaker in accordance with the applicable national standards. • The unit must always be disconnected from the mains and not from the appliance. • Devices with mains plugs are equipped with a safety-tested mains cable of the country of use 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 freely accessible to the user so that the mains cable can be pulled out of the socket in case of emergency. 	<ul style="list-style-type: none"> • Outside the assembly group the device must be disconnectable from the power supply in accordance with the provisions of IEC 62368-1 (e.g. by the primary line protection). • Installation and disassembly of the power supply plug is only permitted if the assembly group is switched off (e.g. by the primary line protection). • The supply lines must be adequately secured and dimensioned. <p style="text-align: center;"><i>Connection Cross Section:</i> $1 \text{ mm}^2 - 2.5 \text{ mm}^2$ 17 AWG – 13 AWG</p> <ul style="list-style-type: none"> • The device must be supplied with a suitable disconnecter (switch). The separation device must be easily accessible, placed near the device and marked as a separation device for the unit.

2.4 Safety during Operation



WARNING!

Avoiding Short-Circuits

Make sure not to get any objects or liquids inside the unit. Electric shock or short circuit could result.

Ventilation Slots

Make sure that the ventilation slots are not covered or dusty, as there is a danger of overheating during operation. Disturbances during operation can result.

Normal Operation

The normal operation and the observance of the EMC limits (electromagnetic compatibility) are only ensured if the housing cover is properly installed and when the doors are closed (cooling, fire protection, shielding against electrical, magnetic and electromagnetic fields).



Switch off in fault / service case

By switching off, the devices are not disconnected from the power supply. In the event of a fault or service case, the devices must be immediately disconnected from all power supplies.

Follow the steps below:

- Switch off the device
- Disconnect all power plugs
- Inform the service
- Devices that are connected via one or more uninterruptible power supplies (UPS) remain operational even when the UPS power cord is disconnected. Therefore, you must put the UPS out of operation according to the documentation of the corresponding user documentation.

2.5 Safety during Maintenance



WARNING!

When you are expanding the device, use only device parts that are approved for the system. Non-observance may result in injury to the EMC or safety standards and cause malfunction of the device.

If device parts, which are released for the system, are extended or removed there may be a risk of injury in the area of the hands, due to the pull-out forces (approx. 60 N).

The service informs you which device parts may be installed.

The device must not be opened, repairs to the device may only be carried out by the manufacturer or by authorized personnel. Improper repairs can result in considerable danger to the user (electric shock, fire hazard).

Unauthorized opening of the device or of individual parts of the device can also lead to considerable risks for the user and result in a loss of warranty as well as an exclusion of liability.



- Danger due to moving parts - keep away from moving parts.



- Device parts can become very hot during operation. Do not touch these surfaces! If necessary, switch off the unit before installing or removing any equipment, and allow it to cool down.

2.6 Handling Batteries



CAUTION!

The lithium battery on the receiver modules has a service life of at least 10 years. If an exchange is necessary, the following notes must be observed:

The device is equipped with a lithium battery. The battery must not be short-circuited or recharged. Replacement of the lithium battery may only be carried out by the manufacturer or authorized personnel.

Risk of explosion if the battery is not replaced correctly. Replace only with the same or equivalent type recommended by the manufacturer.

When disposing used batteries, observe the local regulations for the disposal of hazardous waste.

2.7 Cleaning and Care



ATTENTION!

Do not wet clean the appliance! Penetrating water can cause considerable dangers to the user (e.g., electric shock).

Liquid can destroy the electronics of the device! Liquid penetrates into the housing of the device and can cause a short circuit of the electronics.

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

2.8 Prevention of ESD Damage



ATTENTION!

The designation ESD (Electrostatic Sensitive Devices) refers to measures which are used to protect electrostatically endangered components from electrostatic discharge and thus to prevent destruction. Systems and assemblies with electrostatically endangered components usually have the following characteristics:



Indicator for assemblies with electrostatic endangered components

The following measures protect electrostatically endangered components from destruction:

Prepare removal and installation of assemblies

Unload yourself (for example, by touching a grounded object) before touching assemblies.

Ensure that you wear a grounding strap on the wrist when working with such assemblies, which you attach to an unpainted, non-conductive metal part of the system.

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

Transporting Assemblies

Assemblies may only be touched at the edge. Do not touch any pins or conductors on assemblies.

Installing and Removing Assemblies

Do not touch persons who are not grounded while removing or installing components. This could result in a loss of grounding protection from your electrostatic discharge.

Storing Assemblies

Always keep assemblies in ESD protective covers. These protective covers must be undamaged. ESD protective covers, which are extremely wrinkled or even have holes, no longer protect against electrostatic discharge.

ESD protective covers must not be low-resistance and metallically conductive if a lithium battery is installed on the assembly.

2.9 Return of Electrical and Electronic Equipment



ATTENTION!

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

Separate Collection

Product Category: According to the device types listed in the WEEE Directive, Appendix 1, this product is classified as an IT and communication device.



This product meets 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

For returning your old equipment, please use the country-specific return and collection systems available to you or contact Meinberg.

The withdrawal may be refused in the case of waste equipment which presents a risk to human health or safety due to contamination during use.

Return of used Batteries

Batteries marked with one of the following symbols may not be disposed of together with the household waste according to the EU Directive.

3 Time and Date Display with NTP synchronized Reference

DIS14 is a LED display with network (Ethernet) connection. It was designed to display the time (hours, minutes and seconds) as well as the date (day, month, year and day of the week). The free running clock is being synchronized cyclic via the network connection (RJ45 10/100MBit) by a NTP time server using the Network Time Protocol.

The UTC time sent by the NTP server is converted into the users local time by configurable parameters and displayed correspondingly. A dot in the LED display and/ or a numerical error code indicates a malfunction. Configuration occurs via network using a Telnet connection.

3.1 Network Time Protocol (NTP)

NTP is a common method for synchronization of hardware clocks in local and global networks. The basic concept, version 1 [Mills88], was published in 1988 as RFC (Request For Comments). Experiences made from the practical use in Internet was followed by version 2 [Mills89]. The software package NTP is an implementation of the actual version 3 [Mills90], based on the specification RFC-1305 from 1990 (directory doc/NOTES). Permission to use, copy, modify and distribute this software for any purpose and without fee is hereby granted (read File COPYRIGHT).

NTPs way of operation is basically different from that of most other protocols. NTP does not synchronize all connected clocks, it forms a hierarchy of timeservers and clients. A level in this hierarchy is called a stratum, and stratum-1 is the highest level. Timeservers of this level synchronizes themselves by a reference time source, such as a radio controlled clock, GPS-receiver or modem time distribution. Stratum-1-Servers distribute their time to several clients in the network which are called stratum-2.

A high precision synchronization is feasible because of the several time references. Every computer synchronizes itself by up to three valued time sources. NTP enables the comparison of the hardware times and the adjustment of the own clock. A time precision of 128 ms, often better than 50 ms, is possible.

4 Features of the DIS14/NET

The DIS14/NET is a stand-alone free running clock with integrated power supply that is synchronized via network connection using NTP. The 6-digit LED display shows the time (hours and minutes, with or without seconds) or the date (day, month and year or day-of-week). The display brightness is variable with two push buttons. Serial time strings are generated either once per second or once per minute. Baudrate and framing are free configurable.



4.1 Microprocessor System

The time marks from the receiver circuit are evaluated by the microprocessor system. The checked and decoded time is written to the on-board real time clock and spread by the interface. A software watchdog lets the microprocessor recover from malfunction. A power-fail comparator resets the microprocessor if the supply voltage drops below a specified threshold. A flash EPROM located in the microprocessor is used as program memory that can be loaded with the firmware by the serial interface COM0.

4.2 Buffered Real Time Clock

In case of supply voltage failure the on-board real time clock keeps the time powered by a backup capacitor for more than 150 hours. This capacitor does not need any maintenance and ensures that the DIS14 returns with the actual time information even before the first synchronisation. Alternatively, the clock can be ordered with a lithium battery which has a live time of at least 10 years guaranteed.

4.3 EEPROM

The non-volatile EEPROM is used to store the settings of the DIS14. This ensures a proper restart without any new configuration after the DIS14 was switched off for a time. The two push buttons in the front panel are used to set the parameters. The following items can be set: display brightness, baudrate and framing as well as output mode of the serial interface, format of the time string, time zone (local or UTC) and the language of the day-of-week view. Furthermore, the time can be set manually, e.g. for testing.

4.4 Display

The 6-digit LED display shows the time in two different formats, either with or without seconds, or the date is displayed in two formats, either with the current year or with the day-of-week. Furthermore, in case of a problem a numeric error code is shown instead of the time or date. The green LED digits have a 20/13 mm character height.

Four status LEDs indicate the currently shown information: the "Time" LED is switched on whenever one of the two time formats is displayed. The "Date" LED is switched on when a date format is displayed. Selection of the displayed format is made with the **Mode** button. The "Setup" LED is switched on when the setup menu is entered by pressing the **Mode** button for at least two seconds. The "Error" LED is switched on to indicate that a problem occurs. In addition to the "Error" LED, a numerical error code can be displayed when this is chosen in the setup menu (see "Debug Mode").

The displays brightness is variable by the two push buttons labeled with **Brightness**.

4.5 Serial Interface

The DIS14 provides two serial ports which can either be used as RS232 or RS422 interfaces. The COM0 interface provides an RS422 output, COM1 provides an RS422 input. On this way, a network-synchronized DIS14 can synchronize an additional DIS14 without network connection. The transfer rate and the data format are free selectable. The serial port can send a time string once per second, once per minute or only on request by sending an ASCII character "?" (ASCII code 3Fh).

4.6 Power Supply

The integrated mains power supply provides the clock with a stabilized voltage of 5V. The standard AC power supply has an input range of 100-240V/50-60Hz and is fused with T 0.2 A / 250 V. The DC versions are fused with T 1 A.

The supply voltage is fed to the receiver via a connecting socket in the back of the device. The clock has no power switch and therefore will start immediately. Depending on the supply voltage (see label on the case) the DIS14 is equipped with an IEC socket (AC) or with a 3pin. terminal connector (DC).

5 Installation

5.1 Connection

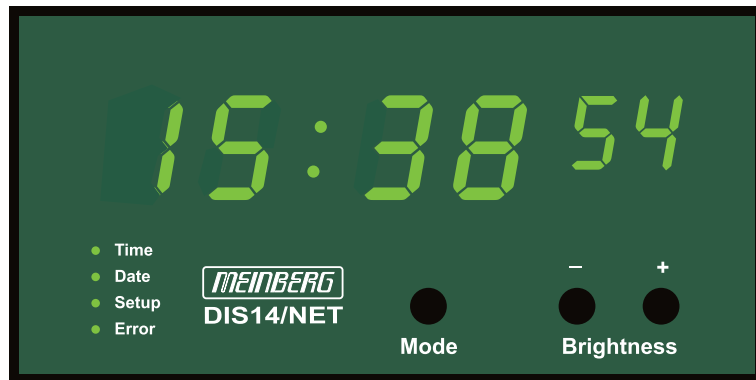
Note: Before connecting the device to the power circuit, the DIS14 must be connected with the network cable. So when using a DHCP server, the IP address of the DIS14 can be allocated properly .

The supply voltage is applied to the radio clock via an AC power connector in the rear panel. The clock has no power switch and starts showing the time of the internal real time clock or, if applicable, a numeric error code immediately after connecting the supply voltage. This is indicated by the "Error" status LED.

After network connection has been established and the DIS14 has successfully synchronized, the display shows the time of the reached NTP server, the configured time zone is taken into consideration. This is indicated by the above mentioned "Error" LED switched off (depending on the NTP request time).

5.2 Setup Menu

The front panel of the DIS14 contains three push buttons. Pressing the button "Mode" for at least two seconds enables the setup menu (LED "Setup" is switched on). This menu allows the configuration of the features provided by the DIS14/NET. All available sub menus are selected by the Mode push button while both Brightness push buttons (+ and -) are used to set the value or to select the available options.



5.2.1 Hour Mode [HM.]

The time can be shown either in a 24h or in a 12h format. When the 12h format is selected, a PM dot indicates whether it is after noon or not. The PM dot is the decimal dot behind the two hour digits. Selection of the format is made with + and -, leave and skip to the next sub menu with **Mode**.

5.2.2 Error-Code [Er.]

Whenever one of the below listed errors occurs, a corresponding numerical error code is displayed instead of the time/date. This error code is displayed as long as the fault cause exists, or until the Mode button is pressed once. In the second case, the error code is shown again after some time if the error is still present. However, the normal operation time/date displaying can be interrupted by the error code provided that the debug mode is enabled (see Setup Menu -> Debug Mode). Otherwise, an error is indicated only by the "Error" LED, the corresponding numerical error code can be displayed in the setup menu (see Setup Menu -> Error Code).

The following error codes are possible:

Er. 00	internal error
Er. 01	no answer from NTP
Er. 02	NTP not synchronized
Er. 03	NTP stratum > stratum of DIS14
Er. 04/05	for debugging only

5.2.3 Time Zone [TZ.]

The time zone of the LED display can be set here. With pressing the button + or - the possible selectable zones are displayed in the following sequence: CET (Central European Time or CET), EET (East European Time) or UTC (without summer time). This setting is only relevant when the DIS14 is DCF77-synchronized. If synchronization is done by serial interface or by an NTP time server, the received time is displayed always (LOCAL).

5.2.4 Language [LG.]

The 2-character abbreviation of the day of the week can be displayed in several languages. Select one of the following options by using the + and - buttons:

1. English
2. German
3. French
4. Spanish
5. Finnish
6. Slovenian
7. Russian

5.2.5 Baud rate COM 0/COM 1 - [B.0] or [B.1]

The baud rate of the serial interfaces can be set in this sub menu. Buttons + or - are used to select one of the available baud rates, button **Mode** is pressed to leave this menu and to enter into the next submenu.

5.2.6 Framing COM 0/COM 1 - [F.0] or [F.1]

The framing of the serial interfaces can be set accordingly. Use buttons + or - to select the framing from the list of available options, press **Mode** to enter the next submenu.

5.2.7 Serial Mode COM 0/COM 1 - [S.0] or [S.1]

The serial interfaces generate a time string either once per second (SEC), once per minute (60 S.) or on request only (on r.). Selection is made with + or -, exit and enter into the next submenu with **Mode**.

5.2.8 Time String Out COM 0/COM 1 - [S.0] or [S.1]

The generated time string can be selected in this sub menu. The available time string formats are:

1. Meinberg Standard
2. Uni Erlangen (without position-datas!!)
3. ATIS
4. Sysplex 1
5. SAT
6. SPA
7. Computime
8. NMEA-RMC (without position-datas!!)

The format of the strings is described in the chapter "Time Strings".

5.2.9 Time Zone Out COM 0/COM 1 - [Z.0] or [Z.1]

The time zone of the serial outputs COM 0 or COM 1 can be set here. With + or - the possible zones are displayed in the following order: CET (Central European Time or CET), EET (East European Time) or UTC (without DST). This setting is only relevant in the case of a DCF77-synchronized DIS14. In case of a serial or NTP synchronized DIS14, the received time is always passed. With pressing the button **Mode** you can enter the next submenu.

5.2.10 Sync In [In.]

The synchronization source of DIS14 is defined here (see also chapter "Synchronization via Interface"). With the buttons + or - the following sources are selectable:

LAN	Synchronization via Ethernet/NTP
232	Synchronization via COM1 (RS232)
422	Synchronization via COM1 (RS422)

5.2.11 IP Address [IP.]

The IP address of the DIS14/NET is shown in four separate numbers (0 ... 255). The first number is displayed until button + is pressed to show the second number and so on. Changing the IP address is not an object in this menu, this is done via network connection as described in chapter "Server Configuration". Button **Mode** is used to jump to the next sub menu.

5.2.12 Debug Mode [DM.]

Whenever an error occurs, a numerical error code is displayed instead of the time/date during normal operation. This error code is displayed there, provided that the debug mode is enabled in this menu by choosing YES with the buttons + and -. Otherwise, if NO is chosen, an error is indicated only by the "Error" LED and the display of time/date is going on. In this case, the corresponding error code can be checked in the setup menu only (see next sub menu "Error Code").

5.2.13 Time String In [TS.]

The generated time string can be selected in this sub menu. The list of available time string format is:

1. Meinberg Standard
2. Uni Erlangen (without position-datas!!)
3. ATIS
5. SAT
7. Computime

The format of the strings is described in the chapter "Time Strings".

5.2.14 Serial Number [SN.]

The 16-digit serial number of the DIS14/NET can be displayed in this menu. The first 4 digits are displayed first, when + is pressed once, the next 4 digits are displayed and so on. The serial number can also be found on the barcode sticker on the rear panel of the housing.

5.2.15 Factory Defaults [FD.]

The configuration of the DIS14, done in this Setup Menu, can be reset to the factory default values. All changes made in the previous menus are rejected if YES is chosen with button +.

5.2.16 Exit Setup and Save all Changes

The configuration is left and all changes made in the setup menu are saved when **Mode** is pressed for at least two seconds. The setup menu can be left in every sub menu by pressing **Mode** for two seconds, it is not necessary to enter and check all of the sub menus. The DIS14 is back in the normal operation mode.

5.3 Firmware Updates

Should it ever be necessary to load a modified version of the system-software into the device, this can be done via the serial interface.

If the two buttons **A** and **B** on the front panel are pressed simultaneously while switching on the power supply, a bootstrap loader of the microprocessor, which is waiting for commands via the serial interface COM0, is activated. Subsequently, the new software can be transferred from any PC with a serial interface. The required charging program will be supplied with the system software. The charging process is independent of the contents of the program-memory, so if the process is interrupted in case of failure, it can easily be repeated.

5.4 Network Configuration

To identify the DIS14 in the network it is necessary 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.

5.5 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 DIS14 itself. The default hostname of the DIS14 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 rear RJ45 connector.

5.6 ARP Method

This method is available under UNIX and Windows based systems. DIS14 will set its address from the first directed TCP/IP packet it receives.

Note: In Windows 7, the command line tool cmd.exe can be used. This program has to be start as administrator to own the rights for entering a new entry into the ARP table.

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 rear 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 DIS14:

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 DIS14 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 DIS14.

```
telnet 191.12.3.77 9999
```

5.7 Extended Configuration via Telnet

As soon as the network parameters of the DIS14 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 DIS14 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 (Example for invoking a telnet client: "C:/> telnet 192.168.0.1 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 DIS14, 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:

```
*** Meinberg XPort Display ***
MAC address 00204A80FBC3
Software version V0451 (090417) CPK6101_XPTEX
Password: *****
```

Press Enter for Setup Mode

```
*** NTP Display V1.01           Meinberg Funkuhren ***
Hardware                       : Ethernet TPI
NtpDisp IP 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 —
NTP Time Server IP 3           : — not set —
Display delay time [+/-ms]    : 0
NTP client stratum [1-15]     : 10
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
                               9 save and exit

Your choice ?
```

Now you can choose which parameter you want to change by entering a number and press RETURN. Here is a description of the available Menu Options:

5.7.1 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 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, the first 24 bits represent the net part and 8 bits are 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
```

5.7.2 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.

5.7.3 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 ANZ14/NET 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.

5.7.4 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)
```

5.7.5 Menu Option 4: Reserved

This menu is reserved for future purposes.

5.7.6 Menu Option 5: Time Zone Configuration

Select 5 to configure the DIS14'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.

Start and end of daylight saving is defined by dates, used by an algorithm which allows the DIS14 to re-compute the effective change-over dates year by year. Starting from the configured date, daylight saving changes the first day which matches the configured day-of-week. For example March 25, 2009 is a Wednesday, so the next Sunday is March 29, 2009.

5.7.7 Menu Option 6: NTP Client Configuration

Select 6 to enter the DIS14'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 then the third NTP server is queried. In case of 0.0.0.0 is entered for the first NTP server, the DIS14 tries to find a NTP server itself.

DIS14 inquires the time information from the NTP server and sets its own freerunning clock. The NTP request time is set to 64sec.

Display Delay Time

This value causes the DIS14 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 DIS14. If the NTP server has a higher stratum during the request than the DIS14, the time information is rejected.

5.7.8 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.

5.7.9 Menu Option 8: Exit without save

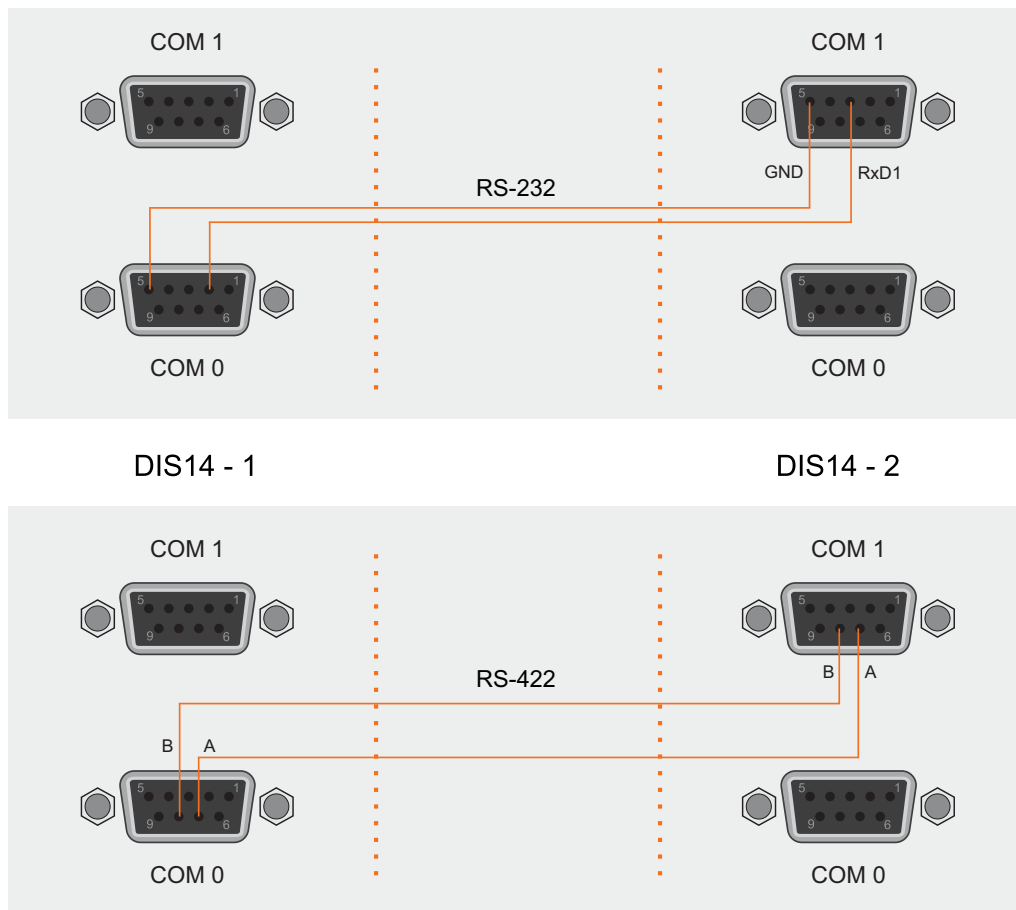
If you changed something by accident or did not change anything, you can leave the Telnet setup by choosing this option. The telnet session is closed without saving the changes and without a reboot.

5.7.10 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 DIS14 module has finished rebooting and can be used again.

5.8 Synchronisation via Serial Interface

In addition to the synchronisation via NTP it is possible to synchronize the DIS14 by a time sting from the serial port input. In this case the DIS14 can be used as a display for a pre-connected master clock. The incoming time string sets the DIS14 time that is running free from this moment. The DIS14 keeps synchronisation to the master clock if the time string comes periodically (once per second or once per minute). This time string is spread concurrently by the serial port output to apply the time string to one or more further displays.(Examples for cascading:)



Beispiele für die Reihenschaltung / *Samples for the serial connection*

The RS-422 current loop interface allows to span distance up to 1200 meters between the systems. Using the RS232 driver the distance between two systems is limited to 15 meters.

5.9 SNMP Reference

The SNMP support of the DIS14 module allows you to monitor the status of the switchcard and the involved radio clocks via SNMP and/or you can be notified when a number of events occur (e.g. when the unit restarts).

SNMP variables representing a number of status values are identified with OIDs (Object Identifier). They are sequences of numbers separated by a period ("."), forming a tree-like structure (with "leafes", and "branches"). More details about SNMP can be found on the internet (e.g. you may check out the site www.net-snmp.org, this is an open source project creating SNMP related software) or in related literature.

An OID looks like this: „1.3.6.1.4.1.5597.20.2.2“

All Meinberg units can be found under the „1.3.6.1.4.1.5597“ branch., the 5597 represents the unique, world-wide used enterprise ID of Meinberg, All variables concerning Meinberg equipment can be found under/behind this node. All Variables representing the status of Meinberg DIS14 can be found by following the branch „1.3.6.1.4.1.5597.20“

Here is a tree-like diagram showing the Meinberg NtpDisp SNMP structure:

```

+---mbgNtpDisp(20)
|
+---mbgNtpDispRefclock(2)
| |
| +--- -R--- String mbgNtpDispClockType(1)
| +--- -R--- Integer32 mbgNtpDispClockTypeVal(2)
| +--- -R--- String mbgNtpDispMode(3)
| +--- -R--- Integer32 mbgNtpDispModeVal(4)
| +--- -R--- String mbgNtpDispState(5)
|
+---mbgNtpDispTraps(3)
|
+---mbgNtpDispBoot(1)
+---mbgNtpDispNotSync(2)
+---mbgNtpDispNotSync(3)
+---mbgNtpDispTestNotification(99)

```


5.10 List of Literature

- [Mills88] Mills, D. L., "Network Time Protocol (Version 1) - specification and implementation", DARPA Networking Group Report RFC-1059, University of Delaware, July 1988
- [Mills89] Mills, D. L., "Network Time Protocol (Version 2) - specification and implementation", DARPA Networking Group Report RFC-1119, University of Delaware, September 1989
- [Mills90] Mills, D. L., "Network Time Protocol (Version 3) - specification, implementation and analysis", Electrical Engineering Department Report 90-6-1, University of Delaware, June 1989
- Kardel, Frank, "Gesetzliche Zeit in Rechnernetzen", Funkuhren, Zeitsignale und Normalfrequenzen, Hrsg. W. Hilberg, Verlag Sprache und Technik, Groß-Bieberau 1993
- Kardel, Frank, "Verteilte Zeiten", ix Multiuser-Multitasking-Magazin, Heft 2/93, Verlag Heinz Heise, Hannover 1993

6 Technical Specifications

Display:	6-digit numeric/alphanumeric LED display for time, date, day-of-week and error code, variable brightness; Digit height: 20/13 mm
Buffering:	In case of supply voltage failure the on-board RTC keeps the time based on XTAL for more than 150 hours (buffer capacitor) optional lithium backup battery (life time: 10 years)
Reliability of Operation:	A watchdog lets the microprocessor recover from malfunction. A power-fail comparator resets the microprocessor if the supply voltage drops below a specified threshold.
Interfaces:	Two serial ports (COM0, COM1) RS-232 (bi-directional) or RS-422 (COM0: Tx only; COM1: Rx only)
	Baudrate: 600, 1200, 2400, 4800, 9600 or 19200 baud Framing: 7N2, 7E1, 7E2, 8N1, 8N2, 8E1, 7O2 or 8O1
Output Mode:	configurable, once per second or once per minute
Output String:	see chapter "Time Strings"
Connectors:	RJ45 10/100MBit Ethernet connector D-SUB9 female connector power cord receptacle or DFK connector
Housing:	Aluminium stack case
Physical Dimensions:	height x width x depth (72 mm x 144 mm x 132 mm) cutout in control panel: 140 mm x 68 mm
Power Requirements:	100-240 V AC / 50-60 Hz, 100 mA or 120-240 V DC, 100 mA or 20-60 V DC, 250 mA or 9-36 V DC, 500 mA
Fuse:	T 0.2 A / 250 V or T 1 A, see inscription on rear panel
Ambient Temperature:	0 ... 50°C
Humidity:	max. 85 %

6.1 Rear Panel Connectors

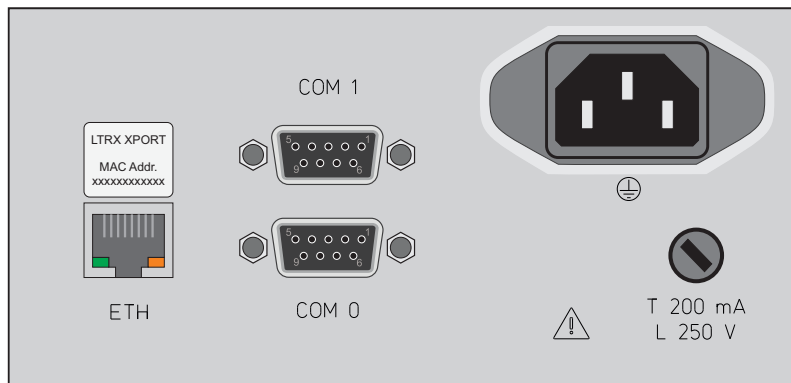
Name	Type	Signal	Cable
COM 0	9pin SUB-D	RS-232 / RS-422	shielded data line
COM 1	9pin SUB-D	RS-232 / RS-422	shielded data line
Antenna	BNC female	77.5 kHz	shielded coaxial cable
Power supply ...or	power cord receptacle DFK connector	100-240 V AC 12 V or 24 V DC	cold-device power plug 2-wire, 0.5mm ² min.

6.1.1 Pin Assignment of the D-SUB Connectors COM0 / COM1

1	n.c.
2	RS-232: TxD
3	RS-232: RxD
4	n.c.
5	GND
6	n.c.
7	RS-422: A (COM0: T-, COM1: R-)
8	RS-422: B (COM0: T+, COM1: R+)
9	n.c.



6.2 Rear View



DIS14/NET - with Network Port (LAN-XPT)

6.3 Time Strings

6.3.1 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 synchronized 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	announcement of discontinuity of time, enabled during last hour before discontinuity comes in effect:		
	'I'	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		

6.3.2 Format of the Uni Erlangen String (NTP)

The time string Uni Erlangen (NTP) of a GPS clock is a sequence of 66 ASCII characters starting with the STX (start-of-text) character and ending with the ETX (end-of-text) character. The format is:

<STX>tt.mm.jj; w; hh:mm:ss; voo:oo; acdfg i;bbb.bbbbn ll.lllle hhhhm<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:

<i><STX></i>	Start-Of-Text, ASCII Code 02h sending with one bit accuracy at change of second
<i>dd.mm.yy</i>	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)
<i>hh.mm.ss</i>	the current time:
hh	hours (00..23)
mm	minutes (00..59)
ss	seconds (00..59, or 60 while leap second)
<i>v</i>	sign of the offset of local timezone related to UTC
<i>oo:oo</i>	offset of local timezone related to UTC in hours and minutes
<i>ac</i>	clock status characters:
a:	'#' clock has not synchronized after reset
' '	(space, 20h) clock has synchronized after reset
c:	'*' GPS receiver has not checked its position
' '	(space, 20h) GPS receiver has determined its position
<i>d</i>	time zone indicator:
'S'	MESZ European Summertime, daylight saving enabled
' '	MEZ European Standard Time, daylight saving disabled
<i>f</i>	announcement of discontinuity of time, enabled during last hour before discontinuity comes in effect:
'!'	announcement of start or end of daylight saving time
' '	(space, 20h) nothing announced
<i>g</i>	announcement of discontinuity of time, enabled during last hour before discontinuity comes in effect:
'A'	announcement of leap second insertion
' '	(space, 20h) nothing announced
<i>i</i>	leap second insertion
'L'	leap second is actually inserted (active only in 60th sec.)
' '	(space, 20h) no leap second is inserted

The following information regarding the receiver position is set to zero because receiver does not support this.

bbb.bbbb latitude of receiver position in degrees
leading signs are replaced by a space character (20h)

n latitude, the following characters are possible:
'N' north of equator
'S' south d. equator

lll.llll longitude of receiver position in degrees
leading signs are replaced by a space character (20h)

e longitude, the following characters are possible:
'E' east of Greenwich
'W' west of Greenwich

hhhh altitude above WGS84 ellipsoid in meters
leading signs are replaced by a space character (20h)

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

6.3.3 Format of the ATIS standard Time String

The ATIS standard Time String is a sequence of 23 ASCII characters terminated by a CR (Carriage Return) character. The format is:

<GID><ABS><TSQ><CC><CS><ST>*yymmddhhmmsswcc*<GID><CR>

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:

<GID>	Address of the receiver		code 7Fh
<ABS>	Originator of message	ASCII '0'	code 30h
<TSQ>	Telegram number	ASCII '0'	code 30h
<CC>	Command code	ASCII 'S' for SET	code 53h
<CS>	Command code	ASCII 'A' for ALL	code 41h
<ST>	Time status	ASCII 'C' for valid time	code 43h
<i>yymmdd</i>	the current date:		
	yy year of the century	(00..99)	
	mm month	(01..12)	
	dd day of month	(01..31)	
<i>hh:mm:ss</i>	the current time:		
	hh hours	(00..23)	
	mm minutes	(00..59)	
	ss seconds	(00..59, or 60 while leap second)	
<i>w</i>	the day of the week	(1..7, 1 = 31h = Monday)	
<i>cc</i>	checksum in hex, built from all characters including GID, ABS, TSQ, CC, ST, ...		
<CR>	Carriage Return, ASCII code 0Dh		

(The standard interface configuration for this string type is 2400 baud, 7E1)

6.3.4 Format of the SYSPLEX-1 Time String

The SYSPLEX1 time string is a sequence of 16 ASCII characters starting with the SOH (Start of Header) ASCII control character and ending with the LF (line feed, ASCII Code 0Ah) character.

Please note:

To receive the Timestring on a selected terminal correctly you have to send a " C " (once, without quotation marks).

The format is:

`<SOH>ddd:hh:mm:ssq<CR><LF>`

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:

<code><SOH></code>	Start of Header (ASCII control character) sending with one bit accuracy at change of second
<code>ddd</code>	day of year (001..366)
<code>hh:mm:ss</code>	the current time:
hh	hours (00..23)
mm	minutes (00..59)
ss	seconds (00..59, or 60 while leap second)
q	Quality indicator (space) Time Sync (GPS lock) (?) no Time Sync (GPS fail)
<code><CR></code>	Carriage-return (ASCII code 0Dh)
<code><LF></code>	Line-Feed (ASCII code 0Ah)

6.3.5 Format of the SAT Time String

The SAT Time String is a sequence of 29 ASCII characters starting with the STX (start-of-text) character and ending with the ETX (end-of-text) character. The format is:

`<STX>dd.mm.yy/w/hh:mm:ssxxxuv<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:

<code><STX></code>	Start-Of-Text, ASCII Code 02h sending with one bit accuracy at change of second
<code>dd.mm.yy</code>	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)
<code>hh:mm:ss</code>	the current time:
hh	hours (00..23)
mm	minutes (00..59)
ss	seconds (00..59, or 60 while leap second)
<code>xxxx</code>	time zone indicator:
'UTC'	Universal Time Coordinated, formerly GMT
'CET'	European Standard Time, daylight saving disabled
'CEST'	European Summertime, daylight saving enabled
<code>u</code>	clock status characters:
'#'	clock has not synchronized after reset
' '	(space, 20h) clock has synchronized after reset
<code>v</code>	announcement of discontinuity of time, enabled during last hour before discontinuity comes in effect:
'!'	announcement of start or end of daylight saving time
' '	(space, 20h) nothing announced
<code><CR></code>	Carriage Return, ASCII Code 0Dh
<code><LF></code>	Line Feed, ASCII Code 0Ah
<code><ETX></code>	End-Of-Text, ASCII Code 03h

6.3.6 Format of the SPA Time String

The ABB SPA Time String is a sequence of 32 ASCII characters starting with the characters ">900WD" and ending with the <CR> (Carriage Return) character. The format is:

>900WD:*jj-mm-tt_hh.mm;ss.fff:cc*<CR>

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:

jj-mm-tt	the current date:		
	jj	year of the century	(00..99)
	mm	month	(01..12)
	tt	day of month	(01..31)
	–	Space	(ASCII-code 20h)
hh.mm;ss.fff	the current time:		
	hh	hours	(00..23)
	mm	minutes	(00..59)
	ss	seconds	(00..59, or 60 while leap second)
	fff	milliseconds	(000..999)
cc	Checksum. EXCLUSIVE-OR result of the previous characters, displayed as a HEX byte (2 ASCII characters 0..9 or A..F)		
<CR>	Carriage Return		ASCII Code 0Dh

6.3.7 Format of the Computime Time String

The Computime time string is a sequence of 24 ASCII characters starting with the T character and ending with the LF (line feed, ASCII Code 0Ah) character. The format is:

T:yy:mm:dd:ww:hh:mm:ss<CR><LF>

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:

T	Start character sending with one bit accuracy at change of second
yy:mm:dd	the current date:
yy	year of the century (00..99)
mm	month (01..12)
dd	day of month (01..31)
ww	the day of the week (01..07, 01 = monday)
hh:mm:ss	the current time:
hh	hours (00..23)
mm	minutes (00..59)
ss	seconds (00..59, or 60 while leap second)
<CR>	Carriage Return, ASCII Code 0Dh
<LF>	Line Feed, ASCII Code 0Ah

6.3.8 Format of the NMEA 0183 String (RMC)

The NMEA String is a sequence of 65 ASCII characters starting with the '\$GPRMC' character and ending with the characters CR (carriage return) and LF (line-feed). The format is:

\$GPRMC,*hhmmss.ss,A,bbbb.bb,n,llll.ll,e,0.0,0.0,ddmmyy,0.0,a*hh*<CR><LF>

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

\$ Start character, ASCII Code 24h
sending with one bit accuracy at change of second

hhmmss.ss the current time:
hh hours (00..23)
mm minutes (00..59)
ss seconds (00..59, or 60 while leap second)
ss fractions
of seconds (1/10 ; 1/100)

A Status (A = time data valid)
(V = time data not valid)

The following information regarding the receiver position is set to zero because receiver does not support this.

bbbb.bb latitude of receiver position in degrees
leading signs are replaced by a space character (20h)

n latitude, the following characters are possible:
'N' north of equator
'S' south d. equator

llll.ll longitude of receiver position in degrees
leading signs are replaced by a space character (20h)

e longitude, the following characters are possible:
'E' east of Greenwich
'W' west of Greenwich

ddmmyy the current date:
dd day of month (01..31)
mm month (01..12)
yy year of
the century (00..99)

a magnetic variation

hh checksum (EXOR over all characters except '\$' and '*')

<CR> Carriage Return, ASCII Code 0Dh

<LF> Line Feed, ASCII Code 0Ah

7 RoHS and WEEE

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

We hereby declare that this product is conform to the European 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), and polybrominated diphenyl ethers (PBDEs), Bis (2-ethylhexyl)phthalat (DEHP), Benzylbutylphthalat (BBP), Dibutylphthalat (DBP), Diisobutylphthalat (DIBP), above the legal threshold.



WEEE status of the product

This product is handled as a B2B (Business to Business) category product. In order to secure a WEEE compliant waste disposal it has to be returned to the manufacturer. Any transportation expenses for returning this product (at its end of life) have to be incurred by the end user, whereas Meinberg will bear the costs for the waste disposal itself.



