MANUAL

ANZ14/ANZ14DCF/ANZ14NET

LED Display with
DCF77 or NTP Option

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Meinberg Radio Clocks GmbH & Co. KG

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1 Imprint

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2 Features of the ANZ14

The ANZ14 is a stand-alone radio clock with integrated DCF77 receiver and power supply. The 14-digit LED display shows time, date and day-of-week. The display brightness is variable. A serial time sting is generated either once per second, once per minute, on request only or never. Baudrate, framing and time zone can be condigured separately by menu and two front panel buttons. It is also possible to use the ANZ14 as a display for a preconnected clock. In this case the partially equipped version without DCF77 receiver is sufficient.

Optionally, the ANZ14 can also be ordered with DCF77 receiver including external indoor antenna AI01 (ANZ14/DCF). Another available option is an NTP version with Ethernet interface (ANZ14/NET).

2.1 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.

2.2 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 ANZ14 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.

2.3 EEPROM

The non-volatile EEPROM is used to store the settings of the ANZ14. This ensures a proper restart without any new configuration after the ANZ14 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.

2.4 Display

The 14-digit LED display shows the time, date and day-of-week. The displays brightness is variable and configurable via menu.

2.5 Serial Interface

The ANZ14 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 ANZ14 with DCF receiver can synchronize an additional ANZ14 without receiver. The transfer rate and the data format are free selectable. The serial port can sent a time string once per second, once per minute or only on request by sending an ASCII character '?' (ASCII code 3Fh).

2.6 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 ANZ14 is equipped with an IEC socket (AC) or with a 3pin. terminal connector (DC).

3 ANZ14 (DCF Option)

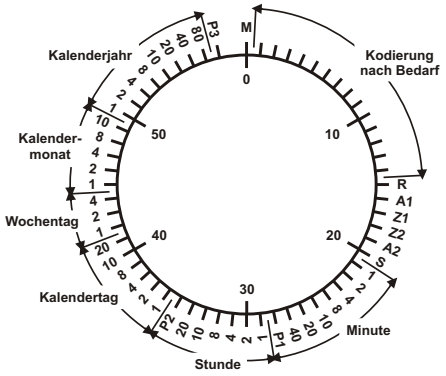
3.1 General Information about DCF77

The radio remote clocks made by Meinberg receive the signal from the long wave transmitter DCF77. This long wave transmitter installed in Mainflingen near Frankfurt/Germany transmits the reference time of the Federal Republic of Germany. This time reference is either the Central European Time (Mitteleuropäische Zeit, MEZ) or the Central European Summer Time (Mitteleuropäische Sommerzeit, MESZ). The transmitter is controlled by the atomic clock plant at the Federal Physical Technical Institute (PTB) in Braunschweig/Germany and transmits the current time of day, date of month and day of week in coded second pulses. Once every minute the complete time information is available.

At the beginning of every second the amplitude of the high precision 77.5 kHz carrier frequency is lowered by 75% for a period of 0.1 or 0.2 sec. The length of these time marks represent a binary coding scheme using the short time mark for logical zeroes and the long time mark for logical ones. The infomation on the current date and time as well as some parity and status bits can be decoded from the time marks of the 15th up to the 58th second every minute. The absence of any time mark at the 59th second of a minute signals that a new minute will begin with the next time mark.

Our radio remote clocks decode the highly accurate information on date and time within a wide range around Germany. So some of our clocks are installed in Bibao/Spain as well as in the City of Umeå in northern Sweden - fully statisfying the requirements of the users. The radio remote clocks automatically switch to summertime and back. The reception of the time information is free of charge and does not need to be registered.

Gernerally it is important to position the antenna in an optimal way. It should be mounted at least 30 centimeters away from the clock unit and from solid steel. The antenna should be aligned at a right angle to the direction of the transmitter (Frankfurt).



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	

3.2 DCF77 Receiver

An external ferrit antenna is used to receive the signal from DCF77 and supplies it to the on-board LF receiver where it is demodulated by a straight detector with automatic gain control. The demodulated time marks are fed to the clock's microprocessor.

3.3 Mounting the Antenna

Generally it is important to position the antenne in an optimal way. The antenna should be aligned at a right angle to the direction of the transmitter (Frankfurt). It should be mounted at least 30 centimeters away from the clock unit and from solid steel. A distance of several meters is recommended to all TVs or computer monitors. In order to get the maximum signal, the antenna should be aligned in two steps. First it should be turned slowly until the modulation LED is flickering irregula or mostly off. Finally the antenna must be turned by 90° from this position to obtain maximum signal. After the antenna has been well adjusted the modulation LED is blinking exactly once per second (except the 59th. second) and the free-run indication (a dot behind the second digits) will disappear after 3 minutes at least.

4 ANZ14 (NET Option)

4.1 Network Time Protocol (NTP)

NTP is a common method for synchronization of hardware clocks in local und global networks. The basic concept, version 1 [Mills88], was published in 1988 as RFC (Request For Comments). Experiances 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 from1990 (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 syncronization is feasible because of the several time references. Every computer syncronizies 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.

4.2 Time and Date Display with NTP synchronized Reference

ANZ14/NET 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 beeing 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.

After the network connection has been established successfully and the ANZ14/NET gets its time over the network the display is synchronized to the time of the available NTP server and to the configured time zone. This is recognizable by the extinguishing of the decimal-point for seconds (depending on the query-interval -> NTP time request).

4.3 Error-Code

Whenever one of the below listed errors occurs, a corresponding numerical error code is displayed in the second line instead of the date. This error code is displayed as long as the fault cause exists, provided that the debug mode is enabled (see Setup Menu -> Debug Mode). Otherwise an error is indicated only by the dot behind the last digit in the first Line.

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 ANZ14
Er. 04/05	for debugging only

4.4 Network Configuration

To identify the ANZ14 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.

4.5 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 ANZ14 itself. The default hostname of the ANZ14 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.

4.6 ARP Method

This method is available under UNIX and Windows based systems. ANZ14 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 ANZ14:

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 ANZ14 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 ANZ14.

telnet 191.12.3.77 9999

4.7 Extended Configuration via Telnet

As soon as the network parameters of the ANZ14 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 ANZ14 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 ANZ14, 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:

4.7.1 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

4.7.2 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.

4.7.3 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.

4.7.4 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)

4.7.5 Menu Option 4: Reserved

This menu is reserved for future purposes.

4.7.6 Menu Option 5: Time Zone Configuration

Select 5 to configure the ANZ14'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 ANZ14 to recompute 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.

4.7.7 Menu Option 6: NTP Client Configuration

Select **6** to enter the ANZ14'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 ANZ14 tries to find a NTP server itself.

ANZ14 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 ANZ14 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 ANZ14. If the NTP server has a higher stratum during the request than the ANZ14, the time infomation is rejected.

4.7.8 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.

4.7.9 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.

4.7.10 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 ANZ14 module has finished rebooting and can be used again.

4.8 SNMP Reference

The SNMP support of the ANZ14 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 ANZ14 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)
```

4.9 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

5 Setup Menu

The front panel of the ANZ14 contains two push buttons **(A+B)**. Pressing both buttons at the same time for at least one seconds enable the Setup Menu. This menu allows the configuraion of all the features provided by the ANZ14.

All available sub menus are selected by the upper push button **A** while the lower push button **B** is used to set the value or to select the available options.

5.1 Enter [En.]

The first menu is the entrance into the setup menu. Button **B** is pressed to exit the setup menu without any change. Button **A** is used to jump to the next sub menu. The available sub menus are described in the following. The changes will not become valid until the configuration is saved in the last sub menu of the setup menu.

5.2 Brightness [Br.]

The brightness of the display can be set in steps from 0 to 9, where 0 represents the most dimmed brightness and 9 the maximum brightness. The value is selected by using the button **B**. Pressing **A** enters the next sub menu.

5.3 Time Zone [TZ]

The time zone of the LED display can be set here. With pressing the button **B** 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 ANZ14 is DCF77-synchronized. If synchronization is done by serial interface or by an NTP time server, the received time is displayed always (LOCAL). With pressing the button **A** you will switch to the next submenu.

5.4 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 button B:

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

5.5 Baudrate [Bd. 0] or [Bd. 1]

The baud rate of the serial interface COM can be set in this sub menu. Button B is used to select one of the available baud rates, button A is pressed to leave this and enter the next sub menu.

The baud rate of the serial interface COM0 and COM can be set in this sub menu. Button **B** is used to select one of the available baud rates, button **A** is pressed to leave this and enter the next sub menu.

5.6 Framing [Fr. 0] or [Fr. 1]

The framing of the serial interface COM can be set accordingly. Use button **B** to select the framing from the list of available options, press **A** to enter the next sub menu.

5.7 Serial Mode [SM. 0] or [SM. 1]

The serial interface generates a time string either once per second (SEC), once per minute (60 S.) or on request only (on r.). Selection is made with **B**, exit and nex sub menu with **A**.

5.8 Time String Out [TS. 0] or [TS. 1]

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
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".

5.9 Time Zone Out [TZ. 0] or [TZ. 1]

The time zone of the serial outputs COM0 or COM1 can be set here. With **B** 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 ANZ14. In case of a serial or NTP synchronized ANZ14, the received time is always passed. With pressing the button **A** you can enter the next submenu.

5.10 Sync In [In.]

The synchronization source of ANZ14 is defined here (see also chapter "Synchronization via Interface"). With the button **B** the following sources are selectable:

1. DCF - Synchronization via DCF77 (optional)
2. 232 - Synchronization via COM1 (RS232)
3. 422 - Synchronization via COM1 (RS422)
4. LAN - Synchronization via Ethernet/NTP (optional)

5.11 IP Address [IP] (ANZ14NET only)

The IP address of the ANZ14 is shown in four seperate numbers (0 ... 255). The first number is displayed until button **B** 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 as described in chapter "Server Configuartion". Button **A** is used to jump to the next submenu.

5.12 Debug Mode [DM] (ANZ14NET only)

Whenever an errors occurs, a corresponding numerical error code is displayed in the second line of the ANZ14/NET instead of the date (see Error Code). This error code is displayed provided that the debug mode is enabled in this menu by choosing YES with the button **B**. Otherwise an error is indicated only by the dot behind the seconds digit.

5.13 Time String IN [TS in]

If the ANZ14 has to be synchronized via a serial time telegram (previous selection 232 or 422), the format of the set-telegram can be selected here (see also chapter "Synchronization via serial Interface"). Selectable options with pressing the button B are:

1. Meinberg Standard
2. Uni Erlangen
3. ATIS
5. SAT
7. Computime

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

5.14 Serial Number [SN]

The 16-digit serial number of the ANZ14 can be displayed in this menu. The first 4 digits are displayed first, when **B** is pressed once, the next 4 digits are displayed and so on. The serial number can also be found on the barcode sticker in the rear panel of the housing.

5.15 Set Time

This sub menu allows to set the time and the date of the ANZ14. This might be usefull when the ANZ14 is used as a free running clock without any synchronisation. Pressing button **B** toggles between YES and NO. The sub is left without any action if **A** is pressed while DO is displayed. However, if YES is displayed while **A** is pressed, time and date is displayed with the first digit flashing. Now it is possible to set time and date by using just the push button **B**. Keep **B** pressed and the flashing digit is incremented. Relause **B** as soon as the digit has reached the designated value. Press **B** once again and the next digit starts flashing and can be incremented accordingly.

When all digits have been set this sub menu is left with the push button **A**. The ANZ14 starts counting this time when the changes are saved in the last sub menu is left with the push button **A**. The ANZ14 starts counting this time when the changes are saved in the last sub menu.

5.16 Factory Defaults [FD]

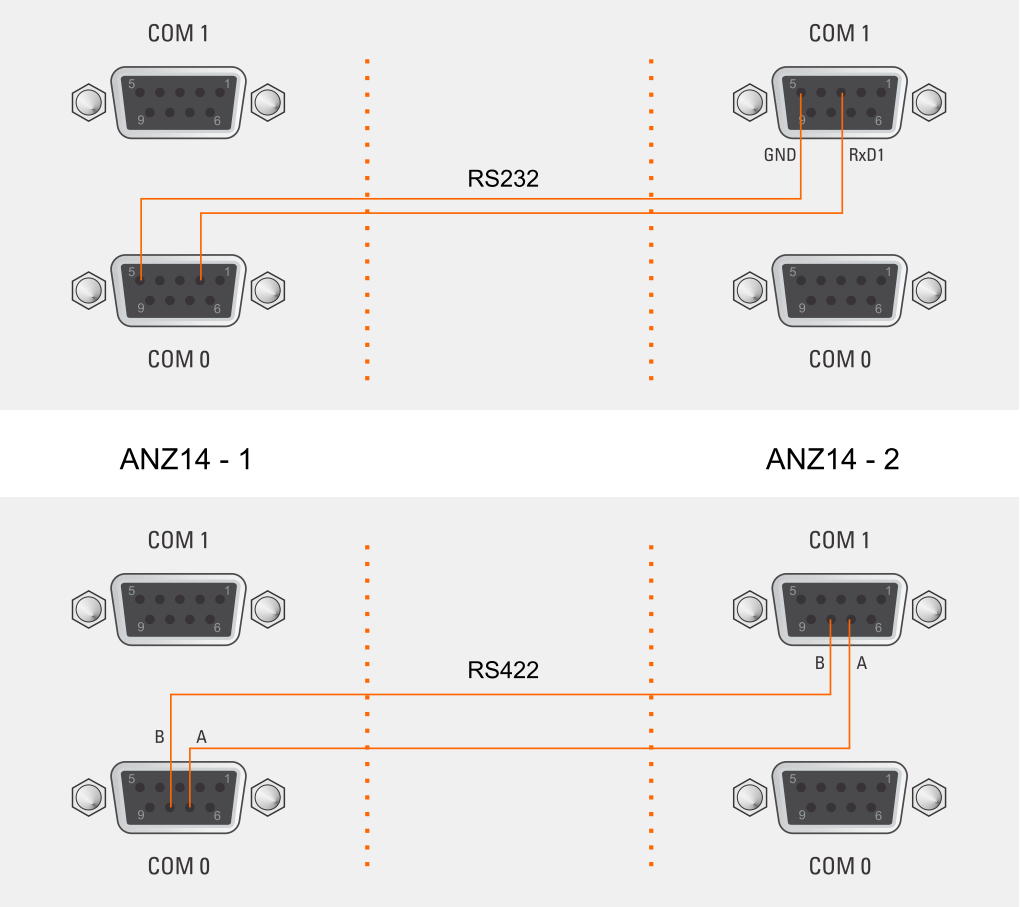
The configuration of the ANZ14, done in this Setup Menu, can be reset to the factory default values. All changes made in the previous menus are rejected if YES is choosen with button **B**.

5.17 Save [Sv.]

All changes made in the setup menu have to be saved before coming into effect, so this sub menu has to be left with button **A** while YES is shown. If this menu is left with NO, all changes are dropped and the ANZ14 continues with the previous configuration.

6 Synchronisation via Serial Interface

In addition to the synchronisation via the integrated DCF77 receiver it is possible to synchronize the ANZ14 V4 by a time sting from the serial port input. In this case the ANZ14 can be used as a display for a pre-connected master clock. The incoming time string sets the ANZ14 time that is running free from this moment. The ANZ14 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 RS422 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.

7 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 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.

8 Technical Specifications ANZ14

DISPLAY:	14-digit, 13/14mm high numeric/alphanumeric LED display for time, date and day-of-week, variable brightness modulation and free running indicated by LEDs
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 software watchdog lets the microprocessor recover from malfunction. A power-fail comparator resets the microprocessor if the supply voltage drops below a specified threshold.
RECEIVER: (optional)	narrowband straight receiver with automatic gain control bandwidth: approx. 40Hz, reception via external ferrite antenna multiple software check of the incoming timecode parity and consistency check over a period ofg two minutes RF distortions indicated by LED and a status character in the serial output sting. Without RF signal the clock runs on XTAL with an accuracy of 10^{-6} (after 24 hours of synchr. operation), indicated by LED
INTERFACES:	two serial ports (COM0, COM1) RS232 (bi-directional) or RS422 (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, once per minute or only on request ("?")
TIME ZONE:	configurable, CET (MEZ/MESZ), EET (OEZ/OESZ) or UTC
OUTPUT/ INPUT STRING:	see chapter "Time Strings"
CONNECTORS:	cold-devices power plug or DFK connector 2 x 9pin D-SUB female connector antenna connector - BNC (DCF77 variant only) RJ45 network port (NET version only)
ANTENNA:	active external ferrite antenna in a plastic case (optional)
HOUSING:	Aluminium stack case
PHYSICAL DIMENSIONS:	height x width x depth (72mm x 144mm x 132mm) cutout for control panel: 140mm x 68mm
POWER REQUIEMENTS:	100-240 VAC/50-60Hz, 100mA or 120-240 VDC, 100mA or 18V-72 VDC, 250mA or 9V-36 VDC, 500mA

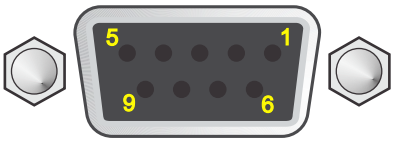
FUSE:	T 0.2A / 250V or T 1A, see inscription on rear panel
AMBIENT TEMPERATURE:	0...50°C
HUMIDITY:	max. 85%

8.1 Rear Panel Connectors

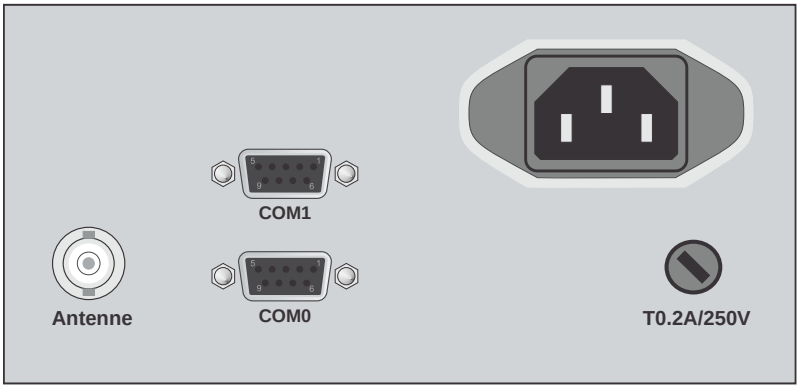
Name	Type	Signal	Cable
COM0	9pin SUB-D	RS232 / RS422	shielded data line
COM1	9pin SUB-D	RS232 / RS422	shielded data line
Antenna	BNC	77,5 kHz	shielded coaxial cable
Power supply	power cord receptacle	100-240 V AC	cold-device power plug
...or	DFK connector	12 V or 24 V DC	2-wire, 0.5mm^2 min.

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

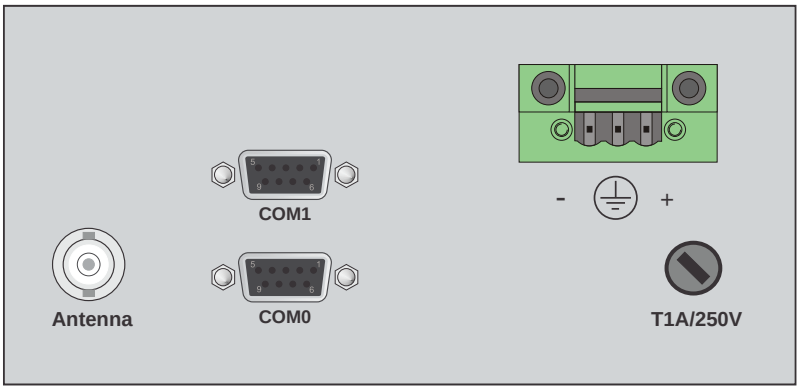
1 n.c.
2 RS232: TxD
3 RS232: RxD
4 n.c.
5 GND
6 n.c.
7 RS422: A (COM0: T-, COM1: R-)
8 RS422: B (COM0: T+, COM1: R+)
9 n.c.



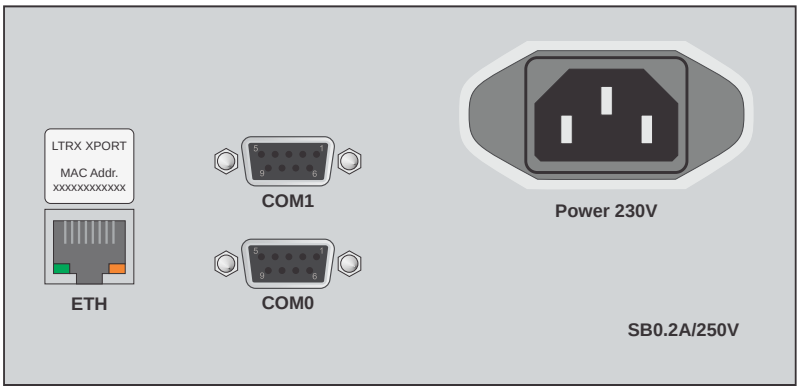
8.2 Rear Views



ANZ14/DCF with 240 VAC / 50-60Hz Power Supply



ANZ14/DCF with DC Power Connector



ANZ14/NET - with Network Port (LAN-XPT)

8.3 Time Strings

8.3.1 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 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

8.3.2 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 lll.llle 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:

<STX> Start-Of-Text, ASCII Code 02h
sending with one bit occuracy 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)

v sign of the offset of local timezone related to UTC

oo:oo offset of local timezone related to UTC in hours and minutes

ac 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

d time zone indicator:

'S'	MESZ	European Summertime, daylight saving enabled
' '	MEZ	European Standard Time, daylight saving disabled

f anouncement 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

g anouncement of discontinuity of time, enabled during last hour before discontinuity comes in effect:

'A'	announcement of leap second insertion
' '	(space, 20h) nothing announced

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

8.3.3 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
yymmdd	the current date:		
	yy year of the century	(00..99)	
	mm month	(01..12)	
	dd day of month	(01..31)	
hh:mm:ss	the current time:		
	hh hours	(00..23)	
	mm minutes	(00..59)	
	ss seconds	(00..59, or 60 while leap second)	
w	the day of the week	(1..7, 1 = 31h = Monday)	
cc	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)

8.3.4 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 controll character and ending with the LF (line feed, ASCII Code 0Ah) character. 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:

<SOH>	Start of Header (ASCII control character) sending with one bit accuracy at change of second		
ddd	day of year		(001..366)
hh:mm:ss	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)
<CR>	Carriage-return (ASCII code 0Dh)		
<LF>	Line-Feed (ASCII code 0Ah)		

8.3.5 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:ssxxxxuv*<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)
xxxx	time zone indicator:		
	'UTC'	Universal Time Coordinated, formerly GMT	
	'CET'	European Standard Time, daylight saving disabled	
	'CEST'	European Summertime, daylight saving enabled	
u	clock status characters:		
	'#'	clock has not synchronized after reset	
	' '	(space, 20h) clock has synchronized after reset	
v	anouncement 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	
<CR>	Carriage Return, ASCII Code 0Dh		
<LF>	Line Feed, ASCII Code 0Ah		
<ETX>	End-Of-Text, ASCII Code 03h		

8.3.6 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

8.3.7 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		

8.3.8 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,lllll.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 occuracy 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	
lllll.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		

9 Declaration of Conformity

Konformitätserklärung

Doc ID: ANZ14/ANZ14DCF/ANZ14NET-2014-06-20

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

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

Produktbezeichnung *Product Designation*	**ANZ14/ANZ14DCF/ANZ14NET**

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, 2014-06-20

Günter Meinberg
Managing Director