MEINBERG
FUNKUHREN

Technical Information

Operating Instructions

ANZ14_V3

Impressum

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Inhaltsübersicht

General Information about DCF77

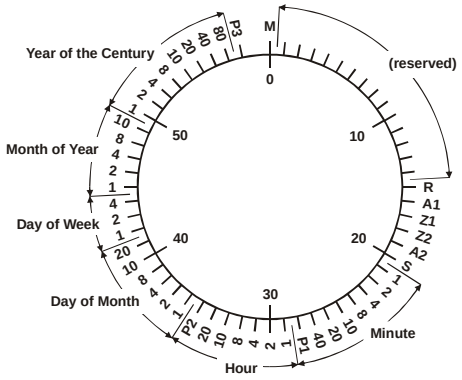
The radio remote clocks made by Meinberg receive the signal from the long wave transmitter DCF77. This long wave transmitter installed in Mainflingen near Frankfurt/Germany transmits the reference time of the Federal Republic of Germany. This time reference is either the Central European Time (Mitteleuropäische 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 information 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 Bilbao/ Spain as well as in the city of Umeå in northern Sweden - fully satisfying 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.

Generally 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).

Figure: Decoding Scheme



M	Start of Minute (0.1 s)
R	RF Transmission via secondary antenna
A1	Announcement of a change in daylight saving
Z1, Z2	Time zone identification
	Z1, Z2 = 0, 1: Daylight saving disabled
	Z1, Z2 = 1, 0: Daylight saving enabled
A2	Announcement of a leap second
S	Start of time code information
P1, P2, P3	Even parity bits

Features of the AM Radio Clock DCF77 ANZ14 V3

The ANZ14 V3 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 displays brightness is variable in four levels. A time string is sent via the serial port either periodic once per second/minute or only on request by sending an ASCII '**?**'. The format of the time string is described in the section "Technical Specifications". The serial port can be set up either as RS232 port or as 20mA current loop port. Baudrate, framing and time zone can be configured separately by DIL switches. It is also possible to use the ANZ14 V3 as a display for a preconnected clock. In this case the partially equipped version without DCF77 receiver is sufficient.

Front View ANZ14 V3

LF 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.

Microprocessor System

The time marks from the receiver circuit are filtered and decoded by the microprocessor system. Parity and consistency checks over a period of two minutes take care for detecting errors in the received time telegram. 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. Aflash EPROM located in the microprocessor is used as program memory that can be loaded with the firmware by the serial interface.

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. Alternatively, the clock can be ordered with a lithium battery which has a live time of at least 10 years guaranteed.

Display

The 14-digit LED display shows the time, date and day-of-week. The displays brightness is variable in four levels by DIL switches. Modulation and RF amplitude are indicated by LED. The brighness of this LED in the front panel depends on the signal strength of the DCF77 carrier and it starts blinking exactly once per second, corresponding to the time marks from DCF77. A decimal point behind the both second digits indicates that the clock runs free without RF signal.

Serial Interface

The ANZ14 V3 provides a serial port that can be set up either as RS232 port or as 20mA current loop port. The input of the 20mA current loop is active, the output is passive. The baudrate can be set between 600 baud and 19200 baud. If the 20mA current loop output driver is used, the transmission speed should not exceed 9600 baud. The framing can be selected:

1 startbit / 7 databits / 1 even paritybit / 2 stopbits (7e2)
1 startbit / 8 databits / no paritybit / 1 stopbit (8n1)

The serial port can sent a time string periodic once per second/minute or only on request by sending an ASCII '**?**'.

Power Supply

The integrated mains power supply provides the clock with a stabilized voltage of 5V. The mains input (230V AC) is fused with T 0.2A / 250V. The DC versions (5V, 12V and 24V) are fused with T 0.5A.

Installation

Supply Voltage

The supply voltage is applied to the radio clock via a connector in the rear panel. The clock has no power switch and starts operation immediately after connecting the supply voltage. Depending on the supply voltage (see designation on the rear) the clock is equipped either with a 230V AC power socket or with a 2-pin DFK connector for 5V, 12V or 24V DC input.

Mounting the Antenna

Generally it is important to position the antenna 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 mostly dimmed. Finally the antenna must be turned by 90° from this position to obtain maximum signal.

Configuration

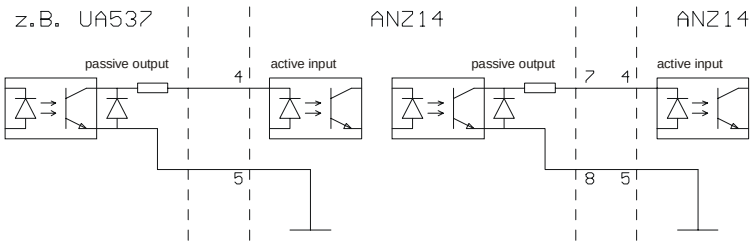
The tenfold DIL switch is used to configure the ANZ14 as follows.

DIL-Switches		1	2	3	4	5	6	7	8	9	10
Display Brightness	max	O	O								
		I	O								
		O	I								
	min	I	I								
Baudrate	600			I	I	I					
	1200			O	I	I					
	2400			I	O	I					
	4800			O	O	I					
	9600			I	I	O					
	19200			O	I	O					
	reserved			I	O	O					
	reserved			O	O	O					
Framing	8n1						O				
	7e2						I				
Display Mode								O	O		
Time String	per second							I	O		
	per minute							O	I		
	on request							I	I		
Time Zone	MEZ / MESZ									O	
	UTC									I	
Serial Port	RS 232										O
	Current Loop										I
Default Setting:		O	O	I	I	O	I	I	O	O	O

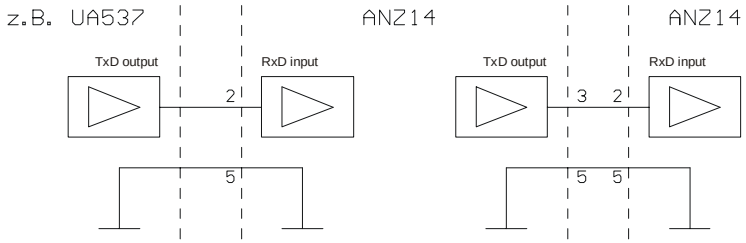
Table DIL-Switches Assignment
(**I** means Switch ON, **O** means Switch OFF)

Display Mode

In the Display Mode (DIL7 and DIL8 OFF) the software clock is turned off and the DCF77 receiver has no effect. The ANZ14 V3 in this mode is a purely display and needs the time string of a preconnected clock once per second. This time string is spread by the serial port output to apply the time string to a number of further displays. (Examples for cascading:)



20mA Current Loop Interface



RS232 Interface

The 20mA current loop interface allows to span distances up to 500m between the systems. Using the RS232 driver the distance between two systems is limited to 15m.

Firmware Updates

Whenever the on-board software must be upgraded or modified, the new firmware can be downloaded to the internal flash memory via the serial port COM0.

If the push button labelled with "Boot" in the rear panel is pushed while the system is powered up, a bootstrap-loader will be activated that waits for instructions from the serial port. The new firmware can be sent to the ANZ14 from any standard PC with serial interface. A loader program will be shipped together with the file containing the image of the new firmware.

The contents of the program memory will not be modified until the loader program has sent the command to erase the flash memory. So if the "Boot" key is pressed unintentionally while the system is powered up, the firmware will not be changed accidentially. After the next power-up the system will be ready to operate again.

Inquiring Software Revision

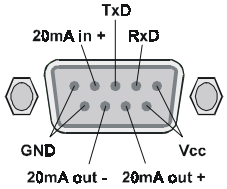
The revision of the loaded software can be red out by sending the three characters "**SN!**" via COM0 to the clock that starts sending the following string:

```
SN:FFFFFFFFFFFFFFFF REV:03.10/01
```

Rear Panel Connectors

Name	Type	Signal	Cable
COM0	9pin SUB-D	RS-232 / 20mA	shielded data line
Antenna	BNC	77.5 kHz	shielded coaxial cable
Power supply	power cord receptacle	230V AC	power supply cord
...or	2-pin DFK	5V, 12V or 24V DC	2-wire, 0.5mm² min.

Pin Assignment of the D-SUB Connector



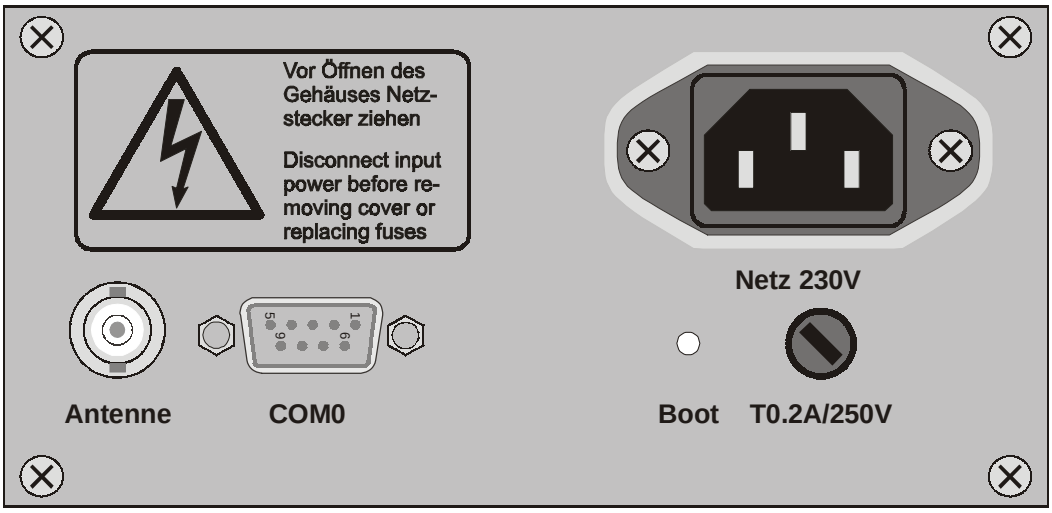
1 Vcc (optional)
2 RxD
3 TxD
4 20mA in +
5 GND (20mA in -)
6 Vcc (optional)
7 20mA out +
8 20mA out -
9 GND

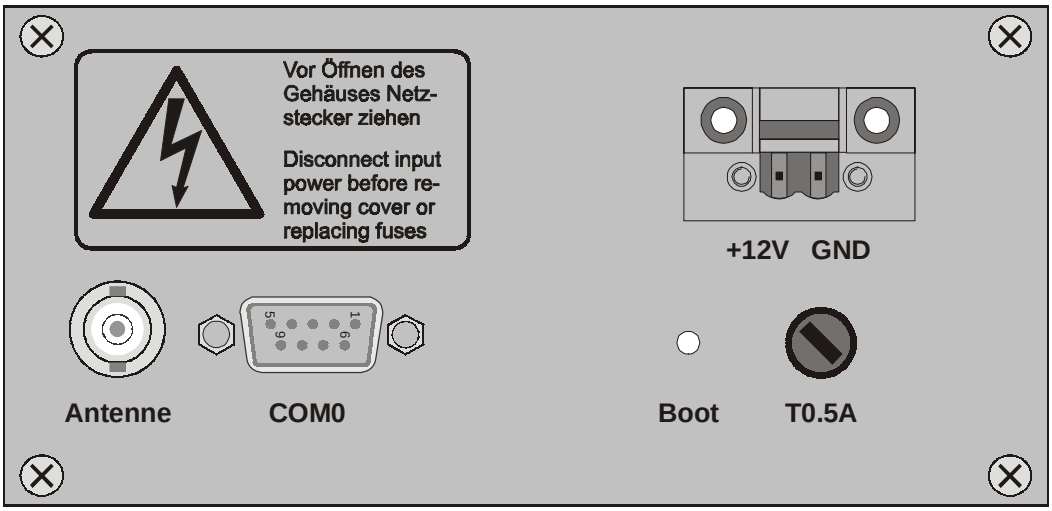
CE Label

CE

This device conforms to the directive 89/336/EWG on the approximation of the laws of the Member States of the European Community relating to electromagnetc compatibility.

Rear View





Rear Views ANZ14 V3 (230V AC and 12V DC Version)

Technical Specificatins

RECEIVER:	narrowband straight receiver with automatic gain control bandwidth: approx. 40Hz reception via external ferrite antenna
DISPLAY:	14-digit, 13/14mm high numeric/alphanumeric LED display for time, date and day-of-week, variable brightness modulation, RF amplitude and free running indicated by LEDs
TIMECODE CHECK:	multiple software check of the incoming timecode parity and consistency check over a period of two minutes
RUNNING ON XTAL:	RF distortions indicated by LED and a status character in the serial output string Without RF signal the clock runs on XTAL with an accuracy of 10^{-6} (after 24 hours of synchr. operation), indicated by LED
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.
INTERFACE:	one serial port, RS232 or 20mA current loop (input active, output passive) Baudrate: 600 ... 19200 baud Framing: 7e2 or 8n1
OUTPUT MODE :	configurable by DIL switches once per second, once per minute or only on request ("**?**")
TIME ZONE:	configurable by DIL switches MEZ/MESZ=CET/CEST, UTC
OUTPUT STRING:	see "Format of the Meinberg Standard Time String"

CONNECTORS:	HF BNC connector D-SUB9 female connector power cord receptacle
ANTENNA:	active external ferrite antenna in a plastic case Length of the cable: up to 100m without amplifier
HOUSING:	Aluminium stack case
PHYSICAL DIMENSIONS:	height x width x depth (72mm x 144mm x 132mm) cutout in control panel: 140mm x 68mm
POWER REQUIREMENTS:	230V AC ± 10%, 50mA or 5V DC ± 5%, 500mA or 12V DC (8V ... 14V), 500mA or 24V DC (18V ... 36V), 250mA
FUSE:	T 0.2A / 250V (@ 230V AC) or T 0.5A (@ 5V, 12V und 24V DC)
AMBIENT TEMPERATURE:	0 ... 50°C
HUMIDITY:	max. 85 %

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)

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:

u: '#' clock has not synchronized after reset
' ' (space, 20h) clock has synchronized after reset

v: '*' DCF77 clock currently runs on XTAL
' ' (space, 20h) DCF77 clock is sync'd with transmitter

x time zone indicator:

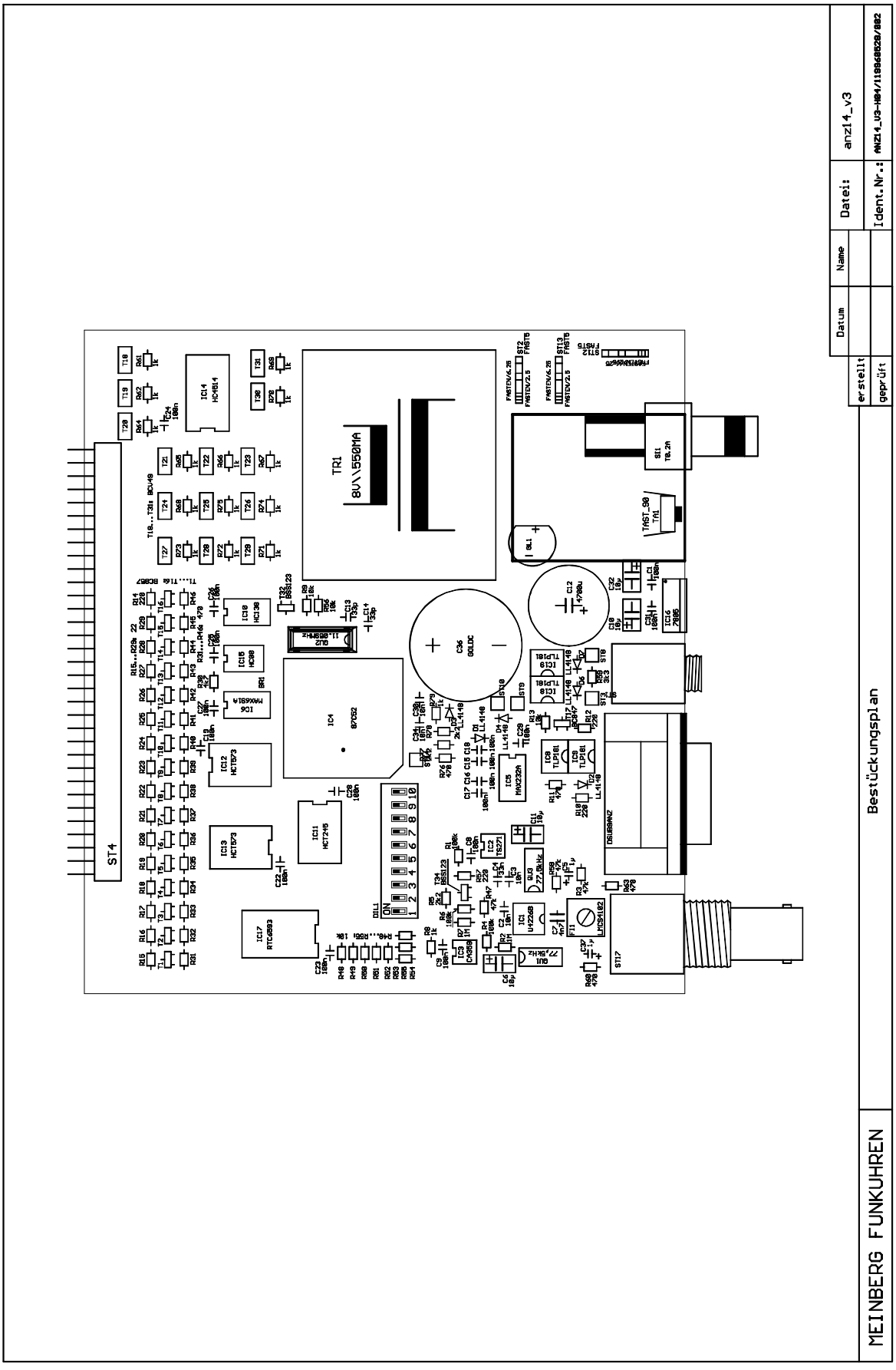
'U'	UTC	Universal Time Coordinated, formerly GMT
' '	MEZ	European Standard Time, daylight saving disabled
'S'	MESZ	European Summertime, daylight saving enabled

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)

Component Layout Main Board



Component Layout Display Board