MEINBERG
FUNKUHREN

Technical Information

Operating Instructions

VP100/20

Impressum

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Inhaltsübersicht

General Information about DCF77

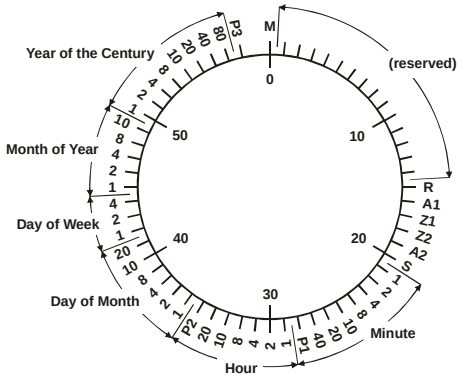
The radio remote clocks made by Meinberg receive the signal from the long wave transmitter DCF77. This long wave transmitter installed in Mainflingen near Frankfurt/Germany transmits the reference time of the Federal Republic of Germany. This time reference is either the Central European Time (Mitteleuropäische 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 VP100/20

The large display VP100/20 is a 50mm hight LED matrix display that shows time and date 20 character wide as follows: day of the week, day of month, month, hours, minutes and seconds. It can be driven as a free running stand alone clock or as a radio clock with integrated DCF77 receiver.

Fig.1: **Front View**

The DCF variant provides automatic changeover of daylight saving. In case of supply voltage failure the on board RTC keeps the time based on XTAL for at least 10 years. Time and Date can be displayed in different languages. The wall mounted housing of the VP100/20 is made of plastic coated steel sheet.

The power connector, the antenna input and the RS232/20mA interfaces provided by VP100/20 are accessible via connectors in the rear panel of the case.

Installation

Power Supply

The requested supply voltage is applied via the power cord receptacle in the rear panel. After connecting the power cord and the antenna (only DCF variant) the system is ready to operate. Time and date become visible on the display.

VP100/20 as Stand Alone Clock

After connecting the power supply the displayed time/date can be set by the two buttons in the rear panel of the case. The accuracy of the time depends on the precision of the internal quartz base.

An automatic changeover of daylight saving can be programmed as described in section "Daylight Saving".

VP100/20 as Radio Clock

It is not possible to run this variant of the VP100/20 as a slave clock. The DSub connector (IN) in the rear panel has no effect. The DSub connector (OUT) can be connected to further VP100/20s or similar systems to run them as slave clocks.

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 synchronous detector with automatic gain control. The demodulated time marks are fed to the clock´s microprocessor.

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 string. The checked and decoded time is written to the on-board real time clock and spread by the interfaces. 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.

In case of supply voltage failure the on-board real time clock keeps the time powered by a lithium battery which has a live time of at least 10 years guaranteed.

After powering up the system the time keeped in the real time clock is displayed immediately. A dot below the colons of the time on the display indicates the modulated DCF77 signal. After synchronisation this dot dissappears, however, after loss of reception for more than 6 hours the colons start flashing. If the antenna is installed properly and the signal from DCF77 can be received without strong distortions, the "Modulation Dot" starts blinking exactly once per second, corresponding to the time marks from DCF77. For a better control an acoustic signal is added to the "Modulation Dot" for 2.5 minutes.

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 carefully. If the antenna is installed properly and the signal from DCF77 can be received without strong distortions, the "Modulation Dot" starts blinking exactly once per second, corresponding to the time marks from DCF77. If this dot flashes intermediately, there is some electrical noise around which prevents the microprocessor from decoding the time message. So a better location for the antenna must be found. In case of correct reception it takes up to three minutes after power-up until the clock is synchronized and the "Modulation Dot" is turned off.

The scope of supply (only DCF77 variant) includes an active ferrite antenna for indoor mounting (AI01) and 5m of RG175 coaxial cable. If an outdoor mounting of the antenna is necessary, the weather proof variant AW02 is to use.

Usage of the Buttons MENU and SET

The time, the language, the brightness and the automatic changeover of daylight saving can be edited by using the buttons MENU and SET.

The button MENU is used to change over from the normal operation mode into the 'set parameters' mode and to select the different menus. The button SET is used to modify the selected menu. When leaving the menu by pushing MENU the modification is acknowledged. When no button is pushed for more than 30 seconds the VP100/20 goes back into normal operation mode with loosing the last modification that was not acknowledged. The menus in detail are described below.

The Menus in Detail

Time & Date

When pressing SET in this menu the actual valid time/date of the VP100/20 appears in the display. With additional pressing and keeping pushed of SET the blinking digit of the time is incremented. When the digit has reached the wanted value the SET button is to release. With another brief pressure to SET the next digit begins to blink and can be incremented in the same way. Pressing MENU acknowledges the modification and changes over to the next menu.

Language

When pressing SET in this menu the actual valid language of the VP100/20 appears in the display. Renewed pressing SET causes another language appearing. When the wanted (and available) language is displayed, the menu is to leave by pressing MENU.

Brightness

The brightness of the display can be graduated in three steps. Press SET in this menu to increment an integer between 1 and 3 where 1 means the most dimmed step and 3 means the fully brightness. Press MENU to acknowledge and to leave this menu.

Daylight Saving

In this menu the automatically changeover of daylight saving can be activated. Press SET in this menu to enable/disable daylight saving and press MENU to acknowledge and to leave this menu.

Winter/Summer Changeover

This menu is only visible when the automatically changeover of daylight saving is enabled. Pressing SET lets the user edit the time/date of the changeover as described in section "Time & Date" but there is one peculiarity:

Beginning and ending of daylight saving may either be defined by exact dates for a single year or using an algorithm which allows the VP100/20 to recompute the effective dates year by year.

The example beside shows how to enter the first case: The day-of-week does not need to be specified and therefore is displayed as wildcards (***). The time/date of next years changeover has to be entered as well (year by year).

***** 30.03.97 02:00:00**

In the second case the day-of-week must be specified. Then, starting from the configured date, daylight saving starts the first day whitch matches the configured day-of-week.

The example shows what has to be entered when daylight saving has to start the last sunday in march every year: The year (**) does not need to be specified because the changeover algorithm is valid for all further years, too.

SON 25.03. 02:00:00**

Summer/Winter Changeover

The Summer/Winter menu appears after ending the Winter/Summer menu by pressing MENU and is to be edited as well.

The example beside shows how to enter a fixed time/date for a singe years daylight saving end: The time/date of next years changeover has to be entered as well (year by year).

***** 26.10.97 03:00:00**

When daylight saving has to end the last sunday in october every year the following has to be entered:

SON 25.10. 03:00:00**

Serial Number

In this menu the serial Number is displayed. This number has to be known for programming text messages or the relay.

Exit

Pressing SET in this menu lets the VP100/20 change over from the 'set parameters' mode into the normal operation mode. All changes of parameters are valid now.

Rear View VP100/20

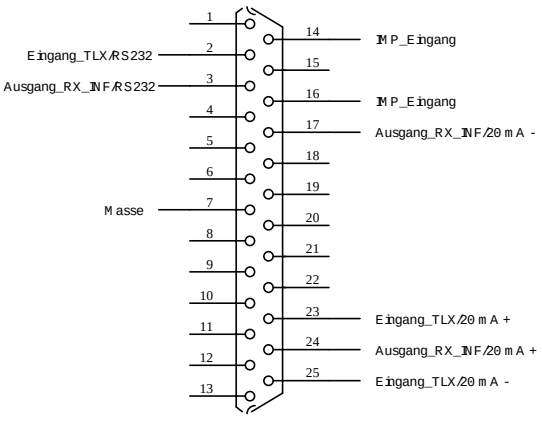
Fig.2: **Rear Panel View**

PC IN	Input for programming the relay or generating a text message shown on the Display of the VP100/20
RELAY	Programmable relay
IN	Input for preconnected clock or master clock (time strings or pulses per minute)
OUT	Output (time strings or pulses per minute) for further VP100/20s or other equivalent Displays.
ANT	Antenna input for external ferrite antenna
Power	Power supply cord (85-264VAC / 120-375VDC)
FUSE	Fuse (T/500mA)
MENU/SET	Buttons to configure the VP100/20

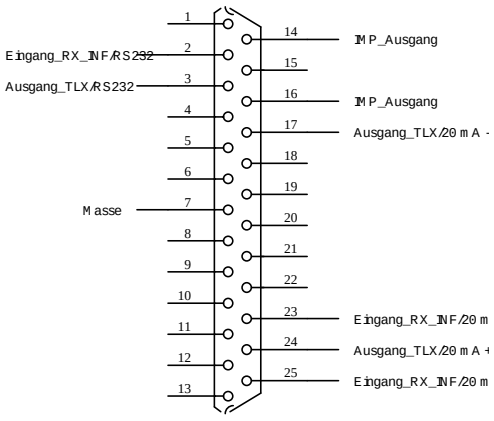
CAUTION

Pull 230V Power Supply Plug before opening the Case

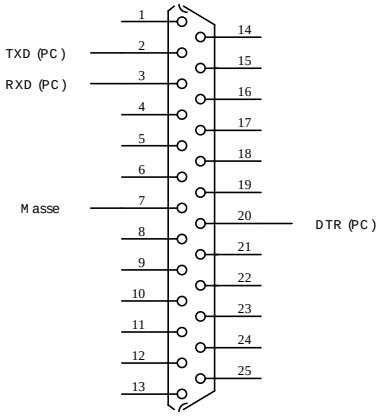
D-SUB Connectors



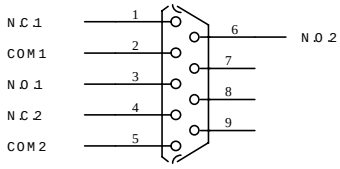
D Sub 25 IN



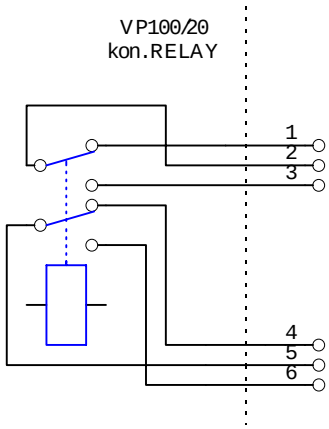
D Sub 25 OUT



D Sub 25 PC IN



D Sub 9 RELAY



Pin Assignments of IN

2	input time strings (RS232)
3	output RX_INF (RS232, only with VP100/20)
7	ground
14	input pulse per minute
16	input pulse per minute
17	output RX_INF (20mA-, only with VP100/20)
23	input time strings (20mA+)
24	output RX_ INF (20mA+, only with VP100/20)
25	input time strings (20mA-)

Pin Assignments of OUT

2	input time strings (RS232)
3	output RX_INF (RS232, only with VP100/20)
7	ground
14	output pulse per minute
16	output pulse per minute
17	output RX_INF (20mA-, only with VP100/20)
23	input time strings (20mA+)
24	output RX_ INF (20mA+, only with VP100/20)
25	input time strings (20mA-)

Pin Assignments of PC IN

2	TxD (PC)
3	RxD (PC)
7	Ground
20	DTR (PC)

Pin Assignments of RELAY

1	REL1a	on
2	REL1a	com
3	REL1a	off
4	REL1b	on
5	REL1b	com
6	REL1b	off

Rear Panel Connectors

Name	Type	Signal	Cable
PC IN	25pin SUB-D	RS232	shielded data line
RELAY	9pin SUB-D		
IN	25pin SUB-D	RS232	shielded data line
OUT	25pin SUB-D	RS232	shielded data line
Ant.	BNC	77.5kHz	shielded coaxial line
Power	power cord receptacle	85-264VAC / 120-375VDC	power supply cord

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.

Technical Specifications:

OPERATION MODE:	- as free running quartz clock with internal RTC - as slave clock synchronized by radio clock or master clock with serial time strings or pulses per minute - as radio clock with integrated DCF77 receiver
DISPLAY:	LED Dot Matrix Display (120 x 7 dots, 915mm x 55mm)
INPUTS:	RS232 or 20mA current loop (passive/active) or pulses per minute (pulse voltage: 48V max.); D-SUB25 connector
OUTPUTS:	RS232 or 20mA current loop (passive/active) or pulses per minute (pulse voltage: as applied to input); D-SUB25 connector
BAUDRATE:	9600 baud
FRAMING:	7E2
TIME STRING:	see "Format of the Meinberg Standard Time String"
BUFFERING:	In case of supply voltage failure the on-board RTC keeps the time based on XTAL for more than 10 years.
POWER REQUIREMENTS:	85-264VAC, 50/60Hz / 120-375VDC, approx. 40VA
FUSE:	0,5A(T)
PHYSICAL DIMENSION:	1000mm x 100mm x 60mm
WEIGHT:	5,2kg

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)

Programming Text Messages and the Relay

The VP100/20 provides a programmable relay output and a facility to display text messages. This features can be programmed with the Windows software "Message Editor" and a PC, connected to the D-SUB connector PC IN of the VP100/20.

The setup programm "setup_med3.exe" needs to be executed in order to install the programm "Message Editor". All steps of the installation are explained during the setup. The executable file "message.exe" is generated in the specified folder. Double click to this file starts the program "Message Editor". The program can also be started using the Windows Start Menu.

Before using "Message Editor" it is necessary to add the connected display to the display list. This is done by the menu Options->Add display. A name has to be entered together with the serial number of the display. The serial number can be displayd as described on page 8. The serial number is a 8 digit number (only the last four are significant). Now up to 32 text messages can be programmed to appear at defined moments on the display. Also the relay output can be programmed.

Files on the Diskette

setup_med3.exe	setup program foe "message.exe"

Jumper Arrangement

Jumper	
JP7	Input select timestring: RS232 / 20mA current loop
JP8, JP9	Input timestring 20mA current loop: active / passive
JP10, JP11	Output RX_INFO 20mA current loop: passive / active
JP14, JP15	Input RX_INFO 20mA current loop: active / passive
JP16	Input select RX_INFO: RS232 / 20mA current loop
JP17, JP18	Output timestring 20mA current loop: passive / active
JP19	Timestring / pulses per minute

Default	
JP7	RS232
JP8	active
JP9	active
JP10	passive
JP11	passive
JP14	active
JP15	active
JP16	RS232
JP17	passive
JP18	passive
JP19	Timestring