MEINBERG

Technical Information

Operating Instructions

USB 5131

Driver Software for
Windows 2000/XP/Vista
Operating Systems

Inhaltsübersicht
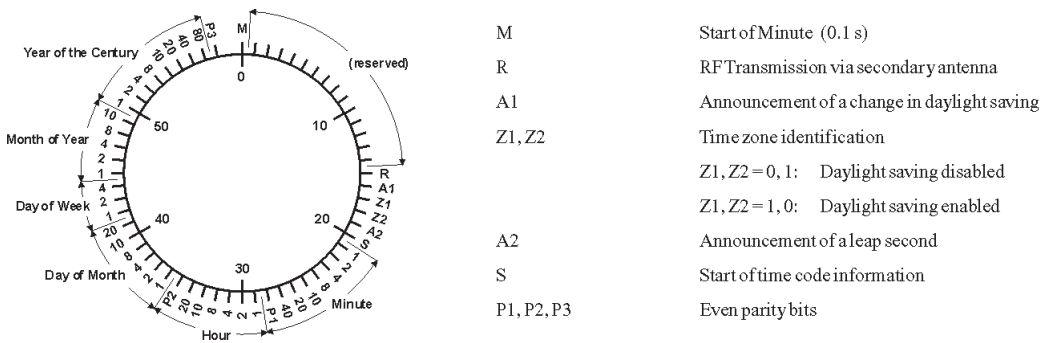
General information about DCF77

The radio 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 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 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

Overview USB5131

The radio remote clock USB5131 has been designed for communication via the serial USB interface. The required power is provided via the USB cable as well, so there is no need for any external power supply.

The DCF77 signal received by the internal antenna is passed to the on-board LF receiver where it is demodulated by a synchronous detector with automatic gain control. The demodulated time marks from the receiver circuit are filtered and decoded by the microprocessor. If no errors are detected in the current time message an additional plausibility check against the previous time message is performed. If that plausibility check passes, too, the real time clock on the board is adjusted corresponding to the decoded time and date.

The USB5131 module provides two integrated LEDs, which show the demodulated time marks (MOD LED) and the state of synchronisation (FR LED).

The scope of supply includes an USB cable with 3 mtrs. of length to connect the USB5131 directly to a PC's USB port.

Also included is the driver software for Windows 2000/XP/VISTA® operating systems that is used to set the system time of the computer and shows some important status information of the USB5131.

Driver software for other operating systems can be found on the Meinberg homepage for download: **http://www.meinberg.de/english/sw/index.htm**

Front View USB5131

Installation

Power Supply

The USB5131 is powered via the PC's USB port. After connecting the USB port the radio clock is ready to operate. For proper operation it is essential to pay attention to the following points.

Aligning the antenna

Generally, the exact alignment of the USB5131 module with its internal antenna is important. It has to be placed in longitudinal direction to the transmitter (Frankfurt/Main), see arrow printed on the label of the module. A distance of several meters to TV- or computer monitors, to computers or microprocessor boards should be kept. These devices can produce interference fields that lead to a poor or no DCF77 receiption. The USB5131 should be installed with a minimum distance of 30cm to all metal objects. Otherwise the ferrite antenna will be detuned and the received power decreases. If it is not possible to archieve a sufficient reception with the internal antenna, it is possible to connect an external antenna to find the optimal antenna location. An indoor antenna AI01 or a weatherproofed outdoor antenna AW02 can be connected to the SMB connector using a coaxial antenna cable with length of up to some hundret meters. An external antenna is recommended whenever difficult conditions regarding the reception reign. Alignment of the antenna (internal as well as external) can be done by watching the modulation LED. Like described in chapter „General information about DCF77", undisturbed pulses per second (except 59. second) without any interfering pulses are required for corrcect decoding of the DCF77 time telegram. Therefore, a modulation LED blinking exactly once per second is a criterion for good receiption of the DCF-signal.

Status LEDs

The two LEDs „Mod" and „FR" reflect the state of synchronisation of the decoded time marks of the USB5131. If the antenna is installed properly and the signal from DCF77 can be received without strong distortions, the green LED labeled Mod starts blinking exactly once per second, corresponding to the time marks from DCF77. If this LED flashes intermediately, there is some electrical noise around which prevents the micro-processor from decoding the time message. In this case, a better location for the antenna must be found. After start-up, the red LED labeled FR (free running) indicates that the clock is running on XTAL and has not synchronized with DCF77 yet. Due to the plausibility checks, it can take up to three minutes after power-up until the clock is synchronized and this LED is turned off. The state of this LED only changes when a new minute begins. Without or with a disturbed RF signal the clock runs on XTAL with an accuracy of 10^{-6} (after 24 hours of synchronous operation, otherwise: 10^{-5}). If the clock have lost reception for more than 12 hours the FR LED starts blinking.

Technical Specifications

RECEIVER:	narrowband straight receiver with automatic gain control bandwidth: approx. 40Hz reception via internal or external ferrite antenna
MODULATION:	demodulated time marks indicated by LED
TIMECODE CHECK:	Multiple software check of the incoming timecode Parity and consistency check over a period of two minutes
FREE RUNNING:	Without RF signal the clock runs on XTAL with an accuracy of 10^{-6} (after 24h of synchronous operation) Disturbed reception indicated by LED
BATTERY BACKUP:	In case of supply voltage failure the on-board RTC keeps the time based on XTAL for more than 150 hours (buffer capacitor)
RELIABILITY OF OPERATION:	Microprocessor supervisory circuit provides watchdog timer, power supply monitoring and backup-battery switchover
INTERFACE:	USB 1.1 (Universal Serial Bus)
TIME ZONE:	CET/CEST (standard), always CET (without daylight saving), UTC or east-european time (CET/CEST + 1h)
CONNECTORS:	USB connector type B SMB antenna connector (male)
POWER SUPPLY:	5V, via USB interface of the PC current consuption: approx. 40 mA
HOUSING:	plastic housing, IP30 protected 73mm x 117mm x 24mm (width x depth x height)
AMBIENT TEMPERATURE:	0 ... 50°C
HUMIDITY:	max. 85 %

Physical Dimensions

Plastic housing, IP30 protected, 73mm x 117mm x 24mm (width x depth x height)

CE Label

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.

Content of the diskette

The diskette contains a driver program that keeps the computer´s system time synchronous to the board time. If the present delivered diskette doesn't include a driver program for the operating system used, it can be downloaded from:

http://www.meinberg.de/english/sw/

On the diskette there is a file called „readme.txt", which helps installing the driver correctly.
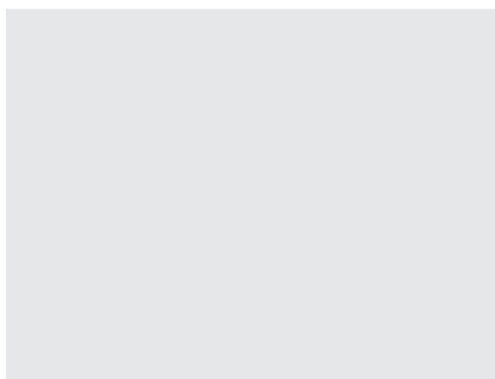
Driver Diskette for Windows 2000/XP/Vista Operating Systems