

Technical Information Operating Instructions

C28COM

Driver software for
Windows 95/98® operating systems

Impressum

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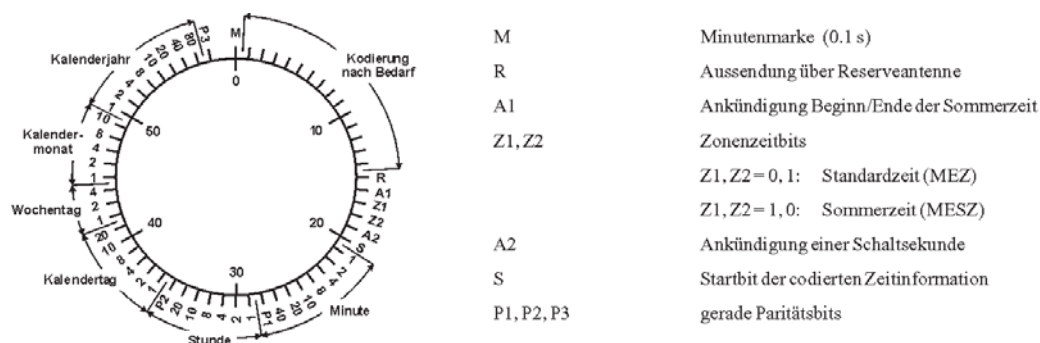
General Information about DCF77

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 (Mittleuropäische Zeit, MEZ) or the Central European Summer Time (Mittleuropäische 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 represents 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.

Figure: Decoding scheme



Overview C28COM

The radio remote clock C28COM is designed to operate in conjunction with a serial RS-232 interface of a computer. The supply voltage for the module is provided by control signals of the COM port. Therefore no external voltage needs to be applied.

The module generates a serial Meinberg Standard String which contains informations like date, time and status of the clock. C28COM sends this string once per second with transmission speed 9600bd framing 7E2, see chapter „Format of the Meinberg standard time string“ for details.

An internal 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 for decoding. 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 software clock and spread by the serial interface of C28COM.

C28COM includes a two-color LED which displays the demodulated DCF77 time marks and the status of the clock.

The clock is precanned with a connection cable of two meters length and is equipped with a 9pin D-SUB female connector (25pin on request). It is appropriated to connect directly to the RS-232 port of a PC.

The scope of supply includes a driver software for Windows95/98® operating systems. This program adjusts the system time of the computer and displays several status information of the time adjustment and the clock C28COM.

Meinberg driver software for various different operating system can be found for free download at: <http://www.meinberg.de/german/sw/index.htm>



Note about using the driver software: the module C28COM doesn't include a real time clock. After power up the time string can't contain the current time until first synchronization therefore. If you are using a Meinberg driver software, the option of accepting the time send by the DCF-clock even in case of free run should not be active.

Installation

After connecting the D-SUB connector to a RS-232 port of a computer the C28COM is already installed. To ensure correct operation the following points have to be considered.

Power supply

The flow control signals RTS (**R**equ**e**st **T**o **S**end) and DTR (**D**ata **T**erminal **R**eady) and the data signal TxD (**T**ransmit **D**ata) of the connected PC port are used to supply the power needed by C28COM.

After powering up the computer the control signals do not conduct the required potential. **For this reason the C28COM is not ready to operate until the driver software is started.** The software switches the control signals to the correct state.

If the user wants to write his own software for evaluating the serial time string, he has to make sure, that the software switches the flow control signals RTS and DTR of the computer into the 'OFF'-state. These lines must have a positive voltage relating to the reference potential (GND).

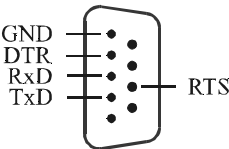
Aligning the antenna

It is important that the position of the module and it's integrated antenna ensures optimal conditions for reception of the DCF77-signal. The antenna should be aligned with the arrow symbol printed on the case pointing to the direction of the transmitter (Frankfurt am Main). A distance of several meters is recommended to all TVs or computer monitors, computers or processorboards. The antenna should have a minimum distance of 30 centimeters from solid steel.

The alignment of the Antenna can be done with the help of the integrated LED. Like described in chapter „General Information about DCF77“, the DCF77 protocol can only be decoded if all time marks can be received correctly without interfering pulses. Therefore a LED switched off strictly once per second (not in second 59) indicates good conditions of reception.

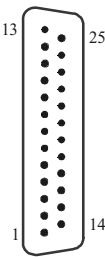
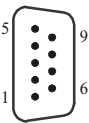
Pin assignment of the 9pin D-SUB

The assignment of the module’s D-SUB connector allows the connection directly to a RS-232 port of a personal computer. If a longer cable is needed it is possible to lengthen it by using a 1:1 cable. The maximum length depends on the RS-232-driver circuit of the computer and can’t be specified generally for this reason.



Pin assignment of the computer’s RS-232 ports

The serial RS-232 ports of a computer are assigned as follows:



9-pin D-SUB Connector		
Pin	Name	Description
1	CD	Carrier Detect
2	RxD	Receive Data
3	TxD	Transmit Data
4	DTR	Data Terminal Ready
5	GND	System Ground
6	DSR	Data Set Ready
7	RTS	Request to Send
8	CTS	Clear to Send
9	RI	Ring Indicator

25-pin D-SUB Connector		
Pin	Name	Description
1	Shield	Shield Ground
2	TxD	Transmit Data
3	RxD	Receive Data
4	RTS	Request to Send
5	CTS	Clear to Send
6	DSR	Data Set Ready
7	GND	System Ground
8	CD	Carrier Detect
20	DTR	Data Terminal Ready
22	RI	Ring Indicator

Status LED

The integrated two-color LED displays the synchronization status and the demodulated time marks of the module C28COM. A red LED indicates a free running clock while a green shining LED shows the user that the clock is already synchronized to DCF77. A correctly demodulated time mark turns off the respective shining LED for 100 msec or 200 msec.

Technical specifications C28COM

RECEIVER:	Narrowband straight receiver with automatic gain control bandwidth approx. 50 Hz, gain control approx. 90 dB internal ferrite antenna
MODULATION:	demodulated time marks displayed by LED
TIMECODE CHECK:	multiple software checks of the incoming timecode parity and consistency check over a period of two minutes
RUNNING ON CRYSTAL:	RF signal distortions causes the clock running on crystal with an accuracy of +/- 20 ppm indicated by LED and status character of serial time string
RELIABILITY OF OPERATION:	a watchdog lets the microprocessor recover from malfunction.
SERIAL INTERFACE:	one asynchronous serial interface (RS-232)
POWER REQUIREMENTS:	via the RS-232 flow control signals RTS and DTR and the data signal TxD load: RTS, DTR approx. 3mA each TxD approx. 2.8mA
HOUSING:	Unbreakable plastic case, 60 mm x 50 mm x 20 mm
AMBIENT TEMPERATURE:	-20 ... 65°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: different for DCF77 or GPS receivers:

 ‘*’ DCF77 clock currently runs on XTAL

 GPS receiver has not checked its position

 ‘ ‘ (space, 20h) DCF77 clock is sync'd with transmitter

 GPS receiver has determined its position

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

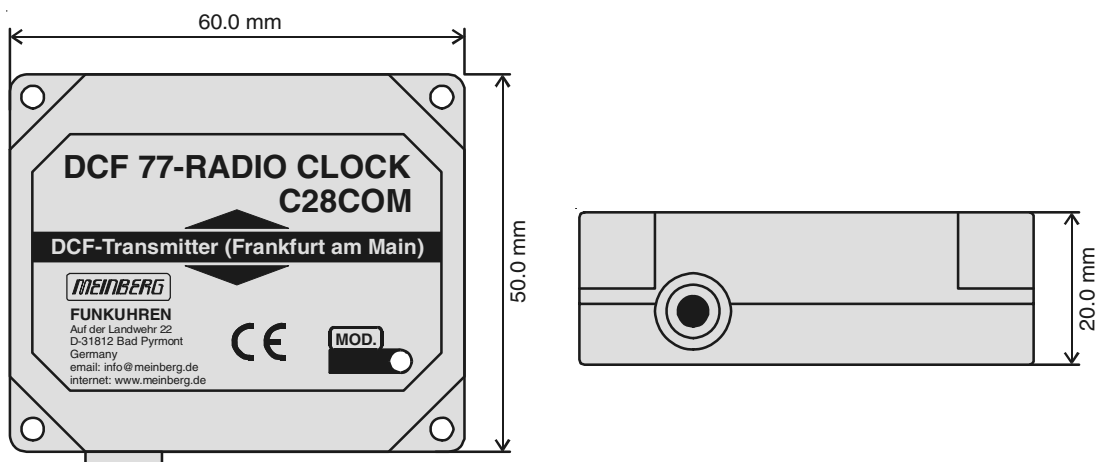
 ‘!’ announcement of start or end of daylight saving time

 ‘A’ announcement of leap second insertion

 ‘ ‘ (space, 20h) nothing announced

<ETX> End-Of-Text (ASCII code 03h)

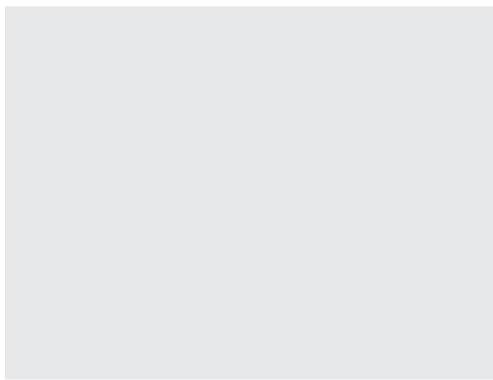
Housing/Dimensions



CE Label



This device conforms to the directive 89/336/EEC concerning the approximation of the laws of the Member States of the European Community relating to electromagnetic compatibility.



Diskette with driver software

Operation under Windows95/98®

The driver software reads the time and status information send by C28COM and adjusts the system time of Windows9x to this reference. Besides C28COM, every Meinberg clock sending a serial Meinberg standard time string once per second can be used as a reference for the driver.

In addition the program monitors the operation status of the radio clock and the time service.

Quick installation

The following steps are required for installation of the driver software:

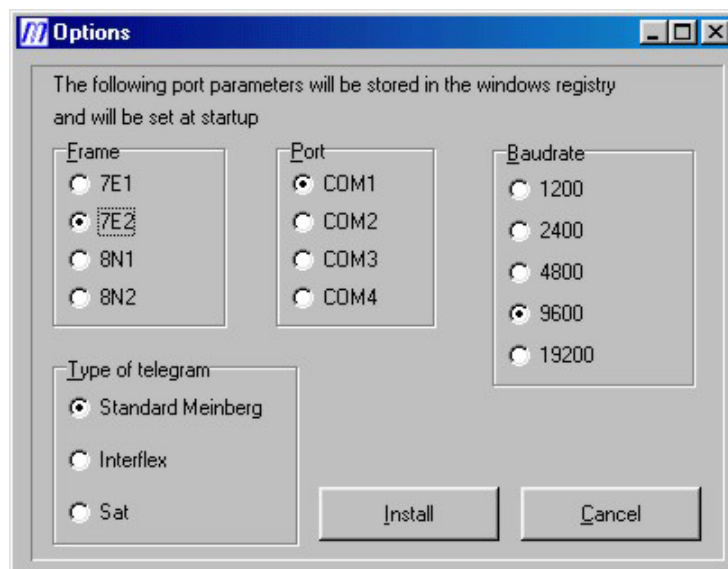
- start installation program SETUP.EXE
 - select directory for installation
 - select program folder
- start program MBGTIMEMON.EXE
 - select language
 - set parameters (RS-232-port, synchronization radius...)
- check status display in driver software

Detailed installation instructions

If the program MBGTIMEMON.EXE is started for the first time, the desired language has to be selected:



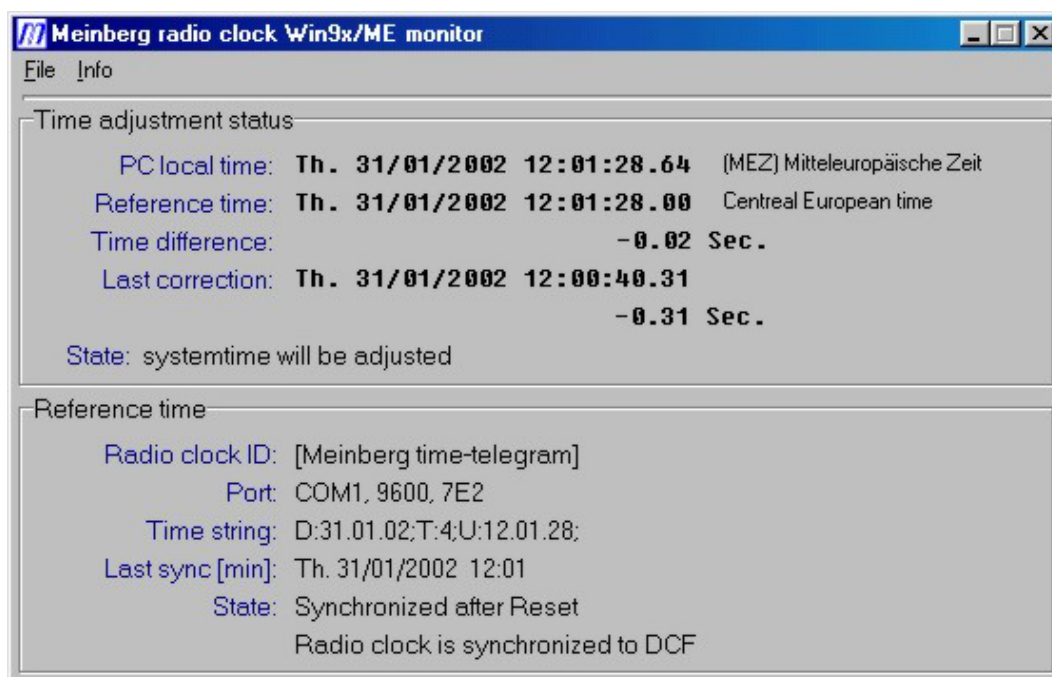
After choosing the language, the following dialog field of the installation routine appears:



The driver software reads the reference time of the C28COM by using one of the computer's RS-232-interfaces. The ports COM1 to COM4, standard transmission speeds of 2400bd to 19200bd and several different framings can be selected. In addition, the type of the serial time telegram can be changed to „Interflex“ or „SAT“ if necessary. **The parameters shown above must be selected for correct operation of the driver software in conjunction with C28COM.** By using button „Install“ all entries in the Windows registry are made and the driver software starts. Submenu „Terminal“ of Menu „File“ starts a program for testing if the time telegrams are send once per second by the clock at the specified COM-port (with the specified parameters).

Important: after installation of the driver software, the time service is not active automatically and the system time is not adjusted therefore. You have to select the option „Start timecontrol“ in menu „File“ to start the time service.

The driver software MBGTIMEMON.EXE



The main tasks of program MBGTIMEMON.EXE are to adjust the system time and to monitor the status of the computer and the radio clock.

The above part of the main window shows the current system time, the time of the external reference, the result of the last comparison of these times and magnitude and time of the last correction of the system time. Informations of the connected radio clock are shown below.

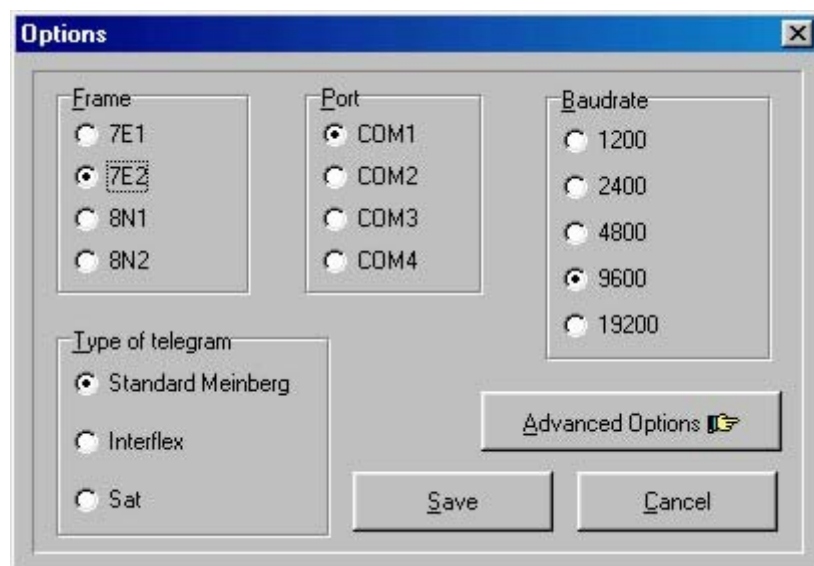
When clicking on the „minimize“ button the driver software is minimized to the Windows TrayIconBar and the program logo is displayed in the symbol bar. The right mouse button may be used to open a menu for starting or stopping the monitor.

The pull-down menu „File“



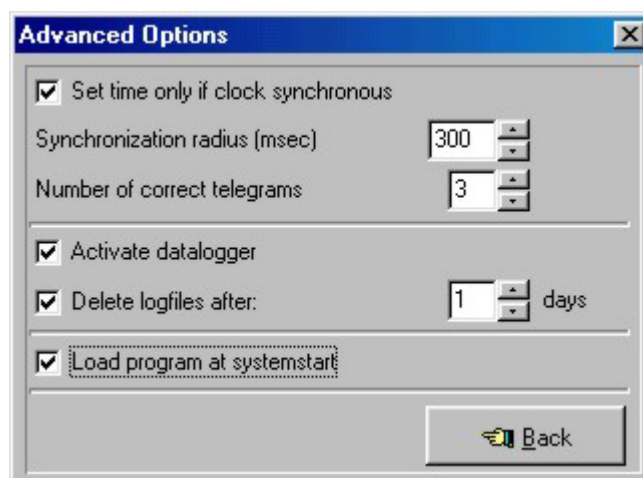
Use the **File** menu to set various parameters or to initiate various tasks. The submenus are described below.

Options



Menu **Options** must be opened to change the parameters of the serial port or the „Advanced Options“.

Advanced Options



This menu may be used to change settings concerning the behaviour of the time service. These options are described below.

Set time only if clock synchronous

If this option is active, the system time is adjusted only if the radio clock is synchronized by DCF77. If the clock enters the free running mode during operation, the system time is not adjusted until C28COM is synchronous again.

As described in chapter „Overview C28COM“, this option should be active.

Synchronization radius

Once per second the time adjustment service calculates the difference between system time and the reference time send by the radio clock. If the magnitude of this difference is less than the value defined by this parameter, the system time will not be adjusted. The „Synchronization radius“ is set to 300 msec per default. This results in a time adjustment only if a difference of more than +/- 0,3 seconds is calculated.

Number of correct telegrams

Whenever the time adjustment service reads the reference time from the radio clock, transmission errors may occur which could lead to a faulty time. The parameter „Number of correct telegrams“ specifies how many correct time telegrams must be received in succession before the time adjustment service accepts the current telegram. In addition, the service makes a plausibility check of each single telegram and of the given number of consecutive telegrams before accepting the information sent by the radio clock and adjusting the system time.

Activate datalogger

The datalogger may be used to record the activities of the time adjustment service in a data file. Seperate files will be generated for each day which are stored in the installation directory of the driver software. The adjustments of the system time and the status of the radio clock are stored in the data file. The times given in the logfile are based on UTC (Universal Time Coordinated).

The name of a data file has the following structure:

YYMMDD.TXT YY: year
 MM: month
 DD: day

The file named „010410.txt“ would be the logfile of April, 10th, 2001 for example.

Extract from a logfile:

C28COM LOGFILE 10.04.01

07:00:47	Start monitor	
07:00:47	Reference time not valid	
07:03:00	clock synchronous	
07:05:52,990	set time: 07:00:53,00	corr: 0,01 Sek
07:55:53,980	set time: 07:01:54,50	corr: 0,07 Sek
08:02:04	Exit monitor	

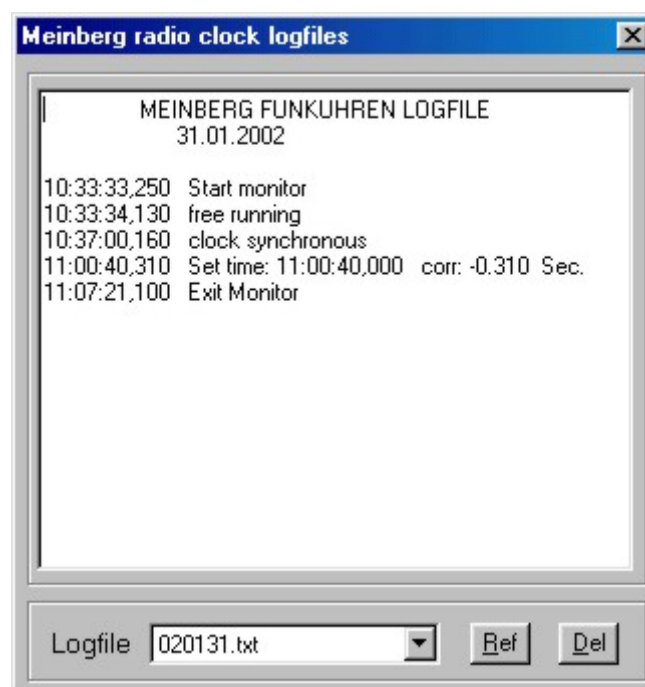
Delete logfiles after * days

This option defines how long logfiles will be stored on the harddisk. The program MBGTIMEMON.EXE checks the age of the logfiles periodically and deletes files that are older than the number of days given by this option.

Load program at systemstart

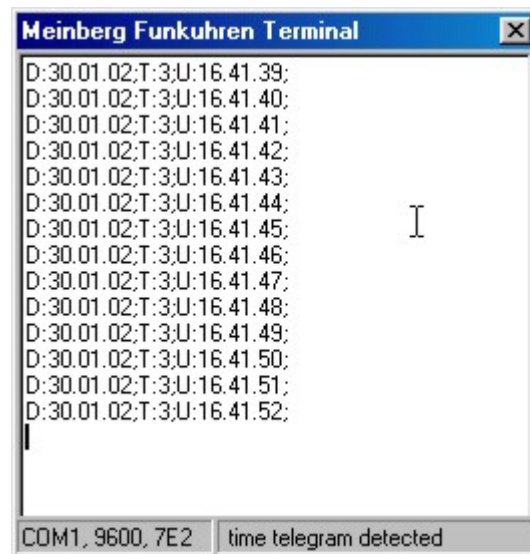
The driver software will be activated automatically during the next start of the Windows operating system if this checkbox is marked.

View logfile



Submenu **View logfile** opens a window showing the current logfile. All other files may be displayed by selecting them from the list at the bottom of the window. Using the „Ref“ button causes an update of the present-day logfile, using the „Del“ button deletes the displayed file.

Terminal



Submenu **Terminal** opens a window displaying the time telegrams received by the time service. If no telegram can be received, check the settings of the RS-232 interface connected to C28COM for: string type **Standard Meinberg**, baudrate **9600bd**, framing **7E2**.

Start/Stop timecontrol

The adjustment of the system time may be activated and deactivated. If the program is minimized in the TrayIconBar, the program logo will be crossed out if the time service is inactive.



Uninstall monitor

This submenu deletes all entries made in the Windows registry. The program folder of the driver software with its files will not be deleted.

Exit monitor

The control of the system time will be stopped and the driver software will be terminated when clicking on this submenu.

Entries in the registry used by the time adjustment service

The driver software adds some entries to the Windows registry under the path:

HKEY_CURRENT_USER\SOFTWARE

The following entries are stored under the key C28COM:

Active	Status of the driver software at last program termination
Autostart	Loading of driver at system start
Comport	Number of COM-port (1-4)
DLogger	Activate datalogger
FileDelDelay	Maximum age of logfiles
Installed	Program has been installed
Language	Selected language 0 = German 1 = English
NumKorTel	Number of correct telegrams
Sync	Set time only if clock synchronous 0=deaktiviert 1=aktiviert
SyncRadius	Synchronization radius

