MEINBERG

Technical Information

Operating Instructions

UA32S

Meinberg Funkuhren GmbH & Co. KG
Lange Wand 9
D-31812 Bad Pyrmont

Phone: ++49 52 81 / 9309-0
Fax: ++49 52 81 / 9309-30

Internet : http://www.meinberg.de
E-Mail : info@meinberg.de

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General Information about DCF77

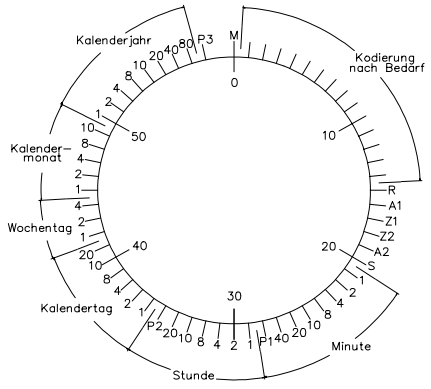
The radio remote clocks made by Meinberg receive the signal from the long wave transmitter DCF77. This long wave transmitter installed in Mainflingen near Frankfurt/ Germany transmits the reference time of the Federal Republic of Germany. This time reference is either the Central European Time (Mitteleuropäische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

R RF Transmission via secondary antenna

A1 Announcement of a change in daylight saving

Z1, Z2 Time zone identification

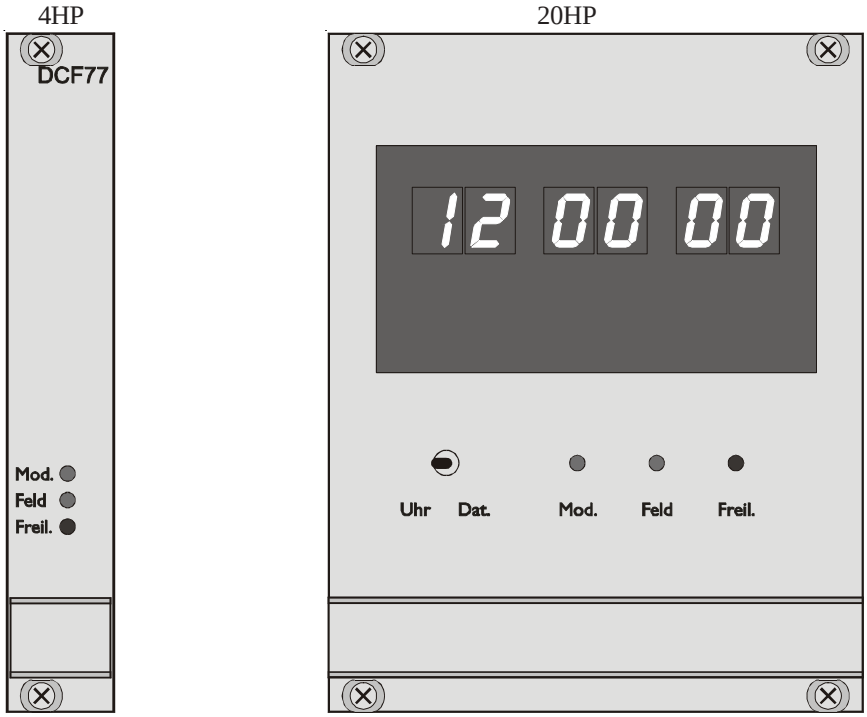
A2 Announcement of a leap second

S Start of time code information

P1, P2, P3 Parity bits

UA32S Overview

The hardware of UA32S is a 100mm x 160mm microprocessor board. The 20mm wide front panel contains three LED indicators ,only the100,8mm wide front panal contains an 7-digit LED display and a time/date switch. An asynchronous serial port is available which can be used to read out information on date, time, and status. The Meinberg standard time string can be sent automatically whenever a new second begins (default) and/or the host has sent a request character. Four optocoupler outputs and 3 relay outputs are available which can be used to switch external components or generate periodic pulses. The outputs can be programmed using data tables residing at specified addresses in the on-board EPROM.



Frontview UA32S

Antenna and LF Receiver

An external ferrit antenna is used to receive the signal from DCF77. Optionally, a weather-proof antenna is available which can be mounted outdoor. A coaxial cable which can be up to more than 100 meters in length is used to pass the antenna's output signal 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.

Mounting the Antenna

The antenna case should be installed at least 30 cm away from the board and from steel girders or plates. The brighness of the LED “Mod” in the front panel depends on the signal strength of the 77.5 kHz carrier. In order to get the maximum signal, the antenna should be aligned in two steps. First it should be turned **slowly** until the “Feld” LED is mostly dimmed. Finally the antenna must be turned by 90° from this position to obtain maximum signal.

If the antenna is installed properly and the signal from DCF77 can be received without strong distortions, the 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 microprocessor from decoding the time message. In this case, a better location for the antenna must be found.

After reset, the LED labeled “Freil.” 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.

Microprocessor Circuit

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 real time clock is read periodically and it's date and time are passed to the display driver and the serial port drivers. Additionally, the microprocessor controls the switch outputs. An on-board microprocessor supervisory circuit provides a watchdog timer which lets the microprocessor recover from malfunction, along with a power-fail comparator which resets the microprocessor if the supply voltage drops below a specified threshold.

Buffered Real Time Clock

If the board's power supply is turned off, a gold cap capacitor on the board lets the real time clock keep time and status for typically 300 hours (150 hours minimum). This capacitor does not need any maintenance. Alternatively, the clock can be ordered with a lithium battery which has 10 years of life time guaranteed.

Display

Only the100,8mm (20HP) wide front panal contains an 7-digit LED display with 10mm character height shows the time or date of the UA32S. A switch in the front panel lets the user select to view either date or time.

Control LEDs

MOD: shows the time marks from DCF 77

FELD: brightness of this LED depends on the strength of the RF signal

FREIL: clock is running on xtal

Asynchronous Serial Port

The asynchronous serial port can be used to transmit information on date, time, and status to other devices. Transmission speed and mode of operation can be configured by changing parameter bytes in the on-board EPROM. See the chapter "Technical Information" for details. Customers can specify their preferred settings when they order the board.

Optocoupler and Relay Outputs

The programming of the switch outputs is done via byte tables in the on-board EPROM. Each of the outputs can either be programmed as pulse output with pulse widths from 0.1 sec to 10 sec, or as time dependent switch output with three turn-on times and three turn-off times per output. Separate byte tables are available for working days and weekend. When the radio clock is ordered, the customer can specify his preferred configuration. When the clock is shipped, this configuration is placed in the EPROM without additional fee.

Default Configuration

Unless the customer has defined his own set of parameters, the radio clock UA32S is beeing shipped with default parameters:

Serial Port: 9600 baud, 7E2, time string per second

Optocoupler 1: one pulse per second
2: one pulse per 10 seconds
3: one pulse per minutes
4: onc pulse per 3 minutes

Relay 1: one pulse per 15 minutes
2: one pulse per hour
3: one pulse per day (00:00:00)

All of the output pulses have a width of 0.1 sec. No switching times are programmed.

Customizing the UA32S Configuration

The chapters below describe how to configure the serial port parameters and the output switching characteristics using the byte tables in the on-board EPROM. The configuration parameters start address is 0E00h. All numbers are in hex notation (rsp. packed BCD), e.g. the 59th second is coded as "59h". The listing of the default configuration is given as an example.

Serial Port

The first two bytes are used to configure the serial port's mode of operation and transmission speed. If the first byte SERMODE is 00h, the time message is sent automatically at the beginning of every new second. If that byte is not zero, the string is sent on request only.

The second byte sets up the transmission speed. See the comments in the listing below for valid entries.

Cyclic Output Pulses

Each of the switching outputs can be turned on or off either cyclically or at predefined times. In order to generate cyclic pulses at one of the outputs, the corresponding byte in one (and only one) of the tables SEKTAB (seconds), MINTAB (minutes), or STDTAB (hours) must be set to a value not equal 0FFh. The pulse length is configured in the table IMPLTAB in units of 0.1 second.

Example:

Optocoupler 3 shall be enabled once every 10 minutes for a time interval of 1.3 seconds. The values below must be entered in the four tables listed above at the positions corresponding to optocoupler 3:

```
SEKTAB:     0FFh    ;not depending on minutes
MINTAB:     10h     ;enable once every 10 minutes
STDTAB:     0FFh    ;not depending on hours
IMPLTAB:    13h     ;pulse length 13 x 0.1 sec = 1.3 sec
```

Programming Turn-On And Turn-Off Times

Switch times have a higher priority than cyclic pulses. So if any turn-on/turn-off times are programmed for an output, no cyclic pulses are generated for that output even if there are entries in the tables for cyclic pulses.

Three tables WERKT1, WERKT2, and WERKT3 are available to define 3 turn-on/turn-off cycles per output for working days (Monday through Friday) and three additional tables WOENDT1, WOENDT2, and WOENDT3 for turn-on/turn-off cycles at the weekend (Saturday and Sunday). Each table has an entry for one turn-on/turn-off cycle per output. Each turn-on time or turn-off time uses three bytes in the sequence hours, minutes, and seconds.

Listing of Default Configuration

```
LOC  OBJ            LINE   SOURCE
                    1
                    2      ;------------------------------------------
                    3      ; Serial Port Configuration
                    4      ;------------------------------------------
                    5
0E00                6                     ORG    0E00h
                    7
                    8      ; Serial Port Mode
                    9      ; 00h    Time String automatically once per second
                    10     ; others Time String only after Request Character '?' received
                    11
0E00 00             12     SERMODE:      DB     00h
                    13
                    14
                    15     ; Serial Port Baud Rate
                    16     ; 06h    600 Baud
                    17     ; 12h    1200 Baud
                    18     ; 24h    2400 Baud
                    19     ; 48h    4800 Baud
                    20     ; 96h    9600 Baud
                    21
0E01 96             22     BDRATE:       DB     96h
                    23
                    24
                    25
                    26
                    27     ;------------------------------------------
                    28     ; Cyclic Output Pulses
                    29     ;------------------------------------------
                    30
                    31     ; 1. Pulse every n seconds
                    32
0E02 FF             33     SEKTAB:       DB     0FFh   ; Relay 1
0E03 FF             34                   DB     0FFh   ; Relay 2
0E04 FF             35                   DB     0FFh   ; Relay 3
0E05 FF             36                   DB     0FFh   ; Optocoupler 1
0E06 FF             37                   DB     0FFh   ; Optocoupler 2
0E07 FF             38                   DB     0FFh   ; Optocoupler 3
0E08 FF             39                   DB     0FFh   ; Optocoupler 4
                    40
                    41
```

```
                        42      ; 2. Pulse every n minutes
                        43
0E09 FF                 44      MINTAB:     DB      0FFh    ; Relay 1
0E0A FF                 45                  DB      0FFh    ; Relay 2
0E0B FF                 46                  DB      0FFh    ; Relay 3
0E0C FF                 47                  DB      0FFh    ; Optocoupler 1
0E0D FF                 48                  DB      0FFh    ; Optocoupler 2
0E0E FF                 49                  DB      0FFh    ; Optocoupler 3
0E0F FF                 50                  DB      0FFh    ; Optocoupler 4
                        51
                        52
                        53      ; 3. Pulse every n hours
                        54
0E10 FF                 55      STDTAB:     DB      0FFh    ; Relay 1
0E11 FF                 56                  DB      0FFh    ; Relay 2
0E12 FF                 57                  DB      0FFh    ; Relay 3
0E13 FF                 58                  DB      0FFh    ; Optocoupler 1
0E14 FF                 59                  DB      0FFh    ; Optocoupler 2
0E15 FF                 60                  DB      0FFh    ; Optocoupler 3
0E16 FF                 61                  DB      0FFh    ; Optocoupler 4
                        62
                        63
                        64
                        65      ; Pulse Lengths (in units of 0.1 sec)
                        66
0E17 10                 67      IMPLTAB:    DB      10h     ; Relay 1
0E18 10                 68                  DB      10h     ; Relay 2
0E19 01                 69                  DB      01h     ; Relay 3
0E1A 01                 70                  DB      01h     ; Optocoupler 1
0E1B 01                 71                  DB      01h     ; Optocoupler 2
0E1C 01                 72                  DB      01h     ; Optocoupler 3
0E1D 01                 73                  DB      01h     ; Optocoupler 4
                        74
                        75
                        76
                        77
                        78      ;-----------------------------------------
                        79      ; Tables with Turn-On/Turn-Off Times
                        80      ;-----------------------------------------
                        81
                        82      ; Each switching time defined in a sequence of hour, minute, second
                        83
                        84
                        85
0F00                    86                  ORG     0F00h
                        87
                        88      ; 1. On/Off cycles for working days (Monday through Friday)
                        89
0F00 FFFFFF             90      WERKT1:     DB      0FFh,0FFh,0FFh          ; Relay 1 ON
0F03 FFFFFF             91                  DB      0FFh,0FFh,0FFh          ; Relay 1 OFF
                        92
0F06 FFFFFF             93                  DB      0FFh,0FFh,0FFh          ; Relay 2 ON
0F09 FFFFFF             94                  DB      0FFh,0FFh,0FFh          ; Relay 2 OFF
                        95
0F0C FFFFFF             96                  DB      0FFh,0FFh,0FFh          ; Relay 3 ON
0F0F FFFFFF             97                  DB      0FFh,0FFh,0FFh          ; Relay 3 OFF
                        98
```

```
0F12 FFFFFF   99                DB    0FFh,0FFh,0FFh        ; Optocoupler 1 ON
0F15 FFFFFF   100               DB    0FFh,0FFh,0FFh        ; Optocoupler 1 OFF
              101
0F18 FFFFFF   102               DB    0FFh,0FFh,0FFh        ; Optocoupler 2 ON
0F1B FFFFFF   103               DB    0FFh,0FFh,0FFh        ; Optocoupler 2 OFF
              104
0F1E FFFFFF   105               DB    0FFh,0FFh,0FFh        ; Optocoupler 3 ON
0F21 FFFFFF   106               DB    0FFh,0FFh,0FFh        ; Optocoupler 3 OFF
              107
0F24 FFFFFF   108               DB    0FFh,0FFh,0FFh        ; Optocoupler 4 ON
0F27 FFFFFF   109               DB    0FFh,0FFh,0FFh        ; Optocoupler 4 OFF
              110
              111
              112   ; 2. On/Off cycles for working days (Monday through Friday)
              113
0F2A FFFFFF   114   WERKT2:     DB    0FFh,0FFh,0FFh        ; Relay 1 ON
0F2D FFFFFF   115               DB    0FFh,0FFh,0FFh        ; Relay 1 OFF
              116
0F30 FFFFFF   117               DB    0FFh,0FFh,0FFh        ; Relay 2 ON
0F33 FFFFFF   118               DB    0FFh,0FFh,0FFh        ; Relay 2 OFF
              119
0F36 FFFFFF   120               DB    0FFh,0FFh,0FFh        ; Relay 3 ON
0F39 FFFFFF   121               DB    0FFh,0FFh,0FFh        ; Relay 3 OFF
              122
0F3C FFFFFF   123               DB    0FFh,0FFh,0FFh        ; Optocoupler 1 ON
0F3F FFFFFF   124               DB    0FFh,0FFh,0FFh        ; Optocoupler 1 OFF
              125
0F42 FFFFFF   126               DB    0FFh,0FFh,0FFh        ; Optocoupler 2 ON
0F45 FFFFFF   127               DB    0FFh,0FFh,0FFh        ; Optocoupler 2 OFF
              128
0F48 FFFFFF   129               DB    0FFh,0FFh,0FFh        ; Optocoupler 3 ON
0F4B FFFFFF   130               DB    0FFh,0FFh,0FFh        ; Optocoupler 3 OFF
              131
0F4E FFFFFF   132               DB    0FFh,0FFh,0FFh        ; Optocoupler 4 ON
0F51 FFFFFF   133               DB    0FFh,0FFh,0FFh        ; Optocoupler 4 OFF
              134
              135
              136   ; 3. On/Off cycles for working days (Monday through Friday)
              137
0F54 FFFFFF   138   WERKT3:     DB    0FFh,0FFh,0FFh        ; Relay 1 ON
0F57 FFFFFF   139               DB    0FFh,0FFh,0FFh        ; Relay 1 OFF
              140
0F5A FFFFFF   141               DB    0FFh,0FFh,0FFh        ; Relay 2 ON
0F5D FFFFFF   142               DB    0FFh,0FFh,0FFh        ; Relay 2 OFF
              143
0F60 FFFFFF   144               DB    0FFh,0FFh,0FFh        ; Relay 3 ON
0F63 FFFFFF   145               DB    0FFh,0FFh,0FFh        ; Relay 3 OFF
              146
0F66 FFFFFF   147               DB    0FFh,0FFh,0FFh        ; Optocoupler 1 ON
0F69 FFFFFF   148               DB    0FFh,0FFh,0FFh        ; Optocoupler 1 OFF
              149
0F6C FFFFFF   150               DB    0FFh,0FFh,0FFh        ; Optocoupler 2 ON
0F6F FFFFFF   151               DB    0FFh,0FFh,0FFh        ; Optocoupler 2 OFF
```

```
                    152
0F72 FFFFFF         153             DB      0FFh,0FFh,0FFh          ; Optocoupler 3 ON
0F75 FFFFFF         154             DB      0FFh,0FFh,0FFh          ; Optocoupler 3 OFF
                    155
0F78 FFFFFF         156             DB      0FFh,0FFh,0FFh          ; Optocoupler 4 ON
0F7B FFFFFF         157             DB      0FFh,0FFh,0FFh          ; Optocoupler 4 OFF
                    158
                    159
                    160
                    161     ; 1. On/Off cycles for weekend (Saturday and Sunday)
                    162
0F7E FFFFFF         163     WOENDT1:DB      0FFh,0FFh,0FFh          ; Relay 1 ON
0F81 FFFFFF         164             DB      0FFh,0FFh,0FFh          ; Relay 1 OFF
                    165
0F84 FFFFFF         166             DB      0FFh,0FFh,0FFh          ; Relay 2 ON
0F87 FFFFFF         167             DB      0FFh,0FFh,0FFh          ; Relay 2 OFF
                    168
0F8A FFFFFF         169             DB      0FFh,0FFh,0FFh          ; Relay 3 ON
0F8D FFFFFF         170             DB      0FFh,0FFh,0FFh          ; Relay 3 OFF
                    171
0F90 FFFFFF         172             DB      0FFh,0FFh,0FFh          ; Optocoupler 1 ON
0F93 FFFFFF         173             DB      0FFh,0FFh,0FFh          ; Optocoupler 1 OFF
                    174
0F96 FFFFFF         175             DB      0FFh,0FFh,0FFh          ; Optocoupler 2 ON
0F99 FFFFFF         176             DB      0FFh,0FFh,0FFh          ; Optocoupler 2 OFF
                    177
0F9C FFFFFF         178             DB      0FFh,0FFh,0FFh          ; Optocoupler 3 ON
0F9F FFFFFF         179             DB      0FFh,0FFh,0FFh          ; Optocoupler 3 OFF
                    180
0FA2 FFFFFF         181             DB      0FFh,0FFh,0FFh          ; Optocoupler 4 ON
0FA5 FFFFFF         182             DB      0FFh,0FFh,0FFh          ; Optocoupler 4 OFF
                    183
                    184
                    185     ; 2. On/Off cycles for weekend (Saturday and Sunday)
                    186
0FA8 FFFFFF         187     WOENDT2:DB      0FFh,0FFh,0FFh          ; Relay 1 ON
0FAB FFFFFF         188             DB      0FFh,0FFh,0FFh          ; Relay 1 OFF
                    189
0FAE FFFFFF         190             DB      0FFh,0FFh,0FFh          ; Relay 2 ON
0FB1 FFFFFF         191             DB      0FFh,0FFh,0FFh          ; Relay 2 OFF
                    192
0FB4 FFFFFF         193             DB      0FFh,0FFh,0FFh          ; Relay 3 ON
0FB7 FFFFFF         194             DB      0FFh,0FFh,0FFh          ; Relay 3 OFF
                    195
0FBA FFFFFF         196             DB      0FFh,0FFh,0FFh          ; Optocoupler 1 ON
0FBD FFFFFF         197             DB      0FFh,0FFh,0FFh          ; Optocoupler 1 OFF
                    198
0FC0 FFFFFF         199             DB      0FFh,0FFh,0FFh          ; Optocoupler 2 ON
0FC3 FFFFFF         200             DB      0FFh,0FFh,0FFh          ; Optocoupler 2 OFF
                    201
0FC6 FFFFFF         202             DB      0FFh,0FFh,0FFh          ; Optocoupler 3 ON
0FC9 FFFFFF         203             DB      0FFh,0FFh,0FFh      ; Optocoupler 3 OFF
                    204
0FCC FFFFFF         205             DB      0FFh,0FFh,0FFh      ; Optocoupler 4 ON
0FCF FFFFFF         206             DB      0FFh,0FFh,0FFh      ; Optocoupler 4 OFF
                    207
                    208
```

```
                209     ; 3. On/Off cycles for weekend (Saturday and Sunday)
                210
0FD2 FFFFFF     211     WOENDT3:    DB      0FFh,0FFh,0FFh          ; Relay 1 ON
0FD5 FFFFFF     212                 DB      0FFh,0FFh,0FFh          ; Relay 1 OFF
                213
0FD8 FFFFFF     214                 DB      0FFh,0FFh,0FFh          ; Relay 2 ON
0FDB FFFFFF     215                 DB      0FFh,0FFh,0FFh          ; Relay 2 OFF
                216
0FDE FFFFFF     217                 DB      0FFh,0FFh,0FFh          ; Relay 3 ON
0FE1 FFFFFF     218                 DB      0FFh,0FFh,0FFh          ; Relay 3 OFF
                219
0FE4 FFFFFF     220                 DB      0FFh,0FFh,0FFh          ; Optocoupler 1 ON
0FE7 FFFFFF     221                 DB      0FFh,0FFh,0FFh          ; Optocoupler 1 OFF
                222
0FEA FFFFFF     223                 DB      0FFh,0FFh,0FFh          ; Optocoupler 2 ON
0FED FFFFFF     224                 DB      0FFh,0FFh,0FFh          ; Optocoupler 2 OFF
                225
0FF0 FFFFFF     226                 DB      0FFh,0FFh,0FFh          ; Optocoupler 3 ON
0FF3 FFFFFF     227                 DB      0FFh,0FFh,0FFh          ; Optocoupler 3 OFF
                228
0FF6 FFFFFF     229                 DB      0FFh,0FFh,0FFh          ; Optocoupler 4 ON
0FF9 FFFFFF     230                 DB      0FFh,0FFh,0FFh          ; Optocoupler 4 OFF
```

Technical Specifications UA32S

RECEIVER:	Synchronous demodulator with automatic gain control bandwidth: approx. 50Hz
ANTENNA:	Active external ferrite antenna in a plastic case Length of the cable: up to more than 100m Standard version: SMB type connector, 5m of RG174 cable Outdoor version: N type connector, RG58 cable, adapter RG58/RG174
RF AMPLITUDE, MODULATION:	Indicated by LED
DISPLAY:	with 20HP front panel:7-Segment display (10mm LED segments) Also available in a 4HP version (no display)
TIMECODE CHECK:	Parity and consistency checking over a period of two minutes RF distortions indicated by both LED and a status character in the serial output string Without RF signal the clock runs on XTAL with an accuracy of 10^{-5}
BATTERY BACKUP:	Gold Cap or Lithium battery when the power is turned off, the on-board RTC keeps the time based on XTAL for more than 150 hours (gold cap) rsp. more than 10 years (lithium battery)
RELIABILITY OF OPERATION:	Microprocessor supervisory circuit provides watchdog timer, power supply monitoring and backup-battery switchover
MANUAL SETTING OF TIME AND DATE:	Two optional push buttons provide manual setting of time and date.

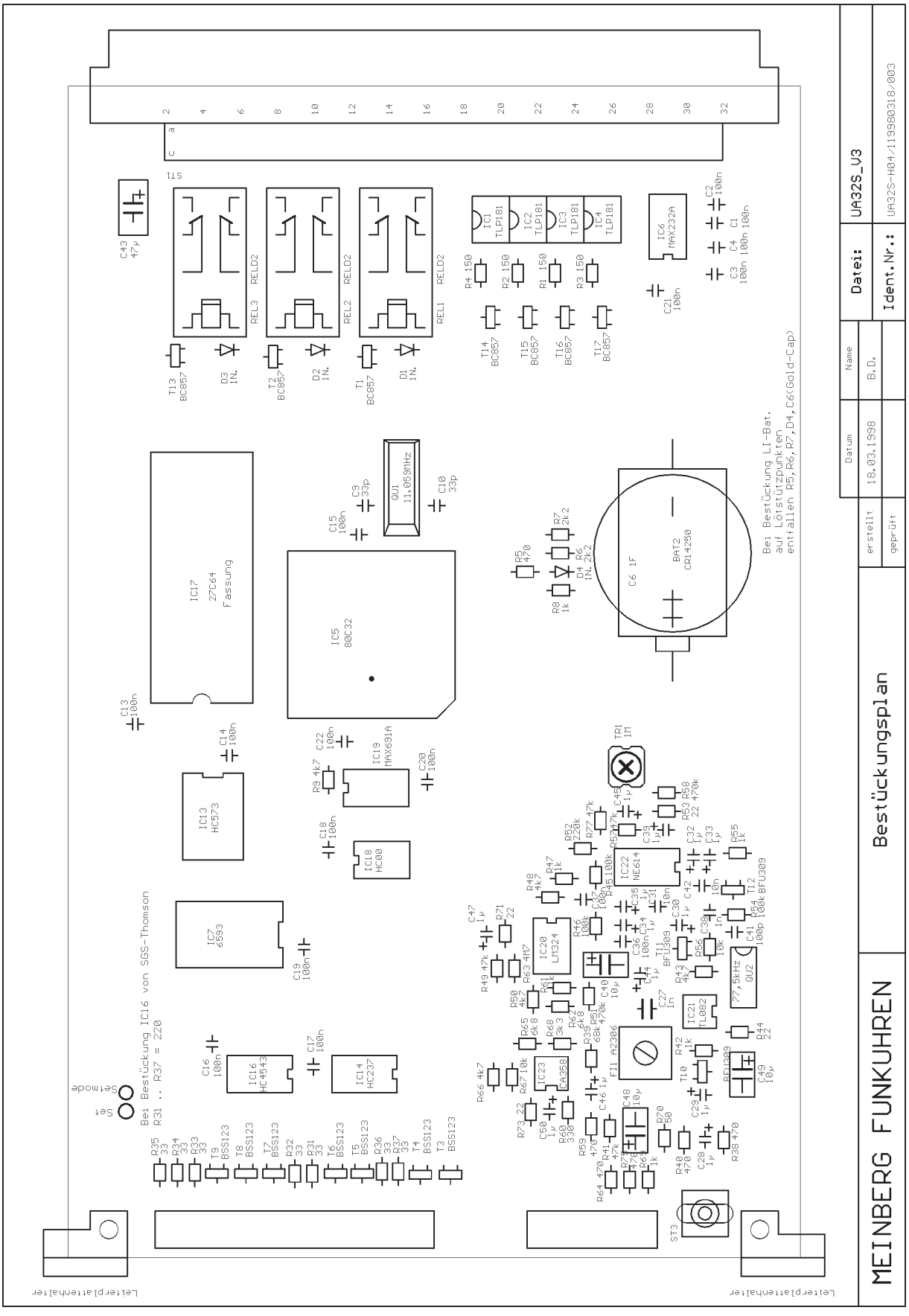
SWITCH OUTPUTS:	4 optocoupler outputs 70V/20mA 3 relay outputs 50W
SERIAL PORT:	One asynchronous serial port (RS-232), baud rate and mode of operation configurable via parameter table in the on-board EPROM Baud Rate: 600 through 9600, default: 9600 Framing: 7E2 (7 data bits, 1 even parity bit, 2 stop bits)
MODE OF OPERATION:	time string transmitted automatically once per second, or after request character '?' has been received
OUTPUT STRING:	Meinberg standard time string
CONNECTORS:	32 pin rear VG edge connector DIN 41612 Subminiature coaxial RF connector (SMB type)
POWER SUPPLY:	+5V, approximately 150mA
PHYSICAL DIMENSIONS:	Eurocard 100mm x 160mm; 1.5mm Epoxy
AMBIENT TEMPERATURE:	0 ... 50°C
HUMIDITY:	max. 85 %
OPTIONS:	Hardware and software modifications accordding to customer specification

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.

Component Layout



UA32S Connector Pin Assignments

	a	c
2	VCC in (+5V)	VCC in (+5V)
4	REL_3A_off	REL_3A_on
6	REL_3A_com	REL_3B_com
8	REL_3B_off	REL_3B_on
10	REL_2_com	REL_2_on
12	REL_1A_off	REL_1A_on
14	REL_1A_com	REL_1B_com
16	REL_1B_off	REL_1B_on
18		
20	OPTO_1_Collector	OPTO_1_Emitter
22	OPTO_2_Collector	OPTO_2_Emitter
24	OPTO_3_Collector	OPTO_3_Emitter
26	OPTO_4_Collector	OPTO_4_Emitter
28		COM0 TxD out
30		COM0 RxD in
32	GND	GND