MEINBERG
FUNKUHREN

Technical Information

Operating Instructions

GPS163TDHS

Incl. Windows Software
GPSMON32

Impressum

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General information

The satellite receiver clock GPS163TDHS has been designed to provide an extremly precise time reference for the generation of programmable pulses and IRIG/AFNOR-codes.

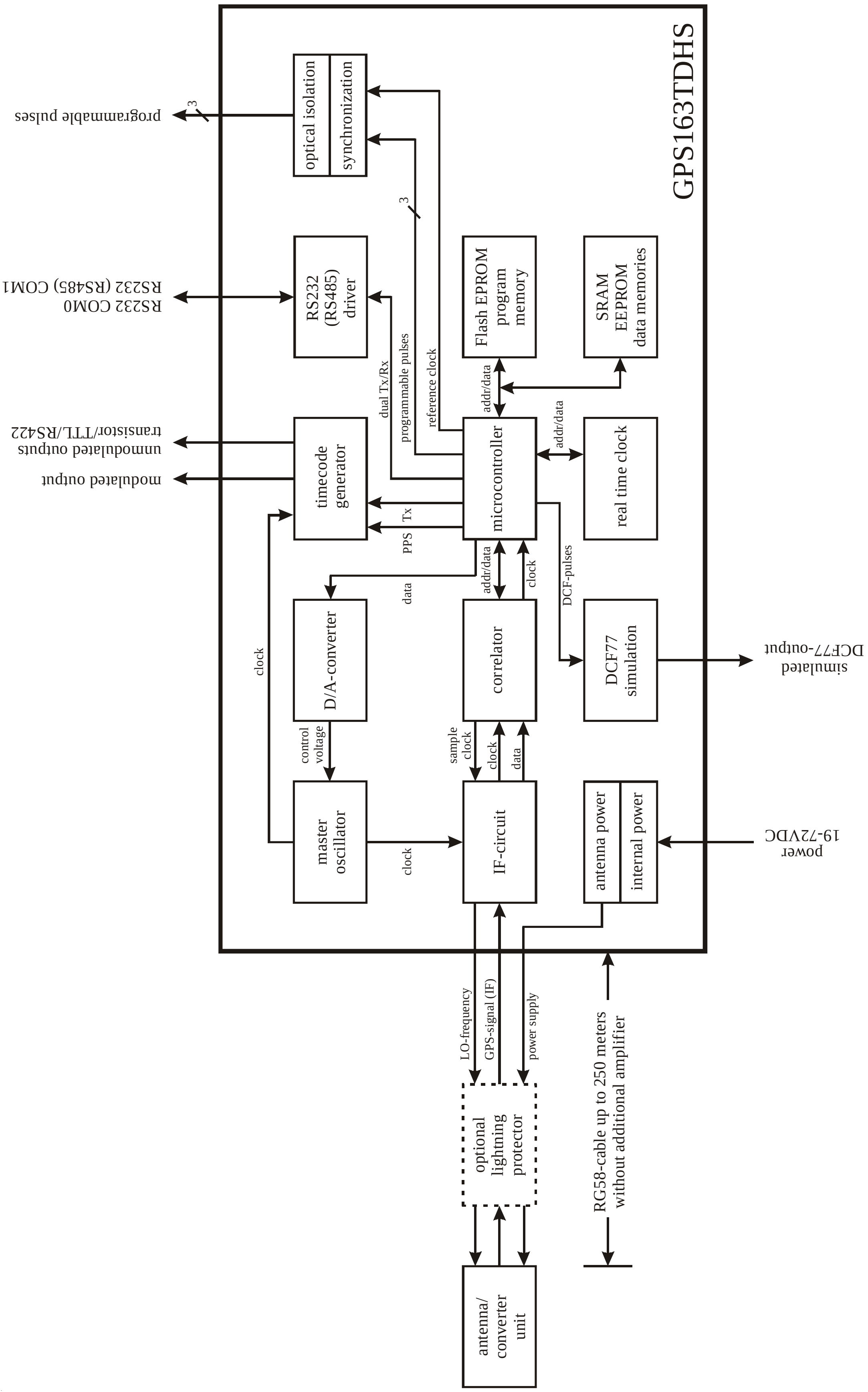
The clock has been developed for applications where conventional radio controlled clocks can´t meet the growing requirements in precision. High precision available 24 hours a day around the whole world is the main feature of the system which receives its information from the satellites of the Global Positioning System.

The Global Positioning System (GPS) is a satellite-based radio-positioning, navigation, and time-transfer system. It was installed by the United States Departement of Defense and provides two levels of accuracy: The Standard Positioning Service (SPS) and the Precise Positioning Service (PPS). While PPS is encrypted and only available for authorized (military) users, SPS has been made available to the general public.

GPS is based on accurately measuring the propagation time of signals transmitted from satellites to the user´s receiver. A nominal constellation of 21 satellites together with 3 active spares in six orbital planes 20000 km over ground provides a minimum of four satellites to be in view 24 hours a day at every point of the globe. Four satellites need to be received simultaneously if both receiver position (x, y, z) and receiver clock offset from GPS system time must be computed. All the satellites are monitored by control stations which determine the exact orbit parameters as well as the clock offset of the satellites´ on-board atomic clocks. These parameters are uploaded to the satellites and become part of a navigation message which is retransmitted by the satellites in order to pass that information to the user´s receiver.

The high precision orbit parameters of a satellite are called ephemeris parameters whereas a reduced precision subset of the ephemeris parameters is called a satellite´s almanac. While ephemeris parameters must be evaluated to compute the receiver´s position and clock offset, almanac parameters are used to check which satellites are in view from a given receiver position at a given time. Each satellite transmits its own set of ephemeris parameters and almanac parameters of all existing satellites.

Block diagram GPS163TDHS



Features of GPS163TDHS

The GPS163TDHS is designed for mounting on a DIN rail. The front panel integrates five LED indicators, a hidden push button, an eight-pole terminal block, three female D-SUB-9- and three BNC-connectors. The receiver is connected to the antenna/converter unit by a 50 Ω-coaxial cable with length up to 250 m (if using RG58-cable). It is possible to connect up to four receivers to one antenna by using an optional antenna diplexer.

The navigation message coming from the satellites is decoded by GPS163´s microprocessor in order to track the GPS system time with an accuracy of better than ±1 µsec. Compensation of the RF signal´s propagation delay is done by automatical determination of the receiver´s position on the globe. A correction value computed from the satellites´ navigation messages increases the accuracy of the onboard TCXO to $\pm 5 \cdot 10^{-9}$ and automatically compensates the oscillators aging. The last recent value is restored from the battery-backed memory at power-up.

Time zone and daylight saving

GPS system time differs from the universal time scale (UTC) by the number of leap seconds which have been inserted into the UTC time scale after GPS has been initiated in 1980. The current number of leap seconds is part of the navigation message supplied by the satellites, so GPS163´s internal real time is based on UTC.

Conversion to local time including handling of daylight saving year by year can be done by the receiver´s microprocessor if the corresponding parameters are set up with the help of the software GPSMON32 (included Windows software).

Pulse outputs

The pulse generator of the satellite controlled clock GPS163TDHS containes three independant channels and is able to generate a multitude of different pulses, which are configured with the software GPSMON32.

The active state of each channel is invertible, the pulse duration settable between 10 msec and 10 sec in steps of 10 msec.

In the default mode of operation the pulse outputs are disabled until the receiver has synchronized after power-up. However, the system can be configured to enable those outputs immediately after power-up.

The pulse outputs are electrically insulated by optocouplers (option: PhotoMOS relays) and are available at the terminal block.

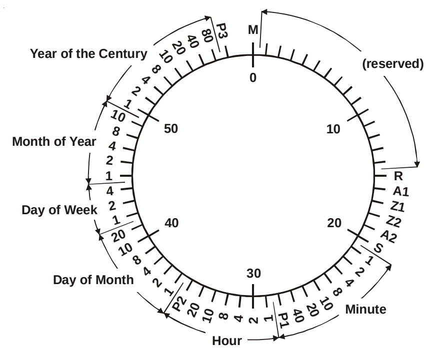
The following modes can be configured for each channel independently:

Timer mode:	Three on- and off-times per day per channel programmable
Cyclic mode:	Generation of periodically repeated pulses. A cycle time of two seconds would generate a pulse at 0:00:00, 0:00:02, 0:00:04 etc.
DCF77-Simulation mode:	The corresponding output simulates the DCF77 time telegram. The time marks are representing the local time as configured by the user.
Single Shot Mode:	A single pulse of programmable length is generated once a day at a programmable point of time
Per Sec. Per Min. Per Hr. modes:	Pulses each second, minute or hour
Status:	One of three status messages can be emitted: ‘position OK’: The output is switched on if the receiver was able to compute its position ‘time sync’: The output is switched on if the internal timing is synchronous to the GPS-system ‘all sync’: Logical AND of the above status messages. The output is active if position is calculated AND the timing is synchronized
Idle-mode:	The output is inactive

DCF77 emulation

The GPS163TDHS satellite controlled clock generates time marks which are compatible with the time marks spread by the German long wave transmitter DCF77. If configured in GPSMON32, these time marks are available as pulse outputs. In addition, an AM-modulated carrier frequency of 77.5kHz is available at a BNC-connector in the front panel. This signal can be used as a replacement for a DCF77-antenna.

The long wave transmitter installed in Mainflingen near Frankfurt/Germany transmits the reference time of the Federal Republic of Germany: time of day, date of month and day of week in BCD coded second pulses. Once every minute the complete time information is transmitted. However, GPS163TDHS generates time marks representing its local time as configured by the user, including announcement of changes in daylight saving and announcement of leap seconds. The coding sheme is given below:



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

Time marks start at the beginning of new second. If a binary "0" is to be transmitted, the length of the corresponding time mark is 100 msec, if a binary "1" is transmitted, the time mark has a length of 200 msec. 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.

Asynchronous serial ports

Two asynchronous serial interfaces (RS-232) called COM0 and COM1 are available to the user. In the default mode of operation, the serial outputs are disabled until the receiver has synchronized after power-up. However, the system can be configured to enable those outputs immediately after power-up. Transmission speeds, framings and the kind of the time string can be configured separately. The serial ports are sending a time string either once per second, once per minute or on request with ASCII ´?´ only. The format of the output strings is ASCII, see the technical specifications for details. The corresponding parameters can be set up by GPSMON32 using serial port COM0.

As an option the serial port COM1 is available as a RS485 interface.

IRIG-outputs

Introduction

The transmission of coded timing signals began to take on widespread importance in the early 1950´s. Especially the US missile and space programs were the forces behind the development of these time codes, which were used for the correlation of data. The definition of time code formats was completely arbitrary and left to the individual ideas of each design engineer. Hundreds of different time codes were formed, some of which were standardized by the "Inter Range Instrumantation Group" (IRIG) in the early 60´s. Detailed information about IRIG and other time codes can be found in the "Handbook of Time Code Formats", by Datum Inc., 1363 South State College Boulevard, Anaheim, California 92806-5790.

Except these time codes other formats, like NASA36, XR3 or 2137, are still in use. The module GPS163TDHS however generates IRIG-B or AFNOR NFS-500 only.

The selection of the generated timecode is done by the software GPSMON32.

Available time codes

The timecode generator of the module GPS163TDHS is able to generate the timecodes shown below. The modulated codes (IRIG B122/B123, AFNOR, IEEE1344) are available via the BNC-connector, the unmodulated codes (IRIG B002/B003 and IEEE1344) via a DSUB connector in the front panel. The unmodulated codes are available as a transistor output with internal pull up (1 kΩ to +5V), with TTL-level into 50 Ω and with RS422 level.

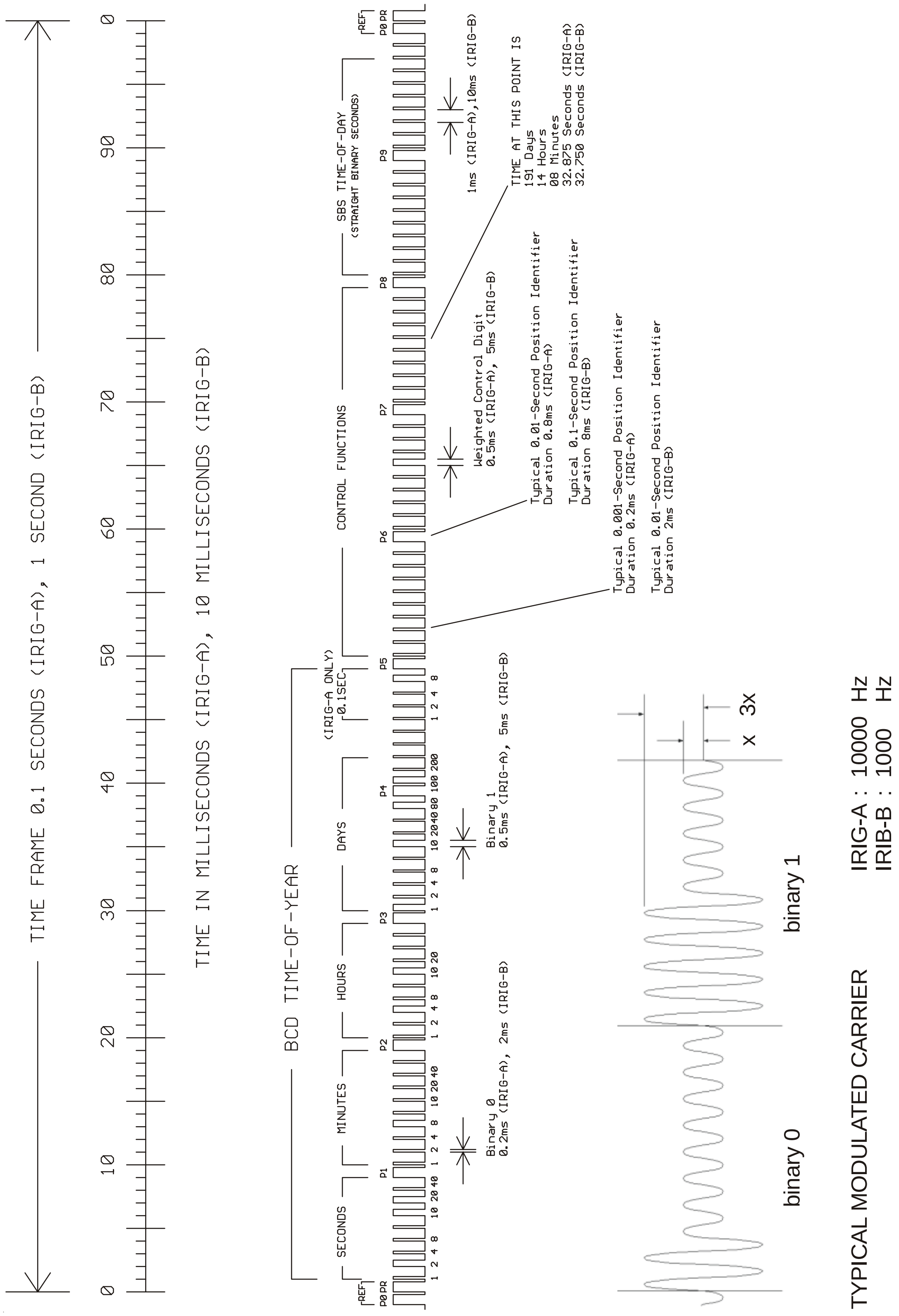
B002:	100pps, DC Level Shift pulse width coded, no carrier BCD time of year
B122:	100pps, amplitude modulated sine wave signal, 1 kHz carrier frequency BCD time of year
B003:	100pps,DC Level Shift pulse width coded, no carrier BCD time of year, SBS time of day
B123:	100pps, amplitude modulated sine wave signal, 1 kHz carrier frequency BCD time of year, SBS time of day
AFNOR:	100pps, amplitude modulated sine wave signal, 1 kHz carrier frequency BCD time of year, complete date, SBS time of day output level adapted
IEEE1344:	Code according to IEEE1344-1995 100pps, AM-Sine wave signal, 1kHz carrier frequency, BCD-time of year, SBS time of day IEEE1344 extensions for: date, timezone, daylight-saving and leap second in control functions (CF) segment. *also see table 'Assignment of CF segment in IEEE1344 mode'*

Code generation

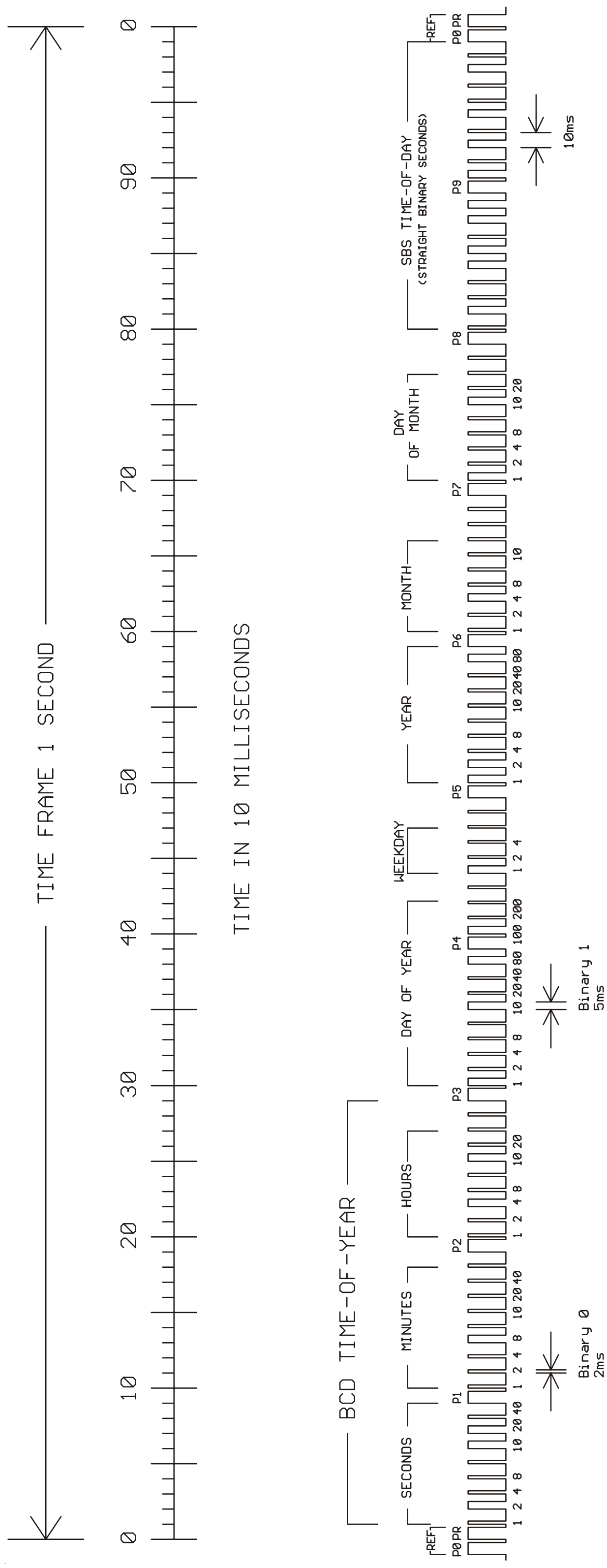
The IRIG-code is available after the code-generation-unit of GPS163 has been synchronized by a pulse per second and a serial time telegram. In the default mode of operation the pulse outputs and the serial ports are disabled until the GPS-receiver has been synchronized after power-up. The generation of the IRIG-code only starts after synchronization therefore.

If the code must be available immediately after power-up, the software GPS-MON32 can be used to enable the pulse outputs and the serial ports without synchronization of the GPS-receiver. In this mode of operation the IRIG-code is not locked to UTC-second until synchronization.

IRIG standard format



AFNOR time code format



Assignment of CF Segment in IEEE1344 mode

Bit No.	Designation	Description
49	Position Identifier P5	
50	Year BCD encoded 1	low nibble of BCD encoded year
51	Year BCD encoded 2	
52	Year BCD encoded 4	
53	Year BCD encoded 8	
54	empty, always zero	
55	Year BCD encoded 10	high nibble of BCD encoded year
56	Year BCD encoded 20	
57	Year BCD encoded 40	
58	Year BCD encoded 80	
59	Position Identifier P6	
60	LSP - Leap Second Pending	set up to 59s before LS insertion
61	LS - Leap Second	0 = add leap second, 1 = delete leap second [1.)]
62	DSP - Daylight Saving Pending	set up to 59s before daylight saving changeover
63	DST - Daylight Saving Time	set during daylight saving time
64	Timezone Offset Sign	sign of TZ offset 0 = '+', 1 = '-'
65	TZ Offset binary encoded 1	Offset from IRIG time to UTC time. Encoded IRIG time plus TZ Offset equals UTC at all times !
66	TZ Offset binary encoded 2	
67	TZ Offset binary encoded 4	
68	TZ Offset binary encoded 8	
69	Position Identifier P7	
70	TZ Offset 0.5 hour	set if additional half hour offset
71	TFOM Time figure of merit	time figure of merit represents approximated clock error. [2.)] 0x00 = clock locked 0x0F = clock failed
72	TFOM Time figure of merit	
73	TFOM Time figure of merit	
74	TFOM Time figure of merit	
75	PARITY	parity on all preceding bits incl. IRIG-B time

[1.)] current firmware does not support leap deletion of leap seconds

[2.)] TFOM is cleared, when clock is synchronized first after power up. *see chapter Selection of generated timecode*

Installation

Power supply

The module GPS163TDHS is designed for operation with a DC (19 V to 72 V, DC-insulation 1.5 kV) power supply. The voltage feed is done by using terminal blocks in the frontpanel of the clock and should have low resistance to minimize spurious emission (EMI).

To avoid potential differences between the signal ground of GPS163TDHS and post-connected units installed on different DIN rails, the signal ground of the clock is insulated from the case.

The case must be grounded by using the rear contact.

Mounting the antenna

The GPS satellites are not stationary but circle round the globe in a period of about 12 hours. They can only be received if no building is in the line-of-sight from the antenna to the satellite, so the antenna/converter unit must be installed in a location from which as much of the sky as possible can be seen. The best reception is given when the antenna has a free view of 8° angular elevation above horizon. If this is not possible the antenna should be installed with a mostly free view to the equator because of the satellite courses which are located between latitudes of 55° North and 55° South. If even this is not possible problems occure especially when at least four sattelites for positioning have to be found.

The unit can be mounted using a pole with a diameter up to 60 mm. A standard coaxial cable with 50 Ω impedance (e.g. RG58C) should be used to connect the antenna/converter unit to the receiver. Cable thinner than RG58 should be avoided due to its higher DC resistance and RF attenuation. When using the optional antenna diplexer the total length of one antenna line between antenna, diplexer and receiver must not be longer than 250 m. If a cable with less attenuation is used its length may be increased accordingly (e.g. 500 m with RG213).

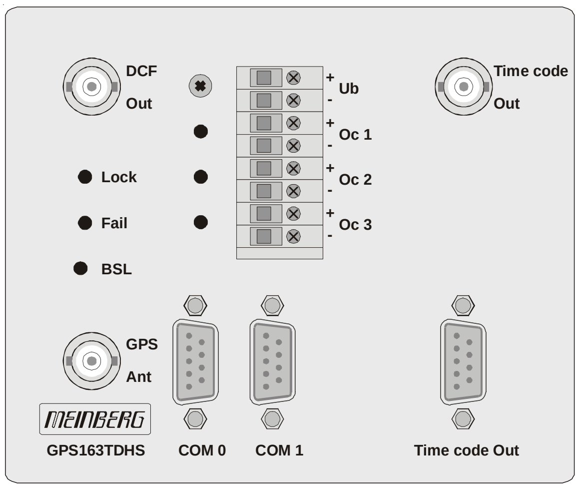
Powering up the system

If both, the antenna and the power supply have been connected, the system is ready to operate. About 10 seconds after power-up the receiver´s TCXO has warmed up and operates with the required accuracy. If the receiver finds valid almanac and ephemeris data in its battery-backed memory and the receiver´s position has not changed significantly since its last operation the receiver can find out which satellites are in view now. Only a single satellite needs to be received to synchronize and generate output pulses, so synchronization can be achieved maximally one minute after power-up.

If the receiver position has changed by some hundred kilometers since last operation, the satellites´ real elevation and doppler might not match those values expected by the receiver thus forcing the receiver to start scanning for satellites. This mode is called **Warm Boot** because the receiver can obtain ID numbers of existing satellites from the valid almanac. When the receiver has found four satellites in view it can update its new position and switch to **Normal Operation**. If the almanac has been lost because the battery had been disconnected the receiver has to scan for a satellite and read in the current almanacs. This mode is called **Cold Boot**. It takes 12 minutes until the new almanac is complete and the system switches to Warm Boot mode scanning for other satellites.

The front panel layout

FAIL LED



The FAIL LED is turned on whenever the receiver is not synchronous to the GPS-system.

LOCK LED

The LOCK LED is turned on if the receiver has acquired at least four satellites and has computed its position after power-up. In normal operation the receiver position is updated continuously as long as at least four satellites can be received. When the receivers position is known and steady only, a single satellite needs to be received for synchronization and generatation of output pulses.

OCx LEDs

The LEDs ‘OC1’, ‘OC2’ and ‘OC3’on the left of the terminal block are indicating the status of the corresponding pulse output. A burning LED symbolizes the ON-state of the optocoupler.

BNC connector DCF Out

The insulated AM-modulated carrier frequency is available at this connector.

BNC connector GPS Ant

The antenna/converter unit is connected to the receiver circuit of the GPS163 using this connector.

Connectors Time code Out

The BNC-connector makes the modulated, the DSUB-connector the unmodulated time codes available to the user.

BSL Key

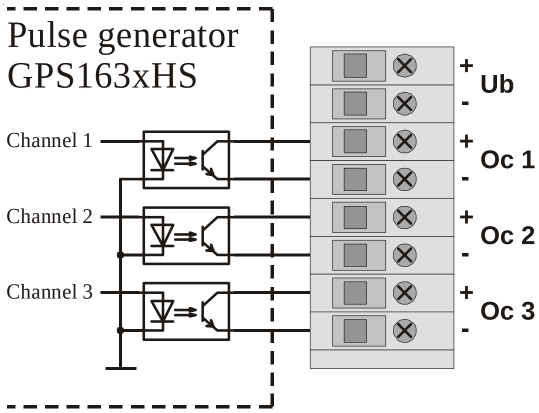
Whenever the on-board software must be upgraded or modified, the new firmware can be downloaded to the internal flash memory using the serial port COM0. There is no need to open the metal case and insert a new EPROM.

If the BSL key behind the front panel is pressed during operation, a bootstrap-loader is actived and waits for instructions from the serial port COM0. The new firmware can be sent to GPS163 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 BSL key is pressed unintentionally, the firmware will not be changed accidentially. After the next power-up, the system will be ready to operate again.

Assignment of the terminal block

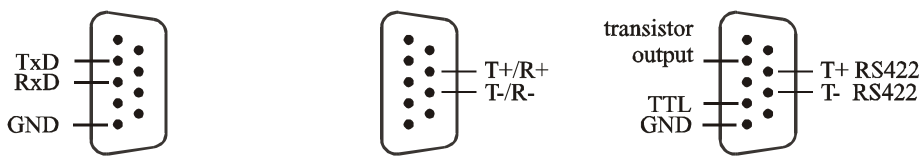
The pulse outputs are available at the terminal block in the front panel. In addition, the power supply is connected to GPS163 using two poles of this terminal block. The marking besides the terminal has the following meaning:



+ Ub	positive potential of power supply
- Ub	reference potential of power supply
+ OCx	Collector of photocoupler
- OCx	Emitter of photocoupler

Assignment of the DSUB connectors

The serial ports COM0 and COM1 and the unmodulated timecodes are available at female D-SUB-9 connectors in the frontpanel. The RS-232 interfaces can be connected to a computer by using a standard modem cable. TxD describes the sending, RxD the receiving line of GPS163TDHS.



RS-232 COM0 und COM1 | RS-485 COM1 (Option) | Time code Out

Replacing the lithium battery

The life time of the lithium battery on the board is at least 10 years. If the need arises to replace the battery, the following should be noted:

ATTENTION!

Danger of explosion in case of inadequate replacement of the lithium battery. Only identical batteries or batteries recommended by the manufacturer must be used for replacement. The waste battery must be disposed as proposed by the manufacturer of the battery.

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.

Technical specifications GPS163TDHS

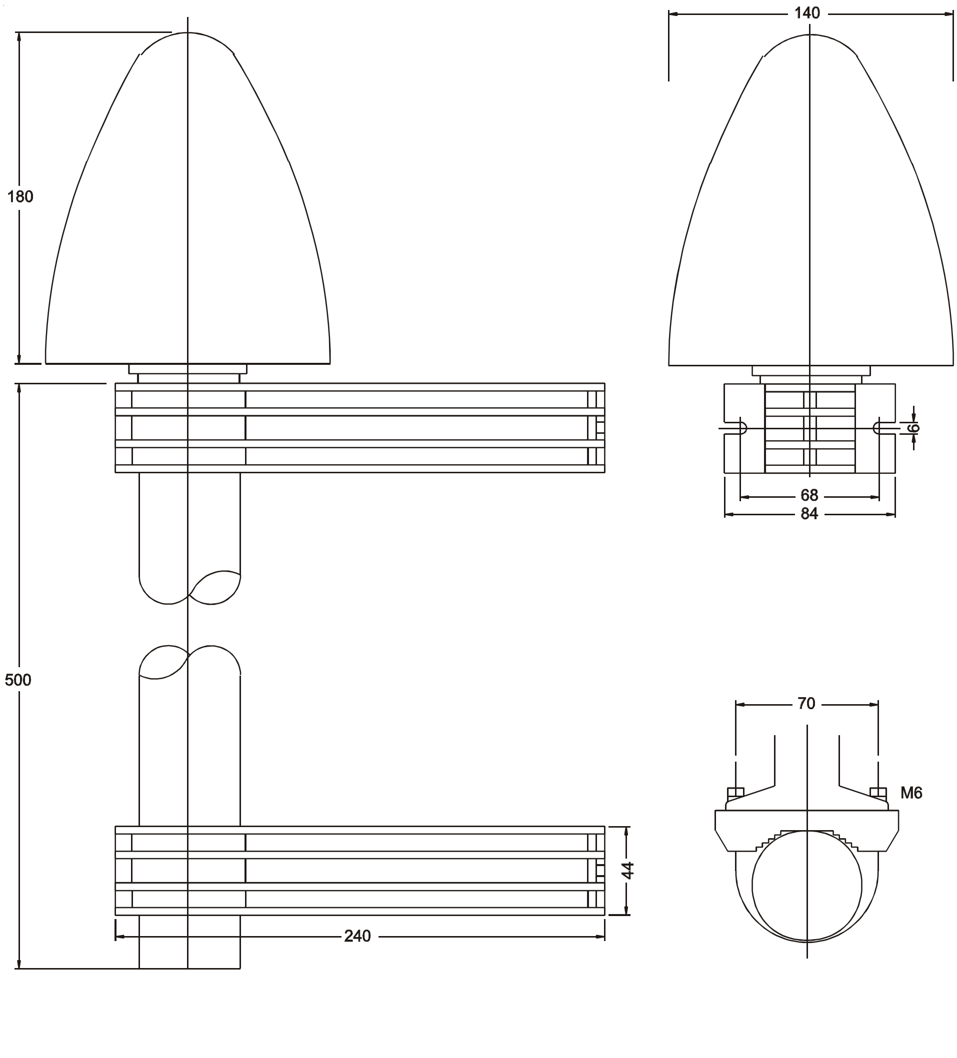
RECEIVER:	6 channel C/A code receiver with external antenna/converter unit
ANTENNA:	Antenna/converter unit with remote power supply refer to chapter "Technical specifications of antenna"
ANTENNA INPUT:	Antenna circuit dc-insulated; dielectric strength: 1000 VDC Length of cable: refer to chapter "Mounting the antenna"
TIME TO SYNCHRO-NIZATION:	one minute with known receiver position and valid almanac 12 minutes if invalid battery-backed memory
BATTERY BACKUP:	storage of pulse configuration and important GPS-system data in the internal RAM, backed-up by lithium battery lifetime of battery 10 years min.
ACCURACY OF INTERNAL OSCILLATOR:	after sync. and 20 min of operation $\pm 5 \cdot 10^{-9}$ during first 20 minutes of operation $\pm 2 \cdot 10^{-8}$
PULSE OUTPUTS:	three programmable outputs insulation by optocouplers U_{CEmax} = 55 V, I_{Cmax} = 50 mA, P_{tot} = 150 mW, V_{iso} = 5000 V pulse delay: t_{on} e.g. 20 µsec (I_C = 10 mA) t_{off} e.g. 3 µsec (I_C = 10mA) Option: PhotoMOS-relay U_{max} = 400 V, I_{max} = 150 mA, P_{tot} = 360 mW, V_{iso} = 1500 V default settings: inactive

ACCURACY OF PULSES:	better than ±1 µsec after synchronization and 20 minutes of operation better than ±3 µsec during the first 20 minutes of operation
SERIAL PORTS:	2 independant asynchronous serial ports COM0 (RS-232) Baud Rate: 300 up to 19200 Framing: 7N2, 7E1, 7E2, 8N1, 8N2, 8E1 COM1 (RS232, for internal use only) Baud Rate: 300 up to 19200 Framing: 7E2, 8N1, 8O1, 8E1 time string selectable for COM0 and COM1 ‘standard Meinberg’, ‘SAT’, ‘NMEA’ or ‘Uni Erlangen (NTP)’ default settings: COM0: 19200, 8N1 COM1: 9600, 8N1 ‘Standard Meinberg’ time string per second mode of operation ‘if sync’
TIME CODE OUTPUTS:	<u>modulated via BNC-connector:</u> IRIG: $3V_{PP}$ (MARK), $1V_{PP}$ (SPACE) into 50 Ω AFNOR: $2.17V_{PP}$ (MARK), $0.69V_{PP}$ (SPACE) into 600 Ω <u>modulated via DSUB-connector:</u> Field effect transistor with internal pull-up (1k Ω) to +5V Data of transistor: Uds_{max} = 100 V, Id_{max} = 150 mA, P_{max} = 250 mW TTL into 50 Ω RS422
DCF77 EMULATION:	AM-modulated 77.5 kHz carrier frequency usable as replacement for a DCF77 antenna output level approximately -55 dBm (unmodulated) active after reset

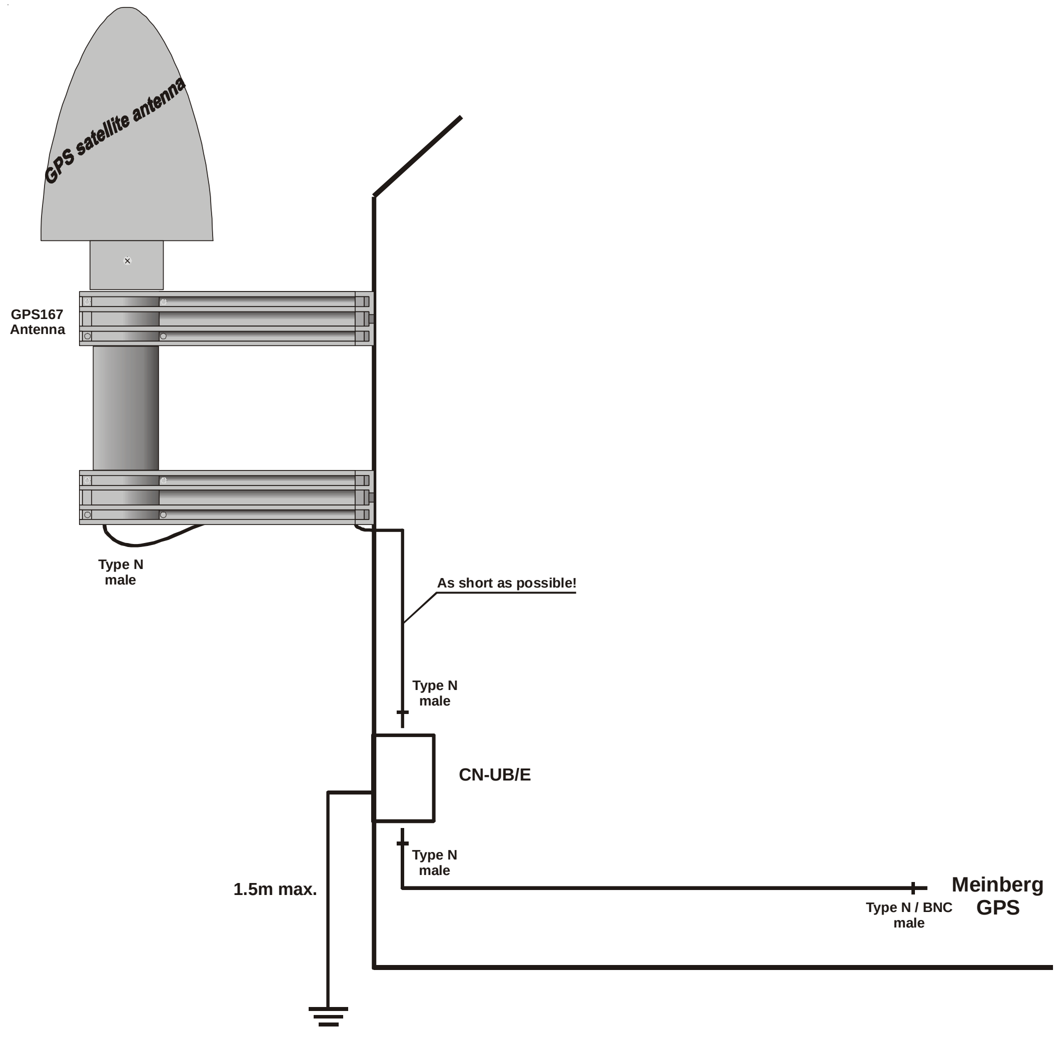
STATUS INDICATION:	receiver status:		
	Lock:	the reciever was able to compute its position after power-up	
	Fail:	the receiver is asynchronous to the GPS-system	
	status of the pulse outputs: a burning LED indicates the active state of the corresponding optocoupler		
POWER REQUIREMENTS:	19-72 VDC, e.g. 3.6W DC-insulation 1.5 KV		
DIMENSION:	105 mm x 125.5 mm x 104 mm (H x B x T)		
CONNECTORS:	coaxial BNC connectors for antenna/converter unit, AM-modulated DCF77 output and AM-modulated time code-output female D-SUB-9 connectors for serial interfaces and unmodulated time code terminal block for connection of pulse outputs and power supply		
AMBIENT TEMPERATURE:	0 ... 50°C		
HUMIDITY:	85% max.		

Technical specifications of antenna

ANTENNA:	dielectrical patch antenna, 25 x 25mm receive frequency: 1575.42 MHz bandwidth: 9 MHz
CONVERTER:	local oscillator to converter frequency: 10 MHz first IF frequency: 35.4 MHz
POWER REQUIREMENTS:	12V ... 18V, @ 100mA (provided via antenna cable)
CONNECTOR:	coax type N, female
AMBIENT TEMPERATURE:	-25 ... +65°C
HOUSING:	ABS plastic case for outdoor installation (IP56)
PHYSICAL DIMENSION:	



Assembly with CN-UB/E (CN-UB-280DC)



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 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)

Format of the SAT time string

The SAT time string is a sequence of 29 ASCII characters starting with the STX (start-of-text) character and ending with the ETX (end-of-text) character. The format is:

<STX>*tt.mm.jj/w/hh:mm:ss*ME*zzxy*<CR><LF><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)

zz time zone indicator:
‘Z ‘ MEZ European Standard Time, daylight saving disabled
‘SZ’ MESZ European Summertime, daylight saving enabled

x clock status characters:
‘*’ 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

y anouncement of discontinuity of time, enabled during last hour before discontinuity comes in effect:
‘!’ announcement of start or end of daylight saving time
‘ ‘ (space, 20h) nothing announced

<CR> Carriage return (ASCII code 0Dh)

<LF> Line feed (ASCII code 0Ah)

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

Format of the NMEA (RMC) string

The NMEA String is a sequence of 65 ASCII characters starting with the ‘$’ character and ending with the characters CR (carriage return) and LF (line-feed). The format is:

$GPRMC,hhmmss.ss,A,bbbb.bb,n,lllll.ll,e,0.0,0.0,ddmmyy,0.0,a*hh<CR><LF>

The letters printed in *italics* are replaced by ASCII numbers or letters whereas the other characters are part of the time string. The groups of characters as defined below:

$	start character (ASCII-Code 24h)
hhmmss.ss	the current time: *hh* hours (00..23) *mm* minutes (00..59) *ss* seconds (00..59, or 60 while leap second) *ss* fractions of seconds (1/10 ; 1/100)
A	Status (A = time data valid) (V = time data not valid)
bbbb.bb	latitude of receiver position in degrees leading signs are replaced by a space character (20h)
n	latitude, the following characters are possible: ‘N’ north of equator ‘S’ south d. equator
lllll.ll	longitude of receiver position in degrees leading signs are replaced by a space character (20h)
e	longitude, the following characters are possible: ‘E’ east of Greenwich ‘W’ west of Greenwich
ddmmyy	the current date: *dd* day of month (01..31) *mm* month (01..12) *yy* year of the century (00..99)
a	magnetic variation
hh	checksum (EXOR over all characters except ‘$’ and ‘*’)
<CR>	carriage-return; ASCII-Code 0Dh
<LF>	line-feed; ASCII-Code 0Ah

Format of the time string Uni Erlangen (NTP)

The time string Uni Erlangen (NTP) of a **GPS-clock** is a sequence of 66 ASCII characters starting with the STX (start-of-text) character and ending with the ETX (end-of-text) character. The format is:

<STX>tt.mm.jj; w; hh:mm:ss; voo:oo; acdfg i;bbb.bbbbn lll.llle hhhh**m*****<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)

v sign of the offset of local timezone related to UTC

oo:oo offset of local timezone related to UTC in hours and minutes

ac clock status characters:
- *a*: ‘#’ clock has not synchronized after reset
- ‘ ‘ (space, 20h) clock has synchronized after reset

- *c*: ‘*’ GPS receiver has not checked its position
- ‘ ‘ (space, 20h) GPS receiver has determined its position

d time zone indicator:
- ‘S’ MESZ European Summertime, daylight saving enabled
- ‘ ‘ MEZ European Standard Time, daylight saving disabled

f anouncement of discontinuity of time, enabled during last hour before discontinuity comes in effect:
- ‘!’ announcement of start or end of daylight saving time
- ‘ ‘ (space, 20h) nothing announced

g anouncement of discontinuity of time, enabled during last hour before discontinuity comes in effect:
- ‘A’ announcement of leap second insertion
- ‘ ‘ (space, 20h) nothing announced

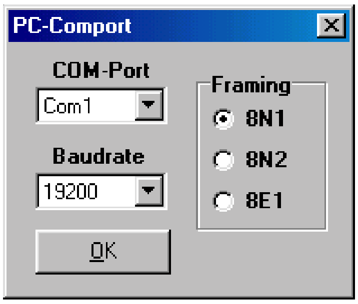
i	leap second insertion ‘L’ leap second is actually inserted (active only in 60th sec.) ‘ ‘ (space, 20h) no leap second is inserted
bbb.bbbb	latitude of receiver position in degrees leading signs are replaced by a space character (20h)
n	latitude, the following characters are possible: ‘N’ north of equator ‘S’ south of equator
lll.llll	longitude of receiver position in degrees leading signs are replaced by a space character (20h)
e	longitude, the following characters are possible: ‘E’ east of Greenwich ‘W’ west of Greenwich
hhhh	altitude above sea level in meters leading signs are replaced by a space character (20h)
<ETX>	End-Of-Text (ASCII-code 03h)

Diskette with Windows Software GPSMON32

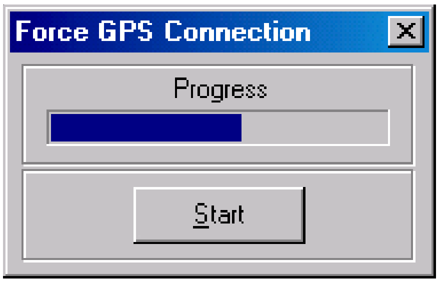
The program GPSMON32

The program GPSMON32 can be used to monitor and program all essential functions of Meinberg GPS-Receivers. The Software is executable under Win9x/2k/NT. To install GPSMON32 just run Setup.exe from the included diskette and follow the instructions of the setup program.

To obtain a connection between your PC and the GPS-receiver, connect the receivers COM0 port to a free serial port of your PC. The PCs comport used by the program GPSMON32 can be selected in submenu **'PC-Comport'** in menu **'Connection'**.



Also transfer rate and framing used by the program are selected in this menu. Communication between the clock and the PC comes about, only if the GPS serial port is configured in the same way as the PCs comport. You can enforce an access, if the GPS serial port is not configured with appropriate parameters for communication. Select the menu item '**Enforce Connection**' in menu **'Connection'** and click **'Start'** in the appearing window. Some firmware versions of GPS167 do not support this way of setting up a connection. If '**Enforce Connection**' doesn't succeed apparently, please change the serial port parameter of GPS COM0 manually to the PCs parameters.



Online Help

The online help can be started by clicking the menu item 'Help' in menu Help. In every program window a direct access to a related help topic can be obtained by pressing F1. The help language can be selected by clicking the menu items Deutsch/ Englisch in the Help Menu.