MANUAL

GPS170SV

GPS Receiver Eurocard

4th November 2013

Meinberg Radio Clocks GmbH & Co. KG

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1 Impressum

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2 General Information GPS

The satellite receiver clock GPS170 has been designed to provide extremly precise time to its user. 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 this 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 24 satellites together with several 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.

3 GPS170SV Features

The GPS170SV hardware is a 100mm x 160mm microprocessor board. The 40.6mm wide front panel integrates two LED indicators and one covered push button. The receiver is connected to the antenna/converter unit by a 50 ohm coaxial cable (refer to "Mounting the Antenna"). Feeding the antenna/converter occurs DC insulated via the antenna cable. Optional an antenna diplexer for up to four receivers connected to one antenna is available.

The GPS170SV is using the "Standard Positioning Service" SPS. Navigation messages coming in from the satellites are decoded by the GPS170SV microprocessor in order to track the GPS system time. Compensation of the RF signal´s propagation delay is done by automatic determination of the receiver´s geographical position. A correction value computed from the satellites´ navigation messages increases the accuracy of the board´s oven controlled master oscillator (OCXO) and automatically compensates the OCXO´s aging. The last state of this value is restored from the battery buffered memory at power-up.

The GPS170SV has several different optional outputs, including three progammable pulses, modulated / unmodulated timecode and max. four RS232 COM ports, depending on the hardware configuation. Additionally, you can get the GPS170SVwith different OCXO´s (e.g. OCXO- LQ / MQ / HQ / DHQ or Rubidium) to cover all levels of accuracy requirements.

You can review and change the hard- and software configuration options of the clock with the GPSMON32 application(see corresponding section in this manual).

3.1 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 since GPS was initiated in 1980. The current number of leap seconds is part of the navigation message supplied by the satellites, so the internal real time of the GPS170 is based on UTC time scale. Conversion to local time and annual daylight saving time can be done by the receiver's microprocessor if the corresponding parameters are set up by the user.

3.2 Pulse and Frequency Outputs

The pulse generator of GPS170 generates pulses once per second (P_SEC) and once per minute (P_MIN). Additionally, master frequencies of 10 MHz, 1 MHz and 100 kHz are derived from the OCXO. All the pulses are available with TTL level at the rear connector.

Frequency Outputs (optional)
The included synthesizer generates a frequency from 1/8 Hz up to 10 MHz synchronous to the internal timing frame. The phase of this output can be shifted from -360° to +360° for frequencies less than 10 kHz. Both frequency and phase can be setup from the front panel or using the serial port COM0. Synthesizer output is available at the rear connector as sine-wave output (F_SYNTH_SIN), with TTL level (F_SYNTH) and via an open drain output (F_SYNTH_OD). The open drain output can be used to drive an optocoupler when a low frequency is generated.

In the default mode of operation, pulse outputs and the synthesizer output are disabled until the receiver has synchronized after power-up. However, the system can be configured to enable those outputs immediately after power-up. An additional TTL output (TIME_SYN) reflects the state of synchronization. This output switches to TTL HIGH level when synchronization has been achieved and returns to TTL LOW level if not a single satellite can be received or the receiver is forced to another mode of operation by the user.

3.3 Time Capture Inputs

Two time capture inputs called User Capture 0 and 1 are provided at the rear connector (CAP0 and CAP1) to measure asynchronous time events. A falling TTL slope at one of these inputs lets the microprocessor save the current real time in its capture buffer. From the buffer, capture events are transmitted via COM0 or COM1 and displayed on LCD. The capture buffer can hold more than 500 events, so either a burst of events with intervals down to less than 1.5 msec can be recorded or a continuous stream of events at a lower rate depending on the transmission speed of COM0 or COM1 can be measured.

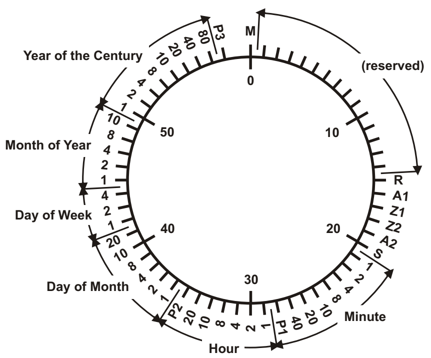
The format of the output string is ASCII, see the technical specifications at the end of this document for details. If the capture buffer is full a message "** capture buffer full" is transmitted, if the interval between two captures is too short the warning "** capture overrun" is being sent.

3.4 Asynchronous Serial Ports (optional 4x COM)

Four asynchronous serial RS232 interfaces (COM0 ... COM3) 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 mode of operation can be configured separately using the setup menu. COM0 is compatible with other radio remote clocks made by Meinberg. It sends the time string either once per second, once per minute or on request with ASCII ´?´ only. Also the interfaces can be configured to transmit capture data either automatically when available or on request. The format of the output strings is ASCII, see the technical specifications at the end of this document for details. A separate document with programming instructions can be requested defining a binary data format which can be used to exchange parameters with GPS170 via COM0.

3.5 DCF77 Emulation

The satellite controlled clock generates TTL level time marks (active HIGH) which are compatible with the time marks spread by the German long wave transmitter DCF77. This 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, the 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. The DCF emulation output is enabled immediately after power-up.

3.6 Programmable pulse (optional)

At the male connector Typ VG64 there are three programmable TTL outputs (Prog Pulse 0-2), which are arbitrarily programmable.

Other technical details are described at the end of this manual.

3.7 Time Code (optional)

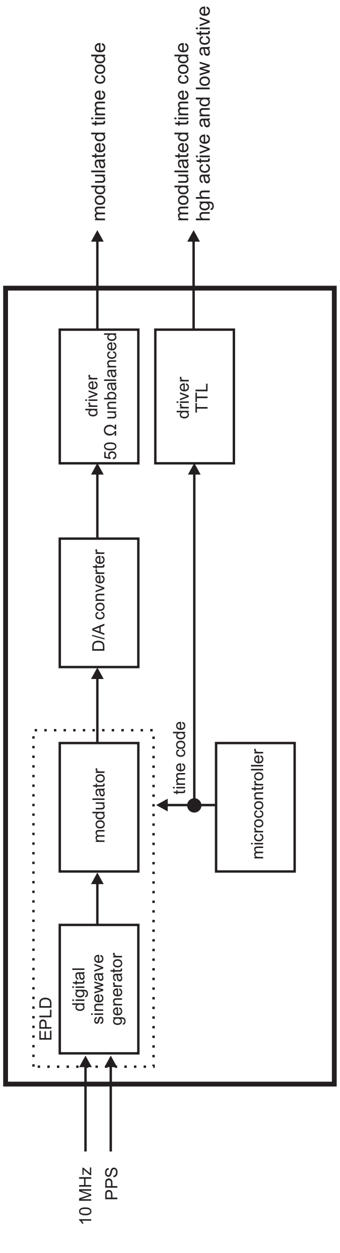
3.7.1 Abstract of Time Code

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 Instrumentation Group" (IRIG) in the early 60´s.

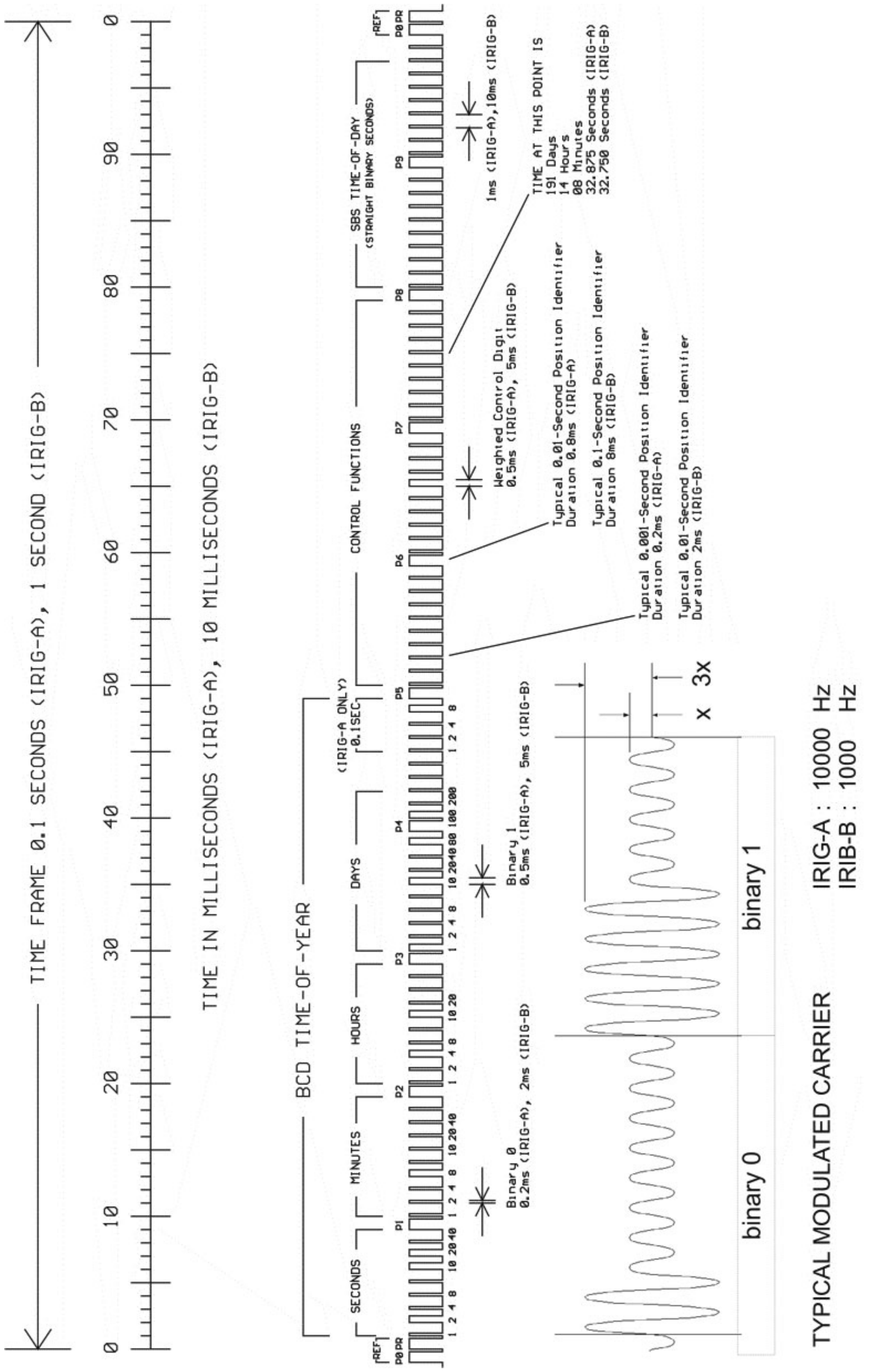
Except these "IRIG Time Codes", other formats like NASA36, XR3 or 2137 are still in use. The board GPS170 however generates the IRIG-B, AFNOR NFS 87-500 code as well as IEEE1344 code which is an IRIG-B123 coded extended by information for time zone, leap second and date. Other formats may be available on request.

A modulated IRIG-B (3Vpp into 50W) and an unmodulated DC level shift IRIG-B (TTL) signal are available at the VG64 male connector of the module.

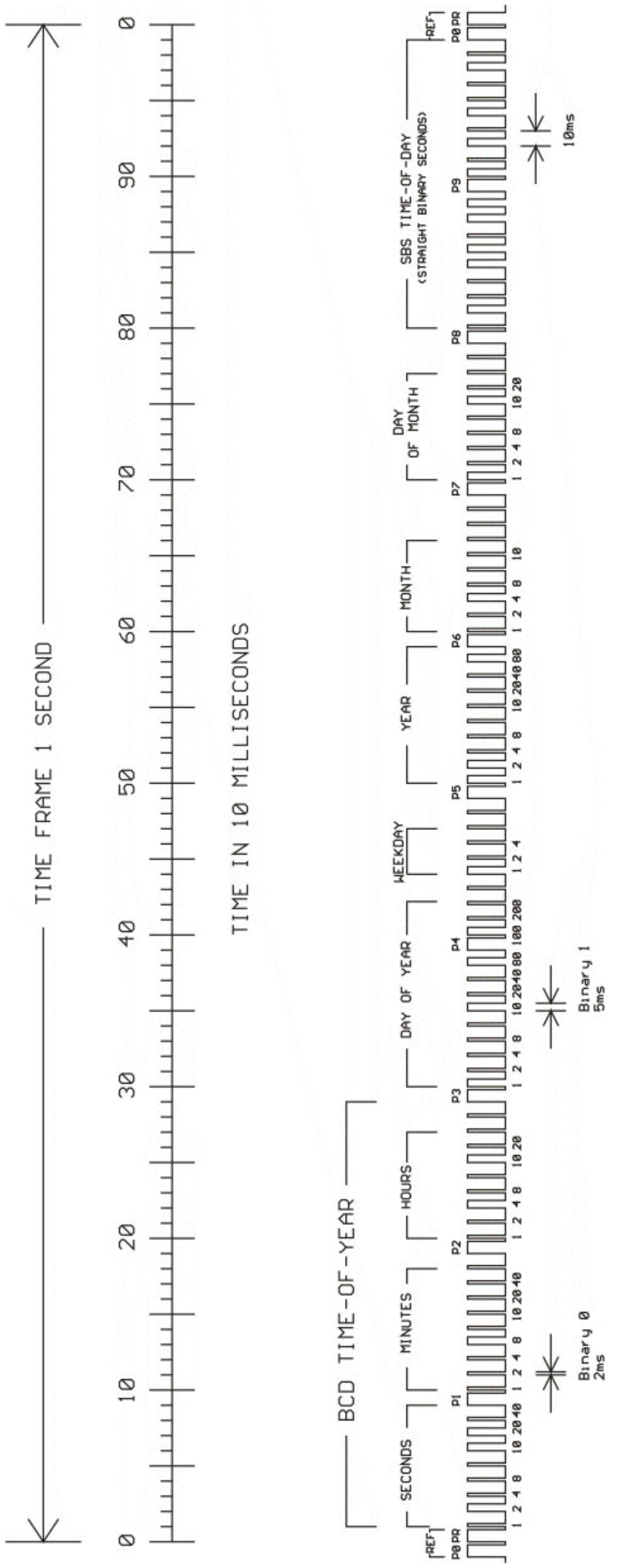
3.7.2 Block Diagram Time Code



3.7.3 IRIG Standard Format



3.7.4 AFNOR Standard Format



3.7.5 Assignment of CF Segment in IEEE1344 Code

Bit No.	Designation	Description
49	Position Identifier P5	
50	Year BCD encoded 1	
51	Year BCD encoded 2	low nibble of BCD encoded year
52	Year BCD encoded 4	
53	Year BCD encoded 8	
54	empty, always zero	
55	Year BCD encoded 10	
56	Year BCD encoded 20	high nibble of BCD encoded year
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	
66	TZ Offset binary encoded 2	Offset from IRIG time to UTC time.
67	TZ Offset binary encoded 4	Encoded IRIG time plus TZ Offset equals UTC at all times!
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	
72	TFOM Time figure of merit	time figure of merit represents approximated clock error. 2.)
73	TFOM Time figure of merit	0x00 = clock locked, 0x0F = clock failed
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

3.7.6 Generated Time Codes

The internal time code generator may be configured to produce various pulse width modulated IRIG-B or AFNOR signals. Codes can be output via the front panel fibre optic ports FO1. . . FO3.

a) B002:	100 pps, DCLS signal, no carrier BCD time-of-year
b) B003:	100 pps, DCLS signal, no carrier BCD time-of-year, SBS time-of-day
c) B006:	100 pps, DCLS Signal, no carrier BCD time-of-year, Year
d) B007:	100 pps, DCLS Signal, no carrier BCD time-of-year, Year, SBS time-of-day
e) AFNOR :	Code according to NFS-87500, 100 pps, wave signal, 1kHz carrier frequency, BCD time-of-year, complete date, SBS time-of-day, Signal level according to NFS-87500
f) IEEE1344:	Code according to IEEE1344-1995, 100 pps, 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')
g) C37.118:	C37.118(DC) Code acc. C37.118, 100 pps, no carrier, BCD time-of-year, SBS time-of-day,C37.118 extensions for date, timezone, daylight saving and leap second in control functions (CF) segment (also see table 'Assignment of CF segment in IEEE1344 mode' but sign bit of local offset is inverted)

3.7.7 Selection of Generated Time Code

The time code to be generated can be selected by Menu Setup IRIG-settings or the GPS Monitorprogram GPSMON32 (except Lantime models). DC-Level Shift Codes (PWM-signal) B00x and modulated sine wave carrier B12x are always generated simultaneously. Both signals are provided at the VG64-Connector, i.e. if code B132 is selected also code B002 is available. This applies for the codes AFNOR NFS 87-500 and IEEE1344 as well.

The TFOM field in IEEE1344 code is set dependent on the 'already sync'ed' character ('#') which is sent in the serial time telegram. This character is set, whenever the preconnected clock was not able to synchronize after power up reset. The 'time figure of merit' (TFOM) field is set as follows.

Clock synchronized once after power up:	TFOM = 0000
Clock not synchronized after power up:	TFOM = 1111

For testing purposes the output of TFOM in IEEE1344 mode can be disabled. The segment is set to all zeros then.

3.7.8 Outputs

The module GPS170 provides modulated (AM) and unmodulated (DCLS) outputs. The format of the timecodes is illustrated in the diagramms "IRIG-" and "AFNOR standard-format".

AM - Sine Wave Output

The amplitude-modulated carrier is available at the VG-connector pin 14a. The carrier frequency depends on the code and has a value of 1 kHz (IRIG-B). The signal amplitude is 3 Vpp (MARK) and 1 Vpp (SPACE) into 50 Ohm. The encoding is made by the number of MARK-amplitudes during ten carrier waves. The following agreements are valid:

a)	binary "0":	2 MARK-amplitudes, 8 SPACE-amplitudes
b)	binary "1":	5 MARK-amplitudes, 5 SPACE-amplitudes
c)	position-identifier:	8 MARK-amplitudes, 2 SPACE-amplitudes

DCLS Output

The pulse width DCLS signals shown in the diagramms "IRIG" and "AFNOR standard format" are coexistent to the modulated output and is available at the VG connector pin 13a with TTL level.

3.7.9 Technical Data

OUTPUTS: Unbalanced AM-sine wave-signal:
3 VPP (MARK) / 1 VPP (SPACE) into 50 Ohm

DCLS signal: TTL

4 Installation

4.1 The Front Panel Layout

FAIL LED
The FAIL LED is turned on whenever the TIME_SYN output is low (receiver is not synchronized).

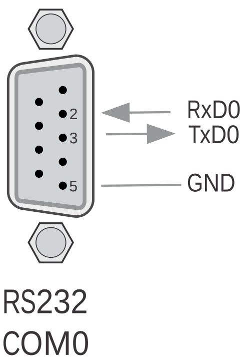
LOCK LED
The LOCK LED is turned on when after power-up the receiver has acquired at least four satellites and has computed its position. In normal operation the receiver position is updated continuously as long as at least four satellites can be received. When the receivers position is known and steady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

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

If the BSL pushbutton behind the front panel is pressed while the system is powered up, a bootstrap-loader is actived and waits for instructions from the serial port COM0. The new firmware can be sent to GPS170SV 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 pushbutton is pressed unintentionally while the system is powered up, the firmware will not be changed accidentially. After the next power-up, the system will be ready to operate again.

4.2 RS232 COM0



The serial port COM0 is accessible via a 9pin DSUB male connector (older version 9pol. DSUB male connector) in the frontpanel of the GPS170, parallel hardwired to the COM0 port on the rear VG edge connector.

4.3 Power Supply

The power supply used with a GPS170 has to provide only one output of +5V. The output voltage should be well regulated because drifting supply voltages reduce the short time accuracy of the generated frequencies and timing pulses. The power supply lines should have low resistance and must be connected using both pins a and c of the rear connector.

4.4 Mounting the GPS 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 antenna/converter unit can be mounted on a pole with a diameter up to 60 mm or at a wall. A 45 cm plastic tube, two holders for wall-mounting and clamps for pole-mounting are added to every GPS170. A standard coaxial cable with 50 ohm impedance should be used to connect the antenna/converter unit to the receiver. The maximum lenght of cable between antenna and receiver depends on the attenuation factor of the used coaxial cable.

Up to four GPS170 receivers can be run with one antenna/converter unit by using the optional antenna diplexer. The total length of one antenna line between antenna, diplexer and receiver must not be longer than the max. lenght shown in the table above. The position of the diplexer in the antenna line does not matter.

High voltage protectors must be installed directly after reaching the indoors. The optional delivered protection kit is not for outdoor usage.

Note:
If the antenna cable was assembled by the user: before powering up the system, make sure that there is no short-circuit between the inner and outer conductor of the antenna cable, because this could cause a fault of GPS170.

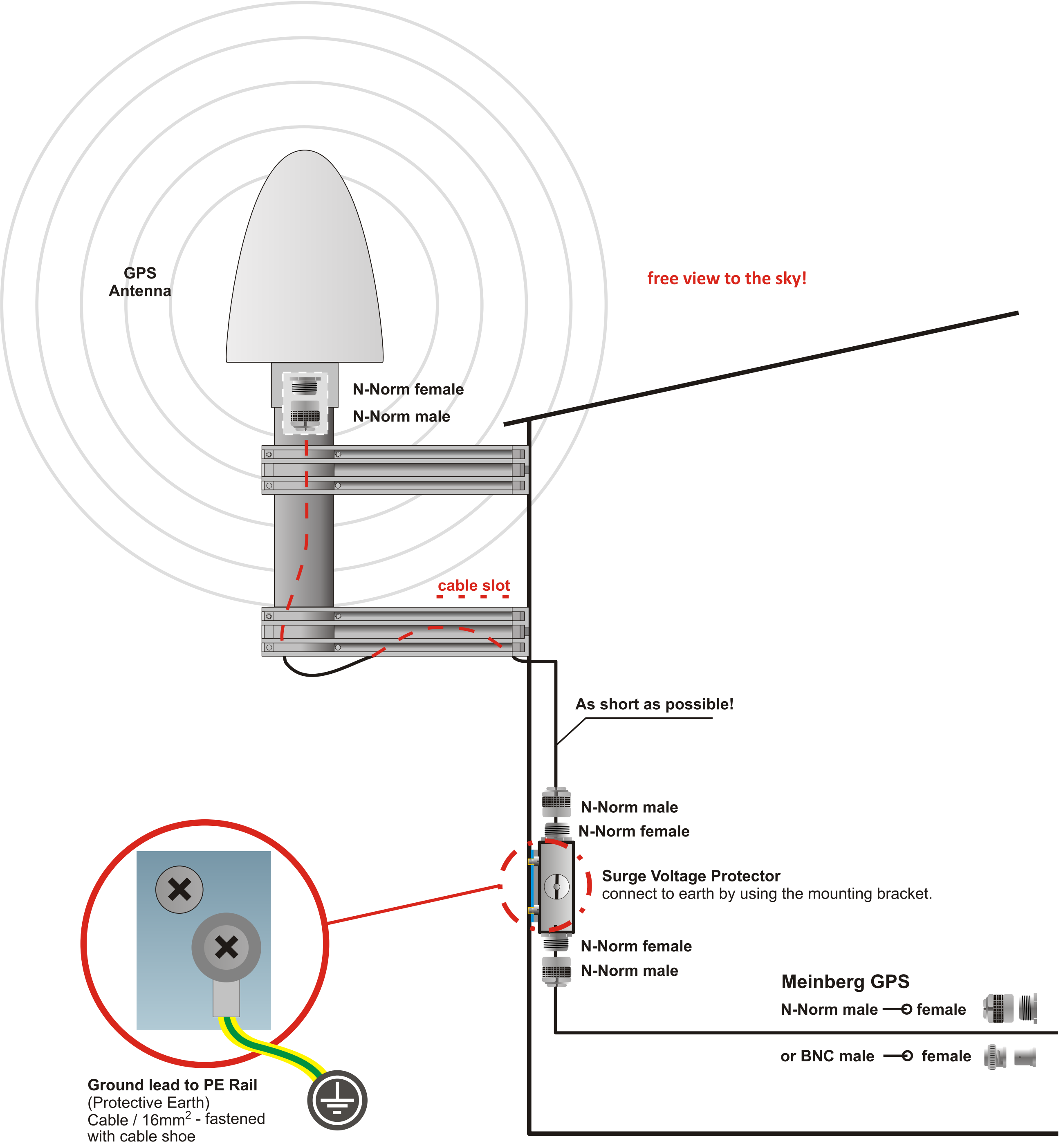
4.4.1 Example:

Type of cable	diameter Ø [mm]	Attenuation at 100MHz [dB]/100m	max lenght. [m]
RG58/CU	5mm	17	300 (1)
RG213	10.5mm	7	700 (1)

(1)This specifications are made for antenna/converter units produced after January, 2005
The values are typically ones; the exact ones are to find out from the data sheet of the used cable

4.4.2 Antenna Short-Circuit Assembly with surge voltage protection

Optional a surge voltage protector for coaxial lines is available. The shield has to be connected to earth as short as possible by using the included mounting bracket. Normally you connect the antenna converter directly with the antenna cable to the system.



4.5 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 (OCXO-LQ) until 3 minutes (OCXO-MQ / HQ) has warmed up and operates with the required accuracy. If the receiver finds valid almanac and ephemeris data in its battery buffered 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 (OCXO-LQ) until 10 minutes (OCXO-MQ / HQ) . After 20 minutes of operation the OCXO is full adjusted and the generated frequencies are within the spezified tolerances.

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.

In the default mode of operation, neither pulse and synthesizer outputs nor the serial ports will be enabled after power-up until synchronization has been achieved. However, it is possible to configure some or all of those outputs to be enabled immediately after power-up. If the system starts up in a new environment (e. g. receiver position has changed or new power supply) it can take some minutes until the OCXO´s output frequency has been adjusted. Up to that time accuracy of frequency drops to 10-8 reducing the accuracy of pulses to $+$-5μs.

5 Safety Instructions

5.1 Skilled/Service-Personnel only: 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.

5.2 CE-Label

MEINBERG Radio Clocks declares under its sole responsibility, that the product **GPS170** to which this declaration relates
is in conformity with the following standards:

Electromagnetic compatibility	**EN55022:2008-07, Class B** Limits and methods of measurement of radio interference characteristics of information technology equipment
	EN55024:2003-10 Limits and methods of measurement of Immunity characteristics of information technology equipment

following the provisions of the directives 2004/108/EC (electromagnetic compatibility), 2006/95/EC (low voltage directive) and 93/68/EEC (CE marking) and its amendments.

6 Technical Specifications GPS170

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
ANTENNA INPUT:	Antenna circuit DC-insulated; dielectric strength: 1000V Length of cable: refer to chapter "Mounting the Antenna"
LC DISPLAY:	4x16 character, menu selectable by push buttons
TIME TO SYNCHRONIZATION:	one minute with known receiver position and valid almanac 12 minutes if invalid battery buffered memory
PULSE OUTPUTS:	change of second (PPS, TTL level into 50?) change of minute (PPM, TTL level)
ACCURACY OF PULSES:	after synchronization and 20 minutes of operation TCXO HQ/OCXO LQ: better than +-250 nsec OCXO MQ/OCXO HQ: better than +-100 nsec OCXO DHQ/Rubidium: better than +-100 nsec better than +-2 μsec during the first 20 minutes of operation
FREQUENCY OUTPUTS:	10 MHz, TTL level into 50 Ohm 1 MHz, TTL level 100 kHz, TTL level
FREQUENZ-SYNTHESIZER:	1/8 Hz up to 10 MHz
ACCURACY OF SYNTHESIZER:	base accuracy depends on system accuracy 1/8 Hz to 10 kHz: Phase syncron with pulse output P_SEC 10 kHz to 10 MHz: frequency deviation < 0.0047 Hz
SYNTHESIZER OUTPUTS:	F_SYNTH: TTL level F_SYNTH_OD: open drain drain voltage: < 100 V sink current to GND: < 100 mA dissipation power at 25°C: < 360 mW F_SYNTH_SIN: sine-wave output voltage: 1.5 V eff. output impedance: 200 Ohm
TIME_SYN OUTPUT:	TTL HIGH level if synchronized

SERIAL PORTS:	max. 4 asynchronous serial ports (RS-232)	
	Baud Rate:	300 up to 19200
	Framing:	7N2, 7E1, 7E2, 8N1, 8N2, 8E1
	default setting:	COM0: 19200, 8N1
		COM1: 9600, 8N1
		COM2: 9600, 7E2
		COM3: 9600, 7E2
	Annotation: Even if one of the setup functions "INIT USER PARMS" is executed, the serial port parameters are reset to default values only if invalid parameters have been configured.	
TIME CAPTURE INPUTS:	triggered on falling TTL slope Interval of events: 1.5msec min. Resolution: 100ns	
POWER REQUIREMENTS:	5V +- 5%, max. @1100mA (see oscilatorspecifikations)	
PHYSICAL DIMENSION:	19" module in a closed 112mm high x 102mm wide closed aluminium case	
FRONT PANEL:	3U / 21HP (128mm high x 107mm wide), Aluminium	
REAR EDGE CONNECTOR:	according to DIN 41612, type C 64, rows a+c (male)	
RF CONNECTOR:	coaxial BNC	
AMBIENT TEMPERATURE:	0 ... 50°C	
HUMIDITY:	85% max.	

6.1 Oscillator specifications

Oscillators available for Meinberg GPS Receivers/Time Servers:
OCXO, TCXO, Rubidium

	TCXO	OCXO LQ	OCXO MQ	OCXO HQ	OCXO DHQ	Rubidium (only available for 3U models)
short term stability (= 1 sec)	$2 \cdot 10^{-9}$	$1 \cdot 10^{-9}$	$2 \cdot 10^{-10}$	$5 \cdot 10^{-12}$	$2 \cdot 10^{-12}$	$2 \cdot 10^{-11}$
accuracy of PPS (pulse per sec)	< ±250 ns	< ±250 ns	< ±100 ns	< ±100 ns	< ±100 ns	< ±100 ns
phase noise	1Hz -60dBc/Hz 10Hz -90dBc/Hz 100Hz -120dBc/Hz 1kHz -130dBc/Hz	1Hz -60dBc/Hz 10Hz -90dBc/Hz 100Hz -120dBc/Hz 1kHz -130dBc/Hz	1Hz -75dBc/Hz 10Hz -110dBc/Hz 100Hz -130dBc/Hz 1kHz -140dBc/Hz	1Hz < -85dBc/Hz 10Hz < -115dBc/Hz 100Hz < -130dBc/Hz 1kHz < -140dBc/Hz	1Hz < -80dBc/Hz 10Hz < -110dBc/Hz 100Hz < -125dBc/Hz 1kHz < -135dBc/Hz	1Hz -75dBc/Hz 10Hz -89dBc/Hz 100Hz -128dBc/Hz 1kHz -140dBc/Hz
accuracy free run, one day	$\pm 1 \cdot 10^{-7}$ ±1Hz (Note1)	$\pm 2 \cdot 10^{-8}$ ±0.2Hz (Note1)	$\pm 1.5 \cdot 10^{-9}$ ±15mHz (Note1)	$\pm 5 \cdot 10^{-10}$ ±5mHz (Note1)	$\pm 1 \cdot 10^{-10}$ ±1mHz (Note1)	$\pm 2 \cdot 10^{-11}$ ±0.2mHz (Note1)
accuracy, free run, 1 year	$\pm 1 \cdot 10^{-6}$ ±10Hz (Note1)	$\pm 4 \cdot 10^{-7}$ ±4Hz (Note1)	$\pm 1 \cdot 10^{-7}$ ±1Hz (Note1)	$\pm 5 \cdot 10^{-8}$ ±0.5Hz (Note1)	$\pm 1 \cdot 10^{-8}$ ±0.1Hz (Note1)	$\pm 5 \cdot 10^{-10}$ ±5mHz (Note1)
accuracy GPS-synchronous, average 24h	$\pm 1 \cdot 10^{-11}$	$\pm 1 \cdot 10^{-11}$	$\pm 5 \cdot 10^{-12}$	$\pm 1 \cdot 10^{-12}$	$\pm 1 \cdot 10^{-12}$	$\pm 1 \cdot 10^{-12}$
accuracy of time free run, 1 day	± 4.3 ms	± 865 µs	± 65 µs	± 22 µs	± 4.5 µs	± 1.1 µs
accuracy of time free run, 1 year	± 16 s	± 6.3 s	± 1.6 s	± 788 ms	± 158 ms	± 8 ms
temperature dependant drift free run	$\pm 1 \cdot 10^{-6}$ (-20...70°C)	$\pm 2 \cdot 10^{-7}$ (0...60°C)	$\pm 5 \cdot 10^{-8}$ (-20...70°C)	$\pm 1 \cdot 10^{-8}$ (5...70°C)	$\pm 2 \cdot 10^{-10}$ (5...70°C)	$\pm 6 \cdot 10^{-10}$ (-25...70°C)

Note 1: The accuracy in Hertz is based on the standard frequency of 10 MHz.

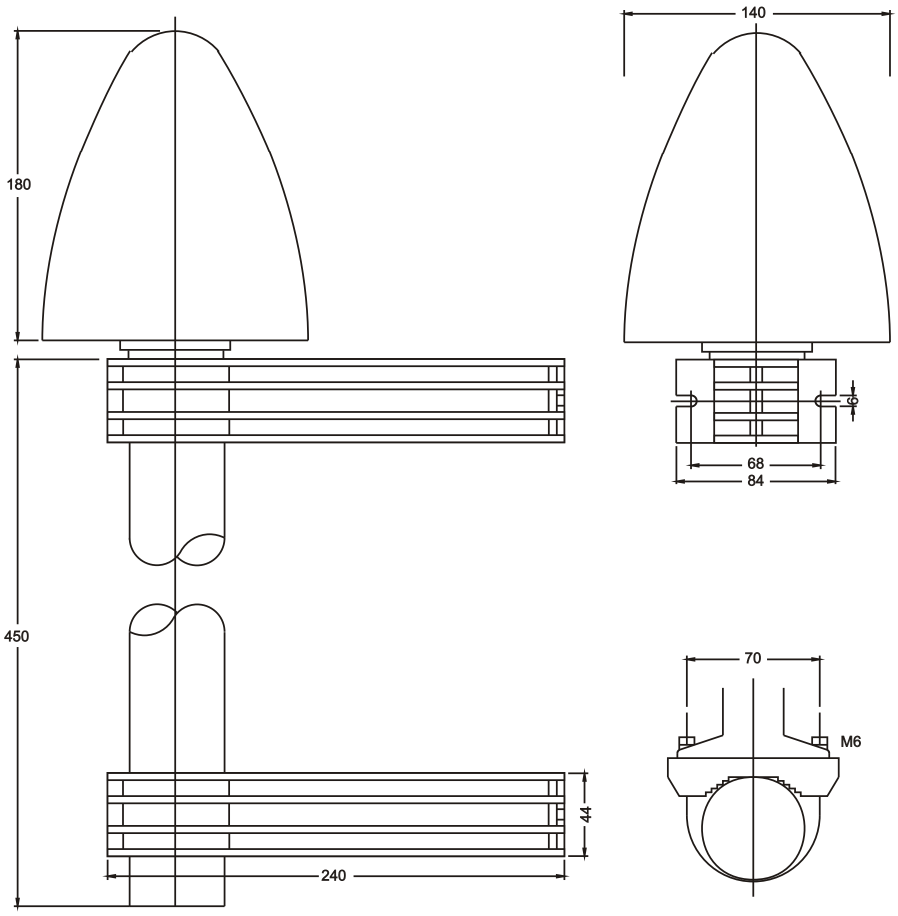
For example: Accuracy of TCXO (free run one day) is $\pm 1 \cdot 10^{-7} \cdot 10$MHz = ± 1 HZ

The given values for the accuracy of frequency and time (not short term accuracy) are only valid for a constant ambient temperature! A minimum time of 24 hours of GPS-syncronicity is required before free run starts.

6.2 Technical Specifications GPS Antenna

ANTENNA:	dielectrical patch antenna,	25 x 25 mm
	receive frequency:	1575.42 MHz
BANDWITH:	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:	N-Type, female	
AMBIENT TEMPERATURE:	-40 ... +65°C	
HOUSING:	ABS plastic case for	
	outdoor installation (IP66)	

Physical Dimension:



6.3 Time Strings

The Time Strings are depent on the Software

6.3.1 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 sending with one bit accuracy at change of second		
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 (depending on clock type):

u:	'#'	GPS: clock is running free (without exact synchr.) PZF: time frame not synchronized DCF77: clock has not synchronized after reset
	' '	(space, 20h) GPS: clock is synchronous (base accuracy is reached) PZF: time frame is synchronized DCF77: clock has synchronized after reset
v:	'*'	GPS: receiver has not checked its position PZF/DCF77: clock currently runs on XTAL
	' '	(space, 20h) GPS: receiver has determined its position PZF/DCF77: clock is syncronized 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

6.3.2 Format of the Meinberg GPS Time String

The Meinberg Standard Time String is a sequence of 36 ASCII characters starting with the STX (start-of-text) character and ending with the ETX (end-of-text) character. Contrary to the Meinberg Standard Telegram the Meinberg GPS Timestring carries no local timezone or UTC but the direct GPS time without conversion into UTC. The format is:

<STX>D:*tt.mm.jj;T:w;U:hh.mm.ss;uvGy;lll*<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)

tt.mm.jj the current date:
- *tt* day of month (01..31)
- *mm* month (01..12)
- *jj* 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 is running free (without exact synchr.)
- ' ' (space, 20h) clock is synchronous (base accuracy is reached)
- *v*: '*' receiver has not checked its position
- ' ' (space, 20h) receiver has determined its position

G time zone indicator 'GPS-Time'

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

lll number of leap seconds between UTC and GPS-Time (UTC = GPS-Time + number of leap seconds)

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

6.3.3 Format of the Meinberg Capture String

The Meinberg Capture String is a sequence of 31 ASCII characters terminated by a CR/LF (Carriage Return/Line Feed) combination. The format is:

CH*x*_ *tt.mm.jj*_ *hh:mm:ss.fffffff* <CR><LF>

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:

x	0 or 1 corresponding on the number of the capture input
_	ASCII space 20h

dd.mm.yy the capture date:

dd	day of month	(01..31)
mm	month	(01..12)
yy	year of the century	(00..99)

hh:mm:ss.fffffff the capture time:

hh	hours	(00..23)
mm	minutes	(00..59)
ss	seconds	(00..59, or 60 while leap second)
fffffff	fractions of second, 7 digits	

<CR> Carriage Return, ASCII Code 0Dh

<LF> Line Feed, ASCII Code 0Ah

6.3.4 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>*dd.mm.yy/w/hh:mm:ssxxxxuv*<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
sending with one bit accuracy at change of second

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)

xxxx time zone indicator:

'UTC'	Universal Time Coordinated, formerly GMT
'MEZ'	European Standard Time, daylight saving disabled
'MESZ'	European Summertime, daylight saving enabled

u clock status characters:

'#'	clock has not synchronized after reset
' '	(space, 20h) clock has synchronized after reset

v 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

6.3.5 Format of the Uni Erlangen String (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.llllе hhhhm*<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 sending with one bit occuracy at change of second		
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 d. 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 WGS84 ellipsoid in meters
leading signs are replaced by a space character (20h)

<ETX> End-Of-Text, ASCII Code 03h

6.3.6 Format of the NMEA 0183 String (RMC)

The NMEA String is a sequence of 65 ASCII characters starting with the '$GPRMC' 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 where as the other characters are part of the time string. The groups of characters as defined below:

$	Start character, ASCII Code 24h sending with one bit accuracy at change of second		
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		

6.3.7 Format of the NMEA 0183 String (GGA)

The NMEA (GGA) String is a sequence of characters starting with the '$GPRMC' character and ending with the characters CR (carriage return) and LF (line-feed). The format is:

$GPGGA,*hhmmss.ss,bbbb.bbbbb,n,lllll.ll,e,A,vv,hhh.h,aaa.a,M,ggg.g,M,,0*cs*<CR><LF>

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

$	Start character, ASCII Code 24h sending with one bit accuracy at change of second		
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.bbbbb	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.lllll	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	
A	Position fix (1 = yes, 0 = no)		
vv	Satellites used (0..12)		
hhh.h	HDOP (Horizontal Dilution of Precision)		
aaa.h	Mean Sea Level altitude (MSL = altitude of WGS84 - Geoid Separation)		
M	Units, meters (fixed value)		
ggg.g	Geoid Separation (altitude of WGS84 - MSL)		
M	Units, meters (fixed value)		
cs	checksum (EXOR over all characters except '$' and '*')		
<CR>	Carriage Return, ASCII Code 0Dh		
<LF>	Line Feed, ASCII Code 0Ah		

6.3.8 Format of the NMEA 0183 String (ZDA)

The NMEA String is a sequence of 38 ASCII characters starting with the **'$GPZDA'** character and ending with the characters **CR** (carriage return) and LF (line-feed). The format is:

$GPZDA,*hhmmss.ss,dd,mm,yyyy,HH,II*cs*<CR><LF>
ZDA - Time and Date: UTC, day, month, year and local timezone.

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

$	Start character, ASCII Code 24h sending with one bit accuracy at change of second		
hhmmss.ss	the current UTC time:		
	hh	hours	(00..23)
	mm	minutes	(00..59)
	ss	seconds	(00..59 or 60 while leap second)
HH,II	the local timezone (offset to UTC):		
	HH	hours	(00..+-13)
	II	minutes	(00..59)
dd,mm,yy	the current date:		
	dd	day of month	(01..31)
	mm	month	(01..12)
	yyyy	year	(0000..9999)
cs	checksum (EXOR over all characters except '$' and '*')		
<CR>	Carriage Return, ASCII Code 0Dh		
<LF>	Line Feed, ASCII Code 0Ah		

6.3.9 Format of the ABB SPA Time String

The ABB SPA Time String is a sequence of 32 ASCII characters starting with the characters "**>900WD**" and ending with the <**CR**> (Carriage Return) character. The format is:

>900WD:*yy-mm-tt_ hh.mm;ss.fff:cc*<CR>

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:

yy-mm-tt	the current date:		
	yy	year of the century	(00..99)
	mm	month	(01..12)
	dd	day of month	(01..31)
	_	Space (ASCII code 20h)	
hh.mm;ss.fff	the current time:		
	hh	hours	(00..23)
	mm	minutes	(00..59)
	ss	seconds	(00..59, or 60 while leap second)
	fff	milliseconds	(000..999)
cc	Check sum. EXCLUSIVE-OR result of the previous characters, displayed as a HEX byte (2 ASCII characters 0..9 or A..F)		
<CR>	Carriage Return, ASCII Code 0Dh		

6.3.10 Format of the Computime Time String

The Computime time string is a sequence of 24 ASCII characters starting with the T character and ending with the LF (line feed, ASCII Code 0Ah) character. The format is:

T:*yy:mm:dd:ww:hh:mm:ss*<CR><LF>

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:

T	Start character sending with one bit accuracy at change of second		
yy:mm:dd	the current date:		
	yy	year of the century	(00..99)
	mm	month	(01..12)
	dd	day of month	(01..31)
	ww	the day of the week	(01..07, 01 = monday)
hh:mm:ss	the current time:		
	hh	hours	(00..23)
	mm	minutes	(00..59)
	ss	seconds	(00..59, or 60 while leap second)
<CR>	Carriage Return, ASCII Code 0Dh		
<LF>	Line Feed, ASCII Code 0Ah		

6.3.11 Format of the RACAL standard Time String

The RACAL standard Time String is a sequence of 16 ASCII characters terminated by a X (58h) character and ending with the CR (Carriage Return, ASCII Code 0Dh) character. The format is:

<X><G><U>*yymmddhhmmss*<CR>

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:

<X>	Control character sending with one bit accuracy at change of second		code 58h
<G>	Control character		code 47h
<U>	Control character		code 55h
yymmdd	the current date:		
	yy	year of the century	(00..99)
	mm	month	(01..12)
	dd	day of month	(01..31)
hh:mm:ss	the current time:		
	hh	hours	(00..23)
	mm	minutes	(00..59)
	ss	seconds	(00..59, or 60 while leap second)
<CR>	Carriage Return, ASCII code 0Dh		
Interface parameters:	7 Databits, 1 Stopbit, odd. Parity, 9600 Bd		

6.3.12 Format of the SYSPLEX-1 Time String

The SYSPLEX1 time string is a sequence of 16 ASCII characters starting with the SOH (Start of Header) ASCII controll character and ending with the LF (line feed, ASCII Code 0Ah) character. The format is:

<SOH>ddd:hh:mm:ssq <CR><LF>

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:

<SOH>	Start of Header (ASCII control character) sending with one bit accuracy at change of second		
ddd	day of year		(001..366)
hh:mm:ss	the current time:		
	hh	hours	(00..23)
	mm	minutes	(00..59)
	ss	seconds	(00..59, or 60 while leap second)
	q	Quality indicator	(space) Time Sync (GPS lock) (?) no Time Sync (GPS fail)
<CR>	Carriage-return (ASCII code 0Dh)		
<LF>	Line-Feed (ASCII code 0Ah)		

6.3.13 Format of the ION Time String

The ION time string is a sequence of 16 ASCII characters starting with the SOH (Start of Header) ASCII controll character and ending with the LF (line feed, ASCII Code 0Ah) character. The format is:

<SOH>ddd:hh:mm:ssq <CR><LF>

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:

<SOH>	Start of Header (ASCII control character) sending with one bit accuracy at change of second		
ddd	day of year		(001..366)
hh:mm:ss	the current time:		
	hh	hours	(00..23)
	mm	minutes	(00..59)
	ss	seconds	(00..59, or 60 while leap second)
	q	Quality indicator	(space) Time Sync (GPS lock) (?) no Time Sync (GPS fail)
<CR>	Carriage-return (ASCII code 0Dh)		
<LF>	Line-Feed (ASCII code 0Ah)		

6.4 Signal Description GPS170

Name	Pin	Function
GND	32a+c	Ground
VCC in (+5V)	1a+c	+5V supply
VCC in (+12V)	2a+c	+12V supply (only for older oscillators)
VDD in (+5V)	3a+c	+5 V supply (TCXO / OCXO)
P_SEC out	6c	Pulse when second changes, TTL level, active high, length 200 msec
P_MIN out	8c	Pulse when minute changes, TTL level, active high, length 200 msec
/RESET_out	9c	RESET signal, Push/Pull up to +5V
Prog. Pulse out	10c-12c	programmable pulse, TTLlevel
100 kHz out	10a	100 kHz frequency output, TTL level
1 MHz out	11a	1 MHz frequency output, TTL level
10 MHz out	12a	10 MHz frequency output, TTL level
TIME CODE DC	13a	Time code unmod. out
TIME CODE AM	14a	Time code mod. out 3Vpp
DCF_MARK out	17c	DCF77 compatible second marks, TTL level, active high, length 100/200 msec
TIME_SYN	19c	TTL output, HIGH level if synchronization has been achieved, LOW level after reset or in case of serious errors (e.g. antenna faulty)
F_SYNTH	21c	Synthesizer output, TTL-Pegel
F_SYNTH_OD	22c	Synthesizer output, Open Drain, max sink current to GND: 150mA
F_SYNTH_SIN	23c	Synthesizer output, sine-wave 1.5 V eff.
CAPx	27c, 28c	Time capture inputs (TTL), capture on falling slope
COMx TxD out		COMx RS-232 transmit data output
COMx RxD in		COMx RS-232 receive data input
SDA, SCL, SCL_EN (reserved)		internal serial control bus, for extension boards, reserved, do not connect

7 The program GPSMON32

The program GPSMON32 can be used to monitor and programm all essential functions of Meinberg GPS-Receivers. The Software is executable under Windows 7, Windows Vista, Win9X, Win2000, WinXP and WinNT. To install GPSMON32 just run **setup.exe** from the included USB flash drive and follow the instructions of the setup program.

Program and clock can communicate either via serial link or via TCP/IP connection if the clock is prepared for (LANXPT or SCU-XPT board). The mode to be used can be selected in menu *"Connection -> Settings"* by the checkboxes serial and network.

7.1 Serial Connection

To obtain a connection between you 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 apperaring window. Some firmware versions of the GPS receiver 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.

7.2 Network Connection

(only clocks with Ethernet access!)

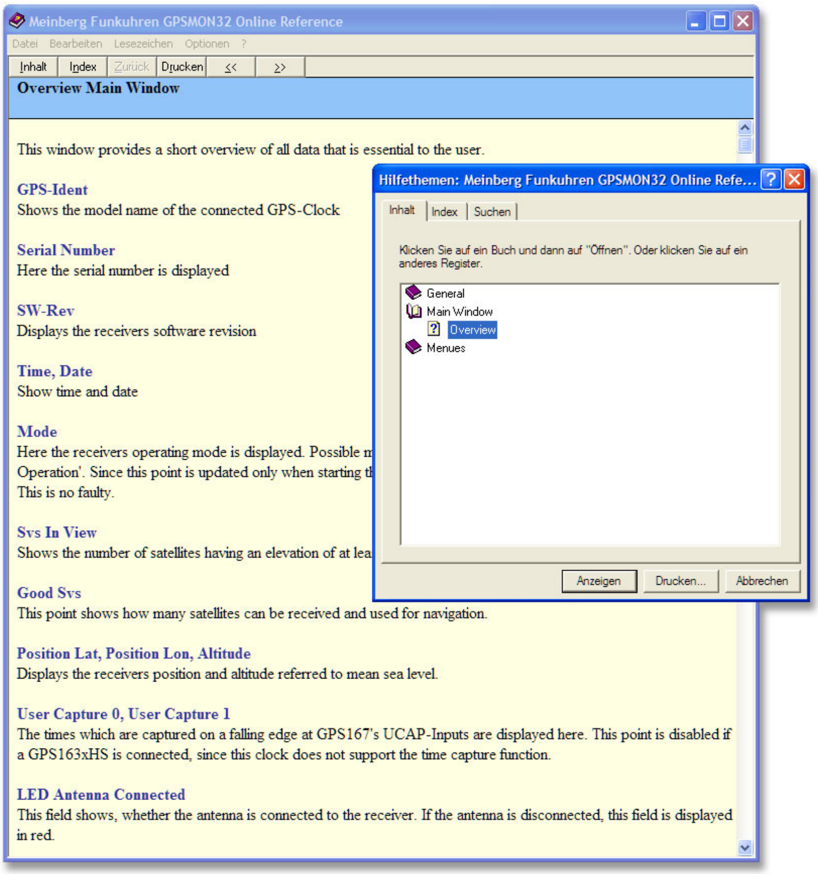
Settings needed for a network connection can be done in menu "Connection->Settings".
To set up a network connection from clock program GPSMON32, the mode "network" must be selected in the field "mode". Further the TCP/IP-Address must be entered in field "IP-Address". If the IP-Address is unknown, the user can let the program search for available clocks in the local network by clicking the "Find" button. A new connection can be set up by clicking to one of the displayed addresses.

Access to radioclocks by network is always protected by a Password.

The online help function of GPSMON32 provides detailed information on setting up a TCP/IP connection.

7.3 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 German/English in the Help Menu


Meinberg Funkuhren GPSMON32 Online Reference
Datei Bearbeiten Lesezeichen Optionen ?
Inhalt Index Zurück Drucken << >>
Overview Main Window
This window provides a short overview of all data that is essential to the user.
GPS-Ident
Shows the model name of the connected GPS-Clock
Serial Number
Here the serial number is displayed
SW-Rev
Displays the receivers software revision
Time, Date
Show time and date
Mode
Svs In View
Good Svs
This point shows how many satellites can be received and used for navigation.
Position Lat, Position Lon, Altitude
Displays the receivers position and altitude referred to mean sea level.
User Capture 0, User Capture 1
The times which are captured on a falling edge at GPS167's UCAP-Inputs are displayed here. This point is disabled if a GPS163xHS is connected, since this clock does not support the time capture function.
LED Antenna Connected
This field shows, whether the antenna is connected to the receiver. If the antenna is disconnected, this field is displayed in red.
Hilfethemen: Meinberg Funkuhren GPSMON32 Online Refe...
Inhalt Index Suchen
Klicken Sie auf ein Buch und dann auf "Öffnen". Oder klicken Sie auf ein anderes Register.
General
Main Window
Overview
Menues
Anzeigen Drucken... Abbrechen