

GPS Receiver

# GPS CR, GPS EXT





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## A1 Safety Instructions

- General rules:** Only use the device as directed in a dry atmosphere. Treat the unit with the same care as other studio devices. Please follow the advice in the following operator's manual.
- Damages in transit:** If the device shows obvious damages from transit the shipper in question must be notified and the dealer must be informed.
- Positioning:** Position device only where sufficient air circulation can be maintained. Extreme temperatures, dust, humidity, shocks and strong electromagnetic fields must be avoided.
- Maintenance:** Use a moist soft textured fabric cloth when cleaning the housing. Do not use polish or any other cleaning agents.
- Repairs:** The unit does not require any extra maintenance. There are no user serviceable parts inside the device. Repairs should be sent to an authorized service partner.
- EMC:** The EMC regulations are observed only under the following condition: use high quality shielded cables at data inputs and outputs.

## A2 Copyright

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## **A3 CE-DECLARATION**

We,

### **Alpermann+Velte**

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declare under our sole responsibility that the units

### **GPS CR**

### **GPS EXT**

meet the intent of the following directives, standards and specifications:

89/336/EEC Electromagnetic Compatibility

EN 50081-1 Emissions

- EN 55022
- EN 55103-1

EN 50082-1 Immunity

- EN 55024
- EN 55103-2

## System Description

The GPS receiver is built-in in a separate housing. An active antenna is connected via a 50 Ω cable at a SMA female connector. Its built-in pre-amplifier is supplied via the same cable. No passive antenna must be connected, as this normally causes a DC short circuit. The time received is output via DSUB female connector every second as a serial telegram.

When the unit is powered off, the real time continues counting battery-powered with the accuracy of the x'tal (see technical data). So when the unit is powered on, a valid time information will be available immediately. With the first synchronous reception of the GPS receiver (under normal conditions of reception this will take 10 minutes approx.) a switch-over to GPS time is made. This time is transferred to the output connector with an accuracy of ± 2μs (jitter) approx. for the seconds pulse (± 20μs for the serial telegram). If then a GPS reception failure occurs, the time will continue counting with an accuracy of 1μs per second (10<sup>-6</sup>). The only pre-condition is that the temperature-compensated x'tal has meanwhile reached its operating temperature.

The switch-over for Daylight Saving Time will be made automatically. The only time supplied by GPS is the world time UTC (Universal Time Co-ordinated), i.e. the receiver does not supply any information about the moments of time for the switch-over. Therefore, this time is defined according to the current valid legal provision regarding the Central European Time (CET/CEST), i.e. the last Sunday of March resp. October at 1:00 UTC. If such switch-over is not required, the receiver may be switched via internal dip-switch to UTC.

## Display

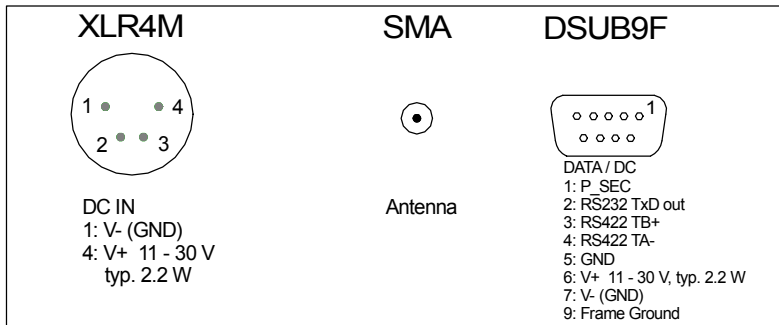
Three LED's indicate the operational status of the receiver:

LED	Color	Function
POWER	green	GPS CR only: Lights up if power is switched on.
MOD	green	Flashing with every transmission of a data telegram.
ERROR	red	Lights up if the receiver is operating in the free-running mode. Will go out if a sufficient number of satellites has been detected to ensure synchronisation.

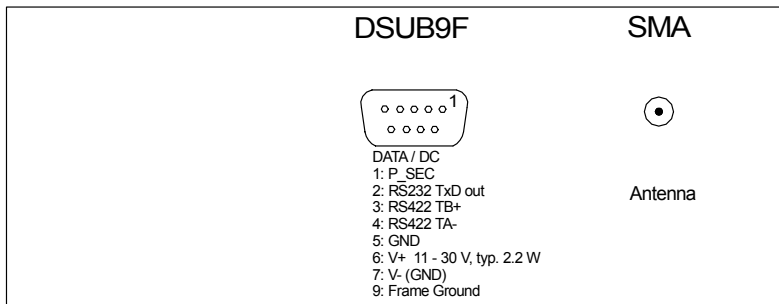
In addition the FREE-LED indicates with a blinking in five-second intervals the exact status of synchronization.

LED FREE	Reception Status	Satellites in reception
Blinks continuously	no synchronization since switch-on	none
Blinks with brief interruptions in five-second intervals	no synchronization since switch-on	number of interruptions corresponds to number of satellites in reception
Switched-off, but blinks briefly in five-second intervals	real-time information was received but reception is not possible at the moment	four times blinking means: no satellites in reception. Every less blink means: one more satellite in reception
Switched-off	synchronous	at least four

## Technical Data



Connections at GPS CR (see chapter "Options" for special connections at the rear).



Connections at GPS EXT.

Antenna input	1575,42 MHz (L1 band), -130 dbW to -163 dbW
Power supply	11-30 VDC, 3 W max. via XLR 4-pins (GPS CR only) or DSUB 9-pins
Data interface connector	DSUB9 female
Antenna connector	SMA female, 50 Ω
Antenna type	active
Power supply pre-amplifier	5 VDC, 100 mA max., short circuit proof
Time from power-on to first synchronous reception	10 minutes approx.
Battery	3 V lithium, working life: 10 years
Date validity	until 31.12.2017
Accuracy (of P_SEC leading edge):	
in free-running mode	at delivery adjusted to <2 ppm/25° C at 15-35° C: <4 ppm at 10-40° C: <8 ppm at 5-45° C: <20 ppm aging (first year): < 3 ppm
jitter at synchronous reception	± 2 μs (2 ppm)
in free-running mode after first synchronous reception	± 1 μs (1 ppm)
Housing GPS CR (¼ 19"/1RU)	aluminium Dimensions: 103 (W) x 42 (H) x 188 (D) mm Weight: 0.5 kg approx.
Housing GPS EXT (wall mount)	die-casting Dimensions: 115 (W) x 90 (H) x 55 (D) mm Weight: 0.5 kg approx.

## Data Interface

A time telegram will be transmitted every second via the serial interface. RS232 and RS422 signals are available, see description of the rear for connection. The receiver is supplied with power via the same connector or via the separate XLR connector to use an AC-DC adapter.

The data string consists of 32 characters in ASCII format:

<STX>D:01.01.98;T:4;U:14.15.41;#\*S!<ETX>

STX	start of text	\$02
D:	followed by the date	day.month.year
T:	followed by the day of week	1-7, 1 = Monday
U:	followed by the time	hours.minutes.seconds A leap second is transferred as second = 60
#	synchronisation after power-on	# = invalid time, no time has been set since power-on. ' ' = internal clock has been set once.
*	current synchronisation	* = internal clock in free-running mode. ' ' = synchronous.
S	time zone	S = Central European Summer Time ' ' = Central European Time U = UTC
!	announcement	! = announcement of the beginning/end of a Daylight Saving Time. A = announcement of a leap second. ' ' = no announcement.
ETX	end of text	\$03

## Configuration

The GPS receiver may be configured via an 8-fold internal dip-switch. With standard delivery all switches are set to „off“.

Switch								Setting
1	2	3	4	5	6	7	8	
off	off							2400 Baud
off	on							4800 Baud
on	off							9600 Baud
on	on							19200 Baud
		off	off					Data format 7E2
		off	on					Data format 7E1
		on	off					Data format 7N2
		on	on					Data format 8N1
				off				Receiver supplies CET / CEST
				on				Receiver supplies UTC
					off			GPS configuration from ROM
					on			GPS configuration from RAM
						off		P_SEC = positive pulses $\approx$ 135 ms
						on		P_SEC = seconds impulse telegram, positive pulses 100 ms / 200 ms
							off	off = standard. on = reserved for options or special features.

## Antenna: mounting, connecting and technical data

The GPS receiver is connected to the antenna with a 50  $\Omega$  coax cable. The receiver has a SMA male connector, the connection at the antenna depends on the type of the antenna. Only an active antenna should be connected, its built-in pre-amplifier is supplied via the same cable.

We recommend that the cable should be as short as possible. The shorter the cable, the less the attenuation and the more likely the chance to receive signals from a sufficient number of satellites even under unfavourable reception conditions. Cables that are too long should be shortened if possible. The cable should not be coiled up (to a ring e.g.), since this will act like a stop filter for the GPS antenna signals. Instead, lay the cable like a string, i.e. as straight as possible.

The antenna is designed for outdoor mounting. Install antenna in horizontal direction, the antenna should "see" a maximum of the sky.

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## Antenna of type: M/A-COM ANP-C-114-4

Attention: discontinued product (01/2002).

Connect the cable to the antenna with a TNC connector (female at antenna). The TNC connector has a rubber protection against atmospheric exposure. The antenna cable is part of the standard accessory: cable RG 58, length = 10 m.

Example of cable types available:

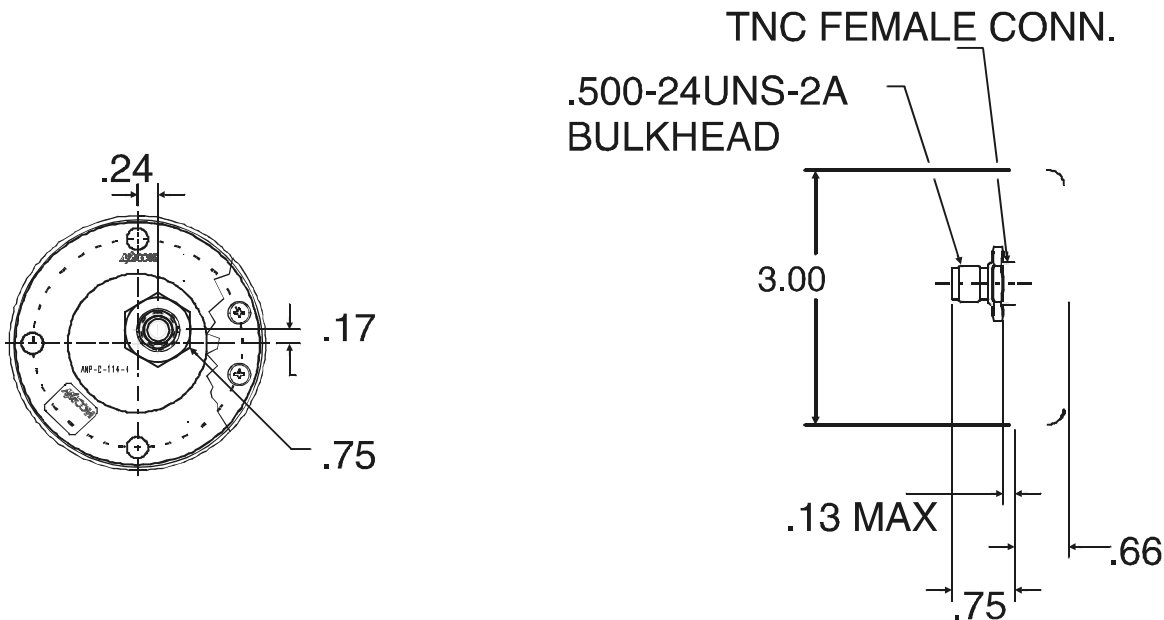
Cable	Length
RG 58	7.5 m (typ.) to 10 m (max.)
RG 400	10 m (typ.) to 15 m (max.)

## Specifications

Frequency	1575 MHz $\pm$ 2 MHz
Gain, Zenith	3.5 dBic
Gain, +10°	-3.0 dBic
Amplifier gain	26 dB
Amplifier noise figure	2.5 dB (typ.)
Power supply	5 VDC, 25 mA typ
Housing colour	white
Operating temperature	-40° C to +85° C
Weight	150 g (max.)

## Mechanical Data

Mount the antenna using the screwed joint underneath.



All figures in inches

## Antenna of type: planTec navigation 60 magnet

This antenna's cable is permanently connected and sealed to the side of the antenna. Type of cable = RG 174 with length  $\approx$  10 m.

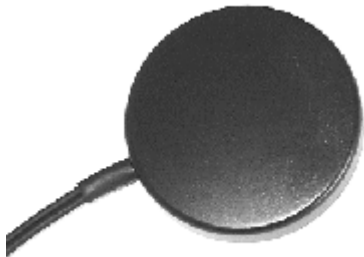
### Technical data

Frequency range	1575,42 MHz
VSWR	< 1,5 typ
Gain with integrated amplifier	25 dB typ
Power supply	5 VDC 2,5 mA typ, 30 mA max
Color of housing	Anthracite
Operating temperature	-40° C - +85° C
Weight	$\approx$ 50 g

### Mechanical

Magnetic mounting at metallic surfaces.

Ø	72 mm
Height	15 mm



## Antenna of type: planTec navigation roof

This antenna's cable is permanently connected and sealed to the bottom of the antenna. Type of cable = RG 174 with length  $\approx$  16 m.

### Technical data

Frequency range	1575,42 MHz
VSWR	< 1,5 typ
Gain with integrated amplifier	25 dB typ
Power supply	5 VDC 25 mA typ, 30 mA max
Color of housing	black
Operating temperature	-40° C - +85° C
Weight	$\approx$ 50 g

### Mechanical

The antenna is mounted by using its centred M16 screw thread.

The antenna has two different moisture seals:

- A seal around the circumference of the antenna.
  - Around the screw thread via use of the smaller O-Ring.

Ø	95 mm
Antenna height without screw thread	16 mm
Length of the screw thread	15 mm



## Options

Software and/or hardware of this unit may be adapted to meet special customer's application. The following chapters describe some of the options available with the standard unit.

### Master Output to control Analogue Clocks

With this option a distribution amplifier supplies the analogue clocks of the *Alpermann+Velte* system with power as well as with time data. The time data forms a telegram similar to the German radio time telegram DCF77. The data bits are transmitted every second except at seconds = 59. The time data are synchronous to the P\_SEC signal of the GPS receiver.

There are up to two output drivers possible, the outputs are connected at a DSUB 9-pins female. Pin assignment:

Master Output
DSUB9F
1: V+ Out
2: V- Out
7: Signal Out
8: Signal GND

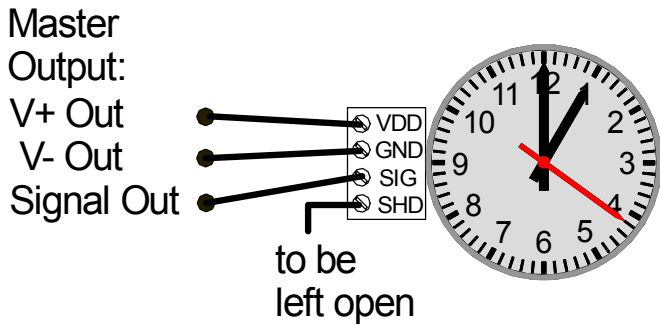
The pins not specified should not be used.

Analogue clocks of the *Alpermann+Velte* system can be equipped with a 4-wire interface (before year 2007) or with a 2-wire interface (starting with year 2007). Please notice the description below.

With this option the technical data of the unit change. Use only the AC/DC adapter delivered with the unit!

Item	Specification
Input voltage	11-18 VDC (instead 11 – 30 VDC)
Power (GPS + 1 x MASTER OUTPUT)	max. 8.4 W (instead max. 3 W)
Power (GPS + 2 x MASTER OUTPUT)	max. 13.8 W (instead max. 3 W)

## Connecting Analogue Clocks with a 4-Wire Interface



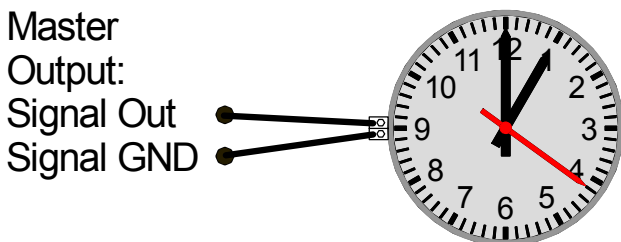
Every slave clock requires  $\leq 11$  mA at  $\geq 6$  V. To calculate the maximum cable length the output voltage, cross section, specific resistance and number of clocks have to be involved. For radial arrangement of copper cables with a cross section of  $0.22 \text{ mm}^2$  and an output voltage of 12 V, the following cable lengths are possible for each output stage:

No. of clocks	1	2	5	10	20	30
Lenght (m)	3500	1750	700	350	175	117

The maximum count of clocks is limited by a 300 mA fuse to 30 clocks each driver. A control LED at the front is directly connected to each signal output.

The 4-wire interface requires "Signal Out" with **positive-going** pulses – please notice chapter "Options with Special Software" for correct setting of the internal dip-switches!

## Connecting Analogue Clocks with a 2-Wire Interface

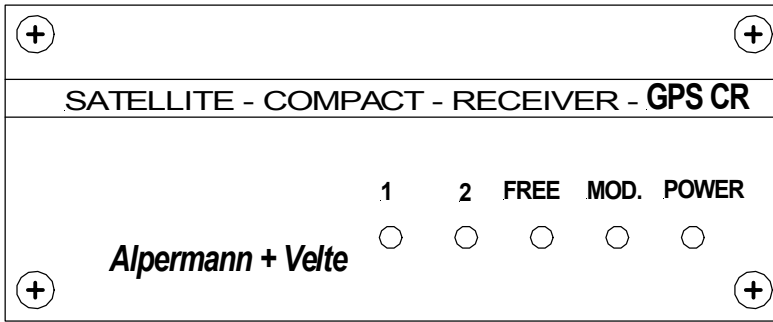


A maximum of 12 clocks can be connected to each output stage to guarantee a faultless operation over the whole specified temperature range. The following table shows standard values of maximum cable length calculated for a typical copper material:

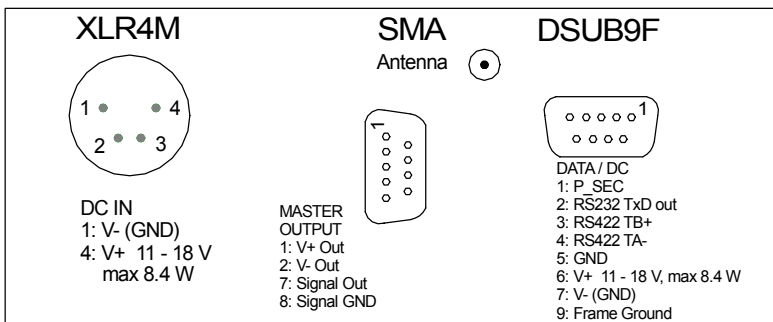
Cross section [ $\text{mm}^2$ ]	0,205	0,324	0,519
	e.g. AWG24 solid bar	e.g. AWG22 solid bar	e.g. AWG20 solid bar
Length [m], 12 clocks	550	870	1400
Length [m], 10 clocks	660	1045	1680
Length [m], 6 clocks	1100	1740	2800

The 2-wire interface requires "Signal Out" with **negative-going** pulses– please notice chapter "Options with Special Software" for correct setting of the internal dip-switches!

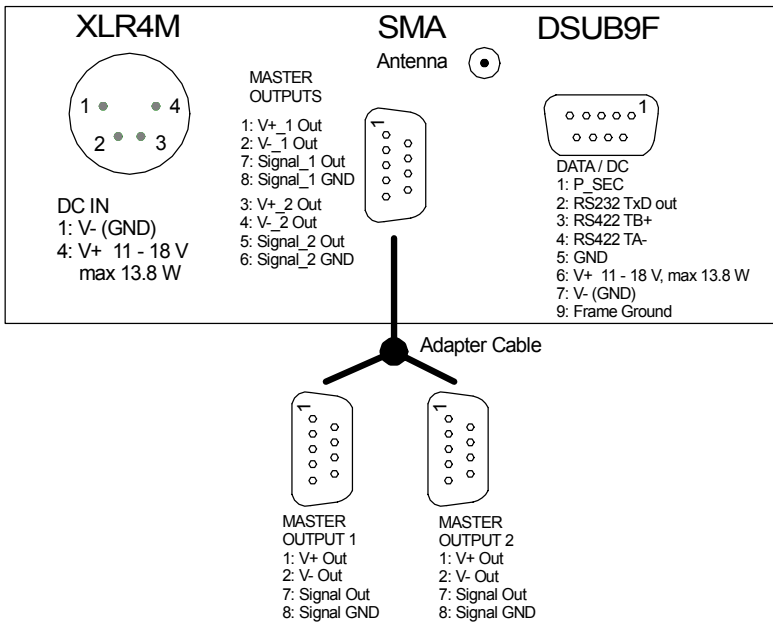
## LED's at the Front and Back Panel Connectors



### GPS CR + 1 x MASTER OUTPUT

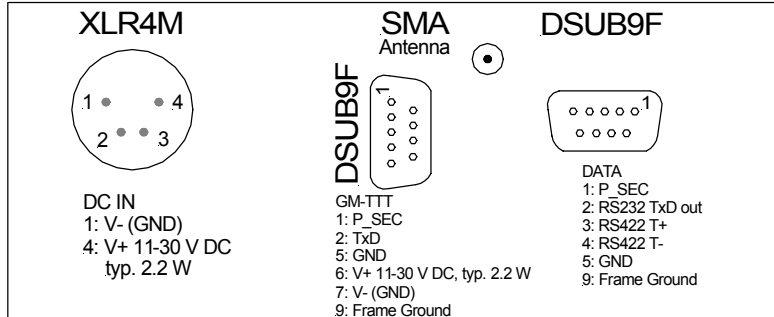


### GPS CR + 2 x MASTER OUTPUT

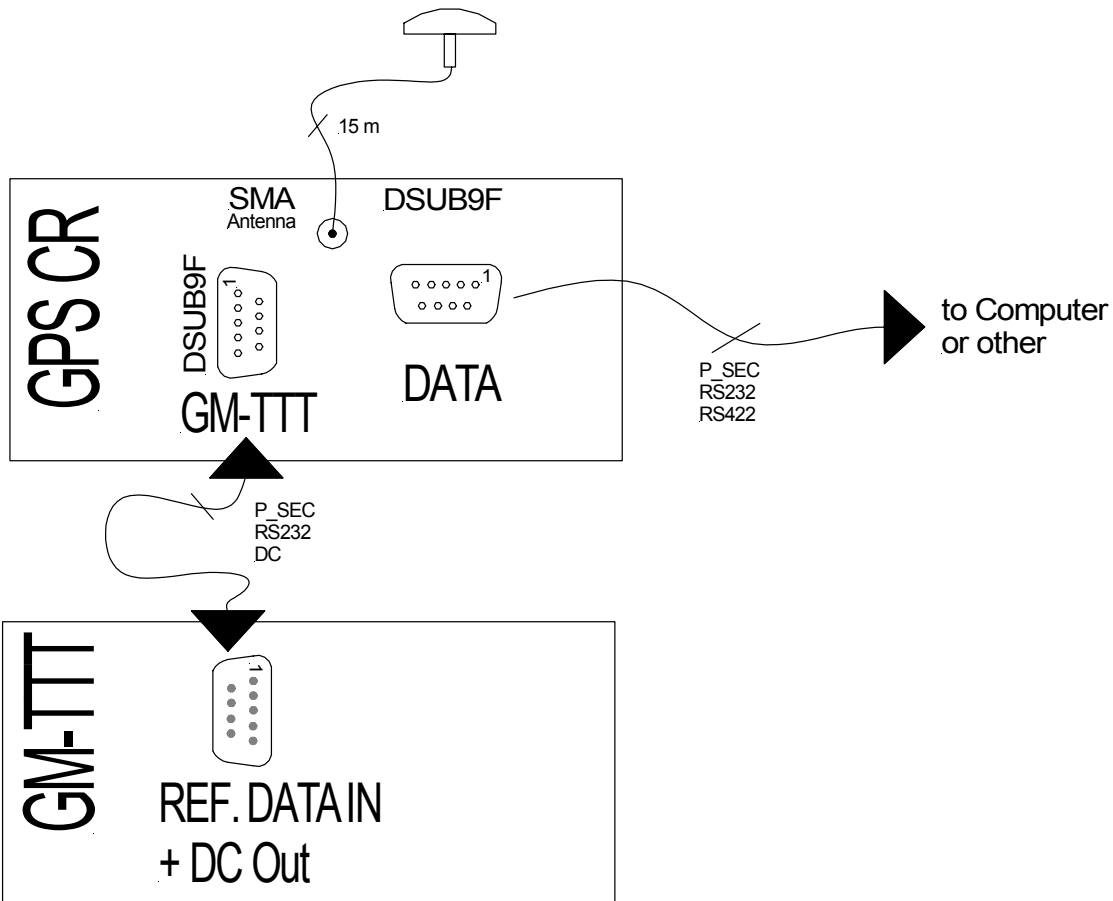


## Connections at the Rear for Special Applications

### Additional "GM-TTT" Connector



Example of "How to Connect":



## Options with Special Software

The internal dip-switch SW8 selects between the standard version or the software with special features:  
 SW8 = off = standard version,  
 SW8 = on = special features.

With SW8 = on, the setting of switches SW1 - SW7 now defines the special feature.

In most cases a special time zone output can be selected. Together with the "Master Option" the generated impulse telegram controls analogue clocks. In this case SW7 defines the polarity of the impulse telegram:

- SW7 = off: positive going pulses to control analogue clocks with a 4-wire interface.
- SW7 = on: negative going pulses to control analogue clocks with a 2-wire interface.

The following features are available:

Switches 1 - 7 (8 = on)	No.	Features
off off off off off off off off or off off off off off off off on	0x00 or 0x40	Time Zone = "Ankara" 1. The P_SEC signal conforms to the impulse telegram, with positive pulses if SW7=off and negative pulses if SW7=on. 2. The time zone will be UTC + 2 hours (normal time) or UTC + 3 hours at Daylight Saving Time (DST). Switching the DST is defined according to the current valid legal provision regarding the Central European Time (CET/CEST). This is the current local time of Ankara, Turkey.
on off off off off off off off or on off off off off off off on	0x01 or 0x41	Time Zone = "Moscow" 1. The P_SEC signal conforms to the impulse telegram, with positive pulses if SW7=off and negative pulses if SW7=on. 2. The time zone will be UTC + 3 hours (normal time) or UTC + 4 hours at Daylight Saving Time (DST). Switching the DST is defined according to the current valid legal provision regarding the Russian Federation. This is the current local time of Moscow, Russia.
off on off off off off off off or off on off off off off off on	0x02 or 0x42	Time Zone = "Tbilisi" 1. The P_SEC signal conforms to the impulse telegram, with positive pulses if SW7=off and negative pulses if SW7=on. 2. The time zone will be UTC + 4 hours (normal time) or UTC + 5 hours at Daylight Saving Time (DST). Switching the DST is defined according to the current valid legal provision regarding the Russian Federation. This is the current local time of Tbilisi, Georgia.
on on off off off off off off	0x03	"GM TTT", internal use only. 1. The time zone will be UTC. 2. If no reception is possible, the real time clock can be set via the serial interface.

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Switches 1 - 7 (8 = on)	No.	Features
off off on off off off off	0x04	<p>"GM TTT DCF", internal use only.</p> <ol style="list-style-type: none"> <li>1. The second's pulse P_SEC is modulated according to the standard version with SW7 = on.</li> <li>2. If no reception is possible, the real time clock can be set via the serial interface.</li> <li>3. The time zone will be UTC</li> </ol>
on off on off off off off or on off on off off off on	0x05 or 0x45	<p>Time Zone = "Ankara / UTC"</p> <ol style="list-style-type: none"> <li>1. The P_SEC signal conforms to the impulse telegram, with positive pulses if SW7=off and negative pulses if SW7=on.</li> <li>2. The time zone of the second's pulse P_SEC will be UTC + 2 hours (normal time) or UTC + 3 hours at Daylight Saving Time (DST). Switching the DST is defined according to the current valid legal provision regarding the Central European Time (CET/CEST). This is the current local time of Ankara, Turkey.</li> <li>3. The timezone of the serial interface is UTC.</li> </ol>
off on on off off off off or off on on off off off on	0x06 or 0x46	<p>Time Zone = "Moscow / UTC"</p> <ol style="list-style-type: none"> <li>1. The P_SEC signal conforms to the impulse telegram, with positive pulses if SW7=off and negative pulses if SW7=on.</li> <li>2. The time zone of the second's pulse P_SEC will be UTC + 3 hours (normal time) or UTC + 4 hours at Daylight Saving Time (DST). Switching the DST is defined according to the current valid legal provision regarding the Russian Federation. This is the current local time of Moscow, Russia.</li> <li>3. The timezone of the serial interface is UTC.</li> </ol>
on on on off off off off or on on on off off off on	0x07 or 0x47	<p>Time Zone = "Tbilisi / UTC"</p> <ol style="list-style-type: none"> <li>1. The P_SEC signal conforms to the impulse telegram, with positive pulses if SW7=off and negative pulses if SW7=on.</li> <li>2. The time zone of the second's pulse P_SEC will be UTC + 4 hours (normal time) or UTC + 5 hours at Daylight Saving Time (DST). Switching the DST is defined according to the current valid legal provision regarding the Russian Federation. This is the current local time of Tbilisi, Georgia.</li> <li>3. The timezone of the serial interface is UTC.</li> </ol>
off off off on off off off	0x08	<p>"DCF invers", internal use only.</p> <ol style="list-style-type: none"> <li>1. The second's pulse P_SEC will be inverted.</li> </ol>

Switches 1 - 7 (8 = on)	No.	Features
on off off on off off off or on off off on off off on	0x09 or 0x49	Time Zone = "Yekaterinburg" 1. The P_SEC signal conforms to the impulse telegram, with positive pulses if SW7=off and negative pulses if SW7=on. 2. The time zone will be UTC + 5 hours (normal time) or UTC + 6 hours at Daylight Saving Time (DST). Switching the DST is defined according to the current valid legal provision regarding the Russian Federation. This is the current local time of Yekaterinburg, Russia.
off on off on off off off or off on off on off off on	0x0A or 0x4A	Time Zone = "Yekaterinburg / UTC" 1. The P_SEC signal conforms to the impulse telegram, with positive pulses if SW7=off and negative pulses if SW7=on. 2. The time zone of the second's pulse P_SEC will be UTC + 5 hours (normal time) or UTC + 6 hours at Daylight Saving Time (DST). Switching the DST is defined according to the current valid legal provision regarding the Russian Federation. This is the current local time of Yekaterinburg, Russia. 3. The timezone of the serial interface is UTC.