MANUAL

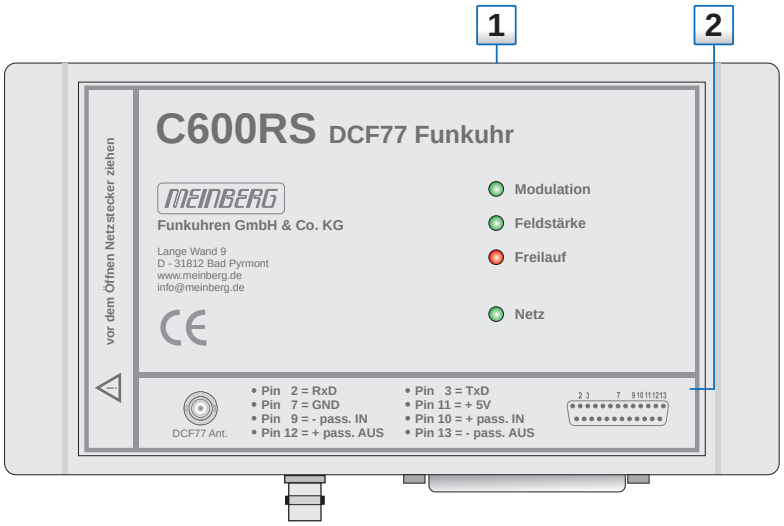
C600RS

RS232 interface
and internal power supply

24th October 2012

Meinberg Radio Clocks GmbH & Co. KG

Front view (Frontansicht) C600RS



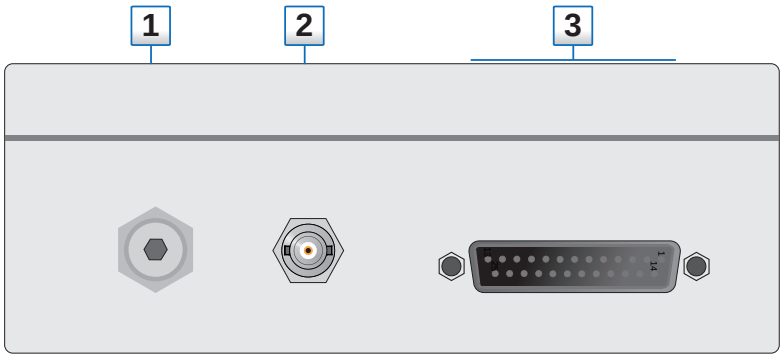
DEUTSCH

1. Status LEDs: Modulation, Feldstärke, Freilauf, Netz
2. Pinbelegung 25pol. D-SUB Buchse

ENGLISH

1. Status LEDs: Modulation, Feldstärke, Freilauf, Netz
2. Pinbelegung 25pin. D-SUB female

Side view (Seitenansicht) C600RS



DEUTSCH

1. Stromversorgung
2. PZF Antenne Eingang, BNC
3. Serielle Schnittstelle, 25pol. D-SUB Buchse

ENGLISH

1. Power
2. PZF Antenna input, BNC
3. Serial port, 25pin. D-SUB female

Table of Contents

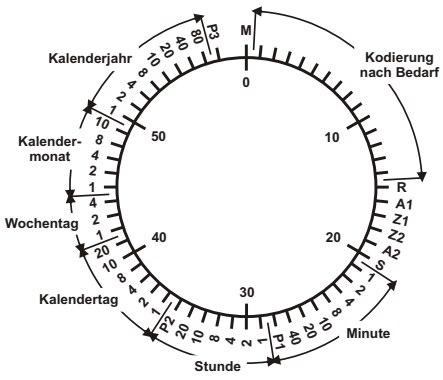
1 General Information about DCF77

The radio remote clocks made by Meinberg receive the signal from the long wave transmitter DCF77. This long wave transmitter installed in Mainflingen near Frankfurt/Germany transmits the reference time of the Federal Republic of Germany. This time reference is either the Central European Time (Mitteleuropäische Zeit, MEZ) or the Central European Summer Time (Mitteleuropäische Sommerzeit, MESZ). The transmitter is controlled by the atomic clock plant at the Federal Physical Technical Institute (PTB) in Braunschweig/Germany and transmits the current time of day, date of month and day of week in coded second pulses. Once every minute the complete time information is available.

At the beginning of every second the amplitude of the high precision 77.5 kHz carrier frequency is lowered by 75% for a period of 0.1 or 0.2 sec. The length of these time marks represent a binary coding scheme using the short time mark for logical zeroes and the long time mark for logical ones. The infomation on the current date and time as well as some parity and status bits can be decoded from the time marks of the 15th up to the 58th second every minute. The absence of any time mark at the 59th second of a minute signals that a new minute will begin with the next time mark.

Our radio remote clocks decode the highly accurate information on date and time within a wide range around Germany. So some of our clocks are installed in Bibao/Spain as well as in the City of Umeå in northern Sweden - fully statisfying the requirements of the users. The radio remote clocks automatically switch to summertime and back. The reception of the time information is free of charge and does not need to be registered.

Gernerally it is important to position the antenna in an optimal way. It should be mounted at least 30 centimeters away from the clock unit and from solid steel. The antenna should be aligned at a right angle to the direction of the transmitter (Frankfurt).



M	Minutenmarke (0.1 s)	
R	Aussendung über Reserveantenne	
A1	Ankündigung Beginn/Ende der Sommerzeit	
Z1, Z2	Zonenzeitbits	
	Z1, Z2 = 0, 1:	Standardzeit (MEZ)
	Z1, Z2 = 1, 0:	Sommerzeit (MESZ)
A2	Ankündigung einer Schaltsekunde	
S	Startbit der codierten Zeitinformation	
P1, P2, P3	gerade Paritätsbits	

2 C600RS

The radio remote clocks C600RS has been designed for applications where only the serial interface is used to transmit information on date and time to other devices. The clock has an enhanced LF receiver and is manufactured using surface mounting technology (SMT). The elevtronic assembly is mounted in a plastic case with four LEDs in the front panel which let the user monitor the clock's status.

2.1 Overview

2.1.1 Antenna and LF Receiver

An external ferrit antenna is used to receive the signal from DCF77. Optionally, a weather-proof antenna is available which can be mounted outdoor. A coaxial cable which can be up to more than 100 meters in length is used to pass the antenna's output signal to the on-board LF receiver where it is demodulated by a detector with automatic gain control. The demodulated time marks are fed to the clock's microprocessor.

2.1.2 Microprocessor Circuit

Time marks from the receiver circuit are filtered and decoded by the microprocessor. If no errors are detected in the current time message an additional plausibility check against the previous time message is performed. If that plausibility check passes, too, the real time clock is read periodically and it's date and time are passed to the serial port drivers. Additionally, the microprocessor generates output pulses when the second or minute changes. An on-board microprocessor supervisory circuit provides a watchdog timer which resets the microprocessor if the supply voltage drops below a specified threshold.

2.1.3 Buffered Real Time Clock

If the board's power supply is turned off, a gold cap capacitor on the board lets the real time clock keep time and status for a minimum of 48 hours (typically 180 hours). This capacitor does not need any maintenance. Alternatively, the clock can be ordered with a lithium battery which has 10 years of life time guaranteed.

2.1.4 Asynchronour Serial Port

Two asynchronous serial ports can be used to transmit information on date and time to other devices. The port (COM 0) can be used as RS-232 port and (COM 1) as 20 mA current loop.

2.2 Installation

The radio remote clock has a built in AC power supply. After the power cable has been connected, a green LED labeled **Netz** indicates that the clock is ready to operate. If the antenna cable has been connected to both the antenna and the clock's BNC connector, the brightness of the LED labeled **Feldstärke** reflects the signal strength of the 77.5 kHz carrier. In order to get the maximum signal, the antenna should be aligned in two steps. First it should be turned **slowly** until the **Feld** LED is mostly dimmed. Finally the antenna must be turned by 90° from this position to obtain maximum signal. The antenna should be installed at least 30 cm away from the clock from steel girders or plates.

If the antenna is installed properly and the signal from DCF77 can be received without strong distorions, the green LED labeled **Modulation** starts blinking exactly once per second, corresponding to the time marks from DCF77. If this LED flashes intermediately, there is some electrical noise around which prevents the microprocessor from decoding the time message. In this case, a better location for the antenna must be found.

After reset, the red LED labeled **Freilauf** indicates that the clock is running on xtal and has not synchronized with DCF77 yet. Due to the plausibility checks, it can take up to three minutes after power-up until the clock is synchronized and this LED is turned off. The state of this LED only changes when a new minute begins.

The serial interfaces are operational immediately after switching on. The type of data transfer, framing and baud rate can be adjusted by a monitor program.

2.2.1 Interfaces

Serial Ports

The asynchronous serial port can be configured by a DIL switch located inside the clock's case. When the clock is beeing shipped, the levers of the DIL switch have been set to some defaults which are marked by asterisks in the tables below. If one of the switch settings has to be changed, th upper party of the clock's case must be removed by datatching the 4 screws located at the edges of the cover.

Serial Input and Output Drivers

The serial sting generated by the microprocessor is fed into a RS-232 output driver plus a 20mA current loop driver in parallel. If the clock is configured to send time messages automatically once per second or once per minute, both of the outputs may be used concurrently.

The serial input drivers need to be connected only if a serial string shall be sent on request. A Monitor program lets the user select either RS-232 input or current loop input. It is **not** possible to use both the current loop input and the RS-232 input together.

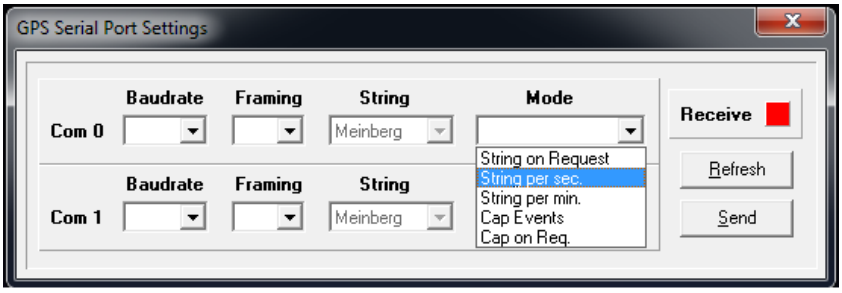
Both the current loop input and output can be wired for either active or passive operation. If a current loop driver shall be operated in active mode, either - 15V must be supplied at the connector or the corresponding pin of the port can be wired to ground. An example application at the end of this manual shows how to connect the port.

Transmission Speed

The transmission speed can be selected by the Monitor program. Any commonly used speed from 600 baud through 19200 baud can be configured.

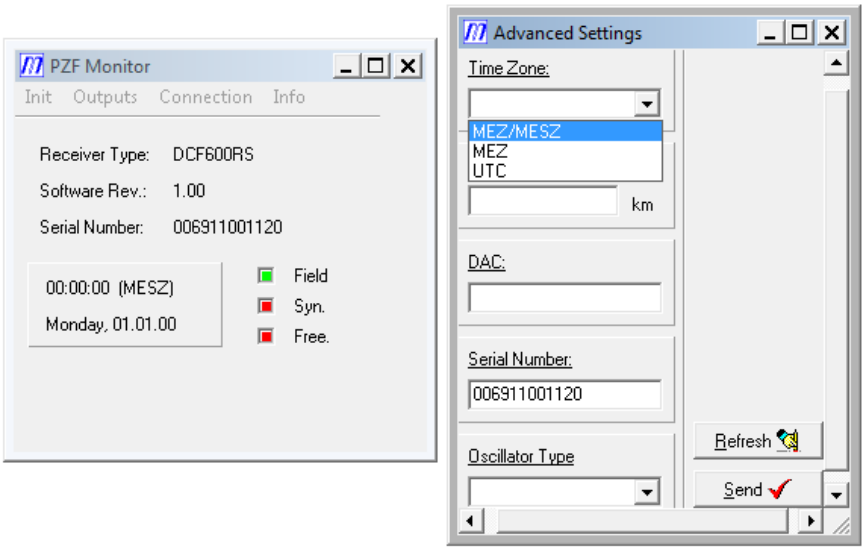
Output mode

The serial port sends a time string on request by incomming '?' character (ASCII code 3Fh). Additionally, a time string can be generated automatically either whenever a new second starts or when a new minute begins. A Monitorprogram are used to select the desired mode of operation:



Time Zone

A Monitorprogram lets the user select the clock's time zone. The serial string may either contain the Central European Time rsp. Central European Summer Time (CET/CEST=MEZ/MESZ), or alway UTC (formerly GMT).



Pulse Outputs

Whenever a new second or minute starts, a corresponding pulse (P_SEC, P_MIN) with a width of 200 msec is generated. These pulses are made available at the DB25 connector via optocoupler outputs. The P_SEC pulse

is also available with RS-232 level (-3...12V/+3...12V). If required, Jumper JP2 must be set to activate this puls. See the technical description and application example at the end of this manual for details.

3 Technical Specifications C600RS

RECEIVER:	Synchronous demodulator with automatic gain control bandwidth: approx. 50Hz
ANTENNA:	Active external ferrite antenna in a plastic case Length of the cable: up to more than 100m
RF AMPLITUDE, MODULATION:	Indicated by LED
TIMECODE CHECK:	Parity and consistency checking over a period of two minutes RF distortions indicated by both LED and a status character in the serial output string Without RF signal the clock runs on XTAL with an accuracy of 10-6
BATTERY BACKUP:	Gold Cap or Lithium battery when the power is turned off, th on-board RTC keeps the time based on XTAL for more than 48 hours (gold cap) rsp. more than 10 years (lithium battery)
RELIABILITY OF OPERATION:	Microprocessor supervisory circiot provides watchdog timer, power supply monitoring and backup-battery switchover
OUTPUT PULSES:	Optocoupler outputs (70V/20mA) provide pulses of 200msec width whenever a new second rsp. minute begins. P_SEC pulse with RS232-level (Jumper JP2 must be set)
ASYNCHRONOUS SERIAL PORT:	Transmission speed, framing, time zone and mode of operation configurable by DIL switch
TRANSMISSION SPEED:	600 through 19200 baud
FRAMING:	7E1, 7E2, 8N1 or 8N2
MODE OF OPERATION:	time sting transmitted automatically once per second, once per minute, or when a request character '?' has been received
TIME ZONE:	MEZ/MESZ=CET/CEST, or UTC
OUTPUT STRING:	see "Format of the Meinberg Standard Time String"
SERIAL LINE DRIVERS:	Output: RS232 and 20mA current loop (active or passive) Input: RS232 or 20mA current loop (active or passive)
CONNECTORS:	DB25 connector

	coaxial RF connector (BNC type)
POWER SUPPLY:	230V AC, 50Hz -15V only when using 20mA current loop
PHYSICAL DIMENSIONS:	Rolec Technobox TBA084 L x B x H (160mm x 81mm x 62mm)
AMBIENT TEMPERATURE:	0...50°C
HUMIDITY:	max. 85%
OPTIONS:	Hardware and software modifications accordding to customer specification

CE

This device conforms to the directive 2004/108/EC on the approximation of the laws of the Member States of the European Community relating to electromagnetic compatibility.

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

3.2 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.llll e 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

3.3 Format of the ATIS Time String

The ATIS standard Time String is a sequence of 23 ASCII characters terminated by a CR (Carriage Return) character. The format is:

/GID//ABS//TSQ//CC//CS//ST/*jjmmtthhmmsswcc*/GID//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:

GID	Address of the receiver	code 7Fh	
ABS	Originator of message	ASCII '0'	code 30h
TSQ	Telegram number	ASCII '0'	code 30h
CC	Command code	ASCII 'S' for SET	code 53h
CS	Command code	ASCII 'A' for ALL	code 41h
ST	Time status	ASCII 'C' for valid time	code 43h
yy.mm.dd.	the current date:		
	yy	year of the century	(00..99)
	mm	month	(01..12)
	dd	day of month	(01..31)
hh.mm;ss.fff	die Zeit:		
	hh	hours	(00..23)
	mm	minutes	(00..59)
	ss	seconds	(00..59, oder 60 while leap second)
w	the day of the week	(1..7, 1=Monday)	
cc	checksum in hex, built from all characters including GID,ABS,TSQ,CC,ST,..		
<CR>	Carriage Return, ASCII Code 0Dh		

(The standard interface configuration for this stiring type is 2400 baud, 7E1)

3.4 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)		

3.5 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

3.6 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		

3.7 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*,*ahh**<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		

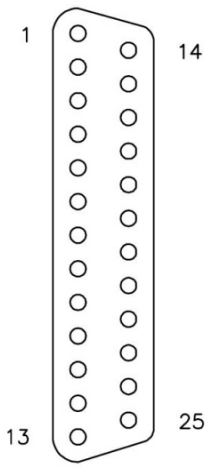
3.8 Connectors

Name	Type	Signal	Cable
Serial Interface	25pin SUB-D	RS232 20mA	shielded data line
Pulse Outputs	pulse per second pulse per minute		
Antenna	BNC	77.5kHz	shielded coaxial line (RG174/RG58)
Power supply	receptable	230V / AC	power supply cord

3.9 SUB-D 25 Connector Pin Assignments

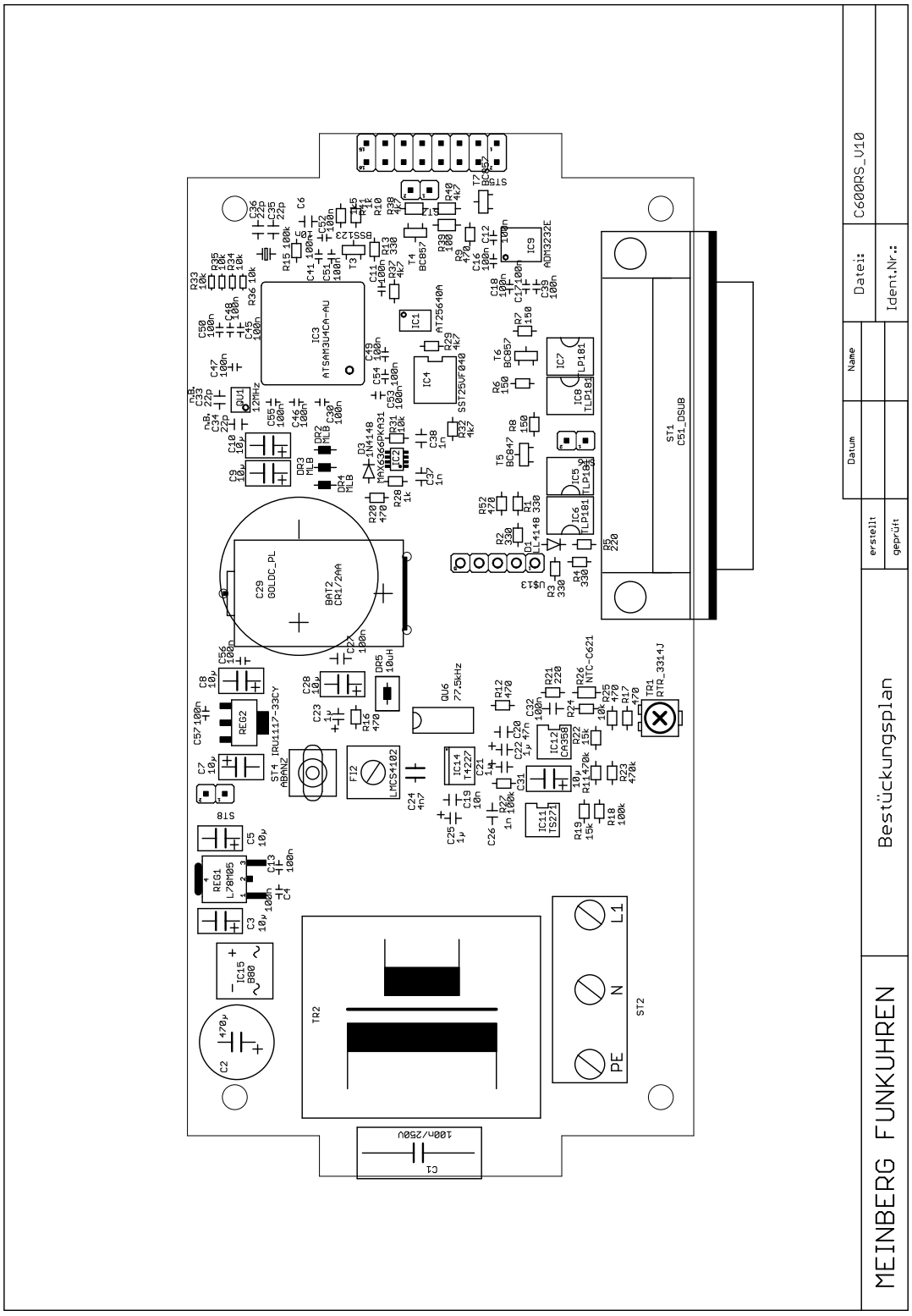
1	
2	RxD in
3	TxD out
4	RTS (gebrückt mit CTS)
5	CTS (gebrückt mit RTS)
6	DSR (gebrückt mit DTR)
7	GND
8	P_SEC (RS232)
9	-pass_in / +act_in
10	+pass_in
11	curr_loop +5V out
12	+pass_out
13	-pass_out / +act_out

14	P_SEC out, collector
15	P_SEC out, emitter
16	P_MIN out, collector
17	P_MIN out, emitter
18	
19	
20	DTR (gebrückt mit DSR)
21	-act_in
22	
23	
24	curr_loop -15V in
25	-act_out



SUB-D Buchse, Frontansicht

3.10 Layout C600RS

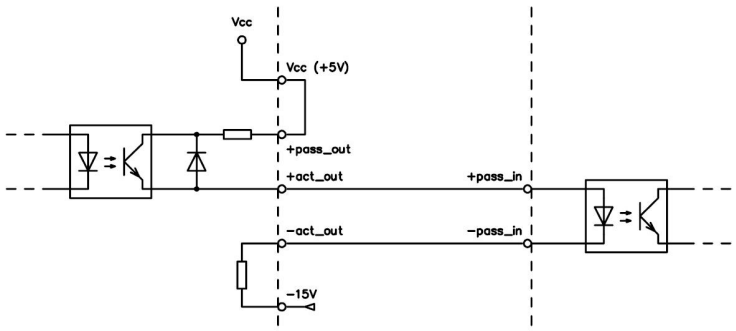


3.11 Usage of the Current Loop Interfaces

The current loop interface can be wired to work in one of two modes: active output drives passive input, or passive output to active input.

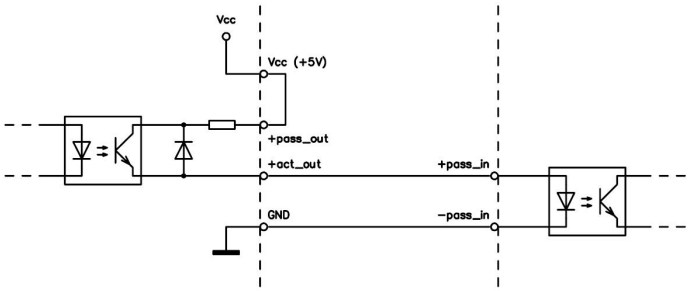
3.11.1 Active Output to Passive Input

If the clock's current loop output shall be wired to operate as active output, a connection from the pin labeled +pass_out to Vcc(+5V) must be provided. The pin labeled -act_out is pulled down to the auxiliary -15V supply, which must be made available by the user.



aktiver current loop Ausgang mit externer -15V Versorgung

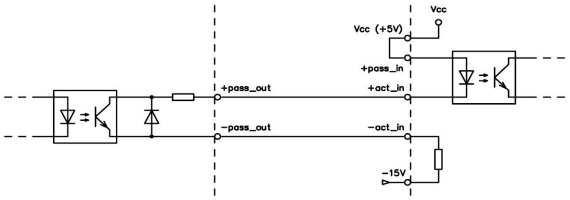
If an extermal -15V supply is not available, the -act_out signal can be connected directly to GND, as shown below:



aktiver current loop Ausgang ohne externe -15V Versorgung

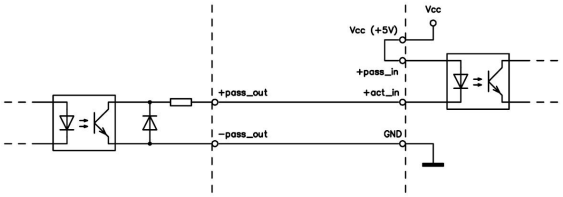
3.11.2 Passive Output to Active Input

If a current loop output shall be wired to operate as passive output, the input must be wired to operate as an active input. A connection from the pin labeled +pass_in to Vcc (+5V) must be provided. The pin labeled -act_in is pulled down to the auxiliary -15V supply, which must be made available by the user.



aktiver current loop Eingang mit externer -15V Versorgung

If an extermal -15V supply is not available, the -act_out signal can be connected directly to GND, as shown below:



aktiver current loop Eingang ohne externe -15V Versorgung

4 Konformitätserklärung / Declaration of Conformity

Hersteller *Manufacturer*	Meinberg Funkuhren GmbH & Co. KG Lange Wand 9, D-31812 Bad Pyrmont

erklärt in alleiniger Verantwortung, dass das Produkt,
declares under its sole responsibility, that the product

Produktbezeichnung *Product Name*	**C600RS**
Modell / Typ *Model Designation*	**DCF77 Funkuhr**

auf das sich diese Erklärung bezieht, mit den folgenden Normen übereinstimmt
to which this declaration relates is in conformity with the following standards

EN55022:2010, Class B	Limits and methods of measurement of radio interference characteristics of information technology equipment
EN55024:2010	Limits and methods of measurement of Immunity characteristics of information technology equipment
EN 61000-3-2:2006 (+A1:2009 +A2:2009)	Electromagnetic Compatibility (EMC) Limits for harmonic current emissions
EN 61000-3-3:2008 (+A1:2001 +A2:2005)	Electromagnetic Compatibility (EMC) Limitation of voltage fluctuation and flicker in low-voltage supply systems
EN 60950-1:2006 (+A11:2009)	Safety of information technology equipment
2011/65/EU	RoHS-directive

gemäß den Richtlinien 2004/108/EG (Elektromagnetische Verträglichkeit), 2006/95/EG (Niederspannungsrichtlinie) und 93/68/EWG (CE Kennzeichnung) sowie deren Ergänzungen.
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.

Bad Pyrmont, den 08.07.2009


C600RS_STD_231012