

Technical Information
Operating Instruction

PZF510

Impressum

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General information

The German long wave transmitter DCF77 started continuous operation in 1970. The introduction of time codes in 1973 build the basic for developing modern radio remote clocks.

The carrier frequency of 77.5kHz is amplitude modulated with time marks each second. The BCD-coding of the time telegram is done by shifting the amplitude to 25% for a period of 0.1s for a logical '0' and for 0.2s for a logical '1'. The receiver reconstructs the time frame by demodulating this DCF-signal. Because the AM-signal is normally superimposed by interfering signals, filtering of the received signal is required. The resulting bandwidth-limiting causes a skew of the demodulated time marks which is in the range of 10ms. Variations of the trigger level of the demodulator make the accuracy of the time marks worse by additional +/-3ms. Because this precision is not sufficient for lots of applications, the PTB (Physical and Technical Institute of Germany) began to spread time informations by using the correlation technique.

The DCF-transmitter is modulated with a pseudo-random phase noise in addition to the AM. The pseudo-random sequence (PZF) contains 512 bits which are transmitted by phase modulation between the AM-time marks. The bit sequence is build of the same number of logical '0' and logical '1' to get a symmetrical PZF to keep the average phase of the carrier constant. The length of one bit is 120 DCF-clocks, corresponding to 1,55ms. The carrier of 77.5kHz is modulated with a phase deviation of +/-10° per bit. The bit sequence is transmitted each second, it starts 200ms after the beginning of a AM second mark and ends shortly before the next one.

Compared to an AM DCF77-receiver, the input filter of a correlation receiver can be dimensioned wide-bandwidth. The incoming signal is correlated with a reconstructed receiver-PZF. This correlation analysis allows the generation of time marks which have a skew of only some microseconds. In addition, the interference immunity is increased by this method because interference signals are suppressed by averaging the incoming signal. By sending the original or the complemented bit sequence, the BCD-coded time information is transmitted.

The absolute accuracy of the generated time frame depends on the quality of the receiver and the distance to the transmitter, but also on the conditions of transmission. Therefore the absolute precision of the time frame is better in summer and at day than in winter and at night. The reason for this phenomenon is a difference in the portion of the sky wave which superimposes the ground wave. To check the accuracy of the time frame, the comparison of two systems with compensated propagation delay is meaningful.

Features PZF510

The PZF510 is a high precision receive module for the DCF77-signal build in eurocard size (100mm x 160mm). The 61mm wide front panel contains an eight digit alphanumeric display, three LEDs and two keys as control actuators.

The microcontroller of the system correlates its receiver-PZF with the incoming pseudorandom sequence and decodes the time information of the DCF-telegram simultaneously. The controller handles input and output functions of the PZF510 and synchronizes the internal realtime clock.

By evaluating the pseudorandom phase noise, the PZF510 is able to generate time frames with thousand times the accuracy of standard AM-time code receiver. The precise regulation of the main oscillator (TCXO, OCXO optional for higher accuracy) of the radio clock is possible therefore. So, the PZF510 can be used as a standard frequency generator besides the application as a time code receiver. Six fixed and one settable TTL-level standard frequencies are available at the rear VG-connector. The synthesizer frequency exists as an open drain output and a sinewave signal also.

The PZF510 delivers TTL-low and TTL-high active pulses per minute and per second further. To distribute informations concerning date, time and status, two independant serial interfaces (RS232) are used which are configurable in a setup menu.

Like mentioned before, the PZF510 includes a battery-backed realtime clock which runs crystal-precise if the main power supply fails.

Important system parameters are stored in a battery-backed (RAM of the RTC) or non-volatile (EEPROM) memory.

If an update of system software becomes necessary, the new firmware can be loaded via serial interface (COM0) without removing the PZF510 for inserting a new EPROM.

Installation

To achieve the technical data given in chapter 'technical specifications', the following points must be observed.

Operating voltage

The clock operates with a single +5V supply. This voltage should be sourced by a linear regulated power supply. If a switched mode power supply is used, the GND access of the PZF510 should be grounded directly or via a capacitance of at least 0.1 μ F. This connection avoids the signal-to-noise ratio reducing influence of harmonics of the switched mode power supply.

Antenna

The PZF510 operates with a ferrite antenna which is damped to match the bandwidth needed for the correlation reception.

Assembly of antenna

The antenna has to be mounted as exactly as possible. Turning it out of the main receive direction will result in less accurate time frames. The antenna must be placed in longitudinal direction to the DCF-transmitter (Frankfurt). The nearness to micro-computers should be avoided (PZF510 included) and the antenna should be installed with a minimum distance of 30cm to all metal objects, if possible. A distance of several meters to TV- or computermonitors must be kept.

After switching the PZF510 to the menu 'FIELD', the adjustment of the antenna can be executed. The displayed value is proportional to the received field strength. The best method of mounting the antenna is to look for the minimum field strength and turn the antenna by 90° to maximum then. A high field strength on its own is no guarantee for good conditions of reception, because interfering signals within the bandwidth of the receiver also have an effect on the displayed value.

The maximum interference immunity can be found by looking at the autocorrelation coefficient (in percent) in the menu 'PZF-STAT'. The displayed value should be close to 75% for best reception.

Front panel



Pilot lamps

The 'Feld'-LED is switched on if a DCF-signal with at least minimum field strength needed for the correlation reception is detected at the input of the receiver.

The 'Syn.'-LED indicates that the autocorrelation coefficient decreases beyond 52% and correct reception is not possible therefore. This happens if a strong interferer within the bandwidth of the receiver is present or the transmitter is switched of.

If the 'Freil.'-LED is on, it was not possible to synchronize the internal realtime clock to DCF-time. This condition occurs for at most two minutes after switching on the PZF510, because two DCF-telegrams are checked for plausibility before the data is taken over. Short disturbance of reception can cause this state too.

Display

The eight digit alphanumeric display shows important information concerning status and time. The setting of system parameters is also done with the help of the display.

Control keys

It is possible to change the displayed information (time, date or status information) by two keys. The 'Menu'-key selects one of several menus. After pressing the 'Set'-button the belonging information appears on the display. Furthermore, the keys are used to set user-specific parameters in several submenus.

Menu items

The type of DCF-clock and the software revision are displayed first after power-up. The following informations are readable before the PZF510 switches to time-display automatically:

PZF REC.
REV:x.xx

The handling of any queries will be simplified if the software revision is given by the user.

The following menus are available then:

TIME:

The current time is displayed.

DATE:

The actual date appears on the display.

DAY o.W.

The day of week will be displayed

PZF STAT

Informations about the decoding of the pseudo-random sequence are available in this menu. The following texts may be displayed:

GSYNC

The pseudo-random sequence is read into the internal RAM for one second and the system tries to achieve a coarse synchronisation. This procedure starts after power-up or worse reception for more than ten seconds.

K: xx%

If the coarse synchronisation was successful, the receiver enters the state of fine-correlation. The system tries to lock the received PZF as exact as possible to generate a precise time frame. The display shows the correlation coefficient at the end of each second, which can be in the range of 52% to 77%. A high value for the coefficient should be achieved by choosing a suitable position for the antenna.

The essential part of the tracking is completed five seconds after the appearance of 'K:xx%' and the generation of pulses per minute and per second starts. Tracking steps of three microseconds are possible each second until the internal realtime clock is synchronized (two minutes max.). Afterwards, corrections of the time frame are executed per minute only. The direction of these steps is displayed by the characters '>' or '<' behind the digits of the correlation coefficient.

FIELD

The digitized value of the field strength is displayed in this menu. There is a logarithmic relation between this value and the field strength. This menu is useful for mounting the antenna, like described in chapter 'Assembly of antenna'.

SETUP

The user-specific parameters of the PZF510 are set in this menu. To avoid the erroneous change of these parameters, it is not possible to enter the submenus by a simple pressing of the 'Set'-key. The first submenu is entered if the 'Set'-button is pressed until the character '*' is displayed behind the text 'SETUP' and the 'Menu'-key is actuated then. The following submenus are selectable ('Set'-button and 'Menu'-key used as usual now):

DIST.o.T

The distance to the transmitter is entered in this menu for compensating the propagation delay of the received pseudo-random code. This setting should be done as exact as possible because the absolute precision of the time frame is influenced by this value.

After pressing the 'Set'-button a four digit kilometer-value is displayed. By pressing the 'Set'-key again, the first position is selected (flashing digit). To choose a different digit, the 'Menu'-key has to be pressed, to increment the current digit the 'Set'-button must be used. If the value is entered, it will be stored by pressing the 'Menu'-key until the display returns to the setup submenu. The km-value is stored in the internal EEPROM of the board.

SYNTH.

The output frequency of the internal synthesizer is selected in this menu. This can be done in the range of 1/3Hz to 9.999MHz.

After setting the frequency (the buttons are used the same way as for setting the km-value) it will be stored in the battery-backed RAM of the PZF510. This value is available directly after a reset therefore.

SYNTH M.

This menu configures at which time after power-up the frequency generation of the synthesizer starts. The following settings are possible:

always

Frequency-generation immediately after reset.

aft. SYN

The clock has to synchronize first before the frequency-generation starts. Frequencies less than 10kHz are phase locked to the precise pulse per second at once.

TIME REF

The selection of timezone MEZ/MESZ or UTC can be done in this menu.

PAR.COM0

Framing and baud rate of the serial channel COM0 are set in this submenu. The following parameters are possible:

Baud rate: 600, 1200, 2400, 4800, 9600 Baud

Framing: 7O2, 7N2, 7E1, 7E2, 8N1, 8N2, 8E1

PAR. COM1

The parameter values of serial channel COM1 are selected in this submenu. These settings are totally independent of COM0, the values allowed are the same as before:

Baud rate: 600, 1200, 2400, 4800, 9600 Baud
Framing: 7O2, 7N2, 7E1, 7E2, 8N1, 8N2, 8E1

SER.MODE

The mode of operation of the serial ports is selected in this submenu. After pressing the 'Set'-button this text is displayed:

0 : x 1 : x

The following settings can be made for each COM-port instead of the 'x' behind the colons:

'S' Time telegram per second
'M' Telegram per minute
'R' Telegram on request (after sending an ASCII '?', 3F hex)

OSZ.ADJ.

The basic model of the PZF510 includes a voltage controlled temperature compensated oscillator (VCTCXO, VCOCXO optional). Its nominal frequency of 10MHz is adjusted by using two digital-to-analog converters (DACs). One of them is responsible for the coarse tuning and the other one for the fine adjustment of the oscillator. The value for the coarse-DAC is settable in the range of 0 to 4095 in this menu.

This value should only be changed by specialized personnel of company Meinberg and not by the user!

DAC CLR

The value of the fine DAC is displayed in this submenu. If the 'Set'-button is pressed for approximately two seconds, the DAC is set to its mid-scale value and the difference to its last value is added to the coarse DAC proportional.

This process is released automatically if the value of the fine DAC exceeds its limits (0...4095). Therefore the setting of the value to mid-scale by hand is reserved for service purposes only.

SER. No.

The eight digit serial number of the PZF510 is displayed. If there is any malfunction of the clock this number may be helpful to eliminate possible defects.

Asynchronous serial interfaces

Two independent serial interfaces (RS232) are available at the rear connector of the clock PZF510. As set in menu 'Ser. Mode', the serial ports can send the Meinberg standard time string either per second, per minute or on request. Additional menus are used to set the framing and baudrate of these interfaces. The time string is build of 32 ASCII characters and includes information about time, date and status. The structure of the string is described in chapter 'Format of the Meinberg standard string'.

Pulse outputs

TTL-low and TTL-high active pulses per minute and per second are generated by the PZF510, which are available at the VG-connector.

Because the internal time frame of the clock has not yet been synchronized with the pseudo random sequence, no pulses are generated directly after reset. In case of normal reception, the receiver needs about 12 seconds for coarse and another 5 seconds for fine synchronization. So, pulses are generated approximately 17 seconds after reset.

Standard frequencies

The PZF510 delivers six standard frequencies. The outputs 100kHz, 1MHz and 10MHz are derived from the main oscillator of the clock which is phase locked to the DCF-system by a digital PLL (phase locked loop). The temperature-dependant drift and the aging of the oscillator can be compensated by this procedure. Therefore the excellent short-term stability of the standard frequencies of $\pm 5 \cdot 10^{-9}$ (standard version with TCXO) is achieved. The value for regulating the digital-to-analog converter of the PLL is available directly after reset because it is stored in the battery-backed RAM of the clock. If the DCF-transmitter fails, the oscillator is controlled by this value also. The accuracy of the standard frequencies will not be worse than $1 \cdot 10^{-8}$ for one hour without reception therefore.

The outputs 77.5kHz, 155kHz and 310kHz are locked to the receiver-PLL directly. They are derived from a DDS-circuit (DDS: direct digital synthesis) which causes a high phase jitter compared to the other standard frequencies. These outputs should only be used as standard frequencies if the receiver is synchronous with DCF77.

Frequency synthesizer

The synthesizer of the PZF510 generates a frequency in the range of 1/3Hz to 9.999MHz, which can be set in the menu 'SYNTH.'. The synthesizer-output is available with TTL-level, as a sinewave signal or an open drain output at the VG-connector.

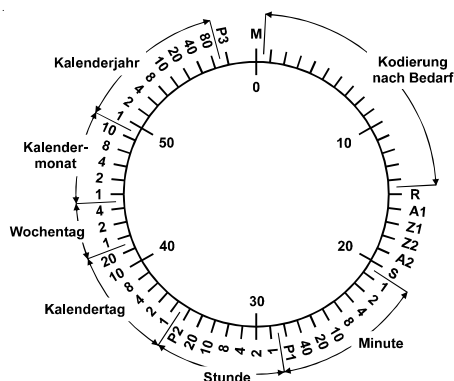
The frequency to be generated can be adjusted by giving the four digits of highest-order, lower significant digits are set to zero. Only the fractions xxx.3Hz, xxx.5Hz and xxx.6Hz are allowed in the Hertz-range. Frequencies of xxx.3Hz or xxx.6Hz lead to a periodic fraction, that means to correct 1/3Hz or 1/6Hz, often used by ripple control systems.

Up to a value of 10kHz the synthesizer is phase-locked to the pulse per second. The accuracy of this frequency reaches the exactness of the standard frequencies therefore. Higher frequencies than 10kHz have a maximum error of +/- 2,35 mHz.

The behaviour of the synthesizer after power-up is selectable (see menu 'SYNTH. M'). Frequency generation can start either directly after reset or after synchronization.

DCF77 emulation

The correlation receiver PZF510 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. The PZF510 generates time marks representing always the DCF-time including announcement of changes in daylight saving and announcement of leap seconds, changing the timezone in the setup menu has no effect on the generation. The coding scheme is given below:



M	Start of Minute (0)
R	RF Transmission via secondary antenna (0)
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 (1)
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.

Realtime clock

The PZF510 includes a battery-backed realtime clock which runs crystal-precise in case of power failure. A relativ accurate time is present immediately after power-up this way. An additional RAM of the realtime clock is used to store important system parameters.

TIME_SYN output

This output is set to TTL-high if the receiver is in synchronous state (LED 'Freil' switched off). The output level changes to TTL-low if the receiver is in asynchronous state for more than one hour. The TIME_SYN output is available at the VG-connector and can be used to release an alarm, for example.

Expansion capabilities

The signals '/RESET in/out', 'SCL out', 'SDA in/out' and 'SCL_EN' at the VG-connector are reserved for future expansions. Like the 'reserved' pins, they should not be connected to any signal by the user.

Firmware updates

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 remove the board to insert a new EPROM.

If the 'Menu' key on the front panel is pressed or the pin '/BOOT' at the blade-connector strip is held at TTL-low level while the system is powered up, a bootstrap-loader is activated and waits for instructions from the serial port COM0. The new firmware can be sent to PZF510 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 'Menu' key is pressed unintentionally while the system is powered up, the firmware will not be changed accidentally. After the next power-up, the system will be ready to operate again.

Replacing the lithium battery

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

ATTENTION!

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

CE label



This device conforms to the directive 89/336/EWG on the approximation of the laws of the Member States of the European Community relating to electromagnetic compatibility.

PZF510 with OCXO

The optional deliverable OCXO of the PZF510 operates with a single +5V power supply. This voltage should be sourced by a stable supply to avoid drifting of the frequency caused by the power supply. Because of the low heating time of the oscillator, the OCXO can be regulated to the specified precision approximately 10 seconds after power-up. During operation the OCXO-version behaves like the TCXO-type but with better accuracy.

ACCURACY: +/- $1 \cdot 10^{-9}$ short term stability for standard frequencies and synthesizer (up to 10kHz)

 +/- $2 \cdot 10^{-8}$ per day without reception of DCF77

Technical specifications

RECEIVER:	Direct conversion quadrature receiver with automatic gain control Bandwidth: approx. 20Hz, external ferrite antenna
CONTROL OF RECEPTION:	The DCF-signal is checked for minimum field strength by micro-processor. The result is indicated by LED. In addition, the value of the digitized field strength is displayed in menu 'FIELD'.
BATTERY-BACKUP:	In case of power failure an internal realtime clock runs crystal-precise. Important parameters are stored in the system-RAM. Life time of lithium battery: 10 years minimum Option: capacitance-backup for about 150 hours
DISPLAY:	Eight-digit alphanumeric display shows important time and status information. Digit-height 5mm.
INTERFACES:	Two independant asynchronous serial ports (RS232)
BAUD RATES:	600, 1200, 2400, 4800 oder 9600 Baud
FRAMING:	7O2, 7N2, 7E1, 7E2, 8N1, 8N2 oder 8E1
PULSE OUTPUTS:	Active-high and active-low pulses per minute and per second, TTL-level, pulse duration 200ms
ACCURACY OF PULSES:	Time delay of two systems PZF510 with a maximum distance of 50km: typ. 20 μ s, max. 50 μ s Time shifting of successive pulses: max. 1.5 μ s
PROPAGATION-TIME COMPENSATION:	The signal delay is compensated if the distance of the receiver to the transmitter is given.
STANDARD FREQUENCIES:	100 kHz, 1 MHz and 10 MHz are synchronized to DCF by a digital PLL. Accuracy in synchronized state: +/- 5 \cdot 10 ⁻⁹ (short term stability) Accuracy in unsynchronized state: 1 \cdot 10 ⁻⁸ for one hour 77.5 kHz, 155 kHz und 310 kHz derived from receiver-PLL Accuracy in synchronous state: +/- 5 \cdot 10 ⁻⁷ (short term stability)

SYNTHESIZER: Frequency range: 1/3 Hz...9.999 MHz
 Accuracy : up to 10 kHz see standard frequencies
 > 10 kHz : +/- 2,35 mHz max.
 Phase jitter : max. 60ns

SYNTHESIZER-
 OUTPUTS: F_SYNTH: TTL-level

F_SYNTH_OD: Open Drain
 Max. drain-source-voltage: 100 V
 Max. drain-current: 100 mA
 Dissipation power, 25° C: < 360 mW

F_SYNTH_SIN: Sinewave
 Output voltage: 1.5 V eff.
 Output impedance: 200 Ohm

TIME_SYN
 OUTPUT: TTL-level, logical-high if receiver is synchronous

TERMINAL
 CONNECTION: Blade-connector strip VG64, DIN 41612
 Sub-miniatur coaxial HF-connector (SMB)

BOARD
 DIMENSIONS: Eurocard size 100mm x 160mm, Epoxy 1,5mm
 Front panel 12TE (61mm)

ANTENNA: Ferrite antenna in plastic housing

HUMIDITY: Relativ humidity 85% max.

TEMPERATURE
 RANGE: 0° - 60° Celsius

POWER
 SUPPLY: + 5V, @ 330mA.

the current below is to add when equipped with OCXO option:
 < 250mA, heating time
 50mA, normal operation (-40°C)
 20mA, normal operation (+25°C)
 10mA, normal operation (+60°C)

Format of the Meinberg Standard Time String

The Meinberg Standard Time String is a sequence of 32 ASCII characters starting with the STX (start-of-text) character and ending with the ETX (end-of-text) character. The format is:

<STX>D:*dd.mm.yy*;T:*w*;U:*hh.mm.ss*;uvxy<ETX>

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

<STX> Start-Of-Text (ASCII code 02h)

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

w the day of the week (1..7, 1 = Monday)

hh.mm.ss the current time:
 hh hours (00..23)
 mm minutes (00..59)
 ss seconds (00..59, or 60 while leap second)

uv clock status characters (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 synchronized 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 announcement 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)

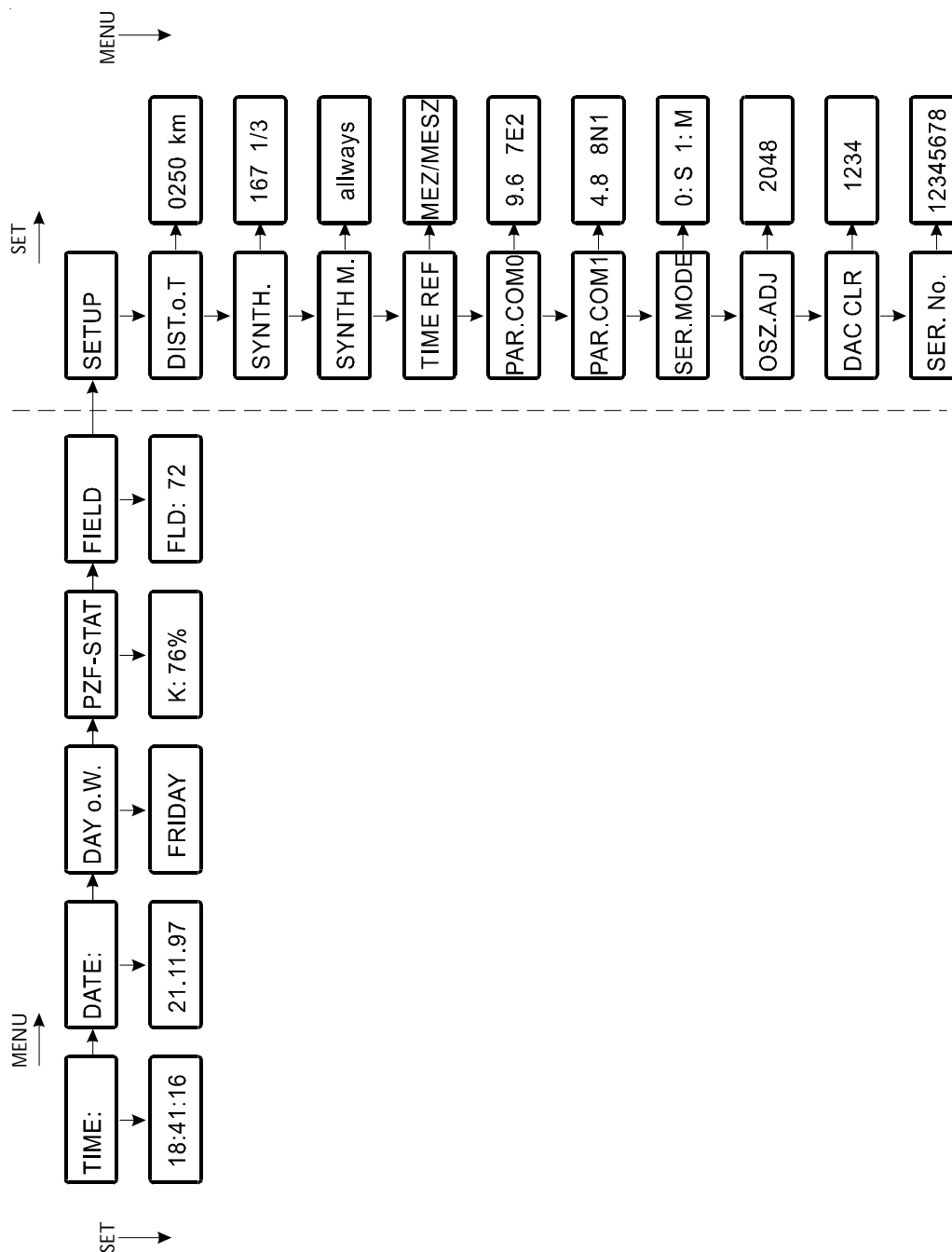
Signal description PZF510

Name	Pin	Function
GND	32a+c	Reference potential
VCC in (+5V)	1a+c	+5V power supply
VDD in (+12V)	2a+c	+12V power supply, reserved
DCF_MARK out	4c	DCF77 emulation, TTL, active high pulse duration: 100ms or 200ms
P_SEC out	6c	Pulse per second, TTL-level, active high
/P_SEC out	6a	Pulse per second, TTL-level, active low
P_MIN out	8c	Pulse per minute, TTL-level, active high
/P_MIN out	8a	Pulse per minute, TTL-level, active low
77,5kHz out	10c	77.5kHz frequency output, TTL-level
155kHz out	11c	155kHz frequency output, TTL-level
310kHz out	12c	310kHz frequency output, TTL-level
100 kHz out	10a	100kHz frequency output, TTL-level
1 MHz out	11a	1MHz frequency output, TTL-level
10 MHz out	12a	10MHz frequency output, TTL-level
F_SYNTH out	21c	Synthesizer frequency, TTL-level
F_SYNTH_OD out	22c	Synthesizer frequency, open-drain
F_SYNTH_SIN out	23c	Synthesizer frequency, sinewave
COM0 TxD out	26c	COM0 RS-232 output
COM0 RxD in	30c	COM0 RS-232 input
COM1 TxD out	24c	COM1 RS-232 output
COM1 RxD in	29c	COM1 RS-232 input
/BOOT in	4a	Input for activating the bootstrap-loader
TIME_SYN out	19c	Status output, TTL-level, high if synchronous
/RESET in/out	9c	RESET-pin, reserved for expansions Do not connect
SDA, SCL, SCL_EN		Serial bus for expansions, do not connect
Reserved		Reserved for future expansions, do not connect

Pin assignment PZF510

	a	c
1	VCC in (+5V)	VCC in (+5V)
2	VDD in (+12V)	VDD in (+12V)
3		
4	/BOOT in	DCF_MARK out
5		reserved
6	/P_SEC out	P_SEC out
7		
8	/P_MIN out	P_MIN out
9		/RESET in/out
10	100 kHz out	77,5 kHz out
11	1 MHz out	155 kHz out
12	10 MHz out	310 kHz out
13		SCL
14		SCL_EN
15		SDA
16		
17		reserved
18		
19		TIME_SYN out
20		
21		F_SYNTH out
22		F_SYNTH_OD out
23		F_SYNTH_SIN out
24		COM1 TxD out
25		
26		COM0 TxD out
27		reserved
28		reserved
29		COM1 RxD in
30		COM0 RxD in
31		
32	GND	GND

Structure of menus PZF510





PZF510- PZF510- E- 13. 01. 05