INSTRUCTION MANUAL

Impulse booster

ETC booster

Certification of the Producer

CE

STANDARDS

The Euro Time Center booster was developed and produced in accordance with the EU Guidelines:
2006 / 95 / EC
2004 / 108 / EC
96 / 48 / EC

References to the Instruction Manual

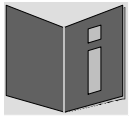
1. The information in this Instruction Manual can be changed at any time without notice. The current version is available for download on www.mobatime.com.
2. This Instruction Manual has been composed with the utmost care, in order to explain all details in respect of the operation of the product. Should you, nevertheless, have questions or discover errors in this Manual, please contact us.
3. We do not answer for direct or indirect damages, which could occur, when using this Manual.
4. Please read the instructions carefully and only start setting-up the product, after you have correctly understood all the information for the installation and operation.

Overview

Table of content

1 Safety

1.1 Safety instructions



Read this chapter and the entire instruction manual carefully and follow all instructions listed. This is your assurance for dependable operations and a long life of the device.

Keep this instruction manual in a safe place to have it handy every time you need it.

1.2 Symbols and Signal Words used in this Instruction Manual

	**Danger!** Please observe this safety message to avoid electrical shock! There is danger to life!
	**Warning!** Please observe this safety message to avoid bodily harm and injuries!
	**Caution!** Please observe this safety message to avoid damages to property and devices!
	**Notice!** Additional information for the use of the device.

1.3 Intended Use

The **impulse booster**, in this manual identified as **ETC booster,** is a line booster for use in impulse clock facilities for 24, 48 and 60V.

The ETC booster can be used for extending an existing impulse line or for transforming the line voltage. The ETC booster uses its own time-keeping and synchronizes itself from the incoming impulses. Therefore, the extended / transformed line can be seen as new, independent clock line.

For additional functions, see the device descriptions in chapter 3.4.

The ETC booster is to be mounted only onto an existing DIN rail or the one provided. Only use the device in a mounted state.

1.4 Observe operating safety!

Caution!

- Never open the housing of the device! This could cause an electric short or even a fire, which would damage your device. Do not modify your device!
- The device is not intended for use by persons (including children) with limited physical, sensory, or mental capacities or a lack of experience and/or knowledge.
- Keep packaging such as plastic films away from children. There is the risk of suffocation if misused.

1.5 Consider the installation site!

Caution!

- To avoid any operating problems, keep the device away from moisture and avoid dust, heat, and direct sunlight. Do not use the device outdoors.
- By operating the device, the heat sinks attached to the sides get warm.
  Make sure there is enough air circulation for the heat to dissipate.
  The device shuts off when overheated. After it has regained its normal operating temperature, it will restart automatically. The settings are saved.

Danger! Make sure
that you wait before using the device after any transport until the device has reached the ambient air temperature. Great fluctuations in temperature or humidity may lead to moisture within the device caused by condensation, which can cause a short.

1.6 Please observe the electromagnetic compatibility!

Caution!

- This device complies with the requirements of the EMC and the Low-voltage Directive.
- This product belongs to Class A in accordance with EN 55022.
  This equipment can lead to radio interference. In this case, measures must be taken by the user.

2 Maintenance

2.1 Troubleshooting: Repairs

Please read carefully chapter "15 Maintenance" if your device does not work properly.

If you cannot rectify the problems, contact your supplier from whom you have purchased the device.

Any repairs must be carried out at the manufacturer's plant.

Disconnect the power supply immediately and contact your supplier, if …

- liquid has entered your device
- the device does not properly work and you cannot rectify this problem yourself.

2.2 Cleaning

- Please make sure that the device remains clean especially in the area of the connections, the control elements, and the display elements.
- Clean your device with a damp cloth only.
- Do not use solvents, caustic, or gaseous cleaning substances.

2.3 Disposing

Device
At the end of its lifecycle, do not dispose of your device in the regular household rubbish. Return your device to your supplier who will dispose of it correctly.

Batteries
The user is legally obliged **(battery regulation)** to return used batteries and accumulators. **Disposing used batteries in the household waste is prohibited!** Batteries/ accumulators containing hazardous substances are marked with the crossed-out bin. The symbol indicates, that this product is forbidden to be disposed in the household waste. Below the chemical shortcuts for the contained hazardous substances of this product are mentioned:
Ag_2O = Silver oxide, **Cd** = Cadmium, **Hg** = Mercury, **Li** = Lithium**, Li-Ion** = Li-ion, **NiCD** = Nickel-cadmium, **NiMH** = Nickel-metal-hybrid, **Pb** = Lead, **$ZnMnO_2$** = tin-manganese dioxide.

You can return used batteries / accumulators free of charge to any collecting point of your local authority or stores, where batteries / accumulators are sold.

Consequently you comply with your legal obligations and contribute to environmental protection!

Packaging
Your device is packaged to protect it from damages during transport.
Packaging is made of materials that can be disposed of in an environmentally friendly manner and properly recycled.

3 General Information: Introduction

3.1 Scope of Delivery

Please check your delivery for completeness and notify your supplier within 14 days upon receipt of the shipment, if it is incomplete.

The package you received contains:

- ETC booster
- Mounting set for wall mounting consisting of:
  - 1 DIN rail
  - 2 screws
  - 2 plastic dowel

3.2 Technical data

See annex E Technical data.

3.3 Device Designation in this Manual

This instruction manual is for the impulse booster. Below, it will be referred to as **ETC booster**.

3.4 Device Description

The ETC booster is a line booster for use in impulse clock facilities for 24, 48 and 60V.

The ETC booster can be used for extending an existing impulse line or for transforming the line voltage. The ETC booster can handle different kinds of impulses for clock lines and the variants of the active DCF signal (see chapter 12). The voltage of the extended line directly depends on the voltage of the used power supply unit. E. g. in order to transform a 24V minute impulse line to 48V, the ETC booster is to be supplied with 48V.

The ETC booster uses its own time-keeping and synchronizes itself from the incoming impulses. Therefore, the extended / transformed line can be seen as new, independent clock line.

4 Installation

4.1 Installation guidelines

Danger! Always consider:
Impulse booster: For the ETC booster, the connection to the power supply must receive an all-pole disconnection and strain relief at the installation site.
The technical data for the mains power input are visible, when the terminal cover is removed.

The ETC booster must be separated from the mains power supply for any maintenance or wiring work.
The device may only be connected by a licensed electrician.
The effective national installation requirements and guidelines must be followed.

4.2 Connections

The connections are specified in annex A Connection diagrams.

Only connect the designated devices to the various inputs and outputs.

4.3 Checklist for start-up

The following list should be of assistance for a safe and fast start-up.

☐ Application specific wiring of the inputs and outputs (annex A)

☐ Connect supply and switch on (chapter 7, annex A)

☐ Read notes of operation (chapter 6)

☐ Set the required menu language (chapter 14.1)

☐ Set time zone of the master clock display (chapter 9.2)

☐ When available, configure external time reference (chapter 10.1) and check the reception quality (chapter 11.1)

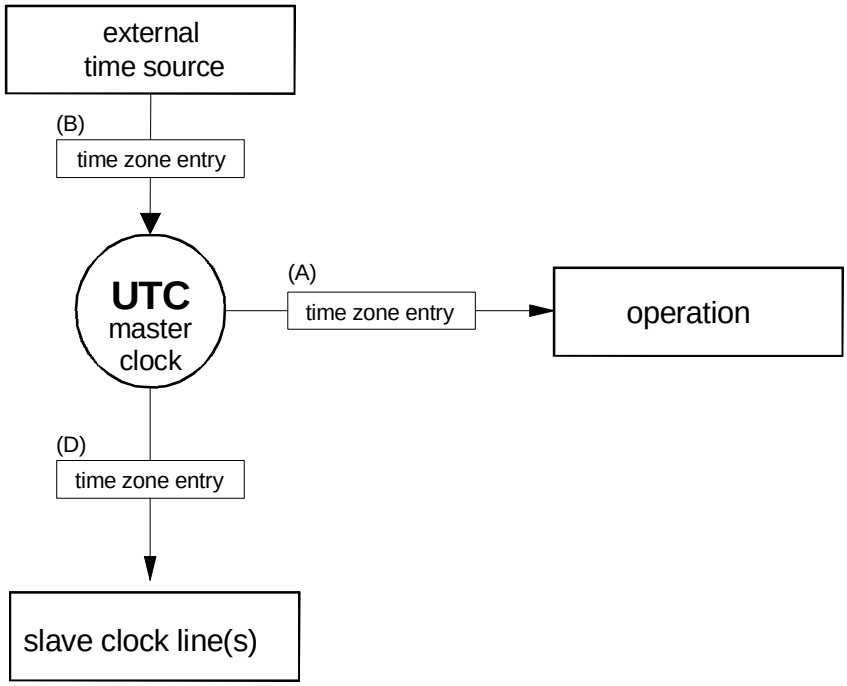
☐ If there is no external time reference, set local time and date manually (chapter 9.1)

☐ Configure outputs according to the requirements (chapter 12)

☐ Once the configuration of the ETC booster is completed, save the current settings in the flash memory (chapter 13.1)

5 Time administration concept

The internal master clock as well as the battery assisted real-time clock run with UTC (Universal Time Coordinate). The synchronization inputs and time outputs as well as the time shown on the display are linked via a time zone entry with the master clock time, i.e. all inputs and outputs can be individually allocated to a specific time zone.



Configurable time zones:

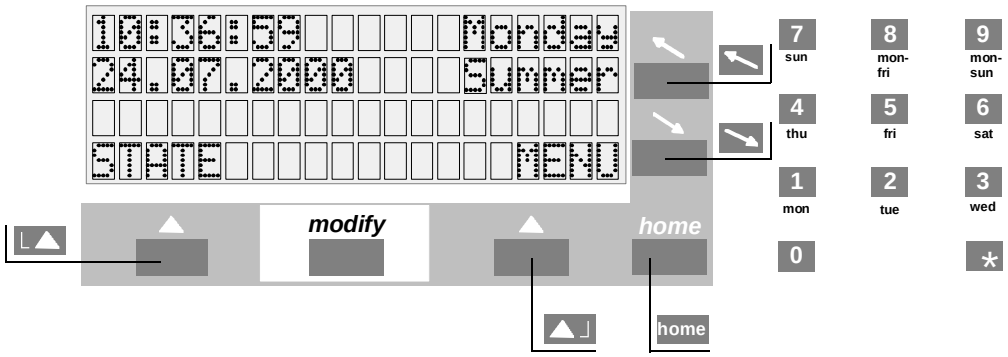
(A) chapter 9.2

(B) chapter 10.2

(D) chapter 1013.412.4.5 / 12.5.3 / 4.312.6.5

6 Operation

6.1 Definitions



Navigation keys

└▲	Status menu, back
▲┘	Main menu, alter, select, OK
↖	Cursor up/left
↘	Cursor down/right
home	Return to main view

***Modify* key**

mod	Selecting an entry from a list, indicated by an arrow (↓)

Numeric keys

* 0 ... 9

6.2 Keypad lock

Simultaneous actuation of keys 0 + ↘ in the main view locks the keypad to prevent further inputs.

The display shows <<< LOCKED >>>.

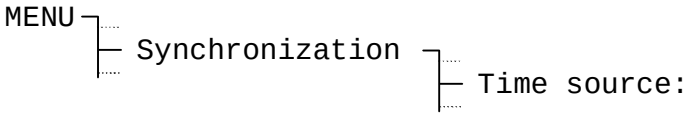
Simultaneous actuation of the keys 1 + ↘ cancels the lock.

```
10:36:59        Monday
24.07.2000      Summer

<<<<<< LOCKED >>>>>>
```

6.3 Menu Navigation

This example explains how to navigate through the menu of the ETC booster and how to change a configuration value. The individual menu items are marked by a schematic diagram of the menu tree.



In the following example, the time source is to be set at DCF.

10:36:59 Monday 24.07.2000 Summer STATE MENU

Press the ▲┘ key (MENU) to enter the main menu.

Time + Date Synchronization Slave clock lines BACK SELECT

The ‘Time + Date’ line then flashes, using the cursor key ↘ move down by one menu item.

Time + Date **Synchronization** BACK SELECT

The ‘Synchronization’ line now flashes, using the navigation key ▲┘ (SELECT) select this menu item.

Time source: none Configuration BACK EDIT

The ‘Time source’ entry now flashes, press the navigation key ▲┘ (CHANGE).

Time source: **none** Configuration CANCEL ↓ OK

Select via the *modify* key mod, indicated by an arrow above the key . Confirm the selection with the navigation key ▲┘ (OK).

Time source: **DCF** Configuration BACK EDIT

DCF is now configured as the time source. The associated time zone is automatically set at 02 (CET).

Return to the main menu with the home key.

7 Power Supply

7.1 External DC – Power Supply

The ETC booster has to be supplied by an external direct current link. Approved currents are 24V, 48V and 60V.

The external DC power supply also dictates the output line voltage.

7.2 Passive Running Reserve Battery

The ETC booster has a passive running reserve. The fitted lithium battery saves all data and operates the internal RTC (Real Time Clock). After a power failure, the master clock time is again at the precise time. The lithium battery is already fitted and connected upon delivery. If a master clock has not been in use for over 2 years, the lithium battery should be replaced. When the master clock is connected, the lithium battery has a service life of at least 15 years.

8 External Time Sources

8.1 General

It is possible to connect the ETC booster to several kinds of time reference. This chapter gives a short description of the time sources. The configuration of the corresponding synchronization mode will be described in chapter 10.

8.2 Minute Impulses

The impulse input allows the synchronization with polarized minute impulses of 24, 48 or 60V. The setting of date and time must be made manually. The seasonal time change-over will be executed automatically.

8.3 Active DCF

The active DCF input allows a synchronization to an active DCF with 24, 48 or 60V. Date and time are automatically adopted. With this synchronization type, the daylight saving time occurs automatically. The DCF modes can be found in chapter 4.312.5.4.

9 Time + Date – Setting and configuring the master clock time

9.1 Manual setting of time and date

Manual setting of the time is required where no external time reference is connected or the clock is set to ‘synchronization only'. Automatically read-in of time information from external time sources overwrites the manual input.

When operating without a time source, set the time zone prior to setting the time, see chapter 9.2.

9.1.1 Time

Manual setting of the time for the master clock unit without modification of the date. The shown time corresponds to the selected time zone, see chapter 9.2.

```
MENU
  Time + Date
    Time:   15:13:09
```

9.1.2 Date

Manual setting of the date for the master clock unit without modification of the time.

```
MENU
  Time + Date
    Date:  04.07.04
```

9.2 Time zone

Choice of time zone. This entry determines the time for the main display and the treatment of the switch program. See also time zone entry (A) in graphic of chapter 5.

```
MENU
  Time + Date
    Time zone:    02
```

The cursor keys  /  are used for selection from the 100 possible entries, or the time zone can be selected by means of a numerical input.

9.3 Quartz correction

Manual correction of the quartz drift.

```
MENU
  Time + Date
    Quartz correction
```

The quartz drift is corrected through input of the observed weekly time deviation between -60.0 to +60.0 seconds. This function is not important when operating with an external time reference.

9.4 Time correction

Time correction of the master clock time between -60.0 and +60.0 seconds.

```
MENU
  Time + Date
    Time correction
```

10 Synchronization – configuration of the external time reference

10.1 Time source

Select the external time source (time reference).

```
MENU
 └ Synchronization
    └ Time source:
```

Select from: **none, minute impulses, DCF**

The time source has to be chosen before setting the corresponding time zone.

10.2 Time zone

Specify the time zone of the time source.

```
MENU
 └ Synchronization
    └ Configuration
       └ Time zone:
```

A time zone is suggested in line with the selected time source. E.g. when selecting **DCF** as time source the time zone 02 for Central European Time will be suggested.

The cursor keys ↖ / ↘ are used for selection from the 100 possible entries, or the time zone can be selected by means of a numerical input.

10.3 Synchronization only

When this setting is activated, the external time source can only set the internal master clock time, where the difference between the time source and the internal master clock is between +/- 1 second and +/- 30 seconds. If the difference is between 0 and 1 second, the internal master clock will be adjusted to the time source in steps of +/- 10 ms per received time telegram.

Notice: After first synchronization of the ETC booster, it is recommended to activate the function 'Synchronization only' to avoid time jumps.

```
MENU
 └ Synchronization
    └ Configuration
       └ Synch. only:
```

Selection from: **Yes** or **No**

10.4 Alarm timeout

Setting the time until an alarm is given, where no valid time can be received from an external time source. For example, with a distorted signal from the time signal receiver.

```
MENU
 └ Synchronization
    └ Configuration
       └ Al.timeout[min]:
```

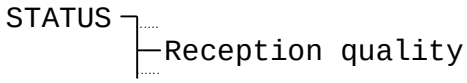
Input range: **0 to 9999 minutes**

11 State – reception quality and alarms

The state menu provides information about current and past alarms as well as about the reception quality of the external time reference. This menu is reached from the main window via the button STATE.

11.1 Reception quality

Displays the configured time source and its current quality. The range for the quality details extends from **0** to **100**.



Example:

Time source: DCF	- Current time source (display only)
Quality tele.: 100	- In the last 10 minutes good reception
Quality signal: 100	- Seconds marking okay
BACK	

11.1.1 Telegram Quality

The following applies to all time sources: Each read-in and valid time packet increases the value by 10. Accordingly, this value decreases by 10 for each missing or invalid time packet.

Telegram quality (resp. sync. quality) is available for all external time sources.

Notice: An ideal figure for telegram quality is 100. All other figures greater than 60 are however adequate for reliable synchronization.

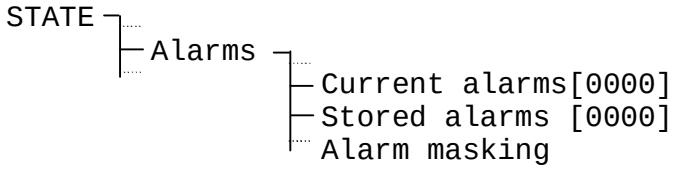
11.1.2 Signal Quality

For all time sources: With every read in of the seconds mark, this figure increases by 1. This figure reduces accordingly by 1 for every missing seconds mark.

Signal quality (resp. valid time telegrams) is available from the following time sources:
DCF

11.2 Alarms

The current and stored alarms are listed under this item.



Current alarms: Announcement of a currently active alarm in the system.

Stored alarms: Alarms, which are occurred at least once since the last alarm clear. A stored alarm can still be active, or already removed.

Alarm masking: A masked alarm is suppressed and will, depending on the masking, not affect the display and the alarm contact or the CAS/CAN communication.

11.2.1 Alarm overview

The alarm list can be found in annex D.

11.2.2 Alarm display

The alarms are displayed on the ETC booster as follows. As an example there are two current alarms shown (mains power failure and overload line active):

```
Current alarms
  ABCDEFGHIJKLMNOP
  ----*-*---------
BACK
```

Legend: **-** No alarm / alarm masked
***** Alarm / Alarm not masked

11.2.3 Reset stored alarms

All occurred alarms are stored and remain in the menu "Stored alarms", even if the error is no longer active in the system. Consequently all alarms can be retraced.

The stored alarms can be reset by selecting and confirming the function DELETE. The time / date information in brackets corresponds to the time (UTC) of the last erasing.

```
Stored alarms
  ABCDEFGHIJKLMNOP
  ----*-*----*----
BACK           DELETE
```

```
Reset all stored
 alarms?
 (11:15:42/28.02.06)
CANCEL            OK
```

11.2.4 Alarm masking

All alarms can be masked by setting the alarm mask. If a masked alarm occurs, it will be suppressed.

Mask alarm relay: **-** Alarm is masked. The alarm is only reported in active and stored alarms but will not be shown in the home display. The alarm relay contact of the ETC booster will not switch.

*	Alarm is reported in active and stored alarms and will be shown in the home display. The alarm relay contact of the ETC boster will switch.

For changing the masks choose the function CHANGE. Highlight the desired letter with the cursor by using the cursor keys (blinking cursor). Then press the *modify* key (arrow occurs in the display) to change the settings. Confirm the entry by pressing OK.

```
Alarm relay
  ABCDEFGHIJKLMNOP
  ****************
BACK              EDIT
```

```
Alarm relay
  ABCDEFGHIJKLMNOP
  ****▉***********
CANCEL      ↓       OK
```

```
Alarm relay
  ABCDEFGHIJKLMNOP
  ****-***********
BACK              EDIT
```

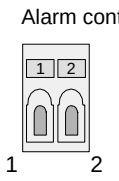
Example:

An ETC booster with external 24V power supply shall not report mains failure alarms in the home display. Therefore in above illustration the mains power alarm (E) was masked.

11.2.5 Alarm contact

The ETC booster provides an alarm contact. It is open as long as at least one active alarm is present. In normal operation, without pending alarms or when an alarm is masked, it is closed.

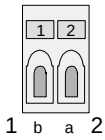
Connection terminals:



12 Slave clock lines

12.1 Line type and connections

Connections:



slave clock line ETC booster

The slave clock line can be individually configured as type “Impulse”, “DCF” or "DCF-Imp". The type “Impulse” allows to output polarized 1-minute-, ½-minute-, 1/5-minute-, 1/8-minute- or 1-second-impulses (refer to chapter 12.4.4) . The type “DCF” outputs a synthetic, active – time code. You are free to choose the suitable signal from six modes (refer to chapter 4.312.5.4). The line type "DCF imp" combines the output of a synthetic, active DCF 77 – time code and the function of a 1-min-impulse line with alternating impulse polarity (refer to chapter 12.6).

For changing the line type, you first have to enter the slave clock lines configuration menu regardless of the current mode setting. E.g. changing the line type from ”Impulse” to “DCF”:

```
...
    Line X [Impulse]
                      Configuration
                                    Line type:
                                              Impulse
```

The modify key *mod* is used for selection of the line type (Impulse/DCF/DCF-Imp).

```
...
    Line X [DCF]
                      Configuration
                                    Line type:
                                              DCF
```

Confirm with the navigation key ▲┘ (OK).

Caution: You must not change the line type of a slave clock line when it is connected to the terminals of the ETC booster. Make sure that the used slave clocks match your line configuration settings **before** connecting the line to the terminals.

Notice: An electronic overload switch protects the output stage in case of short-circuits on the line.

12.2 Active line current supervision

The ETC booster provides an active current supervision for its slave clock lines. For each line individually a high and a low limit can be entered. The first line of the menu shows the current value of the line current.

If the measured current exceeds the high limit or if it falls below the low limit an alarm will occur which indicates a faulty operation on the line. This kind of alarm will not shut down the line. If the current supervision is not in use, set the high limit to the maximum (refer to current allocation) and the low limit to zero.

12.3 Active line voltage supervision

The ETC booster provides an active line voltage supervision for its slave clock lines. In order for the ETC booster to monitor the line voltage, the line voltage to be monitored must be configured.

```
MENU
  Slave clock lines
                    Line voltage: [24V]
```

Selection from: **24V, 48V, 60V**

For every line voltage, there is a defined lower and upper limit. The following table shows the alarm limits:

	voltage		
	24 V	48 V	60 V
lower limit	19 V	38V	50 V
upper limit	32 V	60 V	72 V

12.4 Impulse line

12.4.1 Changing the operation state

```
MENU
  Slave clock lines
                    Line X [Impulse]
                                      State:
```

Selection from: **stop, run, 12:00**

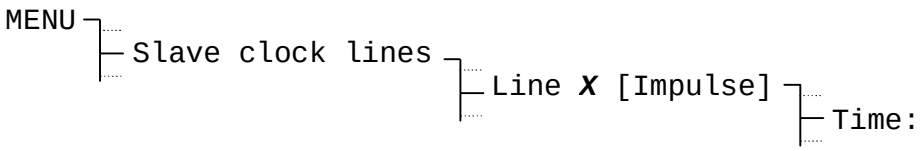
In the *Stop* state, there is no pulse output (pulse line stopped). The state *Run* shifts the pulse line in normal operation (pulse output as set in the configuration).

In the *12:00* state, pulses are sent out until the clock reaches the adjusted catch-up periodicity (see chapter 12.4.7). This state serves the clock to reach a defined position for maintenance:

catch-up periodicity:	**behavior:**
60 sec	Pulse output in catch-up speed, until xx:xx:00 is reached. *(function insignificant).*
12 h	Pulse output in catch-up speed, until 12:00 is reached.
24 h	Pulse output in catch-up speed, until 00:00 is reached.
1 week	*(function insignificant)*

12.4.2 Line time

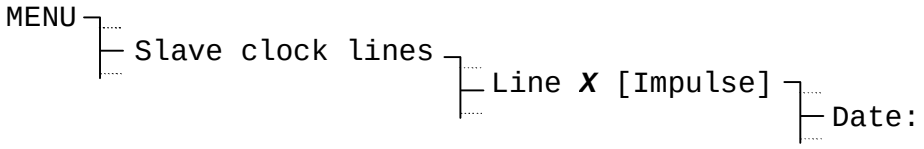
In order to be able to set the slave clocks of an impulse line onto the master clock time, the line must first be stopped (state: stop), then all the hands of the slave clocks must be set to the same position. Set the line time manually to the time displayed on slave clocks (see menu below) and start the line again.



If some slave clocks lack one step (1 second, ½-minute, $^1/_5$-minute, $^1/_8$-minute or 1 minute), the polarity of the line has to be changed at these particular clock connections. Afterwards the clocks shall be set again as per the above mentioned procedure.

12.4.3 Line date

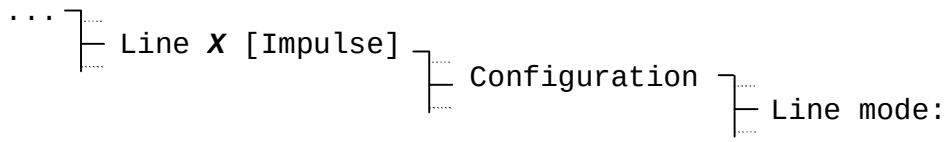
The line date is only important for calendar clocks with a catch-up periodicity of one week (see chapter 12.4.7).



In case of smaller catch-up periodicities (60s, 12h and 24h) the date will be automatically set to the master clock date and is not of importance.

12.4.4 Line mode

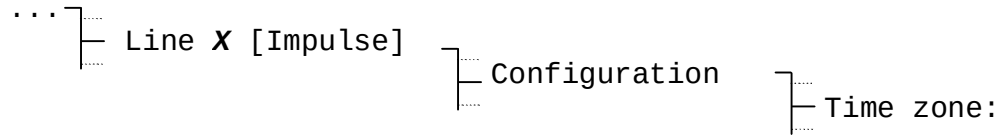
Determines the output frequency of the polarized impulses.



Selection from: **sec, 1/8 min, 1/5 min, 1/2 min, min**

12.4.5 Time zone

Setting of the time zone for this output line.



The cursor keys ↘ / ↘ are used for selection from the 100 possible entries, or the time zone can be selected by means of a numerical input.

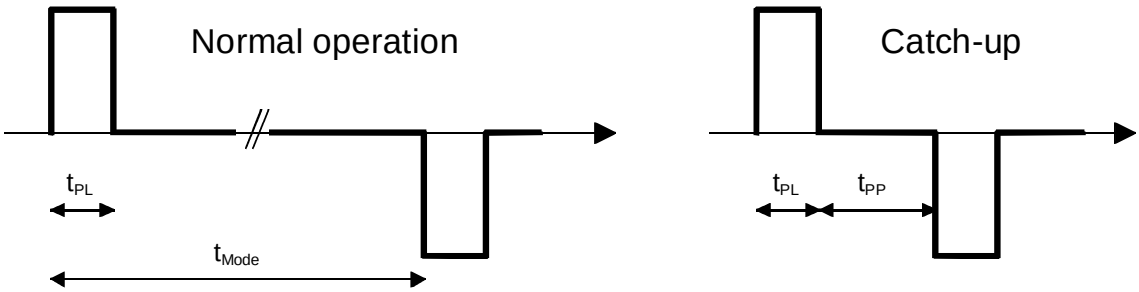
12.4.6 Impulse length and impulse pause

For the impulse length and pause the ETC booster proposes a standard value according to the selected line mode. These values can, however, be changed.

```
...
   Line X [Impulse]
                    Configuration
                                  Pulse length[s]:
                                  Pulse pause[s]:
```

Input range: **0.2s - 0.7s**, for second lines, (sum however smaller 0.8s)
0.2s - 5.9s, for $^1/_8$- and $^1/_5$-minute lines, (sum however smaller 6.0s)
0.2s - 9.9s, for $^1/_2$-minute and minute lines

The value of the impulse pause is only of importance in catch-up running. The following graph gives an explanation of the relations.



t_{PD}: Impulse length
t_{PP}: Impulse pause
t_{Mode}: Impulse cycle determined by the line mode (e.g. min = 1 minute)

12.4.7 Catch-up periodicity

Determines the periodicity of the connected impulse slave clocks.

```
...
   X Line Y
            Configuration
                         Period:
```

Selection from: **60 sec, 12 h, 24 h, 1 week**

12.5 DCF Output

12.5.1 Change of the line state

```
MENU
  Slave clock lines
    Line X [DCF]
      State:
```

With each pressing of **EDIT** the line state alternates between **stop** and **run**.

12.5.2 Line time and date

The displayed time can consequently not be changed and bases on the selected time zone. A stopped line will always display 12:00:00.

```
MENU
  Slave clock lines
    Line X [DCF]
      Time:
      Date:
```

12.5.3 Time zone

Setting of the time zone for this output line.

```
...
  Line X [Impulse]
    Configuration
      Time zone:
```

The cursor keys / are used for selection from the 100 possible entries, or the time zone can be selected by means of a numerical input (refer to annex C).

12.5.4 DCF Mode

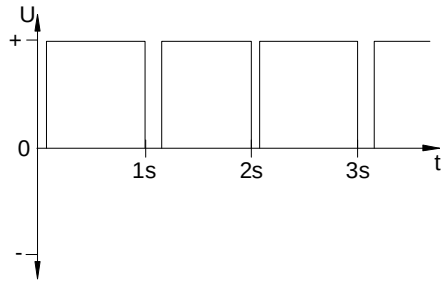
Determines the polarity of the active DCF 77 time code.

```
...
   Line X [DCF]
      Configuration
         Mode DCF: 01
```

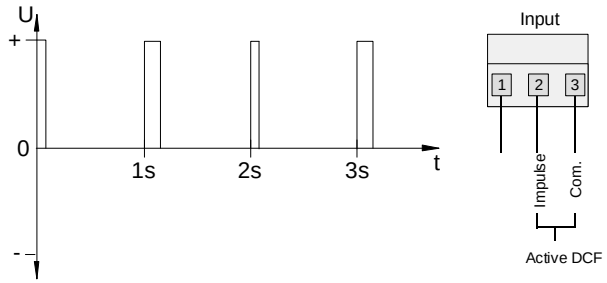
Selection from: **1, 2, 3, 4, 5, 6**

The six different modes :

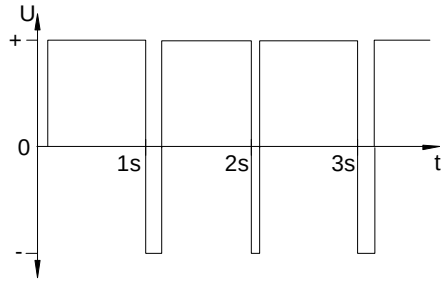
Mode 1



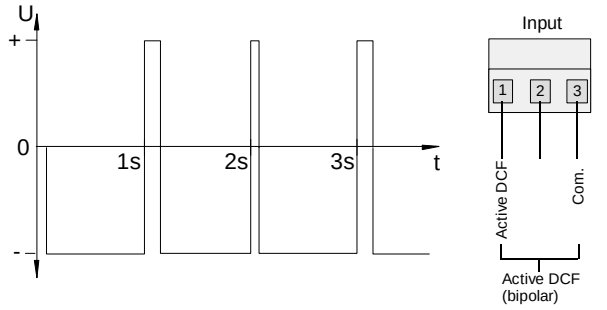
Mode 2



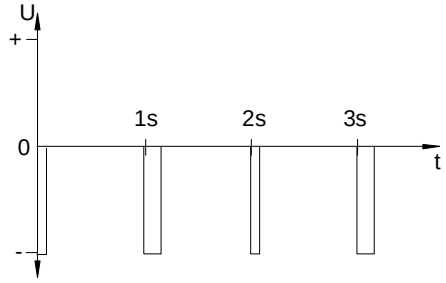
Mode 3



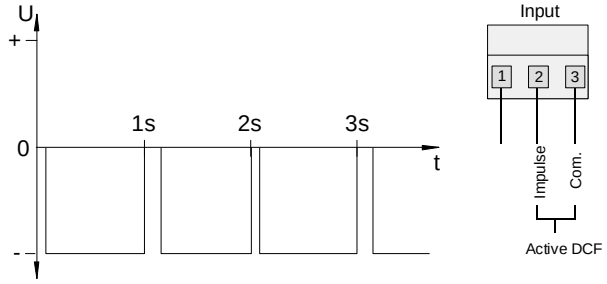
Mode 4



Mode 5:



Mode 6



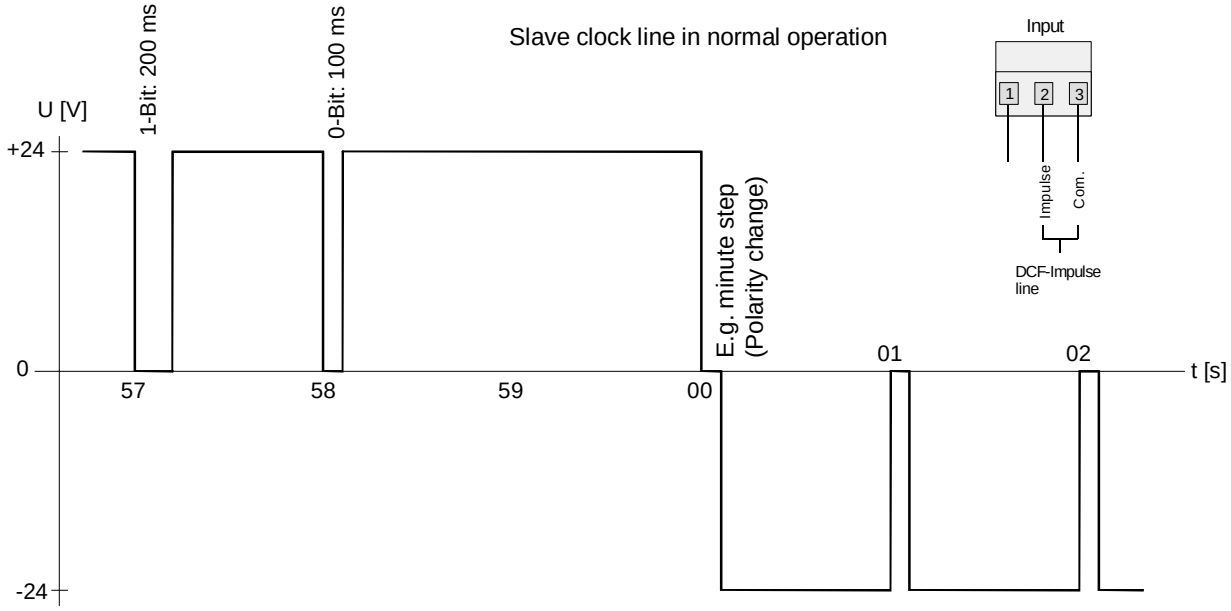
Mode 1/6, 2/5, 3/4 are equal. Their polarity only depends on how the line is connected to the ETC booster. The signal forms show the voltage measured from terminal b to terminal a (see annex A).

12.6 Combined DCF-impulse output

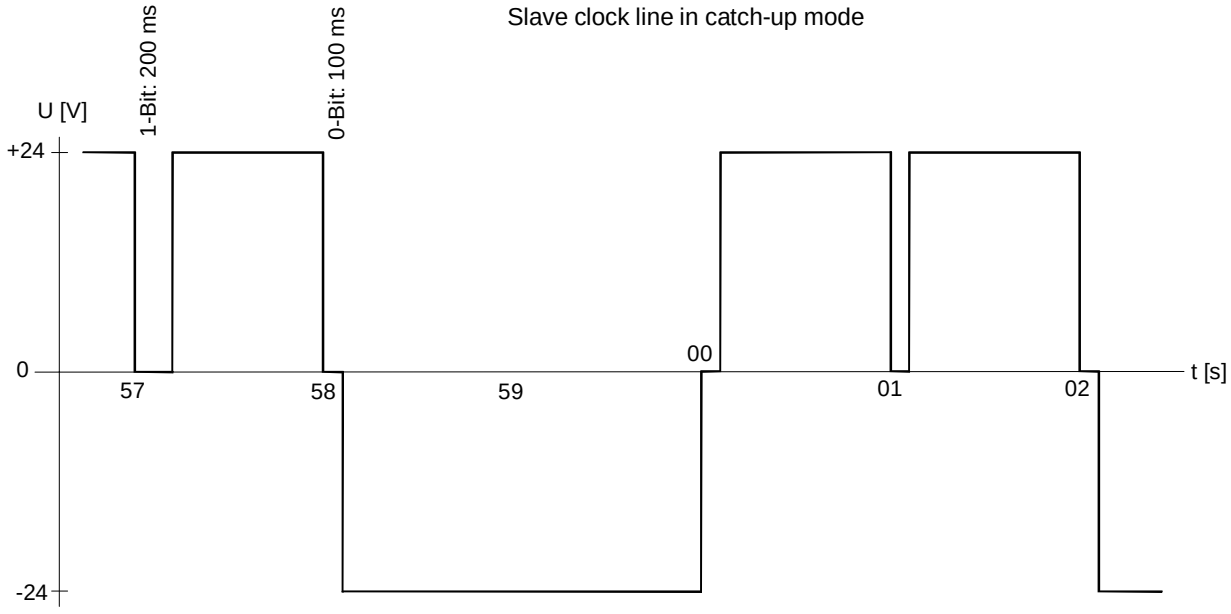
12.6.1 Description

With the line type "DCF-Imp" it is possible to drive minute or ½ -minute impulse clocks and self-setting Active – DCF clocks on the same line. The following line modes are possible:

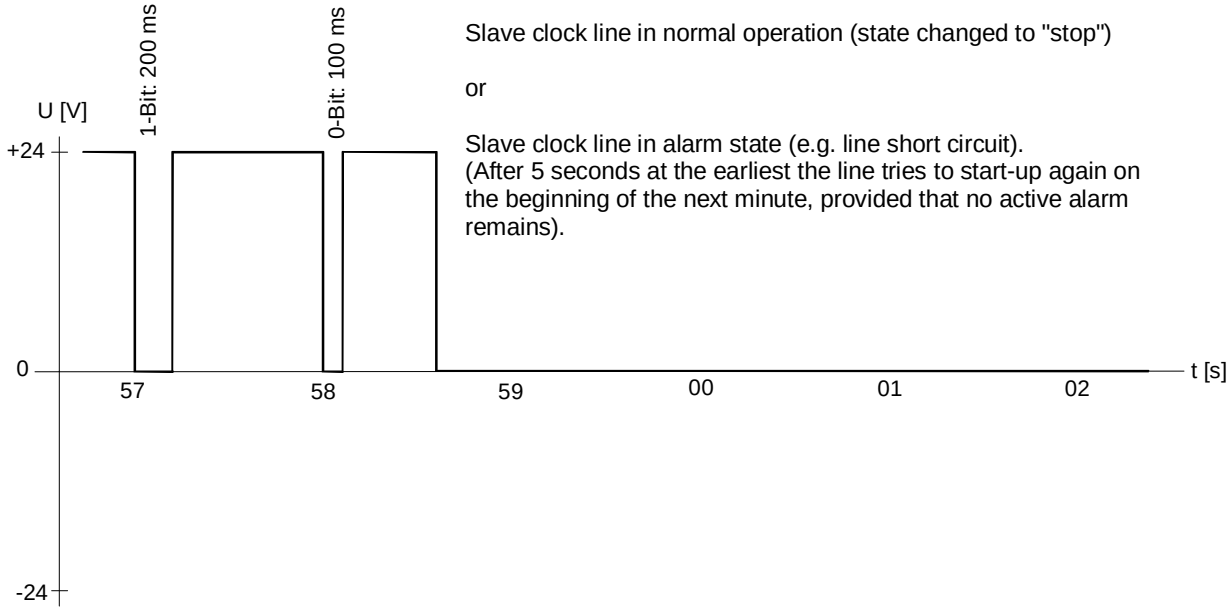
Line in normal operation: DCF time code output 24V, every minute / ½-minute the polarity is changing.



Line in catch-up mode: DCF time code output 24V, every 2 sec. the polarity is changing.



Line stopped: The output is set to mean voltage 0V.



The following settings of the impulse line are fixed and cannot be modified:

Pulse duration: 1.8 or 1.9 s
Pulse pause: 0.2 or 0.1 s
Catch-up periodicity: 12 hours

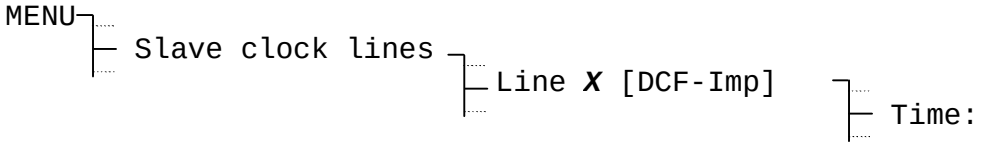
12.6.2 Change of the line state

MENU
- Slave clock lines
  - Line ***X*** [DCF-Imp]
    - State:

With each pressing of **EDIT** the line state alternates between **stop** and **run**. After a line was put into operation (state: run), the output of the minute impulses and DCF 77 time code will start at the beginning of the next minute.

12.6.3 Line time

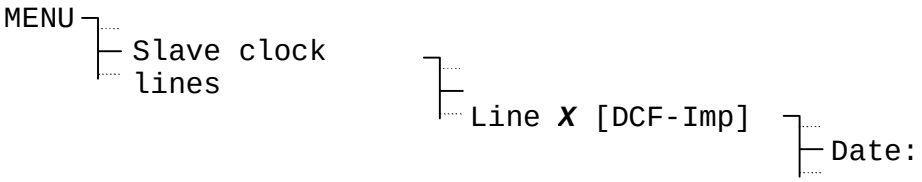
To set the slave clocks of an impulse line to the master clock time, the line must first be stopped (state: stop). Then all the hands of the slave clocks must be set to the same position. Set the line time manually to the time displayed on slave clocks (see menu below) and start the line again.



If some slave clocks lack one step (1 minute), the polarity of the line has to be changed at these particular slave clock connections. Afterwards the clocks shall be set again as per the above mentioned procedure.

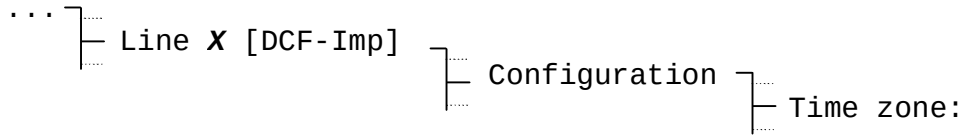
12.6.4 Line date

The line date is only important for calendar clocks with a catch-up periodicity of one week and is therefore not essential to set.



12.6.5 Time zone

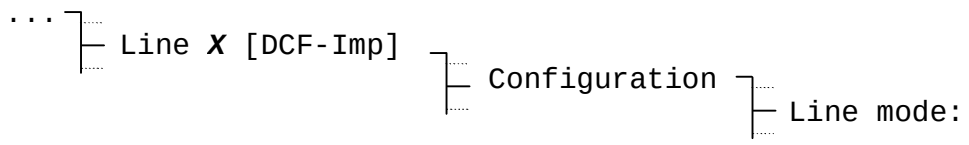
Setting of the time zone for this output line.



The cursor keys / are used for selection from the 100 possible entries, or the time zone can be selected by means of a numerical input.

12.6.6 Line mode

Selection of **min** or **1/2 min** for the output of polarized minute or ½ -minute impulses.



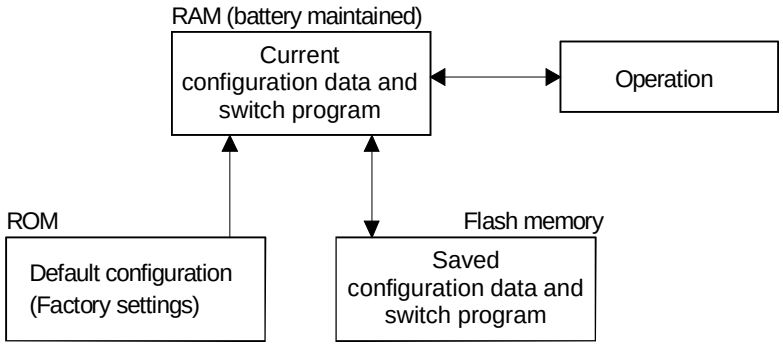
The resulted impulse interval is therefore in normal operation 60, respectively 30 seconds.

13 Data manager – configurations and files

This section deals with the administration of configuration data (settings of the ETC booster) and the download, upload and deletion of files (download of system software, switch programs and season tables).

13.1 Administration of the configuration data

The current configuration data and the switch program are stored in the battery-maintained RAM and can be saved in the non-volatile flash memory and can also be loaded from this, see diagram. In addition, a function permits the loading of default configuration.



13.2 Default configuration

The default configuration (factory settings) will be loaded after the confirmation prompt. With this function the switch program memory and the switch program in RAM are deleted too.

```
MENU
  File manager
    Default config.
```

After the selection, the execution has to be confirmed.
A summary of the default configuration (factory settings) are listed in annex B.

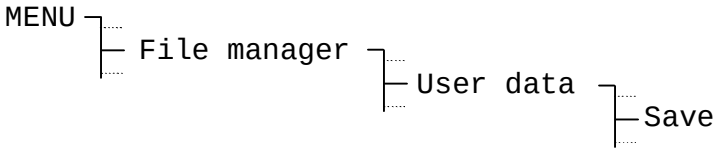
13.3 User configuration

The current ETC booster configuration and the switch program can be saved in the non-volatile flash memory and loaded again from this memory. The settings are thus retained even after a software update.

Notice: It is possible, that configuration data of an old software version becomes invalid, because of larger modifications in the software. Therefore it is important to check the settings of the device after each software update. If needed, the ETC booster has to be configured completely new. Don't forget to save the correct configuration into the flash memory afterwards.

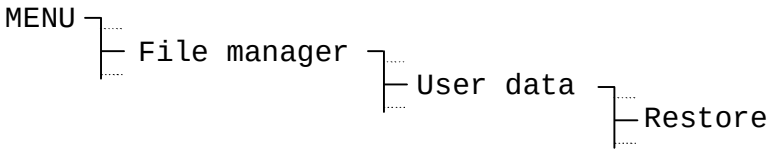
13.3.1 Save

Saves current ETC booster configurations and the switch program in the flash memory.



13.3.2 Restore

Recalls saved ETC booster configurations and the switch program from the flash memory into the RAM.



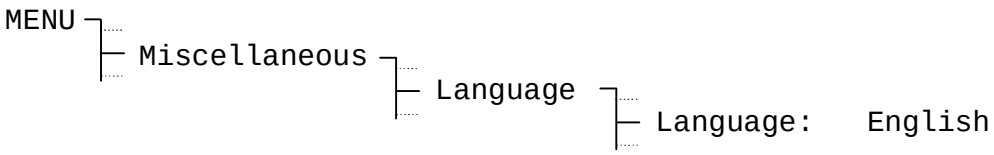
Notice: Loading the configuration from the flash memory into the RAM also takes place automatically after an update of the system software.

14 Miscellaneous

This chapter deals with the adjustments concerning the display presentation, selection of language, as well as the indication of the software and hardware versions.

14.1 Language

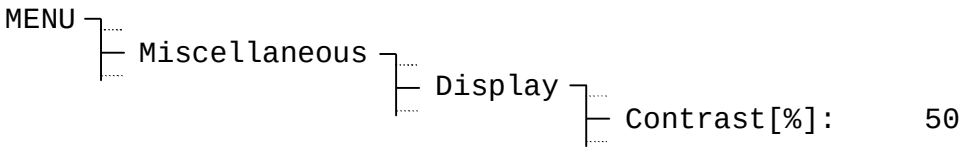
The following languages are available: **English, German, French, Russian, Portuguese and Danish**.



14.2 Display

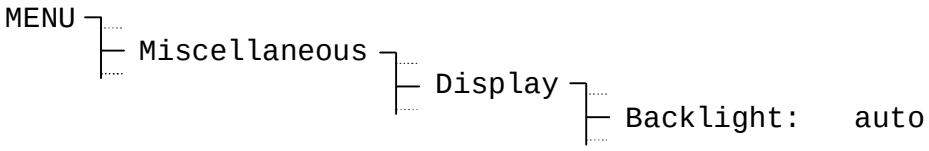
14.2.1 Contrast

The display contrast can be varied between **0** and **99%**.



14.2.2 Backlight

In the factory setting, the backlighting of the LC Display switches off after 3 minutes (**auto**). This automatic setting can also be locked **(On/Off)**.



14.3 Versions

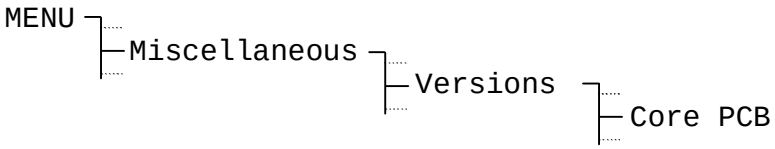
The number and version of the currently installed software and hardware parts can be recalled under this menu item.

14.3.1 System Software

Information about the currently installed system software on the ETC booster.

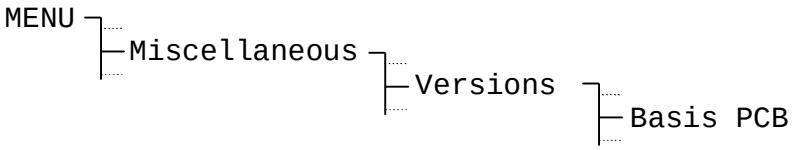
14.3.2 Core Print PCB

Information about the currently installed Core Print on the ETC booster.



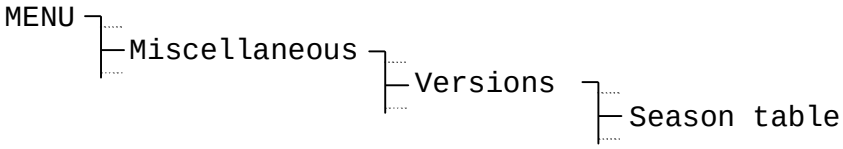
14.3.3 Basis Print PCB

Information about the currently installed Basis Print on the ETC booster.



14.3.4 Season table

Information about the currently installed season table on the ETC booster.



15 Maintenance

15.1 Troubleshooting

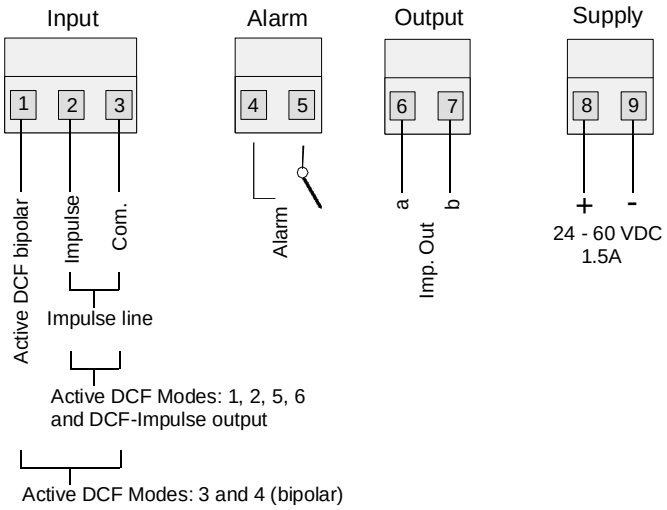
#	Malfunction / indication:	Possible causes/ actions
1	None or wrong text visible on the display (points or incomplete letters).	The RAM memory area of the character set contains invalid data. Possible causes are electrical malfunctions that can arise when restarting after power outages or may be due to strong inductive switching stress of the relay contacts. The fault can usually be remedied by an ETC booster reset using the hotkeys (see description in chapter 15.2).
2	Needed information to contact MOBATIME service.	**Device type, part number, production number and serial number:** These details are given on the adhesive type label. (The device type can be queried using the *mod* button in the Home menu). **Current software version:** This can be queried in the `Miscellaneous/Versions/System Software` menu. **Current and stored alarms:** These can be queried using the `STATE/Alarms` menu. **Place and date of purchase and of commissioning of the device.** **Most comprehensive possible details of the malfunction:** Describe the problem, possible causes, measures taken, the system environment / operating mode and configuration, etc.

15.2 Reset with hotkey combination

The following procedure reset the master clock to initial state (factory settings). Current configuration and switch programs will be lost.

1. Remove power supply (mains / possibly. external battery).
2. Press and hold keys ▲┘ (Selection right) and 2 simultaneously.
3. Switch on (connect) power supply.
4. Release keys (Home menu appears in the display).
5. Load factory configuration under menu `File manager/Default config`. (chapter 13.2).
6. Do the desired configurations / enter switch program or download a program by using SwitchEditor software.
7. When user configuration is completely done, save user data to the FLASH memory by selecting menu `File manager/User Data`. (chapter 13.1).

A Connection diagrams



See chapter 12.5.4 and 12.6

Terminal	Connection	Description
1	Active DCF	Active DCF input
2	Impulse	Impulse input
3	Com.	Common ground active DCF and impulse input
4	Alarm relay contact	
5	Alarm relay contact	
6	Slave clock line a	
7	Slave clock line b	
8	+ VDC	Direct current input (20 – 68 VDC)
9	- VDC	Direct current input (20 – 68 VDC)

B Default configuration

From the factory, the ETC booster is supplied in the default configuration. These settings can be reloaded (see chapter 13.2).

Parameter	Value	Chapter	Page
Time + Date		***9***	***15***
Time zone	02	9.2	15
Quartz correction	0.00 s	9.3	15
Time correction	0.00 s	9.4	15
Synchronization		***10***	***16***
Time source	none	10.1	16
Time zone	00 / 02 (DCF)	10.2	16
Synchronization only	no	10.3	16
Alarm timeout	1440 min	10.4	16
State / Alarms		***11***	***17***
Alarm mask display / relay	Without masking	11.2.4	18
Slave clock lines		***12***	***20***
Line type	Impulse	12.1	20
Line state	stop	12.4.1, 12.5.1,	
Time zone	00	12.4.5, 12.5.3,	
Line current			
Upper limit	1000	12.2	20
Lower limit	0000	12.2	20
Line voltage			
Voltage	24V	12.2	20
Impulse output			
Line mode	sec	12.4.4	22
Pulse length	0.2	12.4.6	23
Pulse pause	0.3	12.4.6	23
Period	12 h	12.4.7	23
DCF output			
DCF impulses	01	12.5.4	25
Miscellaneous		***14***	***31***
Language	English	14.1	31
Contrast	50	14.2.1	31
Backlight	Auto	14.2.2	31

C Time zone table

Time zone entries in the standard season table (version 10.0).

Time zone	City / State	UTC Offset	DST Change	Standard → DST	DST → Standard
00	UTC (GMT), Monrovia, Casablanca	0	No		
01	London, Dublin, Edinburgh, Lisbon	0	Yes	Last Sun. Mar. (01:00)	Last Sun. Oct. (02:00)
02	Brussels, Amsterdam, Berlin, Bern, Copenhagen, Madrid, Oslo, Paris, Rome, Stockholm, Vienna, Belgrade, Bratislava, Budapest, Ljubljana, Prague, Sarajevo, Warsaw, Zagreb	+1	Yes	Last Sun. Mar. (02:00)	Last Sun. Oct. (03:00)
03	Athens, Istanbul, Helsinki, Riga, Tallinn, Sofia, Vilnius	+2	Yes	Last Sun. Mar. (03:00)	Last Sun. Oct. (04:00)
04	Bucharest, Romania	+2	Yes	Last Sun. Mar. (03:00)	Last Sun. Oct. (04:00)
05	Cairo, Pretoria, Harare	+2	No		
06	Amman	+2	Yes	Last Thu. Mar. (23:59)	Last Fri. Oct. (01:00)
07	UTC (GMT)	0	No		
08	Kuwait City, Minsk, Kaliningrad	+3	No		
09	Praia, Cape Verde	-1	No		
10	UTC (GMT)	0	No		
11	Abu Dhabi, Muscat, Tbilisi, Moscow, St. Petersburg, Volgograd, Samara	+4	No		
12	Kabul	+4.5	No		
13	Adamstown (Pitcairn Is.)	-8	No		
14	Tashkent, Islamabad, Karachi	+5	No		
15	Mumbai, Calcutta, Madras, New Delhi, Colombo	+5.5	No		
16	Astana, Thimphu, Dhaka, Yekaterinburg	+6	No		
17	Bangkok, Hanoi, Jakarta, Novosibirsk	+7	No		
18	Beijing, Chongqing, Hong Kong, Singapore, Taipei, Urumqi, Krasnoyarsk	+8	No		
19	Tokyo, Osaka, Sapporo, Seoul, Irkutsk	+9	No		
20	Gambier Island	-9	No		
21	South Australia: Adelaide	+9.5	Yes	1st Sun. Oct (02:00)	1st Sun. Apr. (03:00)
22	Northern Territory: Darwin	+9.5	No		
23	Brisbane, Guam, Port Moresby, Yakutsk	+10	No		
24	Sydney, Canberra, Melbourne, Tasmania: Hobart	+10	Yes	1st Sun. Oct. (02.00)	1st Sun. Apr. (03:00)
25	UTC (GMT)	0	No		
26	UTC (GMT)	0	No		

27	Honiara (Solomon Is.), Noumea (New Caledonia), Vladivostok	+11	No		
28	Auckland, Wellington	+12	Yes	Last Sun. Sep. (02:00)	1st Sun. Apr. (03:00)
29	Majuro (Marshall Is.), Magadan, Anadyr	+12	No		
30	Azores	-1	Yes	Last Sun. Mar. (00:00)	Last Sun. Oct. (01:00)
31	Middle Atlantic	-2	No		
32	Brasilia	-3	Yes	3rd Sun. Oct. (00:00)	3rd Sun. Feb. (00:00)
33	Buenos Aires	-3	No		
34	Newfoundland, Labrador	-3.5	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
35	Atlantic Time (Canada)	-4	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
36	La Paz	-4	No		
37	Bogota, Lima, Quito	-5	No		
38	New York, Eastern Time (US & Canada)	-5	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
39	Chicago, Central Time (US & Canada)	-6	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
40	Tegucigalpa, Honduras	-6	No		
41	Phoenix, Arizona	-7	No		
42	Denver, Mountain Time	-7	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
43	Los Angeles, Pacific Time	-8	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
44	Anchorage, Alaska (US)	-9	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
45	Honolulu, Hawaii (US)	-10	No		
46	Midway Islands (US)	-11	No		
47	Mexico City, Mexico	-6	Yes	1st Sun. Apr. (02:00)	Last Sun. Oct. (02:00)
48	Adak (Aleutian Is.)	-10	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
49	UTC (GMT)	0	No		
50	UTC (GMT)	0	No		
51	UTC (GMT)	0	No		
52	UTC (GMT)	0	No		
53	UTC (GMT)	0	No		
54	Scoresbysund, Greenland	-1	Yes	Last Sun. Mar. (00:00)	Last Sun. Oct. (01:00)
55	Nuuk, Greenland	-3	Yes	Last Sat. Mar. (22:00)	Last Sat. Oct. (23:00)
56	Qaanaaq, Greenland	-4	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
57	Western Australia: Perth	+8	No		
58	Caracas	-4.5	No		
59	CET standard time	+1	No		
60	Santiago, Chile	-4	Yes	2nd Sun. Oct. (00:00)	2nd Sun. Mar. (00:00)
61	Chile, Easter Island	-6	Yes	2nd Sat. Oct. (22:00)	2nd Sat. Mar. (22:00)
62	Baku	+4	Yes	Last Sun. Mar. (04:00)	Last Sun. Oct. (05:00)
63	UTC (GMT)	0	No		
64	UTC (GMT)	0	No		

In countries where the DST switch date changes annually (e.g. Iran, Israel), the time zone has to be defined manually in the user time zone table (entries 80 – 99).

Legend:

UTC:	Universal Time Coordinate, equivalent to GMT
DST Change:	Daylight Saving Time changeover
Standard → DST:	Time change from Standard time (Winter time) to Summer time
DST → Standard:	Time change from Summer time to Standard time (Winter time)

Example:

2nd last Sun. Mar. (02:00) Switch over on the penultimate Sunday in March at 02.00 hours local time

Attention! The Time Zone Table is usually updated every year. The current table is available for download under the following address: *www.mobatime.com* ➔ *Customer Area* ➔ *Customer Support* ➔ *Support Resources* ➔ *Software Tools* ➔ *Time Zone Table*. In case your device is equipped with a newer version than shown in this manual, the current time zone settings should be checked.

D Alarm list

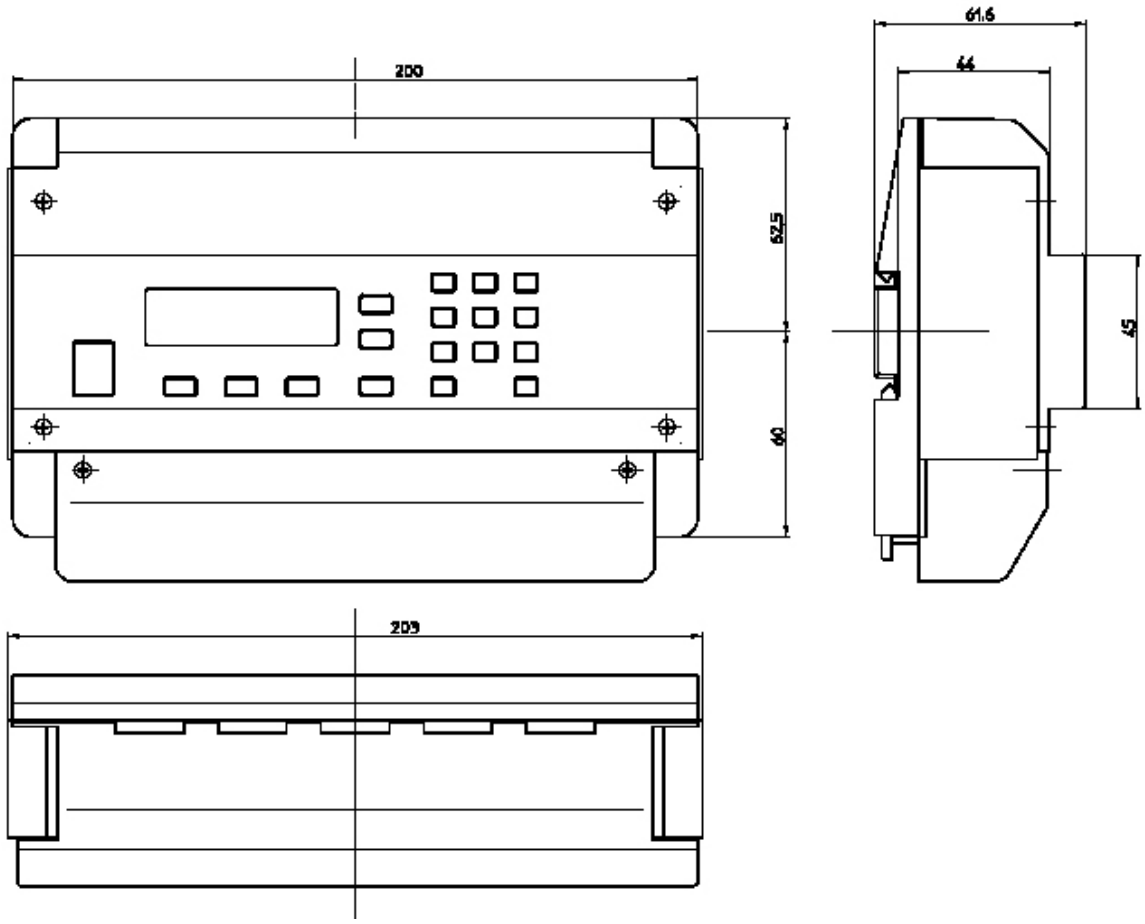
The ETC booster is able to generate up to 16 different alarms depending on the device type. Those alarms are identified by the letters A to P.

A	Failure of external time reception: Within the configured alarm timeout (chapter 10.4), no valid time package was received from the external time source.
B	Internal hardware error
C	Checksum of the saved configuration data is incorrect
D	Error in the automatic quartz trimming: External time source is imprecise or internal quartz is faulty. Error is automatically reset as soon as the deviation from the external time source to the internal quartz sinks again below 50 ppm.
E	Mains power failure
F	Automatic shut down of slave clock line 1 due to overload or short circuit
G	Reserved
H	High current limit exceeded
I	Reserved
J	Low current limit under-run
K	Reserved
L	Line voltage too high / too low
M	Reserved
N	Reserved
O	Reserved
P	Reserved

E Technical data

EMC	EN 50081-1 / EN 61000-6-2 / EN 50121-4 / EN 60950 / Protection class I
Dimensions	Synthetic housing, (H x B x T [mm] = 200 x 145 x 64), see figure below
Weight	approx. 2 kg
Ambient temperature	0 to 50ºC, 10-90% relative humidity, without condensation
Microprocessor	16 Bit, RAM buffered, real-time clock (RTC), flash memory
Lithium battery	Storage shelf life: 2 years Operational service life: 15 years
Display	4 x 20 characters with backlighting
Menu languages	German, English, French, Russian, Portuguese and Danish selectable
Keypad	Alphanumeric with navigation keys
Accuracy	Time output (synchronized): +/- 10 ms absolute Autonomous operation (standard quartz): +/- 0.1 s per day (observed for 24 h), at 20ºC +/- 5ºC.
Time zones	80 predefined entries
Time sources	DCF, minute pulses or none (autonomous).
Alarm contact	Opening relay contact (alarm active ➔ contact open) Switching load: AC1: max. 250 V, 10 A, 2500 VA AC15: max. 230 V, 2 A, 500 VA DC1: 30/110/220V, 10/0,3/0,1 A
DC power supply	Nominal voltage 24, 48 or 60 VDC, range: 20 – 68 VDC
DC output	DC voltage output 22..29 VDC, 200 mA max.
Power consumption	1.5A * 60V = 90W
Impulse line	Line modes: 1 sec., 1/8 min., 1/5 min., ½ min., 1 min., DCF Pulse length: 0.2 – 9.9 sec. (limits depending on line mode) Pulse pause: 0.2 – 9.9 sec. (limits depending on line mode) Period: 60 sec., 12 hours, 24 hours, 1 week Current: up to 1000 mA impulse current Voltage: 24, 48, 60 VDC
DCF line	Line modes: refer to chapter 12.5.4 Current: up to 1000 mA impulse current Voltage: 24, 48, 60 VDC
Alarm relay	Contacts: opening contact

Dimensions of the ETC booster:



F Index

G Connection Table (to be filled-in)

Line	Type	Designation

Example:

Line	Type	Designation
1	*Impulse*	*Slave clock line, main building west, 1st floor*

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