INSTRUCTION MANUAL

MobaTime Server MTS

Master Clock and Universal Time Reference

Certification of the Producer

STANDARDS
The MobaTime Server MTS has been developed and produced in accordance with the EU Standards 89/336/EWG and 96/48/EWG.

Applied standards (see chap. 1.2):
EN 61000-6-2
EN 50121-4
EN 61000-6-4

CE

References to the Instruction Manual

1. The information in this Instruction Manual can be changed at any time without previous notice.
2. This Instruction Manual has been composed with 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 start the setting-up of the product, only once you have correctly understood all information for the installation and of the operation.
5. The installation must only be carried out by skilled staff.
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Overview

Table of Content

1 Introduction

1.1 Scope of Delivery

The scope of delivery includes:
- A complete MobaTime Server equipped with all internal options
- This Instruction Manual (No. 800196)
- MTSW software, consisting of a disk and download cable

1.2 Versions and Options

MobaTime Server MTS is available in the following basic versions:

Model	Basic equipment[1]	Supply	Network processor (S)NTP, SNMP, EMail	EMC
MTS basic 24 VDC	✓	24 VDC	-	EN 50121-4 [2] EN 61000-6-4
MTS basic 230 VAC	✓	110-240 VAC	-	EN 61000-6-2 EN 61000-6-4
MTS basic 230 VAC / EN 50121-4 [3]	✓	110-240 VAC	-	EN 50121-4 [2] EN 61000-6-4
MTS net 24 VDC	✓	24 VDC	✓	EN 50121-4 [2] EN 61000-6-4
MTS net 230 VAC	✓	110-240 VAC	✓	EN 61000-6-2 EN 61000-6-4
MTS net 230 VAC / EN 50121-4 [3]	✓	110-240 VAC	✓	EN 50121-4 [2] EN 61000-6-4

[1] The basic equipment includes synchronisation inputs, master clock functions, display, keyboard and 2 time channels (cf. also chapter 3).
[2] For railway applications.
[3] Differs from MTS... 230 VAC only through upstream over-voltage protection.

In addition, the following internal options are also available:

- **LON-MTS**   LON module for synchronisation and monitoring of the MTS by a Master Time Center MTC
- **OCQ MTS**   Heated high precision crystal
- **MTS BP 12 V / 1.2 Ah** Power reserve lead acid accumulator
- **Adapter boards**   Various adapter boards for time channel outputs. Customized adapter boards are also available.

Note:
The present Instruction Manual contains information for all of the basic versions and options.

2   Checklist for Start-up

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

☐   Read 'References to the Instruction Manual' on page 2

☐   Note assembly information (Annexe G, page 74)

☐   Application specific wiring of the inputs and outputs (Annexe A, page 46 and following)
     Attention: Do not yet connect the MTS net to the LAN network!

☐   Connect supply (230 V AC or 24 V DC) and switch on (Annexe A, page 46 and following)

☐   Read notes of operation (chapter 5, page 10 and following)

☐   Set the required menu language (chapter 12.1, page 37)

☐   Set time zone of the master clock display (chapter 7.2, page 15)

☐   When available, configure external time reference (chapter 6, page 12 and following) and check the reception quality (chapter 0, page 41)

☐   When there is no external time reference, set local time and date manually (chapter 7.1, page 15 and following)

☐   When necessary, load application specific telegram files (chapter 11.4, page 33)

☐   Configure time channels and DCF output according to the requirements (chapter 9.1, page 20)

☐   If available, configure network connection (chapter 10, page 24), connect to LAN network and test functions

☐   Once the configuration of the MTS is completed, save the current settings in the Flash memory (chapter 11.9, page 35)

3   Function Blocks MobaTime Server
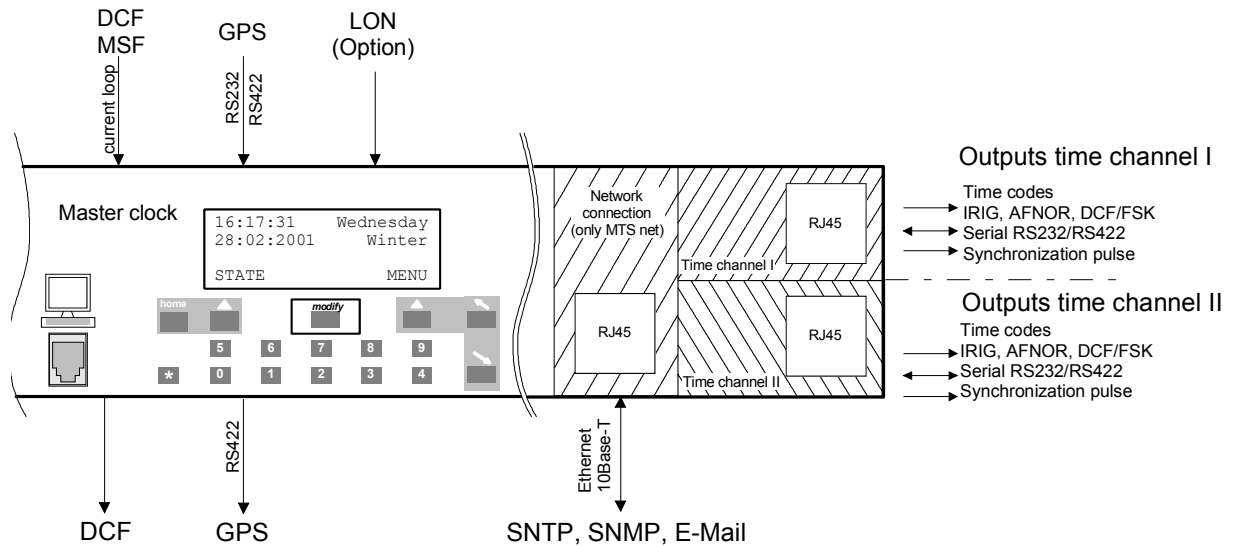
Function block master clock:

- Precise quartz clock with time memory even if there is a power failure
- Synchronization to external time reference
- Automatic acceptance of time and date from the external time reference (interruptible)
- Correction of the quartz deviation and quartz ageing through constant comparison with external time reference (software trimming)
- Output DCF time code with selectable time zone and automatic daylight saving time changeover.
- Monitoring and synchronization from a MTC system (optional)

Function blocks time channels 1 and 2:

- Serial output of time-date information in various formats:
  - selectable audio frequency time codes such as IRIG, AFNOR, DCF/FSK
  - programmable time telegrams via RS 232, respectively RS 422
  - adjustable time marks
- Per time channel, separately selectable time zone with own daylight saving time changeover
- Time channels galvanically isolated

Function block network connection (only MTS net):

- Network processor with TCP/IP, connection: 10Base-T Ethernet (10 Mbit/s)
- SNTP-Service for synchronization of computers in a LAN network or as external time reference for the MTS itself
- SNMP-Traps and E-Mail for centralized supervision of the device

4   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.
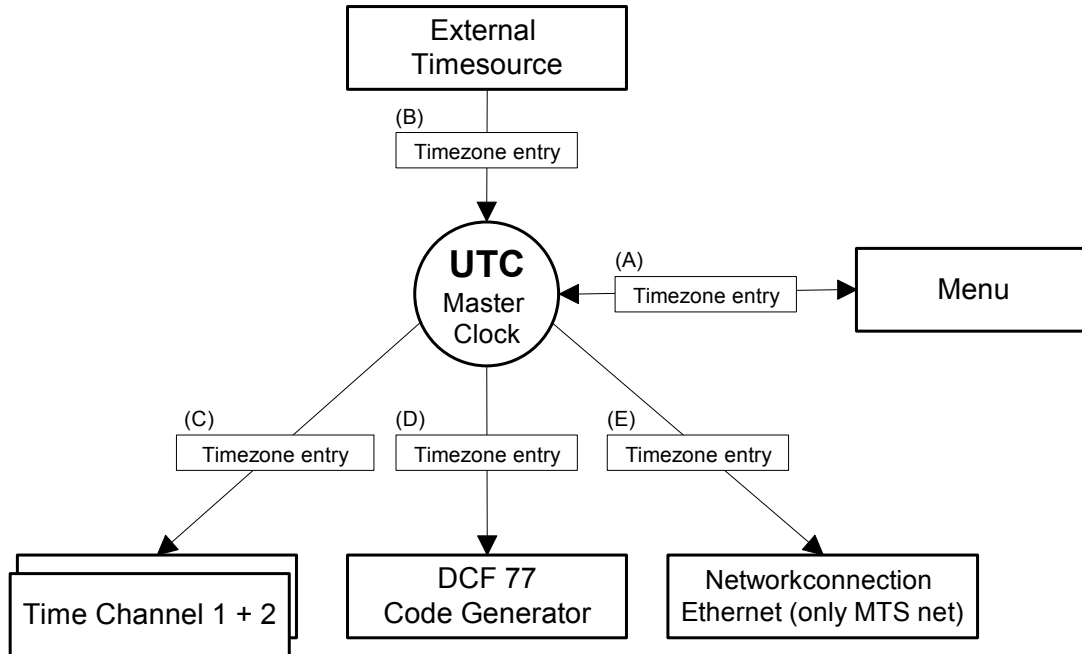
Configurable time zones:
(A)   chapter 7.2
(B)   chapter 8.5
(C)   chapter 9.1.2
(D)   chapter 9.2.2
(E)   (S)NTP is defined as UTC
           Timestamp within e-mails corresponds to Frame time zone, see chapter 7.2

5 Menu-driven Operation

5.1 Definitions
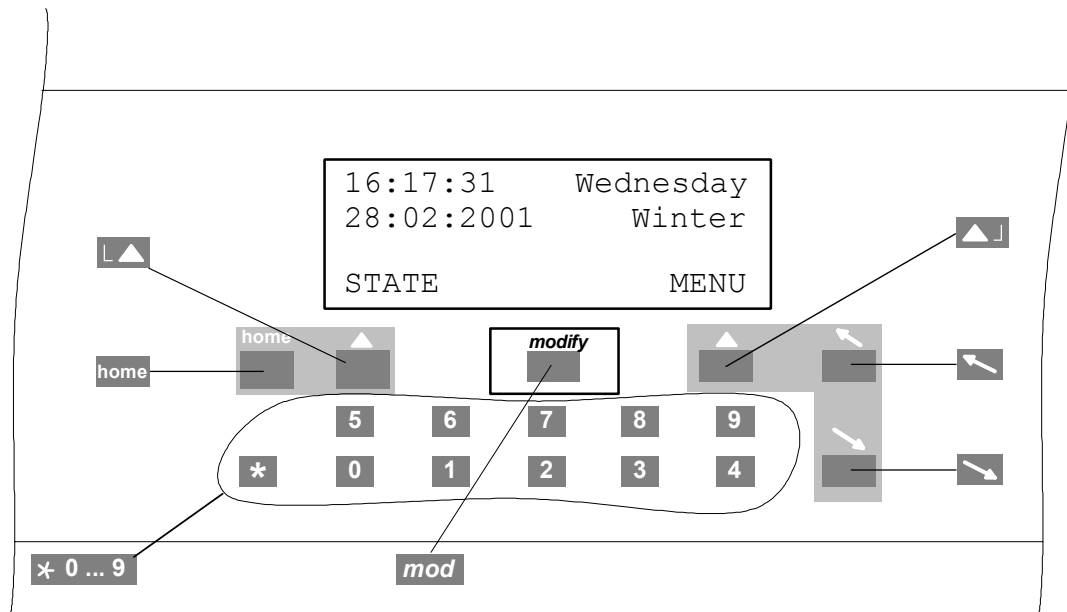
Navigation keys

⌐▲	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

5.2 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 >>>>>>
```

5.3   Menu Navigation

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

```
MENU ┐·····
     ├─ Synchronization ┐·····
     └·····             ├─ Time source:
                        └·····
```
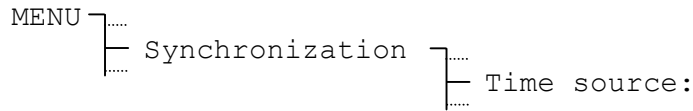
In the following example, the time source is to be set at DCF.

``` 10:36:59   Monday ```
 ``` 24.07.2000   Summer ```
 	
 ``` STATE   MENU ```
	Press the ▲↵ key (MENU) to enter the main menu.

``` Time + Date ```
 ``` Synchronization ```
 ``` Time output ```
 ``` BACK   SELECT ```
	The 'Time + Date' line then flashes, using the cursor key ↘ move down by one menu item.

``` Time + Date ```
 ``` Synchronization ```
 ``` Time output ```
 ``` BACK   SELECT ```
	The 'Synchronization' line now flashes, using the navigation key ▲↵ (SELECT) select this menu item.

``` Time source: none ```
 ``` Time zone: 00 ```
 ``` Only synchro.:   No ```
 ``` BACK   EDIT ```
	The 'Time source" entry now flashes, actuate the navigation key ▲↵ (CHANGE).

``` Time source: none ```
 ``` Time zone: 00 ```
 ``` Only synchro.:   No ```
 ``` 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 ```
 ``` Time zone: 02 ```
 ``` Only synchro.:   No ```
 ``` BACK   EDIT ```
	DCF is now configured as the time source. The associated time zone is automatically set at 02 (CET), see chapter 8.5.
	
	 Return to the main menu with the **home** key.

5.4 Edition of Character Sequences

When configuring the models MTS net it is necessary to edit character sequences (texts). As a first example the system name of the network connection shall be indicated.

```
MENU ┐·····
        ├─ Networkconnection ┐·····
                              ├─ CONFIG. ┐·····
                                         ├─ System name
                                         ·····
```
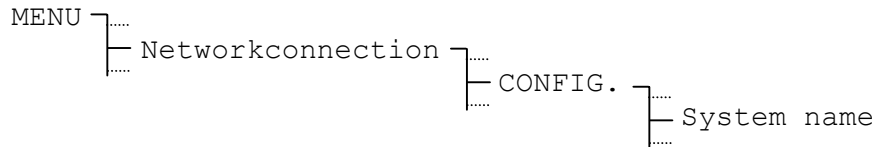
```
System name:
MTS

BACK              EDIT
```

Push navigation key ▲ (EDIT), in order to enter into the entering mode. Selection of five different entering modes. The first three modes are used for the edition of characters:

`<abc>`	Small letters, a-z
`<ABC>`	Capital letters, A-Z
`<@0123>`	Special characters, figures

The other two modes allow scrolling within the character sequence, erasing or entering of characters:

`<SCROLL>`
`<CLEAR/INSERT>`

Switching between the different modes through the *modify* key `mod`. The different actions, i.e. edition of characters, erasing or entering as well as scrolling within the character sequence are executed by means of the cursor keys ↖ ↘.

Depending on the entering mode, the function of the navigation key ▲ changes:

`NEXT`	Take over the item and edit next item
`OK`	Finish entry and take over the character sequence

Some examples of the different entry modes:

```
System name:
M T S
          <ABC>
BACK       ↓       NEXT
```
Choose capital letters with cursor keys ↖ ↘. Key ▲ (NEXT) for next item.

```
E-Mail addressee:
systemadmin@test.ch
        <@0123>
BACK       ↓       NEXT
```
Choose special characters or figure with cursor keys ↖ ↘. Key ▲ (NEXT) for next item.

```
E-Mail addressee:
systemadmin@test.ch
        <SCROLL>
CANCEL     ↓        OK
```
Move the cursor with cursor keys ↖ ↘. Key ▲ (OK) to confirm the entry.

6 External Time Sources

6.1 General

For a good long term stability a synchronization from an external time source is necessary. It is possible to connect the MTS to several kinds of time sources. This chapter gives a short description of these.

The configuration of the corresponding synchronisation mode will be described in chapter 8. The connection diagrams are shown in annexe A.

6.2 DCF – Radio Time Receiver

The connection of a DCF time signal receiver allows the synchronisation from the long wave time signal emitter DCF-77 in Mainflingen (near Frankfurt a.M.), Germany.

The transmission of a time telegram spreads over one minute. After five successive correctly received telegrams the MTS takes over the time information, that means that the synchronisation can last up to six minutes at faultless reception.

At good reception the LED in the receiver (DCF / AD 450) must Flash in second rhythm. The signal quality (see chapter 14.3.2) will be increased each second of 1 up to the max. value of 100. For each correctly received time, the value of the telegram quality will be increased of 10 up to the max. value of 100.

Available DCF time signal receivers: DCF / AD 450, AD 10

The connection of some time signal receivers is not polarity dependent. For further information please consult the corresponding documentation for the receiver.

6.3 GPS 2000 / GPS 3000

GPS time signal receivers provide a world-wide synchronisation over the satellites of the Global Positioning System (GPS) with the precision of an atomic clock.

The MTS can be synchronised by the receivers of the series GPS 2000 and GPS 3000 with RS 422 interface und TSIP protocol.

The connection diagrams are illustrated in the documentation of the GPS receivers.

With the setting GPS-NMEA the MTS can also be operated by a GPS receiver with NMEA 0183 protocol. For further information please refer to chapter F.4.

6.4 MTC (Master Time Center) – LON

In connection with a MTC Master Time Center the MTS can also function as a sub-master clock within a LON network. The MTC module CAL synchronises and supervises up to 16 of such sub-master clocks. However, the MTS needs to be equipped with the option LON-MTS.

6.5 MTC (Master Time Center) – CAS

Similar to LON offers this protocol a synchronisation and supervision of the MTS as a sub-master clock. The transmission follows through the serial interface RS 232 or RS 422. Up to 16 MTS can thus be controlled by a MTC module CAS. An additional interface cable (Art. No. 201 041) allows the connection to a modem.

6.6 Minute Impulses

The opto-coupler interface (Art. No. 33231) allows the synchronisation with polarised minute impulses of 24 V or 48 V. The setting of date and time must be made manually. Following that the master clock will be adjusted to the minute impulses. The seasonal time change-over will, with this synchronisation mode as well, be executed automatically.

The opto-coupler interface has to be connected to the terminals DCF in +-, see also chapter A.6.

6.7 Serial Time Telegram on RS 232 / RS 422

The IF 482 telegram is a time telegram, which sends the time and date information as ASCII characters through the serial interface RS 232 or RS 422. The detailed specification can be found in Annexe F.5.

6.8 LAN Network – (S)NTP (only MTS net)

The LAN network connection of the version MTS net allows not only to act as a (S)NTP server, but also as a (S)NTP client. With this mode the MTS can be synchronised to any time server in LAN. For more information see chapter 10.

7 Time + Date – Setting and Configuring the Master Clock Time

7.1 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 7.2.

7.1.1 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 7.2.

```
MENU ⌐·····
         ├─ Time + Date ⌐·····
                         ├─ Time:    15:13:09
                         └·····
```

7.1.2 Date

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

```
MENU ⌐·····
         ├─ Time + Date ⌐·····
                         ├─ Date:  04.07.00
                         └·····
```

7.2 Time Zone

Select the time zone for the master clock unit.

```
MENU ⌐·····
         ├─ Time + Date ⌐·····
                         ├─ 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.

7.3 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.

7.4 Time Correction

Small time correction of the master clock time between -60.0 to +60.0 seconds.

```
MENU
     ├─ Time + Date
                    ├─ Time correction
```

8 Synchronization – Configuration of the External Time Reference

Selection and configuration of the external time reference.

8.1 Time Source

Select the external time source (time reference).

```
MENU ┐.....
     ├─ Synchronization ┐.....
                        ├─ Time source:
                           .....
```
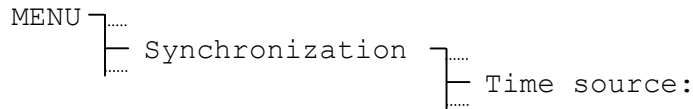
Select from: **none, DCF, MSF, GPS-TSIP, GPS-NMEA, IF482, LON, minute impulses, network** and **CAS**

For definitions of the **NMEA** and **IF482** protocols, see Annexe F.3 and F.5.

If **network** is selected, check also the settings under chapter 10.

For the synchronisation with **minute impulses**, an additional optocoupler interface (art. no. 33231) is necessary, see also chapter 6.6.

The time source must be selected prior to setting the associated time zone (chapter 8.5).

8.2 Interface (only in case of GPS-NMEA-, IF482-, CAS synchronisation)

Choice of the serial interface for the time sources **GPS-NMEA, IF482** or **CAS.**

```
MENU ┐.....
     ├─ Synchronization ┐.....
                        ├─ Interface:
                           .....
```
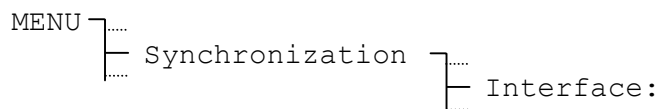
Selection from: **RS232, RS422**

8.3 Baudrate Mode (only with CAS synchronisation)

Choice of baudrate determination in case of synchronisation through CAS protocol.

```
MENU ┐.....
     ├─ Synchronization ┐.....
                        ├─ Baudrate Mode:
                           .....
```
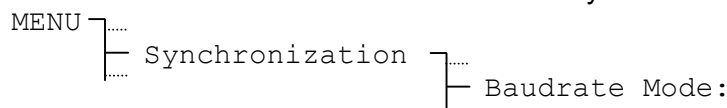
Selection from: **Auto, Hand**

In **Auto** mode the MTS tries to determine the baud rate of the CAS masters automatically and sets the following described baud rate. This process can last for some minutes.

8.4 Baudrate (only with CAS synchronisation)

Configuration of the baudrate in case of synchronisation through CAS protocol.

```
MENU ┐.....
     ├─ Synchronization ┐.....
                        ├─ Baudrate:
                           .....
```
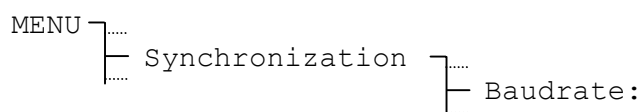
Selection from: **1200, 2400, 4800, 9600, 19200 Bit/s**

8.5   Time Zone

Specify the time zone of the time source.

```
MENU
       Synchronization
                       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.

8.6   Synchronization Only

When this setting is switched on, the external time source can only set the master clock time where the difference between the time source and master clock is less than +/- 30 seconds. Otherwise synchronization is only made to the second change. This prevents time jumps, which could be caused, e.g. through periodic disturbance of the time signal receiver or unsteady time telegrams from other time sources. Automatic daylight saving time changeovers are not affected by this setting.

For safety reasons, it is recommend that after setting-up, the clock should be set to "synchronization only".

```
MENU
       Synchronization
                       Synchro. only:
```

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

8.7   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
                       Al.timeout[min]:
```

Input range: **0 to 9999 minutes**

8.8   Subnet Address (only for LON synchronization)

Setting the subnet address upon synchronization via a LON (Local Operating Network).

This consists of a decimal input, that is displayed as hexadecimal figures in brackets.

```
MENU
       Synchronization
                       Subnet addr:
```

Input range: **001 to 255**, [01] to [FF]

8.9 System Address (only for LON and CAS synchronization)

Setting the system address upon synchronization via CAS protocol or LON (Local Operating Network).

This consists of a decimal input, that is displayed as hexadecimal figures in brackets.

```
MENU ┐.....
     ├─ Synchronization ┐.....
     │.....             ├─ System addr:
                        │.....
```

Input range: **001 to 016**, [01] to [10] for CAS synchronization
                001 to 127, [01] to [7F] for LON synchronization

9 Time Output

Selection and configuration of the time code output for:
- Time channels 1 and 2
- DCF - time code output
- Synchronization pulse outputs

9.1 Time Channel 1 or 2

Configuration and monitoring the time channels 1 and 2.

```
MENU ┐·····
     ├─ Time output ┐·····
     └·····          ├─ Time channel 1/2
                     └·····
```

Display the current time and date information as well as the operating status (operation/stop) of the channel.

```
Time  chan.  1:      RUN
12:11:15          Friday
24.07.2000        Summer
BACK             CONFIG.
```

The [▲] CONFIG. button is used to enter the configuration menu of the time channel specified below.

9.1.1 Changing the State

```
┐·····
├─ CONFIG. ┐·····
└·····      ├─ State:
            └·····
```

Every actuation of [▲] CHANGE will alter the operating condition between **Stop** and **Run.**

An alarm is indicated by the state **Alarm**. The cause of the alarm must be rectified before the time channel can be restarted.

The state applies for all functions of the time channel.

9.1.2 Selecting the Time Zone

The selected time zone applies to all functions of the time channel (audio frequency code, serial communication and synchronization pulses).

```
┐·····
├─ CONFIG. ┐·····
└·····      ├─ 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.

9.1.3 Selecting the Audio Frequency Code

Definitions of the individual codes are given in Annexe F.

```
┌┄┄┄
├─ CONFIG. ┐┄┄┄
│┄┄┄      └─ Audio freq. code ┐┄┄┄
                              └─ Output:
```
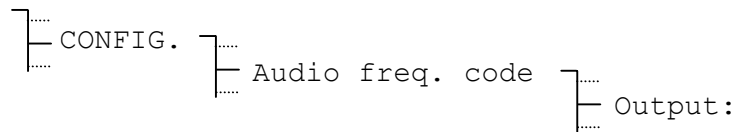
Selectable codes: **IRIG B, IRIG B 12h, IRIG B DIEM** (with date), **IRIG B123, AFNOR A, AFNOR C, IRIG E DIEM, DCF/FSK**

9.1.4 Serial Communication

Configuration of the serial communication takes place by selecting the pertinent telegram file as well as by setting the transmission parameters.

```
┌┄┄┄
├─ CONFIG. ┐┄┄┄
│┄┄┄      ├─Ser. communication ┐
                               ├─Line mode:
                               ├─Telegram file:
                               ├─Baud rate:
                               ├─Parity:
                               ├─Data bits:
                               └─Stop bits:
```
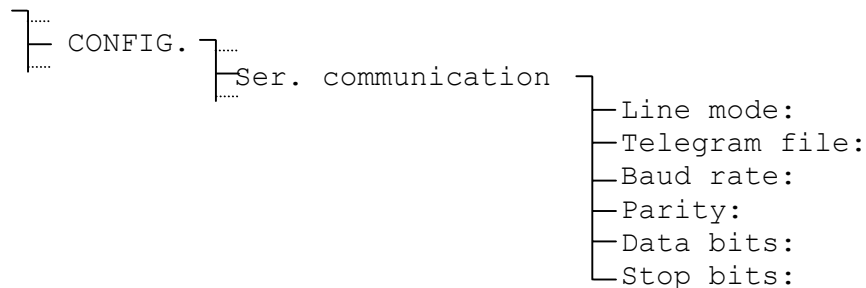
A detailed description of the functionality and structure of a telegram file is given in Annexe E. The download of a telegram file to the MTS is specified in chapter 11.4.

The transmission parameters are adjustable by means of the menu control, although the telegram format is not directly adjustable in this way.

Line mode:	**RS232, RS422** or **RS485**
Telegram file:	**1** from a maximum of **10** stored files
Baudrate:	**300, 600, 900, 1200, 2400, 4800, 9600, 19200 bit/s**
Parity:	**even, odd, none**
Data bits:	**7, 8**
Stop bits:	**1, 2**

9.1.5 Synchronization Pulses

Setting the pulse mode and duration of the synchronization pulses.

```
┌┄┄┄
├─ CONFIG. ┐┄┄┄
│┄┄┄      ├─ Synch. pulses ┐
                           ├─ Pulse mode:
                           └─ Pulse length[s]:
```
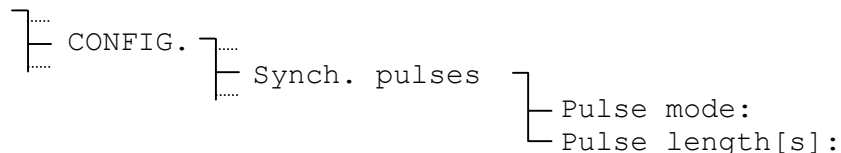
Pulse mode:	**1/sec, 1/min, 1/hour, 1/day, off**
Pulse length:	**0.1 to 25.0 seconds,** whereby the pulse duration must be smaller than the repetition rate set by the pulse mode.

9.2   DCF Output

Configuration of the DCF-77 time signal generator.

```
MENU ⌐·····
      ├─ Time output ⌐·····
                      ├─ DCF output
                      └·····
```

Display of the current time and date information as well as the operating status (run / stop) of the DCF output.

```
DCF output:      Run
12:11:15      Friday
24.07.2000    Summer
BACK         CONFIG.
```

With ▲┘ CONFIG. one enters the subsequently described configuration menu.

9.2.1 Changing the State

```
⌐·····
├─ CONFIG. ⌐·····
            ├─ State:
            └·····
```

With every actuation of ▲┘ EDIT, the operating state changes between **Stop** and **Run.**

After changing the operating state, the DCF output stops, respectively starts only from the beginning of the next minute.

9.2.2 Selecting the Time Zone

The DCF-77 time signal code is defined for Central European Time (CET) with a daylight saving time changeover. The standard setting is therefore time zone 02. For special applications, a different time zone can be set.

```
⌐·····
├─ CONFIG. ⌐·····
            ├─ 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.

9.3   Synchronization Pulses

The synchronization pulses of the two time channels have two mutual parameters. For this reason, they can be configured separately from the time channel menu.

9.3.1 Synchronization Source

```
MENU ⌐·····
      ├─ Time output ⌐·····
                      ├─ Synch. pulses ⌐·····
                                        ├─ Synch. source:
                                        └·····
```

In the default configuration the synchronization pulses are synthetically generated (**synth.**) by the software. The accuracy in this case is +/- 10 ms. Where connected, the

synchronization pulses can also be synchronized by the GPS receiver (**GPS**). The accuracy is then +/- 100 µsec.

9.3.2 Pretiming

```
MENU ┐....
     ├ Time output ┐....
                   ├ Synch. pulses ┐....
                                   ├ Pretiming[ms]:
                                    ....
```
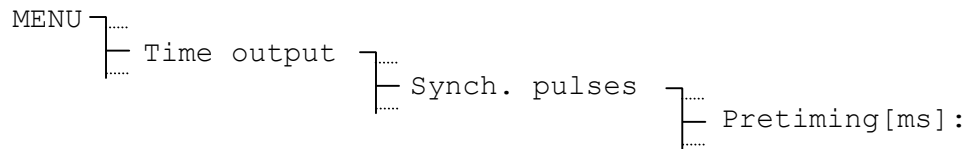
The synchronization pulses can also be actuated up to 800 ms prior to the actual second change.

Input range: **000 – 800 ms**

10 Network Connection (only MTS net)

This chapter includes all the configurations of the LAN network connection. This includes the IP address, adjustments for the time distribution over SNTP, SNMP traps and e-mail. The configuration can be executed once through the menu guidance of the MTS and secondly through a Telnet connection. Simultaneous access through the MTS menu and Telnet connection can lead to wrong configuration parameters and should thus be avoided.

10.1 Connection and Synchronization of a Network

The MTS net is conceived for the connection to a 10 Base-T (10Mbit/s) Ethernet LAN. The connection to the next switching HUB is made by means of a commercially available RJ45 patch cable. In order to connect the MTS directly to an individual PC a crossed patch cable is necessary.

For the synchronization of the PCs any SNTP synchronization tool can be used, as for inst. the Shareware-Tool Tardis (http://www.kaska.demon.co.uk). The following adjustments must be done in the synchronization tool:

Server address: corresponds to the IP address of the MTS

Protocol: To be accordingly set to the MTS-configuration.

SNTP (more accurate than Broadcast, causes, however, also an accordingly extensive network traffic, when a large number of PCs has to be synchronized).

NTP Broadcast (less accurate than SNTP, is, however, not dependent on the number of PCs to be synchronized and thus minimizing the load on the network (remains always the same).

According to the applied tool, various further parameters can be configured, such as synchronization interval and maximal/minimal correction deviation.

The instructions for the configuration of the MTS network parameter (chap. 8.2) can be obtained from the network administrator.

10.2 Configuration through the Menu

This chapter explains the configuration of the network connection through the MTS menu guidance.

```
MENU ┐┈┈┈
     ├─ Networkconnection
     └┈┈┈
```

Display of the current time and date information as well as the operation status (run / alarm) of the network processor.

```
Network:          run
12:11:15      Friday
24.07.2000    Summer
BACK        CONFIG.
```

The following configuration menu will be obtained by ▲⏎ CONFIG.

Attention:
Modifications carried out on the configuration will only be activated after leaving the menu.

In the MTS basic models the following message appears after selection of the item:

```
No networkproces-
 sor installed!

BACK
```

10.2.1 Operation Status

The operation status of the network connection only recognizes the two states **Run** and **Alarm**. It cannot be changed through the menu.

```
┐┈┈┈
├─ CONFIG. ┐┈┈┈
┘┈┈┈       ├─ State:
           ┘┈┈┈
```

An active alarm is signalised through the operation status **Alarm**. In that case, the alarm can be confirmed by deleting the active alarms, see chapter 14.2.

10.2.2 DHCP-Client

If this function is activated, the MTS gets its network configuration (IP address, subnet mask and gateway) automatically from the DHCP server. Previous entered values for IP address, subnet mask and gateway will be overwritten.

```
┐┈┈┈
├─ CONFIG. ┐┈┈┈
┘┈┈┈       ├─ Network config. ┐┈┈┈
           ┘┈┈┈                ├─ DHCP-Cient
                               ┘┈┈┈
```

10.2.3 DHCP name option

If DHCP name option is activated, then the MTS system name is added to the DHCP request. This can be used, for example, so that the DHCP server always assigns the same address to a device with a certain name.

```
┐┈┈┈
├─ CONFIG. ┐┈┈┈
┘┈┈┈       ├─ Network config. ┐┈┈┈
           ┘┈┈┈                ├─ DHCP name option
                               ┘┈┈┈
```

10.2.4 IP Settings

Configuration of IP address, subnet mask and gateway.

```
┐....
├─ CONFIG. ┐....
          ├─ Network config. ┐....
                             ├─ IP address
                             ├─ Subnet mask
                             └─ Gateway
```
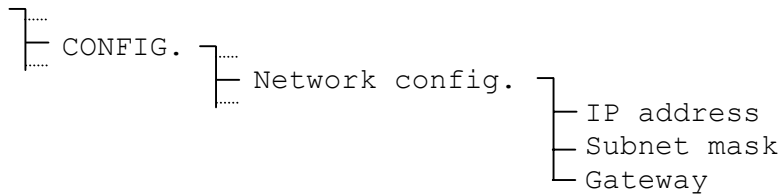
Example:

```
IP address:
      165.123.004.023

BACK              EDIT
```

If the function DHCP-Client is activated, these settings will be overwritten by the DHCP server.

Important:
The IP address should only be changed in agreement with the network administrator.

10.2.5 System Name

The system name serves for the distinction between several MTS in one network. It can be named on choice and have up to 20 characters. Instructions for the entry of character sequences are found in chapter 5.4.

```
┐....
├─ CONFIG. ┐....
          ├─ Network config. ┐....
                             ├─ System name
```
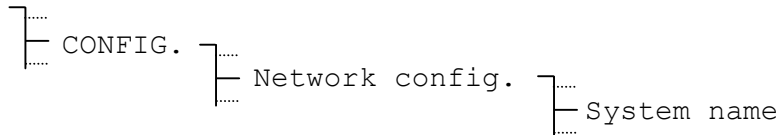
The system name appears in the subject of sent e-mails and in the designation field of the SNMP traps.

10.2.6 Login Name and Login Password

The login name and login password for the Telnet- and FTP-server can be named on choice and have up to 20 characters. Instructions for the entry of character sequences are found in chapter 5.4.

```
┐....
├─ CONFIG. ┐....
          ├─ Network config. ┐....
                             ├─ Login name
                             └─ Login password
```
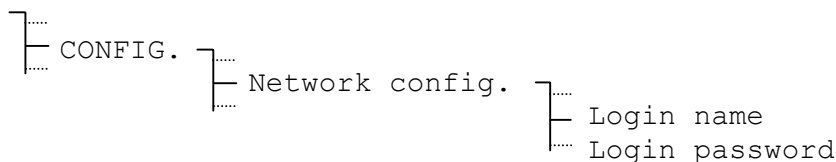
10.2.7 FTP Server, Telnet Server

For security reason the FTP and Telnet server function may be disabled with this settings. However, for a configuration over Telnet, the Telnet server needs to be activated. The FTP is only necessary for software updates over the network.

```
 ─┐.....
  ├─ CONFIG. ─┐.....
  .....        ├─ Network config. ─┐.....
              .....                 ├─ FTP server
                                    └─ Telnet server
```

10.2.8 SNTP Operation Modes

The operation mode for the time distribution through SNTP is determined with the mode parameter.

```
 ─┐.....
  ├─ CONFIG. ─┐.....
  .....        ├─ SNTP configuration ─┐.....
              .....                    ├─ Mode:
                                       .....
```

Selection from :   **OFF**, **Client**, **Server**, **Listen** and **Broadcast**

Client: The MTS runs in SNTP client mode and is synchronized by an (S)NTP server via the network.
Server: The external devices (clients) which are to be synchronized can query the time from the MTS.
Listen: The MTS "listens" on NTP broadcast packets from a particular IP address and takes over their time.
Broadcast: Time packages will be broadcasted in periodic intervals.

Important:
The time source (see chap. 8.1) must also be adjusted to **network** in order to make certain that the time is taken over by the MTS in the client and listen operating modes as well.

10.2.9 SNTP Parameters

Further parameters must be edited, depending on the configured mode of operation (chapter 1.3.5).

```
 ─┐.....
  ├─ CONFIG. ─┐.....
  .....        ├─ SNTP configuration ─┐.....
              .....                    ├─ ...
                                       .....
```

In the following only those parameters are specified which also have to be configured under normal conditions. The remaining parameters are only to be manipulated for special applications and can be left at the default values for standard applications. A description of the remaining parameters can be found in the annexe F.3.

Parameters required in client mode:
Source 1:   IP address of the (S)NTP server
Source 2:   IP address of the spare server, if Source 1 fails
Source 3:   IP address of the spare server, if Source 2 fails
Source 4:   IP address of the spare server, if Source 3 fails
Min. stratum: Stratum level required by the server

Parameters required in server mode:
No required parameters!

Parameters required in list mode:

Source 1:	IP address of the (S)NTP server
Source 2:	IP address of the spare server, if Source 1 fails
Source 3:	IP address of the spare server, if Source 2 fails
Source 4:	IP address of the spare server, if Source 3 fails
Min. stratum:	Stratum level required by the server
Receiving timeout:	Broadcast interval of time server in seconds

Parameters required in broadcast mode:

Broadcast mask:	Subnet for which traps are intended
Interval:	Broadcast interval in seconds

Note:

If problems arise when the MTS is synchronized via a network, then the errors can be displayed via Telnet by using the command *state* in the menu SNTP.

10.2.10 E-Mail

MTS alarm messages can also be sent through e-mails. At each modification of an alarm status such an e-mail containing time stamp, system name and status of the corresponding alarm (annexe D, S. 53) is sent to the configured e-mail receiver. The required sender e-mail address can be configured through the menu.

Example of an alarm e-mail:

From: `mts@testdomain.ch`   [System name]
To: `systemadmin@testdomain.ch`
Subject: **MTS** Frame error 'Failure of external time acceptance' has
          been set

```
MobaTime Server
---------------

Event: Error flag has been set
Error bit: 00 (Failure of external time acceptance)
Device: Frame

Date: 23.10.2003
Time: 18.04.57
```

[Alarm source (Frame or Time Channel 1 / 2)]

[Alarm bit (0..15)]

[New status of the alarm bits]

[Time stamp (pay attention to the configured time zone, chapter 7.2)]
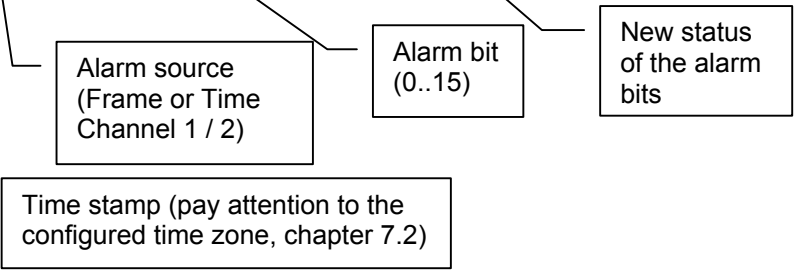
10.2.11 E-Mail Server IP Address

IP address of the used e-mail server shall be indicated.

```
┐.....
├─ CONFIG. ┐.....
│          ├─ SMTP/SNMP config. ┐.....
│          │                    ├─ Email server IP
│          │                    └.....
```
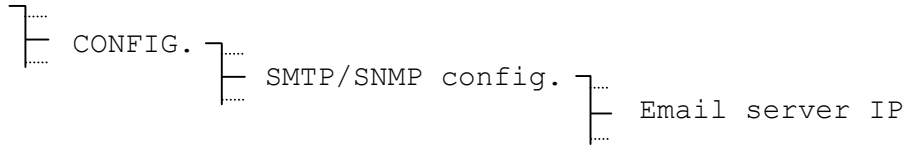
Information:
The entry of 000.000.000.000 deactivates the sending of e-mails.

10.2.12 E-Mail Sender Address

The e-mail sender address shall be indicated in a character sequence with up to 40 characters. Information for the entry of character sequence can be found in chapter 5.4.

```
┐.....
├─ CONFIG. ┐.....
│          ├─ SMTP/SNMP config. ┐.....
│          │                    ├─ Sender address
│          │                    └.....
```
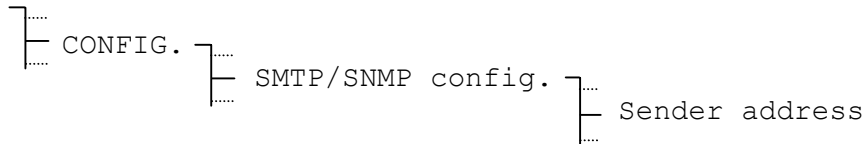
10.2.13 E-Mail Receiver Address

The e-mail receiver address shall be indicated in a character sequence with up to 40 characters. Information for the entry of character sequence can be found in chapter 5.4.

Two different receivers can be used.

```
┐.....
├─ CONFIG. ┐.....
│          ├─ SMTP/SNMP config. ┐.....
│          │                    ├─ Email address 1
│          │                    └┄ Email address 2
```
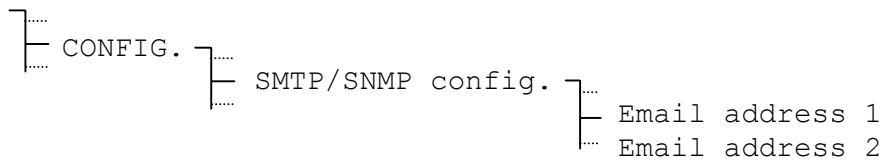
10.2.14 SNMP Traps

In order to broadcast SNMP traps, the IP address of the network manager system must be known. This can be configured here.

```
┐.....
├─ CONFIG. ┐.....
│          ├─ SMTP/SNMP config. ┐.....
│          │                    └─ Trap IP
```
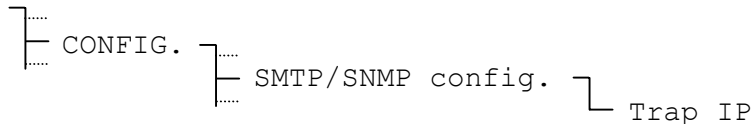
Information:
The entry of 000.000.000.000 deactivates the sending of traps.

10.3 Configuration over Telnet

This chapter explains the configuration of the network connection over a Telnet connection. The pre-setting of the IP address, Subnet mask and Gateway over the MTS menu is, however, indispensable (chapter 10.2.4), as otherwise no access through the network is possible.

10.3.1 Note on Telnet Connections

The Telnet terminal must be configured in such a way that <CR> and <LF> are always sent together for a <Carriage Return>.

10.3.2 Login

For the connection with a Telnet terminal the IP address of the MTS must be indicated. Afterwards the login with login name (Username) and login password (Password) will follow.
Upper and lower case are not taken into consideration.

```
MTS Telnet session

Username : mts
Password : ***
User logged in

MTS>█
```

Default settings:
Login name: mts
Login password: mts

After the login the entry prompt `MTS>` shows, that the MTS is waiting for an entry. If no entry is made during 10 minutes, the Telnet connection is interrupted. Only one connection per MTS is possible at the same time.

10.3.3 Commands

help shows a summary of the available commands together with a small description:

```
MTS>help
help

 Moba Time Server Help (Main menu)
 -----------------------------------------------------------------
 COMMAND                        FUNCTION
 0, Main                        change to root level
 1, NetworkConFiGuration        change to network configuration
 2, SNMPconfiguration           change to smtp/snmp coniguration
    SMTPconfiguration
 3, SNTPconfiguration           change to SNTP configuration

 help, ?                        show commands according to the current menu
 show                           show parameters according to the current menu
 undo                           cancel all modification
 version                        version info
 save                           save and activate the new configuration


MTS>█
```

The capital letters in commands can be used as abbreviations.

Example: NetworkConFiGuration - > **NCFG**

The command names always correspond to the parameter designation.

A corresponding Telnet prompt is displayed depending on the submenu in which one is at the moment:

MTS>   Root-Level
MTS->NCFG>   General network configuration
MTS->SMTP/SNMP>   E-mail and trap configuration
MTS->SNTP>   SNTP configuration

Setting of a parameter:
<Command> <Parameter><CR>

As a confirmation for the entry an echo is broadcasted. An error message appears at a wrong entry format.

Example:
```
MTS->NCFG>ipaddress 192.36.253.43

 IP address = 192.36.253.43

MTS->NCFG>█
```

Important:
The IP address should only be changed in agreement with the network administrator.

A detailed description of the network parameter is found in chapter 10.1.

After modifying a configuration parameter, this will not be activated immediately. In the overview with **show** a message will inform, that the displayed adjustments not yet have been memorized:

```
MTS->NCFG>show

 MTS  Network ConFiGuration
 ---------------------------
 SYStemName:    MTS

 DHCP:          Off
 DhcpHostname:  Off
 IPAddress:     10.2.0.11
 SubNetMask:    255.0.0.0
 GateWay:       10.0.0.5

 LoginName:     MTS
 LoginPassword: MTS

 telnet:        On
 FTPServer:     On

! current changes haven't been activated yet !

MTS->NCFG>█
```

When all the necessary adjustments are made, they can be memorized and activated with **save**. Depending on the made modifications the Telnet connection is interrupted.

```
MTS>save

 reconfigurate... (it needs up to 10 seconds)
 The telnet session will be disconnected for the reconfiguration
█
```

The Telnet connection can also be simply terminated by disconnection from the client. Changes which have not been activate with **save** are thus lost.

11 Data Manager – Configurations and Files

This section deals with the administration of configuration data (settings of the MTS) as well as the downloading and deletion of files on the MTS.

11.1 Administration of the Configuration Data

The current configuration data is 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.
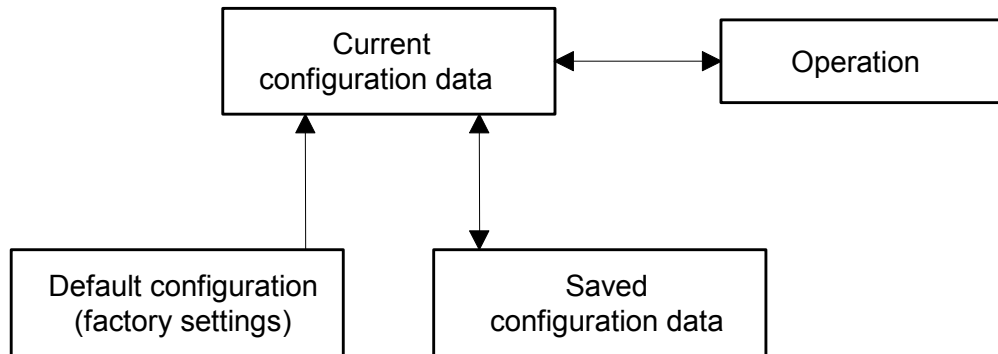
11.2 File Download in General

With the PC software MTSW (see chapter 15), the following files can be downloaded on the MTS: system software, season table, telegram files and menu texts.

This involves use of the RS232 interface, which is available on the terminals of the motherboard or at the telephone plug in the front panel. Both interfaces fulfil the same function. When occupying the interface in the front panel, the interfaces RS232 and RS422 on the terminals of the motherboard are switched off.

A manual interruption of a download by the MTS is not possible. If the download is not started within one minute of being initialised via the menu, the MTS will revert to normal operation from the download mode.

When errors occur during the download of files, these are indicated by means of an error number and text:

```
----- DOWNLOAD -----
Error:            02
Timeout error
       (000000 Bytes)
```

No.	Error message	Troubleshooting
01	Communication error	Check connection
02	Timeout error	Connection interrupted or download not started
03	Checksum error	Transmission error or corrupted file
04	Wrong file	Wrong type of file selected
05	Error writing Flash	Major hardware error; can only be repaired in the factory
06	Error erasing Flash	
07	Wrong record type	Error in the file: system software, season table or menu texts
08	Address out of range	
09	Odd address	
10	Request invalid	Error in the MTSW software

11.3 System Software

The MTS changes to the download mode and awaits new system software via the interface.

```
MENU ┐……
       ├ Data manager ┐……
                        ├ System software ┐……
                                            ├ Load file from PC
                                            └……
```
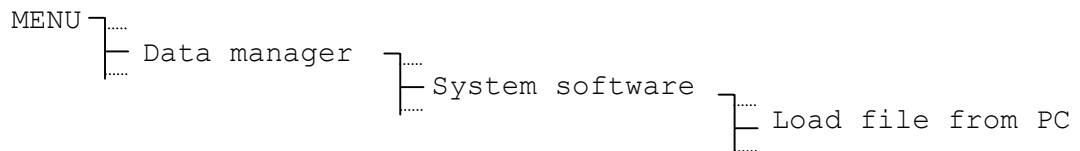
Downloading the system software from an EPROM (Option, see Annexe H) takes place automatically, provided the version of the system software on the EPROM is newer than that of the installed system software.

Recommendation:
Save the existing configuration in the Flash memory prior to a download (chapter 11.9, page 35), otherwise it will be overwritten. Reinstatement of the thus stored configurations takes place automatically after the download.

11.4 Telegram File

The MTS provides space for up to 10 telegram files in the Flash memory. However, position 01 is firmly occupied by the IF482 telegram. The structure and further information about telegram files is available in Annexe E.

11.4.1 Directory

Displays the list of the 10 telegram files.

```
MENU ┐……
       ├ Data manager ┐……
                        ├ Telegram files ┐……
                                           ├ Directory
                                           └……
```
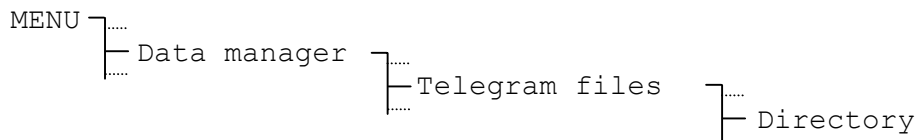
Example:

```
01: IF482.TEL        - Firmly occupied by IF482.TEL
02: MTS Tele 1       - Customer specific telegram
03: ---              - Empty position
BACK
```

11.4.2 Delete File

The selected telegram file is erased from the memory after a confirmation. The telegram `01: IF482.TEL` cannot be erased.

```
MENU ┐.....
     ├─ Data manager ┐.....
     .....            ├─ Telegram files ┐.....
                      .....             ├─ Delete file
                                        .....
```

Caution
Telegram files currently used by time channels should not be deleted.

11.4.3 Download File from PC

The MTS changes to the download mode and awaits a new telegram file via the interface. A newly loaded telegram file occupies the next free position.

```
MENU ┐.....
     ├─ Data manager ┐.....
     .....            ├─ Telegram files ┐.....
                      .....             ├─ Load file from PC
                                        .....
```

Caution
Telegram files with the same name will be overwritten.

11.4.4 Load File from EPROM (option)

When telegram files are stored (not necessarily) on the optional EPROM (see Annexe H), they can be selected here and downloaded into the Flash memory of the MTS. The loaded telegram file occupies the next free position.

```
MENU ┐.....
     ├─ Data manager ┐.....
     .....            ├─ Telegram files ┐.....
                      .....             ├─ Load file from EPROM
                                        .....
```

Caution
Telegram files with the same name will be overwritten.

11.5 Season Table

A new season table can be uploaded via the interface or from an optional EPROM (see Annexe H) on the MTS. For further information about the daylight saving time table, see chapter 4 and Annexe C.

11.5.1 Load File from PC

The MTS changes to the download mode and awaits a new season table via the interface.

```
MENU ┐.....
     ├─ Data manager ┐.....
     .....            ├─ Season table ┐.....
                      .....           ├─ Load file from PC
                                      .....
```

11.5.2 Load File from EPROM (optional)

The MTS changes to the download mode and loads the season table from the EPROM.

```
MENU ┐.....
         ├─ Data manager ┐.....
                            ├─ Season table ┐.....
                                               ├─ Load file from EPROM
                                               .....
```
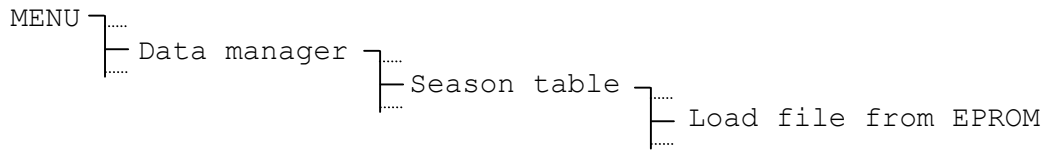
11.6   Menu Texts

The MTS provides the opportunity to load menu texts in a customer specific language. Translation of the menu texts and generation of the menu text file is reserved for the manufacturer.

```
MENU ┐.....
         ├─ Data manager ┐.....
                            ├─ Menu texts ┐.....
                                             ├─ Load file from PC
                                             .....
```
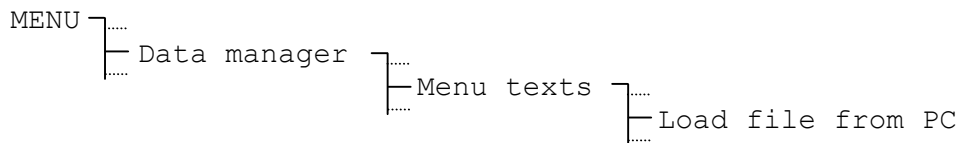
11.7   Network Application (only MTS net)

When a software update of the network connection is necessary, it can be realized though this item. However, a MTSW software higher or equal V 0.88 is necessary.

```
MENU ┐.....
         ├─ Data manager ┐.....
                            ├─ Networkapplication ┐.....
                                                     ├─ Load file from PC
                                                     .....
```
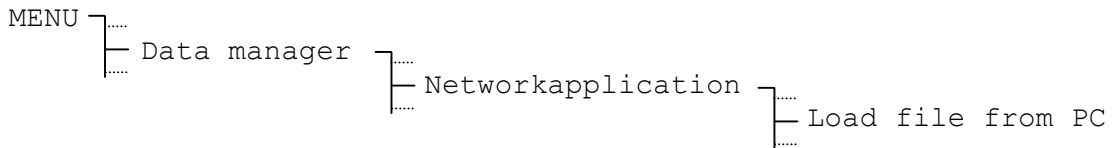
11.8   Default Configuration

The standard ex-works settings can be downloaded here. Resetting to the default configuration can take place individually for the master clock section (frame) and for both the time channels. After selection, execution must be confirmed.

```
MENU ┐.....
         ├─ Data manager ┐.....
                            ├─ Default config.
                            .....
```
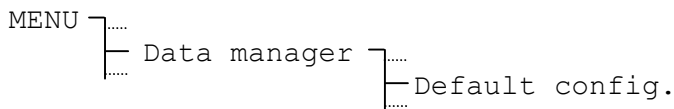
Frame:	NO	- ▲↵ EDIT (NO, YES)
Time channel 1:	NO	- ▲↵ EDIT (NO, YES)
Time channel 2:	NO	- ▲↵ EDIT (NO, YES)
Network	NO	- ▲↵ EDIT (NO, YES), MTS net
Execute		- ▲↵ SELECT
BACK	EDIT	

11.9   User Configuration

The current MTS configuration can be saved in the non-volatile Flash memory and can also be uploaded from this. The settings are thus retained even after a software update.

11.9.1 Save

Current MTS configurations are saved in the Flash memory.

```
MENU ┐.....
     ├─ Data manager ┐.....
     └.....           ├─ User configuration ┐.....
                      └.....                 ├─ Save
                                             └.....
```

11.9.2 Restore

Saved MTS configurations are uploaded from the Flash memory.

```
MENU ┐.....
     ├─ Data manager ┐.....
     └.....           ├─ User configuration ┐.....
                      └.....                 ├─ Restore
                                             └.....
```

Note:
Loading the configuration from the Flash memory also takes place automatically after an update of the system software.

11.10 Remoted Download

Where there is a connection to a PC via the RS232 interface, files (telegram files, season table, etc.) can be downloaded from the PC without manipulation on the MTS. In this case, the RS232 interface is reserved exclusively for file downloads.

```
MENU ┐.....
     ├─ Data manager ┐.....
     └.....           ├─ Remoted download
                      └.....
```

Note:
When this function is switched on, the RS232 as well as the RS422 interface on the main board are no longer available for other functions (no synchronization via GPS, IF482 telegrams or CAS is possible).

12 Miscellaneous – Language and Display

The menu language as well as the settings of the LCD display are selected under this menu item.

12.1 Language

The following languages are available: **English** and **German**.

```
MENU ┐....
     ├─ Miscellaneous ┐....
                      ├─ Language ┐....
                                  ├─ Language:   English
                                  └....
```

12.2 Display

12.2.1 Contrast

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

```
MENU ┐....
     ├─ Miscellaneous ┐....
                      ├─ Display ┐....
                                 ├─ Contrast[%]:     50
                                 └....
```

12.2.2 Backlight

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

```
MENU ┐....
     ├─ Miscellaneous ┐....
                      ├─ Display ┐....
                                 ├─ Backlight:   3 min
                                 └....
```

Note:
A permanently switched on backlight reduces the active reserve power due to the higher power consumption (see Technical Data, Annexe I, page 76).

13 System Information

13.1 Current Versions

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

13.1.1 System Software

Information about the currently installed system software on the MTS.

```
MENU ┐......
     ├─System information ┐......
                          ├─ Current versions ┐......
                                              ├─ System
                                                 software
```
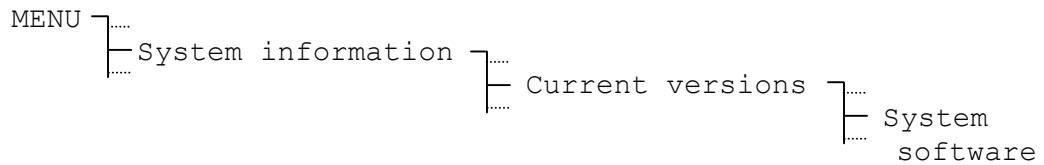
13.1.2 Season Table

Information about the currently installed daylight saving timetable.

```
MENU ┐......
     ├─System information ┐......
                          ├─Current versions ┐......
                                             ├─ Season
                                                table
```
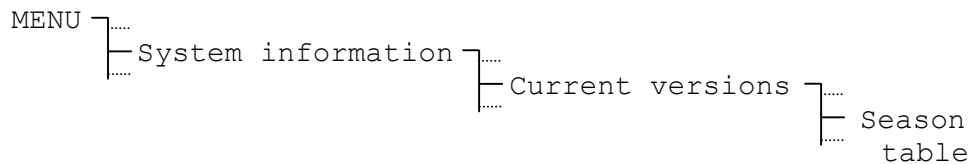
13.1.3 Network Application

Information concerning the currently installed network application on the MTS. Scanning only possible on the models MTS net.

```
MENU ┐......
     ├─ System information ┐......
                           ├─Current versions ┐......
                                              ├─Network
                                                 application
```
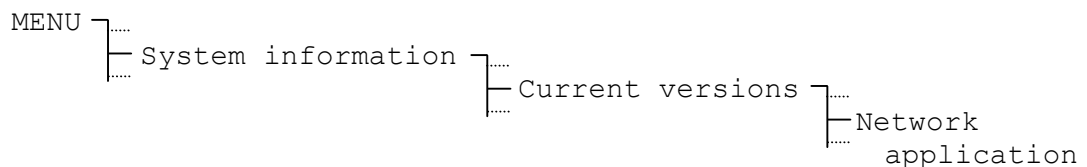
13.2 Files on EPROM (optional)

The number and version of the software available on the EPROM (optional, see Annexe H) can be recalled under this menu item.

13.2.1 System Software

System software is always available on the EPROM. Information about this software is available here.

```
MENU ┐......
     ├─System information ┐......
                          ├─Files on EPROM ┐......
                                           ├─ System software
```

Note:
It is possible that the version on the EPROM is older than the currently installed software. The opposite case is not possible, since a later version of the system software is automatically loaded from the EPROM (see chapter 11.3, page 33).

13.2.2 Season Table

A season table is always stored on the EPROM. Information about this table is available here.

```
MENU ┐.....
       ├─System information ┐.....
                              ├─ Files on EPROM ┐.....
                                                  ├─ Season table
                                                  |.....
```

13.2.3 Telegram File (optional)

When one or more telegram files are saved on the EPROM, this item is available. A maximum of 10 telegram files are displayed as a list on the EPROM.

```
MENU ┐.....
       ├─System information ┐.....
                              ├─ Files on EPROM ┐.....
                                                  ├─ Telegram files
                                                  |.....
```

14 State – Alarms and Reception Quality Display

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.

14.1 Current Alarms

The current alarms are listed under this item. They are divided according to the master clock unit (frame) and time channels. The models MTS net do also show the alarms of the network connection. Decoding of the four digit hexadecimal number is given in Annexe D.

```
STATE ┐·····
      ├─ Current alarms
      └·····
```

```
Frame:           [0000]   - Error word of the master clock unit
Time channel 1:  [0000]   - Error word of time channel 1
Time channel 2:  [0000]   - Error word of time channel 2
Network          [0000]   - Error word of network connection,
BACK                        MTS net
```

Note:
The alarm contact is closed whilst at least one active alarm is being present. During normal operation it is opened.

14.2 Stored Alarms

Past alarms are saved here, i.e. a pertinent alarm bit remains set, even when the active alarm has been reset. The structure of the display and its decoding is the same as that for the current alarms.

```
STATE ┐·····
      ├─ Stored alarms
      └·····
```

The stored alarms can be reset with ▲⌐ CLEAR. The time/date information in brackets indicates the time (UTC) of the last erasure.

```
Clear stored alarms?

 (11:15:42/12.04.01)
CANCEL              OK
```

14.3 Reception Quality

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

```
STATE ┐·····
      ├ Reception quality
      ┘·····
```

Example:

Time source:	DCF
Quality tele.:	100
Quality signal:	100
BACK	

- Current time source (display only)
- In the last 10 minutes good reception
- Seconds marking okay

14.3.1 Telegram Quality (Network: Sync. Quality)

The following applies to all time sources **(except network)**: 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.

The following applies for **network** as time source: Each valid request sequence increases the value by 20. Accordingly, this value decreases by 20 for each invalid request sequence.

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

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

14.3.2 Signal Quality (Network: Valid Packets)

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

The following applies for **network** as time source: Number of valid packets of the last request sequence in percent

Signal quality (resp. valid packets) is available from the following time sources: **DCF, MSF, GPS-TSIP, GPS-NMEA and network.**

15 MTSW Software

15.1 Introduction

The MTSW software is PC software that makes it possible to create files (season tables, telegram files, etc.) or to load them to the MTS.

Telegram files and season tables can be created, opened and modified by the user. The menu texts and the system software cannot be processed, they are created at the factory. They can only be loaded to the MTS.

MTSW software is supported by the operating systems WINDOWS 95, WINDOWS 98, WINDOWS NT4.0 und WINDOWS 2000 / XP.

15.2 Installation and Start

Installation is performed with the supplied 1.44 MB disk by running SETUP.EXE. In the process of installation the interface (COM1 or COM2) must be indicated for communication with the MTS.

The start takes place by selecting the MTSW icons under the program group MOBATIME.

15.3 Menu Assistance

The user menu consists of the **File** menu (Fig. 1), the **Edit** menu (which is not activated) and the **Options** menu which makes selection of the serial interfaces for COM1 and COM2 possible (Fig. 2).
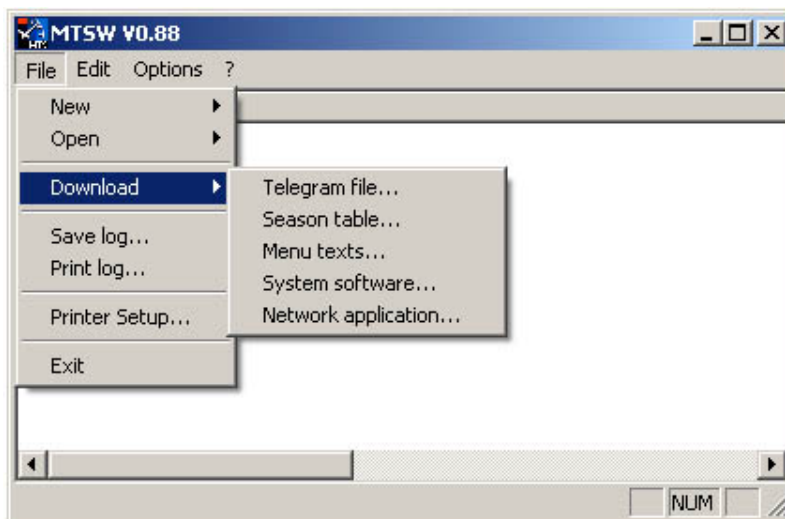
Fig. 1

Fig. 2
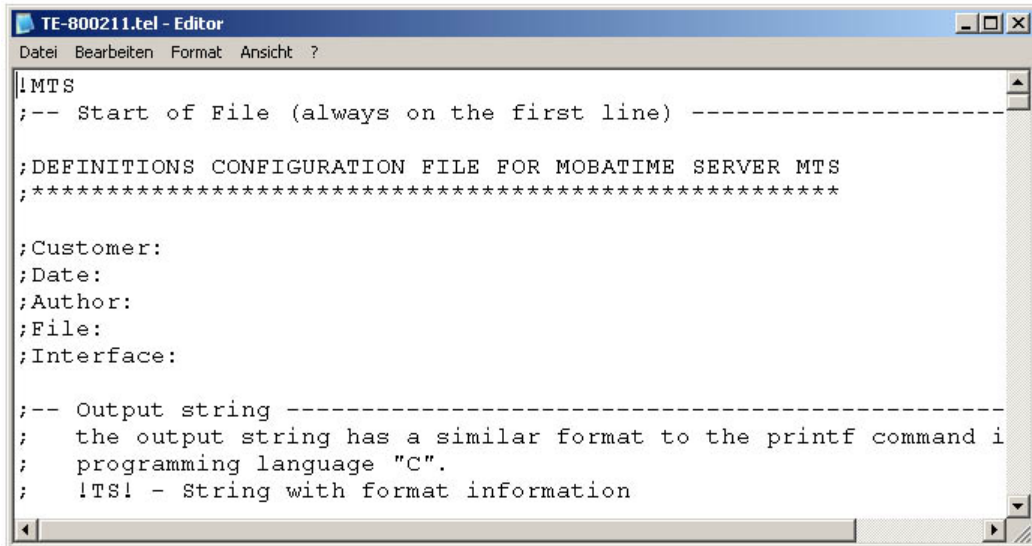
15.4 Telegram File

15.4.1 Telegram File NEW

New telegram files can be created with the text editor. A description of the available commands and formats can be found in the Annexe or the supplied *DATA\TD-800211.TEL* file. This file can also serve as a template for a new telegram file.

15.4.2 Telegram File OPEN

A dialogue window appears when OPEN is selected. A file *.TEL* is then queried. Changes are made with the text editor.

15.4.3 Telegram File DOWNLOAD

A dialogue window appears when Download is selected. A file *.TEL* in format is then queried and transmitted to the MTS. The MTS must be previously prepared for receipt of the data, cf. chapter 11.4.3.

15.5 Season Table

Of the 100 possible time zones, the first 80 entries (0-79) are pre-defined and stored in the standard list. It is also possible to arbitrarily define an additional 20 entries (80-99) (**USER**).

15.5.1 Season Table NEW

Since the first 80 places of the table are occupied, the user can define his own time zones starting with position 80. In order to do so **USER** should be selected the type.

A name must be assigned to the new time zone with the **NEW** key. The time offset in relation to local time and the season are thus defined. In addition, the **mode** is defined, the selection is made of up the precise date, computed date or no summer time. In the lowest input field the beginning and end of summer time are specified with the time, date, day and month. The radio buttons **Begin Summer Time** and **End Summer Time** can be used to switch between the two times.

Caution:
New creation of a season table deletes any existing user entries.

15.5.2 OPEN Season Table

Opening the season table only makes it possible to make changes to the time zone entries starting with position 80 of the user table.

15.5.3 DOWNLOAD Season Table

Downloading the season table file is carried out via a security query.

15.6 Download Menu Texts

This item permits downloading of further menu languages. They can only be purchased from the manufacturer and cannot be edited by the customer. Menu text files have the extension *.MTX.*

15.7 Download System Software

An update of the system software is carried out via this item. The system software is supplied by the manufacturer and cannot be processed by the customer. The system software file has the extension *.BIN.*

The MTS must be previously set to download mode, cf. chapter 11.3.

Recommendation:
Backup the existing configuration of the MTS in its Flash memory prior to the download (chapter 11.9.1), otherwise it will be overwritten. The configurations which are thus saved are then automatically restored after the download.

15.8 Download Network Application (only for MTS net)

The files **CHIP.INI, MTS.BAT, MTS.EXE** and **SNMP.EXE** are required in order to load a new version of the network application to MTS net. They are supplied by the manufacturer and cannot be processed by the customer. The path where these files are located should be indicated in the query window.

The MTS should be previously set to download mode, cf. chapter 11.7.

The files are written to the MTS net after the download is started.
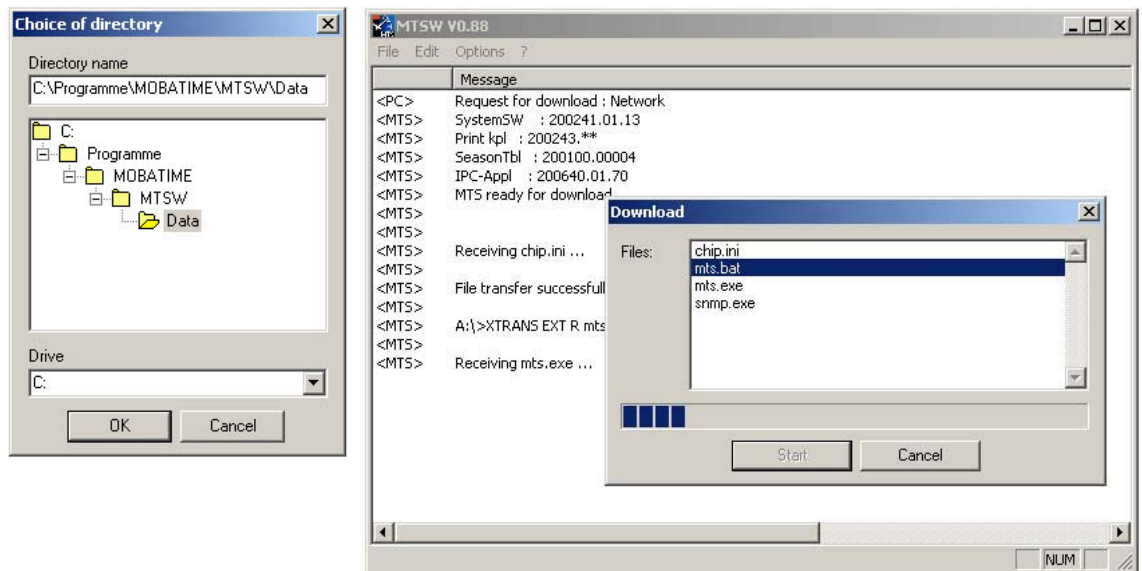
Important:
The system software should always be updated to the most current version prior to downloading a network application.

15.9 Store / Print Log

The reporting window can be stored or printed as a *.LOG* file. This file can be used for diagnosis in the event of an error.

A   Connection Diagrams

A.1   Overview
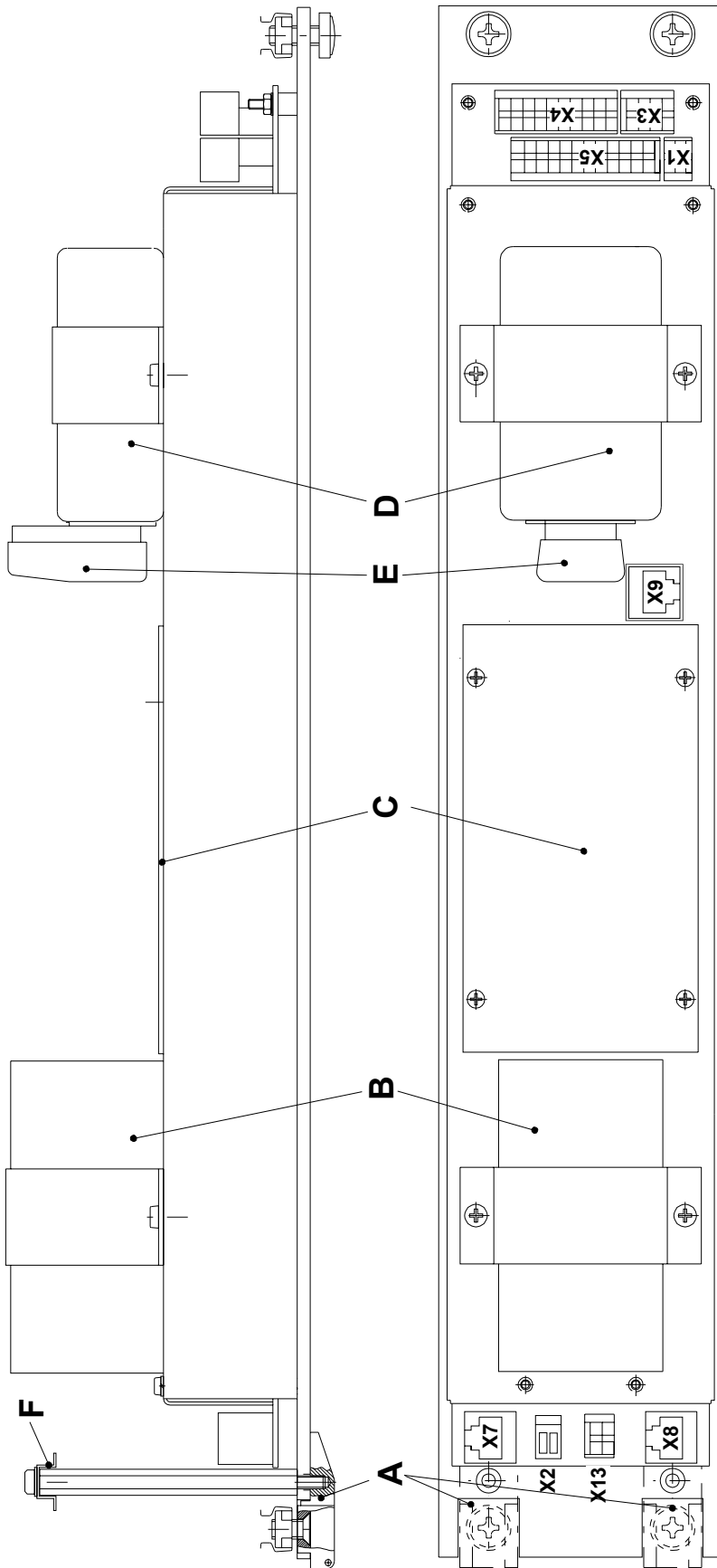
Legend

A Hinge
B Lead-acid battery for reserve power (optional)
C Adapter board (optional)
D Power supply (only models MTS ... 230 VAC)
E Mains plug (only models MTS ... 230 VAC)
F Strain relief bar for cables

X1   DC supply input for mains power supply (MTS ... 230 VAC)
X2   Connection active power reserve
X3   Output GPS for next MTS
X4   Connection GPS receiver, RS422-interface
X5   Inputs and outputs of master clock unit
X7   Time Channel 1
X8   Time Channel 2
X9   Network connection, Ethernet 10Base-T, only MTS net
X13 DC supply input for external DC source (MTS ... 24 VDC)

A.2   Power Supply Models MTS ... 24V DC (Terminal X13)

+V ──────
GND ────── X13
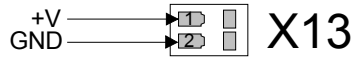
Supply voltage see Annexe I, page 76.

A.3   Power Supply Models MTS ... 230 V AC (Mains Plug)

L	Phase
PE	Ground (yellow-green)
N	Directly earthed conductor

N   PE   L
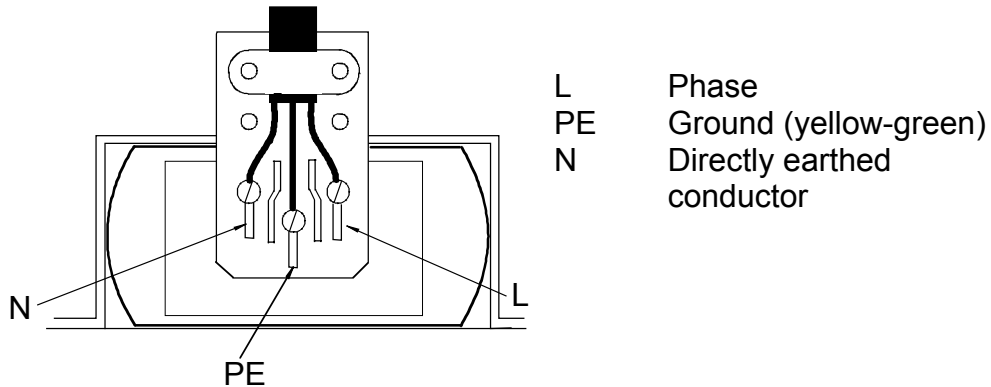
Supply voltage see Annexe I, page 76.

A.4   Power Reserve, optional (Terminal X2)

12 V

+VBat ──────
GND ────── X2
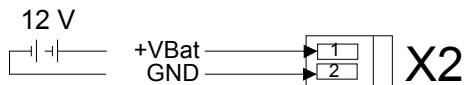
Connection data for the lead-acid battery as well as for the charge current is given in Annexe I, page 76. The battery is only connected when the mains supply is switched on again. This also applies for charged batteries. The MTS has a monitor circuit to prevent total discharge of the battery (flat battery monitor circuit).

Irrespective of the connection of a lead-acid battery, all models of the MTS range have passive reserve power. 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. Where a master clock has not been in use for over 2 years, the lithium battery should be replaced. When the master clock is connected, it has a service life of at least 15 years.

A.5   Network Connection, only MTS net (Plug X9)

The traffic-LED, on the right hand side beside the RJ45 plug informs about the network traffic.
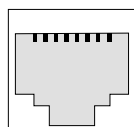
10Base-T Ethernet LAN

RJ45

A.6 Inputs and Outputs of the Master Clock Unit (Terminals X1, X3 to X5)
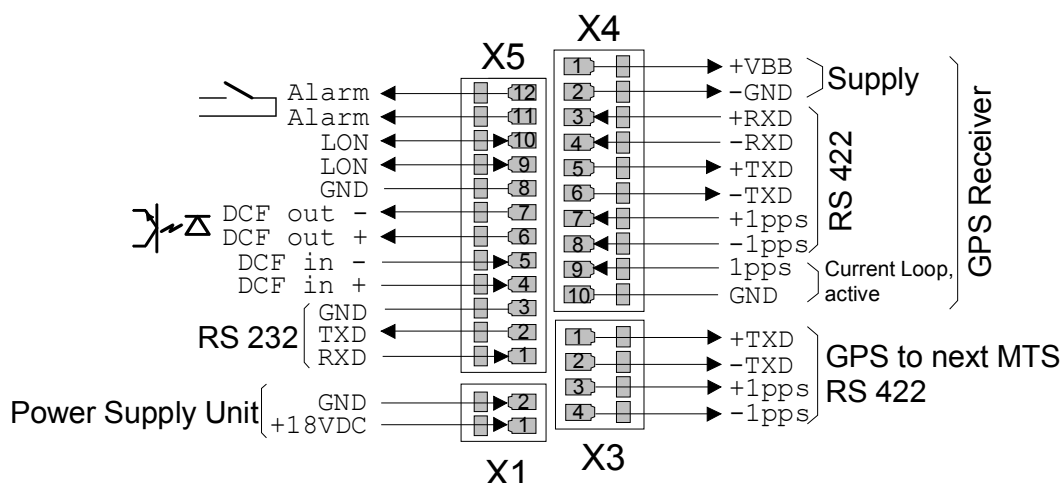
X1 Connection of mains power supply unit (only MTS ... 230 VAC)

X3 Looped signals of the GPS receiver for connection of an additional MTS to the same receiver.

X4 Supply, RS422 interface and PPS input (current loop or RS422) for connection of a GPS receiver.

X5
1-3:	RS232 interface
4-5:	Input DCF receiver, polarity independent
6-7:	Output synthetic DCF time code
	U_{max} = 30 V DC, U_{Bit} = 2.2 V DC @ 20 mA
9-10:	LON Bus
11-12:	Alarm contact, opener,
	max. 125 VAC 0.5 A / 60 VDC 0.1 A / 30 VDC 1 A

Note:
Interfaces RS 232 and RS 422 cannot be used simultaneously. The exclusive use of just one of the two interfaces is necessary.

A.7 Time Channels (Terminals X7 and X8)
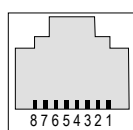
RJ45

X7	Time channel 1
X8	Time channel 2

Pin	Function			
		RS 232	RS 422	
1	AF-Code (IRIG, AFNOR, DCF/FSK, ...)			600 Ohm / 0 dB
2	AF-Code (IRIG, AFNOR, DCF/FSK, ...)			
3	Synchronisation impulse			Optocoupler to GND, max. 20 mA / 35 V
4		RXD	- RXD	
5			+ RXD	
6		TXD	- TXD	
7			+ TXD	
8	GND, electrically isolated			

B Default Configuration

From the factory, the MTS is supplied in the default configuration. These settings can be reloaded (see chapter 11.7).

Parameter	Value	chapter	Page
Time+ Date			
Time zone	02	7.2	15
Quartz correction	0.0 s	7.3	15
Synchronization			
Time source	none	8.1	17
Time zone	00	8.5	18
Synchronization only	No	8.6	18
Alarm timeout	1440 Min	8.7	18
Subnet address	01	8.8	18
System address	01	8.9	19
Time channel 1 and 2			
State	Stop	9.1.1	20
Time zone	00	9.1.2	20
Audio frequency code	AFNOR A	9.1.3	20
Serial communication		9.1.4	21
Line mode	RS232		
Telegram file	IF482.TEL		
Baud rate	9600 Bit/s		
Parity	even		
Data bits	7 bit		
Stop bits	1 bit		
Synchronization pulses		9.1.5	21
Pulse mode	off		
Pulse length	0.5 s		
Synchronization source	synthetic		
Pretiming	0 ms		
Network connection			
Network config.			
DHCP-Client	OFF	10.2.2	25
DHCP name option	OFF	10.2.3	25
IP address	000.000.000.000	10.2.4	26
Subnet mask	000.000.000.000	10.2.4	26
Gateway	000.000.000.000	10.2.4	26
System name	MTS	10.2.5	26
Login name	MTS	10.2.6	26
Login password	MTS	10.2.6	26
FTP server	OFF	10.2.7	26
Telnet server	ON	10.2.7	26
SNTP configuration			
Mode	OFF	10.2.8	27
Source 1	0.0.0.0	10.2.9	27
Source 2	0.0.0.0	10.2.9	27
Source 3	0.0.0.0	10.2.9	27
Source 4	0.0.0.0	10.2.9	27
Stratum level	1	10.2.9	27

Interval	10 (Client),	F.3	70
	32 (Broadcast)	F.3	70
Break	600	F.3	70
Delay	00	F.3	70
Filter size	14	F.3	70
Valid entries	10	F.3	70
Port	123	F.3	70
Sync Lost	120	F.3	70
Rcv timeout	002	F.3	70
Respond time	100	F.3	70
Jitter	15	F.3	70
Asymmetry	50	F.3	70
SMTP/SNMP config.			
Email address 1	-	10.2.13	29
Email address 2	-	10.2.13	29
Email server IP	0.0.0.0	10.2.11	29
Sender address	-	10.2.12	29
Trap IP	0.0.0.0	10.2.14	29

DCF output

State	Stop	9.2.1	22
Time zone	02	9.2.2	22

Data manager

Remoted download	No	11.10	36

Miscellaneous

Language	German	12.1	37
Display contrast	40 %	12.2.1	37
Backlight	3 min. automatic	12.2.2	37

C   Time Zone Table

Time zone entries in the standard season table version 4.

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, Sofia, Vilnius, Warsaw, Zagreb	+1	Yes	Last Sun. Mar. (02:00)	Last Sun. Oct. (03:00)
03	Athens, Istanbul, Minsk, Helsinki, Riga, Tallinn	+2	Yes	Last Sun. Mar. (0300)	Last Sun. Oct. (0400)
04	Bucharest	+2	Yes	Last Sun. Mar. (0000)	Last Sun. Oct. (0000)
05	Cairo	+2	Yes	Last Fri. Apr. (00:00)	Last Mon. Sep. (00:00)
06	Pretoria, Hare	+2	No		
07	Israel	+2	Yes	1st Fri. Apr. (02:00)	1st Fri. Sep. (02:00)
08		+3	No		
09	Moscow, St. Petersburg, Volgograd	+3	Yes	Last Sun. Mar. (02:00)	Last Sun. Oct. (03:00)
10	Teheran	+3.5	Yes	2nd Last Sun. Mar. (00:00)	2nd Last Thu. Sep. (03:00)
11	Abu Dhabi, Muscat, Baku, Tbilisi	+4	No		
12	Kabul	+4.5	No		
13	Ekaterinburg	+5	Yes	Last Sun. Mar. (02:00)	Last Sun. Oct. (03:00)
14	Islamabad, Karachi, Tashkent	+5	No		
15	Bombay, Calcutta, Madras, New Delhi	+5.5	No		
16	Dhaka, Colombo	+6	No		
17	Bangkok, Hanoi, Jakarta	+7	No		
18	Beijing, Chongping, Hong Kong, Perth, Singapore, Taipei, Urumqi	+8	No		
19	Tokyo, Osaka, Sapporo; Seoul	+9	No		
20	Yakutsk	+9	Yes	Last Sun. Mar. (02:00)	Last Sun. Oct. (03:00)
21	Adelaide	+9.5	Yes	Last Sun Oct (02:00)	Last Sun. Mar. (03:00)
22	Darwin	+9.5	No		

		UTC	DST	Standard → DST	DST → Standard
23	Brisbane, Guam, Port Moresby	+10	No		
24	Sydney, Canberra, Melbourne	+10	Yes	Last Sun. Oct. (02.00)	Last Sun. Mar. (03:00)
25	Hobart	+10	Yes	1st Sun. Oct. (02:00)	Last Sun. Oct. (03:00)
26	Vladivostock	+10	Yes	Last Sun. Mar. (02:00)	Last Sun. Mar. (03:00)
27	Solomon Is. , New Caledonia	+11	No		
28	Auckland, Wellington	+12	Yes	Last Sun. Oct. (02:00)	Last Sun. Mar. (03:00)
29	Marshall Is.	+12	No		
30	Azores	-1	Yes	Last Sun. Mar. (00:00)	Last Sun. Oct. (01:00)
31	Middle Atlantic	-2	Yes	1st Sun. Oct. (02:00)	2nd Sun. Feb. (03:00)
32	Brasilia	-3	Yes	2nd Sun. Oct. (00:00)	2nd Last Sun. Feb. (00:00)
33	Buenos Aires	-3	No		
34	Newfoundland	-3.5	Yes	1st Sun. Apr. (02:00)	Last Sun. Oct. (02:00)
35	Atlantic Time (Canada)	-4	Yes	1st Sun. Apr. (02:00)	Last Sun. Oct. (02:00)
36	Caracas, La Paz, Indiana (East)	-4	No		
37	Bogotá, Lima, Quito	-5	No		
38	Eastern Time (US & Canada)	-5	Yes	1st Sun. Apr. (02:00)	Last Sun. Oct. (02:00)
39	Central Time (US & Canada)	-6	Yes	1st Sun. Apr. (02:00)	Last Sun. Oct. (02:00)
40	Tegucigalpa	-6	No		
41	Arizona	-7	No		
42	Mountain Time	-7	Yes	1st Sun. Apr. (02:00)	Last Sun. Oct. (02:00)
43	Pacific Time	-8	Yes	1st Sun. Apr. (02:00)	Last Sun. Oct. (02:00)
44	Alaska	-9	Yes	1st Sun. Apr. (02:00)	Last Sun. Oct. (02:00)
45	Hawaii	-10	No		
46	Samoa, Midway Is.	-11	No		
47	Eniwetok, Kwajalein	-12	No		

Time zone entries 48 to 79 are not occupied in this version.

Legend:
UTC:	Universal Time Coordinate, equivalent to GMT
DST:	Daylight Saving Time
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

D   Alarm List

To display errors, a 16 bit word is available on the master clock unit (frame) and on the two time channels. Bei den Modellen MTS net ist zusätzlich ein Word für die Alarme des Netzwerkanschlusses vorhanden.

A bit number is allocated to each alarm. This allocation is listed in the tables below. The words are shown on the display as a four-digit hexadecimal number.

Alarms frame

Bit	HEX - value	Error
0	**0001**	Failure of external time acceptance: Within the configured alarm timeout (chapter 8.7), no valid time package was read in from the external time source.
1	**0002**	Internal hardware error
2	**0004**	Failure mains or external DC supply
3	**0008**	Error in the automatic quartz trimming: External time source is imprecise or internal quartz is faulty. Fault is automatically reset as soon as the deviation from the external time source to the internal quartz sinks again below 50 ppm.
4	**0010**	Checksum of the saved configuration data is incorrect
5	**0020**	No communication with LON node: External time source configured on LON and no LON node installed or LON node faulty.

Alarms time channels

Bit	HEX - value	Error
0	**0001**	Internal time error
1	**0002**	Faulty time zone configured
2	**0004**	Wrong response from monitored device or reported back time exceeds tolerance
3	**0008**	No response from monitored device
4	**0010**	Communication error (Baud rate, parity, ..)
5	**0020**	Error in telegram file
6	**0040**	Faulty configuration of time channel
7	**0080**	Telegram file not found

Alarms network connection (only MTS net)

Bit	HEX - Value	Error
0	**0001**	No communication with the network processor
1	**0002**	Configured e-mail server not found
2	**0004**	Error at the e-mail transmission
4	**0010**	Incompatible SW version on network processor
5	**0020**	Send error SNMP trap

The hexadecimal number range is defined from 0 to F, whereby F represents 15. The error word appears as the hexadecimal sum of all current errors. The rules for hexadecimal calculation must be observed.

Decimal	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Hexadecimal	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F

Some numerical examples:

```
        0004        0004
        0008        0018
        ────        ────
        000C        001C
```

Example 1:

```
Frame:              [0014]
Time channel 1:     [0006]
Time channel 2:     [00C0]
BACK
```

Frame: [**0014**] = Alarm **0010** (mains failure) and Alarm **0004** (checksum of the configuration data faulty)

Time channel 1: [**0006**] = Alarm **0004** (wrong response from monitored device) and Alarm **0002** (faulty time zone)

Time channel 2: [**00C0**] = Alarm **0080** (telegram file not found) and Alarm **0040** (faulty configuration of time channel)

E   Telegram File Format

Printout of the technical description file TE-800211.TEL, which shows the format and all possible commands of a telegram file. The latest telegram definition file may be found on the included MTSW disk.

```
!MTS
;-- Start of File (always on the first line) -----------------------

;DEFINITIONS CONFIGURATION FILE FOR MOBATIME SERVER MTS
;*******************************************************


;Customer:
;Date:
;Author:
;File:
;Interface:

;-- Output string ------------------------------------------------
;   the output string has a similar format to the printf command in the
;   programming language "C".
;   !TS! - String with format information
;   !TV! - Variables list in output sequence
;   The formats and variables available can be seen below:
:
!TS!"........%d....%d..."   ;string with format information
!TV!var1,var2,..           ;variables list

        ;-- Control and special characters:
        ;   "        ->      String beginning/end
        ;   \"       ->      "
        ;   \xFE     ->      h'FE   (byte binary)
        ;   \\       ->      \
        ;   \n       ->      new line <CR> <LF> (h'0D h'0A)
        ;   %%       ->      %
        ;   %...     ->      Format information (see below)
        ;-- Possible formats:
        ;%dn ascii-dec  where n=1/2/3/4 (number of decimal points)
        ;   i.e.   variable value d'40  => 40  @ n=2
        ;                               => 040 @ n=3

        ;%X  ascii-hex
        ;   e.g.   variable value d'40  => 28

        ;%c  char (binary)
        ;   e.g.   variable value d'40  => h'28

        ;%s  string (always up to ,(comma) see text tables)
        ;   e.g.   string       Jan, => Jan

        ;%b  hex-output of a asciihex-string (always up to ,(comma) see
        ;   text tables)
        ;   e.g.   string       120A  => h'12 h'0A

        ;-- Possible variables:
        ;
        ;Name: Description:              Range:    Format:
        ;-------|----------------------|-----------|------
        ;
        ;MSE    (Millisecond)           (0..999)   1W
        ;HSE    (Hundredth of a second) (0..99)    1B
        ;ZSE    (Tenth of a second)     (0..9)     1B
        ;SEK    (Second)                (0..59)    1B
        ;MIN    (Minute)                (0..59)    1B
        ;STD    (12h or 24h format)     (0..12)
        ;                                or(0..24)  1B
        ;JAR    (Year)                  (0..99)    1W
        ;                              or (1990..2089)
```

```
        ;MTG    (Day of month)            (0..31)    1B
        ;JTG    (Day of year)             (1..366)   1W
        ;WTG    (Day of week)             (0..6)     1W text table !WT!
        ;                                 (Su..Sa)
        ;KAW    (Calendar week)           (1..53)    1B
        ;MON    (Month)                   (1..12)    1W text table !MO!
        ;SAI    (Season)                  (0..2)     1W text table !SA!
        ;                                 (Win/Sum/UTC)
        ;AKS    (Season change            (0/1)      1W text table !AK!
                 announcement)
        ;AMF    (am/pm-Flag)              (0/1)      1W text table !AM!
        ;SST    (Season state)            (0..3)     1W text table !ST!
        ;       (Bit 0 = Early warning bit)
        ;       (Bit 1 = Summer bit)
        ;SYA    (Sync timeout)            (0/1)      1B text table !SY!
        ;       (0:sync ok; 1: sync failure)
        ;CHS    (Checksum)                (0..255)   1B
        ;XCH    (XOR Checksum)            (0..255)   1B
        ;
        ;Example.  Time telegram with following format
        ;
        ;       "Date: tt:mm:yy Time: hh:mm:ss,mmm<CR><LF>"
        ;
        ;!TS!"Date: %d2:%s:%d2 Time: %d2:%d2:%d2,%d3\n"
        ;!TV!MTG,MON,JAR,STD,MIN,SEK,MSE
;----------------------------------------------------------------

;-- Hours format -----------------------------------------------
!PM!
        ;Hours format 12h with am/pm flag
        ;without this entry:   24h format
;----------------------------------------------------------------

;-- Command string ---------------------------------------------
!CS!n!ll!"ss..."!
        ;
        ;n  =   Type of command ('3', '4' or 'a')
        ;       n=3 send telegram on request immediately (once)
        ;       n=4 send telegramm on request on the next second (once)
        ;       n=a send telegramm periodically (see !TI!p! and !SO!)
        ;
        ;ll =   Length of command string in bytes ('01...20')
        ;       ll=00 command string disabled
        ;
        ;ss...  Command string
        ;       (max. 20 characters - has to fit with paramter 'll')
        ;       Use '?' for Wildcards. This character acts as space holder
        ;       for any character.
        ;       Hex values: \xFE -> h'FE (byte binary)
        ;                   \\   -> \
        ;
        ;Example:
        ;       Definition of a command for an immediate telegram
        ;       output on request (command n=3) :
        ;       'time<CR>' (characters ll=05)
        ;
        ;       !CS!3!05!"time?"!
;----------------------------------------------------------------

;-- Sendoffset of telegram output ------------------------------
!SO!hh:mm:ss!
        ;
        ;Sendoffset from 00:00:00 hour for periodical telegram output
        ;(!CS!a!...).
        ;
        ;hh =   hour ('00..23')
        ;mm =   minute ('00..59')
        ;ss =   second ('00..59')
;----------------------------------------------------------------
```

```
;-- Interval automatic telegram output ----------------------------
!TI!p!hh:mm:ss!
        ;
        ;Interval of periodical time output.
        ;
        ;p  =   constant
        ;hh =   hour ('00..23')
        ;mm =   minute ('00..59')
        ;ss =   second ('00..59')
        ;
        ;Example:
        ;       Time output every 5 seconds, start at 06:00 hour
        ;
        ;       !TI!p!00:00:05!
        ;       !SO!06:00:00!
;------------------------------------------------------------------


;-- Synchronization mode ------------------------------------------
!SM!m!
        ;Mode of synchronization:
        ;
        ;m = tcorr   The telegram output will be pretimed (000..800ms).
        ;            Use command !TC!xxx! to set the pretiming value.
        ;m = char    The telegram string containing the time information
        ;            'x+1' will be sent on the second 'x'. A synchronization
        ;            character will then be sent on the second 'x+1'.
        ;            Use command !SZ! to define the character.


!SZ!cc!
        ;Synchronization character:
        ;
        ;cc = 00..FF  ASCII-Code of synchronization character in hex-format


!TC!xxx!
        ;Pretiming:
        ;
        ;xxx = 000..800  Pretiming in Milliseconds

        ;Ex. 1:     The telegramm should be sent 20ms earlier than the
        ;           second-change:
        ;
        ;           !SM!tcorr!
        ;           !TC!020!
        ;
        ;
        ;Ex. 2:     The synchronization character h'FE should mark the
        ;           validity of the time information:
        ;
        ;           !SM!char!
        ;           !SZ!FE!
;------------------------------------------------------------------

;-- Supervision of the external device ----------------------------
!SU!m!
        ;Supervision mode:
        ;
        ;m = none    No supervision.
        ;m = any     Supervision without test, received characters
        ;            (not equal command string) are interpreted as OK.
        ;m = test    Supervision with test, received characters are
        ;            compared with alivestring (!AS!"ss.."!). An error
        ;            is generated after the second receive of a wrong
        ;            string.
        ;m = time    Supervision with time test, the external device
        ;            sends its time information as alivestring. The
        ;            comparison will generate an error if the difference
        ;            of the loop-backed time and the line time is greater
        ;            than the given tolerance.
```

```
;                     Use command !ZT!eee! to set tolerance.
;
;A timeout will also generate an error, if the AB4.1.0 has not
;received a valid alivestring during the configured time. To set
;the timeout use !TO!xxxx!.


!TO!xxxx!
     ;Timeout of alive message:
     ;
     ;xxxx = 0000..9999  Timeout in minutes, does the supervised device
     ;                   not send a valid alivestring during the
     ;                   configured timeout time, an error is generated.

!AS!"ss.."!
     ;Alivestring of external device (only !SU!test!):
     ;
     ;ss...  Alivestring
     ;       (max. 20 characters)
     ;       Use '?' for Wildcards. This character acts as space holder
     ;       for any character.

!ZT!f!
     ;Format of time information in alivestring (only !SU!time!):
     ;
     ;f = ascii  Time information is ASCII coded (2 bytes per entry)
     ;f = bin    Time information is binary coded (1 byte per entry)

!LZ!ll!
     ;Length of alivestring containing time information (only !SU!time!):
     ;
     ;ll = 01..64

!ZP!hh,mm,ss!
     ;Position of time information in alivestring (only !SU!time!):
     ;
     ;hh = 01..64   Position of hours
     ;mm = 01..64   Position of minutes
     ;ss = 01..64   Position of seconds

!ZT!eee!
     ;Time tolerance (only !SU!time!):
     ;
     ;eee = 000..255  Acceptable time tolerance in seconds

     ;Ex. 1:    The external device sends at least all 10 minutes
     ;          a constant string as alive message (string: "OK").
     ;          If the device fails and the AB4.1.0 has not received
     ;          this alive message within the 10 minutes, it will
     ;          generate an error:
     ;
     ;          !SU!test!
     ;          !AS!"OK"!
     ;          !TO!0010!
     ;
     ;
     ;Ex. 2:    The AB4.1.0 should supervise the time of the external
     ;          device in a loop-back manner. A deviation to the
     ;          line time of more than 5 seconds or no message during
     ;          20 minutes should cause an error.
     ;          Format of alivestring: "Time=13:02:58 Date=23.09.00<CR>"
     ;
     ;          !SU!time!
     ;          !ZT!ascii!          ;time in string is ASCII coded
     ;          !LZ!28!             ;length of time string
     ;          !ZP!06,09,12!       ;position of time information
     ;          !ZT!005!            ;time tolerance
     ;          !TO!0020!           ;timeout
;-------------------------------------------------------------------

;===================================================================
```

```
;The following applies generally to the text tables:
;    Name of the table:              !xx!
;    Separating character of the entries:  , (comma)
;    max. 16 chars per entry
;    Warning!:   do not forget "," (comma) after final entry!
;==================================================================

;-- Text table day of week (WTG Su..Sa) 7 entries -------------------
!WT!Sunday,Monday,Tuesday,Wednesday,Thursday,Friday,Saturday,
;-------------------------------------------------------------------

;-- Text table months (Jan..Dec) 12 entries ------------------------
!MO!Jan,Feb,Mar,Apr,May,Jun,Jul,Aug,Sep,Oct,Nov,Dec,
;-------------------------------------------------------------------

;-- Text table season (Win, Sum, UTC) 3 entries--------------------
!SA!Win,Sum,UTC,
;-------------------------------------------------------------------

;-- Text table season change announcement --------------------------
;   (no announcement, announcement) 2 entries
!AK!0,1,
;-------------------------------------------------------------------

;-- Text table season state ----------------------------------------
;    (0 no announcement, winter)
;    (1 announcement, winter)
;    (2 no announcement, summer)
;    (3 announcement, summer) 4 entries
!ST!A,B,C,D,
;-------------------------------------------------------------------

;-- Text table AM/PM flag 2 entries --------------------------------
!AM!am,pm,
            ;1st entry  AM/PM flag=0 ie 00:00..11:59
            ;2nd entry  AM/PM flag=1 ie 12:00..23:59
;-------------------------------------------------------------------

;-- Synchronisation timeout ----------------------------------------
!SY!ok,alarm,
            ;1.Entry  synchronisation ok
            ;2.Entry  synchronisation timeout alarm
;-------------------------------------------------------------------

;-- Start and end character for checksum calculation ---------------
!CK!aa,bb!
        ;aa = first character (telegram start position: 0)
        ;bb = last character + 1

;Is the command !CK! missing, then the calculation will be evaluated
;from the first character up to the checksum byte.
;-------------------------------------------------------------------

;-- File End ---
!EE!

;-- Name of file (optional, appears in the MTS directory) -----------
@nnn...
            ;nnn...  Filename, max. 12 characters followed by a <CR>.
            ;        This entry is optional, if no name is declared
            ;        'NONAMEx.TEL' will appear in the MTS directory.
            ;
            ;IMPORTANT:
            ;        1) This entry has to be placed AFTER the file end
            ;           command !EE!.
            ;
            ;        2) If a file with the same name as an existing
            ;           file on the MTS is loaded to the MTS, the
            ;           existing file will be OVERWRITTEN.
            ;
            ;
```
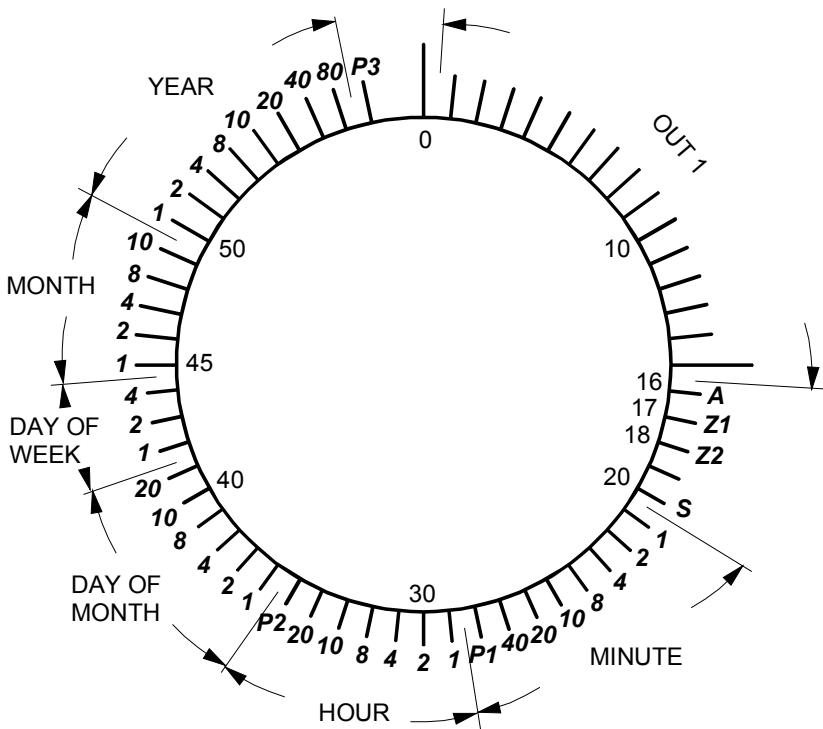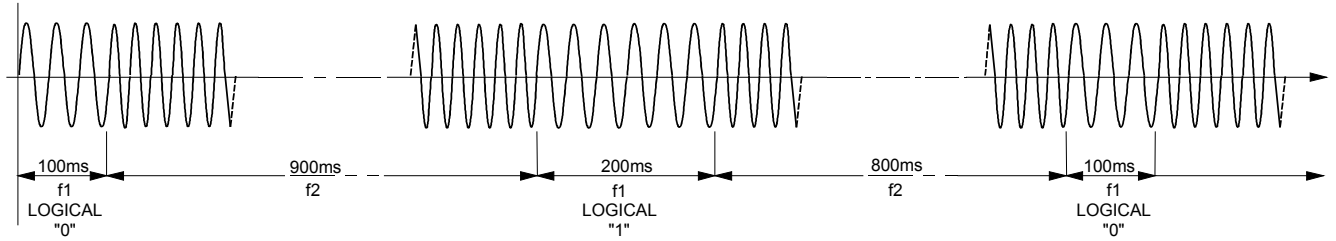
```
            ;Ex.:     !EE!
            ;         @TELEDEF.TEL
            ;         ;last line
;----------------------------------------------------------------

;last line (makes sure that a <CR> follows the filename)
```

F   Definitions of time codes and protocols

F.1   Audio frequency codes

F.1.1 DCF-FSK

MB drawing 112071.ds4

f1= 1000Hz
f2= 1250Hz
U= 2Vpp
LOGICAL "0"= 100ms
LOGICAL "1"= 200ms

A= EARLY WARNING BIT
(for season change)

Z1 & Z2= SEASON BITS		
0	1	= WINTER
1	0	= SUMMER

S= START BIT

P1=PARITY BIT MINUTE
P2=PARITY BIT HOUR
P3= PARITY BIT CALENDAR

Time Code Frame Length = 1 Minute
Bit rate = 1 Bit/Second

F.1.2 IRIG-B Standard (B122)

MB drawing 112072.ds4
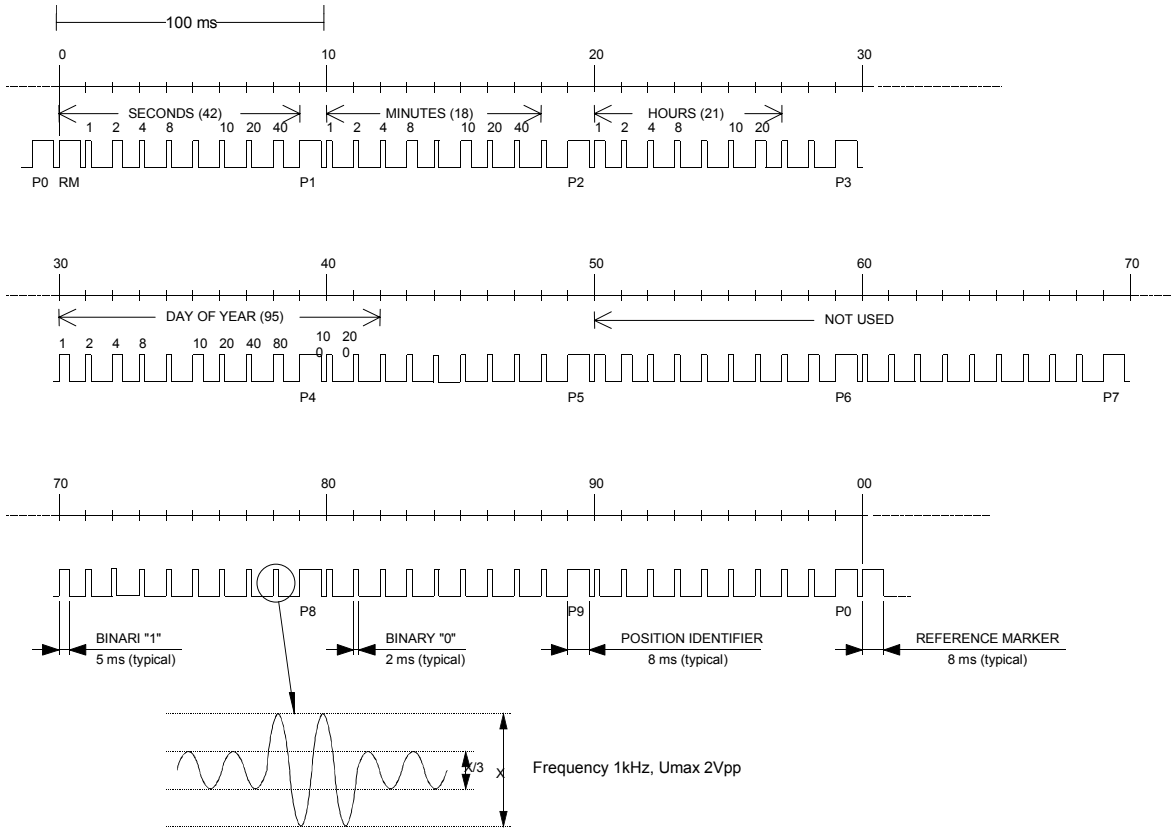
Time Code Frame Length = 1 Second

F.1.3 IRIG-B Standard 12h (B122)

MB drawing 112073.ds4

|← 100 ms →|

0   10   20   30

SECONDS (42)   MINUTES (18)   HOURS *modulo 12* (21)
1 2 4 8 10 20 40   1 2 4 8 10 20 40   1 2 4 8   10 20

P0 RM   P1   P2   P3

30   40   50   60   70

DAY OF YEAR (95)   NOT USED
1 2 4 8   10 20 40 80 100 200

P4   P5   P6   P7

70   80   90   00

P8   P9   P0

BINARI "1"   BINARY "0"   POSITION IDENTIFIER   REFERENCE MARKER
5 ms (typical)   2 ms (typical)   8 ms (typical)   8 ms (typical)

Frequency 1KHz, Umax 2Vpp
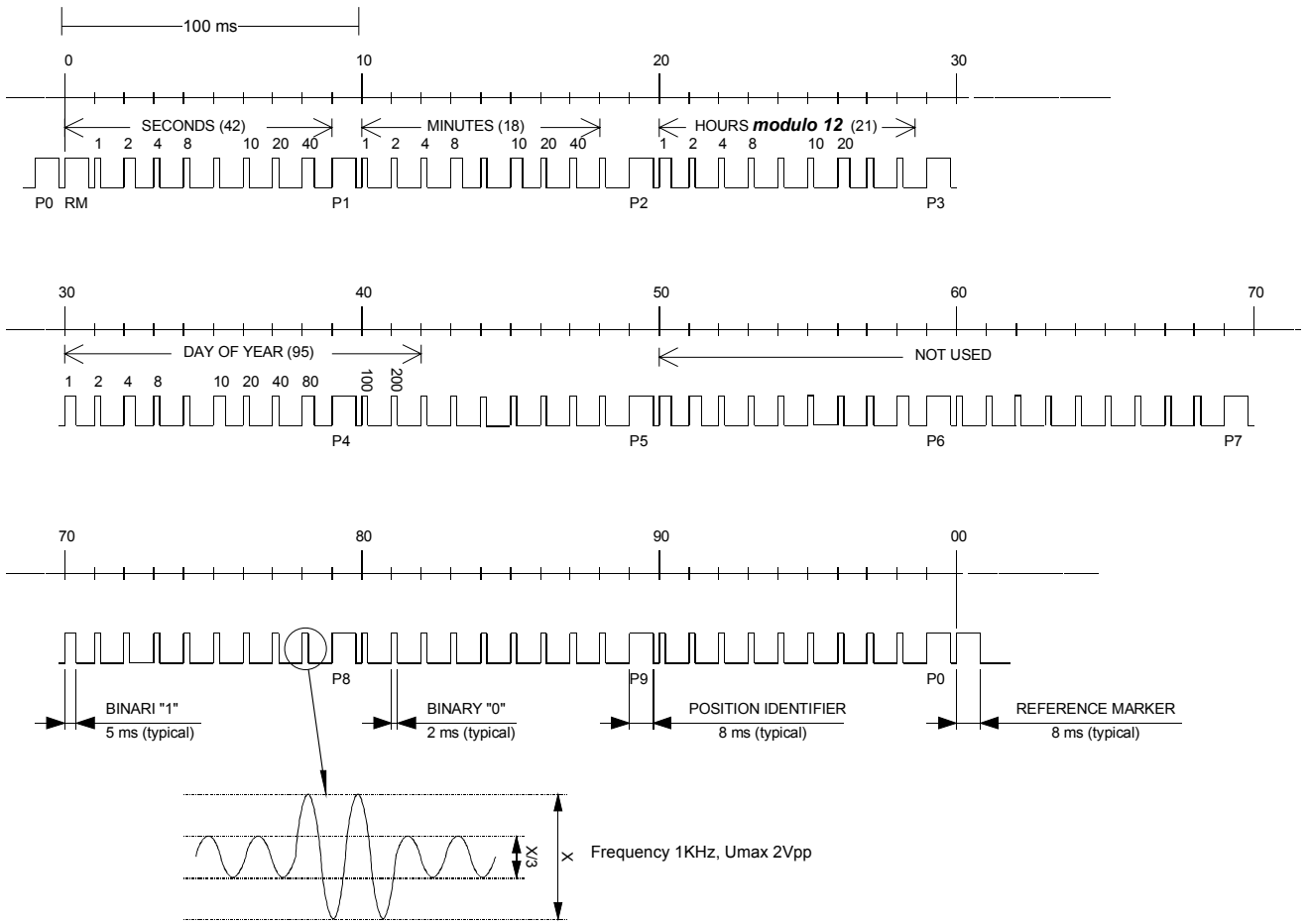
Time Code Frame Length = 1 Second

F.1.4 IRIG-B DIEM (B122)

MB drawing 112074.ds4
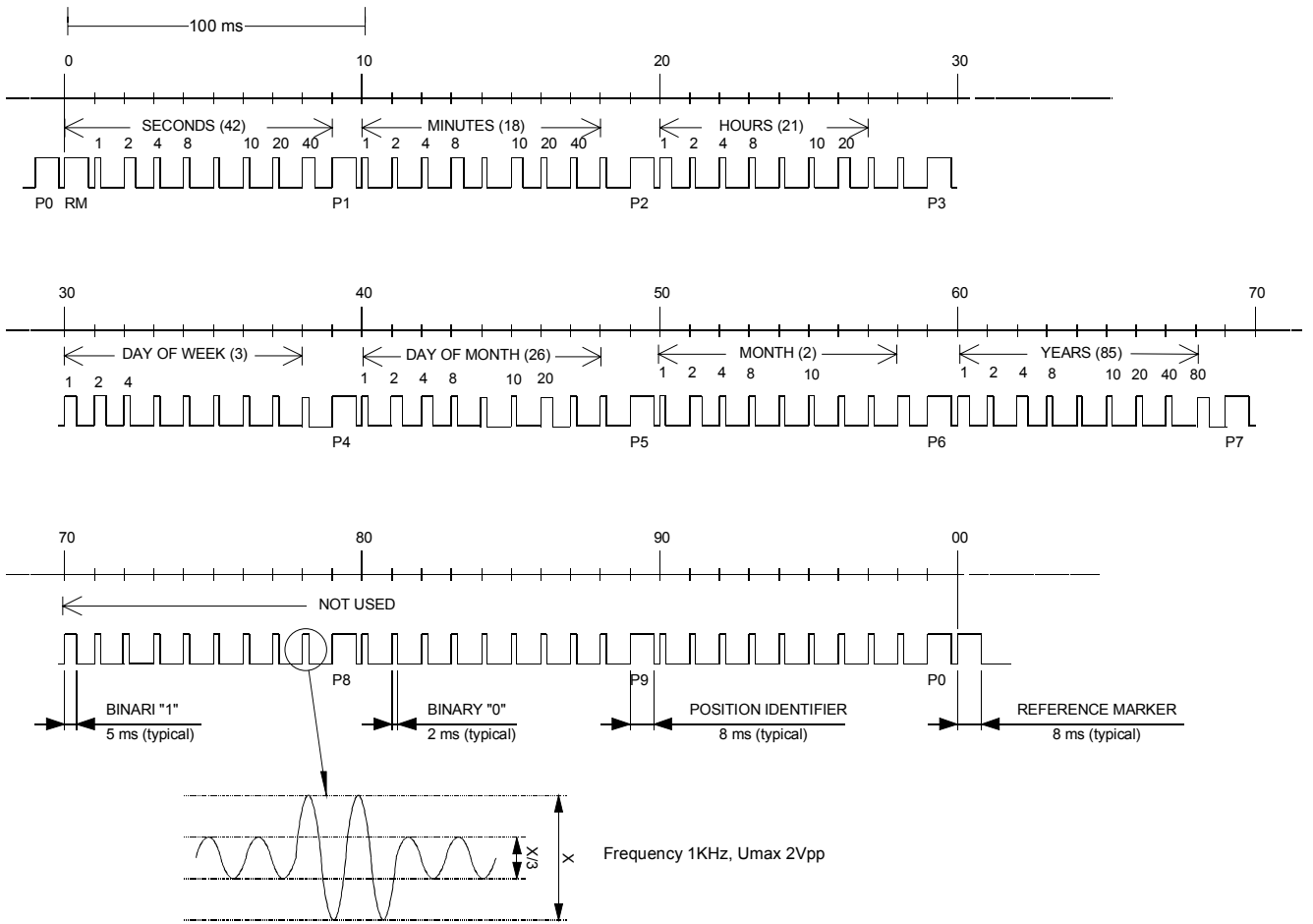
Time Code Frame Length = 1 Second

F.1.5 IRIG-B123

MB drawing TE800239.ds4
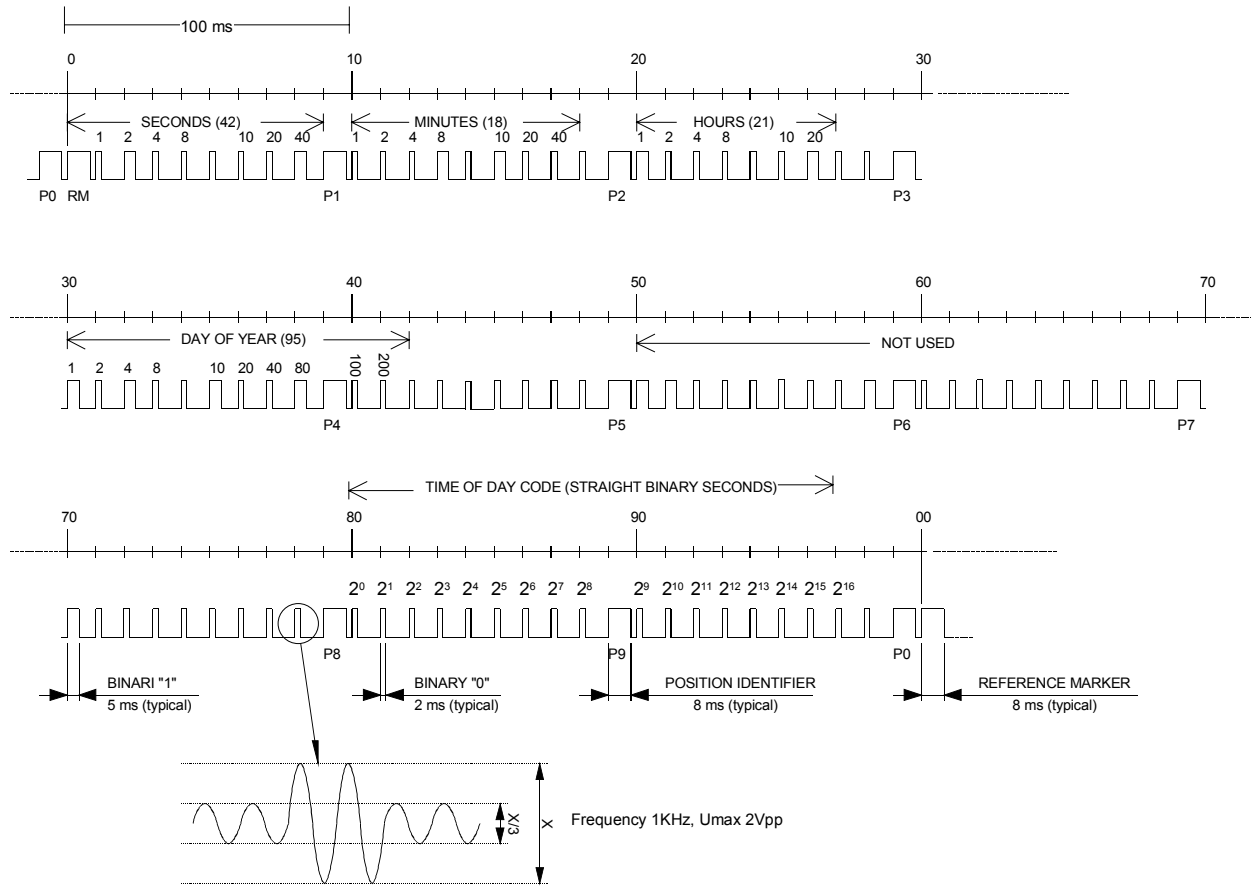
Time code frame length => 1 second

F.1.6 AFNOR-A (NFS 87-500)

MB drawing 112075.ds4
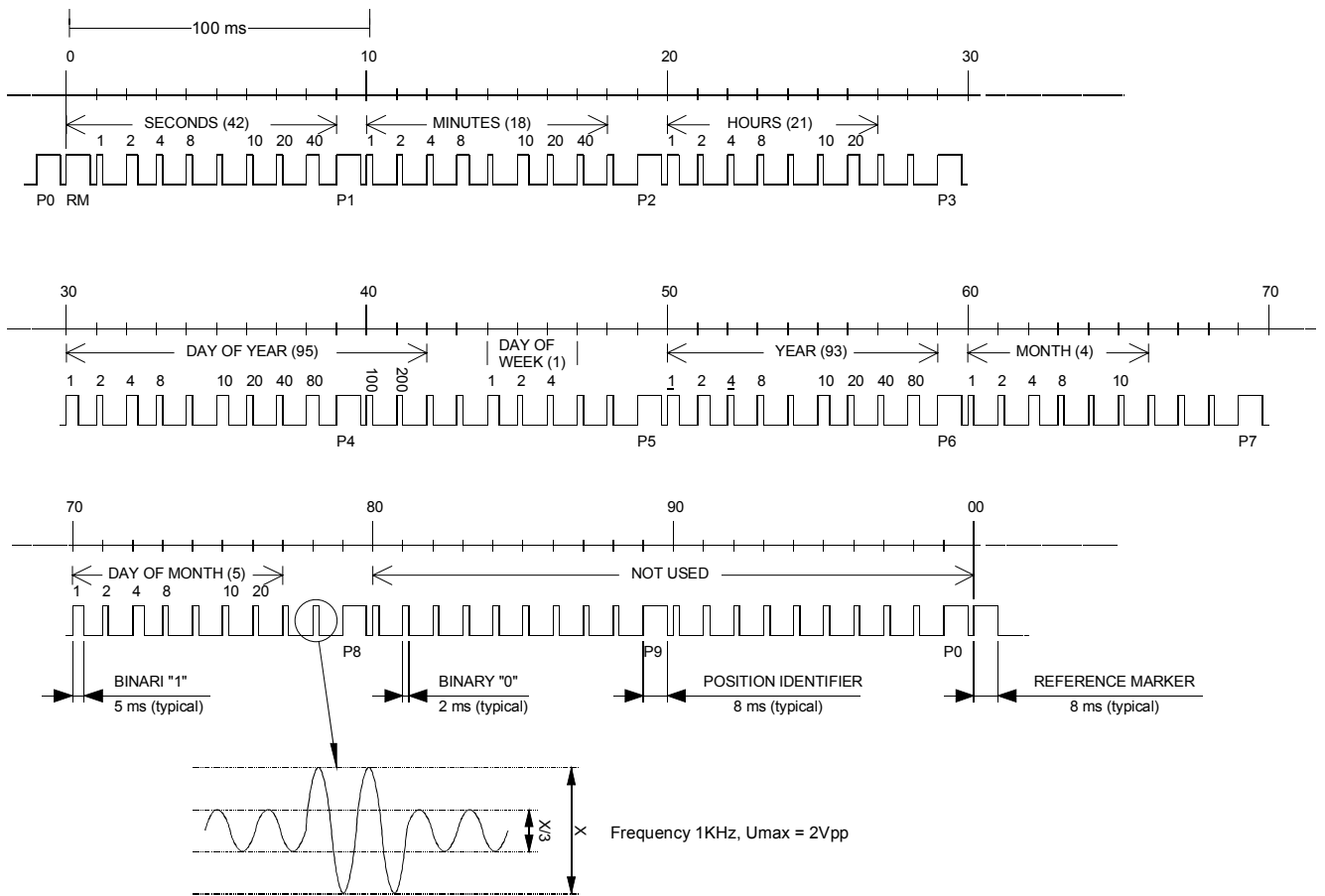
Time Code Frame Length = 1 Second

F.1.7 AFNOR-C (NFS 87-500)

MB drawing 112076.ds4

100 ms

0	10	20	30

SECONDS (42) 1 2 4 8 10 20 40   MINUTES (18) 1 2 4 8 10 20 40   HOURS (21) 1 2 4 8 10 20

P0 RM   P1   P2   P3

30	40	50	60	70

DAY OF YEAR (95) 1 2 4 8 10 20 40 80 100 200   YEAR (93) 1 2 4 8 10 20 40 80   NOT USED

P4   P5   P6   P7

70	80	90	00

P8   P9   P0

BINARI "1"
5 ms (typical)

BINARY "0"
2 ms (typical)

POSITION IDENTIFIER
8 ms (typical)

REFERENCE MARKER
8 ms (typical)

X/3   X   Frequency 1KHz, Umax 2Vpp
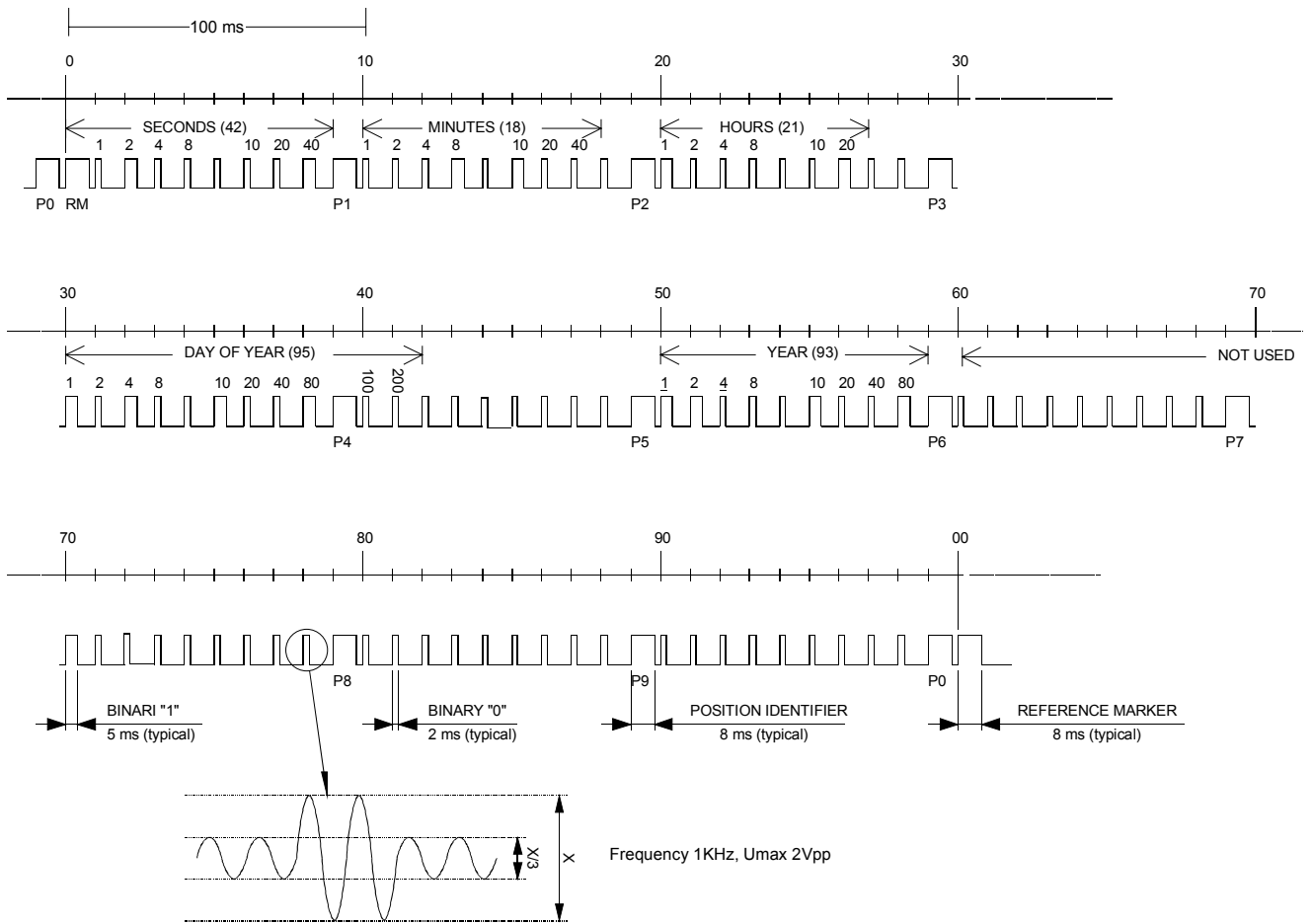
Time Code Frame Length = 1 Second

F.1.8 IRIG-E DIEM (E112)

MB drawing 112077.ds4
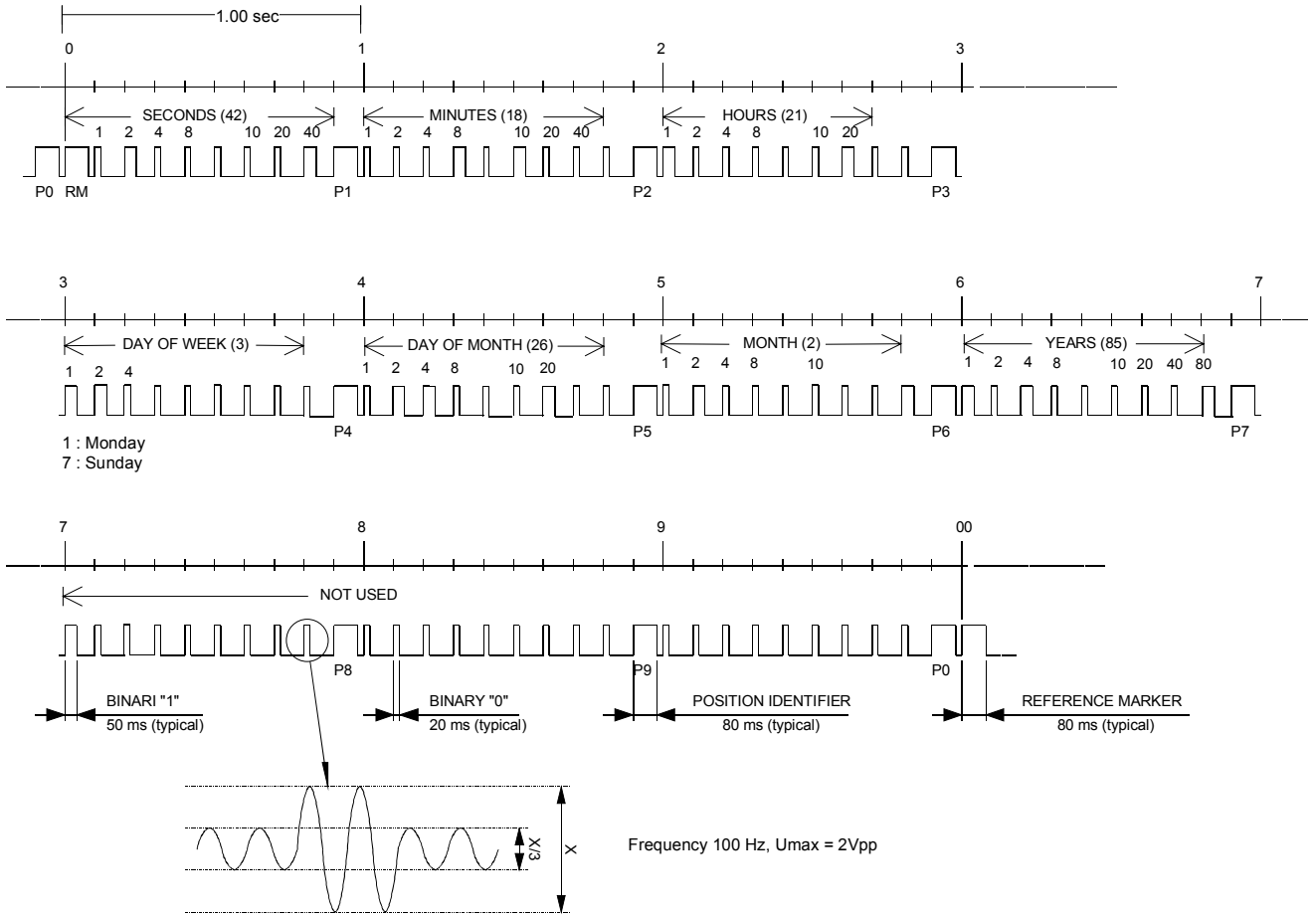
Time Code Frame Length = 10 Seconds

F.2 SNMP Traps (only MTS net)

The distributed SNMP traps have the following fields:

Field	Type	Description	Example
mtsSource	Octet String	System name (max. 20 charact.)	MTS
mtsDate	Octet String	Date	01.12.2001
mtsTime	Octet String	Time	12:30:00
mtsDevice	Integer32	Error source (0=Frame, 1..2=Time Channel 1..2)	0
mtsErrorBit	Integer32	Error bit (0..15)	0
mtsPriority	Octet String	Error priority (W=Warning, A=Alarm)	A
mtsSetClear	Octet String	Error status (C=Cleared, S=Set)	S
mtsDeviceDesc	Octet String	Full text description of field *mtsDevice*	Frame
mtsErrorText	Octet String	Full text description of error	Failure of external time acceptance

The fitting MIB module with the file name MTS.MIB will be supplied together with the MTSW software. It can be found in the sub-directory \DATA.

F.3   SNTP Client Mode (only MTS net)

Asymmetry: Compensation of different transit times for sending and receiving.

Broadcast mask: Subnet in which the broadcast packets are transmitted.

Receiving Timeout [s]: Maximum waiting period for a pending response. The next request is carried out thereafter.

Filter size: Number of time packets which must be present for synchronisation.

Interval [s]: In client mode pause between two requests within a request sequence. An interval of one second is used to begin with after a restart. After each sequence the value is then doubled until the set value is reached.

Pause between two time packets in broadcast and listen mode.

Jitter [ms]:Time packets with a larger deviation in relation to the average value of all packets are rejected.

Max. response time [ms]: Requests which have a longer transit time are rejected.

Min. valid: Number of time packets which must still be valid after filtering in order to effect synchronisation.

Min. stratum: Minimum stratum level required by the (S)NTP server.

Pause [s]: Pause between two request sequences. An interval of one second is used to begin with after a restart. After each sequence the value is then doubled until the set value is reached.

Port: Port used.

Source 1: Main time server.

Source 2: Spare time server if source 1 is not accessible or data are invalid.

Source 3: Spare time server if source 2 is not accessible or data are invalid.

Source 4: Spare time server if source 3 is not accessible or data are invalid.

Stratum level: Stratum level of the MTS in synchronized state. In the case of synchronisation loss (Alarm: Loss of external time transfer) the stratum level drops to 15 and the alarm condition (clock not synchronized) is set in the time packet.

Synch loss [s]: Max period permitted without synchronisation of the (S)NTP server within which time packets are used.

Delay [s]: Delay in a switched line from request to the time that the connection is established.

Various parameters which can be configured in SNTP client mode are shown in the following.
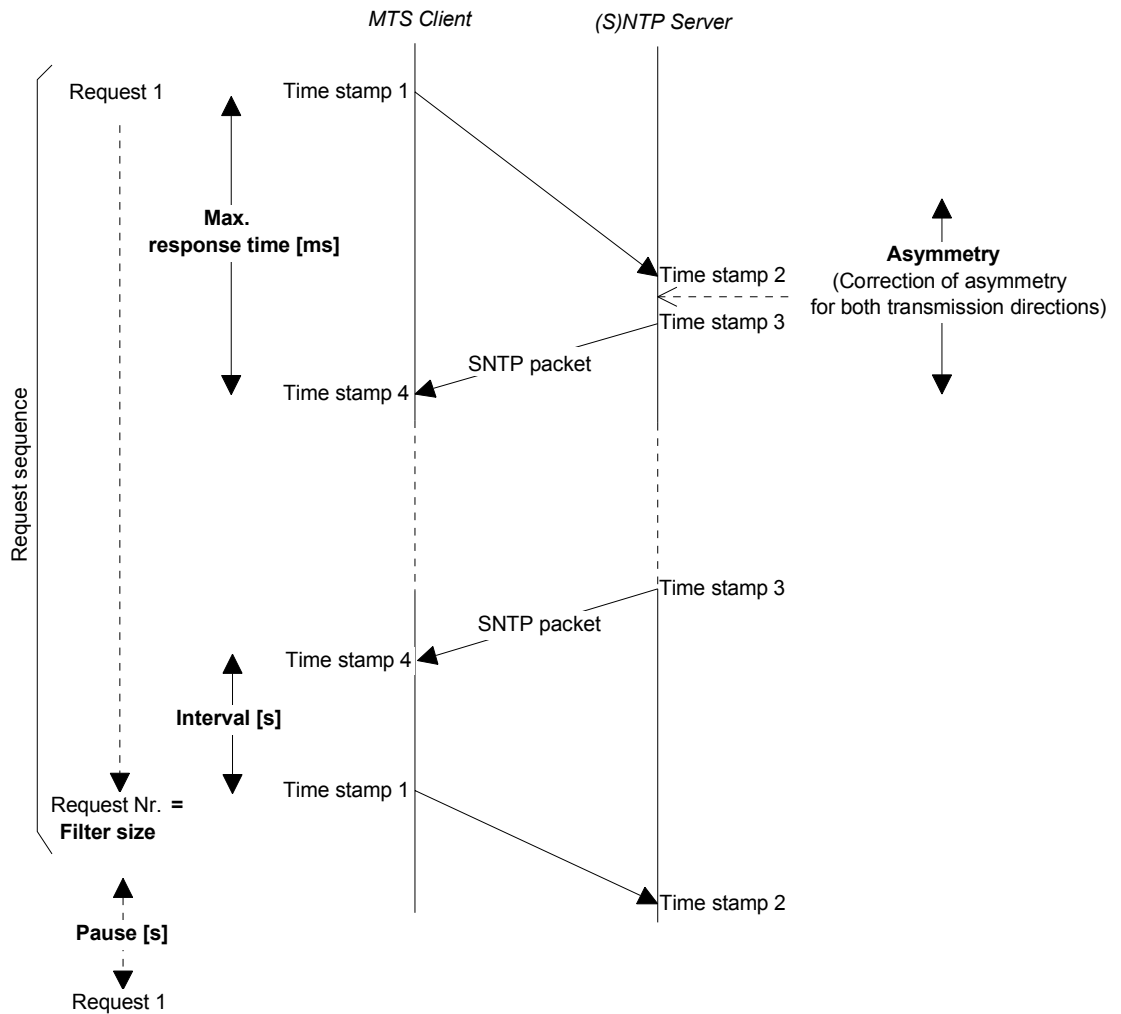
In period from **pause [s]** the MTS starts a request sequence consisting of n requests, where n represents the **filter size**. The individual requests take place in the period from **interval [s].** The maximum permissible **response time [ms]** and any known **asymmetry** can be configured.

Mean value of the received time packets
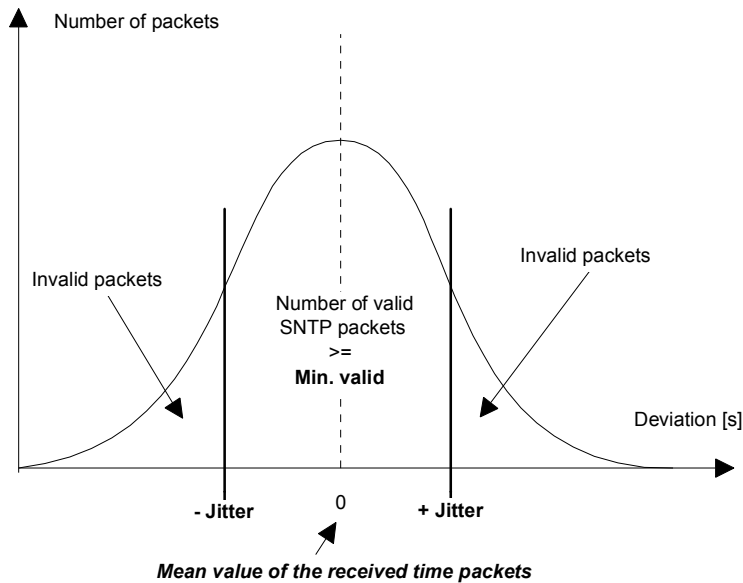
All SNTP packets of a request sequence in the range **+ - jitter [ms]** are valid. If this value is greater than the **Min. valid** value and if the conditions transit time below **Max. response time [ms],** period without synchronisation of the server under **Synch Loss [s]** and stratum level of the server are greater than or equal to the **Min. Stratum**, then the entire request sequence is regarded as valid.

F.4 NMEA 0183 – Protocol

The following parameters apply for synchronization from GPS with the NMEA protocol (Setting GPS-NMEA, chapter 8.1):

Protocol:	NMEA 0183 from Version 2.0 or higher
Interface :	RS232 or RS422
Communication parameters:	4800 Baud, 8 data bits, 1 stop bit, no parity
Synchronization:	1 PPS signal (open collector or RS422)
Expected NMEA packets:	GGA (reception quality)
	ZDA (UTC time and date)

Important:

The specified NMEA packets must:

a) be sent automatically by the GPS receiver at periodic intervals (at least every 10 s),

or

b) must be requested by the MTS by means of a query telegram ($xxGPQ,ZDA*FF and $xxGPQ,GGA*FF).

The used receiver may need to be reconfigured.

F.5 IF482 – Telegram

For synchronization via the serial MB IF482 telegram (setting IF482, chapter 8.1) the following parameters apply:

Protocol:	MB IF482 telegram; format see below
Interface :	RS232 or RS422
Communication parameters:	9600 Baud, 7 data bits, 1 stop bit, even parity
Synchronization:	Telegram ends at the beginning of the second specified in the telegram
Cycle:	1 second

Format:

Byte No.	Meaning	Character	HEX Code
1	Start character	O	4F
2	Monitoring 1)	A or M	41 or 4D
3	Time-Season (Winter/Summer)	W or S	57 or 53
4	Year tens	0 .. 9	30 .. 39
5	Year units	0 .. 9	30 .. 39
6	Month tens	0 or 1	31 or 31
7	Month units	0 .. 9	30 .. 39
8	Day tens	0 .. 3	30 .. 33
9	Day unit	0 .. 9	30 .. 39
10	Monday .. Sunday	1 .. 7	31 .. 37
11	Hours tens	0 .. 2	30 .. 32
12	Hours units	0 .. 9	30 .. 39
13	Minutes tens	0 .. 5	30 .. 35
14	Minutes units	0 .. 9	30 .. 39
15	Seconds tens	0 .. 5	30 .. 35
16	Seconds units	0 .. 9	30 .. 39
17	Telegram end character	<CR>	0D

1) With a correctly received time in the sender unit, the ASCII character 'A' is issued. If 'M' is issued, this indicates that the sender was unable to receive any time signal for over 12 hours (time is accepted with 'A' and 'M').

G Assembly information

1. Screw hinges on sub-assembly mount
2. Screw MTS on to the hinges

MTS

1

2

Front panel
MTS
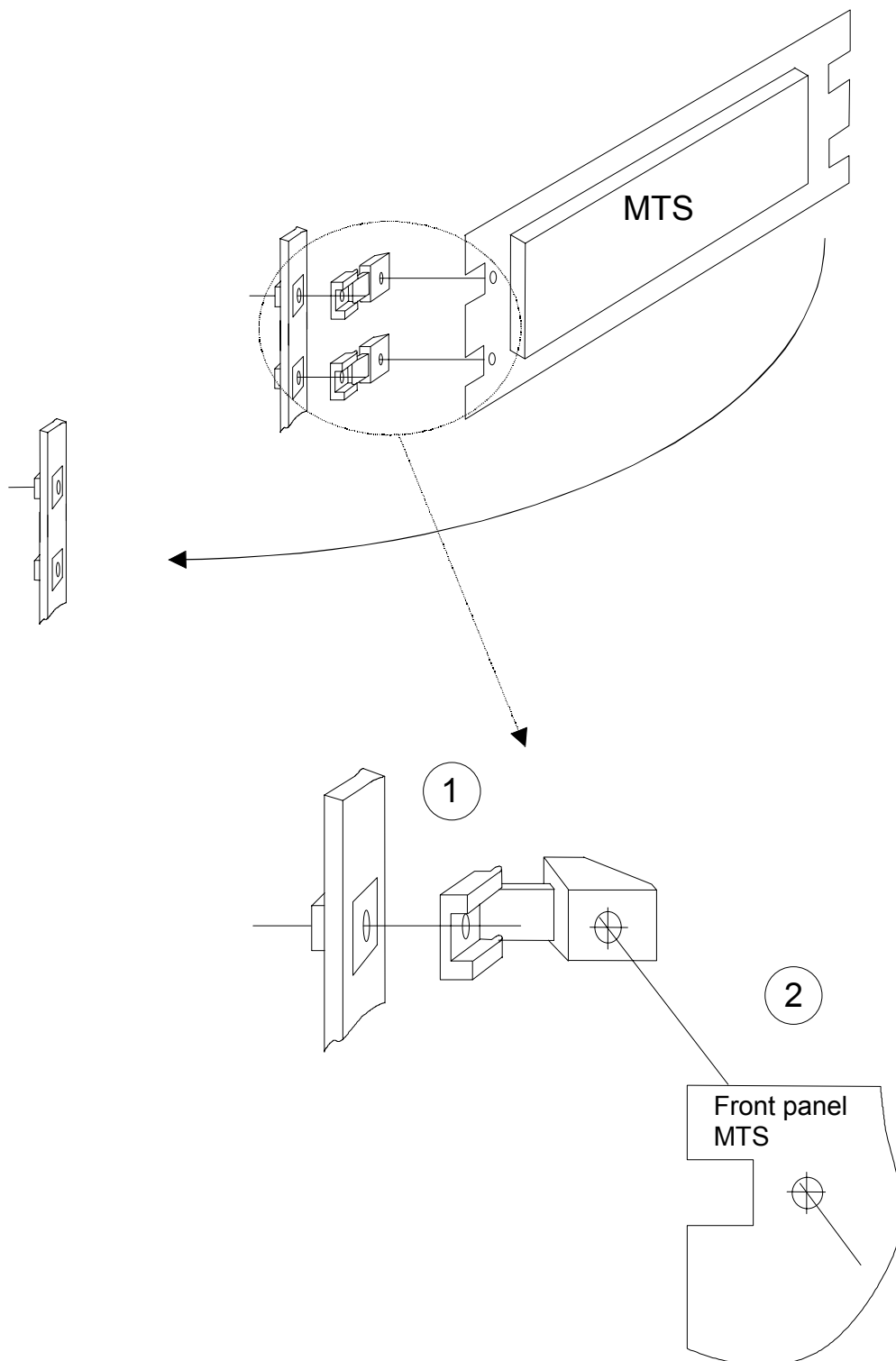
H   Option EPROM

The optionally available EPROM contains the system software and a season table. In addition, up to 10 telegram files can be saved on this EPROM.

The option is primarily intended to enable a software update even when no PC or notebook is available.

Fitment and removal of the EPROM may only be carried out by trained specialist personnel.

Fitment of the EPROM

1. Switch off MTS and disconnect all connections. Remove power supply and pull out the reserve power battery (optional).

2. Remove rear metal panel, by unscrewing the 4 screws in the corners.

3. Carefully place EPROM on socket (IC5) and insert. It is essential to note the orientation (see diagram). Do not bend or break the pins.

4. Short-circuit the jumper: Place coding plug on both pins.

5. Attach rear metal panel and screw on.

6. Insert reserve power battery (optional) and switch on power supply.

EPROM fitted

No EPROM fitted

I   Technical data

EMC	EN 61000-6-2 / EN 50121-4 / EN 61000-6-4 (see chap. 1.2)
Dimensions	HxWxD [mm]: 88 (2 HE) x 483 (19") x max. 95 mm (without options such as lead-acid battery for reserve power)
Weight	MTS basic 24 V DC: 1.2 kg
	MTS basic 230 V AC: 1.4 kg
	Optional lead-acid battery: 0.7 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 and English, selectable
Keypad	Alphanumeric with navigation keys
Accuracy	Time output (synchronized): +/- 10 ms absolute Time mark (GPS synchronized): +/- 0.1 ms absolute Autonomous operation (standard quartz): +/- 0.1 s per day (observed for 24 h), at 20ºC +/- 5ºC.
Power supply	Model MTS ... 230 V AC: 110-240 V AC, 50/60 Hz, < 15 VA Model MTS ... 24 V DC: 24V DC, +20%, - 25%
Power consumption	MTS basic 24 V DC: 50 mA @ 24 V DC at terminal X1 (110 mA with backlighting) 80 mA @ 12 V DC at terminal X2 (200 mA with backlighting)
	MTS net 24 V DC: 100 mA @ 24 V DC at terminal X1 (160 mA with backlighting) 160 mA @ 12 V DC at terminal X2 (300 mA with backlighting)
	Option LON: + 5 mA @ 24 V DC
Reserve power	Optional lead acid battery, gas-proof, 12 V / 1.2 Ah, floating charge with 90 mA, flat battery monitor circuit
Time zones	80 predefined, 20 on PC freely programmable entries
Time sources	DCF, MSF, GPS-TSIP, GPS-NMEA (RS232 / RS422 selectable, packets GGA and ZDA min. every 10 s or on request, query), IF482 telegram (RS232 / RS422 selectable), LON, minute pulses, network with SNTP (only MTS net), CAS or none (autonomous)
Synchronization inputs	Active current loop for two wire DCF, MSF time signal receiver, 1 interface (RS422 / RS232, changeable) for time synchronization from GPS or periodic serial ASCII time telegram (definition MB, IF482), input for synchronization pulse 1PPS from GPS (open collector / RS422), FT-10 LON-Bus for time synchronization and monitoring by a MTC system.
Outputs master clock unit	DCF time code with selectable time zone on passive current loop. FT-10 LON-Bus for time synchronization and monitoring by a MTC system. The signals from the GPS receiver are looped through the MTS to connect a second MTS. Alarm contact, opener, 125VAC 0.5A / 60VDC 0.1A / 30VDC 1A.

Outputs time channel	On RJ 45 connector, isolated: RS 232/422/485 (changeable) for transmission of programmable serial time telegrams. Audio frequency time codes, selectable: IRIG (diverse variants), AFNOR (diverse variants), DCF-FSK, 600 Ohm / 0 dB. Synchronization pulses on isolated passive current loop, opto-coupler max. 20 mA / 35 V, selectable: 1pps, 1ppm, 1pph, 1ppd, pulse duration 0.1 to 25 s, 'Pre-Trigger' from 0 to 800 ms (jointly programmable for both channels), accuracy better than +/- 0.1 ms (with GPS synchronization).
Network connection (only MTS net)	Network processor with TCP/IP stack: time synchonisation of computers over SNTP V3 (RFC 1769), SNMP traps and e-mail for centralized supervision of the device, configuration through menu guidance or Telnet connection Connection: 10Base-T (10 Mbit/s) Ethernet LAN to RJ45

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