

MOUNTING AND INSTRUCTION MANUAL

DTS 4148S.grandmaster

Network – Time Server and Master Clock



Certification of the Producer

STANDARDS

The DTS 4148.grandmaster was developed and produced in accordance with the EU Guidelines:

| | |
|----------------|---------|
| 2014 / 30 / EU | EMC |
| 2014 / 35 / EU | LVD |
| 2008 / 57 / EU | Railway |
| 2011 / 65 / EU | RoHS |
| 1907 / 2006 | REACH |



References to the Instruction Manual

1. The information in this Instruction Manual can be changed at any time without notice. The current version is available for download on www.mobatime.com.
2. The device software is continuously being optimized and supplemented with new options. For this reason, the newest software version can be obtained from the Mobatime website.
3. This Instruction Manual has been composed with the utmost care, in order to explain all details in respect of the operation of the product. Should you, nevertheless, have questions or discover errors in this Manual, please contact us.
4. We do not answer for direct or indirect damages, which could occur, when using this Manual.
5. Please read the instructions carefully and only start setting-up the product, after you have correctly understood all the information for the installation and operation.
6. The installation must only be carried out by skilled staff.
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1 Safety

1.1 Safety instructions



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

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

1.2 Symbols and Signal Words used in this Instruction Manual

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

1.3 Intended Use

The **DTS 4148.grandmaster** is a time server for the use in network environments. It can be synchronized from NTP and be used as NTP server. In addition, it can read the time from DCF or GPS (e.g. from GPS 4500).

It can operate as master clock for a self-setting IRIG clock line. The DTS 4148 has 1 such line.

For additional functions, see the device descriptions in chapter 3.

The device is designed for 19" racks and intended to be installed in a 19" cabinet. Operate the device only in installed condition and with all connectors plugged in.

Use this product only as stated in this instruction manual. Any other use is considered improper use.



1.4 Observe operating safety!

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



1.5 Consider the installation site!

- To avoid any operating problems, keep the device away from moisture and avoid dust, heat, and direct sunlight. Do not use the device outdoors.
- The device is designed for 19" racks and should only be operated installed in a 19" cabinet.



Danger! Make sure

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



1.6 Please observe the electromagnetic compatibility!

- This device complies with the requirements of the EMC and the Low-voltage Directive.



1.7 Network security

- The default password shall be changed after the commissioning of the device.
- A reset of the password to default through hardware is not possible. Using MOBA-NMS the password can be modified. In case an access via MOBA-NMS is not possible, support effort will be needed or the device has to be sent back to the factory.
- All unused services shall be deactivated: FTP, Telnet,...

2 Maintenance

2.1 Troubleshooting: Repairs

Please read carefully Appendix D Troubleshooting if your device does not work properly.

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

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

Disconnect the power supply immediately and contact your supplier if ...

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

2.2 Cleaning

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

2.3 Disposing



Device

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



Packaging

Your device is packaged to protect it from damages during transport.

Packaging is made of materials that can be disposed of in an environmentally friendly manner and properly recycled.

3 General Information: Introduction

3.1 Scope of Delivery

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

The package you received contains:

- DTS 4148.grandmaster
- Mounting set for rack mounting consisting of:
 - 4 pcs nuts for 19" housing
 - 4 screws M6 for the nuts
 - 4 plastic discs for screws M6
- Connector set
 - 1 * spring terminal 6-pole orange
 - 3 * spring terminal 4-pole orange
 - 2 * spring terminal 2-pole orange
 - 1 * spring terminal 5-pole orange
- 2 pcs mounting tools with spring terminals

3.2 Technical Data

See Appendix "H Technical data".

3.3 Device Description in this Manual

This instruction manual is for the time server **DTS 4148.grandmaster**.

3.4 Introduction

The DTS 4148.grandmaster is an NTP Time Server for use in network environments. It can be synchronized by DCF or GPS (e.g. from GPS 4500), AFNOR-A/C, IRIG-B¹ and NTP, and act as an NTP server in a network.

This device is a PTP grandmaster according to IEEE 1588-2008 for the synchronization of PTP clients.

It can be used as a master clock for NTP slave clocks, synchronized via unicast or multicast with NTP and time zone table.

It is equipped with 2 LAN interfaces for the operation in two independent networks.

In addition, the DTS 4148 provides an IRIG/AFNOR line (available as analog and digital (current loop and RS422) output), a serial interface for the output of time telegrams as well as an output line for technical pulses (pulse/frequency/DCF).

As the "main" master clock, the DTS 4148 can synchronize other master clocks or other equipment with DCF and monitor with 1 alarm input.

The DTS 4148 can send both e-mails and SNMP traps for alerting purposes.

Using MOBA-NMS and SNMP, the DTS 4148 can be fully operated and its configuration and system status can be requested.

To maintain a redundant time source, two DTS 4148 can be linked by an optical link.

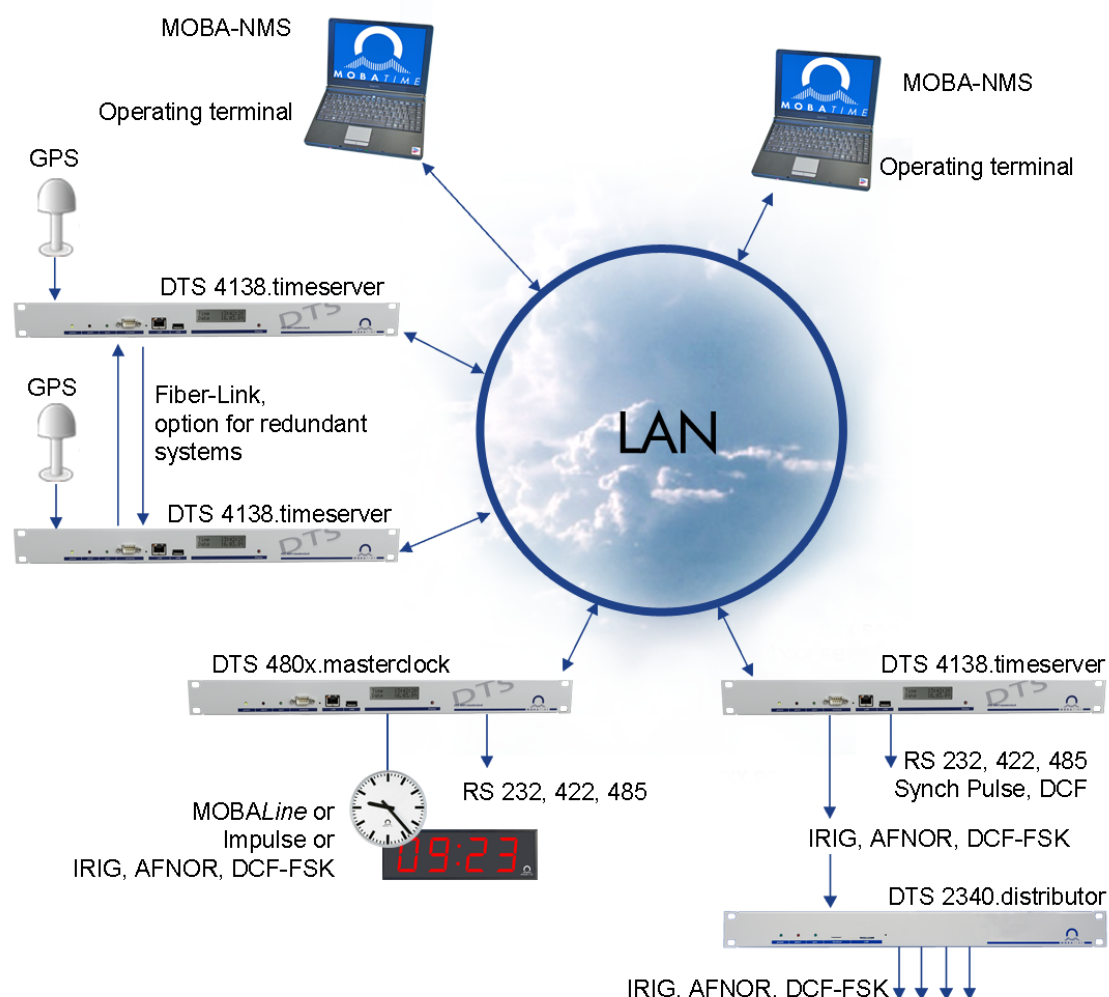
¹ With IRIG-B synchronization the date must be set manually once or by another time source (GPS).

3.5 Device types

| Model: | Features: | Product no.: |
|------------------------------|---|---------------|
| DTS 4148.grandmaster | According to above description with OCXO (temperature compensated quartz) | 117983 |
| DTS 4148S.grandmaster | Same as DTS 4148, Siemens version | 122325 |

3.6 DTS Distributed Time System

DTS (Distributed Time System) is a system developed by Moser-Baer AG to connect decentralized master clocks, slave clock lines and time servers. For communication, standard LAN (Ethernet) is used. The DTS can be centrally operated and monitored.



3.7 MOBA-NMS - Network Management System

MOBA-NMS is software used for central management and inquiry of state and alarm information. It supports DTS devices as well as all MOBATime analog and digital network clocks and can handle a network with more than 1000 devices. This software provides extensive functions for the configuration, installation, back-up / recovery etc. especially for DTS devices.

Due to the DTS concept, MOBA-NMS can be installed multiple times in one network. With different user rights on the device and software level, the configuration abilities of different users can be set as required.

For DTS devices, all communication is conducted over SNMP V3. The SFTP protocol is used for broadcasting files.

3.7.1 Overview of the main functions

The main MOBA-NMS functions for DTS devices and network clocks are listed below:

- automatic device scan over multicast or IP range
- device management using user-defined device groups ➔ see chapter „3.7.2 Device management“
- intuitive user interface with input check for the device configuration
- status / alarm request and display on the device group level
- device firmware update for one or several devices (parallel)
- support for device commands, e. g. reset, restart etc.
- back-up / recovery of DTS devices
- transfer of the whole DTS configuration to another device
- user management with different access rights
- monitor for NTP and time zone packages
- editor for time zone files
- online help
- etc.

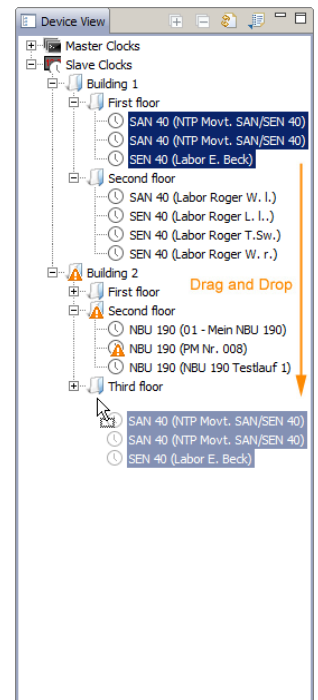
3.7.2 Device management

All MOBATime network devices are displayed in the so-called device view. Here, the devices can be grouped according to user-defined criteria. For this, the individual devices can simply be moved to the according groups and sorted using drag and drop. There is no limit to the number of groups and sub-groups.

Besides the organizational advantages (easier locating, better overview), a device group has the following advantages:

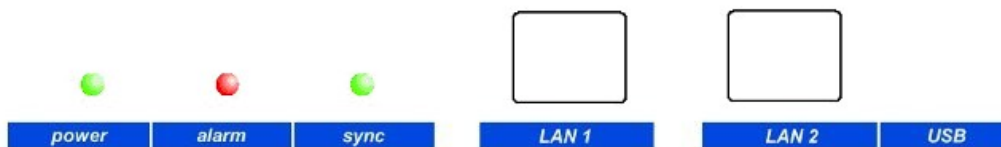
- commands and device updates can be applied to the whole group (including sub-groups).
- Alarms and errors of included devices are displayed on the group level.
- Complete groups can be moved / sorted among themselves.

The content of the device view can be saved and opened at a later time. The created structure and breakdown into groups is preserved.



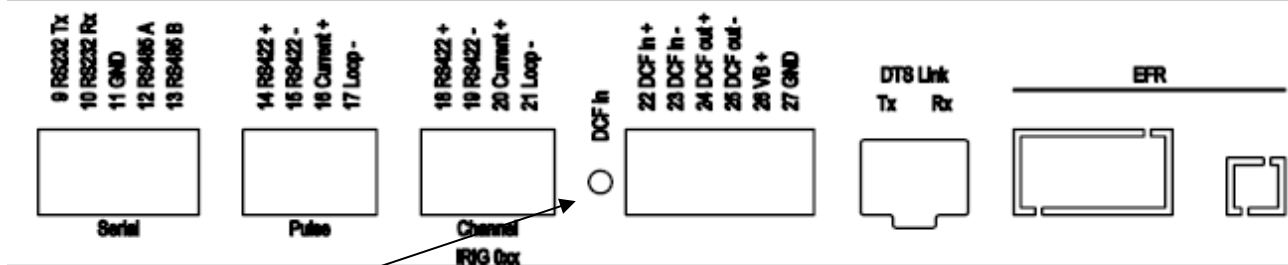
4 Displays

4.1 LED displays front side



| Description | Color | Status | Description |
|----------------------|--------|----------|--|
| Power | Green | On | Mains or DC power supply is in order |
| | | Off | No power supply |
| Alarm | Red | On | The alarm relay signalizes an alarm |
| | | Off | No active alarms |
| Sync | Green | On | DTS 4148 can read the time from a synchronization source |
| | | Off | Synchronization source is not available |
| LAN 1 control lamps: | | | |
| Left | Green | Blinking | Network activity |
| | Orange | Blinking | No connection to network |
| Right | Yellow | Off | 10 Mbit |
| | | On | 100 Mbit |
| LAN 2 control lamps: | | | |
| Left | Green | Blinking | Network activity |
| | Orange | Blinking | No connection to network |
| Right | Yellow | Off | 10 Mbit |
| | | On | 100 Mbit |

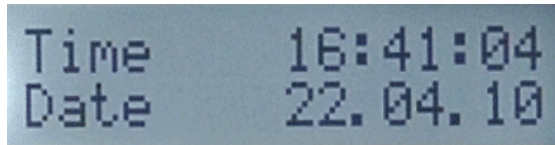
4.2 LED indication back side



| Description | Color | Status | Description |
|-------------|-------|----------|---|
| DCF in | red | Blinking | DCF (GPS reception), blinking every second ➔ time information from receiver |

4.3 Display

Display showing the current status of the DTS 4148.



Display of:

- Time, date
- Current time source
- Stratum of the DTS 4148, status: Master / Slave
- Software version
- IPv4 address LAN 1
- IPv4 address LAN 2
- IPv6 address LAN 1
- IPv6 address LAN 2
- Alarm summary
- Current alarms

The display can be operated by means of the corresponding “Display“ button:

| | |
|---------------------------------|---|
| First press the button briefly: | Switch on the background light |
| Other buttons to press briefly: | Scroll through all displays |
| Press button longer (>3 sec): | Change to default display (time and date) |

The display changes after approx. 3 min without pressing the button for the default display and the background light goes off.

If a USB stick has been plugged in, it will be displayed. If only telegram files should be copied or the network settings should be changed, this can be activated directly with the button. (Press the button until the copy process starts).

5 Installation

5.1 Connections

The connections are specified in Appendix "A Connection diagrams".

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

5.2 Boot procedure of the DTS 4148.grandmaster

The normal booting time of the DTS 4148 is approx. 60 sec. with pre-set IP or with DHCP. The booting procedure of the operating system is displayed on the serial console. After that, the text "starting" appears on the display (during the booting procedure the display is dark and empty). Without connection to a DHCP server, the first start up can take up to 75 seconds. After that, the DHCP option must be set to "off" in the network configuration.

The display "starting" remains until the time of output to the lines.
The duration, depending on the configuration, is 5-30 sec.

5.3 Initial configuration

Per default, the LAN 1 interface is configured with DHCP on. After booting in a network with DHCP server, the received IP address can be displayed.

The LAN 2 interface is configured with the following static settings per default:
IP 192.168.1.5, Subnet 255.255.255.0, Gateway 192.168.1.1

If these possibilities do not work out for the initial configuration, the network configuration can be modified using a USB stick. For this purpose, a text file named **DTS4148NW.conf** is created and filled with the corresponding parameters (not all parameters are required):

```
IP1:192.168.1.3  
SUB1:255.255.255.0  
GW1:192.168.1.1  
IP2:10.0.0.7  
SUB2:255.255.240.0  
GW2:10.0.0.1
```

The insertion of the USB stick is displayed. For taking over the network settings, press the button until the normal time display reappears.

5.4 Firmware

It is recommended to install the current firmware on your device prior to the definite commissioning. The current firmware can be found under www.mobatime.com → *Customer Data* → *Product Ressources* → *Time Server*.

5.5 Basic settings (factory settings)

The basic settings can be found in the table in Appendix "G Parameters".

6 Operation

6.1 General

Operation occurs via a terminal menu or SNMP. SNMP operation is explained in chapter "9 SNMP". Operation with the terminal menu takes place either via Telnet or SSH. After a connection has been set up, the login screen is displayed:



To start the menu, *dtS* must be logged in as user. The standard password is *dtS*. (Changing the password → see chapter "6.5.21 General settings").

Only one menu can be open at any time. The first menu started has priority. The menu is automatically closed after 15 min. without operation, and any possible connection via Telnet or SSH is interrupted.

Backspace:

Backspace must be set to "delete" with the serial terminal:

For example, for **HyperTerminal** under "File → Properties → Settings - Backspace sends DEL" must be selected.

Local echo:

Some terminals (serial or Telnet) do not display the characters entered. It is, therefore, necessary to switch on the "local echo" in the terminal.

6.1.1 Telnet

Windows XP, 7, 8, 10: Start → Run → *telnet [IP address]* or with Putty
User: *dtS*
Password: standard password *dtS*
NetTerm (Shareware)

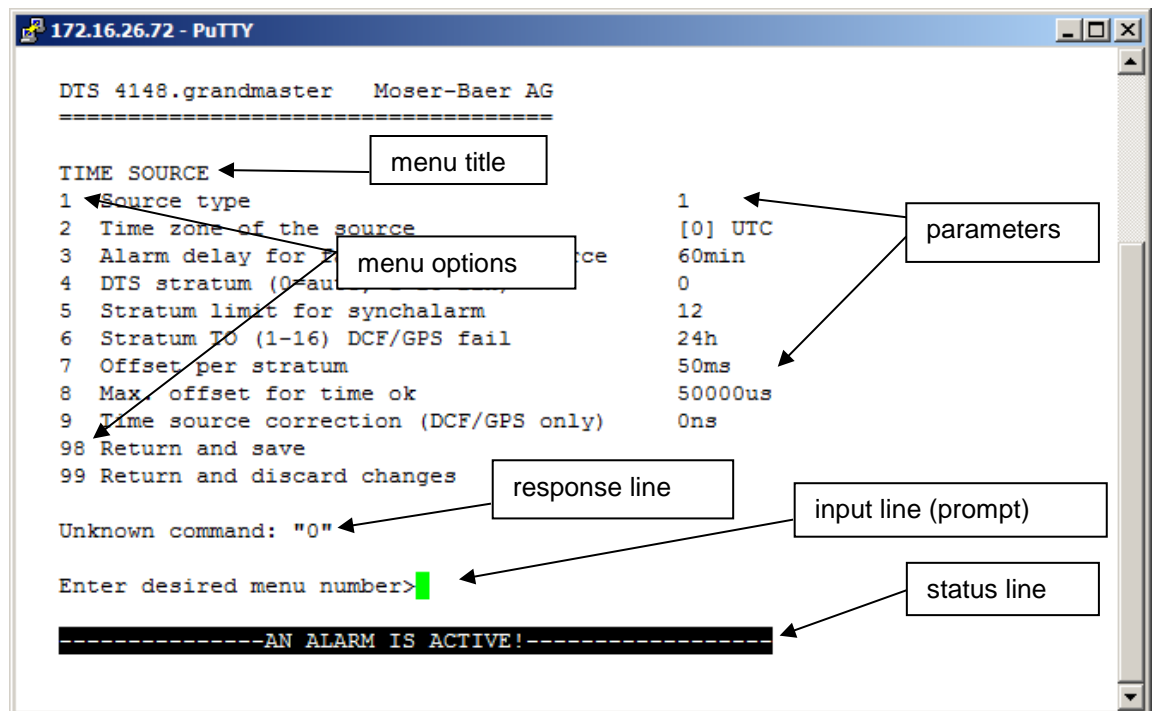
Linux: Start console and enter "*telnet [IP-address]*"

6.1.2 SSH

Windows XP, 7, 8, 10: e.g. with Putty

Linux: Start console and enter "ssh dts@[IP address]"

6.1.3 Menu structure



The current menu is always displayed in the **menu title**. The **menu options** show all the selectable menu functions. Provided the menu item is not a further menu, the set **parameters** are displayed. Error messages (e.g. invalid entries) or additional information to the selected menu items are displayed in the **response line**. The **input line** shows the current input values or options possible. The **status line** only appears, when an information has to be displayed, e.g. "An alarm is active".

All entries must be completed with ENTER (Return) (e.g. also ESC).

The menu window can always be exited with *Ctrl-C* (incl. termination of the Telnet and SSH connection).

The desired menu can be selected with the relevant number.

The numbers 98 and 99 are always used identically:

- With 98, the settings entered are saved and the menu exited. Depending on the change, the DTS 4148, or only partial functions, are rebooted.
- With 99, all changes to the menu are reversed and the menu exited. In the menus where data cannot be saved (command 98), the menu is only exited with 99, but any changes are not saved.

The current menu is updated, without any further entry, with ENTER.

6.2 MOBA-NMS operation

For the configuration of DTS devices via GUI, MOBA-NMS (see chapter „3.7 MOBA-NMS - Network Management System“) can be used. All configuration possibilities are subordinated in different configuration pages (called „tabs“). These tabs are connected to the terminal menu and designated accordingly. Example: The terminal menu „Configuration → Alarms“ can be found in MOBA-NMS under the tab „Alarms“.

Configuration example of a DTS 4801.masterclock:

The screenshot displays the MOBA-NMS web interface for a DTS 4148 device. The top status bar indicates 'DTS 4148 Status: OK' and 'Firmware version: 01170214.010000.010000'. The main content area is divided into several sections: 'List of active alarms' (currently empty), 'Network' (showing settings for Interface 1 and 2, including IP address, subnet mask, gateway, and DNS server), and 'Power' (showing voltage and current supply details). Below these are sections for 'Time, time state' and 'Source'. The 'Time, time state' section shows the internal time (UTC) as Mar 13, 2018 7:41:06 AM, and the 'Source' section shows the actual measured offset as 0s 0us. At the bottom, there is a navigation bar with tabs for 'Overview', 'Outputs', 'Time handling', 'Alarms', 'PTP settings', 'Network', 'SNMP', and 'General, Services'. A 'Refresh' button is located on the right side of the interface.

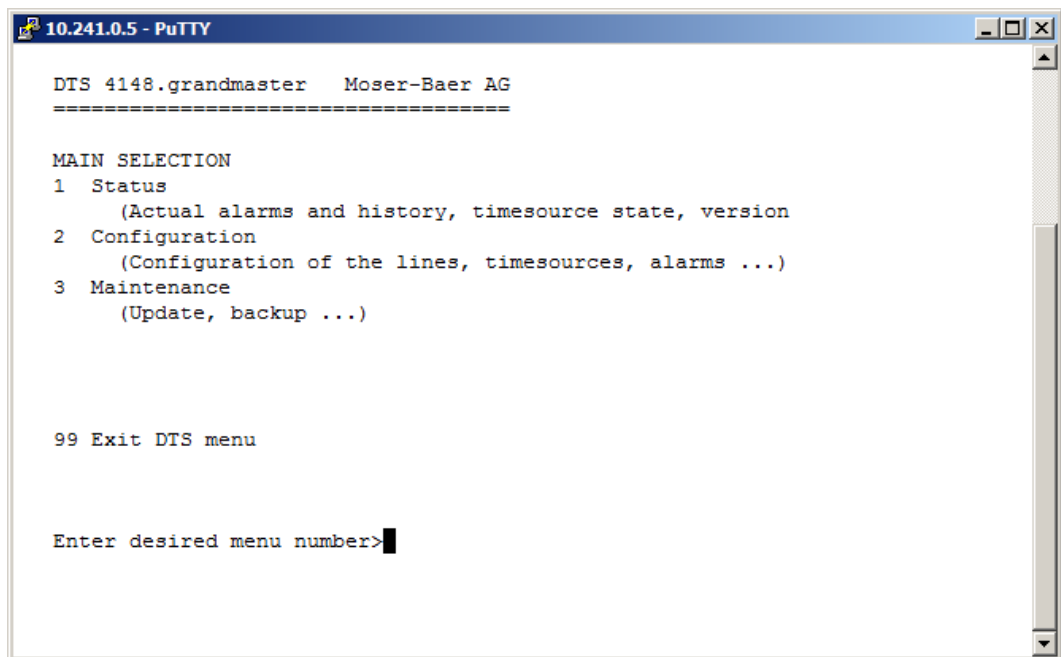
configuration pages
(tabs)

For further details on the general MOBA-NMS operation, check the integrated online help (menu „Help → Show help“).

Important: To enable the communication between MOBA-NMS and the DTS devices, SNMP must be activated! Set terminal menu „Configuration → SNMP → SNMP Mode“ to „on“. SNMP is activated by default.



6.3 Main menu



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

MAIN SELECTION
1  Status
   (Actual alarms and history, timesource state, version)
2  Configuration
   (Configuration of the lines, timesources, alarms ...)
3  Maintenance
   (Update, backup ...)

99 Exit DTS menu

Enter desired menu number>
```

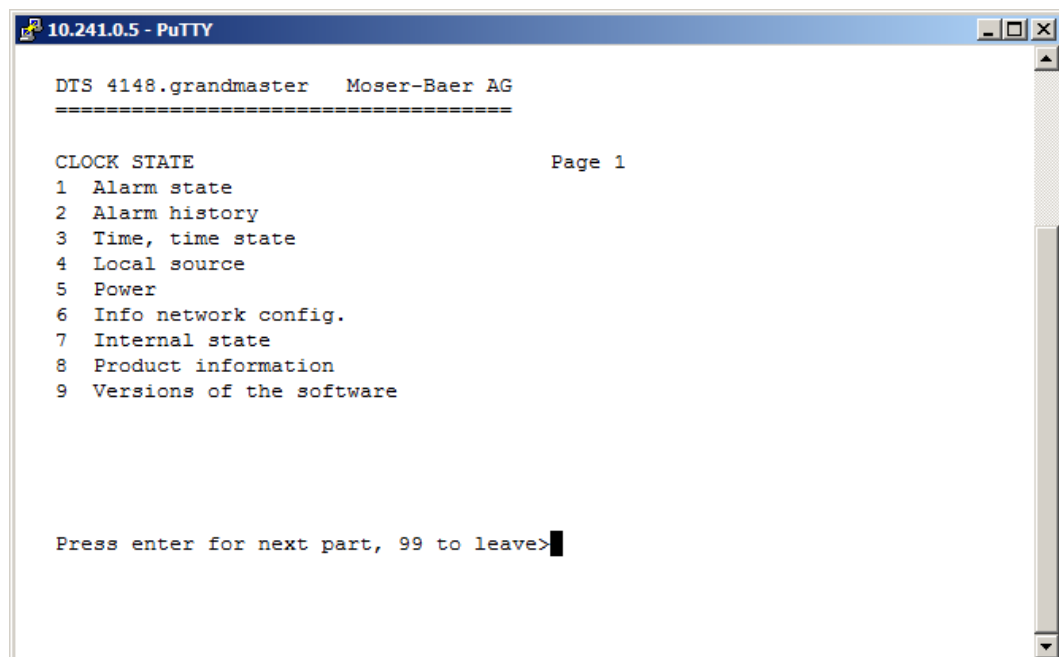
Menus:

- Status: Display of various information regarding operation and environment
See chapter "6.4 Status menu"
- Configuration: Configuration of the DTS 4148
See chapter "6.5 Configuration menu "
- Maintenance: Software update, backup and restore
See chapter "6.6 Maintenance menu"

6.4 Status menu

The status menu consists of 2 pages.

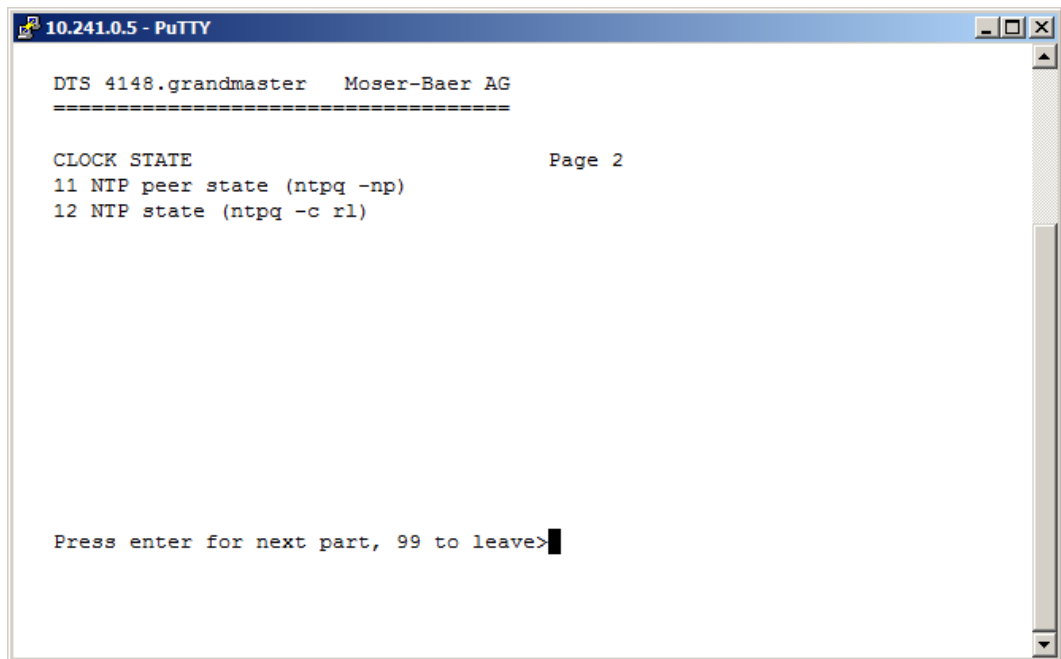
Status menu page 1:



The menu shows various information on the current operating status.

1. Requesting alarm status, display of all the DTS 4148 active errors.
Display of the DTS 4148 alarms (64) on 4 pages. The ALARM DETAIL menu pages can be scrolled through with ENTER. Active alarms are displayed with a *. The ALARM DETAIL menu page can be exited with 99. All DTS 4148 active alarms are displayed, masking (e-mail, traps, relay) only occurs later.
2. Alarm history display.
Display of the DTS 4148 alarm record, newest alarm first. The ALARM RECORD menu pages can be scrolled through with ENTER. The ALARM RECORD menu page can be exited with ESC.
Max. length of error report: 240 messages.
3. Current time and status display. See chapter "6.4.1 Time information and status"
4. Time source information display. See chapter "6.4.2 Time source information"
5. Power supply information (current, voltage) display.
6. Current network configuration display. With ENTER, a second page can be displayed with network information.
7. DTS 4148 system information display (internal status, regulation voltage of the quartz..). This information is for support purposes only.
8. Product information like serial number, firmware version etc.
9. All respective software versions of the DTS 4148 components.

Status menu page 2:



The screenshot shows a PuTTY terminal window titled "10.241.0.5 - PuTTY". The terminal output is as follows:

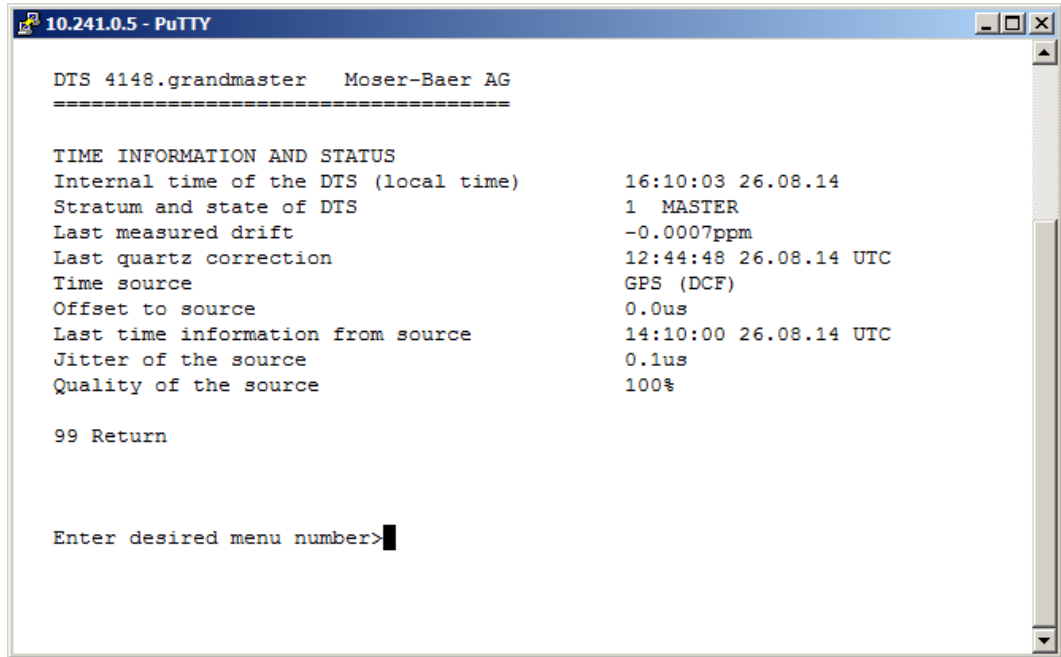
```
DTS 4148.grandmaster    Moser-Baer AG
=====

CLOCK STATE                                Page 2
11 NTP peer state (ntpq -np)
12 NTP state (ntpq -c rl)

Press enter for next part, 99 to leave>
```

Display of information with regard to the internal state of the NTP server.

6.4.1 Time information and status



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster Moser-Baer AG
=====

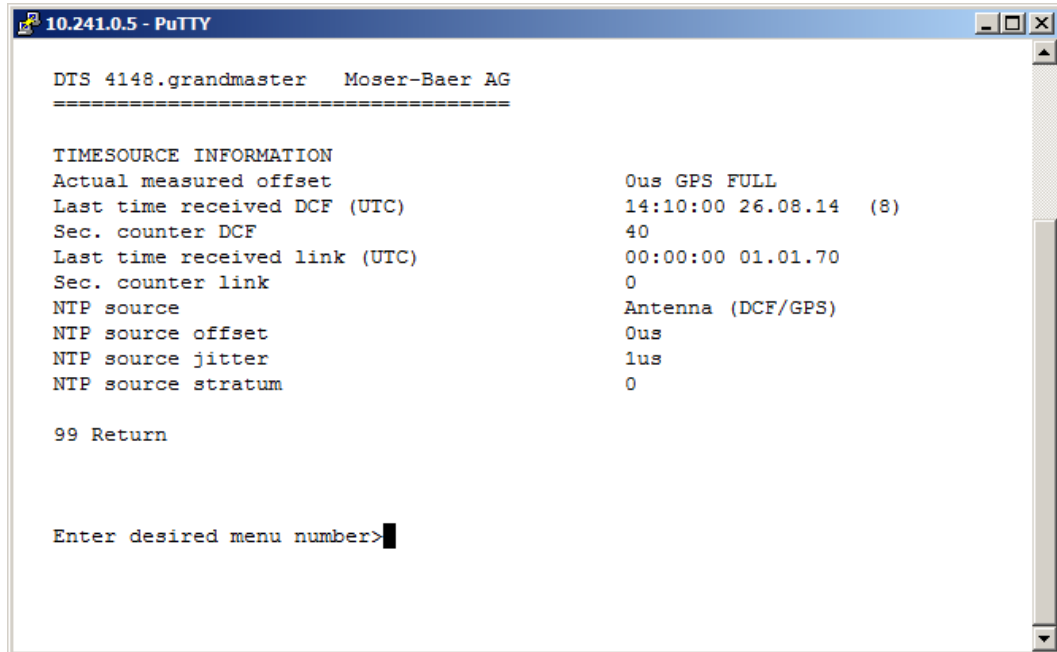
TIME INFORMATION AND STATUS
Internal time of the DTS (local time)      16:10:03 26.08.14
Stratum and state of DTS                   1 MASTER
Last measured drift                        -0.0007ppm
Last quartz correction                     12:44:48 26.08.14 UTC
Time source                               GPS (DCF)
Offset to source                           0.0us
Last time information from source          14:10:00 26.08.14 UTC
Jitter of the source                       0.1us
Quality of the source                      100%

99 Return

Enter desired menu number>
```

- | | |
|----------------------------------|--|
| - Internal time of the DTS: | local time |
| - Stratum and status of the DTS: | current stratum, status: MASTER, SLAVE, not defined |
| - Last measured drift: | drift before the last quartz correction |
| - Last quartz correction: | time of the last quartz correction |
| - Time source: | current time source |
| - Offset to source: | offset to source (source – system time) |
| - Last time info. from source: | time of the last information from source |
| - Jitter of the source: | current jitter |
| - Quality of the source: | quality of the source |

6.4.2 Time source information



The screenshot shows a PuTTY terminal window titled "10.241.0.5 - PuTTY". The terminal output is as follows:

```
DTS 4148.grandmaster Moser-Baer AG
=====

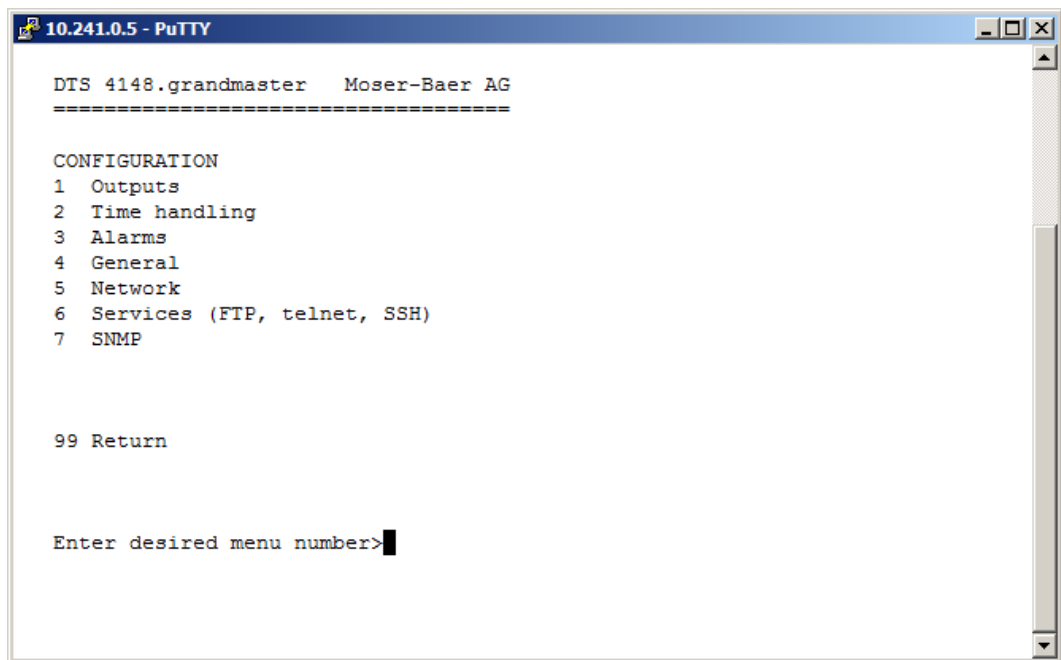
TIMESOURCE INFORMATION
Actual measured offset          0us GPS FULL
Last time received DCF (UTC)    14:10:00 26.08.14 (8)
Sec. counter DCF                40
Last time received link (UTC)   00:00:00 01.01.70
Sec. counter link               0
NTP source                      Antenna (DCF/GPS)
NTP source offset               0us
NTP source jitter               1us
NTP source stratum              0

99 Return

Enter desired menu number>
```

- Currently measured offset: last measured offset with source info and type of measurement (only needed for Moser-Baer support).
- Last time received DCF: last time received from DCF source
In (): Information about number of available satellites (only for GPS 4500 and GNSS 3000). For DCF, this value is random.
- Sec. counter DCF: the counter is incremented by 1 with each DCF pulse. For the minute marker, the counter is set to 0.
- Last time received link: last time received from DTS Link
- Sec. counter link: analogue sec. counter DCF
- NTP – Source: current time source (system-peer) of the NTP Server
Antenna = DCF or GPS
- NTP source offset: current offset of the NTP Server
- NTP source jitter: jitter of the current source
- NTP source stratum: stratum of the current source

6.5 Configuration menu



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

CONFIGURATION
1  Outputs
2  Time handling
3  Alarms
4  General
5  Network
6  Services (FTP, telnet, SSH)
7  SNMP

99 Return

Enter desired menu number>
```

Configuring the DTS 4148 through various submenus:

1. Configuring the lines / outputs (DCF/pulse/frequency, serial interfaces, IRIG/AFNOR/DCF-FSK, SINEC and NTP slave clock line) See chapter "6.5.1 Lines"
2. Configuring the time source, time-keeping etc.
See chapter "6.5.8 Time "
3. Alarm settings (alarm relay, e-mail, SNMP)
See chapter "6.5.15 Alarm"
4. General settings of the DTS 4148 (language, time zone for alarms and display, password for menu, power supply monitoring...)
See chapter "6.5.21 General settings"
5. Network Settings
See chapter "6.5.22 Network"
6. Services (switching network services such as FTP, Telnet, SSH on or off)
See chapter "6.5.23 Services (network services FTP, telnet, SSH...)"
7. SNMP Configuration for GET/PUT.
See chapter "6.5.24 SNMP" (Traps are dealt with in menu '2. Configuration' → '3. Alarms' → '3. Traps'. See also chapter "6.5.19 SNMP traps")

6.5.1 Lines

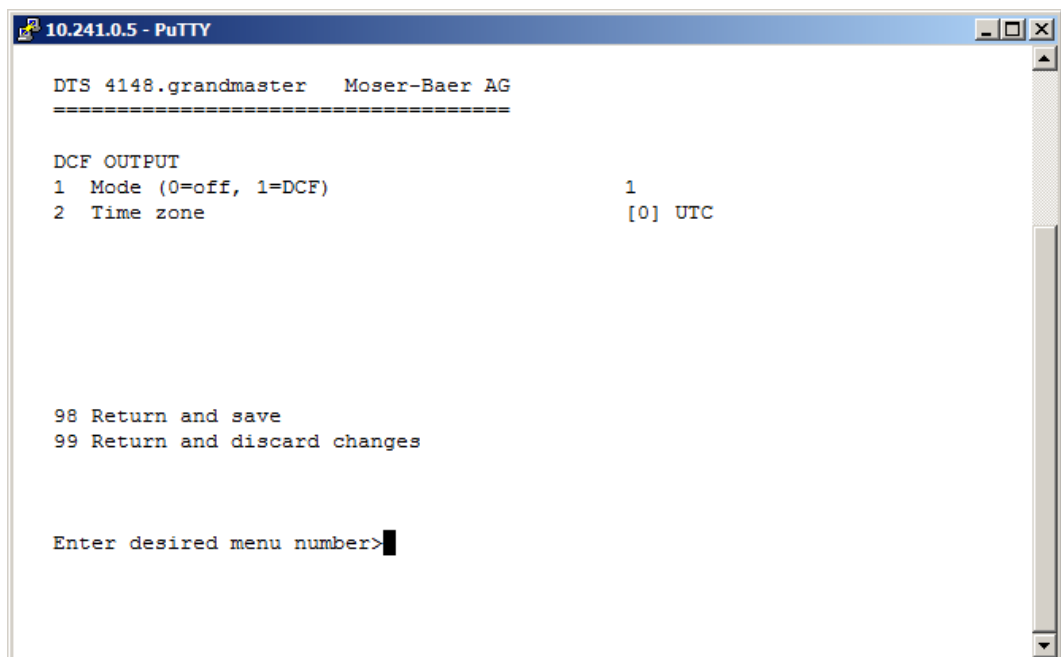
Under lines, settings can be undertaken for the following functions:

- | | |
|---------------------------------------|---------------------|
| 1 DCF - Output | ➔ see chapter 6.5.2 |
| 2 DCF / Pulse / Frequency output | ➔ see chapter 6.5.3 |
| 3 Serial Interface | ➔ see chapter 6.5.4 |
| 4 IRIG / AFNOR / DCF-FSK output | ➔ see chapter 6.5.5 |
| 5 NTP slave clocks / time zone server | ➔ see chapter 6.5.6 |
| 6 SINEC | ➔ see chapter 6.5.7 |

6.5.2 DCF – output

The DTS 4148 is equipped with one DCF output line.

This line is available on the electrical current loop DCF output.



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

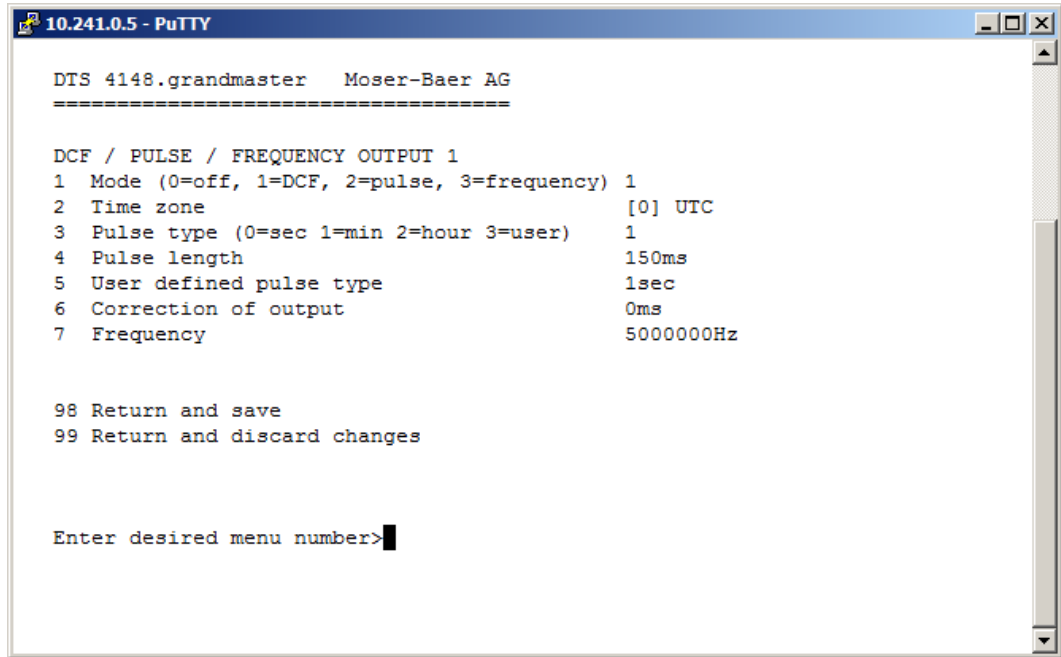
DCF OUTPUT
1 Mode (0=off, 1=DCF)          1
2 Time zone                    [0] UTC

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

1. Select line function: off or DCF on
2. Select time zone ➔ see chapter 6.5.27 Time zone selection.

6.5.3 DCF / Pulse / Frequency output



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

DCF / PULSE / FREQUENCY OUTPUT 1
1 Mode (0=off, 1=DCF, 2=pulse, 3=frequency) 1
2 Time zone [0] UTC
3 Pulse type (0=sec 1=min 2=hour 3=user) 1
4 Pulse length 150ms
5 User defined pulse type 1sec
6 Correction of output 0ms
7 Frequency 5000000Hz

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

1. Select line function: Line switched off, line DCF output, line pulse output, line frequency output
2. Select time zone ➔ see chapter 6.5.27 Time zone selection.
3. Select pulse mode: every second, minute, hour or user-defined.
(Only active with the pulse output function)
4. Select pulse length in ms (1-500ms)
(Only active with the pulse output function)
5. User-defined pulse interval (1-3600 sec) only active with pulse type 3 (=user) (the value is also only then displayed). The pulse always occurs after a multiple of the pulse interval from the 0 second in the 0 minute, e.g.:
 - Pulse interval 960 sec. (16 min.)
➔ Pulse occurs: 00:00:00, 00:16:00, 00:32:00, 00:48:00, 01:00:00, 01:16:00 ...
 - Pulse interval 25sec
➔ Pulse occurs: 00:00:00, 00:00:25, 00:00:50, 00:01:15, 00:01:40, 00:02:05 ...
... 00:59:35, 01:00:00, 01:00:25 ...
6. Output correction (-500ms...+500ms)
7. Frequency 1Hz ... 5MHz

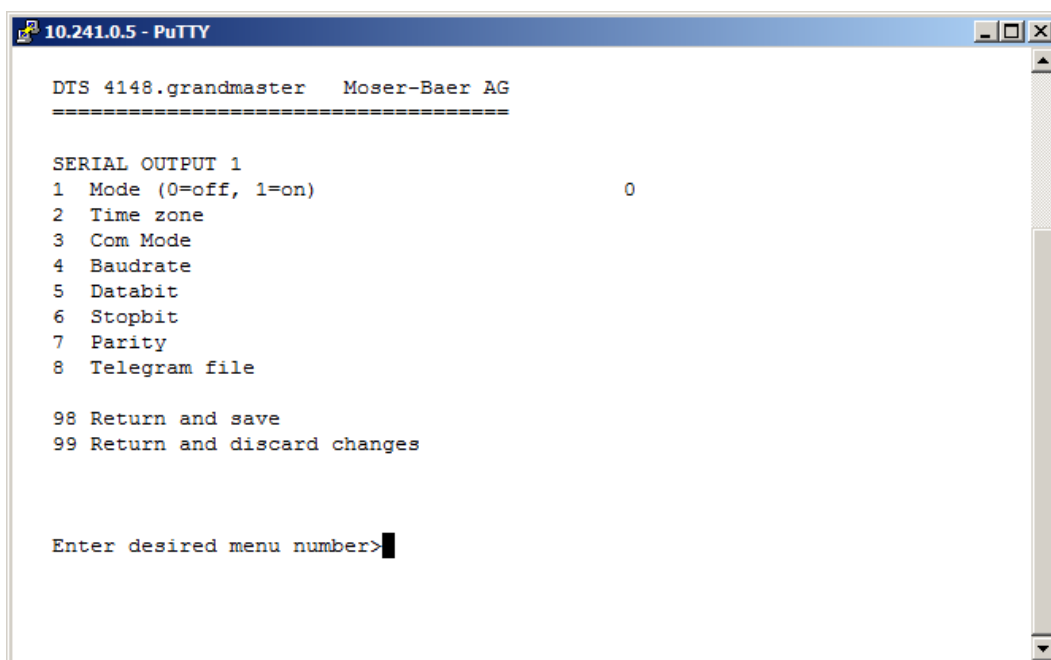


Important: Only frequencies which fulfill the following requirements are to be used, otherwise, phase shifts occur:
 $20'000'000 / \text{frequency} = \text{whole number value}$

Important: Frequencies above 2 MHz are not sent out as a square-wave signal anymore.

6.5.4 Serial interface

Serial telegram output via RS232, RS422 or RS485.



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

SERIAL OUTPUT 1
1  Mode (0=off, 1=on)           0
2  Time zone
3  Com Mode
4  Baudrate
5  Databit
6  Stopbit
7  Parity
8  Telegram file

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

1. Select mode: Line switched off / on
2. Select time zone → see chapter 6.5.27 Time zone selection.
3. Com mode:
 - 1 = send RS 232 (receive is not enabled)
 - 2 = send and receive RS232
 - 3 = send and receive RS485
 - 4 = send RS 422 (receive is not enabled)
4. Baudrate: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400
5. Data bit: 7 or 8
6. Stop bit: 1 or 2
7. Parity: none, even, odd
8. Selecting telegram file changes to the menu “SELECTION OF FILE”

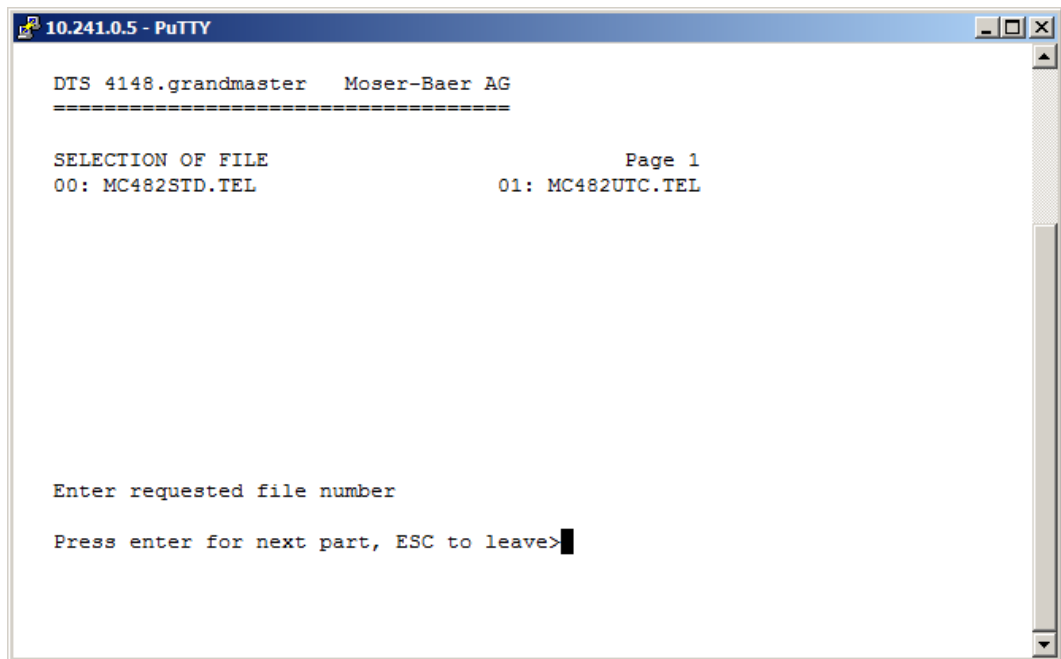


Notice: To set the parameters, the line type has to be selected first.

Notice: No flow control available.

The description of the telegram function and the telegram file can be found in Appendix E Serial Telegrams.

Selection of the telegram file:



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster Moser-Baer AG
=====

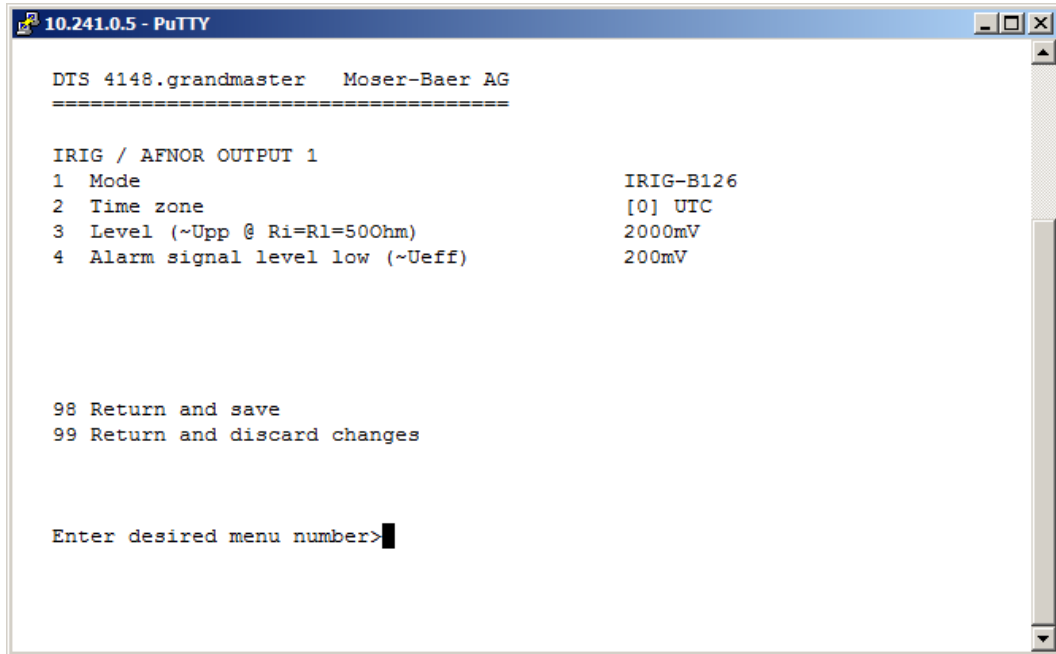
SELECTION OF FILE                                     Page 1
00: MC482STD.TEL                                     01: MC482UTC.TEL

Enter requested file number

Press enter for next part, ESC to leave>|
```

The copy procedure of telegram files is explained in chapter "7.10 Copying Telegram files to the DTS 4148.grandmaster".

6.5.5 IRIG / AFNOR / DCF-FSK Output



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

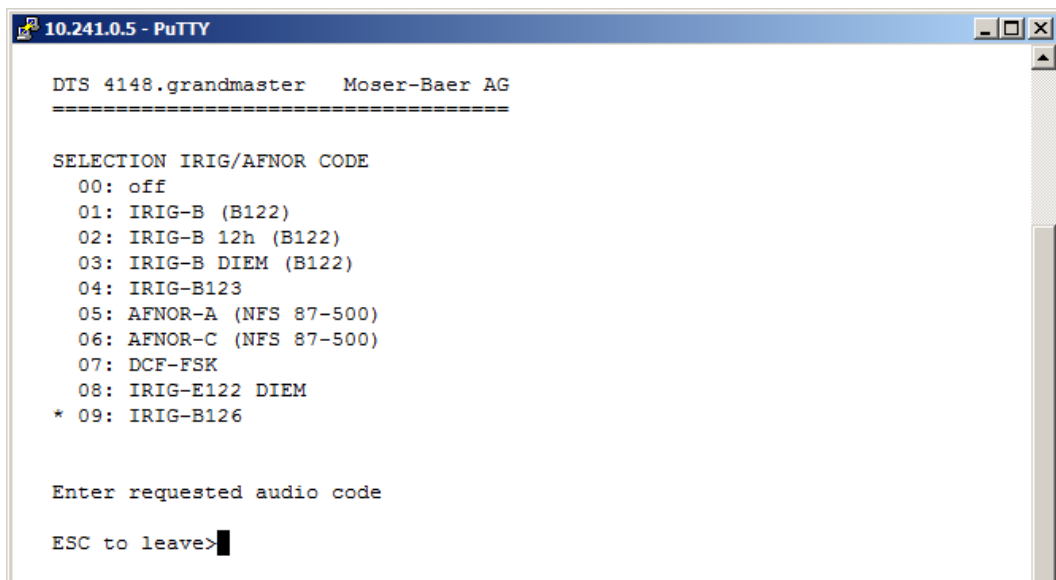
IRIG / AFNOR OUTPUT 1
1 Mode                               IRIG-B126
2 Time zone                         [0] UTC
3 Level (~Upp @ Ri=Rl=50Ohm)       2000mV
4 Alarm signal level low (~Ueff)    200mV

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

1. Select mode: see picture below
2. Select time zone → see chapter 6.5.27 Time zone selection.
3. Configuration of the output voltage level (100 – 5500 mV):
The defined voltage corresponds to the expected output amplitude when power matching (impedance matching) with a load of 50 Ohms is fulfilled. The output voltage is not controlled, resp. it is not adjusted in case of a load change.
4. Configuration of the output voltage level supervision (0 – 2000 mV):
When the output voltage falls below the defined voltage level, an alarm is released.

Selection line function:



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

SELECTION IRIG/AFNOR CODE
00: off
01: IRIG-B (B122)
02: IRIG-B 12h (B122)
03: IRIG-B DIEM (B122)
04: IRIG-B123
05: AFNOR-A (NFS 87-500)
06: AFNOR-C (NFS 87-500)
07: DCF-FSK
08: IRIG-E122 DIEM
* 09: IRIG-B126

Enter requested audio code

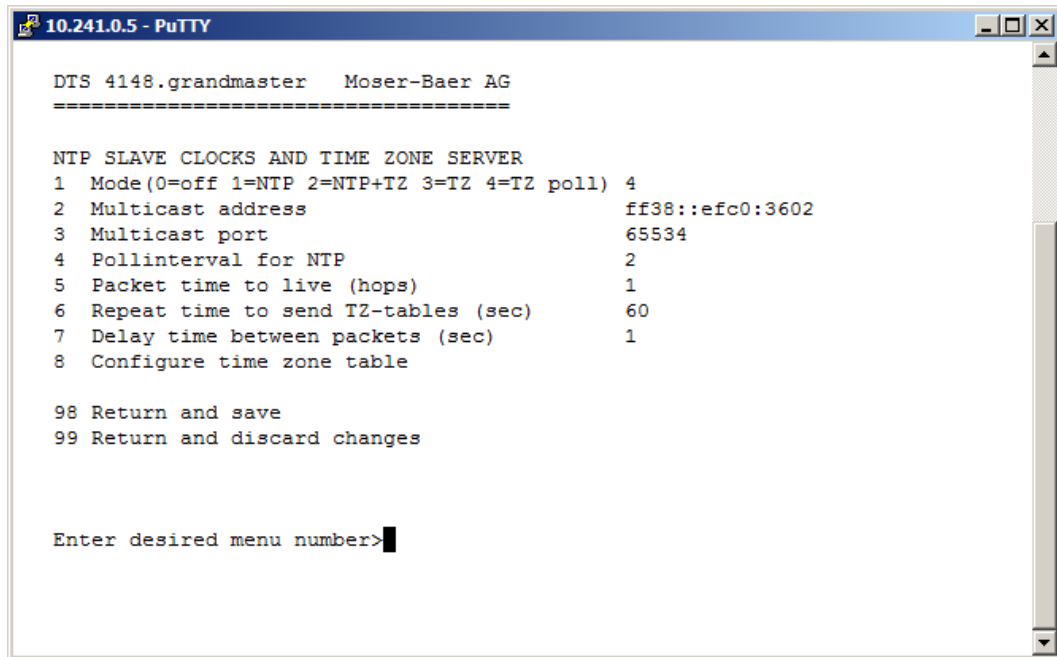
ESC to leave>
```



Notice: With the activation of one of this outputs, the modulated and the digital output are activated at the same time.
Example:
To activate IRIG-B002 output, the Code 01: IRIG-B (B122) has to be set for the corresponding output.

6.5.6 NTP slave clocks / time zone server

NTP slave clock line for operating slave clocks on the LAN (Ethernet). With this clock line, a world time function can be realized.



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

NTP SLAVE CLOCKS AND TIME ZONE SERVER
1 Mode(0=off 1=NTP 2=NTP+TZ 3=TZ 4=TZ poll) 4
2 Multicast address                ff38::efc0:3602
3 Multicast port                   65534
4 Pollinterval for NTP            2
5 Packet time to live (hops)      1
6 Repeat time to send TZ-tables (sec) 60
7 Delay time between packets (sec) 1
8 Configure time zone table

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

1. Mode of clock line: 0 = off, 1 = Send NTP multicast, 2 = Send NTP multicast and time zone table, 3 = Send time zone table, 4 = Time zones on request, 5 (only for maintenance) = Send an empty time zone table and return to previous mode.
2. Multicast address for NTP and time zone server: **239.192.54.x**
Group address: x = 1-15 for MOBATIME devices, e.g. NCI, SEN 40.
3. Multicast port for Time zone server (enter an arbitrary value, empty is not allowed! Value e.g.: 65534). The port is also needed for requesting time zone entries (mode 4).
4. Poll-interval for NTP Multicast in $2^{\text{poll-values}}$ in seconds (range: 1 – 16).
E.g. poll-value = 2 \rightarrow interval: $2^2 = 4$ sec., poll-value = 5 \rightarrow interval: $2^5 = 32$ sec.
For redundant Multicast time servers see remark next page.
5. Packet time to Live (TTL) for NTP- and time-zone-Multicast-packets in hops.
(Number of Routers in a network to transfer the packets through; for simple network without routing, enter value "1", for 1 Router enter "2").
6. Repeat time to send time zone table: 10 – 86400 sec.
7. Delay time between the sending of the individual time zone entries (one entry per Multicast packet) of the table: 1 – 60 sec.
8. Configuration of individual time zone entries. Displays menu "TIME ZONE TABLE".



Notice: Changes of multicast address, poll interval and TLL lead to a **restart** of the NTP server.

Notice: For the operation of a **multicast** communication (NTP and Time Zone Server) **the configuration of a gateway is required** (see chapter "6.5.22 Network"). The gateway can be set manually or by using DHCP.
If there's no gateway available, it's possible to set the own IP as gateway.



Notice: Redundant NTP multicast server:

If two NTP servers in the same network should send NTP with the same Multicast IP address (redundancy), then the first time server has to be configured with a small **pollinterval** (e.g. 2 → 4 sec.) and second time server with a large pollinterval (min. 100 x larger, e.g. 9 → 512 seconds). As long as the first time server is sending NTP Multicast packets, the packets from second time server are ignored. This configuration is needed, to reach a defined situation for the end devices (the DTS with the more frequently NTP send rate gets higher priority for time reception).

Time zone table for the NTP slave clock line:

```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

TIME ZONE - TABLE
Zone01: 0 [0] UTC           Zone02: 2 [+1] Brussel
Zone03: 8 [+3] Kuwait       Zone04: 0 [0] UTC
Zone05: -1 Unknown season   Zone06: -1 Unknown season
Zone07: -1 Unknown season   Zone08: -1 Unknown season
Zone09: -1 Unknown season   Zone10: -1 Unknown season
Zone11: -1 Unknown season   Zone12: -1 Unknown season
Zone13: -1 Unknown season   Zone14: -1 Unknown season
Zone15: -1 Unknown season

Enter requested entry

Press enter for next part, 99 to leave>
```

Display of all time zone entries (15) of time zone servers for NTP slave clock lines.

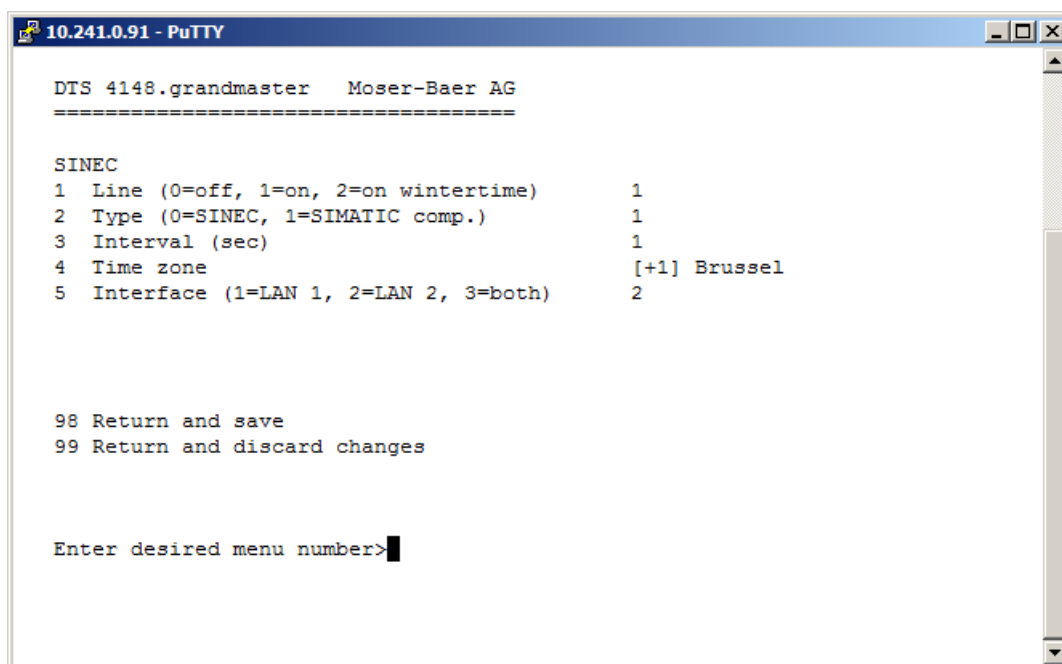
Choose a zone number to change selected zone.

Time zone selection → see chapter “6.5.27 Time zone selection”.

The page can be exited with 99. Changes are first stored or reset on the overlying menu page.

6.5.7 SIMATIC / SINEC

SIMATIC / SINEC signal output over the network.



```
10.241.0.91 - PuTTY

DTS 4148.grandmaster   Moser-Baer AG
=====

SINEC
1 Line (0=off, 1=on, 2=on wintertime)      1
2 Type (0=SINEC, 1=SIMATIC comp.)         1
3 Interval (sec)                          1
4 Time zone                               [+1] Brussel
5 Interface (1=LAN 1, 2=LAN 2, 3=both)     2

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

1. Mode: 0 = off, 1 = on, 2 = on, winter time only
2. Type: 0 = SINEC (S5 compatible), 1 = SIMATIC compatible (PCS7 / S5)
3. Sending interval (in seconds): 1-3600, default 10
4. Time zone selection → see chapter “6.5.27 Time zone selection”.
5. Network interface: 0 = none, 1 = LAN 1, 2 = LAN 2, 3 = both

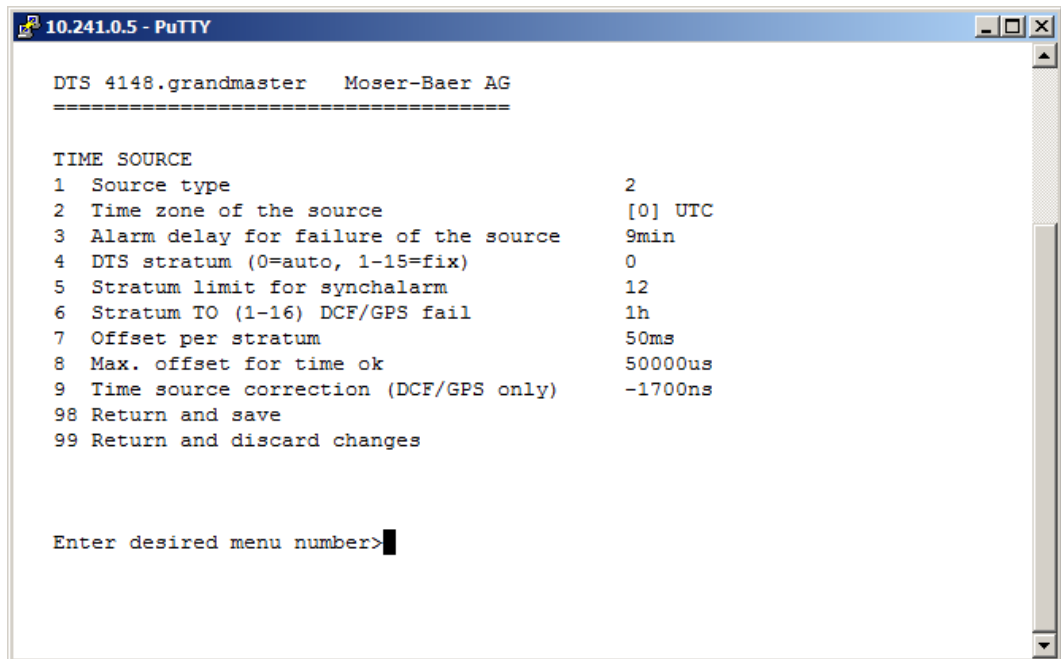
6.5.8 Time handling

Under time administration, settings can be undertaken for the following functions:

- Time source configuration → see chapter “6.5.9 Time source “
- Time adjustment configuration → see chapter “6.5.10 Time adjustment / Time-keeping“
- Redundant operation → see chapter “6.5.11 Redundant operation“
- NTP Server → see chapter “6.5.12 NTP server“
- For setting the time manually → see chapter “6.5.13 Manual time set / Leap second“
- PTP server → see chapter “6.5.14 PTP Server“

6.5.9 Time source

Time source configuration.



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

TIME SOURCE
1 Source type                      2
2 Time zone of the source          [0] UTC
3 Alarm delay for failure of the source 9min
4 DTS stratum (0=auto, 1-15=fix)    0
5 Stratum limit for synchalarm      12
6 Stratum TO (1-16) DCF/GPS fail    1h
7 Offset per stratum                50ms
8 Max. offset for time ok           50000us
9 Time source correction (DCF/GPS only) -1700ns
98 Return and save
99 Return and discard changes

Enter desired menu number>
```

1. Type of time source: 0=none, 1=DCF low quality, 2=GPS-DCF high quality, 3=NTP, 4=AFNOR-A/C or IRIG-B 12X
 2. Time zone of the source: see chapter 6.5.27 Time zone selection.
 3. Alarm delay at failure of time source (minutes):
0 = off, 1-2'160min, default = 0
Error: "loss of time source TO" resp. "loss of local source" in redundant mode as slave
 4. DTS stratum: 0=Stratum is automatically calculated according to the time source (see chapter 8.3).
1-15=Stratum is set on a fix value
 5. Stratum limits for alarm: Limits for alarm "Time source stratum lost" (1-16)
 6. Stratum TO (Timeout):
Duration of stratum change 1 to 16 in the case of time loss (1-999h), e.g. 24 hrs → stratum counts up from 1 to 16 within 24 hrs.
Default value: 12h
 7. Offset per Stratum in ms (0 – 40'000 ms). Stratum is calculated with this value when time is received again:
Offset/Stratum = 30 ms, offset of the time source 150 ms → Stratum = 5
 8. Max. offset for time source to set valid time in µs at start up.
(0-1'000'000µs)
 9. Time source correction (only for DCF), +/-60'000ms
- For description of time source see chapter "8 Time administration"

6.5.10 Time adjustment / Time-keeping

```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

TIME ADJUSTMENT CONFIGURATION
1 Adjust mode (0=follow, 1=set)                1
2 Max. catch up speed                        100000ns/s
3 Time core type (0-255, default 0)          1
4 Synch. only offset                        0ms
5 RTC mode                                    0

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

1. Adjust mode: 0=time is slowly adjusted
 1=time is set immediately
2. Maximum catch up speed in ns/s (0-10'000'000).
3. Quartz type: Standard=0 (0-255)
4. Synch. only offset: 0=off
 100-5000ms=Limits as from which time is no longer
 accepted → Alarm "Syn only diff too great"
5. RTC mode 0=RTC deactivated
 1=ON, with initial time set, independent of the mode (1)
 2=ON



Notice: Explanation to the RTC mode:

RTC mode 0:

After startup of the device the system time starts at 00:00. First of all, the device has to receive the time from its time source. The time adjust happens according to the "1 Adjust mode".

RTC mode 1:

The internal real time clock (RTC) is activated. After startup of the device the system time is set with the RTC time.

The first takeover of the time from the time source happens in one step, independent from the Adjust mode (1) setting.

RTC mode 2:

The internal real time clock (RTC) is activated. After startup of the device the system time is set with the RTC time.

The time takeover from the time source happens according to the Adjust mode (1).

→ Adjust mode = 0: time is slowly adjusted

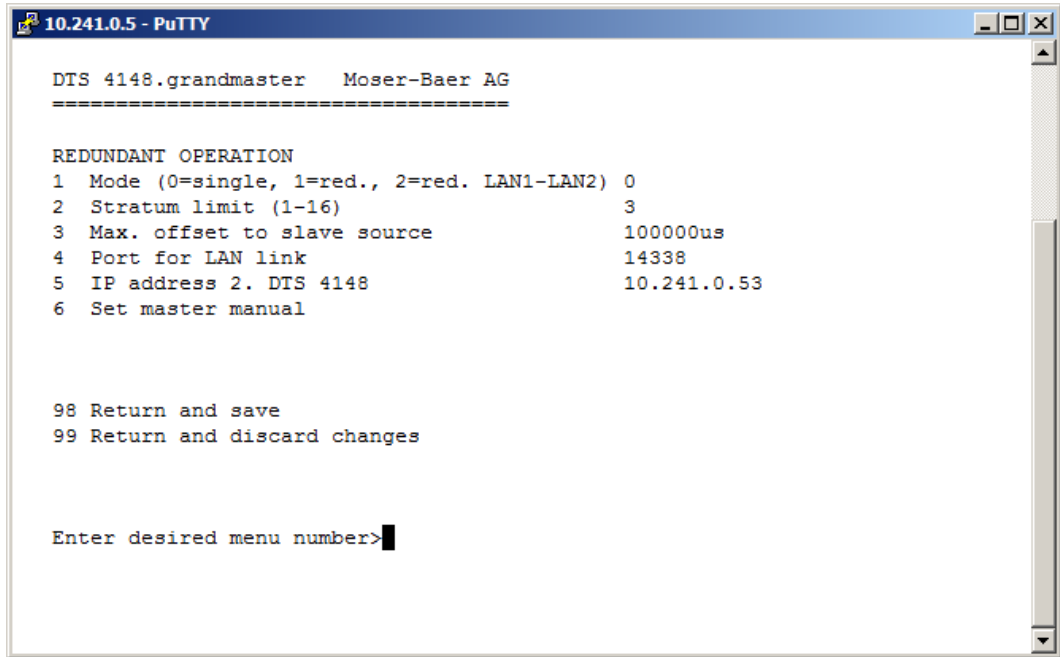
Adjust mode = 1: time is set immediately



Important! For the redundant operation, the RTC mode should be switched off!

For a description of time-keeping see chapter "8 Time administration"

6.5.11 Redundant operation



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster Moser-Baer AG
=====

REDUNDANT OPERATION
1 Mode (0=single, 1=red., 2=red. LAN1-LAN2) 0
2 Stratum limit (1-16) 3
3 Max. offset to slave source 100000us
4 Port for LAN link 14338
5 IP address 2. DTS 4148 10.241.0.53
6 Set master manual

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

1. Mode: 0=single operation
1=redundant operation of 2 DTS 4132 (Master-Slave operation)
2=redundant operation of 2 DTS 4132 (Master-Slave operation) without LAN communication between the 2 devices.
2. Stratum limit to switch from slave to master. Standard 16 (1-16)
3. Max. offset of slaves to the slave time source for triggering the alarm "Offset Source (Slave)" (0-5'000'000us)
4. Port for LAN-Link. default 14338
5. IP address of the 2nd DTS 4148. Only required if the optical link is not working. Format 10.241.23.99
ENTER without entering an address will delete the entry.
6. Manual change from slave to master. The command is effected immediately. Saving with '98' is not required when exiting the menu.

For a description of redundant operation, see chapter "8.12 Redundant operation of 2 DTS 4148.grandmasters"



Important! In redundant operation, no additional NTP servers may be configured as backup sources.

Important! For the redundant operation, the RTC mode should be switched off!

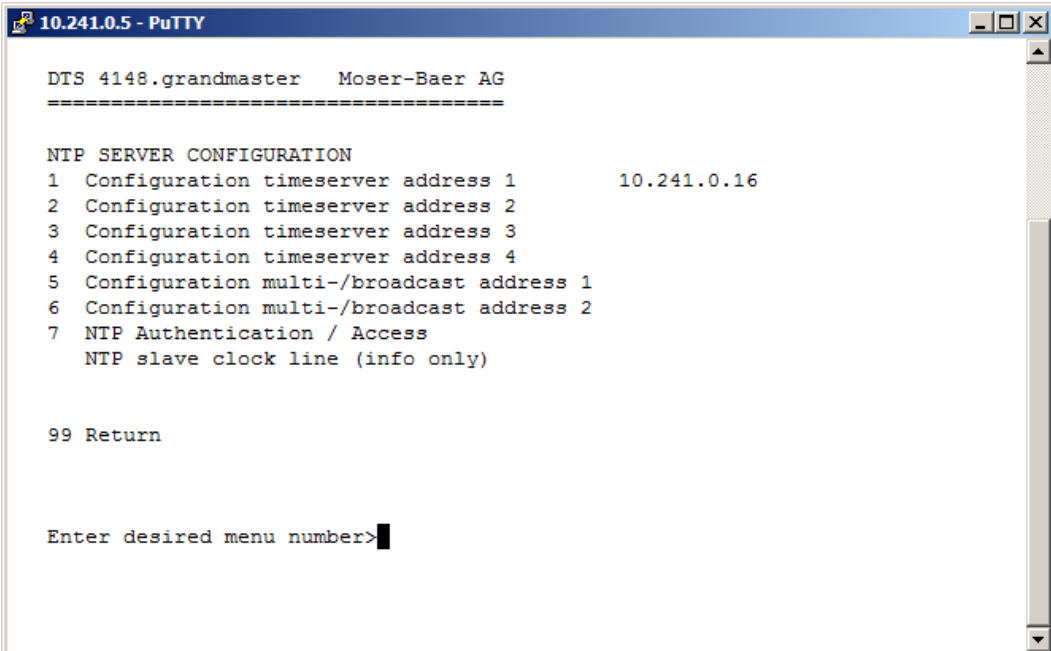
Important! LAN link in redundant mode:
For the redundant operation with additional LAN link, only the LAN 1 can be used. If this is not possible, select redundant Mode 2.
The LAN link is only used for internal communication between the two servers. It is not a redundancy for the optical link.

6.5.12 NTP server

NTP can run as server or combined as server/client. To run NTP as source (NTP as client), in the menu '2. Configuration' → '2. Time handling' → '1. Time source setting' → '1. Source type' choose NTP and set at least one server. If NTP server is configured, but NTP is not indicated as time source, NTP only runs as backup time source (redundancy) to the actual time source.

The exact behavior of NTP time sources is described in chapter "8.5 Time acceptance from NTP".

Further two multicast or broadcast addresses can be configured.



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster Moser-Baer AG
=====

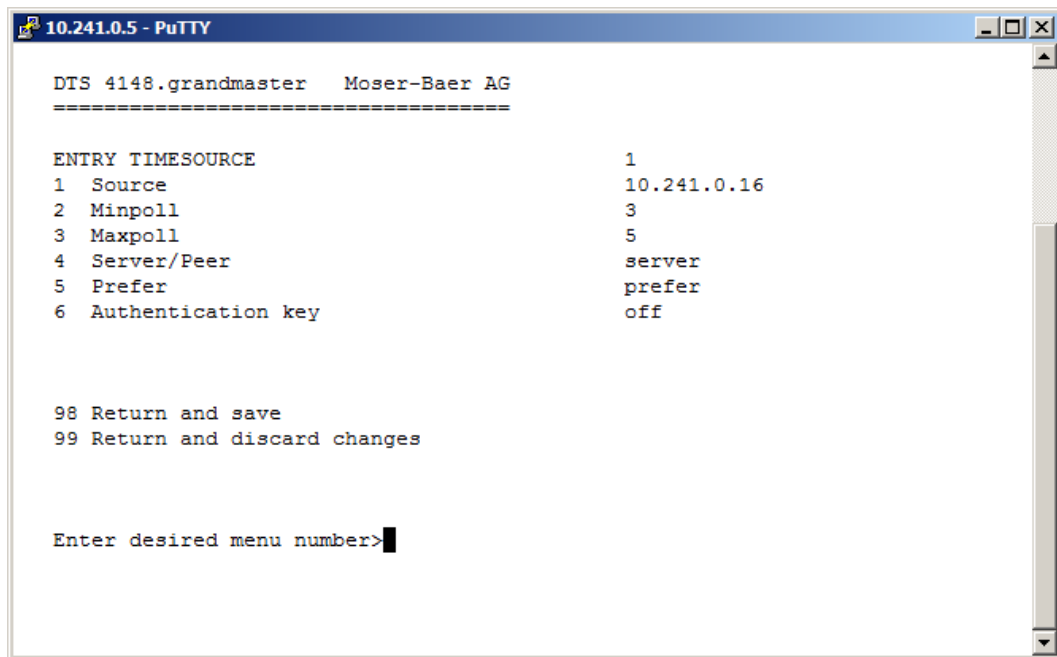
NTP SERVER CONFIGURATION
1 Configuration timeserver address 1      10.241.0.16
2 Configuration timeserver address 2
3 Configuration timeserver address 3
4 Configuration timeserver address 4
5 Configuration multi-/broadcast address 1
6 Configuration multi-/broadcast address 2
7 NTP Authentication / Access
  NTP slave clock line (info only)

99 Return

Enter desired menu number>
```

- 1.-4. Summary about configured NTP – time sources. Select to configure.
 - 5.-6. Summary about configured NTP – broadcast addresses. Select to configure.
 - 7. NTP Authentication: Changes to the menu "NTP AUTHENTICATION"
- Information about a multicast – address, configured for NTP slave clocks.

Configuration of the individual server/peer address is as follows:



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

ENTRY TIMESOURCE                                1
1 Source                                           10.241.0.16
2 Minpoll                                         3
3 Maxpoll                                         5
4 Server/Peer                                     server
5 Prefer                                          prefer
6 Authentication key                             off

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

1. Insert time sources (IP address or name, e.g. "ntp.metas.ch")
ENTER without entry of an address will delete value.
- 2.-3. Configurations of **Minpoll** and **Maxpoll**: Inquiry interval $2^{\text{poll value}}$ in seconds.
0 = automatically
e.g. poll value=2 → interval 2: $2^2 = 4\text{sec.}$, poll value=5 → interval 5: $2^5 = 32\text{sec.}$
Range of poll values (exponent): 1 – 16
To get an exact synchronization it's better to limit Maxpoll to 6 (64 sec.).
4. Set type of NTP inquiry: server or peer
5. Preferred source: on or off
6. Authentication key: off, key number, autokey



Notice: If a key number is entered, the entered key must also be added to the trusted keys.



Notice: All changes lead to a restart of the NTP server!

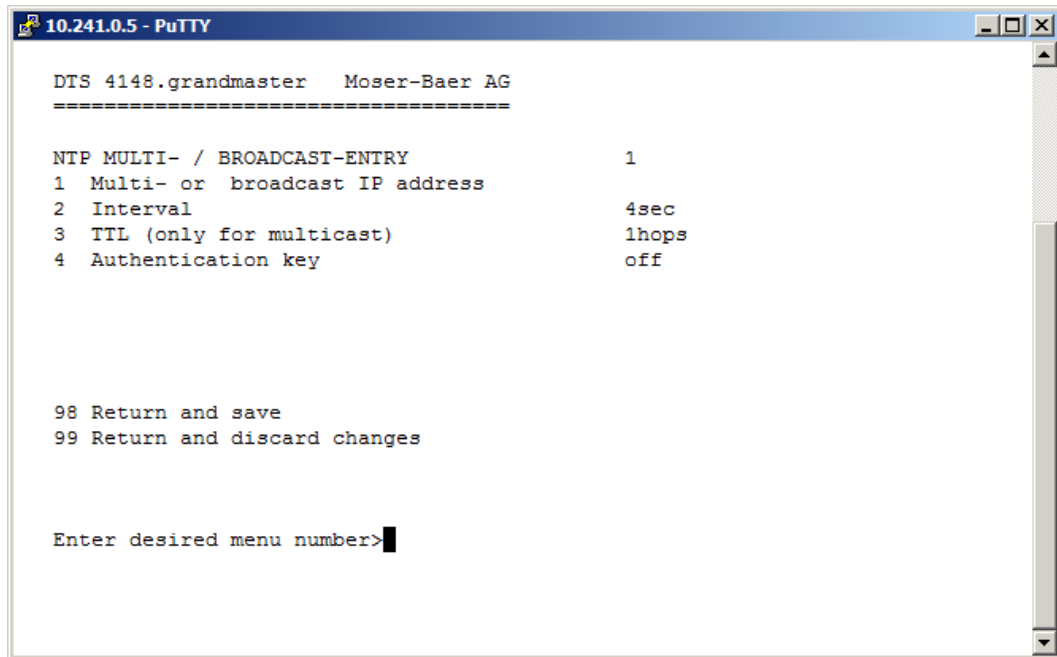


Notice: If NTP only runs as a backup (source DCF or GPS), no NTP source should be indicated as **prefer**!



Notice: Maxpoll should not be selected under 4 (16 sec), as otherwise, internal trimming may be inaccurate.
Maxpoll and Minpoll on automatic can lead to insufficient synchronization accuracy. The specified accuracies were measured with Minpoll = 3 and Maxpoll = 6.
The configuration server should be used whenever possible.

Configuration of the Multi- / Broadcast address is as follows:



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

NTP MULTI- / BROADCAST-ENTRY          1
1 Multi- or broadcast IP address
2 Interval                            4sec
3 TTL (only for multicast)            1hops
4 Authentication key                  off

98 Return and save
99 Return and discard changes

Enter desired menu number>|
```

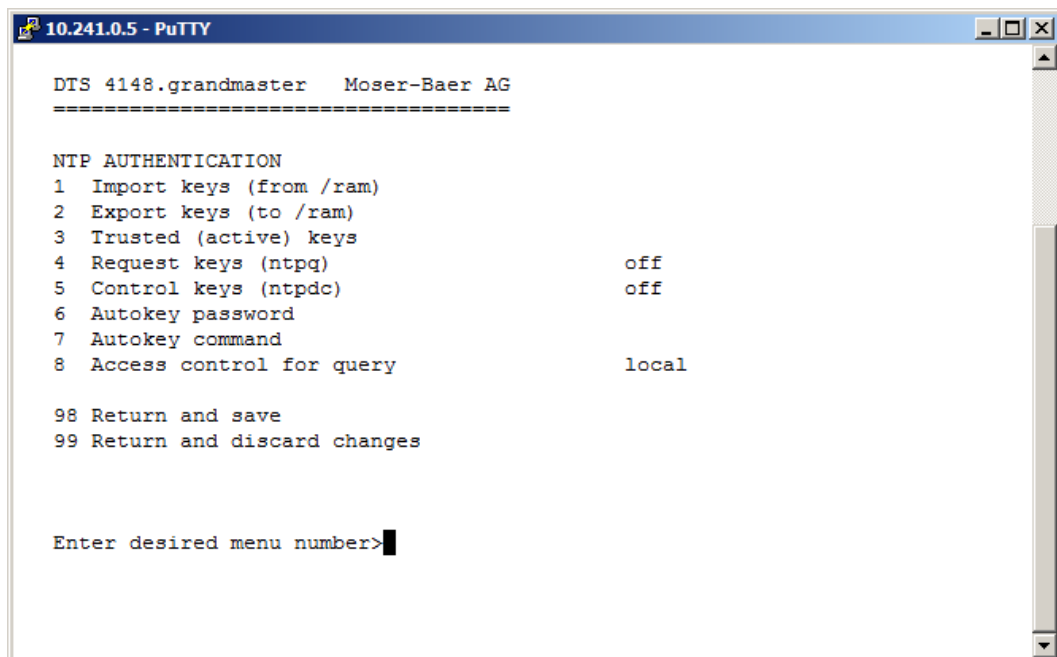
1. IP address of the destination network (multicast or broadcast).
ENTER without entering an address will delete the entry.
2. Interval for sending out the NTP information in seconds.
The interval is rounded after the entry to NTP standard, which only permits values of format 2^x: 1,2,4,8,16,32,64... Maximum 65536 seconds.
3. TTL (time to live) in hops. Only required for multicast.
Number of routers over which the multicast packet should be transmitted: for simple networks without a router - enter 1, for 1 router - enter value 2.
4. Authentication key: off, key number, autokey



Notice: All changes lead to a restart of the NTP server.

Configuration of the NTP authentication:

The NTP authentication is described in chapter "8.10 NTP Authentication".



```
10.241.0.5 - PuTTY
DTS 4148.grandmaster  Moser-Baer AG
=====

NTP AUTHENTICATION
1 Import keys (from /ram)
2 Export keys (to /ram)
3 Trusted (active) keys
4 Request keys (ntpq)                off
5 Control keys (ntpd)                off
6 Autokey password
7 Autokey command
8 Access control for query            local

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

1. Import keys (from /ram directory)

The file ntp.keys must first be copied into the directory /ram.

Notice: The file must be named exactly in this way and written entirely in small letters.

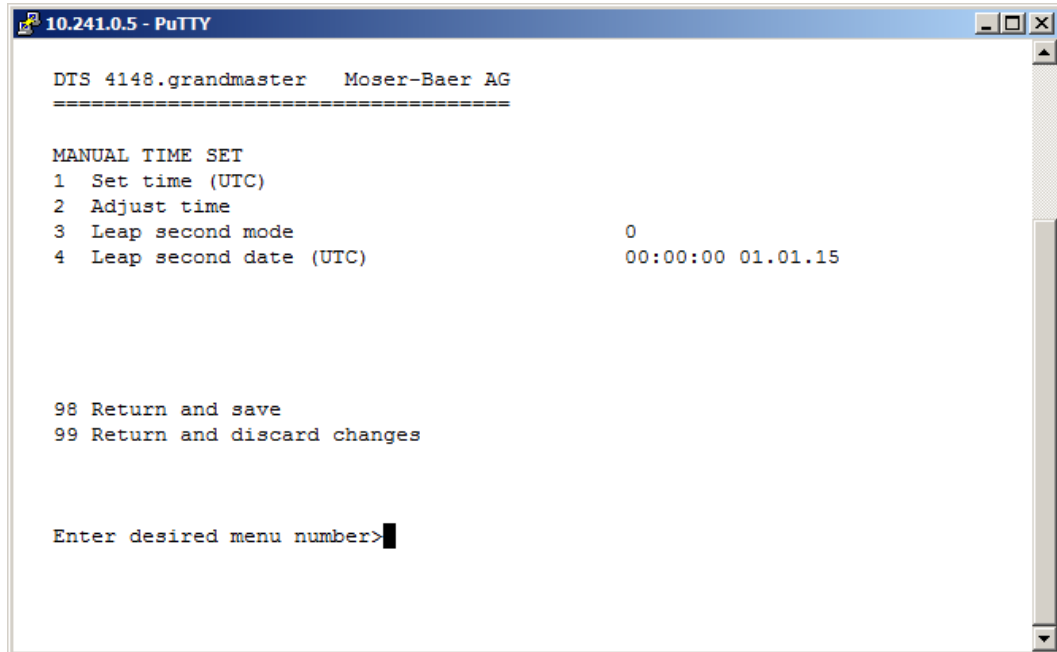
2. Export keys (to /ram directory)
The current ntp.keys file is written in the directory /ram.
3. Select the trusted keys separated by space
4. Select the request key
5. Select the control key
6. Set the auto key password
7. Execute for auto key commands:

| | |
|---------------|---|
| gen_iff | generate the IFF certificate |
| gen_gq | generate the GQ certificate |
| gen_mv* | generate the MV certificate |
| gen_all* | generate all (IFF,GQ,MV) certificates |
| gen_client | generate the client certificate |
| update_server | update the server certificate |
| update_client | update the client certificate |
| export_iff | export the IFF server certificate to /ram. Parameter password of the client |
| export_gq | export the GQ server certificate to /ram. |
| export_mv* | export the MV server certificate to /ram. |
| import_iff | import the IFF server certificate from /ram. |
| import_gq | import the GQ server certificate from /ram. |
| import_mv* | import the MV server certificate from /ram. |
| clear_ram | delete the certificates in /ram |
| clear_keys | delete the certificates in the NTP key directory |

Example: *export_iff myPassword* exports the IFF client certificate to /ram.

*MV schema is currently not available

6.5.13 Manual time set / Leap second



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

MANUAL TIME SET
1 Set time (UTC)
2 Adjust time
3 Leap second mode           0
4 Leap second date (UTC)     00:00:00 01.01.15

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

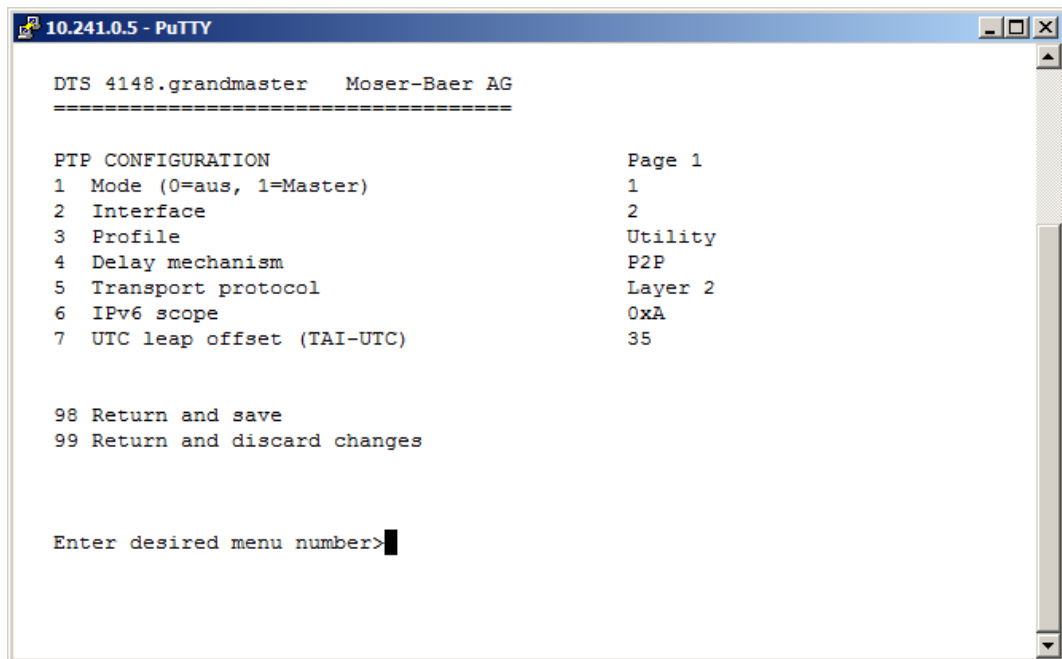
1. Set UTC time in the format "hh:mm:ss DD.MM.YY".
Time is set with ENTER!
2. Correct time in ms (- = backwards). Range: +/-10'000ms
Time is set with ENTER!
3. Leap second mode:
 - 0 off
 - 1 Additional second will be inserted at entered time
Is set to 0=off after inserting the leap second.
 - 1 Second will be left out at entered time
Is set to 0=off after inserting the leap second.
 - 2 Recognize leap second automatically. Only possible with a source with leap second announcement!
4. Set UTC time of leap second in format: "hh:mm:ss DD.MM.YY"

For a description of the leap second, see chapter "8.9 Leap second"

6.5.14 PTP Server

The PTP menu consists of 2 pages:

PTP configuration page 1:



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster Moser-Baer AG
=====

PTP CONFIGURATION                                Page 1
1 Mode (0=aus, 1=Master)                          1
2 Interface                                         2
3 Profile                                           Utility
4 Delay mechanism                                  P2P
5 Transport protocol                               Layer 2
6 IPv6 scope                                       0xA
7 UTC leap offset (TAI-UTC)                        35

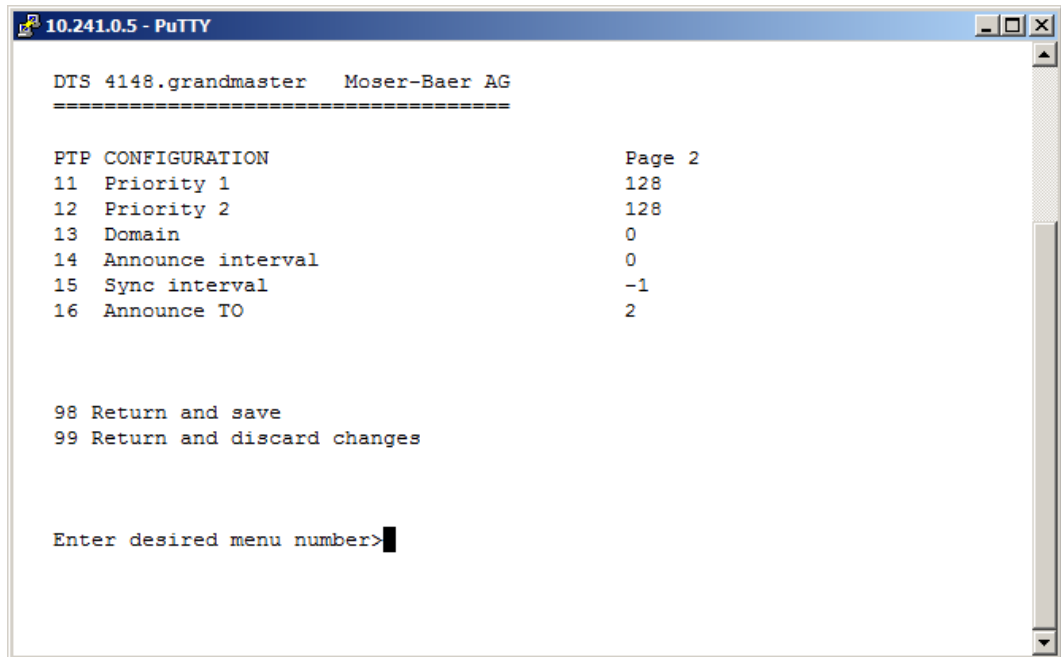
98 Return and save
99 Return and discard changes

Enter desired menu number>
```

- | | |
|---------------------------------------|---|
| 1. Mode | 0 = off, 1 = master |
| 2. Interface | 0 = LAN1, 1 = LAN2, 2 = both, default LAN1 |
| 3. Profile | 0 = none, 1 = default, 2 = utility |
| 4. Delay mechanism | 0 = E2E, 1 = P2P, default E2E |
| 5. Transport protocol | 0 = IPv4, 1 = IPv6, 2 = layer 2, default IPv4 |
| 6. IPv6 scope | 1..15, default 15 (0xE) |
| 7. UTC switch second offset (TAI-UTC) | |

Press ENTER to change to page 2.

PTP configuration page 2:



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

PTP CONFIGURATION                                     Page 2
11 Priority 1                                           128
12 Priority 2                                           128
13 Domain                                              0
14 Announce interval                                  0
15 Sync interval                                       -1
16 Announce TO                                         2

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

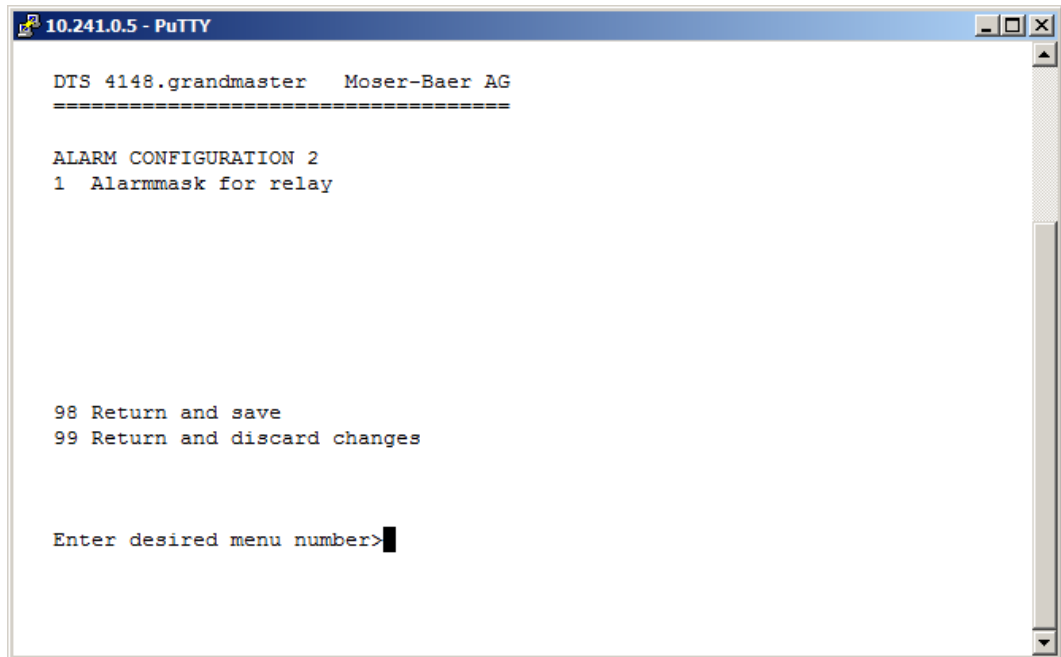
- | | |
|-----------------------|---|
| 11. Priority 1 | 0-255, default 128 |
| 12. Priority 2 | 0-255, default 128 |
| 13. Domain | 0-4, default 0 |
| 14. Announce interval | 0-4, default 1, values in format 2 ^x sec (every 2 sec) |
| 15. Sync interval | -1..1, default 0, values in format 2 ^x sec (every sec) |
| 16. Announce TO | 2..10, default 3, values in format 2 ^x sec (after 8 sec) |
- Press ENTER to change to page 1.

6.5.15 Alarms

Under alarms, settings can be undertaken for the following functions:

- Alarm relay → see chapter 6.5.16
- E-mail → see chapter 6.5.18
- SNMP traps → see chapter 6.5.19
- Alarm input → see chapter 6.5.20

6.5.16 Alarm relay



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

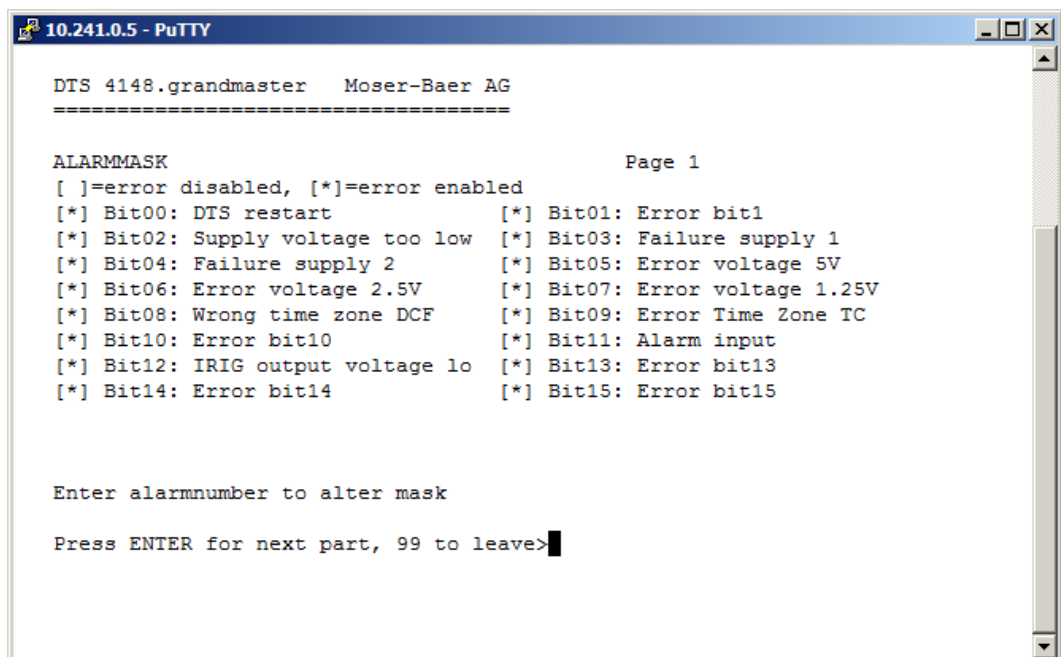
ALARM CONFIGURATION 2
1 Alarmmask for relay

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

1. Alarm mask for relay (see chapter "6.5.17 Alarm mask")

6.5.17 Alarm mask



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

ALARMMASK                                     Page 1
[ ]=error disabled, [*]=error enabled
[*] Bit00: DTS restart                        [*] Bit01: Error bit1
[*] Bit02: Supply voltage too low             [*] Bit03: Failure supply 1
[*] Bit04: Failure supply 2                  [*] Bit05: Error voltage 5V
[*] Bit06: Error voltage 2.5V                 [*] Bit07: Error voltage 1.25V
[*] Bit08: Wrong time zone DCF                 [*] Bit09: Error Time Zone TC
[*] Bit10: Error bit10                        [*] Bit11: Alarm input
[*] Bit12: IRIg output voltage lo             [*] Bit13: Error bit13
[*] Bit14: Error bit14                        [*] Bit15: Error bit15

Enter alarmnumber to alter mask

Press ENTER for next part, 99 to leave>
```

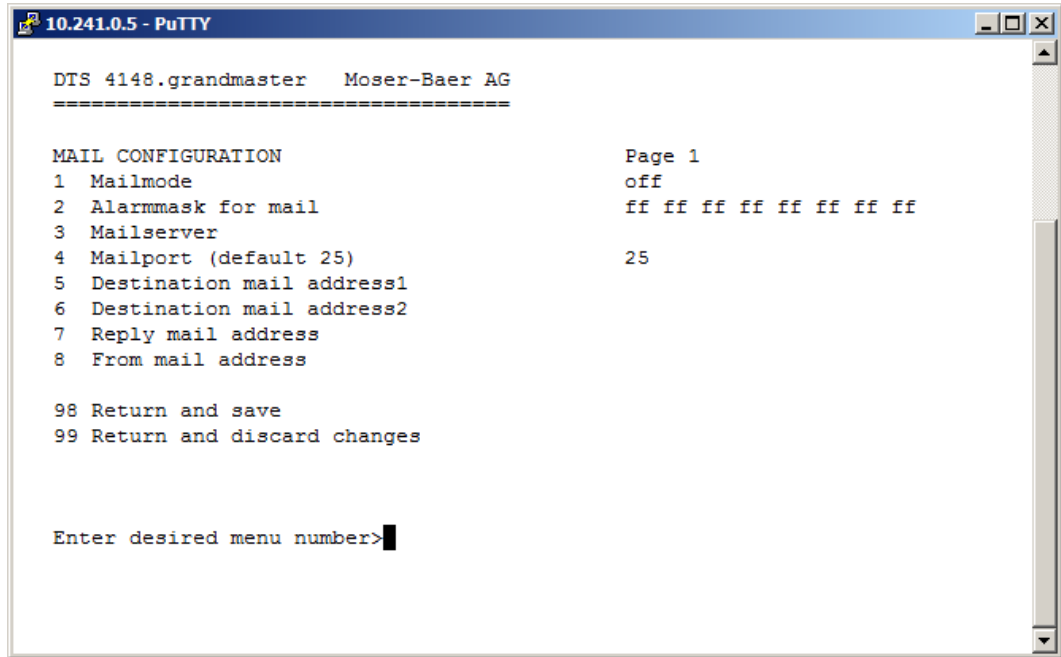
Display of all the DTS 4148 alarms (64) on 4 pages. Pages can be scrolled through with ENTER.

An alarm on the current page can be switched on or off by entering an error number. The page can be exited with 99. The modifications will be saved or restored one menu level higher in "ALARM CONFIGURATION". All Alarms with "error bitxx" are not yet used.

A description of individual errors can be found in appendix "C Alarm list".

The alarm masks for the various applications (E-mail, SNMP, SNMP Traps, alarm relay) can differ.

6.5.18 E-mail



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

MAIL CONFIGURATION                                     Page 1
1 Mailmode                                              off
2 Alarmmask for mail                                   ff ff ff ff ff ff ff ff
3 Mailserver
4 Mailport (default 25)                                25
5 Destination mail address1
6 Destination mail address2
7 Reply mail address
8 From mail address

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

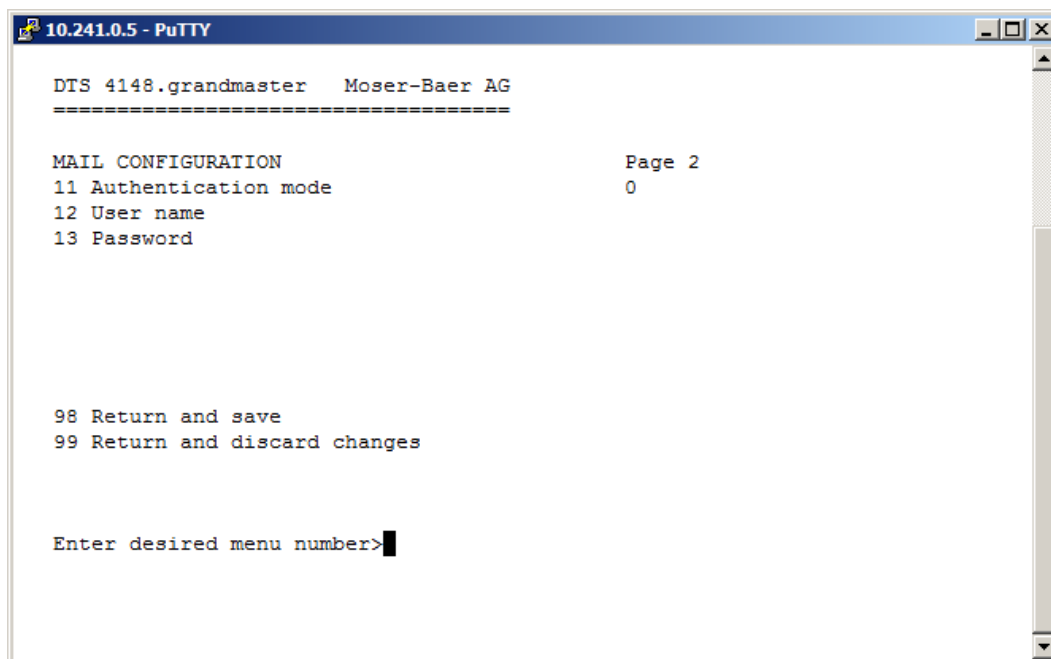
1. E-mail function on or off.
2. Alarm mask for e-mail notifications (see chapter "6.5.17 Alarm mask")
Changes are stored or reset on the overlying menu page "MAIL CONFIGURATION".
3. IP address of the mail server e.g. 10.249.34.5
ENTER without entering an address will delete the entry.
4. Mail server port (often 25)
- 5.-6. Destination e-mail address.
ENTER without entering an address will delete the entry.
7. Reply address (e.g. support, administrator...)
ENTER without entering an address will delete the entry.
8. Sender address (important for authentication through the mail server)
ENTER without entering an address will delete the entry.

Press ENTER to change to page 2.



Notice: Configuration of a gateway is required for sending e-mails (see chapter "6.5.22 Network"). This can be set via DHCP or manually.

E-mail configuration page 2:



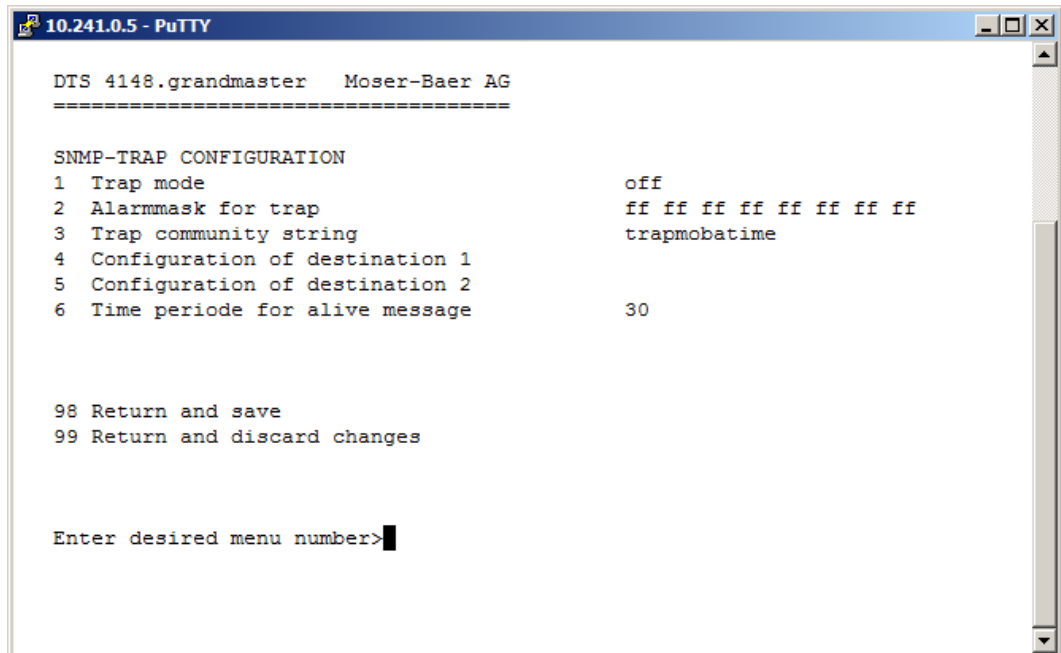
11. Authentication mode:
 - 0=off (sender e-mail address used for authentication)
 - 1=auto (tries CRAM-MD5, LOGIN- PLAIN in this sequence)
 - 2=PLAIN
 - 3=LOGIN
 - 4=CRAM-MD5
 12. User name (only for authentication mode 1-4)
 13. Password (only for authentication mode 1-4)
- Press ENTER to change to page 1.

Format of an error message via E-mail:

```
Event <Alarm 03 set: Power failure 1>
Time <11:26:45 10.01.07>
Hostname <DTS4148 (10.241.0.30)>
```

6.5.19 SNMP traps

For a description of SNMP functionality, see also chapter "9 SNMP". Traps are also designated as notifications (from SNMP V2)



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster Moser-Baer AG
=====

SNMP-TRAP CONFIGURATION
1 Trap mode off
2 Alarmmask for trap ff ff ff ff ff ff ff
3 Trap community string trapmobatime
4 Configuration of destination 1
5 Configuration of destination 2
6 Time periode for alive message 30

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

1. Trap mode on or off (applies to alarm and alive traps)
2. Alarm mask for SNMP trap messages (see chapter "6.5.17 Alarm mask")
Changes are first stored or reset on the overlying menu page "SNMP TRAP CONFIGURATION".
3. Trap community string (group membership for traps).
Standard: *trapmobatime*.
4. Configuration of the receiving system (trap sink) 1
5. Configuration of the receiving system (trap sink) 2
6. Time period for alive messages in seconds. 0 = no alive traps are sent
Range: 1-7'200sec

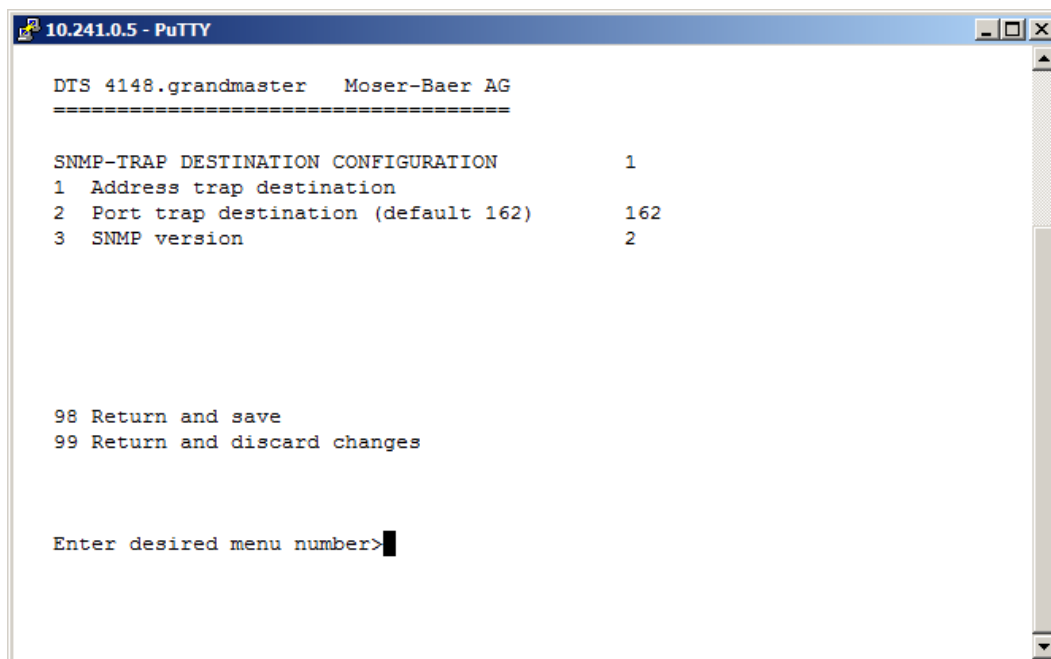
Notice: General settings for SNMP can be found in menu '2. Configuration' → '7. SNMP'. See also chapter "6.5.24 SNMP").

Notice: Configuration of a gateway is required for sending SNMP traps (see chapter 6.5.22 Network). This can be set via DHCP or manually.

Notice: Each configuration change leads to a restart of the DTS SNMP Agent.



Configuration of the receiving systems



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

SNMP-TRAP DESTINATION CONFIGURATION          1
1 Address trap destination
2 Port trap destination (default 162)        162
3 SNMP version                               2

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

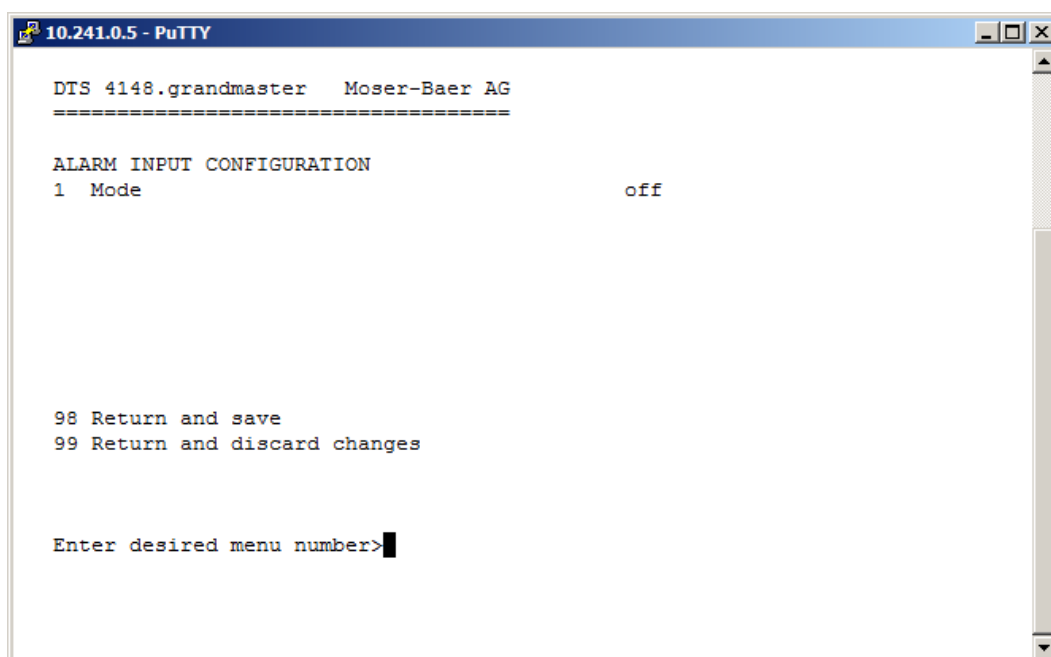
1. Address of the evaluation system e.g. 10.240.0.9.
ENTER without entering an address will delete the entry.
2. Port of the evaluation system (usually 162).
3. SNMP Version: 1=SNMP V1, 2=SNMP V2c



Notice: Each configuration change leads to a restart of the DTS SNMP Agent.

6.5.20 Alarm input

Description of the functionality of the alarm input.



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

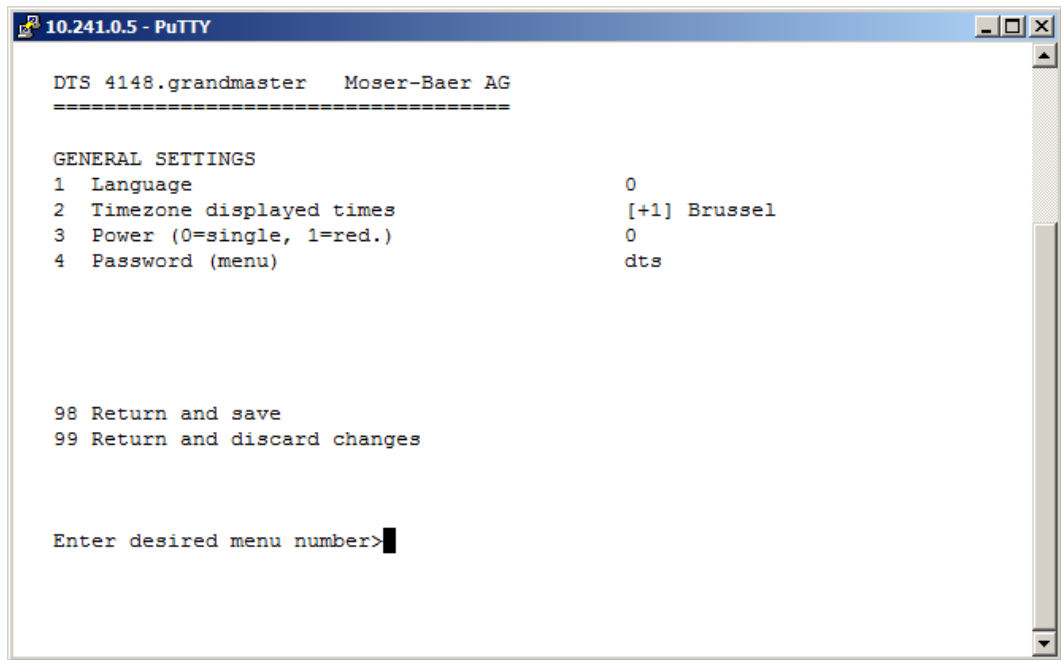
ALARM INPUT CONFIGURATION
1 Mode                                     off

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

1. Mode off, on or inverted.

6.5.21 General settings



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster Moser-Baer AG
=====

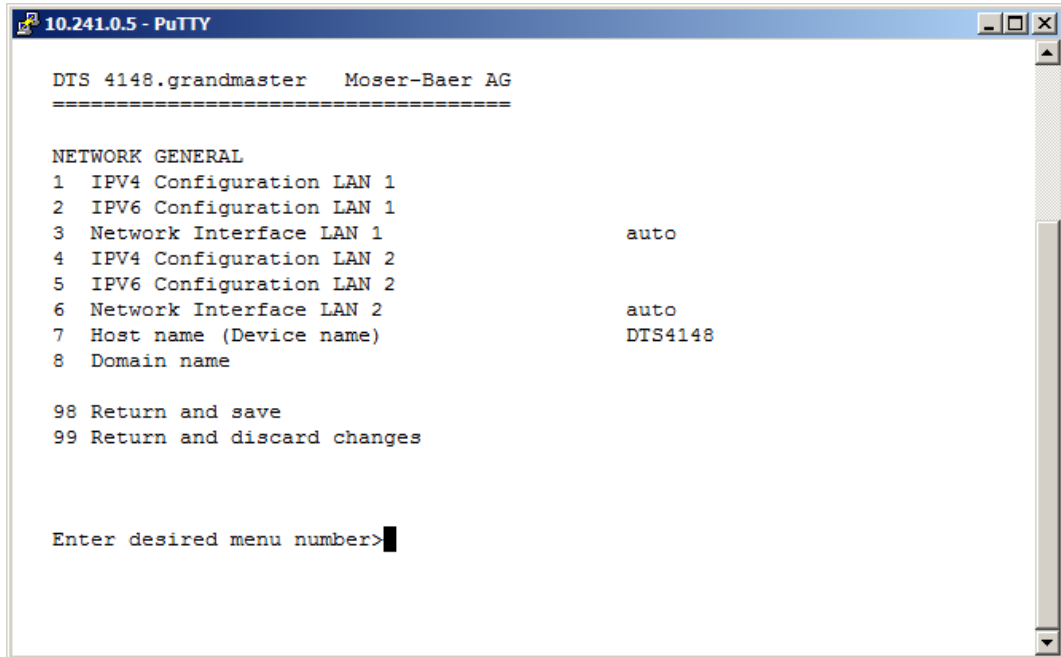
GENERAL SETTINGS
1 Language 0
2 Timezone displayed times [+1] Brussel
3 Power (0=single, 1=red.) 0
4 Password (menu) dts

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

1. Setting the display language
2. Setting the time zone for the display, and also all alarm logs, e-mail and SNMP.
(See chapter 6.5.27 Time zone selection).
3. Power: 0=simple power, 1=redundant power
(See chapter "10 Power supply alternatives")
4. Enter password for the menu (user **dts**) (max. 15 characters).
A password must be configured.

6.5.22 Network



```
10.241.0.5 - PuTTY


DTS 4148.grandmaster Moser-Baer AG
=====

NETWORK GENERAL
1  IPV4 Configuration LAN 1
2  IPV6 Configuration LAN 1
3  Network Interface LAN 1          auto
4  IPV4 Configuration LAN 2
5  IPV6 Configuration LAN 2
6  Network Interface LAN 2          auto
7  Host name (Device name)         DTS4148
8  Domain name




98 Return and save
99 Return and discard changes

Enter desired menu number>
```

1. Configuration of IPv4 parameters LAN 1
2. Configuration of IPv6 parameters LAN 1
3. Set network interface LAN 1: Auto, 100/10Mbit, half, full duplex.
4. Configuration of IPv4 parameters LAN 2
5. Configuration of IPv6 parameters LAN 2
6. Set network interface LAN 2: Auto, 100/10Mbit, half, full duplex.
7. Set host name.

-  **Notice:** **A host name must always be configured.**
Host names and their format are described in the Internet standards RFC 952 and RFC 1123:
Domains and host names may only contain letters (capitals or small letters) and numerals ("0-9"). In addition, the minus sign ("-") may also be used, as long as it is not at the end.
Everything else is not permitted!
8. Set domain e.g. test.org

View of the current network state in Menu: '1 Status' ➔ '6 Info network config.'

-  **Notice:** The menu is closed upon modifying the IP or the DHCP mode.
-  **Notice:** DHCP on/off, each change of this setting will result in a **restart** of the NTP server!
-  **Notice:** For the operation of a **Multicast** communication (NTP and Time Zone Server) **the configuration of a gateway is mandatory**. The gateway can be set manually or by using DHCP. If no gateway is available, the own IP address can be used.



- Notice:** Only one DNS server should be configured (IPv4 or IPv6).
- Notice:** Modifications to the network must be coordinated with the network administrator!
- Notice:** The LAN 1 gateway has priority compared to the LAN 2 gateway!
- Notice:** If only one LAN interface is used, it always has to be LAN 1!
- Notice:** The two LAN interfaces may not be configured in the same network (subnet)!

Network configuration IPv4:

```
10.241.0.5 - PuTTY

DTS 4148.grandmaster Moser-Baer AG
=====

NETWORK IPV4                                LAN 1
1  DHCP                                     on
2  IP address                             DHCP
3  Subnet mask                           DHCP
4  Gateway                               DHCP
5  DNS server                             DHCP

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

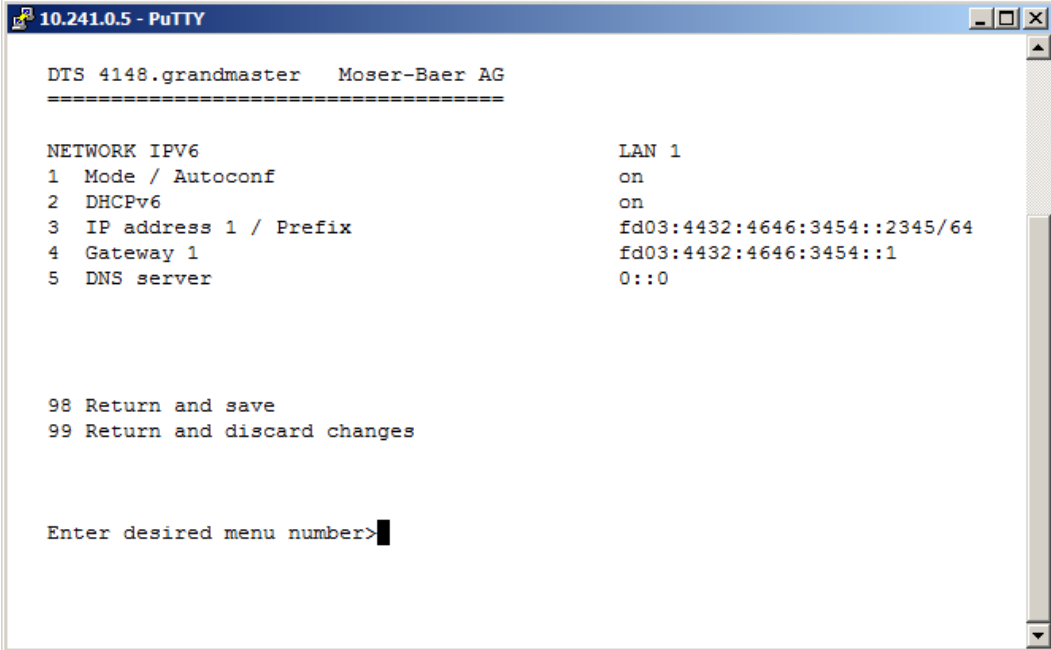
1. DHCP on or off, the following fields are not available in case of DHCP = on. A DHCP **renew** can also be triggered via this point.



- Notice:** DHCP on, if no DHCP server is available, leads to longer start-up time (<75 sec.) of the DTS.

- 2.-5. Set IP address, subnet mask, gateway and DNS server. Format = 10.240.98.7

Network configuration IPv6:



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

NETWORK IPV6                                LAN 1
1 Mode / Autoconf                            on
2 DHCPv6                                     on
3 IP address 1 / Prefix                      fd03:4432:4646:3454::2345/64
4 Gateway 1                                  fd03:4432:4646:3454::1
5 DNS server                                0::0

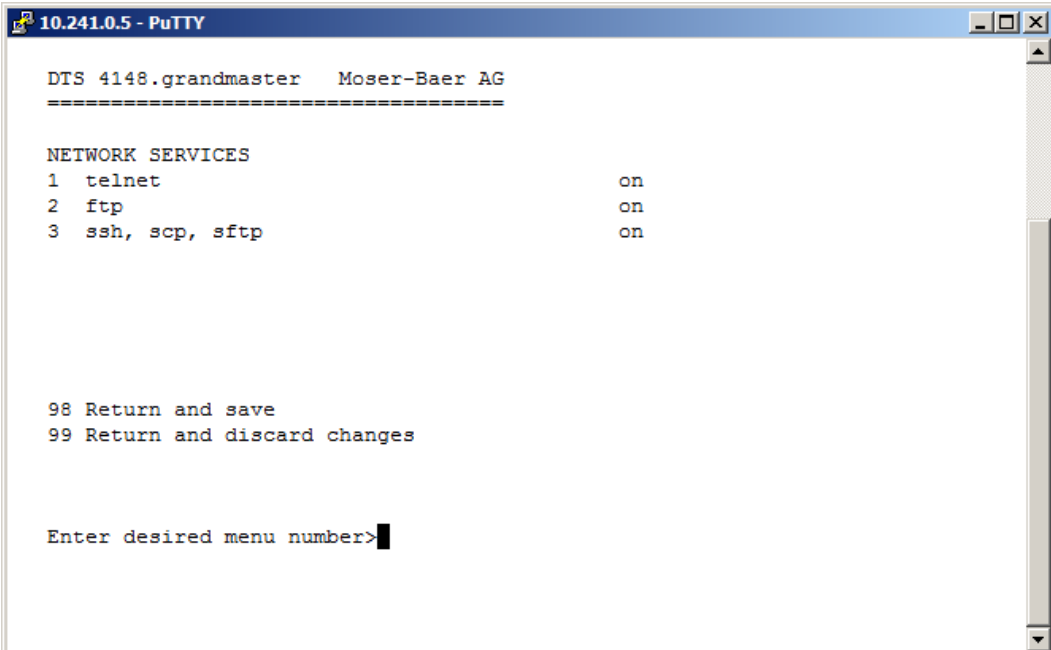
98 Return and save
99 Return and discard changes

Enter desired menu number>
```

1. Autoconf on or off
2. DHCPv6 on or off
3. IP address with prefix in IPv6 format
e.g. 2001:2345:6789::12:1:34/64
4. Gateway in IPv6 format
5. IPv6 DNS server

6.5.23 Services (network services FTP, telnet, SSH...)

Network services configuration:



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

NETWORK SERVICES
1 telnet                                     on
2 ftp                                        on
3 ssh, scp, sftp                            on

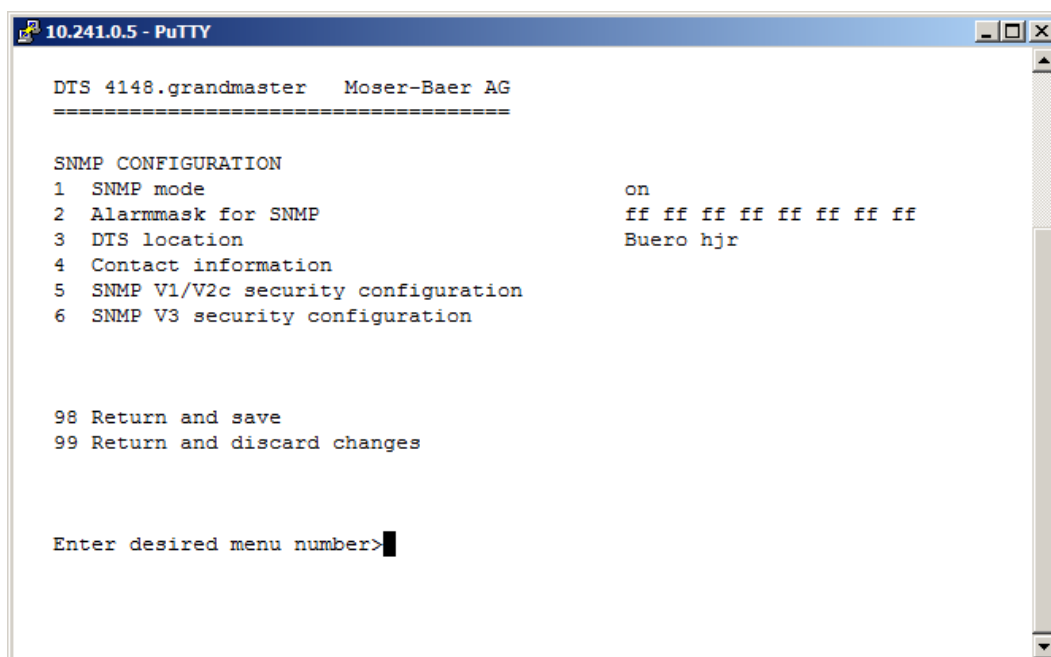
98 Return and save
99 Return and discard changes

Enter desired menu number>
```

- 1.-3. Switch the individual services off or on.

6.5.24 SNMP

For a description of SNMP functionality, see also chapter “9 SNMP”.



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

SNMP CONFIGURATION
1  SNMP mode                      on
2  Alarmmask for SNMP             ff ff ff ff ff ff ff
3  DTS location                   Buero hjr
4  Contact information
5  SNMP V1/V2c security configuration
6  SNMP V3 security configuration

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

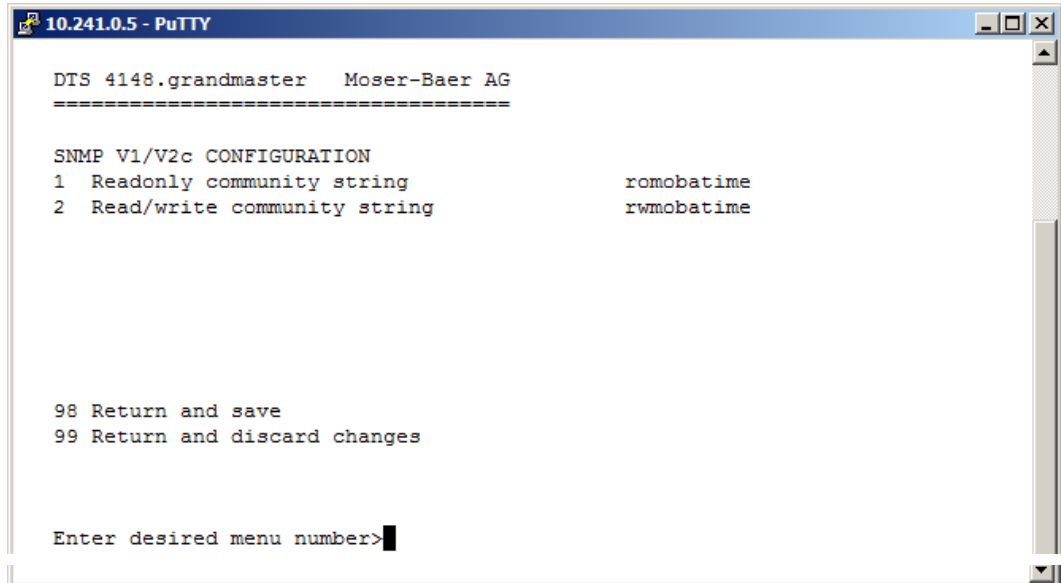
1. Mode. 0=off, 1= V1 + V2c + V3, 2=V2c + V3, 3=V3 only
The MIB 2 SNMP information is also available with "Mode = off".

Notice: To send out MIB-2 traps, the trap community and the destination address must at least be configured in menu '2. Configuration' → '3. Alarms' → '3. Traps'. See also chapter “6.5.19 SNMP traps”.

2. Alarm mask for SNMP status (see chapter "6.5.17 Alarm mask"). The modifications will be saved or restored one menu level higher in “SNMP CONFIGURATION”.
3. DTS Location information, which is displayed in SNMP management tool.
4. Contact information, which is displayed in SNMP management tool.
5. Configuration of SNMP V1 / V2 c (specific settings). See chapter “6.5.25 SNMP V1 / V2c”
6. Configuration of SNMP V3 (specific settings). See chapter “6.5.26 SNMP V3”

Notice: Each configuration change leads to a restart of the DTS SNMP Agent.

6.5.25 SNMP V1 / V2c



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster Moser-Baer AG
=====

SNMP V1/V2c CONFIGURATION
1 Readonly community string      romobatetime
2 Read/write community string    rwmobatetime

98 Return and save
99 Return and discard changes

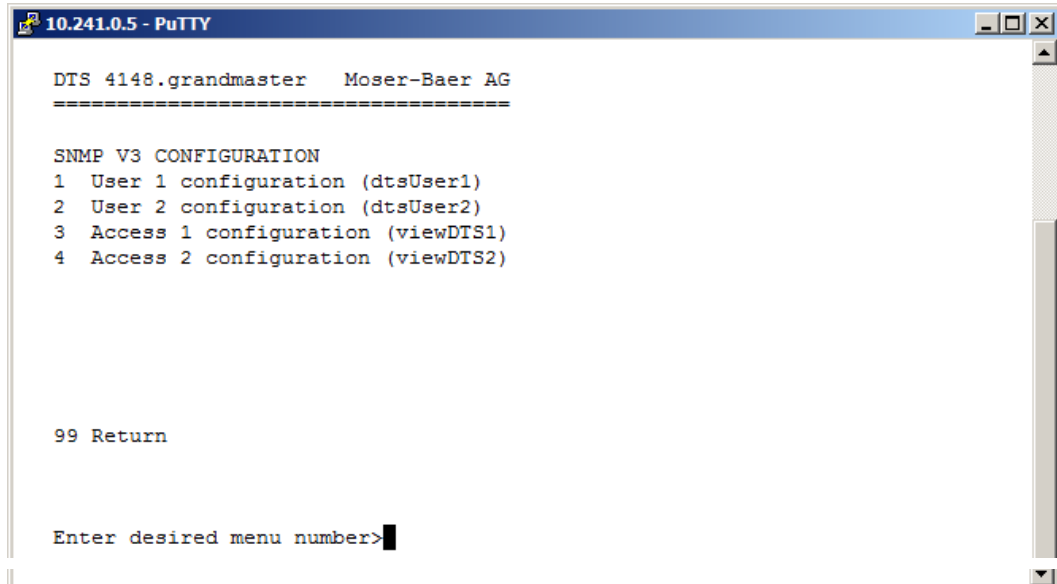
Enter desired menu number>
```

1. Community string for **read only** (Group membership for GET).
Standard: *romobatetime*.
2. Community string for **read/write** (Group membership for GET/PUT).
Standard: *rwmobatetime*.

Notice: Each configuration change leads to a restart of the DTS SNMP Agent.



6.5.26 SNMP V3



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

SNMP V3 CONFIGURATION
1  User 1 configuration (dtsUser1)
2  User 2 configuration (dtsUser2)
3  Access 1 configuration (viewDTS1)
4  Access 2 configuration (viewDTS2)

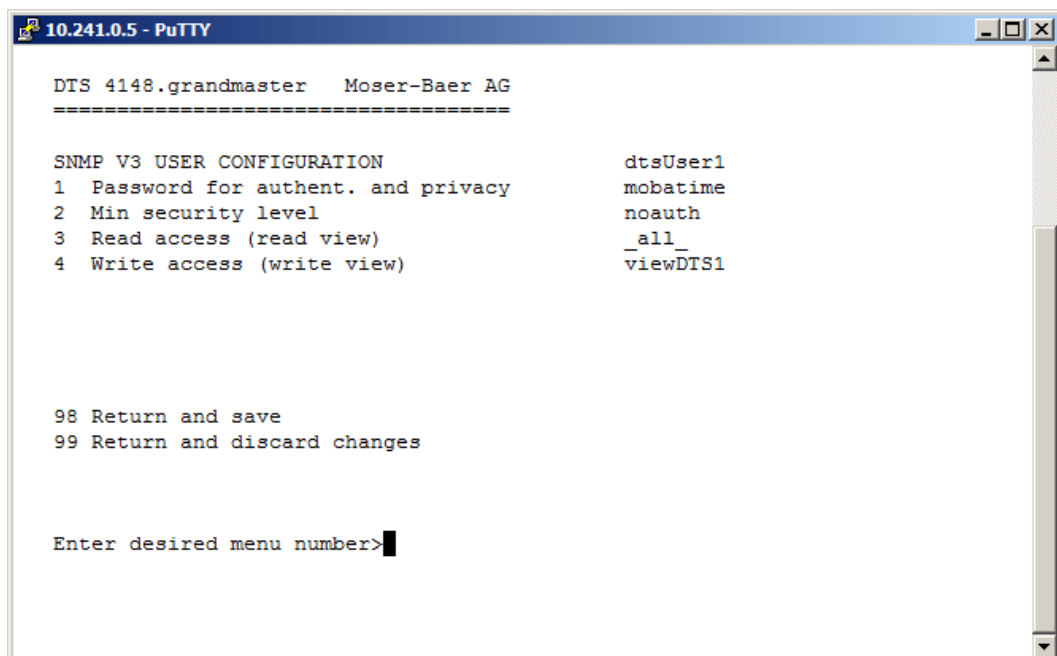
99 Return

Enter desired menu number>
```

1. – 2. Configuration of user-defined SNMP accounts dtsUser1 and dtsUser2
3. – 4. Configuration of user-defined SNMP access rights viewDTS1 and viewDTS2

Notice: Each configuration change leads to a restart of the DTS SNMP Agent.

User configuration SNMP V3:



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

SNMP V3 USER CONFIGURATION                                dtsUser1
1  Password for authent. and privacy                      mobatime
2  Min security level                                     noauth
3  Read access (read view)                                _all_
4  Write access (write view)                              viewDTS1

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

1. Password for authentication (MD5) and privacy (DES). 8 – 40 characters.
2. Minimal security level:
 - 1=noauth (no authentication)
 - 2=auth (only authentication)
 - 3=priv (authentication and privacy)
3. SNMP read access:
 - 0=none (no access)
 - 1=all (full access)
 - 2=DTS info (only DTS specific information)

- 3=user defined 1 (viewDTS1)
4=user defined 2 (viewDTS2)
4. SNMP write access 0=none (no access)
 1=all (full access)
 2=DTS info (only DTS specific information)
 3=user defined 1 (viewDTS1)
 4=user defined 2 (viewDTS2)



Notice: Each configuration change leads to a restart of the DTS SNMP Agent.

Access configuration SNMP V3:

```

10.241.0.5 - PuTTY
DTS 4148.grandmaster Moser-Baer AG
=====

SNMP V3 ACCESS CONFIGURATION      viewDTS1
1 Include OID 1                    .1.3.6.1.4.1.8072
2 Include OID 2                    .1.3.6.1.4.1.2021
3 Include OID 3                    .1.3.6.1.4.1.13842.4
4 Exclude OID 1                    .2
5 Exclude OID 2                    .2
6 Exclude OID 3                    .2

98 Return and save
99 Return and discard changes

Enter desired menu number>

```

1. - 3. Include View path, form: `.1.3.6.1.4.1.13842.4` (e.g. DTS) or `.iso` (complete SNMP ISO path).
4. - 6. Exclude View path: analogue include.



Notice: Each configuration change leads to a restart of the DTS SNMP Agent.

6.5.27 Time zone selection



Display of all the DTS 4148 time zones (100) over several pages. The pages can be scrolled through with ENTER.

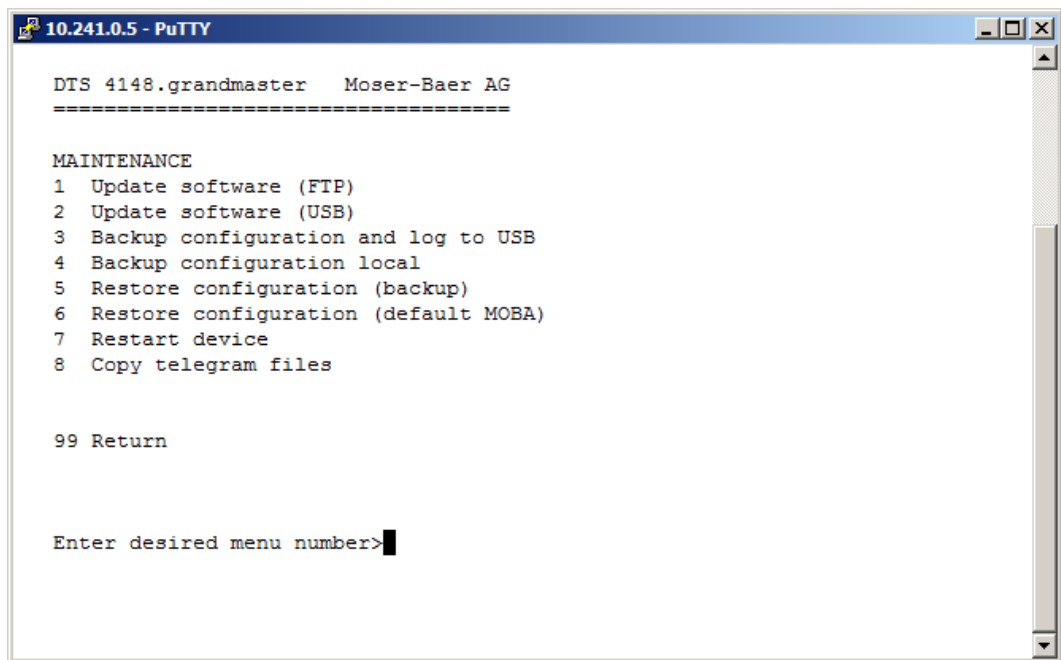
A time zone can be selected on the current page by entering a time zone number.

Only one time zone can be selected.

A * indicates the selected time zone.

Press ESC to leave the page. The modifications will be saved or restored one menu level higher.

6.6 Maintenance menu



```
10.241.0.5 - PuTTY

DTS 4148.grandmaster  Moser-Baer AG
=====

MAINTENANCE
1  Update software (FTP)
2  Update software (USB)
3  Backup configuration and log to USB
4  Backup configuration local
5  Restore configuration (backup)
6  Restore configuration (default MOBA)
7  Restart device
8  Copy telegram files

99 Return

Enter desired menu number>
```

1. Initiating a software update (files must have been copied by FTP into the directory /ram of the DTS 4148 before). ➔ See chapter "7 Updates".
The command always leads to a restart of the DTS 4148 (even if no files were copied for update).



Notice: Possibly save configuration first.

2. Initiate a software update (files must first be put on to a USB stick in the DTS 4148). ➔ See chapter "7 Updates". The command always leads to a restart of the DTS 4148 (even if no files were copied for update)



Notice: Possibly save configuration first.

3. Save the entire configuration (incl. telegram files) and the log files on a USB stick . Also generates a diagnosis file (dts4148system_XXXXXXXXXX.log) in the directory /ram which is also copied on to the USB stick or which can be downloaded per FTP (only for support).
4. Backup the entire configuration locally (➔ file dts4148.conf.bkp is created).
5. Restore the entire configuration from a backup stored locally.
6. Restore the entire configuration to factory settings.
7. Restart DTS 4148.
8. Copy telegram files onto the DTS 4148.
➔ See chapter "7.10 Copying Telegram files to the DTS 4148.grandmaster".

See also chapter "7 Updates".

7 Updates

7.1 Updating images with MOBA-NMS

Steps for updating images using MOBA-NMS:

1. Select DTS device(s) in the device view.
2. Menu 'Edit' → 'Commands' → Select 'Firmware Update...'.
3. Enter the path to the file 'dtscheck.md5' or select it using the 'Browse...' button.
4. Enter further paths to images or select them using the 'Browse...' button.
5. Optionally: Check the box 'Backup device(s) configuration before update' and enter the destination directory for the backup file(s). If a destination folder is selected, the whole device configuration will be saved before the backup. Additionally, if the image 'dts4148cfg.img' is written too, the saved configuration can be automatically restored after the update. For this, check the box 'restore configuration after update'.
6. By clicking the 'OK' button, the update is initiated.



Important: The update procedure (item 6) can take some time (<5 min.) and may not be interrupted under any circumstances. In case of an interruption, the software on the DTS 4148 is destroyed and can only be repaired in the factory.

7.2 Updating images with FTP

Possible images are: u-bootDTS4148, rootfsDTS4148.img, ulmageDTS4148, dts4148app.img, dts4148cfg.img. Additionally the file dtscheck.md5 must exist.

→ **all file names are case-sensitive.**

Steps for updating images:

1. Connect a FTP client software to the DTS 4148 e.g. with Internet Explorer enter: **ftp://dts@[IP address]** (as user dts).
See also chapter
2. If an update of the image **dtscfg.img** is made, the configuration of the DTS 4148 and the telegram files are overwritten. In order to store the configuration, the file *dts4148.conf* from the directory **/etc** and any possible telegram files must be saved from the directory **/var/local/dts**. After the update, the file can again be written on the DTS 4148 in accordance with chapter "7.3 Updating applications or configurations with FTP".
3. Change to the directory **/ram**.
4. Copy the image into the directory **/ram**.
5. Close FTP connection.
6. The update procedure can be started on DTS 4148 by selecting the menu '3. Maintenance' → '1. Update software (FTP)' and press ENTER. The message "Update in progress" appears and at the same time, "Please wait!>" is shown in the command line. All images are copied. The DTS 4148 is automatically restarted on completion of the update.
The Telnet or SSH session has to be restarted.



Notice: The update procedure (point 6) may take some time depending on the type and number of images (<5 min) and must not be interrupted under any circumstances. If interrupted, the software on the DTS 4148 will be destroyed and the DTS 4148 has to be returned to the manufacturer for repairing.

Starting up after an update can also take some minutes (<10 min), or it can result in an additional restart, as the file systems have to be checked first.

To eliminate any mistakes during update procedure, the versions should be verified after the update.

7.3 Updating applications or configurations with FTP

To update individual files such as, e.g. dts4148app, dts4148menu, ntpd, dts4148mod.ko, dts4148.conf, etc. on the DTS 4148, the following steps are carried out
➔ all file names are case-sensitive:

1. Connect a FTP client software to the DTS 4148 e.g. with Internet Explorer enter: **ftp://dts@[IP address]** (as user dts). See also chapter 7.6 FTP connection
2. Change to the directory */ram*.
3. Copy all the files to be updated into the directory */ram*.
4. Close FTP connection.
5. The update procedure can be started on DTS 4148 by selecting the menu '3. Maintenance' ➔ '1. Update software (FTP)' and press ENTER.
 The message "Update in progress" appears and at the same time, "Please wait!>" is shown in the command line. All images are copied. The DTS 4148 is automatically restarted on completion of the update.
 The Telnet or SSH session has to be restarted.



Notice: The update procedure (point 5) may take longer time depending on the type and number of images (<5 min) and must not be interrupted under any circumstances. If interrupted, the software on the DTS 4148 will be destroyed and the DTS 4148 has to be returned to the manufacturer for repairing.

To eliminate any mistakes during update procedure, the versions should be verified after the update.

7.4 Updating images via USB

Possible images are: u-bootDTS4148, rootfsDTS4148.img, ulmageDTS4148, dts4148app.img, dts4148cfg.img. Additionally the file dtscheck.md5 must exist.
➔ all file names are case-sensitive.

Steps for updating images:

1. Copy images to the USB stick
2. Plug the stick in the DTS 4148
3. If an update of the dts4148cfg.img image is made, the configuration of the DTS 4148 and the telegram files are overwritten. In order to store the configuration, the file *dts4148.conf* from the directory */etc* and any possible telegram files must be saved from the directory */var/local/dts*. After the update, the file can again be written on the DTS 4148 in accordance with chapter "7.3 Updating applications or configurations with FTP".

4. The update procedure can be started on DTS 4148 by selecting the menu '3. Maintenance' ➔ '2. Update software (USB)' and press ENTER.
The message "Update in progress" appears and at the same time, "Please wait!>" is shown in the command line. All images are copied. The DTS 4148 is automatically restarted on completion of the update.
The Telnet or SSH session has to be restarted.
5. As soon as the DTS 4148 is restarted, remove the USB stick.



Notice: The update procedure (point 4) may take longer time depending on the type and number of images (<5 min) and must not be interrupted under any circumstances. If interrupted, the software on the DTS 4148 will be destroyed and has to be returned to the manufacturer for repairing.

Starting up after an update can also take some minutes (<10 min), or it can result in an additional restart, as the file systems have to be checked first .

To eliminate any mistakes during update procedure, the versions should be verified after the update.

7.5 Updating applications or configurations via USB

To update individual files, e.g. dts4148app, dts4148menu, ntpd, dts4148mod.ko, dts4148.conf, etc. on the DTS 4148, the following steps are carried out

➔ **all file names are case-sensitive, all names with 4148:**

1. Copy applications (or configuration) to the USB stick
2. Plug the stick in the DTS 4148
3. The update procedure can be started on DTS 4148 by selecting the menu '3. Maintenance' ➔ '2. Update software (USB)' and press ENTER.
The message "Update in progress" appears and at the same time, "Please wait!>" is shown in the command line. All applications are copied. The DTS 4148 is automatically restarted on completion of the update.
The Telnet or SSH session has to be restarted.
4. As soon as the DTS 4148 is restarted, remove the USB stick.



Notice: The update procedure (point 3) may take longer time depending on the type and number of images (<5 min) and must not be interrupted under any circumstances. If interrupted, the software on the DTS 4148 will be destroyed and the DTS 4148 has to be returned to the manufacturer for repair.

To eliminate any mistakes during the update procedure, the versions should be verified after the update.



Important: USB stick recognition:

After removing the USB stick, wait approx. 1 min. before re-inserting the it again. Otherwise it can be, that the USB stick is not recognized.

7.6 FTP connection

Establish anonymous connection:

ftp://"IP address of DTS 4148"

to directly reach the sub-directory **/ram**, e.g. Explorer *ftp://10.241.0.5*

Establish connection as/with a user:

ftp://dts@"IP address of DTS 4148".

e.g. with Internet Explorer enter: *ftp://dts@10.241.0.5*

Password: **dts** resp. the defined password for the menu.

To directly reach the sub-directory **/ram**, you can also enter

ftp://dts@10.241.0.5/ram.

Establish connection with IPv6:

The address **must** be written in brackets []:

e.g. with Internet Explorer enter: *ftp://dts@[fd03:4432:4646:3454::2000]*



Notice: The file has to be copied in binary mode (not ASCII).

FTP tools

| | Windows XP, 7, 8, 10 | Linux (Suse, Redhat) |
|--|---|----------------------|
| Integrated in the system (file manager): | Windows Explorer Start → Execute: Explorer | Konqueror / Dolphin |
| Programs (examples) | CuteFTP | Kbear |

7.7 SFTP connection

SFTP = SSH File Transfer Protocol

SFTP tools

| | Windows XP, 7, 8, 10 | Linux (Suse, Redhat) |
|--|----------------------|----------------------|
| Integrated in the system (file manager): | - | Konqueror / Dolphin |
| Programs (examples) | WinSCP | - |

7.8 SCP connection

SCP = Secure Copy Protocol



Notice: SCP connection can only be established when no menu (operation) is open.

The following error message can be ignored. There is no influence in the functionality of the operation:

```
Command 'groups'
failed with termination code 127 and error message
-sh: groups: not found.
```

SCP tools

| | Windows XP, 7, 8, 10 | Linux (Suse, Redhat) |
|--|----------------------|----------------------|
| Integrated in the system (file manager): | - | With command line |
| Programs (examples) | WinSCP | - |

7.9 Save Configuration externally

(for backup or copy to another DTS 4148)

Save the current configuration via MOBA-NMS:

1. Select DTS device in the device view.
2. Menu 'Edit' → Select 'Backup configuration...'.
→
3. Select the elements that are to be saved. (In case of doubt, select everything)
4. Click button 'Next >'.
→
5. Indicate destination file by clicking the 'Browse...' button.
6. Optionally: enter a free backup comment. E.g. reason for the backup, use, etc. This comment will then be shown during the restoration of the backup.
7. By clicking the 'Finish' button, the backup is created.
8. At the end of the backup, an overview of the process is shown. It shows which elements were saved and which ones are not available or could not be saved.

Save the current configuration via FTP:

1. Connect a FTP client software to the DTS 4148 (with Internet Explorer enter: **ftp://dts@"IP address"**) (as user dts).
2. Change to the DTS 4148 directory **/etc**.
3. Save the file **dts4148.conf** (configuration) to the user PC (e.g. copy the file to the Desktop or to the directory *My Documents*).
4. Additionally also save possible telegram files from the directory **/var/local/dts**.

Save the current configuration via USB-Stick:

The whole procedure can be analogously done with an USB stick.

The copy procedure to the USB stick can be started on DTS 4148 by selecting the menu '3. Maintenance' ➔ '3. Backup configuration and log to USB' and press ENTER. All files (including telegram files) will be copied into the root directory of the USB stick.

Copy configuration to another DTS 4148:

In order to copy the entire configuration or elements of it from a DTS device to another, the according assistant in MOBA-NMS can be used. For this, select the source device (from which the configuration shall be transferred) and start the assistant in the menu 'Edit' ➔ 'Transfer configuration...'. It will lead you through the individual steps.

Without MOBA-NMS, perform the procedure explained in chapter 7.3 resp. 7.5.

Notice: When copying the configuration from one DTS 4148 to an other, the IP address may have to be changed after the download by serial connection.



7.10 Copying Telegram files to the DTS 4148.grandmaster

Analogously to the previously described procedures telegram files can be copied via FTP or USB stick to the DTS 4148.

The copy procedure can be started on DTS 4148 by selecting the menu '3. Maintenance' ➔ '8. Copy telegram-files' and press ENTER. Afterwards, select again in the menu "6.5.4 Serial interface" and reload.

The files are stored in the directory **/var/local/dts** and can be deleted or copied via FTP.

Special case USB stick:

If the DTS recognizes the insertion of an USB stick, it is shown on the display. By pressing the red button the copy procedure can be released (analogously to the above described procedure). The button has to be pressed until the copy procedure is started.

Management with MOBA-NMS:

With MOBA-NMS, the files do not need to be copied manually via FTP or USB stick, since this is already integrated in the MOBA-NMS operation. At every file selection, the 'Change...' link can be clicked. This opens a file dialog which shows all files and allows new files to be loaded onto the device or existing ones to be deleted.

Example of a program file choice:

Program file: [Change...](#)

Link for opening the file dialog for editing the file list.

Notice: After the file copy procedure, the output of the telegram files are re-started (take over of the files).

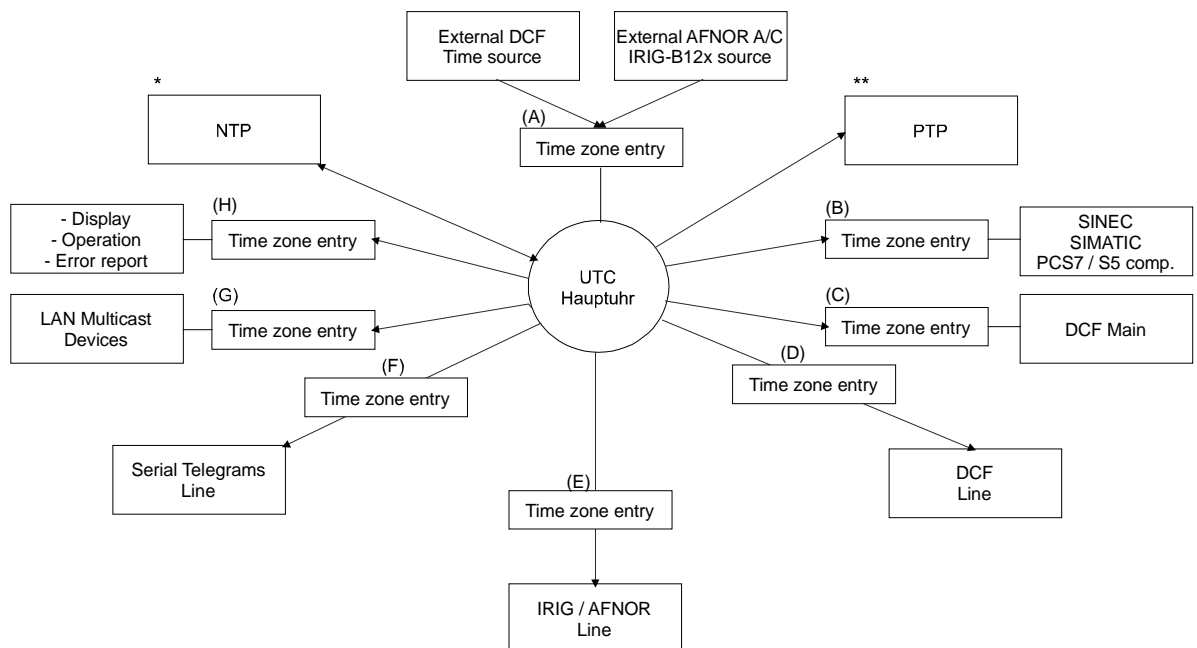
Notice: The **file name** is limited to **8 characters** before the dot, e.g. **IF482Std.tel**



8 Time administration

8.1 Concept of time administration

The internal master clock as well as the real-time clock runs with UTC (Universal Time Coordinated). The synchronisation inputs, the time shown on the display, as well as all outputs 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 6.5.9 Time source
 - (B) chapter 6.5.7 SINEC, SIMATIC PCS7 & S5 compatible
 - (C) chapter 6.5.2 DCF – output
 - (D) chapter 6.5.3 DCF / Pulse / Frequency output
 - (E) chapter 6.5.5 IRIG / AFNOR / DCF-FSK Output
 - (F) chapter 6.5.4 Serial interface
 - (G) chapter 6.5.6 NTP slave clocks / time zone server
 - (H) chapter 6.5.21 General settings
- * NTP is always UTC
- ** PTP is always TAI (PTP timescale)

8.2 Time acceptance

Variants of time synchronization

- Adjusting:
After starting the DTS 4148, the time is set for a first time (from source or manually). Afterwards, the time will only be aligned with maximum adjusting speed if deviating from the source → **no time steps possible**.
Configuration: see chapter “6.5.10 Time adjustment / Time-keeping”
- Setting:
Time deviations are always corrected in full immediately: Seconds are set immediately; partial seconds are corrected with 50ms/s.

Manual time set:

- The time is always set immediately. The stratum is set to 1 or pre-set to a fix stratum. If new source time information is available, the time will be adjusted again and the stratum set accordingly.

8.3 Time acceptance from an external source (DCF or GPS)

Acceptance from an external source (DCF input):

- At least 2 minutes reception (DCF-GPS) is required, before the NTP server is available.
Time source stratum = 0 → stratum of the DTS 4148 = 1

Stratum normal, synchronized operation:

- The stratum value behaves as follows for synchronization from the time source:
If $St_fix > 0$: then $stratum = St_fix$ (particularly for manually set time) applies
If $St_fix = 0$: then $stratum = 1$

Stratum in case of error:

- The stratum value behaves as follows in the case of external time source loss:
If $St_fix > 0$: then $stratum = St_fix$ applies
If $St_fix = 0$:
 then $stratum = \min((t_current - t_lastsynch)/(To * 255), St_max)$ applies
- Adjusting the clock after identifying a leap in time:
If $St_fix > 0$: then $stratum = St_fix$ applies
If $Tst > 0$ AND $St_fix = 0$: then $stratum = \min(Tdiff/Tst, St_max)$ applies
If $Tst = 0$ AND $St_fix = 0$: then $stratum = 1$ (auto) applies

Legend:

| | |
|------------------|--|
| To: | Stratum TO <0-16>, Stratum error timeout time 1-999 [h], for loss of the external source |
| St_fix: | 0..15, configurable stratum, 0 = auto |
| St_max: | 1..16, configurable stratum, 0 = auto |
| t_current [s]: | current time |
| t_lastsynch [s]: | time of the last synchronization |
| Tst: | Offset per stratum, 0..40'000 [ms], parameter time deviation for stratum alteration by 1 |
| Tdiff: | current time difference in ms |

8.4 Time acceptance from external AFNOR-A/C, IRIG-B12x source

The stratum value is calculated same as with DCF/GPS synchronization (chapter 8.3). As IRIG-B120 to 123 time codes do not provide information about the current year, the DTS 4148 has to be synchronized first from another time source or the date has to be set manually. The DCF input and the IRIG input cannot be used at the same time for the synchronization (redundant time source with DCF and IRIG synchronization is not possible).

AFNOR and IRIG-B126 contains the **time and date** information.



Attention: After more than 5 days without power, the DTS 4148 loses the date information. When synchronized with IRIG-B120 to 123 it has to be set again manually.

8.5 Time acceptance from NTP

Acceptance:

- As NTP RFC 1305, RFC 5905 (www.ntp.org)
(see <http://ntp.isc.org/bin/view/Servers/WebHome> for internet-server)

Stratum in normal, synchronized operation:

- Stratum value of DTS is always one step higher than that of the current NTP time server

Stratum in case of an error

- As NTP RFC 1305, RFC 5905 (www.ntp.org)

8.6 NTP as backup

If DTS 4148 is synchronized with a DCF or GPS source, the NTP can be used as redundancy source. This function is active, as soon as at least one grandmaster is configured in menu '2. Configuration' → '2. Time handling' → '4. NTP server'.

Stratum in normal, synchronized operation:

- Equal Stratum value "Time Acceptance from an external source (DCF or GPS)"

Behavior in case of an error:

- Failure of primary Source:
"St. est": Means: Expected NTP Stratum of the NTP sources
"St. est" = MAX(Stratum NTP candidates)
→ Means: "St. est" contains the stratum value of the poorest NTP source.
If internal Stratum > "St. est" + 1, then change to NTP as source takes place
(internal stratum is one step higher than that of the poorest available NTP source).
- As soon as the primary source is available again, the changes are set back.

8.7 Time server

- NTP v4 (compatible with v3) as per RFC 1305, RFC 5905 (port 123)
- SNTP (UDP), RFC 2030 (port 123)
- PTP (UDP), IEEE 1588-2008 (V2) (ports 319 and 320)
- TIME (TCP/UDP), RFC 868 (port 37)
- DAYTIME (TCP/UDP), RFC 867 (port 13)

8.8 Time accuracy, time-keeping

See appendix H Technical data.

8.9 Leap second

The announcement of the switching second is put out by DCF and NTP* each time 1 hour before the defined time.

*The announcement is only sent via NTP if a DCF or IRIG source is active. If only one NTP source is configured, the state of this source is passed on.

Automatic mode

In the automatic mode, the source (DCF or NTP) is checked for a possible announcement during 1 hour prior to the moment of a possible leap second. If the announcement is recognized, it is passed through the NTP and DCF outputs and the leap second is inserted.

The leap second can be inserted at 2 moments per year: 00:00:00 1.1. or 00:00:00 1.7. each in UTC. Whether a leap second is inserted is decided by the organization IERS (<http://www.iers.org>) each time up to half a year in advance.

8.10 NTP Authentication

NTP provides two variants for authentication in version 4:

- NTP symmetric keys (i.e. symmetric keys)
- NTP autokeys

NTP authentication assures a correct time source and prevents manipulation of NTP information. NTP data itself is, however, not encoded.

8.10.1 NTP symmetric keys

A 32-bit key ID and a cryptographic 64/128-bit check sum of the packet is attached to each NTP IP packet.

The following algorithms are used for this purpose:

- Data Encryption Standard (DES)
(partly restricted in North America and no longer integrated into new NTP variants (>V4.2))
- Message Digest (MD5)

The DTS 4148 only supports the MD5 procedure.

The receiving NTP service calculates the check sum with an algorithm and compares it with the one contained in the packet. Both NTP services must have the same encryption key and the same corresponding key ID for this purpose.

Packets with a wrong key or wrong check sum will not be used for synchronization.

The DTS 4148 must be correspondingly configured to be able to use NTP authentication (chapter 6.5.12 NTP server). The NTP service of the other equipment (e.g. server, PC...) must also be configured. In the case of standard NTP, this occurs via the ntp.conf file:

```
# path for key file
keys /etc/ntp/ntp.keys
trustedkey 1 2 3 4 5 6# define trusted keys
requestkey 4 # key (7) for accessing server variables
controlkey 5 # key (6) for accessing server variables
```

```
server ntp1.test.org key 2
server ntp2.test.org key 6
server 192.168.23.5 key 3
```

The description of the ntp.conf file can be accessed via the corresponding man-page, or consulted at <http://www.eecis.udel.edu/~mills/ntp/html/authopt.html>

The authentication mode is automatically activated when a key is used and the paths for the keys have been correspondingly configured.

`trustedkey` defines all keys currently permitted

`requestkey` defines the key for the ntpq help tool.

`controlkey` defines the key for the ntpdc help tool.

The keys are located in the ntp.keys file defined with `keys`. This has the following format:

```
1    M    TestTest
2    M    df2ab658
15   M    I_see!
498  M    NTPv4.98
```

The key ID is in the first column of the file, the format of the keys in the second defined column, and the key itself in the third. There are four key formats, however, nowadays only the MD5 is still used → M. The letter M is no longer written for new NTP variants (>V4.2) and is only necessary for backwards compatibility.

The signs ' ', '#', '\t', '\n' and '\0' are not used in the MD5 ASCII key! Key 0 is reserved for special purposes and should therefore not be used here.

ntp.keys: man page for ntp.keys to be noted (check the internet)

8.10.2 NTP Autokey

The validity of the time received to the NTP clients is assured by symmetric keys. For a higher degree of certainty, exchanging the keys used regularly is, however, necessary to obtain protection, e.g. from replay attacks (i.e. attacks in which recorded network traffic is simply played back).

The autokey procedure was introduced as the exchange is very involved in a large network. A combination of group keys and public keys enables all NTP clients to check the validity of the time information which they receive from servers in their own autokey group.

NTP Autokey is relatively complex in its use and studying the functionality is definitely necessary beforehand.

Autokey is described at <http://www.cis.udel.edu/~mills/proto.html> or on the NTP homepage <http://www.ntp.org>.

Autokey is currently defined in an IETF draft.

<http://www.ietf.org/internet-drafts/draft-ietf-ntp-autokey-04.txt>

The configuration of Autokey is explained in

<http://support.ntp.org/bin/view/Support/ConfiguringAutokey> or in

<http://www.ntp.org/ntpfaq/NTP-s-config-adv.htm#S-CONFIG-ADV-AUTH>.

8.11 PTP

- PTP according to IEEE STD 1588-2008
- V2 only, no V1
- P2P, E2E
- IPv4, IPv6, Layer2, UDP, Multicast according to definition IEEE 1588
- master only (active or passive)
- If both interfaces are used, the DTS 4148 becomes a boundary clock with 2 master ports according to IEEE 1588.
- „2 step“ procedure only: synch. message with follow-up message
- availability of management messages limited: requests only
- profiles: IEEE 1588 annex J, default profile
- no specific PTP SNMP MIB

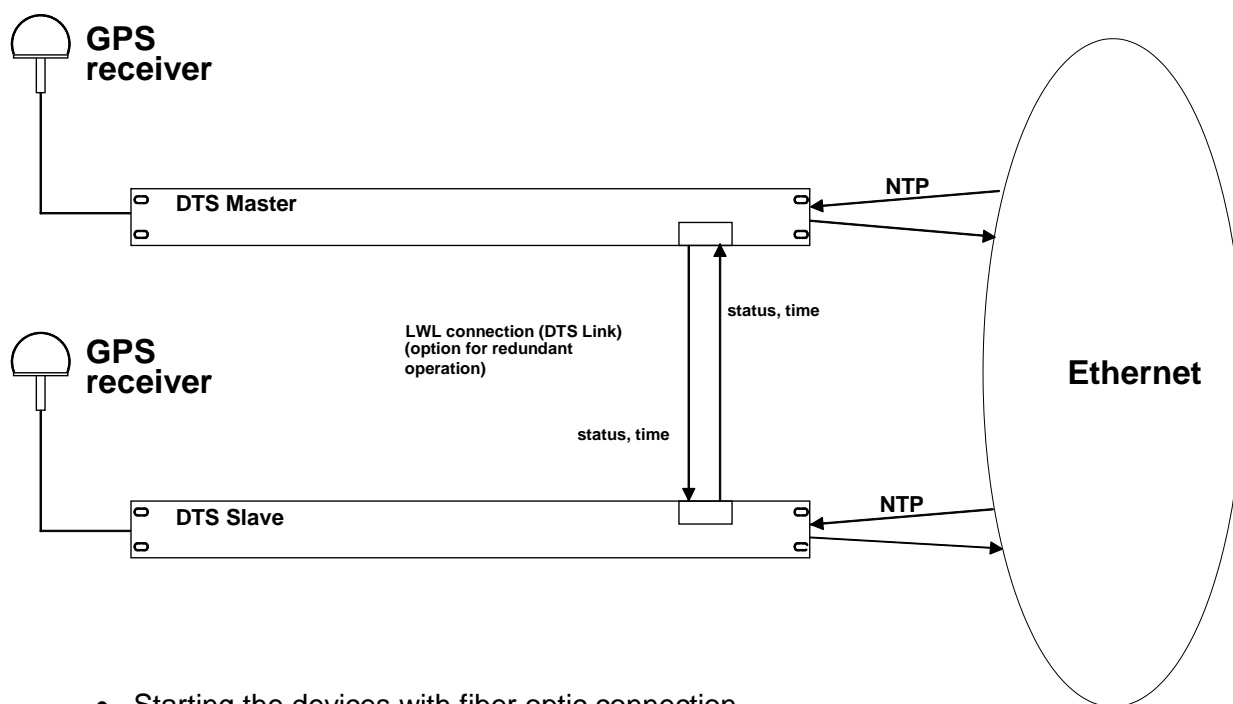
8.12 Redundant operation of 2 DTS 4148.grandmasters

For redundant operation two DTS 4148 devices are synchronized via optical fibers. For this purpose, a mini GBIC module is plugged into both devices and connected via optical fibers (see Appendix H Technical data):



mini GBIC module

Both devices have a GPS receiver in redundant operation. Both devices are configured for the redundant mode, but are basically equal and work out the master/slave role among themselves. The slave is always synchronized to the master in operation. The slave supervises the system time on the basis of its own GPS time and generates an error message, should the time difference amount exceed the configurable value of n milliseconds.



- Starting the devices with fiber optic connection
The devices work out among themselves which is the master (normally the one synchronized first)
- Starting the devices without fiber optic connection
The devices do not send out any time information until there is an LWL connection, or the devices are reconfigured.
- The slave synchronizes to the master.
Whereby $\text{stratum/slave} = \text{stratum/master} + 1$
The time of the slave is always set immediately to the master time (no fine adjustment).

- In case of loss of the master GPS, the master stratum increases on the basis of the configurable parameters up to the maximum stratum. The slave follows, i.e. the slave stratum is always 1 higher. The slave takes over the master role from a configurable stratum value (if the status of the slave is better than that of the master) and synchronizes to its own GPS. The previous master becomes the slave. This distribution of roles remains until the new master loses GPS synchronization.
- In the case of a loss of the master, the slave takes over the master function.
- If the former master is working again, it takes over the actual time of the current master and remains in slave mode.
- In the case of a fiber optic connection loss, the slave checks the status of the master over the network and remains in slave mode as long as the master is accessible and is working normally. If the master is no longer accessible or has a worse status, the slave takes over the master function.

NTP

The NTP clients select the server with the lower stratum.

PTP

- If both interfaces are used, the DTS 4148 becomes a boundary clock with 2 master ports according to IEEE 1588.
- Redundancy (2 Master) via opt. link; both send out (DTS Master is active, DTS Slave is passive)
- Clients use BMC (Best Master Clock algorithm)

SINEC

The DTS 4148.grandmaster slave 'listens in' to the master's time telegrams and itself begins sending out, if two consecutive time telegrams are missing. By switching, the slave takes over the master function.

The redundant operation of a DTS 4148.grandmaster in combination with Simatic S7 or other 'SINEC time servers' is not intended.

DCF coded (fiber optic output)

No redundancy

2 LAN Mode

The two redundant DTS 4148 are not located in the same network. The role decision (master, slave) takes place exclusively via opt. link.

RTC:

RTC is to be deactivated for the redundant mode.

9.1 General

The SNMP version **V2c** or **V3** for *Get*, *Put* and *Notification* (Trap) is used.

A full SNMP agent is implemented on the DTS (MIB II, DTS4148).

For SNMP V2c, following standard *Communities* are used:

| | |
|-------------|---------------------|
| Read only : | <i>romobatime</i> |
| Read/Write: | <i>rwmobatime</i> |
| Trap: | <i>trapmobatime</i> |

For SNMP V3, following standard *User / Passwords* are used:

| | | |
|-----------------|-----------------|-----------------------------|
| <i>dtsUser1</i> | <i>mobatime</i> | |
| <i>dtsUser2</i> | <i>mobatime</i> | |
| <i>dtsInfo</i> | <i>mobatime</i> | (not changeable, read only) |

DtsUser1 and dtsUser2 have full read/write access on all objects. With SNMP V3 rules, access can be reduced. Changes of the rules can only be modified over the DTS menu but not via SNMP.

SNMP V3 agent supports user validation (authentication MD5) and encoding (encryption DES).

MIB II values like sysDescr, sysContact, sysName, or sysLocation can only be modified over the DTS menu but not via SNMP.

The following MIB definitions are used:

SNMPv2-SMI, SNMPv2-MIB, SNMPv2-CONF, SNMPv2-TC, SNMPv2-TM,
SNMP-FRAMEWORK-MIB, SNMP-MPD-MIB, SNMP-NOTIFICATION-MIB,
SNMP-TARGET-MIB, SNMP-USER-BASED-SM-MIB, SNMP-VIEW-BASED-ACM-MIB,
RFC1213-MIB, IF-MIB, IP-MIB, IP-FORWARD-MIB, TCP-MIB, UDP-MIB,
HOST-RESOURCES-MIB, HOST-RESOURCES-TYPES, DISMAN-EVENT-MIB,
NOTIFICATION-LOG-MIB, UCD-SNMP-MIB, NET-SNMP-MIB, NET-SNMP-TC

SNMP V2c, V3:

DTS-COMMON (File: DTS-COMMON-MIB.TXT)

General DTS definition, always required

DTS4148 (DTS4148-MIB.TXT)

Device-specific DTS definitions

The MIB files can be copied from the DTS 4148 with FTP (For FTP use, see chapter "7.6 FTP connection"):

DTS-MIB: */etc/snmp/mibs/*

Standard MIBS: */usr/share/snmp/mibs/*

9.2 Device configuration with SNMP

If one or several variables are set in a configuration group with *Put*, the variable *dts4148????ConfigCmd* must be set at the end to 1 in the corresponding group. The values of the entire configuration group are assumed from the DTS with this command (1=Save).

As long as the accept command has not been set, the changed variables can be restored to the old values by setting the *dts4148????ConfigCmd* variable to 2 (2=undo, restore).

After sending the accept command, a *dts4148ConfigChanged Notification* is sent.

The definitions of the available variables can be taken from the MIB files.

Example:

| Management-System | | DTS |
|--|---|--|
| <i>Put dts4148FTPMODE=1</i> | → | Variable is set to 1 internally |
| <i>Put dts4148NetServicesConfigCmd=1</i> | → | Configuration group is assumed |
| | ← | Sends <i>dts4148ConfigChanged Notification</i> with the new time <i>dts4148NetConfigChangedTime</i> |

9.3 DTS subagent SNMP notification

Protocol: SNMPv2c Notification

For *Notifications* to be sent out, SNMP must be switched on. In addition, at least one receiver system must be configured.

9.3.1 Startup [dts4148StartUp]

Sent out when the subagent for the DTS is started.

This *Notification* is always sent out, as soon as SNMP is activated and a destination address is configured.

9.3.2 Shutdown [dts4148Shutdown]

Sent out when the subagent for the DTS is stopped.

This *Notification* is always sent out, as soon as SNMP is activated and a destination address is configured.

9.3.3 Status changed

[dts4148StatusChanged]

Sent out when the subagent detects a status change in the DTS application process. The following variables are monitored for changes:

dts4148SysStatus, dts4148NTPTInfoCurrentSource, dts4148SysStratum

This *Notification* is always sent out, as soon as SNMP is activated, and a destination address is configured.

The *Notification* sent out contains the following data:

| Field | Type | Size | Description | Example |
|----------------------|--------------|---------|---------------------------------------|------------------|
| dts4148SysStatus | Unsigned Int | 4 Bytes | Contains the internal system status | 66309 |
| dts4148SysOffset | Integer | 4 Bytes | Actual time offset of the system [us] | -1523 → -1.523ms |
| dts4148SysTimeSource | Byte | 1 Byte | Actual time source | 2 |
| dts4148SysStratum | Byte | 1 Byte | Actual system stratum level | 1 |

9.3.4 Configuration changed

[dts4148ConfigChanged]

Sent out when the subagent detects a configuration change in the DTS application processes.

This *Notification* is always sent out, as soon as SNMP is activated and a destination address is configured.

The *Notification* sent out contains the following data:

| Field | Type | Size | Group |
|---|-----------|---------|----------------------------|
| dts4148SysConfigChangedTime | TimeTicks | 4 Bytes | dts4148System |
| dts4148NetworkIf0ConfigChangedTime | TimeTicks | 4 Bytes | dts4148NetworkIf0 |
| dts4148NetworkIf1ConfigChangedTime | TimeTicks | 4 Bytes | dts4148NetworkIf1 |
| dts4148NetConfigChangedTime | TimeTicks | 4 Bytes | dts4148Network |
| dts4148NetServicesConfigChangedTime | TimeTicks | 4 Bytes | dts4148NetServices |
| dts4148TSConfigChangedTime | TimeTicks | 4 Bytes | dts4148TimeSource |
| dts4148RedOpConfigChangedTime | TimeTicks | 4 Bytes | dts4148TimeRedundantOp |
| dts4148NTPConfigChangedTime | TimeTicks | 4 Bytes | dts4148TimeNTPServer |
| dts4148OutMainDCFConfigChangedTime | TimeTicks | 4 Bytes | dts4148OutMainDCF |
| dts4148OutLineDCFPulseFREQConfigChangedTime | TimeTicks | 4 Bytes | dts4148OutLineDCFPulseFREQ |
| dts4148OutLineSerialConfigChangedTime | TimeTicks | 4 Bytes | dts4148OutLineSerial |
| dts4148OutLineIRIGConfigChangedTime | TimeTicks | 4 Bytes | dts4148OutLineIRIG |
| dts4148OutLineSINECConfigChangedTime | TimeTicks | 4 Bytes | dts4148OutLineSINEC |
| dts4148OutLineTZServerConfigChangedTime | TimeTicks | 4 Bytes | dts4148OutLineTZServer |
| dts4148RelayConfigChangedTime | TimeTicks | 4 Bytes | dts4148AlarmRelayConfig |
| dts4148MailConfigChangedTime | TimeTicks | 4 Bytes | dts4148AlarmMailConfig |
| dts4148SnmpConfigChangedTime | TimeTicks | 4 Bytes | dts4148SnmpConfig |
| dts4148SnmpV3ConfigChangedTime | TimeTicks | 4 Bytes | dts4148SnmpV3 |

The *ConfigChangedTime* variables show the time of the last change of the relevant configuration group as TimeTicks value in 1/100th seconds. The management system can decide on the basis of these time values, which configurations need to be reloaded.

The groups and their parameters are listed in appendix “G Parameters”.

9.3.5 Alive Notification

[dts4148Alive]

Sent out in a configurable interval.

This *Notification* is always sent out, as soon as SNMP and the alarm traps are activated and a destination address is configured.

The *Notification* sent out contains the following data:

| Field | Type | Size | Description | Example |
|------------------|--------------|---------|--|--|
| dts4148SysStatus | Unsigned Int | 4 Bytes | Contains the internal system status | 66309 |
| dts4148SysAlarms | Byte Array | 8 Bytes | 64 Bit Alarm flags 1.Byte Bit 0..7 2.Byte Bit 8..15 :: 8.Byte Bit 56..63 | FFF870FF.FFFFFFFF 5.Byte 2.Byte 1.Byte |

9.3.6 Alarm Notification

[dts4148Alarm]

Sent out if alarm status changes, i.e. *Notification* is sent out when an alarm flag is set or deleted.

This *Notification* is always sent out, as soon as SNMP and the alarm traps are activated and a destination address is configured.

The *Notification* sent out contains the following data:

| Field | Type | Size | Description | Example |
|----------------------------|--------------|----------|--|------------------|
| dts4148TrapAlMsgErrorNr | Byte | 1 Byte | No. of the alarm bit (0..63) | 3 |
| dts4148TrapAlMsgErrorState | Byte | 1 Byte | 0 = alarm bit was deleted 1 = alarm bit was set | 1 |
| dts4148TrapAlMsgErrorTime | Unsigned Int | 4 Bytes | PC-time in seconds since 01.01.1970 00:00:00 | 946684805 |
| dts4148TrapAlMsgErrorText | Text | 59 Bytes | Error text | Failure supply 1 |

10 Power supply alternatives

The DTS 4148 permits 2 different power supply alternatives:

1. DC power supply with 24VDC +20% / -10% to "DC in 1" or "DC in 2"

Notice: In the menu: '2 Configuration' → '4 General' → '3 Power' must be set to '0=single'.

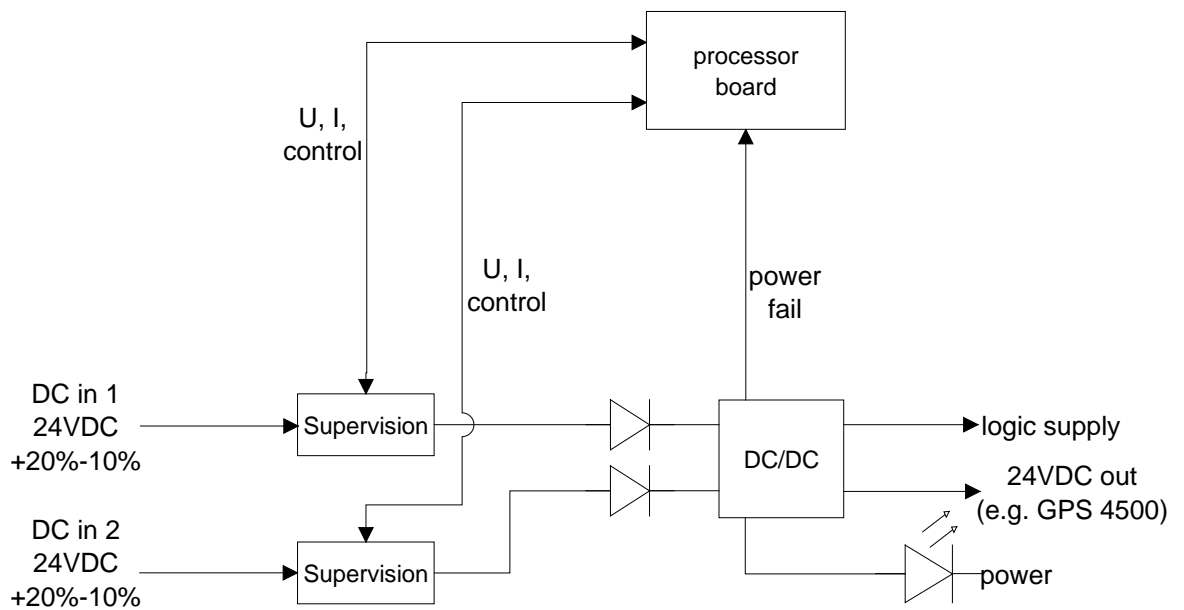
2. Redundant power supply:

Supply1: DC in 1
Supply2: DC in 2

Supply is checked once per minute for correct functioning. The alarm 'loss of power 1' or 'loss of power 2' is set in case of error.

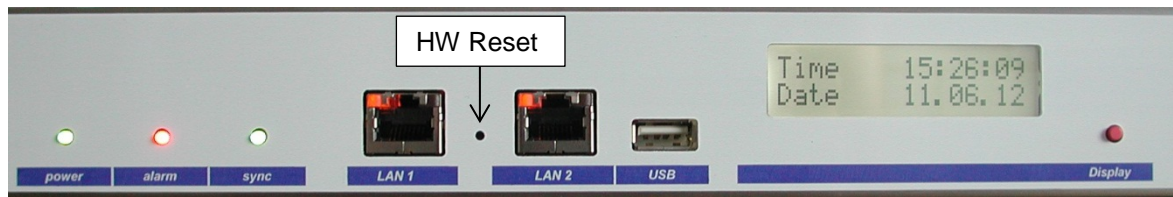
Notice: In the menu: '2 Configuration' → '4 General' → '3 Power' must be set to '1=redundant'.

Block diagram of power supply:



A Connection diagrams

A.1 Front connections



LAN 1 connection:

Plug: RJ45
Interface: Ethernet, 10/100Mbit half- or full duplex
Use only shielded cables!

LAN 2 connection:

Plug: RJ45
Interface: Ethernet, 10/100Mbit half- or full duplex
Use only shielded cables!



Notice: If only one LAN interface is used, it always has to be LAN 1!

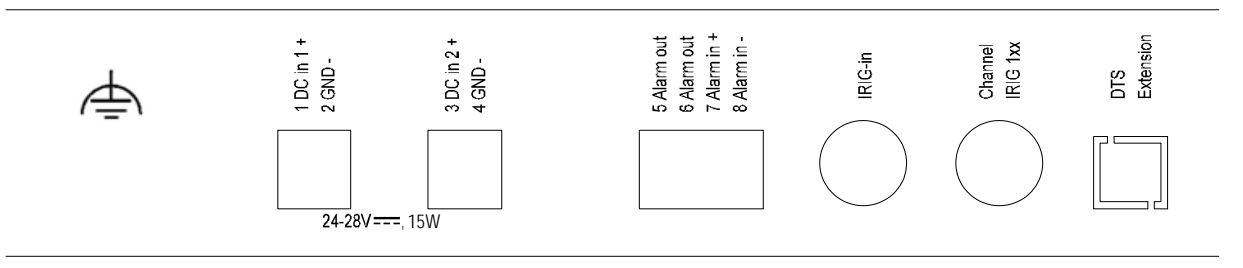
USB connection:

Plug: USB host



Notice: Only permitted for operations with a USB stick!

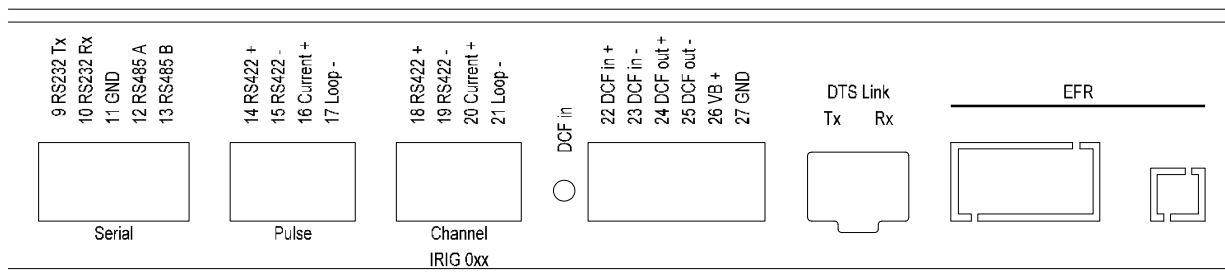
A.2 Connections (rear view)



DTS 4148 connections

For technical data, see appendix “H Technical data”.

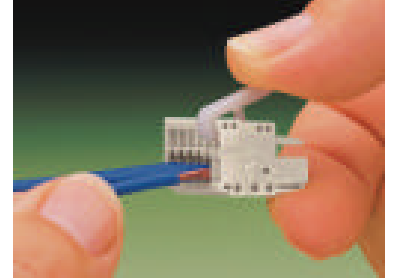
| Clamp | Connection | Description |
|-----------------------|--------------------------|---|
| | Earth connection | |
| 1 | DC in 1 power supply + | Input for external DC supply Ground |
| 2 | DC in 1 power supply GND | |
| 3 | DC in 2 power supply + | Input for external DC supply Ground |
| 4 | DC in 2 power supply GND | |
| 5 | Alarm relay | Alarm contact, open when alarm is active Max. load: 30 W (30 VDC or 1A) or 60 VA (60 VAC or 1A) |
| 6 | Alarm relay | |
| 7 | Alarm input + | Alarm input: 18-36VDC, max. consumption 6mA DC, close contact. Voltage level “high” (24V available) or external contact closed → configurable: alarm or no alarm. Length of connection max. 3m. |
| 8 | Alarm input - | |
| IRIG-In | BNC | AFNOR-A/C, IRIG-B12x synchronization input |
| | | |
| IRIG 12x Channel 1 | BNC: IRIG-B12x output | AFNOR-A/C, IRIG-B1xx and DCF-FSK output for IRIG line 1 |
| DTS extension | DTS extension | DTS extension bus |



| Clamp | Connection | Description |
|-------|-----------------|---|
| 9 | RS232 Tx | RS232 interface of line 1 (Exclusive to the RS485 interface line 1; internally the same interface) |
| 10 | RS232 Rx | |
| 11 | GND | |
| 12 | RS485 A | RS485 interface of line 1 (Exclusive to the RS232 interface line 1; internally the same interface) |
| 13 | RS485 B | |
| 14 | RS422 + Pulse 1 | RS422 output line 1 for DCF, pulse and frequency output (internally the same source of signal like for the current loop output) |
| 15 | RS422 - Pulse 1 | |
| 16 | CL + Pulse 1 | Current loop line 1 for DCF, pulse and frequency output ("Current loop" passive, optocoupler: $U_{max} = 50VDC$, $I_{max} = 10mA$) |
| 17 | CL - Pulse 1 | |
| 18 | RS422 + | Digital IRIG-B signal (00x) of the IRIG line 1 |
| 19 | RS422 - | |
| 20 | Current Loop + | Digital IRIG-B signal (00x) of the IRIG line 1 as current loop ("current loop" passive, optocoupler: $U_{max} = 50VDC$, $I_{max} = 10mA$) |
| 21 | Current Loop - | |
| 22 | DCF input + | DCF input e.g. for the connection of a GPS 4500 or DCF receiver with "current loop" output. |
| 23 | DCF input - | |
| 24 | DCF output + | DCF output, "current loop" passive, $U_{max} = 30VDC$, $I_{on} = 10..15mA$, $I_{off} < 1mA @ 20VDC$ |
| 25 | DCF output - | |
| 26 | DC output + | DC output for GPS 4500 |
| 27 | DC output GND | DC in voltage -2V, max. 400mA |
| | DTS-Link | Optical connection to a 2nd DTS 4148 Mini GBIC plug-in |
| | EFR | Option, for special applications only |

A.3 Plug-in spring terminals

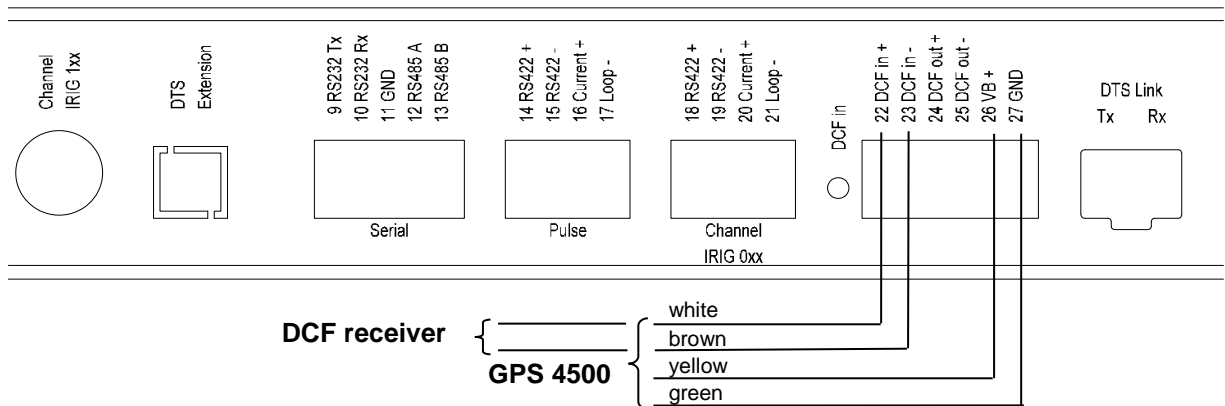
Multiple contact strip 100% protected against wrong plug;
WAGO CAGE CLAMP®-connection
Cross section of 0,08 mm² to 1,5 mm² (from AWG 28 to AWG 14)
Voltage CSA 300 V / current CSA 10 A
Rated voltage: EN 250 V
Rated surge voltage: 2,5 kV
Nominal current: 10 A
Strip length: 7 mm (0,28 in)



Pulled off spring terminal with operation tool:

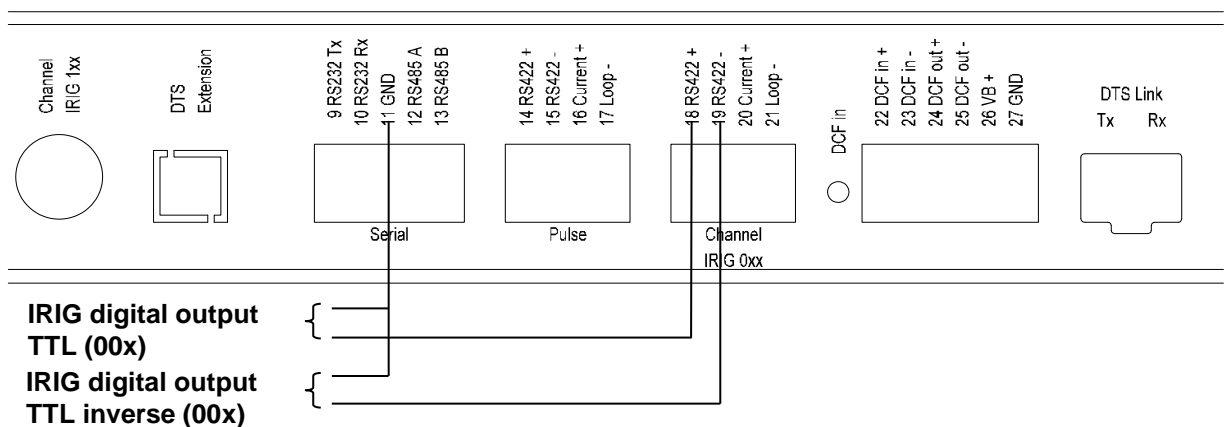
2 operation tools are delivered with the accessory bag.

A.4 Connection GPS 4500, DCF 450 or GNSS 3000



GNSS 3000 according to manual Bx-800813 chap. 9.2 Connection schematics DCF current loop

A.5 IRIG-B00x Digital Output TTL connection



B Time zone table

Time zone entries in the standard season table (version 10.2).

| No. | City / State | UTC Offset | DST | Standard → DST | DST → Standard |
|-----|--|------------|-----|-----------------------------------|-----------------------------------|
| 00 | UTC (GMT), Monrovia | 0 | No | | |
| 01 | London, Dublin, Lisbon | 0 | Yes | Last Sun. Mar. (01:00) | Last Sun. Oct. (02:00) |
| 02 | Brussels, Amsterdam, Berlin, Bern, Copenhagen, Madrid, Oslo, Paris, Rome, Stockholm, Vienna, Belgrade, Bratislava, Budapest, Ljubljana, Prague, Sarajevo, Warsaw, Zagreb | +1 | Yes | Last Sun. Mar. (02:00) | Last Sun. Oct. (03:00) |
| 03 | Athens, Helsinki, Riga, Tallinn, Sofia, Vilnius | +2 | Yes | Last Sun. Mar. (03:00) | Last Sun. Oct. (04:00) |
| 04 | Bucharest | +2 | Yes | Last Sun. Mar. (03:00) | Last Sun. Oct. (04:00) |
| 05 | Pretoria, Harare, Kaliningrad | +2 | No | | |
| 06 | Amman | +2 | Yes | Last Thu. Mar. (23:59) | Last Fri. Oct. (01:00) |
| 07 | UTC (GMT) | 0 | No | | |
| 08 | Istanbul, Kuwait City, Minsk, Moscow, Saint Petersburg, Volgograd | +3 | No | | |
| 09 | Praia, Cape Verde | -1 | No | | |
| 10 | UTC (GMT) | 0 | No | | |
| 11 | Abu Dhabi, Muscat, Tbilisi, Samara | +4 | No | | |
| 12 | Kabul | +4.5 | No | | |
| 13 | Adamstown (Pitcairn Is.) | -8 | No | | |
| 14 | Tashkent, Islamabad, Karachi, Yekaterinburg | +5 | No | | |
| 15 | Mumbai, Kolkata, Chennai, New Delhi, Colombo | +5.5 | No | | |
| 16 | Astana, Thimphu, Dhaka, Novosibirsk | +6 | No | | |
| 17 | Bangkok, Hanoi, Jakarta, Krasnoyarsk | +7 | No | | |
| 18 | Beijing, Hong Kong, Singapore, Taipei, Irkutsk | +8 | No | | |
| 19 | Tokyo, Seoul, Yakutsk | +9 | No | | |
| 20 | Gambier Island | -9 | No | | |
| 21 | South Australia: Adelaide | +9.5 | Yes | 1 st Sun. Oct (02:00) | 1 st Sun. Apr. (03:00) |
| 22 | Northern Territory: Darwin | +9.5 | No | | |
| 23 | Brisbane, Guam, Port Moresby, Vladivostok | +10 | No | | |
| 24 | Sydney, Canberra, Melbourne, Tasmania: Hobart | +10 | Yes | 1 st Sun. Oct. (02:00) | 1 st Sun. Apr. (03:00) |
| 25 | UTC (GMT) | 0 | No | | |
| 26 | UTC (GMT) | 0 | No | | |
| 27 | Honiara (Solomon Is.), Magadan, Noumea (New Caledonia) | +11 | No | | |
| 28 | Auckland, Wellington | +12 | Yes | Last Sun. Sep. (02:00) | 1 st Sun. Apr. (03:00) |
| 29 | Majuro (Marshall Is.), Anadyr | +12 | No | | |
| 30 | Azores | -1 | Yes | Last Sun. Mar. (00:00) | Last Sun. Oct. (01:00) |
| 31 | Middle Atlantic | -2 | No | | |
| 32 | Brasilia | -3 | Yes | 3 rd Sun. Oct. (00:00) | 3 rd Sun. Feb. (00:00) |
| 33 | Buenos Aires | -3 | No | | |
| 34 | Newfoundland | -3.5 | Yes | 2 nd Sun. Mar. (02:00) | 1 st Sun. Nov. (02:00) |
| 35 | Atlantic Time (Canada) | -4 | Yes | 2 nd Sun. Mar. (02:00) | 1 st Sun. Nov. (02:00) |
| 36 | La Paz | -4 | No | | |
| 37 | Bogota, Lima, Quito | -5 | No | | |
| 38 | New York, Eastern Time (US & Canada) | -5 | Yes | 2 nd Sun. Mar. (02:00) | 1 st Sun. Nov. (02:00) |

| | | | | | |
|----|-------------------------------------|------|-----|-----------------------------------|-----------------------------------|
| 39 | Chicago, Central Time (US & Canada) | -6 | Yes | 2 nd Sun. Mar. (02:00) | 1 st Sun. Nov. (02:00) |
| 40 | Tegucigalpa, Honduras | -6 | No | | |
| 41 | Phoenix, Arizona | -7 | No | | |
| 42 | Denver, Mountain Time | -7 | Yes | 2 nd Sun. Mar. (02:00) | 1 st Sun. Nov. (02:00) |
| 43 | Los Angeles, Pacific Time | -8 | Yes | 2 nd Sun. Mar. (02:00) | 1 st Sun. Nov. (02:00) |
| 44 | Anchorage, Alaska (US) | -9 | Yes | 2 nd Sun. Mar. (02:00) | 1 st Sun. Nov. (02:00) |
| 45 | Honolulu, Hawaii (US) | -10 | No | | |
| 46 | Midway Islands (US) | -11 | No | | |
| 47 | Mexico City, Mexico | -6 | Yes | 1 st Sun. Apr. (02:00) | Last Sun. Oct. (02:00) |
| 48 | Adak (Aleutian Is.) | -10 | Yes | 2 nd Sun. Mar. (02:00) | 1 st Sun. Nov. (02:00) |
| 49 | UTC (GMT) | 0 | No | | |
| 50 | UTC (GMT) | 0 | No | | |
| 51 | UTC (GMT) | 0 | No | | |
| 52 | UTC (GMT) | 0 | No | | |
| 53 | UTC (GMT) | 0 | No | | |
| 54 | Ittoqqortoormiit, Greenland | -1 | Yes | Last Sun. Mar. (00:00) | Last Sun. Oct. (01:00) |
| 55 | Nuuk, Qaanaaq, Greenland | -3 | Yes | Last Sat. Mar. (22:00) | Last Sat. Oct. (23:00) |
| 56 | Not used | | | | |
| 57 | Western Australia: Perth | +8 | No | | |
| 58 | Caracas | -4.5 | No | | |
| 59 | CET standard time | +1 | No | | |
| 60 | Not used | | | | |
| 61 | Not used | | | | |
| 62 | Baku | +4 | Yes | Last Sun. Mar. (04:00) | Last Sun. Oct. (05:00) |
| 63 | UTC (GMT) | 0 | No | | |
| 64 | UTC (GMT) | 0 | No | | |

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

Legend:

UTC: Universal Time Coordinate, equivalent to GMT
DST: 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.



Important:

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

Modifications / updating the time zone table:

The time zone tables are filed in the `/etc/mbsn.tbl` (standard table) and `/etc/usersn.tbl` (user table) files.

The user table can be changed with Moser-Baer AG software such as ETCW or MOBA-NMS.

Using MOBA-NMS, it can be downloaded from there, otherwise, it must be copied on to the DTS 4148 in accordance with the update instructions (chapter “7.3 Updating applications or configurations with FTP”).



Notice: The file names ***mbsn.tbl*** and ***usersn.tbl*** must be written in small letters.

C Alarm list

| Number | Error message | Description / Action | Chap. |
|--------|-------------------------|---|-----------|
| 0 | Reboot DTS | DTS 4148 restarted, no intervention required | |
| 1 | Error bit1 | Not used | |
| 2 | Supply voltage too low | Power failure (internally measured) → support | |
| 3 | Power failure 1 | Power failure 1 (only if redundant supply is on) | |
| 4 | Power failure 2 | Power failure 2 (only if redundant supply is on) | |
| 5 | Error voltage 5V | Power failure (internally measured) → support | |
| 6 | Error voltage 2.5V | Power failure (internally measured) → support | |
| 7 | Error voltage 1.25V | Power failure (internally measured) → support | |
| 8 | Wrong time zone DCF | Check DCF configuration | 6.5.2 |
| 9 | Wrong time zone TC | Check TC configuration (IRIG/DCF/Impulse) | 6.5.3 / 5 |
| 10 | Error bit10 | Not used | |
| 11 | Alarm input | Error from external device | 6.5.20 |
| 12 | Low voltage IRIG | Low voltage on analogue AFNOR/IRIG-B output | 6.5.5 |
| 13 | Error bit13 | Not used | |
| 14 | Error bit14 | Not used | |
| 15 | Error bit15 | Not used | |
| 16 | Time source lost | Stratum too high: check time source | 6.5.9 |
| 17 | Failure time source TO | No time information from the selected time source within the configured timeout: Check time source. In slave mode: check link. | 6.5.9 |
| 18 | No valid time | 20 min after starting no valid time → Check time source | |
| 19 | NTP synch. lost | Check NTP source | |
| 20 | Software trimming | Quartz error or poor source quality | |
| 21 | NTP not working | Check NTP configuration | |
| 22 | NTP backup active | Check primary source | |
| 23 | Syn only diff too large | Check synchronization and source | 6.5.10 |
| 24 | No mail server | Check e-mail configuration, check connection | 6.5.18 |
| 25 | SNMP not running | Check SNMP and trap configuration | 6.5.19 |
| 26 | Wrong time zone SINEC | Check time zone SINEC configuration | 6.5.7 |
| 27 | SINEC as sender recvd | 2nd device sends SINEC | |
| 28 | SINEC no tele (slave) | Master does not send SINEC | |
| 29 | Error bit29 | Not used | |
| 30 | No link (optical) | No connection via DTS link (optical link) in redundant operation. Check connection. | |
| 31 | No link (LAN) | No connection via LAN link in redundant operation. Check LAN connection. | |
| 32 | Change Slave->Master | Switch over slave -> master has occurred. Optionally, check the time source of current slave. | |
| 33 | Offset source (slave) | In slave mode only: check time sources Difference between slave and local time source too large | 6.5.11 |
| 34 | Fail local source | In slave mode only: check time sources | 6.5.9 |
| 35 | Error bit35 | Not used | |

| | | | |
|----|------------------------|--|--------|
| 36 | PTP not running | Check PTP configuration | 6.5.14 |
| 37 | Error bit37 | Not used | |
| 38 | Tele.-file invalid | Check telegram file: the file name is longer than 8 digits or the file type is not TEL, Tel or tel; alternatively, syntax error in telegram file | 6.5.4 |
| 39 | Wrong time zone serial | Check serial time zone configuration | 6.5.4 |
| 40 | Error bit40 | Not used | |
| 41 | Error bit41 | Not used | |
| 42 | Error bit42 | Not used | |
| 43 | Error bit43 | Not used | |
| 44 | Error bit44 | Not used | |
| 45 | Error bit45 | Not used | |
| 46 | Error bit46 | Not used | |
| 47 | Error bit47 | Not used | |
| 48 | Error bit48 | Not used | |
| 49 | Error bit49 | Not used | |
| 50 | Error bit50 | Not used | |
| 51 | Error bit51 | Not used | |
| 52 | Error bit52 | Not used | |
| 53 | Error bit53 | Not used | |
| 54 | Error bit54 | Not used | |
| 55 | Error bit55 | Not used | |
| 56 | Error bit56 | Not used | |
| 57 | Error bit57 | Not used | |
| 58 | Error bit58 | Not used | |
| 59 | Error bit59 | Not used | |
| 60 | Error bit60 | Not used | |
| 61 | Error bit61 | Not used | |
| 62 | Error bit62 | Not used | |
| 63 | Error bit63 | Not used | |

D Troubleshooting

| | Error | → | → | Solution / possible cause |
|----|---|---|--|--|
| 1 | DTS does not accept time | Does the reading change (approx. every 3 sec) <i>Sec counter DCF</i> in <i>Status</i> → <i>Source</i> → <i>TIME SOURCE INFORMATION</i> ? | No, but 20 min. have not yet passed since the last reboot. | After new installation or powers supply failure, it may take up to 20 min. until the GPS receiver (e.g. GPS 4500) sends out valid telegrams. Wait for this time to pass. |
| 2 | | | No, for more than 20 minutes. | <ul style="list-style-type: none"> • Check DCF reception LED • Check polarity cabling to GPS. • Check positioning of the GPS receiver |
| 3 | | Error-Bit 23 (<i>Syn only diff too big</i>) in <i>Status</i> → <i>Alarm status</i> set | | <p>The deviation to the received time is beyond the maximal allowed time correction.</p> <p>In the menu <i>Configuration</i> → <i>Time administration</i> → <i>Time-keeping configuration</i> → <i>TIME ADJUSTMENT CONFIGURATION</i>, set the parameter <i>synch. only offset</i> (4) to 0 (=deactivated). The time is now adjusted independently of the deviation's extend. It is however recommended to set a limit in normal operation (default 800ms).</p> |
| 4 | | <i>Offset to source</i> in <i>Status</i> → <i>Time</i> → <i>TIME INFORMATION AND STATUS</i> always shows the same offset | | <ul style="list-style-type: none"> • If Error-Bit 23 set, see point 3 • The deviation is that big, that offset changes cannot be seen due to the displayed resolution. |
| 5 | | Configuration has just been changed | | In the case of configuration changes, particularly if the time configuration is concerned, it can take several minutes for the change to appear correctly. |
| 6 | Error-Bit 16 set (<i>time source fail stratum</i>) | | | See 1 |
| 7 | Error-Bit 17 set (<i>time source fail TO</i>) | | | See 1 |
| 8 | Error-Bit 23 set (<i>Syn only diff too big</i>) | | | See 1 |
| 9 | DTS 4148 is restarting continuously. | | | Check if the network settings are correct, especially the hostname and the gateway has to be configured (when no gateway is available, the own IP address can be used). |
| 10 | LAN LED (left one) is flashing orange. | No connection to the network. | | Check network cabling. |
| 11 | Opening the menu via Telnet is not possible or DTS 4148. grandmaster is not or no longer reachable via network. | | | <p>Check network settings in menu 2 Configuration → 5 Network (only possible with serial connection):</p> <ul style="list-style-type: none"> - IP-Address, Subnet mask and Gateway must be set correctly - Interface should be set to Auto - Check connection with "Ping" - When earlier the menu was not correctly exited (e.g. LAN cable removed), the menu can be blocked up to 15 minutes. |
| 12 | Drift (ppm) of quartz too high | The drift displayed in the menu <i>Status</i> → <i>Time</i> → <i>TIME INFORMATION AND STATUS</i> is bigger than stated in the data sheet. | | <ul style="list-style-type: none"> • The quartz drift is measured and corrected continuously. After initial operation, it may take up to 24 hours until optimal accuracy is reached (with GPS reception). • Very large temperature change (outside the specification) • Time correction was carried out manually. |

| | | | | |
|----|---|--|--|---|
| 13 | System software update | | | <p>The system software can be updated using FTP client software or a USB stick (s. chapter 7 Updates).</p> <p>Your MOBATIME service informs you of use and necessity of a software update. If necessary, they can provide the needed firmware file.</p> |
| 14 | Needed information to contact your MOBATIME service | | | <p>Device type, part number, production number and serial number:</p> <p>These details are given on the adhesive type label.</p> <p>If possible provide the following files for the analysis:</p> <p>All files from the directories /var/log/ and /etc/ and the file: /ram/trim.log.</p> <p>To copy this files use FTP, e.g. Windows Explorer with ftp://[IP address], see chapter 7.6.</p> <p>If the log files cannot be copied, please read out the current software version:</p> <p>The software version can be queried in the menu 1 STATUS/9 Versions of the software</p> <p>Place and date of purchase and of commissioning of the device.</p> <p>Most comprehensive possible details of the malfunction:</p> <p>Describe the problem, possible causes, measures taken, the system environment / operating mode and configuration, etc.</p> |

E Serial Telegrams

E.1 General

A serial interface can be used in two different modes:

- Send out time of telegrams automatically (periodically)
- Receive command, send time telegram (on request)

Output modes

Auto Periodic transmission of a time telegram or a command at the end of a second, minute, hour, or at a max. of 6 programmable times of the day, or definable output – periodicity.

on request Telegram is transmitted on request. The 'request' strings can be defined.

The following requests are possible:

- stop output
- output telegram at once (singly)
- output telegram at the next second (singly)
- output every second / minute / hourly / daily or switch to auto-mode.

Telegram format

Any character sequence. Fill characters ASCII or binary.

Variable display: ASCII decimal, ASCII hexadecimal or binary. Different variables are assigned to strings in text tables (e.g. month: Jan, Feb...). Syntax for the telegram string analogous to the print command in the programming language "C". See chapter E.2 Syntax of the telegram configuration file.

Telegram time

The telegram always contains the time information for the "next" second for periodical telegram output. The telegram content is valid at the send time of the first character. The send time of the telegram can be shifted with the parameter TC (e.g. the standard IF 482 telegram valid at the end of the telegram).

The transmission time of a time telegram can be calculated with the following table. According to the transmission format set, the transmission time in ms for one character is read from the table and multiplied by the number of telegram characters:

| parity stop byte | | 7 data bits | | | | 8 data bits | | | |
|---------------------|-------|-------------------------|-------|----------|-------|-------------|-------|----------|-------|
| | | none | | odd/even | | none | | odd/even | |
| | | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| | | ms per transmitted byte | | | | | | | |
| 300 | bit/s | 30.00 | 33.33 | 33.33 | 36.67 | 33.33 | 36.67 | 36.67 | 40.00 |
| 600 | bit/s | 15.00 | 16.67 | 16.67 | 18.33 | 16.67 | 18.33 | 18.33 | 20.00 |
| 1200 | bit/s | 7.50 | 8.33 | 8.33 | 9.17 | 8.33 | 9.17 | 9.17 | 10.00 |
| 2400 | bit/s | 3.75 | 4.17 | 4.17 | 4.58 | 4.17 | 4.58 | 4.58 | 5.00 |
| 4800 | bit/s | 1.88 | 2.08 | 2.08 | 2.29 | 2.08 | 2.29 | 2.29 | 2.50 |
| 9600 | bit/s | 0.94 | 1.04 | 1.04 | 1.15 | 1.04 | 1.15 | 1.15 | 1.25 |
| 19200 | bit/s | 0.47 | 0.52 | 0.52 | 0.57 | 0.52 | 0.57 | 0.57 | 0.63 |
| 38400 | bit/s | 0.23 | 0.26 | 0.26 | 0.29 | 0.26 | 0.29 | 0.29 | 0.31 |

Example:

9600 Bit/s, 8 data bits, none, 1 stop bit, the telegram has 20 characters.
Transmission time for the entire telegram:
 $20 \times 1.04 \text{ ms} = 20.8 \text{ ms}$

Name of the telegram file

The telegram file name is limited to 8 characters and its extension has to be TEL, Tel or tel, e.g. IF482Std.tel.

E.2 Syntax of the telegram configuration file

```
!TEL
;telegram type also !CTC or !MTS possible
;-- Start of the file (always on the first line) -----

;DEFINITIONS CONFIGURATION FILE FOR PRECISION MASTER CLOCK
;*****

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

;-- Output string -----
; the output string has a similar format to the print 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-dez where n=1/2/3/4 (number of decimal points, max. 3 places received)
; e.g. 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 an 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 (see !PM!)
;JAR (Year) (0..99) 1W
; or (1990..2089)
```



```

;MTG      (Day of the month)      (1..31)      1B
;JTG      (Day of the year)       (1..366)     1W
;WTG      (Day of the week)       (0..6)       1W Text table !WT!
;
;DOW      (Day of the week)       (0..7)       1B !DW!
;KAW      (Calendar week)        (1..53)      1B (according to Din ISO 8601)
;MON      (Month)                 (1..12)      1W Text table !MO!
;MNT      (Month)                 (1..12)      1B
;
;AMF      (am/pm flag)            (0/1)        1W Text table !AM!
;TMQ      (synchronization qual.) (0..255)    or A..Z) 1B (see !TQ!)
;
;SAI      (Season)                (0..2)        1W Text table !SA!
;
;AKS      (Season change          (0/1)        1W Text table !AK!
;          announcement)
;AMF      (am/pm-Flag)            (0/1)        1W Text table !AM!
;SST      (Season status)         (0..3)        1W Text table !ST!
;
;          (Bit 0 = Early warning bit)
;          (Bit 1 = Summer bit)
;SYA      (Synch. alarm)          (0/1)        1W Texttable !SY!
;
;          (0:synch ok, 1: synch alarm -> Alarm Nr.16, 17 or 19)
;CHS      (Check sum)             (0..255)     1B
;XCH      (XOR Check sum)         (0..255)     1B
;X1C      (XOR Check sum low nibble in ASCII) (0..9, A..F) 1B
;X2C      (XOR Check sum high nibble in ASCII)(0..9, A..F) 1B
;
;          Definitions:
;          CHS = (Sum of all bytes up to CHS) AND h'FF
;          XCH = XOR link of all bytes up to CHS

;e.g.     time telegram with following format (36 ASCII characters)
;
;          "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
;-----

;-- Send offset automatic telegram output -----
!SO!hh:mm:ss!
;
;Send offset from midnight 00:00:00 at periodic time
;output (!CS!a!...).
;
;hh =     hour   ('00..23')
;mm =     minute ('00..59')
;ss =     second ('00..59')
;
;e.g.     the periodic time output should start at 06:00:00
;          in each case:
;
;          !SO!06:00:00!
;
;-----

;-- Interval automatic telegram output -----
!TI!p!hh:mm:ss!
;
;Interval from send offset of the periodic time output.
;
;s =     every second
;m =     every minute
;h =     hourly
;d!hh:mm:ss! daily (max. 6 entries)
;p!hh:mm:ss! constant
;hh =     hour   ('00..23')
;mm =     minute ('00..59')
;ss =     second ('00..59')
;
;e.g.1    telegram output every second
;          !TI!s!
;
;e.g.2    telegram output daily at 13:00:00 hours
;          !TI!d!13:00:00!
;
;e.g.3:   the interval of the periodic time output should be 5 seconds:
;          !TI!p!00:00:05!
;-----

```

```

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

;-- Synchronization mode -----
!TC!mmm!
    ;Pretiming of the telegram in ms (-90..995). To synchronize the telegram
    ;end with the second start the TC has to be set according to the telegram
    ;length and the transmission format. If TC is set, it will be performed.
    ;
    ;e.g. Telegram start 120ms before the start of the second:
    ;      !TC!120!
;-----

;-- Format time quality -----
!TQ!MAX VALUE!STEP!
    ;If this entry is absent, the byte value of TMQ is
    ;outputted
    ;MAX VALUE corresponds to the byte value for A
    ;MAX VALUE-STAGE corresponds to the byte value for B
    ;MAX VALUE-2*STAGE corresponds to the byte value for C ...

    ;Example: A for values >=120..101
    ;          B for values =100..81
    ;          C for values = 80..61 ...
    ;
    ;          !TQ!120!20!
;-----

;-- Command Strings -----
!CS!n!l!"ss..."! or !CS!n!l!"ss..."!
;
; n = Number of the command ('2...9')
; n=2 Quit (no telegram output)
; n=3 Telegram output immediately(singly)
; n=4 Telegram output at the next second(singly)
; n=5 Telegram every second
; n=6 Telegram every minute
; n=7 Telegram hourly
; n=8 Telegram daily (-> entry: !TI!d!xx..)
; n=9 Output command (Request for external time source)
; n=a Telegram output periodic according to !TI!p! and !SO!
;
; l or ll = Command length in bytes ('01...20')
; l=0 Command not active
;
; ss... Command string
; (max. 20 characters - must conform with 'l' or 'll')
; Wildcards can be set with the '?' sign.
; This serves as wildcard for any character.
; Characters can also be outputted in AsciiHex format:
; e.g. \xFE d.h <FE>=(h'FE) is inserted
;      \\ d.h '\' is inserted

;e.g. Definition of a commando for immediate telegram
;      output after a request (command n=3) :
;      'time<CR>' (characters ll=05)
;      !CS!3!05!"time?"!
;      !CS!3!5!"time\x0D"!
;-----

;-- Area for check sum calculation-----
!CK!aa,bb!
    ;aa = first character considered (telegram start position: 0)
    ;bb = last character considered + 1

;Missing !CK! in this case the check sum is formed via the whole telegram up to the
;check sum position.
;-----

```

```

;=====
;General info about the text tables:
;   Name of the table:           !xx!
;   Separating character of the entries:  , (comma)
;   Maximal 16 characters pro Entry
;   Warning:           , do not forget(comma) after the last entry!
;=====

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

;-- Weekday modus 1 entry -----
!DW!0..3
           ; 0 : 0 = Sunday, 1 = Monday,... 6 = Saturday
           ; 1 : 1 = Sunday, 2 = Monday,... 7 = Saturday
           ; 2 : 6 = Sunday, 0 = Monday,... 5 = Saturday
           ; 3 : 7 = Sunday, 1 = Monday,... 6 = 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,Som,UTC,
;-----

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

;-- Text table season status -----
;-- (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,
           ;1.Entry  AM/PM flag=0 d.h. 00:00..11:59
           ;2.Entry  AM/PM flag=1 d.h. 12:00..23:59
;-----

;-- Text table synchronization alarm 2 entries -----
!SY!ok,alarm,
           ;1.Entry  synchronization ok
           ;2.Entry  synchronization s-failure
;-----

;-- File End ---
!EE!

;-- Name of the file (optional) ----
@nnn...
           ;nnn... File name, maximum 12 characters and a final
           ;       <CR>. The name can also be omitted, in this
           ;       case CTC 'NONAMEx.TEL'appears in the directory.
           ;
           ;IMPORTANT:
           ;       1) The name must stand AFTER the file end!EE!.
           ;
           ;       2) If a file with the same name is loaded on to the
           ;       CTC, such as one stored on the CTC, the stored one
           ;       will be OVERWRITTEN.
           ;
           ;
           ;e.g.      !EE!
           ;          @TELEDEF.TEL
           ;          ;last line
;-----

;last line (guarantees a <CR> after the file name)

```

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G Parameters

| Group | Parameter | Acc | Default | Unit | SNMP |
|-------------------------|--|-----|-------------------------------------|---------|---|
| Network | 2 * Network | | | | dts4148Network (generally) dts4148Network1 (LAN 1) dts4148Network2 (LAN 2) |
| | DHCP on/off | RW | LAN 1: on LAN 2: off | | dts4148DHCPMode |
| | IP address | RW | LAN 1: dhcp LAN 2: 192.168.1.5 | | dts4148IPAddr |
| | Network mask | RW | LAN 1: dhcp LAN 2: 255.255.255.0 | | dts4148IPMask |
| | Gateway IP | RW | LAN 1: dhcp LAN 2: 192.168.1.1 | | dts4148IPGateway |
| | Name server IP | RW | LAN 1: dhcp LAN 2: | | dts4148IPNameserver |
| | Autoconf V6 | RW | off | | dts4148IPv6AutoConf |
| | DHCPv6 | RW | off | | dts4148IPv6DHCPMode |
| | IP address V6 1 | RW | 0::0 | | dts4148IPv6Addr1 |
| | IP prefix 1 | RW | 64 | | dts4148IPv6Prefix1 |
| | Gateway IPV6 1 | RW | 0::0 | | dts4148IPv6Gateway1 |
| | IP address V6 2 | RW | 0::0 | | dts4148IPv6Addr2 |
| | IP prefix 2 | RW | 64 | | dts4148IPv6Prefix2 |
| | Gateway IPV6 2 | RW | 0::0 | | dts4148IPv6Gateway2 |
| | Name server IPV6 | RW | 0::0 | | dts4148IPv6Nameserver |
| | Link 10/100Mbit | RW | auto | | dts4148EthernetLinkMode |
| | Device name / Host name | RW | DTS4148 | | dts4148Hostname, dts4148NetInfoHostname |
| | Domain | RW | | | dts4148Domain |
| Network Services | | | | | dts4148NetServices |
| | Telnet | RW | on | | dts4148TelnetMode |
| | SSH | RW | on | | dts4148SSHMode |
| | FTP | RW | on | | dts4148FTPMode |
| General | | | | | dts4148System |
| | Display language | RW | engl. | | dts4148Language |
| | Password user <i>dts</i> | RW | dts | | dts4148Password |
| | Time zone operation and alarm messages | RW | MEZ | | dts4148Timezone |
| | Redundant power supply | RW | off | | dts4148PowerSupply |
| Lines | | | | | dts4148OutputLines |
| DCF out | | | | | dts4148OutMainDCF |
| | Mode | RW | on | | dts4148OutMainDCFMode |
| | Time zone | RW | UTC | | dts4148OutMainDCFTimezone |
| SINEC | | | | | dts4148OutLineSinec |
| | Mode | RW | off | | dts4148OutLineSINECMode |
| | Timezone | RW | UTC | | dts4148OutLineSINECTimezone |
| | Interface | RW | none | | dts4148OutLineSINECInterface |
| NTP slave clocks | | | | | dts4148OutLineTZServer |
| | Mode | RW | off | | dts4148OutLineTZServerMode |
| | Multicast IP | RW | | | dts4148OutLineTZServerMCastAddr |
| | Multicast Port | RW | 65534 | | dts4148OutLineTZServerMCastPort |
| | Poll interval NTP | RW | 0 → 1sec | 2^x sec | dts4148OutLineTZServerNTPInterval |
| | Multicast TTL | RW | 1 | | dts4148OutLineTZServerTTL |
| | Table interval | RW | 60 | sec | dts4148OutLineTZServerTableInterval |
| | Entry interval | RW | 1 | sec | dts4148OutLineTZServerEntryInterval |
| | Table time zone entries | RW | -1 | | dts4148OutLineTZServerTable (TZ entry number) |
| DCF / Pulse out | | | | | dts4148OutLineDCFPulseFREQ |
| | Mode (off, DCF, pulse) | RW | 0 | | dts4148OutLineDCFMode |
| | Time zone | RW | UTC | | dts4148OutLineDCFTimezone |
| | Pulse interval (every second, minute...) | RW | sek | | dts4148OutLineDCFPulseType |
| | Pulse time | RW | 100 | ms | dts4148OutLineDCFPulseTime |
| | Pulse period | RW | 1 | sec | dts4148OutLineDCFPulsePeriod |
| | Output correction | RW | 0 | ms | dts4148OutLineDCFPulseCorrection |
| | Frequency | RW | 1000 | Hz | dts4148OutLineDCFFrequency |


| | | | | | |
|----------------------------|---|----|----------------------------------|-----|----------------------------------|
| IRIG / DCF-FSK-Out | | | | | dts4148OutLineIRIG |
| | Mode (off, IRIG) | RW | 0 | | dts4148OutLineIRIGIRIGMode |
| | Time zone | RW | UTC | | dts4148OutLineIRIGTimezone |
| | Level | RW | 2000 | mV | dts4148OutLineIRIGOutputLevel |
| | Level bar | RW | 200 | mV | dts4148OutLineIRIGAlarmLevel |
| | | | | | |
| Serial out | | | | | dts4148OutLineSerial |
| | Mode (off, on) | RW | off | | dts4148OutLineSerialMode |
| | Time zone | RW | UTC | | dts4148OutLineSerialTimezone |
| | Telegram file | RW | MC482STD.TEL | | dts4148OutLineSerialTeleFile |
| | Interface: | RW | h'45 | | dts4148OutLineSerialComParam |
| | Baud rate | RW | 9600 | | |
| | Databit | RW | 7 | | |
| | Stopbit | RW | 1 | | |
| | Parity | RW | even | | |
| | Com mode | RW | out RS232 | | dts4148OutLineSerialComMode |
| | | | | | |
| E-mail | | | | | dts4148AlarmMailConfig |
| | Mode | RW | Off | | dts4148MailMode |
| | IP addr. mail server | RW | | | dts4148MailServerIPAddress |
| | Port mail server | RW | 25 | | dts4148MailServerPort |
| | Receiver address 1 | RW | | | dts4148MailAddrDestination1 |
| | Receiver address 2 | RW | | | dts4148MailAddrDestination2 |
| | Sender address ("login to mail server") | RW | | | dts4148MailAddrFrom |
| | Reply address | RW | | | dts4148MailAddrReply |
| | Error mask | RW | All set: FF FF FF FF FF FF FF FF | | dts4148MailAlarmMask |
| | Auth. Mode | RW | off | | dts4148MailAuthMode |
| | User name | RW | | | dts4148MailUser |
| | Password | RW | | | dts4148MailPassword |
| | | | | | |
| SNMP / - Traps | | | | | dts4148SnmConfig |
| | Trap mode | RW | off | | dts4148SnmTrapMode |
| | Trap community | RW | trapmobatime | | dts4148SnmTrapCommunity |
| | IP addr. target computer 1 | RW | | | dts4148SnmTrapListenerIPAddress1 |
| | Port target computer 1 | RW | 162 | | dts4148SnmTrapListenerPort1 |
| | Trap Version 1 | RW | V2c | | dts4148SnmTrapVersion1 |
| | IP addr. target computer 2 | RW | | | dts4148SnmTrapListenerIPAddress2 |
| | Port target computer 2 | RW | 162 | | dts4148SnmTrapListenerPort2 |
| | Trap version 2 | RW | V2c | | dts4148SnmTrapVersion2 |
| | TRAP error mask | RW | All set: FF FF FF FF FF FF FF FF | | dts4148SnmTrapAlarmMask |
| | TO alive message | RW | off | sec | dts4148SnmTrapAliveMsgInterval |
| | | | | | |
| | SNMP mode | RW | on | | dts4148SnmMode |
| | SNMP error mask | RW | All set: FF FF FF FF FF FF FF FF | | dts4148SnmAlarmMask |
| | Location | RW | | | dts4148SnmLocation |
| | Contact | RW | | | dts4148SnmContact |
| | rocommunity | RW | romobatime | | dts4148SnmROCommunity |
| | rwcommunity | RW | rwmobatime | | dts4148SnmRWCommunity |
| | 2*Access config: | | | | |
| | Password | RW | | | dts4148SnmV3UserPasswordx |
| | UserSecLevel | RW | 1+2: auth | | dts4148SnmV3UserLevelx |
| | UserRead | RW | 1+2: all | | dts4148SnmV3UserReadx |
| | UserWrite | RW | 1=dts1 2=dts2 | | dts4148SnmV3UserWritex |
| | View1 | RW | 1+2: .1.3.6.1.4.1.8072 | | dts4148SnmV3Viewx1 |
| | View2 | RW | 1+2: .1.3.6.1.4.1.2021 | | dts4148SnmV3Viewx2 |
| | View3 | RW | 1+2: .1.3.6.1.4.1.13842.4 | | dts4148SnmV3Viewx3 |
| | View4 | RW | 1+2: .2 | | dts4148SnmV3Viewx4 |
| | View5 | RW | 1+2: .2 | | dts4148SnmV3Viewx5 |
| | View6 | RW | 1+2: .2 | | dts4148SnmV3Viewx6 |
| | | | | | |
| Alarm input/output: | | | | | dts4148RelayAlarmConfig |
| | Error mask relay | RW | All set: FF FF FF FF FF FF FF FF | | dts4148RelayAlarmMask |
| | Mode alarm input | RW | | | dts4148AlarmInput |
| | | | | | |
| NTP / time handling | | | | | dts4148TimeHandling |
| Time source: | | | | | dts4148TimeSource |

| | | | | | |
|----------------------|--|----|--------------|--------------|--------------------------------------|
| | Time source | RW | 2 (GPS, DCF) | | dts4148TSType |
| | Time zone | RW | 0 (UTC) | | |
| | Config. stratum | RW | 0 | Stratum | dts4148TSStratumMode |
| | Max. Time offset to set system time OK | RW | 50ms | us | dts4148TSMaxOffsetForTimeValid |
| | TO time source for error failure synch (TO) | RW | 60 | min | dts4148TSTimeout |
| | Max. stratum for error failure synch (Stratum) | RW | 12 | Stratum | dts4148TSStratumErrorLimit |
| | TO time source stratum | RW | 24 | h | dts4148TSStratumTimeout |
| | Offset change to decrement stratum by 1 | RW | 50 | ms / stratum | dts4148TSOffsetPerStratum |
| | Source correction (DCF only) | RW | 0 | ms | dts4148TSDCFAdjustment |
| Catch-up: | | | | | |
| | Catch-up mode | RW | 1 (set) | | dts4148TSAdjustmentMode |
| | Max. catch-up speed | RW | 100ppm | ns / sec | dts4148TSMMaxAdjustmentSpeed |
| | Core/Quartz type | RW | 1 | | dts4148TSQuartzType |
| | Synch only offset | RW | 0 (off) | ms | dts4148TSOffsetSynchOnly |
| | RTC Mode | RW | 0 (off) | | dts4148TSRTCMode |
| | Leap second mode | RW | 0 (off) | | dts4148TSLeapSecMode |
| | Leap second date next correction | RW | | | dts4148TSLeapSecDate |
| | | | | | |
| Redundant operation: | | | | | dts4148RedundantOp |
| | Mode redundant operation | RW | off | | dts4148RedOpMode |
| | Set manual master | RW | | | |
| | Max. stratum master in red. operation | RW | 16 | Stratum | dts4148RedOpSwitchOverStratum |
| | Max. time offset master to time source slave | RW | 100ms | us | dts4148RedOpMaxOffsetSlaveTimeSource |
| | IP addr. 2. time server | RW | | | dts4148RedOp2ndDTSIPAddress |
| | Port DTS LAN link communication | RW | 14338 | | dts4148RedOp2ndDTSIPPort |
| | | | | | |
| NTP: | | | | | dts4148TimeNTPServer |
| | 4 * NTP source | | | | dts4148NTPSourceTable (1..4) |
| | Addresses | RW | | | dts4148NTPSourceAddr |
| | Minpoll | RW | | 2^x sec | dts4148NTPSourceMinPoll |
| | Maxpoll | RW | | 2^x sec | dts4148NTPSourceMaxPoll |
| | Mode | RW | server | | dts4148NTPSourceMode |
| | Prefer (-red time source) | RW | normal | | dts4148NTPSourcePrefer |
| | Key | RW | off | | dts4148NTPSourceKey |
| | 2 * Broadcast: | | | | |
| | Broadcast address | RW | | | dts4148NTPBrodacstAddr |
| | Interval | RW | 2 → 4s | 2^x sec | dts4148NTPBroadcastInterval |
| | Multicast TTL | RW | 1 | | dts4148NTPBroadcastTTL |
| | Key | RW | off | | dts4148NTPBroadcastKey |
| | Trusted Keys | RW | | | dts4148NTPKeyTrusted |
| | Control Key | RW | 0 | | dts4148NTPKeyControl |
| | Request Key | RW | 0 | | dts4148NTPKeyRequest |
| | Autokey Password | RW | | | dts4148NTPAutokeyPassword |
| | | | | | dts4148NTPKeyGeneratorCmd |
| | | | | | dts4148NTPKeyFileCmd |
| | | | | | |
| PTP: | | | | | dts4148TimePTP |
| | Mode | RW | off | | dts4148PTPMode |
| | Interface | RW | LAN1 | | dts4148PTPInterface |
| | Transport Protocol | RW | IPv4 | | dts4148PTPTranspProto |
| | IPv6 Scope | RW | h'E | | dts4148PTPIPv6Scope |
| | Leap second offset | RW | | | dts4148PTPLeapOffset |
| | Priority 1 | RW | 128 | | dts4148PTPPriority1 |
| | Priority 2 | RW | 128 | | dts4148PTPPriority2 |
| | Domain | RW | 0 | | dts4148PTPDomain |
| | Announce interval | RW | 1 | 2^x sec | dts4148PTPAnnounceInterval |
| | Sync interval | RW | 0 | 2^x sec | dts4148PTPSyncInterval |
| | Announce TO | RW | 3 | 2^x sec | dts4148PTPAnnounceTO |
| | Delay mechanism | RW | E2E | | dts4148PTPDelayMechanism |
| | | | | | |
| Manual Time set | | | | | dts4148TimeManualSet |
| | Time | W | | | dts4148ManualTimeSetUTC |
| | Diff | W | | ms | dts4148ManualTimeSetDiff |
| | | | | | |

| | | | | | |
|-----------------------|-------------------------|---|--|-----|---|
| Product Info | | | | | dts4148ProdInfo |
| | Prod. number | R | | | dts4148ProdInfoProdNo |
| | Article number | R | | | dts4148ProdInfoArticleNo |
| | HW revision | R | | | dts4148ProdInfoHWRevision |
| | HW code | R | | | dts4148ProdInfoHWCode |
| | HW name | R | | | dts4148ProdInfoHWName |
| | Firmware version | R | | | dts4148ProdInfoFirmwareVer |
| System Info | | | | | |
| | DTS state | R | | | dts4148SysStatus |
| | DTS alarms | R | | | dts4148SysAlarms |
| | Alarm relay state | R | | | |
| | SNMP alarms (masked) | R | | | |
| Trap Info | | | | | |
| | Trap state | R | | | |
| | Trap alarm number | R | | | |
| | Trap error state | R | | | |
| | Trap time | R | | | |
| | Trap message | R | | | |
| Time Info | | | | | dts4148SystemTimeInfo |
| | DTS stratum | R | | | dts4148TInfoStratum, dts4148SysStratum |
| | Last drift | R | | | dts4148TInfoLastDrift, dts4148SysLastDrift |
| | Last quartz corr | R | | | dts4148TInfoLastQCCorr |
| | Act. corr. voltage | R | | | dts4148VoltageQuartzAdjust |
| | Current offset sec | R | | sec | dts4148DCFTInfoOffsetSec |
| | Current offset us | R | | us | dts4148DCFTInfoOffsetUsec, dts4148SysOffset |
| | Time of last time info | R | | | dts4148TInfoLastTime |
| | Jitter | R | | | dts4148TInfoSourceJitter |
| | Source quality | R | | | dts4148SysTimeReceptionQuality |
| | Offset of local source | R | | | |
| | Sample type | R | | | |
| | Source Type | R | | | dts4148SysTimeSource |
| | Last DCF time | R | | | dts4148DCFTInfoLastTime |
| | Last Link time | R | | | dts4148DCFTInfoLastLinkTime |
| | DCF pulse counter | R | | | dts4148DCFTInfoSecCount |
| | Link pulse counter | R | | | dts4148DCFTInfoLinkSecCount |
| | Red. State | R | | | dts4148SysMasterMode |
| | NTP source | R | | | dts4148NTPTInfoCurrentSource |
| | NTP offset | R | | | dts4148NTPTInfoSystemOffset |
| | NTP Jitter | R | | | dts4148NTPTInfoSourceJitter |
| | NTP Stratum | R | | | dts4148NTPTInfoStratum |
| | NTP Frequency | R | | | dts4148NTPTInfoFrequency |
| Versions | | | | | dts4148SystemVersions |
| | Version DTS application | R | | | dts4148verApplication |
| | Version DTS module | R | | | dts4148verTimeDriver |
| | Version FPGA module | R | | | dts4148verFPGADriver |
| | Version FPGA | R | | | dts4148verFPGA |
| | Version NTP | R | | | dts4148verNTP |
| | Version kernel | R | | | dts4148verLinux |
| | Version busybox (CLI) | R | | | dts4148verCLIShell |
| | Version rootfs | R | | | dts4148verRootFS |
| | Version language | R | | | dts4148verLangResource |
| | Version TZ table | R | | | dts4148verTimezoneTable |
| | Version snmp master | R | | | dts4148verSNMPMasterAgent |
| | Version snmp common | R | | | dts4148verSNMPSubAgent |
| Power Info | | | | | dts4148SystemPower |
| | Voltage 1 | R | | V | |
| | Voltage 1 | R | | mv | dts4148SupplyVoltage1 |
| | Voltage 2 | R | | V | |
| | Voltage 2 | R | | mv | dts4148SupplyVoltage2 |
| | Current 1 | R | | A | |
| | Current 1 | R | | mA | dts4148SupplyCurrent1 |
| | Current 2 | R | | A | |
| | Current 2 | R | | mA | dts4148SupplyCurrent2 |
| 2*Network Info | | | | | dts4148NetworkInfo |
| | IP v4 | R | | | dts4148NetInfoIPAddr |
| | GW v4 | R | | | dts4148NetInfoIPGateway |
| | Subnet v4 | R | | | dts4148NetInfoIPMask |
| | DNS v4 | R | | | dts4148NetInfoIPNameserver |
| | Hostname | R | | | |
| | Domain | R | | | dts4148NetInfoDomain |
| | DHCP | R | | | dts4148NetInfoDHCPMode |
| | Link | R | | | dts4148NetInfoEthernetLinkMode |

| | | | | | |
|-----------------|------------------------|---|--|--|---------------------------------|
| | IP v6 link local | R | | | dts4148NetInfoIPv6AddrLocal |
| | IP1 v6 | R | | | dts4148NetInfoIPv6Addr1 |
| | IP2 v6 | R | | | dts4148NetInfoIPv6Addr2 |
| | GW v6 | R | | | dts4148NetInfoIPv6Gateway |
| Commands | | | | | dts4148SystemMaintenance |
| | Update cmd. | W | | | dts4148SysUpdateCmd |
| | Backup cmd. | W | | | dts4148SysBackupCmd |
| | Restore cmd | W | | | dts4148SysRestoreCmd |
| | Restore default cmd | W | | | dts4148SysDefaultCmd |
| | Restart cmd | W | | | dts4148SysRestartCmd |
| | Copy files cmd | W | | | dts4148SysCopyFiles |
| | Set all config changed | W | | | dts4148SysAllChanged |

H Technical data

| | | |
|---|--|--|
| Dimensions | 19" Rack, 1HU x 28PU (H x W x D [mm]) = 483 x 44 x 125 | |
| Weight | approx. 1.8 kg | |
| Ambient temperature | 0 to 60°C, 10-90% relative humidity, without condensation | |
| Operation | Telnet / SSH / MOBA-NMS (via LAN). In addition, operation is also possible with SNMP. | |
| Accuracy | GPS (DCF input) to NTP server: GPS (DCF input) to PTP server: PTP master to PTP slave GPS (DCF input) to DCF output: IRIG input to DCF output: NTP to internal time: | typical < +/- 100 µs typisch < +/- 10 µs typisch < +/- 100 ns typical < +/- 10 µs typical < +/- 50 µs typical < +/- 100 µs |
|  | Notice: | NTP reception (DTS 4148 as client or as server to external clients) can be influenced by the network traffic load and network devices (Hub, Switch, Router, Firewall...). |
| | | If many clients request simultaneously, the typical accuracy may not be reached. |
| Time keeping (internal) | Synchronized with GPS: | +/-10 µs to UTC |
| Holdover (free run): | After at least 12 hours synchronization from the time source: | |
| DTS 4148 -> OCXO: | at 20°C +/- 5°C: | < +/- 1 ms / day (< 0.01ppm) * |
| Generally: | During power break (based on internal RTC): at 20°C +/- 5°C: < 5 ppm, but with jitter of +/- 15 ms * After a power failure the RTC time is available during at least 5 days (RTC buffered through a SuperCAP). | |
| | *measured over 24 h | |
| Redundant operation | - Master to slave (optical DTS link): | typical < +/- 1 µs |
| Time server | NTP V4 SNTP PTP TIME DAYTIME | (fully V3 compatible), RFC 1305, RFC 5905 (Port 123) (UDP), RFC 2030 (Port 123) (UDP), IEEE 1588-2008 (V2) (Ports 319 and 320) (TCP/UDP), RFC 868 (Port 37) (TCP/UDP), RFC 867 (Port 13) Max. number of NTP and SNTP client requests: > 1500 requests / sec. (e.g. client request every 60 sec. ➔ 90000 clients) |
| NTP mode | Server, Peer, Broadcast, Multicast | |
| NTP slave clock lines: | 1 line with up to 15 different time zone entries. Communication through multicast: -RFC 3376: Internet Group Management Protocol, Version 3 -RFC 1112: Host extensions for IP multicasting -RFC 4601: Protocol Independent Multicast - Sparse Mode (PIM-SM) -RFC 3973: Protocol Independent Multicast - Dense Mode (PIM-DM) | |
| Time zones (see App. B) | Up to 80 predefined, 20 programmable entries (MOBA-NMS) | |
| PTP | -Standard: IEEE 1588-2008 (V2, no V1) -P2P, E2E -IPv4, IPv6, Layer2, UDP, multicast according to definition IEEE 1588 -Master only (active or passive) -„2 step“ procedure only: synch. message with follow-up message -availability of management messages limited: requests only | |

| | | | |
|---|--|----------------------------|----------------------------------|
| | -profile: IEEE 1588 annex J, Default and Utility profile -no specific PTP SNMP MIB | | |
| 2 Network interfaces | 10BaseT / 100BaseTX (IEEE 802.3) Data transmission rate: Auto-negotiation / manual Connection: RJ-45 Only shielded cables permitted. | | |
| IP Configuration | DHCP, Static IP, IPv4, IPv6 | | |
| Network services | NTP | UDP, Port 123 | see timeserver |
| | SNTP | UDP, Port 123 | see timeserver |
| | PTP | UDP, Port 319 and 320 | see timeserver |
| | TIME | TCP/UDP, Port 37 | see timeserver |
| | DAYTIME | TCP/UDP, Port 13 | see timeserver |
| | Telnet | TCP, Port 23 | operation |
| | SSH | TCP, Port 22 | operation |
| | SCP | über SSH | update |
| | SFTP | über SSH | update |
| | FTP | TCP, Port 21 | update |
| | SNMP | UDP, Port 161 | operation |
| | | UDP, Port selectable (162) | alarm notification, see SNMP |
| | SMTP | TCP, Port selectable (25) | alarm mail see E-Mail |
| | DHCP | UDP, Port 68 | dyn. address allocation (client) |
| | DNS | TCP/UDP, Port 53 | address resolution (client) |
| | DHCPv6 | only IPV6 | |
| | ECHO | ICMP | “Ping“ |
| SNMP | V1, V2c, V3 with MD5 for authentication and DES for encryption (privacy). | | |
| E-mail | Alarm reporting via SMTP. Authentication at the mail server: <ul style="list-style-type: none">- with sender address- with username/password SMTP-Auth with LOGIN, PLAIN (RFC 4954) or CRAM-MD5 (RFC 2195) no “POP before SMTP“ possible | | |
| DCF input | DCF receiver or DCF from GPS, active current loop Time zone: selectable Nominal 28 VDC, max. 32mA, response threshold 8mA | | |
| AFNOR-A/C, IRIG-B12x input: Upp: 100mV – 5500mV | | | |
| Time signal outputs | NTP V4 for slave clocks (unicast and multicast) 1 x IRIG-B output (analog and digital) 1 x DCF, programmable impulse / frequency output over RS 422 and opto coupler (current loop passive) 1 x DCF current loop interface passive 1 x Script files configurable time telegrams on RS 232, RS 422 (only send) and RS 485 | | |
| DCF output (1x) | DCF time code, time zone selectable Max. time deviation with GPS source: +/- 10 µs, jitter < 10 µs DCF time code passive current interface: Vmax = 30 VDC, I _{on} = 10..15 am, I _{off} < 0.1 mA @20VDC | | |
| DCF impulse / frequency output (1x) | 1 line for technical impulses: time zone selectable, output signal correction possible (DCF and impulse) Max. time deviation with GPS source: +/- 10 µs, Jitter < 10 µs Mode: <ul style="list-style-type: none">- DCF time code- impulses: sec., min., h., or user-defined- frequency: 1Hz.. 5MHz (no square signal is possible above 2MHz) | | |

| | |
|--------------------------------------|---|
| | 2 different electrical outputs with the same signal: - passive current loop output, opto coupler: $I_{\max.}=10\text{ mA}$ / $U_{\max.}=50\text{ VDC}$ - RS422 |
| IRIG-B output (1x) | <p>1 high precision IRIG line, available as analog and digital signals. Max. time deviation to GPS (with GPS source): DC level: $< \pm 10\text{ }\mu\text{s}$ Modulated: $< \pm 200\text{ }\mu\text{s}$</p> <p>Accuracy of the signal according to standard: DC level pulse rise time between the 10 and 90% amplitude points: $\leq 1\text{ }\mu\text{s}$ Jitter modulated at carrier frequency: $\leq 1\%$ DC level jitter pulse-to-pulse: $\leq 200\text{ ns}$</p> <p>Line mode: IRIG-B122, IRIG-B Std 12h (Bx22), IRIG-B123, IRIG-B126, IRIG-B DIEM, AFNOR A, AFNOR C, DCF-FSK IRIG-B002, IRIG-B003, IRIG-B006</p> <p>Output voltage level ($R_L=50\text{ Ohm}$): $0.1 - 5.5\text{ Vpp}$ (configurable) SNR_{dB}: typical $\geq 40\text{ dB}$ Impedance: $R_i < 50\text{ }\Omega$ Opto coupler outputs: $I_{\max.}=10\text{ mA}$ / $U_{\max.}=50\text{ VDC}$ RS422 outputs: $U = \text{typical } 3.3\text{ VDC}$</p> |
| Serial interface (1x) (back side) | <p>1 line for telegram output RS232, RS422 or RS485 Max. time deviation to internal time: $\pm 10\text{ ms}$, Jitter $< 10\text{ ms}$ 300-38400 Bauds, 7 or 8 Data bits, Parity: no, even, odd, Stop bit: 1 or 2, no flow control) The description of the telegram function is provided in Appendix E.</p> |
| SINEC | SINEC resp. SIMATIC compatible (PCS7 / S5) telegram over Ethernet according to Siemens definition |
| USB plug | USB host for USB stick |
| Alarm contact | <p>Opening relay contact (Alarm active → contact open). Breaking capacity: $\text{max. } 30\text{ W (DC) or } 60\text{ VA (AC)}$ $\text{max. } 60\text{ VDC or } 1\text{ A / } 30\text{ VAC or } 1\text{ A}$</p> |
| Alarm reporting / Error reporting | <p>Alarm contact see Alarm contact E-mail see E-mail SNMP notification see SNMP trap Display see Display Alarm-LED -</p> |
| Alarm input | 18-36 VDC, max. 6mA, for external closing contact Function configurable |
| DTS Link | <p>Plug-in position for mini GBIC module (GigaBit Interface Converter) 1000Mbps, 3.3V (with LC connector) e.g. D-Link DEM-311GT, SX 850 nm, 1.25 Gbps/MM/3.3 V Maximal cable length depends on type of cable: - Multimode fiber with a diameter of $50\text{ }\mu\text{m}$: $\text{max. } 550\text{ m}$ - Multimode fiber with a diameter of $62.5\text{ }\mu\text{m}$: $\text{max. } 275\text{ m}$ With LX standard, longer cables can be achieved.</p> |
| Display | 2 lines with up to 16 characters for the display of status information. |
| DC power supply | 24 VDC $+20\%$ / -10% / max. 15 W |
| Power supply output | DC in voltage -2 V , max. 400 mA |

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HEADQUARTERS / PRODUCTION

MOSER-BAER AG
Spitalstrasse 7, CH-3454 Sumiswald
Tel. +41 34 432 46 46 / Fax +41 34 432 46 99
moserbaer@mobatime.com / www.mobatime.com

SALES WORLDWIDE

MOSER-BAER SA EXPORT DIVISION
19 ch. du Champ-des-Filles, CH-1228 Plan-les-Ouates
Tel. +41 22 884 96 11 / Fax + 41 22 884 96 90
export@mobatime.com / www.mobatime.com

SALES SWITZERLAND

MOBATIME AG
Stettbachstrasse 5, CH-8600 Dübendorf
Tel. +41 44 802 75 75 / Fax +41 44 802 75 65
info-d@mobatime.ch / www.mobatime.ch

MOBATIME SA
En Budron H 20, CH-1052 Le Mont-sur-Lausanne
Tél. +41 21 654 33 50 / Fax +41 21 654 33 69
info-f@mobatime.ch / www.mobatime.ch

SALES GERMANY, AUSTRIA

BÜRK MOBATIME GmbH
Postfach 3760, D-78026 VS-Schwenningen
Steinkirchring 46, D-78056 VS-Schwenningen
Tel. +49 7720 8535 0 / Fax +49 7720 8535 11
buerk@buerk-mobatime.de / www.buerk-mobatime.de

