

MOUNTING AND INSTRUCTION MANUAL

DTS 4020.timebridge

Network – Time Bridge



Publication Note:

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Certification of the Producer

STANDARDS

The DTS 4020.timebridge was developed and produced in accordance with the EU Guidelines:

2014 / 30 / EU EMC

2014 / 35 / EU LVD



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.
3. We do not answer for direct or indirect damages, which could occur, when using this Manual.
4. Please read the instructions carefully and only start setting-up the product, after you have correctly understood all the information for the installation and operation.
5. 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 4020.timebridge** serves as an interface between the IEEE1588 protocol (PTP) supplied across a packet network to traditional serial Time-of-day (ToD), 1PPS, 10MHz and IRIG B signals.

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

The device is designed for 19" racks or DIN rail. Operate the device only in installed condition and with all connectors plugged in.



Caution!

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.



Caution!

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.



Caution!

1.6 Please observe the electromagnetic compatibility!

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



Caution!

1.7 Network security

- The default password should be changed during commissioning.
- It is not possible to reset the password to factory defaults. The password can be set either with MOBA-NMS or SNMP. If you have no access SNMP access. The device must be sent back to the factory.
- Use encrypted services (SSH, SCP, SFTP)
- Disable unused/insecure services (FTP, Telnet)



More information is available in the DTS Security Guidelines document TE-801252

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 4020.timebridge
- Connector set
 - 1-2¹⁾ piece(s) plug 3-pole black for power supply
 - 1 piece spring terminal 2-pole orange
- 1 piece mounting tools with spring terminals

¹⁾ Depending on power supply option, see chapter 10 Redundant Power supply

3.2 Technical Data

See Appendix "H Technical data".

3.3 Device Description in this Manual

This instruction manual is for the **DTS 4020.timebridge**.

3.4 Introduction

The **DTS 4020.timebridge** serves as an interface between the IEEE1588 protocol (PTP) supplied across a packet network to traditional serial Time-of-day (ToD), 1PPS, 10MHz and IRIG B signals.

It is a PTP Slave according to IEEE 1588-2008 for the synchronization.

It is equipped with up to 2 network ports (IPv4/IPv6). LAN1 is for configuration, LAN2 for synchronization and time distribution.

NTP clients can use the DTS 4020 as a reference. NTP is available on both LAN ports and unicast or multicast is supported.

In addition, the DTS 4020 provides one output for Time-of-Day, two configurable digital frequency outputs and one analogue 10MHz output.

Instead of a frequency, IRIG/AFNOR is available on the analogue and digital outputs.

For alerting the DTS 4020 can send both e-mails and SNMP traps. It has also an alarm relay contact.

Using MOBA-NMS and SNMP, the DTS 4020 can be fully operated and its configuration and system status can be requested.

3.5 Device types

For future use

3.6 DTS Distributed Time System

DTS (Distributed Time System) is a system developed by Moser-Baer AG to distribute time information to decentralized master clocks, slave clock lines and time servers or send synchronization signals to any other equipment. 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.

Overview of MOBA-NMS functions for DTS devices and network clocks:

- automatic device scan over multicast or IP range
- device management using user-defined device groups
- 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

More information is available in MOBA-NMS User-Manual BE-801225.

4 LED displays front side

Description	Color	Status	Description
Sync	Green	On	DTS 4020 is synchronized to the time source
	Orange	On	<i>Future option</i>
		Off	No synchronization to the time source. No output signals available.
Alarm	Red	On	The alarm relay signalizes an alarm
	Orange	On	<i>Future option</i>
		Off	No active alarms
Power1	Green	On	Mains or DC power supply is OK
	Orange	On	<i>Future option</i>
		Off	No power supply
Power2	Green	On	Mains or DC power supply is OK
	Orange	On	<i>Future option</i>
		Off	No power supply
LAN RJ45 control lamps:			
Left	Green	On	Link 100 MBit & 1 GBit
		Off	No Link
Right	Yellow	Blinking	Network activity
		Off	No activity

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 Chassis Ground

In order to guarantee correct operation of the DTS 4020 the chassis must be connected to an earth ground. The earth ground connection is specified in Appendix “A Connection diagrams”.

5.3 Boot procedure of the DTS 4020.timebridge

The normal booting time of the DTS 4020 is approx. 180 sec. with pre-set IP or with DHCP. The booting procedure of the operating system is displayed on the serial console.

5.4 Initial configuration

Per default, all LAN interface for configuration are preconfigured with DHCP on.
If no DHCP server is available in the network, initial configuration has to be done via serial terminal.



Important: The “Micro USB” provides an USB-To-Serial interface
Depending on your operating system you need to install the VCP-Driver
(Virtual-Com-Port-Driver) from <https://www.ftdichip.com/Drivers/VCP.htm>


5.5 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 in the Customer Area → Login required.

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:



```
DTS4020 login:
```

To start the menu, you must be logged in as user *dtls*. The standard password is *dtls*. (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 open connection via Telnet or SSH is interrupted.

Use e.g. Freeware software Putty as a serial terminal.

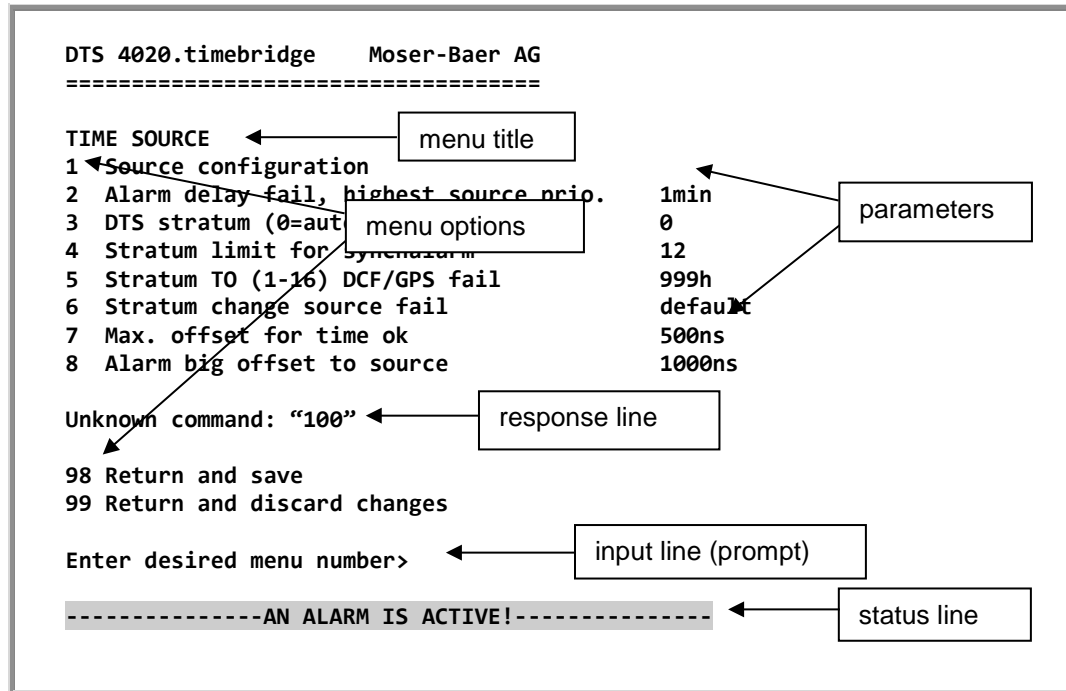
6.1.1 Telnet

Windows:	e.g. with Putty Username: dtls Password: dtls
Linux:	Start console and enter “ <i>telnet [IP-address]</i> ”

6.1.2 SSH

Windows :	e.g. with Putty Username: dtls Password: dtls
Linux:	Start console and enter “ <i>ssh dtls@[IP address]</i> ”

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 4020, 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 4020.timebridge:

The screenshot displays the MOBA-NMS web interface for a DTS 4020 device. The top header shows the device name 'DTS 4020 (Unknown)' and its status 'OK'. A top navigation bar includes icons for various functions like power supply, alarm, digital, analog, and network. The main content area is divided into several sections: 'List of active alarms' (empty), 'Network' (showing LAN 1 and LAN 2 settings), 'NTP state' (with a link to 'Show NTP status details...'), 'Time, time state' (showing internal time, stratum, and source), 'Power' (showing supply mode and voltage), and 'Leap second' (showing status and source). A 'Refresh' button is located at the bottom right of the main content area. The bottom navigation bar contains tabs for 'Overview', 'Network Overview', 'Outputs', 'Time handling', 'Alarms', 'PTP configurations', 'VLAN configurations', 'Network', 'SNMP', 'General, Services', and 'Services'.

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

```
DTS 4020.timebridge Moser-Baer AG
=====

MAIN SELECTION
1 Status
   (Actual alarms and history, timesource state, version)
2 Configuration
   (Configuration of the outputs, 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 4020
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:

```
DTS 4020.timebridge Moser-Baer AG
=====

CLOCK STATE                                     Page 1/2
1 Alarm state
2 Alarm history
3 Time state
4 Time source
5 Time source info
6 Info network config.
7 Internal state
8 Product information
9 Versions of the software

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

Path: 1 Status

The sub-menus show various information's about the current operating status:

1. Requesting alarm status, display of all the DTS 4020 active errors.
Display of the DTS 4020 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 4020 active alarms are displayed, masking (e-mail, traps and relay) only occurs later.

2. Alarm history display.
Display of the DTS 4020 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 "11 Time status information"
4. Time source information display. See chapter "6.4.2 Time source information"
5. PTP Information
6. Current network configuration display. With ENTER, a second page can be displayed with network information.
7. DTS 4020 system information display (internal status, regulation voltage of the oscillator..). This information is for support purposes only.
8. Product information like serial number, firmware version etc.
9. All respective software versions of the DTS 4020 components.

Status menu page 2:

```

DTS 4020.timebridge  Moser-Baer AG
=====

CLOCK STATE                                     Page 2/2
11 NTP peer state (ntpq -np)
12 NTP state (ntpq -c rl)
13 Power
14 Network Diagnostic

Press enter for next part, 99 to leave>

```

Path: 1 Status → [Enter]

11. Display of information with regard to the internal state of the NTP server.
12. Shows state of the time source for NTP
13. Power supply information (voltage) display.
14. Network diagnostic for ping and routing table information.
15. Display information of all possible PTP connections

6.4.1 Time status information

```
DTS 4020.timebridge Moser-Baer AG
=====
```

TIME STATUS INFORMATION	PAGE 1/2
Internal time of the DTS (UTC)	10:11:47 26.01.19
Stratum of DTS	2
TAI Offset	37
Time source	PTP
Last time information from source	09:11:44 26.01.15 UTC
Offset to source	10ns
Jitter of the source	1ns
Quality of the source	100%

99 Return

Enter desired menu number>

Path: 1 Status → 3 Time, time state

- Internal time of the DTS: local time
- Stratum of the DTS: current stratum
- TAI Offset: current TAI offset in seconds (used for PTP)
- Time source: current time source
 - Last time info. from source: time of the last information from source
 - Offset to source: offset to source (source – system time)
 - Jitter of the source: current jitter
 - Quality of the source: quality of the source

```
DTS 4020.timebridge Moser-Baer AG
=====
```

TIME STATUS INFORMATION	PAGE 2/2
Leap second information	
Status	No leap second detected
Date of the next leap second	None
Adjust direction	None
Leap second source	None
Date of the last implemented leap second	None
Oscillator locked state	locked

99 Return

Enter desired menu number>

Path: 1 Status → 3 Time, time state → enter

- Leap second information: Shows if a leap second is detected and when one is detected on which date it will be and in which direction.

Oscillator locked state: Not used

MOBA-NMS: Tab: Overview, Frame:Time, time state

Time, time state

Internal time (UTC):Feb 26, 2020, 1:12:34 PM

Stratum and status:2

Time source:PTP

Offset to source [ns]:1

Last time info from source:Feb 26, 2020, 1:11:37 PM

Jitter of the source [ns]:0

Quality of the source:100%

Oscillator lock state:Locked

Power

Supply mode:Single

Power supply 1 [V]:5.0

Power supply 2 [V]:0.0

Leap second

Status:No leap second detected

Source of leap second:None

Date of next leap second:None

Direction of next leap second:None

Date of last leap second:None

Direction of last leap second:None

Overview

Network Overview

Outputs

Time handling

Alarms

PTP configurations

VLAN configurations

Network

SNMP

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6.4.2 Time source information

All sources overview

DTS 4020.timebridge Moser-Baer AG =====				
TIMESOURCE INFORMATION			PAGE 1/8	
Source	PTP	FREQ		
Configured	yes	yes	no	no
Locked	yes	yes	no	no
Priority	1	2	0	0
Offset [s]	0	0	0	0
Offset [ns]	5	12	0	0
Stability [ppb]	1	6	0	0
Rating	0	1	2	2
99 Return				
Enter desired menu number>				

Path: 1 Status → 4 Local source

Source information (PTP, FREQ)

DTS 4020.timebridge Moser-Baer AG =====		
TIMESOURCE INFORMATION		PTP PAGE 2/3
Priority		Priority 1
State: Reachable / Locked		yes / locked
Last time received		09:12:00 08.11.18 (UTC)
Last measured offset		0ns
Stability (Deviation)		12ppb
Leap status		No leap second detected
Date of next leap second / Adj. direction		None / None
99 Return		
Enter desired menu number>		

Path: 1 Status → 4 Local source → enter (1x – 2x)

For all sources the same information is shown

- | | |
|-----------------------------|--|
| - Priority: | Current source priority |
| - State: Reachable / Locked | A source is reachable if it provides time to DTS on a regular basis. A source is locked, if the time provided is stable. |
| - Last time received: | last time received from source |
| - Last measured offset | last measured offset with source info and type of measurement (only needed for Moser-Baer support). |
| - Stability (Deviation) | Estimation of the current stability in parts-per-billion |
| -Leap second status: | Shows the leap second if it is detected by this source. |

6.4.3 PTP information

PTP instances

```
DTS 4020.timebridge Moser-Baer AG
=====

PTP INSTANCE
1 LAN2 IP1
2 LAN2 IP2

99 Return

Enter desired menu number>
```

Path: 1 Status → 5 Info PTP

See the status of the running PTP instances. It is possible to configure two IP addresses per LAN interface. When PTP is enabled there is a PTP instance started for both IP addresses. Because of that every LAN interface has a submenu for each possible IP address.

PTP Information of the instance

```
DTS 4020.timebridge Moser-Baer AG
=====

PTP INFO DEVICE          LAN2 IP1          PAGE 1/3
State                    SLAVE
Offset to Master         0ns
PathDelay (E2E)          0ns
PathDelay (P2P)          30ns
ClockClass               248
ClockAccuracy            0x2f
TimeSource               0x90

99 Return

Enter desired menu number>
```

Path: 1 Status → 15 Info PTP → 1 LAN2 IP 1

Shows the state of the PTP instance.

Possible values are Master, Slave, Faulty and Unknown

Offset to Master in Nano seconds (only in slave state)

Measured path delay (cable delay). Only in E2E mode and slave state.

Measured peer delay (cable delay). Only in P2P mode. Master and slave both measure the peer delay.

With the clock class and the clock accuracy it is possible to see how the overall quality of the clock is.

Time source shows what source type the device has. In this example 0x90 stands for OTHERS.

6.4.4 Network diagnostic

```
DTS 4020.timebridge Moser-Baer AG
=====

NETWORK DIAGNOSTIC
1 Ping
2 Routing table

99 Return

Enter desired menu number>
```

Path: 1 Status ➔ 14 Network diagnostic

It is possible to configure a ping command and to show the routing table of the device

Ping

```
DTS 4020.timebridge Moser-Baer AG
=====

NETWORK PING
1 Select LAN interface(1-2)      1
2 Select IP configuration(1-2)   1
3 Destination IP address        192.168.0.20

5 Execute ping command

99 Return

Enter desired menu number>
```

Path: 1 Status ➔ 14 Network diagnostic ➔ 1 Ping

1. Select LAN interface on which the ping is sent out
2. Select if the IP configuration one or two shall be used
3. Address of from the other device (Ping Destination)
5. Execute Ping command and shows the result in the same window

6.5 Configuration menu

```
DTS 4020.timebridge  Moser-Baer AG
=====

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

99 Return

Enter desired menu number>
```

Path: 2 Configuration

Configuring the DTS 4020 through various submenus:

1. Configuring the lines / outputs (Time-of-Day and pulse/frequency) See chapter "6.5.1 Outputs"
2. Configuring the time source, time-keeping etc.
See chapter "6.5.8 Time handling"
3. Alarm settings (alarm relay, e-mail, SNMP)
See chapter "6.5.16 Alarm"
4. General settings of the DTS 4020 (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. VLAN configuration
see chapter 6.5.25 VLAN configuration
7. Services (switching network services such as FTP, Telnet, SSH on or off)
See chapter "6.5.26 Services (network services FTP, telnet, SSH...)"
8. SNMP Configuration for GET/PUT.
See chapter "6.5.27 SNMP" (Traps are described in menu '2. Configuration' → '3. Alarms' → '3. Traps'. See also chapter "6.5.20 SNMP traps")

6.5.1 Outputs

Under “Outputs”, settings can be undertaken for the following functions:

```
DTS 4020.timebridge Moser-Baer AG
=====

CONFIGURATION OUTPUTS
1 Time of day
2 Signal out 1 (digital)
3 Signal out 2 (digital)
4 Signal out 3 (analog)

99 Return

Enter desired menu number>
```

Path: 2 Configuration → 1 Outputs

- | | |
|-----------------------------|---------------------|
| 1 Time of Day | → see chapter 6.5.2 |
| 2 Signal output 1 (digital) | → see chapter 6.5.3 |
| 3 Signal output 2 (digital) | → see chapter 6.5.3 |
| 4 Signal output 3 (analog) | → see chapter 6.5.4 |

MOBA-NMS: Tab: Outputs

Time of day

Mode:

TelegramType:

Serial port param.: [Change...](#)

Signal out 1 (digital)

Mode:

Signal out 2 (digital)

Mode:

Signal out 3 (analog)

Mode:

Overview Network Overview **Outputs** Time handling Alarms PTP configurations VLAN configurations Network SNMP General, Services

6.5.2 Time of day – output

The DTS 4020 is equipped with 1 Time of day output

```
DTS 4020.timebridge Moser-Baer AG
=====

TIMEOFDAY OUTPUT                                1
1 Mode (0=off, 1=on)                             1
2 Telegram Type                                  1
3 Baudrate                                         19200
4 Databit                                          8
5 Stopbit                                         1
6 Parity                                           none

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

Path: 2 Configuration → 1 Outputs → 1 Time of day outputs → Time of day out 1

1. Select line function: 0 = Off 1 = On
2. Select telegram type 1 = CCSA TimeInfo, 2 = ITU-T TimeEvent, see Appendix D for protocol specification
3. Baudrate: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400
4. Data bit: 7 or 8
5. Stop bit: 1 or 2
6. Parity: none, even

6.5.3 Signal output digital: Pulse / Frequency / IRIG / 10 MHz

The DTS 4020 is equipped with 2 digital pulse / frequency outputs. The signals are available on the Signal OUT1 and Signal OUT2 connector.

```
DTS 4020.timebridge Moser-Baer AG
=====

PULSE / FREQUENCY OUTPUT                        1
1 Mode                                           1PPS
2 IRIG Mode

98 Return and save
99 Return and discard changes

ESC=back
Mode 0=off, 1=1PPS, 2=IRIG, 3=10MHz, 4=2Hz>

Enter desired menu number>
```

Path: 2 Configuration → 1 Outputs → 2 Signal out 1/2

1. Select line function: 0 = Off
1 = 1 pulse per second
2 = IRIG
3 = 10MHz
4 = 2 Hz
2. Select IRIG mode: see picture below

6.5.4 Signal output analog: IRIG / 10 MHz

The DTS 4020 is equipped with 1 analog pulse / frequency output. The signals are available on the Signal OUT3 connector.

```
DTS 4020.timebridge Moser-Baer AG
=====

PULSE / FREQUENCY OUTPUT          3
1 Mode                             10MHz
2 IRIG Mode

98 Return and save
99 Return and discard changes

ESC=back
Mode 0=off, 2=IRIG, 3=10MHz >

Enter desired menu number>
```

Path: 2 Configuration ➔ 1 Outputs ➔ 4 Signal out 3

2. Select line function:
 - 0 = Off
 - 1 = n/a
 - 2 = IRIG
 - 3 = 10MHz
 - 4 = n/a
3. Select IRIG mode: see picture below

Selection IRIG/AFNOR mode:

```
DTS 4020.timebridge 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>
```

Path: 2 Configuration ➔ 1 Outputs ➔ 2 Signal out 1/2/3 ➔ 2 IRIG Mode

6.5.5 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“
- NTP Authentication → see chapter “6.5.12 NTP”
- For setting the time manually → see chapter “6.5.13 Manual time set / Leap second“
- PTP slave → see chapter "6.5.13 PTP Configuration"

MOBA-NMS: Tab: Time handling

***DTS 4020 (Unknown)**

Time source priority

Priority 1: PTP
Priority 2: SyncE
Priority 3: FREQ
Priority 4: None
Priority mode: Manually

Time source settings

Alarm delay for failure of source [min]: 1
Stratum (0=auto, 1-15=fix): Auto
Stratum limit for synchalarm: 12
Stratum timeout (1-16) source fail [h]: 999
Stratum change when source fails: Default
Max. offset for time ok [ns]: 250
Alarm big offset to source: 1000
Holdover timeout: 0

Leap second / Manual time adjustment

Leap second mode: None
Leap second date:
Set time (UTC): 26.02.2020 13:17:40
Adjust time [ns]: 0

Time adjustment

Adjust mode: Follow (Adjust slowly)
Max. catch-up speed [ns/s]: 50
Synch.only offset (1000-5000000ns, 0=Off): 0
RTC mode: off

PTP settings | **NTP settings**

Max offset to PTP master: 200

Save **Undo Changes**

Overview | Network Overview | Outputs | **Time handling** | Alarms | PTP configurations | VLAN configurations | Network | SNMP | General, Services

6.5.6 Time source

Time source configuration.

```
DTS 4020.timebridge Moser-Baer AG
=====

TIME SOURCE
1 Source configuration
2 Stratum configuration
3 Alarm delay for failure of the source      1min
4 Max. offset for time ok                   250ns
5 Alarm big Offset to source                1000ns
6 Holdover TO                              0s

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

Path: 2 Configuration → 2 Time handling → 1 General source setting

1. Menu to configure source types and priorities
2. Menu to configure stratum
3. Alarm delay at failure of time source (minutes):
1min - 2'160min, default = 1
Error: "loss of time source TO"
4. Maximum offset for time source to set valid time in ns at start up.
(0-1'000'000ns)

For description of time source see chapter "8 Time administration"

5. When the offset to the active source exceeds this value, an error occurs.
6. After this time the device stops holdover and get in unsynchronized state by means disable all outputs.

Time Source Priority configuration

```
DTS 4020.timebridge Moser-Baer AG
=====

TIME SOURCE PRIORITY
1 Source Priority1 PTP
2 Source Priority2 NONE
3 Source Priority3 NONE
4 Source Priority4 NONE

10 Priority Mode manual

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

Path: 2 Configuration → 2 Time handling → 1 General source setting → Source configuration

(1-4)Source PriorityX 0=NONE, 1=PTP, 2=SyncE, 3=Freq, 4=NTP

10 Priority Mode 0 = auto: In this mode the device makes the priority of the sources and not the user. In this case the rating of the source is the priority.

1 = manual: The configured priorities are used to check which source has to be active.

Time Source Stratum configuration

```
DTS 4020.timebridge Moser-Baer AG
=====

TIME SOURCE STRATUM
1 DTS stratum (0=auto, 1-15=fix) 0
2 Stratum limit for synchalarm 12
3 Stratum TO (1-16) source fail 999h
4 Stratum change source fail default

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

Path: 2 Configuration → 2 Time handling → 1 General source setting

1. DTS stratum: 0 = Stratum is automatically calculated according to the time source.
1-15 = Stratum DTS 4020 is set by means of the description in the table in chapter “8.4 ”
2. Stratum limits for alarm: Limits for alarm “Time source stratum lost” (1-16)
3. 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.
4. Stratum change source fail:
default = Default Stratum change behaviour
immediate = Stratum is decreased by one step immediate after
“failure of time source” has been detected

6.5.7 Time adjustment / Time-keeping

```
DTS 4020.timebridge Moser-Baer AG
=====

TIME ADJUSTMENT CONFIGURATION
Adjust mode (0=follow, 1=set)           0
Max. catch up speed                     50ns/s
Time core type (0-255, default 0)      0
4 Synch. only offset                    0ms
5 RTC mode                             0

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

Path: 2 Configuration → 2 Time handling → 2 Time adjustment setting

1. Adjust mode: 0=time is slowly adjusted
1=time is set immediately

Notice: This device supports “adjustment” only, therefore parameter is not configurable

2. Maximum catch up speed
3. Time core type: Standard=0 (0-255) → unused parameter
4. Synch. only offset: 0=off
1'000-5'000'000ns=Limits as from which time is no longer accepted → Alarm “Synch only diff too large”
5. RTC mode 0=RTC deactivated
1=ON

Important! The RTC mode is used only for test purposes!

RTC behaviour if mode=ON:

- A Valid time source has to be available for RTC first time set
- On startup the RTC is used to set the DTS time.
- As soon as an other source is available the DTS swiches to this source
- A time jump has be expectet on such source switch

Important! For the **high precision time signal outputs** (1PPS, 10MHz, ToD,...), the RTC mode should never be switched on!

Important! RTC cannot handle Leap second

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

6.5.8 Manual time set / Leap second

```
DTS 4020.timebridge 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 01.07.15

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

Path: 2 Configuration → 2 Time handling → 3 Manual time adjustment / leap second

1. Set UTC time in the format "hh:mm:ss DD.MM.YY".
Time is set with ENTER!
2. Correct time in ns (- = backwards). Range: +/-1'000'000'000ns
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 "8.8 Leap second"



Notice: Manual time set can be used only for test purposes.
For normal operation a time source is required!

6.5.10 NTP

Up to 4 multicast or broadcast addresses can be configured.

```
DTS 4020.timebridge Moser-Baer AG
=====
```

```
NTP SERVER CONFIGURATION GENERAL
1 NTP Authentication
```

PAGE 1/2

Press enter for next part, 99 to leave

Enter desired menu number>

Path: 2 Configuration → 2 Time handling → 5 NTP server

Page 1. NTP Authentication: Changes to the menu “NTP AUTHENTICATION”

Page 2 Summary about configured NTP – broadcast addresses.
Select to configure.

Notice: LAN ports share configured multicast addresses regarding the following table:

LAN 1-2: Multicast addresses 1-4



Configuration of the NTP authentication:

The NTP authentication is described in chapter "8.9 NTP Authentication".

```
DTS 4020.timebridge 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

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

Path: 2 Configuration → 2 Time handling → 5 NTP server settings → 1 NTP Authentication

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.

The configured keys will be compared with the keys in the file. If a key configured on the device and it is not in the key file, an alarm will appear (NTP authentication error).

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



NTP Multicast Configuration

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

```
DTS 4020.timebridge Moser-Baer AG
=====

NTP MULTI- / BROADCAST-ENTRY
1 Multi- or broadcast IP address      254.192.1.1
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>
```

Path: 2 Configuration → 2 Time handling → 5 NTP server → Page 2

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.



Important: If an authentication key number is defined (see no 4.), the same key number must be also added to the trusted keys.

6.5.13 PTP Configuration

PTP configuration page 1:

```
DTS 4020.timebridge Moser-Baer AG
=====

PTP CONFIGURATION                                config 1  PAGE 1/3
1  Mode                                           0
2  Profile                                         None
3  Delay mechanism                               E2E
4  Transport protocol                             IPv4
5  IPv6 scope                                     0xE
6  Priority 1                                     128
7  Priority 2                                     128

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

Path: 2 Configuration → 2 Time handling → 6 PTP settings → 1 PTP config

1. Mode 0 = off, 1 = Multicast 1- Step, 2 = Multicast 2 - Step,
 3 = Unicast 1-Step, 4 = Unicast 2-Step
2. Profile 0 = none, 1 = default, E2E, 2 = default P2P,
 3 = utility(IEC 61850-9-3), 4 = ITU-T G.8265.1,
 5 = ITU-T G.8275.1, 6 = ITU-T G.8275.2,
 7 = IEEE 802.1AS (gPTP)
3. Delay mechanism 0 = E2E, 1 = P2P, default E2E
4. Transport protocol 0 = IPv4, 1 = IPv6, 2 = layer 2, default IPv4
5. IPv6 scope 1..15, default 15 (0xE)
6. Priority 1 0-255, default 128
7. Priority 2 0-255, default 128

Press ENTER to change to page 2.

PTP configuration page 2:

```
DTS 4020.timebridge Moser-Baer AG
=====

PTP CONFIGURATION                                config 1  PAGE 2/3
8  Domain                                         0
9  LOG Announce interval                         1 (2 second)
10 LOG Sync interval                             0 (1 second)
11 LOG Delay Request interval                    0 (1 second)
12 Announce TO                                   3s
13 Sync TO                                       3s
14 UDP TTL                                       1

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

Path: 2 Configuration → 2 Time handling → 6 PTP function → 1 PTP config 1 [Enter]

8. Domain 0-255, default 0
9. LOG Announce interval -7..7, default 1, values in format 2^x sec (every 2 sec)

10. LOG Sync interval -7..7, default 0, values in format 2^x sec (every sec)
11. LOG Delay Request Interval -7..7, default 0, values in format 2^x sec (every sec)
12. Announce TO 2..10, default 3s
13. Sync TO 2..10, default 3s
14. UDP TTL 1-255, default 1

Press ENTER to change to page 3.

PTP configuration page 3:

```

DTS 4020.timebridge  Moser-Baer AG
=====

PTP CONFIGURATION                                config 1  PAGE 3/3
15 Master Only                                     False
16 Request duration                               3600
17 Local Priority                                  128
18 LOG Query interval                             1

98 Return and save
99 Return and discard changes

Enter desired menu number>

```

Path: 2 Configuration → 2 Time handling → 6 PTP function → 1 PTP config 1 [Enter] [Enter]

15. Master Only 0 = False 1 = True, default 0
16. Request duration 0 – 86400s, default 3600s
17. Local Priority 0 – 255, default 128

Press ENTER to change to page 1.

General PTP configuration:

```

DTS 4020.timebridge  Moser-Baer AG
=====

PTP GENERAL CONFIGURATION
1  UTC leap offset (TAI-UTC)                        37

98 Return and save
99 Return and discard changes

Enter desired menu number>

```

Path: 2 Configuration → 2 Time handling → 4 PTP settings → 2 General PTP configuration

1. UTC leap second offset (TAI-UTC)

PTP slave settings:

```
DTS 4020.timebridge Moser-Baer AG
=====
```

PTP SLAVE SETTINGS

- 1 Alarm offset to PTP Master 200ns
- 2 PTP Unicast Master Table

- 98 Return and save
- 99 Return and discard changes

Enter desired menu number>

Path: 2 Configuration → 2 Time handling → 4 PTP settings → 3 PTP slave settings

1. Max offset to PTP Master to trigger the alarm “Time source big offset“ (100ns – 5'000'000ns)
2. Unicast Master Table. Up to 8 master addresses can be configured

MOBA-NMS: Tab: PTP configuration

General configuration

UTC leap offset (TAI-UTC) [s]: 37

PTP settings

Mode: Multicast 2-step

Profile: None

Delay mechanism: E2E

Transport protocol: Layer 2

IPv6 multicast scope: 14

Priority 1: 128

Priority 2: 128

Domain: 0

Announce interval [s]: 2

Sync interval [s]: 1

Announce timeout [s]: 3

Sync receipt timeout [s]: 3

Delay request interval: 8

PTP slave

Master IP address 1: 10.240.10.123

Master IP address 2:

Master IP address 3:

Master IP address 4:

Master IP address 5:

Master IP address 6:

Master IP address 7:

Master IP address 8:

Save Undo Changes

Overview Network Overview Outputs Time handling Alarms **PTP configurations** VLAN configurations Network SNMP General, Services

6.5.14 F-IN settings

```
DTS 4020.timebridge Moser-Baer AG
=====

F-IN SETTINGS
1 MAX Offset to source          500
2 Mode                          1

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

Path: 2 Configuration → 2 Time handling → 5 F-IN settings

1. MAX Source Offset 100 - 2500000000ns, 0=off
2. Mode: F-IN Mode 1=10MHz, 2=2.048MHz, 3=PPS



Alarm Source offset is only applicable in the Mode 3 = PPS, in every other mode only the frequency is stabilized and not the offset.

6.5.15 Alarms

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

- Alarm relay → see chapter 6.5.20
- E-mail → see chapter 6.5.22
- SNMP traps → see chapter 6.5.23

6.5.16 Alarm relay

```
DTS 4020.timebridge Moser-Baer AG
=====

ALARM CONFIGURATION 2
1 Alarmmask for relay

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

Path: 2 Configuration → 3 Alarms → 1 Alarm relay

1. Alarm mask for relay (see chapter "6.5.20 Alarm mask")

MOBA-NMS: Tab: Alarms

E-Mail

☐ Send alarm e-mails

Alarmlink: [Change...](#)

Mailserver address:

Port (default 25):

Authentication mode:

Username:

Password:

Destination mail address 1:

Destination mail address 2:

Reply mail address:

From mail address:

Traps

☒ Send SNMP traps

Alarmlink: [Change...](#)

Trap community string:

Alive messages interval (0=off) [s]:

Traps destination 1

Destination address:

Destination port (default 162):

SNMP version:

Traps destination 2

Destination address:

Destination port (default 162):

SNMP version:

Alarm relay

Alarmlink: [Change...](#)

[Save](#) [Undo Changes](#)

Overview Network Overview Outputs Time handling **Alarms** PTP configurations VLAN configurations Network SNMP General, Services

Click on "Change..." to open the alarm mask (see chapter "6.5.18 Alarm mask").

6.5.17 Alarm mask

DTS 4020.timebridge Moser-Baer AG
=====

ALARMMASK

Page 1

[]=error disabled, [*]=error enabled

[*] Bit00: DTS restart	[*] Bit01: System warning
[*] Bit02: Supply voltage too low	[*] Bit03: Failure red. supply
[*] Bit04: Internal voltage too low	[*] Bit05: Error bit05
[*] Bit06: Too high offset to PTP	[*] Bit07: Error bit07
[*] Bit08: Too high offset to FRE	[*] Bit09: Error bit09
[*] Bit10: PTP synch lost	[*] Bit11: Error bit11
[*] Bit12: Frequency-In synch lost	[*] Bit13: Error bit13
[*] Bit14: Error bit14	[*] Bit15: Time source big offset

Enter alarm number to alter mask

Press ENTER for next part, 99 to leave>

Path: 2 Configuration → 3 Alarms → 1 Alarm relay → 1 Alarm mask for relay

Display of all the DTS 4020 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 "B Time zone table"

MOBA-NMS: Tab: Alarms → Alarm mask

	No.	Alarm
<input checked="" type="checkbox"/>	00	Restart
<input checked="" type="checkbox"/>	01	System warning
<input checked="" type="checkbox"/>	02	Supply voltage too low
<input checked="" type="checkbox"/>	03	Failure red. supply
<input checked="" type="checkbox"/>	04	Internal voltage too low
<input checked="" type="checkbox"/>	05	Offset to GNSS too big
<input checked="" type="checkbox"/>	06	Offset to PTP too big
<input checked="" type="checkbox"/>	07	Offset to DCF too big
<input checked="" type="checkbox"/>	08	Offset to FREQ too big
<input checked="" type="checkbox"/>	09	Offset to E1 too big
<input checked="" type="checkbox"/>	10	PTP sync lost
<input checked="" type="checkbox"/>	11	DCF sync lost
<input checked="" type="checkbox"/>	12	Frequency-in sync lost
<input checked="" type="checkbox"/>	13	E1 sync lost
<input checked="" type="checkbox"/>	14	GNSS sync lost
<input checked="" type="checkbox"/>	15	Big offset of the time source
<input checked="" type="checkbox"/>	16	Time source fail stratum
<input checked="" type="checkbox"/>	17	Time source fail timeout
<input checked="" type="checkbox"/>	18	No valid time
<input checked="" type="checkbox"/>	19	NTP synch lost
<input checked="" type="checkbox"/>	20	Offset to NTP too big
<input checked="" type="checkbox"/>	21	NTP failed
<input checked="" type="checkbox"/>	22	<No used>
<input checked="" type="checkbox"/>	23	No valid timesource
<input checked="" type="checkbox"/>	24	No mail server
<input checked="" type="checkbox"/>	25	SNMP not running
<input checked="" type="checkbox"/>	26	<No used>

6.5.18 E-mail

```
DTS 4020.timebridge Moser-Baer AG
=====

MAIL CONFIGURATION                                Page 1
1 Mailmode                                         off
2 Alarmmask for mail                             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>
```

Path: 2 Configuration → 3 Alarms → 2 E-Mail

1. E-mail function on or off.
2. Alarm mask for e-mail notifications (see chapter "6.5.20 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:

DTS 4020.timebridge Moser-Baer AG
=====

MAIL CONFIGURATION
11 Authentication mode
12 User name
13 Password

Page 2
0

98 Return and save
99 Return and discard changes

Enter desired menu number>

Path: 2 Configuration → 3 Alarms → 2 E-Mail [Enter]

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 <DTS4020 (10.241.0.30)>

MOBA-NMS: Tab: Alarm, Frame: E-Mail

E-Mail

☒ Send alarm e-mails

Alarmmask: [Change...](#)

Mailserv address:

Port (default 25):

Authentication mode:

Username:

Password:

Destination mail address 1:

Destination mail address 2:

Reply mail address:

From mail address:

Traps

☒ Send SNMP traps

Alarmmask: [Change...](#)

Trap community string:

Alive messages interval (0=off) [s]:

Traps destination 1

Destination address:

Destination port (default 162):

SNMP version:

Traps destination 2

Destination address:

Destination port (default 162):

SNMP version:

Alarm relay

Alarmmask: [Change...](#)

Overview Network Overview Outputs Time handling Alarms PTP configurations VLAN configurations Network SNMP General, Services

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)

```
DTS 4020.timebridge 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 0

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

Path: 2 Configuration → 3 Alarms → 3 Traps

1. Trap mode on or off (applies to alarm and alive traps)
2. Alarm mask for SNMP trap messages (see chapter "6.5.20 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 "6.5.29 SNMP").

Notice: Configuration of a gateway is required for sending SNMP traps (see chapter 6.5.24 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

```
DTS 4020.timebridge 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>
```

Path: 2 Configuration → 3 Alarms → 3 Traps → 4 Configuration of destination 1

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.

MOBA-NMS: Tab: Alarm, Frame: Traps

The image shows a screenshot of the MOBA-NMS configuration window, specifically the 'Traps' tab. The window is divided into two main sections: 'E-Mail' and 'Traps'. The 'E-Mail' section includes fields for 'Alarmmask', 'Mailserver address', 'Port (default 25)', 'Authentication mode', 'Username', 'Password', 'Destination mail address 1', 'Destination mail address 2', 'Reply mail address', and 'From mail address'. The 'Traps' section includes fields for 'Alarmmask', 'Trap community string', 'Alive messages interval (0=off) [s]', and two 'Traps destination' sections. Each 'Traps destination' section includes fields for 'Destination address', 'Destination port (default 162)', and 'SNMP version'. At the bottom of the window, there are 'Save' and 'Undo Changes' buttons, and a navigation bar with tabs for 'Overview', 'Network Overview', 'Outputs', 'Time handling', 'Alarms', 'PTP configurations', 'VLAN configurations', 'Network', 'SNMP', and 'General, Services'.

6.5.20 General settings

```
DTS 4020.timebridge Moser-Baer AG
=====

GENERAL SETTINGS
  Language (info only)           English
  2 Power (0=single, 1=red.)     0
  3 Password (menu)             *****
  4 USB port                     on

98 Return and save
99 Return and discard changes

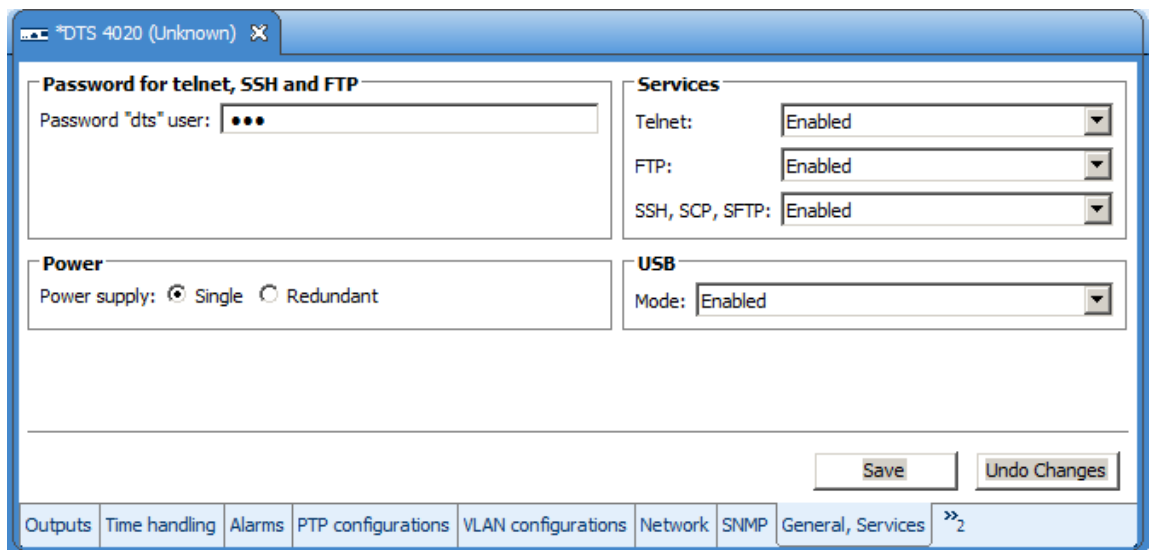
Enter desired menu number>
```

Path: 2 Configuration → 4 General

Device/Display Language

2. Power: 0=single power, 1=redundant power (2 power supplies)
(See chapter “10 Redundant Power supply “)
3. Enter password for the menu (user **dts**) (max. 15 characters).
A password must be configured.
4. USB port: 0=off, 1=on

MOBA-NMS: Tab: General, Services



The screenshot shows the MOBA-NMS configuration window for the 'General, Services' tab. The window title is '*DTS 4020 (Unknown)'. It contains several sections: 'Password for telnet, SSH and FTP' with a password field set to 'dts'; 'Power' with radio buttons for 'Single' (selected) and 'Redundant'; 'Services' with dropdown menus for 'Telnet' (Enabled), 'FTP' (Enabled), and 'SSH, SCP, SFTP' (Enabled); and 'USB' with a dropdown menu for 'Mode' (Enabled). At the bottom right are 'Save' and 'Undo Changes' buttons. A navigation bar at the very bottom includes tabs for 'Outputs', 'Time handling', 'Alarms', 'PTP configurations', 'VLAN configurations', 'Network', 'SNMP', 'General, Services' (which is highlighted), and a right arrow icon.

6.5.21 Network

DTS 4020.timebridge Moser-Baer AG
=====

NETWORK INTERFACES

- 1 LAN 1
- 2 LAN 2

99 Return

Enter desired menu number>

Path: 2 Configuration → 5 Network

MOBA-NMS: Tab: Network – LAN x

The screenshot shows the MOBA-NMS configuration window for 'DTS 4020 (Unknown)'. The 'LAN 1' tab is selected. The interface is divided into several sections:

- General network settings:** Host name: 'Dts4210', Domain name: (empty).
- Port configuration:** Mode: 'Auto negotiation', PTP Support: 'Yes', PTP configuration: 'Yes', SyncE Support: 'Yes', SyncE configuration: (empty).
- IPv4 configuration:** DHCP: 'Enabled', DNS server: '0.0.0.0'.
 - IP address 1:** IP address: '0.0.0.0', Subnet mask: '0.0.0.0', Gateway: '0.0.0.0'. Static Route 1 IP address/Prefix: '0.0.0.0 / 24', Static Route 2 IP address/Prefix: '0.0.0.0 / 24'.
 - IP address 2:** IP address: '0.0.0.0', Subnet mask: '0.0.0.0', Gateway: '0.0.0.0'. Static Route 1 IP address/Prefix: '0.0.0.0 / 24', Static Route 2 IP address/Prefix: '0.0.0.0 / 24'.
- IPv6 configuration:** Auto conf: 'Disabled', DHCP V6: 'Disabled'.
 - IP address / Prefix: '0::0 / 64', Gateway: '0::0'.
 - IP address 2 / Prefix 2: '0::0 / 64', Gateway 2: '0::0', DNS server: '0::0'.
- VLAN configuration:** VLAN configuration for IP 1: 'Disabled', VLAN configuration for IP 2: 'Disabled'.

At the bottom, there are 'Save' and 'Undo Changes' buttons. A navigation bar at the very bottom includes: Overview, Network Overview, Outputs, Time handling, Alarms, PTP configurations, VLAN configurations, Network (selected), SNMP, General, Services.

Network Interface 1 – Page 1

```
DTS 4020.timebridge Moser-Baer AG
=====

NETWORK GENERAL                                LAN 1  PAGE 1/1
1  IPV4 configuration
2  IPV6 configuration
3  Network interface config                    auto
4  Host name (Device name)                    dts4020
5  Domain name
6  IPv4 static routing
7  VLAN config for IP1                        0
8  VLAN config for IP2                        0

98 Return and save, ENTER for next part
99 Return and discard changes

Enter desired menu number>
```

Path: 2 Configuration → 5 Network → 1 LAN 1

1. Configuration of IPv4 parameters
2. Configuration of IPv6 parameters
3. Set network interface: Auto, 1000/100Mbit, half, full duplex.
4. 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!**

5. Set domain e.g. test.org
6. Define up to 2 static routing destinations for IP1 and IP2
7. VLAN configuration for IP1: select predefined VLAN config 1 .. 16, 0=off
See chapter "6.5.27 VLAN configuration"
8. VLAN configuration for IP2: select predefined VLAN config 1 .. 16, 0=off

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

Notice: After modifying the IP or the DHCP mode the menu is always closed.

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 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!

Network configuration IPv4:

```
DTS 4020.timebridge Moser-Baer AG
=====

NETWORK IPV4                                LAN 1
1  DHCP                                      off
2  IP address 1                             192.168.0.10
3  Subnet mask 1                            255.255.255.0
4  Gateway 1                                192.168.0.1
5  IP address 2                             192.168.1.10
6  Subnet mask 2                            255.255.255.0
7  Gateway 2                                192.168.1.1
8  DNS server                               192.168.0.7

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

Path: 2 Configuration → 5 Network → 1 LAN1 → 1 IPv4 configuration

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 (approx. + 60 sec.) of the DTS.

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

Network configuration IPv6:

```
DTS 4020.timebridge Moser-Baer AG
=====

NETWORK IPV6                                LAN 1
1  Mode / Autoconf                           off
2  DHCPv6                                     off
3  IP address 1 / Prefix                     0::0/64
4  Gateway 1                                 0::0
5  IP address 2 / Prefix                     0::0/64
6  Gateway 2                                 0::0
7  DNS server                                0::0

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

Path: 2 Configuration → 5 Network → 1 Network IF 1 → 2 IPv6 configuration

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. IP address with prefix in IPv6 format
e.g. 2001:2345:6789::12:1:34/64
6. Gateway in IPv6 format
7. IPv6 DNS server

6.5.22 IPv4 static routing

For each LAN port up to 2 static routing destinations for IP1 and IP2 can be defined:

```
DTS 4020.timebridge Moser-Baer AG
=====

NETWORK IPV4 STATIC ROUTING          LAN 1
1 IP1 network destination 1 / Prefix  0.0.0.0/24
2 IP1 network destination 2 / Prefix  0.0.0.0/24
3 IP2 network destination 1 / Prefix  0.0.0.0/24
4 IP2 network destination 2 / Prefix  0.0.0.0/24

98 Return and save
99 Return and discard changes

Enter desired menu number>
```

Path: 2 Configuration ➔ 5 Network ➔ 1 LAN 1 ➔ 6 IPV4 static routing

Example: Route all addresses of range 192.168.0-255.0-255 add network destination 192.168.0.0/16

6.5.23 VLAN configuration

This device supports tagged VLAN (virtual LANs) configuration options compatible to IEEE 802.1p/1q.

You can define up to 4 different VLAN configurations.

```
DTS 4020.timebridge Moser-Baer AG
=====

VLAN CONFIGURATION                                VLAN 1
1 Name
2 ID                                                1
3 PCP                                              0

98 Return and save
99 Return and discard changes

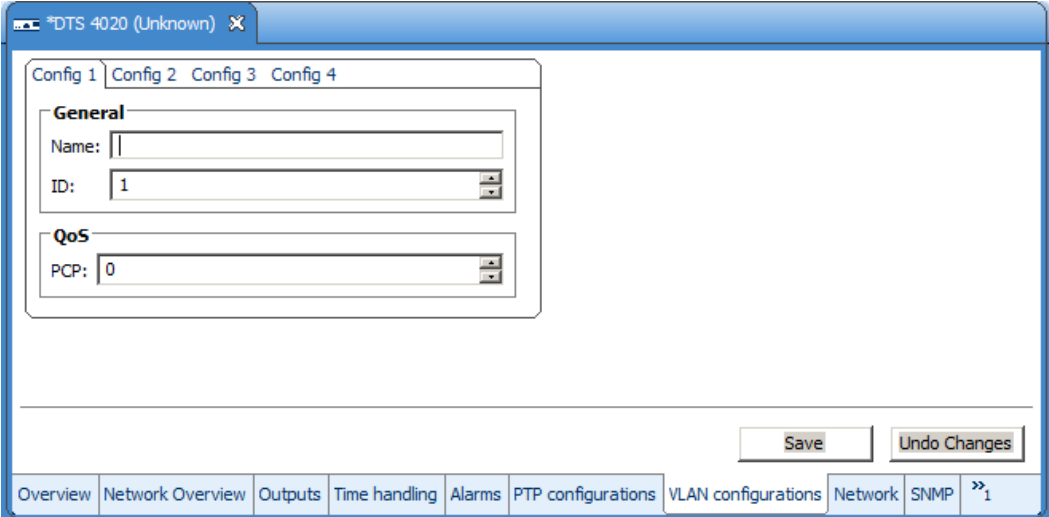
Enter desired menu number>
```

Path: 2 Configuration → 6 VLAN configuration → 1 VLAN config 1

1. Name of the VLAN (Max. 64 characters)
2. Setting the VLAN ID (1 - 4094)
3. - Priority Code Point according to IEEE 802.1Q
Default: PCP: 0

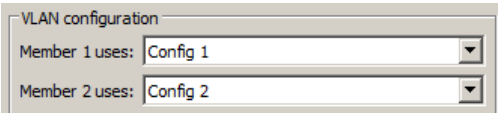
MOBA-NMS: Tab: VLAN configuration, e.g. Config 4

Up to 4 VLAN configurations can be defined. They can be assigned to network ports in Tab: Network. See next page.



MOBA-NMS: Tab: Network, Frame: VLAN configuration

Assign the predefined VLAN config., e.g. Config 1 and Config 2 to IP 1 and IP 2.



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

Network services configuration:

```
DTS 4020.timebridge 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>
```

Path: 2 Configuration → 7 Services (FTP, telnet, SSH)

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

MOBA-NMS: Tab: General, Services; Frame: Services

*DTS 4020 (Unknown) X

Password for telnet, SSH and FTP
Password "dts" user: ***

Services
Telnet: Enabled
FTP: Enabled
SSH, SCP, SFTP: Enabled

Power
Power supply: ☒ Single ☐ Redundant

USB
Mode: Enabled

Save Undo Changes

Outputs Time handling Alarms PTP configurations VLAN configurations Network SNMP General, Services >>2

6.5.25 SNMP

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

```
DTS 4020.timebridge Moser-Baer AG
=====

SNMP CONFIGURATION
1  SNMP mode                                2
2  Alarmmask for SNMP                      ff ff ff ff ff ff ff ff
3  DTS location
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>
```

Path: 2 Configuration → 8 SNMP

1. Mode. 0=off, 1=V1/V2c/V3, 2=V2c/V3, 3=V3.
SNMP information of MIB 2 is always available.

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 “6.5.23 SNMP traps”.

2. Alarm mask for SNMP status (see chapter "6.5.21 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 “6.5.31 SNMP V1 / V2c”
6. Configuration of SNMP V3 (specific settings). See chapter “6.5.32 SNMP V3”

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

MOBA-NMS: Tab: SNMP

General configuration

Location: 130

Contact information:

Alarmmask: ff ff ff ff ff ff ff ff [Change...](#)

SNMP V1 / V2c

Read-only community: romobotime

Read / write community: rvmobotime

SNMP V3 (Be careful! Wrong configuration can cause MOBA-NMS connection problems!)

SNMPAccess 1 (viewDTS1) SNMPAccess 2 (viewDTS2)

Include OID 1: .1.3.6.1.4.1.8072

Include OID 2: .1.3.6.1.4.1.2021

Include OID 3: .1.3.6.1.4.1.13842.4

Exclude OID 1: .2

Exclude OID 2: .2

Exclude OID 3: .2

User 1 (dtsUser1) User 2 (dtsUser2)

Password:

Min. security level: Only authentication

Read access (read view): Full access

Write access (write view): User defined 1 (viewDTS1)

Save Undo Changes

Overview Network Overview Outputs Alarms PTP configurations VLAN configurations Network SNMP General, Services »1

6.5.26 SNMP V1 / V2c

```
DTS 4020.timebridge 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>
```

Path: 2 Configuration → 8 SNMP → 5 SNMP V1/V2c security configuration

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.

6.5.27 SNMP V3

```
DTS 4020.timebridge 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>
```

Path: 2 Configuration → 7 SNMP → 6 SNMP V3 security configuration

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:

```
DTS 4020.timebridge Moser-Baer AG
=====

SNMP V3 USER CONFIGURATION          dtsUser1
1 Password for authent. and privacy *****
2 Min security level                 priv
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>
```

Path: 2 Configuration → 8 SNMP → 6 SNMP V3 security configuration → 1 User 1 configuration (DTSUser1)

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:

```
DTS 4020.timebridge 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>
```

Path: 2 Configuration ➔ 8 SNMP ➔ 6 SNMP V3 security configuration ➔ 3 Access 1 configuration (viewDTS1)

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.

6.6 Maintenance menu

```
DTS 4020.timebridge Moser-Baer AG
=====

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

99 Return

Enter desired menu number>
```

Path: 3 Maintenance

1. Initiating a software update (files must have been copied by FTP into the directory */ram* of the DTS 4020 before). ➔ See chapter "7 Updates".
The command always leads to a restart of the DTS 4020 (even if no files were copied for update).

Notice: Possibly save configuration first.

2. Initiate a software update (files must first be put onto a USB stick and this stick must be connected to the DTS 4020). ➔ See chapter "7 Updates". The command always leads to a restart of the DTS 4020 (even if no files were copied for update)

Notice: Possibly save configuration first.

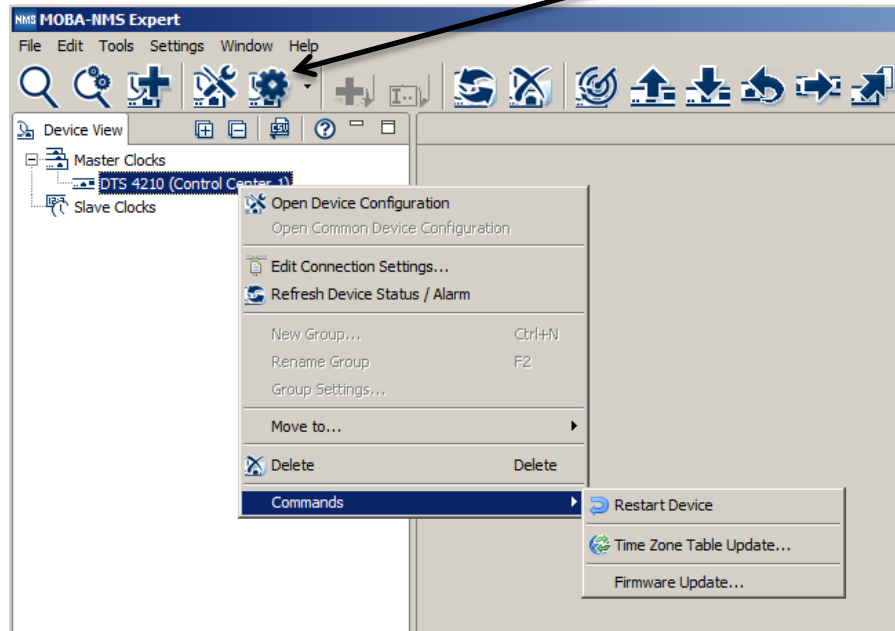
3. Save the entire configuration and the log files on a USB stick . Also generates a diagnosis file (dts4020system_XXXXXXXXXX.log) in the directory */ram* which is also copied on to the USB stick or which can be downloaded per FTP (only for support).
4. Backup the entire configuration locally (➔ file dts4020.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 4020.

See also chapter "7 Updates".

MOBA-NMS: Restart Device, Firmware Update, Time Zone Table Update

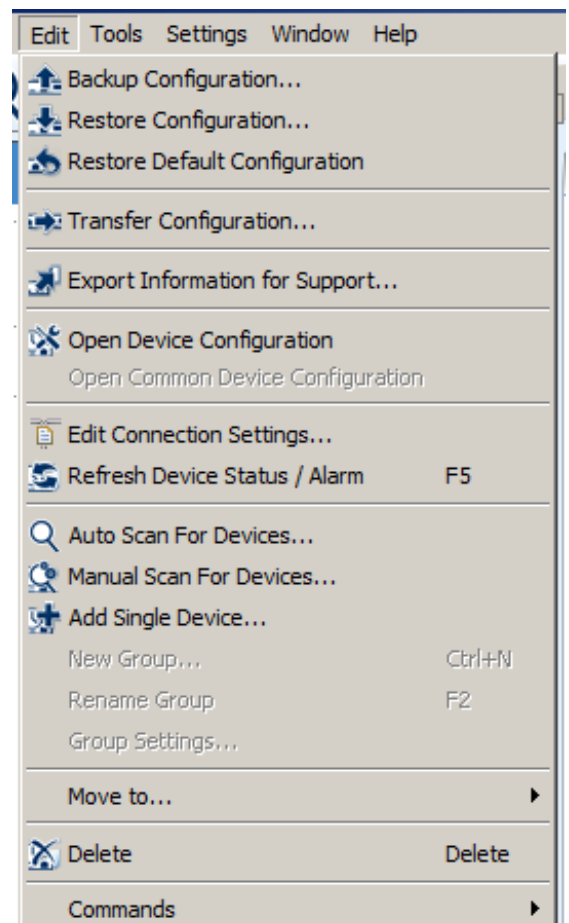
The above mentioned commands can be released by clicking with right mouse button to the device and selecting “Commands”.

The “Commands” menu can be also opened by clicking on “Command Icon”.



The following functions can be started via Menu “Edit”:

- Backup / Restore / Transfer configuration
- Reset to factory settings
- Export log files and configuration for support



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 'dts4020rootfs.tar' 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 4020 is destroyed and can only be repaired in the factory.

7.2 Updating images with FTP

Possible images are:

Boot.bin,	dts4020rootfs.tar,
dts4020ulmage,	dts4020devicetree.dtb
dts4020uboot.scr.	

Additionally the file **dts4020check.md5** must exist.

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

Steps for updating images:

1. Connect a FTP client software to the DTS 4020 e.g. with Windows Explorer enter: **ftp://dts@[IP address]** (as user dts). See also chapter 7.6 FTP connection
2. Change to the directory */ram*.
3. Copy the image into the directory */ram*.
4. Close FTP connection.
5. The update procedure can be started on DTS 4020 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 4020 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 some time depending on the type and number of images (<5 min) and must not be interrupted under any circumstances. In case of an interruption, the software on the DTS 4020 is destroyed and can only be repaired in the factory.

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 / restore device configuration with FTP

To update / restore configuration on the DTS 4020, the following steps are carried out
➔ **all file names are case-sensitive:**

1. Connect a FTP client software to the DTS 4020 e.g. with Windows Explorer enter: **ftp://dts@[IP address]** (as user dts). See also chapter 7.6 FTP connection
2. Change to the directory **/ram**.
3. Copy the **dtsdevice.conf** to into the directory **/ram**.
4. Close FTP connection.
5. The update procedure can be started on DTS 4020 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. The DTS 4020 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. In case of an interruption, the software on the DTS 4020 is destroyed and can only be repaired in the factory.

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

7.4 Updating images via USB

Possible images are: Boot.bin, dts4020rootfs.tar,
dts4020ulmage, dts4020devicetree.dtb
dts4020uboot.scr.
Additionally the file **dts4020check.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 4020
3. The update procedure can be started on DTS 4020 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 4020 is automatically restarted on completion of the update.
The Telnet or SSH session has to be restarted.
4. As soon as the DTS 4020 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. In case of an interruption, the software on the DTS 4020 is destroyed and can only be repaired in the factory.



Notice: Ensure USB port is configured as "on".
➔ See chapter 6.5.23 General settings

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 / restore device configuration via USB

To update / restore configuration on the DTS 4020, the following steps are carried out
➔ **all file names are case-sensitive, all names with 4020:**

1. Copy dtsdevice.conf to the USB stick
2. Plug the stick in the DTS 4020
3. The update procedure can be started on DTS 4020 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. The DTS 4020 is automatically restarted on completion of the update.
The Telnet or SSH session has to be restarted.
4. As soon as the DTS 4020 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. In case of an interruption, the software on the DTS 4020 is destroyed and can only be repaired in the factory.



Notice: Ensure USB port is configured as "on".
➔ See chapter 6.5.23 General settings

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

7.6 FTP connection

Establish anonymous connection:

ftp://“IP address of DTS 4020”

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

Establish connection as/with a user:

ftp://dts@“IP address of DTS 4020”.

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



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

FTP tools

	Vista, Windows 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

	Vista, Windows 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

	Vista, Windows 7, 8, 10	Linux (Suse, Redhat)
Integrated in the system (file manager):	-	With command line
Programs (examples)	WinSCP ¹⁾	-

¹⁾ Due to technical restrictions SCP is only support on command line use SFTP instead → See chapter 7.7SFTP connection

7.9 Save Configuration externally

(for backup or copy to another DTS 4020)

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 4020 (with Windows Explorer enter: **ftp://dts@"IP address"**) (as user dts).
2. Change to the DTS 4020 directory **/etc**.
3. Save the file **dts4020.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 4020 by selecting the menu '3. Maintenance' ➔ '3. Backup configuration and log to USB' and press ENTER. All files will be copied into the root directory of the USB stick.

Copy configuration to another DTS 4020:

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 4020 to an other, the IP address may have to be changed after the download by serial connection.

8 Time administration

8.1 Concept of time administration

The device runs on UTC (Universal Time Coordinated).

*** PTP is always TAI (PTP timescale)

8.2 Synchronization process & diagram

The time that the DTS 4020 maintains is referred to as System time. The System Time is used to supply time to all of the available time of day outputs (such as NTP time stamps, PTP time stamps, etc.).

System time can be synchronized to different time references. All configured sources are monitored simultaneously but the DTS can only synchronize to one source at the time.

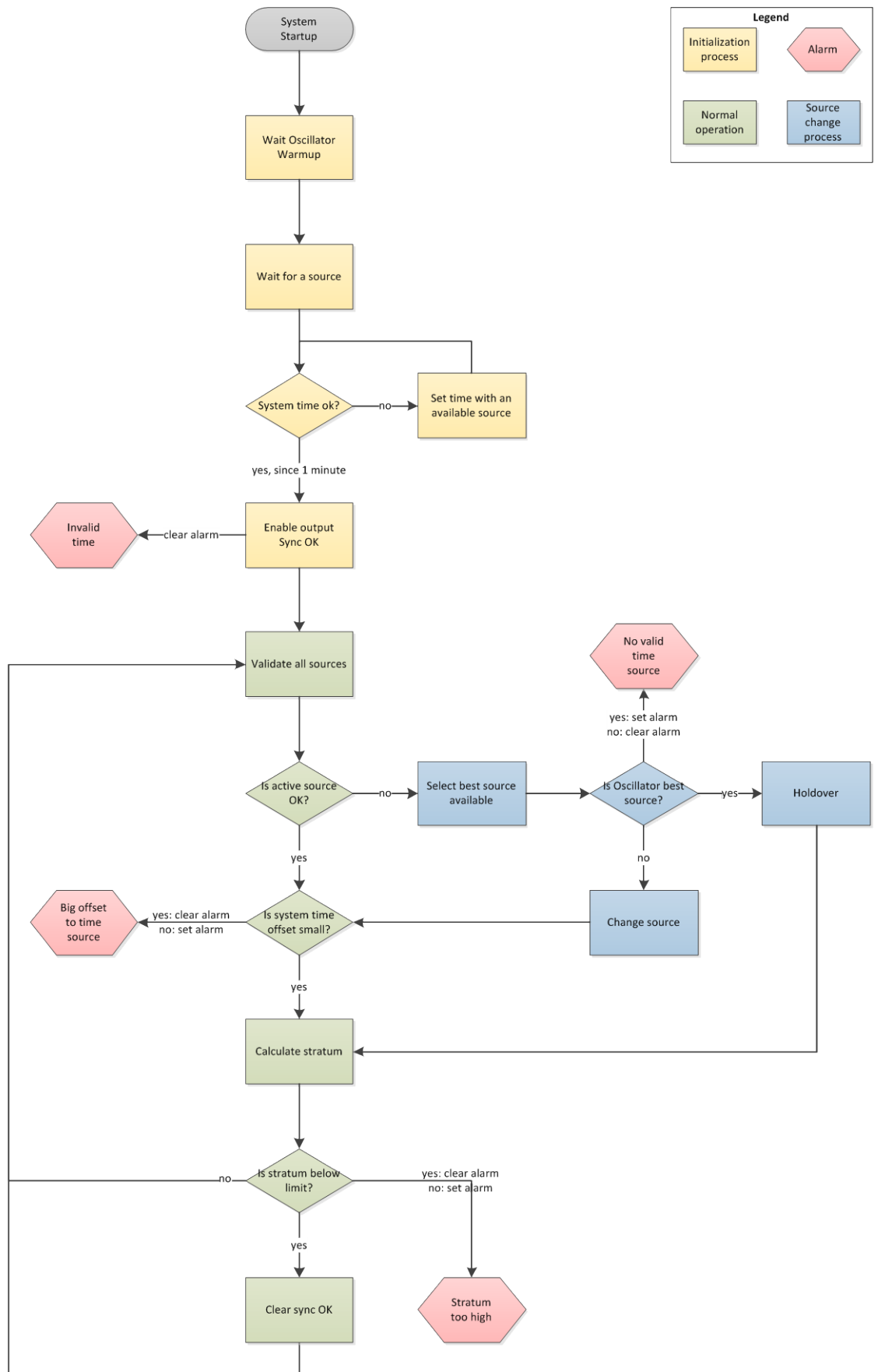
Multiple configured sources allow redundancy on time reference side. The following sources are supported:

- PTP (default)
- SyncE
- Frequency
- *NTP (future option)*

Each source has a user assigned priority that defines the source change process on a source error (e.g. priority 1 source PTP loses reception. If SyncE had priority 2, the DTS would change source and synchronize to SyncE.)

The flow chart below illustrates how the DTS 4020 synchronizes to the available time sources.

1. On system startup, the DTS waits until the oscillator reaches stable state.
2. Then it waits for an available source to set system time (usually it uses the first source that is available, not necessarily source with priority 1).
3. As soon as system time is within nanoseconds to its source, outputs will be enabled and system time OK flag set.
4. In normal operation (system time set), all configured sources are monitored simultaneously.
5. If the active source suddenly is not available anymore (e.g. due to loss of PTP), the DTS will change its active source to the source with the next lower priority (e.g. from prio 1 to prio 2). DTS will always change back to a higher priority source as soon as one is available (see example situation further below). Source changes cannot happen more than ones in 10 minutes.
6. If for some reason no source is available, the device goes into holdover mode (based on internal oscillator).
7. The DTS regularly updates its synchronization status based only on the active source. Such contains stratum calculation and synchronization alarms (e.g. Big offset to time source).



8.3 Time acceptance

System startup:

After finishing the boot procedure, the time reception from any source usually takes 10 minutes or more. The first source available will be taken to set system time even if it does not have priority 1.

Outputs activation:

As soon as the system time was set successfully within nanosecond accuracy to its source, the outputs are activated.

Source changes:

Time source change decisions are either done automatically or manually, depending on user settings.

Automatic mode: The priority is based on deviation estimations of each source. The source with lowest deviation has highest priority.

Manual mode: Uses the user defined source priority list.

Source failures:

The active source is permanently supervised. If it fails for more than 1 minute, DTS will choose the next best source (e.g. from priority 1 to priority 2). Source changes happen immediately but maximal once per 60 seconds, which prevents source hopping.

Variants of time synchronization:

- Adjusting slowly (Adjust Mode = follow):
After starting the DTS, the time is set for a first time (from a source). Afterwards, the time will only be aligned with maximum adjusting speed of a few ns / sec. if deviating from the source.
Configuration: see chapter “6.5.10 Time adjustment / Time-keeping”
- Adjust immediately (Adjust Mode = set): → **this mode is currently not implemented!**

Manual time set:

The time is always set immediately. The stratum is set to 1.

Notice: Manual time setting is intended to use only for testing purposes.



8.4 Stratum handling

Stratum in synchronized operation:

The Stratum value behaves as follows for synchronization from the time source:

- When a fix stratum is configured, the system will always have this configured Stratum.
- If the system has auto stratum configured then the system will have the Stratum of its source plus 1. GNSS has Stratum 0 => DTS therefore Stratum 1. A PTP master clock may have Stratum 1 => DTS therefore has Stratum 2.

Stratum in case of time source loss:

The Stratum value behaves as follows in the case of a time source loss:

When a fix Stratum is configured, the system will always have this configured Stratum.
When the Stratum is set to auto mode the Stratum is calculated as follow:

The Stratum can count from 1 up to 16, which means 15 steps

1 hour => 60 minutes => 3600 seconds, $3600 / 15 \text{ steps} = 240 \text{ s/step}$

E.g. the Stratum timeout is configured to 2 hours, the Stratum is increasing:

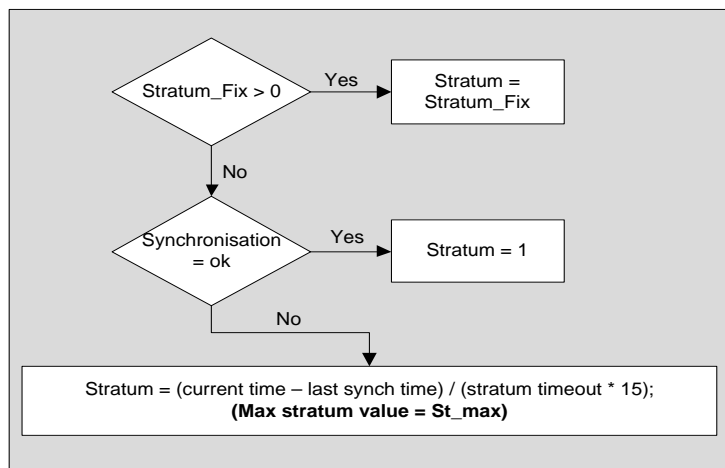
2h => 120min => 7200 sec

$7200 \text{ sec} / 15 = 480 \text{ s/step} \rightarrow 8 \text{ min/step}$

Stratum increase is stopped at configured Stratum limit.

E.g. the Stratum timeout is 2 hours (increasing of the Stratum every 8 minutes), the Stratum limit is set to 12. These means after 8 minutes of synchronisation loss the device will increase the Stratum from 1 to 2. 8 minutes later the device will change the Stratum from 2 to 3 and so on. After 11 steps * 8 minutes = 88 minutes the Stratum of the device is 12. From now on the device will have the Stratum 12 until it is synchronized again. The Stratum increase stops, because the device has from now on the synch alarm (as configured).

Technical description of the stratum functionality:



Legend:

Stratum timeout: Stratum TO <0-16>, Stratum error timeout time 1-999 [h], for loss of the source
St_fix: 0..15, configurable fix stratum, 0 = auto
Max Stratum value: 1..16, configurable stratum limit
current time [s]: current time (can be found in the overview => time state)
last synch time [s]: time of the last synchronization (can be found in the overview => time state)

8.5 Source change example situation

For better understanding of how source changes happen, consider the following situation:

- DTS has 3 sources configured: 1. SyncE, 2. PTP, 3. Freq.
- Time source change mode is set to manual.
- DTS is powered off, all sources are correctly configured and cables plugged-in.

Now, the DTS is powered on and system starts up. Initial synchronization is done by using PTP time even though it does not have priority 1, but because it's the fastest source available.

10 Minutes after choosing PTP as active source, DTS will change to SyncE, it's priority 1 source.

Further, consider the following scenario:

- Priority 1 source, SyncE, loses reception for more than a minute.
- The sources PTP and Freq. are currently available.
- Time source change mode is set to auto.

During DTS uptime all sources are statistically analyzed and rated according to an estimated deviation (this means, the more stable a source, the better its rating).

DTS will switch immediately to priority 3 source, Freq., because its deviation is lower than the one of PTP (meaning in this scenario: PTP is a less stable source than Freq.).

After some days, SyncE is back. Then after some minutes (10 minutes or more) the DTS time handler estimated SyncE as the best source of all three and switches back to SyncE.

As a last scenario consider the scenario above, but:

- Time source change mode is set to manual.

In manual source change mode the statistical analyzation does not make any source rating. Only the priority list made by the user decides which source will be next on a failure.

On a SyncE failure DTS will now switch to priority 2 source, PTP. Freq., as priority 3 source, will be taken if SyncE and PTP fail.

8.6 Time server

- NTP v4 (compatible with v3, RFC 1305) as per RFC 5905 (port 123)
- SNTP (UDP), RFC 4330 (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)

8.7 Time accuracy, time-keeping

See appendix H Technical data.

8.8 Leap second

8.8.1 Introduction to the leap second

A leap second is a one-second adjustment that keeps Coordinated Universal Time (UTC) in sync with the earth's rotation. The organization IERS (www.iers.org) decides within a half year in advance whether a leap second shall be inserted or not.

A leap second can be inserted into UTC time twice a year: on 31th of December or on 30th of June.

A leap second may be added or removed.

The organization IERS (<http://www.iers.org>) decides within a half year in advance whether a leap second shall be inserted or not.

8.8.2 Leap second handling by the DTS 4020:

The DTS 4020 can be prepared by the following procedures to implement a leap second:

- Manual user input
- Currently used source
- Ignore Leap second

→ A received leap second will be saved, so even when the source is not available in the leap moment the leap second will be done. A saved leap second can only be cleared, when the leap second mode is changed to no leap second.

Manual user input:

To ensure that the leap second adjustment process starts at the exact time the leap second may be configured manually.

In this case the leap second adjustment will be executed at the exact date and time even if the GPS reception is not sufficient.

→ **This procedure is recommended by Mobatime!**

PTP and the leap second

PTP provides leap second indication before occurrence, either with the Flag 59 or the Flag 61 depending on the direction of the leap second.

SyncE and the leap second

SyncE does not have a leap second indication.

Freq. and the leap second

Freq. does not have a leap second indication.

8.8.3 Leap second alert notification on DTS 4020 outputs

The DTS 4020 announce a pending leap second adjustment by the following methods:

- **NTP Packets** provides leap second indication within at least 1 hour before occurrence
- **PTP Packets** provides leap second indication within at least 1 hour before occurrence

8.8.4 Leap second correction mode

A Leap Second will be inserted always in one step.

The sequence of dates of the UTC second markers will be as the following
(Example end of the year):

+1 Second

December 31, 23h 59m 59s

December 31, 23h 59m 59s

January 01, 00h 00m 00s

-1 Second

December 31, 23h 59m 57s

December 31, 23h 59m 58s

January 01, 00h 00m 00s

8.8.5 Leap second status indication

The DTS 4020 shows the following information about a leap second

- Leap second status (no Leap Second planned, Leap Second pending)
- Leap second time & date (if pending, otherwise none)
- Leap second adjust direction (-1, +1, if pending)
- Leap Second source (Manual, GNSS, Redundant-Link, PTP, DCF)
- Time & date of last implemented Leap second (since the last reboot)

A Leap Second implementation is also logged in the dts log file (/var/log/dts.log) on the device.

➔ Please see chapter 7.6 how to make a ftp connection to the device.

Implementation in MOBA-NMS

Leap second

Status:	No leap second detected
Source of leap second:	None
Date of next leap second:	None
Direction of next leap second:	None
Date of last leap second:	None
Direction of last leap second:	None

8.9 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.

8.9.1 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 4020 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 4020 must be correspondingly configured to be able to use NTP authentication (chapter 6.5.12 NTP). 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 characters ' ', '#', '\t', '\n' and '\0' are not allowed 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)

8.9.2 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.

<https://tools.ietf.org/html/draft-ietf-ntp-autokey-08>

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>.

8.10 PTP

With the Precision Time Protocol (PTP) it is possible to synchronize a Ethernet Network in sub micro seconds (Nanoseconds). The DTS 4020 supports PTP Version 2 as specified in the IEEE 1588-2008 standard. It is available on 3 different network interfaces (see Appendix "A Connection diagrams").

The DTS 4020 can be configured to run as a PTP Slave. It communicates via the Ethernet ports by sending PTP packets with current time and synchronization information.

Connectors:	Ethernet via 1x RJ45 referring to Appendix "A Connection diagrams"
PTP Version:	PTP V2 according to IEEE 1588-2008, PTP V1 is not supported
Delay Mechanism:	P2P (Peer-to-Peer), E2E (End-to-End)
Transmission mode:	IPv4, IPv6, Layer2, UDP, Multicast and Unicast according to definition IEEE 1588-2008
Master-Slave:	Slave only
Clock Mode:	"2 step" or "1 step"
Profiles:	IEEE 1588 default Profile (E2E and P2P), ITU-T G8275.1, ITU-T G8275.2
SNMP:	no specific PTP SNMP MIB

8.11 Synchronous Ethernet (SyncE)

With SyncE, devices in an Ethernet Network can synchronize their clock to the frequency used to transmit the network packets. The DTS 4020 supports SyncE compatible to ITU G.8262/Y1362. It is available on 1 network interface (see Appendix A Connection diagrams).

The DTS 4020 can be configured to run as a SyncE slave only. It receives the SyncE information over Layer2 packets (ESMC), with the current quality level information.

Connectors: Ethernet via 1x RJ45 port
referring to Appendix A Connection diagrams

Transmission mode: Layer2

Quality Level: Master Level + 1

8.12 Oscillator

During the start-up, the oscillator has to warm-up. The device waits for the oscillator to lock/stabilize.

8.13 Logfile Synchronization status

The DTS 4020 provides a logfile under `/ram/date-wd.log` (e.g. `/ram/20181114-Wed.log`) about the synchronization status seven days back. The Log interval is 1 minute. The maximum value of this 1 minute is written to the file.

Example:

Date&Time	UTC	Offset	PTP	Offset	SyncE	Offset	Freq.	Offset	NTP
141118	000000	104	(+)		0	()	0	()	96 (*)
141118	000001	104	(+)		0	()	0	()	96 (*)
141118	000002	104	(+)		0	()	0	()	96 (*)

(*) = active source

➔ Please see chapter 7.6 how to make an ftp connection to the device.

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, DTS4020).



Notice: For detailed SNMP parameters please refer to MIB file.
See also end of this page.

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

Read only:	<i>romobatetime</i>
Read/Write:	<i>rwmobatetime</i>
Trap:	<i>trapmobatetime</i>

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

<i>dtsUser1</i>	<i>mobatetime</i>	
<i>dtsUser2</i>	<i>mobatetime</i>	
<i>dtsInfo</i>	<i>mobatetime</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 and 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

DTS4020 (DTS4020-MIB.TXT)

Device-specific DTS definitions

MIB-Files copy from DTS device:

The MIB files can be copied from the DTS 4020 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 *mts4020????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 *mts4020????ConfigCmd* variable to 2 (2=undo, restore).

After sending the accept command, a *mts4020ConfigChanged Notification* is sent.

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

Example:

Management-System		DTS
<i>Put</i> mts4020FTPMode=1	→	Variable is set to 1 internally
<i>Put</i> mts4020NetServicesConfigCmd=1	→	Configuration group is assumed
	←	Sends <i>mts4020ConfigChanged Notification</i> with the new time <i>mts4020NetConfigChangedTime</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

[mts4020StartUp]

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

[mts4020Shutdown]

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

[dts4020StatusChanged]

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

dts4020SysStatus, dts4020NTPTInfoCurrentSource, dts4020SysStratum

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
dts4020SysStatus	Unsigned Int	4 Bytes	Contains the internal system status	66309
dts4020TimeInfoSourceOffsetN Sec	Integer	4 Bytes	Actual time offset of the system [ns]	-28 → -28ns
dts4020TimeInfoStratum	Byte	1 Byte	Actual system stratum level	2
dts4020TimeInfoTimeSource	Byte	1 Byte	Actual time source	1

9.3.4 Configuration changed

[dts4020ConfigChanged]

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
dts4020SysConfigChangedTime	TimeTicks	4 Bytes	dts4020System
dts4020NetworkPortConfigChangedTime	TimeTicks	4 Bytes	dts4020NetworkPortEntry
dts4020NetworkIPCfgConfigChangedTime	TimeTicks	4 Bytes	dts4020NetworkIPCfgEntry
dts4020NetworkVLANConfigChangedTime	TimeTicks	4 Bytes	dts4020NetworkVLANCfgEntry
dts4020NetServicesConfigChangedTime	TimeTicks	4 Bytes	dts4020NetServices
dts4020TSConfigChangedTime	TimeTicks	4 Bytes	dts4020TimeSource
dts4020NTPConfigChangedTime	TimeTicks	4 Bytes	dts4020TimeNTPServer
dts4020PTPConfigChangedTime	TimeTicks	4 Bytes	dts4020TimePTPConfig
dts4020OutLinePulseFREQConfigChangedTime	TimeTicks	4 Bytes	dts4020OutLinePulseFREQ
dts4020OutLineAnalogPulseFREQConfigChange dTime	TimeTicks	4 Bytes	dts4020OutLineAnalogPulseFR EQ
dts4020OutTimeOfDayOutConfigChangedTime	TimeTicks	4 Bytes	dts4020OutLineToD
dts4020RelayConfigChangedTime	TimeTicks	4 Bytes	dts4020AlarmRelayConfig
dts4020MailConfigChangedTime	TimeTicks	4 Bytes	dts4020AlarmMailConfig
dts4020SnmppConfigChangedTime	TimeTicks	4 Bytes	dts4020SnmppConfig
dts4020SnmppV3ConfigChangedTime	TimeTicks	4 Bytes	dts4020SnmppV3

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

[dts4020Alive]

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
dts4020SysStatus	Unsigned Int	4 Bytes	Contains the internal system status	66309
dts4020SysAlarms	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

[dts4020Alarm]

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
dts4020TrapAlMsgErrorNr	Byte	1 Byte	No. of the alarm bit (0..63)	3
dts4020TrapAlMsgErrorState	Byte	1 Byte	0 = alarm bit was deleted 1 = alarm bit was set	1
dts4020TrapAlMsgErrorTime	Unsigned Int	4 Bytes	PC-time in seconds since 01.01.1970 00:00:00	946684805
dts4020TrapAlMsgErrorText	Text	59 Bytes	Error text	Failure supply 1

10 Redundant Power supply

The DTS 4020 allows different options for a 2nd power supply for redundant power supply operation:

- Options 1: DC/DC Power Supply
- Options 2: AC/DC Power Supply
- Options 3: Power over Ethernet (PoE)

1. Non-redundant power supply:

Only one power connector is plugged in on connector Power Supply1



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

2. Redundant power supply:

A 2nd power connector is plugged in on connector Power Supply2 or PoE is available on LAN1 interface.

Supply is checked once per minute for correct functioning.

→ The alarm 03: 'Failure red. Supply' is set in case of error.

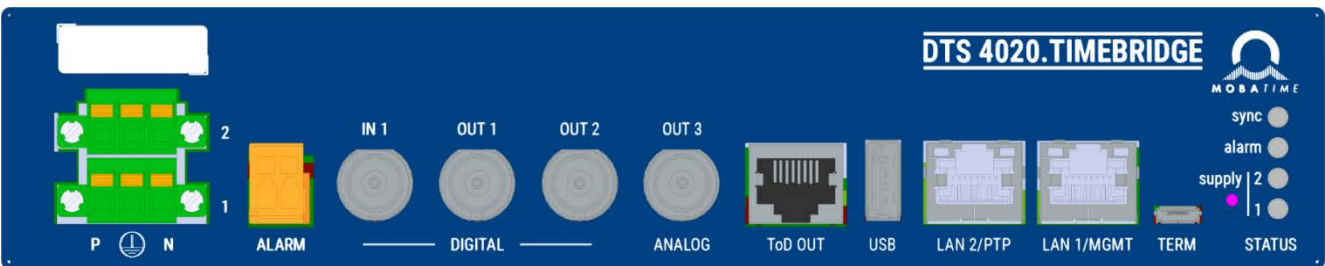


Notice: In the menu: '2 Configuration' → '4 General' → '3 Power' must be set to '1=redundant'.




Notice: All power supply inputs are working and can be used regardless of the configuration. The configuration advises the DTS to supervise both power supplies and generate a possible alarm.

A Connection diagrams



A.1 Power Supply Connection



The diagram shows a green power supply unit with two rows of terminals. The top row is labeled '2' and the bottom row is labeled '1'. Each row has three terminals: a positive terminal (P), a chassis ground terminal (Earth), and a negative terminal (N). A clock icon is shown below the bottom row of terminals.


Power Supply 2

Connection	Description
P	Positive input for power supply
Earth	Chassis Ground
N	Negative input for power supply

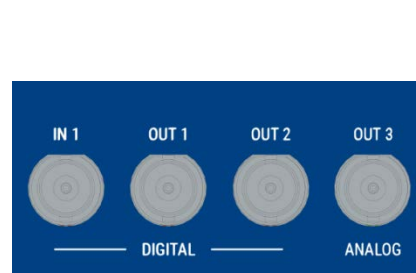
Power Supply 1

Connection	Description
P	Positive input for power supply
Earth	Chassis Ground
N	Negative input for power supply

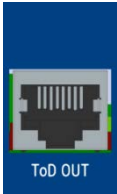
A.2 Alarm contact

	Alarm contact: Max. load:	open when alarm is active see Appendix F Technical data
---	------------------------------	--

A.3 Time and Frequency Signals

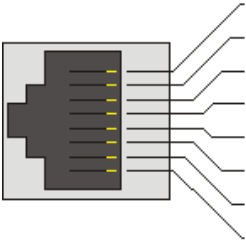
	Connection	Description
	Input 1 BNC female	Pulse and frequency input 50 Ohms
	Output 1 BNC female	IRIG digital, pulse and frequency output 50 Ohms
	Output 2 BNC female	IRIG digital, pulse and frequency output 50 Ohms
	Output 3 BNC female	10MHz sinus and IRIG analogue output 50 Ohms

A.4 Time of Day



ToD OUT

RJ45



RS422 output line for 1 PPS pulse
RS422 output for serial telegram

Pin1: nc
Pin2: nc
Pin3: 1PPS-
Pin4: GND
Pin5: GND
Pin6: 1PPS+
Pin7: ToD-
Pin8: ToD+

A.5 USB connection:



USB

Plug:

USB host



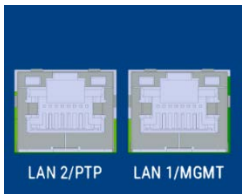
Notice:

Only permitted for operations with a USB stick!

A.6 LAN Interfaces

The LAN interfaces supports the following specification

A.7



	100/1000MBit	NTP / SNTP	SyncE	PTP 2-Step	PTP 1-Step	Configuration Supervision (SNMP, Telnet, SSH)	Multiple IP addresses	802.1Q tagged VLAN	802.1p prioritized VLAN
LAN1	✓	✓				✓	✓	✓	✓
LAN2	✓	✓	✓	✓	✓	✓	✓	✓	✓

A.8 PC - Terminal Connection “TERM”:



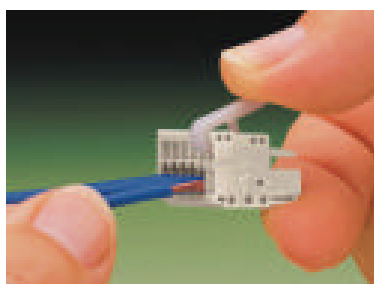
Type of connector:	Micro USB
Interface:	RS232
Baud rate:	38400 Bauds
Data Bits:	8
Parity:	no
Stop Bit:	1
Flow control:	no

Cable DTS 4020 – PC: Standard Micro USB cable
Max. length of the connection 3m

A.9 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 UL/CSA 300 V / current UL/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:



B Alarm list

Nr.	Error message	Description	Action	Chap.
0	Reboot DTS	DTS 4020 restarted	➔ no intervention required	
1	System warning	Internal System Warning	Check dts.log for detail Warning information	
2	Supply voltage too low	Power failure (internally measured)	➔ support	
3	Failure red. supply	Power failure redundant supply (only if redundant supply is on)	➔ Check in the menu which power supply fails	
4	Internal voltage to low	Power failure (internally measured)	➔ support	
5	Error bit 5	Not used		
6	To high offset to PTP	To high offset to PTP	➔ check PTP time source	
7	Error bit 7	Not used		
8	Too high offset to FREQ	To high offset to Frequency-In	➔ check FREQ time source	
9	Too high offset to E1	To high offset to E1	➔ check E1 time source	
10	PTP synch lost		➔ check PTP time source	
11	Error bit 11	Not used		
12	FREQ synch lost		➔ check FREQ time source	
13	Error bit 13	Not used		
14	Error bit 14	Not used		
15	Time source big offset	Big offset to time source detected	➔ check time source	
16	Time source fail stratum	Stratum too high	➔ check time source	
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, 6.5.10
18	No valid time	20 min after starting no valid time	➔ Check time source	6.5.9
19	NTP synch lost		➔ Check NTP configuration	
20	Too high offset to NTP		➔ Check NTP time source	
21	NTP Error	NTP not running	➔ Check NTP configuration	
22	Error bit 22	Not used		
23	No valid time source		➔ Check synchronization and source settings	6.5.10
24	No mail server	No connection to configured mail server	➔ Check e-mail configuration, check connection	6.5.21
25	SNMP Error	SNMP not running	➔ Check SNMP and trap configuration	6.5.22
26	Error bit26	Not used		
27	Error bit27	Not used		
28	Error bit28	Not used		
29	NTP Configuration Error	Configured NTP Authentication Key is not correct	➔ Check the configured NTP trusted keys against imported key file. ➔ Check the configured keys for multicast against configured trusted keys ➔ see dts.log file for details	6.5.12
30	Error bit 30	Not used		
31	Error bit 31	Not used		
32	Error bit 32	Not used		
33	Error bit 33	Not used		
34	Oscillator not locked	During start-up / first time synch: During normal operation:	➔ normal behavior, no action ➔ support	Oscillator not locked

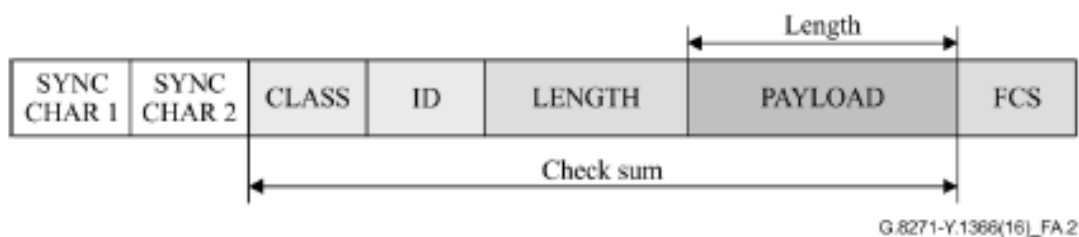
35	SyncE not running			
36	PTP not running	PTP not running	➔ Check PTP configuration	6.5.14
37	Error bit37	Not used		
38	Error bit38	Not used		
39	Error bit39	Not used		
40	Error bit40	Not used		
41	Error bit41	Not used		
42	Error bit42	Not used		
43	Error bit43	Not used		
44	Error bit44	Not used		
45	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		

C Troubleshooting

	Error	→	→	Solution / possible cause
1	DTS 4020 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).
2	LAN LED (left one) is off.	No connection to the network.		Check network cabling.
3	Opening the menu via SSH is not possible or DTS 4020. timebridge is not or no longer reachable via network.			Check network settings in menu 2 Configuration → 5 Network (only possible with serial connection): - 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.
4	System software update			The system software can be updated using FTP client software or a USB stick (s. chapter 7 Updates). Your MOBATIME service informs you of use and necessity of a software update. If necessary, they can provide the needed firmware file.
5	Needed information to contact your MOBATIME service			Device type, part number, production number and serial number: These details are given on the adhesive type label. If possible provide the following files for the analysis: All files from the directories <i>/var/log/</i> and <i>/etc/</i> To copy this files use FTP, e.g. Windows Explorer with ftp://dts@[IP address], see chapter 7.6. If the log files cannot be copied, please read out the current software version: The software version can be queried in the menu 1 STATUS/9 Versions of the software Place and date of purchase and of commissioning of the device. Most comprehensive possible details of the malfunction: Describe the problem, possible causes, measures taken, the system environment / operating mode and configuration, etc.

D ToD (Time of Day) Protocol Specification

The Time of Day message structure is as shown below (according to G.8271 / Y.1366):



D.1 CCSA ToD protocol Time info message

CCSA is commonly known as "China Mobile" ToD protocol and is supported by a variety of equipment manufacturers.

ToD message structure CCSA

Description	Length	expected value
Sync char #1	1 byte	0x43
Sync char #2	1 byte	0x4D
Class	1 byte	0x01 basic type of ToD message
ID	1 byte	0x20 subtype of each class of ToD message
Length	2 byte	Payload excluding Sync, length and FCS bytes in Little Endian Format
Payload	n/a	
Checksum	1 byte	FCs, CRC

CCSA Time info message payload:

Byte Offset	Length	Name	Value
0	4	Second time of week	GPS time of week in second
4	4	Reserve	n/a
8	2	Week	GPS week (GPS time)
10	1	LeapSecond	Leap Seconds (GPS-UTC)
11	1	1PPS status	0x00 Normal* (synchronized to PRTC – time traceable) Any value ≠0x00: Not synchronized to PRTC – time not traceable.
12	1	TAcc	Jitter level of 1PPS (0-255): Not used as not implemented

13	1	Reserved	n/a
14	1	Reserved	n/a
15	1	Reserved	n/a

D.2 ITU-T Time event message

ITU-T Time event message payload:

Byte Offset	Length	Name	Value
0	6	Time	PTP seconds (unsigned 48-bit integer)
6	1	Reserved	n/a
7	1	Flags	Bit 0: leap61 – Positive Leap Second pending Bit 1: leap59 – Negative Leap Second pending Bit 2: UTC offset valid Bit 3: Reserved Bit 4: timeTraceable – time traceable to a primary time standard Bit 5: frequencyTraceable – frequency traceable to a primary frequency standard Bits 6, 7: Reserved
8	2	currentUTCOffset	Current value of the offset between TAI and UTC (i.e., TAI – UTC)
10	4	Reserved	n/a

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U-Boot	Boot loader	2018.01	GPL version 2	COPYING
Linux	Operating system	4.19.0	GPL version 2	COPYING
Busybox	System environment	1.30.1	GPL version 2	LICENSE
NTP	NTP	4.2.8p13	Free	COPYRIGHT
PTP4I	PTP	2.0	GPL version 2	COPYING
pure-ftp	FTP server	1.0.48	Free, partly BSD	COPYING
NetSNMP	SNMP agent	5.7.3	BSD	COPYING
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F Technical data

Dimensions 19" Half Rack, 1HU x 14PU (H x W x D [mm]) = 43 x 221 x 252

Weight approx. 2.0 kg

Ambient temperature 0 to 50°C, 10-90% relative humidity, without condensation

MTBF > 250'000 h

Expected lifetime > 10 years, typical > 15 years

Operation Telnet / SSH / MOBA-NMS (via LAN).
In addition, operation is also possible with SNMP.

Accuracy

Internal accuracy:	PTP to internal time	typ. < +/- 100ns
	SyncE to internal time	typ. < +/- 200ns (frequency only)
	Freq to internal time	typ. < +/- 200ns (frequency only)
Source to output:	PTP to NTP:	typ. < +/- 100 µs
	PTP to Pulse:	typ. < +/- 100 ns
	PTP to ToD:	typ. < +/- 100 ns



Notice: NTP reception (DTS 4020 as server to external NTP 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 server

NTP V4	(fully V3 compatible, RFC 1305), RFC 5905 (Port 123)
SNTP	(UDP), RFC 4330 (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)

Max. number of NTP and SNTP client requests:
> 10'000 requests / sec. per device
(e.g. client request every 60 sec. ➔ 600'000 clients)

NTP mode Server, Peer, Broadcast, Multicast

PTP

- Standard: IEEE 1588-2008 (V2, no V1)
- P2P, E2E
- IPv4, IPv6, Layer2, UDP, multicast and unicast according to definition IEEE 1588
- Slave only
- 1-step and 2-step mode
- availability of management messages limited: requests only
- profile: default (E2E & P2P), ITU-T G.8275.1, ITU-T G.8275.2
- no specific PTP SNMP MIB

VLAN All LAN ports: 802.1Q (tagged VLAN) and 802.1p (prioritized VLAN)
2 VLANs per port can be defined (max. 4 VLANs)

2 Network interfaces 100/1000BaseT
Data transmission rate: Auto-negotiation / manual
Connection: RJ-45
Only shielded cables are 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		
Time signal outputs	NTP V4 (unicast and multicast)		
	1 x Time of Day (ToD) output		
	2 x Pulse / frequency digital output, BNC 50Ohm		
	1 x Pulse / frequency analog output, BNC 50Ohm		
Pulse / frequency digital	2 outputs for technical impulses, BNC connector 50 Ohms 10MHz, 2Hz, 1 PPS (Pulse per second) or IRIG possible (no load: 5 V, with 50 Ohms load: 2.5 V)		
Pulse / frequency analog	1 high precision IRIG analog output or 10MHz sinus		
	Accuracy of the signal according to standard:		
	DC level pulse rise time between the		
	10% and 90% amplitude points:		$\leq 1 \mu s$
	Jitter modulated at carrier frequency:		$\leq 1\%$
	DC level jitter pulse-to-pulse:		$\leq 200 ns$
	Line mode: IRIG-B122, IRIG-B Std 12h (B122), IRIG-E122 DIEM, IRIG-B123, IRIG-B DIEM, AFNOR A, AFNOR C, DCF-FSK, IRIG-B126 (127), IRIG-B002, IRIG-B003, IRIG-B006 (007)		
	IRIG analog: output voltage level		
	($R_L=50 \Omega$):		4 Vpp
	SNR_{dB} :		typical $\geq 40dB$
	Impedance:		$R_i < 50 \Omega$
	IRIG digital:		50 Ω TTL driver output
Frequency in	Future option		
USB plug	USB host for USB stick		

Alarm contact	Opening relay contact (Alarm active ➔ contact open). Breaking capacity: max. 30 W (DC) or 60 VA (AC) max. 60 VDC or 1 A / 30 VAC or 1 A		
Alarm reporting / Error reporting	Alarm contact	see Alarm contact	
	E-mail	see E-mail	
	SNMP notification	see SNMP trap	
	Display	see Display	
	Alarm-LED	-	
DC power supply:	24 – 60 VDC	+20% / -10%	<10W
AC power supply	100 – 240 VAC	+/-10% / 50 – 60 Hz	<10 VA

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