



High precision time server and grandmaster

DTS 4150.grandmaster

The DTS 4150.grandmaster is a combined time distribution and synchronization device with up to 4 network ports (IPv4/IPv6). With its high-precision and intelligent concept for redundant operation, it offers a high degree of reliability and availability.

Your benefits using DTS 4150.grandmaster:

- 4 completely separated LAN ports (3x RJ45, 1x SFP):
 - provide PTP on 3 ports
 - 1- and 2-step master
 - different profiles and domains per port
 - multicast/unicast
 - IPv4/IPv6/Layer 2
 - provide NTP on 4 ports (>10'000 requests/s on all 4 ports combined)
- Outputs:
 - 1x DCF / 1PPS
- High degree of system redundancy by connecting two DTS 4150 via fiber-optic link:
 - high availability
 - master-slave operation with automatic switch over in case of an error
- High degree of synchronization redundancy by connecting up to 4 time sources: GNSS, Link, PTP, DCF

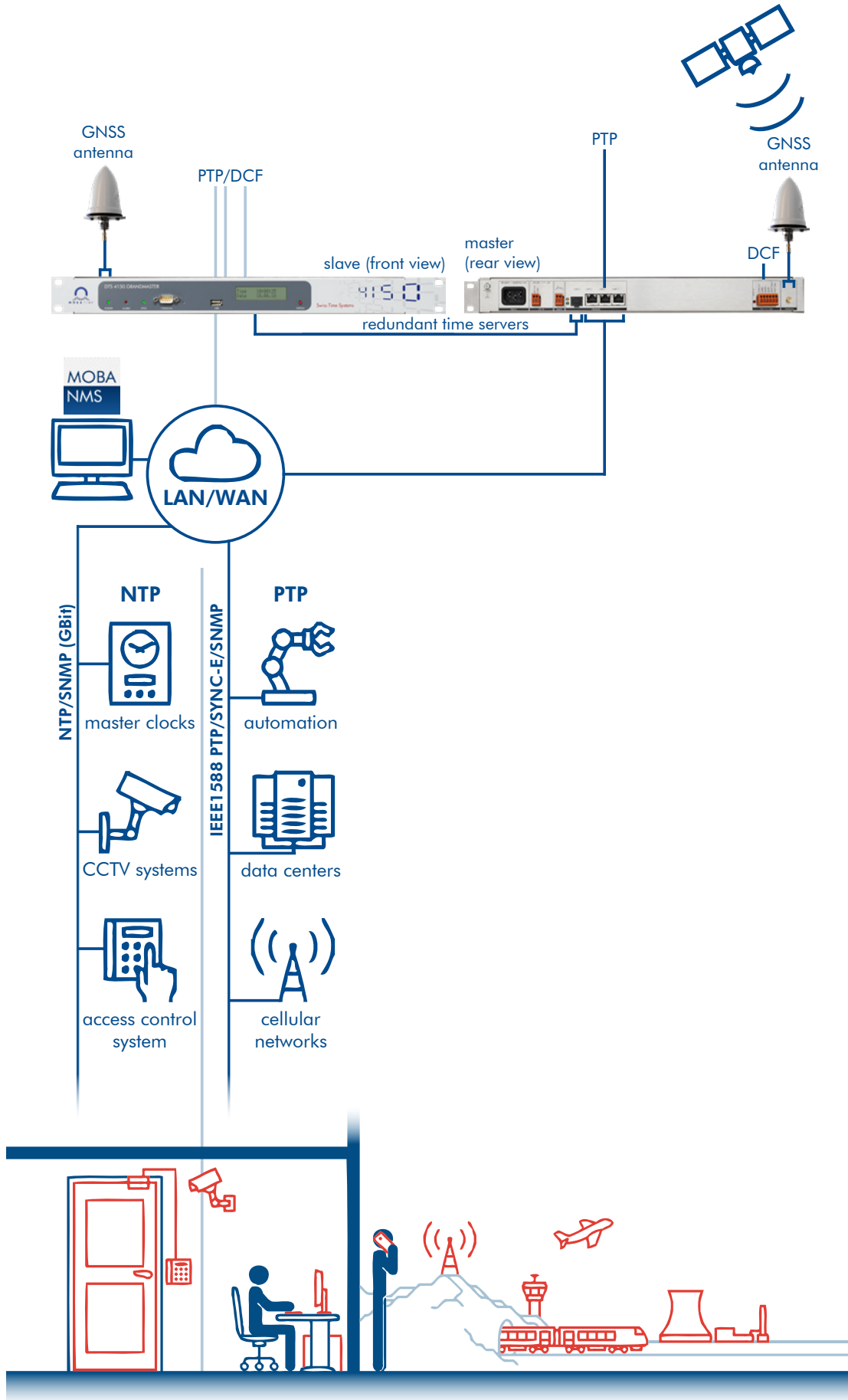
DTS 4150.grandmaster - Technical details

General specifications			
System	CPU	ARM Cortex dual core	
Housing	Dimensions (W x H x D)	483 x 44 x 190 mm	19", 1 HU
	Weight	approx. 1.9 kg	
Display	LCD, 2 lines, for status and time info	✓	
LAN interfaces	100/1000 MBit, RJ45	3	3 maintenance ports
	SFP for miniGBIC module 100/1000Base-T(X) or FX	1	May be used for: - redundant operation (see redundant link) - Optical network for NTP/PTP
Redundant link	For redundant operation of 2 corresponding DTS 4150 with master/slave negotiation	✓	Option to additional network port. See also LAN interfaces miniGBIC/SFP
RS 232 interface	For operation control, D-Sub 9 connector	1	
USB interface	For firmware update	1	
Power supply	Redundant power supply	✓	
	Supply 1 (standard mains connector for 240VAC)	240VAC	
	Supply 2	22..29 VDC	
Ambient temperature	at 10-90% relative humidity, without condensation	0 to 50°C	
Reference signal inputs			
	GNSS RF input (for GNSS Antenna, SMA female connector) to internal GNSS receiver 72 channels, tracking sensitivity -165 dBm	1	
	Optical link from second DTS 4150.grandmaster (SFP)	1	
	PTP (from other grandmaster)	3 (2 if optical link is used for redundant link)	
	DCF (GNSS 4500 / synthetic DCF)	1	
	NTP/SNTP client	4	
Reference signal outputs			
Network	NTP server	>10'000req/s	on all 4 ports combined
	PTP Grandmaster (E2E, P2P, 1-step, 2-step, Multicast, Layer 2, IPv4/IPv6)	RJ45 over 2x 1Gbit port SFP over 1Gbit port	
	PTP profiles: default E2E, P2P, utility (61850-9-3), IEEE 802.1AS		
	SyncE	see PTP Grandmaster	
Others	DCF 77 CL (Current loop) passive output (2 pin terminal) / 1PPS	1	
Network services			
	PTP master IEEE1588-2008 (V2) 1 or 2-step	✓	2x RJ45 1x SFP
	SyncE master	✓	
	NTP V4 (V3 compatible) server	✓	
	NTP mode Server, Peer, Broadcast, Multicast	✓	
	SNTP	✓	
	MD5 authentication for NTP	✓	
	TIME, DAYTIME	✓	
	Telnet, SSH, FTP, SCP, SFTP - disengageable	✓	maintenance ports only
	SNMP Notifications (Traps)	V1/V2c	maintenance ports only
	SNMP Get, Put	V1/V2c/V3	maintenance ports only
	IP V6 support	✓	
	Link Aggregation (IEEE 802.3 ad)	✓	over 2 dedicated LAN interfaces (LAN 2 & 3)
	VLAN	✓	
IP configuration			
IPv4	DHCP	✓	
	static IP	✓	
IPv6	Autoconfiguration	✓	
	static IP	✓	
	DHCPv6	✓	

Alarm I/O			
Electrical	Output: Relay contact	✓	
	Output: SNMP notifications (traps)	V1/V2c	maintenance ports only
Network	Output: Mail	✓	maintenance ports only
	Supervision possible with MOBA-NMS EXPERT (DSS)	✓	maintenance ports only
Oscillator			
	Hold over (after >24h synch. from GNSS) at constant temperature	< ± 1ms / day (<0.01 ppm)	
	Hold over (after >24h synch. from GNSS) at 20°C ± 5°C	< ± 10ms / day (<0.1 ppm)	
	After restart without synchronization (for 24h) at 20°C ± 5°C	< ± 250ms / day (<2.5ppm)	
Accuracy			
Internal accuracy	GNSS to internal time	typ. < +/- 30ns ¹	@ constant ambient temperature
Time source input	GNSS to NTP	typ. < +/- 100µs	@ constant ambient temperature
	GNSS to PTP	typ. < +/- 250ns	@ constant ambient temperature
	GNSS to DCF	typ. < +/- 5µs	@ constant ambient temperature
	SyncE	compatible	@ constant ambient temperature
Operation control			
	MOBA-NMS	✓	maintenance ports only
	Telnet	✓	maintenance ports only
	SSH	✓	maintenance ports only
	SNMP (V1/V2c/V3 get, put)	✓	maintenance ports only
	RS 232 (terminal)	✓	
	LED Alarm	✓	
	LED Power	✓	
	LED Sync	✓	
Compliance			
	EMC: EN 50121-4, 61000-6-4, EN 61000-6-2	✓	
	Safety: IEC 62368	✓	
	CB	✓	
	IEEE 1588-2008	✓	
	NTP RFC 5905	✓	
	IEC 61850	✓	applicable for SNTP/NTP/PTP synchronization only

¹ Only with the internal GNSS module and good satellite reception

DTS 4150.grandmaster - Application example



DTS 4150.grandmaster - Redundant operation

Primary time source

Any of the reference time sources can act as primary time reference to which a grandmaster can synchronize to. Every source the user configures is simultaneously validated by the grandmaster. Two modes are possible: manual (default) and automatic. In manual mode, the grandmaster uses the user-defined priority list for choosing the best source as reference.

In automatic mode, the priority list is generated automatically based on an accuracy rating estimation of all sources.

Redundant time

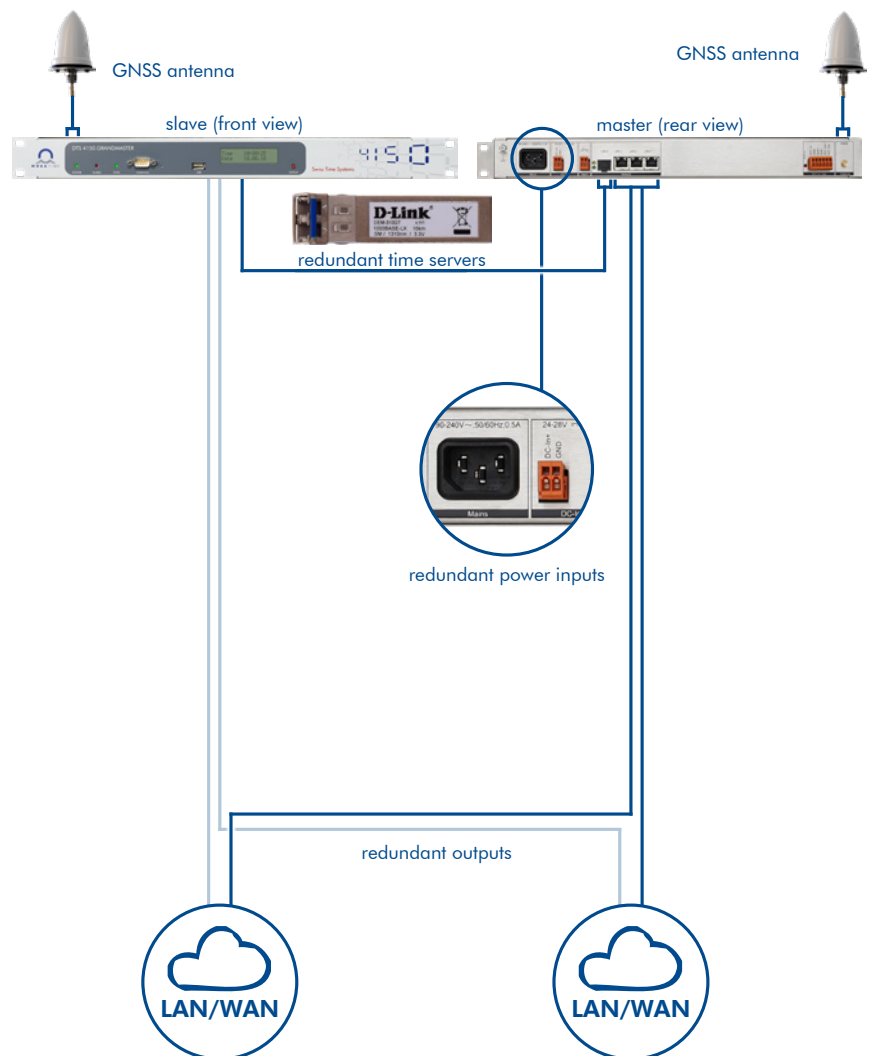
To avoid time deviation between two DTS 4150.grandmasters, they can be linked via a fiber-optic connection by using two GBIC modules. Ideally, both grandmasters use GNSS as primary time reference, but any time reference source can be chosen as primary time reference.

The two grandmasters automatically negotiate their state as master or slave. The slave is synchronized by the master as soon as any better rated/prioritized source has a failure. Swap between master and slave state will occur automatic.

Redundant outputs

If the slave PTP Grandmaster is in passive mode, it does not provide PTP to the network.

Frequency and time code outputs are generated on both devices all the time.



Redundant power

The DTS 4150.grandmaster has three monitored inputs for entirely redundant power supply. The standby power supply input is also monitored.

Possible power variants:

- 24 VDC, non-redundant
- 230 VAC + 24 VDC, redundant
- 230 VAC, non-redundant

DTS 4150.grandmaster - Features

Time precision

Utmost accuracy is achieved with GNSS synchronization. An intelligent time management ensures lasting high accuracy by continuously compensating oscillator drift and aging.

The internal time is adjusted to the active time reference (e.g. GNSS) slowly shifted (in adjustable micro steps) to avoid any time leaps (e.g. after a longer loss of the time source).

Top performance for large networks

The high performance DTS 4150.grandmaster can reply to more than 10'000 NTP and SNTP requests per second, which allows for the synchronization of several thousand clients.

NTP authentication

The DTS 4150 supports NTP authentication for increased security, which allows the clients to verify the source of the received NTP packets.

Safe and convenient operation

Operation over LAN via MOBA-NMS (SNMP), SSH or SNMP protocols is possible. SSH and SNMP (MD5 authentication and DES for encryption) enable a secured connection. Additional connection over RS232 is possible.

PTP Grandmaster

PTP according to IEEE 1588-2008 for the synchronization of highly accurate clients.

Alarm indication

Alarms are reported via SNMP messages, e-mail or by alarm relay. Additionally, the alarm is indicated on the display and on the Alarm LED.



▲ Front view

- Serial Terminal for operation (RS232)
- USB connector for software update, file upload and maintenance
- Status LEDs for power, alarm and synchronization
- Display to show time, date, status, alarm, IP address..



▲ Rear view

- Power: 1x mains power connector, 1x DC power supply input
- alarm relay contact
- Synch. inputs
 - GNSS
 - Redundant link
 - PTP
 - DCF
- Synch. outputs
 - 1x DCF
- LAN connectors
 - 3x RJ45 100/1000MBit
 - 1x SFP
- GNSS antenna connector (SMA female)