High precision time server, grandmaster and PRC

DTS 4160.grandmaster

The DTS 4160.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 4160.grandmaster:

- Up to 4 completely separated LAN ports:
  - provides NTP in different networks (more than 10000 requests/s per DTS 4160)
  - provides PTP in different networks

- Multi-purpose device due to the different time code outputs:
  - 1x E1
  - 2x serial RS 232 / RS 422 / RS 485 interface
  - 1x pulse/frequency output
  - 1x DCF current loop output
  - 1x IRIG-B
- High degree of system redundancy by connecting two DTS 4160 via fiber-optic link:
  - high availability
  - master-slave operation with automatic switch over in case of an error
- High precision time:
  - Time reception from GPS, GLONASS or Beidou
  - rubidium oscillator for holdover (option)

DTS 4160.grandmaster - Redundant operation

Description

To avoid time deviation between two DTS 4160.grandmasters, they can be linked via a fiber-optic connection by using two GBIC modules.

The two timecenters automatically negotiate their state as master or slave. The slave is always synchronized by the master. In case of a failure of the synchronization source (GPS or NTP), automatic swap between master and slave state will occur. The parameters for the swap can be configured.The "master" DTS time server always has the better NTP stratum level than the slave.
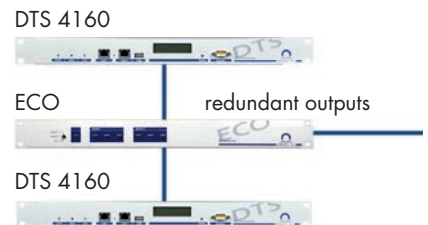
Redundant power

The DTS 4160.grandmaster has two monitored inputs for entirely redundant power supply. The stand-by power supply input is also monitored. Possible power variants:

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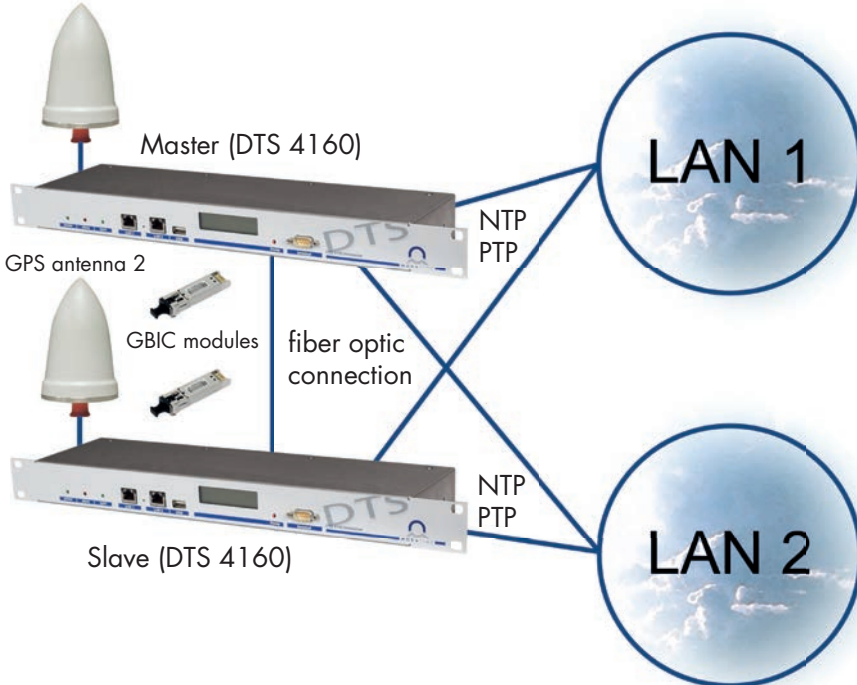- 230 VAC + 24 VDC, redundant

Redundant outputs

Redundant serial telegram, DCF and/or pulse/frequency outputs can be achieved by the external change over unit (ECO).

DTS 4160

ECO   redundant outputs

DTS 4160

Redundant operation with GPS synchronisation source

GPS antenna 1

Master (DTS 4160)

NTP PTP

LAN 1

GPS antenna 2

GBIC modules

fiber optic connection

NTP PTP

LAN 2

Slave (DTS 4160)

Redundant power

Monitored power inputs

85-265 VAC

24 VDC

24 VDC

DTS 4160.grandmaster - Features

Time precision

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

The internal time is adjusted to the time reference (e.g. GPS) in one step or 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 4160.grandmaster can reply more than 10000 NTP and SNTP requests per second, which allows for the synchronization of several thousand clients.

PTP Grandmaster

PTP according to IEEE 1588-2008 for the synchronization of highly accurate clients. Usable for telecom (e.g. LTE), energy (e.g. smart grid), automation, …

NTP authentication

The DTS 4160 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), Telnet, SSH or SNMP protocols is possible. SSH and SNMP (MD5 authentication and DES for encryption) enable a secured connection. Special software is required for operation by SNMP protocol.

Fault indication

Alarms are reported via SNMP messages, e-mail or by alarm relay.
Additionally, the display can be used to check the alarm state by pressing the red push button.

Front view
Connectors:
- USB connector for software update, file upload to the time server (e.g. telegram files, time zone table…) and maintenance
- 2x LAN connector RJ45 10/100/ 1000MBit
- PC terminal connector, RS 232 Sub D 9p male

LEDs: Power, alarm and synchronization.

Display: Time, date, status, alarm, IP…

Rear view
Connectors:
- Power: Mains power connector, 2x DC power supply input
- Alarm: alarm relay contact
- Synch. outputs:
  - 1x E1
  - 2x serial RS 232 / RS 422 / RS 485 interfaces
  - 1x DCF current loop output
  - 1x IRIG-B
  - 1x frequency/pulse output
- LAN connectors:
  - 1x RJ45 10/100MBit
  - 1x SFP
- GPS antenna connector BNC

E1 output as PRC
Frequency output according to ITU G.703 for SOH/SONET networks.

Available 4th quarter 2016

DTS 4160.grandmaster - Technical details

Specifications			
Architecture	Controller module	ARM Cortex Board	FPGA included
	Oscillator	OCXO or Rubidium	see oscillator options below
Housing	19", 1 HE	✓	
Display	LCD, 2 lines, 20 character each, for status and time info	✓	
LAN interfaces	10/100/1000 MBit, RJ45	2	
	10/100 MBit, RJ45	1	
	SFP	1	May be used for: -For redundant operation. See redundant link. -Optical network -Additional network interface miniGBIC module is a not included option.
RS 232 interface	For operation control, D-Sub 9 connector	1	
USB interface	For firmware update	1	
Redundant link	For redundant operation of 2 corresponding devices with master/slave negotiation	✓	Option to additional network port. See also LAN interfaces miniGBIC/SFP
Power supply	Redundant power supply (supply 1 and 2)	✓	
	Supply 1 (standard mains connector for 240VAC)	240VAC or 22..29 VDC	
	Optional supply 1 with screw terminals for 240VAC/110VDC	240VAC, 110VDC or 22..29 VDC	function not yet available*
	Supply 2	22..29 VDC	
Power output	Supply for GPS 4500 receiver	24VDC	
Reference signal inputs			
	NTP / SNTP servers	4	
	IRIG-B (analog/digital)	none	
	PTP slave	✓	function not yet available*
	DCF 77 input (for GPS 4500, GNSS 3000, DCF 450 or DCF 4500)	✓ (reduced accuracy)	
	GPS RF input (for GPS Antenna, BNC connector) with internal GPS module. GPS, Glonass, Beidou included. Galileo planned for future with newer module version.	1	
	SyncE (over 1 front side port)	1 as "holdover" redundancy	SSM / ESMC function not yet available*
	1..10MHz configurable: E1 ,T1, 10MHz, 5MHz	1 as "holdover" redundancy	
	Optional to the above frequencies: Configurable free frequency according the following rule: 20'000'000 / Frequency = needs to be a even value		function not yet available*
Receivers / antennas	GPS 4500	connected to DCF 77 input	
	DCF 4500	connected to DCF 77 input	
	GNSS 3000	connected to DCF 77 input	
	GPS Antenna (internal GPS module)	connected to GPS RF input	

Reference signal outputs

Network			
	NTP server	>10000req/s for the DTS 4160 on one port or shared over all ports	
	NTP slave clocks + timezone server	over all ports	
	PTP Grandmaster (E2E, P2P, 1-step, 2-step, Unicast, Multicast, Layer 2)	over all ports 1-step only over one front side port	
	PTP profiles	default, utility	Optional: telecom
	SyncE	over 1 front side port	function not yet available*
	IRIG Digital	1	
Others	IRIG, AFNOR DCF/FSK	1 precision output, 50 Ohms (AM, DC connectors)	analog and digital
	DCF 77 CL (Current loop) passive output	1	
	Precision pulse/frequency/DCF output on RS422 and CL	1	
	Serial outputs with configurable time telegrams	2 RS 232/422/485 RS 422: output only	
	10 MHz (BNC connector)	1	
	E1 / 2.048MHz, G811, G.812, G813 according oscillator option, no protected output (1:1), no SSM	1	
	T1 / 1.544MHz option to E1 output	1	

Network interface

	10/100/1000BaseT	2	
	SFP for miniGBIC module 10/100/1000Base-T(X) or FX	1	
	10/100Base-T	1	

Network services

	PTP master IEEE1588-2008 (V2) 1 or 2-step	✓	
	SyncE master (over 1 front side port)	✓	When possible slave as holdover (ESMC)
	NTP client	✓	
	NTP V4 (V3 compatible) server	✓	
	NTP mode Server, Peer, Broadcast, Multicast	✓	
	SNTP	✓	
	MD5 authentication for NTP	✓	
	TIME, DAYTIME	✓	
	Telnet, SSH, FTP, SCP, SFTP - disengageable	✓	
	SNMP Notifications (Traps)	V2c/V3	
	SNMP Get, Put	V1/V2c/V3	
	IP V6 support	✓	
	Bonding		only for the 2 front side interfaces function not yet available*
	PRP		only for the 2 front side interfaces function not yet available*
	HSR		only for the 2 front side interfaces function not yet available*
	Remote user authentication (RADIUS, LDAP)		function not yet available*
	Remote logging (syslog)		function not yet available*
	VLAN (used in PTP applications, utility profile)		function not yet available*
	Anti spoofing protection		function not yet available*

IP configuration

	DHCP	✓	
	static IP	✓	

Alarm I/O			
	Output: Relay contact	✓	
	Output: SNMP notifications (traps)	V2c/V3	
	Output: Mail	✓	
	Supervision with MOBA-NMS / DSS possible	✓	
Oscillator			
different options: (long term stability)	TCXO 1*10-7		
	OCXO 1*10-8	Option a	G.813, G.812 IV
	OCXO 1*10-9		G.812 Type I, V, III, IV
	OCXO 1*10-10	Option b	G.812 Type: all
	Rubidium 3*10-11	Option c	G.811
	Hold over (after >24h synchronization) @ constant ambient temperature	according oscillator	for rubidium 1 week
Accuracy			
GPS RF input, internal module	GPS to NTP	typ. < +/- 0.1ms	
	GPS to PTP	typ. < +/- 0.00025ms	
	GPS to DCF	typ. < +/- 0.005ms	
	GPS to pulse output	typ. < +/- 0.005ms	
	GPS to pulse output (additional with improved accuracy)	typ. < +/- 0.0002ms	
	GPS to IRIG (analog)	typ. < +/- 0.2ms	
	GPS to IRIG (digital)	typ. < +/- 0.001ms	
	GPS to serial output	typ. < +/- 10ms (jitter 10ms)	
DCF 77 input with GPS module (GPS 4500 or GNSS 3000)	GPS to NTP	typ. < +/- 0.1ms	
	GPS to PTP	typ. < +/- 0.01 ms	
	GPS to DCF	typ. < +/- 0.01ms	
	GPS to pulse output	typ. < +/- 0.01ms	
	GPS to IRIG (analog)	typ. < +/- 0.2ms	
	GPS to IRIG (digital)	typ. < +/- 0.01ms	
	GPS to serial output	typ. < +/- 10ms (jitter 10ms)	
Redundant link	Master to slave (redundant operation) -for E1 output: 2 GPS are needed!	typ. < +/- 0.00025ms	
Real Time Clock			
	Real Time Clock (disengageable)	1	
Operation control			
	MOBA-NMS	✓	
	Telnet	✓	
	SSH	✓	
	RS 232 (PC-Terminal)	✓	
	SNMP (V2c/V3 get, put)	✓	
	LED Alarm	✓	
	LED Power	✓	
	LED Sync	✓	
	LED DCF in	✓	
	LED's network link	✓	
Compliancy			
	EMC: EN 50121-4, 61000-6-4, EN 61000-6-2	✓	
	Safety: IEC 60950-1	✓	
	CB	✓	
	G.703	✓	
	G.811, G.812, G.813	according oscillator option	
	IEEE 1588-2008	✓	
	IEC 61850	only NTP/PTP synch part	

*future solution possible