# A PTP Grandmaster with GPS, merged with a Precision Reference Generator



*The DXD series from Brainstorm is designed to ease the transition to IP. The flagship model **DXD-16** is a PTP Grandmaster clock with GPS receiver and a multi-format legacy reference generator. While working in a PTP environment, the DXD-16 keeps legacy equipment perfectly synchronized with the IP infrastructure, or vice-versa.*

## FEATURES

### Flexibility and easy integration
- Synchronizes to a PTP network, a GPS clock or a legacy reference
- PTP Grandmaster w/ 4 Ethernet ports
- 16 Universal Outputs: WC, AES, Video Sync, 10MHz

### Reliability
- Dual power sources w/ auto switch-over for redundancy
- Dual references w/ shock-free transitions in case of failure
- Battery back-up for internal TOD clock

### Security
- Independent Ethernet ports - no information flow between network ports

### Upgradable
- OCXO Oscillator
- Internal GPS Receiver
- SDI Input & Loop-Thru
- Time Code reader/generator

## NETWORK SYNC (1588 PTP)

The DXD-16 complies with IEEE 1588 PTP V2 and can be either a PTP Grandmaster, slave or Boundary Clock. PTP (Precision Time Protocol), defined in IEEE 1588, has been broadly adopted by manufacturers as a network synchronizing standard, which means that the DXD-16 can work in a number of systems. PTP profiles supported by the DXD-16 include AES67 and SMPTE 2059.

As a Boundary Clock, the DXD-16 can be a slave to a Grandmaster on one of its attached networks, synchronize its internal clocks to that Grandmaster, and distribute the same Grandmaster time in its role as PTP master to the remaining attached networks. Alternatively it can itself fulfill the function of Grandmaster and be PTP master on all attached networks.

The DXD-16 has four Gigabit Ethernet ports (RJ45). The different ports can be used independently or as primary and secondary pairs. Each network connector supports an electrically and logically independent network, with the DXD-16 acting as a PTP timing bridge. The DXD-16 is not a network switch, and for security reasons no information flows from any network port to any other.

## REFERENCE GENERATOR WITH UNIVERSAL OUTPUTS

The DXD-16 generates up to 6 independent sync pulses and clocks simultaneously and routes them to the 8 BNC universal outputs. **Universal Outputs** offer great flexibility compared to dedicated outputs as they can be configured for any of the generated legacy reference signals. This includes all standard SD and HD video sync formats (Black Burst and HD tri-level sync), word clock and AES-3id (at rates from 32 to 384 KHz, plus all the necessary pull-up/down, including 24:25 conversions, even VSO) and 10MHz.

A high-accuracy internal crystal oscillator (TCXO) provides a very stable frequency reference (+/- 1ppm). External legacy signals can also be used as reference, such as Word Clock, AES, Video Sync (SD & HD) or a 10MHz tone. The generated outputs have extremely low jitter. The output rates are independent from the reference rate which means that any rate can be extracted from any reference such as 59.97 from 25FPS for example.

## GNSS / GPS

An external GNSS/GPS receiver can be connected to the DXD-16 and provide the highly accurate and stable GPS clock and Time Of Day (TOD) as an external timing source. With this function multiple DXD-16's in remote locations will be locked to each other and in phase once they are GPS referenced. Optionally, an internal GPS receiver can be installed.

## RESILIENCE & REDUNDANCY

When using an external reference, a second source can be connected as fallback in case of failure. If the external reference becomes unusable, the DXD-16 continues generating, locked either to the alternate source or to the internal oscillator and re-locks to the reference when it reappears. These transitions occur smoothly and gradually with no sync shock to the system.

The internal time-of-day clock is battery backed-up to keep it running while power is off.

An internal 100-240 VAC power supply is provided as is a DC input for an external 12VDC source. The unit can operate with either of these power sources and either can act as a back-up for the other with auto switch-over in the event of a failure.

## ALARM & REMOTE CONTROL

GPI inputs (3) and outputs (3) are included.

All functions and settings can be monitored and altered via a web browser.

## OPTIONS

- **OCXO** (hardware): An oven-controlled-oscillator (OCXO) is available as an option, providing greater long-term time and TOD accuracy (+/-10ppb, which is less than +/-10 frames per year). The greater accuracy is also useful in GPS systems where extended GPS dropouts may be expected.

- **GNSS/GPS Receiver** (hardware): Instead of relying on an external receiver, an internal GNSS/GPS receiver can be installed. This option includes an SMA antenna input connector. (Antenna not included.)

- **SDI** (hardware): This option includes 2 BNC connectors: IN and LOOP THRU. Video sync can be extracted from the SDI input and used as a reference.  With the time code option, time code from the SDI input can be read and used as a source for the time code generator. The SDI Loop Thru signal can be either buffered or buffered and re-clocked.

- **Time Code** (firmware): Multiple time code streams can be generated simultaneously and routed to the BNC universal outputs and the 2 balanced time code outputs (DB25). Time code can be set by the user or derived from external sources with adjustable offset: LTC, VITC, GPS (TOD) or SDI (option).

# DXD-16 Universal Clock Specifications

## PTP

Complies with IEEE-1588 V2
Unicast / Multicast operation
Configurable as a Grandmaster, slave or Boundary clock
4 Independent Gigabit Ethernet ports (RJ-45)

## SYNCHRONIZATION SOURCES

GPS
PTP
Word clock
AES
Video sync (Black Burst or HD tri-level sync)
10MHz
SDI (option)

## GPS INPUTS

- External GPS receiver:
  - 10 MHz / 1PPS into BNC universal inputs
  - TOD Serial messages: RS232 into DB25
- Internal GPS receiver (option):
  - SMA antenna input

## UNIVERSAL INPUTS

2 BNC input connectors (75Ω) accept the following:
  - Word clock
  - AES
  - Video sync (Black Burst or HD tri-level sync)
  - 10 MHz

## SDI INPUT (option)

BNC 50Ω

## LEGACY GENERATOR

Generates simultaneously up to 6 different rates in any of these formats:
  - Word clock - rates from 32 to 384 KHz
  - AES - rates from 32 to 96 KHz
  - Video sync:
    - NTSC/PAL black burst
      - 525/29.97/30i
      - 625/23.98/24/25i
    - HD tri-level sync
      - 720/23.98/24/25/29.97/30/50/59.94/60P
      - 1080/25/29.97/30i
      - 1080/23.98/24/25/29.97/30sF
      - 1080/23.98/24/25/29.97/30/50/59.94/60p
  - 10 MHz
  - Time Code (option)

## UNIVERSAL OUTPUTS

16 outputs - in 6 groups
BNC - 75Ω
Output signal: any of the generated legacy references

## TIME CODE OUTPUTS (option)

Time Code streams can be sent via the following:
  - Unbalanced: Universal outputs (BNC)
  - Balanced: 2 outputs provided on the DB25 connector

## OSCILLATOR

TCXO: +/- 1ppm
OCXO: +/-10ppb

## BATTERY BACK UP

Internal Time of Day (TOD) clock is battery backed up

## REMOTE CONTROL

3 GPI inputs (DB-25)
Web browser

## ALARM

3 GPI outputs (DB-25)

## PRESETS

10 presets can be programmed for quick recall

## DISPLAY

2.4" TFT LCD - 240 x 320 resolution

## POWER

100-240 VAC
12 VDC @ 60A
With auto switch-over for redundancy

## DIMENSIONS

19" x 1.75" x 8"