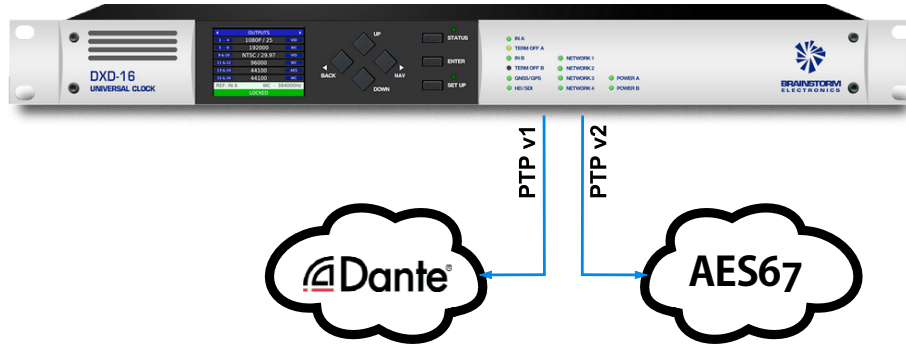


# DXD-16/DANTE® SET UP GUIDE

## - Using the DXD-16 with DANTE -

The DXD-16 Universal Clock is both versatile and flexible. With four independent PTP ports, it can synchronize multiple Media over IP systems, including Dante and AES67. This document examines in details how to set the DXD-16 as a Dante Leader or Follower using PTP v1, but also as a PTP v2 synchronizer simultaneously, acting as a bridge between Dante and AES 67.



Be sure your DXD-16 is running **firmware 2.15** or higher. If you do not have it, firmware can be downloaded from our website [here](#).

## 1. Dante Sync: PTP V1

As Dante uses PTP v1 (IEEE 1588-2002) for sync, the PTP v1 option for the DXD-16 (**DXD16/PTPv1**) is required and needs to be installed in your unit before continuing.

*In the following discussion the terms "Master" and "Leader" are synonymous, as are the terms "Slave" and "Follower".*

## 2. Getting Started

The first thing to do is to get proper communication going between the different devices.

To eliminate uncertainties, it is recommended that you start by testing the DXD-16's parameters with a very simple network.

- 1 switch
- 1 DXD-16
- a handful of Dante devices

This could be performed on a bench. After the parameters are set as described in the following pages, and it is confirmed that all devices communicate properly and are in sync, the DXD-16 can be connected to a larger network with the knowledge that the PTP clocking is operating correctly.

### 3. Test # 1: DXD-16 as a PTP v1 Slave on Port 1

In this first test, a Dante device will be set as the Primary Leader Clock and the DXD-16 will follow the Dante network. Connect port 1 to the switch, along with your Dante devices:

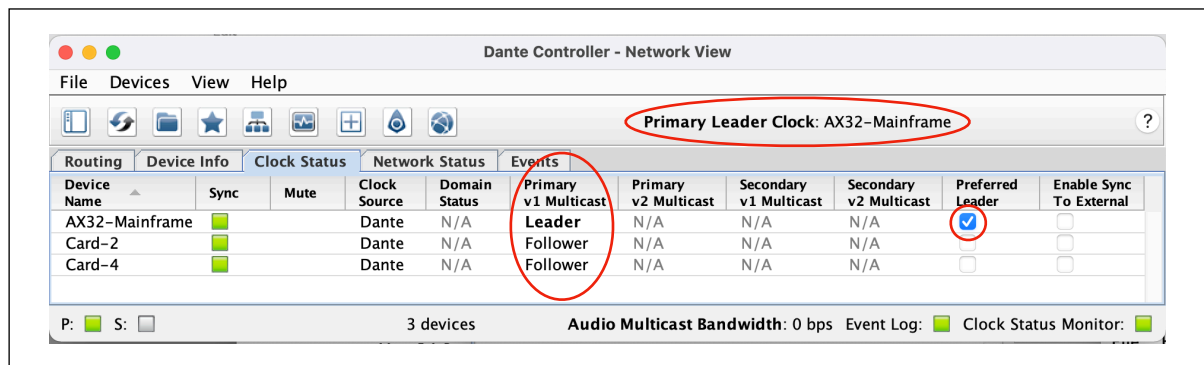
#### • DXD-16 Settings

- Menu 1.1: REFERENCE > **Source = PTP Mode**
- Menu 4.1.1: NET 1 IP ADDRESS > Make sure port 1 has a **valid IP address**
- Menu 5.1: PORT MODES > **Port 1 Mode = Master/Slave Group** (other Ports can be OFF for now)
- Menu 5.2: GRANDMASTER (GROUP) > **Priority 1 = 128 or higher** (equivalent to turning OFF Dante 'Preferred Leader')
- Menu 5.3.1: PORT 1 CONTROL > **PTP Version = PTP Version 1** (When prompted, press the UP key to reset the timing values to the PTP v1 default values)

#### • Dante Settings

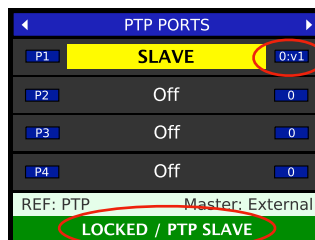
- Turn **ON** 'Preferred Leader' on 1 Dante Device.
- Be sure all other devices have it **OFF**, as well as 'Enable Sync to External'.

► The Dante Controller will indicate: **Primary Leader Clock: 'Name of Dante Device'**.



The Preferred Leader device will be the PTP v1 **LEADER**; all other devices will be PTP v1 **FOLLOWERS**.

► After a short delay the DXD-8 front panel will indicate **LOCKED / PTP SLAVE** on the bottom line of the display; the REFERENCE SOURCES page will indicate **Domain 0, PTP v1** to the right of the SLAVE PTP state.



The DXD-16 is now following the Dante Preferred Leader.

**After the successful completion of test 1, you have confirmed that the devices are communicating correctly and you can continue to Test 2, using the DXD-16 as the PTP Grandmaster.**

## 4. Test # 2: DXD-16 as a PTP v1 Grandmaster

Now that we have confirmed that devices are communicating properly, let's set the DXD-16 as the Primary Leader Clock and sync the Dante devices to the DXD-16.

Keeping all the settings described above and keeping port 1 of the DXD-16 connected to the switch, make the following changes:

- **DXD-16 Settings**

- Menu 5.2: GRANDMASTER (GROUP) > **Priority 1 = 127** or **lower** (equivalent to turning ON Dante 'Preferred Leader')

- **Dante Settings**

- Turn **OFF** 'Preferred Leader' on all Dante Devices.
- Be sure 'Enable Sync to External' is turned **OFF** on all Dante Devices.

NOTE: The system may take a little time to settle. On occasions, you may have to wait several minutes.

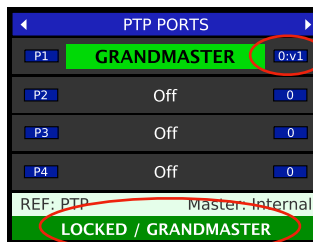
- ▶ The Dante Controller indicates: **Primary Leader Clock: 'Unknown Device'** with the MAC address of the DXD-16. It also indicates that all Dante devices are now PTP v1 FOLLOWERS.

Routing	Device Info	Clock Status	Network Status	Events	00D09480C436						
	Device Name	Sync	Mute	Clock Source	Domain Status	Primary v1 Multicast	Primary v2 Multicast	Secondary v1 Multicast	Secondary v2 Multicast	Preferred Leader	Enable Sync To External
	AX32-Mainframe	<input checked="" type="checkbox"/>		Dante	N/A	Follower	N/A	N/A	N/A	<input type="checkbox"/>	<input type="checkbox"/>
	Card-2	<input checked="" type="checkbox"/>		Dante	N/A	Follower	N/A	N/A	N/A	<input type="checkbox"/>	<input type="checkbox"/>
	Card-4	<input checked="" type="checkbox"/>		Dante	N/A	Follower	N/A	N/A	N/A	<input type="checkbox"/>	<input type="checkbox"/>

P:  S:  3 devices Audio Multicast Bandwidth: 0 bps Event Log:  Clock Status Monitor:

To view the MAC address of the 'Unknowns Device', hover the mouse over the label.  
Note that the first 6 characters of any DXD-16 MAC address or PTP Clock ID are always "00D094".

- ▶ The DXD-16 front panel indicates **LOCKED / GRANDMASTER** on the bottom line of the display; the PTP PORTS page indicates **Domain 0, PTP v1** to the right of the GRANDMASTER PTP state of port 1.



After the successful completion of test 2, you have confirmed that the DXD-16 is recognized as the Best Master Clock.

Now connect the DXD-16 to your main network. If it was set up properly, the DXD-16 should operate the same way as it did in the simple network test. If that is not the case, please refer to the tips on page 6.

## 5. Using a second DXD-16 port as a PTP v2 Grandmaster for non-Dante AES67 devices

Now that the DXD-16 is connected to your main network and that all Dante devices are following the DXD-16 port 1, there may be non-Dante devices in your system requiring PTP v2 sync. In that case, you may choose to lock non-Dante AES67 devices to one of the Dante devices which is supplying v2 “Leader” functionality, a perfectly valid approach, bearing in mind that the Dante Leader device will essentially forward the DXD-16 sync information received on its v1 port.

Device Name	Sync	Mute	Clock Source	Domain Status	Primary v1 Multicast	Primary v2 Multicast	Secondary v1 Multicast	Secondary v2 Multicast	Preferred Leader
AX32-Mainframe	<input checked="" type="checkbox"/>		Dante	N/A	Follower	N/A	N/A	N/A	<input type="checkbox"/>
Card-2	<input checked="" type="checkbox"/>		Dante	N/A	Follower	Leader	N/A	N/A	<input type="checkbox"/>
Card-4	<input checked="" type="checkbox"/>		Dante	N/A	Follower	Leader	N/A	N/A	<input type="checkbox"/>

On the other hand, for a cleaner network setup, or if the Dante devices do not have AES67 capability, or to prevent system disruption should a Dante Leader device be taken off-line for any reason, a more robust solution would be to use a second DXD-16 port as a direct master for the non-Dante v2 devices. In the settings below, we will use **port 2**.

To prevent interaction between the DXD-16 v2 master and the Dante v2 Leader devices, we also recommend the use of a separate PTP Domain for non-Dante AES67 devices. We will use **domain 1** in the following settings.

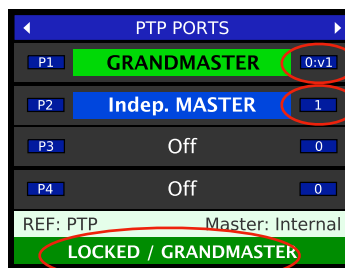
- **DXD-16 Settings** (in addition to the previous settings)

- Menu 4.2.1: IP ADDRESS > Make sure port 2 has a **valid IP address**
- Menu 5.1: PORT MODES > **Port 2 Mode = Independent Master** (required for using a separate PTP domain)
- Menu 5.4.1: PORT 2 CONTROLS > **PTP Version = PTP 2.0**
- Menu 5.4.1: PORT 2 CONTROLS > **PTP Profile = AES67** (When prompted, press the UP key to reset the timing values to the default values of the selected profile)
- Menu 5.4.3: PORT 2 INDEP. MASTER > **Domain = 1**
- Menu 5.4.3: PORT 2 INDEP. MASTER > **Priority 1 = 10** (should be the lowest of all devices in domain 1)

- **Non-Dante AES67 devices Settings**

- PTP Domain = 1
- Priority 1 = **128** (or any number higher than Priority 1 on DXD-16 port 2)

▶ The DXD-16 front panel indicates **LOCKED / GRANDMASTER** on the bottom line of the display. The PTP PORTS page indicates: **Port 1: GRANDMASTER, domain 0, v1** and **Port 2: Independent MASTER, domain 1**.



▶ The non-Dante AES67 devices in PTP domain 1 follow the DXD-16 port 2 as the v2 Master.

In the above scenario, Dante devices and non-Dante devices all have a **common reference**, the DXD-16, generating **PTP v1 sync through port 1 on domain 0** for Dante and simultaneously **PTP v2 through port 2 on domain 1** for non-Dante (see illustration on page 1).

## 6. Troubleshooting tips

After completing successfully tests 1 and 2 described on pages 2 & 3, if clocking is not operating properly when connecting the DXD-16 to the main network, there are most likely issues with the PTP settings or the network itself.

### IEEE 1588 REQUIREMENTS

- **PTP Domain:** All devices need to be on the same domain to achieve sync. Be sure the DXD-16 has **domain 0** selected in menu 5.2 (for Dante devices) and **domain 1** in menu 5.4.3 (for non-Dante devices); be sure the domain for all non-Dante devices is set to 1.
- **Announce Interval & Announce Receipt Timeout:** ANNOUNCE messages are used to establish the best master clock currently available on the network. ALL devices should have the same Announce settings for the Best Master Clock Selection to operate properly.

The default values of '**2 sec [log 1]**' for Announce Interval and '**3 Announce Intervals**' for Announce Receipt Timeout are recommended.

- **Delay Mechanism:** IEEE1588 requires that all devices use the same delay mechanism. P2P can only be used when (a) all switches in the system are PTP-aware and P2P capable, and (b) these switches have been set up correctly. If this is not your situation then definitely use **E2E**.

### NETWORK GUIDELINES

- **Managed switches** are recommended, specifically for the ability to enable IGMP and QoS (see below).
- Make sure **EEE** (Energy Efficient Ethernet) is disabled on your switch. Refer to your switch's instructions and be sure it is set properly.
- When using multiple switches it is preferable to connect the Grandmaster clock to the **root switch**.
- **QoS** must be enabled so that PTP packets get preferential treatment using DSCP / Diffserv priority values. This is particularly important in large networks with mixed traffic. Refer to your switch's instructions and be sure it is set properly.
- **IGMP snooping** must be enabled to prevent the switch from "flooding" all of its ports with multicast messages that its connected devices (e.g. the DXD) have not requested to receive via the IGMP system. This also is particularly important on larger, shared networks. Refer to your switch's instructions and be sure it is set properly.

## 7. Additional Resources

Several guides and tutorials are available online from different manufacturers. These are very useful and will include additional information crucial for the proper transport of A/V over IP such as Session Information or discovery. Here are some links:

- [YAMAHA: Dante Network Design Guide](#)
- [SHURE: Configuring A Network Switch for Shure Devices and Dante/AES67](#)
- [SHURE: Multicast and IGMP in depth](#)
- [FOCUSRITE: Configuring A Switch For Dante](#)
- [LAWO: IP Networking Guide for Video and Audio Applications](#)
- [Ravenna: AES67 PRACTICAL GUIDE](#)