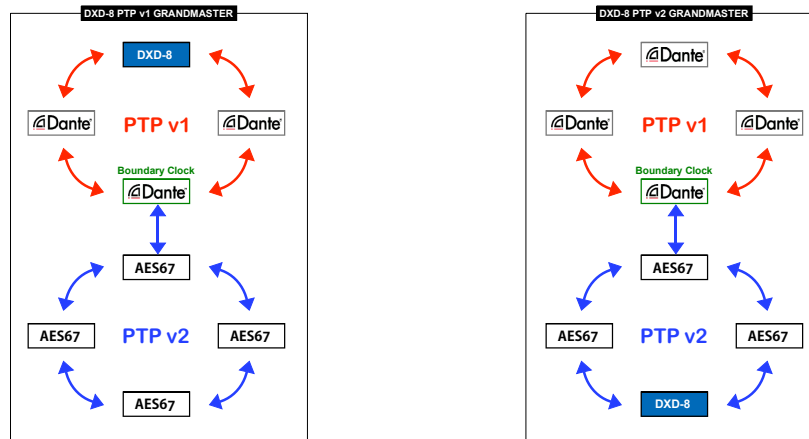


DXD-8/DANTE® SET UP GUIDE

Using the DXD-8 with DANTE

The DXD-8 Universal Clock is both versatile and flexible. Through its PTP port, it can synchronize multiple Media over IP systems, including Dante and AES67.

This document examines in details how to set the DXD-8 as a Dante Leader or Follower using PTP v1. It also looks at how to use the DXD-8 in a system that includes Dante and AES67.



Be sure your DXD-8 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

Dante uses PTP v1 (IEEE 1588-2002) for sync. The PTP option for the DXD-8 (**DXD8/PTP**) includes PTP v2 as well as PTP v1 so once it is installed, your unit is ready for Dante.

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-8's parameters with a very simple network.

- 1 switch
- 1 DXD-8
- 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-8 can be connected to a larger network with the knowledge that the PTP clocking is operating correctly.

3. Test # 1: DXD-8 as a PTP v1 Slave

In this first test, a Dante device will be set as the Primary Leader Clock and the DXD-8 will follow the Dante network. Connect the DXD-8 to the switch, along with your Dante devices:

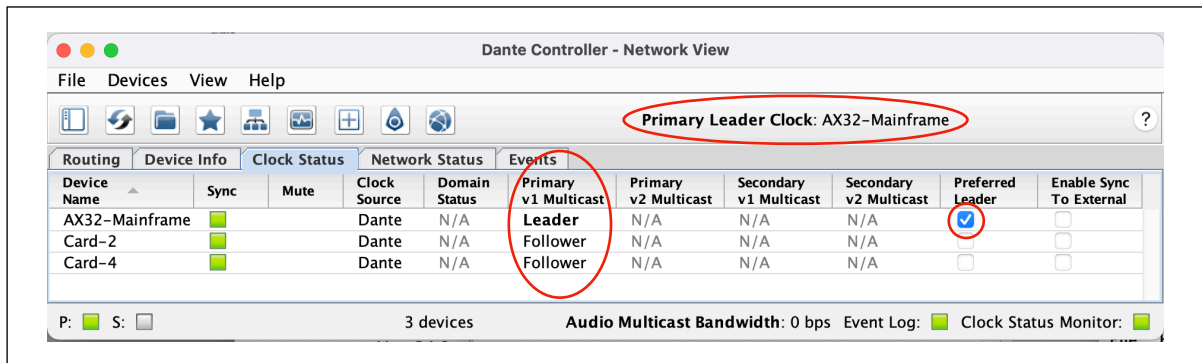
- **DXD-8 Settings**

- Menu 1.1: REFERENCE > **Source = PTP Mode**
- Menu 4.1: IP ADDRESS > Make sure the port has a **valid IP address**
- Menu 5.1: PORT MODES> **Port Mode = On**
- Menu 5.2: GRANDMASTER > **Priority 1 = 128 or higher** (equivalent to turning OFF Dante 'Preferred Leader')
- Menu 5.3: PORT CONTROLS > **PTP Version = PTP Version 1** (When prompted, press the UP key to reset the timing values to the PTP v1 default values)

- **Dante Settings**

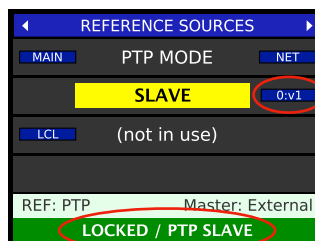
- Turn **ON** 'Preferred Leader' on 1 Dante Device.
- Be sure all other devices have it **OFF**, as well as 'Enable Sync to External'.

► 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-8 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-8 as the PTP Grandmaster.

4. Test # 2: DXD-8 as a PTP v1 Grandmaster

Now that we have confirmed that devices are communicating properly, let's set the DXD-8 as the Primary Leader Clock and sync the Dante devices to the DXD-8.

Keeping all the settings described above in test #1 and keeping the DXD-8 connected to the switch, make the following changes:

- **DXD-8 Settings**

- Menu 5.2: GRANDMASTER > **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.

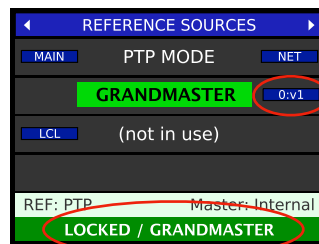
- ▶ The Dante Controller indicates: **Primary Leader Clock: 'Unknown Device'** with the MAC address of the DXD-8. It also indicates that all Dante devices are PTP v1 FOLLOWERS.

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"/>	<input type="checkbox"/>	Dante	N/A	Follower	N/A	N/A	N/A	<input type="checkbox"/>	<input type="checkbox"/>
Card-2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Dante	N/A	Follower	N/A	N/A	N/A	<input type="checkbox"/>	<input type="checkbox"/>
Card-4	<input checked="" type="checkbox"/>	<input 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-8 MAC address or PTP Clock ID are always "00D094".

- ▶ The DXD-8 front panel will indicate **LOCKED / GRANDMASTER** on the bottom line of the display; the REFERENCE SOURCES page will indicate **Domain 0, PTP v1** to the right of the GRANDMASTER PTP state.



After the successful completion of test 2, you have confirmed that the DXD-8 is recognized as the Best Master Clock.

Now connect the DXD-8 to your main network. If it was set up properly, the DXD-8 should operate the same way as it did in the simple network test. If that is not the case, please refer to the Troubleshooting tips on page 6.

5. Using a DXD-8 in a system that includes Dante and AES67

Now that the DXD-8 is connected to your main network and that all Dante devices are following it, there may be non-Dante devices in your system requiring PTP v2 sync.

In that case, you have 2 choices: set the DXD-8 as a PTP v1 Grandmaster or as a PTP v2 grandmaster. In either scenarios, one Dante device will act as a **boundary clock** and be a bridge between v1 and v2 (see diagrams on page 1).

5.1. DXD-8 AS A PTP v1 GRANDMASTER

In this scenario, the Dante system will follow the DXD-8 v1 Grandmaster while the non-Dante AES67 devices will follow one of the Dante devices supplying v2 Leader functionality (AES67-enabled). Keep in mind that the Dante v2 Leader device will essentially forward the DXD-8 sync information received on its v1 port.

• DXD-8 Settings (same as test #2)

- Menu 1.1: REFERENCE > **Source = PTP Mode**
- Menu 4.1: IP ADDRESS > Make sure the port has a **valid IP address**
- Menu 5.1: PORT MODES > **Port Mode = On**
- Menu 5.2: GRANDMASTER > **Priority 1 = 127** or **lower** (equivalent to turning ON Dante 'Preferred Leader')
- Menu 5.3: PORT CONTROLS > **PTP Version = PTP Version 1** (When prompted, press the UP key to reset the timing values to the PTP v1 default values)

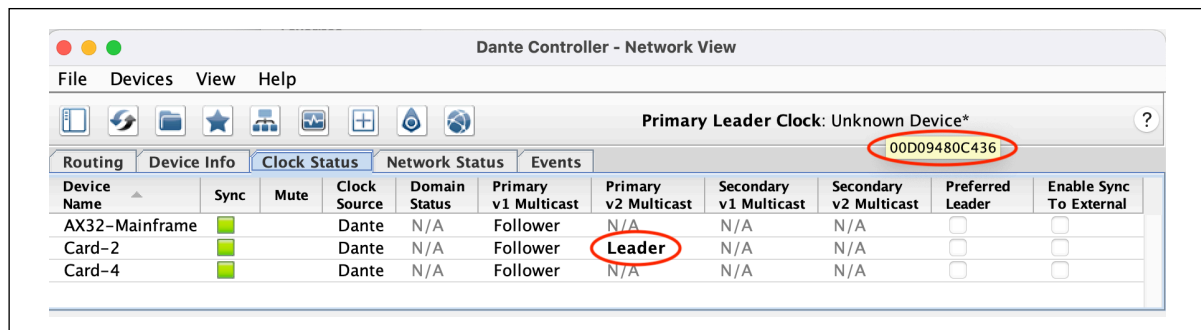
• Dante Settings

- Select a Dante device and enable AES67 mode.
- Turn **OFF** 'Preferred Leader' and 'Enable Sync to External' on all Dante Devices.

• Non-Dante Devices Settings

- **Priority 1 = 128** or **higher**.

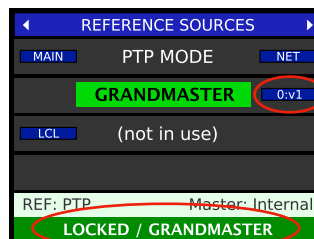
- ▶ The Dante system follows the DXD-8 on its v1 port (**Primary Leader Clock: Unknown Device**, with the DXD-8 MAC address). Simultaneously, the Dante device acting as the boundary clock (Card 2 in our example) is the **PTP Leader** on the v2 port, leading the non-Dante AES67 devices.



The screenshot shows the Dante Controller interface with the 'Clock Status' tab selected. The 'Primary Leader Clock' is identified as 'Unknown Device*' with MAC address '00D09480C436'. A table below lists the status of three Dante devices: AX32-Mainframe, Card-2, and Card-4. Card-2 is highlighted as the 'Leader' for the Primary v2 Multicast.

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"/>	<input type="checkbox"/>	Dante	N/A	Follower	N/A	N/A	N/A	<input type="checkbox"/>	<input type="checkbox"/>
Card-2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Dante	N/A	Follower	Leader	N/A	N/A	<input type="checkbox"/>	<input type="checkbox"/>
Card-4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Dante	N/A	Follower	N/A	N/A	N/A	<input type="checkbox"/>	<input type="checkbox"/>

- ▶ The DXD-8 front panel indicates **LOCKED / GRANDMASTER** on the bottom line of the display; the REFERENCE SOURCES page indicates **Domain 0, PTP v1** to the right of the GRANDMASTER PTP state.



The Dante system follows the DXD-8 and the AES67 system follows an AES67-enabled Dante device.

5.2. DXD-8 AS A PTP v2 GRANDMASTER

In this scenario, the non-Dante AES67 devices will follow the DXD-8 v2 Grandmaster. One Dante device will act as a boundary clock, following the DXD-8 on its v2 port and leading the Dante system on its v1 port simultaneously. This Dante device needs to have AES67 enabled.

• DXD-8 Settings

- Menu 1.1: REFERENCE > **Source = PTP Mode**
- Menu 4.1: IP ADDRESS > Make sure the port has a **valid IP address**
- Menu 5.1: PORT MODES > **Port Mode = On**
- Menu 5.2: GRANDMASTER > **Priority 1 = 10** (needs to be the lowest of all PTP v2 devices)
- Menu 5.3: PORT CONTROLS > **PTP Version = PTP 2.0**
- Menu 5.3: PORT CONTROLS > **PTP Profile = AES67** (When prompted, press the UP key to reset the timing values to the AES67 default values)

• Dante Settings

- Select a Dante device and enable AES67 mode.
- Turn **OFF** 'Preferred Leader' and 'Enable Sync to External' on all Dante Devices.

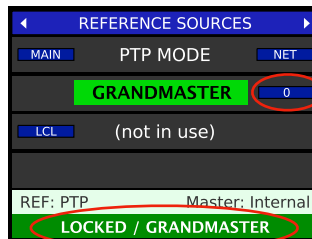
• Non-Dante Devices Settings

- **Priority 1 = 128 or higher.**

- ▶ An AES67-enabled Dante device **follows** the DXD-8 on its v2 port (**Primary Leader Clock: Unknown Device**, with the DXD-8 MAC address) while simultaneously being a **v1 Leader**. All the other Dante devices have 'Follower' indicated in the v1 column in Dante Controller. The Non-Dante AES67 devices follow the DXD-8, as their v2 Grandmaster.

Dante Controller - Network View											
Primary Leader Clock: Unknown Device*											
00D09480C436											
Routing	Device Info	Clock Status	Network Status	Events							
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	Leader	Follower	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"/>	

- ▶ The DXD-8 front panel indicates **LOCKED / GRANDMASTER** on the bottom line of its display; the REFERENCE SOURCES page indicates **Domain 0** to the right of the GRANDMASTER PTP state.



The AES67 system follows the DXD-8 and the Dante system follows an AES67-enabled Dante device.

Both solutions will work fine as long as there is at least 1 Dante device in the system that is AES67 capable and enabled so that it can be used as the boundary clock. A more stable solution would be to use a **Brainstorm DXD-16** as the boundary clock as it can provide PTP v1 and PTP v2 simultaneously through its multiple PTP ports.

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-8 to the main network, there are most likely issues with the network configuration.

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](#)