

DXD-8

Universal Clock

Operations manual

Version 3.00

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1. Introduction

The DXD-8 Universal Clock is a precision multi-format reference generator that provides up to 4 different video syncs and/or audio clocks simultaneously (Black Burst, tri-level sync, WC, AES, 10 MHz) and distributes them through its 8 user-assignable BNC outputs. It can be referenced to a variety of external sources or run as a stand-alone master (internal crystal).

With the PTP option, the DXD-8 acts as a bridge between an IP infrastructure and legacy A/V equipment.

- As a PTP slave, the DXD-8 can generate legacy sync so that the legacy equipment locks to the network.
- As a PTP master, the DXD-8 can lock to an external sync source such as WC, AES or video sync so that the network locks to the legacy equipment.
- As a stand-alone master, locked to its internal oscillator (or optionally to GPS) the DXD-8 provides sync to the network via the PTP port and to the legacy equipment via the BNC outputs, simultaneously.

The Time Code option (DXD/LTC) provides an LTC generator that can generate simultaneously 2 streams of Time-of-Day time code at different formats.

An optional GPS receiver (DXD/GPS) can be installed in the DXD-8. GPS not only provides an extremely accurate source of time, it also enables multiple DXD units in remote locations to be locked and in phase with one another.

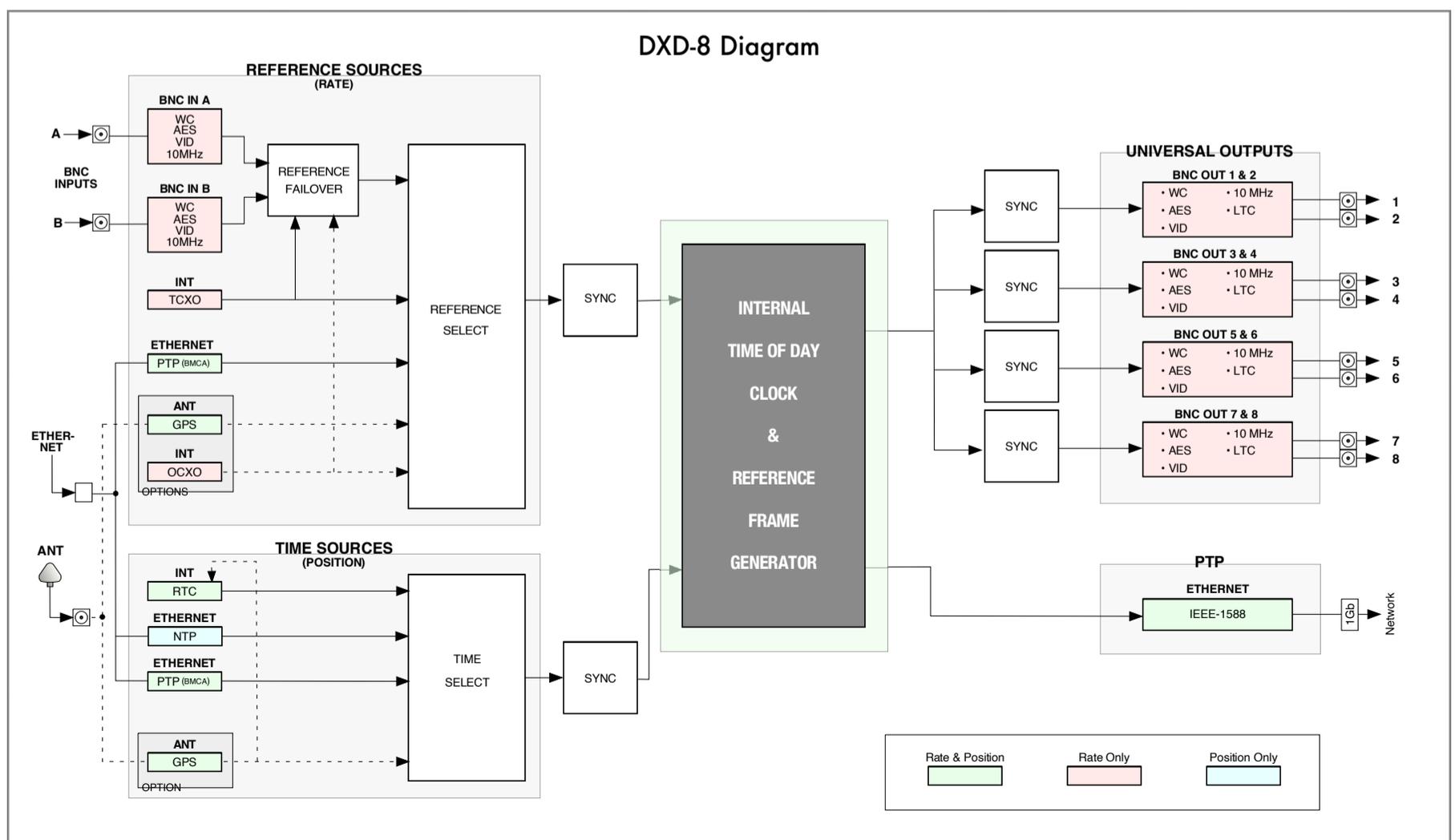
The DXD-8 is designed to provide great flexibility and, with the available options, it can adapt to the requirements of modern broadcast or post production facilities.

MAIN FEATURES:

- 2 user-assignable BNC inputs with auto switch-over
- 8 user-assignable BNC outputs
- 4 separate reference generator
- very low jitter
- internal Real Time Clock (RTC) with battery back-up
- NTP Client and Server
- Remote control via web browser

AVAILABLE OPTIONS:

- PTP (v1 & v2) - software
- gPTP (AVB) - software
- LTC - software
- GPS/GNSS - hardware
- OCXO - hardware



2. Installation

2.1 UNPACKING

When unpacking your DXD-8 the following items should be in the shipping carton:

- DXD-8 unit
- Universal Power Supply (PS-8 12VDC @ 16w)
- IEC power cable
- Registration card

2.2 INSTALLING THE DXD-8

The DXD-8 is designed to be mounted in a standard 19" rack. It requires 1U in height. Usual precautions should be respected when wiring the DXD-8: use high quality cables with good shield to guarantee a good signal transmission. Keep your cables as short as possible. The type of cables required are specified in chapter 4.

To preserve the integrity of the transmission line, it is recommended that you do not 'mult' a single output to multiple devices as it can degrade signal quality.

The BNC reference input needs to be properly terminated. If the DXD-8 is the last device in the chain, turn on the 75Ω termination switch on the rear panel. If you are looping through using a 'T' connector (again, not recommended), turn off the termination switch and make sure there is a 75Ω termination at the end of the chain.

3. Quick Start

You should read this manual to familiarize yourself with the DXD-8 features. The following simple steps are only provided to get you started right away.

Connect the power supply to the Power A jack and plug the IEC cable into a wall outlet. The DXD-8 will turn on as soon as power is connected.

Out of the box, the DXD-8 is set to generate a 48KHz word clock, referenced to its internal crystal. This signal is sent to all 8 outputs.

To make changes, press the [SET UP] button and navigate to the required menu using the [UP] and [DOWN] buttons then pressing the [NAV ►] key.

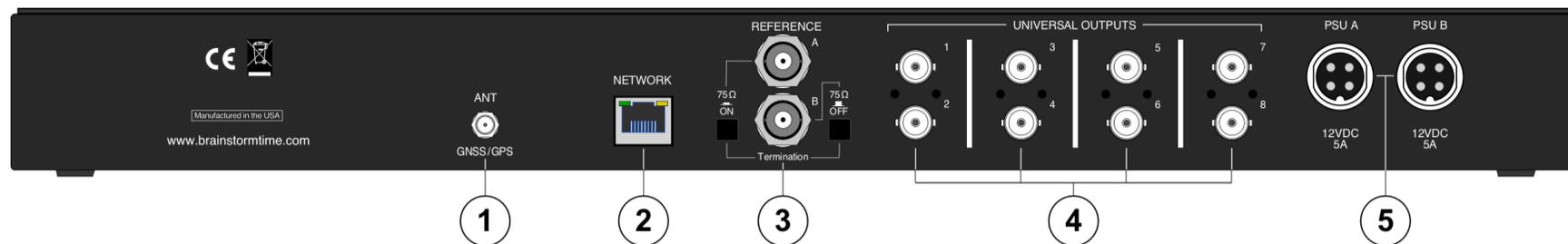
- To change the reference, go to menu 1.1.
- To change the outputs, go to menu 3.

Once you are in the right menu:

- use the [NAV ►] key to navigate to the right field;
- use the [UP] and [DOWN] keys to change the value;
- press the [ENTER] key to save the changes.

For more details on menu navigation, go to 6.3. For details on the different menus, go to chapter 7.

4. I/O's Description and Cable Requirements



4.1 ANTENNA (OPTION)

This port is used to connect a GNSS antenna to the optional DXD/GPS receiver.

Connector: SMA jack

- Use 50Ω coaxial cable with an SMA-Male to connect the GNSS antenna as specified in the DXD/GPS instructions manual.

4.2 ETHERNET

The 1 Gb Ethernet port is used to connect the DXD-8 via TCP/IP protocol to access the unit remotely and to upload firmware from any computer on the network. With the IEEE1588 PTP option, it is also used for network sync..

Connectors: RJ45 jack

- Use a standard cat6 Ethernet cable with RJ45 plugs.

4.3 REFERENCE INPUTS & TERMINATION SWITCHES

The 2 BNC inputs accept WC, AES, Video Sync and 10MHz based on the user selection (INPUTS Menu - see Appendix A for a list of supported HD & SD video formats). 10MHz is a sine wave typically 1/2 v, coming from a GPS receiver, a rubidium clock or other types of generators.

Connectors: BNC

- Use standard 75Ω BNC coaxial cables.

Each input has a 75Ω termination switch. Under normal conditions, it should be on. However, if a 'T' BNC is used to 'daisy-chain' the reference to another unit (not recommended), termination should be off on the DXD-8. The last unit in the chain, and only that unit, should have its termination on.

4.4 UNIVERSAL OUTPUTS

The 8 universal outputs can output Word Clock, AES, 10MHz (1v pk-pk sine wave), HD Video Sync, or SD Video Sync, based on the user selection (BNC OUTPUTS menus).

Connector: BNC

- Use standard 75Ω BNC coaxial cables.

4.5 DC POWER

The DXD-8 requires 12VDC @ 18W. Acceptable range is 12VDC +/-15%.

The external supply provided with the DXD-8 accepts 100 to 240 VAC input at 50 - 60 Hz so it is suitable for use anywhere in the world.

Optionally, a second power supply can be connected to Power Input B for redundancy. To order a second power supply (p/n PS-8), contact your dealer.

To order a DC power supply (p/n PS-9), contact your dealer.

Connector: 4 pin circular connector

- Insert the 4 pin plug into the rear panel jack and secure by screwing the ring. Plug the supply into the wall using the standard IEC cable supplied.

5. Front Panel Display & LED's



5.1 FRONT PANEL DISPLAY

The DXD-8 front panel has a large full color display giving access to all the unit's parameters and settings.

In the normal operating mode, information is presented on the display in multiple pages referred to as the 'Main Rotation' (see chapter 6).

In addition to the normal operating mode, two additional modes exist with their own display pages:

- SET UP Mode
- STATUS Mode

These two specialized modes are activated by pressing the corresponding button to the right of the navigation buttons. An LED lights up for each of these modes indicating activation.

In the STATUS mode, the displays shows additional status information organized in multiple pages, much like the Main Rotation pages (see chapter 6).

The SET UP mode is used to set the unit's parameters as described in 6.3.

Note that SET UP and STATUS modes are mutually exclusive. It means that, if you press the STATUS button while in the SET UP mode, you will exit the SET UP mode and enter the STATUS mode, and vice-versa.

5.2 FRONT PANEL LED'S

There are 8 status LED's to the right of the display insert area:

- IN A:..... a signal is present at the Input A connector;
- TERM OFF A:..... the rear panel termination switch is off (see 4.3);
- IN B: a signal is present at the Input B connector;
- TERM OFF B: the rear panel termination switch is off (see 4.3);
- GNSS/GPS: a signal is present at the antenna input (optional)
- NETWORK: the DXD-8 is connected to a network
- POWER A:..... 12VDC power is connected to the Power A connector
- POWER B: 12VDC power is connected to the Power B connector

Note that, if one of the power LED's is flashing, it indicates that power was present at that connector but then disappeared, possibly due to a faulty power supply, and the other power source took over (see chapter 16 for more information).

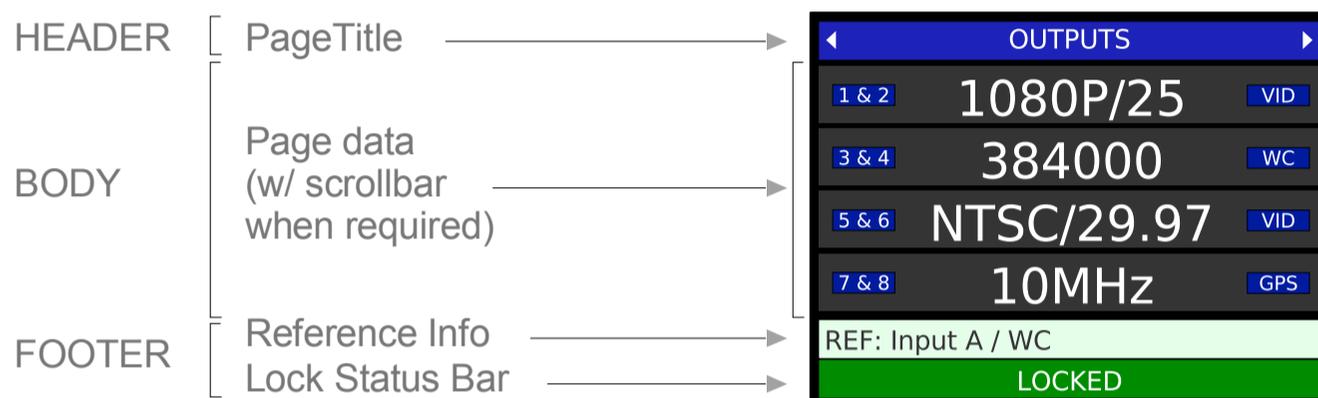
6. Display

6.1 Main Rotation

In the standard operating mode, with neither the Status mode nor the Set Up mode activated, information is presented on the display in multiple pages referred to as the 'Main Rotation'.

To rotate through the different pages, press the [◀ BACK] or [NAV ▶] key.

6.1.1 MAIN ROTATION PAGES LAYOUT



Pages in the main rotation all have a similar structure, made up of several lines arranged in 3 different sections:

- **HEADER (top line):**
Contains the page title. It has a blue background and white letters + left and right navigations arrows.
- **BODY:**
Contains the page data. If required, a scroll bar appears on the left. Pressing the [UP] or [DOWN] buttons displays additional content.
- **FOOTER (bottom 2 lines):**
 - Reference: source and errors or special conditions (see chapters 9 & 10).
 - Lock status. See chapter 11. The background color changes to reflect the lock condition (green indicates Lock).

6.1.2 MAIN ROTATION PAGES

- **OUTPUTS**

This page indicates the rate, format and signal type of each of the 4 BNC output groups. The small blue boxes identifying each output group on the left side of the display change color to indicate timing deviation (see ch. 12).

- **REFERENCE SOURCES**

This page shows the currently selected sources for Main and Alternate Reference. Also indicated are the rates and formats of the reference signals.

- **TIME & DATE**

This page displays up to two different times & dates as set in menu 7.3.

The names of the DXD times selected in menu 7.3 appear in the left column while the name of the standards selected in menu 7.1 appear in the right column.

If 'NO DISPLAY' was set in menu 7.3 for the Lower Display, this page will only show 1 time & date.



6.2 Status Mode

Additional information pages are available in the Status Mode. To enter the Status Mode, press the [STATUS] button. When in Status mode, the Status LED is on.

6.2.1 STATUS INFORMATION PAGES LAYOUT

Status pages are formatted similarly to the Main Rotation pages, with a green header but no footer. Up to 10 lines of information can be displayed on the screen at a time. A green scroll bar will appear on the left of the screen for pages with more than 10 lines.

To change page, use the [◀ BACK] and [NAV ▶] keys; to scroll, use the [UP] and [DOWN] keys.

6.2.2 STATUS INFORMATION PAGES

• UNIT INFORMATION

- | | | |
|-----------------|------------|----------------------|
| • Model | • Version: | • Installed Options: |
| • Serial Number | • Software | • DXD/GPS |
| • Name | • Logic | • DXD/OCXO |
| • Location | • Webpage | • DXD8/PTP |
| | | • DXD/AVB |
| | | • DXD/LTC |

TIMES		
System Time:	2020/04/20 14:11:45	LCL
RT Clock:	2020/04/20 14:11:45	LCL
NTP Client:	2020/04/20 14:11:45	LCL

• NETWORK ADDRESS

- DHCP Enabled (Yes / No)
- IP Address
- Mac Address

• TIMES

Running counters on this page show the following DXD times:

- System Time: Main DXD TOD clock
- RT Clock: continuously running internal back-up clock
- NTP Client: Time-of-Day from an external NTP server

Depending on the installed options, other times can be displayed: PTP Grandmaster, GPS or Time Code.

The standard for each time as set in menu 8.1 TIME STANDARDS is indicated in the right column.

• NTP PORT STATUS

The status information on the NTP port includes some message counters (received and transmitted) that are helpful during troubleshooting.

NTP PORT STATUS		
Server:		
Mode	On	
Pseudo Client:		
Mode	Enabled	
Active	Yes	
Ext Server Name	pool.ntp.org	
Ext Server Addr	162.159.200.1	
Offset	0.0048	
Delay	0.0098	
Dispersion	0.0000	
Message Counters:	(Press ENTER to Clear)-	
	Receive	Transmit
Kiss-o'-Death	0	-
Symm. Active	0	-
Symm. Passive	0	-
Client	2	107
Server	107	2
Broadcast Client	0	0
Broadcast Server	0	-

Note: Display has been enlarged to show all scrolling options

• WC OUTPUT TERMINATION

For each BNC output set to Wordclock, the DXD deduces the apparent value, in ohms, of the termination resistance that is present at the far end of the attached cable. The WC OUTPUT TERMINATION page displays the results of these calculations.

If the output is correctly terminated then the value displayed will be 75Ω. If the measurement is in the area of 37.5Ω then '[Double]' is displayed alongside the value, indicating that the line has apparently been terminated twice. Similarly, if in the area of 25Ω, '[Triple]' is displayed. When no termination is detected then 'Unterminated' is shown.

When an output is set for a signal other than Wordclock, 'Not Wordclock' appears.

WC OUTPUT TERMINATION	
Output 1:	75 ohms
Output 2:	Unterminated
Output 3:	75 ohms
Output 4:	75 ohms
Output 5:	25 ohms [Triple]
Output 6:	37 ohms [Double]
Output 7:	Not Wordclock
Output 8:	Not Wordclock

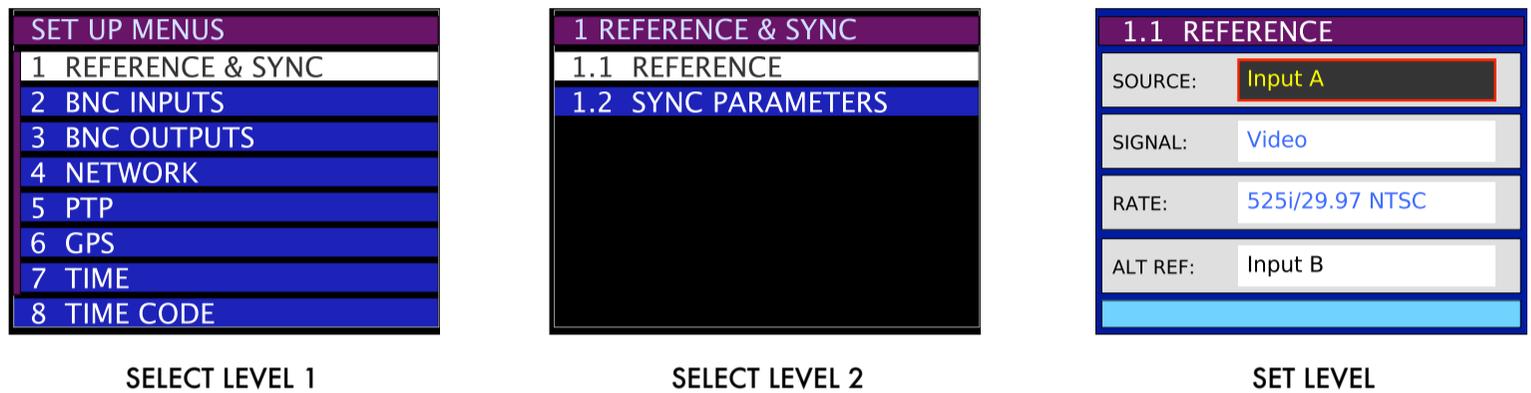
Additional status pages are available for options such as PTP, GPS or Time Code. For more information, see the relevant manuals.

6.3 Set Up Mode

In Set Up mode, all parameters are accessible and can be changed by the user via the front panel. To enter the Set Up mode, press the [SET UP] button. The Set Up LED lights up. To exit the Set Up mode, press the [SET UP] key again and confirm that the Set Up LED is off.

6.3.1 MENU LEVELS

The Set Up mode has different levels. Typically, levels 1 & 2 are SELECT levels, made up of lists of menus organized in logical groups. The number of SELECT levels varies depending on the menu. For example, menu 10 (Presets) only has 1 SELECT level. The other menus have 2. The last level is the SET level, where parameters are set and saved.



6.3.2 NAVIGATION

The navigation keys have different functions depending on the level.

- SELECT LEVELS (1 or 2)
 - Use the [UP] and [DOWN] buttons to select a menu from the list. The current selection is highlighted (black letters, white background). Pressing the [down] button passed the lowest item on the list rotates back to the top of the list.
 - Press the [NAV ►] button to navigate to the next level.
 - Press the [◀ BACK] button to go back to the previous level.
- SET LEVEL
 - Use the [NAV ►] button to navigate to the next field. The currently selected field is highlighted (yellow letters on black background). Pressing the [NAV ►] button passed the last field on the page rotates back to the first one.
 - Use the [UP] or [DOWN] buttons to change the value of the selected field.
 - Use the [◀ BACK] button to go back to the previous Level and exit the current one.

6.3.3 ENTER KEY

After modifying a value, a red border around the edited field appears. To save this new value, press the [ENTER] key. After the [ENTER] key is pressed, the red border disappears, indicating the modification has been saved.

If the cursor is moved to another field without pressing the [ENTER] key first, the red border remains indicating a change was made but not saved yet.

To exit the Set Up mode without making any change, press the [SET UP] key without pressing the [ENTER] key. Note that exiting the SET Level by pressing the [◀ BACK] key without pressing the [ENTER] key first also causes unsaved changes to be lost.

6.3.4 MENU GROUPS

In the current firmware revision, menus are organized in 11 separate groups:

- 1. REFERENCE & SYNC
 - 1.1 Reference
 - 1.2 Sync Parameters
- 2. BNC INPUT
 - 2.1 BNC Input A Set Up
 - 2.2 BNC Input B Set Up
- 3. BNC OUTPUTS
 - 3.1 BNC Outputs 1 & 2
 - 3.2 BNC Outputs 3 & 4
 - 3.3 BNC Outputs 5 & 6
 - 3.4 BNC Outputs 7 & 8
 - 3.5 Audio Base Rate A
 - 3.6 Audio Base Rate B
 - 3.7 Mute On Unlock
 - 3.8 Delay/Advance 1 & 2
 - 3.9 Delay/Advance 3 & 4
 - 3.10 Delay/Advance 5 & 6
 - 3.11 Delay/Advance 7 & 8
- 4. NETWORK
 - 4.1 IP Address
 - 4.2 Advanced Networking
- 5. PTP
 - 5.1 Port Mode
 - 5.2 Grandmaster
 - 5.3 Port Controls
 - 5.4 Port Timing
 - 5.5 Port Time Jam
- 6. NTP
 - 6.1 Server Mode
 - 6.2 Pseudo Client Mode
 - 6.3 Ext Server Name A
 - 6.4 Ext Server Name B
 - 6.5 Poll Timing
- 7. GPS
 - 7.1 Satellites Selections
 - 7.2 GPS Settings
 - 7.3 Advanced GPS Settings
- 8 TIME
 - 8.1 Time Standards
 - 8.2 Real Time Clock
 - 8.3 Time & Date Display
 - 8.4 Leap Seconds
- 9. TIME CODE
 - 9.1 SMPTE 2059 Set Up
 - 9.2 TC Generator 1
 - 9.3 TC Generator 2
- 10. PRESETS
- 11. UTILITY
 - 11.1 Brightness
 - 11.2 Control Lockout
 - 11.3 Clear Memory
 - 11.4 Reboot
 - 11.5 Feature Keys
 - 11.6 Name
 - 11.7 Location

For detailed description of all the parameters and settings in each of these menus, go to chapter 7.

7. Menus Description

7.1 Reference & Sync

7.1.1 REFERENCE (MENU 1.1)

Menu 1.1 lets you select one of the following sources to be used as the DXD-8's reference:

- **Internal**
- **BNC Input A**
- **BNC Input B**

- INTERNAL is the DXD-8 oscillator (TCXO); if the OCXO option is installed, INTERNAL automatically uses the OCXO oscillator and the display indicates 'Internal/OCXO'.

- BNC INPUTS A and B are defined in menus 2.1 and 2.2

- Depending on which reference was selected, additional fields will appear below the SOURCE field:

- **SIGNAL and RATE:** when selecting Input A or Input B, these status field indicate the signal type and the rate of the selected reference, as defined in menus 2.1 and 2.2.
- **ALTERNATE REFERENCE:** when BNC INPUT A has been selected as the reference, this field allows you to select BNC INPUT B as an alternate source to be used as a fail-safe back up. To guarantee a smooth transition, it is required that both sources have the same format and rate. For more on Alternate Reference, see chapter 10.

Note that, if there is no alternate reference, the DXD-8 will always revert to INTERNAL if the reference disappears.

There are no additional fields when the reference source is 'INTERNAL'.

1.1 REFERENCE	
SOURCE:	Input A
SIGNAL:	Wordclock
RATE:	48000
ALT REF:	Input B

7.1.2 SYNC PARAMETERS (MENU 1.2)

These Parameters control the way the DXD syncs to an external reference.

- **BNC INPUT COLOR FRAMING:** Color framing synchronization to video inputs can be enabled in this menu, "CF" indication will appear in the main rotation reference line when enabled and locked.

1.2 SYNC PARAMETERS	
BNC INPUT COLOR FRAMING	On (NTSC/PAL only)

7.2 BNC Inputs

7.2.1 BNC INPUT A SET UP (MENU 2.1)

The 2 BNC Universal inputs can accept WC, AES (AES-3id unbalanced), 10 MHz and video sync (HD & SD - see Appendix A for a list of supported video inputs).

Menu 2.1 lets you select the type of input connected to BNC INPUT A and its rate.

- **SIGNAL:** WC, AES, 10 MHz or Video Sync
- **LEARN/SET:** LEARN is the default value. With LEARN, the DXD-8 determines the incoming rate; with SET, the user determines the incoming rate. For more information on LEARN vs. SET, go to Chapter 9.
- **RATE:** If LEARN is selected, the rate field is Status only (pale Blue) and cannot be changed. If SET is selected, the user can select a rate from a list, based on the type of Signal selected.

NOTE: If the wrong kind of signal is selected, an error message will appear on the display saying: 'REF ERROR'.

7.2.2 BNC INPUT B SET UP (MENU 2.2)

Menu 2.2 is identical to menu 2.1 for BNC Input B except for the following.

If BNC INPUT B is set up differently than BNC INPUT A, a warning message appears on the bottom line: 'ALT REF INCOMPATIBLE'.

As mentioned above, to switch smoothly between 2 different sources in the event of a reference failure, these must be identical (see chapter 10 for more information on Alternate Reference).

7.3 BNC Outputs

The DXD-8 generates 4 different reference signals simultaneously, each of them sent to one of the four BNC output pairs, as described below. Each of these universal output groups can output WC, AES, Video Sync or 10MHz.

7.3.1 BNC OUTPUTS 1&2 (MENU 3.1)

Menu 3.1 defines BNC outputs 1&2

- **SIGNAL** : this field defines the type of signal generated (WC, AES, 10 MHz or Video Sync).

Based on the signal selected, additional fields appear to define more parameters:

- Audio (WC or AES)
 - **BASE & MULT**: Base Rates A or B as defined in menus 3.7 or 3.8 followed by a multiplier (x1, x2, x4, x8)
 - **ACTUAL**: The actual rate will be indicated in this field.
- Video Sync (SD & HD)
 - **RATE**: select a video rate from a list (see appendix A).
- 10MHz
 - no additional field.

3.1 BNC OUTPUTS 1 & 2	
SIGNAL:	Wordclock
BASE & MULT:	Audio Base A x8
ACTUAL:	384000

7.3.2 BNC OUTPUTS 3&4 (MENU 3.2)

Menu 3.2 is identical to menu 3.1 for BNC outputs 3&4.

7.3.3 BNC OUTPUTS 5&6 MENU (3.3)

Menu 3.3 is identical to menu 3.1 for BNC outputs 5&6.

7.3.4 BNC OUTPUTS 7&8 (MENU 3.4)

Menu 3.4 is identical to menu 3.1 for BNC outputs 7&8.

7.3.5 AUDIO BASE RATE A (MENU 3.5)

For audio outputs (Word Clock or AES), two different base rates are available, labeled Audio Base Rate A & B. Menu 3.7 defines Audio Base Rate A.

- **SET/AUTO**: SET is the default value; AUTO is a special function, available only when the input reference is an audio signal. With AUTO, the DXD-8 automatically determines the incoming rate and uses that as the base rate. The advantage is that, if the rate of the input reference changes, so does the generated output, automatically.

- **RATE**: If SET was selected, a rate can be selected from a list that includes 32K, 44.1K and 48K + all the pull coefficients (see appendix B & C). If AUTO was selected, the measured rate of the reference is displayed here (status only).

Note that, with AUTO selected, if the rate of the input reference is a multiple of one of the basic rates, 96K for example, the basic rate will be used instead, 48K in this example.

- **VSO/CENTS**: VSO stands for Variable Speed Oscillator and was a way to vary the speed of old analog tape machines. This function, when activated, allows you to vary the rate of the audio outputs, and thus the pitch. As this function is mainly

3.5 AUDIO BASE RATE A	
SET/AUTO:	Auto
RATE:	48000 [48000]
VSO MODE:	VSO Off
Outputs:	7-8

used for musical applications, the speed adjustment is measured in cents (semi tone/100). The VSO range is +/- 200 cents, i.e. 2 whole tones (+12.2562% to -10.9101%).

NOTES: When adjusting the VSO cents value in the menu, the changes take effect immediately. There is no need to press [ENTER] for every speed change.

When VSO is on, the letters 'VSO' appear on the display next to the rate in the OUTPUTS main rotation page.

7.3.6 AUDIO BASE RATE B (MENU 3.6)

Menu 3.6 is identical to menu 3.5 for Audio Base Rate B.

7.3.7 MUTE ON UNLOCK (MENU 3.7)

To guarantee that the BNCs do not output any signal before the DXD achieves lock, which could cause issues with the receiving equipment, menu 3.9 lets you mute the outputs while unlocked.

On = mute - Default value is off.

Each of the 4 output groups can be set independently: 1-2 / 3-4 / 5-6 / 7-8.

7.3.8 DELAY/ADVANCE 1&2 (MENU 3.8)

This menu enables to delay or advance WC, AES or Video Sync out of this pair of BNC outputs (1&2) by a set amount.

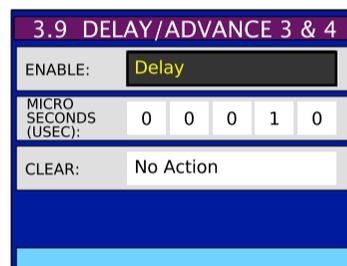
- **ENABLE:** Choices are Off / Delay / Advance. Selecting DELAY or ADVANCE will delay or advance the signal by the amount entered in the next field.

If the signal selected for this output group does not support this function (10MHz or Time Code), the display will say 'Unavailable for signal' in blue letters indicating it cannot be changed.

- **MICRO SECONDS (USEC):** The offset value in micro seconds is made up of 5 separate fields, the one on the far right for μ sec, the one on the far left for the tens of msec.

The offset can vary from 1 μ sec (or 00001 μ sec) to 99999 μ sec (or 99.999 msec).

- **CLEAR:** To clear the value in the field above, toggle to 'PRESS ENTER TO CLEAR' and press the ENTER key.



7.3.9 DELAY/ADVANCE 3&4 (MENU 3.9)

Menu 3.9 is identical to menu 3.8 for BNC outputs 3&4.

7.3.10 DELAY/ADVANCE 5&6 (MENU 3.10)

Menu 3.10 is identical to menu 3.8 for BNC outputs 5&6.

7.3.11 DELAY/ADVANCE 7&8 (MENU 3.11)

Menu 3.11 is identical to menu 3.8 for BNC outputs 7&8.

Display indication of ADVANCE/DELAY activation

The OUTPUTS page on the main rotation display will indicate that a BNC output signal has been advanced or delayed by replacing the blue rectangle with the output format in the right column of the corresponding output group by a red rectangle.

In the illustration above, Outputs 9 & 10 are either delayed or advanced.

Note that even if the value entered is '00,000', the red rectangle will still be show up on the display. To return to blue, the feature must be turned off (i.e. the ENABLE field must be set to OFF).



7.4 Network

7.4.1 IP ADDRESS (MENU 4.1)

Menu 4.1.1 includes fields for DHCP, IP Address, Subnet Mask and Gateway.

DHCP stands for Dynamic Host Configuration Protocol. When on, the DHCP server automatically assigns the IP address. The values in the 3 other fields are in blue, indicating status. When DHCP is off, parameters must be entered manually in the next 3 fields. They are expressed in dot-decimal notation made up of 4 numbers ranging from 0 to 255, separated by dots. The bottom line on the display (blue background) indicates the current IP address.

Note that, when changing the DHCP mode, a reboot will be required and a message will indicate so in the display.

7.4.2 ADVANCED NETWORKING (MENU 4.2)

7.4.2.1 INTERNAL VLAN ID (MENU 4.2.1)

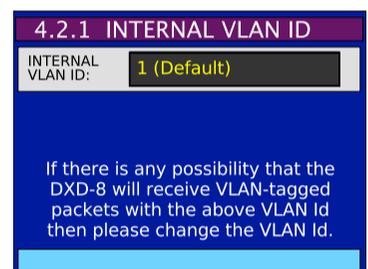
In an effort to filter out unwanted multicast receive packets, the DXD-8 makes use of its internal VLAN Id.

The DXD-8 will never tag any transmitted packets with this VLAN Id. However, care should be taken that the DXD-8 should not receive VLAN-tagged packets using this Id.

While it is highly unlikely that this situation will arise, if there is any possibility that it will, then either the VLAN Id should be changed at its source, or the DXD-8 internal VLAN Id should be changed so that the match does not occur.

Menu "4.2.1 INTERNAL VLAN ID" enables the operator to change the internal VLAN id. A re-boot is required after any change to these menus.

Default ID value is 1.



7.4.5.2 DSCP TRANSMIT VALUES (MENU 4.2.2)

This menu is for PTP operations and is only accessible with a valid PTP Feature key. For more information, please refer to the DXD8/PTP manual.

7.5 PTP

The PTP group of menus is only available if the DXD8/PTP option is installed. If not a message will appear informing you that the PTP Feature Key was not found. The DXD8/PTP is a firmware upgrade for the DXD-8 that can be purchased separately. Please refer to the DXD8/PTP manual for details on the PTP menus.

7.6 NTP

7.6.1 SERVER MODE (MENU 6.1)

Menu 6.1 lets you enable two different modes: 'On' (NTP Server) & 'On With Broadcast' (Broadcast Server)

- **NTP Server:** responds to requests received from NTP clients by sending NTP time information to the requester (unicast);
- **Broadcast Server:** sends unsolicited NTP time information to the NTP multicast address, at intervals specified in menu 6.5. The broadcast method does not support network delay measurements and is not recommended except with devices that are specified as being *Broadcast Clients*. Note that, in this mode, the DXD will also respond to requests received from NTP clients.

7.6.2 PSEUDO CLIENT MODE (MENU 6.2)

Menu 6.2 is called 'Pseudo' Client Mode because, when enabled, the NTP time is not automatically sent out to the server side. Instead, the Time-of-Day received through this port can be transferred manually to the System Time (see below) or automatically to the Real Time Clock (see menu 8.2: Auto Update RT Clock).

- **Pseudo Client Mode:** Choices are: Enable / Disable

- **Ext Server Select:** As an NTP client, the DXD has 4 choices for external NTP server:
 - Automatic: cycling automatically through the 3 choices below until valid NTP data is found (default value).
 - pool.ntp.org: cycling through the servers in the NTP pool
 - Ext Server A: pointing to the server entered in menu 6.3, exclusively
 - Ext Server B: pointing to the server entered in menu 6.4, exclusively

- **Sys. Time Transfer From NTP:** This menu allows for the NTP time to be transferred manually to the DXD System Time. The choices are: Off / Press ENTER to transfer

7.6.3 EXTERNAL SERVER NAME A (MENU 6.3)

A 32 character name can be entered to define External Server A. Each character can be either a number, a letter or a punctuation. Characters are selected by pressing the [UP] and [DOWN] key. IP addresses or server names can be entered such as nist.time.gov. The blue line at the bottom of the screen displays the server name as it is entered.

6.3 EXT SERVER NAME A										
SERVER NAME A:	1	9	2	-	1	6	8	-		
SERVER NAME A Continued:	0	-	2	1	6					
SERVER NAME A Continued:										
SERVER NAME A Continued:										
"192-168-0-216"										

7.6.4 EXTERNAL SERVER NAME B (MENU 6.4)

This menu is identical to menu 6.3, for External Server B.

7.6.5 POLL TIMING (MENU 6.5)

This menu lets you adjust these 2 intervals. Values range from 16 sec to 36h 24m 32s:

- **Client Poll Interval**
- **Broadcast Server Poll Interval**

7.7 GPS

The GPS group of menus is only available if the DXD/GPS receiver is installed. If not a message will appear:

DXD/GPS NOT INSTALLED
The GPS Receiver is required for these menus.

The DXD/GPS is a small board that installs easily inside the DXD. Please refer to the DXD/GPS manual for details on the GPS menus.

7.8 Time

Without PTP or GPS, the base DXD-8 deals with references that do not include time and date such as video sync or word clock. However, the generated outputs are always referenced to the PTP epoch. For that reason, when no Time Of Day source is available to the DXD-8, the internal Real Time Clock will provide Time and Date.

7.8.1 TIME STANDARDS (MENU 8.1)

Four different time standards are available as well as local time:

- **TAI:** International Atomic Time, an atomic coordinated time that has been measuring time continuously since 1955 with no leap seconds. It is used as a base by other standards such as UTC.
- **UTC:** Coordinated Universal Time is the time zone '0' from which all other time zones are calculated. It is based on TAI and since 1972 has added leap seconds every year or so, depending on the earth's rotation. UTC is currently 37 seconds behind TAI.
- **GPS:** Global Positioning System time is used by the atomic clocks in the GPS satellites. It is continuous time (no leap seconds) measured from the GPS time zero point of midnight January 5, 1980. It is 19 seconds behind TAI.
- **Loran:** Long Range Navigation time based on atomic clocks. Like GPS, it is continuous time with no leap seconds measured from the time zero point of midnight January 1st, 1958. It is 10 seconds behind TAI.
- **Local:** Local time is based on UTC and adjusted for time zone and Daylight Saving (menu 7.1)

Menu 8.1 lets you pick which of these standards or local time will be used to display the following DXD times:

- **System Time**, the main Time Of Day clock at the heart of the DXD
- **RT Clock**, Real Time Clock, a constantly running, battery-backed-up clock inside the DXD, providing TOD when no external source is available.
- **NTP**, Time-of-Day from the external NTP Server.

Additional times are available depending on the options installed such as PTP and GPS.

Menu 8.1 also includes Local Time parameters:

- **Local Time Zone**: can be adjusted in hours and minutes with a positive or negative value, relative to UTC (or GMT)
- **Local Daylight Saving**: can be adjusted in hours and minutes (typically 1 hr). DST can only be set manually.

At the bottom of this page a 'hint' message appears for setting the time zone properly: NY -5, Tokyo +9.

8.1 TIME STANDARDS			
SYSTEM / RT CLOCK:	LCL	LCL	
PTP GM / GPS / NTP:	LCL	LCL	LCL
LOCAL TIME ZONE:	-8 Hrs	00 Min	
LOCAL DAYLIGHT SAVING:	0 Hr	00 Min	
Time zone examples: NY -5, Tokyo +9			

7.8.2 REAL TIME CLOCK (MENU 8.2)

Menu 8.2 lets you set several parameters of the RTC (Real Time Clock), the DXD internal back up clock described in chapter 8.

- **Set Time: YYYY/MM/DD and HH:MM:SS**: These fields let you enter manually a date and a time that will become the current date and time of the RTC when the [ENTER] key is pressed.
- **System Time Transfer From RT Clock**: With 'Press ENTER to Xfer' selected, the RT Clock time is transferred to the Main TOD Clock (System Time) when the [ENTER] key is pressed.

8.2 REAL TIME CLOCK			
SET TIME: YYYY/MM/DD	2020	05	22
SET TIME: HH:MM:SS	07	01	18
SYS TIME TRANSFER FROM RT CLK:	Off		
AUTO UPDATE RT CLOCK:	From NTP		
RT Clock:	2020/05/22	07:05:25	TAI

Note that depending on the offset between the 2 clocks, this action will most certainly create a certain amount of 'sync shock' as all the outputs are locked to the System Time.

- **Auto Update RT Clock**: Two different sources can be used for automatically updating the RT Clock: NTP and GPS (optional). When NTP is available, it is recommended that NTP be selected remembering of course that, to make NTP available, the client function must be enabled in menu 6.2.

At the bottom of this page the RTC Time is displayed along with the Time Standard set up in menu 8.1

7.8.3 TIME & DATE DISPLAY (MENU 8.3)

Menu 8.3 lets you select 2 different DXD times & dates to be displayed in the Time & Date display (see 6.1.2 Main Rotation). The choices are:

- System Time
- Real Time Clock
- NTP Client
- No display (lower display only)

The times and dates displayed will match what has been set in menu 8.1 and that setting will appear to the right of the time.

Other choices will be available depending on the installed options: Ext PTP Grandmaster, GPS Receiver, LTC Generators.

7.7.4 LEAP SECONDS (MENU 7.4)

- **UTC Leap Second**: Menu 7.4 lets you enter manually the number of leap seconds to be applied to TAI.

7.9 Time Code

The Time Code group of menus is only available if the DXD/LTC option is installed. If not a message will appear:

LTC FEATURE KEY NOT FOUND
To purchase please contact your Brainstorm dealer.
Feature Keys are unique for each serial number.

The DXD/LTC is a firmware upgrade for the DXD-8. Please refer to the DXD/LTC manual for details on the Time Code menus.

7.10 Presets

Ten different user settings configurations can be stored for quick recall, labeled Preset 1 through Preset 10.

Menu 10 manages the presets. After selecting a preset, there are 5 different actions to choose from:

- Save
- Recall
- Delete
- Change Name
- Clear Name

When Saving, Recalling or Deleting a preset, a confirmation dialog appears on the display.

An 8 character name can be given to each preset using the Change Name and Clear Name commands.

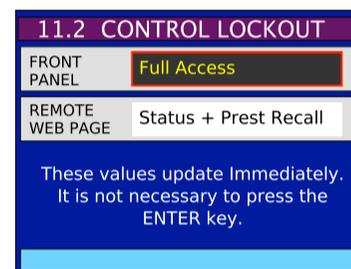
7.11 Utility

7.11.1 BRIGHTNESS (MENU 11.1)

Menu 11.1 lets you adjust the brightness of the LCD display and of the LED's. Values range from 00 to 16, default value is 10. These changes take place immediately without having to press the [ENTER] key.

7.11.2 CONTROL LOCKOUT (MENU 11.2)

To avoid accidental changes, menu 11.2 can limit access to the front panel and to the remote web pages. Choices for the front panel are: Full Access / Lockout; for the Remote Web Pages they are: Full Access / Status Only / Status & Preset Recall. As in menu 11.1, pressing the [ENTER] key is not required.



When Full Access is not granted and a change is attempted, an error message appears in the display or on the web browser. Note that when the front panel is in LOCKOUT mode, changing that mode is still allowed.

7.11.3 CLEAR MEMORY (MENU 11.3)

In menu 11.3, pressing the [ENTER] key clears all the settings stored by the user in the flash memory, except for the presets. It also causes the DXD-8 to reboot. Clear Memory will revert the unit to the **factory presets**, restoring the default values described in Appendix E.

7.11.4 REBOOT (MENU 11.4)

In menu 11.4, pressing the [ENTER] key is the equivalent of cycling power. Confirmation will be required for this action.

7.11.5 FEATURE KEYS (MENU 11.5)

This menu is for entering authorization codes to enable certain features such as PTP, AVB or Time Code. The feature key is a unique series of 4 numbers, separated by periods, valid for one unit only, identified by its serial number.

7.11.6 NAME (MENU 11.6)

A 16 character NAME can be entered in this menu to help identify this unit. The menu splits the name into 2 separate fields of 8 characters each. However, the NAME is a continuous string of 16 characters as shown on the blue status line on the bottom of the display.

The Name of the device will appear in the header of the remote control web page.

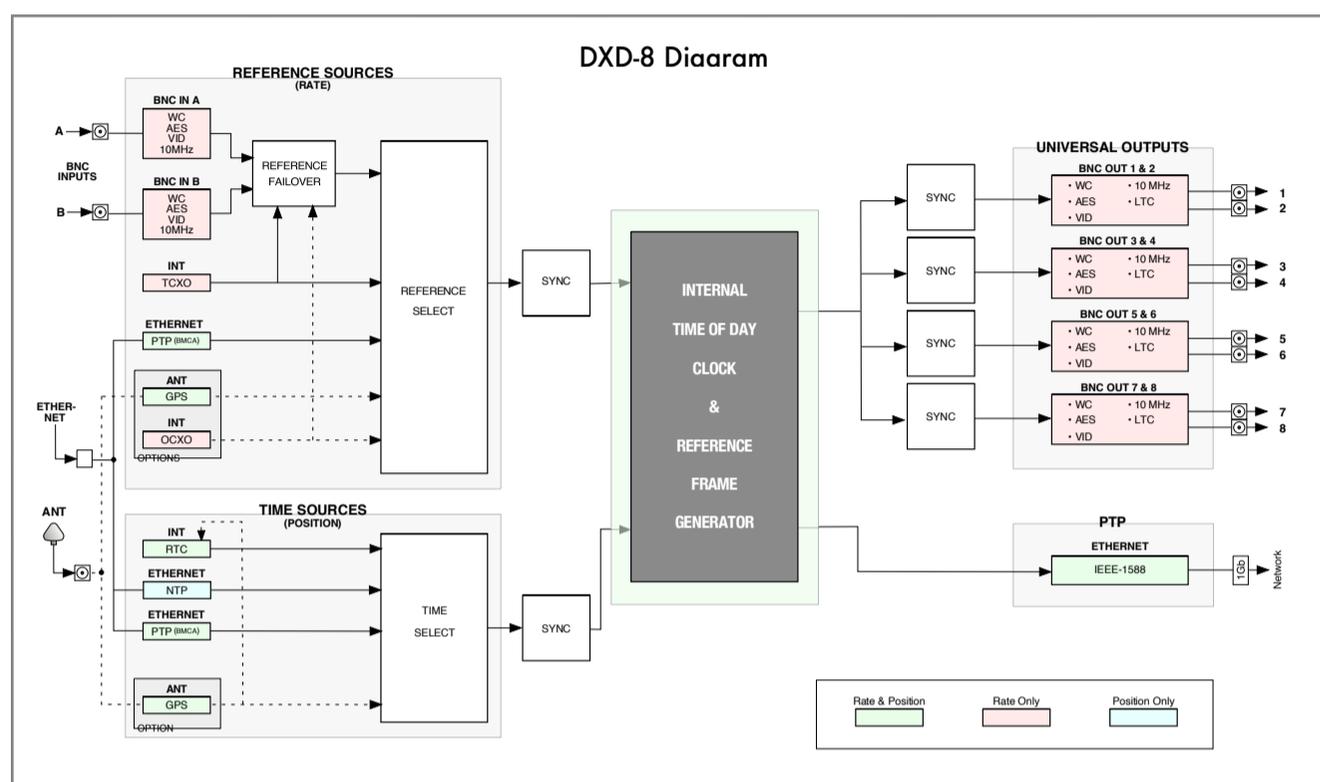
7.11.7 LOCATION (MENU 11.7)

A 16 character LOCATION can be entered in this menu to help identify this unit. The menu splits the name into 2 separate fields of 8 characters each. However, the LOCATION is a continuous string of 16 characters as shown on the blue status line on the bottom of the display.

Like the Name, the Location of the device will appear in the header of the remote control web page.

8. Time of Day

Although PTP is optional on the DXD-8, it is PTP ready and Time of Day is an essential part of its design. In a PTP network, the devices all need to know the Time of Day, i.e. year, month, day, hour and seconds, even nanoseconds, to achieve frequency and phase synchronization. At the heart of the DXD-8 is the Main Time of Day Clock (TOD) & Reference Frame Generator. This is where System Time is generated and where the references generated by the DXD-8 are aligned with the PTP epoch.



A pdf document discussing Time-of Day is available on our web site in the [tutorial section](#).

As shown on the diagram above, some of the reference sources include time and rate information. GPS and PTP for example carry precise time and date information as well as frequency. However, traditional reference signals, such as video sync or word clock, only carry the frequency information. When selecting one of those as reference (BNC inputs), the time information needs to be added from another source. The DXD-8 offers several options.

IMPORTANT NOTE

When using a reference without time information such as video sync, there will be an adjustment in the TOD count so that video frame edges are correctly aligned. The internal TOD is always creating internal frame references that are aligned as required with Jan 1, 1970 (PTP epoch). To lock to an external frame edge the DXD has to move the TOD count by up to +/- half a frame to synchronize the internal TOD frame edge to the incoming edge.

8.1 RTC (REAL TIME CLOCK)

A backup clock, called the RTC (Real Time Clock) is included in the DXD. It is set at the factory (date & time) and runs continuously, even when the unit is turned off as it is powered by an internal battery.

The DXD uses the date & time information from the RTC just after power up and transfers it to the main TOD (System Time). When locking to a new reference, if that reference does not have date & time, the TOD simply continues counting along its current time sequence; if it has date & time, that information is transferred to the TOD.

Although the RTC is set at the factory, it can also be set manually by the operator via the Real Time Clock menu (menu 8.2).

The RTC can also be updated automatically from NTP. This is the recommended setting. Be sure to enable the NTP Client mode in menu 6.2. Alternatively, if the GPS option is installed and GPS is available, GPS can be used to update the RTC.

8.2 REAL TIME CLOCK			
SET TIME: YYYY/MM/DD	2020	05	22
SET TIME: HH:MM:SS	07	01	18
SYS TIME TRANSFER FROM RT CLK:	Off		
AUTO UPDATE RT CLOCK:	From NTP		
RT Clock:	2020/05/22	07:05:25	TAI

8.2 TIME JAM

Another way to receive Time of Day when it is not part of the reference is through Time Jam (this mode is only available when one of the BNC inputs is set as the reference). Current choices for external sources are PTP and GPS, both optional on the DXD-8. During a Time Jam, the DXD-8's TOD will reset to the time of that source of time before locking to the BNC input.

For more information on Time Jam, please see details in the PTP/GPS manuals.

9. Input rate: Learn vs. Set

9.1 BNC INPUT SET UP MENU

In the BNC Input Set Up menus (menus 2.1 and 2.2), the DXD-8 offers a choice between LEARN and SET:

- LEARN: the DXD-8 measures the input reference and determines it's rate;
- SET: the user defines the expected rate.

Most of the time LEARN will work fine and it is the default value. However, at times, the user may choose SET to be sure the DXD-8 does not misinterpret an input frequency which is slightly incorrect. The SET mode may also be chosen for more fail-safe operation, in that there is no chance that the DXD-8 will re-define a frequency which drifts over time.

To illustrate this, let's look at a reference frequency of 95,950Hz. This frequency is slightly below the standard 96k rate but slightly above the pulled down 96k (95,904Hz). If the unit uses this source as reference, here are the 2 possible scenarios:

- If the DXD-8 interprets this as 96k, it will run slow by 0.052%;
- if it interprets it as a pulled down 96k, it will run fast by 0.047%

In SET mode, the user can make that choice; in LEARN mode, the DXD-8 automatically selects the closest frequency, i.e. the pulled down 96K in this case.

9.2 ABOUT USING THE 'SET' MODE FOR THE REFERENCE SOURCE

When choosing SET for the rate of the reference source, there is the possibility that the selected rate will not match the measured rate (actual rate). If that is the case, the DXD-8 will still lock to the reference but the output frequencies will be adjusted proportionately.

For example, if the input reference is SET for PAL, and NTSC video reference is connected, an output frequency requested at 44,100Hz will actually be 52,867Hz ($44100 \times 29.97/25$).

WARNING: When using this function, the user can potentially mislead the DXD-8 and affect the output frequencies. This could be done intentionally to repair prior errors, but caution must be used.

9.3 OFFSPEED REFERENCE

When the reference is detected to be offspeed by more than 0.075%, the Lock bar at the bottom of the status displays indicates the message 'OFFSPEED' in the left third with different color background:



As this may be intentional (see 9.2 above) the background color is orange (warning color), not red (error color). But, as mentioned above, caution must be used with an offspeed reference as it will affect the outputs.

10. External Reference Failover (BNC)

In the event of failure of the external reference, the DXD-8 has 2 different scenarios to insure that the Sync outputs remain safely uninterrupted.

10.1 REFERENCE FAILURE WITH AN ALTERNATE REFERENCE

Menu 1.1 allows for the second BNC input to be used as an alternate reference. With that function enabled, if the main reference disappears or becomes unreadable, the DXD-8 goes from LOCKED to HOLD and displays a 'REF ERROR' message on the right side of the reference line. Once it recognizes the alternate reference, it indicates 'ALTERNATE' in place of the error message and goes through the normal locking procedure, displaying the appropriate status messages in the Lock bar at the bottom of the display (see ch. 11). As both reference sources are identical, this transition happens smoothly and without any sync shock.



The DXD-8 will stay locked to the Alternate reference with the 'ALTERNATE' message in the reference line, even if the original reference reappears.

If the alternate reference fails and the original reference is present, the DXD-8 switches back to the original reference in the same sequence as the one described above. If the original reference is not present, the DXD-8 switches to the Internal crystal as described below.

10.2 REFERENCE FAILURE WITH NO ALTERNATE REFERENCE

If the Alternate Reference function was disabled in menu 1.1 and the main reference disappears or becomes unreadable, the DXD-8 goes from LOCKED to HOLD and displays a 'REF ERROR' message on the right side of the reference line. The DXD-8 stays in the HOLD mode until the reference reappears at which point the DXD-8 automatically goes back into the lock sequence.

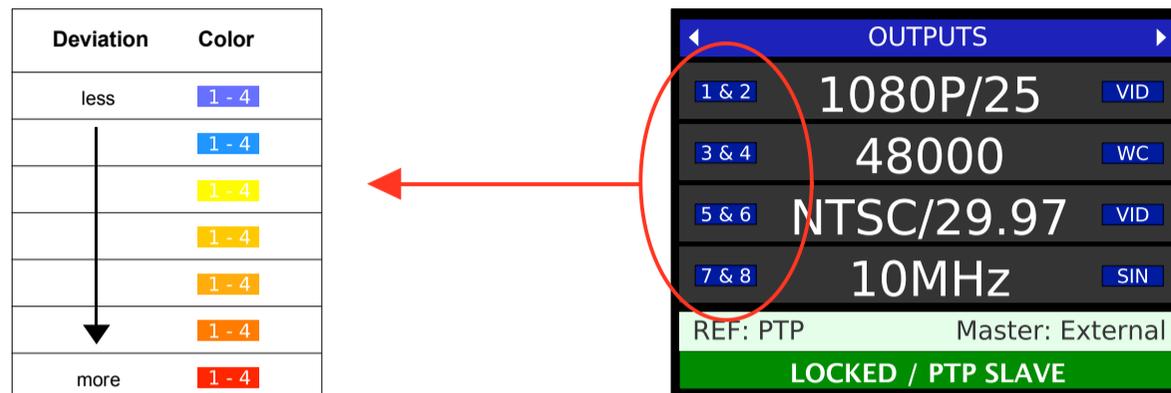
11. Lock Status

The lock status of the DXD-8 is indicated in the lock bar at the bottom of the Main Rotation display. The background color changes to reflect the lock condition so it can be clearly visible from a distance. Below are the different statuses and what they indicate:

HOLD	input reference unavailable, holding frequency and position
HOLD / FREQ LOCK	internal primary frequency adjustments
HOLD / SYNC	general synchronization adjustments
TIME SYNC	Time-of-Day adjustments
OUTPUT ALIGN	output channel synchronization
LOCKED	locked

12. Output Deviation Indication

The DXD-8 continuously monitors each output group and looks for timing deviations. The length of each frame is compared to the previous one and, if a deviation is found, it is reported on the OUTPUTS page of the main rotation display by changing the color of the blue boxes on the left side where the output groups are identified.



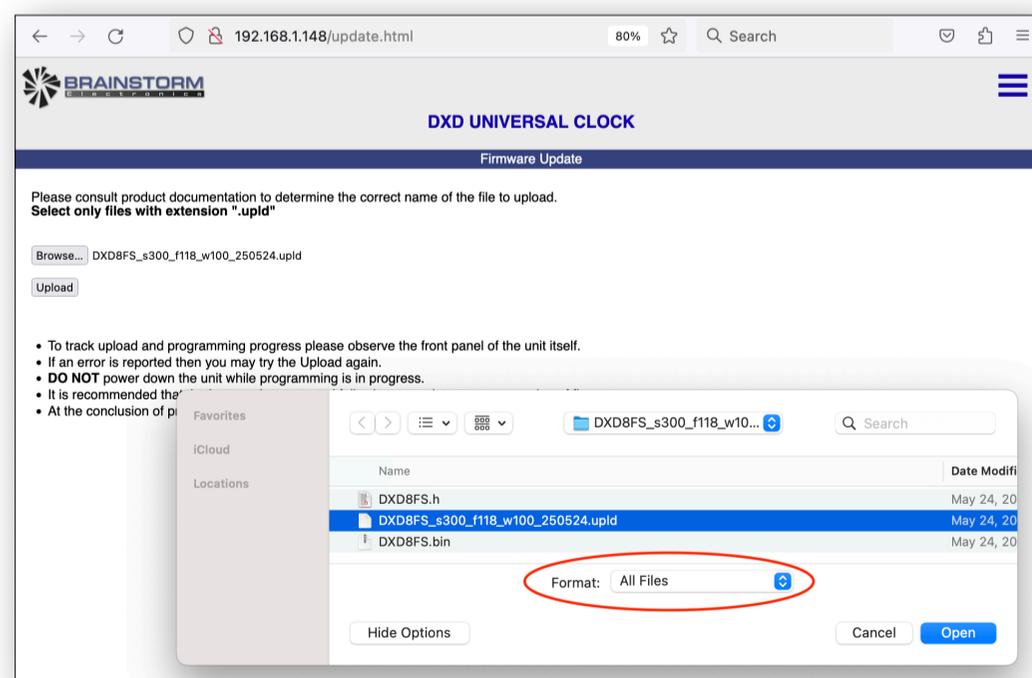
After power up or after selecting a new reference, a lot of jumping around is expected. During a normal synchronization sequence there will mostly be a glitch at the start of the OUTPUT ALIGN sequence, and one more at the end because of the speed change required to get the outputs to the newly desired position.

13. Firmware Updates

Firmware updates are done via the embedded web pages, available in rev. 300 and higher. When updating your DXD-8 from a version earlier than 3.00, point your browser to the IP address of your DXD-8 and a simple firmware loader page will appear similar to the one shown below. When updating firmware from version 3.00 or higher, refer to the next chapter.

13.1 FIRMWARE LOADER PAGE

Click on the [BROWSE] button and select the firmware file on your hard disk. Typically, this would be DXD8FS_<version>.upld. Then click [UPLOAD]. The normal programming sequence will follow.



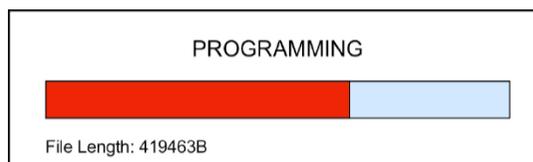
Note: some browsers such as Safari will not let you select the .upld file as it is not a recognized format. When using Firefox, after clicking on [BROWSE], a window appears that will let you navigate to the proper folder. On the bottom left of that window click on the <Options> button. Under FORMAT, select 'all files' so you can select the .upld file.

13.2 PROGRAMMING SEQUENCE

There are 3 steps in the normal programming sequence:

- UPLOAD
- VERIFY
- PROGRAM

The first 2 steps happen very quickly and may not be noticeable. The 3rd step will take a little longer and a window with a progress bar will appear on the front panel display.



After the programming is completed, rebooting is required. A message appears on the display to reboot the unit.

13.3 FIRMWARE FILE NAMING CONVENTION

A DXD-8 firmware release includes 3 different sections:

- software,
- logic (FPGA),
- webpage.

These can be seen in the UNIT INFORMATION Status page, as described in 6.2.2.

Although the 'software' number is used to name a release (rev 1.00 for example), the actual file name includes all 3: DXD8FS_s300_f118_w100_250524.upld, where fs= File System, s=software, f=FPGA logic and w=webpage, followed by the date.

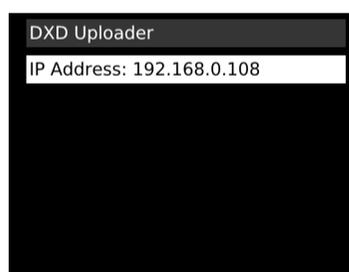
13.4 UPLOADER

The Uploader is a fall-back web page that allows you to restore your DXD-8 in case of a catastrophic programming failure. This page is located in a different area of the Flash Memory, unaltered by regular firmware updates. These failures are very rare and should not happen.

To enter the UPLOADER mode: Hold down the [DOWN] and [SET UP] keys simultaneously while powering up.



All of the LEDs will flash momentarily to notify you that the keys have been recognized. The following message will appear in the display:



From the Uploader mode you can adjust the IP addresses and the DHCP mode in the usual way. Press the [SET UP] key to go into the SET UP mode. Only 3 menus are available while in the Uploader mode: Network, Brightness and Reboot.

Note that settings from the Uploader are not saved, only the main application will do that.

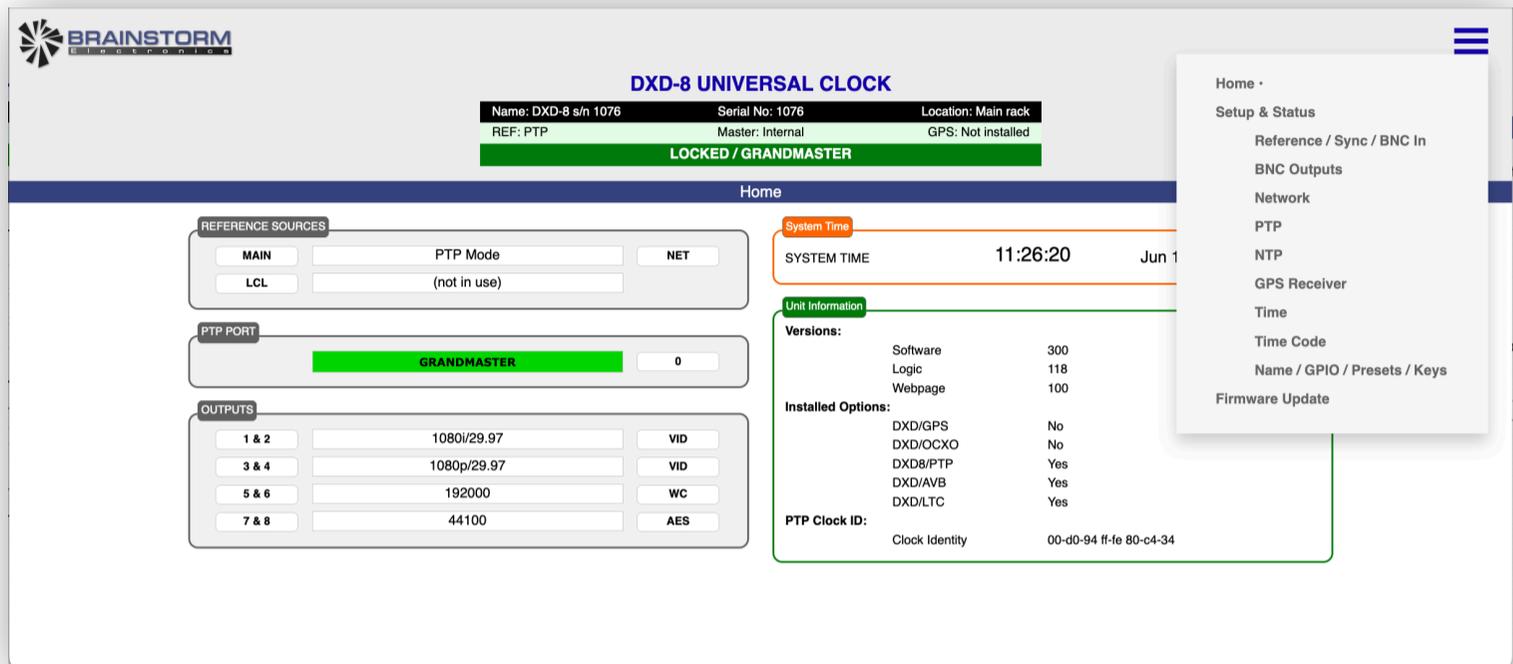
Point your browser to the IP address of your DXD-8. A page similar to the regular Firmware Loader page described above will appear.

To restore your unit, use the BROWSE button to locate the firmware file on your hard disk (.upld) and click UPLOAD. The normal programming sequence described in 12.2 will follow.

14. Remote Control

The DXD-8 firmware includes embedded web pages to control and monitor the unit remotely from a standard web browser. This function was introduced with firmware 3.00.

From your web browser, simply point to the DXD-8 IP address and the Home Page will appear.



For details on the Remote Control, please refer to the DXD Remote Control manual available on our [web site](#).

15. Non-Volatile Storage

The DXD-8 has non-volatile memory holding the current settings. This includes all DXD-8 settings such as network and time settings, rate and reference selections as well as output assignments. This memory is continuously updated so that, when the unit is turned on, it is in the same condition as it was when powered down.

NOTE: You should wait approximately 2 seconds after a change was entered before powering down, to allow for the flash memory to be updated.

16. Power

Two different 12VDC power sources can be connected to the DXD-8. Either one can be used to power the unit. Two front panel LED's indicate if power is connected to the corresponding connector, A or B.

16.1 POWER FAILURE W/ DUAL POWER SOURCES

When two power sources are connected and one fails, the DXD-8 will continue to operate without interruption. The corresponding front panel LED will flash to indicate a failure.

When that occurs, a new power supply should be connected in place of the faulty one. It is not required to power down the unit. The front panel LED will stop flashing when proper power is applied at the corresponding connector and stay on solid.

17. Troubleshooting - Error / Warning Messages

There are several types of messages the DXD-8 will display in case of problems. Two different colors are used: Red for errors; Orange for warnings.

17.1 RATE INVALID WARNING

When selecting a BNC input as the reference source, if the incoming signal does not correspond to the signal defined in menu 2 (BNC Input Set Up), this warning message will appear. A red REF ERROR indication will also appear on the Ref line at the bottom of the main rotation display and the lock status bar will indicated UNLOCKED.

- **Make sure the BNC Input is set properly in menu 2.**

17.2 PRIMARY AND ALTERNATE REFERENCES INCOMPATIBLE

This message appears when BNC Input B is set as an alternate reference and is not the same as BNC Input A.

- **Make sure BNC Input B is set as BNC Input A (menu 2.2).**

17.3 OFFSPEED REFERENCE

When 'SET' is selected in the BNC INPUT SET UP menu and the reference is detected to be off speed by more than 0.075%, the Lock bar at the bottom of the display indicates the message 'OFFSPEED'. Under an 'Offspeed' condition, the DXD-8 will generate a rate different that what is announced. The difference of the generated rate will be the same percentage as the one of the reference input (see chapter 9).

- **Make sure the rate value entered in menu 2 (with SET selected) is the rate of the reference.**

18. Appendix

18.1 APPENDIX A: SUPPORTED VIDEO INPUT AND OUTPUT FORMATS

The following table lists the video formats supported by the DXD-8. Note that because, from a sync standpoint, 1080sF is indistinguishable from 1080i, the difference cannot be detected at the input. Therefore, 1080sF is not available at 25, 29 or 30 rates in the BNC Input Set Up menus. Both 1080sF and 1080i are available for the outputs but it results in the same signal.

525i/29.97 NTSC	720p/23.976	1080i/25	1080p/23.976
525i/30	720p/24	1080i/25 295M	1080p/24
625i/23.976 PAL-	720p/25	1080i/29.97	1080p/25
625i/24 PAL-	720p/29.97	1080i/30	1080p/29.97
625i/25 PAL	720p/30	1080sF/23.976	1080p/30
	720p/50	1080sF/24	1080p/50
	720p/59.94	1080sF/25	1080p/50 295M
	720p/60	1080sF/29.97	1080p/59.94
		1080sF/30	1080p/60

"PAL-" stands for slow PAL.

18.2 APPENDIX B: AUDIO BASE RATES

The DXD-8 has 2 different audio base rates, defined in menus 3.7 and 3.8. Those are used to generate the audio signals, WC and AES.

The table below shows the different rates available, based on 3 different sampling frequencies: 32KHz, 44.1KHz and 48KHz. 44.1KHz has the -0.1% coefficient option while 48KHz has 7 variants (see 18.3).

Basic Sample Rate	Pull coefficient	Actual Rate	Labeled as
32000	0.000%	32,000.000 Hz	32000
44100	-0.100%	44,055.900 Hz	44100 - 0.1%
44100	0.000%	44,100.000 Hz	44100
48000	-4.096%	46,033.920 Hz	48000 - 4.1%
48000	-4.000%	46,080.000 Hz	48000 - 4.0%
48000	-0.100%	47,952.000 Hz	48000 - 0.1%
48000	0.000%	48,000.000 Hz	48000
48000	0.100%	48,048.000 Hz	48000 + 0.1%
48000	4.166%	49,999.680 Hz	48000 + 4.2%
48000	4.271%	50,050.032 Hz	48000 + 4.3%

18.3 APPENDIX C: PULLED RATES

The DXD-8 provides several 'pulled' rates. Different pull coefficients exist because of the different video rates: 30fps, 29.97fps, 25 fps, 24fps and 23.98fps.

- **- 0.1%:** The original rate of NTSC Black & White video was 30fps. When color was introduced, the rate had to be slowed down slightly for technical reasons and a rate of 29.97fps was chosen, or 1/10 of a percent slower (-0.10%).
- **- 4%:** The rate of PAL is 25 fps while the rate of film is 24fps. That is a 4% difference ($25 \times 96\% = 24$).

The DXD-8 provides 0.1% and 4% pulled down and pulled up rates, and a combination of both coefficients down and up as well for multiples of 48KHz. Only -0.1% is provided for multiples of 41.1KHz.

18.4 APPENDIX D: MULTIPLIER RATES

With the 2 base rates properly set, multiples of those can be generated. Below is a table showing the different audio rates that can be generated by the DXD-8.

	Coefficient	Base Rate	x 2	x 4	x 8
32000	none	32,000.000 Hz	-	-	-
44100	-0.1%	44,055.900 Hz	88,112 Hz	176,224 Hz	352,447 Hz
44100	none	44,100.000 Hz	88,200 Hz	176,400 Hz	352,800 Hz
48000	-4.1%	46,033.920 Hz	92,068 Hz	184,136 Hz	368,271 Hz
48000	-4%	46,080.000 Hz	92,160 Hz	184,320 Hz	368,640 Hz
48000	-0.1%	47,952.000 Hz	95,904 Hz	191,808 Hz	383,616 Hz
48000	none	48,000.000 Hz	96,000 Hz	192,000 Hz	384,000 Hz
48000	0.1%	48,048.000 Hz	96,096 Hz	192,192 Hz	384,384 Hz
48000	4.2%	49,999.680 Hz	99,999 Hz	199,999 Hz	399,997 Hz
48000	4.3%	50,050.032 Hz	100,100 Hz	200,200 Hz	400,400 Hz

18.5 APPENDIX E: FACTORY PRESETS

The following are the factory default settings.

REFERENCE		ADVANCED NETWORKING	
Source	Internal	Internal VLAN ID	1
SYNC PARAMETERS		TIME	
BNC Input Color Framing	Off	SYSTEM TIME	TAI
BNC INPUT SET UP A&B		RTCLOCK	TAI
Signal	Video	LOCAL TIME ZONE	-8 Hrs 00 Min
Set/Learn	Learn	LOCAL DAYLIGHT SAVING	0 Hr 00 Min
BNC OUTPUTS 1-8		SET TIME: YYYY/MM/DD (RTC)	2020 / 01 / 01
Signal	SD Video	SET TIME: HH:MM:SS (RTC)	00:00:00
Rate	525i/29.97 NTSC	SYTEM TIME JAM FROM RT CLOCK	Off
AUDIO BASE RATE A		UPPER DISPLAY (TIME & DATE DISPLAY)	System Time
Set/Auto	Set	LOWER DISPLY (TIME & DATE DISPLAY)	No Display
Rate	48000 [48000]	UTC LEAP SECONDS	37
VSO Mode	VSO Off	TIME CODE - SMPTE 2059 SET UP	
AUDIO BASE RATE B		DAILY JAM TIME	01 Hrs 00 Min
Set/Auto	Set	MANUAL DAILY RE-JAM	Off
Rate	44100 -0.1% [44056]	UTILITY	
VSO Mode	VSO Off	LCD Brightness	10
MUTE ON UNLOCK		LED Brightness	10
Outputs 1 - 8	Off	Front Panel Lockout	Off
DELAY/ADVANCE		Name	DXD-8 s/n xxxxx
Outputs 1 - 8	Off	Location	Main Rack
NETWORK			
DHCP	On		
IP Address	-		
Subnet Mask	-		
Gateway	-		

When using the CLEAR MEMORY function (menu 10.3), the factory default values will be recalled after the unit reboots.

18.6 APPENDIX F: MENUS, MESSAGES & DISPLAY PAGES

Below is a graphical representation of most of the menus, messages and pages (main rotation & status mode) that appear on the DXD-8 front panel display.

SET UP MENUS

The SET UP MENUS section displays a grid of 100 screenshots, organized into 10 columns and 10 rows. Each screenshot shows a different configuration screen with various settings and options. The columns are labeled as follows:

- Column 1: SET UP MENUS (Navigation menu)
- Column 2: 1. REFERENCE & SYNC
- Column 3: 2. BNC INPUTS
- Column 4: 3. BNC OUTPUTS
- Column 5: 4. NETWORK
- Column 6: 5. PTP
- Column 7: 6. GPS
- Column 8: 7. TIME
- Column 9: 8. TIME
- Column 10: 9. TIME CODE

MESSAGES

The MESSAGES section displays a row of 7 screenshots showing various error and status messages:

- 9.2 FRONT PANEL LOCKOUT: ERROR FrontPanelLockedOut. Press Any Key to Clear.
- 4. OUTPUTS: PTP NO PORT. Possible causes include: PTP Mode not assigned, Missing IP Address, Network disconnected. Press Any Key to Exit.
- 6. GPS: DXD/GPS NOT INSTALLED. The GPS Receiver is required for these menus. To purchase please contact your Brainstorm dealer.
- 5. PTP: PTP FEATURE KEY NOT FOUND. To purchase please contact your Brainstorm dealer. Feature Keys are unique for each serial number.
- 9.5 FEATURE KEYS: FEATURE KEYS. Set Feature Key values? Please confirm. Press UP to set now. Press DOWN to set later.
- 9.5 FEATURE KEYS: FEATURE KEYS. KEY HAS BEEN SET. Press Any Key to Exit.
- 5. REBOOT CONTROLS: VERSION/PROFILE CHANGE. Do you want to RESET Timing values to their Default values? Press UP to Reset now. Press Any Other Key to Exit.

MAIN ROTATION DISPLAYS

The MAIN ROTATION DISPLAYS section displays a row of 4 screenshots showing the main rotation displays:

- 4.3 OUTPUTS: 1080P/25, 48000, NTSC/29.97, 10MHz.
- 4.4 REFERENCE SOURCES: INPUT A / WC, 48000, (not in use).
- 4.5 TIME & DATE: 10:29:48, Apr 20 2020.
- 4.6 GPS: 10:29:48, Apr 20 2020.

STATUS DISPLAYS

The STATUS DISPLAYS section displays a row of 8 screenshots showing various status displays:

- 4. UNIT INFORMATION: Serial Number, Name, IP Address, MAC Address, Software, Message, etc.
- 4. NETWORK ADDRESS: IP Address, Subnet Mask, Gateway, etc.
- 4. TIMES: System/RT Clock, PTP GM/GPS/NTP, Local Time Zone, etc.
- 4. GPS RECEIVER: Status, Environment, GPS, SBAS, etc.
- 4. GRANDMASTER ID: Priority Class, Output, Environment, etc.
- 4. PTP PORT STATUS: Port Status, Delay Between PTP, PTP Messages, etc.
- 4. NTP PORT STATUS: Port Status, Delay Between NTP, NTP Messages, etc.
- 4. WC OUTPUT TERMINATION: Output 1-8, Mode, etc.