

DXD-16

Universal Clock

Owner's manual

Version 1.00

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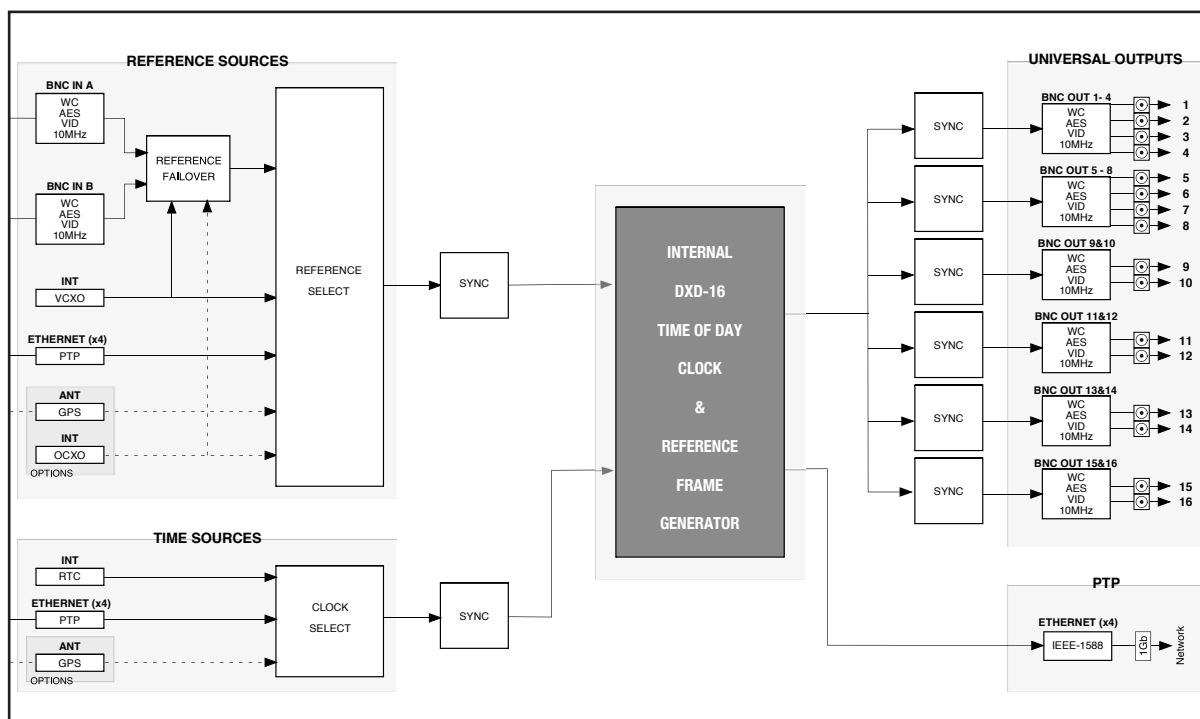
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1. Introduction

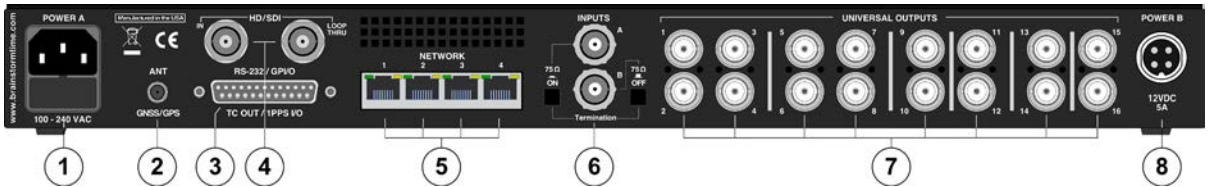
The DXD-16 Universal Clock is a PTP Grandmaster, merged with a precision Reference Generator. On the PTP side, 4 independent Ethernet ports are included. The DXD-16 can be either a PTP Grandmaster, slave or boundary clock. The precision multi-format reference generator provides a total of 6 independent video syncs and audio clocks simultaneously. The 16 universal outputs can be configured for any of the generated signals, giving the DXD-16 great flexibility to adapt to the requirements of modern broadcast or post production facilities.

The GPS option provides an extremely accurate timing source and enables multiple DXD units in remote locations to be locked and in phase with one another.

- 4 independent PTP ports
- 6 separate reference generator
- 16 universal outputs (WC, AES, VID SYNC, 10MHz)
- very low jitter
- 2 universal inputs (WC, AES, VID SYNC, 10MHz)
- Remote control via web browser
- Multiple hardware options: GPS/GNSS, OCXO, SDI Input
- Software option: Time Code Reader/Generator



2. I/O's Description and Cable Requirements



2.1 AC POWER

Universal power input, accepts 100 to 240 VAC.

Connector: IEC inlet - Fuse: 5A 125VAC 5X20MM

- ☛ Use an IEC power cable and connect to an 100/240 AC wall outlet.

2.2 ANTENNA (OPTION)

This port is used to connect an external GPS antenna (GPS option).

Connector: SMA jack

- ☛ Use 50Ω coaxial cable with an antenna as specified in the instructions manual provided with the GPS option.

2.3 RS-232 / GPIO / TC OUT / 1PPS I/O

This multifunction connector is used for connecting an external GPS receiver (RS-232 & 1PPS), GPIO and balanced TC outputs.

Connector: DB-25 female receptacle

- ☛ Use a custom DB-25 cable per the pin out described in appendix G

2.4 HD/SDI (OPTION)

Connectors: BNC IN + BNC Loop Through

- ☛ Use standard 75Ω BNC coaxial cables (see DXD/SDI manual).

2.5 ETHERNET PORTS

4 independent Gb Ethernet ports used to connect the DXD-16 to a network for PTP sync or to control the unit remotely and upload firmware from any computer on the network. Remote control and firmware update is from port 4 only.

Connectors: RJ45 jack

- ☛ Use a standard cat5 or cat6 Ethernet cable with RJ45 plugs.

2.6 REFERENCE INPUTS & TERMINATION SWITCHES

The 2 BNC inputs accept WC, AES, Video Sync and 10MHz based on the user selection (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-16. The last unit in the chain, and only that unit, should have its termination on.

2.7 UNIVERSAL OUTPUTS

The 16 universal outputs can generate Word Clock, AES, 10MHz (1v pk-pk sine wave), HD Video Sync, or SD Video Sync, based on the user selection.

Connector: BNC

• Use standard 75Ω BNC coaxial cables.

2.8 DC POWER

The DXD-16 can also be powered by a 12VDC @ 48W source. Acceptable range is 11VDC to 17VDC.

The DC source can be connected together with the AC source for redundancy.

To order a DC power supply (p/n PS-8), 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.

3. Installation

3.1. UNPACKING

When unpacking your DXD-16 the following items should be in the shipping carton:

- DXD-16 unit
- IEC power cable
- Registration card

3.2. INSTALLING THE DXD-16

The DXD-16 is designed to be mounted in a standard 19" rack. It requires 1U in height. Usual precautions should be respected when wiring the DXD-16: 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 2.

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 reference input needs to be properly terminated. If the DXD-16 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 (not recommended), turn off the termination switch and make sure there is a 75Ω termination at the end of the chain.

4. Quick Start

You should read this manual to familiarize yourself with the DXD-16 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-16 will turn on as soon as power is connected.

Out of the box, the DXD-16 is set to generate NTSC video sync, referenced to its internal crystal. This signal is sent to all 16 outputs.

To make any 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.
- To change the outputs, go to menu 2.

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.

5. Front Panel Display & LED's



5.1. FRONT PANEL DISPLAY

The DXD-16 front panel has a large full color display giving access to all the unit's parameters and settings.

In the standard running mode, the display indicates status information organized in several pages, as described in chapter 6.

In addition to the standard running mode, two additional modes exist that affect the display:

- SET UP Mode
- STATUS Mode

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

In the STATUS mode, additional status information is displayed, organized in multiple pages like the standard running mode's main rotation pages.

In the SET UP mode, the display is used to set the unit's parameters as described in chapter 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.

5.4. FRONT PANEL LED'S

There are 12 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 2.6);
- IN B: a signal is present at the Input B connector;
- TERM OFF B: the rear panel termination switch is off (see 2.6);
- GNSS/GPS: a signal is present at the antenna input
- HD/SDI: a signal is present at the SDI input
- NETWORK 1: port 1 of the DXD-16 is connected to a network
- NETWORK 2: port 2 of the DXD-16 is connected to a network
- NETWORK 3: port 3 of the DXD-16 is connected to a network
- NETWORK 4: port 4 of the DXD-16 is connected to a network
- POWER A: AC Mains 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 (see chapter 9 for more information).

6. Display

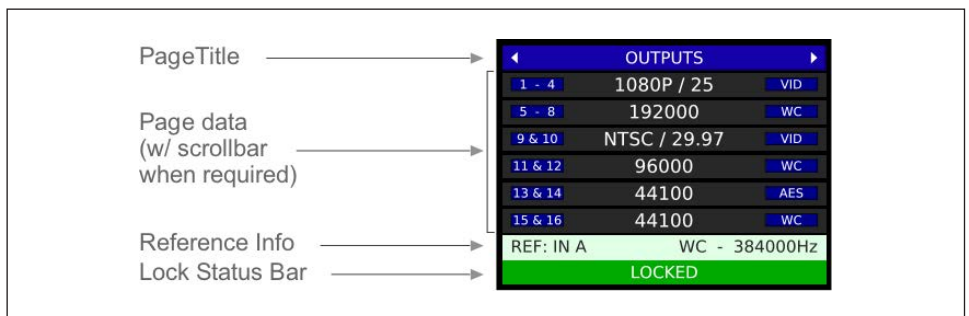
■ 6.1. Main Rotation

In the default running mode, with neither the Status nor the Set Up mode activated, the status information on the display is arranged in multiple pages referred to as the 'main rotation'.

To access and rotate through the different pages, press the [◀] or [▶] key.

6.1.1. MAIN ROTATION PAGES LAYOUT

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



- Header (top line): contains the page title. It has a blue background and white letters.
- 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): contains reference and lock info. The first line displays the reference source and reference errors or special conditions. The second line displays the lock status. Its background color changes to reflect the lock condition: green, yellow or red (see chapter 10).

6.1.2. MAIN ROTATION PAGES

• OUTPUTS

This page indicates the rate, format and signal type of each of the 4 output BNC pairs. For audio rates, if VSO is engaged, it is also indicated.

• 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.

Other pages will appear in the main rotation with new firmware updates or when options are installed, such as PTP or GPS.

■ 6.2. Status Mode

Other status 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. These pages are formatted similarly to the Main Rotation pages. Navigation is identical.

6.2.1. UNIT INFORMATION

This page shows the following information:

- Model
- Serial Number
- DHCP Mode
- IP Address
- Mac Address
- Firmware version (software, logic, webpage)

Additional pages will become available in the status mode with future firmware updates such as BNC inputs info, BNC outputs termination info and other status data.

■ 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 3 different levels. Levels 1 & 2 are made up of lists of menus organized in logical groups; level 3 is where parameters are actually set.



6.3.2. NAVIGATION

As parameters are set in level 3 only, the functions of the navigation buttons change depending on the level.

- LEVELS 1&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.
- LEVEL 3
 - 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 Level 2 and exit Level 3.

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.

Exiting level 3 by pressing the [◀ BACK] key without pressing the [ENTER] key first also causes unsaved changes to be lost.

6.3.4. STATUS VALUES

In Level 3, the line at the bottom of the display (light blue background) indicates status values. Status values are the values actually obtained, based on a menu selection.

6.3.5. MENU GROUPS

In the current firmware version, menus are organized in 5 separate groups:

- 1. Inputs
 - 1.1 Reference
 - 1.2 BNC Input A Set Up
 - 1.3 BNC Input B Set Up
- 2. Outputs
 - 2.1 Outputs 1-4
 - 2.2 Outputs 5-8
 - 2.3 Outputs 9&10
 - 2.4 Outputs 11&12

- 2.5 Outputs 13&14
- 2.6 Outputs 15&16
- 2.7 Audio Base Rate A
- 2.8 Audio Base Rate B

- 3. System Configuration
 - 3.1 Network

- 4. Utility
 - 4.1 Brightness
 - 4.2 Clear Memory
 - 4.3 Reboot

For details on each of these menus, please go to chapter 7.

7. Menus Description

■ 7.1. Inputs

7.1.1. REFERENCE (MENU 1.1)

Menu 1.1 lets you select the source to be used as the DXD-16's reference:

- BNC INPUT A
- BNC INPUT B
- INTERNAL

BNC INPUTS A and B are defined in menus 1.2 and 1.3; INTERNAL is the DXD-16 oscillator, TCXO (or OCXO, if that option is installed).

Additional fields are included in this menu:

- **SIGNAL** and **RATE**: these are status field indicating the status and the rate of the selected reference, as defined in menus 1.2 and 1.3.
- **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.

Note that, to guarantee a smooth transition, both sources must have the same format and rate. For more on Alternate Reference, see chapter 12.

The additional fields are not available when the reference source is 'Internal'.

7.1.2. BNC INPUT A SET UP (MENU 1.2)

The 2 BNC input connectors 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 1.2 lets you select the type of input connected to INPUT A and its rate.

- **SIGNAL:** WC, AES, 10 MHz or Video Sync
- **LEARN/SET:** LEARN is the default value. With LEARN, the DXD-16 determines the incoming rate; with SET, the user determines the incoming rate. For more information on Learn vs. Set, go to Chapter 11.
- **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 Signal type selected.

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

7.1.3. BNC INPUT B SET UP (MENU 1.3)

Menu 1.3 is identical to menu 1.2 for 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, these must be identical (see chapter 12 for more information on Alternate Reference).

■ 7.2. Outputs

The DXD-16 generates 6 different reference signals simultaneously. Each of them is sent to a different group of BNC outputs, as described below.

7.2.1. OUTPUTS 1-4 (MENU 2.1)

Menu 2.1 defines outputs 1-4

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

Based on that selection, additional fields appear to define other parameters:

- Audio (WC or AES)
 - **BASE & MULT:** Base Rate A or Base Rate B as defined in menus 2.7 or 2.8 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.

7.2.2. OUTPUTS 5-8 (MENU 2.2)

Menu 2.2 is identical to menu 2.1 for outputs 5-8.

7.2.3. OUTPUTS 9&10 MENU (2.3)

Menu 2.3 is identical to menu 2.1 for outputs 9&10.

7.2.4. OUTPUTS 11&12 (MENU 2.4)

Menu 2.4 is identical to menu 2.1 for outputs 11&12.

7.2.5. OUTPUTS 13&14 (MENU 2.5)

Menu 2.5 is identical to menu 2.1 for outputs 13&14.

7.2.6. OUTPUTS 15&16 (MENU 2.6)

Menu 2.6 is identical to menu 2.1 for outputs 15&16.

7.2.7. AUDIO BASE RATE A (MENU 2.7)

For audio outputs (Word Clock or AES), two different base rates can be defined labeled Audio Base Rate A & B. Menu 2.7 defines the 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-16 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). 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 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.

7.2.8 AUDIO BASE RATE B (MENU 2.8)

Menu 2.8 is identical to menu 2.7 for Audio Base Rate B.

■ 7.3. System Configuration

7.3.1. NETWORK (MENU 3.1)

DHCP stands for Dynamic Host Configuration Protocol. When enabled, the DHCP server automatically assigns the IP address.

When disabled, parameters must be entered manually. They are expressed in dot-decimal notation made up of 4 numbers ranging from 0 to 255, separated by dots.

The bottom line (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. Utility

7.4.1. BRIGHTNESS (MENU 4.1)

Menu 4.1 lets you adjust the brightness of the LCD display and of the LED's. Values range from 00 to 16. These changes take place immediately without having to press the [ENTER] key.

7.4.2.. CLEAR MEMORY (MENU 4.2)

In menu 4.2, pressing the [ENTER] key clears all the settings changed by the user.

7.4.3. REBOOT (MENU 4.3)

In menu 4.3, pressing the [ENTER] key is the equivalent of cycling power.

8. Non-Volatile Storage

The DXD-16 has non-volatile memory holding the current settings. This includes all DXD-16 settings such as 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.

9. Power

Two different power sources can be connected to the DXD-16: (A) 100-240 VAC and (B) 12 VDC. 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.

9.1. POWER FAILURE W/ DUAL POWER SUPPLIES

When two power sources are connected and one fails, the DXD-16 will continue to operate without interruption. The corresponding front panel LED will flash to indicate a failure.

Note that, with both power sources connected, if the 12VDC supply fails, a new one can be connected in place of the faulty one without powering down the unit. The front panel LED will stop flashing when proper power is applied.

10. Lock Status

The lock status of the DXD-16 is displayed in the lock bar at the bottom of the Status pages. Below are the different statuses and what they indicate:

UNLOCKED	Unable to lock
SLEW	PLL is trying to lock
HOLD	Holding last known frequency after lock failure
RELOCK	Starting the locking procedure
LOCK PENDING	Almost there
LOCKED	Good and locked

The DXD-16 always tries to lock to it's input. Once the rate has been established, if the reference is off speed by more than 10%, it switches to SLEW. Note that with video, the 10% rule applies to the horizontal frequency and not the frame rate.

The LOCK status appears at the bottom of the display on the Status pages. The background color changes to reflect the lock condition:

RED:	UNLOCKED
ORANGE:	SLEW / HOLD/ RELOCK
GREEN:	LOCKED / LOCK PENDING



11. Input rate: Learn vs. Set

11.1. BNC INPUT SET UP MENU

In the BNC Input Set Up menus (menus 1.2 and 1.3), the DXD-16 offers a choice between LEARN and SET:

- LEARN: the DXD-16 measures the input reference and determines it's rate;
- SET: the user defines the expected rate.

Most of the time LEARN will work fine. However, at times, the user may choose SET to be sure the DXD-16 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-16 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-16 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-16 automatically selects the closest frequency, i.e. the pulled down 96K in this case.

11.2. 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-16 will still lock to the reference but the output frequencies will be adjusted proportionately.

WARNING: When using this function, the user can potentially mislead the DXD-16 and affect the output frequencies. This could be done intentionally to repair prior errors, but caution must be used here.

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 ($44100 \times 29.97/25$).

11.3. OFF SPEED REFERENCE

When the reference is detected to be off speed 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 11.2 above) the background color is orange (warning color), not red (error color). But, as mentioned above, caution must be used with offspeed reference **as it affects the outputs.**

12. Source Reference Failover

In the event of failure of the external reference, the DXD-16 has 2 different scenarios to insure that the Sync outputs remain safely uninterrupted.

12.1. 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 reference disappears or becomes unreadable, the DXD-16 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 (RELOCK > LOCK PENDING > LOCKED). As both reference sources are identical, this transition happens smoothly and without any sync shock.



The DXD-16 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-16 switches back to the original reference in the same sequence as the one described above. If the original reference is not present, the DXD-16 switches to the Internal crystal as described below.

12.2. REFERENCE FAILURE WITH NO ALTERNATE REFERENCE

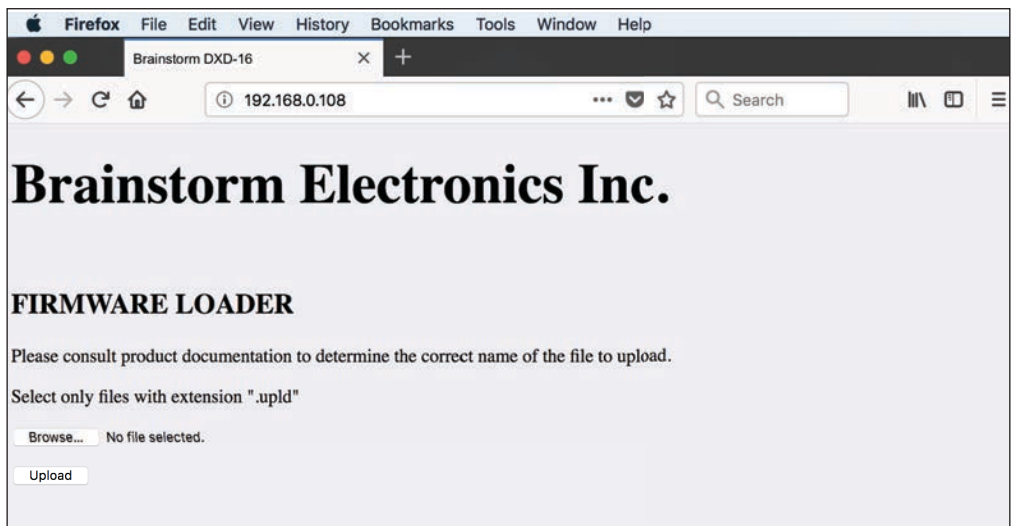
If the Alternate Reference function was disabled in menu 1.1 and the reference disappears or becomes unreadable, the DXD-16 goes from LOCKED to HOLD and displays a 'REF ERROR' message on the right side of the reference line. The DXD-16 stays in the HOLD mode until the reference reappears at which point the DXD-16 automatically goes back into the lock sequence.

13. Firmware Updates

Firmware updates are done via the Ethernet port. The DXD-16 has 4 Ethernet ports. All 4 are equal from a PTP standpoint but firmware updates and remote control are from port #4.

Connect port # 4 of your DXD-16 to your network and point your browser to the IP address of your DXD-16. A simple firmware loader page will appear.

13.1. FIRMWARE LOADER PAGE



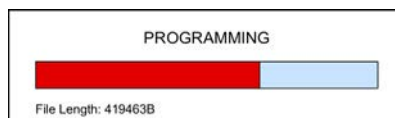
Click on the [BROWSE] button and select the firmware file on your hard disk. Typically, this would be DXD16FS_<version>.upld. Then click [UPLOAD]. The normal programming sequence will follow.

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.



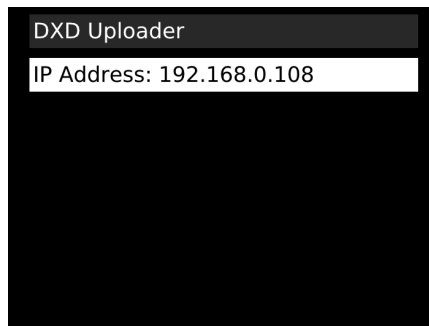
After the programming is completed, rebooting is required. A message appears on the display to reboot the unit.

13.2 UPLOADER

The Uploader is a fall-back web page that allows you to restore your DXD-16 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 [SETUP] 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. Note that only 3 menus are available while in the Uploader mode: Network, Brightness and Reboot.

Point your browser to the IP address of your DXD-16. 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 13.2 will follow.

14. Appendix

14.1. APPENDIX A: VIDEO INPUT FORMATS

The following table lists all the video formats recognized by the DXD-16 as reference:

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.

14.2. APPENDIX B: AUDIO BASE RATES

The DXD-16 has 2 different audio base rates, defined in menus 2.5 and 2.6. 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 14.3).

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%

14.3. APPENDIX C: PULLED RATES

The DXD-16 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-16 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.

14.4. 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-16.

	Coefficient	Base Rate	x2	x4	x8
32000	none	32,000 Hz	-	-	-
44100	-0.1%	44,056 Hz	88,112 Hz	176,224 Hz	352,447 Hz
44100	none	44,100 Hz	88,200 Hz	176,400 Hz	352,800 Hz
48000	-4.1%	46,034 Hz	92,068 Hz	184,136 Hz	368,271 Hz
48000	-4%	46,080 Hz	92,160 Hz	184,320 Hz	368,640 Hz
48000	-0.1%	47,952 Hz	95,904 Hz	191,808 Hz	383,616 Hz
48000	none	48,000 Hz	96,000 Hz	192,000 Hz	384,000 Hz
48000	+0.1%	48,048 Hz	96,096 Hz	192,192 Hz	384,384 Hz
48000	+4.2%	50,000 Hz	99,999 Hz	199,999 Hz	399,997 Hz
48000	+4.3%	50,050 Hz	100,100 Hz	200,200 Hz	400,400 Hz

14.5. APPENDIX E: FACTORY PRESETS

The following are the factory default settings.

BNC INPUT A	Word Clock - LEARN
BNC INPUT B	Word Clock - LEARN
REFERENCE	Internal
ALTERNATE REFERENCE	Disabled
AUDIO BASE RATE A	48000
AUDIO BASE RATE B	44100 -0.1%
OUTPUTS 1 - 4	NTSC Video Sync
OUTPUTS 4 - 8	NTSC Video Sync
OUTPUTS 9 & 10	NTSC Video Sync
OUTPUTS 11 & 12	NTSC Video Sync

OUTPUTS 13& 14	NTSC Video Sync
OUTPUTS 15& 16	NTSC Video Sync
DHCP	On
IP ADDRESS	-
SUBNET MASK	-
GATEWAY	-
LCD BRIGHTNESS	12
LED BRIGHTNESS	10
UNIT NAME	DXD-16 s/n XXXX