

# **DXD/LTC**

## **LTC option for the DXD-8 & DXD-16 Universal Clocks**

### **Operations manual**

Version 4.00

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## 1. Introduction

The DXD/LTC option is available for both DXD models, the DXD16 and the DXD-8.

This firmware can generate 2 separate streams of time code simultaneously at different formats. Each stream can be set as a Time Of Day time code generator or as a simple Run/Stop/Cue generator locked to the currently selected reference.

The DXD/LTC transmits SMPTE 2059-2 "Synchronization Metadata" Management Messages on any PTP port where the SMPTE ST2059 Profile has been enabled.

## 2. Installation

Before using the DXD/LTC, be sure to update your DXD unit with the latest firmware, available on the Brainstorm website. The DXD/LTC will not operate with firmware older than 2.10.

When you purchased the DXD/LTC option, you received a unique authorization key, a series of 4 numbers, separated by periods. This key is only valid for the model and serial number used when you placed the order.

Enter this key in the FEATURE KEYS menu (10.5 on the DXD-8 and 11.5 on the DXD-16), under the main UTILITY menu. On the DXD-8, be sure to enter it in the TIME CODE line.

After entering the authorization key, a message will ask you to confirm setting the feature key now, followed by another message confirming that the feature key has been set. This authorization procedure only needs to happen once, even with subsequent firmware updates. Keep that key handy in case you accidentally change it in the Feature Key menu.

Once the Feature Key has been properly entered, several new menus will become accessible such as the TIME CODE menus. Other menus will also be affected.

## 3. BNC Outputs Menus

### 3.1 SIGNAL

The BNC Outputs menus have a new choice for SIGNAL: Time Code.

### 3.2 SOURCE

After selecting Time Code as the type of signal for this group of outputs, either of the 2 Time Code Generators can be selected: TCG1 or TCG2

### 3.3 RISE/FALL TIME

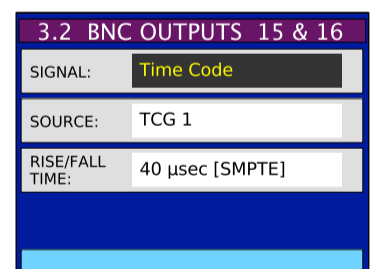
Choices are available for the output waveform with rise and fall times ranging from 1µsec (square wave) to 50µsec (EBU).

The default value is 40 µsec (SMPTE).

#### **NOTE**

On the DXD-16, 2 balanced outputs are available on the DB-25 connector (see appendix C), regardless of how the BNC outputs are configured. The BNC connectors can be used for unbalanced signal when additional outputs are required.

On the DXD-8, only unbalanced BNC outputs are available.



## 4. Time Code Menus

### 4.1 SMPTE 2059 Setup (Menu 9.1)

#### 4.1.1 DAILY JAM TIME:

The Daily Jam is a process where the time code generator realigns precisely with the epoch (midnight on Jan 1, 1970). This process occurs everyday, at the same time, as set in the DAILY JAM TIME field.

The value entered in the DAILY JAM TIME field is the amount of time after midnight, local time, at which the daily jam will occur.

Adjustments can be made in 10 minutes increments. Default value is 01 Hrs 00 Min, i.e. 1:00AM, local time.

9.1 SMPTE 2059 SETUP	
DAILY JAM TIME	01 Hrs 00 Min
JAM TIMES RE-CALCULATE	Off

#### 4.1.2 JAM TIMES RECALCULATE:

Pressing the ENTER key while "Press Enter to Jam" is selected will cause the DXD to recalculate both Jam Times, the time of the Previous Daily Jam Event and the time of the Next Daily Jam Event.

For time code, the Previous Daily Jam Event is the generator's anchor point, until the Next Daily Jam Event. When the local time is too close to the set Daily Jam Time, a manual change will not occur until the next day. By forcing the DXD to recalculate both jam times manually, the operator has the option to make an immediate change.

#### NOTES ON DAILY JAM AND NTSC DRIFT:

The Daily Jam will occur at the set time, no matter what format time code is generated. With 24, 25 or 30 ND time code, there will be no correction as each second is divided in a whole number of frames. However, that is not the case with 29.97. Even when using Drop Frame (i.e. skipping 2 frames on every minute not divisible by 10) a correction will be required as 29.97 time code is actually running at 29.97002997002... fps ( $30 \times (1000/1001)$ ). For that reason, when maintaining a time code sequence longer than 24 hours, it should be jammed to local time daily. Per ST2059-1, a Daily Jam is usually set to occur at an operationally convenient time, typically during the early morning hours in local time. Default value on the DXD is set at 1:00AM.

### 4.2 TC Generator 1 (Menu 9.2)

#### 4.2.1 TCG 1 SETTINGS (MENU 9.2.1)

##### 4.2.1.1 OPERATING MODE

The choices for Operating Mode are Time-Of-Day or Simple/Run/Stop/Cue.

- **Time-Of-Day** means that the time code addresses will match the time-of-day, or System Time in the case of the DXD, expressed in Local Time. This generator can be stopped and restarted. However, when restarted, the generator will jump to the current time of day.
- **Simple Run/Stop/Cue** is like a traditional time code generator. A Cue Point can be set in menu 8.2.2. Unlike the TOD generator, when restarting, the generator will resume where it stopped, unless of course the CUE command was initiated before START.

##### 4.2.1.2 TIME CODE RATE/COUNT

This field has the following choices:

- 23.976/24
- 24/24
- 25/25
- 29.97/DF
- 29.97/NDF
- 30/DF
- 30/NDF

9.2.1 TCG 1 SETTINGS	
OPERATING MODE	Time-Of-Day
TIME CODE RATE / COUNT	29.97/DF
COLOR FRAMING	Enable
STOP HOLD FRAMES	10

#### 4.2.1.3 COLOR FRAMING

Color Framing can only be enabled for PAL and NTSC formats, i.e. when the Rate/Count is set to:

- 25/25
- 29.97/DF
- 29.97/NDF

Enabling Color Framing means that the color field sequence of the time code will be aligned with the PTP epoch (midnight on Jan 1, 1970) per ST2059. The color field sequence can have a duration a 4 or 8 fields (2 or 4 frames).

#### 4.2.1.4 STOP HOLD FRAMES

This represents the number of consecutive frame periods during which the DXD will issue the stopped time code value ("freeze frame") whenever the generator stops or cues.

This number varies from 1 to 99 or even CONTINUOUS. The default value is 10.

### 4.2.2 TCG 1 OPERATIONS (MENU 9.2.2)

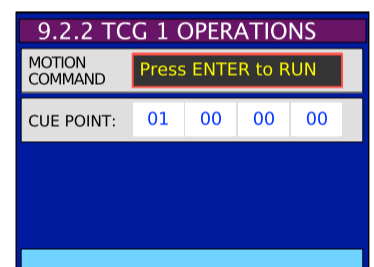
The operations menus will be different based on the selected operating mode.

#### 4.2.2.1 MOTION COMMAND

The Time Code Generator can be controlled different ways: Via the TIME & DATE Main Rotation Page, GPIO or menu 9.2.2. The choices for MOTION COMMAND are:

- Press ENTER to RUN
- Press ENTER to STOP
- Press ENTER to CUE (*Simple Run/Stop/Cue mode only*).

Simply select a command and hit the ENTER key.



#### 4.2.2.2 CUE POINT

Enter a CUE point in hours, minutes, seconds and frames and press the ENTER key.

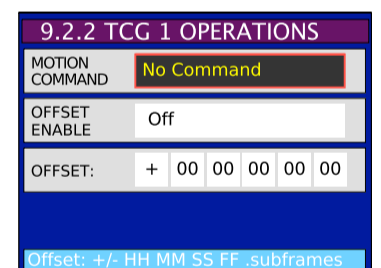
To return the TCG to the CUE point, select "Press ENTER to CUE" and press the ENTER key (*Simple Run/Stop/Cue mode only*)

#### 4.2.2.3 OFFSET ENABLE

This menu turns the offset on or off (*Time-of-Day mode only*)

#### 4.2.2.4 SETTING AN OFFSET

Enter a positive or negative value in hours, minutes, seconds, frames and sub-frames in the Offset fields then press the ENTER key (*Time-of-Day mode only*)



NOTE: If a ToD generator is running with an offset, the box identifying that output group turns red (front panel Output page and web Home page), the same way it turns red if the delay/advance function is enabled in the BNC outputs menus.

## 4.3 TC Generator 2 (menu 9.3)

Menus 9.3 have the exact same functions as 9.2 but for the TCG 2.

## 5. GPIO (DXD-16 only)

New functions have been added to the DXD-16 GPIOs.

### 5.1 GPIO INPUTS

- TCG 1 & 2 Run
- TCG 1 & 2 Stop
- TCG 1 & 2 Cue

### 5.2 GPIO OUTPUTS

- TCG 1 Running
- TCG 2 Running
- Daily Jam Hold
- Daily Jam Pulse

The CUE command (TGIO Input) only applies to the time code generator(s) set to Run/Stop/Cue, not Time-Of-Day.

For detailed informations on the GPIO circuitry, please see the DXD-16 Owners Manual.

## 6. Time & Date Display - Main Rotation

With the DXD/LTC installed, menu 7.3 includes the 2 Time Code Generators to the selection of times to be displayed on the DATE & TIME Main Rotation page, in the upper and lower parts of the display.

- Time-Of-Day TCG: If the selected Time Code Generator (TCG) is set as Time-Of-Day, the line directly under the time code reader will say 'ENTER=Run/Stop'.
- Simple Run/Stop/Cue TCG: If it is set as Simple Run/Stop/Cue it will say 'UP=CUE, ENTER=Run/Stop' since that generator has the option to start from a preset CUE point.

Note that the frame numbers will be replaced on the display by 'FF', when the generator is running and will be displayed when it is stopped. This does not affect the output of course.



Also, the colons between the hours, minutes, seconds and frames will be replaced by semicolons when generating Drop Frame time code, for easy identification.

The blue box on the left of the display identifies the source of the time code (TCG1 or TCG2).

The blue box on the right of the display identifies the rate and frame count. Here is how they are identified in the blue box:

- 23.976/24 ..... **24PD** (Pulled Down)
- 24/24 ..... **24**
- 25/25 ..... **25**
- 29.97/DF ..... **29DF** (Dropped Frame)
- 229.97/NDF ..... **29ND** (Non Drop)
- 30/DF ..... **30DF** (Dropped Frame)
- 30/NDF ..... **30ND** (Non Drop)

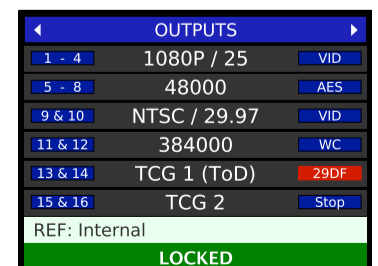
## 7. Outputs Display - Main Rotation

When selecting a TCG in one of the BNC Outputs menus, it will be shown on the OUTPUTS page of the main rotation display, along with the selected format in the blue box on its right.

As mentioned on page 5, If a ToD generator is running with an offset, the box identifying that output group turns red.

The description in the center of the line adds "(ToD)" if the generator is in time-of-day mode.

Text in the blue box to the right indicates "Stop" if the generator is not running. When running the box contains the frame rate.



## 8. Times Display - Status Mode

Several new lines were added to the TIMES Status page with the DXD/LTC option:

- **TC Gen 1:** This line displays the date and address of the first time code generator. As it is a live display, if time code is running, the frame numbers are replaced by the letters 'ff' like on the TIME & DATE display. When the generator is stopped, the frame numbers are displayed. The right column shows the time code format as detailed in ch 6 above.
- **TC Gen 2:** This line is identical to the one above, but for the second Time Code Generator. In the illustration to the right, TC Gen 2 is stopped at the CUE point which is why the frame numbers are displayed.

In each case the date will be displayed for a generator in Time-Of-Day mode, but will be blanked out (dashes) in Start/Stop/Cue mode.

- **Prev Daily:** The time of the PREVIOUS DAILY JAM event is displayed on this line, along with the date. Time code is always LOCAL TIME which is confirmed in the right column.
- **Next Daily:** The time of the NEXT DAILY JAM event is displayed on this line, along with the date. Time code is always LOCAL TIME which is confirmed in the right column.

TIMES		
System Time:	2020/04/20 14:11:45	LCL
RT Clock:	2020/04/20 14:11:45	LCL
GPS:	2020/04/20 14:11:45	LCL
Grandmaster:	2020/04/20 14:11:45	LCL
TOD-GM Ofst:	+0	usec
TC Gen 1:	2020/04/20 14:11:45:ff	29df
TC Gen 2:	- - - - - 01:00:00:00	30nd
Prev Daily:	2020/04/20 01:00:00	LCL
Next Daily:	2020/05/20 01:00:00	LCL

## 9. WEB GUI

The parameters described above in the different front panel menus are all available on the Time Code page of the web GUI. For more details, please refer to the DXD Remote manual.

The screenshot displays the web GUI for the DXD-16 Universal Clock. The browser address bar shows the URL `192.168.0.122/setup_7_tc.html`. The page title is "DXD-16 UNIVERSAL CLOCK".

Device information is shown at the top:

- Name: DXD-16 s/n 1187
- Serial No: 1187
- Location: Main rack
- REF: PTP
- Master: External
- GPS: No satellite link
- Status: LOCKED / PTP SLAVE

The main section is titled "Time Code" and contains several panels:

- Setup (SMPTE 2059 SETUP):** Includes a "Daily Jam Time" field set to 01 hrs and 00 min, a "Set Time" button, and a "Recalculate All Daily Jam Times" button labeled "Press to Recalculate".
- Jam Times:** A table showing jam times:
 

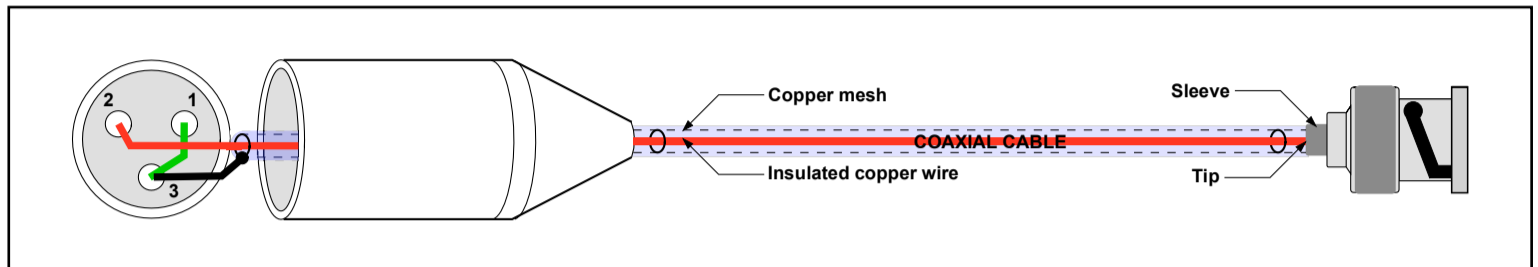
PREVIOUS DAILY JAM TIME	01:00:00	Mar 12, 2025	Local
NEXT DAILY JAM TIME	01:00:00	Mar 13, 2025	Local
- TIME CODE GENERATOR 1 (TCG Setup):**
  - TCG 1 SETTINGS:
    - Operating Mode: Time-Of-Day
    - Frame Rate / Time Code Type: 29DF
    - Color Framing: Enable
    - Stop Hold Frames: 10
- TCG Time:**
  - TCG 1 TIME CODE: 17;10;30;06 Mar 12, 2025 29DF
- TCG 1 OPERATIONS:**
  - Motion Command: RUN (active) STOP
  - Offset Enable: Off
  - Offset [+/- HH MM SS FF . Sub]: + 00 00 00 00 .00
  - Buttons: Press to Set Offset, Cancel

## 10. Appendix

### 10.1 APPENDIX A: USING A 75Ω UNBALANCED OUTPUT

Many time code readers will accept a 75Ω signal. Otherwise, a balun will need to be used.

The other aspect of the BNC output is that it is unbalanced. Here again it should be no problem with most readers using the following wiring (connection between pins 1 & 3, green line, is optional).

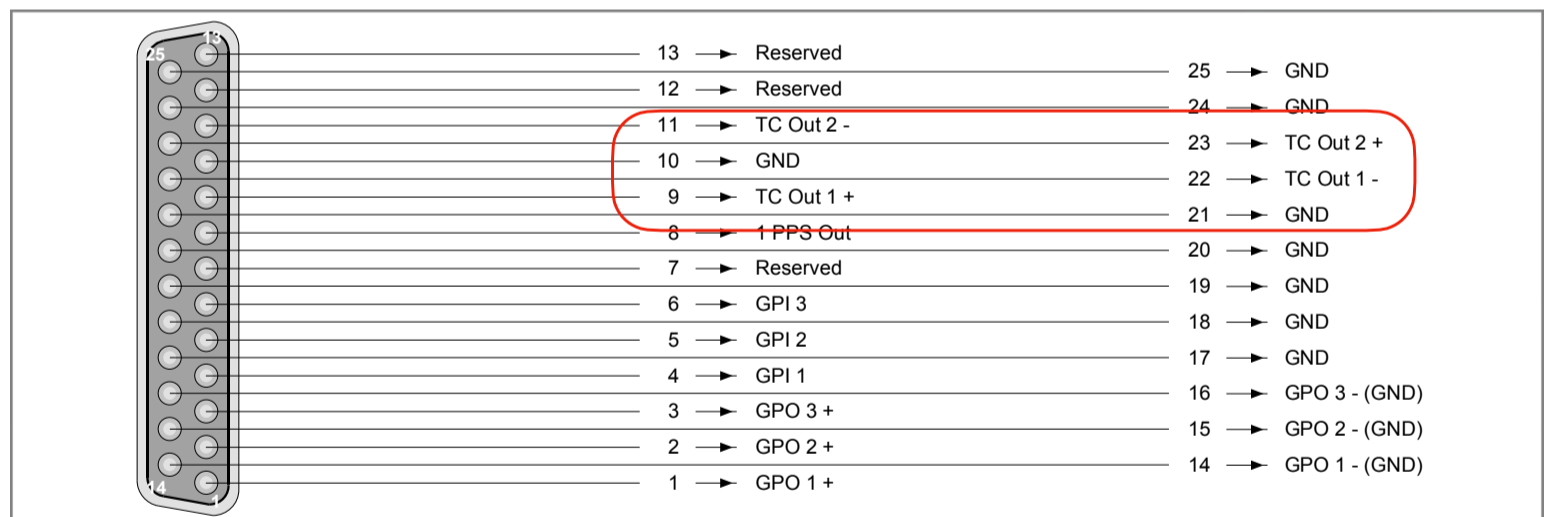


### 9.2 APPENDIX B: BNC OUTPUT LEVEL

- 1.97Vp-p into 75 ohms (nominal 2Vp-p).
- 3.94Vp-p unterminated (nominal 4Vp-p).

### 10.3 APPENDIX C: DB-25 CONNECTOR (DXD-16 ONLY)

As shown on the illustration below, the DB-25 connector provides 2 balanced time code outputs in addition to 3 General Purpose Inputs (GPI) and 4 General Purpose Outputs (GPO). Time Code outputs are only available with the LTC option installed.



TCG1 is connected using pins 9 (+), 22 (-) & 21 (GND); TCG2 is connected using pins 23 (+), 11 (-) & 10 (GND).

- Output level: nominal 2Vp-p differential.

This connector is not available on the DXD-8.