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# DTS Tach to Timecode Converter

(Model E480)

## Operation Manual

**TM-E528**

**Release Version 1.0**

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## DTS Customer Service

DTS engineers are available to assist you. If you have an emergency after business hours, please leave a message with the Answering Service and a technician will return your call as soon as possible.

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Visit our web site <http://www.dtsonline.com> for the latest DTS news on both theater and home products.

## Returning Units for Service

Before sending any item back to DTS for warranty, repair, exchange or replacement parts, please call DTS Customer Service (see above) to provide the serial number of the equipment to be returned and to obtain a **Return Authorization** number. No replacement units will be sent and no shipments will be accepted without a Return Authorization number.

Ship returns (clearly marked with the Return Authorization number on the outside of the package) to the Service Center for your region.

## Regulatory – Safety, Emissions, and Susceptibility

### EMI Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

### Canadian Department of Communications compliance statement:

This equipment does not exceed Class A limits per radio noise emissions for digital apparatus set out in the Radio Interference Regulation of the Canadian Department of Communications. Operation in a residential area may cause unacceptable interference to radio and TV reception requiring the owner or operator to take whatever steps are necessary to correct the interference.

### Avis de conformité aux normes du ministère des Communications du Canada:

Cet équipement ne dépasse pas les limites de Classe A D'émission de bruits radioélectriques pour les appareils numériques telles que prescrites par le Règlement sur le brouillage radioélectrique établi par le ministère des Communications du Canada. L'exploitation faite en milieu résidentiel peut entraîner le brouillage des réceptions radio et télévision, ce qui obligerait le propriétaire ou l'opérateur à prendre les dispositions nécessaires pour en éliminer les causes.

### CE

**\*Warning\*** This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

## Warranty

Equipment manufactured by Digital Theater Systems, Inc. is warranted against defects in materials and workmanship for one year from the date of purchase. There are no other express or implied warranties. Digital Theater Systems, Inc.'s obligation is restricted to repair and replacement of defective parts. Under no circumstances will Digital Theater Systems, Inc. be liable for any other damage, either direct or consequential.

### NOTE

**Warranty void unless the following Factory Warranty Information is provided to DTS within thirty (30) days of purchase.**

#### FACTORY WARRANTY INFORMATION

Complete this form for **each** DTS installation

THEATER NAME/CIRCUIT: \_\_\_\_\_

THEATER LOCATION: \_\_\_\_\_

SCREEN NUMBER \_\_\_\_\_

THEATER CONTACT: Name: \_\_\_\_\_

Telephone: \_\_\_\_\_

LOCAL TECH: Name: \_\_\_\_\_

Telephone: \_\_\_\_\_

DTS SERIAL #: \_\_\_\_\_

Date of Purchase \_\_\_\_\_

**Return completed form via Fax to: +1 (818) 879-2476; Attn: Customer Service, or via mail to: DTS Customer Service – 5171 Clareton Drive – Agoura Hills, CA 91301 – USA.**

# 1. Introduction

The DTS Timecode Converter is a general purpose device used to:

- Convert TACH to DTS timecode.
- Convert TACH to SMPTE 30FND timecode.
- Generate DTS (free-running)
- Generate SMPTE (free-running)

## 1.1. Features:

- Offsets can be applied to output timecode, even “on the fly”.
- Supported Tach frequencies; 240, 300, 360 480 Hz. Additional frequencies are available upon request (at an additional cost).
- All setting are saved in non-volatile memory.
- Twelve non-volatile complete show configurations available.
- Unit dimensions are 19 inches across, 10 inches deep, and 1.75 inches tall.
- The unit may be mounted into a 19 inch equipment rack or be placed on a desktop.

### Features not yet implemented:

- TACH input #2
- in-board cues
- out-board cues

## 1.2. Version ID

When powered up, your DTS Timecode Converter should display the following version number (displayed for only 2 seconds after power up):

```
DTS TACH to timecode  
version 1.08
```

If your unit does not display the above version, call DTS for a firmware or manual upgrade.



## 2. Making the Connection

**⚠ Caution:** Rack mounting – ensure proper grounding between the E480 chassis and the equipment rack.

### 2.1. Connecting the power

Connect mains to AC adapter, and connect the 9VDC output to rear of converter labeled +9VDC 500mA.

**Note:** center pin is +9V and the outside ring is ground.

### 2.2. Connecting a shaft encoder (if used) to the E480 input

Connect the shaft encoder to the Opto Inputs (J4) on the rear of the E480 converter box.

For shaft encoders with TTL level signals (see Schematic, page 9):

Connect phase 'A' to pin 1.

Connect phase 'B' to pin 3.

Connect COM to pins 14, 16.

For shaft encoders with open collect outputs (see Schematic, page 9):

Connect phase 'A' to pin 14.

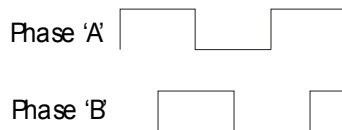
Connect phase 'B' to pin 16.

Connect COM to pin 25.

Connect a jumper from pin 12 to pin 1 and from pin 13 to pin 3.

When running forward, the phase relationship should be as follows:

**Note:** Although the proper count is kept, the converter box does not output in reverse. If everything is otherwise connected properly and the converter does not see tach, then try reversing the phase inputs.



### 2.3. Connecting the E480 Timecode Converter to a DTS-6(D) player:

Signal Name	Timecode Converter Output (9 pin 'D')	DTS Player input (9 pin 'D')
Timecode Output	Pin 1	Pin 1
Ground	Pin 6	Pin 6

(See Pinouts on page 6 and Schematics on page 9 for additional details.)

## 3. The Menus

### 3.1. Setting TACH Mode

1. Press the right arrow key until the bottom line displays either:

```
reference→ TACH
```

or

```
reference→ internal 30Hz
```

2. Press the ENTER key to toggle between the two selections.

The **TACH** reference must be used when locking timecode to film. The **internal 30Hz** reference mode is for non-locking applications.

### 3.2. Setting the Quadrature Option

1. Press the right arrow key until the bottom line displays either:

```
quadrature→ required
```

or

```
quadrature→ not required
```

2. Press the ENTER key to toggle between the two selections.

If Phase 'B' is not connected, then select the **not required** option. Select **required** when true quadrature is used.

### 3.3. Setting System In/Out

1. Press the right arrow key until the bottom line displays either

```
system→ in
```

or

```
system→ out
```

2. Press the ENTER key to toggle between the two selections.

While in the **out** mode, the unit is in bypass and signals on J1 (TC IN) go directly to J2 (TC OUT).

Select **in** for normal operation (default upon power up).

### 3.4. Setting the TACH Input Frequency

1. Press the right arrow key until the bottom line displays

```
TACH→ xxx pulse/sec
```

where xxx is the TACH frequency.

2. To change the TACH frequency, press the ENTER key and notice the cursor appear in the units position as shown below.

```
TACH→ xxx pulse/sec
```

3. Press the up arrow key to toggle through the TACH frequency options.

This setting has no effect if the reference is **internal 30Hz**.

4. Press ENTER again to exit and notice the cursor disappears.

### 3.5. Setting the Timecode Type

1. Press the right arrow key until the bottom line displays  
`timecode→ dts`  
or  
`timecode→ smpte 30FND`
2. Press the ENTER key to toggle between the two selections.

### 3.6. Setting the Offset Time

1. Press the right arrow key until the bottom line displays  
`offset→ ±HH:MM:SS:FF`  
where HH are hour, MM are minutes, SS are seconds and FF are frames in 30FND.
2. To change the offset, press the ENTER key once and notice the cursor appear under the frame units position.  
  
Press the left and right arrow keys to move the cursor from frames through hours. Press the up and down arrow keys to change the value in that position. Holding the key down will allow the numbers to change rapidly. A negative offset can be achieved by decrementing past a zero offset.  
  
In the dts mode, the hours cannot be changed will remain zero. The range in the dts mode is -00:36:24:15 to +00:36:24:15. The range in the SMPTE mode is -23:59:50:29 to +23:59:59:29.  
  
The offset can be changed while the show is running, because updates can be made while the movie is playing. This is convenient during initial setup.
3. Press the ENTER key to exit and notice the cursor disappear.

### 3.7. Setting the SMPTE User Bits (SMPTE mode only)

1. Press the right arrow key until the bottom line displays  
`smpteUB→ UU:UU:UU:UU`  
where UU are the user bits for each field.
2. To change the user bit, press the ENTER key once and notice the cursor appears under the LSB units position.  
  
Press the left and right arrows to move from the LSB to the MSB position. Press the up and down arrows to change the value in that position. Holding the key down will allow the numbers to change rapidly.  
  
The range for each position is 00-FF (hexadecimal). This gives 256 unique values for each position. BCD values can also be used.
3. Press the ENTER key to exit and notice the cursor disappears.

### 3.8. Setting the DTS Serial Number (DTS mode only)

1. Press the right arrow key until the bottom line displays  
`dts SERIAL→ xxxxxx`  
where xxxxx is the DTS serial number.
2. To change the DTS serial number, press the ENTER key once and notice the cursor appears under the units position of the serial number.

Press the left and right arrow keys to move the cursor from units position through the tens of thousands position. Press the up and down arrow keys to change the value in that position. Holding the key down will allow the numbers to change rapidly.

The DTS serial number range is 00000-65536.

3. Press the ENTER key to exit and notice the cursor disappears.

### 3.9 Setting the DTS Reel Number (DTS mode only)

1. Press the right arrow key until the bottom line displays

```
dts REEL #→  xx
```

where xx is the DTS reel number.

2. To change the DTS reel number, press the ENTER key once and notice the cursor appears under the units position of the reel number.

Press the up and down arrow keys to change the value for the reel number. Holding the key down will allow the numbers to change rapidly.

The DTS reel number range is 01-15.

3. Press the ENTER key to exit and notice the cursor disappears.

## 4. Running the Show

After all the connections have been made and proper modes are selected as described above, it is time to run the show.

1. Press the right arrow key until the bottom line displays

```
tc out→ HH:MM:SS:FF
```

This displays the current timecode on the output. In the DTS mode, the hours represent the reel number.

2. Move the film to the start position.

Usually this means putting the Academy start mark in the picture aperture, however you may have a different marker system on your show.

3. Once the marker is in position and the film is parked, press the **PROJ1 ARM** button on the E480 unit.

You should now see the green LED at the upper right start blinking. This means you are armed and ready to go. Pressing the **PROJ1 ARM** button resets the internal counter in the E480 converter unit.

4. Start the projector when you are ready to start the show.

You should now notice the top amber LED illuminates, indicating that you are receiving a tach signal (phase A).

You should also notice the adjacent amber LED (below) will illuminate if you are connected with true quadrature. This indicates that you are receiving a direction signal (phase B) from your projector.

If these LEDs do not illuminate as expected, then there is something wrong in the wiring connections.

If the wiring is correct and the LEDs illuminate as expected, then you will soon see the blinking green LED (arm) become steady and stop blinking. This means the phase locked loop (PLL) has acquired and is locked. Once the timecode becomes a positive number as displayed on the LCD display, the DTS player should see timecode and start playing audio.

5. Now watch the film and check for sync.

You may adjust the offset as necessary to achieve proper sync.

The offset, along with all the other settings, are stored in non-volatile memory so that the unit will have the correct offset next time the show is played, even if power is lost to the unit.

## 5. Pinouts

### Timecode In (J1)

1	Timecode 1 input
2	Timecode 2 input
3	N/C
4	N/C
5	+5VDC output. (30 mA max output)
6	Ground
7	Ground
8	Ground
9	to timecode LED on reader head

### Timecode Out (J2)

1	Timecode 1 output
2	Timecode 2 output (available in bypass mode only)
3	N/C
4	N/C
5	+5VDC (from DTS player)
6	Ground
7	Ground
8	Ground
9	timecode LED enable from DTS player (passes through to J1 pin 9)


### RS232 Port (J3)


1	N/C
2	Serial data output (I)
3	Serial data input (O)
4	Data terminal ready (I)
5	GND
6	Data set ready (O)
7	N/C
8	N/C
9	N/C

**Opto Inputs (J4)**

1	+tach1 (+phase A)
14	-tach1 (-phase A)
2	+tach2 (+phase A)
15	-tach2 (-phase A)
3	+dir1 (+phase B)
16	-dir1 (-phase B)
4	+dir2 (+phase B)
17	-dir2 (-phase B)
5	+incue1
18	-incue1
6	+incue2
19	-incue2
7	+outcue1
20	-outcue1
8	+outcue2
21	-outcue2
9-13	+9volts DC (unregulated)
22-25	ground

## 6. RS232 Protocol and Commands

FUNCTION	FORMAT	Process Time (mS) 
Arm unit	a↵	12
Set REEL number	XXr↵	12
Set dts Serial number	XXXXXs↵	12
Set to DTS mode	dm↵	12
Set to SMPTE mode	sm↵	12
Timecode Offset	±XX:XX:XX:XXo↵	12
smpte USER bits	XX:XX:XX:XXu↵	12
System IN (default)	iy↵	12
System OUT	oy↵	12
Use internal 30Hz reference	if↵	12
Use external tach for reference (default)	tf↵	12
Quadrature required for tach	rq↵	12
Quadrature not required for tach	nq↵	12
Copy current working memory to memory slot XX (01-12)	XXc↵	46
Load memory slot XX to current working memory (01-12)	XXl↵	46
Lock front panel access	lp↵	12
Unlock front panel access (default upon power up)	up↵	12

 It is recommended that a period of 75 mS between RS232 commands be used to avoid conflicts and overruns, to assure that commands are executed properly.

**Note:**

- 1) RS232 port settings:
  - Baud rate: 9600
  - Data bits: 8
  - Stop bits: 1
  - Parity: none
  - flow control: none
- 2) A 1.5 mS character spacing is required as the E480 echoes each character it receives and no characters are received during this echo period.
- 3) Allow 75mS between command packets.
- 4) All characters are ASCII. X represents a user value.
- 5) The last character before the CR identifies the actual function. All preceding characters are inputs to the function. The function character is not case sensitive. Follow the syntax carefully. All LFs are ignored.
- 6) When a function is successfully executed the E480 will return an OK↵ as ACK.
- 7) A ↵ is a CR.
- 8) If the syntax is incorrect or if the values are out of bound, there will be no ACK.

