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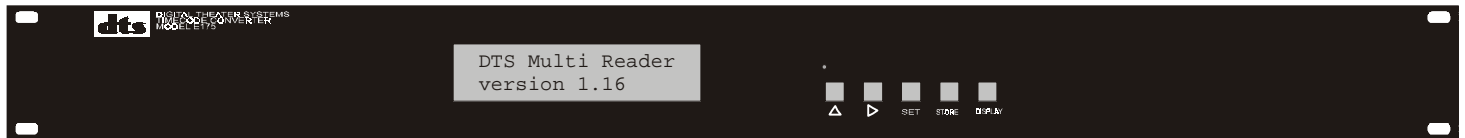
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# DIGITAL THEATER SYSTEMS

Digital Sound for the Movies

## TIMECODE CONVERTER (Model E175) OPERATING MANUAL OM-E175 Rev. 1.2 (DTS Part #9301E175001.2)



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# I Introduction

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

- 1) Convert DTS to SMPTE 30 frame non-drop timecode
- 2) Convert SMPTE 30 frame non-drop to DTS timecode
- 3) Convert TACH to DTS timecode.
- 4) Convert TACH to SMPTE timecode.
- 5) Generate SMPTE (freerunning)
- 6) Generate DTS (freerunning)

Features:

- Offsets can be applied to output timecode, even "on the fly".
- All settings are saved in non-volatile memory except where noted.
- Tach input frequencies can be 30-600Hz in increments of 30Hz.
- Unit dimensions are 19" across, 4.5" deep, and 1.75" tall.
- The unit may be mounted into a 19 inch equipment rack or be placed on a desktop.

Features not yet implemented:

- TIMECODE/TACH input #2
- Receiving timecode LED on front panel.
- Remote RS232 serial command operation.

When powered up, your DTS Timecode Converter should display the following version number, or higher:

```
DTS Multi Reader  
version 1.16
```

(Displayed for only 2 seconds after power up.)

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

## II Making the Connection:

### 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).

### Connecting a shaft encoder (if used) to the E175 input:

Connect the shaft encoder to the 'D' connector labeled TIMECODE/TACH INPUT #1, on the rear of the converter box.

For shaft encoders with TTL level signals (see schematic):

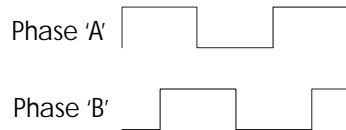
- Connect phase 'A' to pin 3.
- Connect phase 'B' to pin 4.
- Connect COM to pins 6,8 & 9.
- Connect +5 to pin 5.

For shaft encoders with open collect outputs (see schematic):

- Connect phase 'A' to pin 8.
- Connect phase 'B' to pin 9.
- Connect COM to pins 6.
- Connect +5 to pins 3,4&5.

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.



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

<u>Signal Name</u>	<b>Timecode Converter Output</b> <u>(9 pin 'D')</u>	<b>DTS Player input</b> <u>(9 pin 'D')</u>
Timecode Output	Pin 1	Pin 1
Ground	Pin 6	Pin 6

(see PINOUTS and Schematics page 20-21 additional details)

### III DTS to SMPTE Operation:

#### SETUP PROCEDURE:

In this mode DTS timecode is converted to SMPTE timecode. DTS reels become SMPTE hours. DTS shows using SMPTE timecode: First Frame of Picture = hour mark.

#### Setting the Mode:

Press the DISPLAY button until one of following is displayed on the lower line.

```
Read:tach Gen:SMPTE
Read:tach Gen:DTS
Read:SMPTE Gen:DTS
Read:DTS Gen:SMPTE
Gen:DTS
Gen:SMPTE
```

If the lower line of the display does not read:

```
Read:DTS Gen:SMPTE
```

Then:

Press the SET button (the bottom line will blink).

Press the *up arrow* until the bottom line does read as above.

Press the STORE button.

#### Setting the User bits:

SMPTE user bit can be applied to the timecode as follows. Please note, the "Pass serial #" option must be set to OFF (see Setting the "Pass serial #" section below). If the "Pass serial #" option is set to ON, then DTS serial numbers read from the incoming timecode will be converted to User bits and overwrite the User bit field.

Press the DISPLAY button until the following is displayed on the lower line

```
?:?:?:?:?? User
```

Press the SET button.

Press the *right arrow* to change the cursor position (blinking digit).

Press the *up arrow* to increase the value or DISPLAY+*up arrow* to decrease the value.

Enter the desired user bit information.

Press the STORE button to save this value.

## DTS to SMPTE Operation (continued):

### Setting the Main Offset time:

This offset is the offset in time from the DTS timecode being read and the SMPTE timecode being generated. You can use this to convert a given DTS reel number to any desired SMPTE hour number.

Press the DISPLAY button until the following is displayed on the lower line.

??:??:??:?? OfS

Press the SET button.

Press the *right arrow* to change the cursor position (blinking digit).

Press the *up arrow* to increase the value or DISPLAY+*up arrow* to decrease the value.

(Note: Frames are 1/30 second)

Enter the desired offset.

Press the STORE button to save this value.

Press the *up arrow*.

### Setting the Adv/Ret offset:

This adjustment allows the user to apply an additional offset "on the fly". The offset is in addition to the offset described above. This is convenient for fine tuning the offset "on the fly". It should be noted that this value is not saved in non-volatile memory and will be reset to zero when powered up again. Once this offset value is determined, you must apply this offset to the main offset as described above then clear the Adv/Ret offset to zero.

Press the DISPLAY button until the following is displayed on the lower line.

Adv/Ret:0

Press the SET button.

Press the *up arrow* to increase the value or *right arrow* to decrease the value.

(Note: Frames are 1/30 second)

Enter the desired offset.

Press the STORE button.

### Setting the "Pass serial #" option:

When the "Pass serial #" option is set to ON, DTS serial numbers read from the incoming timecode will be converted to User bits and overwrite the User bit field as described above. When the "Pass serial #" option is set to OFF, the User bit field will not be affected.

Press the DISPLAY button until the following is displayed on the lower line.

Pass serial # ???

Press the SET button.

Press the *up arrow* to change the setting.

Press the STORE button to save this setting.

## DTS to SMPTE Operation (continued):

### Setting the Start time:

The Start time is not used but must be set to zero.

Press the DISPLAY button until the following is displayed on the lower line.

```
?:?:00:00:00 Start
```

Press the SET button.

Press the *right arrow* to change the cursor position (blinking digit).

Press the *up arrow* to increase the value or DISPLAY+*up arrow* to decrease the value.

Input the time shown below.

```
00:00:00:00 Start
```

Press the STORE button to save this value.

Press the *up arrow*.

**NOTE:** The following menus should not be modified. They do provide the user with the following information:

```
rdr serial: -----
```

DTS serial number currently being read from the input

```
?:?:????? Ref
```

DTS reel and timecode being read from the input

```
?:?:?:?:?:?? Gen
```

SMPTE timecode currently being output

All other menu items should be ignored.



## IV SMPTE to DTS Operation:

### SETUP PROCEDURE:

In this mode SMPTE timecode is converted to DTS timecode. SMPTE hours become DTS reels.

#### Setting the Mode:

Press the DISPLAY button until one of following is displayed on the lower line.

```
Read:tach Gen:SMPTE
Read:tach Gen:DTS
Read:SMPTE Gen:DTS
Read:DTS Gen:SMPTE
Gen:DTS
Gen:SMPTE
```

If the lower line of the display does not read:

```
Read:SMPTE Gen:DTS
```

Then:

Press the SET button (the bottom line will blink).

Press the *up arrow* until the bottom line does read as above.

Press the STORE button.

#### Setting the DTS Serial Number:

All DTS shows have a unique serial number which is printed on the show discs. This serial number must be entered as follows:

Press the DISPLAY button until the following is displayed on the lower line.

```
Gen serial: ?????
```

Press the SET button.

Press the *right arrow* to change the cursor position (blinking digit).

Press the *up arrow* to increase the value or DISPLAY+*up arrow* to decrease the value.

Enter the desired DTS Serial Number.

Press the STORE button to save this value.

## SMPTE to DTS Operation (continued):

### Setting the Main offset time:

This offset is the offset in time from the SMPTE timecode being read and the DTS timecode being generated. The hour field must be set to zero.

Press the DISPLAY button until the following is displayed on the lower line.

00:??:??:?? OfS

Press the SET button.

Press the *right arrow* to change the cursor position (blinking digit).

Press the *up arrow* to increase the value or DISPLAY+*up arrow* to decrease the value.

(Note: Frames are 1/30 second)

Enter the desired offset. Hours must be zero.

Press the STORE button to save this value.

Press the *up arrow*.

### Setting the Adv/Ret offset:

This adjustment allows the user to apply an additional offset "on the fly". The offset is in addition to the offset described above. This is convenient for fine tuning the offset "on the fly". It should be noted that this value is not saved in non-volatile memory and will be reset to zero when powered up again. Once this offset value is determined, you must apply this offset to the main offset as described above then clear the Adv/Ret offset to zero.

Press the DISPLAY button until the following is displayed on the lower line

Adv/Ret:0

Press the SET button.

Press the *up arrow* to increase the value or *right arrow* to decrease the value.

(Note: Frames are 1/30 second)

Enter the desired offset.

Press the STORE button.

## SMPTE to DTS Operation (continued):

### Setting the Start time:

The Start time is not used but must be set to zero.

Press the DISPLAY button until the following is displayed on the lower line.

?:?:00:00:00 Start

Press the SET button.

Press the *right arrow* to change the cursor position (blinking digit).

Press the *up arrow* to increase the value or DISPLAY+*up arrow* to decrease the value.

Input the time shown below.

00:00:00:00 Start

Press the STORE button to save this value.

Press the *up arrow*.

NOTE: The following menus should not be modified. They do provide the user with the following information:

?:?:?:?:?:?? Ref

SMPTE timecode currently being read from the input

?:?:????? Gen

DTS timecode currently being output

All other menu items should be ignored.

## V TACH to DTS Timecode Operation:

### SETUP PROCEDURE:

#### Setting the Mode:

Press the DISPLAY button until one of following is displayed on the lower line

```
Read:tach Gen:SMPTE
Read:tach Gen:DTS
Read:SMPTE Gen:DTS
Read:DTS Gen:SMPTE
Gen:DTS
Gen:SMPTE
```

If the lower line of the display does not read:

```
Read:tach Gen:DTS
```

Then:

Press the SET button (the bottom line will blink).

Press the *up arrow* until the bottom line does read as above.

Press the STORE button.

#### Setting the DTS Serial Number:

All DTS shows have a unique serial number which is printed on the show discs. This serial number must be entered as follows:

Press the DISPLAY button until the following is displayed on the lower line.

```
Gen serial: ?????
```

Press the SET button.

Press the *right arrow* to change the cursor position (blinking digit).

Press the *up arrow* to increase the value or DISPLAY+*up arrow* to decrease the value.

Enter the desired DTS Serial Number.

Press the STORE button to save this value.

#### Setting the Main offset time:

The main offset is the time from the Picture Start Mark to the First Frame Of Action **minus 3 seconds**. As an example, the Academy Picture Start Mark is 8 seconds ahead of the first frame of picture, minus 3 seconds is 5 seconds. Remember, frames are 1/30 seconds. (see Running the Show below).

Press the DISPLAY button until the following is displayed on the lower line.

```
?:?:?:?:?? OfS
```

Press the SET button.

Press the *right arrow* to change the cursor position (blinking digit).

Press the *up arrow* to increase the value or DISPLAY+*up arrow* to decrease the value.

(Note: Frames are 1/30 second)

Input the offset time **minus 3 seconds** noted below. Note negative value. (8sec-3sec=5sec)

```
-00:00:05:00 OfS (Normal default value).
```

Press the STORE button.

Press the *up arrow*.

## TACH to DTS Timecode Operation (continued):

### Setting the Start time:

Please note that hours represent DTS reel numbers. Minutes, seconds and frames must always be set to zero.

Press the DISPLAY button until the following is displayed on the lower line.

??:00:00:00 Start

Press the SET button.

Press the *right arrow* to change the cursor position (blinking digit).

Press the *up arrow* to increase the value or DISPLAY+*up arrow* to decrease the value.

Input the time shown below.

01:00:00:00 Start (assuming reel one).

Press the STORE button to save this value.

Press the *up arrow*.

### Setting the tach frequency:

Press the DISPLAY button until the following is displayed on the lower line.

Tach pps: ???

Press the *up arrow* to increase this value.

Press the *right arrow* to decrease this value

Adjust the value to match your shaft encoder tach frequency.

Press the STORE button to save this value.

NOTE: The following menus should not be modified. They provide the user with the following information:

?:????? Ref

Current position

?:????? Gen

DTS timecode currently being output

All other menu items should be ignored.

## TACH to DTS Timecode Operation (continued):

### Running the show:

Thread your projector as normal with the Academy Picture Start Mark in the picture gate.

Set the Delay Offset on the DTS player to 5.

NOTE: The Academy Picture Start Mark is 8 seconds ahead of the first frame of picture. If the Picture Start is something other than 8 seconds, then enter the correct Main Offset value **minus 3 seconds** as described above (setting the Main Offset). Remember, frames are 1/30 seconds.

(Example: In the case of an ordinary 35mm film, the Academy Picture Start is 12' ahead of first frame of picture. Twelve feet running at 1.5 ft/sec is 8 seconds.  $8 \text{ sec} - 3 \text{ sec} = 5 \text{ sec}$ )

**Press the *up arrow* to reset the tach counter.** The top line should read:

01:65386 DTS

(Assuming reel #1 and a normal picture start).

### Start the projector.

The large number to the right of 01 represents the negative offset. When the show starts this number will roll over to 0.

Your picture and sound should now be in perfect sync. If it appears to be slightly out of sync, you can either adjust the Delay Offset setting on the DTS player  $\pm$  a frame or two to achieve perfect sync, or adjust the Adv/Ret as described above.

## VI TACH to SMPTE Operation:

### SETUP PROCEDURE:

DTS shows using SMPTE timecode: First Frame of Picture = hour mark.

#### Setting the Mode:

Press the DISPLAY button until one of following is displayed on the lower line.

```
Read:tach Gen:SMPTE
Read:tach Gen:DTS
Read:SMPTE Gen:DTS
Read:DTS Gen:SMPTE
Gen:DTS
Gen:SMPTE
```

If the lower line of the display does not read:

```
Read:tach Gen:SMPTE
```

Then:

Press the SET button (the bottom line will blink).

Press the *up arrow* until the bottom line does read as above.

Press the STORE button.

#### Setting the Main offset time:

The main offset is the time from the Picture Start Mark to the First Frame Of Action. As an example, the Academy Picture Start Mark is 8 seconds ahead of the first frame of picture. Remember, frames are 1/30 seconds. (see Running the Show below). DTS shows using SMPTE timecode: First Frame of Picture = hour mark.

Press the DISPLAY button until the following is displayed on the lower line.

```
?:?:?:?:?:? OfS
```

Press the SET button.

Press the *right arrow* to change the cursor position (blinking digit).

Press the *up arrow* to increase the value or DISPLAY+*up arrow* to decrease the value.

(Note: Frames are 1/30 second)

Input the time noted below. Note negative value.

```
-00:00:08:00 OfS (Normal default value)
```

Press the STORE button.

Press the *up arrow*.

## TACH to SMPTE Operation (continued):

### Setting the Start time:

Please note that hours represent DTS reel numbers. Minutes, seconds and frames must always be set to zero.

Press the DISPLAY button until the following is displayed on the lower line.

??:00:00:00 Start

Press the SET button.

Press the *right arrow* to change the cursor position (blinking digit).

Press the *up arrow* to increase the value or DISPLAY+*up arrow* to decrease the value.

Input the time shown below.

01:00:00:00 Start (assuming reel #1)

Press the STORE button to save this value.

Press the *up arrow*.

### Setting the tach frequency:

Press the DISPLAY button until the following is displayed on the lower line.

Tach pps: ???

Press the *up arrow* to increase this value.

Press the *right arrow* to decrease this value

Adjust the value to match your shaft encoder tach frequency.

Press the STORE button to save this value.

NOTE: The following menus should not be modified. They do provide the user with the following information:

?:????? Ref

Current position

?:?:?:?:?? Gen

SMPTE timecode currently being output

Serial # N/A

Serial # not applicable

All other menu items should be ignored.



## TACH to SMPTE Operation (continued):

### Running the show:

Thread your projector as normal with the Academy Picture Start Mark in the picture gate.

Set the Delay Offset on the DTS player to 5.

NOTE: The Academy Picture Start Mark is normally 8 seconds ahead of the first frame of picture, running at normal film speed. If the Picture Start is something other than 8 seconds, then enter the correct Main Offset value described above. Remember, frames are 1/30 seconds.

(Example: In the case of an ordinary 35mm film, the Academy Picture Start is 12' ahead of first frame of picture. Twelve feet running at 1.5 ft/sec is 8 seconds.)

Press the *up arrow* to reset the tach counter. The top line should read:

00:59:52:00 SMPTE

### Start the projector.

When the show starts and the first frame of picture reaches the picture gate, the Timecode Converter will output 01:00:00:00 (assuming reel #1).

Your picture and sound should now be in perfect sync. If it appears to be slightly out of sync, you can either adjust the Delay Offset setting on the DTS player  $\pm$  a frame or two to achieve perfect sync, or adjust the Adv/Ret as described above.

## VII Generating SMPTE Operation:

### SETUP PROCEDURE:

#### Setting the Mode:

Press the DISPLAY button until one of following is displayed on the lower line.

```
Read:tach Gen:SMPTE
Read:tach Gen:DTS
Read:SMPTE Gen:DTS
Read:DTS Gen:SMPTE
Gen:DTS
Gen:SMPTE
```

If the lower line of the display does not read:

```
Gen:SMPTE
```

Then:

Press the SET button (the bottom line will blink).

Press the *up arrow* until the bottom line does read as above.

Press the STORE button.

#### Setting the User bits:

SMPTE user bit can be applied to the timecode as follows:

Press the DISPLAY button until the following is displayed on the lower line

```
?:?:?:?:?? User
```

Press the SET button.

Press the *right arrow* to change the cursor position (blinking digit).

Press the *up arrow* to increase the value or DISPLAY+*up arrow* to decrease the value.

Enter the desired user bit information.

Press the STORE button to save this value.

#### Setting the Main offset time:

This menu is not used but must be set to zero.

Press the DISPLAY button until the following is displayed on the lower line.

```
?:?:?:?:?? OfS
```

Press the SET button.

Press the *right arrow* to change the cursor position (blinking digit).

Press the *up arrow* to increase the value or DISPLAY+*up arrow* to decrease the value.

Input the time noted below.

```
00:00:00:00 OfS
```

Press the STORE button.

Press the *up arrow*.

## Generating SMPTE Operation (continued):

### Setting the Adv/Ret offset:

This adjustment allows the user to apply an offset "on the fly". This is convenient for fine tuning the offset "on the fly".

Press the DISPLAY button until the following is displayed on the lower line.

Adv/Ret : 0

Press the SET button.

Press the *up arrow* to increase the value or *right arrow* to decrease the value.

(Note: Frames are 1/30 second)

Enter the desired offset.

Press the STORE button.

### Setting the Start time:

This is the timecode that is output when started. Please note that hours represent DTS reel numbers.

Press the DISPLAY button until the following is displayed on the lower line.

?:?:00:00:00 Start

Press the SET button.

Press the *right arrow* to change the cursor position (blinking digit).

Press the *up arrow* to increase the value or DISPLAY+*up arrow* to decrease the value.

Input the desired time.

Press the STORE button to save this value.

Press the *up arrow*.

**NOTE:** The following menus should not be modified. They do provide the user with the following information:

Crystal Reference

This indicates crystal reference

?:?:?:?:?:? Gen

SMPTE timecode currently being output

All other menu items should be ignored.

## OPERATING THE GENERATOR:

After power up, always press SET then press STORE. Press the *up arrow* to reset the timecode. Press the *right arrow* once to start the timecode running. Press the *right arrow* again to stop the timecode running. An offset can be applied "on the fly", see Setting the Adv/Ret above.

## VIII Generating DTS Operation:

### SETUP PROCEDURE:

#### Setting the Mode:

Press the DISPLAY button until one of following is displayed on the lower line.

```
Read:tach Gen:SMPTE
Read:tach Gen:DTS
Read:SMPTE Gen:DTS
Read:DTS Gen:SMPTE
Gen:DTS
Gen:SMPTE
```

If the lower line of the display does not read:

```
Gen:DTS
```

Then:

Press the SET button (the bottom line will blink).

Press the *up arrow* until the bottom line does read as above.

Press the STORE button.

#### Setting the DTS Serial Number:

All DTS shows have a unique serial number which is printed on the show discs. This serial number must be entered as follows:

Press the DISPLAY button until the following is displayed on the lower line.

```
Gen serial: ?????
```

Press the SET button.

Press the *right arrow* to change the cursor position (blinking digit).

Press the *up arrow* to increase the value or DISPLAY+*up arrow* to decrease the value.

Enter the desired DTS Serial Number.

Press the STORE button to save this value.

#### Setting the Main offset time:

This menu is not used but must be set to zero.

Press the DISPLAY button until the following is displayed on the lower line.

```
?:?:?:?:?:? OfS
```

Press the SET button.

Press the *right arrow* to change the cursor position (blinking digit).

Press the *up arrow* to increase the value or DISPLAY+*up arrow* to decrease the value.

Input the time noted below.

```
00:00:00:00 OfS
```

Press the STORE button.

Press the *up arrow*.

## Generating DTS Operation (continued):

### Setting the Adv/Ret offset:

This adjustment allows the user to apply an offset "on the fly". This is convenient for fine tuning the offset "on the fly".

Press the DISPLAY button until the following is displayed on the lower line.

Adv/Ret : 0

Press the SET button.

Press the *up arrow* to increase the value or *right arrow* to decrease the value.

(Note: Frames are 1/30 second)

Enter the desired offset.

Press the STORE button.

### Setting the Start time:

This is the timecode that is output when started. Please note that hours represent DTS reel numbers.

Press the DISPLAY button until the following is displayed on the lower line.

?:?:00:00:00 Start

Press the SET button.

Press the *right arrow* to change the cursor position (blinking digit).

Press the *up arrow* to increase the value or DISPLAY+*up arrow* to decrease the value.

Input the desired time.

Press the STORE button to save this value.

Press the *up arrow*.

**NOTE:** The following menus should not be modified. They do provide the user with the following information:

Crystal Reference

This indicates crystal reference

?:?:????? Gen

DTS timecode currently being output

All other menu items should be ignored.

## OPERATING THE GENERATOR:

After power up, always press SET then press STORE. Press the *up arrow* to reset the timecode. Press the *right arrow* once to start the timecode running. Press the *right arrow* again to stop the timecode running. An offset can be applied "on the fly", see Setting the Adv/Ret above.

## IX Pinouts

### Timecode Inputs (¼ inch jack) Use input #1 as input #2 is not yet implemented

<u>Signal Name</u>	<u>(using TRS plug)</u>	<u>(using a ¼" phono plug)</u>
Timecode High	Tip	Tip
Timecode Low	Ring	Sleeve
Shield	Sleeve	

### Timecode Inputs ('D' connector) NOTE: Use input #1 as input #2 is not yet implemented

1	Timecode input. AC coupled 20kΩ
2	N/C
3	Tach phase A input (anode)
4	Tach phase B input (anode)
5	+5VDC output. (30ma max output)
6	Ground
7	Ground
8	Tach phase A input (cathode)
9	Tach phase B input (cathode)

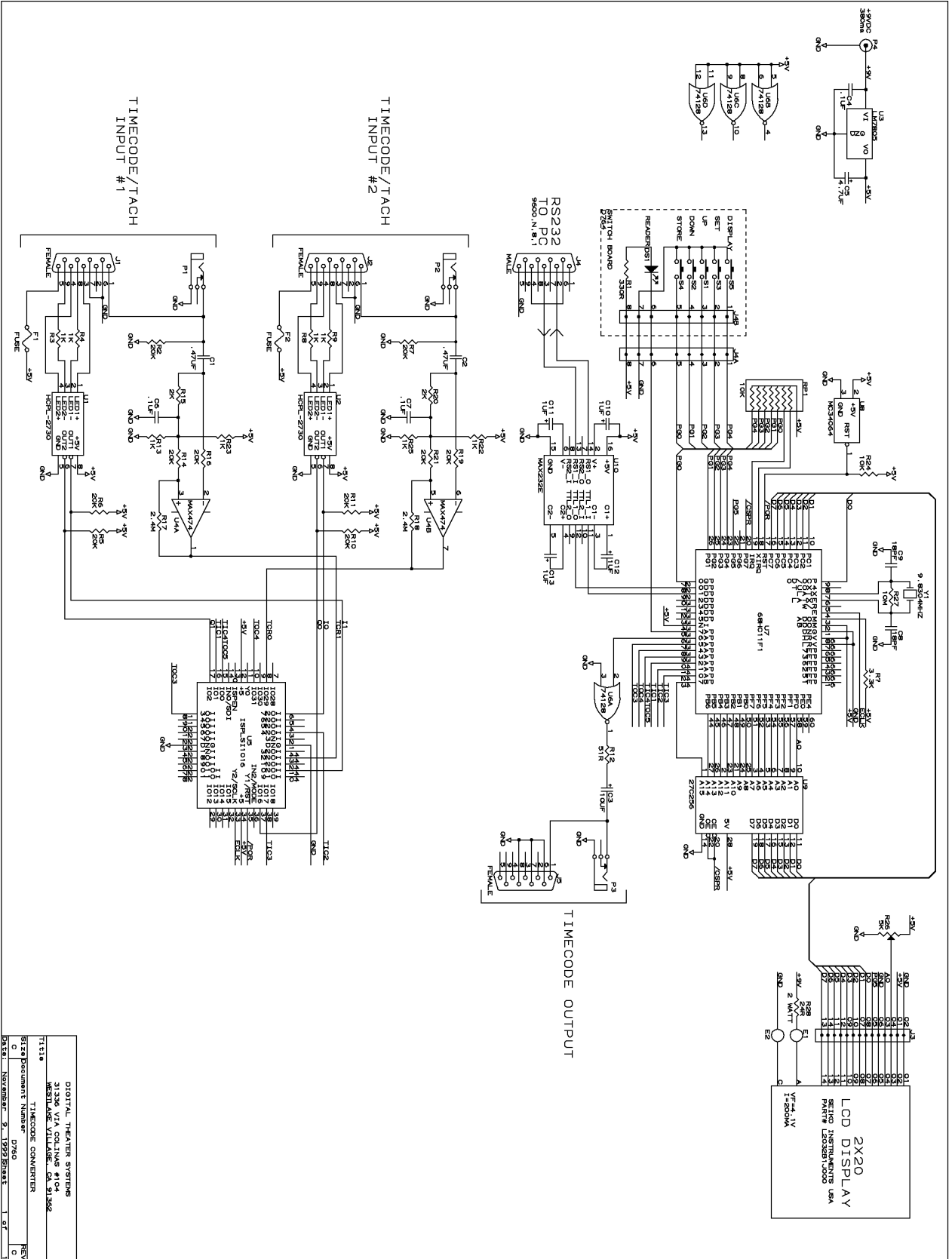
### Timecode Output ('D' connector)

1	Timecode output. AC coupled.
2	N/C
3	N/C
4	N/C
5	N/C
6	Ground
7	Ground
8	Ground
9	N/C

### RS232 Port ('D' Connector)

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

\*



DIGITAL THEATER SYSTEMS	
3000 WILSON AVENUE, SUITE 200	
METHUEN, MASSACHUSETTS 01844	
TIMECODE CONVERTER	
SIZE	Document Number D760
REV	C
DATE	November 3, 1975 Sheet 1 of 1