DIGITAL THEATER SYSTEMS

Digital Sound For Movies

DTS TIMECODE GENERATOR
INSTALLATION and OPERATION MANUAL
OM-E113

(DTS P/N 9301E113004/98)

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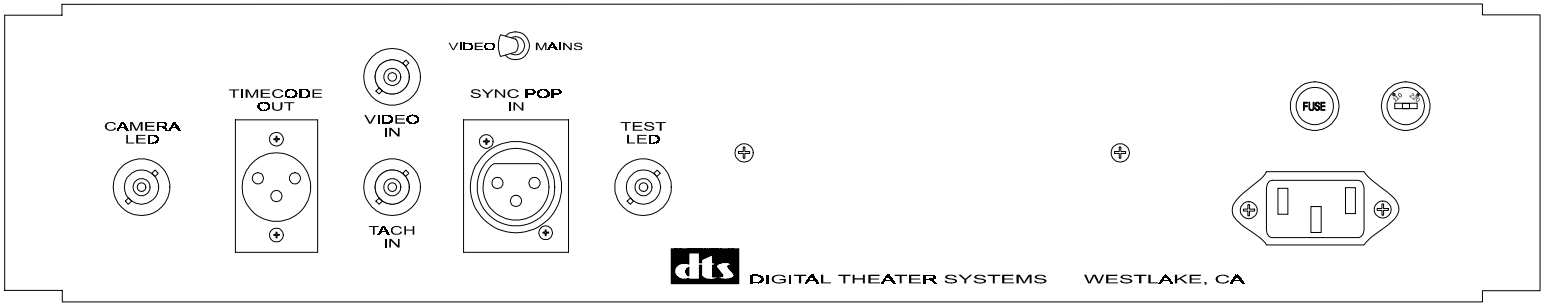
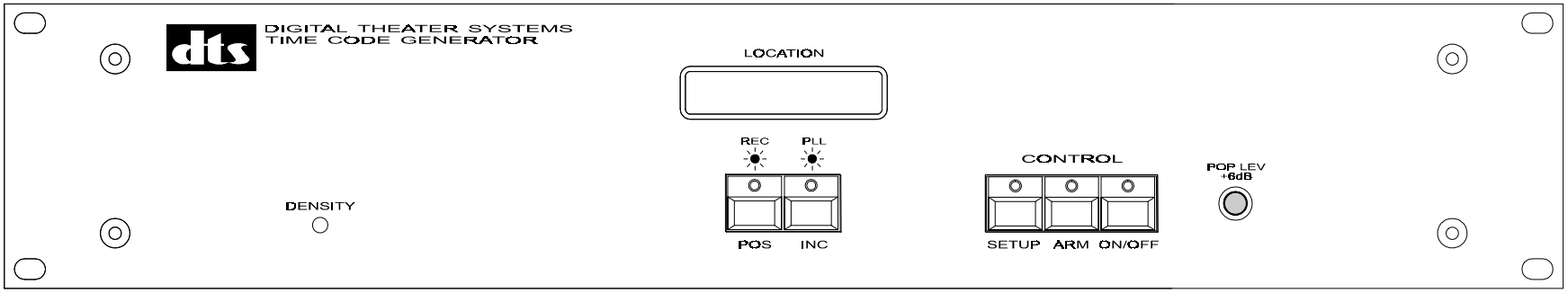

VIDEO
MAINS
CAMERA LED
TIMECODE OUT
VIDEO IN
TACH IN
SYNC POP IN
TEST LED
FUSE
DIGITAL THEATER SYSTEMS
WESTLAKE, CA


DIGITAL THEATER SYSTEMS
TIME CODE GENERATOR
LOCATION
REC
PLL
DENSITY
POS
INC
CONTROL
POP LEV
+6dB
SETUP
ARM
ON/OFF

NOTE: Before using this manual, please refer to illustration of the timecode generator front panel. If your timecode generator does not include the "POP LEV +6db" push-button, this manual should not be used. Please call the DTS factory and request the DTS Timecode Generator manual with revision Date March 28, 1995.

I INTRODUCTION

The DTS Timecode Generator is used to encode optical sound track negatives with DTS timecode. The system includes the DTS writer head assembly that mounts on a type RA1231 recorder for exposing the timecode track negative film. The DTS timecode generator modulates the green exposure LED in real time. The timecode track is exposed simultaneously with the conventional stereo optical sound track and very little additional operator action is required.

The dimensions of the DTS timecode generator are 19" across, 12" deep, and 3.5" high. The unit may be mounted into a 19 inch equipment rack or be placed on a desktop.

II TIMECODE GENERATOR INSTALLATION

- Connect the audio signal (Lt or Rt channel) to the 3 pin female XLR connector labeled SYNC POP IN on the rear panel. This is a balanced 20KΩ bridging input with pin 2 high and pin 3 low. The sync pop minimum detection threshold is -14dBm and has a bandpass filter from 400 Hz to 4KHz. An additional 6dB of sensitivity can be obtained if necessary by pressing and holding the POP LEV+6dB button before the audio sync pop, then releasing.

- The DTS timecode generator must be locked to the same reference as the camera. The DTS timecode generator can be locked either to mains, video (NTSC or PAL) or tach. If the camera has a sync motor connected directly to mains and therefore can only run locked to mains, then toggle the switch on the rear panel of the DTS timecode generator to the MAINS position. If the camera has the ability to lock to a video reference, then toggle the switch on the rear panel of the DTS timecode generator to the VIDEO position. If your camera cannot lock to mains or video but can lock to a tach reference, then remove the top cover from the DTS timecode generator and remove the shunt from W1 (on the D449 main PC board) and place it over the TACH position of W1. Apply a shunt over W5 for either 240Hz or 480Hz tach operation (See silk-screen diagram).
  NOTE: When the DTS timecode generator is shipped from the factory, it is set for either 60Hz line/NTSC or 50Hz line/PAL use. Note the 50Hz/60Hz sticker on rear panel. If you have the wrong version or if there is no sticker on the rear panel then please call DTS.

- The DTS timecode generator is triggered by the audio sync pop on the print master. Voice slating before the sync pop can cause a false start. To prevent this from occurring, there is a tach input on the DTS timecode generator used to gate on the sync pop signal just prior to its arrival. If your camera has SRD installed, this feature must be disabled, however, if you have a tach signal available (240 or 480 Hz signal) and you do <u>not</u> have SRD installed on your camera, please go to

the next paragraph. If a tach signal is unavailable or if your camera has SRD installed, then remove the top cover and place a shunt jumper over W3 labeled NO SLATE (see silk-screen diagram). Skip the following paragraph.

Connect the tach signal (240 or 480 Hz signal) to the BNC labeled TACH IN on the rear panel. The center is high and the shield is low. Remove the top cover and apply a shunt over W5 for either 240 Hz or 480 Hz operation. See silk-screen diagram.

- Connect the DTS writer head, on the camera, to the BNC connector labeled CAMERA LED on the rear panel of the timecode generator. The center pin is connected to the anode and the shield is connected to the cathode. Refer to section III, Mounting the Writer Head.

- There is a timecode signal output which appears on a 3 pin male XLR connector labeled TIME CODE OUT on the timecode generator rear panel. This connection can be used to drive the DTS theater playback units. This is a DC coupled TTL level output where pin 2 is high and pin 3 is ground. For AC coupled operation, remove the shunt over W4. (See silk screen.)

- Place a shunt over W2 labeled SRD.

- Before applying power to the unit be sure the power selector switch on the rear panel is set appropriately for either 110 or 220 VAC.

III MOUNTING THE WRITER HEAD

A competent technician who has experience with optical recording cameras should install the DTS writer head assembly.

Installation of the DTS writer head requires an additional plate that mounts to the right and slightly above the sound drum. The plate and DTS writer head assembly are shipped as a unit pre-focused and pre-aligned. No focus adjustment and very little track placement adjustment should be necessary. As consistent focus is critical, it is extremely important that film pass through the roller without binding, pinching, or buckling. Since the adapter plate straddles both the film drive unit mounting plate and the filter unit mounting plate, three adjustable set screws have been provided in the unlikely event that these two plates are of slightly differing thickness'. This will allow parallel adjustment of the roller's axis with that of the lower filter roller. Slightly loosen the three mounting screws on the adapter plate and adjust the set screws until the roller is square with the thickest plate. A small square will be required. Tighten the three mounting screws on the adapter. If available, use a toothpick to place a small amount of LOCTITE 242 on each set screw when finished. Then make a loop using exposed negative stock, load it on the

camera and run the camera. Using an Allen wrench, adjust the locking Allen screw on the roller shaft until the film passes smoothly through the roller.

An 1/8" hole must be bored to route the wire through the plate. Seal the hole with black RTV to prevent any light leaks. Install a female BNC connector on the rear connector panel of the camera, trim the cable to length, and attach the anode (red wire) to the center pin and the cathode to the shield. This will allow for a simple male BNC to BNC cable connection from the timecode generator to the camera. When using this writer head, illumination is on the base side of the film (i.e. the exposure is made through the film).

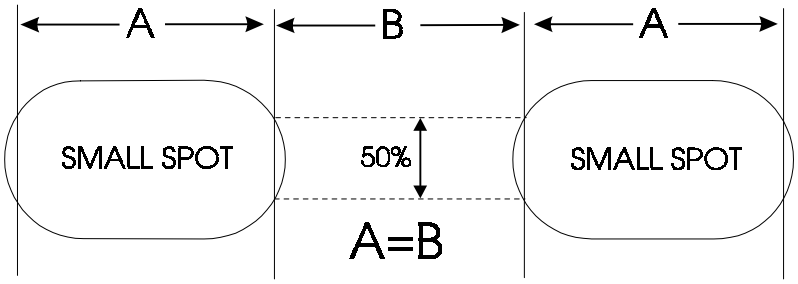
After the camera connection has been made turn on the generator by pressing the ON/OFF button. Wait at least 2 seconds then press the ARM button followed by the POS button. This will start the timecode generator to output timecode.

FOCUS: Focus can be accomplished by doing a series of dip tests for best focus. If the track width is too large or too small, change the focus by rotating the focusing ring, containing the lens, near the roller. *Focus must always be performed prior to adjustment of the track placement*. If the timecode track density appears much darker or lighter than the optical sound track, then adjust the front panel trimpot labeled DENSITY. (see next paragraph).

DENSITY: The exposure density of the timecode track should be similar to the exposure density of the stereo optical track. This exposure should be at least as dark as the optical track but not **too** dark as this will cause excessive *blooming*. The exposure density can be adjusted using the front panel accessible trimpot labeled DENSITY. NOTE: This is a 20 turn trim pot. Since densities are negative stock dependent, we recommend using only one kind of negative stock. If it is necessary to use another negative stock, density tests will need to be made for the new negative stock to be used. Density settings can be recorded so that you can return to any setting without having to redo any tests. To record a setting, connect an AC voltmeter to the BNC connector on the back panel of the timecode generator labeled TEST LED. While the timecode generator is running (i.e. the footage counter on the front panel is counting), record the voltage measured and the stock type.

TRACK PLACEMENT: See diagram for track placement specification. The center of the track should be 298.6 mils from the film edge. The track width may be from 5-8 mils on the sound track negative. The track position can be moved by ±5 mils by sliding the LED sub assembly at the top of the DTS writer head forward or backward. Adjust the position by loosening the button head screw and adjusting the set screw for proper LED placement. Be sure to tighten the button head screw when complete. If more than 5 mils are necessary, shims will have to be added and an alignment jig will be required. As this is always done by DTS personnel, the procedure is not in this manual.

SYMMETRY: After the exposure density is set an adjustment must be made to compensate for the *blooming* effect. The DTS writer head will expose long and short spots on the film. Symmetry adjustment is performed by observing two consecutive short spots on the film (see diagram below). When the DTS timecode generator is shipped from the factory, the trimpot labeled SYM on the circuit board is adjusted fully clockwise. With the SYM trimpot adjusted fully clockwise there is no symmetry compensation, i.e. the signal driving the writer head will have an equal on to off time ratio. Rotating the trimpot counter-clockwise reduces the exposure time, making the exposed spots smaller. The trimpot should be adjusted so that the PRINT film, (not the negative) meets the criteria shown in the figure below. Note, again, this is a 20 turn trimpot. Generally very little compensation is required.



IV OPERATION

TURNING THE TIMECODE GENERATOR ON: Press the ON/OFF button on the front panel to turn the unit on. The red light over the switch will illuminate and the liquid crystal display will briefly show the firmware revision number and the copyright date:

```
DTS TCG  Vx.xx
COPYRIGHT 1993
```

The revision and date display will remain as long as the 'ON/OFF' button is held down. This will allow the firmware revision data to be easily read, if required. When the button is released the display will switch to the setup mode as shown below.

```
M=STD REEL# 01
SERIAL#  00000
```

SETTING THE FILM SERIAL NUMBER AND REEL NUMBER:
Call DTS to obtain an authorized serial number. This serial number and reel number MUST be entered prior to recording. If the serial number **or** reel number is wrong, the negative and all subsequent prints will NOT play. The recording will need to be done again! Press the SETUP button on the front panel and the red light over the switch will illuminate indicating setup mode. The display will read as follows:

```
REEL NUMBER 01
SERIAL#  00000
```

The serial number may read different. The last serial number entered will be retained when unit is turned off. This should help to reduce the number of keystrokes required each time you power up. If the unit is unplugged or building power is lost, the serial number will be reset to zero. The reel number will always be 1 when the timecode generator is powered up, assuming that you will be starting a new film starting with reel 1. To change the reel number and/or serial number, position the cursor (the underline) under the digit you want to change, by pressing the POS button. The cursor will rotate through all the digit positions and back around again. Once the cursor is in the correct position press the INC button to increment the digit until the desired number appears. Continue this process until reel number and serial number read correctly. If a mistake is made, continue scrolling the number until the correct value is reached.

ARMING THE TIMECODE GENERATOR:

START WITH SLATE FEATURE OFF: Load the print master on the reproducer as usual. Start the camera motor, start the reproducer then press and hold the ARM button on the generator. Release the ARM button when the voice slate has ended. You must release the ARM before the sync pop is heard. The light over the ARM will illuminate and the display will show the reel number and footage at zero. Keep your eye on the light over the ARM button until sync pop is heard. The light should extinguish at the onset of the sync pop tone. If the sync pop level appears to be low, press and hold the POP LEV +6dB button just prior to the sync pop tone. This will give an additional 6dB of gain to the sync pop detection circuit.

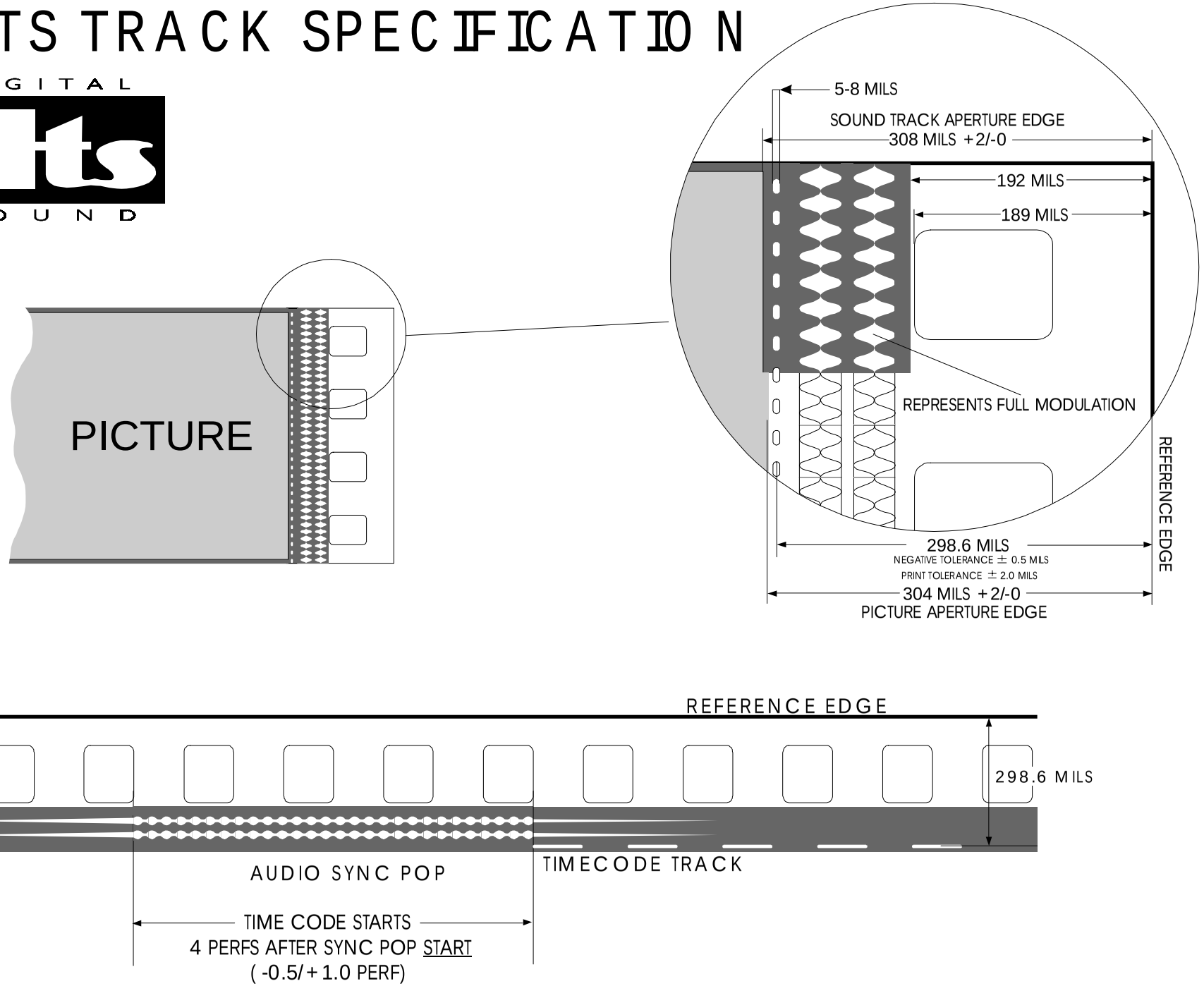
START WITH SLATE FEATURE ON: Position the start mark over the reproducer head. Start the camera motor and then press the ARM button on the timecode generator. The light over the ARM should illuminate and the display will show the reel number and footage at zero. Now start the tape reproducer. Keep your eye on the light over the ARM button until sync pop is heard. The light should extinguish at the onset of the sync pop tone. If the light does not extinguish at the onset of the sync pop then something went wrong and you will need to find the problem and start again. If the sync pop level appears to be low, press and hold the POP LEV +6dB button just prior to the sync pop tone. This will give an additional 6dB of gain to the sync pop detection circuit.

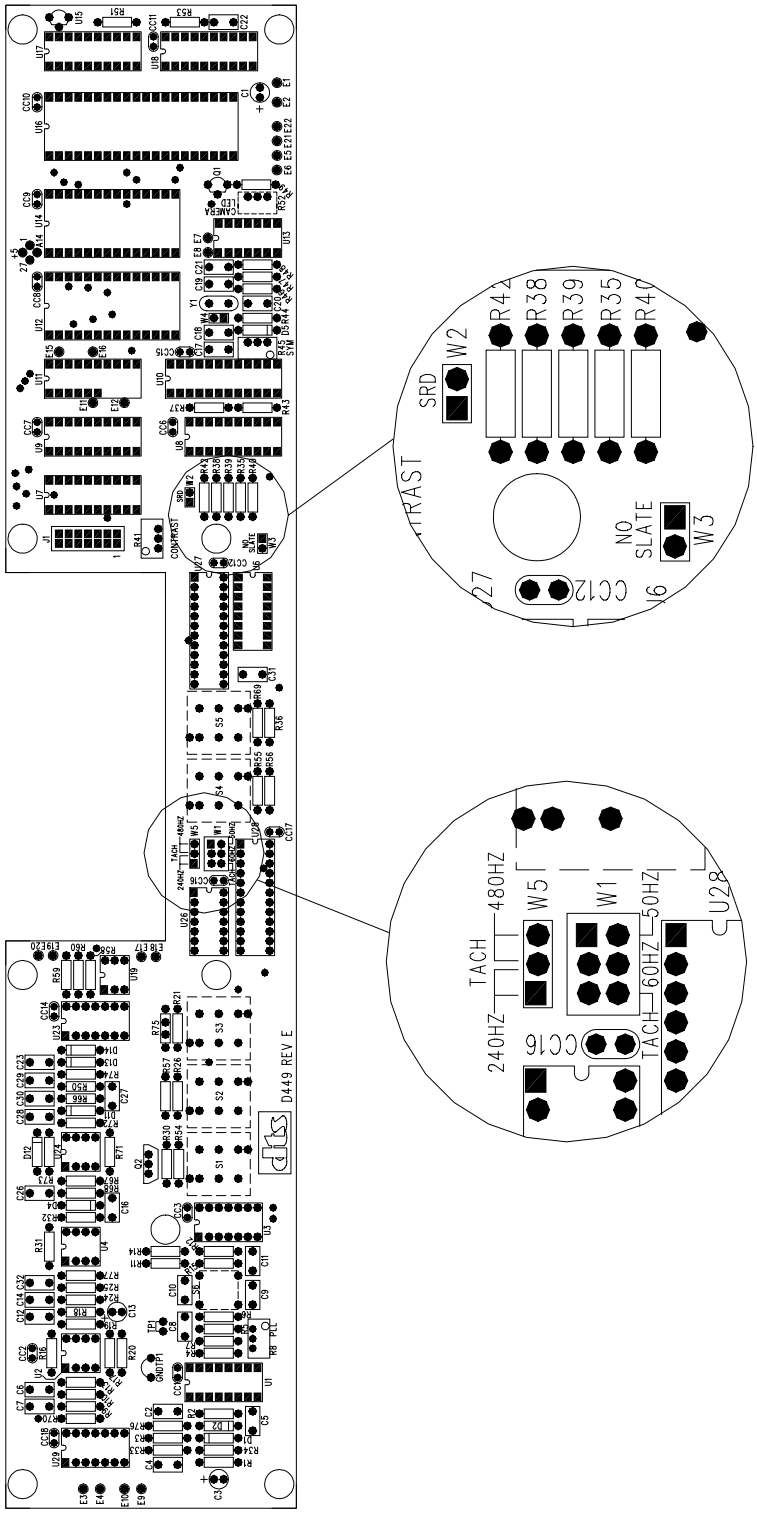
Once the timecode generator is triggered and started the display will continuously show the footage. Do NOT press **any** buttons on the timecode generator until after the tail pop as this will cause timecode to stop or get out of sync.

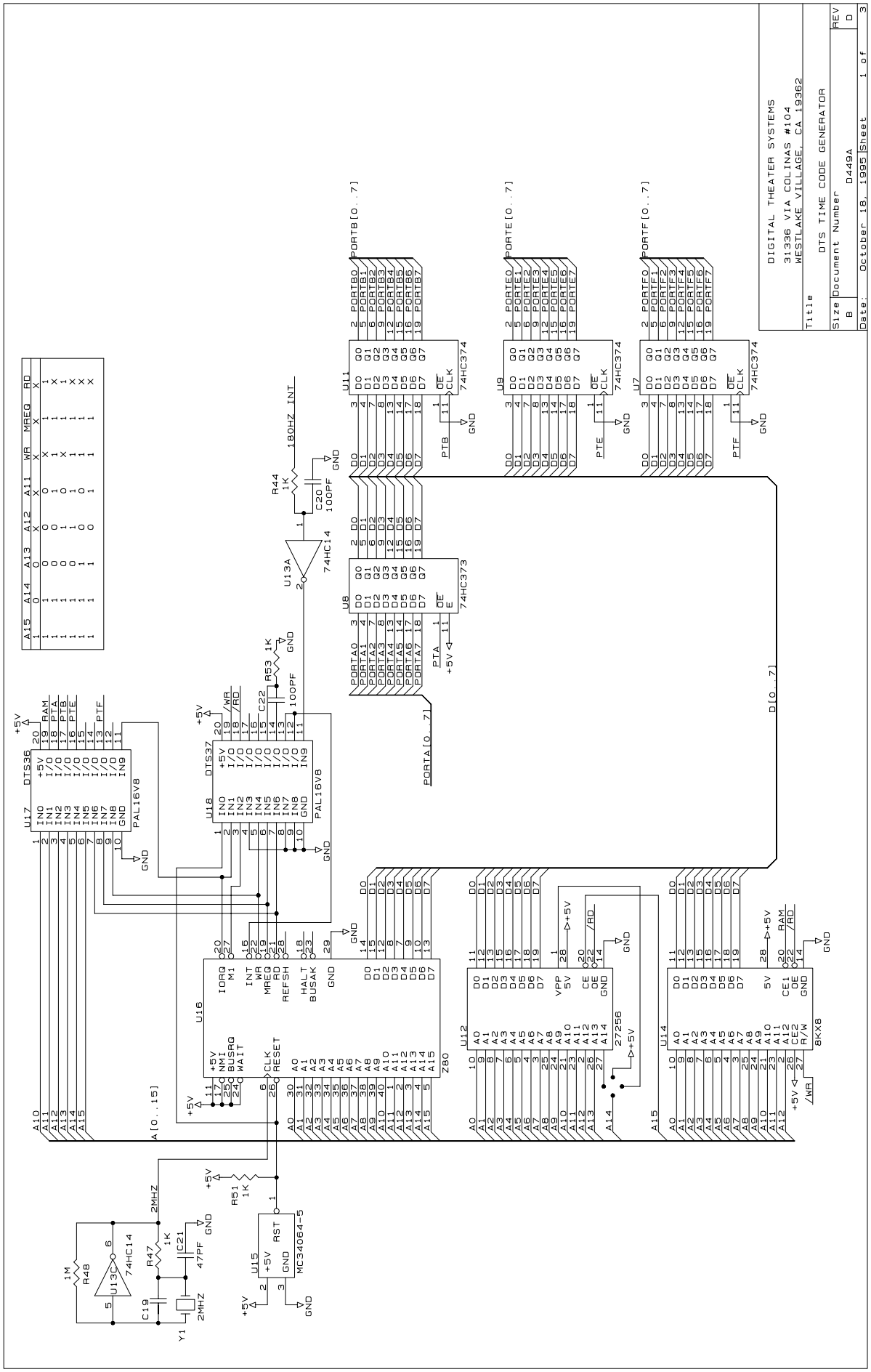
THE REC INDICATOR: Just after the timecode generator is triggered the REC light will blink momentarily, then after about two seconds should remain solid for the duration of the recording. This light indicates that: 1) the DTS writer head in the camera is connected and is writing timecode to the film and 2) the microprocessor is operating properly. The operator should glance at these indicators occasionally and definitely just prior to stopping the camera motor. If the indicators extinguish at any time during the recording, something has gone wrong. If this occurs, unplug the DTS timecode generator for a moment and plug it back in again, to reset it. The serial number and reel number will need to be set again before restarting.

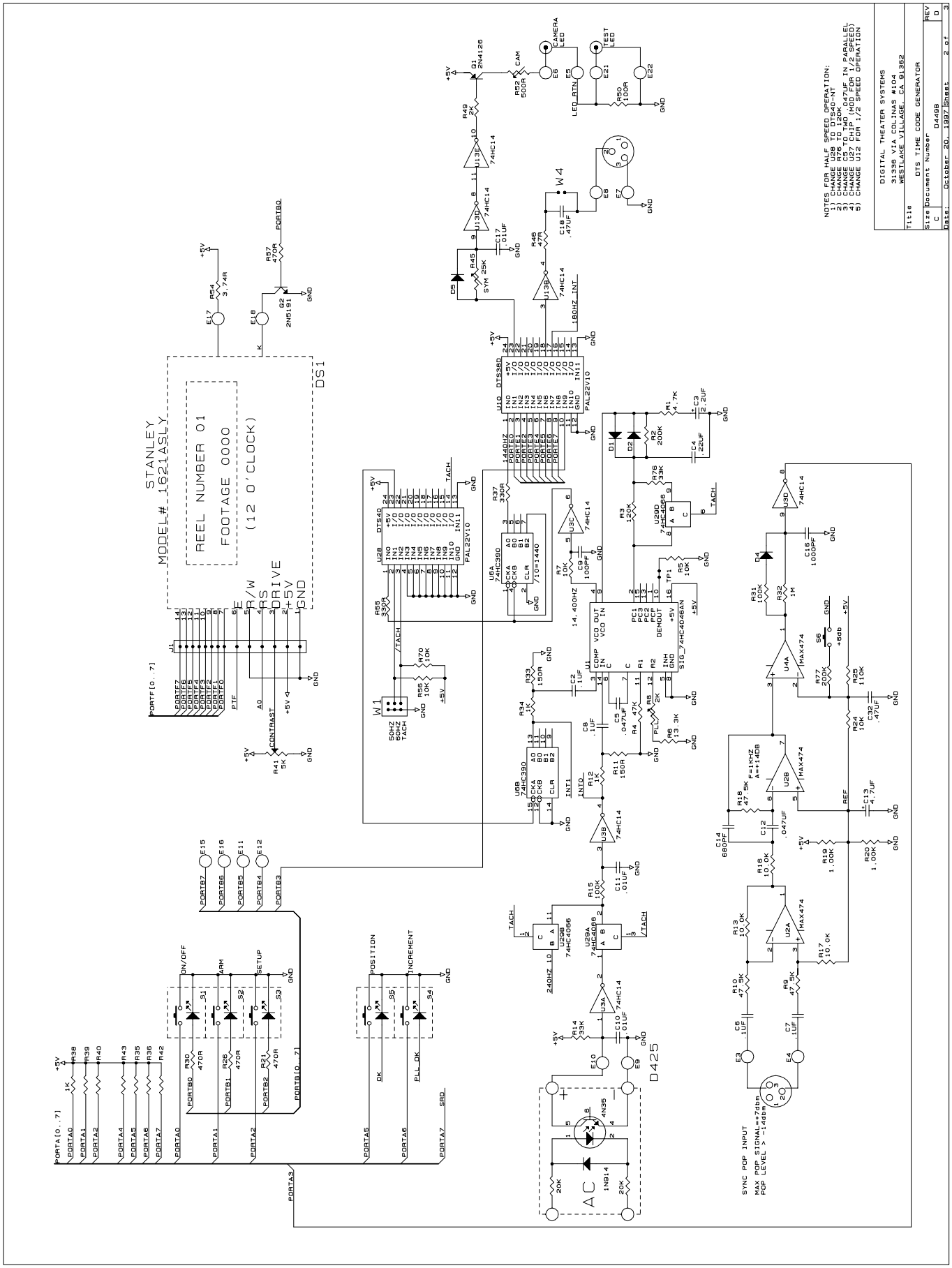
THE PLL INDICATOR: The PLL light is the Phase Locked Loop indicator. When the ARM button is pressed the PLL indicator is reset. As soon as the PLL has locked, the indicator will illuminate. Once locked, a blinking light indicates that there has been loss of sync. The indicator MUST be lit during the recording. If the indicator starts blinking before the end of the recording, the transfer is bad and MUST be done again, after finding out what caused the sync loss and fixing the problem.

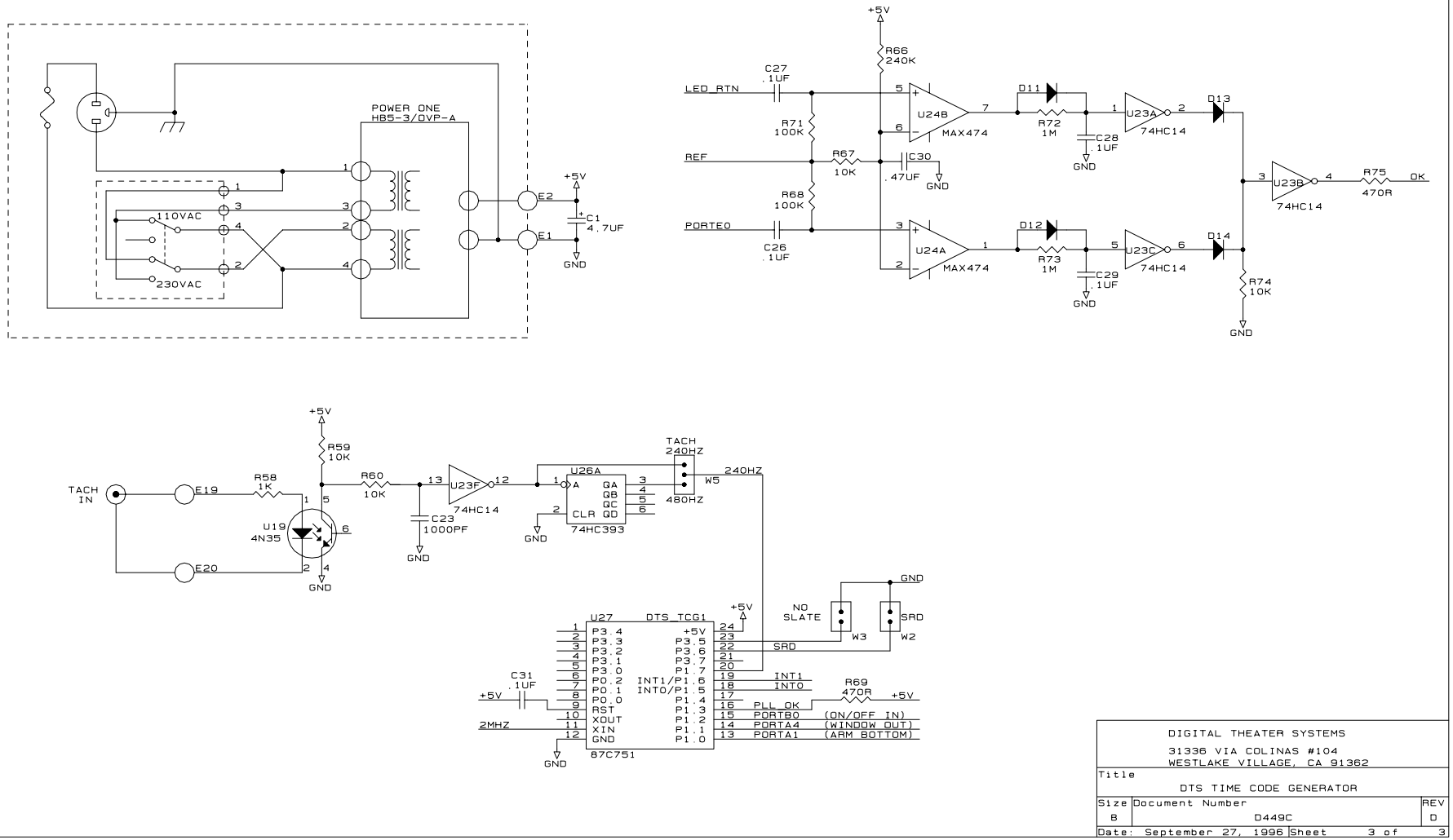
DTS TRACK SPECIFICATION




R44
R38
R39
R35
R40
W2
SRD
CONTRAST
NO SLATE
W3
C12
C16
240HZ
TACH
480HZ
W5
W1
60HZ
50HZ
U28
D449 REV E


DIGITAL THEATER SYSTEMS
31336 VIA COLINAS #104
WESTLAKE VILLAGE, CA 19362
Title
DTS TIME CODE GENERATOR
Size B
Document Number D449A
REV D
Date: October 18, 1995 Sheet 1 of 3
A15 A14 A13 A12 A11 WR MREQ RD
1 0 0 X 0 X X X
1 1 0 0 0 X 1 1
1 1 0 0 1 0 1 1
1 1 0 1 0 0 1 1
1 1 1 0 1 1 1 1
1 1 1 1 0 X X X
U17 DTS36
U18 DTS37
PAL16V8
74HC374
74HC373
74HC14
74HC00
74HC32
Z80
27256
8KX8
MC34064-5
2MHZ
180HZ INT
PORTA[0..7]
PORTB[0..7]
PORTE[0..7]
PORTF[0..7]
A[0..15]
D[0..7]


STANLEY
MODEL # 1621ASLY
REEL NUMBER 01
FOOTAGE 0000
(12 O'CLOCK)
DS1
R/W
AS
DRIVE
+5V
GND
CONTRAST
ON/OFF
ARM
SETUP
POSITION
INCREMENT
SYNC POP INPUT
MAX POP SIGNAL=+7dbm
POP LEVEL > -14dbm
AC
D425
DIGITAL THEATER SYSTEMS
31336 VIA COLINAS #104
WESTLAKE VILLAGE, CA 91362
DTS TIME CODE GENERATOR
D440B
NOTES FOR HALF SPEED OPERATION:
1) CHANGE U28 TO DTS40-NT
2) CHANGE U29 TO 74HC
3) CHANGE C5 TO TWO .047UF IN PARALLEL
4) CHANGE U27 CHIP (MOD FOR 1/2 SPEED)
5) CHANGE U12 FOR 1/2 SPEED OPERATION


POWER ONE
HB5-3/OVP-A
110VAC
230VAC
E2
E1
+5V
C1
4.7UF
GND
+5V
R66
240K
LED_RTN
C27
.1UF
R71
100K
REF
R67
10K
C30
.47UF
R68
100K
PORTE0
C26
.1UF
U24B
MAX474
U24A
MAX474
D11
R72
1M
C28
.1UF
D12
R73
1M
C29
.1UF
U23A
74HC14
U23C
74HC14
D13
D14
U23B
74HC14
R75
470R
OK
R74
10K
TACH
IN
E19
E20
R58
1K
U19
4N35
R59
10K
R60
10K
U23F
74HC14
C23
1000PF
U26A
74HC393
QA
QB
QC
QD
CLR
TACH
240HZ
240HZ
480HZ
W5
U27
87C751
DTS_TCG1
P3.4
P3.3
P3.2
P3.1
P3.0
P0.2
P0.1
P0.0
RST
XOUT
XIN
GND
+5V
P3.5
P3.6
P3.7
P1.7
INT1/P1.6
INT0/P1.5
P1.4
P1.3
P1.2
P1.1
P1.0
INT1
INT0
PLL_OK
PORTB0
PORTA4
PORTA1
(ON/OFF IN)
(WINDOW OUT)
(ARM BOTTOM)
C31
.1UF
2MHZ
R69
470R
NO
SLATE
W3
SRD
W2
GND
DIGITAL THEATER SYSTEMS
31336 VIA COLINAS #104
WESTLAKE VILLAGE, CA 91362
Title
DTS TIME CODE GENERATOR
Size
B
Document Number
D449C
REV
D
Date: September 27, 1996
Sheet 3 of 3