# Model 8010 Digital VITC Generator

# Instruction Manual



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# INFORMATION TO USERS IN EUROPE

## NOTE

### CISPR 22 CLASS A DIGITAL DEVICE OR PERIPHERAL

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to the European Union EMC directive. 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.

# INFORMATION TO USERS IN THE U.S.A.

## NOTE

### FCC CLASS A DIGITAL DEVICE OR PERIPHERAL

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.

## WARNING

Changes or Modifications not expressly approved by Evertz Microsystems Ltd. could void the user's authority to operate the equipment.

Use of unshielded plugs or cables may cause radiation interference. Properly shielded interface cables with the shield connected to the chassis ground of the device must be used.

## REVISION HISTORY

| REVISION | DESCRIPTION | DATE |
|---|---|---|
| 1.0 | Preliminary issue | September 96 |
| 1.1 | Added Colour Frame reference, misc typographical corrections | October 96 |
| 1.2 | Updated Chapters 3, 4 & 5 | December 96 |
| 1.3 | Changes made in Technical Description chapter 5 and insertion of new 8029 & 8037 Schematics & layouts | March 97 |
| | 8037 Schematic Drawings revised | May 97 |
| | Change sheet 1.3-2 Added<br>SMPTE ⇔ EBU timecode translator mode | February 98 |
| | Change sheet 1.3-3 Added | June 98 |
| | Incorporated change sheet 1.3-4 | May 99 |
| | Incorporated change sheet 1.3-5 into chapter 2 | Apr 01 |
| | Revised change sheet 1.3-3 | Feb 02 |

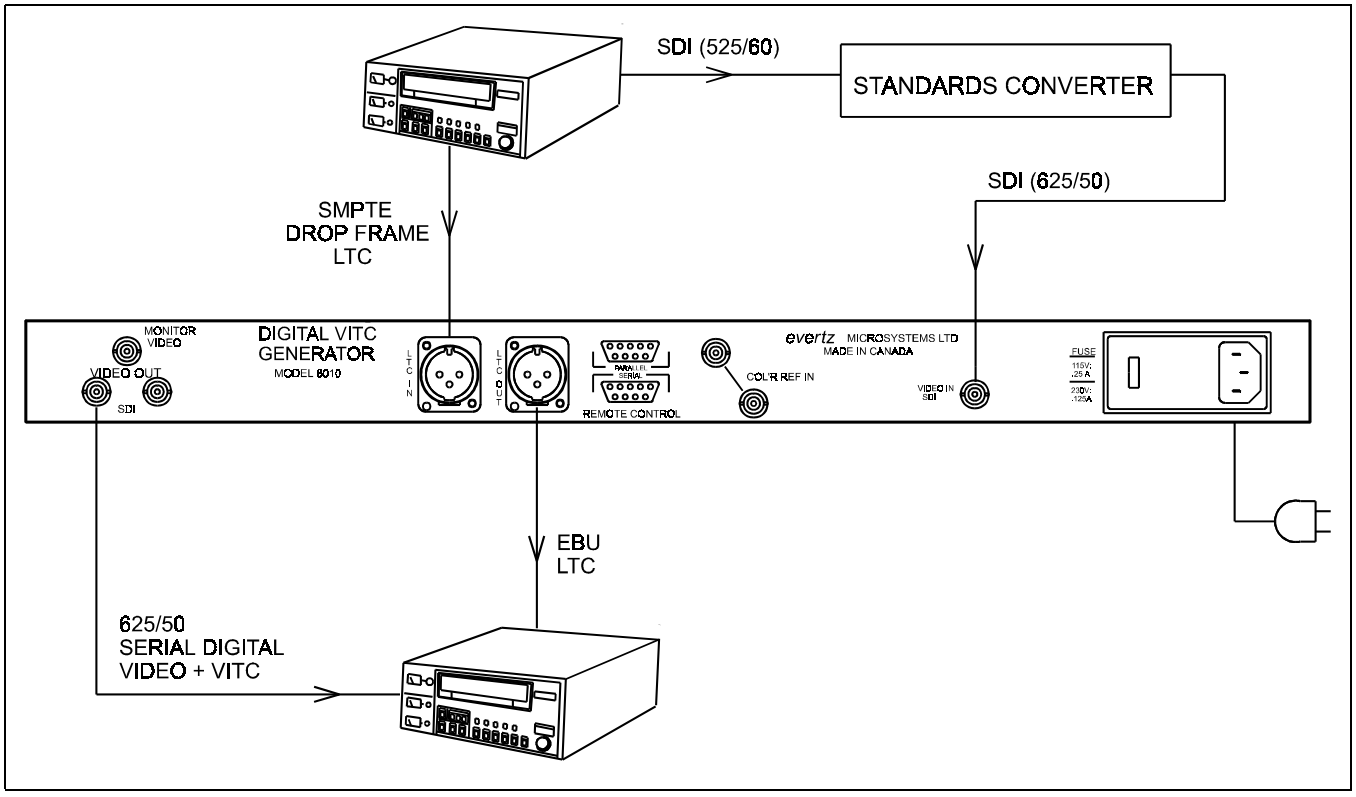
The following document describes the operational changes to the 8010 related to firmware version 980203. References to the 8010 manual are to version 1.3 printed May 1997.

# 1. New Features

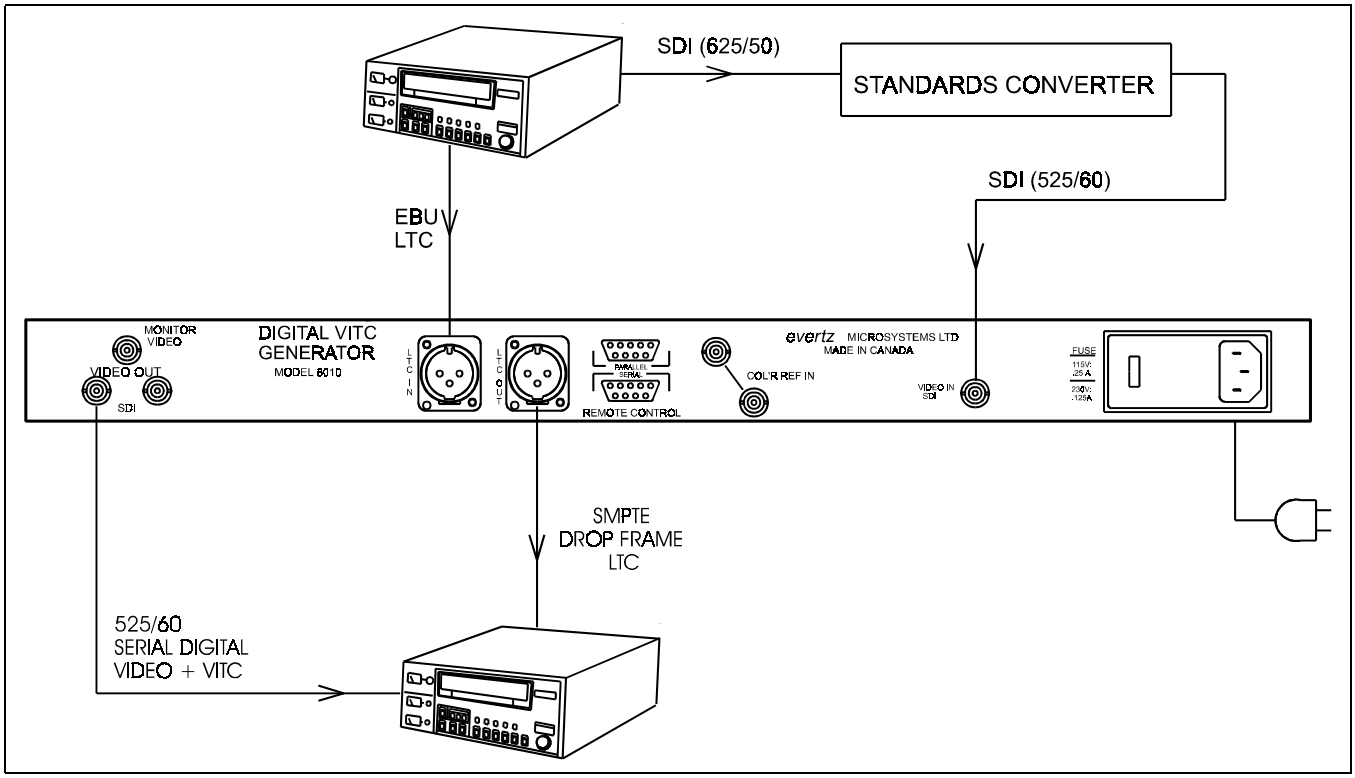
The 8010 now will allow the user to put the unit into a SMPTE ⇔ EBU timecode translator mode. This feature would normally be used to convert timecode in standards conversion applications. In translator mode incoming LTC in the input video standard is converted to timecode in the output video standard. The 8010 is connected to video in the output video standard. The hours, minutes and seconds of the output code are jam synced to the input code. The frames run at the normal frame rate of the output video standard.

The 8010 OFFSET register can be used to enter a frame offset to account for frame delays in the standards converter.

The system configuration drawings below show how the system will be configured in the translate mode of operation.




**System Configuration 525/60 (NTSC) to 625/50 (PAL) Conversions**




**System Configuration 625/50 (PAL) to 525/60 (NTSC) Conversions**

## 1.1 Translate Item Added To GEN MODE Menu.

A new mode has been added to the GEN MODE menu item.

| **GEN MODE** |
|---|
| **Gmode time data** |
| **Gmode time rtime** |
| **Gmode time rub** |
| **Gmode translate** |

**Gmode translate** sets the 8010 into a SMPTE ⇔ EBU timecode translator mode. This mode is used to convert timecode in standards converter applications. In translate mode incoming LTC in the input video standard is converted to timecode in the output video standard. The generator time is compared to the LTC reader time. When the two times disagree by more than the JAM WINDOW parameter, the Generator time is jammed from the reader time, taking into account the frame numbering differences of SMPTE and EBU code. The frames run at the normal frame rate of the output video standard. The JAM LED will come on each time the Generator resynchronizes to the Reader. A jam sync offset can be set using the method outlined in section 3.3.4 of the 8010 manual

**When translating from SMPTE to EBU code, the input code must be in the Drop Frame format. When translating from EBU to SMPTE code, the Generator DROP FRAME mode must be set to DROP FRAME. (See section 3.3.7 of the 8010 manual.)**

## 1.2 JAM WINDOW Item Added to Engineering Setup Menus.

The JAM WINDOW parameter has been added to the Engineering Setup menu. This parameter is used to ignore the natural differences between SMPTE and EBU frames numbers within the second. The frame counting rates of 25 FPS and 30FPS along with the natural difference between the video rates of 29.97 and 30 fps (taking into account the dropped frames) produce an acceptable difference between the SMPTE and EBU frame numbers during a given second. Any difference between the LTC reader input and the generated timecode output numbers (accounting for any programmed OFFSET) will cause the generator to resynchronize to the reader in translate mode. Under normal circumstances the factory default setting of “6” frames should be adequate.

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The following document describes the operational changes to the 8010 related to firmware version 980608. References to the 8010 manual are to version 1.3 printed May 1997.

# 1. New Features

A new Generator mode has been added to the 8010 that allows the user to pass remote control contact closure information in the VITC user bits. This feature allows the user to use the five Parallel remote control inputs to set one of the five remote control user bit patterns. At the decoder end our 622 VITC reader module decodes the remote control user bits and outputs them on five open collector outputs. When the 8010 is operated in this mode the normal functions of the parallel remote control inputs are disabled.

## 1.1 New Item Added To GEN MODE Menu.

A new mode has been added to the GEN MODE menu item.

| **GEN MODE** |
|---|
| **Gmode time data** |
| **Gmode time rtime** |
| **Gmode time rub** |
| **Gmode translate** |
| **Gmode time rctl** |

**Gmode time rctl** sets the 8010 into a user bit remote control mode. In this mode the five input pins on the parallel remote control port are used to control the setting of the five remote control user bits. When the 622 VITC reader module reads the VITC, these five user bits directly control five contact closure outputs. When the 8010 is placed into the TIME RCTL mode, special binary group flags are set, signaling the remote control mode to the decoder. This allows an extra level of security at the decoder and ensures that random user bit patterns do not inadvertently activate the contact closure outputs of the decoder.

When the user selects the remote control mode, the generator user bits will be set to

XX 80 80 93

Where the value of XX depends on the states of the remote control input pins. See table 1.

## 1.2 User Bit entry

When the 8010 is in the **time rctl** mode, the user bits are determined by the state of the parallel remote control inputs. ***Attempts to enter user bits manually from the front panel will not be allowed***.

## 1.3 Functions of the Parallel Remote Control Port changed.

In the **time rctl** mode, the inputs on the Parallel remote control port are used to control the remote control user bits. When the GEN MODE is set to any of the other modes, then the inputs revert to their normal functions as described in section 2.1.5 of the 8010 manual. The parallel port pin designations in remote control mode are shown in Table 1 below. Table 1 also shows the corresponding output pins of both the 7721GPI-D and 622 decoder and the user bits that control them.

The parallel port is the default input source for **time rctl** mode. It will automatically be selected as the input source whenever a rising or falling edge is detected on any of the five pins monitored by the system. The remote control user bits may also be set from the serial port using command 8A. (See section 1.4.1 below) When the user bits have been set from the serial port, the present state of **all** parallel port pins will be ignored. The parallel port will only become the input source again if **any one** of the port pins changes state.

| GPI | 8010 PIN (IN) | 7721GPI-D PIN (OUT) | 622 PIN (OUT) | GUB Data byte 1 |
|---|---|---|---|---|
| 1 | 4 | 4 | 2 | 81 |
| 2 | 5 | 8 | 1 | 82 |
| 3 | 8 | 3 | 3 | 84 |
| 4 | 7 | 1 | 8 | 88 |
| 5 | 6 | 13 | 4 | 90 |

**Table 1:Remote Mode I/O Mapping**

## 1.4 Changes to the Remote Control Protocol

### 1.4.1 Setting the Generator mode.

Command A0 and 80 have been updated as shown below to support the new modes.

**A0** **Sense Generator Mode** Returns 1 byte as defined below.

**80** **Select Generator Mode** 1 byte Selects the mode of the generator.

| | DESCRIPTION | |
|---|---|---|
| **MODE** | **TIME** | **UB** |
| 00 | TIME | DATA |
| 01 | TIME | RDR TIME |
| 02 | TIME | RDR UB |
| 03 | Reserved | |
| 04 | TRANSLATE | |
| 05 | TIME | RCTL |

**Table 4-8: Generator Modes**

### 1.4.2 Setting the Generator User bits

Command 8A can be used to set the remote control user bit patterns when the **time rctl** GEN MODE is selected. The user bit data **must** be of the following form:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 9 | 3 | 8 | 0 | 8 | 0 | UB grp 8 | UB grp 7 |

The user bit groups UB 8 and 7 when combined into an 8 bit value are of the form **100xxxxx** where “x” represents a bit that may be set or cleared. Each bit corresponds directly to one of the 8010 parallel port pins according to Table 1.

When the user bits have been set from the serial port, the present state of **all** parallel port pins will be ignored. The parallel port will only become the input source again if **any one** of the port pins changes state.

If the user bits data is not sent exactly as described above, a NAK will be returned from the 8010, and the remote control user bits will not be affected.

# 2. Miscellaneous Manual errata

The following corrections should be made to the 8010 manual.

There may be some confusion about whether data values in various sections of chapter 4 are in Hexadecimal or Decimal format. In general, all values in chapter 4 are shown in Hexadecimal format unless otherwise noted.

Table 4-1: The data bytes return value for command 1C should be 11 (hexadecimal)

Command 11 Sense Prom Version: Returns the control byte from the command +10 (hex) bytes PROM name + 10 (hex) bytes PROM version

Command 1C Sense Display Data: returns 11 (hex) bytes as described in Display Data Block.

## 2.1 Preset / Sense Char Gen Window Position

The vertical position, horizontal position and window length parameters are in packed BCD format. Table 4-6 incorrectly shows the maximum values for the vertical position. A revised Table 4-6 below shows the correct maximum values. If the VITC lines are set above line 21 or the character raster position is near to the bottom, then the actual maximum values may be less than those shown in the table.

| SIZE | VERT POSITION | HORIZ POSITION |
|---|---|---|
| Tiny | 0 to 30 are valid for NTSC<br>0 to 33 are valid for PAL | 0 to 32 depending on window length |
| Small | 0 to 14 are valid for NTSC<br>0 to 17 are valid for PAL | 0 to 32 depending on window length |
| Large | 0 to 7 are valid for NTSC<br>0 to 8 are valid for PAL | 0 to 32 depending on window length |

**Table 4-6: VCG Sizes**

## 2.2 Sense Generator

The description of the data returned is confusing. The revised version reads as follows:

> Each bit represents a block of data that is requested. Time and user bit data blocks are defined in section 4.5 of this manual. The bits are polled and blocks are assembled in the following order:
> GT GU

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# 1. OVERVIEW

The 8010 is a multi-purpose Digital VITC (D-VITC) Generator that inserts the vertical interval timecode directly into the digital bitstream. The model 8010 VITC generator's lines can be easily programmed from the front panel. In addition, the 8010 generates LTC which follows the D-VITC. The model 8010 also contains a high speed reader for Linear Time Code (LTC), and contains a high resolution character Inserter which can be delegated to either the generator or reader. A 16 digit alphanumeric display can be quickly delegated to show the required data.

The 8010 will accept 525 or 625 line component digital video (4:2:2) or NTSC composite digital video (4 Fsc). With 4:2:2 video, the 8010's time code generator can be preset to lock to the digital program video either by simple frame locking, or where necessary it will colour lock to an analog Colour Reference in accordance with the 4 field NTSC colour sequence ( 8 field PAL). With NTSC 4 Fsc video, the 8010 can be set to reference to the program video in either a colour or no colour frame sequence, extracting the colour information directly from the digital video.

In NTSC colour systems operation, with a frame rate of 29.97002618 Hz where the time of day is used for indexing, the generator may be operated in the drop frame mode. Special indicators in the front panel display and in the character inserter indicate that the unit is operating in the drop frame format.

Two jam sync modes allow the 8010 D-VITC generator to be slaved to incoming LTC. In the continuous jam sync mode, the generator is slaved to the reader, and will follow code discontinuities of the reader. The generator may also be momentarily synchronized to the reader, then it continues to increment normally regardless of the reader code.

Both the generator and reader are capable of working with the unassigned user bits. Several modes of operation are possible. The generator may be preset to insert hexadecimal values for each group in the generated code, and the reader will read hexadecimal values for each binary group. In addition, the user may select the transfer of either reader time or reader user bits into the generator user bits, thus, allowing pre-edit frame addresses to be preserved when new continuous time code is laid down.

The high resolution character inserter provides four independently positionable windows to show time and user bits for both the generator and LTC reader simultaneously. Three character sizes and the choice of white or black characters with or without contrasting background mask are selected from the front panel.

**Features:**

- Accepts 4:2:2 (525 and 625 line) and 4 Fsc NTSC digital video
- Serial digital video input provides automatic cable equalization on cable lengths up to 200 meters of low loss coax such as Belden 8281
- Serial digital video output provides two separate outputs
- Passes embedded audio and other ancillary data signals
- Character Inserter displays time and user bits of Generator and Reader
- Separate positioning of each character window
- Rack mountable
- 8 or 10 bit resolution
- 16 digit Alpha-numeric display, with 10 pushbuttons
- Serial Remote Control of most functions - Broadcasts reader data or sends it on request.

## 1.1. HOW TO USE THIS MANUAL

This manual is organized into 5 chapters: Overview, Installation, Operation, Serial Remote Control Protocol and Technical Description.

**Items of special note are indicated with a double box like this.**

## 1.2. DEFINITIONS

**AES:** (Audio Engineering Society): A professional organization that recommends standards for the audio industries.

**AES/EBU:** Informal name for a digital audio standard established jointly by the Audio Engineering Society and the European Broadcasting Union organizations.

**ANALOG:** An adjective describing any signal that varies continuously as opposed to a digital signal that contains discrete levels representing digits 0 and 1.

**A-TO D CONVERTER (ANALOG-TO-DIGITAL):** A circuit that uses digital sampling to convert an analog signal into a digital representation of that signal.

**BIT:** A binary representation of 0 or 1. One of the quantized levels of a pixel.

**BIT PARALLEL:** Byte-wise transmission of digital video down a multi-conductor cable where each pair of wires carries a single bit.

This standard is covered under SMPTE 125M, EBU 3267-E and CCIR 656.

**BIT SERIAL:** Bit-wise transmission of digital video down a single conductor such as coaxial cable. May also be sent through fiber optics. This standard is covered under SMPTE 259M and CCIR 656.

**BIT STREAM:** A continuous series of bits transmitted on a line.

**BNC:** Abbreviation of "baby N connector". A cable connector used extensively in television systems.

**BYTE:** A complete set of quantized levels containing all the bits. Bytes consisting of 8 to 10 bits per sample are typical in digital video systems.

**CABLE EQUALIZATION:** The process of altering the frequency response of a video amplifier to compensate for high frequency losses in coaxial cable.

**CCIR (International Radio Consultative Committee)** An international standards committee. (This organization is now known as ITU.)

**CCIR-601:** (This document now known as ITU-R601). An international standard for component digital television from which was derived SMPTE 125M and EBU 3246-E standards. CCIR-601 defines the sampling systems, matrix values and filter characteristics for both Y, B-Y, R-Y and RGB component digital television signals.

**CCIR-656** (This document now known as ITU-R656).The physical parallel and serial interconnect scheme for CCIR-601. CCIR-656 defines the parallel connector pinouts as well as the blanking, sync and multiplexing schemes used in both parallel and serial interfaces. It reflects definitions found in EBU Tech 3267 (for 625 line systems) and SMPTE 125M (parallel 525 line systems) and SMPTE 259M (serial 525 line systems).

**CLIFF EFFECT** (also referred to as the 'digital cliff') This is a phenomenon found in digital video systems that describes the sudden deterioration of picture quality due to excessive bit errors, often caused by excessive cable lengths. The digital signal will be perfect even though one of its signal parameters is approaching or passing the specified limits. At a given moment however, the parameter will reach a point where the data ca no longer be interpreted correctly, and the picture will be totally unrecognizable.

**COMPONENT ANALOG:** The non-encoded output of a camera, video tape recorder, etc., consisting of the three primary colour signals: red, green, and blue (RGB) that together convey all

necessary picture information. In some component video formats these three components have been translated into a luminance signal and two colour difference signals, for example Y, B-Y, R-Y.

**COMPONENT DIGITAL:** A digital representation of a component analog signal set, most often Y, B-Y, R-Y. The encoding parameters are specified by CCIR-601. The parallel interface is specified by CCIR-656 and SMPTE 125M.

**COMPOSITE ANALOG:** An encoded video signal such as NTSC or PAL video, that includes horizontal and vertical synchronizing information.

**COMPOSITE DIGITAL:** A digitally encoded video signal, such as NTSC or PAL video, that includes horizontal and vertical synchronizing information.

**D1:** A component digital video recording format that uses data conforming to the CCIR-601 standard. Records on 19 mm magnetic tape. (Often used incorrectly to refer to component digital video.)

**D2:** A composite digital video recording format that uses data conforming to SMPTE 244M. Records on 19 mm magnetic tape. (Often used incorrectly to refer to composite digital video.)

**D3:** A composite digital video recording format that uses data conforming to SMPTE 244M. Records on 1/2" magnetic tape.

**EBU (European Broadcasting Union):** An organization of European broadcasters that among other activities provides technical recommendations for the 625/50 line television systems.

**EBU TECH 3267-E:** The EBU recommendation for the parallel interface of 625 line digital video signal. This is a revision of the earlier EBU Tech 3246-E standard which was in turn derived from CCIR-601.

**EDH** Error Detection and Handling (EDH) is defined in SMPTE RP-165 as a method of determining when bit errors have occurred along the digital video path. According to RP-165, two error detection checkwords are used, one for active picture samples, and the other on a full field of samples. Three sets of flags are used to convey information regarding detected errors, to facilitate identification of faulty equipment or cabling. One set of flags is associated with each checkword, and the third is used to evaluate ancillary data integrity. The checkwords and flags are combined into a special error detection data packet which is included as ancillary data in the serial digital signal.

**EMBEDDED AUDIO:** Digital audio is multiplexed onto a serial digital video data stream.

**ITU:** The United Nations regulatory body governing all forms of communications. ITU-R (previously CCIR) regulates the radio frequency spectrum, while ITU-T (previously CCITT) deals with the telecommunications standards.

**ITU-R601:** See CCIR601

**PIXEL:** The smallest distinguishable and resolvable area in a video image. A single point on the screen. In digital video, a single sample of the picture. Derived from the words *picture element*.

**RESOLUTION:** The number of bits (four, eight, ten, etc.) determines the resolution of the signal. Eight bits is the minimum resolution for broadcast television signals.

4 bits = a resolution of 1 in 16.
8 bits = a resolution of 1 in 256.
10 bits = a resolution of 1 in 1024.

**SERIAL DIGITAL:** Digital information that is transmitted in serial form. Often used informally to refer to serial digital television signals.

**SMPTE (Society of Motion Picture and Television Engineers):** A professional organization that recommends standards for the film and television industries.

**SMPTE 125M:** The SMPTE standard for bit parallel digital interface for component video signals. SMPTE 125M defines the parameters required to generate and distribute component video signals on a parallel interface.

**SMPTE 244M:** The SMPTE standard for bit parallel digital interface for composite video signals. SMPTE 244M defines the parameters required to generate and distribute composite video signals on a parallel interface.

**SMPTE 259M:** The SMPTE standard for 525 line serial digital component and composite interfaces.

**TRS:** Timing reference signals used in composite digital systems. (It is four words long).

**TRS-ID:** Abbreviation for "Timing Reference Signal Identification". A reference signal used to maintain timing in composite digital systems. (It is four words long.)

| | |
|---|---|
| **4:2:2** | A commonly used term for a component digital video format. The details of the format are specified in the CCIR-601 standard. The numerals 4:2:2 denote the ratio of the sampling frequencies of the luminance channel to the two colour difference channels. For every four luminance samples, there are two samples of each colour difference channel. |
| **4Fsc** | Four times subcarrier sampling rate uses in composite digital systems. In NTSC this is 14.3 MHz. In PAL this is 17.7 MHz. |

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# 2. INSTALLATION

## 2.1. REAR PANEL

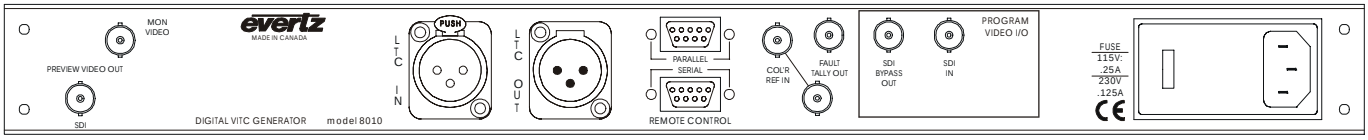


**Figure 2-1: 8010 Rear Panel**

The following sections describe the purpose of the rear panel connectors of the 8010. Sections 2.1.1 to 2.1.3 describe the specific signals that should be connected to the 8010.

### 2.1.1. Program Video Connections

**SDI IN**: A BNC connector for input of 10 bit serial digital video signals compatible with the SMPTE 259M standard.

**SDI BYPASS OUT**: A BNC connector for output of 10 bit serial digital video signals compatible with the SMPTE 259M standard. This video will be normally be the video input with vertical interval time code (VITC) inserted onto it. When the SDI bypass relay is activated (on power failure) the SDI BYPASS OUT is a direct relay connection to the SDI IN.

**FAULT TALLY OUT**: A BNC connector for output of a SMPTE 269M fault tally. The output will be open circuit when the 8010 is processing video normally. The output will be grounded when the 8010 is bypassed.

### 2.1.2. Preview Video Connections

**PREVIEW VIDEO OUT**: A BNC connector for output of 10 bit serial digital video signals compatible with the SMPTE 259M standard. This video will be the video input with VITC inserted onto it when the SDI bypass relay is NOT activated. If the SDI bypass relay is activated, this connector will have NO video output.

### 2.1.3. Colour Reference Connections

**COL'R REF IN:** A BNC loop used to provide a colour-lock reference for the 8010's generator. (only required in 4:2:2 mode when colour frame timecode is required.)

### 2.1.4. Analog Monitor Connections (8010-MON option)

The analog composite monitor output is optional and may not be fitted on your unit.

**MONITOR VIDEO:** A BNC output of the optional composite analog encoder.

### 2.1.5. Remote Control Connections

**SERIAL**: A 9 pin female 'D' connector for RS232/422 communications to a computer

| Pin | Description |
|---|---|
| 1 | Ground |
| 2 | RS-422 Transmit A(-) |
| 3 | RS-422 Receive B(+) |
| 4 | Receive Common |
| 5 | RS-232 Transmit |
| 6 | Transmit Common |
| 7 | RS-422 Transmit B(+) |
| 8 | RS-232 Receive and RS-422 Receive A(-) |
| 9 | Ground |

**PARALLEL**: A 9 pin female 'D' connector for connection to 'closure to ground' remote control signals for the character inserter. Each input has an internal 47 K ohm pull-up to +5 volts.

| Pin | Description |
|---|---|
| 1 | Ground |
| 2 | n/c |
| 3 | n/c |
| 4 | Time-UB Transfer Enable |
| 5 | UB -UB Transfer Enable |
| 6 | VCG Keyer Enable |
| 7 | Jam Sync Enable |
| 8 | VITC Generator Enable |
| 9 | Ground |

### 2.1.6. Power Connections

**LINE**: The 8010 may be set for either 115v/60 Hz or 230v/50 Hz AC operation. The voltage selector switch is accessible on the rear panel. The line voltage connector contains an integral slow blow fuse (and a spare one).

## 2.2. MOUNTING

The 8010 Digital VITC Generator is equipped with rack mounting angles and fits into a standard 19 inch by 1 3/4 inch (483 mm x 45 mm) rack space. The mounting angles may be removed if rack mounting is not desired.

## 2.3. POWER REQUIREMENTS

### 2.3.1. Selecting the Correct Mains Voltage

Power requirements are 115 or 230 volts AC at 50 or 60 Hz, switch selectable on the rear panel. Power should be applied by connecting a 3 wire grounding type power supply cord to the power entry module on the rear panel. The power cord should be minimum 18 AWG wire size, type SST marked VW-1, maximum 2.5 m in length.

**Before connecting the line power, be sure to select the proper line voltage. Also, check that the line fuse is rated for the correct value marked on the rear panel.**

The power entry module combines a standard IEC 320 power inlet connector, voltage selector switch, two 5 x 20 mm fuse holders (one active, one spare) and an EMI line filter.

To change the mains voltage setting, open the cover of the power entry module using a small screwdriver. Remove the drum selector switch, and re-insert it so that the desired voltage is visible through the opening on the mains connector cover. Check that the correct fuse is in use as shown in section below.

### 2.3.2. Changing the Fuse

The fuse holder is located inside the power entry module. To change the fuse, open the cover of the power entry module using a small screwdriver. The fuse holder on the bottom contains the active fuse. The one at the top contains a spare fuse. Pull the bottom fuse holder out and place a fuse of the correct value in it. Use slo blo (time delay) 5 x 20 mm fuses rated for 250 Volts with the following current ratings:

For 115 Volt operation 250 mA

For 230 Volt operation 125 mA

Make sure that the arrow is pointing down when you replace the fuse holder. Close the door on the power entry module and connect the mains voltage.

**Never replace with a fuse of greater value.**

## 2.4. CONNECTING THE DIGITAL VIDEO

### 2.4.1. Video Input

The 8010requires that a digital video source be connected to the VIDEO IN SDI video input. The 8010 may be configured to accept either 525 or 625 line digital video in the component (4:2:2) format or 525 line digital video in the composite (4Fsc) format. The VIDEO TYPE parameter on the front panel menu must be set correctly to match the video input. (See section 3.6.1 for information on changing the video type setting).

The 4:2:2 and 4 Fsc LED's indicate which input is active and whether there is video present. When either is blinking it indicates that there is no video present.

### 2.4.2. Video Output

The VIDEO OUT SDI outputs contain the input video with VITC (with timecode, source ID and VTR status encoded), and character data keyed in by the keyer. Connect one of these outputs to any input on your system that accepts 8 or 10 bit SERIAL digital video. Two identical VIDEO OUT SDI digital video outputs are provided.

## 2.5. LINEAR TIME CODE GENERATOR CONNECTIONS

The LTC reader input connects to your head pre-amplifier output. When using an unbalanced input to the reader, the signal should be applied to pin 3 of the LTC reader input connector. Normally, the unused input, (pin 2) should be connected to ground (pin 1).

The generator code output is available on an XLR connector at the rear panel. Output level is adjustable from approximately 0.5 V to 4 V using the LTC OUT item on the CONFIG menu of the Engineering setup menu system. (See section 3.4.1) The generator code output should be connected to the record input of the time code channel or audio track 2 of

your video recorder (audio track 3 for 1" VTR's). Pin 1 of the XLR is ground, and pins 2 and 3 provide a balanced output.

## 2.6. CONNECTING THE EXTERNAL COLOUR FRAMING REFERENCE

In 4:2:2 video applications where colour framing of the timecode is required, the generator must be locked to a stable 1 volt p-p composite video or colour black source, applied to the generator COL'R REF IN video loop. The internal sync separator has a high impedance input tapped off the loop through, therefore, the video signal must be properly terminated at the end of the line. This colour frame reference is also normally connected to the component to composite encoder which is generating the NTSC or PAL video from the 4:2:2 digital video. In 4:2:2 applications where colour framing is not required, you do not need to connect anything to the COL'R REF IN loop.

The sync to subcarrier (Sc-H) phase relationship of the video source must conform to the NTSC RS-170-A or the PAL 8 field specification. Selection of the colour framed or non colour framed mode is accomplished from the front panel. (See Section 3.3.8) When the video source does not meet the colour frame specifications, the non colour frame mode must be selected to ensure a proper generator lock condition.

In 4 Fsc NTSC applications, where colour framing of the timecode is required, the colour frame information is extracted directly from the composite digital video. In these applications, you do not need to connect anything to the COL'R REF IN loop.

## 2.7. TYPICAL APPLICATION

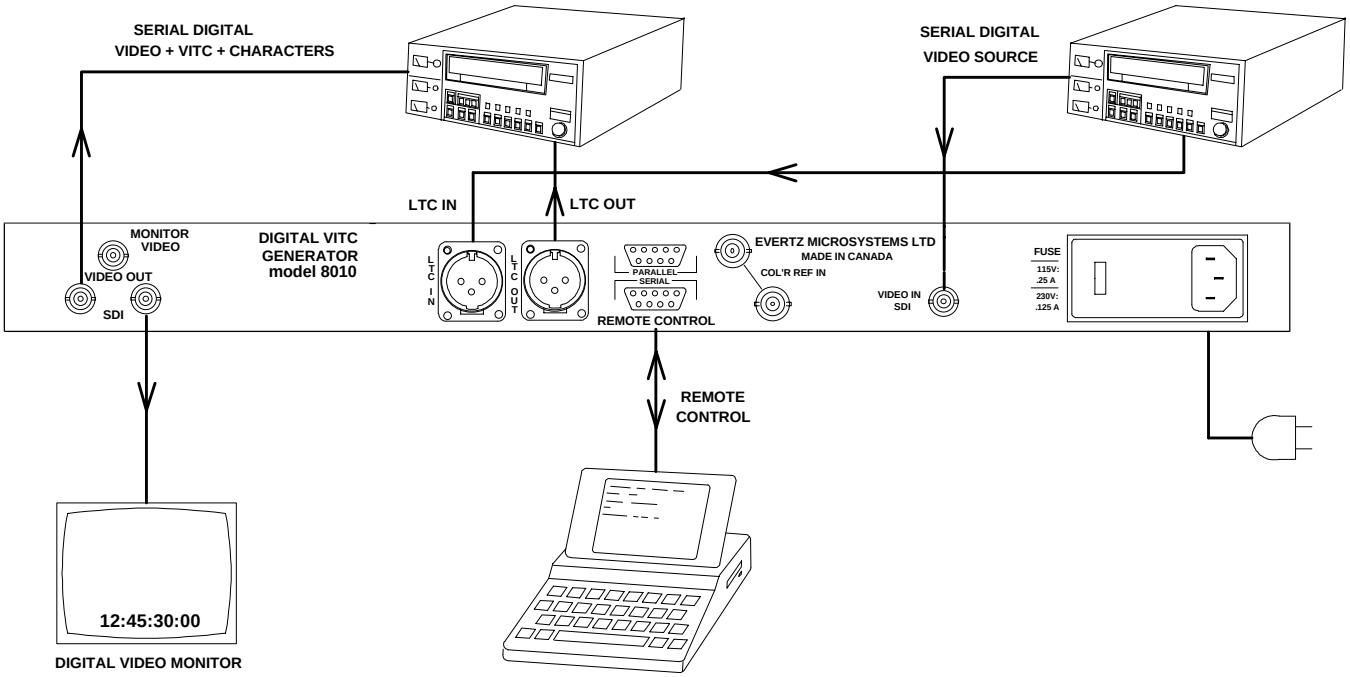


**Figure 2-2: Typical Application of 8010 for Character Generation and Translation from LTC**

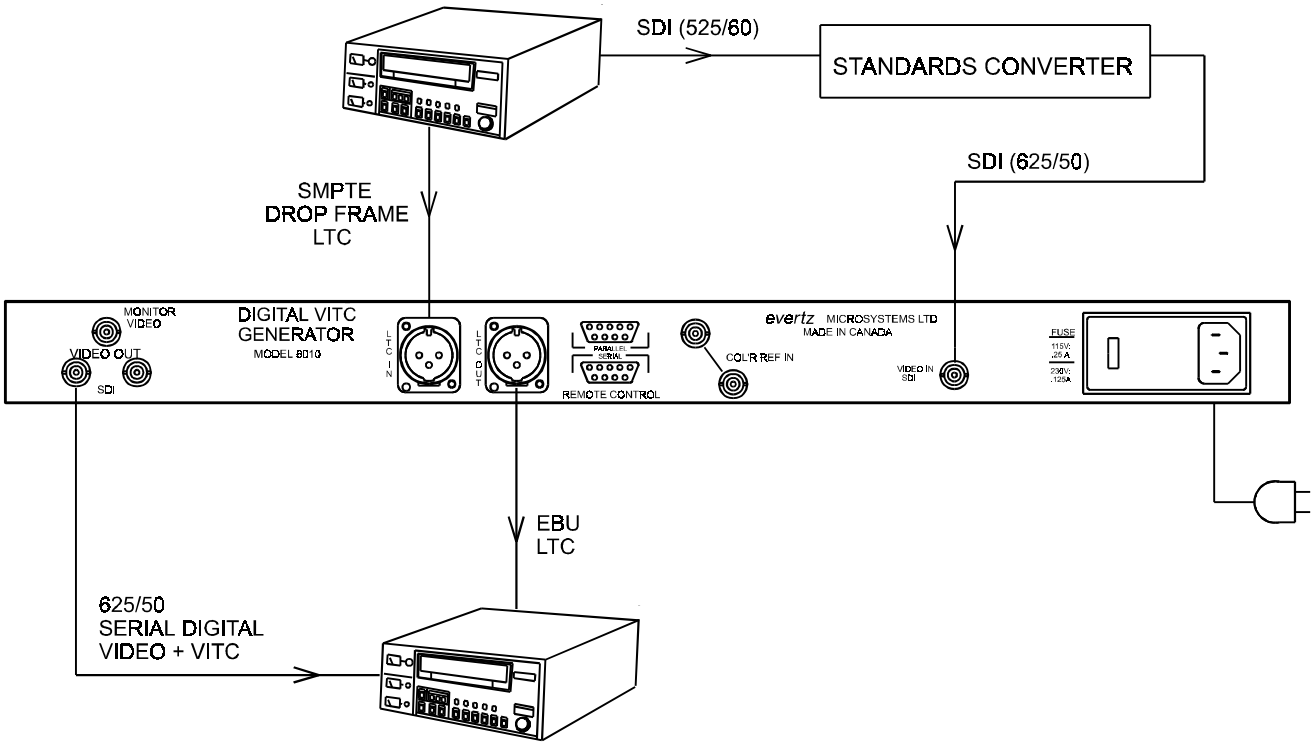


**Figure 2-3: System Configuration 525/60 (NTSC) to 625/50 (PAL) Conversions**

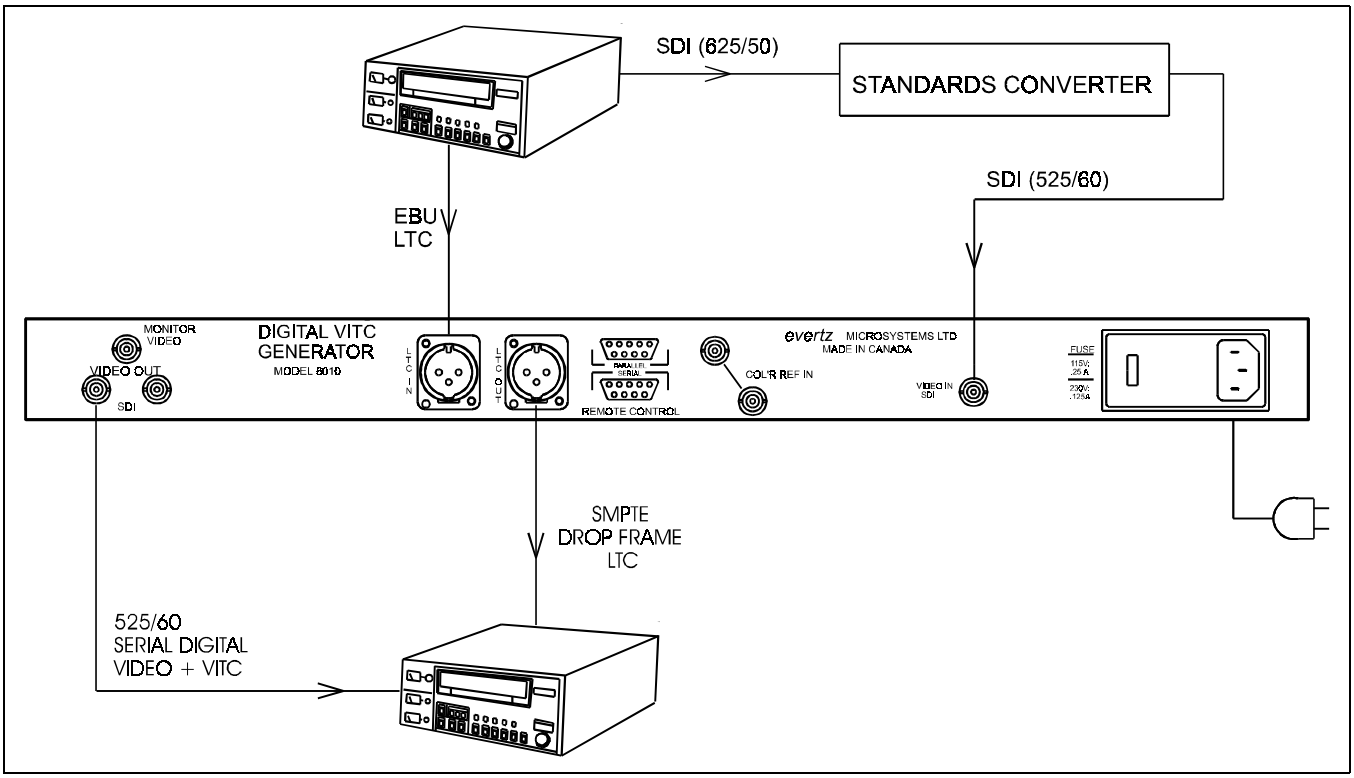


**Figure 2-4: System Configuration 625/50 (PAL) to 525/60 (NTSC) Conversions**

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**Figures**



**Tables**

# 3. HOW TO OPERATE THE DIGITAL VITC GENERATOR

## 3.1 AN OVERVIEW OF KEY AND DISPLAY FUNCTIONS

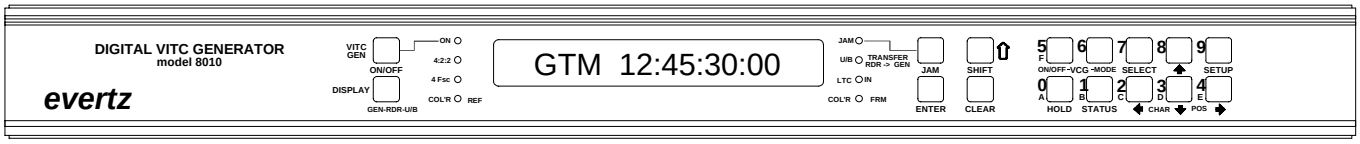


**Figure 3-1: Front Panel Layout**

The display area consists of a 16 digit alphanumeric display, 8 LED status indicators and a 16 pushbutton keypad.

The keypad is used to control the front panel menu system, to set the generator time, position the character display windows, and to provide control of the front panel display. When the **SHIFT** key is held down, the meanings of some of the keys are modified, gaining quick access to a wider variety of functions. (Throughout this manual **SHIFT +** indicates that you should hold down the **SHIFT** key while pressing the second key.)

A front panel programming menu provides a quick and simple method of configuring the 8010 Digital VITC Generator for your application.

Section 3.3 gives detailed information on the specific operations required to control the 8010.

### 3.1.1 The Setup Push-button Group

The Setup key group consists of the **SELECT, SETUP** and ←, →, ↑, ↓ keys and is used to navigate the front panel programming menu system, to position character windows and to enter the source ID message.

**SETUP** Enters the Setup mode which is used to set up various modes of operation. Pressing **SETUP** again while in this mode exits the Setup mode. (See also section 3.3.)

**SELECT** When in the Setup mode the **SELECT** key is used to activate the current choice for the selected item.
When in the Source ID programming mode, the **SELECT** key is used to accept the Source ID message that has been entered.

↑ ↓ ← → When in the Setup mode, the ↑ & ↓ arrow keys are used to move up and down the main items in the menu system and the ← & → arrow keys are used to show the menu choices for the current item. (See also section 3.3.)

When in the VCG window select mode, the arrow keys are used to position the individual character windows on the screen. (See also section 3.5.4.)

When not in either the Setup mode or the VCG window select mode, the arrow keys are used to position all the character windows on the screen. (See also section 3.5.5.) **SHIFT +** arrow keys are used to provide fine adjustment of the character generator raster.

### 3.1.2 The Character Window-Button Group

**CHAR GEN MODE** Initiates VCG window select mode and highlights the selected window. Use the arrow keys to move the window, use the **CHAR GEN ON/OFF** key to turn the window on or off. Press the **MODE** key again to select the next VCG window. Press the **MODE** key a third time to return to the normal VCG display mode.

**CHAR GEN ON/OFF** Turns the character generator ON and OFF. When in the VCG window select mode the **CHAR GEN ON/OFF** key is used to turn individual windows ON and OFF.

### 3.1.3 The Function Button Group

**VITC GEN ON/OFF** Is used to turn the VITC generator on and off. The VITC indicator is ON when the VITC generator is enabled. The time and user bits of the VITC generator are the same as for the LTC generator.

**DISPLAY** Selects what data is being displayed on the front panel. Each time it is pressed it cycles to the next display data. Currently there are four types of display data:

| | | |
|---|---|---|
| **LTM** | **12:34:56:00** | LTC Reader Time information |
| **LUB** | **12 34 56 78** | LTC Reader User Bit information |
| **GTM** | **12:34:56:00** | Generator Time information |
| **GUB** | **12 34 56 78** | Generator User Bit information |

There are also some extended displays which are accessible by pressing the **SHIFT + DISPLAY** keys. Press **SHIFT + DISPLAY** to return to the normal displays. At this time the extended displays are:

| | | |
|---|---|---|
| **OFF** | **00:00:00:00** | Jam Sync Offset register |

**JAM** Is used to momentarily jam the reader time into the generator time. When the **SHIFT + JAM** keys are pressed the 8010 generator will be put into continuous jam sync mode.

**HOLD** When the generator is displayed on the front panel, pressing the **HOLD** key stops the generator time from incrementing. A special character ( **H )** appears to the left of the numeric display on the front panel, indicating that the display is in Hold mode.

Pressing the **HOLD** key again starts the generator incrementing.

When the Reader is displayed on the front panel, pressing the **HOLD** key freezes the reader display data on the front panel and in the VCG. A special character ( **F )** appears to the left of the numeric display on the front panel, indicating that the display is in Freeze mode. Press the **HOLD** key again to return to normal update mode.

**STATUS** Displays the current operational modes of the 8010.

### 3.1.4 An Overview of the SHIFT Key functions

When the **SHIFT** key is held down, the meanings of some of the keys are modified, gaining quick access to a wider variety of functions. Following is a summary of the shifted key functions

**SHIFT+SETUP** Enters the Engineering Setup menu system

**SHIFT+SELECT** Resets the 8010 to factory defaults when you are in the FACTORY RESET menu item of the Engineering Setup Menu.

**SHIFT+↑ & SHIFT+ ↓** Fine adjustment of character vertical raster position

**SHIFT+←** & **SHIFT+ →** Fine adjustment of character horizontal raster position

**SHIFT+DISPLAY** Displays the Jam Sync Offset register

### 3.1.5 An Overview of the Status Indicators

There are 8 status indicators located on the front panel that show operational status of the 8010 at a glance.

**VITC** Indicated that the VITC generator is enabled, and VITC is being inserted into the digital video.

**4:2:2** Indicates that 8010 is configured for component digital signals. If it is blinking, it indicates a valid 4:2:2 digital video signal is not present.

**4 fsc** Indicates that 8010 is configured for NTSC composite digital signals. If it is blinking, it indicates a valid 4 Fsc digital video signal is not present.

**COLR REF** Indicates that the 8010 is receiving a valid colour reference.

**JAM** Indicates that the generator is operating in the continuous Jam Sync Mode.

**U/B TRANSFER** Indicates that the Generator User Bits are being transferred from the Reader time or user bits.

**LTC** Indicates that LTC reader is reading valid code.

**COL'R FRAME** Indicates that the generator is operating in the Colour Frame Mode and that the generator numbers are properly synchronized to the NTSC 4 field or PAL 8 field colour frame sequence.

## 3.2 AN OVERVIEW OF THE FRONT PANEL PROGRAMMING MENU

The key to the operational flexibility of the 8010 Digital VITC Generator lies in the front panel programming menu system. The programming menu system uses the 12 digit alphanumeric display and provides a quick, intuitive method of configuring 8010 Digital VITC Generator, guiding you to the correct setup for your application. The six keys in the Setup key group (**SELECT**, **SETUP,** ← → ↑ ↓) are used to cycle through the various items on the programming menu.

The 8010 menu system consists of a main menu with two or more choices for each menu item. The sub menu items are shown in lower case to allow them to be easily distinguished from the main level items. Figure 3-2 is an overview of the front panel menu system, and shows all the menu items and where you will find the menu choices.

To enter the front panel programming menu, press the **SETUP** key.

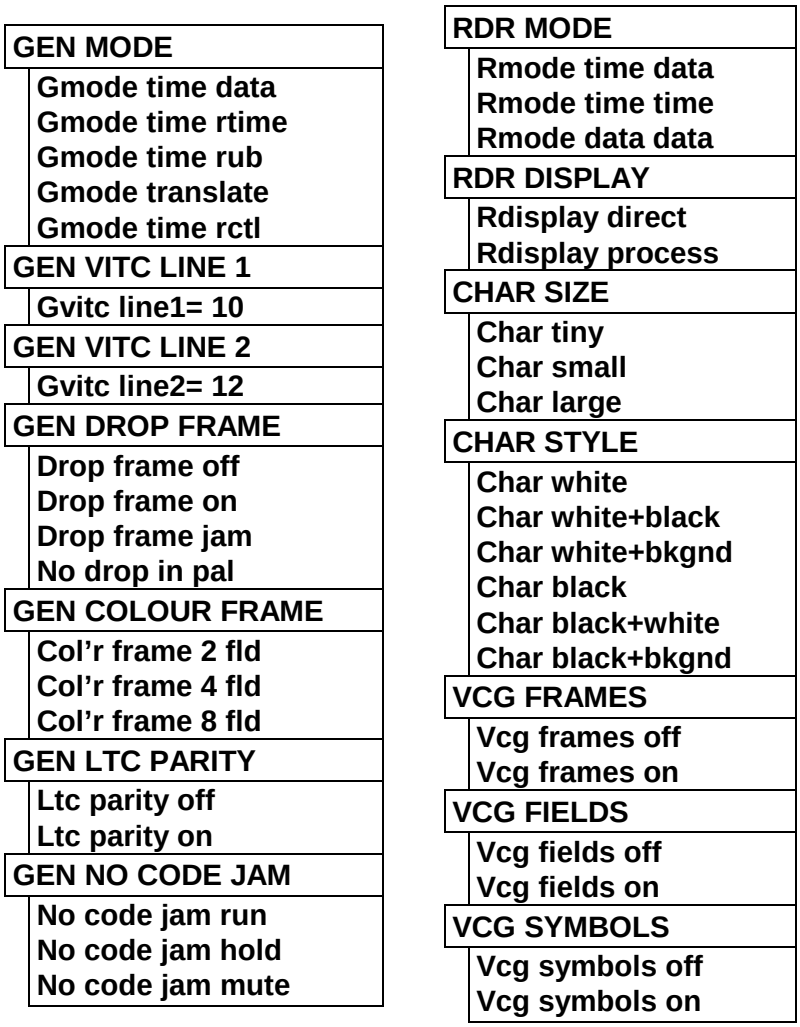


**Figure 3-2: Overview of the 8010 Programming Menu System**

The two vertical arrow keys (↑, ↓) allow you to move vertically within the menu tree. When you have selected the desired menu item, press the → key to reveal the choices for that item. The choice that is currently selected will be blinking. When you have selected the desired sub menu choice press the **SELECT** key to save your choice.

When you have made all the desired changes, press the **SETUP** key to return to the normal display mode.

To aid in finding the descriptions of the various menu items in sections 3.3 to 3.6, the drop down menu items and its sub menu items are shown in the margin of the manual, next to the description as shown.

Each of the menu items is described in section 3.3, with an explanation of what each choice does.

### 3.2.1 Engineering Setup Menu

The Engineering Setup menu allows the advanced user to change various internal parameters of the 8010, or to invoke several advanced modes.

**This menu should be used by advanced users only, as improper use can overwrite user setups.**

The 8010 Engineering Setup menu consists of a main menu with two or more choices for each menu item. The sub menu items are shown in lower case to allow them to be easily distinguished from the main level items. Figure 3-3 is an overview of the Engineering Setup menu, and shows all the menu items and where you will find the menu choices. To enter the Engineering Setup menu, press the **SHIFT+SETUP** keys. Each of the menu items is described in section 3.3, with an explanation of what each choice does.

| | |
|---|---|
| **VIDEO TYPE** | |
| | **Video 422 525**<br>**Video 422 625**<br>**Video 422 auto**<br>**Video 4 Fs 525** |
| **SERIAL BAUD RATE** | |
| | **Baud rate 2400**<br>**Baud rate 9600**<br>**Baud rate 19200**<br>**Baud rate 38400** |
| **SERIAL TEST** | |
| | **Serial test off**<br>**Serial test on** |
| **LTC LEVEL** | |
| | **LTC level 35** |
| **DISPLAY LEVEL** | |
| | **Display level 6** |
| **GEN COLOUR PHASE** | |
| | **Colour phase 01** |
| **JAM WINDOW** | |
| | **Jam window 06** |
| **FACTORY RESET** | |
| | **Shift+sel=reset** |
| **SOFTWARE VERSION** | |
| | **DG80D1.M U960609** |

**Figure 3-3: Overview of the 8010 Engineering Menu**

## 3.3 PROGRAMMING THE GENERATOR MODES

The first seven items on the programming menu are used to program various generator modes such as selecting Drop Frame, Colour Frame, Jam Sync Modes, VITC Generator Line numbers, whether user bits contain static numbers or time information, etc. The following descriptions appear in the order they appear on the menu.

### 3.1.1 Configuring the Generator Operating Modes

**GEN MODE**
- **Gmode time data**
- **Gmode time rtime**
- **Gmode time rub**
- **Gmode translate**
- **Gmode timerctl**

The **GEN MODE** menu item is used to select the type of information that is contained in the time and user bits of the generator. When the 8010 is not in the Jam sync mode, the generator Time bits contain time information entered from the front panel. When the 8010 is in the continuous Jam Sync mode, the time bits are slaved to the reader time.

**Gmode time data** configures the user bits for entering numeric data entered from the front panel.

**Gmode time rtime** transfers the reader's time bits to the generator user bits. The U/B TRANSFER LED will be on. Transferring reader time is useful when you want to record new continuous time code numbers and still retain the original time code numbers for future reference. When synchronizing audio tape machines to video recorders, the audio tape time code may be transferred to the user bits in the new video time code. An alternate method of enabling the Rdr time to Gen UB transfer is to close the TIME-UB TRANSFER remote control input to ground. (See section 3.7)

**Gmode time rub** transfers the reader's user bits to the generator time bits. The U/B TRANSFER LED will be on. Transferring the reader user bits is used when reader time data previously transferred to user bits as above, or other user bit information must be retained when recording new code. When used in conjunction with the continuous Jam Sync mode, both the time and user bits will be transferred to the new tape. An alternate method of enabling the Rdr UB to Gen UB transfer is to close the UB-UB TRANSFER remote control input to ground. (See section 3.5)

**Gmode translate** sets the 8010 into a SMPTE ⇔ EBU timecode mode. This mode is used to convert timecode in standards converter applications. In translate mode incoming LTC in the input video standard is converted to timecode in the output video standard. The generator time is compared to the LTC reader time. When the two times disagree by more than the JAM WINDOW paramter, the Generator time is jammed from the reader time, taking into account the frame numbering differences of SMPTE and EBU code. The frames run at the normal frame rate of the output video standard. The JAM LED will come on each time

the Generator resynchronizes to the Reader. A jam sync offset can be set using the method outlined in section 3.3.4 of the 8010 manual

**When translating from SMPTE TO EBU code, the input code must be in the Drop Frame format. When translating from EBU to SMPTE code, the Generator DROP FRAME mode must be set to DROP FRAME. (See section 3.3.7 of the 8010 manual)**

**Gmode time rctl** sets the 8010 into a user bit remote control mode. In this mode the five input pins on the parallel remote control port are used to control the setting of the five remote control user bits. When the 622 VITC reader module reads the VITC, these five user bits directly control five contact closure outputs. When the 8010 is placed into the TIME RCTL mode, special binary group flags are set, signaling the remote control mode to the decoder. This allows an extra level of security at the decoder and ensures that random user bit patterns do not inadvertently activate the contact closure outputs of the decoder.

When the user selects the remote control mode, the generator user bits will be set to

XX 80 80 93

Where the value of XX depends on the states of the remote control input pins. See table 1.

### 3.1.2 Setting the Generator Time

Press the **DISPLAY** key one or more times to display the generator time if it is not already displayed. The display prompt will show `GTM` when generator time is being displayed. The **ENTER** and **CLEAR** keys are used in conjunction with the numeric keys to set the generator time.

**When entering time data make sure that the generator is not in the continuous JAM SYNC mode (indicated when the JAM LED is on). If it is, press SHIFT + JAM to return to free run mode.**

Press the **ENTER** key to recall the last time that you entered into the generator. The display prompt at the left of the display will blink while data entry mode is active, and the dual functioned keys are now changed to their numeric values. If you want to re-enter this time press the **ENTER** key to complete the data entry into the generator time.
Pressing any numeric key will clear the previous value and place the new value into the numeric display, starting at the right. Unentered digits are assumed to be zero, hence leading zero digits are not required. When the

required number of digits are entered, then press the **ENTER** key to complete the data entry into the generator time.

Attempts to enter too many digits, or make illegal entries, i.e. 65 minutes, will result in the display returning to the last valid time entry made. Re-enter the correct value and press the **ENTER** key. Pressing the **CLEAR** key will cancel the data entry mode without changing any data.

The numeric keys return to their normal display functions when the data entry has been completed by pressing **ENTER** or cancelled by pressing the **CLEAR** key. The display prompt will return to its steady On state when data entry mode has been completed.

**Numeric entry mode must be terminated (GTM will be On steady) before any of the front panel keys will resume normal operation.**

When the 8010 is in the Free run mode, press **GEN HOLD** key (when the Generator is being displayed on the front panel) to start or stop the generator clock. In the continuous jam sync mode, the generator will be slaved to incoming code from the reader.

### 3.1.3 Setting the Generator User Bits

Press the **DISPLAY** key one or more times to display the generator user bits if they are not already displayed. The display prompt will show GUB when user bits are displayed. The **ENTER** and **CLEAR** keys are used in conjunction with the numeric keys to set the generator user bits.

**When entering user bits data make sure that the generator is programmed for TIME DATA mode. (See section 3.1.1)**

Press the **ENTER** key to recall the last User Bits that you entered into the generator. The display prompt at the left of the display will blink while data entry mode is active, and the dual functioned keys are now changed to their numeric values. If you want to re-enter these User Bits press the **ENTER** key to complete the data entry into the generator.

Pressing any numeric key will clear the previous value and place the new value into the numeric display, starting at the right. Pressing the **SHIFT** key and the numeric keys 0 to 5 will enter the corresponding hexadecimal values A to F. Unentered digits are assumed to be zero. When the required number of digits are entered, press the **ENTER** key to complete the data entry into the generator User Bits.
Attempts to enter too many digits will result in the display being blanked. Re-enter the correct value and press the **ENTER** key. Pressing the **CLEAR** key will cancel the data entry mode without changing any data.

The numeric keys return to their normal functions when the data entry has been completed by pressing the **ENTER** key or cancelled by pressing the **CLEAR** key. The display prompt will return to its steady On state when data entry mode has been completed.

**Numeric entry mode must be terminated (GUB will be On steady) before any of the front panel keys will resume normal operation.**

When the 8010 is in the **time rctl** mode, the user bits are determined by the state of the parallel remote control inputs. Attempts to enter user bits manually from the front panel will not be allowed.

### 3.1.4 Jam Syncing the Generator to the Reader

Pressing the **JAM** key transfers the current reader time into the generator clock, then releases the clock to run on its own. This mode is known as 'momentary Jam sync'.

The generator time may be continuously slaved, or 'Jam synced' to data coming from the reader by pressing the **SHIFT+JAM** keys. The JAM LED will be on when Jam sync is enabled. Pressing the **SHIFT+JAM** keys again terminates the Jam sync mode. An alternate method of controlling the jam sync mode is to close Jam Sync Enable remote control input to ground. (See section 3.5) for a full description of the parallel remote control inputs.

Jam sync mode should be used when you need to generate D-VITC that follows an LTC source timecode. In this mode the 8010 will function as an LTC to D-VITC translator.

Jam sync mode should be also used when dubbing longitudinal time code from one tape to another, as the quality of the time code signal deteriorates with each generation, and will become unusable after the third generation.

When the time information is being jammed, the generator and reader times are compared with each other during each frame, automatically compensating for the value programmed into the OFFSET register. If for any reason they are not equal, the jam is bypassed, and the next frame number is substituted by the generator. The JAM indicator will blink off when a jam error is encountered. If the number of consecutive jam bypass errors exceeds 5, the last valid reader time is jammed into the generator again with the programmed OFFSET. In the absence of valid reader data within the last 5 frames, the generator operates according to the programmed NO CODE JAM mode (HOLD = generator stops; RUN = generator increments normally; or MUTE = generator turns off) until valid reader code resumes. At this time it will be re-jammed to the reader, thus repairing large drop outs on the reader tape. (See section 3.1.11 for a full description of the NO CODE JAM modes.)

The drop frame and colour frame modes of the code being read are transferred to the generator during jam sync. The formatted modes return when the Jam sync mode is terminated.

The OFFSET register for the Continuous Jam Sync mode allows you to apply a continuous offset between the generator and reader numbers when you are in continuous Jam sync mode. The value entered into the Offset register will be added to the reader time before it is jammed into the generator. Offset values other than 00:00:00:00 usually indicate that the generator is leading the reader. In order for the generator to lag behind the reader, enter a value equal to 24:00:00:00 minus the lag offset desired.

### 3.1.5 SMPTE EBU ⇔ Translator Mode

The 8010 can be operated in a SMPTE ⇔ EBU timecode translator mode. This feature would normally be used to convert timecode in standards conversion applications. In translator mode incoming LTC in the input video standard is converted to timecode in the output video standard. The 8010 is connected to video in the output video standard. The hours, minutes and seconds of the output code are jam synced to the input code. The frames run at the normal frame rate of the output video standard.

The 8010 OFFSET register can be used to enter a frame offset to account for frame delays in the standards converter.

The system configuration drawings below show how the system will be configured in the translate mode of operation.

**Gmode translate** sets the 8010 into a SMPTE ⇔ EBU timecode mode. This mode is used to convert timecode in standards converter applications. In translate mode incoming LTC in the input video standard is converted to timecode in the output video standard. The generator time is compared to the LTC reader time. When the two times disagree by more than the JAM WINDOW paramter, the Generator time is jammed from the reader time, taking into account the frame numbering differences of SMPTE and EBU code. The frames run at the normal frame rate of the output video standard. The JAM LED will come on each time the Generator resynchronizes to the Reader. A jam sync offset can be set using the method outlined in section 3.3.4 of the 8010 manual

**When translating from SMPTE TO EBU code, the input code must be in the Drop Frame format. When translating from EBU to SMPTE code, the Generator DROP FRAME mode must be set to DROP FRAME. (See section 3.3.7 of the 8010 manual)**

The JAM WINDOW parameter has been added to the Engineering Setup menu. This parameter is used to ignore the natural differences between SMPTE and EBU frames numbers within the second. The frame counting rates of 25 FPS and 30FPS along with the natural difference between the video rates of 29.97 and 30 fps (taking into account the dropped frames) produce an acceptable difference between the SMPTE and EBU frame numbers during a given second. Any difference between the LTC reader input and the generated timecode output numbers (accounting for any programmed OFFSET) will cause the generator to resynchronize to the reader in translate mode. Under normal circumstances the factory default setting of "6" frames should be adequate.

Example 1:

```
Offset:       00:00:01:00
Reader:       01:00:00:00
Generator:    01:00:01:00
```

Example 2:

```
Offset:       23:59:59:00
Reader:       01:00:00:00
Generator:    00:59:59:00
```

**In order to Jam sync the generator time to exactly to the reader time make sure the OFFSET is set 00:00:00:00**

To access the OFFSET register press the **SHIFT+DISPLAY** buttons. The display prompt will be OFFS. The **ENTER** and **CLEAR** keys are used in conjunction with the numeric keys to set the value stored in the OFFSET register.

### 3.1.6 Selecting the Lines to Record VITC On.

| **GEN VITC LINE 1** |
|---|
| **Gvitc line1= 10** |
| **GEN VITC LINE 2** |
| **Gvitc line2= 12** |

The **GEN VITC LINE1** and **GEN VITC LINE2** menu items are used to select the lines on which the VITC will be inserted.

When the **GEN VITC LINE1** sub menu is first selected, the LINE1 number will be shown. Press the left and right (🡐,🡒) keys to change LINE 1. Press the down (🡓) select the **GEN VITC LINE2** menu item. Press the left and right (🡐,🡒) keys to change LINE 2
The user will have to determine by experience the most suitable lines for recording VITC according to the following criteria.

In order to protect the VITC reading process against dropouts, the VITC is usually repeated on 2 non-adjacent lines in the vertical interval of the video signal, not earlier than line 10 (6 for PAL) or later than line 20 (21 for PAL). For certain recordings, the use of some of these lines may interfere with other signals inserted into the vertical interval.

To avoid decoding errors, an adequate margin should be allowed between the video head switching points and the recorded VITC word. Also note that type C VTRs with a sync head have a head switching point in the middle of the permitted lines. Type C VTRs without a sync head do not reproduce some of the permitted lines at all, therefore these lines should not be used for recording VITC. See your VTR manual for further information.

**It is recommended that two non-adjacent lines be used, however adjacent lines and a single line (selected when both lines are the same) are permitted.**

### 3.1.7 Turning the VITC Generator On

The **VITC GEN ON/OFF** key is used to turn the VITC keyer on and off. (You must exit the Setup menu to turn the VITC generator on or off.) When the VITC generator is Off, the program video passes through the VITC keyer with nothing added. When the VITC generator is On, the VITC will be added to the program video.

### 3.1.8 Selecting the Generator Drop Frame Mode (NTSC only)

In NTSC, the video frame rate of approximately 29.97 frames per second causes an error between real time and 'colour time'. To overcome this problem, the drop frame mode was created. This mode compensates for the approximate 4 minute per day error by dropping the first two frame counts (0, 1) at the start of each minutes, except minutes 0, 10, 20, 30, 40, and 50. A drop frame flag bit is set in the code when the drop frame format is used. When the 8010 is operating in the NTSC video standard, the generator may be programmed to operate in either the drop frame or non drop frame mode.

**GEN DROP FRAME**
**Drop frame off**
**Drop frame on**

The **GEN DROP FRAME** menu item is used to the desired drop frame mode for the generator.

Select **Drop frame off** to configure the generator in the non-drop frame or ‘full frame’ mode.

Select **Drop frame on** to configure the generator in the drop frame mode.

**GEN DROP FRAME**
**Drop frame jam**

When the generator is operated in the continuous Jam Sync mode, the generator drop frame mode is the same as the incoming Reader data. The Drop Frame sub menu shows **Drop frame jam**.

**GEN DROP FRAME**
**No drop in pal**

When the 8010 is operating in the PAL video standard, the Drop Frame sub menu shows **NOT APPLICABLE IN PAL**.

### 3.1.9 Selecting the Generator Colour Frame Mode

In most applications the 8010 generator will be gen-locked to the program video. In 4:2:2 applications it is also necessary to supply an external colour reference if you desire to apply colour frame synchronization to the generated time code. This reference is not required when the generator is operated in the 2 field mode. In 4 Fsc NTSC applications the colour reference will be the program video.

| GEN COLOUR FRAME |
|---|
| Col'r frame 2 fld |
| Col'r frame 4 fld |
| Col'r frame 8 fld |

The **GEN COLOUR FRAME** item on the Setup menu is used to select whether the 8010 will apply colour frame synchronization to the code it generates.

**When the video standard is 4 Fsc NTSC:**

When the video standard is 4 Fsc NTSC the 8010 gets its colour frame information from the TRS-ID data packets of the program video. The sync to subcarrier (Sc-H) phase relationship of the video source must conform to RS-170-A specification. The COL'R REF LED will be on when the program video contains colour frame information in its TRS-ID data packets.

Select **Col'r frame 2 fld** to configure the generator in the non colour frame mode.

Select **Col'r frame 4 fld** to configure the generator in the colour frame mode. The front panel COL'R FRM indicator will be on and code generated will have the colour flag bit set.

**When the video standard is 4:2:2 525:**

When the video standard is 4:2:2 525 the 8010 must get its colour frame information from the External Colour frame reference input. The COL'R REF LED will be on.

The **GEN COLOUR PHASE** menu item is used to adjust the colour phase relationship of the timecode to the colour frame reference when the 8010 is operated in colour frame mode. This adjustment is necessary to compensate for frame delays in digital to analog encoders used in the system. (See section 3.4.6)

Select **Col'r frame 2 fld** to configure the generator in the non colour frame mode. This is the normal mode for component applications. It is not necessary to connect a colour reference in the 2 fld mode.

Select **Col'r frame 4 fld** to configure the generator in the colour frame mode. An RS-170A colour reference signal must be applied to the Col'r Ref BNC loop in the rear panel. The Front panel COL'R FRM indicator will be on and code generated will have the colour flag bit set indicating that the generator numbers are properly synchronized to the NTSC 4 field sequence.

**When the video standard is 4:2:2 625:**

When the video standard is 4:2:2 625 the 8010 must get its colour frame information from the External Colour frame reference input. The COL'R REF LED will be on.
The **GEN COLOUR PHASE** menu item is used to adjust the colour phase relationship of the timecode to the colour frame reference when the 8010 is operated in colour frame mode. This adjustment is necessary to compensate for frame delays in digital to analog encoders used in the system. (See section 3.4.6)

Select **Col'r frame 2 fld** to configure the generator in the non colour frame mode. This is the normal mode for component applications. It is not necessary to connect a colour reference in the 2 fld mode.

Select **Col'r frame 4 fld** to configure the generator in the 4 field PAL mode. A PAL 4 field reference signal must be applied to the Col'r Ref BNC loop in the rear panel. The Front panel COL'R FRM indicator will be on and code generated will have the colour flag bit set indicating that the generator numbers are properly synchronized to the PAL 4 field sequence.

Select **Col'r frame 8 fld** to configure the generator in the colour frame mode. A PAL 8 field colour reference signal must be applied to the Col'r Ref BNC loop in the rear panel. The Front panel COL'R indicator will be on and code generated will have the colour flag bit set indicating that the generator numbers are properly synchronized to the PAL 8 field sequence.

**Special precautions should be taken when operating with component video formats.**

**In component video formats the 8010 must get its colour frame information from the External Colour frame reference input.**

**When the component video is encoded into NTSC or PAL video, there may be frame delays encountered. These will change the colour frame relationship of the timecode with respect to the video. The colour frame phase can be adjusted by using the GEN COLOUR PHASE item of the Engineering menu.**

**When the 8010-MON analog output option is installed, the colour sequence of the output video is synchronized to the colour reference video input.**

**Special precautions should be taken when operating in the Jam sync mode.**

**When the colour frame mode is selected, and the code from the reader does not have the colour flag set, the generator will maintain a 2 fld lock only in the jam sync mode. When the jam sync mode is turned off, the formatted colour frame mode will be restored.**

**If the 8010 generator is being operated in the colour frame mode, and the reader code has the colour flag set, the jam sync process will compare the colour framing of the reader code against the generator. If the colour framing of the two do not agree, the JAM indicator will flash on and off at a regular rate. Therefore, if the playback VTR does not have a colour framer built in the 2 fld mode of operation should be selected.**

### 3.1.10 Generator Parity Mode Selection

The purpose of the phase correction parity bit (LTC bit 27 in NTSC, 59 in PAL) is to compensate for phase reversals in the LTC bi-phase mark modulation that could occur when code inserts are performed. Use of the bi-phase mark parity bit is optional as some readers may not recognize its presence.

The **GEN LTC PARITY** item on the GENERATOR menu controls the parity mode of the generator.

| GEN LTC PARITY |
|---|
| Ltc parity off |
| Ltc parity on |

Select **Ltc parity off** to configure the generator for the non parity mode. The bi-phase mark parity bit will be always set to zero.

Select **Ltc parity on** to configure the generator for the parity mode. The bi-phase mark parity bit will be put in a state where every 80 bit word will contain an even number of logic zeros, in order that the magnetization transient between bit cell 79 of one word and bit cell zero of the next shall always be in the same direction.

### 3.1.11 Configuring how the Continuous Jam Mode Works when there is no Reader Code

The **GEN NO CODE JAM** item on the Setup menu controls the operation of the Continuous Jam Sync Mode when there is no incoming code.

Select **No code jam run** when you want the generator to free run when there is no incoming Reader code. When the reader code resumes, the generator will re-jam to the incoming code. Using this mode will allow the user to repair large dropouts in the incoming code. The generated code will be continuous if the incoming code is also continuous.

| GEN NO CODE JAM |
|---|
| No code jam run |
| No code jam hold |
| No code jam mute |

Select **No code jam hold** when you want the generator to stop when there is no incoming Reader code. When the reader code resumes, the generator will re-jam to the incoming code. Use this mode if you want the output of the generator to stop on the last number read when you stop the tape machine supplying the incoming code to the reader.

Select **No code jam mute** when you want to turn off the generator when there is no incoming Reader code. The generator time will stop at the last number read. When the reader code resumes, the generator will turn on and re-jam to the incoming code. Use this mode if you want the output of

the generator to turn off completely when you stop the tape machine supplying the incoming code to the reader.

**Special precautions should be taken when operating in the colour frame mode.**

**When the colour frame mode is selected, and the code from the reader is not in colour frame mode, the generator will maintain a frame lock only in the jam sync mode. When the jam sync mode is turned off, the formatted colour frame mode will be restored.**

**If the 8010 generator is being operated in the colour frame mode, and the reader code is in the colour frame mode, the jam sync process will compare the colour framing of the reader code against the generator. If the colour framing of the two do not agree, the JAM indicator will flash on and off at a regular rate. Therefore, if the playback VTR does not have a colour framer built in, the Non colour frame mode of operation should be selected.**

## 3.2 PROGRAMMING THE READER MODES

The **RDR MODE** and **RDR DISPLAY** items on the programming menu are used to configure the operation of the LTC reader. The following descriptions appear in the order they appear on the menu.

### 3.2.1 Selecting the Format of the Time and User Bit Data

**RDR MODE**
- **Rmode time data**
- **Rmode time time**
- **Rmode data data**

The **READER MODE** menu item is used to select the type of information that is contained in the time and user bits of the reader.

Select **Rmode time data** when the time contains normal time information and the user bits contain numeric data.

Select **Rmode time time** when both the time and the user bits contain time information.
Select **Rmode data data** when both the time and the user bits contain numeric data.

### 3.2.2 Controlling the Reader 'Look ahead' Compensation

**RDR DISPLAY**
- **Rdisplay direct**
- **Rdisplay process**

The **RDR DISPLAY** menu item is used to select whether the normal 'look ahead' compensation for reader dropouts is active or not. Normally, the data is read in one frame and displayed with an 'add 1 frame'

compensation. In some operational modes it is desirable to disable this feature and to display exactly what is being read. The topmost positions of the character generator are not available when in the direct mode.

Select **Rdisplay direct** to enable DIRECT display mode. Data is displayed exactly as it is read without 'look ahead' compensation. Displays from the LTC reader will be ' frame late and cannot be positioned at the very top of the raster.

Select **Rdisplay process** to enable normal 'look ahead' compensation. Displays from LTC reader will be 'on time' but will **NOT** follow code discontinuities immediately. PROCESSED mode should be used for normal operations.

**Direct mode is usually used for diagnostic purposes only.**

## 3.3 CHARACTER GENERATOR FUNCTIONS

Four separately positionable character windows displaying the time and user bits of the reader and generator are available. The four arrow keys (↑, ↓, ←, →) control the position of all the windows . The **CHAR GEN ON/OFF** key selects whether the video character generator (VCG) keyer is on or off. The use of these keys in combination with the **CHAR GEN WINDOW** key selects which windows are displayed and their position on the screen.

The last five items on the programming menu are used to configure the character size, character style, and whether frames fields and symbols should be displayed in the character generator. The following descriptions appear in the order they appear on the menu.

### 3.3.1 Selecting the Character Size

**CHAR SIZE**
- **Char tiny**
- **Chart small**
- **Char large**

The **CHAR SIZE** menu item is used to select one of three sizes for the character generator's display. The on screen format menus always use the small character size.

The **Char tiny** character size occupies 8 lines per field for each character row. This permits 28 vertical positions on the raster in NTSC.

The **Char small** character size occupies 16 lines per field for each character row. This permits 14 vertical positions on the raster in NTSC.

The **Char large** character size occupies 32 lines per field for each character row. This permits 7 vertical positions on the raster in NTSC.

### 3.3.2 Selecting the Character Style

**CHAR STYLE**
- **Char white**
- **Char white+black**
- **Char white+bkgnd**
- **Char black**
- **Char black+white**
- **Char Black+bkgnd**

The **CHAR STYLE** menu item is used to select whether the background mask will be used and whether the characters will be white or black. The on screen format menus are always white characters keyed into a black background mask.

Select **Char white** to disable the background and key white characters directly into the picture.

Select **Char white + black** to key white characters on a black background mask into the picture.

Select **Char white + bkgnd** to key white characters on a transparent gray background mask into the picture. (4:2:2 video only)

Select **Char black** to disable the background and key black characters directly into the picture.

Select **Char black + white** to key black characters on a white background mask into the picture.

Select **Char black + bkgnd** to key black characters on a transparent white background mask into the picture. (4:2:2 video only)

### 3.3.3 Selecting whether the Frames, Fields and Symbols will be displayed on the VCG

**VCG FRAMES**
- **Vcg frames off**
- **Vcg frames on**

The **VCG FRAMES** menu item is used to select whether the frames will be shown when the time is displayed in the character inserter.

Select **Vcg frames off** to hide the timecode frames.

Select **Vcg frames on** to show the timecode frames.

**VCG FIELDS**
- **Vcg fields off**
- **Vcg fields on**

The **VCG FIELDS** menu item is used to select whether the fields will be shown when the time is displayed in the character inserter.

Select **Vcg fields off** to hide the timecode fields.

Select **Vcg fields on** to show the timecode fields.

**VCG SYMBOLS**
- **Vcg symbols off**
- **Vcg symbols on**

The **VCG SYMBOLS** menu item is used to select whether the window identifier symbols will be shown in front of the time and user bit displays of the VCG.

Select **Vcg symbols off** to hide the symbols.

Select **Vcg symbols on** to show the symbols.

### 3.3.4 Selecting and Positioning the Individual Character Inserter Windows

Press **CHAR GEN MODE** to enable the window select mode. All the character windows will appear on the screen with the window for the Reader Time highlighted. Use the arrow keys (↑, ↓, ←, →) to position the Reader Time window on the screen. Use the **CHAR GEN ON/OFF** key to turn the Reader Time window on or off. Press the **CHAR GEN MODE** key a second time to highlight the Reader User Bits window. Use the **CHAR GEN ON/OFF** key to turn the Reader User Bits window on or off and the arrow keys to move it to the desired location. Press the **CHAR GEN MODE** key a third time to highlight the Generator Time window. Use the **CHAR GEN ON/OFF** key to turn the Generator Time window on or off and the arrow keys to move it to the desired location. Press the **CHAR GEN MODE** key a fourth time to highlight the Generator User Bits window. Use the **CHAR GEN ON/OFF** key to turn the Generator User Bits window on or off and the arrow keys to move it to the desired location. Press the **CHAR GEN MODE** key a fifth time or press the **CLEAR** key to return to normal display mode.

For example, to move only the Time window down, leaving the User Bits window in the same place, press **CHAR GEN MODE** and press the ↓ key. Press the **CHAR GEN MODE** key two times to return to the normal display mode.

### 3.3.5 Positioning the Overall Character Display

In the normal VCG display mode, when none of the windows are highlighted, the arrow keys (↑, ↓, ←, →) move all the displayed windows by the same relative amount. For example, to move the time and source ID/status windows both down by one line, press the ↓ key.

### 3.3.6 Making Fine Adjustments To The Character Generator Raster Position

In the normal VCG display mode, when none of the windows are highlighted, holding down the **SHIFT** key while pressing the arrow keys (↑, ↓, ←, →) move the complete character raster in fine increments on the picture. The range of fine adjustment is limited when the character windows are positioned near the edges of the screen.

### 3.3.7 Character Generator On/ Off Controls

There are two factors that control whether the character generator will be turned on or off. In order of priority these are:

1. The **CHAR GEN ON/OFF** key on the front panel alternately turns the characters on and off. The VCG keyer On/Off remote control input can be used to perform this function remotely.

2 The individual windows can be turned off using the **CHAR GEN ON/OFF** key in window select mode. The Time On/Off and User Bits On/Off remote control inputs can be used to perform this function remotely.

### 3.3.8 Special VCG Indicators

The following special indicators are used between the seconds and frames digits of the time window in the character inserter to identify non drop frame and drop frame code (NTSC only)

**Non Drop Frame** Colon (:)
**Drop Frame (NTSC)** Period (.)

## 3.4 PROGRAMMING THE ENGINEERING SETUP FUNCTIONS

The Engineering Setup Menu is used to set the serial port baud parameters, front panel display brightness, reset the 8010 to factory defaults, etc. The Engineering Setup menu items are normally required only during installation. (See section 3.2.1 for information on using the Engineering Setup menu system.

### 3.4.1 Selecting the Video Type

| VIDEO TYPE |
|---|
| Video 422 525 |
| Video 422 625 |
| Video 422 auto |
| Video 4 Fs 525 |

The **VIDEO TYPE** menu item is used to program the 8010 for the digital video format.

Select **422 525** for operation with component video with a line rate of 525 lines per field. Conforming to SMPTE 125M.
Select **422 625** for operation with component video with a line rate of 625 lines per field. Conforming to EBU Tech 3267-E (1992) or the 4:2:2 level of IUT-R 601.

Select **422 auto** for operation with component video with a line rate of either 525 or 625 lines per field. The 8010 will auto detect the line rate and automatically reconfigure itself. Press the **STATUS** key when you are not in the SETUP menus to display the standard that is currently active.

Select **4Fs 525** for operation with composite video formats conforming to the SMPTE 244M.

### 3.4.2 Selecting the Serial Port Baud Rate

| SERIAL BAUD RATE |
|---|
| Baud rate 2400 |
| Baud rate 9600 |
| Baud rate 19200 |
| Baud rate 38400 |

The **SERIAL BAUD RATE** menu item is used to set the baud rate of the remote control serial port. The 8010 supports four different baud rates from 2400 to 38400 baud. Select the highest baud rate that you computer can use for best results. If you are using a RCU-8010 remote control panel the baud rate is fixed.

### 3.4.3 Testing the Serial Port

| SERIAL TEST |
|---|
| Serial test off |
| Serial test on |

The **SERIAL TEST** menu item is used to turn on a serial port test message. When the serial test is on, the 8010 outputs a message similar to:

```
EVERTZ DTCG 8010 SOFTWARE VERSION DG80D1.M U960909
```

### 3.4.4 Adjusting the Output Level of the LTC Generator

| LTC OUT LEVEL |
|---|
| Ltc Level 35 |

The **LTC OUT LEVEL** menu item is used to adjust brightness of the front panel display. Use the ← and →keys to adjust. The recommended output level setting is 35, which is approximately 1 volt peak to peak.

### 3.4.5 Adjusting the Front Panel Display Brightness

| DISPLAY LEVEL |
|---|
| Display Level 2 |

The **DISPLAY LEVEL** menu item is used to adjust brightness of the front panel display. Use the ← and →keys to adjust.

### 3.4.6 Selecting the Colour Frame Phase

| GEN COLOUR PHASE |
|---|
| Colour phase 01 |

The **GEN COLOUR PHASE** menu item is used to adjust the colour phase relationship of the timecode to the colour frame reference when the 8010 is operated in colour frame mode. This adjustment is necessary to compensate for frame delays in digital to analog encoders used in the system.

When the **Gen Colour Phase** is set to 01 the outgoing timecode will be in time with the 8010 colour reference. The colour phase may be adjusted by up to 4 frames in PAL and 2 frames in NTSC applications. This menu item should be adjusted so that the timecode colour phase is in time with the video output of an analog encoder. If the 8010-MON analog output option is installed the colour sequence of the analog video will be the adjusted by the colour phase offset so that it is in time with the time code being generated. A time code analyzer such as the Evertz Model 5300 may be used to verify the correct timing relationship are being maintained.

### 3.4.7 Jam Window

| JAM WINDOW |
|---|
| Jam window 06 |

The JAM WINDOW parameter has been added to the Engineering Setup menu. This parameter is used to ignore the natural differences between

SMPTE and EBU frames numbers within the second. The frame counting rates of 25 FPS and 30FPS along with the natural difference between the video rates of 29.97 and 30 fps (taking into account the dropped frames) produce an acceptable difference between the SMPTE and EBU frame numbers during a given second. Any difference between the LTC reader input and the generated timecode output numbers (accounting for any programmed OFFSET) will cause the generator to resynchronize to the reader in translate mode. Under normal circumstances the factory default setting of "6" frames should be adequate.

### 3.4.8 Resetting the 8010 to Factory Defaults

| FACTORY RESET |
| --- |
| Sh+sel = reset |

The **FACTORY RESET** menu item is used to return the 8010 to its factory defaults. When you press the ← or → keys, the display shows **Sh+sel = reset**. When you press **SHIFT + SELECT** the 8010 will reload its factory defaults and show the message

```
Reset done
```

### 3.4.9 Displaying the 8010 Software version

| SOFTWARE VERSION |
| --- |
| DG80D1.M 960909 |

The **SOFTWARE VERSION** menu item is used to display the 8010's software version. When you press the ← or → keys, the display shows the software version which will be something like:

```
DG80D1.M 960909
```

## 3.5 PARALLEL REMOTE CONTROL FUNCTIONS

A 9 pin D connector located on the rear panel labelled REMOTE CTL provides 6 parallel control inputs for remote control of some of the model 8010 functions. The pinout of the D connector is as follows:

| Pin | | Description |
| --- | --- | --- |
| 1 | | Frame Ground |
| | 6 | VCG Keyer Enable |
| 2 | | n/c |
| | 7 | Jam Sync Enable |
| 3 | | n/c |
| | 8 | VITC Gen Enable |
| 4 | | Time-UB Transfer Enable |
| | 9 | Ground |
| 5 | | UB-UB Transfer Enable |

**VCG KEYER ON/OFF** Provides an alternate method of turning the character inserter keyer On and Off. The character inserter is turned On by a high to low transition on this input, and turned Off by a low to high transition.

**JAM SYNC ENABLE** Provides an alternate method of turning Continuous Jam Sync mode On and Off. Jam Sync is turned On by a high to low transition on this input, and turned Off by a low to high transition. Momentarily closing this input to ground and releasing it will perform a momentary Jam Sync.

**VITC GEN ENABLE** Provides an alternate method of turning the VITC generator On and Off. The VITC generator is turned On by a high to low transition on this input, and turned Off by a low to high transition.

**TIME-UB TRANSFER ENABLE** Provides an alternate method of turning the Reader Time to Generator User Bit transfer function On and Off. Time to User Bit transfer (the same as setting the GEN MODE to **Time Rtime**) is turned On by a high to low transition on this input, and turned Off (the same as setting the GEN MODE to **Time data)** by a low to high transition.

**UB-UB TRANSFER ENABLE** Provides an alternate method of turning the Reader User Bit to Generator User Bit transfer function On and Off. Time to User Bit transfer (the same as setting the GEN MODE to **Time Rub**) is turned On by a high to low transition on this input, and turned Off (the same as setting the GEN MODE to **Time data)** by a low to high transition.

### 3.5.1 Remote Control Mode

A new Generator mode has been added to the 8010 that allows the user to pass remote control contact closure information in the VITC user bits. This feature allows the user to use the five Parallel remote control inputs to set one of the five remote control user bit patterns. At the decoder end our 622 VITC reader module decodes the remote control user bits and outputs them on five open collector outputs. When the 8010 is operated in this mode the normal functions of the parallel remote control inputs are disabled.

In the **time rctl** mode, the inputs on the Parallel remote control port are used to control the remote control user bits. When the GEN MODE is set to any of the other modes, then the inputs revert to their normal functions as described in section 2.1.5 of the 8010 manual. The parallel port pin designations in remote control mode are shown in Table 1 below. Table 1 also shows the corresponding output pins of the 622 decoder and the user bits that control them.

The parallel port is the default input source for **time rctl** mode. It will automatically be selected as the input source whenever a rising or falling edge is detected on any of the five pins monitored by the system. The remote control user bits may also be set from the serial port using command 8A. (See section 1.4.1 below) When the user bits have been set from the serial port, the present state of **all** parallel port pins will be

ignored. The parallel port will only become the input source again if **any one** of the port pins changes state.

| 8010 PIN (IN) | 622 PIN (OUT) | GUB Data byte 1 |
|---|---|---|
| 4 | 2 | 81 |
| 5 | 1 | 82 |
| 8 | 3 | 84 |
| 7 | 8 | 88 |
| 6 | 4 | 90 |

**Table 3-1: Remote Mode I/O Mapping**

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# 4. SERIAL REMOTE CONTROL PROTOCOL

## 4.1. OVERVIEW

- Four wire communications channel utilized - RS-422 levels. Alternate 2 wire interface using RS-232C levels
- Data transmitted asynchronously, bit serial, word serial with data exchange between the devices being digital.
- Transmission rate is selectable 38.4 K, 19.2K, 9600 Baud supported
- Data words utilized by the interface shall be as follows:

  1 START bit + 8 DATA bits +1 PARITY bit + 1 STOP bit.
  The parity bit shall denote EVEN parity

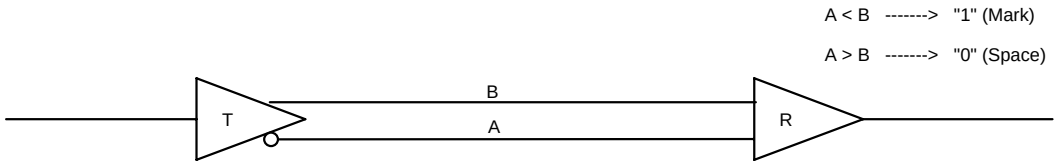
### 4.1.1. Connector Pin Assignment

Interface Connector: 9 pin D-subminiature female (DB-9S)

The pin assignment for the serial port shall be as follows:

| Pin | Function |
|---|---|
| 1 | Frame Ground |
| 2 | Transmit A (-) |
| 3 | Receive B (+) |
| 4 | Receive Common |
| 5 | RS-232 Transmit (Optional) |
| 6 | Transmit Common |
| 7 | Transmit B (+) |
| 8 | Receive A (-) |
| 9 | Frame Ground |

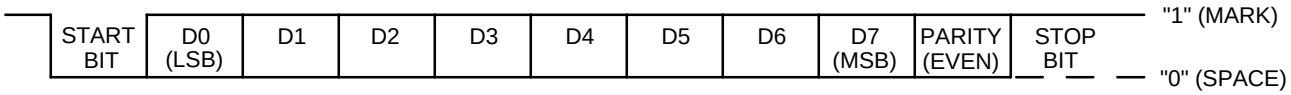
A and B are defined as follows:




### 4.1.2. Data Format

The serial port provides drivers which allow communications in either RS-232C or RS-422 electrical standards. The composition of the bit serial data format is as follows:

1 START + 8 DATA + 1 PARITY + 1 STOP




EVEN PARITY: The total of logic 1's in D0 to D7 and PARITY equals an even number

One of four baud rates is selected using the Engineering SETUP menu. When using the RS-422 standard the preferred baud rate is 38.4 KBaud. When using the RS-232 standard the preferred baud rate is 19.2ÜKBaud.

## 4.2. COMMUNICATIONS PROTOCOL

The Controller shall be denoted as the normal sender of a command (usually a computer). The Device shall be denoted as the normal sender of a Response ( the Evertz unit).

**All command values, arguments and data values shown in this document are expressed in hexadecimal format unless otherwise noted.**

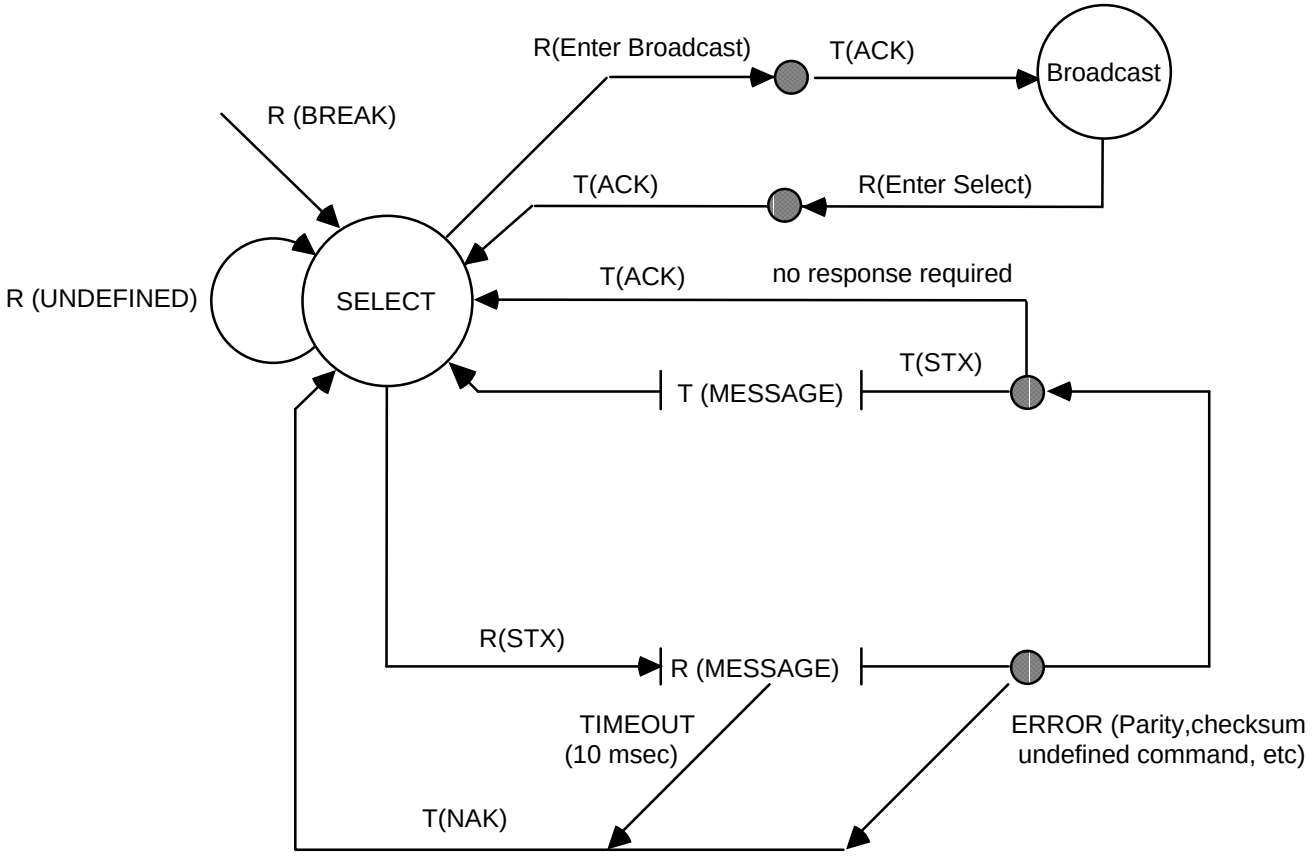



**Figure 4-1: Communications Protocol State Diagram**

The communications protocol is described in Figure 4-1. The Evertz unit (Device) immediately enters the select state upon power-up and remains there unless directed by an Enter Broadcast Cmd (02 hex) to the broadcast communications state. The diagram shows the various states of the device. The designation R( ) indicates the data received from the controller, while the designation T( ) indicates the data transmitted by the Device.

## 4.3. MESSAGE BLOCK FORMAT

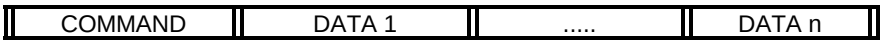
Once communications have been established command messages may be sent to the Device.

Each control message starts with the STX character and ends with a checksum. The message blocks are structured as follows:


| | |
|---|---|
| STX | start of message character (02 hex) |
| BYTE COUNT | count of command message not including the STX, BYTE COUNT or CHECKSUM. |
| MESSAGE | variable length command message. |
| CHECKSUM | the two's complement of the one byte sum of the MESSAGE and the BYTE COUNT. |

The purpose of the checksum is to verify that all the bytes in the message that contain variable data have been received properly. The STX is the only byte that has a fixed value, so it is the only byte not included in the checksum calculation. The checksum is calculated by adding all the variable bytes together. The least significant byte of this sum is then subtracted from 100 hex to compute the checksum. To verify that the checksum is computed correctly, add all the bytes including the checksum but excluding the STX together. The least significant byte of the sum should be zero if the checksum is computed correctly.

The MESSAGE consists of a command and optional bytes of data and is structured as follows:




| | |
|---|---|
| COMMAND | single byte command directed to device. |
| DATA 1...DATA n | variable length, any arguments required by COMMAND. |

If the command message was not accepted by the Device due to a checksum error, parity error or an invalid command the Device will respond with an **NAK** (05 hex) character and re-enter the SELECT state.

If the command message is accepted by the Device and there is no data response required, it will respond with an **ACK** (04 hex) character and re-enter the SELECT state.

If the command message requires a data response, the Device will transmit a response message structured as follows:

| | |
|---|---|
| STX | start of message character (02 hex) |
| BYTE COUNT | count of response message not including STX, BYTE COUNT or CHECKSUM. |
| COMMAND ECHO | Command message echoed |
| MESSAGE | variable length response message consisting of the data requested by the command message. |

CHECKSUM The two's complement of the one byte sum of the COMMAND ECHO, MESSAGE and the BYTE COUNT.

For example, to request the current time code data in BCD format from the reader, the command message would be transmitted as follows:

| 02 | 02 | 66 | 01 | 97 |
|---|---|---|---|---|
| STX | BYTE COUNT | SENSE RDR | BLOCKS | CHECKSUM |

If the current LTC reader time code was 12:45:30:00 Drop Frame the response message would be received as follows:

| 02 | 07 | 66 | 01 | 00 | 30 | 45 | 12 | 01 | 0A |
|---|---|---|---|---|---|---|---|---|---|
| STX | BYTE COUNT | CMD (SENSE RDR) | CMD DATA (BLOCKS) | DATA 1 (FRMS) | DATA 2 (SECS) | DATA 3 (MINS) | DATA 4 (HRS) | DATA 5 (FLAGS) | CHKSUM |

## 4.4. COMMANDS

| Command from Controlling Device | Return to Controlling Device |
|---|---|

| CMD | DATA BYTES | DESCRIPTION | CMD ECHO BYTES | DATA BYTES | NAME |
|---|---|---|---|---|---|
| 00 | | Sense Current Mode | 1 | 1 | Current Mode |
| 01 | | Enter Select Mode | | | ACK |
| 02 | | Enter Broadcast Mode | | | ACK |
| 05 | | Enter Remote Ctl Panel Mode | | | ACK |
| 0B | 1 | Select Video Standard | | | ACK |
| 0C | 01 | Preset Key Scan Code | | | ACK |
| 11 | 1 | PROM Version request | 2 | 20 | PROM Name & Version |
| 1B | | Sense Video Standard | 1 | 1 | Video Standard |
| 1C | | Sense Display | 1 | 11 | Display Data Block |

**Table 4-1: Systems Commands and their Valid Responses**

| Command from Controlling Device | | | Return to Controlling Device | | |
|---|---|---|---|---|---|
| **CMD** | **DATA BYTES** | **DESCRIPTION** | **CMD ECHO BYTES** | **DATA BYTES** | **NAME** |
| 20 | 1 | Select Char Gen Size | | | ACK |
| 21 | 3 | Preset Char Gen Window Pos'n | | | ACK |
| 22 | 2 | Select Char Gen Window On/Off | | | ACK |
| 23 | 1 | Select Char Gen Global On/Off | | | ACK |
| 24 | 1 | Select Char Gen Style | | | ACK |
| 25 | 1 | Select Char Gen Frames | | | ACK |
| 26 | 1 | Select Char Gen Fields | | | ACK |
| 27 | 1 | Select Char Gen Symbols | | | ACK |
| 28 | 2 | Preset Char Gen Raster Pos'n | | | ACK |
| 30 | | Sense Char Gen Size | 1 | 1 | Char Size |
| 31 | 1 | Sense Char Gen Window Pos'n | 2 | 3 | Char Gen Window Pos'n & Len |
| 32 | 1 | Sense Char Gen Window On/Off | 2 | 1 | Char Gen Window On/Off |
| 33 | | Sense Char Gen Global On/Off | 1 | 1 | Char Gen Global On/Off |
| 34 | | Sense Char Gen Style | 1 | 1 | Char Gen Style |
| 35 | | Sense Char Gen Frames | 1 | 1 | Char Gen Frames |
| 36 | | Sense Char Gen Fields | 1 | 1 | Char Gen Fields |
| 37 | | Sense Char Gen Symbols | 1 | 1 | Char Gen Symbols |
| 38 | | Sense Char Gen Raster Pos'n | 1 | 2 | Char Gen Raster Pos'n |

**Table 4-2: Character Generator Commands and their Valid Responses**

| Command from Controlling Device | | | Return to Controlling Device | | |
|---|---|---|---|---|---|
| **CMD** | **DATA BYTES** | **DESCRIPTION** | **CMD ECHO BYTES** | **DATA BYTES** | **NAME** |
| 41 | 2 | Select Reader Mode | | | ACK |
| 44 | 2 | Select Reader Display | | | ACK |
| 45 | 1 | Define Broadcast Mode | | | ACK |
| 61 | 1 | Sense Reader Mode | 2 | 1 | Reader Mode |
| 64 | 1 | Sense Reader Display | 2 | 1 | Reader Display |
| 65 | | Sense Reader Broadcast Mode | 1 | 1 | Reader Broadcast Mode |
| 66 | 1 | Sense Reader | 2 | x | Reader Data |
| 67 | | Sense Reader Broadcast Block | 1 | x | Reader Broadcast Block |

**Table 4-3: Reader Commands and their Valid Responses**

| Command from Controlling Device | | | Return to Controlling Device | | |
|---|---|---|---|---|---|
| **CMD** | **DATA BYTES** | **DESCRIPTION** | **CMD ECHO BYTES** | **DATA BYTES** | **NAME** |
| 80 | 1 | Select Generator Mode | | | ACK |
| 81 | 2 | Preset VITC Generator Lines | | | ACK |
| 82 | 1 | Select Generator Drop Frame | | | ACK |
| 83 | 1 | Select Generator Colour Frame | | | ACK |
| 84 | 1 | Select LTC Generator Parity | | | ACK |
| 85 | 1 | Select VITC Generator On/Off | | | ACK |
| 86 | 1 | Select Generator Run/Hold | | | ACK |
| 87 | 1 | Select Gen Jam Sync Mode | | | ACK |
| 88 | 1 | Select Gen No Code Jam | | | ACK |
| 89 | 4 | Preset Generator Time | | | ACK |
| 8A | 4 | Preset Generator User Bits | | | ACK |
| A0 | | Sense Generator Mode | 1 | 1 | Sense Generator Mode |
| A1 | | Sense VITC Generator Lines | 1 | 2 | VITC Generator Lines |
| A2 | | Sense Generator Drop Frame | 1 | 1 | Generator Drop Frame |
| A3 | | Sense Generator Colour Frame | 1 | 1 | Generator Colour Frame |
| A4 | | Sense LTC Generator Parity | 1 | 1 | LTC Generator Parity |
| A5 | | Sense VITC Generator On/off | 1 | 1 | VITC Generator On/Off |
| A6 | | Sense Generator Run/Hold | 1 | 1 | Generator Run/Hold |
| A7 | | Sense Gen Jam Sync Mode | 1 | 1 | Generator Jam Sync Mode |
| A8 | | Sense Generator No Code Jam | 1 | 1 | Generator No Code Jam |
| A9 | 1 | Sense Generator | 2 | x | Generator data |

**Table 4-4: Generator Commands and their Valid Responses**

## 4.5. DATA FORMATS

### 4.5.1. Time Format Block

| 10 Frm | 1 Frm | 10 Sec | 1 Sec | 10 Min | 1 Min | 10 Hr | 1 Hr | Flags |
|---|---|---|---|---|---|---|---|---|

The Flags byte is a bitmapped byte of the timecode flag bits as follows:

| | | |
|---|---|---|
| Bit 0 | Drop Frame Flag | 0 = Non Drop Frame, 1 = Drop Frame |
| Bit 1 | Colour Frame Flag | 0 = Non Colour Frame, 1 = Colour Frame |
| Bit 2 | VITC Field Flag | 0 = Field 1, 1 = Field 2 |
| Bit 3 | User Bit Group Flag 0 | |
| Bit 4 | User Bit Group Flag 1 | |
| Bit 5 | User Bit Group Flag 2 | |
| Bit 6 | LTC Flag | 1 = LTC Active |
| Bit 7 | VITC Flag | 1 = VITC Active |

The Binary group flag bits are defined as follows:

| | Bin Grp Flag 2 | Bin Grp Flag 1 | Bin Grp Flag 0 |
|---|---|---|---|
| Character set unspecified | 0 | 0 | 0 |
| Eight bit Alpha-numeric Character set | 0 | 0 | 1 |
| Unassigned | 0 | 1 | 0 |
| Unassigned | 0 | 1 | 1 |
| Unassigned | 1 | 0 | 0 |
| Page/Line (SMPTE 262M) | 1 | 0 | 0 |
| Unassigned | 1 | 1 | 0 |
| Unassigned | 1 | 1 | 1 |

### 4.5.2. Data Format Block

| UB grp 2 | UB grp 1 | UB grp 4 | UB grp 3 | UB grp 6 | UB grp 5 | UB grp 8 | UB grp 7 |
|---|---|---|---|---|---|---|---|

### 4.5.3. Display Data Block

| Digit 1 | Digit2 | Digit 3 | ... | Digit14 | Digit 15 | Digit 16 | LED |
|---|---|---|---|---|---|---|---|

The LED byte is a bitmapped byte as follows:

| | | | |
|---|---|---|---|
| Bit 0 | COL | Bit 4 | COL'R REF |
| Bit 1 | LTC | Bit 5 | 4 Fsc |
| Bit 2 | UBTR | Bit 6 | 422 |
| Bit 3 | JAM | Bit 7 | VITC |

## 4.6. COMMAND AND RESPONSE DESCRIPTIONS

### 4.6.1. System Commands

00 Sense Current Mode — Returns 2 bytes as follows

00 = Select
01 = Broadcast
02 = Resend
03 = RCU
04 = Programming

01 Enter Select Mode

02 Enter Broadcast Mode

11 Sense PROM Version — 1 byte — 00 = PROM version

Returns the control byte from the command +10 bytes (hex) PROM name + 10 bytes (hex) PROM version.

0B Select Video Standard — 1 byte — Presets the Video Standard that is being used

00 = 4:2:2 Auto
01 = 4:2:2 525
02 = 4:2:2 625
03 = 4 Fsc 525

| | | | |
|---|---|---|---|
| 1B | Sense Video Standard | | Returns 2 bytes as described in the Select Video Standard Command. |
| 0C | Preset Key Scan Code | 1 byte | Presets a key scan code to the 8010 Key Scan codes are shown in section 5.3 of this manual. |
| 1C | Sense Display Data | | Returns 17 bytes as described in Display Data Block. |

## 4.7. VIDEO CHARACTER INSERTER COMMANDS

Several of the VCG commands need to specify which VCG window they apply to. The following table defines the VCG window numbers.

| WINDOW NUMBER | DESCRIPTION |
|---|---|
| 01 | Reader Time |
| 02 | Reader User Bits |
| 03 | reserved |
| 04 | reserved |
| 05 | Generator Time |
| 06 | Generator User Bits |

**Table 4-5: VCG Window Numbers**

| | | | |
|---|---|---|---|
| 30 | Sense Char Gen Size | | Returns 1 byte as defined below. |
| 20 | Select Char Gen Size | 1 byte | Selects the size of the VCG Character Font<br>00 = Tiny<br>01 = Small<br>02 = Large |

31 Sense Char Gen Window Position Window No Returns 3 bytes of window position as follows.

| Vertical Position | Horizontal Position | Window Length |
|---|---|---|

21 Preset Char Gen Window Position Window No +1 byte Vertical Position
+ 1 Byte Horizontal Position

Sets the starting position of a VCG window on the raster.

| SIZE | VERT POSITION | HORIZ POSITION |
|---|---|---|
| Tiny | 0 to 29 are valid for NTSC<br>0 to 29 are valid for PAL | 0 to 32 depending on window length |
| Small | 0 to 14 are valid for NTSC<br>0 to 16 are valid for PAL | 0 to 32 depending on window length |
| Large | 0 to 7 are valid for NTSC<br>0 to 8 are valid for PAL | 0 to 32 depending on window length |

**Table 4-6: VCG Sizes**

| | | | |
|---|---|---|---|
| **32** | **Sense Char Gen Window On/Off** | | Window No Returns 1 byte as defined below. |
| **22** | **Select Char Gen Window On/Off** | | Window No + 1 byte<br>Turns individual windows on and off.<br>00 = Off<br>01 = On |
| **33** | **Sense Char Gen Global On/Off** | | Returns 1 byte as defined below. |
| **23** | **Select Char Gen Global On/Off** | 1 byte | Turns all windows on and off.<br>00 = Off<br>01 = On |
| **34** | **Sense Char Gen Style** | | Returns 1 byte as defined below. |
| **24** | **Select Char Gen Style** | 1 byte | Selects the Style of the VCG windows.<br>00 = White<br>01 = White on Black<br>02 = Black<br>03 = Black on White |
| **35** | **Sense Char Gen Frames** | | Returns 1 byte as defined below. |
| **25** | **Select Char Gen Frames** | 1 byte | Selects whether the frames digits will be shown on the character inserter.<br>00 = Blanked<br>01 = Displayed |
| **36** | **Sense Char Gen Fields** | | Returns 1 byte as defined below. |
| **26** | **Select Char Gen Fields** | 1 byte | Selects whether the fields digits (for VITC windows time windows only) will be shown on the character inserter<br>00 = Blanked<br>01 = Displayed |
| **37** | **Sense Char Gen Symbols** | | Returns 1 byte as defined below. |

**27** **Select Char Gen Symbols** 1 byte Selects whether the symbols which identify the Character inserter windows will be shown
00 = Blanked
01 = Displayed

**38** **Sense Char Gen Raster Position** Returns 2 bytes of raster position as follows.

| Vertical Position | Horizontal Position |
|---|---|

**28** **Preset Char Gen Raster Position** 2 bytes 1 byte Vertical Position
+ 1 Byte Horizontal Position

Sets the starting position of a VCG raster with respect to the active picture area. For example to start the raster down 2 lines from the top of active picture set the vertical position to 2. To start the raster 5 pixels to the right of active picture set the horizontal position to 5.

## 4.8. READER COMMANDS

Several of the Reader commands need to specify which Reader they apply to. This parameter is called the Reader Number.

**For the 8010 this parameter is always set to 01.**

**61** **Sense RDR Mode** Rdr No Returns 1 byte as defined below

**41** **Select RDR Mode** Rdr No Selects the mode of the reader.
+ 1 byte

Reader modes set according to the following values.

| | DESCRIPTION | |
|---|---|---|
| **MODE** | **TIME** | **UB** |
| 1 | TIME | DATA |
| 2 | TIME | TIME |
| 3 | DATA | DATA |

**Table 4-7: Reader Modes**

**64** **Sense RDR Display** Rdr No. Returns 1 byte as defined below

**44** **Select RDR Display** Rdr No. + 1 byte — Selects whether the look ahead processing will be applied to the reader display.
00 = Processed
01 = Direct

**65** **Sense Broadcast Mode** — Returns 1 byte as defined below

**45** **Define Broadcast Mode** 1 byte — Defines a block of data which will be sent in broadcast mode, and in response to a Sense Broadcast Block command.

| GU | --- | --- | RU | GT | --- | --- | RT |
|---|---|---|---|---|---|---|---|

Each bit represents a variable length block of data which is requested. Time and User Bits are formatted according to the Select RDR Mode command above. The broadcast data blocks are assembled in the following order:

RT RU

**66** **Sense Reader** 1 byte — Returns Reader data as defined by the following byte:

| --- | --- | --- | RU | --- | --- | --- | RT |
|---|---|---|---|---|---|---|---|

Each bit represents a variable length block of data which is requested. Time and data are formatted according to the Select RDR Mode command above. The bits are polled and return blocks are assembled in the following order:

RT RU

**67** **Sense Broadcast Block** — Returns the broadcast block as defined by the Define Broadcast Mode command above.

## 4.9. GENERATOR COMMANDS

**A0** **Sense Generator Mode** — Returns 1 byte as defined below.

**80** **Select Generator Mode** 1 byte — Selects the mode of the generator.

| | DESCRIPTION | |
|---|---|---|
| **MODE** | **TIME** | **UB** |
| 00 | TIME | DATA |
| 01 | TIME | RDR TIME |
| 02 | TIME | RDR UB |
| 03 | Reserved | |
| 04 | TRANSLATE | |
| 05 | TIME | RCTL |

**Table 4-8: Generator Modes**

**A1** **Sense VITC Generator Lines** — Returns 2 bytes as defined below.

**81** **Preset VITC Generator Lines** 2 bytes — Presets the line numbers of the VITC generator

To generate VITC on only one line set Line 1 and Line 2 equal. Line numbers are packed BCD format. Valid lines at 6 to 21 for PAL and 10 to 20 for NTSC.

| | | | |
|---|---|---|---|
| **A2** | **Sense Generator Drop Frame** | | Returns 1 byte as defined below. |
| **82** | **Select Generator Drop Frame** | 1 byte | Selects whether the Generator will operate in the NTSC Drop Frame or Non Drop Frame mode.<br>00 = Non Drop Frame<br>01 = Drop Frame |

**This command is ignored in PAL.**

| | | | |
|---|---|---|---|
| **A3** | **Sense Generator Colour Frame** | | Returns 1 byte as defined below. |
| **83** | **Select Generator Colour Frame** | 1 byte | Selects whether the Generator will operate in Colour or Non colour frame mode.<br>00 = 2 field<br>01 = 4 field<br>02 = 8 field (PAL Only) |

**The drop frame and colour frame operating modes selected by the above commands are used only when the generator is free running. When the generator is jam synced to the Reader these operating modes are determined by the Reader Time code.**

| | | | |
|---|---|---|---|
| **A4** | **Sense Generator Parity** | | Returns 1 byte as defined below. |
| **84** | **Select Generator Parity** | 1 byte | Selects whether the Generator will operate with PARITY On or Off.<br>00 = Parity Off<br>01 = Parity On |
| **A5** | **Sense VITC Generator On/Off** | | Returns 1 byte as defined below. |
| **85** | **Select VITC Generator On/Off** | 1 byte | Turns the VITC Generator On and Off.<br>00 = VITC Generator Off<br>01 = VITC Generator On |

| | | | |
|---|---|---|---|
| **A6** | **Sense Generator Run/Hold** | | Returns 1 byte as defined below. |
| **86** | **Select Generator Run/Hold** | 1 byte | Turns the Generator Hold On and Off.<br>00 = Generator Hold<br>01 = Generator Run |
| **A7** | **Sense Generator Jam Sync Mode** | | Returns 1 byte as defined below. |
| **87** | **Select Generator Jam Sync Mode** | | 1 byte Selects the Generator Jam Sync mode<br>00 = Generator Free Run (Jam Off)<br>01 = Continuous Jam Sync<br>02 = Momentary Jam Sync. |

**When Continuous Jam Sync mode is enabled, then generator time will be slaved to the time code from the Reader. The Run/Hold, Drop Frame, and Colour Frame modes of the generator are determined by the Reader time code. When Continuous Jam Sync mode is terminated, the formatted Run/Hold, Drop Frame and Colour Frame modes of the generator are resumed.**

| | | | |
|---|---|---|---|
| **A8** | **Sense Generator No Code Jam** | | Returns 1 byte as defined below. |
| **88** | **Select Generator No Code Jam** | 1 byte | Determines the behavior of the Generator when it is in continuous jam sync mode and there is no incoming code to the reader.<br>00 = Hold<br>01 = Run<br>02 = Mute |
| **89** | **Preset Generator Time** | 4 bytes | Presets the time code generator. This command has no effect when the generator is in continuous Jam Sync mode. Expects four bytes of time data in BCD format as shown below. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10 Fr | 1 Fr | 10 Sec | 1 sec | 10 Min | 1 Min | 10 Hr | 1 Hr |

| | | | |
|---|---|---|---|
| **8A** | **Preset Generator User Bit Data** | 4 bytes | Presets the generator user bits. This command has no effect when the generator user bits are being transferred from either the Reader Time or User Bits. Expects four bytes of user bit data in DATA Format as shown below. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| UB grp 2 | UB grp 1 | UB grp 4 | UB grp 3 | UB grp 6 | UB grp 5 | UB grp 8 | UB grp 7 |

| | | | |
|---|---|---|---|
| **A9** | **Sense Generator** | 1 byte | Defines a block of data which will be sent in response to a Sense Generator command. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| GU | --- | --- | --- | GT | --- | --- | --- |

Each bit represents a 4 byte block of which is requested. Time and user bit formats are determined by the Select Generator Mode command. The bits are polled and blocks are assembled in the following order:

GT GU

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# 5. TECHNICAL DESCRIPTION

## 5.1. OVERVIEW

The model 8010 Digital VITC Generator combines the latest LSI technology with sophisticated microcontroller firmware to provide a powerful, flexible generator system. The 8010 generates Vertical Interval Time Code directly into the digital video bitstream. In addition, the 8010 generates LTC which follows the D-VITC. The model 8010 also contains a high speed reader for Linear Time Code (LTC), and contains a high resolution character Inserter which can be delegated to either the generator or reader. It displays the data on the front panel and sends out the serial remote control port to a computer.

The front panel alphanumeric display is used to configure various items. The 8010's menu system consists of a main menu with two or more choices on each menu item.

## 5.2. JUMPERS AND SWITCHES

Component layout drawing 8025-83F1 shows the location and function of the switches and jumpers inside the model 8010. The jumper positions marked in **bold** face type are the default settings.

### 5.2.1. DIP Switch Functions

The main circuit board of the model 8010 contains an 8 position DIP switch which is used to invoke various diagnostic and calibration functions.

The functions of each switch are described below.

| Switch | Name | Normal | Function when Open | Function when Closed |
|---|---|---|---|---|
| 1 | Not used | Open | | |
| 2 | Broadcast Mode | Open | Normal Operation | Unit power-up's in *"Broadcast Mode"*; generator timecode data is sent out the serial DB-9 port. |
| 3 | Mon | Open | | Monitor Hardware Installed |
| 4 | Factory Reset | Open | | Resets 8010 to factory defaults on power up |
| 5 | Set Up | Open | Set Up In NTSC | No Set-Up In NTSC |
| 6 | Quick Boot | Closed | | Faster Boot up |
| 7 | Not used | Open | | |
| 8 | Engineering Mode | Open | Normal Operation | Special Engineering functions such as calibration of the Colour frame circuitry |

**Figure 5-1: DIP Switch Functions**

When in Engineering mode the following key presses initiate various diagnostics modes.

**DISPLAY** Displays the complete character font on the VCG screen. Each time it is pressed it cycles to the next Font set.

↑ and ↓ Adjusts the colour frame calibration for the External colour frame reference input. (See section 5.3.9)

### 5.2.2. Jumper Functions - Main Board

All jumpers are printed circuit board links and are installed in the default position. To change the position, the board link must be cut and a wire link must be installed in the desired location.

| | | | |
|---|---|---|---|
| JP1 | LCA Size | A | 3042 |
| | | **B** | 3064/3090 |
| JP3 | EPROM Size | **512** | Board link installed connects MCU EPROM U19 Address A15 to microprocessor A15 for use with 512K size EPROM. |
| | | 256 | Board link installed connects MCU EPROM U19 Address A15 to +5 volts for use with 256K size EPROM. |
| JP4 | EPROM CE | **Pin 2,3** | Board link installed connects Char EPROM CE to ground. |
| | | Pins 1,2 | Board link installed connects Char EPROM CE to +5 Volts after LCA loads. |
| JP5 | | | Not installed for 8010 |
| JP8 | RS232/422 | **232** | Selects RS232 for Pin 5 |
| | | 422 | Disconnects Pin 5 for use with RS422 ports |
| JP10,11,12,13 | | | Not installed for 8010 |

## 5.3. CIRCUIT DESCRIPTION

The model 8010 is a microcontroller based device functionally divided into the following hardware subsystems:

1 Microcontroller & I/O
2 Display and Pushbuttons
3 Serial Digital Video Input
4 Serial Digital Video Output
5 VITC Generator/Character Generator Logic
6 VITC Generator/Character Generator Keyer
7 Analog Composite Monitor

The microcontroller, serial video inputs and outputs, and keyer LCA circuits are all contained on the main circuit board (8025). The display and keypad

circuitry is contained on a separate circuit board (5220) which plugs into the main board via a twenty conductor ribbon cable. The analog composite monitor circuitry is contained on a separate circuit board (8026 or 8029) which plugs into the main board via two forty-four pin headers. The VITC Reader/Character generator logic circuitry is contained on a separate circuit board (8037) which plugs into the main board via a forty-pin header. The relevant schematic drawings are shown in brackets for each section of the circuit. The heart of the model 8010 circuitry is a programmable logic array (LCA) device (U17) which contains the keyer circuitry and the support circuitry for addressing various devices on the board.

### 5.3.1. Microcontroller (8025-36)

At the heart of the model 8010 reader is an 8032 microcontroller, (MCU) U19. Its three 8 bit bi-directional ports and 8 bit bus provide peripheral interfacing to the rest of the circuits. Program memory is contained on EPROM U21. Scratch pad and data RAM are provided internally by the MCU. An onboard oscillator, also part of the MCU, is crystal controlled. Its' 14.7456 MHz frequency is internally divided by 12, resulting in a processor operating frequency of 1.2288 MHz. Address decoder U20 provides decoded chip enables to each of the peripheral devices on the board. Addressable latches U24 and U34 provide mode select control lines used throughout the board.

### 5.3.2. Front Panel Display and Pushbuttons (5220-31)

A 16 digit alphanumeric display, and a 16 button keypad are contained on a separate circuit card (5220) which is connected to the main circuit board via a 20 conductor ribbon cable.

The 16 digit display is self scanning and contains its own character display memory. Data is written to the displays once per frame. Address Latch U1 generates chip enable and address information to the display devices to allow the MCU to write data to the display and control registers.

The status LED's are controlled by interface driver U3. This driver is accessed with a serial clock and data stream once per frame. When all the LED information has been shifted into the driver, it is latched there by the LEDSTB signal from the MCU (display header pin 10).

The 16 pushbuttons are arranged in a 8 x 2 matrix. Data from 8 keys at a time is latched into U2 by signal SH/LD on U2 pin 1. Address decoder U1 selects which set of 8 switches is latched into U2 using enable lines A0 and A1. Each time a key is pressed, the MCU firmware generates a key scan code corresponding to the position of the key in the key matrix.

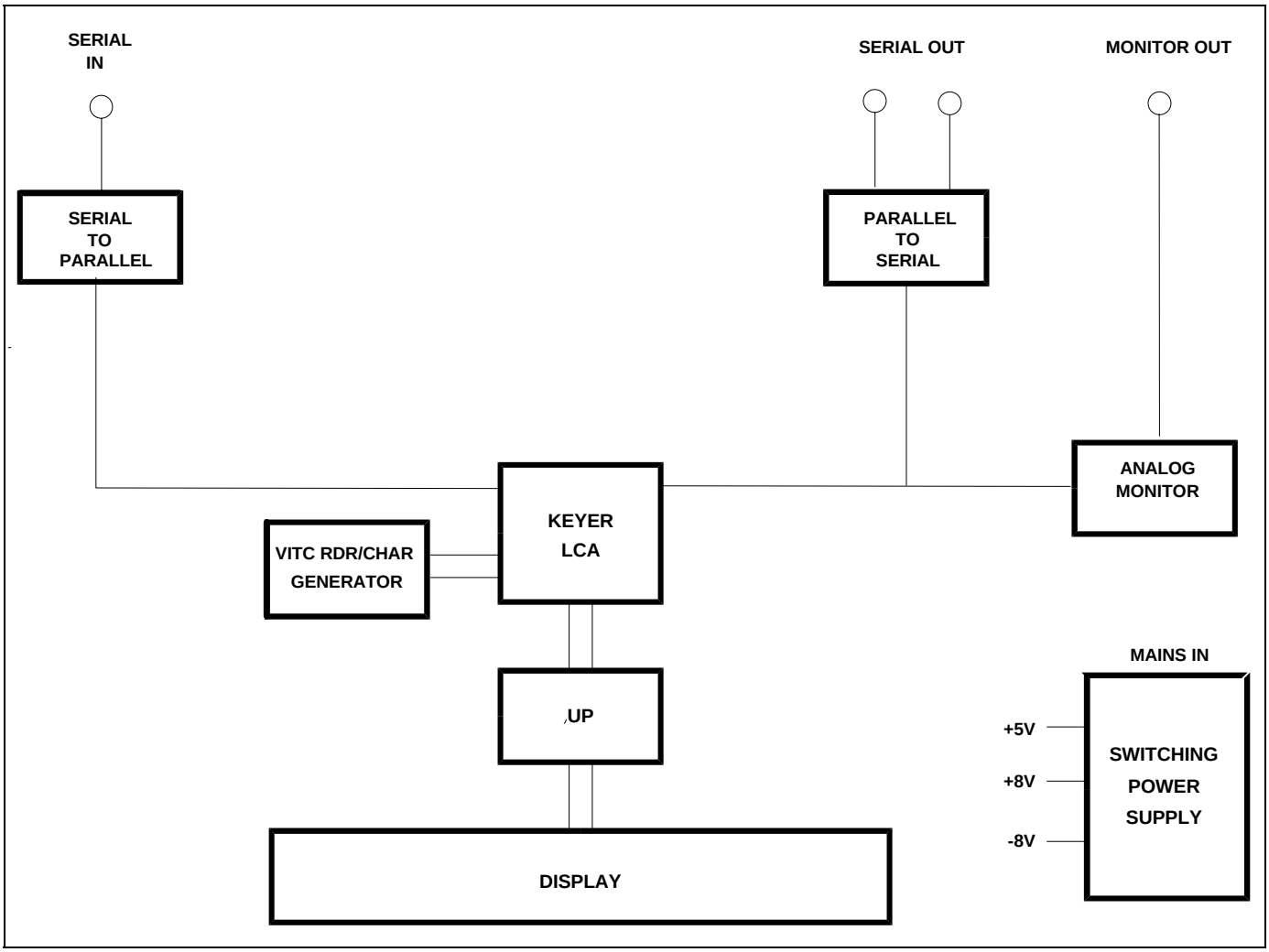


**Figure 5-2: Block Diagram**

To perform a Keyboard test and lamp test of the front panel LED's hold down the SETUP key on power up. The front panel display will show:

```
00    KEY
```

As you press various key combinations various LEDs will illuminate. The front panel display will show the Keyboard scan codes for each key combination pressed. Table 5-1 and Table 5-2 below show the SCAN code for each key. To exit LED test mode, remove and re-apply power to the unit.

| | | | |
|---|---|---|---|
| DISPLAY | 01 | VITC ON/OFF | 41 |
| ENTER | 02 | JAM | 42 |
| CLEAR | 03 | SHIFT | 43 |
| HOLD (NUM 0 | 04 | VCG ON/OFF (NUM 5) | 44 |
| STATUS (NUM 1) | 05 | VCG MODE (NUM 6) | 45 |
| ← (NUM 2) | 06 | SELECT (NUM 7) | 46 |
| ↓ (NUM 3) | 07 | ↑ (NUM 8) | 47 |
| → (NUM 4) | 08 | SETUP (NUM 9) | 48 |

**Table 5-1: Keyboard Scan Codes**

When the SHIFT key is held down each of the keys assume an alternate scan code as shown in the table below.

| | | | |
|---|---|---|---|
| DISPLAY | B1 | VITC ON/OFF | 4B |
| ENTER | B2 | JAM | 53 |
| CLEAR | B3 | VCG ON/OFF (NUM 5) | 5C |
| HOLD (NUM 0 | B4 | VCG MODE (NUM 6) | 5D |
| STATUS (NUM 1) | B5 | SELECT (NUM 7) | 5E |
| ← (NUM 2) | B6 | ↑ (NUM 8) | 5F |
| ↓ (NUM 3) | B7 | SETUP (NUM 9) | 60 |
| → (NUM 4) | B8 | | |

**Table 5-2: Keyboard Scan Codes When SHIFT Key is Down**

### 5.3.3. Serial Digital Video Input (8025-33)

The serial digital input circuitry is based on the Gennum Genlinx Serial Digital Video chip set. The 9005 (U13) receiver/equalizer provides automatic cable equalization and clock extraction from the serial digital signal. It provides a balanced ECL level recovered clock and data signals to the 9000 decoder (U14). The 9000 decoder de-serializes the signal and provides a parallel clock and 10 bits of parallel data input B of the input multiplexer U7, U8, and U9.

The 9005 receiver is capable of working with 143 MHz composite NTSC, 173 MHz composite PAL or 270 MHz component video data rates. The capture frequency of the 9005 is set by trim pots VR2 for 270 Mhz (4:2:2), and VR4 for 143 Mhz (4Fsc NTSC). The capture range can be adjusted with the following procedure.

1. Connect a digital volt meter set on a 10 volt range to the Loop filter test point LF (located at the rear left corner of the 8025 board).

2. Connect a serial digital video signal to the serial input of the 8010. Connect the serial output of the 8010 to a digital monitor, or connect the analog monitor output of the 8010 to an analog monitor.

3. Rotate VR2 for component video ( VR4 for composite) fully clockwise. Slowly rotate the trimpot counter clockwise monitoring the loop filter voltage on the digital volt meter. Continue turning the trimpot until the picture appears. Note the voltage on the LF test point.

4. Continue rotating the trimpot until the loop filter voltage is 250 mVolts above the voltage measured in step 3.

### 5.3.4. Serial Digital Video Output (8025-34)

The serial digital output circuitry is based on the Gennum Genlinx chip set, and consists of the 9002 encoder and 9008 cable driver. The 9002 receives TTL level parallel data and clock signals from the keyer LCA and encodes the data into the SMPTE 259 specified bitstream. Cable driver 9008 receives the serial data from the 9002. The output of the 9008 is adjustable using trim pot VR7, and is nominally set to 800 mVolt p-p. Two identical serial outputs are provided.

### 5.3.5. VITC Generator/Character Generator Logic (8037-31, 8037-32, 8037-33)

The 8037 submodule contains the VITC generator and character generator logic circuitry. The actual extraction of the VITC and insertion of the character data into the digital bitstream is done by the Keyer LCA circuitry on the main board. (See section 5.3.6) The Keyer LCA extracts video sync and pixel clock data from the digital video and passes it to the 8037 on the 40 pin header. Vertical sync (V) is on pin 15, Horizontal sync (H) is on pin 16, Field information (F) is on pin 1 and the digital sample clock (KCK) is on pin 2 of the header. The MCU address and data bus are also fed up the header from the main board. The majority of the logic for the VITC Reader/Character generator functions is contained in a programmable logic device (LCA) U18. Its program is loaded from FLASH EPROM U2 on power up. Configuration latch U3 controls what part of the FLASH EPROM is used during loading of the LCA on power up.

The VITC data is clocked out of the keyer LCA on the main board and passed up the header on pin KC0 to the LCA on the submodule. The VITC bit rate is derived from the sample clock KCK in the LCA. For digital composite NTSC signals, each VITC bit is 8 sample clocks long. For digital component signals the VITC bit rate is 15 sample clocks per 2 VITC bits.

The decoded VITC bit rate clock is used to decode 0 and 1 bits inside the LCA. The LCA validates the cyclic redundancy check (CRC) word and sync bit patterns for the received data and writes the decoded data to RAM U1 one byte (8 bits) at a time. Once per field, the MCU unloads the recovered VITC data from static RAM U1 on lines where VITC reading is enabled.

The majority of the logic for the character generator functions is also contained in a programmable logic device (LCA) U18. The character display is formatted to display 28 rows of 32 characters each in the tiny size, 14 rows the small size, and 7 rows in the large size. Each of the character positions corresponds to one location in static RAM U1. The MCU writes characters into specified locations in the RAM corresponding to the position of the characters on the screen. RAM locations are scanned during each television field. Valid characters address corresponding sections of the character FLASH EPROM U2 and are loaded into the LCA one byte (8 bits) at a time. Each byte corresponds to either the left or right half of a character pixel line. The internal logic in the LCA controls how many lines per character and how many character lines there are on the raster according to registers set by the firmware.

The character pixel clock is derived from and is the same rate as the digital sample clock KCK. A 4 bit value representing the white level of each pixel is clocked out of the LCA on the KC0, KC1, KC2, and KC3 lines and fed down the header to the keyer LCA. The special value with all bits set to 1 disables the keyer where no characters are displayed. The character white level is encoded by the other 15 values to provide anti-aliasing of the character data. Maximum white level is set at 80 IRE, while character black level is fixed at setup level.

### 5.3.6. Keyer LCA (8025-32, 8025-35, 8025-37)

The heart of the 8010 is the Keyer LCA U17 on the main board. Input video from the serial input circuitry is fed to the inputs of the keyer LCA by U7, U8, and U9.

The keyer control signals from the VITC Reader / Character generator submodule and are fed down the 40 pin header on the KC0, KC1, KC2, and KC3 lines and are used to control what data is being inserted into the bitstream and when it will be inserted. During the vertical interval, when VITC is being read, the VITC data is passed up the header on KC0. During the remainder of the field when characters are being generated, character data is passed down from the submodule on all four lines.

The keyer LCA provides parallel data out which is fed to the serial output circuitry. The LCA also generates the necessary signals required to control the analog output circuitry which is contained on the 8026/8029 submodule.

### 5.3.7. High Speed LTC Reader (8037-32)

Incoming code is decoupled and amplified by U7, U8, U9 and associated components to provide a regenerated reader data signal at U9 pin 11. A series of timing pulses, generated by U10 and U11, is used to properly decode 0 and 1 bits of the incoming code. A constant amplitude ramp is generated by U12 and U13 and associated components. Three quarters of the peak ramp level is used as a reference on comparator U14 to decode the data from the clock transitions. If the next code bit is a 0, then

the ramp will exceed the reference before the next transition. If the next bit is a 1, then an extra transition will occur before the ramp exceeds the reference, clocking flip flop U11a on. The LTC data (U11 pin 1) is shifted into LCA U18 and out again into one half of shift register U19. The sync word detector in the LCA generates an LTC RDY signal (TP-3). LTC RDY causes the data for the next frame to be shifted into the other half of U19 while the MCU unloads the data from the previous frame.

### 5.3.8. LTC Generator (8037-33) and (8025-35)

The bit-rate generator, located in the LCA U17 on the 8025 board, divides the 14.456 Mhz crystal frequency down to twice the LTC bit frequency (4798 Hz for NTSC, and 4000 Hz for PAL). An interrupt to the MCU is generated on the MCU to interrupt (U19 pin 16) every 4 bits. The MCU writes the next 4 bits to a register in the LCA and the data is clocked out from the LTCOUT (U17 pin 3) to the LTC shaping circuitry which is located on the 8037 submodule.

The LTC is shaped to the correct rise and fall times by U15 on the 8037 board and associated components and fed to the output driver U17. NOVPOT U16 is a digitally controlled potentiometer, set from the MCU and is used to control the output level of the LTC.

### 5.3.9. Colour Frame Reference (8037-35)

The Col'r Frame video is buffered by Q3 and Q4 and distributed to the reference video sync separator. The sync separator U22 (GS4882) slices the input video at 50% of the sync tip level to provide precision timing for the colour frame circuitry. The sync separator provides H Sync, V Sync and a Frame pulse (active high for field 1) and a back porch pulse to the LCA U18.

Monostable U25a is triggered by the leading edge of HSYNC and times out about 6 usec later. U25b is triggered by the trailing edge of U25a, generating a burst sample window (test point FCW) at the mid point of the burst which is fed to the LCA U18. The length of the WINDOW is slightly less than one half cycle of subcarrier (approx. 90 nsec).

Burst, (test point CB) extracted from the video by U23a and buffered by U23b is fed to the LCA. In the LCA, the WINDOW is ORed with line count 10 (6 for PAL) and fed to the clock input of a phase discriminator flip flop. If a positive going transition of burst occurs during the WINDOW, in the first field of a frame, then the flip flop is clocked on, generating a colour frame pulse (test point TP9) on the 8037 input to the MCU on the 8025.

When the 8010 is in the non colour frame mode, the back porch signal from the sync separator (test point FBP) on the 8037 is Ored with line count 10 (6 for PAL) and fed to the clock input of a phase discriminator flip flop. If a positive going transition of burst occurs during the FBP, in the first field of a frame, then the flip flop is clocked on, generating a burst

present pulse (test point TP9) input to the MCU. This signal is used to detect the PAL 4 field colour frame sequence.

Calibration of the colour frame detector is accomplished in software by adjusting digital potentiometer (U24). Separate calibration values are maintained in the 8010's nonvolatile memory for PAL and NTSC. The colour frame circuitry is calibrated at the factory and should not require any field calibration. If you do need to calibrate the colour frame detector, use the following procedure. To enable adjustment of the NOVPOT, you need set DIP switch 8 on the main circuit board to the On (Closed) position. The front panel display will show a display similar to:

**NTSC** COL REF: 0-99 or **PAL** COL REF: 0-99

Then this message is displayed, the rightmost digits of the display indicate the value of the NOVPOT. The numbers do not have any absolute meaning, but are only a reference used in calibration. Use the ↑ key to adjust the NOVPOT up and the ↓ key to adjust the NOVPOT down.

The generator COL REF VIDEO input must be connected to an RS-170-A NTSC or a 8 field PAL video source and properly terminated. The unit must also be set up to operate in the colour frame mode. This is accomplished by selecting **Colour frame on** on the **COLOUR FRAME** menu item.

You will need a sync pulse generator with a colour field #1 identification pulse output and a dual channel oscilloscope to perform the calibration.

1. Display the colour field #1 ID pulse from your sync generator on channel A of your oscilloscope. Set up the time base to show two pulses (usually 20 msec / div.). Set up your oscilloscope to trigger from channel A.

2. Connect channel B of your scope to test point TP9 (located near the large square integrated circuit U18).

3. Use the ↓ key on the 8010 to adjust the NOVPOT down to its lowest value. Gradually increase the NOVPOT value using the ↑ key until a pulse appears on channel B of your scope. This pulse should be approximately one video field in length and should occur in field 7 for PAL and field 3 for NTSC. The pulse on channel B should be two fields before the second pulse of channel A. (See Figure 5-3 for PAL and Figure 5-4 for NTSC). Write down the NOVPOT value where the pulse first appears correctly.

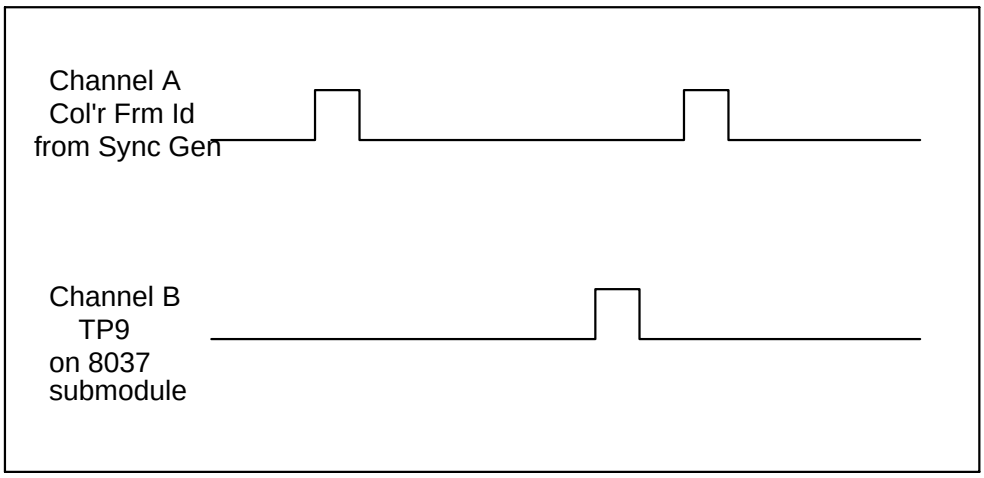


**Figure 5-3: PAL Colour Frame Calibration**

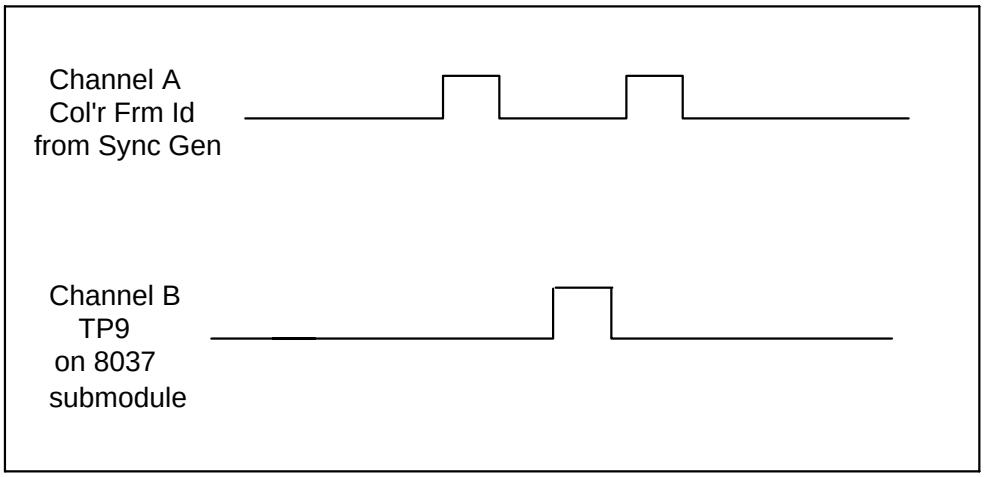


**Figure 5-4: NTSC Colour Frame Calibration**

4. Continue adjusting the NOVPOT value up until the pulse on channel B disappears. Write down the NOVPOT value where the pulse first disappears.

5. Using the ↓ key adjust the NOVPOT value down until it is at the mid point between the upper and lower values. For example: If the upper value is 15 and the lower value is 8, set the NOVPOT to 11. The COL'R LED should be On.

6. Repeat the procedure for the other video standard as required.

7. Set DIP switch #8 to the Off (open) position to return the 8010 to its normal operating mode.

### 5.3.10. Analog Monitor Output - optional (8026-31, 8026-32) or (8029-31, 8029-32)

The 8026 or 8029 submodule contains the analog monitor output circuitry. The heart of the analog monitor is the 22191 Digital Video Encoder chip. When used in component (4:2:2) applications, Y/C data is demultiplexed by latches U4 and U5 and fed to the parallel data port of the 22191. The chrominance signals are modulated onto a digitally synthesized subcarrier by the 22191. Luminance and chrominance signals are separately interpolated at twice the pixel rate and digitally combined. The resulting composite signal is converted to analog levels by a 10 bit D/A converter and output to the analog filter circuitry. The encoder operates from a single clock which is running at 27 MHz (PXCK)

When used in composite (4 Fsc) applications, digital data is latched by U6 and fed to the composite video bus port of the 22191. The digital composite signal is output by a 10 bit D/A converter and output to the analog filter circuitry. In this mode the encoder operates from a single clock which is running at twice the sample rate (8 fsc). U7 generates a control signal ENA_4FS to the 22191 that determines if it operates in the component or composite mode.

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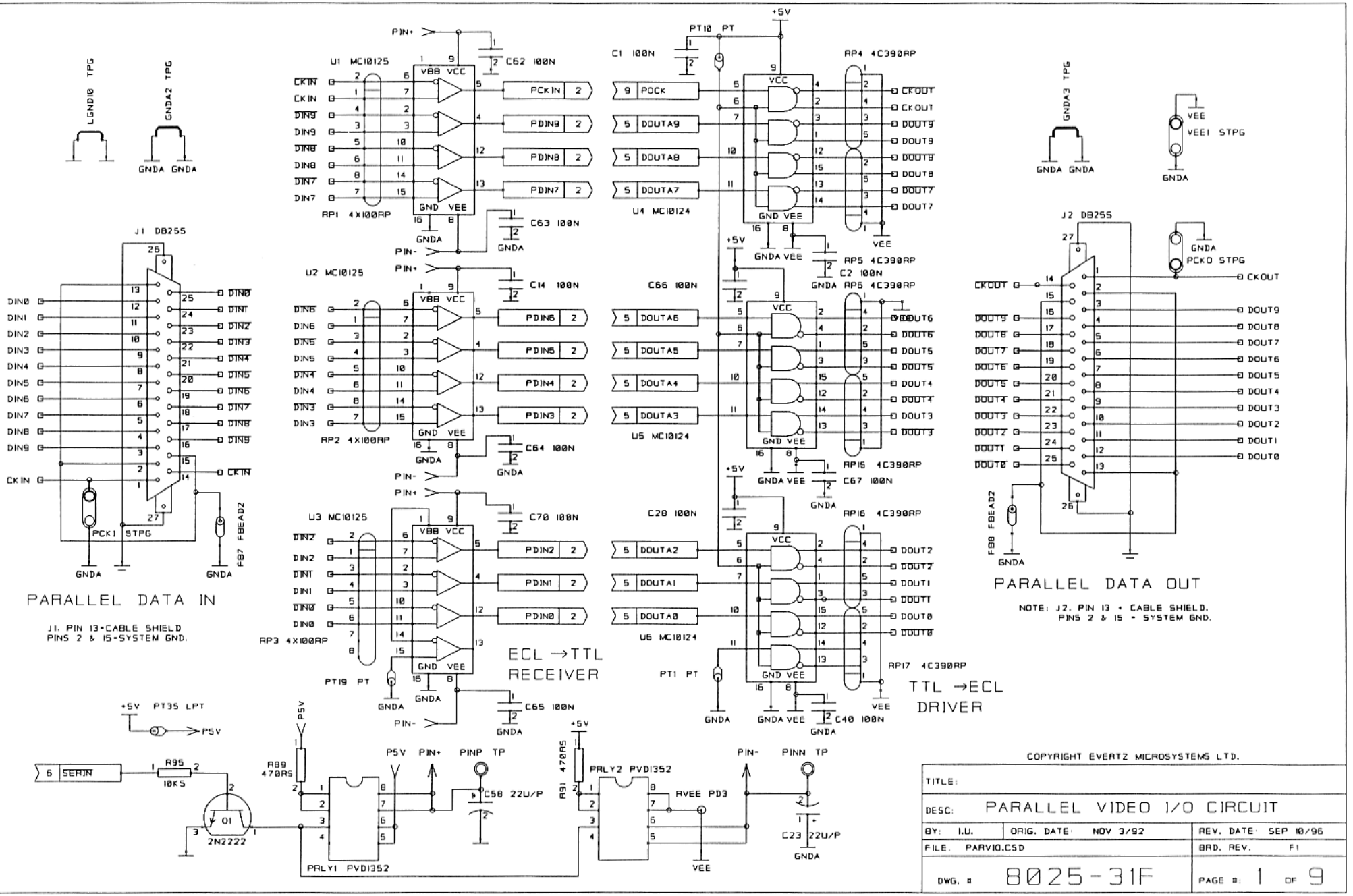




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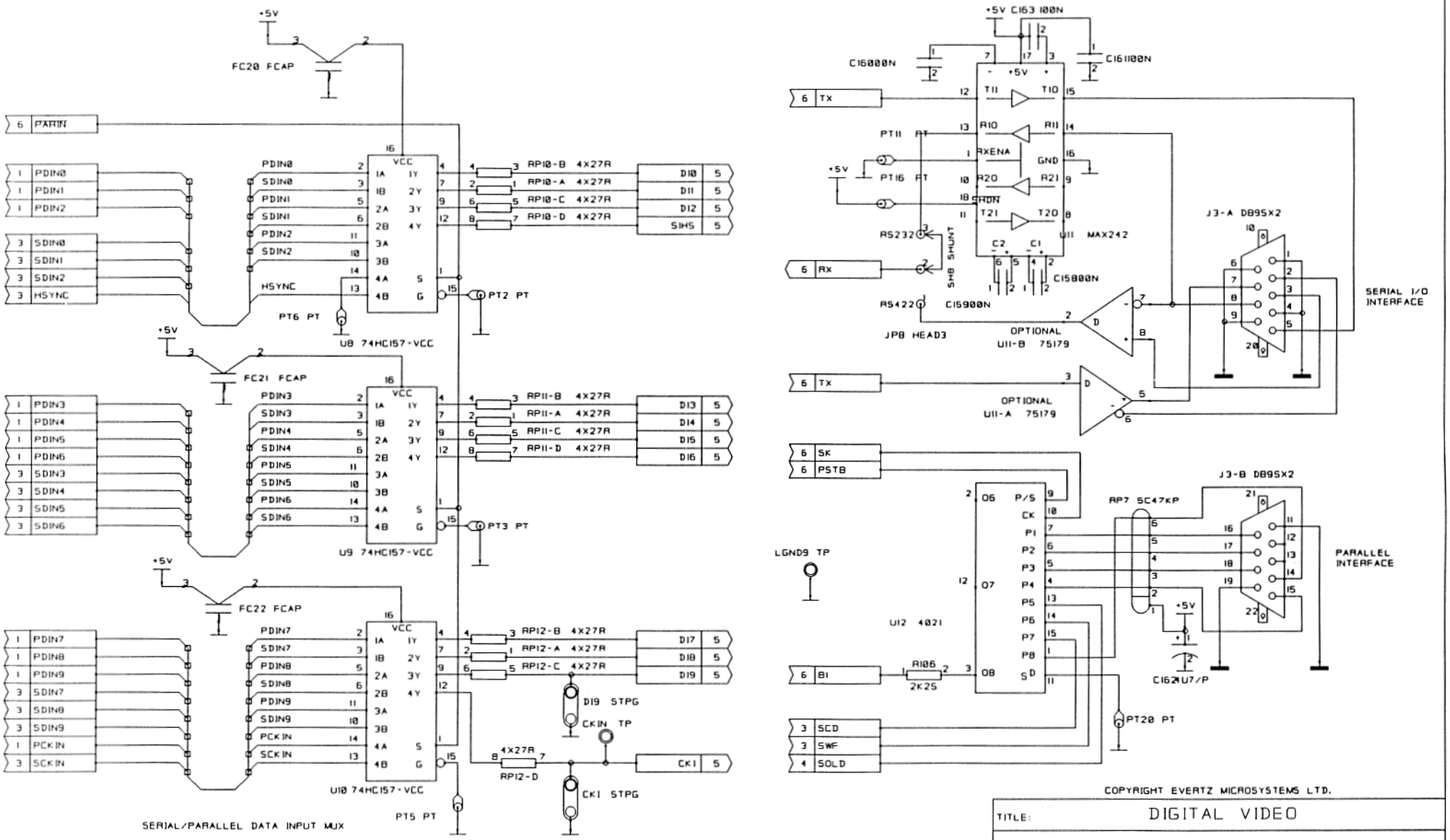
| DWG. # | 8025-31F | | PAGE #: 1 OF 9 |



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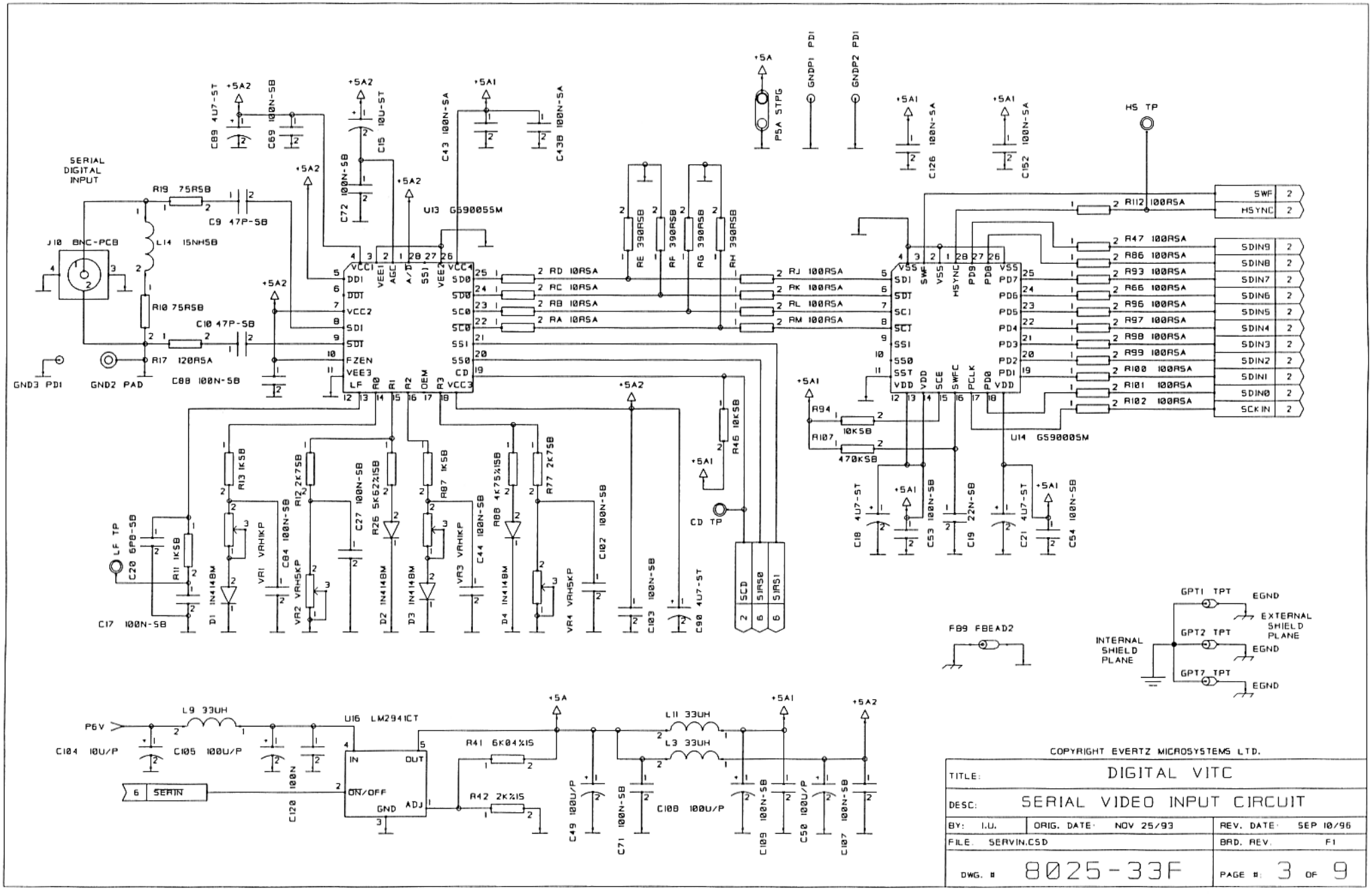




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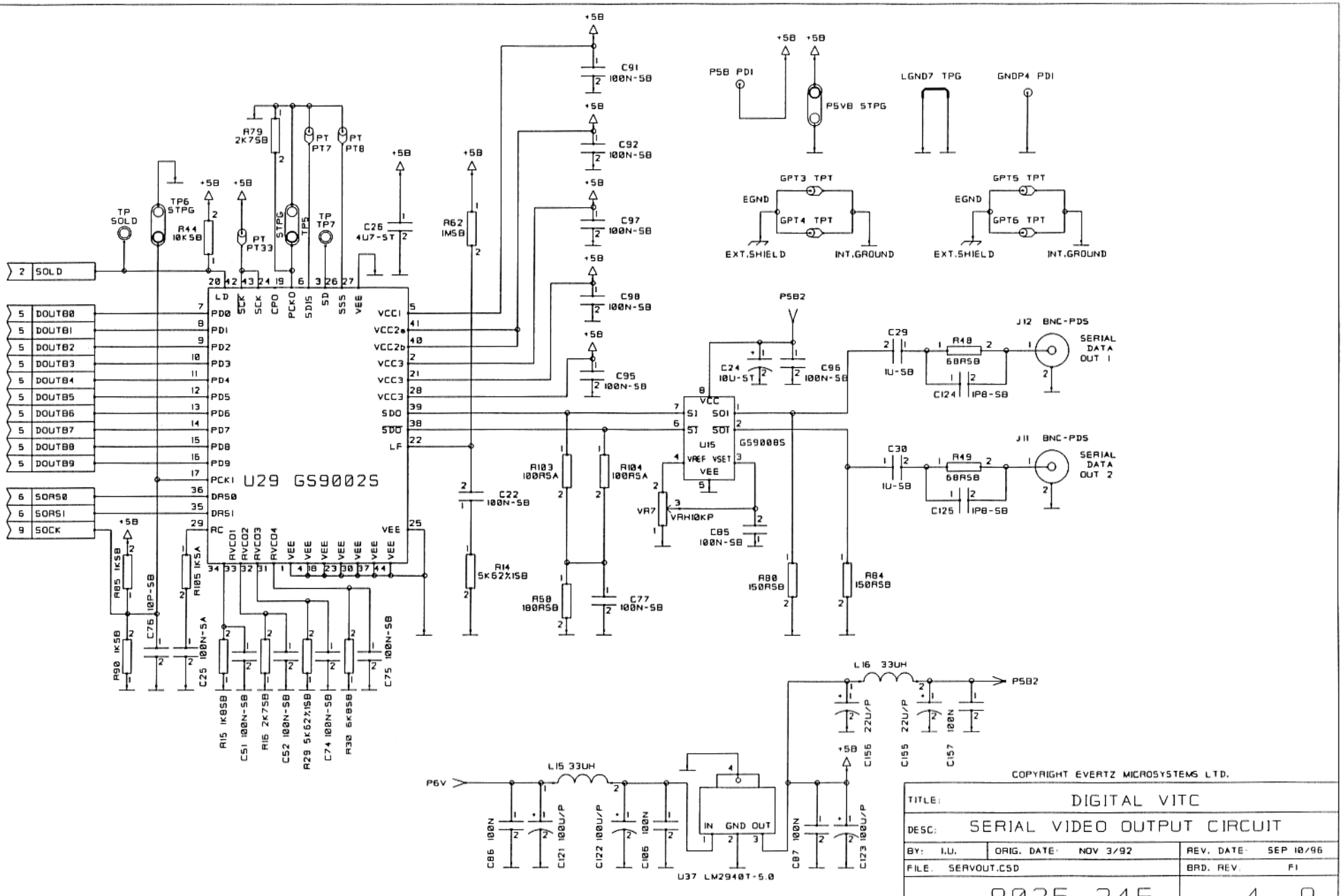
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U15 GS9008S
U37 LM2940T-5.0
SOLD
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DOUTB1
DOUTB2
DOUTB3
DOUTB4
DOUTB5
DOUTB6
DOUTB7
DOUTB8
DOUTB9
SORS0
SORS1
SOCK
+5B
P5B PDI
P5VB STPG
LGND7 TPG
GNDP4 PDI
GPT3 TPT
GPT4 TPT
GPT5 TPT
GPT6 TPT
EGND
EXT.SHIELD
INT.GROUND
P5B2
P6V
J12 BNC-PDS
J11 BNC-PDS
SERIAL DATA OUT 1
SERIAL DATA OUT 2
L16 33UH
L15 33UH
IN GND OUT
COPYRIGHT EVERTZ MICROSYSTEMS LTD.
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DESC: SERIAL VIDEO OUTPUT CIRCUIT
BY: I.U.
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REV. DATE: SEP 10/96
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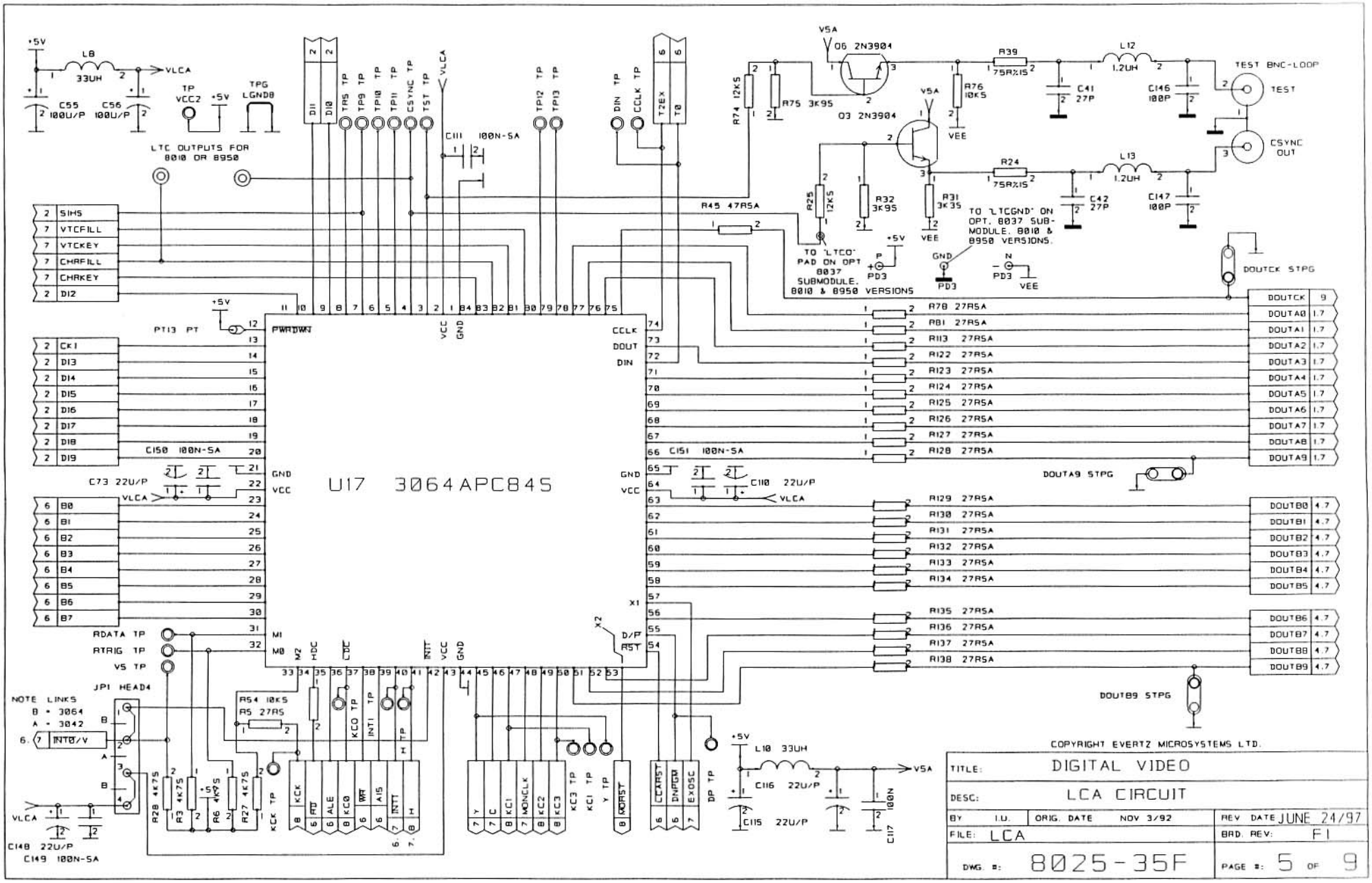
PAGE #: 4 OF 9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L8 33UH
C55 100U/P
C56 100U/P
TP VCC2
TPG LGND8
LTC OUTPUTS FOR 8010 OR 8950
C111 100N-SA
C150 100N-SA
C73 22U/P
C151 100N-SA
C110 22U/P
C148 22U/P
C149 100N-SA
Q6 2N3904
Q3 2N3904
R39 75R1%
R76 10K5
R74 12K5
R75 3K95
R25 12K5
R32 3K95
R31 3K35
R24 75R1%
L12 1.2UH
L13 1.2UH
C41 27P
C42 27P
C146 100P
C147 100P
TEST BNC-LOOP
TEST
CSYNC OUT
R45 47R5A
TO 'LTCO' PAD ON OPT 8037 SUBMODULE. 8010 & 8950 VERSIONS
TO 'LTCGND' ON OPT. 8037 SUB-MODULE. 8010 & 8950 VERSIONS.
DOUTCK STPG
DOUTA9 STPG
DOUTB9 STPG
R70 27R5A
R81 27R5A
R113 27R5A
R122 27R5A
R123 27R5A
R124 27R5A
R125 27R5A
R126 27R5A
R127 27R5A
R128 27R5A
R129 27R5A
R130 27R5A
R131 27R5A
R132 27R5A
R133 27R5A
R134 27R5A
R135 27R5A
R136 27R5A
R137 27R5A
R138 27R5A
R54 10K5
R5 27R5
R28 4K75
R3 4K75
R6 4K75
R27 4K75
L10 33UH
C116 22U/P
C115 22U/P
C117 100N
JP1 HEAD4
NOTE LINKS
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A = 3042
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BY I.U.
ORIG. DATE NOV 3/92
REV DATE JUNE 24/97
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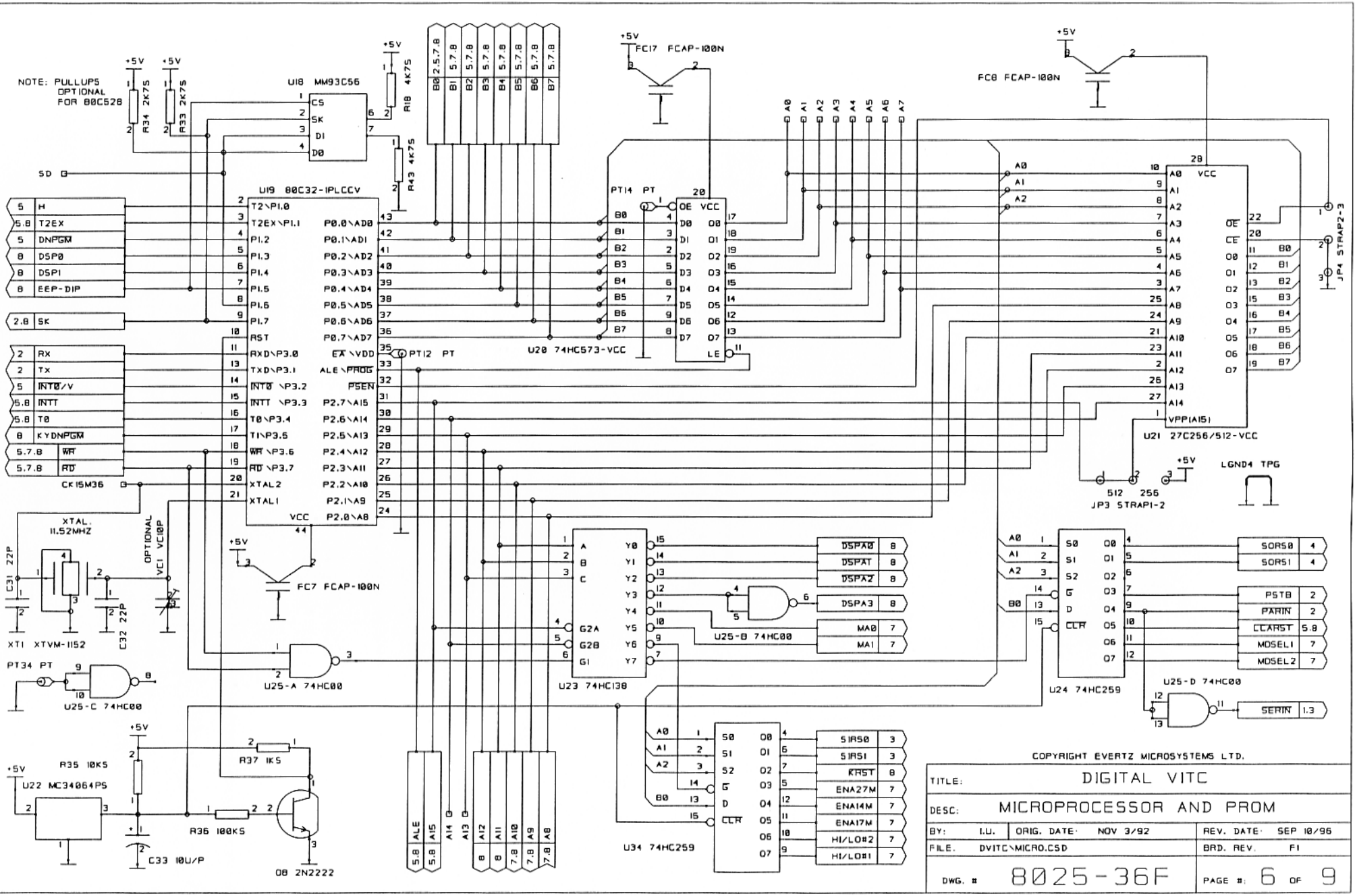
PAGE #: 5 OF 9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U20 74HC573-VCC
U21 27C256/512-VCC
U23 74HC138
U24 74HC259
U34 74HC259
U25-A 74HC00
U25-B 74HC00
U25-C 74HC00
U25-D 74HC00
JP3 STRAP1-2
JP4 STRAP2-3
XTAL. 11.52MHZ
XT1 XTVM-1152
U22 MC34064P5
Q8 2N2222
FC7 FCAP-100N
FC8 FCAP-100N
FC17 FCAP-100N
R34 2K7S
R33 2K7S
R18 4K7S
R43 4K7S
R35 10KS
R37 1KS
R36 100KS
C33 10U/P
C31 22P
C32 22P
VC1 VC10P
CK15M36
COPYRIGHT EVERTZ MICROSYSTEMS LTD.
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BY: I.U. ORIG. DATE: NOV 3/92 REV. DATE: SEP 10/96
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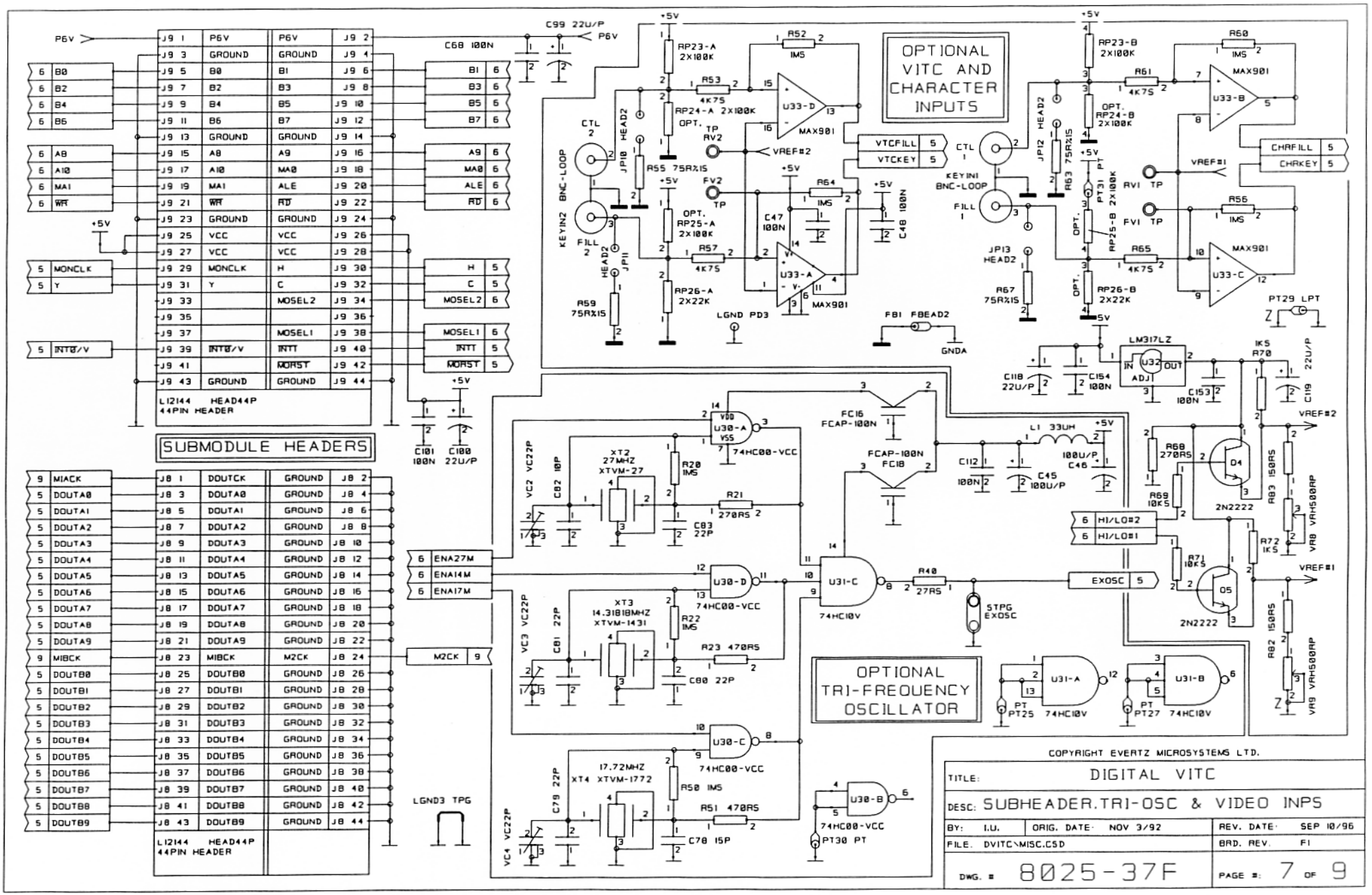
DWG. # 8025-36F PAGE #: 6 OF 9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L12144 HEAD44P
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BY: I.U.
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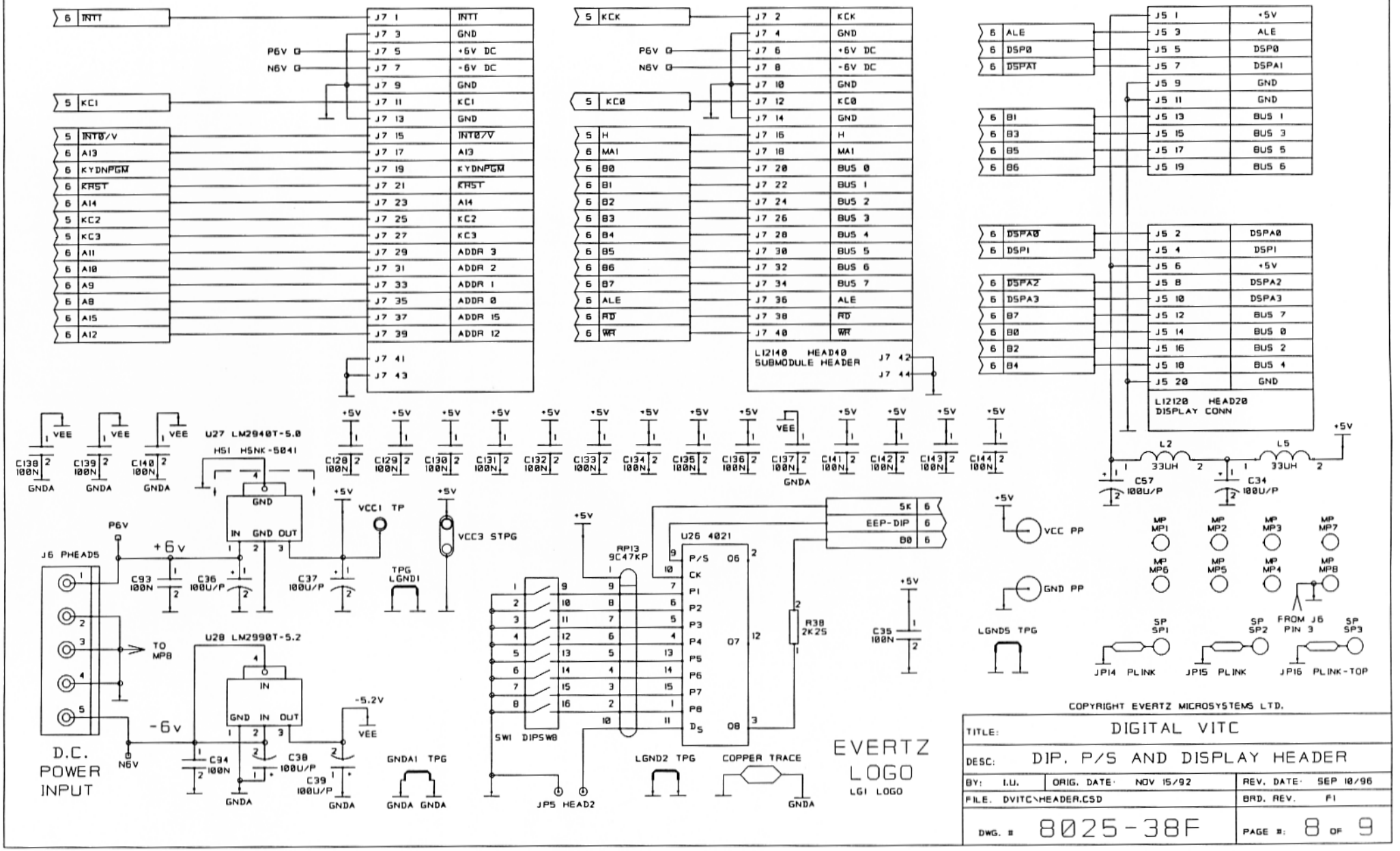
DWG. # 8025-37F
PAGE # 7 OF 9



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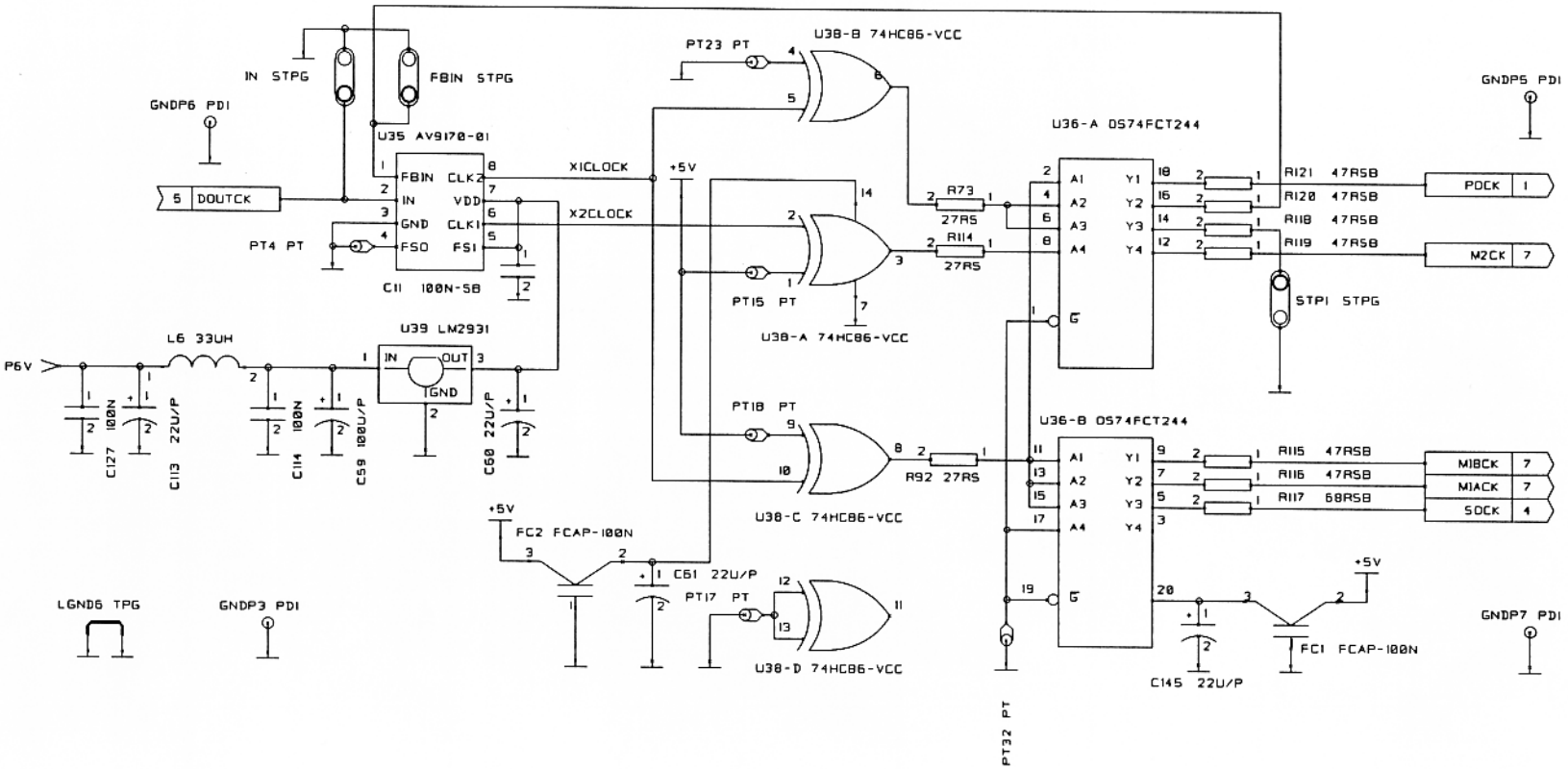




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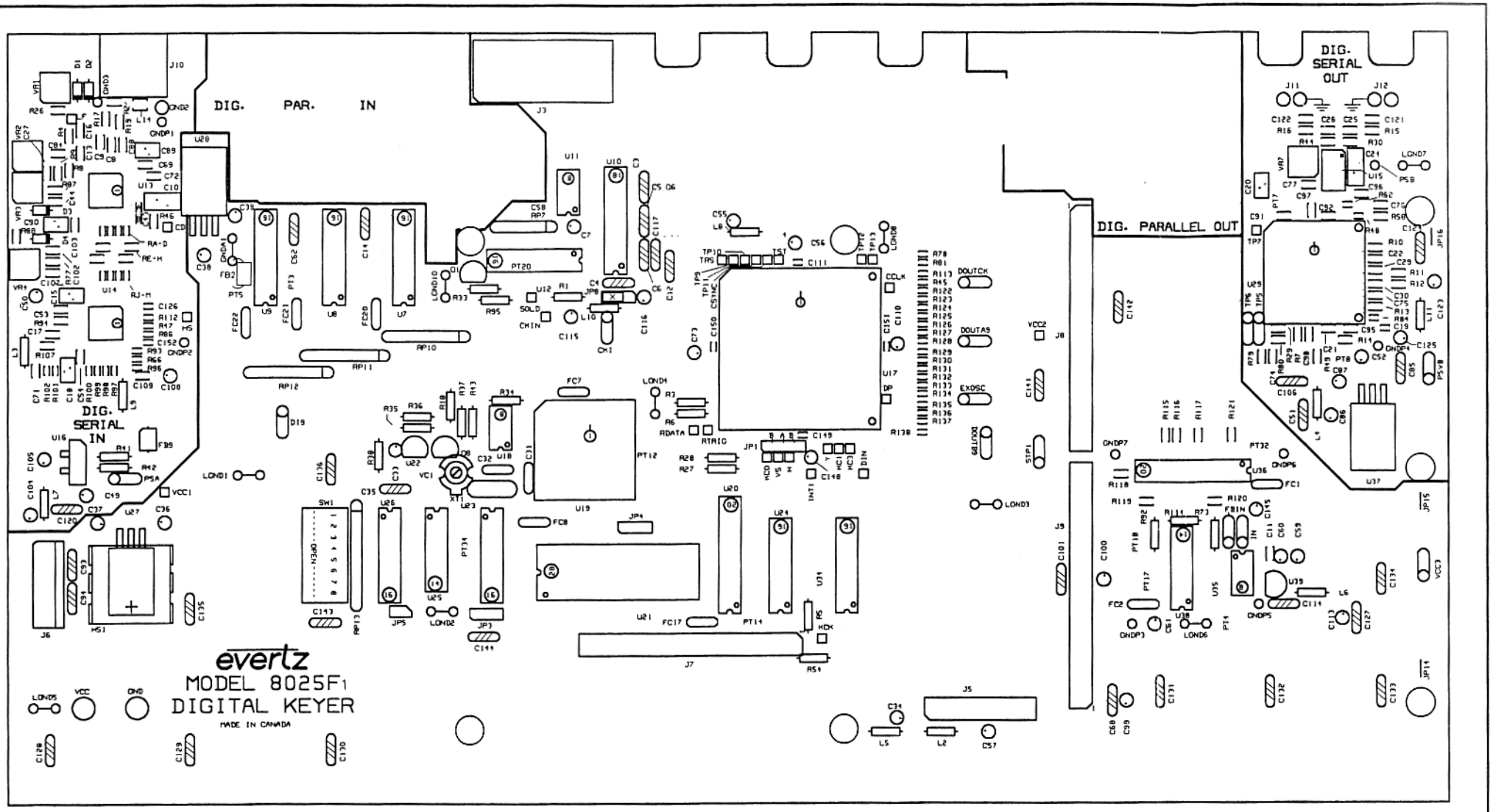


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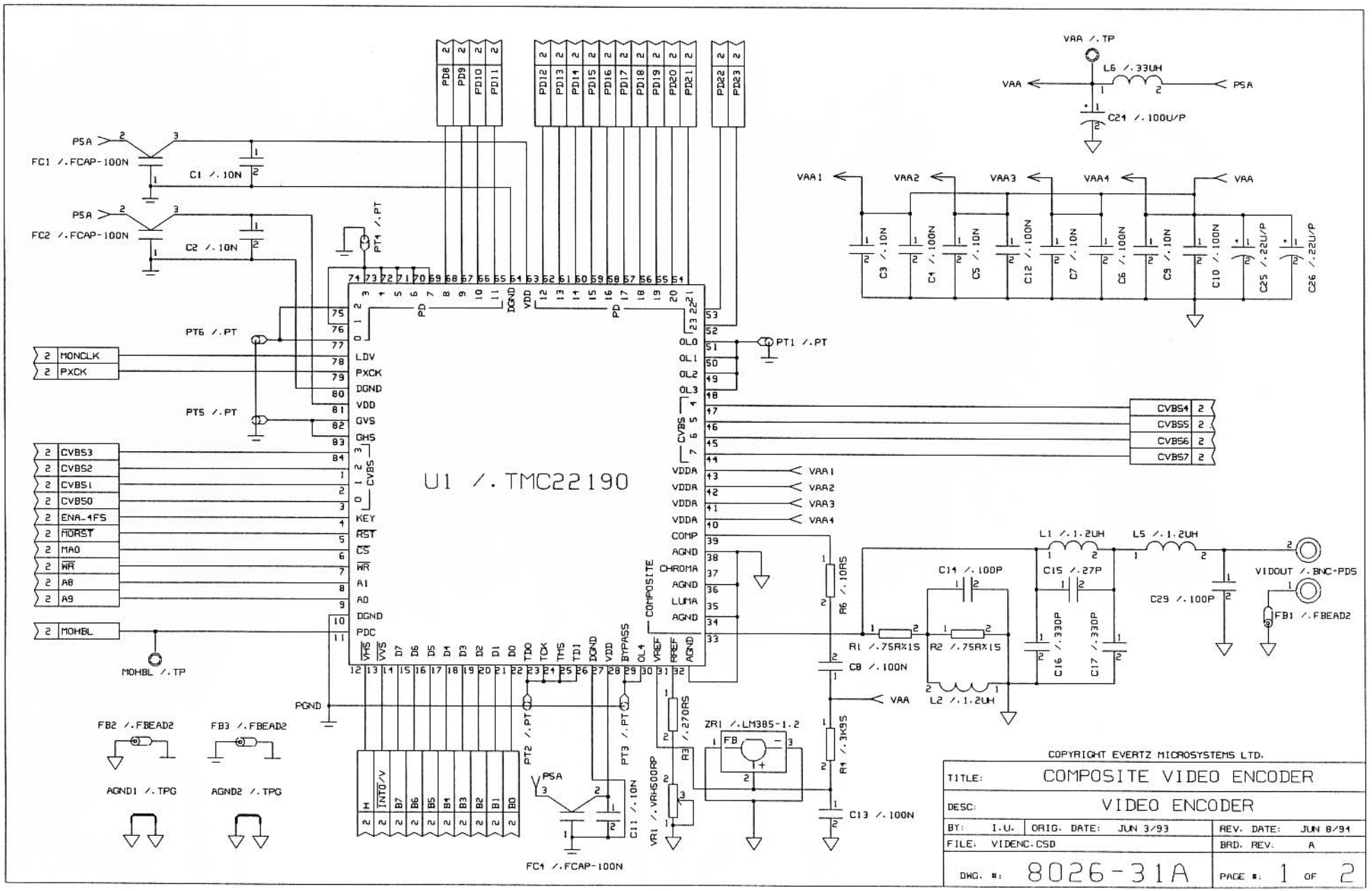
U1 /.TMC22190
COMPOSITE VIDEO ENCODER
VIDEO ENCODER
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VIDOUT /.BNC-PDS
MONCLK
PXCK
MOHBL
CVBS0
CVBS1
CVBS2
CVBS3
CVBS4
CVBS5
CVBS6
CVBS7
ENA_4FS
MORST
MA0
WR
A8
A9
A1
A0
RST
CS
KEY
LDV
GVS
GHS
DGND
VDD
PDC
VAA
VAA1
VAA2
VAA3
VAA4
P5A
PGND
AGND1 /.TPG
AGND2 /.TPG
MOHBL /.TP
FB1 /.FBEAD2
FB2 /.FBEAD2
FB3 /.FBEAD2
FC1 /.FCAP-100N
FC2 /.FCAP-100N
C1 /.10N
C2 /.10N
C3 /.10N
C4 /.100N
C5 /.10N
C6 /.100N
C7 /.10N
C8 /.100N
C9 /.10N
C10 /.100N
C11 /.10N
C12 /.100N
C13 /.100N
C14 /.100P
C15 /.27P
C16 /.330P
C17 /.330P
C21 /.100U/P
C25 /.22U/P
C26 /.22U/P
C29 /.100P
L1 /.1.2UH
L2 /.1.2UH
L5 /.1.2UH
L6 /.33UH
R1 /.75R%1S
R2 /.75R%1S
R3 /.270RS
R4 /.3K9S
R6 /.10RS
VR1 /.VAH500RP
ZR1 /.LM385-1.2
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PT2 /.PT
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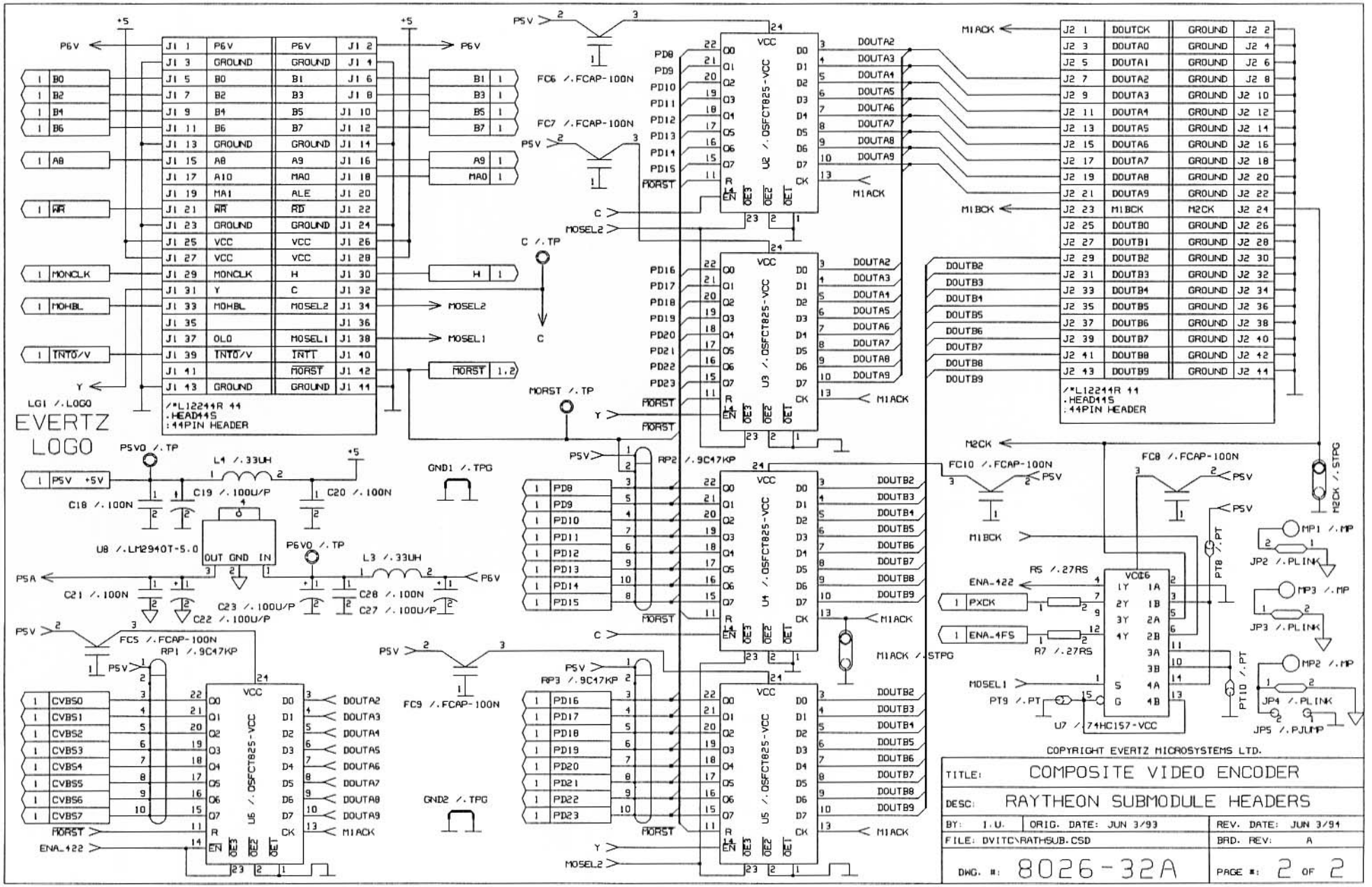
PAGE #: 1 OF 2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U2 /.DSFCT825-VCC
U3 /.DSFCT825-VCC
U4 /.DSFCT825-VCC
U5 /.DSFCT825-VCC
U6 /.DSFCT825-VCC
U7 /.74HC157-VCC
RP1 /.9C47KP
RP2 /.9C47KP
RP3 /.9C47KP
L1 /.33UH
L3 /.33UH
C18 /.100N
C19 /.100U/P
C20 /.100N
C21 /.100N
C22 /.100U/P
C23 /.100U/P
C26 /.100N
C27 /.100U/P
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MORST /.TP
P5V0 /.TP
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GND2 /.TPG
M2CK /.STPG
M1ACK /.STPG
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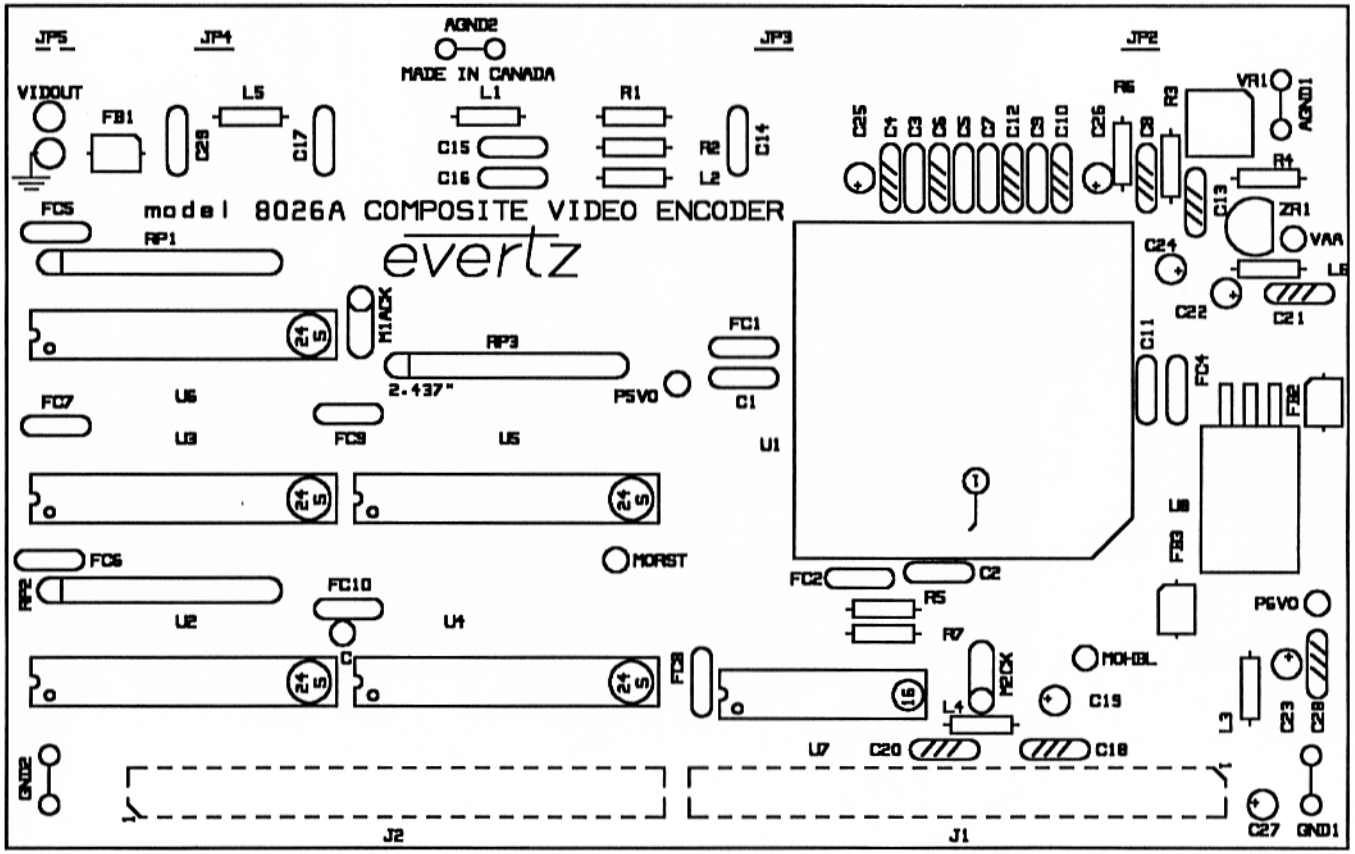
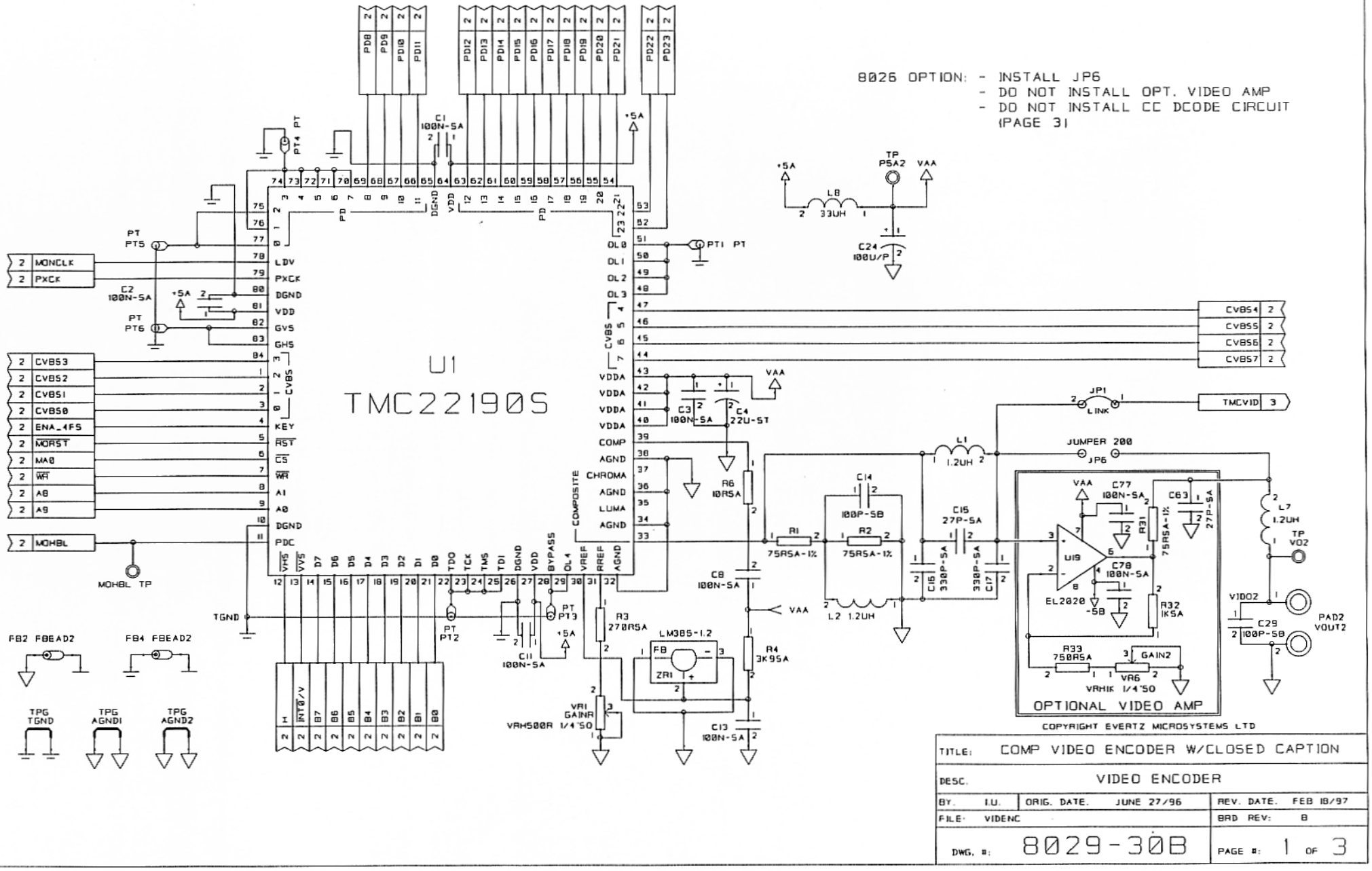
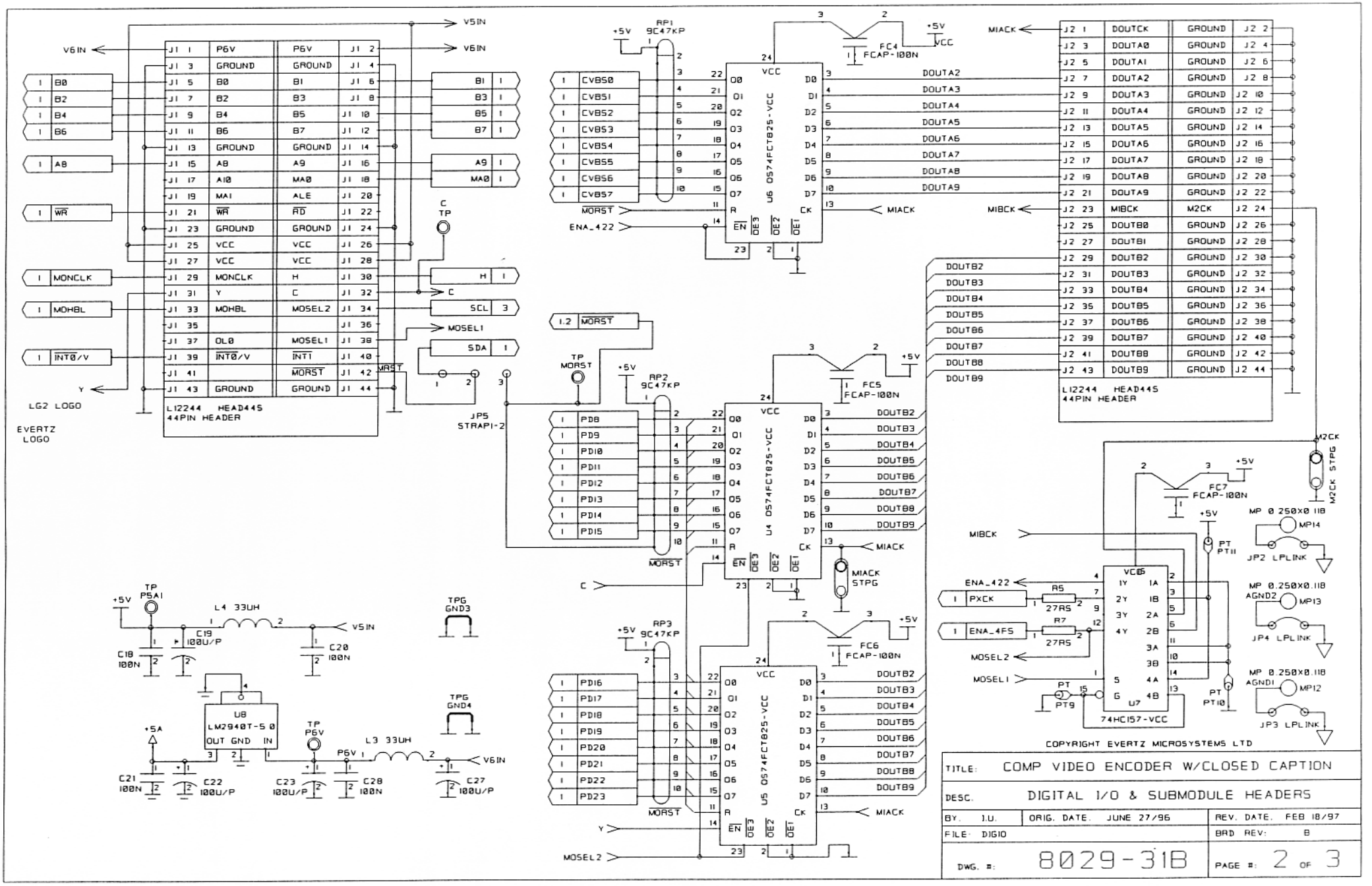
JP2 /.PLINK
JP3 /.MP
JP3 /.PLINK
JP4 /.PLINK
JP5 /.PJUMP
MP1 /.MP
MP2 /.MP
MP3 /.MP
PT8 /.PT
PT9 /.PT
PT10 /.PT
COPYRIGHT EVERTZ MICROSYSTEMS LTD.
TITLE: COMPOSITE VIDEO ENCODER
DESC: RAYTHEON SUBMODULE HEADERS
BY: I.U.
ORIG. DATE: JUN 3/93
REV. DATE: JUN 3/94
FILE: DVITC\RATHSUB.CSD
BRD. REV: A
DWG. #: 8026-32A
PAGE #: 2 OF 2




| | | |
|---|---|---|
| EVERTZ MICROSYSTEMS LTD | ORIG DATE : JUNE 3/93 | REV. DATE : JUNE 7/94 |
| TITLE: 8026 COMPONENT LAYOUT | BRD REV : A | DWG NO.: 8026-80A |


8026 OPTION: - INSTALL JP6
- DO NOT INSTALL OPT. VIDEO AMP
- DO NOT INSTALL CC DCODE CIRCUIT (PAGE 3)
U1
TMC22190S
OPTIONAL VIDEO AMP
COPYRIGHT EVERTZ MICROSYSTEMS LTD
TITLE: COMP VIDEO ENCODER W/CLOSED CAPTION
DESC. VIDEO ENCODER
BY. I.U. ORIG. DATE. JUNE 27/96 REV. DATE. FEB 18/97
FILE: VIDENC BRD REV: B
DWG. #: 8029-30B PAGE #: 1 OF 3

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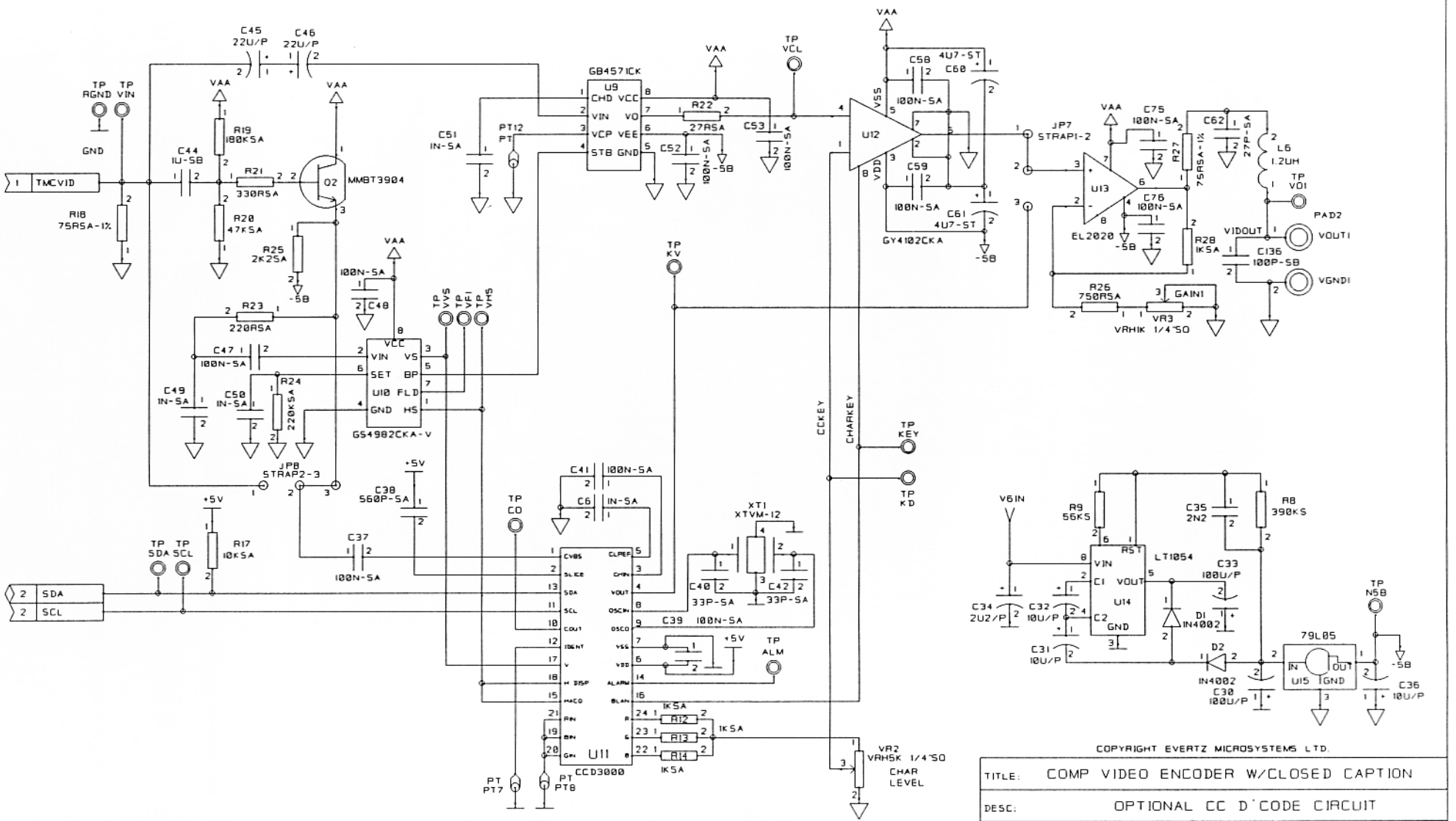
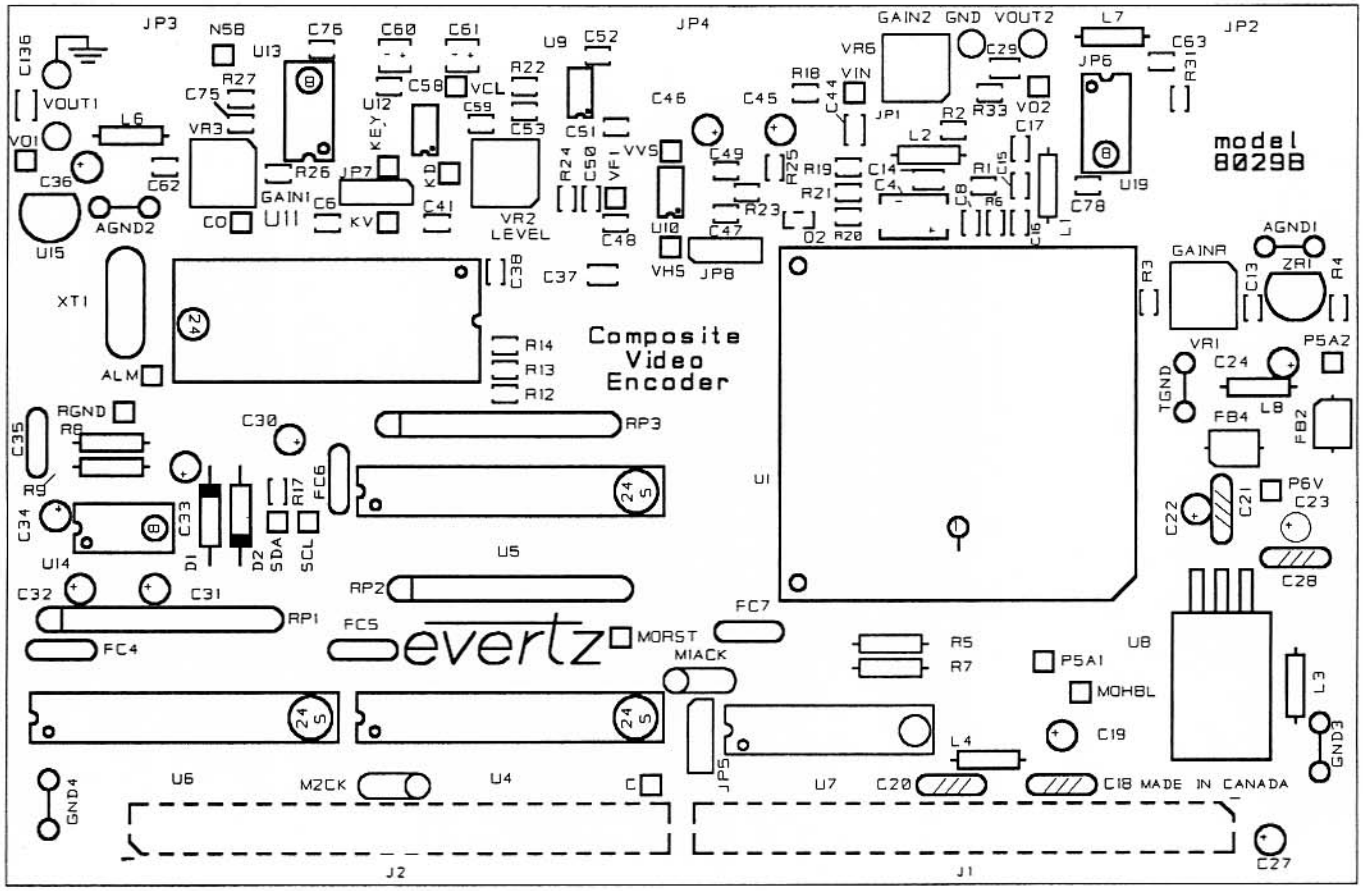
| | | | |
|---|---|---|---|
| TITLE: | COMP VIDEO ENCODER W/CLOSED CAPTION | | |
| DESC. | DIGITAL I/O & SUBMODULE HEADERS | | |
| BY: I.U. | ORIG. DATE: JUNE 27/96 | REV. DATE: FEB 18/97 | |
| FILE: DIGIO | | BRD REV: B | |
| DWG. #: 8029-31B | | PAGE #: 2 OF 3 | |



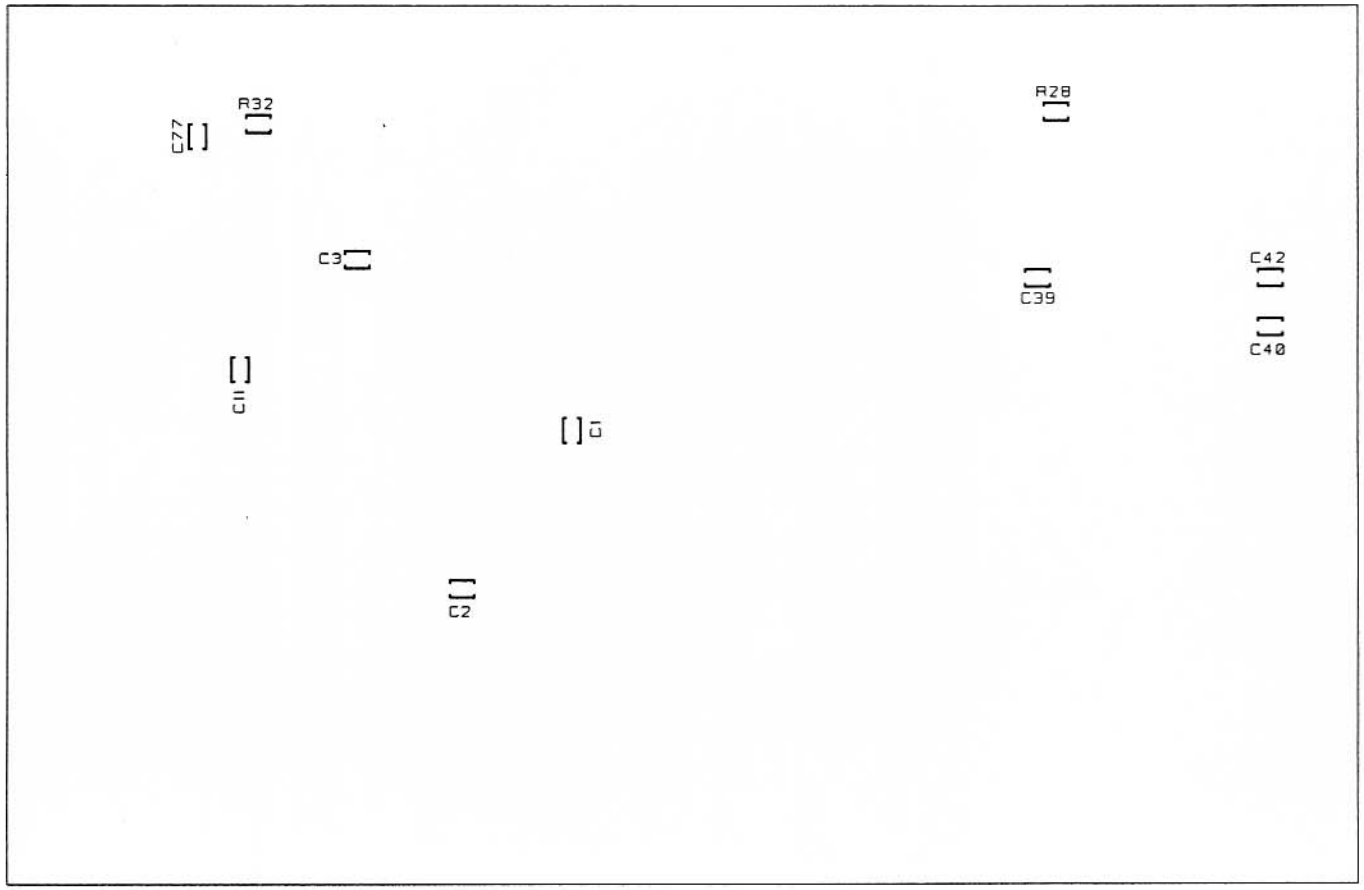



| | | | |
|---|---|---|---|
| TITLE: | COMP VIDEO ENCODER W/CLOSED CAPTION | | |
| DESC: | OPTIONAL CC D'CODE CIRCUIT | | |
| BY: I.U. | ORIG. DATE: JUNE 27/96 | | REV. DATE: FEB 18/97 |
| FILE: VIDEO_10 | | | BRD. REV: B |
| DWG. #: 8029-32B | | | PAGE #: 3 OF 3 |

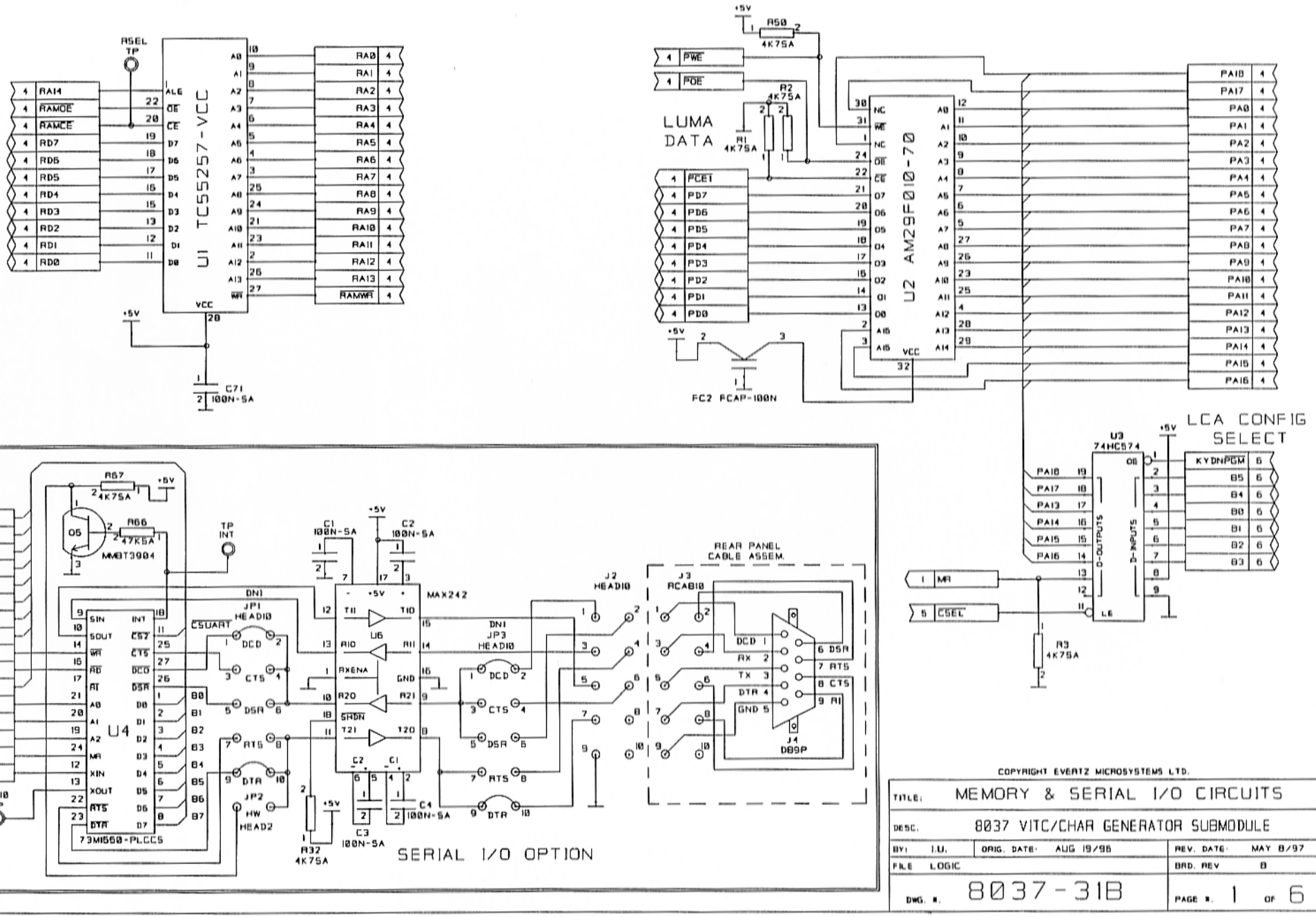



C1, C2, C3 , C11, C39, C40,C42,C77
R28 & R32 ARE MOUNTED ON BACK
OF BOARD.

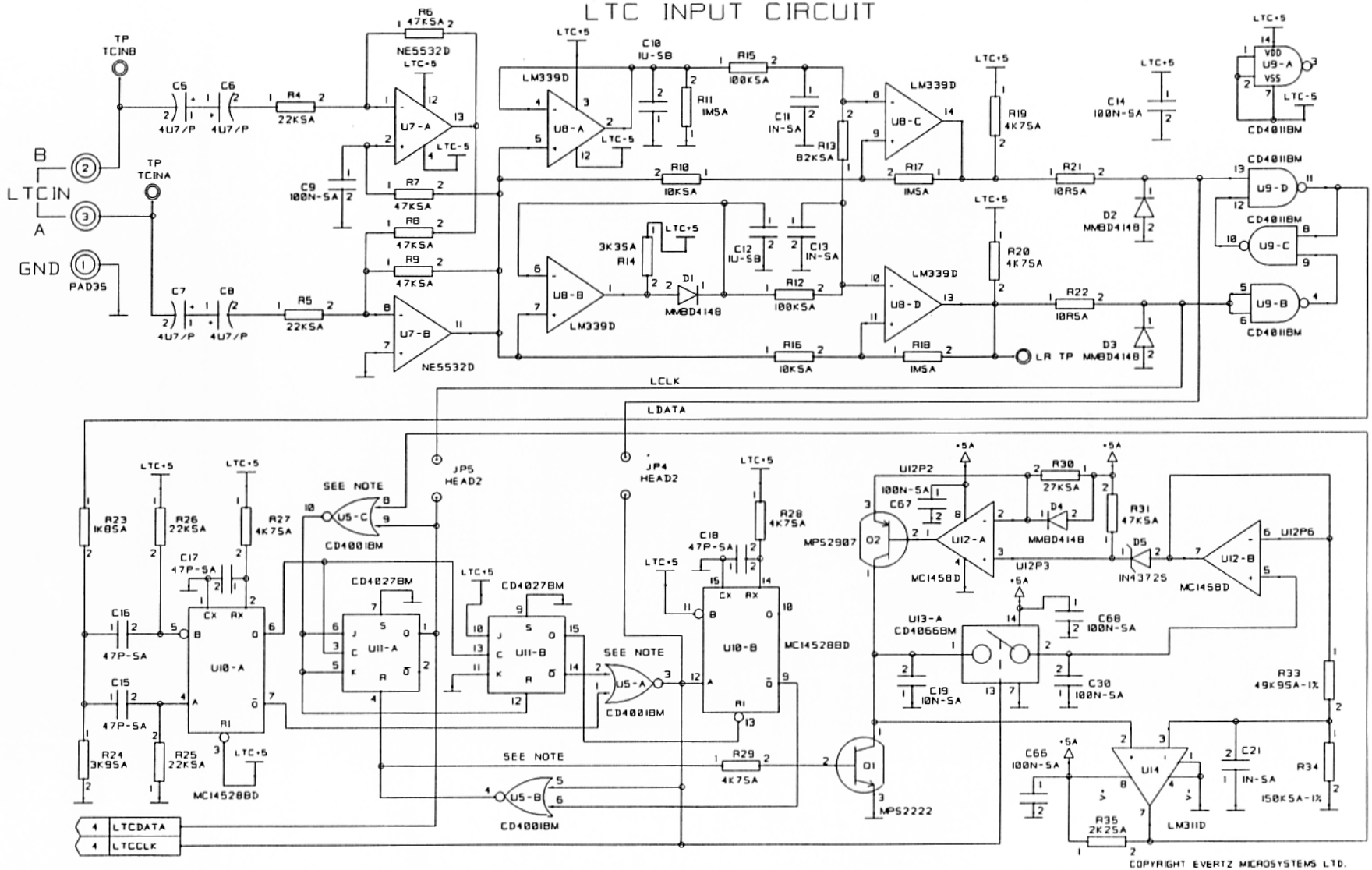
| | | |
|---|---|---|
| EVERTZ | | TITLE: MODEL 8029 COMPOSITE VIDEO ENCODER |
| TITLE : TOP COMPONENT LAYOUT | | DWN BY: I.U. / REV: B |
| DATE: JUN 28/96 | REV DATE: FEB 19/97 | DWG No.: 8029-80B |




| EVERTZ | TITLE: MODEL 8029 COMPOSITE VIDEO ENCODER | |
|---|---|---|
| TITLE : BOTTOM COMPONENT LAYOUT | DWN BY: I.U. | REV: B |
| DATE: JUN 28/96 | REV DATE: FEB 19/97 | DWG No.: 8029-818 |

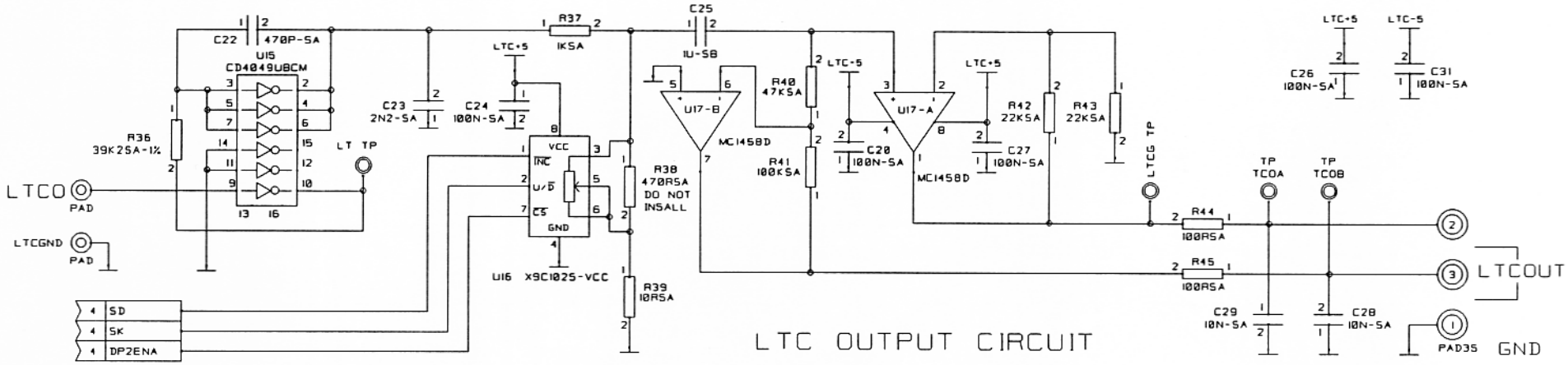

U1 TC55257-VCC
U2 AM29F010-70
U3 74HC574
U4 73M550-PLCCS
MAX242
LUMA DATA
SERIAL I/O OPTION
LCA CONFIG SELECT
REAR PANEL CABLE ASSEM.
COPYRIGHT EVERTZ MICROSYSTEMS LTD.
TITLE: MEMORY & SERIAL I/O CIRCUITS
DESC. 8037 VITC/CHAR GENERATOR SUBMODULE
BY: I.U. ORIG. DATE: AUG 19/95 REV. DATE: MAY 8/97
FILE LOGIC BRD. REV B
DWG. # 8037-31B PAGE # 1 OF 6

# LTC INPUT CIRCUIT




NOTE: U5 WHEN SERIAL I/O OPTION IS INSTALLED U5 WILL BE INSTALLED

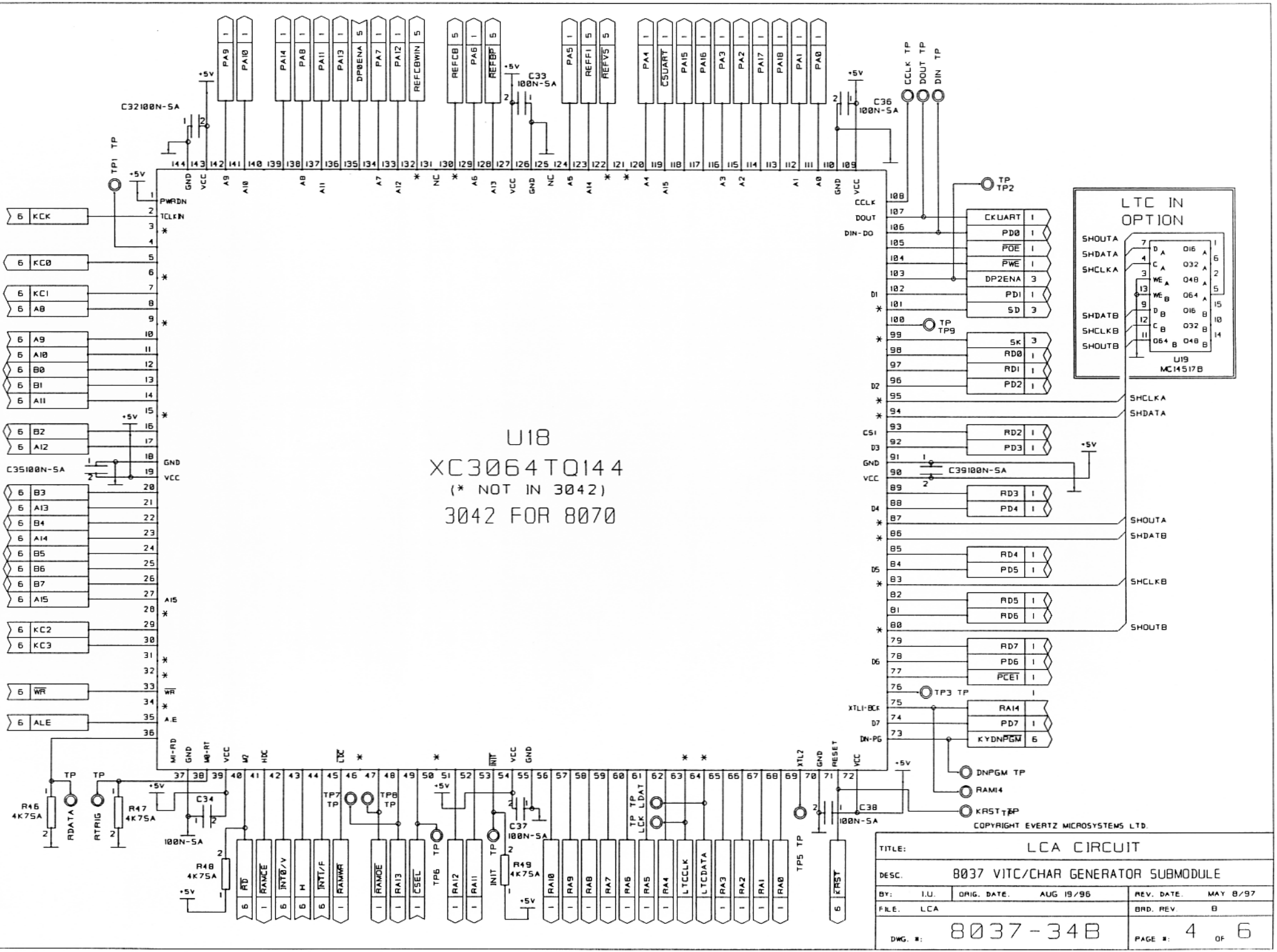
| | |
|---|---|
| TITLE: | OPTIONAL LTC INPUT CIRCUITRY |
| DESC. | 8037 VITC/CHAR GENERATOR SUBMODULE |
| BY: I.U. | ORIG. DATE: AUG 28/96 — REV. DATE: MAY 8/97 |
| FILE: LTCIN | BRD. REV. B |
| DWG # 8037-32B | PAGE # 2 OF 6 |

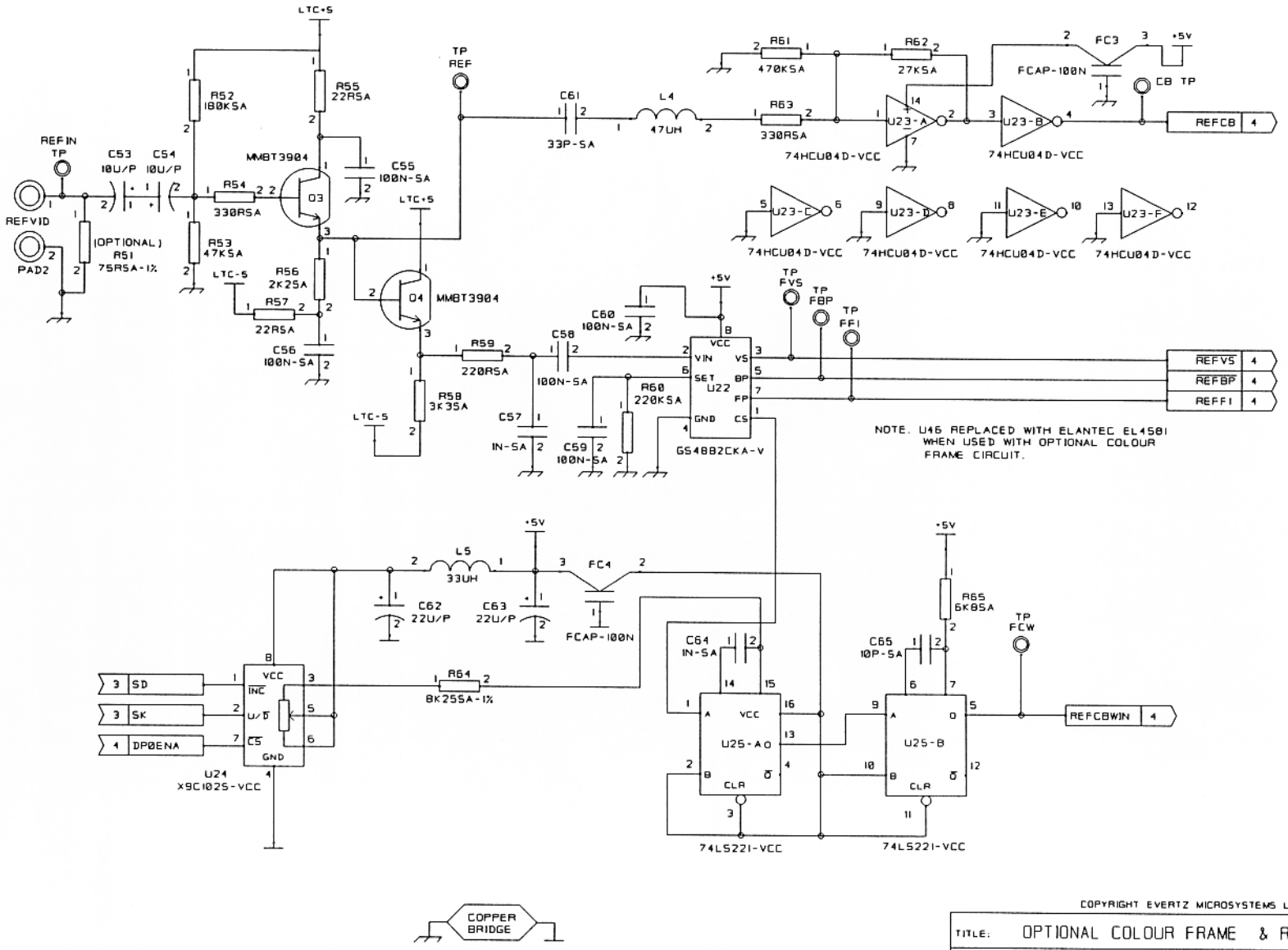



LTC OUTPUT CIRCUIT



| | | | |
|---|---|---|---|
| TITLE: | OPTIONAL LTC OUTPUT CIRCUITRY | | |
| DESC. | 8037 VITC/CHAR GENERATOR SUBMODULE | | |
| BY: I.U. | ORIG DATE: AUG 19/96 | | REV. DATE: MAY 8/97 |
| FILE LTCOUT | | | BRD. REV B |
| DWG. #. | 8037-33B | | PAGE #. 3 OF 6 |

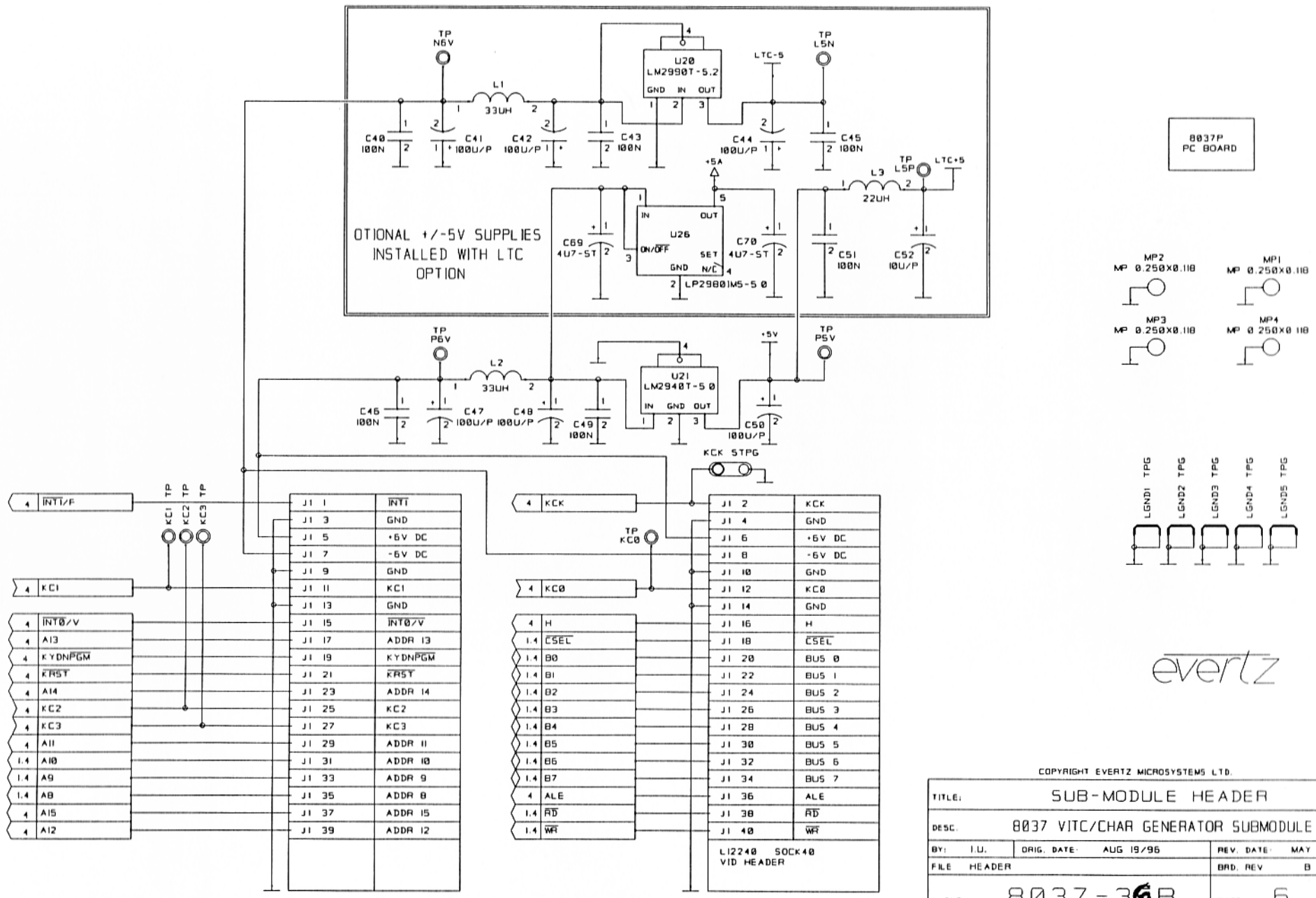

U18
XC3064TQ144
(* NOT IN 3042)
3042 FOR 8070
LTC IN OPTION
U19
MC14517B
C32100N-SA
C33 100N-SA
C36 100N-SA
C35100N-SA
C39100N-SA
C34 100N-SA
C37 100N-SA
C38 100N-SA
R45 4K75A
R47 4K75A
R48 4K75A
R49 4K75A
TP1 TP
TP2
TP3 TP
TP5 TP
TP6 TP
TP7 TP
TP8 TP
TP9
CCLK TP
DOUT TP
DIN TP
RDATA
RTRIG
INIT TP
TP LCK LDAT
DNPGM TP
RAM4
KRST TP
PWRDN
TCLKIN
WR
ALE
GND
VCC
SHOUTA
SHDATA
SHCLKA
SHDATB
SHCLKB
SHOUTB
XTLI-BCK
DIN-PG
COPYRIGHT EVERTZ MICROSYSTEMS LTD.
TITLE: LCA CIRCUIT
DESC. 8037 VITC/CHAR GENERATOR SUBMODULE
BY: I.U.
ORIG. DATE. AUG 19/96
REV. DATE. MAY 8/97
FILE. LCA
BRD. REV. B
DWG. #: 8037-34B
PAGE #: 4 OF 6




COPPER BRIDGE

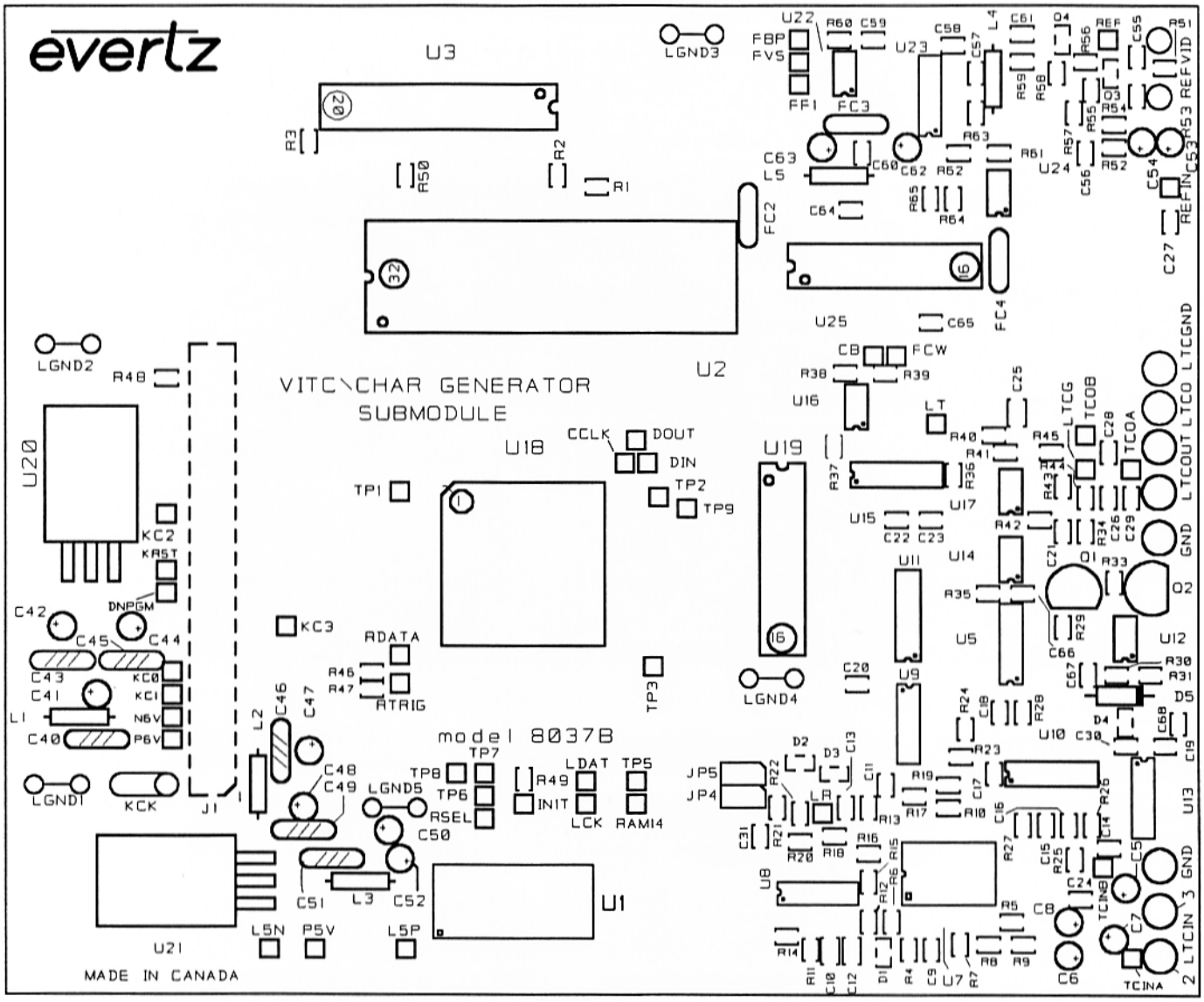


| | | | |
|---|---|---|---|
| TITLE: | OPTIONAL COLOUR FRAME & REF VIDEO CIRCUIT | | |
| DESC. | 8037 VITC/CHAR GENERATOR SUBMODULE | | |
| BY: I.U. | ORIG. DATE: AUG 19/96 | REV. DATE: | MAY 8/97 |
| FILE REF | | BRD. REV | B |
| DWG. #. 8037-35B | | PAGE #. | 5 OF 6 |

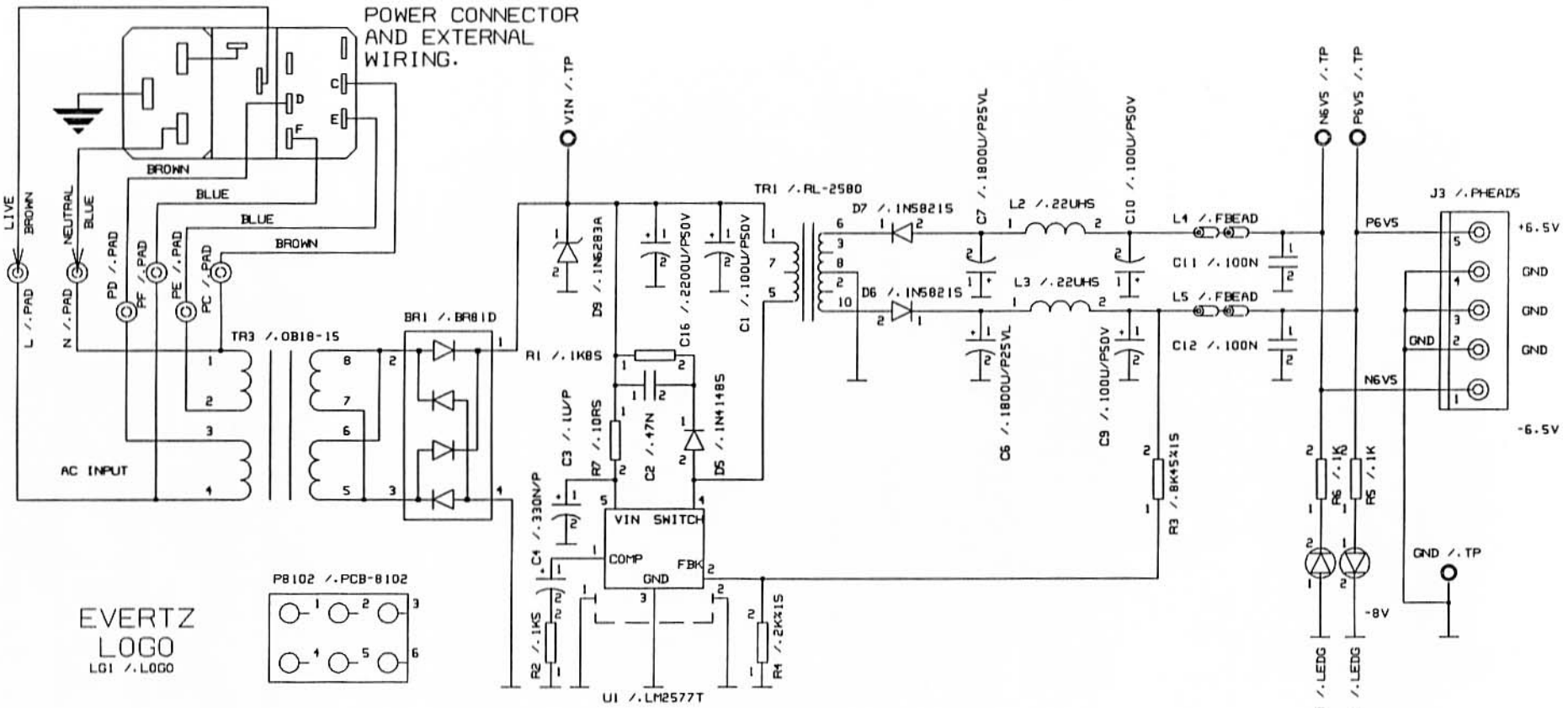





| | | | |
|---|---|---|---|
| TITLE: | SUB-MODULE HEADER | | |
| DESC. | 8037 VITC/CHAR GENERATOR SUBMODULE | | |
| BY: I.U. | ORIG. DATE: AUG 19/96 | REV. DATE: MAY 8/97 | |
| FILE HEADER | | BRD. REV B | |
| DWG. #. 8037-36B | | PAGE # 6 OF 6 | |



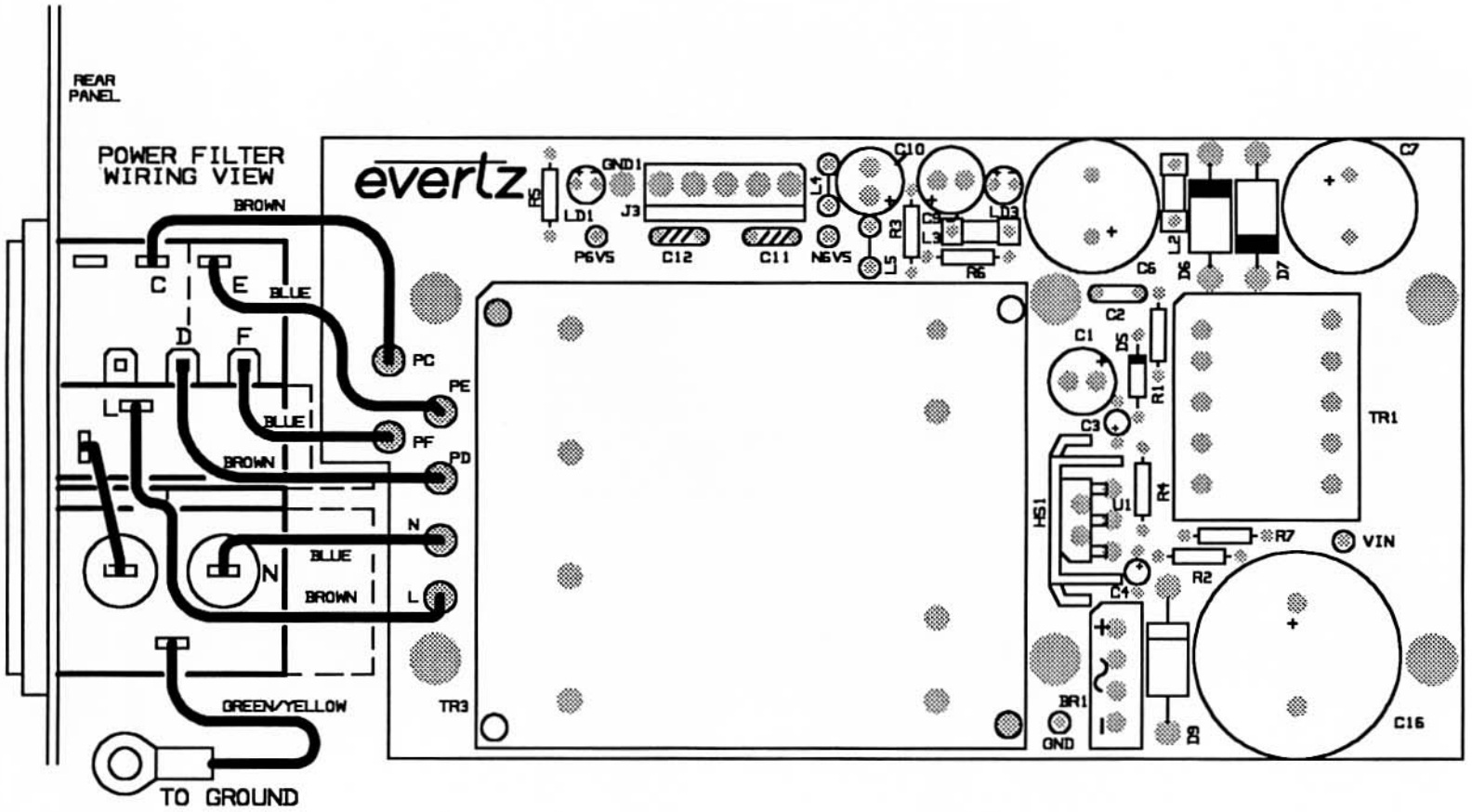

| | | | | |
|---|---|---|---|---|
| EVERTZ | BOARD NO. : MODEL 8037 VITC/CHAR GEN SUBMODULE | TITLE: MODEL 8037 COMPONENT LAYOUT FOR INSTALLATION IN 8010 | REV: B | DWN I.U. |
| | | DATE: MAY 21/97 | DWG NO. : 8037B-80 | |



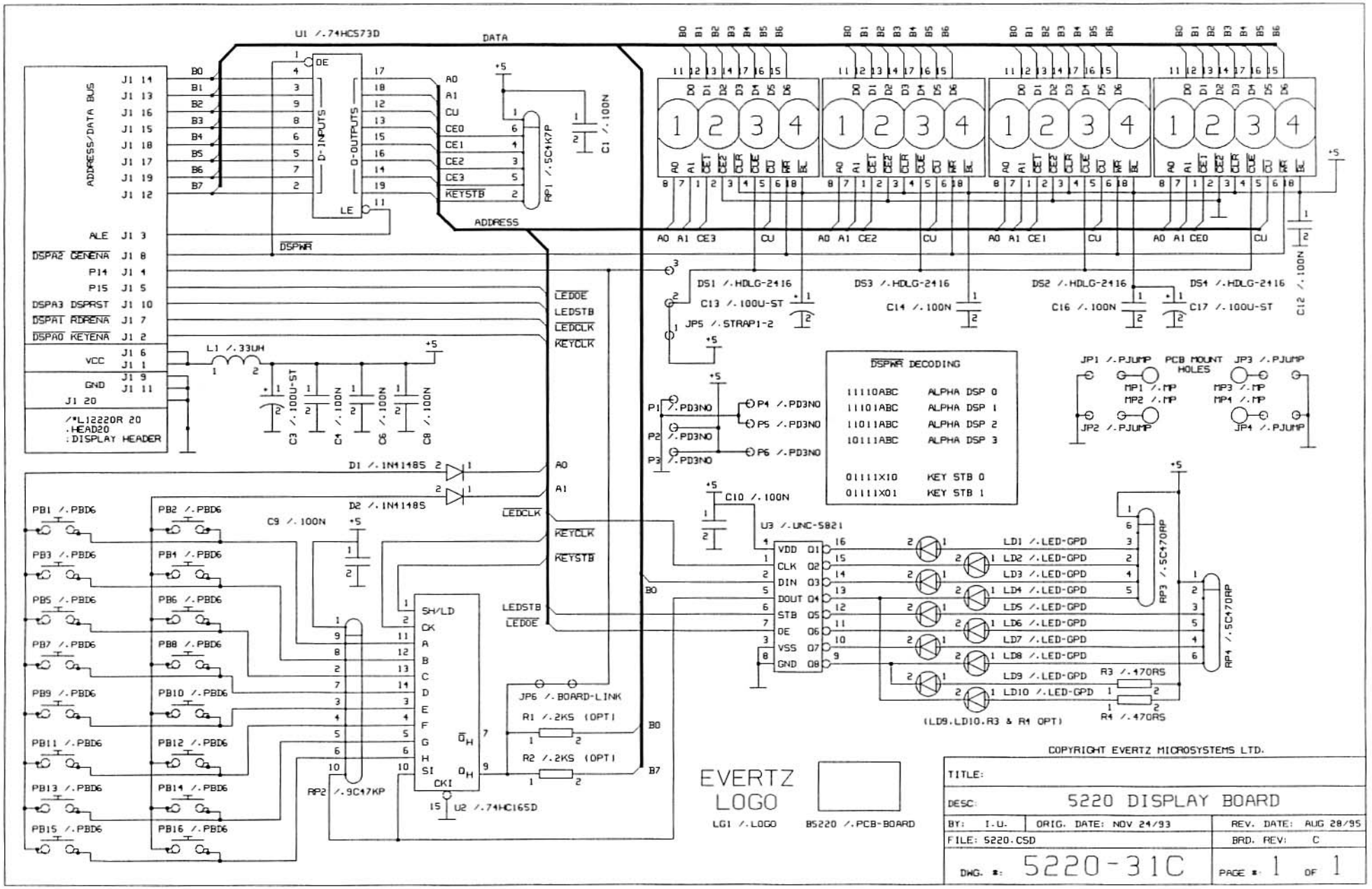

6.5V REGULATOR CIRCUIT

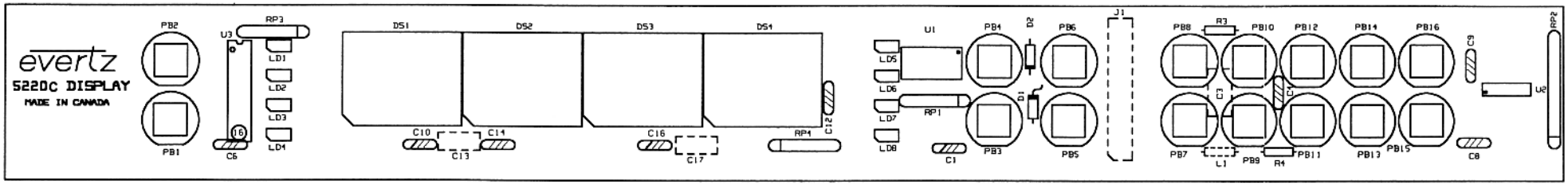


| | | |
|---|---|---|
| TITLE: | | |
| DESC: | POWER SUPPLY CIRCUIT | |
| BY: I.U. | ORIG. DATE: FEB 26/93 | REV. DATE: MAY 6/94 |
| FILE: PWR.CSD | | BRD. REV: A |
| DWG. #: 8102-31A | | PAGE #: 1 OF 1 |




| | | | |
|---|---|---|---|
| EVERTZ MOCROSYSTEMS LTD | ORIG DATE : FEB 26/93 | REV. DATE : | MAY 6/94 |
| TITLE: 8102 COMPONENT LAYOUT | BRD REV : A | DWG NO. : | 8102-80A |


U1 /.74HCS73D
DATA
ADDRESS/DATA BUS
ALE
DSPA2 GENENA
P14
P15
DSPA3 DSPRST
DSPA1 RDRENA
DSPA0 KEYENA
VCC
GND
/*L12220R 20
.HEAD20
:DISPLAY HEADER
D-INPUTS
Q-OUTPUTS
OE
LE
ADDRESS
DSPWR
RP1 /.5C47KP
C1 /.100N
L1 /.33UH
C3 /.100U-ST
C4 /.100N
C6 /.100N
C8 /.100N
DS1 /.HDLG-2416
DS3 /.HDLG-2416
DS2 /.HDLG-2416
DS4 /.HDLG-2416
C13 /.100U-ST
C14 /.100N
C16 /.100N
C17 /.100U-ST
C12 /.100N
JP5 /.STRAP1-2
LEDOE
LEDSTB
LEDCLK
KEYCLK
P4 /.PD3NO
P5 /.PD3NO
P6 /.PD3NO
DSPWR DECODING
11110ABC ALPHA DSP 0
11101ABC ALPHA DSP 1
11011ABC ALPHA DSP 2
10111ABC ALPHA DSP 3
01111X10 KEY STB 0
01111X01 KEY STB 1
JP1 /.PJUMP
PCB MOUNT HOLES
JP3 /.PJUMP
MP1 /.MP
MP2 /.MP
MP3 /.MP
MP4 /.MP
JP2 /.PJUMP
JP4 /.PJUMP
D1 /.1N4148S
D2 /.1N4148S
C9 /.100N
C10 /.100N
U3 /.UNC-5821
LD1 /.LED-GPD
LD2 /.LED-GPD
LD3 /.LED-GPD
LD4 /.LED-GPD
LD5 /.LED-GPD
LD6 /.LED-GPD
LD7 /.LED-GPD
LD8 /.LED-GPD
LD9 /.LED-GPD
LD10 /.LED-GPD
RP3 /.5C470RP
RP4 /.5C470RP
R3 /.470RS
R4 /.470RS
(LD9.LD10.R3 & R4 OPT)
PB1 /.PBD6
PB2 /.PBD6
PB3 /.PBD6
PB4 /.PBD6
PB5 /.PBD6
PB6 /.PBD6
PB7 /.PBD6
PB8 /.PBD6
PB9 /.PBD6
PB10 /.PBD6
PB11 /.PBD6
PB12 /.PBD6
PB13 /.PBD6
PB14 /.PBD6
PB15 /.PBD6
PB16 /.PBD6
RP2 /.9C47KP
U2 /.74HC165D
JP6 /.BOARD-LINK
R1 /.2KS (OPT)
R2 /.2KS (OPT)
EVERTZ LOGO
LG1 /.LOGO
B5220 /.PCB-BOARD
COPYRIGHT EVERTZ MICROSYSTEMS LTD.
TITLE:
DESC: 5220 DISPLAY BOARD
BY: I.U.
ORIG. DATE: NOV 24/93
REV. DATE: AUG 28/95
FILE: 5220.CSD
BRD. REV: C
DWG. #: 5220-31C
PAGE # 1 OF 1




| | | |
|---|---|---|
| EVERTZ MICROSYSTEMS LTD | DRIG DATE : SEP 10/96 | REV. DATE : DEC 7/95 |
| TITLE: 5010, 5150, 5300 & 8010 DISPLAY COMPONENT LAYOUT | BRD REV. C | DWG NO. : 5220-80C |