HDSD9045TR
4:4:4/HD/SD VANC Encoder

Instruction Manual

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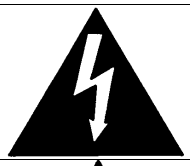
IMPORTANT SAFETY INSTRUCTIONS

	The lightning flash with arrowhead symbol within an equilateral triangle is intended to alert the user to the presence of un-insulated “Dangerous voltage” within the product’s enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.
	The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature ac-companying the product.

- Read this information.
- Keep these instructions.
- Heed all warnings.
- Follow all instructions.
- Do not use this apparatus near water.
- Clean only with dry cloth.
- Do not block any ventilation openings. Install in accordance with the manufacturer’s instructions.
- Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
- Do not defeat the safety purpose of the polarized or grounding type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong is provided for your safety. If the plug provided does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
- Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles and the point where they exit from the apparatus.
- Only use attachments/accessories specified by the manufacturer.
- Unplug this apparatus during lightning storms or when unused for long periods of time.
- Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as the power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

WARNING
TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPARATUS TO RAIN OR MOISTURE.

WARNING
DO NOT EXPOSE THIS EQUIPMENT TO DRIPPING OR SPLASHING AND ENSURE THAT NO OBJECTS FILLED WITH LIQUIDS ARE PLACED ON THE EQUIPMENT.

WARNING
TO COMPLETELY DISCONNECT THIS EQUIPMENT FROM THE AC MAINS, DISCONNECT THE POWER SUPPLY CORD PLUG FROM THE AC RECEPTACLE.

WARNING
THE MAINS PLUG OF THE POWER SUPPLY CORD SHALL REMAIN READILY OPERABLE.

INFORMATION TO USERS IN EUROPE

NOTE

This equipment with the CE marking complies with both the EMC Directive (89/336/EEC) and the Low Voltage Directive (73/23/EEC) issued by the Commission of the European Community.

Compliance with these directives implies conformity to the following European standards:

- EN60065 Product Safety
- EN55103-1 Electromagnetic Interference Class A (Emission)
- EN55103-2 Electromagnetic Susceptibility (Immunity)

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.

CE

EN60065	Safety
EN55103-1: 1996	Emission
EN55103-2: 1996	Immunity

EN504192 2005
Waste electrical products should not be disposed of with household waste. Contact your Local Authority for recycling advice

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.

Evertz Microsystems Ltd

FC

For Commercial Use

Tested to comply with FCC Standards

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

This device may cause harmful interference, and this device must accept any interference received, including interference that may cause undesired operation.

REVISION HISTORY

REVISION	DESCRIPTION	DATE
0.1	First release	Jun 07
0.2	Update Menu structure and KeyLog TRACKER™ chapter	Feb 08

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CHAPTER 1
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1. OVERVIEW

The Evertz 4:4:4/HD/SD VANC Encoder can be used in a variety of applications, such as Video Production Metadata Encoder, Film Metadata Encoder, for both 4:4:4 RGB and 4:2:2 YCbCr high definition video or 4:2:2 YCbCr standard definition video.

When operated as a Film Metadata Encoder, the HDSD9045TR is the heart of the Film post production system and is designed to simplify the management of your film to tape transfers. Under control of the powerful KeyLog TRACKER™ software, the HDSD9045TR permits the seamless integration of video and audio time codes, film KeyKode and production information whether you are transferring to 24, 25 or 30Fps high definition video. During the transfer, KeyLog TRACKER™, Evertz telecine logging and configuration management tool logs the relationships between these important parameters and outputs many industry standard interchange file formats for use by off-line editing systems. The HDSD9045TR can operate in either HDTV or SDTV mode. The HDSD9045TR provides one dual link or single link program output (characters optional) and one single link monitor output with burned in characters.

In 4:4:4 HDTV mode, the HDSD9045TR encodes the time codes, KeyKode and production information into industry standard SMPTE RP215 vertical ancillary (VANC) data packets on its dual link 4:4:4 RGB Program output. In addition, the HDSD9045TR converts the 4:4:4 RGB to a 4:2:2 YCbCr serial output with the VANC data and optional burned in characters for monitoring. In 4:2:2 HDTV mode, the HDSD9045TR encodes VANC data packets on its 4:2:2 YCbCr Program output. In addition, the HDSD9045TR has a second 4:2:2 YCbCr serial output with the VANC data and optional burned in characters for monitoring. In SDTV mode, the HDSD9045TR encodes the time codes, KeyKode and production information into industry standard SMPTE RP201 3-line VITC its 4:2:2 SDI Program output. The Monitor SDI output provides 3-line VITC and burned in characters. The programmable telecine interface allows the encoder to interface to a wide variety of telecine configurations.

When operated as a Video Production Metadata Encoder the HDSD9045TR is designed to simplify the management of your high definition video acquired production material for both 4:4:4 RGB and 4:2:2 YCbCr high definition video. Under control of the powerful KeyLog TRACKER™ software, the HDSD9045TR VANC Encoder permits the seamless integration of video and audio time codes, and production metadata such as camera, lens and dolly information, scene, take and roll numbers. During acquisition or after an editorial dubbing process, KeyLog TRACKER™ logs the essential metadata along with the relationships between the source and record time codes, and outputs many industry standard interchange file formats for use by off-line editing systems.

The HDSD9045TR encodes the time codes, production metadata into industry standard vertical ancillary (VANC) data packets on its dual link 4:4:4 RGB Program output. In addition, the HDSD9045TR converts the 4:4:4 RGB to a 4:2:2 YCbCr serial output with the VANC data and optional burned in characters for monitoring. Metadata is collected from the production environment using up to 3 serial ports or an Ethernet port.

In all HDTV modes, the user can also apply one of 5 user programmable look up tables to either output to modify the “look” of the HDTV output. Separate LTC inputs and outputs for the audio and video time codes, allows handling of mixed film rate and video rate time codes.

The VANC Encoder is often used in conjunction with the HDSD9155Q Afterburner, which is a powerful device designed to facilitate the creation of off-line tapes from the telecine or video production master tapes. The Afterburner can be operated as a high quality downconverter or as a character inserter on the native HDTV signal. As a high quality downconverter the Afterburner provides two clean

(characters optional) SDI downconverted outputs with VITC, suitable for creation of high quality viewing copies, and two SDI and one analog monitoring output with VITC and characters suitable for monitoring or creation of tapes for non-linear editing systems. When the input video is in the 1080p/24sF format the Afterburner also creates a 2:3 pulldown on the output video to create a 30 Fps output. The Afterburner automatically generates video time code for the standard definition VTR that is converted from 24 to 30 Fps, and delayed to match the complete A frame cycle of delay through the Afterburner. When outputting the native HDTV input, the Afterburner provides two clean HDSDI program outputs (with optional characters for virtual slates, etc.) and two HDSDI monitor outputs with characters burned in.

In 'film mode' the Afterburner reads the RP215 Film transfer data that was recorded in the VANC data area by the Evertz HD Film Metadata Encoder during the telecine transfer, and makes burn-in windows. When operating as a downconverter, the essential time code and KeyKode data is also converted into RP201 3-line VITC inserted on the SDTV outputs. The 2:3 cadence can be controlled from the VANC data or from the LTC. The 2:3 cadence can also be locked to an external 6 Hz reference where the Afterburner is directly reading the HD Film Metadata Encoder output.

The HDSD9045TR and HDSD9155Q can be easily configured using version 3 of Evertz popular KeyLog TRACKER™ software (included). The Tracker graphical software allows the user to store multiple configurations for the Film Metadata Encoders and the Afterburners. A simple on screen control in the Tracker software performs switching between 4:4:4 and 4:2:2 HDTV and SDTV modes. Toolbar buttons allow the user to quickly choose which device is being addressed. For stand-alone applications these devices can also be controlled from the local front panel using the built-in on screen menu system. The new version 3 of Evertz popular KeyLog Tracker software allows the user to store multiple configurations for both the HDSD9045TR and HDSD9155Q and is compatible with most of the previous generations of Evertz film Footage Encoders and Afterburners.

HDSD9045TR Features:

HDTV Video Inputs:

- Accepts 1.485 Gb/s SMPTE 292M or dual link SMPTE 372M 1080i/59.94, 1080i/50, 1080p/29.97sF, 1080p/25sF, 1080p/24sF, 1080p/23.98sF serial digital video
- Encodes film transfer information or production metadata in SMPTE RP215 VANC packets – programmable insertion line
- Converts dual link 4:4:4 RGB SMPTE 372M to 4:2:2 SMPTE 292M with user programmable colour look up tables
- Character burns and VANC available on Program and Monitor outputs – can be independently turned on and off
- 5 user programmable Look-up tables to modify the "look" of the HDTV output

SDTV Video Inputs:

- Accepts 270 Mb/s SMPTE 259M-C 525i/59.94 and 625i/50 SDTV serial digital video
- Encodes film transfer information in SMPTE RP201 3-line VITC – programmable insertion lines
- Character burns and 3-line VITC available on Program and Monitor outputs – can be independently turned *ON* and *OFF*

General

- Interfaces to Evertz 5550 or 5500 KeyKode Reader in Telecine Mode
- Interfaces to Fujinon lenses and other metadata collection devices using RS-232 ports or Ethernet in Field Acquisition mode
- Separate LTC reader and generator for video and audio time codes operating at 30, 25 and 24 Fps
- Embedded audio from input inserted on Program and Monitor outputs
- Built-in signal generator to aid in verifying signal path during installation
- Selectable outputs on loss of input video – blue or black with or without characters, or pass input.
- Control from integrated front panel using On screen display menus for stand-alone applications
- Control from Evertz KeyLog TRACKER™ version 3.1 or later using RS-232 or Ethernet connection
- Multiple units can be ganged together using Ethernet – provides a simple way of configuring multiple units (e.g. multi- camera applications) to the same settings.
- Up to 33 character windows separately positional, which can be displayed continuously or on virtual slate trigger
- 3 user programmable text character windows for content ownership protection, facility name, etc.
- Two character sizes and double height character windows enhance visibility of important information

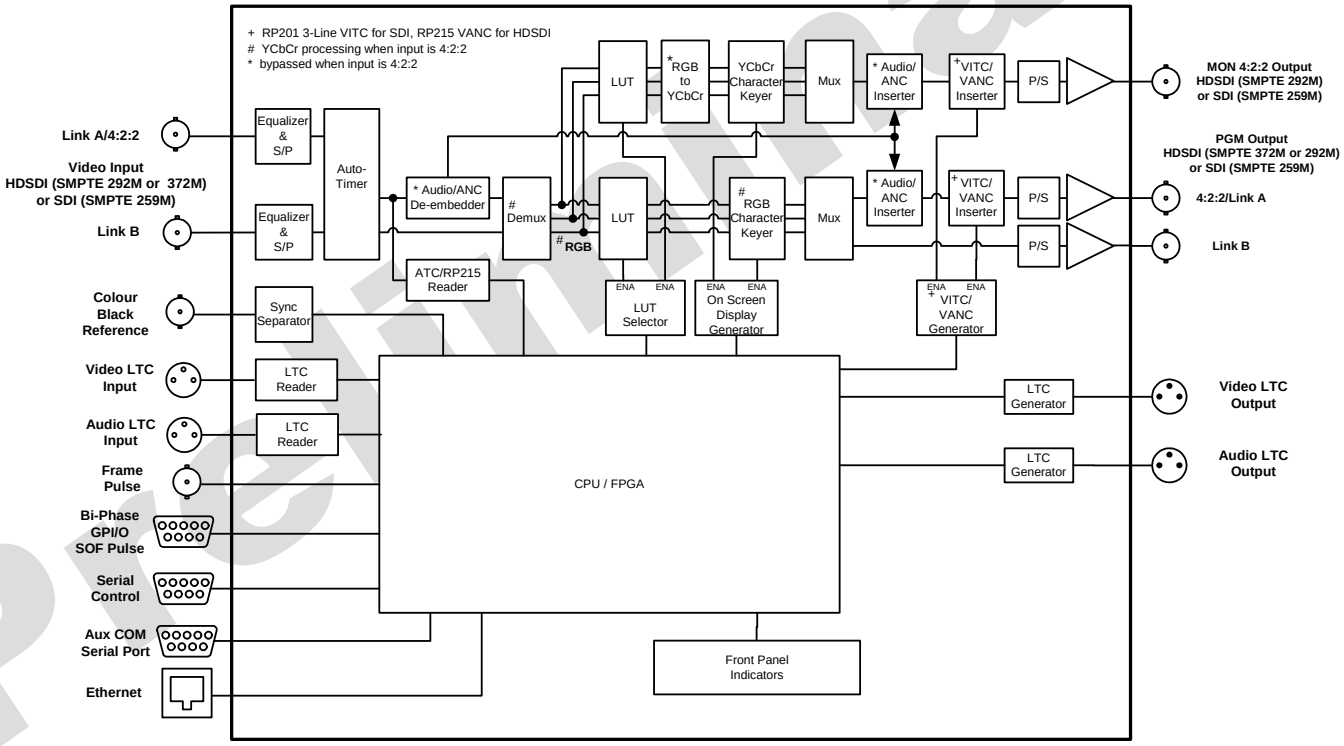

Figure 1-1: Block Diagram

1.1. HOW TO USE THIS MANUAL

This manual is organised into six chapters: Overview, Installation, Front Panel Operation, Configuring using KeyLog Tracker™, System Parameters, and Technical Description. The overview section contains a brief overview of the HDSD9045TR operation and features, a tutorial on 2:3 pulldown and a glossary to define concepts and terms used throughout the remainder of the manual. We highly recommend taking the time to become familiar with the terms and concepts described here before proceeding into the rest of the manual.

Chapter 2 provides a detailed description of the rear panel connectors, and how the HDSD9045TR should be connected into your system.

Chapter 3 provides a detailed description of the operation of the HDSD9045TR using the front panel controls, starting with an overview of the pushbuttons and panel indicators. It includes a complete description of the *ON* screen menu system.

Chapter 4 provides details on installing and connecting the KeyLog TRACKER™ software and a discussion of how to operate the HDSD9045TR in creating telecine masters. Chapter 4 also shows how to calibrate the system timing and verify that the HDSD9045TR is accurately numbering the video frames.

Chapter 5 provides a discussion of how the default operation of the HDSD9045TR can be changed using System Parameters. The system parameters can affect the system timing through the Afterburner, placement of characters on the raster, 2:3 cadence control, functions of parallel inputs and outputs to name a few.

Chapter 6 lists the specifications, gives a discussion of how to update the firmware in the HDSD9045TR and also gives a troubleshooting section with an overview of the Debug character windows available.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important safety related operating and maintenance (servicing) instructions in the literature accompanying the product.

This symbol is intended to alert the user to important operating instructions.

1.2. 2:3 PULLDOWN CREATION FROM 24P VIDEO

When an input video feed of 1080p/23.98sF is fed to the HD Afterburner, it inserts extra fields to create a 2:3 pulldown of the picture on the downconverted output resulting in a 525i/59.94 output. Determination of the output sequence of the fields is determined from a 6 Hz input pulse on the HD Afterburner parallel I/O connector, or from ancillary or LTC time code if it is present. Figure 1-2 shows the process of creating the 2:3 pulldown from the progressive video input.

A 6 Hz pulse applied to the HD Afterburner will normally identify the input frame that will become an A frame at the output (called the *A frame candidate*). This 6 Hz pulse must be coincident with the start of an input frame and can be generated using the Evertz 7700SRG-HD Slave Reference Generator

module. The output of the *A frame candidate* frame will start four input frames later and will consist of two video fields.

In the absence of a 6 Hz input, video time code derived from film ancillary data present on the video input or LTC on the Video Time code In connector of the HD Afterburner can be used to control the pulldown cadence. Input video frames with frame numbers divisible evenly by 4 will normally identify the input frame that will become an A frame at the output (the *A frame candidate*). The output of the *A frame candidate* frame will start four input frames later and will consist of two video fields.

The 4 input frame (5 output frame) delay through the HD Afterburner ensures that A frames on the output are aligned with A frame candidates on the input. The HDSD9155Q Afterburner automatically reinserts the embedded audio from the input onto the delayed downconverted output, however this delay must be compensated for when calibrating the edit timing for the Standard definition VTR.

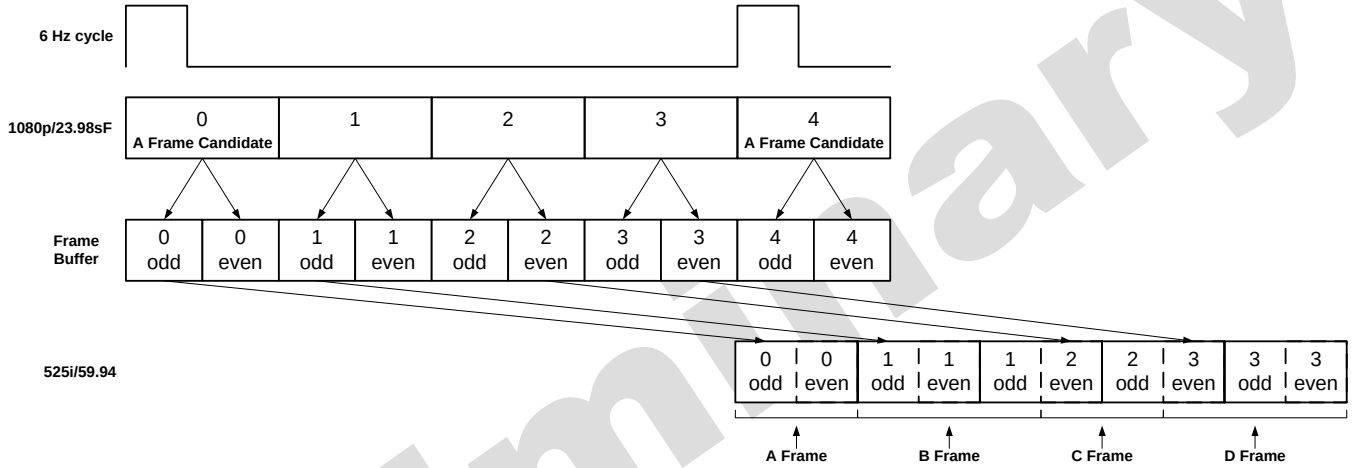

Figure 1-2: 3:2 Pulldown Creation

1.3. DEFINITIONS

2K: A Film image scanned into a computer file at a resolution of 2048 horizontal pixels.

2K: (DaVinci 2K) A colour corrector manufactured by DaVinci Systems. This colour corrector usually is accompanied with a TLC Edit Controller.

2:3 PULLDOWN: Film is typically viewed at 24 frames per second (Fps) while NTSC video is viewed at 30 Fps. To compensate for this difference in the frame rates, telecines use a 2:3 pulldown. Since each video frame is comprised of two video fields, video is viewed at 60 fields per second. Telecines can transfer 24 film frames to 60 video fields (30 video frames). The resulting ratio is 24:60 or 2:5, which means 2 film frames every 5 video fields. The 2:3 implies that one of the film frames is transferred to 2 video fields, the following film frame is transferred to 3 video fields, and so on.

24p: A progressively scanned high definition video format with 1920 pixels and 1080 lines. (See also description sF.)

3 Line VITC: A SMPTE recommended practice (RP201) for encoding Video and Audio time code and KeyKode information into the vertical interval of a standard definition video signal. This

method of encoding the information is intended for use in post-production as a means of conveying the essential address elements that define the film to tape transfer. The encoded data is contained in a block of three consecutive lines of the vertical interval. The first line contains the video time code, the second line contains the KeyKode information, and the third line contains the audio time code.

4K: A Film image scanned into a computer file at a resolution of 4096 horizontal pixels. 4K is considered to be a full-resolution scan of 35mm film.

4 Fsc: Composite Digital video as used in D2 and D3 VTRs. Stands for 4 times the Frequency of Subcarrier, which is the sampling rate used.

4:2:2 The sampling ratio used in the D1 (CCIR 601) digital video signal. For every 4 samples of luminance there are 2 samples each of R-Y (Red minus Luminance) and B-Y (Blue minus luminance).

4:4:4 A sampling ratio that has equal amounts of the luminance and both chrominance channels.

16x9: A wide screen television format in which the aspect ratio of the screen is 16 units wide by 9 high as opposed to the 4x3 of normal TV.

A-Frame Edit: A video edit which starts on the first frame of the 5 video frame (4 film frame) sequence created when 24 frame film is transferred to 30 frame video (see 3:2 pulldown). The A-frame is the only frame in the sequence where a film frame is completely reproduced on one complete video frame. Here is the full sequence. (The letters correspond to film frames.) A-frame = video fields 1&2 (AA), B-frame = video fields 1&2&1 (BBB), C-frame = video fields 2&1 (CC), D-frame = video fields 2&1&2 (DDD).

AES/EBU: (Sometimes abbreviated as AES) Refers to the digital audio standard (AES3-1992) set by the Audio Engineering Society and European Broadcast Union and used by most forms of digital audio from CDs to professional digital video.

Aspect Ratio: The ratio of width to height in a picture. Theatre screens generally have an aspect ratio of 1.85 to 1, widescreen TV (16x9) is 1.77 to 1, and normal TV (4x3) is 1.33 to 1.

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: Acronym for British Naval Connector or Bayonet Nut Connector or Bayonet Neill Concelman - a coaxial cable connector used extensively in professional television systems. These connectors have a characteristic impedance of 75 ohms and are standardised by the IEC 169-8 standard.

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 organisation is now known as ITU.)

CCIR-601: See ITU-R601.

CCIR-656 (This document now known as ITU-R656). The physical parallel and serial interconnect scheme for ITU-R601. CCIR-656 defines the parallel connector pinout 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 when 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 can no longer be interpreted correctly, and the picture will be totally unrecognisable.

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. CCIR-656 and SMPTE 125M specify the parallel interface.

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 ITU-R601 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.

D5: A component digital video recording format that uses data conforming to the ITU-R601 standard. Records on 1/2" magnetic tape.

HD-D5: A component digital video recording format that uses data conforming to the ITU-R709 standard. Records on 1/2" magnetic tape.

D-VITC: Digital Vertical Interval Time Code. A digitised version of SMPTE 12M-1 VITC standardised by SMPTE 266M that is used on 4:2:2 standard definition serial digital signals. See also SMPTE 12M-1

DARS: (Digital Audio Reference Signal) A reference signal conforming to the format and electrical specification of the AES3-1992 standard, but often has only the preamble active. This signal is used for synchronization in digital audio studio applications. The recommended practice AES11-1997 gives further information on the use of a DARS reference.

dB - A symbol indicating that a measurement is made using a logarithmic scale similar to that of the decibel (see below) in that a difference of 10 dB- corresponds to a factor of 10. In each case, the actual measurement is compared to a fixed reference level r and the "decibel" value is defined to be 10 log10(a/r). Many units of this kind have been used and only a few of the more common ones are mentioned in the next entries. In each case the dB symbol is followed by a second symbol identifying the specific measurement. Often the two symbols are not separated (as in "dBA"), but the Audio Engineering Society recommends that a space be used (as in "dB A").

dB FS: Abbreviation for "decibels full scale," a unit of power as measured by a digital device. A digital measurement has a maximum value M depending on the number of bits used. If the actual power measurement is p, the dB FS value displayed is 20·log10(p/M) dB FS. Since p cannot exceed M, this reading is always negative.

dB m, dB W: Logarithmic units of power used in electronics. These units measure power in decibels above the reference level of 1 milliwatt in the case of dB m and 1 watt in the case of dB W. A power of n watts equals 10 log n dB W; conversely, a power of p dB W equals 10(p/10) watts. The same formulas link dB m to milliwatts. An increase of 10 dB m or 10 dB W represents a 10-fold increase in power. Since 1 watt = 1000 milliwatts, 0 dB W = 30 dB m.

dB u: A logarithmic unit of power, similar to dB m but computed from voltage measurements. The reference level is 0.775 volts, the voltage which generates a power of 1 milliwatt across a circuit having an impedance of 600 ohms. A voltage of V volts corresponds to a power of 20·log10(V/0.775) dB u.

decibel (dB): A customary logarithmic measure most commonly used (in various ways) for measuring sound. The human ear is capable of detecting an enormous range of sound intensities. Furthermore, our perception is not linear. Experiment shows that when humans perceive one sound to be twice as loud as another, in fact the louder sound is about ten times as intense as the fainter one. For this reason, sound is measured on logarithmic scales. Informally, if one sound is 1 bel (10 decibels) "louder" than another, this means the louder sound is 10 times louder than the fainter one. A difference of 20 decibels corresponds to an increase of 10 x 10 or 100 times in intensity. The beginning of the scale, 0 decibels, can be

set in different ways, depending on exactly which aspect of sound is being measured. Also see dB- (above).

Drop frame: In NTSC systems, where the frame rate is 29.97002618 frames per second, the drop frame mode permits time of day indexing of the frame numbers by dropping certain frame numbers. Specifically, frames 0, and 1 at the beginning of each minute except minutes 0,10,20,30,40, & 50, are omitted, to compensate for an approximate timing error of 108 frames (3 seconds 18 frames) per hour. A flag bit is set in the time code to signal when the drop frame mode is in effect.

EBU (European Broadcasting Union): An organisation 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 that was in turn derived from ITU-R601.

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 check words 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 check word, and the third is used to evaluate ancillary data integrity. The check words and flags are combined into a special error-detection data packet that is included as ancillary data in the serial digital signal.

Embedded Audio: digital audio is multiplexed onto a serial digital video data stream according to the SMPTE 272m (standard definition) or SMPTE 299m (high definition) standards.

Edge Number: The manufacturers of motion picture film stock print a frame identifying number along the edge of the film, during the manufacturing process. These numbers, also known as KEY NUMBERS, occur at one foot, or half-foot intervals, hence they have also become known as footage numbers. The film frames between the edge numbers are identified by interpolation from one edge number to the next. (Also see KeyKode)

Traditionally, these numbers have been only human-readable. The task of properly identifying the correct number is somewhat tedious, and prone to error, so much care must be taken in establishing the reference frame's number.

Gen lock: In order to derive the 6 Hz relationship between 23.98 Fps and 29.97 Fps frame boundaries, and to ensure that the time code to 6 Hz relationship is fixed, an NTSC colour black video reference must be supplied to the Film Metadata Encoder. Normally, the gen lock signal is the colour black system reference to which the 24p tri-level sync generator is gen locked. The gen lock reference is only necessary when the system video type is 1080p/23.98sF.

HANC: Horizontal Ancillary Data. Ancillary data recorded into the horizontal blanking portion (from EAV to SAV) of all lines a serial digital signal. Examples of data stored in this area includes SMPTE 272M and 299M Embedded audio, RP188 Ancillary Time Code.

HDSDI: High Definition Serial Digital Interface - a standardised interface for transmitting high definition digital television signals using a coaxial cable in serial form. Often used informally

to refer to the 4:2:2 sampled high definition serial digital television signals as specified in SMPTE 292M.

Ink Number: An identifying number is stamped along the edge of the work print and the associated magnetic audio stock. These numbers, also known as ACMADE NUMBERS, occur at one foot intervals; hence they have also become known as footage numbers. The film frames between the edge numbers are identified by interpolation from one edge number to the next.

These Ink Numbers are typically used to keep the picture and sound in sync throughout the work print conforming process.

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: An international standard for standard definition component digital television from which was derived SMPTE 125M and EBU 3246-E standards. ITU-R601 defines the sampling systems, matrix values and filter characteristics for Y, B-Y, R-Y and RGB component digital television signals.

ITU-R709: An international standard for High definition component digital television from which was derived SMPTE 274M and SMPTE 296M standards. ITU-R709 defines the sampling systems, matrix values and filter characteristics for Y, B-Y, R-Y and RGB component digital television signals.

Jam sync: Refers to the operation of slaving the generator to data coming from the reader. Jam sync should be used when dubbing 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.

In the jam sync mode, the generator and reader times are compared with each other during each frame, automatically compensating for the decoding offsets. If for any reason they are not equal, the jam is bypassed, and the next frame number is substituted by the generator. If the number of consecutive jam bypass errors exceeds 5, the last valid reader time is jammed into the generator again. In the absence of valid reader data within the last 5 frames, the generator continues to increment normally until valid reader code resumes. At this time it will be re-jammed to the reader, thus repairing large dropouts on the reader tape.

KeyKode: Machine readable bar-coded edge numbers introduced by Eastman Kodak in 1988, and subsequently standardised for all film manufacturers by the Society of Motion Picture and Television Engineers as SMPTE 254M (35mm), SMPTE 271M (16mm), SMPTE 270M (65mm – 80 perf repetition) and SMPTE 313M (65mm – 120 perf repetition). AGFA refers to it as BAR Code, and FUJI as MR Code. For the sake of consistency throughout this manual we shall refer to it as KeyKode.

Key Info: (also called KeyKode Prefix) The part of the KeyKode number that does not fit into the user bits of time code. The Key Info data normally consists of the film manufacturer ID, the film emulsion letter, and the first six KeyKode digits.

Letterbox: Placing a wide screen image on a conventional TV by placing black bands at the top and bottom of the screen.

LTC: (Linear Time Code or Longitudinal Time Code) This time and address control signal standardised by SMPTE 12M-1 has been in widespread use in the professional video and audio industries since 1975. It is typically written on a time code or address track of a video recorder and provides an individual frame number for each video frame recorded. Each 80 bit code word is associated with one television frame, and consists of 26 time bits, 6 flag bits, 32 user bits and 16 sync bits. This time code may run at 24, 25 or 30 frame counts per second depending on the video format. LTC is also commonly used to distribute time of day information to wall clocks, automation systems and other devices throughout a television facility. In regions of the world using the NTSC or similar non-integer (1/1.001) frame rates, LTC locked to the video frame rate does not maintain accurate time and must be corrected regularly when it is used convey time of day information. (See DROP FRAME, SMPTE 12M.)

NTSC: National Television Standards Committee established the television and video standard in use in the United States, Canada, Japan and several other countries. NTSC video consists of 525 horizontal lines at a field rate of approximately 60 fields per second. (Two fields equal one complete Frame). Only 487 of these lines are used for picture. The rest are used for sync or extra information such as VITC and Closed Captioning.

PAL: Phase Alternating Line. The television and video standard in use in most of Europe. Consists of 625 horizontal lines at a field rate of 50 fields per second. (Two fields equal one complete Frame). Only 576 of these lines are used for picture. The rest are used for sync or extra information such as VITC and Teletext.

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*.

Prefix: The edge numbers are usually composed of a group of digits that remain constant throughout the length of the roll, and a count number, which increments every foot or half foot. The constant numbers, are referred to as the prefix. The count numbers are referred to as the footage number.

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.

RP 168: The SMPTE Recommended Practice for the definition of the vertical interval switching point for synchronous video switching. This recommended practice also defines a default alignment between standard definition and high definition synchronizing pulse signals.

RP 188: The SMPTE Recommended Practice for transmitting time code in the ancillary data space of serial digital television signals. This document was replaced by SMPTE 12M-2 in 2007. See SMPTE 12M-2

RP201: The SMPTE recommended practice for encoding film transfer information into standard definition video signals (see 3 Line VITC).

RP215: The SMPTE recommended practice for encoding film transfer information into vertical ancillary data space for high definition video signals (VANC).

SERIAL DIGITAL (SDI): (Serial Digital Interface) A standardised interface for transmitting digital television signals using a coaxial cable in serial form. Often used informally to refer to the 4:2:2 sampled standard definition serial digital television signals as specified in SMPTE 259M.

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

SMPTE 12M-1: The SMPTE standard for Time and address code. Formerly known as SMPTE 12M, SMPTE12M-1 was revised in 2007 and defines the parameters required for both linear (LTC) and vertical interval (VITC) time codes.

SMPTE 12M-2: The SMPTE standard for transmitting time code in the ancillary data space of serial digital television signals. This document was previously a recommended practice (RP188) and was revised and became a standard in 2007.

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 170M: The SMPTE standard for the NTSC Composite Analogue Television signals.

SMPTE 259M: The SMPTE standard for 525 and 625 line serial digital component and composite interfaces.

SMPTE 272M: The SMPTE standard for embedding audio in serial digital standard definition (SMPTE 259M) video signals.

SMPTE 274M: The SMPTE standard for bit parallel digital interface for high definition component video signals with an active picture of 1080 lines x 1920 pixels. This standard defines the sampling and raster structure for Interlaced, progressive and segmented frame images for 4:2:2 YCbCr and 4:4:4 YCbCr and RGB colour spaces.

SMPTE 291M: The SMPTE standard for ancillary data packet formatting in serial digital video signals.

SMPTE 292M: The SMPTE standard for 1.5 Gb/s high definition serial digital component interfaces.

SMPTE 296M: The SMPTE standard for bit parallel digital interface for high definition component video signals with an active picture of 720 lines x 1280 pixels.

SMPTE 299M: The SMPTE standard for embedding audio in serial digital high definition (SMPTE 292M) video signals.

SMPTE 372M: The SMPTE standard for dual link 1.5 Gb/s serial digital high definition video interfaces.

sF: (Also known as *segmented frame)* The picture is progressively scanned, however divided into two *segments*, containing the odd and even lines. The segments are then sent out the serial digital interface in the same way that the fields of an interlaced video signal are. This format is often used at nominal frame rates of 24, 25 or 30 frames per second.

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.)

User bits: 32 bits in the time code are user assignable. They typically are used to contain reel numbers, scene and take numbers, or other user-oriented data.

VANC Vertical Ancillary Data. Ancillary data recorded into the active portion (from SAV to EAV) of lines during the vertical blanking region of a serial digital signal. Examples of data stored in this area includes RP215 Film Ancillary Data, SMPTE 334M Closed captions, SMPTE 2016 Active format Descriptor (AFD) and Pan-Scan, RP 2020 Audio Metadata to name a few.

VITC: **(Vertical interval time code)** A digital code used for timing and control purposes on video tape which is recorded in the vertical blanking interval of the standard definition video picture, and is referred to as VITC. Each 90 bit code word is associated with one television field, and consists of 26 time bits, 6 flag bits, 32 user bits, 18 sync bits, and an 8 bit error check (CRC) code. See also SMPTE 12M-1.

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CHAPTER 2
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Tables

2. INSTALLATION

2.1. REAR PANEL OVERVIEW

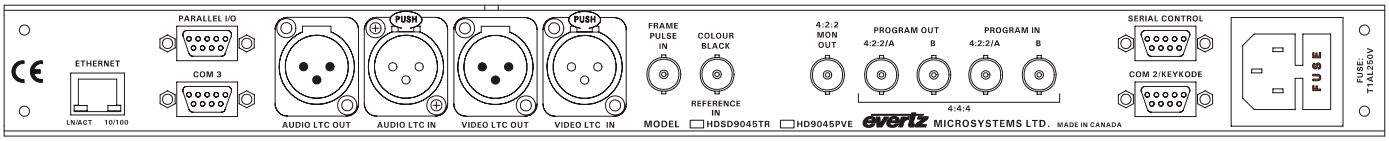


Figure 2-1: HDSD9045TR Rear Panel

Figure 2-1 shows the various connectors on the HDSD9045TR. Sections 2.1.1 to 2.1.12 describe the specific video, time code, and serial port signals that should be connected to the HDSD9045TR.

2.1.1. High Definition Video Connections

The HDSD9045TR is capable of working with the high definition video formats shown in Table 2-6. You must configure the video input type using the KeyLog Tracker™ software or using the Video Type menu item.

PROGRAM IN: The **A/4:2:2** BNC is for connecting the A link of dual link 10-bit 4:4:4 RGB serial digital video signals, compatible with the SMPTE 372M standard. The **B** BNC is for connecting the B link of dual link 10-bit 4:4:4 RGB serial digital video signals. If you are using 4:2:2 serial digital video signals compatible with the SMPTE 292M standard, connect them to the **A/4:2:2** BNC. When using 4:2:2 video the **PROGRAM IN B** BNC is not used.

PROGRAM OUT: These two BNC connectors are the program output of the HDSD9045TR and contain the input serial digital video signals with the VANC metadata packets and optional characters inserted. If you are using dual link 10-bit 4:4:4 RGB serial digital video signals, the **A/4:2:2** BNC contains the A link and the **B** BNC contains the B link. If you are using 4:2:2 serial digital video signals compatible with the SMPTE 292M standard, the **A/4:2:2** BNC contains the 4:2:2 program output. When using 4:2:2 video the **PROGRAM OUT B** BNC is not used.

4:2:2 MON OUT: This BNC connector is the monitor output of the HDSD9045TR and contains serial component video, compatible with the SMPTE 292M standard. If you are using dual link 10-bit 4:4:4 RGB serial digital video signals, this BNC output contains video converted from the dual link 4:4:4 RGB program input video. If you are using 4:2:2 serial digital video signals compatible with the SMPTE 292M standard, this BNC output contains a copy of program input video. The **4:2:2 MON OUT** output also has the VANC metadata packets and optional characters inserted. The characters and VANC insertion can be turned on and off independently of the program output.

2.1.2. Standard Definition Video Connections

The HDSD9045TR is capable of working with the standard definition video formats shown in Table 2-6. You must configure the video input type using the KeyLog Tracker™ software or using the Video Type menu item.

PROGRAM IN: The **A/4:2:2** BNC is for connecting 4:2:2 serial digital video signals compatible with the SMPTE 259M standard. When using standard definition video the **PROGRAM IN B** BNC is not used.

PROGRAM OUT: The **A/4:2:2** BNC connector contains the program output of the HDSD9045TR and contains the input serial digital video signal with the RP201 3 line VITC and optional characters inserted. When using standard definition video the **PROGRAM OUT B** BNC is not used.

4:2:2 MON OUT: This BNC connector is the monitor output of the HDSD9045TR and contains serial component video, compatible with the SMPTE 259M standard. The **4:2:2 MON OUT** output also has the RP201 3 line VITC and optional characters inserted. The characters and RP201 VITC insertion can be turned on and off independently of program output.

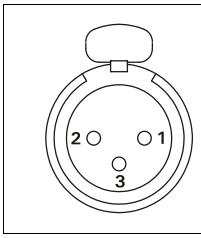
2.1.3. Colour Black Reference Connections

COLOUR BLACK REFERENCE IN: Input BNC connector for a 27.97 frames per second reference. This should be the same reference used to genlock 29.97 frames per second audio sources in applications where the system video type is 1080p/23.98sF. The input can be either a 1 V p-p NTSC sync or colour black reference. This input is only required when the input video is 1080p/23.98sF.

2.1.4. Video Recorder Linear Time code Connections

These time codes will be at the system video frame rate.

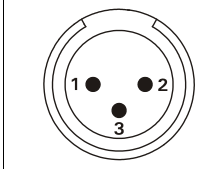
VIDEO LTC IN: This 3 pin female XLR connector is a balanced input for SMPTE 12M-1 linear time code from the video recorder. When using an unbalanced input source, the signal should be applied to pin 3 of the **VIDEO LTC IN** connector. Normally, the unused input (pin 2) should be connected to ground (pin 1).



Pin #	Name	Description
1	GND	Signal Ground.
2	LTC IN+	LTC In + input
3	LTC IN-	LTC in – input

Table 2-1: VIDEO and AUDIO LTC IN Pin Definitions

VIDEO LTC OUT This 3 pin male XLR connector is a balanced output for SMPTE 12M-1 linear time code. This LTC is normally connected to the video recorder. Pin 1 of the XLR is ground, and pins 2 and 3 provide a balanced output. When using a VTR with an unbalanced input, the signal should be connected to Pin 3 of the VIDEO LTC OUT XLR. Pin 2 should be left open.



Pin #	Name	Description
1	GND	Signal Ground
2	LTC OUT+	LTC Out + output
3	LTC OUT-	LTC Out – output

Table 2-2: VIDEO and AUDIO LTC OUT Pin Definitions

2.1.5. Audio Time code Connectors

AUDIO LTC IN: This 3 pin female XLR connector is a balanced input for SMPTE 12M linear time code from the audio playback machine. See Table 2-1 for pinouts.

This input is also used to connect to the Film TC output of the 5550 Universal Film Data Decoder in applications where Film time code (ARRI or Matrix code) is being used. In this case the Audio LTC Out is connected to the chase synchroniser LTC input on the audio playback machine.

AUDIO LTC OUT: This 3 pin male XLR connector is a balanced output for SMPTE/EBU linear time code to the audio playback machine. See Table 2-2 for pinouts.

The frame rate of this LTC input will correspond to the system audio frame rate. In applications where Film time code (ARRI or Matrix code) is being used, this output typically contains time code that is locked to the telecine biphase, and will also be automatically updated from Film time code being read by the 5550 Universal Film Data Decoder. It is only necessary to connect this output to the audio player's chase synchroniser LTC input when the audio machine is not being controlled by a telecine edit controller device.

2.1.6. Telecine and GPIO Connections

PARALLEL I/O: A 9 pin female 'D' connector used for connection to the telecine biphase tach pulse. It also contains the FRID/SOF pulse input, used with BTS/Philips/Thomson telecines, and several other general purpose parallel remote control inputs and outputs. The inputs and outputs operate at TTL levels. Table 5-3 shows the power up default functions of the Parallel I/O connector pins, however, the functions of pins 1, 4, 5, 8, and 9 may be changed using system parameter values. Normally the System parameters (accessible from the Hardware tab of the Options screen in KeyLog TRACKER™) should be set to zero. (See section 5.2.1 for information about changing the default function of the inputs.)

Pin #	Name	Description
1	Film Rate	High to Low = 24 Fps, Low to High = 30 FPS Input (60i video only)
2	FRID/SOF	Philips/Thomson FRID/ SOF Frame Pulse Input
3	BIPH 1	Leading Biphase
4	Video Def	High to Low = Std Def, Low to High = High Def
5	Load Film	Film Frame Centred in Gate Input
6	GND	Ground
7	BIPH 2	Lagging Biphase
8	GPI	Event Log GPI
9	---	Not used

Table 2-3: Parallel I/O Connector Pin Definitions

FRAME PULSE IN: A BNC for input of film frame pulse. This input is only used with Cintel, ITK and Sony telecines. See the respective section for installing your specific telecine type for more information on the frame pulse requirements, and the frame handling settings required to configure the HDSD9045TR correctly.

2.1.7. KeyLog Tracker™ Serial I/O Connections

SERIAL CONTROL: A 9 pin female 'D' connector for establishing an RS-232 connection to a computer running the KeyLog Tracker™ software. This port is also used for firmware upgrades to the HDSD9045TR. See section 2.7.1 for a cable wiring diagram and more information on connecting the HDSD9045TR to KeyLog Tracker™. See section 6.2 for information on upgrading the firmware.

Pin #	Name	Description
1	GND	Chassis ground
2	TxD	RS-232 Transmit Output
3	RxD	RS-232 Receive Input
4		
5	Sig Gnd	RS-232 Signal Ground
6		
7	RTS	RS-232 RTS Input
8	CTS	RS-232 CTS Output
9		

Table 2-4: Serial Control Connector Pin Definitions

2.1.8. KeyKode Reader Connections

COM 2/KEYKODE: A 9-pin female 'D' connector for connection to the 5550 Universal Film Data Decoder (KeyKode Reader). The pinout of the COM2/KEYKODE port is the same as the SERIAL CONTROL port and is shown in Table 2-4. The baud rate of the 5550 output must be set to 38400. See section 2.12 for further information about connecting the KeyKode reader.

AUDIO LTC IN: A 3 pin female XLR connector for input of the decoded Film time code (ARRI or Matrix code) from the Film TC output of the 5550 Universal Film Data Decoder in applications where Film time code (ARRI or Matrix code) is being used. In this case the Audio LTC Out is connected to the chase synchroniser LTC input on the audio player. If you are not using Film time code, the **AUDIO LTC IN** connector is usually connected to the LTC output of your audio play back device. (Nagra or DAT)

2.1.9. Auxiliary COM Port Connections

COM3: This 9-pin female 'D' connector is an additional RS-232 communications port. The pinout of the COM3 port is the same as the SERIAL CONTROL port and is shown in Table 2-4.

2.1.10. Ethernet Network Connections

ETHERNET: This RJ-45 connector is an Ethernet port used for high speed FTP firmware upgrades, to connect to a computer running the KeyLog Tracker™ software and to network HDSD9054TR units together. See section 2.6 for information on connecting to an Ethernet network. See section 3.6.3 for information on setting the I/P addresses for the system. See section 2.7.1 for more information on connecting the HDSD9045TR to KeyLog Tracker™. See section 3.8 for information on networking HDSD9054TR units together. See section 6.2 for information on upgrading the firmware.

2.1.11. Power Connections

The HDSD9054TR power supply operates on either 100-115 or 220-240 volts AC at 50 or 60 Hz and automatically senses the input voltage. 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 SVT marked VW-1, maximum 2.5 m in length.

The IEC 320 power entry module combines a standard power inlet connector, two 5 x 20 mm fuse holders and an EMI line filter. See section 6.2.1 for information on changing the fuses.

CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK, GROUNDING OF THE GROUND PIN OF THE MAINS PLUG MUST BE MAINTAINED.

2.1.12. Mounting

The HDSD9054TR is equipped with rack mounting angles and fits into a standard 19 inch by 1.75 inch by 17.75 inch (483 mm x 45 mm x 451mm) rack space. The mounting angles may be removed if rack mounting is not desired.

2.2. SAMPLE CONFIGURATIONS

A sample installation setup is shown in Figure 2-2 to aid the user in properly connecting the HDSD9045TR into his system. Contact Evertz technical support for other applications.

Figure 2-2 shows the typical connections required for 1080P/24 video transfers when synchronizing production audio using a telecine edit controller during the telecine transfer. In this configuration, the downconverted offline copy of the videotape will be made in a separate dubbing process.

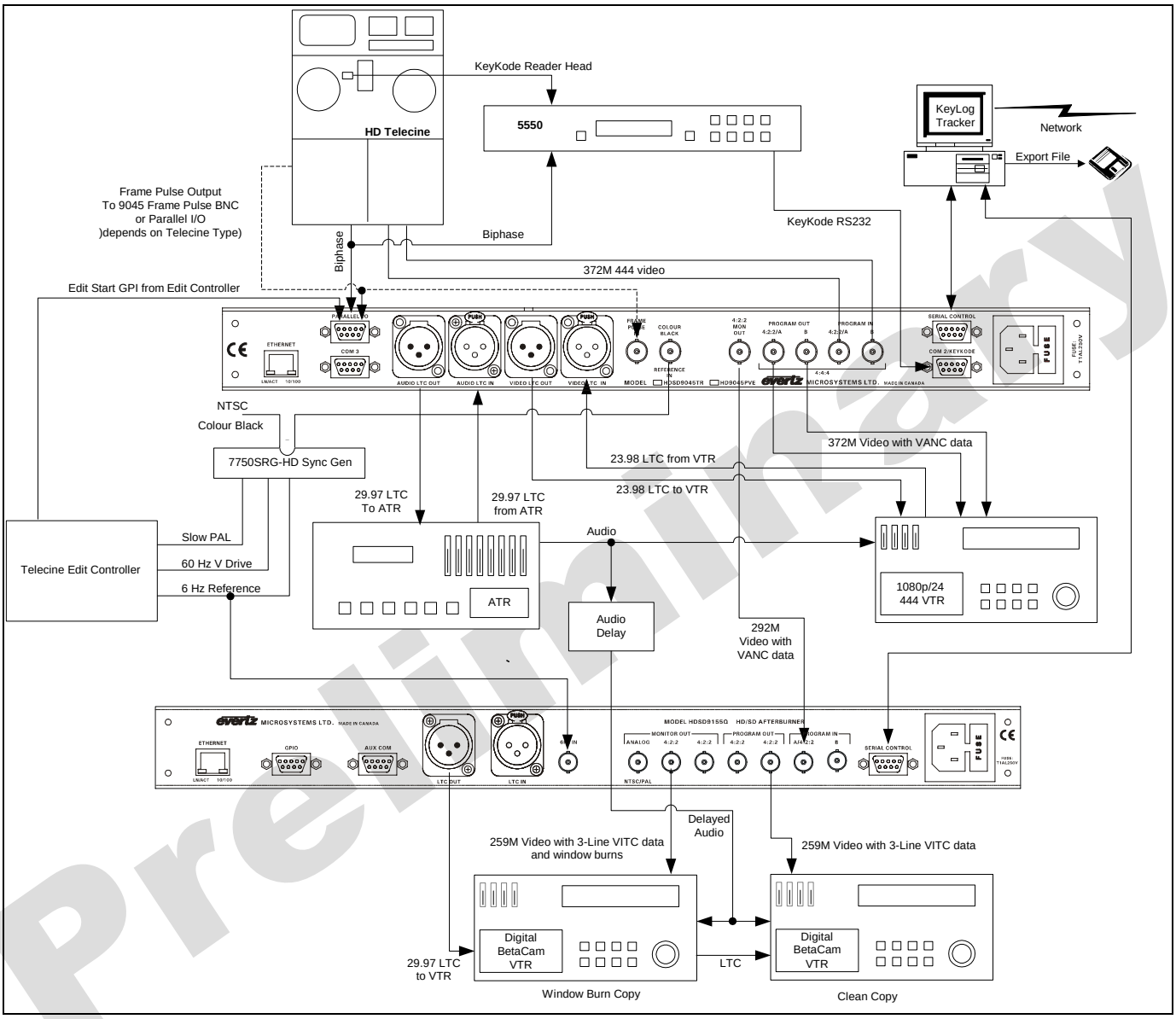


Figure 2-2: High Definition (1080p/24) Connections for Film To Tape Transfer

2.3. CONNECTING THE VIDEO

The HDSD9045TR is capable of operating in several video modes. In addition to connecting the correct video input and output, you must configure the video settings using the front panel to control the on screen *VIDEO* menu, or using the KeyLog TRACKER™ software. The HDSD9045TR is capable of working with the standard definition digital video in the formats shown in Table 2-5 and the high definition digital video in the formats shown in Table 2-6.

Common Name	Active Pixels / Active Lines	Frame Rate	Progressive /Interlace	Standard
525i/59.94	720 x 483	29.97 (30/1.001)	I	SMPTE 125M
625i/50	720 x 576	25	I	EBU Tech 3167E

Table 2-5: Standard Definition Video Input Formats

Common Name	Active Pixels / Active Lines	Frame Rate	Progressive /Interlace	Standard
1080i/59.94	1920 x 1080	29.97 (30/1.001)	I	SMPTE 274M
1080i/50	1920 x 1080	25	I	SMPTE 274M
1080p/29.97sF	1920 x 1080	29.97 (30/1.001)	P (sF)	SMPTE 274M
1080p/25sF	1920 x 1080	25	P (sF)	SMPTE 274M
1080p/23.98sF	1920 x 1080	23.98 (24/1.001)	P (sF)	SMPTE 274M

Table 2-6: High Definition Video Input Formats

If you are using the front panel controls, first set the overall mode using the *MODE* menu item. If you set the *AUTO VIDEO DETECT* menu item to *On*, the HDSD9045TR will attempt to auto detect the video standard after you have set the input video type. If you are not using Auto Video detection then you will have to choose the correct video standard using the *Video* menu item. See section 3.4.2 and 3.4.3 for more information.

If you are using the KeyLog TRACKER™ software, first set the Video Resolution using the *Options* item on the *Tools* menu. You can also enable auto video detect by checking the *Auto Video Detect* check box. If you are not using Auto Video detection, you will have to manually set the video standard using one of the System configurations or a project configuration. See the KeyLog TRACKER™ manual for more information.

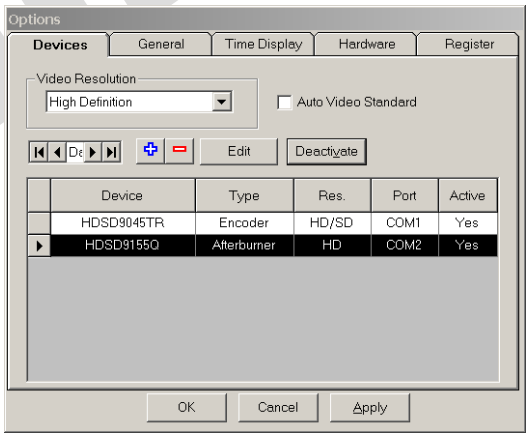


Figure 2-3: Video Configuration using KeyLog TRACKER™

2.3.1. Connecting HDTV Video

2.3.1.1. Dual Link HDTV Video Input and Output

The Dual link 4:4:4 RGB program video source conforming to SMPTE 372M should be connected to the 4:4:4 PROGRAM IN BNCs. You must set the HDSD9045TR to *4:4:4 IN:OUT* or *444FS IN:HD OUT* mode using the *Video Type* menu item or using KeyLog Tracker™. The HDSD9045TR has built in line synchronizers to auto-time the two inputs. If the A link is missing, the front panel HD LED will blink. If the B link is missing the front panel 4:4:4 LED will blink. When a valid 4:4:4 signal is present both the HD and 4:4:4 LEDs will be on solid.

The 4:4:4 PGM OUT outputs contain the input 4:4:4 video with RP215 Film Metadata (VANC) and optional characters keyed in. These outputs will normally be connected to the video recorder video input. The Link A output contains the $GB_{(even)}R_{(even)}$ part of the signal and the Link B output contains the $AB_{(ODD)}R_{(odd)}$ part of the signal.

2.3.1.2. Single Link HDTV Video Input

When you want to operate the HDSD9045TR with single link 4:2:2 program video, the program video source should be connected to Link A/4:2:2 input. You must also set the HDSD9045TR to *HD IN:HD OUT* mode using the *Video Type* menu item or using KeyLog Tracker™.

2.3.1.3. 4:2:2 Single Link HDTV Video Output

In applications where you are using 4:4:4 RGB program video the 4:2:2 output is converted from the dual link 4:4:4 RGB input video and also has the RP215 metadata packets and optional characters inserted. The characters can be turned on and off independently of 4:4:4 outputs. This output will normally be connected to a 4:2:2 video recorder. In applications where a standard definition video tape will be made concurrently with the high definition master, it can be connected to the PROGRAM input of the HD Afterburner. See section 3.4.2 for information about the colour setting the correct colour space conversion for the 4:2:2 output when in dual link mode.

In applications where you are using 4:2:2 YCbCr program video the **A/4:2:2 PGM OUT** BNC contains the input 4:2:2 video with RP215 ancillary data (VANC) and optional characters keyed in. In addition the **4:2:2 MON** output contains a second copy of the output available on the 4:2:2 MON output and also has the RP215 metadata packets and optional characters inserted. The characters on this output can be turned on and off independently of Link A/4:2:2 output.

2.3.2. Connecting SDTV Video

2.3.2.1. SDTV Video Input

When you want to operate the HDSD9045TR with 4:2:2 standard definition program video, the program video source should be connected to Link A/4:2:2 input. You must also set the HDSD9045TR to *SD IN:SD OUT* mode using the *Mode* menu item on the *Video* menu item or using KeyLog Tracker™.

2.3.2.2. SDTV Video Output

The **A/4:2:2 PGM OUT** BNC contains the input 4:2:2 video with RP201 3 line VITC and optional characters keyed in. In addition the **4:2:2 MON** output contains a second copy of the output available on the 4:2:2 MON output and also has the RP201 and optional characters inserted. The characters on this output can be turned on and off independently of Link A/4:2:2 output.

2.4. CONNECTING THE VIDEO RECORDER TIME CODE

The frame rate of the Video time codes will be the same as the system video frame rate. The On screen *TIMECODE* menu or the *Codes* and *Outputs* tabs of the configuration screens in the KeyLog TRACKER™ software control the use of the Video LTC reader and generator. See section 3.5 for more information.

2.4.1. Connecting the Video LTC Generator

The Video LTC Generator output is available on the VIDEO TIME CODE OUT XLR connector on the rear panel. The output level of the generator is factory set to 1 volt peak to peak, but may be adjusted using the level adjustment, located near the back of the 9000TCIO circuit card.

The generator code output should be connected to the time code input of your video recorder. Pin 1 of the XLR is ground, and pins 2 and 3 provide a balanced output. When using a machine with an unbalanced input the signal should be connected to Pin 3 of the generator output XLR. Pin 2 should be left open.

The HDSD9045TR records database index tags in the user bits of Video LTC. If the VTR is being slaved to the HDSD9045TR's Video LTC output, the time code generator built into the VTR should be set to the "EXTERNAL PRESET" mode of operation. The VTR's time code generator does not understand the counting sequences of the encoded data, and will introduce delays and possibly errors in the user bit data if it attempts to regenerate the time code before recording it on tape.

2.4.2. Connecting the Video LTC Reader

Connect the LTC output from your video recorder to the HDSD9045TR's VIDEO LTC IN XLR connector. When using an unbalanced input to the reader, the signal should be applied to pin 3 of the reader input connector. Normally, the unused input (pin 2) should be connected to ground (pin 1). This input is used to jam sync the HDSD9045TR's Video LTC generator to the code previously recorded on tape. This mode is used when the Record VTR is generating its own time code and the HDSD9045TR needs to read it to insert the VTR's time code into the RP215 VANC or RP201 3 line VITC.

2.5. CONNECTING THE AUDIO PLAYER TIME CODE

The frame rate of the Audio time codes may be different than the system video frame rate. Specifically, in applications where the video rate is 23.98 frames per second the Audio frame rate will usually be 29.97 frames per second. The On screen *TIMECODE* menu or the *Codes* and *Outputs* tabs of the configuration screens in the KeyLog TRACKER™ software control the use of the Audio LTC reader and generator.

2.5.1. Connecting the Audio LTC Generator

The Audio LTC output Generator is available on the AUDIO TIMECODE OUT XLR connector at the rear panel. This time code output may be driven from the telecine biphase and may also be updated from incoming film time code being read by the 5550 Decoder. Normally the Audio LTC output is only required when using Film time code, or you wish to manually enter time code slate numbers and have

the audio player follow the telecine movement. In applications where the audio player is being controlled by a telecine edit controller device, you do not need to connect the HDSD9045TR Audio LTC output. The output level of the generator is factory set to 1 volt peak to peak, but may be adjusted using the level adjustment located near the side of the 9000TCIO circuit card.

The Audio LTC output should be connected to the chase synchroniser time code input of your audio player. Pin 1 of the XLR is ground, and pins 2 and 3 provide a balanced output. When using a machine with an unbalanced input the signal should be connected to Pin 3 of the generator output XLR. Pin 2 should be left open.

2.5.2. Connecting the Audio LTC Reader

Connect the LTC output from your audio player to the AUDIO LTC IN XLR connector. When using an unbalanced input to the reader, the signal should be applied to pin 3 of the reader input connector. Normally, the unused input, (pin 2) should be connected to ground (pin 1). This input is used to read time code from the audio player when it is being controlled externally, so that the audio time code can be properly logged.

The AUDIO LTC IN connector is also used to read film time code from the 5550 decoder.

2.6. CONNECTING TO AN ETHERNET NETWORK

The HDSD9045TR is designed to be used with either 10Base-T (10 Mbps) or 100Base-TX (100 Mbps) also known as *Fast Ethernet*, twisted pair Ethernet cabling systems. When connecting for 10Base-T systems, category 3, 4, or 5 UTP cable as well as EIA/TIA – 568 100Ω STP cable may be used. When connecting for 100Base-TX systems, category 5 UTP cable is required. The cable must be “straight through” with a RJ-45 connector at each end. Make the network connection by plugging one end of the cable into the RJ-45 receptacle of the HDSD9045TR and the other end into a port of the supporting hub or switch. If you are connecting the HDSD9045TR directly to a PC, then you will have to use a crossover cable.

The straight through RJ-45 cable can be purchased or can be constructed using the pinout information in Table 2-7. A colour code wiring table is provided in Table 2-7 for the current RJ 45 standards (AT&T 258A or EIA/TIA 258B colour coding shown). Also refer to the notes following the table for additional wiring guide information.

Pin 1

Pin #	Signal	EIA/TIA 568A	AT&T 258A or EIA/TIA 568B	10BaseT or 100BaseT
1	Transmit +	White/Green	White/Orange	X
2	Transmit –	Green/White or White	Orange/White or Orange	X
3	Receive +	White/Orange	White/Green	X
4	N/A	Blue/White or Blue	Blue/White or Blue	Not used (required)
5	N/A	White/Blue	White/Blue	Not used (required)
6	Receive –	Orange/White or Orange	Green/White or Green	X
7	N/A	White/Brown	White/Brown	Not used (required)
8	N/A	Brown/White or Brown	Brown/White or Brown	Not used (required)

Table 2-7. Standard RJ45 Wiring Colour Codes

Note the following cabling information for this wiring guide:

- Only two pairs of wires are used in the 8-pin RJ 45 connector to carry Ethernet signals.
- Even though pins 4, 5, 7 and 8 are not used, so it is mandatory that they be present in the cable.
- 10BaseT and 100BaseT use the same pins, a crossover cable made for one will also work with the other.
- Pairs may be solid colours and not have a stripe.
- Category 5 cables must use Category 5 rated connectors.

The maximum cable run between the Afterburner and the supporting hub is 300 ft (90 m). The maximum combined cable run between any two end points (i.e. Afterburner and PC/laptop via network hub) is 675 feet (205 m).

Devices on the Ethernet network continually monitor the receive data path for activity as a means of checking that the link is working correctly. When the network is idle, the devices also send a link test signal to one another to verify link integrity. The Afterburner rear panel is fitted with two LEDs to monitor the Ethernet connection.

10/100 This amber LED is ON when a 100Base-TX link is last detected. The LED is OFF when a 10Base-T link is last detected (the LINK LED is ON). Upon power-up the LED is OFF as the last detected rate is not known and therefore defaults to the 10Base-T state until rate detection is completed.

LN/ACT This dual purpose green LED indicates that the HDSD9045TR has established a valid linkage to its hub, and whether the Afterburner is sending or receiving data. This LED will be ON when the HDSD9045TR has established a good link to its supporting hub. This gives you a good indication that the segment is wired correctly. The LED will BLINK when the Afterburner is sending or receiving data. The LED will be OFF if there is no valid connection.

Once you have established a valid link you will have to set up the network I/P address for the HDSD9045TR. (See section 3.6.3.) When you have set up the I/P addresses you should be able to 'ping' each of the devices in the system. See section 3.8 for more information on networking HDSD9045TR units.

2.7. CONNECTING THE HDSD9045TR TO KEYLOG TRACKER™

In film or video dailies application, the HDSD9045TR is usually controlled using version 3.1 or later of the Evertz Film system's Graphical User interface (GUI) KeyLog TRACKER™. The KeyLog TRACKER™ software is used to configure the HDSD9045TR's hardware for different applications. Configuration sets can be saved and recalled to speed set-ups of the hardware. In addition, KeyLog TRACKER™ logs the time codes, KeyKode, ink code and pulldown relationship of the film transfer during the transfer. See chapter 4 for more information on installing and using the KeyLog TRACKER™ software.

System requirements for running KeyLog TRACKER™:

- CPU: Pentium III
- Operating System: Win 2000, Win XPPro
- RAM: 256 Mb recommended
- Mouse
- Video: 2 Mb, 800 x 600 minimum
- CD-ROM
- Hard Disk: 20 Mb Free
- Serial Ports: 2 available
- Ethernet (recommended)
- Local or network printer for printing reports (recommended)
- Sound card with speakers used to generate system sounds when logging (recommended)

2.7.1. Physical Connections

The HDSD9045 can be connected to the computer running the KeyLog TRACKER™ software using either an RS-232 serial COM port, or using 10/100 Ethernet. (KeyLog TRACKER™ Version 3.1 or later is required for Ethernet control.) For information on connecting the Ethernet see section 2.6 and 3.8.

2.7.1.1. RS232 Serial Port

A nine pin sub-miniature 'D' connector **(SERIAL CONTROL)** is provided for connection to a computer running the Evertz Film system's Graphical User interface (GUI) KeyLog TRACKER™. This serial port provides a bi-directional RS-232-C data link at 57,600 baud.

In order to connect the HDSD9045TR to your computer make a cable as shown in Figure 2-4. Use this cable to connect the computer's COM port to the **SERIAL CONTROL** connector on the rear of the HDSD9045TR. The HDSD9045TR serial port does not have connections for the DTR, DSR, DCD and RI handshake lines. A standard 9-pin 'straight through' cable may work with some computers if the handshake lines are internally pulled to the active state.

HDSD9045TR End			Computer End	
9 pin D Male	Pin	Belden 9501	Pin	9 pin D Female
TxD	2	———————	2	RxD
RxD	3	———————	3	TxD
Sig Gnd	5	----drain-----	5	Sig Gnd
	7		7	RTS
	8		8	CTS
	4		4	DTR
			1	DCD
	6		6	DSR
	9		9	RI
Frame Gnd	Shield	----drain-----	Shield	Frame Gnd

Figure 2-4: Cable to Connect HDSD9045TR to PC Communications Port

In HDTV applications where you are making a standard definition work copy at the same time as the high definition master, you will also need to connect the HD Afterburner to a different COM port on the PC using a similar cable as shown in Figure 2-5. Using this method, the KeyLog TRACKER™ software can automatically switch the communications to the appropriate hardware device.

If your PC needs to have additional com ports added, make sure that they are configured so that each com port has its own interrupt.

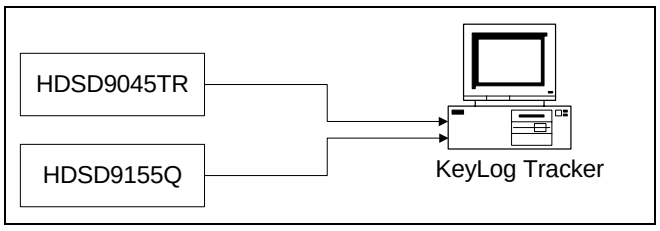


Figure 2-5: Connecting KeyLog TRACKER™ to HDSD9045TR and HDSD9155Q using 2 COM Ports

Once you have connected the HDSD9045TR to the computer using either a serial port or Ethernet connection, you can see the information in chapter 4 for information on installing and running the KeyLog TRACKER™ software.

2.8. CONNECTIONS TO AN EDIT CONTROLLER

2.8.1. Connections to a TLC/DaVinci Edit Controller

If you wish to log the edit events created by the TLC edit controller, the easiest way to accomplish this is to connect the Slate GPI output of the TLC to the DLO GPI input on the HDSD9045TR. For the external TLC this GPI is available on connector J16, pin 2. Connect this GPI output to the GPI input on pin 8 of the Parallel I/O connector. Connect J16 pin 14 to the Parallel I/O ground on pin 6. For other models of TLC consult the instruction manual for the location of the GPI output.

When you are using the HDSD9045TR with 24p video, you must use the 'Dual Sync' mode of the TLC. In order to accomplish this you will need to connect three sync references to the TLC. These sync reference signals are all available on an Evertz 5600MSC Master Sync Generator or a 7750SRG-HD Slave Sync Generator module. Connect a 24 frames per second 'slow PAL' reference to the main TLC gen lock input, connect a 30 FPS Vertical Drive signal to the TLC Colour Frame ID input, and connect a 6 Hz pulse to the TLC J16 Pin 7. For simplicity in making cables to interconnect the HDSD9045TR with the telecine, 5550 and TLC, the 6 Hz connection should be made when you are wiring the biphase cable to the telecine. For more information about using the TLC in dual sync mode consult DaVinci technical bulletin TLC-052, available from the DaVinci web site. For Standard definition video operation calibrate the TLC as you normally would. For High definition video operation calibrate the system timing using the procedure outlined in section 4.5.

2.8.2. Connections to Other Edit Controllers

For other Telecine Edit controllers such as Pandora, or Astec consult the instruction manual for specific details. If you wish to log the edit events created by the edit controller, the easiest way to accomplish this is to connect the GPI output of the Edit controller to the DLO GPI input on the HDSD9045TR.

(Normally the DLO GPI input is on pin 8 of the Parallel I/O connector, but can be configured using the KeyLog TRACKER™ or front panel interface)

2.9. CONNECTING A CINTEL TELECINE

Two signals, (biphase tach and Film Frame pulse) must be connected from the telecine in order to generate field accurate time code and KeyKode numbers. When you are using 1080p/23.98sF video, the Film Frame pulse is not required. The location and description of these signals depend on the model of your telecine. Sections 2.9.1 and 2.9.2 provide an overview of the Cintel connections. Section 2.9.3 provides detailed instructions for your model of Cintel telecines. In addition to making the physical connections to the telecine you will have to select the Biphase rate, Telecine type and set up for any video processing delays between the output of your telecine and the input of the HDSD9045TR using the KeyLog TRACKER™ Telecine Setup Screen. If you are operating the HDSD9045TR using the front panel menus use the *CINE* menu items on the OSD *TIMECODE* menu. (See section 3.5.6) Section 4.5 provides a procedure to verify that you have made the necessary connections and settings for your telecine.

2.9.1. Biphase Tach from the Cintel Telecine

The HDSD9045TR is fitted with a nine pin female 'D' connector (**PARALLEL I/O)** for connection to the telecine biphase. The pin connections are shown in Table 2-3.

The BPH1 and BPH2 inputs (pins 3 & 7 respectively) should be connected to biphase quadrature tach pulses from the telecine. These TTL level pulses usually come at a rate of 10 pulses per film frame. The HDSD9045TR can also accommodate tach rates of 1, 2 or 5 pulses per frame. For best results use the highest biphase rate possible. Use the *BIPHASE RATE* item to set the HDSD9045TR to the correct biphase rate. Correct connections will result in film numbers that increment and decrement when the telecine moves forward and reverse respectively. In the event that the HDSD9045TR counts in the reverse direction when the telecine is in forward play, reverse the two biphase connections to the HDSD9045TR.

To minimize the effects of cross coupling and noise on the biphase signals, which can affect the counting reliability of the HDSD9045TR, you should use a cable, which provides separate shields for each phase of the biphase signal.

2.9.2. Cintel Film Frame Pulse

In addition to the biphase connections, a film frame pulse is required. This active low pulse occurs when a new film frame starts in the video output, while the telecine is in normal play speed. The HDSD9045TR uses the film frame pulse to lock its time code output to the correct telecine pulldown sequence during the transfer.

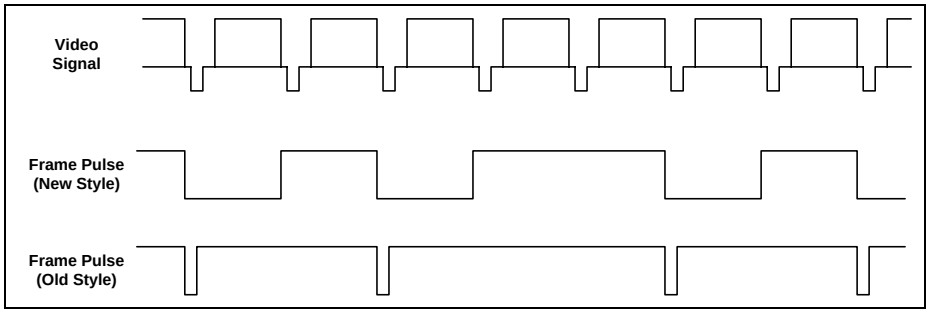


Figure 2-6: Cintel Frame Pulse (shown for 2:3 Transfers)

The actual DC voltage level of the film frame pulse is not critical as long as a 1 volt peak-to-peak minimum signal is applied. The HDSD9045TR is capable of working with a wide variety of different frame pulse waveforms. There are two different styles of Frame pulses on Cintel telecines. The new style pulse is used on URSA Gold and newer machines, the Old style pulse is used on MK III, Digi IV and URSA machines. Selecting the correct telecine type in the OSD menu or in the KeyLog TRACKER™ *Telecine Setup* screen also selects a default frame pulse handling method. The film frame pulse is sampled once per video field approximately mid-field.

It is essential that the HDSD9045TR be connected to the correct FILM FRAME pulse from the telecine. Generally this pulse is labelled “FRAME PULSE” on the Cintel Telecines and is found on the rear of the Telecine.

Connection of a Film frame pulse is required even with 1:1 video transfers in 1080I, 525i and 625i to permit the HDSD9045TR to distinguish the difference between the field 1 and field 2 dominant pull downs. Connection of the Film Frame pulse is not required for 1080p/24 transfers.

Setting the telecine type also selects the default type of pulldown pulse used for the telecine. The telecine type should be set to match the Cintel telecine type being used to accept the Cintel style FRAME pulse input from the “FRAME PULSE” BNC connector on the rear panel.

2.9.3. Cintel C-Reality / DSX

The Biphase tach pulse is available on the 15 pin D Sep Mag connector on the rear of the telecine. These biphase signals must be connected to pins 3 & 7 of the 9 pin parallel I/O D connector of the HDSD9045TR and the Parallel I/O connector on the KeyKode Decoder as shown in Figure 2-7. Retain the separate shielding of each signal up to the HDSD9045TR in order to prevent cross-coupling which can adversely affect the biphase reliability.

5550 End			**HDSD9045TR End**			**C-Reality End**	
Parallel I/O (Male 9 pin D)			**Parallel I/O (Male 9 pin D)**			**Sep Mag (Female 15 pin D)**	
Frame Gnd		--drain--	Frame Gnd		--drain--	Frame Gnd	Shld
			Film Rate	1			
			FRID/SOF	2			
BIPH 1	3	--Pair 1--	BIPH 1	3	--Pair 1--	PH0_B	1
GND	6	--Gnd 1--	GND	6	--Gnd 1--	Ground	5
			Def	4			
			Load Film	5			
BIPH 2	7	--Pair 2--	BIPH 2	7	--Pair 2--	PH1_B	2
GND	6	--Gnd 2--	GND	6	--Gnd 2--	Ground	5

TLC End				
J16 (Female 25 pin D)				
GPO	2	--------	DLO GPI	8
Gnd	14	--------	GND	6
			-----	9
Gnd	13	6 Hz Ground		
6 Hz In	7	6 Hz Input from 7750SRG		

Figure 2-7: Cable to Connect C-Reality Biphase to HDSD9045TR

Connect the Read Frame Sequence BNC on the C-Reality to the FILM FRAME connector on the HDSD9045TR. If necessary, you can use a BNC "T" connector and continue the coax to the devices.

Do not terminate this signal.

The telecine type must be set to Cintel C-Reality. The film frame handling will be set to DIRECT when you set the C-Reality Telecine type.

2.9.4. Cintel URSA Gold / URSA Diamond / RASCAL

The Biphase tach pulse is available on a pair of BNC connectors on the rear of the Mag follower. These biphase signals must be connected to pins 3 & 7 of the 9 pin parallel I/O D connector of the HDSD9045TR and the Parallel I/O connector on the KeyKode Decoder as shown in Figure 2-8. Retain the separate shielding of each signal up to the HDSD9045TR in order to prevent cross-coupling which can adversely affect the biphase reliability.

5550 End			9025TR End			Cintel End Sep Mag
Parallel I/O (Male 9 pin D)			Parallel I/O (Male 9 pin D)			BNC
Frame Gnd		--drain--	Frame Gnd			
			Film Rate	1		
			FRID/SOF	2		
BIPH 1	3	--Pair 1--	BIPH 1	3	--Pair 1--	PH0_B
GND	6	--Gnd 1--	GND	6	--Gnd 1--	Ground
			Def	4		
			Load Film	5		
BIPH 2	7	--Pair 2--	BIPH 2	7	--Pair 2--	PH1_B
GND	6	--Gnd 2--	GND	6	--Gnd 2--	Ground

TLC End J16 (Female 25 pin D)				
GPO	2	--------	DLO GPI	8
Gnd	14	--------	GND	6
			-----	9
Gnd	13	6 Hz Ground		
6 Hz In	7	6 Hz Input from 7750SRG		

Figure 2-8: Cable to Connect URSA Gold / URSA Diamond / RASCAL Biphase to 9025TR

Connect the Frame BNC (BSK 33) on the telecine to the **FRAME PULSE IN** connector on the HDSD9045TR. If necessary, you can use a BNC "T" connector and continue the coax to other devices.

Do not terminate this signal.

URSA Gold telecines with firmware versions prior to 5.06 have different internal timing with respect to the Film Frame pulse output. In order to compensate for these timing differences you need to select the correct telecine type using the KeyLog TRACKER™ software. The film frame handling will be set to DIRECT when you set one of the URSA Gold or URSA Diamond types.

2.9.5. Verifying the Connections to a Cintel Telecine

When you have completed the basic telecine connections, you will need to verify the frame accuracy of the basic system using the procedure in section 4.5 which provides a procedure to verify that you have made the necessary connections and settings for your telecine.

2.10. CONNECTING AN ITK TELECINE

Two signals, (biphase tach and OPD pulse) must be connected from the telecine in order to generate field accurate time code and KeyKode numbers. The location and description of these signals depend on the model of your telecine. Sections 2.10.1 and 2.10.2 provide an overview of the ITK connections. Section 2.10.3 provides some additional information specific to the ITK telecine. In addition to making the physical connections to the telecine you will have to select the Biphase rate, Telecine type and set up for any video processing delays between the output of your telecine and the input of the HDSD9045TR using the KeyLog TRACKER™ Telecine Setup Screen. If you are operating the HDSD9045TR using the front panel menus use the *CINE* menu items on the OSD *TIMECODE* menu. (See section 3.5.6) Section 4.5 provides a procedure to verify that you have made the necessary connections and settings for your telecine.

2.10.1. Biphase Tach from the ITK Telecine

The HDSD9045TR is fitted with a 9-pin female 'D' connector (**PARALLEL I/O)** for connection to the telecine. The pin connections are shown in Table 2-3.

The BPH1 and BPH2 inputs (pins 3 & 7 respectively) should be connected to biphase quadrature tach pulses from the telecine. These TTL level pulses usually come at a rate of 10 pulses per film frame. The HDSD9045TR can also accommodate tach rates of 1, 2 or 5 pulses per frame. For best results use the highest biphase rate possible. Use the *Biphase Rate* item to set the HDSD9045TR to the correct biphase rate. Correct connections will result in film numbers that increment and decrement when the telecine moves forward and reverse respectively. In the event that the HDSD9045TR counts in the reverse direction when the telecine is in the forward direction, reverse the two biphase connections to the HDSD9045TR.

To minimize the effects of cross coupling and noise on the biphase signals, which can affect the counting reliability of the HDSD9045TR, you should use a cable, which provides separate shields for each phase of the biphase signal.

2.10.2. ITK Film Frame Pulse

In addition to the biphase connections, a film frame pulse is required. This pulse occurs when a new film frame starts in the video output, while the telecine is in normal play speed. The HDSD9045TR uses the film frame pulse to lock its time code output to the correct telecine pulldown sequence during the transfer.

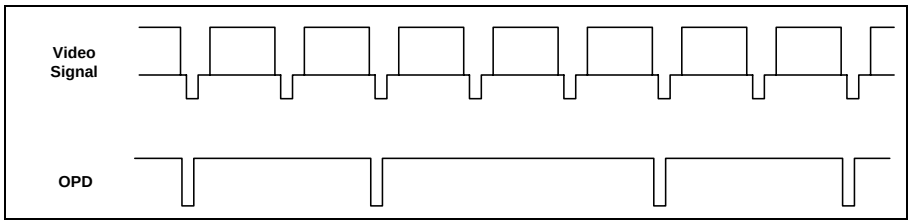


Figure 2-9: ITK OPD Pulse (shown for 2:3 Transfers)

The OPD pulse is a 2 msec wide active low pulse that goes low during the first field of each new film frame on the telecine output. This signal should always change level around VSYNC time. The OPD pulse is available on the rear panel of the telecine and must be connected to the **FRAME PULSE** connector on the HDSD9045TR rear panel.

Connection of a Film frame pulse is required even with 1:1 video transfers in 1080I, 525i and 625i to permit the HDSD9045TR to distinguish the difference between the field 1 and field 2 dominant pull downs. Connection of the Film Frame pulse is not required for 1080p/24 transfers.

Setting the *Telecine Type* item also selects the default type of pulldown pulse used for the telecine. The telecine type should be set to match the ITK telecine type being used to accept the OPD pulse input from the "FRAME PULSE" BNC connector on the rear panel.

2.10.3. ITK Millennium

The Biphase tach pulse is available on the 9-pin D Biphase 1 connector on the Millennium. These biphase signals must be connected to pins 3 & 7 of the 9 pin parallel I/O D connector of the HDSD9045TR as shown in Figure 2-10. Retain the separate shielding of each signal up to the HDSD9045TR in order to prevent cross-coupling which can adversely affect the biphase reliability. You should set the biphase rate of the Mag biphase in the Millennium Metaspeed menu to 10 pulses per frame.

5550 End			**HDSD9045TR End**			**Millennium End**	
Parallel I/O (Male 9 pin D)			**Parallel I/O (Male 9 pin D)**			**Biphase 1 (Male 9 pin D)**	
Frame Gnd		--drain--	Frame Gnd		--drain--	Frame Gnd	Shield
			Film Rate	1			
			FRID/SOF	2			
BIPH 1	3	--Pair 1--	BIPH 1	3	--Pair 1--	Mag 1+	7
GND	6	--Gnd 1--	GND	6	--Gnd 1--	Ground	6
			Def	4			
			Load Film	5			
BIPH 2	7	--Pair 2--	BIPH 2	7	--Pair 2--	Mag 2+	3
GND	6	--Gnd 2--	GND	6	--Gnd 2--	Ground	4

TLC End				
J16 (Female 25 pin D)				
GPO	2	--------	DLO GPI	8
Gnd	14	--------	GND	6
			-----	9
Gnd	13	6 Hz Ground		
6 Hz In	7	6 Hz Input from 7750SRG		

Figure 2-10: Cable to Connect Millennium Biphase to HDSD9045TR

The *Telecine Type* item on the KeyLog TRACKER™ *Telecine Setup* screen must be set to ITK Millennium. The film frame handling will be set to "Latch Negative Transition" Style when you set the ITK Millennium Telecine type.

2.10.4. Verifying the Connections to an ITK Telecine

When you have completed the basic telecine connections, you will need to verify the frame accuracy of the basic system using the procedure in section 4.5 which provides a procedure to verify that you have made the necessary connections and settings for your telecine.

2.11. CONNECTING A PHILIPS/THOMSON/GVG TELECINE

Two signals, (biphase tach and SOF/FRID pulse) must be connected from the telecine in order to generate field accurate time code and KeyKode numbers. The location and description of these signals depend on the model of your telecine. Sections 2.11.1 and 2.11.2 provide an overview of the Philips connections. Section 2.11.3 provides some additional information specific to various telecine models. In addition to making the physical connections to the telecine you will have to select the Biphase rate, Telecine type and set up for any video processing delays between the output of your telecine and the input of the HDSD9045TR using the KeyLog TRACKER™ Telecine Setup Screen. If you are operating the HDSD9045TR using the front panel menus use the *CINE* menu items on the OSD *TIMECODE* menu. (See section 3.5.6) Section 4.5 provides a procedure to verify that you have made the necessary connections and settings for your telecine.

2.11.1. Biphase Tach from the Philips/Thomson/GVG Telecine

The HDSD9045TR is fitted with a 9-pin female 'D' connector (**PARALLEL I/O)** for connection to the telecine. The pin connections are shown in Table 2-3.

The BPH1 and BPH2 inputs (pins 3 & 7 respectively) should be connected to biphase quadrature tach pulses from the telecine. These TTL level pulses usually come at a rate of 10 pulses per film frame. The HDSD9045TR can also accommodate tach rates of 1, 2 or 5 pulses per frame. For best results use the highest biphase rate possible. Use the BIPHASE RATE item to set the HDSD9045TR to the correct biphase rate. Correct connections will result in film numbers that increment and decrement when the telecine moves forward and reverses respectively. In the event that the HDSD9045TR counts in the reverse direction when the telecine is in the forward direction, reverse the two biphase connections to the HDSD9045TR.

To minimize the effects of cross coupling and noise on the biphase signals, which can affect the counting reliability of the HDSD9045TR, the user should use a cable, which provides separate shields for each phase of the biphase signal.

2.11.2. Philips/Thomson/GVG Film Frame Pulse

In addition to the biphase connections, a film frame pulse is required. This pulse from the Philips/Thomson/GVG telecine, (known as the SOF or FRID pulse), changes level when a new film frame starts in the video output, while the telecine is in normal play speed. The HDSD9045TR uses the

film frame pulse to lock its time code output to the correct telecine pulldown sequence during the transfer.

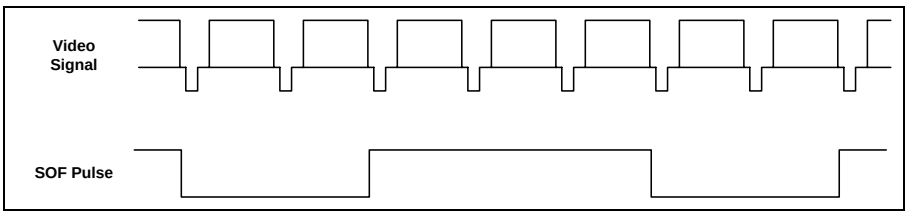


Figure 2-11: Philips SOF Pulse (shown for 2:3 Transfers)

The SOF pulse is a 'square wave' signal that goes high for 2 fields and then low for 3 fields (or vice versa) when running at 24 frames per second (in 1080p/24). The SOF pulse will be a square wave that is high for 2 fields and low for two fields in 25 frames per second transfers in 625i/50 and 1080i/50 and 30 frames per second transfers in 525i/59.94 and 1080i/59.94. This signal should always change level around VSYNC time. The SOF pulse is not present when the telecine is in STOP. Connect the SOF pulse to pin 2 of the 9-pin PARALLEL I/O connector.

Connection of the SOF pulse is required even with 1:1 video transfers in 1080I, 525i and 625i to permit the HDSD9045TR to distinguish the difference between the field 1 and field 2 dominant pull downs. Connection of the Film Frame pulse is not required for 1080p/24 transfers.

Do NOT connect the SOF pulse to the "FRAME PULSE" BNC on the HDSD9045TR. It is connected to pin 2 of the 9-pin Parallel I/O D connector.

Selecting the correct telecine type also selects the FRID/SOF frame pulse handling method. The film frame pulse is sampled once per video field approximately mid-field.

2.11.3. Philips / Thomson Spirit / Shadow

5550 End			HDSD9045TR End			Philips End	
Parallel I/O (Male 9 pin D)			Parallel I/O (Male 9 pin D)			TC Gen Out (Male 9 pin D)	
Frame Gnd		--drain--	Frame Gnd		--drain--	Frame Gnd	Shld
			Film Rate	1			
			FRID/SOF	2	--Pair 3--	SOF	2
BIPH 1	3	--Pair 1--	BIPH 1	3	--Pair 1--	R	1
GND	6	--Gnd 1--	GND	6	--Gnd 1--	Ground	7
			Def	4			
			Load Film	5			
BIPH 2	7	--Pair 2--	BIPH 2	7	--Pair 2--	S	5
GND	6	--Gnd 2--	GND	6	--Gnd 2--	Ground	7

TLC End J16 (Female 25 pin D)				
GPO	2	--------	DLO GPI	8
Gnd	14	--------	GND	6
			-----	9
Gnd	13	6 Hz Ground		
6 Hz In	7	6 Hz Input from 7750SRG		

Figure 2-12: Cable to Connect Spirit/Shadow to the HDSD9045TR

The signals required to connect the Spirit or Shadow telecine are found on the 9-pin D TC GEN OUT connector (J23) on the telecine. Connect the TC Gen Out connector of the telecine to the 9 pin parallel I/O connector of the HDSD9045TR as shown in Figure 2-12. Retain the separate shielding of each signal up to the HDSD9045TR in order to prevent cross-coupling which can adversely affect the biphase reliability.

The telecine type item must be set to Philips Spirit. The film frame handling will be set to FRID Style when you set the Spirit Telecine type.

2.11.4. GVG/Thomson Spirit 2K/4K

5550 End			9025TR End			GVG End	
Parallel I/O (Male 9 pin D)			Parallel I/O (Male 9 pin D)			TC Gen Out (Male 9 pin D)	
Frame Gnd		--drain--	Frame Gnd		--drain--	Frame Gnd	Shld
			Film Rate	1			
BIPH 1	3	--Pair 1--	BIPH 1	3	--Pair 1--	R	1
GND	6	--Gnd 1--	GND	6	--Gnd 1--	Ground	7
			Def	4			
			Load Film	5			
BIPH 2	7	--Pair 2--	BIPH 2	7	--Pair 2--	S	5
GND	6	--Gnd 2--	GND	6	--Gnd 2--	Ground	7
						CFR Out (BNC on Rack 3)	
			FRID/SOF	2	--Pair 3--	CFR	
			GND	6	--Gnd 3--	Ground	

TLC End				
J16 (Female 25 pin D)				
GPO	2	--------	DLO GPI	8
Gnd	14	--------	GND	6
			-----	9
Gnd	13	6 Hz Ground		
6 Hz In	7	6 Hz Input from 7750SRG		

Figure 2-13: Cable to Connect Spirit 2K/4K to the HDSD9045TR

The BIPH 1 and BIPH 2 signals required to connect the Spirit 2K or Spirit 4K telecine are found on the 9-pin D TC GEN OUT connector (J23) on the telecine. The CFR signal is a BNC on Rack 3 of the Telecine. Connect these connectors on the telecine to the 9 pin parallel I/O connector of the 9025TR as shown in Figure 2-13. Retain the separate shielding of each signal up to the HDSD9045TR in order to prevent cross-coupling which can adversely affect the biphase reliability.

The telecine type item must be set to Thomson/GVG Spirit 2K. The film frame handling will be set to FRID Style when you set the Thomson/GVG Spirit 2K Telecine type.

2.11.5. Verifying the Connections to a Philips Telecine

When you have completed the basic telecine connections, you will need to verify the frame accuracy of the basic system using the procedure in section 4.5 which provides a procedure to verify that you have made the necessary connections and settings for your telecine.

2.12. CONNECTING A SONY VIALTA TELECINE

Two signals, (biphase tach and SEQ pulse) must be connected from the telecine in order to generate field accurate time code and KeyKode numbers. Sections 2.12.1 and 2.12.2 provide an overview of the Sony connections. In addition to making the physical connections to the telecine you will have to select the Biphase rate, Telecine type and set up for any video processing delays between the output of your telecine and the input of the HDSD9045TR using the KeyLog TRACKER™ Telecine Setup Screen. If you are operating the HDSD9045TR using the front panel menus use the *CINE* menu items on the OSD *TIMECODE* menu. (See section 3.5.6) Section 4.5 provides a procedure to verify that you have made the necessary connections and settings for your telecine.

2.12.1. Biphase Tach from the Sony Telecine

The HDSD9045TR is fitted with a 9-pin female 'D' connector (**PARALLEL I/O)** for connection to the telecine. The pin connections are shown in Table 2-3.

The BPH1 and BPH2 inputs (pins 3 & 7 respectively) should be connected to biphase quadrature tach pulses from the telecine. The Biphase tach pulse is available on the 9-pin D AUX 6 connector on the Vialta. These biphase signals must be connected to pins 3 & 7 of the 9 pin parallel I/O D connector of the HDSD9045TR as shown in Figure 2-15. Retain the separate shielding of each signal up to the HDSD9045TR in order to prevent cross-coupling which can adversely affect the biphase reliability. Use the BIPHASE RATE item to set the HDSD9045TR to the correct biphase rate. Correct connections will result in film numbers that increment and decrement when the telecine moves forward and reverses respectively. In the event that the HDSD9045TR counts in the reverse direction when the telecine is in the forward direction, reverse the two biphase connections to the HDSD9045TR.

To minimize the effects of cross coupling and noise on the biphase signals, which can affect the counting reliability of the HDSD9045TR, the user must use a cable, which provides separate shields for each phase of the biphase signal.

2.12.2. Sony Film Frame Pulse

In addition to the biphase connections, a film frame pulse is required. This pulse occurs when a new film frame starts in the video output, while the telecine is in normal play speed. The HDSD9045TR uses the film frame pulse to lock its time code output to the correct telecine pulldown sequence during the transfer.

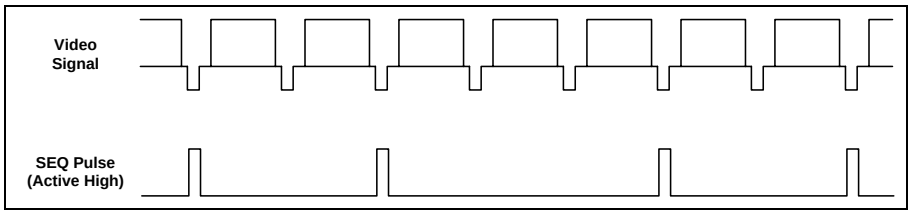


Figure 2-14: Sony SEQ Pulse (shown for 2:3 Transfers)

The SEQ pulse is a 1 msec wide active high pulse that goes high during the first field of each new film frame on the telecine output. This signal should always change level around VSYNC time. The SEQ

pulse is available on the HD output module from the telecine and must be connected to the **FRAME PULSE** connector on the HDSD9045TR rear panel.

Connection of a Film frame pulse is required even with 1:1 video transfers in 1080i, 525i and 625i to permit the HDSD9045TR to distinguish the difference between the field 1 and field 2 dominant pull downs.

5550 End			HDSD9045TR End			Sony End	
Parallel I/O (Male 9 pin D)			Parallel I/O (Male 9 pin D)			Aux 6 (Male 9 pin D)	
Frame Gnd		--drain--	Frame Gnd		--drain--	Frame Gnd	Shld
			Film Rate	1			
			FRID/SOF	2			
BIPH 1	3	--Pair 1--	BIPH 1	3	--Pair 1--	tach10B-	6
GND	6	--Gnd 1--	GND	6	--Gnd 1--	Ground	4
			Def	4			
			Load Film	5			
BIPH 2	7	--Pair 2--	BIPH 2	7	--Pair 2--	tach10A-	9
GND	6	--Gnd 2--	GND	6	--Gnd 2--	Ground	4

TLC End J16 (Female 25 pin D)				
GPO	2	--------	DLO GPI	8
Gnd	14	--------	GND	6
			-----	9
Gnd	13	6 Hz Ground		
6 Hz In	7	6 Hz Input from 7750SRG		

Figure 2-15: Cable to Connect Sony Vialta Biphase to the HDSD9045TR

The telecine type item must be set to Sony Vialta. The film frame handling will be set to “Active High” Style when you set the Vialta Telecine type. If your Telecine has an active low pulse then you will have to manually set the film frame handling to “Latch Negative Transition” style.

2.12.3. Verifying the Connections to a Sony Telecine

When you have completed the basic telecine connections, you will need to verify the frame accuracy of the basic system using the procedure in section 4.5 which provides instructions on how to verify that you have made the necessary connections and settings for your telecine.

2.13. CONNECTING A FILM BARCODE READER

Machine-readable edge numbers by Eastman Kodak and other film stock manufacturers, (referred to as KeyKode numbers); allow the edge number information to be read by a bar code reader. This eliminates the tedium and human error or manual entry, and provides an absolutely accurate identification, entry and tracking of film edge numbers.

The HDSD9045TR VANC Encoder interfaces to the Evertz Model 5550 Universal Film Data Decoder. This KeyKode reader is a self-contained unit and consists of a bar code pickup head, and a decoder device. The pickup head transforms the optical dark and light bar code into electronic signals and is designed specifically to mount on the telecine feed roller just before the film enters the gate. The decoder receives these electronic signals from the pickup head, and sends the decoded KeyKode number via an RS-232 serial link to the VANC Encoder, for automatic placement into the time code.

The HDSD9045TR also interfaces to the older Evertz model 5500 and RIM DigiSync KeyKode Decoders. (See section 2.13.2 for information about connecting these decoders).

2.13.1. Hardware Installation

Consult the 5550 manual for information on installing the KeyKode reader head on your telecine. In order to connect your HDSD9045TR to your 5550, use the cable provided (Evertz part # WA-J18). If you need a longer cable you can make a cable as shown in Table 2-8: Cable to Connect HDSD9045TR to 5550 KeyKode Reader
. Use this cable to connect the 5550 Aux I/O port to the **COM 2/KEYKODE** connector on the rear of the HDSD9045TR. The SERIAL I/O port on the 5550 is typically used to connect to the TLC edit controller.

The Evertz 5500 and 5550 Decoders allow the automatic adjustment of LED intensity when connected to the telecine biphase. For simplicity of wiring this connection should be made when wiring the telecine to HDSD9045TR cable. See the sections on specific telecines for the correct connector pinout.

By default the HDSD9045TR **COM 2/KEYKODE** port operates at 38400 baud, while the TLC edit controller port operates at 9600 baud. You will need to set the baud rate of the AUX I/O port in the 5550 to 38400. This feature is only supported in 5550 software versions later than 990813. If your 5550 unit has an earlier software version installed, you can update it to the current version that you will find in the Firmware directory on the Tracker CD-ROM. Follow the instructions in the Read5550.Txt file in the firmware directory on the CD or consult your 5550 manual for information on updating the software.

HDSD9045TR End			**KeyKode Reader End**	
9 pin D Male	**Pin**	**Belden 9501**	**Pin**	**9 pin D Male**
TxD	2	Black	3	RxD
RxD	3	Red	2	TxD
Sig Gnd	5	drain	5	Sig Gnd
Frame Gnd	Shield		Shield	Frame Gnd

Table 2-8: Cable to Connect HDSD9045TR to 5550 KeyKode Reader

When you have updated the 5550 software you will need to set the 5550 DIP switches as shown in the table below. Set DIP Switch 1 to the Open (38400 Baud) position and DIP switch 3 to the Closed (9600 Baud) position. DIP Switch 2 should be in the Closed position.

Dip Switch	Description	Function when Open	Function when Closed
1	Baud rate of AUX I/O port	38400	9600
2	Reserved to set more baud Rates for SERIAL I/O – Must be Closed	---	Default
3	Baud rate of SERIAL I/O port	38400	9600

Table 2-9: 5550 DIP Switches

2.13.2. Connecting an Evertz 5500 or RIM DigiSync KeyKode Readers

In order to connect your HDSD9045TR to an Evertz 5500 KeyKode reader, make a cable as shown in Figure 2-16. Use this cable to connect the 5500 Serial I/O port to the **COM 2/KEYKODE** connector on the rear of the HDSD9045TR. You can use the same cable to connect the DigiSync reader to the HDSD9045TR. The serial ports on these readers operate at 9600 baud. In order to reduce the HDSD9045TR's KeyKode Reader baud rate to 9600 baud, set system parameter Class 25, parameter number 32 to a non-zero value. See chapter 5 for more information on setting the HDSD9045TR system parameters.

HDSD9045TR End			KeyKode Reader End	
9 pin D Male	Pin	Belden 9501	Pin	9 pin D Male
TxD	2			RxD
RxD	3	Red	2	TxD
Sig Gnd	5	drain	5	Sig Gnd
Frame Gnd	Shield		Shield	Frame Gnd

Figure 2-16: Cable to Connect HDSD9045TR to 5500 KeyKode Reader

2.13.3. Verifying Communications between the HDSD9045TR and KeyKode Reader

Once the KeyKode reader head has been installed on the telecine, and the 5550 KeyKode decoder is connected properly to the HDSD9045TR, you are ready to verify that the reader is reading properly, and that the two units are communicating.

Put a piece of bar-coded film stock onto the telecine, and put the telecine in Play. You should observe that the reader unit is reading the KeyKode, as by the KeyKode LED on the 5550 Decoder unit. If the KK BEEP menu item on the 5550 is set to ON, a tone from the 5550 also indicates that it is reading successfully. The KK LED on the KeyLog TRACKER™ screen should blink On each time a barcode data record is sent to the HDSD9045TR.

Once you have verified proper communications, proceed to the system calibration procedure in section 4.5. After you verify the basic system timing without KeyKode you will be ready to learn the head offset parameters for each film gauge and transfer rate. If communications are not realized, check the installation procedure for the reader unit and connections to the HDSD9045TR as outlined in the previous sections.

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3. HOW TO OPERATE THE VANC ENCODER USING THE FRONT PANEL

The HDSD9045TR VANC Encoder can operate in one of two modes. In the SDTV mode, it takes the input SDI signals, and outputs the SDI with RP201 3-line VITC and burned-in characters. In the HDTV mode, the VANC Encoder takes the input HDSDI video and outputs the HDSDI with RP215 Ancillary data and burned-in characters. In the HDTV mode, the VANC Encoder can be used with single link 4:2:2 YCbCr or dual link 4:4:4 RGB video in the ITU Rec. 709 colour space or with extended range dual link 4:4:4 RGB video.

The VANC Encoder can be configured using the front panel controls and On Screen menu or using version 3.0 or later of the KeyLog Tracker™ software that is distributed with Evertz Film Footage Encoders. This chapter describes the front panel operation. Chapter 4 describes the operation of the VANC Encoder with the KeyLog Tracker™ software.

3.1. AN OVERVIEW OF KEY AND DISPLAY FUNCTIONS

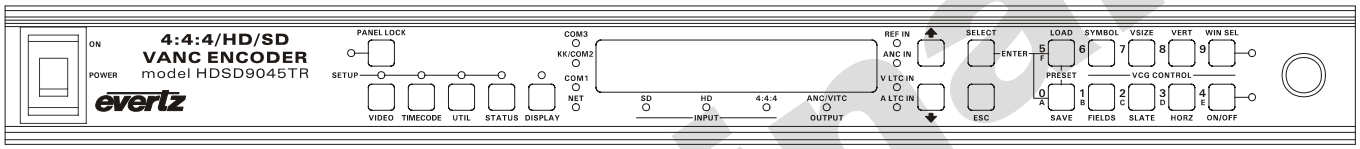

Figure 3-1: Front Panel Layout

The front panel controls consist of a 16 digit alphanumeric display, 20 LED status indicators, a 20 pushbutton keypad, and a shaft encoder knob. The front panel also contains a power switch.

The keypad is used to control the front panel *Setup* menu system, control of the front panel display and to control the character burn-in windows. The shaft encoder knob is used to navigate the front panel menu system and to adjust the position of the on screen character windows.

An On Screen *Setup* menu (also visible on the 16 digit alphanumeric display) provides a quick and simple method of configuring the VANC Encoder for your application. The remainder of section 3.1 gives an overview of the front panel controls. Sections 3.2 to 3.7 provide detailed information on the specific operations required to control the VANC Encoder.

3.1.1. The Setup Pushbutton Group

The Setup pushbutton group consists of the **VIDEO, TIMECODE, UTIL, STATUS, SELECT, ESC, ↑, ↓** keys and the **SHAFT ENCODER** knob and is used to navigate the *Setup* menu system.

VIDEO: Enters the top level of the *Video Setup* menu, which is used to configure the video functions of the VANC Encoder such as Overall mode, video standard, 24 Hz and 720P reference controls, Character window style controls (size, background, etc.), downconverter aspect ratio, etc. See section 3.4.

TIMECODE: Enters the top level of the *Time code Setup* menu, which is used to configure the time code input and output functions of the VANC Encoder. See section 3.5.

UTIL: Enters the top level of the *Utility Setup* menu, which is used to configure miscellaneous functions of the VANC Encoder such as IP address, System Unit address, GPIO functions, etc. See section 3.5.5.

STATUS: Enters the top level of the status setup menu that is used to select various status displays such as video status, audio status, time code status, network status, reference status, etc. See section 3.7.

ESC: When you are in one of the *Setup* menus the **ESC** key is used to move to the next high sub-menu levels.

SELECT: When in one of the *Setup* menus the **SELECT** key is used to move to the next lower sub-menu levels or to select a menu parameter that is to be changed.

↑, ↓, SHAFT ENCODER: When in one of the *Setup* menus, the ↑ and ↓ arrow keys are used to move to various items in the menu system. Turning the **SHAFT ENCODER** knob clockwise (to the right) has the same effect as pressing the ↓ key. Turning the **SHAFT ENCODER** knob counter-clockwise (to the left) has the same effect as pressing the ↑ key (Also see section 3.2)

3.1.2. The Display Button Group

The Display pushbutton group consists of the **DISPLAY** key and is used to select the information being displayed on the front panel when you are not in one of the *Setup* menus. After you press the **DISPLAY** key, you can use the **SHAFT ENCODER** knob or press the **DISPLAY** key again to select the *Status* or *Display* items.

DISPLAY: Allows the user to quickly view the various times of the readers and generators, as well as other display data. (See section 3.2.1)

3.1.3. Panel Lock Key Functions

PANEL LOCK: Pressing this key while holding down the **SELECT** key will lock the front panel. The LED beside the **PANEL LOCK** key will light up indicating that the front panel keys are disabled. Pressing the **PANEL LOCK** key while holding down the SHIFT key again will return the front panel keys to their normal functions and the PANEL LOCK LED will go Off. The *Auto Panel Lock* menu item on the *UTILITY* menu can be set so that the PANEL LOCK function will automatically activate after 10 minutes of inactivity on the front panel.

3.1.4. The Character Window Pushbutton Group

The Character Window pushbutton group consists of the **WIN SEL, ON/OFF, VERT, HORZ, VSIZE SLATE, SYMBOL** and **FIELDS** keys and is used to control the character generator functions.

WIN SEL: Initiates *VCG Window Select Mode* and highlights the Generator time VCG window. Hold the **HORZ** or **VERT** keys down while turning the **SHAFT ENCODER** to move the window, use the ON/OFF key to turn the selected window on or off. Rotate the **SHAFT ENCODER**

without holding any keys down to select the next window and so on. Press The **WIN SEL** key to return to the normal VCG display mode.

ON/OFF: When not in the *VCG Window Select Mode*, turn all the enabled character generator windows ON and OFF (turns off the character keyer). When in the *VCG Window Select Mode* the **ON/OFF** key is used to turn individual windows ON (window will be ON steady) and OFF.

HORZ: When in the *VCG Window Select Mode*, press this key and turn the **SHAFT ENCODER** knob to position the highlighted character window horizontally on the screen. (See also section 3.1.7)

When not in the *VCG Window Select Mode*, press this key and turn the **SHAFT ENCODER** knob to position all the character windows horizontally on the screen.

VERT: When in the *VCG Window Select Mode*, press this key and turn the **SHAFT ENCODER** knob to position the highlighted character window vertically on the screen. (See section 3.1.7)

When not in the *VCG Window Select Mode*, press this key and turn the **SHAFT ENCODER** knob to position all the character windows vertically on the screen.

VSIZE: When in the *VCG Window Select Mode* the **VSIZE** key is used to select whether the selected window will be displayed in normal vertical size or double vertical size. When not in the *VCG Window Select Mode,* this key has no function.

SLATE: When in the *VCG Window Select Mode* the **SLATE** key is used to select whether the selected window will be ON momentarily for the Virtual Slate duration only (window will be flashing), On all the time (window will be ON steady) or OFF all the time (window will remain Off). When not in the *VCG Window Select Mode,* this key has no function.

SYMBOL: When in the *VCG Window Select Mode,* the **SYMBOL** key is used to turn the character window symbol On and Off. When not in the *VCG Window Select Mode,* this key has no function.

FIELDS: When in the *VCG Window Select Mode* the **FIELDS** key is used to turn the time code display's field character On and Off. For windows that do not have a field character this key has no function. When not in the *VCG Window Select Mode,* this key has no function.

3.1.5. The Preset Button Group (Not functional at time of writing)

The Preset pushbutton group consists of the SAVE and LOAD keys and, stores and recalls user presets. At the time of writing, this button group is not functional.

3.1.6. An Overview of the SHIFT Key functions

When the ↑ key is held down while another key is pressed, 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.

When you are entering user bits into the Generator, holding the ↑ key while you press the numeric keys 0 through 5 will change their entered values to the hexadecimal values A through F.

↑+VIDEO Enables the Engineering items on the *VIDEO* menu
↑+TIMECODE Enables the Engineering items on the *TIMECODE* menu
↑+UTIL Enables the Engineering items on the *UTIL* menu

↑+PANEL LOCK Enables or disables the front panel Panel Lock function

3.1.7. Shaft Encoder Knob

The shaft encoder's function is to select various menu items or change the value of a menu item's parameter.

SHAFT ENCODER: When in one of the *Setup* menus, the **SHAFT ENCODER** knob is used to move to various items in the menu system or change a menu item's parameter value. (Also see section 3.2)

When in *VCG Window Select Mode*, the **SHAFT ENCODER** knob in conjunction with the **HORZ** and **VERT** keys is used to position the individual character windows. (See section 3.2) When not in *VCG Window Select Mode*, the **SHAFT ENCODER** knob in conjunction with the **HORZ** and **VERT** keys is used to position all the character windows.

When the *DISPLAY* LED is On, the **SHAFT ENCODER** knob is used to select what is displayed on the front panel display.

3.1.8. An Overview of the Status Indicators

There are 14 status indicators located on the front panel that show operational status of the 5600MSC at a glance.

Five status LEDs on the left side give operational status of items related to the menu system.

VIDEO: This green LED will be On when you are in the *Video* menu. The front panel display will show various items in the *Video* menu.

TIMECODE: This green LED will be On when you are in the *Time code* menu. The front panel display will show various items in the *Time code* menu.

UTIL: This green LED will be On when you are in the *Utility* menu. The front panel display will show various items in the *Utility* menu.

STATUS: This green LED will be On when you are in the *Status* menu and one of the status displays is being displayed on the On screen display.

DISPLAY: This green LED will be On when you are not in one of the *Setup* menus. See section 3.2.1 for a description of the various front panel displays that can be shown on the front panel display.

Four status LEDs underneath the dot matrix display show the input and out video formats of the VANC Encoder. Three of these LEDs indicate the input format and one LED indicates the output format.

SD INPUT: This green LED indicates that the VANC Encoder is receiving a 270 Mb/s SDI input signal compatible with SMPTE 259M-C when it is On. If it is blinking it means that the VANC encoder is in SDI input mode but there is no signal present on the Link A/4:2:2 input.

HD INPUT: This green LED indicates that the VANC Encoder is receiving a single link HDSDI input signal compatible with SMPTE 292M when it is On. If it is blinking it means that the VANC encoder is in one of the HD input modes but there is no signal present on the Link A/4:2:2 input.

4:4:4 INPUT: This green LED indicates that the VANC Encoder is receiving a dual link HDSDI input signal compatible with SMPTE 372M when it is On. If it blinking it indicates VANC encoder is in one of the 4:4:4 input modes but there is no signal present on the Link B input.

ANC/VITC OUTPUT: This green LED indicates that the Ancillary data (HDTV) or VITC (SDTV) inserter is active when it is On. When the LED is Off the Ancillary data/VITC inserter is disabled.

Four status LEDs to the left of the dot matrix display show the presence of embedded audio on the input video as well as network and COM port activity.

COM3: This green LED indicates that there is activity on the **COM3** port.

KK/COM2: This green LED indicates that there is KeyKode data present on the **COM2/KEYKODE** serial port. When the VANC Encoder is jamming to the KeyKode data the LED will be On. When there is data coming in and the VANC Encoder is not jamming to the data (due to head offsets not learned, KK Jam mode set to manual, etc.) the LED will be blinking

COM1: This green LED indicates that there is activity on the **SERIAL CONTROL/COM1** port. This port is usually connected to the computer running the KeyLog TRACKER™ software.

NET: This green LED indicates that there is activity on the Ethernet port.

Four status LEDs to the right of the dot matrix display show the presence of 6 Hz reference signal and the presence of time code inputs.

REF IN: This green LED indicates that there is a valid Reference connected to the VANC Encoder. The reference type is set using the *Reference* menu item on the *Video* menu.

ANC IN: This green LED indicates that there is Ancillary Time code (ATC) or RP215 Film Ancillary data present on the incoming HDSDI.

VLTC IN: This green LED indicates that there is valid Linear Time code (LTC) present on the Video LTC Input connector.

ALTC IN: This green LED indicates that there is valid Linear Time code (LTC) present on the Audio LTC Input connector.

Two status LEDs near the shaft encoder knob are used in conjunction with the character window controls.

WIN SEL: This green LED indicates that the VANC Encoder is in *VCG Window Select Mode*. See section 3.1.4.

ON/OFF: When the VANC Encoder is in *VCG Window Select Mode*, this green LED indicates that the selected character window is turned On. When the VANC Encoder is not in *VCG Window Select Mode*, this green LED indicates that the character keyer is turned On. See section 3.1.4.

3.2. FRONT PANEL DISPLAY FUNCTIONS

3.2.1. Front Panel Displays

The **DISPLAY** key is used to select which data is being displayed in the alphanumeric display. After you press the **DISPLAY** key, you can use the shaft encoder knob to select the various *Display* items. The leftmost characters of the display indicate what is being displayed as follows:

`VTM: 12:34:56.00`	Video Time code
`VUB: 12 34 56 78`	Video Time code User Bits
`ATM: 12:34:56.00`	Audio Time code
`AUB: 12 34 56 78`	Audio Time code User Bits
`RLTM:12:34:56.00`	Video LTC Reader Time
`RLUB:12 34 56 78`	Video LTC Reader User Bits
`OLTM:12:34:56.00`	Video LTC Output Time
`OLUB:12 34 56 78`	Video LTC Output User Bits
`RLTA:12:34:56.00`	Audio LTC Reader Time
`RLUA:12 34 56 78`	Audio LTC Reader User Bits
`OLTA:12:34:56.00`	Audio LTC Output Time
`OLUA:12 34 56 78`	Audio LTC Output User Bits
`EA123456 7890+00`	KeyKode Number
`INK:999F.7890+00`	Ink Number
`ABS:  +1234567`	Absolute Film Frames
`GTM: 12:34:56.00`	Video Time code generator Time
`GUB: 12 34 56 78`	Video Time code generator User Bits
`VOF: 00:00:00:00`	Video Time code offset from LTC Reader Time
`AOF: 00:00:00:00`	Audio Time code offset from LTC Reader Time
`GTMA:12:34:56.00`	Audio Time code generator Time
`SYSTEM ID:  1`	System ID
`123.456.789.123`	System IP Address
`IVa:1080p/23.98SF`	Input video Standard ('a' indicates auto video standard detect)
`OV:1080p/23.98SF`	Output video Standard

3.2.1.1. Special Front Panel Indicators

The following special indicators are used between the groups of digits of the front panel time display to identify non-drop frame and drop frame code when the time code is counting at 29.97 frames per second.

Non Drop Frame	Colon (:)
Drop Frame	Semi-colon (;)

3.2.2. Setting The Generator Time

The VANC Encoder contains free running time code generators for the video and audio time that you can use to output on the LTC outputs. You can set the generator time using the following procedure. Press the **DISPLAY** key and turn the **SHAFT ENCODER** knob to display the generator time if it is not already displayed. The display prompt will show `GTM` or `GTMA` when the generator time is being displayed. The **ENTER (SELECT)** and **ESC** keys are used in conjunction with the numeric keys to set the generator time.

If the VANC Encoder is under the control of KeyLog TRACKER™, you will get a message on the KeyLog TRACKER™ Screen that the VANC Encoder is in Local Mode when the VANC Encoder is in Data Entry 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. Un-entered 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 **ESC** 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 **ESC** 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 or GTMA will be On steady) before any of the front panel keys will resume normal operation and before you can resume control from the KeyLog TRACKER™ software.

3.2.3. Setting the Generator User Bits

You can set the generator user bits using the following procedure. Press the **DISPLAY** key and turn the **SHAFT ENCODER** knob 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 (SELECT)** and **ESC** keys are used in conjunction with the numeric keys to set the generator user bits.

If the VANC Encoder is under the control of the KeyLog TRACKER™, you will get a message on the Tracker Screen that the VANC Encoder is in Local Mode when the VANC Encoder is in Data Entry Mode.

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 ↑ key and the numeric keys 0 to 5 will enter the corresponding hexadecimal values A to F. Un-entered 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 **ESC** 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 **ESC** 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 and before you can resume control from the KeyLog Tracker software.

3.2.4. Entering an Offset Value for the LTC Readers

When the Video or Audio time codes are assigned to come from the Video or Audio LTC reader inputs, two offset registers allow you to apply a continuous offset between the logical Video or Audio time codes and the respective LTC reader time. The value entered into the respective Offset register will be added to the respective LTC reader time before it is entered into the Video or Audio time code register. 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. To access the *VOF* or *AOF* registers press the **DISPLAY** buttons one or more times or press the **DISPLAY** button and turn the **SHAFT ENCODER** until the display prompt shows V0F or A0F. Follow the procedure for entering the Generator time.

3.3. AN OVERVIEW OF THE SETUP MENU SYSTEM

The VANC Encoder can be used in either traditional Telecine Film to Tape applications, Video Dailies applications or as a field production metadata encoder. This personality of the VANC encoder is configured using the *Workflow* menu item on the *TIMECODE SETUP* menu.

When set to the *Cine* workflow, the VANC encoder interfaces to a telecine through its bi-phase and frame pulse interface and encodes film transfer metadata in an RP201 3-line VITC (SDTV) or RP215 Ancillary Data (HDTV). The film metadata includes KeyKode, production audio time code and synced master video record time code, and a variety of production metadata depending on whether it is encoding in HD or SD video. During the transfer process, the KeyLog TRACKER™ software is used to capture the in and out points of each shot as it is laid down to tape. Separate program and monitor outputs are provided to facilitate making a 'clean' Film Transfer master with only the metadata inserted, and also a 'dirty' working copy with over 30 different character windows burned in or flashed on for a

virtual slate at the event in point. For Film applications the VANC Encoder will typically be used in conjunction with the KeyLog TRACKER™ software.

When set to the *V Daily* workflow, the VANC encoder receives its input from a video camera master tape with time code and encodes dailies metadata in an RP201 3-line VITC (SDTV) or RP215 Ancillary Data (HDTV). The dailies metadata includes original Camera source time code, production audio time code and synced master video record time code, and a variety of production metadata depending on whether it is encoding in HD or SD video. During the transfer process, the KeyLog TRACKER™ software is used to capture the in and out points of each shot as it is laid down to tape. Separate program and monitor outputs are provided to facilitate making a 'clean' Film Transfer master with only the metadata inserted, and also a 'dirty' working copy with over 30 different character windows burned in or flashed on for a virtual slate at the event in point. For video dailies applications the VANC Encoder will typically be used in conjunction with the KeyLog TRACKER™ software.

When set to the *Field Acq* workflow, the VANC Encoder encodes video and audio time codes, and production metadata such as camera, lens and dolly information, scene, take and roll numbers into Ancillary data packets. During an editorial dubbing process, the VANC encoder may be set to the *Field Log* workflow, to decode Ancillary data packets that were encoded during *Field Acq* workflow to allow for confidence checking of the metadata. During either field acquisition (*Field Acq* workflow) or during an editorial dubbing process (*Field Log* workflow), KeyLog TRACKER™ logs the essential metadata along with the relationships between the source and record time codes. For field production applications the VANC Encoder can be used as a stand-alone device or in conjunction with the KeyLog TRACKER™ software.

This chapter describes how to operate the VANC Encoder using its built-in front panel interface. The key to the operational flexibility of the VANC Encoder lies in the *Setup* menu system which provides a quick, intuitive method of configuring the VANC Encoder, guiding you to the correct setup for your application. The VANC Encoder can also be controlled using the KeyLog TRACKER™ software (see chapter 4)

The *Setup* menu uses an On Screen Display (OSD) available on the *MON* video outputs and optionally on the *PGM* video outputs. Abbreviated copies of the menu items can also be viewed on the 16-digit front panel alphanumeric display if a video monitor is not available.

The *Setup* menu system consists of four main menus with several choices for each menu item. The **VIDEO, TIMECODE, UTIL** and **SETUP** keys allow you to quickly go to the top of each of the four main menus while the **SELECT, ESC,** arrow keys (↑, ↓) and **SHAFT ENCODER** knob are used to navigate the menu. See Figure 3-2 for an overview of the Setup menus.

To enter the *VIDEO SETUP* menu, press the **VIDEO** key. Similarly you can enter the *TIMECODE SETUP,* the *UTIL SETUP* or *STATUS* menus by pressing the **TIMECODE, UTIL** and **STATUS** keys respectively. This will bring you to the respective main menu where you can use the arrow keys (↑, ↓) or turn the **SHAFT ENCODER** knob to move up and down the list of available top-level menu items. In the OSD, a right pointing arrow (➢) moves up and down the left hand side of the menu items to indicate which item you are currently choosing. (The green LED above the respective button will illuminate to indicate that you are in one of the Setup menus.) This top-level menu item is also displayed in UPPER CASE on the front panel. Some of the menu items may be greyed out on the OSD. These items are either not applicable for the current operating mode, or they are protected Engineering menus. To enter the Engineering menus, press and hold the up arrow key (↑) while you press the **VIDEO, TIMECODE** and **UTIL** keys.

Once you have chosen the desired top-level menu item, press the **SELECT** key to enter the next lower menu level. Sub-menu items are shown in Title Case (The First Letter Of Each Word Is Capitalized) on the front panel.

The top of the menu screen will show the *System Ident* followed by a colon. The *System Ident* is a letter or number allowing the user to distinguish multiple VANC Encoders. The *System Ident* is set in the *UTIL SETUP* menu. See section 3.6.4 for information on setting the *System Ident*. If the VANC Encoder is networked and is a member of a network control gang then the word *GANGED* will also show at the top of the menu screens to remind you that changing this VANC Encoder's menu settings will also affect other members of the gang. See section 3.6.6 for more information on ganged menu operation.

On all menus, there are two extra items: *Back* and *Exit*. Selecting *Back* is equivalent to pressing the **ESC** key at any time in the menu, and will take you to the previous menu (the one that was used to get into the current menu). Selecting *Exit* will exit the *Setup* menu and return the display to its normal operating mode. On the main menu, *BACK* and *EXIT* will both take you to the normal operating mode.

Once in a sub-menu, there may be another menu layer, or there may be a list of parameters to adjust. If there is another set of menu options, use the arrow keys (↑, ↓) or turn the **SHAFT ENCODER** knob to display the desired item within the sub-menu and press the **SELECT** key to get to the bottom of the menu tree where a list of parameters to be adjusted will be shown with an = symbol on the OSD and in Sentence case on the front panel. (The first letter of the parameter is capitalized.)

To adjust any parameter, use the arrow keys (↑, ↓) or turn the **SHAFT ENCODER** knob to move up or down to the desired parameter and press the **SELECT** key. On the OSD, a left pointing arrow (➢) will show on the right hand side of the line indicating that you can now adjust the parameter. On the front panel the active value for the parameter will be shown in Sentence case. Using the arrow keys (↑, ↓) or **SHAFT ENCODER** knob, adjust the parameter to its desired value.

When you are adjusting a parameter value you must accept the changes using the SELECT button before you can access other menu items. The ESC button does not do anything when you are adjusting the parameter values.

When you have selected the desired parameter value, press the **SELECT** key to make that value the active value. On the OSD, the arrow will move back to the left side of the parameter list. On the Front Panel the menu item will be shown again. Press the **ESC** key move back up to the next higher menu level. You can select other parameters from that sub-menu by using the arrow keys (↑, ↓) or turning

the **SHAFT ENCODER** knob, followed by the **SELECT** key. Alternately you can move up one more menu level by pressing the **ESC** key.

Sections 3.4 to 3.7 provide detailed descriptions of the *Setup* menus. The tables in these sections are arranged in an indented structure to indicate the path taken to reach the control.

- **VIDEO**
  - **WINDOWS**
    - Slate Mode
    - Slate Duration
    - Style
    - Character size
    - H Adj
    - V Adj
  - **LUTS**
    - Cur LUT
    - LUT GPI On
    - LUT GPI Off
    - PGM LUT
    - MON LUT
  - **Mode**
  - **Auto Video Detect**
  - **Video**
  - **Program Out**
  - **No Video In**
  - **720P Ref**
  - **30 vs 24 Ref**
  - **30 vs 24 Offset**
- **TIMECODE**
  - **WORKFLOW**
  - **INPUTS**
    - Video TM
    - Video UB
    - Audio TM
    - Audio UB
    - Film Data
    - Ink Data
    - KeyKode Jam
    - Tag Data
    - ANC Source
    - ANC Fallback
    - Time Format
    - Video TC Drop Frame
    - Audio TC Drop Frame
  - **LTC OUTPUT**
    - VLTC TM
    - VLTC UB
    - VLTC Rate
    - ALTC TM
    - ALTC UB
    - ALTC Rate
  - **ANC OUT**
    - ANC Type
    - ANC PGM
    - ANC MON
    - ANC Line
    - Blank PGM
    - Blank MON
  - **VITC OUTPUT**
    - VITC Mode
    - VITC Enable
    - Line 1 TM
    - Line 1 UB
    - Line 2
    - Line 3 TM
    - Line 3 UB
    - 525 VITC Lines
    - 625 VITC Lines
  - **FILM**
    - Film Gauge
    - Film Rate
  - **CINE**
    - Telecine
    - Biphase Rate
    - Pull Input
    - Video Process
    - Pre-Store
    - Stop Win
  - **5550**
    - 5550 Ctl
    - Emulsion
    - KK Intens
    - KK Mode
    - TC Type
    - TC Mode
    - TC Intens
    - LED Saver
  - **KEYKODE**
    - Head Offset
    - KK Play Win
    - KK Shuttle
    - KK Dropout
    - Key Info
  - **FILM TIMECODE**
    - FTC Jam Enable
    - FTC Jam
    - FTC Type
    - FTC Head Offseet
    - FTC Play Win
    - FTC Shuttle
- **UTIL**
  - **GPIO**
    - GPIO1 Func
    - GPI1 Trigger
    - GPIO2 Func
    - GPI2 Trigger
    - GPIO3 Func
    - GPI3 Trigger
    - GPIO4 Func
    - GPI4 Trigger
    - GPIO5 Func
    - GPI5 Trigger
  - **PORTS**
    - Com1 Func
    - Com1 Baud
    - Tracker Comm
    - Com2 Func
    - Com2 Baud
    - KK Baud
    - Com3 Func
    - Com3 Baud
    - ANC Dump
  - **System IP**
    - Common 1st Octet
    - Common 2nd Octet
    - Common 3rd Octet
    - 9045 Address
    - Gateway Address
    - Syslog
    - Syslog Address
    - Tracker Address
    - Tracker Port
    - Announce
    - Mask 1st Octet
    - Mask 2nd Octet
    - Mask 3rd Octet
    - Mask 4th Octet
  - **System Ident**
  - **Auto Panel Lock**
  - **Control Gang**
  - **Configuration**
    - Send Config to
    - Get Config From
  - **Reset Most**
  - **Factory Reset**
- **STATUS**
  - **Video Status**
    - Mode
    - Auto Video
    - SDI Video In
    - B Link In
    - Locked For
    - SDI Video Out
    - LUT
    - PGM Out LUT
    - MON Out LUT
  - **Ref 720P Status**
    - Ref Source
    - Ref Status
    - Black Ref
    - Black Ref Phase
  - **Ref 24PSF Status**
    - Ref Source
    - Ref Status
    - Locked for
    - VTM Pull
    - Black Ref
    - Black Ref Phase
    - Ref In
    - VTC Out
    - ATC Out
    - KK Out
    - Int 6Hz
  - **Misc Status**
    - GPIO 1
    - GPIO 2
    - GPIO 3
    - GPIO 4
    - GPIO 5
    - GPI On
  - **TC In Status**
    - LTC In Status
    - ALTC In Status
    - ANC In Status
  - **COMM Status**
    - Ctl Com Status
    - Com 2 Status
    - Com 3 Status
  - **CINE Status**
    - Biphase In Status
    - Frm Pulse Status
    - KeyKode Status
    - FilmCode Status
  - **5550 Status**
    - Comm
    - KK Valid
    - KK Asym
    - 5550 Biphase
  - **Network Status**
    - Net Neighbours
    - HDSD9045
    - Gateway
    - Syslog
    - Tracker
    - Tracker Port
    - Subnet
    - MAC
    - Net Link
    - Net Activity
    - Net Speed
  - **Versions**
    - Version
    - H/W Rev
    - FPGA Rev
    - NETIF Version
    - 5550 FL

Figure 3-2: On Screen Menu Overview

3.3.1. Accessing the front panel menus using Telnet

If you have a connection via Ethernet, the menus may also be viewed and controlled from a Telnet interface. To gain access to the menu interface open a Telnet session on your computer, connecting to the IP address of the HDSD9045TR.

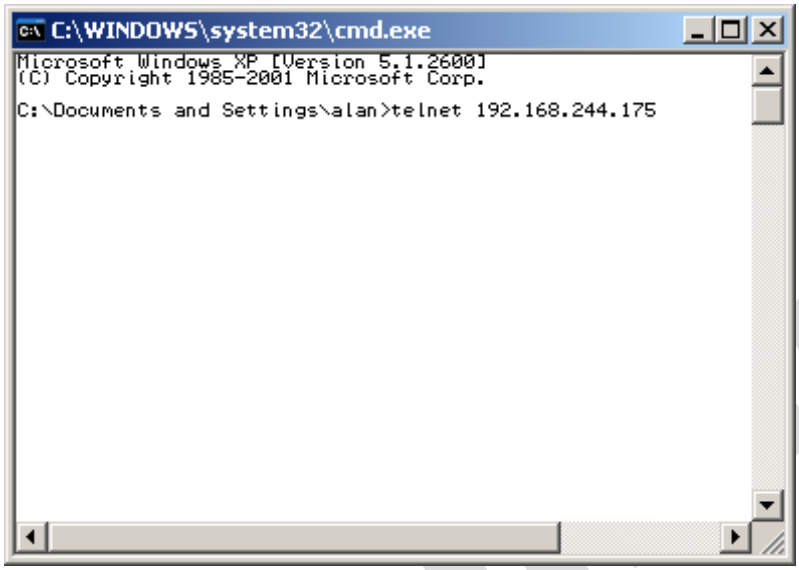

Figure 3-3: Telnet Session

This will open a telnet session with the HDSD9045TR. The HDSD9045TR will return a prompt showing that you are connected.

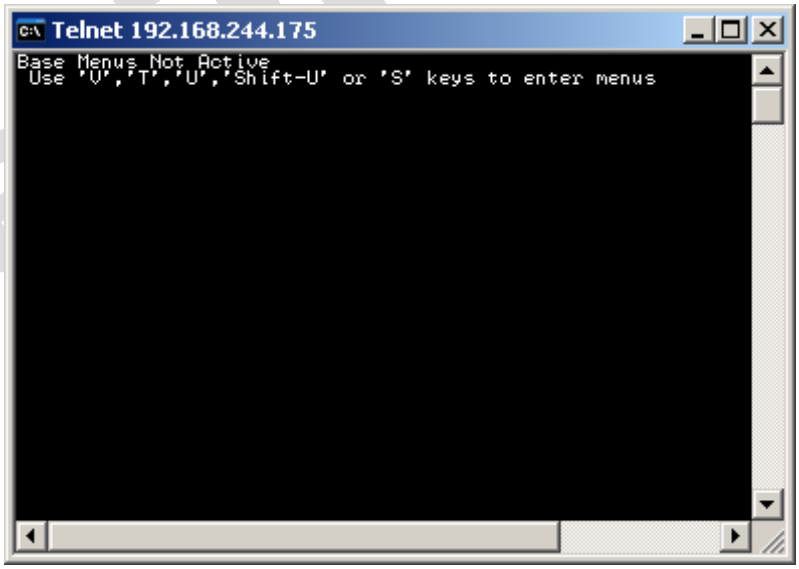

Figure 3-4: Telnet Main Menu

To enter the *VIDEO SETUP* menu, press the **v** key. Similarly you can enter the *TIMECODE SETUP,* the *UTIL SETUP* or *STATUS* menus by pressing the **t, u** and **s** keys respectively. This will bring you to the respective main menu where you can use the arrow keys (↑, ↓) to move up and down the list of available top-level menu items. In the OSD, a right pointing arrow (➢) moves up and down the left

hand side of the menu items to indicate which item you are currently choosing. To enable the Engineering items on each of the menus press the shift key while you enter the menus with the **V**, **T**, and **S** keys.

Once you have chosen the desired top-level menu item, press the **ENTER** key to enter the next lower menu level. Sub-menu items are shown in Title Case. You can continue to navigate the menu by using the arrow keys (↑, ↓) to move up and down, the **ENTER** key to enter the next lower level, and the **ESC** key to move up one level. The current level of the OSD menu screen will be redrawn on the telnet session screen as shown below.

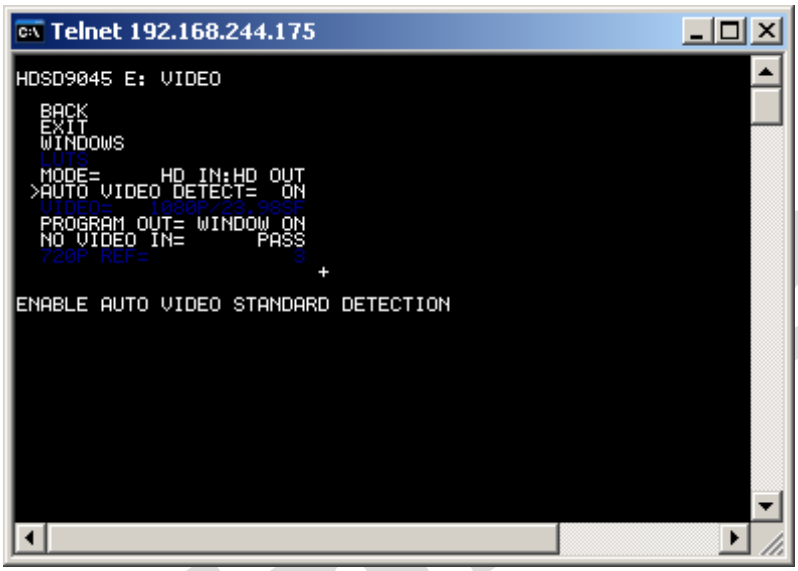

Figure 3-5: Telnet Session Screen

To exit the telnet session press the CRTL+] keys. Then close the command window.

3.4. CONFIGURING THE VIDEO CONTROLS

The *VIDEO* menu items are used to configure parameters associated with the input and output video standards, the character windows, and is also used to configure the downconverter aspect ratio and pulldown. The chart below shows the items available in the *VIDEO* menu. Sections 3.4.1 to 3.4.7 provide detailed information about each menu item.

Windows	Menu to configure the character window parameters.
LUTs	Menu used to configure the Look Up Tables.
Mode	Configures the type of video inputs and outputs.
Auto Video Detect	Selects the auto video standard detect mode.
Video	Selects the video input and output standards when Auto Video Detect is disabled. Shows the current video standard when auto video is enabled.
Program Out	Selects whether the (HD)SDI Program outputs will have Characters burned in or not.
No Video In	Selects the output behaviour when there is no input video.
720P Ref	Selects the reference source when the video input is 720P.
30 vs 24 Ref	Selects the reference source when the video picture content is 24 frames per second and the output video is 30 frames per second nominal.
30 vs 24 Offset	Sets an offset from the frame selected by the 30 vs 24 Reference.

3.4.1. Configuring the On Screen Character Burn-In Windows

The *Windows* sub-menu items are used to configure parameters that affect all the character burn-in windows. The chart below shows the items available in the *Windows* sub-menu. Sections 3.4.1.1 to 3.4.1.5 provide detailed information about each menu item. Attributes for the individual character windows (display On or Off, assigned as part of the Virtual Slate, position, vertical size, symbol On or Off, time code fields On or Off) are controlled using the front panel buttons in the Character Window pushbutton group. See section 3.1.4.

Slate Mode	Sets the operating mode of the Virtual Slate.
Slate Duration	Sets the duration that the Virtual Slate will be displayed after its trigger.
Style	Sets the foreground and background style.
Size	Sets the character font vertical size.
H Adj	Fine adjustment of the horizontal position of the character raster.
V Adj	Fine adjustment of the vertical position of the character raster.

3.4.1.1. Selecting the Virtual Slate Mode

VIDEO
Windows
Slate Mode
Off
Event Start
Between Evnt
GPI Duration
Manual GPI
Between GPI

Character windows can be configured to always remain Off, always On, or On only when the Virtual Slate is active. This control selects the trigger to turn on the Virtual Slate. (See 3.5.2.3 for more info about Events).
Virtual Slate is Off
Virtual Slate comes on for a duration at an Event Start.
Virtual Slate is on between events and for a duration after the Event Start.
Virtual Slate is comes on for a duration at a GPI closure.
Virtual Slate is turned On and Off by a GPI closure (see 3.6.1 for GPI info).
Virtual Slate is On while GPI is inactive and stays On for a duration after GPI becomes active.

3.4.1.2. Setting the Virtual Slate Duration

VIDEO
Windows
Slate Duration
0
0 to 999

This control sets the duration (in frames) that the Virtual Slate will be on after its start trigger in *Event Start, , Between Evnt, Between GPI* and *GPI Duration* modes. (See section 0).

3.4.1.3. Selecting the Character Font Style

VIDEO
Windows
Style

White no bkgnd	White characters keyed in with no background
White on transp	White characters keyed in with transparent grey background
White on pale	White characters keyed in with pale grey background
White on dark	White characters keyed in with dark grey background
White on black	White characters keyed in with solid black background
Black no bkgnd	Black characters keyed in with no background
Black on transp	Black characters keyed in with transparent white background
Black on pale	Black characters keyed in with pale white background
Black on dark	Black characters keyed in with dark white background
Black on white	Black characters keyed in with solid white background
LGrey no bkgnd	*LGrey* characters keyed in with no background
LGrey on transp	*LGrey* characters keyed in with transparent grey background
LGrey on pale	*LGrey* characters keyed in with pale grey background
LGrey on dark	*LGrey* characters keyed in with dark grey background
LGrey on black	*LGrey* characters keyed in with solid black background
Grey no bkgnd	*Grey* characters keyed in with no background
Grey on transp	*Grey* characters keyed in with transparent grey background
Grey on pale	*Grey* characters keyed in with pale grey background
Grey on dark	*Grey* characters keyed in with dark grey background
Grey on black	*Grey* characters keyed in with solid black background

This control selects the foreground and background style of the character windows.

3.4.1.4. Selecting the Character Font Vertical Size

VIDEO
Windows
Character Size
Tiny
Small

This control selects the vertical size of the character font. (You can double the height of this font for some windows using the **VSIZE** key). (See section 3.1.4)
Tiny size is 8 lines per field in SD, 15 lines per field in HD
Small Size is 16 lines per field in SD, 30 lines per field in HD

3.4.1.5. Adjusting the Character Raster Position

VIDEO
Windows
H Adj
0
-16 to +16

This control adjusts the horizontal position (in pixels) of the character raster.

VIDEO
Windows
V Adj
0
-5 to +5

This control adjusts the vertical position (in lines) of the character raster.

3.4.1.6. Working with the Debug Character Window

There are three character windows that are used to display various debug information about the operation of the VANC Encoder. These windows can by used for operational status such as Video Standard. Other information would only be useful to a service technician and would not normally be displayed during operation.

Unlike most of the character windows, you can only select the vertical position of the three debug windows. The Horizontal position function is used to select the contents that will be shown in the debug window. To change the Debug window content, press the **WIN SEL** button. Turn the **SHAFT ENCODER** until the desired debug window name is shown on the front panel. Use the **ON/OFF** button to turn the window On. Press and hold the **VERT** button and turn the **SHAFT ENCODER** to position the window vertically. Press and hold the **HORZ** button and turn the **SHAFT ENCODER** to select what will be displayed in the debug window. As you turn the **SHAFT ENCODER** you will see the names of the various debug window displays shown in the window. See section 6.3 for a description of the contents of the debug character windows.

3.4.2. Setting the Video Operating Mode

VIDEO *Mode* *SD In:SD Out* *HD In:HD Out* *444FS In:HD Out* *444FS In:Out* *4:4:4 In:Out*	With this control, you can select the type of video inputs and PGM and MON outputs for the VANC Encoder. 4:2:2 SD in to SD PGM out with 4:2:2 SD MON out 4:2:2 HD in to 4:2:2 HD PGM out with 4:2:2 HD MON out Full scale 4:4:4 HD in to FS 4:4:4 HD PGM out, with 4:2:2 HD MON out Full scale 4:4:4 HD in to FS 4:4:4 HD PGM out, with FS 4:2:2 HD MON out 4:4:4 HD in to 4:4:4 HD PGM out, with 4:2:2 HD MON out

3.4.3. Selecting the Video Standard

There are two controls that are used to select the input and output video standard for the VANC Encoder. See section 3.4.2.

VIDEO *Auto Video Detect* *On* *Off*	With this control, you can select whether the VANC Encoder will auto-detect the input video standard. When set to *On,* the VANC Encoder will auto-detect the input video standard. The Video Standard menu will be greyed-out, but will show the detected video standard from the list shown below. When set to *Off*, the user must set the video standard using the Video Standard menu item.

When set to *Auto,* the VANC Encoder cannot distinguish between *1080i/59.94* and *1080p/29.97sF* input video so it will be selected as *1080i/59.94*. Similarly *1080p/25sF* will be selected as *1080i/50*.

VIDEO	With this control, you can set the input and output video standard for the VANC Encoder when the Auto Video Detect menu item is set to Off.
Video	These Video standard combinations are available when the *Mode* control is set for SDTV inputs and output
525i/59.94	525i/59.94 input and output
625i/50	625i/50 input and output
	These Video standard combinations are available when the *Mode* control is set for HDTV Inputs and Outputs
1080i/59.94	1080i/59.94 input and output - also includes 1080p/29.97sF
1080i/50	1080i/50 input and output - also includes 1080p/25sF
1080p/23.98sF	1080p/23.98sF input and output
720p/59.94	720p/59.94 input and output

When you select the 1080/23.98sF video format you will also need to set the *24 vs 30 Pulldown Ref* menu item in order to properly determine where the 6 Hz alignment point to 59.94 will occur.

When you select one of the 720p video formats you will also need to set the *720P Ref* menu item in order to properly determine how the 30 Hz LTC will be aligned to the 60 Hz 720P video.

3.4.4. Selecting Whether Characters will be Displayed on the Program Video Outputs

VIDEO	With this control, you can select whether characters will be displayed on the Program Video Outputs.
Program Out	When set to *Clean*, windows and menus never appear.
Clean	When set to *Slate*, windows appear only when virtual slate is active. Menus appear when active.
Slate	When set to *Menus Only*, only the menus will be displayed.
Menus Only	When set to *Window On*, the windows and menus are always on.
Window On	

3.4.5. Selecting the Output Video when there is no Input Video

VIDEO	With this control, you can select the output when there is no video input.
No Video In	
Pass	When set to *Pass*, the output will pass through input signal.
Blue+char	When set to *Blue+char*, the blue screen with message.
Blue	When set to *Blue*, the output will be blue screen only.
Black+char	When set to *Black+char*, the black screen with message
Black	When set to *Black*, the output will be black screen only

3.4.6. Setting the Reference for 720P Video Input Sources (HD Inputs only)

VIDEO
720P Ref
Auto Video In ATC LTC

With this control, you can set the frame reference when the video input is 720p/59.94. In 720P the VANC Encoder uses this reference source to determine which pair of input video frames to align the 29.97 Hz LTC output.

When set to *Auto*, the VANC Encoder will select ancillary time code first and if it is not present it will use LTC (if present on the LTC input)

When set to *Video In ATC*, the time code embedded on the input video is used to align the output video.

When set to *LTC*, the time code present at the LTC IN XLR is used to align the video.

Note that if the input video is from a source that changes between running and stopped time code, the picture may break up momentarily each time the time code starts and stops as the VANC encoder relocks to the time code.

3.4.7. Setting the 24 Hz Pulldown Reference for 1080p/23.98sF Video Input Sources (HD Inputs only)

The VANC Encoder requires a 6 Hz Reference to determine how its internal 24Hz and 30 Hz time bases should be aligned when it is using 1080p/23.98 video. The Reference determines where the 6 Hz sequence will start (i.e. where the 24 Hz and 30 Hz time bases are aligned). All logging of the events is done only on the points at which the HD video coincides with the 6 Hz alignment point. You can select the reference source using the *30 vs 24 Ref* menu item and you can offset the 6 Hz alignment point from the reference using the *30 vs 24 Offset* menu item.

In Film to tape transfers, the Telecine Edit controller is responsibe for controlling the edit so that it coincides with the start of the 6 Hz cycle. Usually it is desirable to have the record video timecode frame :00, :04, :08 etc. line up with the 6Hz cycle. The edit controller must be adjusted to achieve this - and this means that it must be properly locked to the 6 Hz reference. When the edit controller properly lines up the :00 frames of the Record VTR's timecode with 6 Hz point, the HDSD9045TR will indicate this as an 'A' frame pulldown on the VIDEO TIMECODE PULLDOWN section of Tracker's STATUS window. Consult your edit controller's instruction manual for information on how to align the edit point to the 6 Hz reference.

When set to *BLACK REF*, an analog colour black signal connected to the **COLOUR BLACK REFERENCE IN** BNC on the rear panel will be used to derive the 6 Hz alignment point. This colour black signal MUST have a fixed phase relationship to the 1080p/23.89sF video coming from the telecine. This is the recommended setting when you are using an edit controller to dynamically synchronize the source, such as in a telecine transfer. In this method the timing of the 1080p/23.89sF video input is compared against the colour black reference input. The beginning of the video frame where the two signals most closely coincide is established as the start of the 6 Hz cycle. This colour black must be in time and locked to the colour black signal which is referencing the timing reference generator. The timing reference generator should generate a 1080p/23.89sF tri-level sync signal which references the telecine, and the telecine should be generating 1080p/23.89sF video in phase with this tri-level reference.

When set to *6 Hz*, a 6 Hz pulse applied to one of the GPI inputs will be used to derive the 6 Hz alignment point. See Figure 3-6 for specifications on the 6 Hz pulse timing. You must also assign one of the inputs to accept the 6 Hz input using the System parameters, 25-0 to 25-5. This 6 Hz pulse MUST have a fixed phase relationship to the 1080p/23.89sF video coming from the telecine. The rising edge of the 6 Hz pulse determines the start of the 6 Hz cycle. The system timing reference generator should generate a 1080p/23.89sF tri-level sync signal which references the telecine, and the telecine should be generating 1080p/23.89sF video in phase with this 6 Hz reference.

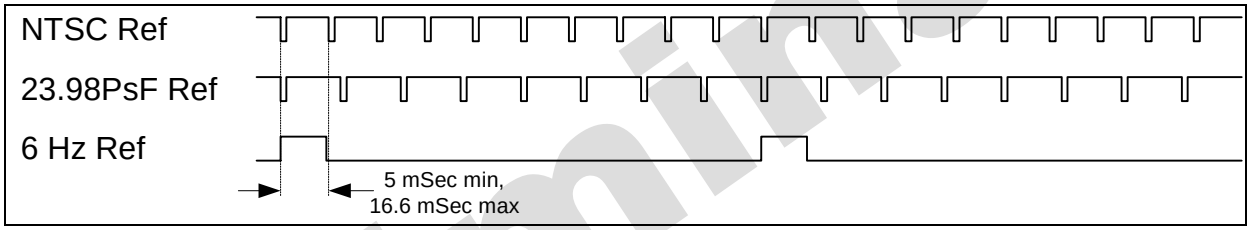

Figure 3-6: 6 Hz Reference Pulse Timing

When set to *ANC VTC*, the ancillary time code on the HD input will be used to derive the 6 Hz alignment point. If there is RP215 Film Ancillary data then the video time code values from the Film ANC will be used. When set to *VTC*, whatever is set to be the video time code source of the HDSD9045TR will be used. When set to *LTC*, the time code that is connected to the **VIDEO LTC IN** XLR will be used. The 6 Hz alignment point will be set so it coincides with the :00 frame of each second. These settings are typically used in Video Dailies modes where there is no edit controller to force the 6 Hz alignment of the source.

When set to *FANC APH*, the video to audio phase information from the RP215 Film ANC on the input video will be used.

VIDEO	With this control, you can set the 6 Hz reference source for the VANC Encoder.
30 vs 24 Ref	
6 Hz	6Hz Input signal – GPI input assigned to 6Hz In
BLACK REF	Colour Black input signal connected to the Reference IN BNC
ANC VTC	Ancillary Data Time code – 00 frame of each second
VTC	Time code from *Video Time code Source* – 00 frame of each second
LTC	Video LTC Input – 00 frame of each second
FANC APH	Film Ancillary Data (RP215) Audio to Video phase flags

VIDEO *30 vs 24 Offset* *A* *B* *C* *D* *A-B*	With this control, you can set the type of frame that occurs at the reference point in the pulldown sequence. Reference where A frame candidate is (frame that will become A frame) Reference where B frame candidate is (frame that will become B frame) Reference where C frame candidate is (frame that will become C frame) Reference where D frame candidate is (frame that will become D frame) Alternate method of forcing B frame at reference. Only available in 2:3 scaler mode.

3.5. CONFIGURING THE CODE INPUTS AND OUTPUTS

The VANC Encoder has the ability to process input video time code, audio time code as well as film KeyKode and Ink numbers for film transfer applications. In addition, the VANC Encoder will encode this information into RP215 film Ancillary Data for HDTV outputs, or RP201 3-line VITC for SDTV outputs. The system Video time code is output as LTC to feed to the record VTR, and the system audio time code is output as LTC to allow audio playback devices to chase lock. Each of these codes is abstracted internally as logical time code sources and outputs. The *TIMECODE* menu items are used to map the logical inputs to the physical outputs, and to configure other parameters associated with the VANC Encoder time code processing. The chart below shows the items available in the *TIMECODE* menu. The *Workflow* menu item sets overall workflow types for the VANC encoder, and determines which of the other logical mapping items are available. (Mapping items that are not available will be greyed out.) Sections 3.5.2.1 to 3.5.4.5 provides detailed information about each menu item.

Workflow	Sets overall workflow which determines other input mapping assignments
Inputs	Settings for the Time code input mapping
LTC Output	Settings for the LTC Output
ANC Output	Settings for the VANC Output (HD outputs only)
VITC Output	Settings for the VITC Output (SD outputs only)
Film	Settings for Film Gauge and transfer rate
CINE	Settings for Telecine (Biphase rate, pulldown ref, processing delays)
5550	Settings used to control the 5550 KeyKode reader
KeyKode	Settings for KeyKode Processing (Head offset, jam windows, etc.)
Film Timecode	Settings for film Time code Processing (Time code Type, Head offset, jam windows, etc.)

3.5.1. Selecting the Workflow Type

TIMECODE	
Workflow	With this control, you can select the overall workflow mode of the VANC Encoder. Other mapping items are greyed out if they are not supported in certain workflows.
Cine	Telecine Transfers (Generates film info locked to telecine bi-phase)
V Daily	Video Dailies applications
Field Acq	Field Acquisition of Metadata from Lens, Camera, Dolly, etc.
Field Log	Dub Logging of Field Acquisition Metadata
ATC Gen	Generator for Ancillary Time Code

3.5.2. Configuring the Time code Inputs

The *Inputs* sub-menu items are used to map the logical inputs to the physical time code input sources, (i.e. where does this time code come from) and configure parameters associated with the input time codes. The chart below shows the items available in the *Inputs* menu. Sections 3.5.2.1 to 3.5.4.5 provide detailed information about each menu items.

Video TM	Selects the source of the logical Video Time code
Video UB	Selects the source of the logical Video user bits
Audio TM	Selects the source of the logical Audio Time code
Audio UB	Selects the source of the logical Audio user bits
Film Data	Selects the source of the logical Film number data
Ink Data	Selects the source of the logical Ink number data
KeyKode Jam	Selects the KeyKode Jam Mode
Tag Data	Selects the source of the logical Tag data (used to trigger events for the virtual slate)
ANC Source	Shows the type of Ancillary data packets being used (Read only)
ANC Fallback	Selects whether the Ancillary data reader automatically reverts to LTC when ANC data is not present

3.5.2.1. Selecting the Source of Video Time and User Bits

TIMECODE	With this control, you can select the source of Video time code time information. This is the main time code used in the VANC Encoder
Inputs	
Video TM	
Film ANC VTM	RP215 Film Ancillary Data Video time
ATC TM	SMPTE 12M-2 Ancillary Time code time (embedded on the video input)
LTC TM +VOF	Video LTC reader time adjusted by value of Video Offset (VOF) register
VITC TM	VITC time (SD Video inputs only)
Gen TM	Generator Time
BIPH V TM	Biphase or virtual Biphase based Video time
Not used	Video time not used – set to 00:00:00:00

TIMECODE	With this control, you can select the source of Video time code user bits information. This is the user bits associated with the main time code used in the VANC Encoder.
Inputs	
Video UB	
Film ANC VUB	RP215 Film Ancillary Data Video user bits
LTC UB	Video LTC reader user bits
LTC TM	Video LTC reader time
VITC UB	VITC user bits (SD Video inputs only)
Gen UB	Generator user bits
Index Tag	Database Index Tag
Logical Tag	Logical Tag set by *TAG data* menu item
KeyKode	KeyKode (last 8 digits)
Ink	Ink Numbers (last 8 digits)
ATC TM	SMPTE 12M-2 Ancillary Time code time (embedded on video input)
ATC UB	SMPTE 12M-2 Ancillary Time code user bits (embedded on video input)
Not used	Video user bits not used – set to 00 00 00 00

3.5.2.2. Selecting the Source of Audio Time and User Bits

TIMECODE	With this control, you can select the source of Audio time code time information. This is the main time code used in the VANC Encoder.
Inputs	
Audio TM	
Film ANC ATM	RP215 Film Ancillary Data Audio time
ATC TM	SMPTE 12M-2 Ancillary Time code time (embedded on the video input)
ATC UB	SMPTE 12M-2 Ancillary Time code user bits (embedded on video input)
ALTC TM+AOF	Audio LTC reader time adjusted by value of Audio Offset (AOF) register
ALTC UB+AOF	Time in Audio LTC UB adjusted by value of Audio Offset (AOF) register
VITC	VITC (SD Video inputs only)
AGen TM	Audio Generator Time
BIPH A TM	Biphase or virtual Biphase based Audio time
ARRI TM	ARRI Film Time code
Matrix TM	Matrix (AATON) Film Time code
Not used	Audio Time bits not used – set to 00:00:00:00

TIMECODE	
Inputs	
Audio UB	With this control, you can select the source of Audio time code user bits information. This is the user bits associated with the main time code used in the VANC Encoder.
Film ANC AUB	RP215 Film Ancillary Data Video user bits
ATC UB	SMPTE 12M-2 Ancillary Time code user bits (embedded on video input)
ALTC UB	Audio LTC reader user bits
ALTC TM	Audio LTC reader time
Audio TM	Same as logical Audio Time (set by *Audio TM* menu)
VITC UB	VITC user bits (SD Video inputs only)
AGen UB	Audio Generator user bits
KeyKode	KeyKode (last 8 digits)
Ink	Ink Numbers (last 8 digits)
ARRI UB	ARRI Film Time code User bits
Matrix UB	Matrix (AATON) Film Time code User bits
Not used	Audio user bits not used – set to 00 00 00 00

3.5.2.3. Selecting the Source of Film KeyKode and Ink numbers

TIMECODE	With this control, you can select the source of KeyKode information.
Inputs	
Film Data	
KeyKode	Biphase based Film numbers jammed to KeyKode Reader
Gen KK	Free running film numbers
RP215 Film ANC	RP215 Film Ancillary Reader KeyKode
Not used	Film data not being used set to zeros

TIMECODE	With this control, you can select the source of Ink Number information.
Inputs	
Ink Data	
Ink	Biphase based Ink numbers
Gen Ink	Free running Ink numbers
RP215 Film ANC	RP215 Film Ancillary Reader Ink numbers
Not used	Ink number data not being used set to zeros

3.5.2.4. Selecting the KeyKode Jam Mode

TIMECODE	With this control, you can select the way that the bi-phase based Film numbers are updated from the KeyKode reader data when the *Film Data* menu item is set to *KeyKode*.
Inputs	
KeyKode Jam	
Never	Biphase based Film numbers only – not updated from KeyKode Reader
Play	Jam Biphase based film numbers only when telecine is locked in Play mode
Once	Jam Biphase based film numbers once when telecine locks in Play
Always	Jam Biphase based film numbers when Play or shuttle window exceeded
After	Auto jam to KeyKode Reader across splices going forward only.

3.5.2.5. Selecting the Source of Tag Data

TIMECODE	
Inputs	
Tag Data	With this control, you can select the source of Tag information. Tag information is usually static throughout a shot but will change from shot to shot. A change in the Tag information triggers an *Event Start* that can be used to trigger the Virtual Slate character windows.
Tracker	KeyLog Tracker sends the Tag data at the beginning of each event
Film ANC TAG	RP215 Film Ancillary Data reader Tag
ATC UB	SMPTE 12M-2 Ancillary Time code user bits (embedded on the video input)
VLTC UB	Video LTC reader user bits
ALTC UB	Audio LTC reader user bits
Scene	RP215 Film Ancillary Data Scene
Video UB	Video Time code User Bits (Set by *Video UB* menu – see section 3.5.2.1)
Audio UB	Audio Time code User Bits (Set by *Audio UB* menu – see section 3.5.2.2)
Random	Tags are generated by HDSD9045TR random number generator

3.5.2.6. Selecting the Ancillary Source

TIMECODE	
Inputs	
ANC Source	Status display showing type of Ancillary data being read. This is a read only display.
ATC-LTC	SMPTE 12M-2 Ancillary time code (LTC packet type)
ATC-VITC	SMPTE 12M-2 Ancillary time code (VITC1 or VITC 2 packet type)
FILM ANC	RP215 Film Ancillary Data

3.5.2.7. Reverting to LTC when there is no Ancillary Data Input

TIMECODE	
Inputs	
ANC Fallback	With this control, you can select whether the video time code source automatically reverts to LTC when ANC data is not present.
On	Video time code automatically reverts to LTC when ANC is not present
Off	Video time code uses only the programmed source

3.5.3. Configuring the LTC Output

The *LTC Output* sub-menu items are used to map the logical inputs to the LTC Output sources, (i.e. where does the LTC output time code come from) and configure parameters associated with the LTC output time code. The chart below shows the items available in the *LTC Output* menu. Sections 3.5.3.1 to 0 provide detailed information about each menu item.

VLTC TM	Selects the source of the Video LTC output time
VLTC UB	Selects the source of the Video LTC output user bits
VLTC Rate	Selects the frame rate of the Video LTC output time code
ALTC TM	Selects the source of the Audio LTC output time
ALTC UB	Selects the source of the Audio LTC output user bits
ALTC Rate	Selects the frame rate of the Audio LTC output time code

3.5.3.1. Selecting the Source of Time and User Bit Information for the Video LTC Output

TIMECODE
LTC Output
VLTC TM
Video TC TM
Audio TC TM
Gen TM
Not used

With this control, you can select the source of the time information that will be used for the Video LTC output.

Video Time code time (Set by *Video TM* menu – see section 3.5.2.1)
Audio Time code time (Set by *Audio TM* menu – see section 3.5.2.2)
Generator Time
LTC output not used

TIMECODE
LTC Output
VLTC UB
Video TC UB
Audio TC UB
Audio TC TM
Gen UB
Not used

With this control, you can select the source of the user bits that will be used for the Video LTC output.

Video Time code UB (Set by *Video UB* menu – see section 3.5.2.1)
Audio Time code UB (Set by *Audio UB* menu – see section 3.5.2.2)
Audio Time code time (Set by *Audio TM* menu – see section 3.5.2.2)
Video Time code Generator user bits
LTC output not used

3.5.3.2. Selecting the Frame Rate of the Video LTC Output

TIMECODE
LTC Output
VLTC Rate
24 FPS
25 FPS
30 FPS

With this control, you can view the nominal frame rate of the Video LTC output time code that is the same as the input video frame rate.

Video LTC frame rate is 24 (23.98) frames per second
Video LTC frame rate is 25 frames per second
Video LTC frame rate is 30 (29.97) frames per second

3.5.3.3. Selecting the Source of Time and User Bit Information for the Audio LTC Output

TIMECODE
LTC Output
ALTC TM
Video TC TM
Audio TC TM
Gen TM
Not used

With this control, you can select the source of the time information that will be used for the Audio LTC output.

Video Time code time (Set by *Video TM* menu – see section 3.5.2.1)
Audio Time code time (Set by *Audio TM* menu – see section 3.5.2.2)
Generator Time
LTC output not used

TIMECODE	With this control, you can select the source of the user bits that will be used for the Audio LTC output.
LTC Output	
ALTC UB	
Video TC UB	Video Time code UB (Set by *Video UB* menu – see section 3.5.2.1)
Audio TC UB	Audio Time code UB (Set by *Audio UB* menu – see section 3.5.2.2)
Audio TC TM	Audio Time code time (Set by *Audio TM* menu – see section 3.5.2.2)
Gen UB	Video Time code Generator user bits
Not used	LTC output not used

3.5.3.4. Selecting the Frame Rate of the Audio LTC Output

TIMECODE	With this control, you can view the nominal frame rate of the Audio LTC output time code. This will typically be the same as the video frame rate except for 1080p/23.98Sf video, the audio rate will typically be 30 FPS
LTC Output	
ALTC Rate	
25 FPS	Audio LTC frame rate is 25 frames per second
30 FPS	Audio LTC frame rate is 30 (29.97) frames per second

3.5.4. Configuring The VITC Output (SD Video only)

The *VITC Output* sub-menu items are used to map the logical inputs to the VITC generator, (i.e. where does the VITC data come from) and configure parameters associated with the VITC generator (line numbers, etc.). This menu item is only available when the VANC Encoder is configured for standard definition video. The chart below shows the items available in the *VITC Output* menu. Sections 3.5.4.1 to 3.5.4.5 provide detailed information about each menu item.

VITC Mode	Selects 3-line (RP201) VITC for Film applications or SMPTE 12M-1 VITC
VITC Enable	Enables/disables the VITC inserter
Line 1 TM	Selects the source of the first line of VITC – time bits
Line 1 UB	Selects the source of the first line of VITC – user bits
Line 2	Selects the source of the second line of VITC – Film data
Line 3 TM	Selects the source of the third line of VITC – time bits
Line 3 UB	Selects the source of the third line of VITC – user bits
525 VITC Lines	Sets the VITC insertion line on 525 line video outputs
625 VITC Line	Sets the VITC insertion line on 625 line video outputs

3.5.4.1. Selecting the VITC Mode

TIMECODE
VITC Output
VITC Mode
1 Line
3 line

With this control, you can select 3-line (RP201) VITC for Film applications or SMPTE 12M-1 VITC.

Standard SMTPE 12M-1 VITC for video applications
RP201 3 line VITC for film applications

3.5.4.2. Selecting Whether VITC will be Inserted on the SD Video Outputs

TIMECODE
VITC Enable
Off
On

This control determines whether vertical interval time code (VITC) will be inserted on the SDI video outputs. The 525 VITC Line and 625 VITC Line menu items set the insertion line(s) for the VITC.

When set to *Off*, the VITC inserter will be disabled.

When set to *On*, the VITC inserter will be enabled.

3.5.4.3. Selecting the Source of Time code for the VITC Output

TIMECODE
VITC Output
Line 1 TM
Out Video TM

With this control, you can select the source of Video time code time information for VITC Line 1.

Video Time code time (Set by *Video TM* menu – see section 3.5.2.1)

TIMECODE
VITC Output
Line 1 UB
In Video TM
Audio TM
Video TC UB

With this control, you can select the source of Video time code user bits information for VITC Line 1.

Video Time code time (Set by *Video TM* menu – see section 3.5.2.1)
Audio Time code time (Set by *Audio TM* menu – see section 3.5.2.2)
Video Time code UB (Set by *Video UB* menu – see section 3.5.2.1)

TIMECODE
VITC Output
Line 2
KeyKode
Ink
Not used

With this control, you can select the source of Film number information for VITC Line 2. (available in *3 line VITC* mode only)

KeyKode information
Ink number information
Line 2 film data bits set to zero

TIMECODE
VITC Output
Line 3 TM
Out Audio TM
Not used

With this control, you can select the source of Production time code time information for VITC Line 3. (available in *3 line VITC* mode only)

Audio Time code time (Set by *Audio TM* menu – see section 3.5.2.2)
Line 3 time bits set to zero

TIMECODE *VITC Output* *Line 3 UB* *Audio TC UB* *Not used*	With this control, you can select the source of Production time code user bits information for VITC Line 3. (available in 3 line VITC mode only) Audio Time code UB (Set by *Audio UB* menu – see section 3.5.2.2) Line 3 user bits set to zero

3.5.4.4. Setting the VITC Line for 525 Line Video Outputs

TIMECODE *VITC Output* *525 VITC Line* *14/16* *10/12 to 18/20*	This control determines the line numbers where VITC will be inserted in 525-line video when the *VITC Mode* is set to *1 line*. VITC is inserted on two non-consecutive lines
TIMECODE *VITC Output* *525 VITC Line* *14.15.16* *10.11.12 to 18.19.20*	This control determines the line numbers where VITC will be inserted in 525-line video when the *VITC Mode* is set to *3 line*. 3-Line VITC is inserted on one set of 3 consecutive lines.

3.5.4.5. Setting the VITC Line for 625 Line Video Outputs

TIMECODE *VITC Output* *625 VITC Line* *19/21* *6/8 to 19/21*	This control determines the line numbers where VITC will be inserted in 625-line video when the *VITC Mode* is set to *1 line*. VITC is inserted on two non-consecutive lines
TIMECODE *VITC Output* *625 VITC Line* *14.15.16* *6.7.8 to 19.20.21*	This control determines the line numbers where VITC will be inserted in 625-line video when the *VITC Mode* is set to *3 line*. 3-Line VITC is inserted on one set of 3 consecutive lines.

3.5.5. Configuring The Film Settings (Available in CINE workflow only)

The *FILM* sub-menu items are used to set the film format and film transfer rate in telecine transfer applications. This menu item is only available when the VANC Encoder *WORKFLOW* menu item is set to *Cine*. The chart below shows the items available in the *FILM* menu. Sections 3.5.5.1 to 3.5.5.2 provide detailed information about each menu item.

Film Gauge	Selects the film gauge and format
Film Rate	Selects the film transfer rate

3.5.5.1. Selecting the Film Format

TIMECODE	With this control, you can select the film gauge and exposure format. Some formats require additional options to be authorized in the HDSD9045TR. Contact the factory or your Evertz representative for more information.
FILM	
Film Gauge	
16mm(20)	16mm 20 perfs per Key Number
16mm(40)	16mm 40 perfs per Key Number (KeyKode reading not supported for this gauge)
35mm-2Perf	35mm 2 perfs per frame (2 perf option required)
35mm-3Perf	35mm 3perfs per frame (21,21 & 22 frames per foot)
35mm-4Perf	35mm 4 perfs per frame (16 frames per foot)
35mm-8Perf	35mm 8 perfs per frame - VistaVision (8 perf option required)
35mm-Decr	35mm 4perf per frame with decrementing KeyKode
65mm(80)-5P	65mm 80 perfs per Key Number 5 perf per frame (65 perf option required)
65mm(80)-8P	65mm 80 perfs per Key Number 8 perf per frame (65 perf option required)
65mm(80)-10P	65mm 80 perfs per Key Number 10 perf per frame (65 perf option required)
65mm(120)-5P	65mm 120 perfs per Key Number 5 perf per frame (65 perf option required)
65mm(120)-8P	65mm 120 perfs per Key Number 8 perf per frame (65 perf option required)
65mm(120)-10P	65mm 120 perfs per Key Number 10 perf per frame (65 perf option required)
65mm(120)-15P	65mm 120 perfs per Key Number 15 perf per frame (65 perf option required)
65mm(120)SHOW	65mm 120 perfs per Key Number ShowScan (65 perf option required)

3.5.5.2. Selecting the Film Transfer Rate

TIMECODE	With this control, you can select the film to video transfer rate. Only the rates appropriate for the input video standard are available.
FILM	
Film Rate	
24@30	24 (23.98) frames per second film transferred to 29.97 FPS video
30@30	30 (29.97) frames per second film transferred to 29.97 FPS video
25@25	25 frames per second film transferred to 25 FPS video
24@24	24 (23.98) frames per second film transferred to 23.98 FPS video

3.5.6. Configuring The Telecine Settings (Available in CINE workflow only)

The *CINE* sub-menu items are used to set the parameters related to the Telecine interface (telecine type, bi-phase rate, pull down type, etc.) in telecine transfer applications. This menu item also allows you to calibrate out system delays in the telecine video path. This menu item is only available when the VANC Encoder *WORKFLOW* menu item is set to *Cine*. The chart below shows the items available in the *CINE* menu. Sections 0 to 0 provide detailed information about each menu item.

Telecine	Selects the telecine or virtual telecine type
Biphase Rate	Selects the telecine bi-phase rate
Pull Input	Selects the telecine 2:3 pull down pulse type
Video Process	Sets the Video rate delay in the telecine path
Pre-Store	Sets the Film rate delay in the telecine path
Stop Win	Sets the time for the telecine to stop from play

3.5.6.1. Selecting the Telecine Type

TIMECODE	With this control, you can select the telecine type.
CINE	
Telecine	
Digi IV	Cintel MK III, Digiscan IV (*Cine WORKFLOW)*
Ursa Gold	Cintel URSA Gold (*Cine WORKFLOW)*
BTS	BTS FDL 60, FDL 90, Quadra (*Cine WORKFLOW)*
Spirit	GVG/Philips Spirit, Shadow, Spirit 2K, Spirit 4K (*Cine WORKFLOW)*
DDR	Digital Disk Recorder with film ANC (*Cine WORKFLOW)*
VTR	VTR source with ATC (*V Daily WORKFLOW)*
Camera	Video source with camera or production ANC (*Field Acq* or Field Log *WORKFLOW)*

3.5.6.2. Selecting the BiPhase Rate

TIMECODE	With this control, you can select the Biphase rate. When the telecine type is set to a virtual telecine the Biphase will be inferred from ancillary data or from LTC numbers running.
CINE	
BiPhase Rate	
ANC	Inferred from ANC
ATC TM	Inferred from Ancillary Time Code time (*V Daily WORKFLOW)*
FILM ANC VTM	Inferred from Film ANC Video Time (*Cine WORKFLOW and DDR Telecine)*
FILM ANC ABS	Inferred from Film ANC absolute frames (*Cine WORKFLOW and DDR Telecine)*
PROD ANC VTM	Inferred from Production ANC Time (*Field Acq* / Log *WORKFLOW)*
PROD ANC ABS	Inferred from Production ANC abs frames (*Field Acq* / Log *WORKFLOW)*
VLTC TM	Inferred from video LTC (*Cine WORKFLOW and DDR Telecine*)
1/2	½ quadrature pulse cycle per film frame (*Cine WORKFLOW*)
1	1 quadrature pulse cycle per film frame (*Cine WORKFLOW)*
2	2 quadrature pulses cycle per film frame (*Cine WORKFLOW)*
5	5 quadrature pulses cycle per film frame (*Cine WORKFLOW)*
10	10 quadrature pulses cycle per film frame (*Cine WORKFLOW)*
NONE	Biphase not used

3.5.6.3. Selecting the Telecine 2:3 Pull Down Pulse Type

TIMECODE	
CINE	
Pull Input	With this control, you can select the telecine 2:3 pull down pulse type. This menu item is only applicable when the *Film Transfer rate* menu item is set to 24@30.
Ignore	Ignore frame pulse – 2:3 pull down will be random
Direct	Read frame pulse directly. active low (newer Cintel telecines)
FRID	Use FRID style frame pulse (BTS, Philips and GVG Spirit, etc.)
Act Lo Filt	Falling edge of pulse denotes start of new film frame (older Cintel telecines)
Act Hi Filt	Rising edge of frame pulse denotes start of new film frame
Direct Filt	Read filtered frame pulse directly, active low
ANC Infer	Inferred from FILMANC data (DDR virtual telecines)
ANC	Direct from FILMANC Pull data
Act Lo 6hz	A falling edge denotes the start of entire 2:3 sequence
Act Hi 6hz	A rising edge denotes the start of entire 2:3 sequence
Direct Inv	Read frame pulse directly, active high
Filt Inv	Read Filtered frame pulse directly, active high
Video TM	Video time code frame 0 is start of entire 2:3 sequence (virtual telecines, VTRs, etc)

3.5.6.4. Selecting the Telecine Video Rate Path Delay

TIMECODE	
CINE	
Video Process	With this control, you can adjust for video rate delays in the telecine output video path (colour correctors, noise reducers, etc.) The delay value is in video fields.
0	
0 to 40	

3.5.6.5. Selecting the Telecine Film Rate Path Delay

TIMECODE	
CINE	
Pre-Store	With this control, you can adjust for film rate delays in the telecine output video path (frame store in Telecine, film grain reducers, etc.) The delay value is in film frames.
0	
0 to 40	

3.5.6.6. Selecting the Telecine Full Stop Delay

TIMECODE	
CINE	
Pre-Store	With this control, you can adjust for amount of time that the HDSD9045TR uses to determine that the telecine film motion has fully stopped (the amount of time when no bi-phase activity is detected). The stop time is in video frames.
30	
0 to 99	

3.5.7. Controlling The KeyKode Reader (Available in CINE workflow only)

The *5550* sub-menu items are used to set the parameters related to controlling the 5550 KeyKode reader from the HDSD9045TR (or from KeyLog TRACKER™ when the HDSD9045TR is under tracker control). This menu item allows enable and disable 5550 control as well as control of the individual menu items on the 5550 KeyKode reader. This menu item is only available when the VANC Encoder *WORKFLOW* menu item is set to *Cine*. The chart below shows the items available in the *5550* menu. Sections 3.5.7.1 to 3.5.7.6 provide detailed information about each menu item.

5550 Ctl	Enables control of the 5550 through the KeyKode serial Port
Emulsion	Selects the Film type – negative or print
KK Intens	Selects the KeyKode Reader LED intensity
KK Mode	Selects the KeyKode Reader LED intensity mode – manual or auto
TC Type	Selects the Film Time code type – Off, ARRI or Matrix (AATON)
TC Mode	Selects the Film Time code Reader intensity mode – manual or auto
TC Intens	Selects the Film Time code Reader Laser intensity
LED Saver	Enables or Disables the LED Save mode

3.5.7.1. Enabling Control of the 5550 from the HDSD9045TR

TIMECODE
- 5550
  - 5550 Ctl
    - Off
    - On

With this control, you can enable control of the 5550 functions from the HDSD9045TR. You must first connect a bi-directional cable as shown in section 2.13.1.
When 5550 Control is Enabled, and you are operating the HDSD9045TR from the front panel you will have to manually adjust the various menu items in the 5550 using the rest of the menu items in the *5550* menu. If you are using KeyLog TRACKER™ to control the HDSD9045TR, the settings are changed in the KeyLog TRACKER™ KeyKode screen, and the control commands are relayed to the 5550 through the HDSD9045TR.

3.5.7.2. Controlling the KeyKode Reader Film Type

TIMECODE
- *5550*
  - Emulsion
    - Neg
    - Print

With this control, you can select the film type you are using.

Film stock is original camera negative
Film stock is work print (positive)

3.5.7.3. Controlling the KeyKode Reader LED intensity

The 5550 KeyKode controls the brightness of the illuminating LED in order to accommodate for the various exposure densities of the KeyKode on the film. The LED intensity control can be either manually controlled by the user or automatically controlled by the 5550. There are two menu items that are used to control the LED intensity.

TIMECODE
5550
KK Intens
0 to 999

With this control, you can directly display/set the intensity of the KeyKode Reader light source. Normally you will require a higher intensity for darker exposures, and a lower intensity for lighter exposures. The value shown ranges from a lower limit (below which the sensor will not detect anything) and 999.

TIMECODE
5550
KK Mode
Man
Auto
Extd
Hunt

With this control, you can select whether you want to set the KeyKode light source intensity manually or have the 5550 use one of its automatic intensity modes.

Select *man* to adjust the intensity manually.

Select *auto* for the normal automatic mode. In this mode the 5550 is constantly adjusting the LED intensity to achieve optimal reading.

Select *extd* for the extended automatic mode. In extended auto mode, the 5550 can recover the optimal setting over a wider range of intensities.

Select *hunt* for the hunt automatic mode. In hunt mode, the 5550 will search through its entire intensity range when it cannot recover any KeyKode. For Hunt mode to work you MUST connect bi-phase pulses from the telecine to the parallel I/O connector on the rear of the KeyKode Reader. See section 2.13.1.

3.5.7.4. Controlling the Film Time Code Reader

TIMECODE
5550
TC Type
Off
Matrix
ARRI

With this control, you can select whether the 5550 will read ARRI or Matrix film time code or not. In order to read Film time code you must have a UV-3 type reader head connected to the 5550.
Select *Off* to disable the Film Time Code reader.
Select *Matrix* to enable the Matrix (AATON) Time Code reader
Select *ARRI* to enable the ARRI Time Code reader

3.5.7.5. Controlling the Intensity of the Time Code Light Source

The 5550 controls the brightness of the time code light source in order to accommodate for the various exposure densities of the time code on the film. The light source intensity control can be either manually controlled by the user or automatically controlled by the 5550. There are two menu items that are used to control the LED intensity.

TIMECODE
5550
TC Intens
0 to 999

With this control, you can directly display/set the intensity of the Film Time code Reader light source. Normally you will require a higher intensity for darker exposures, and a lower intensity for lighter exposures. The value shown ranges from a lower limit (below which the sensor will not detect anything) and 999.

TIMECODE
5550
TC Mode
Man
Auto

With this control, you can select whether you want to set the KeyKode light source intensity manually or have the 5550 use its automatic intensity mode.

Select *man* to adjust the laser intensity manually.
Select *auto* for the automatic mode. In this mode the 5550 is constantly adjusting the laser intensity to achieve optimal time code reading.

3.5.7.6. Enabling the LED Saver

TIMECODE
5550
LED Saver
On
Off

With this control, you can turn off the light sources when the head is not being used. This mode extends the life of the LED and laser light sources and should normally be enabled.

In order to use the LED saver mode you MUST connect bi-phase pulses from the telecine to the parallel I/O connector on the rear of the KeyKode Reader. See section 2.13.1.

3.5.8. Configuring KeyKode Processing Settings (Available in CINE workflow only)

The *KEYKODE* sub-menu items are used to set the parameters related to processing KeyKode information from the KeyKode. This menu item is only available when the VANC Encoder *WORKFLOW* menu item is set to *Cine*. The chart below shows the items available in the *KEYKODE* menu. Sections 3.5.4.1 to 3.5.4.5 provide detailed information about each menu item.

Head Offset	Enables control of the 5550 through the KeyKode serial Port
KK Play Win	Selects the Film type – negative or print
KK Shuttle	Selects the KeyKode Reader LED intensity
KK Dropout	Selects the KeyKode Reader LED intensity mode – manual or auto
Key Info	Selects the Film Time code type – Off, ARRI or Matrix (AATON)

3.5.8.1. Setting the KeyKode Head Offset

TIMECODE
KeyKode
Head Offset
0 to 7000

With this control, you can adjust for the mechanical offset between the location of the Reader head and the gate.

This menu item sets the head offset for the current film gauge and transfer rate. If you change the film gauge or film rate menu items you will have to set a new head offset.

3.5.8.2. Setting the KeyKode Jam Parameters

TIMECODE
KeyKode
KK Play Win
0 to 99

With this control, you can set the number of frames of difference between the KeyKode based numbers and the biphase based numbers that is permitted before the HDSD9045TR will re-jam the biphase from the KeyKode. This setting is only used when the telecine is in the Play mode. Normally this value is set to 0 frames but may be set to a higher value when the biphase rate of the telecine is low.

TIMECODE
KeyKode
KK Shuttle
30
0 to 99

With this control, you can set the number of frames of difference between the KeyKode based numbers and the biphase based numbers that is permitted before the HDSD9045TR will re-jam the biphase from the KeyKode. This setting is only used when the telecine is in the Shuttle mode. Normally this value is set to 30 frames.

TIMECODE
KeyKode
KK Dropout
0 to 99

With this control, you can set how many feet of film must bass without reading KeyKode before the HDSD9045TR detects that KeyKode is not present. Normally it is set to 10 feet.

3.5.8.3. Controlling the KeyKode Prefix Display

TIMECODE
KeyKode
KK Info
Off
On
Info

With this control, you can select whether the KeyKode Prefix will be displayed or not.

Turns *off* the KeyKode Prefix display
Turns *on* the KeyKode Prefix display
The font of the KeyKode prefix will change when there is no KeyKode present.

3.5.9. Configuring The Film Time Code Processing Settings (Available in CINE workflow only)

The *FILM TIMECODE* sub-menu items are used to set the parameters related to processing Film time code information from the KeyKode reader. This menu item is only available when the VANC Encoder *WORKFLOW* menu item is set to *Cine*. The chart below shows the items available in the *FILM TIMECODE* menu. Sections 3.5.9.1 to 3.5.9.4 provide detailed information about each menu item.

FTC Jam Enable	Enables the use of Film Time code
FTC Jam	Selects how the VANC Encoder will jam its bi-phase based numbers to the Film Time code
FTC Type	Selects the type of Film Time code
FTC Head Offset	Enables control of the 5550 through the KeyKode serial Port
FTC Play Win	Selects the Film type – negative or print
FTC Shuttle	Selects the KeyKode Reader LED intensity

3.5.9.1. Controlling the Film Time Code Jam Modes

TIMECODE *Film Timecode* *FTC Jam Enable* *Off* *Jam*	With this control, you can select whether the VANC encoder will jam its Audio time code numbers to the incoming film time code. When set to *Off*, the Film Time code is disabled. When set to *Jam*, the audio numbers will be jammed to incoming Film Time code according to the setting of the *FTC Jam* menu item.

TIMECODE *Film Timecode* *FTC Jam* *Always* *Not Used* *Never* *Play* *Once* *After*	With this control, you can select how the VAN encoder will jam its Audio time code numbers to the incoming film Time code. Use Film Time code in play and shuttle Film Time code not used Manual entry and update from biphase Use Film Time code in play Use Film Time code once when telecine locks Auto jam to Film Time code across splices

3.5.9.2. Controlling the Film Time Code Reader Type

TIMECODE *Film Timecode* *FTC Type* *None* *Matrix* *ARRI*	With this control, you can select the type of Film timecode being received from the 5550. No Film Time Code Matrix (AATON) Film Time Code ARRI Linear Film Time code

3.5.9.3. Setting the Film Timecode Head Offset

TIMECODE
Film Timecode
FTC Head Offset
*-*128 to +127*

With this control, you can adjust for differences in mechanical offset between the location of the KeyKode Reader sensor and the Film Time code reader sensor. Normally this value will be near zero. There are 40 counts per film frame.

3.5.9.4. Setting the Film Time Code Jam Parameters

TIMECODE
Film Timecode
FTC Play Win
0 to 99

With this control, you can adjust the number of frames of difference between the Film Time code based numbers and the biphase based Audio time code numbers that is permitted before the HDSD9045TR will re-jam the Audio time code from the film Time code. This setting is only used when the telecine is in the Play mode. Normally this value is set to 0 frames but may be set to a higher value when the biphase rate of the telecine is low.

TIMECODE
KeyKode
FTC Shuttle
30
0 to 99

With this control, you can set the number of frames of difference between the Film Time code based numbers and the biphase based Audio time code numbers that is permitted before the HDSD9045TR will re-jam the Audio time code from the Film Time code. This setting is only used when the telecine is in the Shuttle mode. Normally this value is set to 30 frames.

3.6. CONFIGURING MISCELLANEOUS ITEMS

The *UTILITY* menu items are used to configure miscellaneous items such as IP addresses, GPI functions, etc. The chart below shows the items available in the *UTILITY* menu. Most of the *UTILITY* menu items are not necessary for day-to-day operation and must be accessed using the Engineering Shift Keys. Sections 3.6.1 to 3.6.9 provides detailed information about each menu item.

GPIO	Configures the general purpose input and output functions.
PORTS	Configures the use of the serial ports and how the VANC Encoder will communicate with the KeyLog TRACKER™ software.
System IP	Configures the network IP addresses.
System Ident	Selects the identification number for this system.
Auto Panel Lock	Turns the Auto panel lock on and off.
Control Gang	Allows for ganged operation of menu controls to other VANC Encoders on the network.
Configuration	Provides configuration controls to send and receive configurations for other VANC Encoders on the network.
Reset Most	Resets most saved settings to factory default, but keeps network, ident, gang.
Factory Reset	Resets the all saved settings to factory defaults.

3.6.1. Configuring the General Purpose Inputs and Outputs

The *GPIO* sub-menu items are used to configure parameters associated with the general purpose inputs and outputs of the VANC Encoder. The chart below shows the items available in the *GPIO* menu. There are five bi-directional GPIO pins, and there are identical menu items that are used to configure each PIN. For the sake of simplicity only the menu items for GPIO1 are shown in the manual. Sections 3.6.1.1 to 3.6.1.2 provide detailed information about each menu item.

GPIO1 Func	Selects the function of the GPIO 1 input/output pin.
GPI1 Trigger	Selects whether GPI1 will trigger on high or low levels or rising or falling edges.
GPIO2 Func	Selects the function of the GPIO 2 input/output pin.
GPI2 Trigger	Selects whether GPI2 will trigger on high or low levels or rising or falling edges.
GPI03 Func	Selects the function of the GPIO 3 input/output pin.
GPI3 Trigger	Selects whether GPI3 will trigger on high or low levels or rising or falling edges.
GPI04 Func	Selects the function of the GPIO 4 input/output pin.
GPI4 Trigger	Selects whether GPI3 will trigger on high or low levels or rising or falling edges.
GPI05 Func	Selects the function of the GPIO 5 input/output pin.
GPI5 Trigger	Selects whether GPI3 will trigger on high or low levels or rising or falling edges.

3.6.1.1. Selecting the Function of the GPIO Pins

UTIL
GPIO
GPI1 Func

I:OSD Windows	GPI: Turn OSD windows On/Off
I:Slate	GPI: Turn Slate windows On/Off
I:6Hz In	GPI: 6Hz Reference Input
I:None	No input or output function
I:RunHold	GPI: Run or hold generators
I:Rate	GPI: Control transfer rate
I:GPI	GPI for data logging
I:Center	GPI: Center the film
I:Vstd	GPI: Change Video standard
I:LUT Select	GPI: Change LUT table
I:DeferJam	GPI: Defer VTC Jam to LTC input
O:Test	GPO: Toggles on and off
O:Test-on	GPO: Output on
O:Test-off	GPO: Output off
O:Sequence	GPO: Start of Output sequence
O:Event	GPO: Pulse for duration of event
O:Event Start	GPO: Pulse at event start
O:Event End	GPO: Pulse at event end

This control is used to select the function of the GPIO pin. The GPI1 Trigger menu item is used to select whether GPI1 will become active on high or low levels, or on rising or falling edges when it is configured as an input.

3.6.1.2. Selecting the How the GPI Triggers

UTIL
GPIO
GPI1 Trigger
Active Close
Active Open
Toggle Open
Toggle Close

This control is used to select whether GPI1 will become active on opening or closing transitions or will toggle states when the GPI1 is operated. The function of the GPI1 input is set using the GPI1 Function menu item.

When set to *Active Close*, the selected GPI1 function will activate when the GPI1 input is closed to ground. For example, the OSD windows could be on when the input is closed to ground.

When set to *Active Open*, the selected GPI1 function will activate when the GPI1 input is opened (released from being closed to ground). For example, the OSD windows could be on when the input is not connected to ground.

When set to *Toggle Close*, the selected GPI1 function will change state when the GPI1 input is being closed to ground. For example, if the OSD windows are on, they will turn off when the input switches from opened to closed. Similarly, if the OSD windows are off, they will turn on when the input switches from opened to closed.

When set to *Toggle Open*, the selected GPI1 function will change state when the GPI1 input is being opened (released from being closed to ground). For example, if the OSD windows are On, they will turn Off when the input switches from closed to open. Similarly, if the OSD windows are Off, they will turn On when the input switches from closed to open.

3.6.2. Configuring the functions of the Serial Ports

The *PORTS* sub-menu items are used to configure the use of the three serial ports of the VANC Encoder. These menu items are also used to determine if the VANC Encoder will user serial port or Ethernet communications with the KeyLog TRACKER™ software. The chart below shows the items available in the *PORTS* menu. Sections 3.6.2.1 to 3.6.2.5 provide detailed information about each menu item.

Com 1 Func	Selects the function of the COM 1 serial port.
Com 1 Baud	Selects the baud rate of the COM 1 serial port.
Tracker Comm	Shows the connection method to the KeyLog TRACKER™ software.
Com 2 Func	Selects the function of the COM 2 serial port.
Com 2 Baud	Selects the baud rate of the COM 2 serial port.
KK Baud Baud	Selects the baud rate of the KeyKode Reader serial port.
Com 2 Func	Selects the function of the COM 2 serial port.
Com 2 Baud	Selects the baud rate of the COM 2 serial port.
ANC Dump	Controls broadcasting of ANC data or serial port or Ethernet.

3.6.2.1. Controlling the COM 1 Serial Port

UTIL *PORTS* *Com 1 Func*	This control is used to select the function of the Com 1 Serial port.
None *Test* *Tracker* *Debug*	Not used except boot up debugging (i.e. firmware updates) Sends Test message to verify port operation Used to connect with KeyLog TRACKER™ Sends Debug messages only

UTIL *PORTS* *Com 1 Baud*	This control is used to select the baud rate of the Com 1 Serial port.
57600 *115200*	Use this for KeyLog TRACKER™ communications Useful for debug and test messages

3.6.2.2. Determining whether KeyLog TRACKER™ Communicates using Serial Port or Ethernet

- *UTIL*
  - *PORTS*
    - *Tracker Comm*
      - *Comm*
      - *Net*
      - *None*

This control allows you to see whether the VANC encoder is set for serial port or network communications to KeyLog TRACKER™.

Com port mode – *COM 1 Func* must be set to *Tracker*.
Network mode – *COM 1 Func* must NOT be set to *Tracker. (Set System IP)*
No KeyLog TRACKER™ communications.

3.6.2.3. Controlling the COM 2 Serial Port

- *UTIL*
  - *PORTS*
    - *Com 2 Func*
      - *None*
      - *Test*
      - *Debug*
      - *KeyKode*
      - *Sensor*

This control is used to select the function of the Com 2 Serial port. When the *WORKFLOW* menu item is set to *CINE*, the *Com 2 Function* will be forced to *KeyKode.*
Not used
Sends Test message to verify port operation
Sends Debug messages only
Communications with KeyKode Reader (default in *CINE WORKFLOW)*
Communications with metadata sensor (default in *Field Acq WORKFLOW)*

- *UTIL*
  - *PORTS*
    - *Com 2 Baud*
      - *9600*
      - *38400*
      - *57600*
      - *115200*

This control is used to select the baud rate of the Com 2 Serial port when *Com 2 Function* is NOT set to *KeyKode.*

- *UTIL*
  - *PORTS*
    - *KK Baud*
      - *38400*
      - *9600*

This control is used to select the baud rate of the Com 2 Serial port when *Com 2 Function* is set to *KeyKode.*

3.6.2.4. Controlling the COM 3 Serial Port

- *UTIL*
  - *PORTS*
    - *Com 3 Func*
      - *None*
      - *Test*
      - *Debug*
      - *Lens*
      - *ANC Dump*

This control is used to select the function of the Com 3 Serial port.

Not used.
Sends Test message to verify port operation.
Sends Debug messages only.
Communications with a lens (default in *Field Acq WORKFLOW).*
Used to broadcast Ancillary data to a computer.

UTIL *PORTS* *Com 3 Baud*	This control is used to select the baud rate of the Com 3 Serial port.
38400 *57600* *115200*	Used when ANC Dump is set to COM3

3.6.2.5. Broadcasting ANC Data to a Computer

UTIL *PORTS* *ANC Dump*	This control is used to select the ANCD dump mode
Off	Not used.
Com 3	Broadcasts ANC Packet information on COM3 (115200 baud).
Net	Broadcasts ANC Packet information via UDP on the Ethernet port.

3.6.3. Setting the System Network I/P Addresses

The VANC Encoder can be controlled over a UDP connection using a good quality, straight-thru Ethernet cable, terminated at both ends with RJ-45 male connectors, as shown in section 2.6. Normally the VANC Encoder is connected to the network through an Ethernet switch. If connecting multiple VANC Encoders, take care to use different IP addresses for each.

The *System IP* sub-menu items on the *UTIL menu* allow the user to change the IP addresses to match the requirements of their network. Each network address consists of a set of four 'octets' separated by periods (e.g. 192.168.9.10). The first three octets are common to all addresses in the VANC Encoder. The remaining octet is unique to each address type. In a private network, typical network addresses could be identified as 192.168.9.XXX. The Subnet mask for this network is set to 255.255.255.0.

The "Gateway" item tells the VANC Encoder network interface the IP address of the "gateway" (commonly referred to as the "firewall"). In its simplest sense the gateway could be the PC directly connected to the VANC Encoder and running the network application software. This gateway links to and communicates with other network gateways. In a private network, this gateway could be identified as 192.168.9.YYY. You should not need to change this item unless you change the upper three octets of the network IP address.

If you are unsure how to configure the network addresses contact your network administrator.

Common 1st Octet	Sets the first octet of the system IP addresses – common to all devices.
Common 2nd Octet	Sets the second octet of the system IP addresses – common to all devices.
Common 3rd Octet	Sets the third octet of the system IP addresses – common to all devices.
9045 Address	Sets the fourth octet of the VANC Encoder's IP address.
Gateway Address	Sets the fourth octet of the Gateway IP address.
Syslog	Sets the network Syslog level.
Syslog Address	Sets the fourth octet of the network Syslog device IP address.
Tracker Address	Shows the fourth octet of the PC running Tracker that you are communicating with (not implemented at time of writing).
Tracker Port	Shows the port number being used to communicate with KeyLog Tracker (not implemented at time of writing).
Announce	Turns *ON* and *OFF* the IP announce function.
Mask 1st Octet	Sets the first octet of the subnet mask.
Mask 2ndt Octet	Sets the second octet of the subnet mask.
Mask 3rdt Octet	Sets the third octet of the subnet mask.
Mask 4th Octet	Sets the fourth octet of the subnet mask.

3.6.3.1. Setting the IP Addresses

For the sake of simplicity only one of the IP addresses will be shown.

UTIL *System IP* *9045 Address* *10* *0 to 255*	This control is used to set the fourth octet of the VANC Encoder's IP address. Use the SHAFT ENCODER to set the appropriate address.

3.6.3.2. Setting the System Logging Function

- *UTIL*
  - *System IP*
    - *Syslog*
      - *Off*
      - *Emergency*
      - *Alert*
      - *Critical*
      - *Error*
      - *Notice*
      - *Info*
      - *All*

This control is used to enable error logging on the network. Syslog messages are sent to the device at the Syslog Address.

Do not Log any messages
Log only emergency messages
Log only alert level or greater messages
Log only critical level or greater messages
Log error level or greater messages
Log Notice level or greater messages
Log Info level or greater messages
Log all messages

3.6.3.3. Setting the Network Discovery IP Announce

- *UTIL*
  - *System IP*
    - *Announce*
      - *Off*
      - *On*

This control is used to enable broadcast of the VANC Encoder's IP address to other VANC Encoders on the network.

Do not broadcast IP address
Broadcast IP address to the Broadcast IP Address

3.6.4. Setting the System ID Number

- *UTIL*
  - *System Ident*
    - *1 to 15, A to Z*

This control allows the user to assign a system ID number to the VANC Encoder. This ID is useful in applications where there are several units connected to the same network. The System ID will display at the top of each screen of the on-screen menus and may also be shown on the front panel using the DISPLAY button. The System ID number can also be used to identify VANC Encoders when updating firmware or when connecting from KeyLog TRACKER™.

3.6.5. Setting the Auto Panel Lock

- *UTIL*
  - *Auto Panel Lock*
    - *On*
    - *Off*

This control enables the Panel Lock function to automatically activate after 10 minutes of inactivity on the front panel.
Set to *On* to automatically enable panel lock after 10 minutes.
Set to *Off* to disable the automatic panel lock function.

3.6.6. Ganged Menu Control Operation

When the VANC Encoder is part of a Network Gang, changing its menu items will cause the menus of all the other VANC Encoders in the same gang to follow the menu changes. Ganged operation is disabled while in Engineering mode. You can also send the VANC Encoder configuration to other gang members. (See section 3.6.7.1). When the VANC Encoder is part of a gang the word **GANGED** will be shown at the top of its menu screen to remind you that you are affecting other devices in the network. See section 3.8 for more information about networking large systems.

UTIL *Control Gang* *None* *1 to 5*	This control allows the user to configure other VANC Encoders in a specific gang when the menus of this VANC Encoder are operated. Set to *None* if you do not want to control other gang members. Select the gang number that you want to control from this VANC Encoder.

3.6.7. Sending and Retrieving Configurations from other Networked VANC Encoders

There are two menu items that allow you to load the VANC Encoder configuration from other VANC Encoders on the network, or to send this VANC Encoder's configuration to other VANC Encoders. In order to see these menu items the VANC Encoder must be networked to other VANC Encoders on a common subnet. See section 3.6.2 for information on setting the I/P addresses for the system. See section 3.8 for a more complete description of features available when VANC Encoders are networked.

3.6.7.1. Sending Configurations to Other Networked VANC Encoders

UTIL *Configuration* *Send Config to* *None* *1 to 15, A to Z* *Gang 1 to Gang 5*	This control is used to send this VANC Encoder's configuration settings to other VANC Encoders on the network. Do not send this configuration. Select individual VANC Encoders by their System ID number. Select groups of VANC Encoders by their Gang number.

You will be prompted to confirm your choice as sending the VANC Encoders configuration will overwrite the settings in the target VANC Encoders.

3.6.7.2. Getting Configurations from other Networked VANC Encoders

UTIL *Configuration* *Get Config from* *None* *1 to 15, A to Z* *Gang 1 to Gang 5*	This control is used to set this VANC Encoder's configuration settings from another VANC Encoder on the network. Do not get any configuration Select individual VANC Encoders by their System ID number Select groups of VANC Encoders by their Gang number

You will be prompted to confirm your selection because retrieving the VANC Encoder's configuration will overwrite the settings in these VANC Encoders.

3.6.8. Resetting the Most Common VANC Encoder Settings to Factory Defaults

UTIL *Reset Most* *No* *Yes*	This control is used to reset most saved settings to the factory default, while still keeping the network, ident, and gang menu settings. Select *Yes* to erase most user menu settings and reboot the unit.

This function is only available on the Engineering menus and should only be used by qualified personnel.

3.6.9. Resetting All the VANC Encoder Settings to Factory Defaults

UTIL *Factory Reset* *No* *Yes*	This control is used to reset the VANC Encoder to its factory defaults. Select *Yes* to erase all user menu settings and reboot the unit.

This function is only available on the Engineering menus and should only be used by qualified personnel. Using this function may result in the loss of network communication with the device.

3.7. DISPLAYING THE VANC ENCODER STATUS

The *STATUS* menu shows various status information about the VANC Encoder operation. The chart below shows the items available in the *STATUS* menu. Sections 3.7.1 to 3.7.10 provide detailed information about each menu item. These status displays are generally for engineering use only.

Video Status	Displays the video status items
Ref 720P Status	Displays 720P Reference status information
Ref 24PsF Status	Displays 24PsF reference status information
Misc Status	Displays miscellaneous status information
TC In Status	Displays the time code input status items
Comm Status	Displays the communications status items
CINE Status	Displays the communications status items
5550 Status	Displays the communications status items
Network Status	Displays the Ethernet interface status
Versions	Displays the Software version information

3.7.1. Displaying the Video Status Information

STATUS	This control allows the user to display the Video status displays.
Video Status	
Mode	Operating Mode
Auto Enabled	Auto Video Standard detection
SDI Video In	Status of SDI Input video
B Link In	Status of 4:4:4 B Input video
Locked for	Time since input video relock
SDI Video Out	Status of SDI Output video
LUT	Current Colour Lookup Table
PGM Out LUT	Status of PGM Out LUT
MON Out LUT	Status of MON Out LUT

3.7.2. Displaying the 720P Reference Status Information

STATUS	This control allows the user to display the Video status displays.
Ref 720P Status	
Ref Source	Reference Source
Ref Status	Reference Status
Black Ref	Colour Black input
Black Ref Phase	Colour Black phase

3.7.3. Displaying the 24PsF Reference Status Information

STATUS	This control allows the user to display the Video status displays.
Ref 24PsF Status	
Ref Source	Reference Source
Ref Status	Reference Status
Locked for	Time since 6hz relock
VTM Pull	Video Time code Pull down of Frame :00
Black Ref	Colour Black input
Black Ref Phase	Colour Black phase
Ref In	Reference Input signal
VTC Out	Output Video Time code frames modulo N
ATC Out	Output Audio Time code frames modulo N
KK Out	Output KeyKode frames modulo N
Int 6HZ	Internal 6HZ time base

3.7.4. Displaying the Miscellaneous Status Information

STATUS	This control allows the user to display the miscellaneous status displays.
Misc Status	
GPI/O 1	Input #1, pin 1
GPI/O 2	Input #2, pin 8
GPI/O 3	Input #3, pin 4
GPI/O 4	Input #4, pin 9
GPI/O 5	Input #5, pin 5
GPI On	Video time code of Event GPI On

3.7.5. Displaying the Time Code Input Status Information

The *TC In Status* sub-menu shows various status information about the time code inputs. The chart below shows the items available in the *TC In Status* sub-menu. Sections 0 to 3.7.5.3 provide detailed information about each menu item. These status displays are generally for engineering use only.

LTC In Status	Displays the Video LTC Input status items
ALTC In Status	Displays the Audio LTC Input status items
ANC In Status	Displays the ancillary data status information

3.7.5.1. Displaying the Video LTC Input Status Information

STATUS	This control is used to show the Video LTC Input Status displays.
TC In Status	
LTC In Status	
LTC Read %	VIDEO LTC Percent read indicator
Phase	VIDEO LTC Phase indicator
LTC Delta Fr	VIDEO LTC change from previous read, in frames
LTC Dynamics	VIDEO LTC average Dynamics
RAW LTC TC	VIDEO LTC raw value
RAW LTC UB	VIDEO LTC raw user bits value
LTC Fr Rate	VIDEO LTC count, frames per second
LTC Exp Rate	VIDEO LTC expected count, frames per second
LTC Speed	VIDEO LTC per cent of play speed
Defer Jam	Ignore small jumps in VIDEO LTC

3.7.5.2. Displaying the Audio LTC Input Status Information

STATUS	This control is used to show the Video LTC Input Status displays.
TC In Status	
ALTC In Status	
ALTC Read %	AUDIO LTC Percent read indicator.
Phase	AUDIO LTC Phase indicator.
ALTC Delta Fr	AUDIO LTC change from previous read, in frames.
ALTC Dynamics	AUDIO LTC average Dynamics.
RAW ALTC TC	AUDIO LTC raw value.
RAW ALTC UB	AUDIO LTC raw user bits value.
ALTC Fr Rate	AUDIO LTC count, frames per second.
ALTC Exp Rate	AUDIO LTC expected count, frames per second.
ALTC Speed	AUDIO LTC per cent of play speed.

3.7.5.3. Displaying the ANC Input Status Information

STATUS	This control is used to show the ANC Input Status displays.
TC In Status	
ANC In Status	
ANC Read %	ANC Percent read indicator
ANC Selected	Preferred ANC packet type
ANC Source	ANC packet type
ANC F1	ANC Field 1 content
ANC F2	ANC Field 2 content
ANC Delta Fr	ANC change from previous read, in frames
ANC Dynamics	ANC average Dynamics
RAW ANC TC	ANC raw value
RAW ANC UB	ANC raw user bits value
ANC Exp Fr Rate	Expected ANC count, frames per second
ANC Fr Rate	ANC count, frames per second
ANC Speed	ANC per cent of play speed
ANC Fld 1 Flag	Average value of field flag in ANC from field 1
ANC Fld 2 Flag	Average value of field flag in ANC from field 2
ANC Fld 1 Delta	Average value of delta frames field 1
ANC Fld 2 Delta	Average value of delta frames field 2

3.7.6. Displaying the Communication Port Status Information

The *COM Status* sub-menu shows various status information about the serial ports. The chart below shows the items available in the *COM Status* sub-menu. Sections 0 to 3.7.5.3 provide detailed information about each menu item. These status displays are generally for engineering use only.

Ctl Com Status	Displays the Serial Control (Com 1) status items
Com 2 Status	Displays the Com 2 status items
Com 3 Status	Displays the Com 2 status items

3.7.6.1. Displaying the Serial Control Port (COM 1) Status Information

STATUS	This control is used to show the Com 1 Status displays.
COM Status	
Ctl Com Status	
Com1 Func	Function of Com1/Control port
Com1 BPS	Com1/Control port baud rate
Com1 settings	Word size and parity of Com1 port
Com1 RX	Details of Com1 port receive
Com1 RX Err	Details of Com1 port receive errors
Com1 TX	Details of Com1 port transmit

3.7.6.2. Displaying the COM 2 Status Information

STATUS	This control is used to show the Com 2 Status displays.
COM Status	
Com 2 Status	
Com2 Func	Function of Com2/Control port
Com2 BPS	Com2/Control port baud rate
Com2 settings	Word size and parity of Com2 port
Com2 RX	Details of Com2 port receive
Com2 RX Err	Details of Com2 port receive errors
Com2 TX	Details of Com2 port transmit

3.7.6.3. Displaying the COM 3 Status Information

STATUS	This control is used to show the Com 2 Status displays.
COM Status	
Com 2 Status	
Com3 Func	Function of Com3/Control port
Com3 BPS	Com3/Control port baud rate
Com3 settings	Word size and parity of Com3 port
Com3 RX	Details of Com3 port receive
Com3 RX Err	Details of Com3 port receive errors
Com3 TX	Details of Com3 port transmit

3.7.7. Displaying the Telecine Status Information

The *CINE Status* sub-menu shows various status information about the telecine interface. The chart below shows the items available in the *CINE Status* sub-menu. Sections 0 to 3.7.5.3 provide detailed information about each menu item. These status displays are generally for engineering use only.

Biphase Status	Displays the Biphase status items
Frm Pulse Status	Displays the Telecine Pull down Frame pulse status items
KeyKode Status	Displays the KeyKode status items
Filmcode Status	Displays the Film Time code status items

3.7.7.1. Displaying the Biphase Status Information

STATUS	This control is used to show the Telecine Biphase Status displays.
CINE Status	
Biphase Status	
Speed	Biphase speed
Biphase HScan	Biphase Scantrack (biphase to video phase relationship)
Biphase FScan	Biphase Film edge numbers Scantrack - compensated for HScan
Biphase VScan	Biphase video time code Scantrack - compensated for HScan
Biphase AScan	Biphase Audio time code Scantrack - compensated for HScan

3.7.7.2. Displaying the Frame Pulse Status Information

STATUS	This control is used to show the Telecine frame pulse Status displays.
CINE Status	
Frm Pulse Status	
Frm In	Frame Pulse In
Locked for	Time since input Frame Pulse relock
Cycle Len	Length of pull down cycle in fields
Exp Cycle Len	Expected Length of pull down cycle in fields
Pull Pattern	Pull down cycle pattern
VTC(:00) Pull	Pull down of Video time code at frame :00
ATC(:00) Pull	Pull down of Audio time code at frame :00
KK(+00) Pull	Pull down at KeyKode Frame +00
Raw Frm	Raw Frame/Pull down Input signal
Process	Processed Frame/Pull down Input signal
VTC Out	Output Video Time code frames modulo N
ATC Out	Output Audio Time code frames modulo N
KK Out	Output KeyKode frames modulo N
OutPull	Output Pull down type
Int Cyl	Internal cycle time base

3.7.7.3. Displaying the KeyKode Status Information

STATUS	This control is used to show the Telecine frame pulse Status displays.
CINE Status	
KeyKode Status	
KeyKode In	Status of KeyKode input

3.7.7.4. Displaying the Film Time Code Status Information

STATUS	This control is used to show the Telecine frame pulse Status displays.
CINE Status	
Filmcode Status	
Filmcode In	Status of Film time code input

3.7.8. Displaying the 5550 Status Information

STATUS	This control is used to show the Com 1 Status displays.
5550 Status	
Comm	Status of communications to and from 5550
Kk Valid	Percent of valid KeyKode reads
KK Asym	Percent of KeyKode asymmetry
5550 Biphase	KeyKode reader biphase count

3.7.9. Displaying the Network Status Information

STATUS	This control allows the user to display the VANC Encoder Network status displays.
Network Status	
Net Neighbours	Status of network VANC Encoder neighbours
HDSD9155Q	IP address of HDSD9155Q Control CPU
Gateway	IP address of Gateway
Syslog	IP address of System Logging destination
Tracker	IP address of PC running KeyLog TRACKER™
Tracker Port	Port number of KeyLog TRACKER™
Subnet	Ethernet Subnet Mask
MAC	Ethernet MAC Address
Net Link	Ethernet Link Status
Net activity	Ethernet Activity Status
Net Speed	Ethernet Link Speed

3.7.9.1. Network Neighbour Status

STATUS	This sub-menu allows the user to display a list of all VANC Encoders and Film Footage Encoders available on the subnet set by the *System IP* menu item. See section 3.6.2.
Network Status	
Net Neighbours	

The following example screen shows sample units on a network.

System ID	Local Device	Gang Number	IP	Type
Back				
Exit				
1 =		Gang:0	B:11	9045
2 =	<-	Gang:1	B:21	9155
3 =		Gang:1	B*31	9155
4 =		Gang:1	B*31	9155
A =	*	Gang:1	B:41	9155

Figure 3-7: Network Neighbours Status Screen

System ID: The System ID of the Afterburner or VANC Encoder is shown in this column. All the information on this line relates to the device pair with this system ID.

* will be shown in the Local Device column if there is more than one system with this System ID

Local Device: <- will be shown in this column if the device displaying the status screen is part of this system.

Gang Number: Shows the Gang number of the VANC Encoder of this system. Will show 0 if the VANC Encoder is not a part of any gang.

IP: Shows the fourth octet of the VANC Encoder IP address system. An asterisk (*) will be shown in place of the colon (:) when there is an IP conflict for this VANC Encoder.

Type: Shows the device type for this unit.

The Network Neighbours status screen may take several minutes to update completely after changes to the network configuration.

3.7.10. Displaying the Firmware Version Information

STATUS	This control allows the user to display the version information for the VANC Encoder.
Versions	
Version	Shows application firmware version and build number.
H/W Rev	Shows hardware version.
FPGA Rev	Shows VANC Encoder FPGA version.
NetIF Version	Shows Network Interface firmware version.
5550 FL	Shows application firmware version of 5550 KeyKode reader.

3.8. NETWORKING MULTIPLE SYSTEMS TOGETHER

In large systems where there are many VANC Encoders it is often desirable to connect them to an Ethernet network. When networked together you can perform the following functions:

- Automatically control all the networked devices from one common point.
  - When you operate the menu system on one VANC Encoder you can have all the other devices in the group (gang) automatically controlled at the same time.
  - This facilitates making quick changes to settings on many devices.
  - You can set up to 5 gangs within the network.

- Manually send the configuration of a VANC Encoder to other VANC Encoders on the network.
  - This allows you to have control over when the configuration of the devices will be updated.
  - You can send the configuration to individual devices or to gangs.

- Manually get the configuration of a VANC Encoder from other VANC Encoders on the network.
  - This allows you to quickly update the configurations of new devices you add to the network.
  - You can get the configuration from individual devices or to gangs.

With the version 3.1 or later of KeyLog TRACKER™ you can also connect the network to a PC running KeyLog TRACKER™. This will simplify control of multiple VANC Encoders from one common location.

Firmware can be uploaded to multiple networked units easily using KeyLog TRACKER™ version 3.0 or later, or using the free Network upgrade utility program available on the Evertz Web Site.

- Load firmware to one or more VANC Encoders or Film Footage Encoders

- Uses the free PostUpgrade utility program (see section 6.3.2) or FTP (see section 6.3.3)

In order to network multiple VANC Encoders together you must connect the VANC Encoders to each other using a network hub or switch. (See section 2.6) Next you must set the IP address for each system. (See section 3.6.2.)

If you wish to connect a PC into the system you will also have to set its IP address so they are on the same subnet as the VANC Encoder.

If connecting multiple VANC Encoders or Film Footage Encoders on the same network, take care to use different IP addresses for each. For example, set the system addresses for System 1 to 10, and for system 2 to 20, etc.; that way the IP address will not overlap and will be easy to remember.

If there is an IP address conflict with other devices in the network the Front panel display of the VANC Encoder will display a flashing message.

`IP CONFLICT`

After setting the IP addresses for each VANC Encoder you need to set the unique System ID values for each VANC Encoder. (See section 3.6.4)

If the VANC Encoder has a System Ident conflict with other VANC Encoders in the network the Front panel display of the VANC Encoder will display a flashing message.

`IDENT CONFLICT`

If you want the devices configured in one or more gangs you will also have to set the gang number in each VANC Encoder. (See section 3.6.6)

Once you have configured each system you will be able to see all the VANC Encoders and Film Footage Encoders connected to the network using the *Network Status* screen on one of the VANC Encoders.

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Tables

4. CONTROLLING THE VANC ENCODER FROM KEYLOG TRACKER™

In many applications the HDSD9045TR VANC Encoder is controlled from the Evertz Graphical User Interface (GUI) KeyLog TRACKER™. The software is used to configure the VANC Encoder's hardware for different applications. Configuration sets can be saved and recalled to speed set-up of the hardware. In order to control the HDSD9045TR VANC Encoder you must use version 3.1 or later of the KeyLog TRACKER™ software. This version should have been shipped on a CD-ROM along with your HDSD9045TR unit.

4.1. PHYSICAL CONNECTIONS

If you are connecting the HDSD9045TR to the computer that will be running the KeyLog TRACKER™ software, using a RS-232 serial port connection see section 2.7 for information on connecting your HDSD9045TR. If you are connecting the HDSD9045TR to the computer that will be running the KeyLog TRACKER™ software, using an Ethernet connection see section 2.6 for information on connecting your HDSD9045TR.

If you will be connecting to the VANC Encoder using a serial port connection set the *COM 1 Func* menu item (on the *Ports menu)* to *Tracker.* The *Tracker Comm* status item on the *Ports* menu should show *Comm.* (See section 3.6.2.1 and 3.6.2.2)

If you are using an Ethernet connection, then set the IP address and Net Mask in the unit using the *SYSTEM IP* menu items (see section 3.6.3). In order to identify multiple devices on the network, make sure that you have set a unique *System Ident* in each device. (See section 3.6.4) You will also need to set the *COM 1 Func* menu item (on the *Ports menu)* to *None (*or anything other than *Tracker)*. The *Tracker Comm* status item on the *Ports* menu should show *Net.* (See section 3.6.2.1 and 3.6.2.2). You should verify that your computer can see the device by 'pinging' it.

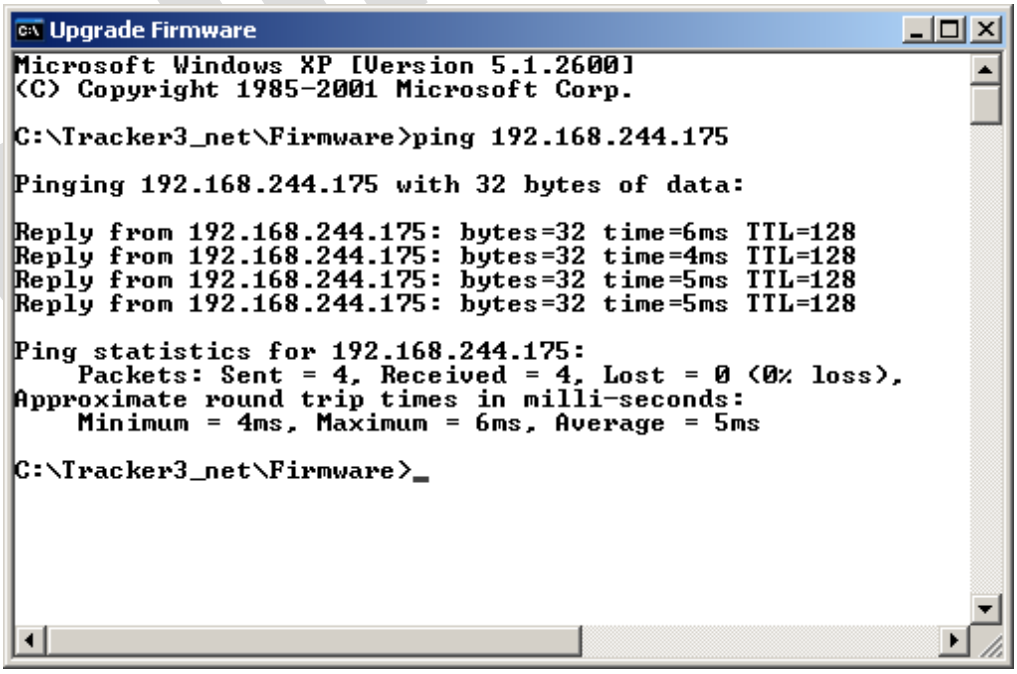

Figure 4-1: Upgrade Firmware Screen

4.2. INSTALLING KeyLog TRACKER™

Insert the KeyLog TRACKER™ CD-ROM into the PC's CD-ROM drive and click on the *Start* button and then select *Settings*. Click on the *Control Panel*, then select *ADD/Remove Programs*. The KeyLog TRACKER™ installation program will guide you through the installation procedure.

Once the installation is complete, click on the *Start* button and then select *Programs*. Select the "Evertz Products" program group and click on the KeyLog TRACKER™ icon.

You are presented with the KeyLog TRACKER™ Splash screen and the "Login" dialog box. Enter "user" as a user name and leave the password area blank, then click the "OK" button.

If KeyLog TRACKER™ detects that you have a network interface card (NIC) installed in the computer you will see the following dialog message:

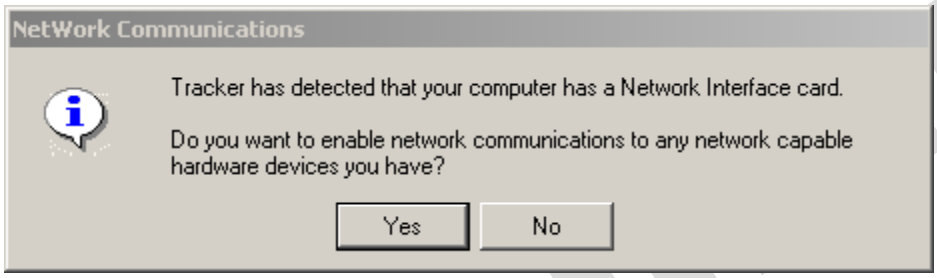

Figure 4-2: Network Communications Window

Press "Yes" to enable network communications in KeyLog TRACKER™, press no to disable Network communications. If you choose to enable network communications KeyLog TRACKER™ will attempt to discover the IP address of the NIC in your computer. If there are multiple NICs in your computer you will see the following dialog message:

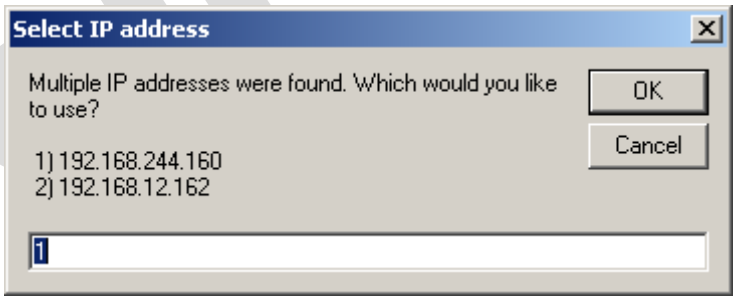

Figure 4-3: Select IP Address Window

This dialog shows a list of the IP addresses in the various NICs of the computer. Choose the NIC that your devices are connected to by entering its number in the text box and then press the OK button. When Tracker has identified a unique NIC and IP address it will show you the following message identified in Figure 4-4:

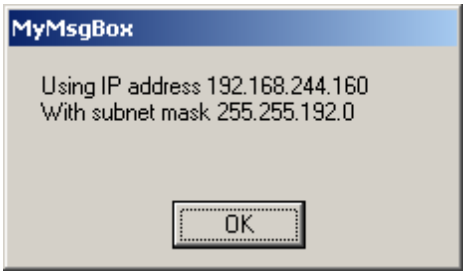

Figure 4-4: MyMsgBox Window

Make sure that your hardware devices are connected to the same subnet.

If you are running KeyLog TRACKER™ for the first time, you must select the devices you wish to control and configure how they are connected to the computer.

4.3. CONFIGURING HOW TRACKER COMMUNICATES TO THE HARDWARE DEVICES

The “Devices” tab of the Options dialog box is used to configure the devices you wish to control and how the computer will communicate with these devices.

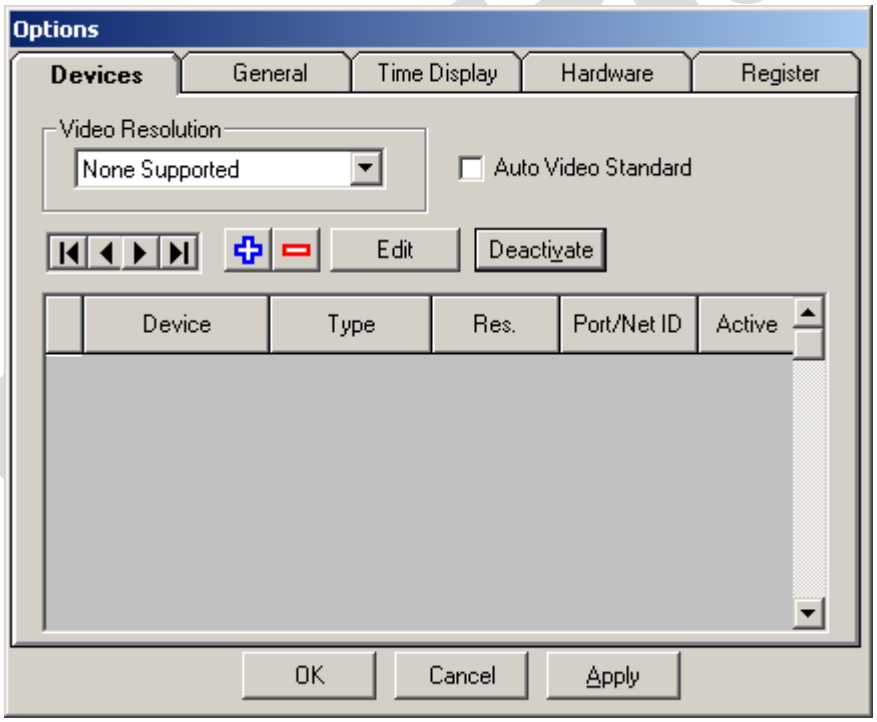

Figure 4-5: Options Window

4.3.1. Communicating to the Devices Using a Serial Port

Press the button to add the HDSD9045TR to the list of controlled devices. Click on the down arrow beside the *Device* dropdown and choose the HDSD9045TR with the mouse.

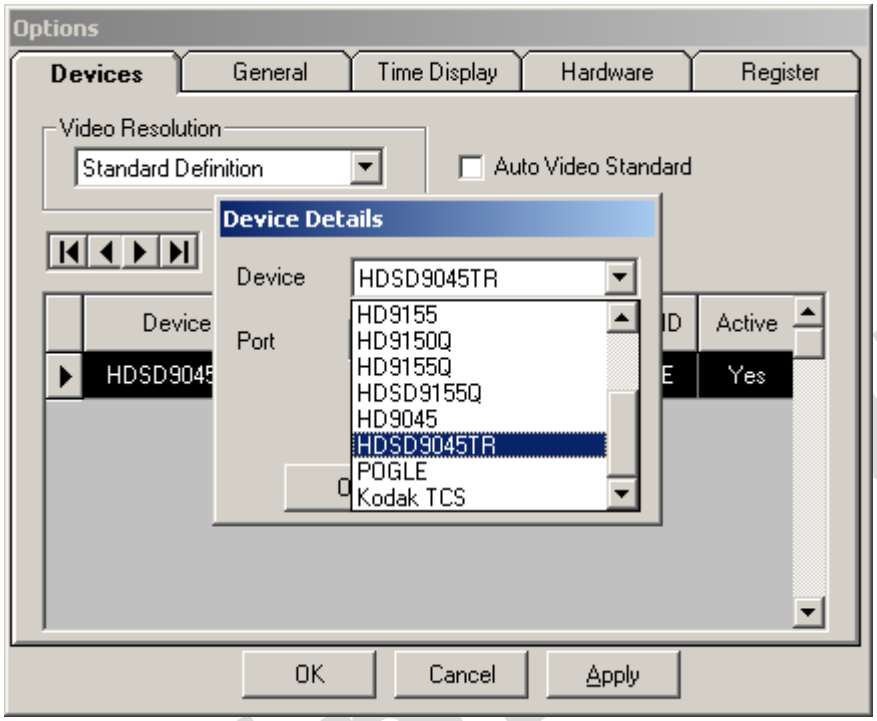

Figure 4-6: Devices Details Window

Click on the down arrow beside the *Port* dropdown and choose the COM port that you connected to the HDSD9045TR. If you check the "Activate Now" check box the HDSD9045TR will automatically become active when you close the screen. Press the *OK* button to add the HDSD9045TR to the list of controlled devices. If you need to add an Afterburner to the controlled devices, repeat this procedure, selecting the correct device and COM port. Make sure each COM port selector is set to the correct COM port.

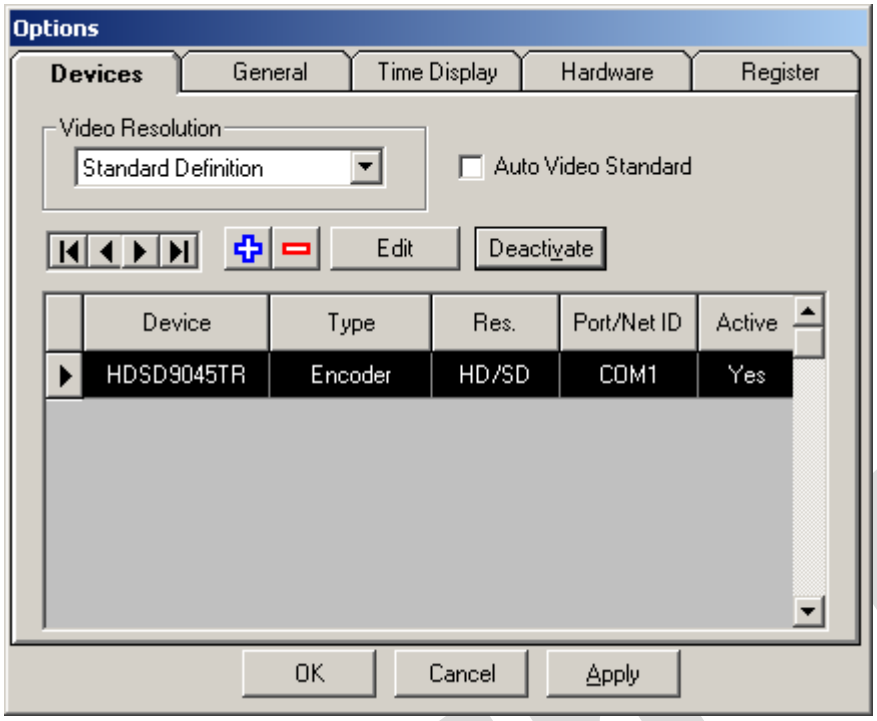

Figure 4-7: Devices Tab with HDSD9045TR Added

4.3.2. Communicating to the Devices Using Ethernet

Press the  button to add the HDSD9045TR to the list of controlled devices. Select the *Network* radio button to force Tracker to search the network for connected devices.

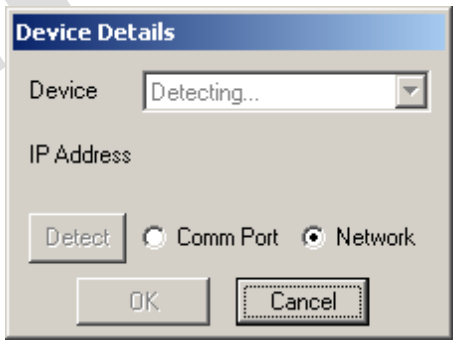

Figure 4-8: Device Details Window

Click on the down arrow beside the *Device* dropdown and you will see a list of the detected devices and their System IDs. Choose the HDSD9045TR with the mouse. If there are no devices detected then check that you have properly connected the devices, and that their IP addresses and Subnet masks are set to match the computer's Subnet mask.

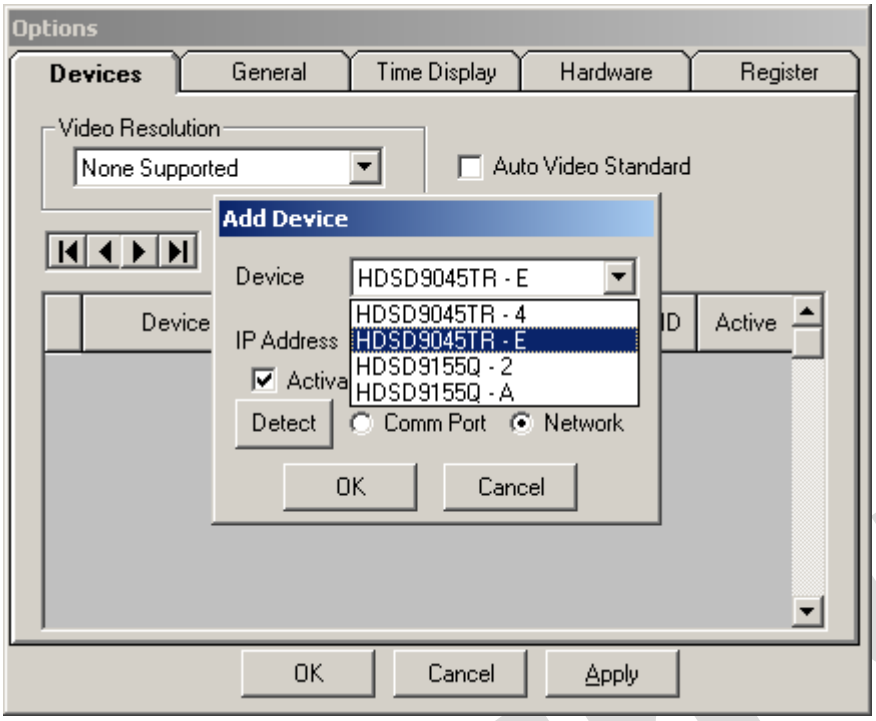

Figure 4-9: Add Device Window

If you check the "Activate Now" check box the HDSD9045TR will automatically become active when you close the screen. Click the *OK* button to add the HDSD9045TR to the list of controlled devices. If you need to add an Afterburner to the controlled devices, repeat this procedure, selecting the correct device.

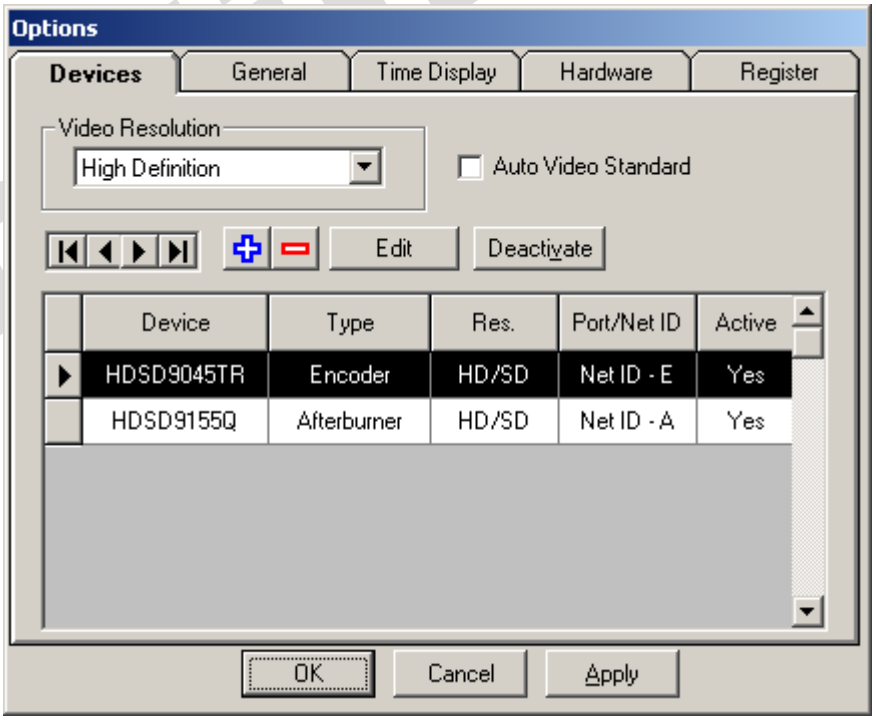

Figure 4-10: Adding Another Device

The "Resolution" control allows you to configure if KeyLog TRACKER™ will be operating in the Standard Definition or High Definition mode. When the resolution control is set to the high definition mode, KeyLog TRACKER™ will *activate* the high definition capable devices. Only one encoder and one Afterburner device can be activated at any time. If the HDSD9045TR is not activated click on the HDSD9045TR line and then press the *Activate* button. To verify communications with the HDSD9045TR, press the *OK* button once you have verified the device connection settings. Press the *Encoder* button on the toolbar. When you press the *OK* button, KeyLog TRACKER™ will attempt to communicate with the activated devices. If the KeyLog TRACKER™ is communicating with the HDSD9045TR using a serial port connection, the COM1 LED on the HDSD9045TR front panel should be On and there should also be a green indicator in the COMM Status Bar at the bottom of the KeyLog TRACKER™ screen. If the KeyLog TRACKER™ is communicating with the HDSD9045TR using an Ethernet connection, the NET LED on the HDSD9045TR front panel should be On and there should also be a green indicator in the COMM Status Bar at the bottom of the KeyLog TRACKER™ screen.

If the KeyLog TRACKER™ COMM indicator is red, that shows that the hardware is not responding. If you receive a "Communications Error" message box, check your cable connection and verify that you have selected the correct communications port on your computer. If you are trying to connect using Ethernet and the HDSD9045TR is in Com port mode, you will see the following dialog box.

Figure 4-11: Communication Error

You must change the HDSD9045TR to Network mode by setting the *COM 1 Func* menu item (on the *Ports menu)* to *None (*or anything other than *Tracker)*. The *Tracker Comm* status item on the *Ports* menu should be set to *Net.* (See section 3.6.2.1 and 3.6.2.2)

4.4. KEYLOG TRACKER™ FIRST TIME SETUP

The first time you run the KeyLog TRACKER™ software you will see a dialog box asking if you want to see the First Time Setup section of the Tracker online Help.

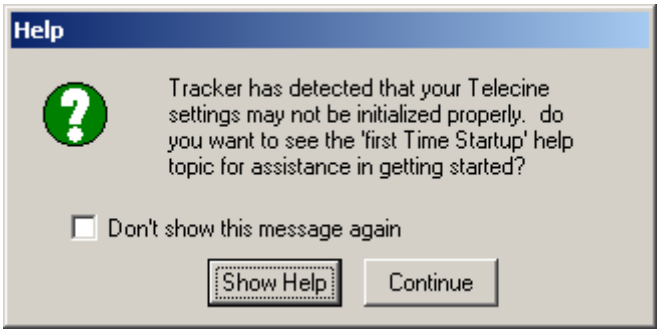

Figure 4-12: Help Window

Press the *Show Help* button to view the help file. The first time setup section of the KeyLog TRACKER™ manual and online help file guides you through the steps required to configure the system. It also introduces you to some of the basic concepts of controlling the VANC Encoder from the KeyLog TRACKER™ software. We recommend that you read through this section before proceeding. The remainder of this chapter gives you additional information to configure the system timing in your telecine room, so that you can achieve consistent frame accurate transfers and VANC/VITC encoding.

Press the *Continue* button to proceed without opening the help file. Check the *Don't show this message again'* check box before pressing the *Continue* button if you do not want to see this message each time you start the KeyLog TRACKER™ software.

4.5. CALIBRATING THE HDSD9045TR SYSTEM TIMING – FILM TO TAPE APPLICATIONS

In order to achieve frame accurate numbering the HDSD9045TR system timing must be properly calibrated according to the following procedure.

It is important to follow the procedure closely as each step depends on the successful completion of the previous step.

The Biphase accuracy test verifies the basic system connections and allows you to compensate for video delays in the colour corrector, noise reducer and other devices in the system.

If you are using an edit controller such as the TLC, POGLE or Astec you will also need to calibrate the system edit timing to achieve frame accurate edits and proper 2:3 pull down control. If you are using the system with high definition 24p video, you will also have to calibrate the edit timing to ensure that the edits are occurring at the 6 Hz reference point. Consult the relevant manuals for information on how to do this.

If you are using the film system in a 2:3 pull down mode, it is preferable to do the system calibration in the 2:3 pull down mode (60i video with film running at 24 FPS) first. This will allow us to properly determine the *Prestore* and *Video Delay* numbers. If you cannot do the 2:3 mode first then proceed directly to the 1:1 modes with either 60i or 50i video. After you have done the 60i and 50I calibration, proceed to the 24p calibration. You will have to go back and do 60i calibration later, if you intend to transfer into 60i video at 24 FPS. You may have to recheck the 1:1 calibrations again if you change the *Video Delay* or *Prestore* delay values in 60i.

4.5.1. Configuring The Basic Setup

The HDSD9045TR *WORKFLOW* menu item must be placed in *CINE* mode to use the HDSD9045TR in Film to Tape applications.

When using KeyLog TRACKER™ software to control the HDSD9045TR, you must first configure the Telecine Setup to match your transfer suite. Choose the *Telecine Setups* item from the *Edit* menu to open the Telecine Setup Screen that will be used to configure the overall behaviour of the HDSD9045TR.

The *Telecine Setups* window shows the System Default Telecine Setup that is installed with the software. Each Telecine Setup consists of a group of telecine related parameters including the telecine type, the telecine biphase rate, the type of frame pulse handling that is appropriate for your telecine, and *Video Delay* and *Prestore* film delay parameters that are appropriate for your installation. Each Telecine Setup also includes a set of KeyKode head offsets.

To view the telecine setup or to change the default settings to match your installation, click on the *Edit* button.

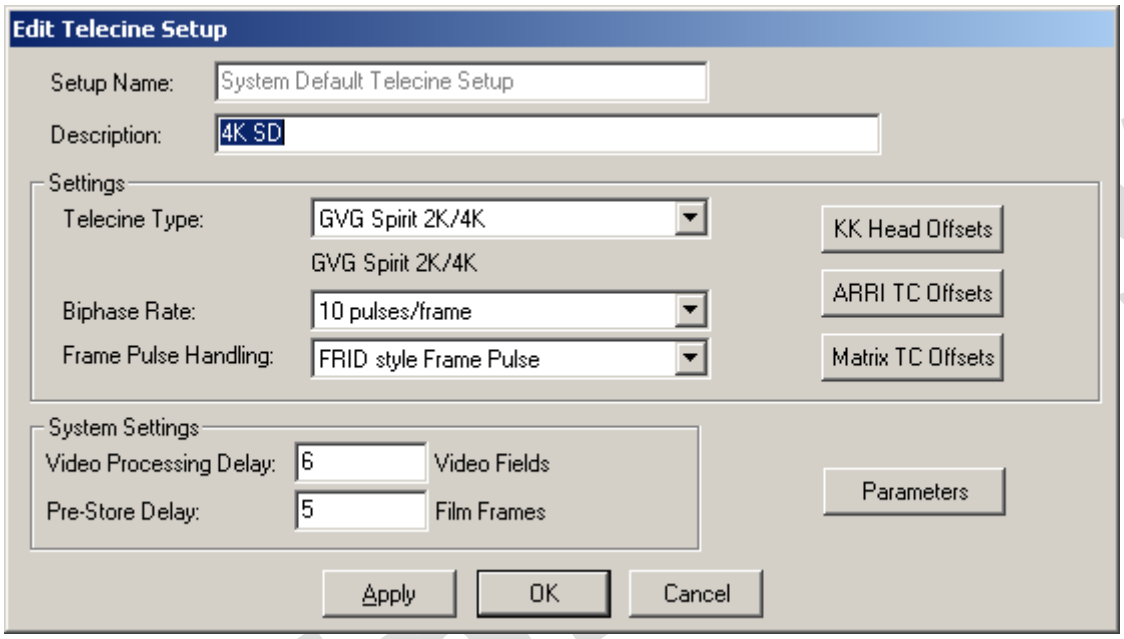

Figure 4-13: Edit Telecine Setup Window

You can change the description to something more appropriate if desired. Select the telecine type that most closely matches your installation by clicking on the down arrow on the telecine type combo box. You are now presented with a list of the possible telecine types supported by the HDSD9045TR hardware. Click on the telecine type to select it. The default biphase rate and Frame Pulse Handling for that telecine type will be automatically entered. Select the correct biphase rate or Frame Pulse Handling using the respective combo boxes. Consult the sections in chapter 2 for your specific telecine type for information on which settings you should use.

If you have video delays between the output of the telecine store and the input of the HDSD9045TR hardware then set the *Video Delay* parameter to the appropriate number of fields. If you have additional *Prestore* film processing delays that have been added for devices such as film grain reducers then enter in the appropriate number of film frames of delay for your system and press the *OK* button. Note that some telecines have internal *Prestore* delays that must also be compensated for. If you do not know what these are they can be adjusted later. When you have set the desired values press the *OK* button to save the new settings. Close the *Telecine Setups* window by clicking on the x in the top right corner.

You must now verify that the Telecine Setups that you have configured work correctly for biphase only applications.

4.5.2. Verifying The Basic Telecine Setup Timing

KeyLog TRACKER™ allows you to save multiple System Configurations. Each System Configuration is stored separately and consists of all of the parameters related to mapping of the Time code and KeyKode Inputs and Outputs, film type and rate, Telecine Setup, Capture modes and character window attributes and positions. KeyLog TRACKER™ ships with several System Default Configurations. These Default configurations can be copied but they cannot be changed.

Choose the *System Configurations* item from the *Edit* menu to open the System Configuration Screen that will be used to configure the overall behaviour of the HDSD9045TR. To verify the accuracy of the basic telecine setup we will create a new system configuration by copying the biphase test configuration for the video standard you are using. Select the System Default biphase test configurations that matches the video standard you are using and press the button. You are presented with the Add System Configuration screen that has seven tabs across the top and two tabs on the right side. The tabs on the side select parameters for the active Encoder or Afterburner. The tabs along the top are used to select sets of parameters for the respective device.

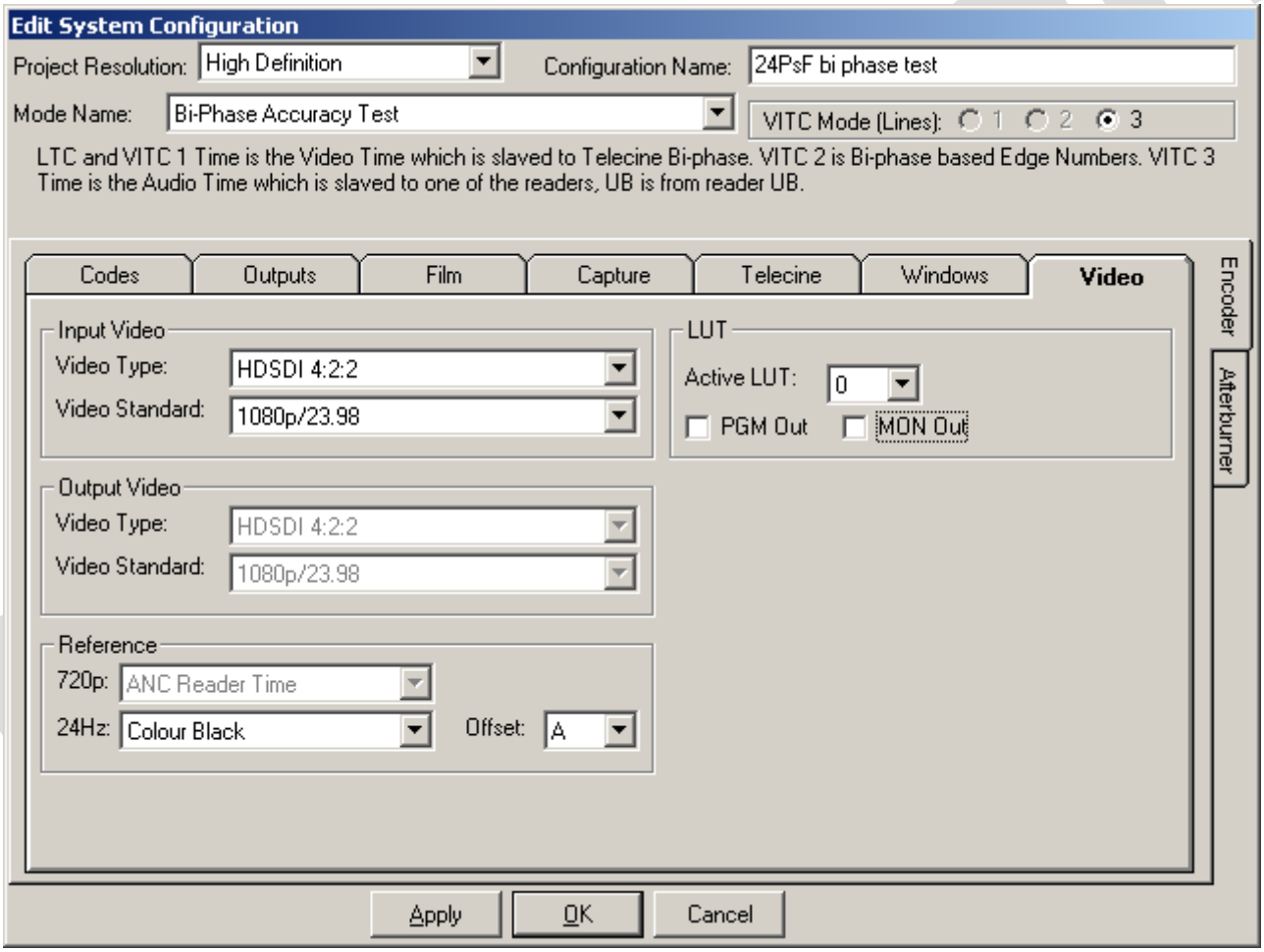

Figure 4-14: Edit System Configuration Window

Enter the name “Engineering Test” for your new System Configuration. The mode combo box allows you to quickly set up the HDSD9045TR hardware for various applications. Clicking on the arrow presents a list of modes that are available with the HDSD9045TR and KeyLog TRACKER™. Choose

the *Biphase Accuracy Test* mode if it is not already displayed. Selecting a mode automatically fills in the appropriate information for most of the other boxes on the configuration screen. See the *System Configurations* help item in the KeyLog TRACKER™ help file for a full description of the *System Configuration* Screen.

Press the Encoder tab on the side to select the set of parameters for the VANC Encoder. Select the *Video* tab that is used to determine the video input and output parameters. Set the Input Video Type and Standard so they are the same as the video standard you are using. Set the 24 Hz Reference to "Colour Black".

Select the *Codes* tab that is used to determine the source of the logical time codes and film codes that are used within KeyLog TRACKER™. The video and audio time code sources are shown in the respective boxes. KeyLog TRACKER™ keeps track of two sets of film numbers: the KeyKode and the ink numbers. For the biphase test we want to update the KeyKode numbers manually so that we can detect the accuracy of the system and for the moment we are going to ignore the ink numbers.

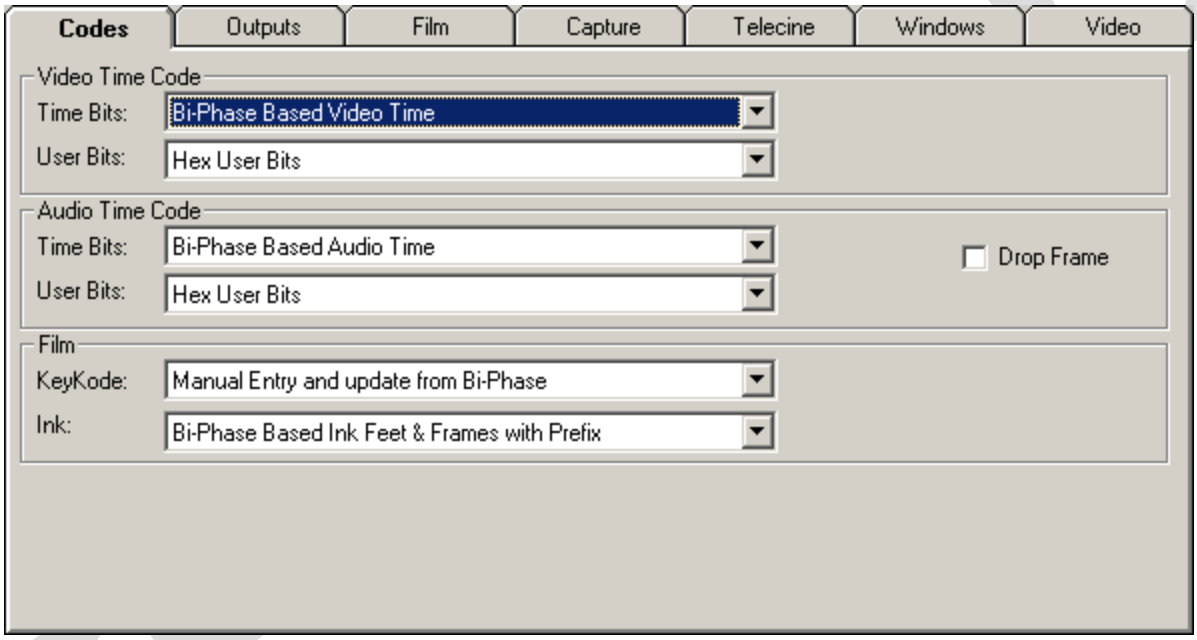

Figure 4-15: Codes Tab

Click the *Outputs* tab to select what time code and KeyKode outputs are going to occur for the Encoder. There are linear time code (LTC) outputs for video and audio, three lines of vertical internal time code (VITC) for standard definition video or Vertical Ancillary Data (VANC) for high definition video. Each of the combo boxes allows you to choose the outputs for your particular application. All of the outputs are preset when you choose the *Biphase Accuracy Test* mode.

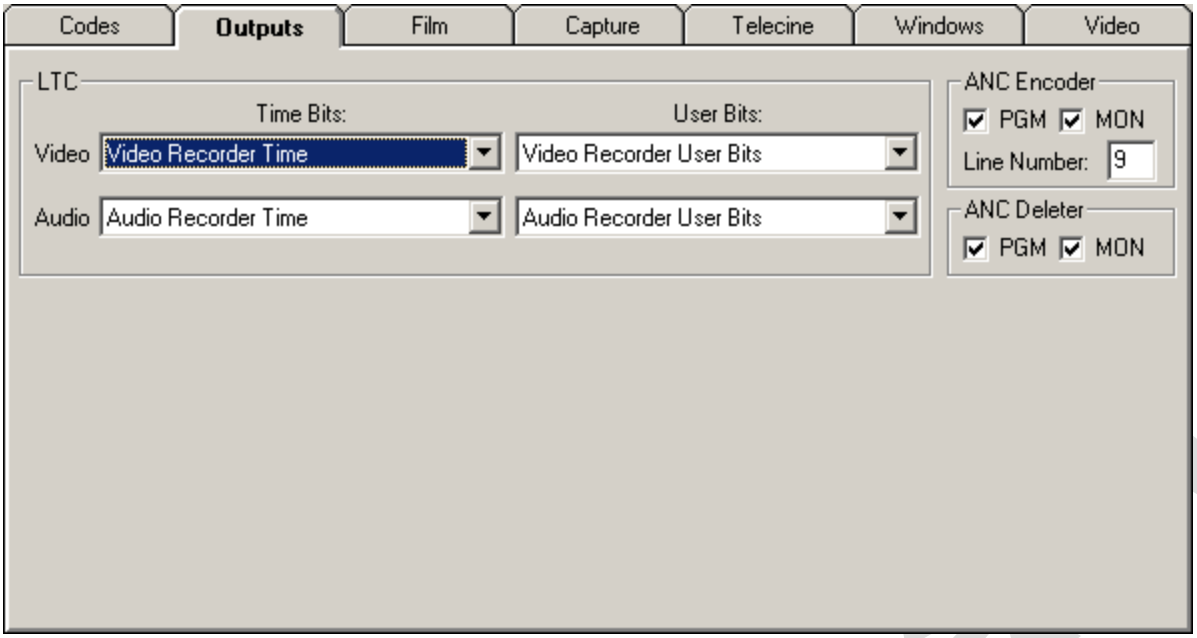

Figure 4-16: Outputs Tab

Click the *Film* tab to select the type of film that you are using, the film transfer rate, the edge number encoding style, and the adjustment of any of the KeyKode settings that are appropriate. Select the appropriate Film Gauge and Film Rate.

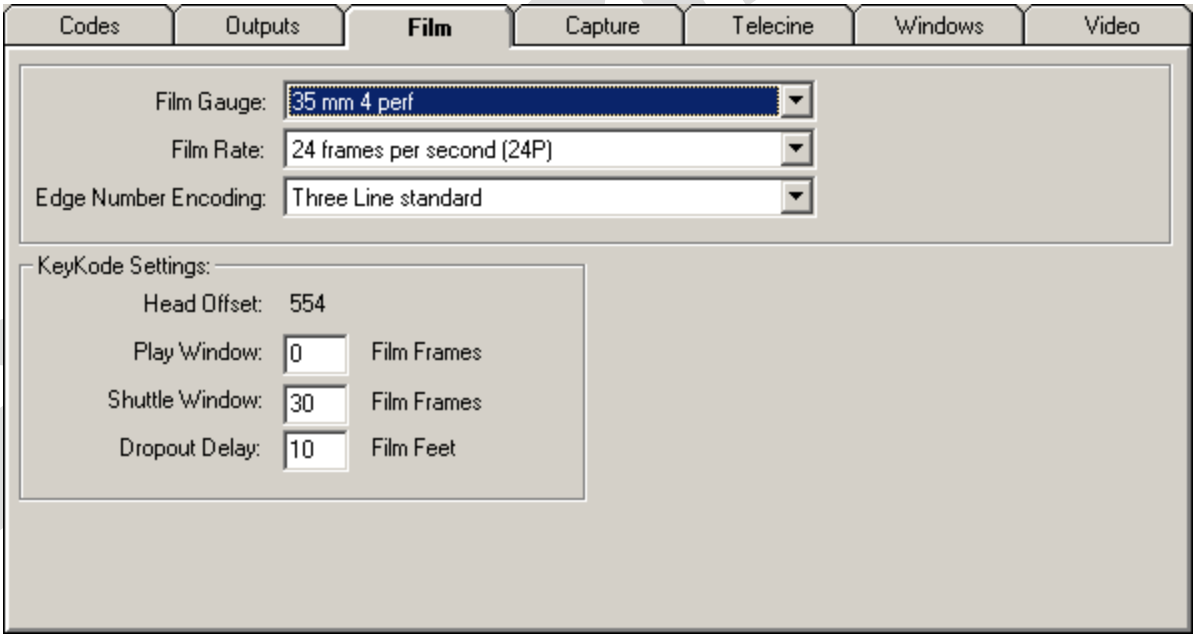

Figure 4-17: Film Tab

The *Capture* tab allows the user to set various parameters that capture data from the HDSD9045TR. The user can ignore the capture settings for the biphase test. The *Telecine* tab allows the user to choose a particular Telecine Setup. At this time the Default System Telecine Setup is the only one available.

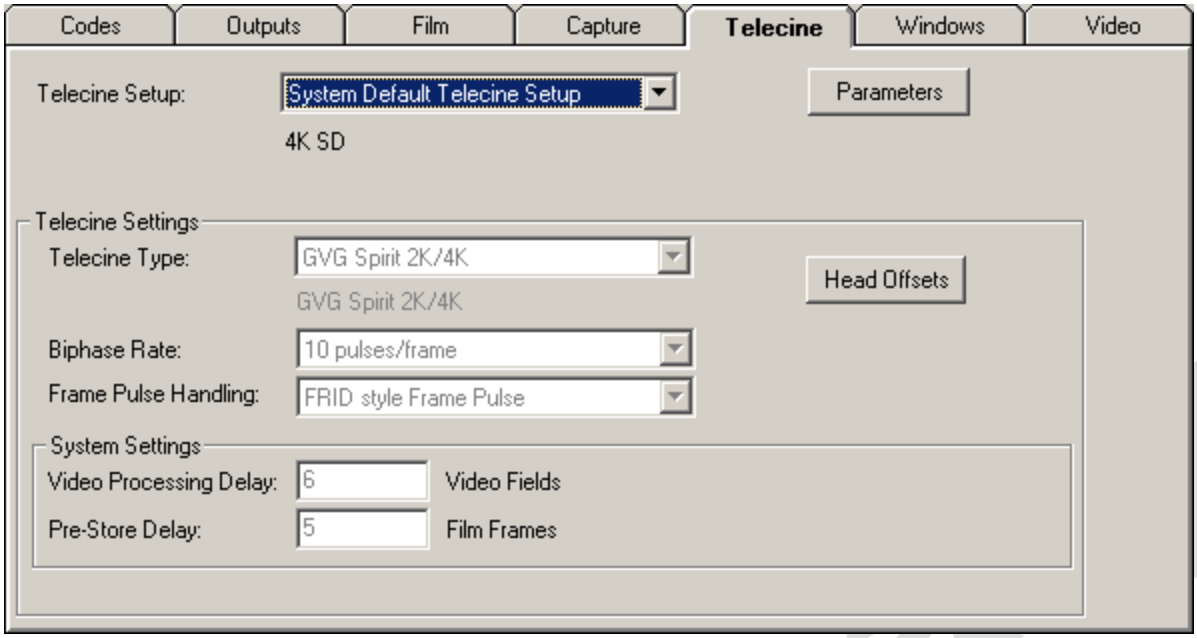

Figure 4-18: Telecine Tab

The *Windows* tab allows you to configure the characters windows burned in on the video. Make sure that the Video Time Code and KeyKode windows are turned on. To do this, select the appropriate window from the list and press the Edit button or just double click on the window name. Make sure that the Window check box is checked, and press the *Okay* button. For more information about configuring the character window displays see the *Project Configuration - Window Settings* help topics in the KeyLog TRACKER™ help file.

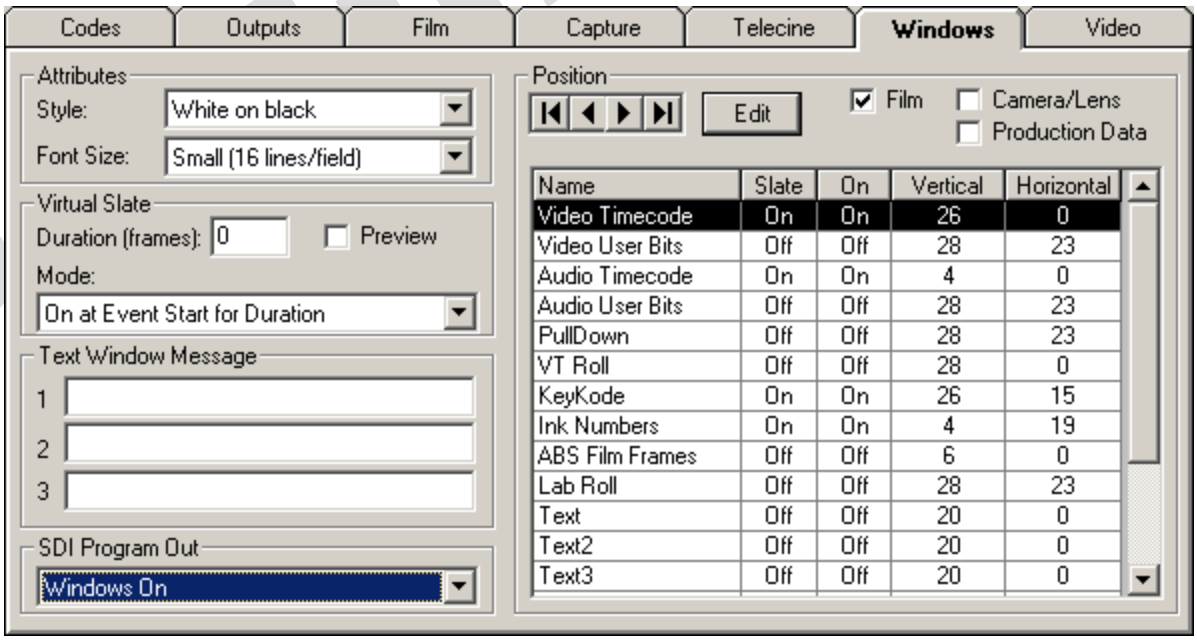

Figure 4-19: Windows Tab

Press the *OK* button to send this information to the HDSD9045TR hardware and save the new System Configuration. Close the *System Configurations* window by clicking on the x button in the top right corner. After setting up the system configuration proceed to the Biphase Accuracy Test to verify the accuracy of your basic telecine setup.

4.5.3. Biphase Accuracy Test

The biphase accuracy test allows you to verify that you have compensated correctly for the system delays in the telecine and the video delays between the output of the telecine and the input of the HDSD9045TR. (Colour corrector and noise reducer delays typically) Once you have verified the basic connections, you may proceed to the KeyKode reader installation.

If you do not verify the frame accuracy of the system at this time, the accuracy of your system with KeyKode will also be affected.

The following simple procedure will help you establish that the HDSD9045TR is properly installed, and that it is configured correctly for your application.

1. Make note of the key number on a piece of reference film. This number is usually the Key number of the frame where a reference KeyKode dot is located (i.e. on the whole foot mark). Mark this reference frame with a punch or grease pencil.

   The Kodak KeyKode Verification film is a good choice for this test as the image area of each film frame has the key number in the visible area. (Contact your local Kodak dealer or you can purchase this film directly from Evertz)

2. Place this film on the telecine, with the reference frame in the gate.

3. If you have already set up the Telecine Parameters and sent the configuration to the hardware as described in section 4.5.1 and 4.5.2 you can proceed to step 4.

   a) Open the KEYLOG TRACKER™ Telecine Setup screen from the *Edit* menu, and select the *System Default Telecine Setup*. Click the *Edit* button to make changes to the System Default Telecine Setup. Set the Video Delay parameter to match the path delay (in video fields) between the telecine output and the HDSD9045TR input.

   b) Open the System Configuration screen from the Edit menu and then open the System Default Configuration called Biphase Accuracy test for the video standard you are using. You will be prompted to make a copy, therefore the user must select *OK*. Give the new configuration a suitable name such as 'Engineering Test'. Make sure that the telecine tab parameters match those of the System Default Telecine Setup. Press the OK button to send the configuration to the HDSD9045TR. It will place the hardware in the correct mode to perform the following test. Close the System Configuration screen. (See the section titled "First Time Setup" in the KeyLog TRACKER™ manual or online help for detailed information).

   c) Open the Encoder Status window using the 

button on the toolbar. This window will allow the user to see critical information on the telecine timing during the accuracy test.

4. a) Select *Load Film* from the *Tools* menu, or press the Load Film button  on the toolbar. (The Load Film procedure must be done each time a new piece of film is loaded onto the telecine. See the Load Film help item in the KeyLog TRACKER™ manual or Online Help for more information.)

   b) Open the Set Codes window from the Edit menu (or press the F2 key) to enter the key number of the reference frame into the KeyKode register, and set the Video time code to 01:00:00:00

5. Back up the telecine and transfer a short piece of film (which includes the reference frame) to videotape. If you are using an edit controller, set the In point of the edit to occur before the reference frame so that you will be able to see the complete pull down sequence before and after the reference frame. Make sure that the character generator output of the HDSD9045TR is recorded on the videotape. When the telecine achieves locked PLAY speed, the telecine FRAME and LOCK LEDs on the HDSD9045TR front panel should be *ON* and there should be a '+' between the footage and frames in the character generator. Press the HELP button on the Encoder Status window if you are not seeing the '+' indicator.

6. While the telecine is in Play mode with the Lock indicator *ON*, make a note of the "Scan Track" value on the Encoder status window. This value shows where the HDSD9045TR thinks the film frame boundaries are and how much the film is moving in the gate due to the effect of Scantrack on older Cintel telecines. When the telecine is first put into the PLAY mode, the Scan Track value should be approximately 00. If you have a Cintel Telecine with Scantrack enabled, the Scan Track value will change gradually, with expected values of less than ±15. On telecines that do not have Scantrack, this value should be relatively constant with a value of less than ±15 when in the locked PLAY condition.

If the Scan Track value exceeds ±19, a counting error will occur in the biphase based numbers. This may be due to a telecine with excessive Scantrack settings, or to improper centering of the film when it is loaded onto the telecine. It may also be due to the telecine type being set incorrectly.

7. If you are not using the film system in a 2:3 pull down mode you can proceed to step 8. Play back the videotape in slow shuttle or jog mode. Examine at least 5 fields of video around the reference frame, and verify that the pull down of the picture matches the pull down of the edge number characters. Do not be concerned if the frame numbers do not match if you know that your telecine has a Prestore Delay.

   If the pull down does not match, then adjust the *Video Delay* parameter in the Telecine Setup Screen. The *Video Delay* parameter will normally be an even number of fields. If the value you determine to be correct is an odd number then adjust it up or down by 5 fields. Park the telecine with the reference frame in the gate and repeat steps 5 and 6 until the pull down matches. (See section 3.5.5 for more information about the *Video Delay* parameter).

8. Once you have verified that the pull down is correct, confirm that the time code and edge code numbers that you entered for the reference frame are also correct. If they are correct you can proceed to learn the KeyKode reader head offset. (See section 4.6.)

If the Edge numbers are not correct, adjust the Prestore Delay parameter on the Telecine Setup Screen. (If the Edge number showing in the window is greater than the reference frame number on the film, increase the Prestore Delay parameter.)

If the time code numbers are not correct, check that you have set the correct Telecine Type setting on the Telecine Setup Screen.

As a last resort, the time code numbers can be adjusted with respect to the Edge numbers by adjusting the Dynamic Trim parameters.

These values should be adjusted with caution, as they do not usually have to be changed from their default values.

In 24 Fps 60i transfers, the pull down of the reference frame is not guaranteed unless you are using a device such as a Time Logic Controller to control the telecine. This means that the reference film frame may correspond to more than one video frame, and that the exact time code / edge code numbering relationship is ambiguous except for A frame pull downs.

9. After you have made any adjustments, park the telecine with the reference frame in the gate. The burn in windows should show the original numbers you entered in step 4a) and the Scan track value showing in the Encoder Status window should be the same as it was after you did the Load Film operation in step 4a). If these numbers do not agree, it may indicate that you are losing biphase counts. Check the instruction in the relevant section of Chapter 2 on connecting the biphase. If the values are the same, repeat steps 4 through 6 until you have satisfactory results. Once you have verified the basic system timing, you may proceed to the KeyKode reader installation.

4.6. LEARNING THE KEYKODE READER HEAD OFFSET

When installing the KeyKode reader head on the telecine, there will be a fixed mechanical mounting offset between the KeyKode reader head and the actual film frame in the gate. In general, this offset will change from installation to installation, but will be fixed for any given installation. Care should be taken when installing and removing the reader head from the telecine, so that the same offset can be maintained. The angle of the reader head, when it is mounted on the telecine may affect the head to gate offset, and the reader reliability. In general, it is desirable to align the reader head such that the angle that the film enters and leaves the reader head is approximately the same. It may be desirable to make an alignment mark on the telecine, to facilitate re-installation, should it become necessary to remove the reader head.

The HDSD9045TR uses separate head offset values for each film format (16 mm, 35 mm 3 perf, 35 mm 4 perf, etc.) for each transfer speed. The KeyLog TRACKER™ software provides a wizard to guide you through the process of learning each of the head offsets. Once calibrated, these head offsets are stored in the KeyLog TRACKER™ Telecine Setup and are sent to the HDSD9045TR each time a system configuration or project configuration is applied. There is a separate list of head offsets stored in each Telecine Setup, so it is desirable to learn all the head offset values you will need before creating additional Telecine setups. A summary of the Head offsets is available using the Edit Telecine Setup screen or from the Telecine tab of the configuration screen.

The Head offset learning procedure MUST be performed before the HDSD9045TR will use the KeyKode information it receives. The head offset for each film type and transfer speed MUST be initialized for each combination used. You will not be able to save configurations that use a film gauge/format with an unlearned head offset.

The head offset learning procedure calculates the exact offset between the head and the gate, and is normally required only during installation. The following the procedure is outlined in the KeyLog TRACKER™ manual section titled *Learning the KeyKode Head Offsets* and is also provided in the online help for KeyLog TRACKER™.

1. Put a piece of bar-coded film stock onto the telecine, and put the telecine in Play. You should observe that the reader unit is reading the KeyKode, as indicated on the reader electronics unit. Usually a beep or tone from the reader electronics unit indicates that it is reading successfully. Also, the KK indicator on the KeyLog TRACKER™ status bar should blink each time a barcode data record is sent to the HDSD9045TR.

2. The next step is to learn the KeyKode head offsets. This is done on the KeyLog TRACKER™ *Telecine Setups* screen. Select *Telecine Setups*... from the *Edit* menu. The Telecine Setups window will open and the System Default Telecine Setup will be selected. Press the *Edit* button to make changes to this telecine setup, and press the *Head Offsets* button to open the Head Offsets screen. This screen shows a summary of the possible head offsets available for the video standard you are using.

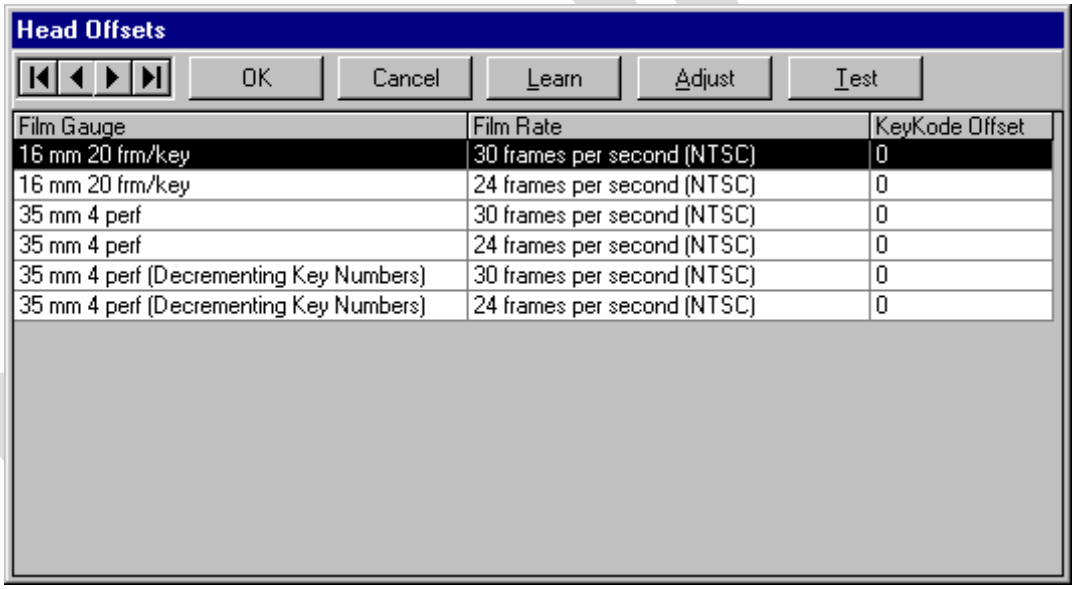

Figure 4-20: Head Offsets Window

3. Select the head offset that you want to learn and press the *Learn* button. The head offset learning wizard will guide you through each of the steps necessary to properly learn the head offset. The first screen reminds you to perform the Biphase accuracy test before you attempt to learn the head offset. If you have already done that press the *Next* button to proceed. If not, then go back and perform the biphase accuracy test as described in section 4.5.1.

4. On a piece of bar-coded film stock, select a reference frame that is beside one of the barcodes. (The reference frame is located beside the reference dot of the barcode as shown in the graphic

on the Head offset wizard screen.) Identify this frame with a punch mark or grease pencil. On 35 mm film, make sure that you do not choose one of the mid-foot bar codes but one of the whole foot ones which have a larger human readable font. The second screen shows what the reference frame KeyKode number should look like for the film type you are using. Press the *Next* button to proceed.

5. Thread this film onto the telecine, and place the reference frame in the gate. Enter the foot and frame number corresponding to the reference frame in the Frame Number box. Select the perf number that corresponds to the perf of the reference frame using the Perf pull down. The barcode in the graphic should look like it does beside the reference frame on the film. Press the *Next* button to proceed to the next step.

6. Put the telecine in play and proceed to learn the head offset. When the telecine is running and KeyKode is reading, the *Learn* button becomes active and the KeyKode/Biphase error will show the number of frames of discrepancy between the KeyKode coming in from the reader and the number that you manually entered. Press the *Learn* button. KeyLog Tracker™ will automatically calculate the head offset and send it to the HDSD9045TR. The KeyKode/Biphase error and KeyKode perf offset will show ?? for a few seconds and then they will be updated with the information based on the new head offset. The KeyKode/Biphase error should be zero. The KeyKode perf offset should match the target perf offset shown. The target perf offset is calculated by KeyLog Tracker™ based on the perf orientation of the reference frame's KeyKode. If necessary you will be prompted by a red warning message to manually adjust the head offset or to press the Learn button again. When you have learned the correct head offset, press the *Next* button to proceed.

If you are using a reference film with discontinuities of the KeyKode numbers (such as the Kodak KeyKode Verification film) you must complete the learning process before you go across the splice.

7. Press the *Finish* button to complete the head offset learning for this film type and store the new head offset in the head offset table. You may now proceed to learn other head offsets or you may proceed to do the KeyKode accuracy test. Make sure you press the *OK* button to save the head offsets. Press the *OK* button one more time to save the head offsets along with your telecine setup.

4.6.1. KeyKode Accuracy Test

To verify the accuracy of the system with KeyKode, modify the Engineering Test system configuration created previously. Choose *System Configurations* from the *Edit* menu. Double-click on the Engineering Test Setup. You are presented with the *Edit System Configuration* screen for the Engineering Test System Configuration. Choose the "KeyKode Accuracy test" mode. This will automatically fill the appropriate information in most of the other boxes on the configuration screen. For the KeyKode test we want to update the KeyKode numbers when the Telecine is in *Play* and *Shuttle*. Select the appropriate Film Gauge and Film Rate from the Film Tab. Make sure that the Video Time Code and KeyKode character windows are visible using the *Windows* tab. Press the *OK* button to send this information to the HDSD9045TR hardware and save the edited System Configuration. Close the System Configurations window by clicking on the x in the top right corner.

In order to proceed with the KeyKode Accuracy test use the following procedure:

1. Make note of the key number on a piece of reference film. This number is usually the Key number of the frame where a reference KeyKode dot is located (i.e. on the whole foot mark.). Mark this reference frame with a punch or grease pencil. Place this film on the telecine with the reference frame in the gate. Select Load Film from the Tools menu, or press the Load Film button  on the toolbar. (The Load Film procedure must be done each time a new piece of film is loaded on to the telecine. See the "Load Film " help item for more information.)

2. Open the Set Codes window in KeyLog Tracker™ by selecting *Set Codes...* from the *Edit* menu, or press the F2 key. Set the Video time code to 01:00:00:00 and set the KeyKode footage number to 0000+00 by entering the values into the respective fields. (This will allow you to tell when the KeyKode numbers have been automatically updated from the incoming KeyKode information.) Press the *OK* button. Open the Encoder Status window by pressing the 

button on the toolbar.

3. Back up the telecine to allow at least 5 seconds pre-roll time. Transfer a short section of film (which includes the reference frame) to videotape. When the telecine achieves locked PLAY speed, the telecine FRAME and LOCK LEDs on the KeyLog Tracker™ status bar should be on and there should be a '+' between the footage and frames in the character generator. The KeyKode number on the KeyLog Tracker™ time bar should update so they are the same as the KeyKode of the reference frame. The KK indicator on the KeyLog Tracker™ status bar should be on. Press the HELP button in the Encoder Status window if the FRAME, LOCK or KK indicators are not on.

4. Play back the videotape in slow shuttle or jog mode, and verify that the Video time code and KeyKode numbers and the pull down letter (in 60i 24 Frames per second transfers) for the reference frame are correct.

5. If the KeyKode numbers are not correct, recheck the head offset learning procedure as described in section 4.6.

6. If the time code numbers are not correct, check that you have set the correct Film Rate setting in the System Configuration that you created for this test.

7. In 24 FPS 60i transfers, the pull down of the reference frame is not guaranteed unless you are using a device such as a Time Logic Controller or POGLE to control the telecine. This means that the reference film frame may correspond to more than one video frame, and that the exact time code / edge code numbering relationship is ambiguous except for A frame pull downs.

8. In 30 FPS 60i or 25 FPS 50i transfers the film frame and time code numbers should change when the picture content changes.

9. After you have made any adjustments, park the telecine with the reference frame in the gate and repeat steps 2 through 4 until you have satisfactory results. If you are still experiencing problems, recheck the accuracy of the numbers without KeyKode as described in section 4.5.3. To verify the accuracy for other film formats or transfer rates, select *System Configurations...* from the Edit menu and double click on the Engineering Test System Configuration. Select the appropriate Film type or Film transfer rate on the Film tab and press *OK*. Then repeat the verification procedure outlined above.

4.7. CALIBRATING THE SYSTEM TIMING IN 24P DUAL SYNC MODE

The following sections describe the procedure for calibrating the film system consisting of an HDSD9045TR and a HDSD9155Q (or other HD Afterburner) operating in HD 24p mode used in conjunction with a HD telecine, DaVinci 2K colour corrector, and External TLC edit controller.

The following procedure should be used to calibrate the edit timing. Figure 4-21 shows edit timing that is properly aligned with the system 6 Hz reference pulse. Figure 4-22 shows edit timing that is not properly aligned with the system 6 Hz reference.

4.7.1. Setting up the System Timing for 24p Video

1. Switch the system to 24p mode. Make sure that the telecine is receiving 24p tri-level sync. Make sure that the TLC has been modified for Dual Sync mode according to the instructions in TLC Technical bulletin TLC-052.

2. If you are using the Evertz 7750SRG-HD to provide the reference pulses to your system make sure that it is configured correctly. Table 4-1 shows the most common switch settings. Make sure that the 7750SRG-HD is receiving an NTSC genlock reference and that DIP switch 6 is set to the On position.

DIP Switch					Output				Genlock		
1	2	3	4	5	1	2	3	4	Type	Lock	Phased Outputs
On	Off	Off	Off	Off	1080i/59.94	1080p/23.98sF	625i/47.96	6Hz Pulse	NTSC	Phase	1
On	On	Off	Off	On	59.94 V drive	1080p/23.98sF	625i/47.96	6 Hz Pulse	NTSC	Phase	1

Table 4-1: 7750SRG-HD Sync Output Selection Switch Settings

3. Connect the 23.98psF tri-level sync from output 2 of the 7750SRG-HD to the telecine. Connect the slow PAL sync from output 3 of the 7750SRG-HD to the TLC Black input. Connect the 59.94 Hz V-Drive from output 1 of the 7750SRG-HD to the TLC CFID input. Connect the 6Hz reference pulse from output 4 of the 7750SRG-HD to the TLC Aux (J16) pin 7. You will also need to connect the 6Hz output pulse to the 6 Hz input of the Afterburner (pin 1 of the parallel I/O Connector, or 6 Hz BND on the HDSD9155Q).

4. Perform the Biphase Accuracy test for 24 P video as described in section 4.5.3. You should not have to adjust the Prestore delay parameter in the Telecine setup screen. You may have to adjust for different video path delays if for example you do not have a noise reducer in the 24p video path. If you need to change the Video Delay parameter you are better to create a new Telecine Setup for 24p.

   You do not need to calibrate the edit timing in the TLC before doing the 24p Biphase accuracy test. You just need to make sure the Biphase based film numbers in the burn-ins agree with those on the film. Also, verify that the Biphase based time code is 1:00:00:00 at the reference film frame.

5. Perform the KeyKode Head offset learning for 24p video as described section 4.6. When you have done that, perform the KeyKode-accuracy test as described in section 4.6.1. Now that you have confirmed the accuracy of the HDSD9045TR character windows in 24p video mode you will use them to adjust the timing of the rest of the system.

4.7.2. Calibrating the Telecine Sync Timing

1. Park the film on a reference frame (preferably one at the beginning of a foot e.g. 7345+00).

2. Record one or two minutes of colour bars on the 24 from HD VTR starting at time code 00:59:50:00.

3. Mark the film reference frame number as the Edit In point and set 1:00:00:00 as the Edit In point for the HD VTR.

4. While the film is parked on the reference frame enter 01:00:00:00 into the HDSD9045TR's VTR time code register using the Set Codes screen (accessible from Edit menu or by pressing the F2 key). Make sure that the HDSD9045TR is still set to the KeyKode Accuracy test mode. The VTR Time code generator should be set to Internal Regen mode.

5. Perform an open-ended edit using the previously entered In points. Make sure you record the Character windows of the HDSD9045TR.

6. Turn on the HDSD9045TR Status screen in Tracker. While the edit is in progress, look at the "Video Time code pull down value on the HDSD9045TR Status Screen in Tracker. If it shows "A", then the Film *Sync Trim in the TLC is correct. If it is not "A", then adjust the Film *Sync Trim in the TLC by the number of frames shown in the chart below.

NOTE: The Time code Pull down value is only valid while the edit is being performed.

Time Code Pull down Value	Adjust * Sync Trim by:
A	0
B	+3
C	+2
D	+1

Table 4-2: Adjusting Sync Trim

Repeat steps 5 and 6 until the Time code pull down value is A.

4.7.3. Calibrating the HD VTR Timing

1. Once you have an edit where the Time code pull down value is "A", then go back to the first frame of the edit. Compare the character burn-in of the HDSD9045TR video time code with the TLC's display of the VTR's time code. If they are the same then proceed to step 8.

   If they are different, adjust the *HD VTR *Sync Trim* value in the TLC by the number of frames of difference between the burn-in and the VTR's time code. Perform the edit again. In order to be able to distinguish the new edit from the previous edit it is recommended that you change the

colour correction significantly before performing the edit. Doing this each time you perform an edit will minimize confusion in determining accuracy at the edit point.

2. Once you have an edit where the HDSD9045TR Video Time Code burn-in agrees with the TLC's reporting of the VTR time code, and then park the tape on the first field of the edit. Compare the time code reported by the TLC with the Edit In point you selected for the VTR. Adjust the HD VTR *In Trim value in the TLC until the edit occurs where you wanted it to be. Once you have set the value, you will have to set the HD VTR *In Trim to the same value.

4.7.4. Calibrating the SD VTR Timing

1. If you are using a SD VTR in the Edit suite you will also have to calibrate its timing. Connect the Video Out of the HDSD9045TR to the Video In of the Afterburner. Make sure that the 6 Hz pulse from the 7750SRG-HD is connected to pin 9 on the Afterburner Parallel I/O connector. Connect the Video output of the Afterburner to SD VTR.

   Repeat the same edit but add the SD VTR as a second recorder. Make sure that you record the Character burn-in windows from both the HDSD9045TR and Afterburner on the SD VTR. Locate a frame early in the edit where the HDSD9045TR Video time code burn-in has the frames at 00. Compare the character burn-in of the HDSD9045TR and Afterburner video time code. The Afterburner and HDSD9045TR burn-ins should agree when the frames numbers of the HDSD9045TR are divisible by 4. These frames should also be A frames on the Afterburner output video. Also compare the character burn-in of the Afterburner video time code with the TLC's display of the SD VTR's time code. If they are the same then proceed to step 8.

   If they are different, adjust the *SD VTR *Sync Trim* value in the TLC by the number of frames of difference between the Afterburner burn-in and the VTR's time code. Perform the edit again. In order to be able to distinguish the new edit from the previous edit it is recommended that you change the colour correction significantly before performing the edit. Doing this each time you perform an edit will minimize confusion in determining accuracy at the edit point.

Note: There is a 5 frame delay (4 frames at 24 FPS) in the Afterburner, so the **Sync Trim* value you would expect is 5 frames more than the HD VTR.

2. Once you have an edit where the Afterburner Video Time Code burn-in agrees with the TLC's reporting of the SD VTR time code, and then park the tape on the first field of the edit. Compare the time code reported by the TLC with the Edit In point you selected for the SD VTR. Adjust the SD VTR *In Trim value in the TLC until the edit occurs where you wanted it to be. Once you have set the value, you will have to set the SD VTR *In Trim to the same value.

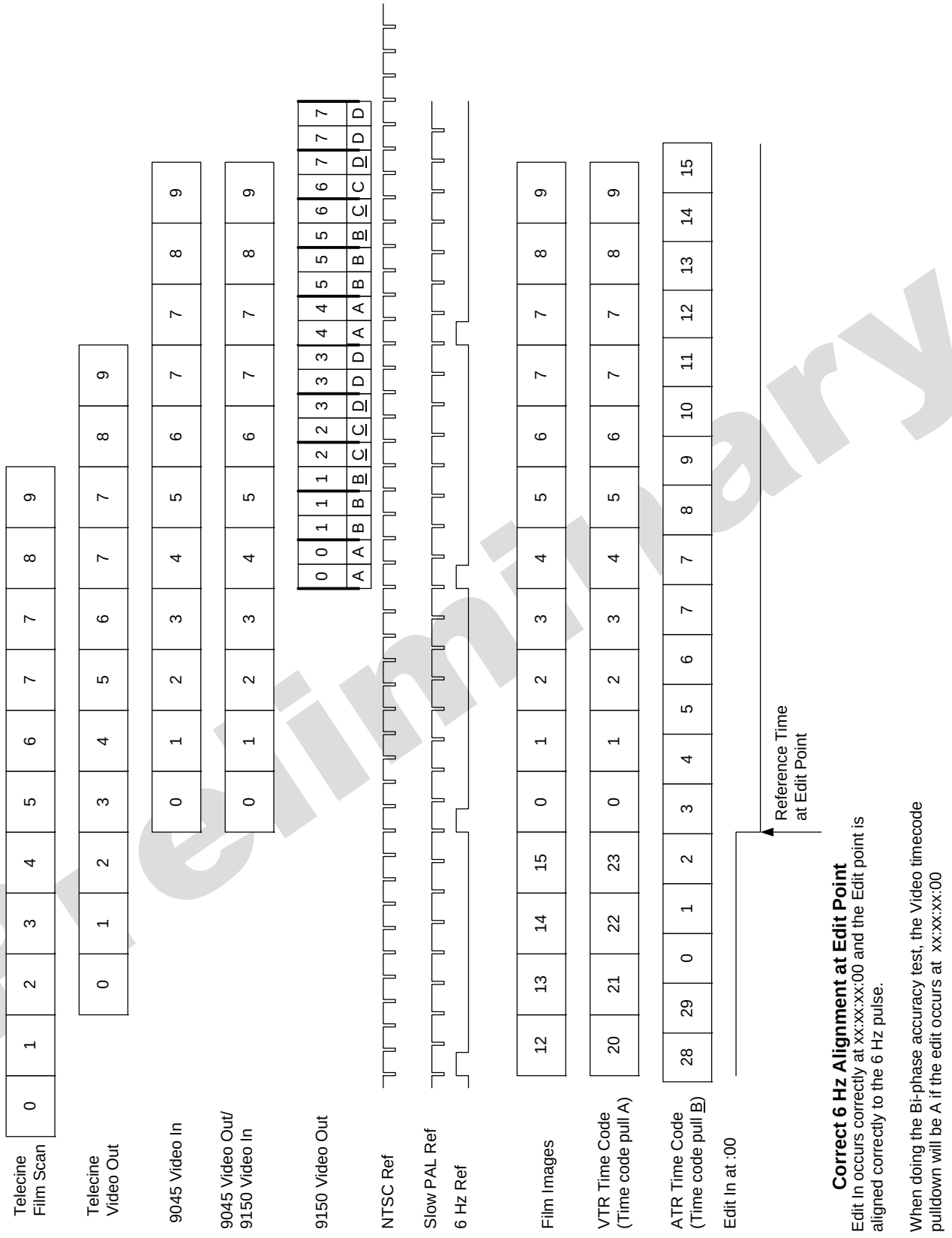

Figure 4-21: Correct 24P Edit Timing

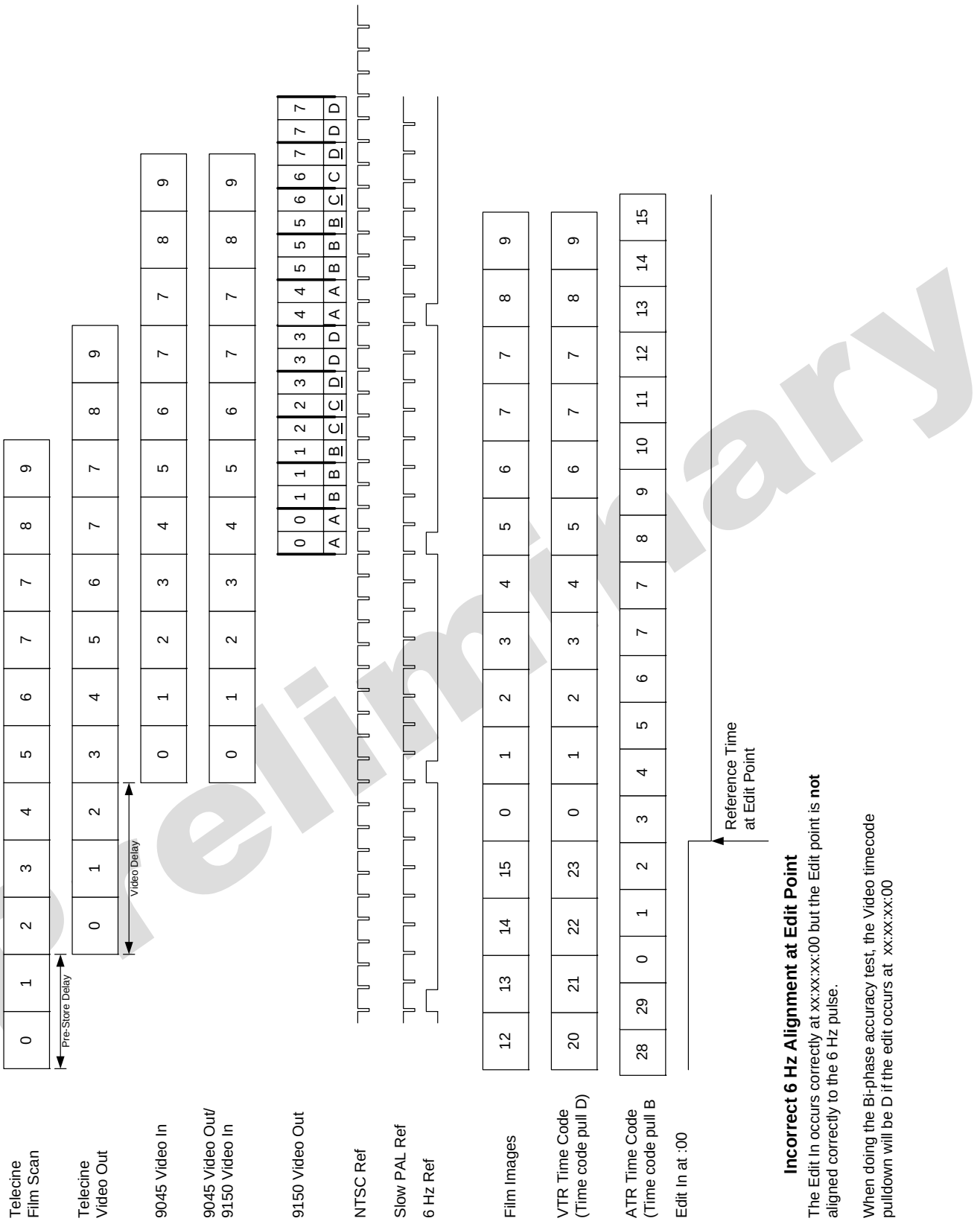

Figure 4-22: Incorrect 24P Edit Timing

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5. SYSTEM PARAMETERS

5.1. SYSTEM PARAMETERS OVERVIEW

The HDSD9045TR VANC Encoder hardware allows the user to change the default behaviour of various functions by the use of parameters. These parameters are grouped according to classes. Within each class, parameters are identified by a parameter number. Each parameter has a value with the default value for each parameter being zero. Parameters in class 25 apply to the HDSD9045TR and will be described in this chapter. (Table 5-1 to Table 5-3 shows the currently defined parameters for each class with a brief description of the parameter function) The parameters in class 1 are specific to different telecine types. Each Telecine Setup in the Tracker software stores a separate set of Class 1 parameters. The parameter numbers shown in the tables below are decimal numbers. The following sections describe the operation of each parameter in detail.

Parameter	Name	Description
0	9025/9045 VideoAdjust	Trim for video time code dynamic numbers
1	9025/9045 FilmAdjust	Trim for film dynamic numbers
2	9025/9045 AudioAdjust	Trim for audio time code dynamic numbers
21	9025/9045 Biphase Max X Play	Biphase filter max, as a multiple of play speed
22	9025/9045 Biphase Reverse	Non-Zero reverses Biphase direction
23	9025/9045 Biphase Average Size Adjust	Adjusts size of average from default of 8

Table 5-1: Class 1: Telecine Parameters (Linked to a specific telecine type)

Parameter	Name	Description
0	9025/9045 Parallel I/O Port Pin 1	Input/Output function for this pin (See section 2)
1	9025/9045 Parallel I/O Port Pin 8	Input/Output function for this pin (See section 2)
2	9025/9045 Parallel I/O Port Pin 4	Input/Output function for this pin (See section 2)
3	9025/9045 Parallel I/O Port Pin 9	Input/Output function for this pin (See section 2)
4	9025/9045 Parallel I/O Port Pin 5	Input/Output function for this pin (See section 2)
20	9025/9045 Deferred event end enable	Non-zero enables special event end handling
27	9025/9045 Legacy Ink frames Enable	Non-Zero to enable binary/legacy ink frame ANC numbers
30	9025/9045 Character Horizontal Offset	Signed Horizontal pixel offset from default
31	9025/9045 Character Vertical Offset	Signed Vertical scan line offset from default
32	9025/9045 KK port low baud enable	Non-zero enables 9600 baud KK interface
33	9025/9045 KK Decoder Control Enable	Non-Zero enables remote control of 5550 on KK port
34	9025/9045 KK Decoder Status Enable	Non-zero disables polling for 5550 status
35	9025/9045 Lock Exit Control	Non-Zero disables grabbing Lock Exit 1 A Frame early

Table 5-2: Class 25 - HDSD9045TR System Parameters

5.2. 9045 PARAMETERS (CLASS 25)

5.2.1. HDSD9045TR Input/Output Pin Functions

Parameters 0 to 4 of Class 25 control the functions of the five input/output pins on the Parallel I/O Connector. (See Table 5-3) When the parameter value is set to zero (0), or the parameter is not defined, the default function of the I/O pin is selected as shown in Table 5-3.

To change the functions of the input/output pins change the respective parameter for the pin (see Table 5-3) to the values shown below. The input functions are selected by negative values as shown in

Table 5-4. The output functions are selected by positive values as shown in **Error! Reference source not found.**.

For example:

To change the function of pin 4 to select the film transfer rate (falling edge selects 24 Fps) set the pin 4 function parameter (class 25 parameter 2) to value –5.

To change the function of pin 4 to output a pulse at the start of each internal 6 Hz cycle, set the pin 4 function parameter (class 25 parameter 2) to value 23.

Pin	Controlled by Class 25 Parameter	Signal Name	Description
1	0	INP_FUNC_RATE	Input: Falling edge -> 24Fps, Rising edge -> 30Fps (60I only)
4	2	INP_FUNC_VSTD	Input: Falling edge -> 1080i/60, Rising edge -> 1080p/24
5	4	INP_FUNC_CENTER	Input: Falling edge -> activates centering function
8	1	INP_FUNC_GPI	Input: Falling edge -> activates data logging GPI
9	3	INP_FUNC_NONE	No input function

Table 5-3: Default HDSD9045TR I/O Pin Functions

Parameter Value	Signal Name	Description
0	INP_FUNC_DEFAULT	Functions as **default** input
-1	INP_FUNC_VSTD	Falling edge -> 1080i/60, Rising edge -> 1080p/24
-2	INP_FUNC_VSTD_INV	Falling edge -> 1080p/24, Rising edge -> 1080i/60
-3	INP_FUNC_GPI	Falling edge -> activates data logging GPI
-4	INP_FUNC_GPI_INV	Rising edge -> activates data logging GPI
-5	INP_FUNC_RATE	Falling edge -> 24Fps, Rising edge -> 30Fps (60I only)
-6	INP_FUNC_RATE_INV	Falling edge -> 30Fps, Rising edge -> 24Fps (60I only)
-7	INP_FUNC_CENTER	Falling edge -> activates centering function
-8	INP_FUNC_CENTER_INV	Rising edge -> activates centering function
-9	INP_FUNC_GAUGE	Falling edge -> 35mm, Rising edge -> 16mm
-10	INP_FUNC_GAUGE_INV	Falling edge -> 16mm, Rising edge -> 35mm
-11	INP_FUNC_CHRONOFF	Falling edge -> Chars off, Rising edge -> Chars on
-12	INP_FUNC_CHRONOFF_INV	Falling edge -> Chars on, Rising edge -> Chars off
-13	INP_FUNC_6HZREF	Pin is active high, TTL, 1 field wide 6Hz reference pulse input
-14	INP_FUNC_6HZREF_INV	Pin is active low, TTL, 1 field wide 6Hz reference pulse input
-15	INP_FUNC_CHRTOGL	Falling edge -> toggles character on/off
-16	INP_FUNC_CHRTOGL_INV	Rising edge -> toggles character on/off inverted
-17	INP_FUNC_RUNHOLD	Falling edge -> timecode hold, Rising edge -> timecode run
-18	INP_FUNC_RUNHOLD_INV	Rising edge -> timecode hold, Falling edge -> timecode run
-19	INP_FUNC_RUNHOLD_TOGL	Falling edge -> toggles timecode run/hold
-20	INP_FUNC_RUNHOLD_TOGL_INV	Rising edge -> toggles timecode run/hold
-23	INP_FUNC_PRESTOP	Active Low Pre-Stop from Quadra Telecine
-24	INP_FUNC_PRESTOP_INV	Active High Pre-Stop from Quadra Telecine
-25	INP_FUNC_SLTONOFF	Falling edge -> Virtual Slate On, Rising edge ->Virtual Slate Off
-26	INP_FUNC_SLTONOFF_INV	Falling edge -> Virtual St Off, Rising edge -> Virtual Slate On
-27	INP_FUNC_SLTTOGL	Falling edge -> Toggles Virtual Slate On/Off
-28	INP_FUNC_SLTTOGL_INV	Rising edge -> Toggles Virtual Slate On/Off
-255	INP_FUNC_NONE	No input function

Table 5-4: Alternate HDSD9045TR Input Pin Functions

Parameter Value	Signal Name	Description
0	DBUG_RATE_NONE	Functions as default input
1	DBUG3_IOTEST	Pin Toggles once per second
2	DBUG_RATE_RATE	High output indicates 1:1 frame rate, low PULLED
3	DBUG_MISC_VSYNC	Spike for duration of HD Field 1 Vsync interrupt process
6	DBUG_MISC_VFLD1	Hi=Video field 1, tic based
7	DBUG_MISC_AFLD1	Hi=Audio time base field 1, tic based
8	DBUG_MISC_F0	Lo=Video fields where output KeyKode frame number = 0
9	DBUG_MISC_V0	Lo=Video fields where output VTR timecode frame number = 0
10	DBUG_MISC_A0	Lo=Video fields where output ATR timecode frame number = 0
18	DBUG_MISC_VMOD	Lo=Video fields where output VTR timecode frm no. mod N = 0
19	DBUG_MISC_AMOD	Lo=Video fields where output ATR timecode frm no. mod 5 = 0
20	DBUG_GAUGE_KMOD	Lo=Video fields where output KK abs frames no. mod N = 0
23	DBUG_MISC_VCYCL0	Tic Frame 0 of internal video sequence (6 Hz pulse in 24P)
24	DBUG_MISC_ACYCL0	Tic Frame 0 of internal audio sequence
25	DBUG_MISC_FCYCL0	Tic Frame 0 of internal film sequence
38	DBUG_GAUGE_6HZI	Tic Frame 0 of internal film sequence
39	DBUG_GAUGE_30HZI	Frame 0 of 6Hz or 30Hz reference input

Table 5-5: Alternate HDSD9045TR Output Pin Functions

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6. TECHNICAL DESCRIPTION

6.1. SPECIFICATIONS

6.1.1. Serial Digital Video Input

Standard:

HDTV Mode:	1.485 Gb/sec 4:2:2 HDTV serial digital (SMPTE 292M) or 4:4:4 RGB dual link HDTV serial digital (SMPTE 372M) 1080i/59.94, 1080i/50, 1080p/29.97sF, 1080p/25sF, and 1080p/23.98sF - selectable or auto-detect
SDTV Mode:	270 Mb/s 4:2:2 SDTV serial digital (SMPTE 259M-C) 525i/59.94 and 625i/50 - selectable or auto-detect
Connector:	BNC per IEC 61169-8 Annex A.
Equalization:	Automatic to 300m @ 270Mb/s with Belden 8281 or equivalent cable Automatic to 130m @ 1.5Gb/s with Belden 1694 or equivalent cable
Embedded Audio:	SMPTE 272M or SMPTE 299M – supports up to 4 groups

6.1.2. Serial Digital Video Outputs

Standard:	Same as input
Outputs:	
HDTV Mode:	Program video with RP215 Ancillary Data embedded and optional characters
SDTV Mode:	Program video with RP201 3-Line VITC embedded and optional characters
Number of outputs:	1 Dual Link 4:4:4 RGB or Single Link 4:2:2 program (same as Input) 1 Single link 4:2:2 monitor
Connectors:	BNC per IEC 61169-8 Annex A.
Embedded Audio:	SMPTE 272M or SMPTE299M –up to 4 groups transferred from input video
Signal Level:	800mV nominal
DC Offset:	0V ±0.5V
Rise and Fall Time:	200ps nominal
Overshoot:	<10% of amplitude
Wide Band Jitter:	< 0.2 UI

6.1.3. 24 to 30 Hz Reference Input

Standard:	NTSC Colour Black
Connectors:	BNC per IEC 61169-8 Annex A.
Signal Level:	1 V p-p nominal, internally terminated with 75 ohms

6.1.4. LTC Generators

Standard: SMPTE 12M-1
Frame Rate: 24, 25 and 30 Fps nominal
Number of Outputs: 2
Connectors: 3 pin male XLR type connector.
Level: Adjustable, 0.5V to 4.5V p-p

6.1.5. LTC Readers

Standard: SMPTE 12M-1
Frame Rate: 24, 25 and 30 Fps nominal
Number of Outputs: 2
Connectors: 3 pin female XLR type connector
Level: 0.2 to 4V p-p, balanced or unbalanced
Speed: 1/30th to 50x play speed, VTR dependent

6.1.6. Serial Remote Control (Com 1)

Standard: RS-232, 57600 baud
Connector: 9 pin female “D”
Control: Computer control of all functions, firmware upgrade

6.1.7. KeyKode Reader Port (Com 2 in CINE Mode)

Standard: RS-232; 38400 or 9600 baud
Connector: 9 pin female “D”
Protocol: Evertz 5550, 5500 KeyKode Decoder, RIM DigiSync

6.1.8. MetaData Communications Ports (Com 2 and Com 3 in Field ANC Mode)

Standard: RS-232 or RS-422; 38400, 57600, 115,200 baud
Connector: 9 pin female “D”
Protocol: Fujinon L10 Lens Protocol compatible
Number of Ports: 2

6.1.9. Ancillary data Output Port (Com 3 in Field Log Mode)

Standard: RS-232 or RS-422; 115,200 baud
Connector: 9 pin female “D”
Protocol: Fujinon L10 Lens Protocol compatible
Number of Ports: 2

6.1.10. Telecine Interface (Cine Mode)

Connector: 9 pin female "D"
Tach Input: bi-phase quadrature pulses - 1,2,5, or 10 x film rate, TTL level
Frame Pulse:
Cintel: > 1.6 V p-p active low, 1 pulse per film frame, (BNC per IEC 61169-8 Annex A.)
Thomson: TTL level SOF, 1 edge per film frame (9 pin female D)
Sony: > 1.6 V p-p active high, 1 pulse per film frame, (BNC per IEC 61169-8 Annex A.)

6.1.11. GPIO Interface

Connector: 9 pin female "D"
Type: Opto-isolated bi-directional I/O – TTL level
Number: 5
Function: User programmable

6.1.12. Ethernet

Network Type: Fast Ethernet 100 Base-TX IEEE 802.3u standard for 100 Mbps baseband CSMA/CD local area network
Ethernet 10 Base-T IEEE 802.3 standard for 10 Mbps baseband CSMA/CD local area network
Connector: RJ-45
Function: Firmware upgrades via FTP, computer control using KeyLog Tracker GUI, Ancillary Data output in Filed Log mode

6.1.13. Physical

Dimensions: 19" W x 1.75" H x 18.75" D.
(483mm W x 45mm H x 477mm D)
Weight: 8 lbs. (3.5Kg)

6.1.14. Electrical

Power: Autoranging 100 to 240 VAC 50/60 Hz, 40 W.
Safety: ETL listed.
Complies with EU safety directive
EMI/RFI: Complies with FCC Part 15 Class A,
EU EMC Directive

6.2. SERVICING INSTRUCTIONS

CAUTION – These servicing instructions are for use by qualified service personnel only. To reduce the risk of electric shock do not perform any servicing instructions in this section of the manual unless you are qualified to do so.

Make sure that both power cords are disconnected before opening the top cover of the unit.

6.2.1. Changing the Fuses

The fuse holder is located inside the power entry module. To change the fuses, disconnect the line cord from the power entry module and pull out the fuse holder from the power entry module using a small screwdriver. The fuse holder contains two fuses, one for the line and one for the neutral side of the mains connection. Pull out the blown fuse and place a fuse of the correct value in its place. Use time delay 5 x 20 mm fuses rated for 250 Volts with a current rating of 1 amp. (T1AL250V) Carefully reinsert the fuse holder into the power entry module.

Check that the line fuse is rated for the correct value marked on the rear panel. Never replace with a fuse of greater value.

6.3. UPGRADING FIRMWARE

The VANC Encoder contains application firmware that is contained in a FLASH EPROM device. From time to time firmware updates will be provided to add additional features to the unit. In addition the VANC Encoder contains a separate set of firmware for the network interface CPU.

Sometimes, updating the firmware in the unit will cause a reset of the non-volatile memory settings to their factory default values, including the IP addresses of the units. If this occurs, you may not be able to upgrade the firmware until you re-program your custom IP addresses back into the VANC Encoder. If you are operating the VANC Encoder in a stand-alone configuration (not using KeyLog TRACKER™ to configure the unit) it is advisable to save the current configuration before you update the firmware. If the non-volatile settings are reset during the firmware upgrade you will be able to restore them after you have restored the IP addresses of the VANC Encoder.

There are four methods of updating the firmware in the VANC Encoder: KeyLog TRACKER™ (serial communication or FTP), PostUpgrade Utility (FTP), manual File Transfer Protocol (FTP) and Serial communication upload. Due to the large size of the firmware binary files one of the FTP methods is the preferred method of updating the firmware. If you have KeyLog TRACKER™ connected to the VANC Encoder using an Ethernet connection then you can do a FTP firmware update using the KeyLog TRACKER™ software.

Prior to initiating the upgrade process:

- Download the new application code from the download section of the Evertz web site (www.evertz.com/download.php). Choose the firmware downloads section and type in HDSD9155Q in the model number entry box and press the “GO” button. Unzip the file into a

working folder on your PC. If you are using the KeyLog TRACKER™ software you should place the file into the "Firmware" sub-folder of the Tracker installation folder (C:\Program Files\Evertz\Tracker by default). If you are using the PostUpgrade utility software you should place the file into the same folder (or a sub folder) as the PostUpgrade installation folder.

Set up the temporary working folder in the root of your c:\ drive with a maximum 8 character folder name. This will make it easier to navigate the file system from the command prompt that only allows 8 character file names in some operating systems.

Firmware file names use the following naming conventions. (xxxx is the build number)

Firmware File name	Description
HS9045TR_xxxx	VANC Encoder main application firmware
NETIF_xxxx	VANC Encoder Network interface CPU firmware

Table 6-1: Typical Firmware File Names

To update the firmware using the KeyLog TRACKER™ software follow the procedure outlined in section 6.3.1. To update the firmware using the PostUpgrade FTP utility software follow the procedure outlined in section 6.3.2. To update the firmware using the FTP upgrade process follow the procedure outlined in section 6.3.3. To update the firmware using the serial upgrade process follow the procedure outlined in section 6.3.4.

6.3.1. KeyLog TRACKER™ Method of Updating Firmware

You will need the following equipment in order to update the Firmware using the KeyLog TRACKER™ method:

- PC with KeyLog TRACKER™ software running
- PC connected to the VANC Encoder
- New firmware supplied by Evertz

6.3.1.1. Step 1 – Configuring the Unit for Firmware Upgrades

1. Power up the unit.

6.3.1.2. Step 2 – KeyLog TRACKER™ Setup

2. Start KeyLog TRACKER™

3. Confirm that you have established communications to the unit that you wish to upgrade. (A green COMM indicator will show at the bottom of the KeyLog TRACKER™ screen)

4. From the TOOLS menu of the KeyLog TRACKER™ choose the UPGRADE FIRMWARE option. A dialog box asking you to choose the serial port or FTP method will appear.

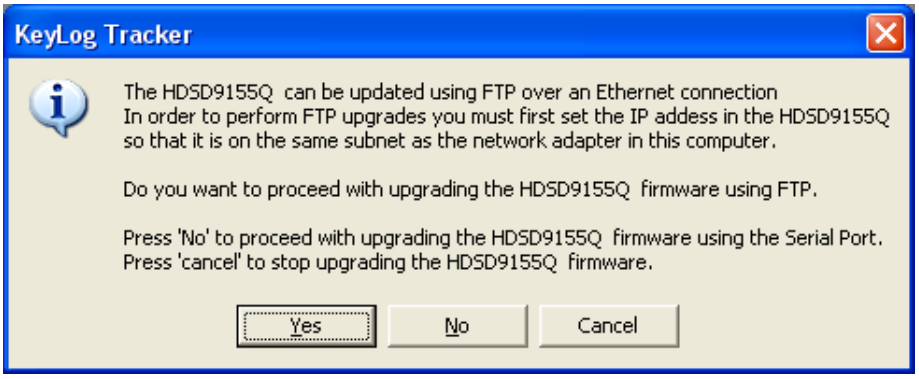


Figure 6-1: KeyLog Tracker

If you are connected to the VANC Encoder over a network (see section 6.3.2.1 for info about connecting the network) you can upgrade using the FTP method by pressing the "Yes" button. From here the procedure is similar to the PostUpgrade Utility. Follow the instructions starting in step 6 of section 6.3.2.2.

If you wish to upgrade using the serial port method press the "No" button. You will be presented with the following dialog box.

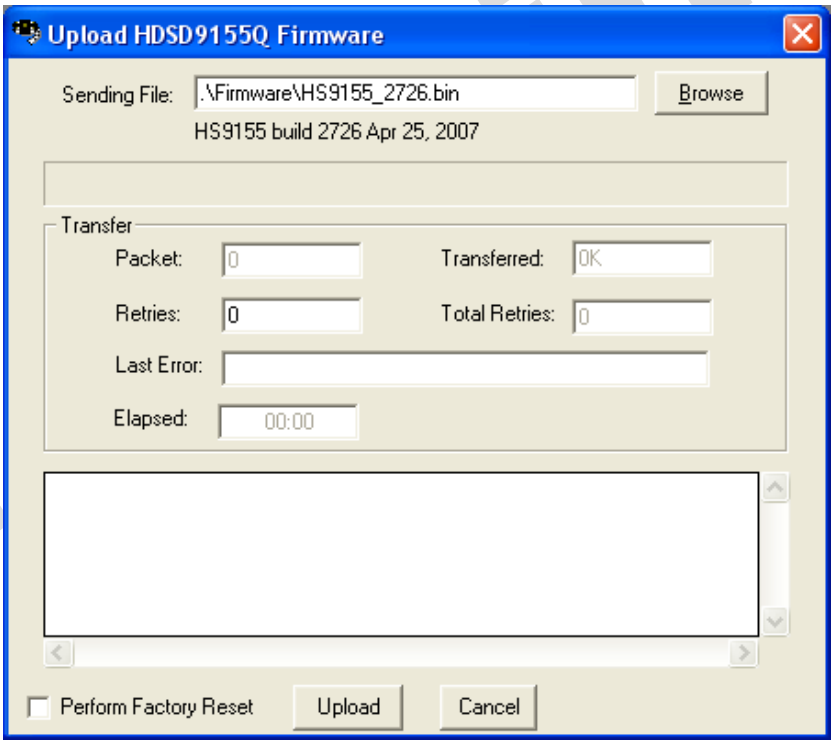


Figure 6-2: Upload HDSD9155Q Firmware Window

5. Use the BROWSE button to open the file dialog and choose the new firmware file. Typical filenames are in Figure 6-1. The build version of the firmware will be shown in the dialog box.

6. Click the UPLOAD button at the bottom of the upgrade dialog. Tracker will begin upgrading the firmware showing the communications and progress of the upgrade. On successful completion of the upload the unit should now reboot. After the unit reboots successfully with the new firmware the

'Upload Firmware' dialog will disappear. You can then resume normal operations with the KeyLog TRACKER™ software.

7. If the upgrade is interrupted or cancelled before completion, then KeyLog TRACKER™ will not be able to communicate to the unit. In that case you will have to manually upload the firmware using the procedure outlined in section 6.3.4.

6.3.2. PostUpgrade FTP Utility Method of Updating Firmware

You will need the following equipment in order to update the Firmware using the PostUpgrade FTP utility software:

- PC with Ethernet network port
- Appropriate Ethernet cable as outlined in section 2.6
- PostUpgrade utility software downloaded from the Evertz web site. Install the utility on your PC by double clicking on the PostUpgrade.EXE file.
- New firmware downloaded from the Evertz web site as described in section 6.3. Unzip the firmware into the same folder where you installed the PostUpgrade utility software.

6.3.2.1. Step 1 – Establishing a Valid Network Connection

Before any FTP (file transfer protocol) upgrades can be initiated, the user must determine the IP address of the VANC Encoder. Both the PC/laptop and the units must be on the same subnet for the FTP upgrade to work properly. See section 3.6.2.

1. The *System IP* menu item allows the user to set the networking parameters of the unit. See section 3.6.2. If you are not sure how to set the network parameters, contact your networking/IT administrator.

   Once you return to the Main Menu wait for 30 seconds for the new network parameters to be saved in the Flash memory.

2. Connect a crossover network cable from the PC/laptop to the unit. If you are connecting through a hub then use a straight through network cable as shown in section 2.6.

3. On your PC, open a Command Prompt window. This can be accomplished by using the run command under the start button, type "cmd"; see Figure 6-3:

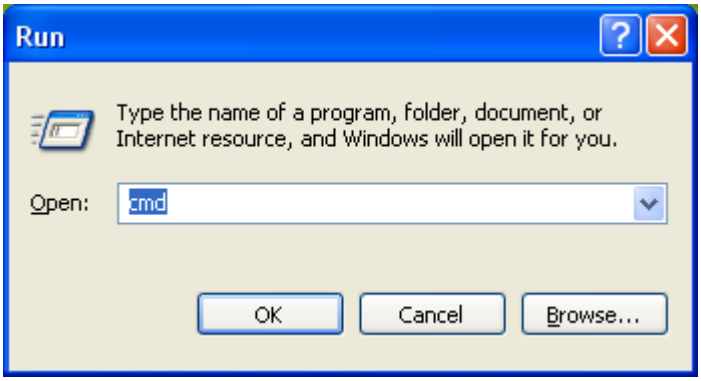


Figure 6-3: Run Window

4. "Ping" the IP addresses of both devices in the system. (VANC Encoder main CPU and network CPU) For example, in the command window type:

```
C:\>ping 192.168.9.10 <Enter>
```

If a proper network connection has been established to the device, a "reply" is displayed on the DOS window. If there is a faulty network connection, a "Destination Host Unreachable" message is provided. If this occurs, either the IP addresses of the nodes should be verified or the network (Ethernet) cable is faulty. For more information, please see section 2.6 of this manual.

If you are unable to 'ping' the devices, you will have to use the serial port upgrade method outlined in section 6.3.4.

6.3.2.2. Step 2 – Upgrading the Application Code

The firmware in the VANC Encoder main CPU and network CPU need to be in a matched set for proper operation of the system. If you are upgrading multiple firmware images you should upgrade the VANC Encoder main application code first, and the network CPU last. If you do not follow this order you may not be able to update some parts of the system using the FTP method.

5. Start the PostUpgrade Software

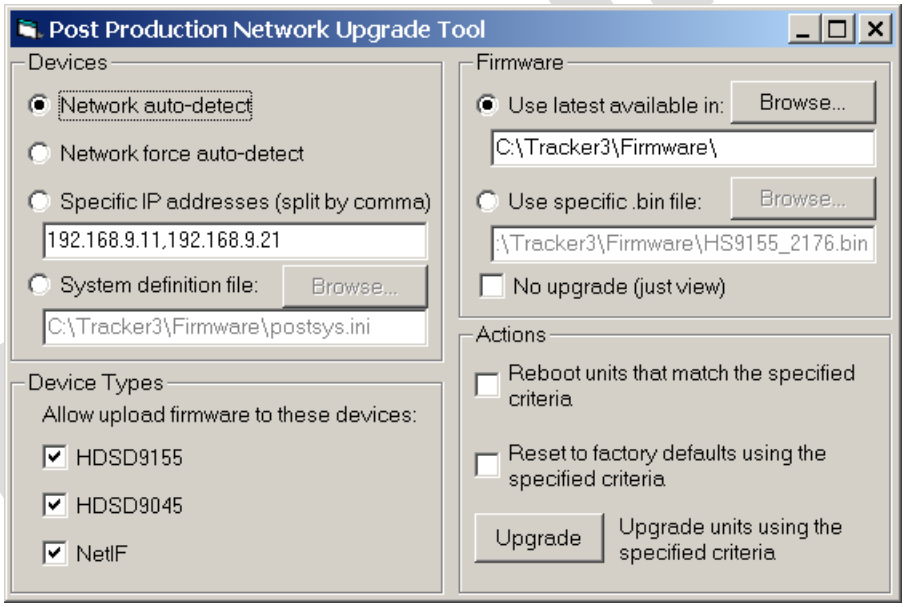


Figure 6-4: Post Production Network Upgrade Tool

6. The Devices box allows you to choose how you are going to specify the units to be upgraded.

- If you have the *Network Announce* function turned on in your **VANC Encoder** the firmware utility can auto-detect your unit.
- If you have the *Network Announce* function turned off, you can force an auto-detect by checking the appropriate radio button.
- You can specify a list of valid IP addresses for units you wish to upgrade

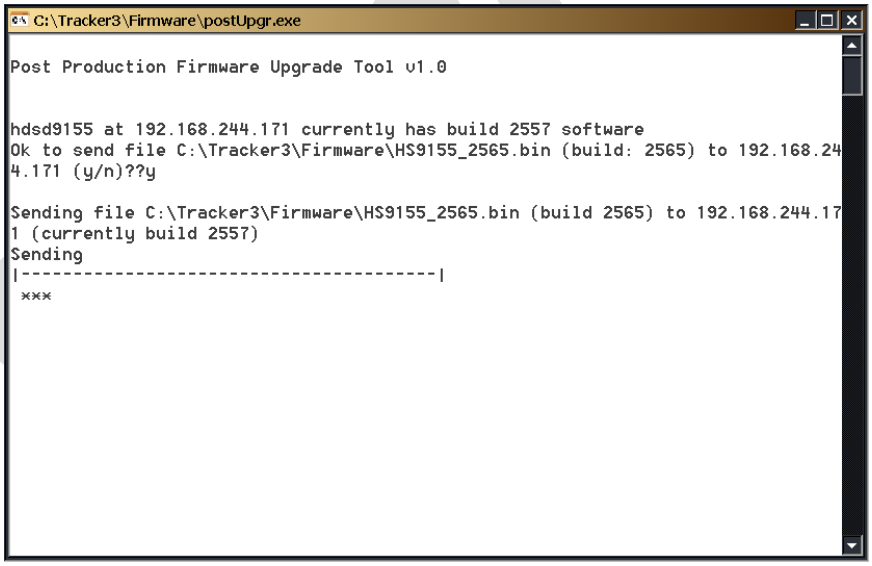
- You can list the valid IP addresses in a “System Definition File” such as the *Postsys.ini* sample file provided with the PostUpgrade utility.

7. The Device Types box allows you to choose the device types you are upgrading.
- Check the type of device you are upgrading.
- If you want to upgrade the network interface CPU also check that box.

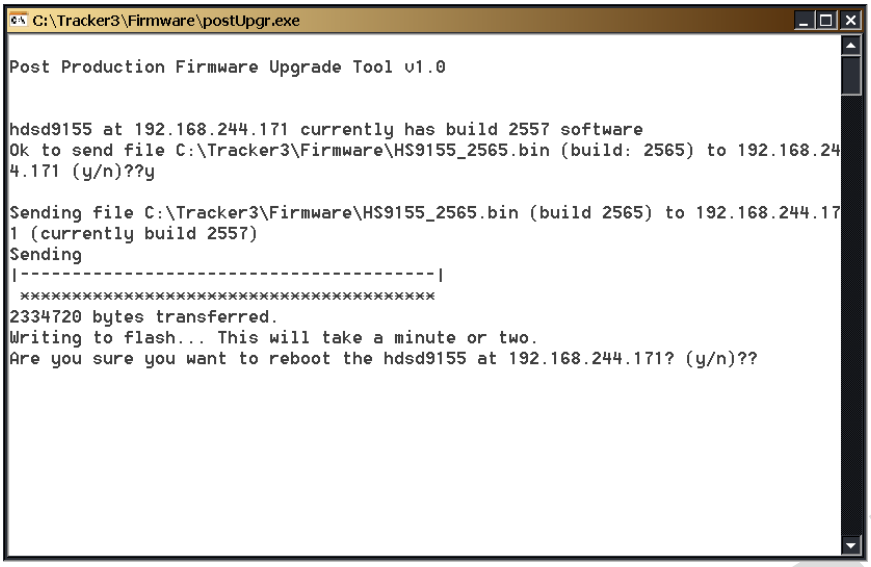
8. The Firmware box allows you to select the location of the firmware you will send.
- You can send the latest firmware in the specified folder.
- You can send a specific firmware version from the specified location.
- You can run the utility to see what versions are installed in each unit.

9. The Action box allows you to determine what actions you will perform after the upgrade:
- You can reboot the device after upgrading the firmware (recommended). The firmware you upload to the unit will not become active until after a reboot.
- You can reset the device back to its factory defaults. This action will cause the IP settings to revert to the factory default values, and therefore you may lose communications with the unit. Use the Factory Reset feature with caution. It is not normally required for firmware upgrades.

10. After you have selected the upgrade options that you want, press the "Upgrade” button. The PostUpgrade software will open an FTP session on your computer and begin communicating with each of the devices that you have specified. It will prompt you before upgrading or rebooting individual units. You will get a progress indicator as the firmware is sent to the unit.



11. After the firmware is transferred it will be written to the Flash memory of the unit – this will take a minute or two. The On screen display and the front panel will also provide some progress indicators during the upgrade. The screen below shows a sample of what you would expect when upgrading your VANC Encoder.



12. When the upgrade is complete the FTP session will end. You can close the PostUpgrade utility software.

6.3.3. Manual FTP (File Transfer Protocol) Method of Updating Firmware

You will need the following equipment in order to update the Firmware using the FTP process.

- PC with Ethernet network port.
- Appropriate Ethernet cable as outlined in section 2.6.
- New firmware downloaded from the Evertz web site as described in section 6.3.

6.3.3.1. Step 1 – Establishing a Valid Network Connection

Before any FTP (file transfer protocol) upgrades can be initiated, the user must establish a valid network connection.

1. Follow the procedure in section 6.3.2.1 to establish a valid network connection.

The Network Interface CPU and the main CPU in the VANC Encoder share the same IP address. An FTP connection to the VANC Encoder using the default FTP port of 23 will FTP to the main CPU. In order to FTP to the Network CPU you must use port 50023. Note that some FTP clients (including the standard one provided with Windows) will not allow you to FTP to port 50023. It is therefore recommended that you use the KeyLog TRACKER™ or the PostUpgrade utility if you need to update the network interface firmware.

6.3.3.2. Step 2 – Upgrading the Application Code

The firmware in the VANC Encoder main CPU and network CPU need to be in a matched set for proper operation of the system. If you are upgrading multiple firmware images you should upgrade the VANC Encoder main application code first, and the network CPU last. If you do not follow this order you may not be able to update some parts of the system using the FTP method.

2. In the Command window type: `ftp xxx.xxx.xxx.xxx` (IP address)

3. Press the <Enter> key when prompted for a "Username"

4. Press the <Enter> key when prompted for a "Password"

5. Type "`hash`" at the "FTP>" to turn on the progress indicator during the ftp upload.

6. At the "FTP>" prompt, type the following: `put "the name of the file.bin".`
   (For example: "`put hs9155q_1133.bin`")

7. If the application file is not local to where you are performing the ftp, then include the path with the name (For example: `put c:\firmware\hs9155q_2557.bin`)

8. The FTP screen displays a message indicating the successful opening of a data connection to the device.

9. The file transfer takes about 90 seconds during which time you will see the transfer progress indicated by # characters on the FTP screen. You will also see a progress indication on the On screen display and the **VANC Encoder** front panel.

10. When the # characters stop the unit will transfer the firmware to its Flash memory. During this process, which takes about 60 seconds, you will not see any activity on the FTP screen. The On screen display will show the progress of writing the application code to the Flash memory.

During this time it is mandatory that all power cycles of the unit be avoided.

11. You will see a 'Transfer complete' message when the firmware has been successfully written to the flash memory.

12. Type "`quote boot`" at the "FTP>" prompt to reboot the unit so that the new firmware will take effect. You will see a message indicating that the unit will reboot in 5 seconds.

13. Within 5 seconds type "`quit`" at the "FTP>" prompt to exit the FTP session for this unit before it reboots. If you do not quit the session before the reboot then the FTP session will freeze and you will have to type `<ctrl-C>` one or more times to terminate the FTP session.

The screen below shows a typical FTP session for upgrading the **VANC Encoder** main application code.

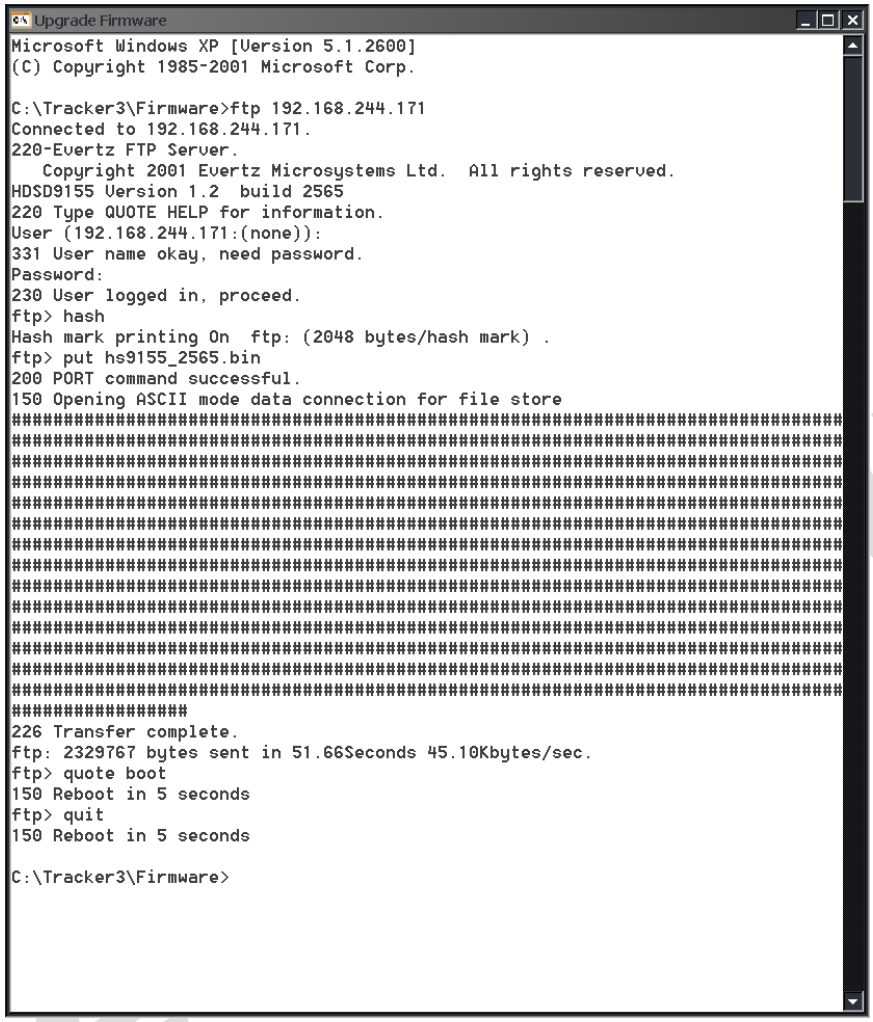


Figure 6-5: Upgrade Firmware Screen

6.3.3.3. Step 3 – Completing the Upgrade

14. When you are done upgrading the **VANC Encoder** you can close the DOS window and disconnect the network cable.

6.3.4. Serial Port Method of Upgrading Application Firmware

You will need the following equipment in order to update the camera adapter or base station firmware.

- PC with available communications port. The communication speed is 57600 baud, therefore a PC capable of supporting this baud rate is required.
- "Straight-thru" serial extension cable (DB9 female to DB9 male)
- Terminal program that is capable of Xmodem file transfer protocol. (such as HyperTerminal)
- New firmware downloaded from the Evertz web site as described in section 6.3

6.3.4.1. Step 1 – Terminal Program Setup

1. Connect the serial cable to the **SERIAL CONTROL** DB9 connector.

2. Connect the 9 pin connector on the end of the serial update cable to the PCs' RS-232 communications port.

3. Start the terminal program.

4. Configure the port settings of the terminal program as follows:

Baud	**57600**
Parity	**no**
Data bits	**8**
Stop bits	**2**
Flow Control	**None**

5. Power up the VANC Encoder unit.

6.3.4.2. Step 2 – Invoke Upload Mode from the Terminal Program

7. Power up the unit. After the unit powers up, a banner with the boot code version information should appear in the terminal window. The cursor to the right of the word BOOT> should be spinning for about 5 seconds then the unit will continue to boot.

   For example:

```
EVERTZ MCF5407 MONITOR 2.3 BUILD 8
COPYRIGHT 1997, 1998, 1999, 2000, 2001, 2002 EVERTZ MICROSYSTEMS LTD.
28F160C3B FLASH DETECTED
MCF5407 COLD BOOT> |
```

8. The following is a list of possible reasons for failed communications:

   - Defective Serial Upgrade cable.
   - Wrong communications port selected in the terminal program.
   - Improper port settings in the terminal program. (Refer to step 7 for settings). Note that HyperTerminal will not change port settings while connected. Click on HyperTerminal's "Disconnect" Button then click the "Reconnect" button to activate changes to the port settings.
   - PC requires hardware flow control despite the HyperTerminal settings.

9. While the cursor is spinning press the <CTRL> and <X> keys on your computer keyboard at the same time, this should stop the cursor from spinning. The spinning prompt will only remain for about 5 seconds. You must press <CTRL-X> during this 5 second delay. If the unit continues to boot-up, simply cycle the power and repeat this step.

10. Hit the <ENTER> key on your computer once.

11. Type the word "upgrade", without quotes, and hit the <ENTER> key once.

12. The boot code will ask for confirmation. Type "y", without quotes.

13. You should now see a prompt asking you to upload the file.

6.3.4.3. Step 3 – Uploading the New Firmware

14. Upload the “*.bin” file supplied using the X-Modem transfer protocol of your terminal program. If you do not start the upload within 10 minutes the unit’s Boot code will time out. You can restart the upgrade process by power cycling the unit.

15. The boot code will indicate whether the operation was successful upon completion of the upload.

For Example:

```
UPLOAD OKAY
MCF5407 COLD BOOT> |
```

16. The following is a list of possible reasons for a failed upload:

- If you get the message "transfer cancelled by remote" you must restart the terminal program and load the bin file, then remove and install the module again.
- The supplied “*.bin” file is corrupt.
- Wrong file specified to be uploaded.
- Wrong file transfer protocol used – make sure you specify Xmodem, not Xmodem 1K.
- The PCs’ RS-232 communications port cannot handle a port speed of 57600.
- Noise induced into the Serial Upgrade cable.

6.3.4.4. Step 4 – Completing the Upgrade

17. Type the word “boot”, without quotes, and hit the <ENTER> key once or power cycle the unit. The unit should now reboot.

18. You can now close the terminal program and disconnect the RS-232 serial cable from the PC.

6.4. HDSD9045TR DEBUG WINDOWS

Each Tracker configuration has one or more text windows called "DEBUG", on the WINDOWS tab of the project or system configuration. DEBUG windows can display additional information on the output video. Changing the HORIZONTAL position value for the DEBUG window can control the information format. (The window cannot be moved horizontally).

The format and content of the displays may change as the firmware evolves, but here are the current displays. Some content is intended for use only by the Evertz engineers, and is not documented ("EV_ENG"). Some displays may be truncated when using Standard Definition video.

Some Displays show a line of "@@@@@@@@@@@@@@@@@@@@" characters under specific conditions. These displays are designed to be visible on an oscilloscope that is monitoring the output video (usually in some analog form).

Debug Window Value	Debug Window Name	Description
0	WIN BP	BP: decimal Biphase hw or delta hw
1	WIN HW	IN: binary i/o pins DIP: binary dip switch input
2	WIN TFPHASE	VTF: video to film phase ATF: audio to film phase
3	WIN SCAN	ERR: kk error FSCAN: scantrack
4	WIN VFLD2	@@@@@ on field 2 characters
5	WIN VPULL	@@@@@ on new picture (pulldown)
6	WIN F0	@@@@@ on kk frames == 0
7	WIN V0	@@@@@ on VTR timecode frames == 0
8	WIN A0	@@@@@ on ATR timecode frames == 0
9	WIN PULLT	PULL: pull type of keykode
10	WIN VAPHASE	VPH: video phase APH: audio phase FPH: film phase
11	WIN REF	REF: phase of 30Hz or 6HZ and lock count
12	WIN FRAME	FRAME: frame pulse rate counters
13	WIN GPI	GPI: VTR TC where GPI was detected
14	WIN DLO	DLO: VTRTC KK ATRTC of event
15	WIN VIDEO	VID: input video type
16	WIN BPPHASE	Biphase Reference Edge Phase
17	WIN KKSTAT	KeyKode Stats
18	WIN ASCAN	Film Time code Stats
19	WIN ABSREF	Reference Point for JAM After Reference Mode
20	WIN IDLE	Processor Idle Measurement
21	WIN VLTC	Video LTC reader stats
22	WIN ALTC	Audio LTC reader stats
23	WIN POP UP ERRORS	POP UP ERRORS
24	WIN ANC VTR	9025DDR ANC reader stats
25	WIN ANC ABS	9025DDR ANC ABS frame stats
26	WIN RP215	RP215 stats
2nd Last	WIN REV	Firmware Revision
Last	WIN RAM	00000000: RAM viewer values

Table 6-2: HDSD9045TR Debug Window Functions

6.4.0. WIN BP (0) Biphase Display

```
BP:04321:+100.3 DY:222222 B:+0 X:+4
```

04321	Current biphase hardware counter value
+100	% of play speed
.3	State (0-3) of the two biphase inputs at sample time
DY:222222	Dynamics flags of the biphase based film, video and audio systems respectively
B:+0	Biphase 'noise' counter. Counts invalid biphase transitions
X:+0	For Evertz Engineering Use Only

6.4.1. WIN HW (1) Hardware Display

```
IN:0110011 DIP:11111110
```

IN:0110011	Real time display of parallel port inputs MSB (6) to LSB (0), including some internal inputs
DIP:11111110	Real time display of DIP switch, MSB (8) to LSB (1), where 0 indicates switch is in the DOWN/ON position.

6.4.2. WIN TFPHASE (2) Timecode to Film Phase Indicator

```
VTF:0000000B0 A:0000000B0 C
```

VTF:0000000B0	Video timecode absolute frames extrapolated back to film abs frames 0. The B is the pulldown indicator (A,B,C,D) of biphase video timecode hh:mm:ss:00 frames. The pulldown indicator acts as the decimal point of the timecode-to-film phase indicator
A:0000000B0	Likewise for the audio biphase timecode
C	Pulldown indicator for KeyKode ffff+00 frames

6.4.3. WIN SCAN (3) KeyKode Error And Scantrack Display

```
ERR:+00 F:+01 V:+02 A:+03 H:+04.3BC
```

ERR:+00	difference between KeyKode input and biphase based KeyKode
F:+01	Biphase Film numbers 'scantrack' , includes compensation for 'hardware scantrack'
V:+02	Biphase Video numbers 'scantrack', includes compensation for 'hardware scantrack'
A:+03	Biphase Audio numbers 'scantrack', includes compensation for 'hardware scantrack'
H:+04	Hardware 'scantrack' relative to the reference edge of biphase chosen at 'Load Film' action. This is the value reported to Tracker and most closely resembles the scantrack of the Evertz 4025.
.3	state of biphase at sample time
B	is the pulldown indicator (A,B,C,D) of video timecode hh:mm:ss:00 frames.
C	is the pulldown indicator (A,B,C,D) of audio timecode hh:mm:ss:00 frames.

6.4.4. WIN VFLD2 (4) Video Field 2

@@@@@ on video field 2 characters

6.4.5. WIN VPULL (5) Video Pulldown

@@@@@ on new picture (pulldown)

6.4.6. WIN F0 (6) KeyKode Frames 0

@@@@@ on KeyKode frames == 0

6.4.7. WIN V0 (7) Video Timecode Frames 0

@@@@@ on VTR timecode frames == 0

6.4.8. WIN A0 (8) Audio Timecode Frames 0

@@@@@ on ATR timecode frames == 0

6.4.9. WIN PULLT (9) Pulldown Type

```
PULL:A  V:B  A:C
PULL:A        Is the pulldown indicator (A,B,C,D) of KeyKode ffff+00 frames.
V:B           Is the pulldown indicator (A,B,C,D) of video timecode hh:mm:ss:00 frames.
A:C           Is the pulldown indicator (A,B,C,D) of audio timecode hh:mm:ss:00 frames.
```

6.4.10. WIN VAPHASE (10) Timebase Phase

```
VPH:0.000 APH:0.000 FPH:3.126 0 0
VPH:0.000     Video timebase phase
APH:0.000     Audio timebase phase
FPH:3.125     Film timebase phase
```

6.4.11. WIN REF (11) 6Hz Reference Info

REF:.N/A not applicable unless video is 1080p/24sF
For all displays, the '.' after "REF:" - shows ' ' if display is too high vertically, '@' if reference input is active in this field, or '.' if reference input is inactive in this field.

```
REF:.6 01 8
REF:.6            Indicates 6Hz input signal detected
01                lock count
8                 bit number of input

REF:.30-VAF 101 123 456 789 323 lC
REF:.30           Indicates 30Hz NTSC reference detected
-VAF              Video phase, audio phase, film phase
101 123 456 789 323     HD line numbers of NTSC Vsync
lC                Lock count
```

6.4.12. WIN FRAME (12) Frame Pulse Input Analysis

```
FRM: 5/2 3-2 2R 10H0 10S0 HIS.23
```

FRM: 5/2	2 pulses every 5 fields detected
3-2	A pulses 3 fields apart then 2 fields apart
2R	Frame rate lock count and lock indicator
10H	hw seq lock count and lock indicator
0	Difference between hw sequence count and internal sequence count
10S	Sequence lock count and lock indicator
0	Difference between iseq and seq
H	Hardware sequence field 0
I	Input sequence field 0
S	Sequence field 0
.	Shows ' ' if display is too high vertically, '@' if Frame Pulse input is active in this field, or '.' if Frame Pulse input is inactive in this field.
2	Sequence field number
3	Output sequence number

6.4.13. WIN GPI (13) GPI Input Frame Number

```
GPI:12:59:59:23
```

Video timecode of frame number where GPI input is detected going from off to on

6.4.14. WIN DLO (14) Data Logging Output

```
DLO:5 12:59:59:23 9999+00 13:01:01:05
```

DLO:5	DLO Type identifier
12:59:59:23	Video timecode
9999+00	KeyKode feet and frames
13:01:01:05	Audio timecode

6.4.15. WIN VIDEO (15) Video Mode Indicator

```
VID: 525i/59.94 AUTOSTD AUTODEF5
```

Displays the current video standard, indicates whether autovideo standard switching is enabled, and (HDSD9025 only) whether auto switching between Hi-def and Standard-def is enabled and how many seconds before auto-definition switching activates.

6.4.16. WIN BPPHASE (16) Biphase Reference Edge Phase

```
BF:159 BV:001 BA:001
```

BF:159	Film timebase tic number at Reference edge of biphase
BV:001	Video timebase tic number at Reference edge of biphase
BA:001	Audio timebase tic number at Reference edge of biphase

6.4.17. WIN KKSTAT (17) KeyKode Reader stats

5550 CTL DISABLED	Parameter 25-33 set to zero: 5550 Control not enabled
5550 POLL DISABLED	Parameter 25-34 set to non-zero: 5550 Polling disabled
NO 5550 CTL: TXT DEBUG OUT ON	Character debug output instead of 5550 Control
5550 CTL NOT SUPPORTED"	Software does not support 5550 control
KK COMM NOT ACTIVE	Communications has not been established

K%098 ASYM+020 IN:999 35RN AUT 5550 Status as described below

K%098	KeyKode percent valid read
ASYM+020	KeyKode asymmetry percent
IN:999	KeyKode intensity setting
35R	Film gauge 35: 35 mm, 35R: 35 mm reverse side, 16: 16 mm
N	N:Neg, P:Print
AUT	KeyKode mode MAN:Manual, AUT:auto, EXT:Extended Auto, or HNT:Hunt

6.4.18. WIN ASCAN (18) Film Timecode Stats

AERR:+00 P:02 C:03 T:0 %100 @24/24

AERR:+00	Number of frames of difference between incoming Film Timecode and biphase based Film timecode number. may also show "AJAM6"" or "AJAMOFF:"
P:02	'perf' of film timecode
C:03	Jam counter of film timecode
T:0	Tic number (0-9) of audio timebase, when LTC detected as ready i.e. approximate phase
%100	Actual number of frames read in a second, expressed as a percentage of the expected reads
@24/24	Counting modulus detected on incoming LTC / vs. expected counting modulus and frame rate

6.4.19. WIN ABSREF (19) Reference Point for JAM After Reference Mode

KKREF: +1000 AK: +1001

KKREF: +1000	Absolute frames of film KeyKode reference point
AK: +1001	Absolute frames of film timecode reference point

6.4.20. WIN IDLE (20) Processor Idle Measurement

IDL: 2737(73%) X:2766 N:2700 9

2737	Average Number of times through the task list per frame
(73%)	average percentage of frame spent idling
X:2766	Max idling
N:2700	Min idling
9	Minimum microseconds to get through the task list

6.4.21. WIN VLTC (21) Video LTC reader stats

```
VLTC:%100 T:0 23:59:59:24 @25/30
```

%100	Actual frames read in a second, expressed as a percentage of the expected reads
T:0	Tic number (0-9) of video timebase, when LTC detected as ready i.e. approximate phase
23:59:59:24	Actual timecode value read, uncompensated
@25	Counting modulus detected on incoming LTC
/30	Expected counting modulus and frame rate

6.4.22. WIN ALTC (22) Audio LTC reader stats

```
ALTC:%100 T:0 23:59:59:23 @24/30
```

%100	Actual frames read in a second, expressed as a percentage of the expected reads
T:0	Tic number (0-9) of audio timebase, when LTC detected as ready i.e. approximate phase
23:59:59:23	Actual timecode value read, uncompensated
@24	Counting modulus detected on incoming LTC
/30	Expected counting modulus and frame rate

6.4.23. WIN ERRORS (23) Pop up errors

Various error and warning messages will display briefly as they occur

6.4.24. WIN ANC VTR (24) ANC Video timecode

```
ANC:%100 F1 L23:59:59:23@24/24
```

L	Source type L=RP188LTC, 1=RP188VITC1, 2=RP188VITC2, F=RP215
%100	Valid read rate as a percentage of expected read rate
F1	Fields in which data is read - F12 indicates both field 1 and field 2
L	Dynamics flags L-locked, P-play, F-forward, S-stop, R-reverse
23:59:59:23	Raw, uncompensated timecode read - NOT LIKELY TO EXACTLY MATCH picture content! ':' will be replaced by '*' when timecode not valid, or not readable or discontinuous
@24/30	Timecode counting rate / expected rate
22	Timecode dynamics flags

6.4.25. WIN ANC ABS (25) ANC Absolute Frames

```
ABS:%100 F1 L00123456@24/24
```

%100	Valid read rate as a percentage of expected read rate
F1	Fields in which data is read - F12 indicates both field 1 and field 2
L	Dynamics flags L-locked, P-play, F-forward, S-stop, R-reverse
00123456	Raw, uncompensated abs frames read - NOT LIKELY TO EXACTLY MATCH picture content!

6.4.26. WIN RP215 (26) RP215 Stats

Displays various RP215 Fields

6.4.27. WIN REV (always the 2nd last display) Firmware Revision

```
REV LP9045B2 09 0623 U 060630
```

LP9045B2	Firmware name LP9045 for HDSD9045TR
09	
0623	Firmware build number
U	R = Released. U = unreleased
060630	Firmware build date

6.4.28. WIN RAM (always the last display) RAM Display

```
40000000:4f001000 08000402 4003a4b4
```

40000000:	Address, controlled by parameter 29-20, balance of line shows RAM contents for next 12 locations

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CHAPTER 7
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Tables

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7. FILM EMULSION CODES

If you are seeing a question mark in place of the film manufacturer or film type when reading and displaying KeyKode, the reason is as follows. The film barcode has a human readable component which shows the film manufacturer as a letter ('O', 'A', 'E', 'K' or 'F' for ORWO, Agfa, Eastman, Kodak and Fuji) and the film type as a letter (ex. 'J' for Kodak 5296 type film). The actual bar-code contains only numbers and so the manufacturer and type must be encoded as a numeric code. For clarity and convenience, Evertz has chosen to display these codes exactly as shown in the human readable portion of the film. We translate the codes into the alphabetic characters as established by each film manufacturer.

From time to time new film types with new codes are introduced by the film manufacturers. When these new films are read or displayed by the Film Footage Encoder, Afterburner or KeyLog TRACKER™, they may display as a question mark ('?') in place of either the film manufacturer or film type or both. The rest of the barcode is read and handled correctly. The actual codes are internally used by the software, and the KeyKode foot and frames are completely accurate. Only the display of the codes is affected.

The code translation tables are up to date and accurate and we endeavour to obtain the information from the film manufacturers in advance of the release of new film products. We regularly update the Emulsion code tables and provide updates on our website (http://www.evertz.com/ftp.html). We suggest you check this site regularly to make sure you have the most up to date emulsion codes.

The film manufacturers and film types currently supported are shown in the following charts.

Manufacturer			Emulsion		Film Type	Added
	Code	Letter	Code	Char		
ORWO	00 (35mm)	O	29	U	UN 54 (100 ASA)	May 15, 06
	10 (16mm)		37	U	N 74 (400 ASA)	May 15, 06

Table 7-1: ORWO Emulsion Codes(not supported in all products)

Manufacturer			Emulsion		Film Type	Added
	Code	Letter	Code	Char		
Agfa	01 (35mm)	A	20	N	XT 100	
	11 (16mm)		24	M	XTR 250	
			83	F	XT 320	
			84	S	XTS 400	

Table 7-2: Agfa Emulsion Codes

Manufacturer			Emulsion		Film Type	Added
	Code	Letter	Code	Char		
Kodak	02 (35mm)	K	00	P	5600 (obsolete)	Mar 22, 95
	12 (16mm)		14	X	SO-214 SFX 200T	Jan 6, 99
	22 (65mm)		20	Y	5620 Prime Time (obsolete)	
			22	E	5222/7222	
			24	L	5224 (obsolete)	
			31	H	5231/7231	
			34	D	5234/7234	
			43	A	5243/7243 (obsolete)	
			44	V	5244/7244 (obsolete)	
			45	K	5245/7245	
			46	I	5246/7246 Vision 250D	Feb 28, 97
			47	B	5247/7247 (obsolete)	
			48	M	5248/7248	
			49	O	5249 (obsolete)	
			72	S	5272/7272	
			74	Z	5274/7274 Vision 200T	Feb 28, 97
			77	Q	5277/7277	Feb 9, 96
			79	U	5279/7279	
			87	W	5287/7287 (obsolete)	May 13, 94
			89	R	5289 Vision 800T	Aug 10, 98
			92	N	7292 (obsolete)	
			93	L	5293/7293	Jul 15, 92
			94	G	5294/7294 (obsolete)	
			95	F	5295 (obsolete)	
			96	J	5296/7296 (obsolete)	
			97	C	5297/7297 (obsolete)	
			98	T	5298/7298 (obsolete)	Nov 23, 11
Eastman	02 (35mm)	E	01	K	5201/7201 Vision2 50D	Nov 2, 05
	12 (16mm)		05	Q	5205/7205 Vision2 250D	Nov 19, 04
	22 (65mm)		12	M	5212/7212 Vision2 100T	Jan 27, 04
			17	L	5217/7217 Vision2 200T	Jan 27, 04
			18	H	5218/7218 Vision2 500T	Nov 25, 02
			19	J	5219/7219 Vision3 500T	Dec 12, 07
			29	B	5229/7229 Vision2 Expression 500T	Jan 5, 04
			42	V	5242/7242 Vision Intermediate	Nov 25, 02
			63	E	5263/7263 Vision 500T	Mar 9, 01
			65	C	7265	Nov 19, 04
			66	D	7266	Nov 19, 04
			84	G	5284/7284 Vision Expression 500T	Mar 9, 01
			85	A	5285 100D	Nov 25, 99
			99	I	7299	Jun 30, 05

Table 7-3: Kodak Emulsion Codes

Manufacturer			Emulsion		Film Type	Added
	Code	Letter	Code	Char		
Fuji	03 (35mm)	F	01	I	F-CI (8501, 8601, 8701) (obsolete 95)	
	13 (16mm)		02	I	F-CI (8502, 8602, 8702) (obsolete 07)	May 4, 95
	23 (65mm)		03	I	ETERNA CI Intermediate (8503,4503)	Dec 12, 07
			10	N	F-64 (obsolete 05/95)	
			11	I	ETERNA RDI Digital Inter (8511,4511)	Dec 12, 07
			13	I	F-CI (obsolete)	
			14	N	F-500 (obsolete)	
			20	N	F-64D (obsolete 05/95)	
			21	N	F-64D (8521, 8621, 8721) (obsolete 98)	May 4, 95
			22	N	F-64D (8522, 8622)	Jun 24, 98
			30	N	F-125 (obsolete 05/95)	
			31	N	F-125 (8531, 8631, 8731) (obsolete 98)	May 4, 95
			32	N	F-125 (8532, 8632) (obsolete 07)	Jun 24, 98
			40	R	VELVIA colour reversal (8540)	Apr 2, 03
			43	N	ETERNA Vivid160 (8543,8643)	Dec 12, 07
			50	N	F-250 (obsolete 05/95)	
			51	N	F-250 (8551, 8651, 8751) (obsolete 99)	May 4, 95
			52	N	F-250 (8552, 8652,) (obsolete 07)	Apr 15, 99
			53	N	ETERNA 250 (8553, 8653)	Apr 5, 06
			60	N	F-250D (obsolete 05/95)	
			61	N	F-250D (8561, 8661, 8761) (obsolete 99)	May 4, 95
			62	N	F-250D (8562, 8662) (obsolete 07)	Apr 15, 99
			63	N	ETERNA 250D (8563, 8663)	Apr 5, 06
			70	N	F-500 (8570, 8670, 8770) (obsolete 95)	
			71	N	F-500 (8571, 8671) (obsolete 99)	Jun 12, 96
			72	N	F-500 (8572, 8672) (obsolete 07)	Apr 15, 99
			73	N	ETERNA 500 (8573, 8673)	Jun 30, 05
			82	N	F-400 (8582, 8682) (obsolete 07)	July 17,00
			83	N	ETERNA 400 (8583, 8683)	Jun 30, 05
			92	N	REALA 500D (8592, 8692)	Mar 09,01

Table 7-4: Fuji Emulsion Codes

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