



# V6304

## HD Dolby E<sup>®</sup> Encoder

---

**User Guide**

**Issue: 3.0**

© Pro-Bel Ltd

[www.pro-bel.com](http://www.pro-bel.com)



## Contents

---

<b>1</b>	<b>Description</b>	<b>6</b>
1.1	General	6
1.2	Supported Video Standards	7
<b>2</b>	<b>Installation</b>	<b>8</b>
2.1	Rear Panel	8
2.2	Connections	9
2.2.1	REF BNCs and (HD)SDI BNCs	9
2.2.2	Metadata on Molek KK3	9
2.2.3	Audio I/O on BNCs	9
2.2.4	Audio I/O on HDD26 connector	10
2.2.5	Breakout Cable Specification	10
2.2.6	Breakout Cables and Panels	11
2.3	Module and Environmental Specifications	11
2.4	Signal Specifications	12
2.5	Audio and Video Insertion Delays	13
2.6	Adjustment Ranges	13
2.6.1	Video Adjustments	13
2.6.2	Audio Adjustments	13
2.7	Hardware	14
2.7.1	The PCB	14
2.7.2	Links and Switches	14
2.7.3	Fuse	15
2.8	Front Panel	16
2.8.1	Direct Indications	16
2.8.2	Display and Switches	17
2.8.3	Remote/Local Control	17
2.9	Variant	18
2.10	Submodules	18
2.11	Functional Block Diagram	19
2.11.1	Inputs and Outputs	19
2.11.2	References and Clocks	19
2.11.3	Video DMX and MUX	20
2.11.4	Supervisor CPU	20
2.11.5	Video I/O to rear module	20



<b>3</b>	<b>System Operation</b>	<b>23</b>
<b>3.1</b>	<b>Local Control</b>	<b>23</b>
3.1.1	Start Up	23
3.1.2	Menu Control	23
3.1.3	Menu Examples	24
3.1.4	Sleep	24
3.1.5	Banner	25
3.1.6	High Level Signal Status	25
3.1.7	Variable Calibration	26
<b>3.2</b>	<b>Remote Control</b>	<b>27</b>
<b>3.3</b>	<b>Dolby Encoding</b>	<b>28</b>
3.3.1	Dolby E Basics	28
3.3.2	Input Status	29
3.3.3	Input Selection and DMX Group	30
3.3.4	Input Gains	30
3.3.5	Input Phases	30
3.3.6	Input Delays	30
3.3.7	Synchronisation	31
3.3.8	Metadata and Metadata Source	32
3.3.9	External Metadata - Status	33
3.3.10	Program Configuration	35
3.3.11	Dolby bit depth	36
3.3.12	Metadata revert mode	38
3.3.13	Pass through Mode and SRCs	38
3.3.14	Video Delay (V6304/DM only)	38
3.3.15	Dolby Frame Delay	39
3.3.16	Dolby Encoding Status	39
3.3.17	Dolby Sync Status	39
<b>3.4</b>	<b>Working with Metadata</b>	<b>40</b>
3.4.1	Reading the AC-3 Output Metadata values	40
3.4.2	Internal AC-3 Metadata - Restoring the Factory Default	41
3.4.3	Internal Metadata - Loading Presets	41
3.4.4	Internal Metadata - Saving Presets	42
3.4.5	External Metadata - Status	42
<b>3.5</b>	<b>Internal AC-3 Metadata Configuration</b>	<b>43</b>
3.5.1	AC3 Prog	43
3.5.2	Dialog Normalisation	43
3.5.3	Audio Coding Mode	44
3.5.4	Low Frequency Effects Channel	44
3.5.5	Bitstream Mode	45
3.5.6	Line Mode Compression Profile	45
3.5.7	RF Mode Compression Profile	46
3.5.8	Centre Downmix Level	46
3.5.9	Surround Downmix Level	46
3.5.10	Dolby Surround Mode	46
3.5.11	Audio Production Information Exists	47
3.5.12	Mix Level	47
3.5.13	Room Type	47



3.5.14	Extended Bitstream Information 1 Exists	47
3.5.15	Ext BSI : Preferred Stereo Downmix Mode	48
3.5.16	Ext BSI : Lt/Rt Center Downmix Level	48
3.5.17	Ext BSI : Lt/Rt Surround Downmix Level	48
3.5.18	Ext BSI : Lo/Ro Center Downmix Level	49
3.5.19	Ext BSI : Lo/Ro Surround Downmix Level	49
3.5.20	Extended Bitstream Information 2 Exists	49
3.5.21	Ext BSI : Dolby Surround EX mode	50
3.5.22	Lowpass Filter	50
3.5.23	LFE Lowpass Filter	50
3.5.24	Surround Phase Shift	50
3.5.25	Surround 3 dB Attenuation	51
<b>3.6</b>	<b>MUX Control (V6304/DM only)</b>	<b>52</b>
<b>3.7</b>	<b>(HD)SDI Input and Output</b>	<b>53</b>
<b>3.8</b>	<b>System</b>	<b>54</b>
3.8.1	Version Numbers	54
3.8.2	Display Sleep	54
3.8.3	Display Brightness	54
3.8.4	GP I/O	55
<b>4</b>	<b>Calibration</b>	<b>56</b>
4.1	Set-Up	56
4.2	Free-Run Frequency	56
<b>5</b>	<b>Menus and Controls</b>	<b>57</b>
<b>5.1</b>	<b>Menu Structure</b>	<b>58</b>
5.1.1	V6304	58
5.1.2	V6304/DM	59
<b>5.2</b>	<b>Controls and Status</b>	<b>60</b>
5.2.1	Input Selection	60
5.2.2	Input Delay	60
5.2.3	Input Phase	60
5.2.4	Input Gain	61
5.2.5	Dolby E Controls	61
5.2.6	Internal Metadata Controls	62
5.2.7	Output Metadata Status	62
5.2.8	Mux Control	65
5.2.9	Dolby Status	65
5.2.10	Status	67
5.2.11	Engineering	68
5.2.12	Calibration	69
5.2.13	Configuration	69
5.2.14	Test Mode	71



<b>6</b>	<b>Appendix</b>	<b>72</b>
<b>6.1</b>	<b>Trouble Shooting Guide (Frequently Asked Questions)</b>	<b>72</b>
6.1.1	Dolby Encoding	72
6.1.2	Others	74
6.1.3	Initialization, Power On-Selftest & Error Messages	74
<b>6.2</b>	<b>Default AC-3 Metadata settings</b>	<b>75</b>
<b>6.3</b>	<b>Using Embedded Metadata and SDID</b>	<b>76</b>
6.3.1	Introduction	76
6.3.2	Selection of Embedded Metadata	77
6.3.3	Status of Embedded Metadata	77
6.3.4	Input Selection and Channel Mapping	78
<b>6.4</b>	<b>Dolby Reference issues with Progressive Video</b>	<b>80</b>
6.4.1	Background	80
6.4.2	Dolby E Frame Rates	80
6.4.3	High Frame Rates	81
6.4.4	System issues	81
6.4.5	Summary	81
<b>6.5</b>	<b>Software Versions</b>	<b>82</b>



## 1 Description

The module described in this manual forms part of the Vistek 1600 range of interface products. Although it processes High Definition (HD) video signals, it is fully compatible with all other products in the range in terms of its form factor, power supply requirements and control interface.

The V6304 is a module for encoding multi-channel, multiple dual channel, and multiple mono digital audio signals into the Dolby E compressed format. It is part of the Pro-Bel Vistek range of modules targeted at HDTV interface applications. The V6304 modules are single-width 3U units designed to fit in a V1606 rack, and are backwards compatible with the V1603 rack. Use of the V6304 in the V1601 1U rack is presently unsupported and support is not envisaged in the future. A passive rear module is required for all signal interconnections.

The individual products are as follows:

<b>V6304</b>	Basic Dolby E Encoder Module
<b>V6304/DM</b>	Dolby E Encoder Module with HD DMX/MUX capability

The V6304 modules are both designed around the Dolby Cat559 Dolby E OEM decoder module.

### 1.1 General

In free-standing mode, the V6304 encodes the PCM audio signals on its audio inputs to Dolby E in accordance with encoding parameters set up by the user, or obtained from a metadata stream applied to a dedicated metadata input connector.

The digital input signals to the Dolby encoder (including those extracted by the DMX on the V6304/DM) are passed through sample rate converters on the V6304 so there is no need for them to be synchronous with the reference or each other. The V6304 AES inputs support sample rates of 32kHz to 96kHz.

There is a versatile front panel with an alphanumeric display which lets the operator set up a large number of parameters and read the internal status of the unit. The module is fully compatible with the DART remote control system which means it can be controlled by the V1602/5 1U Control Panels, ViewNet PC based control software or any other 3<sup>rd</sup> party software written for the DART system.

A common use for the V6304 is in Standards Conversions (SC) applications, sometimes referred to in the Dolby literature as *transcoder* applications. In an SC application, Dolby-encoded bitstreams at the input frame rate are required to be decoded, the resulting PCM delayed so as to properly match delays in the video chain, and then re-encoded to Dolby bitstream at the output frame rate. In this application the decoding of Dolby bitstream, the processing and delay matching of the resulting PCM signals (and possibly metadata) may be performed by an existing V6302 module.

PCM audio channels and Dolby metadata are output by the V6302 module and then input to the new V6304 module, which re-encodes the PCM into Dolby E in accordance with parameters conveyed by the metadata. Thus the transcoded Dolby bitstream will be similarly assembled to the original Dolby bitstream, but at a different frame rate.



## 1.2 Supported Video Standards

The HD VALID reader module will output both SD and HD, although an FPGA re-load is required when switching between SD and HD. The supported standards are listed here.

Tektronix Definition	SMPTE	Colloquial
1920x1080/60/2:1	274M - 4	1080i60
1920x1080/59.94/2:1	274M - 5	1080i59
1920x1080/50/2:1	274M - 6	1080i50
1920x1080/30/1:1	274M - 7	1080p30
1920x1080/29.97/1:1	274M - 8	1080p29
1920x1080/25/1:1	274M - 9	1080p25
1920x1080/24/1:1	274M - 10	1080p24
1920x1080/23.98/1:1	274M - 11	1080p23
1920x1080/24/1:1SF	RP211 - 15	1080sf24
1920x1080/23.98/1:1SF	RP211 - 16	1080sf23
1280x720/60/1:1	296M	720p60
1280x720/59.94/1:1	296M	720p59
1280x720/50/1:1	296M	720p50
1280x720/30/1:1	296M	720p30
1280x720/29.97/1:1	296M	720p29
1280x720/25/1:1	296M	720p25
1280x720/24/1:1	296M	720p24
1280x720/23.98/1:1	296M	720p23
1920x1035/60/2:1	260M	1035i60
1920x1035/59.94/2:1	260M	1035i59
625/50/2:1	125/259M	625i50
525/59.94/2:1	125/259M	525i59

## 2 Installation

### 2.1 Rear Panel

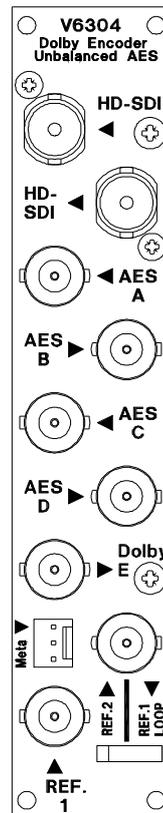
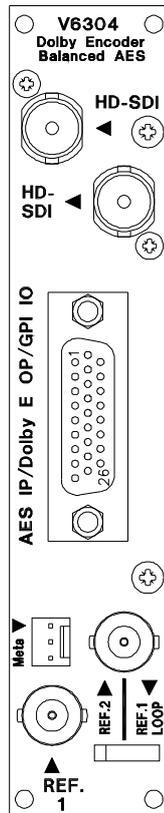
The **V16AR3AJ** balanced rear panel provides connections for I/O using a high density D-type connector for the audio and other ancillary signals, such as GP inputs and output. Metadata is connected via a 3-way Molex KK-series connector.

The **V16AR3AH** unbalanced rear provides connections for audio I/O on BNC connectors and metadata on a 3-way Molex KK-series connector. This has the advantage of simpler cable connections, but at the expense of losing the GP inputs and outputs.

The Rear Panels incorporate an ID mechanism and may be identified from the front panel of the V6304 from the **STATUS** menu by:

**Rear Mod**    **Unbal**  
                   **Balanced**  
                   **Invalid**

V6304 plugged into an unbalanced rear  
 V6304 plugged into a balanced rear  
 Incorrect Rear Module in use.





## 2.2 Connections

### 2.2.1 REF BNCs and (HD)SDI BNCs

These BNCs are present on all types of rear panel and are used as follows:

BNC	Description
REF 1 IN	External reference input Ref. 1. Reference is video NTSC/PAL/HD bi-level and tri-level sync. A jumper on the V6304 allows the input impedance of Ref 1. to be set to either Hi-Z or 75Ω.
REF 2 IN REF LOOP OUT	When the red slide on the switch is towards the REF.2 side, this is an input for external reference input Ref. 2. Reference is video NTSC/PAL/HD bi-level and tri-level sync. A jumper on the V6304 allows the input impedance of Ref 2. to be set to either Hi-Z or 75Ω.  When the red slide on the switch is towards REF. 1 LOOP, this is an output of a reference loop from Ref. 1. This facilitates daisy chaining references. The maximum recommended length of such a video daisy chain is 4, and the last V6304 in a daisy chain should have the termination jumper on Ref. 1 set for 75Ω.
HD-SDI IN	(HD)SDI reference and signal input On the V6304 this is an (HD) SDI video reference, whereas on the V6304/DM it is both a reference and an input.
HD-SDI OUT	(HD) SDI signal output on V6304/DM only. Not used on V6304.

### 2.2.2 Metadata on Molek KK3

The V6304 has a metadata input on a 3-way Molex KK-series connector that accepts a single asynchronous Dolby E metadata stream as an RS485 signal, at a baud rate of 115.2 kbps.

### 2.2.3 Audio I/O on BNCs

These are only available on the unbalanced rear panels. They provide for unbalanced AES inputs for channels AES A IN . . . AES D IN and unbalanced output for Dolby E bitstream on AES carrier.



## 2.2.4 Audio I/O on HDD26 connector

On the balanced rear panel there is a 26 way connector in the same footprint size as a standard 15 way D type connector. (HDD26) It is used for all the balanced digital audio connections, and other signals.

Three dedicated programmable GP Inputs (GPI) and one configurable GP Input/Output (GPIO) are also provided on this connector. If the HDD socket is to be used for audio and connected with multi-way cable over a long distance (in excess of 50m) it is desirable that the audio pairs are individually screened, otherwise crosstalk may occur.

The signals to and from the pins on this connector are as shown in this table:

Signal Group Label	HDD26 Pin	Signal Function
Audio 1 AES A in ⇐	9	PCM Input AES A Pos
	18	PCM Input AES A Neg
	26	GND
Audio 2 AES B in ⇐	8	PCM Input AES B Pos
	17	PCM Input AES B Neg
	26	GND
Audio 3 AES C in ⇐	7	PCM Input AES C Pos
	16	PCM Input AES C Neg
	26	GND
Audio 4 AES D in ⇐	6	PCM Input AES D Pos
	15	PCM Input AES D Neg
	25	GND
Audio 5 DolbyE out ⇒	5	Dolby E Output A Pos
	14	Dolby E Output A Neg
	25	GND
Audio 6 not used	4	reserved
	13	reserved
	25	GND
Audio 7 not used	3	reserved
	12	reserved
	1	GND
Audio 8 not used	2	reserved
	11	reserved
	1	GND
Audio 9 not used	20	reserved
	19	reserved
	1	GND
GPI0_0	24	GP Input/Output 0 (GPI4)
GPI_1	23	GP Input 1
GND	10	GND
GPI_2	22	GP Input 2
GPI_3	21	GP Input 3

## 2.2.5 Breakout Cable Specification

In many cases it may be desirable to make up a breakout cable from the HDD socket. If the cable is long (>50m) it should be made with separately screened sections to minimise crosstalk interference. Each of the Signal Groups listed under 2.2.4 should be individually screened.



## 2.2.6 Breakout Cables and Panels

The V6304 is compatible with the V6905 Breakout Cable which provides 4 AES inputs, 4 AES outputs and GPIO from the HDD26 connector. The Dolby E output of the V6304 corresponds to *AES A out* on this breakout cable. The V6304 is also compatible with the V6907 breakout panels but the number of unused I/O when using this panel means it's not the most compact or cost effective solution.

## 2.3 Module and Environmental Specifications

Parameter	Environmental Specification
Module Size (V6304)	Standard V1600 range module – 100mm x 270mm. Fits in V1606 3U rack, V6011 '1-Box' or V6012 TwoBox
Rear Panels	V16AR3AJ Single Width Rear with Balanced Audio Connections V16AR3AH Single Width Rear with Unbalanced Audio Connections
Operating Voltage	+9 .. +18V
Operating Temperature	0°C to +40°C. Cooling is from the V1606 rack.
Power Consumption	V6304 12W



## 2.4 Signal Specifications

SIGNAL	TYPE	COMMENTS
Power V6304	< 7W	Supplied from rack 9-24Vdc fused 2A
Power V6304/DM	< 12W	Supplied from rack 9-24Vdc fused 2A
Video Reference Ref. 1 and Ref. 2	B+B	Any 1V Composite video may be used, but Black & Burst is recommended. Format may be PAL, NTSC or HD with bi or tri-level sync. Zin = 75Ω or HI Z link selectable
Audio Input, Digital (AES)	Balanced	Zin = 110Ω Conforms to AES3-2003. Input Sample rate 32–96kHz
Audio Input, Digital (AES)	Unbalanced	Zin = 75Ω      Zout = 75Ω Conforms to AES3id-2001 Input Sample rate 32–96kHz
Audio Output, Dolby E encoded on AES carrier	Balanced	Conforms to the <i>Dolby Laboratories Coding Standard for Dolby E</i> , and is transported on the AES carrier in compliance with SMPTE 337M-2000. AES conforms to AES3-2003 with signal level of 5Vpp ±20% and Zout = 110Ω balanced. Sample rate 48kHz locked to reference
Audio Output, Dolby E encoded on AES carrier	Unbalanced	Conforms to the <i>Dolby Laboratories Coding Standard for Dolby E</i> , and is transported on the AES carrier in compliance with SMPTE 337M-2000. AES conforms to AES3id-2001 with signal level of 1Vpp ±20% and Zout = 75Ω unbalanced. Sample rate is 48kHz locked to reference
GP Inputs	TTL/LVTTL	TTL thresholds. 5V-tolerant. Diode-resistor clamped to 5V.
Video Input, (HD)SDI	unbalanced	Input conforms to SMPTE 424M-2006 to accept (HD)SDI video signals up to 3GHz. Zin = 75Ω Presently only supports input up to 1.5 GHz
Video Output, (HD)SDI	unbalanced	Output conforms to SMPTE 292M-1998 to generate (HD)SDI video signals up to 3GHz. Zout = 75Ω Presently only supports output up to 1.5 GHz
GP Output	HCMOS	LVC MOS output 0-3.3V. 24mA max Diode-resistor clamped to 3.3V.
Dolby MetaData input	RS485	Accepts a single asynchronous Dolby E metadata stream as defined in SMPTE RDD 6-2006, as an RS485 signal, at a baud rate of 115.2 kbps with physical interface as per ANSI/TIA/EIA-485-A. Pins: Top = GND, Centre = '+', Bottom = '-'



## 2.5 Audio and Video Insertion Delays

The V6304 is a Dolby Encoder and the encoding process is subject to one full video frame's delay. The V6304/DM which has video output, applies a compensating delay applied to the video. The delay is adjustable from a throughput minimum to several frames. Default is one video frame.

## 2.6 Adjustment Ranges

### 2.6.1 Video Adjustments

The table below shows the full ranges of the video adjustments:

VARIABLE	RANGE	RESOLUTION
Video Delay	-2 field to +5 field, where 0field = 1 <i>frame</i> delay	1 field
Dolby Delay	-16 lines to +15 lines relative to video frame ref.	1 line

### 2.6.2 Audio Adjustments

#### 2.6.2.1 Input Gain

Gain in the range -16dB to +15.875dB in 0.125dB steps can be applied to each of the six mono audio input channels.

#### 2.6.2.2 Input Phase

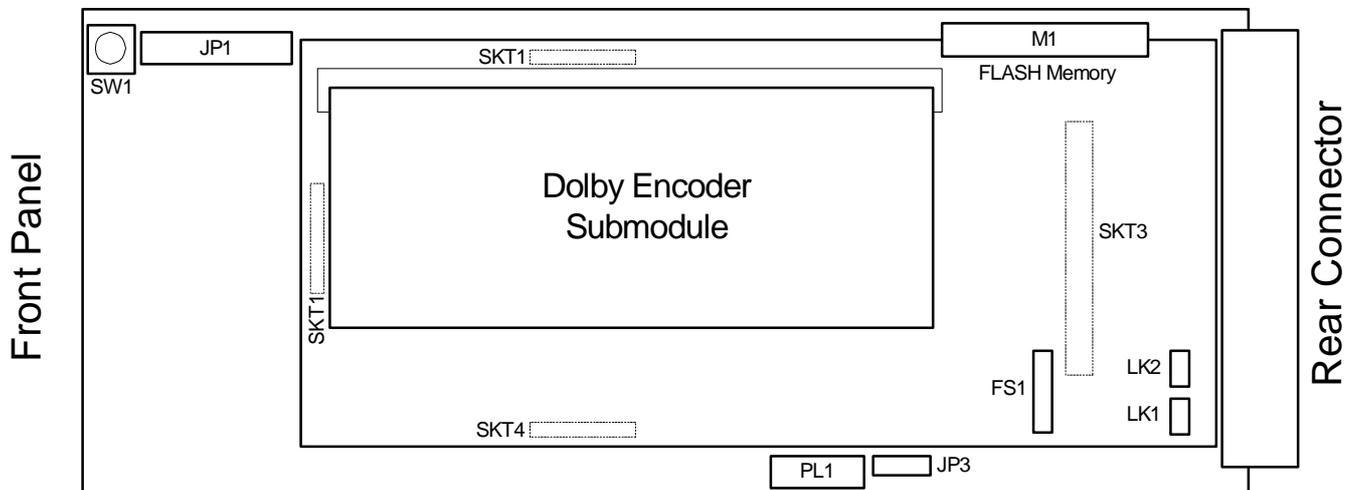
A phase flip of 180 degrees can be applied to any of the six mono audio input channels.

## 2.7 Hardware

### 2.7.1 The PCB

The figure below shows diagrammatically the printed circuit board along with certain other components of interest. In particular it shows the position and orientation of the links and switches which set up the operation modes and the location of the various sub-modules.

The FLASH Memory Module is shown, as it is the component that would need to be changed as a result of any software upgrade in the field. It is a custom Vistek module and care must be taken to ensure that a replacement is inserted the right way round and pushed fully 'home'. When removing the FLASH Memory Module, care must be taken to extract it evenly to avoid bending the pins. No special tools are needed for extracting or inserting the FLASH Memory Module.



### 2.7.2 Links and Switches

The purposes of the links and switches is shown in the following table. Details of their operation are described in later sections.

ITEM	Title	Section	Comments
SW1	RESET		Used to reset the internal H8 microcontroller
M1	8MB FLASH Memory		Store all the H8 CPU and FPGA data
PL1	JTAG Connector		For development and test use only
JP3	JTAG enable		Never fitted for operational use.
JP1	Program Connector		Used to download program code into the H8
FS1	2A Fuse		Fuses +15V from backplane down to baseboard
LK1	Video REF Term 1		Fit to terminate the Video reference 1
LK2	Video REF Term 2		Fit to terminate the Video reference 2

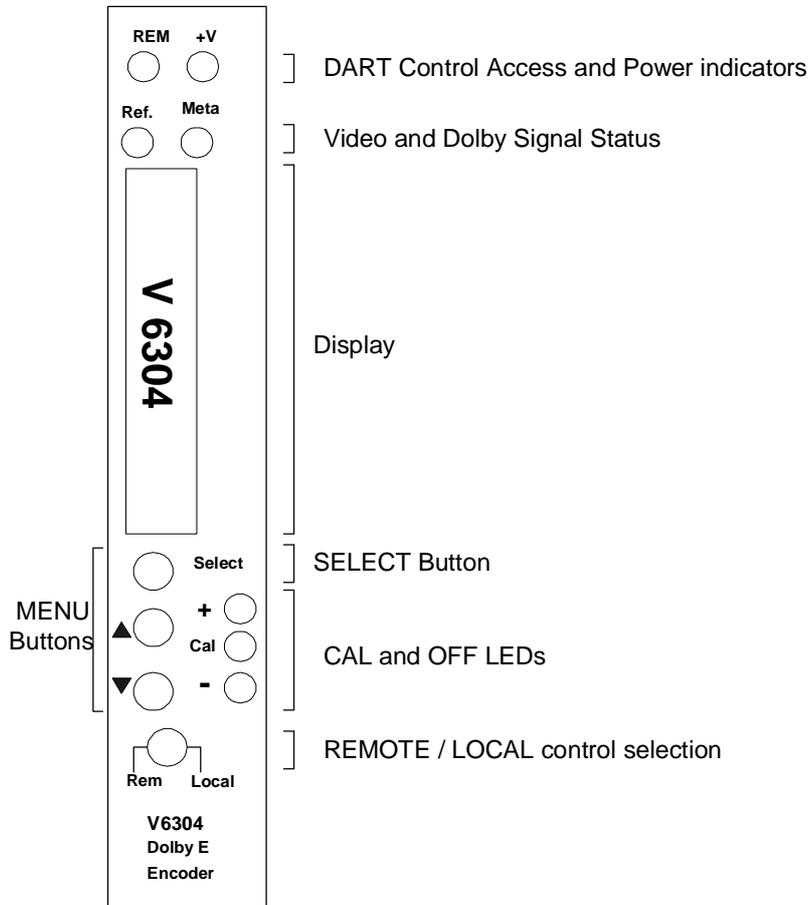


## 2.7.3 Fuse

There are two fuses on the V6402:

FS 1	Fuse 2 Amp Wire ended		In series with the +15V input to the module.
FS2	Resettable fuse 0.5A SMD		Protects 3V3 power feed to JP2 programming connector. Factory use only.

## 2.8 Front Panel



The front panel on the provides the user with total control and monitoring of the unit without the need to consult manuals and read unlabelled indications. At first use the menu system may seem cumbersome but with only a small amount of practice it will become very easy to use.

### 2.8.1 Direct Indications

The four LEDs at the top of the panel provide these direct indications of the unit:

- REM Short blinks to indicate access by the DART controller, if fitted. It does **not** directly indicate that the unit is in remote control mode. If the rack frame does not have a Rack Controller fitted then this LED will not blink.
- +V Indicates that the main +5V is present on the board. This is derived from the +15V distributed through the rack. The V6304 does have many power rails, but only the main +5V is indicated here. It will, of course, be off if the fuse, FS1, were to have been blown.
- Meta Indicates that an external source of valid metadata for Dolby E encoding is being received.
- Ref Ref LED will light if the automatically selected reference or the manually forced reference is on SDI, Ref.1 or Ref.2 and the reference on the selected input is present. The Ref LED does not light if the automatically or manually selected reference is on Free-run.



## 2.8.2 Display and Switches

The main display is an eight character LED matrix display. It has been set so that when fitted into a 3U rack (V1606) it can be read from the left, and when fitted to a 1U rack (V1601) it is horizontal and the 'proper' way up.

The three buttons are labelled **Select**, ▲ and ▼. The **Select** button is used to move down and up the menus. A short press will move down one level, while pressing and holding for about half a second will move up one level. If you continue to hold it will progressively move up a level every half second until it reaches the top level (**SLEEP**), or you let go, in which case it will stay where it is. When at any level the ▲ and ▼ buttons will move through the list of options, or if in an actual variable (such as video delay in fields) they will change the values. The menu system is described in more detail in later sections.

If the unit is in Local control then the display and switches are used to set up and show the operation the module. If in remote mode then they are still active for showing the status but cannot be used to actually change anything.

Beside the ▲ and ▼ buttons are three LEDs marked +, **CAL** and -. In general the **CAL** LED is used to show that a variable is set to its normalised value and if not then the others show which direction to which it has been changed or that it is no longer on its CAL value.

## 2.8.3 Remote/Local Control

The lowest switch selects between Local control and Remote control over DART:

Local	Control is from the front panel itself.
Rem	Control is from the DART system. This requires the use of an external controller running a suitable programme, which communicates with multiple racks using the Dartnet protocol.



## 2.9 Variant

At present the V6304 has two configuration options, the V6304 and the V6304/DM with integral DMX and MUX. Indication of which configuration is in force is easily visible from the front panel by going to

**STATUS Variant**

Available configurations are **None** (V6304) and **DMX+MUX** (V6304/DM). The variant may only be changed by the factory.

## 2.10 Submodules

The V6304 will always be fitted with the 130-5000 submodule and there are no other options. The 130-5000 submodule carries the Cat559 Dolby Encoder in a SIMM72 socket. To remove it, loosen the two screws, push the side spring clips both outwards and carefully withdraw the submodule at an oblique angle. To refit the Dolby Cat559 encoder, insert it into the SIMM socket at an oblique angle as far as it will go. Then push the south edge of the module towards the V6302 baseboard until two clicks are heard as the spring clips snap home. Finally replace the washers and nuts on the threaded shanks protruding through the two mounting holes.

These are the available modules:

<b>Product Code</b>	<b>Part No.</b>	<b>Description</b>
ALL	130-5000	Dolby E encoder submodule with Dolby Cat559 encoder OEM

## 2.11 Functional Block Diagram

Figure 2 shows the hardware block diagram of the V6304 and V6304/DM with a Class 7 DART interface. Figure 3 shows the implementation of the V6304 as a 130-5000 submodule on a video baseboard. The following discussion makes reference to these figures.

### 2.11.1 Inputs and Outputs

: Four AES receivers and FPGA logic are used to receive and decode to I<sup>2</sup>S the incoming AES audio data from the rear panel connectors. In the V6304, the PCM inputs to the Cat559 encoder are sourced only as I<sup>2</sup>S from the AES receivers on the rear panel inputs. The V6304/DM contains de-embedding and embedding logic in the FPGA, and the PCM inputs to the Cat559 encoder may be selected as I<sup>2</sup>S from either the de-embedded streams or I<sup>2</sup>S from the AES receivers on the rear panel inputs. Each PCM input to the Cat559 encoder may be sourced from any of the rear panel inputs or any of the DMX inputs. Selection is done in pairs only and no mixing is possible.

The encoded Dolby E output bitstream generated by the Cat559 is also in I<sup>2</sup>S form and is processed in the FPGA into a SMPTE337-compliant AES stream and output on the rear panel connector.

Metadata is received by an RS422 standard differential receiver and routed to the Dolby Cat559 module. The source selection of the metadata to be used - ie from external or embedded - is under user control.

The V6304 has 3 dedicated GP inputs and one configurable GPIO which are diode clamped and buffered by 5V tolerant logic buffers. The GPI and GPIO are only available on the balanced rear panel.

### 2.11.2 References and Clocks

The V6304 has three possible reference sources for the Dolby encoder: In Auto mode the default 25/29.98Hz reference for the Cat559 is derived from the deserialised (HD)SDI video data. If this is not present the reference is obtained from the Ref.1 BB. If Ref. 1 is not present the reference is obtained from the Ref. 2 BB /TLS video reference on the rear panel. Finally, if no reference is found present, the V6304 generates a free-run reference internally. The Auto reference mode can be overridden to force use of a particular selected reference irrespective of the presence of others.

The V6304/DM has the same reference options as the V6304 and the embedding logic requires a video rate clock, which may be 27MHz, 74.25MHz, 74.1758MHz, or 74.25/1.001 depending on the incoming SDI input standard. When the reference SDI, the video clock is obtained from the incoming SDI and the SDI output clock frequency is the same as the SDI input clock frequency. If there is only a BB/TLS reference and no SDI input is present, the V6304/DM must synthesise the internal clock from the BB/TLS reference. As shown on Figure 1, this is done by the video baseboard, which uses a Line Locked Loop to generate 27MHz from the BB/TLS.

The Dolby E output of the Cat559 requires a set of I<sup>2</sup>S audio clocks that are frequency synchronous with the video reference applied to the Cat559. The V6304 has provision for an onboard PLL1707 chip which generates a 24.576MHz audio clock from the applied 27MHz video clock. Within the FPGA the 24.576MHz is multiplied up by 4 to create a 98.304MHz clock for all audio processing.



## 2.11.3 Video DMX and MUX

An integral part of the embedding logic in the V6304/DM is a video frame delay to compensate for the one frame audio encoding delay of the Cat559 encoder, to ensure that the audio to video synchronism referenced to the rear panel inputs is preserved on the mux'd outputs after encoding.

The V6304/DM embedding logic embeds the Dolby E bitstream on the same video standard as that of the video input. There is selection logic which routes the Dolby E bitstream to the selected embedding group. The module warns the user if a group is already in use (which is very likely) and the user has the option of blanking all existing groups or replacing the specific group required.

## 2.11.4 Supervisor CPU

The supervisor CPU is the H8S/2633 in common with the other HD platforms, and is located on the video baseboard. The CPU manages the various hardware/firmware blocks in response to the menu options selected on the front panel and on the DARTbus. An EEPROM (not shown on the block diagram) provides non-volatile storage of setup parameters. The DARTbus interface protocol is a Class 7 interface due to the large number of setup and status options presented by the Cat559 encoder.

## 2.11.5 Video I/O to rear module

On the video baseboard the V6304 submodule fits in the sites of both the I/O daughterboard and the submodule in much the same way as the V6333/4 DMX/MUX was implemented. The V6304 submodule accommodates the HMM backplane connector, an (HD)SDI video equaliser, an (HD)SDI video line driver, and BB/TLS reference input circuitry.

# Vistek V6304 HD Dolby E® Encoder



Fig 2: V6304 DOLBY E ENCODER - AUDIO FLOW DIAGRAM

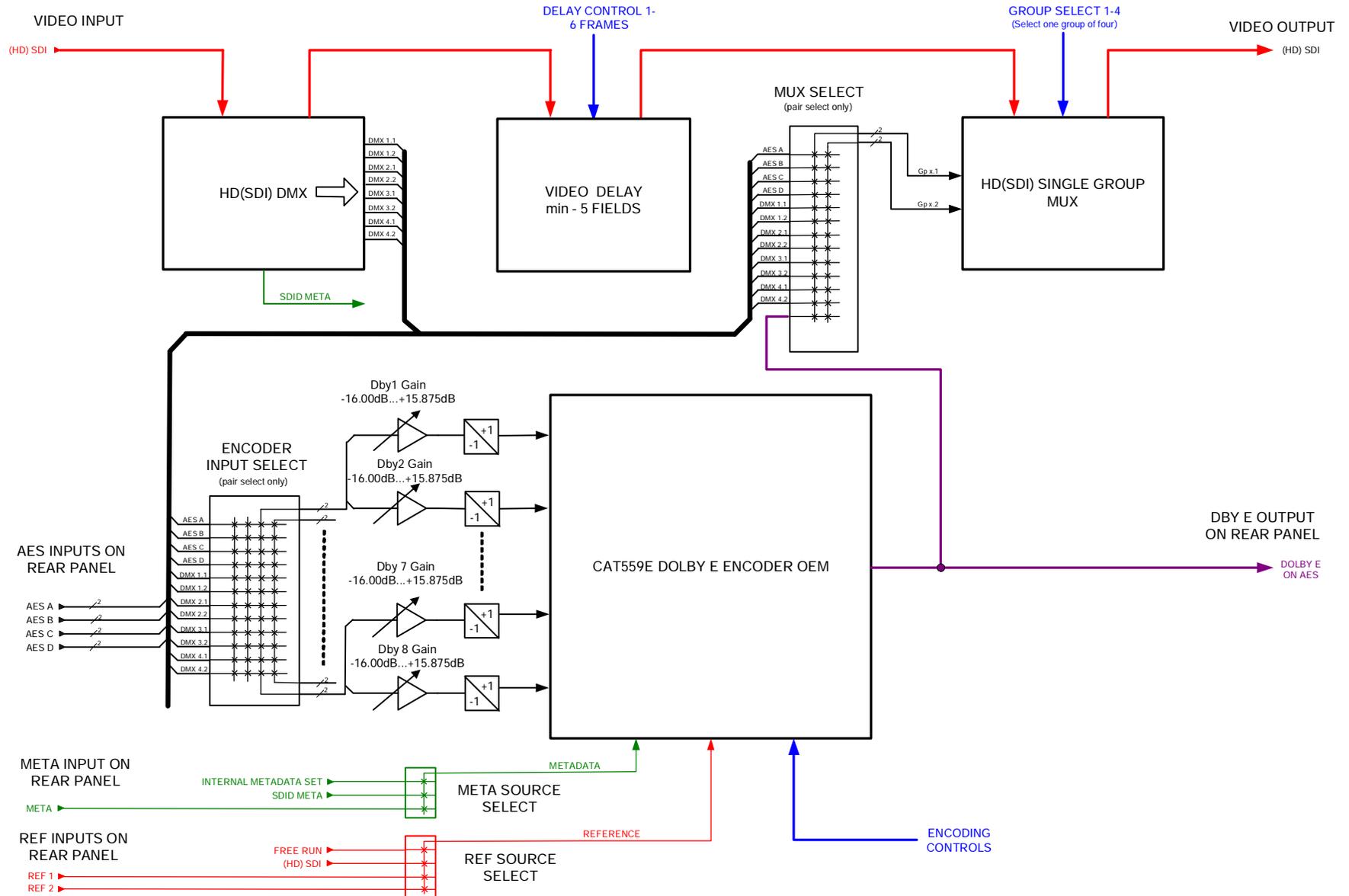
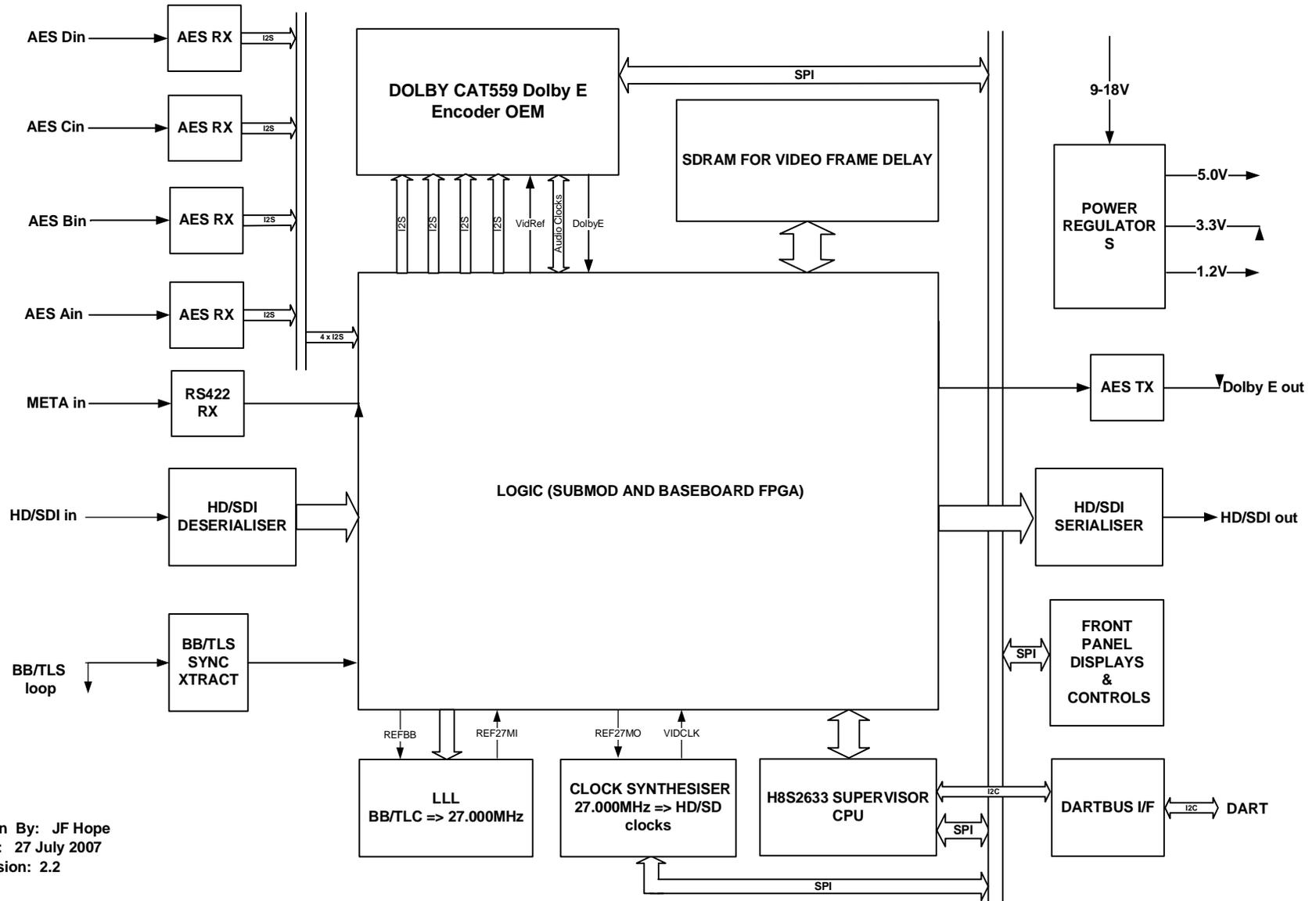


Fig 3: V6304 DOLBY E ENCODER – HARDWARE BLOCK DIAGRAM



Drawn By: JF Hope  
 Date: 27 July 2007  
 Revision: 2.2



## 3 System Operation

### 3.1 Local Control

#### 3.1.1 Start Up

Local control and monitoring of the V6302 is done through the front panel with its eight character LED display and three control buttons **Select**, **▲** and **▼**. There are three LEDs which also contribute to the status indication; these are labelled **+**, **Cal** and **-**.

After power up the display will start at the top level and show the unit type as **V6304**

#### 3.1.2 Menu Control

The **Select** and **▲** and **▼** buttons are used to manoeuvre around the menu system. The menu structure has five levels and the **Select** button is used to go up and down the structure. The **▲** and **▼** buttons are used to move between selections or to adjust a parameter depending on which sort of menu is displayed. The five levels are as follows:

Sleep	Display is blank (except for Banner warnings).
Top Level	As above, <b>V6304</b>
Main Menu	The Main Menu items, such as <b>I/P SEL</b> , <b>DOLBY</b> , <b>ENG'ING</b> etc. These items are all in Upper Case.
Sub Menu	Menu items under each main heading, such as <b>Meta Src</b> under the <b>DOLBY</b> Main menu. These items are all in Sentence Case (generally lower case but with upper case first letters).
Parameter	The lowest level under the Sub Menu, and used to actually adjust a parameter. The display will depend on the actual parameter and may be a value such as <b>+0.000dB</b> for a gain or <b>ON</b> or <b>OFF</b> for a switch variable. There is usually a title to describe the variable and a small icon in the left hand character position, but 8 characters cannot provide for a detailed description.

Some menu options are only available if certain optional submodules have been included. For example the **DMX** controls under **DOLBY** is only available on the V6304/DM variant.

To move down a level just press the **Select** button briefly; then press either the **Select** button again to go down another level or the **▲** and **▼** buttons to move around the options within a level.

To move up a level press and hold the **Select** button for about half a second which will move up one level. If you continue to hold the **Select** button then it will move up a level every half a second until it reaches the Sleep level (one above the Top Level).

A complete list of all the menus is given in Section 6.



## 3.1.3 Menu Examples

This section has examples of how to manoeuvre through the menu system. The first one starts with the unit in its 'sleep' mode where the display is blank, and then proceeds to set the Program Configuration for use with internal metadata to 8x1.

Action	Display	Comments
Select	V6304	Top Level
Select	DOLBY	First Main Menu
▼	Meta Src	
▼	Int Cfg	The Sub Menu we want
Select	5.1+2	The default setting
▲	5.1+2x1	...
▲	4+4	...
▲	4+2x2	...
▲	. . .	...
▲	8x1	Set it to the 8x1 config that we want

Now we shall go force the Reference source to external Ref.1. The following steps should be taken from the current position (Select+Hold means that you should press and hold the select button for about half a second):

Action	Display	Comments
Select+Hold	Int Cfg	UP to the Sub Menu level
Select+Hold	DOLBY	UP again to the Main Menu
▼	STATUS	
▼	ENG'ING	Along to the Engineering Main Menu
Select	Ref. Src	To the Sub Menu we want
Select	Auto	The default setting
▲	SDI In	...
▲	Ref. 1	The setting we want

## 3.1.4 Sleep

If the front panel is not used for a certain amount of time then the display will automatically go into a sleep mode when it will be blank. Pressing any of the buttons will cause it to 'wake up' back into the top level. The time delay before the unit slips into sleep mode can be set up using the **ENG'ING : sLleep** menu.

The brightness of the display can also be adjusted using the **ENG'ING : LEDLevel1** menu.



## 3.1.5 Banner

There are some conditions which need to be directly indicated to the operator and although the display system is highly versatile for a lot of complex operations it is not really convenient for immediate indications. In the past LEDs on the front panel have been used for this purpose.

To help with this a banner message will pass across the screen from right to left to show any critical statuses when the display is in sleep mode. This saves the need to manoeuvre down the menus to find out, for example, that an input has failed. Remember it is not necessary to wait for the time-out period for the unit to go into sleep mode, it can be forced there by going up a level from the so-called Top Level. The Banner function is not yet implemented on the V6304

## 3.1.6 High Level Signal Status

There are two LEDs on the top of the front panel to indicate that the reference and external metadata for Dolby E encoding are present, and consequently these also indicate that they are absent. When the V6304/DM is set to use internal metadata for Dolby encoding with `Meta Src` set to `Int meta`, the status of the external metadata is not important. It is displayed nonetheless so that the operator can first establish the presence of external metadata should they want to select `Meta Src` to `Ext meta`. However there is no direct indication as to the actual reference in use, which when `Ref.Src` is set to `Auto` could be any of the references. Because some installations may use multiple references and therefore need a quick indication of which reference source is in use, there are parallel menus with the Top Level. These are also used to indicate the presence of valid AES audio at the rear panel inputs

If you press the ▲ and ▼ buttons from the Top Level then you will see the `Ref. Src` and `Meta Src` status directly. In each case this will show the signal presence and if it is there then what format it is. Again this is considerably faster than manoeuvring down the menu structure. There are presently five different stati available at this level. They are:

- ▼ `A0 B X C0 D0` etc.
- ▼ `Ref SDI0` or `Ref Ref1X`  
or `Ref Ref20` etc.
- ▼ `Met Int` or `Met Ext0`  
or `Met Ext X`

These indications are still at the Top Level, so a single press of the Select button will immediately move down the menu tree.



## Vistek V6304 HD Dolby E<sup>®</sup> Encoder

### 3.1.7 Variable Calibration

Most variables have a calibrated or normalised value, not all of which are obvious. In the listing of all the variables in Section 6 the normalised value is shown.

Any variable can be individually set to its normalised value by pressing the ▲ and ▼ buttons at the same time.

Within each of the Main Menus at the end of the list of Sub Menus is a pseudo Sub Menu called **Norm**. Selecting into this will let you normalise all the parameters within the Main Menu item to their normalised value.

The three LEDs beside the ▲ and ▼ buttons are used to show whether the variable is calibrated or not. After calibration the **CAL** LED will be ON.



## 3.2 Remote Control

In addition to being controlled with the menu system on the front panel the V6304 can also be controlled over the DART remote control system. For this it should be fitted into a rack which also contains a V6081 Rack Controller. **Note that the earlier V606 Rack Controllers cannot be used with this Class 7 module.** The V6081 Rack Controller provides an interface between all the units in the rack and the external DARTNET network. Various controlling devices are available for accessing units on the DARTNET; these include the V1605 1U hardware panel, the V1602 2U hardware panel, and the more sophisticated ViewNet Client Server PC-based interface. The earlier ViewFind PC-based control system does not support the Class 7 version of the V6304. It is also possible to have third party software written to interact with DARTNET. The details and specification of the DART interface are described elsewhere and may be obtained from Pro-bel.

There are separate settings for the unit when operating in Local and Remote control modes. This means that if the unit is changed between Local and Remote mode then the settings may change. The advantage of this is that if the unit has been set up locally and the operator inadvertently changes to Remote mode (which probably has different, or even default, settings) the local settings are not lost. There could be a disadvantage in that once the unit has been set up remotely it cannot not be switched to Local without causing a disturbance. The V6304 has some settings that are NOT adjustable through the remote control. These are listed below:

ENG' ING	Sleep	Set the display Sleep timeout
ENG' ING	LEDLevel	Set the Display brightness
CONFIG	Banner	Turn the top level display Banner On or Off



## 3.3 Dolby Encoding

### 3.3.1 Dolby E Basics

The Dolby E encoding system is designed to be used within a video environment and encoding is based on frames, each associated with a frame of video. For this reason the Dolby E encoding process requires a *video reference* which provides framing information to tie the encoded audio blocks to video frames.

In Dolby E encoding a *program* is defined as an ensemble of channels carrying related information content, such as a mono signal, a stereo pair, or a multichannel ensemble such as surround sound 5.1. *Program configurations* describe how one or more programs are combined into the ensemble of channels encoded into Dolby E. A Dolby E encoded bitstream can contain more than one program. The format of the program configuration for Dolby E is of the form: **a + b + c + ...** where **a**, **b**, **c** are *separate programs* and are denoted by a number (or number code) indicating the *number of channels within that program*. There are many program configuration possibilities; the full list is shown below.

The Dolby E encoding process accepts up to 8 separate inputs in the form of 4 pairs. In Dolby nomenclature these are referred to as (A1,A2), (B3,B4), (C5,C6) and (D7,D8). Dolby have introduced a convention for the required assignment of signals to the encoder inputs for the various program configurations in Dolby E encoding, which is used for both encoders and decoders. A table of the required Input Channel Assignments is shown below in Table 1.

Output Bitstream format	Program Configuration Meta Cfg	Encoder Input Channel Assignments							
		A1	A2	B3	B4	C5	C6	D7	D8
Dolby E®	5.1+2	0L	0R	0C	0LF	0Ls	0Rs	1L	1R
	5.1+2x1	0L	0R	0C	0LF	0Ls	0Rs	1C	2C
	4+4	0L	0R	0C	0S	1C	1S	1L	1R
	4+2x2	0L	0R	0C	0S	2L	2R	1L	1R
	4+2+2x1	0L	0R	0C	0S	2C	3C	1L	1R
	4+4x1	0L	0R	0C	0S	3C	4C	1C	2C
	4x2	0L	0R	2L	2R	3L	3R	1L	1R
	3x2+2x1	0L	0R	2L	2R	3C	4C	1L	1R
	2x2+4x1	0L	0R	2C	3C	4C	5C	1L	1R
	2+6x1	0L	0R	3C	4C	5C	6C	1C	2C
	8x1	0C	1C	2C	3C	4C	5C	6C	7C
	5.1	0L	0R	0C	0LF	0Ls	0Rs	none	none
	4+2	0L	0R	0C	0S	none	none	1L	1R
	4+2x1	0L	0R	0C	0S	none	none	1C	2C
	3x2	0L	0R	2L	2R	none	none	1L	1R
	2x2+2x1	0L	0R	2C	3C	none	none	1L	1R
	2+4x1	0L	0R	3C	4C	none	none	1C	2C
	6x1	0C	1C	2C	3C	4C	5C	none	none
	4	0L	0R	0C	0S	none	none	none	none
	2+2	0L	0R	none	none	none	none	1L	1R
2+2x1	0L	0R	none	none	none	none	1C	2C	
4x1	0C	1C	2C	3C	none	none	none	none	
7.1	0L	0R	0C	0LF	0Ls	0Rs	0BSL	0BSR	
7.1 Screen	0L	0R	0C	0LF	0Ls	0Rs	0LE	0RE	



The assignment of Dolby E encoder input channels to program channels as defined by Dolby convention is mandatory. Failure to adhere to the convention will result in an encoded bitstream that cannot be properly decoded.

As an aid to the user the V6304 shows the input assignment convention for the active audio coding mode (acmod) under the STATUS menu. A typical example for the 5.1+2 program configuration is shown below:

<b>STATUS</b>	<b>Dby 1/2</b>	<b>0L</b>	<b>0R</b>	Ch 1 = Left front channel program 0
				Ch 2 = Right front channel program 0
	<b>Dby 3/4</b>	<b>0C</b>	<b>0LF</b>	Ch 3 = Centre front channel program 0
				Ch 4 = LF effects channel program 0
	<b>Dby 5/6</b>	<b>0Ls</b>	<b>0Rs</b>	Ch 5 = L surround channel program 0
				Ch 6 = R surround channel program 0
	<b>Dby 7/8</b>	<b>1L</b>	<b>1R</b>	Ch 7= L channel program 1
				Ch 8 =R channel program 1

The settings described in the remaining paragraphs of Section 3.3 are the basic minimum required to set up the V6304 Dolby Encoder with external metadata or factory default internal metadata. The adjustment of AC-3 metadata parameters for use with the internal metadata is of a more specialised nature and may need to be adjusted for a particular application by persons with specialised knowledge of the Dolby E system. These adjustments are described separately under Section 3.4.

### 3.3.2 Input Status

You can find out what the status is of any of the AES rear panel inputs and the DMX groups on the V6304/DM from the **STATUS** menu:

<b>STATUS</b>	<b>AES I/P</b>	<b>AÖ BX CX</b>	
	<b>DMX GP1</b>	<b>G1 s s</b>	if DMX/MUX option installed
			first symbol <b>Ö</b> Gp1.1, 2 <sup>nd</sup> symbol <b>Ö</b> Gp1 .2
		. . .	<b>s = Ö</b> : Original DMX data on this AES
		. . .	<b>s = X</b> : Nothing on this AES
	<b>DMX GP2</b>	<b>G2 s s</b>	Symbols as above for Gp 1
		. . .	
	<b>DMX GP3</b>	<b>G3 s s</b>	Symbols as above for Gp 1
		. . .	
	<b>DMX GP4</b>	<b>G4 s s</b>	Symbols as above for Gp 1



# Vistek V6304 HD Dolby E® Encoder

## 3.3.3 Input Selection and DMX Group

On the V6304 the source of audio for each of the four encoder input pairs A,B,C,D may be sourced from the rear panel inputs AES A through AES D such that:

Rear Panel AES[A..D] => Encoder Inp[A..D]

On the V6304/DM the number of input sources is extended to include channels from the DMX groups with several options for consecutive channel allocation provided, for example

DMX Gp [1.1...2.2] => Encoder Inp [A..D]

DMX Gp [3.1...4.2] => Encoder Inp [A..D].

The V6304/DM furthermore allows the start of the block of 4 consecutive pairs in the DMX channels to be assigned automatically from the SDID in the digital video.

On both V6304 and V6304/DM shuffling - but no mixing - may be done on a pair for pair basis through the **ENG' ING** menu so that for example on the V6304/DM:

Rear Panel AES[D, Gp1.1,B,C] => Encoder Inp[A,B,C,D]

Input Selection menu:

<b>I/P SEL</b>	<b>I/P Sel</b>	<b>AES</b>	default setting
		<b>DMX SDID</b>	on V6304/DM only
		<b>GP 1/2</b>	on V6304/DM only
		<b>GP 3/4</b>	on V6304/DM only
		<b>Eng'ing</b>	
	<b>Norm</b>	<b>N *****</b>	

## 3.3.4 Input Gains

Each of the six channels which can be input to the Dolby E encoding process can be gain trimmed over a range of -16dB to +15.875dB in increments of 0.125dB. The gains are effected downstream of the Input Selection and may be adjusted from the **I/P GAIN** menu.

<b>I/P GAIN</b>	<b>Gn Dby1</b>	<b>0.00dB</b>	(default)
	<b>Gn Dby2</b>	<b>+4.00dB</b>	
	<b>...</b>		
	<b>Gn Dby8</b>	<b>-3.25dB</b>	

## 3.3.5 Input Phases

Each of the six channels which can be input to the Dolby E encoding process can be phase flipped, ie inverted. The phase flips are effected downstream of the Input Selection and may be adjusted from the **I/P PHASE** menu.

<b>IP PHASE</b>	<b>Phs Dby1</b>	<b>0°</b>	(default)
	<b>Phs Dby2</b>	<b>0°</b>	(default)
	<b>...</b>		
	<b>Phs Dby8</b>	<b>180°</b>	

## 3.3.6 Input Delays

Function is not presently supported.



## 3.3.7 Synchronisation

All encoder input signals including those from the DMX on the V6304/DM are resynchronised by means of sample rate converters to be coherent with the video reference used by the Dolby encoder. It is possible through the ENG'ING menu to bypass these sample rate converters, but then the applied inputs must be pre-synchronised to the video reference.

The video reference may be the SDI input, one of two external video B/B inputs, or the V6304's free running oscillator. An *Auto* mode is provided, which should suffice for most applications. In Auto mode, the preferred sequence of reference source connection is SDI input => Ref. 1 => Ref. 2 => Free Run. This means that so long as you have an SDI input present, it will be used as the video reference source, irrespective of what other reference sources may be present. Some applications will not find this appropriate, so the Auto mechanism may be overridden and facility is made to force a particular reference source if required. The reference is selected from the ENG'ING menu at the Ref Src sublevel as follows:

```

ENG'ING   Ref Src   Auto           (default)
          SDI in
          Ref 1
          Ref 2
          Free
    
```

Both the V6304 rear panels have a pair of BNC sockets for a REF. LOOP (in and out), and a slide switch that selects between 'Ref.2' and 'Loop'. This switch must be correctly set for the particular reference connection employed. The lower BNC socket is always used as Ref. 1 IN. The next BNC socket (2nd from the bottom) will be used as Ref.2 IN when the slide switch is in the Ref.2 position, and for the Ref.1 OUT, when the slide switch is in the 'Loop' position. Input impedance of Ref.1 IN and Ref.2 IN may be set to either Hi-Z or 75Ω by means of the jumper links described in Section 2.

For the SDI input the **STATUS** will display the video standard present on the input. For the B/B references Ref.1 and Ref.2 the **STATUS** will display the presence and field rate of the reference applied under REF I/P. **REF src** will display which reference source (SDI, Ref 1 or Ref 2) is presently being used, and **REF std** will display the standard of that reference. For example:

```

STATUS   I/P Std   720p59
STATUS   REF I/P   Ref1  590
STATUS   REF Src   Ref REF1
STATUS   REF Std   720p59
    
```

Whenever the reference source is Free run, having defaulted there in Auto mode or having been forced to Free run, there is a choice of Default Frame Rate. This is set on the CONFIG menu as follows:

```

CONFIG   Def. F/R   LastUsed
          50 Hz    Free run frame rate is whatever was last applied
          59.94 Hz Fixed at 50Hz (Dby Del in 625i50 lines)
          Fixed at 59.94 Hz (Dby Del in 525i59 lines)
    
```



# Vistek V6304 HD Dolby E® Encoder

## 3.3.8 Metadata and Metadata Source

Metadata is a frame-by-frame set of bits associated with both the Dolby E encoding process and any subsequent AC-3 coding process that may be applied to each of the programs in the Dolby E carrier. Metadata consists of a single Dolby E part and an AC-3 part for each program.

Metadata input to the Dolby E encoding process is used partly by the Dolby E encoder and is further output by the encoder as part of the encoded Dolby E bitstream. Dolby E decoders receiving the bitstream will use it to decode the Dolby E and will also output it as a discrete metadata stream along with its associated decoded PCM channels. If these PCM channels and metadata are input to an AC-3 coder, it will use the AC-3 parameters within the metadata to control the AC-3 encoding process. Put simply: Dolby E coders use the Dolby E part of the metadata and Dolby Digital (AC-3) coders ignore it. Dolby Digital (AC-3) coders use the AC-3 part of the metadata, whereas Dolby E coders only taxi it around.

The source of the metadata must be set up for the V6304 Dolby E encoder, which as a minimum needs the Program Configuration from the Dolby E part of the metadata to control the Dolby E encoding process. The V6304 can use either internal metadata as defined by factory defaults (or user adjusted) or external metadata applied to the rear panel connector.

The V6304/DM has an additional source of metadata. The (HD)SDI video stream can carry up to 9 embedded metadata streams as per SMPTE 2020-1 draft. This metadata will usually apply to program material to be encoded carried on the same (HD)SDI stream. Details on how the SDID system works may be found in the Appendix. The Metadata source is selected from the **DOLBY E** menu as follows. The **Meta src** control is like a 'master switch' - whatever source is selected will be invoked and the other sources will be disregarded. If the /DM option is fitted, **Ext Meta** selects which external source to use.

<b>DOLBY E</b>	<b>Meta Src</b>	<b>Int meta</b>	Metadata sourced from internal settings.
		<b>Ext meta</b>	Metadata sourced from external stream – see also Meta Rvt under ENG'ING
	<b>Ext Meta</b>	<b>Ser meta</b>	Metadata sourced from serial stream
		<b>SDI meta</b>	Metadata sourced from SDI stream - see also SDID and Meta Rvt under ENG'ING

In general Internal metadata will be used in any circumstances where an external metadata stream is unavailable. This is typically when the encoder is performing first-time encoding of a set of PCM audio channels into Dolby E. The PCM channels may represent programs that may later be AC-3 encoded for broadcast transmission or storage on consumer media such as DVD, or they may be straight PCM that's not ever to be encoded. The internal metadata will have a Dolby E part that's used for the Dolby E encoding, and it will have an AC-3 part which will be included in the output bitstream. The internally generated metadata set is automatically framed at the frame rate of the video reference applied.



## 3.3.9 External Metadata - Status

External metadata is used when the Dolby E encoder is re-encoding a set of PCM audio channels that have previously been decoded from a Dolby E bitstream by a Dolby E decoder. In this case it is important that coding parameters for the Dolby E encoding, as well as AC-3 parameters destined for downstream AC-3 coders are preserved in the re-encoding. The Dolby E decoder generates a set of metadata bits from the decoding process and outputs as this as discrete stream. The Dolby E encoder accepts this metadata stream as input and incorporates it in the Dolby E bitstream. When external metadata is used the program configuration is derived from the external metadata stream and the internal program configuration set by the user is ignored.

The presence of external metadata and details about it may be established by looking at several entries under the **DBY STAT** menu. These stati are readable irrespective if the V6304 is encoding with Internal or External metadata.

<b>DBY STAT</b>	<b>Meta I/P</b>	<b>s s s</b>	Serial metadata /SDI metadata present/absent <b>s = 0</b> : There is metadata present on this source <b>s = C</b> : There is no metadata on this source 1 <sup>st</sup> symbol relates to serial meta on the rear panel input 2 <sup>nd</sup> symbol refers to embedded meta on any of the 9 SDID 3 <sup>rd</sup> symbol refers to embedded meta on the <i>selected</i> SDID
<b>DBY STAT</b>	<b>Ext Meta</b>	<b>Absent</b> <b>Invalid</b> <b>No AC-3</b> <b>Valid</b> <b>ValidBSI</b>	Metadata not present Metadata invalid Metadata does not include AC-3 Valid but no extended BSI Valid with extended BSI

The **REM** LED on the V6304 front panel gives real time indication on the validity of the currently selected external metadata source, irrespective whether the encoder is using internal or external metadata.

The *program configuration* of the external metadata may be used to identify the program corresponding to the encoding to be done and also to ascertain its *program number* within the metadata stream.

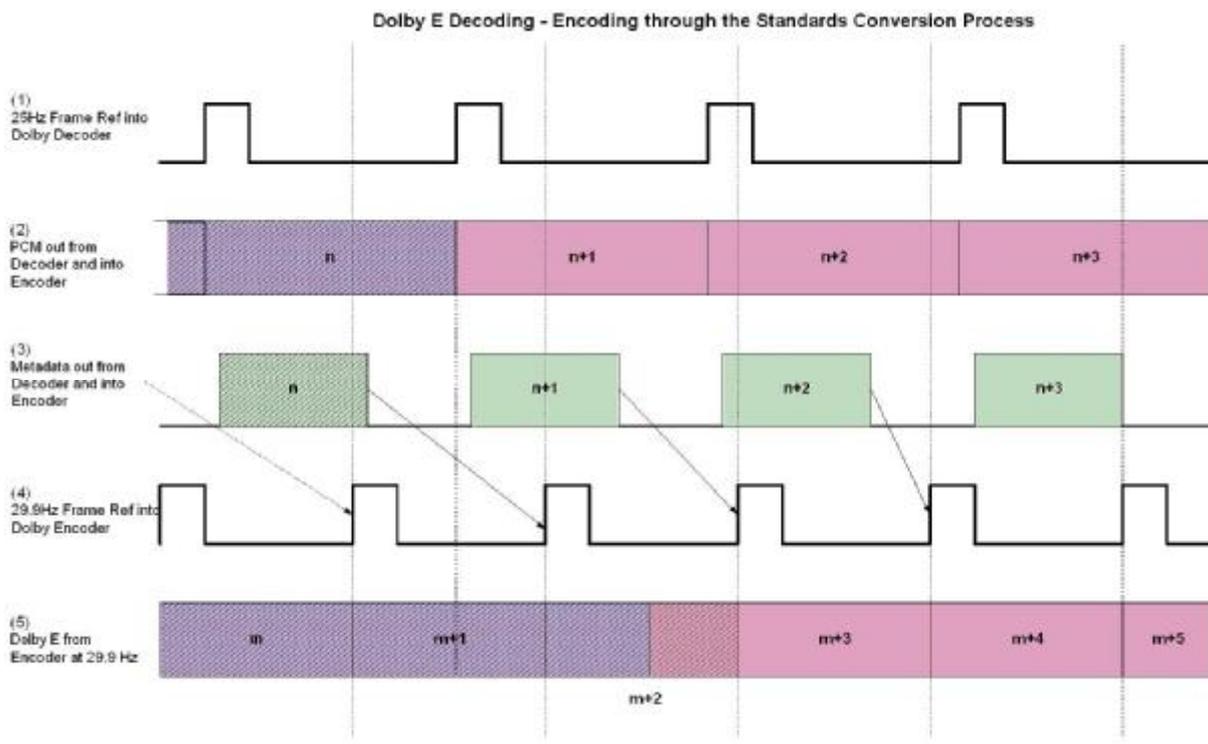
<b>DBY STAT</b>	<b>Meta Cfg</b>	<b>5.1+2</b> <b>5.1+2x1</b> <b>4+4</b> <b>4+2x2</b> <b>. . .</b>
-----------------	-----------------	--

A common use for the V6304 with external metadata is in Standards Conversions (SC) applications. In an SC application, Dolby E-encoded bitstreams at the input frame rate are required to be decoded, the resulting PCM delayed so as to properly match delays in the video chain, and then re-encoded to Dolby E bitstream at the output frame rate. In this application, of which a block diagram is shown in Figure 5, the decoding of Dolby bitstream, the processing and delay matching of the resulting PCM signals may be performed by a Pro-bel V6302 module. PCM audio channels and a discrete stream of Dolby metadata are output by the V6302 module and then input to the V6304 Dolby E encoder module, which re-encodes the PCM into Dolby E and incorporates the AC-3 metadata parameters into the Dolby E bitstream. Thus the re-encoded Dolby E bitstream will be functionally identical to the original Dolby E bitstream, but at a different frame rate.

The use of the V6304 with an external metadata stream having a frame rate other than that used for encoding is subject to a software modification on the encoder OEM by Dolby Laboratories. Dolby Firmware of version 1120 or later is required. Early versions of the V6304 may have encoder OEMs without this capability. Please refer to Pro-bel Engineering for further information.

When the Dolby E encoder uses external metadata stream having a different frame rate than that used for encoding, it will always use control from the last valid frame of external metadata received. This difference in frame rates will lead to a fundamental limitation which is shown in Figure 4.

**Figure 4**



Metadata is frame-based, ie metadata blocks are designed to be associated with a given frame of PCM data input to the Dolby E encoder. Usually, the nature of most metadata content is that it is quasi-stationary and it's not strictly necessary to have metadata input on a frame-by frame basis. However, strictly speaking, parameters having a major impact, such as DialNorm or Program Configuration may be changed 'on the fly'. Figure 3 shows that in an SC application it is not possible to have seamless transition of audio through an SC with a step change in metadata values because Dolby E is inherently frame-based. Signal (2) shows PCM audio coming from a Dolby decoder, with its associated metadata stream in Signal (3) and 25Hz frame reference in Signal (1). The hatched areas indicated program material corresponding to a specific program configuration carried by the metadata. The PCM audio content changes appropriately with this metadata and is shown as a change in colour from mauve to pink. It can be seen that within the 25Hz clock domain, all changes in program configuration are appropriately made at a frame boundary.



The PCM and Metadata of Signal (2) and (3) respectively are fed to the input of a Dolby encoder, along with a 29.9Hz frame reference which is completely asynchronous to the 25Hz system. The Dolby encoder always applies the most recent full frame of received metadata on the 29.9Hz frame boundary, because it, too, is frame-based. Signal (5) shows the encoded Dolby E output. Hatching indicates that encoding that has been done with the hatched metadata set. It can be seen in frame m+2 of the encoded Dolby output in Signal (5) that PCM intended for encoding by unhatched metadata (ie pink) is being encoded according to metadata from the 'unhatched' set. This will cause an audio disturbance of maximum duration of one frame.

Dolby Laboratories have acknowledged this issue and at the present time the only workaround is to control program content prior to the original coding to Dolby E and ensure that changes in encoding configuration are only made when the PCM audio content has been faded to zero. Another way of looking at this is that Dolby E cannot support X-fades in an SC application; only V-fades are accommodated. Differential delay between input PCM and input metadata exacerbates this situation and the difference in delay should be minimised in decoding equipment.

### 3.3.10 Program Configuration

The Program Configuration used by the Dolby E encoder core may be read from the **DBY STAT** menu as shown below. It shows the Program Configuration of the *metadata presently in use*, whether it be sourced internal, external or from SDI:

```

DBY STAT  Prog Cfg  5.1+2
                    5.1+2x1
                    4+4
                    4+2x2
                    . . .
    
```

When using external metadata, either serial or SDI, the program configuration is determined by the Dolby E part of the external metadata stream and the user has no control over it. When the metadata source is set to Internal (**Int Meta**), the Dolby E encoder has no way of telling what Program Configuration to use, and the user must define this by setting an internal program configuration appropriate to the nature of the program material input to the encoder. The internal Program Configuration is set on the **DOLBY E** menu as follows:

```

DOLBY E   Prog Cfg  5.1+2           These only in effect when Meta Src set to Int meta
                    5.1+2x1
                    4+4
                    . . .
    
```

**Note:** To load the chosen Program Configuration, once it is displayed on the V6304 display, it is necessary to briefly 'blip' the SEL button. In the V6304, it is so that whenever a set of parameters will be exchanged, such as loading a program configuration or loading/saving a user preset or changing the AC-3 metadata set for internal metadata edit, the SEL button must be 'blipped'. If this is not done, the display will change back to its previous setting after 15 seconds.



## Vistek V6304 HD Dolby E<sup>®</sup> Encoder

### 3.3.11 Dolby bit depth

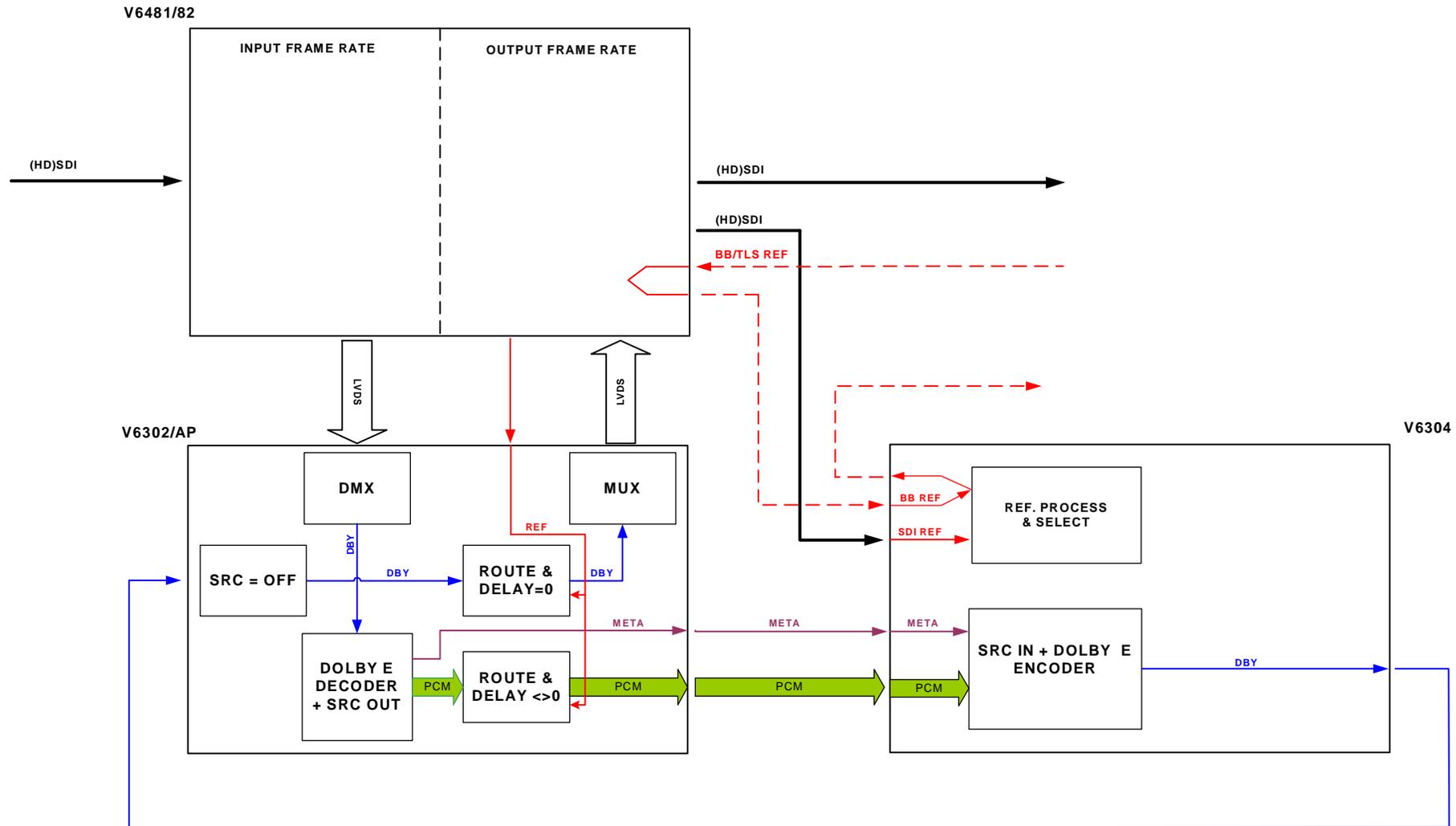
The V6304 supports Dolby E encoding with bit depth of 16 or 20 bits. Default is 20 bits.

DOLBY E	Dby Bits	16 bit
		20 bit

# Vistek V6304 HD Dolby E® Encoder



Figure 5 - V6304 in a typical Standards Converter Application





# Vistek V6304 HD Dolby E<sup>®</sup> Encoder

## 3.3.12 Metadata revert mode

This setting determines what happens if the V6304 is running with external metadata and the external metadata fails. The V6304 can revert to either internal metadata or the last valid external metadata received (default). If no valid external metadata has ever been received the V6304 will default to internal metadata.

DOLBY E	Meta Rvt	Last Use	(default)
		Internal	

## 3.3.13 Pass though Mode and SRCs

The V6304 can be set either to place encoded Dolby E on the Dolby E output, or to pass through whatever signal is on the Dby1/2 input to the Dolby E output. Normally this would be restricted to a PCM signal, because the Dolby E encoder's sample rate converters will not pass through a bitstream unaltered. When bit for bit passthrough is required, for example to pass through an existing AC-3 or Dolby E signal, the SRC's on the V6304 must be turned off. Turning the SRCs off enforces the restriction that the signal on Dby1/2 must be pre-synchronised to the same clock reference as the V6304 is using, and the V6304 must not be set to use a free-run reference.

DOLBY E	Enc Mode	Encode Passthru	(default)
DOLBY E	SRC	Normal Bypass	(default) requires inputs pre-sync'd with ref

## 3.3.14 Video Delay (V6304/DM only)

Dolby E encoding creates a default delay of one video frame in the audio. In order that video and audio synchronism not be lost, the V6304/DM introduces a compensating delay in the video output. This control is not applicable to the standard V6304 which has no video output other than a loop through of the input. The units of the video delay adjustment are video fields, relative to a default of one complete frame. The range of adjustment is min fields to +5 fields relative to one full frame. It should be borne in mind when adjusting this setting that all progressive video standards have field rate equal to frame rate, whereas interlaced video standards have field rate of twice the frame rate.

ENG'ING	Vid Del	min	minimum absolute delay
		Ÿ	
		0f	compensated with zero nett delay (default)
		ß	
		+5f	



### 3.3.15 Dolby Frame Delay

Sometimes it may be required to provide a small offset between the start of a Dolby E frame and the start of the reference video frame to increase or decrease the *guard space*. The V6304 provides an adjustment to offset the reference supplied to the Dolby E encoder from -16 lines to +15 lines with respect to the video reference in use. The standard of the reference in use can be seen in the ENG'ING menu under REF Std. When the V6304 is in free run the last reference standard is remembered and the Dolby delay is still relative to this. If the V6304 is forced to use an internal 59Hz or 50Hz reference while in free run the Dolby delay will be in 525i59 or 625i50 lines respectively.

```

DOLBY E   Dby Del   -16L
                Y
                0           default
                B
                +15L
    
```

### 3.3.16 Dolby Encoding Status

The V6304 and V6304/DM provide indication of the status of the encoding taking place through entries under the STATUS Menu. The most important of these is **Dby Enc** which is a high level status of the Dolby Encoder and can show **Encode** or **Error**. In the event of Dby Enc showing Error there will be no encoded output. To diagnose the cause of this you should inspect the status of **Dby Sync**, which reports validity of the reference applied to the Dolby Encoder OEM.

```

DBY STAT   Dby Enc   Encode
                Error
    
```

### 3.3.17 Dolby Sync Status

As has been mentioned, the Dolby E system is based on a video frame reference and such must be applied for encoding to work properly. There is a status which gives the health of the sync signal presently applied to the Dolby E encoder core of the V6304.

```

DBY STAT   Dby Sync   Sync 0           Sync present and correct
                Sync C           Sync present but not correct
                Absent           Sync absent
    
```



## 3.4 Working with Metadata

When using external metadata, there are no metadata parameters under user control. When using internal metadata, the Program Configuration is the only Dolby E part of the metadata under user control, and most of the AC-3 part of the metadata is under user control. The AC-3 metadata parameters are not used in the Dolby E encoding process, but are incorporated in the Dolby E bitstream for use by downstream coders.

This section describes how to make adjustments to the AC-3 part of the metadata and save them for later use. To be in a position to adjust AC-3 metadata, the user must have selected the metadata source to internal metadata. This directs the V6304 to get its metadata from its internal metadata store, rather than an external stream. The internal metadata store is non-volatile and contains a full set of adjustable AC-3 metadata parameters for each of the (up to 8) programs defined by the selected program configuration. The original factory settings are the Dolby Labs factory default values for the particular program configuration selected and are given in Appendix A. Adjustment of the AC-3 metadata settings is made under the **INT META** menu, which will only be displayed when **Meta Src** is set to **Int Meta**.

### 3.4.1 Reading the AC-3 Output Metadata values

Output metadata is the AC-3 metadata that's actually being output on the Dolby E bitstream on a given program within the program configuration. Output metadata may be read, irrespective of whether the encoder is using internal or external metadata. The user can read the values of the output metadata parameters from the **O/P META** menu. For example, if the program configuration is 5.1+2, there are two programs: The 5.1 program is program 1 and the 2 program is program 2 and each has an AC-3 metadata set associated with it. Because the V6304 can only display one set of AC-3 metadata at a time, the user has to select the program number of the set that they wish to see displayed. This is done on the **DOLBY E** menu:

<b>DOLBY E</b>	<b>AC3 Prog</b>	<b>Prog 1</b>	first program in current program config
		<b>Prog 2</b>	second program in current program config
		...	

Only those program numbers which are present in the current program configuration will be displayed; it is not possible to select a non-existent program. Changing the program involves the loading of an entire set of parameters into the V6304 internal metadata store, and requires the user to briefly 'blip' the **SEL** button once the desired program number is displayed. Confirmation of the selected program number may be found on the **O/P META** menu itself.

<b>O/P META</b>	<b>AC3 Prog</b>	<b>Prog 1</b>	first program in current program config
		<b>Prog 2</b>	second program in current program config
		...	



**Note:** The program selected above for display in the O/P **META** menu is also applied as the program under adjustment in the **INT META** menu, when the metadata source is set to internal. Under the **INT META** menu, **Prog ID** is a status only and cannot be adjusted.

```

INT META  AC3 Prog  Prog 1      first program in current program config
                Prog 2      second program in current program config
                ...
    
```

### 3.4.2 Internal AC-3 Metadata - Restoring the Factory Default

If internal AC-3 metadata has been adjusted, it may sometimes be required to return to the Dolby Labs factory defaults of internal AC-3 metadata *for the present program configuration*. With metadata source selected to Internal, this may be done on the **INT META** menu by using the **Norm** and **Norm All** functions which are right at the bottom of the menu. **Norm** initialises the presently selected program's metadata values to the factory default. **Norm All** initialises the metadata sets of all the programs to the factory default. To invoke the Norm functions, with the asterisks shown in the display, briefly press the **▲** and **▼** buttons together. The + and - LEDs will blink to confirm the action.

```

INT META  Norm          N *****  sets factory default on presently selected program
                Norm All N *****  sets factory default on all programs
    
```

### 3.4.3 Internal Metadata - Loading Presets

The V6304 has two user defined program configurations with their associated sets of internal metadata that may be loaded into the internal metadata store. They are called User 1 and User 2. To load one of these presets, first ensure that **Meta Src** is set to **Int Meta**. Then select **LoadUser** under the **DOLBY E** menu, scroll up or down until the desired preset name **User 1** or **User 2** is displayed. Finally, momentarily press - 'blip' - the **SEL** button once. The **INT META** menu will remain displayed when a preset is loaded, and the the values of the metadata parameters for the preset may be adjusted.

```

DOLBY E  LoadUser  User 1      Preset: User 1
                User 2      Preset: User 2
    
```

**Note:** Loading the preset also loads the program configuration with which it was saved. In other words, both the Dolby E part and the AC-3 part of a metadata set are stored in a preset. This reduces the risk of loading an inappropriate metadata values for a given program configuration.



## 3.4.4 Internal Metadata - Saving Presets

The present program configuration and all its associated metadata present in the internal metadata store may be saved to any one of the two User Presets, **User 1** and **User 2**. Controls for saving the metadata set to a preset are under **SaveUser** submenu of the **DOLBY** menu. To save a preset, go to the **DOLBY E** menu, scroll down to the **SaveUser** submenu and select the target preset name. When it is displayed, momentarily press - 'blip' - the **SEL** button once. The preset will be saved and will overwrite whatever was previously in the preset. The preset save saves all the metadata values for all the programs in the program configuration, as well as the program configuration itself. The values in the internal metadata store are not affected by the save.

<b>DOLBY E</b>	<b>SaveUser</b>	<b>User 1</b>	intl metadata store => User1 preset
		<b>User 2</b>	intl metadata store => User2 preset

## 3.4.5 External Metadata - Status

The presence of external metadata and details about it may be established by looking at several entries under the **DBY STAT** menu. Note that all the status applies to the *selected* external metadata stream. These stati are readable irrespective if the V6304 is encoding with Internal or External metadata.

<b>DBY STAT</b>	<b>Meta I/P</b>	<b>s</b>	<b>s</b>	Serial metadata /SDI metadata present/absent <b>s = 0</b> : There is metadata present on this source <b>s = C</b> : There is no metadata on this source 1 <sup>st</sup> symbol relates to serial metadata I/P on rear panel 2 <sup>nd</sup> symbol relates to metadata embedded on SDI
-----------------	-----------------	----------	----------	--

<b>DBY STAT</b>	<b>Ext Meta</b>	<b>Absent</b>	Metadata not present
		<b>Invalid</b>	Metadata invalid
		<b>No AC-3</b>	Metadata does not include AC-3
		<b>Valid</b>	Valid but no extended BSI
		<b>ValidBSI</b>	Valid with extended BSI

The V6304/DM can receive external metadata through the SDI and in this case there is an associated parameter called SDID which indicates which embedded channel has on it the start of the contiguous ensemble of embedded audio channels to be used for encoding.

<b>DBY STAT</b>	<b>SDID</b>	<b>No SDID</b>
		<b>Gp1.1</b>
		<b>Gp1.2</b>
		<b>...</b>
		<b>Gp4.2</b>

The status **Prog Cfg** under **DBY STAT** menu shows the program configuration presently being used. Therefore the program configuration of the external metadata may be read from the **DBY STAT** menu provided the metadata source has first been set to external.

<b>DBY STAT</b>	<b>Prog Cfg</b>	<b>5.1+2</b>
		<b>5.1+2x1</b>
		<b>4+4</b>
		<b>4+2x2</b>
		<b>...</b>



## 3.5 Internal AC-3 Metadata Configuration

The **INT META** menu is only displayed when the V6304 is set to use internal metadata. The menu contains a large number of controls which will be discussed in the sections below. It should be noted that Pro-bel has adhered to recommendation from Dolby Labs as to which parameters are adjustable for which programs. This means that not all parameters are adjustable for all programs - if a parameter name does not appear in the display for a given program, it has been deemed non-adjustable. It should be remembered that adjusting the AC-3 parameters will not affect coding of the Dolby E in the V6304 and will only affect downstream coding of the AC-3 programs in a Dolby Digital or other AC-3 coder.

### 3.5.1 AC3 Prog

This is a status which shows the ID of the selected program within the present program configuration. It is read-only and you cannot use it to change the selected program. To change the **AC3 Prog** you should select the desired program under **AC3 Prog** of the **DOLBY E** menu and 'blip' the **SEL** button.

### 3.5.2 Dialog Normalisation

Dialog Normalisation (abbreviated to **DialNorm**) represents the long-term A-weighted average level of dialogue within a presentation,  $Leq(A)$ . This level can be quantified with a suitable Broadcast Loudness Meter. When received at the consumer's AC-3 decoder, **DialNorm** determines a level shift in the decoder that sets, or *normalizes*, the average audio output of the decoder to a preset level. This aids in matching audio volume between program sources. The V6306 allows DialNorm to be adjusted in the range -31dB to -1dB in 1dB steps. Dialog Normalisation is available for adjustment on all AC-3 programs.

<b>INT META</b>	<b>DialNorm</b>	<b>-1 dB</b>	
		-	
		<b>-27dB</b>	Default
		-	
		<b>-31dB</b>	



# Vistek V6304 HD Dolby E® Encoder

## 3.5.3 Audio Coding Mode

Audio Coding Mode (abbreviated to AC Mode or acmod), also known as *Channel Coding Mode* indicates the active channels within the encoded bitstream and instructs the encoder which inputs to use for this particular program; it tells the consumer's decoder what channels are present in this program so the decoder can deliver the audio to the correct speakers. It is a universal metadata parameter and the setting is described as X/Y, where X is the number of front channels (Left,Center, Right) and Y the number of rear (Surround) channels. AC Mode is available for adjustment on all AC-3 programs.

<b>INT META</b>	<b>AC Mode</b>	3/2	Audio Coding Mode or Channel Coding Mode
		2/2	
		3/1	(n Front channels ) / (n Surround channels)
		2/1	
		3/0	
		2/0	
		1/0	

In Dolby E the program configuration restricts the coding modes that can meaningfully be applied. For example in the 5.1+2 program configuration, where program 1 is a 5.1 channel, it must use AC mode 3/2, and if you set it to something inappropriate like 2/0, the metadata setting will conflict with the program configuration and the results may be unpredictable.

## 3.5.4 Low Frequency Effects Channel

The Low Frequency Effects channel is sometimes known as *subwoofer channel* and the universal metadata parameter is abbreviated **LFEon** . The status of **LFEon** indicates to an AC-3 encoder/decoder whether an LFE channel is present within the bitstream. Audio Coding Mode determines whether the LFE Channel parameter can be set. Although **LFEon** is available for adjustment on all AC-3 programs, it should be borne in mind that there must be at least three channels present to be able to add an LFE channel. The AC Mode should always be set to a value appropriate to the Dolby E program configuration. For example, for a program configuration of 5.1+2 the ACMode 3/2 is appropriate for program 1 and 2/0 for program 2. Swapping these around would have unpredictable results at the consumer decoders.

<b>INT META</b>	<b>LFE Chan</b>	<b>LFE on</b>	LFE channel on
		<b>LFE off</b>	LFE channel off



## 3.5.5 Bitstream Mode

Abbreviated to BS Mode, this universal metadata parameter describes the nature of the encoded program material. It is adjustable for all AC-3 programs. The options are:

INT META	BS Mode		
	<b>MainComp</b>	Main Complete:	From 2 to 6 channels with all content. Default setting
	<b>Mus&amp;Effc</b>	Music & Effects:	Main serice minus the dialog channel. Usually associated with a separate Dialogue program
	<b>VisualIm</b>	Visually Impaired:	1 channel containing narrative description of an associated video channel.
	<b>Hear Imp</b>	Hearing Impaired:	1 channel containing all content , processed for increased intelligibility.
	<b>Dialogue</b>	Dialogue:	1 or 2 channels containing dialog. Usually associated with a separate Mus&Effc program.
	<b>Commntry</b>	Commentary:	1 channel with supplementary commentary
	<b>Emergency</b>	Emergency:	1 channel for emergency messages with priority to mute all other programs
	<b>VO/Karao</b>	Voice Over/Karaoke:	(coding mode = 1) Voice Over: A single channel to be decoded and mixed with the centre channel.  (coding mode > 1) Karaoke: Left and right channels have music. Centre channel has a guide melody. Ls and Rs have optional backing vocals.

## 3.5.6 Line Mode Compression Profile

This universal metadata parameter is often called *Dynamic Range Control* and abbreviated *DynRng*. In the V6306 it is abbreviated **LineMode**. The Line Mode Compression Profile may take the following preset values which have been designed for a range of content producers:

INT META	LineMode	
	<b>None</b>	
	<b>Film Std</b>	
	<b>Film Lgt</b>	
	<b>MusicStd</b>	
	<b>MusicLgt</b>	
	<b>Speech</b>	

Line-level or power-amplified outputs from two-channel set-top decoders, two channel digital televisions, 5.1-channel digital televisions, Dolby Digital A/V surround decoders, and outboard AC-3 adapters use Line Mode. The values of the compression parameters associated with each of these profiles, as well as the profile curves themselves are given in the Dolby Laboratories document : *Dolby Metadata Guide Issue 3* which is available online from <http://www.dolby.com>. The Line Mode Compression Profile is adjustable for all AC-3 programs.



# Vistek V6304 HD Dolby E® Encoder

## 3.5.7 RF Mode Compression Profile

Abbreviated **RFMode**, RF mode is designed for products (such as set-top boxes) that generate a downmixed signal for connection to the RF/antenna input of a television set; however, it is also useful in situations where heavy DRC is required—for example, when small PC speakers are used for DVD playback. In RF mode, high- and low-level compression scaling is not allowed. When RF mode is active, that compression profile is always fully applied. *Dolby Metadata Guide Issue 3* contains more details. The V6306 provides the preset options as below for this universal metadata parameter: The RF Mode Compression Profile is adjustable for all AC-3 programs.

<b>INT META</b>	<b>RFMode</b>	<b>None</b>
		<b>Film Std</b>
		<b>Film Lgt</b>
		<b>MusicStd</b>
		<b>MusicLgt</b>
		<b>Speech</b>

## 3.5.8 Centre Downmix Level

When the encoded audio has three front channels (L, C, R), but the consumer has only two front speakers (left and right), this parameter indicates the nominal downmix level for the Center channel with respect to the Left and Right channels. AC-3 decoders use this universal metadata parameter during downmixing in Lo/Ro mode when Extended BSI parameters are not active. The Centre DownMix Level is only adjustable for AC-3 programs that have 4 or more channels. The following options are available for Centre Downmix Level, which is abbreviated **C MixLev** on the V6306.

<b>INT META</b>	<b>C MixLev</b>	<b>-3.0 dB</b>	with respect to L and R channels
		<b>-4.5 dB</b>	
		<b>-6.0 dB</b>	

## 3.5.9 Surround Downmix Level

When the encoded audio has one or more Surround channels, but the consumer does not have surround speakers, this parameter indicates the nominal downmix level for the Surround channel(s) with respect to the Left and Right front channels. AC-3 decoders use this universal metadata parameter during downmixing in Lo/Ro mode when Extended BSI parameters are not active. The Surround DownMix Level is only adjustable for AC-3 programs that have 4 or more channels. The following options are available for Surround Downmix Level, which is abbreviated **S MixLev** on the V6306:

<b>INT META</b>	<b>S MixLev</b>	<b>-3.0 dB</b>	with respect to L and R channels
		<b>-6.0 dB</b>	
		<b>off</b>	Surround channels do not contribute to the mix

## 3.5.10 Dolby Surround Mode

This universal metadata parameter indicates to a Dolby Digital decoding product that also contains a Dolby Pro Logic decoder (for example a 5.1-channel amplifier), whether or not the two-channel encoded bitstream contains a Dolby Surround (Lt/Rt) program that requires Pro Logic decoding. Decoders can use this flag to automatically switch on Pro Logic decoding as required. Dolby Surround Mode is available for adjustment on AC-3 programs that have 2 or more channels.

<b>INT META</b>	<b>Dby Surr</b>	<b>None</b>	Dolby Surround not indicated
		<b>Surr off</b>	Not Dolby Surround encoded
		<b>Surr on</b>	Dolby Surround encoded



## 3.5.11 Audio Production Information Exists

This parameter is abbreviated **AProdInf** and indicates whether the *mixing level* and *room type* values are valid. If *Yes*, then a receiver or amplifier could use these values as described below. If *No*, then the values in these fields are invalid. In practice, only high-end consumer equipment implements these features. The V6306 options for **AProdInf** are **Off** and **On**. This must be set to **On** before room type and mix level can be changed.

## 3.5.12 Mix Level

This Production Info parameter will only be available for adjustment (or appear on the read-only menu **O/P META**) if the **AProdInf** parameter is set to **On**. The Mixing Level parameter, abbreviated to **MixLevel**, describes the peak sound pressure level (SPL) used during the final mixing session at the studio. The parameter allows a consumer's amplifier to set its volume control such that the SPL in the replay environment matches that of the mixing room. This control operates in addition to the dialogue level control, and is best thought of as the final volume setting on the consumer's equipment. Mix Level is available for adjustment on all AC-3 programs.

<b>INT META</b>	<b>MixLevel</b>	<b>80 dB</b>	Final audio mixing level
		- -	(only with Audio Product Information On)
		<b>111 dB</b>	

## 3.5.13 Room Type

This Production Info parameter will only be available for adjustment (or appear on the read-only menu **O/P META**) if the **AProdInf** parameter is set to **On**. The Room Type parameter describes the equalization used during the final mixing session at the studio. A *Large* room is a dubbing stage with the industry standard X-curve equalization; a *Small* room has flat equalization. This parameter allows an amplifier to be set to the same equalization as that heard in the final mixing environment. Room Type is available for adjustment on all AC-3 programs.

<b>INT META</b>	<b>RoomType</b>	<b>None</b>	No equalisation
		<b>Large</b>	X-curve equalisation
		<b>Small</b>	Flat equalisation

## 3.5.14 Extended Bitstream Information 1 Exists

In response to requests from content producers, Dolby Laboratories modified the definitions of several metadata parameters from their original definition as described in ATSC document A/52. The revised definitions have been accepted by the ATSC in A52/B and they allow more information to be carried about the audio program and also allow more choices for stereo downmixing. These metadata parameters are referred to as *Extended BSI*. Under the **INT META** (control and status) and **O/P META** (status only) menus the V6306 has a status called **Ext BSI1** which indicates with values **BSI1 off** and **BSI1 on** whether or not Extended BSI is present on an external metadata stream. When encoding with internal metadata in manual mode, **Ext BSI1** is on by default and it is recommended by Dolby Labs that it be left on.



## 3.5.15 Ext BSI : Preferred Stereo Downmix Mode

This extended bitstream 1 parameter is only displayed on the O/P **META** and INT **META** menus if the **Ext BSI1** shows **BSI on**. Preferred Stereo Downmix Mode is abbreviated **DMixMode** and it allows the producer to select either the Lt/Rt or the Lo/Ro downmix in a consumer decoder that has stereo outputs.

<b>INT META</b>	<b>DMixMode</b>	<b>None</b>	Not indicated.
		<b>LtRt</b>	The Lt/Rt downmix sums the Surround channels and adds them, in-phase to the Left channel and out-of-phase to the Right channel. This allows a Dolby Surround Pro Logic decoder to reconstruct the L/C/R/S channels for a Pro Logic home theater.
		<b>LoRo</b>	The Lo/Ro downmix adds the Left and Right Surround channels discretely to the Left and Right speaker channels, respectively. This preserves the stereo separation for stereo-only monitoring and produces a mono-compatible signal.

Consumer receivers are able to override this selection, but this parameter provides the opportunity for a 5.1-channel soundtrack to play in Lo/Ro mode without user intervention. This is especially useful on music material. Also, the mono signal feeding the RF/Antenna output is usually derived from the Lo/Ro downmix. Preferred Stereo Downmix Mode is only available for adjustment on AC-3 programs that have 4 or more channels.

## 3.5.16 Ext BSI : Lt/Rt Center Downmix Level

This extended bitstream 1 parameter is only displayed on the O/P **META** and INT **META** menus if the **Ext BSI1** shows **BSI on**. This parameter indicates the level shift applied to the Center channel when adding to the left and right outputs as a result of downmixing to an Lt/Rt output. Its operation is similar to the center downmix level (**C MixLev**) in the universal (non-BSI) metadata. The Lt/Rt Centre Downmix Level is only available for adjustment on AC-3 programs that have 4 or more channels.

<b>INT META</b>	<b>LtRtCMix</b>	<b>+3.0 dB</b>
		<b>+1.5 dB</b>
		<b>0.0 dB</b>
		<b>-1.5 dB</b>
		<b>-3.0 dB</b>
		<b>-4.5 dB</b>
		<b>-6.0 dB</b>
		<b>Off</b>

## 3.5.17 Ext BSI : Lt/Rt Surround Downmix Level

This extended bitstream 1 parameter is only displayed on the O/P **META** and INT **META** menus if the **Ext BSI1** shows **BSI on**. This parameter indicates the level shift applied to the Surround channels when adding to the left and right outputs as a result of downmixing to an Lt/Rt output. Its operation is similar to the surround downmix level (**S MixLev**) in the universal (non-BSI) metadata. The Lt/Rt Surround Downmix Level is only available for adjustment on AC-3 programs that have 4 or more channels.

<b>INT META</b>	<b>LtRtSMix</b>	<b>-1.5 dB</b>
		<b>-3.0 dB</b>
		<b>-4.5 dB</b>
		<b>-6.0 dB</b>
		<b>Off</b>



### 3.5.18 Ext BSI : Lo/Ro Center Downmix Level

This extended bitstream 1 parameter is only displayed on the O/P **META** and **INT META** menus if the **Ext BSI1** shows **BSI1 on**. This parameter indicates the level shift applied to the Center channel when adding to the left and right outputs as a result of downmixing to an Lo/Ro output. When Extended BSI parameters are active, this parameter replaces the Center Downmix Level parameter (C MixLev) in the universal parameters. The Lo/Ro Centre Downmix Level is only available for adjustment on AC-3 programs that have 4 or more channels.

```

INT META  LoRoCMix  +3.0 dB
                +1.5 dB
                0.0 dB
                -1.5 dB
                -3.0 dB
                -4.5 dB
                -6.0 dB
                Off
    
```

### 3.5.19 Ext BSI : Lo/Ro Surround Downmix Level

This extended bitstream 1 parameter is only displayed on the O/P **META** and **INT META** menus if the **Ext BSI1** shows **BSI on**. This parameter indicates the level shift applied to the Surround channels when downmixing to an Lo/Ro output. When Extended BSI parameters are active, this parameter replaces the Surround Downmix Level (S MixLev) parameter in the universal parameters. The Lo/Ro Surround Downmix Level is only available for adjustment on AC-3 programs that have 4 or more channels.

```

INT META  LoRoSMix  -1.5 dB
                -3.0 dB
                -4.5 dB
                -6.0 dB
                Off
    
```

### 3.5.20 Extended Bitstream Information 2 Exists

Extended bitstream information 2 encompasses a further optional group of metadata parameters under the **INT META** and O/P **META** menus. The V6306 has a status called **Ext BSI2** which indicates with values **BSI2 off** and **BSI2 on** which shows if extended BSI 2 is present on an external metadata stream or in the internal metadata table. The parameters within extended bitstream information 2 will only be displayed if **Ext BSI2** shows **BSI2 on**. Furthermore, extended bitstream information 2 is nested within extended bitstream information 1, which means that the display of extended bitstream information 2 parameters is also conditional to **Ext BSI1** showing **BSI1 on**. **Ext BSI 2** is on by default and it is strongly recommended that it be left on.



# Vistek V6304 HD Dolby E® Encoder

## 3.5.21 Ext BSI : Dolby Surround EX mode

This extended bitstream 2 parameter is only displayed on the O/P **META** and INT **META** menus if the **Ext BSI2** shows **BSI2 on**. The Dolby Surround EX™ mode code, abbreviated to **SurEXmod** on the V6306, indicates whether or not the program has been encoded in Dolby Surround EX. This information is not used by the AC-3 decoder, but may be used by other portions of the audio reproduction equipment. Dolby Surround EX mode is only available for adjustment on AC-3 programs having 5 or more channels.

<b>INT META</b>	<b>SurEXmod</b>	<b>Not Ind</b>	Surround EX Status not indicated
		<b>SrEX off</b>	
		<b>SrEX on</b>	

## 3.5.22 Lowpass Filter

This universal metadata parameter is abbreviated to **LP Filtr** on the V6306. It determines whether an audio bandwidth (20kHz) lowpass filter is applied to the main input channels of an AC-3 encoder prior to encoding. This filter removes high frequency signals that are not encoded. At the suitable data rates, this filter rolls off above 20 kHz. In all cases it prevents aliasing on decoding and is normally switched on. This parameter is not passed to the consumer decoder. The audio bandwidth lowpass filter is selectable on all AC-3 programs.

<b>INT META</b>	<b>LP Filtr</b>	<b>LPF Off</b>	Lowpass Filter disabled
		<b>LPF on</b>	Lowpadd Filter enabled

## 3.5.23 LFE Lowpass Filter

This universal metadata parameter is abbreviated to **LFE Filtr** on the V6306. It determines whether a 120 Hz eighth-order lowpass filter is applied to the LFE channel input of an AC-3 encoder prior to encoding. It is ignored if the LFE channel is disabled. This parameter is not sent to the consumer decoder. The filter removes frequencies above 120 Hz that would cause aliasing when decoded. This filter should only be switched off if the audio to be encoded is known to have no signal above 120 Hz. The LFE lowpass filter is only appropriate on AC-3 programs having **LFE Chan** set to **LFE On**.

<b>INT META</b>	<b>LFE Filtr</b>	<b>LFE Off</b>	LFE channel lowpass filter disabled
		<b>LFE on</b>	LFE channel lowpass filter enabled

## 3.5.24 Surround Phase Shift

This universal metadata parameter is abbreviated to **SurrPhse** on the V6306. It causes the AC-3 encoder to apply a 90-degree phase shift to the Surround channels. This allows an AC-3 decoder to create an Lt/Rt downmix simply. For most material, the phase shift has a minimal impact when the AC-3 program is decoded to 5.1 channels, but it provides an Lt/Rt output that can be decoded with Dolby Pro Logic to L, C, R, S, if desired. However, for some phase-critical material (such as music) this phase shift is audible when listening in a 5.1-channel format. Surround Phase Shift is only appropriate on AC-3 programs having 4 or more channels.

<b>INT META</b>	<b>SurrPhse</b>	<b>90° Off</b>	Surround 90° phase shift disabled
		<b>90° On</b>	Surround 90° phase shift enabled



## 3.5.25 Surround 3 dB Attenuation

This universal metadata parameter is abbreviated to **surrAttn** on the V6306. It determines whether the encoder attenuates the surround channel(s) by 3 dB before encoding. It balances the signal levels between theatrical mixing rooms (dubbing stages) and consumer mixing rooms (DVD or TV studios). Consumer mixing rooms calibrate all five main channels are at the same sound pressure level, whereas theatrical mixing rooms calibrate the surround channels 3 dB lower than the front channels. Surround 3dB Attenuation is only appropriate on AC-3 programs having 4 or more channels.

<b>INT META</b>	<b>SurrAttn</b>	<b>-3dB Off</b>	Surround channels not attenuated
		<b>-3dB On</b>	Surround channels attenuated -3dB



## 3.6 MUX Control (V6304/DM only)

The V6304/DM can replace any one audio group Gp1. . .Gp4 in the (HD) SDI. On the selected group, for AES1 and AES2, the V6304 can embed either the AC-3 bitstream, digital silence, any of the rear panel AES inputs, or any of the AES channels that were embedded on any group on the incoming SDI. This raises an important issue of synchronisation.

On the selected group, the V6304 will perform embedding synchronous to the current video reference. This means that if it is desired to embed any of the incoming embedded AES onto the selected group, the incoming AES must be pre-synchronised with the V6304 reference.

In the V6304/DM the MUX group is selected from the **MUX CTRL** menu as follows:

<b>MUX CTRL</b>	<b>Mux Grp</b>	<b>None</b>	Default
		<b>Grp 1</b>	Group 1 overwritten
		<b>Grp 2</b>	...
		<b>Grp 3</b>	...
		<b>Grp 4</b>	Group 4 overwritten

Each MUX group comprises two AES channels which are named Gpx.1 and Gpx.2 where x is the number of the MUX group. The next stage of adjustment is to determine what will be MUX'd onto each of the AES within the group selected above. This is also set on the **MUX CTRL** menu, using the submenus **AES 1** and **AES 2**. The default is **AC-3**.

<b>MUX CTRL</b>	<b>AES 1</b>	<b>None</b>
		<b>AC-3</b>
		<b>DMX 1.1</b>
		...
		<b>DMX 4.2</b>
	<b>AES 2</b>	<b>None</b>
		...
		<b>DMX 4.2</b>

When embedding AC-3 onto a MUX Group the V6304/DM will replace the original embedded data (if any) on that group.

The V6304/DM will as default pass whatever embedded data may be on the incoming (HD)SDI stream. If it is desired to 'blanket blank' the existing embedded data by blanking the ancillary data (Anc) this can be done from the **ENG'ING** menu as follows:

<b>ENG'ING</b>	<b>Anc</b>	<b>Pass</b>
		<b>Blank</b>

Note: Audio that has been de-embedded in the DMX and then re-embedded in the MUX is not precisely phase and delay-matched with embedded audio that is simply passed through on the video. Although the delay match is adequate for lip-sync, it is not recommended to split multi-channel audio programs over these paths.



## 3.7 (HD)SDI Input and Output

Unlike a number of other Pro-bel HD modular interface products the V6304 and V6304/DM do not have two (HD) SDI inputs. There is only one (HD)SDI input connector on the rear panel and one (HD)SDI output connector, which is not used on the V6304 and only carries (HD)SDI on the V6304/DM. The V6304 and V6304/DM support a number of different video standards. The standard of the video on the (HD)SDI input may be read from the STATUS menu as shown below. Not all the supported input standards are shown below. Refer to Section 1.2 for a complete list.

STATUS	I/P std	NO I/P
		NO STD
		720p59
		720p60
		..
		..
		..
		525i59
		625i50

The V6304/DM video output standard is always the same as the video input standard; it is NOT possible to perform cross-conversion or standards conversion on this product. Therefore, the MUX function on the V6304/DM is only operational when there is an SDI input applied and the MUX will always inherit the video standard from the input. If a user forces selection of a reference other than the SDI input, it is the user's responsibility to ensure that the SDI input and the forced reference have compatible standards, otherwise the video output will be unusable.



# Vistek V6304 HD Dolby E® Encoder

## 3.8 System

### 3.8.1 Version Numbers

There are three separate items of software/firmware in the V6304 and they all have separate version numbers. These can be read on the following read only menus:

<b>STATUS</b>	<b>Soft ver</b>	<b>n.nn.nn</b>	Version of the H8S/2633 operating code
	<b>FPGA ver</b>	<b>nn.nn</b>	Version of the EP1C20 Cyclone FPGA
	<b>Dby ver</b>	<b>nn.nn</b>	Version of the Cat559 Dolby Encoder
	<b>CPLD ver</b>	<b>nn.nn</b>	Version of the MAX7128AETC CPLD
	<b>PCB ver</b>	<b>nn.nn</b>	Version of the PCB
	<b>Boot ver</b>	<b>n.nn.nn</b>	Version of the H8 bootloader software

### 3.8.2 Display Sleep

Since, for the vast majority of its life, the V6304 will operate behind the front panel of a rack frame the display on the local front panel will not be visible so it will go to sleep after a certain time. This timeout delay can be changed on the **ENG'ING : sLeep** menu to be anything between 0 and 30 minutes; 0 minutes means that it will stay on indefinitely. The sleep timeout always counts from the last front panel button push. The default time is 5 minutes.

The panel can also be forced into its sleep mode by moving up a level from the Top Level menu which displays the module type, **V6304**.

To get the display to come on again simply press one of the buttons and the menus will start again at the Top Level.

### 3.8.3 Display Brightness

The brightness of the front panel display can be adjusted on the **ENG'ING : LEDLevel1** menu.

**ENG'ING LEDLevel1** █ █ █ █



## 3.8.4 GP I/O

GP I/O on the V6304 is only supported on the balanced rear panel **V16AR3AJ**. The rear panel type may be identified from the STATUS menu as follows:

<b>STATUS</b>	<b>Rear Mod</b>	<b>Unbal</b>	V6304 plugged into an unbalanced rear
		<b>Balanced</b>	V6304 plugged into a balanced rear
		<b>Invalid</b>	Incorrect rear

The V6304 when used with the balanced rear panel has one GPI/O that is configurable as output (GPO 0) or input (GPI 4). GPI 1, GPI 2 and GPI 3 are always inputs.

GPI 1, GPI 2 and GPI 3 have TTL compatible Schmitt trigger logic thresholds, ie  $V_{in} > 2.0$  is recognised as logic 1 and  $V_{in} < 0.8V$  is recognised as logic 0. These inputs are 5V tolerant and have 5V resistor-diode clamps to protect the module from transients, but the clamps will be damaged by sustained application of voltages in excess of 5V. All GPI are asserted low, if when connected to GND.

GPI 4 is **NOT** 5V tolerant and has 3.3V resistor-diode clamps. Sustained application of voltages in excess of 3.3V will damage the input. The GPO output levels are 3.3V LVCMOS output levels, ie  $V_{out} = 3.3V$  for logic 1 and  $V_{out} = 0V$  for logic 0 (with no loading). Maximum output loading on the GPO is 24mA. Do not apply external voltage to the GPO.

Configuration of the GPIO and the GPI is done on the **CONFIG** menu as shown in the example below. Each GPIO has a number of options to which it may be configured. For GPI 1 to GPI 3 these options are all inputs and for GPIO 0/GPI 4 some of the options are inputs and others are outputs. The example does not show configuration of all the GPIO, only GPI4. A full list of the options is given in the section on **CONTROLS**.

<b>CONFIG</b>	<b>GPI 4</b>	<b>none</b>	GPI4 disabled
		<b>I/P AES</b>	GPI4 input, sets inputs from rear panel AES
		<b>SDID</b>	GPI1 input, sets inputs from DMX channels as specified in SDID
		<b>I/P Eng</b>	GPI4 input, sets inputs as set under <b>ENG'ING</b> menu
		<b>Ref SDI</b>	GPI4input, sets ref source to force SDI
		<b>Ref REF 1</b>	GPI4 input, sets ref source to force REF
		<b>Ref REF 2</b>	
		<b>Meta Int</b>	
		<b>Meta Ext</b>	
		<b>Dby Enc</b>	GPI output: Dolby bitsream being produced
		<b>Dby Sync</b>	GPI output: Valid Sync being received



## 4 Calibration

### 4.1 Set-Up

The V6304 has a protection against inadvertent adjustment of calibration parameters. This takes the form of a 'master switch' called Cal Mode, which may be set to **On** or **Off**. Only when Cal Mode is set to **On** will adjustment of calibration parameters be possible. Cal Mode is on the **CALIB** menu:

<b>CALIB</b>	<b>Cal Mode</b>	<b>OFF</b>	<b>n</b>	The Calibration Menu below is locked to prevent accidental change.
		<b>ON</b>		The Calibration Menu is unlocked

### 4.2 Free-Run Frequency

The frequency of the Free running oscillator may be trimmed once the **Cal Mode** on the v6304 has been set to **On**.

<b>CALIB</b>	<b>Free</b>	<b>+127</b>		Frequency trim on free run VCXO
		<b>Y</b>		
		<b>0</b>	<b>n</b>	
		<b>B</b>		
		<b>-128</b>		
	<b>Norm</b>	<b>N *****</b>		



## 5 Menus and Controls

These tables on the following pages show a complete list of all the parameters that can be controlled locally for the various configurations. Unless otherwise shown they can also be controlled over the DART remote control system. Not all menus are available at any one time, since they depend on module configurations and sometimes on the operating conditions. The tables also show the full range of the controls and their ranges and normalised value, if appropriate. The normalised value or setting is shown by the 'n'.



# Vistek V6304 HD Dolby E® Encoder

## 5.1 Menu Structure

### 5.1.1 V6304

I/P SEL	IP PHASE	I/P GAIN	DOLBY E	INT META	O/P META	DBY STAT	STATUS	ENG'ING	CALIB	CONFIG
I/P Sel	Phs Dby1	Gn Dby1	Meta Src	AC3 Prog	AC3 Prog	Meta I/P	Variant	Anc Data	Cal Mode	Def F/R
Norm	Phs Dby2	Gn Dby2	Prog Cfg**	DialNorm	DialNorm	Ext Meta	Options	Ref Src	CntrFreq	Banner
	Phs Dby3	Gn Dby3	AC-3 Pgm**	AC Mode	AC Mode	Prog Cfg	AES I/P	Dby 1/2	Norm	Password
	Phs Dby4	Gn Dby4	SaveUser**	LFE Chan	LFE Chan	Meta Rvt	SDI Std	Dby 3/4		Option
	Phs Dby5	Gn Dby5	LoadUser**	BS Mode	BS Mode	Frm Rate	Ref I/P	Dby 5/6		I/P Mode
	Phs Dby6	Gn Dby6	SRC	LineMode	LineMode	Dby Sync	Ref Src	Dby 7/8		PCB Rev
	Phs Dby7	Gn Dby7	Meta Rvt	RF Mode	RFMode	Dby Enc	Ref Std	Sleep		H/W Rev
	Phs Dby8	Gn Dby8	Dby Bits	C MixLev	C MixLev	Dby 1/2	Free run	LEDLevel		TestMode
	Norm	Norm	Enc Mode	S MixLev	S MixLev	Dby 3/4	Sub-Mod	Norm		Factory
			Vid Del	Dby Surr	Dby Surr	Dby 5/6	I/O Mod			Norm
			Dby Del	AProdInf	AProdInf	Dby 7/8	Rear Mod			
			Norm	MixLevel	MixLevel		Soft Ver			
				RoomType	RoomType		FPGA Ver			
				Ext BSI1	Ext BSI1		DbyFWVer			
				DMixMode	DMixMode		DbyHWVer			
				LtRtCMix	LtRtCMix		DbyDevce			
				LtRtSMix	LtRtSMix		CPLD Ver			
				LoRoCMix	LoRoCMix		PCB Ver			
				LoRoSMix	LoRoSMix		Boot Ver			
				Ext BSI2	Ext BSI2					
				SurEXmod	SurEXmod					
				LP Filtr	LP Filtr					
				LFE Filt	LFE Filt					
				SurrPhse	SurrPhse					
				SurrAttn	SurrAttn					
				Norm						
				Norm All						

\*\* The Sel button is blipped to select a Prog Cfg or an AC3 Prog, or load/save a User preset

# Vistek V6304 HD Dolby E® Encoder



## 5.1.2 V6304/DM

I/P SEL	IP PHASE	I/P GAIN	DOLBY E	INT META	O/P META	MUX CTRL	DBY STAT	STATUS	ENG'ING	CALIB	CONFIG
I/P Sel	Phs Dby1	Gn Dby1	Meta Src	AC3 Prog	AC3 Prog	Mux Grp	Meta I/P	Variant	Anc Data	Cal Mode	Def F/R
Norm	Phs Dby2	Gn Dby2	Meta Ext	DialNorm	DialNorm	AES 1	Ext Meta	Options	Ref Src	CntrFreq	Banner
	Phs Dby3	Gn Dby3	Prog Cfg**	AC Mode	AC Mode	AES 2	Prog Cfg	AES I/P	△Vid Del	Norm	Password
	Phs Dby4	Gn Dby4	AC3 Prog**	LFE Chan	LFE Chan	Norm	Meta Rvt	DMX GP1	Dby 1/2		Option
	Phs Dby5	Gn Dby5	SaveUser**	BS Mode	BS Mode		Frm Rate	DMX GP2	Dby 3/4		I/P Mode
	Phs Dby6	Gn Dby6	LoadUser**	LineMode	LineMode		Dby Sync	DMX GP3	Dby 5/6		PCB Rev
	Phs Dby7	Gn Dby7	SRC	RF Mode	RFMode		Dby Enc	DMX GP4	Dby 7/8		H/W Rev
	Phs Dby8	Gn Dby8	Meta Rvt	C MixLev	C MixLev		Dby 1/2	SDI Std	SDID		TestMode
	Norm	Norm	Dby Bits	S MixLev	S MixLev		Dby 3/4	Ref I/P	Sleep		Factory
			Enc Mode	Dby Surr	Dby Surr		Dby 5/6	Ref Src	LEDLevel		Norm
			Vid Del	AProdInf	AProdInf		Dby 7/8	Ref Std	Norm		
			Dby Del	MixLevel	MixLevel			Free run			
			Norm	RoomType	RoomType			Sub-Mod			
				Ext BS11	Ext BS11			I/O Mod			
				DMixMode	DMixMode			Rear Mod			
				LtRtCMix	LtRtCMix			Soft Ver			
				LtRtSMix	LtRtSMix			FPGA Ver			
				LoRoCMix	LoRoCMix			DbyFWVer			
				LoRoSMix	LoRoSMix			DbyHWVer			
				Ext BS12	Ext BS12			DbyDevce			
				SurEXmod	SurEXmod			CPLD Ver			
				LP Filtr	LP Filtr			PCB Ver			
				LFE Filt	LFE Filt			Boot Ver			
				SurrPhse	SurrPhse						
				SurrAttn	SurrAttn						
				Norm							
				Norm All							

[Grey Box] = MUX/DMX option

\*\* The Sel button is blipped to select a Prog Cfg, change AC3 Prog, load/save a User preset

**Notes:**

1. INT META menu available only if internal metadata selected. Some INT META menu items are dependent on the Prog Cfg and Meta Pgm selected. When Int meta is selected, it also selects which internal AC-3 Metadata Program is set up by the INT META menu
  2. AC-3 Pgm selects which AC-3 Metadata Program is shown in the O/P META menu.
- Dby 1/2, etc., in the ENG'ING menu are available if Eng'ing is selected on the I/P Sel control
3. The states of AProdInf, Ext BS11 and Ext BS12 and the number of channels in the selected program determine what is visible in the INT META and O/P META menus
  4. A User preset contains 8 sets of AC-3 metadata plus the Prog Cfg. SaveUser, LoadUser and Prog Cfg are available in the DOLBY E menu only if Int meta is selected



## 5.2 Controls and Status

These tables show a complete list of all the parameters that can be controlled locally for the various configurations. Unless otherwise shown they can also be controlled over the DART remote control system. Not all menus are available at any one time, since they depend on whether the V6306/DM option is fitted, and sometimes on the operating conditions.

The tables also show the full range of the controls and their ranges and normalised value, if appropriate. The normalised value or setting is shown by the 'n'.

### 5.2.1 Input Selection

I/P SEL	I/P Sel	AES	n	Rear Panel AES[A..D] => Encoder Inp[A..D]
		DMX SDID		/DMX only. DMX[SDID start chan] => Encoder Inp [A..C]. Unused encoder inputs will be set to PCM silence
		GP 1/2		/DMX only. DMX Gp [1.1...2.1] => Encoder Inp [A..C]
		GP 3/4		/DMX only. DMX Gp [3.1...4.1] => Encoder Inp [A..C]
		Eng'ing		Settings on ENG'ING Menu => Encoder Inp [A..C]
	Norm	<sup>N</sup> *****		

### 5.2.2 Input Delay

*(Not presently supported)*

I/P DLY	Dly Dby1	0 ms	n	Delay in ms applied to encoder input Dby 1
		-		
		50 ms		
	Dly Dby2	range as above		Delay in ms applied to encoder input Dby 2
	Dly Dby3	range as above		Delay in ms applied to encoder input Dby 3
	Dly Dby4	range as above		Delay in ms applied to encoder input Dby 4
	Dly Dby5	range as above		Delay in ms applied to encoder input Dby 5
	Dly Dby6	range as above		Delay in ms applied to encoder input Dby 6
	Dly Dby7	range as above		Delay in ms applied to encoder input Dby 7
	Dly Dby8	range as above		Delay in ms applied to encoder input Dby 8
Norm	<sup>N</sup> *****			

### 5.2.3 Input Phase

IP PHASE	Phs Dby1	0 °	n	Phase of encoder input Dby 1
		180 °		
	Phs Dby2	options as above		Phase of encoder input Dby 2
	Phs Dby3	options as above		Phase of encoder input Dby 3
	Phs Dby4	options as above		Phase of encoder input Dby 4
	Phs Dby5	options as above		Phase of encoder input Dby 5
	Phs Dby6	options as above		Phase of encoder input Dby 6
	Phs Dby7	options as above		Phase of encoder input Dby 7
	Phs Dby8	options as above		Phase of encoder input Dby 8
	Norm	<sup>N</sup> *****		



## 5.2.4 Input Gain

I/P GAIN	Gn Dby1	+15.88dB		Gain of encoder input Dby 1	
		-			
		+0.00dB	n	Increments of 0.125dB	
		-			
			-16.00dB		
	Gn Dby2	range as above		Gain of encoder input Dby 2	
	Gn Dby3	range as above		Gain of encoder input Dby 3	
	Gn Dby4	range as above		Gain of encoder input Dby 4	
	Gn Dby5	range as above		Gain of encoder input Dby 5	
	Gn Dby6	range as above		Gain of encoder input Dby 6	
	Gn Dby7	range as above		Gain of encoder input Dby 7	
	Gn Dby8	range as above		Gain of encoder input Dby 8	
Norm		N *****			

## 5.2.5 Dolby E Controls

DOLBY E	Meta Src	Ext meta	n	Metadata sourced from external serial stream – see also Ext Meta if \DM and Meta Rvt under ENG-NG Metadata sourced from internal defaults.
		Int meta		
	Ext Meta	Ser meta		/DMX only. Metadata sourced from serial stream.
		SDI meta		/DMX only. Metadata sourced from SDI.
	Prog Cfg	5.1+2	n	Momentarily press SEL button to load new Prog Cfg setting
		5.1+2X1		
		4+4		
		4+2X2		
		4+4X1		
		4+2+2X1		
		4+4X1		
		4X2		
		3X2+2X1		
		2X2+4X1		
		2+6X1		
		8X1		
		5.1		
		4+2		
		4+2X1		
		3X2		
		2X2+2X1		
		2+4X1		
		6X1		
		4		
	2+2			
	2+2X1			
	4X1			
7.1				
7.1Scr				
AC3 Prog	Prog 1	n	Applicable only if Meta Src => Int Meta The range of control is limited by the number of programs available in the program configuration. Momentarily press SEL button to load new AC-3Prog setting	
	Prog 2			
	Prog 3			
	Prog 4			
		Prog 5		
		Prog 6		
		Prog 7		
		Prog 8		



# Vistek V6304 HD Dolby E® Encoder

<b>SaveUser</b>	<b>User 1</b>	<b>n</b>	Momentarily press SEL button to save preset
	<b>User 2</b>		
<b>LoadUser</b>	<b>User 1</b>	<b>n</b>	Momentarily press SEL button to load preset
	<b>User 2</b>		
<b>SRC</b>	<b>Normal</b>	<b>n</b>	Ref must be synchronous with the encoder audio inputs to use this setting.
	<b>Bypass</b>		
<b>Meta Rvt</b>	<b>Last Ext</b>	<b>n</b>	If Meta Src = Ser meta/SDI meta, metadata source reverts to last valid serial/SDI metadata if external metadata fails
	<b>Int</b>		If Meta Src = Ser meta/SDI meta, metadata source reverts to internal metadata if external meta fails
<b>Dby Bits</b>	<b>20 bit</b>	<b>n</b>	AES bits D3..0 are not used on L and R samples
	<b>16 bit</b>		AES bits D7..0 are not used on L and R samples
<b>Enc Mode</b>	<b>Encode</b>	<b>n</b>	PCM will be encoded into Dolby E
	<b>Passthru</b>		Dby A will be passed through to Dolby E output
<b>Dby Del</b>	<b>+15L</b>		Guard band position in video lines
	<b>- -</b>		Adjustment is relative to nominal correct position
	<b>0L</b>	<b>n</b>	
	<b>- -</b>		
	<b>-16L</b>		
<b>Norm</b>	<b>N *****</b>		

## 5.2.6 Internal Metadata Controls

### 5.2.7 Output Metadata Status

<b>INT META</b>  INT META menu displayed only if Meta Src => Int Meta  O/P META menu always displayed	<b>AC3 Prog</b>	<b>Prog 1</b>	<b>n</b>	Read only. To set AC3 Prog use AC3 Prog control under the DOLBY E menu. The range of control is limited by the number of programs available in the program configuration.
		<b>Prog 2</b>		
		<b>Prog 3</b>		
		<b>Prog 4</b>		
		<b>Prog 5</b>		
		<b>Prog 6</b>		
		<b>Prog 7</b>		
		<b>Prog 8</b>		
	<b>DialNorm</b>	<b>-1 dB</b>		Dialog Level
		<b>- -</b>		
		<b>-27dB</b>	<b>n</b>	
		<b>- -</b>		
		<b>-31dB</b>		
	<b>AC Mode</b>	<b>3/2</b>	<b>n</b>	Dolby Digital® Audio Channel Mode (coding mode). (n Front channels) / (n Surround channels)
		<b>2/2</b>		
<b>3/1</b>				
	<b>2/1</b>			
	<b>3/0</b>			
	<b>2/0</b>			
	<b>1/0</b>			
<b>LFE chan</b>	<b>LFE on</b>	<b>n</b>	LFE (subwoofer) channel ON	
	<b>LFE off</b>		LFE (subwoofer) channel OFF	



	<b>BS Mode</b>	<b>MainComp</b>	<b>n</b>	Main Complete - Bitstream Mode
		<b>Mus&amp;Effc</b>		Music & Effects
		<b>VisualIm</b>		Visually Impaired
		<b>Hear Imp</b>		Hearing Impaired
		<b>Dialogue</b>		Dialogue
		<b>Commntry</b>		Commentary
		<b>Emergency</b>		Emergency
		<b>VO/Karao</b>		Voice Over/Karaoke
	<b>LineMode</b>	<b>None</b>		"Line Mode" Dynamic Range Profile
		<b>Film Std</b>	<b>n</b>	
		<b>Film Lgt</b>		
		<b>MusicStd</b>		
		<b>MusicLgt</b>		
		<b>Speech</b>		
	<b>RFMode</b>	<b>None</b>		RF Mode Compression Profile
		<b>Film Std</b>	<b>n</b>	
		<b>Film Lgt</b>		
		<b>MusicStd</b>		
		<b>MusicLgt</b>		
		<b>Speech</b>		
	<b>C MixLev</b>	<b>-3.0 dB</b>	<b>n</b>	Centre downmix level
<b>-4.5 dB</b>				
<b>-6.0 dB</b>				
<b>S MixLev</b>	<b>-3.0 dB</b>	<b>n</b>	Surround downmix level	
	<b>-6.0 dB</b>			
	<b>Off</b>			
<b>Dby Surr</b>	<b>Not Ind</b>		Dolby Surround not indicated	
	<b>Surr off</b>	<b>n</b>	Not Dolby Surround encoded	
	<b>Surr on</b>		Dolby Surround encoded	
Production Information Parameters ↓	<b>AProdInf</b>	<b>None</b>	<b>n</b>	No Audio Product Information
		<b>Exists</b>		Audio Product Information exists
	<b>MixLevel</b>	<b>80 dB</b>	<b>n</b>	Final audio mixing level (only with Audio Product Information ON)
		<b>-</b>		
		<b>105 dB</b>		
		<b>111 dB</b>		
	<b>RoomType</b>	<b>Not Ind</b>	<b>n</b>	Room Type (only with Audio Product Information ON)
		<b>Large</b>		
		<b>Small</b>		
	Extended Bitstream 1 Parameters	<b>Ext BS11</b>	<b>BS11 off</b>	
<b>BS11 on</b>			<b>n</b>	When on, enables items below
Available when Ext BS11 on	<b>DMixMode</b>	<b>Not Ind</b>		Not indicated.
		<b>LtRt</b>	<b>n</b>	The Lt/Rt downmix sums the Surround channels and adds them, in-phase to the Left channel and out-of-phase to the Right channel. This allows a Dolby Surround Pro Logic decoder to reconstruct the L/C/R/S channels for a Pro Logic home theater.
↓		<b>LoRo</b>		The Lo/Ro downmix adds the Left and Right Surround channels discretely to the Left and Right speaker channels, respectively. This preserves the stereo separation for stereo-only monitoring and produces a mono-compatible signal.



# Vistek V6304 HD Dolby E® Encoder

	<b>LtRtCMix</b>	+3.0 dB		LtRt Centre Mix Level
		+1.5 dB		
		0.0 dB		
		-1.5 dB		
		-3.0 dB	n	
		-4.5 dB		
		-6.0 dB		
	Off			
	<b>LtRtSMix</b>	-1.5 dB		LtRt Surround Mix Level
		-3.0 dB	n	
		-4.5 dB		
		-6.0 dB		
	Off			
	<b>LoRoCMix</b>	+3.0 dB		LoRo Centre Mix Level
		+1.5 dB		
		0.0 dB		
-1.5 dB				
-3.0 dB		n		
-4.5 dB				
-6.0 dB				
Off				
<b>LoRoSMix</b>	-1.5 dB		LoRo Surround Mix Level	
	-3.0 dB	n		
	-4.5 dB			
	-6.0 dB			
Off				
Extended Bitstream 2 Parameters available with Ext BSI1 & Ext BSI2 on	<b>Ext BSI2</b>	BSI2 off		Extended Bitstream Information 2 When on, enables items below
		BSI2 on	n	
	<b>SurrndEX</b>	Not Ind	n	Surround EX Mode status not indicated
		SrEX off		
		SrEX on		
	<b>LP Filt</b>	LPF Off		Lowpass Filter
		LPF On	n	
	<b>LFE Filt</b>	LFE Off		LFE Channel Lowpass Filter
		LFE On	n	
	<b>SurrPhse</b>	90° Off		Surround 90 degrees Phase Shift Filter
		90° On	n	
	<b>SurrAttn</b>	-3dB off	n	Surround channels not attenuated Surround channels attenuated -3dB
		-3dB on		
		<b>Norm</b>	<sup>N</sup> *****	
<b>Norm All</b>		<sup>N</sup> *****		



## 5.2.8 Mux Control

MUX CTRL	Mux Grp	None	n	Only on /DM version
		Grp 1		
		Grp 2		
		Grp 3		
		Grp 4		
	AES 1	Silence	n	Only on /DM version... DMX Gx.x must be synchronous with the V6306 reference
		Dolby E		
		DMX G1.1		
		DMX G1.2		
		DMX G2.1		
		DMX G2.2		
		DMX G3.1		
		DMX G3.2		
		DMX G4.1		
	DMX G4.2			
	AES 2	Silence	n	Only on /DM version... DMX Gx.x must be synchronous with the V6306 reference
		Dolby E		
		DMX G1.1		
		DMX G1.2		
		DMX G2.1		
		DMX G2.2		
		DMX G3.1		
		DMX G3.2		
		DMX G4.1		
DMX G4.2				
Norm		N *****		

## 5.2.9 Dolby Status

DBY STAT	Meta I/P	Meta s s s	Serial metadata /SDI metadata present/absent s = 0 : There is metadata present on this source s = C : There is no metadata on this source 1 <sup>st</sup> symbol refers to serial metadata I/P on rear panel 2 <sup>nd</sup> symbol refers to ANY metadata on SDI 3 <sup>rd</sup> symbol refers to metadata on selected SDID
	Ext Meta	Absent	Metadata not present
		Invalid	Metadata invalid
		No AC-3	Metadata does not include AC-3
		Valid	Valid but no extended BSI
Ext Cfg	ValidBSI	Valid with extended BSI	
	none	Program Config of serial/SDI metadata	
	5.1+2		
	5.1+2x1		
	4+4		
	4+2x2		
	4+2+2x1		
	4+4x1		
	4x2		
	3x2+2x1		
	2x2+4x1		
	2+6x1		
	8x1		
5.1			



# Vistek V6304 HD Dolby E® Encoder

		4+2		
		4+2x1		
		3x2		
		2x2+2x1		
		2+4x1		
		6x1		
		4		
		2+2		
		2+2x1		
		4x1		
		7.1		
		7.1Scr		
	<b>Meta Rvt</b>	<b>Rvt Meta</b>		When Meta Src => Ext meta, encoder is using reversion metadata. Also shows this when Meta Src => Int Meta.
		<b>Ext Meta</b>		Encoder operating on valid external metadata
	<b>Frm Rate</b>	<b>23 fps</b>		Frame rate of present Dolby E encoding
		<b>23.98 fps</b>		
		<b>24 fps</b>		
		<b>25 fps</b>		
		<b>29.97 fps</b>		
		<b>30 fps</b>		
		<b>Not Ind.</b>		
	<b>Dby Sync</b>	<b>Sync 0</b>		Sync to Dolby Encoder is OK
		<b>Sync C</b>		Sync is present but incorrect
		<b>Absent</b>		Sync absent
	<b>Dby Enc</b>	<b>Active</b>		Dolby E bitstream is being output
		<b>Error</b>		No Dolby E is being output
	<b>Dby 1/2</b>	<b>0L 0R</b>		for information – mandatory input channel assignments. See Section 3.31 Table 1 Examples shown here are for program config 5.1+2
		<b>...</b>		
	<b>Dby 3/4</b>	<b>0C 0LFE</b>		
		<b>...</b>		
	<b>Dby 5/6</b>	<b>0Ls 0Rs</b>		
		<b>...</b>		
	<b>Dby 7/8</b>	<b>1L 1R</b>		
		<b>...</b>		



## 5.2.10 Status

<b>STATUS</b>	<b>Variant</b>	V6304		
		V6304DM		
	<b>Options</b>	No optns	n	
		DMUX+MUX		if DMX option installed
	<b>AES I/P</b>	AsBsCsDs		Rear panel AES inputs present/absent <b>s = 0</b> : There is data on this AES <b>s = C</b> : There is nothing on this AES
	<b>DMX GP1</b>	G1 s s		if DMX/MUX option installed first symbol 0 Gp1.1, 2 <sup>nd</sup> symbol 0 Gp1.2
		. . .		<b>s = 0</b> : There is data on this AES
		. . .		<b>s = C</b> : There is nothing on this AES
	<b>DMX GP2</b>	G2 s s		Symbols as above for Gp 1
	<b>DMX GP3</b>	G3 s s		Symbols as above for Gp 1
	<b>DMX GP4</b>	G4 s s		Symbols as above for Gp 1
	<b>SDI Std</b>	NO I/P		
		NO STD		
		720p59		
		720p60		
		720p29		
		720p30		
		720p50		
		720p25		
		720p23		
		720p24		
		1080i59		
		1080i60		
		1080p29		
		1080p30		
		1080i50		
		1080p25		
		1080p23		
		1080p24		
		1080sf23		
		1080sf24		
		1035i59		
		1035i60		
		576p50		
525i59				
625i50				
	<b>Ref I/P</b>	Ref C		Ref status is displayed if the selected reference is Auto, SDI or Ref
		Ref 590		"
		Ref 600		"
		Ref 290		"
		Ref 300		"
		Ref 500		"
		Ref 250		"
		Ref 230		"
		Ref 240		"
	<b>Ref Src</b>	Ref SDI		Current source of the reference
		Ref REF		
		Ref FREE		
	<b>Ref Std</b>	As SDI Std		Current reference standard s = ↑ : signal is asserted s = ↓ : signal not asserted
		GPI	1s2s3s4s	



# Vistek V6304 HD Dolby E® Encoder

	Free run	Free Off	
		Free On	
Sub-Mod	Dby Enc		n = 0 means Dolby Digital® encoder submodule
		ID [n]	n = 1. . 6 are ID codes for other Vid Proc submodules
		none	n = 7 means no submodule is fitted
I/O Mod	Comb [0]		n = 0 means combined I/O and Video Proc submod
		ID [n]	n = 1. . 3 are ID codes for other I/O submodules
Rear Mod	Unbal		V6306 plugged into an unbalanced rear
		Balanced	V6306 plugged into a balanced rear
		Invalid	The Wrong Trousers, Grommit!
Soft ver	XX.XX.XX		
FPGA ver	XX.XX		
DbyFWVer	XXXX		
DbyHWVer	XXXX		
DbyDevce	559D		
CPLD ver	XX.XX		
PCB ver	XX.XX		
Boot ver	XX.XX.XX		

## 5.2.11 Engineering

ENG'ING	Anc	Pass	n	Only on /DM option
		Blank		
	Ref Src	Auto	n	SDI -> Ref -> Free Run
		SDI in		Force ref to SDI input
		Ext Ref		Force ref to BB/TLS Ref
		Free		Force ref to free run
ΔVid Del	Min			This control is /DM only: Min is close to -2f
		-1f		
		0f	n	Video and encoded audio are co-timed at 0f
		+1f		
		. . .		
		+5f		
Dby 1/2	AES A		n	This control sets input A selection for Eng'ing mode on I/P SEL mernu. Default if not /DM. Not available if not Eng'ing mode.
		AES B		
		AES C		
		Gp 1.1	n	DMX sources only on /DM option. Default if /DM
		Gp 1.2		"
		Gp 2.1		"
		Gp 2.2		"
		Gp 3.1		"
		Gp 3.2		"
		Gp 4.1		"
		Gp 4.2		"
		Dby 3/4	options as above	
Dby 5/6	options as above		This control sets input C selection for Eng'ing mode on I/P SEL mernu Default AES C (not /DM), Gp2.1 (/DM)	
Dby 7/8	options as above		This control sets input C selection for Eng'ing mode on I/P SEL mernu Default AES D (not /DM), Gp2.1 (/DM)	



	SDID	No Assoc	n	Only on V6304/DM
		Gp 1.1		This control sets the selected SDID to one of the 9 possible SDIDs
		Gp 1.2		
		Gp 2.1		
		Gp 2.2		
		Gp 3.1		
		Gp 3.2		
		Gp 4.1		
		Gp 4.2		
Sleep	Zz 30 min	Ý		
		Zz 5 min	n	
		Ý		
		Zz 0 min		
	LED Level	■ ■ ■ ■ ■		Bargraph shows relative LED intensity
Norm	N *****			

## 5.2.12 Calibration

CALIB	Cal Mode	OFF	n	The Calibration Menu below is locked to prevent accidental change.
		ON		The Calibration Menu is unlocked
	Free	+127		Frequency trim on free run VCXO
		Ý		
		0	n	
		β		
		-128		
	Norm	N *****		

## 5.2.13 Configuration

CONFIG	Def F/R	LastUsed	n	Specifies frame rate to use when reference is Free Run
		50Hz		
		59.94Hz		
	GPI 1	Off	n	GPI1 disabled
		I/P AES		GPI1 input, sets inputs from rear panel AES
		I/P SDID		GPI1 input, sets inputs from DMX channels as specified in SDID
		I/P Eng		GPI1 input, sets inputs as set under <b>ENG'ING</b> menu
		Ref SDI		GPI1 input, sets ref source to force SDI
		Ref REF 1		GPI1 input, sets ref source to force REF 1
		Ref REF 2		GPI1 input, sets ref source to force REF 2
		Meta Int		GPI1 input, sets Metadata source to Internal
		Meta SDI		GPI1 input, sets Metadata source to SDI metadata
		Meta Ser		GPI1 input, sets Metadata source to Serial metadata
	GPI 2	Off		GPI2 disabled
		I/P AES		GPI2 input, sets inputs from rear panel AES
		I/P SDID		GPI1 input, sets inputs from DMX channels as specified in SDID
		I/P Eng		GPI2 input, sets inputs as set under <b>ENG'ING</b> menu
		Ref SDI		GPI2 input, sets ref source to force SDI



# Vistek V6304 HD Dolby E® Encoder

		<b>Ref REF 1</b>		GPI2 input, sets ref source to force REF 1
		<b>Ref REF 2</b>		GPI2 input, sets ref source to force REF 2
		<b>Meta Int</b>		GPI1 input, sets Metadata source to Internal
		<b>Meta SDI</b>		GPI1 input, sets Metadata source to SDI metadata
		<b>Meta Ser</b>		GPI1 input, sets Metadata source to Serial metadata
	<b>GPI 3</b>	<b>Off</b>		GPI3 disabled
		<b>I/P AES</b>		GPI3 input, sets I inputs from rear panel AES
		<b>I/P SDID</b>		GPI1 input, sets inputs from DMX channels as specified in SDID
		<b>I/P Eng</b>		GPI1 input, sets inputs as set under <b>ENG'ING</b> menu
		<b>Ref SDI</b>		GPI3 input, sets ref source to force SDI
		<b>Ref REF 1</b>		GPI3 input, sets ref source to force REF 1
		<b>Ref REF 2</b>		GPI3 input, sets ref source to force REF 2
		<b>Meta Int</b>		GPI1 input, sets Metadata source to Internal
		<b>Meta SDI</b>		GPI1 input, sets Metadata source to SDI metadata
		<b>Meta Ser</b>		GPI1 input, sets Metadata source to Serial metadata
	<b>GPI 4</b>	<b>Off</b>		GPI4 disabled
		<b>I/P AES</b>		GPI2 input, sets inputs from rear panel AES
		<b>I/P SDID</b>		GPI1 input, sets inputs from DMX channels as specified in SDID
		<b>I/P Eng</b>		GPI2 input, sets ginputs as set under <b>ENG'ING</b> menu
		<b>Ref SDI</b>		GPI2 input, sets ref source to force SDI
		<b>Ref REF 1</b>		GPI2 input, sets ref source to force REF 1
		<b>Ref REF 2</b>		GPI2 input, sets ref source to force REF 2
		<b>Meta Int</b>		GPI1 input, sets Metadata source to Internal
		<b>Meta Ext</b>		GPI1 input, sets Metadata source to External
		<b>Dby Enc</b>		GPI output, Dolby bitstream being produced
	<b>Dby Sync</b>		GPI output: Dolby encoder receiving valid sync	
	<b>Banner</b>	<b>On</b>		Warning banner enabled when in display Sleep state
		<b>Off</b>	<b>n</b>	
	<b>Password</b>	<b>*****</b>		Password entry for restricted options
	<b>Options</b>	<b>None</b>		Selects standard functionality
		<b>DMX+MUX</b>		Selects /DM functionality
	<b>I/P Mode</b>	<b>Auto</b>		V6304 reconfigures on SDI HD/SD input change
		<b>HD</b>		V6304 locked to HD configuration
		<b>SD</b>		V6306 locked to SD configuration
	<b>PCB Rev</b>	<b>15</b>		Sets PCB version:
		<b>Ý</b>		A= 1, B=2, etc
		<b>0</b>		<i>Password required. level 2: 29876.</i>
	<b>H/W Rev</b>	<b>15</b>		Sets ECN mod status:
<b>Ý</b>			A=First = 1, B=second = 2, etc	
<b>0</b>			<i>Password required. Level 2: 29876</i>	
<b>TestMode</b>	<b>On</b>		Controls TEST menu availability	
	<b>Off</b>	<b>n</b>		
<b>Factory</b>	<b>On</b>		Enables factory debug mode	
	<b>Off</b>	<b>n</b>		
<b>Norm</b>	<b>N *****</b>			



## 5.2.14 Test Mode

TEST	FPGA	Load	n	Controls whether FPGA loaded from FLASH
		No Load		
	DebugO/P	Off	n	Standard debug dump to RS232 comms
		On		
	DbyWrDbg	Off	n	sends Cat559 write commands to debug terminal
		On		
	DbyRdDbg	Off	n	sends Cat559 write commands to debug terminal
		On		
	FPGAMode	HD		Indicates which mode FPGA is operating in
		SD		
	FPGAFunc	nn		
	GPI Func	nnnnnnnn		
	DART Log	Off	n	enables DART logging
		On		
	Dby Func	60		Sets Cat559E Function Group in Hex
		-		
		AE		
	DbyParam	00= nnnn		Sets Cat559E Parameter in Hex and displays it's value Valid Param number Range will vary - See Dolby Cat559E Serial Control Parameters doc
		-		
		FF= nnnn		
DisClas7	Enabled	n	Module functions as a Class 7 DART module	
	Disabled		Class 7 disabled for REFdata programming	



## 6 Appendix

### 6.1 Trouble Shooting Guide (Frequently Asked Questions)

This section is to be a help in solving some common difficulties with the V6304. If there is no control at all from the front panel first check that the **REM/LOCAL** switch is set to **LOCAL**. If local controls appear to be being sometimes ignored, check that there are no GPI asserted and that all the **GPI1...GPI4** are set to **OFF** under the **CONFIG** menu. There are all situations which our own engineers have found themselves in, so its likely customer and engineers in the will sooner or later encounter these issues.

#### 6.1.1 Dolby Encoding

Symptom	Possible explanation
There is no Dolby E output from the rear panel connector	<ol style="list-style-type: none"> <li>1. Check whether the encoder is encoding by looking at <b>Dby Enc</b> on the <b>STATUS</b> menu. If this shows error then:</li> <li>2. Check whether the encoder has a valid reference by looking at <b>Dby Sync</b> on the <b>STATUS</b> menu. If this shows error then:</li> <li>3. Check status of SDI input and B/B references Ref.1 and Ref.2. on the <b>STATUS</b> menu.</li> <li>4. Check the Ref. Loop slide switch on the rear panel is in the correct position.</li> </ol>
There is Dolby E output from the rear panel connector but not on the embedded output.	<ol style="list-style-type: none"> <li>1. Check that the SDI video standard on the input is valid by looking under the <b>STATUS</b> menu.</li> <li>2. Check on the that the module is a V6304/DM by looking at <b>Variant</b> on the <b>STATUS</b> menu.</li> <li>3. Check that the <b>MUX Grp</b> on <b>MUX CTRL</b> menu is set to the group you are monitoring.</li> <li>4. Check that you are monitoring on the right group.</li> <li>5. If using a B/B reference and forcing the reference standard to this input, check that your applied reference is the same standard as the applied SDI.</li> </ol>
Dolby E output is present but it is not correctly encoded. There is silence/noise/channels mixed up.	<ol style="list-style-type: none"> <li>1. If using Internal metadata, check that you have set the <b>Prog Cfg</b> (internal program configuration) correctly on the <b>DOLBY</b> menu.</li> <li>2. If using External metadata check on the <b>STATUS</b> menu that it is present, you have selected it as the <b>Meta Src</b> on the <b>DOLBY</b> menu.</li> <li>3. If using External metadata look at <b>Meta Cfg</b> on the <b>STATUS</b> menu to check that the program configuration shown is what you think it should be.</li> <li>4. Check that the input channel selections are correct for the program configuration in use in accordance with the Dolby convention. Look at <b>I/P SEL</b> menu and <b>Dby1/2...Dby7/8</b> on <b>DBY STAT</b> menu.</li> <li>5. Look on the <b>STATUS</b> menu at the specific inputs you have selected to verify that they are actually present. If possible monitor the audio on them to check that there's something there.</li> </ol>
The V6304 is set for <b>Meta Src: Ext Meta</b> but it does not appear to be using the external metadata stream	<ol style="list-style-type: none"> <li>1. If the application is a standards converter and/or the External metadata stream applied has a different frame rate to the encoding reference (SDI/Ref.1/Ref.2), check <b>Dby Ver</b> on the <b>STATUS</b> menu and consult Pro-bel engineering.</li> <li>2. If the metadata and reference frame rates are the same, or you have established your decoder version will support different frame rates, establish that the external Metadata stream is a valid Dolby E metadata stream. Check <b>Ext Meta</b> under <b>DBY STAT</b> menu, which will indicate if the stream is valid and if it contains BSI.</li> </ol>



<p>The V6304 is not passing through any audio when in <b>Passthru</b> mode</p>	<ol style="list-style-type: none"> <li>1. The audio is there, but in the current revision the V6304 channel status is permanently fixed to 'Non Audio'. Some DACs will mute when CS has this setting. Change the setting on your DAC so that it doesn't mute.</li> </ol>
<p>The V6304 is corrupting Dolby Digital/Dolby E/AC3/DTS etc when passing it through in <b>Passthru</b> mode</p>	<ol style="list-style-type: none"> <li>1. The SRC's are probably set to Normal. Set <b>SRC</b> to <b>Bypass</b> under the <b>DOLBY E</b> menu.</li> <li>2. If the SRCs are already bypassed, check that the equipment feeding the Dolby E/DTS/AC-3 signal is operating off the same reference as the V6304, and that the V6304 is actually using this reference by looking at <b>STATUS: Ref Src</b>. If the input signal and the V6304 are not running on the same (or coherent) clocks, non-audio data cannot be passed uncorrupted.</li> </ol>
<p>Adjusting AC-3 Metadata under <b>INT META</b> menu makes no difference to the decoded output</p>	<ol style="list-style-type: none"> <li>1. If the decode output is PCM directly decoded from DOLBY E then the AC-3 metadata controls will have no effect. Remember that AC-3 metadata is used by AC-3 coders and is only taxi'd about by Dolby E. A typical chain is: PCM =&gt;V6304=&gt; Dolby E =&gt; Dolby E decoder =&gt; PCM =&gt; AC-3 encoder =&gt; AC-3 decoder =&gt; PCM</li> <li>2. If the decoded output is PCM from a chain as described in (1) above, check that serial metadata has been properly transmitted as serial stream through each PCM leg of the chain, and encoding devices in the chain are set to use external metadata.</li> <li>3. If the decoded output is PCM from a chain as described in (1) above check under <b>DOLBY E: AC3 Prog</b> (or under <b>INT META: AC-3 Prog</b>) that the program for which you are adjusting the metadata is the same program that you are monitoring the PCM. Eg if you are using 5.1+2 and you are monitoring the 5.1 program while adjusting AC-3 metadata of the 2 program, there will be no effect.</li> <li>3. Check that you have set the V6304 to use Internal metadata if the V6304 is the start of the chain and you are adjusting AC-3 metadata on it. No adjustments are possible on external metadata.</li> <li>4. Check that the AC-3 coder(s) in your chain have been correctly set up to use the appropriate program's AC-3 metadata from the possibly 8 that are in a discrete metadata stream. In the 5.1+2 example, if you are adjusting AC-3 metadata for the 5.1 program (AC3 Prog 1) and the AC-3 coder is set to using program 2 from the external metadata stream, there will be no effect.</li> </ol>
<p>Under the <b>DOLBY E</b> menu I changed the setting of: <b>Prog Cfg or AC3 Prog or LoadUser or SaveUser</b> but nothing happened</p>	<p>These controls require the user to momentarily press the <b>SEL</b> button to load the sets of values. If you foreget to 'blip' the <b>SEL</b> button lie this, the display will return to its previous value and the new settings will not be invoked.</p>
<p>The <b>Norm</b> and <b>Norm All</b> functions appear not be working under <b>INT META</b> menu.</p>	<p>These controls require the user to press the <b>▲</b> and <b>▼</b> buttons together - you may have blipped <b>SEL</b> by mistake or done nothing.</p>
<p>The V6306 is encoding Dolby E Program Config 5.1 or 5.1+2 with input of simple tones. On decoding, Ch Dby 4 gives no output.</p>	<p>Check the tone frequency on Dby 4 input. If the tone frequency is much greater than 500Hz it cannot be encoded.</p>



# Vistek V6304 HD Dolby E® Encoder

## 6.1.2 Others

Symptom	Possible explanation
Display never goes to sleep	Check whether the Sleep delay has been set to 0 Mins which means stay awake.
Front panel can change but there is no control No remote control available	The unit is probably in Remote mode. The panel is still life for monitoring. Old V606 rack controller is used. Exchange it for a V6081 rack controller

## 6.1.3 Initialization, Power On-Selftest & Error Messages

On power up the V6304 performs a sequence of operations and a self-test to set itself up for use as a Dolby E Encoder. Below is an explanation of error codes which can be displayed during this setup and selftest sequence:

Flash upgrading	ERROR 01	Flash erasing failed
	ERROR 02	Flash programming failed
	ERROR 03	Main program checksum error after programming
	ERROR 04	Bootloader checksum error after programming
	ERROR 05	No program loaded and no valid upgrade in Flash Stick
	ERROR 06	Bootloader upgrade required but no valid bootloader upgrade in Flash Stick
FPGA configuration	ERROR 07	STATUS stayed low after CONFIG pulsed low
	ERROR 08	DONE stayed high after CONFIG pulsed low
	ERROR 09	STATUS went low during configuration
	ERROR 10	DONE stayed low after configuration
Local EEPROM	ERROR 11	Error writing to local EEPROM
	ERROR 12	Error reading from EEPROM
	ERROR 13	Initialising EEPROM to default data
	ERROR 14	Initialising parameters to default data
Debug port	ERROR 15	Receive buffer overflow
	ERROR 16	Receive overrun
	ERROR 17	Receive framing error
	ERROR 18	Receive parity error
DSP	ERROR 19	DSP program load error
Flash upgrading	STATUS 02	Reprogramming bootloader
	STATUS 03	Reprogramming main program
	STATUS 04	Reprogramming finished



## 6.2 Default AC-3 Metadata settings

The table below shows the default settings used for AC-3 metadata when the V6304 module is factory reset or the INT META settings are normalised.

Channels in prog	5.1/7.1	4	2	1
DialNorm	<----- -27dB ----->			
AC Mode	3/2	3/1	2/0	1/0
LFE Chan	On	<----- Off ----->		
BS Mode	<----- Main complete ----->			
LineMode	<----- Film Standard ----->			
RF Mode	<----- Film Standard ----->			
C MixLev	-3.0dB	-3.0dB		
S MixLev	-3.0dB	-3.0dB		
Dby Surr	<--- Surr Off ----->			
AProdInf	<----- Off ----->			
MixLevel	<----- 105dB ----->			
RoomType	<----- Not indicated ----->			
Ext BSI1				
DMixMode	Lt/Rt	Lt/Rt		
LtRtCMix	-3.0dB	-3.0dB		
LtRtSMix	-3.0dB	-3.0dB		
LoRoCMix	-3.0dB	-3.0dB		
LoRoSMix	-3.0dB	-3.0dB		
Ext BSI2				
SurEXMod	Off			
LP Filtr	<----- Enabled ----->			
LFE Filt	Disabled	<----- Disabled ----->		
SurrPhse	Disabled	Disabled	Disabled	Disabled
Surr Attn	Disabled	Disabled	Disabled	Disabled
RF OvPrt	No Access to this Parameter			



## 6.3 Using Embedded Metadata and SDID

### 6.3.1 Introduction

SMPTE 2020-1 Draft 070606 makes provision for up to nine embedded metadata streams to be carried on an (HD) SDI video stream. This allows a plurality of Dolby E or Dolby Digital (AC-3) encoders to be fed from one video stream, although it must be mentioned that it is highly unlikely that more than, say three of these embedded metadata streams would ever be used. In practice, one would run out of embedded channels long before one was able to use all nine embedded metadata streams! Each of the embedded metadata streams has a number called SDID, which not only identifies the embedded metadata stream but also identifies the embedded channel which is the first channel in a set of consecutive embedded channels which constitutes a program/s to be encoded to Dolby E or AC-3. For example, if there was an embedded metadata stream with SDID=02 it would contain metadata which was to be used to encode the set of channels starting with DMX Gp 1.1. The SDID does not give any information on how many channels might be in this set, or whether they comprise one or more audio programs, or how the set of channels is mapped to the inputs of an encoder - this information must either be obtained from the Program Configuration within the embedded metadata stream itself, or must be known a-priori from a convention adopted within the broadcasting institution. The latter will be the usual case, and be based on the specification of the encoders used. An embedded metadata stream can also be meant for use on encoding audio channels which are *not* embedded and are obtained from elsewhere. In this case there is no association between the embedded metadata set and any embedded audio channels which may be present. The table below shows the meaning of the SDID numbers defined in SMPTE 2020-1

**Association between SDID values and the First Audio Channel Pair of a Program**

DMX Audio Channel Pair	DMX Group	SDID
No association	None	01
Channel pair 1/2	Gp 1.1	02
Channel pair 3/4	Gp 1.2	03
Channel pair 5/6	Gp 2.1	04
Channel pair 7/8	Gp 2.2	05
Channel pair 9/10	Gp 3.1	06
Channel pair 11/12	Gp 3.2	07
Channel pair 13/14	Gp 4.1	08
Channel pair 15/16	Gp 4.2	09



## 6.3.2 Selection of Embedded Metadata

As the V6304 can only encode a single Dolby E stream, the user is provided with a means of selecting which SDID to use from the 9 possible SDIDs. Not all the 9 SDID may be present; indeed it is unlikely that more than one or two will be available in practice. With the limited display capability of the V6304, it is not possible to provide a display which simultaneously shows the status of all the 9 possible SDID streams, but since the REM LED gives a real time indication of the validity of the presently selected external metadata source, this can be used as a status indication while selecting the SDID from the ENG'ING menu. It will be seen in the table above that the SDID numbers used by SMPTE don't directly correlate with channel numbers in an easy to use form, and to allow for more intuitive operation the V6306 provides SDID selection in terms of the embedding group numbers as shown below.

ENG'ING	SDID	No Assoc
		Gp 1.1
		Gp 1.2
		Gp 2.1
		Gp 3.1
		Gp 3.2
		Gp 4.1
		Gp 4.1

## 6.3.3 Status of Embedded Metadata

The presence of embedded metadata and details about it may be established by looking at several entries under the **DBY STAT** menu. These stati are readable irrespective if the V6304 is encoding with Internal or External metadata.

<b>DBY STAT</b>	<b>Meta I/P</b>	<b>s s s</b>	Serial metadata /SDI metadata present/absent <b>s = 0</b> : There is metadata present on this source <b>s = C</b> : There is no metadata on this source 1 <sup>st</sup> symbol relates to serial meta on the rear panel input 2 <sup>nd</sup> symbol refers to embedded meta on any of the 9 SDID 3 <sup>rd</sup> symbol refers to embedded meta on the <i>selected</i> SDID
<b>DBY STAT</b>	<b>Ext Meta</b>	<b>Absent</b>	Metadata not present
		<b>Invalid</b>	Metadata invalid
		<b>No AC-3</b>	Metadata does not include AC-3
		<b>Valid</b>	Valid but no extended BSI
		<b>ValidBSI</b>	Valid with extended BSI



## 6.3.4 Input Selection and Channel Mapping

The input channel selection referred by the SDID is not enforced on the V6304, as cases may exist where a user wishes to intentionally use an embedded metadata stream to encode channels sourced from elsewhere, even though embedded source channels may exist. The I/P SEL menu affords this choice. This raises the issue of Channel Mapping when using embedded data. Because the SDID as described in SMPTE 2020-1 does not provide information on how the set of channels is mapped to the inputs of an encoder, a strategy must be defined for this. Because of the significant industry penetration of Dolby E encoders, Pro-bel has adopted a Channel Mapping based strictly on the Input Assignment convention used by Dolby in all their equipment and described in Section 3.3.1.

This raises the issue of how to deal with Dolby Input Assignments which have non-contiguous Channel Assignments.. Consider the extract from the Dolby Input Channel Assignments table below The 2+2 and 2+2x1 program configurations do not use channels B3,B4,C5,C6.

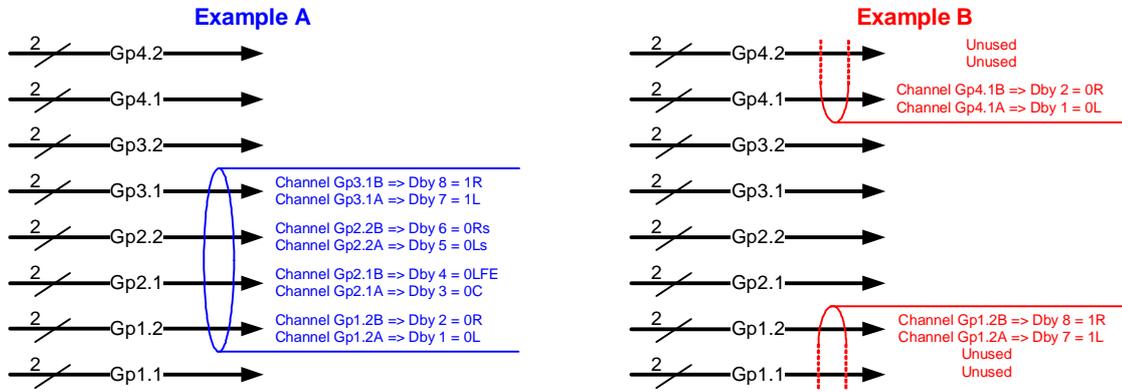
Output Bitstream format	Program Configuration Meta Cfg	Encoder Input Channel Assignments							
		A1	A2	B3	B4	C5	C6	D7	D8
Dolby E <sup>U</sup>	5.1+2	0L	0R	0C	0LF	0Ls	0Rs	1L	1R
	5.1+2x1	0L	0R	0C	0LF	0Ls	0Rs	1C	2C
	4+4	0L	0R	0C	0S	1C	1S	1L	1R
	2+2	0L	0R	none	none	none	none	1L	1R
	2+2x1	0L	0R	none	none	none	none	1C	2C

The method adopted by Pro-bel in the V6304 for SDID Input Selection is to always to map a full set of 8 channels for input selection. This means we are prepared to 'waste some channels' in an SDID assignment rather than deviate from Dolby's well used input assignment. Consequently, we have to deal with the issue that arises if the SDID refers to, say Gp 4.1 and the program configuration is 2+2. The lack of contiguity in the Dolby Input Assignments means that an SDID mapping which starts at Gp 4.1 would overflow the available channels! Pro-bel have decided to adopt a modulo arrangement to handle with this situation, in other words, the array of channels 'wraps around' from Gp 4.2 back to Gp 1.1 . Hopefully, persons who allocate the SDID in the broadcasting industry will steer clear of SDID assignments like this which are inherently contentious in terms of the Dolby Input Channel Assignments, as different equipment manufacturers will undoubtedly handle them in different ways.



The diagram shows how the V6304 would map 2 different examples, of which Example B highlights the modulo convention adopted by Pro-bel in the V6304.

## Embedded audio channels with SDID Input Channel Mapping



Assoc	SDID	Embedded meta
Gp4.2	09	.....
Gp4.1	08	.....Meta Pgm Cfg 2+2..... <b>Example B</b>
Gp3.2	07	.....
Gp3.1	06	.....
Gp2.2	05	.....
Gp2.1	04	.....
Gp1.2	03	.....Meta Pgm Cfg 5.1+2..... <b>Example A</b>
Gp1.1	02	.....
No Assoc	01	.....

## 6.4 Dolby Reference issues with Progressive Video

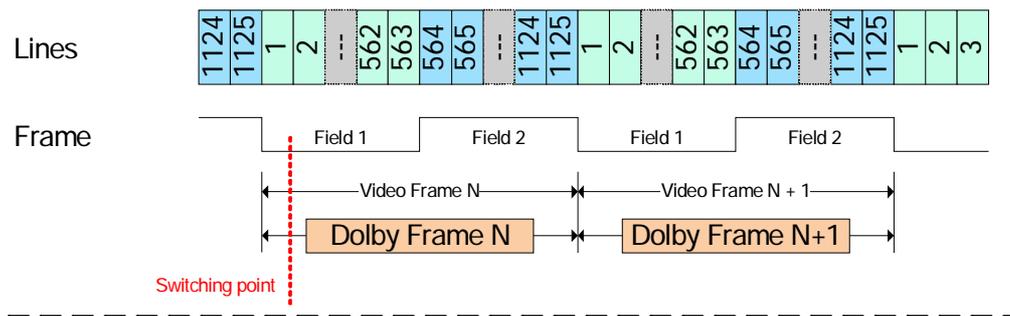
### 6.4.1 Background

Audio encoded into Dolby E is formatted into a frame of data. This Dolby E frame is designed to have a length and rate suitable for the video it is to be associated with. This facilitates the encoded audio to be switched, dropped, or repeated in the same manner as the video signal without breaking the Dolby E frame.

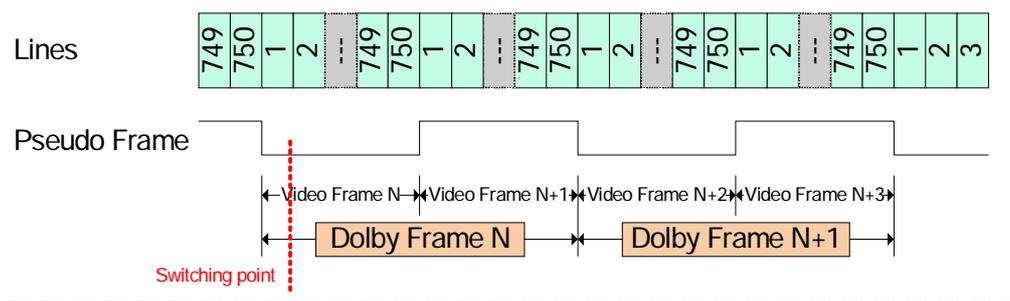
### 6.4.2 Dolby E Frame Rates

Currently the Dolby E frame rates are 24/1.001, 24, 25, 30/1.001, 30 in Hz. So, as an example, a 1080i 29Hz (59Hz field rate) video frame can be associated with a 29Hz Dolby E frame as shown in A. The Dolby E frame spans field 1 and field 2 of the 1080i video, which is OK since any switches will occur on the frame boundary, leaving the Dolby E frame intact.

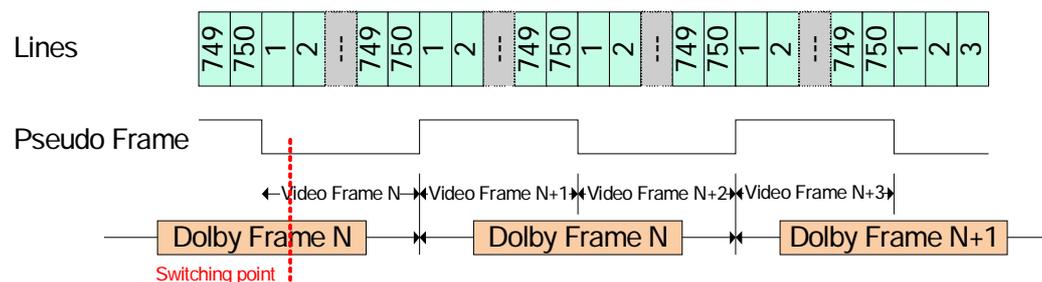
a) 1080i 59Hz



b) 720p 59Hz - Dolby Frame Settles on Video Frame N



c) 720p 59Hz - Dolby Frame Settles on Video Frame N + 1



## 6.4.3 High Frame Rates

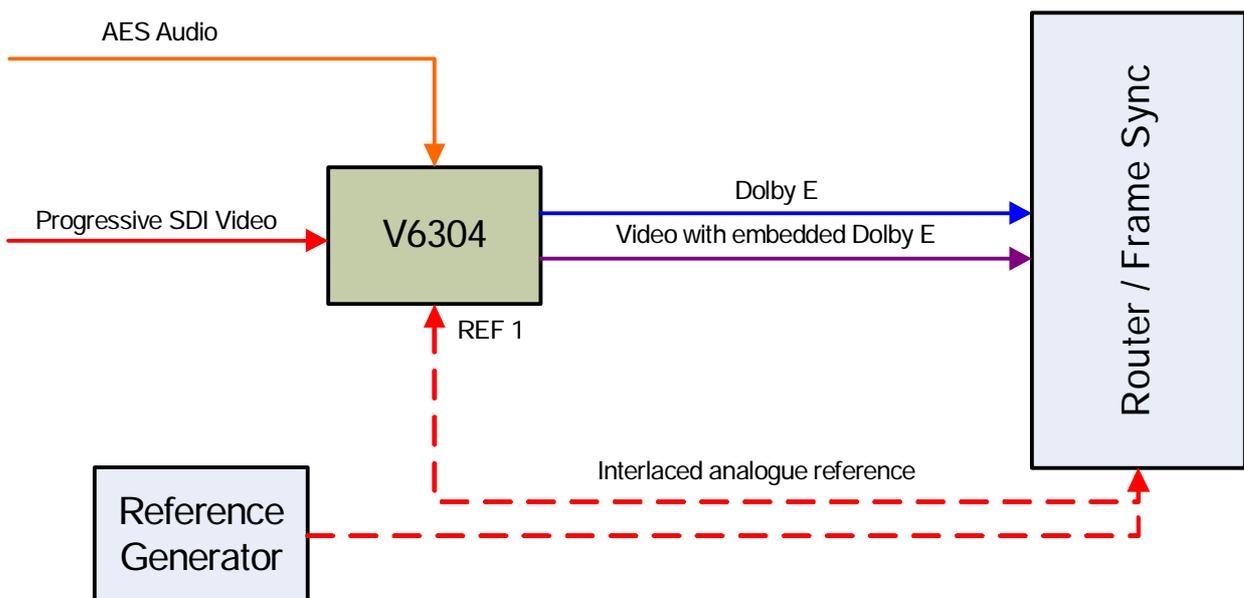
An issue can occur when dealing with video frame rates greater than 30Hz such as 720p 59Hz. There is no way of generating a Dolby E stream at a frame rate of 59Hz, the best that can be done is to generate a 29Hz Dolby E stream that will span 2 frames of the video (see B). With nothing else to set the timing the Dolby E frame will randomly start on a progressive frame (see C). This can cause a problem if the video is switch later in the video system chain on the progressive frame in the middle of the Dolby E frame.

## 6.4.4 System issues

This is a system issue. With the V6304 set in Auto mode with a progressive SDI input, it is the SDI input that is used as the reference. This has no field information in it suitable to get round the issues described here. If a suitable reference is applied to REF 1 of the V6304 the Dolby E frame will start on the nearest progressive frame to the reference's frame signal and still maintain proper alignment to the SDI video. By using the same reference on REF 1 as that used by the equipment that performs video or audio switching frame switches will occur on the correct frame of the progressive signal, and the Dolby E frames will be properly aligned to accommodate this.

## 6.4.5 Summary

If it is anticipated that video at frame rates above 30Hz will be used, a suitable reference (less than or equal to 30Hz frame rate and interlaced) should be connected to REF 1 of the V6304. This should be the same reference as used by the device(s) in the chain that may perform the frame switching (see below).





## Vistek V6304 HD Dolby E® Encoder

### 6.5 Software Versions

This table gives a brief summary of the various versions of software that have been issued with the corrections and improvements for each. This has been included in this manual so that users with earlier versions can understand when some facilities, or menu options may not appear.

VERSION	DATE	REMARKS
PA886A V1_0	Feb 2008	Initial version. No MUX/DMX support. No editing of AC-3 metadata settings
PA886C V2_0 (not released)	Dec 2008	Full editing facility for AC-3 metadata provided No DMX/MUX support No support for embedded metadata
PA886D V3_0	Feb 2009	Full DMX/MUX support Embedded metadata support