



V6306

HD Dolby[®] Digital (AC-3) Encoder

User Guide

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Pro-Bel Ltd

www.pro-bel.com



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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 V6306 is a module for encoding multi-channel, multiple mono digital audio signals into the Dolby Digital (AC-3) compressed format. The term AC-3 will be used through this document, since although it is equivalent to Dolby Digital, AC-3 is the normative industry standard. It is part of the Pro-Bel Vistek range of modules targeted at HDTV interface applications. The V6306 modules are single-width 3U units designed to fit in a V1606 rack, and are backwards compatible with the V1603 rack. Use of the V6306 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:

V6306	Basic Dolby Digital (AC-3) Encoder Module
V6306/DM	Dolby AC-3 Encoder Module with HD DMX/MUX capability

The V6306 modules are both designed around the Dolby Cat559D Dolby Digital OEM decoder module.

1.1 General

In free-standing mode, the V6306 encodes the PCM audio signals on its audio inputs to AC-3 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 AC-3 encoder (including those extracted by the DMX on the V6306/DM) are passed through sample rate converters on the V6306 so there is no need for them to be synchronous with the reference or each other. The V6306 AES inputs support sample rates of 32kHz to 48kHz. The V6306 will not accept 96kHz audio.

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 3rd party software written for the DART system.

A common use for the V6306 is to generate AC-3 for input to an MPEG encoder, prior to signal transmission. The AC-3 encoder will usually be given a video reference signal, which in the case of the V6306 can be the (HD) SDI video signal itself. Most MPEG decoders feature some degree of video frame delay, and the V6306 can adjust the latency of the AC-3 encoding such that the audio and video input to the MPEG encoder are timed up correctly.

Another common application is the re-encoding of an AC-3 surround sound program that was previously decoded and whose constituent channels are available as linear PCM along with a serial metadata stream which describes how they were originally encoded.



1.2 Supported Video Standards

The V6306 AC-3 encoder 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
1280x720/60/1:1	296M	720p60
1280x720/59.94/1:1	296M	720p59
1280x720/50/1:1	296M	720p50
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.

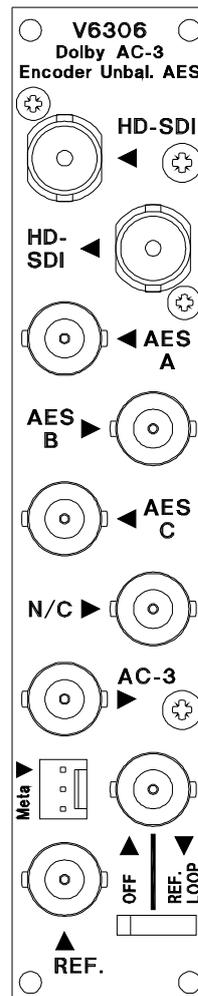
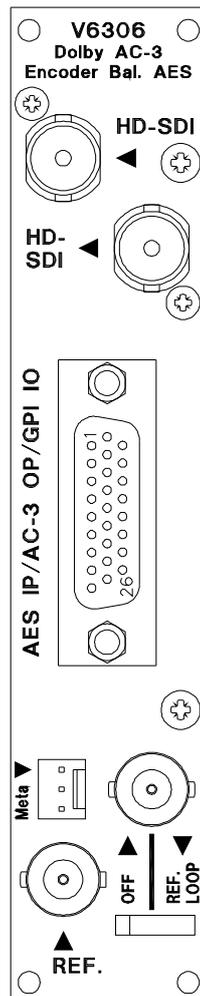
The Rear Panels incorporate an ID mechanism and may be identified from the front panel of the V6306 from the **STATUS** menu by:

Rear Mod **Unbal**
 Balanced
 Invalid

V6306 plugged into an unbalanced rear

V6306 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 IN	External reference input REF. Reference is video NTSC/PAL/HD bi-level and tri-level sync. A jumper on the V6306 allows the input impedance of REF. to be set to either Hi-Z or 75Ω.
REF LOOP	When the red slide on the switch is towards the ON side, the REF. input is looped to the REF LOOP output. When the red slide on the switch is towards the OFF side the REF LOOP is disconnected from REF. REF LOOP facilitates daisy chaining references. The maximum recommended length of such a video daisy chain is 4, and the last V6306 in a daisy chain should have the termination jumper on REF. set for 75Ω.
HD-SDI IN	(HD)SDI reference and signal input On the V6306 this is an (HD) SDI video reference, whereas on the V6306/DM it is both a reference and an input.
HD-SDI OUT	(HD) SDI signal output on V6306/DM only. On the V6306 it is a regenerated version of HD-SDI IN .

2.2.2 Metadata on Molek KK3

The V6306 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. Such a metadata stream can contain metadata for up to 8 AC-3 programs, and the V6306 provides for selection of the desired program's metadata from the metadata stream.

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 C IN and unbalanced output for the encoded AC-3 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 not used	6	reserved
	15	reserved
	25	GND
Audio 5 AC-3 out ⇒	5	AC-3 Output A Pos
	14	AC-3 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
GPIO_0 GPI_1	24	GP Input/Output 0 (GPI4)
	23	GP Input 1
GND	10	GND
GPI_2 GPI_3	22	GP Input 2
	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.



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2.2.6 Breakout Cables and Panels

The V6306 is compatible with the V6905 Breakout Cable which provides 4 AES inputs, 4 AES outputs and GPIO from the HDD26 connector. The AC-3 output of the V6306 corresponds to *AES A out* on this breakout cable. The V6306 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 (V6306)	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	V6306/DM 12W



2.4 Signal Specifications

SIGNAL	TYPE	COMMENTS
Power V6306	< 7W	Supplied from rack 9-24Vdc fused 2A
Power V6306/DM	< 12W	Supplied from rack 9-24Vdc fused 2A
Video Reference Ref.	B+B, TLS	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 32–48kHz <i>The V6306 will not accept 96kHz audio.</i>
Audio Input, Digital (AES)	Unbalanced	Zin = 75Ω Zout = 75Ω Conforms to AES3id-2001 Input Sample rate 32–48kHz <i>The V6306 will not accept 96kHz audio.</i>
Audio Output, AC-3 encoded on AES carrier	Balanced	Conforms to the AC-3 specification, 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 ATSC document A/52B, 14 June 2005: <i>Digital Audio Compression Standard (AC-3, E-AC-3) Revision B</i> . 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 V6306 is an AC-3 encoder and the encoding process is not based on video frames like Dolby E. Some applications will require AC-3 to be output from the V6306 co-timed with the video. Some MPEG encoders may apply video delay internally but require audio input to be pre-delayed by a similar amount. The V6306/DM is designed to automatically equalize delay between video throughput path and audio throughput path, irrespective of which audio source (eg. rear panel inputs or DMX channels) is used, or which audio output (eg. rear panel output or MUX channels) is used. The default video delay used to achieve this delay equalization is fixed for a given video standard, and the audio delay is automatically adjusted to match the video delay. The user has the option to trim the audio delay, in steps of 1ms, relative to the equalized value. Adjustment range is -11ms to +50 ms.

Tektronix Definition	SMPTE	Colloquial	Video Delay in Frames	Video Delay in ms
1920x1080/60/2:1	274M - 4	1080i60	6	200
1920x1080/59.94/2:1	274M - 5	1080i59	6	200
1920x1080/50/2:1	274M - 6	1080i50	6	240
1280x720/60/1:1	296M	720p60	12	200
1280x720/59.94/1:1	296M	720p59	12	200
1280x720/50/1:1	296M	720p50	12	240
1920x1035/60/2:1	260M	1035i60	6	200
1920x1035/59.94/2:1	260M	1035i59	6	200
625/50/2:1	125/259M	625i50	6	240
525/59.94/2:1	125/259M	525i59	6	200

2.6 Adjustment Ranges

2.6.1 Video Adjustments

There are no video adjustments.

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.

2.6.2.3 Encoding delay

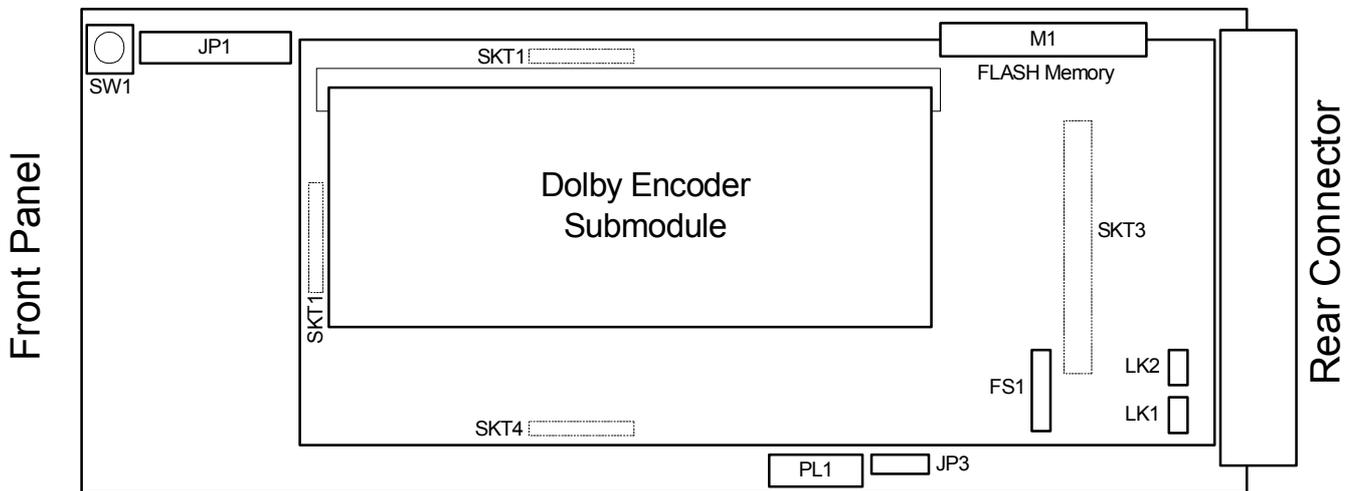
Encoding delay can be adjusted from -11ms to +50ms relative to the video delay, in steps of 1ms.

2.7 Hardware

2.7.1 The PCB

The figure on the next page 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 Pro-bel 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		Fit to terminate the Video reference
LK2	reserved		leave closed



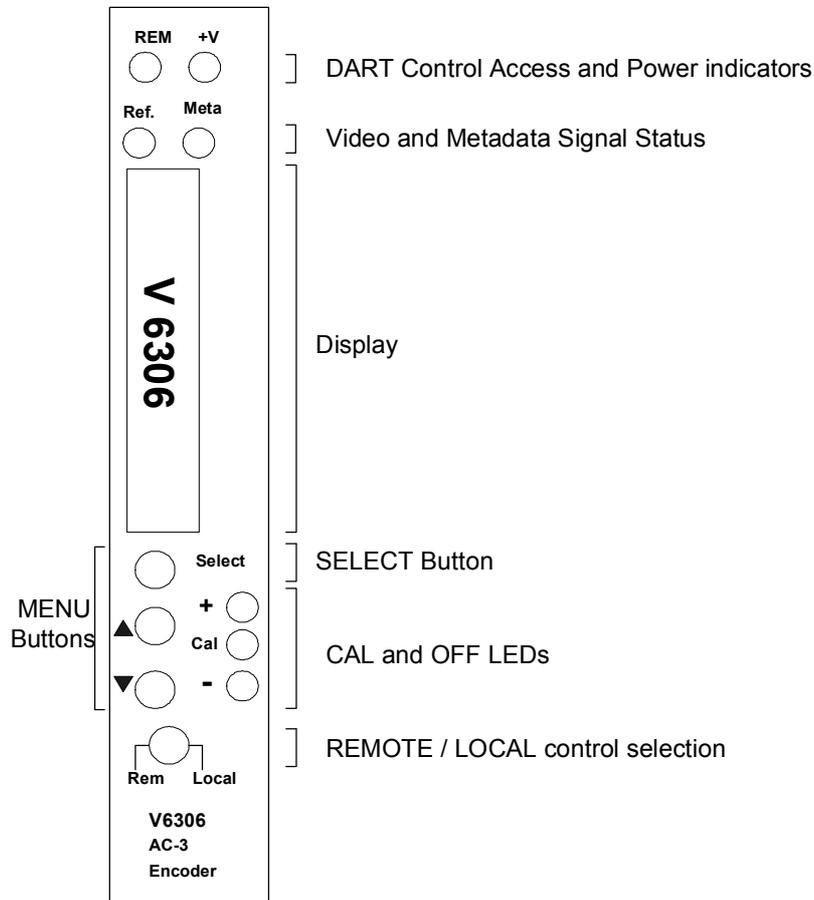
Vistek V6306 HD Dolby® AC-3 Encoder

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 module 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 V6306 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 AC-3 encoding is being received.
- Ref** Ref LED will light if the selected reference is on SDI, or Ref. 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 **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 V6306 has two configuration options, the V6306 and the V6306/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** **None**

Available configurations are **None** (V6306) and **DMX+MUX** (V6306/DM). The variant may only be changed by the factory.

2.10 Submodules

The V6306 will always be fitted with the 130-5000 submodule and there are no other options. The 130-5000 submodule carries the Cat559D 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 Cat559D 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 V6306 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 for the V6306 and V6306/DM:

Product Code	Part No.	Description
ALL	130-5000	AC-3 encoder submodule with Dolby Cat559D encoder OEM

2.11 Functional Block Diagram

Figure 2 shows the hardware block diagram of the V6306 and V6306/DM with a Class 7 DART interface.

2.11.1 Inputs and Outputs

Four AES receivers and FPGA logic are used to receive and decode to I²S the incoming AES audio data from the rear panel connectors. In the V6306, the PCM inputs to the Cat559D encoder are sourced only as I²S from the AES receivers on the rear panel inputs. The V6306/DM contains de-embedding and embedding logic in the FPGA, and the PCM inputs to the Cat559 encoder may be selected as I²S from either the de-embedded streams or I²S from the AES receivers on the rear panel inputs. Each PCM input to the Cat559D 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 AC-3 output bitstream generated by the Cat559D is also in I²S 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 Cat559D module. The source selection of the external metadata to be used – ie from external serial or embedded – is under user control.

The V6306 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 V6306 has three possible reference sources for the AC-3 encoder: In Auto mode the default 25/29.98Hz reference for the Cat559D 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 V6306 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 V6306/DM has the same reference options as the V6306 and the embedding logic requires a video rate clock, which may be 27MHz, 74,25MHz or 74,179MHz, depending on the incoming SDI input standard. When the reference is set to 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 V6306/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 AC-3 output of the Cat559D requires a set of I²S audio clocks that are frequency synchronous with the video reference applied to the Cat559. The V6306 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 V6306/DM is a video frame delay to compensate for the encoding delay of the Cat559D 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 V6306/DM embedding logic embeds the AC-3 bitstream on the same video standard as that of the video input. There is selection logic which routes the AC-3 bitstream to the selected MUX group. The module does not provide a warning if the selected MUX group is already present/in use. It automatically replaces the group.

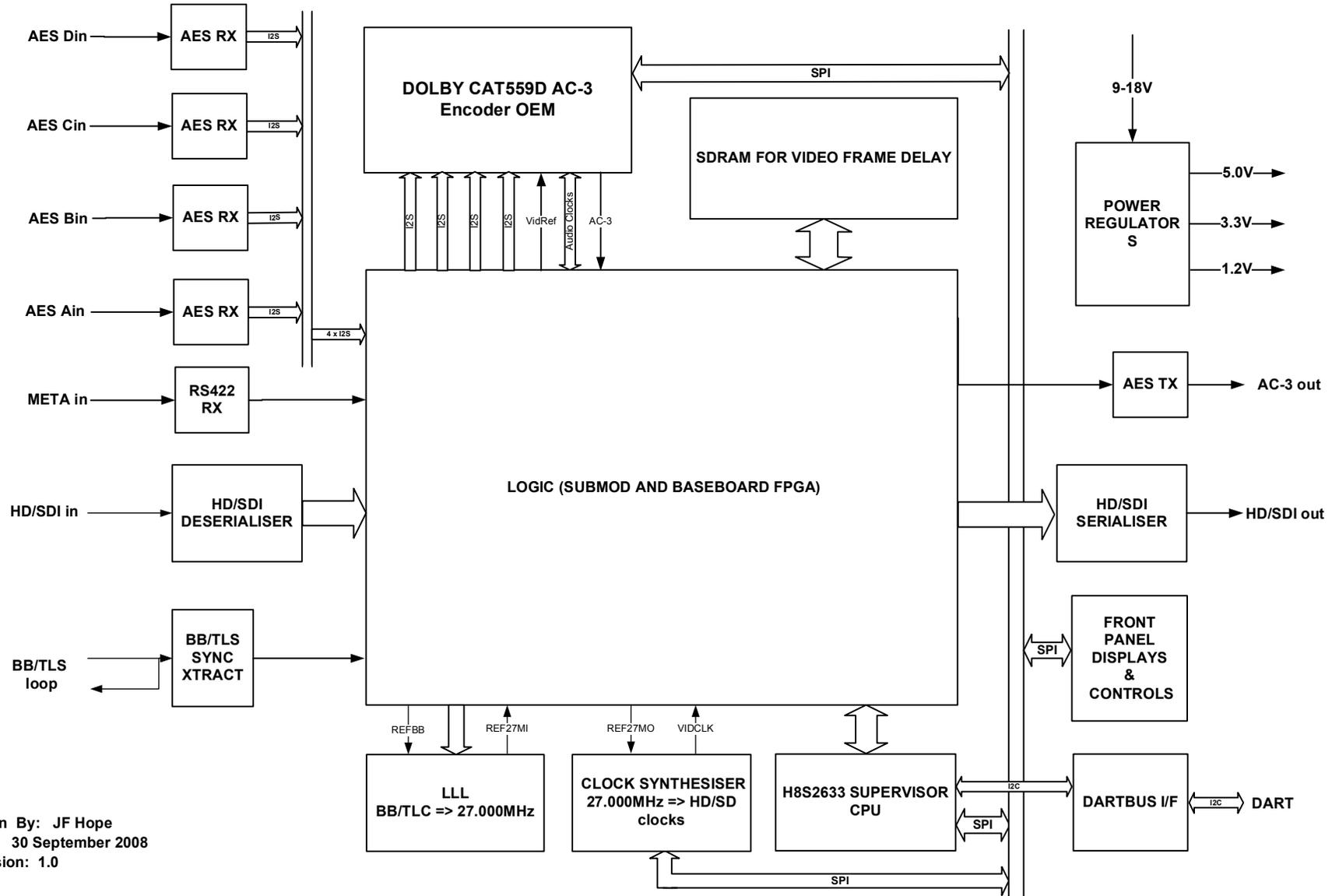
2.11.4 Supervisor CPU

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 V6306 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 V6306 submodule accommodates the HMM backplane connector, an (HD)SDI video equaliser, an (HD)SDI video line driver, and BB/TLS reference input circuitry.

Figure 2: V6306 Dolby Digital (AC-3) Encoder Module - Hardware Block Diagram



Drawn By: JF Hope
 Date: 30 September 2008
 Revision: 1.0



3 System Operation

3.1 Local Control

3.1.1 Start Up

Local control and monitoring of the V6306 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 labeled **+**, **Cal** and **-**.

After power up the display will start at the top level and show the unit type as **V6306**.

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, V6306
Main Menu	The Main Menu items, such as I/P SEL , I/P GAIN , ENG'ING etc. These items are all in Upper Case.
Sub Menu	Menu items under each main heading, such as Gain A1 under the I/P GAIN 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 +0.000dB for a gain or ON or OFF 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 V6306/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 the sections on MENUS and CONTROLS.



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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	V6306	Top Level
Select	DOLBY	First Main Menu
▼	Meta Src	
▼	Meta Pgm	The Sub Menu we want
Select	Prog 1	The default setting
▲	Prog 2	...
▲	Prog 3	...
▲	Prog 4	...
▲
▲	Prog 8	Set it to Program 8 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	Meta Pgm	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 : Sleep** menu.

The brightness of the display can also be adjusted using the **ENG' ING : LEDLevel** 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 V6306.

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 V6306/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 **Ser 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 maneuvering down the menu structure. A few are shown below:

▼	A√ B x C√		etc.
▼	Ref 59√	or	Ref x etc.
▼	Ref SDI	or	Ref EXT etc.
▼	Meta x x	or	Meta √ x etc.

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



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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 default 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 default 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 V6306 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 V6306. 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 V6306 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 Digital® (AC-3) Basics

The Dolby Digital encoding system is a bandwidth-efficient coding system used to convey a *single audio program* through a limited capacity medium to a consumer decoder. The audio program can be mono, stereo, or a surround sound ensemble. The Dolby Digital system is used with various media, including DVD's (Digital Versa Disc), cinema film, and various terrestrial and satellite broadcasting systems. Dolby Digital was developed originally by Dolby Laboratories Inc and was adopted by the ATSC as the AC-3 standard, which is described in ATSC document A/52B, 14 June 2005: *Digital Audio Compression Standard (AC-3, E-AC-3) Revision B*. The terms Dolby Digital and AC-3 are generally interchangeable.

The AC-3 format is a frame-based format, but the frames are not associated with any specific video frame rate. The AC-3 frames are 1536 audio samples in length with $sps = 48kHz$, giving a frame length of 32ms. There is therefore no video frame reference associated with AC-3, and the reference on the V6306 serves only to lock the frequency of the V6306 clock system to that of the reference. The application will determine whether or not this is necessary.

To handle mono, stereo or surround sound programs, AC-3 has a parameter called Audio Coding Mode (acmod) which determines what channels will exist in the program. Audio Coding Mode values are denoted by a number n/m in which n gives the number of front channels and m is the number of back channels. In addition there may be a Low Frequency Effects (LFE) channel, sometimes called a subwoofer channel. Where there is an LFE, the notation is n/m followed by an L .

V6306 encoder accepts up to 6 separate inputs in the form of 3 pairs. In Dolby Digital nomenclature these are referred to as (A1,A2), (B3,B4) and (C5,C6). Dolby have introduced a convention for the required assignment of signals to the encoder inputs for the various program configurations in Dolby Digital encoding, which is used for both Dolby encoders and decoders. A table of the required Input Channel Assignments is shown below.

Audio Coding Mode	Input Channel assignments					
	Dby 1/2		Dby 3/4		Dby 5/6	
	A1	A2	B3	B4	C5	C6
1/0	unused	unused	C	unused	unused	unused
2/0	L	R	unused	unused	unused	unused
3/0	L	R	C	unused	unused	unused
2/1	L	R	unused	unused	S	unused
3/1	L	R	C	unused	S	unused
2/2	L	R	unused	unused	Ls	Rs
3/2	L	R	C	unused	Ls	Rs
3/0L	L	R	C	LFE	unused	unused
2/1L	L	R	unused	LFE	S	unused
3/1L	L	R	C	LFE	S	unused
2/2L	L	R	unused	LFE	Ls	Rs
3/2L	L	R	C	LFE	Ls	Rs

In the table above, L, R, C, stand for Left, Right, Centre. LFE stands for Low Frequency Effects, S for Surround and Ls, Rs for Left Surround and Right Surround respectively.



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The assignment of Dolby Digital 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 V6306 shows the input assignment convention for the active audio coding mode (acmod) under the STATUS menu. An example for the 3/2 audio coding mode with LFE on is shown below:

STATUS	Dby 1/2	L R	Ch 1 = Left front channel Ch 2 = Right front channel
	Dby 3/4	C LF	Ch 3 = Centre front channel Ch 4 = LF effects channel
	Dby 5/6	Ls Rs	Ch 5 = L surround channel Ch 6 = R surround channel

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 V6306/DM from the **STATUS** menu:

STATUS	AES I/P	A[√] BX CX	
	DMX GP1	G1 s s	if DMX/MUX option installed first symbol \odot Gp1.1, 2 nd symbol \odot Gp1 .2 s = $\sqrt{\quad}$: Original DMX data on this AES s = X : Nothing on this AES
		. . .	
	DMX GP2	G2 s s	Symbols as above for Gp 1
		. . .	
	DMX GP3	G3 s s	Symbols as above for Gp 1
		. . .	
	DMX GP4	G4 s s	Symbols as above for Gp 1

3.3.3 Input Selection and DMX Group

On the V6306 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...C] => Encoder Inp[A...C]

On the V6306/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 Grp [1.1...2.1] => Encoder Inp [A..C]

DMX Grp [3.1...4.1] => Encoder Inp [A..C].

The V6306/DM furthermore allows the start of the block of 3 consecutive pairs in the DMX channels to be assigned automatically from the SDID in the digital video. Note that the SDID is really meant for DolbyE and gives the start channel of program 1 in the Dolby E program set. Because the Dolby E program set can comprise up to 8 programs, using the SDID to select the start channel for encoding by the V6306 will only work correctly if the program to be encoded corresponds to program 1 in the metadata set. If the program is not program 1 the input selection will have to be done manually from



the **ENG' ING** menu.

On both V6306 and V6306/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 V6306/DM:

Rear Panel AES[D, Grp1.1,B] => Encoder Inp[A,B,C] .

See the section on CONTROLS for details. The basic Input Selection menu is as follows:

I/P SEL	I/P Sel	AES	default setting
		DMX SDID	on V6306/DM only
		GP 1/2	on V6306/DM only: Grp1.1 . . .Grp2.1
		GP 3/4	on V6306/DM only: Grp3.1 . . .Grp4.1
		Eng' ing	

3.3.4 Input Gains

Each of the six channels which can be input to the AC-3 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.

I/P GAIN	Gn Dby1	0.00dB	(default)
	Gn Dby2	+4.00dB	
	...		
	Gn Dby6	-3.25dB	

3.3.5 Input Phases

Each of the six channels which can be input to the AC-3 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.

IP PHASE	Phs Dby1	0°	(default)
	Phs Dby2	0°	(default)
	...		
	Phs Dby6	180°	

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 V6306/DM are synchronised by means of sample rate converters to be coherent with the clock reference used by the Dolby Digital AC-3 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 reference. Further, it should be noted that when the sample rate converters are bypassed the audio encoding delay is reduced by 3ms. This is not compensated by the V6306 and the user should manually increase the encoding delay by 3ms to make up for this.

The reference may be the SDI video input, the external video B/B/TLS input, or the V6306's free running



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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 => Free Run. This means that so long as you have an SDI input present, it will be used as the 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
                Ext Ref
                Free
  
```

Both the V6306 rear panels have a pair of BNC sockets for a REF. LOOP (in and out), and a slide switch that enables the REF. LOOP. This switch must be correctly set for the particular reference connection employed. The lower BNC socket is used as REF. IN. The next BNC socket (2nd from the bottom) will output the same reference when the slide switch is in the 'LOOP' position. Input impedance of REF. 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 /LS reference Ref. the STATUS will display the presence and field rate of the reference applied under REF I/P. REF Src will display which reference source 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    Ref 59√
STATUS      Ref Src    Ref EXT
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      Free run frame rate is whatever was last applied
                50 Hz        as reference (default option)
                59.94 Hz   Fixed at 50Hz
                59.94 Hz   Fixed at 59.94 Hz
  
```

3.3.8 Metadata Source

Metadata is a frame-based set of bits at a video frame repetition rate which controls parameters of the *Dolby E* encoding process, including the AC-3 parameters of any AC-3 programs which may be part of the *Dolby E* program set. A single *Dolby E* metadata stream can support AC-3 metadata for up to 8 different AC-3 programs. Because the V6306 AC-3 encoder encodes only one program, it allows the user to select which of the up to 8 metadata sets in the *Dolby E* metadata stream to use for the encoding.

The source of the metadata must be set up for the *Dolby* encoder to operate properly. The V6306 can



encode with either external metadata applied to the rear panel connector, or internal metadata as determined by program configuration set by **DOLBY => Int Cfg**. The V6306/DM has an additional source of metadata. The SDI can carry an embedded metadata stream as per SMPTE 2020-1 draft. This metadata will apply to decoded program material embedded in the same SDI stream.

Metadata source is selected from the **DOLBY** 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.

DOLBY	Meta Src	Int meta	Metadata sourced from internal settings.
		Ext meta	Metadata sourced from external stream – see also Meta Rvt under ENG-'NG
	Ext Meta	Ser meta	Metadata sourced from serial stream
		SDI meta	Metadata sourced from SDI stream – see also Meta Rvt under ENG-'NG

Internal metadata is typically used when the encoder is performing first-time encoding of a set of PCM audio channels. Or when re-encoding a set of PCM channels which was previously encoded but for which discrete metadata is unavailable. In this case the user has to set up the program configuration to suit the nature of the programs applied as input, and from this the encoder will generate a suitable set of metadata bits internally and use it to control the encoding process.

External metadata is typically used when the 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 the re-encoding be done with the same control parameters as it was originally done. The Dolby E *decoder* generates a set of metadata bits from the decoding process and outputs as a discrete stream that can be input to a Dolby *encoder* (usually Dolby E but can also be AC-3) to ensure that this can be achieved. When external metadata is used with the V6306 AC-3 encoder the program configuration of the metadata is read from the external metadata bits and the user has to select which program from the possibly 8 programs contains appropriate AC-3 metadata.. When using external metadata the internal metadata and presets is ignored in the V6306 encoding process. Similarly, when using internal metadata, the user may read the external metadata, although it will be ignored in the encoding process.

A common use for the V6306 with external metadata is a so-called *transcoder* application, from Dolby E to Dolby Digital (AC-3) for MPEG encoding. Surround sound programs for video are often transported in the broadcasting environment as Dolby E in the 5.1 + 2 program configuration. Here the 5.1 represents the surround sound ensemble and the 2 represents mixed-down stereo or stereo in a second language. A Dolby E decoder (such as the Pro-bel Vistek V6302) decodes this into 8 PCM channels along with a discrete metadata stream. The first six channels of PCM comprise the 5.1 program, and the remaining two comprise the stereo program. A typical MPEG-2 HD encoder such as the Tandberg EN5780 can accept up to four AES-3 inputs, (all of which is AC-3 compatible). Broadcasters often want to have two or more soundtracks associated with a single video program – a surround soundtrack for consumer decoding by Dolby Digital decoders and a stereo PCM soundtrack for consumers who don't have Dolby Digital decoders. In such an application, the PCM stereo pair would be fed directly from the V6302 AES output into one of the MPEG encoder AES inputs, and the other 3 PCM pairs comprising the surround program would be fed from the V6302 into a V6306 AC-3 encoder. The AC-3 output of the V6306



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would be fed to another AES input of the MPEG encoder. To re-encode the surround program correctly, serial metadata would be routed from the V6302 Meta output to the V6306 Meta input. If the original Dolby E had 5.1 +2 program configuration, the V6306 would be set to select program 1's AC-3 metadata from the serial metadata stream. The V6306 AC-3 encoder will accept metadata streams at any frame rate.

3.3.9 Internal Metadata – Loading Presets

The V6306 has several options for using internal metadata and these may be selected from the **Int Mode** submenu of the **DOLBY** menu. There are four internal preset configurations that are able to satisfy most broadcast applications. They are called *Film Surround*, *Film Stereo*, *Music Surround*, and *Music Stereo*. These presets have the same settings as those presets of the same name established by Dolby Labs in their DP569 Dolby Digital Encoder, and which are given in Appendix A. In addition, there are four User Presets which may be configured and loaded. To load (or recall) a preset, first ensure that **Meta Src** is set to **Int Meta**. Then under the **Int Mode** submenu, scroll up or down until the desired preset name is displayed. Finally, momentarily press – 'blip' – the **SEL** button once. The **INT META** menu will *not* appear when a preset is loaded, but the values of the metadata parameters for the preset being used may be read off the read-only **O/P META** menu. Presets are loaded from the **DOLBY** menu as follows:

DOLBY	Int Mode	Film Surr	Preset: <i>Film Surround</i> .
		Film Ster	Preset: <i>Film Stereo</i> .
		Mus Ster	Preset: <i>Music Stereo</i> .
		Mus Surr	Preset: <i>Music Surround</i> .
		User 1	Preset: <i>User 1</i>
		User 2	Preset: <i>User 2</i>
		User 3	Preset: <i>User 3</i>
		User 4	Preset: <i>User 3</i>
		Manual	Non-volatile user adjust.

3.3.10 Internal Metadata – Manual Mode

In the Manual Mode the V6306 allows the user to completely configure the internal metadata to suit their purpose. Manual Mode is invoked from the **DOLBY** -> **Int Mode** submenu above and it is loaded as if it were a preset, ie. it must be 'blipped' by momentarily pressing the **SEL** button when **Manual** is displayed. This action will not change any metadata parameters, but the **INT META** menu will be visible at the main menu level. The user may change the manual settings from the controls under the **INT META** menu. The settings may also be read from the read-only **O/P META** menu.

3.3.11 Internal Metadata – Saving Presets

The configuration present in the Manual metadata set may be saved to any one of the four User Presets, **User1** to **User 4**. Controls for saving the metadata set to a preset are under **SaveUser** submenu of the **DOLBY** menu. To save a preset, first ensure that the metadata settings have been adjusted as required using the controls under the **INT META** menu while in **Manual** mode. Then go to the **DOLBY**



menu and scroll down to the **SaveUser** submenu and select it. The target preset name may be selected from a list, and 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 target preset will also become the selected item under the **Int Mode** submenu, as the parameters saved under Manual mode are still in force, but they now belong to a preset name. The **INT META** menu will *not* appear once a preset is saved, but the values of the metadata parameters for the preset being used may be read off the read-only **O/P META** menu.

DOLBY	SaveUser	User 1	int Manual metadata set => User1 preset
		User 2	int Manual metadata set => User2 preset
		User 3	int Manual metadata set => User3 preset
		User 4	int Manual metadata set => User4 preset

3.3.12 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 V6306 is encoding with Internal or External metadata.

DBY STAT	Meta I/P	s	s	Serial metadata /SDI metadata present/absent
				s = √ : There is metadata present on this source
				s = X : There is no metadata on this source
				1 st symbol relates to serial metadata I/P on rear panel
				2 nd symbol relates to metadata embedded on SDI

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

The V6306/DM can receive external metadata through the SDI and in this case there is an associated parameter called SDID which indicated which embedded channel has on it the start of the contiguous ensemble of embedded audio channels to be used for encoding.

DBY STAT	SDID	No SDID
		Gp1.1
		Gp1.2
		...
		Gp4.2

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.

DBY STAT	Meta Cfg	5.1+2
		5.1+2x1
		4+4
		4+2x2
		. . .

The Audio Coding Mode of each of the up to 8 programs within the Dolby E metadata stream can be



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found from the **MetCM Px** entries under the **DBY STAT** menu. The number of **MetCM Px** entries displayed will equal the number of programs configured within the metadata stream. For example, if **Meta Cfg** is 5.1+2, there are 2 programs and so there will be entries for **MetCM P1** and **MetCM P2**. In this case the Audio Coding Mode of **MetCM P1** and **MetCM P2** will be 3/2 and 2/0 respectively.

```

DBY STAT  MetCM P1  3/2
           2/2
           3/1
           2/1
           ...
           1/0
           MetCM P2  3/2
           ...
           MetCM P8  3/2
           ...
           1/0
  
```

3.3.13 External Metadata – Selecting the Program

If it is intended to use external metadata, the user must first select the metadata source using **Meta Src** control as described in an earlier section. Then the user should select which program to use from the external metadata stream, as the stream can contain up to 8 programs. This is done with the **Meta Pgm** control and is a two part process; the user has to first select the desired program by the usual menu method of up and down arrows, and then load the desired program's metadata into the encoder by 'blipping' the **SEL** button. The values of the metadata parameters will be displayed in the **O/P META** menu. Note that the encoder will continue using the previous setting until the **SEL** button is blipped to load the parameters.

```

DOLBY      Meta Pgm  Prog 1
           Prog 2
           Prog 3
           . . .
           Prog 8
  
```

Note: Not all programs may contain Dolby Digital Metadata segments. See STATUS Menu for details.

3.3.14 Metadata Revert

Metadata Revert decides what action to take if the V6306 is encoding AC-3 using an external metadata stream and the metadata stream fails. The user can select either to use the last valid external metadata received, or to revert to internal metadata tables.

```

DOLBY      Meta Rvt  Last Use  (default)
           Internal
  
```

The status of the reversion may be read from the **DBY STAT** menu item **Meta Rvt** which shows if the encoder is operating on external metadata or reverted metadata.

3.3.15 Bitstream Format

The encoded AC-3 bitstream can use 32 bit words and occupy the whole audio frame, using both subframes, or it can be 16 bit and occupy only subframe 1 or 2. Default is 32 bits, both subframes.



DOLBY	Dby Bits	32 bit	32-bit AC-3 code uses both X and Y subframes
		16 bit X	16-bit AC-3 code uses only X/Z subframes
		16 bit Y	16-bit AC-3 code uses only Y subframes

3.3.16 Pass though Mode and SRCs

The V6306 can be set either to place encoded AC-3 on the AC-3 output, or to pass through whatever signal is on the A1/2 to the AC-3 output. Normally this would be restricted to a PCM signal, because the Dolby Digital 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 V6306 must be turned off. Turning the SRCs off enforces the restriction that the signal on A1/2 must be pre-synchronised to the same clock reference as the V6306 is using, and the V6306 must not be set to use a free-run reference.

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

Note that when the sample rate converters are bypassed the audio encoding delay is reduced by 3ms. This is not compensated by the V6306 and the user should manually increase the encoding delay by 3ms to make up for this.

3.3.17 Data Rate

The data rate of the AC-3 bitstream may be set up from the **DOLBY** menu. It is an encoder setting and is not conveyed by metadata. The data rate in question is the rate of raw audio output data from the encoding process, not the symbol rate of the AES-3 compatible output carrier, which is constant at 6.144 Mbps. The AC-3 data rate is therefore a measure of how much the audio program is compressed.

DOLBY	DataRate	Auto 384	Default
		Auto 448	
		56 kbps	
		64 kbps	
		80 kbps	
		96 kbps	
		112 kbps	
		128 kbps	
		160 kbps	
		192 kbps	
		224 kbps	
		256 kbps	
		320 kbps	
		384 kbps	
		448 kbps	
		512 kbps	
		576 kbps	
		640 kbps	

The control shown above under the **DOLBY** allows the user to set the data rate in Internal Manual and External Metadata modes. The control is not displayed if a preset is loaded.



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The availability of certain channel modes depends on the encoder data rate and whether the LFE channel is present. For example, you can't have a mono stream with an LFE channel (1.1) or a 3/2 stream at 96 kbps. Appropriate data rates for the various audio coding modes are shown in the table below.

Audio Coding Mode	Definition and data rate
1/0	Mono From 56 kbps, usually 96 kbps
2/0	Stereo From 96 kbps, usually 192 kbps
3/0	From 256 kbps
2/1	From 256 kbps
3/1	From 320 kbps
2/2	From 320 kbps
3/2	From 384 kbps, often 448 kbps

The V6306 provides two automatic data rate options and a number of fixed options. It is recommended that one of the Auto options is used. The actual data rate that will result from the Auto options when using various audio coding modes is summarized in the following table:

Audio Coding Mode	Auto 384	Auto 448
1/0	96 kbps	96 kbps
2/0	192 kbps	256 kbps
2/1, 3/0	256 kbps	256 kbps
2/2, 3/1	320 kbps	320 kbps
3/2	384 kbps	448 kbps

The adjustment of data rate is only available in the Internal Manual Mode and the External Metadata mode. When using the fixed data rates (ie not Auto 384 or Auto 448) it is the user's responsibility to select a data rate which is appropriate for the coding mode and the application. The actual data rate being output from the encoder may be read as a status from the DBY STAT menu as follows:

```
DBY STAT  DataRate  Auto 384
                          Auto 448
                          56 kbps
                          64 kbps
                          . . .
                          448 kbps
                          512 kbps
                          576 kbps
                          640 kbps
```

If the data rate selected is too low, the encoder will ignore the setting and will use the minimum data rate appropriate for the audio coding mode. This will result in a different values being shown under the control **DOLBY** -> **DataRate** and the status **DBYSTAT** -> **DataRate**. If in doubt, use one of the Auto options.



3.3.18 Dolby (AC-3) delay

The V6306 applies a fixed delay of an integral number of frames video delay, as tabulated in Section 2.5 for the supported video input standards. So that video and audio may be co-timed going into an MPEG encoder, the V6306 automatically matches the audio encoding latency to this delay. The delay compensation is applied to all paths from all audio inputs to all audio outputs, embedded or rear panel. The user may adjust the audio encoding delay relative to the automatically matched value by using the delay adjustment is under the **DOLBY** menu as shown below:

```
DOLBY      Dby Dly      +50 ms
              ↑↓
              0 ms      Audio delay automatically matched to video
              ↑↓
              -11 ms
```

3.3.19 Output Metadata Parameters

The Output Metadata Parameters are the actual metadata parameters that the V6306 is using to encode, be they sourced from external or internal metadata or presets. The **O/P META** menu is always displayed and is read-only. For details on the individual metadata settings, see the section on **INT META**.



3.3.20 Adjusting Internal AC-3 Metadata Parameters

The **INT META** menu is only displayed when the V6306 is set to use internal metadata in Manual mode. The menu contains a large number of controls which will be discussed in the sections below.

3.3.20.1 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.

INT META	DialNorm	-1 dB	
		↑↓	
		-27dB	Default
		↑↓	
		-31dB	

3.3.20.2 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.

INT META	AC Mode	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	

3.3.20.3 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-3I encoder/decoder whether an LFE channel is present within the bitstream. Audio Coding Mode determines whether the LFE Channel parameter can be set. There must be at least three channels present to be able to add an LFE channel.

INT META	LFE Chan	LFE on	LFE channel on
		LFE off	LFE channel off



3.3.20.4 Bitstream Mode

Abbreviated to BS Mode, this universal metadata parameter describes the nature of the encoded program material. The options are:

INT META	BS Mode	MainComp	Main Complete: From 2 to 6 channels with all content. Default setting
		Mus&Effc	Music & Effects: Main serice minus the dialog channel. Usually associated with a separate Dialogue program
		VisualIm	Visually Impaired: 1 channel containing narrative description of an associated video channel.
		Hear Imp	Hearing Impaired: 1 channel containing all content , processed for increased intelligibility.
		Dialogue	Dialogue: 1 or 2 channels containing dialog. Usually associated with a separate Mus&Effc program.
		Commntry	Commentary: 1 channel with supplementary commentary
		Emergncy	Emergency: 1 channel for emergency messages with priority to mute all other programs
		VO/Karao	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.

3.3.20.5 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	None
		Film Std
		Film Lgt
		MusicStd
		MusicLgt
		Speech

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>



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3.3.20.6 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:

INT META	RFMode	None
		Film Std
		Film Lgt
		MusicStd
		MusicLgt
		Speech

3.3.20.7 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 following options are available for Centre Downmix Level, which is abbreviated **C MixLev** on the V6306.

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

3.3.20.8 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 following options are available for Surround Downmix Level, which is abbreviated **S MixLev** on the V6306:

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



3.3.20.9 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.

INT META	Dby Surr	None	Dolby Surround not indicated
		Surr off	Not Dolby Surround encoded
		Surr on	Dolby Surround encoded

3.3.20.10 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.

3.3.20.11 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.

INT META	MixLevel	80 dB	Final audio mixing level (only with Audio Product Information On)
		↑↓	
		111 dB	

3.3.20.12 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.

INT META	RoomType	None	No equalisation
		Large	X-curve equalisation
		Small	Flat equalisation



3.3.20.13 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.

3.3.20.14 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.

INT META	DMixMode	None	Not indicated.
		LtRt	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 theatre.
		LoRo	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.

3.3.20.15 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.

INT META	LtRtCMix	+3.0 dB
		+1.5 dB
		0.0 dB
		-1.5 dB
		-3.0 dB
		-4.5 dB
		-6.0 dB
		Off



3.3.20.16 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.

INT META	LtRtSMix	-1.5 dB
		-3.0 dB
		-4.5 dB
		-6.0 dB
		Off

3.3.20.17 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.

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

3.3.20.18 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.

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



3.3.20.19 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.

3.3.20.20 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** 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.

INT META	SurEXmod	Not Ind	Surround EX Status not indicated
		SrEX off	
		SrEX on	

3.3.20.21 20kHz Lowpass Filter

This universal metadata parameter is abbreviated to **LP Filtr** on the V6306. It determines whether a 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 operates 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.

INT META	LP Filtr	LPF Off	Lowpass Filter disabled
		LPF on	Lowpadd Filter enabled

3.3.20.22 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.

INT META	LFE Filtr	LFE Off	LFE channel lowpass filter disabled
		LFE on	LFE channel lowpass filter enabled



When testing the V6306 on single tones, it will be found that the encoding process can accommodate single tones as high as 500Hz through the LFE channel if the LFE Lowpass Filter is turned off, but that tones of 1kHz or more cannot be encoded. This is because there is a further anti-alias filter with cutoff at approximately 750Hz in the LFE encoding process, and this filter cannot be turned off.

3.3.20.23 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.

INT META	SurrPhse	90° Off	Surround 90° phase shift disabled
		90° On	Surround 90° phase shift enabled

3.3.20.24 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.

INT META	SurrAttn	-3dB Off	Surround channels not attenuated
		-3dB On	Surround channels attenuated -3dB

3.3.20.25 RF Overmodulation Protection

This universal metadata parameter is abbreviated **RF OvPrt** on the V6306. When **RF OvPrt** is enabled, the AC-3 encoder includes pre-emphasis in its calculations for RF Mode compression, which provides protection against over modulation when a decoded AC-3 bitstream is RF modulated. The parameter has no effect when decoding using Line mode compression.

Except in rare cases, this parameter should be disabled.

INT META	RF OvPrt	Prot off	RF overmodulation protection disabled
		Prot on	RF overmodulation protection enabled



3.4 MUX Control (V6306/DM only)

The V6306/DM can replace any one audio group Gp1. . .Gp4 in the (HD) SDI. On the selected group, for AES1 and AES2, the V6306 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 V6306 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 V6306 reference.

In the V6306 the MUX group is selected from the **MUX CTRL** menu as follows:

MUX CTRL	Mux Grp	None	Default
		Grp 1	Group 1 overwritten
		Grp 2	...
		Grp 3	...
		Grp 4	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**.

MUX CTRL	AES 1	None
		AC-3
		DMX 1.1
		...
		DMX 4.2
	AES 2	None
		...
		DMX 4.2

When embedding AC-3 onto a MUX Group the V6306/DM will replace the original embedded data (if any) on that group.

The V6306/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:

ENG'ING	Anc	Pass
		Blank

Note: Audio that has been de-embedded in the DMX and then re-embedded in the MUX is not delay-matched with embedded audio that is simply passed through on the video. This should be borne in mind when dealing with multi-channel audio programs.



3.5 (HD)SDI Input and Output

Unlike a number of other Pro-bel HD modular interface products the V6306 and V6306/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 V6306 and only carries (HD)SDI on the V6306/DM. The V6306 and V6306/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 V6306/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 V6306/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.



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3.6 System

3.6.1 Version Numbers

There are three separate items of software/firmware in the V6306 and they all have separate version numbers. These can be read on the following read only menus:

STATUS	Soft Ver	nn.nn.nn	Version of the H8S/2633 operating code
	FPGA Ver	nn.nn.nn	Version of the EP1C20 Cyclone FPGA
	DbyFWVer	nnnn	Version of the Cat559 Dolby Encoder operating code
	DbyHWVer	nnnn	Version of the Cat559 Dolby Encoder hardware
	DbyDevce	559D	Dolby Encoder product code
	CPLD Ver	nn.nn	Version of the MAX7128AETC CPLD
	PCB Ver	nn.nn	Version of the PCB
	Boot Ver	nn.nn.nn	Version of the H8 bootloader software

3.6.2 Display Sleep

Since, for the vast majority of its life, the V6306 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, **V6306**.

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

3.6.3 Display Brightness

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

ENG' ING LEDLevel █ █ █ █

3.6.4 GP I/O

GP I/O on the V6306 is only supported on the balanced rear panel **V16AR3AJ**. The rear panel type may be identified from the STATUS menu as follows:

STATUS	Rear Mod	Unbal	V6306 plugged into an unbalanced rear
		Balanced	V6306 plugged into a balanced rear
		Invalid	Incorrect rear

The V6306 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 and are active LOW.

GPI 1, GPI 2 and GPI 3 have TTL compatible Schmitt trigger logic thresholds, ie $V_{in} > 2.0$ is interpreted as logic 1 and $V_{in} < 0.8V$ is interpreted 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. The inputs have 10k ohm resistor pullups to 3.3V

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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. Like GP1 1 to GPI 3, GPI 4 is asserted LOW. 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**.

CONFIG	GPI 4	none AES I/P SDID I/P Eng I/P Ref SDI Ref REF Meta P1 Meta P2 Meta P3 Meta P4 Meta Int Meta SDI Meta Ser Dby Enc	GPI4 disabled GPI4 input, sets inputs from rear panel AES GPI1 input, sets inputs from DMX channels as specified in SDID GPI4 input, sets inputs as set under ENG'ING menu GPI4input, sets ref source to force SDI GPI4 input, sets ref source to force REF GPI4 input, sets Metadata source to Internal GPI4 input, sets Metadata source to External SDI GPI4 input, sets Metadata source to External Serial GPI output: Dolby bitsream being produced
---------------	--------------	---	---

The Status of individual GPI may be read from the **STATUS** Menu. An Up Arrow indicates the input is high and a down arrow indicates the input is low (switched to GND)

STATUS	GPI	1↑2↑3↓4↑	↑ means GPI is active Input is active when connected to GND or connected to V_{in} where $V_{in} < 0.8V$ ↓ means GPI is not active Input is inactive when left open or connected to V_{in} , where $2.0V \leq V_{in} \leq 5.0V$
---------------	------------	----------	--



4 Calibration

4.1 Set-Up

The V6306 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:

CALIB	Cal Mode	OFF	n	The Calibration Menu below is locked to prevent accidental change.
		ON		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 V6306 has been set to **On**.

CALIB	Free	+127		Frequency trim on free run VCXO
		↑		
		0	n	
		↓		
		-128		
	Norm	N *****		



5 Menu 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'.



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5.1 Menu Structure

5.1.1 V6306

I/P SEL	I/P DLY	IP PHASE	I/P GAIN	DOLBY	INT META ¹	O/P META	DBY STAT	STATUS	ENG' ING	CALIB	CONFIG	TEST
I/P Sel	Dly Dby1	Phs Dby1	Gn Dby1	Meta Src	DialNorm	DialNorm	Meta I/P	Variant	Ref Src	Free	Def F/R	FPGA
Norm	Dly Dby2	Phs Dby2	Gn Dby2	Meta Pgm	AC Mode	AC Mode	Ext Meta	Options	Dby 1/2 ³	Norm	GPI1 ⁴	DebugO/P
	Dly Dby3	Phs Dby3	Gn Dby3	Int Mode	LFE chan	LFE chan	Meta Cfg	AES I/P	Dby 3/4 ³		GPI2 ⁴	DART Log
	Dly Dby4	Phs Dby4	Gn Dby4	SaveUser ¹	BS Mode	BS Mode	Meta Rvt	SDI I/P	Dby 5/6 ³		GPI3 ⁴	DisClas7
	Dly Dby5	Phs Dby5	Gn Dby5	SRC	LineMode	LineMode	Dby Enc	Ref I/P	Sleep		GPI4 ⁴	
	Dly Dby6	Phs Dby6	Gn Dby6	Meta Rvt	RFMode	RFMode	ACL Mode	Ref Src	LEDlevel		Banner	
	Norm	Norm	Norm	Dby Bits	C MixLev	C MixLev	DataRate	Ref Std	Norm		Password	
				Enc Mode	S MixLev	S MixLev	MetCM P1 ²	GPI ⁴			Option	
				Dby Del	Dby Surr	Dby Surr	MetCM P2 ²	Free run			I/P Mode	
				DataRate	AProdInf	AProdInf	MetCM P3 ²	Sub-Mod			PCB Rev	
				Norm	MixLevel	MixLevel	MetCM P4 ²	I/O Mod			H/W Rev	
					RoomType	RoomType	MetCM P5 ²	Rear Mod			TestMode	
					Ext BSI1	Ext BSI1	MetCM P6 ²	Soft ver			Factory	
					DMixMode	DMixMode	MetCM P7 ²	FPGA ver			Norm	
					LtRtCMix	LtRtCMix	MetCM P8 ²	DbyFWVer				
					LtRtSMix	LtRtSMix	Dby 1/2	DbyHWVer				
					LoRoCMix	LoRoCMix	Dby 3/4	DbyDevce				
					LoRoSMix	LoRoSMix	Dby 5/6	CPLD ver				
					Ext BSI2	Ext BSI2		PCB ver				
					SurEXmod	SurEXmod		Boot ver				
					LP Filtr	LP Filtr						
					LFE Filt	LFE Filt						
					SurrPhse	SurrPhse						
					SurrAttn	SurrAttn						
					RF OvPrt	RF OvPrt						
					Norm							

Visible if AProdInf On.

Visible if Ext BSI1 On.

Visible if Ext BSI2 On.

1. INT META menu and SaveUser in the DOLBY menu are visible in Int Mode Manual only.

2. MetCM P1-8 visibility depends on number of external metadata programs available.

3. Visible in ENG'ING menu if I/P Sel control set to Eng'ing

4. Visible if balanced rear fitted.

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5.1.2 V6306/DM

I/P SEL	I/P DLY	IP PHASE	I/P GAIN	DOLBY	INT META ¹	O/P META	MUX CTRL	DBY STAT	STATUS	ENG' ING	CALIB	CONFIG	TEST
I/P Sel	Dly Dby1	Phs Dby1	Gn Dby1	Meta Src	DialNorm	DialNorm	Mux Grp	Meta I/P	Variant	Ref Src	Free	Def F/R	FPGA
Norm	Dly Dby2	Phs Dby2	Gn Dby2	Ext Meta	AC Mode	AC Mode	AES 1	Ext Meta	Options	Dby 1/2 ³	Norm	GPI1 ⁴	DebugO/P
	Dly Dby3	Phs Dby3	Gn Dby3	Meta Pgm	LFE chan	LFE chan	AES 2	SDID	AES I/P	Dby 3/4 ³		GPI2 ⁴	DART Log
	Dly Dby4	Phs Dby4	Gn Dby4	Int Mode	BS Mode	BS Mode	Norm	Meta Cfg	DMX GP1	Dby 5/6 ³		GPI3 ⁴	DisClas7
	Dly Dby5	Phs Dby5	Gn Dby5	SaveUser ¹	LineMode	LineMode		Meta Rvt	DMX GP2	Sleep		GPI4 ⁴	
	Dly Dby6	Phs Dby6	Gn Dby6	SRC	RFMode	RFMode		Dby Enc	DMX GP3	LEDlevel		Banner	
	Norm	Norm	Norm	Meta Rvt	C MixLev	C MixLev		ACL Mode	DMX GP4	Norm		Password	
				Dby Bits	S MixLev	S MixLev		DataRate	SDI I/P			Option	
				Enc Mode	Dby Surr	Dby Surr		MetCM P1 ²	Ref I/P			I/P Mode	
				Dby Del	AProdInf	AProdInf		MetCM P2 ²	Ref Src			PCB Rev	
				DataRate	MixLevel	MixLevel		MetCM P3 ²	Ref Std			H/W Rev	
				Norm	RoomType	RoomType		MetCM P4 ²	GPI ⁴			TestMode	
					Ext BSI1	Ext BSI1		MetCM P5 ²	Free run			Factory	
					DMixMode	DMixMode		MetCM P6 ²	Sub-Mod			Norm	
					LtRtCMix	LtRtCMix		MetCM P7 ²	I/O Mod				
					LtRtSMix	LtRtSMix		MetCM P8 ²	Rear Mod				
					LoRoCMix	LoRoCMix		Dby 1/2	Soft ver				
					LoRoSMix	LoRoSMix		Dby 3/4	FPGA ver				
					Ext BSI2	Ext BSI2		Dby 5/6	DbyFWVer				
					SurEXmod	SurEXmod			DbyHWVer				
					LP Filtr	LP Filtr			DbyDevce				
					LFE Filt	LFE Filt			CPLD ver				
					SurrPhse	SurrPhse			PCB ver				
					SurrAttn	SurrAttn			Boot ver				
					RF OvPrt	RF OvPrt							
					Norm								

Visible if AProdInf On.

Visible if Ext BSI1 On.

Visible if Ext BSI2 On.

1. INT META menu and SaveUser in the DOLBY menu are visible in Int Mode Manual only.

2. MetCM P1-8 visibility depends on number of external metadata programs available.

3. Visible in ENG' ING menu if I/P Sel control set to Eng'ing

4. Visible if balanced rear fitted.



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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		^N *****	

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 5
Norm		^N *****		

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
	Norm		^N *****	



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
Norm	N			

5.2.5 Dolby Controls

DOLBY	Meta Src	Ext meta	n	Metadata sourced from external serial stream – see also Ext Meta if \DM and Meta Rvt under ENG-ING	
		Int meta		Metadata sourced from internal defaults.	
	Ext Meta	Ser meta		/DMX only. Metadata sourced from serial stream.	
		SDI meta		/DMX only. Metadata sourced from SDI.	
	Meta Pgm	Prog 1	n	Applicable only if Meta Src => Ser or SDI meta	
		Prog 2		Note: Not all programs may contain Dolby Digital Metadata segments. See STATUS Menu for details.	
		Prog 3		Range of control is limited by the number of programs available in the external metadata.	
		Prog 4			
		Prog 5			
		Prog 6			
		Prog 7			
		Prog 8			
	Int Mode	Flm Surr	n	Preset: <i>Film Surround.</i>	Only if Meta Src => Int meta Momentarily press Sel button to load Preset, otherwise it reverts to previous selection after 15sec.
		Flm Ster		Preset: <i>Film Stereo.</i>	
		Mus Ster		Preset: <i>Music Stereo.</i>	
		Mus Surr		Preset: <i>Music Surround.</i>	
		User 1		Preset: <i>User 1</i>	
		User 2		Preset: <i>User 2</i>	
		User 3		Preset: <i>User 3</i>	
		User 4		Preset: <i>User 3</i>	
	Manual		Non-volatile user adjust.		
	SaveUser	User 1		int Manual -> User 1	Momentarily press Sel button to save Preset.
		User 2		int Manual -> User 2	
		User 3		int Manual -> User3	
		User 4		int Manual -> User 4	
	SRC	Normal	n		
Bypass			Ref must be synchronous with the encoder audio inputs to use this setting.		



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Meta Rvt	Last Use	n	If Meta Src = Ser meta/SDI meta, metadata source reverts to last valid serial/SDI metadata if external metadata fails
	Int		If Meta Src = Ser meta/SDI meta, metadata source reverts to internal metadata if external meta fails
Dby Bits	32 bit	n	AC-3 code occupies both subframes
	16 bit X		AC-3 code occupies only X/Z subframe
	16 bit Y		AC-3 code occupies only Y/Z subframe
Enc Mode	Encode	n	
	Passthru		Dby A will be passed through to AC-3 output
Dby Del	+50 ms		Encoding latency (delay) in ms, relative to the video delay
	↑↓		
	0 ms	n	Corresponds to 6 video frames (all standards)
	↑↓ -11 ms		
DataRate	Auto 384	n	Available only in External Metadata or Internal Manual mode
	Auto 448		
	56 kbps		
	64 kbps		
	80 kbps		
	96 kbps		
	112 kbps		
	128 kbps		
	160 kbps		
	192 kbps		
	224 kbps		
	256 kbps		
	320 kbps		
	384 kbps		
	448 kbps		
	512 kbps		
576 kbps			
640 kbps			
Norm	N *****		



5.2.6 Internal Metadata Controls

5.2.7 Output Metadata Status

INT META All parameters available in Int Mode	DialNorm	-1 dB		Dialog Level	
		↑↓			
		-27dB	n		
		↑↓			
			-31dB		
	AC Mode	3/2	n	Dolby Digital® Audio Channel Mode (coding mode). (n Front channels) / (n Surround channels)	
		2/2			
		3/1			
		2/1			
		3/0			
		2/0			
		1/0			
	LFE chan	LFE on	n	LFE (subwoofer) channel	
		LFE off		LFE (subwoofer) channel OFF	
	BS Mode	MainComp	n	Main Complete – Bitstream Mode	
		Mus&Effc		Music & Effects	
		VisualIm		Visually Impaired	
		Hear Imp		Hearing Impaired	
		Dialogue		Dialogue	
		Commntry		Commentary	
		Emergency		Emergency	
		VO/Karao		Voice Over/Karaoke	
	LineMode	None		“Line Mode” Dynamic Range Profile	
		Film Std	n		
		Film Lgt			
		MusicStd			
		MusicLgt			
		Speech			
	RFMode	None		RF Mode Compression Profile	
		Film Std	n		
		Film Lgt			
		MusicStd			
MusicLgt					
Speech					
C MixLev	-3.0 dB	n	Centre downmix level		
	-4.5 dB				
	-6.0 dB				



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Continued...

<p>Extended Bitstream 1 Parameters</p> <p>Available in Manual mode and when using external metadata with Ext BS11 on</p> <p>”</p>	S MixLev	-3.0 dB	n	Surround downmix level	
		-6.0 dB			
		Off			
	Dby Surr	Not Ind			Dolby Surround not indicated
		Surr off	n		Not Dolby Surround encoded
		Surr on			Dolby Surround encoded
	AProdInf	None	n		No Audio Product Information
		Exists			Audio Product Information exists
	MixLevel	80 dB			Final audio mixing level
		↑↓			(only with Audio Product Information ON)
		105 dB	n		
		↑↓			
	RoomType	Not Ind	n		Room Type (only with Audio Product Information ON)
		Large			
		Small			
	Ext BS11	BS11 off			Extended Bitstream Information 1
		BS11 on	n		When on, enables items below
	DMixMode	Not Ind			Not indicated.
		LtRt	n		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 theatre.
		LoRo			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.
	LtRtCMix	+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			
	LtRtSMix	-1.5 dB			LtRt Surround Mix Level
		-3.0 dB	n		
-4.5 dB					
-6.0 dB					
Off					



Continued...

Extended Bitstream 2 Parameters Available in Manual Mode with Ext BS11 & Ext BS12 on	LoRoCMix	+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		
	LoRoSMix	-1.5 dB		LoRo Surround Mix Level
		-3.0 dB	n	
		-4.5 dB		
		-6.0 dB		
		Off		
	Ext BS12	BSI2 off		Extended Bitstream Information 2
		BSI2 on	n	When on, enables items below
	SurrndEX	Not Ind	n	Surround EX Mode status not indicated
		SrEX off		
		SrEX on		
	LP Filt	LPF Off		Lowpass Filter
		LPF On	n	
	LFE Filt	LFE Off		LFE Channel Lowpass Filter
		LFE On	n	
	SurrPhse	90° Off		Surround 90 degrees Phase Shift Filter
		90° On	n	
	SurrAttn	-3dB off	n	Surround channels not attenuated
		-3dB on		Surround channels attenuated -3dB
	RF OvPrt	Prot off	n	RF Overmodulation Protection
Prot on				
Norm	^N		INT META menu only	



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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	
		AC-3			
		DMX G1.1		DMX Gx.x and AESx must be synchronous with the V6306 reference	
		DMX G1.2			
		DMX G2.1			
		DMX G2.2			
		DMX G3.1			
		DMX G3.2			
		DMX G4.1			
		DMX G4.2			
		AES A			
		AES B			
		AES C			
		AES D			
	AES 2	Silence	n		Only on /DM version
		AC-3			
		DMX G1.1		DMX Gx.x and AESx must be synchronous with the V6306 reference	
		DMX G1.2			
		DMX G2.1			
DMX G2.2					
DMX G3.1					
DMX G3.2					
DMX G4.1					
DMX G4.2					
AES A					
AES B					
AES C					
AES D					
Norm	N *****				



5.2.9 Dolby Status

DBY STAT	Meta I/P	Meta s s	Serial metadata /SDI metadata present/absent S = √ : There is metadata present on this source s = X : There is no metadata on this source 1 st symbol relates to serial metadata I/P on rear panel 2 nd symbol relates to metadata embedded on SDI
	Ext Meta	Absent	Metadata not present
		Invalid	Metadata invalid
		No AC-3	Metadata does not include AC-3
		Valid	Valid but no extended BSI
		ValidBSI	Valid with extended BSI
	SDID	No SDID	
		Gp1.1	This status indicates the start channel of the program ensemble for which embedded metadata is present. The program ensemble can consist of 2 to 8 channels
		Gp1.2	
		Gp2.1	
		Gp2.2	
		Gp3.1	
		Gp3.2	
		Gp4.1	
		Gp4.2	
	Meta Cfg	none	
		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	
		4+2	
		4+2x1	
		3x2	
		2x2+2x1	
		2+4x1	
6x1			
4			
2+2			
2+2x1			
4x1			
7.1			
7.1Scr			
Meta Rvt	Rvt Meta	Encoder operating on reversion metadata (rear panel)	
	Ext Meta	Encoder operating on external metadata	



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Continued...

	Dby Enc	Active		Dolby Digital AC-3 bitstream is being generated
		Stopped		No output
		Passthru		Mode set to pass through
	ACL Mode	3/2		Same as AC Mode under INT META and O/P META but includes status of LFE Chan.
		3/1		
		3/0		
		2/2		
		2/1		
		2/0		
		1/0		
		3/2L		
		3/1L		
		3/0L		
	DataRate	Auto 384	n	Data rate being output by the encoder
		Auto 448		
		56 kbps		
		64 kbps		
		80 kbps		
		96 kbps		
		112 kbps		
		128 kbps		
		160 kbps		
		192 kbps		
		224 kbps		
		256 kbps		
		320 kbps		
		384 kbps		
448 kbps				
512 kbps				
576 kbps				
640 kbps				
MetCM P1	3/2		Channel Mode of serial/SDI metadata Program 1	
	2/2			
	3/1			
	2/1			
	3/0			
	2/0			
	1/0			
MetCM P2	options as above		Audio Channel Mode of serial/SDI metadata Program 1	
MetCM P3	options as above		Audio Channel Mode of serial/SDI metadata Program 1	
MetCM P4	options as above		Audio Channel Mode of serial/SDI metadata Program 1	
MetCM P5	options as above		Audio Channel Mode of serial/SDI metadata Program 1	
MetCM P6	options as above		Audio Channel Mode of serial/SDI metadata Program 1	



Continued...

	MetCM P7	options as above	Audio Channel Mode of serial/SDI metadata Program 1
	MetCM P8	options as above	Audio Channel Mode of serial/SDI metadata Program 1
	Dby 1/2	L R	for information – mandatory input channel assignments.
		0C 1C	
		off off	
	Dby 3/4	C LFE	
		C off	
		off C	
		off off	
	Dby 5/6	Ls Rs	
		S off	
off off			

5.2.10 Status

STATUS	Variant	V6306		
		V6306DM		
	Options	No optns	n	
		DMUX+MUX		if DMX option installed
	AES I/P	As Bs Cs		Rear panel AES inputs present/absent s = √ : There is data on this AES s = X : There is nothing on this AES
	DMX GP1	G1 s s		if DMX/MUX option installed first symbol ó Gp1.1, 2 nd symbol ó Gp1.2 s = √ : There is data on this AES
		. . .		
		. . .		s = X : There is nothing on this AES
	DMX GP2	G2 s s		Symbols as above for Gp 1
	DMX GP3	G3 s s		Symbols as above for Gp 1
	DMX GP4	G4 s s		Symbols as above for Gp 1
	SDI I/P	NO I/P		
		NO STD		
		720p59		
		720p60		
		720p29		
		720p30		
		720p50		
		720p25		
		720p23		
720p24				
1080i59				
1080i60				
1080p29				
1080p30				
1080i50				
1080p25				
1080p23				



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		1080p24	
		1080sf23	
		1080sf24	
		1035i59	
		1035i60	
		576p50	
		525i59	
		625i50	
	Ref I/P	Ref X	Ref status is displayed if the selected reference is Auto, SDI or Ref
		Ref 59√	"
		Ref 60√	"
		Ref 29√	"
		Ref 30√	"
		Ref 50√	"
		Ref 25√	"
		Ref 23√	"
		Ref 24√	"
	Ref Src	Ref SDI	Current source of the reference
		Ref REF	
		Ref FREE	
	Ref Std GPI	As SDI Std	Current reference standard s = ↑ : signal is asserted s = ↓: signal not asserted
		1s2s3s4s	
	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
	Dby 1/2	AES A	n	This control sets input A selection for Eng'ing mode on I/P SEL menu. 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		This control sets input B selection for Eng'ing mode on I/P SEL menu Default AES B (not /DM), Gp1.2 (/DM)
	Dby 5/6	options as above		This control sets input C selection for Eng'ing mode on I/P SEL menu Default AES C (not /DM), Gp2.1 (/DM)
	Sleep	Zz 30 min		
		↑		
		Zz 5 min	n	
		↑		
	Zz 0 min		Set sleep = 0 to disable sleep function	
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
		↑		
		0	n	
		↓		
		-128		
	Norm	N *****		



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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			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 ENG'ING menu
	Ref GPI			GPI1 input, sets ref source to force GPI
	Ref REF			GPI1 input, sets ref source to force REF
	Flm Surr			GPI1 input, sets Preset for Int meta: <i>Film Surround</i>
	Flm Ster			GPI1 input, sets Preset for Int meta: <i>Film Stereo</i>
	Mus Ster			GPI1 input, sets Preset for Int meta: <i>Music Stereo</i>
	Mus Surr			GPI1 input, sets Preset for Int meta: <i>Music Surround</i>
	Meta P1			GPI1 input, selects metadata Program 1
	Meta P2			GPI1 input, selects metadata Program 2
	Meta P3			GPI1 input, selects metadata Program 3
	Meta P4			GPI1 input, selects metadata Program 4
	Meta Int			GPI1 input, sets Metadata source to Internal
	Meta GPI			GPI1 input, sets Metadata source to GPI
	Meta Ser			GPI1 input, sets Metadata source to serial
	GPI 2	Off		
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
Eng I/P				GPI2 input, sets inputs as set under ENG'ING menu
Ref GPI				GPI2 input, sets ref source to force GPI
Ref REF				GPI2 input, sets ref source to force REF
Flm Surr				GPI1 input, sets Preset for Int meta: <i>Film Surround</i>
Flm Ster				GPI1 input, sets Preset for Int meta: <i>Film Stereo</i>
Mus Ster				GPI1 input, sets Preset for Int meta: <i>Music Stereo</i>
Mus Surr				GPI1 input, sets Preset for Int meta: <i>Music Surround</i>
Meta P1				GPI1 input, selects metadata Program 1
Meta P2				GPI1 input, selects metadata Program 2
Meta P3				GPI1 input, selects metadata Program 3
Meta P4				GPI1 input, selects metadata Program 4
Meta Int				GPI1 input, sets Metadata source to Internal
Meta GPI				GPI1 input, sets Metadata source to GPI
Meta Ser				GPI1 input, sets Metadata source to serial
GPI 3		Off		
	I/P AES			GPI3 input, sets I 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 ENG'ING menu
	Ref GPI			GPI3 input, sets ref source to force GPI
	Ref REF			GPI3 input, sets ref source to force REF
	Flm Surr			GPI1 input, sets Preset for Int meta: <i>Film Surround</i>

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	Flm Ster		GPI1 input, sets Preset for Int meta: <i>Film Stereo</i>
	Mus Ster		GPI1 input, sets Preset for Int meta: <i>Music Stereo</i>
	Mus Surr		GPI1 input, sets Preset for Int meta: <i>Music Surround</i>
	Meta P1		GPI1 input, selects metadata Program 1
	Meta P2		GPI1 input, selects metadata Program 2
	Meta P3		GPI1 input, selects metadata Program 3
	Meta P4		GPI1 input, selects metadata Program 4
	Meta Int		GPI1 input, sets Metadata source to Internal
	Meta SDI		GPI1 input, sets Metadata source to SDI
	Meta Ser		GPI1 input, sets Metadata source to serial
GPI 4	Off		GPI4 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
	Eng I/P		GPI2 input, sets ginputs as set under ENG'ING menu
	Ref SDI		GPI2 input, sets ref source to force SDI
	Ref REF		GPI2 input, sets ref source to force REF
	Flm Surr		GPI1 input, sets Preset for Int meta: <i>Film Surround</i>
	Flm Ster		GPI1 input, sets Preset for Int meta: <i>Film Stereo</i>
	Mus Ster		GPI1 input, sets Preset for Int meta: <i>Music Stereo</i>
	Mus Surr		GPI1 input, sets Preset for Int meta: <i>Music Surround</i>
	Meta P1		GPI1 input, selects metadata Program 1
	Meta P2		GPI1 input, selects metadata Program 2
	Meta P3		GPI1 input, selects metadata Program 3
	Meta P4		GPI1 input, selects metadata Program 4
	Meta Int		GPI1 input, sets Metadata source to Internal
	Meta SDI		GPI1 input, sets Metadata source to SDI
	Meta Ser		GPI1 input, sets Metadata source to serial
	Dby Enc		GPI output: Dolby bitstream being produced
Banner	On		Warning banner enabled when in display Sleep state
	Off	n	
Password	*****		Password entry for restricted options
Options	None		Selects standard functionality
	DMX+MUX		Selects /DM functionality
I/P Mode	Auto		V6306 reconfigures on SDI HD/SD input change
	HD		V6306 locked to HD configuration
	SD		V6306 locked to SD configuration
PCB Rev	15		Sets PCB version:
	↑		A= 1, B=2, etc
	0		<i>Password required. level 2: 29876.</i>
H/W Rev	15		Sets ECN mod status:
	↑		A=First = 1, B=second = 2, etc
	0		<i>Password required. Level 2: 29876</i>
TestMode	On		Controls TEST menu availability
	Off	n	



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	Factory	On		Enables factory debug mode
		Off	n	
	Norm	N *****		

5.2.14 Test Mode

TEST	FPGA	Load	n	Controls whether FPGA loaded from FLASH
		No Load		
	DebugO/P	Off		Standard debug dump to RS232 comms
		On		
	DART Log	Off	n	enables DART logging
		On		
	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 V6306. If there is no control from the front panel first check that the switch is set to Local.

6.2 Dolby Encoding

Symptom	Possible explanation
There is no AC-3 output from the rear panel connector	<ol style="list-style-type: none"> 1. Check whether the encoder is encoding by looking at Dby Enc on the DBY STAT menu. If this shows error then: 2. Check status of SDI input and B/B references REF on the STATUS menu. 3. Check the Ref. Loop slide switch on the rear panel is in the correct position.
There is AC-3 output from the rear panel connector but not on the embedded output.	<ol style="list-style-type: none"> 1. Check that the SDI video standard on the input is valid by looking under the STATUS menu. 2. Check on the that the module is a V6306/DM by looking at Variant on the STATUS menu. 3. Check that the MUX Grp on MUX CTRL menu is set to the group you are monitoring. 4. Check that you are monitoring on the right group. 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.
AC-3 output is present but it is not correctly encoded. There is silence/noise/channels mixed up.	<ol style="list-style-type: none"> 1. If using Internal Manual metadata, check that you have set the AC Mode (internal program configuration) correctly on the INT META menu. 2. If using External metadata check on the STATUS menu that it is present, you have selected it as the Meta src on the DOLBY menu. 3. If using External metadata look at Meta Cfg on the STATUS menu to check that the program configuration shown is what you think it should be. Check also that you have selected the right program from the external metadata stream using Meta Pgm under DOLBY menu. The AC Mode of each program is displayed under the DBY STAT menu 4. Check that the input channel selections are correct for the program configuration in use in accordance with the Dolby convention. Look at I/P SEL menu and Dby A...Dby C on the DOLBY menu. 5. Look on the STATUS 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 and it's what is expected.
The V6306 is embedding AC-3 correctly on the selected group's AES 1, but the DMX channel selected for AES 2 has clicks and pops corrupting the audio.	<ol style="list-style-type: none"> 1. The incoming audio on the DMX that you have selected for AES 2 is not synchronous with the video reference you are applying to the V6306. Ensure that all AES from DMX that you wish to re-embed is pre-synchronised with the video reference. Just because the incoming video is that used for V6306 reference doesn't mean the audio embedded on that video is synchronous to it, because HD supports asynchronous embedded audio. 2. The AES from the DMX that you wish to re-embed is properly synchronised with the video ref to the V6306. If this is the case, check that the V6306 is actually operating on the desired reference.



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The V6306 is encoding AC-3 5.1 with input of simple tones. On decoding, Ch Dby 4 gives no output.	Check the tone frequency on Dby 4 input. <ol style="list-style-type: none"> 1. If the tone frequency is much greater than 500Hz it cannot be encoded under any circumstances. 2. If the tone frequency is less than 500Hz but more than 120Hz, it will only be encoded if the LFE filter is set to off. See section
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6.3 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	The unit is probably in Remote mode. The panel is still life for monitoring.
No remote control available	Old V606 rack controller is used. Exchange it for a V6081 rack controller

6.4 Initialization, Power On-Selftest & Error Messages

On power up the V6306 performs a sequence of operations and a self-test to set itself up for use as an AC-3 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



6.5 Metadata Presets

Metadata Param	Stereo Film	Stereo Music	Surround Film	Surround Music
Dialogue Level	-27dB	-27dB	-27dB	-27dB
Audio Coding Mode	2/0 Stereo	2/0 Stereo	3/2	3/2
LFE Channel	Disabled	Disabled	Enabled	Disabled
Data Rate	192 kbps	256 kbps	448 kbps	448 kbps
Bitstream Mode	Main Complete	Main Complete	Main Complete	Main Complete
Line Mode Profile	Film Standard	Music Standard	Film Standard	Music Standard
RF Mode Profile	Film Standard	Music Standard	Film Standard	Music Standard
RF Ov Protect	Disabled	Disabled	Disabled	Disabled
Centre Downmix	0.707 (-3 dB)	0.707 (-3 dB)	0.707 (-3 dB)	0.707 (-3 dB)
Surround Downmix	0.707 (-3 dB)	0.707 (-3 dB)	0.707 (-3 dB)	0.707 (-3 dB)
Dolby Surround	Dolby Surrnd	Not Dolby Surrnd	Not Dolby Surrnd	Not Dolby Surrnd
Audio Prod Info	Yes	Yes	Yes	Yes
Mixing Level	85 dB	80 dB	85 dB	80 dB
Room Type	Not Indicated	Not Indicated	Not Indicated	Not Indicated
Copyright	Yes	Yes	Yes	Yes
Original Bitstream	Yes	Yes	Yes	Yes
Extended BSI 1 & 2	Exists	Exists	Exists	Exists
Preferred Downmix	Lt/Rt	Lo/Ro	Lt/Rt	Lo/Ro
Lt/Rt Cntr Downmix	0.707 (-3 dB)	0.707 (-3 dB)	0.707 (-3 dB)	0.707 (-3 dB)
Lt/Rt Surr Downmix	0.707 (-3 dB)	0.707 (-3 dB)	0.707 (-3 dB)	0.707 (-3 dB)
Lo/Ro Cntr Downmix	0.707 (-3 dB)	0.707 (-3 dB)	0.707 (-3 dB)	0.707 (-3 dB)
Lo/Ro Surr Downmix	0.707 (-3 dB)	0.707 (-3 dB)	0.707 (-3 dB)	0.707 (-3 dB)
Dolby Surrnd EX	Not Dolby EX	Not Dolby EX	Not Dolby EX	Not Dolby EX
A/D Converter Type	Standard	Standard	Standard	Standard
De-emphasis	Autodetect	Autodetect	Autodetect	Autodetect
DC Filter	Enabled	Enabled	Enabled	Enabled
Lowpass Filter	Enabled	Enabled	Enabled	Enabled
LFE Lowpass Filter	Enabled	Enabled	Enabled	Enabled
Surrnd 3dB Atten	Disabled	Disabled	Disabled	Enabled
Surrnd Phase Shift	Disabled	Disabled	Enabled	Enabled



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6.6 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
PA922A V1_0	20-11-08	Initial version. No DMX/MUX support
PA922B V2_0	06-02-09	DMX/MUX support provided. No support for embedded metadata or SDID No support for slow frame rate video inputs